



DEFENSE LOGISTICS AGENCY
WEAPONS SUPPORT
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COLUMBUS, OHIO 43218-3990

October 14, 2026

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Initial Draft of: MIL-PRF-39012 EP Study
Project Number: 5935-2027-001

The preliminary Engineering Practice Study, is now available for viewing and downloading from the DLA Weapons Support (Columbus)-VA Web site:

<https://weaponssupportapps.dla.mil/programs/milspec/default.aspx>

The proposal is to update the VSWR test in MIL-PRF-39012.

Concurrence or comments are required at this Center within 30 days from the date of this letter. Late comments will be held for the next coordination of the document. Comments from military departments must be identified as either "Essential" or "Suggested". Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians of this office, as applicable, in sufficient time to allow for consolidating the department reply. Lack of response to this draft will be construed as concurrence.

If this document is of interest to you, please provide your comments or suggested changes. The point of contact for this document is Mr. Candelaria, phone number 614-693-3113, e-mail Eric.Candelaria@dlamil.

Sincerely,

-/ Signed/-
MUHAMMAD AKBAR
Chief,
Interconnection Branch

ENGINEERING PRACTICE STUDY

TITLE: PROPOSED VSWR TEST CHANGES FOR
MIL-PRF-39012 GENERAL SPECIFICATION FOR RF CONNECTORS,
AND APPLICABLE SLASH SHEETS

14 October 2026

ENGINEERING PRACTICE STUDY (SEE ATTACHMENT 1)

PRELIMINARY

Study Conducted By DLA Weapons Support

Project Number: 5935-2027-001

Prepared by:

Eric Candelaria

I. OBJECTIVES: The purpose of this EPS is to determine voltage standing wave ratio (VSWR) requirements in MIL-PRF-39012 for using a vector network analyzer (VNA).

II. BACKGROUND: The swept frequency VSWR test was removed from MIL-PRF-39012 and replaced with the use of a VNA to measure VSWR. The removal of the swept frequency method left MIL-PRF-39012 slash sheets unclear. It is proposed to add swept frequency back into MIL-PRF-39012, and to clarify the VSWR test using a VNA. See attachment 1 for the proposed change to the VSWR test.

III. RESULTS: All comments on this study shall be submitted to eric.candelaria@dla.mil. Resulting coordinated comments will provide a basis for updating the MIL-PRF-39012 VSWR test with the inclusion of swept frequency.

IV. CONCLUSIONS: The final comments on this study will determine the verbiage of the VSWR test within MIL-PRF-39012.

V. RECOMMENDATIONS: DLA Weapons Support recommends that all military and industry representatives review the existing format and provide comments.

Attachment 1

MIL-PRF-39012 currently has the following VSWR test requirements:

4.6.11 VSWR. The VSWR shall be measured in accordance with the following procedure or a method acceptable to the Government. In the event of dispute the method outlined herein shall be used.

The measurement shall be made on a Vector Network Analyzer using a full 12 term error correction with the appropriate calibration standards. A minimum of 400 data points shall be used.

Optional calibration: single port 6 term calibration can be used.

The test connector shall be terminated to an appropriate load. The cable's length should have attenuation equal to or greater than $\frac{1}{2}$ the dynamic range of the analyzer. A termination can be added to the end of the long cable to ensure that no signal is reflected back to the connector under test.

MIL-PRF-39012 will be updated to the following:

4.6.11 VSWR. The VSWR shall be measured in accordance with the following procedure or a method acceptable to the Government. In the event of dispute, one of the methods outlined herein shall be used.

- a. Part should be tested using a Network Analyzer with the Time Domain (TDR) option installed. This is essential to allow the effect of the adapters to be "gated" out. The recommended network analyzer systems include suitable equipment with National Institute of Standards and Technology (NIST) traceability or equivalent. All gating will be completed in accordance with the procedures stated by the network analyzer manufacturer with the following time domain settings:

TABLE I. Suggested Time Domain Settings.

