Keysight 11636B APC-3.5 mm Power Divider DC to 26.5 GHz

Operating and Service Manual

KEYSIGHT TECHNOLOGIES

Notices

Copyright Notice

Manual Part Number

11636-90001

Edition

Edition 4, January 16, 2019

Printed in:

Printed in Malaysia

Published by:

Keysight Technologies
Bayan Lepas Free Industrial Zone,
11900 Penang, Malaysia

Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

Declaration of Conformity

Declarations of Conformity for this product and for other Keysight products may be downloaded from the Web. Go to http://www.keysight.com/go/conformity. You can then search by product number to find the latest Declaration of Conformity.

U.S. Government Rights

The Software is “commercial computer software,” as defined by Federal Acquisition Regulation (“FAR”) 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement (“DFARS”) 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at http://www.keysight.com/find/sweula. The license set forth in the EULA represents the exclusive authority by which the U.S. government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No additional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFAR 227.7103-5 (c), as applicable in any technical data.

Warranty

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED “AS IS,” AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, KEYSIGHT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. KEYSIGHT SHALL NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR OF ANY INFORMATION CONTAINED HEREIN. SHOULD KEYSIGHT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT SHALL CONTROL.

Safety Information

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Waste Electrical and Electronic Equipment (WEEE) Directive

This instrument complies with the WEEE Directive marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.

Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/mta
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

Table of Contents

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

List of Figures

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

List of Tables

THIS PAGE HAS BEEN INTENTIONALLY LEFT BLANK.

Introduction

From DC to 26.5 GHz, the 11636B provides excellent output power symmetry between the two output ports. Its design provides excellent source match for fault applications using network analyzers. However, it is not recommended for ratio or source leveling applications.

The 11636B provides a symmetrical 6 dB power division. It can also be used as a power combiner: when signals are input at the two output ports, the sum of the two signals appears at the input port.

Specifications

Maximum input power: 0.5 W (27 dBm)

Frequency range: DC to 26.5 GHz

Input/output SWR:

- DC to 10.0 GHz: ≤1.22
- 10.0 GHz to 26.5 GHz: ≤1.29

Tracking between output ports:

- DC to 18.0 GHz: <0.25 dB
- 18.0 to 26.5 GHz: <0.50 dB

Maximum insertion loss: <7.5 dB (DC to 26.5 GHz)

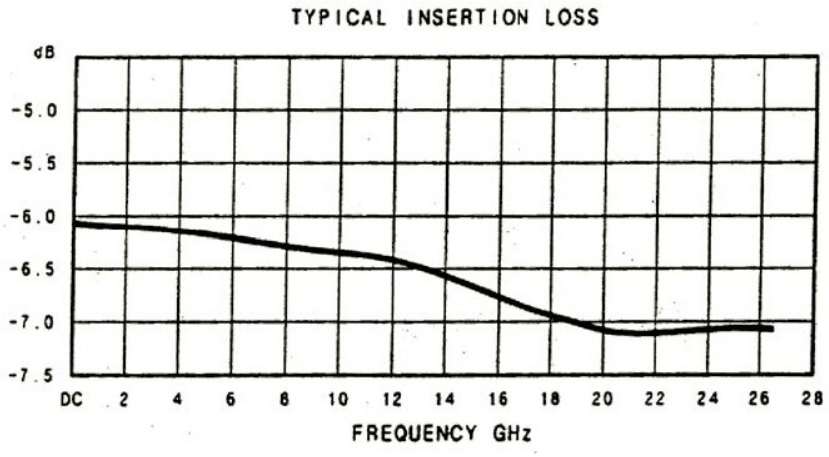

Figure 1 Insertion loss

Phase tracking between output arms: <3 degrees, typical

Nominal insertion loss: 6.0 dB + 0.04 dB/GHz

Number of ports: Three

Connectors: 3.5 mm on all ports

Dimensions:

NOTE In the following graphic, dimensions are given in inches (cm) and are maximum unless otherwise specified.

