

DISTINCTION IN THE WORLD OF ENGINE CONTROL



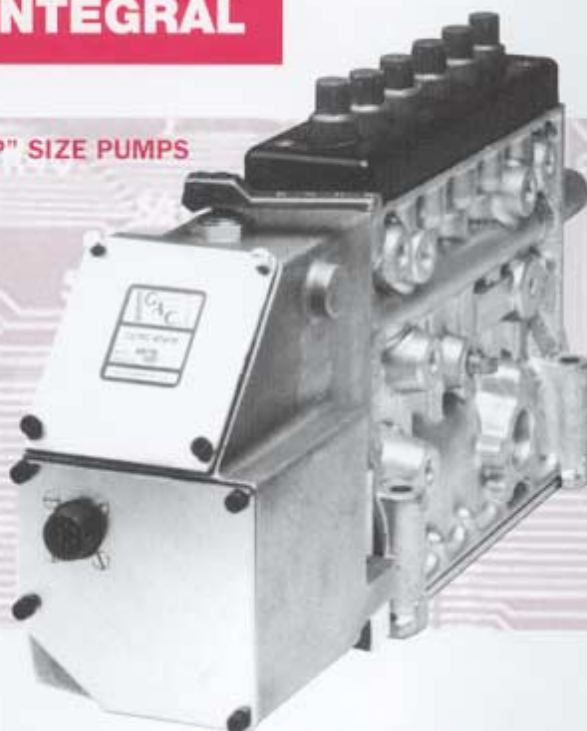
GOVERNORS
AMERICA
CORP.

ENGINE GOVERNING SYSTEMS

ELECTRIC ACTUATORS - INTEGRAL

GAC Proportional Electromagnetic Actuators position the engine fuel control mechanism. The highly reliable rotary design of the environmentally sealed actuators have no sliding parts, require no maintenance, and can accommodate any linkage configuration. The multiple voltage feature of the ACB and ADB types offer application convenience. Exceptional response times result in superior performance. For fail safe operation, an internal spring returns the actuator to minimum fuel when de-energized. For fuel management applications, position feedback transducers are available within various actuator series.

FOR "P" SIZE PUMPS



ACB275 Series

- mounts on the pump in place of the mechanical governor
- capable of controlling up to 12 cyl. pumps
- sealed to protect linkage and electromagnetic components from contamination
- connects directly to fuel rack without a bellows
- includes manual shut-off mechanism
- no external lubrication drain lines required
- position feedback transducer is available, model ACB 275F
- optimum performance for inline pumps
- MW pump adapter kit available

FOR STANADYNE PUMPS



ADC100 Series

- mounts directly on Stanadyne "D" Series pumps to eliminate brackets and external linkage
- automotive electrical connector
- actuator replaces fuel shutoff solenoid function
- sealed design prevents contamination of fuel
- faster response than competitive designs

FOR "A" SIZE PUMPS



ACD176

- mounts on the pump in place of the mechanical governor
- capable of controlling up to 8 cyl. pumps
- sealed to protect linkage and electromagnetic components from contamination
- connects directly to fuel rack without a bellows
- includes manual shut-off mechanism
- compact size, fast response
- cost effective design

ELECTRIC ACTUATORS - EXTERNAL



ADC120

- 1.0 lb-ft torque, 25° rotation, <32 msec. response
- small low cost model
- ideal for small fuel systems up to 150 hp with low friction
- suitable for rotary or small in-line fuel pumps or small carburetors



ADB120E4

- **new improved design** – meters fuel to Cummins engines with PT fuel systems
- fuel delivery capability – up to the V16 engine
- relief of fuel rail pressure insures fastest governor response
- field proven – best long life design for PT fuel systems
- Cummins Engine Co. approved



ADC225

- 2.2 lb-ft torque, 25° rotation, <45 msec. response
- low cost, versatile model
- suitable for multi-plunger fuel pumps and medium size carburetors



