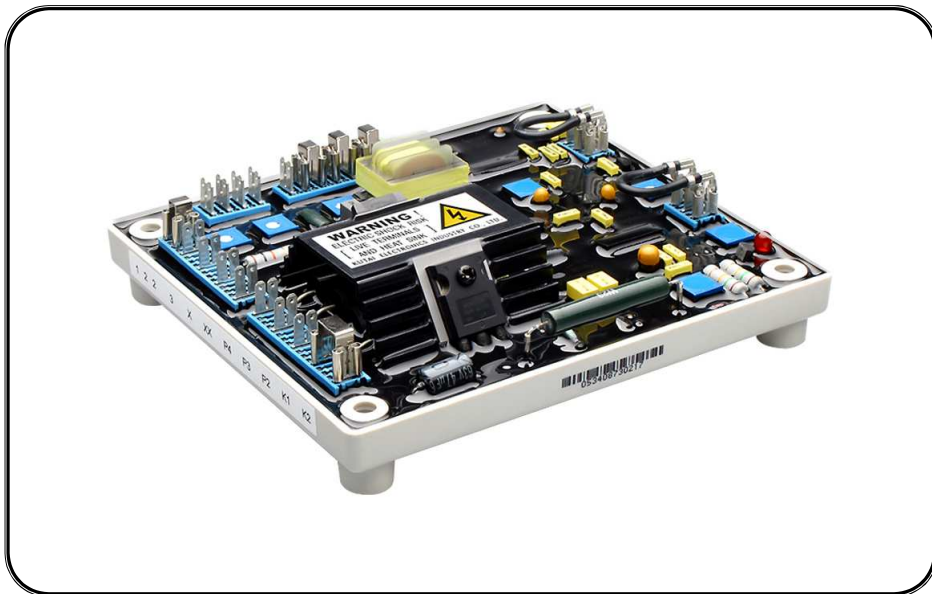


VR341

Generator Automatic Voltage Regulator Operation Manual



Automatic Voltage Regulator

Replaces Cummins Onan 305-0846 Newage MX341

Part # E000-23410*

*Use for reference purposes only - not an OEM product.



1. INTRODUCTION

Sensing Input

Voltage	190 ~ 264 VAC Max, 1 phase, 2 wire
Frequency	50 / 60 Hz, nominal

Power Input (PMG)

Voltage	140 ~ 220 VAC Max, 3 phase 3 wire
Current	3A phase
Frequency	100 ~ 120 Hz, nominal

Output

Voltage	Max. 120 VDC
Current	Continuous 2.7A Intermittent 6A for 10 sec
Resistance	Min. 15 ohm

Voltage Regulation

< $\pm 1\%$ (with 4% engine governing)

Voltage Build-up

Residual voltage at AVR terminal > 5 VAC

Thermal Drift

0.03% per $^{\circ}\text{C}$ change in AVR ambient

External Volts Adjustment

$\pm 10\%$ with 1K ohm 1 watt trimmer

Unit Power Dissipation

Max. 12 watt

Under Frequency Protection (Factory Setting)

Set point 95% Hz
Slope 170% down to 30 Hz

Current Limit Input

10 ohms burden
Sensitivity range 0.5 ~ 1A

Soft Start Ramp Time

3 sec.

Analogue Input

Max. Input	± 5 VDC
Sensitivity	1V for 5% generator volts
Input Resistance	1K ohm

Droop Input

Burden	10 ohm
Max. sensitivity	0.07 A for 5% droop (PF=0)
Max. input	0.33 A

Over Voltage Detector Input

Set point 300V. Time delay 1 Sec (fixed)	
CB trip coil volts	10 ~ 30 VDC
CB trip coil resistance	20 ~ 60 ohms

Over Excitation Protection

Set point	75 VDC
Time delay	10 sec (fixed)

Typical System Response

AVR response 10 ms
Filed current to 90% 80 ms
Machine Volts to 97% 300 ms

Environmental

100Hz ~ 2kHz 3.3g

Relative Humidity

0~70 $^{\circ}\text{C}$ 95% (see note 6)

Operating temperature

-40 to +70 $^{\circ}\text{C}$

Storage temperature

-55 to +80 $^{\circ}\text{C}$

Dimensions

150mm L * 135mm W * 40mm H

Weight

394g $\pm 2\%$

2. GENERAL DESCRIPTION

- VR341 is a two phase sensed Automatic Voltage Regulator and forms part of the excitation system for a brush-less generator. Excitation power is derived from a three-phase permanent magnet generator (PMG), to isolate the AVR control circuits

from the effects of nonlinear loads and to reduce radio frequency interference on the generator terminals. Sustained generator short circuit current is another feature of the PMG system.

