

## AK-10 Voltage Output Mode

The AK-10 output circuit can source current into an output load and simultaneously measure the voltage drop across the load. The output circuit is a constant current source with a variable setpoint. If the firmware adjusts the current setpoint based on the output voltage measurements, a pseudo constant voltage mode can be achieved.

Based on the above characteristics, the firmware has been modified to support a Voltage Output mode. It is important to note that this is an “emulated” constant voltage mode, and certain restrictions apply.

In operation, the user will place a dummy load resistor across the output terminals, and enter a voltage setpoint. The AK-10 will maintain the user entered voltage setpoint across the load by adjusting the output current setpoint.

### Selecting a suitable output load resistor.

The output load resistance must allow the AK-10 to source full scale current (20 mA) at the desired full scale voltage.

Example: You want to source a 1 – 5 volt signal into an indicator. The full scale voltage (5) divided by the full scale current (.020) gives a resistance value of 250 ohms. You should use an output load resistor of approximately 250 ohms to achieve maximum accuracy and stability over the 1 – 5 volt range.

The output load resistance should have good temperature characteristics. The resistance value (accuracy) is **not** important.

In the above example, the load resistor will be dissipating 0.1 watts. This will warm the resistor and change it's resistance. The AK-10 firmware will have to adjust the output current to track the changing resistance. Since the adjustments are made by the firmware in response to the voltage feedback measurements, the output voltage will display a slight sawtooth waveform. A resistor with a temperature coefficient of 25 ppm/° or better, is recommended.

The output load resistance should have a power rating at least 4 times greater than the power it will be dissipating. This will minimize the heat rise and subsequent resistance shift.

The best way to mount the dummy load resistor is to attach it to a stacking dual banana jack. These are available with either solder lugs or screw terminals for mounting the resistor.

### Operation

Press the **SRC** key and select `VOLTS` from the menu. If the Volts selection is not visible, you do not have firmware installed that supports the Voltage Output mode.

Attach a dummy load resistor across the output terminals.

Enter an output value in volts.

The output gain may have to be reduced if you are using a large value (>1000 ohms) load resistor (not recommended).

### Specifications

The accuracy of the voltage output is based on several factors.

The accuracy of the voltage feedback measurement is 0.015% of reading plus 0.01 volts. Since the output load is floating above ground, we have to measure the voltage at both terminals and take the difference. This means the final measurement error is double the individual error (maximum) or 1.4 times the individual error (typical).

The voltage feedback measurement is taken at the input of the AK-10 output terminals. The voltage that the unit under test sees, is at the output side of the dummy resistor adapter. A typical resistance value for this junction is 0.020 ohms. At 20 mA, this will give an addition error of 0.0004 volts.

Test lead resistance can *usually* be ignored if the unit under test has a reasonably high input resistance. The test leads supplied with the AK-10 have a typical resistance of less than 0.150 ohms. For an output voltage of 20 volts into an instrument with an input impedance of 100K ohms, the current in the test leads will be 200 uA, and the resultant voltage error will be 30 uV.

Accuracy specifications are based on a *stable* resistance load.

Range	0.1 – 22	volts
Resolution	0.01	volts
Accuracy	$\pm 0.05\%$ rdg + 0.02 volts	