ACB2000

- 7.5 lb-ft torque, 25° rotation, <80 msec. response
- wide angular travel
- substantial reserve torque (up to 10 lb-ft) to move linkage systems with high inertia and moderate friction loads
- through shaft design and universal mounting simplifies installation
- sized for engines approximately 400 to 1800 hp.
- suitable for large carburetors, large fuel pumps and multiple injector systems



ADB225F

- same features as ADC225
- internal position feedback transducer incorporated

ELECTRONIC SPEED CONTROL UNITS

DIGITAL ENGINE CONTROL

GAC Speed Control Units are designed and manufactured in various configurations to meet application requirements using the latest analog and digital control technologies. Reverse battery polarity protection and fail safe protection in the event of loss of speed sensor signal or battery voltage is incorporated into every GAC Speed Control Unit.

A wide variety of application needs can be satisfied with GAC's constant or variable speed governing in isochronous or droop operation. All circuit boards are hard potted or conformally coated to be vibration and moisture resistant.



DSC1000

- **NEW** generation, microprocessor based engine control for use with EDC or GAC actuators
- applications include: gen sets, marine, mining and various other industrial applications
- engine emission controlled with: starting fuel, boost pressure fuel limiting, ramping functions and temperature sensing
- total fuel management i.e. multiple torque maps, multiple droop/isochronous options.
- end of line programming and field configurable design
- designed for high reliability
- fault indication with reduced power modes
- CAN bus data transfer (J1939) for total system integration
- modular software can be customized to the application with a standard PC

BASIC ISOCHRONOUS GOVERNING



ESD1000

- simple isochronous operation
- lowest cost speed control
- rugged hard potted design



ESD2100

- single engine isochronous operation
- precise speed control
- easy installation and adjustment
- adjustable PID functions



ESD2200

- all features of ESD2100
- extremely rugged hard potted
- single engine isochronous operation
- high performance design

THROTTLE POSITION FEEDBACK CONTROL



ESD5400

- all features of ESD5200
- compatible to position feedback actuators
- suitable for larger mass linkage and higher friction fuel control levers
- fuel limit function
- speed ramping control
- dual gain function

IGNITION SENSING CONTROLS



ECC200

- isochronous or low droop operation
- senses speed from ignition system or generator (no magnetic speed sensor required)
- available with 1, 2 or 3 speed settings
- available for fixed or variable speed control



ECC300

- senses speed from solid state ignition system (gas engines)
- rugged hard potted module
- available in multiple speeds or wide range variable speed models
- simple adjustment procedure
- low frequency sensing 20-200 hz

MULTI-FUNCTION CONTROLS



ESD5100

- all the features of ESD2100
- selectable droop operation
- adjustable idle speed
- interfaces with accessories
- multi-voltage unit
- soft coupler option



ESD5200

- all the features of ESD5100
- includes independent single element speed switch with Test/Reset switches
- integral speed switch with 10 amp relay output



ESD5300

- all the features of ESD5100
- two element speed switch included
- built-in ramp generator
- starting fuel limiting for engine emissions control



ESD5500

- all the features of ESD5100
- starting fuel ramping to minimize exhaust smoke
- starting fuel limiting/adjustment
- soft coupling feature

