



## GAC SOLUTIONS for GASEOUS ENGINES



GOVERNORS AMERICA CORP.

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## From Simple Solutions to EPA Approved

GAC offers a wide range of solutions for gaseous powered engines, from simple black smoke solutions to an advanced cost-effective gaseous-fueled engine management system with exhaust emissions control to meet worldwide standards.

### SIMPLE SOLUTIONS

From black smoke control to engines that run on natural, propane or biofuel gasses, GAC offers simple solutions to common issues.

### FIMS EPA APPROVED SOLUTION

GAC also offers emission control standard solutions, with the basic fuel and ignition management system (FIMS) for low-pressure applications using a venturi mixer and stepper motor control valve.

GAC designed the free software. The system most often includes a built-in engine speed governor and two separate modules which can operate as a stand-alone system depending on your application needs.

The complete-system approach results in a cost-effective solution that offers the most significant potential for engine efficiency and exhaust emissions improvements.

- **Clean burn** – Closed-loop exhaust oxygen sensor control
- **Natural gas** - GAC ATBs resist the harshest gaseous fuel types using spring return butterfly valves, precision bearings, and idle air adjustment for safe, maintenance-free solutions. High temperature sealed (5 bar), position feedback sensor, mechanical position indicator. Hazardous/explosive environment versions are also available.
- **Low-pressure design** - perfect for stationary applications using shale gas, digester gas, biogas, landfill gas, wellhead gas, coalbed/seam gas
- **Reliable** - industrial grade - GAC provides quality design production using signature potted controls for extreme vibration and temperature capability & durability. All products leave GAC 100% tested, so our quality is of the highest caliber, with no downtime
- **Economical** pricing - no need to buy a separate speed controller; fully integrated into AFR
- GAC developed & controlled software - customizable, easy-to-use, quick turnaround for modifications and changes
- Complete kits available – A full range of venturi mixer sizes with integrated or separate fuel control valves. GAC can supply all the necessary hardware from sensors, coils, spark plugs & wires, harnessing, and regulators.

# ARROW A-32, A-42, AND A-62 NATURAL GAS ENGINES

## GENERATOR: OIL AND GAS INDUSTRY

[Arrow Engine Company](#), building natural gas engine solutions for the oil and gas industry since 1955, has used GAC products for over 35 years as an integral part of the engines. The GAC throttle body (ATB) controls fuel flow, working with the carburetor.

THE GAC ESD2401 speed control unit is located in an enclosed box on the flywheel housing, making it easy to update if required.



### ESD2401



### ATB452T2F14



**NOTE:** All components are sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB452T2F14-24</a>	ATB T2 Series Integral Throttle Body Electric Actuators
Speed Controllers	<a href="#">ESD2401</a>	ESD2400 Series Isochronous electronic controller



# ARROW A54 Natural Gas

## OIL AND GAS INDUSTRY GENERATOR

The [Governor Shop](#) has been providing solutions around Western Canada since 2012. This modification to an Arrow A54 5.4L to a gaseous generator uses a GAC throttle body (ATB T2) in an oil field pump generator.

The engines use a process input (4-20 mA) from a Lufkin panel controlled by a GAC EEG6550. This solution can also be used on the A-32 and A-42 Arrow engines.



### EEG6550



### ATB452T2F14



NOTE: All components are sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB452T2F14-24</a>	ATB T2 Series Integral Throttle Body Electric Actuators
Speed Controllers	<a href="#">EEG6550</a>	Series Enhanced Electronic (EEG) Controller with droop

## ARROW A90 NATURAL GAS

### OIL AND GAS INDUSTRY GENERATOR

SES Arrow Generator out of Tulsa OK, USA builds custom generators. This 25 KW unit built on an Arrow A90 8.8L uses a GAC throttle body, ATB452T2N14-24, controlled using the GAC ESD5131.

SES Arrow relies on GAC products to support its industry customers. Their solutions cannot fail during operation; that is why they choose GAC for dependable, innovative solutions.



