



NOW AVAILABLE!

- DUAL BANK EPC-150 SYSTEM FOR LEAN BURN ENGINES
- ADVANCED EPC-100 CONTROL CAPABILITIES
- BUTTERFLY-STYLE CONTROL VALVE

## AIR/FUEL RATIO CONTROL FOR STOICHIOMETRIC AND LEAN-BURN CARBURETED ENGINES EPC-100/150 SERIES

- UNIVERSAL LINE OF AIR/FUEL RATIO CONTROLS FOR STOICHIOMETRIC AND LEAN-BURN ENGINES
- ACCURATE CLOSED-LOOP CONTROL OF AIR/FUEL RATIO FOR MINIMUM ENGINE EMISSIONS
- PRECISE FULL AUTHORITY ACTUATION FOR POSITIVE CONTROL OF FUEL
- MODBUS-BASED EPC-100 TERMINAL PROGRAM AND EXPANDED I/O AVAILABLE TO IMPLEMENT ADVANCED CONTROL STRATEGIES
- FULLY SUPPORTS MODBUS RTU COMMUNICATIONS WITH INCLUDED PC MONITORING SOFTWARE
- PLUNGER AND BUTTERFLY-STYLE CONTROL VALVES AVAILABLE IN A RANGE INLET/OUTLET SIZES
- CSA CERTIFIED FOR USE IN CLASS I, DIVISION 2, GROUP C AND D HAZARDOUS AREAS

The EPC-100/150 Air/Fuel Ratio Controls are applicable to virtually any carbureted natural gas-fueled engine. This universal line of emission control systems includes two specific models:

**EPC-100** is designed for use on carbureted engines operating on a stoichiometric (lambda 1.0) air/fuel mixture. This control is highly suited for use in conjunction with 3-way catalytic converters and it incorporates provisions for enhanced control strategies utilizing auxiliary inputs such as manifold air pressure.

**EPC-150** is designed for use on carbureted, lean-burn engines operating on air/fuel mixtures ranging from lambda 1.2 to 1.8.

These advanced and expandable control systems utilize microprocessor technology, thus allowing for the execution of sophisticated control strategies and a high level of application-specific customization. This advanced control capability is coupled with precision full-authority fuel control valves which together assure the user of long-term air/fuel ratio stability and ultimately reduced engine exhaust emissions.

Advanced EPC-100 control strategies can now be incorporated using an expanded suite of system inputs and outputs, including additional thermocouples, lambda (oxygen) sensors, 0-5 volt transducers, and discrete switches. Utilizing the Enhanced EPC-100 Terminal Program, a user can now implement the dynamic adjustment of the lambda sensor setpoint(s), controller gain (responsiveness), and additional diagnostic/control functionality.

While utilizing fundamentally different oxygen sensing technology, both the EPC-100 and EPC-150 operate on the basis of closed-loop control to a setpoint utilizing data from exhaust-mounted oxygen sensors as feedback. With the exhaust oxygen setpoint for lowest emissions entered into the controller, the EPC units then precisely control the flow of fuel to the engines through the stepper motor valve(s) to maintain that oxygen level during engine operation.

The EPC-100/150 controllers feature an alphanumeric LCD display which gives operators continual access to critical operating data without the need for non-hazardous area approved hand-held programmers. Controller operating mode, stepper motor control valve position(s), and exhaust oxygen sensor value(s) are just a few of the display-accessible parameters. To facilitate integration with supervisory monitoring and control systems, the EPC-100/150 fully supports the ModBus RTU communications protocol. A full-featured PC-based monitoring and control software package is included with each EPC-100/150 system.

