

User Manual



80A01

Trigger Prescale Limiting Preamplifier Module

071-0873-00

This document applies to firmware version 1.1.0
and above.

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80A01 Trigger Prescale Preamplifier Module Instrument Software Requirements

The 80A01 prescaled trigger amplifier was designed to be used with software release versions 1.1.0 and later of the 8000 series sampling oscilloscope application. If your instrument is running a release prior to version 1.1.0, Tektronix recommends that you upgrade your instrument to the latest version.

Determining which software version your instrument has

To determine the software version running on your CSA8000 or TDS8000, select About TDS/CSA in the Help menu from the user interface. This command displays the About TDS/CSA dialog which lists the current software version number.

How to get an upgrade

If you find that you are running an older version of software, please visit the Tektronix website at <http://www.tektronix.com> to find out how to get an upgrade version mailed to you. When you visit the Tektronix website, select the Oscilloscopes page. You will find upgrade information there.

Using earlier versions of software with your 80A01 module

While the 80A01 was designed to be used with software release 1.1.0 or later, it can be used with earlier versions of the software with the following limitations and non-standard behavior:

1. If the 80A01 is inserted in the left-most small slot (labeled CH1 / CH2) of the TDS/CSA8000 and at least one optical module is present, the 80A01 will behave normally.
2. If the 80A01 is inserted in any other slot or there are no optical modules present, the following behavior will be seen:
 - a. The instrument will behave as if the odd-numbered channel for the slot in which the 80A01 is inserted is available for acquisition. Thus if the module is inserted in the right-most small slot, the TDS/CSA8000 will believe that it can acquire data on Channel 7. Turning on acquisition on this "pseudo-channel" will result in a waveform being acquired from a floating input. This pseudo-waveform will appear as a DC level with all points having amplitude approximately equal to zero.
 - b. The System Properties dialog (accessed by selecting System Properties from the Utilities menu in the user interface) may contain incorrect information.

In either scenario (1. or 2.), the actual performance of the 80A01 in amplifying RF signals is not degraded.

WARRANTY

Tektronix warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If a product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

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.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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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.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety Summary* in other system manuals for warnings and cautions related to operating the system.

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.

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

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

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 symbols may appear on the product:



Preface

This is the user manual for the 80A01 Trigger Prescale Preamplifier Module. It covers capabilities of the module and how to install it, how to operate the module, and lists specifications of the module.

Manual Structure

This manual is composed of the following chapters:

- *Getting Started* shows you how to configure and install your module, lists standard and optional accessories,
- *Operating Basics* describes controlling the module using the front panel and the instrument user interface, system interaction, the programmer interface, and user adjustments.
- *Specifications* lists all typical and guaranteed specifications for this product.

Related Manuals

This manual is part of a document set of standard-accessory manuals and online documentation; this manual mainly focuses on installation and background needed to use the module features. See the following list for other documents supporting CSA8000 and TDS8000 instrument operation and service. The part numbers of these documents are listed in the *Accessories* section of your instrument user manual.

Manual name	Description
<i>CSA8000 & TDS8000 Online Help</i>	An online help system, integrated with the User Interface application that ships with the CSA8000 and TDS8000 instruments
<i>CSA8000 & TDS8000 References</i>	A quick reference to major features of the instrument and how they operate
<i>CSA8000 & TDS8000 User Manual</i> ¹	The user manual for the CSA8000 and TDS8000 instruments
<i>80C00 Optical Module User Manual</i> ¹	The user manual for the optical modules. Included as a standard accessory if you ordered optical modules with your instrument
<i>CSA8000 & TDS8000 Programmer Online Guide</i>	An alphabetical listing of the programming commands and other information related to controlling the instrument over the GPIB
<i>CSA8000 & TDS8000 Service Manual</i>	Describes how to service the instrument to the module level. This optional manual must be ordered separately

¹ You can insert the 80A01 module user manual in Appendix A of the *CSA8000 & TDS8000 User Manual*.

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* 1-503-627-2400 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.

Getting Started

The Tektronix 80A01 Trigger Prescale Preamplifier Module is a one-channel 8-14 GHz AC coupled 50 Ω limiting preamplifier module that can be installed in the CSA8000 Communications Signal Analyzer and TDS8000 Digital Sampling Oscilloscope. It is designed to increase the sensitivity of the prescale trigger input of the 8000 Series instruments to ≤ 200 mV_{pk-pk}.

