

Instructions



TCA75 75 to 50 Ohm Impedance Conversion Adapter 071-1192-00

There are no current European directives that apply to this product. This product provides cable and test lead connections to a test object of electronic measuring and test equipment.

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to all safety summaries prior to performing service.

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In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

To Avoid Fire or Personal Injury

Ground the Product. This product is indirectly grounded through the grounding conductor of the mainframe power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Keep Product Surfaces Clean and Dry.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:



WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*



CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. The following symbol may appear on the product:



Contacting Tektronix

Phone	1-800-833-9200*
Address	Tektronix, Inc. Department or name (if known) 14200 SW Karl Braun Drive P.O. Box 500 Beaverton, OR 97077 USA
Web site	www.tektronix.com
Sales support	1-800-833-9200, select option 1*
Service support	1-800-833-9200, select option 2*
Technical support	Email: techsupport@tektronix.com 1-800-833-9200, select option 3* 6:00 a.m. - 5:00 p.m. Pacific time

* **This phone number is toll free in North America. After office hours, please leave a voice mail message.
Outside North America, contact a Tektronix sales office or distributor; see the Tektronix web site for a list of offices.**

TCA75 Impedance Conversion Adapter

The TCA75 (Figure 1) is a 75-to 50 Ω impedance conversion adapter with a very low VSWR (voltage standing-wave ratio). The adapter allows you to connect video and communication signals from a 75 Ω source to the 50 Ω input of oscilloscopes equipped with the TekConnect interface, while minimizing aberrations and reflections. The TCA75 adapter fully complies with ANSI T1.102 and ITU-T G.703.

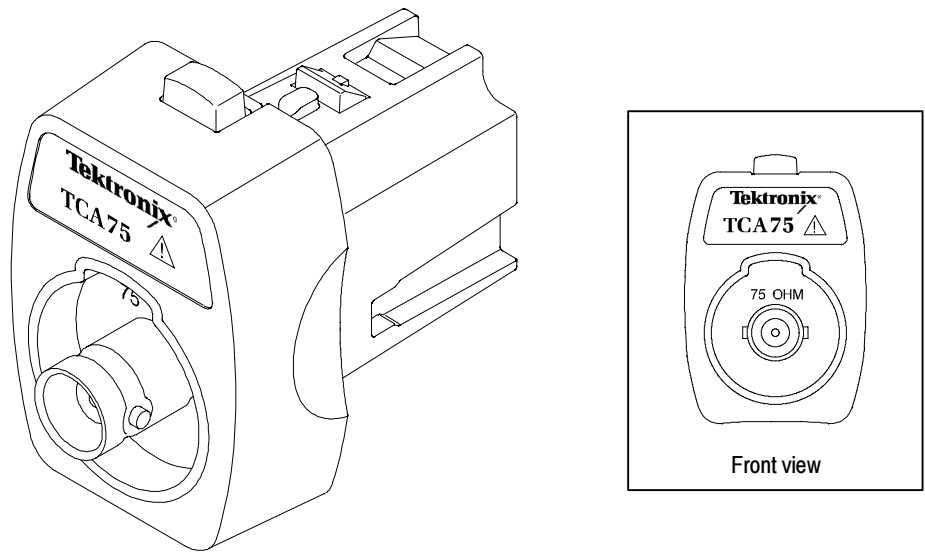


Figure 1: TCA75 Adapter



CAUTION. The TCA75 adapter contains components that are sensitive to electrostatic discharge (ESD). To avoid electrostatic damage, observe ESD precautions when handling the adapter.

Standard Accessories

Table 1 lists the standard accessories included with the adapter.

Table 1: Standard accessories

Description	Tektronix part number
Instruction Manual	071-1192-XX

Connecting the TCA75 Adapter to the Host Instrument

The output of the TCA75 adapter connects directly to the TekConnect interface on Tektronix TDS6000, TDS7000, and CSA7000 Series oscilloscopes, as shown in Figure 2. The TCA75 is not compatible with oscilloscopes that do not have the TekConnect interface. The shell of the input on all oscilloscopes must connect to earth ground.

