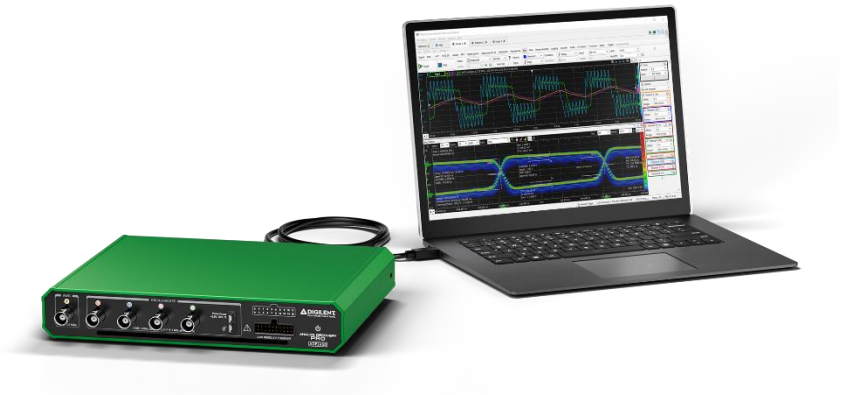
# Analog Discovery Pro 2400 Series Datasheet

**High-Speed, High-Bandwidth Mixed Signal Oscilloscopes**



### Highlighted Features

- USB-based Mixed Signal Oscilloscopes
- Four analog inputs at either 12-bit, 600 MS/s, 100+ MHz bandwidth (ADP2440) or 8-bit, 1 GS/s, 200+ MHz bandwidth (ADP2450)
- Dual Mode and low latency memory segmentation
- Arbitrary Waveform Generator with 15 MHz bandwidth
- Freely allocatable deep buffer memory
- 16 digital inputs/outputs supporting a variety of communication protocols
- Bode plot, dedicated FFT, impedance analyzer, bus analyzer, data logger, and more
- Extensive and powerful software support with WaveForms and WaveForms SDK

## Overview

Smart. Capable. Balanced.

The Analog Discovery Pro 2440 and Analog Discovery Pro 2450 deliver serious measurements for the engineer who knows what matters. Choose between four analog channels of either 100 MHz bandwidth at 12-bit resolution (ADP2440) or 200 MHz bandwidth at 8-bit resolution (ADP2450) with both featuring 16 independent digital I/O and seamless integration with the WaveForms software. These USB 3.0 oscilloscopes provide the right level of performance where you need it. Circuit design, embedded systems, or your own unique test workflow; you can do it all without distracting from your task at hand.

When you need a real tool to solve real problems, use the Analog Discovery Pro.

# 1 Features

**Analog Inputs**

- Analog Discovery Pro 2440
  - Four BNC input channels with 12-bit resolution with up to ±25 V input range
  - 100+ MHz bandwidth, 600 MS/s interleaved
- Analog Discovery Pro 2450
  - Four BNC input channels with 8-bit resolution with up to ±25 V input range
  - 200+ MHz bandwidth, 1 GS/s interleaved
- 10 different hardware input ranges for multiple levels of precision
- Many additional views including FFT, Histogram, Persistence, Eye Diagram, and Analog-to-Digital plots
- Complex trigger support including Edge, Pulse, Timeout, Glitch, Transition, and Window conditions
- Dedicated Spectrum Analyzer, Network/Bode Plot Analyzer, and Impedance Analyzer instruments

**Analog Output**

- One BNC output function generator channel with 14-bit resolution, ±5 V output range
  - 15+ MHz bandwidth, up to 125 MS/s
- Standard, Advanced, and Custom Waveforms supported
  - Sine, Square, Triangle, Ramp, DC, Pulse, Noise, Burst
  - Uni and Bidirectional Frequency and/or Amplitude Sweep
  - Multiple modulation techniques including AM, FM, PM, and Summation

**Digital I/O**

- 16 digital I/O with a configurable pull resistor
- Internally clocked up to a 1.2 GS/s sampling rate
- Many protocol analyzers including SPI, I2C, UART, 1-Wire, CAN, GPIB, I2S, LIN, JTAG, Manchester, SAE JA1850, and Quadrature Decoders
- Protocol generation support for SPI, UART, I2C, CAN, HDMI CEC, SWD, and AVR
- Two bidirectional BNC triggers for external and internal triggering

**Additional Features**

- Dual Mode to operate two devices simultaneously for 8 analog inputs, 32 digital I/Os, and 2 AWGs
- Automatic device phase adjustment between devices in Dual Mode
- USB 3.2 (5 Gbps) transfer speeds
- Triggering and cross triggering between instruments working simultaneously and independently
- Complex and custom math for each instrument to support the filtering and generation of any signal
- Deep Buffer Memory that can be freely allocated between Analog and Digital systems
- Memory Segmentation with only 1 µS latency between high-speed repeated captures
- Metal enclosure with DIN rail support for easy mounting

**Software Support**

- Digilent's free and powerful WaveForms software for Mac, Windows, and Linux
- WaveForms SDK for custom applications and scripting through C/C++, Python, C#, Visual Basic

## Comparison Chart

| What do you need? | | ADP2440 | ADP2450 |
|---|---|---|---|
| High Sample Rate and Bandwidth? | 12-bit, 100 MHz, 600 MS/s across 4 channels? | ● | |
| | 8-bit, 200 MHz, 1 GS/s across 4 channels? | | ● |
| 16 freely configurable Digital I/O generating and interpreting data? | | ● | ● |
| Bode plots, FFTs, Eye Diagrams, Impedance Analyzer, custom math? | | ● | ● |
| Arbitrary Waveform Generator supporting everything from sine and square waves to phase and amplitude modulation in burst pulses? | | ● | ● |
| To have everything from Scope Probes and functionality to software and product support included in a single one-time price? | | ● | ● |

