



RIGOL

# DHO900 Series

## Digital Oscilloscope

Data Sheet  
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# DHO900 Series

## Digital Oscilloscope

### Compact Size, Various Functions

7" Capacitive Multi-touch Screen



265.35 mm (W) × 161.75 mm (H) × 77.38 mm (D)





## Application Scenarios

It is compact and portable, easy to be used on the workbench, in the classroom, on the test site, and in other application scenarios.

You can put it on the workbench, with supporting legs folded or unfolded; put it flat on the workbench; or fix its rear panel to the desktop clamp-on stand to save room.



## N-in-1 Integrated Digital Oscilloscope

### ● Digital Oscilloscope

Capture rate up to 1,000,000 wfms/s (in UltraAcquire Mode), 50 Mpts memory depth, and 12-bit high resolution

### ● Logic Analyzer

16 digital channels (std.), 25 Mpts memory depth for the waveforms of all the digital channels, max. sample rate 625 MSa/s

Support analog/digital channel triggers and decodes, convenient digital channel operation

### ● Arbitrary Function Generator (AFG)

Single-channel AFG output (std.), support 6 standard waveforms and user-defined waveforms, with the max. frequency 25 MHz

Sample rate up to 156 MSa/s, support modulation

### ● Protocol Analyzer

Support RS232/UART, I2C, SPI, CAN, and LIN serial bus decodings that can help engineers make an in-depth waveform analysis; widely used in the auto electronics and other fields.

### ● Bode Plot (Standard for DHO914S and DHO924S)

The DHO900 series can generate the sweep signal of the specified range by controlling the built-in signal generator module and output the signal to the switching power supply to carry out loop analysis test. The bode plot can display the gain and phase variations of the system under different frequencies, helping engineers analyze the phase margin (PM) and gain margin (GM) to quickly judge whether the system is stable.

### ● Type-C Interface

Provides power with the mobile power supply via this interface, making the on-site test more flexible.



## Application



Embedded Design

With a standard configuration of embedded decodes, the DHO900 series supports digital signal analysis, efficiently analyzing the analog and digital signals in the embedded system.



Power Design

The 12-bit resolution delivers 4096 vertical digitizing levels, capable of capturing the signal details of the high-precision power supply. The S model is equipped with a standard configuration of built-in signal generator and Bode plot loop analysis function, making it easy to do the switching power supply test.



Automobile Electronics

The DHO series offers standard CAN and LIN auto bus decodes, capable of addressing the decoding demands of the automobile communication system.

# Product Features

## Product Features

- Ultra-low noise floor, purer signal, never miss the small signals
- Up to 12 bits resolution for all the models of this series
- Max. analog bandwidth of 250 MHz, 4 analog channels
- 16 digital channels (std.), logic probe required to be purchased if needed
- Max. real-time sample rate of 1.25 GSa/s
- Max. memory depth of 50 Mpts
- Vertical sensitivity range: 200  $\mu$ V/div to 10 V/div
- Max. capture rate of 1,000,000 wfms/s (in UltraAcquire mode)
- Digital phosphor display with real-time 256-level intensity grading
- Integrates the AFG function, bode plot analysis, histogram, digital signal analysis, and etc
- Waveform search and navigation function allows you to debug the signal anomalies faster
- 7" (1024x600) capacitive multi-touch screen
- Brand new Flex Knob brings user-friendly experience
- USB Device & Host, LAN, and HDMI interfaces (std.) for all the models of this series
- Novel and delicate industrial design, easy to operate
- Unique online upgrade






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The DHO900 series is RIGOL's new launched high-performance economical digital oscilloscope. Though compact in design, it has superior performance. It features a capture rate up to 1,000,000 wfms/s (in UltraAcquire Mode), 50 Mpts memory depth, 12 bits resolution, and low noise.

The DHO900 series supports 16 digital channels. One instrument can make an analysis on both the analog and digital signals to meet the embedded design and test scenarios. With an affordable price equivalent to purchasing an entry-level instrument, you can access the auto serial and parallel bus analysis, bode plot analysis, and other functions to meet the test demands in the R&D, education, and scientific research fields.






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# RIGOL Probes and Accessories Supported

| Model  | Type                         | Description   |
|--|------------------------------|---|
| <b>Passive High-impedance Probe</b>  |                              |   |
|  <p>PVP2150</p>   | Passive High-impedance Probe | <ul style="list-style-type: none"> <li>• Attenuation: 10:1/1:1</li> <li>• 1X BW: DC to 35 MHz</li> <li>• 10X BW: DC to 150 MHz</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>   |
|  <p>PVP2350</p>   | Passive High-impedance Probe | <ul style="list-style-type: none"> <li>• Attenuation: 10:1/1:1</li> <li>• 1X BW: DC to 35 MHz</li> <li>• 10X BW: DC to 350 MHz</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>   |
|  <p>PVP3150</p> | Passive High-impedance Probe | <ul style="list-style-type: none"> <li>• Attenuation: 10:1/1:1</li> <li>• 1X BW: DC to 20 MHz</li> <li>• 10X BW: DC to 150 MHz</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>   |
| <b>High-voltage Single-ended Probe</b>   |                              |   |
|  <p>RP1010H</p> | High-voltage Probe           | <ul style="list-style-type: none"> <li>• Attenuation: 1000:1</li> <li>• BW: DC to 40 MHz</li> <li>• DC: 0 to 10 kV DC</li> <li>• AC: pulse <math>\leq 20</math> kVp-p</li> <li>• AC: sine <math>\leq 7</math> kV<sub>rms</sub></li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul> |
|  <p>RP1018H</p> | High-voltage Probe           | <ul style="list-style-type: none"> <li>• Attenuation: 1000:1</li> <li>• BW: DC to 150 MHz</li> <li>• DC+AC<sub>peak</sub>: 18 kV CAT II</li> <li>• AC<sub>rms</sub>: 12 kV CAT II</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>  |