**ESD5131**



**ATB452T2N14-24**



**NOTE:** All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB452T2N14-24</a>	ATB Series integral throttle body electric actuators controls air/fuel mixture to a gaseous-fueled engine
Speed Controller	<a href="#">ESD5131</a>	Multi-V DC • Switchable Soft Coupling and Lead Circuit with adjustable PID and idle speed adjustment.

# CATERPILLAR 3408 18 L NATURAL GAS

## INDUSTRIAL GENERATOR

This application uses the GAC Ignition Control Module (ICM) paired with an ESD5330 Speed controller to run the ignition system in this wasted spark, crankshaft triggering, CAT 3408, 18 L, V-8, with 136 flywheel teeth.

While the ICM tends to the spark, the ESD5330 ensures smooth running.



**ICM200-4**



**ESD5330**



**ACB2001**



**NOTE:** All components are sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ACB2001</a>	Rotary output, 24 V, linear torque proportional electric servo torque to 16.3 Nm
Ignition Control	<a href="#">ICM200-4</a>	Charges a high-energy inductive ignition coil using technology with fixed and variable timing modes and in-field timing trim/offset
Speed Controllers	<a href="#">ESD5330</a>	Speed control unit designed to precisely control engine speed and provide fast precise response to transient engine loads using the ACB2001.

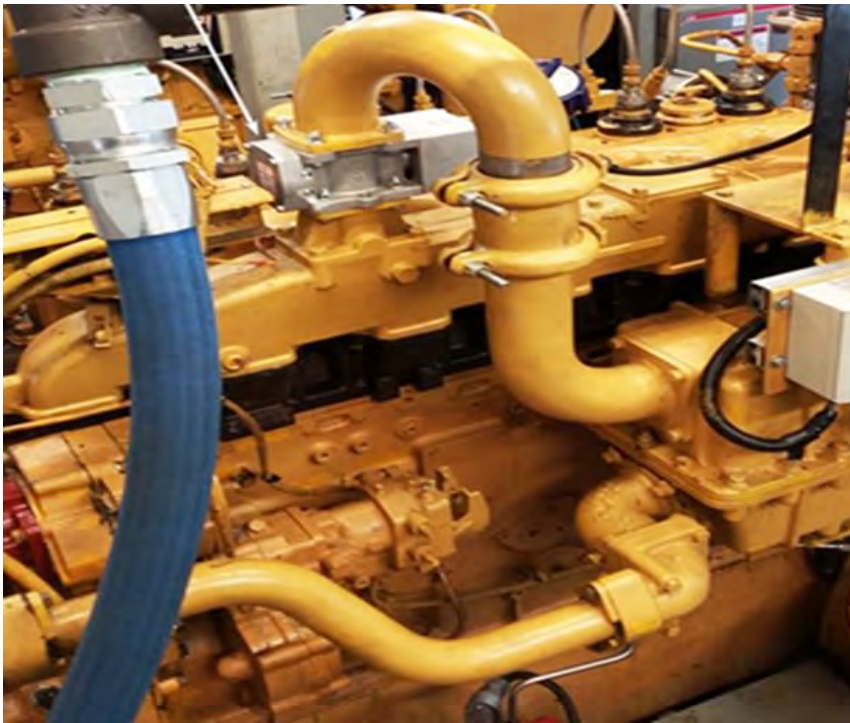


# CATERPILLAR G3406 14.6L

## INDUSTRIAL

The [Governor Shop](#), of Alberta Canada upgraded a 14.64L, 6 cylinder Caterpillar G3406 natural gas engine to a GAC control system using an ATB652T2N-24 with an ESD5526 speed controller and an EAM121 as an interface. The GAC solution provided easy installation and superior performance.

The ESD5526E, with its anti-windup feature, is specifically designed for gaseous fueled engine control.



**ESD5526E**



**EAM121**



**ATB652T2N-24**



NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2N-24</a>	Integral Throttle Body Electric Actuator controls air or air/fuel mixture to a gaseous-fueled engine
Speed Controller	<a href="#">ESD5526E</a>	Speed control unit is a closed loop control, with low current optimized PID
Interface Module	<a href="#">EAM121</a>	Interface module designed to communicate between $\pm 3$ V DC output to nominal 5.0 V.



