PURPOSE

The MVC-301 Manual Voltage Control is used as a backup control device to provide manual voltage control in case of a voltage regulator failure. The MVC-301 can be mounted on a control panel in ground vehicles, stationary equipment, or shipboard locations.

DESCRIPTION

The solid-state MVC-301 is enclosed in a metal chassis and designed for “through-the-hole” mounting. Mode selection is made with an Auto-Off-Manual control switch located on the front panel. Setpoint adjustments are made through an external 10 kΩ potentiometer control element. MVC-301 connections are made at a terminal strip located on the rear panel. Figure 1 illustrates the front and rear panels of the MVC-301.

SPECIFICATIONS

Input Power:	120 Vac or 240 Vac, single-phase
Output Adjustment Range	
120 Vac Input:	1 to 32 Vdc or 1 to 63 Vdc
240 Vac Input:	1 to 63 Vdc or 1 to 125 Vdc
Power Dissipation:	30 W maximum
Minimum Residual Voltage for Buildup:	6 Vac
Temperature	
Operating:	–40 to 158°F (–40 to 70°C)
Storage:	–85 to 212°F (–65 to 100°C)
Weight:	
Net:	3.0 lb. (1.36 kg)
Shipping:	5.0 lb. (2.25 kg)
Shock:	Withstands up to 15 g in each of three mutually perpendicular axes.
Vibration:	Withstands 5 to 27 Hz at 1.3 g, 27 to 52 Hz at 0.036 in. double amplitude, and 52 to 500 Hz at 5 g.
EC Directive:	RoHS 2 2011/65/EU

FUNCTIONAL DESCRIPTION

The MVC-301 controls voltage through a phase-controlled SCR rectifier bridge. Adjusting the external Manual Voltage Adjust control alters the SCR firing angle and adjusts the level of voltage supplied to the exciter field.

During startup, the internal buildup circuit holds the SCR power bridge at maximum output. Once the voltage builds to approximately 30 Vac, the buildup circuit relinquishes control to the external Manual Voltage Adjust control.

The Auto-Off-Manual control mode switch provides the ability to transfer from voltage regulator control to the MVC-301 and vice versa. An internal freewheeling diode connected to the field allows safe switching without the risk of arcing.

The MVC-301 operates from a nominal 120 Vac or 240 Vac source without the need for any electrical wiring changes such as tap selection or terminal connections. Taps are provided to select a 32 Vac, 63 Vac, or 125 Vac maximum output.