| Model  | Type                            | Description  |
|--|---------------------------------|--|
|  <p>RP1300H</p>   | High-voltage Probe              | <ul style="list-style-type: none"> <li>• Attenuation: 100:1</li> <li>• BW: DC to 300 MHz</li> <li>• CAT I 2000 V (DC+AC)</li> <li>• CAT II 1500 V (DC+AC)</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul> |
| <b>High-voltage Differential Probe</b>   |                                 |  |
|  <p>PHA0150</p>   | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• BW: DC to 70 MHz</li> <li>• Max. voltage <math>\leq 1500</math> Vpp</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>  |
|  <p>PHA1150</p>   | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• BW: DC to 100 MHz</li> <li>• Max. voltage <math>\leq 1500</math> Vpp</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>   |
|  <p>PHA2150</p> | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• 50X BW: DC to 160 MHz</li> <li>• 500X BW: DC to 200 MHz</li> <li>• Max. voltage <math>\leq 1500</math> Vpp</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>       |
|  <p>RP1025D</p> | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• BW: DC to 25 MHz</li> <li>• Max. voltage <math>\leq 1400</math> Vpp (DC + AC P-P)</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>                                |
|  <p>RP1050D</p> | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• BW: DC to 50 MHz</li> <li>• Max. voltage <math>\leq 7000</math> Vpp (DC + AC P-P)</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>                                |
|  <p>RP1100D</p> | High-voltage Differential Probe | <ul style="list-style-type: none"> <li>• BW: DC to 100 MHz</li> <li>• Max. voltage <math>\leq 7000</math> Vpp (DC + AC P-P)</li> <li>• Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>                               |



| Model  | Type          | Description   |
|--|---------------|---|
| <b>Current Probe</b>   |               |   |
|  <p>RP1001C</p>   | Current Probe | <ul style="list-style-type: none"> <li>BW: DC to 300 kHz</li> <li>Maximum Input</li> <li>AC: <math>\pm 100</math> A</li> <li>AC P-P: 200 A</li> <li>AC RMS: 70 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>   |
|  <p>RP1002C</p>   | Current Probe | <ul style="list-style-type: none"> <li>BW: DC to 1 MHz</li> <li>Maximum Input</li> <li>AC: <math>\pm 70</math> A</li> <li>AC P-P: 140 A</li> <li>AC RMS: 50 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> </ul>  |
|  <p>RP1003C</p> | Current Probe | <ul style="list-style-type: none"> <li>BW: DC to 50 MHz</li> <li>Maximum Input</li> <li>AC P-P: 50 A (non-continuous)</li> <li>AC RMS: 30 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> <li>Required to order RP1000P power supply.</li> </ul>   |
|  <p>RP1004C</p> | Current Probe | <ul style="list-style-type: none"> <li>BW: DC to 100 MHz</li> <li>Maximum Input</li> <li>AC P-P: 50 A (non-continuous)</li> <li>AC RMS: 30 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> <li>Required to order RP1000P power supply.</li> </ul>  |
|  <p>RP1005C</p> | Current Probe | <ul style="list-style-type: none"> <li>BW: DC to 10 MHz</li> <li>Maximum Input</li> <li>AC P-P: 300 A (non-continuous), 500 A (@pulse width <math>\leq 30</math> us)</li> <li>AC RMS: 150 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> <li>Required to order RP1000P power supply.</li> </ul> |

| Model   | Type                 | Description   |
|---|----------------------|---|
|  <p>RP1006C</p>  | Current Probe        | <ul style="list-style-type: none"> <li>BW: DC to 2 MHz</li> <li>Maximum Input</li> <li>AC P-P: 700 A peaks, non-continuous</li> <li>AC RMS: 500 A</li> <li>Compatibility: All models of RIGOL's digital oscilloscopes</li> <li>Required to order RP1000P power supply.</li> </ul> |
|  <p>RP1000P</p>  | 4CH Power Supply     | Power supply for RP1003C, RP1004C, RP1005C, and RP1006C; supporting 4 channels.   |
| <b>Logic Analyzer Probe</b>   |                      |   |
|  <p>PLA2216</p> | Logic Analyzer Probe | <ul style="list-style-type: none"> <li>Logic analyzer probe dedicated for MSO5000 and DHO900 series</li> </ul>  |



# Specifications

All the specifications are guaranteed except the parameters marked with "Typical" and the oscilloscope needs to operate for more than 30 minutes under the specified operation temperature.

## Overview of the DHO900 Series Technical Specifications

| Overview of the DHO900 Series Technical Specifications |   |         |         |         |
|--|---|---------|---------|---------|
| Model  | DHO914  | DHO914S | DHO924  | DHO924S |
| Analog Bandwidth<br>(-3 dB)                            | 125 MHz   |         | 250 MHz |         |
| Rise Time<br>(10% to 90%, typical)                     | ≤2.8 ns   |         | ≤1.4 ns |         |
| No. of Input/Output Channels                           | 4 input analog channels<br>16 input digital channels (required to purchase the PLA2216 logic analyzer probe)<br>single-channel arbitrary function generator (AFG) output (only available for the S model) |         |         |         |
| Sampling Mode  | Real-time Sampling  |         |         |         |
| Max. Sample Rate of Analog Channel                     | 1.25 GSa/s (single-channel <sup>[1]</sup> ), 625 MSa/s (dual-channel <sup>[2]</sup> ), 312.5 MSa/s (full-channel <sup>[3]</sup> )   |         |         |         |
| Max. Memory Depth                                      | 50 Mpts (single-channel <sup>[1]</sup> ), 25 Mpts (dual-channel <sup>[2]</sup> ), 10 Mpts (full-channel <sup>[3]</sup> )  |         |         |         |
| Max. Waveform Capture Rate                             | 30,000 wfms/s (Vector Mode)<br>1,000,000 wfms/s (UltraAcquire Mode)   |         |         |         |
| Vertical Resolution                                    | 12 bits   |         |         |         |
| Hardware Real-time Waveform Recording and Playing      | Max. 500,000 frames   |         |         |         |
| Peak Detection   | Capture 1.6 ns glitches   |         |         |         |
| LCD Size and Type                                      | 7" capacitive multi-touch screen  |         |         |         |
| Display Resolution                                     | 1024x600  |         |         |         |