## Callout Diagram

### ANALOG DISCOVERY PRO 2440 / 2450 Walk Around

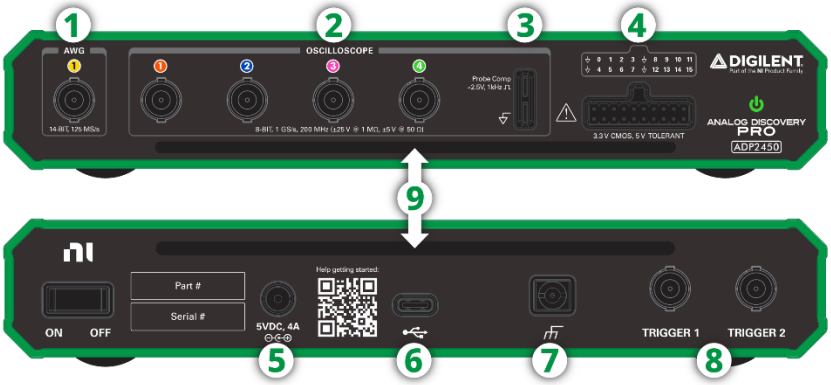
**1. Arbitary Waveform Generator**
- 1 channel on a BNC connector
- 14 bits, ±5 V output range
- 125 MS/s, 15+ MHz bandwidth

**2. Oscilloscope (*2440* / *2450*)**
- 4 inputs on BNC connectors
- **12** / **8** bits, 10 hardware input ranges
- **100+** / **200+** MHz bandwidth for all ranges
- **600 MS/s** / **1 GS/s** aggregate sample rate
- 1 MΩ / 50 Ω selectable input impedance

**3. Probe Compensation Tabs**
- Easy BNC probe calibration

**4. Digital I/O**
- 16 configurable inputs/outputs
- Pattern Generator and Logic Analyzer
- Protocol Analysis and Generation

**5. Power Supply Input**
- External 5 V, 4 Amp supply included




**6. USB Connector**
- USB 3.1, Type C cable included

**7. Earth Ground Screw**
- To facilitate earth ground connections

**8. BNC Triggers**
- Input or output
- Used to facilitate Dual Mode

**9. Ventilation Holes**
- To enable airflow for the on-board fan

**Additional Features**
- Spectrum Analyzer
- Network Analyzer
- Impedance Analyzer
- Data Logger
- Deep Buffer memory
- USB 3.1 speeds (5Gbps)
- Rapid Triggering

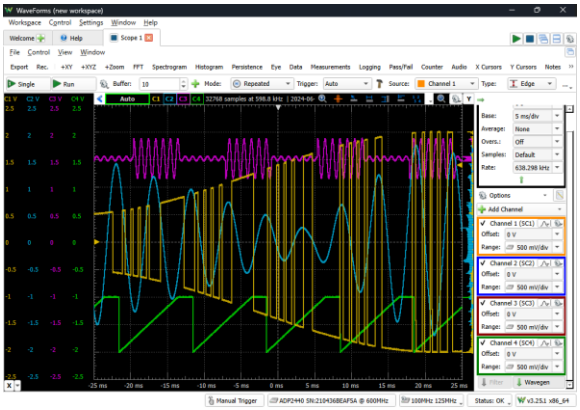
# 2 WaveForms Software

Digilent's WaveForms software offers a unified device experience across all our Test and Measurement devices, enabling use of all hardware features and instruments. It features a friendly user interface that has the feel of traditional benchtop devices. WaveForms makes it easy to acquire, visualize, analyze, produce, and reuse both analog and digital signals simultaneously on Windows, MacOS, and Linux.

For even more customization potential, the WaveForms Software Development Kit (SDK) can be used to create custom applications and scripts to control the T&M device in Python, C, and additional languages.

The WaveForms software supports the following instruments for the Analog Discovery Pro 2400 Series:

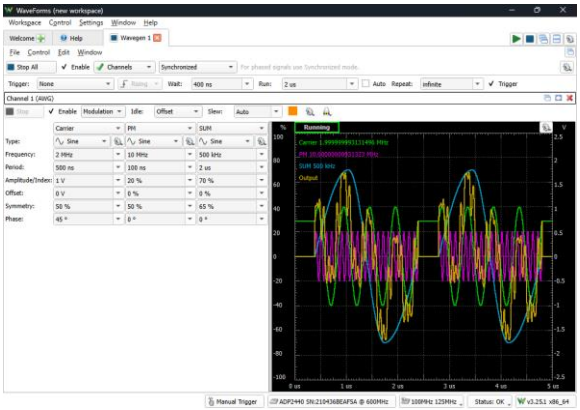
## 2.1 Oscilloscope



The Oscilloscope instrument captures analog input data via the analog input scope channels. When this instrument is used, the Analog Discovery Pro 2440 acts as a 12-bit 100+ MHz bandwidth oscilloscope with up to 600 MS/s across all four channels. The ADP2450 acts as an 8-bit 200+ MHz bandwidth oscilloscope with up to 1 GS/s across all four channels.

Each device has 10 different hardware input ranges, deep buffer memory, and complex triggering to enable precise data collection for every engineer.

