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Guide to Synchronising and Load Sharing Part 2

Governor and AVR interfacing

**With DSE8710 / DSE8610 / DSE75xx / DSE55xx & DSE55x
controllers**

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057-046 DSE Guide to Synchronising and Load Sharing Part 2 – Governor and AVR interfacing

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1 INTRODUCTION

This document (Part 2 of the DSE Guide to Synchronising and Load Sharing) is intended to provide a guide to panel designers for interfacing the 550 / 555 / 5510 / 5520 / 7510 / 7520 / 8610 / 8710 Synchronising / Load Sharing Controllers to many of the most popular engine speed governors and automatic voltage regulators.


Part 1 of this manual consists of the Guide to Synchronising and Load Sharing and how to use / configure the 5xxx controller for use in synchronising and load sharing systems.

The information contained within this document should be used as a guide to assist the system designer. Information should be checked against the documentation of the governor / AVR being used and their respective manufacturers contacted if assistance with these devices is required.

Equipment designated with the asterisk (*) have been tested and witnessed working by DSE personnel. However, the diagrams included within this manual are intended as a guide only, Engineers must be familiar with the AVR / Governor being used, and should always refer to the respective manufacturers instructions.

Settings for SW1 and SW2 are intended as a guide only. Individual sets may require different values for SW1 and/or SW2 depending upon the initial set up of the governor or AVR being connected to.

If your AVR / Governor is not covered within this manual, please contact our technical support department for advice using the contact details below.

 **NOTE:** - Some of the examples contained within this manual refer to engine connectors and governor/ECU functions that may be optional. Ensure you check with your engine/governor supply that the terminals discussed here are included with your purchase. This may sometimes incur additional cost to have the function enabled or fitted to the engine/governor/ECU

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2 INTERFACING TO GOVERNORS / ENGINE ECU'S

This section details the interface connections between the DSE controllers and the most popular engine speed governors used with diesel generating sets.

If your particular type of Governor is not covered within this section, you are referred to the section entitled *Determining connections and settings for governors/AVRs not listed in this publication* elsewhere in this document.

2.1 INTERFACING WITH 8710, 8610, 75XX AND 55XX CONTROLLERS

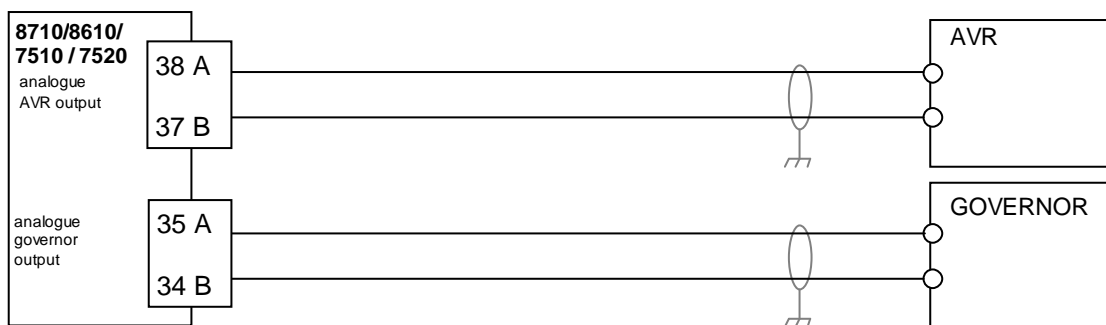
The analogue governor output provides an isolated, adjustable DC voltage level to connect into the control inputs of many governors. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The output is also suitable for connection to the load sharing inputs of many popular engine speed governors. This enables the 8710, 8610, 75xx and 55xx to adjust the speed of the engine to match the mains / bus and hence get the supplies into synchronism and is especially suited for use in active power sharing systems.

There is usually no requirement for speed droop to be enabled on the engine/governor, although this can help in certain applications (ie when in base load against another generator rather than the mains (Utility) supply

2.1.1 SPECIFICATIONS

Item	Value
Output type	DC voltage level
Isolation	Optically isolated to 1000V
Minimum output load	1000Ω

2.1.2 CONNECTION DETAILS (8710, 8610, 7510, 7520)

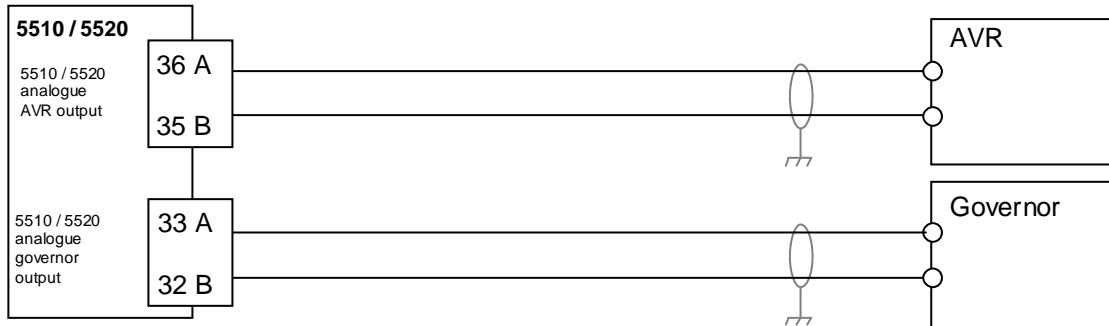


NOTE: - Further details on connections to various governors can be found elsewhere in this manual.

NOTE: - For details of the analogue AVR output see the relevant section elsewhere in this manual.

NOTE: - The length of cable between the DSE controller and the governor should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

2.1.3 CONNECTION DETAILS (5510/5520)



NOTE: - Further details on connections to various governors can be found elsewhere in this manual.

NOTE: - For details of the analogue AVR output see the relevant section elsewhere in this manual.

NOTE: - The length of cable between the 5510 / 5520 and the governor should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

2.1.4 ANALOGUE GOVERNOR OUTPUT SETTINGS

To enable the analogue Governor output to interface with as many different types of governor as possible, settings for voltage range and nominal voltage are adjustable using the module configuration software. These allow the user to configure the output of the module to match the input of the governor.

The SW1 software selector sets the 'centre' point of the interface module's output. For example: if the output range required is 1V to 3V, with the 'centre' point being at 2V, then the position of the SW1 selector would be 4.0, giving a voltage offset of 2V.

The SW2 software selector sets the voltage output range of the interface module's output. For example: if the output range required is 1V to 3V, then the position of the SW2 selector would be 1.0, giving a voltage range of $\pm 1V$ from the 'centre' point of 2V

For reference purposes, the software settings perform the following functions:

SW1 setting	'centre' voltage of governor output
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range of governor output
0	$\pm 0.5V$
1	$\pm 1.0V$
2	$\pm 1.5V$
3	$\pm 2.0V$
4	$\pm 2.5V$
5	$\pm 3.0V$
6	$\pm 3.5V$
7	$\pm 4.0V$
8	$\pm 4.5V$
9	$\pm 5.0V$

Typical wiring diagrams and SW1/SW2 selector settings for many of the most popular governors are included within the DSE guide to synchronising and Load Sharing (Part2).

NOTE: - If the governor you are using is not listed within this manual, it may still be possible to interface to it using the analogue governor output. Contact your governor manufacturer to check if the product has a DC voltage input for connection to a synchroniser / load sharer, and if so, what the 'voltage range' and 'centre voltage' is. You can then use the tables above to determine settings for SW1 and SW2. Analogue governor output terminal A is the negative output terminal and B is the positive output terminal (providing governor output reversed is not selected in the DSE controller's configuration). If the 'centre voltage' and 'voltage range' are not available from the governor manufacturer, providing the input is compatible with a DC voltage signal, it still may be possible to interface to it using the DSE modules. Contact our Technical Support Department for advice.

8710, 8610, 75xx and 55xx series controllers contain an analogue output to interface to the governor / ECU. This output is PC configurable using the configuration software to configure the centre voltage and voltage range to suit the governor / ECU in use. Additionally, the controller will send speed control signals via the electronic engine data link when used in conjunction with compatible engines.

LOCATION OF SW1 AND SW2 SELECTORS – 8710, 8610

Access to the software selectors is gained by using the configuration software in conjunction with the USB A to USB B connection cable.

The settings are found on the SCADA | GENERATOR page as shown below :

The screenshot displays the SCADA | GENERATOR configuration interface. It is organized into several sections:

- Interface**: The main title of the configuration page.
- Governor**: Contains two sliders. The first slider is labeled "Center (SW1)" with a value of 6.4. The second slider is labeled "Range (SW2)" with a value of 0.0.
- Speed and Frequency**: A table showing real-time values:

Engine Speed	0 RPM
Generator Frequency	0.0 Hz
Governor Analog	0.0 %
AVR Analog	0.0 %
- AVR**: Contains two sliders. The first slider is labeled "Center (SW1)" with a value of 8.0. The second slider is labeled "Range (SW2)" with a value of 0.0.
- Phase to Neutral Voltages**: A table showing voltage readings:

L1 - N	L2 - N	L3 - N
0.0 v	0.0 v	0.0 v
- Phase to Phase Voltages**: A table showing voltage readings:

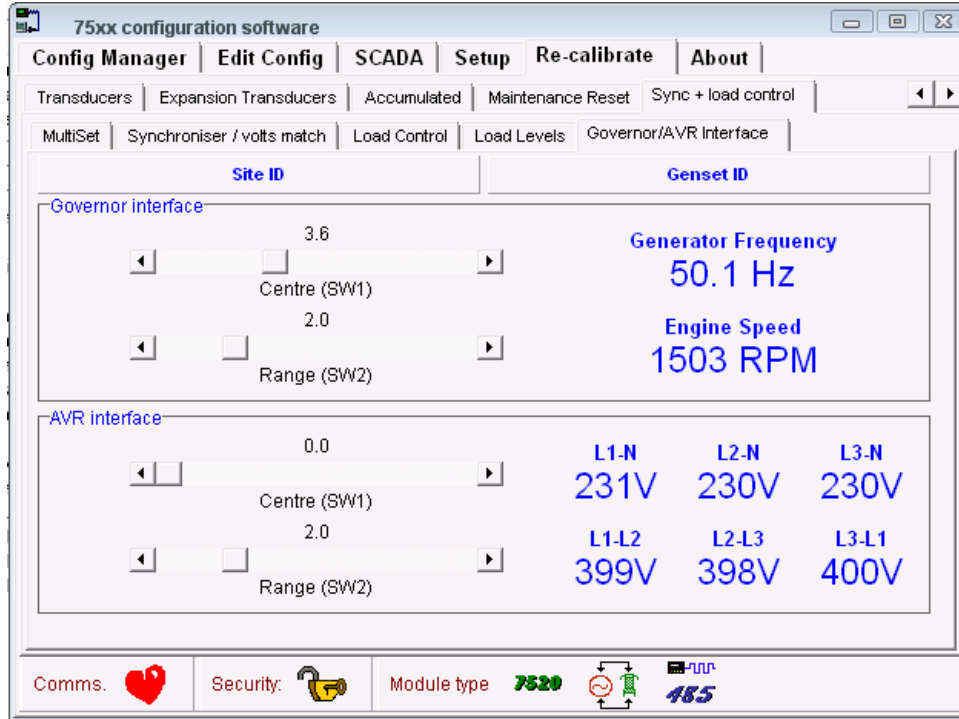
L1 - L2	L2 - L3	L3 - L1
0.0 v	0.0 v	0.0 v

Throughout this manual, SW1 and SW2 in the connection diagrams refer to these software "sliders".

LOCATION OF SW1 AND SW2 SELECTORS – 75XX & 55XX

Access to the software selectors is gained by using the configuration software in conjunction with the P810 interface cable.

The settings are found on the “Recalibrate” tab as shown below:




Throughout this manual, SW1 and SW2 in the connection diagrams refer to these software “sliders”.

2.2 INTERFACING WITH 55X CONTROLLERS

550 / 555 / 557 controllers require model P120 to interface between the controller and the governor or ECU. This interface has two selector switches to configure the centre voltage and voltage range to suit the governor or ECU in use.

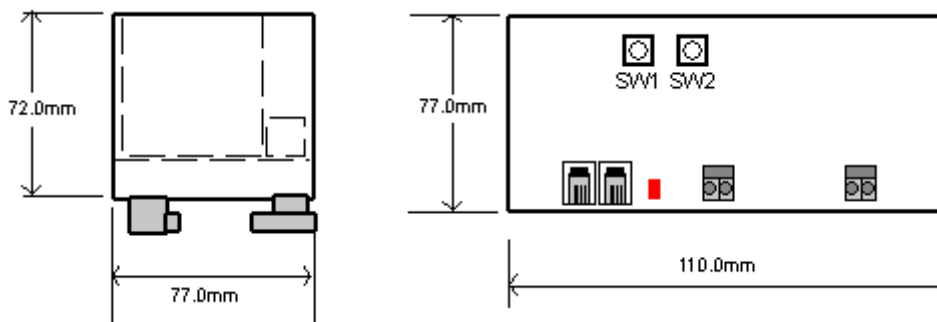
NOTE:- The P120 device is NOT required for 87xx/86xx/75xx/55xx controllers. See section entitled “87xx/86xx/75xx/55xx analogue governor output”.
The P120 analogue governor interface module is ONLY used to interface the 550/555/557 controllers with supported governors

Description	Photograph
<p>The P120 analogue governor interface module provides an isolated, adjustable DC voltage level to connect into the control inputs of many governors. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing inputs of many popular engine speed governors.</p> <p>The P120 interface is controlled directly by the 55x controller via its P120/P121 analogue expansion port. This enables the 55x to adjust the speed of the engine to match the mains / bus and hence get the supplies into synchronism. The P120 module is especially suited for use in active power sharing systems.</p>	

2.2.1 SPECIFICATIONS

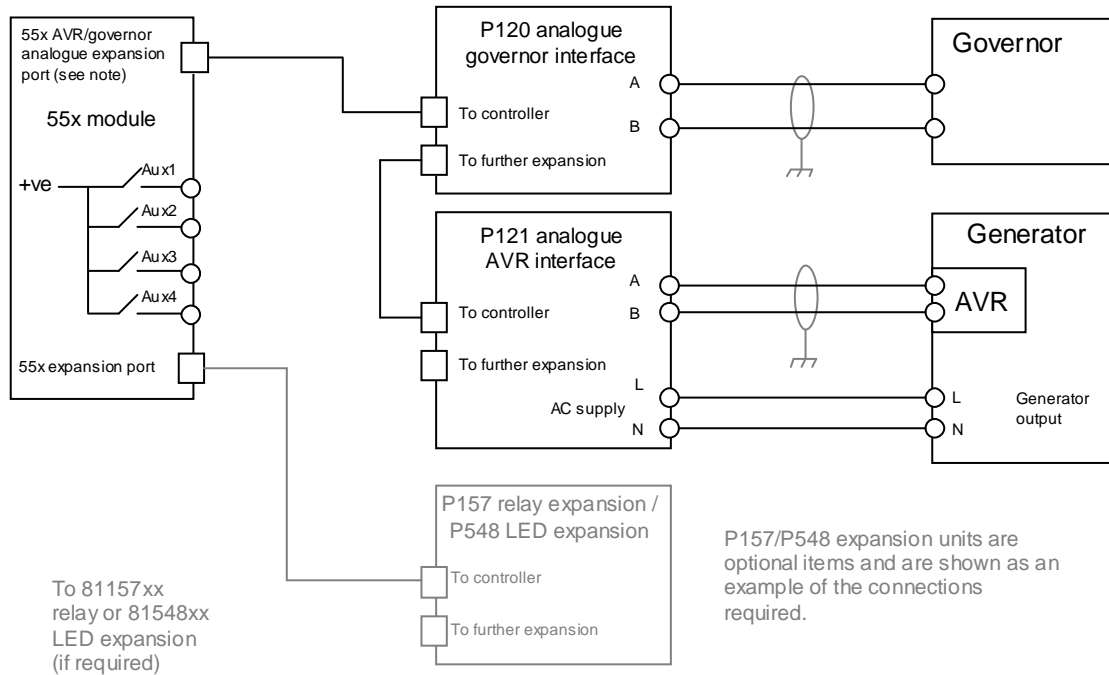
Item	Value
DC input Voltage range	8V – 35V DC continuous. Reverse polarity protected
Max operating current	75mA at 12V, 45mA at 24V.
Output type	Optically isolated DC voltage level
Minimum output load	1000Ω
Operating temperature range	-30°C to +70°C
Indications	Combined DC power on / Link lost LED
Fixing	TS32 32mm top hat din rail fixing (din rail not supplied)
IP protection	IP30
Appropriate standards	BS EN 60950, BS EN 50081-2, BS EN 50082-2

2.2.2 CASE DIMENSIONS



2.2.3 CONNECTION DETAILS

Connection to the controller is made by connecting the data cable supplied with the interface module to the P120/P121 analogue expansion socket of 55x load sharing enabled controllers. Where more than one analogue expansion module is required in the system, the modules can be 'daisy-chained' by connecting the "To further expansion" socket of one expansion module to the "To controller" socket of another, as shown below. The order of the modules in the 'daisy chain' is not important.



