Product Design Specification

MD1C Automatic Voltage Regulator (AVR). Part number 036-245.

Description, specification and adjustments.

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Product Design Specification

General description

MD1C is a full wave phase controlled diverter type AVR and forms part of the excitation system for a rotating field generator.

The AVR is interlinked with the main stator windings and rotating field to provide closed loop control of the output voltage with load regulation in the order of +/- 3.5%.

Positive voltage build up from residual levels is ensured by the main excitation components (choke, auxiliary winding and bridge rectifier) and is not a function of the AVR.

Excitation power is derived directly from an auxiliary winding in the generator stator and is arranged to provide an excess of excitation allowing the diverter AVR to trim away the surplus.

The AVR senses the voltage in the main generator stator winding and controls the power fed to the rotating field to maintain the generator output voltage within the specified limits, compensating for load, speed, temperature and power factor of the generator. (See note 1).

Underspeed protection is inherent in the design of the excitation components as excitation power is produced proportional to speed. As the AVR is a diverter type, the AVR ceases to operate as the generator volts fall below nominal.

Technical specification

Sensing input.

Voltage	100-130 V AC
Frequency	50-60 Hz nominal
Phase	1
Wire	2

Power input (diverter ratings).

Voltage	400 v peak max.
Current	1 Amp continuous
	1.5 Amp for 10 seconds
Polarity	Raw DC + F1 - F2
Frequency	Rectified 50-60 Hz nominal
Wire	2

Regulation.

+/- 3.5% average. (See note 1)

Thermal drift.

0.07%V per degree centigrade change in AVR ambient

External voltage adjustment.

None

Under frequency protection.

Inherent in generator design

Unit power dissipation.

5 watts max.

Build up voltage.

3.0VAC (not an AVR function)

Cooling.

Forced, 200m^3 / hr. minimum

Environmental.

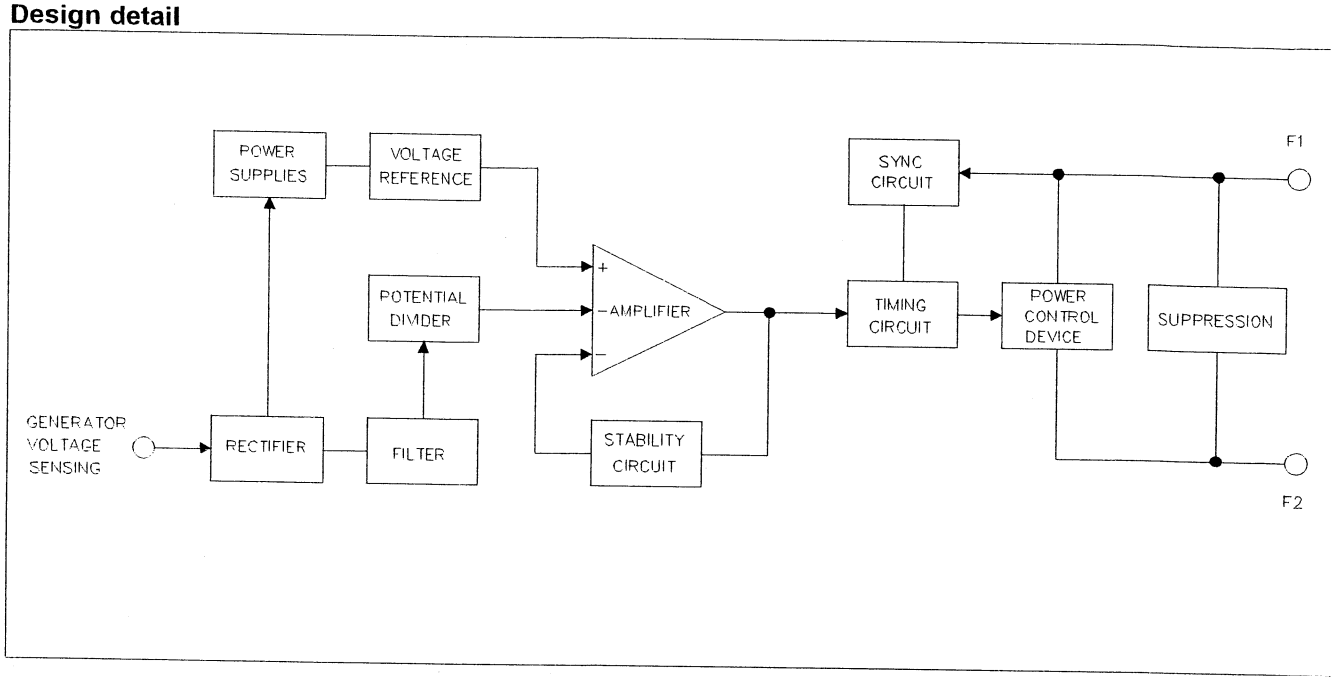
Vibration:	20-100Hz	50mm/s
	100Hz-2kHz	3.3g
Relative Humidity	0-60c	95%
Operating temperature		-40 to +60c
Storage temperature		-55 to +80c

Notes:

1 The ability of the AVR to regulate the generator output voltage is determined by the performance of the main excitation components. i.e. The amount of surplus excitation provided.

Product Design Specification

Design detail



The main functions of the AVR are as follows:-

Rectifier converts the AC generator voltage into DC for processing by the AVR.

Filter converts the rectified AC into a mean DC signal for control purposes.

Potential divider attenuates the input voltage and includes the range potentiometer adjustment which provides the means to adjust the generator output voltage.

Voltage reference is a zener diode for DC voltage comparison.

