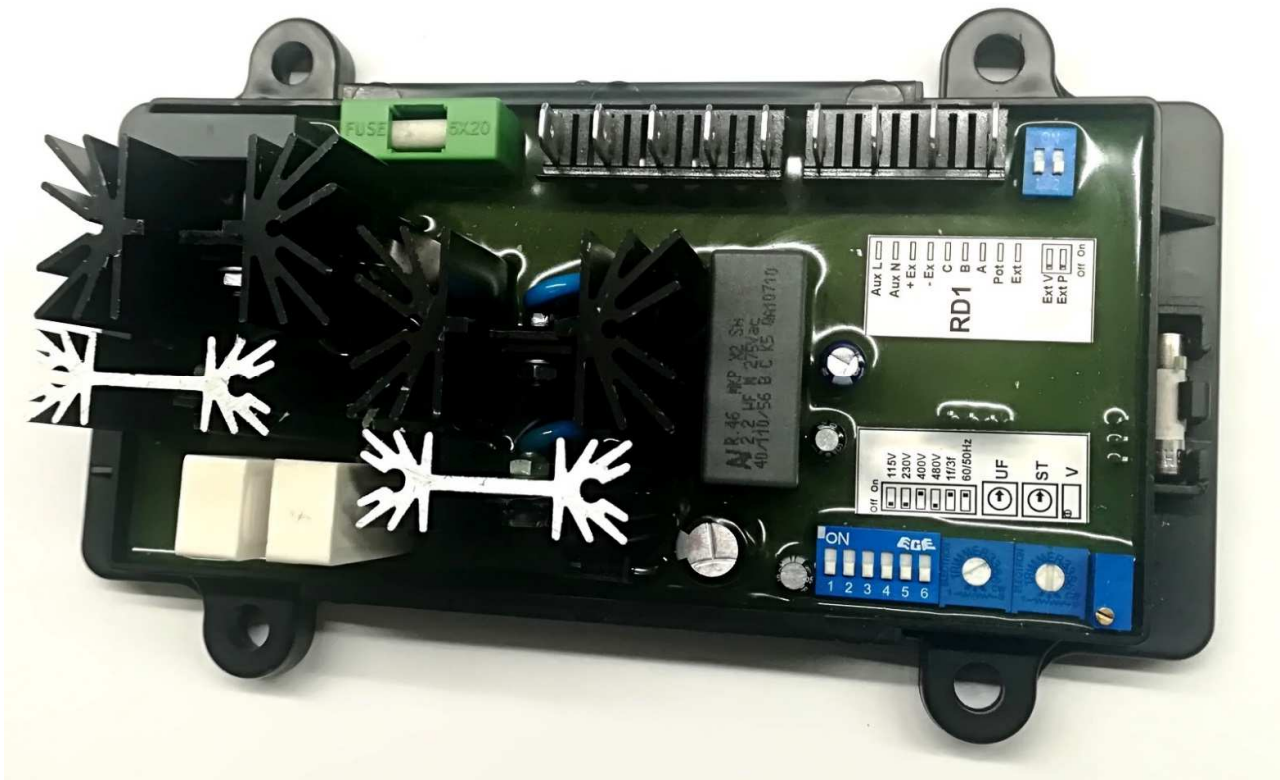


RD1 Digital AVR

Automatic Voltage Regulator

OPERATION MANUAL



REV01 07/2019



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GENERAL FEATURES

SINCRO RD1 is a digital voltage regulator designed for 50/60 Hz brushes generators.

It regulates the output voltage of a generator by controlling the field current.

It has single and three phase sensing.

RD1 is powered by an auxiliary circuit on the main stator.

The RD1 controls and keeps constant the average value of the 3RMS phase voltages.

A frequency measuring circuit continually monitors the alternator output and provides output under-speed protection of the excitation system, by reducing the output voltage proportionally with speed below a pre-settable threshold. A manual adjustment is provided for factory setting of the under frequency roll off point, (UF). This can easily be changed to 50 or 60 Hz with two dip switches.



ELECTRICAL SPECIFICATIONS

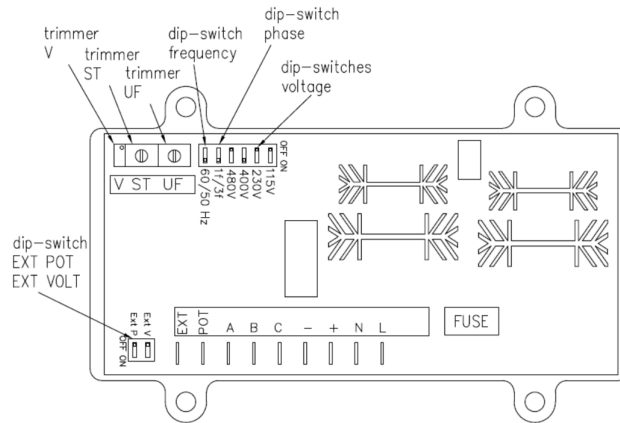
RD1 AVR includes:

- a terminal strip (9 terminals)
- a voltage trimmer
- a stability trimmer
- an under frequency trimmer
- a range sensing selection DIP switches
- a frequency selection DIP switch
- a stability selection DIP switch
- a sensing selection DIP switch (single/three-phase)
- an external pot setting output selection DIP switch
- an external voltage setting output selection DIP switch
- electric protection with fuse.