NOTE: - The P120 analogue expansion port is only fitted to load sharing enabled 55x controllers. Where this function is not fitted to the controller, it is not possible to use the P120 interface modules.

Where a different method of interface to the governor is used, load sharing will not be possible.

NOTE: - As the P120 module provides a DC voltage level to the governor, it is important that the DC supply to the module is the same supply as provided to the governor. It is equally important that the DC supply cable length between the governor and the P120 module is kept to an absolute minimum. It is recommended that where possible, the P120 module be fitted in close proximity to the governor control unit to facilitate this requirement.

NOTE: - The length of cable between the P120 interface unit and the governor should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

NOTE: - The maximum total length of the cable between the module, P120 and P121 is 100 meters.

2.2.4 P120 SELECTOR SWITCH SETTINGS

To enable the P120 analogue Governor interface modules to interface with as many different types of governor as possible, rotary selectors for voltage range and nominal voltage are fitted. These allow the user to configure the output of the module to match the input of the governor.

The SW1 selector sets the 'centre' point of the interface module's output. For example: if the output range required is 1V to 3V, with the 'centre' point being at 2V, then the position of the SW1 selector would be 4, giving a voltage offset of 2V.

The SW2 selector sets the voltage output range of the interface module's output. For example: if the output range required is 1V to 3V, then the position of the SW2 selector would be 1, giving a voltage range of $\pm 1V$ from the 'centre' point of 2V

For reference purposes, the switch positions perform the following functions:

SW1 setting	'centre' voltage of P120
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range of P120
0	$\pm 0.5V$
1	$\pm 1.0V$
2	$\pm 1.5V$
3	$\pm 2.0V$
4	$\pm 2.5V$
5	$\pm 3.0V$
6	$\pm 3.5V$
7	$\pm 4.0V$
8	$\pm 4.5V$
9	$\pm 5.0V$

Typical wiring diagrams for many of the most popular governors are included within this manual (See sections entitled Interfacing to Governors).

Where these diagrams include the P120 interface module, the switch positions required for both SW1 and SW2 are given.

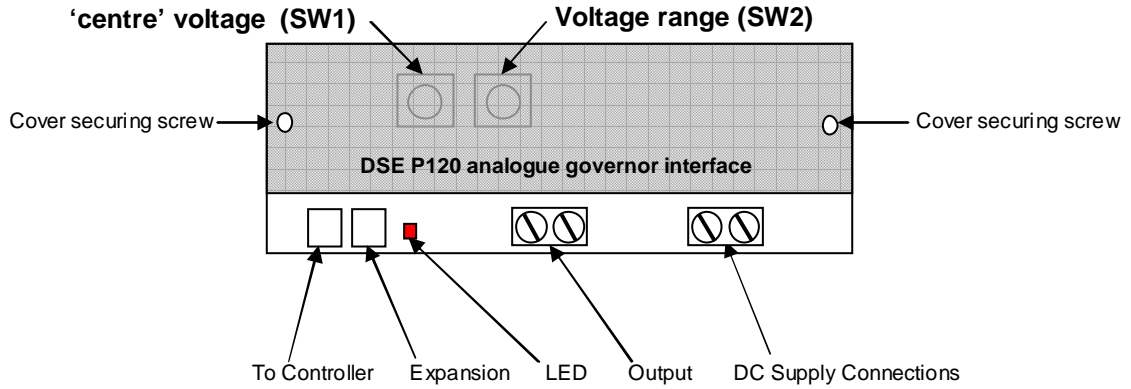
NOTE: - If the governor you are using is not listed within this manual, it may still be possible to interface to it using the P120 module. Contact your governor manufacturer to check if the product has a DC voltage input for connection to a synchroniser / load sharer, and if so, what the 'voltage range' and 'centre voltage' is. You can then use the tables above to determine settings for SW1 and SW2. P120 terminal A is the negative output terminal and B is the positive output terminal (providing governor output reversed is not selected in the 55x controller's configuration).

If the 'centre voltage' and 'voltage range' are not available from the governor manufacturer, providing the input is compatible with a DC voltage signal, it still may be possible to interface to it using the P120 modules. Contact our Technical Support Department for advice.

If the governor is not fitted with a DC voltage input for connection to synchroniser/load share modules, then a different interface method will be required. See section entitled Interfacing to governors.

2.2.5 LOCATION OF SW1 AND SW2 SELECTORS

Access to the selectors is gained by removing power to the interface module, then removing the two screws that are used to secure the transparent cover. The selectors are positioned as shown below:



Throughout this manual, SW1 and SW2 in the connection diagrams refer to these switches.

2.3 DETERMINING CONNECTIONS AND SETTINGS FOR GOVERNORS NOT LISTED IN THIS PUBLICATION

The following guide is intended to assist the user to determine where to connect to governors not listed in this document.

Additionally it will assist you to find the correct settings for SW1 (centre) and SW2 (range).

This diagram shows how the remote adjust potentiometer is usually connected to the governor. The potentiometer adjusts the voltage into the IN terminal between the voltages supplied at '-' and '+'.
 +
 IN
 -

To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage of terminal '+' in relation to terminal '-' as shown.

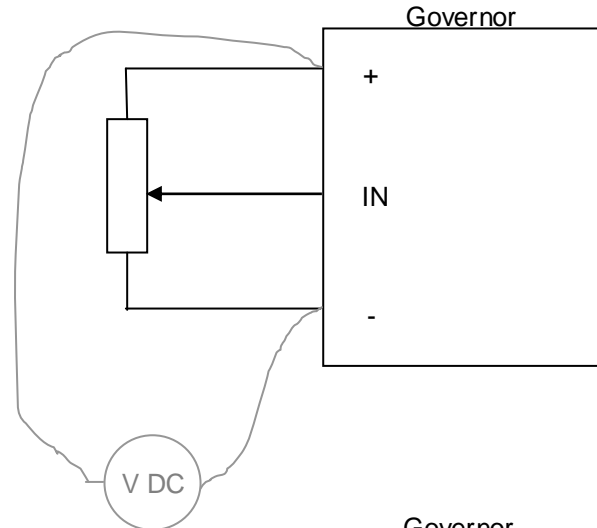
Example. You measure 4V from '-' to '+'. Halving this voltage gives the centre voltage (2V).

The range voltage setting will have a maximum value of 2V above or below the centre voltage).

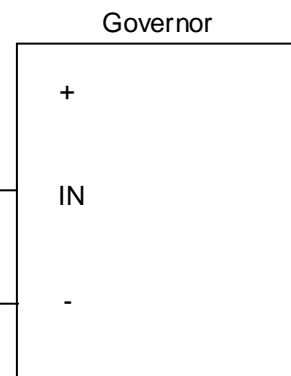
To determine the settings of SW1 and SW2, refer to the tables below.

The DSE controller (or DSE P120) connects only to the "-" and "IN" terminals and provides the varying DC voltage to simulate the turning of a potentiometer.

The Analogue output terminals of the DSE controller (or DSE P120) are connected as follows. Note that the "+" terminal of the governor/AVR is left unconnected.



DSE Analogue output B
 DSE Analogue output A



SW1 and SW2 settings

SW1 setting	'centre' voltage
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

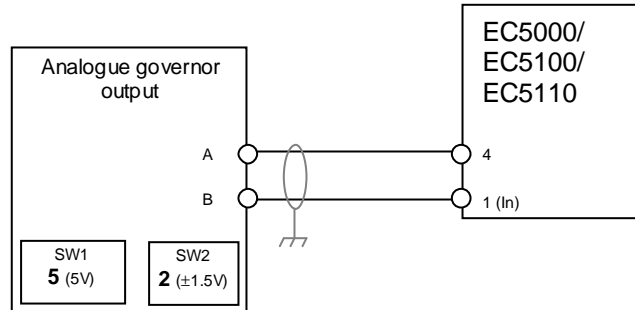
SW2 setting	Voltage range
0	±0.5V
1	±1.0V
2	±1.5V
3	±2.0V
4	±2.5V
5	±3.0V
6	±3.5V
7	±4.0V
8	±4.5V
9	±5.0V

NOTE:- On DSE8710, DSE8610, DSE75xx and DSE55xx controllers, SW1 and SW2 settings can be adjusted by a setting change of 0.1 which equates to 0.05V. ie setting 4.5 gives a centre (SW1) voltage of 2.25V. When using P120/P121, SW1 and SW2 go up in steps of 1 which equates to 0.5V. You may have to compromise to find a switch setting close to the measured value if the measured value is not a multiple of 0.5V.

2.4 AMBAC

2.4.1 EC5000* / EC5100* / EC5110*

Using Analogue governor output module:



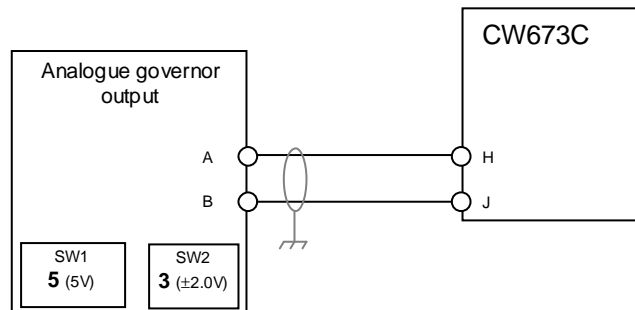
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers: Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.4.2 CW673C

Using Analogue governor output module:



NOTE:

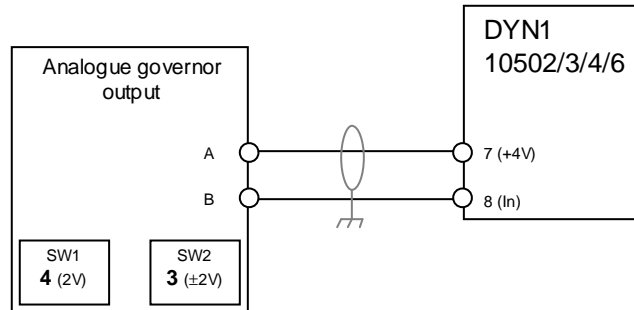
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers: Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.5 BARBER COLMAN

2.5.1 DYN1 10502, 10503, 10504, 10506

Using Analogue governor output:

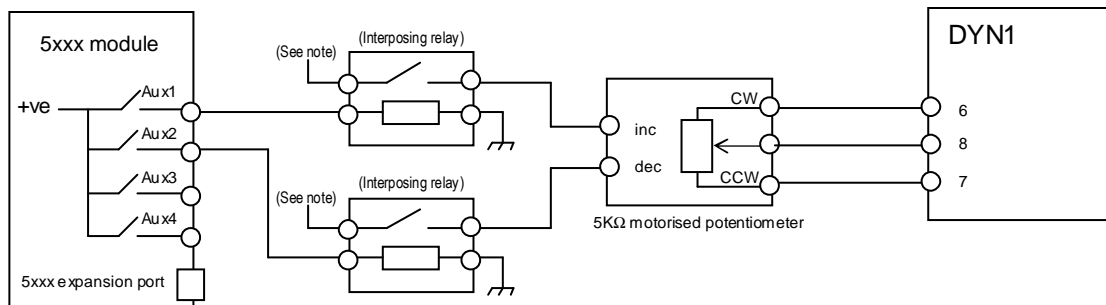


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using external motorised potentiometer:



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

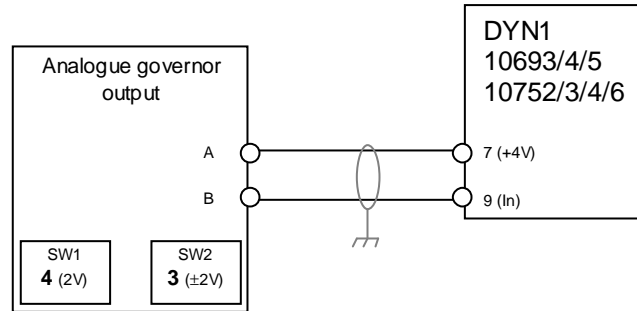
MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives. For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

2.5.2 DYN1 10693, 10694, 10695, 10752, 10753, 10754, 10756

Using Analogue governor output:



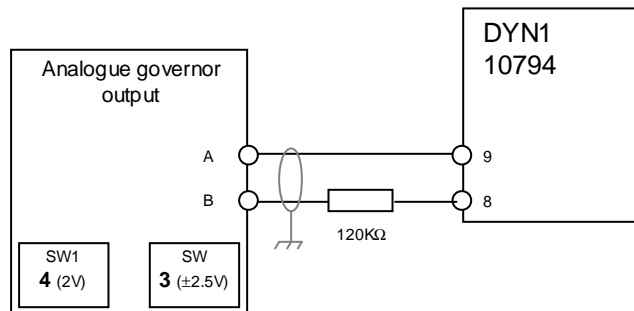
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.5.3 DYN1 10794*

Using Analogue governor output:



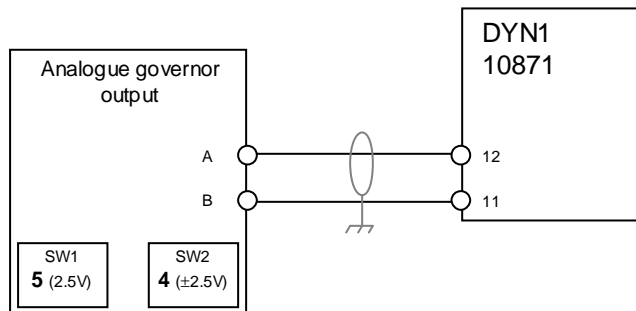
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.5.4 DYN1 10871

Using Analogue governor output:

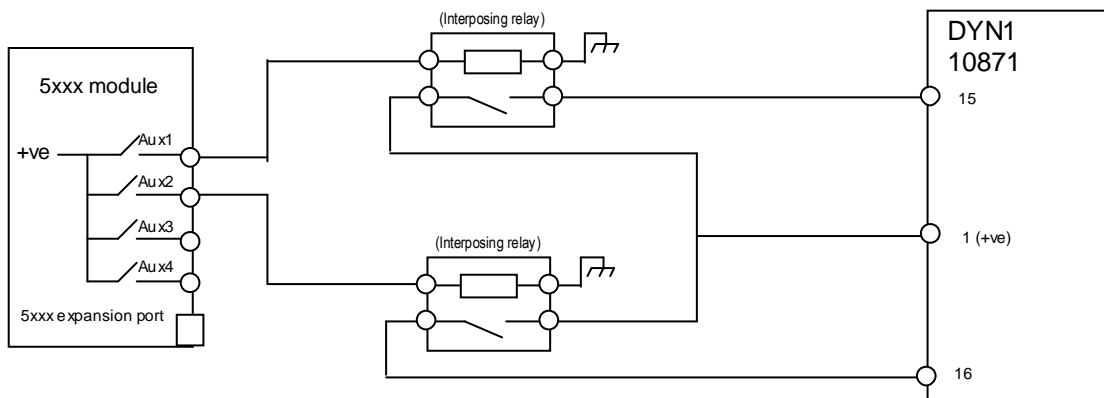


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

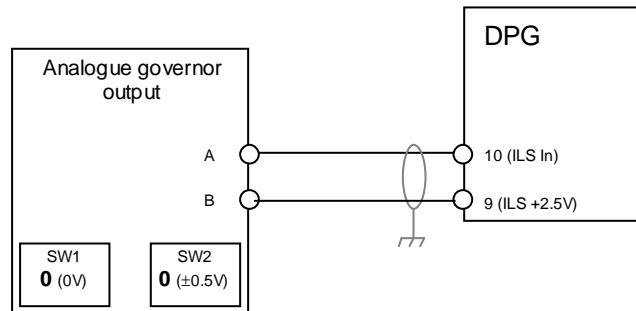
550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using discrete raise / lower inputs:



2.5.5 DPG 2201*

Using Analogue governor output module:



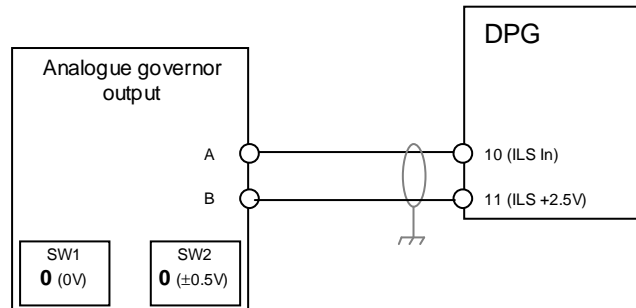
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.5.6 DPG 2401

Using Analogue governor output module:



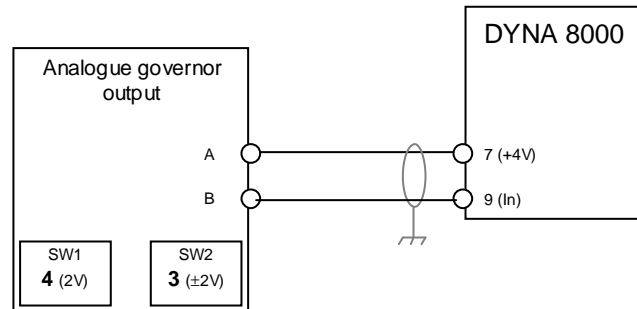
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.5.7 DYNA 8000*

Using Analogue governor output module:

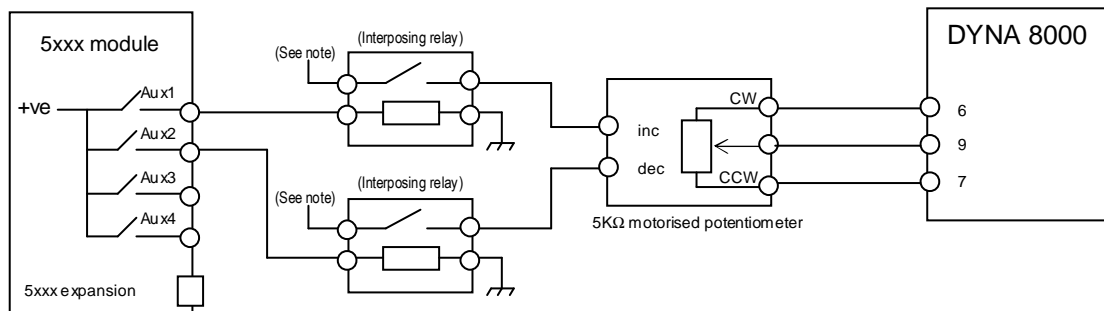


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using external motorised potentiometer:



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

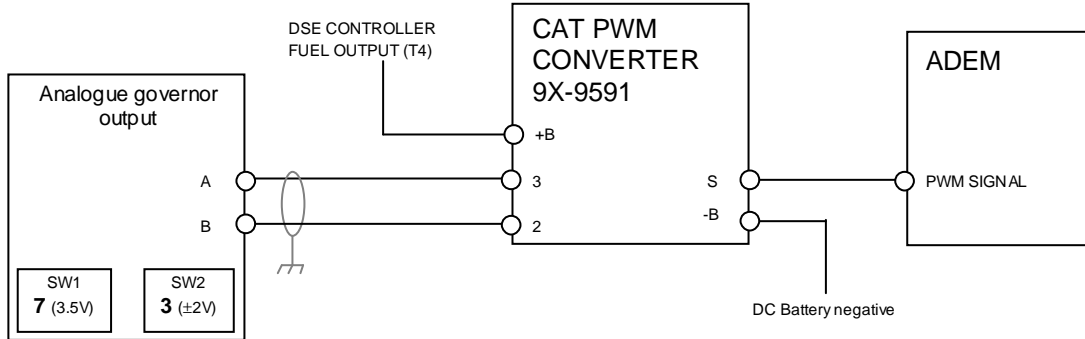
Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives. For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

2.6 CATERPILLAR

2.6.1 ADEM*

Using Analogue governor output module:

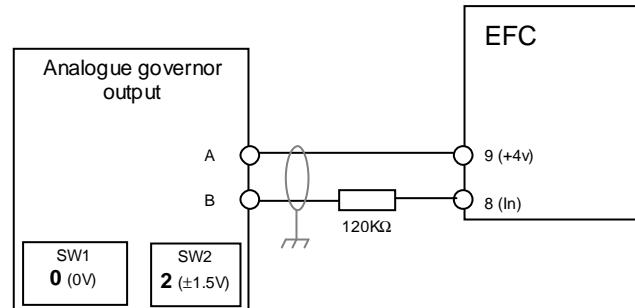


NOTE: CAT PWM CONVERTER 9X-9591 is available from your local CAT dealer and is used to allow the DSE 55xx series or P120 interface to interface with the CAT ADEM PWM controller.

2.7 CUMMINS

2.7.1 EFC*

Using Analogue governor output module:



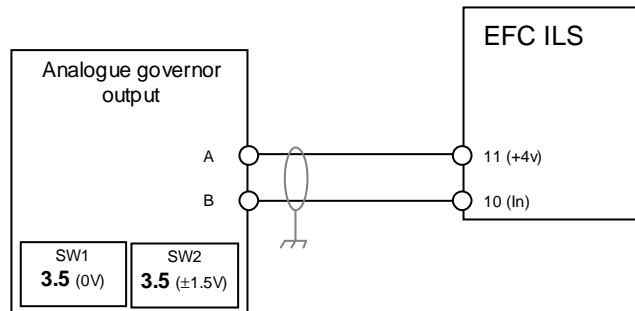
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.7.2 EFC WITH SMOKE LIMITING AND ILS

Using Analogue governor output module:



NOTE: Put the governor into "Run 1" (which switches off remote pot) adjust engine speed to 48Hz. (Min speed)

Put back into "Run"

Connect DSE module as shown above and set SW1 and SW2 as shown. Fine tune SW1 when the set is first run off load to ensure correct operating speed.

NOTE:

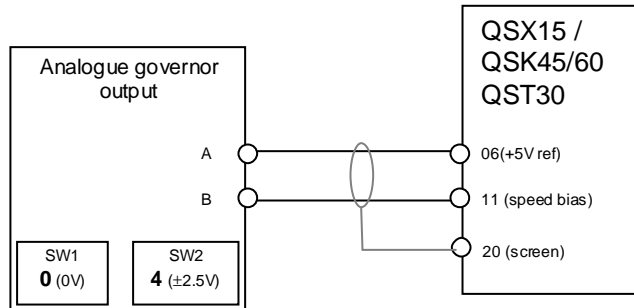
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Thanks to J.Brown of Enrogen for providing this information.

- 2.7.3 QST 30*
- 2.7.4 QSX 15
- 2.7.5 QSK 45/60

Using Analogue governor output Module:



NOTE: - Ensure that the QSK45/60 adjustable parameter *Speed Bias Input Type* is set to 'Woodward'.

NOTE:

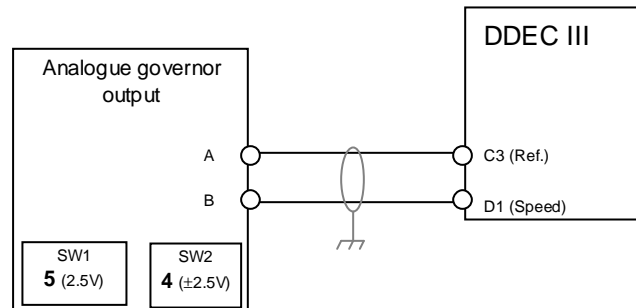
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.8 DETROIT DIESEL

2.8.1 DDEC III

Using Analogue governor output:



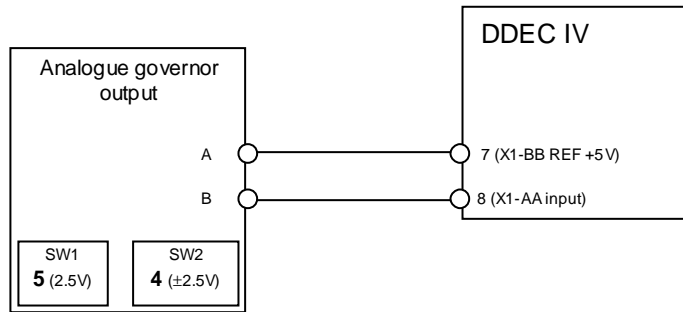
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.8.2 DDEC IV*

Using Analogue governor output:



NOTE:

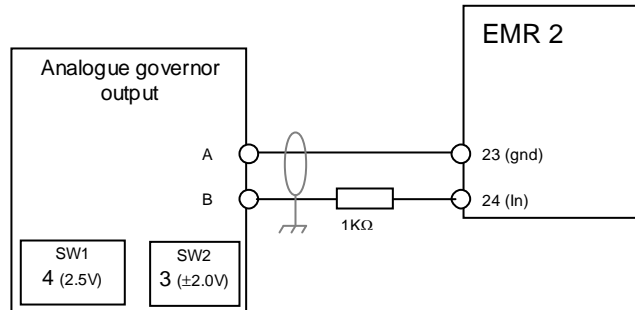
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.9 DEUTZ

2.9.1 EMR 2 ELECTRONIC ENGINE GOVERNOR*

Using Analogue governor output module:

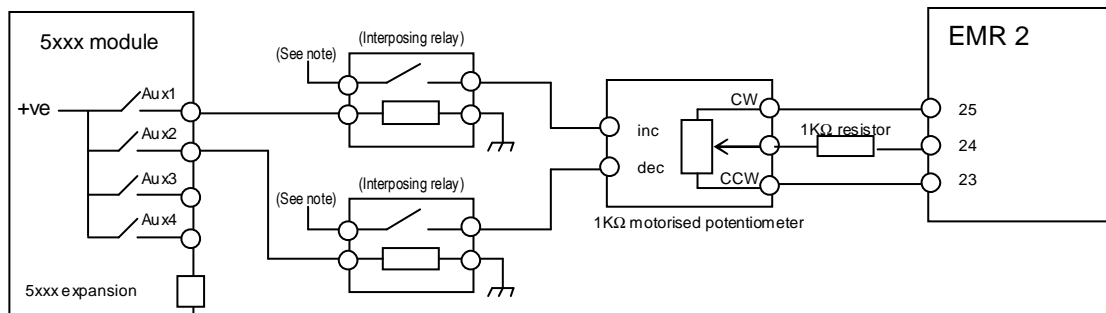


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using external motorised potentiometer:



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

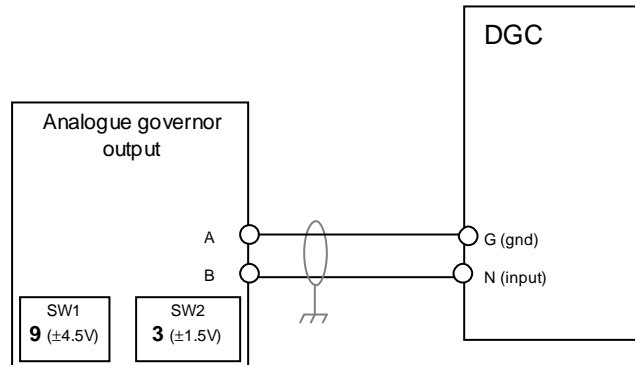
Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives. For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

2.10 DOOSAN

2.10.1 DGC

Using Analogue governor output Module:



MODULE CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

The DGC uses lower voltage on input N = higher speed. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the analogue governor output:

Configuration item	Selection
Reverse governor output	<input checked="" type="checkbox"/>

NOTE:

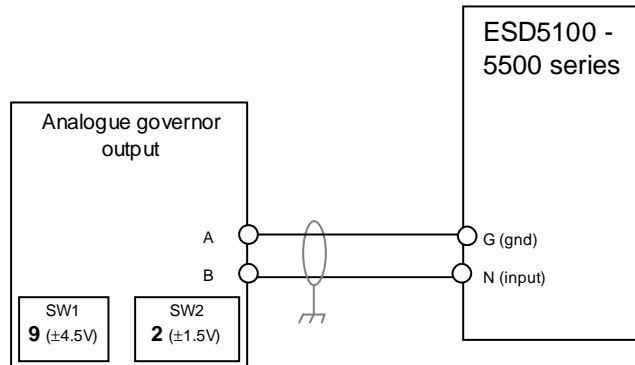
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.11 G.A.C. (GOVERNORS AMERICA CORP.)

2.11.1 5100 - 5500 SERIES*

Using Analogue governor output Module:



MODULE CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

The 5100-5500 uses lower voltage on input N = higher speed. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the Analogue governor output:

Configuration item	Selection
Reverse governor output	<input checked="" type="checkbox"/>

NOTE:

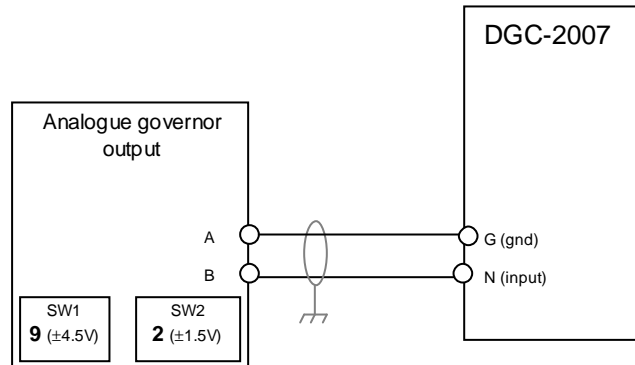
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.12 GHANA CONTROL

2.12.1 DGC-2007*

Using Analogue governor output Module:



MODULE CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

The DGC-2007 uses lower voltage on input N = higher speed. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the Analogue governor output:

Configuration item	Selection
Reverse governor output	<input checked="" type="checkbox"/>

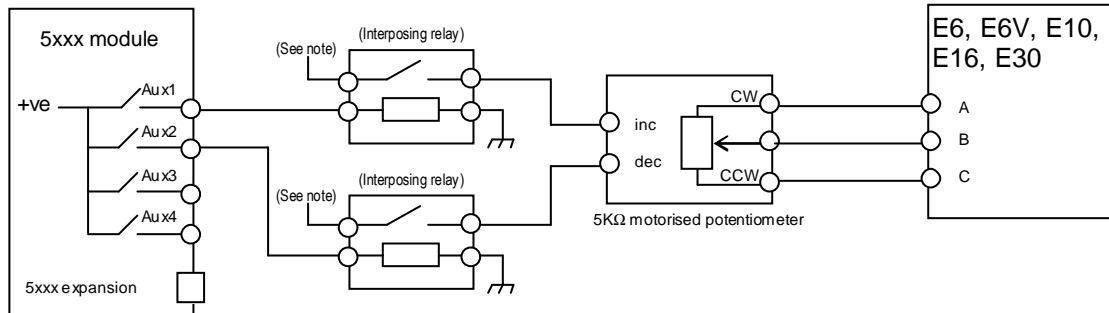
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.13 HEINZMANN

2.13.1 E6, E6V, E10, E16, E30



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

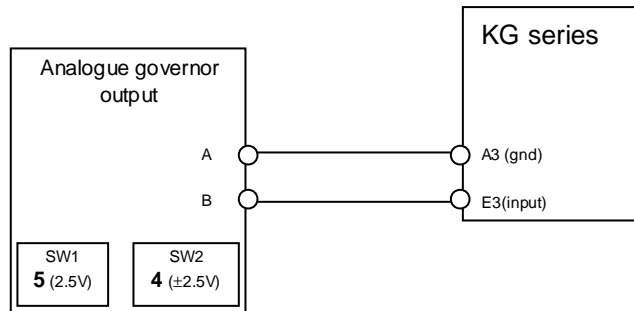
MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives.
For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

2.13.2 KG SERIES (6-04 TO 10-04)*

Using Analogue governor output:



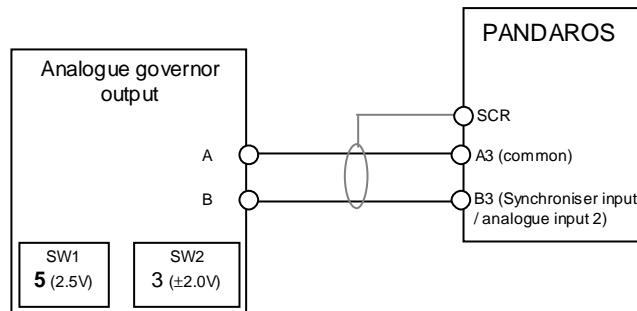
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.13.3 PANDAROS*

Using Analogue governor output:



NOTE:- Pandaros is configurable using “Pandaros Packager”. Various options must be correctly set as follows :

- Single / Parallel generator (other) no droop.
- Analogue input 1 (load share) disabled in the ‘load control’ section of the Pandaros software.
- Analogue input 2 (sync input) configured to be 0-5V.

