HP 70138A
MMS VECTOR VOLTMETER

Operating Manual

SERIAL NUMBERS

This manual applies directly to HP 70138A Vector Voltmeters with serial numbers prefixed 2914U.

NOTE

Use this manual only with instruments that have a "U" in their serial-number prefix.

First Edition

HP 70138A Manual Set HP Part Number: 70138-90007

Operating Manual HP Part Number: 70138-90004

Microfiche Operating Manual HP Part Number: 70138-90005

Printed in U.K. : April 1989

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HP 70138A Vector Voltmeter

The HP 70138A Vector Voltmeter is a dual-channel, autoranging, receiver which measures the voltages of two CW signals and the phase difference between them. The following diagram shows the vector relationship between two signals at the same frequency and the way that one is used as a phase reference in the HP 70138A.

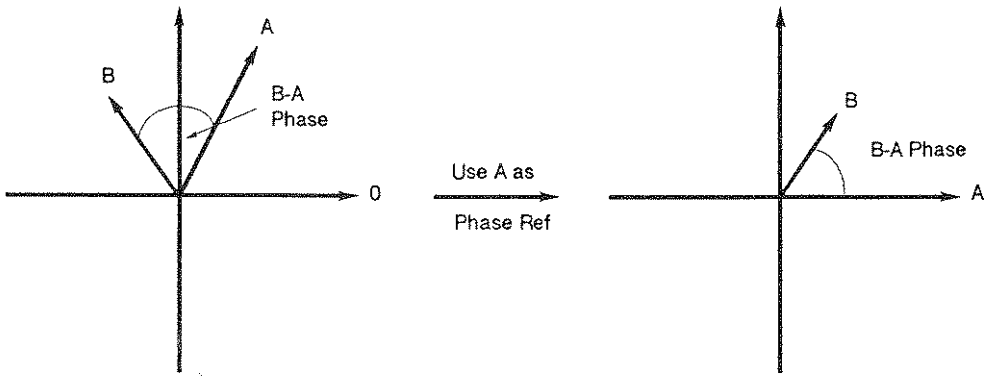

Figure 1-4. Vector Signals

The measurements can be of a single channel or the ratio between the two channels, and results can be displayed as voltage or power (in linear or log units), normalized magnitude and phase angle, or real and imaginary components. In addition the HP 70138A has built-in procedures for simple network analysis. The HP 70138A has two configurations - the first providing two high impedance probe inputs with a frequency range from 100kHz to 1GHz, and the second providing two 50ohm type-N connector inputs with a frequency range of 300kHz to 2GHz. The configuration can be changed by replacing the instrument's input module.

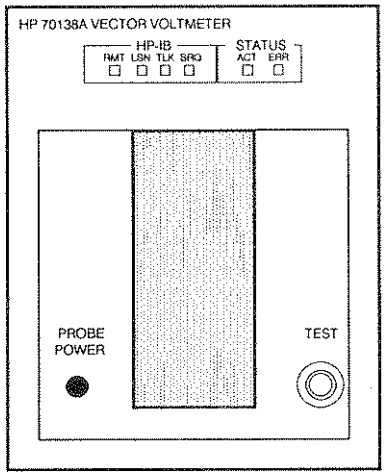

Figure 1-5. HP 70138A Vector Voltmeter

Applications

The HP 70138A is a component of the HP 70000 Modular Measurement System that can be used in any application where CW vector signal information is required - particularly in the design, manufacture or service of RF assemblies. The HP 70138A is a high-sensitivity receiver and can be used with any source, including an HP 70000 MMS system source, a tracking generator, or one that is part of the device to be tested.

Typical measurements include voltage, power, gain or loss, impedance and phase matching. Measurements can be made either from the input to the output of the device, or by probing within the device. Other measurements include transmission and reflection - procedures that include test system calibration against known standards.

Equipment Required

A typical setup includes a source (which may be part of the device to be tested), a reference path and a measurement path. Cables, adapters and other accessories required depend on the application. The following diagram shows an example setup.

