

DE-1550

Small Engine & Compressor Package Monitoring System

- **State-of-the-art control system specifically designed to protect, monitor and control critical rotating machinery, such as engine or motor-driven compressors, pumps and generators operating in harsh/hazardous areas**
- **Built-in linear speed control allows for linear suction pressure vs engine speed control**
- **Integrated rich-burn engine air/fuel ratio control to support effective emissions management strategies**
- **Selectable number of auto-start attempts. Safety warning and countdown timer visible on the enhanced display between start attempts.**
- **System inputs can be individually configured for:**
 - **Sensor Type: Analog transducer input, thermocouple input (type J or K) or digital (switch) input**
 - **Sensor Class: Class A, B or C logic**
 - **Digital Input Sensor Run/Fault Status: Normally-open or Normally-closed**
- **Large color-changing display offers optimal annunciation of all functions.**
- **ModBus-RTU compatible, and easily configurable via included Windows™-based terminal program Integrated AFR Control**

The DE-1550 Small Engine & Compressor Package Monitoring System uses state-of-the-art microcontrollers and surface-mount PCB assembly technology to provide users of compressors and other critical rotating equipment with a sophisticated, yet reliable, means of protecting and controlling both the prime mover and the load machine (compressor, pump, etc.).



The integrated AFR controller system operates on the basis of closed-loop control to a setpoint utilizing data from an exhaust-mounted oxygen sensor as feedback. With the exhaust oxygen setpoint for lowest emissions entered into the controller, the AFR controller precisely controls the flow of fuel to the engine through the AFR valve so as to maintain the target oxygen level during engine operation. The DE-1550 provides the safety shutdown functions needed to prevent unnecessary damage to the equipment.

The base DE-1550 configuration offers a number of digital and analog outputs, as well as twenty (20) inputs that can be individually configured for use with switch contacts, analog transducers and up to 12 of the inputs can be configured for J or K thermocouples. This approach also allows for a single control system to be used across a fleet of units, thus simplifying maintenance and part stocking requirements, along with system training requirements for operating personnel.

Ease of system setup and configuration sets the DE-1550 apart from other PLC-style or competitive controllers. USB-based connectivity to the device and an intuitive, Windows™-based terminal program for system configuration eliminates the need for any knowledge of ladder-logic or other functional programming languages. ModBus-RTU communications are fully supported for remote monitoring and/or control applications.



DE-1550 Description and Operation

The innovative, CSA-certified DE-1550 control system comprehensively starts, protects, monitors, and controls critical rotating equipment such as reciprocating engines, compressors, and pumps. It incorporates a proven and reliable Display Module for front panel mounting, with the Terminal Module/Integrated AFR DIN-rail mounted in the rear of the enclosure.

System Overview

Display Module — System operating and application performance information such as engine speed, monitored pressures and temperatures, and shutdowns is available via a robust, sixteen position, sealed-membrane keypad and 128 x 64-pixel graphics display with multi-color backlighting. The backlight colors will change according to the condition of the engine. The backlight colors are as follows for the given engine conditions:

RED: FAULT / STOP
GREEN: RUNNING
YELLOW: TIMERS ACTIVE
PURPLE: TEST MODE

Each analog channel (including speed) may be viewed.

Terminal Module with Integrated AFR — All system digital and analog inputs and control outputs are routed through the DE-1550 Terminal Module. Unique to the DE-1550, all system inputs are individually configurable for use as discrete (switch) inputs, thermocouple inputs (J or K) ch50-61 only, or as analog transducer inputs.

System Operation

The scalable and expandable nature of the DE-1550 allows it to be used on the simplest safety-shutdown-oriented applications, on mid-range applications with minimal or moderate auto-start or capacity control requirements, and on highly-complex units where a significant number of points must be monitored and functions controlled simultaneously, including engine air/fuel ratio.

Safety-Shutdown Functions — At its core, the DE-1550 is an annunciator which directly monitors parameters such as temperatures, pressures, and speeds, against a set of safety shutdowns. Once detected, the DE-1550 will take the necessary actions (as configured by the user) to alert the operator and/or shutdown the engine by interrupting the flow of fuel and disabling the ignition system.

Control Functions — Full auto-start capabilities, including crank-disconnect, are available in the DE-1550. On-board 4-20mA PID control outputs (up to two) and digital outputs (up to 12) offer a range of sophisticated capacity control options.

