TEK INSTRUCTION MANUAL

Part No. 070-7496-00
Product Group 3T

P6703

1 GHz, 1300 nm O/E CONVERTER

Please Check for
CHANGE INFORMATION
at the Rear of This Manual

First Printing MARCH 1989

Tektronix®
COMMITTED TO EXCELLENCE

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SAFETY SUMMARY

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

OPERATOR

WARNING

Some laser devices that can be used with this instrument are considered to be an acute hazard to skin and eyes from direct radiation. Protective housings and safety interlocks must be provided and operational to prevent exposure of the operator to this radiation. All equipment incorporating lasers must be installed in accordance with Federal Regulations as defined in HHS Publication FDA 88-8035 available from:

Office of Compliance (HFZ-300)
Center for Devices and Radiological Health
5600 Fishers Lane
Rockville, Maryland 20857

Terms In This Manual

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

CAUTION — **CAUTION** statements identify conditions or practices that could result n damage to the equipment or other property.

Do Not Operate In Explosive Atmospheres

To avoid explosion, do not operate this product in any explosive atmosphere unless it has been specifically certified for such operation

SERVICE

Use Care When a Signal Source is Connected

To avoid personal injury, do not touch exposed connections and components while the converter is connected to power supplies or a signal source.

The 6703 Probe

SPECIFICATION

DESCRIPTION

The TEKTRONIX P6703 is an analog optical-to-electrical converter which converts an optical input signal into an output voltage for display on an oscilloscope equipped with the TEKPROBE™ interface. The conversion is linear with input optical power and allows the system to function as an optical power meter with high speed analog capability. The conversion is calibrated for a gain of 1 V/mW when the input signal is in the 1300 nm band. The approximate response at other wavelengths in the range of 1100 nm to 1700 nm can be determined by a graph located on the converter body and in this manual (see Figure 1-1).

Use of the TEKPROBE™ interface allows the oscilloscope to interrogate the converter to automatically determine and display the proper scale factor (in watts) and set the input termination to the required 50-Ω. An oscilloscope-controlled calibrated offset of 0 to 1 mW is also available through this interface.

Input to the converter is through an SMA-style fiber optic connector (FC style available in Option 01, ST style available in Option 02). Most manufacturer's SMA-style connectors are compatible with this connector.

ACCESSORIES

The P6703 is shipped with the following standard accessories:

1 Instruction Manual

1 Carrying Case

Part numbers, options, optional accessories, and related products are listed in "REPLACEABLE PARTS" (Section 6).

PERFORMANCE CONDITIONS

The electrical and optical characteristics listed in Tables 1-1and 1-2 apply when the converter is calibrated between 20°C and 30°C and is used with a calibrated instrument system operating within the environmental conditions stated in Table 1-3.

Items listed in the "Performance Requirement" column are verifiable qualitative or quantitative limits. Items listed in the "Supplemental Information" column are not verified in the "PERFORMANCE CHECK PROCEDURE" (Section 4); they are either explanatory notes, calibration setup descriptions, performance characteristics for which no absolute limits are specified, or characteristics that are impractical to check.

The converter's physical characteristics are listed in Table 1-4.

Table 1-1
Optical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Wavelength Range	1100 to 1700 nm.[a]	Calibrations made at 1300.
Optical Input	Accepts fiber up to 100 µm core diameters. NA[b] $\leq$ 0.29.	
Offset Compensation	0 to 1 mW.	
Input Dynamic Range	0 to 1 mW at 0 mW offset. 0.9 to 2 mW at 1 mW offset.	See Figure 3-1.
Maximum Optical Input for Linear Output	2 mW (offset at 1 mW).[a] 1 mW (no offset).	
Absolute Maximum Nondestructive Optical Input	10 mW.[a]	
Input Connector Uncertainty	< 0.15 dB.[a]	

[a] **Performance requirement not checked in manual.**
[b] **Numerical Aperature.**

Table 1-2
Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Conversion Gain	1 V/mW ±12% at dc, 1300 nm.	Calibrations made at 1300 nm.
Bandwidth	1 GHz (-3 dB optical, -6 dB electrical).	
Noise Equivalent Power	< 1 µW (rms).	
Risetime	≤ 500 picoseconds.	
Aberrations	≤ ± 10%, 15% p-p total.	
Output Zero	≤ ± 15 mV 15-55° C. ≤ –30 + 15 mV 0-55° C.	
Offset	0 to 1.000 mW.	

[a] Performance Requirement not checked in manual.

TABLE 1-2 (CONT)
Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Output Load Requirements	50 Ω ± 1%	
Power Requirements	TEKPROBE™ interface. 10 mW.[a]	+15 Vdc ± 4%, 20 mA max.[a] +5 Vdc ± 4%, 60 mA max.[a] -5 Vdc ± 4%, 60 mA max.[a] <10 mV ripple (20 Hz to 500 kHz).

TABLE 1-3
Environmental Characteristics

Characteristic	Information
Temperature Range (Operating)	0° C to +55° C (+32 F to +131° F).
Temperature Range (Nonoperating)	-62° to +75 ° C (-80° F to +167 ° F).
Humidity	Five cycles (120 hr.) 95% to 97% relative humidity at 30° C to 60°C.
Transportation	Qualifies under National Safe Transit Association's Pre-shipment Test, 1A-B-1.
Electrostatic Immunity	Will withstand discharge of a 500 pF capacitor charged to 20 kV, through a 1k Ω resistor (to TEKPROBE ™ interface pins).

TABLE 1-4
Physical Characteristics

Characteristic	Information
Net Weight (includes accessories)	70 g (2.5 oz).