## Vertical System Analog Channel

| Vertical System Analog Channel            |   |  |
|---|---|--|
| Input Coupling                            | DC, AC, or GND  |  |
| Input Impedance                           | 1 M $\Omega$ $\pm$ 1%   |  |
| Input Capacitance                         | 15 pF $\pm$ 3 pF  |  |
| Probe Attenuation Coefficient             | 0.001X, 0.002X, 0.005X, 0.01X, 0.02X, 0.05X, 0.1X, 0.2X, 0.5X, 1X, 2X, 5X, 10X, 15X, 20X, 50X, 100X, 150X, 200X, 500X, 1000X, 1500X, 2000X, 5000X, 10000X, 15000X, 20000X, and 50000X |  |
| Maximum Input Voltage                     | CAT I 300 V <sub>rms</sub> , 400 V <sub>pk</sub> (DC + V <sub>peak</sub> )  |  |
|   | Remarks   | Whether the probe is used or not, the transient overvoltage is not allowed to occur.<br>Please use the instrument dedicated for the specified measurement category (not applicable to CAT II, III, and IV) |
| Vertical Resolution                       | 12 bits   |  |
| Vertical Sensitivity Range <sup>[4]</sup> | 200 $\mu$ V/div to 10 V/div   |  |
| Offset Range                              | $\pm$ 0.5 V (<500 $\mu$ V/div)  |  |
|   | $\pm$ 1 V ( $\geq$ 500 $\mu$ V/div, $\leq$ 65 mV/div)   |  |
|   | $\pm$ 8 V (>65 mV/div, $\leq$ 270 mV/div)   |  |
|   | $\pm$ 20 V (>270 mV/div, $\leq$ 2.75 V/div)   |  |
|   | $\pm$ 100 V (>2.75 V/div, $\leq$ 10 V/div)  |  |
| Dynamic Range                             | $\pm$ 4 div (12 bits)   |  |
| Bandwidth Limit (Typical)                 | 20 MHz, FULL; selectable for each channel   |  |
| DC Gain Accuracy <sup>[4]</sup>           | $\pm$ 1% (>5mV/div, FullScale)  |  |
|   | $\pm$ 2% ( $\leq$ 5mV/div, FullScale, Typ.)   |  |
| DC Offset Accuracy                        | $\leq$ 200 mV/div ( $\pm$ 0.1 div $\pm$ 2 mV $\pm$ 1.5% of offset value)  |  |
|   | >200 mV/div ( $\pm$ 0.1 div $\pm$ 2 mV $\pm$ 1.0% of offset value)  |  |
| Channel-to-Channel Isolation              | $\geq$ 100:1  |  |
| ESD Tolerance                             | $\pm$ 8 kV (on input BNCs)  |  |

## Vertical System Digital Channel

### Vertical System Digital Channel

|                          |   |
|--------------------------|---|
| Number of Channels       | 16 input channels (D0 to D15)<br>(D0 to D7, D8 to D15)  |
| Threshold Range          | $\pm 15.0$ V, in 10 mV step   |
| Threshold Accuracy       | $\pm (100.00 \text{ mV} + 3\% \text{ of threshold setting})$  |
| Threshold Selection      | TTL(1.4 V), CMOS5.0(2.5 V), CMOS3.3(1.65 V), CMOS2.5(1.25 V), CMOS1.8(0.9 V), ECL(-1.3 V), PECL(3.7 V), LVDS(1.2 V), 0.0V<br>User (threshold adjustable for a single channel) |
| Max. Input Voltage       | $\pm 40$ V peak CAT I; transient overvoltage 800 Vpk  |
| Max. Input Dynamic Range | $\pm 10$ V + threshold  |
| Minimum Voltage Swing    | 500 mVpp  |
| Input Impedance          | about 101 k $\Omega$  |
| Probe Load               | about 8 pF  |
| Vertical Resolution      | 1 bits  |

## Horizontal System--Analog Channel

### Horizontal System--Analog Channel

|  |   |
|--|---|
| Range of Time Base                                       | 2 ns/div to 500 s/div   |
|  | Fine  |
| Time Base Resolution                                     | 100 ps  |
| Time Base Accuracy                                       | $\pm 25 \text{ ppm} \pm 5 \text{ ppm/year}$   |
| Time Base Delay Range                                    | Pre-trigger -5 div  |
|  | Post-trigger 1 s or 100 div, whichever is greater   |
| Delta Time Accuracy                                      | $\pm (\text{Time Base Accuracy} \times \text{Readout}) \pm (0.001 \times \text{Screen Width})$<br>$\pm 20 \text{ ps}$ |
| Channel-to-Channel Skew Correction                       | $\pm 100 \text{ ns}$ , Accuracy $\pm 1 \text{ ps}$  |
| Analog Channel-to-Channel Delay (Typical) <sup>[5]</sup> | $\leq 2 \text{ ns}$   |

### Horizontal System--Analog Channel

|                 |      |  |
|-----------------|------|--|
| Horizontal Mode | YT   | Default  |
|                 | XY   | Channel 1/2/3/4  |
|                 | SCAN | Time base $\geq 200$ ms/div  |
|                 | ROLL | Time base $\geq 50$ ms/div, available to enter or exit the ROLL mode by adjusting the horizontal timebase knob |

## Horizontal System--Digital Channel

### Horizontal System--Digital Channel

|  |   |
|--|---|
| Min. Detectable Pulse Width                      | 5 ns  |
| Maximum Input Frequency                          | 200 MHz (accurately copied as the sine wave of the maximum frequency of the logic square wave; input amplitude is the minimum swing; the shortest the ground cable is required for the logic probe) |
| Channel-to-Channel Skew (Typical) <sup>[6]</sup> | $\pm 5$ ns  |

