EPM72 Engine Protection Module

Genset Controls - Timers - Monitors - Trips - Battery Charging - Spares & Accessories - Custom Products

- All facilities as KSM72 ..... plus much more !
- (optional) Pin for Pin compatibility with RSM72
- (optional) Crank-Cut & Over-crank lockout
- (optional) Integral Hours Counter

EPM72D

Combining the convenience of manual operation with engine protection against Low Oil Pressure (LOP), Coolant Fault (HET) and (optionally) Overspeed & / or an Auxillary Input, these Keystart Modules are easily mounted into almost any control panel or switchbox. Set in a compact 72mmsq DIN sized module they can be used with a wide range of engine driven equipment.

The front panel has five 'High Intensity' LED's indicating system status. The key switch provides…

PREHEAT (EPM72_J option Only)
Select Pre-Heat if required, just prior to starting the engine. Use it for the shortest possible time to preserve charge in the battery (typically 10sec – but dependant on the ambient temperature). Do not leave the switch in this position. (See page-3 for 'Timed Pre-Heat' options).

OFF / RESET Use to stop the engine and resets all Shutdowns. Always ensure that the engine is stationary before restarting.

RUN Powers the unit, energises the fuel solenoid and starts the Hold-Off timer (T0). If the key remains in this position for 25sec's or more, the Hold-Off timer will elapse and the module will latch out on 'Low Oil Pressure'. To start the engine from an alarm condition, the key must first be turned to the 'OFF' position for at least 1 second (see above).

START Hold in this position to crank the engine, releasing it to the 'Run' position as soon as the engine 'fires'. If the engine fails to start after approx. 10 sec's return the key to the 'OFF' position, wait approx. 10 sec's and try again. If the engine fails to start after three attempts, turn the key to the 'Off' position and consult the manufactures Handbook.

Assuming that the engine 'fires', the keyswitch is released to disengage the starter motor; the set runs up to normal speed and the Hold-Off timer (T0) is running. The tachometer circuitry (EPM72B or D) continually monitors for Overspeed. When the hold-off timer has elapsed, the LOP and HET fault circuits are enabled. In the event of a shutdown, the appropriate fault Led is lit, the Alarm output (if applicable) is activated, the Fuel & Starter relays are locked out and the LOP & HET channels disabled (first-up interlock).

The 'close to –Ve on fault', Auxiliary input is always active as it is not inhibited by T0 or any other shutdown. If T0 is required then select an EPM72 with the 'T' option (see page 5).

ORDERING INFORMATION

Model No.	Connectors	Overspeed	Channel – 5		Pin Compatible With	
			Charge Fail	'Lamp Only'		
EPM72A	One	---	---	Yes	KSM72A	
EPM72B	One	Yes	---	Yes	KSM72B	
EPM72C	One	---	Yes	---	KSM72C	
EPM72D	One	Yes	Yes	---	KSM72D	
EPM72CV	Two	EPM72C + 'Aux' input + outputs for: Swt +ve & Alarm				
* EPM72CZ	Two	EPM72CV + Timed Pre-Heat output				
EPM72DV	Two	EPM72D + 'Aux' input + outputs for: Swt +ve, Alarm & Meter				
EPM72DZ	Two	EPM72DV + Timed Pre-Heat output				
EPM72D - / XX	Dummy 2nd Connector for wiring, allowing later upgrade to RSM72, by changing modules					
EPM72E	As EPM72D + 'Crank-Cut' on running + 'Overcrank' Lock-out + Meter O/P					