- The AVR senses the voltage in the main generator winding and controls the power fed to the exciter stator and hence the main rotor to maintain the generator output voltage within the specified limits, compensating for load, speed, temperature and power factor of the generator.
- Soft start circuitry is included to provide a smooth controlled build up of generator output voltage.
- A frequency measuring circuit continually monitors the shaft speed of the generator and provides under-speed protection of the excitation system by reducing the generator output voltage proportionally with speed below a pre-settable threshold. A further enhancement of this feature is an adjustable volts per Hertz slope to improve engine recovery time on turbo charged engines. Soft start circuitry is included to provide a smooth controlled build up of generator output voltage.
- Uncontrolled excitation is limited to a safe period by internal shutdown of the AVR output device. This condition remains latched until the generator has stopped.
- Provision is made for the connection of a remote voltage trimmer, allowing the user fine control of the generator's output.
- An analogue input is provided allowing connection to a controller or other external devices with compatible output.
- The AVR has the facility for droop CT connection, to allow parallel running with other similarly equipped generators.

NOTE :

1. Derate linearly from 3.7A at 50 °C to 2.7A at 70 °C.
2. The stated voltage regulation may not be maintained in the presence of certain transmitted radio signals. Any change in regulation will fall within the limits in Criteria B of S.EN.61000-6-2 : 2001.
3. After 10 minutes.
4. Applies to Mod status E onwards. Generator de-rate may apply. Check with factory. Factory set, semi-sealed, jumper selectable.
5. Any device connected to the analogue input must be fully looting (galvanically isolated from ground), with an insulation strength of 500Vac.
6. Non condensing.

3. SUMMARY OF AVR CONTROLS

CONTROL	FUNCTION	DIRECTION
VOLTS	To adjust generator output voltage	Clockwise increases output voltage
STABILITY	To prevent voltage hunting	Clockwise increase the damping effect
UFRO	To set the UFRO knee point	Clockwise reduces the knee point frequency
DROOP	To set the generator droop to 5% at 0pf	Clockwise increases the droop
TRIM	To optimize analogue input sensitivity	Clockwise increases the gain or sensitivity
EXC	To set the over excitation cut off level	Clockwise increase the cut off level
DIP	To set the frequency related voltage dip	Clockwise increases the voltage dip

4. ADJUSTMENT OF AVR CONTROLS

4.1 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, or by the external hand trimmer if fitted.

Terminals 1 and 2 on the AVR will be fitted with a shorting link if no hand trimmer is required.

WARNING

Do not increase the voltage above the rated generator voltage. If in doubt, refer to the rating plate mounted on the generator case.

Do not ground any of the hand trimmer terminals, as these could be above earth potential. Failure to observe this could cause equipment damage.

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

1. Before running the generator, turn the VOLTS control fully counter-clockwise.
2. Turn remote voltage rheostat (if fitted) to midway position.
3. Turn STABILITY control to midway position.
4. Connect a suitable voltmeter (0~300V ac) across line to neutral of the generator.
5. Start generator set, and run on no load at nominal frequency e.g. 50~53Hz or 60~63Hz.
6. If the red Light Emitting Diode (LED) is illuminated, refer to the Under Frequency Roll Off (UFRO) adjustment.
7. Carefully turn VOLTS control clockwise until rated voltage is reached.
8. If instability is present at rated voltage, refer to stability adjustment, then re-adjust voltage if necessary.
9. Voltage adjustment is now completed.

4.2 Stability Adjustment

- The AVR includes stability or damping circuit to provide good steady state and transient performance of the generator.
- A jumper link selector is provided to optimize the response of the stability circuit to various size generators.
- The link should be positioned as shown in the diagram according to the kW rating of the generator. The correct setting of the Stability adjustment 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).

4.3 Under Frequency Roll Off (UFRO) Adjustment

The AVR incorporates an under-speed protection circuit which gives a volts/Hz characteristic when the generator speed falls below a presentable threshold known as the “knee” point. The red Light Emitting Diode (LED) gives indication that the UFRO circuit is operating.

