



ES52WI20

*Engine
Controller*

Installation and User Manual for the ES52WI20 Engine Controller.

Full Version

File: ES52WI20rev1.3
Oct 26, 2006

Thank You For Purchasing This DynaGen Product

Please Read Manual Before Installing Unit

Receipt of Shipment and Warranty Return Information

Upon receipt of shipment, carefully remove the unit from the shipping container and thoroughly examine the unit for shipping damage. In case of damage, immediately contact the carrier and request that an inspection report be filed prior to contacting DynaGen.

All returned items are to be shipped prepaid and include a Return Material Authorization (RMA) number issued by DynaGen. RMA forms are available by contacting DynaGen Technical Support through the contact methods listed below.

Limited Warranty

DynaGen will repair or replace any ES52WI20 series engine controller which proves to be defective under normal and proper use within **Three Years** from the date of shipment. This constitutes the only warranty and no other warranty shall be implied.

We welcome your comments and suggestions. Please contact us at:

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SPECIFICATIONS

Operating VDC limits:	3.3VDC min. - 30VDC max.
Standby current draw:	8mA
Operating current draw:	175mA
Reverse polarity protected:	Internal protection will prevent damage to unit under a reverse polarity condition. Re-connect power leads properly, and normal operation will resume.
Speed sensing input accepts:	Generator AC output directly. Crank Disconnect fixed at 22 HZ Over speed fixed at 70HZ
Speed sensing maximum rating:	Withstands Line voltage (300 V.A.C. max)
Operating temperature range:	-40 ^o C ⇒ +85 ^o C,
Operating humidity range:	0 ⇒ 95% non-condensing
Fuel & Crank contact output:	10 Amps max. each Continuous sourcing(+bat) output. Kick back diode provided on fuel and crank output
Pull Coil Output:	300 mA Max (switches to +Vbat) Kick back diode recommended on slave relay
Preheat Output	300 mA Max (switches to +Vbat) Kick back diode recommended on slave relay
Start/Stop connection:	A grounded signal is required on the Start input as well as the stop input. The Stop input must be closed for a period of 2.5 seconds to stop the engine. A rocker switch with two mom positions is recommended for the start/stop connections.
Actual unit weight:	0.67 lb. (0.30kg)
Unit dimensions:	3.302” x 3.342” x 1.8”

WIRING INSTALLATION GUIDELINES

Danger: The controller does not generate a warning prior to engine start. Do not work on the engine while power is applied to the unit. It is recommended that warning signs be placed on engine equipment indicating the above.

INSTRUCTIONS

Following these instructions will help avoid common installation problems during wiring and setup.

- Battery must be disconnected before any wiring connections are made.
- Wire length from the engine to the controller should not exceed 6 meters (20 feet).
- All failure inputs have a 3 second delay before shutdown occurs.

Wiring size and type should be as specified below. Use **stranded wire**, since solid wire has a tendency to crack, break and loosen over time.

TYPES AND SIZES

Terminal	Wire Size	Current max.	Function
CON 1	18	100mA	Speed signal connector (300 VAC max)
1	18	100mA	Start/Stop Connection (+bat)
2	18	7mA	Oil pressure switch
3	18	7mA	Engine Temperature switch
4	18	7mA	Stop Input switch Grounded input
5	14	10 A	Starter Output
6	12	10 A	Battery negative (-)
7	18	10 A Fused	Auto (+bat)
8	18	10 A Fused	Auto (+bat)
9	12	7 mA	Start input connection. Grounded input only
10	12	7 mA	Start input connection. Grounded input only
11	14	10 A	Fuel output
12	18	300 mA	Preheat output. Slave relay required
13	18	300 mA	Low Oil output
14	18	300 mA	High Temperature output
15	18	300 mA	Over Crank output
16	18	300 mA	Over-speed output
17	18	300 mA	Engine Run output
18	18	300 m A	Failure output
19	N/A	300 mA	Pull Coil Output. Slave relay required
20	18		Common Ground. Not to be used as main Gnd.