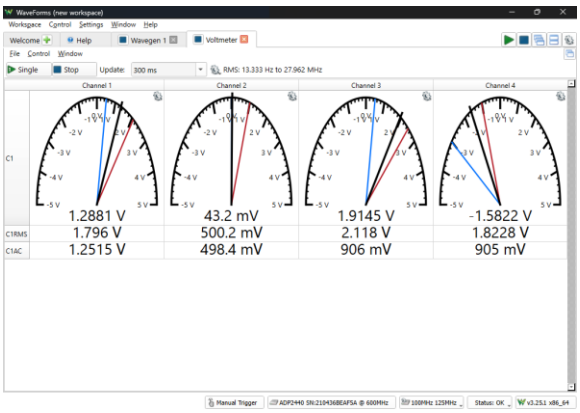
## 2.2 Waveform Generator



The Waveform Generator instrument can output a wide variety of analog waveforms. Supported waveform shapes include everything from simple waveforms like Sine and Triangle waves to amplitude and frequency sweeps to sending out bursts of carrier signals with phase modulation and amplitude summation. Each of the Analog Discovery Pro 2400 devices have an arbitrary waveform generator with ±5 V output and 15 MHz of bandwidth.

## 2.3 Voltmeter

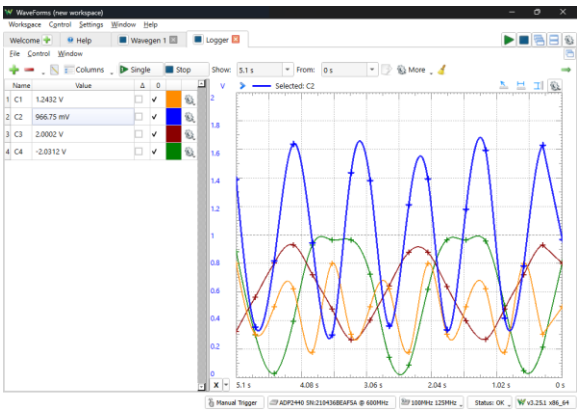
The Voltmeter instrument offers a relaxed view of the Oscilloscope, taking averages on each of the four analog inputs over a user acquisition rate. The historic high and low measurements are tracked and maintained throughout the acquisition.




## 2.4 Data Logger

The Data Logger instrument can capture and display large buffers of analog input data on the Scope pins. The Data Logger can capture up to 10 million samples at user defined and hardware timed update rates ranging from every 5 µS to once an hour.

Larger and faster data logging can be performed through Record mode on the Oscilloscope.

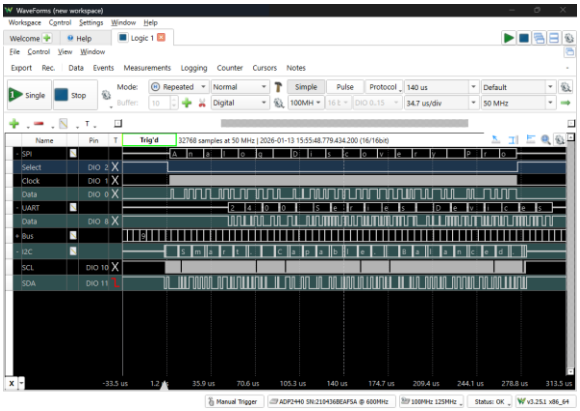


## 2.5 Logic Analyzer

With the Logic Analyzer, the 16 digital input/output channels can be freely grouped as buses and protocols. Protocol groups can be used to view the decoded contents of packets of many communications protocols, including SPI, I2C, UART, CAN, I2S, LIN, SAE J1850, SWD, and more.

A wide variety of trigger conditions are supported from edge, glitch, timeouts, exact pulse length with hysteresis, edge counts, and user specified protocol frames.

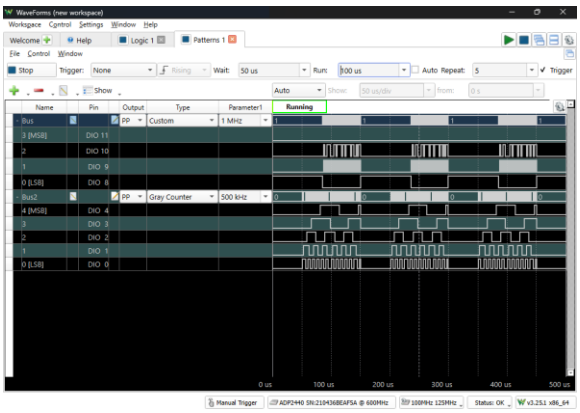
The Analog Discovery Pro 2400 Series devices allow for fine system frequency adjustment of the digital system between 75 MHz and 150 MHz, with scaled internal sample rates up to 1.2 GHz.



## 2.6 Pattern Generator

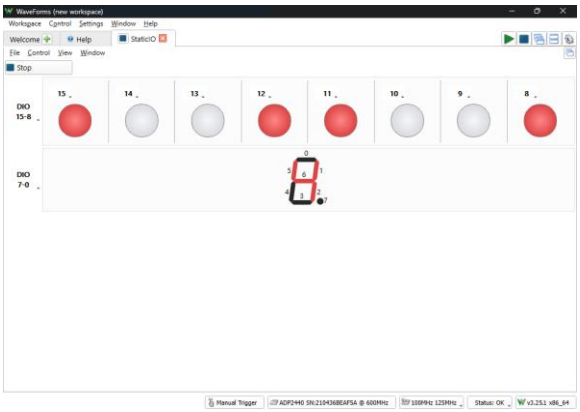
The Analog Discovery Pro 2400 devices can assign each of the digital pins as individual output or as a group of outputs. Different patterns, from simple clocks and noise to burst signals and binary counters to custom truth tables and user defined patterns can be generated.

Each output can be set as push-pull, open source, open drain, or tri-state output. Communication protocol patterns can be generated using the Protocol instrument.



