

ECONOSTART 8000 series

AMF ENHANCEMENT FOR KEYSTART SERIES

The Econostart generator controller has been designed as a low cost Automatic Mains Failure (AMF) enhancement to the Modex Keystart range. It features:-

- single phase detection of mains failure/healthy conditions
- 3 attempt engine start with automatic crank release.
- automatic, timed control of engine starting and stopping, and of mains and generator contactors.

Econostart is a separate, DIN rail mounted controller. The combination of Keystart and Econostart enables a generator to be started either manually (using the Keystart's switch) or automatically (in response to a mains failure).

Principles of Operation

The following should be read in conjunction with the brief note on the 'auxiliary control' series of Keystart units and the typical application circuit (both overleaf).

Power Supply

Econostart is available in either 12 V DC or 24 V DC supply versions. The DC supply terminals are protected against transient voltages and reverse polarity connection.

The +ve DC supply terminal of Econostart is typically connected to the 'Aux. Out' terminal of a Keystart controller, such that the Econostart is only activated when the Keystart is switched to 'AUX'.

Engine Control

Econostart controls the starting and stopping of the engine through two switched +ve relay outputs:

- **Run** output: used to control the engine's fuel circuit, normally via the 'Aux. In' terminal of a Modex Keystart. The output activates (goes +ve) at the end of the 'start delay' (after a mains fail). It de-activates at the end of the 'stop' delay (after a mains return and 'restoration' delay).
- **Start** output: used to control the engine starter motor circuit. It gives up to 3 engine start attempts, each consisting of a 10 second pulse and 10 second dwell.

Econostart automatically releases the starter when it detects that the generator frequency has risen to above 30% of nominal. The Start output remains latched out until Econostart returns the engine to 'standby' mode or the power supply is removed and re-applied.

Mains and Generator Sensing and Contactor Control

The condition of the mains and generator AC supplies is sensed through two single phase inputs. The mains and generator load contactors are then controlled by two separate relay outputs:-

- **Mains Contactor relay** (SPNC contacts): this relay remains de-energised (contacts closed) while the mains is healthy or when Econostart is powered down. If the mains voltage falls below 60% of nominal, the mains is considered as failed and the Mains Contactor relay energises (contacts open).
- **Generator Contactor relay** (SPCO contacts): this relay only energises a) when the generator is required to be on load, and b) provided that the generator's output frequency is above 85% of nominal. The normally open contacts of this relay are normally therefore used in the generator contactor coil circuit. The relay de-energises, and Econostart allows the engine to run on, off load, if at any time the generator frequency falls below 75%.



Product Specification

Power supply:

	(12 V units)	(24 V units)
Operating voltage: Steady state	9 – 15 V DC	18 – 32 V DC
Brown out / cranking	<= 5V for 2 secs	<= 10V for 2 secs
Current consumption	<= 250 mA	

Inputs:

Mains AC:	
Maximum input voltage	350 V AC max.
Pre-set mains fail voltage	approx. 66% of nominal
Generator AC:	
Operating voltage range	90 – 350 V AC
Nominal input frequency	50/60 Hz.

Outputs:

	(all ratings for resistive load)
Run and start relays	+ ve DC (switched SPNO contacts) 16 A max. per output, or 20 A max. combined (both at 24 V DC)
Mains contactor relay	volt free SPNC relay contacts 8 A max. @ 240 V AC
Generator contactor relay	volt free SPCO relay contacts 8 A max. @ 240 V AC
Generator status relay	volt free SPNO relay contacts 8 A max. @ 240 V AC
Mains fail, mains healthy and start fail	- ve DC (open collector transistor) 250mA max. @ 33 V DC

Timers:

Start delay	adjustable, <= 2 secs. to >= 60 secs.
Restoration delay	adjustable, <= 3 mins. to >= 60 mins.
Cool delay	adjustable, <= 10 secs. to >= 5 mins.
Starter crank/dwell time	fixed, 10 secs. +/- 10%

Physical:

Operating temperature	-10 to +55 °C
Case sealing	IP30
Vibration	1 G, 50 Hz to 5 kHz.
Dimensions (W x H x D)	100 x 70 x 110 mm
Weight	approx. 330 g

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time.

Status outputs

An additional set of SPNO contacts provide for the remote signalling of 'generator on load'. Three -ve DC outputs (open collector transistor types) are also provided for the signalling of 'mains healthy', 'mains failed' and 'engine failed to start'. (The latter activates if Econostart detects that the generator has failed to start after 3 attempts).

Timers

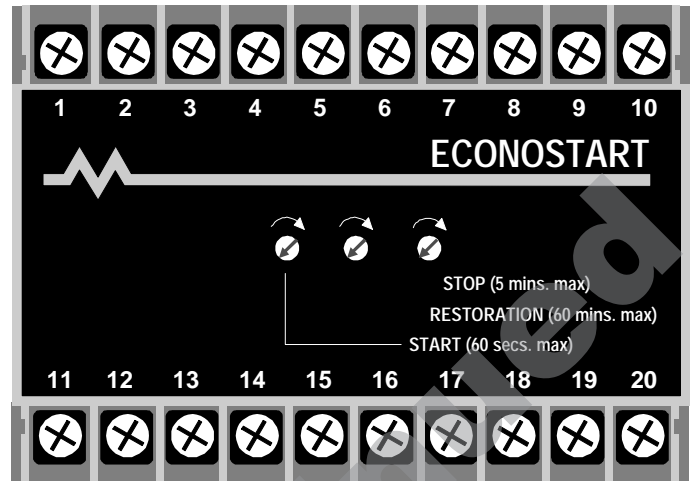
Econostart has three delay timers for the controlled operation of the generator's starting, stopping and load transfer. Each timer is adjusted using a potentiometer in the front facia:-

