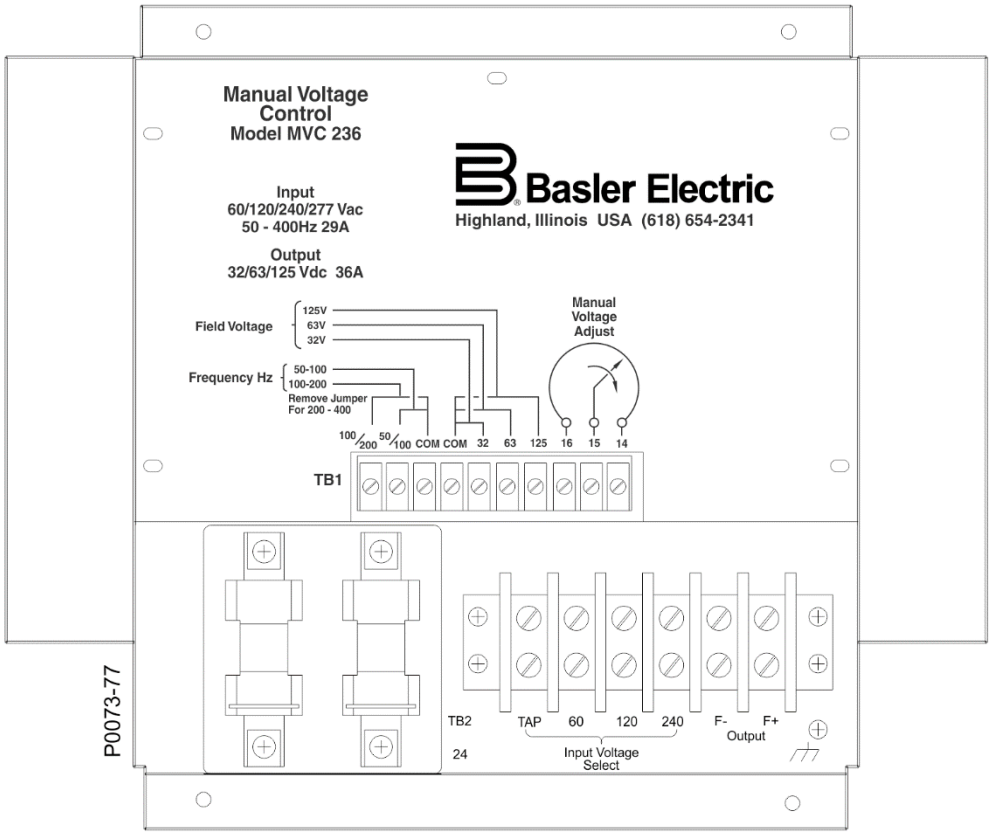
INSTRUCTION MANUAL

FOR

MVC 236

Manual Voltage Control



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Preface

This instruction manual provides information about the installation and operation of the MVC 236 Manual Voltage Control. To accomplish this, the following information is provided:

- Functional description
- Mounting
- Connections
- Operation
- Maintenance

Conventions Used in this Manual

Important safety and procedural information is emphasized and presented in this manual through Warning, Caution, and Note boxes. Each type is illustrated and defined as follows.

Warning!
Warning boxes call attention to conditions or actions that may cause personal injury or death.

Caution
Caution boxes call attention to operating conditions that may lead to equipment or property damage.

Note
Note boxes emphasize important information pertaining to Manual Voltage Control installation or operation.

Basler Electric
12570 State Route 143
Highland IL 62249-1074 USA
www.basler.com
info@basler.com
Tel: +1 618.654.2341
Fax: +1 618.654.2351

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Warning!

READ THIS MANUAL. Read this manual before installing, operating, or maintaining the MVC 236. Note all warnings, cautions, and notes in this manual as well as on the product. Keep this manual with the product for reference. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

To prevent personal injury or equipment damage, only qualified personnel should install, operate, or service this system.

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The English-language version of this manual serves as the only approved manual version.

Contents

Introduction

Manual Voltage Control MVC 236 enables manual control of generator output and is intended as a backup system for an associated automatic voltage regulator. During generator startup, an integrated buildup circuit maintains maximum MVC 236 output power for reliable buildup of the generator output voltage.

The MVC 236 is intended for behind-the-panel mounting. MVC 236 components are mounted on a 14-gauge, steel chassis with an aluminum cover and heat sinks. MVC 236 modules with part number 9204300100 have a chassis constructed from low-carbon steel while MVC 236 modules with part number 9204300104 have a chassis constructed from 316-grade stainless steel.

Standard Equipment

The MVC 236 is supplied with a potentiometer and spike suppression module.

Potentiometer

The potentiometer is intended for remote mounting and controls the MVC 236 setpoint.

Spike Suppression Module

The spike suppression module protects the MVC 236 from potentially damaging voltage spikes when the MVC 236 is powered by a high-impedance source.