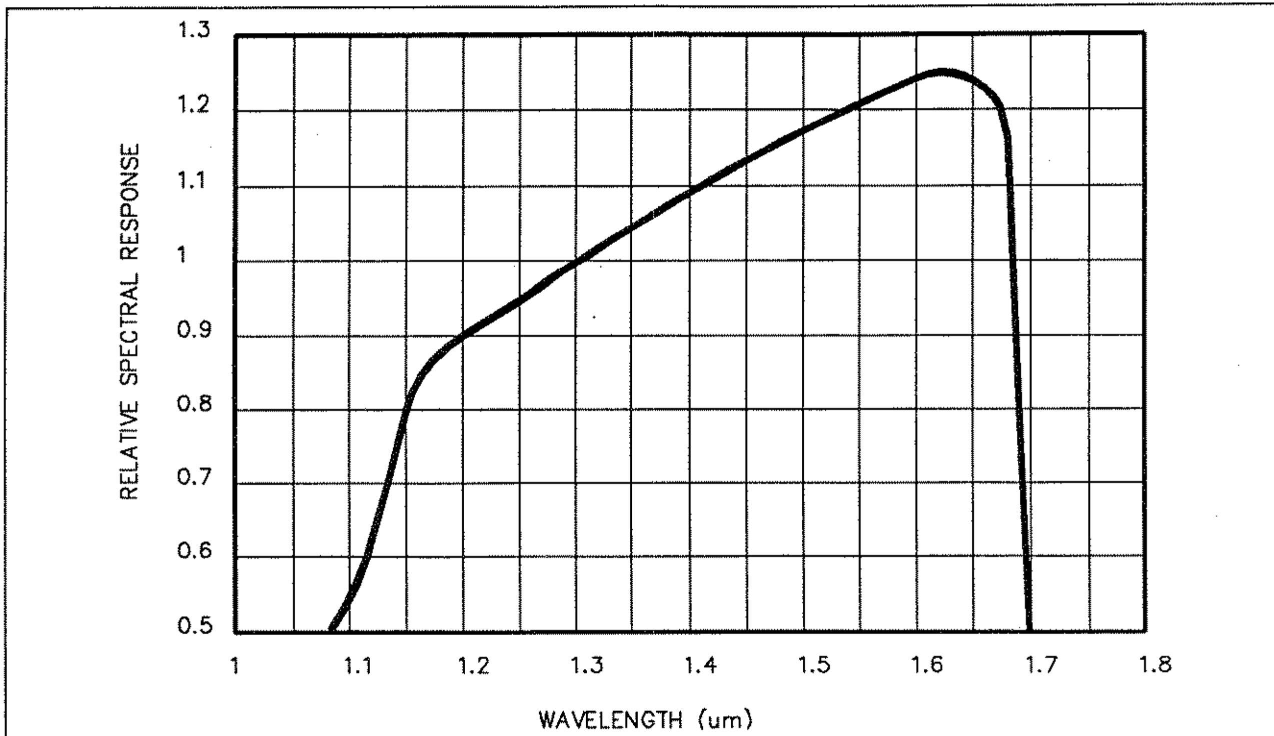

Figure 1-1. Normalized Spectral Response.

OPERATING INSTRUCTIONS

INTRODUCTION

This section of the manual is intended to familiarize the operator with the use of the P6703 Optical Converter.

NOTE

Upon receipt, save the shipping and packaging materials for reuse should reshipment become necessary. Refer to "MAINTENANCE" (Section 6) for further information.

CONVERTER HANDLING

The P6703 and its accessories should be handled carefully at all times. Avoid dropping the converter assembly since damage and misalignment of the photodiode optical assembly may result. The dust cap should be installed over the end of the optical input assembly when a fiber optic connector is not attached. Avoid crushing, excessively bending or crimping the fiber optic cables.

Converter Cleaning

The converter needs very little cleaning. The optical input in particular can be damaged by excessive or improper cleaning. Reduce the need for cleaning by installing the protective cap over the input when it is not being used. Refer to "MAINTENANCE" for cleaning procedures.

CONNECTIONS

BNC Locking Ring

The BNC Locking Ring locks the converter onto the host instrument and houses the TEKPROBE™ interface connections (described below).

TEKPROBE™ Interface (Level 2)

Provides connections for power, signal, and data transfer, and allows the oscilloscope system to automatically set the scale factor (in mW) and input termination. An oscilloscope-controlled calibrated offset is also transmitted through this connection.

Optical Input Connector

Allows connection to a fiber optic cable with an SMA, FC or ST connector (depending on the converter option). Cleaning and replacement instructions are included in "MAINTENANCE" (Section 6).

OPERATING CONSIDERATIONS

Optical Input

Optical fibers with a core diameter of up to 100 microns with a Numerical Aperture (NA) of 0.29 can be connected to the optical input through an SMA connector (or through an optional FC or ST connector). Most manufacturer's SMA-style optical connectors will connect to the converter. It is recommended that the straight-ferrule SMA connector that does not require use of a plastic alignment sleeve be used (Amphenol® 905 or equivalent). If a stepped-style connector (Amphenol® 906 or equivalent) is used, adapter cables are available as optional accessories.

NOTE

The stepped connection itself will connect with the converter, but the alignment will be poor without the use of a short, plastic sleeve. If a sleeve is used to improve alignment it may become lodged in the converter and be difficult to remove.

Adapter cables that aid in connecting many popular optical connectors are available (see "OPTIONAL ACCESSORIES").

The converter uses a rod lens to focus the light from the end of the fiber onto a large area (300-micron diameter) photodiode. The use of this technique makes the unit readily adaptable to a large range of fiber sizes and numerical apertures while making it relatively insensitive to minor misalignment of the fibers in the connector. The P6703 is calibrated for a wavelength of 1300 nm. For any other wavelength in the range of 1100 nm to 1700 nm, the conversion gain can be determined from the responsivity curve shown on the converter cover and in "SPECIFICATIONS" (Section 1, Figure 1-1).

Output

The P6703 converts input optical power (0 to +2 mW) into a corresponding output voltage ranging from – 0.1 V to +1.0 V (into a 50-Ω load, an output ratio of 1 V output from 1 mW of input at 1300 nm). The converter output is displayed as mW or μW on the oscilloscope screen.

Offset

Tektronix oscilloscopes equipped with the TEKPROBE™ (Level 2) interface include a calibrated offset feature. The P6703 makes use of this feature to offset the converter output level so that specific portions of the displayed signal can be easily analyzed.

This feature will also simplify drift and relative power measurements. The effect that the offset has on dynamic range is illustrated in Figure 3-2. The 11000 Series Oscilloscope Instruction Manual provides a more complete explanation of TEKPROBE™ interface capabilities and operation. Please refer to "THEORY OF OPERATION" in this manual (Section 3) for additional information on converter signal development.

THEORY OF OPERATION

INTRODUCTION

This section is intended to provide a general description of how the P6703 converter develops the output signal.

The P6703 can be divided into the following functional blocks:

1. Optical Input
2. Offset Circuit
3. High Frequency Amplifier
4. Flexible Circuit Board and Interconnects

1. Optical Input

The optical input to the converter is supplied through the input fiber optic connector to a large-area photodiode that is tolerant of minor misalignment.

The optical signal is focused on the photodiode surface by means of a rod lens. Photons are absorbed at the photodiode, generating a current proportional to the optical input power. The converter is calibrated so that this current is converted to 1 V/mW with an optical-input wavelength of 1300 nm. (The responsivity of the photodiode depends on the wavelength of the input source. See Figure 1-1 for responsivity at other wavelengths.)

2. Offset Operation

An offset current can be used to compensate for offset drift of the converter circuit and amplifier, and to allow the linear operating region of the converter to be adjusted in accordance to the input signal. (Figure 3-2 illustrates the relationship between offset and linear operating range.) When used, a controlling current level (offset) is supplied to the input of the HF amplifier.

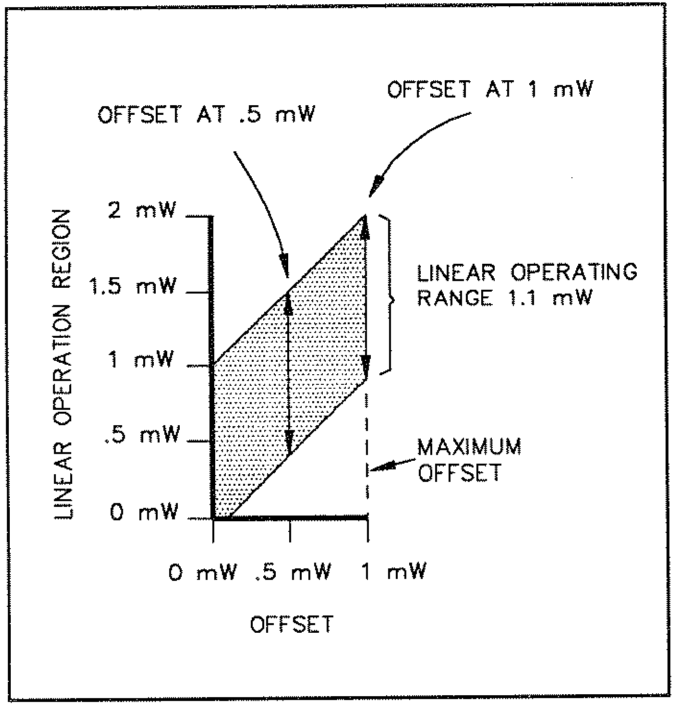

Figure 3-1. Offset Effect on Linear Operation Region.

