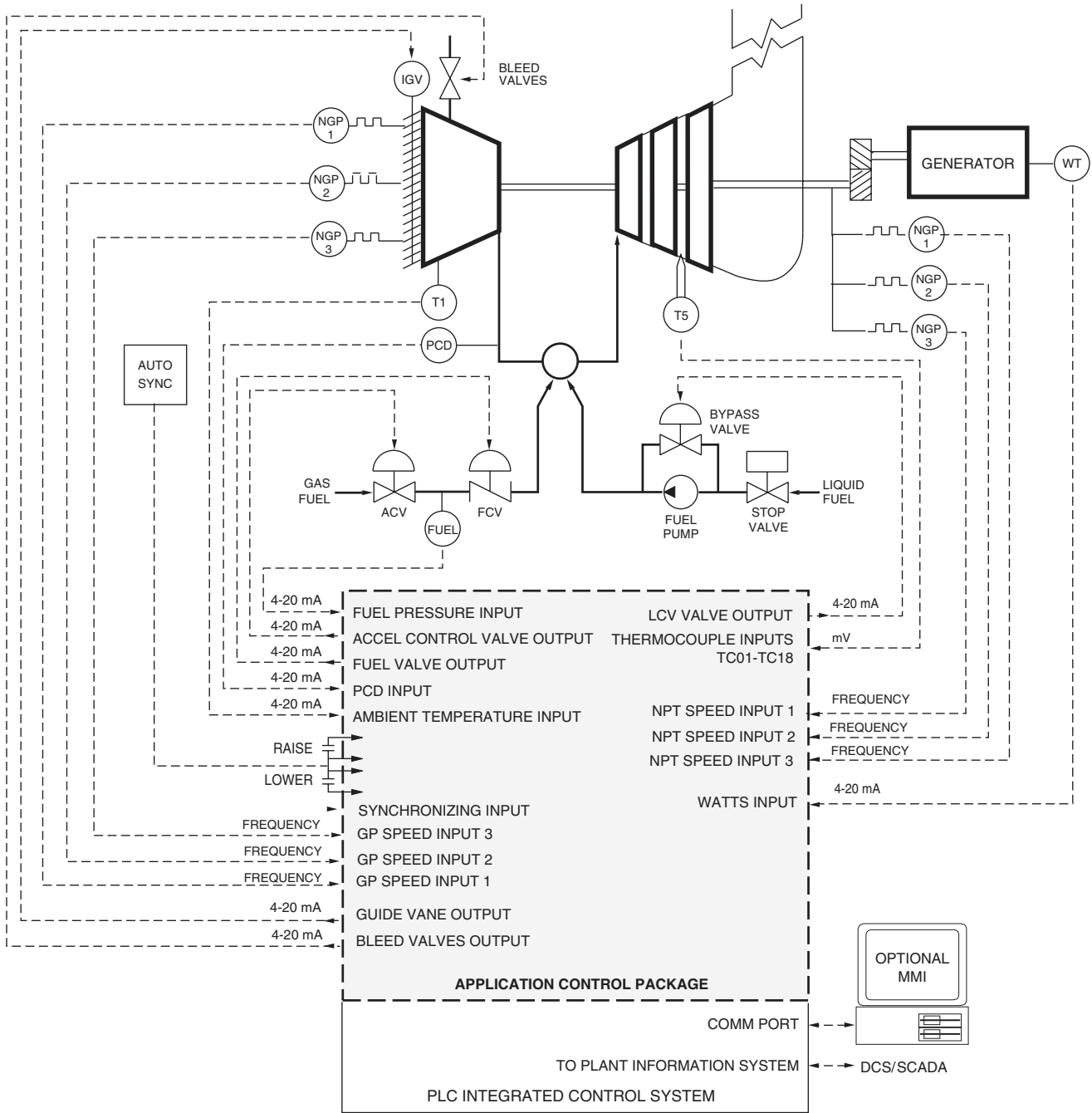


SOLAR MARS® GAS TURBINE GENERATOR DRIVE APPLICATION CONTROL PACKAGE



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



APPLICATION

The Petrotech Solar Mars® application control package replaces older mechanical/hydraulic/electronic/pneumatic Mars® 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, inlet guide vane 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 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

Application control package for Solar Mars® 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:

- Up to Three (3) redundant NGP Speed.
- Up to Three (3) redundant NPT Speed.

Analog inputs, mV:

- T5 (up to 18 thermocouples).

Analog outputs, 4-20 mA:

- Acceleration control valve position setpoint.
- Fuel control valve position setpoint.
- Inlet guide vanes position setpoint (if applicable).
- Bleed valve position setpoint.

Operating states:

- Firing.
- Warm-up.
- Accelerate.
- Synchronize.
- Load.

Status, alarms, and shutdowns:

- Fault .
- GP overspeed alarm.
- GP underspeed shutdown.
- GP overspeed shutdown.
- Redundant GP overspeed shutdown.
- ΔGP alarm
- NPT overspeed alarm.
- NPT underspeed shutdown.
- NPT overspeed shutdown.
- Redundant NPT overspeed shutdown.
- ΔNPT alarm
- High T5 alarm.
- High T5 shutdown.
- Low T5 shutdown.
- Low T5 delayed alarm.
- High T5 delayed shutdown.
- Rejected thermocouple.
- Too few thermocouples shutdown.
- ΔT alarm
- ΔT shutdown
- Thermocouple spread alarm.
- Thermocouple spread shutdown.
- Turbine maximum limit.
- Turbine minimum limit.
- GP speed #1.
- GP speed #2. (If used)
- GP speed #3. (If used)



SCOPE OF SUPPLY - Continued

- NPT speed #1.
- NPT speed #2. (If used)
- NPT speed #3. (If used)
- 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.
- Inlet guide vane controller.
- 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 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 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.

Petrotech, Inc.
 151 Brookhollow Esplanade
 New Orleans, Louisiana 70123
 USA

Phone: (504) 620-6600
 Fax: (504) 620-6601
 Email: info@petrotechinc.com
 Website: www.petrotechinc.com