Optional Equipment

Available optional equipment for the MVC 236 includes an Auto/Off/Manual control switch and a nulling chassis.

Auto/Off/Manual Switch

An available Auto/Off/Manual switch (P/N 9204306100) enables transfer of control between the MVC 236 and automatic voltage regulator.

Nulling Chassis

An available nulling chassis (P/N 9204304100) provides “bumpless” transfers from the automatic voltage regulator to the MVC 236.

Functional Description

The MVC 236 supplies power to the generator field through a phase-controlled, silicon-controlled rectifier (SCR) bridge. By adjusting the remotely-mounted, manual voltage adjust control, the firing angle of the SCR changes to provide an adjustable voltage level to the exciter field.

A simplified block diagram illustrating MVC 236 operation is shown in Figure 1.

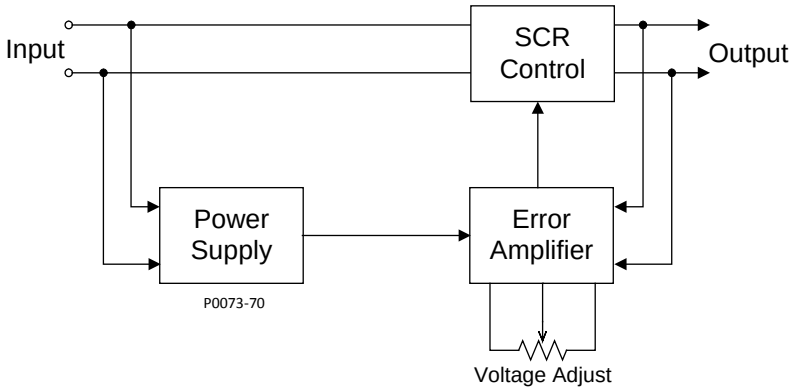


Figure 1. MVC 236 Block Diagram

Operating Power

MVC 236 operating power can be supplied from a source with a nominal rating of 60 Vac, 120 Vac, or 240 Vac. The nominal source voltage is made on the MVC 236 through a tap selection.

The operating power frequency can be within one of three jumper-selectable ranges: 50 to 100 Hz, 100 to 200 Hz, or 200 to 400 Hz.

Buildup Circuit

During generator startup, the MVC 236 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 remotely-mounted, potentiometer for manual control of the field excitation level.

Auto/Manual Transfer

The available Auto/Off/Manual switch (P/N 9204306100) enables transfer from the automatic voltage regulator to the MVC 236 and vice versa. Circuitry within the MVC 236 allows safe switching without the risk of arcing.

Output Power

The jumper-selectable MVC 236 power output is rated for a nominal field voltage of 32 Vdc, 63 Vdc, or 125 Vdc.

Spike Suppression

Higher impedance sources, such as power isolation transformers and permanent magnet generators (PMGs), may have enough inductance to produce damaging voltage spikes in the MVC 236 power output stage. In these applications, use of the provided spike suppression module is recommended to filter out

these potentially damaging voltage spikes. The *Installation* chapter provides information about mounting and connecting the spike suppression module.

Mounting

For maximum cooling, the MVC 236 must be mounted vertically. The mounting location can be anywhere the ambient temperature does not exceed the environmental conditions listed in the *Specifications* chapter. Figure 2 illustrates the overall mounting dimensions of the MVC 236. Maximum mounting depth for the MVC 236 is 4.375 inches (111 millimeters). Dimensions shown in Figure 2 are in inches with millimeters in parenthesis.

