Service Manual

Tektronix

SD-32
Sampling Head

070–8269–01

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 the Safety Summary prior to performing service.

Please check for change information at the rear of this manual.

First Printing: May 1993

Instrument Serial Numbers

Each instrument manufactured by Tektronix has a serial number on a panel insert or tag, or stamped on the chassis. The first letter in the serial number designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

B010000	Tektronix, Inc., Beaverton, Oregon, USA
E200000	Tektronix United Kingdom, Ltd., London
J300000	Sony/Tektronix, Japan
H700000	Tektronix Holland, NV, Heerenveen, The Netherlands

Instruments manufactured for Tektronix by external vendors outside the United States are assigned a two digit alpha code to identify the country of manufacture (e.g., JP for Japan, HK for Hong Kong, IL for Israel, etc.).

Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

Printed in U.S.A.

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such 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; or c) 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 Information

This section gives all the information needed to apply power to the SD-32 Sampling Head.

Safety information as well as information on installing and removing the sampling head, packaging for shipment, and environmental conditions such as operating temperature is included here.

Introduction

The *SD-32 Sampling Head Service Manual* is designed for use by qualified service personnel. It contains information necessary to check and maintain the SD-32 Sampling Head.

The SD-32 Sampling Head is a single-channel, 50 GHz bandwidth sampling head. It is designed for use in the the 11800 Series Digital Sampling Oscilloscopes, the SM-11 Multi-Channel Unit, and the CSA 803 Series Communications Signal Analyzers.

Safety Summary

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

Terms in Manuals

CAUTION statements in manuals identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements in manuals identify conditions or practices that could result in personal injury or loss of life.

Terms on Equipment

CAUTION on equipment means a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER on equipment means a personal injury hazard immediately accessible as one reads the marking.

Symbols in Manuals

Static Sensitive Devices

Symbols on Equipment

DANGER High Voltage

Protective ground (earth) terminal

ATTENTION Refer to manual

Grounding the Instrument

The sampling head is grounded through the grounding conductor of the oscilloscope's power cord. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminal. A protective-ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Danger Arising from Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating), can render an electric shock.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate the sampling head in an atmosphere of explosive gasses.

Installing and Removing the Sampling Head

To avoid damage to the instrument, set the instrument's ON/STANDBY switch to STANDBY before installing or removing sampling head.

The SD-32 Sampling Head slides into the one of the front panel compartments of an 11800 Series Digital Sampling Oscilloscope or CSA 803 Series Communications Signal Analyzer. Figure 1-1 shows the front panels of the instruments and the locations of the sampling head compartments.

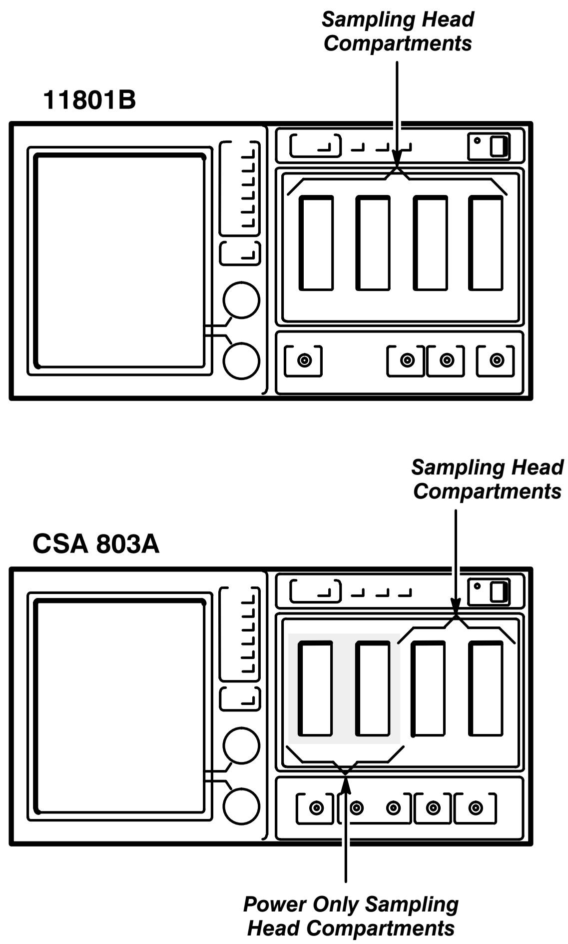


Figure 1-1: Sampling Head Compartments in an 11801B and a CSA 803A

With the ON/STANDBY switch set to STANDBY, place the sampling head in a compartment and slowly push it in with firm pressure. Once the sampling head is seated, turn the lock-down screw to tighten the sampling head in place. See Figure 1-2.

CAUTION

If the green indicator light remains on when the STANDBY position is selected, then the switch has been left internally disabled after the servicing of the power supply. To enable the ON/STANDBY switch, refer to the Maintenance section of your instrument's Service Manual.

To avoid damage to the instrument, set the instrument's ON/STANDBY switch to STANDBY before installing or removing a sampling head.

To remove the sampling head from an instrument, set the instrument's ON/STANDBY to STANDBY. Turn the lock-down screw to loosen the sampling head, and then slowly pull out the sampling head.

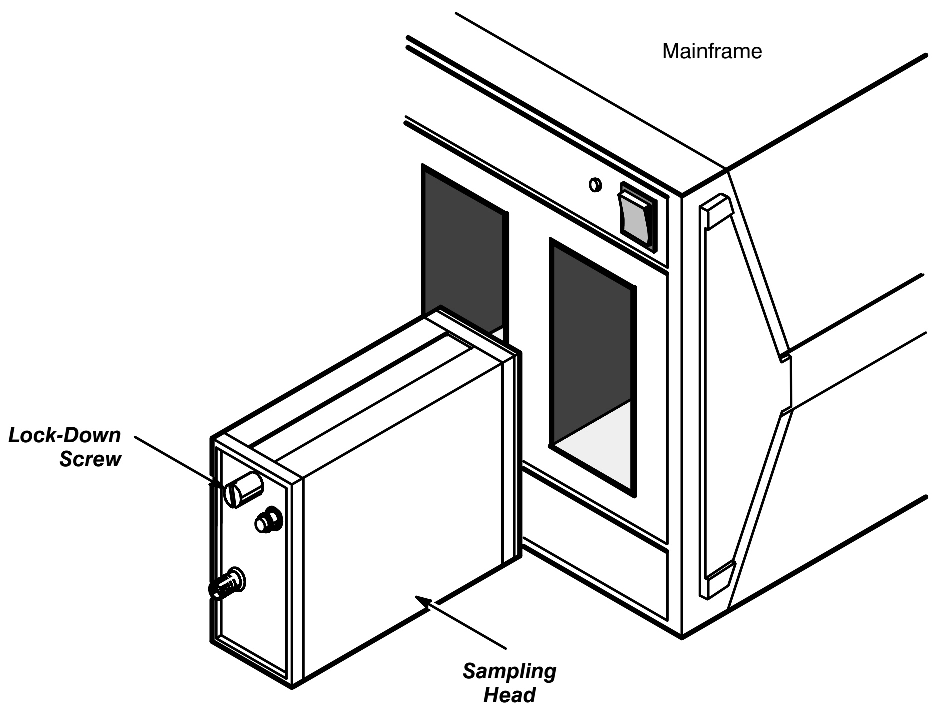


Figure 1-2: Installing a Sampling Head in an Instrument

Packaging for Shipment

If possible, save and reuse the original carton and packaging to package sampling head when shipping it by commercial transportation.

Attach a tag to the sampling head if it is shipped to your local Tektronix service center for service or repair. Include the following information on the tag:

- Name and address of the instrument and sampling head owner.
- Name of a person at your firm who can be contacted about the instrument and sampling head.
- Complete instrument and sampling head type and serial number.
- A description of the service required.

Package the sampling head as follows, if the original package is not available or is not fit for use:

☐ **Step 1:** Attach a short-circuit termination to the sampling head input.

☐ **Step 2:** Obtain a corrugated cardboard carton with inside dimensions at least six inches (15 cm) greater than the sampling head dimensions. Use a carton with a bursting test strength of at least 200 pounds per square-inch.

☐ **Step 3:** Fully wrap the sampling head with anti-static sheeting, or its equivalent, to protect the finish.

☐ **Step 4:** Tightly pack dunnage or urethane foam between the carton and the sampling head to cushion the sampling head on all sides. Allow three inches of packing on each side.

☐ **Step 5:** Seal the carton with shipping tape or with industrial staples.

☐ **Step 6:** Mark the address of the Tektronix service center and your return address on the carton in one or more prominent places.

Operating Environment

The following environmental requirements are provided to ensure proper operation and long sampling head life.

Operating Temperature

Operate the sampling head where the ambient temperature is between 0° C and +50° C. Store the sampling head in ambient temperatures from −40° C to +75° C. After storage at temperatures outside the operating limits, allow the chassis to reach the operating temperature range before applying power.

Measurement accuracy can be improved after a 20-minute warm-up period by performing the calibrations in the **Enhanced Accuracy** menu of the mainframe instrument. Calibrations should be repeated if the temperature changes more than ±5° C or if the sampling head is removed from the instrument.

Checks and Adjustments

This section contains procedures to check the specifications and measurement limits listed in Table 2-1. The Specification or Measurement Limit is listed at the beginning of each procedure as well. These procedures contain only check steps since the SD-32 Sampling Head has no internal adjustments. The parts in this section provide a logical sequence of checks for performing a comprehensive performance verification procedure to verify that the sampling head meets specifications. To functionally test the sampling head, perform the parts in Table 2-1 which have a "yes" in the Functional Test column.

Refer to the *SD-32 Sampling Head User* manual for more information about specifications and sampling head operation. Refer to Table 2-2 for information concerning test equipment used in the setups.

Table 2-1: Measurement Limits and Specifications

Part and Description	Measurement Limit	Specification	Functional Test
Procedure 1 Power-On	none	none	yes
Procedure 2 Dot Transient Response			
250 mV with automatic calibration		≤5% error	yes
500 mV with automatic calibration		≤5% error	no
500 mV with default settings	±20% error		no
Procedure 3 Offset			
Offset	±2 mV		yes
Offset change with repetition rate		±5 mV	no
Procedure 4 Noise			
Smoothing Off		$<2.3\ mV_{RMS}$	yes
Smoothing On		$<1\ mV_{RMS}$	yes

Table 2-1: Measurement Limits and Specifications (Cont.)

Part and Description	Measurement Limit	Specification	Functional Test
Procedure 5 Acquisition Aberrations (with 067−1338−0X source)			no
0 to 300 ps 300 ps to 3 ns 2 ns to 100 ns 100 ns and up −10 ns to −20 ps	+14% to −7% +6.5% − 4% ±1.2% ±0.6% ±4%		
Procedure 6 Maximum Signal Voltage	1% Aberrations for a 1 V Step Amplitude		no
Procedure 7 Bandwidth	50 GHz	±3 dB	no

Test Equipment

Table 2-2 lists test equipment suggested for use with this manual. Procedure steps are based on the test equipment examples given, but other equipment with similar specifications may be substituted. Test results, setup information, and related connectors and adapters may be altered by the use of different equipment.

Table 2-2: Test Equipment

Description	Minimum Specification	Examples of Applicable Test Equipment
11800 Series Oscilloscope or CSA 803 Series Communications Signal Analyzer	Tektronix digital sampling oscilloscope	Tektronix 11801/A/B, 11802 Digital Sampling Oscilloscope Tektronix CSA 803, CSA 803A Communications Signal Analyzer
Pulse Generator	1 ns rise time, 5 V output, 10 Hz to 250 MHz frequency range	Tektronix PG 502 Pulse Generator with a TM 500 Series Power Module
Time Mark Generator	1 ns through 5 s markers in a 1–2–5 sequence, at least 5 parts in 10^7 accuracy	Tektronix TG 501A Time Mark Generator with a TM 500 Series Power Module
Calibration Generator	DC output, 0.5% accuracy 1 V output amplitude	Tektronix PG 506A Calibration Generator with a TM 500 Series Power Module
Calibration Step Generator		Tektronix 067–1338–0X Calibration Step Generator (where X represents either a 0, 1, 2, 3, 5, or 6; depending on the power supply appropriate for your country. Refer to Section 5, *Replaceable Parts*)
Frequency Synthesizer	50 MHz to 40 GHz Output adjustable to +2 dBm, with LF reference output	Wiltron 6769B
Sweep Generator	40 GHz to 50 GHz Output adjustable to 0 dBm	Wiltron 6672B
Waveguide Coupler	WR-19, 10 dB	Aerowave 19-3000/10
Waveguide Detector	WR-19, 40–50 GHz	Pacific Millimeter Products Model UD

Table 2-2: Test Equipment (Cont.)

Description	Minimum Specification	Examples of Applicable Test Equipment
System Controller	Any compatible controller with MS DOS and a serial port configured for COM1	IBM compatible PC with terminal emulation software
Power Meter	50 GHz bandwidth	HP 437B
Power Sensor	50 GHz bandwidth	HP 8487A
RF Cable	12-inch; SMA connectors	Tektronix Part 174–1364–00
Serial Cable	10-ft RS-232-C Cable	Tektronix Part 012–0911–00
Sampling Head Extender		Tektronix Part 012–1220–00
Coaxial Cable or Adapter	Semirigid, 6-inch with 2.9 mm connectors or 2.9 mm MM Adapter.	Cable: Tektronix Part 015–0564–00 Adapter: Tektronix Part 015–0613–00
Adapter, KM to VM	KM to VM	Wiltron 34VK50
Adapter, WR19 Waveguide to VM	WR19 Waveguide to VM	Wiltron 35WR19V
Adapter, VF to VF	VF to VF, characterized	Wiltron SC4193
Adapter	Characterized FF 2.4 mm to 2.9 mm	Tektronix Part 015–0615-00
Adapter, SMA to BNC (4 required)	SMA male to BNC female	Tektronix Part 015–0554–00
Adapter, K or SMA F to V or 2.4 mm M *		Tektronix Part 011–0157–00 (furnished with SD-32)
10 dB Attenuator	50 GHz bandwidth, one male and one female V	Wiltron 41V–10
Attenuator, 5X	14 dB attenuation, 50 Ω, one male and one female BNC	Tektronix Part 011–0060–02
Attenuator, 2X	6 dB attenuation, 50 Ω, one male and one female BNC	Tektronix Part 011–0069–02

Table 2-2: Test Equipment (Cont.)

