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59552A
Fiber-Optic Distribution Amplifier
and
59553A
Fiber-Optic Receiver

User's Guide

This manual describes a Symmetricom fiber-optic distribution amplifier and a Symmetricom fiber-optic receiver, including their system hardware and software.

This operating manual is the primary document for the 59552A Fiber-Optic Distribution Amplifier and the 59553A Fiber-Optic Receiver.

This manual applies to the 59552A Fiber-Optic Distribution Amplifier and 59553A Fiber-Optic Receiver you have received unless update information is included with the equipment.

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Warning Symbols That May Be Used In This Book

Instruction manual symbol; the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual.

Indicates hazardous voltages.

Indicates earth (ground) terminal.

or

Indicates terminal is connected to chassis when such connection is not apparent.

Indicates Alternating current.

Indicates Direct current.

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- Guide Organization page v
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Guide Organization

Table of Contents lists the beginning of each chapter in the guide, helping you locate information.

In This Guide (this preface) introduces you to the User's guide, provides product descriptions, and general information on the 59552A Fiber-Optic Distribution Amplifier and the 59553A Fiber-Optic Receiver.

Chapter 1, "**Getting Started**," introduces you to the 59552A/59553A with illustrated overviews of a typical distribution system, and the 59552A/59553A's front and rear panels. A section on power cabling requirements is also provided.

Chapter 2, "**Configuring Your 59552A/59553A**," provides configuration procedures with overview information for the 59552A/59553A.

Chapter 3, "**Operational Verification**," provides an abbreviated series of checks that may be performed to give an high degree of confidence that the 59552A and 59553A are operating properly.

Chapter 4, "**Specifications**," lists the 59552A and 59553A specifications and characteristics.

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Description of Symmetricom Fiber-Optic Distribution Amplifier and Receiver

High-integrity distribution of a common clock is the backbone for power-utility substation synchronization. The 59552A Fiber-Optic Distribution Amplifier and the 59553A Fiber-Optic Receiver provide a simple, modular approach to signal routing. Immunity to electrical noise makes fiber-optic cable a superior choice for the challenging environment of the power substation.

59552A Fiber-Optic Distribution Amplifier

The 59552A Fiber-Optic Distribution Amplifier, used with the 59553A Fiber-Optic Receivers, provides clean, timing-quality transmission of precise frequency and time signals, or distribution of timing signals for various applications (such as the analysis, monitoring, and control of power-utility substations). In a typical application requiring distribution of one pulse per second (1 PPS) and IRIG-B time code, the 59552A provides an identical, synchronous clock signal and precise time of day to every distribution point.

The 59552A Fiber-Optic Distribution Amplifier receives a digital (TTL) signal and an analog signal via two BNC connectors. The distribution amplifier combines the signals, and transmits the result on each of the eight fiber-optic outputs. Signal integrity is maintained over fiber-optic cable lengths of up to 1 kilometer (3,281 feet). *One 59553A receiver is required for each of the outputs that are used*.

The 59552A front-panel LEDs provide quick status indication.

The 59552A is completely compatible with the 59551A GPS Measurements Synchronization Module, which provides high-quality timing signals (both 1 PPS and IRIG-B) as standard rear-panel outputs.

59553A Fiber-Optic Receiver

The 59553A Fiber-Optic Receiver is located at remote equipment installations to receive a distributed signal from a common clock. The 59553A receives the signal on fiber-optic cable, separates the analog and digital waveforms, reconstructs the analog time code, and outputs each signal to a BNC connector.

The 59553A, used with the 59552A Fiber-Optic Distribution Amplifier, provides clean, timing-quality transmission to analyze monitoring and control equipment in power-utility substations, or any application involving precise frequency and time signals. In a typical application requiring distribution of one pulse per second (1 PPS) and IRIG-B time code, the 59953A ensures an identical, synchronous clock signal and precise time of day at each distribution point.

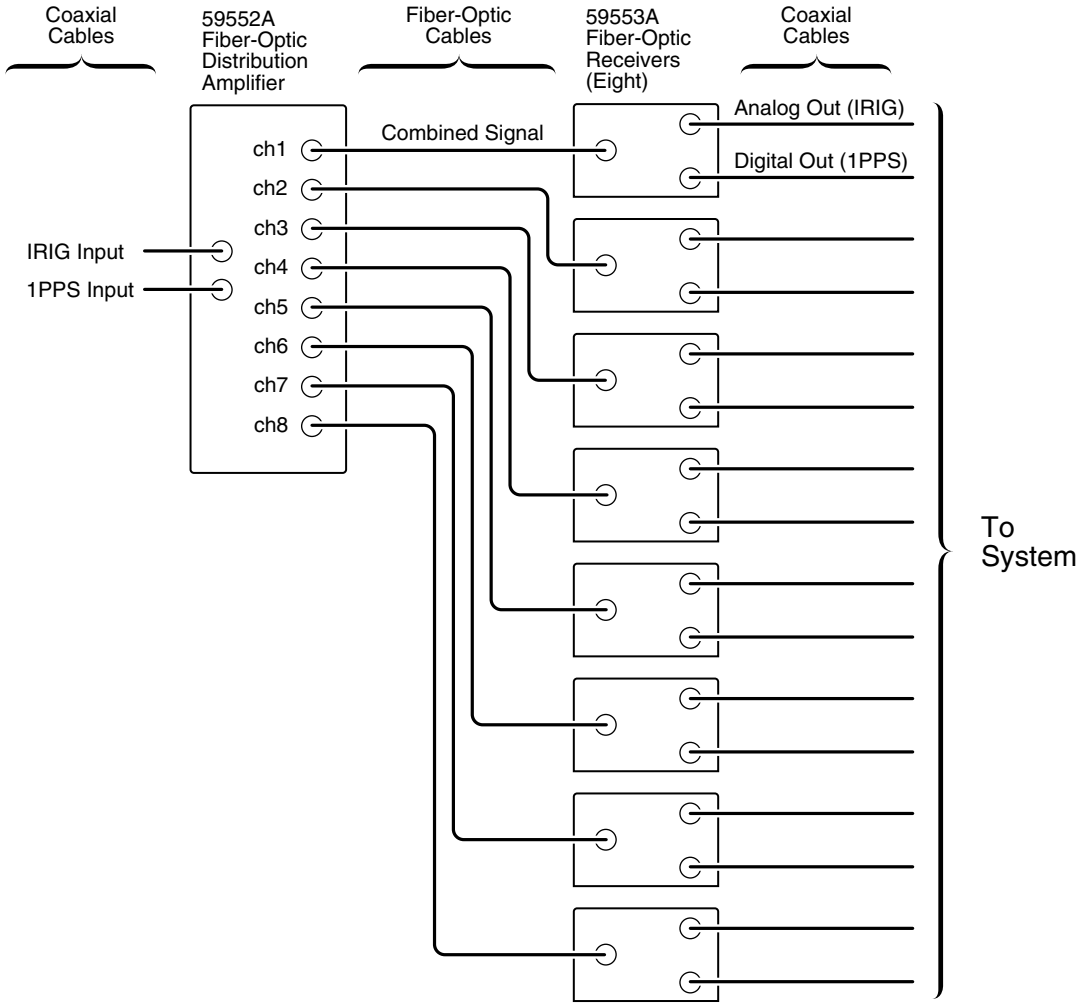
The 59553A front-panel LEDs provide quick status indication.

1

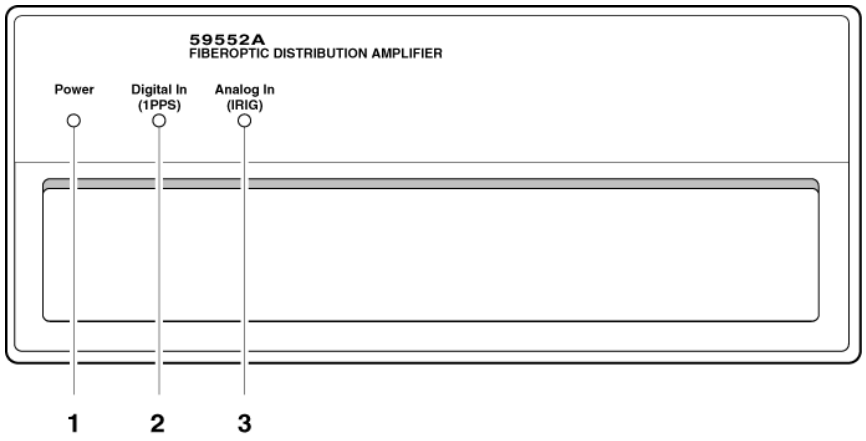
Getting Started

Typical Timing Signal Distribution System

The following block diagram illustrates how the 59552A distribution amplifier and the 59553A receiver can be connected for a typical application requiring distribution of one pulse per second (1 PPS) and IRIG-B time code. The 59553A ensures an identical, synchronous clock signal and precise time of day at each distribution point. In addition to connecting the 59552A and 59553A as shown in the block diagram, you may need to configure both the 59552A and 59553A by positioning internal jumpers (refer to Chapter 2, "Configuring Your 59552A/59553A"). You will also need to connect power to each unit (refer to the section titled "Preparing the 59552A/59553A for Use" in this chapter).