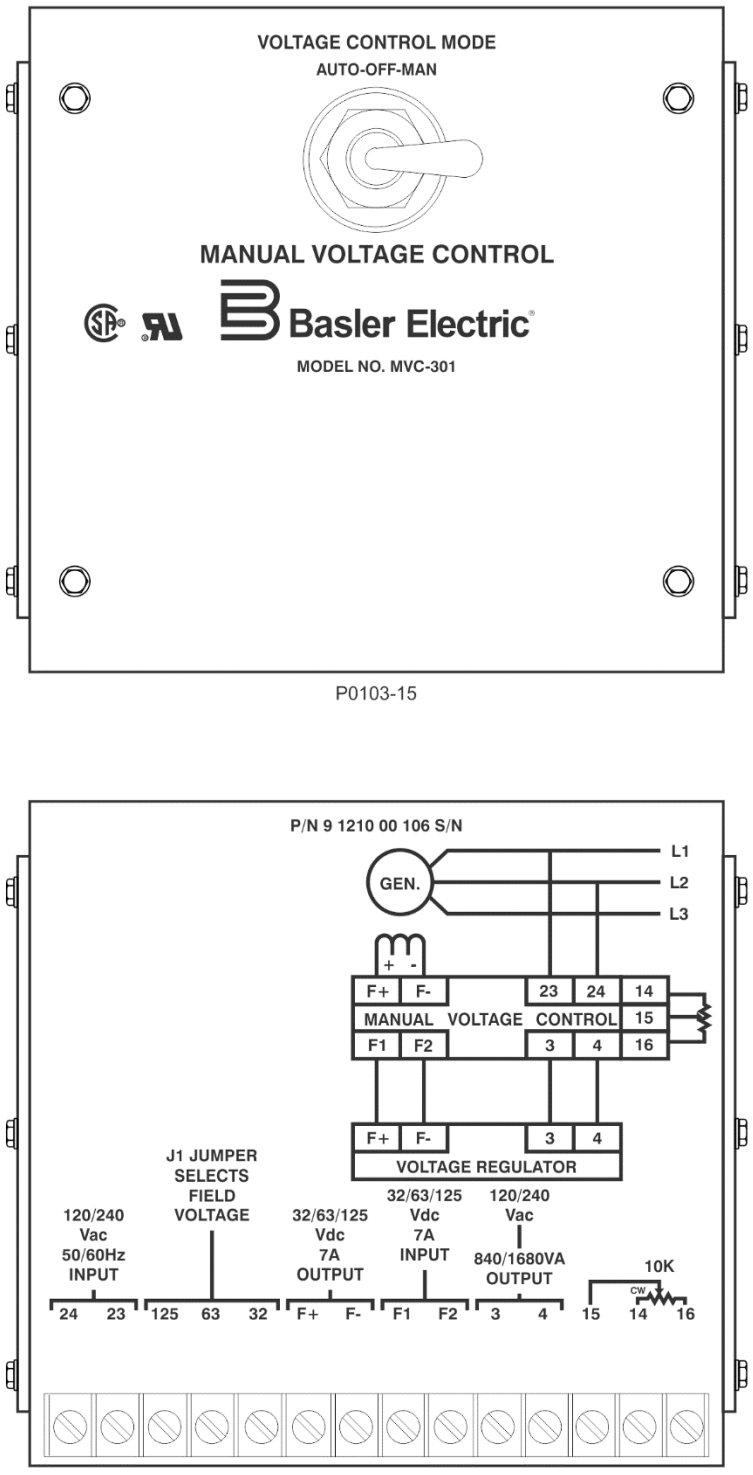


Figure 1. MVC-301 Front and Rear Panels

MOUNTING

The MVC-301 is designed for “through-the-panel” mounting. It can be installed in any position but vertical mounting is preferred to improve ventilation/cooling.

Overall mounting dimensions are shown in Figure 2. The front panel of the MVC-301 can be removed and relocated. Figure 3 illustrates the panel drilling dimensions for relocating the front panel. All dimensions are expressed in inches with millimeters in parenthesis.

