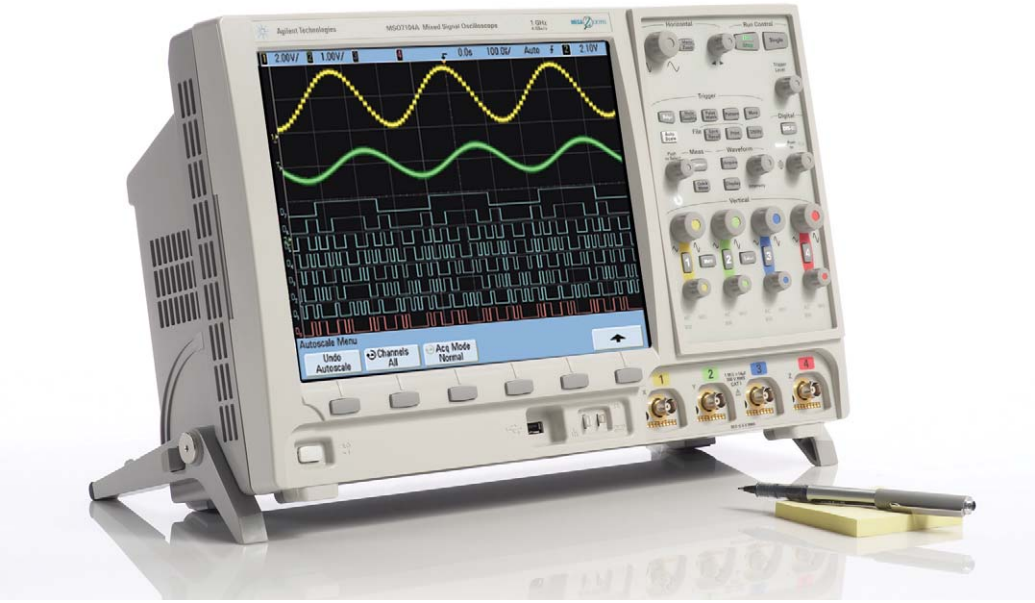
Agilent InfiniiVision 7000 Series Oscilloscope

Demo guide



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Agilent Technologies

Product Overview

Engineered for best signal visibility

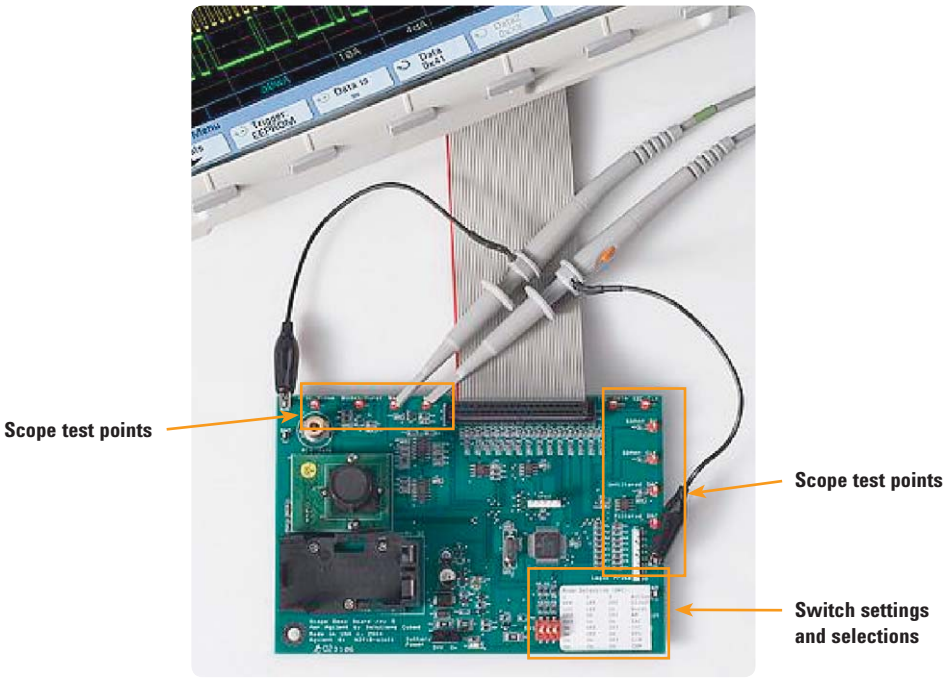
We've engineered the InfiniiVision 7000 Series to deliver the world's best-in-class representation of signals under test. What gives these scopes best signal visibility?

