COMPLEX SOLUTIONS
MADE SIMPLE

DEEP SEA ELECTRONICS PLC

DSE705
ATS CONTROL MODULE

OPERATING MANUAL

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DSE Model 704 Control System Operators Manual

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1 INTRODUCTION

The **705** is a configurable **A**utomatic **T**ransfer **S**witch control module, and is designed to work in conjunction with generator control modules that will accept a remote start input. It monitors the incoming AC mains supply (1 or 3 phases) for under voltage. If the voltage falls out of limits the module will issue a start command to the generating set controller. Once the set is available and producing an output within limits the ATS module will control the transfer devices and switch the load from the mains to the generating set. Should the mains supply return to within limits the module will command a return to the mains supply and shut down the generator after a suitable cooling run. Various timing sequences are used to prevent nuisance starting and supply breaks.

Configuration is via the front panel. No other equipment such as a computer or programming lead is required.

2 DESCRIPTION OF OPERATION

2.1 MANUAL RUN ON LOAD

To initiate a start sequence in **Manual Run On Load**, press the  pushbutton, and the start sequence is initiated.

The start/run output is activated.

Once the unit detects the alternator frequency of 45Hz, the **Warm Up** timer is initiated, allowing the engine to stabilise before accepting the load.

The load will be transferred to the generator.

The module will continue to run in this mode until another mode is selected.

If the generator should fail and the mains (utility) are available, the load is transferred back to the mains (utility).

NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

2.2 MANUAL RUN OFF LOAD

To initiate a start sequence in **Manual Run Off Load**, press the  pushbutton, and the start sequence is initiated.

The start/run output is activated.

The generator will be run off load and no further action is taken.

If during this time the mains (utility) should fail, the load will be transferred to the generator. However, the unit will **NOT** return the load to the mains (utility). The load will stay with the generator until another mode is selected.

NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

2.3 AUTOMATIC MODE OF OPERATION

This mode is activated by pressing the AUTO pushbutton. An LED indicator beside the button confirms this action.

Whether the start sequence is initiated by mains (utility) failure, or by remote start input, the following sequence id followed:

To allow for short term mains supply transient conditions or false remote start signals, the Mains Fail Delay timer is initiated. After this delay the start/Run output is activated.

Once the unit detects the alternator frequency of 45Hz, the **Warm Up** timer is initiated, allowing the engine to stabilise before accepting the load.

If the remote start is being used and has been configured to **Remote start is on load,** or the mains has failed, the load will be transferred to the generator.

On the return of the mains supply, (or removal of the **Remote Start** signal if the set was started by remote signal), the **Mains Return delay** timer is initiated. Once it has timed out, the load is transferred back to the mains (utility). The **Cooling** timer is then initiated, allowing the engine a cooling down period off load before shutting down. Once the **Cooling** timer expires the Start/Run output is de-activated.

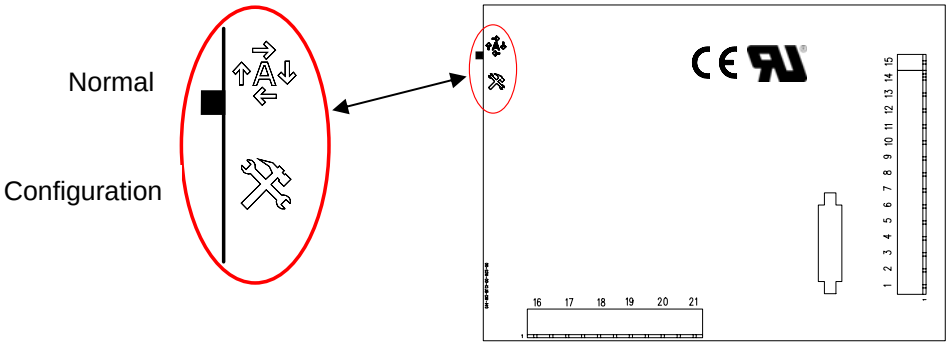
If the mains should fail (or a **Remote Start** signal is re-activated) whilst the generator is **Cooling** down, the load will be immediately transferred to the generator.

If the generator should fail, i.e. frequency falls below 20Hz the unit will switch back to the mains, even if the mains is not available.

NOTE: - If at any time the Close To Neutral Position input is activated, the switching device that is closed will be opened. (Load shedding). The switching device will not be re-closed until this input is removed. All other operations are unaffected.

