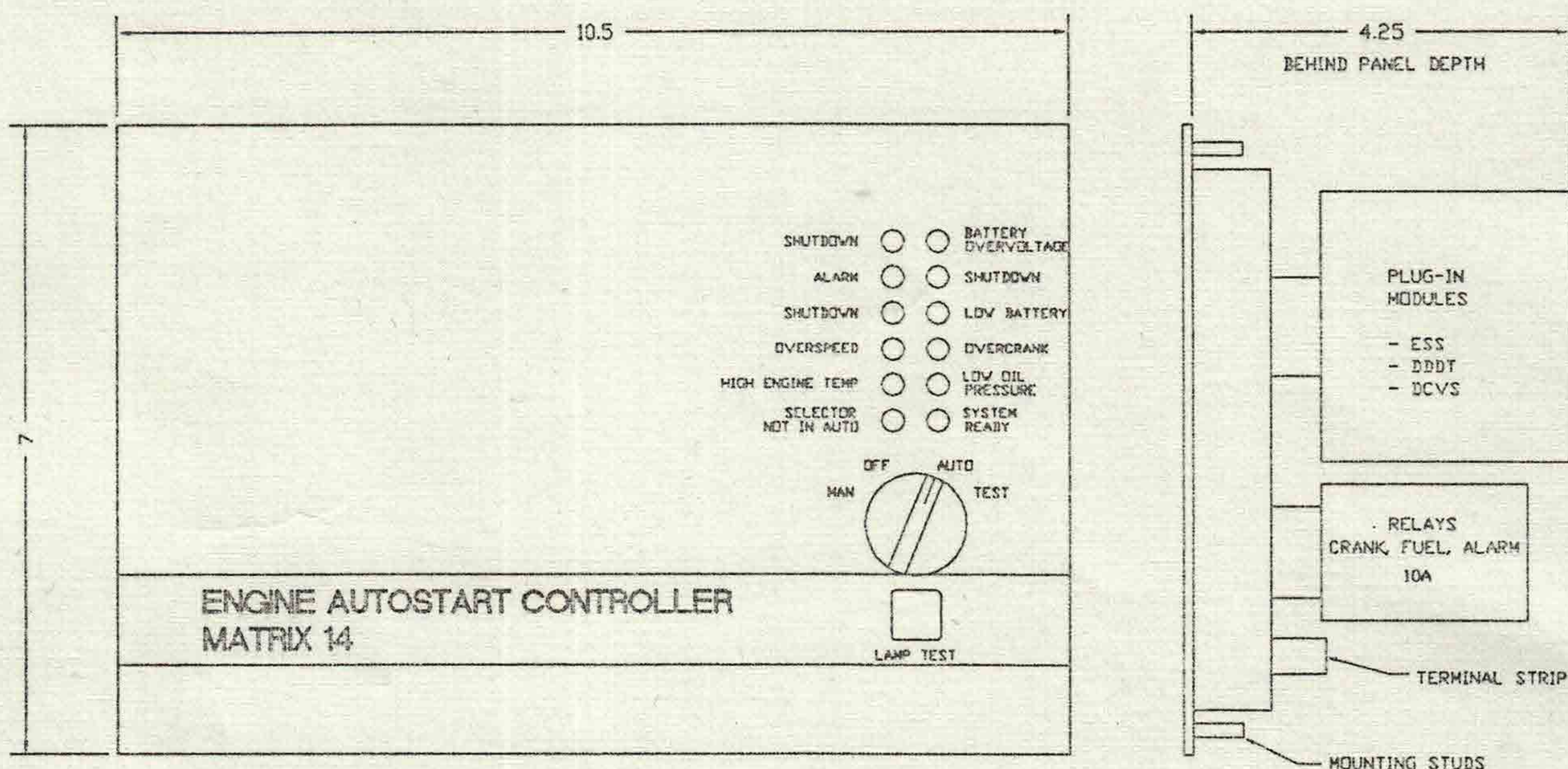


MATRIX 14 ENGINE CONTROLLER



DESCRIPTION

The MATRIX 14 is a relay based modular engine controller designed for unattended use in a NEMA 1 operating environment.

The unit contains twelve various shutdown and alarm circuits with LED indicator lamps for low power, long life, and is available in 12 or 24 volt DC versions with plug in modules for timing, speed sensing, and voltage sensing.

The plug-in components such as ESS, DDDT, DCVS, and SST-15 and SST-30, operate from voltage ranges 7-30 volts DC for efficient inventory control and ease of service. The MATRIX 14 voltage however must be specified when ordering.

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INDICATORS/ALARMS:

The Standard MATRIX 14 is equipped with the following:

1. Four position selector switch.
2. Lamp test - allows for bulk testing of all LEDs
3. Overcrank shutdown.
4. High engine temperature shutdown.
5. Overspeed shutdown.
6. System ready LED - indicates battery is connected.
7. Not in auto LED flashes in any position other than automatic.
8. Selector in OFF OR SELECTOR NOT IN AUTO:
 - a) Alarm Relay 1 (AL1) pulls in when the selector is in the OFF position.
 - b) Alarm Relay 1 (AL1) pulls in when selector is "NOT IN AUTO".

Optional Shutdowns and Alarms are as follows:

1. Low fuel level*.
2. Low battery voltage.
3. Low engine temperature.
4. Low coolant level*.
5. Excess vibration*.
6. Battery overvoltage.
7. High engine temperature prewarning.
8. Low oil pressure prewarning.