WIRING GUIDELINES

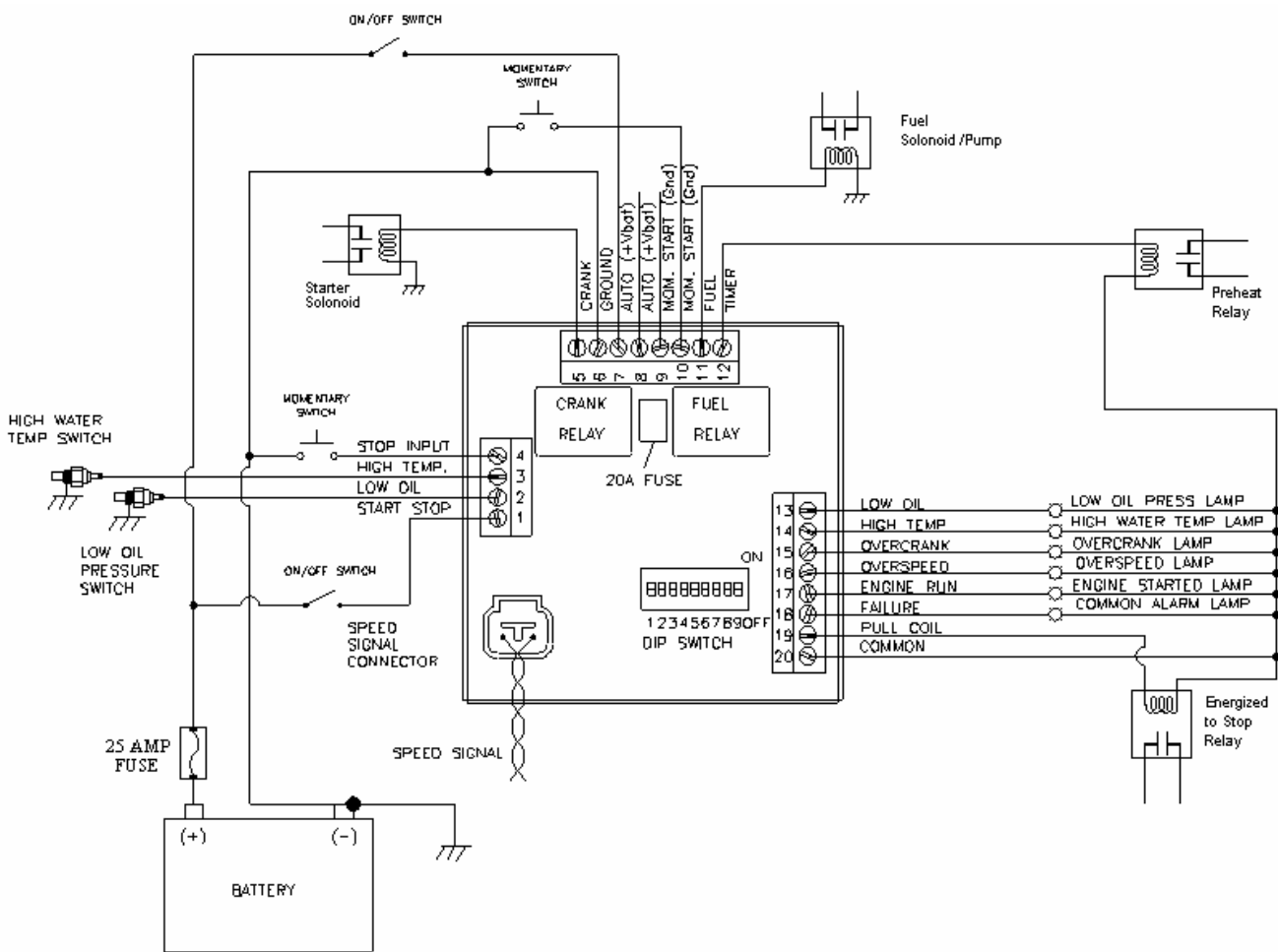
1. DO NOT use wire smaller than 18 AWG.
2. The connections supplying DC power to the ES52WI20 panel should preferably run directly from the battery posts with no splices or other connections. Avoid, as much as possible, using chassis (aluminum or iron engine parts) as return conductor for battery negative voltage; copper wiring is recommended. Failure to follow the above may result in erratic operation, due to large voltage drops across wiring connections.
3. DO NOT short Crank output or Fuel outputs to ground, as this will cause on board 20 Amp fuse to blow and may result in damage to ES52WI20 on board relays.
4. When replacing fuse, removable terminals and relays, only use factory recommended parts:
5. DO NOT use AC coil slave relays from controller outputs. Use intermediate relays of suitable size and coil rating.
NOTE: All ES52WI20 engine controllers are shipped standard with 12VDC coil relays for +12 VDC systems. If the engine controller is used in a +24 VDC system, the onboard relays MUST be replaced with 24VDC coil relays.
6. DO NOT exceed the maximum rated current and voltage on each of the controller outputs. Do not exceed 10 amps for each of the Fuel and Crank outputs, and 300ma for the annunciation and timer outputs.
7. The Pull coil output is internally protected against overload and short circuit (fault). Pull coil output energizes for 2 seconds after crank output energizes.
8. Two wires must be connected for the speed signal NOTE: A mating connector complete with 8 feet of cabling is provided as standard with each unit.
9. To verify the operation of engine controller outputs, measure voltage (i.e. meter in volts) when outputs should be ON, DO NOT measure current (i.e. meter in amps), this may cause damage to on board relays.

