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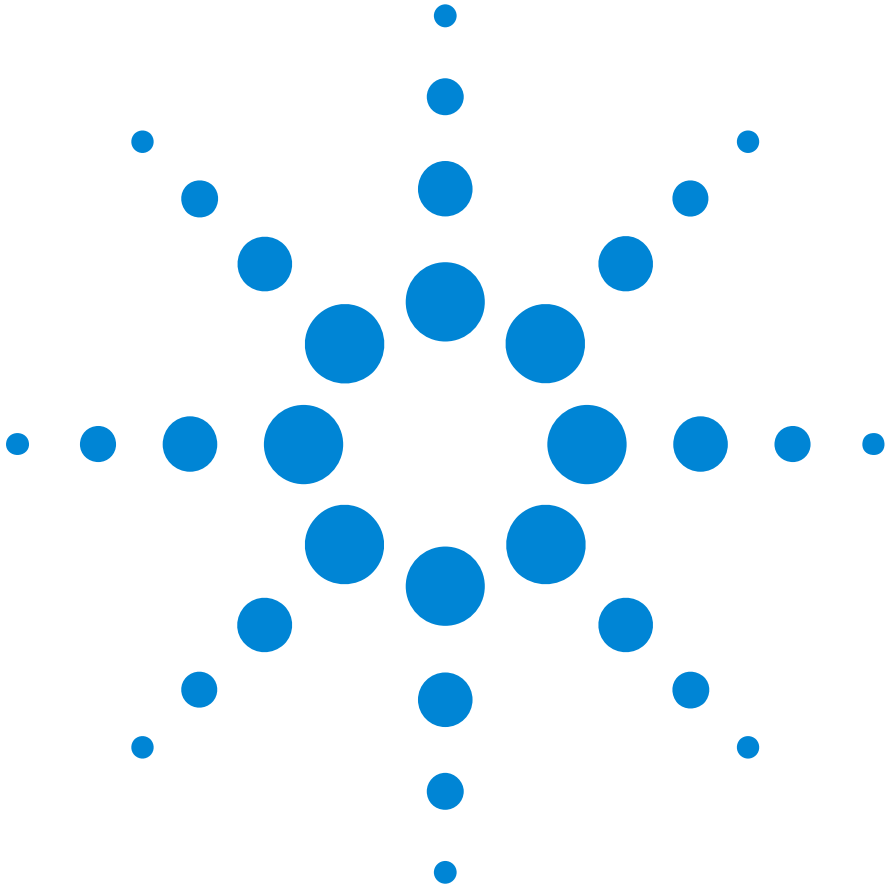
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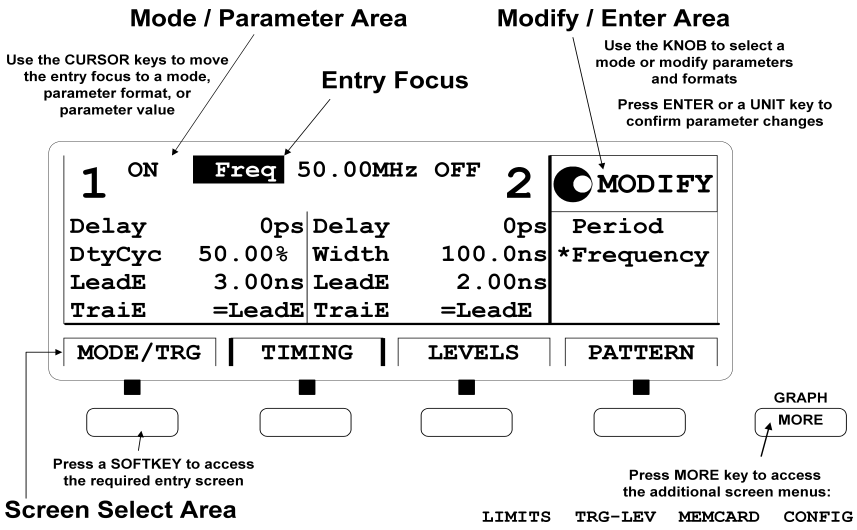
Agilent 81110A 165/330 MHz
Agilent 81104A 80 MHz Pulse/Pattern Generators

Quick Start Guide



Agilent Technologies

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Quick Start Guide

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

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About this Book

This quick start guide helps you to quickly get familiar with the features and the user interface of the Agilent 81110A Pulse Generator.

The information is valid for Agilent 81104A and Agilent 81110A. Where required the differences are explicitly mentioned. Possible configurations are:

Output Modules for 81104A Mainframe

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

Output Modules for 81110A Mainframe

Module	Description	Max Quantity
81111A	10V/ max. 165 MHz Output Channel	2
81112A	3.8V/ max. 330 MHz Output Channel	2

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

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Chapter 1 "Introducing the 81110A/81104A Pulse and Pattern Generators" on page 15 gives a general overview of the Agilent 81110A, its features, the user interface, and the steps required for operating the instrument.

Chapter 2 "Getting Started" on page 31 gives the setup information for some real-world signal examples, which can easily be used by varying only some parameter values.

Chapter 3 "Using the 81110A/81104A" on page 59 provides complete information on the user interface screens.

Installation and maintenance are described in *Appendix A "Installation & Maintenance" on page 111*.

For specifications and information on operating the instrument by means of remote control, please refer to the *Reference Guide*, p/n 81110-91021.

Conventions Used in this Book

This book uses certain conventions to indicate elements of the Agilent 81110A's user interface. The following table shows some examples:

Softkeys	Press the MODE/TRG softkey to access the Mode/ Trigger screen.
Hardkeys	Press the MORE key to switch to the alternative softkey layout.
Alternate Keys	Press SHIFT + 0 (ON/OFF1) to switch on output 1. The alternate key label—which is selected by pressing the SHIFT key—is given in parentheses.
Screen Quotes	Move the entry focus down to PULSE-PERIOD and turn the knob to select INTERNAL PLL.
Entry Focus	The highlight field, that can be moved with the cursor keys, to change modes, parameters, or parameter formats.

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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 a protective earth contact. Do not negate the protective action by using an extension power cord without a protective grounding conductor. Grounding one conductor of a two-conductor outlet is not sufficient protection.

Service instructions are for trained service personnel. 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.

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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.

In the manuals:

WARNING **Warnings call 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 until the indicated conditions are fully understood and met.**

CAUTION Cautions call 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 until the indicated conditions are fully understood and met.

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1 Introducing the 81110A/81104A Pulse and Pattern Generators

The purpose of the introduction chapter is to give a general overview of the 81110A/81104A.

The main features and use models are described in *"What you can do with the 81110A/81104A" on page 16*.

Operating the instrument via the front panel user interface is described in *"The Front Panel" on page 18* and *"Operating the 81110A/81104A" on page 20*.

"Help is Available" on page 29 shortly introduces the 81110A/81104A's on-line help system.

Finally, *"The Rear Panel" on page 30* takes a look at the back of the 81110A/81104A.

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What you can do with the 81110A/81104A

This section introduces the basic features and use models of the 81110A/81104A Pulse and Pattern Generators.

Basic Features

The Pulse and Pattern Generators generate all standard pulses, digital patterns and multi-level waveforms needed to test all current logic technologies (such as TTL, CMOS, ECL, PECL, LVDS, GTL) and other digital designs up to 330 MHz.

The instruments provide a reliable and wide range of signals, which can be used in even more applications than its predecessor, the Agilent 8110A. This is due to enhancements made in the feature set and specifications of the Agilent 8110A. The glitch and drop out free varying of any timing parameter and the timing calibration feature of the Agilent 81110A/81104A contribute to more accurate and confident characterizations of the DUTs.

Benchtop Testing

The 81110A/81104A feature a graphic display showing all pulse parameters at a glance. The cursor keys and the modify knob allow fast and simple operation.

The user interface is designed to minimize the time invested in getting familiar with the instrument. After familiarization, the instrument supports quick setups of signals. This leaves you free to concentrate on the measurement task and testing of the DUT.

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Automated Testing

The 81110A/81104A has the same SCPI conform command structure for the feature sets identical to the Agilent 8110A. As with the Agilent 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 81110A/81104A an invaluable instrument in a wide range of technical applications. Programs designed for the Agilent 81104A can be used without any changes for the Agilent 81110A with Agilent 81111A 10V/165 MHz outputs.

NOTE For the command reference list, refer to the *Reference Guide*, part number 81110-91021.

The Agilent 81110A compared to the Agilent 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 Agilent 81110A. The second channel that is installed must be the same as channel one.

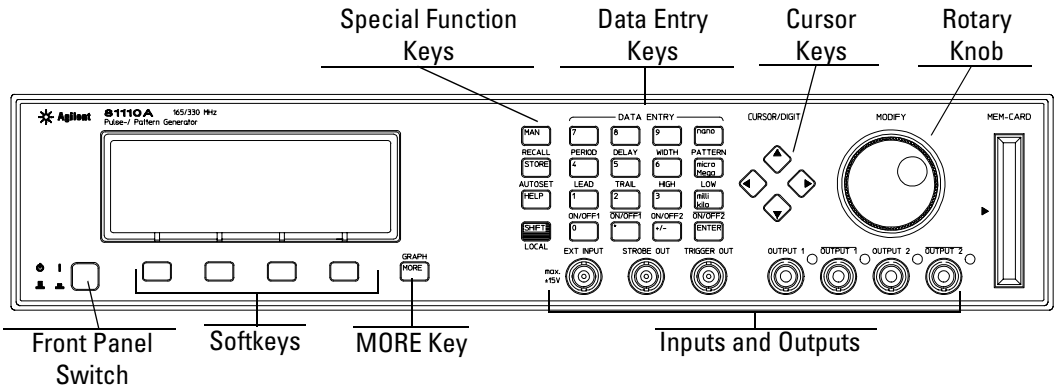
NOTE Do not mix the output channels for the Agilent 81110A.

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

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The Front Panel

When used for benchtop testing, the instrument is mainly operated from the front panel.



The **front panel switch** is used to switch on and off the instrument.

NOTE When the front panel switch is off, the instrument is in “standby” mode. The instrument is disconnected from the AC line power *only* by disconnecting the power cord.

The four keys below the display are the **softkeys** (software-controlled keys). The current function of each softkey is indicated in the corresponding box on the display.

Pressing the MORE key changes the softkey layout.

The other keys (**special function keys**, **data entry keys**, **cursor keys**) and the **rotary knob** are used to select and modify parameters when operating the instrument (see *“Operating the 81110A/81104A” on page 20*).

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The major inputs and outputs of the instrument are available at the front panel:

- The external input (EXT INPUT) can be used to connect an external arming source (started or gated modes). For details, please refer to *"The Mode/Trigger Screen" on page 60*.
- The trigger signal (TRIGGER OUT) marks the start of the pulse period or of parts of a pattern (see *"The Mode/Trigger Screen" on page 60*). You can set the output levels according to the used technology (TTL, ECL, PECL) or enter test-specific values (see *"The Trigger-Level Screen" on page 96*).
- The strobe signal (STROBE OUT) marks beginning and end of a burst in Burst mode. In Pattern mode, this signal is programmable per bit.
- The OUTPUT connectors provide the signal output (normal and inverted), the indicators show the current state of the output (on or off).

NOTE For information on the use of the memory card slot, refer to *"The Memory Card Screen" on page 98*.

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Operating the 81110A/81104A

This section guides you through the first steps when operating the 81110A/81104A via the user interface.

NOTE For information on operating the 81110A/81104A via remote control, please refer to the *Reference Guide*, part number 81110-91021.

Switching On the Instrument



After switching on the instrument the display indicates that the instrument selftest is running. This can take several seconds to complete.

If the selftest fails, you see a flashing E at the bottom of the screen. Press the HELP key to see a list of the selftest error messages. Use the knob or the cursor keys to scroll through the list if necessary.

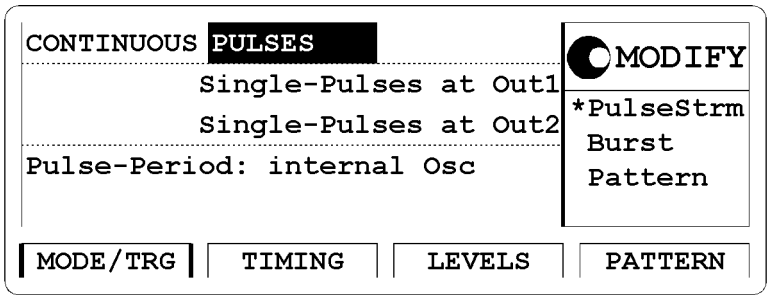
To return to normal operation press HELP again. Note that the selftest error messages are removed from the error queue after this.

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The Basic Screens

The major parameters for pulse generation can be set up in 3 screens. For setting up patterns there are two more basic screens.

The **Mode/Trigger screen** allows you to set the fundamental operating and trigger modes with respect to the signal required.



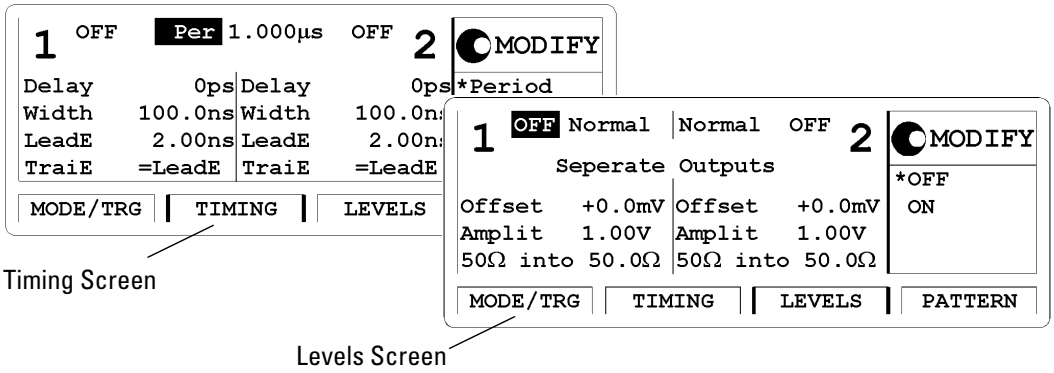
Press the MODE/TRG softkey to access this screen.

In this screen, you can set up the signal to be gated, started or continuous, and to be a pulse stream, a burst (several pulses followed by a pause) or a pattern.

In the lower section you can specify the trigger source and control the trigger output (in started and in gated mode).

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The **Timing screen** and the **Levels screen** allow you to specify timing and level parameters for the signals to be generated.



Press the TIMING OR LEVELS softkey to access these screens.

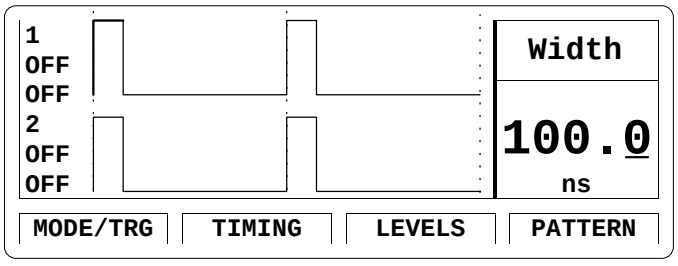
In the Timing screen you can set up the clock frequency and, for output 1 and 2, the timing for the signals (delay, pulse width, duty cycle, ...).

The Levels screen allows you to specify the level parameters for the signals to be generated. You can select between preset values of different technologies and/or adjust values according to individual requirements. Set the values in terms of high/low level or offset/amplitude. If the 81110A/81104A is equipped with two output modules, the channels can be set as separate outputs or to be digitally added.

NOTE

It is possible to view all parameters for one channel on one screen (see *"The Configuration Screen" on page 103*).

Pressing SHIFT + MORE (GRAPH) when the Timing or the Levels screen is displayed, toggles between the textual display and a graphical representation of the parameters.



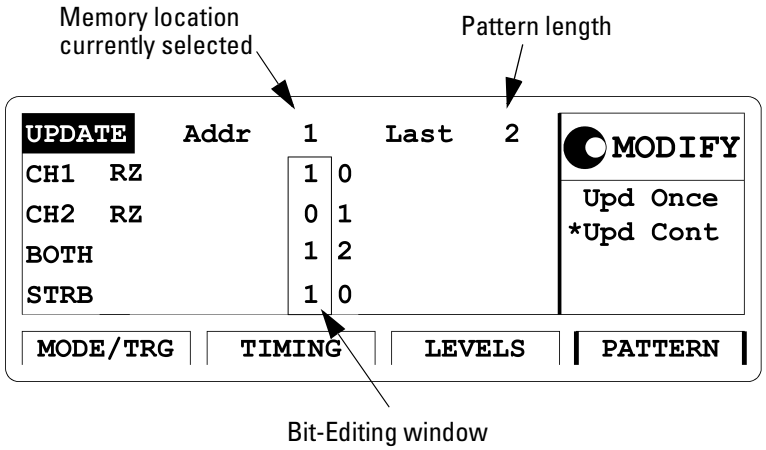
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In both screens, you can switch on and off the outputs. Their status (ON or OFF) is indicated on screen and by an LED next to the output connector.

The **Pattern screen** allows you to compose a data stream composed of RZ or NRZ signals.

You can set up the length of the pattern and edit the pattern data for each address within the pattern. Additionally, the strobe output can be programmed for each address, providing a comfortable trigger output in pattern mode.

You can enter data by using block editing functions, and you can enter the data bit by bit.



NOTE A signal with a number of pulses followed by a pause can be set up more comfortably as a burst signal.

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Adjusting Parameters

Adjusting parameters within a screen, requires two steps:

- selecting the parameter
- adjusting its value

Some parameters allow different formats of their values. For example, the pulse width can be displayed and entered as an absolute value, as duty cycle (percentage of the period), or as the delay of the trailing edge.

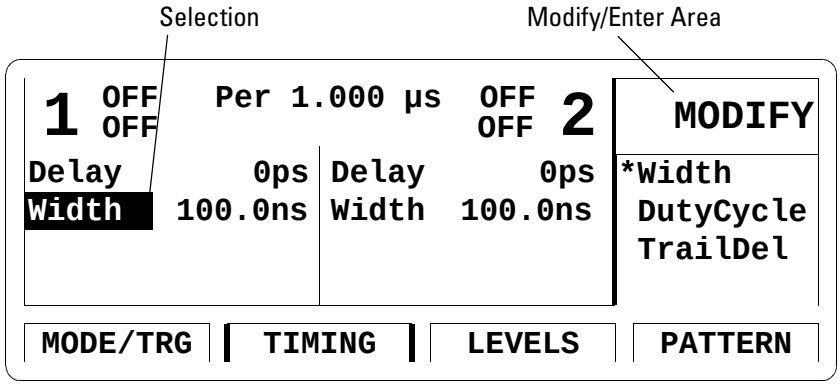
The following sections show the standard procedure for adjusting parameters, and list some features useful for the advanced user.