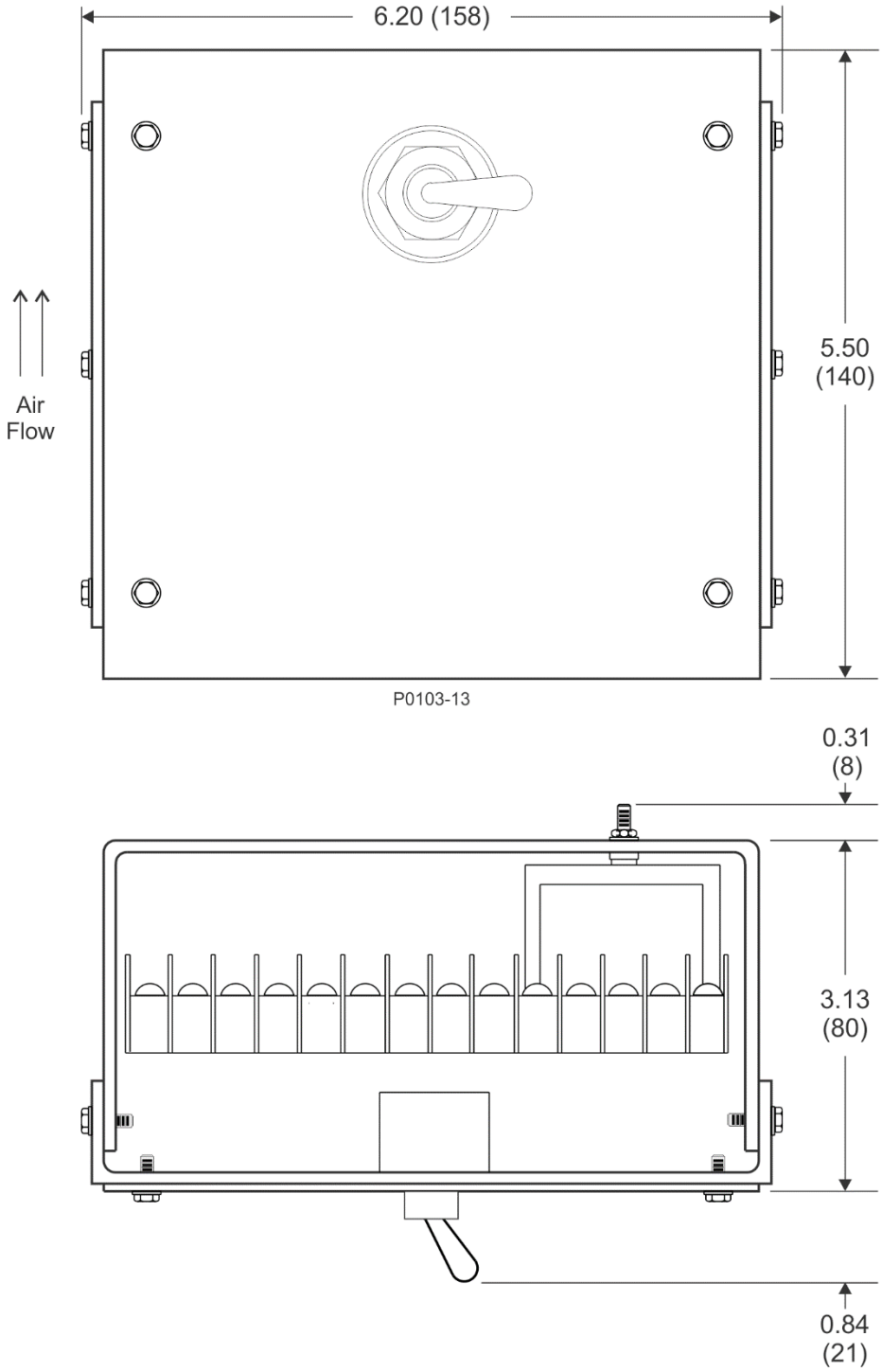


Figure 2. MVC-301 Mounting Dimensions

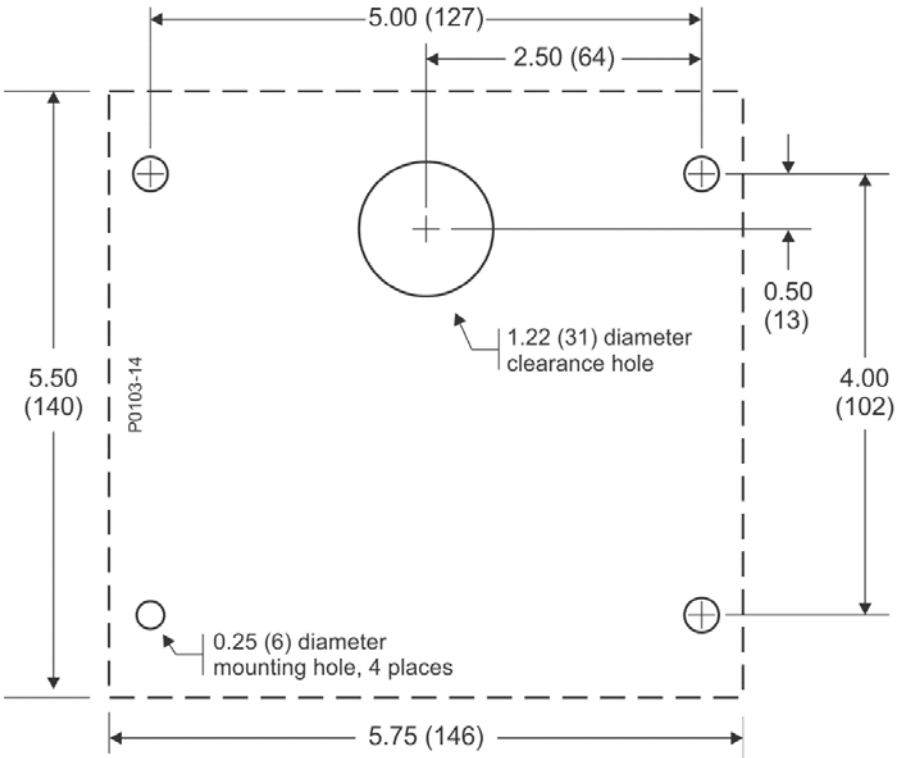


Figure 3. Drilling Dimensions for Remote Mounting of Front Panel

CONNECTIONS

MVC-301 connections are made at the terminal strip located on the rear panel. The #6 terminal screws accept wire sizes over the range of 22 to 12 AWG