## 2.7 Static I/O

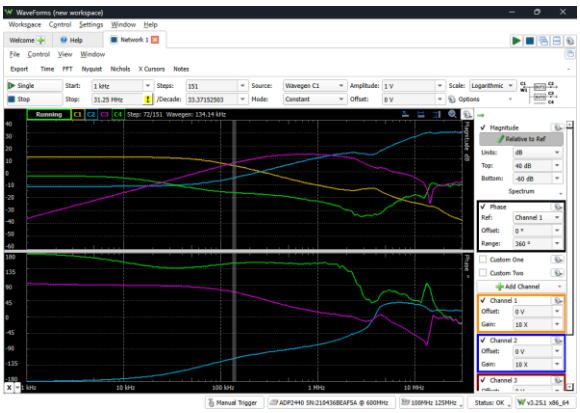
The Static I/O instrument can emulate a variety of user input/output devices on the 16 digital input/output pins. Virtual LEDs, buttons, switches, sliders, and displays can be assigned to specific digital I/O pins and interacted with within the WaveForms user interface.



## 2.8 Spectrum Analyzer

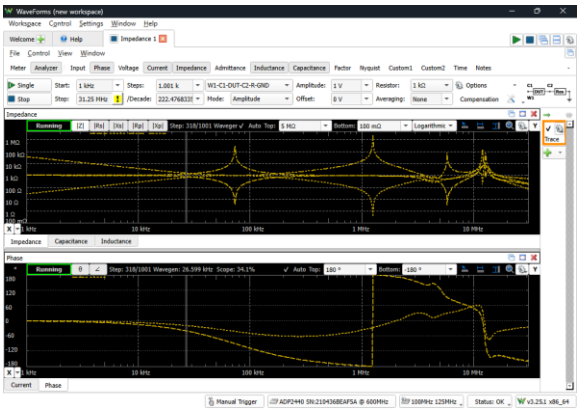
The Spectrum Analyzer instrument is used to view the power of frequency-domain components of analog signals captured on the analog input channels through either an FFT or CZT algorithm. Each captured trace can have different windowing functions applied for nuanced spectral analysis. Cursors and automatic measurements include noise floor, SFDR, SNR, THD and more.

## 2.9 Network Analyzer



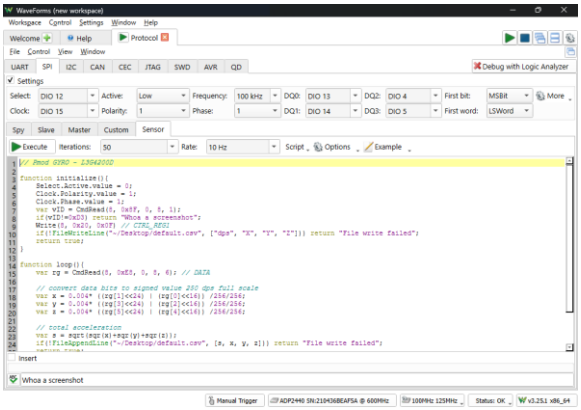
The Network Analyzer instrument can be used to view the amplitude and phase response of a circuit under test. Bode, Nichols, and Nyquist plots can also be viewed with this instrument. The Network Analyzer instrument uses the analog output and analog input channels of the Analog Discovery Pro 2400 Series device to probe a test circuit, by generating a frequency sweep of known amplitude and measuring the circuit response. The Network Analyzer can be configured to use an external signal to provide input to the circuit under test, rather than using the analog output channel.

## 2.10 Impedance Analyzer



The Impedance Analyzer instrument is used to view a wide variety of frequency response characteristics of an unknown circuit under test. Input, Phase, Voltage, Current, Impedance, Admittance, Inductance, Factor, and Nyquist plots are all available. In addition, Custom plots can be used to present the results of a wide variety of different mathematical operations on buffered data.

## 2.11 Protocol Analyzer

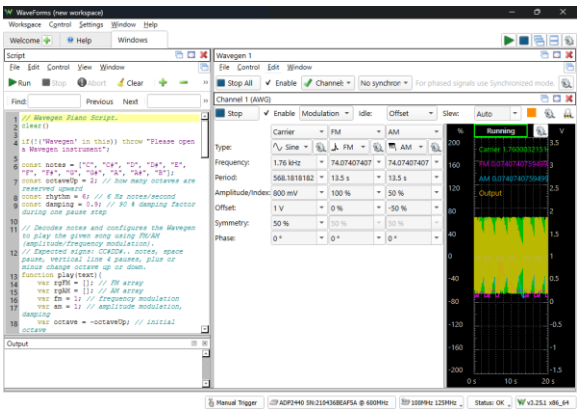


The Protocol Analyzer instrument generates a variety of common communication protocols including UART, SPI, I2C, CAN, HDMI CEC, SWD, and AVR.

Protocol data can also be simultaneously and automatically interpreted for the above protocols in addition to JTAG and Quadrature Decoder. Protocol data can be alternatively analyzed through the Logic Analyzer. Custom scripts can also be written within the Protocol Analyzer instrument to generate transaction sequences.

## 2.12 WaveForms Script Editor

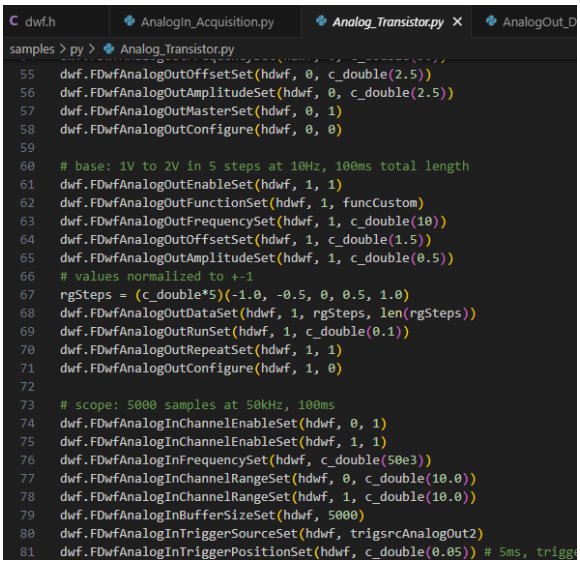
Each of WaveForms' instruments can be controlled through scripts within the WaveForms application itself. WaveForms' "Script" instrument allows the user to write and run JavaScript code that can control the rest of the application through an extensive API. This allows the user to configure and run many instruments at the same time, in an easily repeatable way.