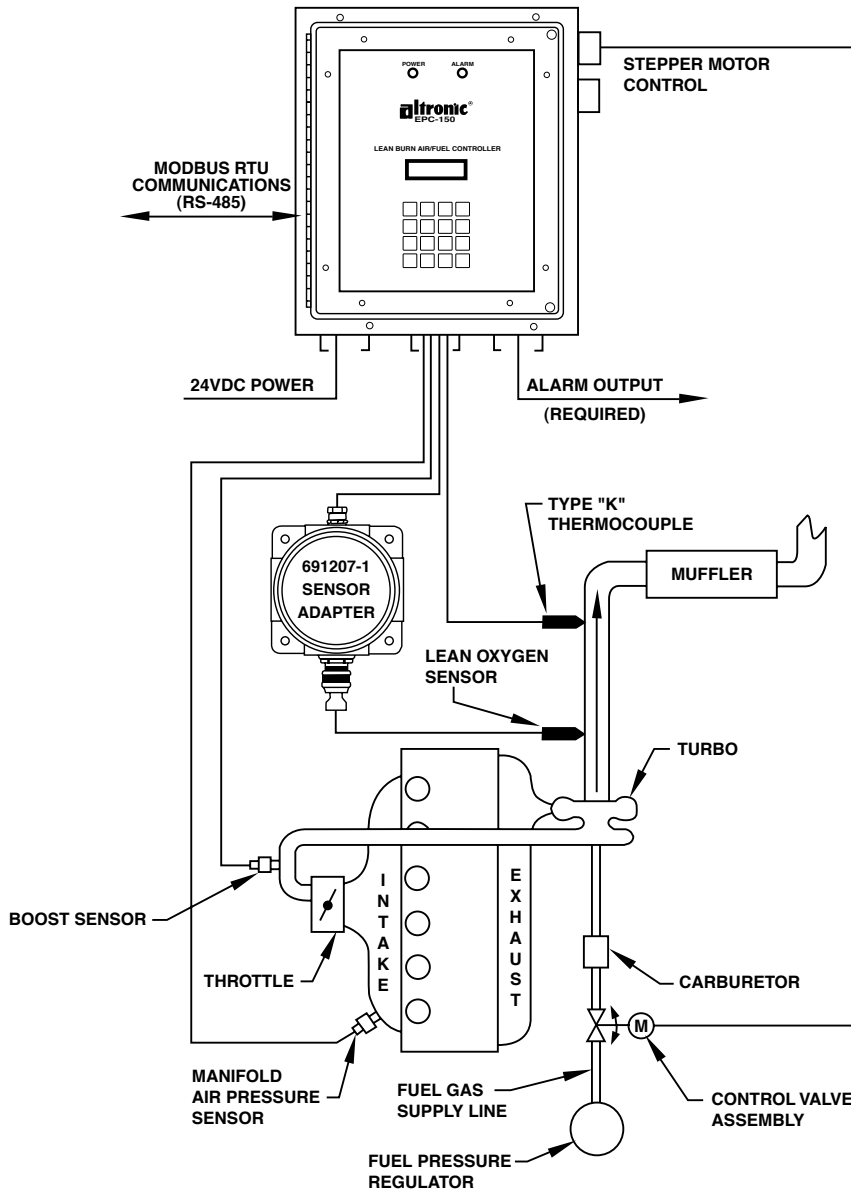
Power requirement is 24VDC, 1-3 amps (depending upon model). In remote areas, power can be provided by the Altronic 24VDC Alternator Power Packages – refer to form ALT.



CERTIFIED  
CLASS I, DIVISION 2  
GROUPS C AND D

## LEAN-BURN ENGINE EPC-150 SYSTEM DIAGRAM

(single bank shown)



## EPC-150 Air/Fuel Ratio Control for Carbureted, Lean-Burn Engines

- Designed on the highly successful EPC-100 control platform
- Applicable to both single and dual regulator, lean-burn engine configurations
- Utilizes a durable and cost-effective lean-burn oxygen sensor for positive, closed loop air/fuel ratio control
- Full-authority fuel control eliminates maintenance-intensive I/PS and hazardous direct gas admission into the air intake of the engine
- Features innovative control technology to reduce engine “lug” conditions and provide accurate air/fuel ratio control at lighter engine loads

The EPC-150 is designed for use on all in-line or vee-style, lean-burn, carbureted natural gas-fueled engines. Suitable applications include the highly popular Caterpillar 3400 and 3500-series engines, Waukesha VHP-class lean-burn engines, and most Cummins and Superior models. This innovative control offers reliable, precise, and positive air/fuel ratio control, while maintaining installation and operational simplicity. It also incorporates a number of advanced operating features to address engine conditions specific to lean-burn operation.