and have a maximum torque of 9 in-lb (1 N•m). Terminal assignments are shown in Figure 1 and typical MVC-301 connections are illustrated in Figure 4.

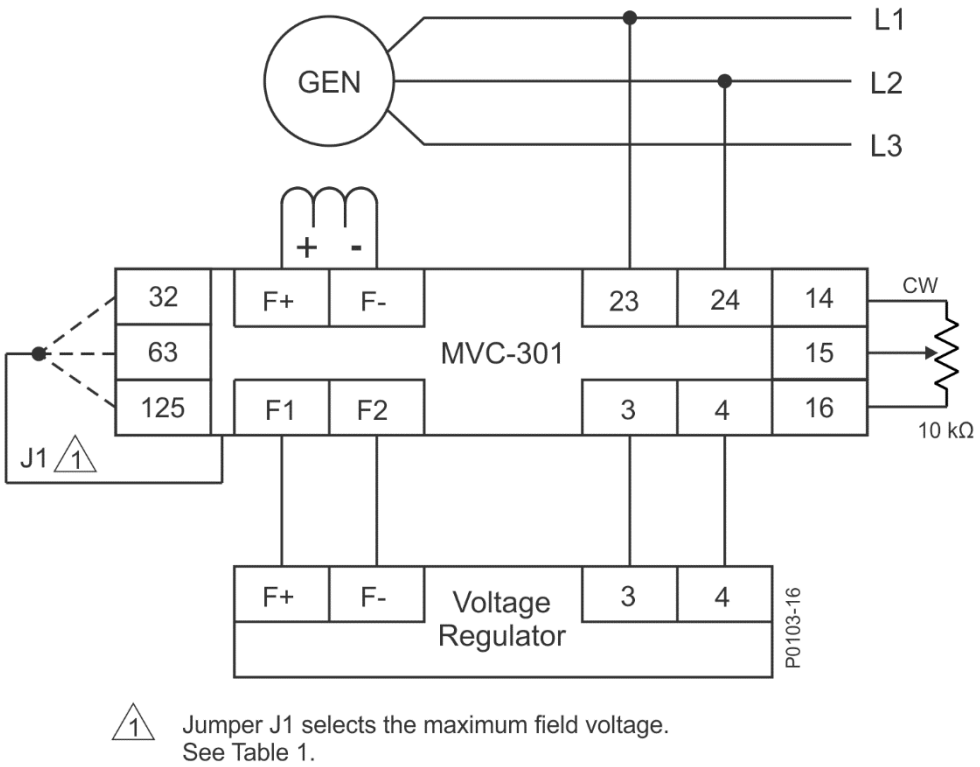
The control potentiometer is connected at MVC-301 terminals 14, 15, and 16. A Basler motor operated control (MOC) can be connected in place of the potentiometer.