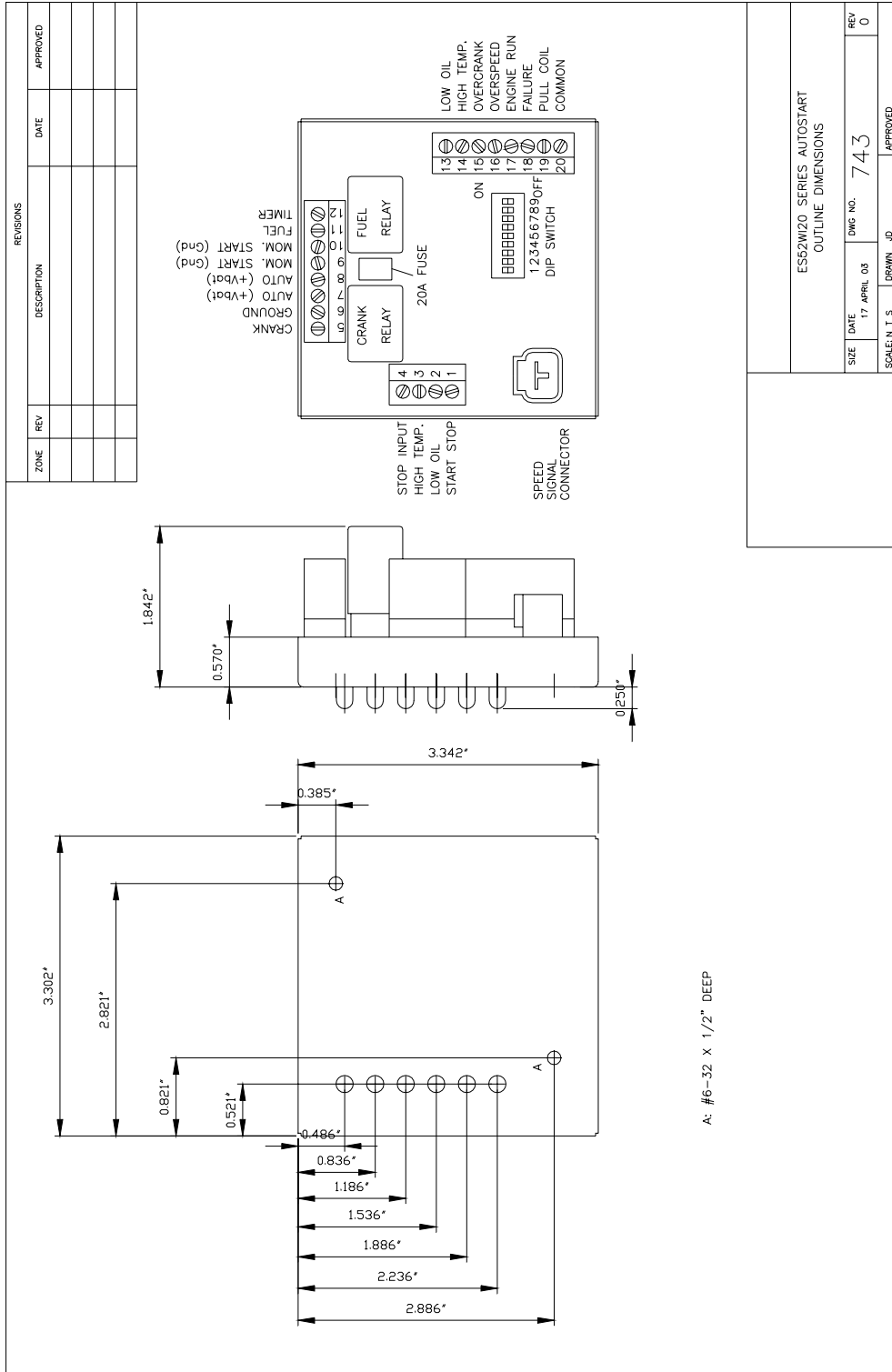
TERMINAL DESCRIPTION

Term #	Description
CON1	Speed signal input for crank disconnect, engine run, and Over-speed sensing. Be sure to use twisted pair wiring for this connection. An 8 foot wiring harness is supplied as standard. 300 VAC max. input voltage.
1	(Start/Stop) terminal. When +12/24 VDC is applied, the controller proceeds to starting the engine.
2	Oil pressure switch. For proper operation, oil input must be connected to ground or +12/24 VDC via an oil switch. This switch must be the N.O. type, close on failure (low pressure)
3	Temperature switch. For proper operation, temperature input must be connected to ground or +12/24 VDC via a temperature switch. This switch must be the N.O. type, close on failure (high temperature).
4	The Stop input. For proper operation, Stop Input must be connected to ground
5	Crank output provides 10A maximum. Crank output closes to +12/24 VDC during cranking; opens when either the engine has started or during Crank Rest.
6	Battery ground connection for the controller module. A good ground connection, directly from the battery , is required for proper operation.
7,8	Auto terminal. When +12/24 VDC is applied, the controller is in the standby mode waiting for a Start/Stop signal (+12/24 VDC applied to Test).
9,10	Start Input Terminal. When Ground is applied to this terminal, a start signal is initiated. This terminal is grounded input only.
11	Fuel output provides 10A maximum. Fuel output closes to +12/24 VDC when start signal is actuated, and opens when either an Engine failure is detected or when stop signal is applied.