# 3 Extended Software Support

Users can further customize their experience with the Analog Discovery Pro 2400 Series devices with Digilent's WaveForms SDK.

By leveraging the extensive API, users can create their own applications to programmatically control and communicate with the Analog Discovery Pro in many other platforms such as a Raspberry Pi or your favorite data processing environment.



# 4 Analog Discovery Pro 2000 Series Specifications

These specifications are typical unless otherwise stated and are valid following 30 minutes of warm-up at 25 °C unless otherwise noted. Warranted specifications are valid at $T_{cal}$ ±5 °C. Temperature coefficients are calculated using the temperature change from the last external calibration.

Specifications not assigned to an individual device are valid for all Analog Discovery Pro 2400 Series devices.

## 4.1 Mixed Signal Oscilloscope

### Analog Input Channels

Supports the Oscilloscope, Voltmeter, Data Logger, Spectrum Analyzer, Network Analyzer, Impedance Analyzer, Curve Tracer, and Script Editor instruments.

**Vertical System**

| | ADP2440 | ADP2450 |
|---|---|---|
| **Number of Channels** | Four | |
| **Input Type** | Referenced single-ended | |
| **Connector Type** | Front Panel BNC | |
| **Hardware Input Ranges** | ±25 mV, ±50 mV, ±100 mV, ±250 mV, ±500 mV, ±1 V, ±2.5 V, ±5 V, ±10 V[1], ±25 V[1] | |
| **Resolution** | 12 bits | 8 bits |
| **DC Accuracy (warranted)** | ±2 mV ± 0.5% of range (scale ≤ 0.05 V/div, $V_{inCM}$ = 0 V)<br>±10 mV ± 0.5% of range (0.05 V/div < scale ≤ 0.5 V/div, $V_{inCM}$ = 0 V)<br>±100 mV ± 0.5% of range (scale > 0.5 V/div, $V_{inCM}$ = 0 V)[1] | |
| **Bandwidth (-3 dB)[2]** | 100+ MHz | 200+ MHz |
| **Input Impedance (selectable per channel)** | 50 Ω ±1%, typical<br>1 MΩ ±1%, typical | |
| **Input Capacitance (1 MΩ)** | 20 pF, typical | |
| **Input Coupling** | DC or AC, user selectable | |
| **AC Coupling Cutoff (-3 dB)** | 16 Hz at 1 MΩ input impedance | |
| **Overvoltage protection** | ±6.5 V (DC + AC peak) at 50 Ω input impedance<br>±50 V (DC + AC peak) at 1 MΩ input impedance | |

**DC Offset Range**

| Hardware Input Ranges | Programmable DC Offset Range | DC Offset Range Accuracy |
|---|---|---|
| ±25 mV, ±50 mV, ±100 mV, ±250 mV | ±250 mV | ±2 mV ± 0.5% of range (scale ≤ 0.05 V/div, $V_{inCM}$ = 0 V) |
| ±500 mV, ±1 V, ±2.5 V | ±2.5 V | ±10 mV ± 0.5% of range (0.05 V/div < scale ≤ 0.5 V/div, $V_{inCM}$ = 0 V) |
| ±5 V, ±10 V, ±25 V | ±25 V | ±100 mV ± 0.5% of range (scale > 0.5 V/div, $V_{inCM}$ = 0 V)[1] |

[1] When using the 50 Ohm Input Impedance option on the analog input channels the maximum voltage input is ±5 V.

[2] When using a cable with the appropriate frequency response. BNC PROBES ARE 2200

### Horizontal System

| | ADP2440 | ADP2450 |
|---|---|---|
| Aggregate Sample Rate | 600 MS/s | 1 GS/s |
| Maximum Buffer Size[1] | Up to ~357.9 million samples | Up to ~536.8 million samples |

## Digital Input Channels

Supports the Logic Analyzer, Pattern Generator, Static IO, Protocol, and Script Editor instruments.

### Vertical System

| | |
|---|---|
| Number of Channels | 16 |
| Connector | 100 mil 2×10 MTE Header |
| Function Control | Individually programmable as Digital Inputs or Outputs |
| Input Voltage | 0 V to 3.3 V CMOS (5 V tolerant) |
| Input Logic Level | Input Low Voltage, $V_{IL}$, Min 0 V, Max 0.8 V<br>Input High Voltage, $V_{IH}$, Min 2.0 V, Max 5 V |
| Output Type | 3.3 V CMOS |
| Output Logic Level | Output Low Voltage, $V_{OL}$, Min 0 V, Max 0.5 V<br>Output High Voltage, $V_{OH}$, Min 2.4 V, Max 3.3 V |
| Slew Rate | Slow (default), Fast[2] |
| Drive Strength | 4 mA, 8 mA (default)[2] |
| Configurable Pull Resistors | None (default), pull-up, pull-down, or keeper[3] |
| Overvoltage Protection | Short-circuit to ground, ±20 V |

### Horizontal System

| | |
|---|---|
| Maximum Sampling Rate[4] | 1.2 GS/s |
| Maximum Buffer Size[5] | Up to ~268.4 million samples for all digital inputs |

[1] The maximum buffer size varies depending on the deep buffer memory allocation, sample rate, and number of enabled channels. See the Reference Manual for additional details.