59552A Front Panel at a Glance

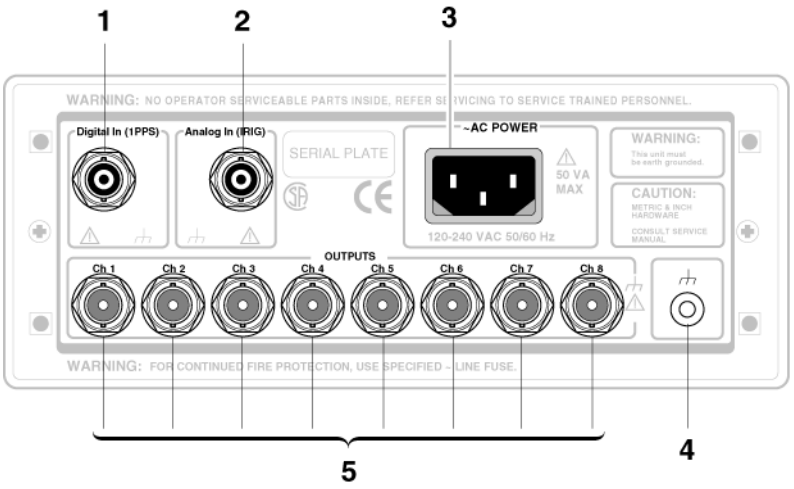


1 When the **Power** indicator is illuminated, it indicates that input power is supplied to the 59552A.

2 When the **Digital In (1 PPS)** indicator is flashing on and off, it indicates that the 59552A is receiving the 1 PPS (1 Pulse Per Second) signal typically from the 59551A GPS Measurements Synchronization Module.

3 When the **Analog In (IRIG)** indicator is illuminated, it indicates that the 59552A is receiving the IRIG-B signal typically from the 59551A GPS Measurements Synchronization Module.

59552A Rear Panel at a Glance



1 Digital In (1 PPS) BNC connector for receiving the 1 Pulse Per Second signal typically from the 59551A GPS Measurements Synchronization Module.

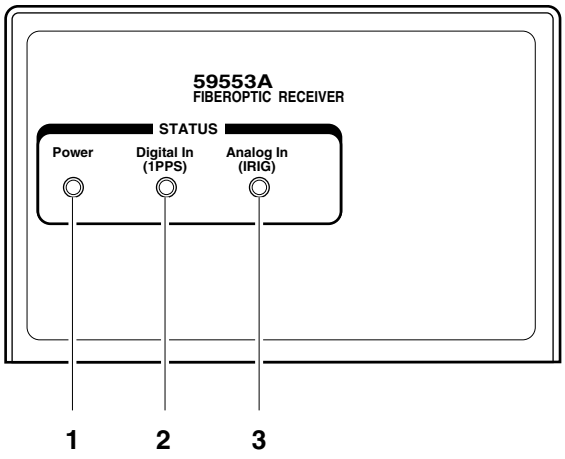
2 Analog In (IRIG) connector for receiving the IRIG-B signal typically from the 59551A GPS Measurements Synchronization Module.

3 AC POWER input jack. The AC input jack is standard. The unit operates from ac voltage. It can also be operated from dc voltage via this ac jack by using the supplied IEC 320 dc connector plug.

4 Frame-ground stud for chassis-ground connection.

5 OUTPUTS fiber-optic connectors (metal ST) for transmitting the results of the two-signal combined (1 PPS and IRIG) or the one-signal digital (1 PPS) to the 59553A Fiber-Optic Receiver.

59553A Front Panel at a Glance

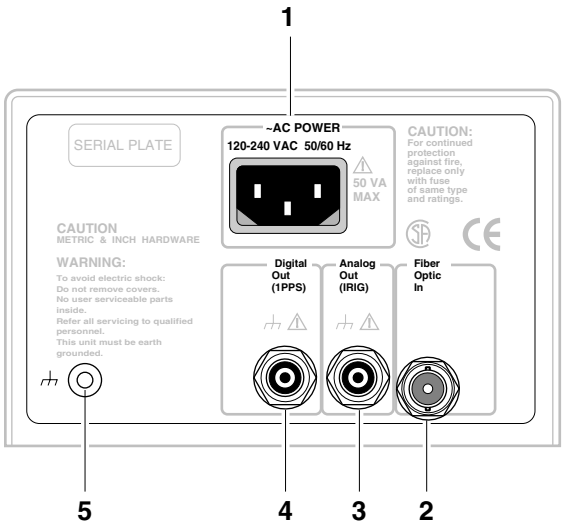


1 When the **Power** indicator is illuminated, it indicates that input power is supplied to the 59553A.

2 When the **Digital In (1 PPS)** indicator is flashing on and off, it indicates that the 59553A is receiving the 1 PPS (1 Pulse Per Second) signal from the 59552A Fiber-Optic Distribution Amplifier.

3 When the **Analog In (IRIG)** indicator is illuminated, it indicates that the 59553A is receiving the IRIG-B signal from the 59552A Fiber-Optic Distribution Amplifier.

59553A Rear Panel at a Glance



1 **AC POWER** input jack. The AC input jack is standard. The unit operates from ac voltage. It can also be operated from dc voltage via this ac jack by using the supplied IEC 320 dc connector plug.

2 **Fiber Optic In** fiber-optic connectors (metal ST) for receiving the transmitted results of the two-signal combined (1 PPS and IRIG) or the one-signal digital (1 PPS) from the 59552A Fiber-Optic Distribution Amplifier.

3 **Analog Out (IRIG)** BNC connector for outputting the signal to the system.

4 **Digital Out (1 PPS)** BNC connector for outputting the signal to the system.

5 Frame-ground stud for chassis-ground connection.

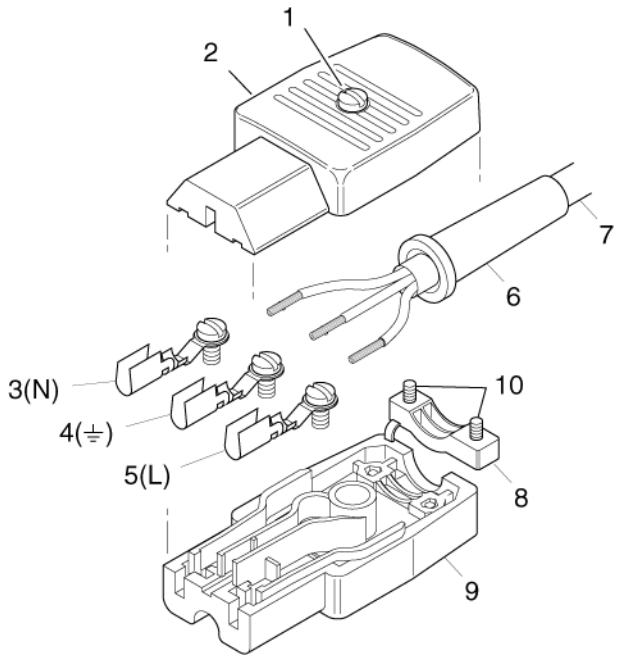
Preparing the 59552A/59553A for Use

To Connect AC Power

The ac power module or jack senses incoming voltage and automatically selects the proper setup. Just connect the 59552A/59553A to the ac power source using the supplied power cord.

To Assemble and Connect the +129 Vdc IEC 320 Connector/Cable

The 59552A/59553A is operated from ac voltage. It can also be operated from 129 Vdc. Note that you will have to assemble your own dc power cable using 18 AWG connecting wires and the supplied IEC 320 dc connector plug as shown in Figure 1-1A.



1 Cover screw
2 Top cover
3 Negative (low voltage) terminal
4 Chassis ground terminal
5 Positive (high voltage) terminal
6 Cable sleeve
7 Cable (customer supplies)
8 Wire clamp
9 Bottom cover
10 Wire clamp screws

Figure 1-1A. 129 Vdc IEC 300 DC Connector Plug and Power Cable Exploded View

1 Using a small flat blade screwdriver, open the connector by loosening the cover center screw (**1**) that holds the two covers (**2**, **9**) of the connector plug together as shown in Figure 1-1A.

2 Using a small flat blade screwdriver, pry loose contact terminals **3**, **4**, and **5** from the bottom cover (**9**) of the connector plug.

3 Slide the cable sleeve (**6**) over the cable (**7**).

4 Loosen the screw of **5** (**L**) terminal, and connect the positive (high) voltage wire to the terminal.

The “L” terminal marking is inscribed inside the bottom cover (**9**).

5 Tighten screw. Soldering is not necessary.

6 Loosen the screw of **3** (**N**) terminal, and connect the negative (low) voltage wire to the terminal.

The “N” terminal marking is inscribed inside the bottom cover (**9**).

7 Tighten screw. Soldering is not necessary.

8 Loosen the screw of **4** (⏚) terminal, and connect the ground (chassis) wire to the terminal.

The “⏚” terminal marking is inscribed inside the bottom cover (**9**).

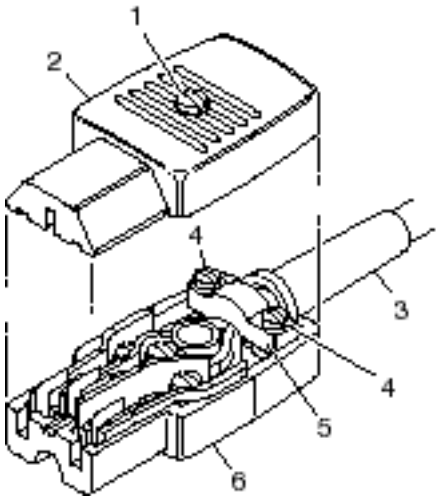
9 Tighten screw. Soldering is not necessary.

10 With the wires connected to the terminals (**3**, **4**, and **5**), re-insert the terminal in their proper positions in the bottom cover (**9**).

11 Make sure that the cable sleeve’s (**6**) brim is placed in the groove or slot in the bottom cover (**9**).

12 Clamp the wires down using the wire clamp (**8**). Position the clamp and over the wires and attach and secure it to bottom cover (**9**) by tightening the two screws (**10**).

At this point, your connector plug and cable assembly should look similar to Figure 1-1B.



1 Cover screw
2 Top cover
3 Cable sleeve
4 Wire clamp screws
5 Wire clamp
6 Bottom cover

Figure 1-1B. 129 Vdc DC Power Cable Assembly

13 As shown in Figure 1-1B, join the two covers (**2**, **6**) by properly positioning them together and tightening the wire clamp screws (**4**).