## Acquisition System

### Acquisition System

|                                     |   |   |
|-------------------------------------|---|---|
| Max. Sample Rate of Analog Channel  | 1.25 GSa/s (single-channel <sup>[1]</sup> ), 625 MSa/s (dual-channel <sup>[2]</sup> ), 312.5 MSa/s (full-channel <sup>[3]</sup> ) |   |
| Max. Memory Depth of Analog Channel | 50 Mpts (single-channel <sup>[1]</sup> ), 25 Mpts (dual-channel <sup>[2]</sup> ), 10 Mpts (full-channel <sup>[3]</sup> )          |   |
| Acquisition Mode                    | Normal  | Default   |
|                                     | Peak Detection  | Capture 1.6 ns glitches                             |
|                                     | Average Type  | 2, 4, 8, 16...65536 are available for you to choose |
|                                     | UltraAcquire  | Waveform capture rate up to 1,000,000 wfms/s        |



## Trigger System

| Trigger System      |   |  |
|---------------------|---|--|
| Trigger Source      | Analog channel (CH1 to CH4), digital channel (D0 to D15)                            |  |
| Trigger Mode        | Auto, Normal, Single  |  |
| Trigger Coupling    | DC  | DC coupling trigger                                  |
|                     | AC  | AC coupling trigger                                  |
|                     | High Frequency Rejection  | Cut-off frequency to 120 kHz (internal trigger only) |
|                     | Low Frequency Rejection   | Cut-off frequency to 120 kHz (internal trigger only) |
| Noise Rejection     | Increases delay for the trigger circuit (internal trigger only), On/Off             |  |
| Holdoff Range       | 8 ns to 10 s  |  |
| Trigger Bandwidth   | Internal trigger: analog bandwidth of the oscilloscope                              |  |
| Trigger Sensitivity | Internal trigger: 0.5 div, $\geq 50$ mV/div; 0.7 div (with noise rejection enabled) |  |
| Trigger Level Range | Internal trigger: $\pm 4.5$ div from the center of the screen                       |  |

## Trigger Type

| Trigger Type |  |
|--------------|--|
| Trigger Type | Edge trigger, Pulse trigger, Slope trigger, Video trigger, Pattern trigger, Duration trigger, Timeout trigger, Runt trigger, Window trigger, Delay trigger, Setup/Hold trigger, Nth Edge trigger, RS232/UART, I2C, SPI, CAN, and LIN |
| Edge         | Triggers on the threshold of the specified edge of the input signal. The edge types can be Rising, Falling, or Either.<br>Source channel: CH1 to CH4, D0 to D15  |
| Pulse        | Triggers on the positive or negative pulse with a specified width. The pulse width is greater or smaller than a certain value or within a certain time range.<br>Source channel: CH1 to CH4, D0 to D15                               |

## Trigger Type

|            |  |
|------------|--|
| Slope      | <p>Triggers on the positive or negative slope of the specified time. The slew time is greater or smaller than a certain value or within a certain time range.</p> <p>Source channel: CH1 to CH4</p>  |
| Video      | <p>Triggers on all lines, specified line, odd field, or even field that conforms to the video standards. The supported video standards include NTSC, PAL/SECAM, 480p/60Hz, 576p/50Hz, 720p/60Hz, 720p/50Hz, 720p/30Hz, 720p/25Hz, 720p/24Hz, 1080p/60Hz, 1080p/50Hz, 1080p/30Hz, 1080p/25Hz, 1080p/24Hz, 1080i/60Hz, and 1080i/50Hz.</p> <p>Source channel: CH1 to CH4</p>     |
| Pattern    | <p>Identifies a trigger condition by searching for a specified pattern. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, X, Rising, or Falling.</p> <p>Source channel: CH1 to CH4, D0 to D15</p>  |
| Duration   | <p>Triggers when the specified pattern meets the specified duration condition. The pattern is a combination of multiple selected channel sources. The logic pattern of each channel is H, L, and X. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range.</p> <p>Source channel: CH1 to CH4, D0 to D15</p> |
| Timeout    | <p>Triggers when duration of a certain event exceeds the specified time. The event can be specified as Rising, Falling, or Either.</p> <p>Source channel: CH1 to CH4, D0 to D15</p>  |
| Runt       | <p>Triggers when the pulses pass through one threshold but fail to pass through another threshold.</p> <p>Source channel: CH1 to CH4</p>   |
| Window     | <p>Triggers in a specified window state when the rising edge of the signal crosses the upper threshold or the falling edge crosses the lower threshold. The window state can be Enter, Exit, or Time.</p> <p>Source channel: CH1 to CH4</p>  |
| Delay      | <p>Triggers when the time difference between the specified edges of Source A and Source B meets the preset time. The duration is greater or smaller than a certain value, or within a certain time range, or outside a certain time range.</p> <p>Source channel: CH1 to CH4, D0 to D15</p>  |
| Setup/Hold | <p>When the setup time or hold time between the input clock signal and the data signal is smaller than the specified time.</p> <p>Source channel: CH1 to CH4, D0 to D15</p>  |
| Nth Edge   | <p>Triggers on the Nth edge that appears after the specified idle time. The edge can be specified as Rising or Falling.</p> <p>Source channel: CH1 to CH4, D0 to D15</p>   |

| Trigger Type |  |
|--------------|--|
| RS232/UART   | Triggers on the Start, Error, Check Error, or Data frame of the RS232/UART bus (up to 20 Mb/s).<br>Source channel: CH1 to CH4, D0 to D15   |
| I2C          | Triggers on the Start, Stop, Restart, MissedACK, Address (7 bits, 8 bits, or 10 bits), Data, or Address Data of the I2C bus.<br>Source channel: CH1 to CH4, D0 to D15  |
| SPI          | Triggers on the specified pattern of the specified data width (4 to 32) of SPI bus. CS and Timeout are supported.<br>Source channel: CH1 to CH4, D0 to D15   |
| CAN          | Triggers on the start of a frame, end of a frame, Remote ID, Overload, Frame ID, Frame Data, Data&ID, Frame Error, Answer Error, Check Error, Format Error, Bit Fill, and Random of the CAN signal (up to 5Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF.<br>Source channel: CH1 to CH4, D0 to D15 |
| LIN          | Triggers on the Sync, ID, Data (length settable), Data&ID, Wakeup, Sleep, and Error of the LIN bus signal (up to 20 Mb/s).<br>Source channel: CH1 to CH4, D0 to D15  |