Standard Procedure

To experience the standard procedure for adjusting parameters, consider the following example where the duty cycle is set to 50%.

1 Press the TIMING softkey to access the Timing screen.

2 Use the cursor keys to select the WIDTH parameter.



The available formats for the pulse width parameter are displayed in the Modify/Enter area.

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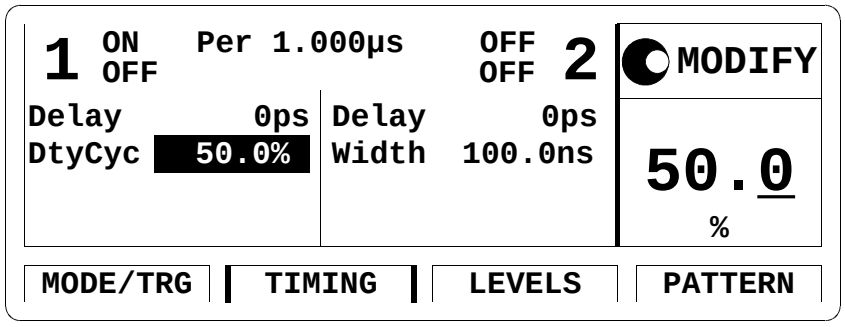
When changing the parameter format, the instrument automatically recalculates the value.

3 Turn the knob to select DUTYCYCLE.
The selected setting is indicated by an "*".

4 Move the cursor to the right to select the duty cycle value.

5 Use the data entry keys or the knob to enter the required value: 50.

6 Press the ENTER key to confirm your selection.



If you need to specify a unit for a parameter, simply press the appropriate unit key (NANO, MICRO/MEGA, MILLI/KILO) instead of the ENTER key.

With this small example, you have learned the basic steps required for adjusting parameters. For a complete reference of parameters and formats available in the individual screens, refer to *Chapter 3 "Using the 81110A/81104A" on page 59*.

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Advanced Procedures

The following features can be used to make operation more comfortable.

- **Selecting parameters**



Most keys of the front panel have an additional function. The SHIFT key provides fast access to the additional functions of the data entry keys and the special function keys.

For example, it is possible to quickly access the pulse width parameter by pressing SHIFT + 6 (WIDTH). The entry focus will be positioned on the corresponding editing field.

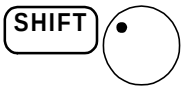
- **Changing the step size**



When modifying a value in the Modify/Enter area, pressing the SHIFT key followed by cursor left/right moves the cursor to a different digit in the displayed number.

Thus, you can change the step size for parameter change before you vary the value either with the up/down cursor keys or the knob.

- **Overprogramming**



Pressing the SHIFT key while turning the knob, 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 output switched on when overprogramming to have the internal error check system activated. This error check system warns you about impossible settings.

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Switching the Outputs On and Off

When you switch the instrument on, the outputs and inverted outputs are switched off to protect the device under test. The LED indicator next to the connector indicates the output state.

ON/OFF1
0

For example, to switch output 1 on or off

- either press SHIFT + 0 (ON/OFF1),
- or move the cursor to the ON/OFF parameter in the Timing or Levels screen and select the appropriate value by turning the knob.

To switch on or off output 2 and/or the inverted outputs, proceed in the same way. You can use the following short cuts:

Short Cut	**Output**
SHIFT + 0 (ON/OFF1)	Normal Out 1
SHIFT + . (decimal point) ($\overline{\text{ON/OFF1}}$)	Inverted Out 1
SHIFT + +/- (ON/OFF2)	Normal Out 2
SHIFT + ENTER ($\overline{\text{ON/OFF2}}$)	Inverted Out 2

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Using the Special Function Keys

The instrument provides the following special function keys:

MAN

- The MAN key can be used to run and to stop the instrument, and, in triggered or gated mode, to manually arm and/or trigger the instrument if there is no other source available (see *"The Mode/Trigger Screen" on page 60*).

RECALL
STORE

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

  In the internal memory location 0 there is a default setting stored. Pressing SHIFT + STORE (RECALL) and selecting 0 resets the instrument to the default setting.

SHIFT
LOCAL

- The SHIFT key provides fast access to additional functions.

  When the front panel controls are locked in remote control, pressing the SHIFT key unlocks the front panel controls.

HELP

- The HELP key provides access to the instrument's on-line help or in warning or error state, access to Warning/Error Report screen.

  Pressing SHIFT + HELP (AUTOSET) sets the instrument to a valid setting based on the current period setting.

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Help is Available

Whenever you are in doubt or the instrument signals warnings or errors, press the HELP key.

Help

If there are *no warnings or errors* pending, pressing the HELP key displays information on the currently selected parameter, the parameter help. More information is available within the help system:

- **Parameter Help**

  The help information gives a short description of the parameter or setting options and the corresponding SCPI command(s) syntax for programming the parameter or setting.

  If there is more than one screen available (indicated by small arrows), use the knob or the cursor keys to scroll through the help information.

  To access parameter help from other screens of the help system, press the ON FIELD softkey.

- **Concept Help**

  Pressing the CONCEPT softkey within the help system displays a short description of the instrument.

- **Serial Numbers and Software Revision**

  Pressing the SERIAL # softkey within the help system displays information on serial numbers and software revision codes of the instrument.

Warnings and Errors

If there *are warnings or errors* pending (indicated by a flushing W or E), pressing the HELP key displays a list of the current messages. Using the ERROR QU and WARNING softkeys, you can toggle between both lists. For more information on warnings and errors, see *"Warnings and Errors" on page 107*.

Exit Help

To exit from the help system, press the HELP key again, or press the EXIT HELP softkey.

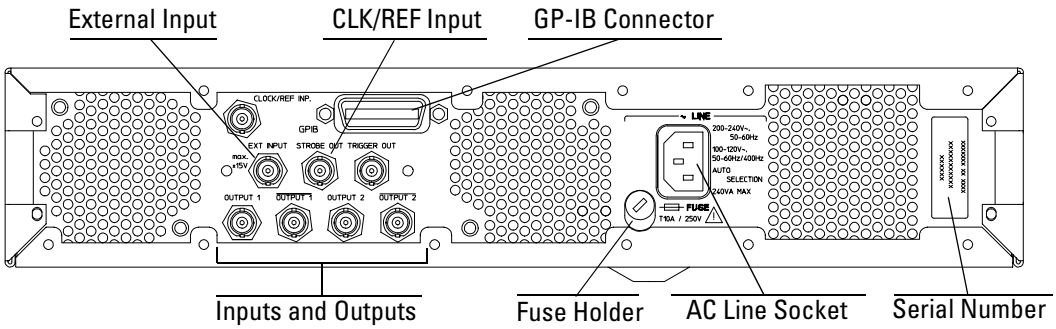
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The Rear Panel

The rear panel always provides two connectors:

- The external input (EXT INPUT) can be used to connect an external arming source (started or gated modes).
- The input connector for external clock or PLL reference (CLOCK/REF INPUT) can be used if a higher frequency accuracy is required.
- The GP-IB connector providing the interface for remote control.

The following figure shows the rear panel view with the option UN2.



With option UN2 the major inputs and outputs of the instrument (as described in *"The Front Panel" on page 18*) are available at the rear panel:

- external input (EXT INPUT)
- clock/reference input (CLK/REF INPUT)
- trigger signal (TRIGGER OUT)
- signal output (OUTPUT)

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2 Getting Started

The intention of this chapter is to give the necessary steps to set up generic signals for first-time users of the 81110A/81104A.

This chapter provides examples for the following types of signals:

- *"Setting Up a Clock Signal" on page 32*
- *"Setting Up a Pulse Signal" on page 37*
- *"Setting Up a Serial Data Stream Signal" on page 41*
- *"Setting Up an Edge-Displacement Signal" on page 45*
- *"Setting Up a Dual Clock Signals" on page 50*
- *"Setting Up a Burst Signal" on page 55*

At the end of each example, the required set of device commands is listed to provide programming examples. For further information on the commands and a complete command reference please refer to the *Reference Guide*, p/n 81110-91021.

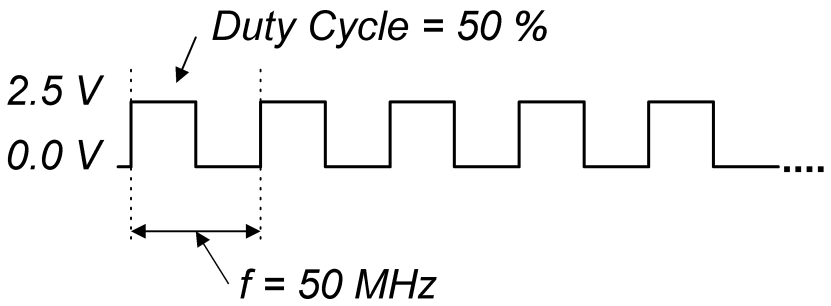
The examples are intended to be performed one after the other. Therefore, the first example provides the most detailed instructions, while the other examples are described on a higher level.

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Setting Up a Clock Signal

Task

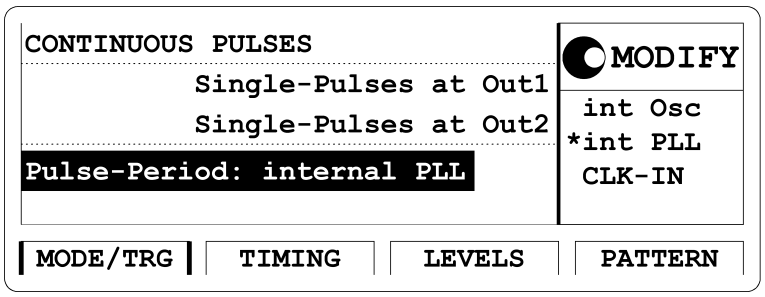
Set up a continuous clock signal with 50 MHz frequency with PLL accuracy, a duty cycle of 50 %, 3 ns transition times, a high level of 2.5 V and a low level of 0 V.



Instructions

To set the **operating mode and trigger mode** as required:

1. Reset all parameters and modes by pressing SHIFT + STORE (RECALL) + 0.
2. Press the MODE/TRG softkey to enter the Mode/Trigger screen. Trigger mode CONTINUOUS and operating mode PULSES are selected by default.
3. Move the entry focus down to select SINGLE-PULSES AT OUT1 and then PULSE-PERIOD: INTERNAL PLL.

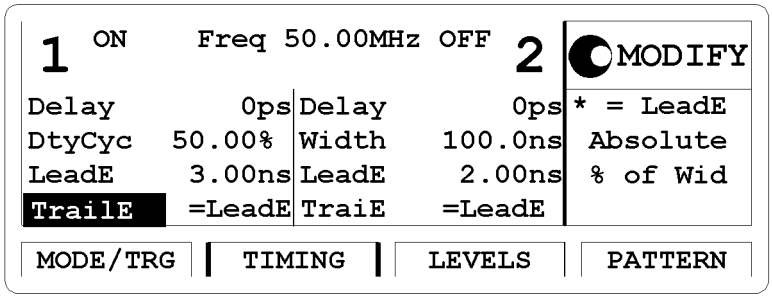


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To set the **timing parameters** as required:

1. Press the TIMING softkey to enter the Timing menu.
2. 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.

   This turns on the output 1 and activates the internal error check to detect parameter conflicts.
3. Move the entry focus to PER and select FREQ.
4. Move the entry focus to the FREQ entry field and enter a value of 50 MHz by pressing 5 + 0 + MICRO / MEGA.
5. Move the entry focus down to the width of output 1 and select DUTYCYC.
6. Move the entry focus to the right and enter 50% by typing 5 + 0 + ENTER.
7. Move the entry focus down to enter 3 + NANO for the leading edge. Trailing edge should be the same as leading edge (TRAIL E = LEAD E).



NOTE With Agilent 81110A with Agilent 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 Agilent 81104A are 3 ns.

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To set the **level parameters** as required:

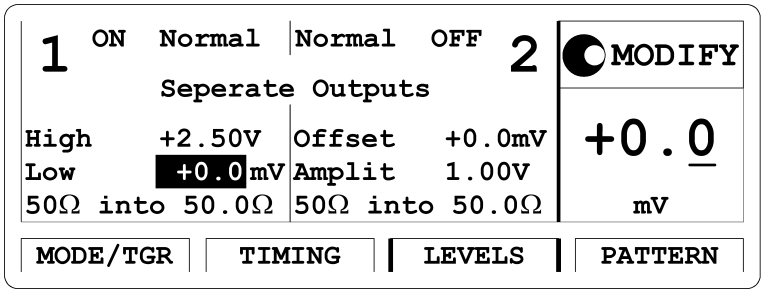
1 Press the LEVELS softkey to enter the Levels menu.

2 Move the entry focus to OFFSET and AMPLITUDE and in the MODIFY area select HIGH-LOW.

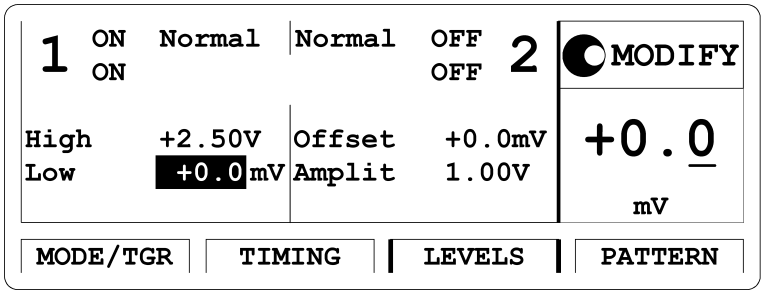
3 Move the entry focus to the high level entry field and press 2 + . + 5 + ENTER for the high level.

4 Move down the entry focus to the low level entry field and press 0 + ENTER.

For the Agilent 81104A or 81110A with an 81105 module installed, the screen looks as follows.

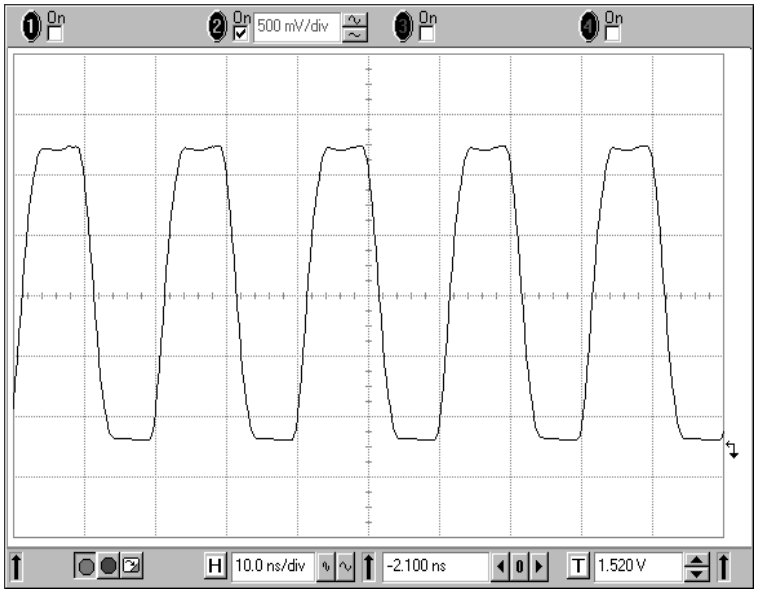


For the Agilent 81110A with an 81112 module installed, the screen looks as follows.



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The following figure shows the signal as displayed on the Agilent 54810A Infinium Oscilloscope. Use the generator's TRIGGER OUT to trigger the scope.



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Programming Example

If you want to include this clock signal in your GP-IB program, use the following command lines. The comment lines starting with a # are not 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