The current level that is provided is determined by the oscilloscope through the TEKPROBE™ interface, as well as by the settings of R2010 and R2024. These potentiometers are set during the adjustment procedure so the converter output is properly zeroed, and a 1 V offset signal programmed by the oscilloscope system corresponds to 1 mW of input signal and reads as mW on the oscilloscope system display.

The linear operating region of the amplifier shifts when an offset current is applied (see Figure 3-1). Amplification is undistorted only when a signal is maintained within this dynamic window (large signals that are not entirely within the dynamic window should be attenuated).

3. High-Frequency Amplifier

Input to the high-frequency amplifier is equal to the sum of the current generated in the photodiode and the offset current. The amplifier consists of two transimpedance amplifier stages cascaded in series.

A transimpedance amplifier converts an input current to an output voltage according to the relationship shown in Figure 3-2.

For lowest noise a large feedback resistor is desired, but this also decreases bandwidth. In the P6703 a first stage feedback resistor of 750 Ω (R_f - See Figure 3-2) allows a bandwidth of 1 GHz to be achieved with an equivalent input noise level of < 1µW. Overall amplifier gain is set by R1016 to give an output of 1 V/mW into 50 Ω (calibrated at 1300 nm) (See Figure 5-1).

4. Flexible Circuit Board and Interconnects

The flexible circuit board includes a factory-programmed ROM (U1010) that stores data (such as converter model, identification number, and coding information) for the oscilloscope system. It also provides the signal path and interconnections for the offset function from the oscilloscope system.

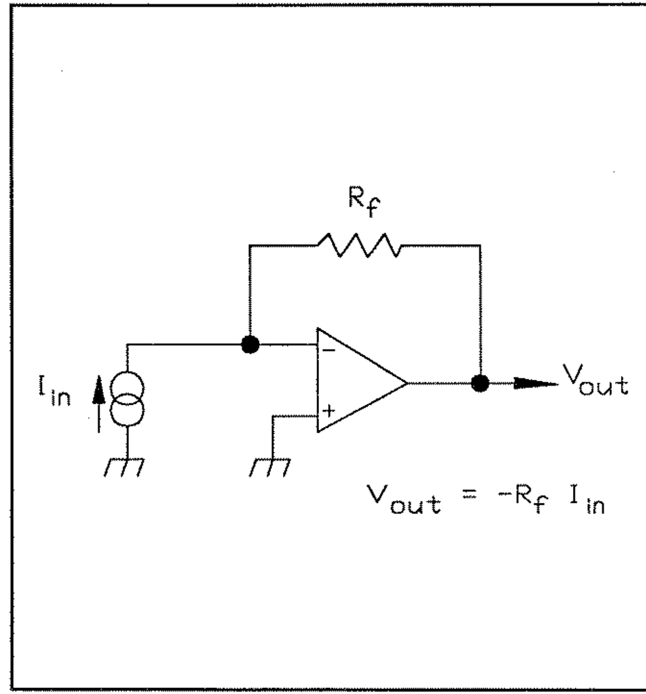

Figure 3-2. Transimpedance Amplifier.

PERFORMANCE CHECK PROCEDURE

PURPOSE

The "PERFORMANCE CHECK PROCEDURE" is used to verify the converter's performance requirements as listed in "SPECIFICATION" (Section 1), and to determine the need for readjustment. This procedure may also be used as an acceptance check and a test of the converter after repair.

TEST EQUIPMENT REQUIRED

Test equipment described in Table 4-1 is a complete list of equipment required to accomplish both the "PERFORMANCE CHECK PROCEDURE" in this section and the "ADJUSTMENT PROCEDURE" in Section 5. Test equipment recommended is the minimum necessary to provide accurate results; therefore, substitute equipment must meet or exceed the specifications of the equipment listed. Detailed operating instructions for test equipment are not contained in this procedure. Should additional operating information be needed, refer to the appropriate test equipment instruction manual.

These procedures were written for use when the converter is used with an 11000 Series Oscilloscope system. Procedures or portions of procedures may vary when converters are used in other configurations or systems, or with 11000 Series systems with firmware updates not available at the time of publication.

LIMITS AND TOLERANCES

The limits and tolerances given in this procedure are for the P6703 converter under test only. Test equipment error is not included except as noted.

PREPARATION

Before proceeding with checks, allow sufficient warm-up time for test equipment to stabilize (typically 20 minutes). Each of the following checks can be independently performed.

Table 4-1
Test Equipment Required

Item Description	Purpose	Recommended Example
1. Oscilloscope System	All checks.	Tektronix 11402 with 11A72 vertical amplifier.
2. Optical Source	Conversion Gain. Risetime & Aberrations. Bandwidth.	ORTEL 3510A or equivalent with appropriate connectors.
3. Optical Attenuator	Conversion Gain. Risetime & Aberrations. Bandwidth.	JDS MINIVOAT 4000 or equivalent with appropriate connectors.
4. Optical Power Meter	Conversion Gain.	HP Model 8152A with HP81521B Head and appropriate connections or equivalent.
5. Electrical Pulse Generator	Risetime & Aberrations.	Tektronix PG506 or equivalent.[a]
6. Signal Generator	Bandwidth.	Tektronix SG504 or equivalent.[a]

[a] **Requires TM500 or TM5000 - Series power module mainframe.**

Table 4-1 (Cont)
Test Equipment Required

Item Description	Purpose	Recommended Example
7.Optical Reference Receiver	Risetime & Aberrations.	ORTEL CORP MODEL PD050 PIN photodiode with appropriate connectors and cables or equivalent.
8.TD Pulser Test Fixture	Risetime & Aberrations.	Tektronix Part Number 067-0681-01.
9. 50-Ω Precision BNC cable	Risetime & Aberrations.	Tektronix Part Number 012-0482-00 or equivalent.
10. Low Capacitance Alignment Tool	All adjustments.	Tektronix Part Number 003-1364-01 or equivalent.
11. Digital Prescaler	Bandwidth	Tektronix DP501 or equivalent.
12. 50-Ω Power Divider	Bandwidth	Tektronix Part Number 015-1014-00 or equivalent.

[a] **Requires TM500 or TM5000 - Series power module mainframe.**

PROCEDURE STEPS

1. Noise Check

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

a. Connect the P6703 to the vertical input of the oscilloscope system.

b. Place the protective cap over the P6703 optical input.

c. Set the oscilloscope as follows:

MODE	WAVEFORM
MAIN SIZE (TIME/DIV)	10 ns/div
VERTICAL SIZE (WATTS/DIV)	10 μW/div
VERT OFFSET	0

(Display trace should now be at center screen.)

d. Using the Define Waveform Menu, define a trace equal to the waveform minus the average value of the waveform. (e.g. if the converter is plugged into Chanel One of the left plug-in, define the trace as L1 –Avg (L1).

e. Set the oscilloscope mode to MEASURE.

f. Select RMS and MEAN.

g. CHECK - that the MEAN value is < 0.1 μW.

h. Verify that the RMS value is <1 μW.

2. Output Zero

Equipment Required (see table 4-1):

Oscilloscope System (Item 1)

a. Set oscilloscope mode to MEASURE, and OFFSET to 0.

b. Set the oscilloscope system for 10 μW/div. (The oscilloscope trace should be at center screen.)

c. Place the protective cap over the P6703 optical input and connect the P6703 to the oscilloscope system vertical input. Display the output waveform of the P6703.

d. Measure output zero.

e. VERIFY - that P6703 output zero is within 10 ± 1μWof 0.0 μW (without an optical input).

