GX 340 SERIES

(AUTOMATIC VOLTAGE REGULATOR)

Email Address: info@powersystems.com.au

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This AVR will replace the following Stamford Part Nos. And many more

350 28700
450 11700
E000 24030
E000 23410

Power Drive Systems

GX 340 AUTOMATIC VOLTAGE REGULATOR

1. INTRODUCTION

The GX340 is a solid state device, which is designed to give accurate and stable voltage regulation of alternators.

The regulator is specially designed to replace most Stamford electronic regulators for series 3 and 4 machines, one or three phase 50 or 60 Hz machines with out the need to rewire the AVR.

The regulator is suitable for parallel operation of alternators with quadrature droop facilities with only an additional standard 1 amp current transformer being required.

The regulator has several features:

- Voltage adjustment $\pm$ 10% over each range
- Overload sensing and shutdown
- Wide range of stability
- Underspeed adjustment which will provide voltage droop with large motor starting loads, this feature will provide excellent starting characteristics and prevent unnecessary stalling of the prime mover
- Remote voltage adjustment available
- Transformer isolated voltage sensing
- Accessory input DC signals up to +/- 5volt
- Quadrature droop

2. OPERATION

The regulator senses the alternator output and derives excitation power from the 2 phase connections to the alternator tapped output. 208 volts or from the permanent magnet exciter on series 3 machines.

Regulation and stability is maintained provided the prime mover speed is within governor class A1 to IS03046, at any machine load or power factor by comparing the sensed voltage with an internal reference point.

The unit constantly adjusts the field excitation level to compensate for voltage difference between the sensed voltage and reference.

Output voltage of the machine will be held to $\pm$ 1.5% including cold to hot variations in ambient conditions of -40 deg. to +70 deg. and engine speed changes of $\pm$ 4% from preset nominal.

3. CONSTRUCTION

The assembled PCB can be solidly mounted in the standard alternator terminal box which provides the necessary mechanical protection or in a separate control cubicle enclosure.

All components used are selected for stable operation in ambients ranging from -10 deg. to 70 deg. and severely capacity derated for high reliability.

The printed circuit board is a 1.5mm reinforced fibreglass with double sided tracks and plated through holes.

4. CONTROLS

There are 7 standard controls on each regulator.

a. STABILITY I - R9

This potentiometer adjusts the stability and response of the alternator and should initially be set in a counter-clockwise position and rotate clockwise to give optimum stability and response characteristics. Once set, no further adjustment should be necessary.

Full CCW position gives maximum response, minimum stability.

Full CW position gives minimum response, maximum stability.

b. VOLTAGE ADJUST - R11

This potentiometer varies the reference voltage and hence the amount of excitation of the alternator which adjusts the output voltage over a range of ± 10%.

An external 5K potentiometer may be added for remote panel voltage adjustment. When this is used the loop between 1 and 2 on the external connector block should be removed and the internal pot is turned to maximum.

c. UNDERSPEED - R19

This potentiometer sets the frequency at which voltage drooping with speed will occur.

For example, if set at 48Hz and a large motor is started which temporarily overloads the prime mover on starting, once the speed falls to 48Hz the alternator voltage will decrease and as an automatic reduced voltage starter and greatly assist in motor starting.

d. OVERLOAD - R32

This potentiometer sets the maximum permissible field excitation should the engine speed remain constant whilst the alternator is overloaded. Allowances are made for temporary overloaded by a non-adjustable built in 15 seconds delay.

Once the overload does trip, the output voltage falls to approximately 50 volts and can only be reset by stopping the engine.

e. STABILITY II - R10

This potentiometer widens the range of stability and should always be normally fully anti-clockwise and only adjusted slightly clockwise to counter further stability should 'Stability I' run out of range particularly on **single phase machines.**

f. **QUADRATURE DROOP - R2**
This potentiometer sets the amount of CT signal injected into the sensing circuit to cause voltage droop which increases PF loads.

g. **VOLTAGE TRIM - R47**
This potentiometer sets the level of external DC voltage applied up to +/- 5 volts to adjust for F / VAR control.