Options	Features	Term.
* EPM72 - A	Open collector 'Alarm' output on term.7 (single connector builds only)	7
EPM72 - H	Integral (LCD) 'Hours Counter'	
♣ EPM72 - - M	Magnetic Pick-Up (MPU) speed sensing in place of 'Main Alternator' frequency sensing.	9 & 10
EPM72 - - - R	'Active-Low' drivers for external lamps &/or relays via a separate 8-way (top) connector.	a ---- h
EPM72 - - - - S	'Symbols' on front panel in place of text.	
* EPM72 - - - - -T	'Active-Low' driver output at the end of T0 period (& no fault shutdown)	7
EPM72 - - - - - -V	Pre-Heat terminated after T0 time (max. 25sec from crank-cut) to suit certain engines	
♦ EPM72 - - - - - - X	LED-1 to show 'Aux.' channel 'Status' in place of 'DC on'. Please specify 'overstick' label!	
⊗ EPM72 - - - - - - - Y	Pulsed output for Fuel pull-in coil. Typically for.YANMAR engines.	7
Input Phasing		
EPM72 - - -	Het (Cooling Fault) & Lop (Low Oil Pressure) are both 'closed to ground' (Batt -Ve) on fault	
EPM72 - - - / HR	'Het Reversed' - open from ground (Batt -Ve) on fault	
EPM72 - - - / LR	'Lop Reversed'- open from ground (Batt -Ve) on fault	
EPM72 - - - / HLR	'Het & Lop Reversed' - {both of the above} - open from ground (Batt -Ve) on fault	

NOTE: 1/ * & ⊗ These Models & Options are 'Mutually Exclusive' as they all use terminal 7, but for different functions!
These 'Active-Low' driver output(s) are open collector transistors, each rated at 40V / 150mA
2/ ♦ The 'X' Option is only available on EPM72 DV & DZ builds.
3/ ♣ The 'M' option is only available on the EPM72B--, EPM72D-- & EPM72E-- builds
4/ EPM72CZ & DZ builds, inhibit the Starter until the Pre-Heat time has elapsed
5/ ⊗ The 'Y' option is only available on EPM72CZ & DZ builds

SPECIAL BUILDS

EPM72 - - - / - - / X0? These 'X' numbers, indicate non-standard product, which has been manufactured to suit a specific customer. They do not appear in any catalogues and may only be available to the original customer. When re-ordering, please quote the full part number together with the 'Serial Number' of the original unit(s).

CUSTOMISED PRODUCTS

If you require spare or replacement units with 'Model Numbers' & / or 'Build Options' not listed here --- please contact our sales desk for the latest price and delivery. Always quote the serial No. of the original unit.

CONNECTIONS

Always ensure that the correct wire sizes are used and that all terminals are tightened correctly.

Terminal	Description	Input / Output	Connect To ------
1 LOP	Low Oil Pressure	-Ve Input	Low Oil Pressure switch
2 HET	High Engine Temp.	-Ve Input	High Engine Temp. switch
3 Starter	Max. Load 16 Amps (resistive) *	+Ve Output	Solenoid or Solenoid Relay
4 Batt+	Supply +Ve		Battery positive
5 Fuel	Max. Load 16 Amps (resistive) *	+Ve Output	Solenoid or Solenoid Relay
6 Batt -	Common DC -Ve supply		Battery negative
7 (See text)			
8 C.F.	Charge Failure	+Ve Output	Charging Alternator (WL)
9 AC or MPU -	Speed sensing		115/230VAC (Main Alternator or
10 AC or MPU+	Speed sensing		Magnetic Pick-Up (see 'Options')
11	(Reserved for RSM72)		
12 Meter +	Analogue Meter Output	+Ve Output	RPM Meter / DC Voltmeter --- see text
13 Pre-Heat	Open Collector Transistor ***	-Ve Output	Pre-Heat control relay
14 Alarm	Open Collector Transistor ***	-Ve Output	Alarm control relay
15 Swt +Ve	Switched +Ve Output **	+Ve Output	To power, 'Alarm' relay etc.
16 Aux	Auxiliary Shutdown	-Ve Input	Expansion Module(s) or Spare I/P
17	(Reserved for RSM72)		
18	(Reserved for RSM72)		
19 L.T.	Lamp Test	+Ve Input	'Global' Lamp Test circuits

NOTE : * De-rate to 14% for Inductive Loads (2.2A for Relay or (Solenoid) see below
** Limit to 500mA Maximum.
*** Limit to 300mA Maximum. Flywheel diode(s) should be connected across inductive Load(s)

WARNING: Fuel & Starter Outputs

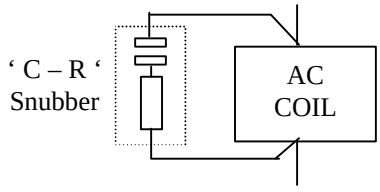
Although the on board relays and are quite capable of directly switching small solenoids, we would recommend that slave relays are always used as a matter of course unless both the Fuel & Starter Solenoid currents are known, and are within the specification of the EPM72. In line with other manufacturers, we quote the Fuel and Starter outputs as 16A (resistive) which relates to the contact ratings of the internal relays. However, as both Solenoids & Relays are inductive loads this 16A rating must ***always*** be de-rated to 14%, that is maximum continuous current of 2.2A to allow for a 'seven times' inrush, when the inductive load is energised.

