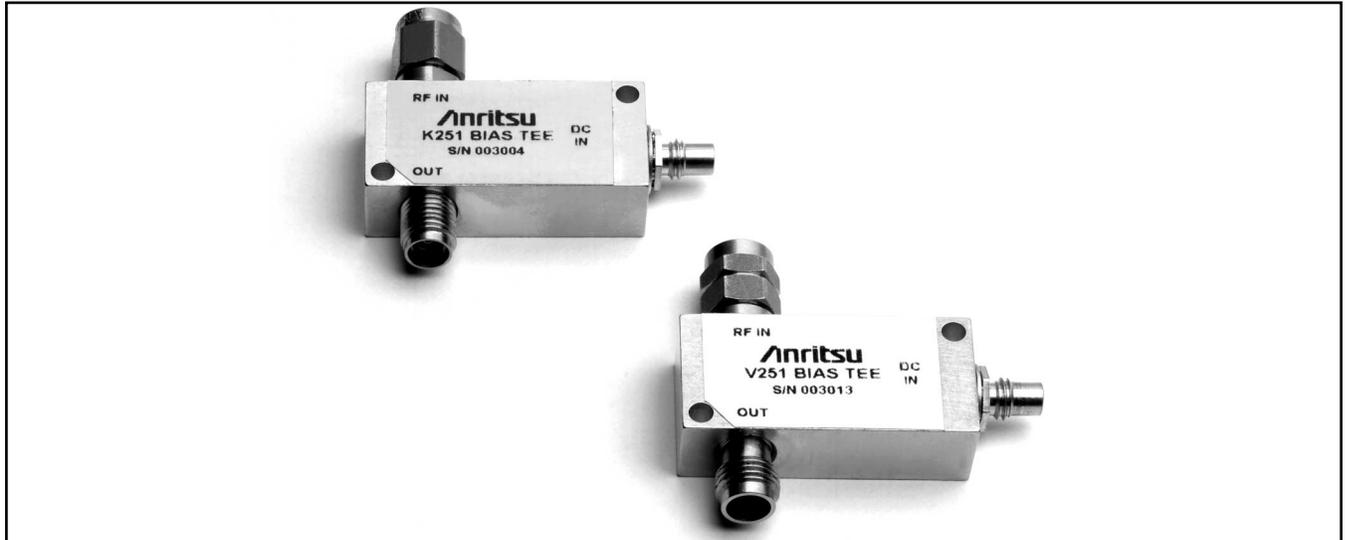


# OPERATION AND MAINTENANCE MANUAL FOR MODEL K251 AND V251 BIAS TEE



**Figure 1.** Models K251 and V251 Bias Tees

## 1. INTRODUCTION

This manual describes the Models K251 and V251 Bias Tee (Figure 1). It provides specifications and a list of precautions the user should observe when using these devices.

## 2. DESCRIPTION

The K251 and V251 Ultra-Wideband Bias Tees have been optimized for optical communications and other high-speed pulse, data or microwave applications. They supply both DC and high-frequency drive signals to a user device via a single input port, and they deliver outstanding performance from <100 kHz to >40 or 65 GHz.

These devices feature fast rise times, excellent low frequency response, minimum insertion loss and flat group delay. Precision K Connectors® and V Connectors® assure excellent impedance match across the wide bandwidths available.

## 3. SPECIFICATIONS

Table 2 provides performance specifications.

## 4. PRECAUTIONS

ANRITSU K251 and V251 Bias Tees are high-quality, precision laboratory devices and should receive the same care and respect afforded other such components. Complying with the following precautionary notes will guarantee longer component life and less equipment downtime due to connector failure. Also, such compliance will ensure that RF component failures are not due to misuse or abuse—two failure modes not covered under the ANRITSU warranty.