1. **It's attractive.** The 12.1 inch display size, largest in class, helps you easily view multiple analog, digital, and/or serial signals.

2. **It's fast.** With the industry's fastest uncompromised update rate of 100,000 waveforms per second, you can see a display more representative of the signals details under test than with any other scope. Capture infrequent events and subtle signal details. Unlike competitive products, the update rate stays fast and knobs stay responsive when you use deep memory, digital channels, or serial bus decode.

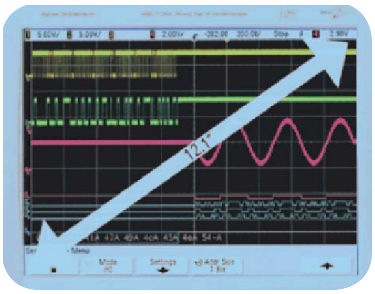
3. **It's smart.** A wide range of application packages provide meaningful insight into your application-specific problems.

A few brief demos will introduce you to the best signal visibility advantages of the InfiniiVision 7000 Series oscilloscopes. Comprehensive labs are available in the "InfiniiVision 7000 Series Evaluation Guide."



Product Overview

Check out the instrument's mechanical design.

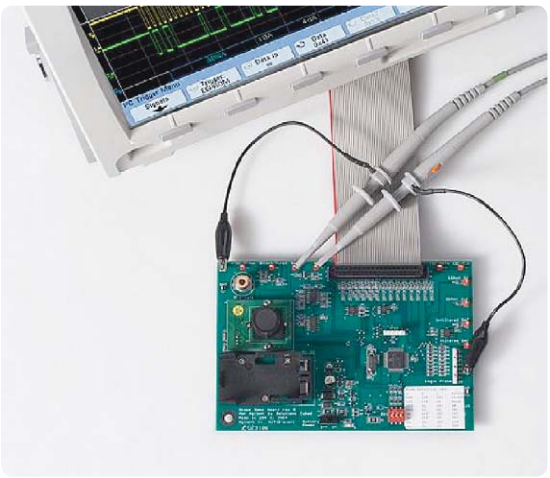


- **Large display** The first attribute you'll notice is the large display. At 12.1 inches, the display has 40% more surface area than our competitors' scopes. Bigger displays have become increasingly important as general purpose scopes need more space to display digital and serial signals in addition to traditional scope channels.
- **Shallow depth** Each model comes in a package that is just 6.5 inches deep, and weighs only 13 pounds. This combination makes the scope extremely portable and easy to use in places where bench space is limited. The handle is always available to pick the instrument up and safely transport it to a new location.

- **Mixed signal oscilloscopes (MSO) models** - Agilent invented MSO technology over a decade ago and the InfiniiVision family is our 3rd generation of this technology. Agilent's MSO can automatically set up analog and digital channels and provides several unique triggering modes not available on MSO oscilloscopes from other vendors.
- **DSOs and MSOs** For previously purchased DSOs, Agilent also provides a DSO to MSO upgrade kits that takes just 5 minutes to install.
- **Connectivity** There's a convenient USB port on the front panel. There's another one on the back of the instrument, along with LAN and an XGA video out port for connection to an external monitor. There's also a connector on the back for an MSO digital cable.
- **Stability** Agilent's industry-unique mechanical design stabilizes the product and inhibits tipping. With legs extended, try pushing against the top front of the instrument.
- **Reliability** All InfiniiVision models come with a standard 3-year warranty.
- **Advantages of non-MS Windows®** Because it's not MS Windows-based, it boots quickly and is not subject to problems associated with open operating systems.
- **Whisper quiet** Note how quiet the instrument is while running. It's the quietest scope in its class, producing just 10 dBa of noise.
- **Bandwidths** The InfiniiVision 7000 Series offers bandwidths of 100 MHz, 300 MHz, 350 MHz, 500 MHz, and 1 GHz.
- **Channels** Two or four analog channels are available on DSOs. Mixed signal oscilloscope models add 16 digital channels. The label shows which model is being shown today.
- **Memory depth** All models ship standard with 8 Mpts acquisition memory.
- **Controls** Each analog channel has its own vertical knobs. Other dedicated buttons allow autoscale, triggering, measurement, acquisition mode, and digital channel selection. The multi-purpose knob is pushable as is the digital selection knob.