In a typical operation, the DE-1550 starts and warms-up the engine/compressor, raises it to load-carrying speed, and then automatically applies the load by actuating compressor slide valves or other capacity control devices. Should the control setpoint not be

met at the minimum load-carrying speed, the compressor speed is automatically raised in an effort to meet the desired process pressure setpoint. This control strategy is governed by a number of user-adjustable load and speed limits which can inhibit the application of additional load beyond what is deemed to be safe, can force the system to shed load, and can shut the engine/compressor down in the event that a maximum speed is exceeded.



DE-1550 Engine Air/Fuel Ratio Control

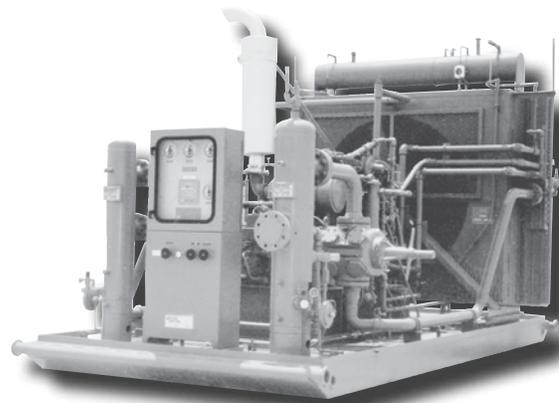
With the exhaust oxygen setpoint for lowest emissions entered into the controller, the DE-1550 in the AFR controller precisely controls the flow of fuel to the engine through the AFR valve via the dedicated control output so as to maintain the target oxygen level. This system is easily setup/adjusted and cost-effectively maintained through the use of industry-standard automotive-style exhaust sensors.

DE-1550 System Speed Control

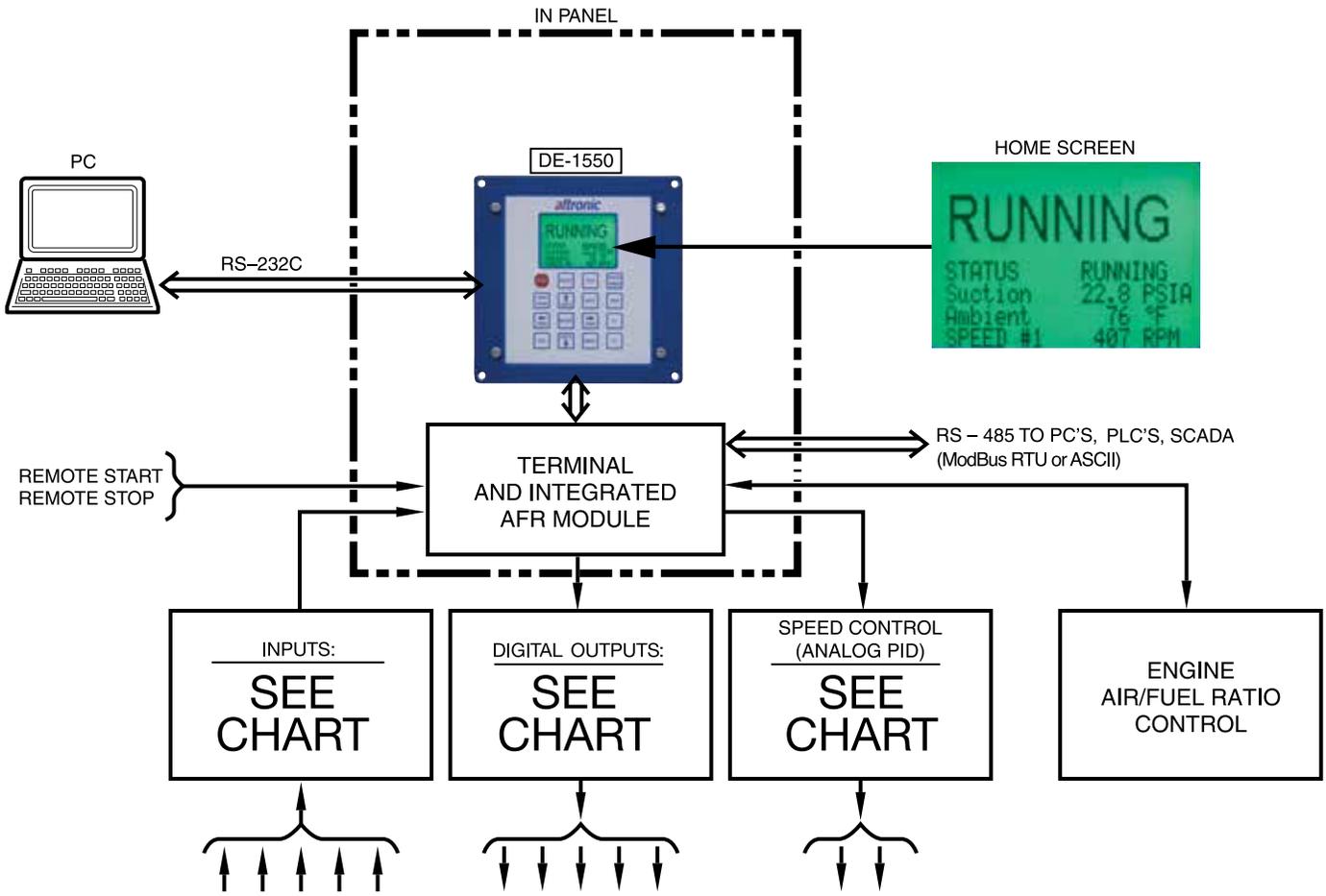
The DE-1550 features a sophisticated speed control capability, inclusive of both a fixed speed control and dynamic speed management referenced to a monitored input parameter. Two strategies are available in controlling the on-board 4-20mA outputs:

PID Mode of Operation: The PID strategy uses the familiar P/I/D values with the setpoint determined by the Target Speed Strategy. It can also be set to either DIRECT or INVERSE acting.

NON-PID Mode of Operation: the NON-PID strategy uses an X-Y strategy where the target speed is the X and the Y is the 4-20mA out. This strategy is useful when a 4-20mA output is sent to another device or actuator which is physically managing fuel control.



System Diagram



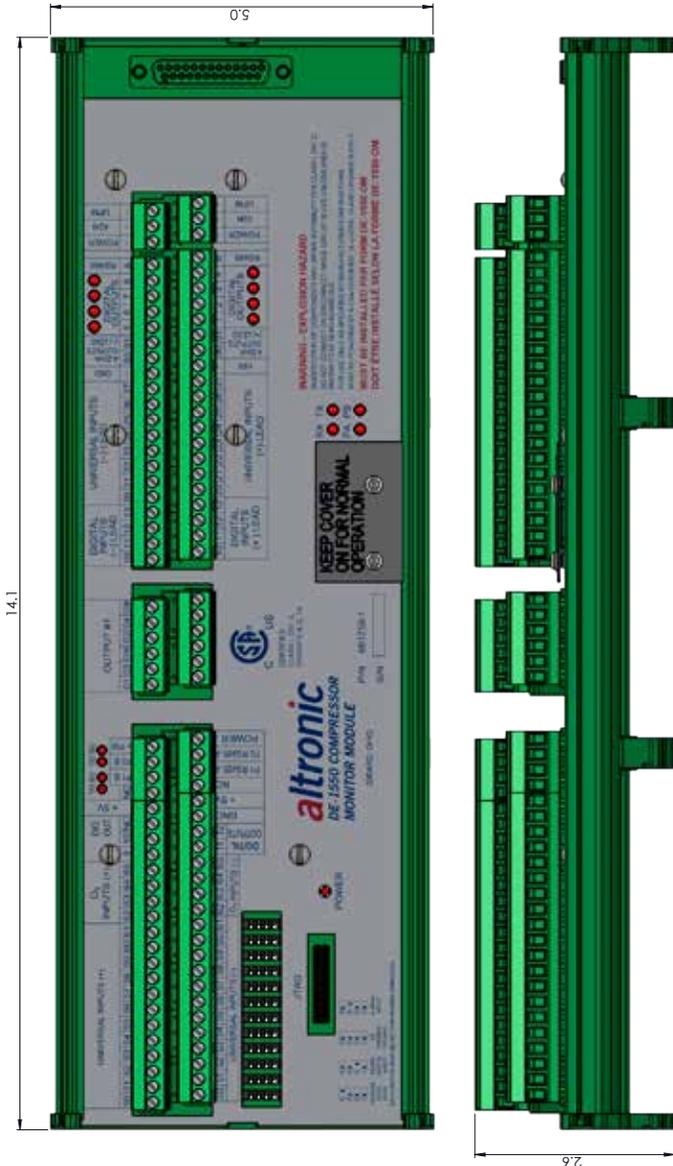
DISPLAY MODULE	TERMINAL BOARD	DISCRETE INPUTS	ANALOG INPUTS	FREQUENCY (SPEED) INPUTS	DIGITAL OUTPUTS	ANALOG P.I.D. OUTPUTS	AFR CONTROL INPUT
DE-1550	691758	4	20 configurable	1	12	2	1