Like the EPC-100, the EPC-150 is a closed-loop air/fuel ratio controller designed to precisely adjust fuel delivery to meet and maintain a user-entered exhaust oxygen setpoint. The exhaust oxygen level is continuously monitored by a proven and reliable, yet moderate cost lean-burn oxygen sensor. During system setup, an exhaust gas analyzer is used to determine the oxygen level at which engine-out emissions are at their lowest, with the corresponding setpoint entered into the EPC-150 system as the control setpoint. Thus, as load and other parameters change on the engine, the EPC-150 will maintain the air/fuel ratio to meet the desired exhaust oxygen level, maintaining “in-compliance” engine performance.

A number of features unique to the EPC-150 optimize the controller’s ability to manage fuel-delivery and control issues specific to lean-burn engines. The EPC-150 incorporates a unique control protocol designed to limit “lug” conditions whereby a lightly loaded lean-burn engine becomes incapable of generating sufficient turbo boost to meet the speed setpoint established by the governor. This control approach, which monitors intake air pressure both before and after the throttle plate, enables the controller to automatically offset the oxygen setpoint for richer operation and ultimately increased turbo boost pressures. With the engine operating more smoothly and achieving the necessary RPM, automatic control at the desired oxygen setpoint is then restored. As with all other EPC-150 operating parameters, the point at which such an offset would be made, and the value of that offset, is fully adjustable from the front keypad of the control unit or remotely utilizing the integral RS-485 ModBus RTU communications system.

## EPC-100 Air/Fuel Ratio Control for Carbureted, Stoichiometric Engines

- Precision control for rich-burn (stoichiometric) engines
- Assures maximum efficiency for 3-way catalytic converters
- Universal design for control of in-line or V-type, naturally-aspirated or turbocharged engines
- New expanded features and control strategies available for enhanced operation
- Full-authority fuel control eliminates maintenance-intensive I/Ps and hazardous direct gas admission into the air intake of the engine

