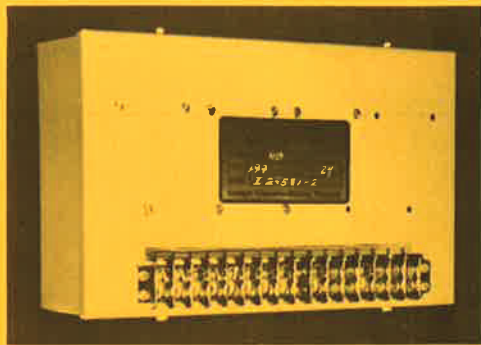




AUTOMATIC START CONTROLS

MODEL
KLAS 40-D40

Components are carefully selected to provide maximum reliability and service life. The critical engine-crank circuits are equipped with highly dependable solid state time delay relays for consistent timing of crank and rest intervals.

Mode of operation is selected by a three or four position switch as specified. In "MANUAL" position the control is energized immediately; in "AUTOMATIC", operation commences only when a remote set of contacts close, such as those of an automatic transfer switch; center position is "OFF". The four position rotary switch gives an additional "TEST" position in which the automatic control is out of the circuit and the engine may be started manually.

Current during cranking cycle flows thru closed contacts of relay 3 to coil of crank relay 1. It closes and completes starting circuit (terminals 3 & 5) and coil circuit of time relay No. 4. After an interval of about 7 seconds, No. 4 pulls in momentarily, its contacts energizing No. 3 relay which drops out relay 1 crank circuit. Relay 3 remains closed to supply current to time relay 5 for a 7 second "rest" period until 5 opens to break lock-out of 3. Current then flows again as in initial cranking cycle.

Unless engine starts, this sequence continues until relay 6 closes in about 90 seconds, locking in relay 3. Overcrank light and alarm is then activated and cranking stops.

If the engine start, voltage appears at relay 2 from battery charging generator or centrifugal switch, breaking starting solenoid current and continuity of relay 6, discontinuing cranking limiter.

Reset control by turning to "OFF" position.



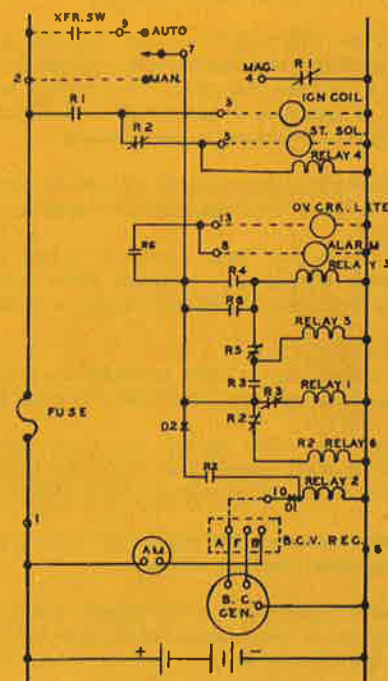
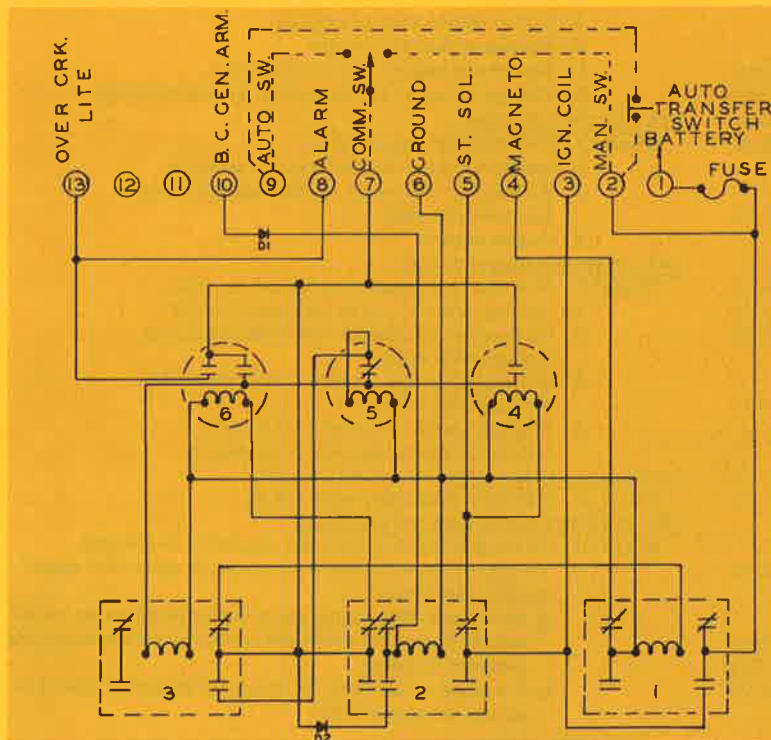
4 POSITION ROTARY SWITCH



