INSTRUCTIONS

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FOR
ANALOG VOLTAGE CONTROLLER
Model AVC63-4 (P/N 9166800136)
Model AVC63-4D (P/N 9166800134)

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INTRODUCTION

AVC63-4 and AVC63-4D analog voltage controllers regulate voltage on 50 or 60 hertz brushless generators. The controllers include frequency compensation, over-excitation shutdown, solid-state buildup circuitry, and EMI filtering.

AVC63-4 adjustment potentiometers are located on the terminals and components side of the controller (see Figure 1). AVC63-4D adjustment potentiometers are accessed through the controller front panel (see Figure 2).

SPECIFICATIONS

Output Power

Maximum Continuous:	4 Adc at 63 Vdc (252 W)
One Minute Forcing:	7 Adc at 100 Vdc (700 W) with 240Vac power input

Exciter Field DC Resistance

15 to 100 Ω

Input Power

Range:	190 - 240 Vac, ±10%, single-phase
Frequency:	50/60 Hz, ±10%
Burden:	500 VA

Sensing Input

190 to 240 Vac, single-phase, 50/60 Hz, ±10%, common with ac power input

Voltage Adjustment Range

171 to 264 Vac

Regulation Accuracy

Better than ±1.0%, no-load to full-load

Response Time

Less than 1.5 cycles for ±5% changes is sensing voltage

EMI Suppression

Internal electromagnetic interference (EMI) filtering

Overexcitation Shutdown

Field voltage shuts down after time delay if exciter field voltage exceeds 100 Vdc, ±5%. (See *Overexcitation Shutdown* for inverse time delay curve and description.)

Voltage Buildup

Automatic voltage buildup occurs for residual generator voltages as low as 6 Vac.

Power Dissipation

8 W maximum

Temperature

Operating:	–40 to 140°F (–40 to 60°C)
Storage:	–85 to 185°F (–65 to 85°C)

Vibration

2 to 27 Hz:	1.3 G
27 to 52 Hz:	0.036 inches, double-amplitude
52 to 1000 Hz:	5 G

Shock

Withstands up to 20 G in each of three mutually perpendicular axes.

Weight

8 oz (220 g) net

Agency Certification

UL recognized and CSA certified

CONTROLS

AVC63-4 and AVC63-4D controls consist of jumpers and screwdriver-adjusted potentiometers.

Jumpers

Two jumpers connect to the controller terminals: the Corner Frequency jumper and the Voltage Adjust Rheostat jumper. These jumpers are shown in Figure 3.

Corner Frequency Jumper

Analog voltage controllers are delivered with the Corner Frequency Jumper set for 60 hertz operation. This gives a corner frequency of 55 hertz. For 50 hertz operation and a corner frequency of 45 hertz, the Corner Frequency jumper must be moved to the 50 Hz terminal.

Voltage Adjust Rheostat Jumper

Analog voltage controllers are delivered with the Voltage Adjust Rheostat jumper connected across terminals 6 and 7. This enables adjustment of the generator output voltage through the controller's internal Voltage Control potentiometer. Clockwise rotation of the voltage control increases generator voltage.

If remote adjustment of the generator output is desired, the Voltage Adjust Rheostat jumper must be replaced with a user-supplied rheostat. A 1000 ohm, ½-watt rheostat will provide adequate voltage adjustment range for most applications. Figure 8 shows the proper remote rheostat connections.

Potentiometer Controls

AVC63-4 potentiometer controls are located on the components and terminals side of the controller and are shown in Figure 1. AVC63-4D potentiometer controls are accessible through the controller front panel and are shown in Figure 2.

INPUT POWER/SENSING INPUT

Power for the exciter field and analog voltage controller is derived from the generator output. The acceptable power input range is 171 to 264 Vac and is connected to terminals 3 and 4. Connect wiring as shown in the interconnection diagram of Figure 8.

EXCITER FIELD POWER CIRCUIT

Controller terminal F+ is connected to the brushless exciter field positive terminal and controller terminal F– is connected to the brushless exciter field negative terminal.

CAUTION

The exciter field dc resistance must be 15 Ω or greater and less than 100 Ω.

If the exciter field dc resistance is less than 15 Ω and the full-load field current does not exceed the maximum continuous current rating of the controller, a resistor of

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sufficient wattage must be added in series with the field to increase the total resistance to 15 Ω.

FREQUENCY COMPENSATION

The frequency compensation feature improves system load pickup performance by restraining voltage recovery until the frequency has also started to recover. Figures 4 and 5 illustrate the underfrequency characteristics of the AVC63-4 and AVC63-4D.