- a. Beware of Destructive Pin Depth on Mating Connectors.* Measure the pin depth of the connector that mates with the RF component, *before* mating. Use an ANRITSU Pin Depth Gauge (Figure 2, Table 1) or equivalent. Based on RF components returned for repair, destructive pin depth on mating connectors is the major cause of

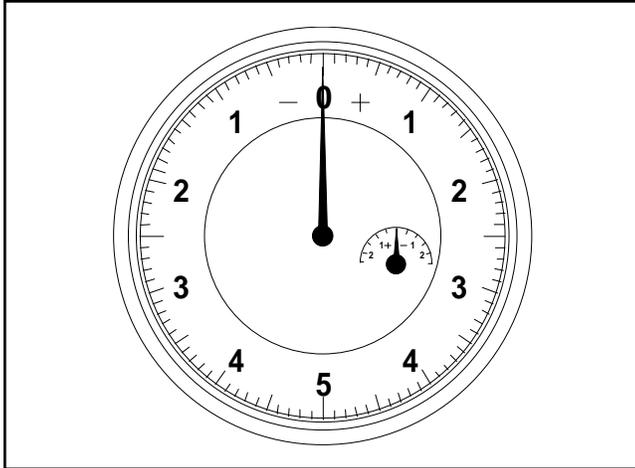
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**Figure 2.** Pin Depth Gauge

**Table 1.** Available Gauging Sets

| Model | Connector Type | Gauging Set Model |
|-------|----------------|-------------------|
| V251  | V              | Consult Factory   |
| K251  | K              | 01-162            |

failure in the field. When an RF component connector is mated with a connector having a destructive pin depth, damage will likely occur to the RF component connector. (A destructive pin depth has a center pin that is too long in respect to the connector's reference plane.)

The center pin on an RF component connector has a precision tolerance measured in mils (1/1000 inch), whereas connectors on test devices that mate with RF components may not be precision types. Their pins may not have the proper depth. *They must be measured before mating to ensure suitability.* When gauging pin depth, if the test device connector measures out of tolerance in the "+" region, the center pin is too long. Mating under this condition will likely damage the RF component connector. On the other hand, if the test device connector measures out of tolerance in the "-" region, the center pin is too short. While this will not cause any damage, it will result in a poor connection and a consequent degradation in performance.

The pin depth for bias tee models are as shown below:

- K251: 0.000 to -0.005.
- V251: 0.000 to -0.003.

- Avoid Over Torquing Connectors.** Over torquing connectors is destructive; it may damage the connector center pin. *Never* use pliers to tighten connectors.
- Avoid Mechanical Shock.** RF components are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. They are laboratory-quality devices and, like other such devices, require careful handling.
- Keep Bias Tee Connectors Clean.** The precise geometry that makes the RF component's high performance possible can be easily disturbed by dirt and other contamination adhering to connector interfaces. When not in use, keep the connectors covered. Refer to paragraph 5 for cleaning instructions.

## 5. MAINTENANCE

ANRITSU recommends that no maintenance other than cleaning be attempted by the customer. The bias tee should be returned to ANRITSU for repair and/or service when needed.

The traditional method of cleaning K Connectors with a cotton swab and alcohol can break the male connector pin on the precision connectors. The reason: the cotton swab has a larger diameter than the connector (that is, the area between the inner wall and the center pin.)

We still recommend using a cotton swab; however, you need to trim the swab before inserting into the connector.

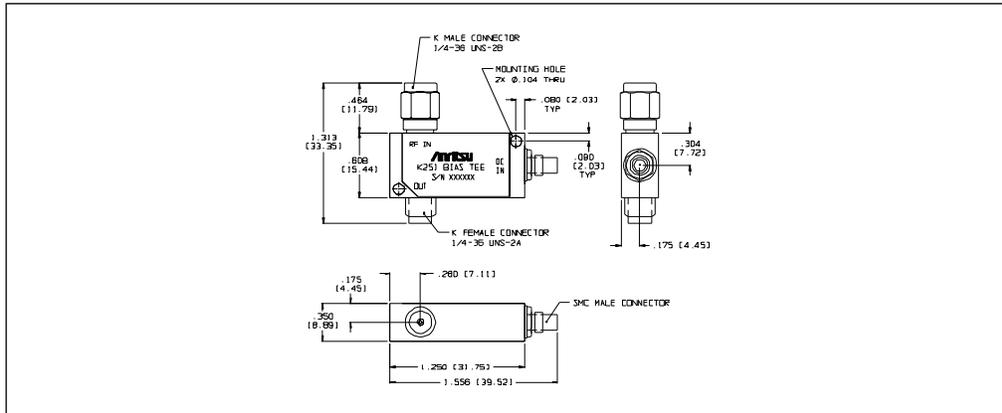
For best results, observe the following precautions:

- Use either the finger saver that has been provided with the bias tee or use a 5 inch-pound torque wrench when connecting to other devices. No other tools are recommended.
- Always spin the coupling nut to tighten connections. Spinning the connector body causes premature wear to the connector interface.

