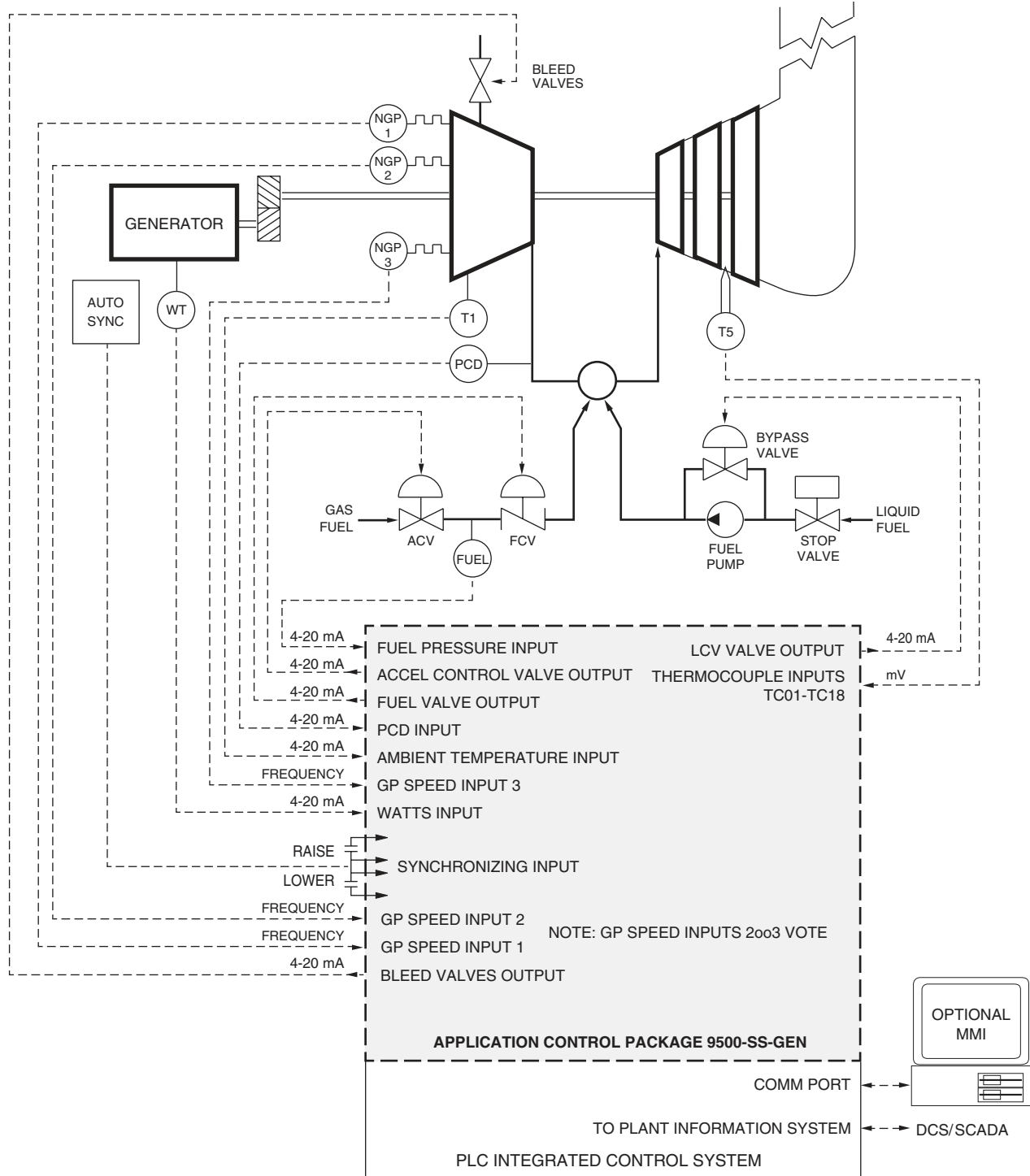# SOLAR SATURN® GAS TURBINE GENERATOR DRIVE APPLICATION CONTROL PACKAGE

PETROTECH

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Simplified schematic showing a Petrotech Solar Saturn® gas turbine generator drive application control package integrated into an advanced PLC-based control system.

APPLICATION

The Petrotech Solar Saturn® application control package replaces older mechanical/hydraulic/electronic/pneumatic Solar Saturn® fuel regulators with a modern, reliable application control package which runs on an advanced PLC-based system. The control package for the gas turbine generator set provides fuel control, acceleration control, and bleed valve control.

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, Allen-Bradley, and Modicon.

- **Fault tolerant:**

  Control package is available on Triplex 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.

- **Improved start-up reliability:**

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

- **Improved engine 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.

- **Reduced maintenance and calibration:**

  Acceleration control valve schedule is integrated into the application control package, increasing reliability while decreasing system complexity.

SCOPE OF SUPPLY

The application control package for Solar Saturn® gas turbine generator drive system, includes:

Analog inputs, 4-20 mA:
- Watts (load control)
- Compressor discharge pressure (PCD)
- Fuel interstage pressure
- Ambient temperature (T1)

Analog inputs, frequency:
- Three (3) redundant NGP
- Three (3) redundant NPT

Analog inputs, mV:
- T5 (up to 18 thermocouples)

Analog outputs, 4-20 mA:
- Acceleration control valve position setpoint
- Fuel control valve position setpoint
- Bleed valve position setpoint

Operating states:
- Firing
- Warm-up
- Accelerate
- Synchronize
- Load

Status, alarms, and shutdowns:
- Fault
- GP overspeed alarm
- GP underspeed alarm
- GP overspeed shutdown
- Redundant GP overspeed shutdown
- $\triangle$GP alarm
- NPT overspeed alarm
- NPT underspeed alarm
- NPT overspeed shutdown
- Redundant NPT overspeed shutdown
- $\triangle$NPT alarm
- High T5 alarm
- High T5 shutdown
- Low T5 shutdown
- Low T5 delayed alarm
- High T5 delayed shutdown
- Rejected thermocouple.
- Too few thermocouples shutdown.
- $\triangle$T alarm
- $\triangle$T shutdown
- Thermocouple spread alarm
- Thermocouple spread shutdown
- Turbine maximum limit
- Turbine minimum limit
- GP speed #1
- GP speed #2
- GP speed #3
- GP speed #4
- GP speed #5

SCOPE OF SUPPLY-Continued

- NPT speed #1
- NPT speed #2
- T5 switch #1
- Manual
- High firing fuel pressure shutdown
- Transmitter failure alarms
- Transmitter failure shutdowns
- Output failure shutdowns
- Control mode

Controllers/special features:
- Start-up controller for fuel valve
- GP controller for fuel valve
- NPT controller for fuel valve
- T5 controller for fuel valve
- Bleed valve controller
- Acceleration control
- Combustion monitoring system
- Isochronous loadsharing
- Bumpless transfer between droop and isochronous modes

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 SCAD
- PLC hardware
- Man machine interface unit with WonderWare InTouch® licensed software package
- Complete custom engineered control panel, factory tested and ready to install
- Fuel control valve system upgrade
- Acceleration control valve system upgrade
- Inlet guide vanes actuator system upgrade or retrofit
- Bleed valve actuator system upgrade
- Thermocouple upgrade
- Synchronizing and regulation equipment
- Vibration system upgrade
- Installation and commissioning
- Training