NOTE:

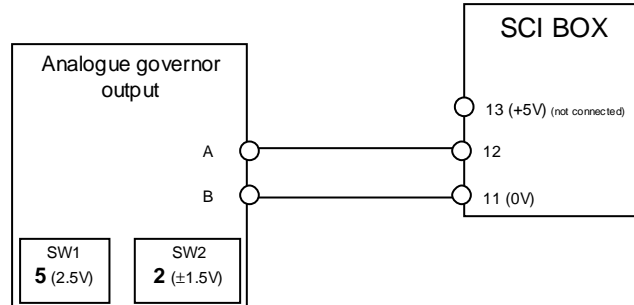
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.14 IVECO

2.14.1 CURSOR 13TE2 (WITH SCI BOX)*

Using Analogue governor output:



NOTE:- The dip switches on the SCI box are set as follows :
1=OFF, 2=ON, 3=OFF, 4=OFF

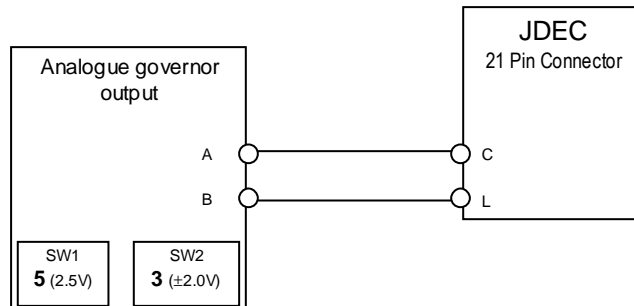
NOTE:- SCI box is provided by Iveco and provides input / output terminals for engine speed control.

NOTE:
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.
550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.15 JOHN DEERE

2.15.1 JDEC

Using Analogue governor output:



NOTE:

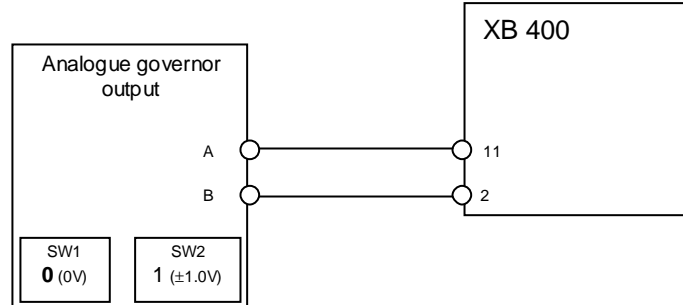
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.16 MITSUBISHI

2.16.1 XB400*

Using Analogue governor output:



NOTE:

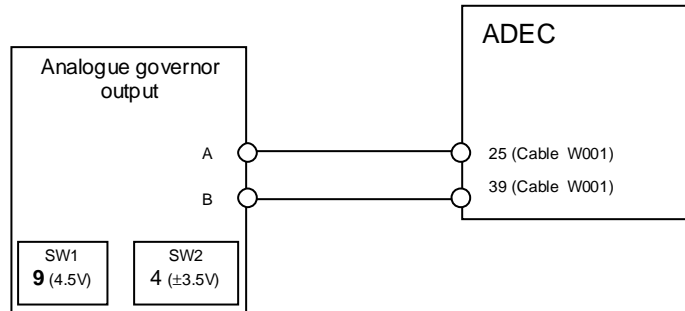
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.17 MTU

2.17.1 ADEC 2000* / 4000

Using Analogue governor output:



NOTE: - MTU speed settings are configurable by MTU and while correct at the time of this document publication the data above was correct. However due to MTU production and ECU configuration processes, ECU requirements may change from those mentioned above. You should refer to MTU for details.

NOTE: - The range of speed adjustment possible is configurable within the ADEC 4000 controller. You are referred to the ADEC 4000 operating instructions for further details of this function.

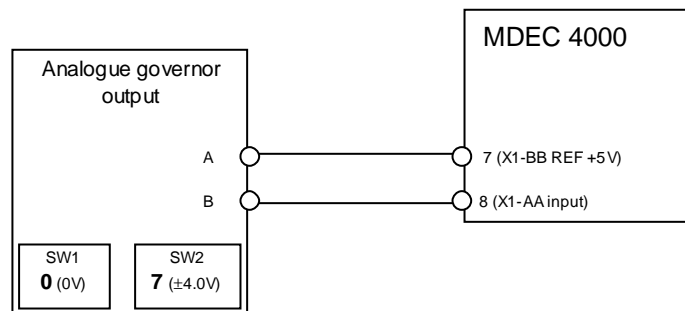
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.17.2 MDEC 2000* / 4000*

Using Analogue governor output:



NOTE: - MTU speed settings are configurable by MTU and while correct at the time of this document publication the data above was correct. However due to MTU production and ECU configuration processes, ECU requirements may change from those mentioned above. You should refer to MTU for details.

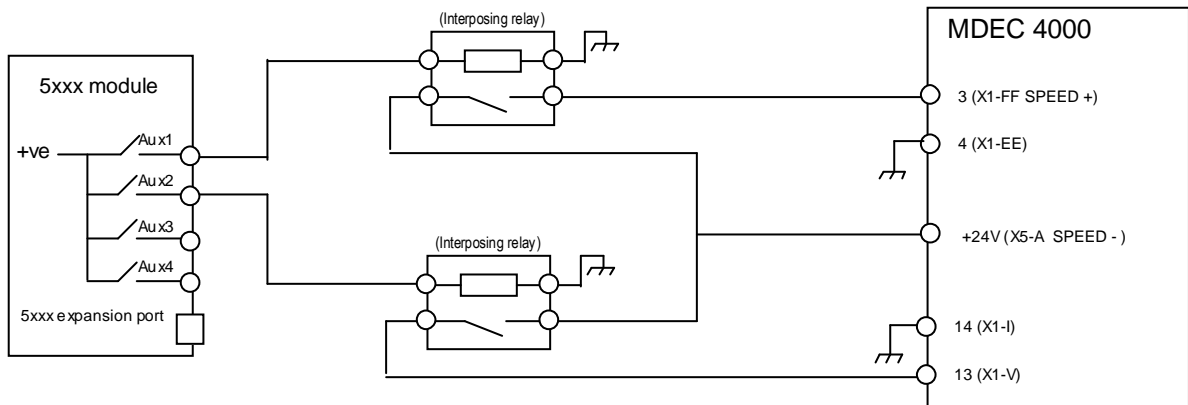
NOTE: - The range of speed adjustment possible is configurable within the MDEC 4000 controller. You are referred to the MDEC 4000 operating instructions for further details of this function.

NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using 5x internal raise/lower relays:



MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay


NOTE: - Briefly activating the input for less than 1s increases or decreases the nominal speed by 1 RPM.
 When the input is activated for more than 1s, the nominal speed is adjusted automatically at a configurable rate. Source mtu ELEKTRONIK ECU 4/G Documentation (Part 1)

Using CAN for speed control

MTU MDEC is the electronic management system fitted to the MTU 2000 and MTU 4000 series engines. Speed control of these engines can be 'automatic', taking place over the engine data link between the MDEC and the DSE controller. Hence there is no requirement to connect the analogue governor output terminals (A/B).

When speed control is via the "CAN" link, SW1 and SW2 must still be set in the "Recalibrate" section of the 5xxx configuration software :

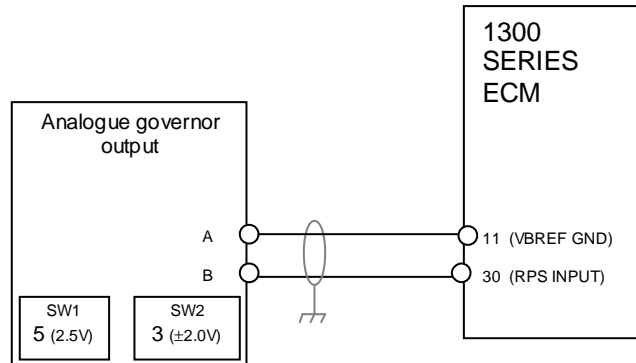
SW1 5 (2.5V)	SW2 2 ($\pm 1.5V$)
------------------------	--------------------------------

 **NOTE: - Speed control over CAN is only possible when using the MDEC 304 version. MDEC 303 does not support speed control over the CAN link.**

2.18 PERKINS

2.18.1 1300 SERIES ENGINE CONTROLLER*

Using Analogue governor output Module:



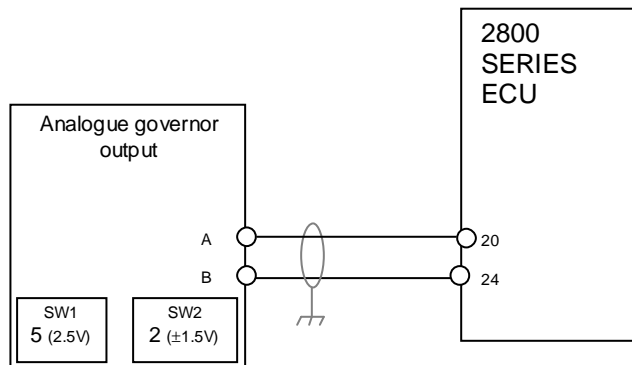
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.18.2 2800 SERIES ENGINE CONTROLLER*

Using Analogue governor output Module:



NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.19 SCANIA

2.19.1 S6 ENGINE CONTROLLER*

S6 is the electronic management system fitted to the Scania electronic engines. Speed control of these engines is via two methods.

If taking advantage of the DSE controllers' CAN interface it is not necessary to fit the Scania Co-ordinator device. Engine instrumentation, diagnostics and speed controller is provided by the DSE controllers CAN data link to the S6 ECU. Hence there is no requirement to connect the analogue governor output terminals (A/B).

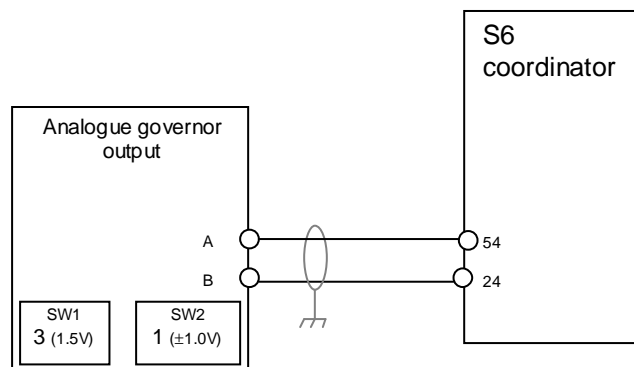
When speed control is via the "CAN" link, SW1 and SW2 must still be set in the "Recalibrate" section of the 5xxx configuration software :

SW1 5 (2.5V)	SW2 2 ($\pm 1.5V$)
-----------------	-------------------------

NOTE:- It is not necessary to fit the Scania Co-ordinator device. Engine instrumentation and diagnostics is provided by the DSE controller (8610,75xx,55xx)

When using a Scania S6 engine in conjunction with a DSE controller not fitted with the CAN interface (ie DSE 550 / 555) you must fit the Scania Co-ordinator device and use analogue speed control signals as shown below :

Using Analogue governor output Module:



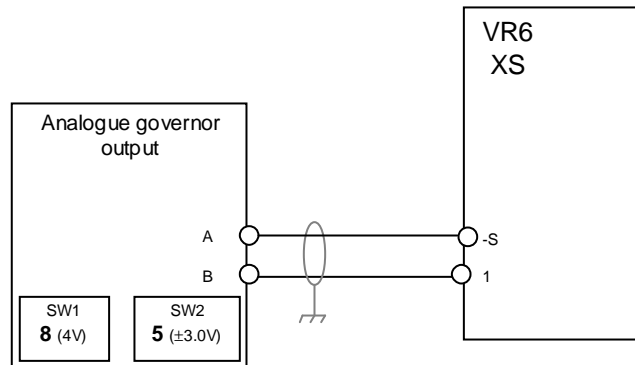
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.20 TOHO XS*

Using Analogue governor output Module:



NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers: Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.21 VOLVO

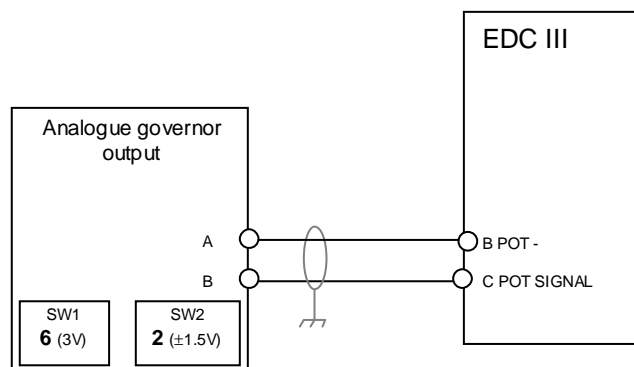
2.21.1 873979*

This governor is manufactured for Volvo by G.A.C. See section entitled *G.A.C. 5100-5500 Series for connection details.*

2.21.2 EDC III*

EDCIII is the electronic management system fitted to the Volvo TAD12 engine. Connections are the EDC III's standalone connector.

Using Analogue governor output Module:



NOTE:

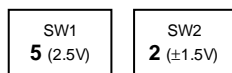
8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers: Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.21.3 EMS2*

EMS2 is the electronic management system fitted to the Volvo TAD9 and TAD16 electronic engines. Speed control of these engines is 'automatic', taking place over the engine data link between the EMS2 and the DSE controller (8710, 8610, 75xx, 55xx). Hence there is no requirement to connect the analogue governor output terminals (A/B).

When speed control is via the "CAN" link, SW1 and SW2 must still be set in the "Recalibrate" section of the 5xxx configuration software :



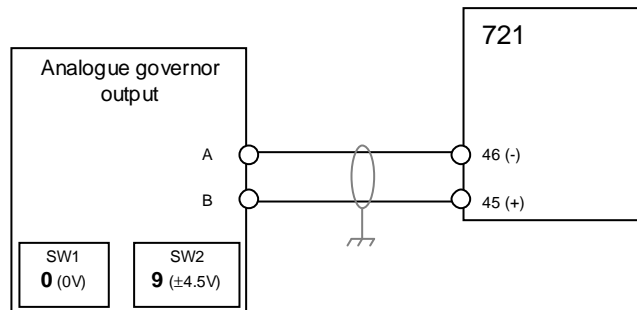
NOTE:- It is not necessary to fit the Volvo CIU device. Engine instrumentation and diagnostics is provided by the DSE controller (8710,8610,7510,5510).