The UFRO adjustment is preset and sealed and only requires the selection of 50 or 60Hz and 4 pole or 6 pole, using the jumper link as shown in the diagram. For optimum setting, the LED should illuminate as the frequency falls just below nominal, i.e. 47Hz on a 50Hz system or 57Hz on a 60Hz system.

4.4 DROOP Adjustment

Generators intended for parallel operation are fitted with a quadrature droop C.T. which provides a power factor dependent signal for the AVR. The C.T. is connected to S1, S2 on the AVR, (see generator wiring diagram for details). The DROOP adjustment is normally preset in the works to give 5% voltage droop at full load zero power factors. Clockwise increases the amount of C.T. signal injected into the AVR and increases the droop with lagging power factor ($\cos \phi$). With the control fully anti-clockwise there is no droop.

4.5 Trim Adjustment

- An analogue input (A1 A2) is provided to connect to the controller or other devices. It is designed to accept dc signals up to ± 5 volts.
- The dc signal applied to this input adds to the AVR sensing circuit. A1 is connected to the AVR 0 volts. Positive on A2 increases excitation. Negative on A2 decreases excitation.
- The TRIM control allows the user to adjust the sensitivity of the input. With TRIM fully anti-clockwise the externally applied signal has no effect. Clockwise it has maximum effect.
- Normal setting is fully clockwise when used with a controller.

WARNING

Any devices connected to this input must be fully floating and galvanically isolated from ground, with an insulation capability of 500V ac. Failure to observe this could result in equipment damage.

4.6 Er Excitation (EXC) Adjustment

This adjustment is set and factory sealed and should not be tampered with. An over excitation condition is indicated by the illumination of the red LED which also indicates under-speed running and over-voltage.

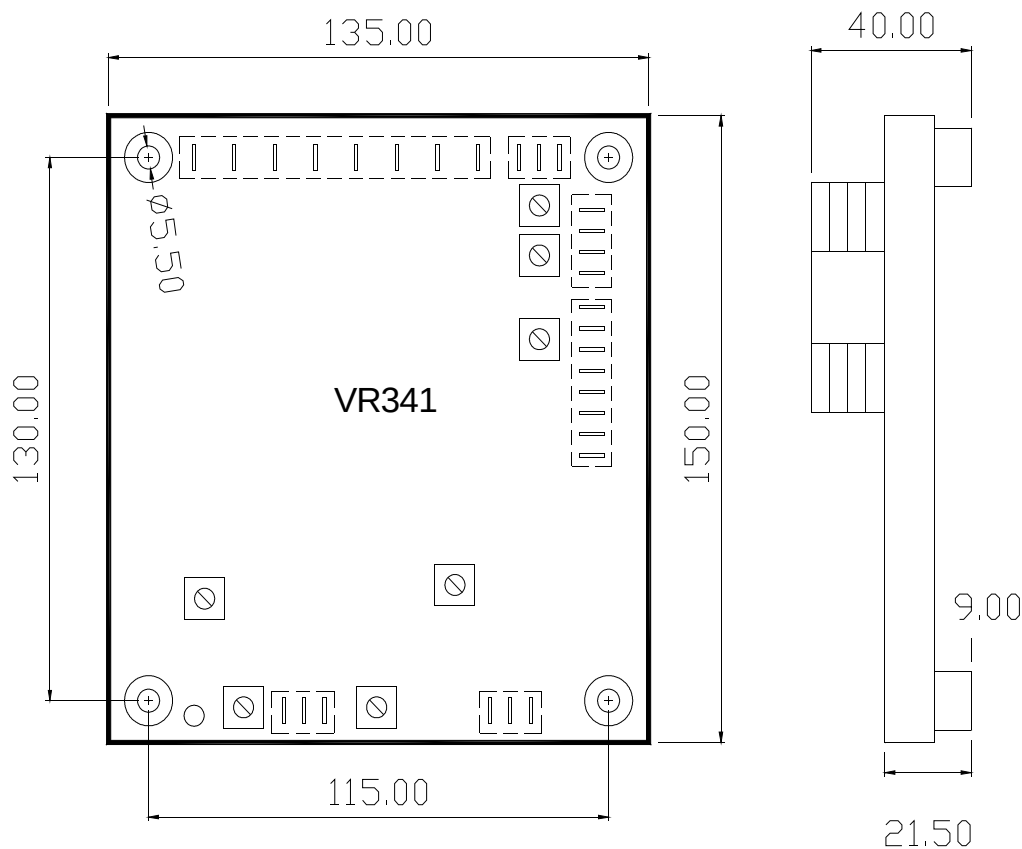
The generator must be stopped to reset an over-excitation trip.

