INSTRUCTION MANUAL
FOR

VOLTAGE REGULATOR
Model: VR485-100-L
Part Number: 9 2482 00 109

Basler Electric

Publication Number: 9 2482 00 993
Revision: B 12/99

INTRODUCTION

This manual provides information concerning the operation and installation of a VR485-100-L Voltage Regulator. To accomplish this, the following is provided.

- Specifications
- Installation
- Operation
- Maintenance

WARNING

TO AVOID PERSONAL INJURY OR EQUIPMENT DAMAGE, ONLY QUALIFIED PERSONNEL SHOULD PERFORM THE PROCEDURES PRESENTED IN THIS MANUAL.

First Printing: November 1991

Printed in USA

December 1999

It is not the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice. Should further information be required, contact Basler Electric Company, Highland, Illinois.

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CONTENTS

SECTION 1 • GENERAL INFORMATION

GENERAL DESCRIPTION

The VR485-100-L Voltage Regulator controls the output voltage of 400 Hz brushless generators by supplying the required exciter field current. The VR485-100-L includes circuitry for line drop compensation, underfrequency limiting, and excitation current limiting.

SPECIFICATIONS

Refer to Table 1-1 for the electrical specifications and to Table 1-2 for the physical specifications of the VR485-100-L Voltage Regulator.

Table 1-1. Electrical Specifications

Dc Output Power:	2.5 Adc at 63 Vdc (157.5 W) maximum continuous 3.6 Adc at 90 Vdc (324 W) forcing one minute.
Exciter Field Dc Resistance:	25 ohms, minimum.
Ac Power Input:	320 Vac, center-tapped, 400 Hz (special transformer). 20 Vac, 400 Hz (special transformer).
Sensing Input:	208 Vrms ±10%, single phase, 400 Hz.
Sensing Burden:	2 VA.
Voltage Adjust Range:	187 - 229 Vac.
Regulation Accuracy:	Better than ±1.0% no load to full load.
Temperature Stability:	1.0% maximum for a 60°F change in ambient temperature.
Response Time:	Less than 1.5 cycles.
Frequency Compensation:	Approximately 0.66 V/Hz below 380 Hz.
Excitation Current Limit:	5 Adc.
Line Drop Compensation:	Adjustable from 0 to 15% of the generator voltage with a 1 A CT input.
Line Drop Compensation Burden:	2 VA (Basler Part Number BE 23571-002).
Voltage Build-up:	Provides a minimum of 6 Vdc to the exciter field for voltage build-up with as little as 10 Vac residual on the Power Transformer primary.
Power Dissipation:	40 Watts maximum.

Table 1-2. Physical Specifications

Operating Temperature:	-32°C (-26F) to +60°C (+140°F).
Storage Temperature:	-40°C (-40°F) to +85°C (+185°F).
Weight:	4.0 lb. (1.2 kg) Net.

ACCESSORY ITEMS

Power Isolation Transformer

A special power isolation transformer is required to operate the VR485-100-L. The transformer (Basler Part Number BE 25089-001) has a center-tapped, 320 Vac winding for the main Voltage Regulator exciter power and a 20 Vac winding for supplying low voltage power to the internal regulator circuitry.

Line Drop Compensation CT

A current transformer (Basler Part Number BE 23571-002) is required to supply line current information to the Line Drop Compensation circuit. The CT turns-ratio should be such that 1 A is supplied from the CT secondary when the generator is at full load. The CT should be rated for 2 VA minimum at 400 Hz.

SECTION 2 • INSTALLATION

MOUNTING

For optimum cooling of the regulator, it is recommended that the regulator be mounted vertically. Refer to the outline drawing, Figure 2-1.