Description	Minimum Specification	Examples of Applicable Test Equipment
50 Ω Termination, SMA connector	Impedance 50 Ω, SMA male connector	Tektronix Part 015–1022–00
50 Ω Termination, BNC connectors	Impedance 50 Ω, BNC connectors	Tektronix Part 011–0049–01
Short Circuit Termination	Male SMA connector	Tektronix Part 015–1020–00 (furnished with SD-32)
RF Cables (3 required)	42″, RG58, BNC connectors	Tektronix Part 012–0057–01
Wrist Strap		Tektronix Part 006–3415–01
Static Control Mat		Tektronix Part 006–3414–00
Needle-nose pliers		
Pozidriv Screw-driver	P1 tip	
Torque wrench	5/16″, 5–8 in-lb.	
Allen wrench	3/32″	

*** The 2.4 mm connector on the SD-32 will mate with either 2.4 mm or type V connectors. Types K and SMA also can be interconnected.**

Using These Procedures

Each procedure begins with a setup illustration that shows the test equipment and how to connect it. Refer to Table 2-2 for examples of the test equipment for each procedure.

Conventions in this Manual

In these procedures, the following conventions are used:

- CAPITAL letters within the body of text identify front panel controls, indicators, and connectors (for example, MEASURE) on the instrument and sampling head.
- **Bold** letters identify menu labels and display messages.
- Initial Capital letters identify connectors, controls, and indicators (for example, Position) on associated test equipment. Initial Capital letters also identify adjustments inside the sampling head.

In some steps, the first word is italicized to identify a step that contains a performance verification or an adjustment instruction. For example, if *Check* is the first word in the title of a step, an electrical specification is checked. If *Adjust* appears in the title, the step involves an electrical adjustment. If *Examine* is the first word in the title, the step concerns measurement limits that indicate whether the sampling head is operating properly; these limits are not to be interpreted as electrical specifications.

Initialized and Stored Settings

At the beginning of most steps, you are instructed to **Initialize** the instrument as part of the setup. The **Initialize** feature, available through the UTILITY menu, presets all instrument controls and functions to known values. Initializing the instrument at the beginning of a step eliminates the possibility of settings from previous procedures causing erroneous or confusing results.

Menu Selections and Measurement Techniques

Details on measurement techniques and instructions for making menu selections are generally not included in this manual. Comprehensive descriptions of menus and instrument features are located in the *User Manual* for your instrument and in the *SD-32 Sampling Head User Manual*.

Setup Illustrations

You can use any of the 11800 Series Digital Sampling Oscilloscopes or the CSA 803 Series Communications Signal Analyzers as the mainframe instrument in these procedures. A "Mainframe Instrument" is shown in each procedure; the exact location of connectors on your mainframe instrument may differ from that shown in the illustration.

In particular, the 11802 Oscilloscope and CSA 803 Series Communications Signal Analyzers have only two sampling head compartments, as compared to four in the 11801 Series Oscilloscopes. Locations of controls and connectors on each instrument are shown in Figure 2-1.

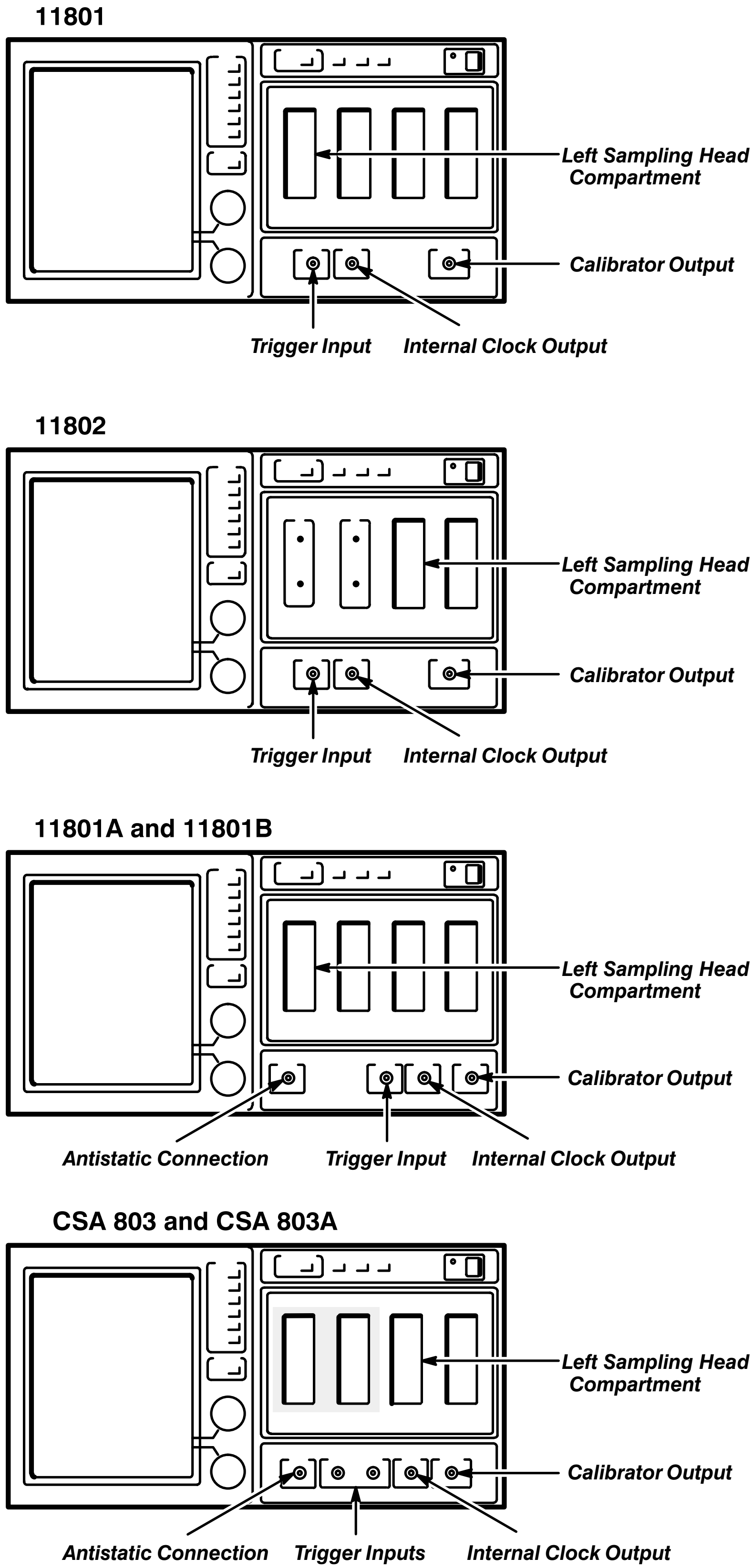
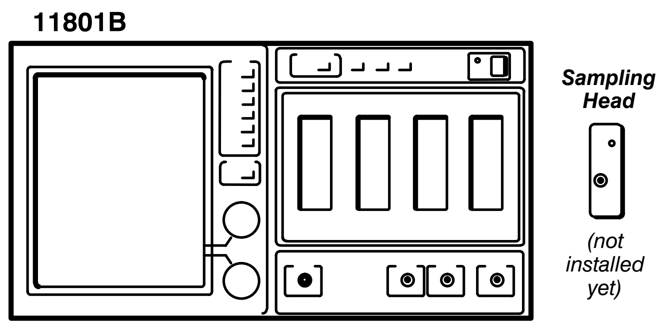


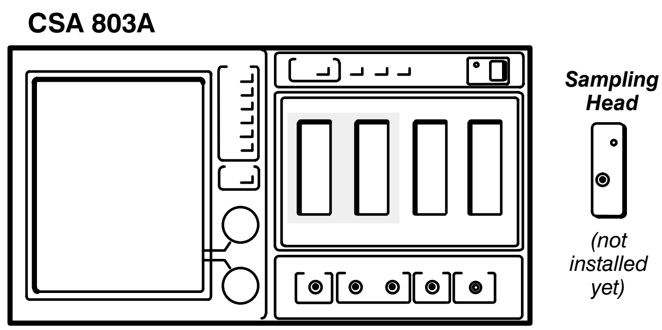
Figure 2-1: Locations of Controls and Connectors on Mainframe Instruments

Procedure 1 Power-On

Perform this procedure within the ambient temperature range of +18° C to +28° C.

Setup to Power-On





Procedure to Power-On

☐ **Step 1:** Set the following in the order listed:

Sampling Head
    Not installed yet
Instrument Mainframe
    ON/STANDBY switch . . . . STANDBY

☐ **Step 2:** Install the SD-32 sampling head in the left sampling head compartment.

☐ **Step 3:** With the instrument's rear panel PRINCIPAL POWER SWITCH set to OFF, connect the instrument to a suitable power source.

☐ **Step 4:** Set the rear panel PRINCIPAL POWER SWITCH to ON and then the instrument's front panel ON/STANDBY switch to ON.

When the instrument is first installed, the rear panel PRINCIPAL POWER SWITCH should be set to and remain in the ON position. Then, use the front panel ON/STANDBY switch to perform all subsequent power switching.

☐ **Step 5:** Power-on the following test equipment so that it is warmed up with the instrument to be tested (For a complete list of test equipment, see Table 2-2):

- Calibration generator
- Calibration step generator
- Frequency synthesizer
- Sweep generator
- Power meter
- Time mark generator
- Pulse generator

Procedure 2 Dot Transient Response

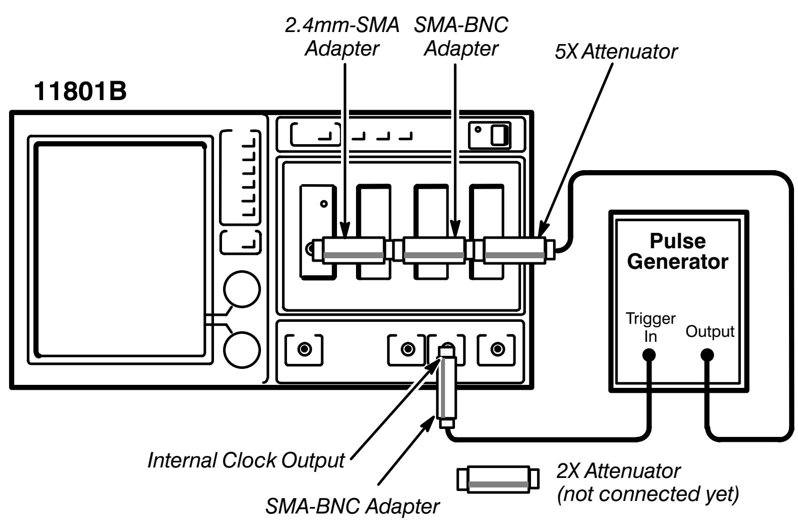
This procedure shows the setup and lists the steps to check the dot transient response.The dot transient response is examined at 250 mV and 500 mV with automatic calibration settings, at 500 mV with default settings.

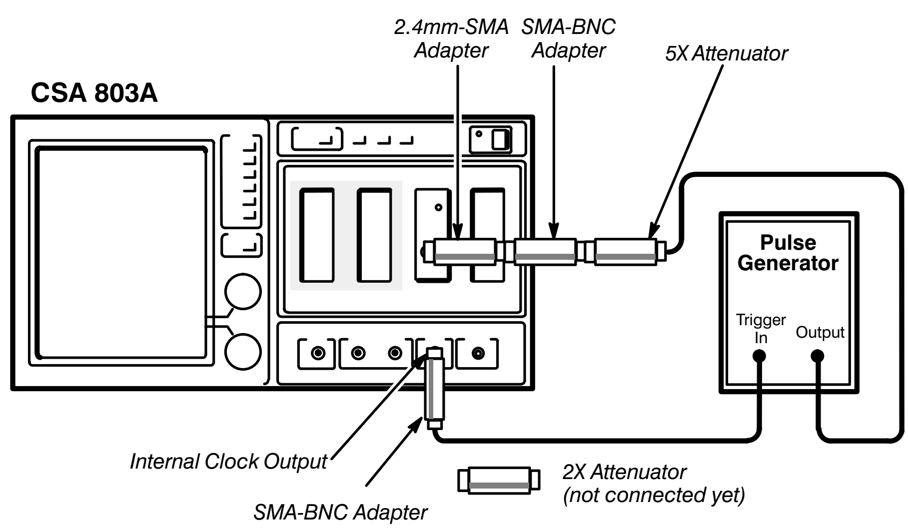
Measurement Limits

The measurement limits for the dot transient response error are:

- ≤ 5% error when measured at 250 mV and 500 mV with automatic calibration settings
- ± 20% error when measured at 500 mV with default settings

Setup to Check Dot Transient Response





Procedure to Check Dot Transient Response

☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
- CH 1 SELECT CHANNEL On/Off . . . . On

Instrument Mainframe
- Vertical (↕) icon . . . . press
- **Vert Size: M1** . . . . 50 mV/division
- TRIGGER button . . . . press
  - **Source** . . . . **Internal Clock**
- Horizontal (↔) icon . . . . press
- **Main Pos** . . . . press
  - **Set to Min** . . . . press
- **Main Size** . . . . 20 ns/division

Pulse Generator
- Back Terminator button . . . . pull out
- Period . . . . External Trigger
- Duration . . . . square wave

Examine dot response at 250 mV with automatic calibration settings — by performing Steps 2 through 31.

☐ **Step 2:** Set the pulse generator's amplitude for a level of 375 mV peak-peak observed on the instrument screen.

☐ **Step 3:** Set the **Vert Offset: MI** so that the step is approximately centered on the screen.

☐ **Step 4:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).

☐ **Step 5:** Touch **Loop Gain** and then the channel number you are using.

☐ **Step 6:** Touch **Automatic Calibrate.** Ignore message at top of screen regarding connection of calibrator output. Then touch **Proceed.**

☐ **Step 7:** Touch **Exit**.

☐ **Step 8:** Set the pulse generator's amplitude for a 250 mV peak-peak display.

☐ **Step 9:** Press the WAVEFORM button and then touch **Horizontal Desc**.

☐ **Step 10:** Touch **Main Record Length** in the **Horizontal Description** pop-up menu and then set the top knob for a **Main Record Length** of 512.

☐ **Step 11:** Press the UTILITY button and then **Instr Options**.

- [ ] **Step 12:** Set **Vectored Trace** to **Off** in the **Instrument Options** pop-up menu.
- [ ] **Step 13:** Touch **Display Intensity** in the **Instrument Options** pop-up menu and then set the top knob for **90%** intensity.
- [ ] **Step 14:** Touch **Exit**.
- [ ] **Step 15:** Touch **Cursors** on the top of the screen.
- [ ] **Step 16:** Touch **Cursor Type** and then **Horizontal Bars** in the **Cursor Type** pop-up menu.
- [ ] **Step 17:** Touch **Exit.**
- [ ] **Step 18:** Touch the **Cursor 1** selector near the top knob and then touch **Fine** in the pop-up menu.
- [ ] **Step 19:** Set **Cursor 1** (top knob) to the average of the bottom of the pulse before the step.
- [ ] **Step 20:** Set **Cursor 2** (bottom knob) to the top of the step.
- [ ] **Step 21:** Read **ΔV** as the peak-to-peak step amplitude and then record this value as **V** for later use.
- [ ] **Step 22:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).
- [ ] **Step 23:** Touch **Loop Gain** and set the **Divide by Two Mode** to **On** in the **Loop Gain Calibration** pop-up menu.
- [ ] **Step 24:** Touch **Cursors** at the top of the screen.
- [ ] **Step 25:** Set **Cursor 1** to the average of the bottom of the pulse before the step.
- [ ] **Step 26:** Set **Cursor 2** to the average of the bottom of the pulse under the step.
- [ ] **Step 27:** Read **ΔV** and then record this value as V_L for later use.
- [ ] **Step 28:** Set **Cursor 2** to the average of the top of the pulse.
- [ ] **Step 29:** Read **ΔV** and then record this value as V_H for later use.
- [ ] **Step 30:** Check that the negative dot response error $[(-V_L/V_H) \times 100\%]$ is within $\pm5\%$.
- [ ] **Step 31:** Check that the positive dot response error $[100\% \times (V_H - V)/(V - V_L)]$ is within $\pm5\%$.