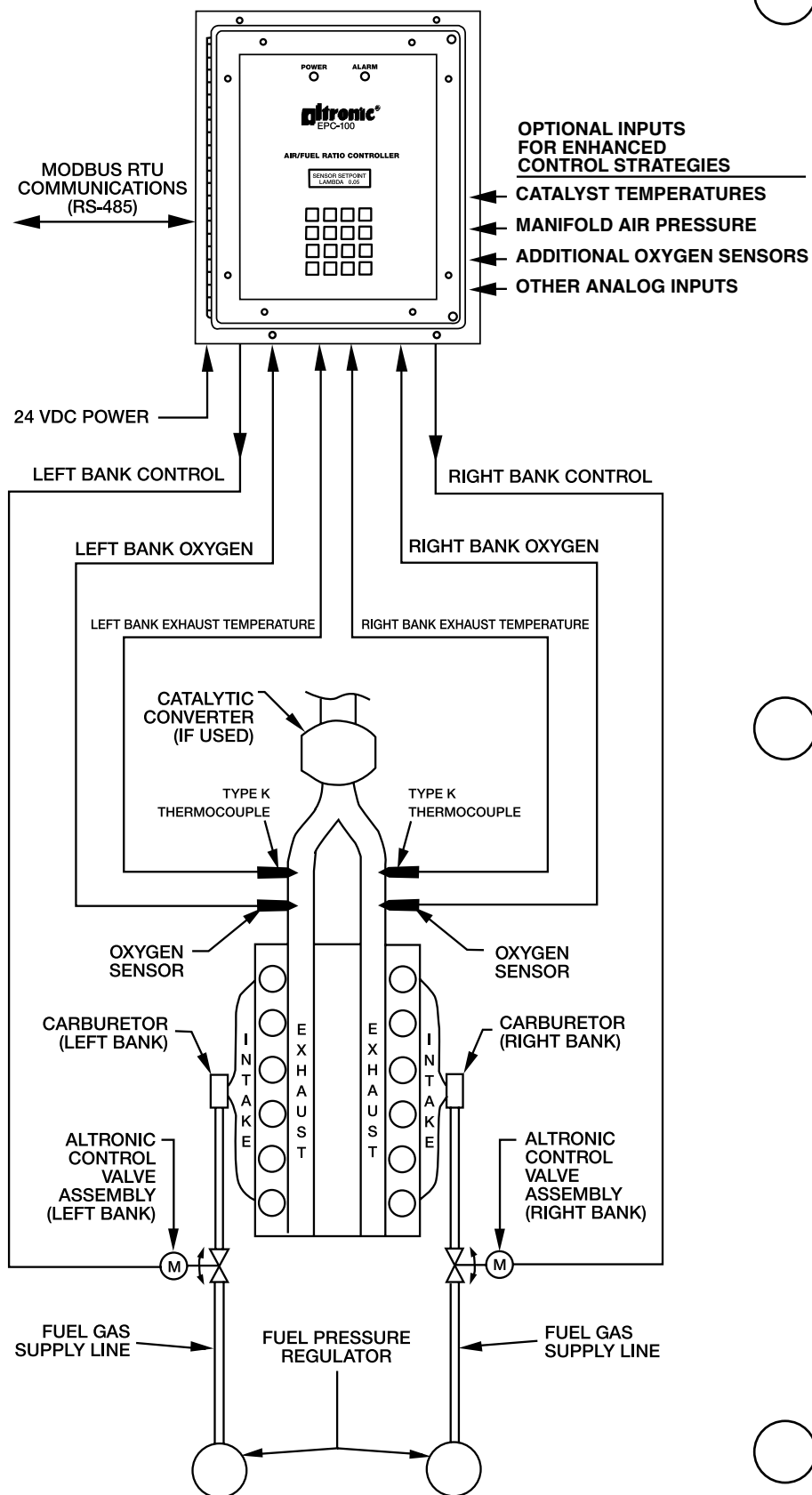
The Altronic EPC-100 has been designed and built for use in conjunction with a 3-way catalytic converter on rich-burn, carbureted natural gas engines as a means of reducing engine exhaust emissions. The EPC 100 is currently in service on thousands of gas engines worldwide. It offers users easy installation, a maximum level of application flexibility, ease of operation, and air/fuel ratio stability.

The EPC-100 has been completely upgraded, providing user access to all important system operating data via a Modbus RTU-compliant, RS-485 serial data link. The addition of a number of new inputs and outputs, including two additional type K thermocouples, two additional oxygen sensors, four 0-5 volt general purpose parametric transducer inputs, and four additional discrete outputs also dramatically expand the control options available to EPC-100 users. With such a broad array of inputs and outputs now available, innovative control strategies, such as lambda setpoint compensation for engine load variations, catalyst temperature, and catalytic converter performance, will further enhance the EPC-100 control options and functionality to suit the specific needs and control requirements of the application. Please refer to the section to the right entitled "Enhanced EPC-100 Control Strategies" for additional information.