5. ADJUSTMENTS

a. **VOLTAGE**
The regulator sensing voltage must be first adjusted to the nominal output voltage.

Note:

If replacing other electronic regulators for convenience use the same sensing connections if possible.

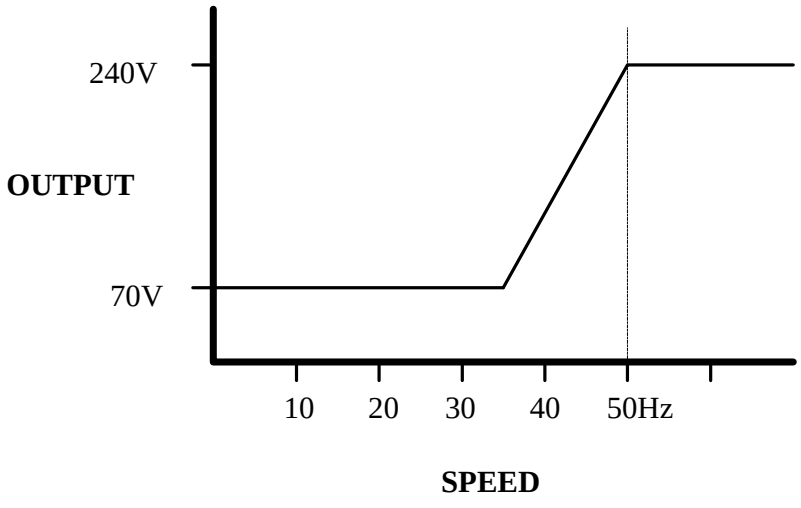
b. **STABILITY**
Rotate clockwise to increase stability.

To check, if after sudden load change prolonged fluctuation occurs, turn stability slightly clockwise, or if voltage is very slow to recover from load changes then counter clockwise.

c. **UNDERSPEED**
To adjust the alternator must be running at the correct speed.
i.e. 50Hz ± at no load.

Connect an AC voltmeter across the output of the alternator and slowly turn the underspeed potentiometer clockwise until the voltage just starts to fall, then turn slightly counterclockwise, approx 30 deg.

To check, apply full load if possible and voltage should not droop more than 1%, or alternatively lower speed to 48Hz and voltage should droop.



d. **OVERLOAD**

Note:

Some alternator manufacturers state maximum field voltage or scoop setting, these will correspond to overload setting.

To adjust correctly connect a 0-50V voltmeter across the field positive and negative.

Run the plant at the correct speed and apply full load, slowly turn the overload potentiometer counter-clockwise until the LED just lights then turn 30 deg. clockwise until LED off.

Apply overload, LED should illuminate for 15-20 seconds before output falls to approximately 50-80 volts AC.

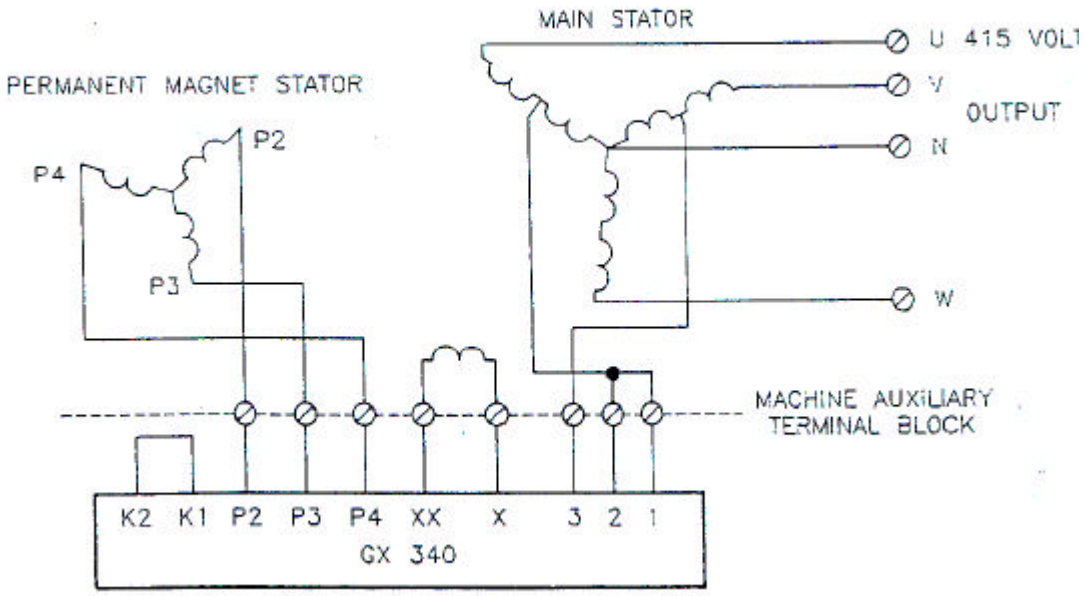
Stopping the plant will automatically reset this function.