Initial Connections

1. **Connect** the MSO ribbon cable from the InfiniiVision demo board (N2918-61601) to the scope.
2. **Press** [**Save/Recall**] and select **Default Setup**. to ensure that the scope is in an initial known state.

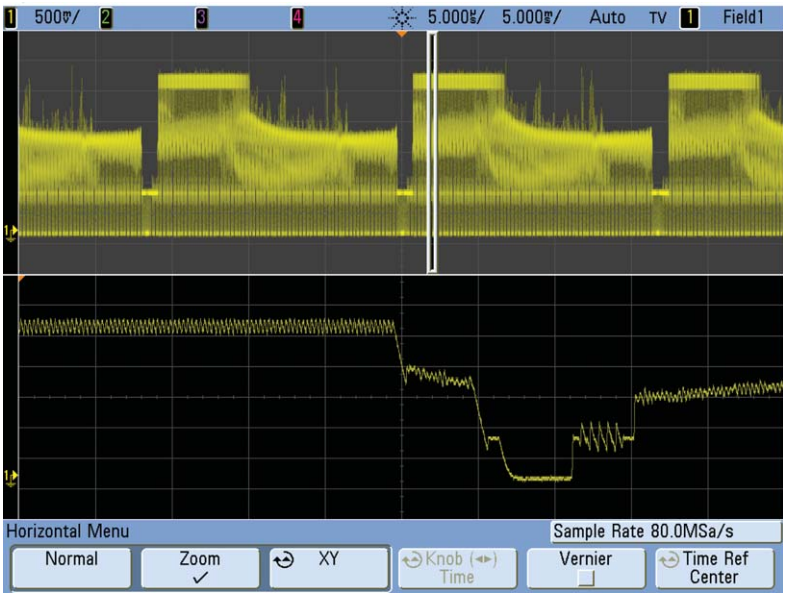


Quick MegaZoom Display and Deep Memory Demo

1. **Set** demo board mode switch to “0-0-0” (Video signal) and connect channel-1 probe to the “NTSC video” test pin and probe ground to any available ground pin.
2. **Press** [**AutoScale**]
3. **Change** the **Timebase** to 10.00 ms/div
4. **More** (Front panel trigger menu) = TV
5. **Adjust** [**Intensity**] knob to 50%
6. **Wave** your hand over camera to observe display responsiveness and display quality while acquiring 4 MB of data for each acquisition.
7. **Using** deep memory, zoom-in and observe the details of this video signal:
   a. Press [**Stop**]
   b. Press [**Menu/Zoom**] and then turn Zoom on
   c. Set Zoom Timebase = 5.000 µs/div
   d. Set Delay = ~1.00 ms

With the Industry's fastest uncompromised update rate of 100,000 waveforms per second and high resolution XGA display (256 intensity levels), the InfiniiVision family of oscilloscopes show signal detail other oscilloscopes miss.

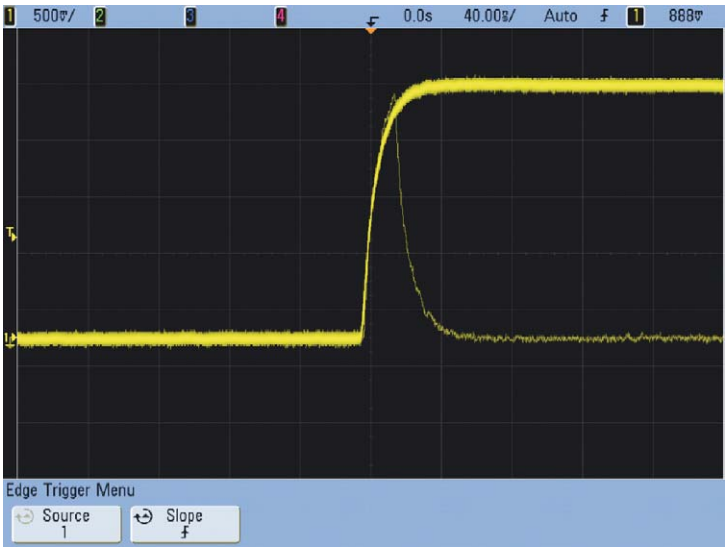
Notice not only the high resolution display that closely emulates the display of a traditional analog oscilloscope, but also how responsive the display is to changes in the signal, even though the scope is repetitively digitizing 4 MB for each acquisition.



