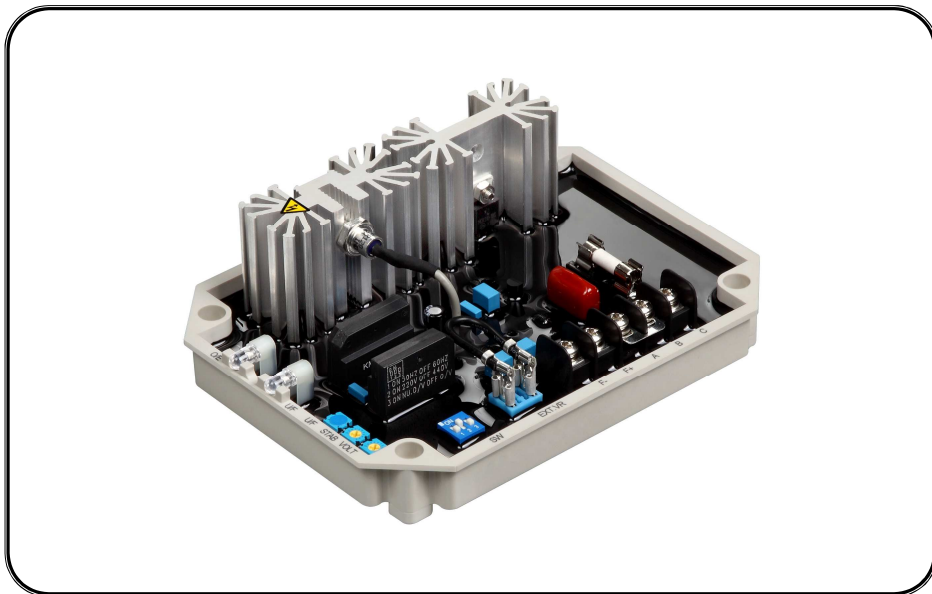


ADVR-073

Hybrid Universal Analog Digital Voltage Regulator Operation Manual



Self Excited 7 Amp Analog / Digital Voltage Regulator
For shunt and auxiliary windings generators
With over-excitation and lost of sensing protection



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1. SUMMARY

The ADVR-073 is an advance (Hybrid Analog/Digital Voltage Regulator) design for general-purpose isochronous stand alone applications. The ADVR-073 uses an extremely reliable CPU (Central Processing Unit) in its design. This eliminates complex analogue components and circuits that are inherently over sensitive to temperature anomalies, as a result eliminating voltage instability and drift.

2. SPECIFICATION

Sensing Input

Voltage	170 ~ 520 VAC, 1 phase 2 wire DIP switch selectable
Frequency	50 / 60 Hz, DIP switch selectable

Power Input

Voltage	100 ~ 300 VAC, 1 phase 2 wire
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Output

Voltage	Max. 63 VDC @ 220 VAC input
Current	Continuous 7A Intermittent 15A for 10 sec
Resistance	9 to 100 ohm

Voltage Regulation

< $\pm 0.5\%$ (with 4% engine governing)

Voltage Build-up

Residual voltage at AVR terminal > 5 VAC

Thermal Drift

0.03% per °C change in AVR ambient

In addition, we added over excitation and loss of sensing shutdown protections, with matching U/F, O/E LED indicator lights. Consequently, this AVR prevents the generator from excitation overload, with its resulting exciter and regulator damage. It is easy to install and flexible for use in both shunt type and generators with auxiliary windings.

External Volts Adjustment

7% with 1K ohm 1 watt trimmer

EMI Suppression

Internal electromagnetic interference filtering

Unit Power Dissipation

Max. 8 watt

Under Frequency Protection (Factory Setting)

At 50 Hz - knee point set at 45 Hz
At 60 Hz - knee point set at 55 Hz

Over Excitation Protection

78 ± 5 VDC @220VAC 5sec

Soft Start Ramp Time

3 sec.

Dimensions

150mm L * 115mm W * 51.5mm H

Weight

430g $\pm 2\%$

3. WIRING

3.1 A to C : Sensing Input

- **DIP SW-2** is switch **ON**, voltage sensing range from 170 to 260V (See Figure 2 & 3)
- **DIP SW-2** is switch **OFF**, voltage sensing range from 340 to 520V (See Figure 4)

3.2 B to C : Power Input

Power Input terminals from B to either C use 100 to 300VAC shunt or auxiliary windings.