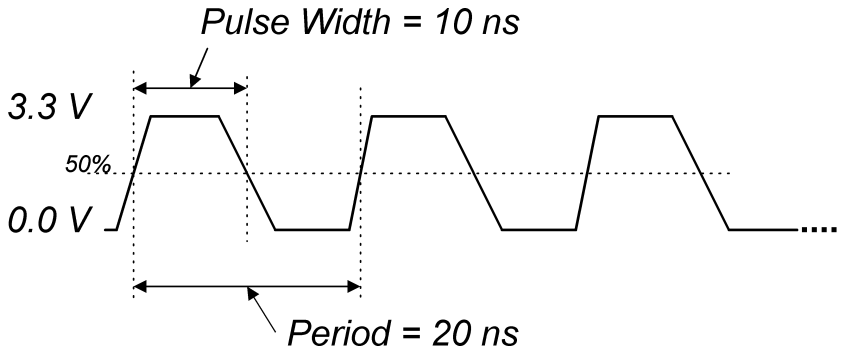
# Enable the output 1 and the complement output 1 (Agilent 81110A
# with Agilent 81112A 3.8V/330 MHz output channel installed, only).
:OUTPut1  ON
:OUTPut1:COMPlement  ON
```


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Setting Up a Pulse Signal

Task

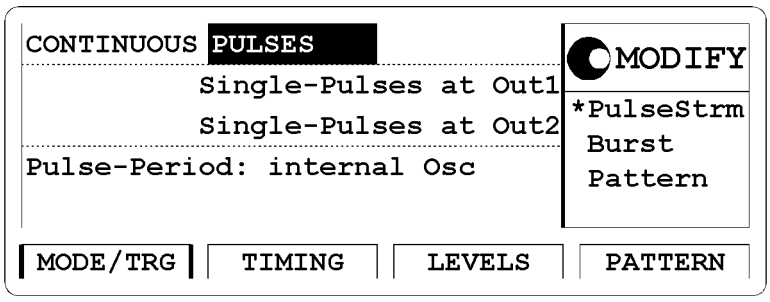
Set up a continuous pulse signal with 20 ns period, a pulse width of 10 ns, a leading edge of 3 ns, a trailing edge of 5 ns, an amplitude of 3.3 V and an offset of 1.65 V (high level 3.3 V, low level 0.0 V).



Instructions

To set the **operating mode and trigger mode** as required:

1 Reset all parameters and modes by pressing SHIFT + STORE (RECALL) + 0. For reference the current MODE/TRG screen is displayed. There is nothing to change.



To set the **timing parameters** as required:

1 Press the TIMING softkey to enter the Timing menu.

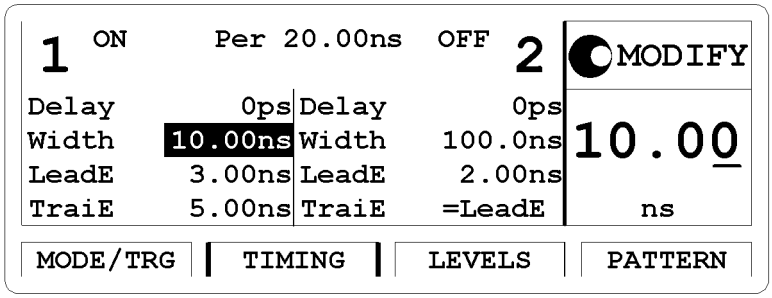
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2 Switch ON the output channel 1.

3 Enter a period of 20 NS. Enter a pulse width of 10 NS.

4 Enter 3 NS for leading edge. Select ABSOLUTE for trailing edge and enter a value of 5 NS.

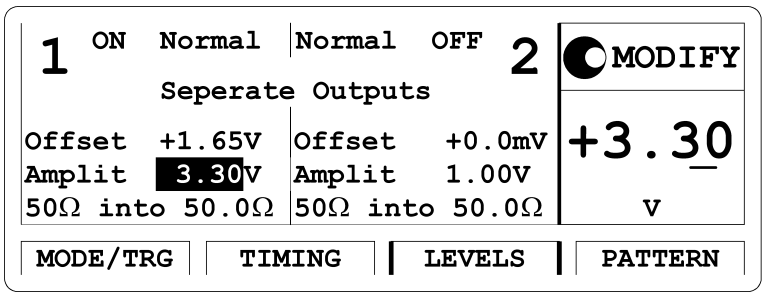
NOTE With Agilent 81110A with Agilent 81112A 3.8V/330 MHz output channels installed the transition times can be either 800 ps or 1.6 ns, trailing edge is equal to leading edge. The minimum transition times for the Agilent 81104A are 3 ns.



To set the **level parameters** as required:

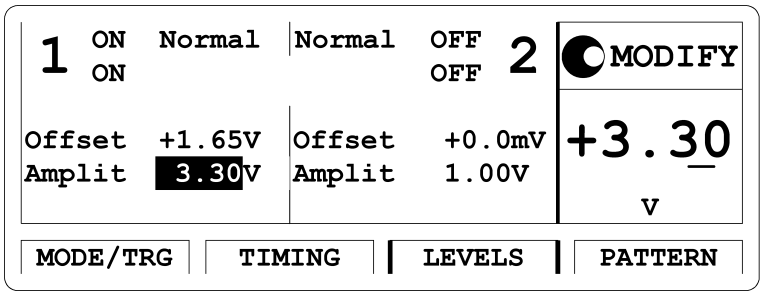
1 Press the LEVELS softkey.

2 Enter an offset of 1.65 V and an amplitude of 3.30 V.
For the Agilent 81104A or 81110A with an 81105 module installed, the screen looks as follows.

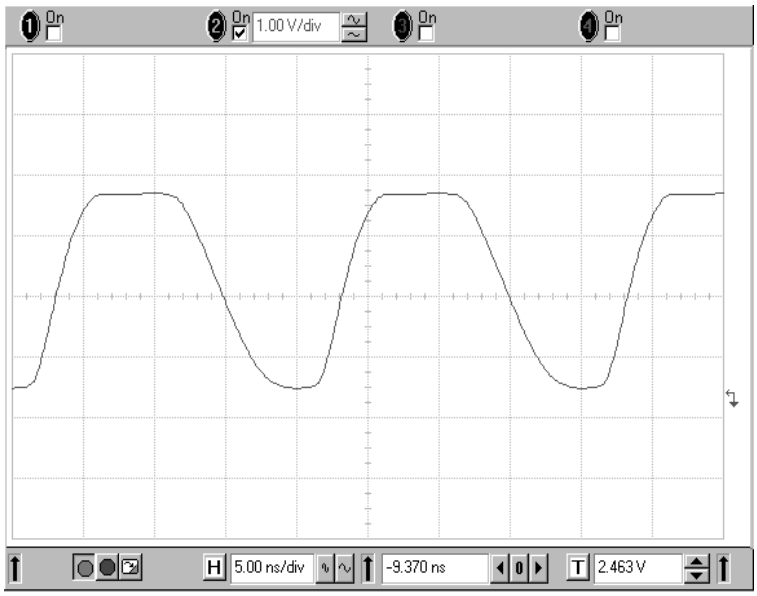


For the Agilent 81110A with an 81112 module installed, the screen looks as follows.

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The following figure shows the signal as displayed on the Agilent 54810A Infinium Oscilloscope. Use the generator's TRIGGER OUT to trigger the scope.



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Programming Example

If you want to include this burst signal in your GP-IB program use the following command lines. The comment lines starting with a # are not 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 Agilent 81110A with Agilent 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 (Agilent 81110A
# with Agilent 81112A 3.8V/330 MHz output channel installed, only).
:OUTPut1  ON
:OUTPut1:COMPlement  ON
```


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Setting Up a Serial Data Stream Signal

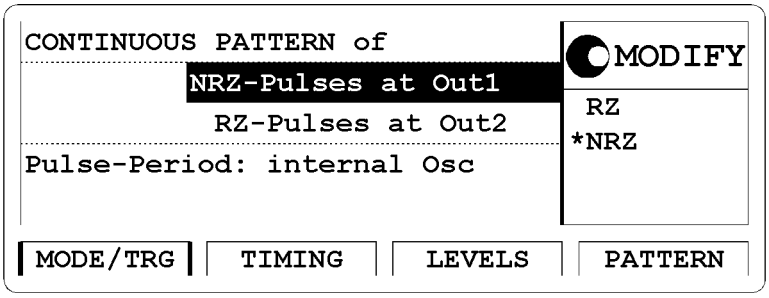
Task

Set up a continuous 24-bit long pattern signal with NRZ data output format at 80 MBit/s and ECL output level. The pattern is '111001110011001001010010'.

Instructions

To set the **operating mode and trigger mode** as required:

1. Reset all parameters and modes by pressing SHIFT + STORE (RECALL) + 0.
2. Press the MODE/TRG softkey to enter the Mode/Trigger screen.
3. Select CONTINUOUS PATTERN OF.
4. Highlight RZ-PULSES AT OUT 1 and select NRZ.



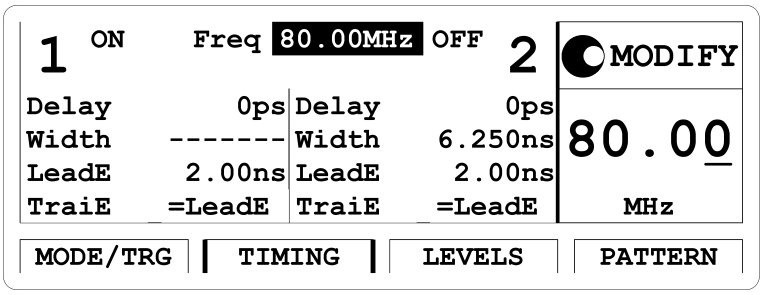
To set the **timing parameters** as required:

1. Press the TIMING softkey to enter the Timing menu.
2. Switch ON the output 1.
3. Enter a frequency of 80 MHz.

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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.

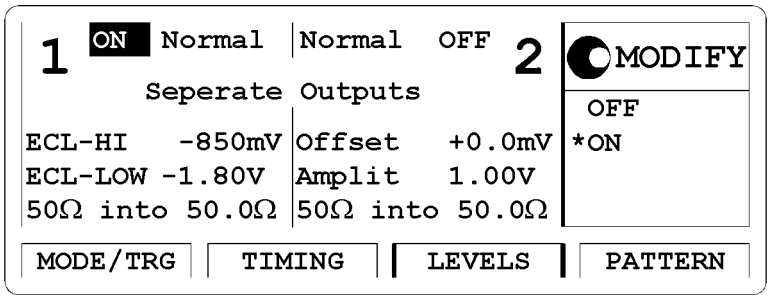
The `'-------'` in the output 1 width entry field relate to the NRZ data output format selection.



To set the **level parameters** as required:

1 Press the LEVELS softkey to enter the Level menu.

2 Change **`Offset`** and **`Amplitude`** mode to ECL levels by selecting SET ECL in the Modify Area.



NOTE An Agilent 81110A with Agilent 81112A 3.8V/330 MHz output channels installed has fixed 50 Ω source impedance and does not offer to adjust for a load impedance other than 50 Ω.

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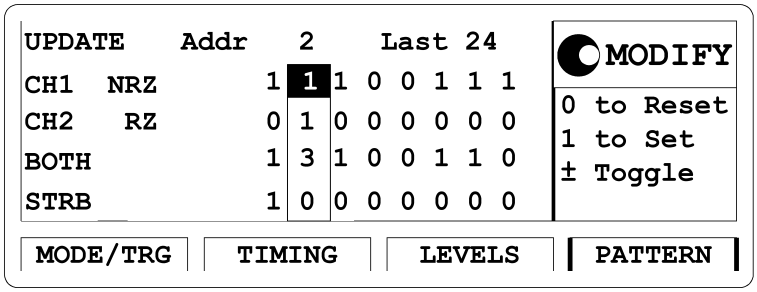
To set up the **pattern** as required:

1 Press the PATTERN softkey.

2 Move the entry focus to LAST and enter a value of **24**.

3 Move the entry focus to the bit-editing window for CH1 and enter the pattern `111001110011001001010010` by pressing the 0 or 1 key, respectively.

When entering the pattern the bit-editing window automatically moves one location to the right after each key stroke. By turning the knob counterclockwise you can move the bit-editing window back. The currently selected memory location is shown by ADDR.



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

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Programming Example

If you want to include this burst signal in your GP-IB program use the following command lines. The comment lines starting with a # are not 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  #2241110011100110010010100 10

# 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 (Agilent 81110A
# with Agilent 81112A 3.8V/330 MHz output channel installed, only).
:OUTPut1  ON
:OUTPut1:COMPlement  ON
```


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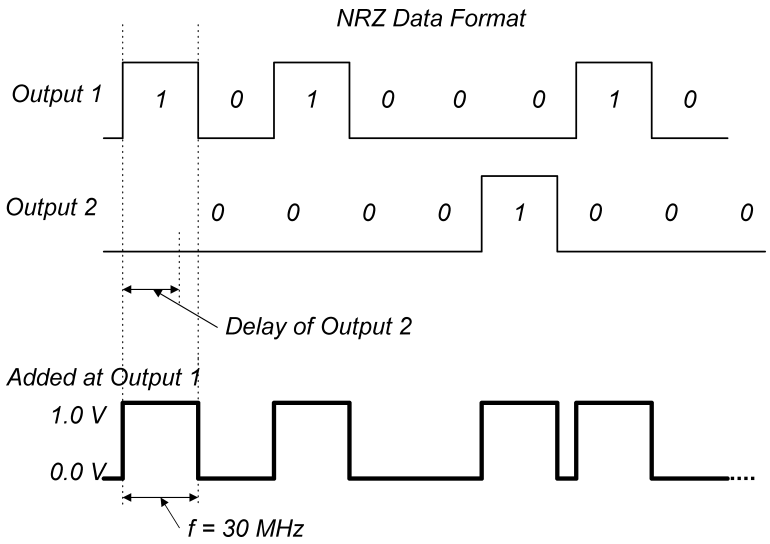
Setting Up an Edge-Displacement Signal

Task

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

NOTE

For this example, both outputs and the channel addition feature are required. Therefore, this type of signal can only be performed with Agilent 81104A and Agilent 81110A with Agilent 81111A 10V/165 MHz outputs.



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Instructions

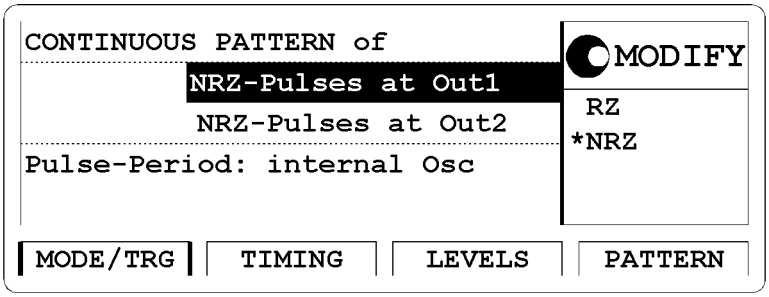
To set the **operating mode and trigger mode** as required:

1 Reset all parameters and modes by pressing SHIFT + STORE (RECALL) + 0.

2 Press the MODE/TRG softkey to enter the Mode/Trigger screen.

3 Select CONTINUOUS PATTERN OF.

4 Select NRZ-PULSES at Out 1 and NRZ-PULSES at Out 2 using the MODIFY knob.



To set up the **pattern** as required:

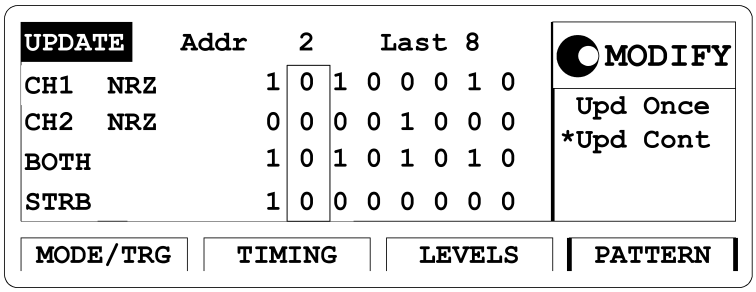
1 Press the PATTERN softkey.

2 Set up the bit pattern as follows. Enter 8 for LAST.

3 Move to the bit-editing window for CH1 and enter pattern **10100010** for channel 1.

4 Move down to CH2 and select first address by turning the knob counterclockwise.

5 Enter pattern **00001000** for channel 2.



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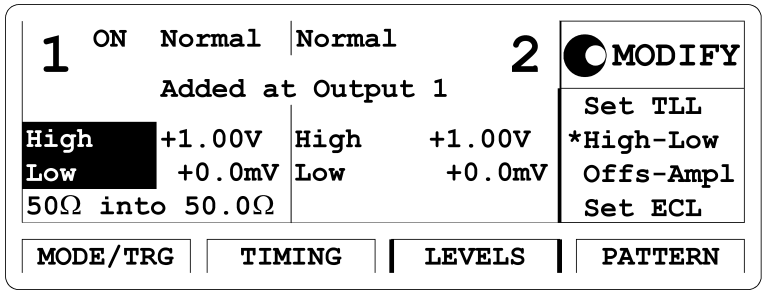
To set the **level parameters** as required:

1 Press the LEVELS softkey.

2 Switch **ON** both channels.

3 Change SEPARATE OUTPUTS to ADDED AT OUTPUT 1.

4 Set high level to 1.00 V and low level to 0.0 MV for both outputs.



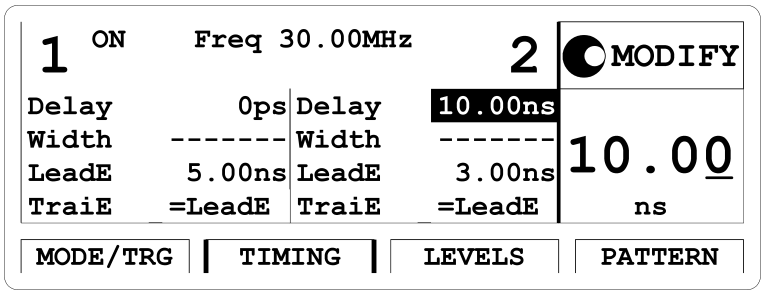
To set the **timing parameters** as required:

1 Press the TIMING softkey.

2 Enter a frequency of 30 MHz and a delay of 10 NS for output 2.

3 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 transition times are 5 ns.

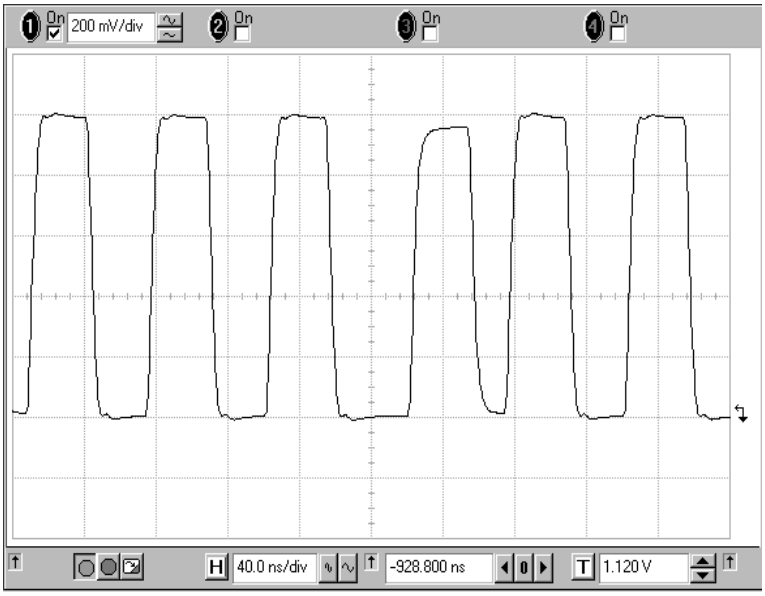
4 Enter transitions of 5 ns for output 1 to achieve same transition time shape in the added signal.



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

The following figure shows the signal as displayed on the Agilent 54810A Infinium Oscilloscope. Use the generator's STROBE OUT to trigger the scope.



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Programming Example

If you want to include this burst signal in your GP-IB program use the following command lines. The comment lines starting with a # are not required.

NOTE

Two outputs and the channel addition feature are required for this example. Therefore, this example can be performed by Agilent 81104A and Agilent 81110A with Agilent 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

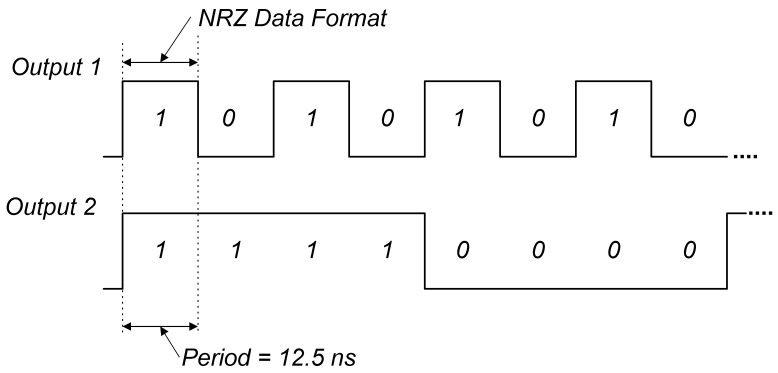
# Enable the output 1 and the output 2.
:OUTPut1   ON
:OUTPut2   ON
```


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Setting Up a Dual Clock Signals

Task Set up a Dual Clock Signal 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 level of 0 V. Output 1 generates a clock signal that is half of the system clock. Output 2 divides the system clock by 8.

NOTE For this example two outputs are required.



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.