3 POSITION SWITCH

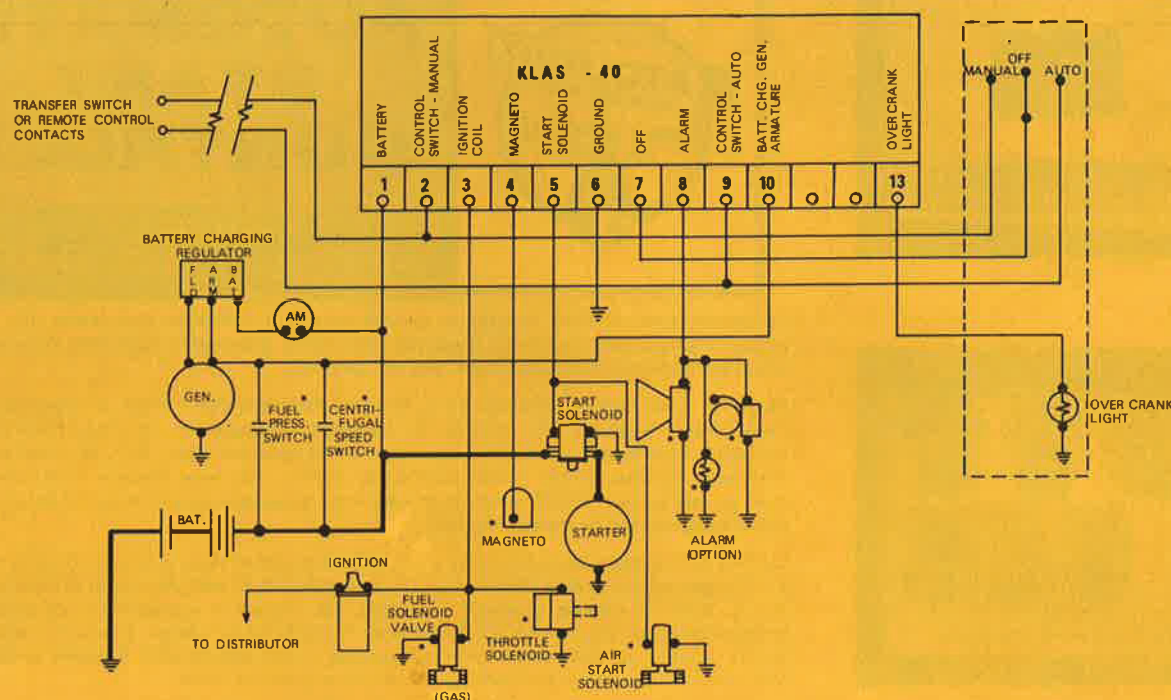


FAILURE INDICATING LIGHT



KATOLIGHT CORPORATION
MANKATO, MINNESOTA 56001

KATOLIGHT AUTOMATIC ENGINE CONTROL OPERATING INSTRUCTIONS – MODEL KLAS 40 & D40



This instruction bulleting covers normal installation, operating and test procedures. This Klas 40 and Klas D40 controls provide basic engine control features. This control has 5 crank cycles of approximately 7 to 10 second crank and 7 to 10 second rest for an approximate total of 90 seconds. This is predetermined by the settings of rheostats on solid state relays 4, 5, and 6. These solid state relays give precise timing and are not effected by the fluctuations of ambient temperature and battery voltage. After the crank interval and the engine has attempted to start and has not started, the control will remain off and alarm will be activated until reset. With normal engine start the battery charging generator will build up voltage, or if you use a N.O. Centrifugal Speed Switch, will close as the engine reaches 300 rpm and disconnect cranking and engine will continue running.

The Klas 40 or Klas D40 is designed for automatic operation in conjunction with an automatic transfer switch or load start switch. (It may be used on either standard battery ignition, magneto or diesel systems, dependent on accessories specified).

INSTALLATION: The Klas 40 or Klas D40 control horizontal chassis mounting is preferred. If severe vibration is present, shock insulators may be required to prevent the relays from cycling when not energized. Mounting in an enclosure or panel free of dust and fumes will afford maximum contact life and reduce spark hazard.

Wire terminations should be made with solderless connectors. Use No. 14 flexible wire for short runs, heavier wire for remote locations.

CAUTION: Circuitry of this control is limited to 9 amps. Starter solenoids, audio alarms, etc., requiring more than 9 amps must be controlled by additional heavy-duty relays or contactors operated by the control.

A 3-position switch, failure lights and decal are provided for control of the unit. Functions are "OFF, AUTOMATIC & MANUAL".

OPERATION: The "OFF" position should be used while servicing the engine, since cranking cannot occur. It is also used to shut down the engine for any reason and to reset the control after a failure.