3.3 Power Input Voltage Selection

If generator rated voltage is 220VAC (Line to line phase voltage), the power input B, C and sensing input A, C can be joined (See Figure 3) or separately (See Figure 2).

3.4 F+, F- : Connect generator field wires

- F+ and F- are the positive and negative excitation output terminals.
- EXT.VR is the connections for the external voltage adjustment. Use a (1K ohm 1W) rheostat when not in use, keep terminals shorted.

※ Always use high quality connection wire AWG16 or 1.25mm² 85-degrees C, 600V to connection terminals A, B, C, F+ and F-.

4. DIP SWITCH SETTING

4.1 SW-1 Frequency

- DIP SW-1 switch ON, for use in 50Hz
- DIP SW-1 switch OFF, for use in 60Hz

4.2 SW-2 Sensing Voltage Selection

- DIP SW-2 switch ON, input voltage 170 to 260V
- DIP SW-2 switch OFF, input voltage 340 to 520V

4.3 SW-3 Activate Over-Excitation Protection

- DIP SW-3 switch ON, Over Excitation Protection Disabled. If over excitation occurs, the O/E LED turns-on, but the ADVR will not shutdown and protect.
- DIP SW-3 switch OFF. Over Excitation Protection activated. If over excitation occurs, the O/E LED turns-on and the ADVR will shutdown excitation.

5. System Protection

5.1 Under Frequency Protection (Roll off)

- To prevent over excitation, if the generator runs at the wrong speed the ADVR activates the under frequency protection and decreases field excitation.
- Dip switch 1 together with the U/F adjustment, sets the Knee-Point frequency where this activation takes place. This adjustment is already factory preset.
- When engine frequency falls under the Knee-Point frequency setting, the U/F protection indication LED turn on. However, when the Generator frequency is higher than the Knee-Point frequency the LED turns off.

5.2 Over Excitation Protection

- If you are using a standard AVR and you overload the generator or the sensing wires get disconnected (on a auxiliary powered AVR) , the excitation voltage rapidly increase, causing severe damage to the AVR or exciter. The ADVR-073 has over excitation protection shutdown that cuts excitation at once.
- When over excitation protection is activated and the excitation voltage exceeds $78 \pm 5\text{VDC}$ @220V for over 5 seconds, the AVR immediately shutdown the excitation output, leaving only the residual voltage output and turning on the O/E shutdown LED. To reset, the engine must come to a complete stop for at least 10 seconds and then restarted.
- If over excitation protection is disabled, the warning LED indication turn on, but the excitation output is not disconnected.

6. ADJUSTMENT

6.1 VOLT : Voltage Adjustment

- DIP SW-2 switch ON, input voltage 170 to 260V
- DIP SW-2 switch OFF input voltage 340 to 520V

6.2 STAB : Stability Adjustment

- careful adjust the STAB (Stability) adjustment, improves the AVR and generator feedback time to improve voltage stability.

6.3 U/F : Setting the under-frequency knee point

- **DIP SW-1** set to **ON**, set for 50Hz operation.
- U/F adjustment range at 50Hz is from 40 to 50Hz (Factory preset @ 45Hz).
- **DIP SW-1** set to **OFF**, set for 60Hz operation.
- U/F adjustment range at 60Hz is from 50 to 60Hz (Factory preset @ 55Hz).

7. Startup Adjustment

7.1 Voltage Adjustment (VOLT)

Set VOLT and STAB full CCW. Start generator and wait until it reaches rated frequency. Slowly adjust VOLT CW to its rated voltage. If you are using an external VR, set it first to its center position before setting volts.

7.2 Stability Adjustment (STAB)

If the generator voltage oscillates back and forth, adjust the STAB to steady the output voltage. Over adjustment, CW may give you large voltage swings when changing loads. Use an analog type voltmeter when setting STAB. Connect the voltmeter to terminals F+ and F- and slowly adjust STAB for minimum needle movement when varying load.

7.3 Under Frequency Adjustment (U/F)

To adjust the U/F setting, select working HZ using DIP SW 1, start the engine and adjust engine speed to either 55Hz or 45Hz slow adjust U/F until the red U/F LED turns ON. Returning the engine speed back to normal turns the LED light off.