NOTE. Proper operation of the 80A01 module requires that the operating system software installed on the main instrument is version 1.1.0 or greater. To display the version installed, select About TDS/CSA8000 from the Help menu in the user interface. See the section in this manual titled 80A01 Trigger Prescale Preamplifier Module Instrument Software Requirements for more information on getting software upgrades if needed.

Product Description

The module provides the features shown in Table 1. See *Specifications* for a full list of product specifications.

Table 1: 80A01 module characteristics

Characteristic	Value or description
Input/output impedance	50 Ω
Input/output connectors	SMA
Coupling	AC
Trigger level	Fixed at 0 V
Maximum input voltage swing	1.1 V _{p-p}
Amplifier bandwidth	8 to 14 GHz
Instrument trigger sensitivity with 80A01 installed	≤ 200 mV, 8 to 12.5 GHz (typical)



CAUTION. To prevent electrostatic damage to the 8000 Series instrument and modules, follow the precautions described in this manual and the manuals accompanying your instrument. (See Electrostatic Discharge starting on page 5.)

As shown in the block diagram in Figure 1, there are two identical SMA female connectors on the front panel: one 50Ω RF input and one 50Ω RF output. Input voltage is passed through the amplifier, allowing trigger sensitivity to drop as low as 200 mV_{pk-pk} in the 8–12.5 GHz range

The module receives power through the Tekprobe–Sampling interface. The Power LED indicates the module is receiving power through the interface connector.



CAUTION. To prevent electrostatic damage to the 8000 Series instrument and module, follow the precautions described in this manual and the manuals accompanying your instrument. (See Electrostatic Discharge starting on page 5.)

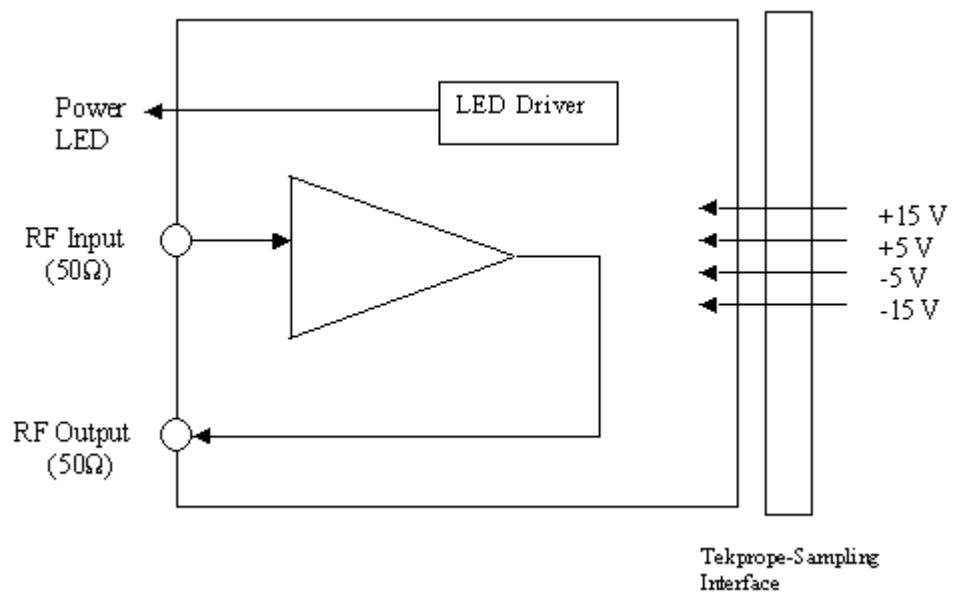


Figure 1: 80A01 module block diagram

Options and Accessories

This section lists the standard and optional accessories available for the module, as well as the product options.

Options Option R3 (Three years of calibration services) is orderable with this module.