4.7 DIP Adjustment

This feature is mostly used when the generator is coupled to turbo charged engines with limited block load acceptance. The feature works by increasing the V/Hz slope to give greater voltage roll off in proportion to speed.

With the DIP control fully anti-clockwise, the generator voltage will follow the normal V/Hz line as the speed falls below nominal. Turning the DIP control clockwise provides greater voltage roll-off aiding engine recovery.

5. FITTING AND OPERATING (Refer to generator wiring diagram for connection details)



Outline Drawing
Figure 1

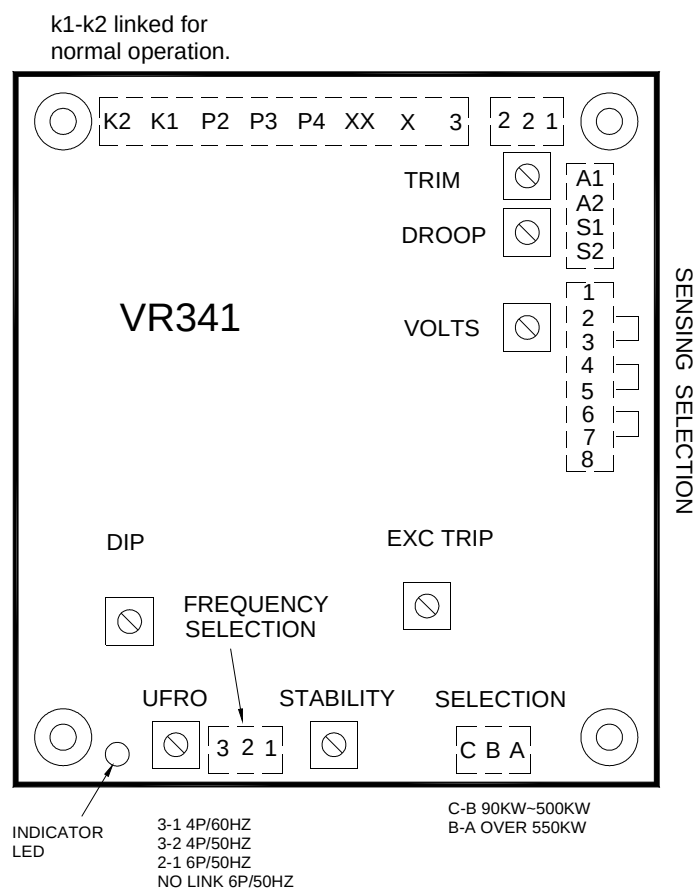


Figure 2 Drawing

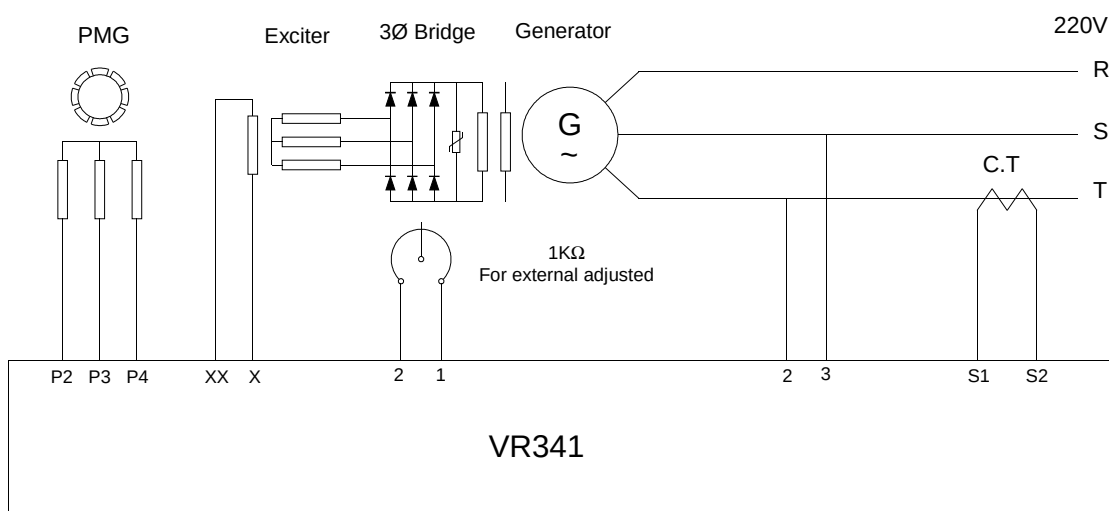


Figure 3 Wiring Drawing

Note : When the system voltage is over 250VAC, a transformer is necessary at sensing input terminals.