General Specifications

COMMUNICATIONS PORTS	1 RS-232, 2 RS-485, USB
DISPLAY	128 x 64-pixel, alphanumeric, backlit
SCAN RATE	3 per second
AMBIENT TEMPERATURE	-40°C to +85°C (-40°F to +185°F)
POWER REQUIRED	12 to 24 Vdc, 15 watts max. (Std. DE)
POWER REQUIRED	12 Vdc, 15 watts max. (DIV 1 System)
HAZARDOUS AREA CERTIFICATION	
CSA – Class I, Division 2, Groups C and D	

Dimensions



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To Order

DISPLAY MODULE

DE-1550 Display ModuleDE-1550

TERMINAL AND INTEGRATED AFR MODULE

DE-1550 Terminal/AFR Module..... 691758

Available Altronic Transducers

PRESSURE TRANSDUCERS

0-15 psia	691204-15
0-50 psia	691204-50
0-100 psia	691204-100
0-300 psia	691204-300
0-500 psia	691204-500
0-100 psig/0-680 Kpa	691201-100
0-300 psig/0-2040 Kpa	691201-300
0-500 psig/0-3400 Kpa	691201-500
0-1000 psig/0-6800 Kpa	691201-1000
0-2000 psig/0-136 bar.....	691201-2000
0-5000 psig/0-340 bar	691201-5000

TEMPERATURE TRANSDUCERS

Range: +5°F to 350°F / -15°C to 176°C (±3°F / ±2°C)

1.75" length	691202-300
5.75" length	691203-300

Range: -40°F to 450°F / -40°C to 232°C (±6°F / ±4°C)

1.75" length	691212-450
3.75" Length	691213-450B
5.75" length	691213-450

AFR CONTROL VALVES AND ACCESSORIES

Control Valve, 1.5" NPT, below 250HP	690154-2
Control Valve, 1.5" NPT, 250-1,000 HP	690154-1
Butterfly Valve, 2.0" NPT, 500-1,500HP	690220-1
Butterfly Valve, 2.5" NPT, 750-2,000HP	690225-1
Butterfly Valve, 3.0" NPT, 1,000-3,000HP	690230-1
Accessories Kit, Rich-Burn, 25 ft. cables.....	691310-1
Accessories Kit, Rich-Burn, 50 ft. cables	691310-2
Accessories Kit, Lean-Burn, 25 ft. cables	691315-1
Accessories Kit, Lean-Burn, 50 ft. cables	691315-2

NOTE: Order one Accessory Kit per carburetor.

One Type K thermocouple required per carburetor (not supplied in kit).

691310-1 ACCESSORIES KIT

Oxygen Sensor	610621
Cable Assembly, Control Valve, 25 ft	693005-1
Cable Assembly, O2 Sensor, 25 ft.....	693006-1

691310-2 ACCESSORIES KIT

Oxygen Sensor	610621
Cable Assembly, Control Valve, 50 ft	693005-2
Cable Assembly, O2 Sensor, 50 ft.....	693006-2

691315-1 ACCESSORIES KIT

Oxygen Sensor	610813
Oxygen Sensor Converter	691207-1
Pressure Sensor (qty. 2)	691204-50
Cable Assembly, Control Valve, 25 ft	693005-1
Cable Assembly, Pressure Sensor, 25 ft. (qty. 2).....	693008-25
Cable Assembly, O2 Sensor, 25 ft.....	693009-1

691315-2 ACCESSORIES KIT

Oxygen Sensor 610813	610813
Oxygen Sensor Converter	691207-1
Pressure Sensor (qty. 2)	691204-50
Cable Assembly, Control Valve, 50 ft	693005-2
Cable Assembly, Pressure Sensor, 50 ft. (qty. 2).....	693008-50
Cable Assembly, O2 Sensor, 50 ft.....	693009-2

TRANSDUCER CABLES

5 ft. length.....	693008-5
25 ft. length	693008-25
50 ft. length	693008-50