2.22 WOODWARD

For Woodward DYNA products please see 'Barber Colman' elsewhere in this manual.

2.22.1 721 DIGITAL SPEED CONTROL

Using Analogue governor output:

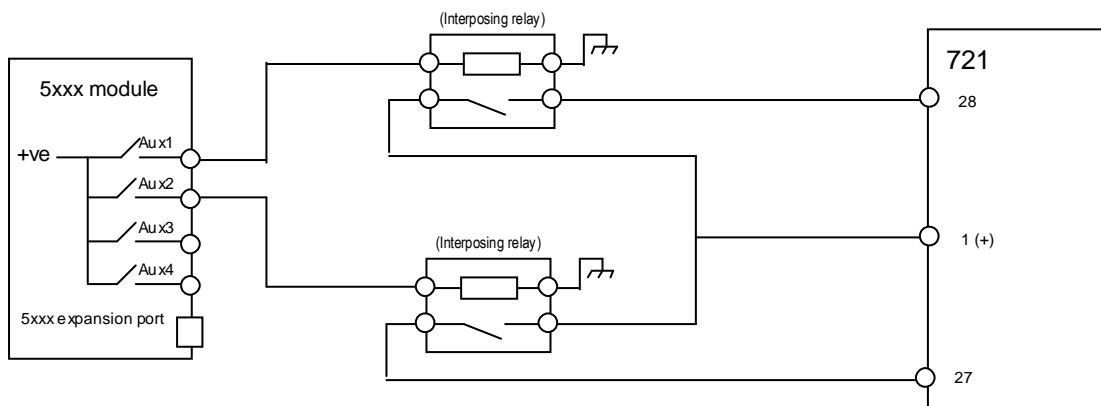


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

Using discrete raise/lower inputs:

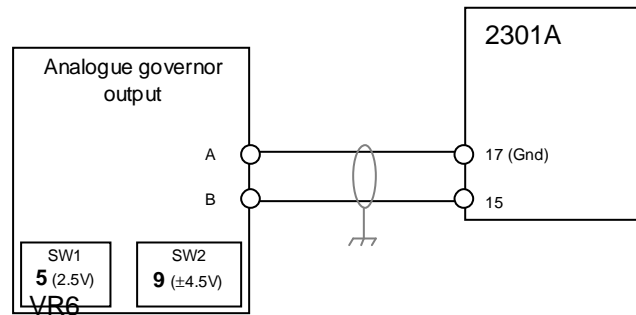


MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

2.22.2 2301A SPEED CONTROL*

Using Analogue governor output



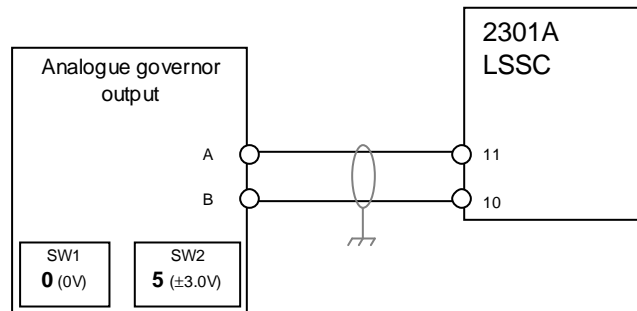
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.22.3 2301A LSSC LOAD SHARE

Using Analogue governor output



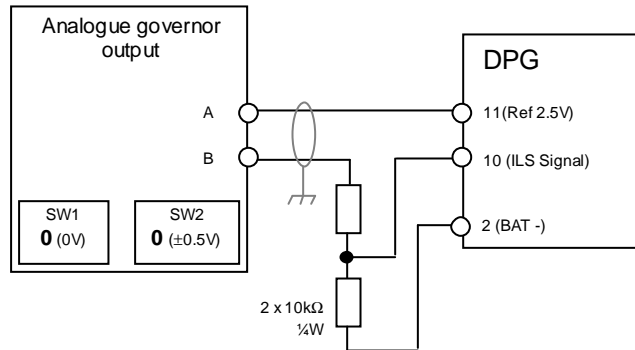
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.22.4 DPG

Using Analogue governor output



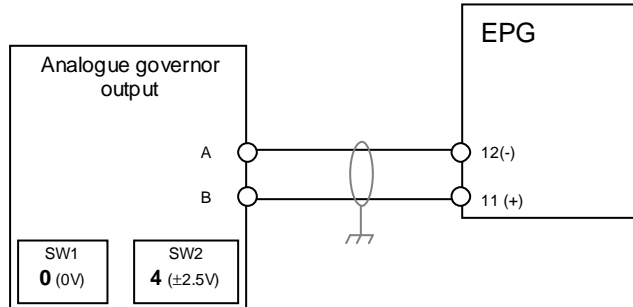
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.2.2.5 EPG (ELECTRICALLY POWERED GOVERNORS)*

Using Analogue governor output

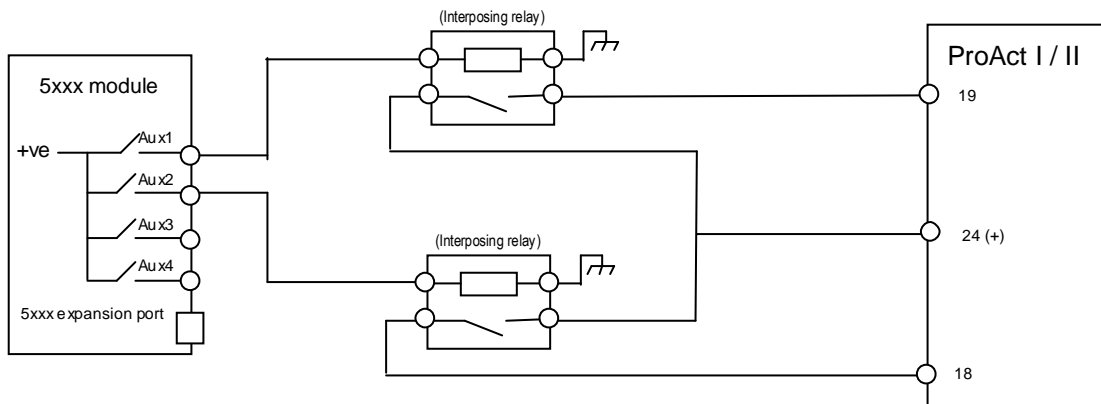


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue governor output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

2.2.2.6 PROACT I / II



MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

3 INTERFACING TO AUTOMATIC VOLTAGE REGULATORS

This section details the interface connections between the DSE controllers and the most popular Automatic Voltage Regulators (AVRs) used with diesel generating set alternators. If your particular type of AVR is not covered within this section, please contact our technical support department for advice.

3.1 INTERFACING WITH 8710, 8610 AND 75XX CONTROLLERS

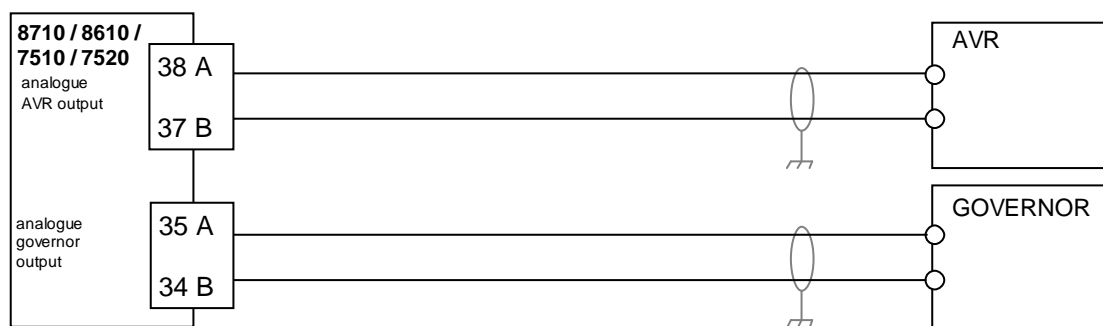
NOTE:- This section applies only to the analogue AVR output integral to the 8710,8610 and 75xx controllers..

The analogue AVR output provide an isolated, adjustable DC voltage level to connect into the control inputs of many automatic voltage regulators. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing controller inputs of many popular AVRs. This enables the DSE controller to adjust the alternator voltage output to match the mains / bus and hence get the supplies into synchronism. The module is especially suited for use in reactive power sharing systems.

3.1.1 SPECIFICATIONS

Item	Value
Output type	Optically isolated DC voltage level
Isolation	Optically isolated to 5000V
Minimum output load	1000Ω

3.1.2 CONNECTION DETAILS



NOTE:- Further details on connections to various AVRs can be found in the *DSE Guide to Synchronising and Load Sharing (Part2)*.

NOTE:- For details of the analogue governor output see the relevant section elsewhere in this manual.

NOTE:- The length of cable between the DSE controller and the AVR should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

3.2 INTERFACING WITH 55XX CONTROLLERS

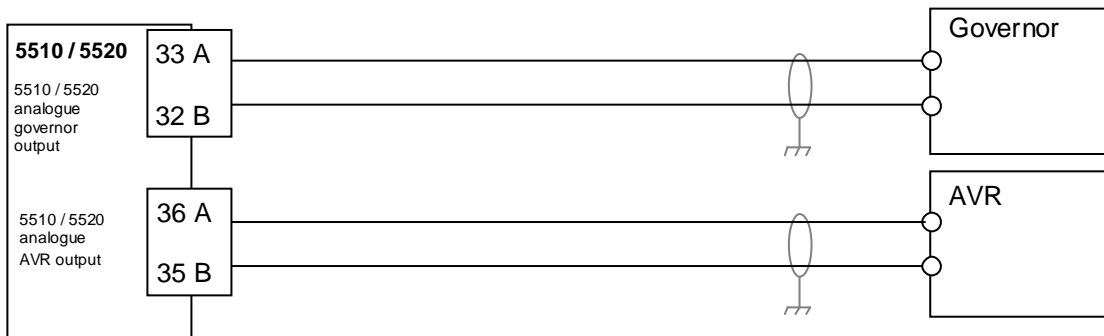
NOTE:- This section applies only to the analogue AVR output integral to the 5510 / 5520 controllers..

The analogue AVR output provide an isolated, adjustable DC voltage level to connect into the control inputs of many automatic voltage regulators. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing controller inputs of many popular AVRs. This enables the 55xx to adjust the alternator voltage output to match the mains / bus and hence get the supplies into synchronism. The 55xx module is especially suited for use in reactive power sharing systems.

3.2.1 SPECIFICATIONS

Item	Value
Output type	Optically isolated DC voltage level
Isolation	Optically isolated to 5000V
Minimum output load	1000Ω

3.2.2 CONNECTION DETAILS



NOTE:- Further details on connections to various AVRs can be found in the *DSE Guide to Synchronising and Load Sharing (Part2)*.

NOTE:- For details of the analogue governor output see the relevant section elsewhere in this manual.

NOTE:- The length of cable between the 5510 / 5520 and the AVR should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

3.2.3 ANALOGUE AVR OUTPUT SETTING

To enable the DSE controller module to interface with as many different types of AVR as possible, selectors for voltage range and nominal voltage are adjustable using the configuration software. These allow the user to configure the output of the module to match the input of the AVR.

The SW1 software selector sets the 'centre' point of the interface module's output. For example: if the output range required is 1V to 3V, with the 'centre' point being at 2V, then the position of the SW1 selector would be 4.0, giving a voltage offset of 2V.

The SW2 software selector sets the voltage output range of the interface module's output. For example: if the output range required is 1V to 3V, then the position of the SW2 selector would be 1.0, giving a voltage range of $\pm 1V$ from the 'centre' point of 2V

3.2.4 SW1 / SW2 SOFTWARE SELECTOR SETTINGS.

For reference purposes, the software selectors perform the following functions:

SW1 setting	'centre' voltage of P121
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range of P121
0	$\pm 0.5V$
1	$\pm 1.0V$
2	$\pm 1.5V$
3	$\pm 2.0V$
4	$\pm 2.5V$
5	$\pm 3.0V$
6	$\pm 3.5V$
7	$\pm 4.0V$
8	$\pm 4.5V$
9	$\pm 5.0V$

Typical wiring diagrams and SW1/SW2 selector settings for many of the most popular AVRs are included within the DSE guide to synchronising and Load Sharing (Part2).

NOTE: - If the AVR you are using is not listed within this manual, it may still be possible to interface to it using the analogue AVR output. Contact your AVR manufacturer to check if the product has a DC voltage input for connection to a synchroniser / load sharer, and if so, what the 'voltage range' and 'centre voltage' is. You can then use the tables above to determine settings for SW1 and SW2. Analogue AVR output terminal A is the negative output terminal and B is the positive output terminal (providing AVR output reversed is not selected in the 55xx controller's configuration).
 If the 'centre voltage' and 'voltage range' are not available from the AVR manufacturer, providing the input is compatible with a DC voltage signal, it still may be possible to interface to it using the DSE modules. Contact our Technical Support Department for advice.

LOCATION OF SW1 AND SW2 SELECTORS – 8710/8610

Access to the software selectors is gained by using the configuration software in conjunction with the USB A to USB B connection cable.

The settings are found on the SCADA | GENERATOR page as shown below :

The screenshot displays the SCADA | GENERATOR configuration page, which is organized into several sections:

- Interface**: The main title of the configuration page.
- Governor**: Contains two sliders. The 'Center (SW1)' slider is set to 6.4, and the 'Range (SW2)' slider is set to 0.0.
- Speed and Frequency**: A table showing real-time values for various parameters:

Engine Speed	0 RPM
Generator Frequency	0.0 Hz
Governor Analog	0.0 %
AVR Analog	0.0 %
- AVR**: Contains two sliders. The 'Center (SW1)' slider is set to 8.0, and the 'Range (SW2)' slider is set to 0.0.
- Phase to Neutral Voltages**: A table showing voltage readings for three phases:

L1 - N	L2 - N	L3 - N
0.0 v	0.0 v	0.0 v
- Phase to Phase Voltages**: A table showing voltage readings for three phase combinations:

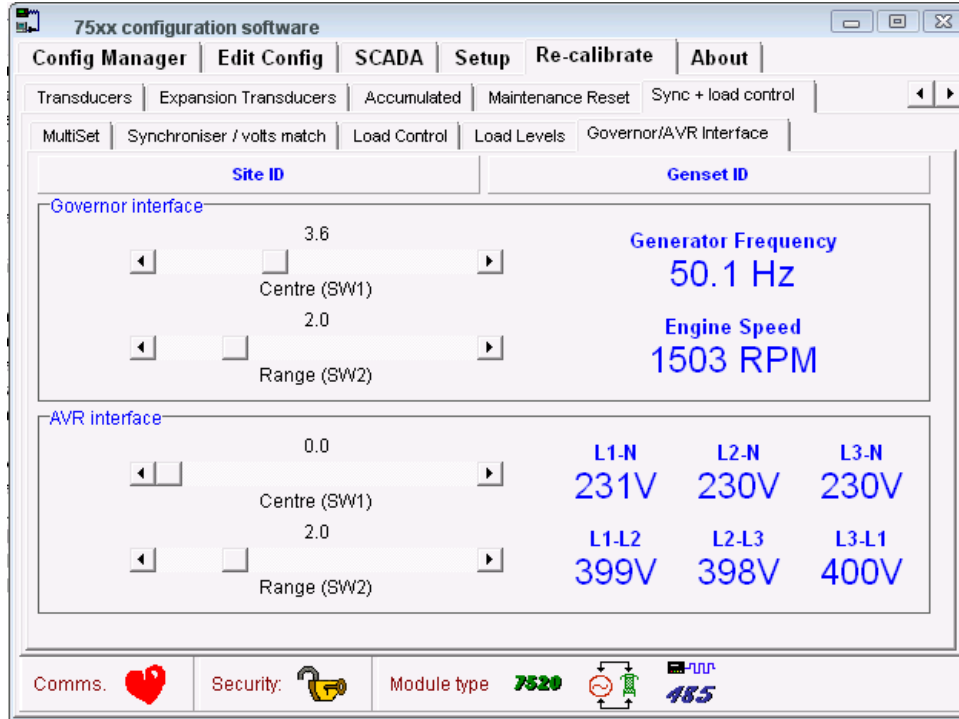
L1 - L2	L2 - L3	L3 - L1
0.0 v	0.0 v	0.0 v

Throughout this manual, SW1 and SW2 in the connection diagrams refer to these software "sliders".