On 12 lead machines, you can sense of the center of the wye if preferred.

※ If the step above does not correct the problem, please contact us.

AVR CONVERSION INSTRUCTIONS

Fitting Kit 45-0053

For Use With MX341 AVR Part No. E000-23410

Permanent Magnet Generators ONLY

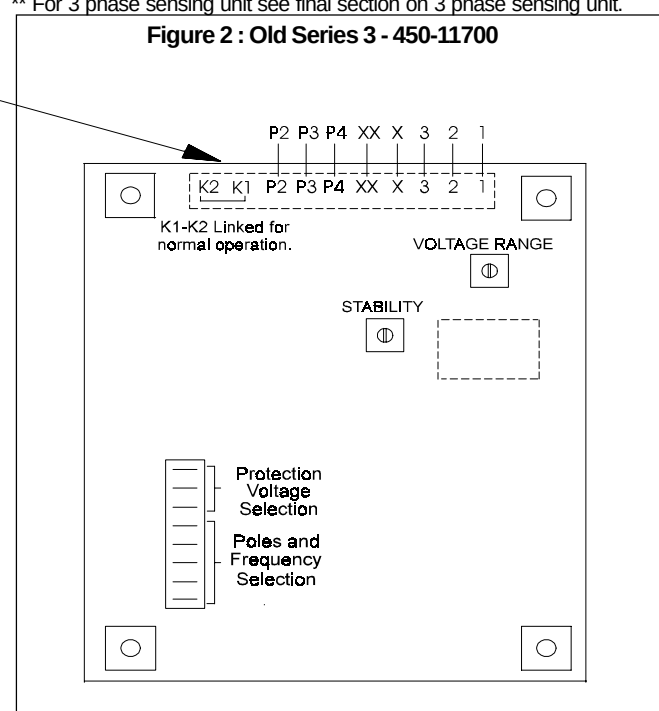
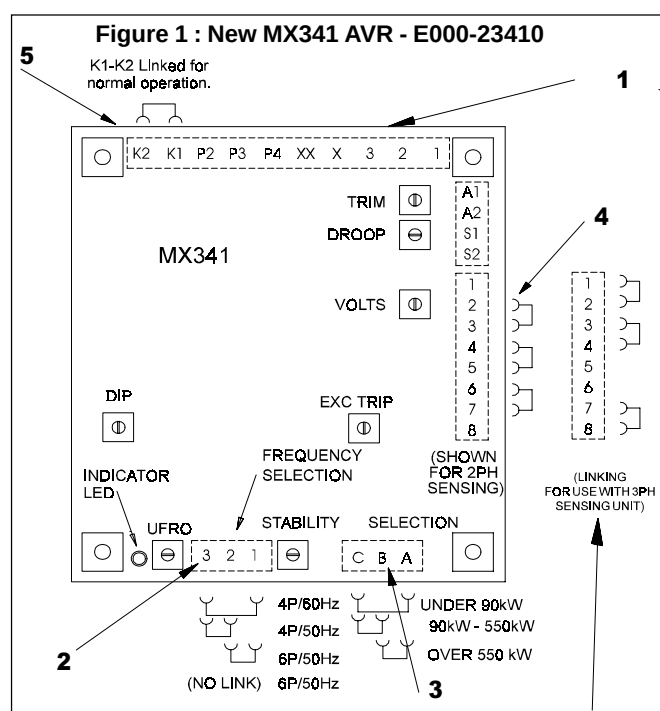
Fitting kit 45-0053 comprises the following:-

- 1 - Adjustment & Identity Label E00-13418
- 1 - MX341 Instruction Sheet NP7-006:5513

The MX341 AVR is fully interchangeable with the following:-

Series 3	4 Pole	450-11700
Series 3	3 Phase Sensing	450-11800**
Series 3	VAr, AVR	E000-23010
Series 3	VAr, AVR (3 Phase Sensing)	E000-23015**
Series 3	Special Slope AVR	E000-23000
Series 3	LA32	E000-23020
Series 3	LA33	E000-23030

** For 3 phase sensing unit see final section on 3 phase sensing unit.



Warning !