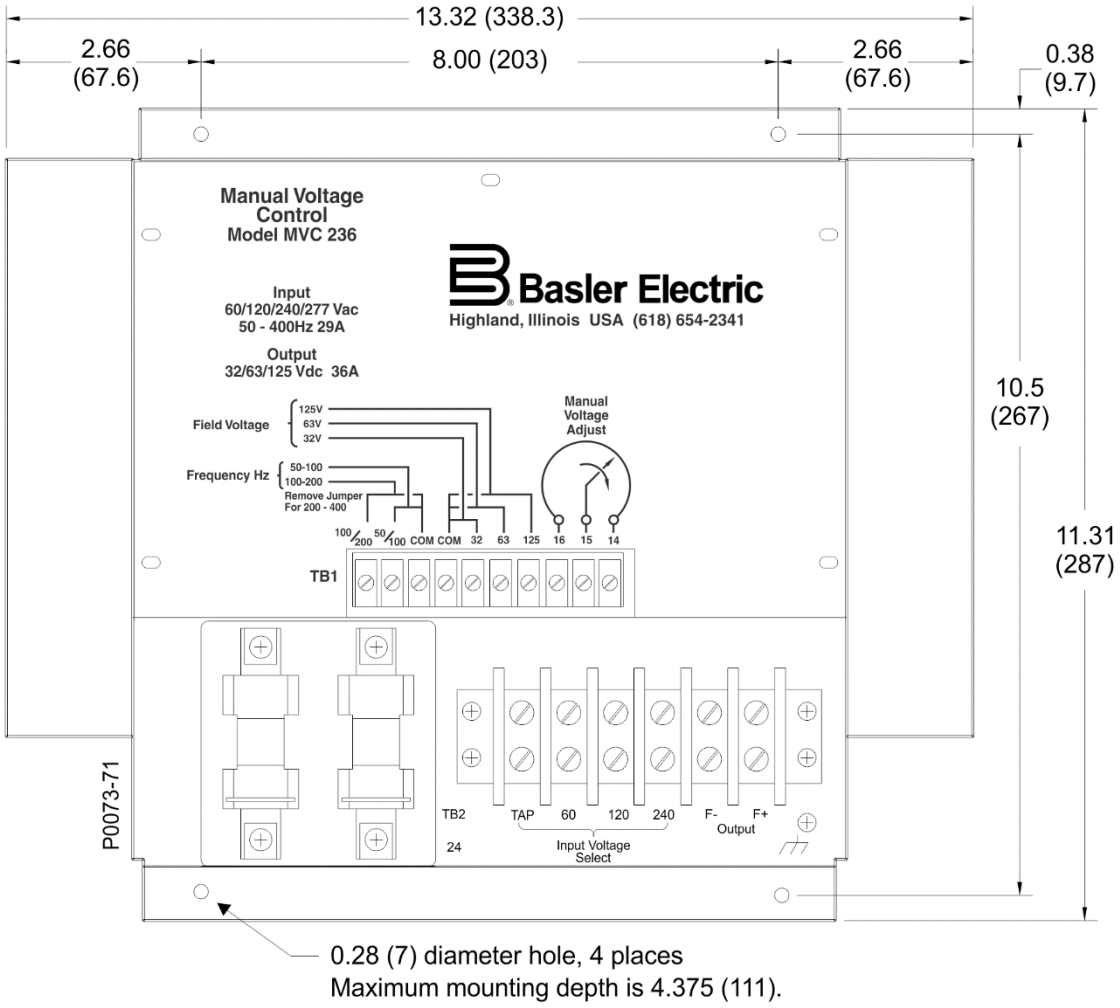
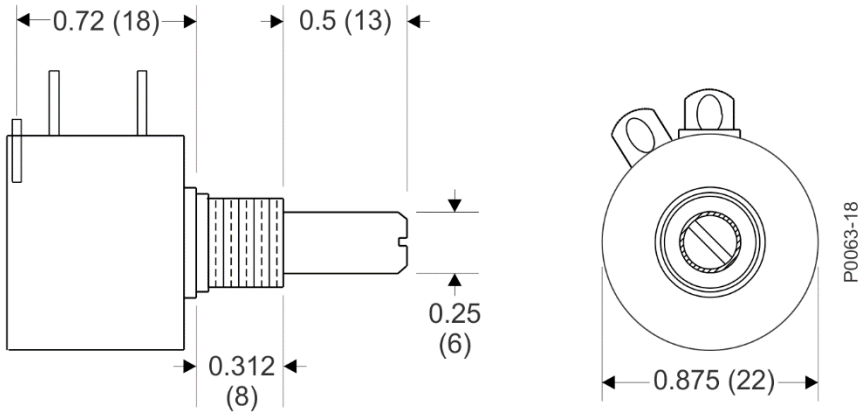


Figure 2. MVC 236 Mounting Dimensions

Manual Voltage Adjust Potentiometer

Mounting dimensions for the manual voltage adjust potentiometer are shown in Figure 3. The 10 kΩ, 1 W potentiometer, Basler part number 21565, is supplied with a mounting nut and lock washer.



Notes:
1. All dimensions are in inches (millimeters)
2. Panel drilling hole is 0.411 (10).
3. Mounting threads are 0.375-32 UNEF-2A.

Figure 3. Manual Voltage Adjust Potentiometer Dimensions

Spike Suppression Module

The spike suppression module can be mounted in any position and location where the ambient temperature does not exceed the operational limits. Due to the rugged construction of the spike suppression module, it can be mounted directly on the generator. Select module mounting hardware based on the vibration and shock expected during normal operation. Figure 4 illustrates the overall and mounting dimensions for the spike suppression module. Maximum mounting depth for the spike suppression module is 2.625 inches (67 millimeters). Dimensions shown in Figure 4 are in inches with millimeters in parenthesis.

