



# **DEEP SEA ELECTRONICS PLC**

## **Guide to Synchronising and Load Sharing Part 2:**

### **Governor and AVR Interfacing** **With DSE8xxx, DSE75xx and DSE55xx Series**

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**DSE Guide to Synchronising and Load Sharing Part 2: Governor and AVR Interfacing**

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**Amendments List**

Issue	Comments
16	Updated Sincro DBL1 inputs Updated PROACT II information to include analogue AVR interface Added new governor Woodward L-series Added new governor TOHO XS-400C-16 Added new AVR DSEA106 Added new AVR Marelli M31FA600A (DEC20)

Typeface: The typeface used in this document is *Arial*. Care should be taken not to mistake the upper case letter I with the numeral 1. The numeral 1 has a top serif to avoid this confusion.

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## 1 INTRODUCTION

**▲ NOTE: Settings for SW1 and SW2 are intended as a guide and starting point only. Individual sets may require different values for SW1 and/or SW2 depending upon the initial setup of the governor or AVR being connected to. All SW1 and/or SW2 settings mentioned in this document are to be tested using the steps mentioned in sections *DETERMINING CONNECTIONS AND SETTINGS FOR GOVERNOR/AVR* elsewhere in this document.**

This document (Part 2 of the DSE Guide to Synchronising and Load Sharing) is intended to provide a guide to panel designers for interfacing DSE 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 controllers 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.

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 supplier 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**

Should you have any queries arising from this manual, contact our Technical Department:

**INTERNATIONAL TEL: +44 (0) 1723 890099**

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## 2 INTERFACING TO GOVERNORS / ENGINE ECU'S

This section details the interface connections between the DSE controllers and the most commonly used 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* elsewhere in this document.

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 common engine speed governors.

This enables the DSE Controller 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.

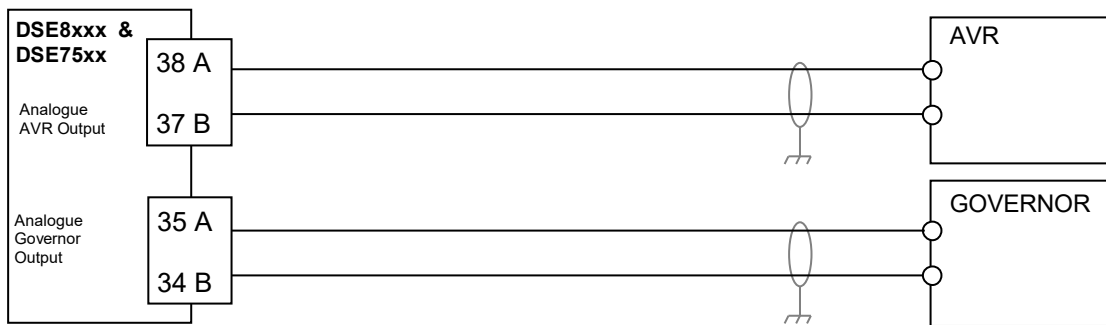
There is usually no requirement for speed droop to be enabled on the engine/governor, although this can help in certain applications (ie when in base load against another generator rather than the mains (Utility) supply

### 2.1 SPECIFICATIONS

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

### 2.2 INTERFACING WITH THE CONTROLLER

#### 2.2.1 CONNECTION DETAILS FOR DSE86XX AND DSE75XX SERIES

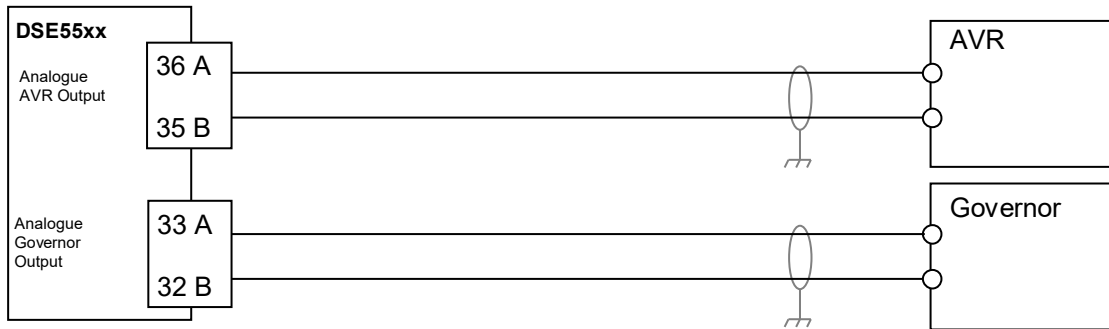


**NOTE:** Further details on connections to various governors can be found elsewhere in this manual.

**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.

## 2.2.2 CONNECTION DETAILS FOR DSE55XX SERIES



**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.



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

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

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

SW1 Setting	'Centre' Voltage Of Governor Output
0	0 V
1	0.5 V
2	1.0 V
3	1.5 V
4	2.0 V
5	2.5 V
6	3.0 V
7	3.5 V
8	4.0 V
9	4.5 V
10	5.0 V

SW2 Setting	Voltage Range Of Governor Output
0	$\pm 0.5$ V
1	$\pm 1.0$ V
2	$\pm 1.5$ V
3	$\pm 2.0$ V
4	$\pm 2.5$ V
5	$\pm 3.0$ V
6	$\pm 3.5$ V
7	$\pm 4.0$ V
8	$\pm 4.5$ V
9	$\pm 5.0$ V

Typical wiring diagrams and settings for SW1/SW2 for many common governors are shown elsewhere in this document.

**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 may be possible to interface to it using the DSE modules. Contact our Technical Support Department for advice.

DSE 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 FOR DSE8XXX SERIES**

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 interface with several control panels:

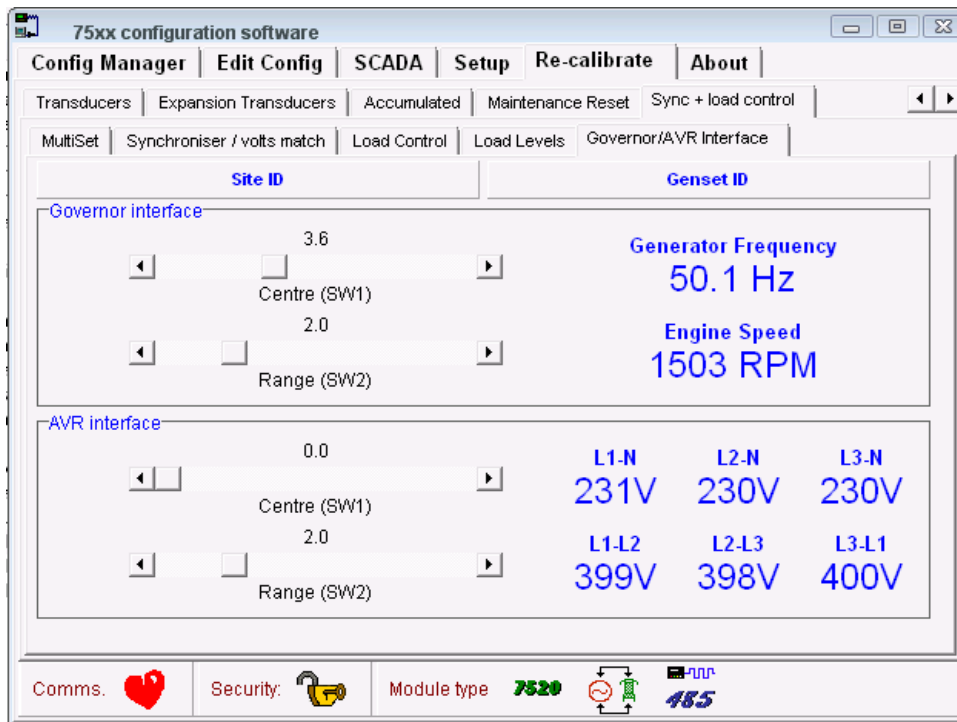
- Interface** (Main title)
- Governor** section:
  - Centre (SW1) 6.4 with a slider set to 6.4 and a Reset button.
  - Range (SW2) 2.0 with a slider set to 2.0 and a Reset button.
- Speed And Frequency** section:
  - Engine Speed: 0 RPM
  - Generator Frequency: 0.0 Hz
  - Governor Analogue: 0.0 %
  - AVR Analog: 0.0 %
- AVR** section:
  - Centre (SW1) 1.6 with a slider set to 1.6 and a Reset button.
  - Range (SW2) 7.0 with a slider set to 7.0 and a Reset button.
- Phase To Neutral Voltages** section:
  - L1 - N: 0.0 V
  - L2 - N: 0.0 V
  - L3 - N: 0.0 V
- Phase To Phase Voltages** section:
  - L1 - L2: 0.0 V
  - L2 - L3: 0.0 V
  - L3 - L1: 0.0 V

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

## LOCATION OF SW1 AND SW2 SELECTORS FOR DSE75XX AND DSE55XX SERIES

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”.

## 2.3 DETERMINING CONNECTIONS AND SETTINGS FOR GOVERNORS

The following guides are 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) and confirm that the settings mentioned in this document are correct for your application.

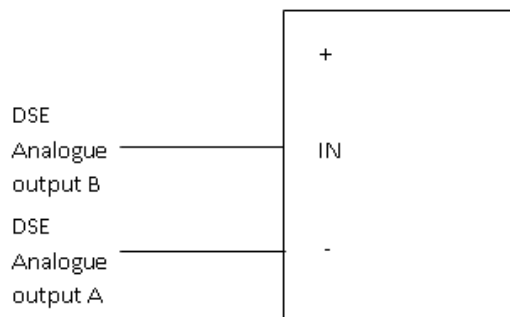
### 2.3.1 'FOUR STEPS TO SYNCHRONISING' METHOD

**NOTE:** The following procedure only refers to the first of the Four Steps to Synchronising. For further information on the remain three, contact DSE Technical Support.

#### SETTING UP THE GOVERNOR (ADJUSTMENT OF SW1 AND SW2)

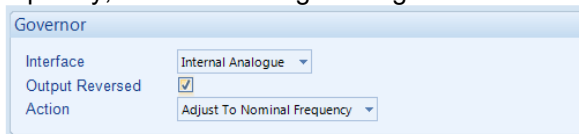
##### BEFORE YOU START

1. **When using a DSExx20 synchronising module, ensure inputs are configured for 'Mains Load Inhibit' and 'Generator Load Inhibit'.**
2. Ensure that the generator is connected to a **DEAD BUS BAR WITH NO LOADS** connected.
3. With the generator breaker open, set the generator to run at the **Nominal Frequency** without the DSE module connected to the Governor. To achieve this you will have to adjust the settings on the governor.
4. Connect the DSE module to the Governor once completed. The DSE controller 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 are connected as follows. Note that the "+" terminal of the governor is left unconnected.

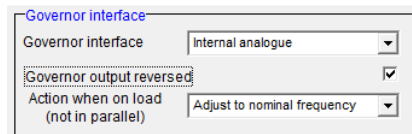


#### ADJUSTMENT OF GOVERNOR SW1

5. **When using a DSExx20 synchronising module, ensure the inputs configured for 'Mains Load Inhibit' and 'Generator Load Inhibit' are active.**
6. Start the generator and ensure that the breaker is left open.
7. Check the direction of drive by increasing and decreasing SW1. If the frequency increases whilst SW1 is being decreased tick the option 'Output Reversed'. If moving SW1 does not change the frequency, check the wiring to the governor for faults.



DSE8xxx Series Example

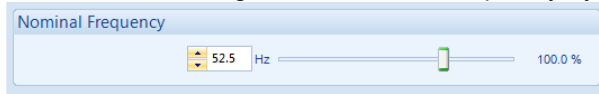


DSE75xx & DSE55xx Series Example

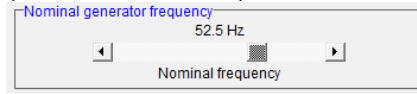
8. Adjust the SW1 setting for the Governor until the generator runs at **Nominal Frequency (50 Hz or 60 Hz)**
9. Stop the generator. SW1 is now complete and needs to be left alone.

**ADJUSTMENT OF GOVERNOR SW2**

10. When using a DSExx20 synchronising module, ensure the input configured for 'Mains Load Inhibit' and is active but the input for Generator Load Inhibit' is not active.
11. Increase the setting of the Nominal Frequency by 2.5 Hz (52.5 Hz or 62.5 Hz)

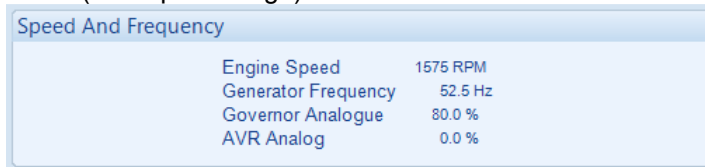


DSE8xxx Series Example

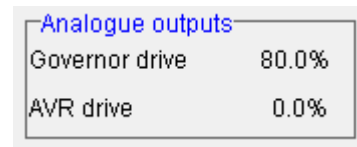


DSE75xx & DSE55xx Series Example

12. Start the generator. With the breaker open the generator will run at setting of SW1 (50 Hz or 60 Hz).
13. Close the generator breaker onto a **DEAD BUS BAR WITH NO LOADS** connected. The generator frequency shall start to increase towards the new Nominal Frequency setting (52.5 Hz or 62.5 Hz) however it may not achieve this.
14. Adjust SW2 to allow the frequency to increase to the new Nominal Frequency (52.5 Hz or 62.5 Hz)
15. Keep adjusting SW2 further to ensure Governor Drive reads within **75% to 85%**, the sign of the drive (+ or - percentage) does not matter.

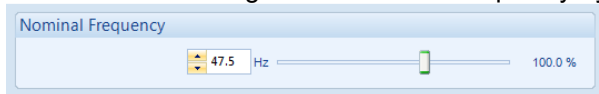


DSE8xxx Series Example

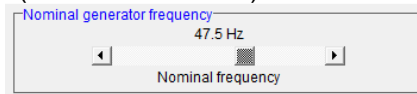


DSE75xx & DSE55xx Series Example

16. Stop the Generator
17. Decrease the setting of the Nominal Frequency by 2.5 Hz (47.5 Hz or 57.5 Hz)

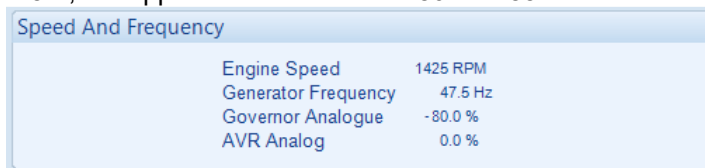


DSE8xxx Series Example

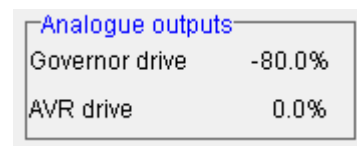


DSE75xx & DSE55xx Series Example

18. Start the generator. With the breaker open the generator will run at setting of SW1 (50 Hz or 60 Hz).
19. Close the generator breaker onto a **DEAD BUS BAR WITH NO LOADS** connected. The generator frequency shall start to decrease towards the new Nominal Frequency (47.5 Hz or 57.5 Hz).
20. SW2 is then adjusted further to ensure Governor Drive reads within **75% to 85%**, the sign of the drive (+ or - percentage) does not matter. Note that any change made to the lower percentage will be the same for the upper percentage. For example, if the lower percentages from 70% to 75%, the upper will increase from 80% to 85%.



