

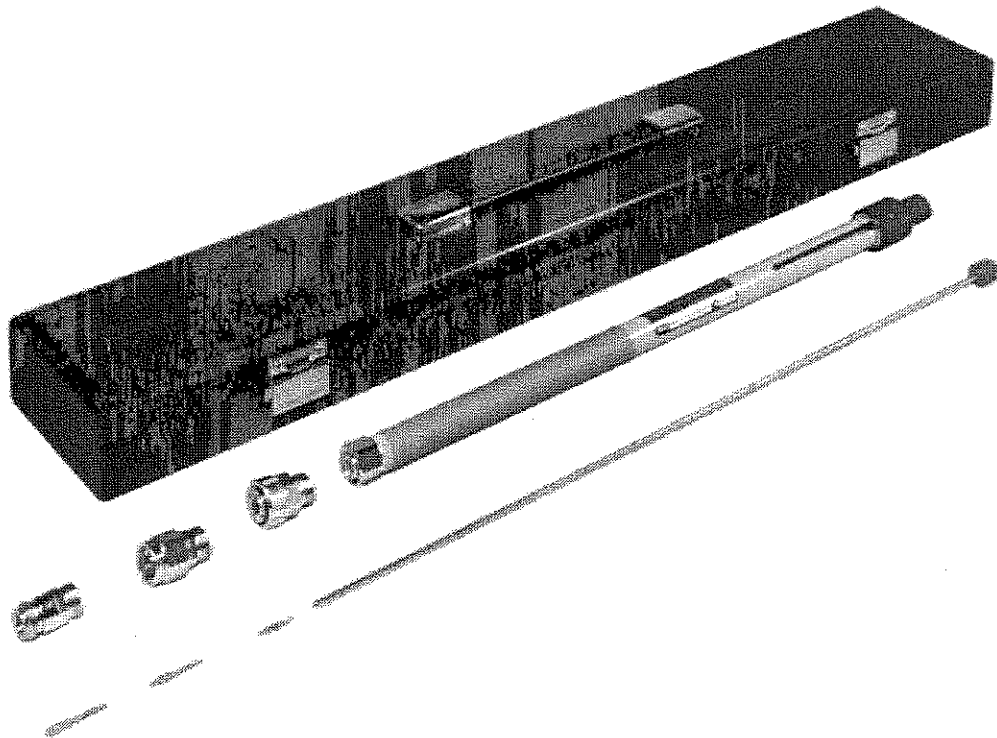
Operating Manual

Precision Sliding Short 0.9 GHz to 18 GHz

Model 2508A

The following data sheets are located at the back of this manual:

- 2C-204 - Precision Sliding Shorts, 7mm Type N, Model 2508A
- 5E-049 - Precision Type N Connectors, 7mm
- 5E-061 - Precision LPC7 Connectors





1. GENERAL INFORMATION

This manual applies to the Maury Microwave Corporation Model 2508A Precision Sliding Short. This instrument is a movable, sliding short for use in precision microwave measurements from 0.9 to 18 GHz. Refer to the Data Sheets to familiarize yourself with the components provided and to enhance or facilitate your specific measurement application.

1.1 DESCRIPTION

The sliding short, with all supplied components, is furnished in an attractive wood instrument case along with operating instructions.

The instrument provides measurement capability in both APC7 and precision Type N male and female connectors. It is supplied with three precision beadless connectors and a center conductor that accepts Type N male or female contacts or an LPC7 spring-loaded pin. These components are further described in Sections 1.4.1 and 1.4.2.

1.1.1 Air Transmission Line

Among the many features of this precision sliding short, the most important is its high precision, machined 7mm air transmission line (see Figure 1.1). This air line provides a precise 50 ohm impedance standard which will maximize measurement accuracy. The accuracy of the air line is achieved by imposing demanding tolerances on the coaxial diameters. In addition, the center conductor is manufactured from stainless steel for mechanical rigidity then silver layered and gold flashed (prevents tarnishing) to provide low attenuation characteristics.