The corner frequency range is set for 50 hertz or 60 hertz by connecting the Corner Frequency jumper to the appropriate terminal. Refer to *Controls, Jumpers* for details about selecting the corner frequency range.

The corner frequency setting is adjusted by the Underfrequency control (potentiometer). Clockwise rotation of the Underfrequency control increases the corner frequency and counterclockwise rotation decreases the corner frequency. If user adjustment of this factory-set potentiometer is desired, follow the *Preliminary Setup* and *System Startup* procedures.

OVEREXCITATION SHUTDOWN

The overexcitation shutdown feature removes controller output power, after a time delay, if the exciter field voltage exceeds 100 Vdc, ±5%. The time delay is inversely proportional to the magnitude of the detected overvoltage—up to 135 Vdc. Beyond 140 Vdc, the field voltage is removed after approximately 2 seconds. Figure 6 shows the over-excitation shutdown time delay characteristic curves.

Once the output power is removed, the controller can be reset by decreasing the input voltage to less than 10 Vac for two seconds, minimum. This can be achieved by stopping the prime mover or by interrupting the controller input power with a reset switch.

INSTALLATION

Mounting

The AVC63-4 and AVC63-4D controllers may be mounted on the generator in any convenient position. Figure 7 shows the outline dimensions and drilling locations. Dimensions are shown in inches with millimeters in parenthesis.

The recommended mounting hardware is two #8 or M4 screws torqued to 9 inch-pounds (0.9 newton meters). Nylon-lined locking nuts are recommended when installing the controller with loose hardware.

Connections

AVC63-4 and AVC63-4D controller terminals consist of quarter-inch, quick-connect tabs.

Figure 8 shows a typical interconnection diagram for the AVC63-4 and AVC63-4D controllers.

OPERATING PROCEDURES

The following procedures provide instructions for adjusting the AVC63-4 and AVC63-4D controllers. Symptoms caused by certain generator system problems or a faulty controller are included along with suggested remedies.

CAUTION

Meggers and high-potential test equipment must not be used. Use of such equipment could damage the semiconductors contained in the controller.

Preliminary Setup

Complete the following steps before proceeding with system startup.

1. Verify that the analog voltage controller specifications conform with the requirements of the generator system.
2. Ensure that the controller jumpers are positioned as follows.
   a. If a remote voltage adjust rheostat will not be used, ensure that the Voltage Adjust Rheostat jumper is connected across terminals 6 and 7.
   b. If a 55 hertz corner frequency for a 60 hertz system is desired, connect the Corner Frequency jumper to the 60 Hz terminal. If a 45 hertz corner frequency for a 50 hertz system is desired, connect the Corner Frequency jumper to the 50 Hz terminal.
3. Ensure that the connections between the generator system and the controller are correct.
4. Install the fuses as shown in Figure 8.
5. Set the controller's Voltage control fully counter-clockwise and the remote voltage adjust rheostat (if used) to the centered position.
6. Adjust the controller's Stability control fully clockwise. This provides the most stability and the slowest response.
7. If user adjustment of the Underfrequency control is required, start with the potentiometer adjusted to the fully counterclockwise position. Then, slowly adjust the potentiometer clockwise to set.

System Startup

NOTE

All voltage readings are to be taken with an average-reading voltmeter.

1. Perform the steps under *Preliminary Setup*.
2. Start the prime mover and bring it up to rated speed. Generator voltage should build up. If it does not build up, perform the steps under *Field Flashing*.
3. Slowly adjust the controller's Voltage control (or remote voltage adjust rheostat) until the generator voltage reaches the nominal level.

   If the voltage does not build up to the rated level:
   a. Check the generator output for excessive load or a short-circuit.
   b. If a minimal residual of 6 volts is not present, perform the steps under *Field Flashing*.
4. Apply and remove the generator load to verify stability.

   If the generator responds too slowly or hunts (oscillates):
   a. Check the generator output for excessive load or a short-circuit. Adjust the controller's Stability control with no load applied.
   b. Check the stability of the governor system.
5. Check regulation under normal operating conditions.

   If the regulation is poor:
   a. Verify that the prime mover is operating at rated speed.
   b. Verify that the voltmeter is connected to the same point as the controller sensing.
   c. Use an average-sensing voltmeter (not an rms-sensing voltmeter).
6. Verify the corner frequency setting by slowly reducing the generator frequency until the generator output voltage just starts to decrease.