Standard Accessories The following accessories are shipped with the instrument:

Table 2: Standard accessories

Item	Part Number
80A01 Trigger Prescale Preamplifier Module User Manual	070-0873-xx
(2) SMA male 50 Ω termination caps	015-1022-xx
Transit case, ESD protective	004-5091-xx

Optional Accessories The following accessories are orderable for use with the module at the time this manual originally published. Consult a current Tektronix catalog for additions, changes, and details:

Table 3: Optional accessories

Item	Part Number
2X attenuator (SMA male-to-female)	015-1001-xx
5X attenuator (male-to-female)	015-1002-xx
Coaxial cable	015-0560-xx
Power divider	015-0565-xx
Asymmetrical power divider	015-0683-xx
SMA accessory kit	020-1693-xx
CSA8000 & TDS8000 Service Manual	071-0438-xx

Installation

The 80A01 module fits into one of the small module compartments on the front panel of an 8000 Series instrument. Figure 2 shows the front panel of an instrument and the locations of the small module compartments.

To install a module, first power off the instrument using the front-panel On/Standby switch. Then place the module in a compartment and slowly push it in with firm pressure. Once the module is seated, turn the hold-down screw on the module to tighten the module into place. See Figure 2.



CAUTION. To prevent damage to the module or instrument, never install or remove a module when the instrument is powered-on or when either input connector is unprotected.

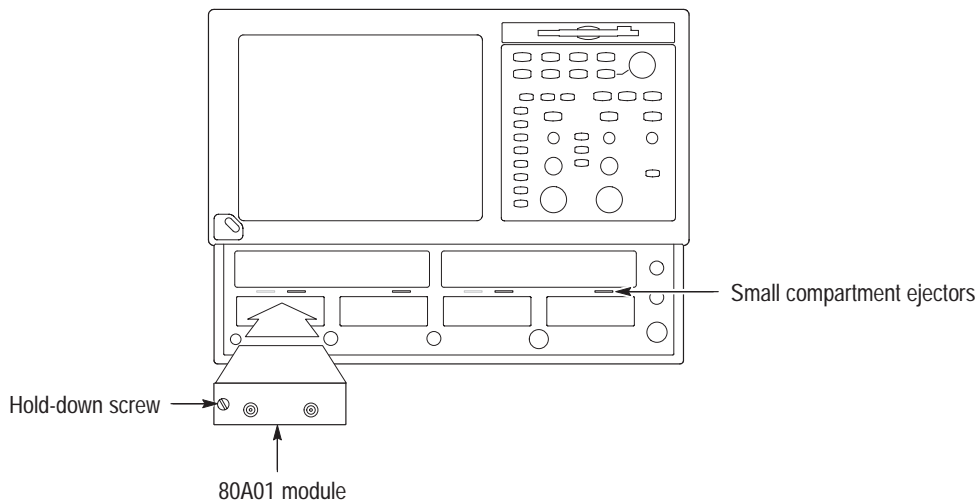


Figure 2: Installing a module

NOTE. When removing your module, first loosen the hold-down screw, then use the module ejector on the main instrument to eject the module.

Electrostatic Discharge

To prevent electrostatic damage to the 8000 Series instrument and modules, follow the precautions described in this manual and the manuals that come with your instrument.

Circuitry in the module is very susceptible to damage from electrostatic discharge or from overdrive signals. Be sure to only operate the module in a static-controlled environment. Be sure to discharge to ground any electrostatic charge that may be present on the center and outer connectors of cables before attaching the cable to the module.

Know your signal source. If it is capable of delivering overvoltages, it is safer to not depend on the signal source settings for protection, but instead use an external attenuator that protects the input from the worst-case conditions. For example, for a 10 V maximum source connected to a 1 V maximum module, use a 10X attenuator. Where possible, connect your cables to the signal source first, and to the module second.



CAUTION. To prevent damage from electrostatic discharge, install 50 Ω terminations (Tektronix part number 015-1022-xx) on the I/O connectors before removing them from an instrument, storing a module, or when not in use. Store the module in a static-free container, such as the shipping container. Whenever you move the module from one instrument to another, use a static-free container to transport the module.

To prevent damage to the module, discharge to ground any electrostatic charge that may be present on the center and outer conductors of cables before attaching the cable to the module.

To prevent damage to the module, do not create an ESD antenna by leaving cables dangling off the module input with the other end open.

To prevent damage to the module or instrument, never install or remove a module when the instrument is powered-on.

Always use a wrist strap (provided with your instrument) when handling modules or making signal connections. Wear anti-static clothing and work in a static-free workstation when using modules.



To prevent damage to the module or instrument, do not apply a signal outside the Maximum Input Voltage Swing for your module.

Static Controlled Workstation

For information on creating a static-controlled workstation, consult the Electronic Industries Association document EIA-625; *Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices*.

