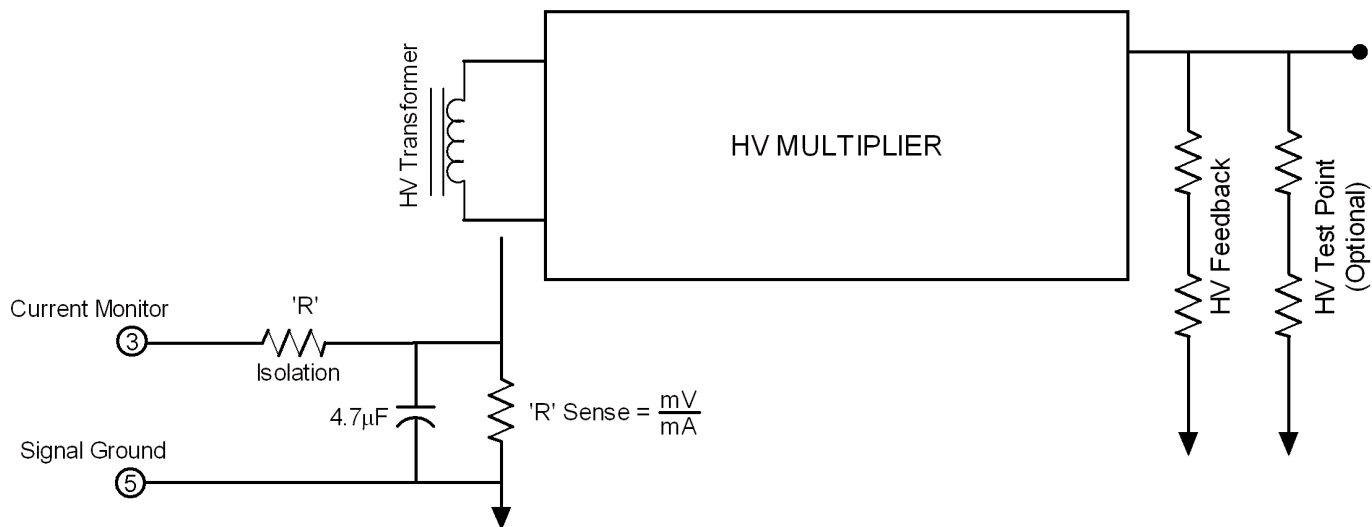


UltraVolt's high-voltage power supplies (HVPSs) have an output-current monitor (I_{out} Monitor), which allows the total output current of the HV multiplier to be monitored. Note, since the sense circuit is in the return path to the transformer, the current-monitor signal has a sign opposite of the sign of the HVPS. Therefore, a negative HVPS has a positive current-monitor voltage and a positive HVPS has a negative current-monitor voltage.

The current monitor is generated via an internal sense circuit and brought to the output pin through an isolation resistor. The signal can be integrated by connecting a small capacitor between the I_{out} Monitor and the Signal Ground Return to form an R*C with the internal isolation resistor. The isolation resistor varies with the HVPS series as does the internal sense-circuit impedance, which varies from model to model. The "A" Series has a 15k Ω , 1% isolation resistor. The 60W-, 125W-, and 250W-"C" Series units have a 5k Ω , 1% isolation resistor. The 20W- and 30W-"C" Series units have no isolation resistor because pin 3 is used for grounding (to achieve boost). The I_{out} Monitor output impedance is therefore very low (varying from 22 Ω to <1 Ω depending on the model).



The current monitor indicates all current flowing from the HVPS HV multiplier. This total current is comprised of the external HV load placed on the supply, the internal HV resistor used to provide a feedback signal to regulate the HVPS, and the internal HV resistor for the E_{out} test point (if the unit is so equipped). To develop a "true" output-current monitor, the leakage current in the HVPS internal resistor(s) has to be subtracted from the current monitor. If the current monitor is fed to a computer through an analog-to-digital converter, this nulling can be achieved in software by using Ohm's Law. To calculate the internal leakage current, divide the output voltage by the total of the internal resistor(s) and subtract that current from the current measured on the current-monitor pin. If the current monitor is used in an analog circuit, a simple analog-summing circuit can be created using the output-voltage monitor as a correction current. The analog-summing circuit is easily implemented, since the polarity of the output-voltage test point is opposite that of the output-current monitor.

It is important to note, the internal-divider leakage current is directly proportional to output voltage and reduces linearly to zero as output voltage is reduced toward zero. The leakage current represents a higher percentage of the current-monitor signal in higher voltage models and a lower percentage in lower voltage models. As an example, the 1/4A24-P30 has an output of up to

250VDC @ 120mA, and a 2.5MΩ internal-divider resistor with a current of 100μA. The internal current is <0.085% of the output-current-monitor signal, not significant enough in most applications to null out. On the 20A12-P4, the output is up to 20kV @ 200μA and the internal-divider resistor has a current of 40μA. The internal current is >16% of the output-current-monitor signal.