# CHEVY 8.1L NATURAL GAS

## COMBINED HEAT AND POWER (CHP)

Aegis Energy Services provides turnkey installation of modular combined heat and power systems using a natural gas-fueled Chevrolet 8.1 L engine.

Using a GAC EEG6500 and an ATB552T2F14 55 mm throttle body, Aegis meets the required strict performance and reliability requirements. A GAC MSP6723 is used for speed reference.

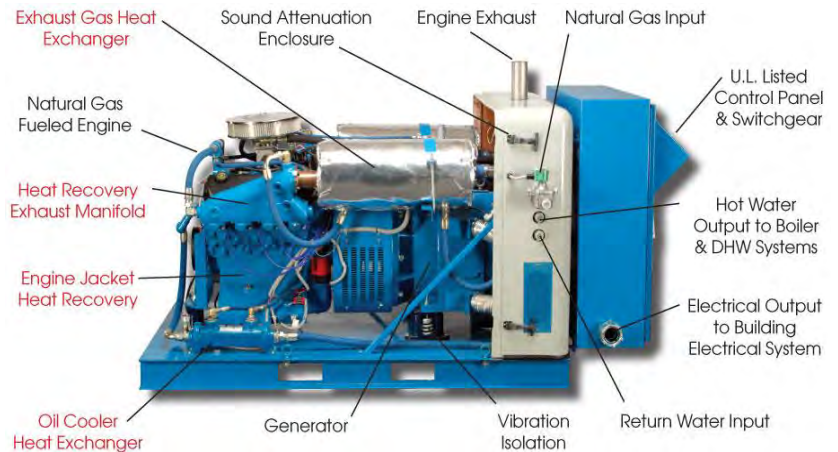
The ATB552T2F14 features a position feedback sensor used by the air-fuel ratio system to determine the actual throttle position for precise control. The ESD6500 provides multiple PID, using GAC SmartVu configuration software, and is environmentally sealed and tamper resistant.



### ESD6500



### ATB552T2F14



NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2N-24</a>	Integral Throttle Body Electric Actuator controls air or air/fuel mixture to a gaseous-fueled engine
Speed Controller	<a href="#">EEG6500</a>	Speed control unit with multi-V DC and built-in display
Magnetic Pickup Sensor	<a href="#">MSP6723</a>	M16 x 1.5 Threaded MSP Series

# CUMMINS GTA855 14L AND 8.3L 6 CYLINDER TURBO

## INDUSTRIAL / GEN SET / IRRIGATION PUMP

These irrigation pumps were in need of an overhaul. The upgrade to GAC components improved the function and ease of setup.



**GTA 8.3L**



**GTA855**

**ESD5526E**



**RSC671**



**ATB652T2N**



**NOTE:** All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2N-24</a>	Integral Throttle Body Electric Actuator controls air or air/fuel mixture to a gaseous-fueled engine
Speed Controller	<a href="#">ESD5526E</a>	Speed control unit is a closed loop control, with low current optimized PID
Ramp Speed Controller	<a href="#">RSC671</a>	Linear, electronic speed control module designed to smoothly accelerate and decelerate an engine at independently adjustable rates.



# CUMMINS VT1710 - 28.0L, V12 ENGINE

## IRRIGATION

GAC's dual driver solutions support for gaseous and diesel engines using sensors to share information and balance dual engines.

The Cummins VT1710 engine requires two gaseous throttle body Actuators, each receiving equal fuel levels.

Two GAC - Integrated Actuator Throttle Bodies (ATB's) with feedback capability - one on each fuel flow bank. Two thermocouples measure, track, and trim the balance based on exhaust temperatures.

GAC's ESD5111 speed controller controls the load response of both balanced actuators.

The Dual Driver Module (DDM101) regulates the fuel in each cylinder using fuel and exhaust temperature balance.

### ESD5111



### DDM101



### ATB652T2F14



NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2F14-24</a>	Integral Throttle Body Electric Actuator controls air or air/fuel mixture to a gaseous-fueled engine
Driver	<a href="#">DDM101</a>	This module drives two independent, feedback actuators from one GAC speed controller.
Speed Controller	<a href="#">ESD5111</a>	Speed controller provides fast and precise response to transient load changes with adjustable PIB and idle.