Amplifier compares the attenuated mean generator voltage, to the reference voltage and amplifies the difference (error) to provide a controlling signal for the power device.

Stability circuit provides adjustable negative ac feedback to ensure good steady state and transient performance of the control system.

Timing circuit controls the conduction period of the output device.

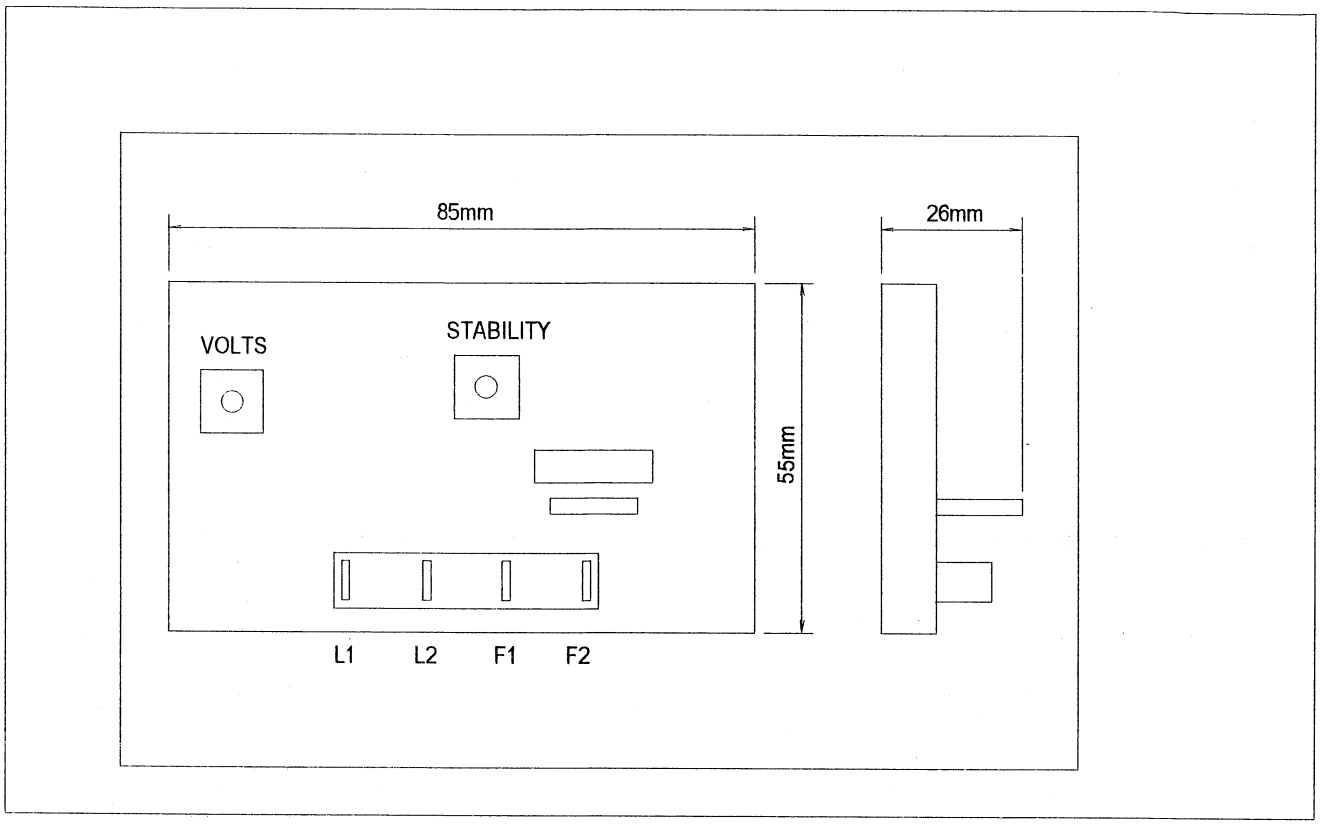
Power control device short circuits or diverts field current in response to the error signals produced by the amplifier and timing circuit.

Sync circuit ensures that the timing circuit is in synchronism with the generator output frequency.

Power supply components consist of dropper resistors, zener diodes and smoothing to provide the required voltages for the AVR circuitry.

Suppression components are included to provide output device protection from voltage transients that may be present across the generator field terminals.

Position of adjustments



Control	Function	Direction
Volts	To adjust generator output voltage	Clockwise increases output voltage
Stability	To prevent voltage hunting	Clockwise increases the damping effect

Voltage adjustment.

The generator output voltage is set at the factory, but can be altered by careful adjustment of the VOLTS control on the AVR board.

WARNING!

DO NOT INCREASE THE VOLTAGE ABOVE THE RATED GENERATOR VOLTAGE. IF IN DOUBT, REFER TO THE RATING PLATE MOUNTED ON THE GENERATOR CASE.

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

Before running the generator, turn the VOLTS control fully anti-clockwise.

Turn STABILITY control to midway position.

Connect a suitable voltmeter across the output of the generator.

Start generator set, and run at a no-load condition at nominal frequency e.g. 50-53 Hz or 60-63 Hz.

Carefully turn the VOLTS control clockwise until rated voltage is reached.

If instability is present at rated voltage, slowly turn the STABILITY control clockwise until voltage is steady, then re-adjust voltage if necessary.

Voltage adjustment is now complete.

Stability adjustment.

The AVR includes a STABILITY or damping circuit to provide good steady state and transient performance of the generator.

The correct setting of the STABILITY control can be found by running the generator at no load and slowly turning the STABILITY control anti-clockwise until the generator voltage starts to become unstable.

The optimum or critically damped position is slightly clockwise from this point, (i.e. where the machine volts are stable but close to the unstable region).