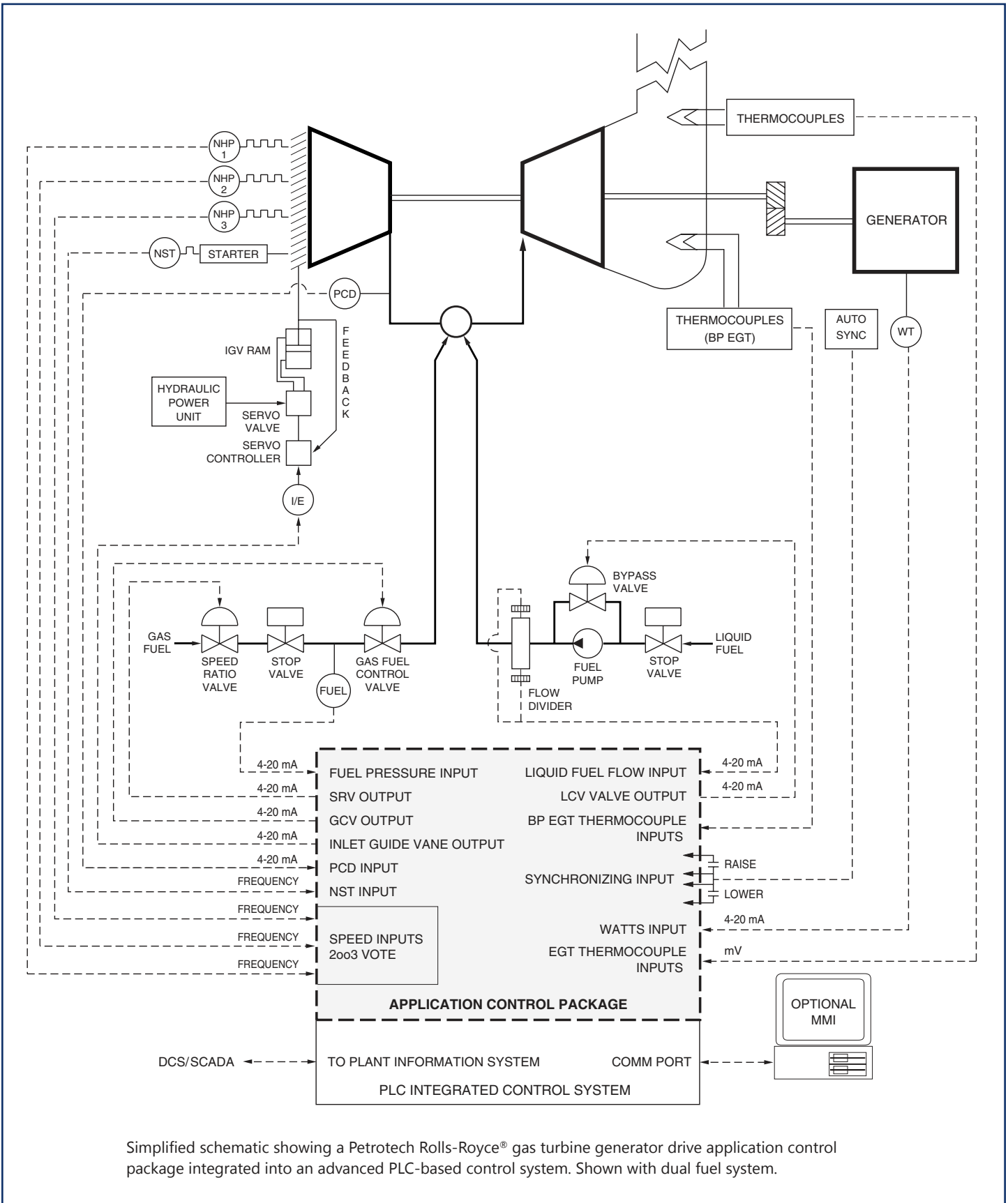


ROLLS-ROYCE® GAS TURBINE GENERATOR DRIVE APPLICATION CONTROL PACKAGE



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Simplified schematic showing a Petrotech Rolls-Royce® gas turbine generator drive application control package integrated into an advanced PLC-based control system. Shown with dual fuel system.



APPLICATION

The Rolls-Royce® gas turbine generator 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, Siemens/TI, Modicon, 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 Rolls-Royce® 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:

- 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.



SCOPE OF SUPPLY - Continued

- 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.
- 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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