14 Finally, secure the two covers by tightening the cover screw (**1**).

15 Observing the correct polarity, attach the other ends of the wires to a proper dc power source to operate the Module.

2

Configuring Your 59552A/59553A

Chapter Contents

This chapter provides configuration procedures with overview information for the 59552A/59553A.

This chapter is organized as follows:

- Introduction page 2-3
- Removing the Covers page 2-5
  - To Remove 59552A Cover page 2-5
  - To Remove 59553A Cover page 2-6
- Configuring for One-Signal Distribution (Digital Mode Operation) page 2-9
  - Overview of the Digital Mode page 2-9
  - To Configure the 59552A and 59553A for Digital Mode Operation page 2-11
- Configuring for Two-Signal Distribution (Combined Mode Operation) page 2-16
  - Overview of Combined Mode page 2-16
  - To Configure the 59552A and 59553A for Combined Mode Operation page 2-18

Introduction

There are two ways the 59552A Fiber-Optic Distribution Amplifier and the 59553A Fiber-Optic Receiver can be configured to distribute signals.

- Digital Mode configuration, which distributes one digital signal, (i.e., a 1 PPS signal).
- Combined Mode configuration, which distributes two signals: one analog and one digital (i.e., the IRIG-B and 1 PPS signals, respectively).

NOTE *The factory configures the instruments for Combined Mode operation. Selection of Digital Mode operation requires reconfiguration of both the 59552A and 59553A by repositioning of internal jumpers, as shown in tables 2-1 and 2-2.*

If your application requires transmission of only one digital signal, use the Digital Mode. Digital Mode passes signals with minimal delay compared with those associated with combining digital and analog information. The timing of both rising and falling edges are preserved.

Table 2-1 summarizes the *factory default* two-signal or Combined Mode configuration. Table 2-2 summarizes the one-signal or Digital Mode configuration.

Table 2-1. 59552A/59553A Two-Signal Configuration

Feature	*Choices	Factory	59552A Jumpers		59553A Jumpers	
		Default (✓)	Jumper	Pin Position	Jumper	Pin Position
Mode	**Combined (two signals)**	✓	P5	1,2	P4	1,2
			P6	1,2		
Digital Input On-Time Edge	**Rising Edge of Input**	✓	P7	1,2		
			P8	1,2		
	Falling Edge of Input		P7	2,3		
			P8	2,3		
Input Impedance, Analog	**600 Ohms**	✓	P3	2,3		
	10 kilohm		P3	1,2		
Input Impedance, Digital	**50 Ohms to GND**	✓	P4	1,2		
	1 kilohm to +5 Volts		P4	2,3		
Digital Output On-Time Edge	**Rising Edge at Output**	✓			P3	1,2
	Falling Edge at Output				P3	2,3

* The boldfaced choices in this column indicate the factory defaults.

Table 2-2. 59552A/59553A One-Signal Configuration

Feature	*Choices	Factory	59552A Jumpers		59553A Jumpers	
		Default (✓)	Jumper	Pin Position	Jumper	Pin Position
Mode	Digital (one signal)		P5	2,3	P4	2,3
			P6	2,3		
Digital Input Conditioning	**Output replicates input**	✓	P7	1,2		
			P8	1,2		
Input Impedance, Analog	Input unused	✓	P3	2,3		
Input Impedance, Digital	**50 Ohms to GND**	✓	P4	1,2		
	1 kilohm to +5 Volts		P4	2,3		
Digital Output Conditioning	**Rising Edge at Output**	✓			P3	1,2

* The boldfaced choices in this column indicate the factory defaults.
** Both the rising and falling edges are preserved.

The following sections describe how to configure your amplifier and receiver for your application.

Removing the Covers

Tools Required

The following tools are required for these removal procedures:

- Hand TORX® 10 screwdriver (T10)—for 59553A
- Hand TORX® 15 screwdriver (T15)—for 59552A

To Remove 59552A Cover

The following procedure tells you how to remove the cover from the 59552A Fiber-Optic Distribution Amplifier. The cover is removed to access the jumpers.

WARNING **WHEN THE COVER IS REMOVED FROM THE INSTRUMENT, LINE VOLTAGES ARE EXPOSED WHICH ARE DANGEROUS AND MAY CAUSE SERIOUS INJURY IF TOUCHED. DISCONNECT POWER.**

1 Remove the power cord from the 59552A.

2 To remove the rear bezel, loosen the captive screws on the sides as shown in Figure 2-1 using the TORX 15 screwdriver.

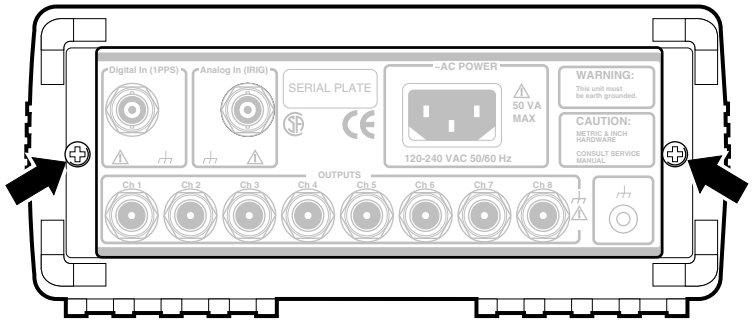


Figure 2-1. Rear Bezel Removal (59552A)

3 Remove the screw located at the bottom near the rear of the cover as shown in Figure 2-2.

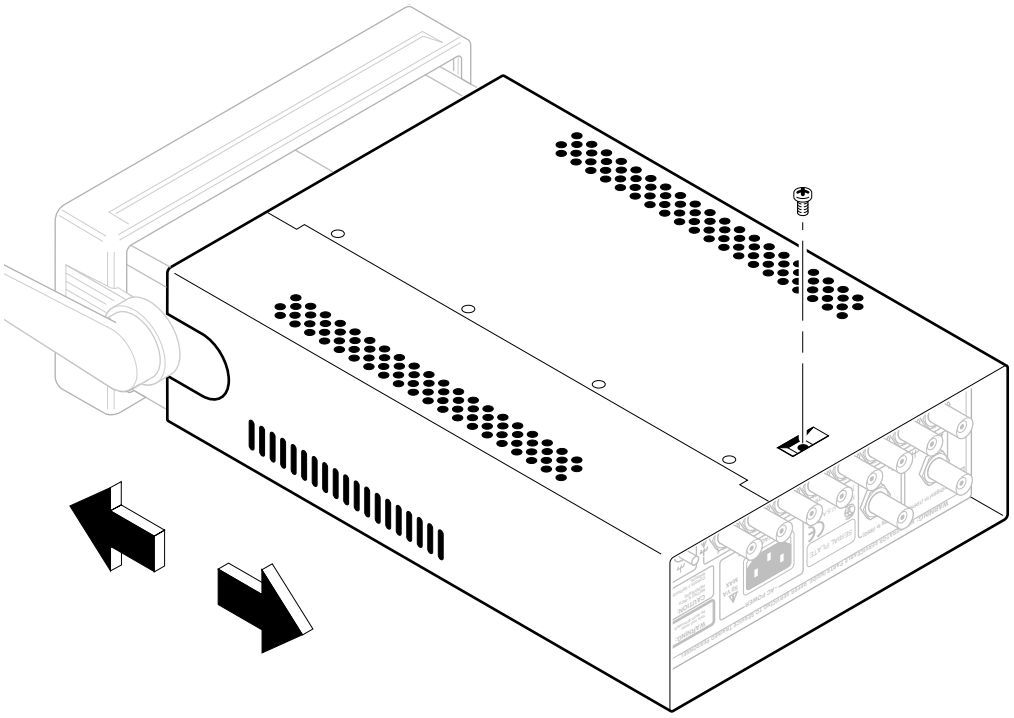


Figure 2-2. Bottom View for Cover Removal (59552A)

4 With one hand gripping the front bezel, pull the cover off with the other hand by sliding the cover backward.

To Remove 59553A Cover

The following procedure tells you how to remove the cover from the 59553A Fiber-Optic Receiver. The cover is removed to access the jumpers.

WARNING **WHEN THE COVER IS REMOVED FROM THE INSTRUMENT, LINE VOLTAGES ARE EXPOSED WHICH ARE DANGEROUS AND MAY CAUSE SERIOUS INJURY IF TOUCHED. DISCONNECT POWER.**

1 Remove the power cord from the 59553A.

2 Remove two screws on each side of the 59553A as shown in Figure 2-3 using the TORX 10 screwdriver.

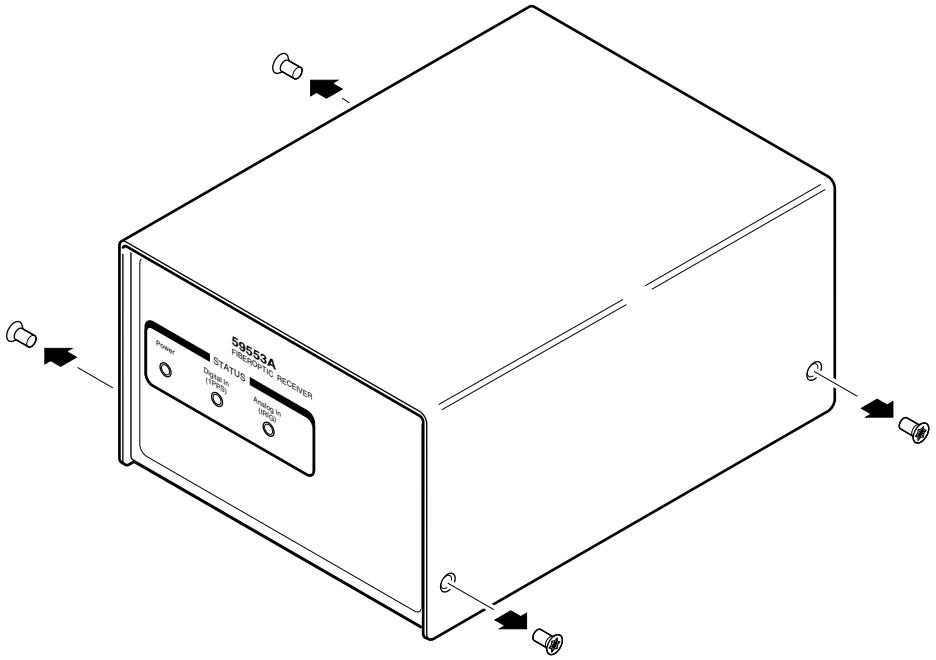


Figure 2-3. Removing Screws in the Cover (59553A)