Quick Waveform Update Rate Demo

1. **Set** demo board mode switch to "0-0-0" (Glitch signal) and connect the channel-1 probe to the [**Glitch/Burst**] test pin and probe ground to any available ground pin.
2. **Press** [**Autoscale**]
3. **Set** [**Timebase**] = 50.0 ns/div.
4. **Adjust** [**Intensity knob**] = 100%

Since the InfiniiVision MSO can update waveforms up to 100,000 waveforms/sec, the InfiniiVision MSO has a 99.995% probability of capturing the glitch on channel 1 even though this glitch occurs just once every 30,000 cycles. Using the same setup, the Tektronix MSO4000 has just a 1.29% probability of capturing the glitch because this MSO updates waveforms at just 125 waveforms per second when using its logic channels.

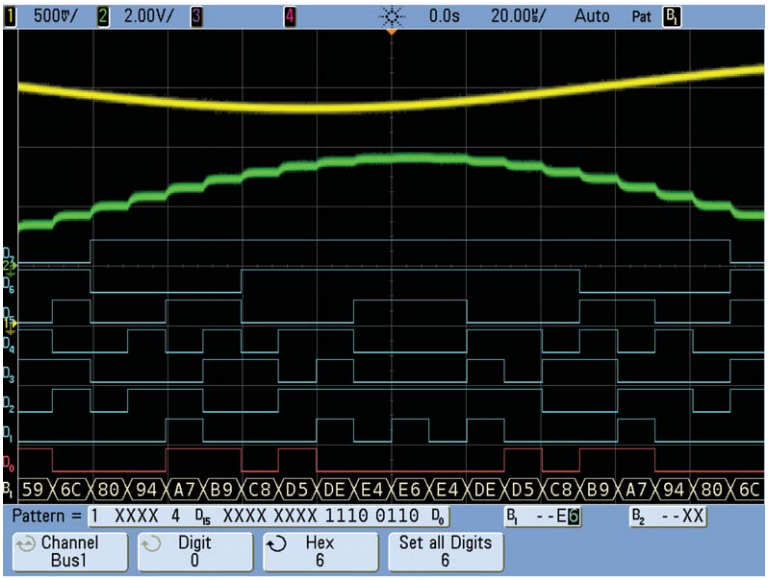


Quick Mixed-Signal with Measurement Statistics Demo

1. **Set** demo board mode switch to "0-1-1" (DAC signal), and connect Ch1 probe to **Unfiltered DAC**, and Ch2 to [Filtered DAC] test pins and probe ground to any available ground pin.
2. **Press** [**Autoscale**] then Adjust [**Intensity**] knob to 50%
3. **Set** [**Timebase**] = 20.00 µs/div
4. **Turn** on an 8-bit "bus" display.
   a. Press [**D15 Thru D0**] on the front panel key
   b. Select **Bus**, then select Bus1 = On
5. **Trigger** on the DAC digital inputs at their highest level (E6)
   a. Select [**Pattern**] from the front panel trigger key.
   b. Set B1 = E6
6. **Set** [**Timebase**] = 100.0 µs/div
7. **Turn** on measurements with statistics:
   a. Select [**Quick Meas**] with the front panel key and press [**Statistics**]

Agilent's MegaZoom III IC's in the InfiniiVision family of oscilloscopes, include both digital and analog memory processing in a single IC. This allows the InfiniiVision scopes to maintain full analog performance and responsiveness even when digital channels are turned on.

Because the digital channels are completely integrated with the analog channels, Agilent's InfiniiVision MSO is the only MSO that can automatically set up the digital/logic channels using Autoscale. The InfiniiVision MSO also provides several unique logic triggering modes, such as sequence triggering, pattern duration triggering, and mixed-signal triggering, which are not available on many MSOs.