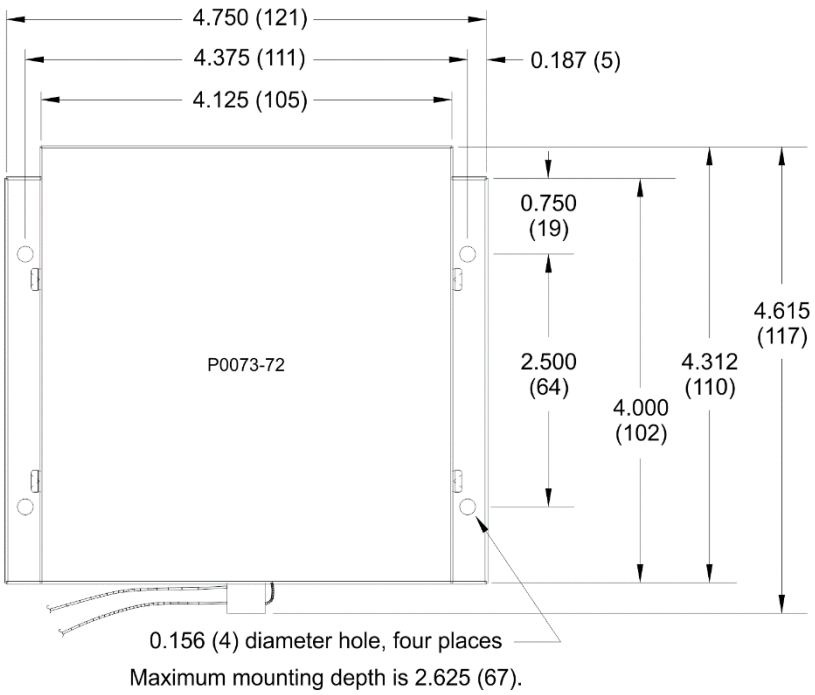


Figure 4. Spike Suppression Module Mounting Dimensions

Connections

Caution

High-potential test equipment should be applied with extreme care. Incorrect application of dielectric test voltages will damage the MVC 236.

Connection drawings for typical MVC 236 applications are provided in Figure 5 and Figure 6.

Table 1 serves as a legend for the Auto/Off/Manual Switch of Figure 5.

For Figure 6, switch contacts 1 and 2 are closed for manual operation and switch contacts 3 and 4 are closed for auto operation.

Table 1. Auto/Off/Manual Switch Legend for Figure 5

Switch Position	Contact									
	1-2	1-3	5-4	5-6	7-8	9-10	11-12 †	13-14 †	15-16 †	17-18 †
Manual		X	X				X			
*							X			
Off							X			
*										
Auto	X			X	X	X		X	X	X

* Make before break.
† Contacts required for automatic voltage regulator maintenance.

Connection Guidelines

Observe the following guidelines when making MVC 236 connections.

Input Power

Operating power is applied at MVC 236 terminals 23 and 24. The MVC 236 and operating power wiring should be protected with fuses. Configure the MVC 236 for the applied, nominal operating power by connecting the jumper from terminal TB2-TAP to the proper terminal on TB2 (60, 120, or 240).