ELECTRONIC SPEED CONTROL UNITS

"C" SERIES CONTROLS

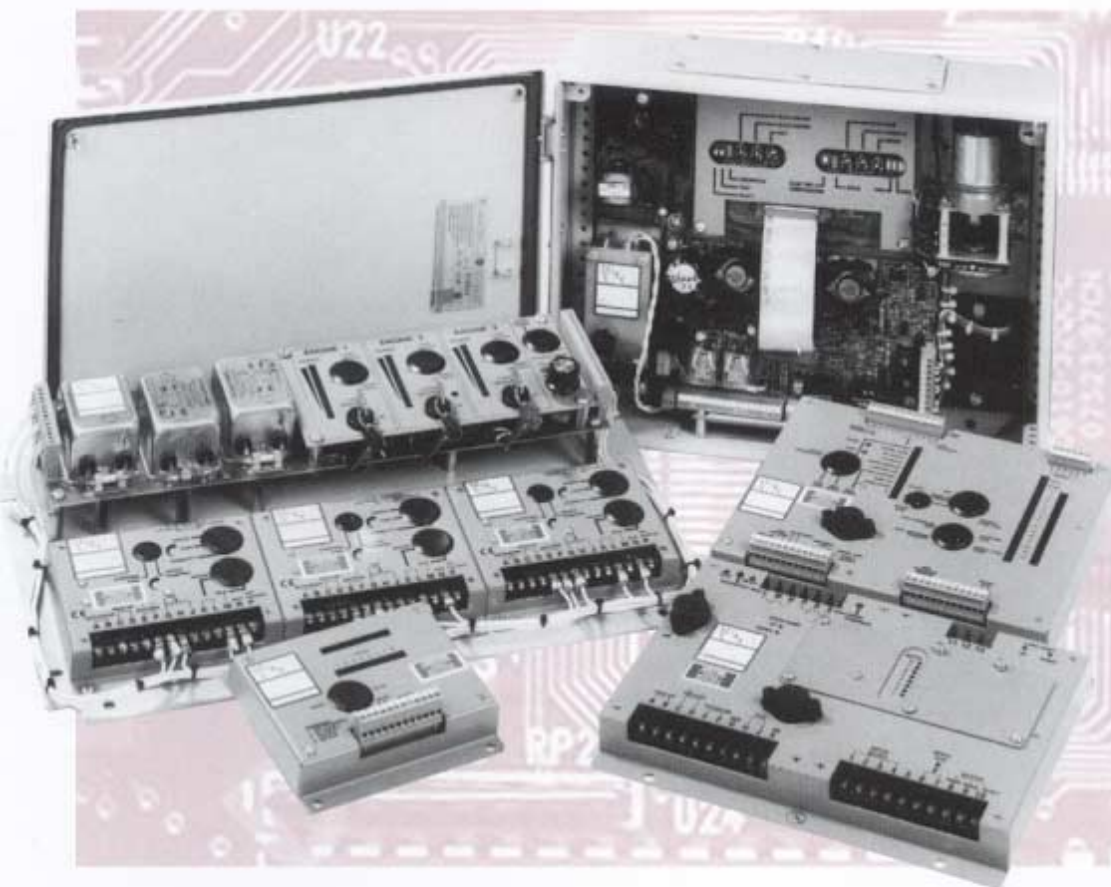
- exceptionally responsive phase locked loop design
- widest speed range, 33:1
- interfaces with all accessories
- meets military specification performance requirements
- supplied with military connector or convenient terminal block



ESC61C



ESC63C



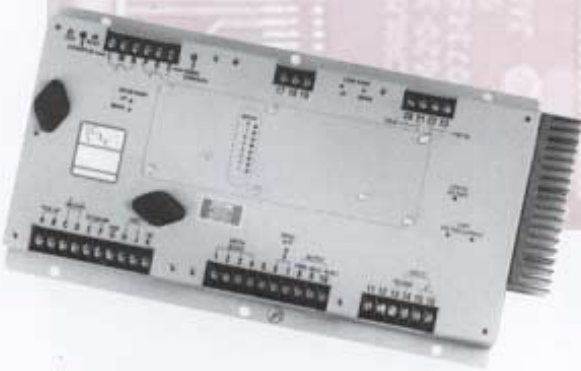
CUSTOM ENGINE CONTROL SYSTEMS

For specific engine control needs, Governors America Corp. can design and manufacture systems which are required to attain desired engine performance and application control results. Contact GAC's capable Engineering Department with your application requirements.

LOCOMOTIVE CONTROLS

GAC Locomotive Engine Controls provide both variable and eight notch speed control functions. For diesel electric applications, a complete speed and excitation control is available. Smooth speed and load changes are achieved with the built-in speed ramping function. Additional functions such as wheel slip, auto reset and speed switches are included.