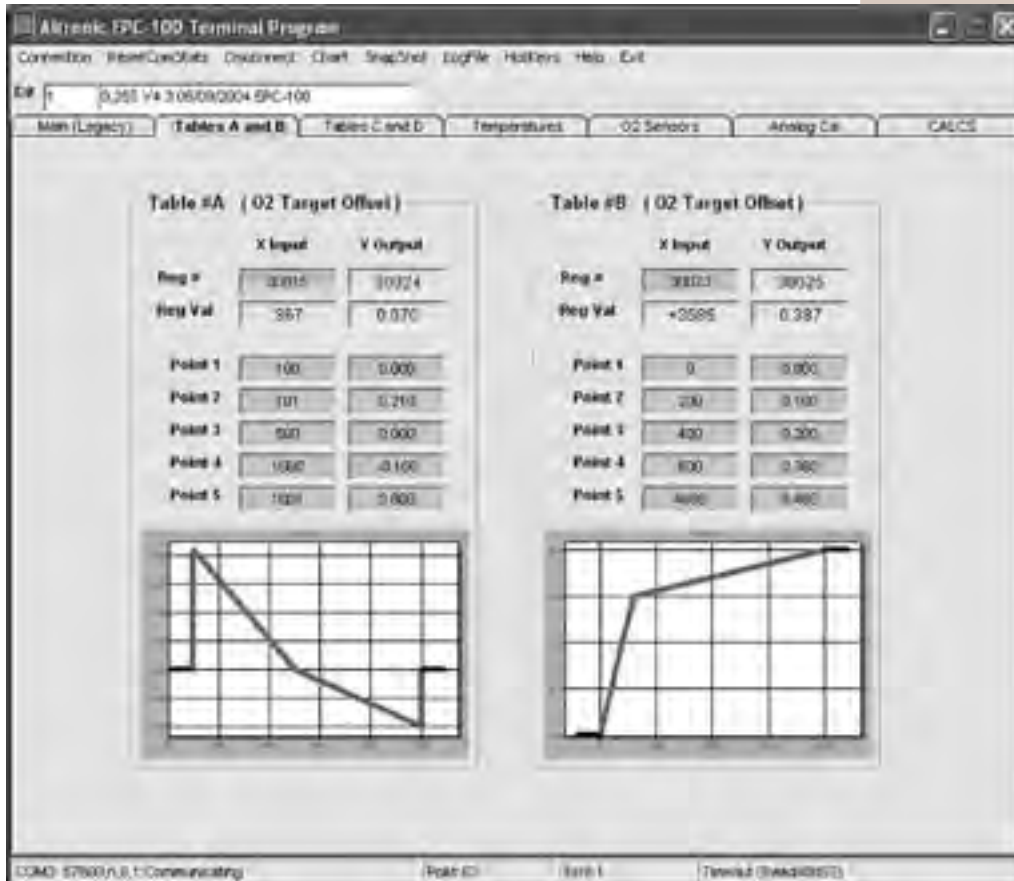
The EPC-100 provides dual channel operation for applications with one or two regulators. An oxygen sensor is used in the exhaust stream to sense O<sub>2</sub> content. Once proper exhaust temperatures have been reached to allow for accurate sensor operation, the unit begins to adjust the flow of fuel into the engine to meet the proper exhaust oxygen setpoint(s) for minimum emissions. The full-authority fuel control valve(s), mounted in the fuel line between the carburetor and the final cut regulator, assures precise, repeatable control of the air/fuel ratio without resorting to the potentially dangerous strategy of adding fuel to the air intake of the engine.

The EPC-100 utilizes advanced digital linear actuator control technology for precise, repeatable fuel control. Please refer to the section to the right entitled "Altronic Gas Control Valves" for further details.