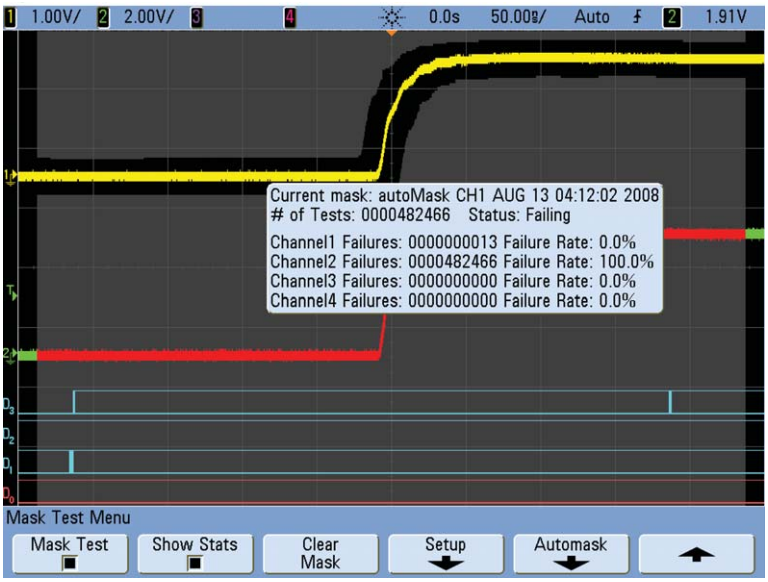


Quick Mask Testing with Statistics Demo

1. **Set** demo board mode switch to “0-0-0” (Glitch signal) and connect the channel-1 probe to the [**Glitch/Burst**] test pin.
2. **Press** [**Autoscale**]
3. **Set** [**Timebase**] = 50.0 ns/div.
4. **Adjust** [**Intensity**] knob = 100%
5. **Use** Mask/Limit testing to accurately determine the relative glitch rate.
   a. Select [**Acquire**], then [**Mask Test**]
   b. Select [**Automask**], then [**Create Mask**]
6. **Set** up Mask testing to stop-on-failure
   a. Set to On Error = Stop
7. **To enable** statistics, press [**Statistics**] soft key. There is also a [**Reset statistics**] soft key to clear mask statistics between runs. You can toggle the transparent or non-transparent statistics background from this menu.

Mask testing provides a fast and easy way to test your signals to specified standards, as well as the ability to uncover unexpected signal anomalies, such as glitches.

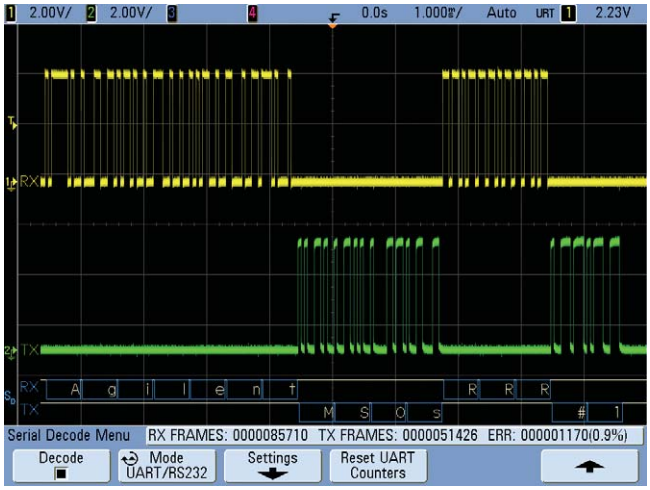
Note that with hardware-based mask testing, not only are tests performed at the same rate as the scope's waveform update rate (Up to 100,000 tests per second), but we also have a very accurate statistical measurement of the failure rate (~0.003%).



Quick Serial Bus Decode with Segmented Memory Demo

Set demo mode switch to "1-1-0" (RS232 signal), and connect Ch1 probe to **SDRAM CLK** and Ch2 probe to **SDRAM** Data

1. **Press** [**Autoscale**]
2. **Set** [**Timebase**] = 1.000 ms/div
3. **Turn** on RS232/UART protocol decoding with ASCII formatting
   a. Select [**Acquire**], then [**Serial Decode**], then set Mode to UART/RS232
   b. Turn Decode to On, Select [**Settings**], then [**Base**] = ASCII
   c. Select [**Bus Config**], then set [**Parity**] = Odd
4. **Turn** on default labels: press [**Label**]
5. **Trigger** on Tx data = "M" (MASCII = 4DHEX)
   a. Press [**More-Trigger**] (front panel key), then set [**Trigger**] = UART/RS232
   b. Select [**Settings**], then set [**Base**] = ASCII
   c. Select [**Trigger Setup**], then set [**Trigger**] = Tx Data and [**Data**] = "M"

