

Deep Sea Electronics Plc

MODEL 500

AUTOMATIC TRANSFER SWITCH

CONTROL MODULE

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TABLE OF CONTENTS

Section	Page
INTRODUCTION.....	3
CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.....	3
1. OPERATION.....	4
1.1 CONTROL.....	4
FIG 1 - FRONT PANEL LAYOUT.....	4
1.2 OPERATION.....	4
2. FUNCTIONS & INDICATIONS.....	5
FIG 2 - LED DESCRIPTIONS.....	5
2.1 INPUT FUNCTIONS.....	5
2.2 OUTPUT FUNCTIONS.....	6
3. INSTALLATION INSTRUCTIONS.....	7
3.1 PANEL CUT-OUT.....	7
FIG 3 - CUT-OUT DIMENSIONS.....	7
3.2 COOLING.....	7
3.3 UNIT DIMENSIONS.....	7
FIG 4 - DIMENSIONS.....	7
3.4 FRONT PANEL LAYOUT.....	8
FIG 5 - FRONT PANEL.....	8
3.5 REAR PANEL LAYOUT.....	8
FIG 6 - REAR PANEL.....	8
4. ELECTRICAL CONNECTIONS.....	9
4.1 CONNECTION DETAILS.....	9
PLUG "A" 5 WAY.....	9
PLUG "B" 8 WAY.....	9
5. SPECIFICATION.....	10
6. COMMISSIONING.....	11
PRE-COMMISSIONING.....	11
7. FAULT FINDING.....	12
8. TYPICAL WIRING DIAGRAM.....	13
9. CALIBRATION.....	14
FIG 7 - MAINS FAIL TRIP ADJUST.....	14
10. ICON DESCRIPTIONS.....	15
10.1 ICONS.....	15
11. APPENDIX.....	17
11.1 TYPICAL 52X & 500 MODULE CONNECTION DIAGRAM.....	17
FIG 8 - TYPICAL 500 MODULE CONNECTION.....	17
11.2 TYPICAL 52X & 500 MODULE SYSTEM DIAGRAM.....	18
FIG 9 - TYPICAL 500 MODULE SYSTEM.....	18

INTRODUCTION

The **500** Module is an automatic transfer switch control module. It is designed to monitor the incoming AC mains supply (3 phases) for under voltage. Should this fall out of limits the module will issue a start command to the generating set controller. Once the set is available 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 stop requesting the generator.






A clear mimic diagram with 'International' symbols and LED indications provide 'at a glance' information as to supply availability and load switching status.

Voltage trip adjustment is via a potentiometer accessed from the rear of the module.

Sequence timing and function is controlled by the configurable timers in the **52x** engine control module to which the **500** module is connected.

The module is mounted in a robust plastic case, connection to the module is via plug and socket connectors.

CLARIFICATION OF NOTATION USED WITHIN THIS PUBLICATION.

 NOTE:	Highlights an essential element of a procedure to ensure correctness.
 CAUTION!:	Indicates a procedure or practice which, if not strictly observed, could result in damage or destruction of equipment.
 WARNING!:	Indicates a procedure or practice which could result in injury to personnel or loss of life if not followed correctly.
ã	DEEP SEA ELECTRONICS PLC own the copyright to this manual, which cannot be copied, reproduced or disclosed to a third party without prior written permission.
	Compliant with BS EN 60950 Low Voltage Directive Compliant with BS EN 50081-2 EMC Directive Compliant with BS EN 50082-2 EMC Directive
	Year 2000 Compliant

1. OPERATION

On connection of the DC power supply to the module, the module becomes active.

1.1 CONTROL

Operation of the **500** module is fully automatic and no user control is necessary.

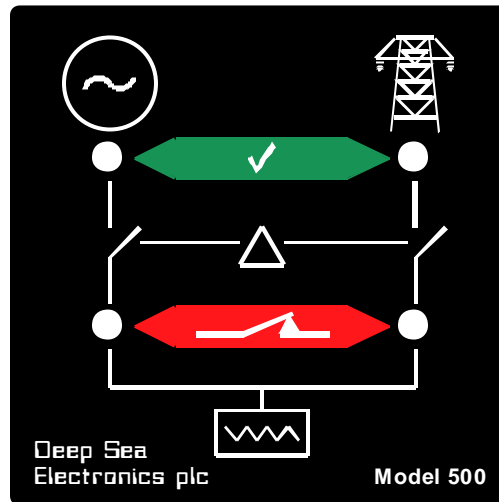


FIG 1 - FRONT PANEL LAYOUT

1.2 OPERATION

In the event of a Mains failure the module operation would normally be as follows:-

The **'Mains available' LED** extinguishes and the module de-energises the **'Run Generator' Relay**, causing the 'Run' contacts to close. A generator start module (52x) receives this signal and initiates the engine start observing the any necessary start delay.