3 CONFIGURATION INSTRUCTIONS

- With the unit in **Auto** AUTO mode, **Configuration Mode** is selected by operation of a small switch on the rear, left-hand edge of the PCB. This is partially hidden to prevent accidental operation.



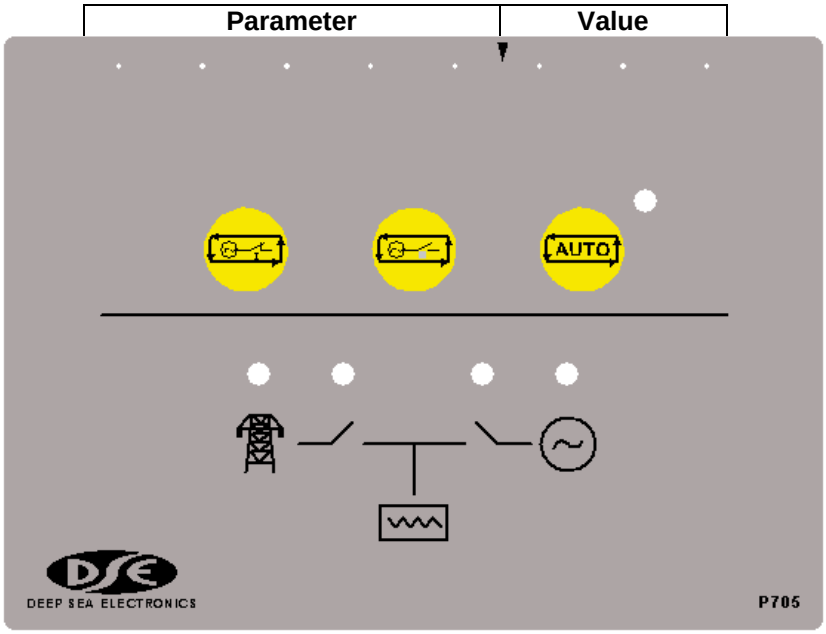
- Once **Configuration Mode** is selected, the 'Auto' LED will commence rapid flashing, and all normal operation is suspended.

- The **Run On Load** pushbutton can be used to select the LED 'code' that corresponds to the required function. The 5 left-hand LED's will form the code. See configuration table over leaf.

- The **Run Off Load** pushbutton will allow the user to change the associated value. The 3 right-hand LED's inform the user of the current setting for the chosen function. See configuration table over leaf.

- When the required parameters are displayed, pressing the **Auto** AUTO button will save the new setting, and the process is repeated for each function change.

- When configuration is complete, the **Configuration Mode** Selector Switch should be returned to the 'Normal' position.



4 CONFIGURATION TABLES

FUNCTIONS AND CONFIGURATION TABLE									
Function	○	○	○	○	○	○	○	○	Value **(Default in Bold)**
Start Delay	○	○	○	●	○	○	○	○	0 Seconds
						○	○	●	**5 Seconds**
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Used to give a delay between mains failure and starting the engine. Used to prevent the generating from starting on brown outs (dips) or short mains outages.									

Mains Return Delay	○	○	○	●	●	○	○	○	0 Seconds
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	**30 Seconds**
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Used to give a delay between the mains returning and the system switching the load back to the mains. Used to ensure that the mains is steady before this action is executed.									

Warm Up Timer	○	○	●	○	●	○	○	○	**0 Seconds**
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Delay between the engine being available for use, and the closure of the generator load-switching device to allow time for the engine to warm before being loaded.									

Cooling Timer	○	○	●	●	○	○	○	○	**0 Seconds**
						○	○	●	5 Seconds
						○	●	○	10 Seconds
						○	●	●	15 Seconds
						●	○	○	20 Seconds
						●	○	●	30 Seconds
						●	●	○	60 Seconds
						●	●	●	180 Seconds
Delay between opening the generator load-switching device and stopping the engine to allow time for the engine to cool down before being stopped. This is particularly useful when used in conjunction with turbo-charged engines.									

Remote Start Input Type	○	●	●	●	○	○	○	○	**Remote Start**
						○	○	●	Simulate Mains
Programmable input can be configured to one of the following. ♦ Remote start – If the input is active the generator will be started, and stopped if the input is deactive. Mains fail is allways active. ♦ Simulated mains – If the input is active the generator will not start in the event of a mains failure. E.G. if the generator is supporting a non 24 hour operation, a 24 hour timer can be used to prevent a mains failure from starting the generator and taking load.									

