

**Getting Started**  
with the  
**Agilent Serial Pulse**  
**Data Generator**  
81141A/81142A

You only need a few minutes to get started with the Serial Pulse Data Generator.

This Getting Started Brochure helps you to quickly understand the operating principles and set up the instrument.

If you need more detailed information on the Serial Pulse Data Generator, check out the Online Help. The Help also offers printable versions of the Operating Guide and the Programming Guide.



**Agilent Technologies**

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General Safety Precautions

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument.

Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Before operation, review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

General

This product is a Safety Class 1 instrument (provided with a protective earth terminal). The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

All Light Emitting Diodes (LEDs) used in this product are Class 1 LEDs as per IEC 60825-1.

Environmental Conditions

This instrument is intended for indoor use in an installation category II, pollution degree 2 environment. It is designed to operate within a temperature range of 5 – 40 °C (40 – 105 °F) at a maximum relative humidity of 95% and at altitudes of up to 2000 meters.

Refer to the specifications tables for the ac mains voltage requirements and ambient operating temperature range.

Before Applying Power

Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack-mounted the rack must be provided with an easily accessible mains switch.

Ground the Instrument

To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the ac power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

Do not operate the instrument in the presence of flammable gases or fumes.

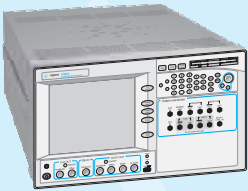
Do Not Remove the Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel. Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

# Installing the Agilent Serial Pulse Data Generator

## Inspect Shipment

Check if the Serial Pulse Data Generator shipping container contains the following standard deliverables:



The Agilent Serial Pulse Data Generator 81141A/81142A

If the contents are incomplete, if there is mechanical damage, or if the instrument does not work within its specifications, notify the nearest Agilent office. The Agilent office will arrange for repair or replacement without awaiting settlement.

For the complete content of your delivery please refer to the Box Contents List.



Power Cable



USB Cable



Agilent IO Libraries Suite CDs



This Getting Started Brochure



Box Contents List

## Power Requirements

When the front panel switch is off, the instrument is in standby mode. The instrument can only be disconnected from the AC line power by disconnecting the power cord. The instrument must be positioned so that the operator can easily access the power cable inlet.

The instrument can operate from any single-phase AC power source supplying 100 – 240 V in the frequency range from 47 – 63 Hz. The maximum power consumption is 350 VA. The power supply automatically adapts to the applied AC power (Auto Selection) and monitors the AC power range.

The mains plug can only be inserted in a socket outlet that provides protective earth contact. Any interruption of the protective earth contact inside or outside the instrument makes any operation of the instrument dangerous. Intentional interruption is prohibited.

## Connect the Instrument

1 If desired, connect a keyboard and mouse.

This is optional, the instrument can be operated without external input devices. Mouse and keyboard are not included in the shipment. You can use standard USB or PS/2 devices.

2 Connect the line cord.

3 Turn on the instrument.

4 Ensure that the Data Out and Clock Out connectors are properly terminated.

Data and Clock output connectors of the instrument that are not used in your test setup must be terminated with 50 Ohm to ground.

For detailed information about working with the instrument, please refer to the Online Help.