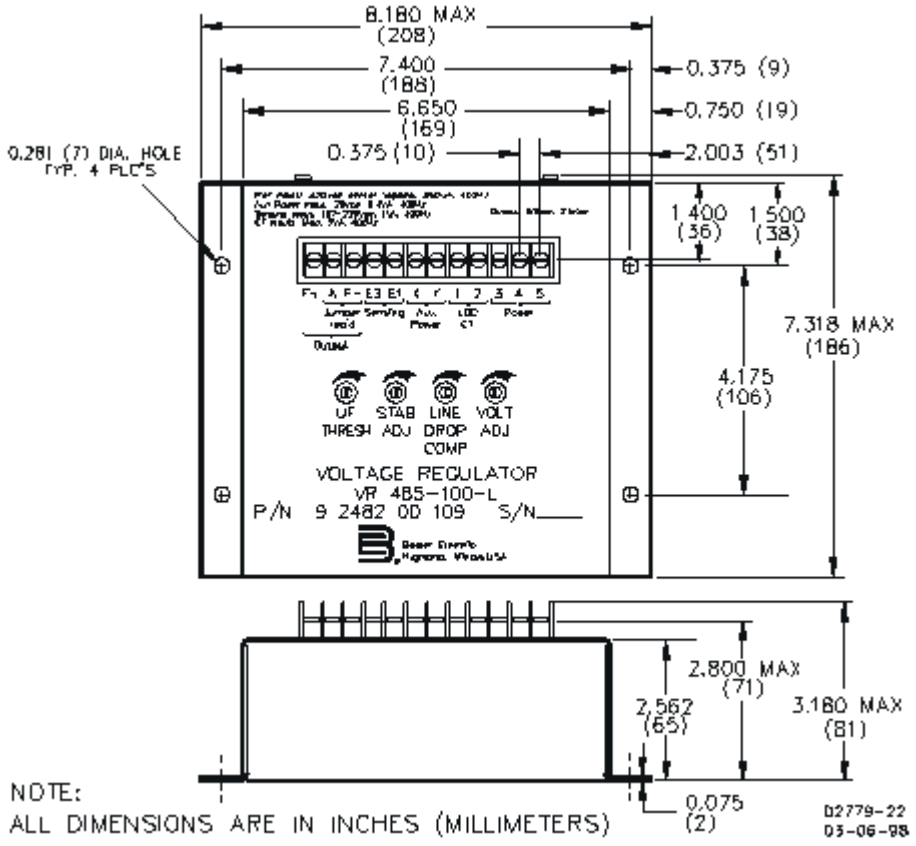

Figure 2-1. Outline Drawing

INTERCONNECTION

a. The voltage regulator interconnection is provided by Figure 2-2.

b. If an external voltage adjust rheostat is to be used, connect it between the generator Aϕ, and terminal E1 as shown in Figure 2-2. If an external voltage adjust rheostat is not to be used, connect terminal E1 directly to the generator Aϕ line.

c. Connect the exciter field terminals to F+ and F- while observing polarity. Be sure to connect terminal F- to terminal A as damage will result if these two terminals are not connected together.

d. A flashing source may be required (refer to *Field Flashing* in Section 3). If it is, connect it as shown in Figure 2-2.

e. Install fuses and a shutdown switch.

