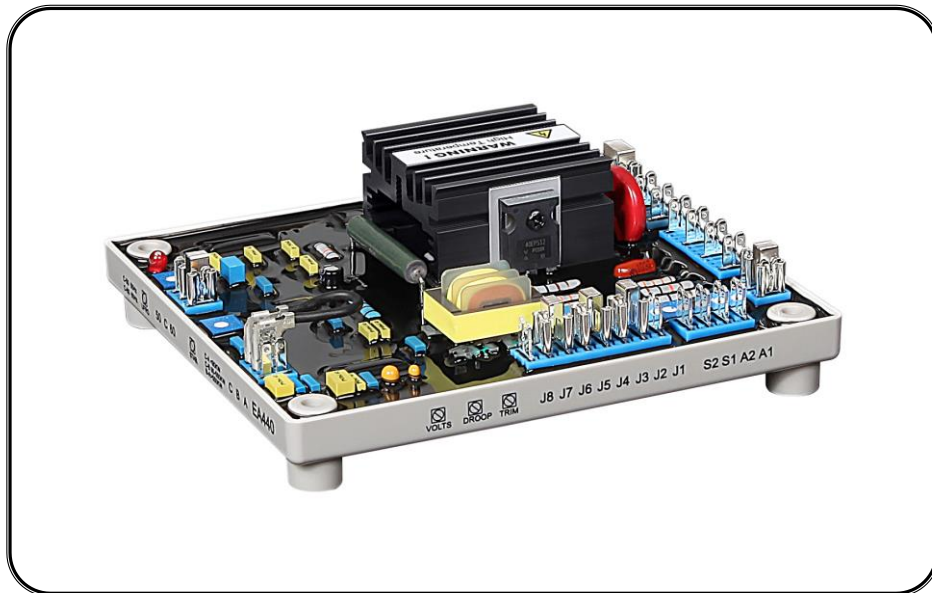


# EA440

## **Generator Automatic Voltage Regulator Operation Manual**



Self Excited Automatic Voltage Regulator  
Compatible with Newage SX440\*

\* All manufacturer names and numbers are used for reference purpose only and do not imply that any part is the product of these manufacturer.

# SECTION 1 : SPECIFICATION

## Sensing Input

Voltage 190 – 264 Vac, 1 phase 2 wire  
 Frequency 50 / 60 Hz, selectable

## Quadrature Droop Input

Burden 10 ohms  
 Max. input 0.33 A  
 Max. sensitivity 0.07 A for 5% droop (PF=0)

## Excitation Output

Voltage Max. 90 Vdc @ power input 207 Vac  
 Current Continuous 4A  
 Intermittent 10A for 10 secs.  
 Resistance Min. 15 ohm

## Analogue Voltage Input

Input Resistance 1K ohm  
 Max. Input +/- 5 Vdc  
 Sensitivity 1V for 5% generator volts

## External Voltage Adjustment

Max. +/- 8% @ 1K ohm 1 watt potentiometer

## Under Frequency Protection

Set point 95% Hz  
 Slope 170% down to 30 Hz

## Voltage Regulation

Less than +/- 1% ( with 4% engine governing )

## Voltage Thermal Drift

Less than 3% at temperature range -40 to +70 °C

## Build Up Voltage

5 Vac residual volts at power input terminal

## Environment

Operating Temperature -40 to +70 °C  
 Storage Temperature -40 to +85 °C  
 Relative Humidity Max. 95%  
 Vibration 3.3 Gs @ 100 – 2K Hz