## Search&Navigation

| Search&Navigation |  |
|-------------------|--|
| Type              | Edge, Pulse  |
| Source            | Analog channel   |
| Copy              | Copies the search settings from or to the trigger settings mutually, including threshold setting and search condition settings |
| Result Display    | Displays in event table form; can be exported to the external or internal memory   |
| Navigation        | Time navigation: navigates to the acquired waveforms in time order.  |
|                   | Event navigation: uses the navigation keys to scroll through the event search results and navigates to the specified event.    |
|                   | Frame navigation: navigates to the specified frame segment in UltraAcquire mode.   |

## Waveform Measurement

| Waveform Measurement |                            |  |
|----------------------|----------------------------|--|
| Cursor               | Number of Cursors          | 2 pairs of XY cursors  |
|                      |                            | Voltage deviation between cursors ( $\Delta Y$ )   |
|                      | Manual Mode                | Time deviation between cursors ( $\Delta X$ )<br>Reciprocal of $\Delta X$ (Hz) ( $1/\Delta X$ )  |
|                      | Track Mode                 | Fixes Y-axis to track X-axis waveform point's voltage and time values<br>Fixes X-axis to track Y-axis waveform point's voltage and time values   |
|                      | Auto Measurement           | Allows to display cursors during auto measurement  |
|                      | XY Mode                    | Measures the voltage parameters of the corresponding channel waveforms in XY time base mode.<br>X = Channel 1, Y = Channel 2   |
| Auto Measurement     | Number of Measurements     | 41 auto measurements; and up to 10 measurements can be displayed at a time.  |
|                      | Measurement Source         | CH1 to CH4, D0 to D15, Math1 to Math4  |
|                      | Measurement Range (Region) | Main, Zoom   |
|                      | All Measurement            | Displays 33 measurement items (vertical and horizontal) for the current measurement channel; the measurement results are updated continuously.   |
|                      | Vertical                   | Vmax, Vmin, Vpp, Vtop, Vbase, Vamp, Vupper, Vmid, Vlower, Vavg, VRMS, Per. VRMS, Overshoot, Preshoot, Area, and Period Area.   |
|                      | Horizontal                 | Period, Frequency, Rise Time, Fall Time, +Width, -Width, +Duty, -Duty, Positive Pulse Count, Negative Pulse Count, Rising Edge Count, Falling Edge Count, Tvmax, Tvmin, +Slew Rate, and -Slew Rate |
|                      | Others                     | Delay(A↑-B↑), Delay(A↑-B↓), Delay(A↓-B↑), Delay(A↓-B↓), Phase(A↑-B↑), Phase(A↑-B↓), Phase(A↓-B↑), and Phase(A↓-B↓)   |



## Waveform Calculation

| Waveform Calculation  |               |   |
|-----------------------|---------------|---|
| No. of Math Functions |               | 4 math functions available to be displayed at a time  |
| Operation             |               | A+B, A-B, A×B, A/B, FFT, A&&B, A  B, A^B, !A, Intg, Diff, Sqrt, Lg, Ln, Exp, Abs, AX+B, LowPass, HighPass, BandPass, and BandStop |
| Color Grade           |               | Supports FFT  |
| FFT                   | Record Length | Max. 1 Mpts (The max. number of the points to be analyzed for the FFT operation is 1 Mpts.)                                       |
|                       | Window Type   | Rectangular, Blackman-Harris, Hanning (default), Hamming, Flattop, and Triangle.  |
|                       | Peak Search   | A maximum of 15 peaks, determined by the user-defined threshold and offset threshold  |

## Waveform Analysis

| Waveform Analysis  |  |  |
|--------------------|--|--|
| Waveform Recording | Stores the signal under test in segments according to the trigger events, that is, saves all the sampled waveform data as a segment to the RAM for each trigger event. The maximum number of the sampled segments reaches 500,000.             |  |
|                    | Source   | All enabled analog channels  |
|                    | Analysis   | Support playing frame by frame or continuous playing; capable of calculating, measuring, and decoding the played waveforms |
| PassFail           | Compares the signal under test with the user-defined mask to provide the test results: the number of successful tests, failed tests, and the total number of tests. The pass/fail event can enable immediate stop, beeper, and the screenshot. |  |
|                    | Source   | Any analog channel   |

## Waveform Analysis

|             |   |  |
|-------------|---|--|
| Histogram   | The waveform histogram provides a group of data, showing the number of times a waveform hits within the defined region range on the screen. The waveform histogram not only shows the distribution of hits, but also the ordinary measurement statistics. |  |
|             | Source  | Any analog channel, auto measurement item  |
|             | Type  | Horizontal, vertical, and measure  |
|             | Measure   | Statistics: Sum, Peaks, Max, Min, Pk_Pk<br>Histogram: Mean, Median, Mode, Bin width, Sigma, and XScale |
|             | Sampling Mode   | Supports all modes, except the Zoom, XY, and ROLL modes  |
| Color Grade | Provides a dimensional view for waveform intensity, color grade > 16, 256-level color scale display   |  |
|             | Source  | Any analog channel   |
|             | Color Theme   | Temperature and intensity  |
|             | Sampling Mode   | Supports all modes   |

## Serial Decoding

### Serial Decoding

|                     |  |
|---------------------|--|
| Number of Decodings | 4 protocol types can be decoded and enabled at the same time   |
| Decoding Type       | Standard: Parallel, RS232/UART, I2C, SPI, LIN, and CAN   |
| Parallel            | Up to 4 bits of Parallel decoding, supporting any analog channel Support user-defined clock and auto clock settings.<br>Source channel: CH1 to CH4, D0 to D15      |
| RS232/UART          | Decodes the RS232/UART (up to 20 Mb/s) bus's TX/RX data (5-9 bits), parity (Odd, Even, or None), and stop bits (1-2 bits)<br>Source channel: CH1 to CH4, D0 to D15 |
| I2C                 | Decodes the address (with or without the R/W bit) of the I2C bus, data, and ACK.<br>Source channel: CH1 to CH4, D0 to D15  |