In "MANUAL" position, the engine will start and operate normally with safety shutdown features in effect.

"AUTO" position places the control directly across a remote automatic transfer contactor or other device which then controls the engine. The failure light will indicate overcrank (engine failed to start during the 90

second crank cycle). It will remain on until unit is manually reset. An alarm horn (same voltage as control) may also be used in conjunction with failure light.

Total cyclic cranking time is approximately 90 seconds with normal ambient temperature and fully charged battery. There are 5 cranking cycles of 10 seconds each which can be varied by adjusting potentiometer R5. There are 4 rest cycles of 10 seconds each which can be varied by adjusting potentiometer R4. Should engine fail to start in this time the overcrank light will go on and the alarm will ring (if used) and no further cranking will occur until manually reset. If engine starts normally, check starter solenoid to see that it disengages at about 1/4 engine speed.

Should unit fail to crank:

- Check:**
1. Battery
 2. Fuse
 3. Dirt in engine control contacts
 4. Voltage at starter solenoid
 5. Starter and solenoid for malfunction
 6. Voltage on term. 10 (no voltage during cranking)

Unit will start, then fail:

- Check:**
1. Fuel and fuel supply filters
 2. Ignition system - fuel or throttle solenoid
 3. Carburetor adjustment or fuel injector pump - fuel solenoid valve
 4. Engine control

Unit cranks but does not start:

- Check:**
1. Fuel and fuel supply line for dirt or leaks
 2. Ignition system, fuel or throttle solenoid
 3. Carburetor adjustment, fuel injection pump, fuel solenoid valve
 4. Voltage at ignition, throttle, fuel solenoid or fuel solenoid valve
 5. Engine control - contacts may be dirty. Use contact cleaning tool, not abrasives.

Unit cranks continuously: (over 100 seconds)

- Check:**
1. Defective time delay relay No. 6.

Unit starts but starter does not disengage:

- Check:**
1. All leads in crank disconnect circuit for continuity.
 2. Voltage on term. 10 (battery voltage present after engine reaches 600 RPM)
 - a) No voltage after engine starts indicates defective speed switch, if used for crank disconnect or no battery charging generator buildup.
 - b) If voltage on terminal 10, check for defective relay 2 in control or open diode