1.1.2 Connectors and Center Conductor

The connectors are coupled to the instrument by means of a precision, virtually reflectionless, beadless coupling. The movable center conductor allows the user to achieve a butt contact condition at the mating center conductor to eliminate any gap discontinuity.

1.1.3 Shorting Element

The shorting element is movable over at least one-half wavelength at the lowest rated frequency while providing a typical VSWR greater than 100:1 (the shorting element provides a typical VSWR of 100:1 neglecting line loss, see Section 1.2.1).

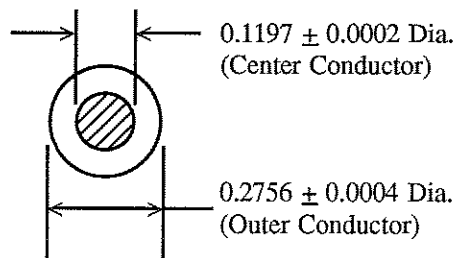


FIGURE 1.1: PRECISION 7mm AIR TRANSMISSION LINE



1.2 SPECIFICATIONS

| | |
|---|--|
| Frequency Range | 0.9 to 18 GHz |
| VSWR - Chassis | 1.004 max. (54 dB min. R.L.) |
| VSWR - Shorting Element | >100:1 typ. 1 |
| VSWR - LPC7 Connector | <1.002 + 0.001f (GHz) |
| VSWR - Type N Connector (Female or Male)..... | <1.02 + 0.002f (GHz) |
| Nominal Impedance | 50 ohms |
| Air Transmission Line Size | 7mm (See Figure 1.1) |
| Power Rating | 100 watt average, 5kw peak |
| Travel | >1/2 wavelength at 0.9 GHz |
| Connectors | Refer to Section 1.4.1 |
| Center Conductor and Contacts | Refer to Section 1.4.2 |
| Length (unit) | 10.5 in. (excluding connectors) |
| Size of Instrument Case | 25.25 L x 4 W x 2 H inches |
| Weight | 3 lbs.; shipping 5 lbs. |
| Additional Accessories (provided) | Instrument Case, 1/2" and 9/16" Wrench |

1 Neglecting line loss, see Section 1.2.1

1.2.1 Line Loss Considerations

The shorting element in this instrument will provide a typical VSWR of 100:1 across the operational frequency range when the length of air transmission line, between the shorting element and the connector interface, is reduced to an absolute minimum. However, in actual practice, inescapable transmission line losses will be introduced into the instrument as a function of the elements position along the line. In the worst case, where the shorting element is at its farthest position from the connector interface of the instrument and the operational frequency is at 18 GHz, the transmission line loss can approach 0.3 dB one way. This creates an additional return loss of 0.6 dB which will effectively reduce the instrument's VSWR to the neighborhood of 30:1.

1.3 APPLICATIONS

The precision sliding short is a basic tool for precision microwave measurements. It has an extremely accurate air transmission line (50 ohms ± 0.3%) and the ability to vary the reflection phase angle.

- a) One application of this instrument is in verifying the power handling capability of a microwave device. In many cases, microwave components are required to handle a given amount of average power when terminated with a short circuit at any phase angle. Applying this instrument as the termination of a device under test, allows the user to vary the angle of reflection as desired by sliding the element.
- b) Another application is to use this instrument as a stub tuner for impedance matching in laboratory measurement systems. In this application, the 2508A would be attached to the side arm of a three port tee junction.



