

Null Meter Application Guide Introduction

Purpose:

The TEGAM Null Meter Application Guides are written to assist both the new and experienced user of high-sensitivity Null Meters/Nano-Voltmeters. For the new user, the Application Guides provide a basic understanding of the fundamentals of measurement process that use Null Meters. For the experienced user, the Application Guides provide a refresher on fundamentals but more importantly help the user moving from the use an older model null meter to the TEGAM AVM-2000.

In the later case, the experienced user will often find small differences in results (especially when working in the micro-volt and sub-micro-volt region). In most cases these differences can be attributed to differences in measurement technology, the impact of added features, and simply different ways of making measurements. The various TEGAM Null Meter Application Guides address a range of different issues that may be encountered when making these transitions.

Background:

The TEGAM AVM-2000 is a fourth generation null meter. It was designed to replace earlier null meters such as the TEGAM AVM-100, the Fluke 845AB, the HP 419, the Keithley 155 and earlier models.

As a fourth generation product, the AVM-2000 offers extended features and specifications designed to allow the user to make effective null measurements in today's environment.

The user familiar with earlier generation null meters will find differences in null measurements from time-to-time. In most cases these differences are as a result of greater control now available over the measurement process and often due to the elimination of small or accounting for offsets previously inherent to measurements made using null meters with less functionality.

For example, the AVM-2000 offers a wide range of signal filtering. The displayed voltage (null) can be filtered from 0.1 second to 100 seconds in steps that are in a 1-2-5 sequence. Earlier null meters simply offered fixed filtering typically in the area of 3 seconds with filtering increasing to approximately 5 seconds for the most sensitive ranges. As noise reduction is a function of the square root of the integration time, measurements with the AVM-2000 can be made that reduce the contribution of low-frequency noise by a factor of 10 or will increase the contribution of low-frequency noise by a factor of 3.

A brief summary of the differences between the AVM-2000 and predecessor Null Meters is shown on page 2 of this Application Guide.

Solving the Problem:

A brief summary of the differences between the AVM-2000 and predecessor Null Meters is shown on page 2 of this Application Guide. Refer to the indicated TEGAM Null Meter User Guide for additional information on how this feature/specification contributes to measurement issues.

APPLICATION GUIDES RELATED TO SPECIFICATION & FEATURE DIFFERENCES BETWEEN NULL METERS				
Feature/Specification	TEGAM AVM-2000	TEGAM AVM-100	Fluke 845 AB	TEGAM Null Meter Application Guide
Filtering	Selectable: 0.1 Second – 100 Second 1-2-5 Steps	Fixed: 5 Second 1 μ V, 3 Second 3 μ V, 1.5 Second all other ranges	Fixed: 5 Second 1 μ V, 3 Second 3 μ V, 1.5 Second all other ranges	AN 307
Zero Function (Voltage)	Separate Zero adjustment for ZERO and OPERATE Modes for each Range	Zero adjustment for ZERO Mode trimmed for 1 – 30 μ V, 100 μ V, 300 μ V and 1 mV – 300 V	Zero adjustment for ZERO Mode trimmed for 1 – 30 μ V, 100 μ V, 300 μ V and 1 mV – 300 V	AN309
Zero Function (Input Offset Current)	User adjustable: Maximum offset \pm 2.5 nA	Internal adjustment: Maximum offset \pm 150 pA	No adjustment	AN305
Input Impedance	User selectable: 1, 10, 100, 1000 M Ω to 1 mV 10 or 100 M Ω 3 mV to 300 V 1 kV fixed at 100 M Ω	1 M Ω 1 μ V – 1 mV 10 M Ω 3 mV – 100 mV 100 M Ω 300 mV – 1 kV	Early models 10 M Ω 1 μ V – 100 mV 100 M Ω 300 mV – 1 kV Later models 1 M Ω 1 μ V – 1 mV 10 M Ω 3 mV – 100 mV 100 M Ω 300 mV – 1 kV	AN-tbd
Offset Voltage	Offsets of: \pm 10 X “3s” range \pm 30 X “1s” range maximum of 30 mV	None	None	AN309