*These three indications may be either alarms or shutdowns depending on customer requirements. Although these alarms are shown in our standard position on the front page, labeling may be changed to accommodate any manner of other functions.

ANNUNCIATION

As standard on the MATRIX 14 an alarm relay (AL1) is supplied with a single NO/NC fault contact. AL1 has the capability to act as both an alarm indicator and shutdown indicator. However, it is possible to separate the two functions by incorporating the optional second alarm relay (AL2). AL2 is then set for alarms only and AL1 becomes the shutdown indicator. This is done at the factory and should be indicated on the order form.

REMOTE ANNUNCIATION

An optional remote annunciation panel allows all shutdowns and alarms to be viewed from a second location. The panel comes complete with an audible alarm, common fault indication, and silence switch.

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FAILSAFE

If required by the customer, any of the input faults can be arranged in the failsafe mode of operation. The inputs needed for failsafe must be indicated on the order form.

CONTROL DEVICES

The standard MATRIX 14 is equipped with the following:

1. SST30 -Crank Timer
Cranks the engine for a set amount of time. Adjustable from 10 - 30 seconds.
2. SST15 - Oil Pressure Bypass Timer
Allows oil pressure to build up on starting before a fault is indicated - adjustable from 0.5 - 15 seconds.
3. FR - Fuel Rack Pilot Relay.
A 10 AMP relay to pull in fuel rack solenoid.
4. CP - Crank Pilot Relay.
A 10 AMP relay to pull in the start solenoid.
5. Output Terminal for louver relay connection.

Optional Control Devices as follows:

1. ESS-2 Electronic Speed Sensor
Indicates cranking, crank termination and overspeed conditions.
2. DDDT - Dual Delay DC Timer
Delays starting the engine after power failure, and allows for a cool-down period when hydro resumes.
3. DCVS - DC Voltage Sensor
Unit monitors battery condition and is capable of indicating both high and/or low battery voltages.
4. MCT - Multi-Crank Timer
Direct replacement for SST3) to allow for multiple crank attempts.
5. AB - Air Box
1 AMP contact provided for an air box relay.
6. FBR - Fire Box Relay
Relay indicates one of two conditions:
 - a) FBR is dedicated 1 AMP NO contact which closes when the selector is "OFF".
 - b) FBR is dedicated 1 AMP NO contact which closes when the selector is "NOT IN AUTO".

* Detailed information on the individual control devices may be found on the following pages.

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SEQUENCE OF OPERATIONS

NORMAL OPERATION

When switched to the MANUAL position, or if in the AUTO position and the engine start contacts close (at transfer switch), the crank relay, fuel relay and over-crank timer (SST-30), are energised which in turn energise the engine fuel rack and starter solenoids.

As the engine cranks, the electronic speed switch (ESS-2) monitors the engine R.P.M. At a preset speed, usually about 20 Hz., the electronic speed switch (ESS-2) de-energises the crank relay and energises the crank lock-out relay. This ensures that the starter motor will not attempt to re-engage during this run cycle.

During the starting sequence, the low oil pressure sensor is by-passed from the system through timer SST-15 for a preset time after starting. If the oil pressure has built up before SST-15 times out, then the engine will continue to run normally.

The engine will continue to run normally until the switch is moved to the OFF position or if the start signal contacts (in transfer switch) are opened.

There are some variations to the above sequence depending on the equipment ordered. If a multi-crank timer (MCT) is installed, the engine will attempt to start a preset number of times (max. 5) with preset dwell periods in between before the controller locks out on "over-crank". Also if a Dual Delay DC Timer (DDDT) is installed, the controller will delay starting after the start signal is received, and will delay shut-down after the start signal is cancelled. These delays are adjustable and only operate in the AUTO mode.

ABNORMAL OPERATION - SHUTDOWN CONDITIONS

GENERAL

The "normal" shut-down sequence when a FAULT signal is received causes a latching (shut-down) relay to energise, de-energising the fuel relay and energising the alarm relay and a front panel indicator light.

OVER-CRANK

If the engine does not start within the preset crank time as determined by SST-30, the fuel and crank relays are de-energised and the shut-down relay, and alarm relay are energised and the over-crank light turned on indicating a shut-down condition. If a multi-crank timer (MCT) is installed, this will not take place until the MCT has

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completed it's prescribed start attempts.

LOW OIL PRESSURE

The low oil pressure signal is inhibited during cranking and for a preset time after starting (per SST-15). If a signal fault occurs at any time there-after, the corresponding shut-down relay is latched, initiating the shutdown mode.

HIGH ENGINE TEMPERATURE

The controller will initiate the engine shut-down mode on receiving a high engine temperature fault signal whether the engine is running or not, lighting the corresponding LED indicator light.

OVERSPEED

If the engine goes into an overspeed condition, the electronic speed sensor, ESS-2, initiates a shutdown procedure, and lighting the corresponding LED indicator. If an optional air box damper is installed, it will also shut off the air to the engine.

ALARMS

When additional alarms are utilised, the fault sensor will only cause the alarm relay to energise and light the corresponding LED indicator. The engine will not shut-down. The alarm relay and the LED indicator will be reset when the fault has been corrected.

The MATRIX 14 also provides a set of "dry" NO/NC contacts from the alarm relay for remote annunciation.

RESET

When the controller goes into a shut-down mode, it must be switched to the OFF position to reset the systems and prepare for an engine restart.

TESTING

When the selector switch is moved to the TEST position, it opens a set of contacts which, when connected to the transfer switch, initiates a test sequence.