3 Lift cover off the 59553A as shown in Figure 2-4.

Removing the Covers

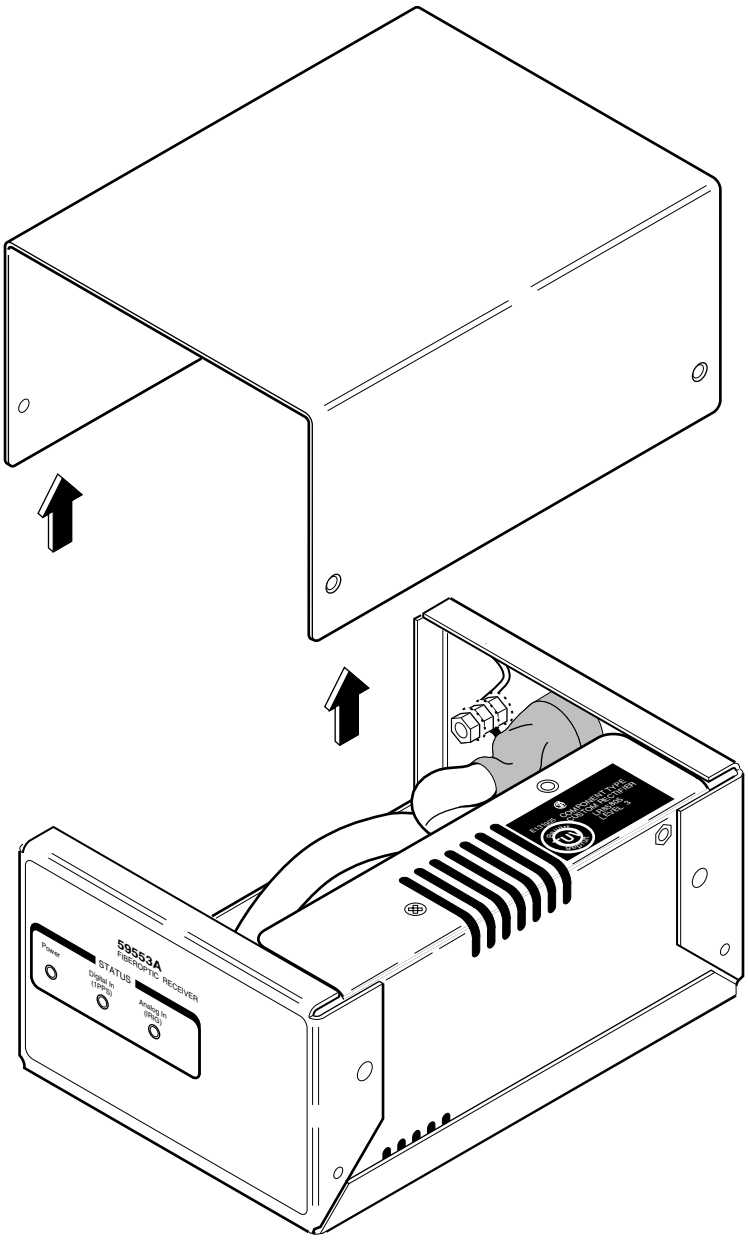


Figure 2-4. Removing the Cover (59553A)

Configuring for One-Signal Distribution (Digital Mode Operation)

Overview of the Digital Mode

As shown in Figure 2-5, the Digital Mode provides for distribution of one signal. The signal is typically the 1 PPS output from the 59551A GPS Measurements Synchronization Module. The signal is connected to the **Digital In (1 PPS)** BNC connector of the 59552A Fiber-Optic Distribution Amplifier via a BNC cable where the signal is distributed to each of the eight fiber-optic outputs of the 59552A (**Ch 1** through **Ch 8**). Using a fiber-optic cable, each of these outputs can be connected to the **Fiber Optic In** connector of an 59553A Fiber-Optic Receiver. Finally, the 1 PPS signal is output at the **Digital Out (1 PPS)** BNC connector of each 59553A to supply the timing signals to the system.

Digital Mode is intended to transmit a single digital signal.
The distribution system output replicates the system input. Waveform characteristics such as pulse widths are preserved, with no inversion.

The system can transmit digital signals at rates from dc to 5 MBAUD.

Distribution delay depends primarily on the length of fiber line used. The 2 microsecond delay typical of Combined Mode is not present for Digital Mode, because the single digital signal does not use the two-signal combining hardware.

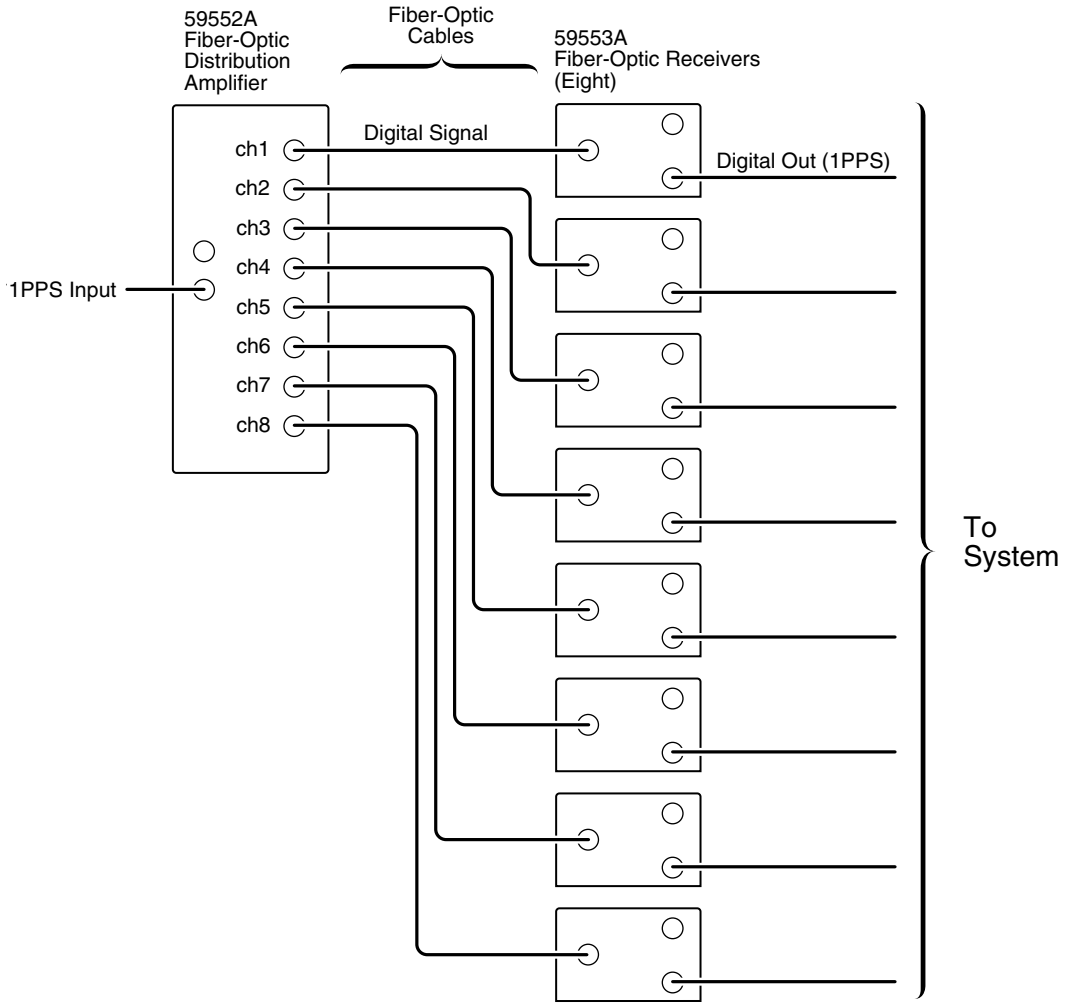


Figure 2-5. Block Diagram of One-Signal Digital Mode Operation (Using Eight 59553As)

To Configure the 59552A and 59553A for Digital Mode Operation

Perform the following procedures to configure the 59552A Fiber-Optic Distribution Amplifier for Digital Mode operation.

Configuring the 59552A for Digital Mode

1 Remove the cover.

See the section titled “Removing the Covers.”

2 In the 59552A, place both jumpers P5 and P6 in the pins 2,3 position (i.e., pins 2 and 3 shorted or connected together) as shown in Figure 2-6.

3 Place both jumpers P7 and P8 in the pins 1,2 position as shown in Figure 2-6.

4 Place jumper P3 in the pins 2,3 position (the 600 Ω input impedance default position for the **Analog In (IRIG)** input) as shown in Figure 2-6.

5 If you require a 50 Ω load applied to the **Digital In (1 PPS)** input, place jumper P4 in the pins 1,2 position as shown in Figure 2-6.

If you do not require a 50 Ω load applied to the **Digital In (1 PPS)** input, place jumper P4 in the pins 2,3 position.

6 Re-install the cover by performing the cover removal procedure in reverse.

7 Perform the procedure in the following section on each 59553A Fiber-Optic Receiver to complete the Digital Mode configuration.