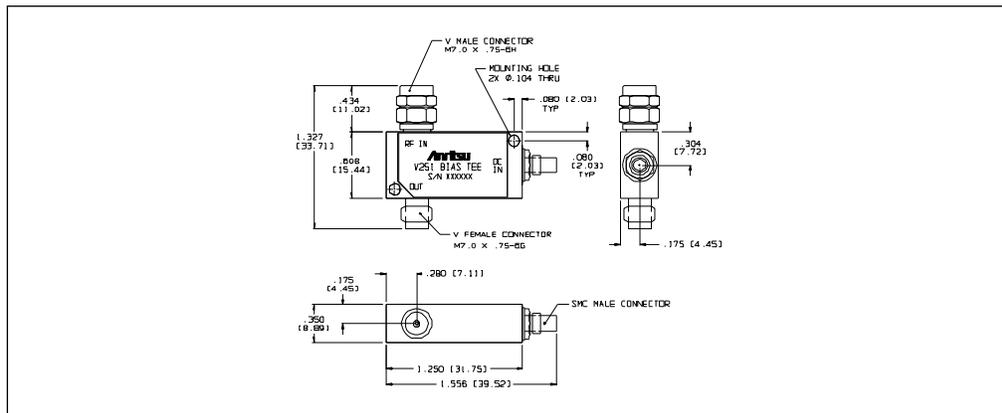
Do not disturb connector center pin. Improper use (see above) of a cotton swab or other such probe to clean the inner connector may cause the center conductor to hinge on its bead and weaken or shear the internal connection.

**Table 2.** Performance Specifications, 1 of 2

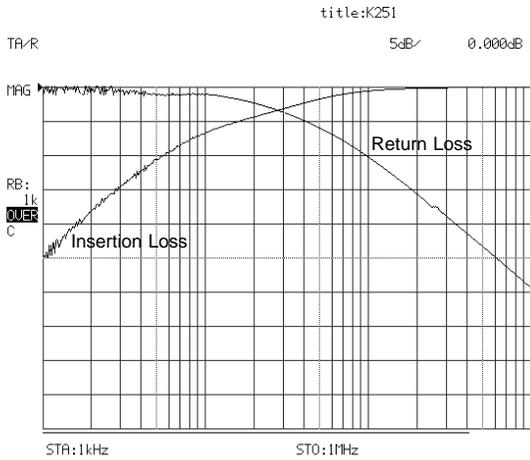
| Specification           | K251  | V251  |
|-------------------------|---|---|
| Frequency Range, 3dB BW | 50 kHz to 40 GHz  | 100 kHz to 65 GHz                                     |
| Insertion Loss          | <2.0 dB typical   | <2.5 dB typical                                       |
| Return Loss             | See Figure 2 and 3  | See Figure 4 and 5                                    |
| Rise Time               | < 7 ps typical  | < 5 ps typical  |
| Group Delay             | 110 ± 1 ps typical  | 113 ± 1 ps typical                                    |
| Max DC Voltage          | 16VDC   | 16VDC   |
| Max RF Power            | 1 W   | 1 W   |
| Connectors              | RF Input: K Male<br>RF Output: K Female<br>DC Bias: SMC (m) | Input: V Male<br>Output: V Female<br>DC Bias: SMC (m) |