FUNCTIONS AND CONFIGURATION TABLE									
Function	○	○	○	○	○	○	○	○	Value **(Default in Bold)**
Remote Start Function	○	●	●	●	●	○	○	○	Remote Start Is Off load
						○	○	●	**Remote Start Is On Load**

The remote start input can be configured to one of the following.

- Remote start is off load – The generator will start and run off load when the remote start input is active.
- Remote start is on load – The generator will start, and the load transferred to the generator when the remote start is active.

Auxiliary Output 1 Function	●	○	○	●	○	○	○	○	Not used
						○	○	●	Mains Failure
						○	●	○	Generator Available
						○	●	●	Generator On Load
						●	○	○	Mains On Load
						●	○	●	**System in Auto**
						●	●	○	Close to neutral Position

Programmable output can be configured to one of the following.

- Mains Failure. - The output is energised after the delay mains fail timer has elapsed and stays energised until the delay mains return timer has elapsed.
- Generator Available. - The output is energised after the warm up timer has elapsed and generator voltage is sensed.
- Generator On Load. - The output is energised when the unit has switched over to generator supply.
- Mains On Load. - The output is energised when the unit has switched over to mains supply.
- System in auto. - The output is energised when the unit is in automatic mode.
- Close to Neutral Position. - The output is energised when the close to neutral position input is active.

Auxiliary Output 2 Function	●	○	○	●	●	○	○	○	Not used
						○	○	●	**Mains Failure**
						○	●	○	Generator Available
						○	●	●	Generator On Load
						●	○	○	Mains On Load
						●	○	●	System in Auto
						●	●	○	Close to neutral Position

Programmable output can be configured to one of the following.

- Mains Failure. - The output is energised after the delay mains fail timer has elapsed and stays energised until the delay mains return timer has elapsed.
- Generator Available. - The output is energised after the warm up timer has elapsed and generator voltage is sensed.
- Generator On Load. - The output is energised when the unit has switched over to generator supply.
- Mains On Load. - The output is energised when the unit has switched over to mains supply.
- System in auto. - The output is energised when the unit is in automatic mode.
- Close to Neutral Position. - The output is energised when the close to neutral position input is active.

Mains Under Voltage (Trip / Return)	●	○	●	○	○	○	○	○	60V / 70V
						○	○	●	70V / 80V
						○	●	○	80V / 90V
						○	●	●	90V / 100V
						●	○	○	120V / 140V
						●	○	●	140V / 160V
						●	●	○	160V / 180V
						●	●	●	**180V /200V**

If for example 180V/200V is selected the generator will be started and the load transferred if any phase falls below 180V with respect to the neutral for the duration of the delay start timer. The load will be transferred back to mains when the mains voltage returns to 200V or higher for the duration of the mains return timer. (The system must be in Auto)

5 TERMINAL DESCRIPTION

PIN No	DESCRIPTION	CABLE SIZE	NOTES
1	DC Plant Supply Input (-ve)	**1.0mm**	Connected to plant battery negative
2	DC Plant Supply Input (+ve)	**1.0mm**	Connected to plant battery positive (Recommended Fuse 2A)
3	Remote Start Output	**1.0mm**	Remote Start Input to all DSE modules.
4	Auxiliary Output relay 1	**1.0mm**	Configurable output.
5	Auxiliary Output relay 2	**1.0mm**	Configurable output.
6	NOT USED		DO NOT CONNECT
7	NOT USED		DO NOT CONNECT
8	NOT USED		DO NOT CONNECT
9	NOT USED		DO NOT CONNECT
10	NOT USED		DO NOT CONNECT
11	Close To Neutral. (Mains & Generator Off Load)	**0.5mm**	Switch to negative.
12	Remote Start Input	**0.5mm**	Switch to negative.
13	Mains loading Relay Normally Open contact	**1.0mm**	Used to close the mains contactor / breaker
14	Generator loading Relay Normally Open contact	**1.0mm**	Used to close the generator contactor / breaker
15	Functional Earth	**1.0mm**	Connect to a good clean earth point
16	Mains L1 Voltage Monitoring Input	**1.0mm**	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
17	Mains L2 Voltage Monitoring Input	**1.0mm**	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
18	Mains L3 Voltage Monitoring Input	**1.0mm**	Connect to Mains L1 supply (AC) (Recommend 2A Fuse Max.)
19	Mains N Voltage Monitoring Input	**1.0mm**	Connect to Mains N supply (AC)
20	Alternator Input L1	**1.0mm**	Do not connect if not used. (2A Fuse)
21	Alternator Input N	**1.0mm**	Do not connect if not used.