DO NOT CONNECT AS SHOWN FOR 3 PHASE SENSING UNLESS THE GENERATOR IS ALREADY FITTED WITH A 3 PHASE SENSING UNIT.

INSTRUCTIONS

Refer to figure 1 and 2 (above) the following instructions refer to items 1-5 respectively on above diagrams.

Refer to figure 3 and 4 (overleaf) for instruction 6 and AVR and auxiliary terminal position.

1. Connect AVR wires to terminals with identical markings. Cut off and insulate lead P1 if fitted.
2. Select correct frequency tapping 50Hz or 60Hz, 4 and 6 pole machines.
3. Select correct link on C, B, A, for size of generator.
4. Links will be connected as shown on AVR, **DO NOT MOVE THESE LINKS** unless your old AVR (figure 2) is type 450-11800 with separate 3 phase sensing unit. See section overleaf on 3 phase sensing unit.
5. **DO NOT REMOVE LINK MARKED K1-K2** on AVR terminals, unless a protection trip was fitted across K1-K2 on previous AVR.

Refer to figure 3,4,5 and 6 overleaf.

6. Remove generator terminal box lid, link together auxiliary terminals marked 1 and 2 or short wires 1 and 2 together on the same terminal.

Generator Types - AVR and Auxiliary Terminal Position

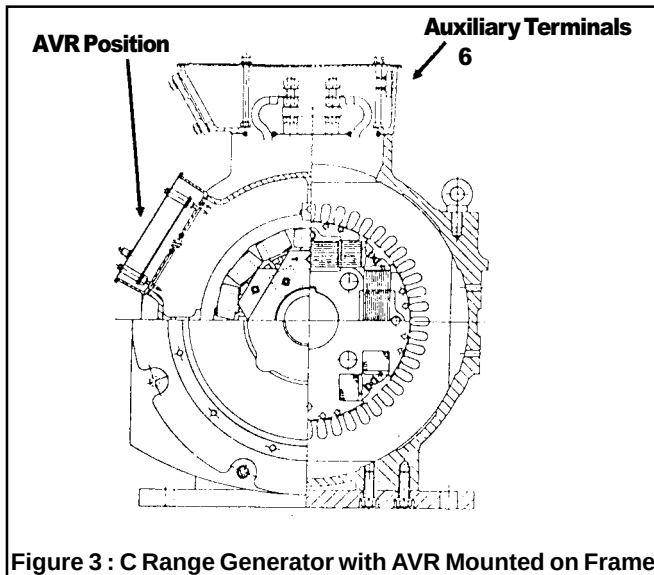


Figure 3 : C Range Generator with AVR Mounted on Frame

AUXILIARY TERMINALS

If a remote voltage trimmer is not required, short circuit auxiliary terminal 1 and 2, as shown in figures 5 and 6.

MACHINES MANUFACTURED AFTER FEB 87

For machines manufactured after February 1987 a new Push-on auxiliary terminal arrangement is within the terminal box (See figure 5 below). Pull-off wire marked 1 and push-on to auxiliary terminal marked 2.

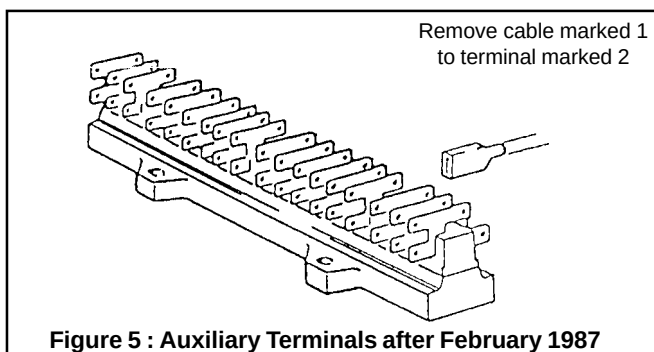


Figure 5 : Auxiliary Terminals after February 1987

MACHINES MANUFACTURED BEFORE FEB 87

For machines manufactured before February 1987 a Stud arrangement is within the terminal box (See figure 6 below). Unscrew stud holding wire marked 1 remove all washers and place onto auxiliary terminal marked 2.

