Operation Manual

11947C Transient Limiter

Part NO. CK-11947-90006
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Revision: A

Notice

Product Transition

Under the authorization of Agilent Technologies, Cokeva, Inc. is offering the 11947C as a direct replacement for the Agilent 11947A. The 11947C provides the functionality and reliability you expect.

Contacting Cokeva Sales and Service Office

For more information, please contact us at:

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Business hours: Mon – Fri | 8:00 AM - 4:30 PM (Pacific Standard Time)

In any correspondence or telephone conversation, please refer to your instrument by its model number and full serial number.

Certification

Cokeva, Inc. certifies that this product met its published specifications at the time of shipment from the factory.

Warranty

This Cokeva, Inc. product is warranted against defects in material and workmanship for a period of two years from date of shipment or for the length of a purchased warranty extension if applicable. During the warranty period, Cokeva, Inc. will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to Cokeva, Inc. Buyer shall prepay shipping charges to Cokeva, Inc. and Cokeva, Inc. shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Cokeva, Inc. from another country.

Cokeva, Inc. warrants that its software and firmware designated by Cokeva, Inc. for use with an instrument will execute its programming instructions when properly installed on that instrument. Cokeva, Inc. does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error-free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance or calibration by Buyer or by vendors not approved by Cokeva, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. COKEVA SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. COKEVA, INC. SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Assistance

For any assistance, contact the Cokeva, Inc. Sales and Service Office at +1 916.543.7600 between 8:00 AM – 4:30 PM (PST), Mon – Fri.

Content

SAFETY SYMBOLS

The following safety symbols are used throughout this manual. Familiarize yourself with each of the symbols and its meaning before operating this instrument.

Caution

The *caution* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a *caution* sign until the indicated conditions are fully understood and met.

Warning

The *warning* sign denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a *warning* sign until the indicated conditions are fully understood and met.

General Safety Considerations

Warning

Before this instrument is switched on, **make sure it has been properly grounded through the protective conductor of the ac power cable to a socket outlet provided with protective earth contact.**

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal can result in personal injury.

Warning

There are many points in the instrument which can, if contacted, cause personal injury. Be extremely careful.

Any adjustments or service procedures that require operation of the instrument with protective covers removed should be performed only by trained service personnel.

Caution

Before this instrument is switched on, make sure its primary power circuitry has been adapted to the voltage of the ac power source.

Failure to set the ac power input to the correct voltage could cause damage to the instrument when the ac power cable is plugged in.

1. General Information

Introduction

The Cokeva, Inc. Model 11947C Transient Limiter is an instrument accessory that protects input circuitry from transients and accidental overloads. This operation manual explains how to use the limiter, briefly describes tests that can be used to verify its specifications, and suggests the actions to take should the limiter need repair or calibration.

Specifications

Specifications and characteristics are listed in Table 1-1. These are performance standards or limits against which the instrument may be tested.

Table 1-1. Specifications and Characteristics

SPECIFICATIONS:	
Frequency Range	9 kHz to 200 MHz
Insertion Loss	
> 30 dB	below 2 KHz
10 dB ±05 dB	9 kHz to 50 MHz
10 dB +2.2 dB-0.5 dB	50 MHz to 200 MHz
Calibration Accuracy	±0.2 dB at 25°C
Maximum Input Level	
Continuous	2.5 W average (+34 dBm)
Pulse	10 kW for 10 μs
DC Voltage	±12 V
Connectors	
Input	BNC (female)
Output	Type N (male)

Table 1-1. Specifications and Characteristics (continued)

CHARACTERISTICS:	
Insertion Loss	
13 dB	<6 kHz, >400 MHz
Impedance	50Ω
Reflection Coefficient	
Input	
<0.13 (1.3 SWR)	9 kHz to 50 MHz
<0.26 (1.7 SWR)	50 MHz to 200 MHz
Output	
< 0.09 (1.2 SWR)	9 kHz to 50 MHz
< 0.29 (1.8 SWR)	50 MHz to 200 MHz
Limiting Threshold	50 mW (+17 dBm)
Overall Length	138 mm (5.4 inches)

Description

The Cokeva 11947C Transient Limiter is a unidirectional, solid-state, passive device for use from 9 kHz to 200 MHz. It consists of a diode limiter, a 10 dB attenuator, and a high-pass filter integrated into a 50Ω transmission line. The transient limiter has no adjustments.

The SWR characteristics in Table 1-1 apply below the limiting threshold. SWR above the threshold is unpredictable, since the Cokeva 11947C effects its limiting by reflecting some of the input power.

Limiting is nonlinear and depends on input power and ambient temperature. The typical limiting curves shown in Figure 1-1 apply at an ambient temperature of 25°C.