Transform Mode <u>1/</u>	Gate Type	Gate Shape <u>2/</u>	Start Gate Time (ps)	Stop Gate Time (ps)
Low-pass	Bandpass	Minimum, Normal, Wide	End of Adapter <u>3/</u> – Rise Time of Gate <u>4/</u>	End of Device Under Test + Rise Time of Gate

1/ The low-pass mode will have a higher resolution than the band-pass mode.

2/ Each shape specified will not be smaller than the minimum gate span to ensure the response has the correct start and stop times.

3/ "Port Extension" is also used for detection to move the measurement plane after calibration is complete.

4/ The minimum window is used for best resolution.

5/ The maximum window is used for best dynamic range.

The printer/plotter and the computer should be any unit compatible to the system. The test adapters will utilize the following frequency bands:

Frequency	VSWR
500 MHz	1.055
1 GHz	1.055
5 GHz	1.075
10 GHz	1.100
15 GHz	1.125
18 GHz	1.140
26 GHz	1.180
40 GHz	1.25
50 GHz	1.30
65 GHz	1.375

50-ohm precision air lines may also be used on both sides of the device under test.

Calibration of the system should be performed using the manufacturer's calibration kits and the recommended calibration procedures. The frequency range shall be DC to 65 GHz. The VSWR calibration test setup shall be verified using the manufacturers verification kits. The calibrated system VSWR shall be less than $1.02 + .001F$ (F in GHz).

The VSWR of the DUT shall be measured using the procedures described in the manufacturer's operating instructions. The time domain shall then be used to remove the effects of the test adapter with the recommended settings as mentioned above.

The output shall be generated using the appropriate printer/plotter.

b. In the basic measurement setup on [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 should be matched within .5 dB.

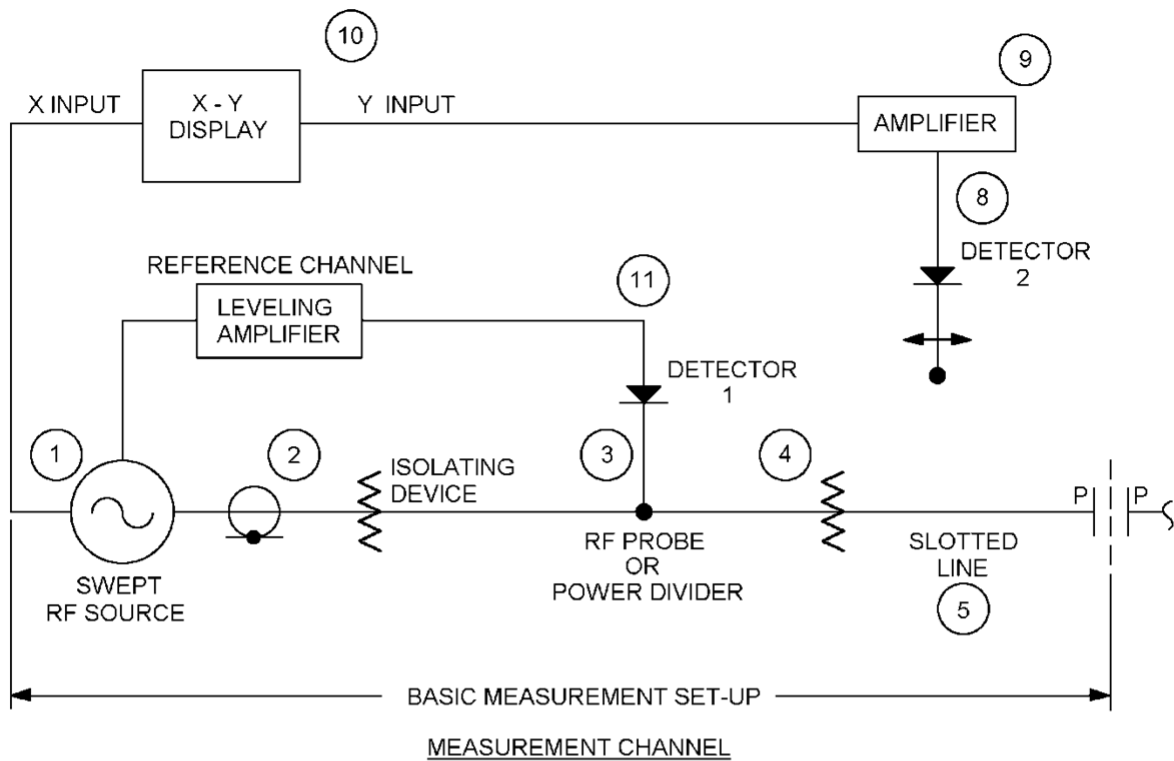
To measure VSWR several sweeps are made with the slotted line probe incrementally positioned over at least a half wavelength at the lowest frequency of interest. In this manner an X-Y display is generated whose upper and lower envelope limits represent maximum and minimum amplitudes of the standing wave for each frequency in the test band. A base line may be generated by making a sweep with no input to the measurement channel amplifier. The resultant X-Y display is calibrated according to the characteristics of the measurement channel detector and amplifier, e.g., linear, square law, logarithmic, etc .