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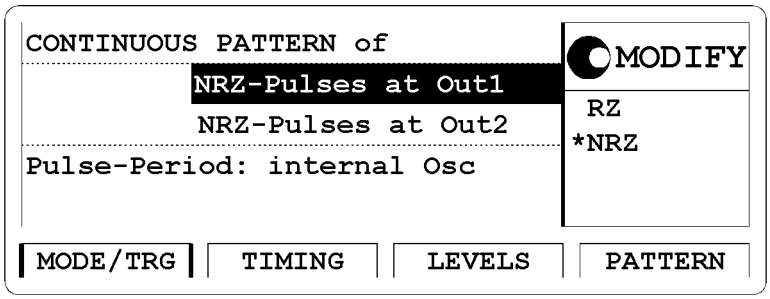
Instructions

To set the **operating mode and trigger mode** as required:

1 Reset all parameters and modes by pressing SHIFT + STORE + 0.

2 Press the MODE/TRG softkey to enter the Mode/Trigger screen.

3 Select PATTERN OF with NRZ-PULSES AT OUT 1 & OUT 2.



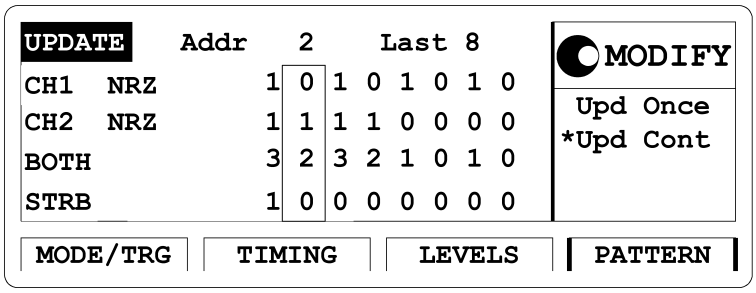
To set up the pattern as required:

1 Press the PATTERN softkey.

2 Enter 8 for LAST.

3 Move to CH1, select Clock÷N, and press the ENTER key twice to get a pattern for clock division by 2.

4 Move to CH2, select Clock÷N, and press ENTER key. Press 8 and ENTER, to get a pattern for clock division by 8.

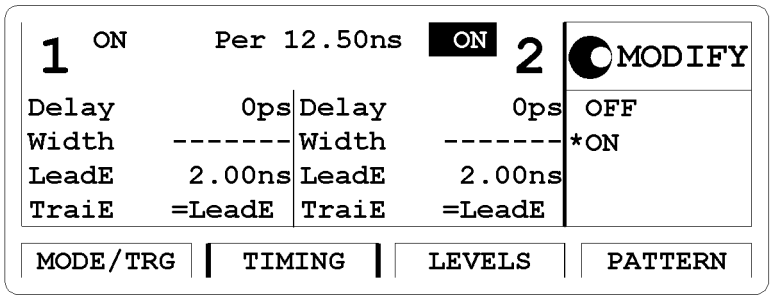


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To set the **timing parameters** as required:

1 Press the TIMING softkey.

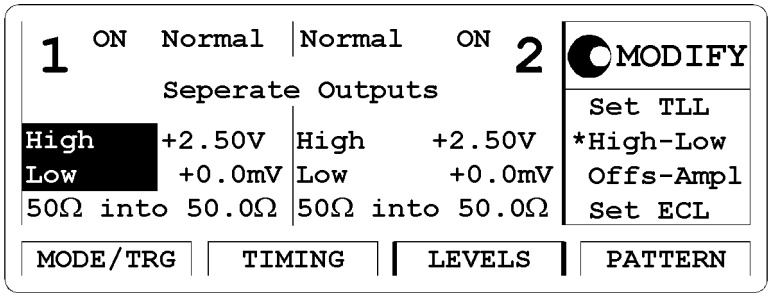
2 Switch ON both outputs. Set the period to 12.5 NS.



To set the **levels parameters** as required:

1 Press the LEVELS softkey.

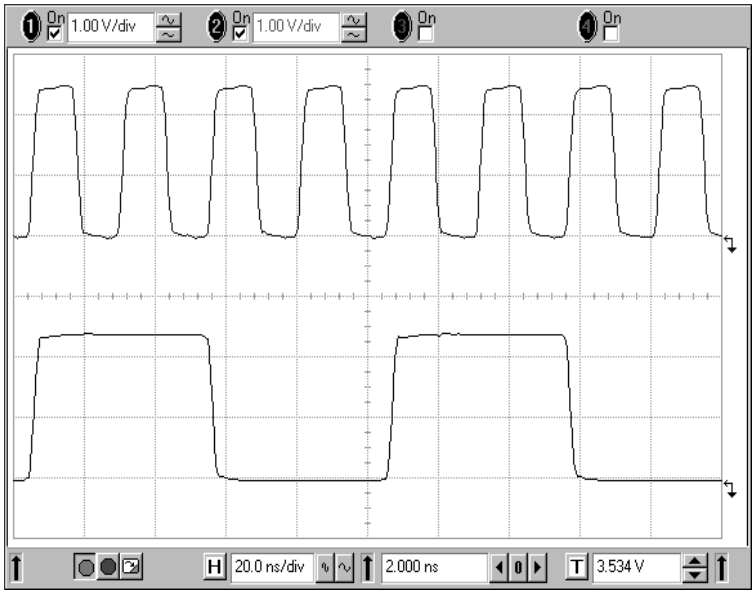
2 Set high levels of 2.50 V and low levels of 0.0 MV for both outputs.



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

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The following figure shows the signals as displayed on the Agilent 54810A Infinium Oscilloscope. Use the generator's STROBE OUT to trigger the scope.



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Programming Example

If you want to include this burst signal in your GP-IB program use the following command lines. 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 Agilent 81110A with Agilent 81112A 10V/330 MHz outputs installed)
# the following commands have to be included:
:OUTPut1:COMPlement  ON
:OUTPut2:COMPlement  ON
```


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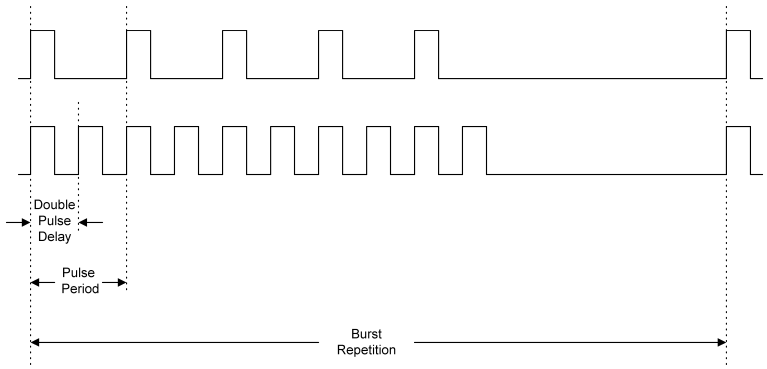
Setting Up a Burst Signal

Task

Set up a burst signal with a burst repetition of 5 µs. One signal should have two pulses at the period 500 ns. The levels are 2Vpp amplitude and offset of 0V.

NOTE

For this example two outputs are required.



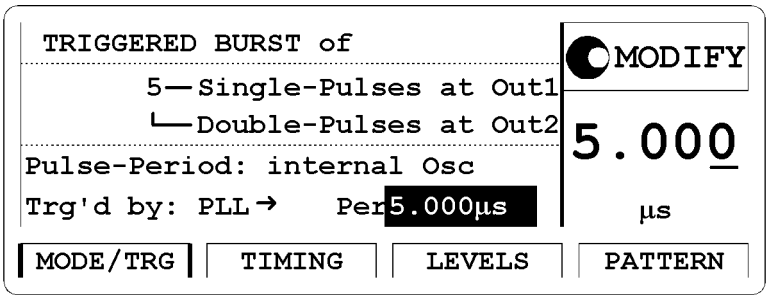
Instructions

To set the **operating mode and trigger mode** as required:

1. Reset all parameters and modes by pressing SHIFT + STORE + 0.
2. Press the MODE/TRG softkey to enter the Mode/Trigger screen.
   The internal PLL is used to trigger the startable internal oscillator. The PLL defines the burst repetition, the oscillator generates the pulse period.
3. Move to CONTINUOUS and select TRIGGERED.
4. Move to PULSES and select BURST OF.
5. Move down and set 5 - SINGLE-PULSES AT OUT 1 and DOUBLE-PULSES AT OUT 2.

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6 Move down and select TRG'D BY: PLL → PER and set the burst repetition to 5.000 µs.



To set the **timing parameters** as required:

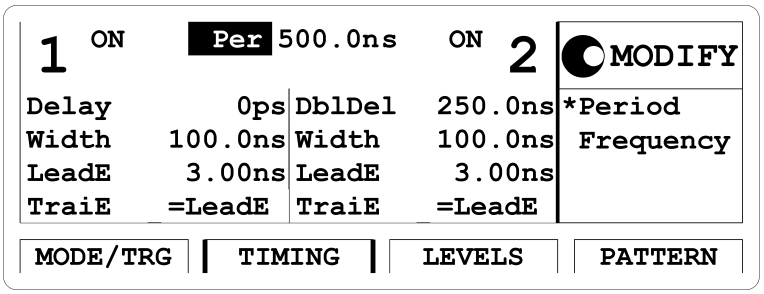
1 Press the TIMING softkey.

2 Switch the output 1 and the output 2 ON.

3 Enter a pulse period of **500 ns**. F

4 For output 1 enter a width of 100 NS, a leading edge of **3 ns** and set the trailing edge to TRAILE = LEADE.

5 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.



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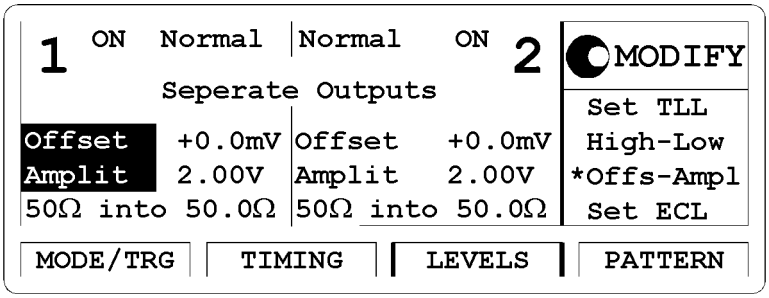
To set the **level parameters** as required:

1 Press the LEVELS softkey.

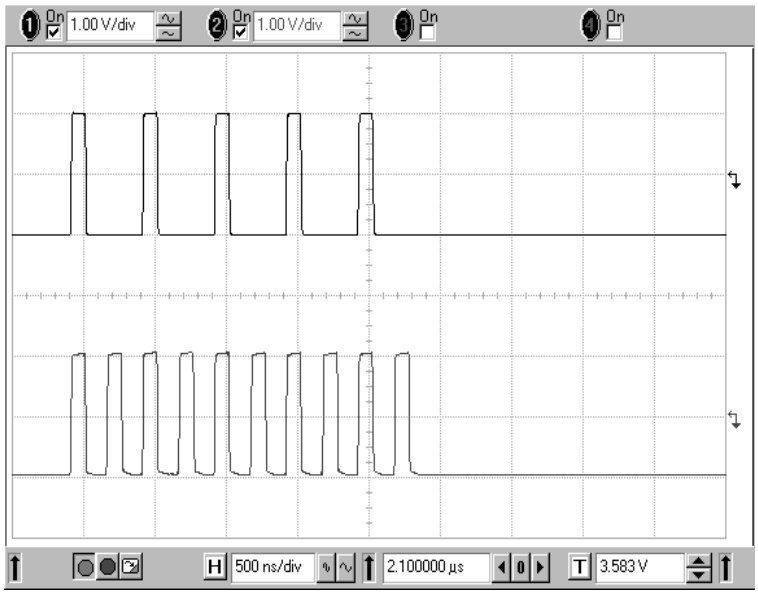
2 Select SEPARATE OUTPUTS.

3 For Channel 1 choose an offset of 0.0 MV and an amplitude of 2.00 V.

4 For Channel 2 choose an offset of **`0.0 mV`** and an amplitude of 2.00 V.



The following figure shows the signals as displayed on the Agilent 54810A Infinium Oscilloscope. Use the generator's STROBE OUT to trigger the scope.



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Programming Example

If you want to include this burst signal in your GP-IB program use the following command lines. 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 ms.
: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 ms
: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 Agilent 81110A with Agilent 81112A 3.8V/330MHz Outputs installed)
# the following commands have to be included:
:OUTPut:COMPlement  ON
:OUTPut2:COMPlement  ON
```

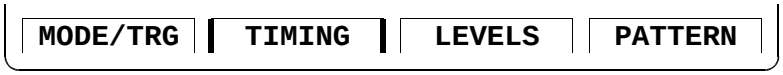

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3 Using the 81110A/81104A

This chapter provides complete reference information for using the 81110A/81104A by means of the user interface screens.

Each screen is described in detail. To access the individual screens, use the softkeys below the screen. There are two softkey layouts:

- the default layout



- the alternative layout displayed after pressing the MORE key



At the end of this chapter, *"Warnings and Errors" on page 107* provides details on the instrument's warning and error messaging system.

NOTE For general information on using the 81110A/81104A and information on the instrument's hardkeys, please refer to *Chapter 1 "Introducing the 81110A/81104A Pulse and Pattern Generators" on page 15*.

NOTE For information on using the 81110A/81104A via remote control, please refer to the *Reference Guide*, part number 81110-91021.

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The Mode/Trigger Screen

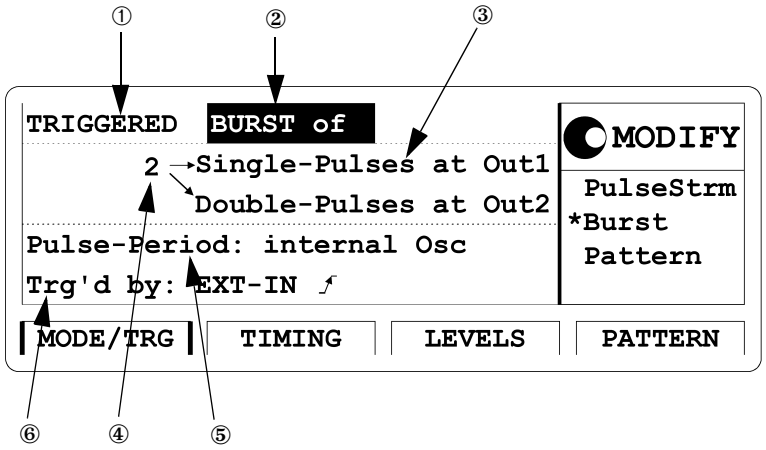
This section describes the Mode/Trigger screen, starting with an overview of the available parameter combinations, followed by detailed descriptions of each combination.

Overview

To access the Mode/Trigger screen, press the MODE/TRG softkey.

The following figure shows a typical Mode/Trigger screen, where the individual parameters are indicated. The parameter combinations are listed in the table on the next page.

The following sections explain these combinations in more detail.



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In this screen you can set up the overall operating modes of the instrument.

① Trigger Mode	CONTINUOUS			TRIGGERED			GATED			EXT WIDTH
② Pulse Mode	PULSES	BURST	PATTERN	PULSES	BURST	PATTERN	PULSES	BURST	PATTERN	
③ Pulse Type	Single/Double		RZ/NRZ	Single/Double		RZ/NRZ	Single/Double		RZ/NRZ	
④ Length		2-65536	2-16384		2-65536	2-16384		2-65536	2-16384	
⑤ Period Source	int Osc int PLL CLK-IN				int Osc int PLL CLK-IN		int Osc int PLL CLK-IN			
⑥ Arming Source				MAN-Key EXT INPUT	MAN- Key EXT INPUT PLL[a]		MAN- Key EXT INPUT			MAN- Key EXT INPUT
TRIG-GER OUT	Marks each pulse period generated									
STROBE OUT	Not Used	↑on 1st ↓on last	Program-mable	Not Used	↑on1st ↓on last	Program-mable	Not Used	↑on 1st ↓on last	Program-mable	Not Used

[a] PLL cannot be used as Pulse and Arming source at the same time

Pulse Types

The following pulse types can be selected per output:

SINGLE-PULSES — Single pulse per period, delay parameter sets delay to leading edge from start of period.

DOUBLE-PULSES — Double pulse per period, double-delay parameter sets delay between leading edges of pulses.

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Pattern Formats

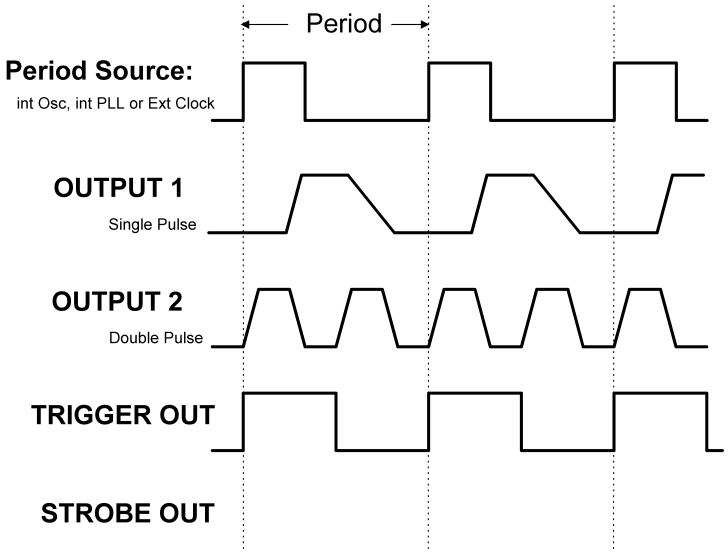
In pattern mode the pulse output formats can be selected from:

RZ	A single pulse is generated in each pulse period with data value 1, no pulse is generated for data value 0.
NRZ	A leading edge is generated for a 0→1 data transition, a trailing edge is generated for a 1→0 data transition.

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Continuous Pulses Mode

The following figure shows typical timings for trigger mode CONTINUOUS and pulse mode PULSES.



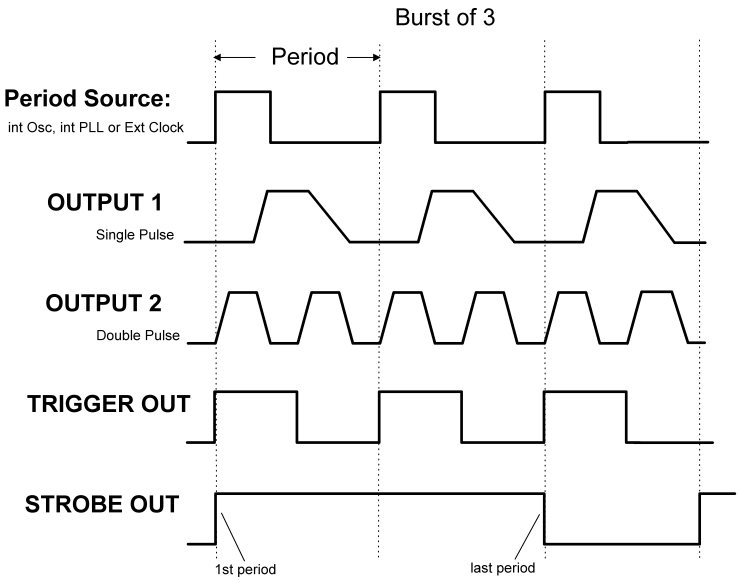
Characteristics

- Pulse periods are generated continuously
- TRIGGER OUT marks each pulse period.
- STROBE OUT not used in continuous pulse mode.