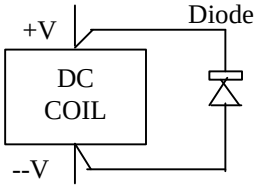
WARNING: Voltages dangerous to human life

Voltages **dangerous to human life** may be present at some of the terminal connections of this unit. Ensure that all AC and DC supplies isolated before attempting any connection / disconnection.

Noise Suppression Components

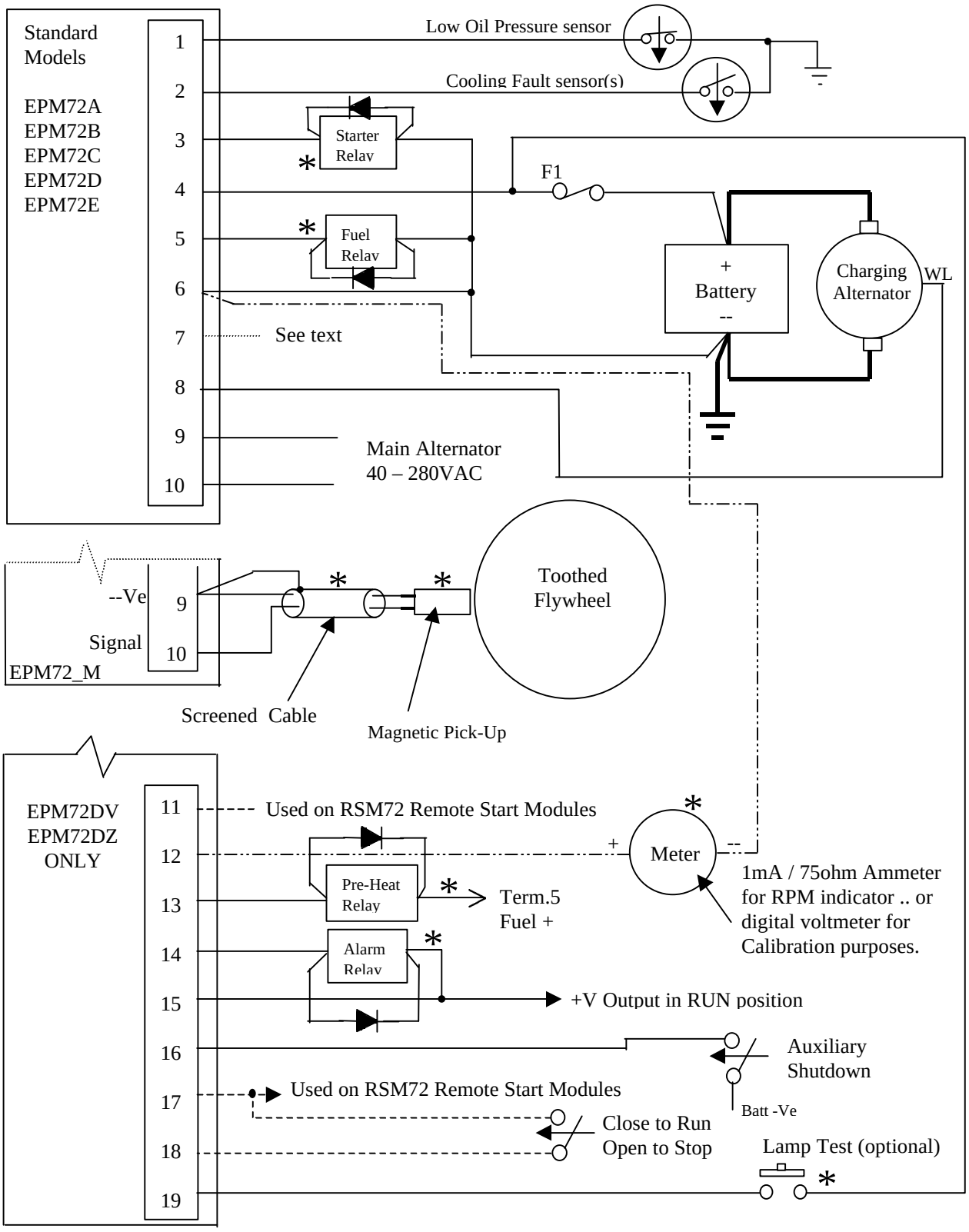
Both AC & DC inductive components (i.e. Relays, solenoids, etc) should be connected as shown --





