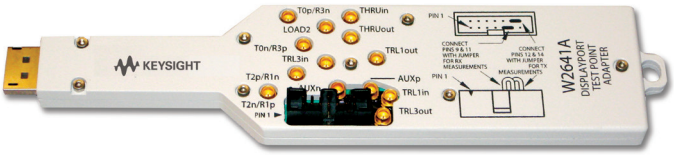
# Keysight Technologies
# W2641A DisplayPort Test Point Access Adapter

Data Sheet


Connect to your DisplayPort device to make physical layer parametric measurements

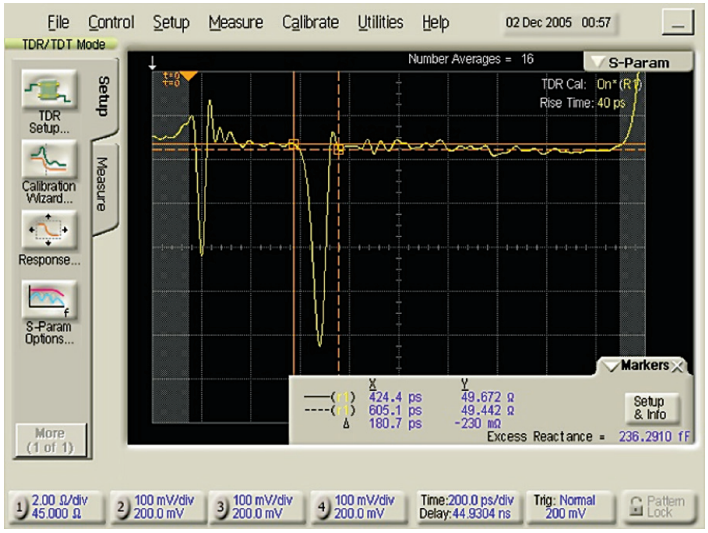
KEYSIGHT TECHNOLOGIES

Emerging standards for consumer electronic devices and entertainment equipment provide for higher screen resolutions than ever before, which meets the market need for the highest computer monitor viewing quality possible. High screen resolutions necessitate higher link rates which place new demands on the source, sink and media such as cable or PC boards. This electrical signal environment makes measurement of physical layer parameters even more important and at the same time, more difficult. The Keysight Techologies W2641A DisplayPort test point access adapter provides unrivaled convenience and performance.

## DisplayPort standard

The evolution of the DisplayPort standard, sponsored by VESA[1], was driven by demand for higher-resolution and less-expensive computer displays. Computer industry insiders have long believed that the industry would ultimately shift to all digital flat-panel displays, and DisplayPort is the digital transport interface standard that finally promises to supplant the popular VGA CRT monitor. The low-profile DisplayPort connector is ideal for crowded back panels, motherboard designs able to drive multiple monitors, and portable equipment that offers uncompromised viewing. The DisplayPort connector has been designed to support the high DisplayPort bit rates now and in the future. It is likely that DisplayPort will become the primary video interface for desktop and laptop personal computers, and it may ultimately be used in consumer electronics equipment such as DVD players.

The DisplayPort standard covers a wide range of screen resolutions and physical configurations. It outlines tests for the high-speed digital signals for source and sink testing, low-frequency control path (the AUX channel), link -layer and protocol verification such as HDCP (high bandwidth content protection) and media evaluation.

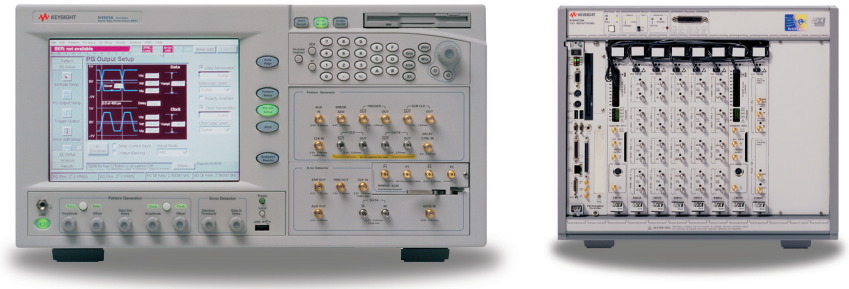


Impedance vs location can be analyzed on your DisplayPort designs

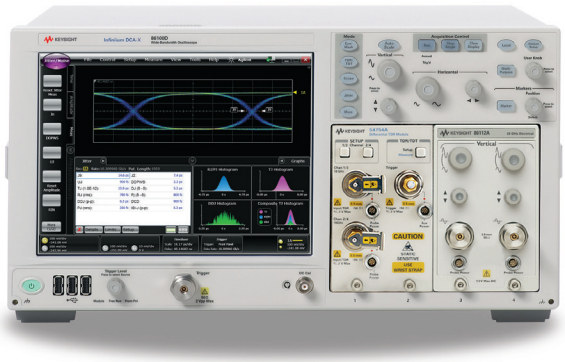
1. Video Electronics Standards Association (www.vesa.org)

