

Automatic Voltage Regulator

The WT-2 Voltage Regulator is an encapsulated unit contained in a plastic case. The regulator controls the dc exciter field power of conventional, 50 or 60 Hz brushless generators that have a max 63 V_{dc} exciter field to regulate the generator output voltage. Regulation is provided by sensing the generator output voltage, converting it to a dc signal and comparing the signal to a reference voltage signal. An error signal is developed and used to control the dc field power in order to maintain a constant generator output.

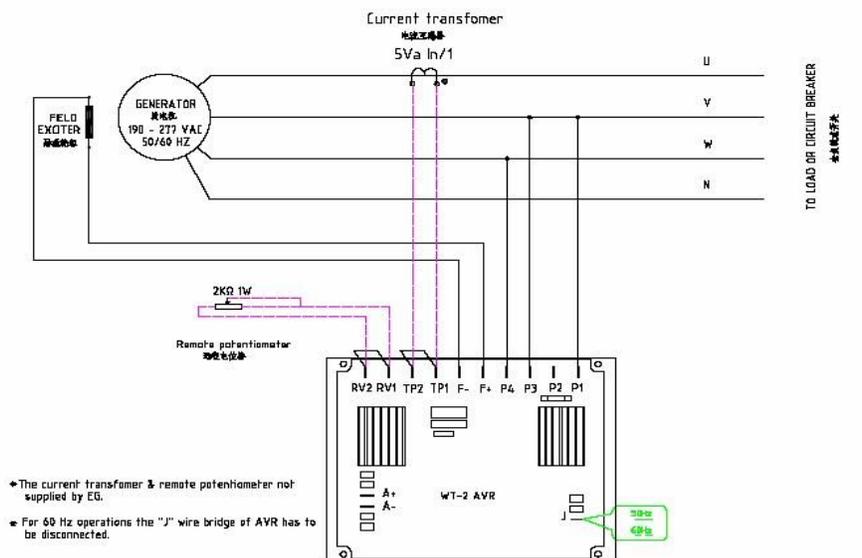


Fig. 1 Connection of WT-2 in 200VAC system

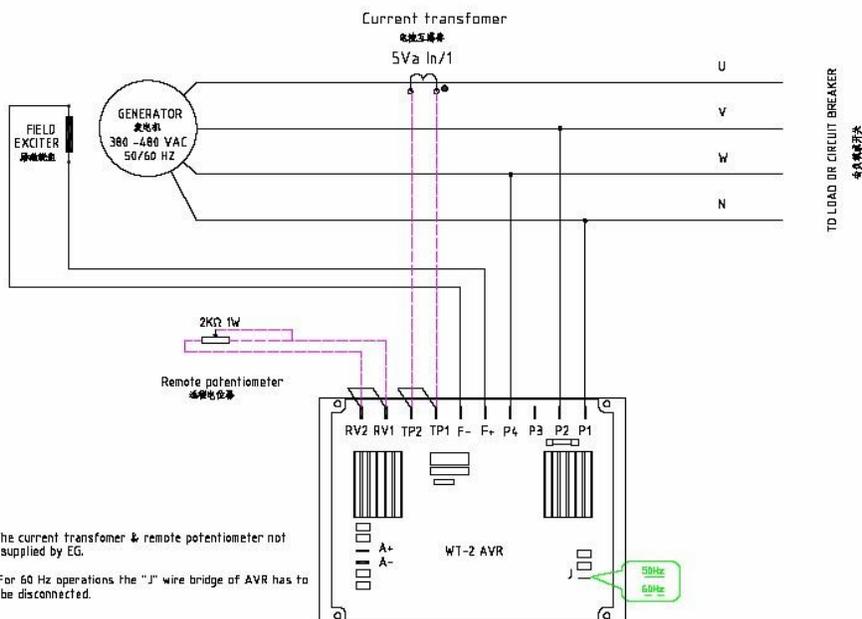


Fig. 2 Connection of WT-2 in 400VAC system

CONNECTION OF AVR

- the "J" is a connection for 50 Hz operation, or disconnection the "J" for 60 Hz operation.

- If an external voltage adjust control is being used, connect the potentiometer (minimum 1W, resistance 2000 Ω) to terminals Rv1 and Rv2. If not, connect a jumper between terminals Rv1 and Rv2.
- Connect the exciter field to terminals F+ and F-. Be sure to observe polarity.
- Connect the input power to the generator stator to provide power to terminals P1 and P4. The input should be connected 200~277Vac.
- Connect the sensing input P2 and P4 for 400Vac operation or P3 and P4 for 200 Vac operation. The sensing should be connected "line to line".