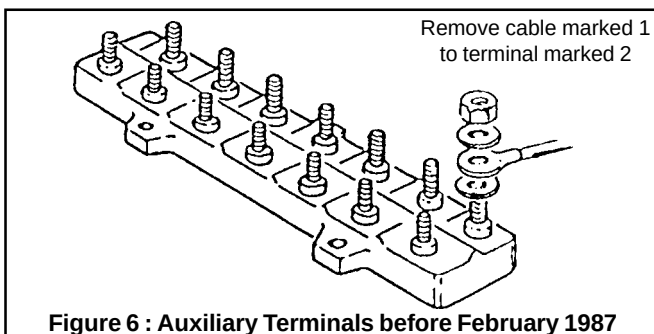


Figure 6 : Auxiliary Terminals before February 1987

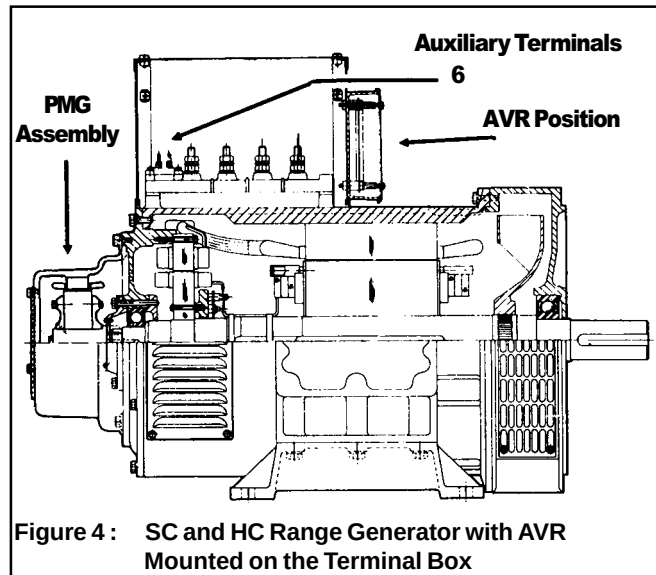


Figure 4 : SC and HC Range Generator with AVR Mounted on the Terminal Box

SETTING UP INSTRUCTIONS

Refer to MX341 instruction sheet (Publication No. NP7-006:5513), for adjustment of voltage and stability controls.

If the generator is NOT required for parallel operation or for use with VAR/PF controller, adjust AVR controls marked "DROOP" AND "TRIM" fully ANTICLOCKWISE.

For parallel operation the MX341 AVR is fully compatible with existing droop equipment in the generator.

REMOTE HAND TRIMMER : 1K W Part No. 071-01649

If a remote hand trimmer is required, it is connected to the auxiliary terminal block at terminals 1 and 2 in the generator terminal box. If a 4.7K W trimmer (Part No. 071-01037) is already fitted, then the effective control will be "all at one end". If this is unsatisfactory for fine voltage adjustment then the new 1K W hand trimmer should be fitted.

3 PHASE SENSING UNIT

The MX341 will operate in conjunction with the existing 3 phase sensing unit (Part No. 450-11000). The correct connection links must be made on the AVR for 3 phase sensing. Refer to the MX341 instruction sheet (Publication No. NP7-006:5513).

Should the 3 phase sensing unit be faulty, a direct replacement is available from our Parts Department.

IMPORTANT ! SEE ITEM 4 OVERLEAF.

DO NOT CONNECT AVR IN THE 3 PHASE SENSING MODE UNLESS A SEPERATE 3 PHASE SENSING UNIT IS ALREADY FITTED OR HAS BEEN PURCHASED FOR FITTING WITH THE MX341 AVR.

NEWAGE INTERNATIONAL LIMITED

Registered Office and Address:

PO Box 17, Barnack Road, Stamford, Lincolnshire PE9 2NB England.

Telephone: 44 (0) 1780 484000 Fax: 44 (0) 1780 484100 Website: newagestamford.com Registered in England No. 441273