1.4 EQUIPMENT SUPPLIED

- a) 1 ea. - Precision Sliding Short Chassis Assembly, Model 2508S1
- b) 1 ea. - Precision Center Conductor Assembly (silver layered, gold flashed), Model 2508S4
- c) 1 ea. - Precision LPC7 Spring-Pin, Model 2684S
- d) 1 ea. - Precision Type N Contact, Female .065H (with slots), Model 2507S1
- e) 1 ea. - Precision Type N Contact, Male .065P (with pin), Model 2507S2
- f) 1 ea. - Precision LPC7 Connector, Model 2699K
- g) 1 ea. - Precision Type N Connector, Female, Model 8802D
- h) 1 ea. - Precision Type N Connector, Male, Model 8802A
- i) 1 ea. - Open-End Wrench, 1/2" and 9/16", Model 2517S3
- j) 1 ea. - Instrument Case, Model 2517S2

1.4.1 Connectors

This instrument is supplied with the following precision connectors:

- a) LPC7 connector when used with the LPC7 spring-pin in the center conductor, the LPC7 connector makes precision measurements with APC7 connectors. The center conductor is continuous, free of any junction discontinuities, and relies on the mating APC7 connector for centering. Refer to Engineering Data 5E-061.
- b) Precision Type N connector, female when used with the female Type N contact (.065H) in the center conductor, forms a high precision Type N connector that complies with most precision Type N connector specifications. Refer to Engineering Data 5E-049.
- c) Precision Type N connector, male when used with the male Type N contact (.065P) in the center conductor, forms a high precision Type N connector that complies with most precision Type N connector specifications. Refer to Engineering Data 5E-049.

1.4.2 Center Conductor and Contacts

This instrument is supplied with a special gold-plated, silver layered stainless steel center conductor (Model 2508S4) that accepts the following spring pin and contacts:

- a) LPC7 Spring-Pin, Model 2684S
- b) Precision Type N Contact, Female .065H (with slots), Model 2507S1
- c) Precision Type N Contact, Male .065P (with pin), Model 2507S2

1.5 UNPACKING AND INSPECTION

Unpack and inspect the instrument immediately upon receipt. Retain all packing materials until inspection is complete. These packing materials may be required for return shipment should you discover any damage. If there is any indication of damage, file a claim with the carrier. Refer to the warranty in Section 5.



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1.6 HANDLING PRECAUTIONS

The Model 2508A is a precision instrument and requires the careful handling associated with any precision equipment.

- 1.6.1 The center conductor must be handled with extreme care; do not allow to bend, sag or be scratched. Remove the center conductor from the instrument when not in use or degradation in performance can result. When connected to a device to be tested, this instrument should be properly supported in order to eliminate stresses at the coupled connector joint.
- 1.6.2 Do not drop, strike or otherwise mechanically damage the instrument. In addition, care must be taken not to lose the components. Several loose connectors and contacts have been furnished with this instrument which enables you to configure the instrument as desired. Keep these items in the instrument case to avoid loss when not in use.



2. OPERATING INSTRUCTIONS

This section describes installing the connectors, installing spring-pin or contacts in the center conductor, and connecting the sliding short to the device. The numbers in parenthesis refer to the items in Table 1 and Figure 4.1 for ease of identification of the components.

2.1 APC7 CONNECTOR MEASUREMENTS

2.1.1 General Information

Use the LPC7 connector (18) with the LPC7 spring-pin (7) installed in the center conductor (4). This combination forms a precision APC7 connector interface. The spring-pin provides concentric alignment when mated to an APC7 connector. The spring-pin compresses within the center conductor allowing the center conductor to achieve a butt joint with the APC7 contact.

2.1.2 Installing LPC7 Connector

- a) Engage the rear of the LPC7 connector to the chassis assembly (1) and thread on by turning the nut (16) on the chassis—make sure components are properly aligned. Use a thin, flat 1/2" open-end wrench (0.100 max. thick) (22) to hold the LPC7 connector. Use your fingers to hold the nut on the chassis and gently tighten by hand.
- b) To remove the LPC7 connector, hold it with the 1/2" open-end wrench and slowly unscrew by turning the nut on the chassis by hand.
- c) After each use, remove the LPC7 connector and return it to the instrument case.