For further information or advice - Please contact the sales desk

Basic Connections



NOTES : 1/ Items marked * are generally available 'ex-stock' from Capricorn Controls.
2/ Term.17 & 18, close for auto-start on RSM72. Pre-wire for upgrade path to Remote Start Module
3/ Low Oil Pressure & Cooling Fault sensors are shown 'close to ground' on fault ……. See text
4/ Cooling Fault could be 'High Engine Temp' & / or 'Low Coolant Level'
5/ Fuse F1, rate at 5A A/S if Fuel & Starter slave relays used or 10A A/S if only starter slave fitted

Wiring Instructions for Specific Build 'Options'

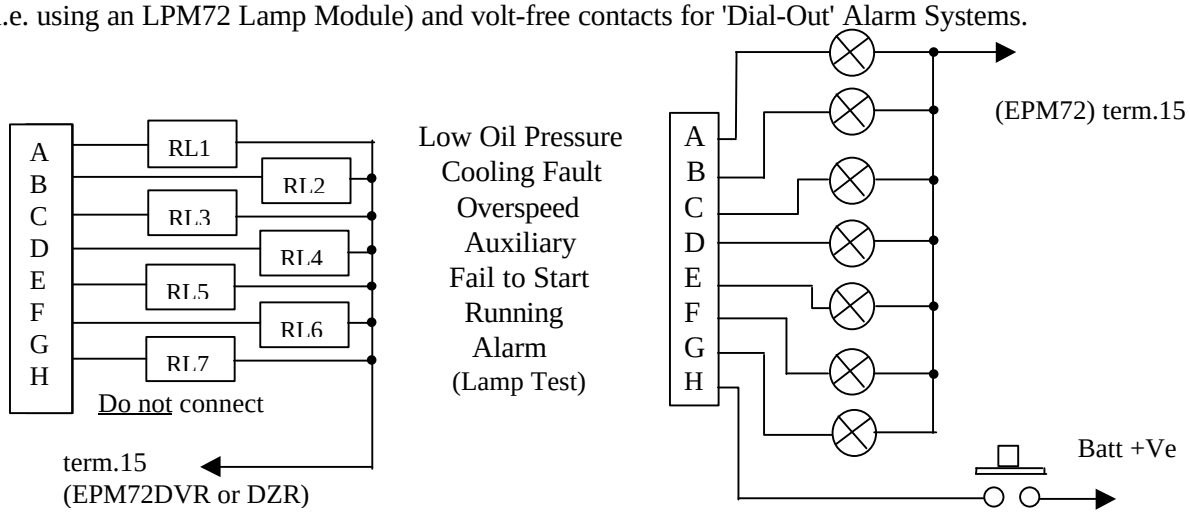
1/ **EPM72--M--** Speed sensing via Magnetic Pick-Up (in place of main alternator frequency sensing).

Term. 9 (-Ve) and term.10 (signal) should be connected to the Magnetic Pick-Up terminals via a screened cable.

