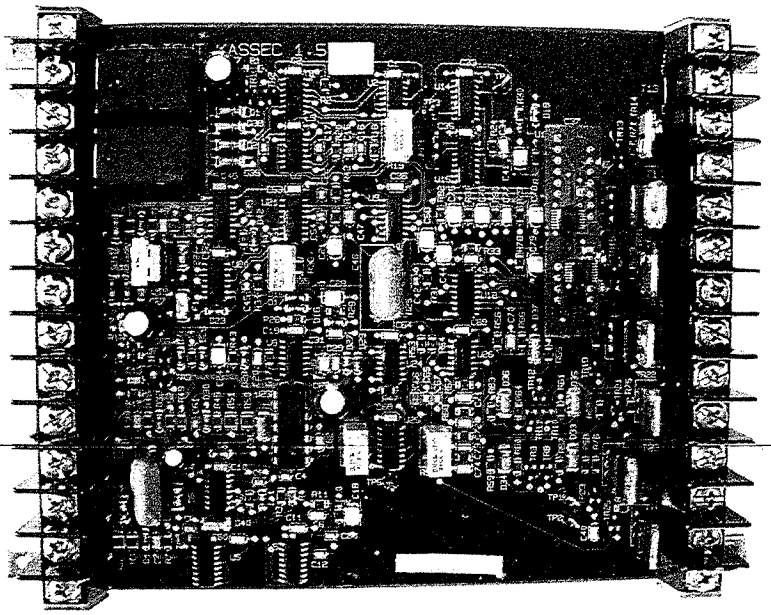
Automatic Solid State Engine Control (KASSEC)

HIGHLIGHTS

- Compatible with virtually all engines in today's marketplace
- Reliable solid-state design
- External alarm circuit for remote failure indication. Source 2 Amp Resistive
- Ease of installation, simple mounting bracket



DESCRIPTION

Automatic Solid State Engine Control (KASSEC) will automatically start and stop diesel, gasoline, natural gas and LPG engines or engine-generator sets under the control of an automatic transfer switch of load start contact closed to run. KASSEC is manufactured and tested to the highest quality control standards to ensure reliability.

SPECIFICATIONS

- Consistent operation from -30° C (-22° F) to +60° C (+140° F)
- Reliable solid-state design
- Accommodates requirements for NFPA-110 annunciator for hospital application
- Compatibility with virtually all engines in today's marketplace
- Barrier screw type terminals U.L. and C.S.A. listed, with approved means for solderless connection of conductors
- Adjustable seven (7) to fifty (50) second engine cranking circuit
- Adjustable one (1) or five (5) crank / rest cycles
- Adjustable seven (7) to fifty (50) second oil failure circuit
- External alarm circuit for remote failure indication. Source 2 Amp Resistive
- Available for 12 or 24 volt negative ground battery systems
- Four (4) crank disconnects are available. (Mag pickup, engine alternator, 110 VAC, and auxiliary 12V DC or 24V DC). The mag pickup and engine alternator crank disconnects are adjustable.
- Positive lockout circuits prohibit recranking while engine is running
- First failure shutdown lockout
- 8 amp relay contacts for start and ignition system
- Unit is sealed with a durable conformal coating

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INSTALLATION GUIDE

KASSEC will be in the "standby monitoring" mode whenever terminals #1 and #4 have battery voltage on them. In the "standby monitoring" mode, KASSEC will draw approximately 15 mA of current on the 12 volt model and approximately 17 mA of current on the 24 volt mode.

In the "standby monitoring" mode: when battery voltage is placed on Terminal #8 by the closing of a remote switch, relay or a transfer switch, the logic signal in KASSEC will operate the relays in KASSEC initiating cranking. Terminals #2 and #3 will have battery voltage on during the "cranking" period. During the "cranking rest" period, Terminals #2 and #3 will have zero voltage on them.

If the engine starts, one or more of the crank disconnect terminals #5, 6, 7 or 12 must have a signal placed on them. The KASSEC "start" relay will then open and Terminal #3 will go to zero volts. KASSEC is now in the "run" mode.