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Continuous Burst Mode

The following figure shows typical timings for trigger mode CONTINUOUS and pulse mode BURST.



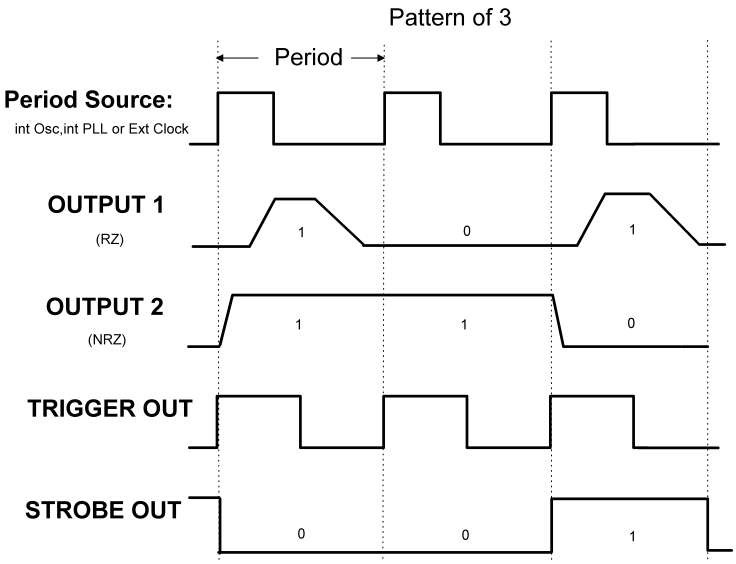
Characteristics

- A burst of pulse periods is repeated continuously.
- You can select the number of pulse periods per burst in the range of 2–65536.
- TRIGGER OUT marks each pulse period.
- STROBE OUT rises at the start of the first pulse period in a burst and falls at the start of the last pulse period.

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Continuous Pattern Mode

The following figure shows typical timings for trigger mode CONTINUOUS and pulse mode PATTERN.



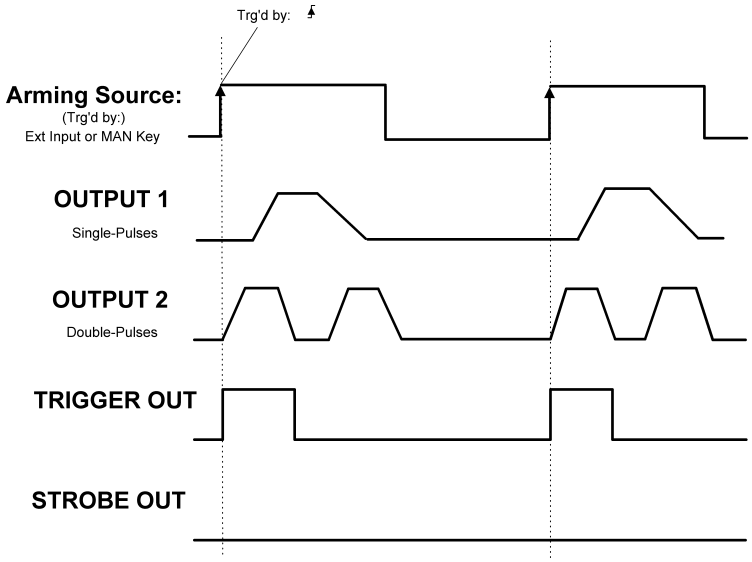
Characteristics

- A pattern of pulses is repeated continuously.
- You can select between RZ and NRZ data pulses for each output.
- In the Pattern screen you can set the pattern length in the range 2–16 384 and program the data values for each output.
- TRIGGER OUT marks each pulse period.
- STROBE OUT is bit-programmable on the Pattern screen (NRZ format only).

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Triggered Pulses Mode

The following figure shows typical timings for trigger mode TRG'D BY and pulse mode PULSES.

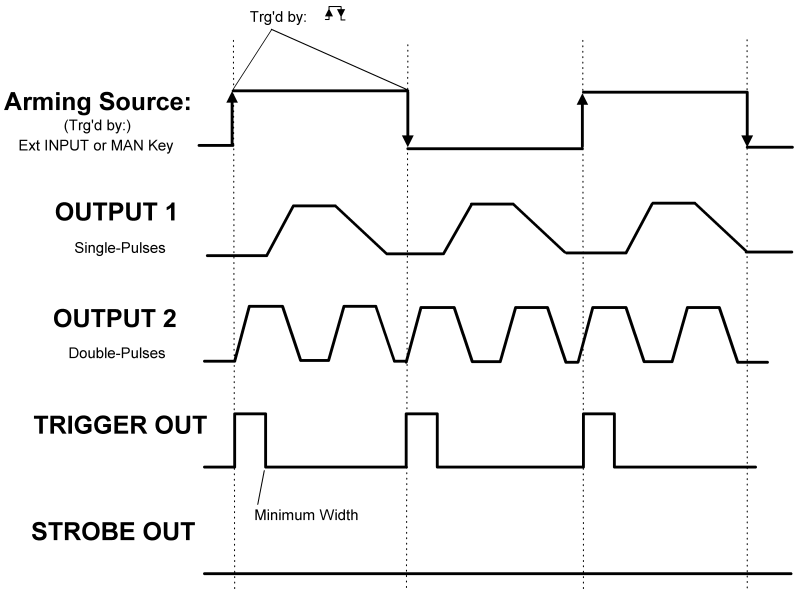


Characteristics

- Single pulse periods are triggered by an active edge at the selected arming source
  - MAN key on front panel, triggered by press or release or both.
  - EXT INPUT (External signal) triggered by rising or falling or both edges.
- TRIGGER OUT marks each pulse period.

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The following figure shows typical timings when the signal is triggered by both rising and falling edge of the arming source.



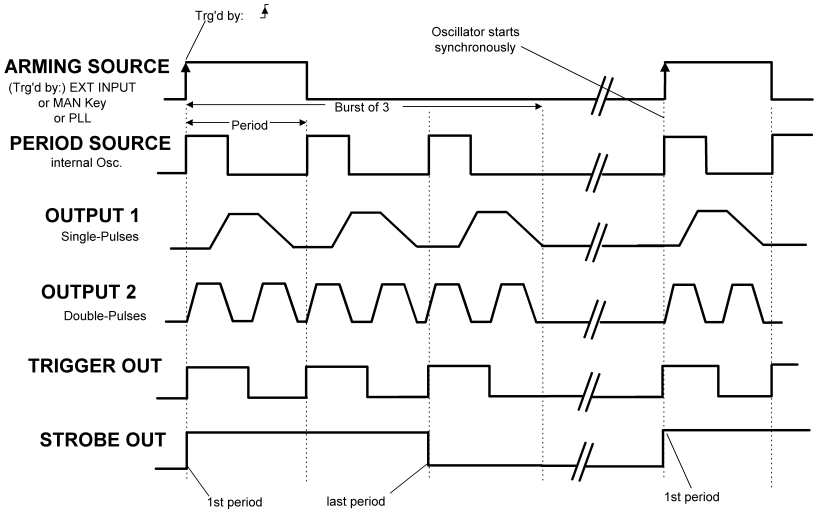
NOTE The PLL cannot be selected as the arming source. Select continuous pulses mode with the PLL as PERIOD SOURCE to achieve the same result.

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Triggered Burst Mode

The following figures show typical timings for trigger mode TRIGGERED and pulse mode BURST.

For the first example, the synchronously triggerable internal oscillator is used to source the period. The bursts are triggered by the rising edge of the arming source.

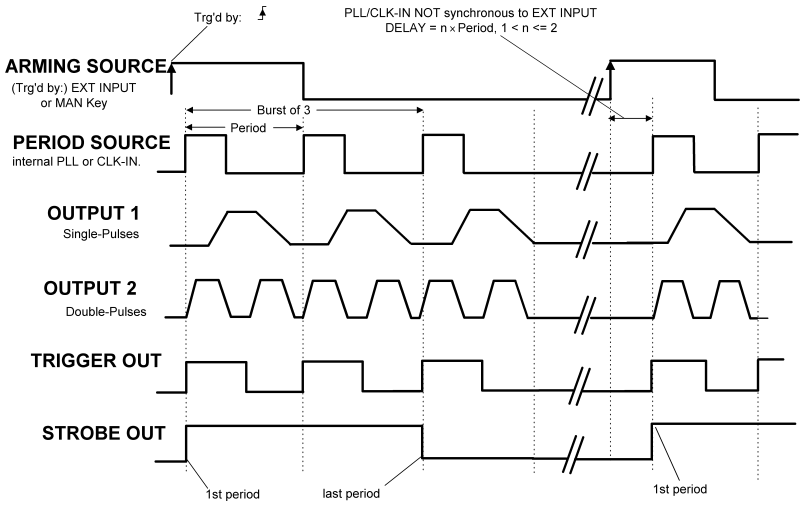


Characteristics

- A burst of pulse periods is triggered by an active edge at the selected arming source
  - MAN key on front panel, triggered by press or release or both.
  - EXT INPUT (External signal) triggered by rising or falling or both edges.
  - PLL (Internally triggered bursts), select the triggering period.
- You can select the number of pulse periods per burst in the range of 2–65536.
- TRIGGER OUT marks each pulse period.
- STROBE OUT rises at the start of the first pulse period in a burst and falls at the start of the last pulse period.

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For the second example, either the internal PLL or an external CLK-IN are used to source the period—both cannot be triggered synchronously.



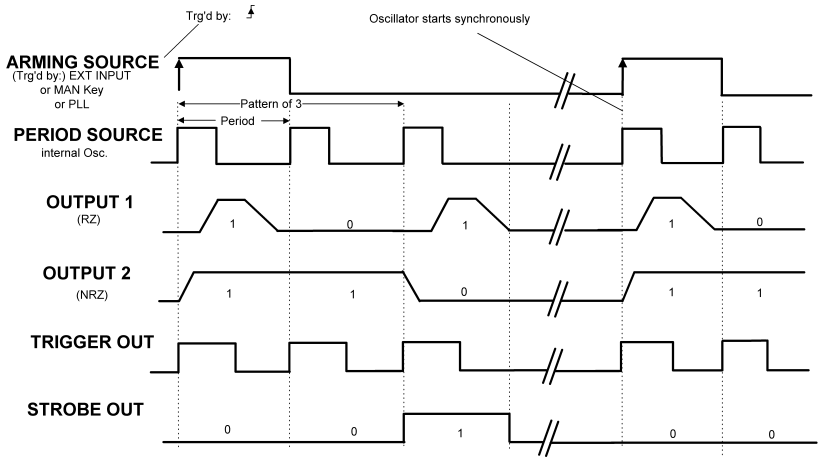
NOTE You cannot use the PLL as both pulse-period source and as arming source at the same time.

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Triggered Pattern Mode

The following figures show typical timings for trigger mode TRIGGERED and pulse mode PATTERN.

For the first example, the synchronously triggerable internal oscillator is used to source the period. The patterns are triggered by the rising edge of the arming source.

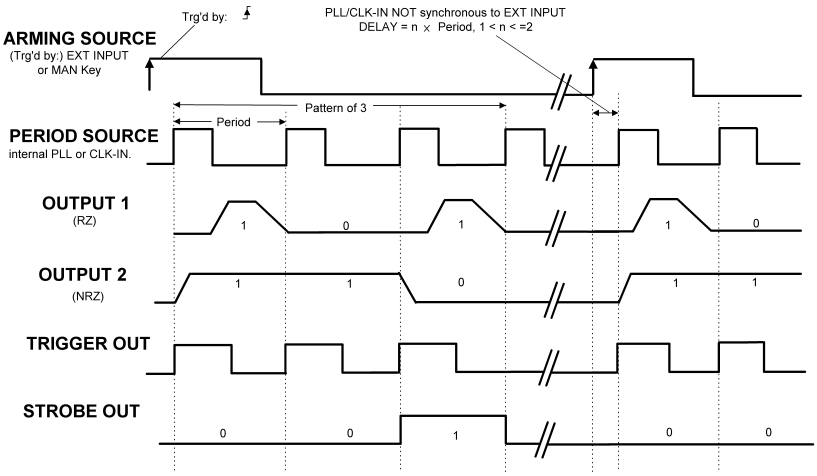


Characteristics

- A pattern of pulses is triggered by an active edge from the selected arming source.
  - MAN KEY on front panel, triggered by press, release or both.
  - EXT INPUT (External signal) triggered by rising, falling or both edges.
  - PLL (Internally triggered patterns), select the triggering period.
- You can select between RZ and NRZ data pulses for each output.
- On the Pattern screen you can set the pattern length in the range of 2–16384 and program the data values for each OUTPUT.
- TRIGGER OUT marks each pulse period.
- STROBE OUT is bit-programmable on the Pattern screen (NRZ format only).

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For the second example, either the internal PLL or an external CLK-IN are used to source the period—both cannot be triggered synchronously.



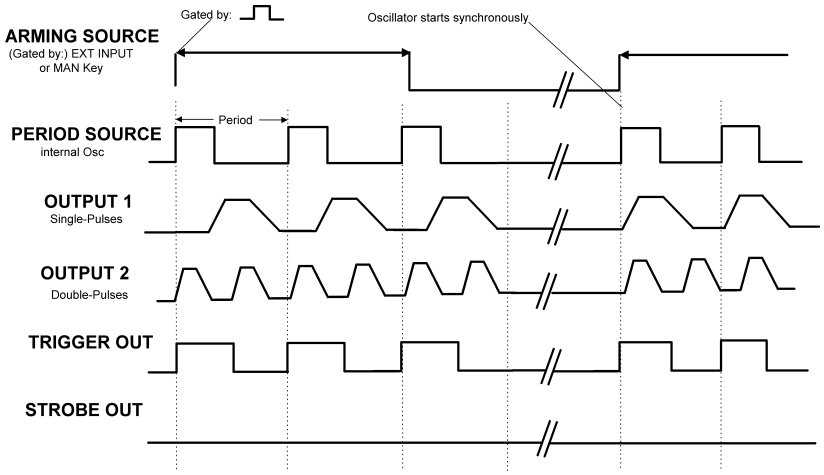
NOTE You cannot use the PLL as both pulse-period source and arming source at the same time.

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Gated Pulses Mode

The following figures show typical timings for trigger mode GATED and pulse mode PULSES.

For the first example, the synchronously triggerable internal oscillator is used to source the period.

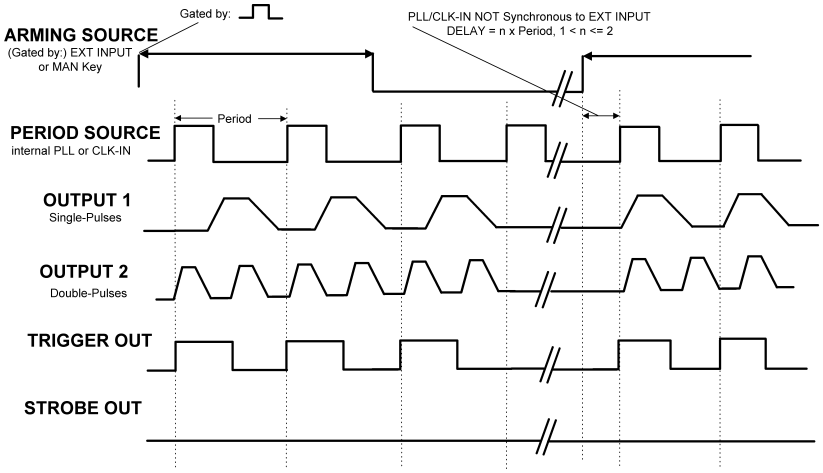


Characteristics

- Pulse periods are enabled by (GATED BY) an active level at the selected arming source
  - MAN KEY on front panel, gated while pressed or released or both.
  - EXT INPUT (External signal) gated by high, low or both levels.
- TRIGGER OUT marks each pulse period.

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For the second example, either the internal PLL or an external CLK-IN are used to source the period—both cannot be triggered synchronously.

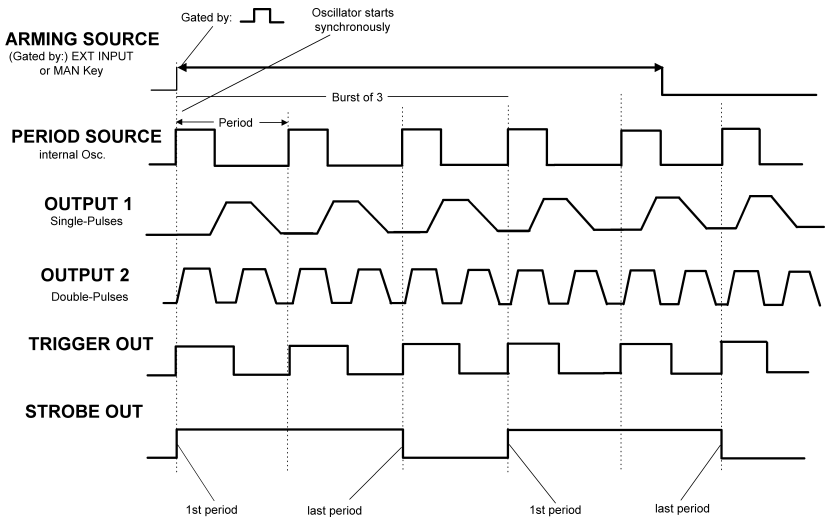


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Gated Burst Mode

The following figures show typical timings for trigger mode GATED and pulse mode BURST.

For the first example, the synchronously triggerable internal oscillator is used to source the period.