DSE8xxx Series Example



DSE75xx & DSE55xx Series Example

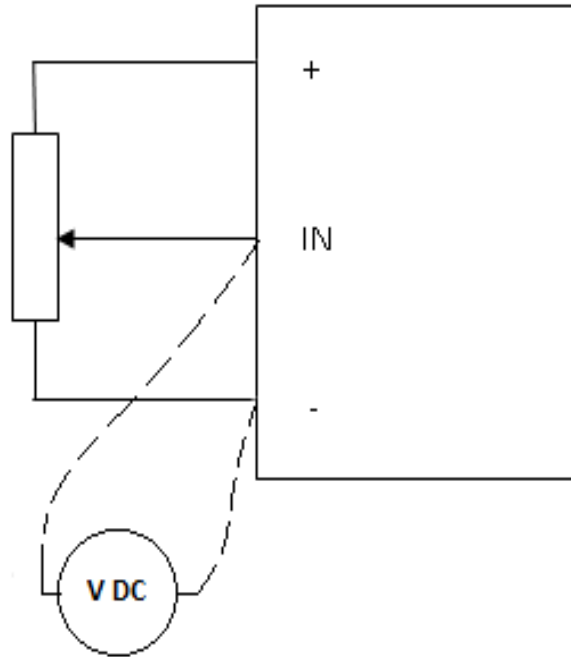
21. Change the setting of the Nominal Frequency back to the actual Nominal Frequency (50 Hz or 60 Hz).

### 2.3.2 VOLTAGE MEASUREMENT METHOD

The below 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 '+'.  
 To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage between terminal 'In' and terminal '-' as in the following steps:

To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage between terminal 'In' and terminal '-' as in the following steps:

1. Connect the potentiometer specified by the manufacturer and DC voltage meter as shown below.

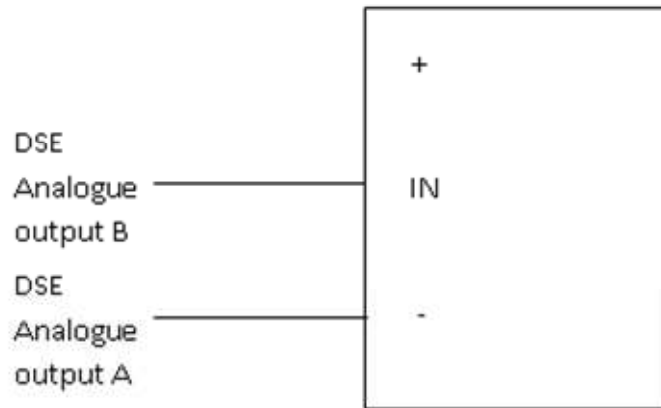


**NOTE:** V1 or V2 might be shown negative on the multi-meter, it is important to write down the sign as we need to know the full voltage range, and the centre voltage in some cases might be 0V.

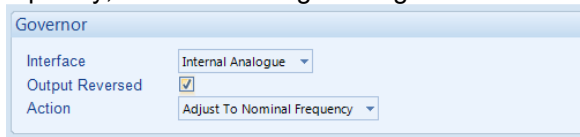
2. Turn the potentiometer till the frequency reaches +3 Hz above nominal frequency (53 Hz or 63 Hz), measure the voltage across terminal 'In' and terminal '-' and note this value as  $V1$  (Example  $V1 = +1$  V).
3. Turn the potentiometer in the opposite direction till the frequency reaches -3 Hz below nominal frequency (47 Hz or 57 Hz), measure the voltage across terminal 'In' and terminal '-' and note the value as  $V2$  (Example  $V2 = +4$  V).
4. The centre voltage is derived from these two values would be:  $V_{centre} = (V1+V2)/2$  (For example  $(1V + 4V)/2 = 2.5$  V).
5. The range voltage is would be calculated by:  $V_{range} = V_{centre} - V1$  or  $V_{range} = V2 - V_{centre}$  (For example  $2.5V - 1V = 1.5V$ )

**NOTE:** If the Frequency cannot reach +/- 3 Hz around the nominal (on some Governors), a change of +/- 2.0 Hz is acceptable for DSE load share controllers; any less than +/- 2.0Hz might not give the required range for load sharing at high load levels.

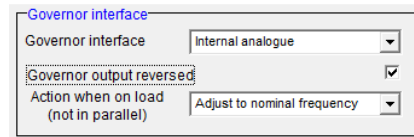
6. Connect the DSE module to the Governor once completed. The DSE controller connects only to the “-” and “IN” terminals and provides the varying DC voltage to simulate the turning of a potentiometer. The Analogue output terminals of the DSE controller are connected as follows. Note that the “+” terminal of the Governor is left unconnected.



7. Check the direction of drive by increasing and decreasing SW1. If the frequency increases whilst SW1 is being decreased tick the option 'Output Reversed'. If moving SW1 does not change the frequency, check the wiring to the governor for faults.



DSE8xxx Series Example



DSE75xx & DSE55xx Series Example

8. Using the tables below, match  $V_{centre}$  to the appropriate SW1 setting and match  $V_{range}$  to the appropriate SW2 setting (For example SW1 of 5 =  $V_{centre}$  of 2.5 V and SW2 of 2 =  $V_{range}$  of 1.5 V)

**SW1 AND SW2 SETTINGS**

SW1 Setting	'Centre' Voltage
0	0 V
1	0.5 V
2	1.0 V
3	1.5 V
4	2.0 V
5	2.5 V
6	3.0 V
7	3.5 V
8	4.0 V
9	4.5 V

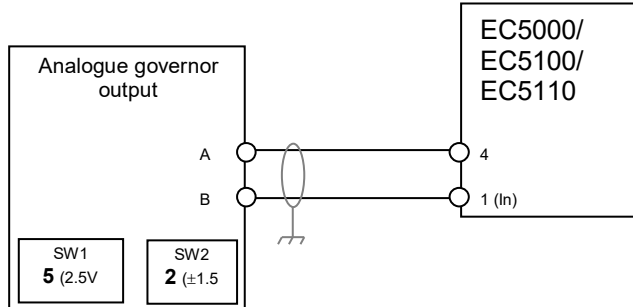
SW2 Setting	Voltage Range
0	±0.5 V
1	±1.0 V
2	±1.5 V
3	±2.0 V
4	±2.5 V
5	±3.0 V
6	±3.5 V
7	±4.0 V
8	±4.5 V
9	±5.0 V

**NOTE:** SW1 and SW2 settings can be adjusted by a setting change of 0.1 which equates to 0.05 V. ie setting 4.5 gives a centre (SW1) voltage of 2.25 V.

## 2.4 AMBAC

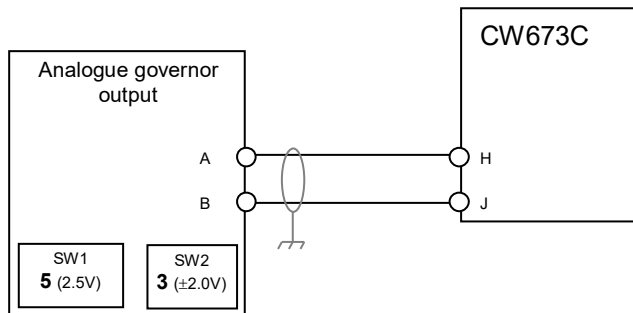
### 2.4.1 EC5000\* / EC5100\* / EC5110\*

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.4.2 CW673C

#### USING ANALOGUE GOVERNOR OUTPUT:

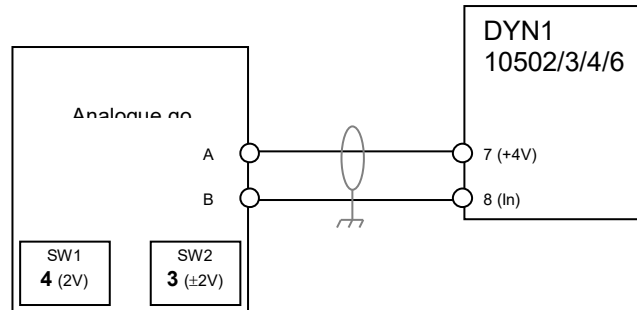




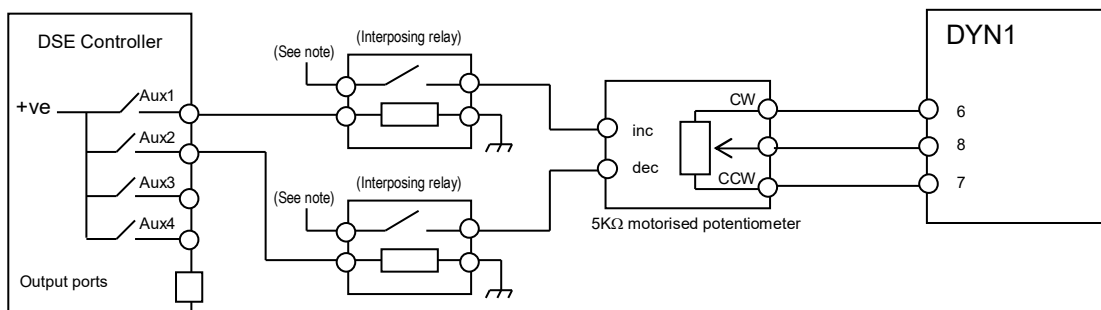
## 2.5 BARBER COLMAN

### 2.5.1 DYN1 10502, 10503, 10504, 10506

#### USING ANALOGUE GOVERNOR OUTPUT:



#### USING EXTERNAL MOTORISED POTENTIOMETER:



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

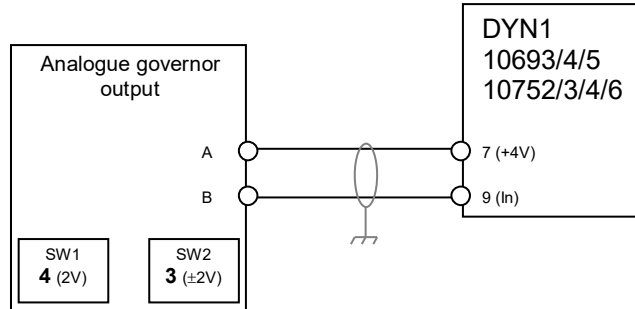
#### MODULE CONFIGURATION FOR DSE OUTPUTS.

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.

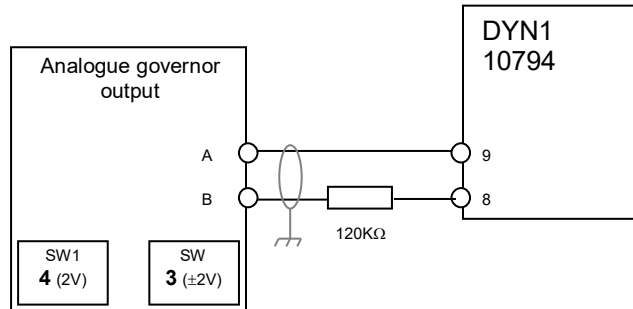
**2.5.2 DYN1 10693, 10694, 10695, 10752, 10753, 10754, 10756**