Output (Field) Voltage

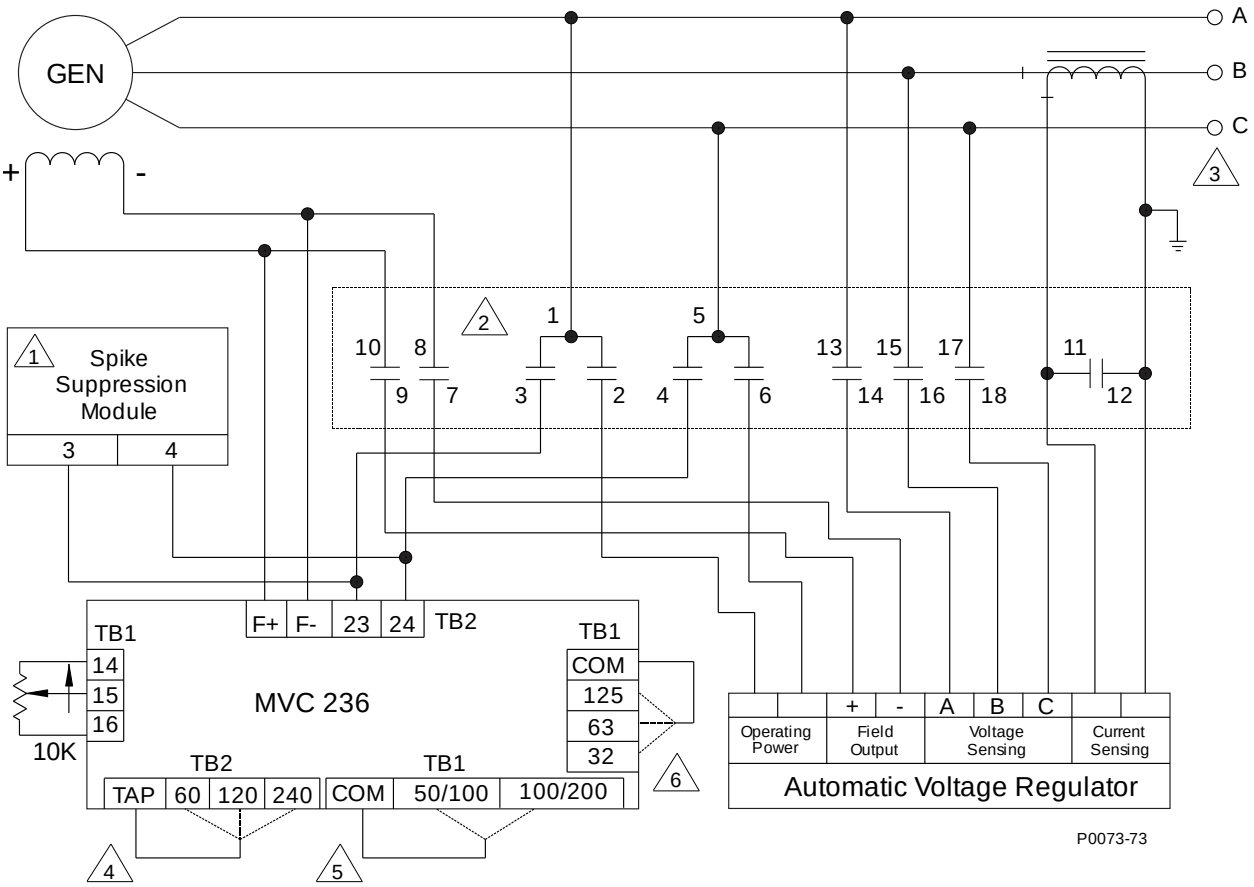
Select the desired output (field) voltage (32 Vdc, 63 Vdc, or 125 Vdc) by connecting the jumper wire from terminal TB1-COM (Field Voltage) to the proper terminal.

Frequency Selection

Configure the MVC 236 for the operating power frequency. Connect a jumper wire between terminal TB1-COM (Frequency Hz) and the appropriate terminal for 50 Hz to 100 Hz operation or 100 Hz to 200 Hz operation. For an operating power frequency within the range of 200 Hz to 400 Hz, omit the jumper.

Manual Voltage Adjust Potentiometer

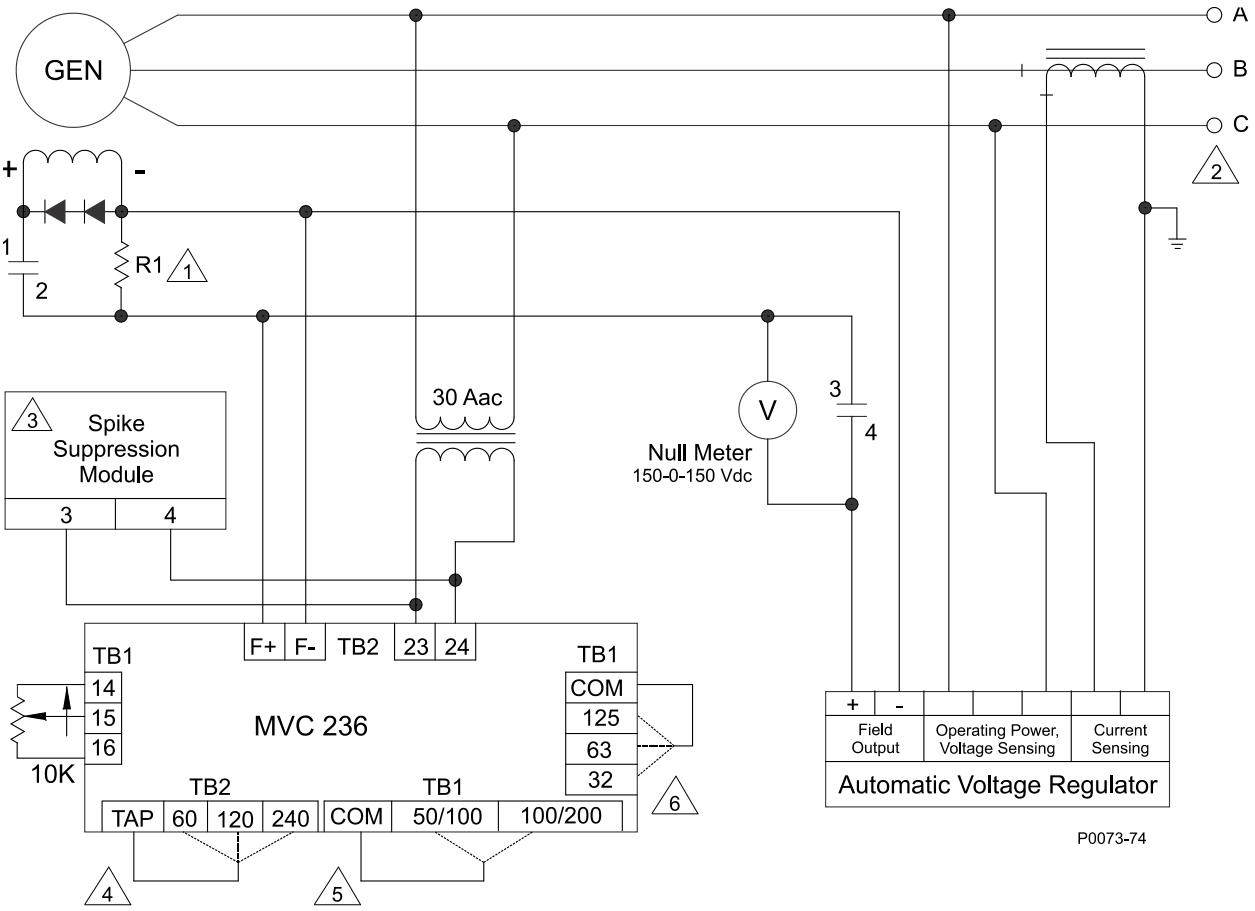
Connect the manual voltage adjust potentiometer to MVC 236 terminals TB1-14, TB1-15, and TB1-16 as shown in the connection diagrams. If desired, a Basler Electric Motor Operated Control with a 10 kΩ control element can be used instead of the supplied potentiometer.