3. Conversion Gain

NOTE

The converter output is equal to the displayed output minus the vertical offset, and is greatly affected by its relationship to the linear operating region of the amplifier. To ensure an accurate display, the user should make certain that the display is within the linear operating region in all checks.

Please refer to Figure 4-1 for this check.

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Optical Source (Item 2)

Optical Attenuator (Item 3)

Optical Power Meter (Item 4)

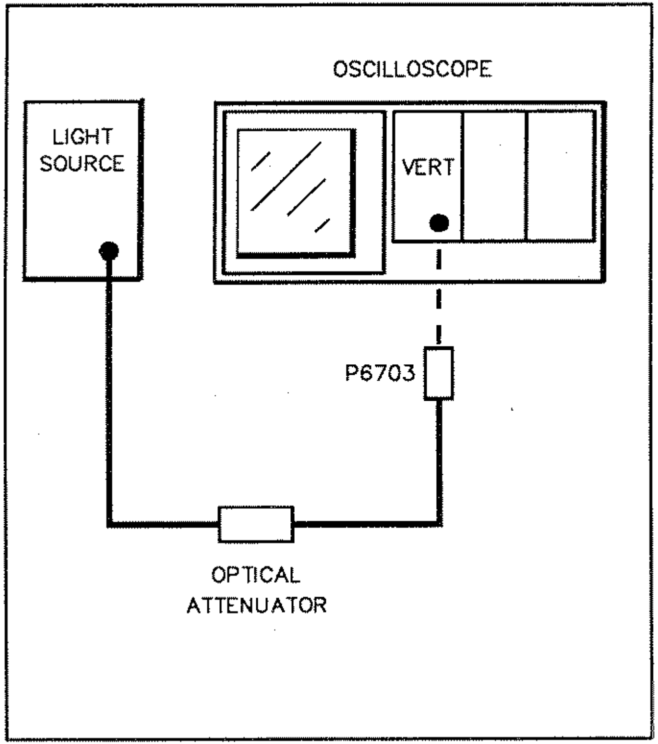

Figure 4-1. Conversion and Offset Gain Check Setup.

a. Connect the optical attenuator between the optical signal source and the optical power meter.

b. Adjust the optical attenuator to provide 0.5 mW at the meter.

c. Connect the P6703 converter to the oscilloscope system input. Set the oscilloscope system to display 100 µW/div.

d. Measure and note the P6703 output MEAN with no input signal applied.

e. Connect the optical attenuator output to the input of the converter.

f. VERIFY - that the change in the converter output is 0.5 mW (5 div. ± 12%).

4. Offset Gain

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Optical Source (Item 2)

Optical Attenuator (Item 3)

Optical Power Meter (Item 4)

a. Connect the optical attenuator between the optical source and the optical power meter.

b. Adjust the optical attenuator to provide 0.5 mW at the meter.

c. Connect the P6703 to the oscilloscope system vertical input. Set the oscilloscope system to display 100 µW/div.

d. Set VERT OFFSET to 0 (with no optical input to the P6703).

e. Connect the optical attenuator output to the P6703 input.

f. Measure and note the P6703 output MEAN value.

g. Adjust the offset for + 0.5 mW.

h. CHECK - that the MEAN value has not changed more than ± 75 µW (±15%).

5. Risetime and Aberrations

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Optical Source (Item 2)

Optical Attenuator (Item 3)

Electrical Pulse Generator (Item 5)

Optical Reference Receiver (Item 7)

TD Pulser Test Fixture (Item 8)

50-Ω Cable (Item 9)

a. Connect the Pulser input (through a 50-Ω cable) to the pulse generator HIGH AMPL output, and the pulser output to the oscilloscope system vertical input.

b. Adjust the pulse generator, TD Pulser, and oscilloscope system to obtain a triggered pulse.

c. Move the TD Pulser (without disconnecting the generator or altering the TD TRIGGERED LEVEL) to the input of the light source generator.

d. Connect the output of the light source to the input of the optical reference receiver. Connect the output of the optical receiver to the oscilloscope system vertical input (refer to Figure 4-2).

e.Connect the Trigger Out of the PG506 to the input trigger channel of the oscilloscope system.

f. Adjust the oscilloscope system for a triggered display.

g. NOTE - the system RISE $T_{(r\ system)}$ and aberrations.

h. Remove the optical reference receiver and connections from the light source and the oscilloscope system. Connect the optical attenuator and P6703 in its place.

i. Adjust the optical attenuator, so that the optical input signal lies between .3 and .7 mW.

j. NOTE - the system RISE $T_{R\ (converter\ \&\ system)}$.

k. Calculate the risetime of the converter using the following formula:

$$T_{R(converter)} = \sqrt{(T_{R\ Converter\ +\ System})^2 - (T_{R\ System})^2}$$

l. CHECK - that the resulting risetime is 500 ps or less.

m. Adjust the oscilloscope system Main Size so that the 100% level of the oscilloscope measurement system is referenced to the flat portion of the pulse (see Figure 4-3).

n. Use the WAVEFORM, Acquire Description and Cursors (on the highest and lowest aberration points) to obtain an average of the front corner aberrations (refer to Figure 4-3).

o. CHECK - that the aberration average minus the system aberrations do not exceed (±10%, 15% p-p).

