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EIA STANDARD

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Standing Wave Ratio (SWR) Test Procedure for Electrical Connectors

EIA-364-106

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Electronic Components, Assemblies & Materials Association

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(From Standards Proposal No. 4417-A, formulated under the cognizance of the CE-2.0 National Connector Standards Committee.)

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CONTENTS

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TEST PROCEDURE No. 106

STANDING WAVE RATIO (SWR) TEST PROCEDURE FOR ELECTRICAL CONNECTORS

(From EIA Standards Proposal No. 4417-A, formulated under the cognizance EIA CE-2.0 Committee on National Connector Standards.)

1 Introduction

1.1 Scope

This standard establishes test methods to evaluate existing standing wave ratio (SWR) of connectors, coaxial, radio frequency (RF). Measured SWR shall not exceed that specified over the frequency range specified.

2 Test resources

2.1 Equipment

2.1.1 Swept RF source.

2.1.2 Isolating devices, two.

2.1.3 RF sampling device with frequency-amplitude characteristics matched to the second radio frequency sampling device, see 2.1.4, to within 0.5 dB.

2.1.4 RF sampling device with precision hermaphroditic output connector. Residual SWR < 1.006 + 0.003f (f in GHz).

2.1.5 Standard precision adapter, maximum SWR

2.1.6 Detectors, two

2.1.7 Amplifiers, two

2.1.8 X-Y display

2.1.9 Cable simulator termination

2.1.10 Selected test cable

2.1.11 Precision hermaphroditic cable connector

2.1.12 Precision hermaphroditic termination

2.1.13 Standard precision adapters

2.1.14 Selected long cable whose attenuation is 26 dB minimum at lowest test frequency, or as specified.

3 Test specimen

3.1 Description

Specimen shall consist of a connector with attached cable.

3.2 Preparation

The wired specimen shall not be cleaned, unless otherwise specified in the referencing document.

4 Test procedure

The SWR shall be measured in accordance with the following procedure. Diagrams for the swept frequency SWR system check out and measurement procedures are shown in figure 1.

4.1 Basic measurement setup

In the basic measurement setup of figure 1, detector 1 provides a feedback signal to the swept RF source in order to normalize the output signal of detector 2. The frequency-amplitude characteristics of detectors 1 and 2 shall be matched within 0.5 dB.

4.2 SWR measurement

4.2.1 Slotted line technique

Ten or more sweeps are made with the radio frequency probe repositioned in equal increments over at least a half wavelength at the lowest frequency of the band being swept. In this manner an X-Y display is generated whose upper and lower envelope limits represent maximum and minimum amplitudes of the standing wave for each frequency in the test band.

4.2.2 Frequency reflectometer / RF bridge technique

A single sweep shall be made using sufficient RF power to provide as X-Y display less than 80 percent and/or, if possible, greater than 20 percent of full scale.

4.2.3 Calibration

Except for logarithmic plots, a base line containing frequency marker pips shall be generated by making a sweep with no radio frequency input. The resultant X-Y display shall be calibrated according to the characteristics of the measurement channel detector and amplifier, e.g. linear, square law, logarithmic, etc.

4.3 SWR test system check

The SWR test system is checked out by successively terminating the radio frequency sampler with the elements shown in steps 1 and 2 and sweeping the frequency over the specified test band. In step 1 the system SWR shall be $< 1.02 + 0.004f$ (f measured in GHz). In step 2 the system SWR shall be as specified.

4.4 Cable termination

When the connector must be evaluated by terminating a cable, the system is checked out with the radio frequency sampler terminated as in step 3 using the specified cable. The impedance variation (random and/or periodic) from the nominal characteristic impedance for the selected test cable shall be no more than 1.0 percent when tested by time domain reflectometry having a system rise time equal to or shorter than the period of one half cycle of the highest frequency of test. In step 3 the system SWR shall be as specified.

4.5 Cable simulator termination

When the connector is terminated by a cable simulator, tests are performed with the radio frequency sample terminated as shown in step 7. The input part of the cable simulator must have the same interface configuration, dimensions, and dielectric as the recommended cable interface for the connector under test. The cable simulator shall meet the specified SWR when tested as shown in step 6.

4.6 Standard precision adapter interface

The standard precision adapter interface shall conform to IEEE Standard 287. Standard precision adapters shall not exceed the specified SWR requirements. Standard test adapter designs shall be approved by the military qualifying agency.