[2] Configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

[3] Internal to the FPGA and configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

[4] Sampling rate configurable within WaveForms. See the Reference Manual for additional information.

[5] The maximum buffer size varies depending on the deep buffer memory allocation, sample rate, and number of enabled channels. See the Reference Manual for additional details.

## 4.2 Arbitrary Waveform Generator (Wavegen)

Supports the Waveform Generator, Network Analyzer, Impedance Analyzer, Tracer, and Script Editor instruments.

**Vertical System**

| | |
|---|---|
| **Number of Channels** | One |
| **Output Type** | Single-ended |
| **Connector Type** | BNC |
| **Standard Functions** | Sine, square, triangle, sawtooth, ramp up, ramp down, DC voltage, noise, trapezium, others |
| **Advanced Waveforms** | Sweep, modulation and summing (phase, AM, FM), math, play mode, custom |
| **Output Voltage Range**[1] | ±5 V open-circuit or at high impedance load |
| **Resolution** | 14 bits |
| **DC Accuracy** | ±10 mV ±0.5% of ($\|V_{out}\| \leq 1.25$ V)<br>±25 mV ±0.5% of ($\|V_{out}\| > 1.25$ V) |
| **Output Impedance** | 50 Ω |
| **Bandwidth** | >15 MHz |
| **DC Current Drive** | 30 mA maximum |
| **Slew Rate** | 300 V/µS, typical |
| **Overvoltage Protection** | Short-circuit protected to ±15 V |

**DC Offset Range**

| Output Range | Offset Range[1] |
|---|---|
| Low Range | ±1.25 V |
| High Range | ±5 V |

**Horizontal System**

| | |
|---|---|
| **Maximum Sample Rate** | 125 MS/s |
| **Maximum Play Buffer Size**[2] | 200 million samples |

[1] The combination of signal amplitude and DC offset cannot exceed the output range or DC current drive specifications.

[2] The maximum buffer size varies depending on the deep buffer memory allocation, sample rate, and number of enabled channels. See the Reference Manual for additional details.

## 4.3 Digital Outputs

Supports the Patterns, Static I/O, Protocol, and Script Editor instruments. These pins are the same ones used in the Digital Inputs of the Mixed Signal Oscilloscope.

**Vertical System**

| | |
|---|---|
| **Number of Channels** | 16 |
| **Connector** | 100 mil 2×10 MTE Header |
| **Function Control** | Individually programmable as Digital Inputs or Outputs |
| **Input Voltage** | 0 V to 3.3 V CMOS (5 V tolerant) |
| **Input Logic Level** | Input Low Voltage, $V_{IL}$, Min 0 V, Max 0.8 V<br>Input High Voltage, $V_{IH}$, Min 2.0 V, Max 5 V |
| **Output Type** | 3.3 V CMOS |
| **Output Logic Level** | Output Low Voltage, $V_{OL}$, Min 0 V, Max 0.5 V<br>Output High Voltage, $V_{OH}$, Min 2.4 V, Max 3.3 V |
| **Slew Rate** | Slow (default), Fast[1] |
| **Drive Strength** | 4 mA, 8 mA (default) |
| **Configurable Pull Resistors** | None (default), pull-up, pull-down, or keeper[2] |
| **Overvoltage Protection** | Short-circuit to ground, ±20 V |

**Horizontal System**

| | |
|---|---|
| **Typical Sampling Rate[3]** | 100 MS/s |
| **Maximum Buffer Size** | 32768 samples |

## 4.4 Trigger System

### Trigger Features

| | |
|---|---|
| **System Trigger Sources** | Analog channels, Digital channels, Arbitrary Waveform Generator start, Pattern Generator start, External trigger (TRIG1 or TRIG2), Manual |
| **Trigger Modes** | None, Auto, Normal, Manual (Forced Trigger), Single |
| **Analog Trigger** | Edge, pulse, timeout, transition, hysteresis |
| **Digital Trigger** | Edge, level, glitch, timeout, length, counter, value, protocol |
| **Output Trigger Sources** | Analog channels, Digital channels, Arbitrary Waveform Generator start, Pattern Generator start, External trigger (TRIG1 or TRIG2), Manual |

[1] Configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

[2] Internal to the FPGA and configurable within WaveForms. Selected setting shared with all DIOs and Trigger IOs.

[3] Sampling rate configurable within WaveForms. See the Reference Manual for additional information.

### External Trigger Characteristics

Each trigger can be used as a trigger input or output for multiple instruments.

| | |
|---|---|
| **Number of Channels** | Two |
| **Trigger Type** | Digital |
| **Connector** | Back Panel BNC |
| **Input Voltage** | 0 V to 3.3 V CMOS (5 V tolerant) |
| **Input Logic Level** | Input Low Voltage, $V_{IL}$, Min 0 V, Max 0.8 V<br>Input High Voltage, $V_{IH}$, Min 2.0 V, Max 5 V |
| **Output Type** | 3.3 V CMOS |
| **Output Logic Level** | Output Low Voltage, $V_{OL}$, Min 0 V, Max 0.5 V<br>Output High Voltage, $V_{OH}$, Min 2.4 V, Max 3.3 V |
| **Channel Pull Resistors** | 1 MΩ pull-down |
| **Direction Control** | Programmable as input or output |

## 4.5 Connectivity

### USB Interface

| | |
|---|---|
| **Device to Computer Interface** | USB 3.0 (5 Gbps), Type C |

## 4.6 Power Requirements

The ADP2400 Series devices require external power. An appropriate power supply is included with the device.

| | |
|---|---|
| **External Power Supply Voltage** | 4.5 V to 5.5 V |
| **External Power Supply Current** | 4 A recommended |
| **Barrel Connector Size** | 5.5 mm × 2.1 mm (positive inner pin) |

## 4.7 Physical Characteristics

### Dimensions

| | |
|---|---|
| **Dimensions (Width x Depth x Height)** | 210 mm x 164.5 mm x 37.9mm<br>(8.27" x 6.48" x 1.49") |
| **Dimensions with connectors (Width x Depth x Height)** | 210 mm x 191.4 mm x 37.9mm<br>(8.27" x 7.54" x 1.49") |
| **Weight** | 993 g (2.19 lbs) |

**Note:** If the device needs to be cleaned, wipe exterior surfaces with a dry lint-free cloth or soft-bristle brush. Do not use abrasive compounds on any part of the product. Do not dissemble or remove any part of the enclosure of the product when cleaning. Contact NI Services (ni.com/support) for more information.