If load is not available an alternative test is to connect a 50 ohm rheostat in the field circuit (series) and by increasing the resistance this will cause the field voltage to increase until the desired maximum level is reached. (In the absence of any manufacturers detail a maximum field voltage of 46 - 48V can be used.)

6. CONNECTIONS

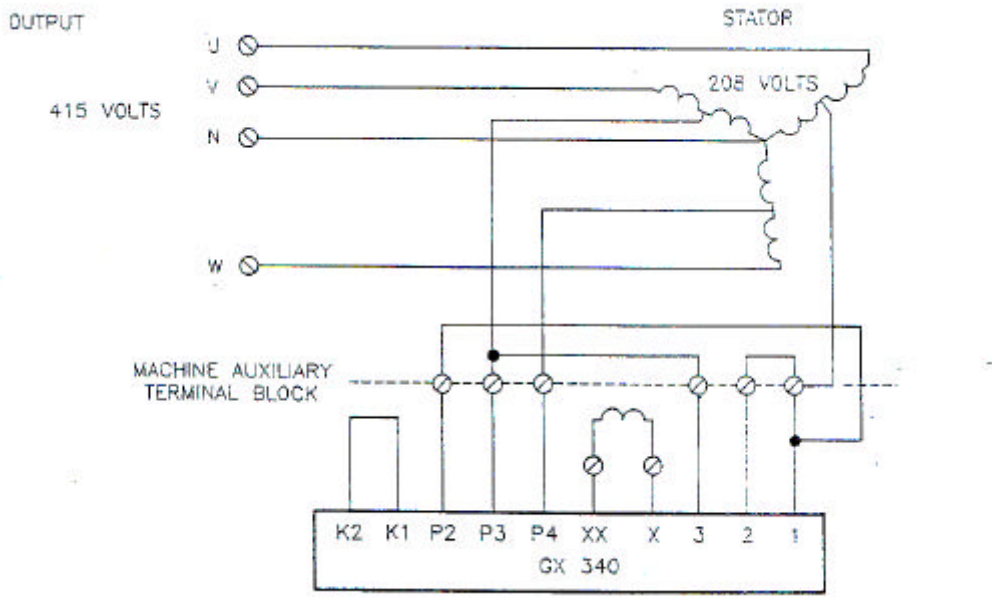
a. **STANDARD 3 PHASE 4 WIRE**
Permanent magnet exciter system