## Test point access adapters

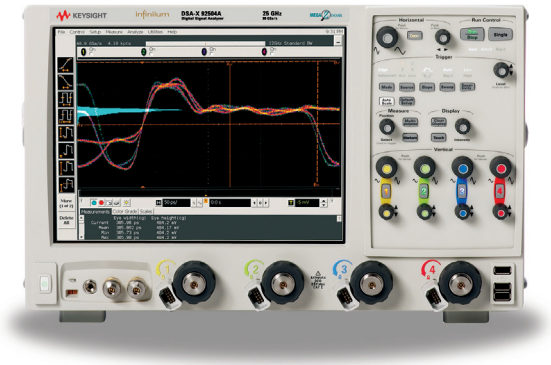
Test point access adapters (TPA) should be as transparent as possible to each measurement, connect to a wide range of test product form factors, and have the flexibility to measure several parameters. The W2641A TPAs have low loss, very good impedance characteristics and low intra-pair and inter-pair skew to provide the high signal fidelity connection required. These TPAs have been designed to conveniently connect to DisplayPort receptacles without obstructing cables or presenting a footprint near the device under test greater than the DisplayPort receptacle connector itself. W2641A DisplayPort test point access adapters provide the widest bandwidth and best performance on the market, thus enabling you to see the nuances of your source eye diagrams, printed circuit board and connector impedance profiles and evaluate your DisplayPort sink performance.



Pair a W2641A TPA with a Keysight N4903A J-BERT or 81250 ParBERT for DisplayPort sink validation.



Use the Keysight 86100C and 86100D digital communication analyzer with a W2641A TPA for transmission line impedance analysis.



Use a Keysight Infiniium DSO90000 or DSOX90000 Series oscilloscope with a W2641A TPA for DisplayPort source validation.

## DisplayPort source testing

The DisplayPort Physical Layer Compliance Test Specification (CTS) covers source tests such as level verification, pre-emphasis level, skew, jitter, data eye, transition time and many other parameters. When you pair W2641A TPAs with Keysight Technologies' Infiniium 90000 or 90000 X-Series oscilloscopes and the U7232A DisplayPort compliance test software, you will have uncompromised accuracy and unrivaled simplicity in characterizing your source design. The TPA's excellent performance enables you to clearly see nuances in the transmitted pattern and determine how to improve the performance of the source and channel. The U7232A DisplayPort compliance test software automates measurements of the multitude of parameter configurations possible in DisplayPort devices and provides you with an extensive report on how the devices have performed. The U7232A is designed for use in validation and compliance labs so you can use the full measurement suite before you submit your devices to a DisplayPort Authorized Test Center for certification to make sure you've taken care of problems in advance.

## DisplayPort AUX channel testing

The DisplayPort specification includes a special channel, the AUX channel, which is used to dynamically coordinate the link source and sink. The W2641A exposes this differential lane that operates at 1 Mbs with two connections available: one using the standard SMP connectors used in the high-speed lanes and another on a digital interface header. Also available on the digital interface header are power supply lines and the hot plug detect (HPD) line, which can also be probed for noise measurements, triggering, etc.

## DisplayPort sink testing

The DisplayPort Physical Layer Compliance Test Specification stipulates a receiver tolerance test regimen where the digital data is transmitted with phase jitter having sinusoidal and random characteristics, as well as a calibrated channel degradation (called intersymbol interference, or ISI). The signal parameters, such as jitter quantity and level, vary according to the bit rate being tested. These signals can be injected to a DisplayPort sink from Keysight sources such as the N4903A JBERT and the 81250 ParBERT through the W2641A.

For the calibration of the sink test setup, a complementary receptacle test fixture is needed. This is available as a third party product BIT-DP-RTF-0001 from BitifEye Digital Test Solutions, (see www.bitifeye.com). The same product is needed for testing so-called tethered devices, i.e. devices such as monitors with DisplayPort cables inseparably connected to them. To facilitate automated measurements and process control, the N5990A test automation software platform offers automated DisplayPort compliance and characterization tests.