NOTE: - For single-phase mains monitoring the neutral should be connected to terminal 19, L1 should be connected to terminals 16,17 and 18.

NOTE: - For two phase mains monitoring the L2 should be connected to terminal 19, L1 should be connected to terminals 16,17 and 18. The voltage between the two phases must not exceed 305 Volts.

NOTE: - All the outputs are solid state, rated at 1.2 Amps 8 Volts to 35 Volts DC, and switch to battery negative when active.

6 SPECIFICATION

DC Supply:	8 Volts to 35 Volts DC Continuous.
Cranking Dropouts:	Able to survive 0 Volts for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5 Volts. This is achieved without the need for internal batteries.
Max. Current:	Operating 50mA Standby 10mA
Alternator Input Range:	75 Volts (ph-N) to 277 Volts (ph-N) AC (+20%)
Mains Input Range	15 – 277 Volts (ph-N) AC (+20%)
Alternator Input Frequency:	50 - 60 Hz at rated engine speed (Minimum: 75V AC Ph-N) Generator available 45Hz Generator failed 20Hz
Mains Input Frequency	50 – 60 Hz
Start Output:	1.2 Amp DC at supply voltage.
Fuel Output:	1.2 Amp DC at supply voltage.
Auxiliary Outputs:	1.2 Amp DC at supply voltage.
Dimensions:	125mm x 165mm x 28 mm
Charge Fail:	12 Volts = 8 Volts CF 24 Volts = 16 Volts CF
Operating Temperature Range:	-30°C to + 70^0C
Applicable Standards	Compliant with BS EN 60950 Low Voltage Directive Compliant with BS EN 50081-2: 1992 EMC Directive Compliant with BS EN 61000-6-4: 2000 EMC Directive CE Compliance to European Legislation Registered Component for USA & Canada

Deep Sea Electronics plc reserve the right to change specification without notice.

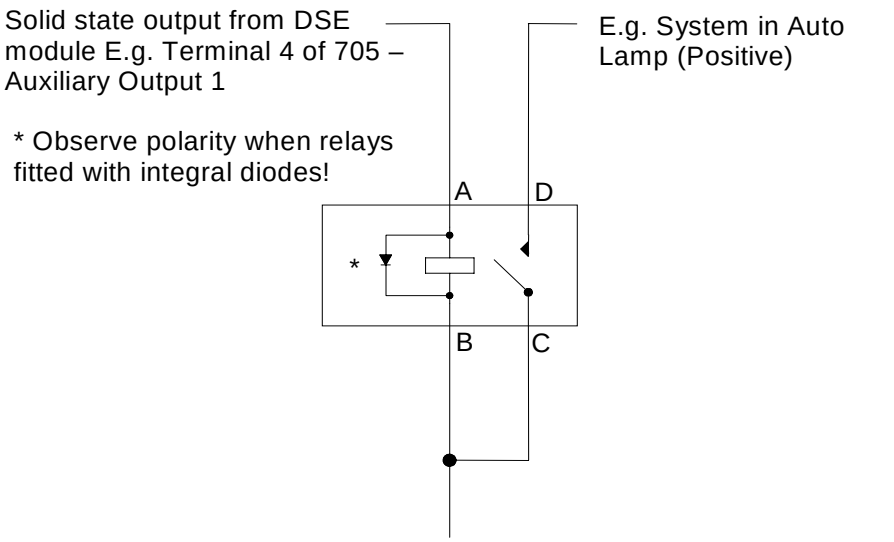
7 SOLID STATE OUTPUTS

DSE's utilisation of Solid State Outputs gives many advantages, the main points being:

- No Moving Parts
- Fully Overload / Short Circuit Protected.
- Smaller dimensions hence lighter, thinner and cheaper than conventional relays.
- Less power required making them far more reliable.

The main difference from conventional outputs is that solid state outputs switch to negative (–ve) when active. This type of output is normally used with an automotive or plug in relay.