If adjustment of the corner frequency is required:

a. Rotate the Underfrequency control fully counterclockwise.
b. Reduce the generator frequency from nominal (either 50 Hz or 60 Hz) to the desired corner frequency.
c. Slowly adjust the Underfrequency control clockwise until the generator output voltage just starts to decrease.

Field Flashing

When the controller is operated with the generator for the first time, the polarity of the field's residual magnetism may not be correct or the magnitude may not be high enough. If generator voltage does not increase after startup, stop the prime mover and perform the following steps.

1. With the prime mover at rest, connect a dc source in series with a 3 to 5 Ω limiting resistor to the field's positive (F+) and negative (F–) terminals. The dc source should not be grounded and should not have an output greater than 12 Vdc.
2. Apply the dc voltage for approximately 3 seconds, then remove it.
3. With controller terminals 3 and 4 disconnected, start the prime mover and measure the voltage at the generator output terminals.
4. If the voltage is greater than 6 Vac, voltage buildup should be successful and controller terminals 3 and 4 can be reconnected. If less than 6 Vac is measured, repeat steps 1 through 3. If repeating these steps does not result in generator voltage buildup, contact Basler Electric.

OPERATIONAL TEST

1. Connect the analog voltage controller as shown in Figure 9. Do not apply power. Ensure that the light bulbs are rated for 120 volts and less than 100 watts.
2. Adjust the controller's Voltage control and remote voltage adjust rheostat (if used) fully counterclockwise.
3. Apply 240 Vac, 60 Hz power to the controller. The light bulbs should flash momentarily.
4. Slowly adjust the controller's Voltage control clockwise.

Results

1. Before minimum luminance is reached, the light bulbs should attain maximum luminance to signify the regulation point.
2. At the regulation point, a small change in the Voltage control or remote voltage adjust rheostat position should turn the light bulbs on or off.

CONTROLLER DIFFERENCES

Previous versions of the AVC63-4 controller, sold prior to mid-2003, are slightly different in appearance and control adjustment.

Your controller version can be determined by the location of the heat sinks. Figure 10 shows the heat sink location on the previous and current version of the AVC63-4.

Adjustment of the Underfrequency Control is different on previous versions of the AVC63-4. When adjusting the Underfrequency Control on previous versions, clockwise rotation decreases the corner frequency and counterclockwise rotation increases the corner frequency. References to the rotation of the Underfrequency control in this publication should be reversed when adjusting the corner frequency on previous versions of the AVC63-4.