LOCATION OF SW1 AND SW2 SELECTORS – 75XX & 55XX

Access to the software selectors is gained by using the configuration software in conjunction with the P810 interface cable.

The settings are found on the “Recalibrate” tab as shown below:




Throughout this manual, SW1 and SW2 in the connection diagrams refer to these software “sliders”.

3.3 INTERFACING WITH 55X CONTROLLERS

550 / 555 / 557 controllers require model P121 to interface between the controller and the AVR. This interface has two selector switches to configure the centre voltage and voltage range to suit the governor / ECU in use.

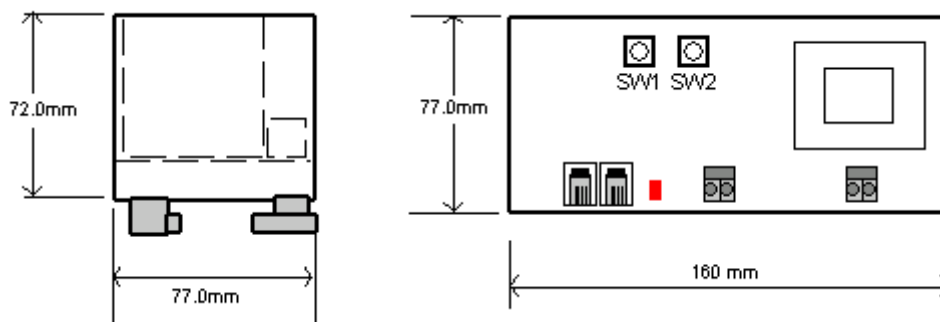
NOTE:- This device is NOT required for 8710,8610,5510/5520 controllers. These controllers have integral analogue AVR outputs. See section entitled “5510/5520 analogue AVR output”.
 The P121 analogue governor interface module is ONLY used to interface the 550/555/557 controllers with supported AVRs.

Description	Photograph
<p>The P121 analogue AVR interface modules provide an isolated, adjustable DC voltage level to connect into the control inputs of many automatic voltage regulators. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing controller inputs of many popular AVRs.</p> <p>The P121 interface is controlled directly by the 55x controller via its AVR analogue expansion port. This enables the 55x to adjust the alternator voltage output to match the mains / bus and hence get the supplies into synchronism. The P121 module is especially suited for use in reactive power sharing systems.</p>	

3.3.1 SPECIFICATIONS

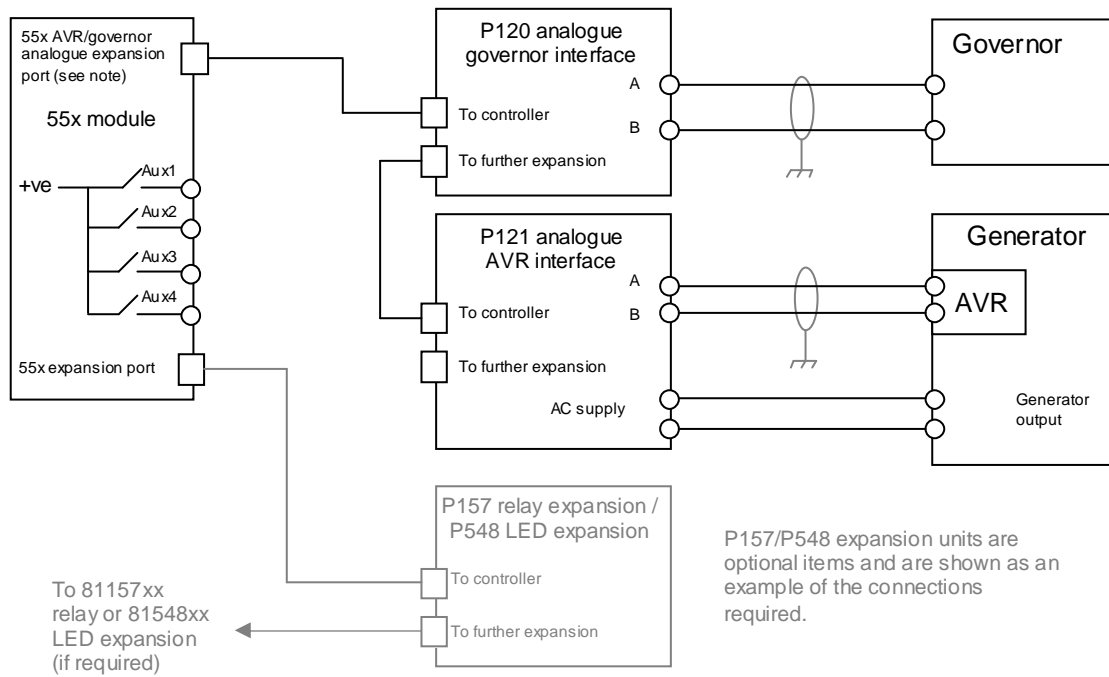
Item	Value
AC input Voltage range	152 V AC to 305 V AC (+20%)
AC input frequency	50Hz to 75Hz at rated engine speed
Maximum burden	2VA
AC input isolation	Double insulated transformer
Output type	Optically isolated DC voltage level
Minimum output load	1000Ω
Operating temperature range	-30°C to +70°C
Indications	Combined AC power on / Link lost LED
Fixing	TS32 32mm top hat din rail fixing (din rail not supplied)
IP protection	IP30
Appropriate standards	BS EN 60950, BS EN 50081-2, BS EN 50082-2

3.3.2 CASE DIMENSIONS



3.3.3 CONNECTION DETAILS

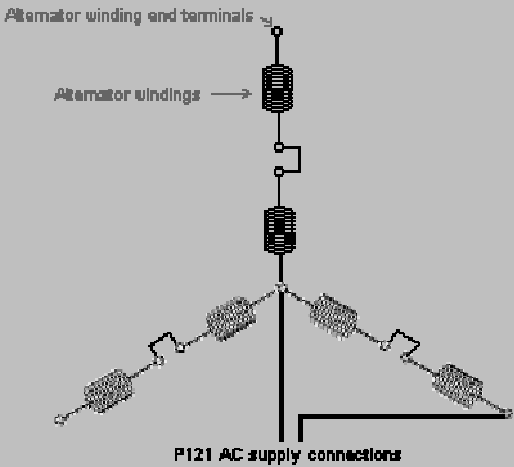
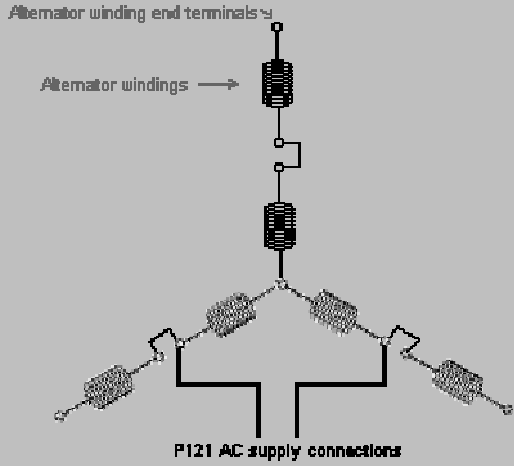
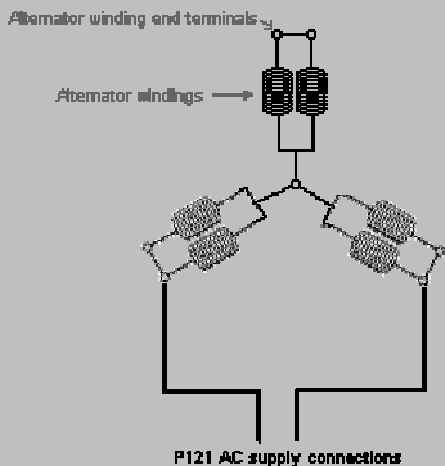
Connection to the controller is made by connecting the data cable supplied with the interface module to the P120/P121 analogue expansion socket of 55x load sharing enabled controllers. Where more than one analogue expansion module is required in the system, the modules can be 'daisy-chained' by connecting the "To further expansion" socket of one expansion module to the "To controller" socket of another, as shown below. The order of the modules in the 'daisy chain' is not important.



NOTE: - The AVR analogue expansion port is only fitted to load sharing enabled 55x controllers. Where this function is not fitted to the controller, it is not possible to use the P121 interface modules. Where a different method of interface to the governor is used, load sharing will not be possible.

NOTE: - The length of cable between the P121 interface unit and the AVR should be kept as short as possible. Foil screened cable is recommended for this purpose to ensure integrity of the control signal.

NOTE: - The maximum total length of the cable between the module, P120 and P121 is 100 meters.

Diagram	Description
<p data-bbox="209 253 740 315"><u>P121 AC Supply connections (230V nominal voltage)</u></p>  <p data-bbox="379 779 612 808">P121 AC supply connections</p>	<p data-bbox="810 315 1382 528">The P121 AVR interface module is normally sited within the generator control panel, along with the 55x controller. In this case, where the Ph-N voltage is between 170V and 277V, it's AC supply terminals can be connected to the alternator output L1 and N terminals within the panel.</p>
<p data-bbox="209 846 740 909"><u>P121 AC Supply connections (230V nominal voltage) – Alternative connection</u></p>  <p data-bbox="379 1348 612 1377">P121 AC supply connections</p>	<p data-bbox="810 909 1382 1093">However, the P121 may also be fitted within the alternator box. In this instance, it's AC supply can be connected as shown in the example. This allows for a more straightforward conversion between 110V and 220V for instance, on hire sets.</p> <p data-bbox="810 1126 1382 1279">I.e. In the example shown the windings are connected in series to give 230V. If a switch were to alter the series links to parallel links to give 115V, the P121 supply connections would not need to be moved.</p>
<p data-bbox="209 1406 740 1469"><u>P121 AC Supply connections (115V nominal voltage)</u></p>  <p data-bbox="379 1930 612 1960">P121 AC supply connections</p>	<p data-bbox="810 1469 1358 1621">When used with a 115V nominal system (or a three phase system where the ph-ph voltage does not exceed 277V), the P121 AC supply connections must be wired as shown in this example (i.e. phase to phase).</p>

3.3.4 P121 SELECTOR SWITCH SETTINGS

To enable the P121 analogue AVR interface module to interface with as many different types of AVR as possible, rotary selectors for voltage range and nominal voltage are fitted. These allow the user to configure the output of the module to match the input of the AVR.

The SW1 selector sets the 'centre' point of the interface module's output. For example: if the output range required is 1V to 3V, with the 'centre' point being at 2V, then the position of the SW1 selector would be 4, giving a voltage offset of 2V.

The SW2 selector sets the voltage output range of the interface module's output. For example: if the output range required is 1V to 3V, then the position of the SW2 selector would be 1, giving a voltage range of $\pm 1V$ from the 'centre' point of 2V

For reference purposes, the switch positions perform the following functions:

SW1 setting	'centre' voltage of P121
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range of P121
0	$\pm 0.5V$
1	$\pm 1.0V$
2	$\pm 1.5V$
3	$\pm 2.0V$
4	$\pm 2.5V$
5	$\pm 3.0V$
6	$\pm 3.5V$
7	$\pm 4.0V$
8	$\pm 4.5V$
9	$\pm 5.0V$

Typical wiring diagrams for many of the most popular AVRs are included within this manual (See section entitled Interfacing to AVRs).

Where these diagrams include the P121 interface modules, the switch positions required for both SW1 and SW2 are given.

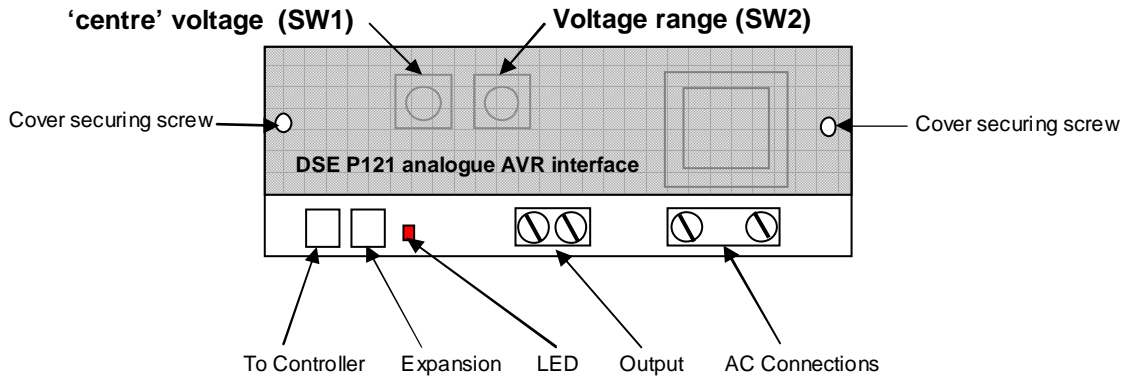
NOTE: - If the AVR you are using is not listed within this manual, it may still be possible to interface to it using the P121 modules. Contact your AVR manufacturer to check if the product has a DC voltage input for connection to a synchroniser / load sharer, and if so, what the 'voltage range' and 'centre voltage' is. You can then use the tables above to determine settings for SW1 and SW2. P121 terminal A is the negative output terminal and B is the positive output terminal (providing governor output reversed is not selected in the 55x controller's configuration).

If the 'centre voltage' and 'voltage range' are not available from the AVR manufacturer, providing the input is compatible with a DC voltage signal, it still may be possible to interface to it using the P121 modules. Contact our Technical Support Department for advice.

If the AVR is not fitted with a DC voltage input for connection to synchroniser/load share modules, then a different interface method will be required. See section entitled Interfacing to AVRs.

3.3.5 LOCATION OF SW1 AND SW2 SELECTORS

Access to the selectors is gained by removing power to the interface module, then removing the two screws that are used to secure the transparent cover. The selectors are positioned as shown below:

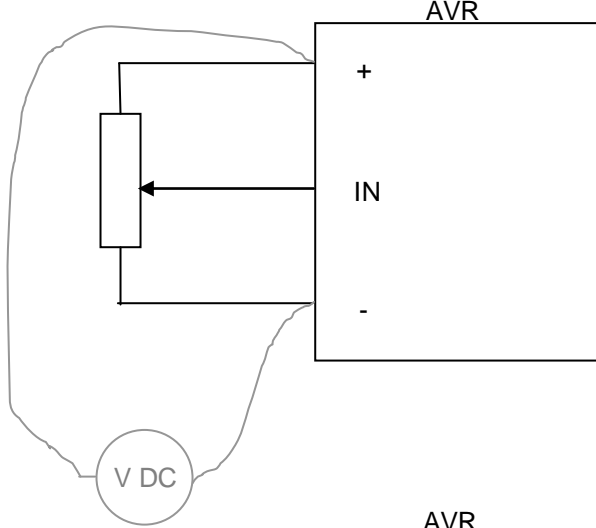


WARNING! Suitable steps should be taken to isolate the generator supply from the P121 AVR interface module before removing the cover. The cover must not be removed while the engine is running. Ensure the cover is correctly refitted before reconnecting the power and attempting to start the engine.

3.4 DETERMINING CONNECTIONS AND SETTINGS FOR AVRS NOT LISTED IN THIS PUBLICATION

The following guide is intended to assist the user to determine where to connect to AVRs not listed in this document.

Additionally it will assist you to find the correct settings for SW1 (centre) and SW2 (range).

This diagram shows how the remote adjust potentiometer is usually connected to the AVR. The potentiometer adjusts the voltage into the IN terminal between the voltages supplied at '-' and '+'.