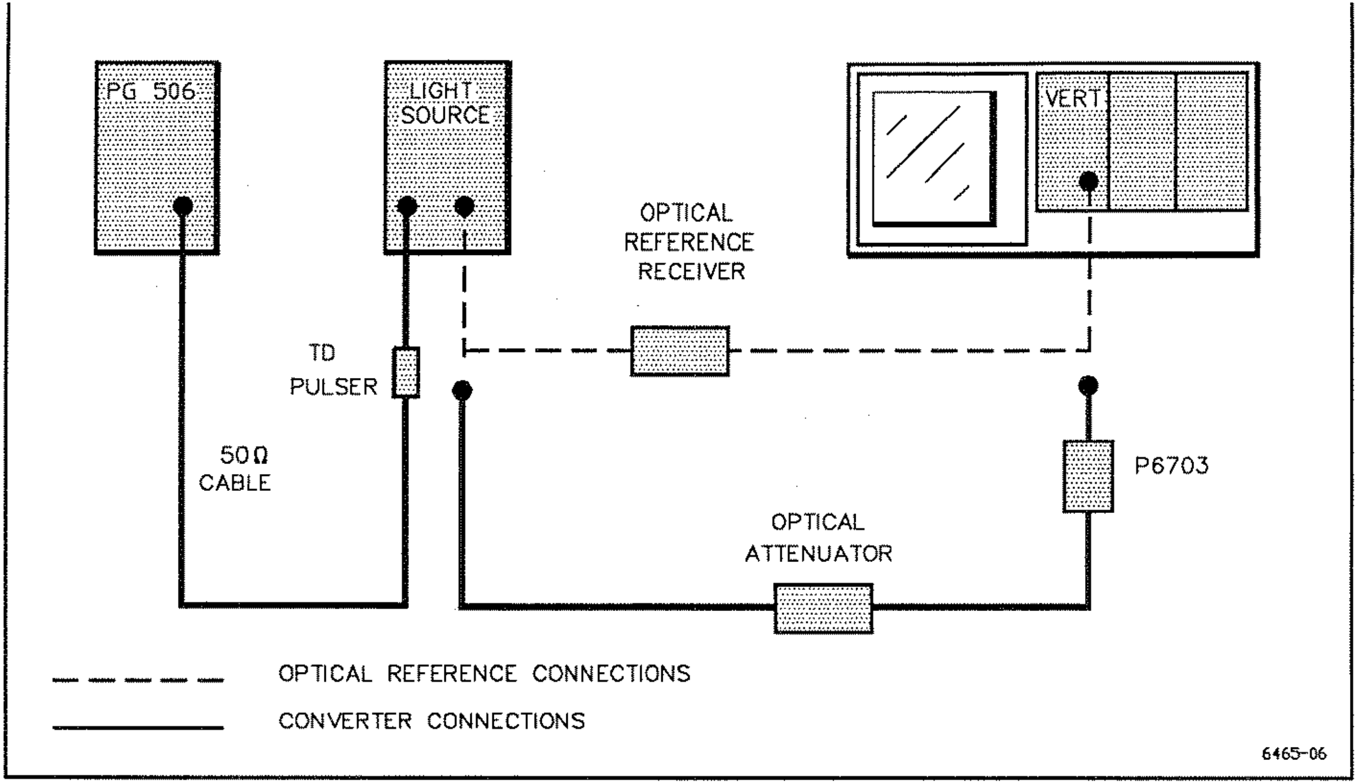

Figure 4-2. Risetime and Aberration Check Setup.

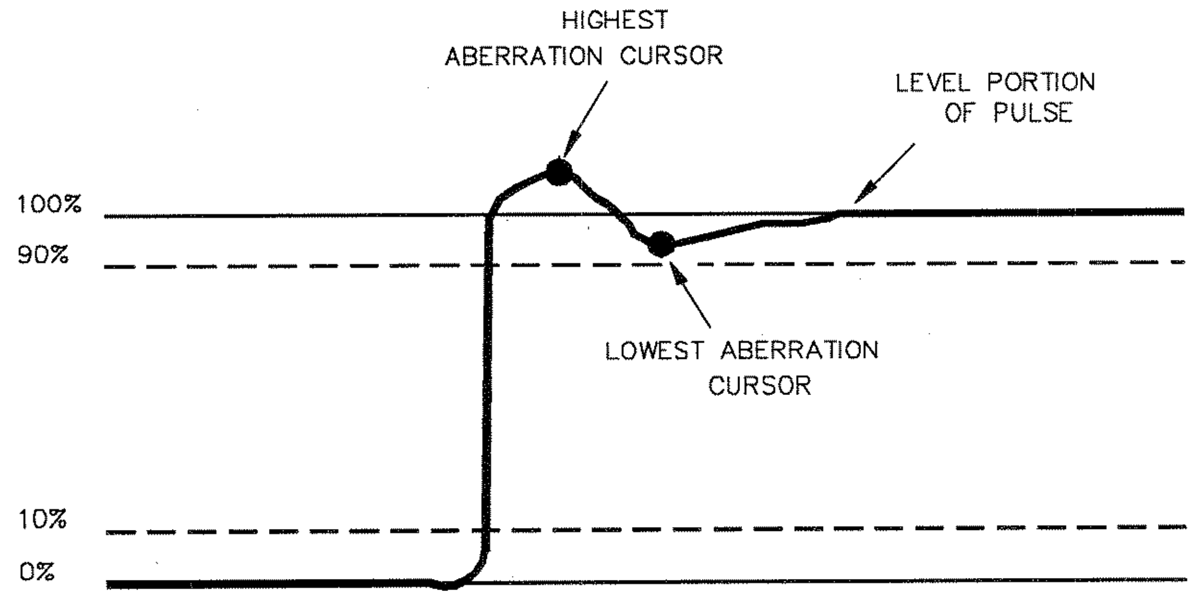

Figure 4-3. Typical Aberration Averaging Display.

6. Bandwidth

Please refer to Figure 4-4 for this check.

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Digital Prescaler (Item 11)

Optical Source (Item 2)

50–Ω Power Divider (Item 12)

Signal Generator (Item 6)

Optical Attenuator (Item 3)

a. Connect the generator through a 50-Ω divider.

b. Connect one output of the divider to the Digital Prescaler input.

c. Connect the output of the Digital Prescaler to the Trigger Input chanel of the oscilloscope vertical amplifier.

d. Connect the other output of the divider to the optical source R_f input.

e. Adjust the oscilloscope system for 4 divisions of signal display (at 100 ns/div).

f. Set the output of the signal generator to 1GHz and the time base to 1ns/cm.

g. Adjust for triggered display and average for 16 cycles (to improve stability).

h. Check that signal display is >1.4 Divisions. This is –4.5 dB optical which is derived from the –3 dB optical (–6 dB electrical) P6703 specification combined with the –3dB electrical (–1.5 dB optical) scope specification at 1GHz.

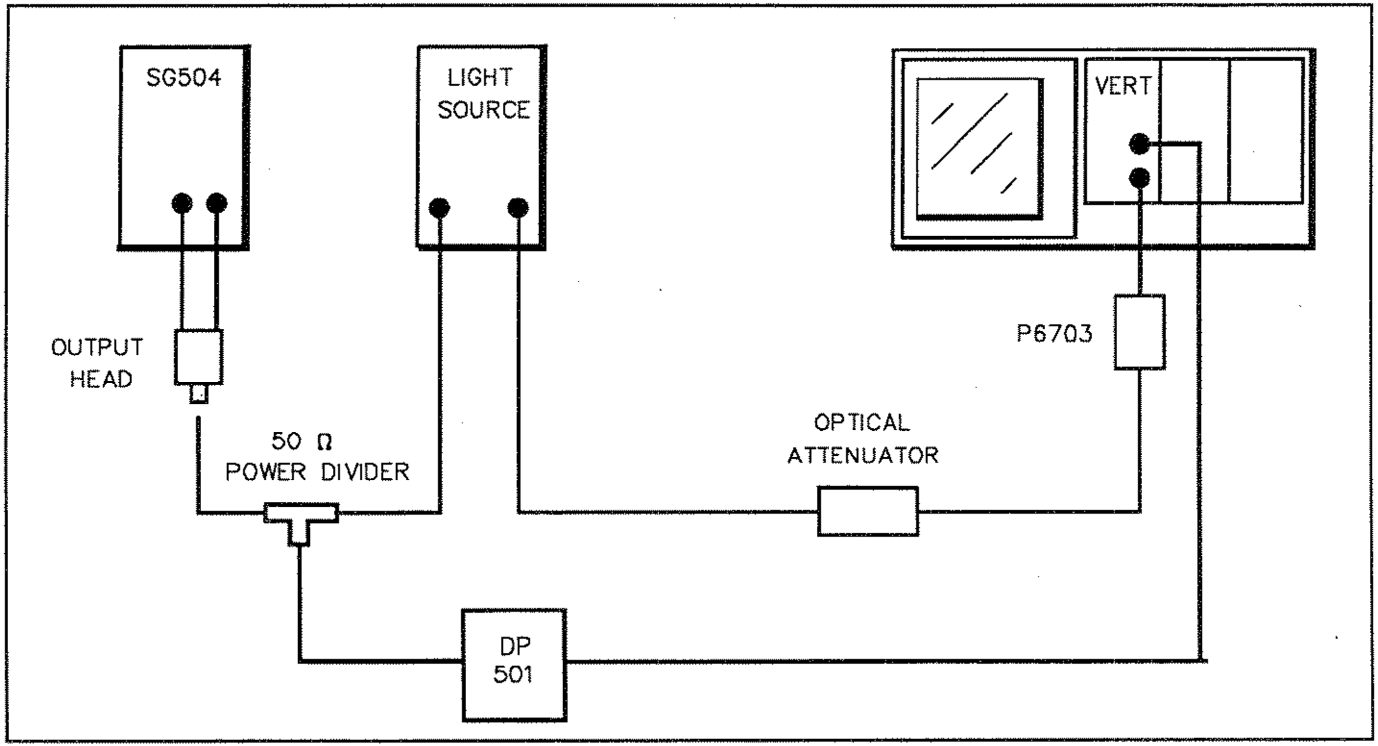

Figure 4-4. Bandwidth Check Setup.