# CUMMINS 855 NATURAL GAS / PROPANE

## IRRIGATION

GAC worked with [Johnson Irrigation Engine Service](#), a third-generation full-service engine and generator support company, to determine their irrigation engines' optimal natural gas control system.

This Cummins 855 14L uses GACs throttle body and EDG5500 speed controller to provide a smooth system.



**EDG5500**



**ATB652T2N**



**NOTE:** All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2N-24</a>	Integral throttle body electric actuator controls air or air/fuel mixture to a gaseous-fueled engine
Speed Controllers	<a href="#">EDG5500</a>	Digital speed controller with built-in display, regulates engine speed on diesel and gasoline reciprocating engines.

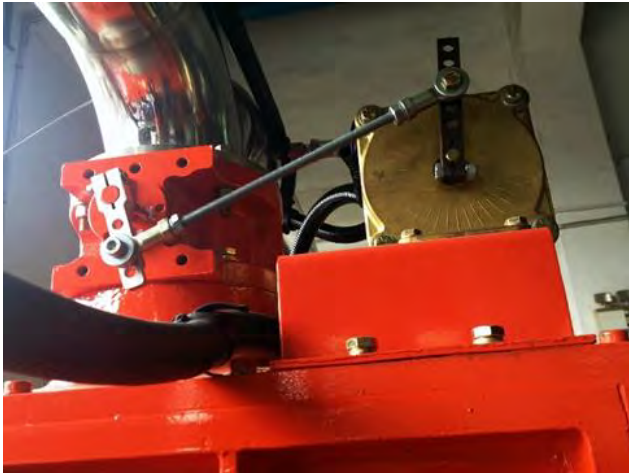


# CUMMINS 37.8 L NATURAL GAS

## GENERATOR

A generator manufacturer asked GAC for a solution for their 500 kW gaseous gen-set built on the Cummins Kt38 37.8L engine.

The ACB2001 provides the required power, while the ESD5330, specifically designed to run the ACB2001, ensures stability and smooth results.



**ACB2001**



**NOTE:** All components sold separately.

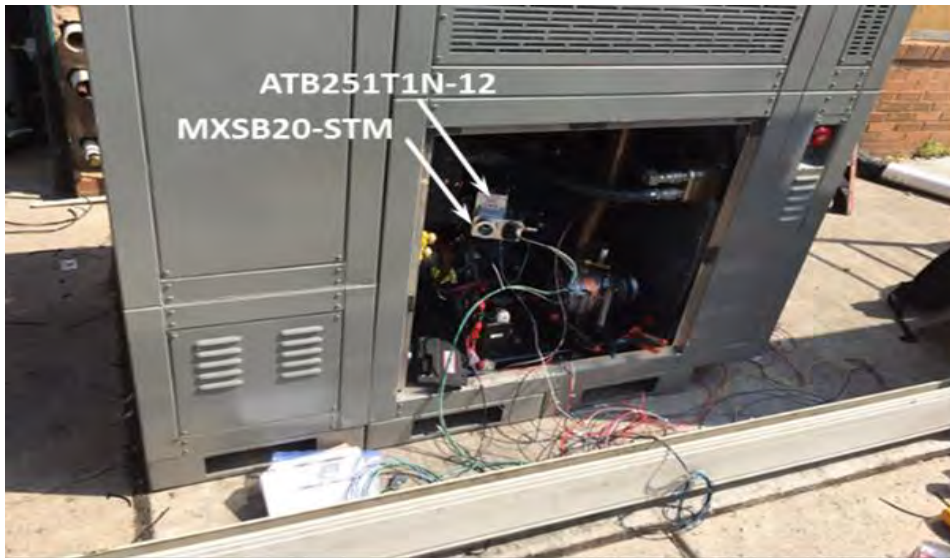
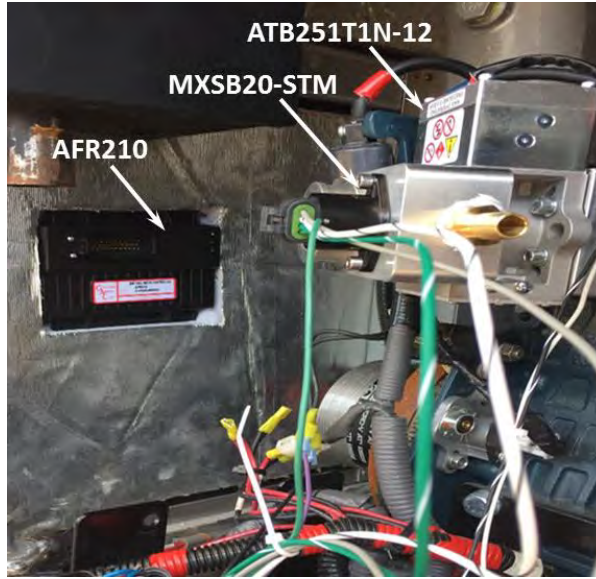
COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ACB2001</a>	Rotary output, 24 V, linear torque proportional electric servo torque to 16.3 Nm
Speed Controllers	<a href="#">ESD5330</a>	Speed control unit designed to precisely control engine speed and provide fast precise response to transient engine loads using the ACB2001.