**USING ANALOGUE GOVERNOR OUTPUT:**



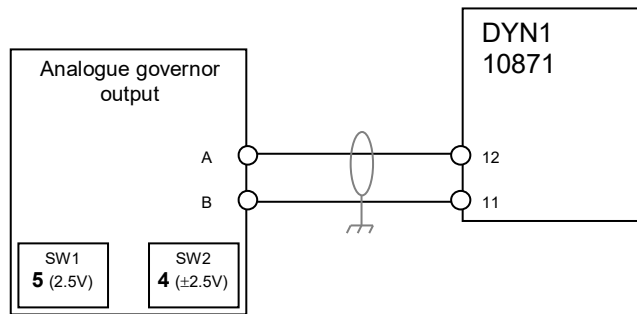
**2.5.3 DYN1 10794\***

**USING ANALOGUE GOVERNOR OUTPUT:**

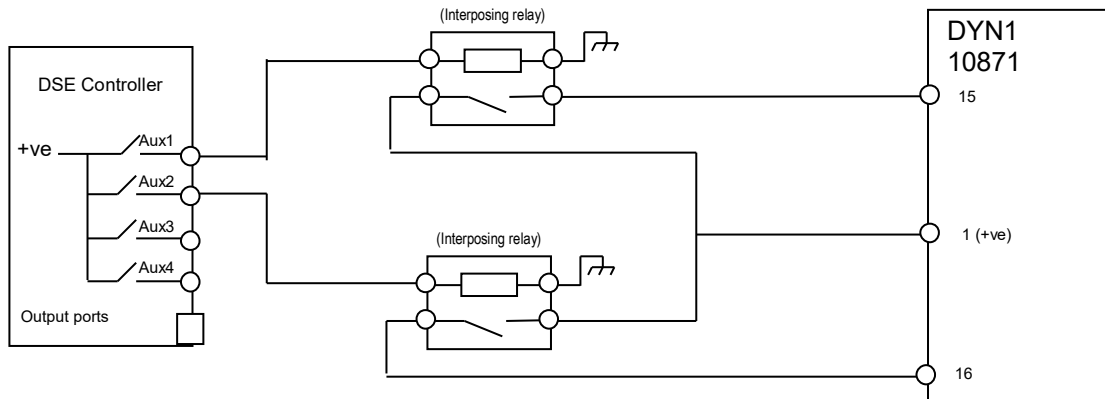


### 2.5.4 DYN1 10871

#### USING ANALOGUE GOVERNOR OUTPUT:

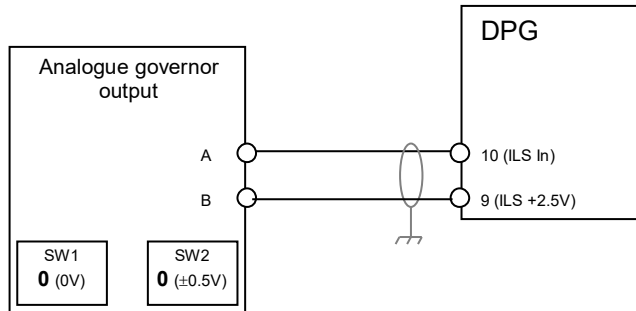


#### USING DISCRETE RAISE / LOWER INPUTS:



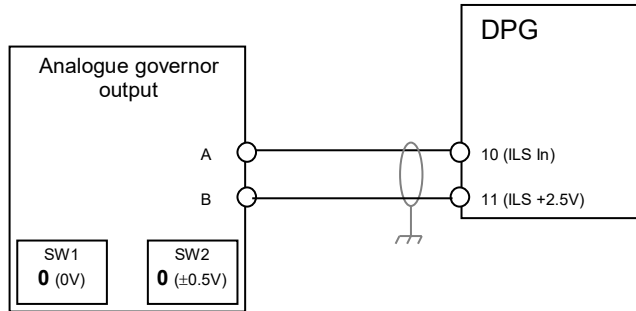
### 2.5.5 DPG 2201\*

#### USING ANALOGUE GOVERNOR OUTPUT:



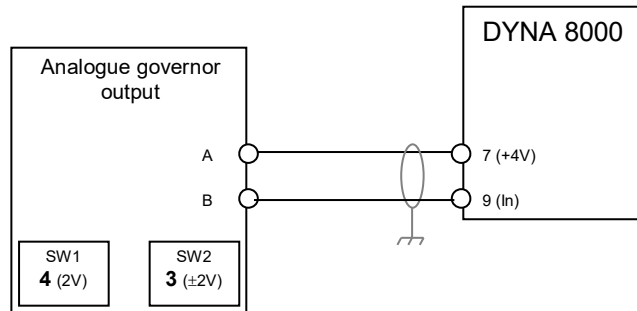
### 2.5.6 DPG 2401

#### USING ANALOGUE GOVERNOR OUTPUT:

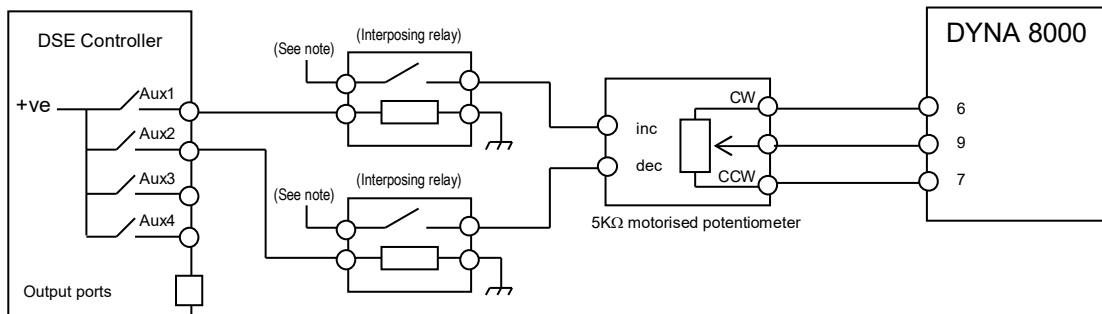


### 2.5.7 DYNA 8000\*

#### USING ANALOGUE GOVERNOR OUTPUT:



#### 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 DSE OUTPUTS.

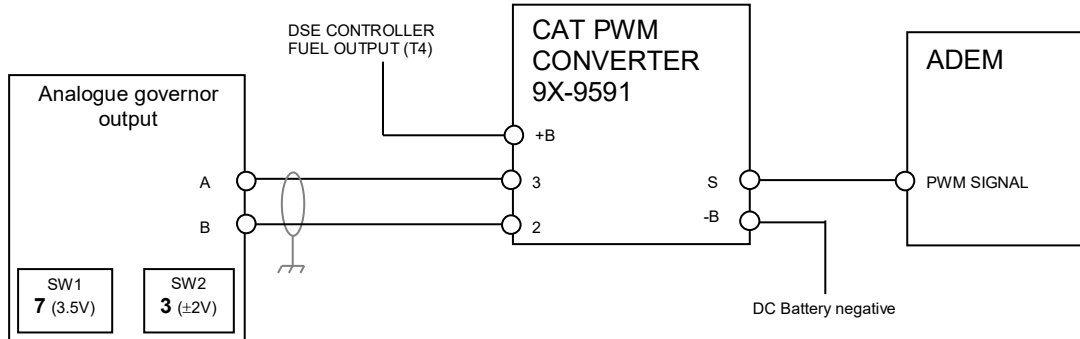
Module Relay	Polarity	Output Source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

**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:

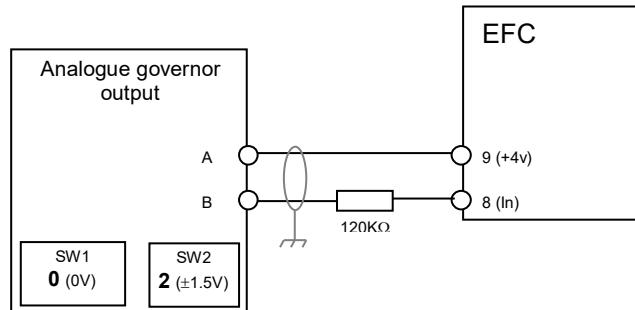


**NOTE:** CAT PWM CONVERTER 9X-9591 is available from your local CAT dealer and is used to allow the DSE module to interface with the CAT ADEM PWM controller.

## 2.7 CUMMINS

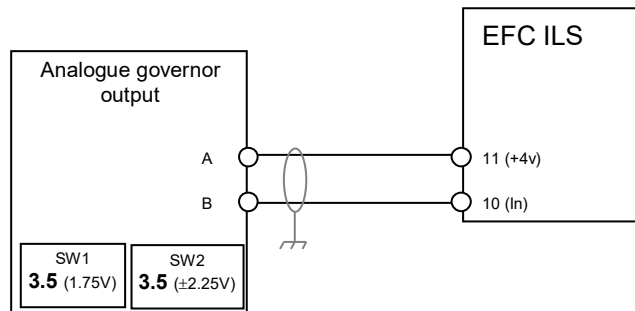
### 2.7.1 EFC\*

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.7.2 EFC WITH SMOKE LIMITING AND ILS

#### USING ANALOGUE GOVERNOR OUTPUT:



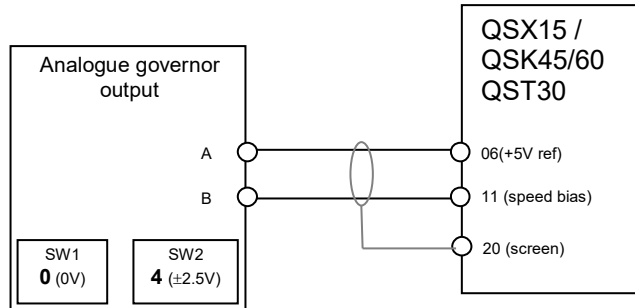
**NOTE:** Put the governor into "Run 1" (which switches off remote pot) adjust engine speed to 48Hz. (Min speed)

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.

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

**USING ANALOGUE GOVERNOR OUTPUT:**



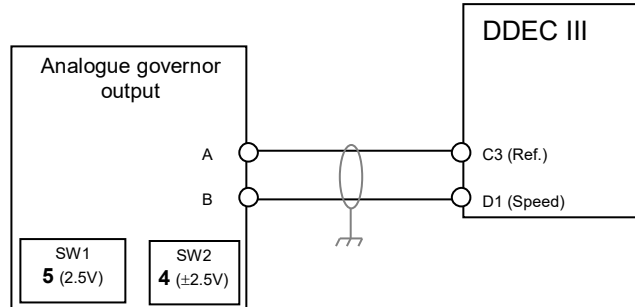
**▲ NOTE: Ensure that the QSK45/60 adjustable parameter Speed Bias Input Type is set to 'Woodward', and that the Woodward Speed Bias value is set to "Enable".**



## 2.8 DETROIT DIESEL

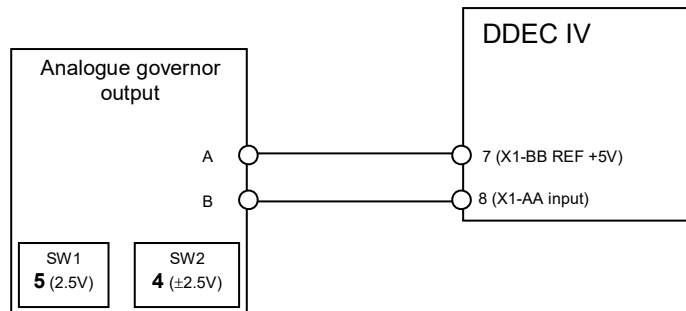
### 2.8.1 DDEC III

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.8.2 DDEC IV\*

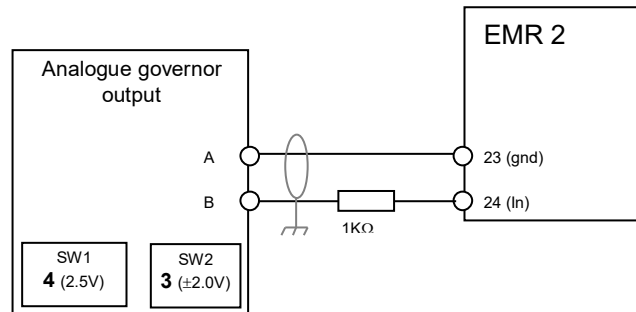
#### USING ANALOGUE GOVERNOR OUTPUT:



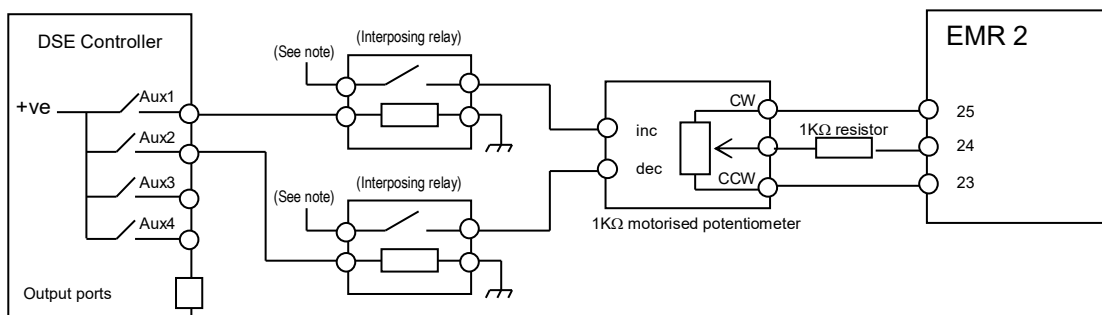
## 2.9 DEUTZ

### 2.9.1 EMR 2 ELECTRONIC ENGINE GOVERNOR\*

#### USING ANALOGUE GOVERNOR OUTPUT:



#### 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 DSE OUTPUTS.

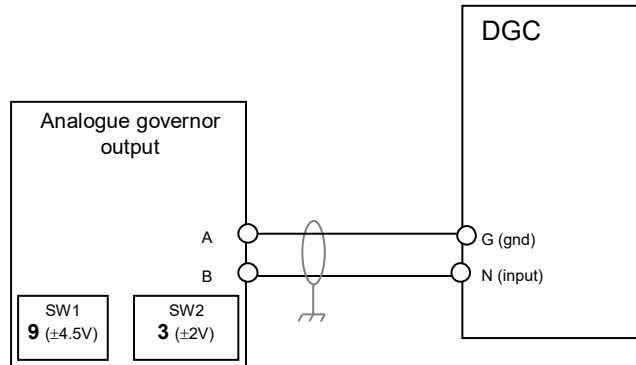
Module relay	Polarity	Output source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

**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 CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

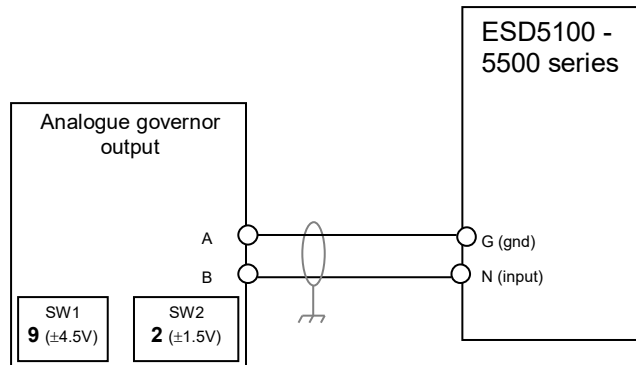
The DGC uses lower voltage on input N = higher speed. Therefore, we need to configure the DSE controller to 'reverse' the polarity of the analogue governor output:

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

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

### 2.11.1 5100 - 5500 SERIES\*

#### USING ANALOGUE GOVERNOR OUTPUT:



#### MODULE CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

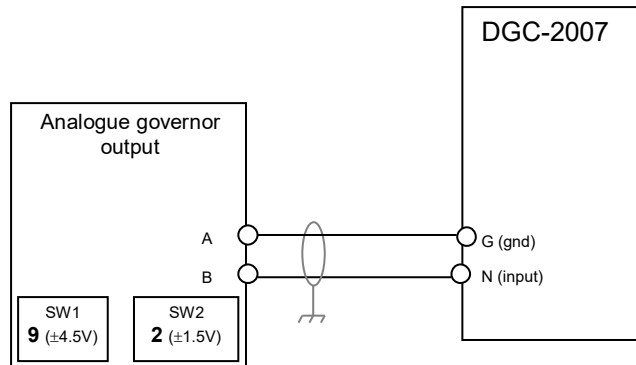
The 5100-5500 uses lower voltage on input N = higher speed. Therefore, we need to configure the DSE load share controller to 'reverse' the polarity of the Analogue governor output:

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

## 2.12 GHANA CONTROL

### 2.12.1 DGC-2007\*

#### USING ANALOGUE GOVERNOR OUTPUT:



#### MODULE CONFIGURATION FOR ANALOGUE GOVERNOR INTERFACE

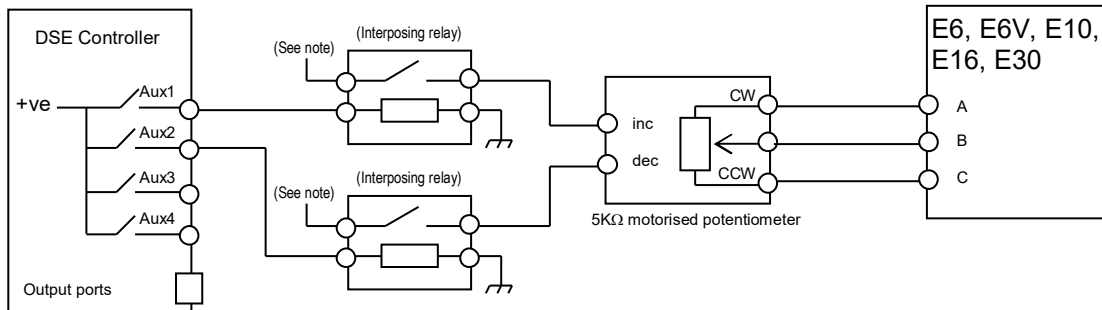
The DGC-2007 uses lower voltage on input N = higher speed. Therefore, we need to configure the DSE load share controller to 'reverse' the polarity of the Analogue governor output:

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

## 2.13 HEINZMANN

### 2.13.1 E6, E6V, E10, E16, E30

#### USING EXTERNAL MOTORISED POTENTIOMETER:



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

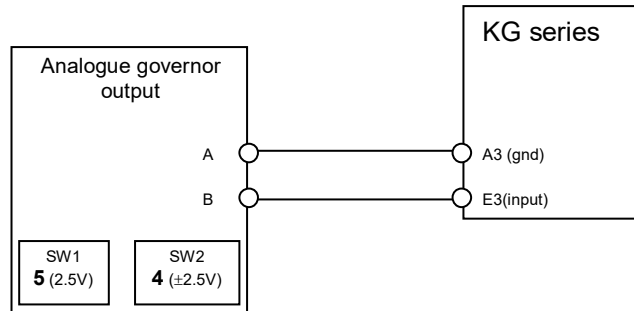
#### MODULE CONFIGURATION FOR DSE OUTPUTS.

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.