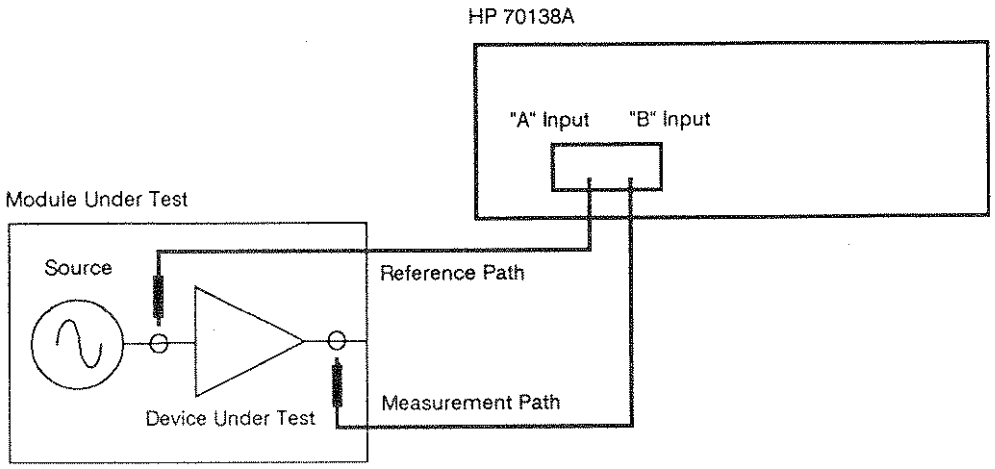

Figure 1-6. Typical Probing Set-up

In order for the source to be suitable for use with the HP 70138A, it has to meet certain specifications. It must produce a stable CW signal at the frequency of interest, with no modulation.

FRONT PANEL FEATURES

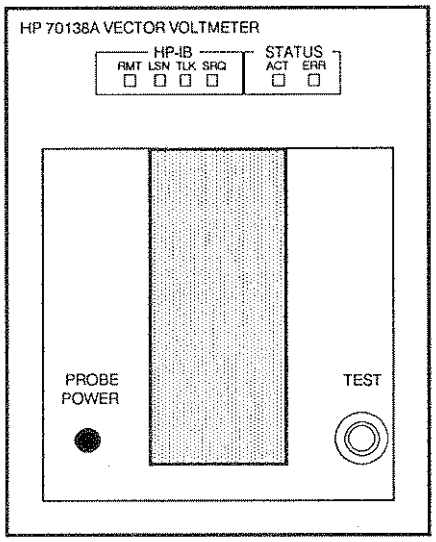

Figure 1-7. Front Panel

The front-panel LEDs indicate the status of the HP 70138A Vector Voltmeter. The front-panel LEDs should turn on and off while the HP 70138A Vector Voltmeter is doing its self-test (for example, at turn-on).

HP-IB Indicators

The following LEDs indicate the HP-IB status of the HP 70138A Vector Voltmeter. They indicate the types of activity that the HP 70138A Vector Voltmeter is engaged in and do **not** indicate an error condition.

RMT The RMT (remote) LED, when lit, indicates that the HP 70138A is being controlled remotely over the HP-IB. Otherwise, this LED will only be lit during self-test, when it is turned on and off to test the LED.

LSN The LSN (listen) LED, when lit, indicates that the HP 70138A is being controlled remotely over the HP-IB and is in a listen state. Otherwise, this LED will only be lit during self-test, when it is turned on and off to test the LED.

TLK The TLK (talk) LED, when lit, indicates that the HP 70138A is being controlled remotely over the HP-IB and is in a talk state. Otherwise, this LED will only be lit during self-test, when it is turned on and off to test the LED.

SRQ The HP 70138A can be set by the user to request service from its HP-IB controller when certain conditions occur (for example, an error condition, or completion of any operation). The SRQ LED will light when these conditions occur. Otherwise, the LED will only be lit during self-test when it is turned on and off to test the LED.

STATUS Indicators

The following LEDs indicate the operational status of the HP 70138A Vector Voltmeter.

ACT The ACT (active) LED is on when the HP 70138A Vector Voltmeter is the instrument being controlled by the display keyboard (over the HP-MSIB). Otherwise, this LED will only be lit during self-test, when it is turned on and off to test the LED.

ERR This is the error LED. If this LED is lit at any time (other than during self-test, when it is turned on and off to test the LED), there is a problem with the HP 70138A Vector Voltmeter. The LED will go out when the error has been reported over the HP-MSIB or HP-IB and the error condition no longer exists. If this LED flashes at about a 1Hz rate, this indicates that the HP 70138A Vector Voltmeter cannot communicate on the HP-MSIB. NOTE: For hardware and internal errors, the ERR LED will remain lit until a power cycle or restart, no matter how many times the error is reported. This is because the source of the error still exists.

PROBE POWER This output provides +12V and -12V supplies, which is sufficient to drive an HP 85024A High Frequency Probe.

TEST This output provides a signal at approximately 1.6MHz and 100mV to allow the user to check that the HP 70138A Vector Voltmeter is operating. The signal is controlled by the [Misc] [TEST ON OFF] function. The LED beside the connector is on when the test output is enabled.

REAR PANEL FEATURES

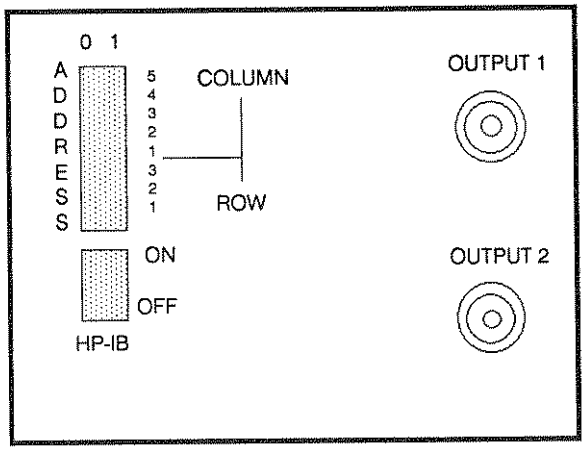

Figure 1-8. Rear Panel

The Rear Panel Outputs provide dc signals which can be fed to external measuring equipment. There are two distinct modes of operation for these outputs.

Normal Mode
This mode provides an analog representation of the digital display values, including internal instrument correction factors. OUTPUT 1 corresponds to DISPLAY 1 and OUTPUT 2 corresponds to DISPLAY2. The update rate is the same as the display update rate (approximately 3 readings per second). The sensitivity is 1mV per displayed digit.

A display value of 123.4mV will produce a d.c. output of 1234mV.
A display value of -135.7 degrees will produce a dc output of -1357mV.

If the MAG RANGE key is used to change the display resolution, the rear panel outputs will change with the display values.

A typical use of this mode might be to drive a chart recorder or similar logging instrument.

Direct Analog Output Mode
This mode provides continuous direct output signals from the internal magnitude and phase detectors through 800Hz low-pass filters. Only limited internal instrument correction factors are applied to the output signals. OUTPUT 1 corresponds to either A or B magnitude (in mV) whichever is selected on the front panel. OUTPUT 2 corresponds to B-A phase. The full scale deflection (FSD) chosen on the front panel always produces an output of 1 volt and this defines the OUTPUT 1 sensitivity .

A display FSD of 1000mV will produce an output of 1000mV for an input of 1000mV.
A display FSD of 31.6mV will produce an output of 1000mV for an input of 31.6mV.

The OUTPUT 2 sensitivity is fixed at 1mV per 0.1 degrees.

A typical use of this mode might be to make narrowband swept measurements on crystals.

HP-MSIB CONNECTOR
This connector is the only means of communication between the HP 70138A Vector Voltmeter and the HP 70001A Mainframe. This interface carries all HP-MSIB and HP-IB signals to and from the module.

HP-IB ON/OFF
With this switch set to OFF, the HP 70138A HP-IB is switched off and it uses only the HP-MSIB for communication. The HP 70138A will not respond over the HP-IB with this switch set to OFF.

ADDRESS SWITCH
The address switches are a group of two-position toggle switches. Each can be set to either 1 or a 0. The factory setting HP-MSIB address for the HP 70138A is row 0, column 8.