# KUBOTA WG752 3 CYLINDER, 0.74L ENGINE

## GASEOUS CO-GEN CHP POWER

Cogeneration through combined heat and power (CHP) is the simultaneous production of electricity with the recovery and utilization of heat.

GAC's AFR210 offers an 'Anti-Wind-Up' PID feature that minimizes RPM overshoot and/or under-shoot.



### AFR201



### ATB251T1N1



### MXB20-STM



**NOTE:** All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Speed Controller	<a href="#">AFR210</a>	Air fuel management system controller
Actuator	<a href="#">ATB251T1N-12</a>	ATB T1 Integral Throttle Body Electric Actuators are designed to control the air or air/fuel mixture to a gaseous-fueled engine
Other Items	<a href="#">MSP6827C</a> <a href="#">MXB20-STM</a>	Magnetic Speed Pickup Mixer

# MAN E2876 150 KW NATURAL GAS

## COMBINED HEAT AND POWER (CHP)

[Co-Energy America](#), now part of ClarkeEnergy, builds combined heat and power (CHP) solutions across the east coast, including various New England health care facilities and schools looking to reduce energy costs, enhance energy reliability, and reduce emissions. GAC's ATB and SDG solution create a simple, effective solution that Co-Energy America accounts on.

CHP provides both energy conversion and overall savings of 40% compared to the separate purchase of electricity from a utility company's electrical grid and a separate gas boiler for onsite heating.

### SDG514



### ATB652T2F14



**NOTE:** All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2F14-24</a>	Integral throttle body electric actuator with feedback sensor controls air or air/fuel mixture
Smart Digital Governor	<a href="#">SDG514</a>	Smart Digital Governor designed for industrial applications using a solid-state microprocessor.



# SCANIA SGI-12-ST BIO\_GAS

## POWER GENERATION CONVERSION TO BIO-FUEL

When an EU farm wanted to use its available methane supply better, they converted their SGI-12 to a 12-liter dual fuel SGI-12 gas engine to bio-fuel.

Now running on 45 to 60% Methane, the engine can also use LNG, CNG, LBG, or Natural Gas.



**ESD5526**



**ATB652T2F14**



NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2F14-24</a>	Integral throttle body electric actuator with feedback sensor controls air or air/fuel mixture
Speed Controller	<a href="#">ESD5526E</a>	Speed control unit is a closed loop control, with low current optimized PID



# TEDOM NATURAL GAS GENERATOR

## POWER

Tedom natural gas generator sets for industrial locations. It is tuned with an ESD5550 controller, making this 100 – 180 kW, 1.9 liter, a lean burn system.



### ESD5550



### ATB652T2F14



NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB652T2F14-24</a>	Integral throttle body electric actuator controls air or air/fuel mixture to a gaseous-fueled engine
Speed Controllers	<a href="#">ESD5550</a>	Speed control with fuel adjustments to help minimize startup issues and black smoke.