Once the generator is running and the 'Engine Running' signal is present the **'Generator available' LED** will illuminate. The module will then await the 'Load transfer' signal from the generator controller, once this is present the Module will then energise the **'Close mains' relay** which causes the 'Close mains' contacts to open, thus opening the mains contactor. The **'Mains on load' LED** will extinguish. After a short time delay (Transfer Delay =0.7 seconds) to allow the mains contactor to open, the **'Close generator' relay** is energised causing the 'Close generator' contacts to close, thus causing the generator contactor to close. The **'Generator on load' LED** will illuminate.

Should the mains supply return to within limits the **'Mains Available' LED** will illuminate and the module will energise the **'Run Generator' Relay** causing the 'Run' contacts to open, thus instructing the generator start module to initiate its engine stop sequence. On removal of the 'Load transfer' signal the **'Generator Close' relay** will de-energise and the 'Generator Close' contacts will open. The **'Generator On load' LED** will extinguish. Following the 'transfer delay' the module will de-energise the **'Mains close' relay** and the 'Close mains' contacts will close. The **'Mains On Load' LED** will illuminate. When the 'Engine Running' signal is removed the module will then extinguish the **'Generator Available' LED**. The module will then await the next mains failure event.

2. FUNCTIONS & INDICATIONS

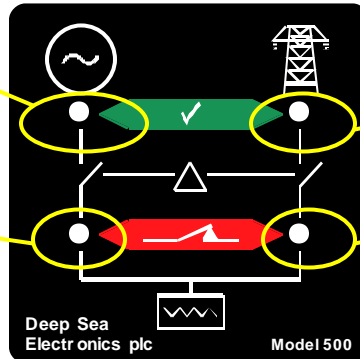
The module status is indicated by front panel LED's. This allows for easy monitoring of system operation.

Generator Running LED

Indicates that 'Generator Running' Input is active (if used)
Else will illuminate when 'Load generator' input is active

Generator On load LED

Indicates that the Generator has been selected to supply the load



Mains Available LED

Indicates that the incoming Mains supply is above the Undervolts trip level

Mains On load LED

Indicates that the AC mains has been selected to supply the load.

FIG 2 - LED DESCRIPTIONS

2.1 INPUT FUNCTIONS

The 500 module has inputs dedicated to the functions as listed below.

GENERATOR RUNNING, this is a normally open +ve signal. It is used to provide an indication that the generator is running. The **500** module will illuminate the 'Generator Running' LED whenever this input is active.

NOTE:- The 'Generator Running' input is optional and may be omitted if true engine running indication is not required. If the 'Generator Running' input is not used, then the 'Generator Running' LED will be illuminated when the 'Load Transfer' input is active.

LOAD TRANSFER, this is a normally open +ve signal. It is used to provide a signal that the generator is ready to load. The **500** module will monitor this input for confirmation to load the generator from the generator start controller (On a **520** module the 'Load Transfer' output can be connected to this input). If this signal is not present the generator will not take load even though the output voltage and frequency may be acceptable. This may be useful if other sequences occur on the generator before it is ready to load, such as smoke limiting, etc.

2.2 OUTPUT FUNCTIONS

The **500** module is fitted with a number of relay outputs. The functions are fixed as detailed below.

START/RUN GENERATOR, normally closed Battery -ve contact. This output supplies the **start/run signal** to the generator automatic start controller. The relay will de-activate* whenever the **500** module calls for the generator to start. If the **500** module stops the generator, this output will become inactive.