12	The Preheat output provides 300mA maximum. This output energizes immediately after the start signal is activated. The Preheat output turns on for the specified time as set by dip switches 7 and 8.
13	Low Oil pressure output provides 300mA maximum. Oil output closes to +12/24 VDC when the engine shuts down due to a Low Oil pressure condition. Flashing Low Oil output indicates an Auxiliary Input failure.
14	High water temperature output provides 300mA maximum. Temperature output closes to +12/24 VDC when the engine shuts down due to a high temp condition.
15	Over-crank output provides 300mA maximum. Over-crank output closes to +12/24 VDC when the engine shuts down due to an Over-crank failure.
16	Over-speed output provides 300mA maximum. Over-speed output closes to +12/24 VDC on an Over-speed failure and is open otherwise. Flashing output indicates Loss of Speed Signal.
17	Engine running output provides 300mA maximum. Engine Running output closes to +12/24 VDC when the engine starts (speed > crank disconnect setting), and opens when the engine stops. Flashing output indicates Crank Rest period.
18	Engine failure output provides 300mA maximum. Engine failure output activates on any failure (closes to +12/24 VDC when activated).

19	The Pull Coil output provides 300mA maximum. Energizes for 2 seconds after start signal is received from controller. Output closes to +12/24 VDC when activated.
20	Common ground- for annunciation outputs only. DO NOT USE AS MAIN GROUND TO CONTROLLER UNIT.

GENERAL WIRING DIAGRAM





A: #6-32 x 1/2" DEEP

ADJUSTMENTS AND SETUP PROCEDURES

Warning: The following procedures will require engine operation. Be sure to follow all safety guidelines and wiring procedures.