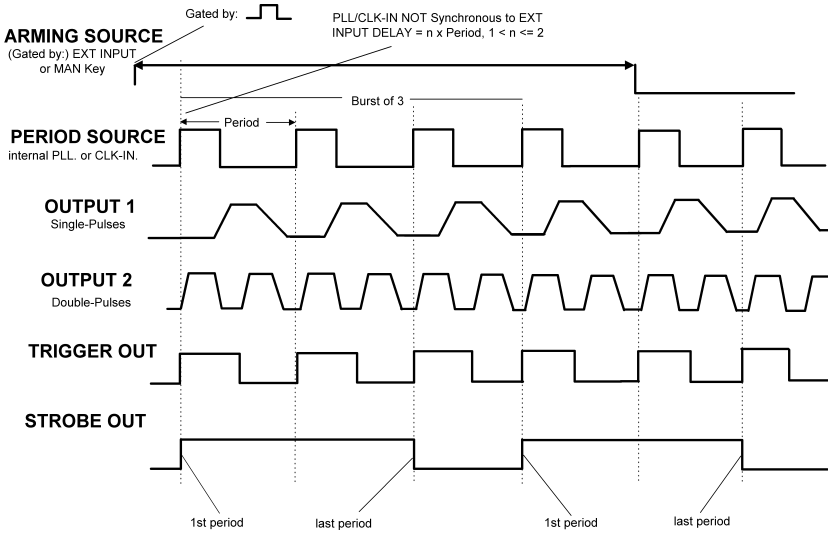


Characteristics

- Bursts of pulse periods are enabled by (GATED BY) an active level at the selected arming source:
  - MAN key on front panel, gated while pressed or released or both.
  - EXT INPUT (External signal) gated while high or low or both.
- You can select the number of pulse periods per burst in the range 2–65536.
- TRIGGER OUT marks each pulse period.
- STROBE OUT rises at the start of the first pulse period in a burst and falls at the start of the last pulse period.

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For the second example, either the internal PLL or an external CLK-IN are used to source the period—both cannot be triggered synchronously.



Gated Pattern Mode

With trigger mode GATED and pulse mode BURST the instrument shows the following characteristics:

- A pattern of pulses is enabled by (GATED BY) an active level at the selected arming source.
  - MAN key on front panel, gated while pressed, released or both.
  - EXT INPUT (External signal) gated while high or low or both.
- On the Pattern screen you can set the pattern length in the range of 2–16384 and program the data values for each output.
- TRIGGER OUT marks each pulse period.
- STROBE OUT is bit-programmable on the Pattern screen (NRZ format only).

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External Width Mode

In external width mode, the pulse width is determined by an external signal

- The pulse width is determined by an external signal:
  - MAN key: Pressing the key generates a leading edge, releasing the key generates a trailing edge.

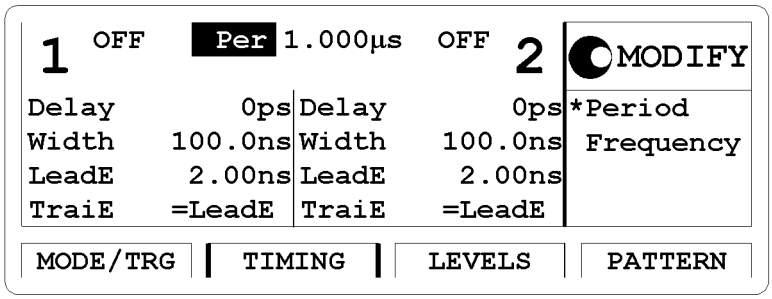
    EXT-IN: A rising-edge at the EXT INPUT generates a leading edge, a falling edge at the EXT INPUT generates a trailing edge.
- The threshold and impedance of the EXT INPUT can be selected on the Trigger-Level screen.
- The period, delay, and width of the output pulse are not programmable in this mode as they are determined by the external signal.

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The Timing Screen

To access the Timing screen press the TIMING softkey.

The Timing screen is only available if you have two channels fitted to your Agilent 81110A or Agilent 81104A mainframe *and* you have selected GROUP PARAMS BY: TIMING/LEVELS on the Configuration screen.



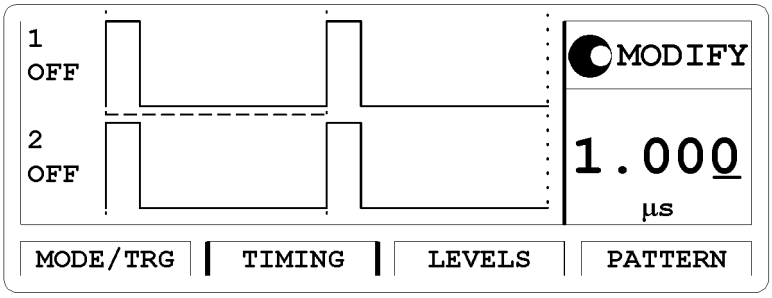
NOTE On screens of the Agilent 81110A with Agilent 81112A 3.8V/330 Mhz outputs the second status output is displayed for differential outputs. The trailing edge is always coupled to the leading edge. The leading edge can be selected in the range from 0.8 ns and 1.6 ns.

The individual timing parameters are described in more detail in the following. Parameters can be entered in different formats.

If you prefer to set the timing parameters per output together with the level parameters of that output, switch the type of parameter grouping. See *"Parameter Grouping (Group Params by)" on page 104*.

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When you press SHIFT + MORE (GRAPH) or the TIMING softkey again, you will see a graphical representation of the timing parameters of both channels. The currently selected parameter is displayed in the Modify/Enter area and is indicated by dashed or bold lines in the graphical display.



Note that in graphics mode you can only adjust the values of each parameter, not the parameter format. If you want to change the format of a parameter, for example WIDTH to DUTYCYCLE, you must be in text mode to select the parameter name with the cursor.

NOTE With the 81110A/81104A you can sweep your timing values without danger of spurious pulses or drop-outs that could cause measurement errors. This applies to continuous mode with timing values < 100 ms (frequency: < 10 Hz), and consecutive values between one-half and twice the previous value.

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Pulse-Period Parameter

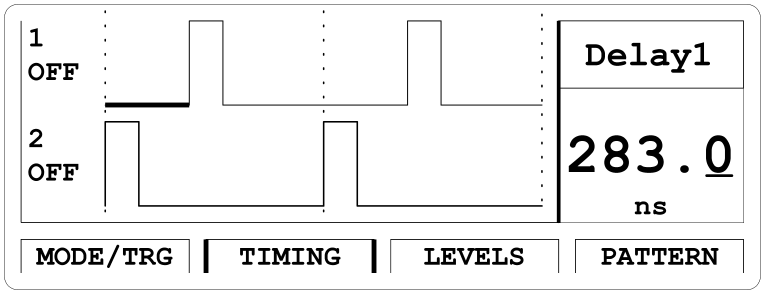
Set the pulse period as either PERIOD or FREQUENCY.

NOTE You can select the pulse-period source on the Mode/Trigger screen.

If you select the CLK IN connector as the pulse-period source, the pulse period/frequency is determined from the signal applied to CLK IN:

MEAS ONCE	The external signal is measured once. Press ENTER to measure again.
MEAS CONT	The external signal is measured continuously until the instrument receives a command via GP-IB. To invoke continuous measurements again you have to switch the instrument to local operating mode by pressing SHIFT + LOCAL and start continuous measurement again.

Pulse Delay Parameter



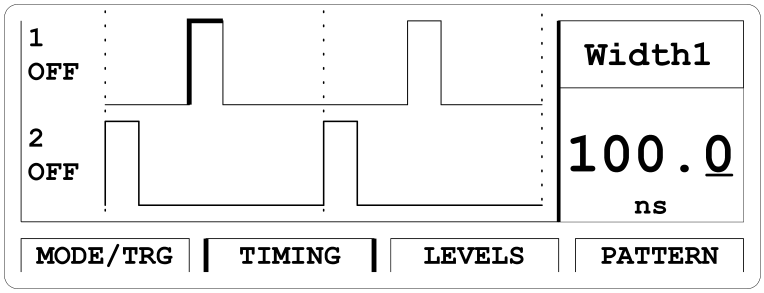
Set the delay of the leading edge within the pulse period. There are three delay formats available:

- DELAY (select ABSOLUTE)
  DELAY is the absolute delay from the start of a pulse period to the start of the leading edge of the pulse.
- DELAY% (select % OF PERIOD)
  The delay from the start of the pulse period to the start of the leading edge expressed as a percentage of the pulse period.

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- PHASE (select PHASE)
  The phase delay in degrees from the start of the pulse period to the start of the leading edge (360° = 1 pulse period).

Pulse Width Parameter



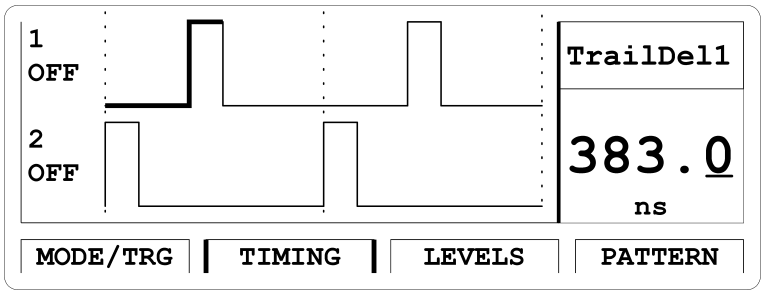
Set the width of the output pulse. There are three width formats available:

- WIDTH (select WIDTH)
  The absolute pulse width measured from the start of the leading edge to the start of the trailing edge. In this format, the pulse width is independent of changes in pulse period and delay.
- DTYCYC (select DUTYCYCLE)
  The duty cycle is the pulse width measured from the start of the leading edge to the start of the trailing edge expressed as a percentage of the period. In this format, if you adjust the period, the absolute width is adjusted to maintain the duty cycle.

NOTE You cannot have the width format set to DTYCYC and the leading/trailing-edge format set to percentage of width (LEADED%/TRAILE%) at the same time.

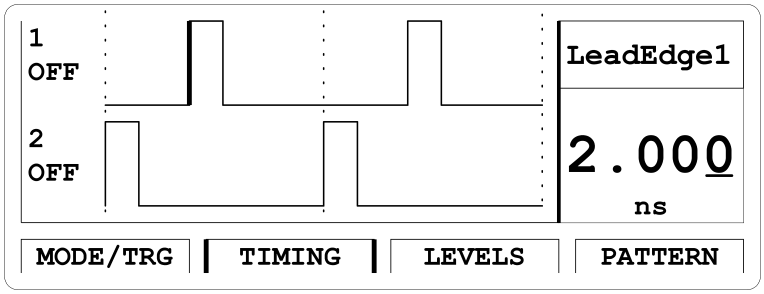
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Pulse Trailing-Delay Parameter



The trailing delay is the absolute delay from the start of the pulse period to the start of the trailing edge. In this format the trailing edge remains fixed relative to the start of the pulse period if you adjust the pulse-delay (leading-edge delay) or the pulse period.

Pulse Leading-Edge Parameter



Set the transition time for the leading edge of the pulse, measured from 10% to 90% of the pulse amplitude.

There are two formats available (selectable in text mode):

- LEADED
  The absolute transition time measured from 10% to 90% of pulse amplitude. In this format the leading edge is independent of the pulse width.

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- LEADED%
  The absolute transition time expressed as a percentage of pulse width. In this format if you adjust the pulse width, the transition time is adjusted to maintain the edge-time as a percentage of the width.

NOTE You cannot have the width format set to DTYCYC and the leading/trailing edge format set to percentage of width (LEADED%/TRAILE%) at the same time.

NOTE The leading edge of an Agilent 81110A with Agilent 81112A 3.8 V/330 MHz outputs can be selected from 0.8 ns or 1.6 ns.

Pulse Trailing Edge Parameter

Set the trailing-edge transition time of the pulse, measured from 10% to 90% of pulse amplitude.

There are three formats available, selectable in text mode:

- =LEADE
  The trailing-edge transition time is coupled directly to the leading edge to maintain a symmetrical pulse.
- TRAILED
  The absolute transition time measured from 10% to 90% of pulse amplitude. In this format the trailing edge is independent of the leading edge and pulse width.
- TRAILE%
  The trailing-edge transition time expressed as a percentage of the pulse width. In this format if you adjust the pulse width, the transition time is adjusted to maintain the edge-time as a percentage of the width.

NOTE Note that you cannot have the width format set to DTYCYC and the leading/trailing edge format set to percentage of width (LEADED%/ TRAILE%) at the same time.

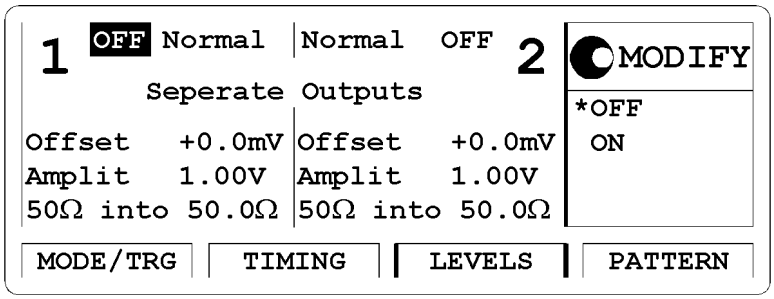
NOTE The trailing edge of the Agilent 81110A with Agilent 81112A 3.8 V/ 330 MHz outputs is always coupled to the leading edge.

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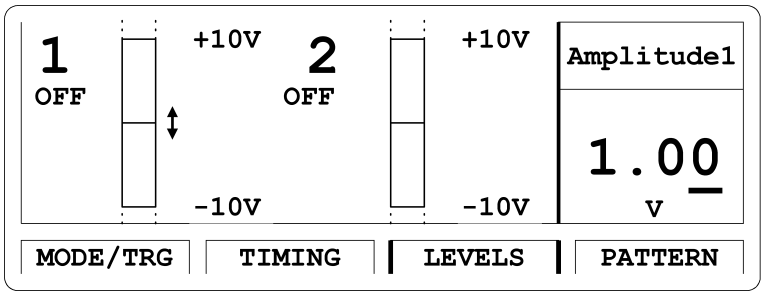
The Levels Screen

To access the Levels screen press the LEVELS softkey.

The Levels screen is only available if you have two channels fitted to your Agilent 81110A or Agilent 81104A mainframe *and* you have selected GROUP PARAMS BY: TIMING/LEVELS on the Configuration screen.



When you press SHIFT + MORE (GRAPH) or the LEVELS softkey, you will see a graphical representation of the level parameters. The currently selected parameter is displayed in the Modify/Enter area and is indicated in the graphical display.



Use the Levels screen to view and control the pulse-level parameter for both channels on one screen. If you have a single channel instrument both the timing and level parameters are displayed on the Output screen (see *"The Output Screens" on page 106*).

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Normal/Complement Parameter

Switch the OUTPUT between NORMAL and COMPLEMENT modes (in text mode only).

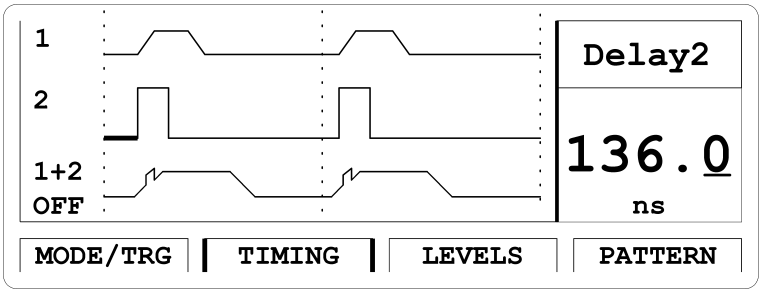
NORMAL	Pulse leading edge rises from low to high level, trailing edge falls from high to low level.
COMPLMNT	Pulse leading edge falls from high to low level, trailing edge rises from low to high level

Separate/Added Outputs Parameter

NOTE The channel add option is not available for the Agilent 81110A with Agilent 81112A 3.8 V 330 MHz outputs installed. This parameter is only available in text mode, and if you have two output channels fitted.

Switch ADDED output mode on and off.

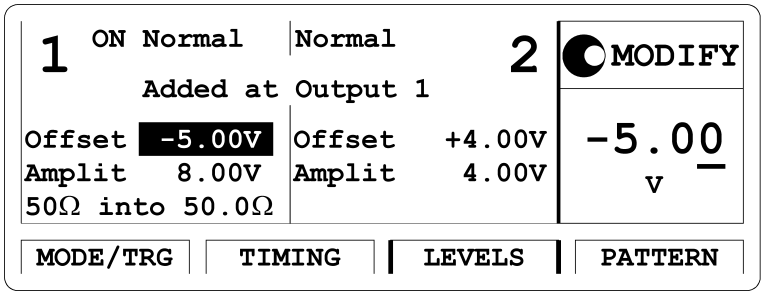
- SEPARATE OUTPUTS
  Output 1 and output 2 operate as entirely separate output channels.
- ADDED AT OUTPUT 1
  Output 1 and output 2 signals are added together at the output 1 connector. The output 2 connector is no longer used. You can use this mode to create complex pulse waveforms as shown in the figure below.



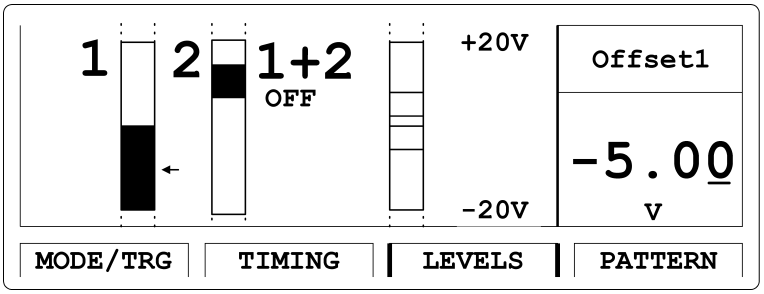
NOTE By using the pattern mode you can code 3 or 4-level codes, or place spike pulses from output 2 on particular data pulses on output 1, for example.

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Because output 2 is no longer used, its impedance parameters are no longer available, see figure below.



The Levels graphic page is also modified to indicate the multiple levels formed by outputs 1 and 2:



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Offset/Amplitude, High/Low Level Parameters

Set and display the pulse levels in terms of either offset and amplitude, or high and low level. You can quickly set TTL or ECL output levels using the SET TTL and SET ECL formats.

- SET TTL

  Set the levels to the default TTL levels automatically:

  TTL-HI: +2.50 V
  TTL-LOW: +0.0 mV

  The default levels are set once and can be adjusted afterwards by moving the entry focus to the values as normal.

- HIGH-LOW

  Select high and low level format for the pulse levels.

- OFFS-AMPL

  Select offset and amplitude format for the pulse levels. Offset is measured from 0V to the middle of the pulse amplitude. Pulse amplitude is the difference between the high and low levels of the pulse.

- SET ECL

  Set the levels to the default ECL levels automatically:

  ECL-HI: –850 mV
  ECL-LOW: –1.80 V

  These default levels are set once and can be adjusted afterwards by moving the entry focus to the value as normal.

Voltage/Current Mode (mV/V/mA/A)

Move the entry focus onto the level units to select between setting the pulse-levels IN VOLTS or IN AMPERES.

NOTE This parameter is only available in text mode.

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Output Source Impedance Parameter (50 Ω into)

An impedance of 50 Ω or 1 kΩ is selectable. There is no selection for the Agilent 81110A when fitted with Agilent 81112A 3.8 V 330 MHz output channels.