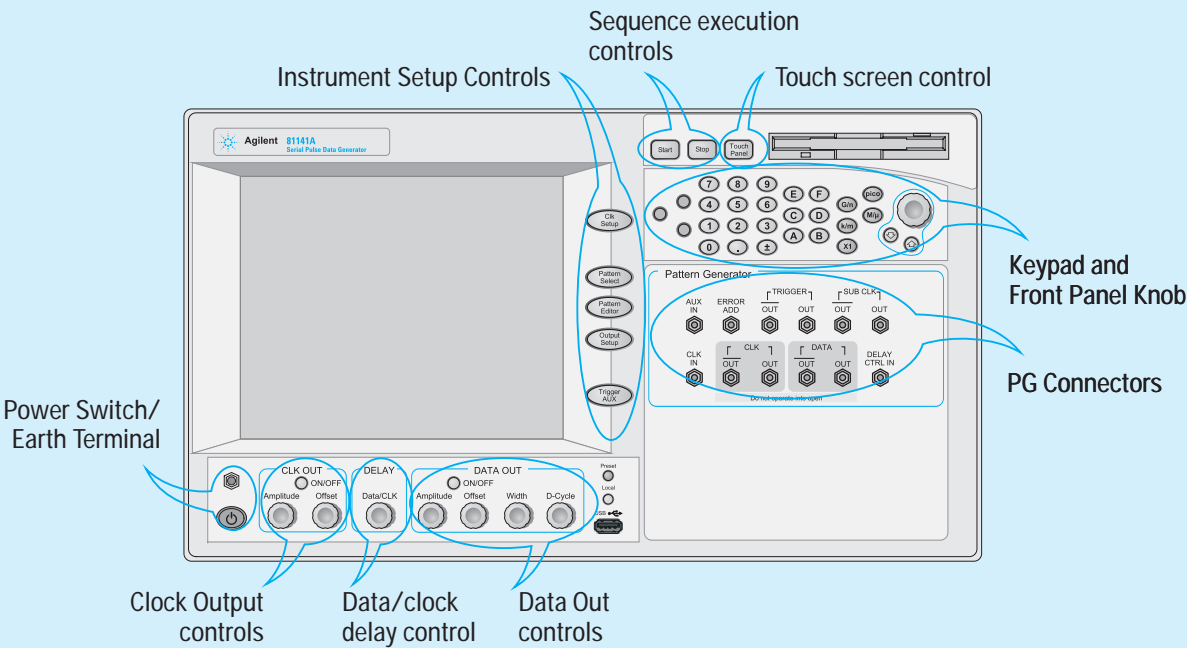
## Ventilation Requirements

Make sure that there is adequate clearance of 50 mm (2 in) at the top and right side of the instrument to ensure adequate air flow. If the air flow is restricted, the internal operating temperature will be higher, reducing the instrument's reliability.

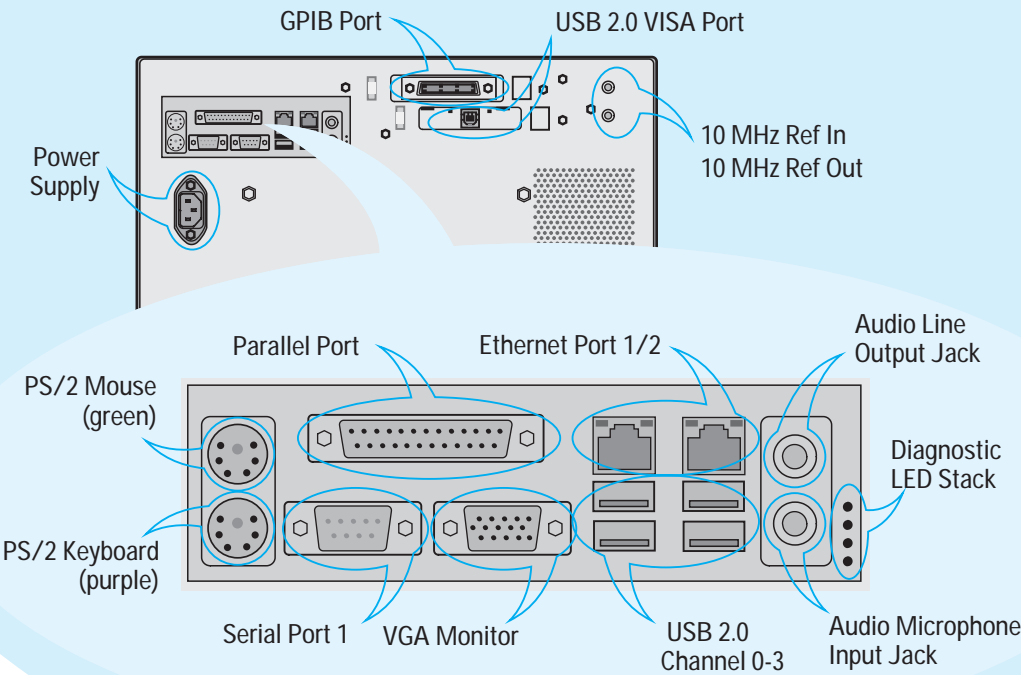
Do not cover the ventilation holes.