The electronic is sealed with resin (it is a perfect protection against vibration and humidity).

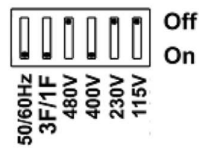
DIP SWITCHES CONFIGURATION

RD1 AVR has two groups of DIP switches:



The first group (group 1) of DIP switches selects the nominal voltage of sensing.

- 115 Vac
- 230 Vac
- 400 Vac
- 480 Vac
- the working frequency 50 Hz or 60 Hz
- single phase or 3 phases sensing



DIP switch group 1



DIP switch group 2

The second group (group 2) of DIP switches selects:

- The possibility to set generator output by External voltage (Ext V, ON)
- The possibility to set generator output by External Potentiometer (Ext P, ON)

ADJUSTMENTS

VOLTAGE ADJUSTMENT

Adjusting the trimmer “V” changes the output voltage.

Take the generating set to its nominal speed and turn until the required voltage is obtained.

If a small variation in speed causes a voltage variation, then the underspeed protection trimmer “UF” should first be calibrated.

Adjusting the “V” trimmer, the ranges are the following:

- DIP-switch on 115 V position, range 100÷130 V
- DIP-switch on 230 V position, range 185÷245 V
- DIP-switch on 400 V position, range 340÷460 V
- DIP-switch on 480 V position, range 440÷520 V.

STABILITY ADJUSTMENT

If there are voltage fluctuations, adjust the potentiometer “ST”, which modulates the reaction time of the regulator to external inputs, thereby eliminating any instability in the alternator-load system.

UNDER FREQUENCY KNEE ADJUSTMENT

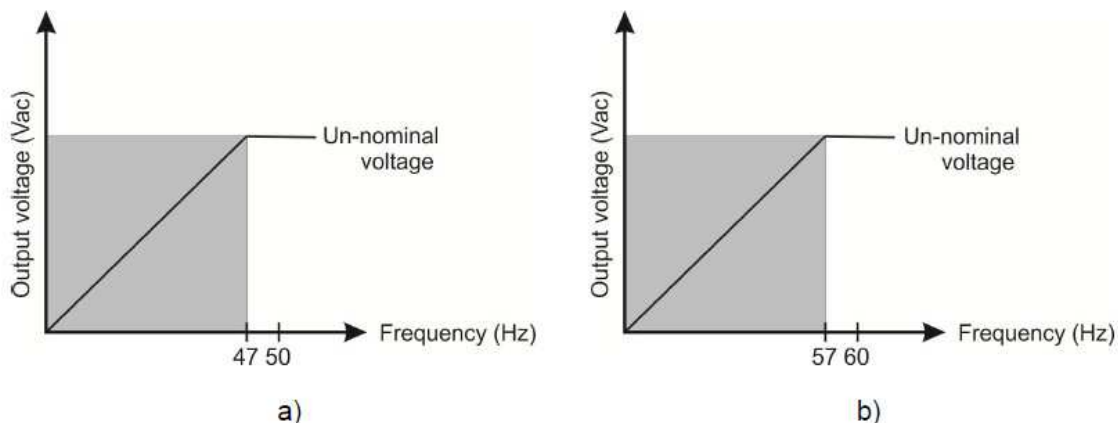
AVR RD1 incorporates an underspeed protection circuit (UF) which gives a volts/Hz characteristic when the alternator speed falls below a presettable threshold known as the "knee" point.

The UF knee adjustment is preset at factory at the 47Hz on a 50Hz system or 57Hz on a 60Hz system. Selection of 50 / 60Hz can be made using the DIP-Switches.

The figures below show the curves for voltage variation as a function of frequency variation.

For nominal frequency operation, UF is disabled. When rotation decreases (e.g. when shutting down), excitation decreases, reducing the output voltage of the alternator.

The pre-set "knee" point can be altered, by UF trimmer, according to the needs of each application.



Under frequency “knee”: a) 50 Hz system, b) 60 Hz system

UF trimmer is a single potentiometer turn.

