AS440 AUTOMATIC VOLTAGE REGULATOR (AVR)

Technical specification

SENSING INPUT
- Voltage: Jumper selectable 100-130 Vac 1 phase or 190-264 Vac 1 phase
- Frequency: 50-60 Hz nominal

POWER INPUT
- Voltage: 100-264 V ac 1 phase
- Frequency: 50-60 Hz nominal

OUTPUT
- Voltage: 82 V d.c. @ 200 V a.c.
- Current: continuous 4A (see note 1). transient 7.5A for 10 secs.
- Resistance: 15 ohms min (10 ohms min when input volts is less than 175 ac)

REGULATION
+/- 1.0% (see note 2)

THERMAL DRIFT
0.03% per deg. C change in AVR ambient (see note 3)

TYPICAL SYSTEM RESPONSE
- AVR response: 20 ms
- Filed current to 90%: 80 ms
- Machine Volts to 97%: 300 ms

EXTERNAL VOLTAGE ADJUSTMENT
+/-10% with 1 k ohm 1 watt trimmer (see note 4)
Increasing resistance lowers voltage.

UNDER FREQUENCY PROTECTION
- Set point: 94 -98% Hz (see note 5)

UNIT POWER DISSIPATION
12 watts maximum

BUILD UP VOLTAGE
4 Volts @ AVR terminals

ANALOGUE INPUT
- Maximum input: +/- 5 Vdc (see note 6)
- Sensitivity: 1V for 5% Generator Volts (adjustable)
- Input resistance: 1k ohm

QUADRATURE DROOP INPUT
10 ohms burden
Max. sensitivity: 0.07 A for 5% droop 0PF
Max. input: 0.33 A

OVER EXCITATION PROTECTION
- Set point: 65 V dc
- Time delay: 10-15 seconds (fixed)

ENVIRONMENTAL
- Vibration: 20-100 Hz 50mm/sec; 100Hz – 2kHz 3.3g
- Operating temperature: -40 to +70C (note 7)
- Relative Humidity 0-70C: 95% (note 8)
- Storage temperature: -55 to +80C

NOTES
1. De-rate by 12% if mounted in 'portrait' orientation.
2. With 4% engine governing.
3. After 2 minutes.
4. Generator de-rate may apply. Check with factory.
5. Factory set, semi-sealed, jumper selectable.
6. Any device connected to the analogue input must be fully floating (galvanically isolated from ground), with an insulation strength of 500V ac.
7. De-rate output current by 5% per degree C above 60C.
8. Non condensing.

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
STAB SWITCH	TO OPTIMISE TRANSIENT PERFORMANCE	SEE TABLE ABOVE
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
VTRIM	TO OPTIMISE ANALOGUE INPUT SENSITIVITY	CLOCKWISE INCREASES THE GAIN OR SENSITIVITY
EXC TRIP	TO SET OVER EXCITATION TRIP CUT OFF LEVEL	CLOCKWISE INCREASES THE CUT OFF LEVEL

ADJUSTMENT OF AVR CONTROLS

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. If major adjustment is necessary or you lose stability, follow the 'VOLTAGE SETUP PROCEDURE'.

Terminals 1 and 2 on the AVR w ill be fitted with a shorting link if no hand trimmer is required. Terminals La and Lb are linked only for special low voltage applications.

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

WARNING! Do not ground an of the hand trimmer terminals as these could be abov e earth potential. F ailure to observe this could cause equipment damage.

WARNING!
If a replacement AVR has been fi tted or re-setting of the VOLTS adjustment is required, turn the VOLS control fully anti-clockwise before running generator.

VOLTAGE SETUP PROCEDURE

For major adjustments and replacing the AVR.
Read and understand this procedure before attempting to follow it.

1. Before running generator, turn the VOLTS control fully anti-clockwise.
2. Turn remote volts trimmer (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.

STABILITY ADJUSTMENT

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

A switch is provided to change the response of the stability circuit to suit diffe rent frame size generators and applications. The table shows the options available.
The slow response settings may prove helpful in reducing lamp flicker.

The correct setting of the Stability adjustment can be found by running the generator at no load and slow ly turning the stability control anti-clockwise until the generator voltage starts to become unstable.

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

UNDER FREQUENCY ROLL OFF ADJUSTMENT

The AVR incorporates an underspeed protection circuit which gives a volts/Hz characteristic when the generator speed falls below a presettable threshold know n 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 50/60Hz using the jumper link.

For optimum setting, the LE D should illuminate as the frequency falls just below nominal, i.e. 47Hz on a 50Hz system or 57Hz on a 60Hz system.

DROOP ADJUSTMENT

Generators intended for paralle l operation are fitted w ith a quadrature droop C.T. which provides a pow er factor dependent signal for the AVR. T he C.T. is connected to S1, S2 on the AVR.

The DROOP adjustment is normally preset in the works to give 5% voltage droop at full load zero power factor.

Clockwise increases the amount of C.T. signal injected into the AVR and increases the droop w ith lagging power factor (cos Ø). W ith the control fully anti-clockwise there is no droop.

TRIM ADJUSTMENT

An analogue input (A1 A2) is provided to connect to a Power Factor Controller or other devices. It is designed to accept dc signals up to +/- 5 volts.

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

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. W ith TRIM fully anti-clockwise the externally applied signal has no effect. Clockw ise it has maximum effect.