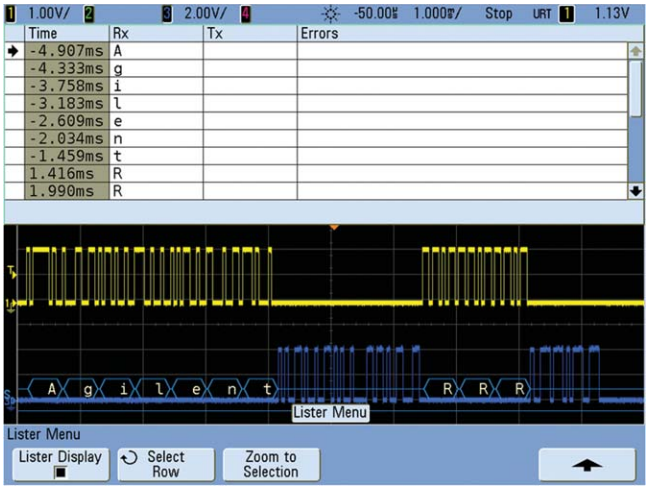


Note the flashing red "1" at the end of the Tx decoded message. This is an indication of a parity bit error. Hardware-based decoding ensures that this infrequent error condition is captured and displayed.

Now turn on serial lister

Turn on RS232/UART Serial Lister.

6. **Select** [Acquire], then **[Serial Decode]**, then **[Lister]**
7. Select **[Lister Display]**



In addition to seeing decoded packet data on the bus waveform itself, you can view all captured packets in a listing view where the decode matches the on-screen waveform data

Now turn on segmented memory

1. **Capture** 500 UART messages using SegmentedMemory.
   a. Press [**Acquire**] and select Segmented
   b. Set the number of segments = 500 and turn segmented on
2. **Review** the captured segments with serial decoding and find the first parity bit error (red "1" at end of Tx data stream) and note the time tag.
   c. Set Current Seg = 1 to N
3. Note the time tag of the last captured segment.
   d. Set Current Seg = 500

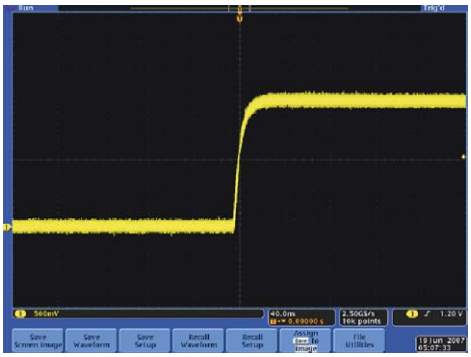
Segmented memory acquisition conserves valuable acquisition memory by only capturing important segments of a signal. This is not only useful for capturing low-duty cycle signals such as laser pulses, but this can also be very useful to capture packets of serial data without wasting memory on the signal idle time.

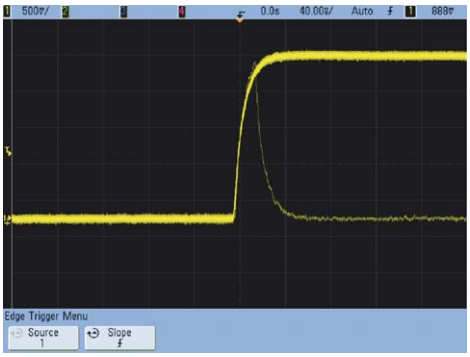
Quick Head-to-Head Demo with Tek 4000 MSO or DSO

We encourage side-by-side comparisons. If you have a Tek 4000 series DSO or MSO, we encourage you to try the two and see which is best equipped to help you debug faster. Fast debug requires quickly finding infrequent events. In this example we're measuring a pulse train that has a glitch occurring several times a second. Agilent's InfiniiVision MSO7000 oscilloscope captures this glitch on average two and a half times per second, allowing you to this elusive problems as they occur.