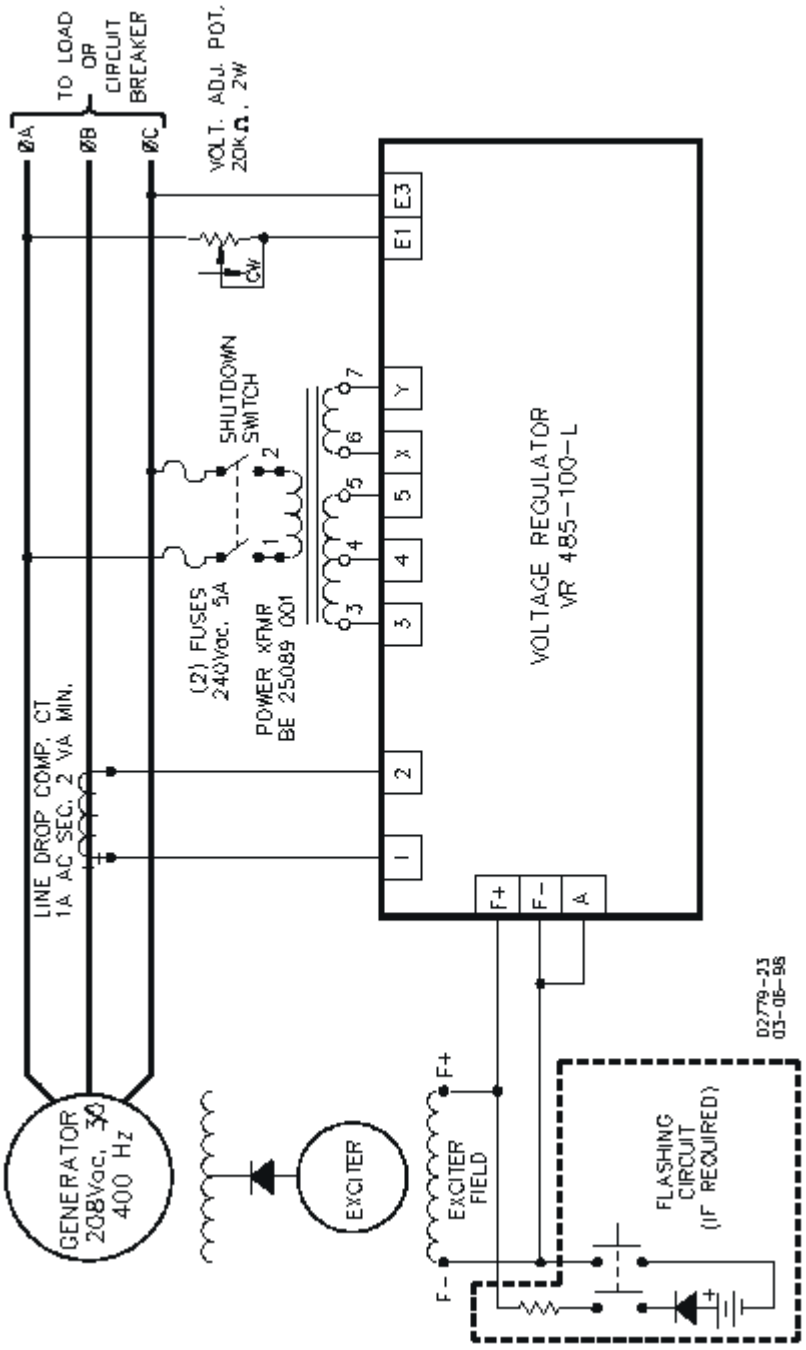

Figure 2-2. Interconnection Diagram

f. Connect the power transformer as shown in Figure 2-2. The power transformer primary (terminals 1 and 2) may be connected to either the generator output or a separate 208 Vac source. If a separate 208 Vac source is used, the requirement for a flashing source is eliminated.

g. Connect the Line Drop Compensation CT secondary to terminals 1 and 2.

SECTION 3 • OPERATION

GENERAL

The following system operation procedures provide instructions for adjusting the VR485-100-L voltage regulator. Symptoms resulting from a faulty regulator and certain generator system problems are included, together with suggested remedies.

Complete the following steps before proceeding with the system start-up.

CAUTION

Meggers and high potential test equipment must not be used. Incorrect use of such equipment could damage the semiconductors contained in the regulator.

PRELIMINARY SET-UP

a. Verify that the voltage regulator specifications conform with the generator system requirements.

b. Ensure the voltage regulator is correctly connected to the generator system.

OPERATION AT REDUCED SPEEDS

During periods of prime mover idling, use the excitation shutdown switch to remove power from the voltage regulator.

SYSTEM START-UP

a. Perform preliminary set-up as described previously.

NOTE

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

b. Start prime mover and bring up to rated speed.

RESULT: Voltage should build up. If not, proceed to *Field Flashing*.

c. Slowly adjust the regulator **VAR** CW until the generator output voltage reaches the nominal value. If used, adjust the remote **VAR** to set the generator voltage to the exact value desired.

RESULT: Voltage should build up to rated value. If voltage does not build up to rated value, check generator for short or excessive load. If necessary, perform field flashing.

d. Check regulator under normal operating and loading conditions.

RESULT: Voltage regulation should be better than ±1.0% no-load to full-load. If regulation is not within this range:

1) Voltage reduction under load may be due to speed change from no load to full load, causing the frequency compensation (V/Hz) circuit to reduce voltage at lower frequencies.

2) Replace voltage regulator if the prime mover speed is not changing.

ADJUSTMENTS

Field Flashing

The VR485-100-L will provide at least 6 Vdc to the exciter field for voltage build-up if at least 10 Vac residual voltage is present at the Power Transformer primary. If 6 Vdc is not sufficient for voltage build-up or if 10 Vac residual is not present on the Power Transformer primary, it may be necessary to add a

flashing circuit as shown in Figure 2-2. The flashing voltage source should be sufficient to cause the generator output to be between 50% and 75% of the nominal no-load voltage. Care should be taken to avoid applying excessive flashing voltage as damage may result. If the available dc voltage source is too high, a series limiting resistor is required.

Underfrequency Threshold Adjustment

The underfrequency threshold is factory preset at 380 Hz. If a different threshold is desired, perform the following procedure:

(1) Bring the prime mover/generator up to rated speed and voltage.

(2) Adjust the **UF THRESH** Adjustment fully counter-clockwise (CCW).

(3) Adjust the Prime Mover speed to the desired underfrequency threshold (corner frequency).

(4) Slowly adjust the **UF THRESH** Adjustment clockwise (CW) until the generator voltage just starts to decrease.