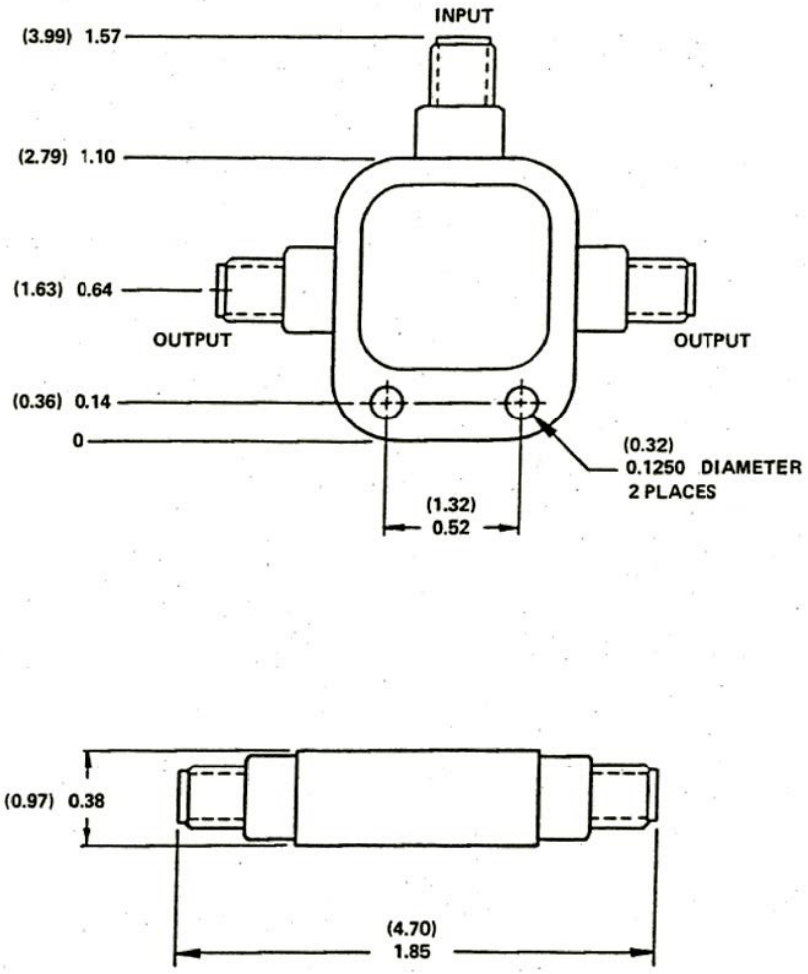

Figure 2 Dimensions

Mating the 11636B Power Divider with Other Precision 3.5 mm Devices

The 11636B power divider has precision 3.5 mm connectors, and is best used with other precision 3.5 mm devices. When mating connectors, observe the following precautions:

- Push them straight together.
- Make sure the male contact pin is precisely aligned with the female.
- Do not overtighten the connectors.
- NEVER rotate either center conductor (by turning the device body).
- Only turn the outer nut of the male connector.
- Torque to 8 in-lb (96 N-cm) for the final connection.

An 8 in-lb torque wrench is available from Keysight. For the part number, refer to "Equipment and Supplies" on page 15.

Mating the 11636B Power Divider with SMA Devices

CAUTION **SMA connectors are not precision devices, and are often out of mechanical tolerances even when new. Out of tolerance SMA connectors will likely ruin a precision 3.5 mm connector on the first mating. Gage SMA connectors before use.**

The 11636B power divider has precision 3.5 mm connectors. SMA connectors will mate with precision 3.5 mm connectors. However, caution is necessary to prevent accidental damage due to worn or out-of-tolerance SMA connectors. Such connectors can destroy a precision 3.5 mm connector even on the first connection. Keysight Technologies recommends that you remember the following important information:

- SMA connectors are not precision mechanical devices.
- They are not designed for repeated connections.
- They are very susceptible to mechanical wear.
- SMA connectors are often out of mechanical tolerances when new.

Before mating an SMA connector (even a new one) to a precision 3.5 mm connector, inspect the SMA connector carefully both visually and mechanically. To measure the mechanical tolerances, use a precision connector gage. A male SMA connector pin which is too long can smash or break the delicate fingers on the precision 3.5 mm female connector, damaging it beyond possibility of repair. Gaging SMA connectors is the most important step in preventing damage to your equipment, and it takes very little time. Gaging instructions and gage part numbers are provided in the *Connector Care for RF and Microwave Coaxial Connectors* document. It can be viewed online by searching for part number 08510-90064 at www.keysight.com.

Use the following precautions when mating SMA and precision 3.5 mm connectors:

- Push them straight together.
- Make sure the male contact pin is precisely aligned with the female.
- Do not overtighten the connectors.