Check dot response at 500 mV with automatic calibration settings — by performing Steps 32 through 52.

- ☐ **Step 32:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).
- ☐ **Step 33:** Touch **Loop Gain.**
- ☐ **Step 34:** Set **Divide by Two Mode** to **Off** in the **Loop Gain Calibration** pop-up menu.
- ☐ **Step 35:** Touch **Exit**.
- ☐ **Step 36:** Set the **Vert Size: M1** to 100 mV/div.
- ☐ **Step 37:** Set the pulse generator's amplitude for a 500 mV peak-peak display.
- ☐ **Step 38:** Touch **Cursors** on the top of the screen.
- ☐ **Step 39:** Set **Cursor 1** to the average of the bottom of the pulse before the step.
- ☐ **Step 40:** Set **Cursor 2** to the average of the top of the pulse.
- ☐ **Step 41:** Read **ΔV** as the peak-to-peak step amplitude and then record this value as **V** for later use.
- ☐ **Step 42:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).
- ☐ **Step 43:** Touch **Loop Gain** and then the channel number you are using in the **Loop Gain Calibration** pop-up menu.
- ☐ **Step 44:** Set **Divide by Two Mode** to **On** in the **Loop Gain Calibration** pop-up menu.
- ☐ **Step 45:** Touch **Cursors** at the top of the screen.
- ☐ **Step 46:** Set **Cursor 1** to the average of the bottom of the pulse before the step.
- ☐ **Step 47:** Set **Cursor 2** to the average of the bottom of the pulse after the step.
- ☐ **Step 48:** Read the **ΔV** value and then record this value as V_L for later use.
- ☐ **Step 49:** Set **Cursor 2** to the average of the top of the pulse.
- ☐ **Step 50:** Read **ΔV**, and then record this value as V_H for later use.
- ☐ **Step 51:** Check that the negative dot response error $[(-V_L/V_H) \times 100\%]$ is within $\pm 5\%$.

☐ **Step 52:** Check that the positive dot response error $[100\% \times (V_H - V)/(V - V_L)]$ is within $\pm 5\%$.

Check dot response at 500 mV with default settings — by performing Steps 53 through 62.

☐ **Step 53:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).

☐ **Step 54:** Touch **Loop Gain.**

☐ **Step 55:** Touch **Recall Defaults** in the **Loop Gain Calibration** pop-up menu.

☐ **Step 56:** Touch **Exit**.

☐ **Step 57:** Touch **Cursors** at the top of the screen.

☐ **Step 58:** Set **Cursor 1** to the average of the bottom of the pulse before the step.

☐ **Step 59:** Set **Cursor 2** to the average of the bottom of the pulse after the step.

☐ **Step 60:** Read the **ΔV** value and then record this value as V_L for later use.

☐ **Step 61:** Set **Cursor 2** to the average of the top of the pulse and read **ΔV**. Record this value as V_H.

☐ **Step 62:** *Examine* that the negative dot response error $[(-V_L/V_H) \times 100\%]$ is $\leq 20\%$.

Procedure 3 Offset

This procedure shows the setup and lists the steps to examine offset and check offset with repetition rate.

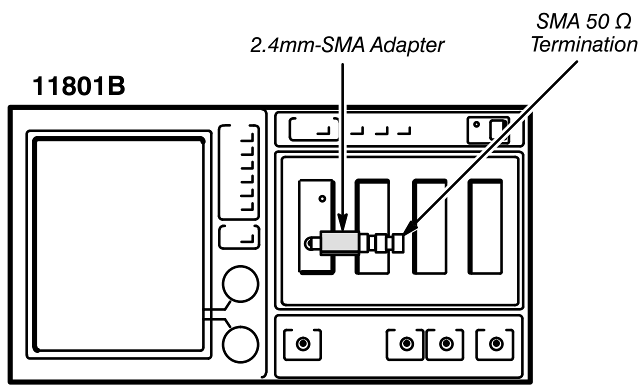
Measurement Limits

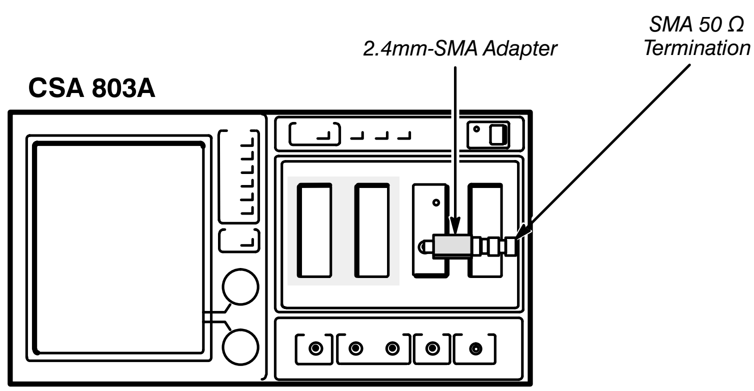
The measurement limit for the offset is 0 V ±2 mV.

Specifications

The specification for the offset change with repetition rate is 0 V ±5 mV.

Setup to Examine Offset





Procedure to Examine Offset

☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
- CH 1 SELECT CHANNEL On/Off . . . . On

Instrument Mainframe
- TRIGGER button . . . . press
  - **Source** . . . . **Internal Clock**
- ENHANCED ACCURACY button (11801/2) . . . . press
- UTILITY button (11801A/B, CSA 803 Series) . . . . press
  - **Enhanced Accuracy** (11801A/B, CSA 803 Series) . . . . touch
  - **Calibrate All** pop-up menu . . . . **Recall Defaults**

☐ **Step 2:** Press the WAVEFORM button then select **Acquire Desc** in the major menu.

☐ **Step 3:** In the pop-up menu, select **Average N** to turn on averaging and then select **Set Avg N**.

☐ **Step 4:** Use the upper knob to set the **Average N** value to **32**.

☐ **Step 5:** Touch **Offset Null** in the **Enhanced Accuracy** menu.

☐ **Step 6:** Touch **Manual Calibrate** in the **Offset Nulling** pop-up menu.

☐ **Step 7:** Touch the **Offset Null: M1** selector, **0**, and then **Enter** in the **Numeric Entry & Knob Res** pop-up menu.

☐ **Step 8:** Touch the vertical (↕) icon and then set **Vert Size: M1** to 50 mV/div.

☐ **Step 9:** Press the MEASURE button.

☐ **Step 10:** Touch **Measurements** and then **Mean** in the **Measurements** pop-up menu.

☐ **Step 11:** Touch **Mean** in the MEASURE major menu and then set **Data Interval** to **whole zone** in the **Mean** pop-up menu.

☐ **Step 12:** *Check* that **Mean** is 0 V ±200 mV.

☐ **Step 13:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).

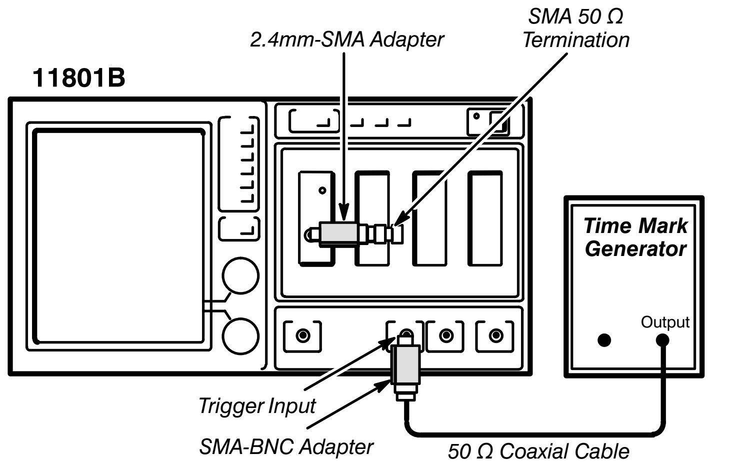
☐ **Step 14:** Touch **Offset Null**.

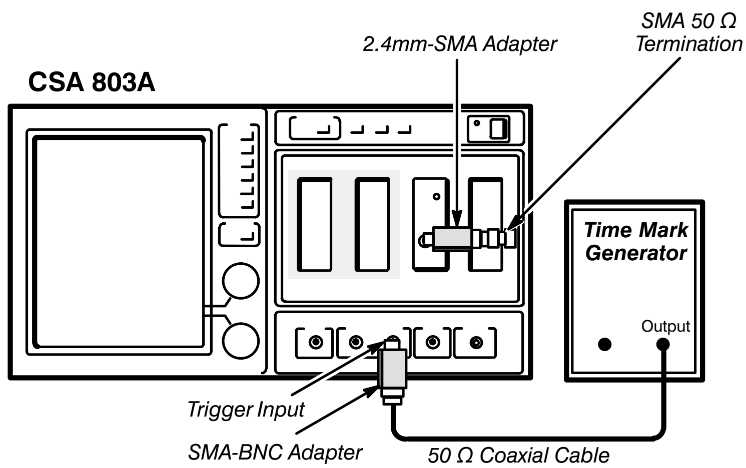
☐ **Step 15:** Touch **Automatic Calibrate** and then **Proceed** in the **Offset Nulling** pop-up menu.

☐ **Step 16:** Press the MEASURE button.

☐ **Step 17:** *Examine* that the **Mean** (offset) is 0 V ±2 mV.

Setup to Check Offset Change with Repetition Rate





Procedure to Check Offset Change with Repetition Rate

☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
- CH 1 SELECT CHANNEL On/Off . . . . On

Instrument Mainframe
- ENHANCED ACCURACY button (11801/2) . . . . press
- UTILITY button (11801A/B, CSA 803 Series) . . . . press
  - **Enhanced Accuracy** (11801A/B, CSA 803 Series) . . . . touch
  - **Calibrate All** pop-up menu . . . . **Recall Defaults**

Time Mark Generator
- Marker (sec) . . . . 0.2 µs

☐ **Step 2:** Press the TRIGGER button and then touch **Level**.

☐ **Step 3:** Set the **Trig Level** until a trace appears.

- [ ] **Step 4:** Touch the vertical (↕) icon and then set the **Vert Size: M1** to 2 mV/div.
- [ ] **Step 5:** Set **Vert Offset: M1** so that the trace is vertically centered on the screen.
- [ ] **Step 6:** Set the time mark generator's marker setting to 10 ms.
- [ ] **Step 7:** Press the WAVEFORM button and then touch **Acquire Desc**.
- [ ] **Step 8:** Set **Average N** to **On** and then touch **Set Avg N**.
- [ ] **Step 9:** Set **Average N** to **8** with the top knob.
- [ ] **Step 10:** Wait until the **Acquire Desc** selector in the WAVEFORM major menu shows that eight averages have been completed.
- [ ] **Step 11:** Press the MEASURE button.
- [ ] **Step 12:** Touch **Measurements** and then **Mean** in the **Measurements** pop-up menu.
- [ ] **Step 13:** Touch **Compare & References** in the MEASURE major menu.
- [ ] **Step 14:** Touch **Save Current Meas Values as References** and then set **Compare** to **On**.
- [ ] **Step 15:** Set the time mark generator's marker setting to 5 ms.
- [ ] **Step 16:** Press the WAVEFORM button. Touch **Remove/Clr Trace 1** in the major menu area then press **Clear Trace 1** in the pop-up menu to restart averaging.
- [ ] **Step 17:** Wait until the **Acquire Desc** selector in the WAVEFORM major menu shows that eight averages have been completed.
- [ ] **Step 18:** Press the MEASURE button.
- [ ] **Step 19:** *Check* that **ΔMean** (offset with a repetition rate) is 0 V ±5 mV.
- [ ] **Step 20:** Continue to decrease the time mark generator's marker setting and repeat Steps 16–19 for each setting down to 0.1 µs.

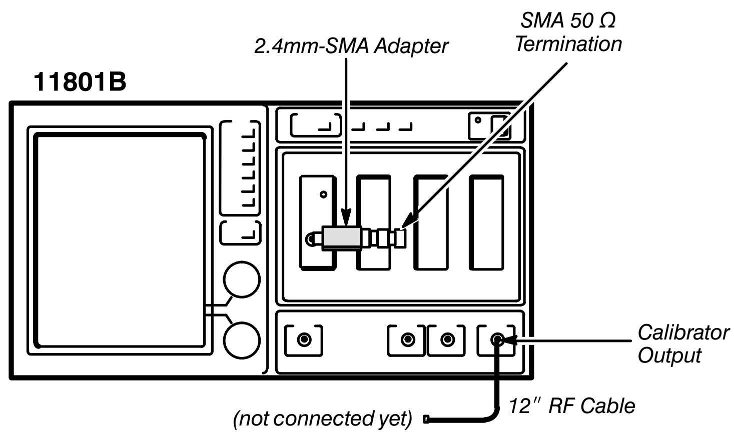
Procedure 4 Noise

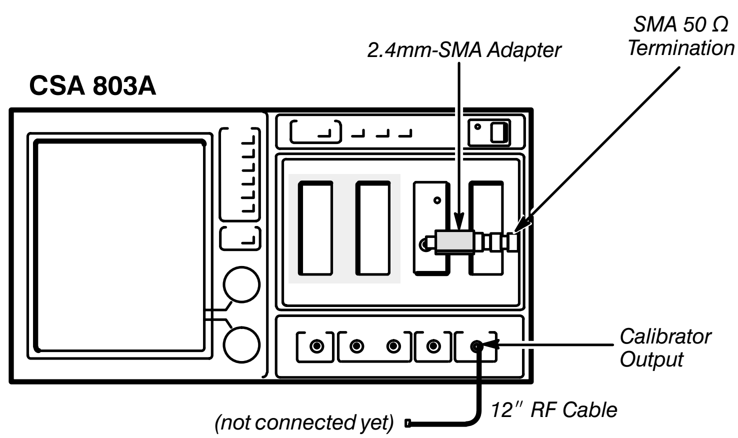
This procedure shows the setup and lists the steps to check noise from the sampling head.

