

INSTRUCTIONS

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FOR
ANALOG VOLTAGE CONTROLLER
DBT63-4 P/N 9166800142

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INTRODUCTION

The DBT63-4 analog voltage controller regulates the output voltage of a brushless generator operating at 50 or 60 hertz. Separate power and sensing inputs, coupled with the power input's wide voltage range, enable the DBT63-4 to use a generator auxiliary winding as its control power source. Additional DBT63-4 features include frequency compensation, overexcitation shutdown, solid-state buildup circuitry, and electromagnetic interference filtering.

SPECIFICATIONS

Power Input

Voltage Range: 200 to 300 Vac, from generator auxiliary winding
Frequency: 50/60 Hz
Burden: 500 VA
Terminals: F+/3, E3/4

Sensing Input

Nominal Voltage: 240 Vac
Voltage Range: 171 to 264 Vac, single-phase
Frequency: 50/60 Hz
Terminals: E3/4, E1

Power Output

Maximum Continuous: 4 Adc at 63 Vdc
Ten-Second Forcing: 7 Adc at 100 Vdc with 240 Vac power input
Exciter Field DC Resistance: 15 to 100 Ω
Terminals: F+/3, F-

Power Dissipation

Maximum: 8 W

Regulation

Voltage Adjustment Range:
Accuracy: Better than $\pm 1.0\%$, no-load to full-load
Response Time: <1.5 cycles for $\pm 5\%$ changes in sensing voltage

Voltage Buildup

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

Overexcitation Shutdown

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

Vibration Ratings

2 to 27 Hz: 1.3 G
27 to 52 Hz: 0.036 in (0.914 mm), double-amplitude
52 to 1,000 Hz: 5 G

Shock Ratings

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

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Temperature Ratings

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

Weight

Net: 7.5 oz (213 g)

CONTROLS

DBT63-4 controls consist of jumpers and screwdriver-adjusted potentiometers.

Jumpers

Two jumpers connect to the controller terminals: the Corner Frequency jumper and Voltage Adjust Rheostat jumper.

Corner Frequency Jumper

DBT63-4 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

DBT63-4 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.

If remote adjustment of the generator output is desired, the Voltage Adjust Rheostat jumper must be replaced with a user-supplied rheostat. A 1,000 ohm, half-watt rheostat will provide adequate voltage adjustment for most applications. shows the proper rheostat connections.

Potentiometer Controls

DBT63-4 potentiometer controls are accessed through the controller front panel and are shown in Figure 1.

Voltage Control

This potentiometer adjust the level of excitation power supplied from the DBT63-4 to the field. Clockwise rotation increases the level of field power and, as a result, the generator voltage.

Stability Control

This potentiometer adjust the controller response to changes in the monitored generator voltage. Lower settings (counterclockwise rotation) provide less stability and faster response. Higher settings (clockwise rotation) provide more stability and slower response.

Underfrequency Control

This potentiometer adjusts the corner frequency setting. Clockwise rotation increases the corner frequency and counterclockwise rotation decreases the corner frequency.

POWER AND SENSING INPUTS

Separate power and sensing inputs enable the DBT63-4 to obtain an independent source of power from the generator auxiliary winding while sensing the generator voltage from the generator main stator winding. Controller power over the range of 200 to 300 Vac connects to terminals F+/3 and E3/4. Sensing voltage over the range of 171 to 264 Vac connects to terminals E1 and E3/4.

POWER OUTPUT

DBT63-4 terminals F+ and F- connect to the brushless exciter field. The exciter field resistance must be 15 ohms or greater and less than 100 ohms. If the exciter field dc resistance is less than 15 ohms and the full-load field current does not exceed the maximum, continuous current rating of the controller, a resistor of sufficient wattage must be added in series with the field to increase the total resistance to 15 ohms.

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FREQUENCY COMPENSATION

Frequency compensation improves system load pickup performance by restraining voltage recovery until the frequency also starts to recover. Figure 2 and Figure 3 illustrate the underfrequency characteristics of the DBT63-4.

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). If user adjustment of this factory-set potentiometer is desired, follow the *Preliminary Setup* and *System Startup* procedures in the *Operating Procedures* section.