## Serial Decoding

|     |   |
|-----|---|
| SPI | Decodes the MISO/MOSI data (4-32 bits) of the SPI bus. The available mode includes "Timeout" and "CS".<br>Source channel: CH1 to CH4, D0 to D15   |
| CAN | Decodes the remote frame (ID, byte number, CRC), overload frame, and data frame (standard/extended ID, control domain, data domain, CRC, and ACK) of the CAN bus (up to 5 Mb/s). The supported CAN bus signal types include CAN_H, CAN_L, TX/RX, and DIFF.<br>Source channel: CH1 to CH4, D0 to D15 |
| LIN | Decodes the protocol version (1.X or 2.X) of the LIN bus (up to 20 Mb/s). The decoding displays sync, ID, data, and check sum.<br>Source channel: CH1 to CH4, D0 to D15   |

## Bode Plot<sup>[7]</sup>

### Bode Plot

|                             |                    |
|-----------------------------|--------------------|
| Start Freq                  | 10 Hz to 24.99 MHz |
| Stop Freq <sup>[8]</sup>    | 100 Hz to 25 MHz   |
| Number of Points per Octave | 10 to 300          |
| Output Amplitude            | 20 mV to 5 V       |

## Arbitrary Function Generator (AFG)<sup>[7]</sup>

### AFG (technical specifications are typical values)

|                     |  |
|---------------------|--|
| Number of Channels  | 1  |
| Output Mode         | Normal (Single-channel output)   |
| Sample Rate         | 156 MSa/s  |
| Vertical Resolution | 14 bits  |
| Max. Frequency      | 25 MHz   |
| Output Waveform     | Standard Waveform: Sine, Square, Ramp, DC, Noise<br>User-defined waveform: supported |

**AFG (technical specifications are typical values)**

|                    |                                       |   |
|--------------------|---------------------------------------|---|
| Sine               | Frequency Range                       | 2 mHz to 25 MHz                             |
|                    | Flatness                              | ±0.5 dB (relative to 1 kHz)                 |
|                    | Harmonic Distortion                   | -40 dBc                                     |
|                    | Spurious (non-harmonics)              | -40 dBc                                     |
|                    | Total Harmonic Distortion             | <1%   |
|                    | S/N Ratio                             | 40 dB                                       |
| Square             | Frequency Range                       | 2 mHz to 15 MHz                             |
|                    | Rise/Fall Time                        | <15 ns                                      |
|                    | Overshoot                             | <5%   |
|                    | Duty                                  | 1% to 99%, adjustable                       |
|                    | Jitter                                | 500 ps                                      |
| Ramp               | Frequency Range                       | 2 mHz to 150 kHz                            |
|                    | Linearity                             | 1%  |
|                    | Symmetry                              | 0 to 100%                                   |
| Noise              | Frequency Range                       | 25 MHz analog bandwidth                     |
| Arbitrary Waveform | Frequency Range                       | 2 mHz to 10 MHz                             |
|                    | Waveform Length                       | 2 pts to 16 kpts                            |
|                    | Supports loading the stored waveforms |   |
| Frequency          | Accuracy                              | 100 ppm                                     |
|                    | Resolution                            | 0.1 Hz or 4 bits (whichever is greater)     |
| Amplitude          | Output Range                          | 2 mV to 10 V (frequency ≤ 10 MHz)           |
|                    |                                       | 2 mV to 5 V (frequency > 10 MHz)            |
|                    | Resolution                            | 100 µV or 3 bits (whichever is greater)     |
|                    | Accuracy                              | ±(2% of setting + 1 mV) (Frequency = 1 kHz) |



**AFG (technical specifications are typical values)**

|            |            |  |
|------------|------------|--|
| DC Offset  | Range      | -5 V to 5 V  |
|            | Resolution | 100 $\mu$ V or 3 bits (whichever is greater)   |
|            | Accuracy   | $\pm$ (2% of offset setting + 5 mV + 0.5% of amplitude)  |
| Modulation | AM         | Modulating Waveform: Sine, Square, Triangle, Up Ramp, Down Ramp, and Noise.<br>Carrier Waveform: Sine, Square, Ramp<br>Modulation Source: Internal<br>Modulation Depth: 0% to 120%<br>Modulation Frequency: 2 mHz to 1 MHz                                 |
|            |            | Modulating Waveform: Sine, Square, Triangle, Up Ramp, Down Ramp, and Noise.<br>Carrier Waveform: Sine, Square, Ramp<br>Modulation Source: Internal   |
|            |            | Frequency Deviation: 2 mHz to set carrier frequency (limited by the carrier frequency setting; the sum of the frequency deviation and carrier frequency shall not exceed the upper limit of the carrier frequency)<br>Modulation Frequency: 2 mHz to 1 MHz |
|            |            | Modulating Waveform: Sine, Square, Triangle, Up Ramp, Down Ramp, and Noise.<br>Carrier Waveform: Sine, Square, Ramp<br>Modulation Source: Internal   |
|            | PM         | Phase Deviation: 0° to 360°, default 90°<br>Modulation Frequency: 2 mHz to 1 MHz   |
|            |            |  |

**Auto****Auto**

|           |   |
|-----------|---|
| AutoScale | Min voltage > 10 mVpp, duty cycle > 1%, frequency > 35 Hz |
|-----------|---|

**Digital Voltmeter****Digital Voltmeter**

|          |  |
|----------|--|
| Source   | Any analog channel                           |
| Function | DC, AC+DC <sub>rms</sub> , AC <sub>rms</sub> |

## Digital Voltmeter

|               |  |
|---------------|--|
| Resolution    | ACV/DCV: 3 digits  |
| Limits Beeper | Sounds an alarm when the voltage value is within or outside of the limit range |

## High-precision Frequency Counter

### High-precision Frequency Counter

|                |                                       |                          |
|----------------|---------------------------------------|--------------------------|
| Source         | Any analog channel                    |                          |
| Measure        | Frequency, period, totalizer          |                          |
| Counter        | Resolution                            | 3-6 digits, user-defined |
|                | Max. Frequency                        | Max. analog bandwidth    |
| Totalizer      | 48-bit totalizer                      |                          |
|                | Counts the number of the rising edges |                          |
| Time Reference | Internal reference                    |                          |