 **NOTE:-** *=The Start/Run Relay is normally closed to enable the **500** module to operate in a fail-safe manner.

CLOSE MAINS RELAY, normally closed volt free contact. This output supplies the close signal to the mains contactor or breaker. The volt free configuration allows it to be used with different types of switching device. The relay will de-activate** whenever the **500** module calls for the mains supply to be loaded. When the **500** module unloads the mains supply this output will become inactive.

 **NOTE:-** **=The Close Mains Relay is normally closed to enable the **500** module to operate in a fail-safe manner.

CLOSE GENERATOR RELAY, normally open volt free contact. This output supplies the close signal to the generator contactor or breaker. The volt free configuration allows it to be used with different types of switching device. The relay will activate whenever the **500** module calls for the generator to be loaded. When the **500** module unloads the generator this output will become inactive.

3. INSTALLATION INSTRUCTIONS

The model **500** ATS control Module has been designed for front panel mounting. Fixing is by 2 spring loaded clips for easy assembly.

3.1 PANEL CUT-OUT

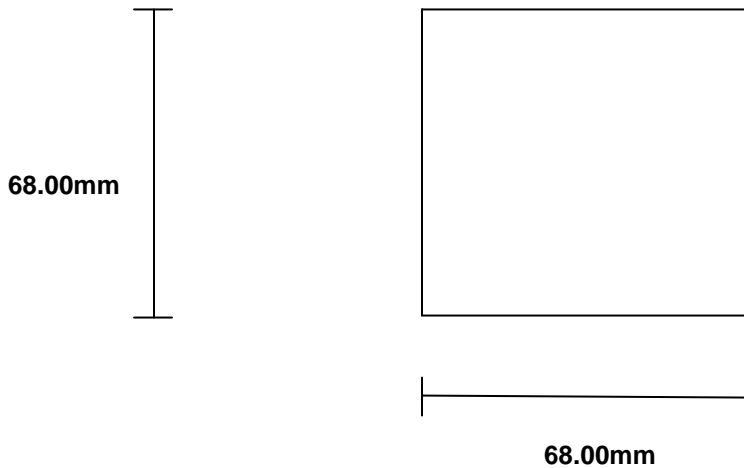


FIG 3 - CUT-OUT DIMENSIONS

In conditions of excessive vibration the module should be mounted on suitable anti-vibration mountings.

3.2 COOLING

The module has been designed to operate over a wide temperature range **-25 to +55° C**. However allowances should be made for the temperature rise within the control panel enclosure. Care should be taken **NOT** to mount possible heat sources near the module unless adequate ventilation is provided. The relative humidity inside the control panel enclosure should not exceed **85%**.

3.3 UNIT DIMENSIONS

All dimensions in mm.