SPEED & LOAD CONTROL



8 NOTCH SPEED CONTROL



WIDE RANGE SPEED CONTROL



LCC107A

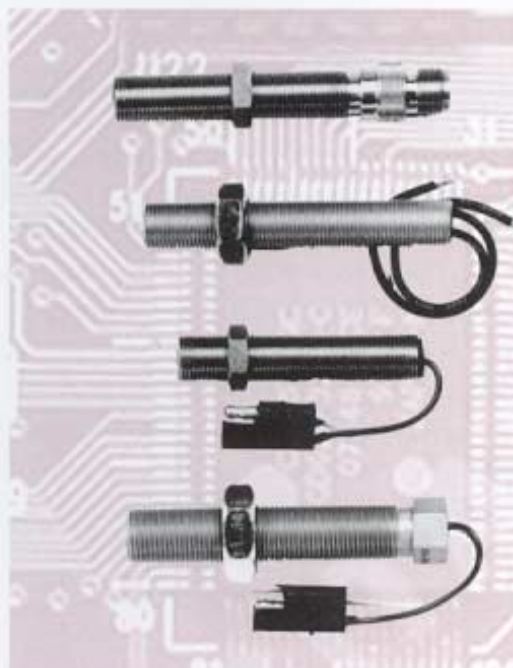
- 8 notch speed control with ramping
- dual wheel slip control inputs
- generator excitation control up to 110V @ 12 amps
- built-in 2 element speed switch
- isolated circuits for governor and excitation
- generator voltage and current limiting circuits
- false code protection

LCC200A

- 8 notch speed control
- built-in 2 element speed switch
- speed ramping accel/deceleration
- wheel slip control
- adjustable starting fuel
- start fuel ramping to minimize exhaust smoke

LCC300A

- wide range seamless speed control
- 0-10VDC or 0-20MA speed set inputs
- speed ramping accel/deceleration
- adjustable starting fuel
- starting fuel ramping to minimize exhaust smoke
- integral two element speed switch



MSP677

MSP6720

MSP6721

MSP6724

SPEED SENSORS

The Magnetic Speed Sensor detects when ring gear teeth, or other ferrous projections, pass the tip of the sensor. Electrical impulses are produced by the sensor's internal coil and sent to the speed control unit. The signal from the magnetic speed sensor, teeth per second (Hz.), is directly proportional to engine speed. Speed sensors are available in various lengths in both U.S. and metric threads. Wire leads, military connectors, automotive connectors or stud terminals are available. Over 15 styles are currently available.

GEN SET PARALLELING MODULES

LOAD SHARING MODULES

Load Sharing Modules allow for electrical load to be proportionally shared between two or more generator sets while the system frequency is held constant. As an accessory to the Electronic Governing System, the module measures the true power current, and through a parallel cable interconnection, continuously controls the governing system to share the load among multiple generators. An internal load anticipation circuit maximizes performance in single or parallel operation. In addition to their primary function of load sharing, the LSM201 and LSM672 also contain adjustable monitors for forward and reverse power and are available with a load ramping feature. The LSM201 can soft load and unload the generator.

BASIC LOAD SHARING



LSM100

- all electronic power sensing
- accurately measures true power
- load anticipation and droop adjustments included
- small, compact size

FORWARD and REVERSE POWER MONITORS



LSM672

- precise isochronous load sharing
- forward and reverse power monitors with relay outputs
- load anticipation function

POWER MONITORS and RAMPING POWER CONTROL



LSM201

- all the features of LSM100
- forward power monitor w/adjustable delay
- reverse power monitor w/adjustable delay
- mains power control with ramp
- load ramping (soft loading and unloading)
- power monitor with LED bar graph
- built-in parallel cable relay simplifies installation



SYC6714

- fast, automatic phasing synchronizer
- isolated high voltage/low power consumption A.C. inputs
- adjustable dynamics and breaker closure window
- LEDs provide status information

SYNCHRONIZER

The SYC6714 is designed to provide smooth, fast, automatic paralleling of generators at an economical cost. The synchronizer is an accessory module which automatically adjusts the engine governor to obtain an equal phase relationship between the oncoming generator and the main bus. A "SYNC CHECK" function is provided, and the unit activates an internal relay to parallel the generator to the main bus. The typical time for synchronization is usually less than 3 seconds when the generator sets are at rated speed with optimum governor performance settings. The synchronizer can be used with EAM modules to interface with competitive governors. For generator voltage control, see the Voltage Matching Module VMA100 on the following page.

