

How to Connect and Test a Regulated Model

This Application Note describes how to connect and test a regulated unit and applies to these EMCO products:

- C Series
- CA Series
- CA-T Series
- CB Series
- H Series
- P Series

Safety Warning

High voltage power supplies present a serious risk of personal injury if not used in accordance with design and/or use specifications, if used in applications on products for which they are not intended or designed, or if they are used by untrained or unqualified personnel.

For more information, please refer to the EMCO Safety Warning and Disclaimer located at:

<http://www.emcohighvoltage.com/pdfs/Safety-Warning-Concern-HV-3460B.pdf>

General Information

- EMCO regulated models are not isolated and have a common input and output ground connection.
- The output voltage is tightly controlled in regulated units, regardless of the load condition.
- How tightly the output voltage is controlled depends on the regulation specification of the selected EMCO unit.

See the product series Data Sheets for more information.

Necessary Equipment / Parts

Refer to Figure 1:

- **Input supply A ($V_{in A}$):** A low voltage DC power supply to power the EMCO unit. Refer to EMCO data sheets to determine input voltage and input current specifications. Select a low-voltage DC power supply that matches the required input voltage and meets or exceeds the input current requirements.
- **Input supply B ($V_{in B}$):** A low voltage DC power supply (low current) to drive the programming voltage input to the EMCO unit. Refer to EMCO data sheets to determine programming voltage specifications.
- **Output voltage measurement device:** Use a high-voltage rated oscilloscope probe or resistor divider to measure the actual high voltage output. See EMCO accessory model V1G for a resistor divider:
<http://www.emcohighvoltage.com/pdfs/v1gseries.pdf>.

Optional

- **High-voltage rated resistor:** Select a high-voltage rated resistor sized for a Full Load output.
$$\text{Max rated output voltage} / \text{Max rated output current} = \text{Full Load Resistor (R}_{FL}\text{)}$$
- **Digital multimeter (DMM):** Use a DMM to measure the low voltage output from the voltage monitor pin on CA and H Series models.

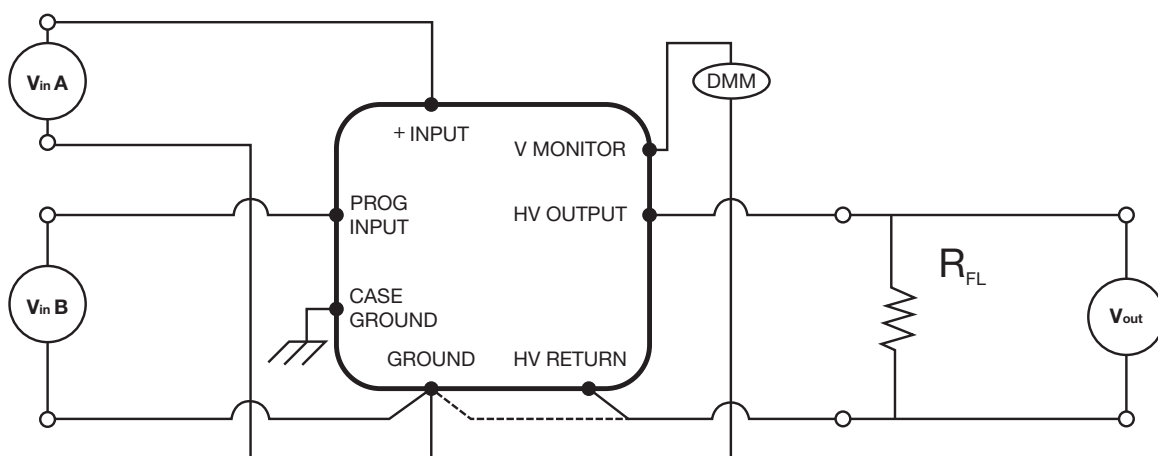


Figure 1

Connecting and Testing

Follow these steps to connect and test a regulated unit:

1. Make Connections

- Connect $V_{in A}$ to the (+) INPUT pin of the EMCO model, with the return on the GROUND pin. Do not connect the input supply ground to the HV RETURN.
- Connect $V_{in B}$ to the PROG INPUT pin of the EMCO model, with the return on the GROUND pin. This will be the same ground connection as for $V_{in A}$. Do not connect GROUND to HV RETURN.
- Connect the measurement device across the output leads as described above.
- Connect CASE GROUND pin to input GROUND pin OR other physical ground connection. There should not be more than 50V potential between the CASE GROUND pin and the circuit GROUND. (C and CA Series have a CASE GROUND.)
- DMM – Connect from V MONITOR pin to GROUND pin. (CA and H Series have a Voltage Monitor.)