To prevent voltage regulator or MVC-301 damage, it is imperative that the MVC-301 be connected to provide an output that is compatible with the voltage regulator rating. When the MVC-301 and voltage regulator are properly matched, the MVC-301 will provide smooth control of the generator output voltage when manual operation is selected.

Use Table 1 to determine the appropriate input voltage and select the output voltage. Based on the voltage regulator model, the proper MVC-301 input rating is selected and connections are made between the generator and MVC-301 terminals 23 and 24 in order to supply the specified voltage. The MVC-301 has a wire jumper connected from the printed circuit board to the barrier strip. Connect this jumper to the appropriate Voltage Selection terminal listed in Table 1.

Table 1. Voltage Selection Chart

Voltage Regulator		MVC-301	
Model	**Maximum Rating**	**AC Input Voltage**	**Voltage Selection Terminal**
KR7F, KR7FF, SR8A, SR8F	125 Vdc at 7 Adc	240	125
SR4A, SR4F, KR4F, KR4FF	63 Vdc at 7 Adc	120	63
SR2001, SR2004	63 Vdc at 7 Adc	240	63
KR2F, KR2FF	32 Vdc at 7 Adc	120	32
APR63-5	63 Vdc at 7 Adc	240	63
APR125-5	125 Vdc at 7 Adc	240	125
HP63	63 Vdc at 7 Adc	240	63



1 Jumper J1 selects the maximum field voltage. See Table 1.

Figure 4. MVC-301 Typical Connections

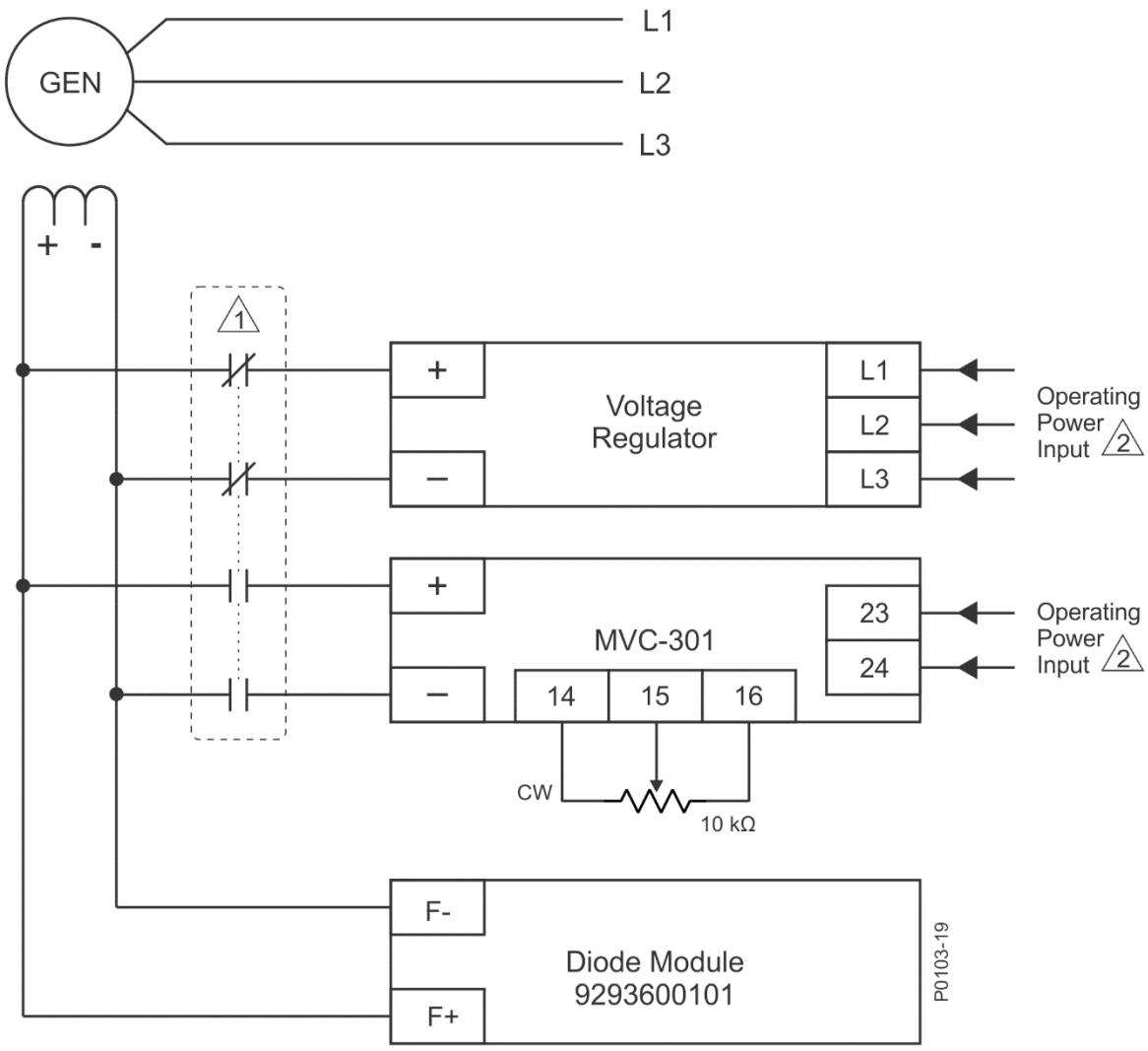
Applying the MVC-301 with a digital voltage regulator that relies on field current measurement for field regulation (such as the Basler DECS-150 or DECS-250) can result in damage if connected as shown in Figure 4 and on the MVC-301 front panel. In these applications, an auto/manual control switch and diode module must be implemented as shown in Figure 5. The switch transfers control of excitation between the voltage regulator and the MVC-301. The diode module, Basler part number 9293600101, suppresses excessive field voltage buildup when the switch is operated and its contacts change state.