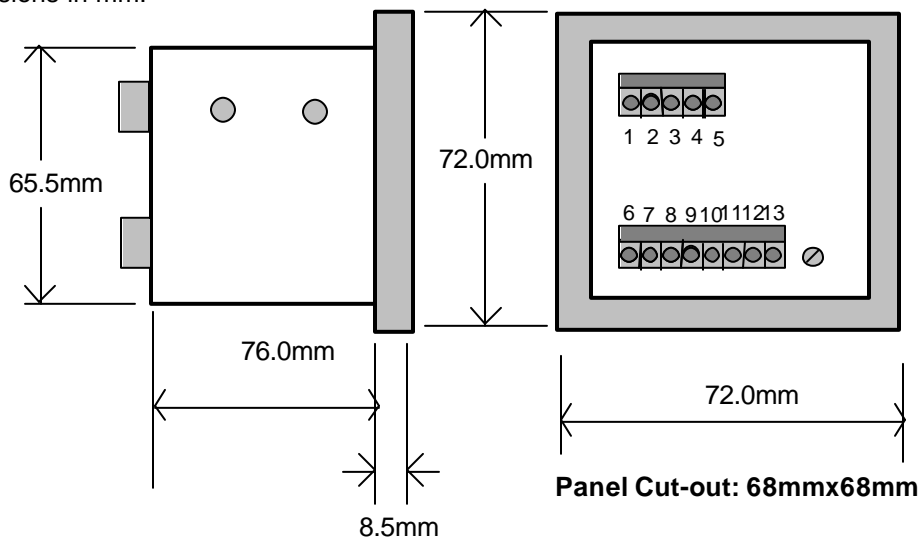


FIG 4 - DIMENSIONS

3.4 FRONT PANEL LAYOUT

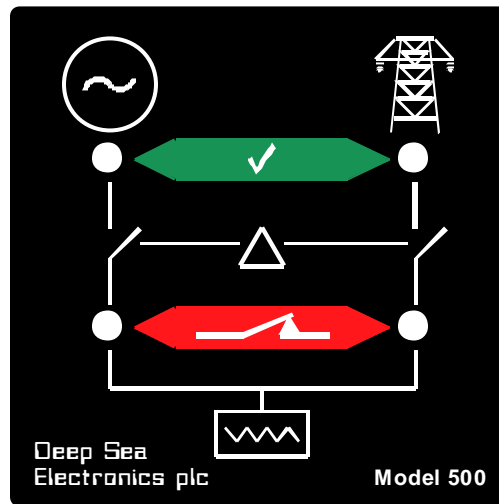
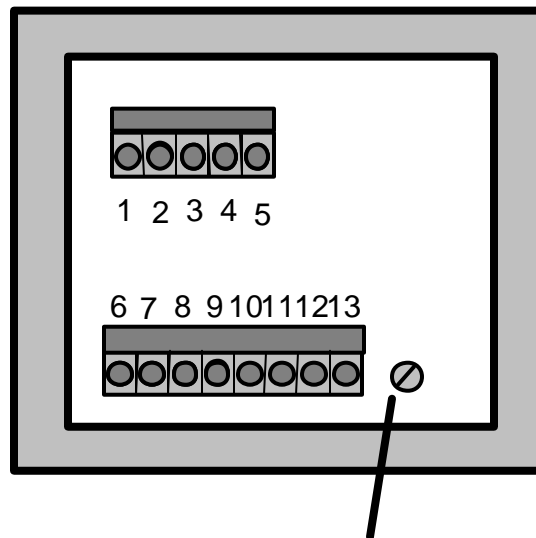


FIG 5 - FRONT PANEL

3.5 REAR PANEL LAYOUT



Mains Fail Trip Adjust

FIG 6 - REAR PANEL

4. ELECTRICAL CONNECTIONS

Connections to the **500** Module are via plug and sockets.

4.1 CONNECTION DETAILS

The following describes the connections and recommended cable sizes to the 2 plugs and sockets on the rear of the **500** Module. See rear panel layout **FIG 5**.

PLUG "A" 5 WAY

PIN No	DESCRIPTION	TYPICAL CABLE	NOTES
1	DC Plant Supply Input (+ve)	2.5mm	(Recommended Fuse 6A)
2	DC Plant Supply Input (-ve)	2.5mm	
3	Load Generator Input	2.5mm	Switch to +ve. Signal from gen-start module that generator is available for loading. Recommended 52x control source - 'Load Transfer'
4	Engine Running Input	2.5mm	Switch to +ve. Signal from gen-start module that generator is running. (Optional) Recommended 52x control source - 'Delayed alarms armed'
5	Start/Run Generator	2.5mm	Voltage Free contact, normally closed. NOT RATED FOR MAINS VOLTAGE.

PLUG "B" 8 WAY

PIN No	DESCRIPTION	TYPICAL CABLE	NOTES
6	Generator contactor close relay	1.0mm	Voltage free contact, normally open.
7	Generator contactor close relay	1.0mm	Voltage free contact, normally open.
8	Mains contactor close relay	1.0mm	Voltage free contact. Normally closed.
9	Mains contactor close relay	1.0mm	Voltage free contact. Normally closed.
10	Mains Input Live L1	0.5mm	Incoming AC mains supply. Recommended fuse 2A.
11	Mains Input Live L2	0.5mm	Incoming AC mains supply. Recommended fuse 2A.
12	Mains Input Live L3	0.5mm	Incoming AC mains supply. Recommended fuse 2A
13	Mains Input Neutral	0.5mm	Incoming AC mains supply.