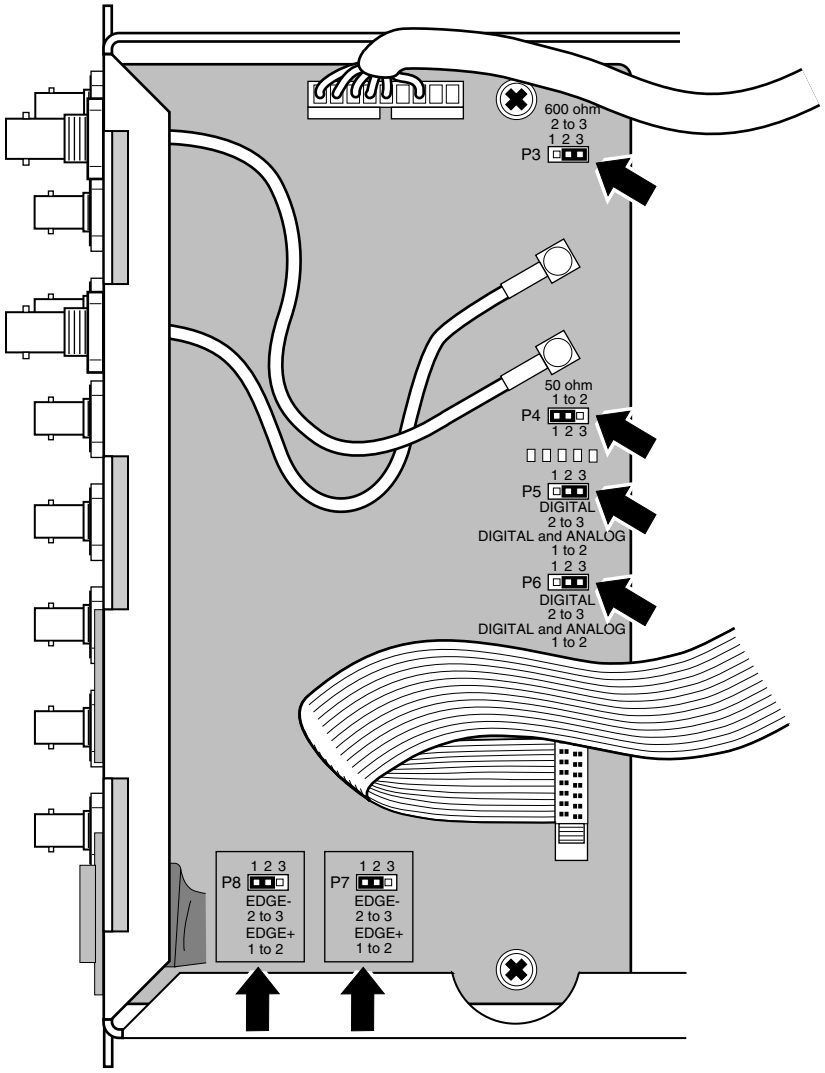


Figure 2-6. 59552A Digital Mode Jumper Locations

Configuring the 59553A for Digital Mode

1 Remove the cover.

See the section titled “Removing the Covers.”

2 In the 59553A, place jumper P3 in its pins 1,2 default position as shown in Figure 2-7.

3 Place jumper P4 in the pins 2,3 position to select one-signal transmission as shown in Figure 2-7.

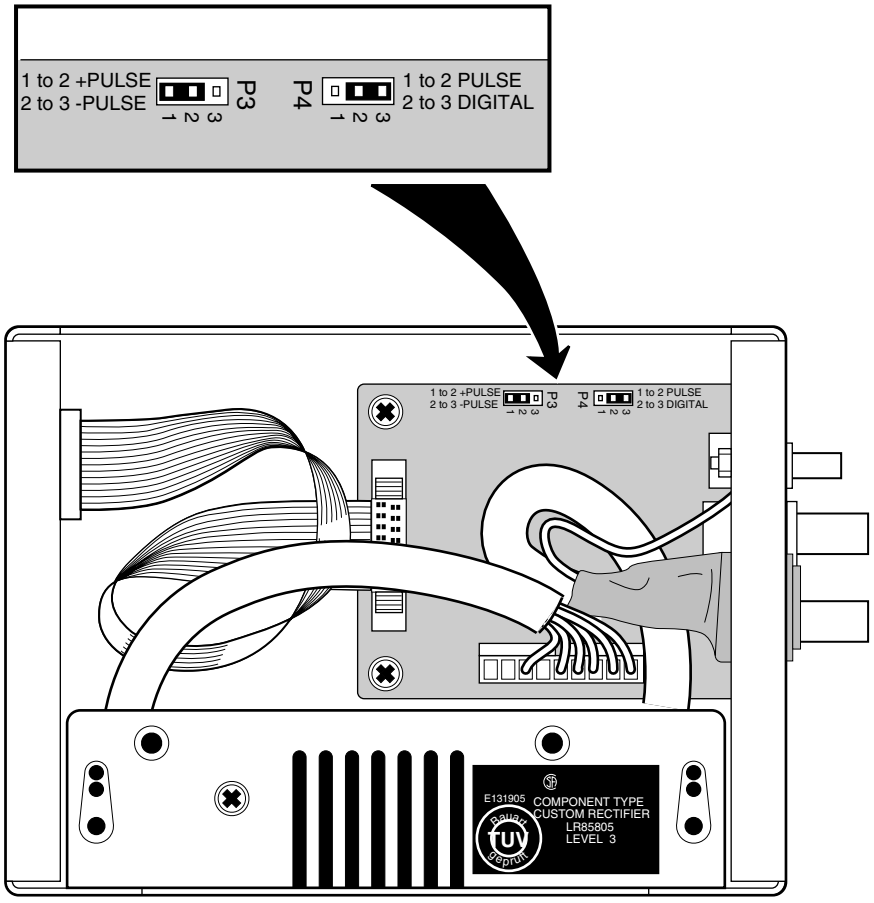


Figure 2-7. 59553A Digital Mode Jumper Locations

4 Re-install the cover by performing the cover removal procedure in reverse.

5 Now, connect the units as shown in Figure 2-8.

This completes the One-Signal Distribution (Digital Mode Operation) configuration procedure.

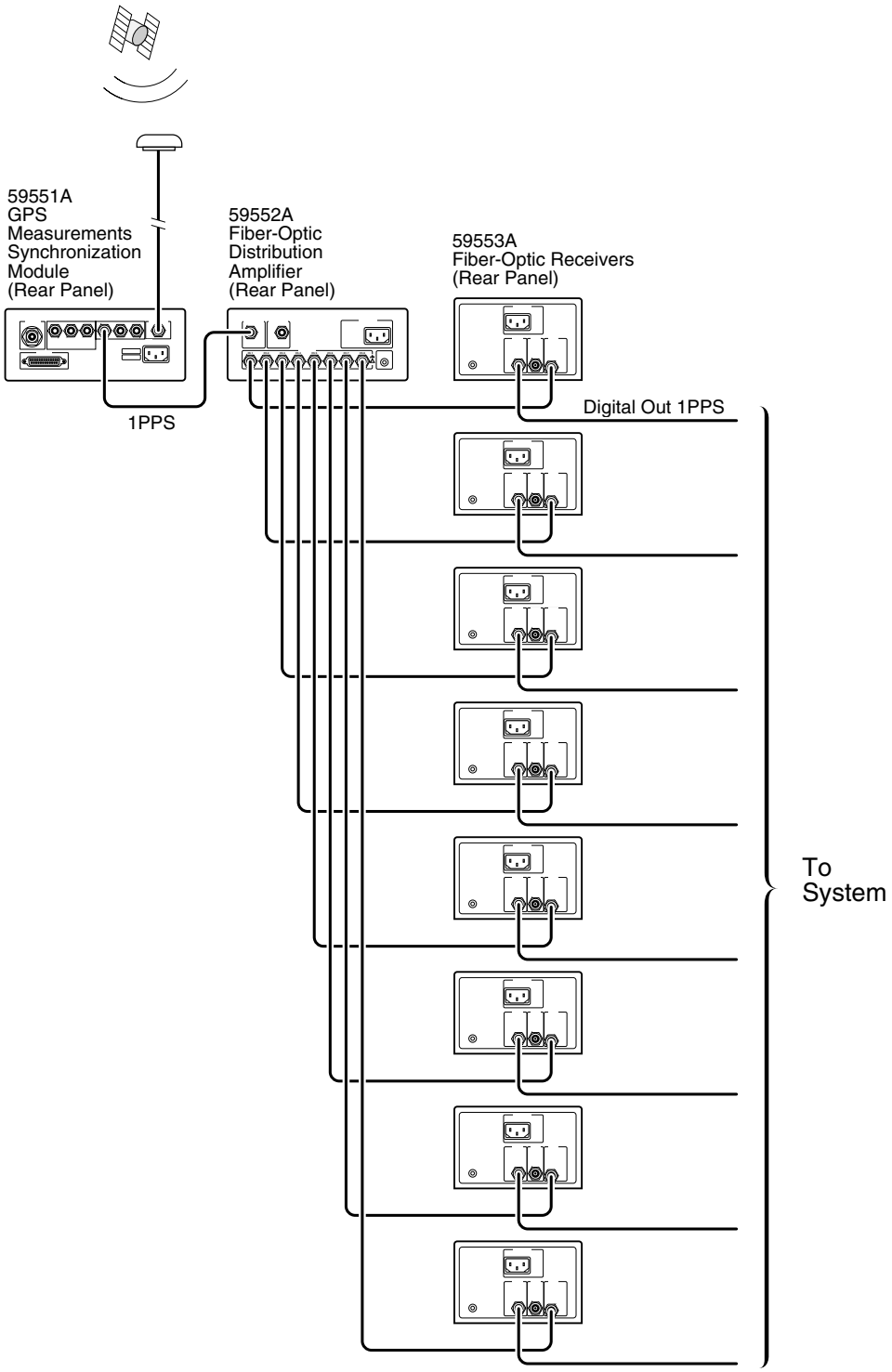


Figure 2-8. One-Signal Digital Mode Hookup (Using Eight 59553As)

Configuring for Two-Signal Distribution (Combined Mode Operation)

Overview of Combined Mode

As shown in Figure 2-9, the Combined Mode provides for distribution of two signals. The signals are the 1 PPS (digital) and IRIG-B (analog) outputs from the 59551A GPS Measurements Synchronization Module. The signals are connected to the **Digital In (1PPS)** and **Analog IN (IRIG)** connectors of the 59552A Fiber-Optic Distribution Amplifier via BNC cables. These signals are distributed to each of the eight fiber-optic outputs of the 59552A (**Ch 1** through **Ch 8**). Using fiber-optic cables, each of these outputs can be connected to the **Fiber Optic In** connector of an 59553A Fiber-Optic Receiver. Finally, the combined signals are output at the **Digital Out (1 PPS)** and **Analog Out (IRIG)** connectors of the 59553A to supply timing signals to a system.