## Command Set

### Command Set

|                                 |                    |
|---------------------------------|--------------------|
| Common Commands Support         | IEEE488.2 Standard |
| Error Message Definition        | Error messages     |
| Support Status Report Mechanism | Status Reporting   |
| Support Syn Mechanism           | Synchronization    |

## Display

### Display

|             |   |
|-------------|---|
| LCD         | 7-inch capacitive multi-touch screen, gesture enabled operation |
| Resolution  | 1024×600 (Screen Region) 16:9                                   |
| Graticule   | 10 horizontal divisions x 8 vertical divisions                  |
| Persistence | Off, Infinite, variable persistence (100 ms to 10 s)            |
| Brightness  | 256 intensity levels (LCD, HDMI)                                |

## Processor System

| Processor System             |  |
|------------------------------|--|
| Processor                    | Cortex-A72 up to 1.8 GHz, 6-core processor |
| System Memory                | 4 GB RAM                                   |
| Operating System             | Android                                    |
| Internal Non-volatile Memory | 8 GB                                       |

## I/O

| I/O                       |                  |   |
|---------------------------|------------------|---|
| USB2.0 Host               |                  | 1 on the front panel  |
| USB2.0 Device             |                  | 1 on the rear panel   |
| LAN                       |                  | 1 on the rear panel, 10/100 Base-T, supporting LXI-C  |
| Web Remote Control        |                  | Supports Web Control interface (input the IP address of the oscilloscope into the Web browser to display the operation interface of the oscilloscope) |
| AFG OUT <sup>[7]</sup>    | Waveform Output  | 1 on the rear panel, BNC connector  |
|                           |                  | 1 on the rear panel, BNC connector  |
|                           | Output Interface | Vo (H) ≥ 2.5 V open circuit, ≥1.0 V 50 Ω to GND<br>Vo (L) ≤ 0.7 V to load ≤4 mA, ≤0.25 V 50 Ω to GND  |
|                           | Trigger Output   | Outputs a pulse signal when the oscilloscope is triggered   |
| AUX OUT                   |                  |   |
|                           | Pass/Fail        | Output a pulse signal when a pass/fail event occurs.<br>Supports user-defined pulse polarity and pulse time (100 ns to 10 ms)                         |
| HDMI                      | Video Output     | 1 on the rear panel, HDMI 1.4, A plug. It is used to connect to an external monitor or projector  |
| Probe Compensation Output |                  | 1 kHz, 3 V <sub>pp</sub> square waveform  |

## Power Supply

### Power Supply

|                        |   |
|------------------------|---|
| Power Supply Interface | Type-C  |
| Power Voltage          | DC 12 V, 4 A  |
| Power                  | Max. 48 W (when connected to various interfaces, USB storage device, active probes) |

## Environment

### Environment

|                   |               |  |
|-------------------|---------------|--|
| Temperature Range | Operating     | 0°C to 50°C                                    |
|                   | Non-operating | -30°C to +60°C                                 |
| Humidity Range    | Operating     | below +30°C: ≤90% RH (without condensation)    |
|                   |               | +30°C to +40°C, ≤75% RH (without condensation) |
|                   |               | +40°C to +50°C, ≤45% RH (without condensation) |
|                   | Non-operating | below 60°C: ≤90% RH (without condensation)     |
| Altitude          | Operating     | below 3,000 m                                  |
|                   | Non-operating | Below 15,000 m                                 |

## Warranty and Calibration Interval

### Warranty and Calibration Interval

|                                  |  |
|----------------------------------|--|
| Warranty                         | Three years for the mainframe, excluding the probes and accessories. |
| Recommended Calibration Interval | 18 months  |



## Regulations

| Regulations                   |  |   |
|-------------------------------|--|---|
| Electromagnetic Compatibility | Compliant with EMC DIRECTIVE 2014/30/EU, compliant with or higher than the standards specified in IEC 61326-1:2013/EN 61326-1:2013 Group 1 Class A |   |
|                               | CISPR 11/EN 55011  |   |
|                               | IEC 61000-4-2:2008/EN 61000-4-2  | ±4.0 kV (contact discharge), ±8.0 kV (air discharge)  |
|                               | IEC 61000-4-3:2002/EN 61000-4-3  | 3 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 2 GHz); 1 V/m (2.0 GHz to 2.7 GHz)   |
|                               | IEC 61000-4-4:2004/EN 61000-4-4  | 1 kV power line   |
|                               | IEC 61000-4-5:2001/EN 61000-4-5  | 0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)                                   |
|                               | IEC 61000-4-6:2003/EN 61000-4-6  | 3 V, 0.15-80 MHz  |
|                               | IEC 61000-4-11:2004/EN 61000-4-11  | Voltage dip: 0% UT during half cycle; 0% UT during 1 cycle ; 70% UT during 25 cycles<br>short interruption: 0% UT during 250 cycles |
| Safety                        | EN 61010-1:2019  |   |
|                               | EN 61010-031:2015  |   |
|                               | IEC 61010-1:2016   |   |
|                               | IEC 61010-2-030:2017   |   |
|                               | UL 61010-1:2012 R7   |   |
|                               | UL 61010-2-31:2017 R2  |   |
|                               | CAN/CSA-22.2 No. 61010-1-12:2017   |   |
|                               | CAN/CSA-22.2 No. 61010-2-30:2018   |   |
| Vibration                     | CAN/CSA-22.2 No. 61010-031-07:201  |   |
|                               | Meets GB/T 6587; class 2 random<br>Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random   |   |

## Regulations

|       |   |
|-------|---|
| Shock | Meets GB/T 6587-2012; class 2 random  |
|       | Meets MIL-PRF-28800F and IEC 60068-2-27; class 3 random   |
|       | In non-operating conditions: 30 g, half-sine wave, 11 ms duration, 3 shocks along the main axis, total of 18 shocks |