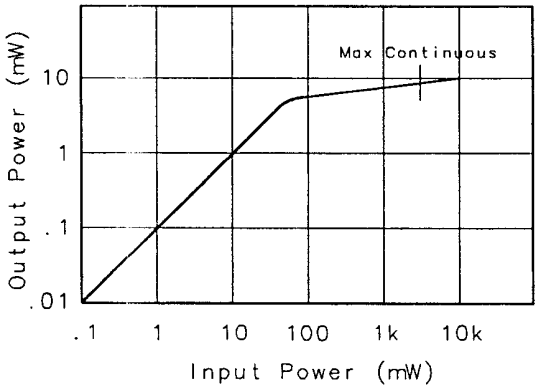

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Figure 1-1. Typical Limiting Characteristics

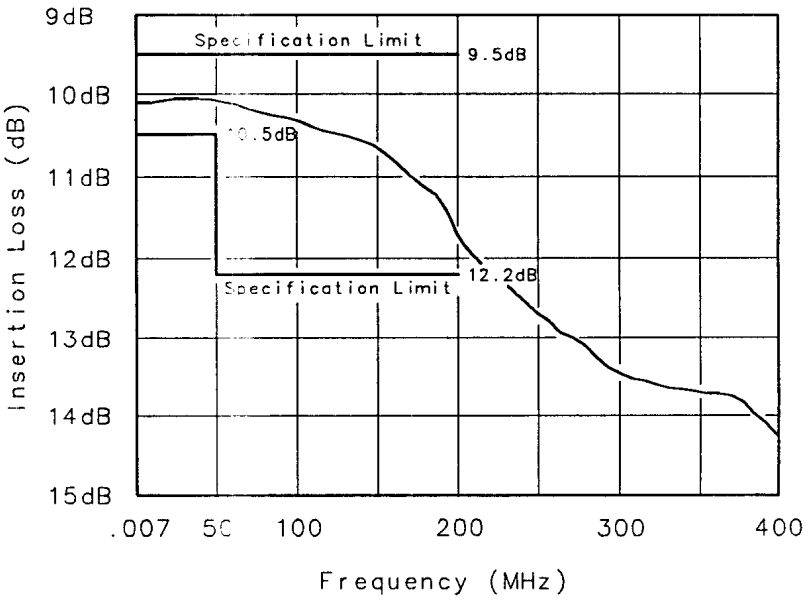

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Figure 1-2. Typical Insertion Loss Versus Frequency

Initial Inspection

Inspect the shipping container for damage. If the container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness, and the Cokeva 11947C has been checked mechanically and electrically. Procedures for checking electrical performance are given in Chapter 3, "Operation Verification."

If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass operation verification tests, notify the Cokeva, Inc. office (listed below). If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Cokeva office. Keep the shipping materials for inspection by the carrier. The Cokeva office will arrange for the repair or replacement of the instrument without waiting for claim settlement.

Cokeva Sales and Service Office

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Rocklin, CA 95765 USA
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Office hours: 8:00 AM – 4:30 PM (PST), Mon - Fri

2. Operation

Description

For reliable operation over its full frequency and power range, the limiter must be used as a unidirectional device. Incident power must be applied as shown on the label of the limiter.
The limiter protects the input mixer and attenuator of a spectrum analyzer subjected to transients from Line Impedance Stabilization Networks during conducted EMI measurements.

Although harmonic distortion is generated by the Cokeva 11947C while it is limiting, the limiter still will prevent transients from damaging the device it is protecting.

Caution

Do not apply more than 2.5 W average power or 10 kW pulse power to the limiter. Apply <±12 Vdc. Exceeding these levels could result in permanent damage to the limiter.

Mating Connectors

Mating connectors used with the limiter should be Type N female at the output and BNC male at the input.

Caution

Do not reverse the polarity of the limiter. Doing so can destroy the limiter.

Operating Environment

The Cokeva 11947C should be operated only within the following temperature range: O°C to 55°C.

Storage and Shipment

The Cokeva 11947C may be stored or shipped in environments within the following temperature range: -40°C to +75°C.

Containers and materials identical to those used in factory packaging are available through Cokeva, Inc. offices. If the instrument is being returned to Cokeva, Inc. for servicing, attach a tag indicating the type of service required, the model number and full serial number of the instrument, and your complete return address. Also, mark the container FRAGILE, to assure careful handling. In any correspondence, refer to the instrument by model number and full serial number.

3. Operation Verification

Insertion Loss and Frequency Response

Description

The following procedure will check insertion loss at the frequencies where calibration factors have been provided. A comprehensive test makes a swept measurement using, for example, an HP 3577A.