NOTE This parameter is only available in text mode

Load Impedance Parameter (50.0Ω)

Adjust the load impedance value expected at the output to compensate for non-50Ω loads. The displayed level-parameters are then calculated using this value and therefore represent the levels at a non-50Ω static load.

Output Voltage and Power Protection

NOTE When an output is switched on, the instrument monitors the actual voltage and current levels at the output. The output is automatically switched off if voltage levels or power dissipation reach levels that could damage the output circuits.

The available output levels for an output could therefore be limited by external voltages, loads and the level settings of the *other* output if you are using a dual channel instrument with outputs added at output 1 (see Specifications).

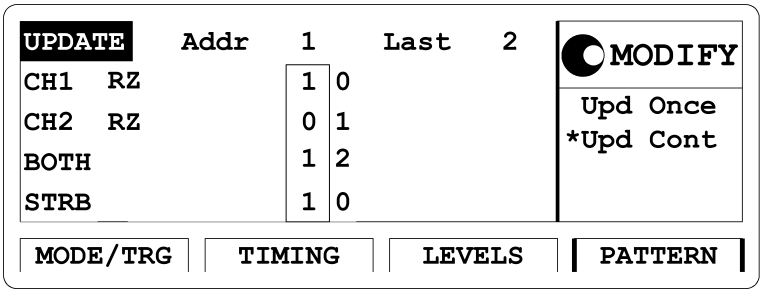
NOTE On the screen of the Agilent 81110A with Agilent 81112A 3.8 V/330 MHz outputs installed the second output status is displayed for differential outputs. The instrument also assumes 50 Ω load impedance and there is no added outputs option available.

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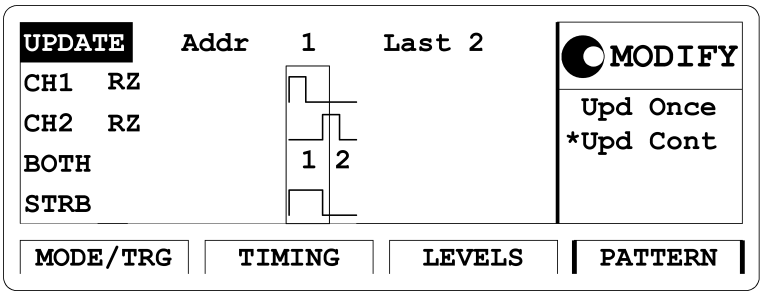
The Pattern Screen

Use the Pattern screen to set up a pattern sequence to be generated by the instrument when you select the pattern mode on the Mode/Trigger screen.

To access the Pattern screen, press the PATTERN softkey.



When you press SHIFT + MORE (GRAPH) or the PATTERN softkey, you will see a graphical representation of the level parameters.



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Update Parameter

Select to update the hardware after each of your changes in the screen or only on demand.

- UPDATE (select UPD CONT)

  The pattern data at the outputs are updated continuously as you edit the data on the screen.

- NO UPD (select UPD ONCE)

  The pattern data at the outputs are not updated automatically from the screen. You can therefore modify the data patterns on the screen without affecting the pattern which is currently being generated at the Outputs.

  Press ENTER to update the pattern once.

Address Parameter

Adjust the address of the bit-editing window to scroll through the data. The figure in the following section shows the bit-editing window with the third bit in the pattern selected.

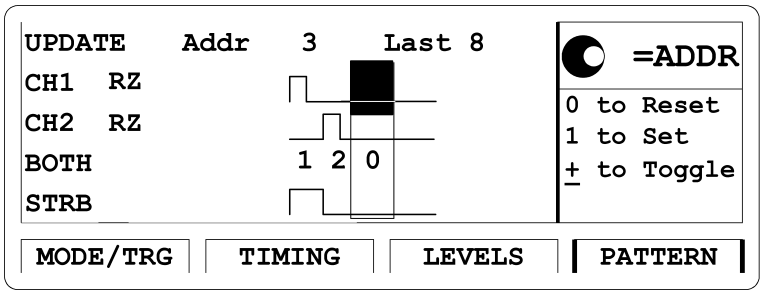
Last Parameter

Adjust the last bit number to set the length of the pattern in the range of 2–16384.

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Bit-Editing Window

Move the entry focus into the bit-editing window to edit individual data bits. The bit-editing window moves automatically one location to the right for each pattern entered.



While the entry focus is in the bit-edit window you can use the knob to scroll through the data.

RZ/NRZ Data Format

The data output format RZ or NRZ can be selected for the channels if not already done in the Mode/Trigger screen

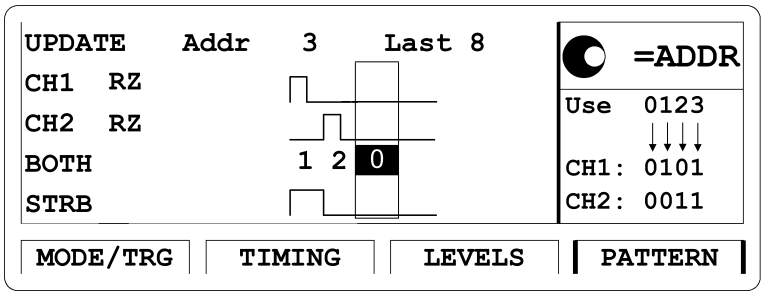
Outputs (CH1,CH2) and Strobe Out (STRB)

Use the data entry keys to edit the data bit at the cursor:

- 0 set bit to 0, and move the bit-editing window to the next bit.
- 1 set bit to 1, and move the bit-editing window to the next bit.
- + /– toggle bit without moving the bit-editing window.

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You can edit both output channels together in the BOTH pattern. This makes it easy to enter data for 3 or 4-level codes.

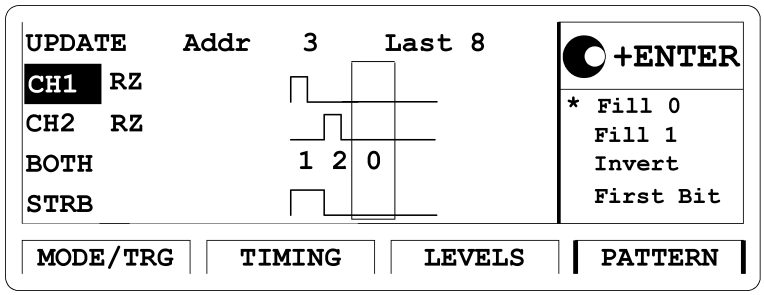


The following table shows the coding to be used when editing both output channels together.

CH1	0	1	0	1
CH2	0	0	1	1
BOTH	0	1	2	3

Block Editing Functions (CH1/CH2/BOTH/STRB)

Move the entry focus onto the CH1, CH2, BOTH or STRB at the left hand side of the screen to use the block editing functions.



Select the function using the MODIFY knob. Press ENTER confirm your selection.

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NOTE

Most of the block editing functions apply from (or at) the current address in the bit-editing window to the last bit in the pattern.

The data memory is 16384 bits long. Bits beyond the last bit are not affected by the editing functions except when you insert or delete bits.

- FILL 0
  Set all bits from ADDR to LAST inclusive to 0.
- FILL 1
  Set all bits from ADDR to LAST inclusive to 1.
- INVERT
  Invert all bits from ADDR to LAST inclusive.
- FIRST BIT
  Set the first bit to 1, and bits 2 to LAST to 0.
- LAST BIT
  Set the LAST bit to 1, and all preceding bits to 0.
- INS BIT
  Insert a bit at ADDR. The bit value is copied from the current bit at ADDR, and bits ADDR to 16384 are shifted right. Bit 16384 is lost.
  The LAST parameter is *not* automatically incremented, so the length of the generated pattern is not increased unless you adjust the LAST parameter yourself.
- Del Bit
  Delete the bit at ADDR. All following bits are shifted left, bit 16 384 is copied.
  The LAST parameter is *not* automatically decremented, so the length of the generated pattern is not decreased unless you adjust the LAST parameter yourself.

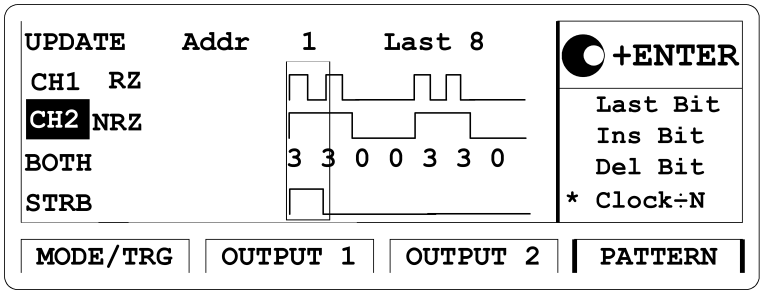
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- CLOCK÷N

  Fill bits ADDR to LAST with a divided clock pattern. After pressing ENTER you can adjust the dividing factor from 2 to 16384 and press ENTER again to implement.

n	Sequence	n	Sequence
2	101010101010101...	6	111000111000111...
3	100100100100100...	7	111000011100001...
4	110011001100110...	8	111100001111000...
5	110001100011000...		

  Note that the output signal is only a square wave if you are using NRZ data. You can see this best in graphics mode:



- PRBS 2^N-1

  Fill bits ADDR to LAST with a 2^n-1 Pseudo-random Binary Sequence. After pressing ENTER you can adjust n in the range 7 to 14 and press ENTER again to implement.

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Hints on Editing Pattern Data

The block editing functions, apart from Insert and Delete, do not affect data bits beyond the current LAST bit. Therefore, you can use the ADDR and LAST parameters to define the block of bits you want to edit.

Remember, however, that the LAST parameter also defines the length of the pattern generated at the outputs.

Example

You are currently generating a 48-bit pattern on output 1 and now want to fill bits 10 to 20 with data value 1. On the Pattern screen:

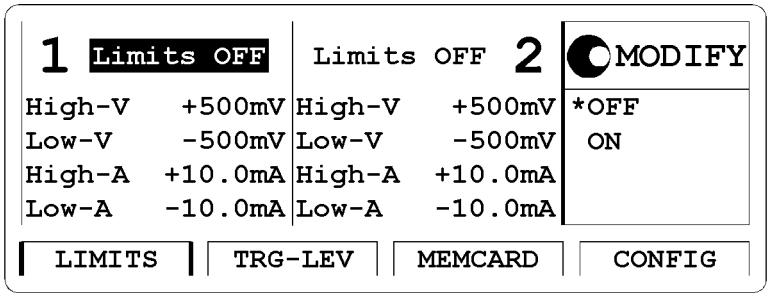
1. If necessary, move the cursor to UPDATE and select UPD ONCE to prevent the data edits from affecting the pattern currently being generated at the output.
   If NO UPD is already selected or if it is not important if the pattern is disturbed during the editing, you can ignore this step.
2. Adjust ADDR to 10.
3. Adjust LAST to 20
   If UPDATE is still active, the pattern at the output will now be automatically reduced to 20 bits in length.
4. Move the cursor to CH1 to access the block editing functions for output 1.
5. Use the MODIFY knob to select FILL 1 from the list of functions.
6. Press ENTER to fill bits 10 to 20 with data value 1.
   If UPDATE is still active, the pattern at the OUTPUT will now change automatically.
7. Adjust LAST back to 48 to reset the pattern length to 48.
   If UPDATE is still active, the pattern at the OUTPUT will now be set to a length of 48 bits.
8. If necessary, move the cursor to NO UPD and press ENTER to update the pattern being generated at the OUTPUT (or select UPD CONT).

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The Limits Screen

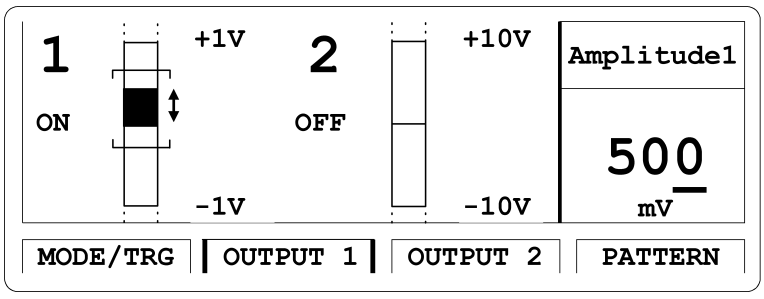
Use the Limits screen to set up voltage and current limits for the pulse level parameters to prevent accidental damage of the device under test.

To access the Limits screen press the LIMITS softkey. If this softkey is not displayed, press MORE.



After you switch on the limits, the pulse level parameters on the Levels/ Output screens cannot be adjusted outside the ranges specified on the Limits screen if the output is switched on. Note that because current and voltage limits apply, the available ranges of the impedance parameters are also affected.

When output limits are on, the limits are indicated on the LEVELS/ OUTPUT pages in graphics mode. The level bar is scaled accordingly:



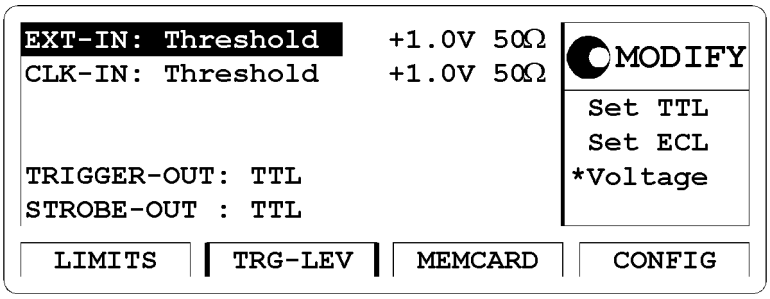
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The Trigger-Level Screen

Use the Trigger-Level screen to:

- Set the triggering threshold and input impedance for the EXT INPUT connector.
- Set the triggering threshold and input impedance for the CLK IN connector.
- Set the output levels for the STROBE OUT and TRIGGER OUT connectors.

To access the Trigger-Level screen, press the TRG-LEV softkey. If the softkey is not displayed, press MORE.



EXT-IN Parameter

Move the entry focus to EXT-IN to quickly set the triggering threshold of the external input connector (EXT INPUT) to a TTL or ECL compatible level.

- SET TTL
  Set the EXT INPUT threshold to +2.5V.
  To adjust the threshold, you can move the entry focus to the value.
- SET ECL
  Set the EXT INPUT threshold to –1.3V.
  To adjust the threshold, you can move the entry focus to the value.

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- VOLTAGE
  You can set any threshold level in the range of –10.0 V to +10.0 V. To adjust the threshold, you can move the entry focus to the value.

EXT-IN Impedance Parameter (50Ω/10kΩ)

Toggle the input impedance of the EXT INPUT connector between 50Ω and 10 kΩ.

CLK-IN Parameter

Move the entry focus to CLK-IN to quickly set the triggering threshold of the clock input connector (CLK IN) to a TTL or ECL-compatible level.

- SET TTL
  Set the CLK IN threshold to +2.5V.
  To adjust the threshold, you can move the entry focus to the value.
- SET ECL
  Set the CLK IN threshold to –1.3V.
  To adjust the threshold, you can move the entry focus to the value.
- VOLTAGE
  You can set any threshold level in the range of –10.0 V to +10.0 V. To adjust the threshold, you can move the entry focus to the value.

CLK-IN Impedance Parameter (50Ω/10kΩ)

Toggle the input impedance of the CLK IN connector between 50 Ω and 10 kΩ.

TRIGGER-OUT Level Parameter

Select an output level (into 50 Ω) for the TRIGGER OUT connector according to the technology used at the output (TTL or ECL).

STROBE-OUT Level Parameter

Select an output level (into 50 Ω) for the STROBE OUT connector according to the technology used at the output (TTL or ECL).

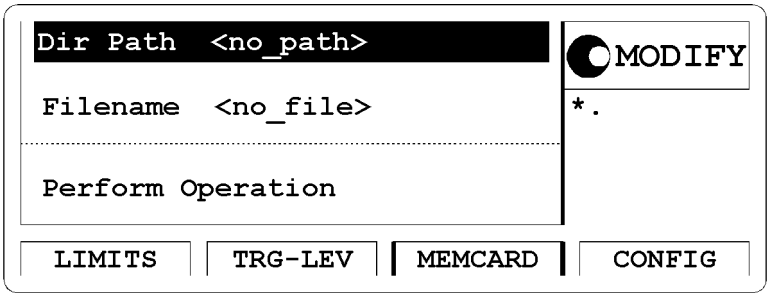
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The Memory Card Screen

Use the Memory Card screen to:

- Store instrument settings to the memory card.
- Recall instrument settings from the memory card.
- Delete files from the memory card.
- Format a memory card.

To access the Memory Card screen, press the MEMCARD softkey. If the softkey is not displayed, press MORE.

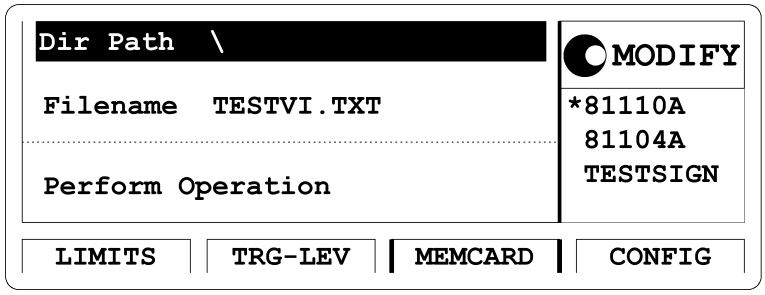


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Current Directory Parameter (Dir Path)

Move the entry focus to DIR PATH to change the directory on the memory card or to view the subdirectories in the current directory (The current directory name is displayed next to DIR PATH).

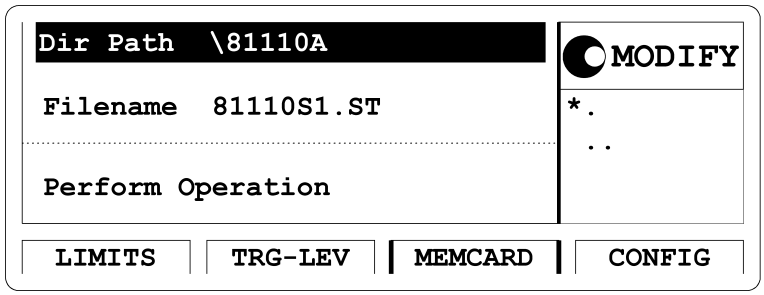
All the sub-directories in the current directory are listed in the modify area.



NOTE Settings from Agilent 81104A cannot be used in the Agilent 81110A or vice versa.

To change directory:

1. Use the MODIFY knob to select the directory name from the list of files and directories in the MODIFY window.
2. Press ENTER.