Operating Basics

This chapter makes you familiar with the operation of your module. This chapter describes the front-panel controls and connectors, interaction of the module with your instrument, user adjustments, and the programmer interface.

Usage

Figure 3 shows the front panel of the module and identifies the connectors and indicators.



CAUTION. *To prevent damage to your module or instrument, do not apply a signal outside the Maximum Input Voltage Swing for your module.*

To prevent electrostatic damage to the instrument and modules, follow the precautions described in this manual and the manuals accompanying your instrument. (See Electrostatic Discharge starting on page 5.)



Always use a wrist strap (provided with your instrument) when handling modules or making signal connections.

The input circuitry in your module is very susceptible to damage from overdrive signals and electrostatic discharge. Never apply a DC or peak voltage greater than the Maximum Input Voltage (see page NO TAG) of your module. Only operate the instrument and module in a static-controlled environment.

Front Panel

The 80A01 module contains three primary features:

Hold-down screw

Use this to secure the module in the instrument module compartment once connected. Turn clockwise to secure and counterclockwise to release. To prevent damage to the module, use the compartment ejectors to remove the module from the compartment (see Figure 2 on page 4 for the location of the ejectors).

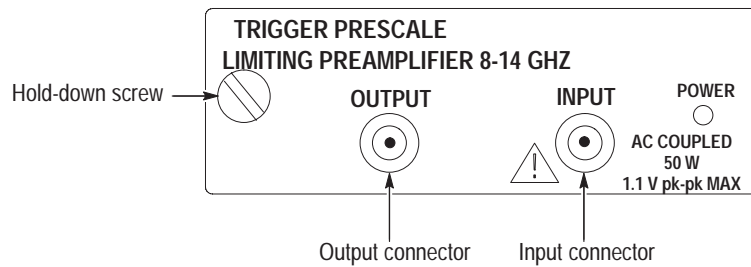


Figure 3: 80A01 module front panel

Input and Output Connectors

The two connectors on the front panel of the 80A01 module provide connections for the input and output signals. Both connectors are SMA female connectors.

Connector Care. Never attach a cable to a sampling-module connector if the cable has a worn or damaged connector because you may damage the sampling-module connector. Use extra care when attaching or removing a cable from the connectors. Turn only the nut, not the cable. When attaching a cable to a sampling-module connector, align the connectors carefully before turning the nut. Use light finger pressure to make this initial connection. Then tighten the nut lightly with a wrench.

NOTE. For best repeatability and to prolong connector life, use a torque wrench and tighten the connection to the range of 79-112 N·cm (7-10 in•lb).

If the module connectors will receive heavy use, such as in a production environment, you should install adapters (such as a Tektronix 015-0549-xx for 3.5 mm connectors) on the module to make connections to the device under test.

Power LED

There is one LED on the front panel of the 80A01 module that indicates whether or not the module is receiving power. The 80A01 module receives power through the Tekprobe-Sample interface. When the module is receiving power the LED is lit. If the module is installed but is not receiving power, check that the module is seated correctly. Additionally, turn the hold-down screw clockwise to make sure the module is installed tightly.

System Interaction

The 80A01 module is part of a larger instrument system. This module functions as a preamplifier for the prescaler trigger input. You connect a voltage to the input connector and it is automatically passed through the amplifier. You then send the output voltage where you want it to go for testing and evaluation.

The remainder of the system interaction for this module is contained in the documentation set included with your TDS8000 or CSA8000 instrument. See the *8000 Series User Manual* prescale trigger section for more information on how to use signals output from the 80A01 module.

Programmer Interface Commands

The remote-programming commands for all modules are documented in the *CSA8000 & TDS8000 Programmer Online Guide*.

User Adjustments

All module setups, parameters, and adjustments are controlled by the instrument. To save, recall, or change any module settings, use the instrument menus or front-panel controls or consult the *CSA8000 & TDS8000 User Manual* or *CSA8000 & TDS8000 Online Help*

Specifications

This section contains specifications for the 80A01 Trigger Prescale Preamplifier Module. All specifications are guaranteed unless noted as “typical.” Typical specifications are provided for your convenience but are not guaranteed.