7.1 TYPICAL CONNECTIONS

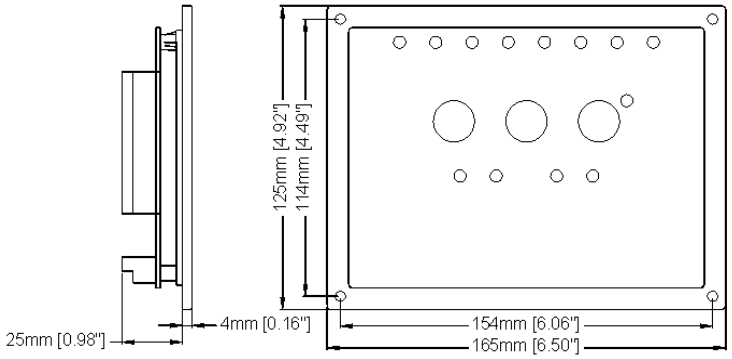


	Solid State Output from DSE Module Pin	Automotive relay Pin	8 Pin Plug in relay	Function
A	3	86	7	Fuel Output
B		85	2	To Positive supply via fuse
C		30	1	To Positive supply via fuse
D		87	3	To Fuel Solenoid

Example of relay pins connected to DSE solid state output to drive a fuel solenoid.
See overleaf for overall typical wiring diagram

NOTE: - The **Close Mains Relay** should be NORMALLY CLOSED when de-energised for fail safe reasons. Should the DC supply fail the mains will always be available. The output from the DSE solid state output when energised will OPEN the relay therefore isolating the mains supply.

8 DIMENSIONS

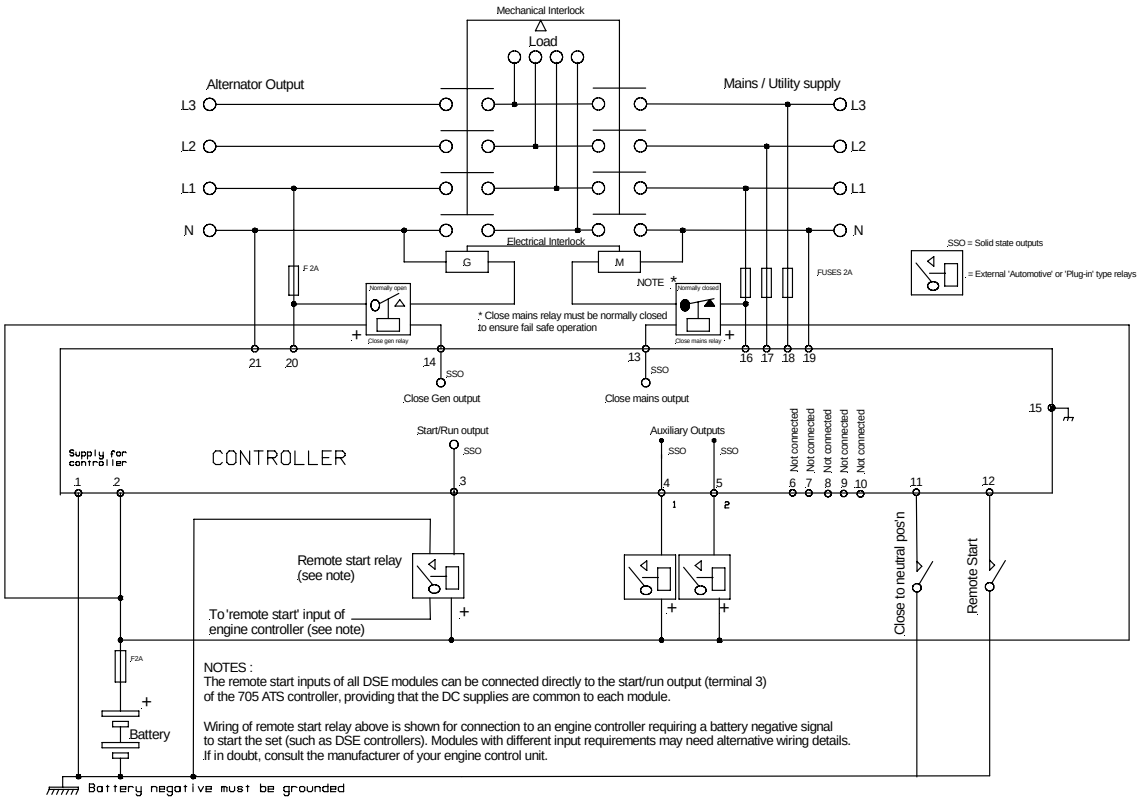


Dimensions:
165mm x 125mm x 29mm
(6.5” x 4.9” x 1.2”)

Panel cut-out:
149mm x 109mm
(5.9” x 4.3”)

Mounting Method:
4 x 4.2mm diameter holes suitable for M4 screws.

9 TYPICAL CONNECTIONS



Terminals suitable for 22-16 awg (0.6mm^2-1.3mm^2)field wiring
Tightening Torque = 0.8N-m (7lb-in)

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