### Physical Connectivity

| | |
|---|---|
| **Mixed Signal Oscilloscope** | Four BNC |
| **Digital I/O** | One 2x10 MTE header |
| **External Trigger** | Two BNC |
| **Arbitrary Waveform Generator** | One BNC |
| **Security Cable Slot** | One, complies with Kensington security slot dimensions |
| **USB Connectivity** | One Type C |
| **External Power Port** | One 5.5 mm × 2.1 mm (positive inner pin) |
| **DIN Rail Mounting Holes**[1] | Two |
| **Earth Ground Connector** | One screw |
| **Probe Compensation Tabs** | One set |

## 4.8 Safety Voltages

Connect only voltages that are within these limits.

### Rated Voltages

| | |
|---|---|
| **Oscilloscope Input to GND** | ±25 $V_{pk}$ for 1 MΩ<br>±5 $V_{pk}$ for 50 Ω |
| **AWG to GND** | ±5 $V_{pk}$ with open circuit or high-Z load<br>±3.5 $V_{pk}$ at maximum current |
| **Digital Input to COM** | ±3.3 $V_{pk}$, ±5 $V_{pk}$ tolerant |
| **Digital Output to COM** | ±3.3 $V_{pk}$ |

### Temporary Overvoltage Protection

The Analog Discovery Pro has been designed to withstand power frequency overvoltage of relatively long duration as specified below. Voltages beyond these levels may cause permanent damage.

| | |
|---|---|
| **Oscilloscope Input to GND** | ±50 $V_{pk}$ for 1 MΩ input resistance<br>±6.5 $V_{pk}$ for 50 Ω input resistance |
| **AWG to GND** | ±15 $V_{pk}$, short-circuit to ground |
| **Digital Input to COM** | ±20 $V_{pk}$, short-circuit to ground |

[1] A pair of mounting holes to facilitate the connection to a bracket allowing the Analog Discovery Pro to be mounted alongside other devices in a DIN Rail configuration. The maximum screw length to be used is 5/16".

## 4.9 Environmental

| | |
|---|---|
| **Ambient Operating Temperature** | 0 °C to 40 °C (32 °F to 104 °F) |
| **Storage Temperature** | -20 °C to 60 °C (-4 °F to 158 °F) |
| **Operating Humidity** | 10% to 90% RH non-condensing |
| **Storage Humidity** | 5% to 95% RH non-condensing |
| **Pollution Degree** | 2 |
| **Maximum Altitude** | 2000 m |

**Note:** For indoor use only.

## 4.10 Ventilation Clearance and Cooling

This product has fan vents located at both the front and rear panels. The standard airflow direction is front to back cooling. Adequate clearance is required at the front and back of the product and surrounding equipment, inclusive of indiscriminate heat generating devices, and any potential air flow blockages must be removed to ensure proper cooling.

| | |
|---|---|
| **Minimum Cooling Clearances** | 51 mm (2 in.) at the front and back |

**Note:** If stacking multiple units, additional clearance may be required to accommodate increased thermal load and airflow disruption. Evaluate cooling needs based on ambient temperature and device usage.

## 4.11 Certifications

- CE and KC certifications (https://www.ni.com/product-certifications)
- Safety, Environmental, and Regulatory Information (https://files.digilent.com/SERI/ADP2440_2450-SERI.pdf)
- Statement of Volatility (https://files.digilent.com/statement-of-volatility/SoV_Analog_Discovery_Pro_2440-2450.pdf)

# 5 Ordering Information and Purchasing Options

**Digilent Part Numbers:**

- 410-436 – Analog Discovery Pro (ADP2450)
- 410-436-1 – Analog Discovery Pro (ADP2440)

All Analog Discovery Pro 2400 Series product kits come with:

- One (1) Analog Discovery Pro device. Either the:
  - Analog Discovery Pro (ADP2450) for 410-436
  - Analog Discovery Pro (ADP2440) for 410-436-1
- Four (4) T2200 200 MHz x1/x10 Oscilloscope Probes
- One (1) 2x10 keyed flywire MTE Cable
- Twenty (20) Minigrabbers with Leads
- One (1) 2-meter USB 3.2 Type C to C cable
- One (1) 5 V, 4 Amp Switching Power Supply kit with US and EU adapters
- One (1) Quick Start Guide
- One (1) Safety, Environment, and Regulatory Information document

# 6 Recommended Accessories

Digilent Part Number: 240-136 – BNC to Minigrabber Cable

Digilent Part Number: 240-134 – BNC to Alligator Clip Cable

Use of these BNC cables is recommended for analog output. BNC Oscilloscope Probes should not be used with the AWG.

# 7 Additional Resources

Reference material for all of the Analog Discovery Pro 2000 Series devices including a getting started guide, reference manual, specifications, and tutorials on each of the instruments within WaveForms can be found on the Analog Discovery Pro 2000 Series' Resource Center on Digilent's Reference site.