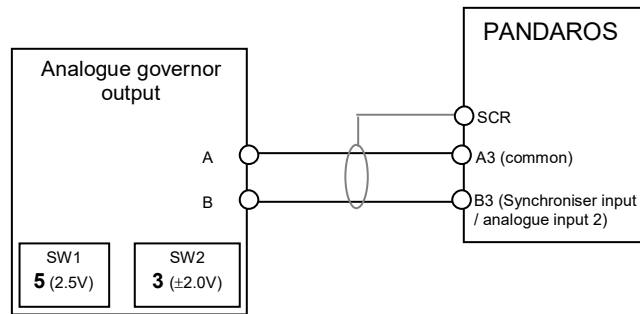
**2.13.2 KG SERIES (6-04 TO 10-04)\***

**USING ANALOGUE GOVERNOR OUTPUT:**



### 2.13.3 PANDAROS\*

#### USING ANALOGUE GOVERNOR OUTPUT:



**NOTE:** Pandaros is configurable using "Pandaros Packager". Various options must be correctly set as follows:

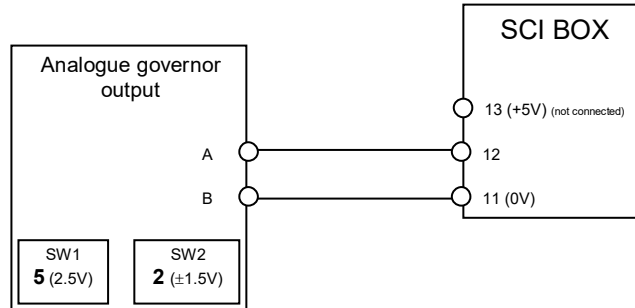
- Single / Parallel generator (other) no droop.
- Analogue input 1 (load share) disabled in the 'load control' section of the Pandaros software.
- Analogue input 2 (sync input) configured to be 0-5 V.



## 2.14 IVECO

### 2.14.1 CURSOR 13TE2 (WITH SCI BOX)\*

#### USING ANALOGUE GOVERNOR OUTPUT:



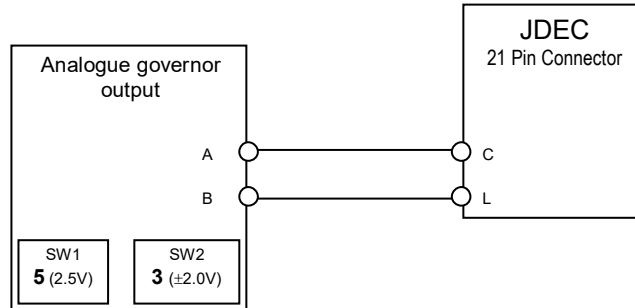
**NOTE:** The dip switches on the SCI box are set as follows:  
1=OFF, 2=ON, 3=OFF, 4=OFF

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

## 2.15 JOHN DEERE

### 2.15.1 JDEC

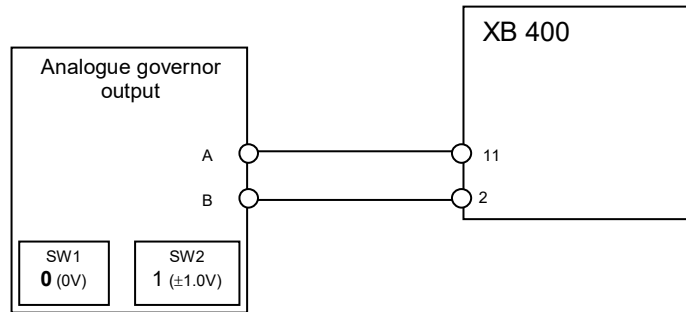
#### USING ANALOGUE GOVERNOR OUTPUT:



## 2.16 MITSUBISHI

### 2.16.1 XB400\*

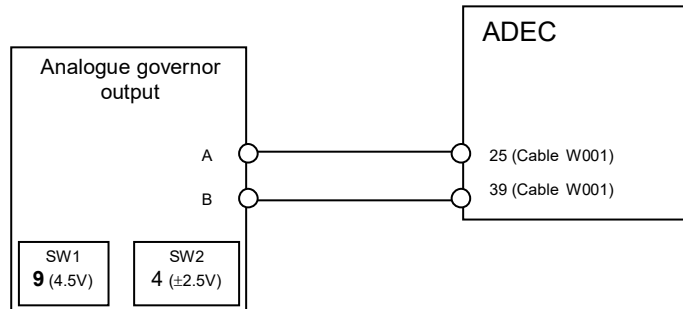
#### USING ANALOGUE GOVERNOR OUTPUT:



## 2.17 MTU

### 2.17.1 ADEC 2000\* / 4000

#### USING ANALOGUE GOVERNOR OUTPUT:

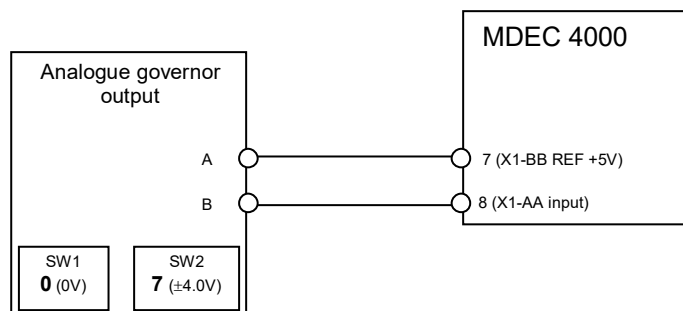


**NOTE:** MTU speed settings are configurable by MTU and at the time of this document publication the data above was correct. However due to MTU production and ECU configuration processes, ECU requirements may change from those mentioned above. You should refer to MTU for details.

**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.

### 2.17.2 MDEC 2000\* / 4000\*

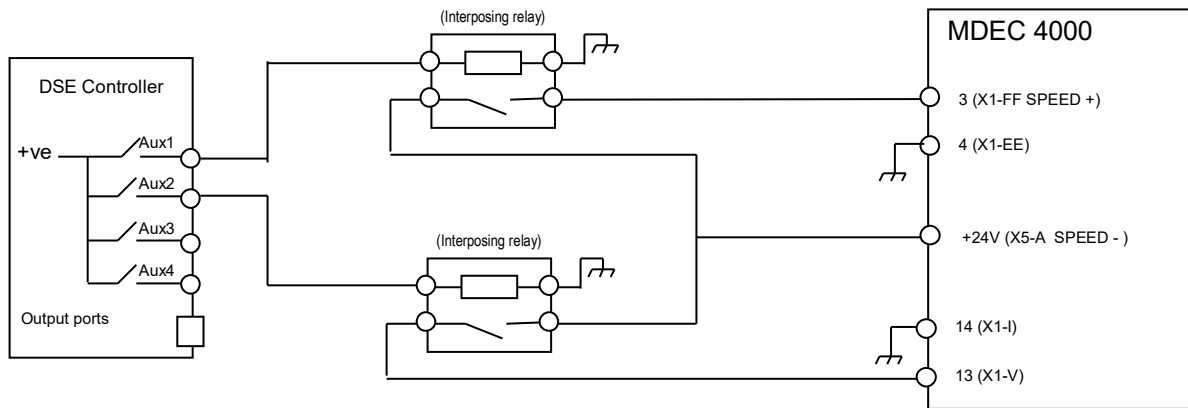
#### USING ANALOGUE GOVERNOR OUTPUT:



**NOTE:** MTU speed settings are configurable by MTU and 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.

**USING DISCRETE RAISE/LOWER INPUTS:**



**MODULE CONFIGURATION FOR DSE OUTPUTS.**

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 DSE configuration software :

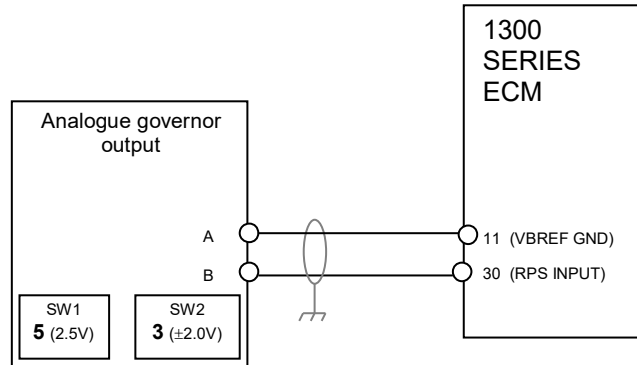
SW1 5 (2.5V)	SW2 2 (±1.5V)
-----------------	------------------

**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

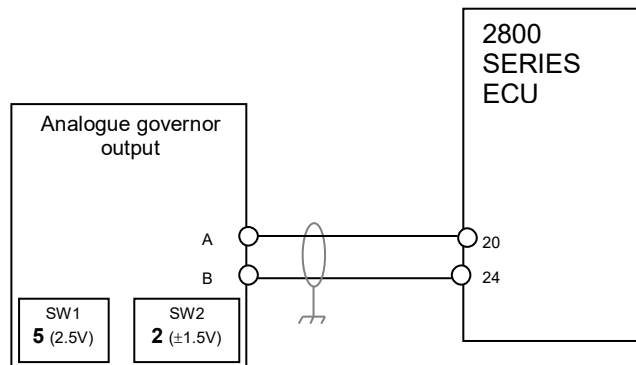
### 2.18.1 1300 SERIES ENGINE CONTROLLER\*

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.18.2 2800 SERIES ENGINE CONTROLLER\*

#### USING ANALOGUE GOVERNOR OUTPUT:



## 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 the CAN data link.

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 DSE configuration software :

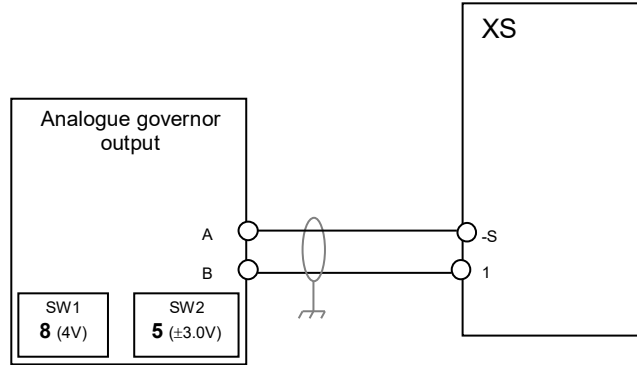
SW1 5 (2.5V)	SW2 2 ( $\pm 1.5V$ )
-----------------	-------------------------

**▲ NOTE: It is not necessary to fit the Scania Co-ordinator device. Engine instrumentation and diagnostics are provided by the DSE controller.**

## 2.20 TOHO

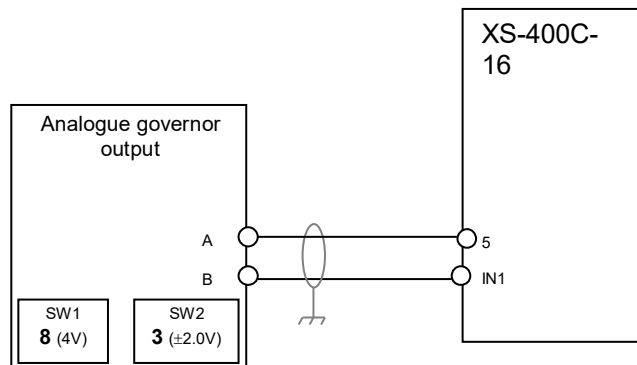
### 2.20.1 TOHO XS\*

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.20.2 TOHO XS-400C-16\*

#### USING ANALOGUE GOVERNOR OUTPUT:





## 2.21 VOLVO

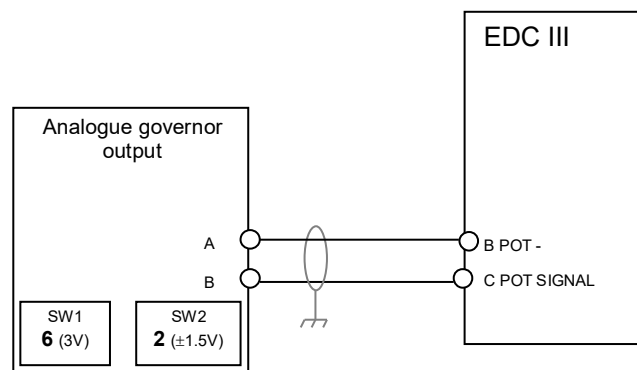
### 2.21.1 873979\*

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.

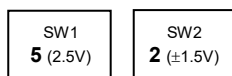
#### USING ANALOGUE GOVERNOR OUTPUT:



### 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. 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 DSE configuration software :



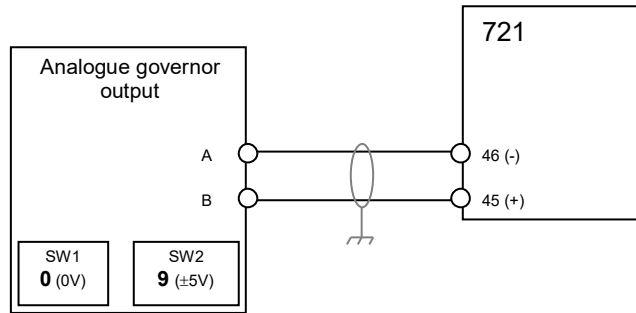
**NOTE:** It is not necessary to fit the Volvo CIU device. Engine instrumentation and diagnostics is provided by the DSE controller.

## 2.22 WOODWARD

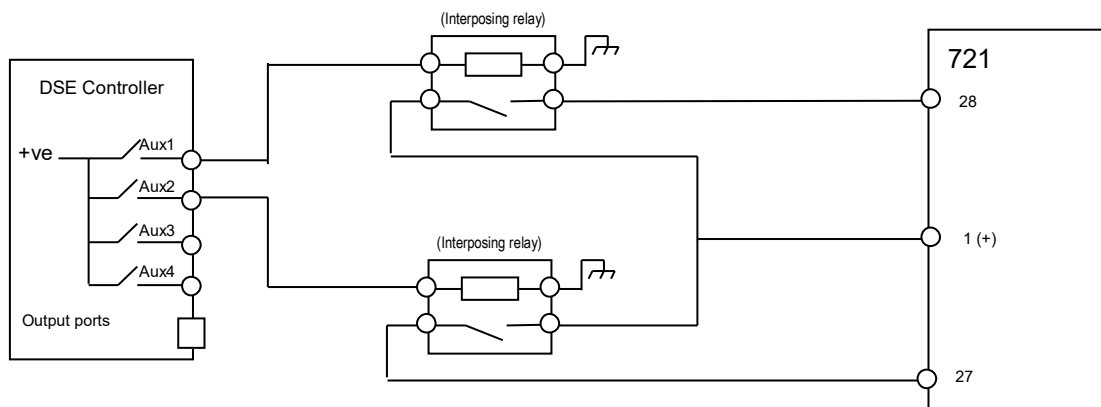
For Woodward DYNA products please see 'Barber Colman' elsewhere in this manual.