 **NOTE:-** If single phase sensing is required the single phase can be fed into all of the three phase inputs.

5. SPECIFICATION

DC Supply	8.0 to 35 V Continuous.
Cranking Dropouts	Able to survive 0 V for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5V
Max. Operating Current	85 mA at 12 V. 92 mA at 24 V.
AC Voltage Input Range	100 - 300 V AC RMS Nominal
AC Voltage Adjustment Range	75 - 275 V AC RMS
AC Freq. Range	50/60Hz
Mains Relay Output	8 Amp RMS rated NC.
Generator Relay Output	8 Amp RMS rated NO.
Start/run Relay Output	5 Amp DC at supply voltage NC connected internally to -Ve
Dimensions	72 X 72 X 76 DIN
Operating Temperature Range	-25 to +55°C
Transfer Delay time	0.8seconds (+/- 0.1seconds)

6. COMMISSIONING

PRE-COMMISSIONING

Before the system is started, it is recommended that the following checks are made:-

- 6.1. The unit is adequately cooled and all the wiring to the module is of a standard and rating compatible with the system.
- 6.2. The unit **DC** supply is fused and connected direct to the battery and of correct polarity.
- 6.3. The **AC** supplies are fused and correctly connected to the appropriate feeds.

 **NOTE:- If single phase sensing is required the single phase can be fed into all three phase inputs.**

- 6.1. To check the **500** module take appropriate measures to prevent the engine from starting (disable the operation of the fuel solenoid). After a visual inspection to ensure it is safe to proceed, connect the battery supply. Simulate a mains failure by interrupting one of the phases of the incoming AC supply.
- 6.2. The Start/run signal will be given to the generator start control which should then attempt to start the generator. Returning the **500** module the incoming AC supply to normal should remove the start/run generator signal.
- 6.1. Restore the engine to operational status (reconnect the fuel solenoid), again simulate a mains failure by interrupting one of the phases of the incoming AC supply, and this time the engine should start and once it is up to operating parameters the '**GENERATOR AVAILABLE LED**' should illuminate.
- 6.1. The mains contactor or breaker should open and after a short delay the generator contactor or breaker should close. The generator is now on load and the '**GENERATOR ON LOAD LED**' should illuminate.
- 6.2. Return the incoming AC mains supply to normal and the '**MAINS AVAILABLE LED**' should illuminate and the start/run generator signal should be removed. After the '**MAINS RETURN TIMER**' (*in the generator control module*) has expired the generator contactor or breaker should open, and after a short delay the mains contactor or breaker should close.
- 6.5. If despite repeated checking of the connections between the **500** module and the customers system, satisfactory operation cannot be achieved, then the customer is requested to contact the factory for further advice on:-