Optional

- Full Load Resistor – Connect across the output leads.
 - Between HV OUTPUT and HV RETURN (For ALL CA Series, C Series $\geq 5KV$, and H Series $\geq 10KV$).
 - Between the HV OUTPUT and GROUND (For C Series $< 5KV$, and H Series $< 10KV$).

2. Turn on Input Supplies

- Turn on $V_{in A}$ to power the unit with voltage set to 0. Adjust voltage $V_{in A}$ to the required input voltage for the selected EMCO model. $V_{in A}$ must be turned on at least 100msec prior to $V_{in B}$ to avoid damage due to improper sequencing.
- Next, turn on $V_{in B}$ to drive the programming pin with voltage set to 0. Adjust voltage $V_{in B}$ to the maximum programming voltage input for the selected EMCO model.

3. Take Test Data

No Load Test

- Measure the HV OUTPUT with a high-voltage rated oscilloscope probe or a simple voltage divider.

Full Load Test

- Remove $V_{in} B$, and then $V_{in} A$.
- Connect the Full Load Resistor (R_{FL}).
- Repeat Connecting and Testing Steps:
 1. Make Connections.
 2. Turn on Input Supplies.
 3. Take Test Data.

Optional

- Measure the voltage from the V MONITOR output pin with a DMM. This is a low-voltage, scaled down version of the actual high-voltage output.
- The C Series does not include a voltage monitor pin.
- The CA and H Series include a voltage monitor pin.

Example: Necessary Equipment / Parts

This example is based on the EMCO Model CA20P, which requires the following equipment:

- $V_{in} A = +12VDC$, $<220mA$ [Can be between $+11.5$ and $+15.5 VDC$]
- $V_{in} B = +5VDC$, $<150\mu A$
- V1G, EMCO Voltage Divider
- 4Mohm resistor rated up to 2KV
- DMM

Example: Connecting and Testing

1. Make Connections as shown in Figure 2. Refer to CA Data Sheet for more information and detail.

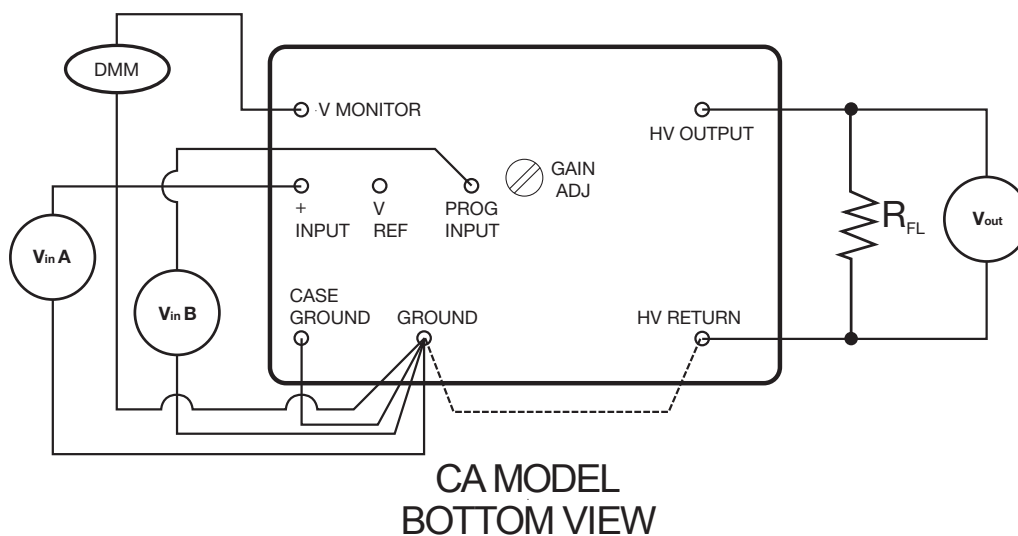


Figure 2

2. Turn on Input Supplies

First $V_{in} A$, then $V_{in} B$.

3. Take Test Data

No Load Test

- The V1G Voltage Divider should show an output of +2VDC (1000:1) that corresponds to a high-voltage output of +2KVDC. If necessary, this can be adjusted with the GAIN ADJ pot.
- $V_{in} A$ should have a current reading of no more than 100mA.
- If using a high-voltage scope probe, then the output voltage should be between +1999 and +2001VDC and the ripple should be no more than 20mV peak-to-peak.
- Read DMM voltage as measured from voltage monitor pin; +5VDC indicates a high-voltage output of +2KVDC.

Full Load Test

- All readings should be the same as above except $V_{in} A$ will have a higher current, up to 220mA.

Online Tutorials

Please see our tutorial on How to Connect and Test a Regulated Model:

<http://www.emcohighvoltage.com/emco-high-voltage-tutorials.php>