KASSEC has cyclic cranking which is adjustable. If the engine does not start in the first period of the cranking cycle, cranking will rest for the second period of the cranking cycle. These periods are equal. KASSEC will repeat cycle-cranking for an adjustable amount of cranks (1-5). If the engine has not started, KASSEC will go into an "overcrank failure" mode and both the Common Alarm Terminal #23 and the Overcrank Failure Terminal #13 will activate and battery voltage will be supplied from these terminals to be used for a failure light. Terminals #2 and #3 will go to zero volts. KASSEC is now locked in an "overcrank failure" mode resettable by turning the power to Terminal #4 off and on again.

When the engine starts, the Oil Failure circuit of KASSEC starts timing. If the Oil Failure Sender Terminal #24 does not activate (open from the ground) before the end of the timing period, KASSEC will go into the "low oil pressure failure" mode and shut the engine down. Terminals #2 and #3 will go to zero volts. The Common Alarm Terminal #23 and the Oil Failure Terminal #14 will activate and battery voltage will be supplied by these terminals to be used for a failure light. KASSEC is now locked in a "low oil pressure failure" mode resettable by turning the power to Terminal #4 off and on again. If Terminal #24 is grounded while KASSEC is in the "run" mode, KASSEC will go into the "low oil pressure failure" mode and shut the engine down. Terminals #2 and #3 will go to zero volts. The Common Alarm Terminal #23 and the Oil Failure Terminal #14 will activate and battery voltage will be supplied by these terminals to be used for a failure light. KASSEC is now locked in a "low oil pressure failure" mode resettable by turning the power to Terminal #4 off and on again.

If any of the Failure Sender Terminals (#18, 19, 21, or 22) go to ground while KASSEC is in a "cranking" or "run" mode, KASSEC will go into a "failure" mode and shut the engine down. Terminals #2 and #3 will go to zero volts. The Failure Lamp Terminal (#16, 20, 17, or 15) respectively coinciding with the Failure Sender will activate and battery voltage will be supplied by this terminal to be used for a failure light. The Common Alarm Terminal (#23) will activate and supply battery voltage. KASSEC is now locked in a "failure" mode resettable by turning the power to Terminal #4 off and on again.

NOTE: "battery voltage" or "supply voltage" will refer to the battery's positive voltage. "Ground" will refer to the negative side of the battery.

Terminal #1 supplies battery voltage to the high current requirement sections of the circuit. Battery voltage is supplied by KASSEC to the six Failure Lamps (Terminals #13, 14, 15, 16, 17 and 20), the Common Alarm Terminal #23, the Start Terminal #3 and the "energized to run" terminal #2.

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Terminal #2 is the "energized to run" terminal. Up to 8 amps is available from this terminal to supply an external engine "run" component such as an ignition coil or fuel solenoid.

Terminal #3 is the Starter Solenoid Terminal. Up to 8 amps is available from this terminal to supply a starter solenoid on the engine.

Terminal #4 supplies battery voltage to all the logic circuitry. Anytime Terminal #4 is brought from the ground to battery voltage, KASSEC will be reset. Note: Terminal #4 is the main reset terminal for KASSEC.

Terminal #5 is the Mag Pickup Crank Disconnect input. This is one of four crank disconnects on KASSEC. When KASSEC is in the "cranking" mode and the input frequency of the mag pickup equals a value set by the adjustable resistor on KASSEC, KASSEC will crank disconnect and go into the "run" mode. If the signal from the mag pickup is lost while KASSEC is in the "run" mode and this is the only crank disconnect being used, KASSEC will go into the "overcrank failure" mode and shut the engine down.

NOTE: Whenever Terminal #5 is not in use, it must be tied to Terminal #9, Ground, to prevent accidental triggering of the crank disconnect circuitry.

Terminal #6 is the Engine Alternator Crank Disconnect Terminal. This is one of four crank disconnects on KASSEC. When an A.C. signal from the stator terminal of the engine alternator is fed to this terminal and KASSEC is in the "cranking" mode, KASSEC will crank disconnect and go into the "run" mode. With KASSEC in the "run" mode, the unit will not shut down or go into overcrank with loss of the alternator Crank Disconnect.