2.1.3 Installing Spring-Pin in the Center Conductor

CAUTION: Handle the center conductor with extreme care; do not allow it to bend, sag, or be scratched. It is good practice, prior to each use, to inspect the center conductor for nicks or scratches, and then wipe it off with a clean, soft, lint-free cloth. **Keep all components in instrument case when not in use.**

- a) Do not install the spring-pin while the center conductor is in the instrument. Always remove the center conductor when changing the spring-pin or contacts to prevent damage.
- b) Install the spring-pin into the blunt end of the center conductor. Make sure the spring-pin can be pushed all the way into the center conductor and springs back out to ensure that it's not hanging up.
- c) Loosen the clamping nut (11) at the rear of the chassis, and insert the center conductor into the instrument until it protrudes from the front end.
- d) To remove the center conductor, loosen the clamping nut at the rear of the chassis, grasp the knob (21) of the center conductor and pull straight out.
- e) Return the components to the instrument case. The center conductor, when not in use, should be kept in the instrument case to preserve its straightness. Do not leave it in the instrument or lying around.
- f) Periodically inspect the center conductor on a surface plate to examine its straightness.

2.1.4 Preparation for Measurement

Assemble the LPC7 connector per Section 2.1.2, and install the center conductor (with spring-pin) per Section 2.1.3. The instrument is now ready for use.



2.1.5 Connecting the Sliding Short to a Device

CAUTION: Avoid Stress On Connectors. The instrument should be properly supported so when it is connected to the device to be tested, make sure that it will not apply any stress to the coupled connector joint.

- a) With the rear clamping nut loose and the center conductor protruding from the front end of the instrument, carefully insert the spring-pin into the center hole in the connector contact of the mating connector.
- b) Lightly tighten the rear clamping nut (this will provide a slight amount of tension to keep the center conductor in place while the outer conductor is being coupled).
- c) Slide the outer conductor forward and thread the connector coupling nut until tight (make sure the coupling nut of the mating connector is in its storage mode).
- d) While maintaining slight pressure on the knob of the center conductor, loosen the rear clamping nut. Then gently push the knob forward until you feel the conductors butt together. Hold securely and tighten the rear clamping nut.

CAUTION: Do not exert excessive axial pressure or bowing of the center conductor may result.

- e) The instrument and device under test are now properly connected and ready for measurements.
- f) In disconnecting, take care not to rotate the connection. Disconnect by slowly unscrewing the coupling nuts and gently pull the instrument straight out from the device.

2.2 PRECISION TYPE N CONNECTOR MEASUREMENTS

2.2.1 General Information

- a) Precision Type N connector, female (20) is used with the female Type N contact (5).
- b) Precision Type N connector, male (19) is used with the male Type N contact (6).
- c) The resulting connector interface, produced by the combination of the male or female Type N connector and the male or female Type N contact in the center conductor, complies with most precision Type N connector specifications. Refer to Engineering Data Sheet 5E-049 for interface information.

CAUTION: There are numerous "Type N" connector interfaces in use today. Damage and/or undue reflections can result in the event of incompatible mating. We highly recommend that the interface of the Type N connector of the device to be tested, is established prior to conducting measurements with this instrument. Operating Note 2505-98 (available on request) provides additional information on Type N connector measurements, and how to use the various combinations of connector and contacts (in the center conductor).

2.2.2 Installing Type N Connectors

- a) Engage the rear of the Type N connector to the chassis assembly (1), and thread on by turning the nut (16) on the chassis—make sure components are properly aligned. Use a thin, flat 9/16" open-end wrench (0.100 max. thick) (22) to hold the Type N connector. Use your fingers to hold the nut on the chassis and gently tighten by hand.
- b) To remove the Type N connector, hold it with the 9/16" open-end wrench and slowly unscrew by turning the nut on the chassis by hand.
- c) After each use, remove the Type N connector and return it to the instrument case.