# SCANIA 6 CYL ENGINES 270KW GENERATOR

## VILLAGE WATER PUMP

Two Scania DC13 072A engines supported by a GAC solution provide power for three water pumps in a Brazilian town.

The GAC throttle body combines with the AFR speed controller to provide the tools to run lean, while protecting the engine.

This generator runs efficiently, consumes less fuel than a normal engine, and produces more power.



**ATB75T4N14**



**AFR201**



NOTE: All components sold separately.


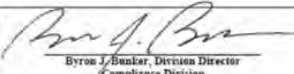
COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB75T4N14-24</a>	ATB T4 Series Integral Throttle Body Electric Actuators
Controller	<a href="#">AFR201</a>	Air-Fuel ratio management controller
Other	<a href="#">MXLB75</a>	Mixer, large bore.

# EPA APPROVED NATURAL GAS ENGINE

## KEEPING IT CLEAN

GAC's FIMS fuel management system allowed this Wisconsin motors engines to become EPA certified, running down 60% methane content in the fuel.

The Wisconsin Motors TM27 is a 4-cylinder, 2.7 L, LP or Natural Gas, 52 HP, 1500, 1800, 2000-2400 RPM, 12 V DC. Using the GAC ATB401T1N-12 with the AFR201 they achieved with EPA approval.

		UNITED STATES ENVIRONMENTAL PROTECTION AGENCY 2013 MODEL YEAR CERTIFICATE OF CONFORMITY WITH THE CLEAN AIR ACT OF 1990		OFFICE OF TRANSPORTATION AND AIR QUALITY ANN ARBOR, MICHIGAN 48105	
Certificate Issued To: Wisconsin Motors, LLC. (U.S. Manufacturer or Importer)		Effective Date: 09/25/2013		Issue Date: 09/25/2013	
Certificate Number: DWMLB02.7TM2-004		Expiration Date: 12/31/2013		Revision Date: N/A	
 Byron J. Bunker, Division Director Compliance Division					
Manufacturer: Wisconsin Motors, LLC. Engine Family: DWMLB02.7TM2 Certificate Number: DWMLB02.7TM2-004 Certification Type: Stationary (Part 60) Fuel: Natural Gas (CNG/LNG) Emission Standards: HC + NOx (g/kW-hr): 2.7 CO (g/kW-hr): 4.4 NMHC + NOx (g/kW-hr): 2.7 Emergency Use Only: N					
Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) as prescribed in those provisions, this certificate of conformity is hereby its nonroad engines, by engine family, more fully described in the documents. This certificate of conformity covers only those new nonroad spark-ignition documentation required by 40 CFR Part 60 and which are produced that not cover nonroad engines imported prior to the effective date of the cert. It is a term of this certificate that the manufacturer shall consent to all in warrant or court order may lead to revocation or suspension of this cert rendered void <i>ab initio</i> for other reasons specified in 40 CFR Part 60. This certificate does not cover large nonroad engines sold, offered for sa					