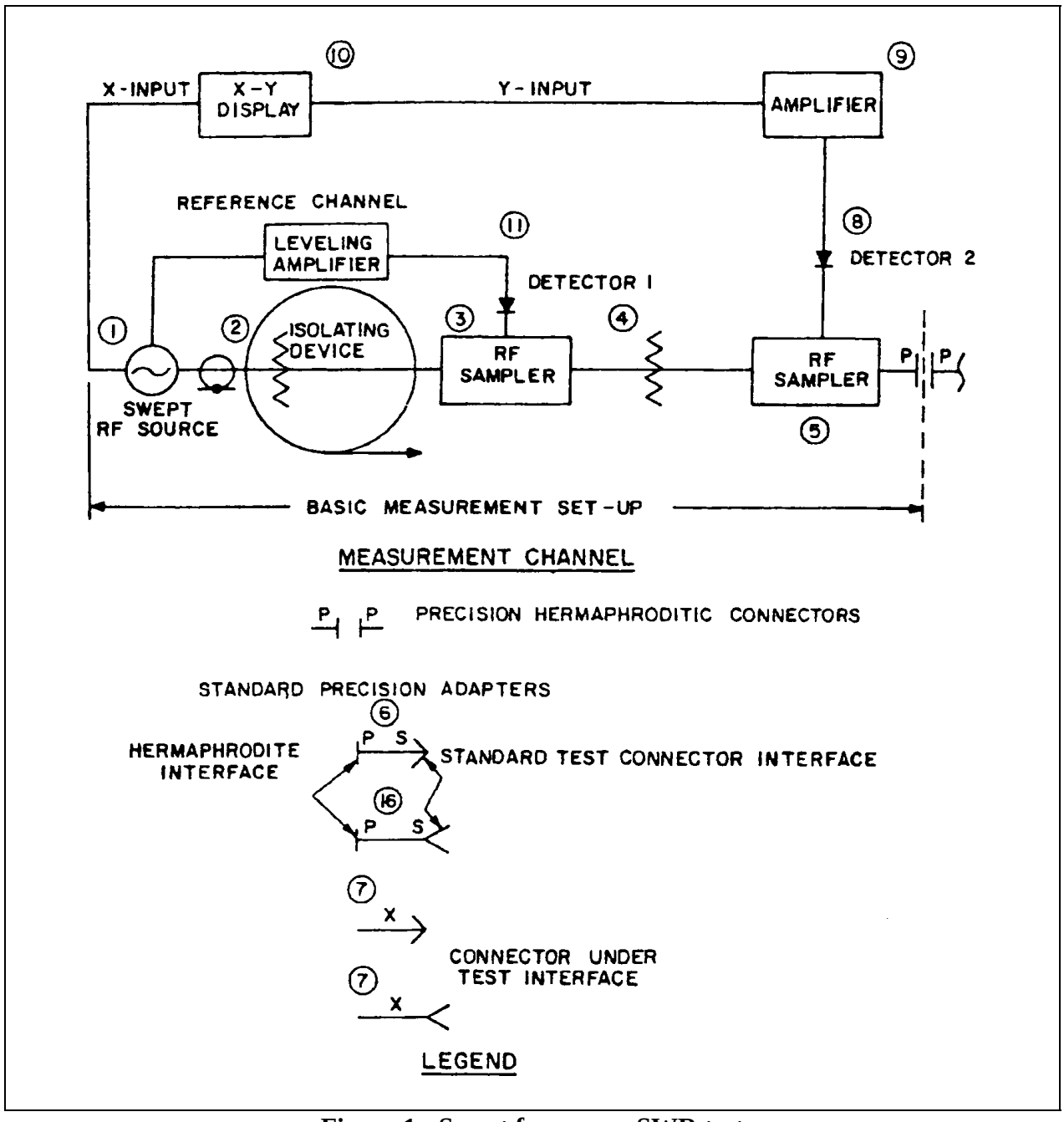

Figure 1 - Swept frequency SWR test

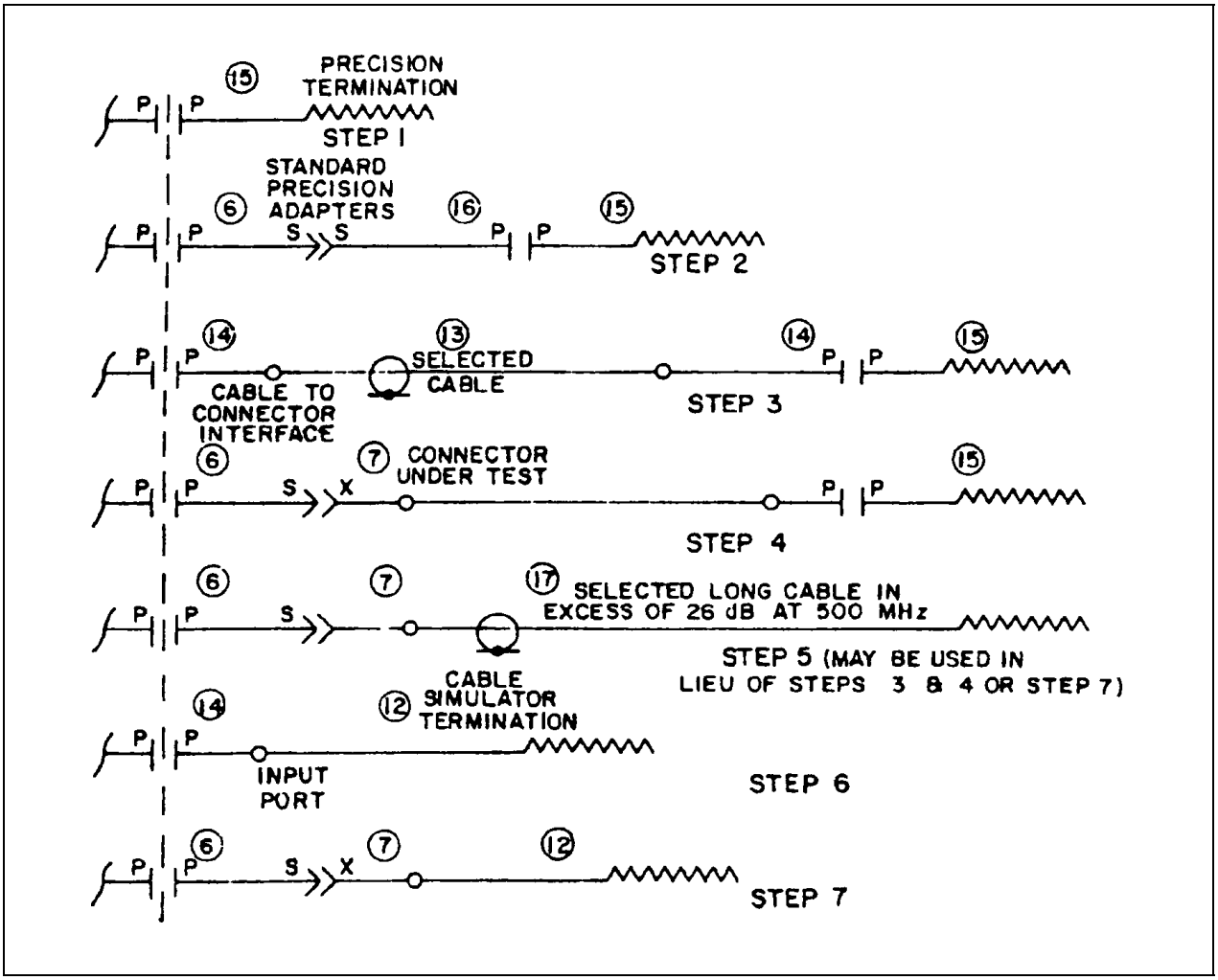

Figure 1 - Swept frequency SWR test (continued)

5 Details to be specified

The following details shall be specified in the referencing document:

5.1 Attenuation, if other than 26 dB; see 2.1.14

5.2 Test band; see 4.3

5.3 System SWR; see 4.3 and 4.4

5.4 Test cable; see 4.4

5.5 Cable simulator; see 4.5

5.6 Component SWR; see 4.4

5.7 Standard precision adapter; see 4.5 and 4.6

6 Documentation

Documentation shall contain the details specified in clause 5, with any exceptions, and the following:

6.1 Title of test

6.2 Specimen description, including fixturing if applicable (photographs may be used)

6.3 Test equipment used, and date of last and next calibration

6.4 Test and procedure

6.5 Original charts

6.6 Values and observations

6.7 Name of operator and date of test

EIA Document Improvement Proposal

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