2.2.3 Installing Type N Contacts in the Center Conductor

CAUTION: Handle the center conductor with extreme care; do not allow it to bend, sag, or be scratched. It is good practice, prior to each use, to inspect the center conductor for nicks or scratches, and then wipe it off with a clean, soft, lint-free cloth. **Keep all components in instrument case when not in use.**

- a) Do not install a contact while the center conductor is in the instrument. Always remove the center conductor when changing contacts or spring-pin to prevent damage. Also, in the case of the female Type N contact (.065H), inspect the contact, and using finger pressure, squeeze the opposing segments together in both planes.
- b) Thread the contact into the blunt end of the center conductor (4) and tighten securely—finger tight is adequate. **Do not use pliers or wrenches.** Make sure the contact is fully bottomed and no gap exists.
- c) Loosen the clamping nut (11) at the rear of the chassis, and insert the center conductor into the instrument until it protrudes from the front end.
- d) To remove the center conductor, loosen the clamping nut at the rear of the chassis, grasp the knob (21) of the center conductor and pull straight out.
- e) Return the components to the instrument case. The center conductor, when not in use, should be kept in the instrument case to preserve its straightness. Do not leave it in the instrument or lying around.
- f) Periodically inspect the center conductor on a surface plate to examine its straightness.

2.2.4 Preparation for Measurement

Assemble the female or male Type N connector per Section 2.2.2, and install the center conductor (with male or female Type N contact) per Section 2.2.3. The instrument is now ready for use.

2.2.5 Connecting the Sliding Short to a Device

CAUTION: Avoid Stress On Connectors. The instrument should be properly supported so when it is connected to the device to be tested, make sure that it will not apply any stress to the coupled connector joint.

- a) With the rear clamping nut (11) loose and the center conductor (4) protruding from the front end of the instrument, carefully align the Type N contact of the center conductor to the device's connector that is to be coupled and gently engage the contact (engagement must be made straight on).
- b) Screw on the Type N connector securely by means of the coupling nut.
- c) Push the center conductor knob (21) at the rear of the chassis (use slight pressure) to make sure a butt joint is achieved at the contacts.

CAUTION: Do not exert excessive axial pressure or bowing of the center conductor may result.

- d) Then lock the clamping nut (finger tight is adequate). This secures the center conductor so it will not move when the sliding element is moved.
- e) The instrument and device under test are now properly connected and ready for measurements.
- f) In disconnecting, take care not to rotate the connection. Disconnect by slowly unscrewing the coupling nuts and gently pull the instrument straight out from the device.



3. MAINTENANCE

The 2508A sliding short is a precision instrument and requires the careful handling associated with any precision instrument.

3.1 GENERAL INFORMATION

- a) Avoid dropping, bumping or scratching any of the components and keep them free of foreign particles. This applies to center conductor, contacts, spring-pin, connectors, and the connector coupling at the end of the chassis.
- b) Components should be inspected prior to use and cleaned with a soft, lint-free cloth on a regular basis.
- c) When connected to a device under test, this instrument should be properly supported in order to eliminate stresses at the coupled connector joint.
- d) In disconnecting, take care not to rotate the connection. Disconnect by slowly unscrewing the coupling nuts and gently pull the instrument straight out from the device under test.
- e) Always store the components in the instrument case whenever you are not using them.

3.2 CONNECTORS

- a) Avoid putting vertical or lateral force on any connector. The instrument should be properly supported so when it is connected to the device, make sure that it will not apply any stress to the coupled connector joint.
- b) When threading components together, carefully align them. Most fits, like the connectors to the chassis, are snug slip fits. Do not use pliers or excessive force when threading connectors together.
- c) Damaged or defective connectors or components are to be set aside immediately. It will damage any good connector to which it is attached. Throw the damaged component away or mark it and put it aside for repair.

3.3 CENTER CONDUCTOR

- a) Handle the center conductor with extreme care; do not apply excessive force or allow it to bend or sag.
- b) Periodically clean the center conductor using a suitable solvent and a soft, clean, lint-free cloth.
- c) Periodically inspect the center conductor for nicks or scratches and examine its straightness on a surface plate.
- d) Do not leave the center conductor in the instrument or lying around when not in use.