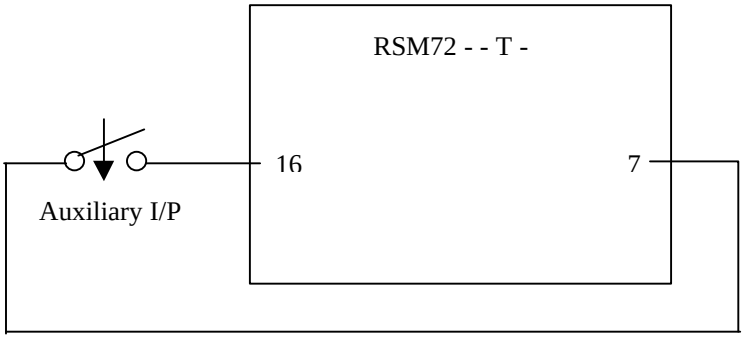
Always ensure that --

(a) The screen is ONLY connected to term.9 and if wired via a terminal block, that the integrity of the screen is maintained.
(b) If one of the Magnetic Pick-Up connections is connected to it's case, that this one is connected to term.9
(c) The correct gap is set between the Magnetic Pick-Up and the Flywheel teeth.

2/ **EPM72--R--** Seven, 'active-low' drivers allow external lamps &/or relays (150mA / 30VDC max each output) to be connected via an 8 way (top) connector. Typical applications include: remote indication (i.e. using an LPM72 Lamp Module) and volt-free contacts for 'Dial-Out' Alarm Systems.

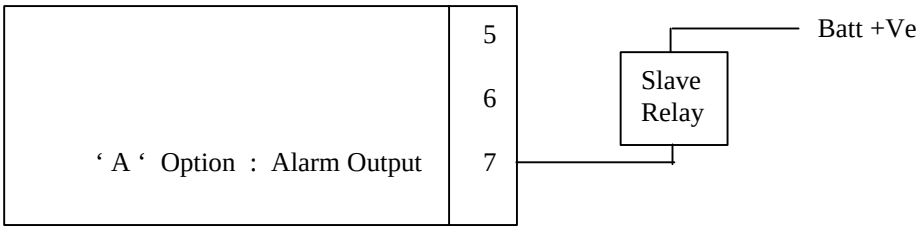


4/ **EPM72--T--** 'Active-Low' driver output (on term.7) at the end of the 'T0' hold-off timer period

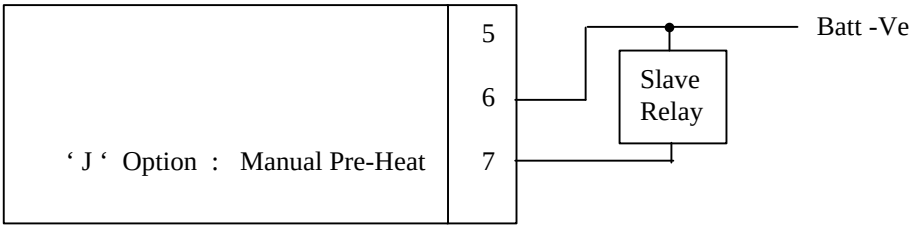


Connected as shown above, the 'Aux.' channel is subject to the 'T0' timer, and provided with 'First-up Interlock'. This 'T0' output is capable of sinking 150mA / 30VDC and could be used to drive an external relay (connect to term.15 SW+ or term.5 Fuel +).

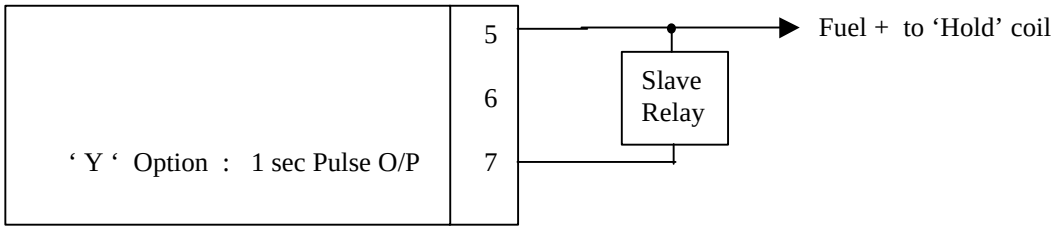
5/ **EPM72 - - A** Active Low Alarm Output



