

TECHNICAL MANUAL

R120

Automatic Voltage Regulator (AVR)

<https://gensetpart.com/generator-avr/>

COMPATIBLE REPLACEMENT PART

POPULACE has manufactured generator electronic parts in Xiamen, China since 2006. 1000+ SKUs in stock, 1-5 day dispatch, every unit burn-in tested before shipment.

Document contents

- Specification and technical characteristics
- Terminal assignment and wiring diagram
- Installation, adjustment and settings
- Troubleshooting table

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Why source this part from POPULACE

- Factory in Xiamen, China - operating since 2006 (20 years)
- Over 1000 SKUs held in stock; dispatch within 1-5 days
- Every unit burn-in tested at 65 C before shipment
- CE and ISO 9001 production system; full batch traceability
- Free technical support for wiring, settings and fault diagnosis

Get a quote / technical support

Web: <https://gensetpart.com>
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5 - MULTIMETER CHECKS

Equipment: Digital multimeter, **Type:** MECO or equivalent.

Select Diode mode on the digital multimeter. The resistance between F1 and F2 (with the multimeter jack common applied to F1 of the AVR) should be between 0.4 and 0.6 k Ω , and vice versa (with the multimeter jack common applied to F2 of the AVR) should give **INFINITY**.

ZERO indicates a power device failure in both cases. No further tests (static or dynamic) are allowed, as they would lead to the fuse blowing.

The resistance between F2 and U (both sides) should be 180 k Ω .

The resistance between F2 and V with the multimeter jack common applied to the AVR V terminal should be approximately 2.2 M Ω in the 10 M Ω range and vice versa (with the multimeter jack common applied to the AVR F2 terminal) should be 15 M Ω .

ZERO indicates a power device failure in both cases. No further tests (static test or dynamic tests) are allowed, as they would to the fuse blowing.

The resistance between U and V should be between 300 k Ω and 400 k Ω . Open circuit indicates AVR failure. During a static test, the lamp will not turn OFF or, when connected to the generator, it will produce a ceiling voltage (for 3-phase ONLY).

The resistance between U and N1 should be between 200 k Ω and 260 k Ω . Open circuit indicates AVR failure. During a static test, the lamp will not turn OFF or, when connected to the generator, it will produce a ceiling voltage (for 1-phase ONLY).

The resistance between N and F1 should be very low or ZERO ohms. If the circuit is open, the lamp will not glow when the static test is performed.

R120 AVR

1 - TECHNICAL SPECIFICATION

1) Sensing input

- Voltage: 277 VAC 10% for 1-phase, 415 VAC line-to-line 10% for 3-phase, 2-line sensing. The AVR senses the true average of the line-to-line waveform. Use the resistor (SMD) network for trouble-free sensing and control of sensed voltage/regulation.

2) Input power

- Voltage: 277 VAC rms 10%
- Frequency: 50/60Hz

3) Output power

- Voltage: 95 VDC for 240 VAC Input
- Current:
4 A DC
6 A for 30 sec. (when allowed by the field resistance)

4) Operating temperature: -20 to +70

5) Storage temperature: -40 to +80

6) Voltage setting: min 10% of rated voltage.

7) Stability setting: can be adjusted to obtain a correct transient response in steady state.

8) Under frequency roll-off setting: available below 46 Hz for 50 Hz and below 56 Hz for 60 Hz.

9) Voltage build-up: 2 Volts (L-N)

10) Voltage regulation: 1% at the AVR terminals with a THC <5%.

11) Thermal drift: 1% for 30 change in temperature.

12) Response time: less than 50 ms.

13) Closed loop response: typically 0.5 sec to recover 98% of the defined voltage for a field forcing ratio of 1:2.

14) Sensing loss protection: the voltage should disappear when the sensing circuit is open.

15) Overexcitation protection: 10 VDC to 85 VDC.

Set point: 60 VDC

16) Protection fuse: 4 A, 240 VAC.

17) Potentiometer sealing: except for the V-trimpotentiometer, all potentiometers are sealed.

18) Frequency roll-off indicator: LED provided (UF).

19) Sensing loss indicator: LED provided (SL).

20) Overexcitation indicator: LED provided (OE).

21) Protection on the devices: suitable R-C snubber to be provided for the device used to protect against voltage surges.

22) Potting/Encapsulation details: the components on the AVR should be completely encapsulated with suitable PU resin compound to absorb transients/vibrations during operation.

23) Alternator excitation details: (typical)