8. Field Flashing

When setting up the AVR for the first time, the polarity of the residual magnetism may be reversed or too weak to operate the regulator. If reversing the field connections does not induce build-up, and the residual voltage is less than 5 VAC, shut down the engine and continue with the following steps.

- Stop the generator and disconnect the field wires (F+ and F-), apply a DC Voltage (3 to 12VDC) using a car batteries positive to terminal F+ and battery negative to terminal F-, using a current-limiting resistor from 3 to 5 ohms 20 watt. (See Figure 5).
- Flash for 3 seconds before removing the battery.
- Disconnect the AVR AC power input terminals and restart the generator, measure the residual voltage. If this voltage is now greater than 5VAC, reconnect the voltage regulator, now voltage build-up should be successful. If the voltage is still less than 5VAC, repeat steps 7.1 and 7.2.
- If residual voltage is greater than 5VAC, but still unable to build up voltage output, replace with a new voltage regulator.

WARNING

Excessive field flashing may cause damage to the AVR or the generator exciter coil.

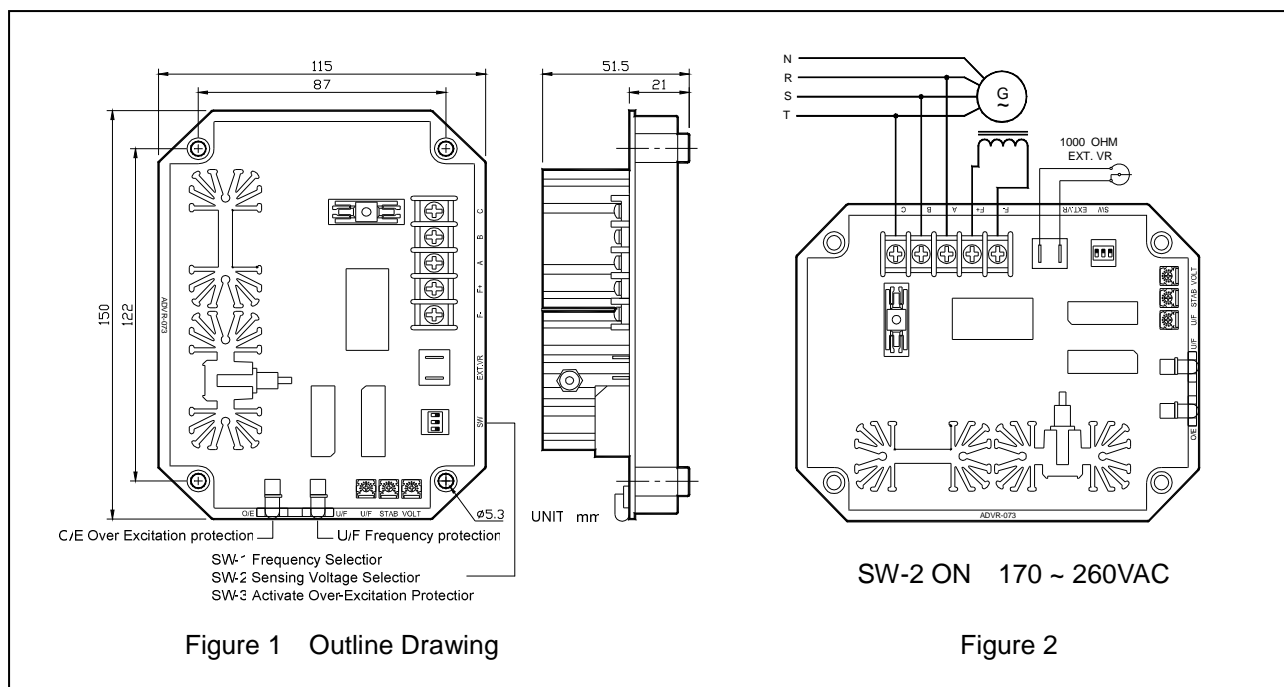
9. TROUBLE SHOOTING

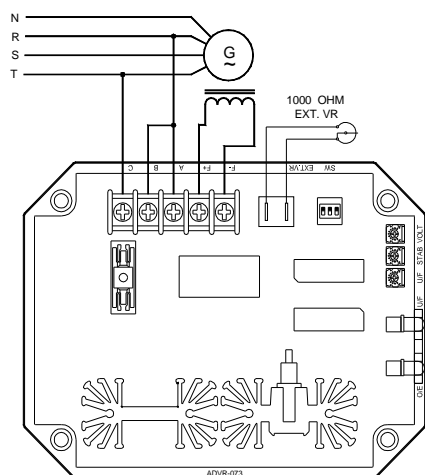
SYMPTOM	CAUSE	CORRECTION
No Voltage Output	Engine under speed	Please refer to generator service manual
	Low residual voltage	Please refer to section 7 "Field Flashing"
	B, C, F+, F-, Terminal connection not properly connected	Reference from Figure 2 ~ Figure 4