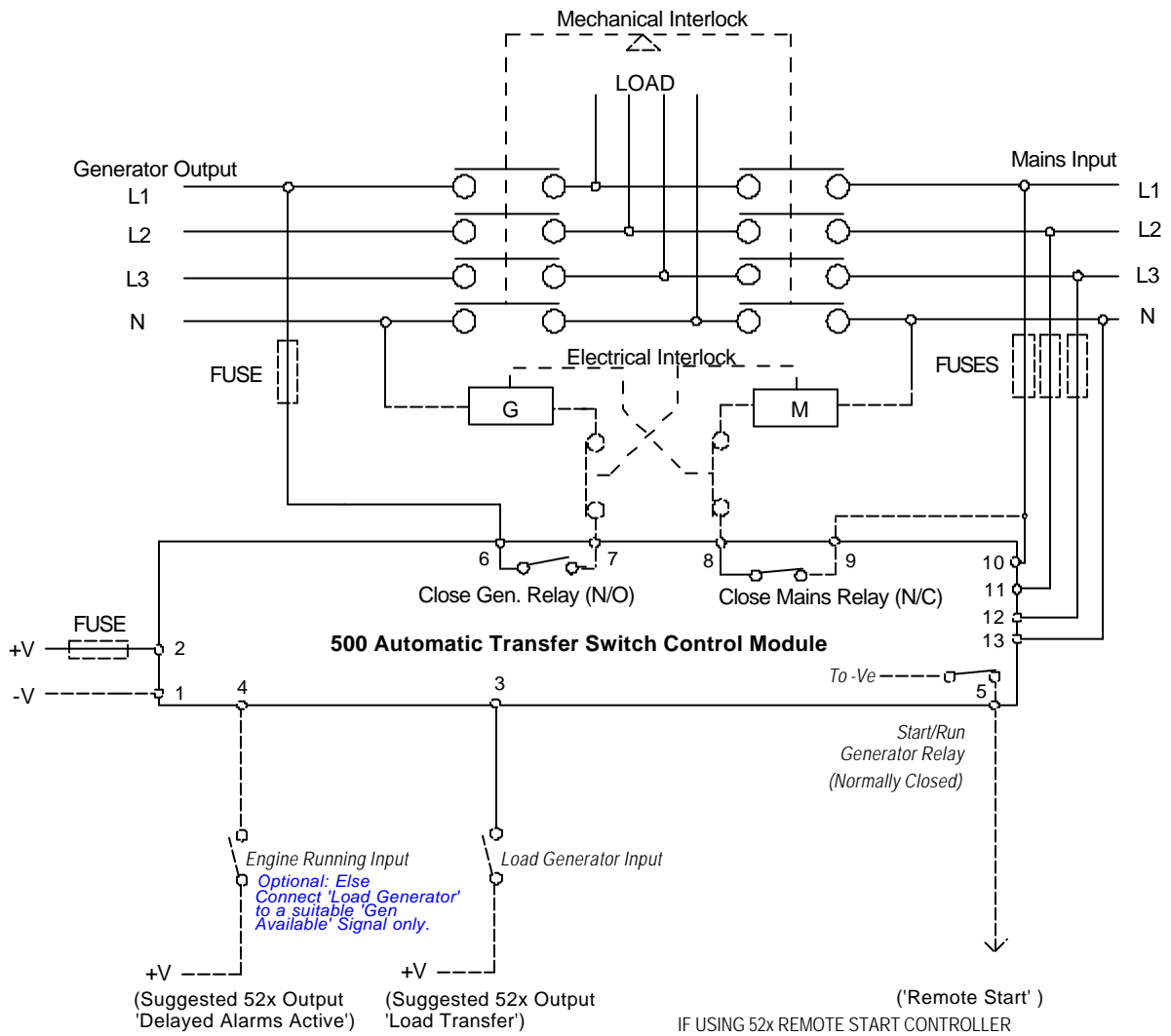
INTERNATIONAL TEL: 44 (0) 1723 377566
INTERNATIONAL FAX: 44 (0) 1723 354453
E-mail: Support@Deeplc.com

7. FAULT FINDING

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check the AC supplies are within the module specification. Check DC supply voltage is not above 35 Volts or below 8 Volts. Check the operating temperature is not above 55 °C. Check the DC fuse.
Unit attempts to start the generator when mains is present.	Check AC supply to unit is in limits. Check setting on 500 module is correct.
Generator does not become available.	Check Load Generator input is correctly connected.
Engine runs but generator will not take load	Check Warm up timer has timed out and Load Generator input is correctly connected.

▲ NOTE:- If connected to a P52x Generator Control Module, fault finding can be assisted greatly by utilising the Diagnostic feature available from the PC Interface. This will display the P52x module state, any alarm conditions present and the state of all inputs and outputs. It is recommended that diagnostics are used to aid fault finding where-ever possible.

8. TYPICAL WIRING DIAGRAM



INTERNATIONAL TEL: 44 (0) 1723 377566
INTERNATIONAL FAX: 44 (0) 1723 354453
E-mail: Support@Deepseapl.com

9. CALIBRATION

The **500** module has been pre-calibrated in the factory to give a mains failure trip at 180 Vac and mains return of 200 Vac Phase to Neutral. If a different setting is required, follow the following procedures. (Refer to fig 7).

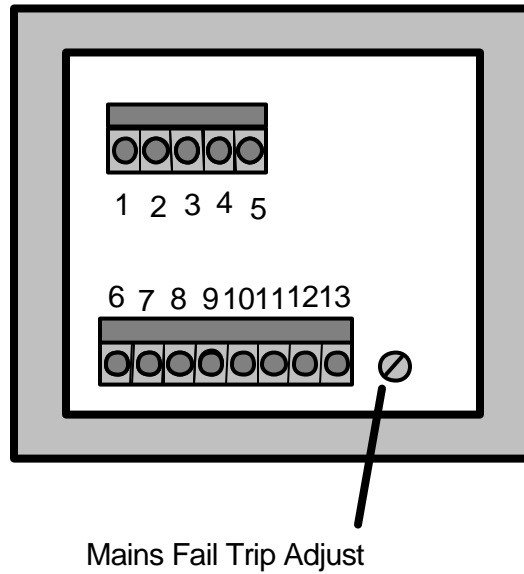


FIG 7 - MAINS FAIL TRIP ADJUST






- a) Turn the Mains Volts Trip potentiometer fully anti-clockwise.
- b) Connect the DC supply.
- c) Connect a variable AC voltage to the mains sensing inputs and set to the trip voltage required.
- d) **Very slowly** turn the potentiometer clockwise until the **MAINS AVAILABLE LED** extinguishes this is an indication that the module has sensed the mains failure at the required level.

