ADVR-073

Hybrid Universal Analog/Digital 7 Amp Voltage Regulator with over-excitation and lost of sensing Proteccion with Provision for Power Input from an auxiliary winding

Operations Manual
1. SUMMARY
The ADVR-073 is an advance (Hybrid Analog/Digital Voltage Regulator) design for general-purpose isochronous applications. The ADVR-073 uses an reliable CPU (Central Processing Unit) in its design. This eliminates complex analogue components and circuits that are inherently over sensitive to temperature eliminating voltage instabilities and drift. 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, preventing exciter and regulator damage. It is easy to install and flexible for use in both shunt type and generators with auxiliary windings.

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

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

**Voltage Regulation**
- < ± 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

**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 ±5VDC @220VAC 5sec

**Soft Start Ramp Time**
- 3 sec.

**Dimensions**
- 150mm L * 115mm W * 51.5mm H

**Weight**
- 430g ± 2%

3. WIRING

3.1 A to C: Sensing Input

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

3.2 B to C: Power Input
Power Input terminals from B to C use 100 to 300VAC shunt or from an 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 are used to connect the external voltage adjustment rheostat, use a (1K ohm 1W) Rheostat. Keep terminals shorted, when not used.
Always use high quality 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 50 Hz
- DIP SW-1 switch OFF, for use in 60 Hz
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 the over Excitation Protection is 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 is 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, or 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 were 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 Why Over Excitation Protection?
- If you are using a standard AVR and you overload the generator or the sensing wires get disconnected (when using the auxiliary powered winding), the excitation voltage rapidly increase, causing severe damage to the AVR or exciter. The ADVR-053 has over excitation protection shutdown that cuts excitation at once.
- When over excitation protection is activated and the excitation voltage exceeds 78 ±5VDC @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 on OFF, set for 60Hz operation.
- U/F adjustment range at 60Hz is from 50 to 60Hz (Factory preset @ 55Hz).
- DIP SW-1 set to ON, set for 50Hz operation.
- U/F adjustment range at 50Hz is from 40 to 50Hz (Factory preset @ 45Hz).
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

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

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.

10. FIGURE AND SIZE

Figure 1

UNIT : mm

Figure 2

SW-2 ON 170 ~ 260VAC

UNIT : mm
Substitute only with original model protection fuse.
We reserve the right to make changes without prior notice.