## STOICHIOMETRIC "RICH-BURN" ENGINE EPC-100 SYSTEM DIAGRAM



## Enhanced EPC-100 Control Strategies (Firmware Version 5.0)

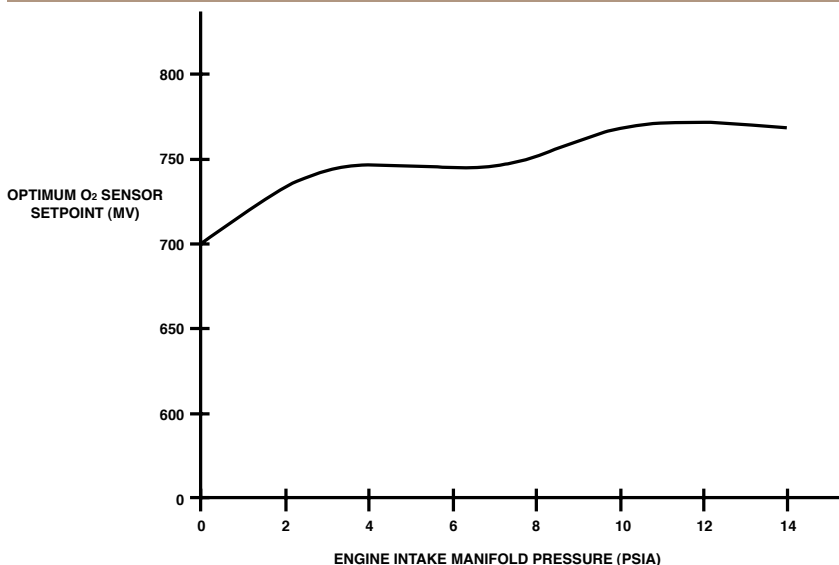


- Enhanced EPC-100 Terminal Program enables users to implement custom control functionality onto a standard EPC-100 hardware set
- Offers user-customizable control of the target lambda setpoint(s) and controller gain adjustment, as well as access to additional alarm, shutdown, and emissions compliance diagnostics
- Utilizes the inputs and outputs already included in EPC-100 units beginning with serial number 5713
- “Open” architecture of the EPC-100 Terminal Program allows for almost limitless control flexibility

In recent years, many users have found it necessary or helpful to apply new air/fuel ratio control capabilities as part of a larger effort to secure more consistent or even further reduced exhaust emission levels across a range of operating conditions. The Enhanced EPC-100 Terminal Program offers advanced,

user-customizable control parameters for the dynamic adjustment of the target O<sub>2</sub> setpoints and controller gains, as well as a means of inhibiting automatic control on the basis of satisfying an external parameter such as load or a post-catalyst O<sub>2</sub> setpoint. This is accomplished through the use of a proprietary, high-level Windows™-based software package included with each Altronic EPC-100 system.

In the example outlined at left, the EPC-100 target O<sub>2</sub> setpoint is dynamically adjusted versus load (in this case derived through an input transducer monitoring air manifold pressure) as just one possible implementation of this new and advanced control technology. Incorporating this approach, the user retains the simplicity and familiarity of the EPC-100 system if no enhanced setpoint or gain adjustment control is required, but can easily invoke such control functionality should it become required to meet additional operational or performance needs. Additionally, as these enhanced features and capabilities are accessible only via the EPC-100 Terminal Program, their operation and configuration is essentially hidden from the user and resistant to tampering or unauthorized adjustment.



### EXAMPLE OF AN ENHANCED CONTROL STRATEGY – TARGET O<sub>2</sub> SETPOINT VS. LOAD

The curve above represents just one of the many enhanced control strategies available in the current EPC-100 system, utilizing the Enhanced EPC-100 Terminal Program. This example illustrates the use of intake air manifold pressure (i.e. engine load) as a means of directly varying the oxygen (O<sub>2</sub>) target setpoint for optimum catalytic converter efficiency. Other possible control strategies can make use of temperature or post-catalyst oxygen sensor inputs.