## Mechanical Characteristics

### Mechanical Characteristics

|            |  |
|------------|--|
| Dimensions | 265.35 mm (W) x 161.75 mm (H) x 77.38 mm (D) |
|------------|--|

|                       |                           |
|-----------------------|---------------------------|
| Weight <sup>[9]</sup> | Package excluded: 1.78 kg |
|                       | Package included: 2.78 kg |

## Non-volatile Memory

### Non-volatile Memory

|                    |               |   |
|--------------------|---------------|---|
|                    | Setup/Image   | setup (*.stp), image (*.png, *.bmp, *.jpg)  |
|                    | Waveform Data | CSV waveform data (*.csv), binary waveform data (*.bin), list data (*.csv), and reference waveform data (*.ref, *.csv, *.bin) |
| Data/File Storage  |               |   |
| Internal Capacity  |               | 8 GB  |
| Reference Waveform |               | Displays 10 internal waveforms  |
| Setting            |               | Storage is limited by the capacity  |
| USB Capacity       |               | Supports the USB storage device that conforms to the industry standard  |

### Note:

[1]: Single-channel mode: If any one of the channels is enabled, it is called single-channel mode.

[2]: Dual-channel mode: if any two of the channels are enabled, it is called dual-channel mode.

[3]: Full-channel mode: if any three channels or all of the four channels are enabled, it is called full-channel mode.

[4]: 200  $\mu$ V/div and 500  $\mu$ V/div is a magnification of 1 mV/div setting. For vertical accuracy calculations, use full scale of 8 mV.

[5]: For any channel, under the same input impedance with DC-coupled, the Volts/div setting is the same for 100 mV/div and 200 mV/div.

[6]: Channel-to-Channel skew is  $\pm 5$  ns when the sample rate on the digital channel is 625 MSa/s and the period is 1.6 ns.

[7]: Only DHO914S and DHO924S models are equipped with the Bode plot and AFG function.

[8]: The stop frequency shall be greater than the start frequency.

[9]: Standard configuration.

# Order Information and Warranty Period

## Order Information

| Order Information   | Order No. |
|---|-----------|
| <b>Model</b>  |           |
| 250 MHz, 1.25 GSa/s, 50 Mpts, 4CH                                   | DHO924S   |
| 250 MHz, 1.25 GSa/s, 50 Mpts, 4CH                                   | DHO924    |
| 125 MHz, 1.25 GSa/s, 50 Mpts, 4CH                                   | DHO914S   |
| 125 MHz, 1.25 GSa/s, 50 Mpts, 4CH                                   | DHO914    |
| <b>Standard Accessories</b>   |           |
| Power Adaptor Conforming to the Standard of the Destination Country | — —       |
| Banana-Plug Ground Connecting Cable                                 | — —       |
| DHO924/DHO924S: Passive Probe x4 (350 MHz)                          | PVP2350   |
| DHO914/DHO914S: Passive Probe x4 (150 MHz)                          | PVP3150   |
| <b>Recommended Accessories</b>                                      |           |
| 16-channel Logic Analyzer Probe                                     | PLA2216   |

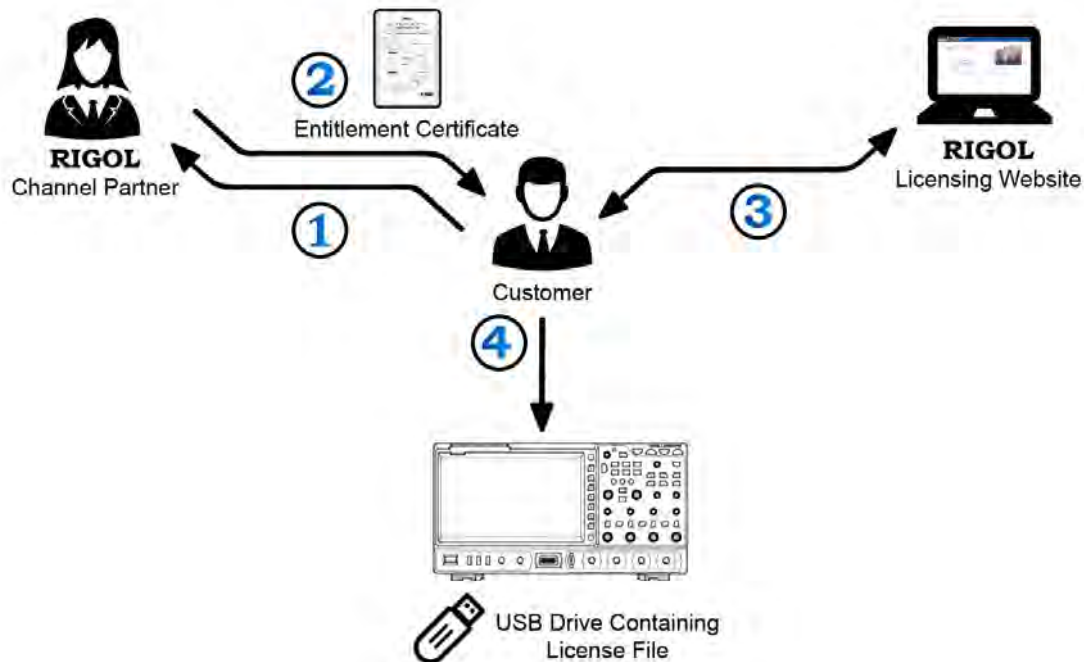
### NOTE:

For all the mainframes, accessories and options, please contact the local office of RIGOL.

## Warranty Period

Three years for the mainframe, excluding the probes and accessories.

# Option Ordering and Installation Process



1. According to the usage requirements, please purchase the specified function options from **RIGOL Sales Personnel**, and provide the serial number of the instrument that needs to install the option.
2. After receiving the option order, the **RIGOL** factory will mail the paper software product entitlement certificate to the address provided in the order.
3. Log in to **RIGOL** official website for registration. Use the software key and instruments serial number provided in the entitlement certificate to obtain the option license code and the option license file.
4. Download the option license file to the root directory of the USB storage device, and connect the USB storage device to the instrument properly. After the USB storage device is successfully recognized, the **Option install** menu is activated. Press this menu key to start installing the option.

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