Normal setting is fully clockwise when used w ith a Pow er

OVER EXCITATION (EXC TRIP) ADJUSTMENT

The adjustment is set and sealed in the works and should not be altered.

An over excitation condition is indicated on the common LED which also indicates under speed running.

The generator must be stopped to reset an over excitation condition.

ISOLATING THE EXCITATION CIRCUIT

In some applications it is desirable to isolate the excitation circuit. There are two different ways of doing this depending on the AVR connection to the generator stator.

The modifications mentioned below must be done with the generator at rest.

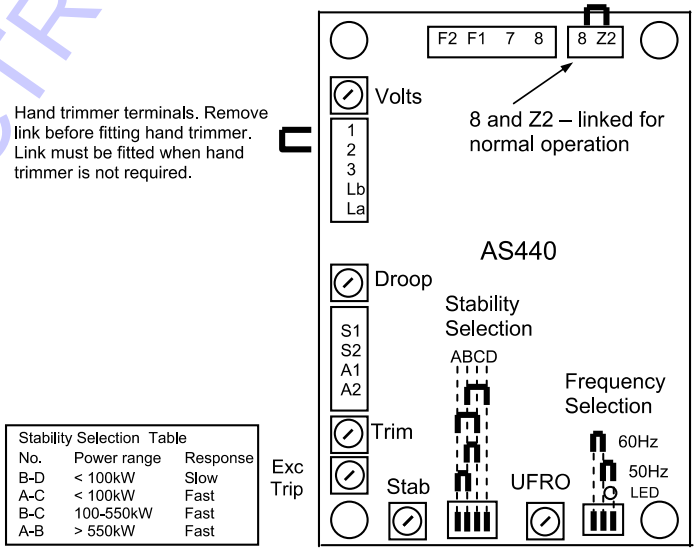
If the AVR is fitted with a link across the 2 way terminal block Z2 & 8, then the AVR power circuit is connected to the main stator winding. In this case a switch with a Nominal rating of 240vac 10 Amps can be connected across the AVR terminals Z2 & 8 after removing the link.

When the switch is open, the excitation circuit is isolated. The link should be kept for future use if required.

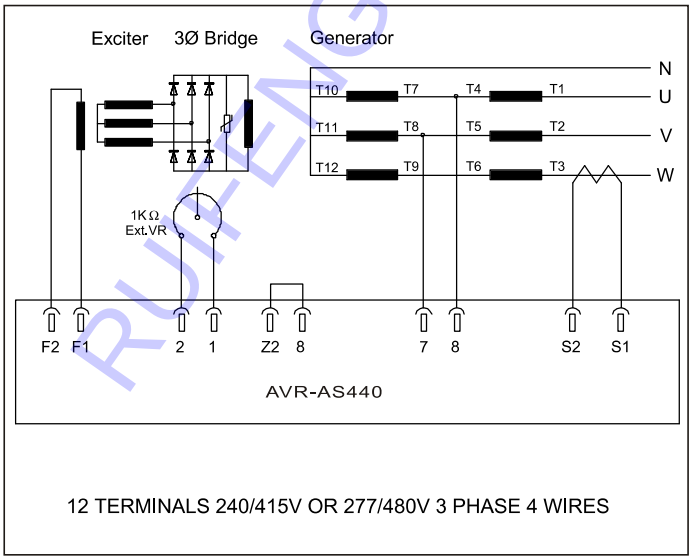
If the AVR has a wire connected to terminal Z2 (wire labeled Z2), then the AVR power circuit is connected to an auxiliary winding. In this case a switch with a nominal rating of 240vac 10 Amps can be connected in series with the wire Z2.

When the switch is open, the excitation circuit is isolated.

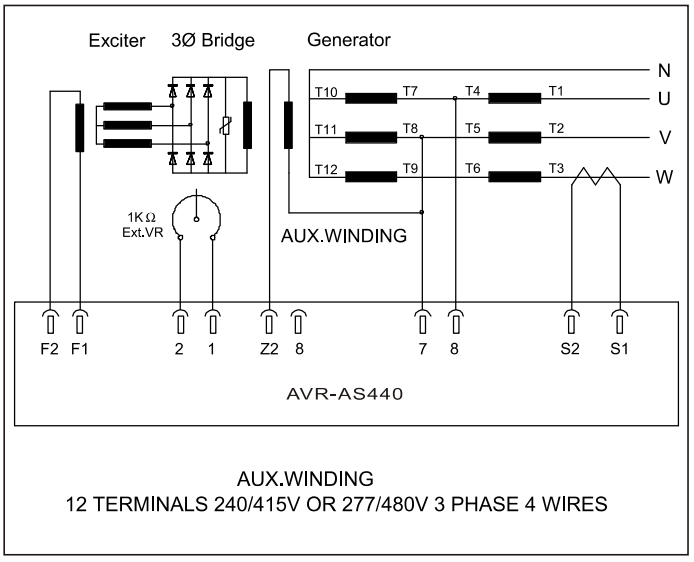
REFER TO GENERATOR WIRING DIAGRAM FOR CONNECTION DETAILS



Stability Selection Table		
No.	Power range	Response
B-D	< 100kW	Slow
A-C	< 100kW	Fast
B-C	100-550kW	Fast
A-B	> 550kW	Fast



12 TERMINALS 240/415V OR 277/480V 3 PHASE 4 WIRES



AUX.WINDING
12 TERMINALS 240/415V OR 277/480V 3 PHASE 4 WIRES