The VSWR test system is checked out successively terminating the slotted line with the elements shown in steps 1 and 2 and sweeping the frequency over the specified test band ([see 3.1](#)). In step 1 the system VSWR shall be less than $1.02 + .004 F$ (F measured in GHz). In step 2, the system VSWR shall be as specified ([see 3.1](#)).

For qualification and group C inspection ([see tables II and VII](#)), the system is checked out with the slotted line terminated as in step 3 using the specified cable ([see 3.1](#)). The impedance variation (random and/or periodic) from the nominal characteristic impedance specified for the selected test cable should be no more than 1.0 percent when tested by time domain reflectometry. In step 3, the system VSWR shall be as specified ([see 3.1](#)). For qualification and group C inspection, the connector under test is measured with the slotted line terminated as in step 4. The VSWR shall be as specified ([see 3.1](#)).

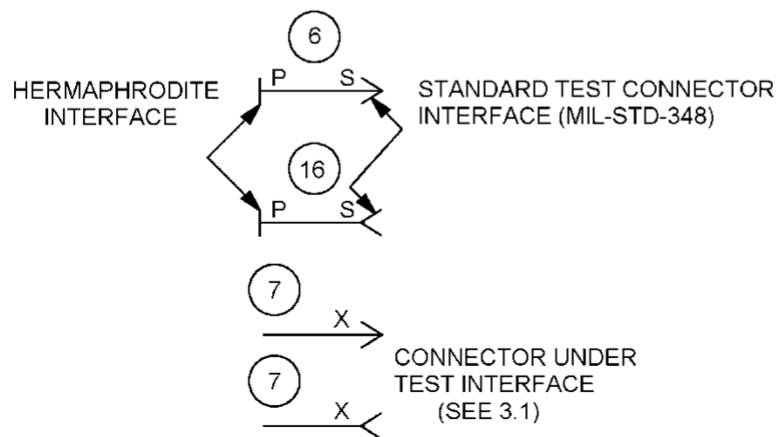
Group B inspection tests ([see table V](#)) are performed with the slotted line terminated as shown in step 7. The input part of the cable simulator must have the same interface configuration, dimensions, and dielectric as the recommended cable interface for the connector under test. The cable simulator for group B inspection tests must meet the specified VSWR ([see 3.1](#)) when tested as shown in step 6.

The standard precision adapter interface shall conform to IEEE Standard 287. Item 6 (standard precision adapters) shall not exceed the specified VSWR requirements ([see 3.1](#)). Standard test adapter designs shall be approved by the military qualifying agency.



P | P PRECISION HERMAPHRODITIC CONNECTORS

STANDARD PRECISION ADAPTERS



LEGEND

FIGURE 1. Swept frequency VSWR test.

