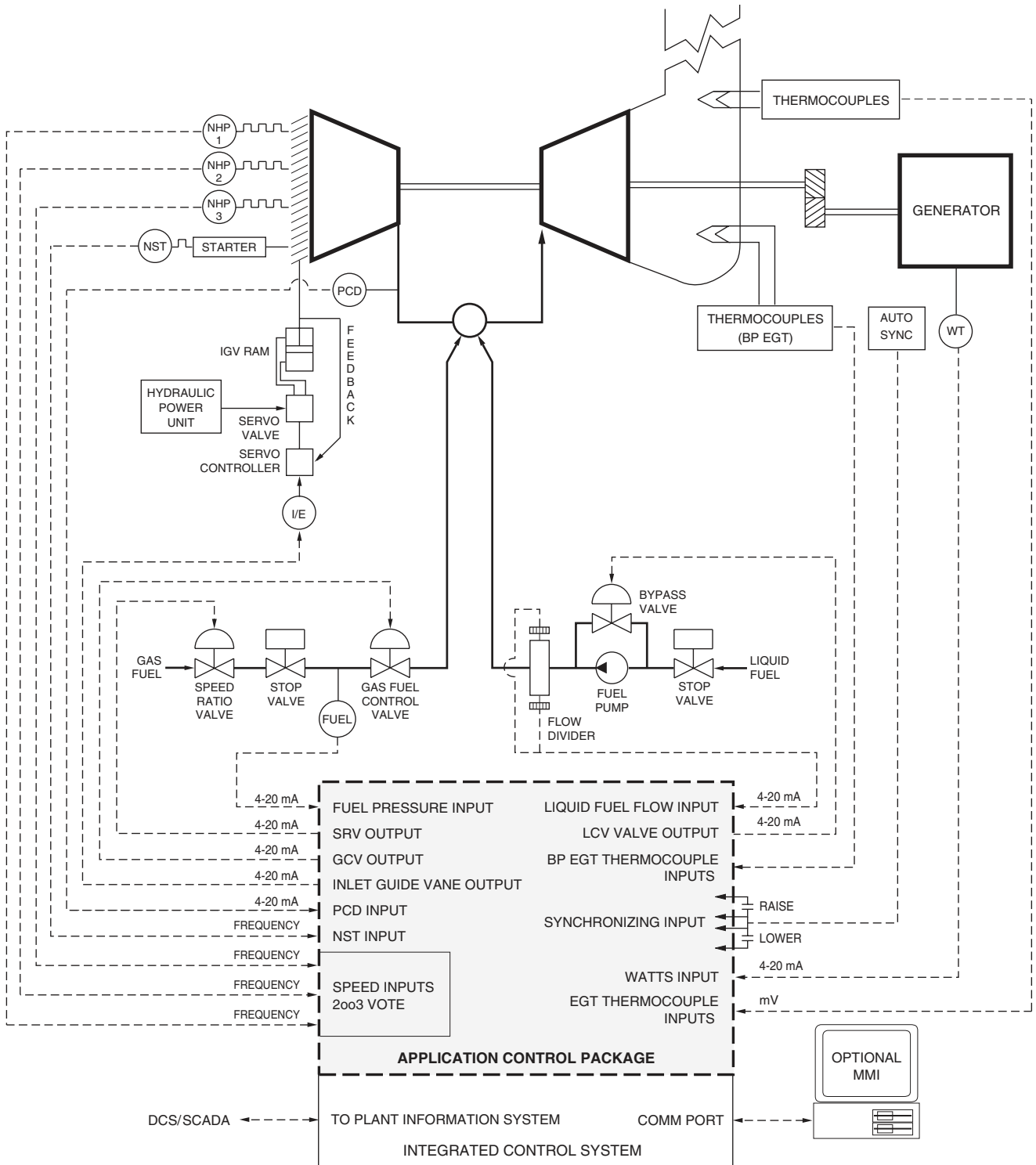


GE® LM5000 GAS TURBINE GENERATOR DRIVE APPLICATION CONTROL PACKAGE



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Simplified schematic showing a Petrotech GE® LM5000 gas turbine generator drive application control package integrated into an advanced control system. Shown with dual fuel system.



APPLICATION

The Petrotech GE® LM5000 gas turbine gen set application control package replaces older mechanical/hydraulic/electronic/pneumatic gas turbine fuel regulators with a modern, reliable application control package which runs on an open architecture advanced PLC-based system. The control package for the gas turbine provides on-line dual fuel control, speed ratio control, and inlet guide vane control based on temperature.

ADVANTAGES

• Hardware independent system:

Application control package's portability allows customer choice of PLC platform, reducing need for additional spare parts and training expenses. Available PLCs include General Electric 90-70 and 90-30, Siemens/TI, Modicon Quantum and Allen-Bradley.