NOTES

1. Spike suppression module is required when isolation transformer is used.
2. Manual/Off/Auto switch is required for AVR maintenance.
3. Phase rotation is ABC.
4. Connect tap for nominal input voltage used.
5. Connect jumper for generator frequency. (Jumper is removed for 200 to 400 Hz.)
6. Connect jumper for application field voltage.

Figure 5. Typical MVC 236 Connections



NOTES

1. Minimum load current through R1 is 0.35 Adc. For 125 Vdc applications, R1 is 350 Ω, 100 W. For 63 Vdc applications, R1 is 180 Ω, 50 W. For 32 Vdc applications, R1 is 90 Ω, 25 W.
2. Phase rotation is ABC.
3. Spike suppression module is required when isolation transformer is used.
4. Connect tap for nominal input voltage used.
5. Connect jumper for generator frequency. (Jumper is removed for 200 to 400 Hz.)
6. Connect jumper for application field voltage.

Figure 6. MVC 236 Interconnection with Null Meter Circuit

Operation

When the Auto/Off/Manual control switch is placed in the Manual position, the automatic voltage regulator is removed from the circuit and the generator output is manually controlled by the MVC 236. When the Auto/Off/Manual control switch is placed in the Auto position, the generator output voltage is controlled by the automatic voltage regulator. Complete excitation shutdown occurs when the Auto/Off/Manual control switch is placed in the Off position.

Warning!

When the Auto/Off/Manual control switch is placed in the Manual or Off position, some of the voltage regulator terminals remain connected to the generator and present a potential shock hazard. No attempt should be made to remove or troubleshoot the automatic voltage regulator during generator operation.

Operating Procedure

1. Start the prime mover according to the manufacturer's procedure and set the manual voltage adjust potentiometer to its minimum value (fully counterclockwise).
2. Place the Auto/Off/Manual switch in the Manual position. Note that the generator voltage may be unstable (hunting) if the manual voltage adjust potentiometer is set below 30 Vac.
3. Allow the generator voltage to build and then slowly increase the generator output voltage with the manual voltage adjust control until the generator output voltage reaches the desired level.

Operational Test

MVC 236 operation can be verified by using the following procedure. Operational test connections are shown in Figure 7. Note that an automatic voltage regulator is not required for this test.

1. Connect the MVC 236 according to the connections shown in Figure 7.
2. Connect the field voltage jumper for 125 Vdc.
3. Adjust the manual voltage adjust control fully counterclockwise and apply 120 Vac input power.
4. Slowly rotate the manual voltage adjust control clockwise and observe that the brightness of the light bulb increases proportionally until reaching full luminance.
5. Rotate the manual voltage adjust control fully counterclockwise and remove the 120 Vac input power.
6. Connect the field voltage jumper for 63 Vdc.
7. Apply power and slowly rotate the manual voltage adjust control clockwise and observe that the brightness of the light bulb increases proportionally. Observe that the light bulb luminance is half of what is was when the field voltage jumper was set in the 125 Vdc position.
8. Rotate the manual voltage adjust control fully counterclockwise and remove the 120 Vac input power.
9. Connect the field voltage jumper for 32 Vdc.
10. Apply power and slowly rotate the manual voltage adjust control clockwise and observe that the brightness of the light bulb increases proportionally. Observe that the light bulb luminance is half of what is was when the field voltage jumper was set in the 63 Vdc position.