Figure 1



b. STANDARD 3 PHASE SERIES 4

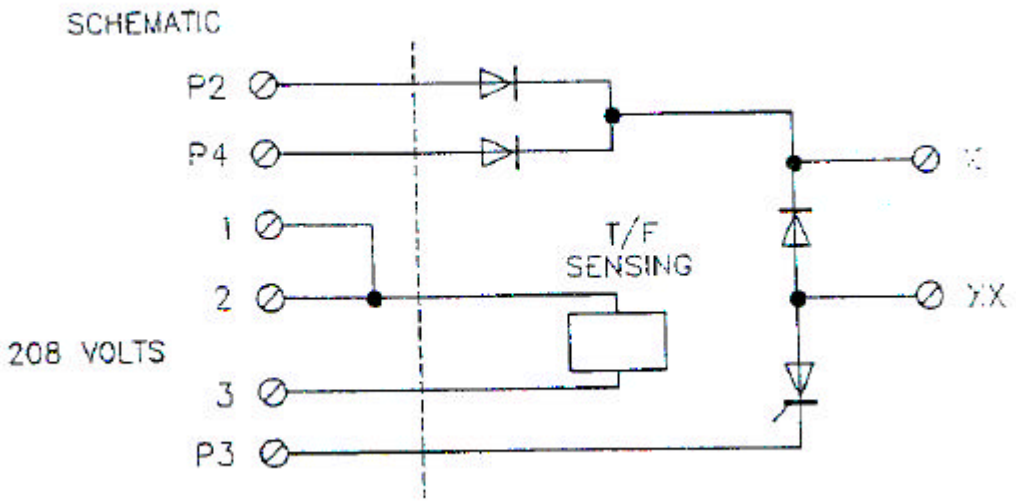
Figure 2



c. <u>SERIES 3 CONNECTIONS</u>

Voltage sensing between U (1 and 2) and V (3) = 208 Volts.
Power to AVR P2, P3, and P4.

Figure 3



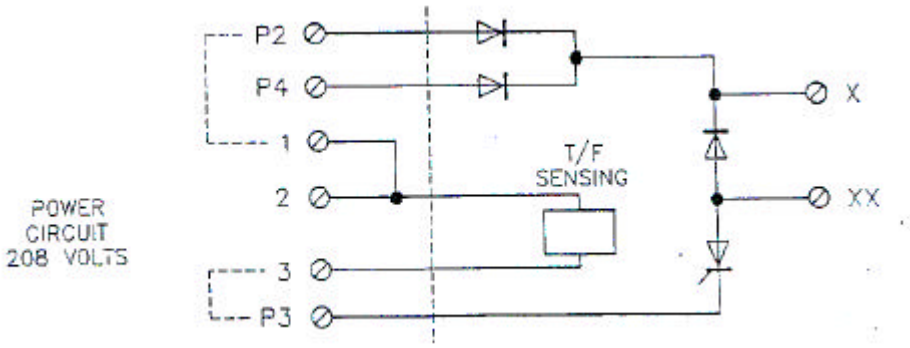
d. **SERIES 4 CONNECTIONS**

Voltage sensing between U (1 and 2) and V (3) = 208 Volts.
Power to AVR from P2 looped to (1 and 2), P3 (3), and P4.

Notes:

Power for excitation comes from 2 phase supply
Neutral not connected to AVR

Figure 3



8. **DROOP FACILITY**

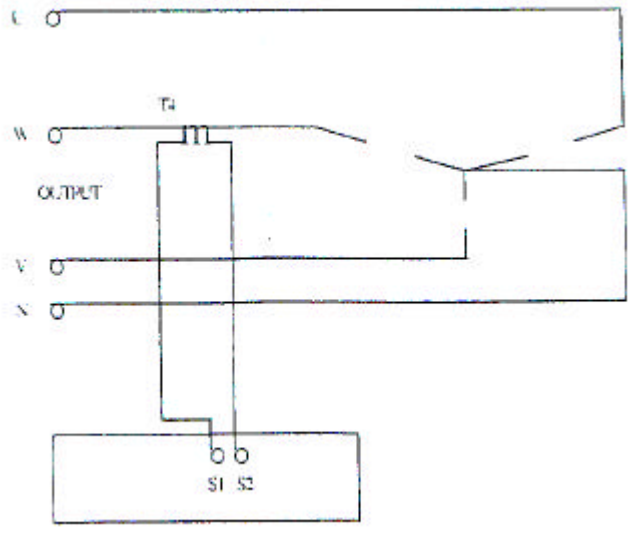
The regulator has quadrature droop facilities for parallel operations.

