DATA SHEET

DS-11003

OBSOLETE

Voltage Forcing Module [VF]

- **Output Voltage: ±100V**
- **Output Current: ±200mA**
- **Output Power: 20W**
- **Programmable Bipolar Voltage**
- **6 Voltage Ranges: 2.5V to 100V Full Scale**
- **No Overshoot in Step Response**
- **Indefinite Short Circuit Protection**
- **Kelvin Sensing**
- **Connects to All DUT Pins**
- **Low Quiescent Current**
- **Lowest Cost Source**

Specifications

Range	Source Error		Resolution
	Offset	% of Value	
2.5V	1.25mV	0.05	1.25mV
5V	2.5mV	0.05	2.5mV
10V	5mV	0.05	5mV
25V	12.5mV	0.05	12.5mV
50V	25mV	0.05	25mV
100V	50mV	0.05	50mV

Comments:

1. Specifications apply for 24 hours and ±1C° after SelfCal or manual calibration.
2. Current limits at approximately 240mA.
3. Voltage accuracy uncertainty is ± (offset error + % of value error). For example, forcing 1V on the 2.5V range results in:

   V_{out} = 1V ± (1.25mV + 0.05% of 1V)
   V_{out} = 1V ± 1.75mV

Analog Circuitry

The VF module is a programmable voltage source that can supply a load current >200mA at ±100VDC. Critical analog circuitry consists of a high gain, high voltage, FET input operational amplifier followed by a power output stage plus precision wire-wound resistors for setting ranges. A precision DAC converts 12-bit digital signals to precise bipolar outputs.

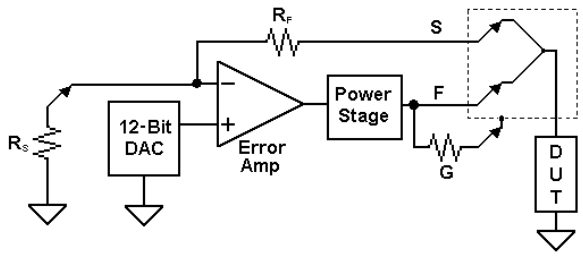

Figure 1 - Block Diagram

Output Voltage

In Figure 1, the voltage reference is a 12-bit precision DAC, which outputs voltage on three full-scale ranges of 2.5, 5, and 10V. Connecting R_S to ground multiplies the output voltage by 10X, thereby providing three more ranges (25, 50, and 100V).

The composite amplifier loop gain for the error amplifier and power stage is greater than 100dB so gain-related errors are effectively non-existent.

Kelvin Sensing

The VF is connected to any of the five analog nodes on the backplane via a three-pole switch. This configuration allows the accuracy-enhancing feature of Kelvin sensing within a fully encompassing driven guard.

Short Circuit Protection

Although the VF can supply up to 200mA to a load, it is fully protected against output short circuits. Maximum output current is limited to approximately 240mA. Heat dissipaters on the output stage transistors allow indefinitely long shorts to ground.

Voltage Step Response

The bandwidth and, hence, step-response time shown in figures 2 and 3 are virtually independent of load. The VF module offers rapid step-response settling to a specified accuracy without overshoot.

Slew Rate

Large signal slew rate is non-linear behavior that requires additional delay than the linear response shown in figures 2 and 3. Slew rate is essentially independent of load except as the load current approaches the current limit of ~200mA. Slew time to within ±5% of a given voltage change is shown in Table 1.

Voltage Change	Load Current as a Percent of Maximum					
	0	**10**	**50**	**90**	**99**	**99.9**
100	45	48	68	134	251	375
50	20	22	33	70	134	202
25	7	8	15	38	75	115
15	2	3	8	24	51	80
10	0	0	4	17	39	62

Table 1 - Slew Time in µsec

Normalized Output Step Response

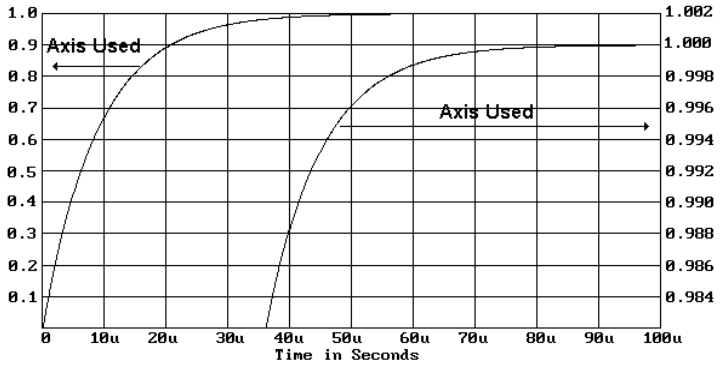

Figure 2 - 2.5, 5, 10 Volt Ranges

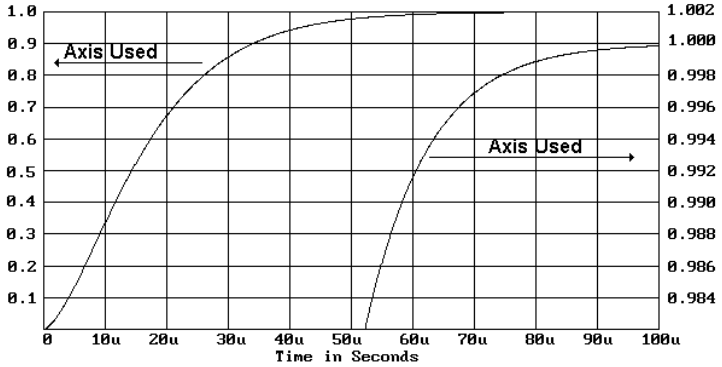

Figure 3 - 25, 50, 100 Volt Ranges