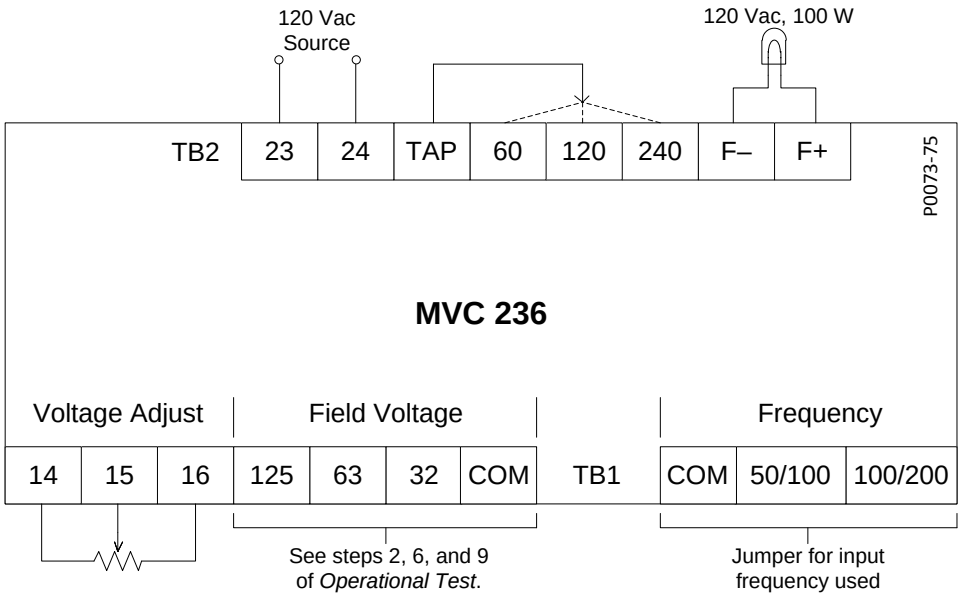


Figure 7. MVC 236 Operational Test Connections

Maintenance

Periodic inspection should be made to ensure that the MVC 236 is clean and free from accumulations of dust and moisture. Verify that all connections are clean, tight, and free of corrosion.

Corrective Maintenance

Due to a protective, conformal coating, repair of printed circuit components should not be attempted. Replacement of the printed circuit board is recommended. Table lists the recommended spare parts for the MVC 236.

Table 2. Recommended Spare Parts

Component Designator	Basler P/N	Quantity	Description
	9179201101	1	Printed circuit board assembly
	9261500101	1	Spike suppression module for MVC 236 P/N 9204300100
	9261500102	1	Spike suppression module for MVC 236 P/N 9204300104
CR5	08608	1	Diode, type S3680
F1, F2	21627	2	Fuse, type JJS40, 40 A
PM1, PM2	42403	2	SCR power module, 800 V, 90 A
R27, R28	21564	2	Resistor, wire-wound, 15 Ω, 50 W
R32	21565	1	Potentiometer, 10 kΩ, 5%, 1 W
T1	BE22746001	1	Transformer

Troubleshooting

If an MVC 236 malfunction is suspected, the troubleshooting chart of Figure 8 can be used to determine the probable cause of the malfunction and determine corrective actions. Refer to the *Maintenance* chapter for a procedure for bench-testing the MVC 236.