- **Start:** sets a delay between the detection of a mains failure and an attempt to start the engine, preventing an unnecessary engine start during very short fluctuations of the mains AC supply voltage.
- **Restoration:** ensures that the mains has returned and has stayed consistently healthy (for this time period) before Econostart transfers the load from the generator back to the mains. If the mains fails again during this time period, the timer resets and Econostart keeps the generator running on load.
- **Stop:** allows the generator run on, off load, after the load has been transferred back to the mains, cooling the engine before it returns to 'standby' mode. If the mains fails during this time period, both 'stop' and 'restoration' timers reset and Econostart transfers the load back to the generator.

Physical

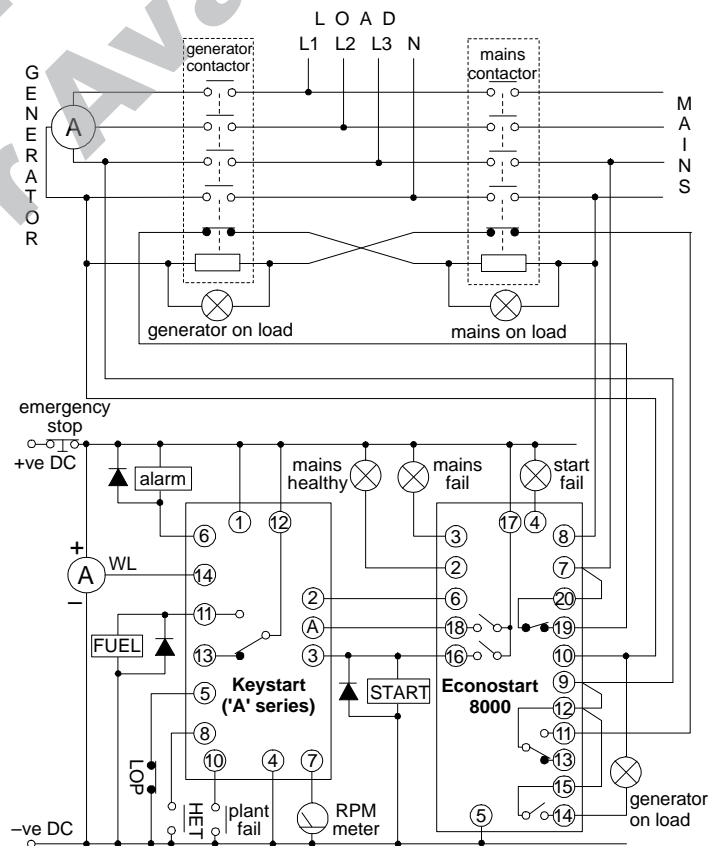
Econostart may be DIN rail mounted or fixed to a flat surface using two holes at the rear of the casing.

Front Facia and Electrical Connection



1	- No connection -	11	Gen. contactor output N/O
2	Mains healthy output (-ve)	12	Gen. contactor output C/O
3	Mains fail output (-ve)	13	Gen. contactor output N/C
4	Start fail output (-ve)	14	Gen. status output N/O
5	-ve DC power supply	15	Gen. status output C/O
6	+ve DC power supply	16	Start output (+ve)
7	Mains AC Line	17	+ve DC (feed for 16 and 18)
8	Mains AC Neutral	18	Run output (+ve)
9	Generator AC Line	19	Mains contactor output N/C
10	Generator AC Neutral	20	Mains contactor output C/O

Typical Connection Circuit (with Keystart 9000/9600 series)



The Keystart 'A' series - principles of operation

All Modex Keystarts provide for the manual, local control of a generator, by use of their STOP, RUN and START keyswitch positions. Keystarts may optionally be fitted with an 'auxiliary control' feature, allowing each unit to be powered into RUN mode by the use of remote switching. Econostart uses this feature to control the Keystart, and hence the engine, when an automatic start is needed. Keystarts with the 'A' option have a fourth keyswitch position marked AUX (anti-clockwise from STOP) and two additional terminals:-

'AUX. IN' (pin A): When +ve DC is applied to this terminal, the Keystart powers up exactly as if the unit had been switched to RUN (i.e. the engine fuel is turned on). Econostart uses this feature to control the Keystart when an automatic start is needed. (Econostart's +ve RUN output is connected directly to the Keystart's Aux. In terminal.)

'AUX. OUT' (pin 2): is a switched +ve DC output which activates when the Keystart is switched to AUX (turning to this position does not activate any other Keystart circuitry). Aux. Out is typically used as the +ve feed for a remote switching circuit, so that the Keystart can only be powered up (via Aux. In) when it is switched to AUX. 'Aux. Out' may similarly be connected direct to the +ve DC supply terminal of an Econostart; the Econostart's AMF features only then becomes active when the Keystart is switched to AUX.

For full details of the Keystart's operation, please refer to our separate literature.

When ordering, please specify:-

- Unit type (Econostart 8000)
- Supply voltage (12V DC or 24V DC)
- Mains/Generator voltage and frequency

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