Terminal #7 is the Auxiliary Crank Disconnect Terminal. This is one of four crank disconnects on KASSEC. When a positive voltage is placed on this terminal and KASSEC is in the "cranking" mode, KASSEC will go into a "run" mode and this is the only crank disconnect being used. Loss of the positive voltage on Terminal #7 will place KASSEC into an "overcrank failure" mode and shut the engine down.

Terminal #8 is the Transfer Switch Terminal. This terminal is the main controlling terminal. Anytime this terminal is at battery positive, the unit will be in active modes of trying to start, run, failure. If Terminals #1 and #4 have battery voltage on them and Terminal #8 has no battery voltage present, KASSEC is in a "standby" position. Whenever this terminal is brought to battery voltage, KASSEC will be in an "operate" mode. The only exception to this is when a shutdown failure has occurred. KASSEC can only be reset from a failure mode by bringing Terminal #4 from Ground to battery voltage.

Terminal #9 is the Ground Terminal for KASSEC. All the grounded points should be common to this terminal.

Terminal #10 is not connected.

Terminal #11 is not connected.

NOTE: Terminals #10 and #11 are left open for isolation between Ground and the 120 volts A.C. These terminals may be used as tie points if needed.

Terminal #12 is the 120 volt A.C. Crank Disconnect. This is one of four crank disconnects on KASSEC. When KASSEC is in the "cranking mode" and a 120 volt A.C. 60 Hz. Signal is fed to this terminal, KASSEC will crank disconnect and go into a "run" mode. With KASSEC in the "run" mode, the unit will not shut down or go into "overcrank" mode with loss of the 120 Volt Crank Disconnect.

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Terminal #13 is the Overcrank Failure Indicator Terminal. When an overcrank failure occurs, the unit has cranked for a preset number of times and failed to start or the loss of the overcrank signal (mag pickup or auxiliary crank disconnect) has occurred. The maximum "on state" load current that Terminal #13 can supply is two (2) amps resistive.

Terminal #14 is the Oil Failure Indicator Terminal. If Terminal #24 is brought to ground after the oil timer on KASSEC times out, Terminal #14 will supply battery voltage indicating an oil failure. The maximum "on state" load current that Terminal #14 can supply is two (2) amps resistive.

Terminal #15 is a failure indicator output terminal. If Terminal #22 is brought to ground, Terminal #15 will supply battery voltage for a failure lamp. The maximum "on state" load current that Terminal #15 can supply is two (2) amps resistive.

Terminal #16 is a failure indicator output terminal. If Terminal #18 is brought to ground, Terminal #16 will supply battery voltage for a failure lamp. The maximum "on state" load current that Terminal #16 can supply is two (2) amps resistive.

Terminal #17 is a failure indicator output terminal. If Terminal #21 is brought to ground, Terminal #17 will supply battery voltage for a failure lamp. The maximum "on state" load current that Terminal #17 can supply is two (2) amps resistive.

Terminal #18 is a failure sender input terminal. If this terminal is brought to ground, Terminal #16 will indicate a failure and the engine will shut down.

Terminal #19 is a failure sender input terminal. If this terminal is brought to ground, Terminal #20 will indicate a failure and the engine will shut down supplying battery voltage. This terminal will also supply battery voltage if the number of recranks has been satisfied or if a crank disconnect (mag pickup or auxiliary crank disconnect) has been lost. The maximum "on state" load current that Terminal #23 can supply is two (2) amps resistive.

Terminal #20 is a failure indicator output terminal. If Terminal #19 is brought to ground, Terminal #20 will supply battery voltage for a failure lamp. The maximum "on state" load current that Terminal #20 can supply is two (2) amps resistive.

Terminal #21 is the failure sender input terminal. If this terminal is brought to ground, Terminal #17 will indicate a failure and the engine will shut down.

Terminal #22 is a failure sender input terminal. If this terminal is brought to ground, Terminal #15 will indicate a failure and the engine will shut down.