# Operating the Agilent Serial Pulse Data Generator

Now that the instrument is running, let's take a look at its front panel elements:



The rear panel of the instrument provides the following connectors:

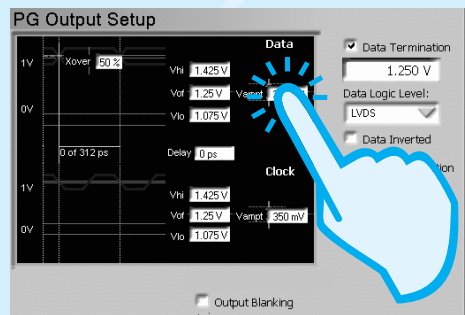


To avoid damage to the Serial Pulse Data Generator and your devices under test, always use an ESD strap that is connected to the earth terminal.

# Operating the Agilent Serial Pulse Data Generator

## Changing Parameters

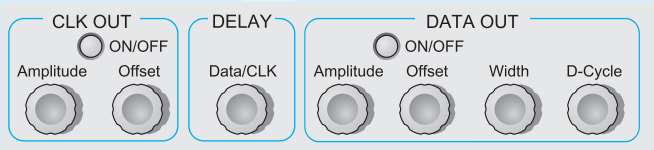
With the touchscreen, your finger is the mouse. Tipping an item with your finger is like clicking it with the mouse.



You can use the numeric keypad to enter values by hand, or the large knob to adjust values.



You can also use the knobs at the bottom of the instrument to change certain frequently used values in run-time.

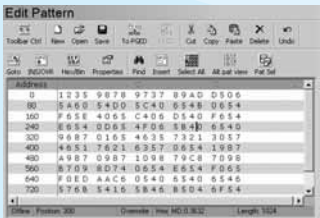


## Navigating the GUI

The menu buttons allow you to quickly navigate through the instrument's software sections:

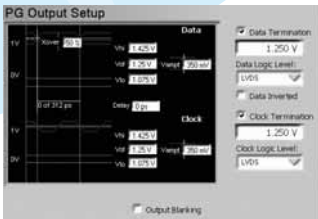
Pattern Editor

Pattern Editor



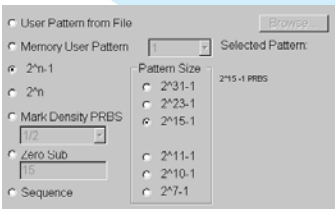
Output Setup

Output Setup



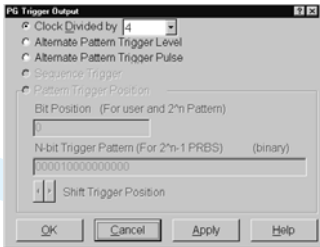
Pattern Select

Pattern Select



Trigger AUX

Trigger/AUX



# Preparing the Test

## How Can You Check the Instrument's Operation?

The quickest way to familiarize yourself with the instrument is to set up a short test. All you need for this test is an oscilloscope or Digital Communication Analyzer, two APC/RPC cables, and maybe two SMA adapters to connect the pattern generator's Data Out and Clock Out to the oscilloscope.

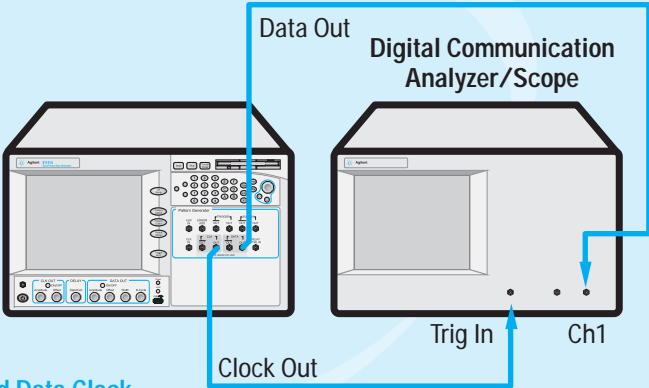
## Setting up the Pattern Generator

1 Reset the instrument.



This sets all voltages and parameters to default values.

