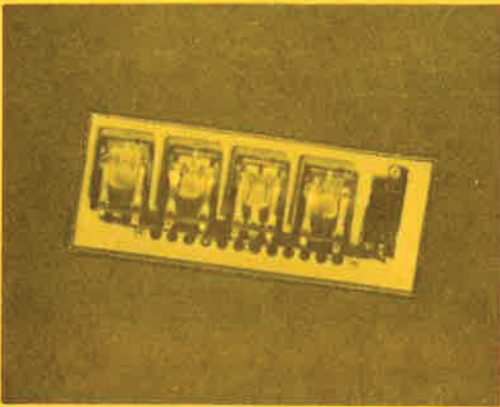
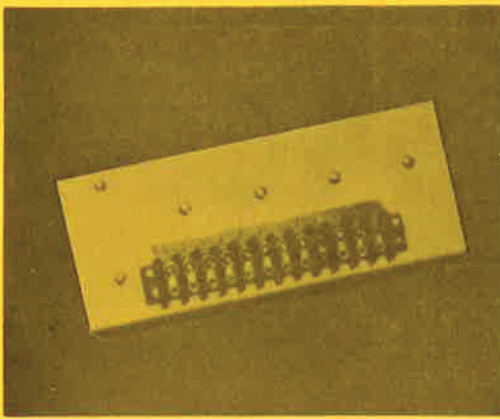




AUTOMATIC START CONTROLS

**MODEL
KLAS 20-D20**

Component selection is engineered to provide reliability and accuracy of operation consistent with the application. Time delay relay is of the thermal type to give consistent service. All models feature enclosed contacts for longer life and greater reliability.

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 normally closed contacts in relay 4 to time delay relay 5 and thru relay 2, normally closed, to start solenoid. It also flows thru normally closed contact of relay 3 to activate relay 1 to remove magneto ground, if used, and energize ignition coil or throttle solenoid of diesel units.

If engine fails to start within about 45 seconds, relay 5 closes to lock out relays 4 and 3 to stop cranking and activate failure light or alarm. When engine starts, relay 2 pulls in receiving its signal from terminal 10 thru normally open speed switch (closes at 300 rpm) or from battery charging generator. This breaks cranking circuit and locks relay 2 in. Oil pressure circuit locks in thru relay 4 after relay 5 completes its cycle.

Oil pressure (NC) and high temperature (NO) switches when closed lock in relay 3 to drop out relay 1, breaking ignition or throttle solenoid circuit. Alarm and failure light are energized thru relay 3.