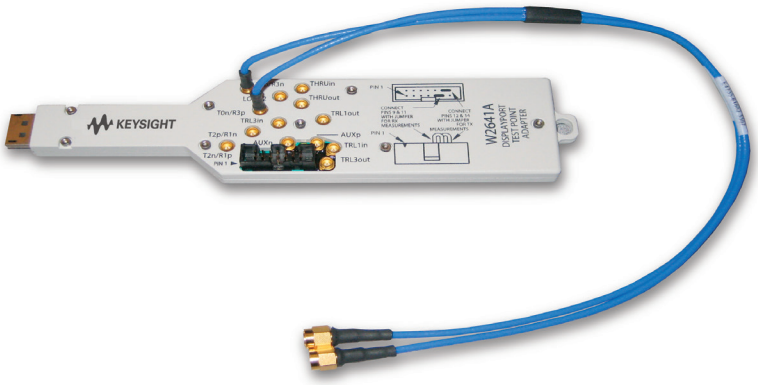
## DisplayPort device connection

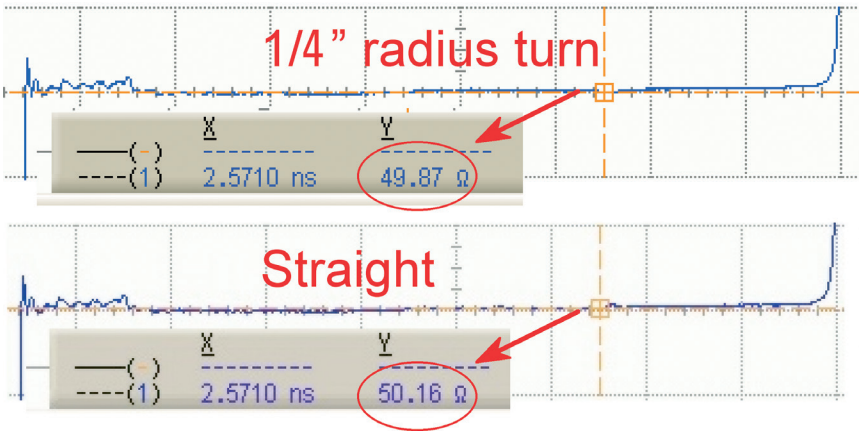
The W2641A connects directly into a DisplayPort receptacle connector such as found on graphic cards, motherboards and on PCs. The fixture was designed to reduce possibility of interference to other connectors and cable types. Even so, there are always connection configurations where interference is seen or where perpendicular entry to the W2641A is inconvenient or impossible. To address some of these conditions, the W2641A DisplayPort Adapter fixture comes with highly flexible cables with constant impedance characteristics even when acutely bent. A diagram of such a test setup is shown below and the impedance difference is shown adjacent. It is clear that no degradation in measurement accuracy is seen.

Extra convenience in connection is afforded by the addition of the N5460A cables, which have a right angle SMP connection. These are phase matched to less than 2ps and have superior impedance and loss characteristics.

## DisplayPort media testing

The W2641A Test Point Adapter can also be used to evaluate motherboard trace layout and connector design by connecting to a DisplayPort receptacle connector. With this connection a vector network analyzer or a TDR may be used to evaluate your design. To aid in this analysis, TRL calibration structures are provided for de-embedding the fixture – such a de-embed process will move the reference plane of measurement to the plug pins of the mated connection (receptacle mated with the adapter's plug) to afford the utmost accuracy.




Less than 1% impedance change for bent cable


W2641A with N5460A SMP right angle cable

## W2641A test accessories

| Model number | Description | Quantity |
|---|---|---|
| N5460A | Phase matched pairs: right-angle SMP to SMA male (recommended, options) | 1, 2, 4 |
| E4809-23801 | Cable plug-in tool (optional) | 1 |
| E4809-23802 | Cable removal tool (required for right angle SMP cables) | 1 |
| N4235-61602 | Phased matched pair: SMP to SMA cables (standard replacement cables for W2641A) | 2, 4, 8 |