### 2.22.1 721 DIGITAL SPEED CONTROL

#### USING ANALOGUE GOVERNOR OUTPUT:



#### USING DISCRETE RAISE/LOWER INPUTS:

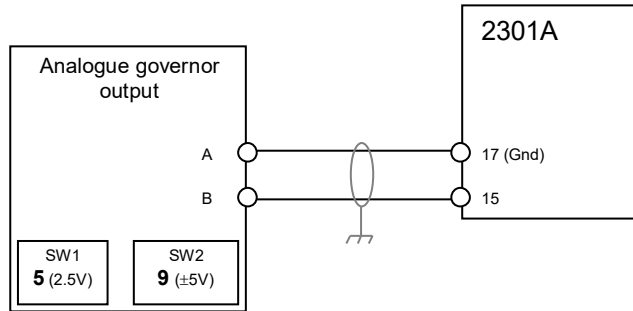


#### MODULE CONFIGURATION FOR DSE OUTPUTS.

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

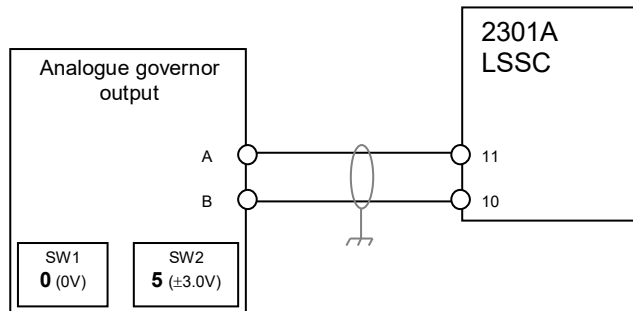
### 2.22.2 2301A SPEED CONTROL\*

#### USING ANALOGUE GOVERNOR OUTPUT:



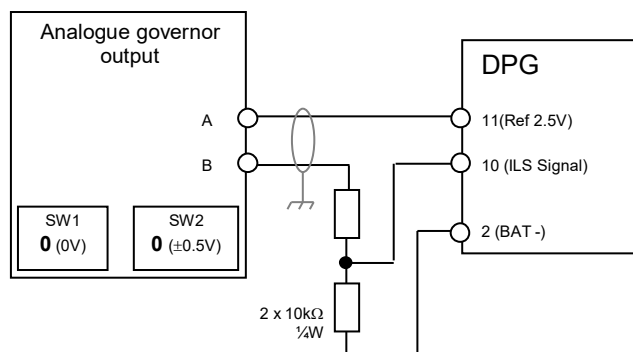
### 2.22.3 2301A LSSC LOAD SHARE

#### USING ANALOGUE GOVERNOR OUTPUT:



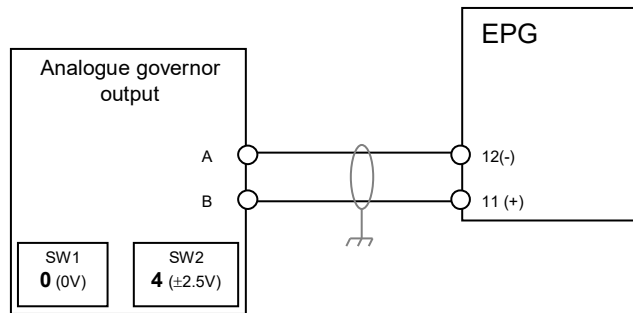
### 2.22.4 DPG

#### USING ANALOGUE GOVERNOR OUTPUT:



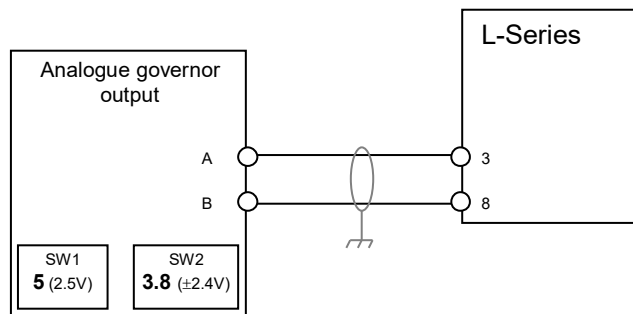
### 2.22.5 EPG (ELECTRICALLY POWERED GOVERNORS)\*

#### USING ANALOGUE GOVERNOR OUTPUT:



### 2.22.6 L-SERIES\*

#### USING ANALOGUE GOVERNOR OUTPUT:

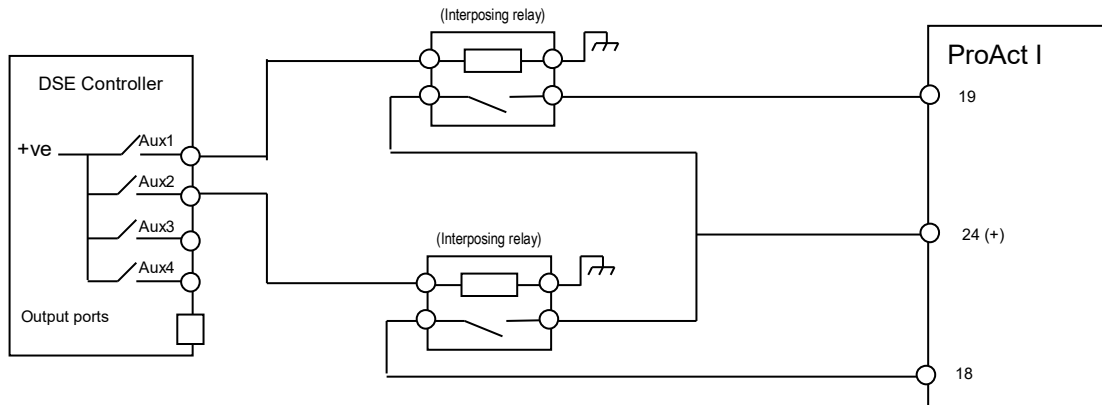


**NOTE:** To be used as shown in the above diagram, the Woodward L-Series governor must have the AUX input configured as *Isochronous Loadsharing Analog Input*. For further information, refer to the L-Series OEM manuals.

**NOTE:** To be used as shown in the above diagram, the Woodward L-Series governor must have the Aux1 input set to *0-5 V analog*. For further information, refer to the L-Series OEM manuals.

### 2.22.7 PROACT I

#### USING DISCRETE RAISE/LOWER INPUTS:

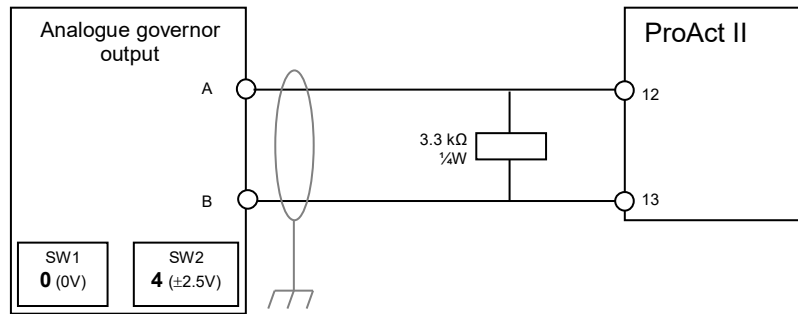


#### MODULE CONFIGURATION FOR DSE OUTPUTS.

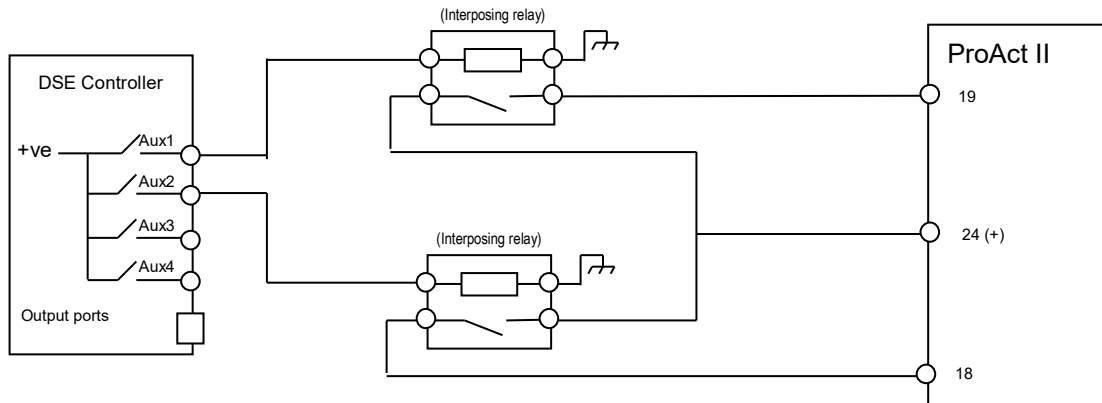
Module Relay	Polarity	Output Source
Aux. 1	Energise	Speed Raise Relay
Aux. 2	Energise	Speed Lower Relay

### 2.22.8 PROACT II

#### USING ANALOGUE GOVERNOR OUTPUT:



#### USING DISCRETE RAISE/LOWER INPUTS:

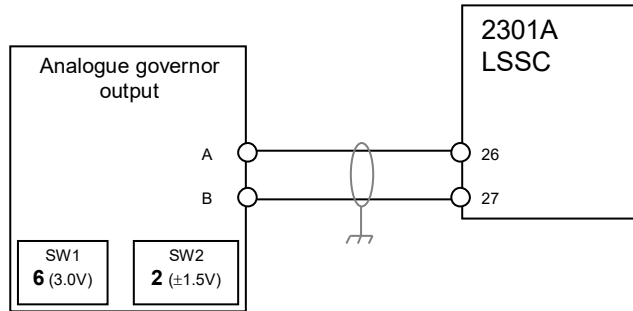


#### MODULE CONFIGURATION FOR DSE OUTPUTS.

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

### 2.22.9 9907 LOAD SHARING MODULE/PWM OUTPUT

#### USING ANALOGUE GOVERNOR OUTPUT:



### 3 INTERFACING TO AUTOMATIC VOLTAGE REGULATORS

This section details the interface connections between the DSE controllers and the most common 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.

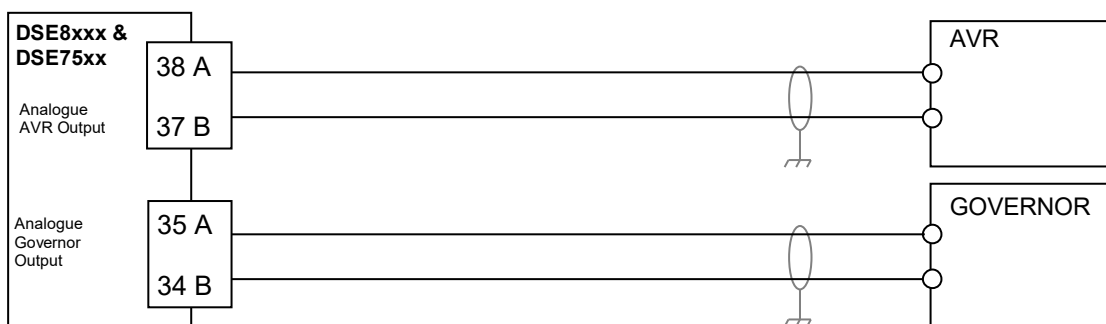
The analogue AVR output provide an isolated, adjustable DC voltage level to connect into the control inputs of many automatic voltage regulators. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing controller inputs of many common 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 SPECIFICATIONS

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

#### 3.2 INTERFACING WITH THE CONTROLLER

##### 3.2.1 CONNECTION DETAILS FOR DSE8XXX AND DSE75XX SERIES



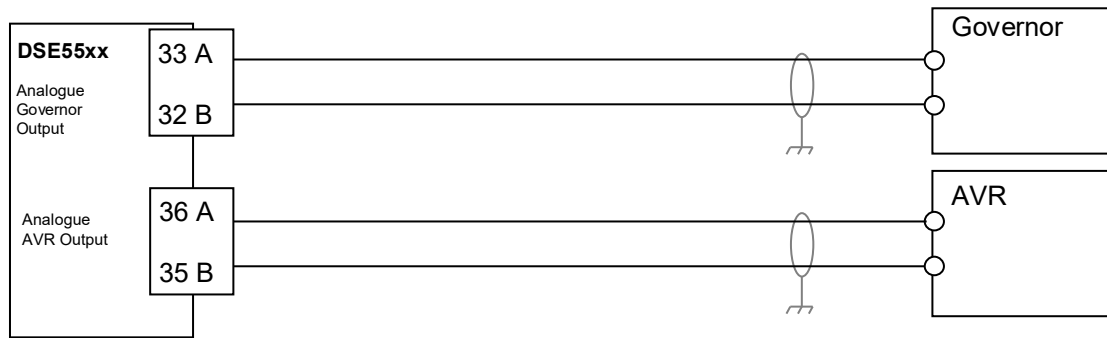
**NOTE:** Further details on connections to various governors can be found elsewhere in this manual.

**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.



### 3.2.2 CONNECTION DETAILS FOR DSE55XX SERIES



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

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

**NOTE:** The length of cable between the DSE module 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 'centre' 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 module's analogue 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
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	$\pm 0.5V$
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 settings for SW1/SW2 for many common governors are shown elsewhere in this document.

**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 DSE 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 may be possible to interface to it using the DSE modules. Contact our Technical Support Department for advice.

**LOCATION OF SW1 AND SW2 SELECTORS FOR DSE8XXX SERIES**

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 interface with the following sections:

- Interface** (Header)
- Governor** section:
  - Centre (SW1) 6.4 with a slider set to 6.4 and a Reset button.
  - Range (SW2) 2.0 with a slider set to 2.0 and a Reset button.
- Speed And Frequency** section:

Engine Speed	0 RPM
Generator Frequency	0.0 Hz
Governor Analogue	0.0 %
AVR Analog	0.0 %
- AVR** section:
  - Centre (SW1) 1.6 with a slider set to 1.6 and a Reset button.
  - Range (SW2) 7.0 with a slider set to 7.0 and a Reset button.
- Phase To Neutral Voltages** section:

L1 - N	L2 - N	L3 - N
0.0 V	0.0 V	0.0 V
- Phase To Phase Voltages** section:

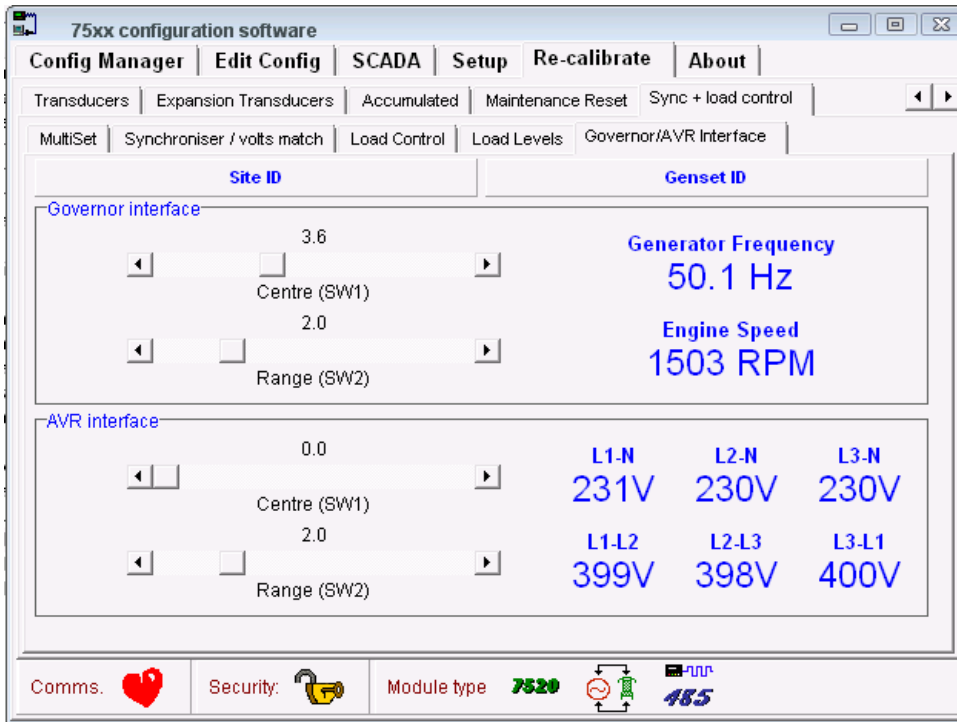
L1 - L2	L2 - L3	L3 - L1
0.0 V	0.0 V	0.0 V

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

**LOCATION OF SW1 AND SW2 SELECTORS FOR DSE75X & DSE55XX SERIES**

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 DETERMINING CONNECTIONS AND SETTINGS FOR AVRS

The following guides are 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) and confirm that the settings mentioned in this document are correct for your application.