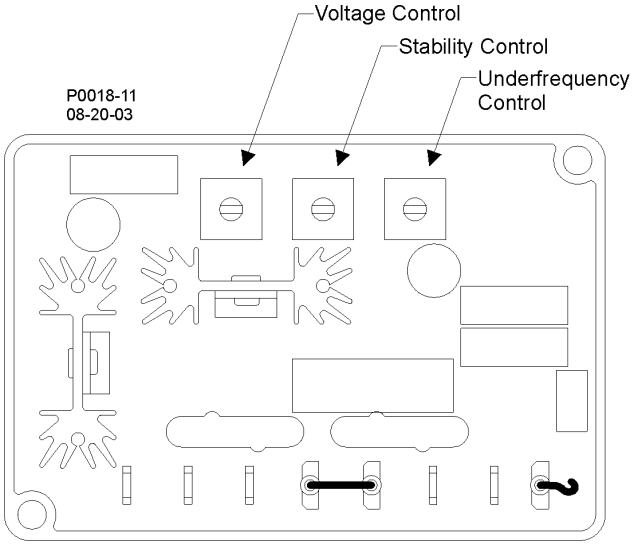

Figure 1. AVC63-4 Potentiometer Control Locations

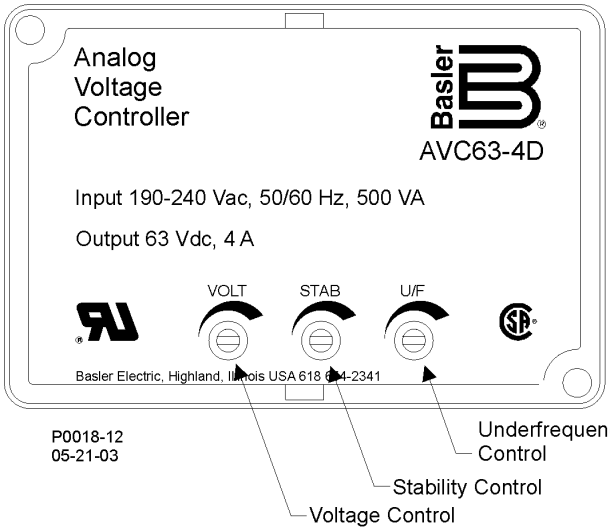

Figure 2. AVC63-4D Potentiometer Control Locations

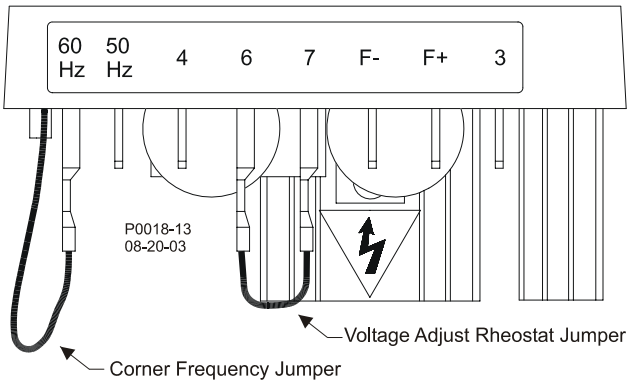

Figure 3. Jumper Locations

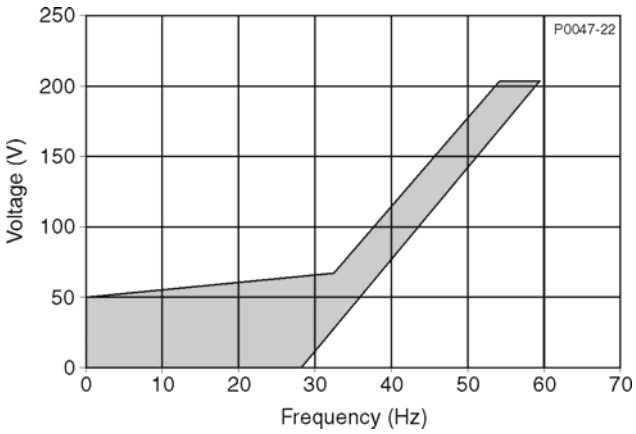

Figure 4. Frequency Compensation Characteristic - 60 Hz

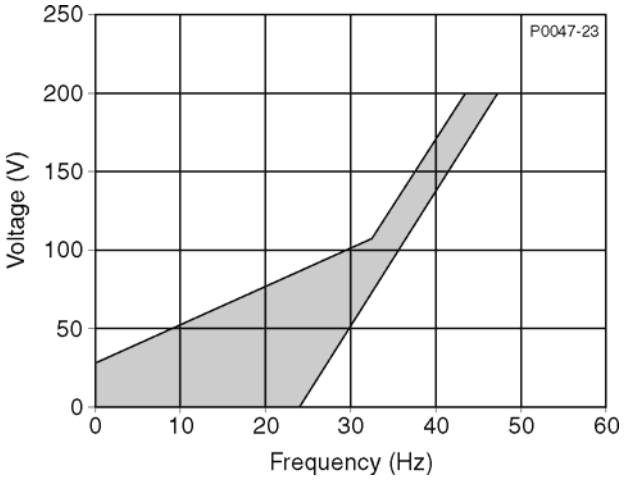

Figure 5. Frequency Compensation Characteristic - 50 Hz