(5) Bring the Prime Mover speed up to rated speed. The voltage should return to nominal.

Stability Adjustment

If a stability setting is desired that provides the fastest possible voltage response with good generator stability, an oscilloscope or other voltage recording device should be used.

(1) Rotation of the **STAB ADJ** control clockwise (CW) will slow response time.

(2) Rotation of the **STAB ADJ** control counter-clockwise (CCW) will speed response time. If this control is rotated too far CCW, the generator voltage may oscillate (hunt).

(3) Rotate the **STAB ADJ** control CW just past the point where oscillation occurred.

Voltage Adjustment

(1) Adjustment of the generator output voltage may be accomplished by using either an external 20 kΩ potentiometer or the front panel **VOLT ADJ** control. With either potentiometer set near its center of rotation, the other potentiometer will provide a ±10% adjustment of the generator output voltage (nominal is 208 V).

(2) If the external control not used, the 20 kΩ potentiometer may be replaced with a jumper between terminal E1 and the generator Aϕ line. However, this will lower the overall voltage adjust range of the front panel **VOLT ADJ** control.

(3) If a higher range of adjustment is required than the standard ±10%, the external 20 kΩ potentiometer may be replaced with a 10 kΩ, 1/2 W, fixed resistor connected from terminal E1 to the generator Aϕ line.

Line Drop Compensation Adjustment

With proper selection of the Line Drop Compensation CT Turns-Ratio to deliver 1 A secondary current at full-load, the Line Drop Compensation Circuit can be adjusted by a front panel line drop compensation adjustment (refer to Figure 2-2) from 0% to 15% increase of nominal voltage. To set the line drop compensation, proceed as follows:

(1) Rotate the front panel **LINE DROP COMP** control fully counter-clockwise (CCW).

(2) Start the Prime Mover/Generator and adjust for rated voltage.

(3) Apply full rated load at rated power factor to the generator.

(4) Slowly adjust the fornt panel **LINE DROP COMP** control clockwise (CW) while monitoring the generator system voltage at the generator terminals. Continue adjusting the front panel **LINE DROP COMP** control until the desired level of compensation is achieved.

SECTION 4 • MAINTENANCE

PREVENTIVE MAINTENANCE

A periodic inspection of the unit should be made to ensure that it is kept clean and free from accumulations of dust and moisture. Ensure that all the wire connections to the voltage regulator are clean, secure, and properly insulated.

TROUBLESHOOTING

In case of failure/defective operation of the unit, the following table (Table 4-1) is provided to aid in the determination of the cause and the possible solution.

Table 4-1. Troubleshooting

Symptom	Possible Cause	Remedy
Voltage does not build up.	a. No voltage or incorrect voltage to power input at terminals **3**, **4** and **5**.	a. Flash field. b. Verify wiring. c. Check fuses. d. Check shutdown switch. e. Replace regulator.
	b. Overexcitation circuit is shutting off regulator.	Shutdown prime mover then restart. Watch for high voltage.
Voltage does not build up to rated value.	a. Internal or external voltage adjustments are improperly set.	Adjust front panel **VOLT** control and/or external voltage adjust rheostat.
	b. Prime mover speed to slow.	Verify speed and correct as necessary.
	c. Underfrequency roll-off point set too low.	Adjust **UF THRESH** front panel adjustment.
	d. Faulty regulator.	Replace regulator.
Voltage high and uncontrollable.	a. No sensing input.	Verify wiring.
	b. Faulty regulator.	Replace regulator.
Generator response too slow or hunting.	a. Improper front panel **STAB** adjustment.	Re-adjust front panel **STAB** adjustment.
	b. Faulty regulator.	Replace regulator.
Poor regulation.	a. Field requirements not matched to regulator capability or regulator output rating too low for generator requirements.	Verify specifications.
	b. Underfrequency set too high.	Check underfrequency adjustment.
	c. Low prime mover speed.	Verify prime mover speed.

SECTION 5 • MANUAL CHANGE INFORMATION

CHANGES

Substantive changes in this manual to date are summarized in Table 5-1.

Table 5-1. Summary of Changes

Revision	Summary of Changes	ECA No.	Date
A	Added “Basler Part Number BE 23571-002” reference to the CT in Table 1-1, *Line Drop Compensation Burden*, and on page 1-2 in *Line Drop Compensation CT* paragraph. Changed the format of the manual. Added Section 5 • Manual Change Information.	16637	03/98
B	Changed description of Line Drop Compensation Adjustment on page 3-2	7484	12/99