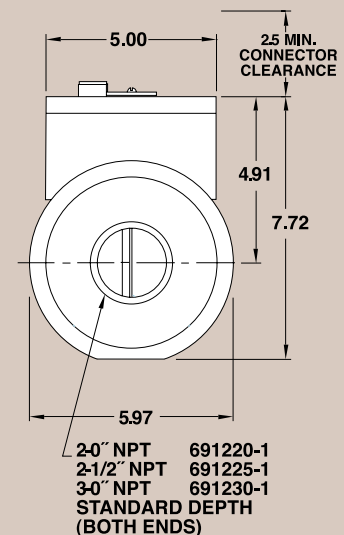
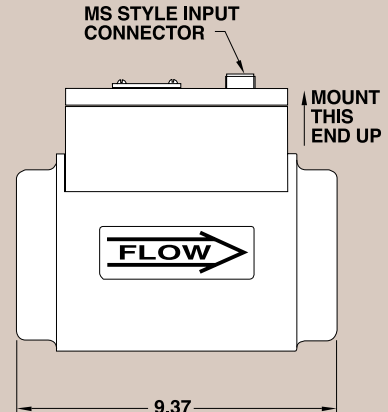
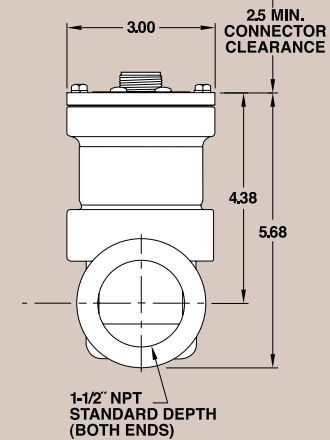
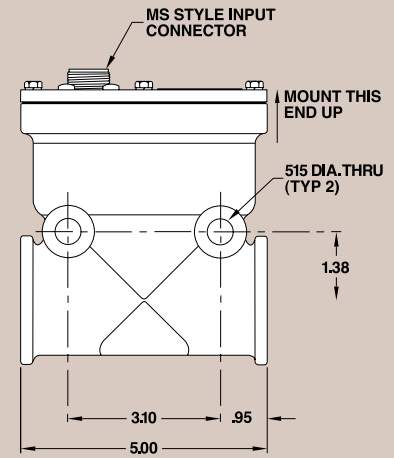
## Altronic Gas Control Valves

- Designed for use with Altronic EPC-100 and EPC-150 Air/Fuel Ratio Control Systems and suitable for other gas control applications
- “Universal” valve designs are suitable for use on in-line or vee-style, naturally-aspirated or carbureted, and stoichiometric or lean-burn natural gas engine
- Sophisticated digital linear actuator utilized in all valve models for precise, repeatable control
- Available in both plunger and butterfly-valve configurations
- CSA certified for use in Class I, Division 2, Group D hazardous areas

Altronic offers a family of fuel control valves for use with its EPC-100/150 controls and for other gas control applications. These rugged, reliable actuators have become the fuel control standard in the oil and gas and power generation industries for the precision control that they offer and the minimal requirement for maintenance and calibration.

Altronic Gas Control Valves are available in both plunger-style and butterfly configurations (see diagrams to right). “Universal” in their design, they are suitable for use with both the EPC-100 and EPC-150 air/fuel ratio controllers on both in-line and vee-style engines, and in both naturally-aspirated and turbocharged configurations. 1.5” NPT, 2.0” NPT, 2.5” NPT, and 3.0” NPT fuel line diameters can be directly accommodated without any need for additional adaptor fittings in the line. Please refer to the back page of this brochure for additional ordering details, including general specifications on appropriate valve sizing versus horsepower. A driver module is available for use with all Altronic Gas Control Valves. This module accepts a 4-20mA control signal generated by a third-party controller (such as a PLC or supervisory engine control) and allows the valves to be used in a range of additional applications.

The controls utilized by the EPC-100 and EPC-150 systems guarantee full authority over the flow of fuel to the engine. They also avoid the potentially dangerous practice of injecting supplemental fuel gas through a small and potentially unreliable commercial solenoid valve into the air intake of the engine. The incorporation of such solenoid valves into the control strategy of competitive air/fuel ratio control approaches fundamentally limits the total control range to a few percent of the total fuel flow of the engine, and ultimately introduces significant additional safety risks to the equipment and associated personnel.



2-0" NPT 691220-1  
 2-1/2" NPT 691225-1  
 3-0" NPT 691230-1  
 STANDARD DEPTH  
 (BOTH ENDS)

## EPC-100 Specifications

### INPUTS

- (2) Oxygen Sensors (1/carburetor)
- (2) Type K Ungrounded Thermocouples (1/carburetor)

### OPTIONAL INPUTS

- (2) Additional Type K Ungrounded Thermocouples
- (2) Additional Oxygen Sensors
- (4) 0-5 volt analog signals

### OUTPUTS

- (2) Stepper Motor Controlled Fuel Valves (1/carburetor)
- (1) Alarm

### OPTIONAL OUTPUTS

- (4) Discrettes

### DISPLAY

Alphanumeric 2X16 character backlit

### POWER REQUIREMENT

18-30 VDC, 1 AMP

### TEMPERATURE

-40°F. to +158°F./ -40°C. to +70°C.