ADJUSTMENT PROCEDURE

PURPOSE

This section contains the information necessary to perform converter gain, offset gain, and offset zero adjustments for the P6703 Converter. The adjustment procedures are not intended to be troubleshooting guides. However, any deficiency found during the performance of each adjustment step should be corrected before continuing. Tektronix Field Service Centers and the Factory Service Center provide instrument repair and adjustment service. Refer to Section 6 for further repair information.

The top cover of the converter must be removed to make the following adjustments. Instructions for removing the covers are given in Section 6 ("MAINTENANCE").

TEST EQUIPMENT REQUIRED

Test equipment described in Table 4-1 is a complete list of equipment required to accomplish the Adjustment Procedure. (However, Item 1, the Oscilloscope System, may be any 11000 Series Oscilloscope and vertical plug-in.)

These procedures were written for use when the converter is used with an 11000 Series oscilloscope System. Procedures or portions of procedures may vary when converters are used in other configurations or systems, or with 11000 Series systems with firmware updates not available at the time of publication.

PREPARATION

Before proceeding with checks, allow sufficient warm-up time for test equipment to stabilize (typically 20 minutes). refer to Figure 5-1 for the location of adjustments used in the following checks.

PROCEDURE STEPS

1. Adjust Converter Gain

NOTE

The converter output is equal to the displayed output minus the vertical offset, and is greatly affected by its relationship to the linear operating region of the amplifier. To ensure an accurate display, the user should make certain that the display is within the linear operating region in all checks.

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Optical Source (Item 2)

Optical Attenuator (Item 3)

Optical Power Meter (Item 4)

Adjustment Tool (Item 11)

a. Connect the optical attenuator between the optical signal source and the optical power meter.

b. Adjust the attenuator to provide an optical power reading of 0.5 mW on the meter.

c. Set the oscilloscope system to display a trace with a MEAN of 0.

d. Connect the P6703 converter to the oscilloscope system vertical input with the cap installed over the optical input.

e. ADJUST - converter output zero (R2024) so that the converter output is 0.

f. Connect the optical signal to the input of the converter.

g. ADJUST - converter gain (R1016) so that the converter output is 0.5 mW (the same as the optical attenuator reading).

2. Adjust Output Zero and Offset Gain.

Equipment Required (see Table 4-1):

Oscilloscope System (Item 1)

Adjustment Tool (Item 11)

a. Connect the converter to the oscilloscope system vertical amplifier.

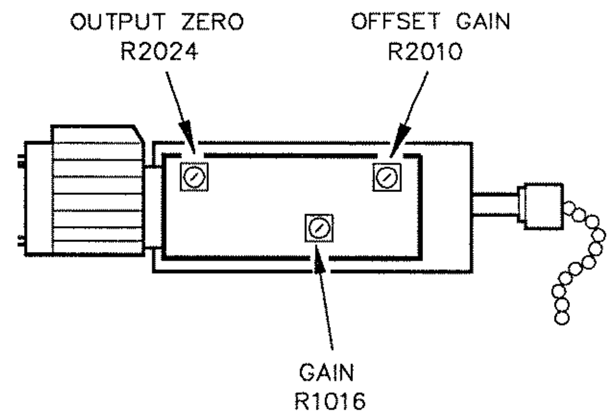

Figure 5-1. Adjustment Locations

b. ADJUST - (with the protective dust cap in place) converter output zero (R2024) so that converter output is zero.

c. Set the vertical offset to -1 mW.

d. Select MEASURE mode on the oscilloscope system.

e. Measure the MEAN.

f. ADJUST - R2010 so that the measured mean is 0 µW.

g. Recheck converter output zero. If necessary to readjust output zero, repeat steps b through f.

h. This concludes the adjustment procedures.

NOTE

The converter gain (R1016) and offset gain (R2010) adjustments interact. It may be necessary to readjust each alternately to obtain the best accuracy.

MAINTENANCE

This section contains information for performing preventive and corrective maintenance and instrument repackaging instructions.

PREVENTIVE MAINTENANCE

WARNING

To prevent electric shock or shorting of components, do not perform preventive maintenance while the converter is connected to the oscilloscope system.

Preventive maintenance consists primarily of cleaning and visual inspection. When performed on a regular basis, preventive maintenance can prevent instrument breakdown and may improve instrument reliability. Frequency of maintenance depends on the severity of the environment. A convenient time to perform maintenance is just before a performance check and calibration.

CLEANING

CAUTION

Avoid the use of chemical cleaning agents which may damage the plastics and circuit board used in the converter. In particular, avoid chemicals containing benzene, toluene, xylene, acetone, MEK, or similar solvents. For additional information on recommended cleaning agents, consult your Tektronix Service Center or representative.

Optical Input Lens

CAUTION

Use extreme caution when cleaning the converter optical input lens. Use of abrasive cleaners, solvents, excessive rubbing or high-pressure air will damage the lens.

Ordinarily, the lens should not need to be cleaned. To reduce the necessity for cleaning, keep the protective cover over the optical input to the converter at all times other than when in use. Use clean, dry, low-pressure air (5 lb./sq.in maximum) to remove dust from the lens.

Exterior

Loose dust accumulated on the outside of the converter can be removed with a soft cloth or a small brush. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners. Avoid causing damage to the optical input lens during the cleaning procedure.

Interior

Normally, the main circuit board will not require cleaning unless a cover has been removed for an extended period of time. The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air (about 9 lb/sq. in). Remove any dirt which remains with a soft brush or a cloth dampened with a nonresidue-type cleaner, preferably isopropyl alcohol. A cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate circuit components.

TROUBLESHOOTING

Individual components are not replaceable by the customer. Obtain a new assembly to replace a defective one, or send the converter to a Tektronix Repair Center for repair (see "ASSEMBLY REPLACEMENT" and "INSTRUMENT REPACKAGING" procedures in this section).

The following basic procedure may be useful in locating and isolating a malfunction in the converter (refer to disassembly procedures provided later in this section to gain access to specific assemblies):

a. Ensure that all interconnections and mechanical components are functional.

b. Check the photodiode assembly by removing it and checking it on a curve tracer. The reverse-bias leakage current should be < 5 uA at 15 V. Diode response can be checked by directing a bright light (such as a flashlight) into the the optical-input connector. DO NOT disassemble the photodiode/lens assembly (see CAUTION under "ASSEMBLY REPLACEMENT" in this section).

c. Check the voltage levels at the junction of the flex circuit board and the main circuit board (refer to circuit diagrams in "REPLACEABLE PARTS"). If there is a problem, separate the two boards.

d. Recheck the voltage levels where the flex board would connect to the main circuit board. If the voltage levels on the flex circuit board are incorrect, the problem is most likely in the flex board. If the voltage levels on the flex board are correct with the main board disconnected, the problem is most likely on the main circuit board.