All specifications apply to all models of module unless noted otherwise. To meet specifications, three conditions must first be met:

- The instrument must have been calibrated/adjusted at an ambient temperature between +20° C and +30° C.
- The oscilloscope must have been operating continuously for 20 minutes within the operating temperature range specified.
- The instrument must be in an environment with temperature, altitude, humidity, and vibration within the operating limits described in these specifications

The 80A01 Trigger Prescale Preamplifier module is a single-channel 8-14 GHz AC coupled limiting preamplifier. It increases the trigger sensitivity of the 8000 Series instruments to $\leq 200 \text{ mV}_{\text{pk-pk}}$ up to 12.5 GHz (typical).

Table 4: Module characteristics

Specifications	Characteristics
Mainframe interface	Tekprobe-Sampling, Level 3. Hot switching is not permitted.
Input and output connectors	Female SMA
Input power ¹	-10 dBm to +5 dBm, AC coupled
Output power	+10 dBm maximum saturation
Output voltage ²	8-12.5 GHz, input voltage $200 \text{ mV}_{\text{pk-pk}}$ to $1 \text{ V}_{\text{pk-pk}}$; $\geq 1 \text{ V}_{\text{pk-pk}}$ 12.5-14 GHz, input voltage $200 \text{ mV}_{\text{pk-pk}}$ to $1 \text{ V}_{\text{pk-pk}}$; $\geq 1 \text{ V}_{\text{pk-pk}}$ (typical)
Input/output impedance	50Ω AC coupled (typical)
Input/output VSWR	2.0:1 maximum from 8-14 GHz (typical)
Power requirements	2.35 W
Maximum input voltage swing	$1.1 \text{ V}_{\text{pk-pk}}$
Noise figure	5 dB maximum

¹ See **Input Voltage Swing** specification for more information.

² Amplifier functions to 14 GHz but prescale trigger is nominally limited to 12.5 GHz for $200 \text{ mV}_{\text{pk-pk}}$ sensitivity.

Table 5: Environmental specifications

Specification	Characteristics
Temperature	Operating: +10° C to +40° C
Humidity	Non-operating: 5% to 90% relative humidity Operating: 20% to 80% relative humidity

Table 6: Mechanical specifications

Specifications	Characteristics
Weight	0.37 kg (13 oz.)
Overall dimensions	Height: 24 mm (0.95 in) Width: 74 mm (2.90 in) Depth: 114 mm (4.95 in) Does not include connectors, connector savers, connector covers, push buttons, or lock-down hardware protruding from the front or rear panels.
Construction material	Chassis aluminum alloy; Front panel plastic laminate; Circuit boards glass-laminate; Cabinet sleeve aluminum Cabinet end covers aluminum

Table 7: Electromagnetic specifications

Specification	Characteristic
Emissions	The instrument meets or exceeds the EMC requirements of the following standards: Emissions European Community Requirements (including EN 61326) EN55011 Class A Radiated Emissions EN55011 Class A Conducted Emissions IEC 1000–3–2 Power Harmonic Current Emissions
Susceptibility	The instrument meets or exceeds the EMC requirements of the following standards: EN61326–1 European Community Requirements IEC 1000–4–2 Electrostatic Discharge Immunity 4 kV contact discharge 8 kV air discharge Performance criteria B

Glossary

Attenuation

A decrease in magnitude of current, voltage, or power of a signal.

Attenuator

An electronic transducer that reduces the amplitude of a signal.

Bandwidth

The range of frequencies handled by a device or system. Bandwidth is a measure of network capacity. Analogue bandwidth is measured in cycles per second. Digital bandwidth is measured in bits of information per second.

Channel

A place to connect a signal or attach a network or transmission line to modules.

dB

Decibel: a method of expressing power or voltage ratios. The decibel scale is logarithmic. The formula for decibels is:

$$\text{dB} = 20 \log (V_i/V_{\text{ref}})$$

where V_i is the voltage of the incident pulse, V_{ref} is the voltage reference, and \log is the decimal-based logarithmic function.

Dialog Box

A displayed box in which you enter instrument commands.

External Attenuation

Attenuation that is outside the module.

Impedance

The opposition to an AC signal in the wire. Impedance is very much like resistance to a DC signal in a DC circuit. Impedance is made up of resistance and inductive and capacitive reactance.

Trigger

An electrical event that initiates acquisition of a sample as specified by the time base.

Waveform

The visible representation of an input signal or combination of signals.

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