SPEED RAMPING CONTROLS

These ramp generators are full time, linear electronic modules that adjust the governor speed setting. Their function is to accelerate and decelerate an engine at independently adjustable rates. Ramped engine speed is useful in minimizing the smoke and noise associated with rapid engine speed changes.



RSC671

- wide range, infinite resolution, adjustable, up/down engine speed ramping
- accepts process control 4-20 ma input or voltage ranges from 0 to 10v
- for applications requiring smooth variable speed operation

RSC672

- smoothly ramps up to operating speed and down to idle on switch contact
- primarily for generator set or two speed applications

GENERATOR CONTROLS

The Power Ramp Control, PRC100A is designed to regulate the power output of one to five engine generators when in parallel with a main utility bus. This device can smoothly control the power output of all the generators by using ramping to load/unload or load limit. It also can be controlled by an external power signal to regulate the export or import of power to maintain the mains at a specific power level.

POWER RAMP CONTROL



PRC100A

- controls an entire group of engines
- bumpless loading and unloading
- zero power indicator
- high and low load limit adjustments

VOLTAGE MATCHING MODULE



VMA100

- voltage matching within selectable triple tolerance bands
- out of voltage range - auto shut off
- transient protected and internal shielding of AC/DC circuits
- provides enable signal to synchronizer to form total voltage and phase control system
- internal raise/lower relays interface to external voltage adjusting circuits

LOAD ANTICIPATION MODULES FOR GEN SETS

Increased governor system performance is achieved by sensing electrical load changes prior to engine speed changes. The signal provided to the speed control unit by the LAM100 causes the governor system to react to the load change more quickly.



LAM100

- improves genset transient performance
- directly senses electrical load changes
- multiple outputs adjustable to match all speed control units

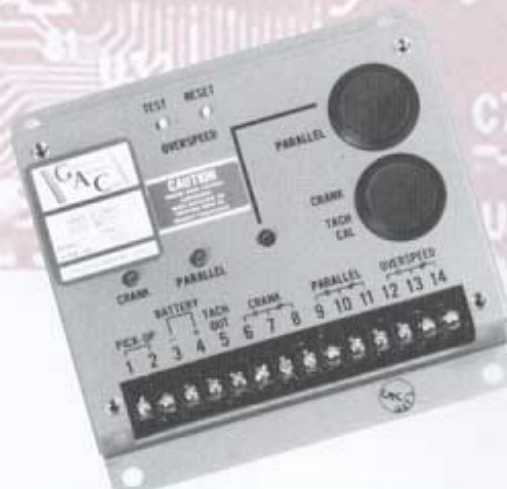
SPEED SWITCHES

GAC Speed Switches sense engine speed from a magnetic speed pick-up and activate an internal relay to provide output for crank termination, intermediate speed monitoring or overspeed protection.



SSW674 (one element)

- high or low selectable speed ranges to suit most control requirements
- selectable latching or non-latching relay output
- tachometer output voltage signal
- loss of speed sensor protection
- small, compact, low cost



SSW675/SSW676 (two or three element)

- crank termination, overspeed sensing (SSW675)
- SSW676 has third element for paralleling, under frequency, or any intermediate speed monitoring
- convenient overspeed test and reset functions
- 10 amp relay outputs with LED indicators
- analog tachometer output voltage signal



INTERFACE MODULES

Interface Modules are available to facilitate the use of GAC load sharing modules and auto synchronizers with other manufacturer's speed controls.