OBTAINING REPLACEMENT PARTS

Ordering Parts

When ordering, to ensure receiving the proper parts or assemblies, include all of the following information with your order:

1. Instrument type (including modification or option numbers).

2. Description of the part (if electrical, include the circuit number).

3. The Tektronix part number.

ASSEMBLY REPLACEMENT

TEKPROBE ™ Contact Pin Replacement

Carefully grasp the end of the pin to be replaced with a pair of needle nosed pliers and pull it straight out of the BNC assembly. To install a new pin, carefully hold the pin with needle nosed pliers and push the pin into the BNC assembly.

Be careful not to bend or crush the pin.

Converter Top Cover Removal

Remove the top cover (the cover with slots), with the cover removal tool. (See Figure 6-1.) The removal tool is available as an optional accessory, see "REPLACEABLE PARTS".

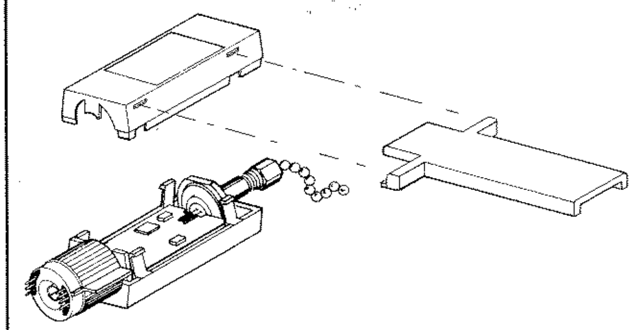

Figure 6-1 Top Cover Removal

Flex Circuit Board Replacement

To replace the flex circuit board:

a. Remove the top cover.

b. Carefully pry up the main circuit board, photodiode, and BNC assemblies.

c. Disconnect the BNC assembly from the main circuit board.

CAUTION

The flex circuit board (as well as the main board) are easily damaged by excessive heat, and the connections from the flex circuit board to the main board are close together. To ensure proper operation of the converter:

1. *Use only silver solder and a temperature-controlled soldering iron with a maximum tip temperature of 600°F.*
2. *Keep the soldering iron contact as brief as possible.*
3. *Observe and note the position of all connections. Check that there are no shorts or opens before reassembling the converter.*

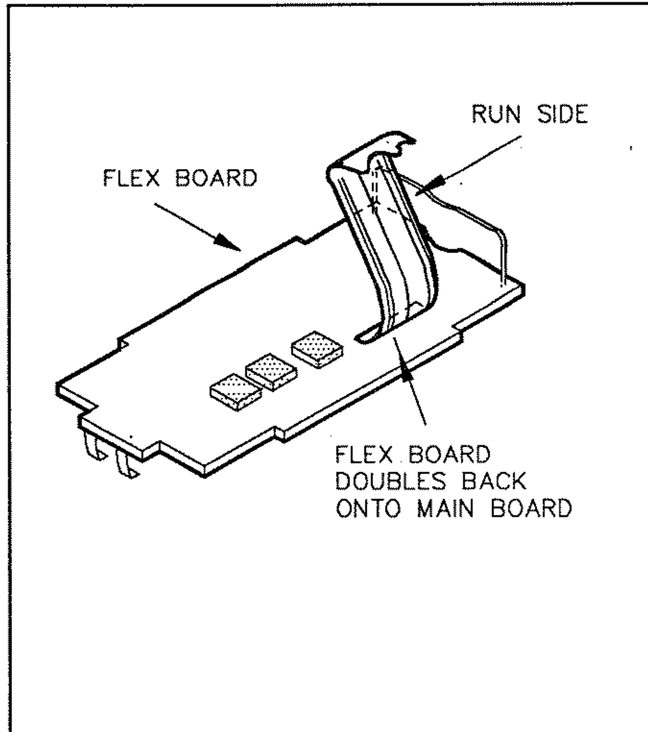

Figure 6-2. Flex Circuit Board Replacement.

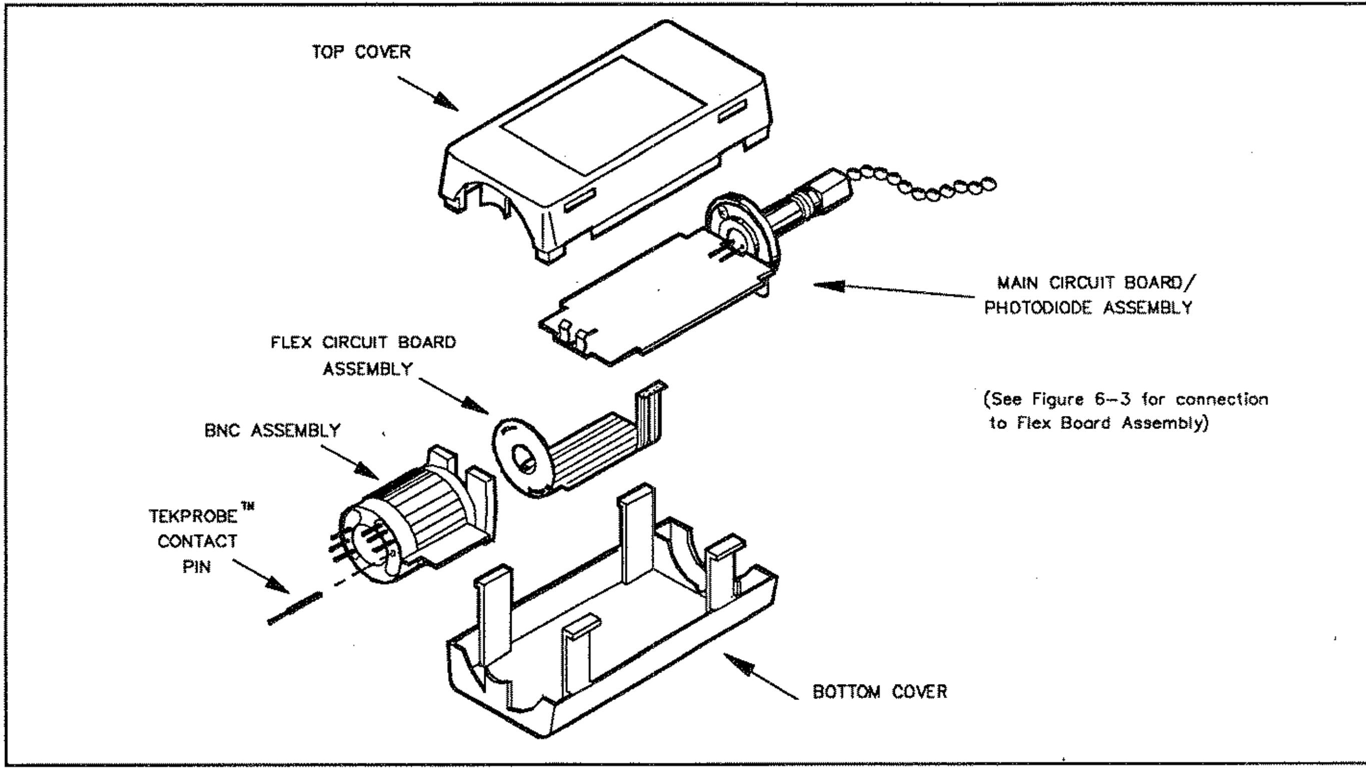

Figure 6-3. Assembly Replacement.

d. Carefully unsolder the flex board from the BNC assembly and the main circuit board.

e. Carefully solder the new flex circuit board to the main circuit board and the BNC assembly.

f. Reassemble (by reversing the disassembly procedure) the BNC and the converter body.