Quadrature droop allows load sharing of reactive load (KVAR) only since KW load is a function of the prime mover.

A current transformer with 1 amp output at 10VA secondary rating and ratio the alternator output is required.

The current transformer must be connected in the blue phase or W output terminal. It is to be noted that the AVR senses Red L1 and Yellow L2 phase voltage and to achieve quadrature droop, current must be sensed in the blue or L3 phase.

Figure 4



Notes:

R2 must be adjusted on both plants to give same voltage drop (approximately 5V/100%) for equal % of load for correct KVAR load sharing.

If rising voltage with load is detected the current transformer primary current flow direction must be reversed by reversing the transformer wires.

9. SPECIFICATIONS

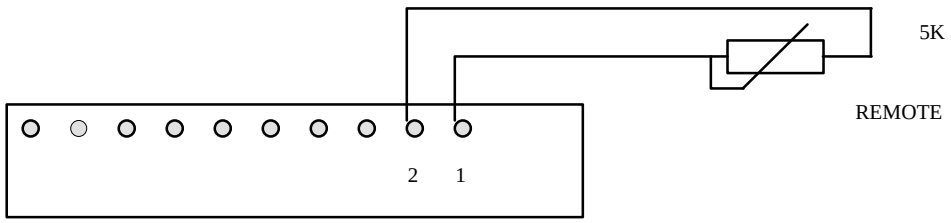
Voltage range 170 - 280 ± 10% input
Frequency 50 - 60 Hz
Maximum field current 10 amps
SCR rated at 25 amps 1000 volts
Suitable for single and three phase alternators
Regulation ± 1%
Temperature -40 to 70°
Underspeed adjustment 10Hz - 120Hz
Time delay 15 - 20 seconds approximately fixed for overload shutdown
Residual voltage required for reliable excitation 3-5 volts
Minimum field resistance 3-5 ohms
Field voltage approx 50% of input sensing voltage
Quadrature droop
V/ trim accessory input +/- 1v = ± 15 volts

10. REMOTE VOLTAGE CONTROL

The AVR has remote voltage facilities where the voltage range can be varied up to 10%.

Remove bridge between terminal 1 and 2 and fit external 5K linear 2W potentiometer. Turn the pot on the AVR fully clockwise so as to have maximum voltage range.

Figure 5



Important:

Potentiometer is operating at high voltage to earth

11. AVR CONVERSION INSTRUCTIONS

Remove old or defective AVR and note connections on the back of the unit.

The terminal positions may be different from that of the new AVR.