• Fault tolerant:

Control package is available on fault tolerant controllers for critical control applications.

• Simplified interface to DCS or SCADA:

Communication tasks are handled with a separate, dedicated module in the PLC, increasing data rate and simplifying network installation.

• Improved fuel regulation:

Fast loop sampling rate, combined with modern digital control techniques, improves steady-state setpoint control, and reduces overshoot during transients, allowing full load rejection without driving the unit into overspeed.

• Improved start-up reliability:

Special "lean lightoff" procedure ignites all burners with essentially 100% reliability, and with greatly reduced thermal stress.

• Improved exhaust temperature monitoring and control:

Advanced statistical algorithms detect turbine hot/cold spots and automatically reject failed thermocouples.

• Fail-safe features:

Redundant overspeeds; open/short monitoring of mA and thermocouples; readback monitoring of outputs, and special self-check features improve safety.

• Non-proprietary interfaces:

Simple 4-20 mA, RTD, thermocouple, and dry contact I/O allow simple interface to existing sequence/protection logic unit, making low-cost partial upgrades practical, and system troubleshooting simple.

• Improved operator information with optional MMI:

Optional Man-Machine Interface MS Windows-based graphic operator interface displays system status, trending and data logging, which can be used as part of a preventive maintenance program.

SCOPE OF SUPPLY

The application control package for the GE® LM5000 gas turbine generator drive system, includes:

Analog inputs, 4-20 mA:

- Watts (load control)
- Compressor discharge pressure (PCD)
- Fuel interstage pressure

Analog inputs, frequency:

- Three (3) redundant NHP
- One (1) starter speed

Analog inputs, mV:

- EGT (up to 18 thermocouples)

Analog outputs, 4-20 mA:

- Watts (load control).
- Compressor discharge pressure (PCD).
- Fuel interstage pressure.

Analog inputs, frequency:

- Three (3) redundant NHP.
- One (1) starter speed.

Analog inputs, mV:

- EGT (up to 18 thermocouples).

Analog outputs, 4-20 mA:

- Speed ratio valve position setpoint.
- Fuel control valve position setpoint.
- Inlet guide vane position setpoint (if applicable).

Operating states:

- Firing
- Warm-up
- Accelerate
- Load
- Upset

Status, alarms, and shutdowns:

- Fault.
- NHP overspeed alarm
- NHP underspeed alarm
- NHP overspeed shutdown
- Redundant NHP overspeed shutdown
- Δ NHP alarm
- High blade path EGT alarm
- High blade path EGT shutdown
- Low blade path EGT shutdown
- High EGT alarm
- High EGT shutdown
- Low EGT shutdown
- Rejected thermocouple
- Too few thermocouples shutdown
- Δ T alarm
- Δ T shutdown
- Thermocouple spread alarm
- Thermocouple spread shutdown
- Turbine maximum limit
- Turbine minimum limit
- NHP speed #1
- NHP speed #2
- NHP speed #3
- NHP speed #4
- NHP speed #5
- EGT switch #1
- Blade path EGT switch #1
- Bolt test



- Manual
- Starter overspeed
- Starter zero speed
- High firing fuel pressure shutdown
- PCD bias active
- Flow following error
- Transmitter failure alarms
- Transmitter failure shutdowns
- Output failure shutdowns
- Control mode

Controllers/Special Features

- Start-up controller for fuel valve
- NHP controller for fuel valve
- NHP acceleration controller for fuel valve
- EGT controller for fuel valve
- EGT rate of rise controller for fuel valve
- Blade path EGT controller
- Blade path EGT/PCD schedule
- EGT controller for inlet guide vanes (if applicable)
- Combustion monitoring system
- Dual fuel capability with on-line transfer

Ramps:

- Firing (lean lightoff) ramp
- Start-up ramp
- Loading ramp
- Cooldown ramp

Does not include:

- PLC hardware
- Gas turbine sequencing and protection discrete logic
- Generator sequencing and protection discrete logic
- Synchronizing and regulation equipment
- End elements

OPTIONS FOR COMPLETE CONTROL SYSTEM UPGRADE

- Gas turbine sequencing and protection discrete logic
- Generator sequencing and protection discrete logic
- Communication interface to DCS or SCADA
- PLC hardware
- Man machine interface unit with WonderWare InTouch® licensed software package
- Complete custom engineered control panel, factory tested and ready to install
- Fuel valve system upgrade
- Inlet guide vanes actuator system upgrade or retrofit
- Thermocouple upgrade
- Flame sensor upgrade
- Vibration system upgrade
- Installation and commissioning
- Training

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