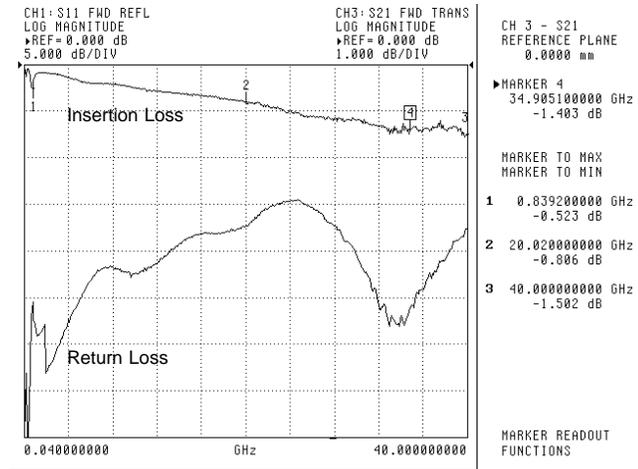
**Outline Drawing, K251**



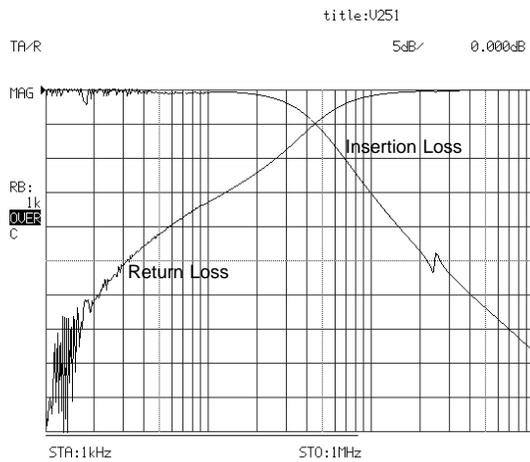
**Outline Drawing, V251**



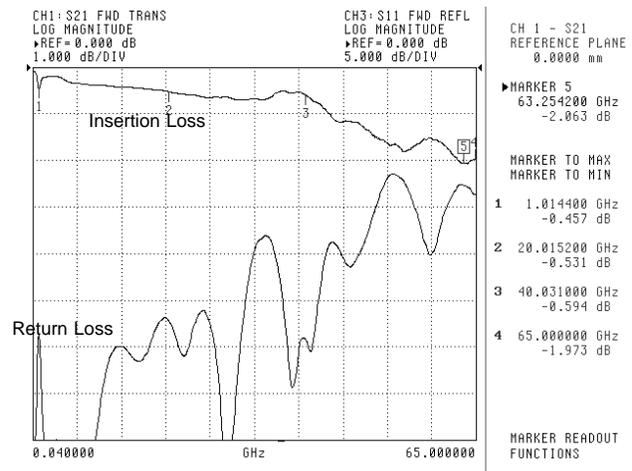
**Figure 2.** Typical K251 Insertion Loss and Return Loss, 1 kHz to 1 MHz



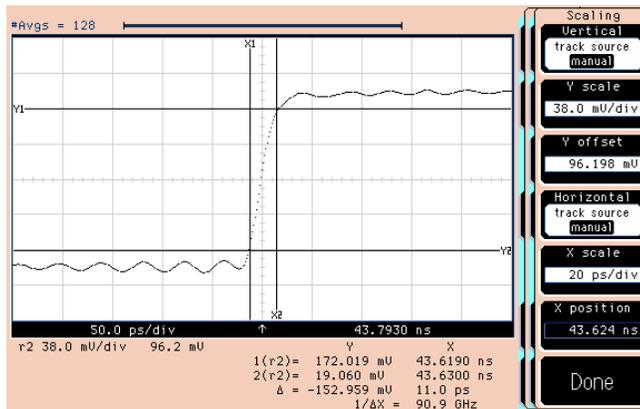
**Figure 3.** Typical K251 Insertion Loss and Return Loss, 40 MHz to 40 GHz



**Figure 4.** Typical V251 Insertion Loss and Return Loss, 1 kHz to 1 MHz



**Figure 5.** Typical V251 Insertion Loss and Return Loss, 40 MHz to 65 GHz



**Figure 6.** Typical Uncorrected Pulse Response for V251.

Absolute risetime for the Bias Tee is derived from this measured data by applying the RSS method to compensate for the risetime of the input pulse.

$$T_{meas} = \sqrt{T_{BT}^2 + T_{PG}^2}$$

$T_{meas}$  = Uncorrected rise time

$T_{BT}$  = Absolute Bias Tee risetime

$T_{PG}$  = Rise time of input pulse