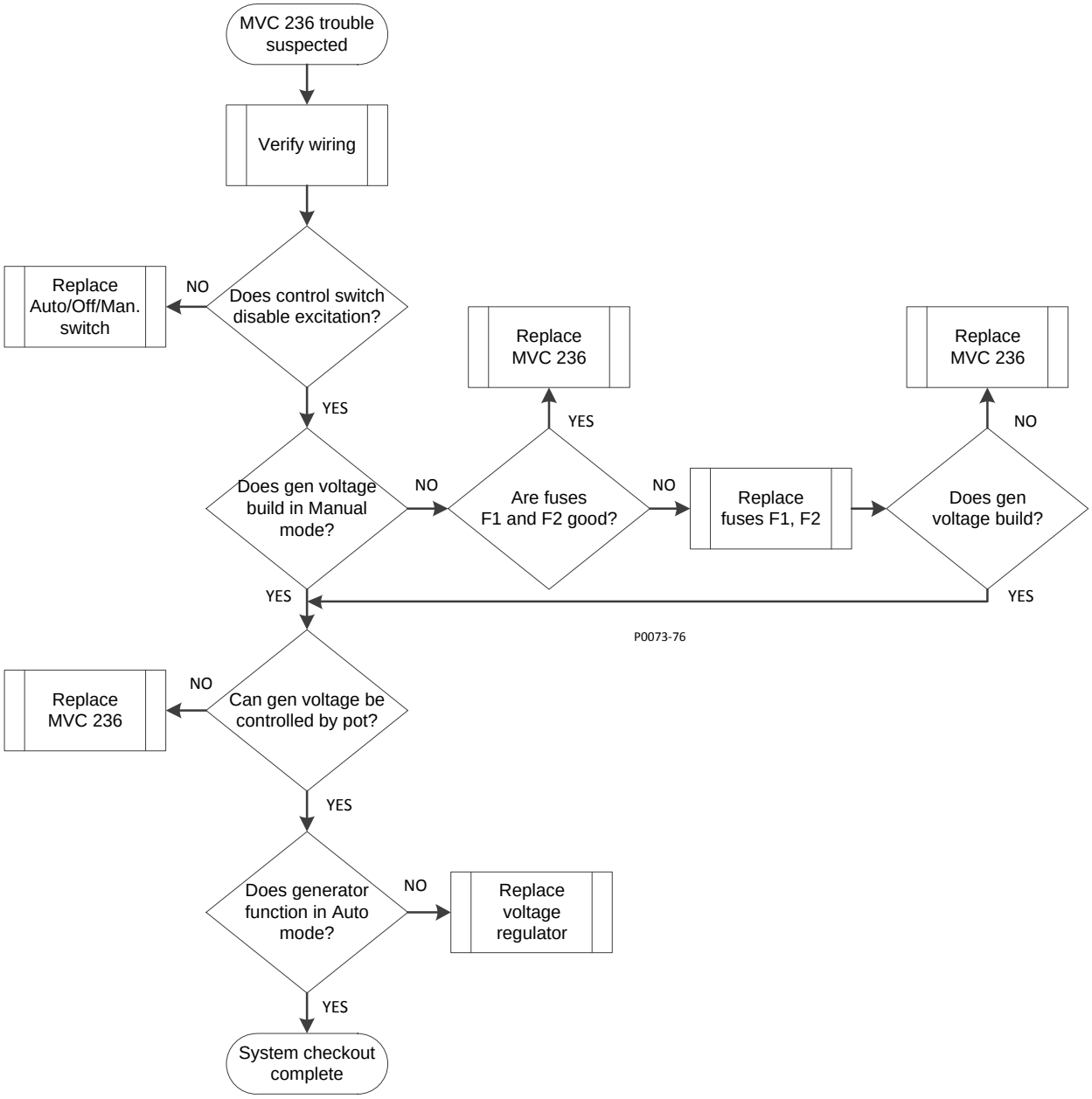


Figure 8. MVC 236 Troubleshooting Chart

Specifications

Power Input

Frequency
50 to 400 Hz, single-phase

Voltage Range

60 Vac Nominal:	45 to 70 Vac
120 Vac Nominal:	90 to 153 Vac
240 Vac Nominal:	170 to 305 Vac

Power Dissipation
85 W

Minimum Residual Buildup Voltage

10% of 60 Vac nominal input voltage or 5% of 120/240 Vac nominal input voltage.

Regulation

Accuracy

2% for a 10% change in input power and 5% for a 30% change in input power.

Temperature Stability

±5% for a 50°C temperature change

Power Output

60 Vac Nominal Input
32 Vdc at 36 Adc, nominal. No less than 40 Vdc at maximum potentiometer setting.

120 Vac Nominal Input
63 Vdc at 36 Adc, nominal. No less than 79 Vdc at maximum potentiometer setting.

240 Vac Nominal Input
125 Vdc at 36 Adc, nominal. No less than 156 Vdc at maximum potentiometer setting.

Minimum Field Resistance

32 Vdc Nominal Output:	0.88 Ω
63 Vdc Nominal Output:	1.75 Ω
125 Vdc Nominal Output:	3.47 Ω

Physical

Temperature

Operating:	–40 to 70°C (–40 to 158°F)
Storage:	–40 to 85°C (–40 to 185°F)

Humidity
98% noncondensing, maximum

Shock
Withstands up to 15 G in each of three mutually perpendicular axes without any degradation of performance.

Vibration

Withstands up to 2 G of force over a frequency spectrum of 10 to 500 Hz.

Weight

MVC 236:	6.8 kg (15.0 lb.)
Spike Suppression Module:	608 g (1.34 lb.)

Dimensions

Refer to the *Mounting* chapter for MVC 236 and spike suppression module dimensions.

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12570 State Route 143
Highland IL 62249-1074 USA
Tel: +1 618.654.2341
Fax: +1 618.654.2351
email: info@basler.com

No. 59 Heshun Road Loufeng District (N)
Suzhou Industrial Park
215122 Suzhou
P.R. CHINA
Tel: +86 512.8227.2888
Fax: +86 512.8227.2887
email: chinainfo@basler.com

111 North Bridge Road
15-06 Peninsula Plaza
Singapore 179098
Tel: +65 68.44.6445
Fax: +65 68.44.8902
email: singaporeinfo@basler.com