Tek MSO4000

Agilent InfiniiVision MSO7000





Setup for the Tek MSO4000:

1. **Set** the InfiniiVision 7000 demo board switch (SW1) to the "glitch" mode (**off–off–off**).
2. **Connect** the channel 1 probe to the glitch/burst test point.
3. **Press Default Setup**.
4. **Press Autoset**
5. **Press** intensity button and increase the intensity setting with multipurpose knob A.
6. **Change** horizontal timebase knob two clicks clockwise (to 40 ns/div) to isolate a single edge.
7. **Set** scope to V/div to 500 mV/div, and trigger level to approximently 1 Volt.

The Tex MSO4000 scope regularly show the infrequent glitch.

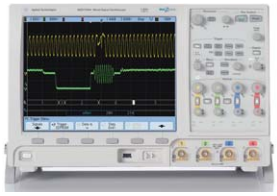
Setup for the Agilent MSO7000:

1. **Set** the InfiniiVision 7000 demo board switch (SW1) to the "glitch" mode (**off–off–off**).
2. **Connect** the channel 1 probe of each scope to the glitch/burst test point.
3. **Press [Save/Recall]** and select **Default Setup** to ensure that the scope is in an initial known state.
4. **Press Autoset**
5. **Increase** the intensity setting to 100% to easily display the glitch.
6. **Change** the timebase to 50 ns/div. to isolate a single edge..
7. **Correct** waveform scaling (500 mV) and triggering level of approximately 1 Volt are automatically set.

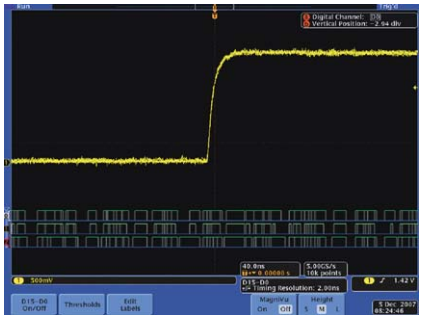
The Agilent 7000 scope regularly show the infrequent glitch.

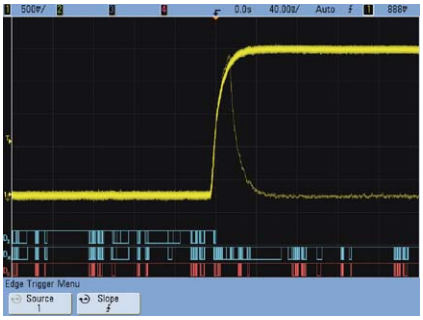
Quick Head-to-Head Demo with Tek 4000 MSO or DSO

Tek MSO4000



Agilent InfiniiVision MSO7000





However, if we change any of the following settings on the two scopes, the Tek 4000 no longer regularly displays the glitch while the Agilent InfiniiVision 7000 continually captures the glitch

1. **Turn on** digital channels (turn on one or many). Press d15-d0 on both (press again to turn off).
2. **Turn on** deep memory (try 10 Mpts on the Tek scope. Agilent memory is always available and adjusted automatically as the t/div knob is turned to display a larger time window on screen).
3. **Change** to a different timebase setting (try 10 ns/div on both scopes).

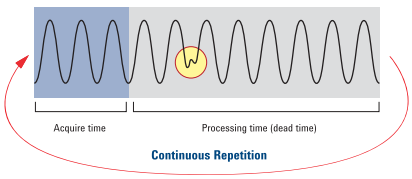
Additional items to compare:

- With digital channels and deep memory available, turn on infinite persistence on both scopes.
- How regularly does each show the glitch? If you wait long enough, both scopes will find it.
- While the InfiniiVision 7000 has a 99.99% with deep memory and digital channels on probability of finding the glitch at least once in 5 seconds test time, the Tek 4000 scope has a probability of less than 1% of finding the glitch in a 5-second test.
- Time how long it is before the Tek scope displays the glitch. Clear the infinite persistence on both scopes and measure the time before the glitch is displayed on each.

Why does the Agilent MSO consistently capture the glitch while the Tek MSO doesn't? In real-time mode, digital oscilloscopes repetitively acquire data and then process the data for display. While the scope is processing, its acquisition system is blind to your signal activity. Oscilloscopes with fast update rates minimize processing time and will find infrequent events that scopes with slower update rates will miss.

With the fast uncompromised update rate of the Agilent InfiniiVision 7000 Series:

- Get responsive knobs and controls
- See infrequent events that other scopes miss
- Display subtle signal detail



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