- EAM100 allows GAC load sharing modules and synchronizers to be used with CUMMINS EFC speed controls
- EAM101 allows GAC load sharing modules and synchronizers to be used with DYNA 8000 and DYNA 1 controls
- EAM103 allows for Barber Colman load sharing modules and synchronizer to be used with GAC speed control units.
- EAM104 allows for GAC load sharing modules and synchronizer to be used with DDEC 3 controllers.
- EAM105 allows for GAC load sharing modules and synchronizer to be used with Heinzmann KG6-04/10-04 speed controls.
- EAM106 allows GAC load sharing modules and synchronizers to be used with CUMMINS EFC digital speed controls.
- LSI100 allows GAC load sharing modules to be used with Woodward 2301 load sharing controls with grounded parallel cable designs.

PORTABLE TEST SET

The TSE 100 is a portable test set that is used to evaluate the operation of ESC and ESD speed control units from GAC.

The TSE 100 can operate in any of three modes. Mode 1 tests the unit prior to installation using an internal engine simulation, Mode 2 utilizes the engine battery for power so that the actuator can be tested and Mode 3 monitors the speed control unit while it is controlling the engine speed.



TSE100

GOVERNOR SYSTEM INSTALLATION KITS

Governor System Installation Kits provide the necessary brackets, cables, and hardware to install a GAC Electronic Governor. Each kit is custom designed for a specific engine model and application. Contact GAC for assistance in selecting the correct kit for your application requirements.



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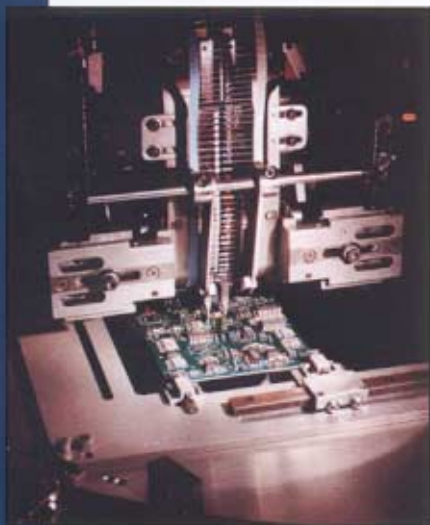


Governors America Corporation is proud to provide products and services for the following array of engines:

- CATERPILLAR
- CUMMINS
- DETROIT DIESEL
- JOHN DEERE
- DEUTZ
- FORD
- GM
- HERCULES
- IVECO
- ISUZU
- KUBOTA
- KOMATSU
- MTU
- MAN
- MERCEDES
- MITSUBISHI
- PERKINS
- LISTER PETTER
- SCANIA
- VM
- VW
- VOLVO

and many more.

GOVERNORS AMERICA CORPORATION provides innovative and specialized engine control products to an international base of customers. GAC products are vital components of generator set, materials handling, marine propulsion, locomotive, off-highway and numerous other applications. The company is focused on the development, production, marketing and distribution of electromechanical and electronic controls for engines.



A broad technically advanced line of Electronic Governing Systems is the foundation of the GAC product family. GAC control systems range in complexity from basic single speed isochronous governors to sophisticated multi-engine load sharing/power control systems, locomotive engine controls, nuclear hardened engine governor devices and a variety of complementing governor system components. Complete installation kits designed for a variety of specific engines are available.

New product development is an ongoing priority at GAC. To maintain its leadership in the engine controls field, GAC utilizes the most advanced technologies available for the development of all its products.

The company's headquarters, engineering, sales administration and manufacturing operations are located in a newly expanded facility in the Agawam Industrial Park. This additional manufacturing capacity allows GAC to meet increasing demand for its products around the world.

GAC's Quality Assurance Group maintains an established quality system and is implementing the procedures necessary to receive ISO 9001 certification. A QA manager directs the group's quality assurance technicians and inspectors. In compliance with the EMC standards in effect since January 1996, GAC has received CE approval for various governor speed control units and autparalleling accessories.

GAC is truly a global company with a customer base that extends to all corners of the world. Engine control systems are currently provided to a host of engine manufacturers, engine distributors and OEMs that incorporate industrial engines as part of their products. GAC has established an international sales and service network that provides representation on six continents.

Governors America Corporation provides superior response to any engine control needs. Our experience in the field of engine controls and our reputation for unmatched customer service has resulted in GAC being selected as the engine control solution partner by an impressive list of international companies.



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