# 8 Digilent Test and Measurement

## 8.1 Analog Discovery Pro Line

Digilent's Analog Discovery Pro line is for users who are ready to go pro. With expanded feature sets not offered in Digilent's Discovery Essentials including deep memory, higher bandwidth, networking capability, and USB 3.0, an Analog Discovery Pro device has already stepped up to the challenging task ahead of you.

Devices in the Analog Discovery Pro family provide the utility of professional benchtop equipment with the flexibility of a portable instrument. The series includes mixed signal oscilloscope and programable power supply instruments that give engineers the ability to tap into the efficiency of the WaveForms software while offering a wider selection of specifications in products created with the professional in mind. Other members of the Analog Discovery Pro family include:

### Analog Discovery Pro 2230

- Mixed signal oscilloscope
- BNC connectors and an aluminum case
- Two analog inputs – 50+ MHz bandwidth
- One analog output – 15 MHz bandwidth
- 16 Digital I/O
- Sample rates up to 125 MS/s
- Two programmable power supply outputs
- Deep memory buffers for long acquisitions – up to 128 MS per channel for analog input
- USB 3.0 connectivity
- Dual Mode for synchronization of multiple devices

### Analog Discovery Pro 3000 Series

- Mixed signal oscilloscope
- Two or four analog inputs, two analog outputs
- 0.5 GS/s sample rate (with oversampling), per channel
- 55+ MHz bandwidth
- 16 Digital I/O
- Ethernet connectivity
- Linux Mode

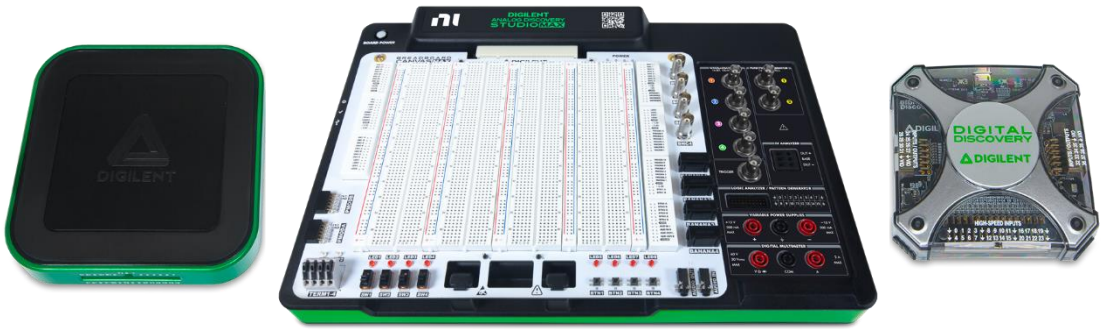
### Discovery USB Programmable Power Supply (DPS3340)

- USB programmable power supply
- Three channels
- 1 V to 5 V, -1 V to -15 V, 1 V to 15 V

### Analog Discovery Pro 5000 Series

- Mixed signal oscilloscope
- Four analog inputs, one analog output
- 1.5 GS/s or 2 GS/s sample rate, per channel
- 350 MHz or 500 MHz bandwidth
- 34 Digital Inputs at 1 GS/s, 8 Digital I/O
- Dedicated Digital Multimeter and DC Power Supplies

## 8.2 Discovery Essentials



Digilent's Discovery Essentials are perfect for engineers looking for a low barrier to entry while broadening their expertise with Test and Measurement equipment. These devices are cost-optimized for students and engineers alike, provide maximum value for minimal cost. From the Digital Discovery, a dedicated workhorse for debugging digital interfaces, to the Analog Discovery Studio Max, an all-in-one electronics laboratory, to the legendary Analog Discovery 3, in conjunction with Digilent's freely available WaveForms software, each device provides a solid foundation for any engineer who needs to test or debug their projects.

### Analog Discovery 3

The Analog Discovery 3 is a multi-function test and measurement device, providing a digital oscilloscope, logic analyzer, waveform generator, pattern generator, and much more — all in a device that fits in the palm of your hand. In combination with differential inputs, programmable power supplies, and the flexible WaveForms software (supported by Windows, Mac, and Linux), the Analog Discovery 3 can be used in the lab, in the field, or even at home. You're no longer tied down to a traditional benchtop and stacks of expensive test instruments.

### Digital Discovery

The Digital Discovery is a combination USB logic analyzer and pattern generator, featuring 24 high-speed digital inputs and 16 digital I/O channels. With a high-speed adapter, the device can sample up to 800 MS/s on up to 8 input channels. Sampling up to 100 MS/s is supported on all channels. DDR memory offers deep input buffers, with 64 MS of input buffer per high-speed input channel.

### Analog Discovery Studio Max

The Analog Discovery Studio is versatile and comprehensive electronics laboratory solution tailored for academic environment, integrating everything from a digital multimeter to spectrum analyzer and protocol generator to power supplies all in a single device. It also featuring removable Canvas modules – A modular ecosystem of top boards that let you customize the Analog Discovery Studio Max platform for your learning environment, from both Digilent and our partners around the globe. The accessibility is expanded even further beyond the WaveForms software with the LabVIEW WaveForms Toolkit to leverage LabVIEW's extensive analysis tools.

# 9 About Digilent

We're committed to making engineering accessible, offering competitive pricing, portable products, and comprehensive documentation. With a global presence spanning three continents, Digilent ensures speedy and cost-effective access to our products through an extensive distribution network. Specializing in USB-based test and measurement devices, flexible and intuitive software, low-cost data acquisition and data logging tools, and AMD-based FPGA development boards, our products' design philosophy champions your creativity. By providing world class documentation and support and keeping our hardware and software flexible and practical, we are continuing to provide the building blocks while you bring the brilliance.