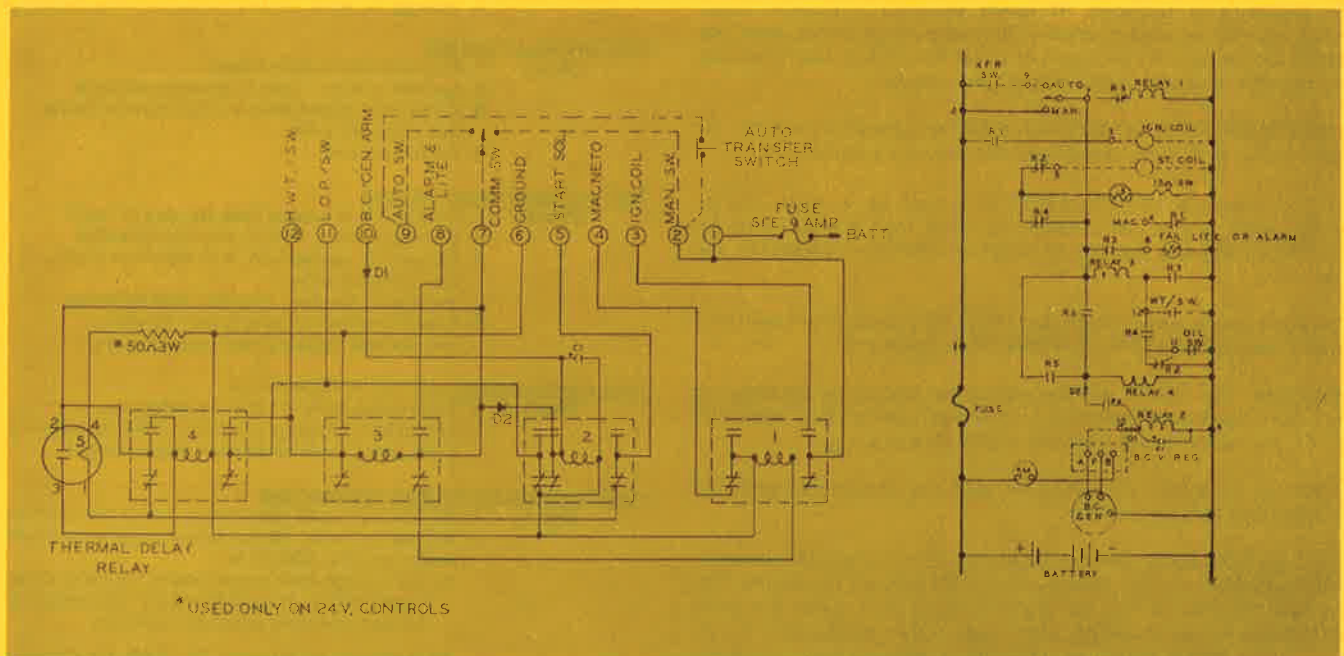
THREE POSITION SWITCH • FOUR POSITION



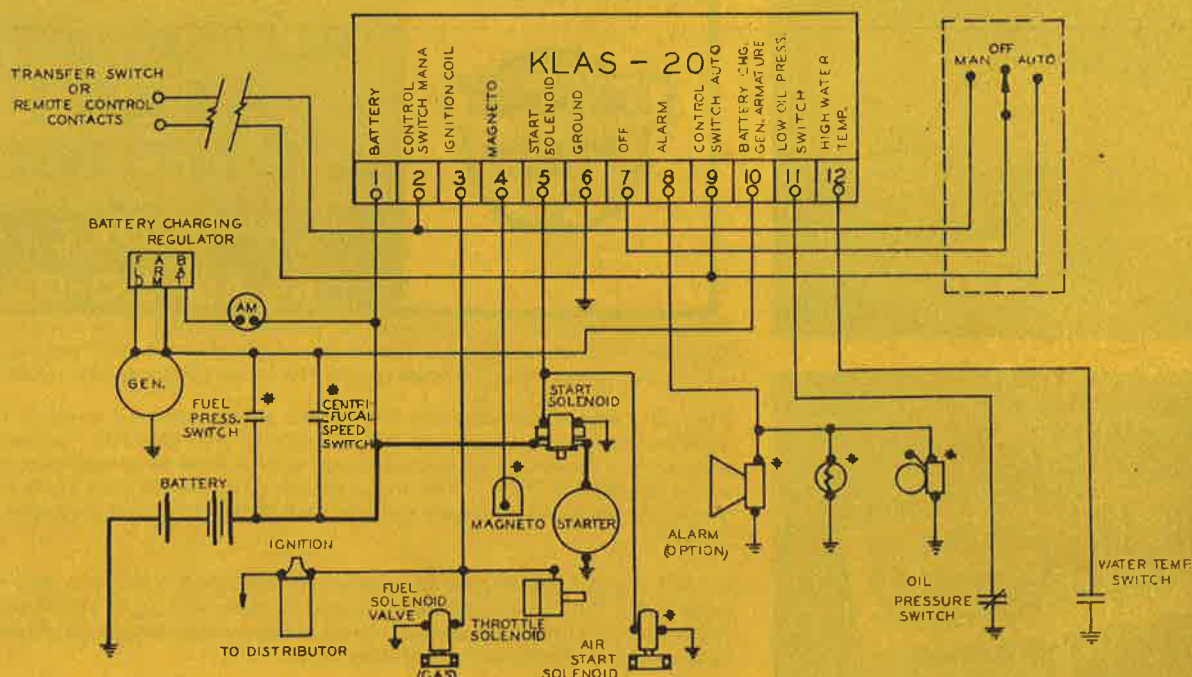
ROTARY SWITCH •



FAILURE INDICATING LIGHTS



KATOLIGHT CORPORATION
MANKATO, MINNESOTA 56001



The instruction bulletin covers normal installation, operating and test procedures. The Klas 20 and D20 controls provide basic engine control features. Cranking interval of approximately 45 seconds is predetermined and may vary somewhat due to 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 and operation safety shutdowns for high water temperature and low oil pressure are connected, providing normally open switches on the engine for these function. Oil pressure failure occurs instantly except immediately following cranking period. During this period, there is a 10 to 15 second delay provided.

The Klas 20 and D20 are 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: With the Klas 20 or Klas D20 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 termination 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 that the engine failed to start during the crank cycle (overcrank) or shutdown from high water temperature or oil pressure failure. 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.

Cranking time is approximately 45 seconds with normal ambient temperature and fully charged battery. A 5 watt resistor or potentiometer may be installed per diagram to increase or decrease cranking time. A 50 ohm resistor is supplied with the control for 24 VDC only. Less resistance will shorten the cycle. Should engine fail to start, the alarm light, if used, will go on and no further cranking will occur until manually reset.

RESET CONTROL AFTER FAILURE BY TURNING FUNCTION SWITCH TO "OFF".

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 lines 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
 5. Engine control - contacts may be dirty. Use contact cleaning tool, not abrasives.

Unit cranks continuously: (over 60 seconds)

- Check:**
1. Time delay relay 5 - may be defective.
 2. Low battery voltage at control (low voltage will cause delay relay to be very slow acting)

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.