Failure Bypass delay will occur for a period of 15 seconds after the starter has disengaged and the engine is running (engine running LED on). After Bypass delay has expired, the engine controller then looks for failures such as Low Oil and High Temp.

The steps for calibration of the ES52WI20 controller to a specific system is as follows:

1. **Speed Signal Settings**
2. **Failure Input Delays**
3. **Shutdown Functions**

1: Speed Signal Settings:

The ES52WI20 uses generator output as a form of speed sensing.
The Crank Disconnect setting is fixed to 22HZ
The Over-speed setting is fixed to 70HZ.

NOTE: The ES52WI20 controller will accept input voltages of up to 300 VAC for speed sensing. Voltages about 300 VAC requires the use of a step down transformer.

2: Failure Input Delays:

The following failure input shutdown delays are incorporated in the ES52WI20 controller:

Oil Pressure Failure Delay: The oil pressure failure delay is set to 1.25 seconds.

High Temperature Failure Delay: The high temperature failure delay is set to 1.25 seconds.

Over-speed Failure Delay: The over-speed failure delay is set to 1.5 seconds.

Stop Input Delay: The stop input delay is set to 2.5 seconds.

3: Start Up/Shutdown Functions:

The ES52WI20 controller can be started up and shut down by 2 means of operations:

NOTE: + V Battery must be applied to AUTO terminal for both means of startup or shutdown.

i). Momentary Start/Momentary Stop (Grounded Input Only)

The Momentary Start/Momentary Stop functions work in the following manner:

- a). A ground signal is applied to either one of the momentary start terminals (9 or 10). The ground must be applied for a period of 2 seconds to initiate starting sequence. After the engine has proceeded to the preheat mode the start signal can now be disconnected.
- b). The controller enters the Preheat mode (if enabled)
- c). After the Preheat mode, the controller proceeds to the cranking mode, and the pull coil is enabled for 2 seconds.
- d). The controller continues in cranking mode until the engine reaches the crank disconnect speed. The engine running LED turns on, and the engine proceeds to run.
- e). To stop the engine, a ground signal is applied to the momentary stop terminal (4).

NOTE: If the ground signal is not remove from the momentary start terminals (9 or 10) after the engine has entered the running mode (engine running LED turned on), the controller cannot be shut down by applying a ground signal to the momentary stop terminal (4). All other shutdown modes (low oil, high temperature, over-crank, over-speed, loss of speed condition) will still function correctly.

ii). Start/Stop (+ V Battery)

The Start/Stop function works in the following manner:

- a). A +V Battery signal is applied to the start/stop terminal (1).
- b). The controller enters the Preheat mode (if enabled)
- c). After the Preheat mode, the controller proceeds to the cranking mode, and the pull coil is enabled for 2 seconds.
- d). The controller continues in cranking mode until the engine reaches the crank disconnect speed. The engine running LED turns on, and the engine proceeds to run.
- e). To stop the engine, the +V Battery signal is removed from the start/stop terminal (1).

DIP SWITCH SETTINGS

DIP SWITCH # 6:

DIP Switch # 6 is used to set the crank time as well as the number of crank attempts. The following table outlines the settings:

DIP SWITCH # 6	CRANK TIME (SECONDS)	CRANK ATTEMPTS
OFF	20	4
ON	15	5

DIP SWITCHES 7 & 8:

DIP Switches 7 & 8 are used to set the Preheat time. The following table outlines the settings:

DIP SWITCH 7	DIP SWITCH 8	PREHEAT TIME (SECONDS)
OFF	OFF	0
OFF	ON	5
ON	OFF	10
ON	ON	15

DIP SWITCHES NOT USED:

The following DIP Switches have no function on the ES52WI20 controller:

DIP SWITCH # 1
DIP SWITCH # 2
DIP SWITCH # 3
DIP SWITCH # 4
DIP SWITCH # 5
DIP SWITCH # 9

SYSTEM OPERATING STATES

There are 3 main operating modes for the ES52WI20 engine controller; they are as follows:

- A. PREHEATING**
- B. CRANKING**
- C. RUNNING**
- D. FAILURE**

PREHEATING:

After the Start input is activated the engine controller proceeds to preheating the engine. The preheat time is as specified by DIP switches 7 and 8. The Start input must remain closed for the full duration of the preheat time. If at any time during the preheat cycle the start input opens, then the controller returns to the idle mode waiting for another start signal.