## Soft Start Ramp Time

2 seconds +/- 10%

## Static Power Dissipation

Max.12 watts

## Dimensions

150.0 (L) x 135.0 (W) x 48.0 (H) mm

## Weight

418 g +/- 2%

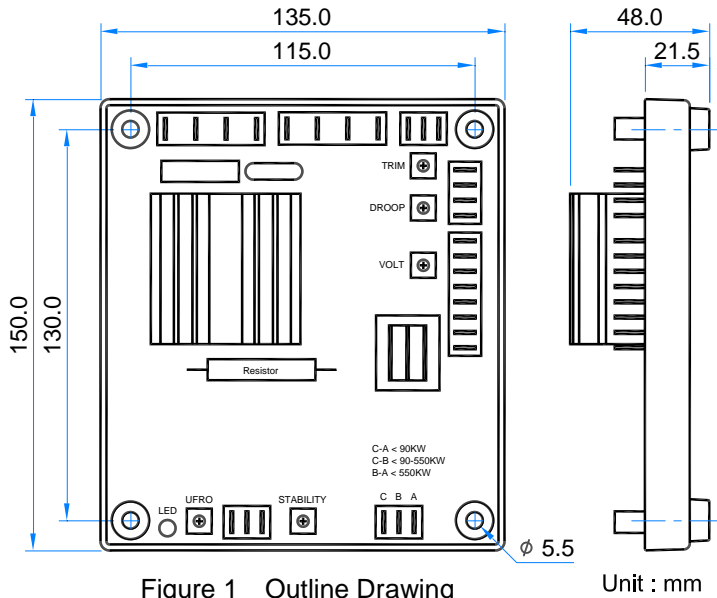


Figure 1 Outline Drawing

**ATTENTION**

1. AVR can be mounted directly on the engine, genset, switchgear, control panel, or any position that will not affect operation. For dimension reference, please see Figure 1.
2. All voltage readings are to be taken with an average-reading voltmeter Meggers and high-potential test equipment must not be used. Use of such equipment could damage the AVR.
3. Improper setting of under-frequency protection could cause the output voltage of the unit to drop or become unstable under with changes in load. Avoid making any changes to the U/F setting unless necessary.

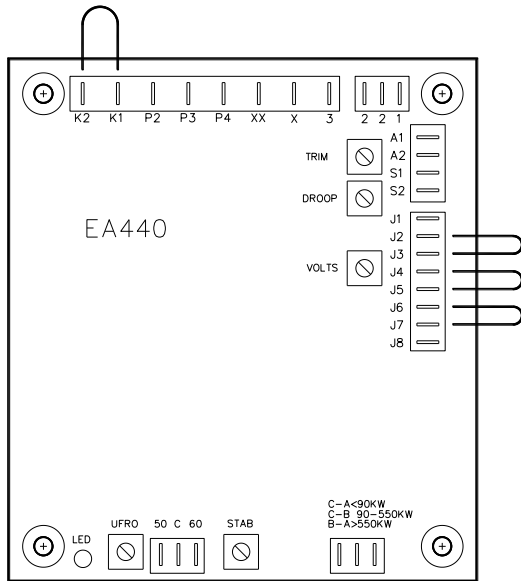


Figure 2 Bypass Drawing

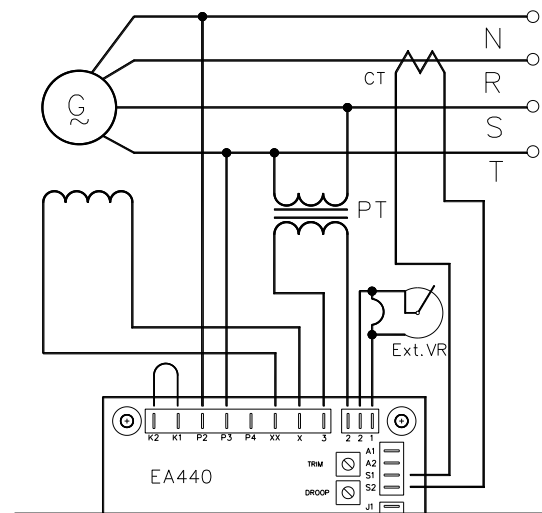


Figure 3 Wiring Drawing

## SECTION 2 : WIRING

- 2.1 K1, K2 : Field input external switch terminals. Linked for normal operation.
- 2.2 P2, P3 : External power input terminals.
- 2.3 3, 2 : Sensing input terminals.
- 2.4 1, 2 : External VR terminals. Linked for useless.
- 2.5 X,XX : X connect to field (+), XX connect to field (-).
- 2.6 S1, S2 : Droop CT input terminal.
- 2.7 A1, A2 : VAR/PF controller input.
- 2.8 A, B, C : Link A, C for under 90 KW.  
Link B, C for 90 – 550 KW.  
Link A, B for over 550 KW.
- 2.9 J1 – J8 : Jump select terminals, 2-3, 4-5, 6-7. please refer to Figure 2 and Figure 3.

## SECTION 3 : ADJUSTMENT

### 3.1 Voltage Adjustment

The generator output voltage can be altered by adjustment of the volt VR on the AVR board, or by the external trimmer (1K ohm) if fitted.

- (1) The terminals 1&2 must be linked if no hand trimmer.
- (2) Before start the generator, please turn the Volt trimmer on the AVR board fully anticlockwise Turn the external trimmer to midway position.