The on-time edge of the Digital Out (1 PPS) at the 59553A output is delayed approximately 2 microseconds through the distribution amplifier and receiver hardware. Additional delay attributable to transmission through fiber will depend on the fiber line used.

Independent of your choice for the amplifier input, you can select the on-time edge: either the *rising* or *falling* edge of 59552A amplifier input. *The system is configured at the factory to use the **rising** edge as the on-time edge*.

You can select whether the on-time edge is produced as a *rising* or *falling* edge at the output of the 59553A Fiber-Optic Receiver. *The system is configured at the factory to transmit a **rising** edge as the on-time edge*.

Regardless of the pulse polarity selected, the pulse width is fixed at approximately 70 microseconds.

The system transmits the IRIG analog signal unmodified, with minimal delay.

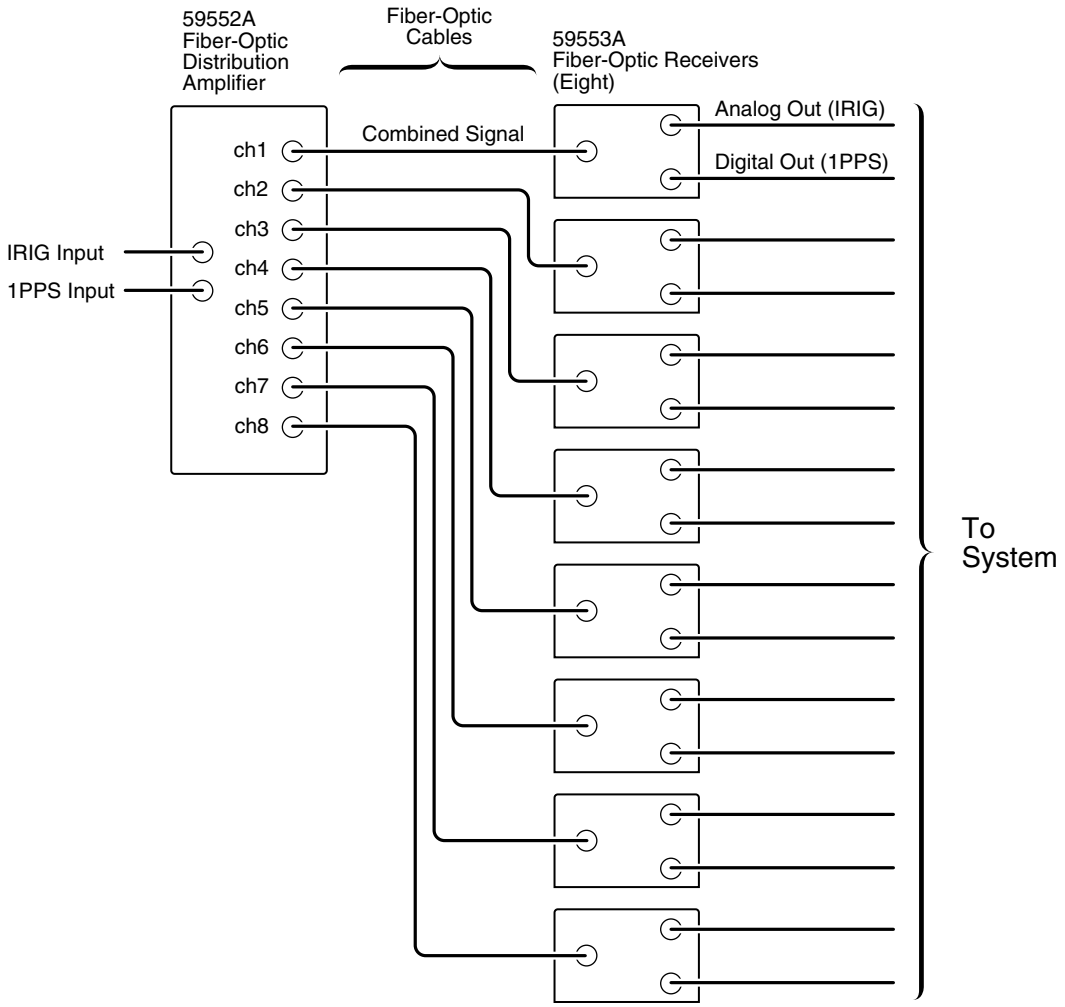


Figure 2-9. Block Diagram of Two-Signal Combined Mode Operation (Using Eight 59553As)

NOTE The 59552A and 59553A are shipped from the factory configured for Combined Mode Operation. You need to perform these procedures only if the instruments have reconfigured since receipt.

To Configure the 59552A and 59553A for Combined Mode Operation

Perform the following procedures to configure the 59552A Fiber-Optic Distribution Amplifier for Combined Mode operation.

Configuring the 59552A for Combined Mode Operation

1 Remove the cover.

See the section titled “Removing the Covers.”

2 In the 59552A, place both jumpers P5 and P6 in the pins 1,2 position (i.e., pins 1 and 2 shorted or connected together) as shown in Figure 2-10.

3 To select whether the on-time edge is the *rising* or the *falling* edge of the 1 PPS signal input to the 59552A, set jumpers P7 and P8 depending on your on-time edge requirement.

If you require the *rising edge* of the 1 PPS input as the on-time edge, place both jumpers P7 and P8 in the pins 1,2 position as shown in Figure 2-10.

If you require the *falling edge* of the 1 PPS (digital) input as the on-time edge, place both jumpers P7 and P8 in the pins 2,3 position.

4 If you require a 600 Ω input impedance for the IRIG (analog) input, place jumper P3 in the pins 2,3 position as shown in Figure 2-10.

If you require a 10 kΩ input impedance for the IRIG (analog) input, place jumper P3 in the pins 1,2 position.

5 If you require a 50 Ω load applied to the **Digital In (1 PPS)** input, place jumper P4 in the pins 1,2 position as shown in Figure 2-10.

If you do not require a 50 Ω load applied to the **Digital In (1 PPS)** input, place jumper P4 in the pins 2,3 position.

6 Re-install the cover by performing the cover removal procedure in reverse.

7 Perform the procedure in the following section on each 59553A Fiber-Optic Receiver to complete the Combined Mode configuration.

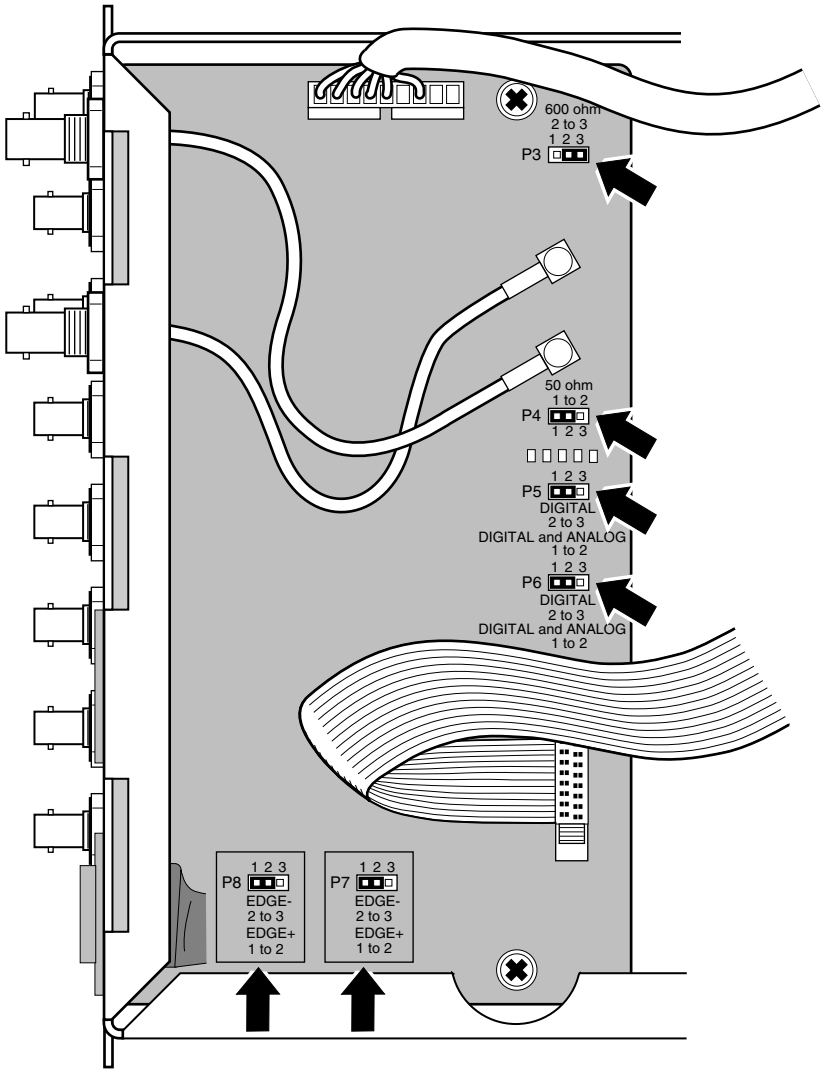


Figure 2-10. 59552A Combined Mode Jumper Locations

Configuring the 59553A for Combined Mode Operation

1 If you need to set the *rising edge* of the 1 PPS output to correspond with on-time edge (system output is a positive pulse), place jumper P3 in its pins 1,2 default position as shown in Figure 2-11.