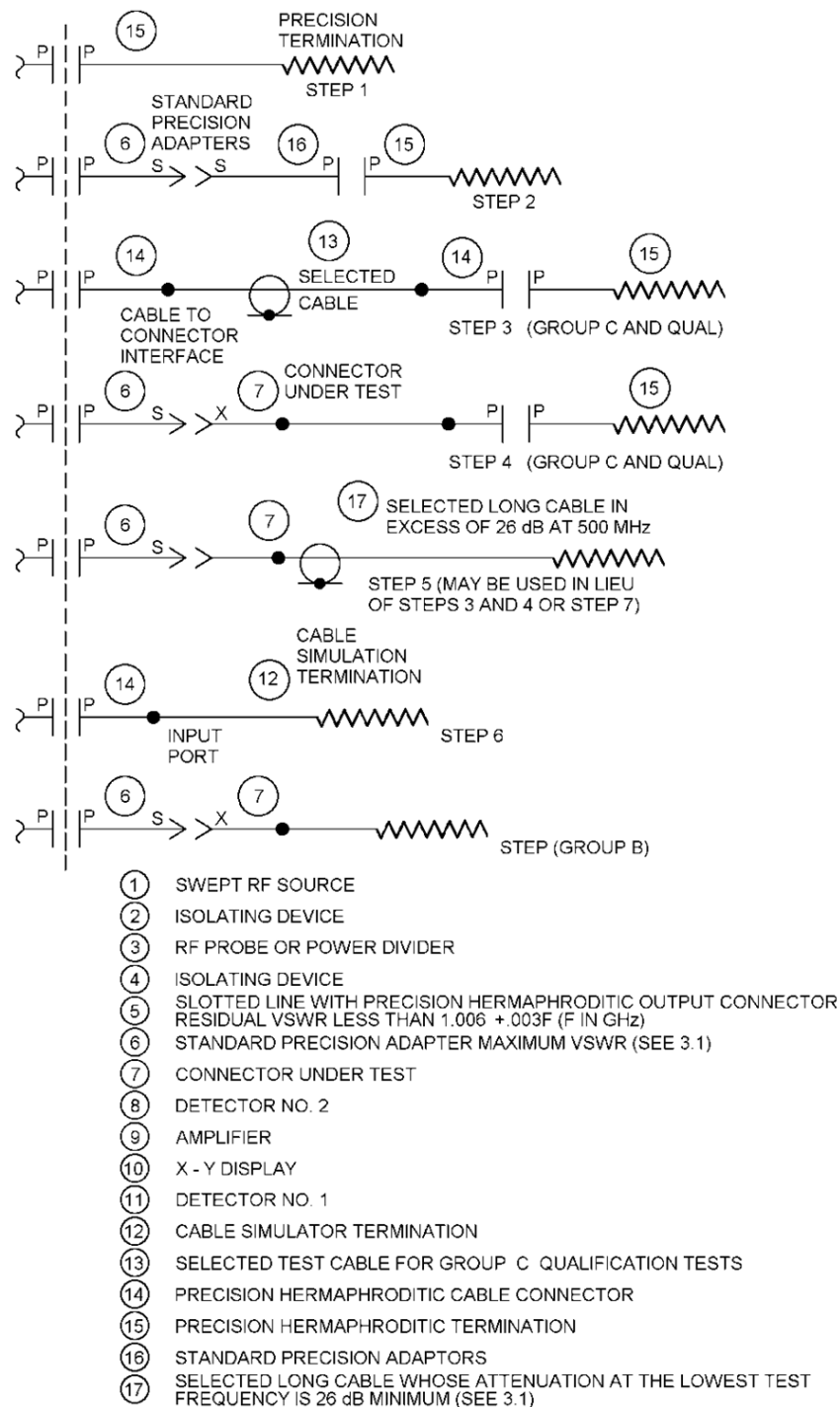


FIGURE 1. Swept frequency VSWR test – Continued.