- (3) Turn the stability trimmer on the AVR board to midway position.
- (4) Connect a voltmeter to generator output voltage terminals.
- (5) Start generator set and run on no load at nominal frequency 50 – 53 Hz or 60 – 63 Hz.
- (6) If the red Led is illuminated, refer to the under frequency roll off adjustment.
- (7) Carefully turn volt trimmer clockwise until rated voltage is reached.

### 3.2 Stability Adjustment

If a replacement AVR has been fitted or re-setting of the stability control is required, turn the stability trimmer slowly clockwise until the output voltage is steady, on or off load.

### 3.3 Droop Adjustment

Generator intended for parallel are fitted with a quadrature droop CT with provides a power factor dependent signal for the AVR. The CT is connected to S1, S2 on the AVR. The Droop adjustment is normally present in the works to give 5% voltage droop at full load zero power factor. Clockwise increases the amount of CT signal injected into the AVR and increases the droop with lagging power factor. With the control fully anticlockwise there is no droop.

### 3.4 Trim Adjustment

An auxiliary input is provided to connect to A1, A2. It is designed to accept DC +/- 5V. Turn the TRIM trimmer fully anticlockwise has no effect, Clockwise it has maximum effect.

## SECTION 4 : FIELD FLASHING

When the regulator is installed correctly but the generator is failed to generate power. Besides carbon brushes were worn out, here are two possible causes below.

### 4.1 The polarity of field is inverse

Solution : Exchange the connection of F+ and F-.

### 4.2 The residual voltage is less than 5 Vac, Solution 1 :

4.2.1 Shut down generator, disconnect the wiring between AVR and generator then flash the field. Flashing duration = 3 seconds. (See wiring in Figure 4)

Resistor 3 – 5 ohms for full wave AVR

Resistor 5 – 10 ohms for half wave AVR

**Warning!! Over field flashing may damage the field winding of generator.**

4.2.2 Restart generator and measure the residual voltage by AC Voltmeter, if it is still less than 5 Vac, repeat the previous process, after several times, the residual voltage still cannot be built, Kutai EB500 is strongly recommended, see Figure 4.

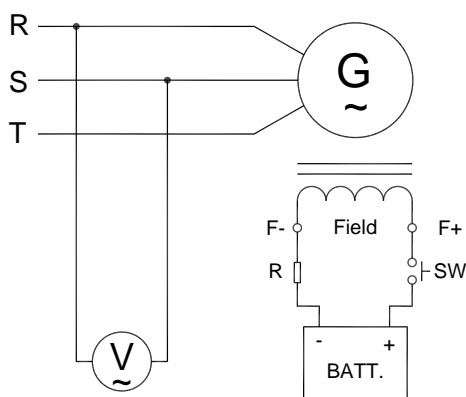


Figure 4 Manual Field Flash

## WARNING

**Overly field flashing may damage the AVR or generator excitation winding.**

**Please make sure you have read and understand the contents of the instruction manual prior to installation. Incorrect wiring connection may result in irreversible damage to the product and other equipments.**

## SECTION 5 : PARALLEL FUNCTION

### 5.1 Parallel Compensation

5.1.1 When it is required to operate the regulator in parallel with an isolated or utility bus, in addition to the regulator provisions, a 10VA current transformer (CT) is required ( See Figure 3 ). The CT is connected in a generator line and should deliver from 1 amperes secondary current at rated load.

5.1.2 The phase relationship of CT signal to the regulator sensing voltage must be correct or the system will not parallel properly. The CT must be installed in the line of the three phase generator that does not supply sensing to the regulator.

### 5.2 Reactive Droop Compensation

5.2.1 For reactive droop compensation, connect the CT to it's respective regulator as shown on Figures 3.

5.2.2 A unit-parallel switch shorts the parallel CT secondary to prevent any droop signal from being injected into the regulating system during single unit operation. The switch may not be required on parallel droop compensation applications where a voltage drop is not objectionable.

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## SECTION 6 : TROUBLE SHOOTING

SYMPTOM	POSSIBLE CAUSES	SOLUTIONS
Voltage does not build up	Engine speed is too low	Please refer to the Generator Manual
	wires are not connected well	Please refer to Figure 2
	Defective Generator	Please refer to the Generator Manual
Low output voltage	External VR broken	Check wiring and testing VR
	Terminal 1&2 not linked	Please linked terminal 1&2
	Terminal 3&2 no sensing input	Please refer to Figure 2
	Under frequency	Please refer to the Generator Manual
	Defective Generator	Please refer to the Generator Manual
Over output voltage	AVR adjustment not well	Please refer to voltage adjustment page
	Defective Generator	Please refer to the Generator Manual

※ Appearance and specifications of products are subject to change for improvement without prior notice.