UltraVolt HVPS I_{out} Monitor Scale Factors

“AA” Series Model	4 Watt	20 Watt	30 Watt
1/16AA	64mA / 1.5V	320mA / 330mV	480mA / 500mV
1/8AA	32mA / 2.75V	160mA / 675mV	240mA / 930mV
1/4AA	16mA / 4.9V	80mA / 1.135V	120mA / 1.65V
1/2AA	8mA / 10.1V	40mA / 2.25V	60mA / 3.4V
1AA	4mA / 10.75V	20mA / 4.35V	30mA / 6.5V
2AA	2mA / 10.4V	10mA / 6.6V	15mA / 9.85V
4AA	1mA / 11.1V	5mA / 6.65V	7.5mA / 9.85V
6AA	660uA / 9.9V	3.3mA / 6.74V	5mA / 10.0V

“A” Series Model	4 Watt	15 Watt	20 Watt	30 Watt
1/8A	32mA / 73mV	-	160mA / 86mV	240mA / 83mV
1/4A	16mA / 75mV	-	80mA / 80mV	120mA / 81mV
1/2A	8mA / 65mV	-	40mA / 79mV	60mA / 81mV
1A	4mA / 72mV	-	20mA / 82mV	30mA / 75mV
2A	2mA / 63mV	-	10mA / 77mV	15mA / 71mV
4A	1mA / 61mV	-	5mA / 75mV	7.5mA / 88mV
6A	666uA / 52mV	-	3.3mA / 68mV	5mA / 88mV
10A	400uA / 2.39V	1.5mA / 8.17V	-	3mA / 7.88V
15A	266uA / 1.68V	1mA / 5.52V	-	2mA / 5.29V
20A	200uA / 1.32V	750uA / 4.21V	-	1.5mA / 8.15V
25A	160uA / 1.1V	600uA / 3.42V	-	1.2mA / 6.56V
30A	133uA / .95V	500uA / 2.89V	-	1.0mA / 5.52V
35A	114uA / .72V	429uA / 2.39V	-	857uA / 4.66V
40A	100uA / 1.30V	375uA / 4.20V	-	750uA / 8.15V

“F” Series Model	4 Watt	15 Watt	20 Watt	30 Watt
1/16A with -F	-	-	-	-
1/8A with -F	32mA / 73mV	-	160mA / 86mV	240mA / 83mV
1/4A with -F	16mA / 75mV	-	80mA / 80mV	120mA / 81mV
1/2A with -F	8mA / 65mV	-	40mA / 79mV	60mA / 81mV
1A with -F	4mA / 72mV	-	20mA / 82mV	30mA / 79mV
2A with -F	2mA / 63mV	-	10mA / 77mV	15mA / 71mV
4A with -F	1mA / 64mV	-	5mA / 75mV	7.5mA / 85mV
6A with -F	666uA / 59mV	-	3.3mA / 68mV	5mA / 88mV

“C” Series Model	20 Watt	30 Watt	60 Watt	125 Watt	250 Watt
1/8C	160mA / 63mV	240mA / 57mV	480mA / 1.2V	1 Amp / 1.2V	2 Amp / 1.2V
1/4C	80mA / 73mV	120mA / 60mV	240mA / 1.2V	.5Amp / 1.2V	1 Amp / 1.2V
1/2C	40mA / 68mV	60mA / 50mV	120mA / 1.1V	250mA / 1.2V	500mA / 1.2V
1C	20mA / 65mV	30mA / 63mV	60mA / 1.2V	125mA / 1.1V	250mA / 1.1V
2C	10mA / 63mV	15mA / 68mV	30mA / 1.16V	62.5mA / 1.2V	125mA / 1.2V
4C	5mA / 45mV	7.5mA / 67mV	15mA / 1.3V	31.3mA / 1.2V	62.5mA / 1.2V
6C	3.3mA / 53mV	5mA / 72mV	10mA / 1.62V	20.9mA / 1.18V	41.6mA / 1.2V
8C	-	-	7.5mA / 1.6V	15.6mA / 1.1V	-
10C	-	-	6.0mA / 1.47V	12.5mA / 1.15V	-
12C	-	-	5.0mA / 1.24V	10.4mA / 1.40V	-
15C	-	-	4.0mA / 1.0V	8.3mA / 1.10V	-
20C	-	-	3.0mA / 4.61V	6.25mA / 9.57V	-
25C	-	-	2.4mA / 3.72V	5.0mA / 7.69V	-
30C	-	-	2.0mA / 3.1V	4.17mA / 6.5V	-

Nominal I_{out} Monitor tolerance is $\pm 10\%$
N/A = Not Applicable

On positive HVPS the I_{out} Monitor is a negative voltage
On negative HVPS the I_{out} Monitor is a positive voltage

UltraVolt High Voltage Power Supply Total Internal HV Divider Resistance

“AA” Series Model	4/20/30 Watt
1/16AA	560k
1/8AA	1.1 Meg
1/4AA	2 Meg
1/2AA	5.4 Meg
1AA	40 Meg
2AA	67 Meg
4AA	100 Meg
6AA	120 Meg

“A” Series Model	4/15/20/30 Watt	“A-F” Version
1/8A	1.25 Meg	91.7k
1/4A	2.5 Meg	2.0 Meg
1/2A	5.0 Meg	3.3 Meg
1A	4W/50M, 20/30W 10 Meg	8.3 / 5 Meg
2A	100 Meg	50 Meg
4A	200 Meg	66.6 Meg
6A	300 Meg	75.0 Meg
10A	250 Meg	-
15A	375 Meg	-
20A	500 Meg	-
25A	625 Meg	-
30A	750 Meg	-
35A	2.22 Gig	-
40A	2.22 Gig	-

“C” Series Model	20/30 Watt	60/125/250 Watt
1/8C	909k	990k
1/4C	2 Meg	2.43 Meg
1/2C	3.3 Meg	4.76 Meg
1C	5.0 Meg	9.09 Meg
2C	50.0 Meg	50.0 Meg
4C	66.6 Meg	66.6 Meg
6C	75.0 Meg	75.0 Meg
8C	-	285.7 Meg
10C	-	333.3 Meg
12C	-	375.0 Meg
15C	-	500.0 Meg
20C	-	667.0 Meg
25C	-	770.0 Meg
30C	-	858.0 Meg