If you need to set the *falling edge* of the 1 PPS output to correspond with on-time edge (system output is a negative pulse), place jumper P3 in its pins 2,3 position.

2 Place jumper P4 in the pins 1,2 position to select two-signal transmission as shown in Figure 2-11.

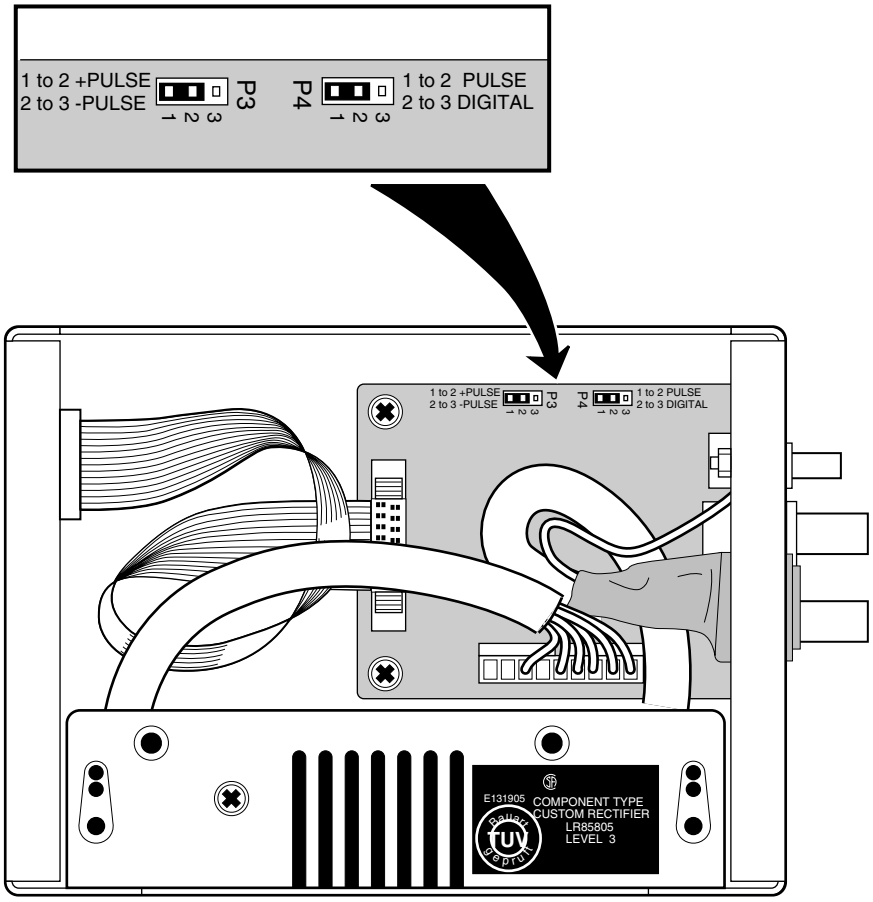


Figure 2-11. 59553A Combined Mode Jumper Locations

3 Re-install the cover by performing the cover removal procedure in reverse.

4 Now, connect the units as shown in Figure 2-12.

This completes the Two-Signal Distribution (Combined Mode Operation) configuration procedure.

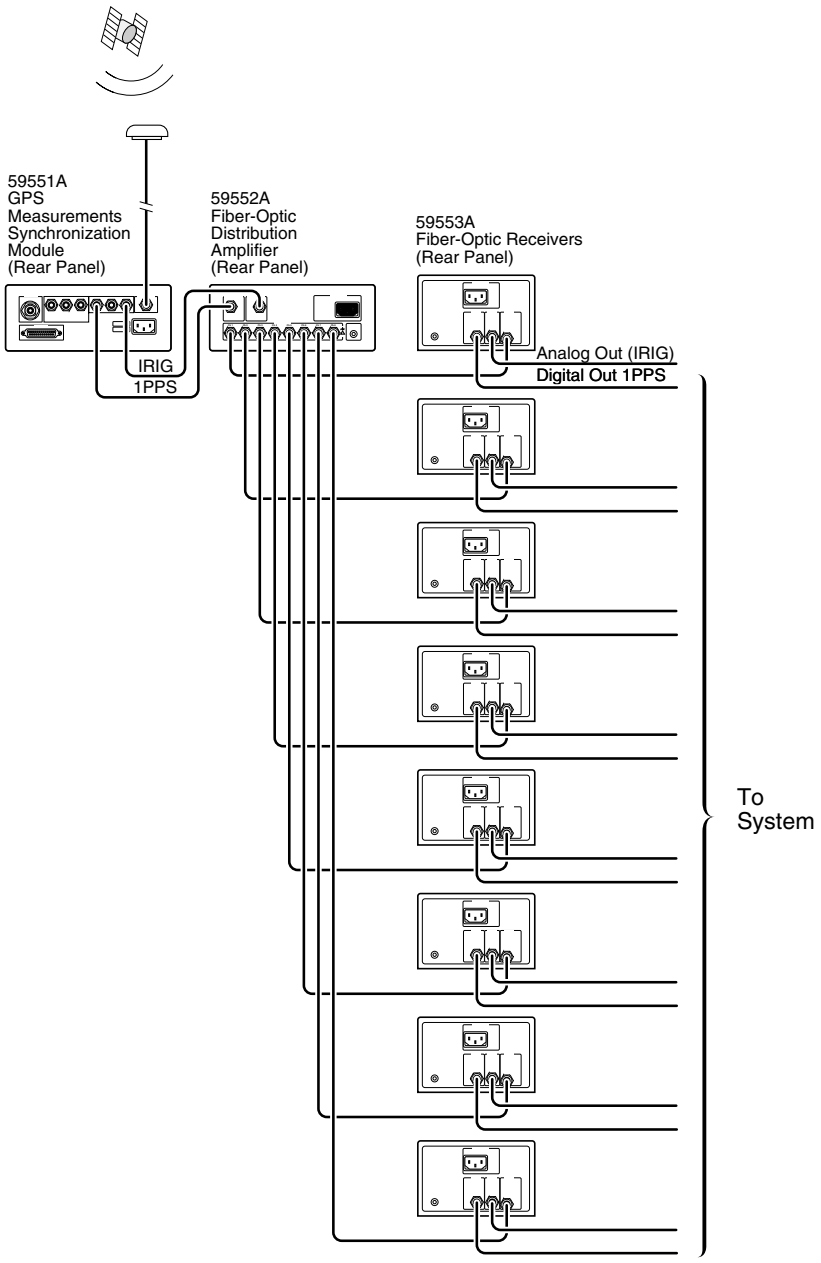


Figure 2-12. Two-Signal Combined Mode Hookup (Using Eight 59553As)

3

Operational Verification

Chapter Contents

This chapter provides the operational verification procedures, which are an abbreviated series of checks that may be performed to give a high degree of confidence that the instrument is operating properly without performing the complete performance tests. An operational verification is useful for incoming inspection, routine maintenance, and after instrument repair.

This chapter is organized as follows:

- Introduction page 3-3
- Equipment Required page 3-3
- 59552A/59553A Operational Verification page 3-4
  - Setup page 3-4
  - Digital Out (1 PPS) and Analog (IRIG) Out Waveform Tests page 3-5
  - LED Indicator Test page 3-6

Introduction

The 59552A Fiber-Optic Distribution Amplifier and the 59553A Fiber-Optic Receiver are designed to be used together for the conversion/transmission/reception/re-conversion of 1 PPS (digital) and IRIG-B (analog) signals. Because of this tandem relationship, the operational verification will require that at least one each of the 59552A and 59553A be available, plus a nominal length of metal ST fiber optic cable for connecting the two instruments.

For more information on connections and power supply requirements, refer to Chapter 1, “Getting Started,” in this guide.

Equipment Required

The test equipment listed in Table 3-1 is necessary to perform the Operational Verification. The suggested HP model number (or equivalent) will ensure that the equipment has the necessary characteristics to perform the test.

You may substitute any other equipment provided that it has the same or better specifications for the function in use.

Table 3-1. Recommended Test Equipment for Operational Verification.

Description	HP Model Number
Function Generator/Arbitrary Waveform Generator as a 1 PPS source	HP 33120A (or equivalent)
Function Generator/Arbitrary Waveform Generator as a 1 kHz source	HP 33120A (or equivalent)
Digital Oscilloscope	HP 54600B (or equivalent)
50Ω Coaxial Cable with BNC connectors (4)	HP 10503A (or equivalent)
62.5/125 micrometer (um) Fiber Optic Cable with Metal ST Connectors	
50Ω Feedthrough	HP 10100C (or equivalent)

59552A/59553A Operational Verification

This test will require that all eight fiber-optic outputs (**Ch 1** through **Ch 8**) on the 59552A be tested.

Setup

1 Ensure that both the 59552A and 59553A are set to the factory default two-signal combined operation.

Refer to Chapter 2, "Configuring Your 59552A/59553A," in this guide for assistance in determining this operating mode. If each of the instruments was directly received from the factory, these defaults should already be set up.