During the Preheat period the fuel output remains on. After the preheat time has expired, the preheat output turns off and the controller goes to cranking mode of operation.

CRANKING:

The Fuel/Ignition output **REMAINS ON** during the full Crank cycle

When the unit enters the cranking mode of operation, the Crank/Starter output and the Pull coil output turn on. After 2 seconds of cranking the pull coil output turns off and the start output remains on.

If at any time during the cranking cycle the speed signal goes above the crank disconnect setting, the crank/starter output turns off and the controller proceeds to the running mode of operation.

The engine will continue to crank as long as the start input is closed. If at any time during the crank cycle the start signal turns off, then the controller proceeds to the idle mode waiting for another start signal.

NOTE: The crank/starter output is automatically turned off when the speed goes above the crank disconnect setting, Once the engine has started, the user can then remove the start signal and the engine will continue to run.

RUNNING:

When the controller enters the running state of operation, it monitors for failures such as:

- Low Oil (After *Oil bypassTM* period)
- High Engine Temperature (After crank disconnect period)
- Aux. Input failure (After crank disconnect period)
- Loss of Speed Signal
- Over-speed

A 15 second bypass time applies to the low oil and high engine temperature shutdowns.

The engine will continue to run until a failure occurs or in the event that the stop input is activated.

FAILURE:

The controller will enter the failure state if any of the following conditions occur:

- Engine Over-speed while running
- Engine Loss of speed signal while Running
- Engine Over-Crank failure
- Engine Low Oil pressure failure
- Engine High Temperature failure
- Engine Stop Input failure

The failure state is a latched condition and power must be removed from the Auto terminal #7, before any servicing of the engine is performed.

LED INDICATIONS

FRONT PANEL LED INDICATIONS

What the LED's look like	Condition/Failure
No LED's ON.	"Ready" unit waiting for start signal, +12/24 VDC to Auto terminal. "OFF", no +12/24 VDC to Auto terminal.
Low Oil, steady	Low Oil Pressure Failure
High Temperature, steady	Over-temperature Failure
Over-Speed, steady	Speed Signal present above Over-Speed
Engine Running, steady	Engine Controller is in running mode of operation.
Over-speed flashing	Loss of speed signal Engine stall Engine overload Bad or broken speed signal
Engine Running, flashing	Crank-rest period. Cranking will resume soon after rest period is over.

TROUBLESHOOTING GUIDELINES

TROUBLE	POSSIBLE CAUSE	SUGGESTED ACTION
Unit does not operate when ground is applied to start terminal. Switch to start position	Power leads to unit are reversed	Confirm correct wiring for ground and +bat, and re-attempt testing.
	Bad ground connection from engine to controller unit.	Run wire directly from battery - to the ground terminal #6 on controller unit.
	No power to auto on unit	Check auto and place power to auto terminal if necessary
Preheat output no working	Overload on preheat output	Remove Overload on preheat output and normal operation will resume.
Engine does not crank	Battery is low or terminals are dirty	Clean terminals and re-charge battery (change battery if necessary)
	Crank circuitry wiring improperly connected	Measure the voltage at crank terminal. Ensure there is +Vbat. If not, replace on board relay. If +Vbat is available at engine controller, check wiring.
Engine cranks but does not start	Out of fuel	Check fuel level, add fuel if necessary
	Ignition control wiring not installed properly	Refer to engine control wiring section and check ignition connections
	Fuel relay damaged	Check fuel relay and replace if damaged.
Pull coil output does not activate	Short or overload on pull coil output	Remove short or overload on output. A slave relay is required . output rated 300mA max.
Engine starts, but running LED does not illuminate.	fault(short or overload) on one of the annunciator outputs	check for fault, once fault is corrected then operation resumes.
	Speed signal harness may be defective, or bad connection.	Measure AC voltage available at speed signal harness.
	Speed signal improperly connected, missing, or damaged.	Check and correct speed signal wiring.