	Defective generator	Please refer to generator service manual
Low Voltage Output	A, C, B, C, Terminal incorrect connection	Reference from Figure 2 ~ Figure 4
	Defective VR or not properly connected	Check connection and VR
	Under frequency	Please refer to generator service manual
	Incorrect exciter specification	Please refer to generator service manual
	AVR Incorrect voltage selected	Please refer to section 3 "DIP Switch setting"
Blown Fuse	Over excitation current / incorrect wiring	Reference from Figure 2 ~ Figure 4
Over Voltage Output	A, C, terminals not properly connected or incorrectly connected	Reference from Figure 2 ~ Figure 4
	AVR Incorrect voltage selected	Please refer to section 3 "DIP Switch setting"
Unstable Voltage Output	"STAB" Stability incorrectly adjusted	Please refer to section 5 "Adjustment"

ATTENTION

1. AVR can be mounted directly on the engine, genset, switchgear, control panel, or any position that will not affects 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.

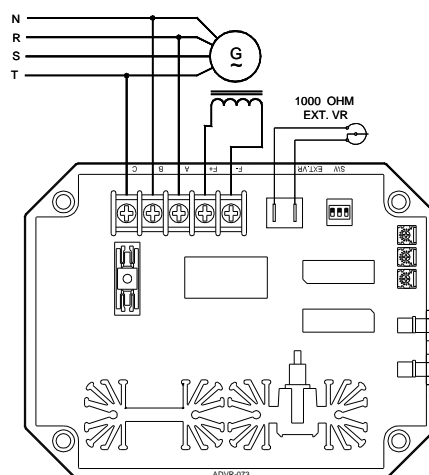
10. FIGURE AND SIZE





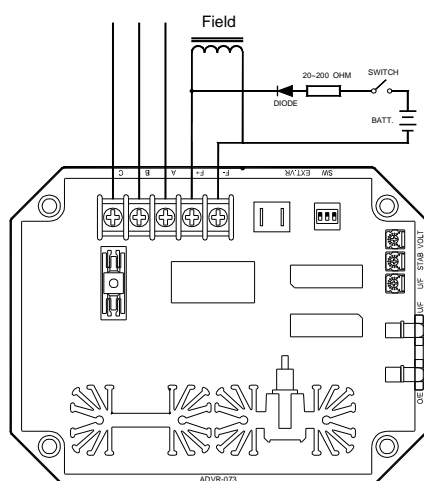
SW-2 ON 170 ~ 260VAC

Figure 3

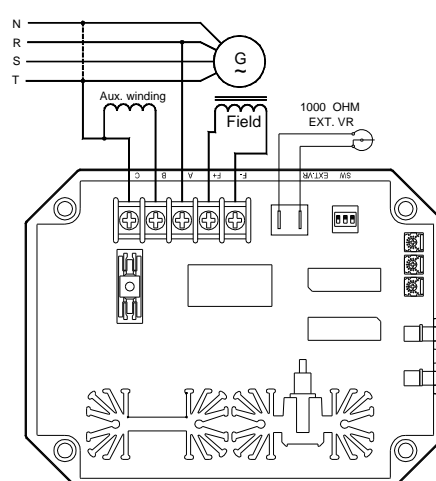


SW-2 OFF 340 ~ 520VAC

Figure 4



Flash with Battery
Figure 5



With Aux. Winding
Figure 6

- ※ Use only original supplied spare protection fuse for fuse replacement.
- ※ Please accept our sincere apology if any modification in performance, specification or appearance is made without prior notice.