### COMMUNICATIONS

ModBus RTU Protocol (RS-485)

## EPC-150 Specifications

### INPUTS

- (2) Oxygen Sensors (1/regulator)
- (2) Type K Ungrounded Thermocouples (1/regulator)
- (2) Boost Pressure Sensor
- (2) MAP Sensor

### OUTPUTS

- (2) Stepper Motor Controlled Fuel Valve (1/regulator)
- (1) Alarm

### DISPLAY

Alphanumeric 2X16 character backlit

### POWER REQUIREMENT

24 VDC, 3 AMPS

### TEMPERATURE

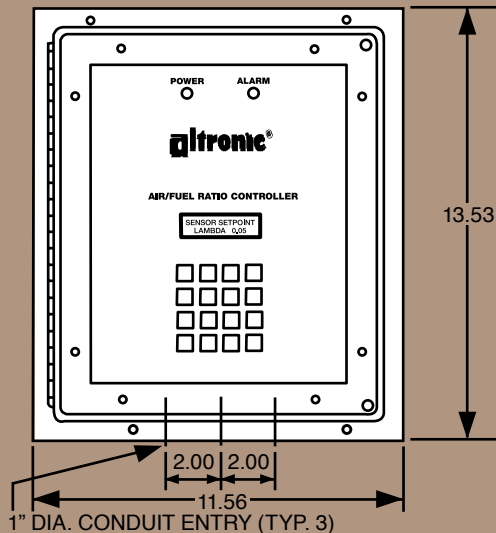
-40°F. to +158°F./ -40°C. to +70°C.

### COMMUNICATIONS

ModBus RTU Protocol (RS-485)

## EPC-100/150 Dimensions

Panel cutout: 10.12"W x 12.12"H



## Ordering Information

### SYSTEM COMPONENTS

Air/Fuel Ratio Controller

EPC-100

EPC-150

EPC-100

EPC-150

### CONTROL VALVES

Control Valve, 1.5" NPT, below 250 HP

690154-2

690154-2

Control Valve, 1.5" NPT, 250-1,000 HP

690154-1

690154-1

Butterfly Valve, 2.0" NPT, 500-1,500 HP

690220-1

690220-1

Butterfly Valve, 2.5" NPT, 750-2,000 HP

690225-1

690225-1

Butterfly Valve, 3.0" NPT, 1,000-3,000 HP

690230-1

690230-1

### ACCESSORY KITS

Accessory Kit, 25 ft. cables

691310-1

691315-1

Accessory Kit, 50 ft. cables

691310-2

691315-2

**Note: Order one Accessory Kit per carburetor. One Type K thermocouple required per carburetor (not supplied in kit).**

-1 KIT  
(25 ft.)

-2 KIT  
(50 ft.)

### ACCESSORY KIT CONTENTS: (EPC-100)

Oxygen Sensor

691310-1

691310-2

Cable Assembly, Control Valve.

610621

610621

Cable Assembly, O<sub>2</sub> Sensor

693005-1

693005-2

693006-1

693006-2

### ACCESSORY KIT CONTENTS: (EPC-150)

Oxygen Sensor

691315-1

691315-2

Oxygen Sensor Converter

610813

610813

Pressure Sensor (qty. 2)

691207-1

691207-1

Cable Assembly, Control Valve

691204-50

691204-50

Cable Assembly, Pressure Sensor (qty. 2)

693005-1

693005-2

Cable Assembly, O<sub>2</sub> Sensor

693008-25

693008-50

693009-1

693009-2

**altronic<sup>®</sup>**  
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