Terminal #23 is the Common Alarm Terminal. When any of the failutres (Terminal #13, 14, 15, 16, 17, or 20) are supplying battery voltage, Terminal #23 will be supplying battery voltage. This terminal will also supply battery voltage if the number of recranks has been satisfied or is a crank disconnect (mag pickup or auxiliary crank disconnect) has been lost. The maximum "on state" load current that Terminal #23 can supply is two (2) amps resistive.

NOTE: When an inductive load is connected on Terminal #23, a clamping diode must be connected across the inductive load.

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Terminal #24 is the Oil Failure Sender Terminal. If this terminal is brought to ground after a preset time delay, set by an adjustable resistor, Terminal #14 will supply battery voltage for a failure lamp and the engine will shut down.

Terminal #5 Mag Pickup	Terminal #6 Engine Alternator	Terminal #7 Auxiliary	Terminal #12 120 Volt	Will Shut Down?
		X		YES
X				YES
X		X		YES
			X	NO
		X	X	NO
X			X	NO
X		X	X	NO
	X			NO
	X	X		NO
X	X			NO
X	X	X		NO
	X		X	NO
	X	X	X	NO
X	X		X	NO
X	X	X	X	NO

(1) Note: Both must be disconnected before unit will shut down.

For a full understanding of the crank disconnects on KASSEC, refer to the crank disconnect chart. Any combination of crank disconnects may be used. As can be seen from the chart, if the signal on Terminal #5, the Mag Pickup Crank Disconnect, is lost while KASSEC is in the "run" mode and this is the only crank disconnect being used, KASSEC will go into an "overcrank failure" mode and shut the engine down. The same is true for Terminal #7, the Auxiliary Crank Disconnect. When used by itself, if this signal is lost while KASSEC is in the "run" mode, KASSEC will go into an "overcrank failure" mode and shut the engine down.

When the combination of Terminals #5 and #7 are used together and KASSEC is in the "run" mode, both crank disconnect signals must be lost, then KASSEC will go into an "overcrank failure" mode and shut the engine down. When using any other crank disconnect or combination of other crank disconnects, loss of one or all of the crank disconnects will not shut the engine down.

INSTALLATION RECOMMENDATIONS

When solid state electronics are used as engine controls, the major problems causing the majority of malfunctions are excessive load currents connected to the outputs, low battery voltages (mainly at cranking) and EMI electrical noise. The following information will help alleviate these problems and insure a proper running system.

1. An auxiliary relay driven by KASSEC should be used whenever the current of an output exceeds the following parameters: total current of starter and ignition outputs, 8 amps; any single failure output 2 amps resistive.
2. If the cranking system for a particular engine demands a very high cranking current, another battery which supplies power only to KASSEC may be required.
3. When fused properly, the maximum load current that KASSEC can supply is 8 amps and the maximum input operating current for KASSEC is 1 amp. The size of wire used to supply power to KASSEC under maximum load should never be less than #16. Proper sizing of wire will eliminate excessive voltage drops when the system requires maximum power.
4. Although KASSEC has been designed to reject induced noise, certain precautions should be taken to reduce the common noise which is present on all engine and generator sets. To prevent false signals from being induced into the magnetic pickup circuitry of KASSEC, the wires to KASSEC from the magnetic pickup should be a twisted of shielded pair.
5. Whenever an inductive load is de-energized, a back EMF which can damage solid state components is generated. To alleviate this effect, a clamping diode should be connected across all inductive loads.
6. Components such as the ignition system, high and low voltage wiring, starter, A.C. generator wiring and battery charger to alternator all generate a certain amount of noise. If possible, wiring connected to KASSEC should be routed away from these components.

7. A voltmeter, test light or other appropriate test instrument should be used to check the input and output terminal of KASSEC. Shorting any of KASSEC's terminals to battery positive or negative when testing could create major problems if the wrong terminals were to be shorted. This type of testing can result in blown fuses and damage to KASSEC's solid state components.

NOTE: Due to the fact that KASSEC utilizes electrical control to start and stop the engine, any hydraulic or pneumatic devices such as starters or fuel solenoids must have an electrical to mechanical interface to activate them.

DIAGRAM