Main Circuit Board /Photodiode Assembly Replacement

a. Remove the top cover.

b. Carefully pry up the main circuit board, photodiode, and BNC assemblies.

c. Remove the BNC assemblies from the main circuit board.

d. Carefully unsolder the flex board from the main circuit board.

e. Carefully solder the flex circuit board to the new main circuit board.

f. Reassemble (by reversing the disassembly procedure) the BNC and the converter body.

BNC Assembly Replacement

a. Remove the top cover.

b. Carefully pry up the main circuit board, photodiode, and BNC assemblies.

c. Remove the BNC assembly from the main circuit board and unsolder the flex circuit board connections.

d. Carefully solder the new flex board to the BNC assembly and install the new BNC assembly on the main circuit board.

e. Reassemble (by reversing the disassembly procedure) the BNC and photodiode assemblies and the converter body.

READJUSTMENT AFTER REPAIR

After any electrical or optical component has been repaired or replaced, complete the "PERFORMANCE CHECK PROCEDURE" (Section 4), to verify that the converter is within specification limits. If adjustment is necessary, perform the appropriate "ADJUSTMENT PROCEDURE" (Section 5).

INSTRUMENT REPACKAGING

If the converter is to be shipped to a Tektronix Service Center for service or repair, attach a tag that contains the following information:

a. Owner's name and address and the name of an individual that can be contacted.

b. Description of the service required.

To repackage the converter, use the original packaging carton in which your converter was shipped. If the original packing is unfit for use or is not available, repackage the converter as follows:

a. Obtain a corrugated cardboard carton having inside dimensions that allow for at least 2 inches of cushioning around the converter. Use a carton having a test strength of at least 175 pounds.

b. Surround the converter with protective polyethylene sheeting.

c. Cushion the converter on all sides by tightly packing dunnage or urethane foam between carton and converter, allowing 2 inches on all sides.

d. Seal the carton with shipping tape or an industrial stapler.

e. Send the instrument to the nearest Tektronix Repair Center (check your Tektronix Product Catalog for the correct address).

REPLACEABLE PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office 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 developed in our engineering department. It is therefore important to include the following information in your order: Part number, instrument type or number, serial number, and modification number (if applicable). If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

ITEM NAME

In the 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, the U.S. Federal Cataloging Handbook H6-1 can be used.

INDENTATION SYSTEM

This parts list is indented to indicate item relationships. Following is an example 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

--- * ---

Detail Part of Assembly and/or Component
Attaching parts for Detail Part

--- * ---

Parts of Detail part
Attaching parts for Parts of Detail Part

--- * ---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented parts are part of and included with, the next higher indentation. The separation symbol --- * --- indicates the end of attaching parts.

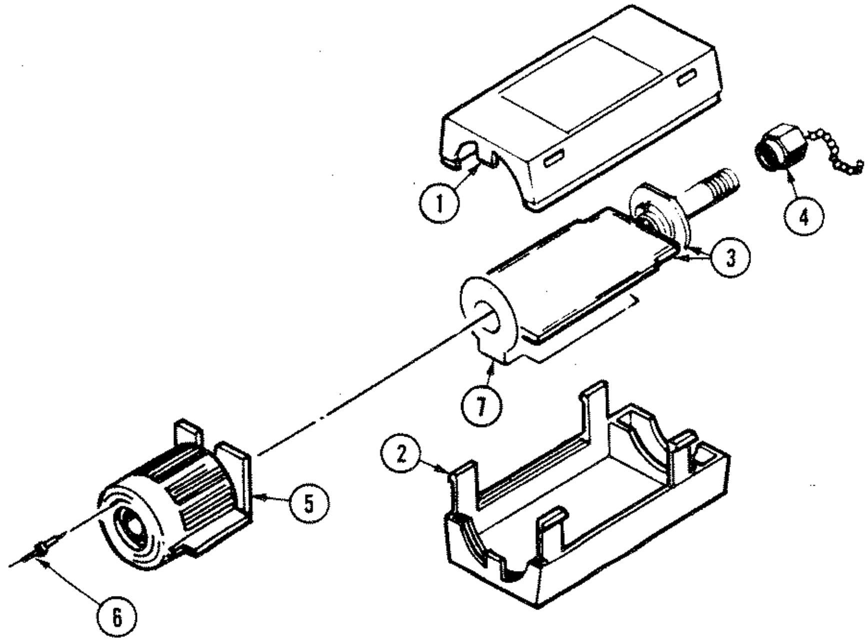

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Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	206-0406-00			1	COMP BOX,TOP:W/LABEL,P6703	80009	206-0406-00
-2	206-0407-00			1	COMP BOX,BOT:W/LABEL,P6703	80009	206-0407-00
-3	672-0267-00			1	CIRCUIT BD ASSY:MAIN (STANDARD ONLY)	80009	672-0267-00
	672-0268-00			1	CIRCUIT BD ASSY:MAIN (OPTION 01 ONLY)	80009	672-0268-00
	672-0269-00			1	CIRCUIT BD ASSY:MAIN (OPTION 02 ONLY)	80009	672-0269-00
-4	200-3455-00			1	COVER,CONN:DUST CAP,NON SHORTING (STANDARD ONLY)	98291	50-601-4110-890
	200-3091-00			1	COVER,DUST:FC STYLE SINGLE MODE CONN (OPTION 01 ONLY)	80009	200-3091-00
	200-3659-01			1	COVER,CONNECTOR:DUST CAP,METAL,W/BEAD CHAIN (OPTION 02 ONLY)	80009	200-3659-01
-5	131-4128-00			1	CONN,RCPT,ELEC:	80009	131-4128-00
-6	131-3627-01			6	CONTACT,ELEC:GOLD PLATED TIP	18359	ORDER BY DESCR
-7	670-9726-09			1	CIRCUIT BD ASSY:FLEX,TESTED	80009	670-9726-09
					STANDARD ACCESSORIES		
	016-0156-03			1	CASE,CRYG,PROBE:W/O TRAYS	53718	ORDER BY DESCR
	070-7496-00			1	MANUAL,TECH:INSTR,P6703	80009	070-7496-00
					OPTIONAL ACCESSORIES		
	003-1383-00			1	RLSE TOOL,COVER:COMP BOX,POLYCARBONATE	80009	003-1383-00
	174-0876-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA TO ST CONN	65148	IOCA1254-2B
	174-0877-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA TO DIAMOND CONN	65148	IOCA1258-2B

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-	174-0878-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA TO FC CONN	65148	IOCA1253-2B
	174-0879-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA TO SMA CONN	65148	IOCA1250-2B
	174-0880-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA TO BICONIC CONN	65148	IOCA1251-2B
	174-1303-00			1	CABLE,FIBER OPT:2 METER,100/140 MICRON,SMA	65148	ORDER BY DESCR

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
18359	PYLON CO INC	51 NEWCOMB ST	ATTLEBORO MA 02703-1403
53718	GRACE W R AND CO POLYFIBRON DIV/AIRMOLD/	BECKER FARMS INDUSTRIAL PK P O BOX 610	ROANOKE RAPIDS NC 27870
65148	INTEROPTICS DIV OF WILLIAM J PURDY CO	770 AIRPORT BLVD	BURLINGAME CA 94010-1927
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077-0001
98291	SEALECTRO CORP BICC ELECTRONICS	40 LINDEMAN DR	TURNBULL CT 06611-4739