OVEREXCITATION SHUTDOWN

If the exciter field voltage exceeds 100 Vdc, the overexcitation shutdown feature removes excitation power from the field after a time delay. The time delay is inversely proportional to the magnitude of the detected overvoltage—up to 135 Vdc. Beyond 140 Vdc, excitation power is removed after approximately two seconds. Figure 4 illustrates the overexcitation shutdown time delay characteristic curves.

Once output power is removed, the DBT63-4 can be reset by decreasing the input power to less than 10 Vac for two seconds, minimum. This can be achieved by stopping the prime mover or by interrupting the input power with a reset switch.

INSTALLATION

Mounting

The DBT63-4 can be mounted on the generator in any convenient position. Figure 5 shows the outline and mounting dimensions. The recommended mounting hardware is two #8 or M4 screws torque to 9 inch-pounds (0.9 newton meters). Nylon-lined locking nuts are recommended.

Connections

DBT63-4 terminals (Figure 6) consist of quarter-inch, quick-connect tabs. Amp 154718-3 (positive-lock receptacle) or Amp 154719-1 (nylon housing) connectors are recommended for use with these terminals. Typical connections are illustrated in Figure 7.

OPERATING PROCEDURES

The following procedures are provided for adjusting DBT63-4 controllers. Symptoms caused by certain generator system problems or a faulty controller are included along with suggested remedies.

Preliminary Setup

Complete the following steps before proceeding with system startup.

1. Verify that the DBT63-4 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 controller are correct.
4. Install the fuses as shown in Figure 7.
5. Set the DBT63-4 Voltage control fully counterclockwise and the remote voltage adjust rheostat (if used) to the center position.
6. Adjust the DBT63-4 Stability control fully clockwise for the greatest stability (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.

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System Startup

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. The generator voltage should build up. If the generator voltage does not build up, perform the steps under *Field Flashing*.
3. Slowly adjust the controller 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 minimum residual of 6 Vac 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 Stability control with no load applied.
 - b. Check the stability of the governor system.
5. Check regulation under normal operating conditions. If 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 decreasing. 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 DBT63-4 is operated with the generator for the first time, the polarity of the field 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 ohm limiting resistor to the field 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 three 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 DBT63-4 as shown in Figure 8. Do not apply power. Ensure that the light bulbs are rated for 120 volts and less than 100 watts.
2. Adjust the controller Voltage control and remote voltage adjust rheostat (if used) fully counterclockwise.
3. Apply 240 Vac, 60 hertz power to the controller power and sensing inputs. The light bulbs should light momentarily.
4. Slowly adjust the controller Voltage control clockwise.
5. Before minimum luminance is reached, the light bulbs should attain maximum luminance to signify the regulation point.
6. 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.

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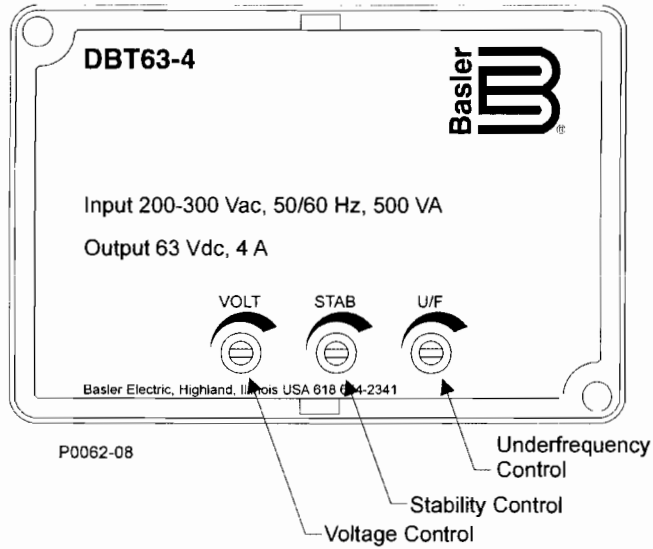