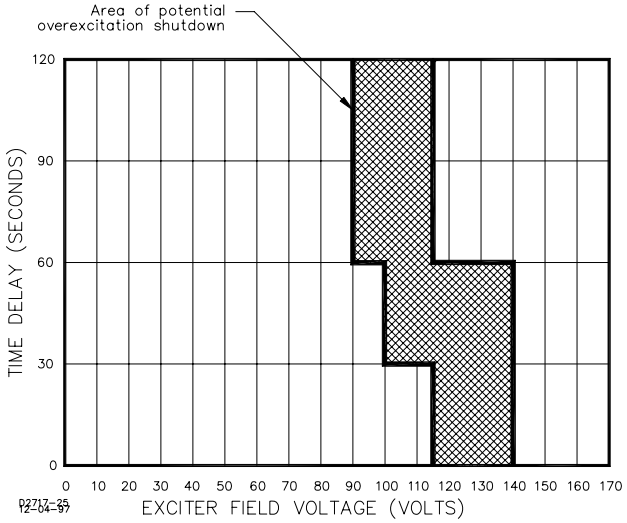

Figure 6. Overexcitation Shutdown Time Delay Characteristic

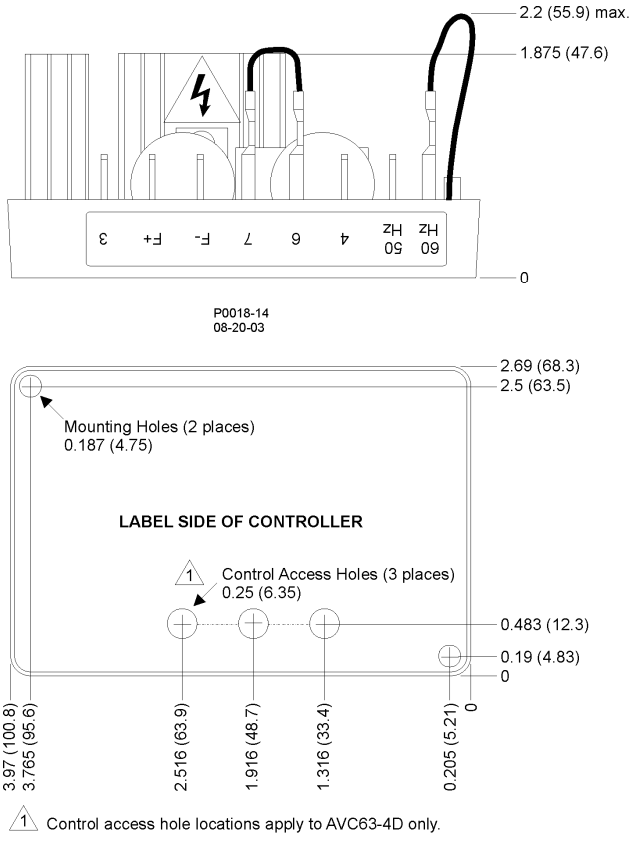

Figure 7. Outline and Drilling Dimensions

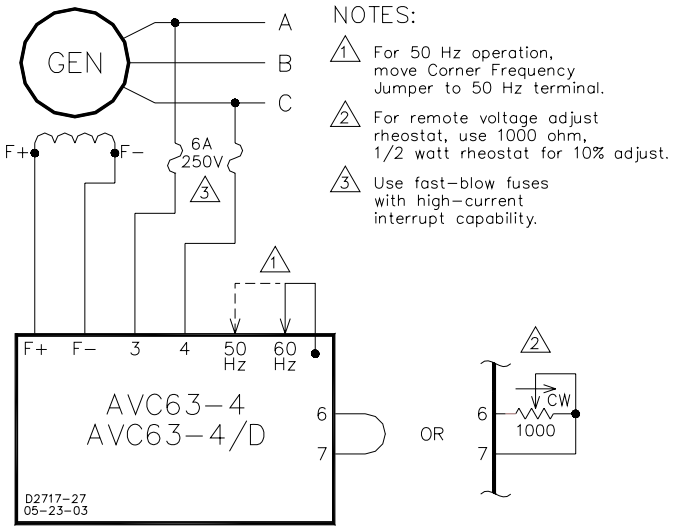

Figure 8. Typical Interconnection, 208/240 V Nominal

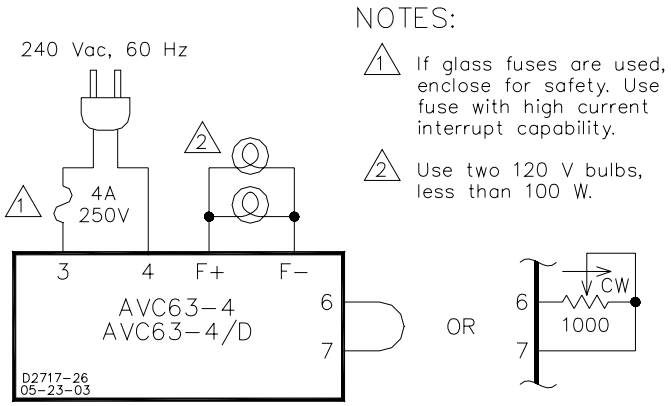

Figure 9. Operational Test Diagram

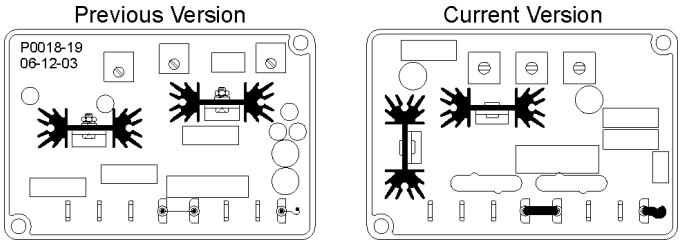

Figure 10. Controller Version Heat Sink Locations

NOTES