2 Connect the equipment as shown in Figure 3-1 to begin testing of the first fiber-output channel (**Ch 1**) of the 59552A.

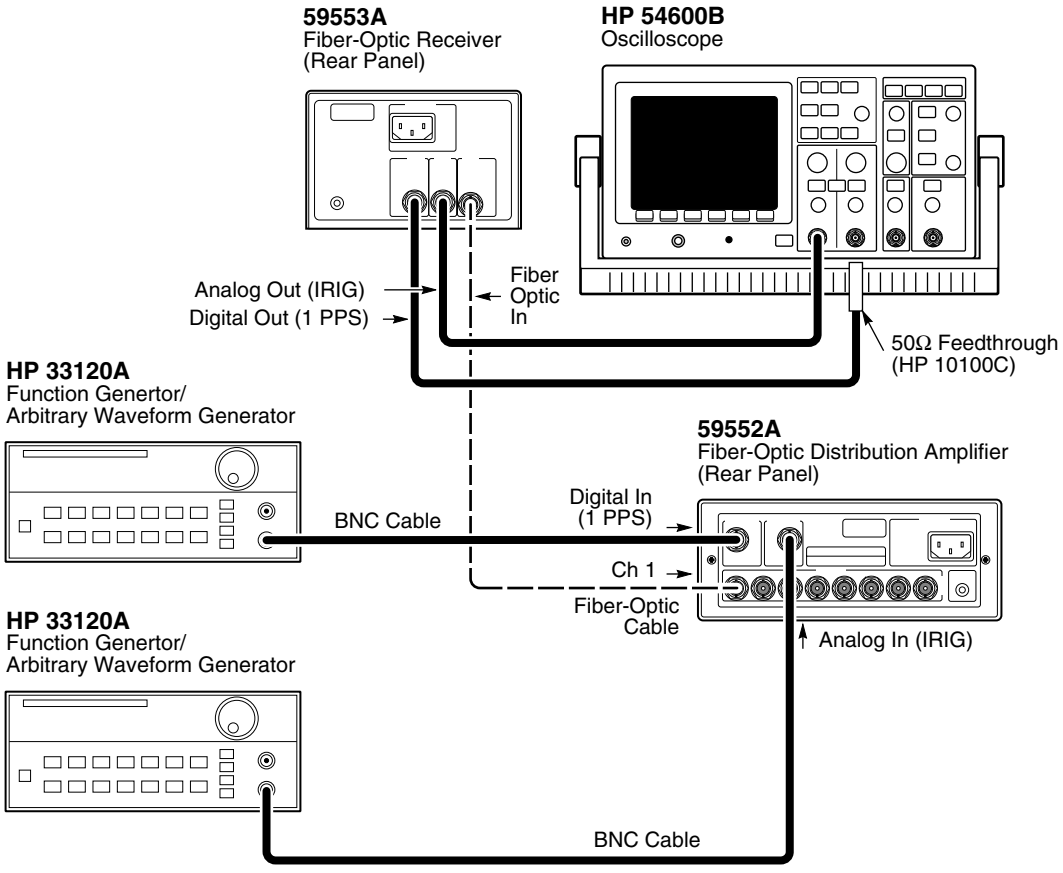


Figure 3-1. Operational Verification Setup

Digital Out (1 PPS) and Analog (IRIG) Out Waveform Tests

1 Set the HP 33120A (the one that connects to the 59552A's **Digital In (1 PPS)** input) to provide a 1 PPS signal by setting its controls as follows:

   a. Press Square Wave function key.

   b. Press **Freq** key, then **Enter Number** key.

   c. Using the appropriate number keys, enter in the value **1 Hz**.

   d. Press the blue **Shift**, then **%Duty** key.

   e. Press the ∨ (decrease) key until 20% is displayed.

   f. Press **Ampl** key, then **Enter Number** key.

   g. Enter in the value **5.0 Vpp**.

   h. Press **Offset** key, then **Enter Number** key.

   i. Enter in the value **2.5 V**.

2 Set the other HP 33120A to output a 1 kHz sine wave with a 1 Vp-p amplitude by setting its controls as follows:

   a. Press Sine Wave function key.

   b. Press **Freq** key, then **Enter Number** key.

   c. Using the appropriate number keys, enter in the value **1 KHz**.

   d. Press **Ampl** key, then **Enter Number** key.

   e. Enter in the value **1.0 Vpp**.

3 Set the Channel 2 input of the HP 54600B Oscilloscope to dc coupled, vertical 1 Volt/div, sweep 10 µsec/div, and positive trigger.

4 Verify the presence of a 1 PPS signal on Channel 2.

5 Set the Channel 1 input of the HP 54600B Oscilloscope to dc coupled, vertical 1 Volt/div, and sweep 100 msec/div.

6 Verify the presence of a 1 kHz sine wave on Channel 1.

7 Connect the next fiber-optic output of the 59552A to the 59553A and repeat steps 4 and 6 until all 8 ports on the 59552A have been verified.

LED Indicator Test

1 Verify that the front-panel **Digital In (1PPS)** LED is flashing on both the 59552A and the 59553A.

2 Verify that the **Analog In (IRIG)** LED is illuminated for both the 59552A and the 59553A.

This completes the 59552A/59553A Operational Verification.

4

Specifications

Introduction

Both warranted specifications and operating characteristics for the 59552A and 59553A are provided in this chapter. To distinguish warranted specifications from operating characteristics, the word “nominal” appears next to a characteristic.

Configuration Information

There are two ways the 59552A and 59553A fiber-optic products can be configured to distribute signals.

1. The "Combined Mode" configuration distributes two signals, one analog and one digital (such as IRIG-B and 1 PPS respectively).
2. The "Digital Mode" configuration distributes one digital signal (such as a 1 PPS signal).

If your application requires transmission of only one digital signal, you may choose to use the Digital Mode. Digital Mode passes signals with minimal delay compared to that associated with combining digital and analog information.

The factory configures the instruments for Combined Mode operation. Selection of Digital Mode operation requires reconfiguration of both the 59552A and 59553A by repositioning of internal jumpers.

Both warranted specifications and operating characteristics are covered below. The word "nominal" appears next to a characteristic to distinguish it from the warranted specifications.

System Specifications

Combined Mode

Transmission distance: up to 1 km
Digital edge rate maximum: 1 kHz
Digital edge delay: 2 µs ±5%
(input of 59552A to output of 59553A—excluding delay through fiber-optic cable; cable adds approximately 5 ns/meter)
Digital output pulse width: 70 µs (nominal)
Digital input pulse polarity: positive or negative (selectable with internal jumper)
Digital output pulse polarity: positive or negative (selectable with internal jumper)
Digital output pulse, risetime/falltime: less than 5 ns into a 50 Ω load
Digital output short-term jitter: 5 ns rms (nominal) when signal transmitted 1 km
Analog input frequency range: 10 Hz to 10 kHz
Analog voltage gain: unity
(input of 59552A to output of 59553A driving 600 Ω load)

Digital Mode

Transmission distance: up to 1 km
Digital edge rate maximum: 5 Mbd
Digital edge delay,
rising edge:
120 ns (nominal) plus delay through fiber-optic cable; cable adds approximately 5 ns/meter
falling edge:
85 ns (nominal) plus delay through fiber-optic cable; cable adds approximately 5 ns/meter
Digital output pulse width: output replicates input subject to delay contraints noted above
Digital ouput short-term jitter,
rising edge:
3 ns rms (nominal) when signal transmitted 1 km
falling edge:
2 ns rms (nominal) when signal transmitted 1 km
Digital pulse, risetime/falltime: less than 5 ns

59552A Fiber-Optic Distribution Amplifier

Inputs:
One digital input typically used as 1 PPS input
One analog input typically used as IRIG-B123 input

Digital input
Input signal requirements: TTL
Input impedance: 50 Ω to GND (default) or 1 kΩ to +5 volts configurable with internal jumper
Analog input
Input signal requirements: 5 volts peak-to-peak (nominal)
Input impedance: 600 Ω (default) or 10 kΩ configurable with internal jumper

Outputs:
Number of optical outputs: 8
Optical connector: metal ST

Front-panel LEDs indicating:
- Power
- Digital input active
- Analog input active

Note that annunciator is activated at a minimum voltage of 1.6 volts pk-pk (nominal)

Power Requirements:
ac Power: 90 to 132 Vac or 198 to 264 Vac, automatically selected; 50 to 60 Hz
or
dc Power: 129 Vdc, 115 to 140 Vdc operating range

Dimensions:
Height: 88.5 mm
Width: 212.6 mm
Depth: 348.3 mm
Weight: 3 kg
Half-Rack module

59553A Fiber-Optic Receiver

Inputs:
Number of optical inputs: 1
Optical connector: metal ST

Outputs:
One digital output typically used as 1 PPS output
One analog output typically used as IRIG-B123 output

Digital output
Output signal: TTL
Output impedance: drives 50 Ω to GND
Analog Output
Output signal: 5 volts peak-to-peak (nominal)
Output impedance: drives 600 Ω to GND

Front-panel LEDs indicating:
- Power
- Digital input active
- Analog input active

Note that annunciator is activated at a minimum voltage of 1.6 volts pk-pk (nominal)

Power Requirements:
ac Power: 90 to 132 Vac or 198 to 264 Vac, automatically selected; 50 to 60 Hz
or
dc Power: 129 Vdc, 115 to 140 Vdc operating range

Dimensions:
Height: 87.1 mm
Width: 133.2 mm
Depth: 185.3 mm
Weight: 0.91 kg

Fiber-Optic Cable Core Size Recommendations:
62.5/125 µm

Ordering Information

59552A
59553A
*129 Vdc operation

*59552A and 59553A come standard with 110, 240 Vac. For use with 129 Vdc power, assemble and connect your own cable assembly using the supplied dc connector plug (1252-5672). See instructions in Chapter 1.

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