Figure 1. DBT63-4 Potentiometer Controls

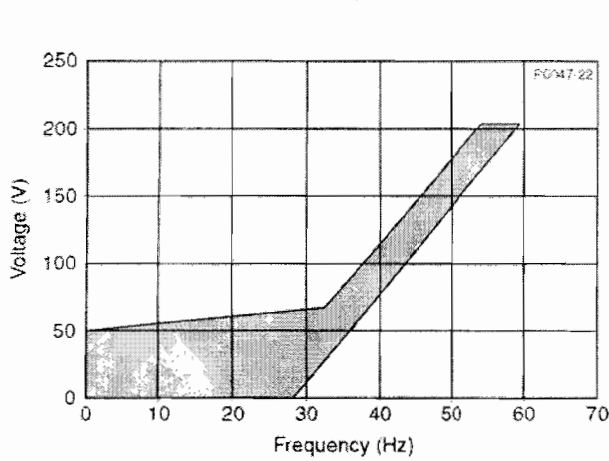


Figure 2. Frequency Compensation Characteristic - 60 Hz

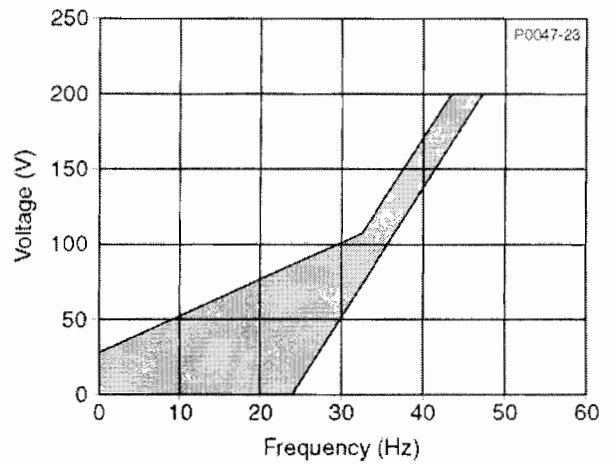


Figure 3. Frequency Compensation Characteristic - 50 Hz

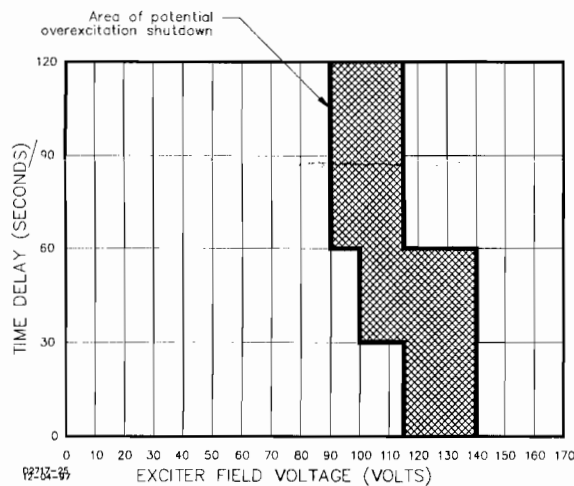


Figure 4. Overexcitation Shutdown Time Delay Characteristic

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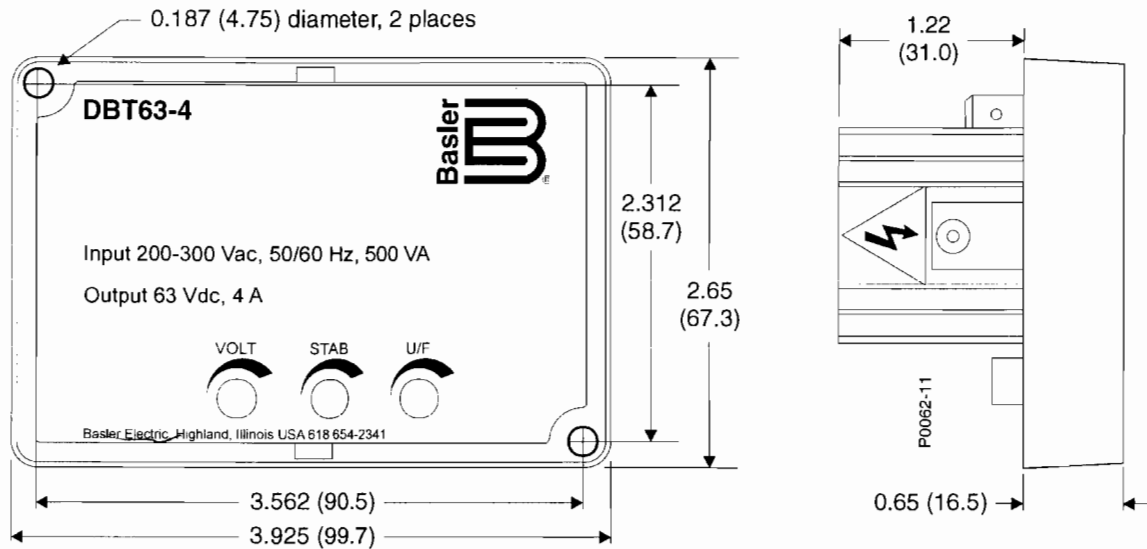