3.4 CONTACTS, SPRING-PIN AND CHASSIS

- a) Do not use pliers or wrenches on the contacts. Finger tight is adequate.
- b) Do not install a spring-pin or contact while the center conductor is in the instrument.
- c) When not in use, keep the end of the chassis covered with the plastic cap. This will prevent foreign material from entering the instrument.



4. REPLACEABLE PARTS

4.1 This section contains information for ordering replaceable parts. Table 1 provides the model number and description required to order additional components. Also, the column listing the item numbers in Table 1 corresponds to the referenced item number on the components in Figure 4.1.

| ITEM | QTY. | MODEL NO. | DESCRIPTION |
|------|-------|-----------|------------------------------------|
| 1 | 1 ea. | 2508S1 | Chassis Assembly |
| 2 | 1 ea. | 2517S2 | Instrument Case [3] |
| 3 | 1 ea. | 2508S3 | Shorting Element Assembly |
| 4 | 1 ea. | 2508S4 | Center Conductor Assembly |
| 5 | 1 ea. | 2507S1 | Type N Contact, Female .065H |
| 6 | 1 ea. | 2507S2 | Type N Contact, Male .065P |
| 7 | 1 ea. | 2684S | Spring-Pin |
| 8 | 1 ea. | [1] | Slide |
| 9 | 1 ea. | [1] | Bushing, Slide |
| 10 | 1 ea. | [1] | Collet |
| 11 | 1 ea. | [1] | Nut, Clamping |
| 12 | 1 ea. | [1] | Sleeve |
| 13 | 1 ea. | [1] | Screw |
| 14 | 1 ea. | [1] | Screw, Set |
| 15 | 1 ea. | [1] | Ring |
| 16 | 1 ea. | [1] | Nut |
| 17 | 1 ea. | [2] | Screw, Set |
| 18 | 1 ea. | 2699K | LPC7 Connector |
| 19 | 1 ea. | 8802A | Type N Connector, Male (Red Dot) |
| 20 | 1 ea. | 8802D | Type N Connector, Female (Red Dot) |
| 21 | 1 ea. | [2] | Knob |
| 22 | 1 ea. | 2517S3 | Wrench (Special) 1/2" and 9/16" |

TABLE 1: REPLACEMENT PARTS LIST

- [1] Part of Chassis Assembly (Item 1) – not sold as spare parts.
- [2] Part of Center Conductor Assembly (Item 4) – not sold as spare parts.
- [3] Not supplied with nameplate.



4.2 The components shown in Figure 4.1 reference the item numbers that correspond to the item numbers listed in the item column in Table 1 (the instrument case and wrench are not shown in the figure).