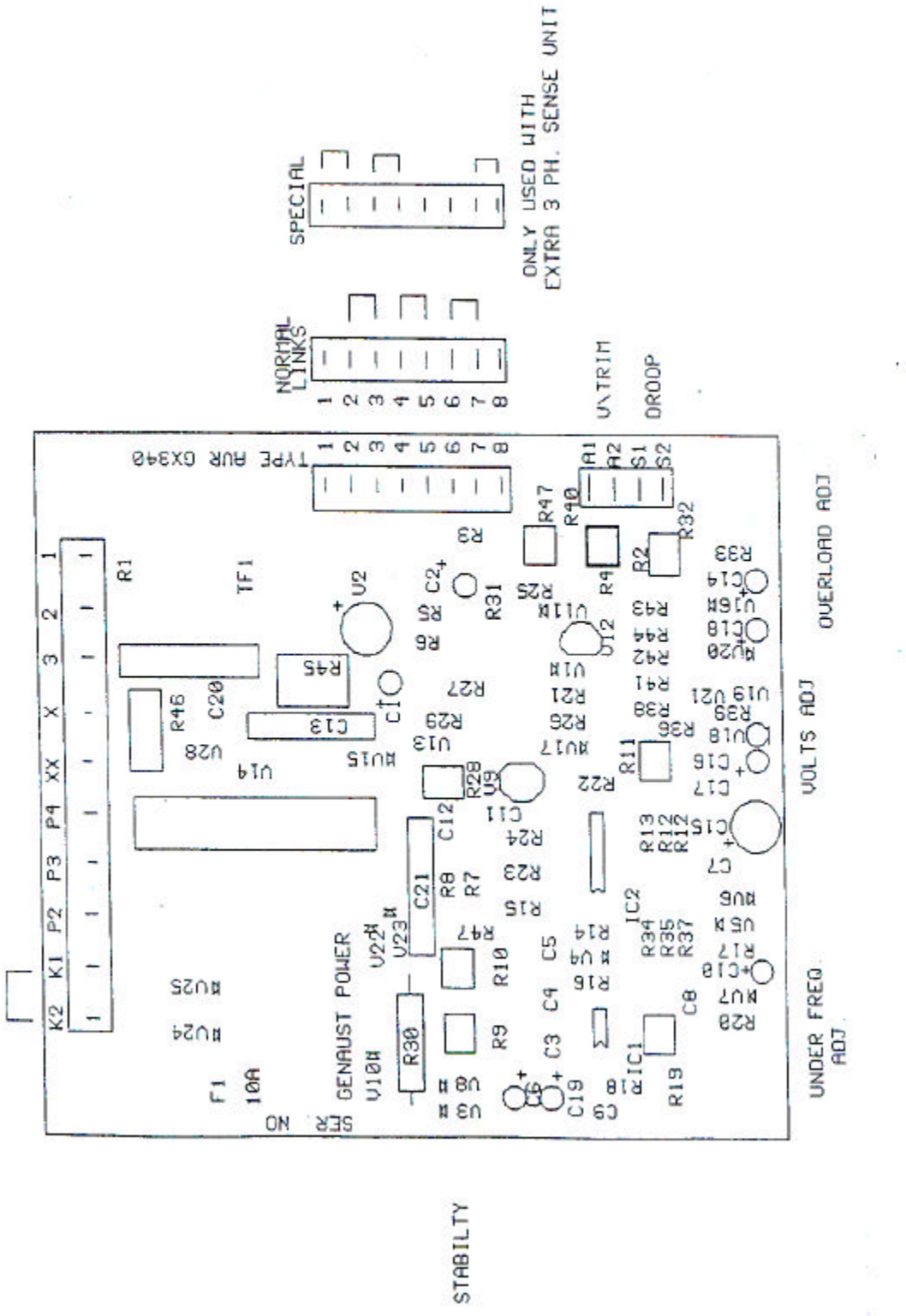
Reconnect replacement AVR taking note of wire markings to corresponding terminal numbers. Eg. P2 to P2, x to x etc.

Notes:

If AVR had P1 connected, cut off and insulate - P1 wire is not used.

12. COMPONENT LAYOUT

Figure 6



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WARRANTY CLAIM PROCEDURE

(a) On identifying a possible component fault advise the company in writing the model and serial number of the component and major assembly it is part of as well as fault details.

(b) Remove and return the faulty component to the company following any tests or checks requested by the company.

BASIC WARRANTY CONDITIONS

(a) The warranty is a 12 month back to base warranty where the customer is liable for the re delivery costs.

(b) Items modified without the companies knowledge or approval may not be warrantable.

(c) If the company is required to inspect / remove or reinstall any part of the goods, the customer will be liable for any out of pocket expenses.

(d) Major third party items such as engines and alternators are subject to the original manufacturers warranty only.

(e) The warranty does not cover inter alias, loss of damage due to accident misuse or fair wear and tear.

WARRANTY REGISTRATION

CUSTOMER NAME: _____

ADDRESS: _____

_____

TELEPHONE No: _____ **FAX No:** _____

ITEM MODEL No: _____ **SERIAL No:** _____

SUPPLIER NAME: _____

DATE PURCHASED: _____