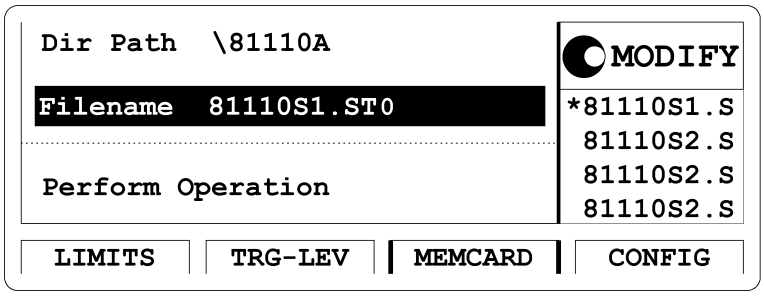


NOTE Note that when you are in a sub-directory you can return to the parent-directory by selecting .. from the directory list in the MODIFY window.

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Filename Parameter

Move the entry focus to the FILENAME parameter to view and select a file from the current directory. Use the MODIFY knob to scroll through the filenames listed in the MODIFY window.



Memory Card Operations

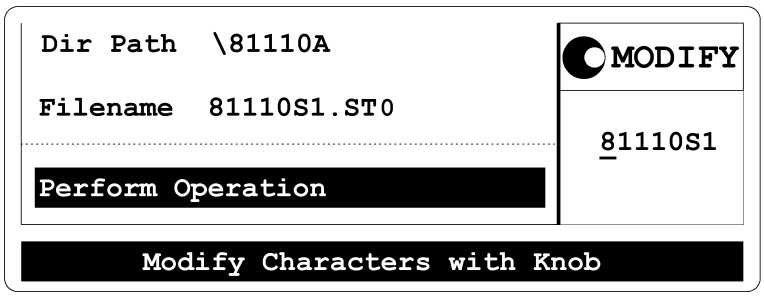
Move the entry focus onto PERFORM OPERATION and use the knob to select the operation:

- READCARD
  Read the DOS file-system information from the memory card after inserting a new card. Press ENTER to carry out the operation.
- RECALL
  Recall the selected file as the current-instrument setting. Press ENTER to carry out the operation.

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- STORE

  Store the current instrument setting to the memory card.



  Press ENTER once to start editing the filename for the setting in the MODIFY window. The currently selected filename is used as default.

CAUTION If you do not modify the filename, the existing file will be overwritten when you press ENTER.

  Press CURSOR UP or CURSOR DOWN to cancel the store operation at any time.

  To modify the filename, move the character cursor with the CURSOR keys. The filename can be up to 8 characters long. Character can be modified by using the knob. When you have finished, press ENTER to store the setting.

  Note that the DOS filename suffix ".ST0" is added automatically to the filename when you store the current settings.

- STORE ALL

  Store the current instrument setting and the instrument setting memories 1 to 9 to the memory card. Each setting is stored in a separate file with the same name but different suffixes (".ST0" for the current setting, ".ST1" to ".ST4" for setting memories 1 to 4).

  Press ENTER once to start editing the filename for the setting in the MODIFY window. The currently selected filename is used as default.

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CAUTION If you do not modify the filename, the existing file will be overwritten when you press ENTER.

Press CURSOR UP or CURSOR DOWN to CANCEL the store operation at any time.

To modify the filename, move the character cursor with the CURSOR keys. The filename can be up to 8 characters long. Character can be modified by using the knob. When you have finished, press ENTER to store the setting.

- DELETE

  Delete the selected file from the memory card. Press ENTER to start the operation.

- FORMAT

  Format the memory card. Press ENTER to start the operation.

CAUTION Formatting a memory card destroys any existing files on the card.

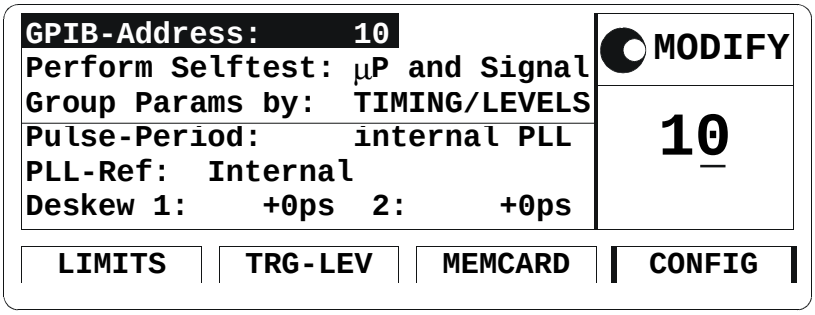
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The Configuration Screen

Use the Configuration screen to:

- Set the GP-IB address of the instrument.
- Perform a selftest.
- Group the pulse parameters by timing and levels or by output 1/2 on a two-channel instrument.
- Select the frequency reference source and the frequency for the PLL.

To access the Configuration screen, press the CONFIG softkey. If the softkey is not displayed, press MORE.



GP-IB Address

Set the Agilent 81110A or Agilent 81104A GP-IB address in the range of 0 to 30. The default address of both instruments is 10.

Perform Operation "Selftest"

Select SELFTEST in the MODIFY area.

Start the selftest by pressing ENTER. If the selftest fails, a flashing E is displayed. Press HELP to see the list of error messages.

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Perform Operation "Calibrate"

Select CALIBRATE in the MODIFY area.

Start the timing calibration for the VFO-period, delay and width circuitries by pressing ENTER.

If the calibration fails, a flashing E is displayed. Press HELP to see the list of error messages.

NOTE Timing Calibration is available for Agilent 81110A only.

Parameter Grouping (Group Params by)

NOTE This option is only available if your Agilent 81110A or Agilent 81104A mainframe is equipped with two output modules.

Configure the grouping of the pulse-parameters on the user interface:

- TIMING/LEVELS

  The pulse timing parameters for outputs 1 and 2 are grouped together on the Timing screen.

  The pulse-level parameters for outputs 1 and 2 are grouped together on the Levels screen.

- OUTPUT 1/2

  All timing and level parameters for output 1 are grouped together on the Output 1 screen.

  All timing and level parameters for output 2 are grouped together on the Output 2 parameter screen.

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Pulse Period Source

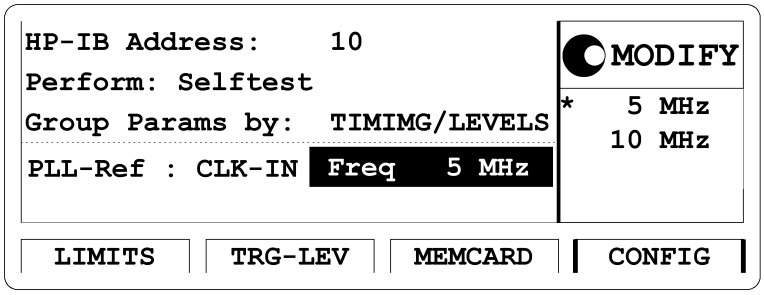
The instrument provides an internal PLL to generate the pulse period. However, you can use an external clock source applied to the CLK/REF INPUT connector instead.

- INTERNAL PLL
  Internal PLL is used for pulse period generation.
- CLK-IN
  External clock source is used for pulse period generation.

PLL Reference

Set the frequency reference source for the PLL:

- INTERNAL
  The internal 5 MHz reference.
- CLK-IN
  An external reference signal at the CLK IN (PLL REF) connector. You can set the expected frequency of the external reference to 5 MHz or 10 MHz:



Deskew Parameter

Set the deskew of output 1 and 2 in to compensate for different cable delays.

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The Output Screens

If two channels are installed, the Output screens show both, timing and level parameters combined on one screen for output 1 and one screen for output 2. To make the Output screens available, the parameter GROUP PARAMS BY: must be set to OUT 1/2 in the Configuration screen (see *"The Configuration Screen" on page 103*).

To access an Output screen, press the OUTPUT1 or OUTPUT2 softkey.

NOTE If only one channel is installed, Timing and Levels screens are grouped in an Output screen automatically.

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Warnings and Errors

The 81110A/81104A has two levels of error reporting called “warnings” and “errors”. Checking for errors and warnings is always enabled, unless you switch it off via the GP-IB using the `:SYSTem:CHECk` command or by switching off the output(s).

- A **warning** is generated when the output signal *could* be invalid due to a combination of worst case uncertainties at the current settings of all relevant parameters.

  For example, when adjusting the pulse width, all other timing parameters and their uncertainties have to be considered in order to check if the width setting will fits within the pulse period.

  Note that the warning limits are therefore not fixed for a particular parameter, but vary with the settings of the related parameters. It is also possible that the error and warning limits are the same, that is, a warning does not occur before the error limit is reached.

  If a warning occurs, the settings are still implemented in the hardware because the worst-case conditions used to evaluate the warning limits are very unlikely to occur in practice.

  A blinking W indicates that one or more warnings have occurred. Press HELP to view the warning list.

- An **error** is generated when an invalid mode is chosen, or the required parameter settings cannot be implemented in the output hardware. Multiple errors can occur, but only the first error detected is displayed.

  An error is indicated by a blinking error message at the bottom of the screen.

NOTE If the output(s) are switched off and you are using the knob to adjust parameters, it is usually not possible to generate warnings or errors. All parameters are automatically limited to settings that guarantee specified operation.

However, if you press the SHIFT key while turning the knob, you can adjust a parameter beyond its warning limits. This requires the output(s) to be switched on.

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NOTE You can press SHIFT + HELP (AUTOSET) to carry out an autoset. The instrument resets all parameters, based on the current period setting, to remove all warning and error conditions.

Warning and Error Reporting Example

1. Switch on the instrument and recall the standard settings by pressing SHIFT + RECALL / STORE + 0.
   The period is now set to 1 µs.
2. Switch on output 1 by pressing SHIFT + ON/OFF 1 / 0.
3. On the Timing or Output 1 screen, move the parameter cursor to the value of the WIDTH parameter (100NS).
4. Use the knob to make the WIDTH as large as possible (approximately 940NS).
   This limit is intended to guarantee that the actual output pulse is within specifications, for the actual period.
   The limit is calculated taking into account a worst case combination of minimum period from the period setting (1 µS) and maximum width from the width setting (940 NS) together with minimum leading and trailing edge settings (for example, 2.00 NS).

NOTE Note that if you now cannot modify the current setting of the leading edge (for example, 2.00 ns) with the knob. This is because the upper and lower warning limits are currently 2.00 ns. The width is at its maximum value and width+leading edge+trailing edge ≤ period.

5. Press SHIFT and adjust the Width above its warning limit. A flashing W appears to indicate that a warning condition has occurred.

NOTE Note that as long as no errors occur, the output hardware is set up and attempts to generate the required output.

6. Press HELP to see the warning message:
   TRAILING EDGE 1 MAY CUT NEXT PULSE
7. Press HELP again to return to the Width parameter.

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8 Increase the WIDTH further to approximately 980 ns and press HELP to see the current warnings:

WIDTH 1 TOO CLOSE TO PERIOD

TRAILING EDGE 1 MAY CUT NEXT PULSE

9 Press HELP again to return to the WIDTH parameter.

10 Increase the WIDTH further until a flashing error message appears (approximately 1.10 µs):

OUTPUT 1: WIDTH > PERIOD

You have reached the current upper error-limit of the WIDTH parameter.

The setting is not implemented in the output hardware.

11 Press SHIFT + HELP to perform an AUTOSET.

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A Installation & Maintenance

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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 Agilent office. (Please request the latest performance tests from Agilent Technologies) Keep the shipping materials for inspection by the carrier. The Agilent office will arrange for repair or replacement without awaiting settlement.

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Standard Deliverables

The 81110A/81104A shipping container contains the following standard deliverables:

1. The instrument, either an Agilent 81110A or an Agilent 81104A Mainframe with one or two channels installed.
2. This Quick Start Guide and a Reference Guide
3. A power cord.

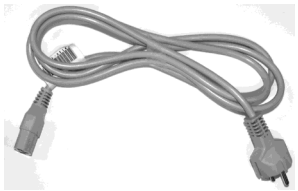
1. Agilent 81110A Pulse/Pattern Generator



2. This Quick Start Guide and the Reference Guide



3. A Power Cord

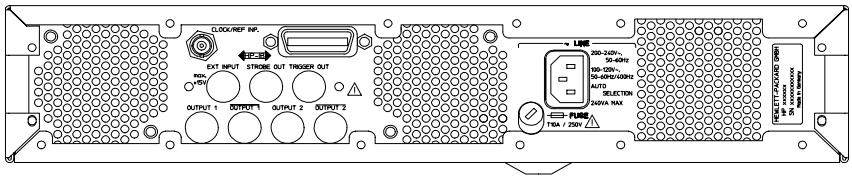


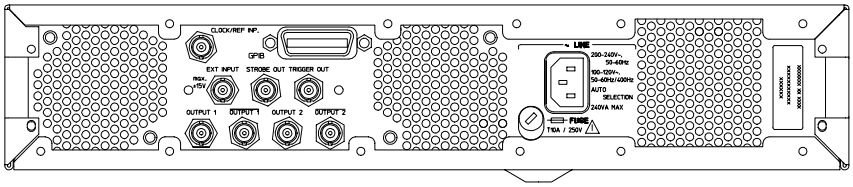
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Options and Accessories:

Options

Rear Panel Connectors	Option UN2 All inputs and outputs are at the rear panel
Second Channel	Agilent 81105A 10V/80 MHZ for mainframe Agilent 81104A, Agilent 81111A 10V/165 MHz or Agilent 81112A 3.8V/330 MHz for mainframe Agilent 81110A
1 MB SRAM Memory Card	Option UFJ (Agilent part number 0950-3380)





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Handle Accessory

Front Handle Kit: Agilent part number 5063-9226

Rack Mounting Accessories

Rack Mount Kit	Agilent part number 5063-9212
Rack Mount and Front Handle Kit	Agilent part number 5063-9219
Rack Slide Kit	Agilent part number 1494-0059

Quick Start Guide Language Options

French Guide	Option ABF (Agilent part number 81110-91220)
Japanese Guide	Option ABJ (Agilent part number 81110-91520)
Taiwan Chinese Guide	Option AB0 (Agilent part number 81110-91620)
Korean Guide	Option AB1 (Agilent part number 81110-91720)
Chinese Guide	Option AB2 (Agilent part number 81110-91820)

Additional Documentation Options

Service Manual	Option 0BW

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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.



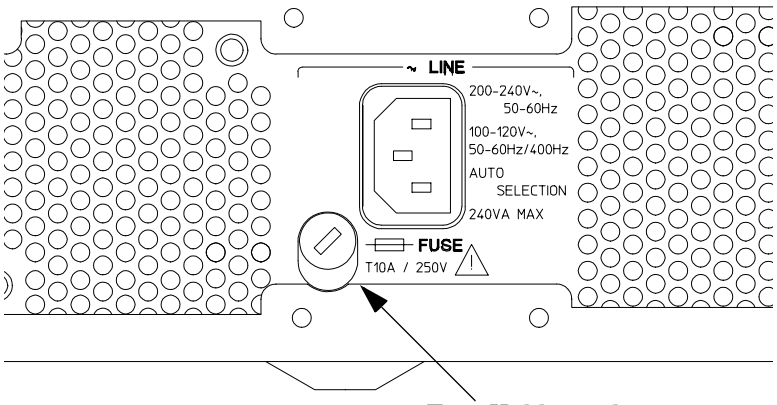
The instrument can operate from any single-phase AC power source supplying 100–240 V in the frequency range from 50 to 60 Hz, or 100–120 V at 400 Hz. The maximum power consumption is 300 VA with all options installed. When the instrument is switched on the power supply adapts automatically to the applied AC power (Auto Selection) and monitors the AC power range during operation.

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Replacing the Fuse

1 Remove the power cord.

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



3 Replace the fuse with the equivalent part

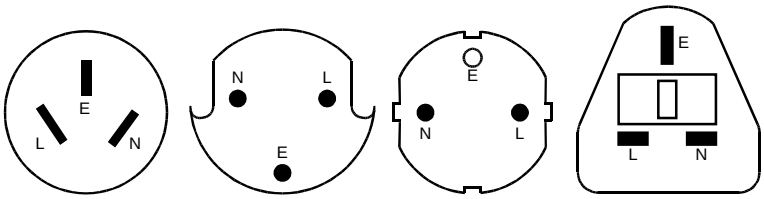
Line Voltage	Fuse Type	Agilent Part Number
100 - 240 V~	T 10A, 250 V	2110-0720

4 Refit the fuse-cap.

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Power Cable

In accordance with international safety standards, this instrument is equipped with a three-wire power cable. The figure below shows the part numbers of the power cables available. When connected to an appropriate AC power receptacle, this cable grounds the instrument cabinet.

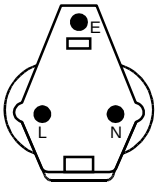


Australia
8120-1369

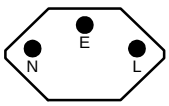
Denmark
8120-2956

Europe
8120-1689

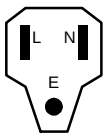
Great Britain
8120-1351



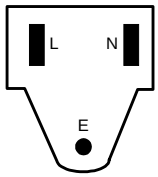
South Africa
8120-4211



Switzerland
8120-2104



United States 120V
8120-1378



Japan 120V
8120-4753

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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 Agilent Service for repair.

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Battery



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

NOTE Recycle or dispose used batteries according to local regulations. Or contact your Agilent representative for information on battery recycling.

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 Agilent 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.

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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.

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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.

Donotoperatetheinstrumentinthepresenceofflammable gases, fumes or powders. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

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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.**

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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.

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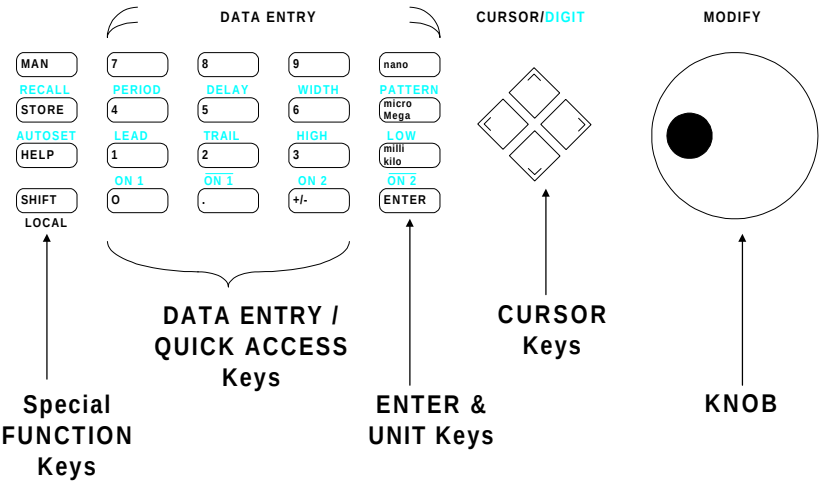
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