The adjustment range is:

- DIP switch on 50 Hz position, range 42÷50 Hz
- DIP switch on 60 Hz position, range 52÷60 Hz

CONNECTING AN EXTERNAL POTENTIOMETER (5 kOhm)

Remote voltages adjustment:

put the DIP switch “Ext pot” in ON position and “Ext voltage” in OFF position (they are in the group 2 of DIP switches). Connect the external potentiometer (5kOhm, ½W) to the free terminals “EXT POT”.

The external potentiometer can only reduce the original set point of the AVR.

To increase the voltage setting it is necessary to turn the external potentiometer completely anticlockwise (min. resistance) and then to adjust the max limit with “V” potentiometer.

CONNECTING AN EXTERNAL VOLTAGE (0-10 Vdc) FOR PARALLEL DEVICE

Remote voltage adjustment:

put the DIP switch “Ext voltage” in ON position and “Ext pot” in OFF position (they are in the group 2 of DIP switches). Connect the minus voltage (-) to the free terminal “EXT” and the plus voltage (+) to the free terminal “POT”. Connect half voltage range (5 Vdc) on “EXT” “POT” input. With V trimmer adjust alternator voltage to nominal value for that range.

CONNECTIONS

Output (DC field connection):

- At terminals “+Ex” (red wire) and “-Ex” (black wire).

The power supply has to be connected:

- At terminals “AuxN” (neutral) and “AuxL” (line/phase).

The power can be supplied by using an independent auxiliary winding, integrated in the alternator stator, or the phase of sensing.

The terminal L is internally (in the AVR) connected with A terminals.

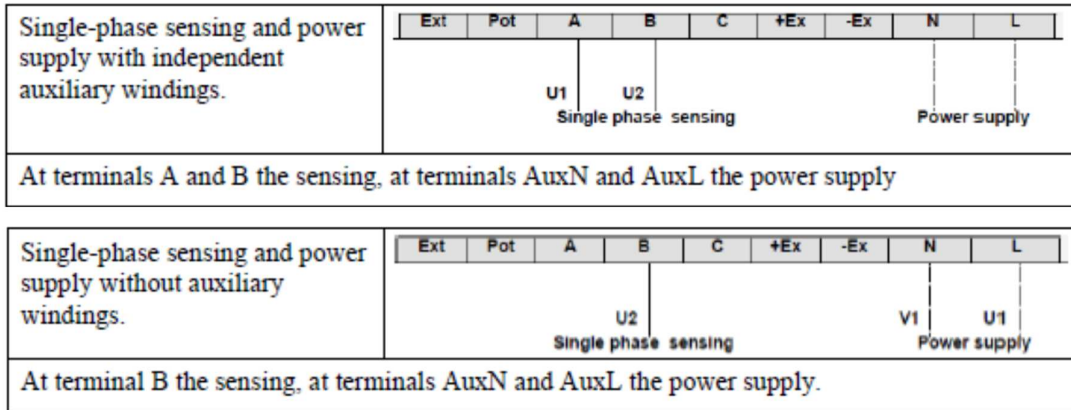
The L line is protected by fuse (type F8 A, 250 V, T 5x20).

For the three phases alternator the voltage reference must be connected as follows:

Single-phase sensing and power supply with independent auxiliary windings.	<table border="1"> <thead> <tr> <th>Ext</th> <th>Pot</th> <th>A</th> <th>B</th> <th>C</th> <th>-Ex</th> <th>+Ex</th> <th>N</th> <th>L</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>U</td> <td>V</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4" style="text-align: center;">Single phase sensing</td> <td colspan="5" style="text-align: center;">Power supply</td> </tr> </tbody> </table>	Ext	Pot	A	B	C	-Ex	+Ex	N	L			U	V						Single phase sensing				Power supply				
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U-V-W are the three phases of the alternator. N is the neutral