2 Connect the oscilloscope or DCA



The inverted Data Clock outputs are not used and must be terminated with 50 Ohms to ground.

## Setting the Bit Rate

After power on, the Serial Pulse Data Generator shows the Bit Rate Setup screen.

1 Keep the "Internal" clock source.

2 Enter the required clock rate or select one from the list of preset bitrates.

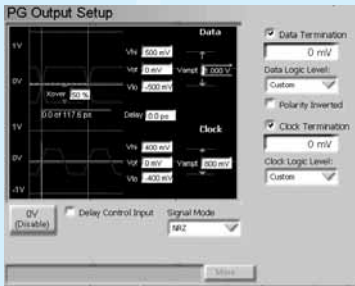


You can easily add your favorite frequencies to the list.

# Preparing the Test

## Setting up Voltage Levels

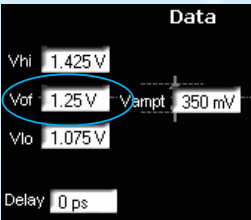
1 Switch to the *PG Output Setup*



2 Now select the logic family LVDS for the data and clock port.



3 Let's increase the signal's data offset by 100 mV. Just tip the offset field,



4 and turn the fine-tuning knob until you have the desired value.



Use the Up and Down buttons below the knob to position the cursor.

# Viewing the Eye Diagramm

We will now generate a Pseudo Random Binary Signal (PRBS) and observe the eye diagram with the oscilloscope.

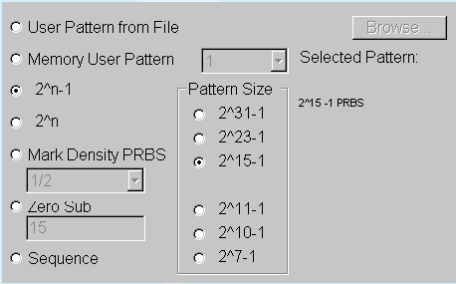
## Choose the Pattern

- 1 Press the Pattern Select button to open the *Select Pattern* dialog.



- 2 Select the pattern type  $2^n-1$  PRBS.

- 3 Select the PRBS polynomial.

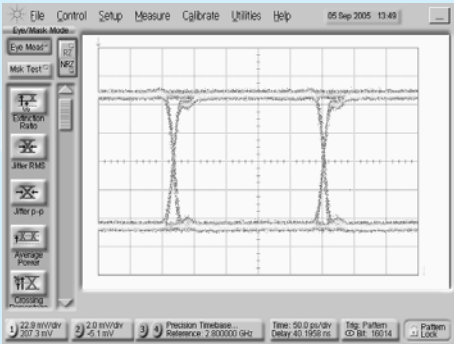


## Inspect the Output

- 1 Enable the Clock and Data outputs (press the On/Off buttons below the screen).



- 2 Ensure that your oscilloscope or DCA is not set up for averaging.



You can now measure slew rates, overshoot, and ringing. You can also estimate the jitter caused by the internal clock oscillator.



# Setting up a Sequence of Patterns

The built-in sequencer allows you to define sequences of patterns. A sequence consists of up to four blocks that can be looped. Each block can generate a pause signal (constant 0 or 1), a divided clock, a  $2^n - 1$  PRBS, or a user pattern.

We will set up a simple sequence that consists of a header, payload data, and a footer. We will also check the sequence trigger.

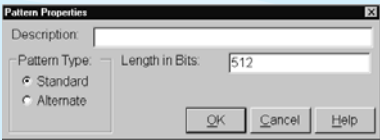
## Creating the Header Pattern

You can import existing pattern files in various data formats. For now, we create a pattern manually.