6/ **EPM72 - - J** Active High Manual Pre-Heat Output



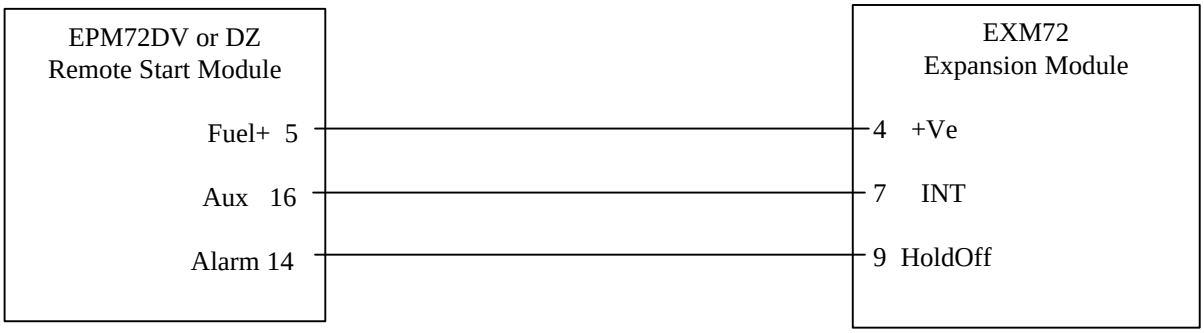
7/ **EPM72 - - Y** Active Low (1sec) Pulse Output for fuel solenoids with separate 'pull-in' coil.



Here the Slave Relay will be used to switch Batt +Ve (at perhaps > 30A, for 1 sec) to the fuel solenoid 'Pulse' Coil. The 'Hold' coil current would normally be within the rating of the on-board relay.

Connection to an EXM72 Expansion Module

The EXM72 Expansion Module should be connected as shown. It provides up to four shutdown channels and incorporates its own T0 Timer and a wealth of other features.



Please refer to the EXM72 'Data & Application Note' for further information

FAULT FINDING ----- EPM72 BASED SYSTEMS

Always check the 'obvious' first ----

- System correctly wired
- Correct EPM72 type fitted for the specific application
- EPM72 suitably calibrated
- All connections use suitably rated cables to comply with all appropriate regulations.
- All terminal screw connections tight.
- Battery(s) charged, in good condition, clean & tight connections and of the correct voltage
- The Module MUST be fitted in a control panel with adequate protection from extremes of Temperature, Humidity & Vibration

WARNING - Incorrect wiring could damage the module i.e. -

1/ Loose connections on battery negative (term.6) & / or battery +Ve (term.4)
2/ Connecting any 'Active low' outputs (i.e. Pre-Heat, Alarm, etc.) directly to a positive supply.
3/ connecting any positive DC outputs (i.e. Starter, Fuel, Exc.+, etc.) directly to a negative supply.
4/ connecting any DC terminals to an AC supply.

- **Unit Dead - set will not start :**
  Check for battery supply on term.4(B+) and term.6(B-) of the EPM72 using a DC voltmeter or by shorting term.4 to term.19 (lamp test) [EPM72DV or DV models] and observing if the Led's light.
- **False tripping of Overspeed shutdown :**
  (a) Module requires calibration (see below)
  (b) Open-circuit probe (magnetic pick-up version ONLY). Always use a screened cable where the screen is connected to Batt-Ve at the controller end only.
  (c) Engine 'over-speeding'.
  (d) External relays and Contactor coils may require noise suppression components (see page 2).
- **Fuel operates but no Starter :**
  (a) Preheat timer set near maximum (50secs), wait for this time to elapse.
- **Engine starts correctly and then shuts-down on 'Over-Crank' :**
  (a) Short-circuit probe or probe too far from flywheel teeth (magnetic pick-up version ONLY).
  (c) AC sensing version - short-circuit, open-circuit or with a voltage <50VAC or frequency incompatible with the EPM72 type fitted.
- **No Pre-Heat output [EPM72DZ]:** *Pre-Heat timer (0 - 50 sec) set near minimum, adjust to suit application.*
- **Low oil pressure shutdown :** *Faulty pressure switch, incorrect type or trip setting*
- **Cooling Fault (High engine temp.) shutdown :** *(b) Faulty temperature switch, incorrect type or trip setting*
  (c) Incorrect EPM72 type for use with Temperature switch fitted
- **Charging Alternator fails to excite :**
  (a) incorrect type of EPM72 fitted
  (b) rear mounted 82R resistor damaged, missing or too high a value (may require 47R on certain 12VDC Alternators).
  (c) charge fail (term.8) not connected to WL. connection on the charging alternator
- **Overspeed and / or Nominal-Speed Calibration :**
  (a) Connect a digital (or other D.C voltmeter) to term.12 (meter +) and battery negative
  (b) Run engine at or close to normal speed, measure & note the actual frequency (or speed using a tacho)
  (c) Calculate: Meter output (at required Overspeed) = OS / Nominal x 2.50 (i.e. [57Hz / 50Hz] x 2.50V = 2.85V)
  (d) Set 'Overspeed Trip' pot fully **anti-clockwise**, adjust the 'Speed Cal' pot until the meter reads 2.85V
  (e) Slowly, wind the 'Overspeed Trip' pot **clockwise** until the unit (just) shutsdown on Overspeed.
  (f) Wind 'Cal' potentiometer 3 turns **anti-clockwise**. Repeat (b).
  (g) Adjust Cal pot for meter output = Actual / Nominal x 2.50V (i.e. [52Hz / 50Hz] x 2.50V = 2.60V)