Figure 5. Outline and Mounting Dimensions

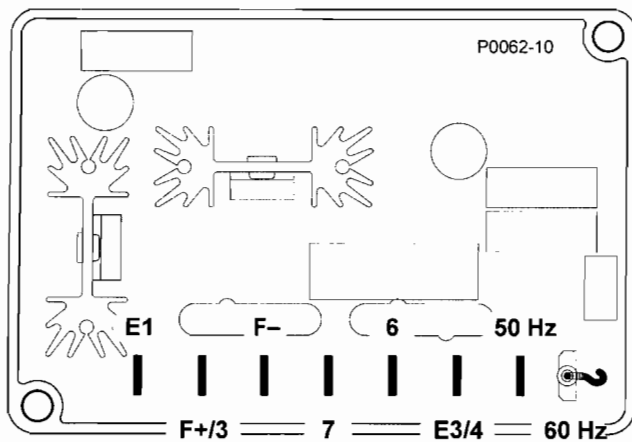


Figure 6. DBT63-4 Terminals

NOTES

1. Operating power is applied to terminals F+/3 and E3/4.
2. Generator sensing voltage is applied to terminals E3/4 and E1.
3. If used, external voltage-adjust rheostat is connected to terminals 6 and 7. If an external rheostat is not used, a jumper should be connected across terminals 6 and 7.
3. F+/3 and F- are the field output terminals.
4. DBT63-4 is delivered with Corner Frequency jumper connected to 60 Hz terminal for a 60 hertz system. For a 50 hertz system, the jumper is moved to the 50 Hz terminal.

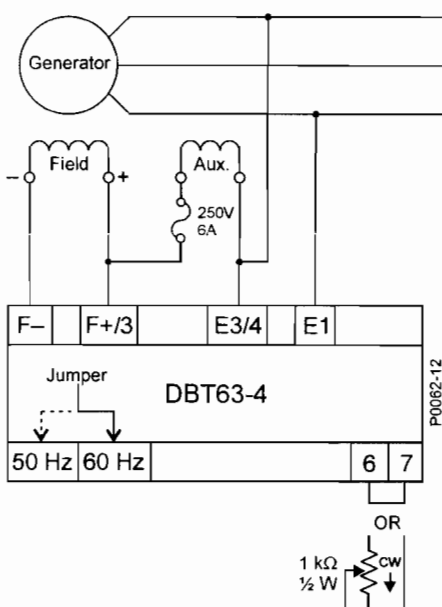


Figure 7. Typical Connections

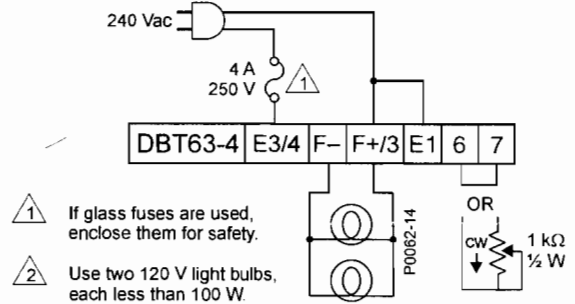


Figure 8. Test Connections

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