- 1 Open the Pattern Editor.



- 2 From the toolbar, choose *New* and set the length to 512 bits.



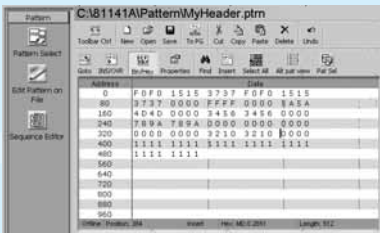
512 bits is the bit-resolution of the pattern generator.

- 3 From the toolbar, click *Bin/Hex*. In hex mode, you can enter four bits with one keystroke.

- 4 Type your pattern.

Explore the capabilities of the Pattern Editor, like cut, copy, and paste.

Note that we have set a couple of bits at the end to pure ones. This will make it easy to distinguish the header from the payload.



- 5 Save the pattern in a file.

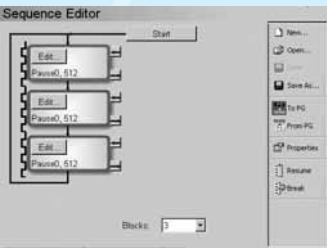
We have named the file MyHeader.ptnr.

## Creating the Sequence

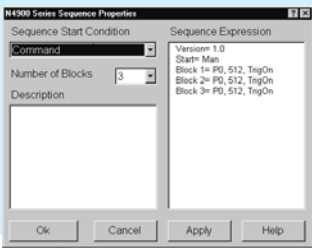
- 1 Open the Sequence Editor.



The sequence looks now like this:



This provides you with a *Start* button to start the sequence execution manually.

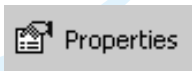


- 4 Set the sequence start condition to *Command*.

- 2 Set the number of blocks to 3.

If necessary, delete useless loops by clicking the associated button.

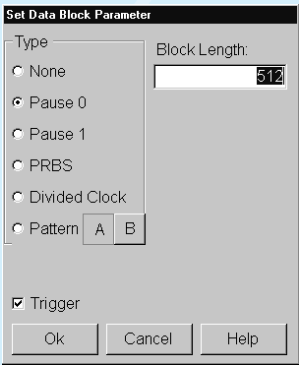
- 3 Open the Properties dialog.



# Modifying the Test Setup

## Inserting Data into the Sequence Blocks

- 1 Click the *Edit...* button inside the first block.



- 2 Click *Pattern* and browse for the header pattern you have stored.

- 3 Click the *Edit...* button of the second block. Set the length to 2048 bits and click *PRBS*. Select the polynomial you wish to generate. This is our payload. Disable the Trigger.

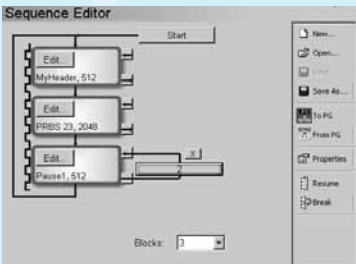
- 4 Set the third block to *Pause 1* and disable the Trigger. This block may help a device to recover.

- 5 Add a loop to the third block.

Click the block's out arrow, then its in arrow. This creates the loop.

Click the *INF* button, choose *Counted*, and change the loop counter to 2. This block will be two times repeated.

Now, your sequence looks like this:



- 6 Download the sequence to the pattern generator.



# Inspecting the Sequence Execution

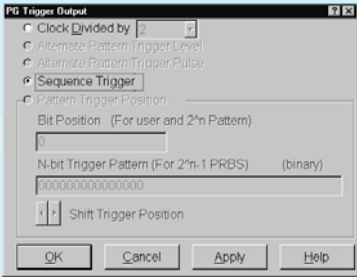
To observe the sequence trigger together with the generated data, you need a two-channel oscilloscope that can synchronize on the signal at a channel. If your oscilloscope requires a separate trigger, you need a power splitter and two additional cables to connect the instrument's Trigger Out with the second channel and the trigger input of the scope.