The TCA75 adapter connects to the host instrument through the TekConnect interface. The TekConnect interface features a spring-loaded latch that indicates a reliable connection has been made to the TekConnect-host instrument. Slide the TCA75 adapter into the TekConnect receptacle on the host instrument. The unit snaps into the host instrument when fully engaged.

NOTE. After connecting the adapter to the oscilloscope, run the Probe Calibration Routine described on page 11 to ensure accurate measurements.

To release the TCA75 adapter from the host instrument, grasp the adapter, depress the latch button, and pull it out of the TekConnect receptacle.

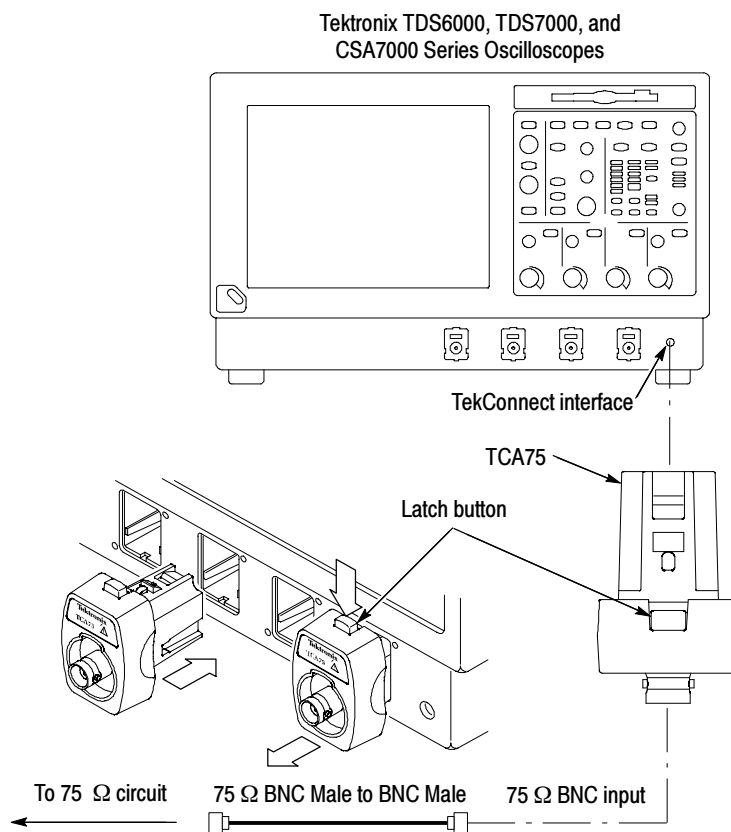


Figure 2: Connecting the adapter to oscilloscopes with the TekConnect interface

Input Signal Connections

The 75 Ω female BNC input of the TCA75 adapter accepts a 75 Ω male BNC connector. The signal input cable (source) must be 75 Ω . See Table 2 for typical 75 Ω signal sources.

Table 2: Input signal connections

Impedance	Standard	Data rate Mb/s)
75 Ω	D-1	270
	D-2	143
	DS-3	44.736
	DS-4	139.264
	STS-1	51.84
	STS-3/STM-1	155.51
	E-2	8.448
	E-3	34.368
	E-4	139.264
	SMPTE 259M	270, 360
	SMPTE 292M	1.485 Gb/s

Specifications

This section contains the specifications and compliances for the TCA75 Impedance Adapter. All specifications are guaranteed unless noted as typical. Typical specifications are provided for your convenience but are not guaranteed. Specifications that are marked with the ✓ symbol are checked in the *Performance Verification* on page 7.

Specification ¹ /compliance	Description																								
Communication and video standards	<table> <tr> <td>D-1</td> <td>(270 Mb/s)</td> <td>E-2</td> <td>(8.448 Mb/s)</td> </tr> <tr> <td>D-2</td> <td>(143 Mb/s)</td> <td>E-3</td> <td>(34.368 Mb/s)</td> </tr> <tr> <td>DS-3</td> <td>(44.736 Mb/s)</td> <td>E-4</td> <td>(139.264 Mb/s)</td> </tr> <tr> <td>DS-4</td> <td>(139.264 Mb/s)</td> <td>SMPTE 259M</td> <td>(270/360 Mb/s)</td> </tr> <tr> <td>STS-1</td> <td>(51.84 Mb/s)</td> <td>SMPTE 292M</td> <td>(1.485 Gb/s)</td> </tr> <tr> <td>STS-3/STM-1</td> <td>(155.51 Mb/s)</td> <td></td> <td></td> </tr> </table>	D-1	(270 Mb/s)	E-2	(8.448 Mb/s)	D-2	(143 Mb/s)	E-3	(34.368 Mb/s)	DS-3	(44.736 Mb/s)	E-4	(139.264 Mb/s)	DS-4	(139.264 Mb/s)	SMPTE 259M	(270/360 Mb/s)	STS-1	(51.84 Mb/s)	SMPTE 292M	(1.485 Gb/s)	STS-3/STM-1	(155.51 Mb/s)		
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STS-3/STM-1	(155.51 Mb/s)																								
Compliance with industry standards	ANSI T1.102 and ITU-T G.703																								
Input VSWR (return loss), typical	≤1.1:1 (≥26.45 dB) to 4 GHz (see Figure 3)																								
✓ Input impedance	75 Ω ±1.5% at DC and 25° C (derate at a linear rate to ±2% @ 0 and 50° C)																								
✓ Output impedance	50 Ω ±1.5% at DC and 25° C (derate at a linear rate to ±2% @ 0 and 50° C)																								
✓ Attenuation accuracy @ DC	2.46X ±1.5% at DC (-6 dB pwr)																								
Bandwidth, (-3dB) typical	≥4.0 GHz																								
Rise time, typical	<100 ps (calculated from the formula .4/bandwidth = rise time)																								
Rated input voltage (Power)																									
Average power, DC	≤12 VDC or ≤12 V _{RMS} (2 W maximum @ 25 °C) (derate at a linear rate to 1.625 W @50 °C)																								
Peak power, AC	500 W (Duty cycle of 4% and maximum pulse width of 10 microseconds.)																								
Temperature	Class 5 Limits																								
Operating	0 °C to +50 °C (+32 °F to +122 °F)																								
Nonoperating	-55 °C to +75 °C (-67 °F to +167 °F)																								
Humidity	Class 5 Limits																								
Operating	+30 °C to +50 °C (+86 °F to +122 °F), 90 to 95% RH																								
Nonoperating	-55 °C to +75 °C (-67 °F to +167 °F), 90 to 95% RH																								
EC Compliance	This product is exempt from the requirements of the European 98/336 EEC directive.																								
Pollution Degree	Pollution Degree 2 (as defined in IEC 61010-1). Note: Rated for indoor use only.																								

NOTE. If the ambient temperature changes by 5 °C or more, run the Probe Calibration Routine described on page 11 to maintain the highest accuracy measurements.

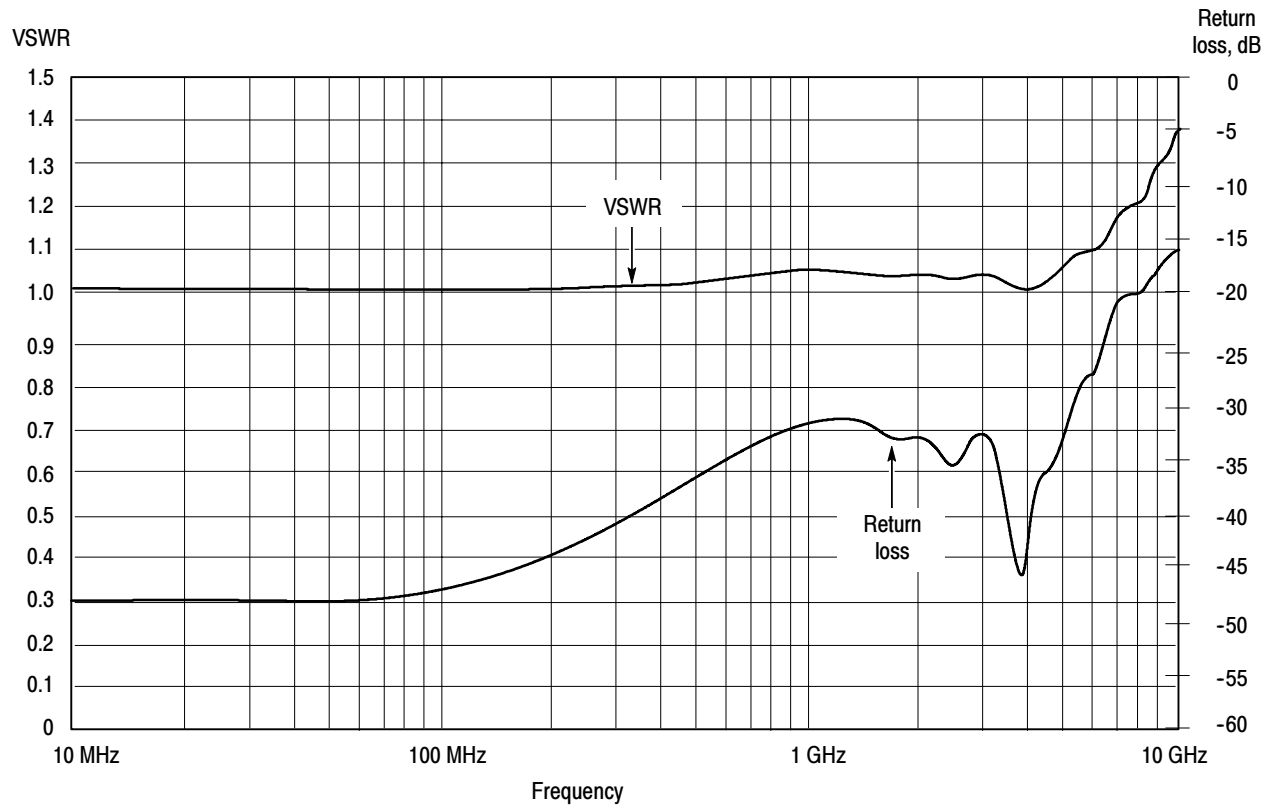


Figure 3: Typical VSWR and return loss

Performance Verification

Use the following procedures to verify the warranted specifications of the TCA75 adapter. Before beginning these procedures, photocopy the test record on page 12, and use it to record the performance test results for your TCA75 adapter. The recommended calibration interval is one year.

These procedures are for use by qualified service personnel only.

Warm up the test equipment for at least 20 minutes prior to performing these tests.

Test Equipment

Table 3 itemizes the equipment required, lists the minimum requirements, and provides an example or part number of the equipment.

Table 3: Test equipment

Description	Minimum requirements	Example product
Power supply	1 VDC out across 75 Ω with <0.5 mV resolution	Wavetek 9100
Digital multimeter (2)	5 1/2 digit with sense, Ω 4 wire, 50 Ω and 75 $\Omega \pm 0.1\%$, DCV: 1 V and 200 mV $\pm 0.1\%$	Keithley 2000 or Fluke 884X
SMA to BMA adapter	Male SMA-to-female BMA	Tyco 1059758-1
BNC banana adapter (3)	BNC female-to-dual banana plug	Tektronix part number 103-0090-00
50 Ω BNC cable (2)	BNC male-to-BNC male, 24 inches	Tektronix part number 012-1342-00
50 Ω BNC T adapter	2 female-to-1 male BNC	Tektronix part number 103-0030-00
50 Ω termination	50 $\Omega \pm 0.1\%$, 2W, SMA	Tektronix part number 015-1022-01
50 Ω termination	50 Ω , 2W, BNC	Tektronix part number 011-0049-02
50 Ω adapter	SMA barrel	Tektronix part number 015-1012-00
50 Ω adapter	SMA-to-BNC	Tektronix part number 015-1018-00
75 Ω BNC cable (2)	BNC male-to-BNC male, 24 inches	Tektronix part number 012-1339-00
75 Ω BNC T adapter	2 female-to-1 male	Pasternack PE9365
75 Ω termination	75 $\Omega \pm 0.025\%$, 2 V _{RMS} , BNC	Tektronix part number 011-0102-03

Output Impedance

This test checks the 50 Ω output impedance (of the TekConnect interface circuit) of the adapter.

1. Set up the multimeter as follows:

Multimeter	Setting
Mode	Ω 4 Wire
Range	100 Ω

2. Connect the TCA75 adapter as shown in Figure 4.

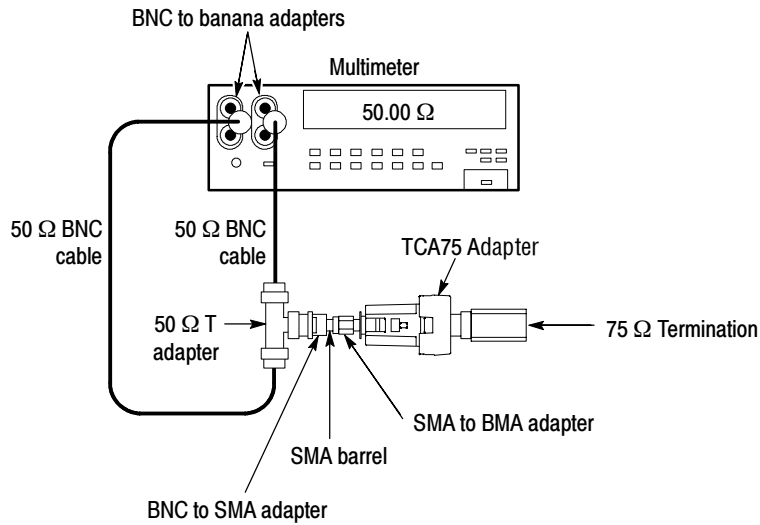


Figure 4: Test setup for output impedance

3. Check that the multimeter reads $50\ \Omega \pm 1.5\%$ ($49.25\ \Omega$ to $50.75\ \Omega$).
4. Record the results in the test record.
5. Disconnect the setup.

Input Impedance

This test checks the 75 Ω input impedance of the adapter.

1. Connect the TCA75 adapter as shown in Figure 5.

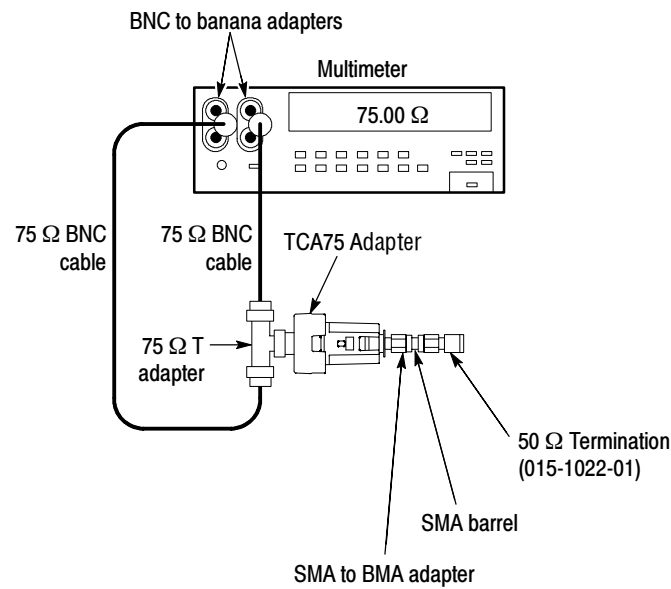


Figure 5: Test setup for input impedance

2. Check that the multimeter reads 75 $\Omega \pm 1.5\%$ (73.875 Ω to 76.125 Ω).
3. Record the results in the test record.
4. Disconnect the setup.

Attenuation Accuracy

1. Set up the equipment as follows:

Multimeter #1	Setting
Mode	DCV
Range	10 V (3 digit resolution)
Multimeter #2	Setting
Mode	DCV
Range	1 V (3 digit resolution)
Power Supply	Setting
DCV	1.000 V