Measurement Limits

For the SD-32 Sampling Head, the measurement limit for noise is 2.3 mV_{RMS} without smoothing and 1 mV_{RMS} with smoothing.

Setup to Examine Noise





Procedure to Examine Noise

- ☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
CH 1 SELECT CHANNEL On/Off .... On
Instrument Mainframe
TRIGGER button .... press
Source .... **Internal Clock**
Main Size .... 20 ns/div
ENHANCED ACCURACY button (11801/2) .... press
UTILITY button (11801A/B, CSA 803 Series) .... press
Enhanced Accuracy (11801A/B, CSA 803 Series) .... touch
Calibrate All pop-up menu .... **Recall Defaults**

- ☐ **Step 2:** Touch **Loop Gain** in the **Enhanced Accuracy** menu.
- ☐ **Step 3:** Disconnect the 50 Ω termination from the CH 1 input and connect the CALIBRATOR to the CH 1 input through the 12-inch RF cable.
- ☐ **Step 4:** Touch the channel number you are using, **Automatic Calibrate,** and then **Proceed** in the **Loop Gain Calibration** pop-up menu.
- ☐ **Step 5:** Disconnect the CALIBRATOR from the CH 1 input and reconnect the 50 Ω termination.
- ☐ **Step 6:** Press the WAVEFORM button and then touch **Acquire Desc.**
- ☐ **Step 7:** Set **Average N** to **On**.
- ☐ **Step 8:** Press the AUTOSET button.
- ☐ **Step 9:** Touch the vertical (↕) icon. Set the **Vert Size: M1** to 2 mV/div.
- ☐ **Step 10:** Touch **Def Tra** at the top of the screen.
- ☐ **Step 11:** In the **Vertical Description** pop-up menu, touch the following selectors in the order given:

  Mainframe (*11801 Series only)*, **1**, **–**, **Avg (**, **Mainframe** (*11801 Series only)*, **1**, **)**,**Enter Desc**.
- ☐ **Step 12:** Press the MEASURE button and then touch **Measurements**.
- ☐ **Step 13:** Touch **RMS** in the **Measurements** pop-up menu and then **RMS** in the MEASURE major menu.
- ☐ **Step 14:** Set **Data Interval** to **whole zone** in the **RMS** pop-up menu.
- ☐ **Step 15:** *Examine* that **RMS** is less than 2.3 mV.
- ☐ **Step 16:** Press the WAVEFORM button.

- [ ] **Step 17:** Touch **Sampling Head Fnc's** and then set **Smoothing** to **On** in the **Sampling Head Functions** pop-up menu.
- [ ] **Step 18:** Press the MEASURE button.
- [ ] **Step 19:** *Examine* that **RMS** is less than 1 mV.

Procedure 5 Acquisition Aberrations

This procedure shows the setup and lists the steps to check acquisition aberrations.

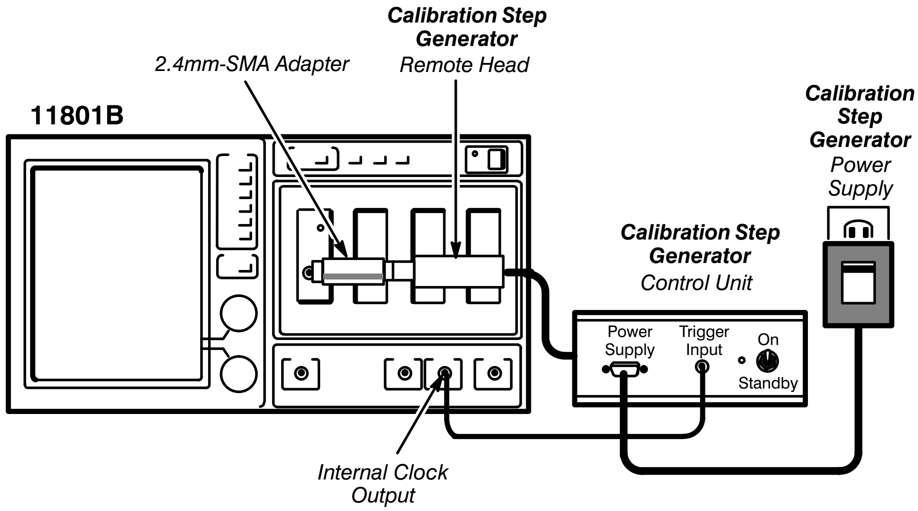
Measurement Limits

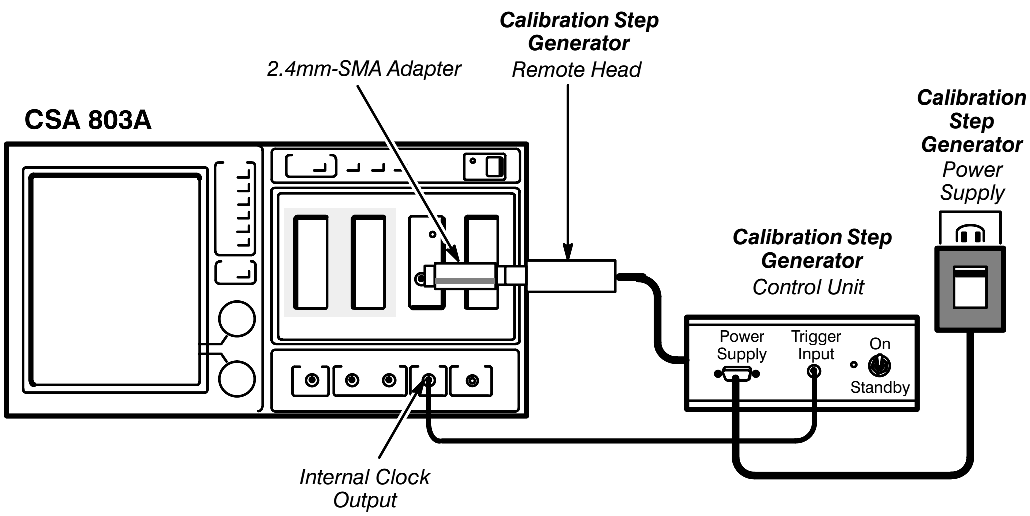
The measurement limits for acquisition aberrations are listed in Table 2-3, Aberration Measurement Limits.

Table 2-3: Aberration Measurement Limits

Time Difference from the Rising Edge of Waveform	Aberration Measurement Limits
0 to 300 ps	$-7\% \leq$ aberration % $\leq 14\%$
300 ps to 3 ns	$-4\% \leq$ aberration % $\leq 6.5\%$
3 ns to 100 ns	$-1.2\% \leq$ aberration % $\leq 1.2\%$
100 ns and up	$-0.6\% \leq$ aberration % $\leq 0.6\%$
-10 ns to -20 ps	$-4\% \leq$ aberration % $\leq 4\%$

Setup to Examine Acquisition Aberrations





Procedure to Examine Acquisition Aberrations

☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
- CH1 SELECT CHANNEL On/Off . . . . On

Instrument Mainframe
- ENHANCED ACCURACY button (11801/2) . . . . press
- UTILITY button (11801A/B, CSA 803 Series) . . . . press
  - **Enhanced Accuracy** (11801A/B, CSA 803 Series) . . . . touch
  - **Calibrate All** pop-up menu . . . . **Recall Defaults**
- TRIGGER button . . . . press
  - **Source** . . . . **Internal Clock**

Calibration Step Generator
- ON/STANDBY switch . . . . ON

☐ **Step 2:** Press the WAVEFORM button and then touch **Acquire Desc**.

☐ **Step 3:** Set **Average N** to **On** and then touch **Set Avg N**.

☐ **Step 4:** Set **Average N** to 128 with the top knob.

☐ **Step 5:** Press the AUTOSET button.

☐ **Step 6:** Touch the horizontal (↔) icon and then set the **Main Size** to 100 ns/div.

☐ **Step 7:** Set the **Main Pos** so that the rising edge of the step is at the left-most edge of the screen.

☐ **Step 8:** Touch the vertical (↕) icon and then set the **Vert Offset: M1** so that the average of the top of the pulse between 100 ns after the step and the right edge of the screen is at the horizontal centerline.

☐ **Step 9:** Set the **Vert Size: M1** to 2 mV/div.

☐ **Step 10:** Touch **Vert Offset: M1** and then **Fine** in the **Numeric Entry & Knob Res** pop-up menu.

☐ **Step 11:** Set **Vert Offset: M1** so that the average of the top of the pulse from 100 ns after the step to the right edge of the screen is at the horizontal centerline.

☐ **Step 12:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur 100 ns after the step is $\leq$0.75 vertical divisions from the horizontal centerline (0.6% of the step amplitude).

☐ **Step 13:** Touch the horizontal (↔) icon and then set the **Main Size** to 10 ns/div.

☐ **Step 14:** Set the **Main Pos** so that the rising edge of the step is at the left-most edge of the screen.

☐ **Step 15:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur between 3 ns and 100 ns after the step is ≤1.5 vertical divisions from the horizontal centerline (1.2% of the step amplitude).

☐ **Step 16:** Set the **Main Size** to 500 ps/div and then the **Main Pos** so that the rising edge of the step is at the left-most edge of the screen.

☐ **Step 17:** Touch the vertical (↕) icon and then set the **Vert Size** to 5 mV/div.

☐ **Step 18:** *Examine* that the magnitude of the maximum positive aberration that occurs between 300 ps and 3 ns after the step is ≤3.25 vertical divisions from the horizontal centerline (6.5% of the step amplitude).

☐ **Step 19:** Examine that the magnitude of the maximum negative aberration that occurs between 300 ps and 3 ns after the step is ≤2 vertical divisions from the horizontal center line (4% of the step amplitude).

☐ **Step 20:** Touch the vertical (↕) icon and then set the **Vert Size: M1** to 10 mV/div.

☐ **Step 21:** Touch the horizontal (↔) icon and then set the **Main Size** to 50 ps.

☐ **Step 22:** Set the **Main Pos** so that the rising edge of the step is at the left-most edge of the screen.

☐ **Step 23:** *Examine* that the magnitude of the maximum positive aberration that occurs in the first 300 ps after the step is ≤3.5 vertical divisions from the horizontal centerline (14% of the step amplitude).

☐ **Step 24:** *Examine* that the magnitude of the maximum negative aberration that occurs in the first 300 ps after the step is ≤1.75 vertical divisions from the horizontal centerline (7% of the step amplitude).

☐ **Step 25:** Touch the **Main Pos** selector and then **Set to Min** in the **Numeric Entry and Knob Res** pop-up menu.

☐ **Step 26:** Set the **Main Size** to 10 ns/div.

☐ **Step 27:** Touch the vertical (↕) icon and then set **Vert Offset: M1** so that the average of the bottom of the pulse at 10 ns before the step is at the horizontal centerline.

☐ **Step 28:** Touch the horizontal (↔) icon and then set the **Main Size** to 1 ns/div.

☐ **Step 29:** Set the **Main Pos** so that the rising edge of the step is at the right-most edge of the screen.

☐ **Step 30:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur between 10 ns and 500 ps before the 10% point of the step is ≤1.0 vertical divisions from the horizontal centerline (4% of the step amplitude).

☐ **Step 31:** Set the **Main Size** to 50 ps/div and then the **Main Pos** so that the rising edge of the step is at the right-most edge of the screen.

☐ **Step 32:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur between 500 ps and 20 ps before the 10% point of the step is $\leq$1.0 vertical divisions from the horizontal centerline (4% of the step amplitude).

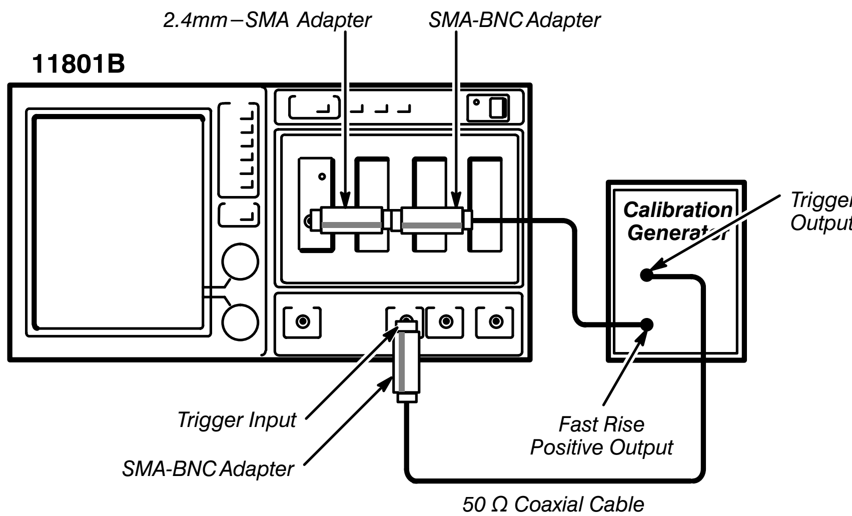
Procedure 6 Maximum Signal Voltage

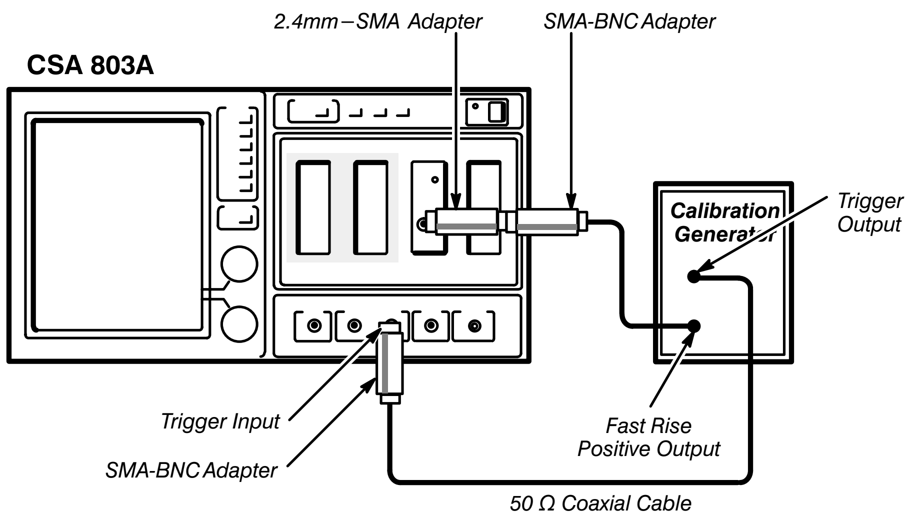
This procedure shows the setup and lists the steps to examine the maximum signal voltage.

Measurement Limit

The measurement limit for the maximum signal voltage is 1% of the step amplitude.

Setup to Examine Maximum Signal Voltage





Procedure to Examine Maximum Signal Voltage

☐ **Step 1:** Initialize the instrument settings, then make the following settings in the order listed:

Sampling Head
- CH 1 SELECT CHANNEL On/Off . . . . On

Instrument Mainframe
- ENHANCED ACCURACY button (11801/2) . . . . press
- UTILITY button (11801A/B, CSA 803 Series) . . . . press
  - **Enhanced Accuracy** (11801A/B, CSA 803 Series) . . . . touch
  - **Calibrate All** pop-up menu . . . . **Recall Defaults**
- TRIGGER button . . . . press
  - **Slope** . . . . –
- **Main Size** . . . . 5 μs/div

Calibration Generator
- Amplitude . . . . maximum amplitude
- Period . . . . 10 μs
- Variable adjustment . . . . mid range

☐ **Step 2:** Touch the vertical (↕) icon and then set the **Vert Offset: M1** so that the waveform is vertically centered on the screen.

☐ **Step 3:** Set the calibration generator's amplitude so that it displays a 1 V peak-to-peak square wave.

☐ **Step 4:** Touch the horizontal (↔) icon and then set the **Main Size** to 500 ns/div.

☐ **Step 5:** Set the **Main Pos** so that the positive-going step is within 1/2-division to the right of the left-most edge of the screen.

☐ **Step 6:** Press the WAVEFORM button.

☐ **Step 7:** Touch **Acquire Desc** and then set **Average N** to **On** in the **Acquire Description** pop-up menu.

☐ **Step 8:** Touch **Set Avg N** and then set **Average N** to 128 with the top knob.

☐ **Step 9:** Touch the vertical (↕) icon and then set the **Vert Offset: M1** so that the average of the top of the pulse at 500 ns after the step is on the horizontal centerline.

☐ **Step 10:** Set **Vert Size: M1** to 5 mV/div.

☐ **Step 11:** Touch **Vert Offset: M1** and then **Fine** in the **Numeric Entry & Knob Res** pop-up menu.

☐ **Step 12:** Set **Vert Offset: M1** so that the average of the top of the pulse 500 ns after the step is on the horizontal centerline.

☐ **Step 13:** Set the **Main Size** to 200 ns/div.

☐ **Step 14:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur between 200 ns and 800 ns from the rising edge of the step is ≤2 vertical divisions from the horizontal centerline (1% of the step amplitude).

☐ **Step 15:** Touch the horizontal (↔) icon and then set the **Main Size** to 20 ns/div.

☐ **Step 16:** Set the **Main Pos** so that the step is within 1/2 division of the left-most edge of the screen.

☐ **Step 17:** *Examine* that the magnitude of the maximum positive and negative aberrations that occur between 10 ns and 200 ns from the rising edge of the step is ≤2 vertical divisions from the horizontal centerline (1% of the step amplitude).

Procedure 7 Bandwidth

This procedure shows the setups and lists the steps to check the bandwidth. The procedure given is a manual method; therefore only a few frequency points are measured. If a more thorough characterization is desired, the procedure can be automated.

There are three sections to the procedure: Measuring the Signal Source Output, Measuring the System Frequency Response, and Calculating the Sampling Head Frequency Response. The first two sections have their own set-ups and involve making measurements. The third part mathematically combines the results of the first two parts.

All three sections must be performed twice, once for the 0 Hz–40 GHz frequency range and once for the 40 GHz–50 GHz frequency range.

Refer to Table 2-2 (at the beginning of *Checks and Adjustments*) for minimum equipment specifications and typical equipment types recommended in performing this procedure.

In this procedure, the term "Signal Source" is used to refer to both the Frequency Synthesizer used to test the 0 Hz–40 GHz range and the Sweep Generator used to test the 40 GHz–50 GHz range.

Measurement Limits

The measurement limits for bandwidth are:

$-3 \text{ dB} \leq$ Normalized Frequency Response $\leq +3 \text{ dB}$

Measuring the Signal Source Output

NOTE

Before beginning this test, power-on all test equipment (as listed in Procedure 1) and allow it to warm up for at least 30 minutes.

☐ **Step 1:** Calculate the correction factors to compensate for the adapter (Wiltron SC4193) used on the Power Sensor input. Enter the data supplied with the adapter and power sensor into Table 2-11 (located on page 2-44). Use the following formula to calculate the result (adapter correction factor) for each frequency entry and enter the result in the Adapter Correction Factor columns of Tables 2-11, 2-12, and 2-13. See Table 2-4 for example entries.

$$\text{Adapter Correction Factor} = \frac{1 - 2 \times |S22| \times |\rho| \times \cos(\phi 22 + \phi\rho) + |S22|^2 \times |\rho|^2}{|S21|^2}$$

☐ **Step 2:** Enter the power sensor cal factors (printed on the Power Sensor) into Tables 2-12 and 2-13.

Table 2-4: Calculation of Adapter Correction Example Values

Frequency (Example)	Adapter Scattering Parameters[1]			Power Sensor Reflection Coefficient[2]		Adapter Correction Factor
	S22		S21	(ρ) or Rho		
	Mag S22	Phase Φ22	Mag S21	Mag |ρ|	Phase Φρ	
0.05 GHz	0	−6.8	0.993	0.028	−110.8	1.014
10 GHz	0.0001	−126.0	0.997	0.018	168.7	1.048
20 GHz	0.0024	86.4	0.968	0.047	−175.2	1.067
30 GHz	0.0008	−163.5	0.959	0.058	158.3	1.087
40 GHz	0.0028	69.8	0.957	0.048	−5.9	1.092
45 GHz	0.0026	124.3	0.944	0.083	111.3	1.122
50 GHz	0.0025	171.9	0.925	0.111	168.4	1.168

[1] Information supplied with adapter
[2] Fixed values as supplied by Instrument vendor

☐ **Step 3:** Connect the Power Sensor to the Power Ref connector on the Power Meter.

☐ **Step 4:** Press the Zero key and wait for the zeroing routine to finish.

☐ **Step 5:** Press the Cal (Shifted Zero) key and then key in the Ref Cal Factor of the Power Sensor (printed on the Power Sensor) using the Data Entry arrow keys.

☐ **Step 6:** Press the Enter key and verify that the Power Meter displays the message "CAL*****".

The Power Meter is now calibrated to accurately perform power measurements.

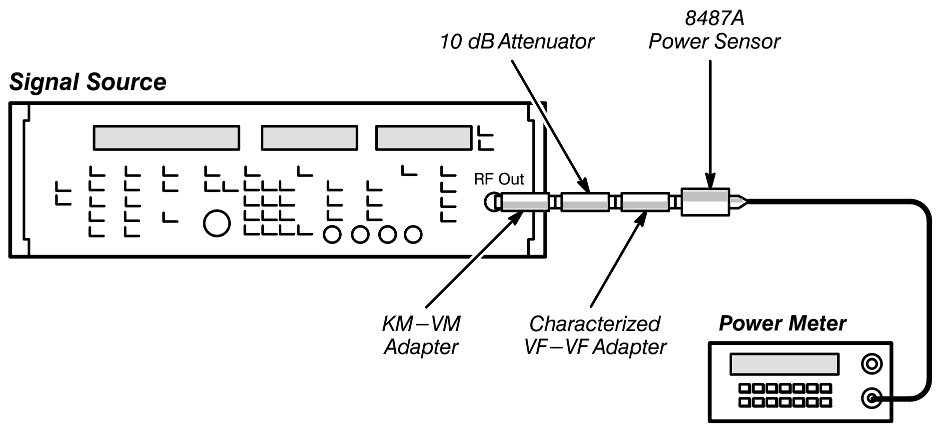
☐ **Step 7:** Press the Cal Fac button (Shift, Freq) then key in 100% and then press Enter.

☐ **Step 8:** Press the dBm/W button, if required to make the Power Meter indicate measurements in dBm, and then disconnect the Power Sensor from the Power Ref Connector on the Power Meter.

Set up the Signal Source as shown in the following figure. The RF output may be located on the rear panel of the Signal Source or on the front panel, as illustrated in the figure, depending on the particular instrument you are using.

First, set up the 50 MHz–40 GHz frequency synthesizer (for example, the Wiltron 6769B) and perform the rest of the procedure for the 50 MHz to 40 GHz frequency range. Then perform the same procedure for the 40 GHz to 50 GHz frequency range using the 40 GHz–50 GHz sweep generator (for example, the Wiltron 6672B).

Setup to Measure the Output Power of the Signal Source (0 Hz–40 GHz Test)



Steps to Measure the Output Power of the Signal Source (0 Hz–40 GHz Test)

- [ ] **Step 9:** Connect the Power Sensor through the 10 dB attenuator and adapters to the RF output of the Signal Source.
- [ ] **Step 10:** Set the Signal Source's Operate/Standby switch to Operate.
- [ ] **Step 11:** Press the RF Level 1 button on the Signal Source, enter 2 on the keypad, then press the GHz/dBm button to set the indicated power to +2 dBm.
- [ ] **Step 12:** Press the CW Output Select button on the Signal Source, enter 50 on the keypad, then press the MHz button to enter the 50 MHz reference frequency.
- [ ] **Step 13:** Press the RF On button if necessary to activate the output.

NOTE

Perform the next step only once.

☐ **Step 14:** Press the RF Level 1 button on the Signal Source. Using the Signal Source knob, adjust the Signal Source output level to obtain a reading of −8.0 dBm ±0.1 dBm on the Power Meter. Make this adjustment only once; do not adjust it at other frequencies.

☐ **Step 15:** Press the CW Output Select button on the Signal Source to terminate level adjustment and enable frequency adjustment.

☐ **Step 16:** Read the power (in dBm) from the Power Meter and then record this value in the Measured Power column of Table 2-12 (located on page 2-45) for later use. Refer to Table 2-5 for example entries.

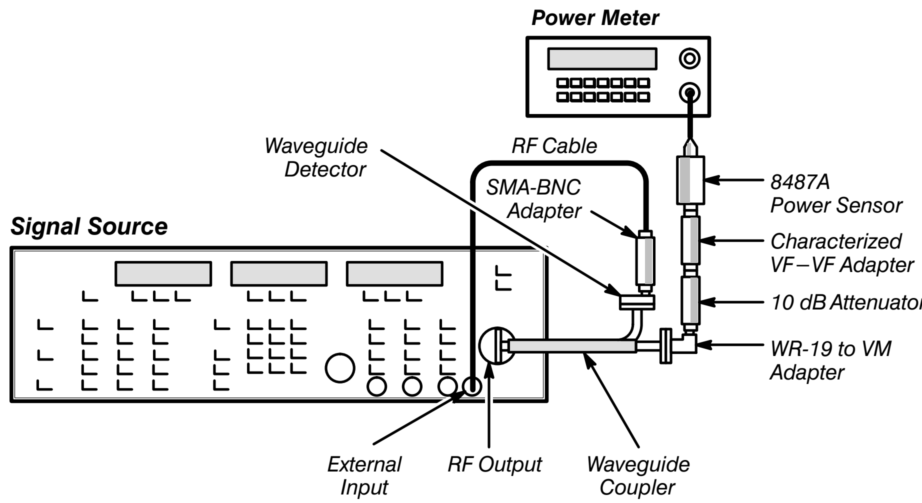
Table 2-5: Signal Source Response, 0 Hz−40 GHz Example Values

Frequency (GHz)	Measured Power (dBm)	Power Sensor Cal Factor	Adapter Correction Factor	Corrected Power (dBm)
0.05 GHz	−8.04	1.000	1.014	−7.98
10 GHz	−8.43	0.986	1.048	−8.17
20 GHz	−8.61	0.970	1.067	−8.20
30 GHz	−8.63	0.942	1.087	−8.01
40 GHz	−8.98	0.935	1.092	−8.31

☐ **Step 17:** Enter the next frequency listed in Table 2-12 into the Signal Source by entering the frequency in GHz on the keypad, then press the GHz button.

☐ **Step 18:** Repeat Steps 16 and 17 for each frequency listed in Table 2-12.

Setup to Measure the Output Power of the Signal Source (40 GHz–50 GHz Test)



Steps to Measure the Output Power of the Signal Source (40 GHz–50 GHz Test)

- [ ] **Step 19:** Connect the Power Sensor through the 10 dB attenuator, adapter, and waveguide coupler to the RF output of the Signal Source.
- [ ] **Step 20:** Press the Level button on the Signal Source, enter 0 on the keypad, then press the GHz/dBm button to set the indicated power to 0 dBm.
- [ ] **Step 21:** Press the CW CF button on the Signal Source. Enter the first frequency in the 40 GHz to 50 GHz range to be measured (for example, 40) on the keypad, then press the GHz/dBm button to enter the frequency.
- [ ] **Step 22:** Press the RF On button, if necessary, to activate the output.
- [ ] **Step 23:** Press the Detector Leveling button, if necessary, to turn on the adjacent light.

NOTE

Perform the next step only once.

- [ ] **Step 24:** Adjust External ALC Gain on the Signal Source until the Power Meter reads −10.0 dBm ±0.1 dBm. Make this adjustment only once; do not adjust it at other frequencies.

☐ **Step 25:** Read the power (in dBm) from the Power Meter and then record this value in the Measured Power column of Table 2-13 (located on page 2-45) for later use. Refer to Table 2-6 for example entries.

Table 2-6: Signal Source Response, 40 GHz–50 GHz Example Values

Frequency (GHz)	Measured Amplitude (mV)	Power Sensor Cal Factor	Adapter Correction Factor	Corrected Power (dBm)
40 GHz	−10.01	0.935	1.092	−9.34
45 GHz	−10.10	0.895	1.122	−9.12
50 GHz	−9.27	0.863	1.168	−8.79

☐ **Step 26:** Enter the next frequency listed in Table 2-13 into the Signal Source by entering the frequency in GHz on the keypad, then press the GHz button.

☐ **Step 27:** Repeat steps 25 and 26 for each frequency listed in Table 2-13.

Calculation of Corrected Power (All Frequencies)

☐ **Step 28:** After all power measurements have been made, use the following formula to determine the corrected power for each frequency in Tables 2-12 and 2-13:

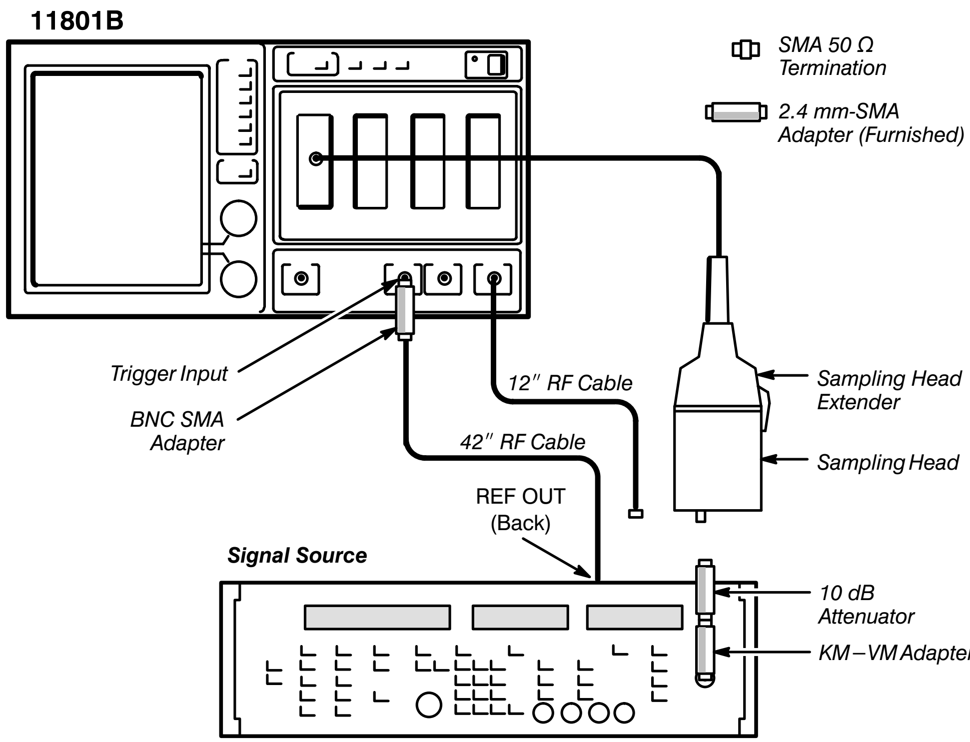
$$Corrected\ Power = Measured\ Power - 10\log_{10}(Power\ Sensor\ Cal\ Factor) + 10\log_{10}(AdapterCorrection\ Factor)$$

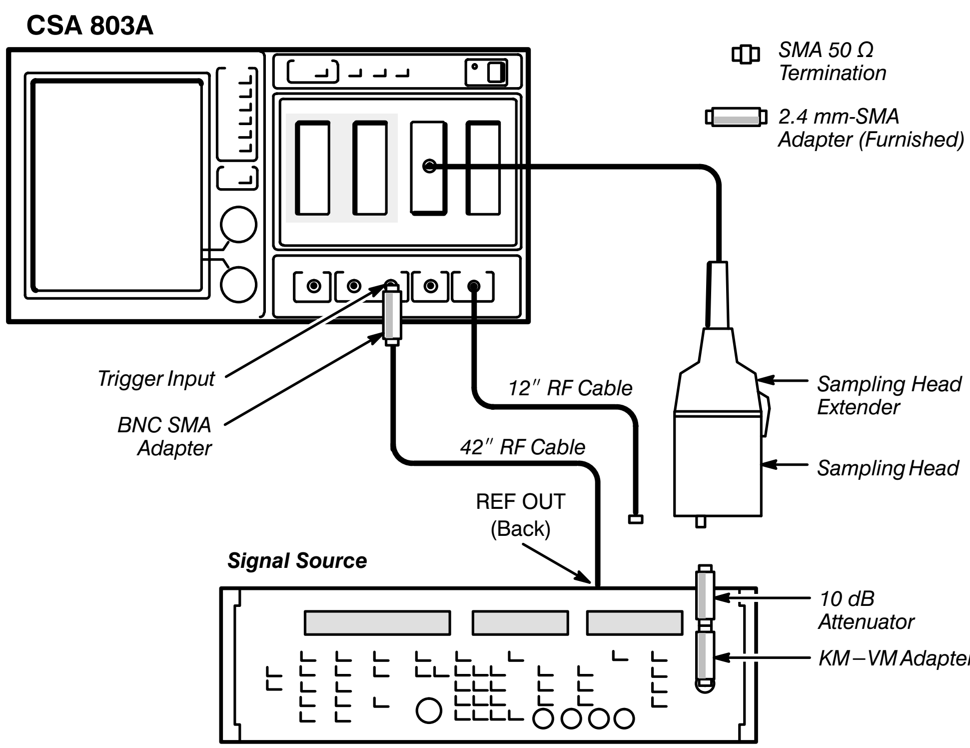
Record these values in the Corrected Power columns of Tables 2-12 and 2-13 for later use.

Measuring the System Frequency Response

To begin the second part of this procedure, set up the Mainframe and sampling head as shown in the figure below. Prior to performing any measurement, you must warm up the instrument. This requires that the PRINCIPAL POWER SWITCH and ON/STANDBY switch of the instrument be set to ON for twenty minutes.

Setup to Measure the System Frequency Response (0 Hz–40 GHz)





☐ **Step 1:** Connect the Signal Source 10 MHz Ref Output to the instrument TRIGGER INPUT through a 42-inch RF cable and BNC-SMA adapter.

☐ **Step 2:** Connect the instrument CALIBRATOR output to the sampling head input through a 12-inch RF cable and the furnished 2.4 mm-SMA adapter.

☐ **Step 3:** Touch **Initialize** in the UTILITY major menu to reset the instrument to the default configuration.

☐ **Step 4:** Press the TRIGGER button, then touch the **Source** in the main menu area, and select **Internal Clock** in the Trigger Source pop-up menu. (On the CSA 803 Series, press **Exit**.)

☐ **Step 5:** On the sampling head, press the Channel Select button.

☐ **Step 6:** Press the UTILITY button and touch **Enhanced Accuracy** (11801A/B and CSA 803 Series) or press the ENHANCED ACCURACY button (11801/2).

☐ **Step 7:** Touch **Loop Gain**, the channel number to be calibrated, and then **Automatic Calibrate** in the Loop Gain Calibration pop-up menu.

☐ **Step 8:** Touch **Proceed** and then **Store Constants** in the Loop Gain Calibration pop-up menu.

☐ **Step 9:** Disconnect the 12-inch RF cable from the sampling head. Leave the 2.4 mm-SMA adapter in place at the sampling head.

☐ **Step 10:** Touch **Offset Null** in the **Enhanced Accuracy** menu and then **Automatic Calibrate** in the Offset Nulling pop-up menu.

☐ **Step 11:** Connect a 50 Ω termination to the sampling head input.

☐ **Step 12:** Touch **Proceed** and then **Store Constants** in the Offset Nulling pop-up menu.

☐ **Step 13:** Touch **Exit** and then disconnect the 50 Ω termination and the adapter from the sampling head input.

Measuring System Response, 0 Hz–40 GHz

☐ **Step 14:** Connect the 0 Hz–40 GHz Signal Source through the adapter and 10 dB attenuator to the sampling head input as shown in the setup illustration on page 2-37.

☐ **Step 15:** On the instrument, set the **Main Size** to 10 ns/div and the **Vert Size** to 50 mV/div.

☐ **Step 16:** Press the UTILITY button, then select **Instr Options** in the major menu area (on the 11801A/B and CSA 803 Series, first press **Page to Utility Menu**, if necessary), and set **Vectored Traces** to **Off** in the pop-up menu.

☐ **Step 17:** Press the TRIGGER button, then select **Source** in the main menu area, and select **External** (**External Direct** on the CSA 803 Series) in the pop-up menu.

☐ **Step 18:** Press the CW Output Select button on the Signal Source. Enter 50 on the keypad then press the MHz button to enter the 50 MHz reference frequency.

☐ **Step 19:** You should now see about five cycles of displayed waveform on the instrument. Press the WAVEFORM button, select **Acquire Desc** in the major menu, and touch **Average N** to turn averaging On. Then touch **Set Avg N** and adjust **AvgN** to 64 using the upper knob.

☐ **Step 20:** Press the MEASURE button, select **Measurements** in the major menu, and select **Peak-Peak** from the pop-up menu. Touch **Exit Menu** to remove the pop-up menu. Record the **Peak-Peak** value in the Measured Amplitude column of Table 2-14 on page 2-45. (See Table 2-7 for example entries.)

☐ **Step 21:** *(Optional)* Repeat Step 20 for any additional frequencies up to 5 GHz that you wish to measure, setting the Signal Source to each frequency and adjusting the instrument **Main Size** to display several cycles.

☐ **Step 22:** Disconnect the Signal Source from the sampling head input and connect the 2.4 mm-SMA adapter and the 50 Ω termination to the sampling head input.

NOTE

Do not change the vertical size for the following measurement.

☐ **Step 23:** Record the Peak-Peak value in the Measured Noise column, 0.05 GHz row (and for any additional frequencies up to 5 GHz) of Table 2-14.

Table 2-7: System Response, 0 Hz–40 GHz Example Values

Frequency (GHz)	Measured Amplitude (mV)	Measured Noise (mV)	Corrected Amplitude (mV)	Calculated System Power (dBm)
0.05 GHz	251.9	1.7	250.2	–8.05
10 GHz	260.0	1.7	258.3	–7.78
20 GHz	260.0	1.7	267.9	–7.46
30 GHz	270.2	1.7	268.5	–7.44
40 GHz	267.4	1.7	265.7	–7.53

☐ **Step 24:** Reconnect the Signal Source to the sampling head input.

☐ **Step 25:** On the instrument, set the **Main Size** to 100 ps/div. Touch the **Cursors** icon, then touch **Cursor Type** in the major menu, and select **Horizontal Bars** from the pop-up menu.

☐ **Step 26:** Touch the **Cursor 1** label near the upper knob and then touch **Fine** in the pop-up menu.

☐ **Step 27:** Press the TRIGGER button and then touch **Source** in the major menu area. Select **Internal Clock** from the pop-up menu.

☐ **Step 28:** Press the WAVEFORM button, then touch **Acquire Desc** in the major menu, and select **Set Env N** in the pop-up menu. Set **Envelope N** to 64 using the lower knob.

☐ **Step 29:** Touch **Acquire Desc** in the major menu and touch **Envelope N** in the pop-up menu to turn **Envelope N** on. (Note that **Average N** is now off.)

☐ **Step 30:** Set the Signal Source to the next frequency in Table 2-14 (0 Hz–40 GHz) or Table 2-15 (40 GHz–50 GHz).

☐ **Step 31:** For the second and subsequent times you repeat this procedure, press the WAVEFORM button and then select **Acquire Desc** in the major menu.

☐ **Step 32:** Select **Envelope Complete** from the **Acquire Desc** pop-up menu. When the entry in the **Acquire Desc** selector reads **Stopped**, touch the **Cursors** icon.

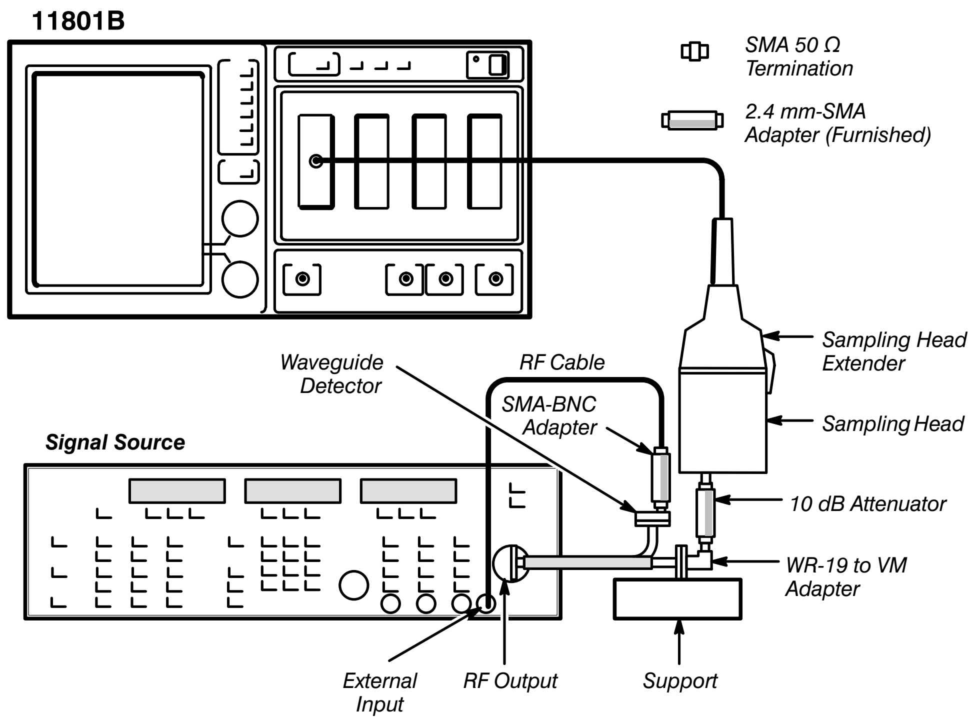
☐ **Step 33:** Place Cursor 1 at the average level of the bottom of the trace. Place Cursor 2 at the average level of the top of the trace and record the **ΔV** value in the Measured Amplitude column of Table 2-14 (0 Hz–40 GHz) or Table 2-15 (40 GHz–50 GHz). (See Tables 2-7 and 2-8 for example values.)

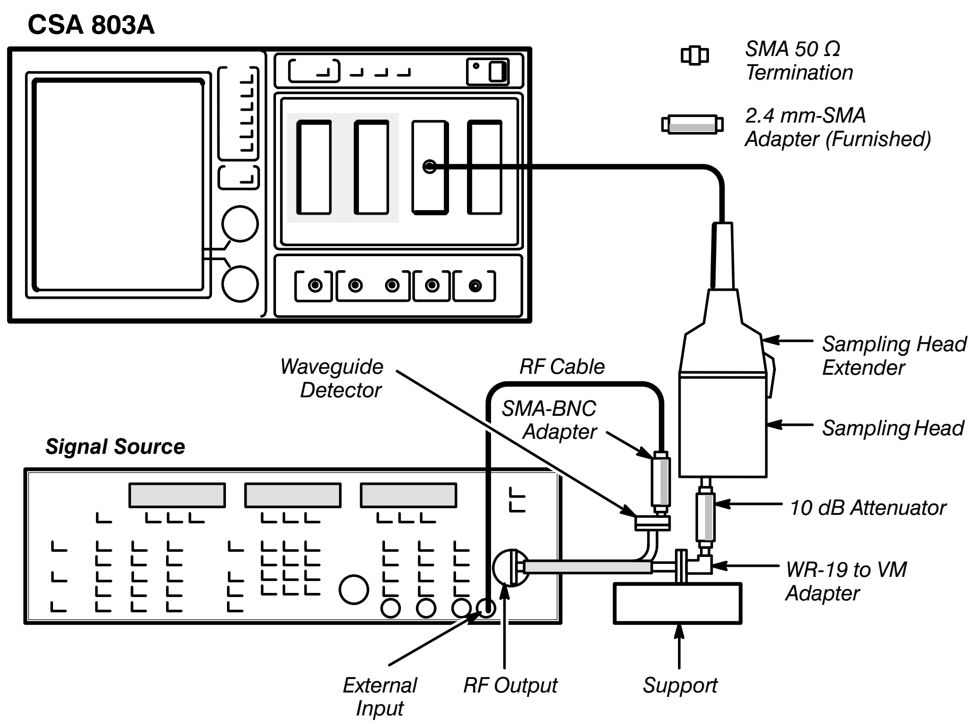
☐ **Step 34:** Repeat steps 30 through 33 for each frequency listed in Table 2-14.

Table 2-8: System Response, 40 GHz–50 GHz Example Values

Frequency (GHz)	Measured Amplitude (mV)	Measured Noise (mV)	Corrected Amplitude (mV)	Calculated System Power (dBm)
40 GHz	250.3	10.0	240.3	–8.41
45 GHz	236.8	10.0	226.8	–8.91
50 GHz	197.2	10.0	187.2	–10.57

Setup to Measure the System Frequency Response (40 GHz–50 GHz)





Measuring System Response, 40 GHz–50 GHz

☐ **Step 35:** Connect the 40 GHz–50 GHz Signal Source through the waveguide coupler, adapter, and 10 dB attenuator to the sampling head input, as shown in the setup illustration.

☐ **Step 36:** Repeat Steps 30 through 33 for each frequency listed in Table 2-15.

Measuring System Noise

☐ **Step 37:** Disconnect the Signal Source from the sampling head input and connect the 2.4 mm-SMA adapter and the 50 Ω termination to the sampling head input.

NOTE

Do not change the vertical size for the following measurement.

☐ **Step 38:** Repeat steps 31 through 33 and record the **ΔV** value in the Measured Noise column of Tables 2-14 and 2-15 for all frequencies greater than 5 GHz.

Calculating the Sampling Head Frequency Response

In this last part of the procedure, the frequency characterization is calculated using the results from the first two parts.

☐ **Step 1:** Subtract the Measured Noise value (Tables 2-14 and 2-15) from the Measured Amplitude value (Tables 2-14 and 2-15) for each frequency. Record these values in the Corrected Amplitude column of Table 2-14 (0 Hz–40 GHz) and Table 2-15 (40 GHz–50 GHz).

Convert the Corrected Amplitude values to power values in dBm as follows:

☐ **Step 2:** Determine the Calculated System Power for each frequency listed in Table 2-14 and Table 2-15 using the following formula:

$$\textit{Calculated System Power (in dBm)} = 10\log_{10}\left[2.5\ (\textit{Corrected Amplitude (in V)})^2\right]$$

Record these values in the Calculated System Power column of Table 2-14 and Table 2-15.

☐ **Step 3:** To determine the frequency response of the sampling head only, subtract the frequency response of the Signal Source from the response of the system as follows:

Frequency Response = Calculated System Power − Corrected Power

Use Calculated System Power from Tables 2-14 and 2-15; use Corrected Power from Tables 2-12 and 2-13.

Record these values in the Frequency Response column of Tables 2-16 and 2-17 (See also Tables 2-9 and 2-10 for example entries).

Table 2-9: Sampling Head Frequency Characterization, 0 Hz−40 GHz Example Values

Frequency (GHz)	Frequency Response (dB)	Measurement Error (dB)	Normalized Frequency Response (dB)	Measurement Limit
0.05 GHz	−0.07	−0.07	0.00	±3 dB
10 GHz	+0.39	−0.07	+0.46	±3 dB
20 GHz	+0.74	−0.07	+0.81	±3 dB
30 GHz	+0.57	−0.07	+0.64	±3 dB
40 GHz	+0.78	−0.07	+0.85	±3 dB

Table 2-10: Sampling Head Frequency Characterization, 40 GHz−50 GHz Example Values

Frequency (GHz)	Frequency Response (dB)	Measurement Error (dB)	Normalized Frequency Response (dB)	Measurement Limit
40 GHz	+0.93	−0.07	+1.00	±3 dB
45 GHz	+0.21	−0.07	+0.28	±3 dB
50 GHz	−1.78	−0.07	+1.71	±3 dB

Correct the Frequency Response gain values for the measurement error as follows:

☐ **Step 4:** Subtract the Measurement Error from the Frequency Response for each frequency, and then record these values in the NORMALIZED Frequency Response column in Tables 2-16 and 2-17 as follows:

$$\textit{Normalized Frequency Response} = \textit{Frequency Response} - \textit{Measurement Error}$$

☐ **Step 5:** Check that the Normalized Frequency Response value is within the specified measurement limits.

Calculation Tables for this Procedure

Use these tables to record calculations and results for this section. (You may want to photocopy these pages.)

Table 2-11: Calculation of Adapter Correction Factors

	Adapter Scattering Parameters[1]			Power Sensor Reflection Coefficient[2]		
	S22		S21	(ρ) or Rho		
Frequency (Example)	**Mag S22**	**Phase Φ22**	**Mag S21**	**Mag |ρ|**	**Phase Φρ**	**Adapter Correction Factor**
0.05 GHz						
10 GHz						
20 GHz						
30 GHz						
40 GHz						
44 GHz						
50 GHz						

[1] Information supplied with adapter
[2] Fixed values as supplied by instrument vendor

Table 2-12: Signal Source Response, 0 Hz–40 GHz

Frequency (GHz)	Measured Power (dBm)	Power Sensor Cal Factor	Adapter Correction Factor	Corrected Power (dBm)
0.05 GHz				
10 GHz				
20 GHz				
30 GHz				
40 GHz				

Table 2-13: Signal Source Response, 40 GHz–50 GHz

Frequency (GHz)	Measured Power (dBm)	Power Sensor Cal Factor	Adapter Correction Factor	Corrected Power (dBm)
40 GHz				
45 GHz				
50 GHz				

Table 2-14: System Response, 0 Hz–40 GHz

Frequency (GHz)	Measured Amplitude (mV)	Measured Noise (mV)	Corrected Amplitude (mV)	Calculated System Power (dBm)
0.05 GHz				
10 GHz				
20 GHz				
30 GHz				
40 GHz				

Table 2-15: System Response, 40 GHz–50 GHz

Frequency (GHz)	Measured Amplitude (mV)	Measured Noise (mV)	Corrected Amplitude (mV)	Calculated System Power (dBm)
40 GHz				
45 GHz				
50 GHz				

Table 2-16: Sampling Head Frequency Characterization, 0 Hz–40 GHz

Frequency (GHz)	Frequency Response (dB)	Measurement Error (dB)	Normalized Frequency Response (dB)	Measurement Limit
0.05 GHz				±3 dB
10 GHz				±3 dB
20 GHz				±3 dB
30 GHz				±3 dB
40 GHz				±3 dB

Table 2-17: Sampling Head Frequency Characterization, 40 GHz–50 GHz

Frequency (GHz)	Frequency Response (dB)	Measurement Error (dB)	Normalized Frequency Response (dB)	Measurement Limit
0.05 GHz				±3 dB
40 GHz				±3 dB
45 GHz				±3 dB
50 GHz				±3 dB

Maintenance

This section contains information for performing preventive maintenance and procedures for exchanging faulty sampling heads, removing and replacing sampling head internal circuitry, and changing the sampling head identification number.

Preventive Maintenance

Preventive maintenance performed regularly can prevent breakdown and may improve reliability of the instrument or sampling head. The severity of the environment to which the sampling head is subjected determines the frequency of maintenance.

Exterior

Loose dust accumulated on the outside of the instrument or sampling head can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt in and around the sampling head connector and front panel switches.

Periodic Electrical Checks

To ensure accurate measurements, perform periodic electrical checks on the instrument and sampling head after each 2,000 hours of operation, or every 24 months if used infrequently. Procedures to perform periodic electrical checks are given in Section 2, *Checks and Adjustments*.

Static-Sensitive Device Classification

CAUTION

Static discharge can damage any semiconductor component in the instrument or sampling head. To prevent damage from electrostatic discharge, follow all precautions listed in this section.

The instrument and sampling head contain electrical components that are susceptible to damage from static discharge. Table 3-1 gives relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

- [ ] **Step 1:** Minimize handling of static-sensitive components.
- [ ] **Step 2:** Transport the sampling heads in their original containers and store the sampling heads on a metal surface or conductive foam. Transport the sampling heads with short circuit terminations on the inputs. Label any package that contains static-sensitive assemblies or components.
- [ ] **Step 3:** Discharge the static voltage from your body by wearing a wrist strap while handling these components. Service static-sensitive assemblies or components only at a static-free work station by qualified service personnel. Use a static control mat and wrist strap.
- [ ] **Step 4:** Clear the work station surface of anything that can generate or hold a static charge.
- [ ] **Step 5:** Keep the component leads shorted together whenever possible.
- [ ] **Step 6:** Pick up components by the body, never by the leads.
- [ ] **Step 7:** Do not slide the components over any surface.
- [ ] **Step 8:** Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

Table 3-1: Relative Susceptibility to Electrostatic Discharge (ESD)

Semiconductor Classes	Relative Susceptibility Levels[1]
MOS or CMOS microcircuits or discrete circuits, or linear microcircuits with MOS inputs (most sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFET	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (least sensitive)	9

[1]Voltage equivalent for levels (voltage discharged from a 100 pF capacitor through resistance of 100 Ω):

1 = 100 to 500 V
2 = 200 to 500 V
3 = 250 V
4 = 500 V
5 = 400 to 600 V
6 = 600 to 800 V
7 = 400 to 1000 V (est.)
8 = 900 V
9 = 1200 V

Exchanging Sampling Heads

If a sampling head fails any of the parts in Section 2, *Checks and Adjustments*, then it may be exchanged for a new sampling head.

Sampling head exchanges can be made with either your local Tektronix service center or the Central Tektronix Exchange Center in Beaverton, Oregon.

For more information on exchanging your sampling head, refer to Module Exchange in Section 5, *Replaceable Parts*.

Removing and Replacing the Sampling Head Internal Circuitry

CAUTION

To avoid damage to the sampling head, set the instrument ON/STANDBY switch to STANDBY and remove the sampling head from the instrument before removing or replacing the internal circuitry.

Perform the following procedures to remove and replace the internal circuitry in the sampling head.

- ☐ **Step 1:** Remove the SELECT CHANNEL On/Off button by gently pulling on the plastic knob with small needle-nose pliers.
- ☐ **Step 2:** Remove the small Pozidriv screws on each side of the sampling head casing as shown in Figure 3-1.
- ☐ **Step 3:** Remove the short-circuit termination and adapter, then the front panel, and the casing from the internal circuitry.
- ☐ **Step 4:** Install the internal circuitry into the gray shipping casing.
- ☐ **Step 5:** Replace the adapter and short-circuit termination on the sampling head input.
- ☐ **Step 6:** Return the internal circuitry (the circuit board and attached carrier) for sampling head exchange or repair.
- ☐ **Step 7:** To replace the internal circuitry, follow the removal procedures in reverse order.

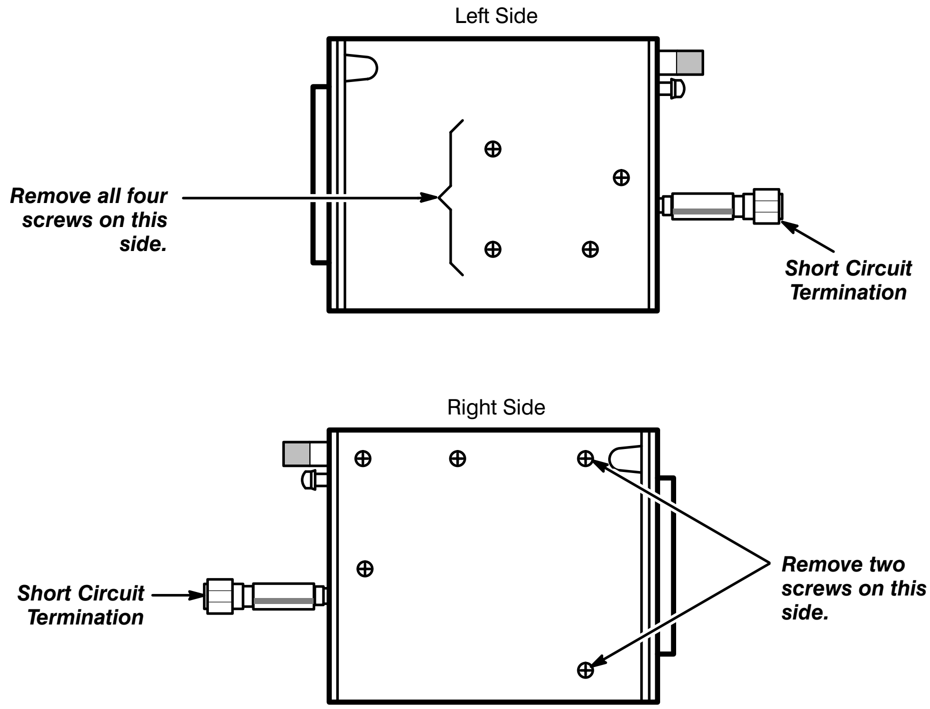


Figure 3-1: Sampling Head Screw Locations

Changing the Sampling Head Identification Number

The following procedure allows you to change the sampling head identification number to fit the requirements of your application.

The following equipment, in addition to an 11800 Series Oscilloscope or CSA 803 Series Communications Signal Analyzer and a sampling head, is necessary to perform this procedure:

- IBM PC or any other compatible PC that has MS DOS and an RS-232-C serial port configured for COM1
- a serial cable

Procedure to change the sampling head identification number:

☐ **Step 1:** Set the instrument's PRINCIPAL POWER SWITCH to OFF. Install one of the short-circuit jumpers across the two J860 pins on the A5 Time Base/Controller Board. These short circuit jumpers are located on several jumper pins on the A5 Time Base/Controller board. This board is located on the bottom of the instrument and can be accessed once the bottom panel is removed. Refer to the *Maintenance* section in the *Service Manual* for your instrument for more information on accessing this board. See Figure 3-2 for the location of jumper J860.

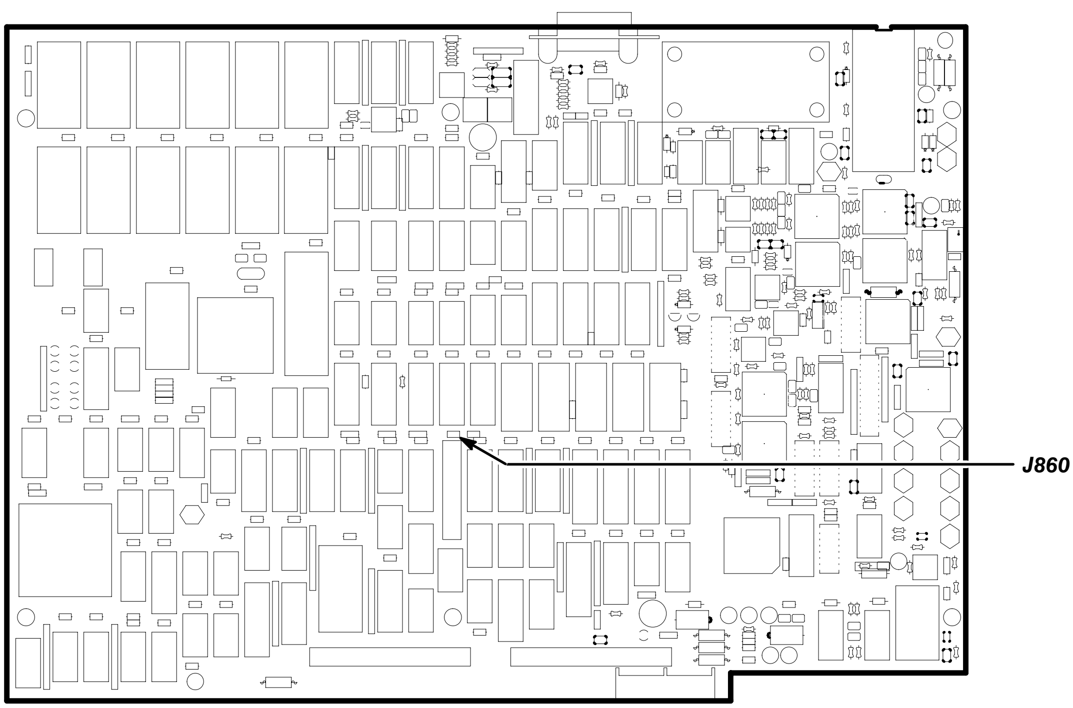


Figure 3-2: A5 Time Base/Controller Board Jumper Location

- ☐ **Step 2:** Boot up the PC with **MS DOS** operating.
- ☐ **Step 3:** Connect the serial cable to the instrument's RS-232-C port located at the rear of the instrument. Connect the other end of the cable to the COM1 port on the PC.
- ☐ **Step 4:** Install the sampling head in any sampling head compartment in the instrument.
- ☐ **Step 5:** Set the PRINCIPAL POWER SWITCH to ON and the ON/STANDBY switch to ON.
- ☐ **Step 6:** After the diagnostics are complete, press the UTILITY button and then touch **RS-232 Parameters**.
- ☐ **Step 7:** Set the **Baud Rate** to **4800 Bd**, the **Parity** to **none**, and the **Stop Bits** to **1** in the **RS-232 Parameters** pop-up menu.
- ☐ **Step 8:** Insert the Sampling Head Utility Software floppy disk (provided in this manual) into the "A" drive of the system controller.
- ☐ **Step 9:** On the PC, type **a:** and then press the return or enter key.
- ☐ **Step 10:** Type **id** and then press the return or enter key.

The PC then displays the following message:

Make sure 11800 RS232 port is set up as follows:

Baud Rate	**4800**
Parity	**none**
Stop bits	**1**

Enter mainframe head number [1..4]

NOTE

When entering the sampling head number, the 11802 Oscilloscope and CSA 803 Series Communications Signal Analyzers have only head number 1 and head number 2. The 11801 Series Oscilloscopes have head number 1 through head number 4. The head numbers correspond to the sampling head compartments and are in ascending order (reading from left to right).

☐ **Step 11:** To Enter the sampling head number, type in the correct sampling head number and then press the return or enter key.

The PC then displays the following message:

Current ID number is: "XXXXXXXX"
Enter new ID number (8 characters max):

NOTE

The X's between the quotes represent the current ID number. Eight is the maximum number of digits allowed and one is the minimum. Any character is allowed, except a space ( ) character.

☐ **Step 12:** Enter one to eight characters for the new identification number.

The instrument will then flash the message:

Change in channel M × configuration

four times at the top of the screen.

☐ **Step 13:** Set the ON/STANDBY switch to STANDBY, and then switch it back to ON.

☐ **Step 14:** To verify the new identification number, press the UTILITY button, and then touch **Identify**.

The new identification number now appears under **Mainframe Sampling Heads** in the **System Identification** pop-up menu.

Theory of Operation

The SD-32 is a single channel, high-performance sampling head that can be installed in the 11800 Series Digital Sampling Oscilloscopes, the SM-11 Multi-Channel Unit, and the CSA 803 Series Communications Signal Analyzers.

System Functional Overview

This section describes and illustrates the major functions of the SD-32 Sampling Head (see Figure 4-1).

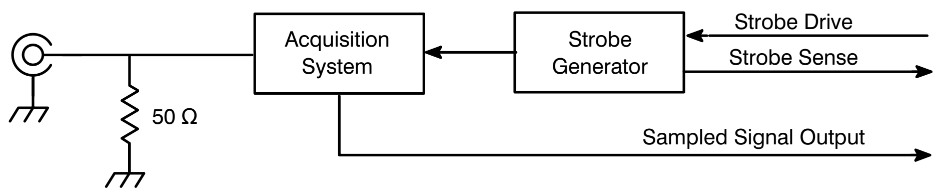


Figure 4-1: SD-32 Sampling Head Block Diagram

The sampling head acquisition system performs the function of a very fast sample-and-hold circuit for the mainframe instrument. It uses local analog feedback to achieve high accuracy and high throughput for repetitive input signals. For random input signals like those found in eye diagram measurements, accuracy depends on the dot transient response of the sampling head. Dot response can easily be adjusted through the enhanced accuracy menu in the mainframe.

The strobe drive signal from the instrument controls the timing of the strobe assertion to the acquisition system.

The strobe sense signal is a part of the strobe signal returned to the instrument. The instrument monitors the time duration of the strobe drive/strobe sense loop and adjusts a delay inside the instrument to maintain correct strobe timing.

The following two sub-sections describe how the two sampling head parameter adjustments, Loop Gain and Offset Null, affect sampling head performance.

Loop Gain

Loop gain determines the sampling head's ability to accurately follow an input voltage change that occurs between two adjacent samples. The accuracy with which the sampling head output follows the input signal is termed the dot transient response.

When loop gain is unity (1), the value of the first sample acquired after an input voltage change accurately reflects the voltage change, indicating a good dot transient response (see Figure 4-2).

If loop gain is adjusted too low, then the value of the first sample acquired after an input voltage change will be between the value of the last sample and the new voltage.

If loop gain is adjusted too high, then the value of the first sample acquired after the input voltage change will be greater than the new voltage level.

Figure 4-2 shows the displayed trace results for the three loop gain conditions.

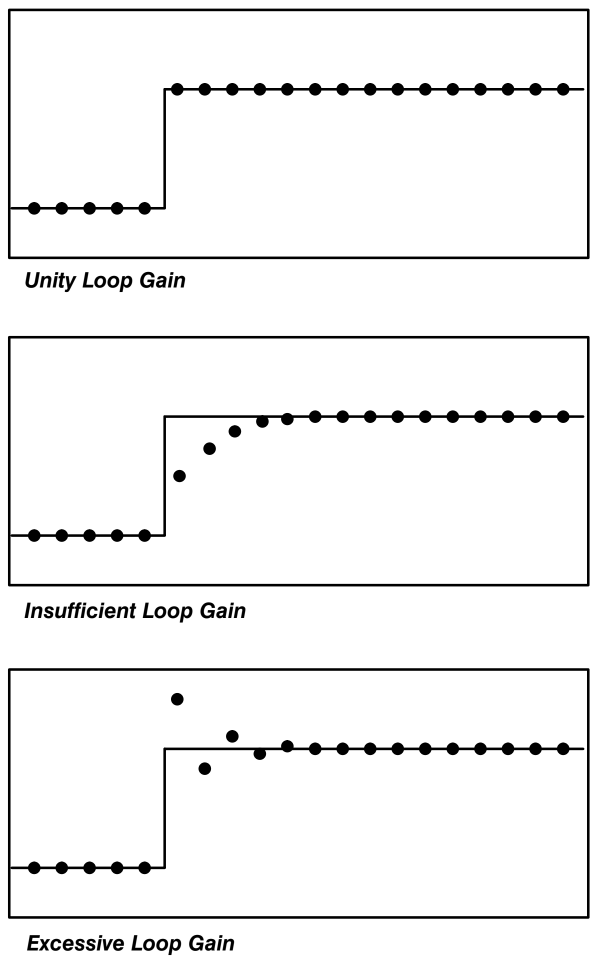


Figure 4-2: Displayed Traces at Various Loop Gain Settings

Offset Null

The offset null adjustment removes unwanted DC offset that may be present in the sampling head. This adjustment effectively zeroes the sampling head so that an input signal with 0 V of amplitude delivers a 0 V output.

If offset null is not adjusted correctly, then measurements taken at the instrument mainframe will be incorrect. The absolute voltage values for any cursors displayed on the trace will be incorrect as well.

Replaceable Parts

This section contains a list of the components that are replaceable for the SD-32 Sampling Head. As described below, use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available from or through your local Tektronix, Inc. service center or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest circuit improvements. Therefore, when ordering parts, it is important to include the following information in your order:

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If a part you order has been replaced with a different or improved part, your local Tektronix service center or representative will contact you concerning any change in the part number.

Change information, if any, is located at the rear of this manual.

Module Replacement

The SD-32 Sampling Head is serviced by module replacement, so there are three options you should consider:

- **Module Exchange.** In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1–800–TEKWIDE, ext. 6630.
- **Module Repair.** You may ship your module to us for repair, after which we will return it to you.
- **New Modules.** You may purchase new replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

The tabular information in the Replaceable Parts List is arranged for quick retrieval. Understanding the structure and features of the list will help you find the all the information you need for ordering replacement parts.

Item Names

In the Replaceable Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, U.S. Federal Cataloging Handbook H6-1 can be used where possible.

Abbreviations

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1.

CROSS INDEX – MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609–3320
TK1163	POLYCAST INC	9898 SW TIGARD ST	TIGARD OR 97223
TK1465	BEAVERTON PARTS MFG CO	1800 NW 216TH AVE	HILLSBORO OR 97124–6629
TK1916	SKS DIE CASTING CO	2200 4TH	BERKELEY CA 94710–2215
0GZV8	HUBER AND SUHNER INC	500 WEST CUMMINGS PARK	WOBURN MA 01801
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
5–1–1	366–0673–00			1	KNOB:O.096 ID X 0.24 OD X 0.299H	TK1163	ORDER BY DESC
–2	334–8148–00			1	MARKER,IDENT:MKD SD32,FRONT PANEL	80009	334814800
–3	333–3857–00			1	PANEL,FRONT: (ATTACHING PARTS)	TK1916	ORDER BY DESC
–4	211–0030–00			6	SCREW,MACHINE:2–56 X 0.25,FLH,STL (END ATTACHING PARTS)	TK0435	ORDER BY DESC
–5	380–0980–00			1	HSG,SAMPLING HEAD:	TK1465	ORDER BY DESC
	657–0083–50			1	MODULAR ASSY:SD32 FIELD REPLACEABLE UNIT	80009	657008350
					STANDARD ACCESSORIES		
	011–0158–00			1	ADPTR,COAX:2.92MM(K)FEM/1.85MM(V)MALE	80009	011015800
	015–1020–00			1	TERM,COAXIAL:SHORT CIRCUIT,SMA	0GZV8	64SMA–50–0–1
	070–8268–01			1	MANUAL,TECH:USER,SD32	80009	070826801
	070–8269–01			1	MANUAL,TECH:SERVICE,SD32	80009	070826901
					OPTIONAL ACCESSORIES		
	067–1338–00			1	FIXTURE,CAL:SAMPLING HEAD CAL UNIT (STANDARD)	80009	067133800
	067–1338–01			1	FIXTURE,CAL:SAMPLING HEAD CAL UNIT (EUROPEAN)	80009	067133801
	067–1338–02			1	FIXTURE,CAL:SAMPLING HEAD CAL UNIT (UNITED KINGDOM)	80009	067133802
	067–1338–03			1	FIXTURE,CAL:SAMPLING HEAD CALUNIT (AUSTRALIAN)	80009	067133803
	067–1338–05			1	FIXTURE,CAL:SAMPLING HEAD CAL UNIT (SWITZERLAND)	80009	067133805
	067–1338–06			1	FIXTURE,CAL:SAMPLING HEAD CAL UNIT (JAPANESE)	80009	067133806

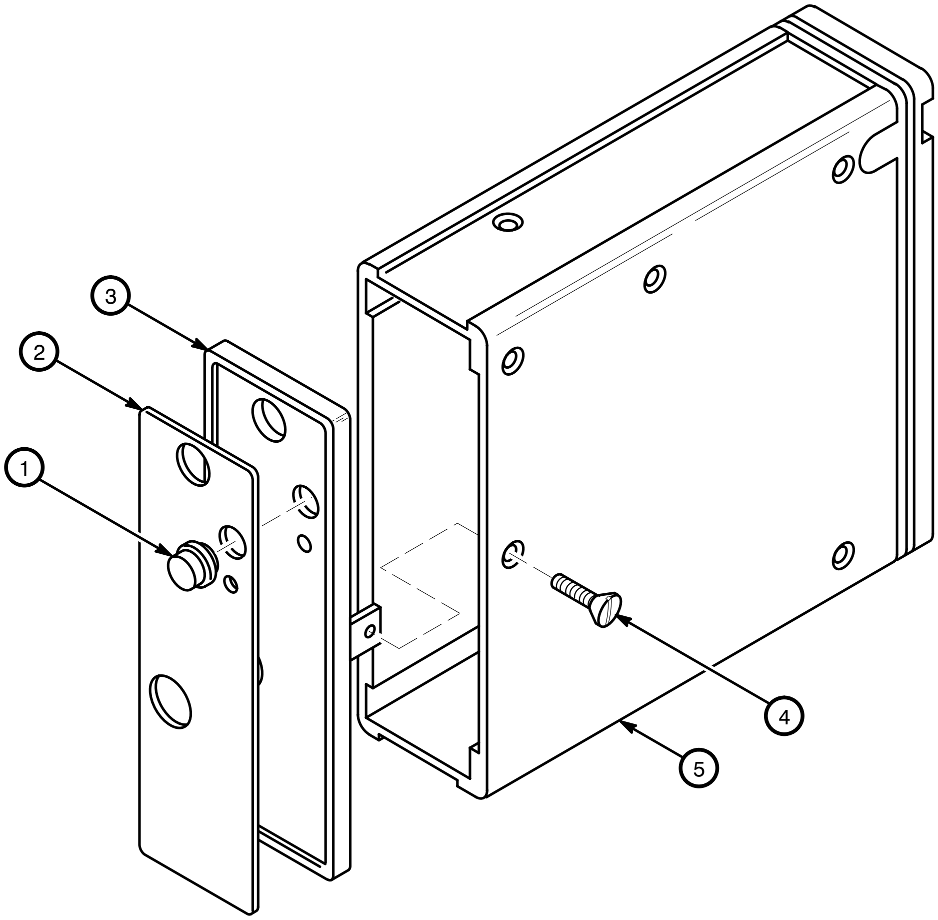


Figure 5-1: Exploded View of the SD-32 Sampling Head