The **MAINS RETURN** will be approximately 20 Vac above the trip level

10. ICON DESCRIPTIONS

The **DSE P500** module is supplied with graphical icons instead of text. This enables the module to be used where text in the English language may cause problems and also allows for a standard module for all world markets to be used.

10.1 ICONS

Symbol	Meaning	Description
	Mains	Indicates the incoming mains supply
	Generator	Indicates the generator which is being controlled
	Load	Indicate the load to which the Mains of the generator are being fed.
	Available	Indicates that either the mains or the generator supplies are present and within limits.
	On load	Indicates that either the mains or the generator has been selected to supply the load.

11. APPENDIX

11.1 TYPICAL 52X & 500 MODULE CONNECTION DIAGRAM

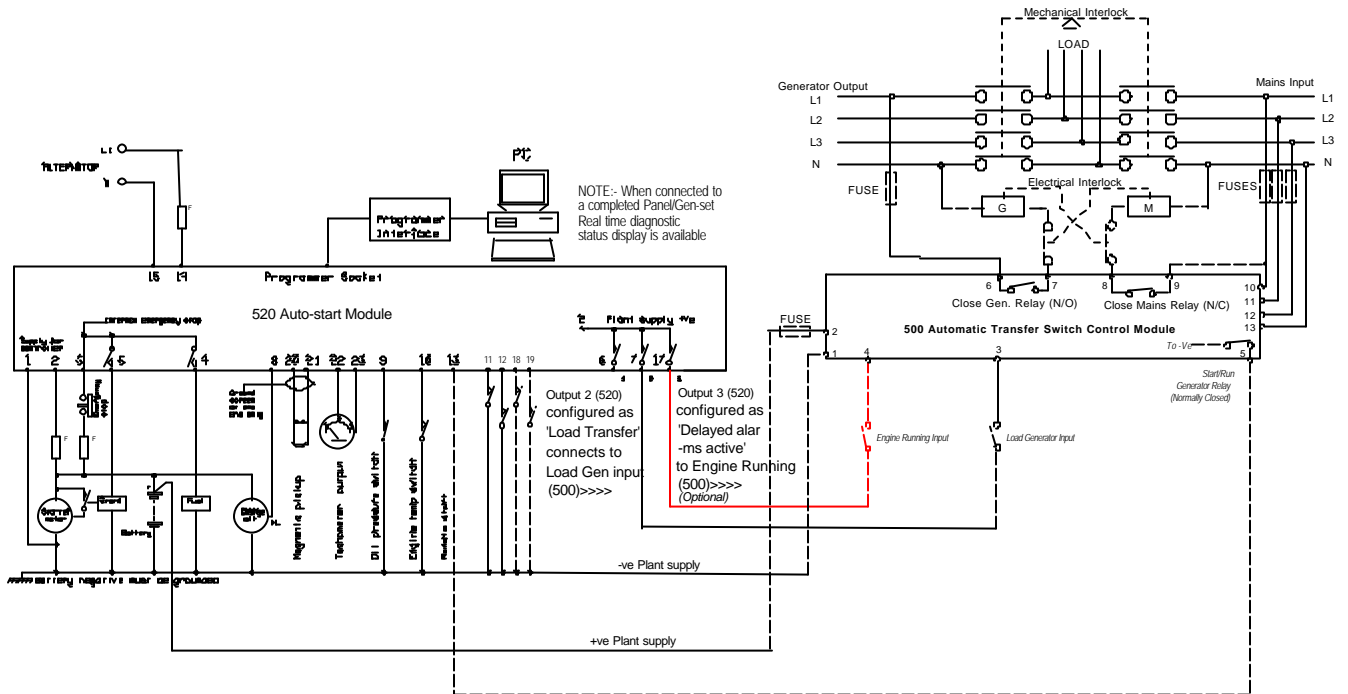


FIG 8 - TYPICAL 500 MODULE CONNECTION

11.2 TYPICAL 52X & 500 MODULE SYSTEM DIAGRAM

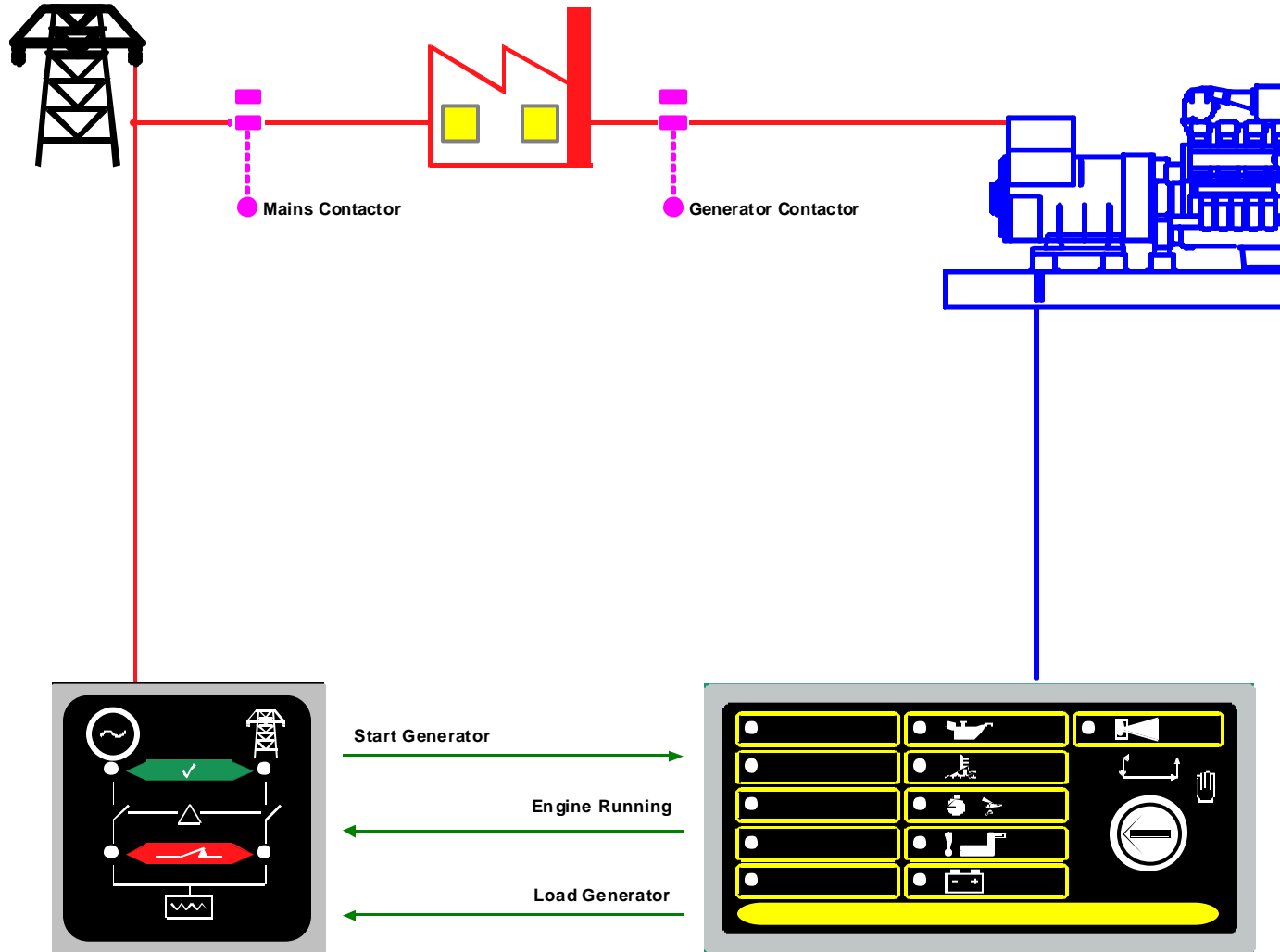


FIG 9 - TYPICAL 500 MODULE SYSTEM