PARALLEL OPERATION

When it is required to operate the regulator in parallel with an isolated or utility bus, in addition to the regulator provisions, a 5 VA current transformer (CT) is required (See Figures 2 and 3.) This CT is connected in a generator U line and should deliver from TP1 to TP2 amperes secondary current at rated load. 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 U line of the three-phase generator. That does not supply sensing to the regulator.

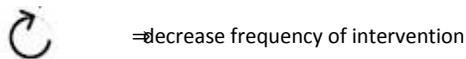
Figures 2 and 3 show the correct CT polarity for A-B-C phase rotation sequence. If the phase rotation sequence is A-C-B, the CT's secondary leads must be interchanged.

ADJUSTMENTS

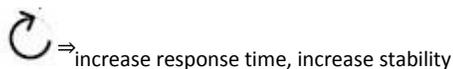
VOLT - potentiometer for adjusting the output voltage of the generator: to adjust the output voltage of the generator: the voltage adjustment possibility depends on the characteristics of the generator. Normally the internal potentiometer RP1 allows possibility of adjusting the voltage in a wide range (i.e. between 350 and 480 V, or between 170 and 277 V); to obtain setting or to adjust the voltage from the control panel, or in order to limit the voltage range, an external potentiometer can be connected a finer possibility of voltage to the terminal "RV1" and "RV2" (resistance about 2000 Ohm, 1W, to obtain +/- 5% voltage regulation).



FREQ -potentiometer for changing the low speed protection: usually it is set at the factory in order to reduce the excitation when speed becomes lower than 90% of rated speed at 50 Hz. By removing the bridge which normally shorts the terminals "Hz" and "60", the speed protection acts properly for 60 Hz operation. By acting on potentiometer RP3 it is possible to adjust further (in case should it be necessary) the frequency at which the low speed protection is effective.



STABILITY SETTING - The voltage regulator is provided with internal adjustable stability circuits in order to allow operation in a wide range of applications. The operation of the regulator can be set on field to adapt it to the characteristics of the plant and of the driving engine (i.e. diesel engine, water turbine, gas turbine) in order to obtain the best voltage response. To change the stability characteristics of the regulator, it is necessary to act on the potentiometer "RP2" for fine setting of stability



DROOP - The device is included in the voltage, to allow parallel operation between similar generators: the device permits to share correctly the total reactive power required by the load among all generators operating in parallel. The device is composed by an external current transformer (which is sensing the current in phase U) and by a "droop" circuit internal in the regulator.

The voltage regulator is provided with input terminals (terminals “TP1” and “TP2”) for easy connection to current transformer. Such terminals are normally short-circuited by a connection, when the generator is used in single operation .If the voltage is increasing as the load increases, it is necessary to reverse the leads of the current transformer at the terminals “TP1-TP2”.