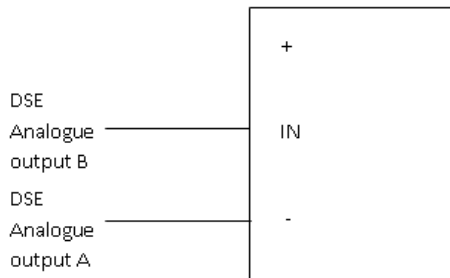
#### 3.3.1 'FOUR STEPS TO SYNCHRONISING' METHOD

**NOTE:** The following procedure only refers to the first of the Four Steps to Synchronising. For further information on the remain three, contact DSE Technical Support.

#### SETTING UP THE AVR (ADJUSTMENT OF SW1 AND SW2)

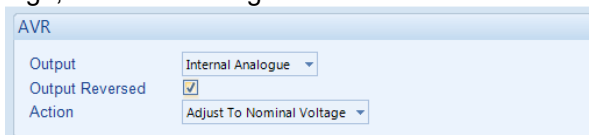
##### BEFORE YOU START

1. **When using a DSExx20 synchronising module, ensure inputs are configured for 'Mains Load Inhibit' and 'Generator Load Inhibit'.**
2. Ensure that the generator is connected to a **DEAD BUS BAR WITH NO LOADS** connected.
3. With the generator breaker open, set the generator to run at the **Nominal Voltage** without the DSE module connected to the AVR. To achieve this you will have to adjust the settings on the AVR.
4. Connect the DSE module to the AVR once completed. The DSE controller 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 are connected as follows. Note that the “+” terminal of the AVR is left unconnected.

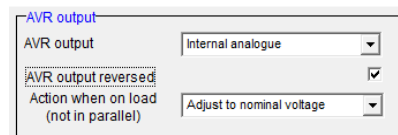


#### ADJUSTMENT OF AVR SW1

5. **When using a DSExx20 synchronising module, ensure the inputs configured for 'Mains Load Inhibit' and 'Generator Load Inhibit' are active.**
6. Start the generator and ensure that the breaker is left open.
7. Check the direction of drive by increasing and decreasing SW1. If the voltage increases whilst SW1 is being decreased tick the option 'Output Reversed'. If moving SW1 does not change the voltage, check the wiring to the AVR for faults.



DSE8xxx Series Example

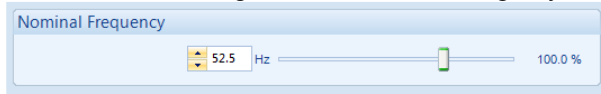


DSE75xx & DSE55xx Series Example

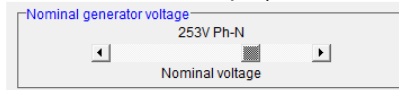
8. Adjust the SW1 setting for the AVR until the generator runs at **Nominal Voltage (230V for example).**
9. Stop the generator. SW1 is now complete and needs to be left alone.

**ADJUSTMENT OF AVR SW2**

10. When using a DSExx20 synchronising module, ensure the input configured for 'Mains Load Inhibit' and is active but the input for 'Generator Load Inhibit' is not active.
11. Increase the setting of the Nominal Voltage by 10% (230 v to 253 V for example)

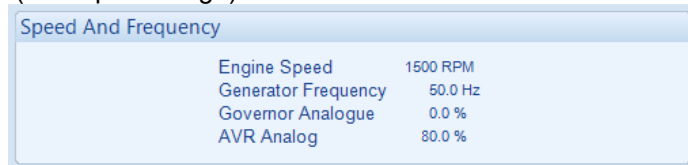


DSE8xxx Series Example

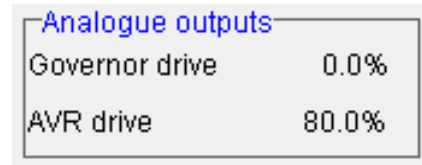


DSE75xx & DSE55xx Series Example

12. Start the generator. With the breaker open the generator will run at setting of SW1 (230V for example).
22. Close the generator breaker onto a **DEAD BUS BAR WITH NO LOADS** connected. The generator voltage shall start to increase towards the new Nominal Voltage setting (253V for example) however it may not achieve this.
23. Adjust SW2 to allow the voltage to increase to the new Nominal Voltage setting (253V for example)
24. Keep adjusting SW2 further to ensure AVR Drive reads within **75% to 85%**, the sign of the drive (+ or - percentage) does not matter.

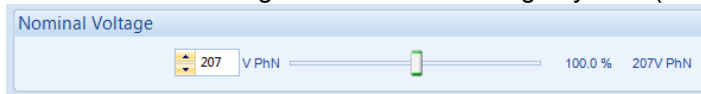


DSE8xxx Series Example

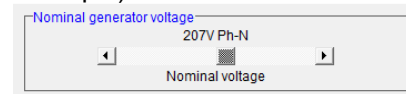


DSE75xx & DSE55xx Series Example

25. Stop the Generator
26. Decrease the setting of the Nominal Voltage by 10% (207 V for example)

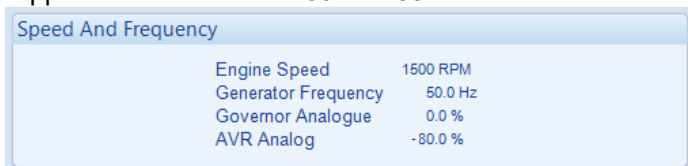


DSE8xxx Series Example

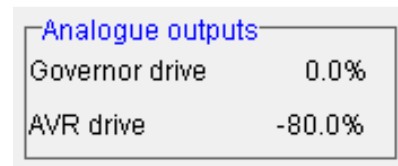


DSE75xx & DSE55xx Series Example

27. Start the generator. With the breaker open the generator will run at setting of SW1 (230V for example).
28. Close the generator breaker onto a **DEAD BUS BAR WITH NO LOADS** connected. The generator voltage shall start to decrease towards the new Nominal Voltage (207 V for example).
29. SW2 is then adjusted further to ensure AVR Drive reads within **75% to 85%**, the sign of the drive (+ or - percentage) does not matter. Note that any change made to the lower percentage will be the same for the upper percentage. For example, if the lower percentages from 70% to 75%, the upper will increase from 80% to 85%.



DSE8xxx Series Example



DSE75xx & DSE55xx Series Example

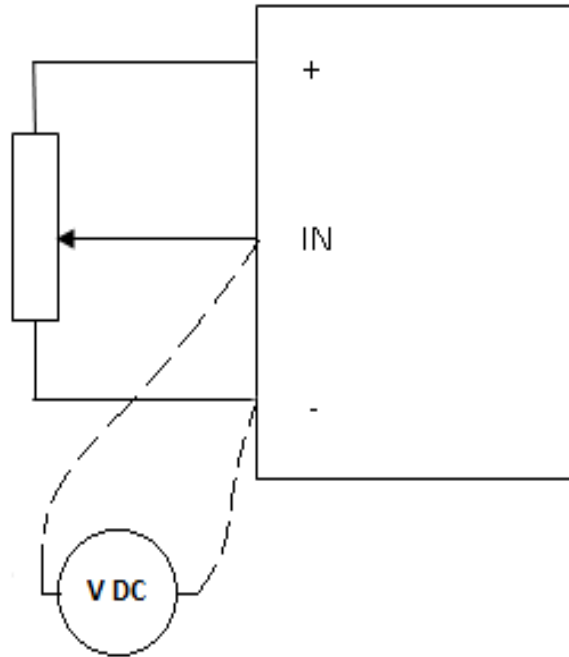
30. Change the setting of the Nominal Voltage back to the actual Nominal Voltage (230 V for example).

### 3.3.2 VOLTAGE MEASUREMENT METHOD

The below 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 '+'.  
 To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage between terminal 'In' and terminal '-' as in the following steps:

To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage between terminal 'In' and terminal '-' as in the following steps:

1. Connect the potentiometer specified by the manufacturer and DC voltage meter as shown below.



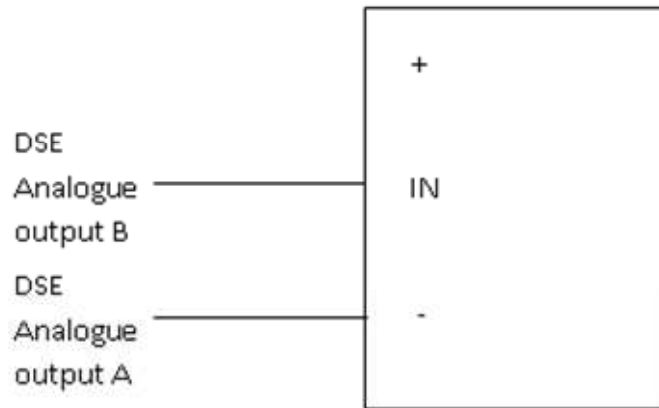
**NOTE:** V1 or V2 might be shown negative on the multi-meter, it is important to write down the sign as we need to know the full voltage range, and the centre voltage in some cases might be 0V.

2. Turn the potentiometer till the voltage reaches +13% above nominal voltage (230V to 260V), measure the voltage across terminal 'In' and terminal '-' and note this value as  $V1$  (Example  $V1 = -3\text{ V}$ ).
3. Turn the potentiometer in the opposite direction till the voltage reaches -13% below nominal voltage (230V to 200V), measure the voltage across terminal 'In' and terminal '-' and note the value as  $V2$  (Example  $V2 = +5\text{ V}$ ).
4. The centre voltage is derived from these two values would be:  $V_{centre} = (V1+V2)/2$  (For example  $(-3\text{V} + 5\text{V})/2= 1\text{V}$ ).
5. The range voltage is would be calculated by:  $V_{range} = V_{centre} - V1$  or  $V_{range} = V2 - V_{centre}$  (For example  $1\text{V} - (-3\text{V}) = 4\text{V}$ )

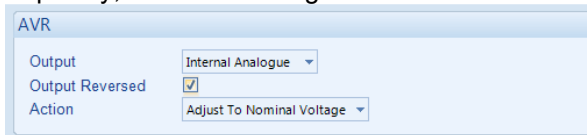
**NOTE:** If the voltage cannot reach +/-13 % around the nominal (on some AVRs), a change of +/-10% is acceptable for DSE load share controllers; any less than +/-10% might not give the required range for load sharing at high load levels.

## Interfacing to Automatic Voltage Regulators

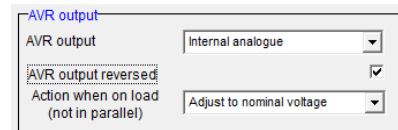
6. Connect the DSE module to the AVR once completed. The DSE controller connects only to the “-” and “IN” terminals and provides the varying DC voltage to simulate the turning of a potentiometer. The Analogue output terminals of the DSE controller are connected as follows. Note that the “+” terminal of the AVR is left unconnected.



7. Check the direction of drive by increasing and decreasing SW1. If the voltage increases whilst SW1 is being decreased tick the option 'Output Reversed'. If moving SW1 does not change the frequency, check the wiring to the AVR for faults.



DSE8xxx Series Example



DSE75xx & DSE55xx Series Example

8. Using the tables below, match  $V_{centre}$  to the appropriate SW1 setting and match  $V_{range}$  to the appropriate SW2 setting (For example SW1 of 2 =  $V_{centre}$  of 1 V and SW2 of 7 =  $V_{range}$  of 4 V)

### 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:** 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.

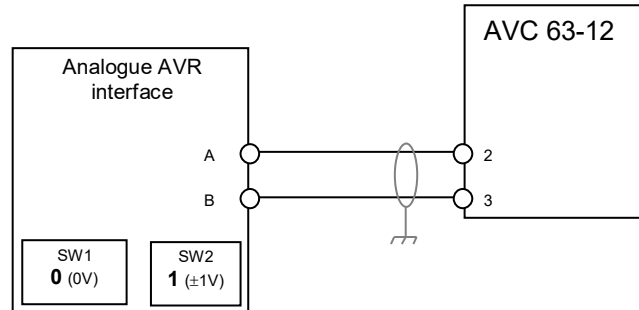
**NOTE:** Some AVRs only have two terminals. If they are not listed within this document, please contact us for advice.



### 3.4 BASLER

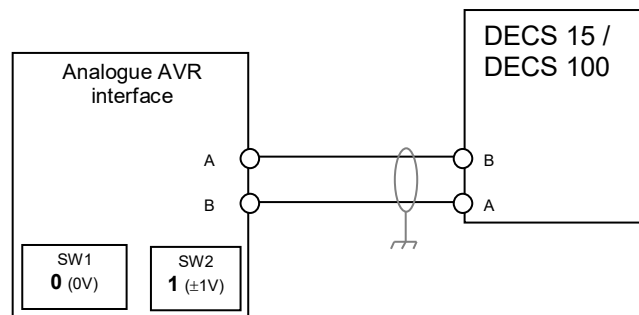
#### 3.4.1 AVC 63-12

**USING ANALOGUE AVR OUTPUT:**



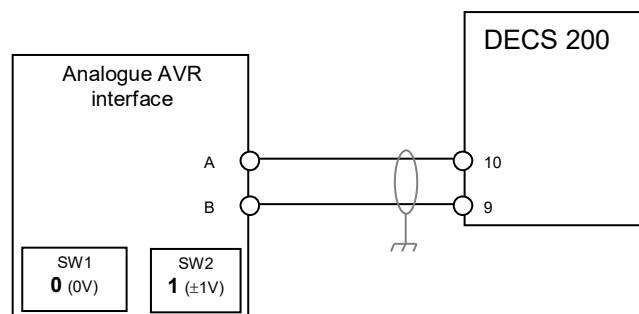
#### 3.4.2 DECS 15, DECS 100

**USING ANALOGUE AVR OUTPUT:**



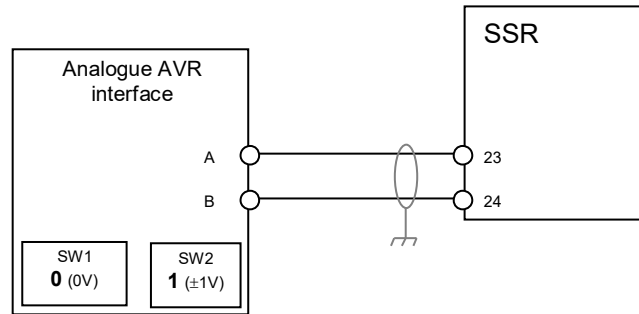
#### 3.4.3 DECS 200

**USING ANALOGUE AVR OUTPUT:**



### 3.4.4 SSR

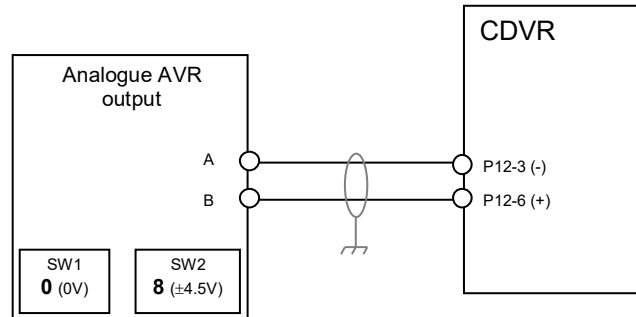
#### USING ANALOGUE AVR OUTPUT:



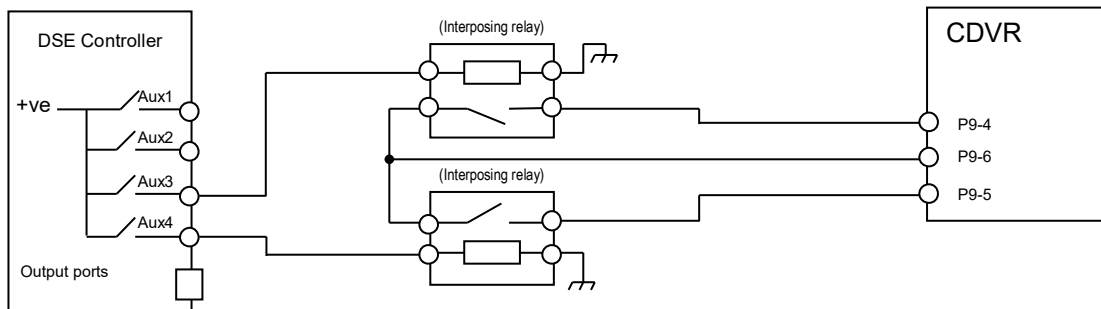
### 3.5 CATERPILLAR

#### 3.5.1 CDVR

##### USING ANALOGUE AVR OUTPUT:



##### USING DISCRETE RAISE/LOWER INPUTS:

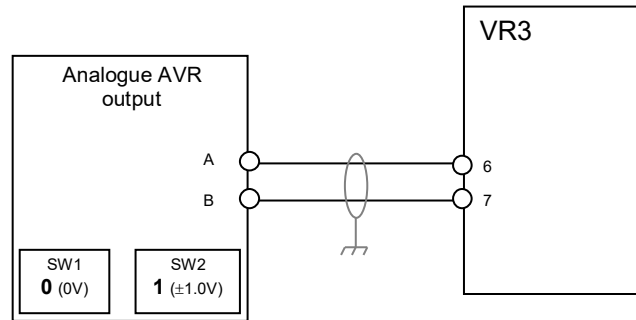


##### MODULE CONFIGURATION FOR DSE OUTPUTS.

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

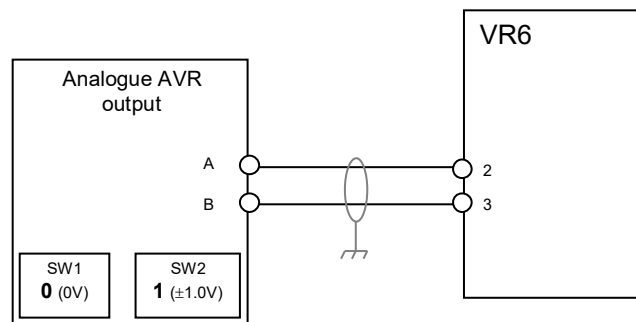
### 3.5.2 VR3

#### USING ANALOGUE AVR OUTPUT:



### 3.5.3 VR6

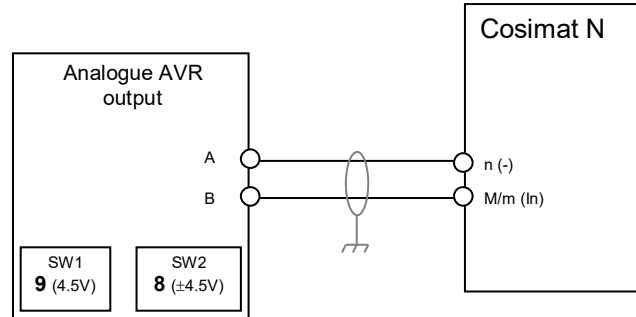
#### USING ANALOGUE AVR OUTPUT:



### 3.6 COSIMAT

#### 3.6.1 COSIMAT N

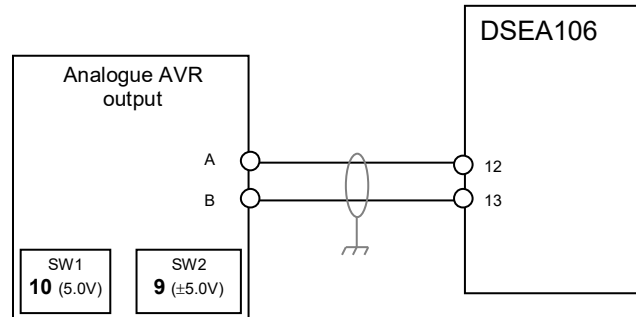
**USING ANALOGUE AVR OUTPUT:**



### 3.7 DEEP SEA ELECTRONICS PLC\*

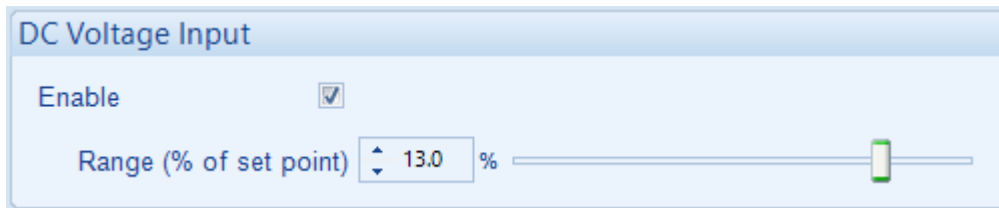
#### 3.7.1 DSEA106

##### USING ANALOGUE AVR OUTPUT:



**NOTE:** Ensure the correct voltage range is selected before operation. This is set using the DIP switches on the DSEA106. For further information, refer to DSE Publication: 057-241 *DSEA106 Operator Manual*.

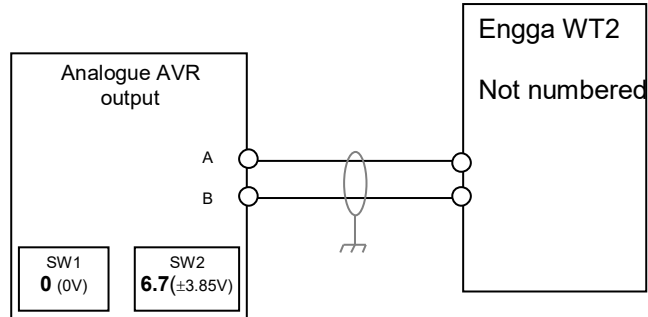
**NOTE:** Ensure the DSEA106 *External Bias* setting for the selected voltage range is enabled and configured to 13% as shown in the below image. For further information, refer to DSE Publication: 057-242 *DSEA106 Configuration Suite PC Software Manual*.



### 3.8 ENGGA\*

#### 3.8.1 WT2

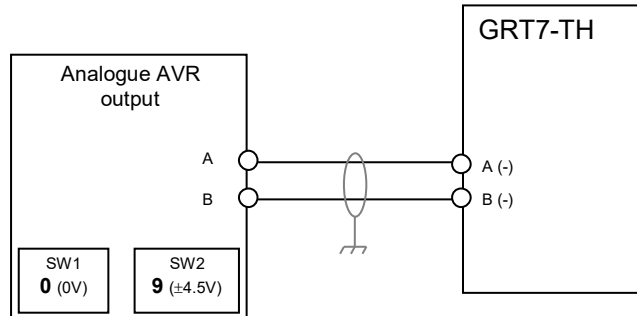
USING ANALOGUE AVR OUTPUT:



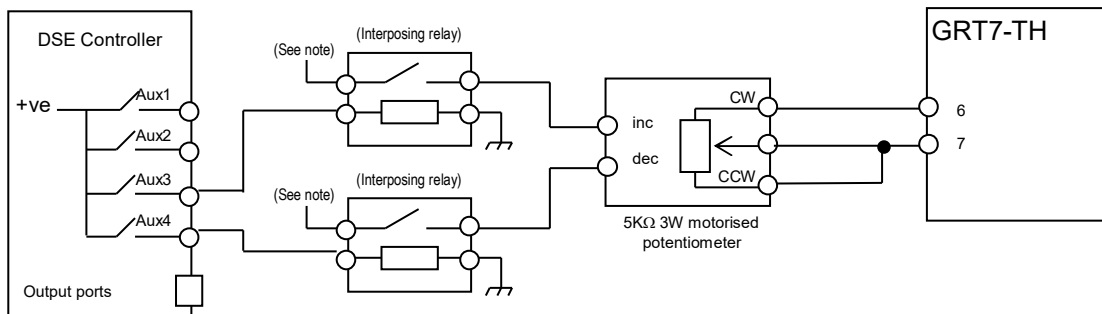
### 3.9 GRAMEYER

#### 3.9.1 GRT7-TH\*

##### USING ANALOGUE AVR OUTPUT:



##### 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 DSE OUTPUTS.

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

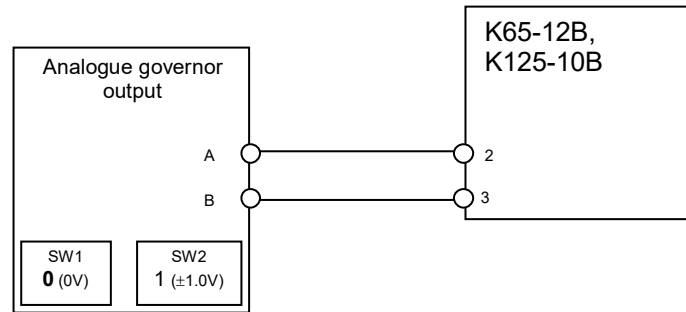
**NOTE:** Applying a 'brake' to motorised potentiometers will help the response and stability of the potentiometer control. This brake is not necessary for digital potentiometers, only potentiometers with motor drives. For typical details on applying a 'brake' to potentiometer motors, please refer to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



### 3.10 KATO

#### 3.10.1 K65-12B, K125-10B

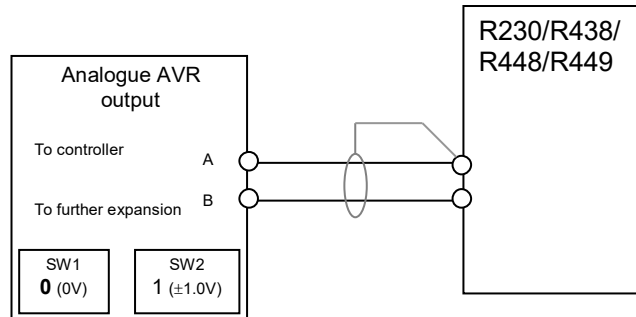
**USING ANALOGUE AVR OUTPUT:**



### 3.11 LEROY SOMER

#### 3.11.1 R230 / R438\* / R448 / R449

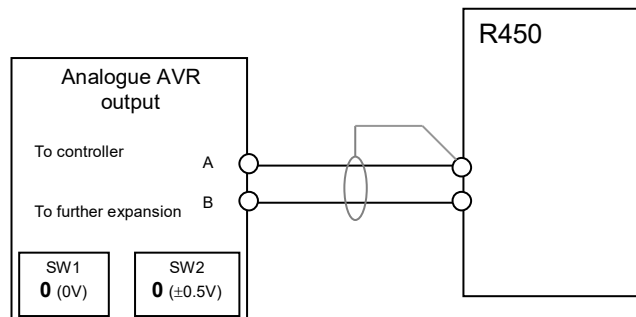
##### USING ANALOGUE AVR OUTPUT:



**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 R450\*

##### USING ANALOGUE AVR OUTPUT:



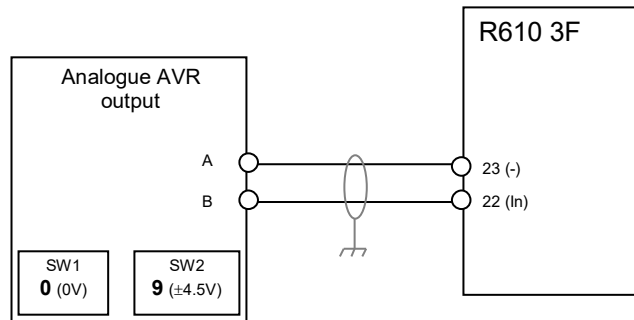
**NOTE:** The remote adjust input on the AVR are terminals ST4. Incorrect polarity will result in being unable to volts match or VAr share. You may need to reverse the connections if this occurs.

#### 3.11.3 R250

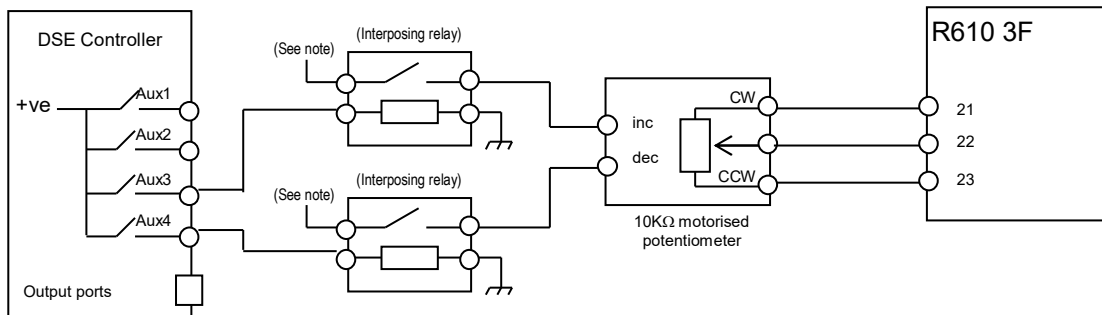
**NOTE:** The R250 is not suitable for synchronising and load sharing applications.