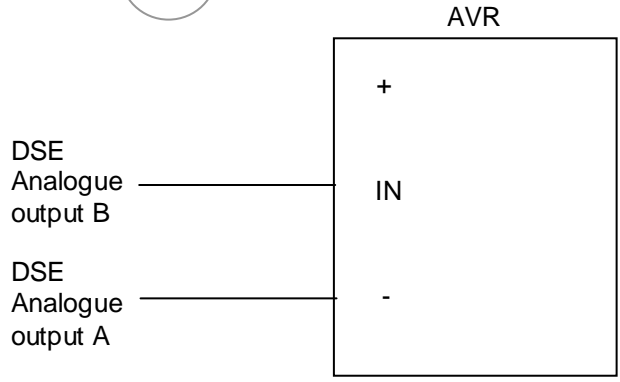
To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage of terminal '+' in relation to terminal '-' as shown.

Example. You measure 4V from '-' to '+'. Halving this voltage gives the centre voltage (2V).

The range voltage setting will have a maximum value of 2V above or below the centre voltage).

To determine the settings of SW1 and SW2, refer to the tables below.

The DSE controller (or DSE P121) connects only to the "-" and "IN" terminals and provides the varying DC voltage to simulate the turning of a potentiometer.

The Analogue output terminals of the DSE controller (or DSE P121) are connected as follows. Note that the "+" terminal of the AVR is left unconnected.


SW1 and SW2 settings

SW1 setting	'centre' voltage
0	0V
1	0.5V
2	1.0V
3	1.5V
4	2.0V
5	2.5V
6	3.0V
7	3.5V
8	4.0V
9	4.5V

SW2 setting	Voltage range
0	±0.5V
1	±1.0V
2	±1.5V
3	±2.0V
4	±2.5V
5	±3.0V
6	±3.5V
7	±4.0V
8	±4.5V
9	±5.0V

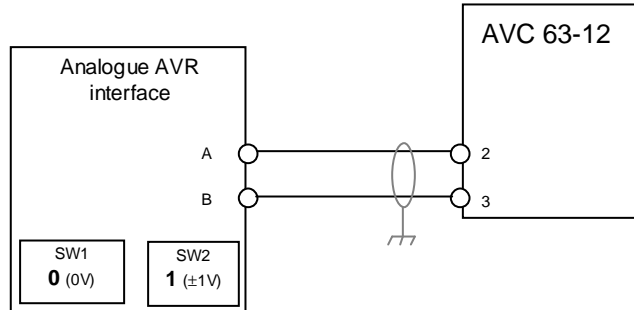
NOTE:- On DSE 8710/8610/75xx/55xx controllers, SW1 and SW2 settings can be adjusted by a setting change of 0.1 which equates to 0.05V. ie setting 4.5 gives a centre (SW1) voltage of 2.25V.
 When using P121, SW1 and SW2 go up in steps of 1 which equates to 0.5V. You may have to compromise to find a switch setting close to the measured value if the measured value is not a multiple of 0.5V.

NOTE:- Some AVRs only have two terminals. If they are not listed within this document, please contact us for advice,

3.5 BASLER

3.5.1 AVC 63-12

Using Analogue AVR output module:



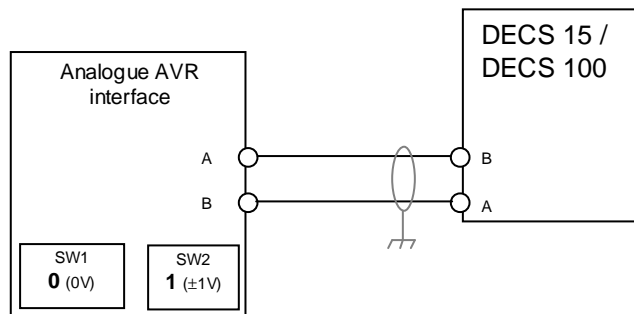
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.5.2 DECS 15, DECS 100

Using Analogue AVR output module:



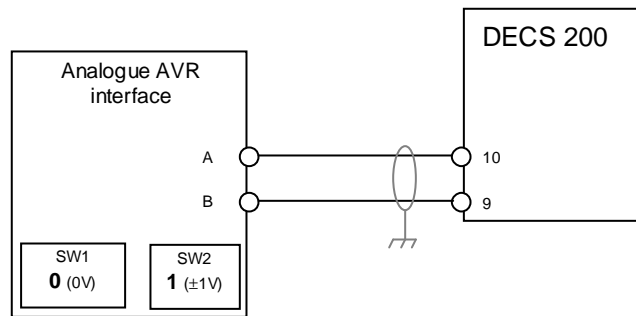
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.5.3 DECS 200

Using Analogue AVR output module:



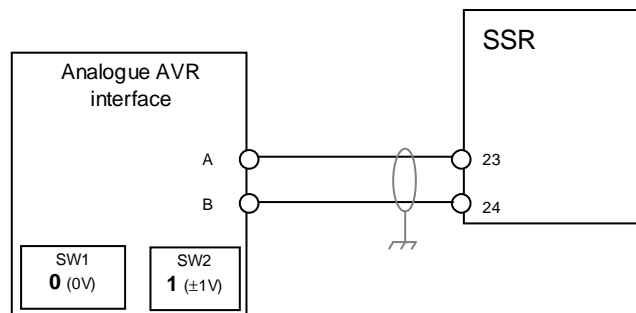
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.5.4 SSR

Using Analogue AVR output module:



NOTE:

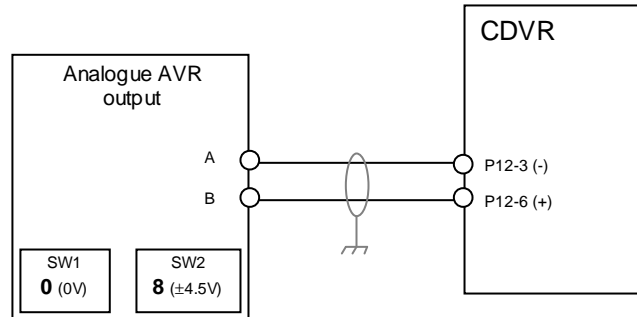
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.6 CATERPILLAR

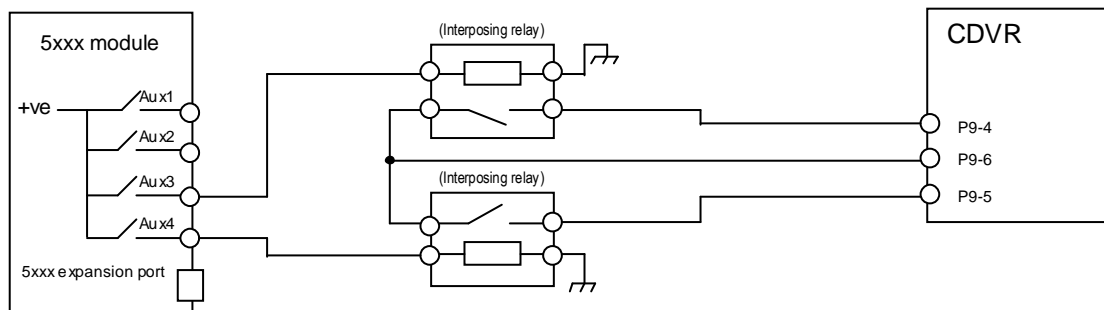
3.6.1 CDVR

Using Analogue AVR output Module:



NOTE:
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.
550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

Using module relays

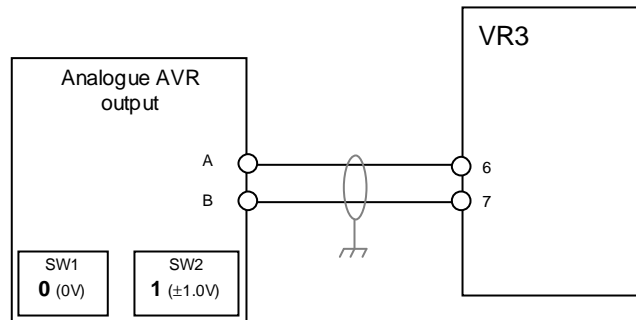


MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

3.6.2 VR3

Using Analogue AVR output Module:



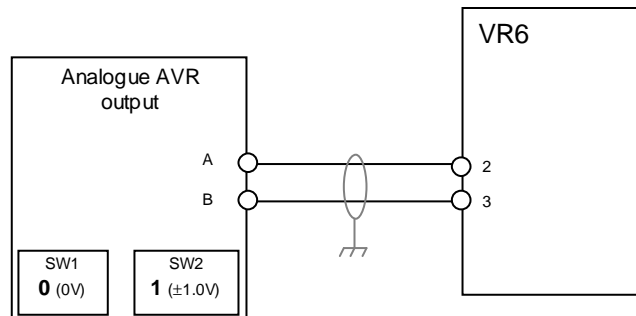
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.6.3 VR6

Using Analogue AVR output Module:



NOTE:

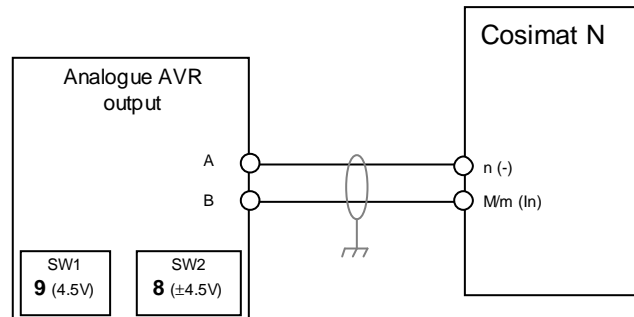
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.7 COSIMAT

3.7.1 COSIMAT N

Using Analogue AVR output Module:



NOTE:

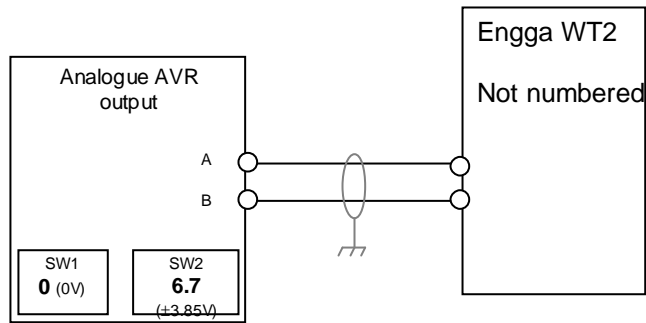
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.8 ENGGA*

3.8.1 WT2

Using Analogue AVR output Module:



NOTE:

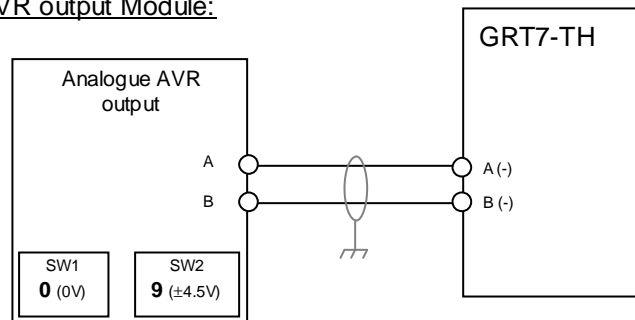
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.9 GRAMEYER

3.9.1 GRT7-TH*

Using Analogue AVR output Module:



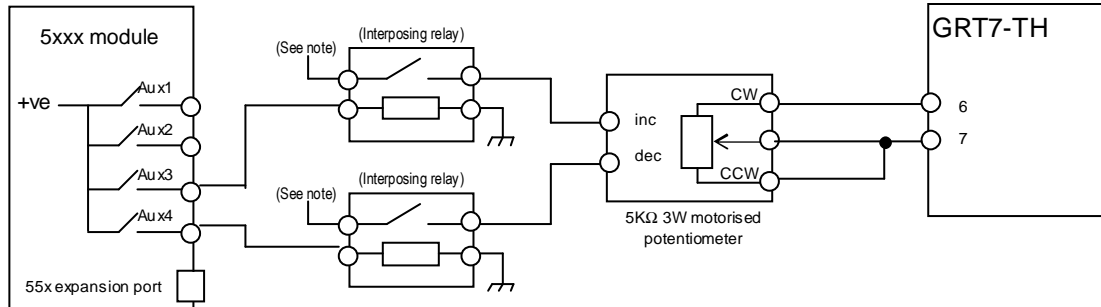
NOTE: - Using a P121 for AVR interface gives approximately +/- 5% adjustment of generator output voltage.

NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

Using external motorised potentiometer:



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

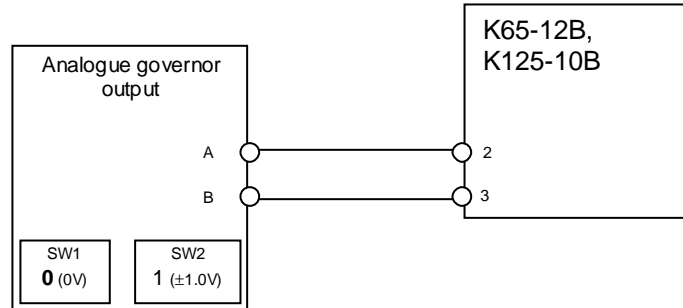
Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives. For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

3.10 KATO

3.10.1 K65-12B, K125-10B

Using Analogue governor output:



NOTE:

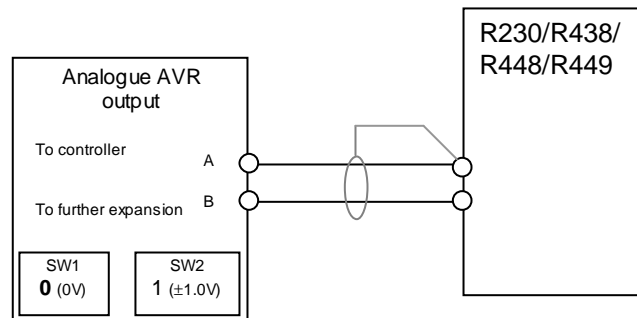
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue governor output is provided using the P120 governor interface module, compatible with load sharing enabled 550 / 555 controllers.

3.11 LEROY SOMER

3.11.1 R230 / R438* / R448 / R449


Using Analogue AVR output Module:



NOTE:

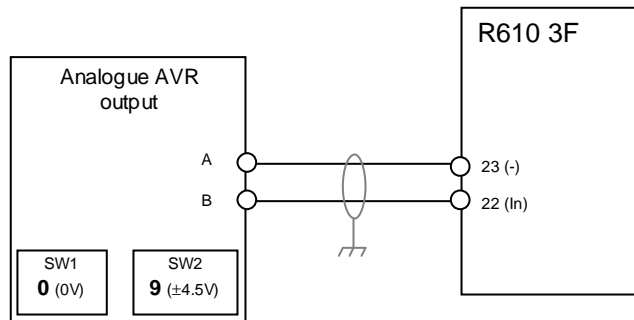
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

 NOTE: - The remote adjust input on the AVR are terminals ST4. Incorrect polarity will result in being unable to volts match or VAr share. You may need to reverse the connections if this occurs.

3.11.2 R610 3F

Using Analogue AVR output Module:

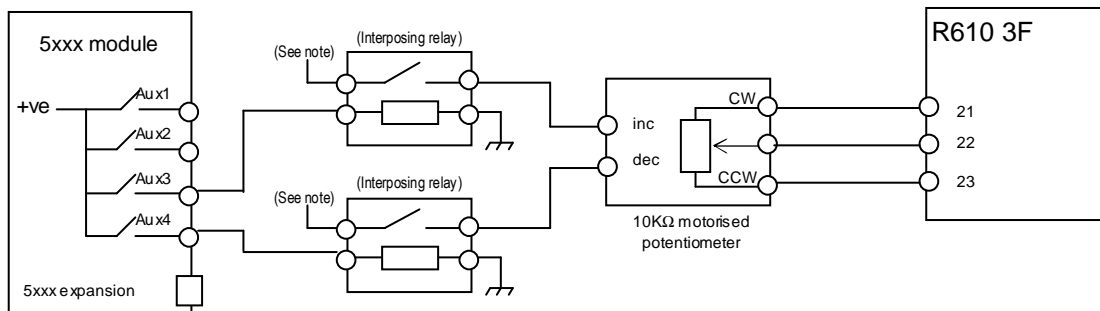


NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

Using external motorised potentiometer:



NOTE: - Interposing relay should connect to recommended polarity and voltage for potentiometer input. Refer to potentiometer manufacturer for details.

MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

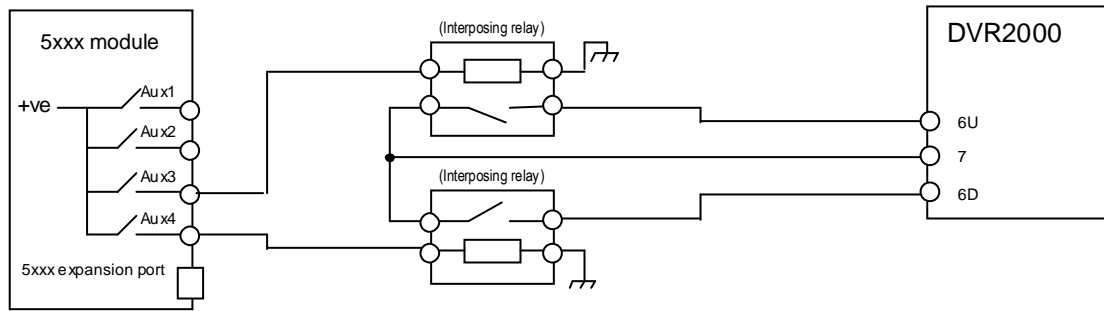
Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

NOTE:- Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives.

For typical details on applying a 'brake' to potentiometer motors, please refer to the APPENDIX section of this manual.

3.12 MARATHON

3.12.1 MAGNAMAX DVR2000 / DVR2000C



MODULE CONFIGURATION FOR 5xxx AUXILIARY RELAYS.

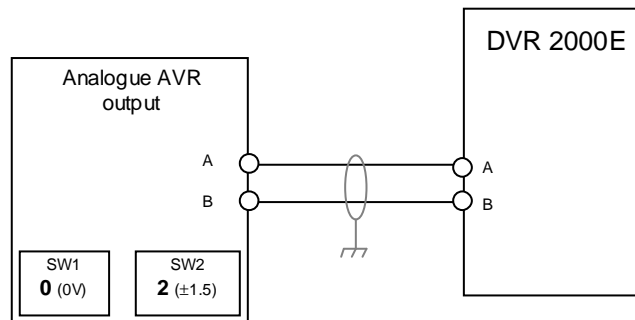
Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

NOTE: - The Interposing relays must have contacts rated for 240V 1A AC. Care is required because “input power” voltages are present between 6U & 7 and 6D & 7. (Source: Marathon Electric Magnamax^{DVR}™ Technical Manual for Model DVR® 2000)

NOTE: - The Magnamax^{DVR}™ AVR disables the voltage raise/lower inputs when in the *select mode*. I.e. The 55x controller cannot ‘remotely adjust’ the generator’s output voltage while the Magnamax^{DVR}™ AVR is in *Select mode*.

3.12.2 MAGNAMAX DVR2000E*

Using Analogue AVR output:



NOTE:

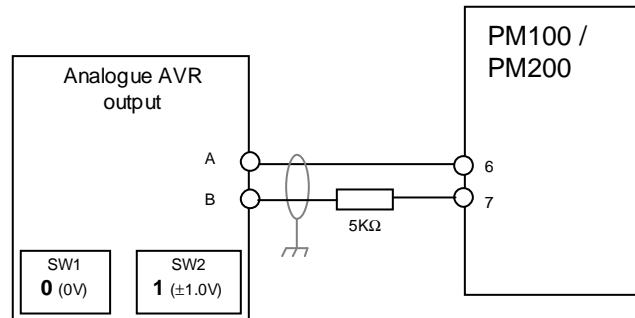
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

NOTE:- Setting SW2 to position 1 (1.5V) gives the possibility of +/- 10% adjustment in voltage. This is normally considered enough for voltage matching. If more adjustment is required, increase SW2. The Marathon DVR2000E’s input can accept upto a maximum of +/- 3V to give +/- 30% adjustment range. This can be achieved by setting P121 SW2 = 6 (3V)

3.12.3 MAGNAMAX PM100* / PM200*

Using Analogue AVR output:



NOTE:

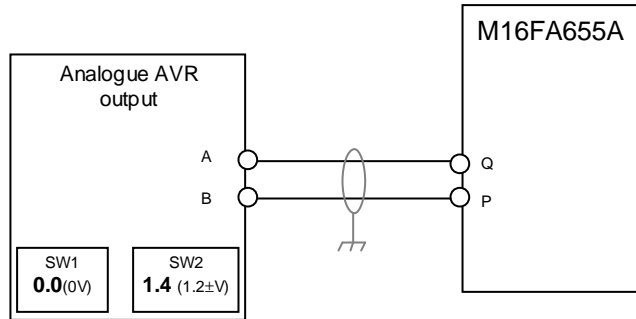
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.13 MARELLIMOTOR S.P.A.

3.13.1 M16FA655A *

Using analogue AVR output:



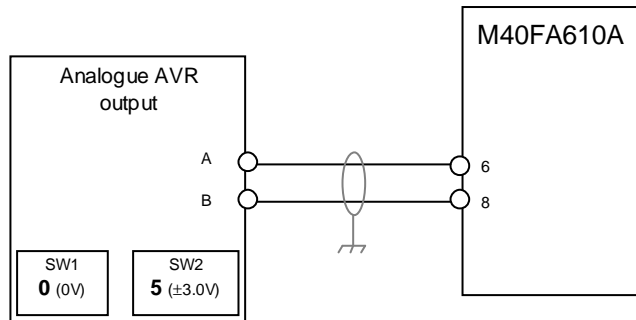
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.13.2 M40FA610A

Using analogue AVR output:



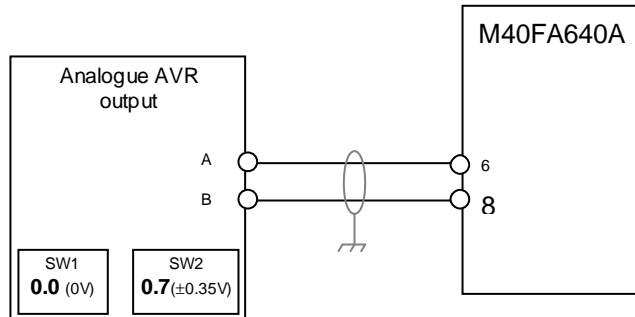
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.13.3 M40FA640A *

Using analogue AVR output:



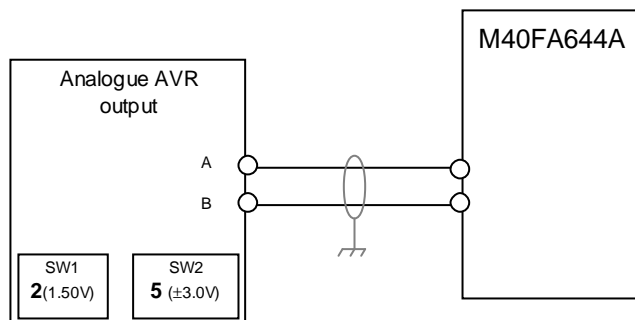
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers

3.13.4 M40FA644A – TERMINAL NUMBERS NOT YET ADDED

Using analogue AVR output:



NOTE:

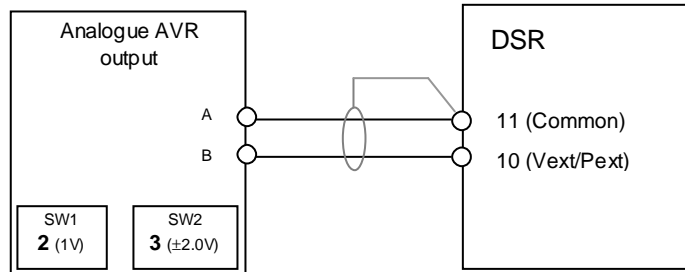
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.14 MECC ALTE S.P.A.

3.14.1 DSR DIGITAL REGULATOR

Using analogue AVR output:



NOTE: Ensure the DSR parameter 16 is set to +/10% (factory setting of +/-5% is not high enough for voltage matching or VAr sharing operation).

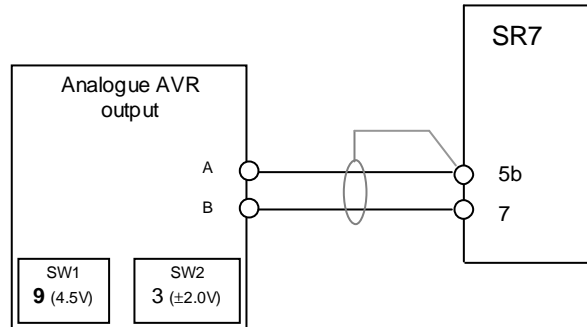
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.14.2 S.R.7*

Using analogue AVR output:



MODULE CONFIGURATION FOR ANALOGUE AVR OUTPUT

The SR7 uses lower voltage on input N = higher generator output voltage. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the voltage output:

Configuration item	Selection
Reverse AVR output	<input checked="" type="checkbox"/>

NOTE:

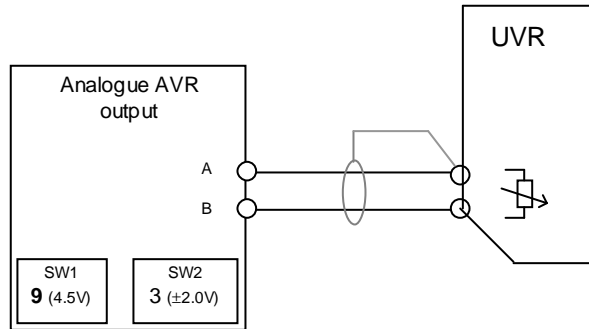
8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

NOTE:- When the analogue AVR output is connected to the Mecc Alte AVR the alternators output voltage will rise. It is recommended to set the AVR voltage to minimum setting before connecting the analogue AVR output.

3.14.3 U.V.R.*

Using analogue AVR output:



MODULE CONFIGURATION FOR ANALOGUE AVR OUTPUT

The UVR uses lower voltage on input N = higher generator output voltage. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the voltage output:

Configuration item	Selection
Reverse AVR output	<input checked="" type="checkbox"/>

NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

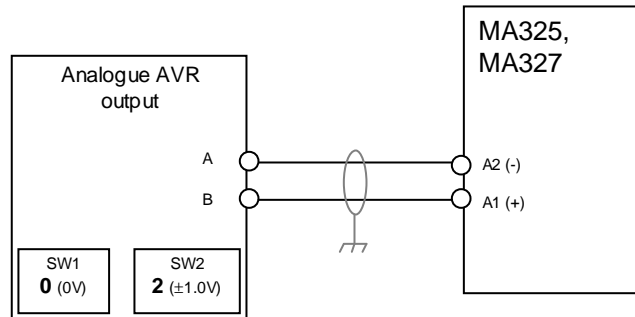
550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

NOTE:- When the analogue AVR output is connected to the Mecc Alte AVR the alternators output voltage will rise. It is recommended to set the AVR voltage to minimum setting before connecting the analogue AVR output.

3.15 NEWAGE INTERNATIONAL

3.15.1 MA325, MA327

Using Analogue AVR output Module:



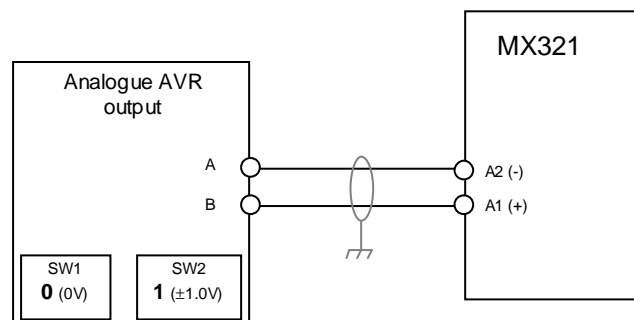
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.15.2 MX321*

Using Analogue AVR output Module:



NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

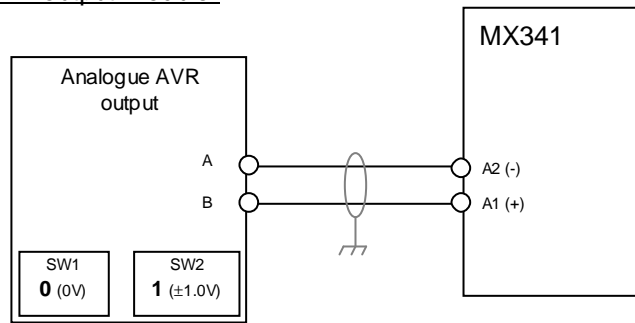
NOTE:- MX341 inputs A1/A2 are “disabled” when the AVR’s voltage trim is wound fully anticlockwise!

The more “clockwise” the AVR’s voltage trim setting is, the more effect that the P121 will have upon the voltage adjustment.

NOTE:- It has been noticed that some MX321’s have the A1 and A2 terminals ‘the other way round’. At the time of producing this document the reason for this is not known. Suffice to say if you have a set where the alternator output rises when it should fall, swap the connections to A1 and A2 on the MX321.

3.15.3 MX341*

Using Analogue AVR output Module:



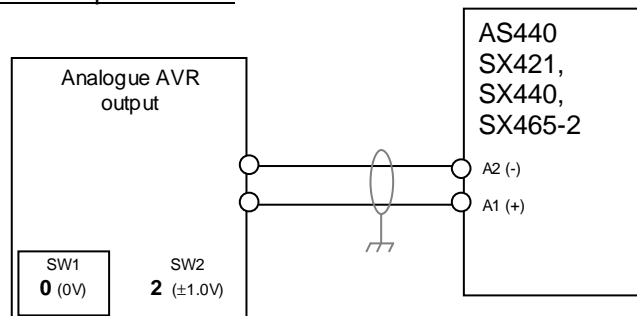
NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.
550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

NOTE:- MX341 inputs A1/A2 are “disabled” when the AVR’s voltage trim is wound fully anticlockwise!
The more “clockwise” the AVR’s voltage trim setting is, the more effect that the P121 will have upon the voltage adjustment.

3.15.4 AS440, SX421, SX440*, SX465-2

Using Analogue AVR output Module:



NOTE: - Ensure the “VTrim” adjustment for the SX440’s voltage adjustment input is set to accept a signal of ±1V DC.

NOTE:- Ensure that some droop is configured using the AVR’s “Droop” adjustment. (typically 5%).

NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.
550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

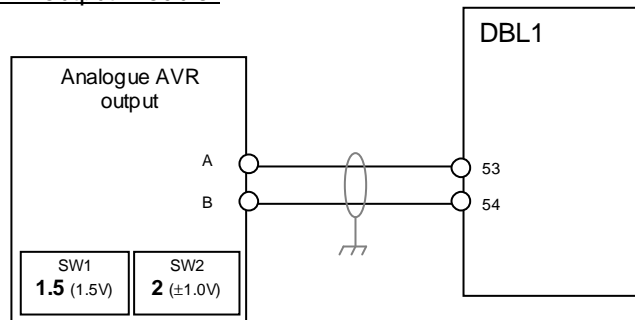
3.15.5 SX460

Early versions of this AVR is not suitable for use with the DSE sync / load share controllers as no input for speed control exists. Later versions are fitted with the speed control input.

SINCRO S.R.L.

3.15.6 DBL1*

Using Analogue AVR output Module:



MODULE CONFIGURATION FOR ANALOGUE AVR OUTPUT

The AVR uses lower voltage on input 54 = higher generator output voltage. Therefore, we need to configure the 5xxx controller to 'reverse' the polarity of the voltage output:

Configuration item	Selection
Reverse AVR output	<input checked="" type="checkbox"/>

NOTE:

8710 / 8610 / 75xx / 55xx controllers: Analogue AVR output is integral to the controller.

550 / 555 controllers : Analogue AVR output is provided using the P121 governor AVR module, compatible with load sharing enabled 550 / 555 controllers.

3.16 WEG

3.16.1 GRT7-TH*

As this device is manufactured by Grameyer, please see the section entitled Grameyer elsewhere in this manual.

4 APPENDIX

Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives.