- Full load:
Excitation voltage: 40 to 50 V
Excitation current: 2.5 to 4.0 A

24) Terminal marking: see diagram

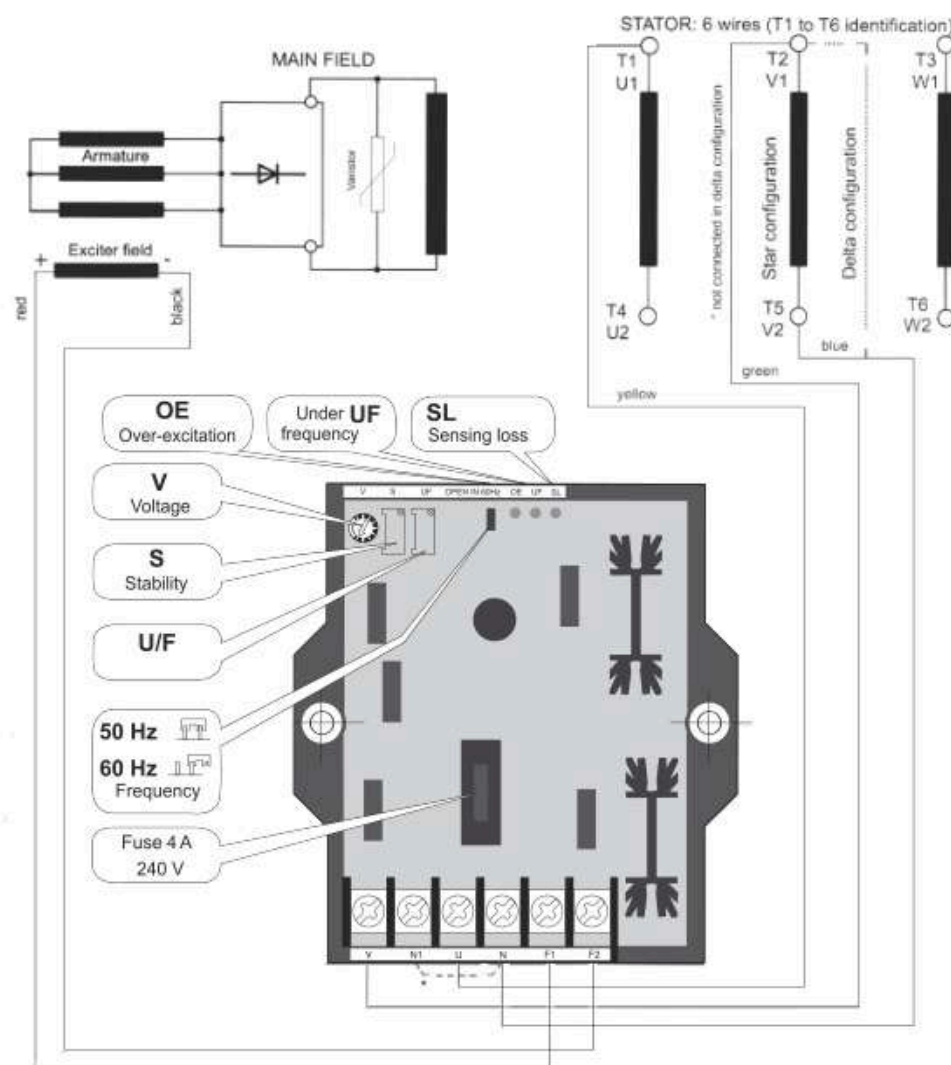
25) Dimensions:

- Overall: 104 x 94 x 40 (mm)
- Mounting: 83 (mm)
- Mounting hole dia: 5.5 (mm)

26) Weight: 185 g

2 - MAIN FUNCTION OF THE AVR

The AVR is powered by the line-to-neutral terminals of the AC generator with 240 VAC at 50/60Hz. The regulated sensing voltage is based on the AVR input power.



* Note: for delta configuration (1PH – 3PH), use terminals N and U, short N and N1.

The AVR builds up the generator voltage from its residual voltage to rated voltage.

When the generator is loaded, the sensed voltage decreases and generates an error signal, which is required in order for the closed loop system to work.

Depending upon the value of the amplified voltage, the ramp intersects the amplified voltage at a point which is early or late in the half-cycle.

At this intersection point, a starting pulse is produced to trigger the power device.



Only qualified personnel should replace/work on the AVR.
Do not increase the voltage beyond the rated voltage.

3 - AVR SETTINGS

3.1 - V-TRIM (V)

This function is provided for setting the voltage up to $\pm 10\%$ of rated voltage by means of a potentiometer. Turn the potentiometer clockwise to increase the voltage and vice versa, once the rated speed has been reached.

The default setting is 415 V $\pm 2\%$ for 3-phase, 240 V $\pm 2\%$ for 1-phase.

3.2 - UF - Under frequency knee point setting

This function is provided to protect the AC generator from sustained low speed operation through a potentiometer. The AVR will reduce the voltage in proportion with the speed below the defined value.

The procedure for setting the UF potentiometer is as follows:

First run the generator at full speed (50 Hz) and turn UF by a few turns clockwise, making sure that the voltage does not increase. Now turn the UF potentiometer slowly anticlockwise. At a particular point the red LED glows and the voltage will start to decrease. Stop turning the potentiometer at this point and turn the potentiometer clockwise by two turns after rated voltage is restored.

The factory default setting is 46 Hz.

3.3 - STAB (S)

This function is provided to stop voltage hunting by means of a potentiometer. Turn clockwise to increase stability (to stop oscillation). Turning too far clockwise will result in a sluggish response and possibly also oscillations.

The factory default setting is slightly higher than critical damping (around halfway).

4 - AVR CONTROLS

No.	Control	Function	Direction
1	VOLTS	Sets the generator output voltage	Turn clockwise to increase output voltage
2	STAB	Stops voltage hunting	Turn clockwise to increase stability
3	UFRO	Sets the Under frequency knee point	Turn clockwise to to reduce the knee point