ALLISON 501-KB® GAS TURBINE GENERATOR DRIVE APPLICATION CONTROL PACKAGE

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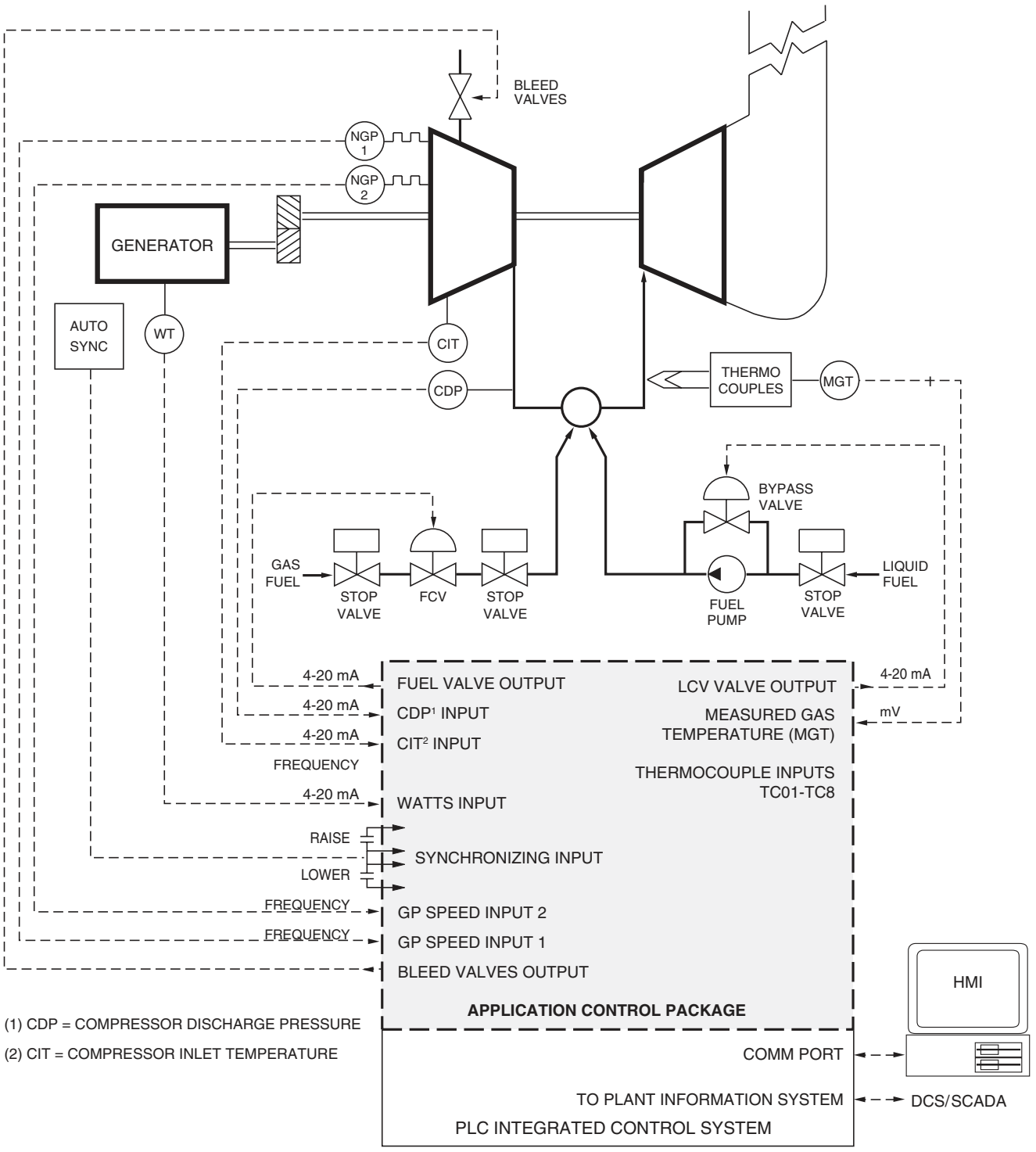

Simplified schematic showing a Petrotech Allison 501-KB® gas turbine generator drive application control package integrated into an advanced PLC-based control system.

APPLICATION

The Allison 501-KB® gas turbine generator drive application control package replaces older mechanical/hydraulic/electronic/pneumatic fuel regulators with a modern, reliable application control package which runs on an advanced PLC-based system. The control package for the gas turbine provides fuel control and bleed valve control.

ADVANTAGES

- **Hardware independent system:**
  Application control package's portability allows customer choice of platform, reducing need for additional spare parts and training expenses. Available PLCs include General Electric, Siemens, 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 improve 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 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 and reliability.
- **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 HMI:**
  Optional Human Machine Interface MS Windows-based graphic operator interface displays system status, trending and data logging, which can be used as part of a preventative maintenance program.

SCOPE OF SUPPLY

The application control package for the Allison 501-KB® gas turbine generator drive system, includes:

Analog inputs, 4-20 mA:
- Watts (load control).
- Compressor discharge pressure (CDP)
- Compressor Inlettemperature (CIT)

Frequency Iputs:
- Two (2) redundant NGP

Analog inputs, mV:
- MGT (up to 8 thermocouples)

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

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

Status, alarms and shutdowns:
- Fault
- GP overspeed alarm
- GP underspeed shutdown
- GP overspeed shutdown
- Redundant GP overspeed shutdown
- △GP alarm
- High MGT alarm
- High MGT shutdown
- Low MGT shutdown
- Low MGT delayed alarm
- Rejected thermocouple (TC)
- Too few thermocouples shutdown
- Thermocouple spread alarm
- Thermocouple spread shutdown
- Manual
- High firing fuel pressure shutdown
- Transmitter failure alarms
- Transmitter failure shutdowns
- Output failure shutdowns
- Control mode

SCOPE OF SUPPLY - Continued

Controllers/special features:

- Start-up controller for fuel valve
- NGP controller for fuel valve
- MGT controller for fuel valve
- MGT rate of rise controller
- Fuel acceleration schedule
- Fuel deceleration schedule
- Deceleration rate limiter.
- Corrected speed (CNGP) override
- Bleed valve controller
- Combustion monitoring system
- Stagnation detection system
- Dual fuel capability with online transfer

Ramps:

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

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
- Human machine interface unit with licensed HMI software package
- Complete custom engineered control panel, factory tested and ready to install
- Fuel control valve system upgrade
- Bleed valve actuator system upgrade
- Thermocouple upgrade
- Synchronizing and regulation equipment
- Vibration system upgrade
- Installation and commissioning
- Training

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