– NEVER rotate either center conductor (by turning the device body).

– Only turn the outer nut of the male connector.

– Torque to 5 in-lb (50 N-cm) for the final connection.

Note that the torque listed above is less than when mating two precision 3.5 mm connectors. A 5 in-lb torque wrench is available from Keysight. For the part number, refer to "Equipment and Supplies" on page 15.

Significant structural and dimensional differences exist between these two type of connectors. Precision 3.5 mm connectors use an air dielectric. Only air exists between the center and outer conductors. The male or female center conductor is supported by a plastic bead, deep within the body of the connector. In SMA connectors, a plastic dielectric supports the entire length of the center conductor. In addition, the diameters of both the inner and outer conductors differ between SMA and precision 3.5 connectors. When an SMA connector is mated with a 3.5 mm connector, the connection will exhibit a discontinuity mismatch (SWR) of 1.10 typical at 20 GHz (return loss = 26.5 dB). SMA and 3.5 mm connectors should be mated only when a high connector mismatch can be tolerated.

Using only precision 3.5 mm connectors will provide superior SWR and insertion loss. It will also extend the life of your power divider (and other test equipment connectors) by reducing mechanical wear.

Refer to Table 1 for a list of precision 3.5 mm adapters available from Keysight Technologies. A precision 3.5 mm (m) to precision 3.5 mm (m) adapter, or precision airline, can be used to extend the life of the 11636B connectors.

Operating Environment

The operating environment should be within the following limits:

Temperature	0° to +55°C (+32° to +131°F)
Humidity	Up to 95% relative
Altitude	Up to 4.572 meters (15,000 feet)

Adjustments

The 11636B power divider requires no electrical or mechanical adjustments.

Service

The circuit elements of the 11636B are split into three identical channels. A malfunction will usually occur in only one channel and can be verified by moving the connection to another channel of the divider.

An ohmmeter can be used to check the continuity of the inner conductor connections. The resistance from either output center conductor to the input center conductor should be 33.3 ohms +/– 2 ohms.

There are no replaceable components for the power divider. A worn or damaged power divider must be replaced in whole.

Table 1 Precision 3.5 mm adapters available from Keysight Technologies

Description	Part number
Precision 3.5 mm (m) to type-N (m)	1250-1743
Precision 3.5 mm (m) to type-N (f)	1250-1750
Precision 3.5 mm (f) to type-N (m)	1250-1744
Precision 3.5 mm (f) to type-N (f)	1250-1745
Precision 3.5 mm (m) to Precision 7 mm	1250-1746
Precision 3.5 mm (f) to Precision 7 mm	1250-1747
Precision 3.5 mm (m) to Precision 3.5 mm (m)	85027-60007
Precision 3.5 mm (f) to Precision 3.5 mm (f)	85027-60005
Precision 3.5 mm (m) to Precision 3.5 mm (f)	85027-60006

Equipment and Supplies

The following equipment and supplies are required for the maintenance and use of, but are not supplied with, your 11636B power divider.

Table 2 Equipment and supplies

Item	Part number	Recommended use
3.5 mm gage sets (part of the 85052B calibration kits)	11752-60105 (f) 11752-60106 (m)	Periodic gaging of connectors. Gage every SMA connector before use.
Torque wrench, 5/16”, 96 N-cm (8 in-lb) (part of the 85052B calibration kit)	8710-1765	Mating two precision 3.5 mm connectors.
Torque wrench, open-end, 5/16”, 60 N-cm (5 in-lb)	8710-1582	Mating a precision 3.5 mm connector to an SMA. connector.
Document: *Connector Care for RF and Microwave Coaxial Connectors*	08510-90064	Following instructions on using and maintaining coaxial connectors.

Cleaning Connectors

For information on cleaning connectors, refer to the *Connector Care for RF and Microwave Coaxial Connectors* document. It can be viewed online by searching for part number 08510-90064 at www.keysight.com.

Contacting Keysight

Assistance with test and measurement needs and information on finding a local Keysight office are available on the Web at:

www.keysight.com/find/assist

NOTE **In any correspondence or telephone conversation, refer to the Keysight product by its model number and full serial number. With this information, the Keysight representative can determine whether your product is still within its warranty period.**

Edition 4, January 16, 2019

Printed in Malaysia

11636-90001
www.keysight.com