Adjust the potentiometer “RP4” until the desired amount of droop is achieved

⇒ the droop increase

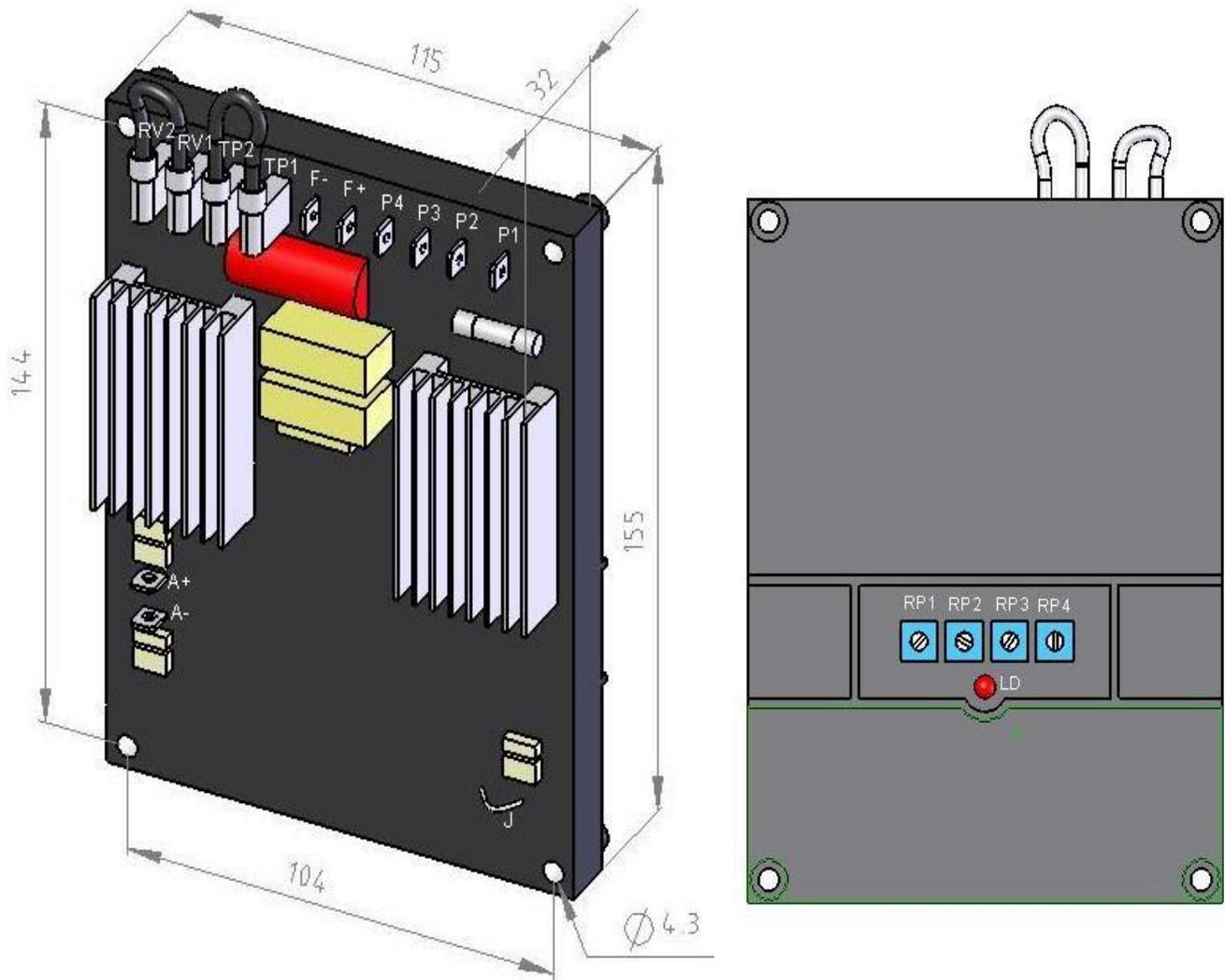


Figure 3 WT-2 AVR dimension drawing

AVR checking

To operationally test any WT-2 AVR, refer to Figure No.4 and perform the following steps:-

- Connect the voltage regulator as shown in Figure 4 and apply 230 Vac.

- Adjust the RP1 control fully counter-clockwise(CCW).

RESULT: Observe that the lamp does not light.

-Adjust RP1 control fully clockwise (CW).

RESULT: Observe that the lamp is now lit.

-Adjust RP1 control until the lamp just goes out.

AVR operation is satisfactory if the above results are obtained. Stability, however, must be tested with the generator and AVR together.

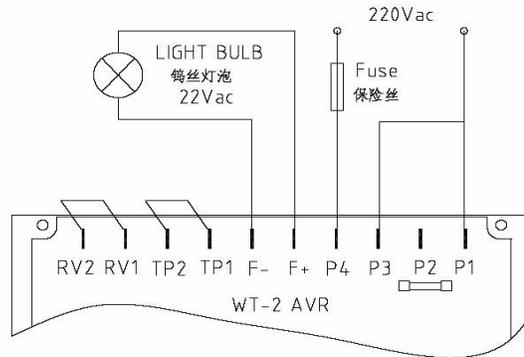


Figure No.4 AVR wiring diagram

AVR troubleshooting

Trouble	Possible Cause	Remedy Measures
No power supply	<ul style="list-style-type: none"> - insufficient of residual voltage - RV1 and RV2 not connected F+ and F- not connected - sensing cable not connected. - generator set under-speed - AVR damage 	<p>Apply 12V battery to recharge Refer above diagram and re-connect</p> <p>Reconnect again Adjust to rated speed. Change new AVR</p>
Voltage too low	<ul style="list-style-type: none"> - generator set under-speed - wrong FREQ setting 	<p>Adjust to rated speed Adjust the setting</p>
Voltage too high	<ul style="list-style-type: none"> - AVR setting too high - AVR damage 	<p>Adjust AVR setting Check and replace new AVR</p>
Voltage unstable	<ul style="list-style-type: none"> - RP2 wrong setting 	<p>Adjust RP2</p>
Voltage fluctuation between 300V 400V	<ul style="list-style-type: none"> - generator set speed too low - wrong FREQ setting 	<p>Adjust generator set speed Adjust the setting</p>

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