## Test accessories

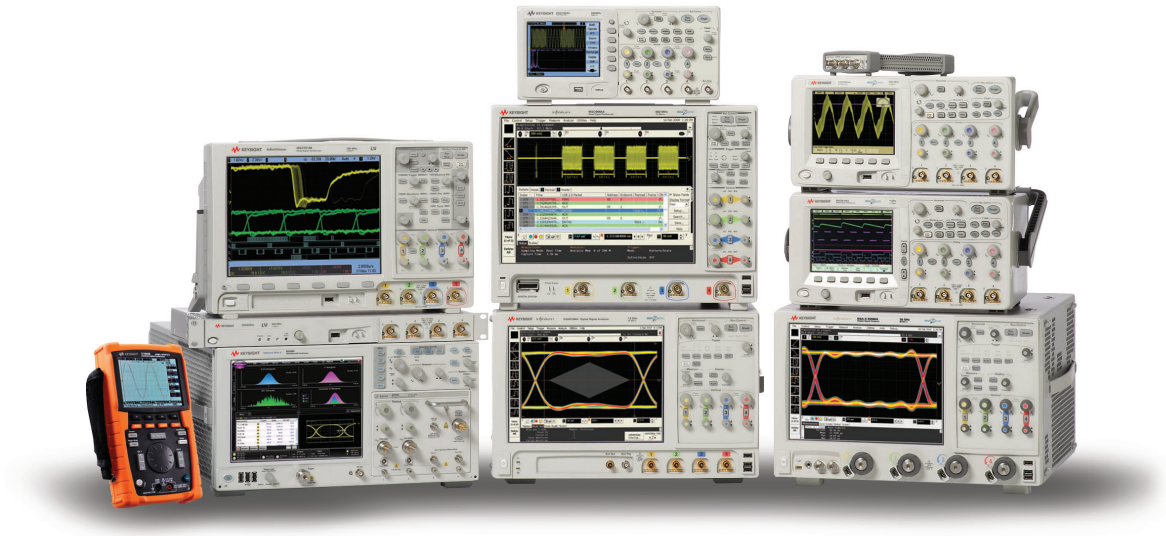
| Model number | Description |
|---|---|
| 11667B | Power splitter, DC to 26.5 GHz, 3.5-mm (f) connectors |
| 11636B | Power divider, DC to 26.5 GHz, 3.5-mm (f) connectors |
| 8493B | Coaxial attenuator (3, 6, 10, 20 or 30 dB), DC to 18 GHz, SMA connector |
| 1250-1158 | SMA (f - f) adapter, DC to 18 GHz |
| 1250-1159 | SMA (m - m) adapter, DC to 18 GHz |
| 1250-1397 | Right-angle adapter, SMA (m - m) |
| 1250-1741 | Right-angle adapter, SMA (f - m) |
| 1250-1698 | SMA tee adapter (m, f, f), DC to 12.4 GHz |
| 1250-1694 | SMA (m) to SMA (f) Adapter |
| 15442A | Cable kit, four 90-cm (36-inch) SMA (m - m) cables |
| 15443A | Matched cable pair, two 90-cm (36-inch) SMA (m - m) cables, propagation delay within 25 ps |
| 1810-0118 | SMA (m) 50 Ω termination |
| 33SMA-Q50-0-4 | SMA push-on adaptors from S.M. Electronics (or equivalent) |

## Related literature

| Publication title | Publication type | Publication number |
|---|---|---|
| *Infiniium 90000 Series Oscilloscopes and 1160 Series Probes* | Data Sheet | 5989-7819EN |
| *U7232A DisplayPort Compliance Test Software* | Data Sheet | 5989-7198EN |
| *Keysight method of implementation for DisplayPort sink compliance test* | *Application Note* | 5989-9147EN |
| *N4903A JBERT* | *Data Sheet* | 5989-2899EN |
| *N4915A-006 DisplayPort ISI generator* | *Data Sheet* | 5989-8688EN |
| *ParBERT TMDS generator* | *Data Sheet* | 5989-5537EN |
| *N5990A Test automation software* | *Data Sheet* | 5989-5483EN |
| *Infiniium 90000 X-Series oscilloscopes* | *Data sheet* | 5990-5271EN |
| *86100D Technical Specifications* | Data sheet | 5990-5824EN |

## Product Web site

For the most up-to-date and complete application and product information, please visit our product Web site at: www.keysight.com/find/scope-apps



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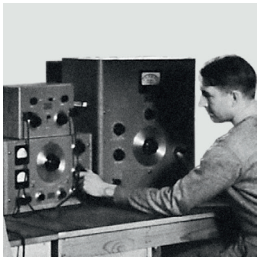

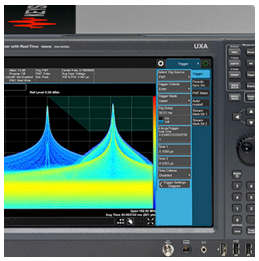

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