**ATB75T4N14**



**AFR201**

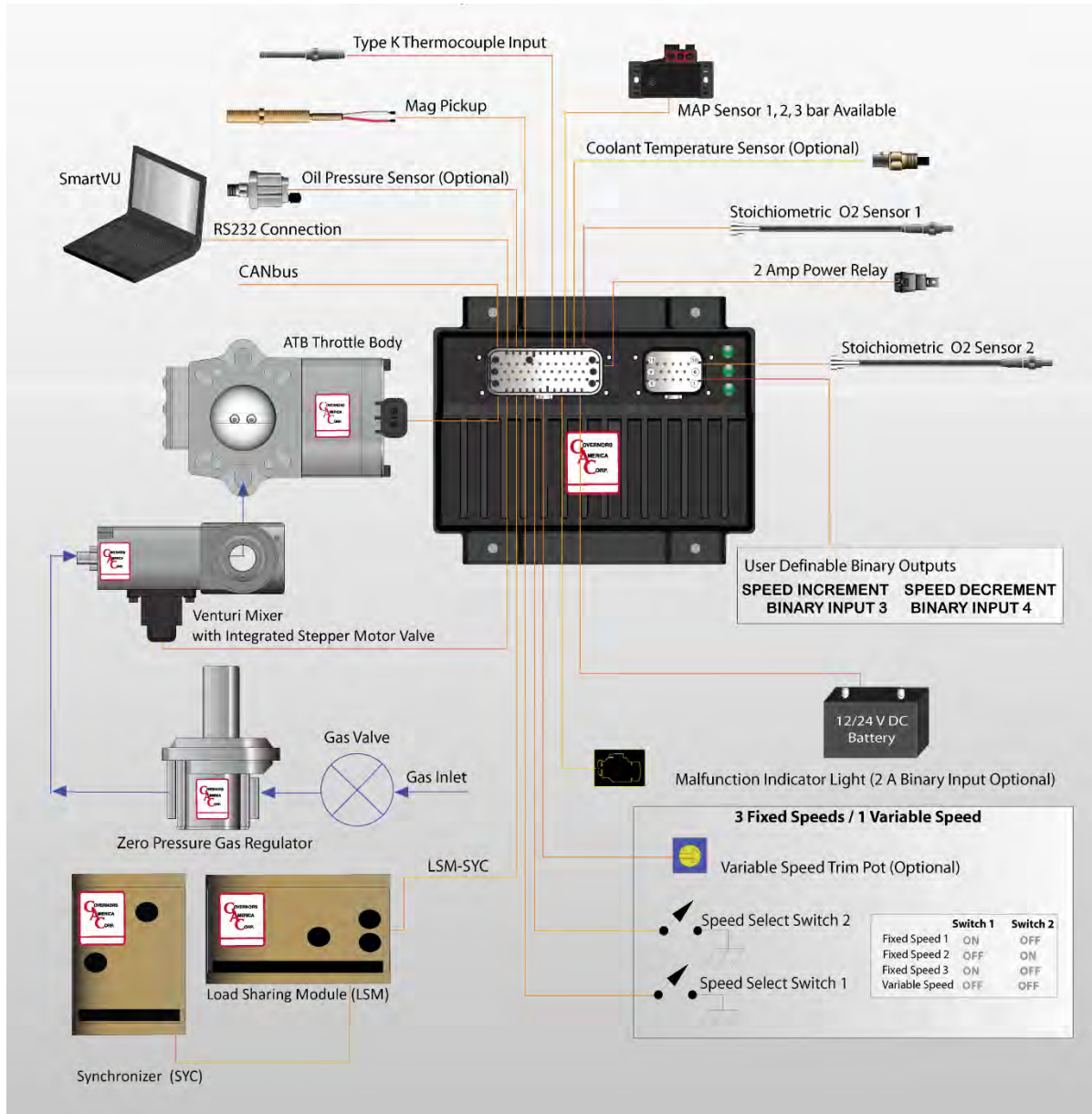


NOTE: All components sold separately.

COMPONENT	PART NUMBER	DESCRIPTION
Actuator	<a href="#">ATB75T4N14-24</a>	ATB T4 Series Integral Throttle Body Electric Actuators
Controller	<a href="#">AFR201</a>	Air-Fuel ratio management controller
Other	<a href="#">MXLB75</a>	Mixer, large bore.



# GENERIC AFR INSTALLATION



## AFR SOLUTION

The Air Fuel Ratio (AFR) 200 series controller is part of the GAC comprehensive fuel management system for gaseous-fueled, spark-ignited engines ranging from 1 L to 13 L+

The AFR used in a fuel management system applies to a wide range of gaseous fueled engines ranging from 1 L to 13 L+. The AFR200 series controllers, when used in conjunction with GAC [ICM200](#) (Ignition Control Module) series, offer a complete Fuel and Ignition Management Solution (FIMS) referred to as the FIMS500 system. Each of these controllers can work independently of the other in the event of a failure.

The AFR supports a universal actuator or a GAC actuator throttle body (ATB). Using engine displacement and operating RPM. Additional details on the complete [AFR Solution installation](#) is available on the GAC website.