2. Connect the equipment as shown in Figure 6.

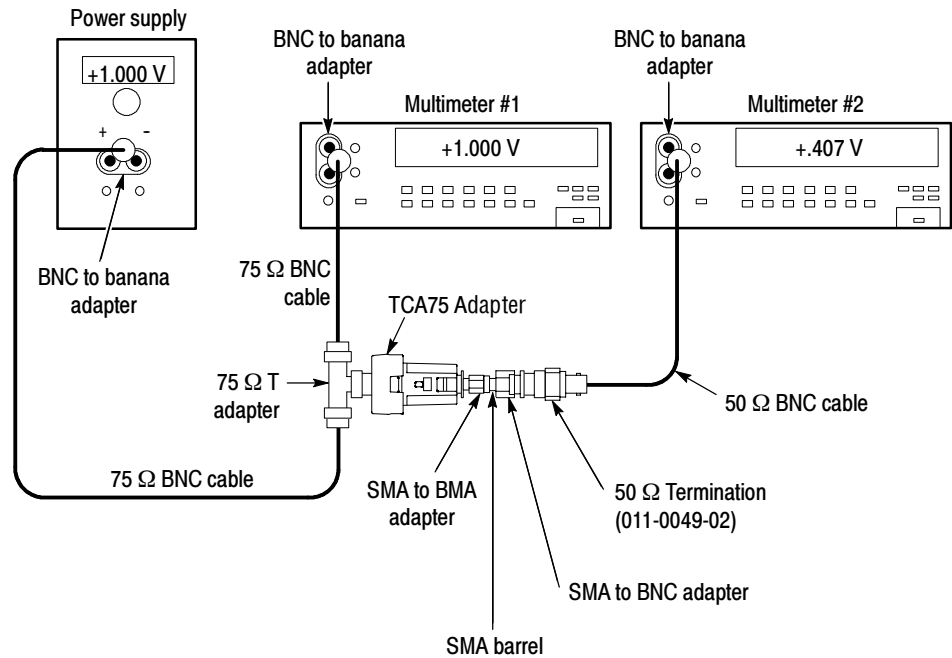


Figure 6: Measuring the attenuation accuracy

3. Power on the power supply, and adjust the output until multimeter #1 reads 1.000 V.
4. Check that the voltage is attenuated by $2.46X \pm 1.5\%$ (multimeter #2 reads 0.402 V to 0.414 V).

5. Record the measurement results in the test record.
6. Calculate the attenuation factor by dividing the voltage that you measured in step 4 (the adapter output) into 1.000 V (the adapter input, from step 3).
7. Record the calculated results in the test record.
8. Power off the power supply, and disconnect the test setup.

Probe Calibration Routine

This is a functional check of the TCA75 adapter that uses the probe calibration output signal and probe calibration feature of the oscilloscope.

1. Connect the TCA75 adapter to any channel on the oscilloscope.
2. Connect a 75 Ω coaxial cable between the TCA75 adapter input and the PROBE COMPENSATION output connector on the oscilloscope. The test setup is now connected as shown in Figure 7.

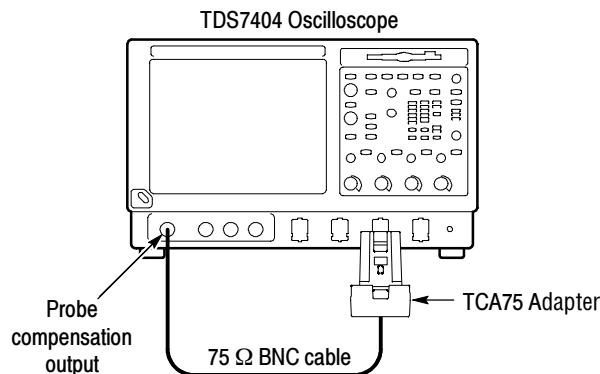


Figure 7: Probe setup

3. Select Probe Cal from the Vertical menu on the oscilloscope.
4. When the calibration routine completes, verify that the Pass message displays. Record the results on the test record.

This completes the performance verification of the TCA75 adapter.

TCA75 Test Record

Photocopy this page and use it to record the performance test results for your TCA75 adapter.

TCA75 Test Record

Instrument Number: _____
 Temperature: _____ RH %: _____
 Date of Verification: _____ Technician: _____

TCA75 Performance Test	Minimum	Incoming	Outgoing	Maximum
Output impedance: 50 Ω \pm 1.5%	49.25	_____	_____	50.75
Input impedance: 75 Ω \pm 1.5%	73.875	_____	_____	76.125
Attenuation accuracy: 2.46 X (-6 dB) \pm 1.5% (measured with 1.0 V on the input)				
Input voltage	N/A	1.000	1.000	N/A
Output voltage	0.402	\div _____	\div _____	.414
Input \div output = attenuation factor	2.415	= _____	= _____	2.487
Probe Calibration Routine	Pass/Fail	_____	_____	N/A