OPERATION

With the Auto-Off-Manual mode switch placed in the Manual position, the automatic voltage regulator is removed from the line and generator output voltage is controlled manually by the MVC-301. When the mode switch is placed in the Auto position, the generator output voltage is controlled by the voltage regulator. Complete excitation shutdown occurs when the mode switch is placed in the Off position.

Warning!

With the voltage control mode switch in the Manual or Off position, some voltage regulator terminals remain connected to the generator and present a potential shock hazard. No attempt should be made to remove or troubleshoot the voltage regulator while the generator is running.



1 Auto/manual control transfer switch contacts must be rated appropriately for the field requirements.

2 Voltage regulator and MVC-300 operating power inputs can be shunt- or station-powered.

Figure 5. MVC-301 Connections with PWM Voltage Regulator

Start the prime mover and set the Manual Voltage Adjust control to minimum (fully counterclockwise) and place the Auto-Off-Manual control mode switch in the Manual position. Note that the voltage may be unstable (hunting) if the Manual Voltage Adjust control is set below 30 Vac.

Allow the generator voltage to build up and slowly increase the generator output voltage with the Manual Voltage Adjust the control until the generator voltage reaches the desired level.

OPERATIONAL TEST

To verify that the MVC-301 is functioning properly, perform a bench test using the connections shown in Figure 5 and the following procedure. Note that a voltage regulator is not required for this test.

1. With no power applied to the MVC-301 and all connections to the voltage regulator removed, place the MVC-301 Auto-Off-Manual mode switch in the Manual position.
2. Connect a 120 Vac, 100 watt incandescent lightbulb to MVC-301 terminals F+ and F–. Connect the MVC-301 jumper to terminal 63.

3. With the Manual Voltage Adjust control fully counterclockwise, apply a 120 Vac source to MVC-301 terminals 23 and 24. Slowly rotate the control clockwise and observe that the brightness of the lightbulb increases proportionally until it reaches full brightness.
4. Rotate the Manual Voltage Adjust control fully counterclockwise. Remove the 120 Vac source from terminals 23 and 24 and select 32 Vdc operation by moving the MVC-301 jumper to terminal 32. Apply 120 Vac to MVC-301 terminals 23 and 24 and observe that the brightness of the lightbulb increases as the Manual Voltage Adjust control is rotated clockwise. Observe that the lightbulb is at approximately half of its previous brightness when the MVC-301 jumper was connected to terminal 63.

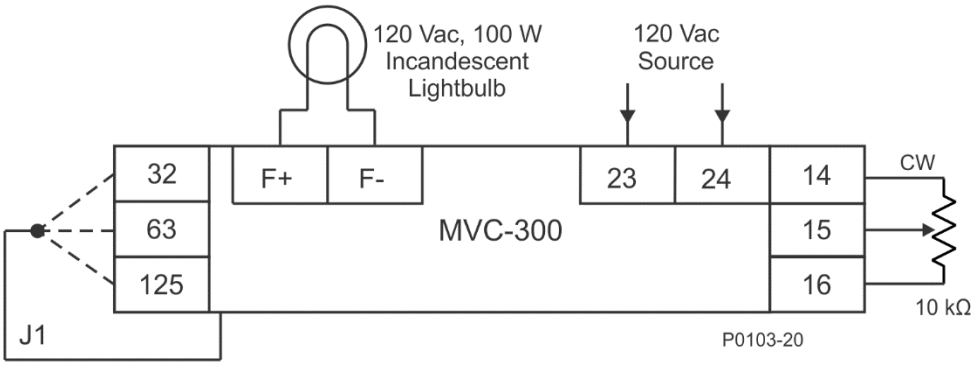


Figure 6. MVC-301 Test Connections

MAINTENANCE

Periodic inspection should be made to ensure that the MVC-301 is clean and free from accumulations of dust and moisture. Verify that all terminal connections of the MVC-301 and voltage regulator are clean and tight.

Replacement Parts

A reasonable stock of spare parts minimizes downtime in the event of malfunction. When ordering replacement parts from Basler Electric, always specify the part number, quantity, and description of the item. MVC-301 replacement parts are listed in Table 2.

Table 2. Replacement Parts

Component Designator	Description	Part Number	Quantity
—	Printed circuit board	9121001105	1
F1, F2	Fuse, 10 A, 250 V	18347	2

Troubleshooting

Use the following troubleshooting procedures if the MVC-301 fails to operate as expected. For an MVC-301 bench test procedure, refer to *Operational Test*.

1. Verify that all MVC-301 wiring is correct and in accordance with the connection diagram of Figure 4.

   If the wiring is incorrect or defective, correct or repair as needed.

   If all wiring is correct, proceed to step 2.
2. Verify that the Auto-Off-Manual control mode switch turns off the excitation.

   If the excitation does not turn off, replace the MVC-301.

   If the excitation shuts down, proceed to step 3.
3. With the Auto-Off-Manual switch in the Manual position, verify that the generator output voltage builds up.

   If the generator output voltage builds up, proceed to step 6.

   If the generator output voltage does not build up, proceed to step 4.
4. Verify that MVC-301 fuses F1 and F2 are good.

If either fuse is open, replace it and proceed to step 5.

If both fuses are good, replace the MVC-301.

5. Verify that the generator output voltage builds up.

   If the generator output voltage does not build up, replace the MVC-301.

   If the generator output voltage builds up, proceed to step 6.

6. Verify that the generator output can be controlled by the MVC-301 control potentiometer.

   If the generator output voltage cannot be controlled, replace the MVC-301.

   If the generator output voltage is controllable, proceed to step 7.

7. Verify that the generator operates as expected with the MVC-301 Auto-Off-Manual control mode switch in the Auto position.

   If the generator fails to operate properly, troubleshoot the voltage regulator.