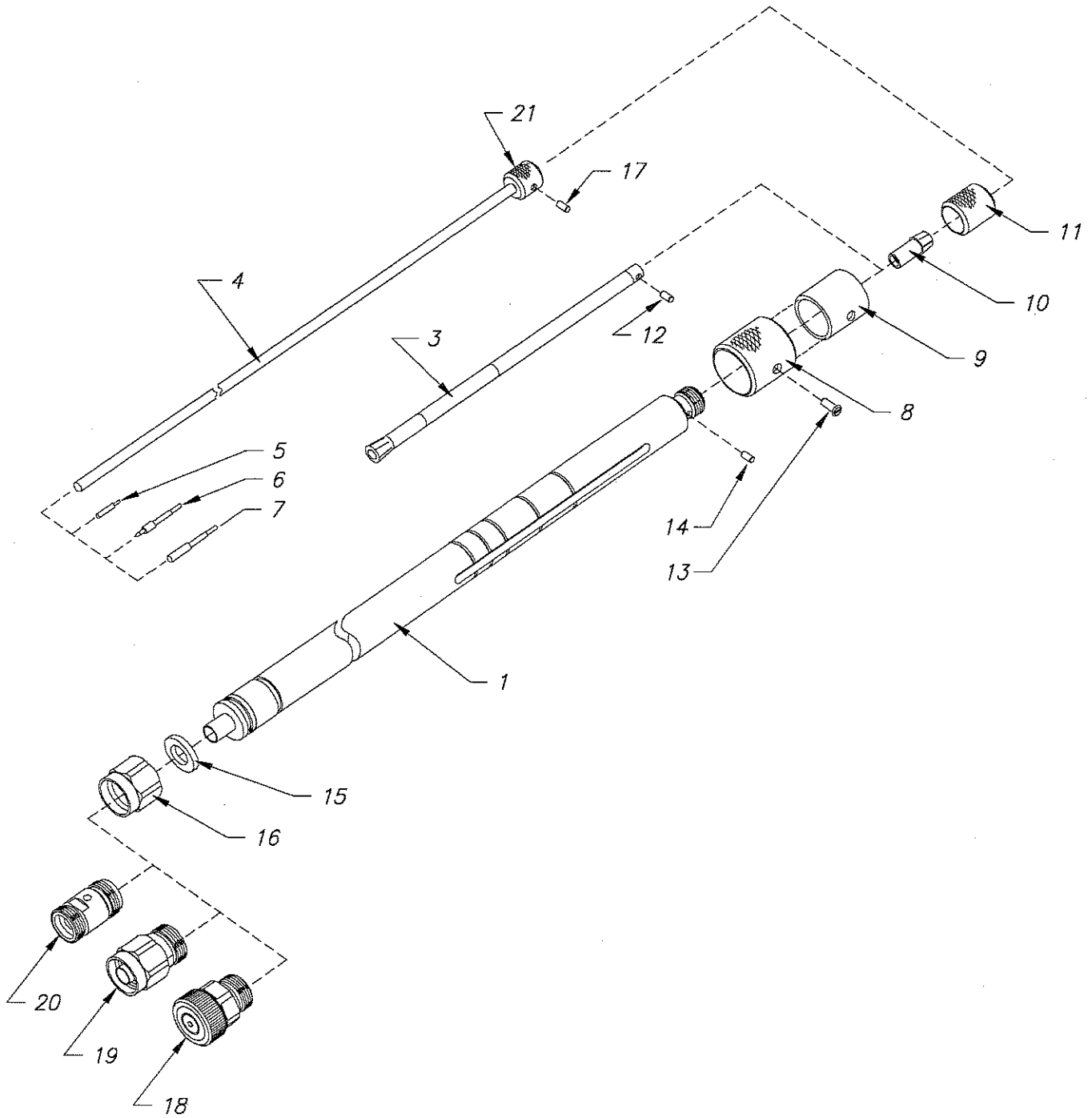


FIGURE 4.1: PRECISION SLIDING SHORT



4.3 ORDERING INFORMATION:

4.3.1 Should additional information or services be required, address inquiries to:

Maury Microwave Corporation
2900 Inland Empire Boulevard
Ontario, California 91764
USA

Attention: Customer Service Phone: (909) 987-4715 Fax: (909) 987-1112

4.3.2 Specify the following information for each part:

- a) MMC Stock Number
- b) Description of Part
- c) Model Number and Serial Number of Instrument
- d) If part is not listed, give complete description, function and location.

5. WARRANTY

WARRANTY

We warrant each instrument of our manufacture to be free from defects in material and workmanship. Our obligation under this warranty is limited to servicing or adjusting any instrument returned to our factory for that purpose, and to making good at our factory any part or parts thereof except tubes, fuses or batteries. This warranty period is limited to one year from date of shipment to the original purchaser, and to equipment which is returned to us with transportation charges prepaid and which, upon our examination, shall disclose to our satisfaction to have been defective. This warranty does not cover wear from normal usage nor subsequent damage after shipment.

We reserve the right to make changes in design at any time without incurring any obligation to install such changes on units previously sold by us.

This constitutes the only warranty extended by us, and is in lieu of any other obligations or liabilities on our part in connection with the sale of our equipment.

MAURY MICROWAVE
CORPORATION

FORM NO. 243A-1 (2/87)