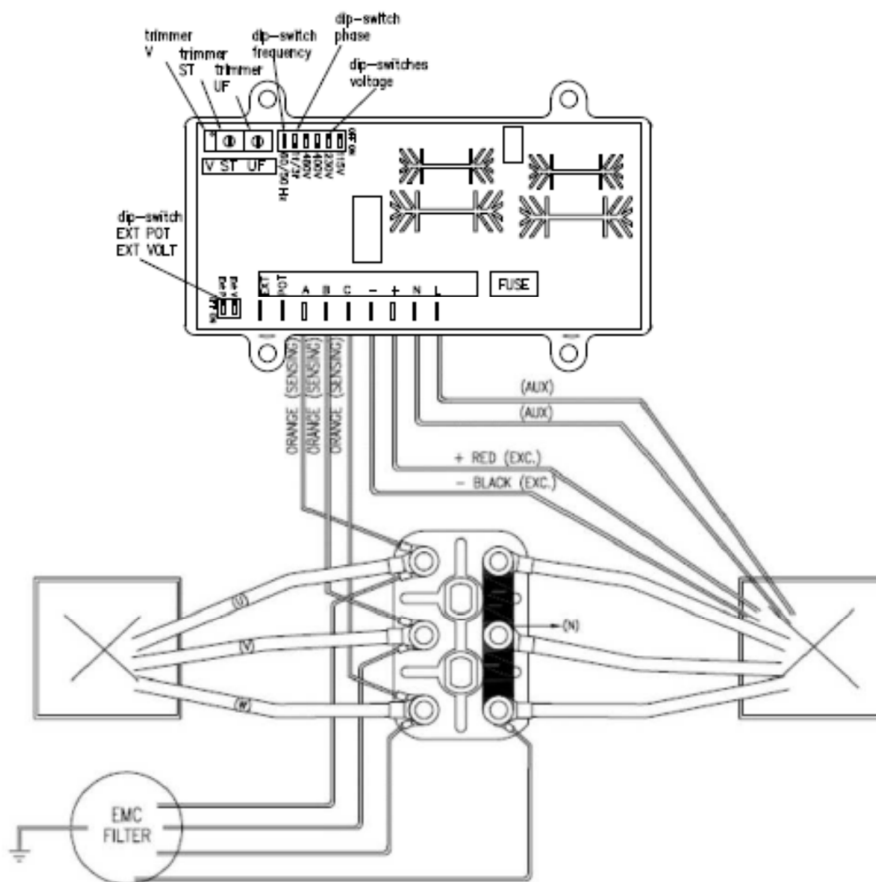
For the single phase alternator the voltage reference must be connected as follows:



U1-V1 are the output of the alternator (230 V).
 U1-U2 is half phase (115 V).

The external voltage potentiometer:
 - At terminals "Ext" and "Pot".

WIRING DIAGRAM



STARTING UP

If a replacement AVR has been fitted, or the re-setting of the voltage adjustment is required, please proceed as follows:

1. Connect the wires coming from the alternator according to the description in the CONNECTION DIAGRAM and the type of alternator to be used.
2. Check that the DIP switches group 2 and group 1 are consistent with the characteristics of the machine (voltage, frequency, remote control)
3. Before running alternator, turn the volts trimmer "V" anti-clockwise
4. Turn stability trimmer "ST" to midway position
5. Start alternator set, and run on no load at nominal frequency e.g. 50-53 Hz or 60-63 Hz
6. Carefully turn volts trimmer "V" (or external pot, if fitted) clockwise until rated voltage is reached
7. If instability is present at rated voltage, refer to stability adjustment, and then re-adjust voltage if necessary

MAINTENANCE AND TROUBLE-SHOOTING

PREVENTIVE MAINTENANCE

Periodical inspections of the equipment are required to ensure they are clean, dust and moisture free. It is essential that all terminals and connections are kept free from corrosion.

TROUBLE-SHOOTING

Trouble	Possible causes	Solutions
NO OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Demagnetized machine - Wrong connection of the AVR - Loose terminals/connections - External potentiometer doesn't work (if present) - Burnt fuse - Faulty AVR 	<ul style="list-style-type: none"> - Connect (for a while) an external battery (12Vdc) to the exciter (respecting the polarities) - Check as per wiring diagram - Check if all terminals/connections are well tightened - Change external potentiometer (if present) - Check and replace - Replace the AVR
LOW OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Voltage potentiometer wrongly adjusted - Sensing wrongly connected - Dip-switch wrongly positioned - Low frequency (under the UF limit) - Under-Frequency protection is not properly adjusted - Faulty AVR 	<ul style="list-style-type: none"> - Check and adjust - Check the sensing connections - Check and fix - Increase the engine speed - Check and adjust - Replace the AVR
HIGH OUTPUT VOLTAGE	<ul style="list-style-type: none"> - Voltage potentiometer wrongly adjusted - Sensing wrongly connected - Dip-switch wrongly positioned - Missing sensing - Faulty AVR 	<ul style="list-style-type: none"> - Check and adjust - Check the sensing connections - Check and fix - Check if sensing is interrupted - Replace the AVR
UNSTABLE VOLTAGE	<ul style="list-style-type: none"> - Stability response incorrectly adjusted - Unstable engine speed - Loose terminals/connections - Faulty AVR 	<ul style="list-style-type: none"> - Adjust trimmer "ST" - Check the frequency/engine speed - Check if all terminals/connections are well tightened - Replace the AVR
FUSE BLOWS CONTINUOUSLY	<ul style="list-style-type: none"> - UF protection adjusted for a very low frequency (so the fuse burn during the turn-off procedure) - Faulty AVR 	<ul style="list-style-type: none"> - Adjust UF limit to a value close to the nominal frequency - Replace the AVR



CHALLENGE THE OUTSIDE

SINCRO IS INSIDE

SINCRO has been manufacturing trustable alternators for over 30 years.
At the core of your best energy up to 2.6 MVA. Standard and custom.
Proudly 100% Made in Europe.



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