## Enabling the Sequence Trigger

1 Open the Trigger Output setup dialog.



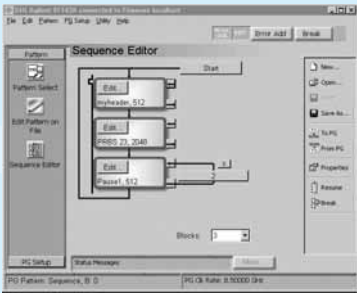
2 Enable Sequence Trigger.



This is only possible after a sequence has been downloaded to the pattern generator.

3 Return to the Sequence Editor.

You can also associate a trigger with each of the blocks.

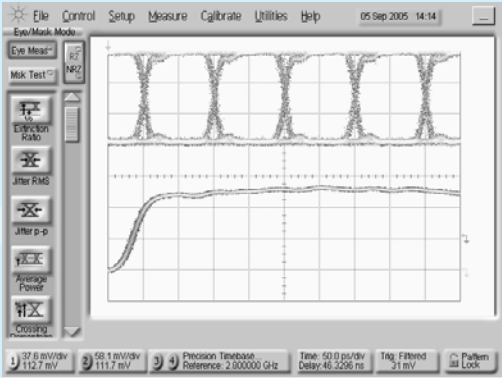


As shown on the screen, a trigger will be generated whenever the first block starts.

## Viewing the Results

1 To start the sequence execution, click *Start* or press the Start button of the Serial Pulse Data Generator.

On the oscilloscope, you can see both the eye diagram and the trigger slope.

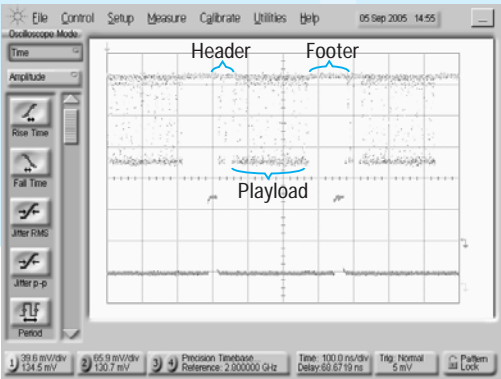


You can also check how the trigger appears when the overall loop restarts the first block.

2 To stop the sequence execution, click *Resume* or press the *Resume* button of the Serial Pulse Data Generator.

*Resume* re-initializes the sequence. The pattern generator stops and waits for the sequence start signal which in our example is the Start button.

You can even identify the three blocks of the loop.



# What Else You Can Do

## Generate Trigger Signals

The pattern generator can be set up to send trigger signals for different purposes. These signals can indicate various occasions like the beginning of patterns.

## Use Alternating Patterns

Set up two different data patterns that are sent alternately or externally controlled. This can be used to insert errors on particular positions in the data pattern or to test the DUT's ability to recover from gaps in the data stream.

## Error Add and Delay Control

Error Add allows you to insert single errors into a defined bit stream. Delay Control makes it possible to vary the delay between clock and data by applying an external voltage. You can thus generate an artificial jitter with frequencies up to several Ghz.

## Programming Support

The Serial Pulse Data Generator can be programmed remotely via SCPI or IVI-COM commands. See the Programming Guide. For IVI-COM refer also to:  
[www.agilent.com/find/adnivicominfo](http://www.agilent.com/find/adnivicominfo)  
[www.agilent.com/find/adnivicompapers](http://www.agilent.com/find/adnivicompapers)  
[www.agilent.com/find/adnivicomdrivers](http://www.agilent.com/find/adnivicomdrivers)  
[www.agilent.com/find/adndownloads](http://www.agilent.com/find/adndownloads)

## How to Get Help

The Serial Pulse Data Generator is equipped with a context-sensitive Online Help. There you will find comprehensive information on the basic concepts of the Serial Pulse Data Generator, detailed procedures for operating it, and reference information on all elements of the GUI and the programming interface.

## Agilent Corporate Information

For further product information, ordering information, and related literature, please refer to the website:

