User Manual

Tektronix

A6906S
Fiber-Optic Isolation System

070-8900-04

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

WARRANTY

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EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73A
8444 AB Heerenveen
The Netherlands

declare under sole responsibility that the

A6906S Fiber Optic Isolation System

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 55011 Class A Radiated and Conducted Emissions

EN 50081-1 Emissions:

EN 60555-2 AC Power Line Harmonic Emissions

EN 50082-1 Immunity:

IEC 801-2 Electrostatic Discharge Immunity
IEC 801-3 RF Electromagnetic Field Immunity
IEC 801-4 Electrical Fast Transient/Burst Immunity

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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.

Injury Precautions

Use Proper Power Cord

To avoid fire hazard, use only the power cord specified for this product.

Avoid Electric Overload

To avoid electric shock or fire hazard, do not apply a voltage to a probe that is outside the range specified for that probe.

Do Not Operate Without Covers

To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.

Do Not Operate in Wet/Damp Conditions

To avoid electric shock, do not operate this product in wet or damp conditions.

Ground the Product

Portions of this product are grounded through the grounding conductors of the power cords. 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.

Use Proper Fuse

To avoid fire hazard, use only the fuse types and ratings specified for this product.

Do Not Operate in Explosive Atmospheres

To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Wear Eye Protection

Wear eye protection if exposure to high-intensity rays or laser radiation exists.

Product Damage Precautions

Use Proper Power Source

Do not operate this product from a power source that applies more than the voltage specified.

Do Not Operate With Suspected Failures

If you suspect there is damage to this product, have it inspected by qualified service personnel.

Safety Terms and Symbols

Terms in This Manual

These terms may appear in this manual:

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

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 in This Manual

This symbol may appear in the manual:

This symbol indicates where specific cautions and warnings are found.

Symbols on the Product

These symbols may appear on the product:

DANGER
High Voltage

Protective ground
(earth) terminal

ATTENTION
Refer to
manual

Preface

The A6906S Fiber-Optic Isolation System allows long-distance transmission of electrical signals. Features include:

- Ability to safely use the transmitter in a floating or ungrounded environment.
- Electrical isolation between transmitter and receiver.
- Up to 200 meter fiber-optic cable length (with Option 3).
- 100 MHz bandwidth.

The A6906S Fiber-Optic Isolation System converts an input analog electrical signal into an optical signal. This signal is then transmitted along the fiber-optic cable, received, and converted back into an electrical signal. This transmission scheme provides a signal transmission system that operates over long distances, offers low distortion, transmits at high speed, and electrically insulates the signal. The A6906S Fiber-Optic Isolation System has the following components:

- A69T06 Transmitter, with battery pack, fiber-optic cable, and probe.
- A69R06 Receiver.
- A69C06 Sealed Lead-Acid Battery Charger.

The A69T06 Transmitter is an electrical-to-optical (E/O) converter; it converts an input electrical signal into an optical signal. System gain is controlled by an attenuator that is set in a 1–2–5 sequence. The A69T06 is also provided with a variable-gain amplifier for self-calibration to maintain measurement precision. The A69T06 is powered by an internal sealed rechargeable lead-acid battery pack.

The A69R06 Receiver is an optical-to-electrical (O/E) converter. It converts an optical signal input, via a fiber-optic cable, into an electrical signal. This unit functions as the controller for the A69T06 Transmitter. It can be used to control self-calibration and transmitter attenuator switching using front-panel operations. The A69R06 can also be controlled from an external device via the GPIB (IEEE–488) interface.

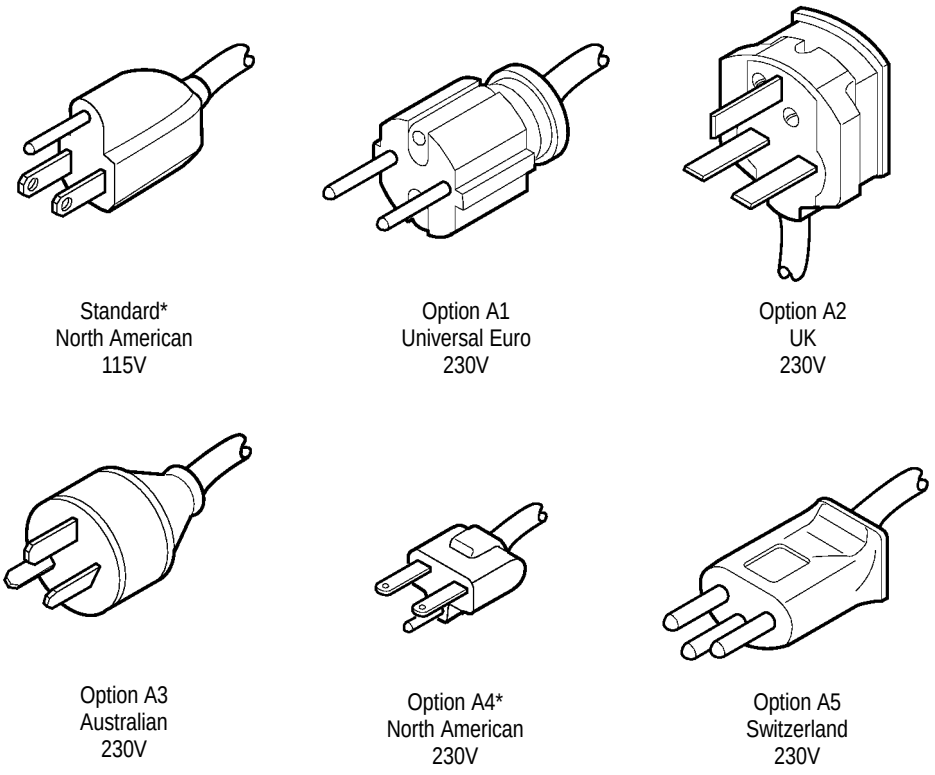
The A69C06 Sealed Lead-Acid Battery Charger charges the battery pack while the battery pack is removed from the A69T06.

Options

You can order the A6906S Fiber-Optic Isolation System with different options, as listed in Tables i and Figure i.

Table i: A6906S Order Options

Option Number	Description
01	Replace standard 3 meter fiber-optic cable with 20 meter cable.
02	Replace standard 3 meter fiber-optic cable with 100 meter cable.
03	Replace standard 3 meter fiber-optic cable with 200 meter cable.
04	Replace standard 3 meter fiber-optic cable with 10 meter cable.



* ***Canadian Standards Association certification includes these power plugs for use in the North American power network***

Figure i: Power-Cord Plug Options

Standard Accessories

The standard accessories that are included with the A6906S are listed below. Accessories, for example spare battery packs, can be ordered separately by using the Tektronix part numbers listed in the Replaceable Parts List on page 53.

- battery pack
- 50 Ω BNC Cable
- 50 Ω Feedthrough Termination
- Industrial lead set (for banana plug test accessories)
- Retractable Hook Probe Tip
- Spare Fuse for the A69R06
- Spare Fuse for the A69C06
- Fiber-Optic Cable Connector Cleaner (set of 5)
- A6906S Fiber-Optic Isolation System User Manual
- Two power cords
- 6-Inch Ground Lead

Optional Accessories

The optional accessories listed below can be ordered for use with your A6906S. Tektronix part numbers for these accessories can be found in the Replaceable Parts List on page 53.

- 75 Ω BNC Cable
- 75 Ω Feedthrough Termination
- GPIB Cable
- Index Matching Oil (for optical cable connections)
- Fiber-Optic Cable Connector Cleaner (set of 200)

Customer Support

To help you get the best performance from your A6906S, Tektronix offers the sales, application, and service support:

Sales Support

To order optional equipment and accessories, call the Tektronix National Marketing Center at 1-800-426-2200. Outside the United States or Canada, contact your nearest Tektronix Service Center.

Application Support

For assistance in applying the A6906S Fiber-Optic Isolation System to your measurement needs, contact Tektronix Customer Support at 1-800-835-9433 x2400, between 6 am and 5 pm Pacific time. Outside the United States or Canada, contact your nearest Tektronix Service Center.

Service Support

To obtain exchange modules to repair your A6906S, call the Tektronix FastParts Center at 1-800-848-5083. If you want Tektronix to perform repair or calibration services, or should your A6906S system need repair beyond that described in this manual, contact your nearest Tektronix Service Center.

Getting Started

This section tells you how to set up the A6906S Fiber-Optic Isolation System for battery charging and normal operation. Since the A69T06 Transmitter operates using battery power, you will first need to charge the battery pack.

AC Power

The A6906S Fiber-Optic Isolation System is capable of continuous operation with input voltages that range from 90 V to 250 V with source voltage frequencies from 47 Hz to 66 Hz.

Detachable three-wire power cords with three-contact plugs are provided with the A69R06 Receiver and A69C06 Sealed Lead-Acid Battery Charger for connection to both the power source and protective ground. For electrical shock protection, insert these plugs into a power source outlet that has a properly grounded protective ground contact.

Charging the battery pack

The A69T06 Transmitter is powered from a battery pack. To charge the battery pack, you need to remove it from the A69T06 Transmitter. It takes 12 hours to charge a battery pack that has been fully discharged. You cannot use a battery pack to power the A6906S while the battery pack is charging, but you can use a second battery pack to operate the A69T06 while charging a battery pack using the A69C06.

WARNING. *Before removing the battery pack for charging, disconnect the probe from the circuit being measured.*

Do not put your hand or any foreign object into the battery pack compartment after removing the battery pack.

Do not use the A69C06 Sealed Lead-Acid Battery Charger with any instrument or battery other than the A6906S battery pack.

1. Connect the A69C06 Sealed Lead-Acid Battery Charger to the AC power source through the supplied grounded power cord. Make sure that the green **POWER** light is on.
2. Turn off the A69T06 by pressing the **OFF** button on the battery pack. The red power light will turn off.

3. Remove the battery pack from the A69T06 by unscrewing the two thumbscrews on the front of the battery pack, as shown in Figure 1. Pull the battery pack completely out of the A69T06.

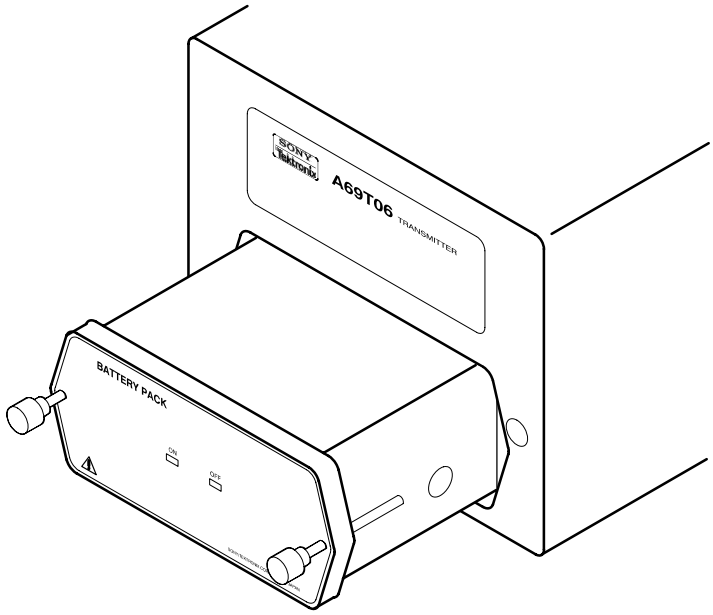


Figure 1: A69T06 Battery Removal

4. Connect the cable from the A69C06 **OUTPUT** to the connector on the right side of the battery pack, as shown in Figure 2.

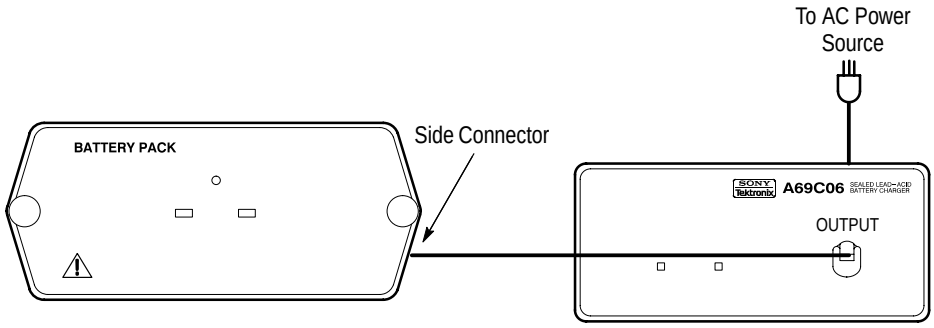


Figure 2: Battery Charging

5. Make sure the red **CHARGE** light on the front of the A69C06 is on. When the battery pack is fully charged, this light will turn off.

***NOTE**. battery packs are shipped fully charged. If you do not see the charge light come on, the battery pack is still fully charged and can be used immediately.*

6. When the battery pack is fully charged, disconnect it from the A69C06 and reinstall it in the A69T06 Transmitter. Install the battery pack right-side up in the A69T06, or the A69T06 will not operate even though the power light turns on.

Preparing for Operation

Figure 3 shows the connections necessary to use the A6906S Fiber-Optic Isolation System.

***NOTE**. The A69T06 Transmitter, fiber-optic cable, and A69R06 Receiver have been calibrated at the factory as a unit. Do not exchange modules among A6906S Fiber-Optic Isolation Systems; Tektronix will not warrant performance to specifications if you do so. Always use an A69T06 and A69R06 having matching serial numbers.*

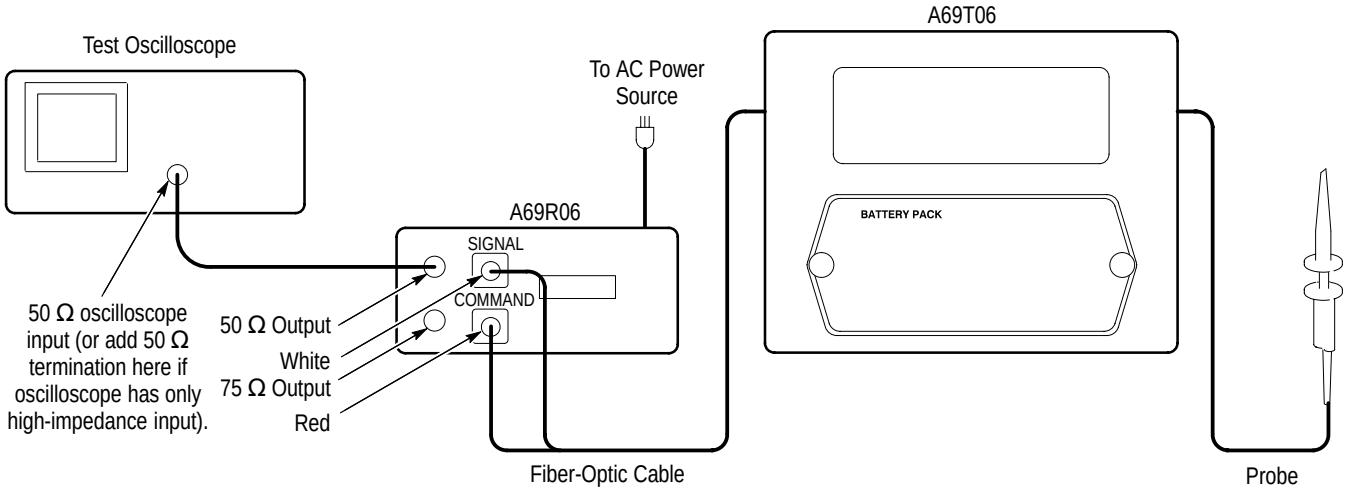


Figure 3: A6906S Connections for Use

Connecting the Fiber-Optic Cable

The fiber-optic cable connects the A69R06 Receiver to the A69T06 Transmitter. The cable consists of two optical conductors, one for signal and one for control commands. The two optical conductors are marked with different colored protective caps: white marks the signal conductor and red marks the command conductor.

CAUTION. *Be careful not to bend the fiber-optic cable excessively or apply excessive force. When storing the fiber-optic cable, be sure to replace the cable and the unit's protective caps to protect them from soiling.*

1. Remove the protective caps from the A69R06 **SIGNAL** and **COMMAND** connectors.
2. Remove the red protective cap from the fiber-optic cable.
3. Remove the clear plastic protector from the optical surface of the fiber-optic cable.
4. Place the cable strain relief around the A69R06 **COMMAND** conductor as shown in Figure 4.
5. Insert the uncovered cable plug into the A69R06 **COMMAND** conductor. Verify that the plug's notch is completely seated in the connector's groove and then tighten the plug retaining ring, hand tight only.

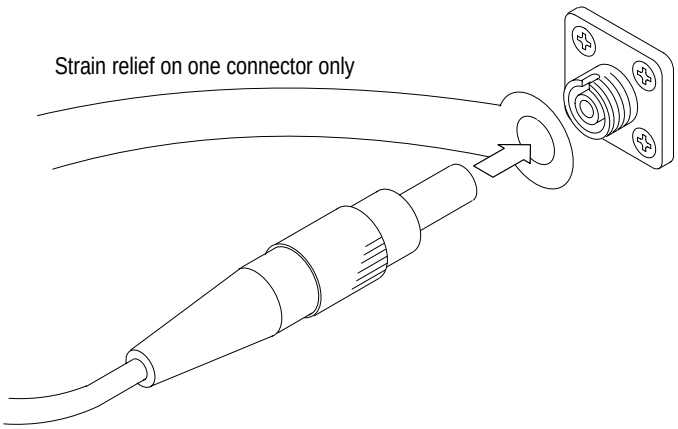


Figure 4: Connection of the Fiber-Optic Cable and Connector

6. Repeat steps 2 and 5 for the white-capped fiber-optic cable, connecting it to the A69R06 **SIGNAL** connector.

Connecting to the Oscilloscope

Use the included 50 Ω BNC cable to connect the A69R06 **50 Ω OUTPUT** to a 50 Ω oscilloscope input. If you have a 75 Ω system, you can use the 75 Ω OUTPUT connector instead.

If your oscilloscope has only high-impedance inputs, you can install the included 50 Ω feedthrough termination between the oscilloscope input and the 50 Ω BNC cable. Do not install the termination at the A69R06 end of the cable.

NOTE*. The self-calibration feature of the A6906S requires that the 50 Ω output of the A69R06 be terminated into 50 Ω. If you are using a 75 Ω system, attach the 50 Ω feedthrough termination to the 50 Ω output and use the 75 Ω output to connect to the system input.*

AC Power

Connect the A69R06 Receiver to the AC power source through the supplied grounded power cord.

Once you have connected the fiber-optic cable, the oscilloscope, and the power cord, the A6906S Fiber-Optic Isolation System system is ready to power on and use.

Operating Basics

This section tells you how to operate the A6906S Fiber-Optic Isolation System once it is installed.

NOTE. *To use this section, you must first install the A6906S as described in the Getting Started section starting on page 1. A battery pack must be charged and installed in the A69T06 Transmitter.*

Power On and Calibration

The A6906S requires that both the A69T06 Transmitter and A69R06 Receiver be powered on. The A69T06 takes power from its battery pack, and the A69R06 takes power from the AC line.

1. On the A69T06 battery pack, press the **ON** button to turn on transmitter power. The red light between the ON and OFF buttons will turn on.

2. On the A69R06, turn on the power using the **POWER OFF/ON** switch on the back panel.

   If the attenuation display shows Er1, check the fiber-optic cable connections between the transmitter and receiver. If necessary, clean the optical connectors as described in Cleaning Optical Connectors on page 11.

   Allow the system to warm up for 20 minutes before proceeding. If you do proceed to use the A6906S, perform step 3 below after 20 minutes have passed since power on. Performance to specifications is guaranteed only after 20 minutes warm-up.

NOTE. *The self-calibration feature of the A6906S requires that the 50 Ω output of the A69R06 be terminated into 50 Ω. If you are using a 75 Ω system, attach the 50 Ω feedthrough termination to the 50 Ω output and use the 75 Ω output to connect to the system input.*

3. On the A69R06 front panel, press the **CAL** button to initiate the calibration procedure. The transmitter and receiver will calibrate themselves to each other. The calibration process takes approximately one minute the first time after power on, subsequent calibrations take approximately 30 seconds. When the calibration is complete, the green PASS light will turn on.

If the red FAIL light comes on instead, check the fiber-optic cable connections between the transmitter and receiver. If necessary, clean the optical connectors as described in Cleaning Optical Connectors on page 11. If the green PASS light still doesn't come on, the instrument needs repair.

Once the A6906S is powered up and calibrated, it is controlled by the front panel buttons on the front of the A69R06 Receiver. It can also be controlled by a GPIB computer or controller connected to the A69R06, making it a part of an automated test system.

Optional Temperature Calibration

The A69T06 monitors its internal temperature and applies internal calibration corrections to compensate for drift in offset. Temperature does not affect the A69R06 and so it has no temperature monitoring system.

Normally, temperature corrections are applied based on default correction values. You can override the default values with values that are optimized to a specific temperature; however, if the temperature changes while the override values are in effect the A69T06 will not correct the for the offset drift induced by the changed temperature. To set optimum override values, follow these steps:

1. Install the A6906S in the environment in which it will be used.
2. On the A69R06, press the **CAL** and **COUPLING** buttons simultaneously.
3. Press the A69R06 **COUPLING** button again.
4. Allow the temperature environment to stabilize. Do not continue to step 5 until the A69T06 has been in a temperature-stable environment for at least 20 minutes.
5. Press the A69R06 **COUPLING** button again. Until this step is completed, the A6906S will not respond to GPIB commands.

To return to normal operation with default temperature correction values:

1. Install the A6906S in the environment in which it will be used.
2. On the A69R06, press the **CAL** and **COUPLING** buttons simultaneously.
3. Press the A69R06 **CAL** button again.

Operation

To use the A6906S Fiber-Optic Isolation System to take a measurement, connect the probe to the circuit you want to test, select the ATTENUATOR and COUPLING settings on the A69R06, and view the output on the oscilloscope.

WARNING. *Do not apply the probe to voltages that exceed the maximum ratings indicated on the rear panel of the A69T06.*

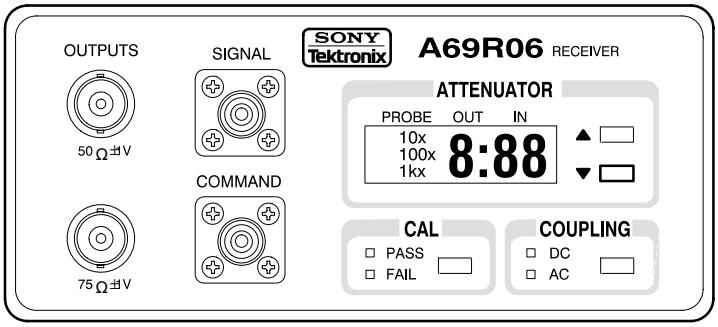


Figure 5: A69R06 Receiver Controls

Attenuator Controls

The ATTENUATOR controls consist of a digital readout and two buttons, ▲ and ▼. The digital readout displays the attenuation factor of the A69T06 and A6906S, but does not include the 100× attenuation of the probe. The 100× light in the attenuator display is always on to remind you to include this factor when reading the displayed attenuation.

The buttons adjust the attenuation factor up or down, to increase or decrease the displayed height of the signal on the oscilloscope display. Table 1 shows the attenuation factors of the A69T06 including probe.

Table 1: A6906S Attenuation Factors with Probe Factor Included

Displayed Attenuation Factor	Probe Tip to Oscilloscope Input Attenuation	Output Amplitude of a 40 V_{p-p} Signal
1 : 50	5,000×	8 mV_{p-p}
1 : 20	2,000×	20 mV_{p-p}
1 : 10	1,000×	40 mV_{p-p}
1 : 5	500×	80 mV_{p-p}
1 : 2	200×	200 mV_{p-p}
1 : 1	100×	400 mV_{p-p}
2 : 1	50×	800 mV_{p-p}
5 : 1	20×	2.0 V_{p-p}

Calibration Controls

The CAL button starts the self-calibration process . This performs automatic internal adjustments in the A69T06 and A69R06, and adjusts the transmitter and receiver to each other. When the calibration is complete, the green PASS and red FAIL lights tell you whether the self-calibration was successful.

If the self-calibration fails, clean the optical connectors as described in Cleaning Fiber-Optic Cable Connectors on page 11. If the green PASS light still doesn't come on, the instrument needs repair.

Coupling Controls

The COUPLING button changes the A6906S system to either DC or AC coupling. Push the button to change the setting from one to the other. The green DC or AC lights tell you which coupling mode is selected.

Oscilloscope Controls

The oscilloscope you use with the A6906S provides controls for triggering, horizontal size, vertical size, and other display parameters. Use these oscilloscope controls just as you would when using a regular oscilloscope probe.

6-Inch Ground Lead

Figure 6 shows the 6-inch ground lead that is included with the A6906S as a standard accessory. Use the 6-inch ground lead in place of the longer ground lead for measuring fast-rising waveforms.

WARNING. *To avoid electrical shock, do not touch the metal of the ground clip. Handle the clip by the insulation above the Limit Mark as shown in Figure 6.*

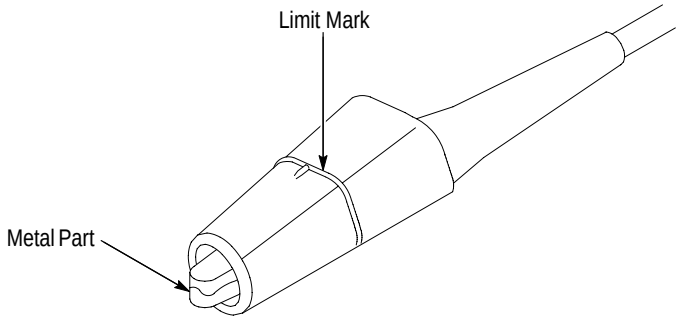


Figure 6: 6-Inch Ground Lead Clip

Cleaning Fiber-Optic Cable Connectors

If the fiber-optic cable or front panel optical connector is dirty, the system may not perform as it should or may fail self-calibration. If the fiber-optic cable or connector is dirty, use the fiber-optic cleaner accessory to clean it as shown in Figure 7. Normally, a single cleaner can clean a number of fiber-optic cables or connectors. If the connector is extremely dirty, use a small amount of alcohol and use the cleaner only once.

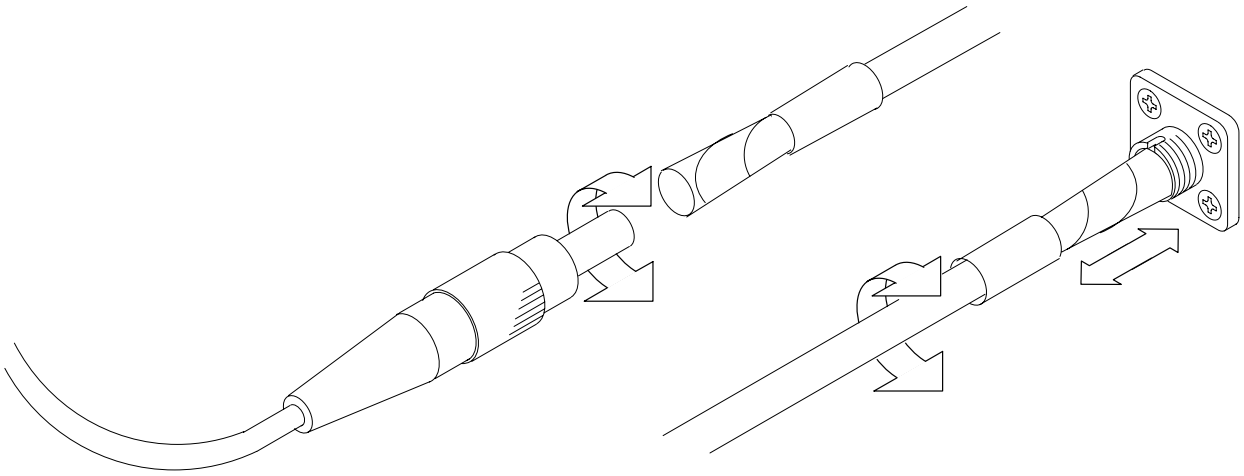


Figure 7: Fiber-Optic Cable and Connector Cleaning

Programming

You can use a computer to control the A6906S and make measurements. With an oscilloscope that also can be programmed, the computer and A6906S can form a complete, automated measurement system.

Setting Up

Your computer, also known as the controller, must be capable of operating on a GPIB bus that conforms to IEEE Std 488.1–1987. GPIB cards are available to provide this capability for personal computers.

The A69R06 Receiver has a 24-pin GPIB connector on its rear panel, as shown in Figure 8. This connector has a D-type shell and conforms to IEEE Std 488.1–1987.

Attach an IEEE Std 488.1–1987 GPIB cable between this connector and your controller. Figure 8 shows how cables can be stacked together. You can stack a second cable on either the receiver connector or the controller connector, to similarly connect your oscilloscope.

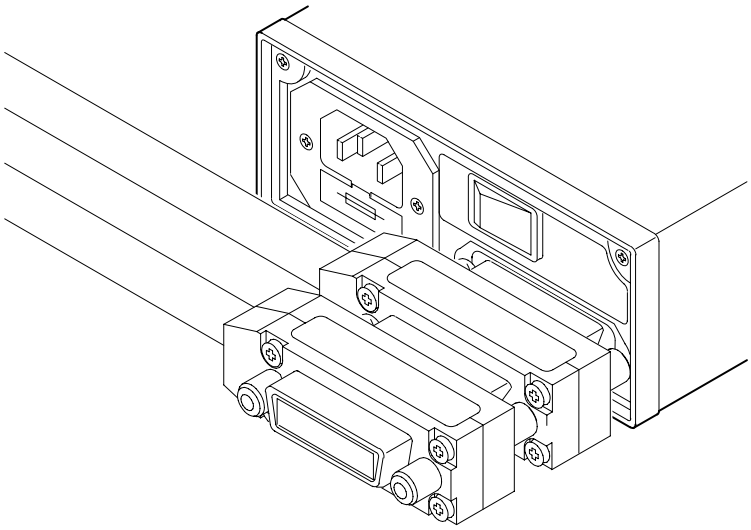


Figure 8: Stacked GPIB Connectors

GPIB Requirements

Observe these rules when you use your A69R06 with a GPIB network:

- Assign a unique device address to each device on the bus. No two devices can share the same device address.
- Do not connect more than 15 devices to the bus.
- Connect one device for every 2 meters (6 feet) of cable used.
- Do not use more than 20 meters (65 feet) of cable for the entire bus.
- Power on at least two-thirds of the devices on the network while using the network.
- Connect the devices on the network in a star or linear configuration as shown in Figure 9. Do not use loop or parallel configurations.

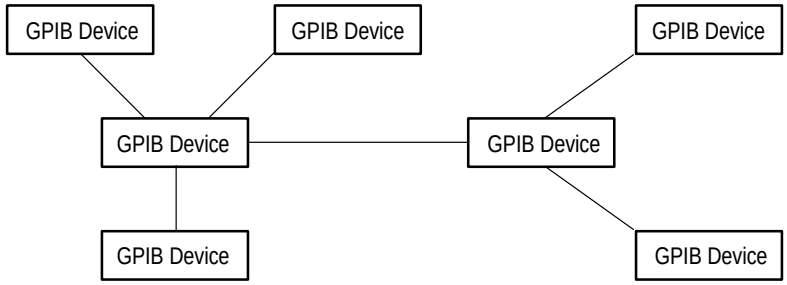


Figure 9: Typical GPIB Network Configuration

Setting GPIB Parameters

You must set the GPIB parameters of the A69R06 to match the configuration of the bus and controller.

GPIB Address

Set the GPIB ADDRESS using the A69R06 front panel. The GPIB controller uses this address to send commands to the A69R06. The address of the A69R06 must be different from the addresses used by all other devices on the bus.

To set the GPIB address, press the **ATTENUATOR ▼** and **COUPLING** buttons simultaneously and then release them. The attenuator display shows the current address. Press the ▲ and ▼ buttons to change the address. When the proper address is set, press the **COUPLING** button to return to normal operation.

You can set the address from 0 through 30. You can also set the A69R06 to "off line," which disables all communications with the controller, by specifying address 31.

GPIB Terminator

The termination mode specifies what conditions the A69R06 looks for to determine the end of a command. The terminator may be set to "EOI" only or "LF or EOI." You will need to consult your controller documentation to determine which setting is best for your configuration.

To set the GPIB terminator, press the **ATTENUATOR ▲** and **COUPLING** buttons simultaneously and then release them. The attenuator display shows the current termination. Press the ▲ and ▼ buttons to change the termination. When the proper termination mode is set, press the **COUPLING** button to return to normal operation.

The termination mode also specifies the termination of output messages from the A69R06 to the controller. When the mode is "LF or EOI," the A69R06 adds CR and LF characters to the end of messages. In "EOI" only mode, the A69R06 adds no characters to messages.

Other Documents You Will Need

Tektronix cannot know what type of controller you will use with your A69R06, and so this document cannot cover the topics that are specific to your installation. To completely understand and implement a GPIB system, you will need the documentation that supports your controller. If you are using a personal computer with a GPIB card, you will need the documentation for both the PC and the GPIB card.

Commands

Command names show both upper- and lower-case characters. Only the upper-case characters are required. You can abbreviate commands by omitting lower-case characters, starting from the end. For example, you can enter the COUpling command as COUPLING, COUPL, or COU. You can use lower-case letters anyplace in command names or arguments: coUpLiNg, CouPl, or cou are valid.

Table 2: A6906S GPIB Commands

Command Name	Description
CALibration	Executes self-calibration, optionally returns result
COUpling	Sets or queries input coupling
EVent?	Returns the last pending event code
HELp?	Returns a list of A6906S GPIB commands
ID?	Returns instrument ID including firmware version numbers
INIt	Initializes A6906S to factory default settings
PROBE?	Returns the probe type
RANge	Sets or queries the attenuator range
RQS	Enables or disables system requests (SRQs)
SERIAL?	Returns A6906S serial number
SET?	Returns all A6906S settings as command string
STAndby	Sets or queries standby mode
TRAns?	Queries status of transmitter
TESt?	Performs A6906S self test query

CALibration

Initiates the self-calibration of the A6906S. The query form returns the result.

Syntax

```
CALibration
CALibration?
```

Returns PASS or FAIL, depending on the self-calibration result.

Examples CALIBRATION
performs a self-calibration of the A6906S without a return message.

CAL?
might return CAL PASS.

COUpling

Sets or queries the input coupling of the A6906S.

Syntax

```
COUpling AC
COUpling DC
COUpling?
```

Arguments AC sets the input to AC coupling. DC sets the input to DC coupling.

Examples COU DC
sets the A6906S input to DC coupling.

COU?
might return COUP DC, indicating that the A6906S input is set to DC coupling.

EVEnt? (Query Only)

Returns the error or event code for the most recent event reported by serial poll, or for the highest priority condition pending.

Syntax

```
EVEnt?
```

Returns The most recent error/event code.

Examples EVE?
might return EVENT 266 as the most recent error code.

HELp? (Query Only)

Returns a list of commands that are recognized by the A6906S.

Syntax

```
HElp?
```

Returns Will always return the string CAL, COU, EVE, HEL, ID, INI, PRO, RAN, RQS, SET, STA, TRA, TES

ID? (Query Only)

Returns the A6906S identification, including the Codes and Formats Version and the firmware version.

Syntax `ID?`

Returns The instrument identification string.

Examples ID?
may return the string ID SONY_TEK/A69R06, V81.1, FV1.00

INIt (No Query Form)

Initializes the A6906S (both A69R06 and A69T06) to factory default settings.

Syntax `INIt`

PRObe? (Query Only)

Returns the type of probe connected to the A69T06. This will always be X100.

Syntax `PROBETYpe?`

Returns `PROBETYPE X100`

Examples PROBETY?
will return PROBETYPE X100.

RANge

Sets or queries the A6906S attenuator range setting.

Syntax

```
RANge 1:50
RANge 1:20
RANge 1:10
RANge 1:5
RANge 1:2
RANge 1:1
RANge 2:1
RANge 5:1
RANge?
```

Arguments The argument tells how much the A6906S should attenuate or amplify the input signal.

Examples RAN 1:50
sets the A6906S to attenuate signals by a factor of 50. (Combined with the 100× probe, the total attenuation is a factor of 5,000.)

RAN?
might return RANGE 1:1, indicating that the A6906S is set to neither amplify nor attenuate.

RQS

Enables or disables SRQs (System Requests). When disabled, the A6906S does not act on error conditions other than to log them, and does not signal that it is ready to transmit data to the controller.

Syntax

```
RQS ON
RQS OFF
RQS?
```

Arguments ON enables SRQ events. Off disables SRQ events.

Examples RQS ON
enables SRQ events.

SET? (Query Only)

Returns a string containing all the individual programming commands required to return the A6906S to its present state. This string can be saved and sent at some future time when you want to return the A6906S to all the present settings.

Syntax

```
SET?
```

Returns

```
COU <AC | DC>;RAN <1:50 | 1:20 | 1:10 | 1:5 | 1:2 | 1:1 | 2:1 |
5:1>;RQS <ON | OFF>;STA <ON | OFF>
```

Examples

SET?
might return COU AC;RAN 1:2;RQS OFF;STA OFF

STAndby

Enables or disables the standby mode, or queries the current standby mode setting.

Syntax

```
STAndby ON
STAndby OFF
STAndby?
```

Arguments

ON turns standby mode on, OFF turns standby mode off.

Returns

ON or OFF

Examples

STA ON turns on standby mode.

STA?
might return STANDBY OFF, indicating standby mode is off.

TRAns? (Query Only)

Queries the state of the A69T06. This is needed because the GPIB interface is a part of the A69R06.

Syntax `TRAns?`

Returns NORMAL if the A69T06 has a charged battery and is responding normally, LOW if the battery pack has a low charge level, OFF if it is powered off or not responding, or UNKNOWN if the A69R06 cannot determine the status.

Examples TRA?
might return TRA NORMAL, indicating that the A69T06 is operating normally with a full battery charge.

TESt? (Query Only)

Instructs the A6906S to perform a self-test operation and return the result.

Syntax `TESt?`

Returns PASS or FAIL

Examples TES?
might return TEST PASS, indicating that the self-test completed successfully with no errors.

Status Bytes and Event Codes

The status and error reporting system of the A69R06 interrupts the controller by asserting an SRQ (service request). The service request indicates that an event has occurred that requires attention. When the controller polls the bus, the status byte returned by the A69R06 indicates the type of event that occurred. A further EVEnt? query will return an event code that gives more specific information about the cause of the service request. The SRQ status byte and the event code provide a limited amount of information about the specific cause of the service request.

Table 3: Status Bytes

	Binary		Decimal	
Category	**RQS Off**	**RQS On**	**RQS Off**	**RQS On**
No Status	0000 0000	0000 0000	0	0
Power On	0000 0001	0100 0001	1	65
Operation Complete	0000 0010	0100 0010	2	66
Command Error	0010 0001	0110 0001	33	97
Execution Error	0010 0010	0110 0010	34	98
Internal Error	0010 0011	0110 0011	35	99
Execution Warning	0010 0110	0110 0110	38	102

Table 4: Event Codes

Category	Code	Description
Command Errors	101	Command header error
	103	Command argument error
	106	Missing argument
	151	Command statement too long
Execution Errors	203	I/O buffers full
	204	Command received during self-calibration
Internal Errors	302	Self-calibration fail
	350	Battery off
System Events	401	Power on
	402	Self-calibration pass
Internal Warning	550	Low battery charge

Appendix A: Specifications

All specifications are subject to the following conditions:

- The A6906S and probe have been warmed up for at least 20 minutes.
- The A6906S and probe have been self-calibrated at an ambient temperature between 20° C and 30° C after the warm up period.

The specifications in Table 5 and Table 9 are warranted specifications unless otherwise noted. Other specifications are typical or nominal characteristics.

Table 5: Electrical Specifications

Input-to-Output Voltage Ratio	User selectable:	*without probe (typical)*	*with probe*
		1 : 50 attenuation	5,000×
		1 : 20 attenuation	2,000×
		1 : 10 attenuation	1,000×
		1 : 5 attenuation	500×
		1 : 2 attenuation	200×
		1 : 1 (unity)	100×
		2 : 1 gain	50×
		5 : 1 gain	20×
DC Offset Accuracy, all ranges	±10 mV		
Gain Accuracy, 50 Ω output, at 500 mV DC		*without probe (typical)*	*with probe*
	1 : 50 attenuation	±3.0%	±3.2%
	1 : 20 attenuation	±3.0%	±3.2%
	1 : 10 attenuation	±2.5%	±2.7%
	1 : 5 attenuation	±2.5%	±2.7%
	1 : 2 attenuation	±2.5%	±2.7%
	1 : 1	±2.0%	±2.3%
	2 : 1 gain	±2.0%	±2.3%
	5 : 1 gain	±2.0%	±2.3%
Bandwidth, –3 dB	DC to 100 MHz		
Flatness, passband	±5% with probe, DC to 20 MHz ±5% without probe, DC to 30 MHz, typical		
Rise Time	3.5 ns		
Probe Input Impedance	10 MΩ, typical 2.9 pf, typical		
Aberrations, without probe with probe	 $6\%_{p\text{-}p}$, typical within first 20 ns $10\%_{p\text{-}p}$, typical within first 20 ns		

Table 5: Electrical Specifications (Cont.)

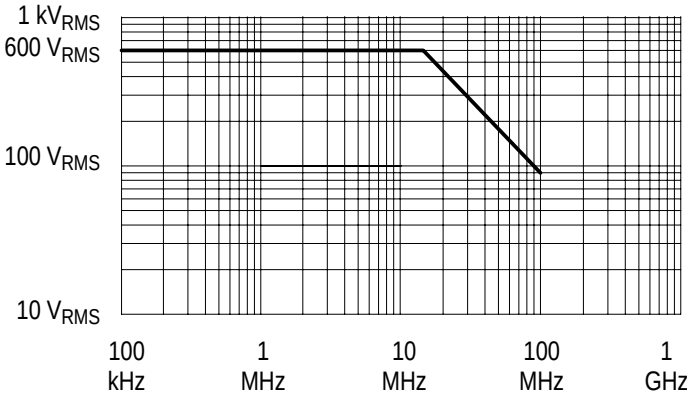
Total Harmonic Distortion 1 kHz Sine Wave	1.0% (at 1 V_{p-p} output), typical 2.0% (at 2 V_{p-p} output), typical	
Output Noise Level DC to 100 MHz	≤2.2 mV_{RMS}	
Output Impedance, at DC	50 Ω ±5% 75 Ω ±5%	
Maximum Rated Normal Mode Input Voltage probe tip to probe common	848 V (DC plus peak AC) 6 kV (peak surge ≤250 µs)	
Maximum Rated Common Mode Input Voltage probe common to earth ground	848 V (DC plus peak AC) 6 kV (peak surge ≤250 µs)	
Maximum Output Voltage, 50 Ω Output	2 V_{p-p}	
Common Mode Rejection Ratio	without probe, 1:1 range 80 dB at 1 MHz, typical 60 dB at 10 MHz, typical	with probe, 5:1 range 120 dB at 60 Hz, typical 60 dB at 1 MHz, typical 40 dB at 10 MHz, typical
Common Mode Slew Rate	100 kV/µs, typical	
Delay, 3 m Fiber-Optic Cable	50 ns, typical	
Power Requirements	90 to 250 VAC, 47 to 66 Hz 10 W (A69R06), typical 25 W (A69C06), typical	
Frequency Derating with probe, typical		

Table 6: Fiber-Optic Cable Characteristics

Optical Fiber Type	Plastic clad multimode fiber
Core/Clad Size	200/230 µm
Numeric Aperture	0.4
Fiber-Optic Cable Maximum Tension, Cable Connector	 40 kg (88 lb) 2 kg (4.4 lb)
Fiber-Optic Cable Minimum Bend Radius, no tension	100 mm 50 mm short term

Table 7: Battery Characteristics

Battery Life, Continuous transmitter use at 25° C	12 hours
Battery Rated Capacity	12 Ah
Battery Full Charge Time at 25° C	12 hours
DC Supply Current from Battery to Transmitter	800 mA (normal mode) 150 mA (standby mode)
Maximum Battery Charge Current	1.25 A

Table 8: Physical Characteristics

Weight	A69T06: 7.8 kg (17.2 lb) A69R06: 1.7 kg (3.7 lb) A69C06: 1.4 kg (3.1 lb)	
Outside Dimensions, not including probe or fiber-optic cable	A69T06 H: 139 mm (5.5 in) W: 170 mm (6.7 in) D: 475 mm (18.7 in)	A69R06 and A69C06 56 mm (2.2 in) 120 mm (4.7 in) 300 mm (11.8 in)

Table 9: Environmental Characteristics

Operating Temperature A69T06, A69R06 A69C06	 0° C to 50° C 10° C to 35° C
Humidity, operating and non-operating	95% relative humidity from 30° C to 50° C MIL-E-16400F paragraphs 4.5.9 through 4.5.9.5.1, class 4.
Non-Operating Temperature, A69T06, A69R06 A69C06 battery pack	 –25° C to 50° C –25° C to 70° C –15° C to 30° C (long-term storage, >1 month)
Electrostatic Immunity	20 kV
Safety Certifications	UL1244, CSA-C22.2 #231–M89

Table 10: GPIB Interface Functions

Name	Subset	Notes
Source Handshake	SH1	Complete capability
Acceptor Handshake	AH1	Complete capability
Talker	T6	Basic talker, serial poll, unaddress if MLA
Listener	L4	Basic listener, unaddress if MTA
Service Request	SR1	Complete capability
Remote/Local	RL2	No local lockout
Parallel Poll	PPO	No capability
Device Clear	DC1	Complete capability
Device Trigger	DT0	No capability
Controller	C0	No capability

Appendix B: Performance Verification

This section contains a collection of procedures for checking that the A6906S Fiber-Optic Isolation System performs as warranted. The procedures check all the warranted characteristics in *Appendix A: Specifications* on page 23.

***NOTE**. A brief functional verification can be performed without test equipment. Install the A6906S Fiber-Optic Isolation System as described in Power On and Calibration on page 7, and perform the self-calibration. If the PASS light comes on, the system is verified as functional.*

Prerequisites

The tests in this subsection comprise an extensive, valid confirmation of performance and functionality when the following requirements are met:

1. The battery pack must be charged as described in Charging the battery pack on page 1. The battery pack must be installed in the A69T06.
2. The A69T06 and A69R06 must be connected with the fiber-optic cable, and the A69R06 must be connected to an oscilloscope, as described in Preparing for Operation on page 3.
3. All cabinets must be in place.
4. The A6906S Fiber-Optic Isolation System must have been operating for a continuous warm-up period of at least 20 minutes within the operating temperature specified in *Appendix A: Specifications* on page 23.
5. The self-calibration routine must have been performed and passed after the warm-up period, as described in *Power On and Calibration* on page 7.

Required Test Equipment

Table 11 lists all the test equipment required to do the performance check.

Table 11: Test Equipment Required for Performance Verification

Description	Minimum Requirements	Example	Purpose
Oscilloscope	350 MHz bandwidth, automated measurement capability: Mean, RMS, Rise Time, Peak-Peak	Tektronix TDS 460	Checking noise, rise time, aberration and bandwidth
Calibration Generator	Fast-rise signal level 100 mV to 1 V, repetition rate 1 MHz, rise time ≤1 ns, flatness ±2%	Tektronix PG 506A	Checking rise time
Sine Wave Generator	250 kHz to 100 MHz, variable amplitude to 1 V_{p-p} into 50Ω, 50 kHz reference	Tektronix SG 503	Checking bandwidth
Coaxial Cable, 50 Ω Precision (2 required)	50 Ω, 1 m (36 in), male-to-male BNC connectors	Tektronix part number 012-0482-00	Signal connection
Feedthrough Termination, 50 Ω	50 Ω, female-to-male BNC connectors	Tektronix part number 011-0049-01	Signal termination
BNC to Dual Banana Connector	Female BNC to male dual banana	Tektronix part number 103-0090-00	Various tests

Offset and Noise Check

Perform this check with the A6906S Fiber-Optic Isolation System connected to an oscilloscope and configured for normal use, as shown in Figure 3 on page 3. Use the 6-inch ground lead on the probe common lead.

1. Short the probe tip to the probe common lead. The connections should now be configured as shown in Figure 10.
2. On the A69R06, set the **ATTENUATOR** to 1 : 1 and **COUPLING** to AC.
3. Set the oscilloscope as follows:

   Horizontal . . . . . 1 µs/div
   Vertical . . . . . 5 mV/div
   Coupling . . . . . AC
   Impedance . . . . . 50 Ω
   BW Limit . . . . . On (100 MHz)
   Measurement . . . . . RMS and Mean
   Acquisition Mode . . . . . Sample (Average off)

4. To measure noise, check that the RMS measurement readout of the oscilloscope is less than 2.2 mV.

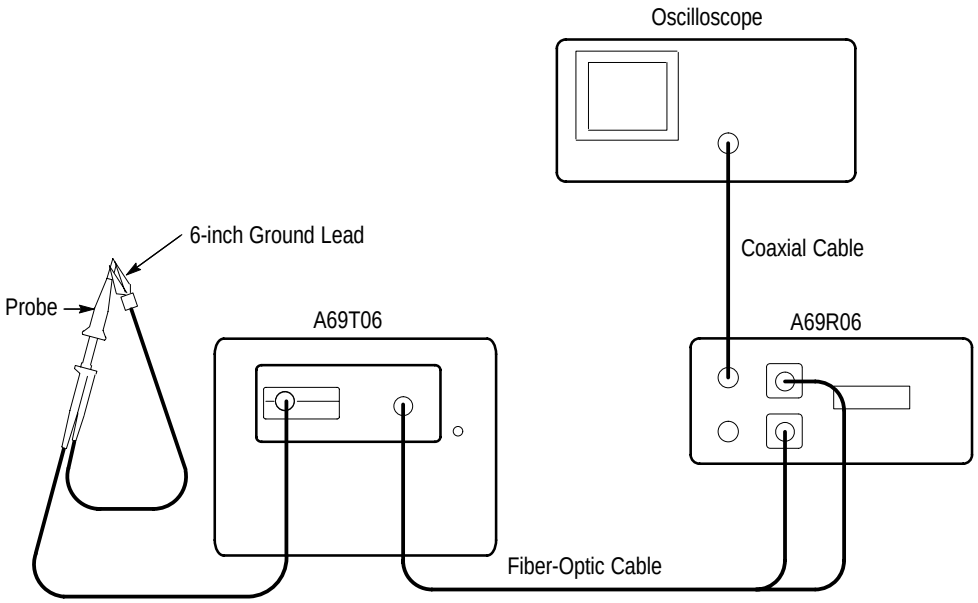


Figure 10: Noise Check Setup

5. Change the oscilloscope acquisition mode to average, and the coupling to DC.
6. To measure offset,check that the Mean measurement readout of the oscilloscope is <±10 mV.
7. Unclip the 6-inch ground lead from the probe tip.

Rise Time Check

Perform this check with the A6906S Fiber-Optic Isolation System connected to an oscilloscope and configured for normal use, as shown in Figure 3 on page 3. Use the 6-inch ground lead on the probe common lead.

1. Attach a coaxial cable to the fast rise output of the calibration generator. Attach a 50 Ω feedthrough termination to the other end of the coaxial cable. Attach a BNC to Dual Banana Connector to the 50 Ω feedthrough termination, and connect the A6906S probe to the banana jacks. Make sure the probe tip is connected to the signal jack and the 6-inch ground lead is connected to the ground jack. Attach another coaxial cable from the **Trigger Output** of the Cal Generator to channel 2 on the oscilloscope. The connections should now be configured as shown in Figure 11.

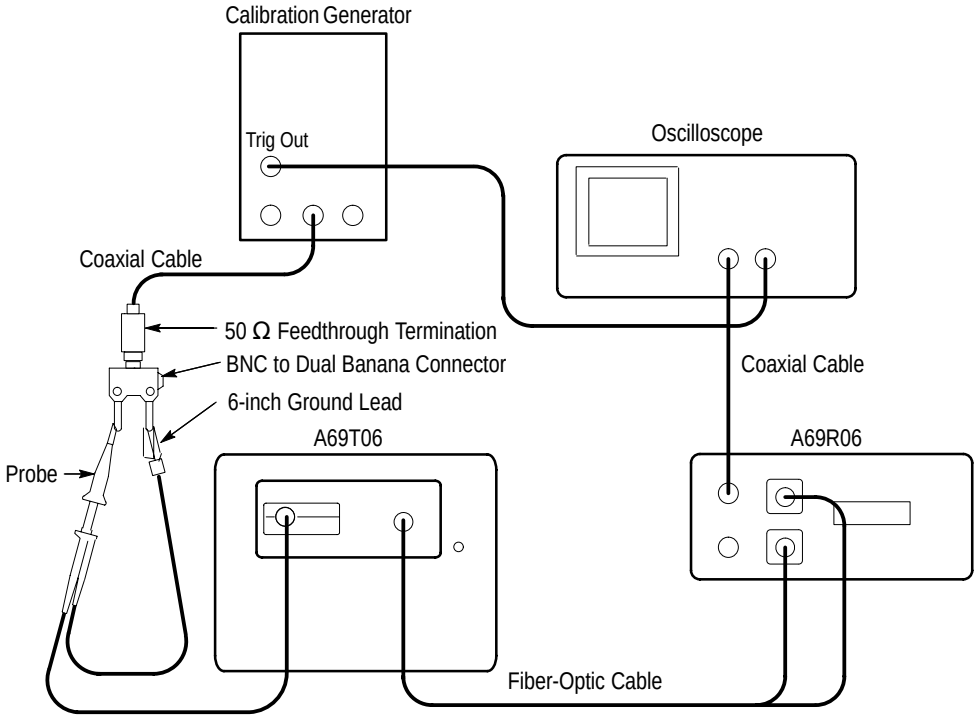


Figure 11: Rise Time Check Setup

2. Set up the oscilloscope as follows:

Horizontal	10 ns/div
Measurement	Rise Time
Trigger Source	Channel 2
Trigger Coupling	DC

	Channel 1	**Channel 2**
Vertical	2 mV/div	200 mV/div
Coupling	DC	DC
Impedance	50 Ω	50 Ω
BW Limit	Off	Off
Averaging	On	On

3. Set up the calibration generator as follows:

Amplitude	Fast Rise, Positive Slope, Max Ampl.

4. On the A69R06, set the **ATTENUATOR** to 1 : 1 and **COUPLING** to AC.

5. Adjust the calibration generator pulse amplitude for five divisions of display on the oscilloscope, and a frequency of 1 MHz. Check that the Rise Time measurement readout of the oscilloscope is 3.5 ns or less.

Bandwidth Check

Perform this check with the A6906S Fiber-Optic Isolation System connected to an oscilloscope and configured for normal use, as shown in Figure 3 on page 3. Use the 6-inch ground lead on the probe common lead.

1. Attach a coaxial cable to the output of the sine wave generator. Attach a 50 Ω feedthrough termination to the other end of the coaxial cable. Attach a BNC to Dual Banana Connector to the 50 Ω feedthrough termination, and connect the A6906S probe to the banana jacks. Connect the probe tip to the signal jack and the 6-inch ground lead to the ground jack. The connections should now be configured as shown in Figure 12.

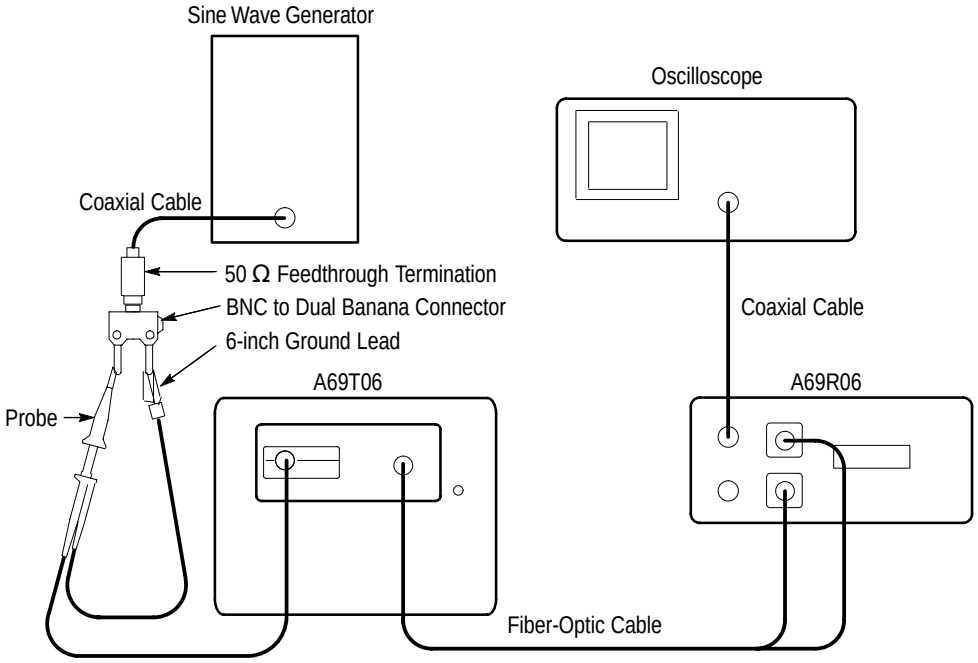


Figure 12: Bandwidth Check Setup

2. Set up the oscilloscope:

Horizontal	5 µs/div
Vertical	10 mV/div
Coupling	DC
Impedance	50 Ω
BW Limit	Off
Acquisition Mode	Average (8)
Trigger Source	Channel 1
Trigger Coupling	DC
Measurement	Peak–Peak

3. On the A69R06, set the **ATTENUATOR** to 1 : 1 and **COUPLING** to AC.
4. Set the output of the sine wave generator to a reference frequency of 50 kHz.
5. Adjust the sine wave generator output level so that the Peak-Peak measurement readout of the oscilloscope is 50 mV.
6. Set the oscilloscope horizontal to 5 ns/div.
7. Set the sine wave generator frequency to 100 MHz.
8. Confirm that the Peak-Peak measurement readout on the oscilloscope is ≥35.4 mV.

Gain Check

Perform this check with the A6906S Fiber-Optic Isolation System connected to an oscilloscope and configured for normal use, as shown in Figure 3 on page 3. Use the 6-inch ground lead on the probe common lead.

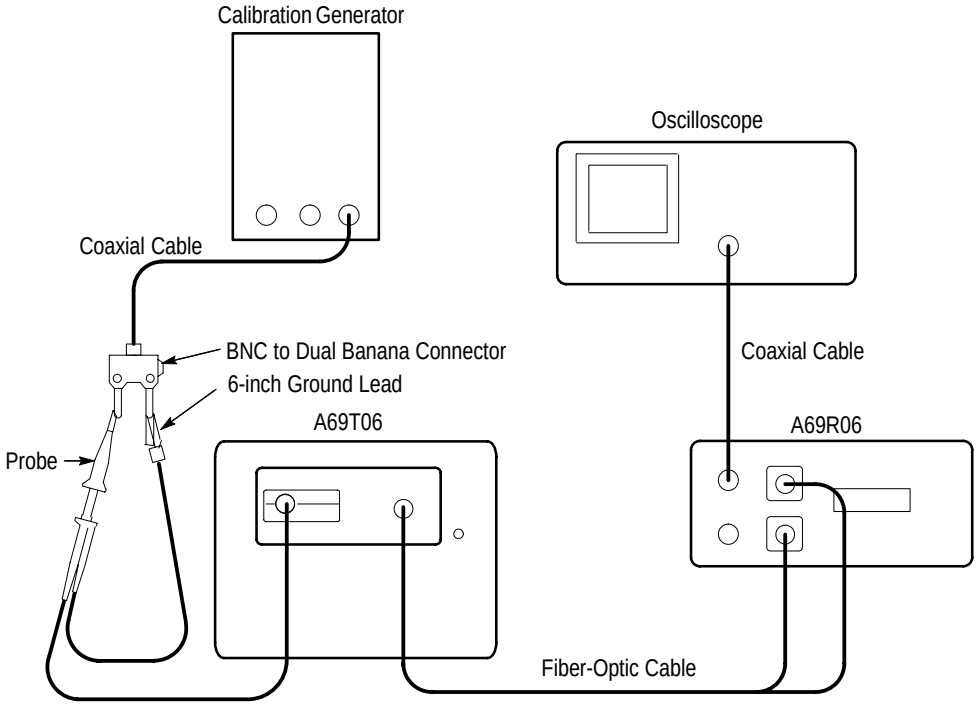


Figure 13: Gain Check Setup

1. Attach a coaxial cable to the standard amplitude output of the calibration generator. Attach a BNC to Dual Banana Connector to the other end of the

coaxial cable, and connect the A6906S probe to the banana jacks. Make sure the probe tip is connected to the signal jack and the 6-inch ground lead is connected to the ground jack. The connections should now be configured as shown in Figure 13.

2. Set up the oscilloscope:

Averaging	On
Horizontal	500 µs/div
Vertical	100 mV/div
Coupling	DC
Impedance	50 Ω
BW Limit	On (20 MHz)
Measurements	Peak-Peak
Acquisition Mode	Hi Res

3. Set the output of the calibration generator to 10 V.

4. Set the A69R06 **ATTENUATOR** to 5 : 1 and DC coupling. Adjust the trigger for a stable display. Use the TDS 460 **SET LEVEL TO 50%** button. Check that the oscilloscope Peak-Peak measurement readout is between 488.5 mV and 511.5 mV. Repeat for each of the A69R06 **ATTENUATOR** settings. Refer to Table 12 and check that the oscilloscope Peak-Peak measurement readout is within the limits given.

Table 12: Gain Accuracy Limits

ATTENUATOR Setting	Calibration Generator Voltage	Oscilloscope Vertical Size	Oscilloscope Peak-Peak Measurement Readout
5 : 1	10 V	100 mV/div	488.5 mV to 511.5 mV
2 : 1	20 V	100 mV/div	390.8 mV to 409.2 mV
1 : 1	50 V	100 mV/div	488.5 mV to 511.5 mV
1 : 2	100 V	100 mV/div	486.5 mV to 513.5 mV
1 : 5	100 V	50 mV/div	194.6 mV to 205.4 mV
1 : 10	100 V	20 mV/div	97.3 mV to 102.7 mV
1 : 20	100 V	10 mV/div	48.4 mV to 51.6 mV
1 : 50	100 V	5 mV/div	19.36 mV to 20.64 mV

Probe Check

Perform this check with the A6906S Fiber-Optic Isolation System connected to an oscilloscope and configured for normal use, as shown in Figure 3 on page 3. Use the 6-inch ground lead on the probe common lead.

1. Check that the probe readout on the A69R06 has the 100× light turned on.
2. Connect a coaxial cable to the **HIGH AMPL** (high amplitude) output of a calibration generator. Attach a BNC to dual banana connector to the other end of the coaxial cable. Connect the A6906S probe to the BNC to dual banana connector by attaching the probe tip to the signal side of the BNC to dual banana connector and attaching the reference common lead to the ground side. Figure 14 illustrates these connections.

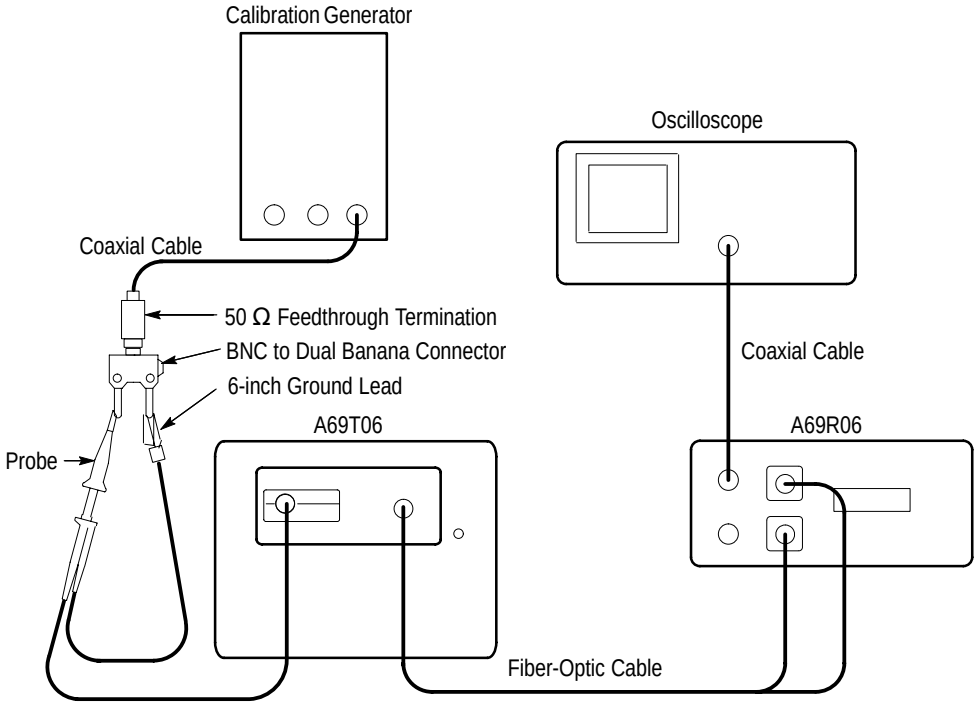


Figure 14: Probe Check Setup

3. Set up the oscilloscope:

Horizontal	2 µs/div
Vertical	10 mV/div
Coupling	DC
Impedance	50 Ω
BW Limit	On (20 MHz or 100 MHz)
Acquisition Mode	Average

4. Adjust the A69R06 **ATTENUATOR** to 1 : 1.

5. Set the calibration generator to produce a 10 kHz high-amplitude signal, and the output amplitude to display a 5 division high waveform on the oscilloscope.

6. Confirm that the flatness of the upper waveform half is within 4% of total signal amplitude.

Appendix C: GPIB Interface Messages

The following explains how the A69R06 reacts to standard interface messages. Message abbreviations used are from ANSI/IEEE Std 488–1978.

My Talk Address and My Listen Address (MTA and MLA)

The A69R06's address is established as previously explained in the GPIB Address and Terminator information. When the A69R06 receives its own address along with either of these messages, it responds by entering the appropriate state: ready to talk or ready to listen.

Go to Local (GTL)

The GTL message sets the A69R06 to local state.

Device Clear (DCL)

The DCL message reinitializes communication between the A69R06 and the controller. In response to DCL, the A69R06 clears any input and output messages as well as any unexecuted control settings. Also cleared are any errors and events waiting to be reported (except the power-on event). If the SRQ line is asserted for any reason other than power-on, it becomes unasserted when the DCL message is received.

Selected Device Clear (SDC)

The SDC message performs the same function as DCL; however, only instruments that have been listen-addressed respond to SDC.

Serial Poll Enable and Disable (SPE and SPD)

The SPE message causes the A69R06 to transmit its serial-poll status byte when it is talk addressed. The SPD message switches the A69R06 back to normal operation.

Unlisten and Untalk (UNL and UNT)

When the UNL message is received, the A69R06's listen function is placed in an idle (unaddressed) state. In the idle state, the A69R06 will not accept messages over the bus until MLA is asserted.

The talk function is placed in an idle state when the A69R06 receives the UNT message. In this state, the A69R06 cannot transmit via the bus until MTA is asserted.

Interface Clear (IFC)

When IFC is asserted, both the Talk and Listen functions are placed in an idle state. This produces the same effect as receiving both the UNT and the UNL commands.

Remote/Local Functions

The A69R06 is always in one of the following states:

Local. The A69R06 always starts up in local mode when power is first applied. In addition, the unit switches to local mode from remote mode when one of the following occurs:

- A front panel operation is performed while in remote mode.
- The REN line goes false.
- The GTL message is received when addressed as a listener.

Remote. When both the ATN and REN lines are true and the A69R06 receives an MLA message, operation changes from local status to remote status.

Warning

The following servicing instructions are for use only by qualified personnel. To avoid personal injury, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer to General Safety Summary and Service Safety Summary prior to performing any service.

Appendix D: Maintenance

Most of the parts of the A6906S Fiber-Optic Isolation System cannot be serviced by the user. User repair is limited to replacing the following modules:

- The entire A69C06.
- Line fuse in the A69C06.
- The entire A69R06 (replacement requires factory recalibration of all modules).
- Line fuse in the A69R06.
- The entire A69T06 (replacement requires factory recalibration of all modules).
- battery pack in the A69T06.
- Probe in the A69T06.
- Fiber-Optic Cable in the A69T06 (replacement with fiber-optic cable of different length may require factory recalibration of all modules—see Table 14 on page 46).

NOTE. *The A69T06 Transmitter, fiber-optic cable, and A69R06 Receiver are calibrated at the factory as a matched unit. Tektronix does not warrant performance to specifications if you exchange modules among A6906S Fiber-Optic Isolation Systems. Always use an A69T06 and A69R06 having matching serial numbers.*

You can replace a failed module or return it to your Tektronix Service Center for repair. If you replace the A69T06, A69R06, or in some cases replace the fiber-optic cable with one of a different length, you must return the entire A6906S Fiber-Optic Isolation System to your Tektronix Service Center for calibration or performance to specifications is not warranted.

Replacing Fuses

The A69R06 and A69C06 have AC line fuses. The A69T06 and the battery pack do not have user-replaceable fuses.

CAUTION. *To prevent equipment damage, do not substitute a spare fuse from one assembly for another. The spare fuses for the A69C06 and the A69R06 are not interchangeable.*

The housing for the fuses is a part of the line cord connector in the body of the A69R06 and A69C06 modules. To remove the fuse, unplug the AC power cord from the A69R06 or A69C06. Using a small screwdriver, open the fuse case and replace the fuse. Always replace the fuse with one of the same type and ratings.

Replacing the Probe

You can replace the probe attached to the A69T06 by removing the panel of the A69T06 that the probe cord passes through. You will need a small PZ1 POSIDRIV screwdriver.

WARNING. *To prevent injury or death, do not use the A6906S while the transmitter is open for access to the transmitter sub-unit. Electrical isolation is not provided and the transmitter sub-unit will be at ground potential of the system being measured.*

1. Remove the panel of the A69T06 by removing the six screws holding it in place. Pull the panel out slowly, being careful not to put tension on the fiber-optic cable.

CAUTION. *To prevent cable or probe damage, do not pull on the fiber-optic cable or the fiber-optic cable connectors.*

   If you need more free length of fiber-optic cable, carefully pull it through the grommet holding it in the removed panel. Pull slowly and do not exert any tension on the optical connectors inside the A69T06.

2. Pull out the two spacers holding the transmitter sub-unit inside the A69T06.

3. Reach inside the A69T06 and pull the transmitter sub-unit out, but do not completely remove it from the case of the A69T06. See Figure NO TAG. If necessary, pull on the probe compensation box (part of the probe connector).

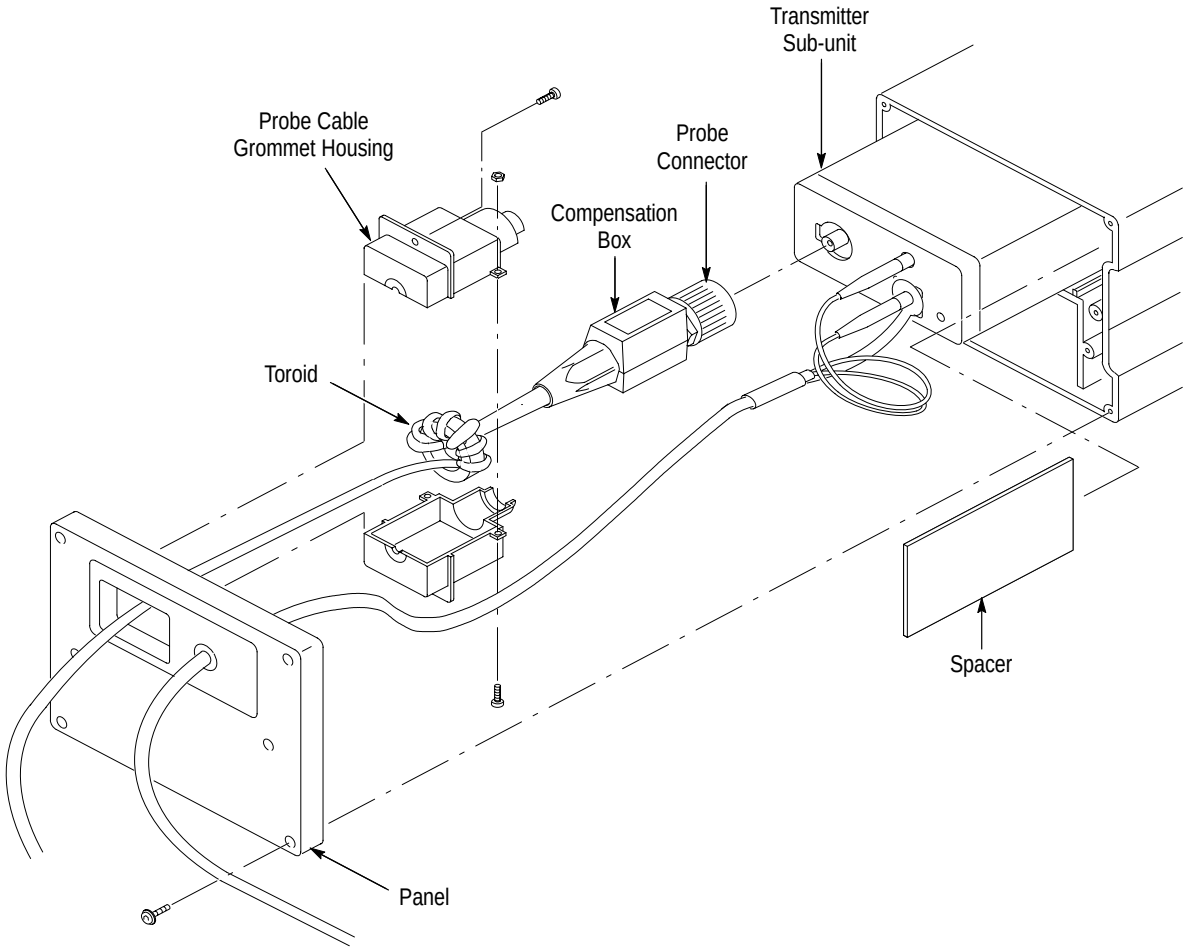


Figure 15: Replacing the probe

4. Remove the probe from the transmitter sub-unit **ELEC INPUT** connector by rotating the probe connector counterclockwise and pulling it off.

5. Remove the probe cord grommet housing from the A69T06 panel by removing the two screws holding it in place.

6. Remove the two screw and nut assemblies holding together the two halves of the grommet assembly.

7. Pull the probe out through the A69T06 front panel.

8. Remove the probe tip from the probe to allow the probe head to pass through the toroid.

9. Unwind the probe cable from the toroid inside the probe cable grommet housing. The toroid improves the high frequency CMRR performance of the A6906S.

WARNING. *To prevent injury or death, do not substitute probes of different types for the double-insulated probe supplied with the A69T06. Exposed conductive parts of the probe are at ground potential of the system being measured.*

10. Reassemble the A6906S in the reverse order of disassembly.

NOTE. *Begin reassembly by winding the probe cable around the toroid. Wind exactly seven full turns around the toroid, and keep the toroid as close to the probe compensation box as possible. The strain relief on the probe cable coming out of the probe compensation box can be part of the cord that is wound around the toroid.*

11. Before completing reassembly of the A69T06, perform a low-frequency compensation of the new probe, as described in the next section. Perform this adustment before reinstalling the back panel.

12. After compensating the new probe, complete the assembly by reinstalling the A69T06 back panel. Two of the six screws for this panel are shorter than the others; the shorter screws go in the middle height positions on the panel and the longer screws go in the corners.

Probe Compensation

Perform the probe compensation with the A6906S Fiber-Optic Isolation System configured for normal use.

1. Connect the A6906S probe to the calibrator output of the test oscilloscope.
2. Adjust the A69R06 **ATTENUATOR** to 5 : 1.

NOTE. *The common lead of the A6906S must be connected to a ground connector on the test oscilloscope for successful completion of the low-frequency probe compensation.*

3. Set the test oscilloscope to display the calibrator signal.
4. Set the horizontal to display at least one full waveform cycle, and set the vertical so that the waveform amplitude is at least 80% of full screen height.
5. Insert a non-conductive screwdriver into the hole in the A6906S probe compensation box. Rotate the screwdriver until optimum waveform flatness is obtained. The probe compensation box is attached to the probe connector that attaches to the A69T06.

Replacing the Fiber-Optic Cable

You can replace the fiber-optic cable with one of the cables listed in Table 13.

CAUTION. *To prevent equipment damage, use extreme caution not to damage the cable or connectors when replacing a fiber-optic cable. If you do not have experience working with fiber-optic cable and connectors, you are encouraged to return the A6906S Fiber-Optic Isolation System to a Tektronix Service Center for cable replacement and calibration.*

Table 13: Available Fiber-Optic Cables

Fiber-Optic Cable Length	Cable Type A	Cable Type B
3 m	174-3152-00	174-3152-01
10 m	174-2924-01	174-2924-02
20 m	174-2925-01	174-2925-02
100 m	174-2926-01	174-2926-02
200 m	174-2927-01	174-2927-02

NOTE. *If you replace the fiber-optic cable with a different length than previously installed, you may need to return the complete A6906S Fiber-Optic Isolation System to a Tektronix Service Center. Performance to specifications is not warranted unless calibrated by Tektronix.*

Table 14 lists cable length changes that require system recalibration.

Table 14: Fiber-Optic Cable Changes Requiring Recalibration

Fiber-Optic Cable Length	to 3 m	to 10 m	to 20 m	to 100 m	to 200 m
from 3 m				recalibrate	recalibrate
from 10 m				recalibrate	recalibrate
from 20 m				recalibrate	recalibrate
from 100 m	recalibrate	recalibrate	recalibrate		recalibrate
from 200 m	recalibrate	recalibrate	recalibrate	recalibrate	

To replace the fiber-optic cable, remove the panel of the A69T06 that the probe cord passes through using a small PZ1 POSIDRIV screwdriver.

CAUTION. *Before removing the fiber-optic cable from the A69T06, make sure the other end of the cable is disconnected from the A69R06 and the cable connectors at that end have the protective caps in place. Replace the optical connector covers on the A69R06 whenever the fiber-optic cable is disconnected.*

Transmitter Panel Removal

Refer to Figure 16 when removing the transmitter panel.

CAUTION. *Before removing the fiber-optic cable from the A69T06, make sure the other end of the cable is disconnected from the A69R06 and the cable connectors at that end have the protective caps in place. Replace the optical connector covers on the A69R06 whenever the fiber-optic cable is disconnected.*

1. Remove the panel of the A69T06 by unscrewing and removing the six screws that hold it in place. Pull the panel out slowly, being careful not to pull on the fiber-optic cable.

CAUTION. *Do not pull on the fiber-optic cable or the fiber-optic cable connectors. Excessive strain can damage the fiber-optic cable or probe.*

2. Pull out the two spacers holding the transmitter sub-unit inside the A69T06. Reach inside the A69T06 and pull the transmitter sub-unit out, but do not completely remove it from the case of the A69T06. If necessary, you may grasp and pull on the probe compensation box which is part of the probe connector.

WARNING. *While the A69T06 Transmitter is open for access to the transmitter sub-unit, electrical isolation is not provided and the transmitter sub-unit will be at ground potential of the system being measured. Do not use the A6906S in a floating-ground mode, or use it to measure hazardous voltages, while the A69T06 is open.*

3. Disconnect the probe from the **ELEC INPUT** connector on the transmitter sub-unit by twisting the probe connector counterclockwise and pulling it off.

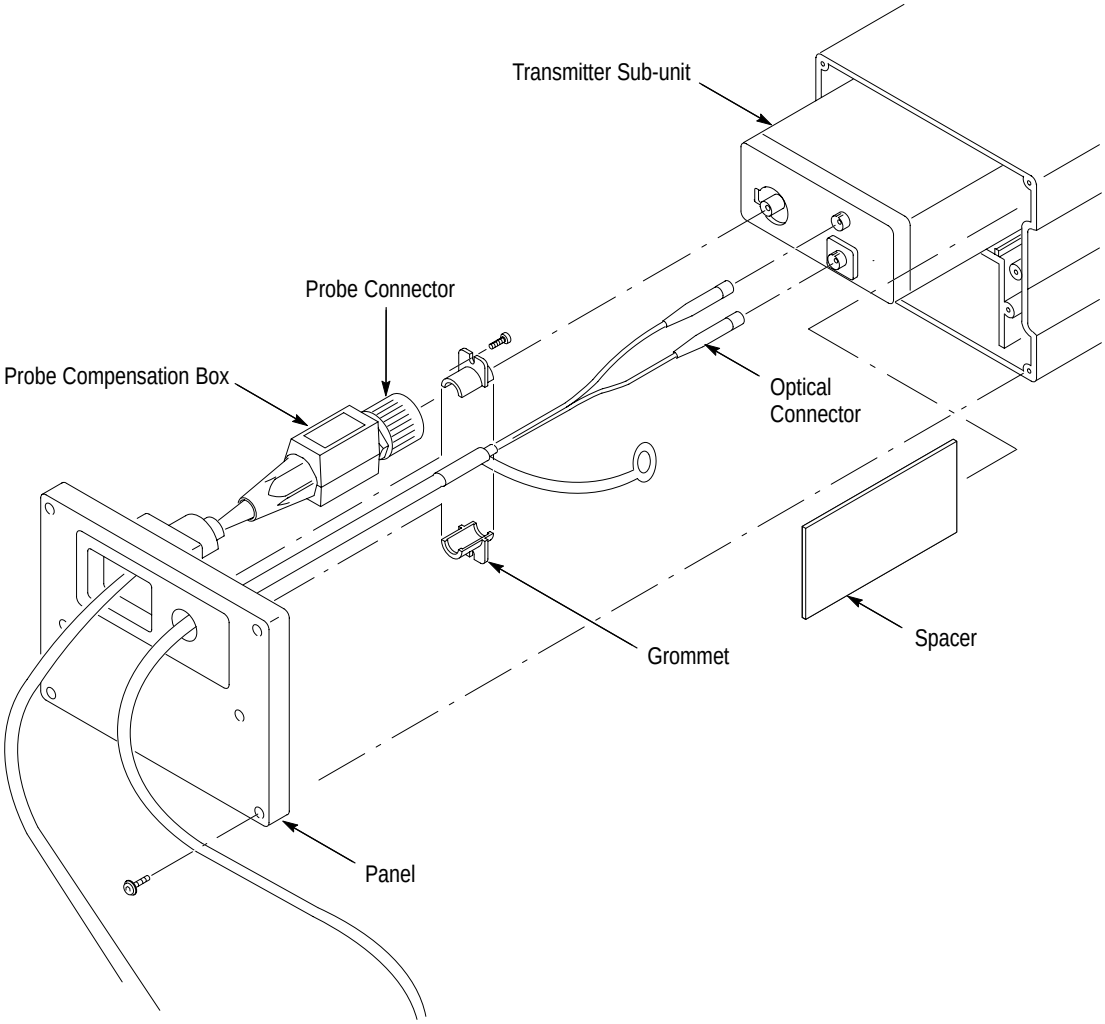


Figure 16: Removing the Panel

Fiber-optic Cable Removal

If you are replacing a fiber-optic cable perform steps 1 to 3. If this is a first-time installation, perform step 2.

1. Remove the fiber-optic cable from the transmitter sub-unit by unscrewing the two optical connectors. Pull off the connectors along with the cable strain release.
2. Remove the optical cable grommet from the A69T06 panel by removing the two screws holding it in place. Once unscrewed, the grommet will disassemble into two pieces.
3. Pull out one connector at a time through the A69T06 panel.

Fiber-optic Cable Installation

The installation procedure varies depending on whether the fiber-optic cable is type A or B as shown in Table 13 on page 46.

Installation for Fiber-optic Cable Type A

See Figure17 for installing the fiber-optic cable type A.

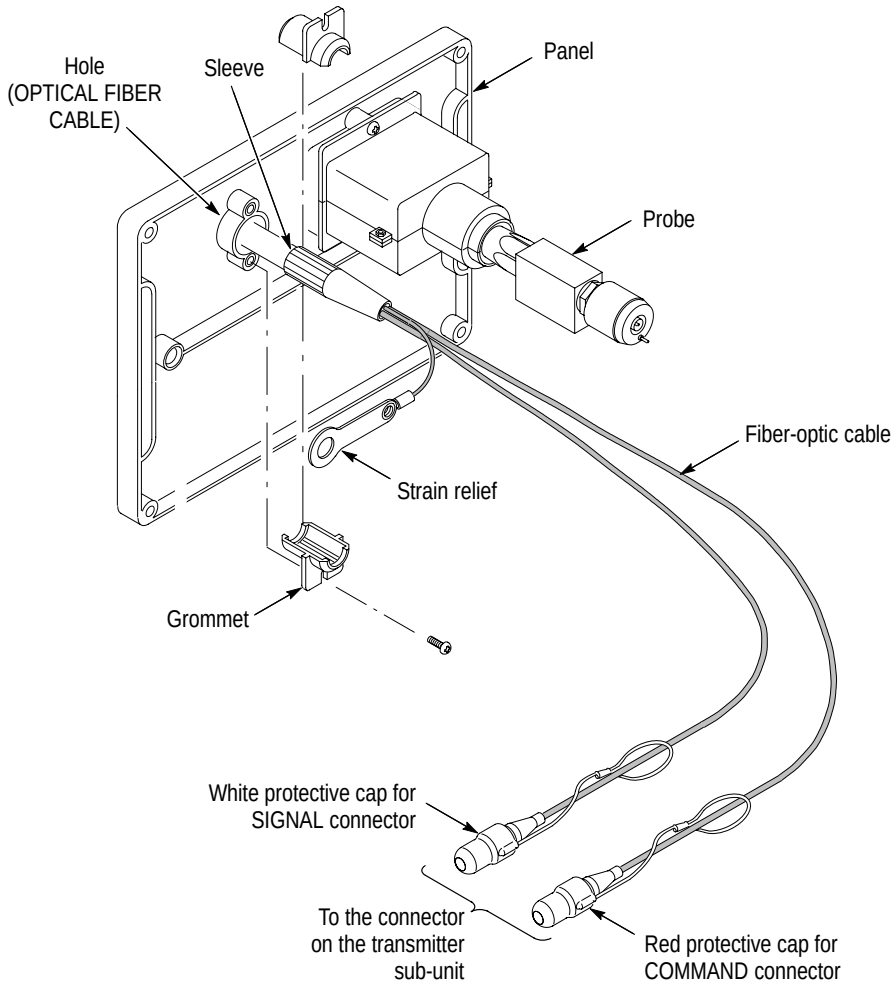


Figure 17: Fiber-optic Cable Installation (for Type A)

1. Pass one of the optical connectors from outside to inside through the hole labeled **OPTICAL FIBER CABLE** on the panel.

CAUTION. *You cannot pass the other connectors through the hole unless the protective caps are removed. To prevent damage, be careful not to get the connectors dirty.*

2. Remove the protective cap from the other connector, and then pass that connector from outside to inside through the hole on the panel.
3. Pass the strain relief from outside to inside through the hole on the panel.
4. Connect the **SIGNAL** connector (with white protective cap) of the fiber-optic cable to the **OPTICAL SIGNAL INPUT** connector on the transmit sub-unit.
5. Place the cable strain relief around the **OPTICAL COMMAND INPUT** connector on the transmit sub-unit, as show in Figure 18.

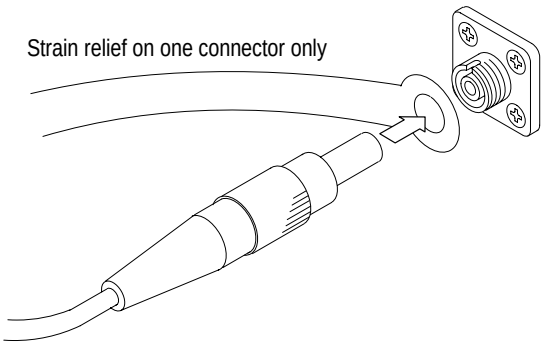


Figure 18: Connection of the Fiber-optic Cable and Connector

6. Connect the **COMMAND** connector (with red protective cap) of the fiber-optic cable to the **OPTICAL COMMAND INPUT** connector on the transmit sub-unit. Verify that the cable strain relief is firmly seated between the connectors.

Installation for Fiber-optic Cable Type B

See Figure 19 for installing the fiber-optic cable type B.

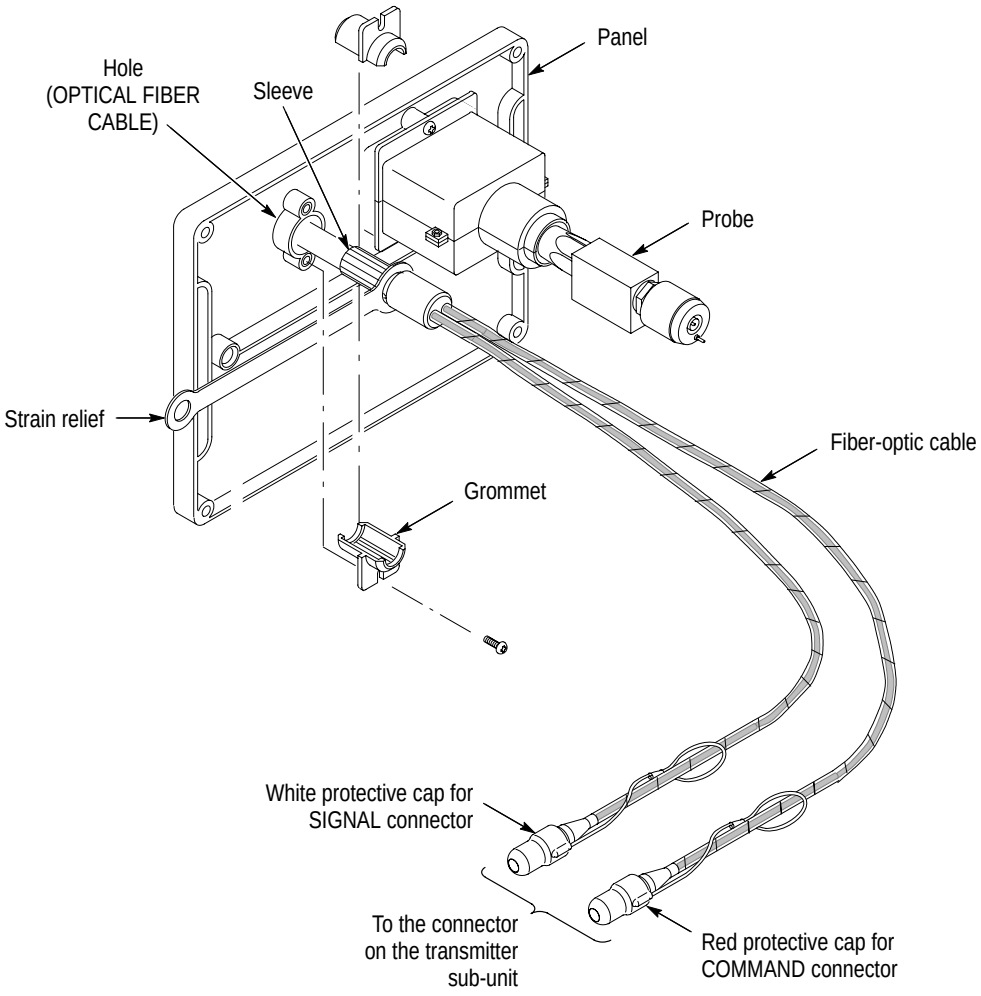


Figure 19: Fiber-optic Cable Installation (for Type B)

1. Pass one of the optical connectors from outside to inside through the hole labeled **OPTICAL FIBER CABLE** on the panel.

CAUTION. *You cannot pass the other connector through the hole unless the protective cap is removed. To prevent equipment damage, be careful not to get the connector dirty.*

2. Remove the protective cap from the other connector, and then pass that connector from outside to inside through the hole on the panel.

3. Move the strain relief backward from the sleeve of the fiber-optic cable, and then pass the whole sleeve completely through the hole on the panel.
4. As slightly bending the end of the strain relief where the fiber-optic cable is passing through, pass the whole strain relief from outside to inside through the hole on the panel.
5. Connect the **SIGNAL** connector (with white protective cap) of the fiber-optic cable to the **OPTICAL SIGNAL INPUT** connector on the transmit sub-unit.
6. Place the cable strain relief around the **OPTICAL COMMAND INPUT** connector on the transmit sub-unit, as show in Figure18.
7. Connect the **COMMAND** connector (with red protective cap) of the fiber-optic cable to the **OPTICAL COMMAND INPUT** connector on the transmit sub-unit. Verify that the cable strain relief is firmly seated between the connectors.

Panel Installation

1. Cover the fiber-optic cable sleeve with two pieces of optical cable grommet while observing the orientation of the grommet in the panel; the long end points away from the transmitter sub-unit, and then install the grommet into the panel as was being installed before.
2. Connect the probe to the **ELEC INPUT** connector on the transmitter sub-unit.

CAUTION. *When re-installing the panel, be careful not to put the fiber-optic cable between the panel and the cabinet.*

3. Re-install the panel of the A69T06 by screwing the six screws. Two of the six screws for the panel are shorter than the others; the shorter screws go into the middle height positions on the panel and the longer screws go into the corners.

Calibration

Perform the performance check for the A6906S instrument as described in *Appendix B: Performance Verification*.

Appendix E: Replaceable Parts List

This section contains a list of the components that are replaceable for the A6906S Fiber-Optic Isolation System. As described below, use these lists 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.

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 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.

Indentation System

This parts list is indented to show the relationship between items. The following example is of the indentation system used in the Description column:

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
(END ATTACHING PARTS)

Detail Part of Assembly and/or Component
Attaching parts for Detail Part
(END ATTACHING PARTS)

Parts of Detail Part
Attaching parts for Parts of Detail Part
(END ATTACHING PARTS)

Attaching parts always appear at the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. Attaching parts must be purchased separately, unless otherwise specified.

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
S3109	FELLER	72 Veronica Ave Unit 4	Summerset NJ 08873
TK0191	SONY/TEKTRONIX	PO BOX 5209, TOKYO INTERNATIONAL	TOKYO JAPAN 100–31
TK2541	AMERICOR ELECTRONICS LTD	2682 W COYLE AVENUE	ELK GROVE VILLAGE IL 60007
0B445	ELECTRI–CORD MFG CO INC	312 EAST MAIN ST	WESTFIELD PA 16950
64537	KDI ELECTRONICS INC SUBSIDIARY OF KDI CORP	31 FARINELLA DR	EAST HANOVER NJ 07936
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Serial No. Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
16–1	010–0568–00			1	PROBE,PASSIVE:DOUBLE INSULATED,100X (ALSO INCLUDES 16-10 AND 16-11)	80009	010056800
–2	650–3122–00	J300000	J300290	1	TRANSMITTER:W/INSULATING BOX (A69T06) (STANDARD ONLY)	80009	650312200
	650–3122–01	J300291		1	TRANSMITTER:W/INSULATING BOX (A69T06) (STANDARD ONLY)	80009	650312201
	650–3123–00	J300000	J300290	1	TRANSMITTER:W/INSULATING BOX (A69T06;03) (OPTION 03 ONLY)	80009	650312300
	650–3123–01	J300291		1	TRANSMITTER:W/INSULATING BOX (A69T06;03) (OPTION 03 ONLY)	80009	650312301
–3	650–3022–00			1	BATTERY PACK AS:6V 12AH,SHIELDED LEAD–ACID BATTERY	80009	650302200
–4	159–0345–00			1	FUSE,CARTRIDGE:DIN,1A,250V,FAST	80009	159034500
–5	159–0260–00			1	FUSE,CARTRIDGE:2A,250V,MEDIUM	80009	159026000
–6	650–3063–00			1	RECEIVER: A69R06	80009	650306300
–7	174–3152–00			1	CA ASSY,FBR OPT:3M L,MULTIMODE,FC TO FC (STANDARD ONLY)	80009	174315200
	174–2925–01			1	CA ASSY,FBR OPT:20M L,MULTIMODE,FC TO FC, W/TENSION RELIEF (OPTION 01 ONLY)	80009	174292501
	174–2926–01			1	CA ASSY,FBR OPT:100M L,MULTIMODE,FC TO FC, W/TENSION RELIEF (OPTION 02 ONLY)	80009	174292601
	174–2927–01			1	CA ASSY,FBR OPT:200M L,MULTIMODE,FC TO FC, W/TENSION RELIEF (OPTION 03 ONLY)	80009	174292701
	174–2924–01			1	CA ASSY,FBR OPT:10M L,MULTIMODE,FC TO FC, W/TENSION RELIEF (OPTION 04 ONLY)	80009	174292401
–8	200–4146–00			2	COVER,DUST:FC TYPE FBR OPT CONN,WHITE	80009	200414600
–9	650–3064–00			1	BATTERY CHARGER: A69C06	80009	650306400
–10	206–0461–00			1	PROBE,HEAD:100X,BLACK (PART OF 16–1)	80009	206046100
–11	013–0107–08			1	TIP,PROBE:MINIATURE/COMPACT SIZE,BLACK (PART OF 16–1)	80009	013010708
–12	200–4147–00			2	COVER,DUST:FC TYPE FBR OPT CONN,RED	80009	200414700
–13	200–4173–00			2	CAP,DUST:FC TYPE OPT FBR CONN,PLASTIC	80009	200417300

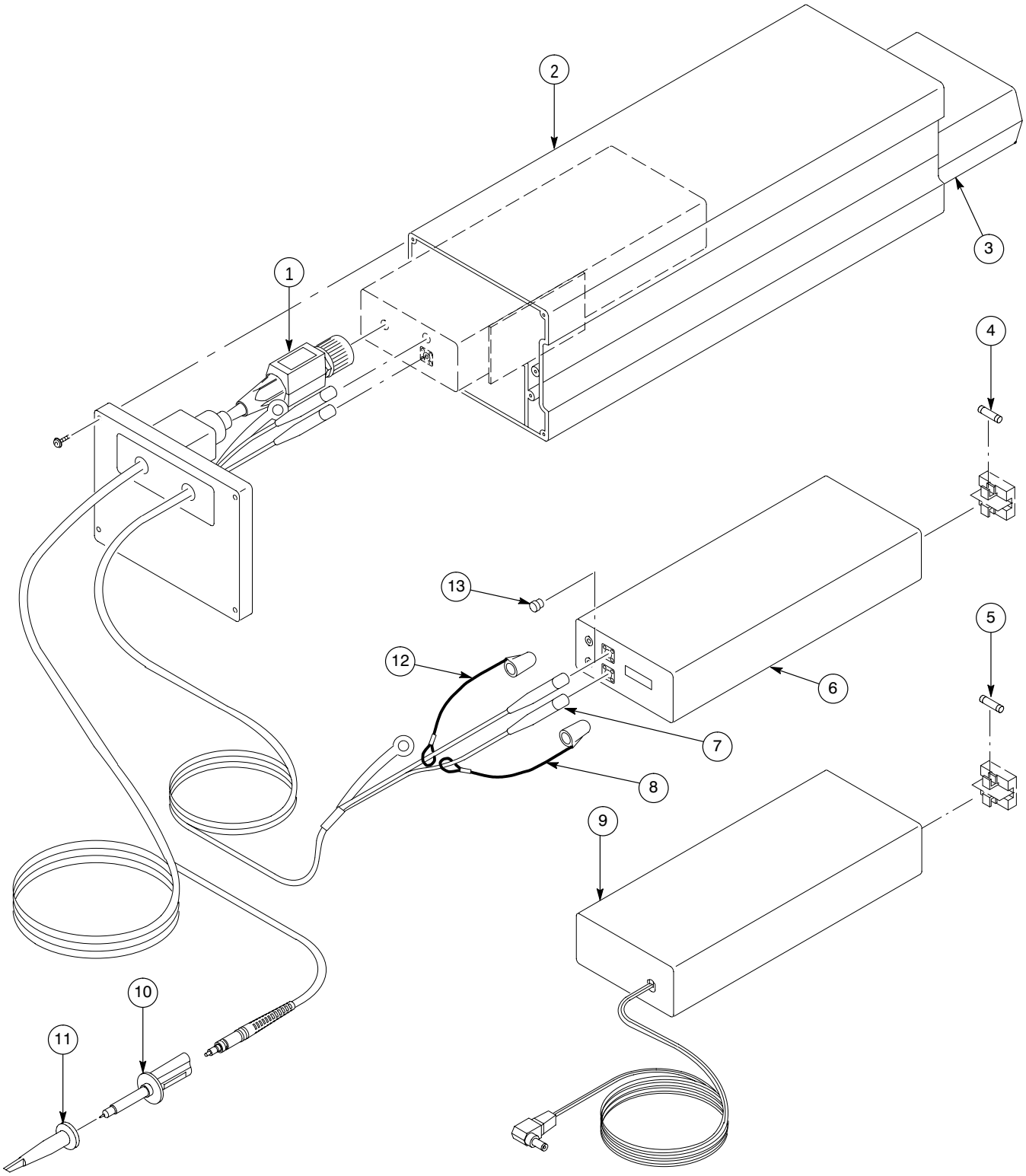


Figure 20: Replaceable Parts

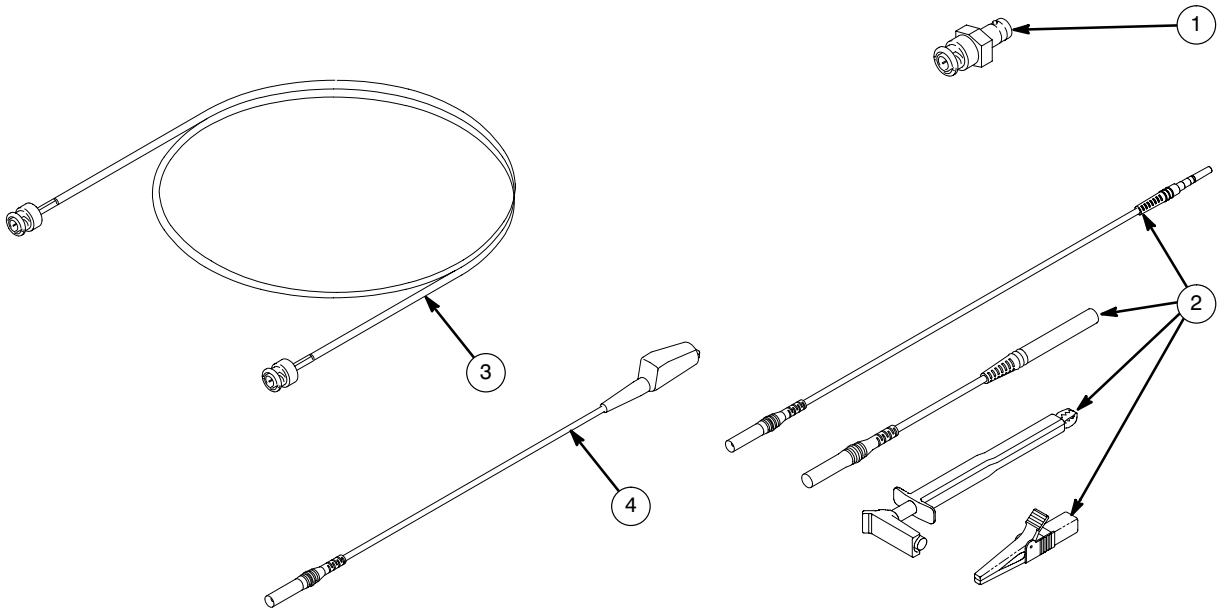


Figure 21: Accessories

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Serial No. Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
21–					**STANDARD ACCESSORIES**		
–1	011–0049–01			1	TERMN,COAXIAL:50 OHM,2W,BNC	64537	T132DS
–2	012–1392–00			1	LEAD,SET:(1) SIGNAL,(1) GROUND	80009	012139200
–3	012–0057–01			1	CA ASSY,RF:COAXIAL,;RFD,50 OHM,43 L,BNC,MALE,STR, BOTH ENDS,W/STRAIN RELIEF BOOT BOTH ENDS	80009	012005701
–4	196–3422–00	J300406		1	LEAD,ELECTRICAL23 AWG,6.000 L,BLACK PVC	TK0191	196342200
	016–1218–00			1	CLEANER:2.5MM DIA X 130MM L,CHEMICAL TEXTILE, STICK–TYPE,5 PIECES	80009	016121800
	161–0066–00			2	CABLE ASSY,PWR,:3,18AWG,98 L,SVT,GREY/BLK,60 DEG C,IEC BME X STR,IEC RCPT,10A/125V (STANDARD ONLY)	0B445	ECM–161–0066–00
	161–0066–09			2	CABLE ASSY,PWR,:3,0.75MM SQ,220V,99.0 L EUROPEAN (OPTION A1–EUR0PEAN)	S3109	86511000
	161–0066–10			2	CABLE ASSY,PWR,:3,0.1MM SQ,250VOLT,2.5 METERS LONG,UNITED KINGDOM,STR IEC–320 RCPT,13 AMP FUSED UK PLUG (OPTION A2–UNITED KINGDOM)	S3109	BS/13–H05VVF3G0
	161–0066–11			2	CABLE ASSY,PWR,:3,1.00MM SQUARED,250V,10 AMP, 2.5METERS LONG,AUSTRALIA, (STRAIGHT) (OPTION A3–AUSTRALIAN)	S3109	198–000
	161–0066–12			2	CABLE ASSY,PWR,:3,18 AWG,98 L,SVT,GREY/BLK, 60 DEG C,BME X STR,IEC RCPT,10A/250V (OPTION A4–NORTH AMERICAN)	TK2541	13E68,25–1E–250

Fig. & Index No.	Tektronix Part No.	Serial No. Effective	Serial No. Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
	161–0154–00			2	CABLE ASSY,PWR,:3,1.00MM SQ,250V,10A,2.5 METER (OPTION A5–SWISS)	S3109	12–H05VVF3G 00–
	159–0260–00			1	FUSE,CARTRIDGE:2A,250V,MEDIUM	80009	159026000
	159–0345–00			1	FUSE,CARTRIDGE:DIN,1A,250V,FAST	80009	159034500
	070–8900–04			1	MANUAL,TECH:USER A6906S	80009	070890004
					OPTIONAL ACCESSORIES		
	011–0055–01			1	TERM,COAXIAL:75 OHM,1W,BNC	80009	011005501
	012–0991–00			1	CABLE,COMPOSITE:IDC,GBIB,2 METER,24 COND	80009	012099100
	012–0074–00			1	CA ASSY,RF:COAXIAL,RFD,75 OHM	80009	012007400
	016–1208–00			1	CLEANER:2.5 MM DIA X 130 MM L TEXTILE,STICK–TYPE, 200 PIECES	80009	016120800
	252–0408–00			1	OIL:INDEX MATCHING OIL FOR OPT CONN	80009	252040800

Glossary

Amplification
The degree of increase in amplitude as a signal passes through a device such as a probe or amplifier. That is, the ratio of the output measure to the input measure. For example, a ×5 amplifier will magnify, or increase, the input signal's voltage by a factor of 5. Amplification is the reciprocal of attenuation.

Attenuation
The degree of reduction in amplitude as a signal passes through a device such as a probe or attenuator. That is, the ratio of the input measure to the output measure. For example, 100× probe will attenuate, or reduce, the input signal's voltage by a factor of 100. Attenuation is the reciprocal of amplification.

Bandwidth
The frequency range within which an instrument's performance with regard to a particular characteristic falls within specified limits, usually –3 dB.

Controller
A computer that controls the action of one or more peripheral devices.

Coupling
The association of two or more systems or circuits for the transfer of power or information from one to the other.

Fiber-Optic Cable
A cable of one or more conductors that carry information in the form of the relative intensity of a signal of light.

Floating Ground
A system where signal ground is connected to a potential that is different than earth ground.

Frequency
The reciprocal of the time period. Measured in Hertz (Hz) where 1 Hz = 1 cycle per second.

Gain
See *Amplification*.

GPIB (General Purpose Interface Bus)
An interconnection bus and protocol that allows you to connect multiple instruments in a network under the control of a controller. Also known as IEEE 488 bus. Transfers data with eight parallel data lines, five control lines, and three handshake lines.

Isolation
Electrical insulation between the input signal ground of a measurement system and earth ground. Usually, the output of an isolation system grounds the output signal to the earth ground.

Oscilloscope
An instrument for making a graph of two factors, usually voltage versus time.

Probe
An input device that connects test and measurement equipment to a circuit under test.

Query
A type of command that requests a specified condition or status of the instrument.

S/N Ratio
The ratio of the signal level to the noise level of a waveform.

SRQ
A Service ReQuest is initiated by the A69R06 in response to some internal event, in order to call this event to the attention of an external controller connected to the GPIB interface.

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