Equipment

Spectrum Analyzer	HP 8566A/B, HP 8558A/B
Synthesized Sweeper	HP 8340A
Frequency Synthesizer	HP 3335A
Adapter, Type N (m) to BNC (f)	1250-1250

Procedure

1. Connect the HP 3335A 50Ω output to the spectrum analyzer input, using a BNC cable and the Type N-to-BNC adapter.
2. Cycle power on the HP 3335A; this resets the instrument.
3. On the HP 3335A, press (AMPLITUDE) 20 (-dBm).
4. Set the spectrum analyzer controls as follows:
   (INSTR PRESET)
   (START FREQ) 5 (kHz)
   (STOP FREQ) 110 (kHz)
   (VIDEO BW) 1 (kHz)
5. Set the HP 3335A frequency:
   (FREQUENCY) 9 (kHz)
6. On the spectrum analyzer, press (SINGLE) sweep and after completion of sweep, (PEAK SEARCH). Record marker amplitude in column 2 of Table 3-1.
7. Repeat steps 5 and 6 for HP 3335A frequencies of 10 kHz, 30 kHz, and 100 kHz.
8. Set the spectrum analyzer controls as follows:
   (START FREQ) 500 (kHz)
   (STOP FREQ) 31 (MHz)
9. Repeat steps 5 and 6 for HP 3335A frequencies of 1 MHz, 10 MHz, and 30 MHz.
10. Replace the adapter on the spectrum analyzer input with the Cokeva 11947C Transient Limiter.
11. Repeat steps 4 through 9, recording the marker amplitude in column 3 of Table 3-1.
12. Remove the Cokeva 11947C Transient Limiter.
13. Connect a cable from the HP 8340A RF output to the spectrum analyzer input using the Type N-to-BNC adapter and other adapters as required.

14. Set the spectrum analyzer controls as follows:

    (START FREQ) 50 (MHz)

    (STOP FREQ) 210 (MHz)

15. Set the HP 8340A controls as follows:

    (INSTR PRESET)
    (POWER LEVEL) -10 (dBm)

16. Set the HP 8340A frequency:

    (CW) 100 (MHz)

17. On the spectrum analyzer, press (SINGLE) sweep and after completion of sweep, (PEAK SEARCH). Record maker amplitude in column 2 of Table 3-1.

18. Repeat steps 16 and 17 for HP 8340A CW frequencies of 150 MHz and 200 MHz.

19. Replace the adapter on the spectrum analyzer input with the Cokeva 11947C Transient Limiter.

20. Repeat steps 16, 17 and 18 and record the marker amplitude in column 3 of Table 3-1.

21. Subtract the readings in column 3 from those in column 2, and record the difference in column 4 of Table 3-1.

22. Compare the results in column 4 with the limits in column 5 of Table 3-1.

Table 3-1. Insertion Loss/Frequency Response

Column 1 Frequency	Column 2 Input Level (dBm)	Column3 Output Level (dBm)	Column 4 Insertion Loss (dB)	Column 5 Limits (dB)
9 kHz	_____	_____	_____	9.5 to 10.5
10 kHz	_____	_____	_____	9.5 to 10.5
30 kHz	_____	_____	_____	9.5 to 10.5
100 kHz	_____	_____	_____	9.5 to 10.5
1 MHz	_____	_____	_____	9.5 to 10.5
10 MHz	_____	_____	_____	9.5 to 10.5
30 kHz	_____	_____	_____	9.5 to 10.5
100 MHz	_____	_____	_____	9.5 to 12.2
150 MHz	_____	_____	_____	9.5 to 12.2
200 MHz	_____	_____	_____	9.5 to 12.2

Limiting

Description

To check the typical limiting threshold requires a high power source (greater than +17 dBm).
However, the limiting action can be verified by testing the Cokeva 11947C Transient Limiter in reverse, bypassing the input attenuation.

Equipment

Synthesizer /Function Generator . . . . . HP 3325A
Digital Voltmeter . . . . . HP 3456A

Procedure

1. Cycle power on the HP 3325A to reset it.
2. Connect the Cokeva 11947C Transient Limiter output to the HP 3325A output using the

Type N-to-BNC adapter.

3. Connect the Cokeva 11947C Transient Limiter input to the HP 3456A volts input using a BNC cable and a BNC-to-banana plug adapter.
4. Set the HP 3325A controls as follows:
   (FREQ) 10 (kHz} (~)
   (AMPTD) 10 (VOLT)
5. Press (RESET) on the HP 3456A and select (~V).
6. If the HP 3456A reads less than 0.52 V, the limiting action is working. If the HP 3456A reads more than 0.60 V, at least one limiting diode is open and the limiting action is impaired.
7. If the HP 3456A reads between 0.52 V and 0.60 V, additional testing is required to determine if the limiting action is working. Return to Cokeva for calibration and service.

For Cokeva Internal Reference Only

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