### 3.11.4 R610 3F

#### USING ANALOGUE AVR OUTPUT:



#### 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 DSE OUTPUTS.

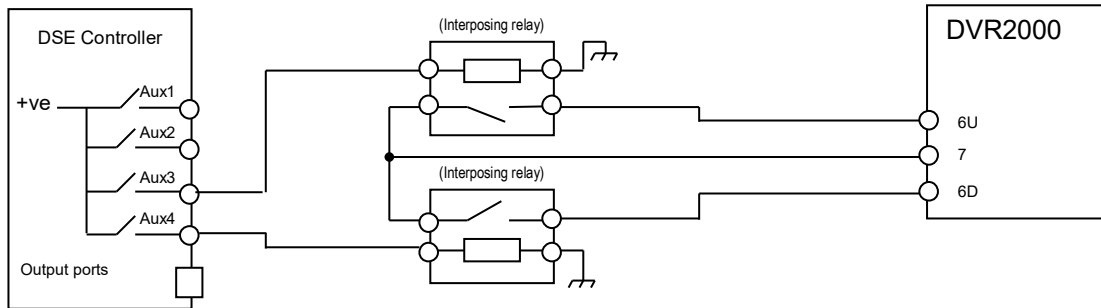
Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

**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

##### USING DISCRETE RAISE/LOWER INPUTS:



##### MODULE CONFIGURATION FOR DSE OUTPUTS.

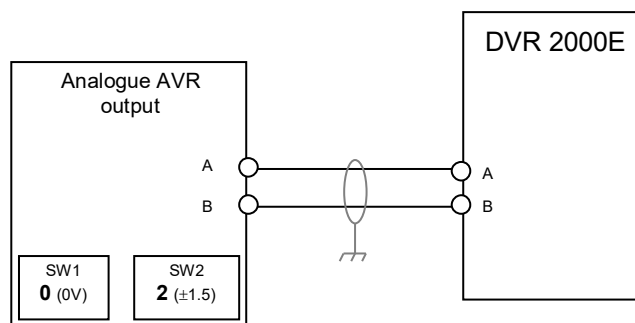
Module relay	Polarity	Output source
Aux. 3	Energise	Voltage Raise Relay
Aux. 4	Energise	Voltage Lower Relay

**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 DSE controller cannot ‘remotely adjust’ the generator’s output voltage while the Magnamax DVR™ AVR is in Select mode.

#### 3.12.2 MAGNAMAX DVR2000E\*

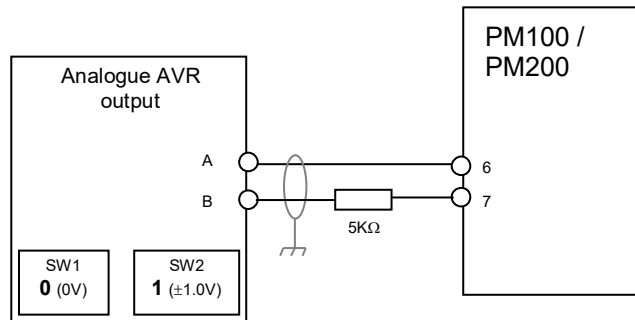
##### USING ANALOGUE AVR OUTPUT:



**NOTE:** 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 DVR 2000E’ s input can accept up to a maximum of +/- 3V to give +/- 30% adjustment range.

### 3.12.3 MAGNAMAX PM100\* / PM200\*

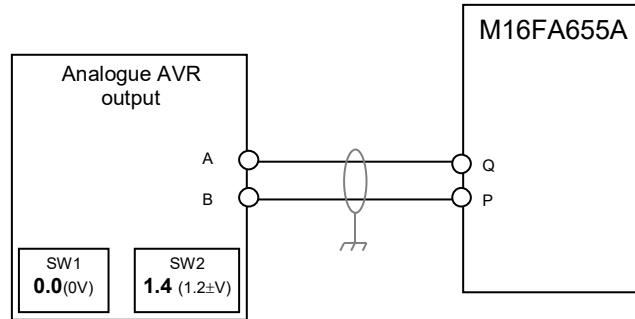
#### USING ANALOGUE AVR OUTPUT:



### 3.13 MARELLIMOTOR S.P.A.

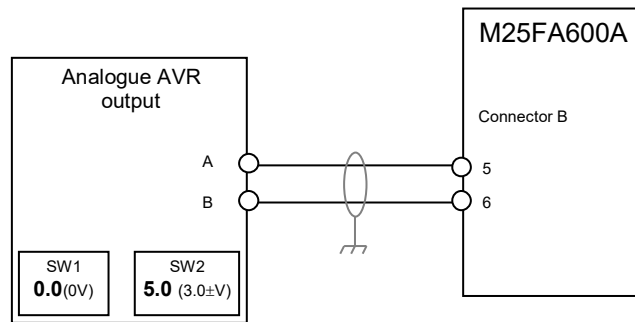
#### 3.13.1 M16FA655A \*

##### USING ANALOGUE AVR OUTPUT:



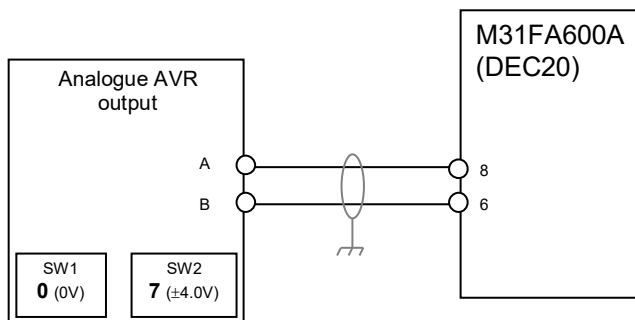
#### 3.13.2 M25FA600A

##### USING ANALOGUE AVR OUTPUT:



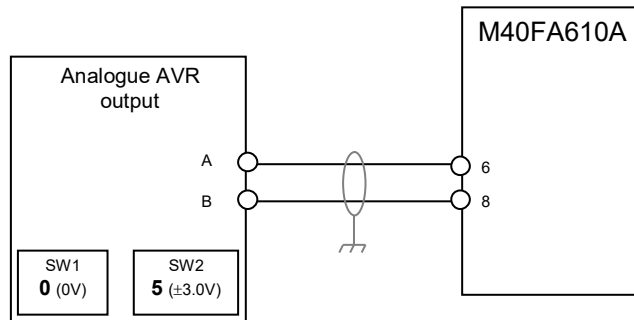
#### 3.13.3 M31FA600A (DEC20)

##### USING ANALOGUE AVR OUTPUT:



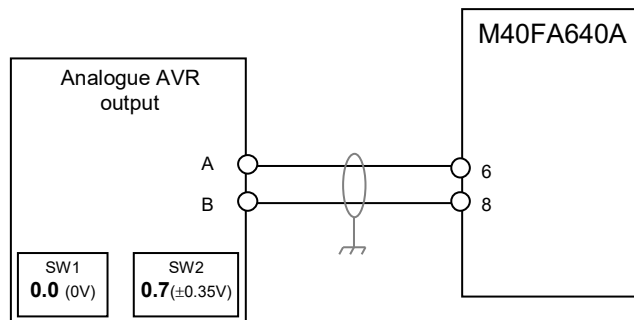
### 3.13.4 M40FA610A

#### USING ANALOGUE AVR OUTPUT:



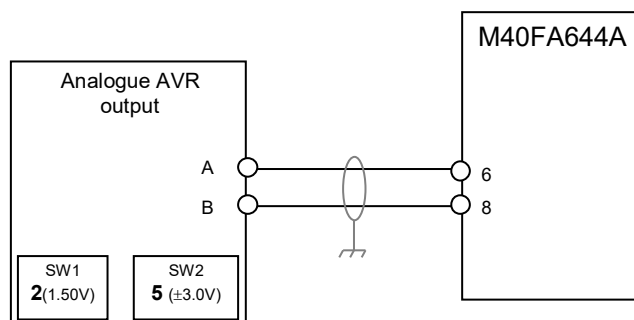
### 3.13.5 M40FA640A \*

#### USING ANALOGUE AVR OUTPUT:



### 3.13.6 M40FA644A

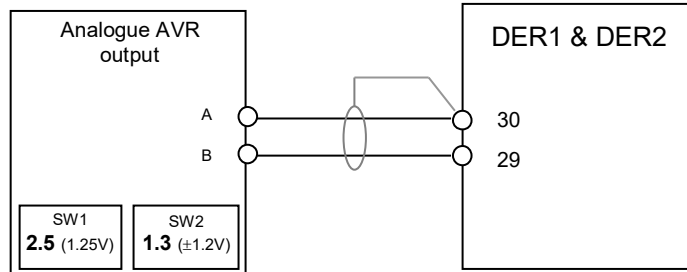
#### USING ANALOGUE AVR OUTPUT:



### 3.14 MECC ALTE S.P.A.

#### 3.14.1 DER1, DER2

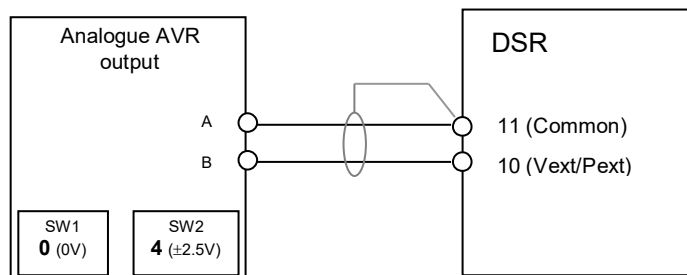
##### USING ANALOGUE AVR OUTPUT:



**NOTE:** DER1 remote adjustment input (terminals 29 & 30) is only enabled once terminals 27 and 28 on the AVR are linked together.

#### 3.14.2 DSR

##### USING ANALOGUE AVR OUTPUT:



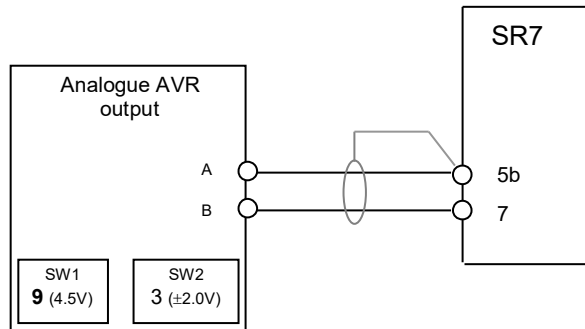
**NOTE:** Current production of the Mecc Alte DSR allows for +/-14% movement of the output voltage away from the nominal.

Very 'early' versions of the DSR required DSR parameter 16 to be set to +/-10% (factory setting of +/-5% is not high enough for voltage matching or VAR sharing operation).



3.14.3 S.R.7\*

**USING ANALOGUE AVR OUTPUT:**



**MODULE CONFIGURATION FOR ANALOGUE AVR OUTPUT**

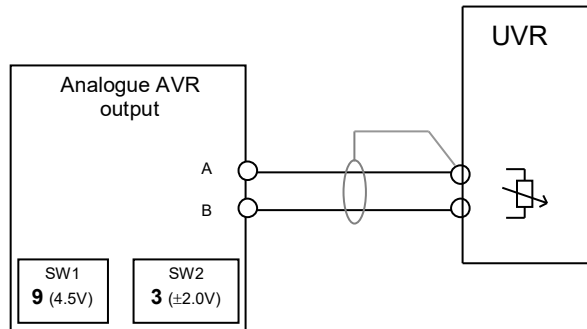
The SR7 uses lower voltage on input N = higher generator output voltage. Therefore, we need to configure the DSE load share controller to 'reverse' the polarity of the voltage output:

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

**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.

3.14.4 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 DSE load share controller to 'reverse' the polarity of the voltage output:

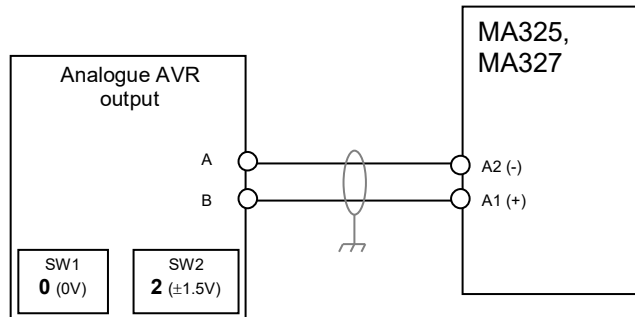
Configuration Item	Selection
Reverse AVR output	<input checked="" type="checkbox"/>

**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

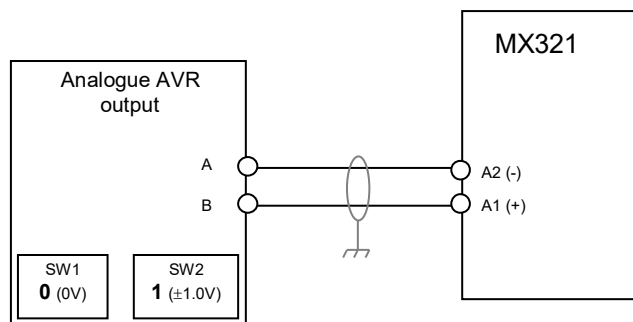
#### 3.15.1 MA325, MA327

##### USING ANALOGUE AVR OUTPUT:



#### 3.15.2 MX321\*

##### USING ANALOGUE AVR OUTPUT:

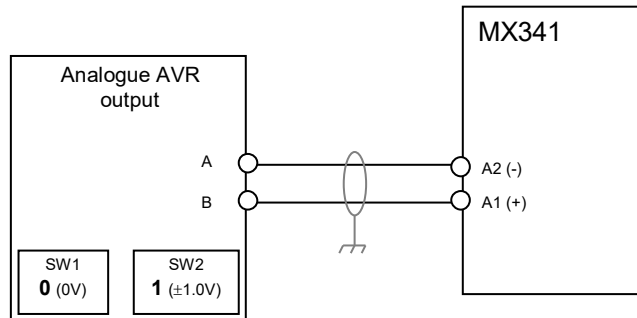


**NOTE:** MX321 inputs A1/A2 are “disabled” when the AVR’s voltage trim is wound fully anticlockwise!  
The more “clockwise” the AVR’s voltage trim setting is, the more effect that the DSE module will have upon the voltage adjustment.

**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\*

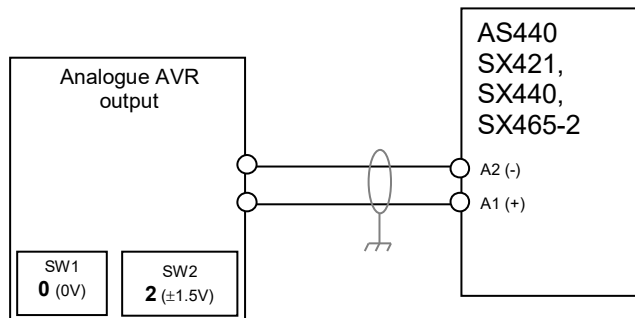
#### USING ANALOGUE AVR OUTPUT:



**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 DSE controller will have upon the voltage adjustment.

### 3.15.4 AS440, SX421, SX440\*, SX465-2

#### USING ANALOGUE AVR OUTPUT:



**NOTE:** Ensure the “V Trim” adjustment for the SX440’s voltage adjustment input is set to accept a signal of  $\pm 1$  V DC.

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

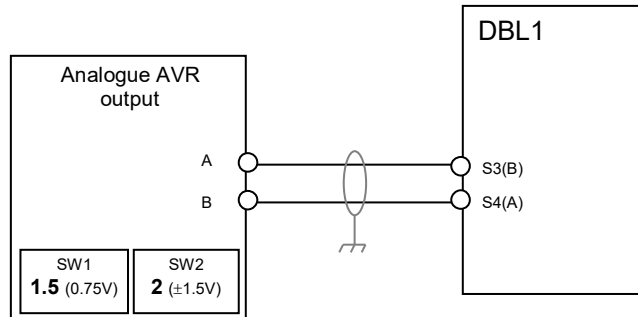
### 3.15.5 SX460

**NOTE:** Early versions of this AVR are 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.

### 3.16 SINCRO S.R.L.

#### 3.16.1 DBL1\*

##### USING ANALOGUE AVR OUTPUT:



##### MODULE CONFIGURATION FOR ANALOGUE AVR OUTPUT

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

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

### **3.17 WEG**

#### **3.17.1 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.