SPECIFICATION

Supply

12 / 24V Single range supply, operating from 6V to 30VDC
Drop Out : < 4 VDC Absolute maximum supply : 40VDC

Speed Sensing

Magnetic Pickup	600 Hz to 6 kHz at rated speed. (5V to 100Vac pk - pk)
Alternator	50 Hz to 400 Hz at rated speed. (40V to 280V Rms. absolute Maximum)

User Adjustable Functions

Pre-Heat Timer	0 - 50 sec (set at minimum, unless requested otherwise) [EPM72CZ or DZ]
Over-crank Delay	7 - 24 sec (set at 15sec, unless requested otherwise) [EPM72E]
Hold-Off Timer	5 - 25 sec (set at 25sec, unless requested otherwise)
Speed Calibration	--- Set 'Cal' potentiometer for meter output = 2.50Vat Nominal Speed EPM72B, D or E]
Crank Cut Threshold	15 - 60% of Rated Speed (set at 40% unless requested otherwise) [EPM72E]
Overspeed Trip Level	102 - 125% of Rated Speed (set at 117% unless requested otherwise)

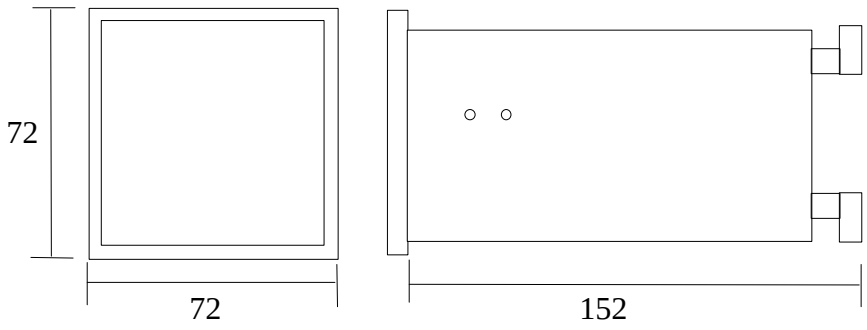
General

Ambient temperature -10^0C to $+55^0$C Operating, -25^0C to $+70^0$C Storage

Construction

Through panel fitting**,** 72mm sq. DIN standard case. Reverse screen-printed "LEXAN" front panel.
Printed Circuit Boards are varnished as standard.

Dimensions



Notes:
1/ Not to Scale
2/ All dimensions in mm
3/ Panel cut-out
68 x 68 mm

MOUNTING

The module must be fitted into a suitable control panel that provides adequate protection from the extremes of Temperature, Humidity & Vibration. If the control panel is set-mounted then suitable 'Anti-Vibration' mounts MUST be used

Note: If specific information or a replacement unit is required, please ensure that the 'Serial Number' of the original unit is quoted.

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Keystart, Remote Start, Start-on-Demand, Mains Failure, Mutual Standby & Multi-set Controllers. Annunciators and Lamp Modules. Voltage, Current, Frequency, Speed, and Temperature Monitors. Timers. Transport Refrigeration Spares. Batteries, Battery Chargers and Power Supplies. Spares and Accessories. Customised Products and Bespoke Designs.