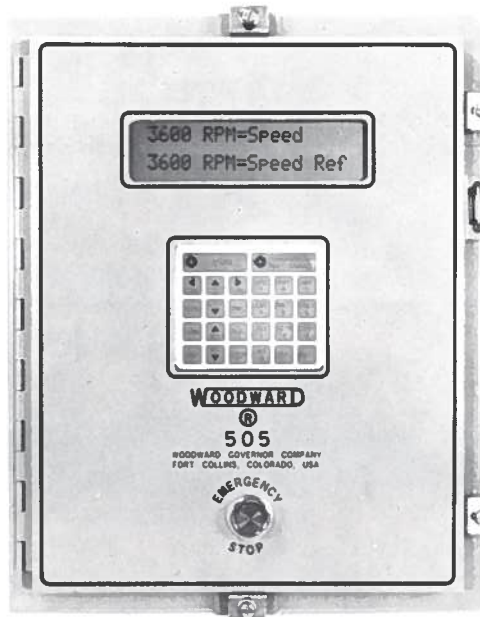


# 505/505E

## Digital Governors For Steam Turbines



- Microprocessor-Based Digital Control
- Field-Configurable
- User-Friendly Menu Format
- View Program & Change Dynamics While Running
- LCD Display of All Governor/Turbine Parameters
- CSA Approved, Class I, Div 2, Grps A-D
- Isochronous Load Sharing Capability
- Modbus® Communications

### APPLICATION

#### 505

The 505 is designed to control single or split-range actuator applications, interfacing with either one or two electrohydraulic, pneumatic, or electric actuators. Typical functions include turbine speed control, load control, inlet pressure control, exhaust pressure control, import/export control, and isochronous loadsharing (through a DSLC). Depending on your application, other control functions are available.

#### 505E

The 505E is designed for single-extraction, and/or admission industrial process applications, interfacing with two electrohydraulic, pneumatic, or electric actuators. Typical functions include turbine speed control, extraction and/or admission

control, load control, inlet pressure control, exhaust pressure control, import/export control, and isochronous loadsharing (through a DSLC). Depending on your application, other control functions are available.

### DESCRIPTION

Woodward's 505 and 505E Digital Governors are microprocessor-based controls designed for industrial steam turbines or small utility turbogenerators. The 505 and 505E can load share with any system using Woodward's DSLC line of power control devices. They are easily configured and operated in the field via a user-friendly menu format. Easy to follow instructions are presented in either English or Spanish (505 only) through a two-line display. Operators can view actual and setpoint values on the same screen. Its standard NEMA 4 and

optional NEMA 4.X construction withstands harsh environments. Both controls are versatile enough to be mounted locally at the turbine or remotely in the control room. Best of all, the implementation requires minimal engineering and installation costs.

## STANDARD PROGRAM FEATURES

### MENU FORMAT

#### Configuration Blocks

- TURBINE START
- SPEED CONTROL
- SPEED REFERENCE
- EXTR/ADM CONTROL (505E)
- AUXILIARY CONTROL (505)
- CONTACT INPUTS
- SHUTDOWN LOGIC
- VALVE LIMITERS
- DROOP
- CRITICAL SPEEDS
- IDLE/RATED
- UNITS
- REMOTE INPUT
- CASCADE CONTROL
- RELAY OUTPUT
- HAND VALVES
- ANALOG READOUT
- COMMUNICATIONS

#### Standard Features

Two-line, liquid-crystal display (LCD) readout, 20 alphanumeric characters per line

Display screens show all information needed to operate the control (rpm, kW, psi, etc.)

Auxiliary control PID channel for use as kW or process control (505)

Configurable for extraction, admission, or extraction and admission applications (505E)

Remote control through contact interfaces, a 4-20 mA remote speed/load input, and/or a RS-232 (Modbus) port

Cascade control channel for process control through adjustment of the speed PID's reference

True isochronous loadsharing (through a Woodward DSLC)

Valve limiters to manually limit valve position

Four programmable 4-20 mA analog readouts  
RS-232 (Modbus ASCII or RTU) port for operational mode communications

CPU watch-dog, power supply monitoring, and power-up diagnostics

Woodward worldwide service supported by Woodward's service and applications engineers

## OPTIONAL ACCESSORIES

Digital Speed Matching (DSM) synchronizer – used for automatic synchronizing

Digital Synchronizer and Load Control (DSLCL) – used for automatic synchronizing and isochronous loadsharing

Real Power Sensor – used to sense and control generator power

Dual Power Source – used for selecting redundant or alternate power sources

## CONTROL SPECIFICATIONS

### INPUTS

Power – 24 Vdc, 125 Vdc, 115 Vac, 50/60 Hz

Speed – one or two MPUs (magnetic pickups), 1.0 Vrms to 30 Vrms, 350 Hz to 12 kHz

Remote input – 4-20 mA (speed reference or DSLCL)

Cascade control – 4-20 mA

Auxiliary control – 4-20 mA (505)

Extraction/Admission control – 4-20 mA (505E)

kW/load input – 4-20 mA

Six preset contact inputs – External Emergency Shutdown, External Clear (reset alarms), Generator Breaker Aux Contact, Utility Tie Breaker Contact, Raise Speed Contact, Lower Speed Contact

Ten programmable contact inputs – the options are: External Stop, External Run, Raise Valve Limit (HP & LP for 505E), Lower Valve Limit (HP & LP for 505E), Auxiliary Reference Raise and Lower (505), Extraction\Admission Reference Raise and Lower (505E), Extraction, Cascade Reference Raise, Cascade Reference Lower, MPU Failed

Override, Overspeed Test, Idle/Rated Select, Enable Cascade Control, Enable Remote Input, Start Enable, Enable Ext/Adm Control, Ext/Adm demand Raise, and Lower, Enable Ext/Adm prior Speed Dynamics Select.

### **OUTPUTS**

One or two actuator outputs – 4-20 mA or 20-160 mA to electrohydraulic, pneumatic or electric actuators

Eight relay outputs – three preset outputs for alarm, overspeed trip, and shutdown; five selectable outputs: max control speed, two speed switches, remote input active, extr/adm control switch (505E), auxiliary switch point (505), HP & LP valve limiter switches, and hand valves 1 through 4.

Four analog readouts – 4-20 mA, programmable readouts; speed input, speed setpoint, extr/adm input (505E) extr/adm setpoint (505E), cascade control input, cascade control setpoint, input, kW input, valve limiter positions, actuator 1 and 2 position (505), HP/LP actuator position (505E) and auxiliary input and reference (505)

### **COMMUNICATIONS**

RS-232 – Modbus (RTU or ASCII) or dumb terminal

### **OPERATING CONDITIONS**

-25°C to +65°C ambient air temperature range

-40°C to +85°C internal component temperature range Industrial-grade components

NEMA type 4 (watertight and dust-tight, indoor/outdoor) enclosure for either bulkhead or flush mounting

Approximate dimensions 20 x 16 x 8 inches (508 x 406 x 203 mm)

Humidity – designed to meet MIL-STD-810D, Method 507.2, Procedure II, induced, nonhazardous, (fifteen 24-hour cycles, varying 20-75% humidity, over 30-63°C)

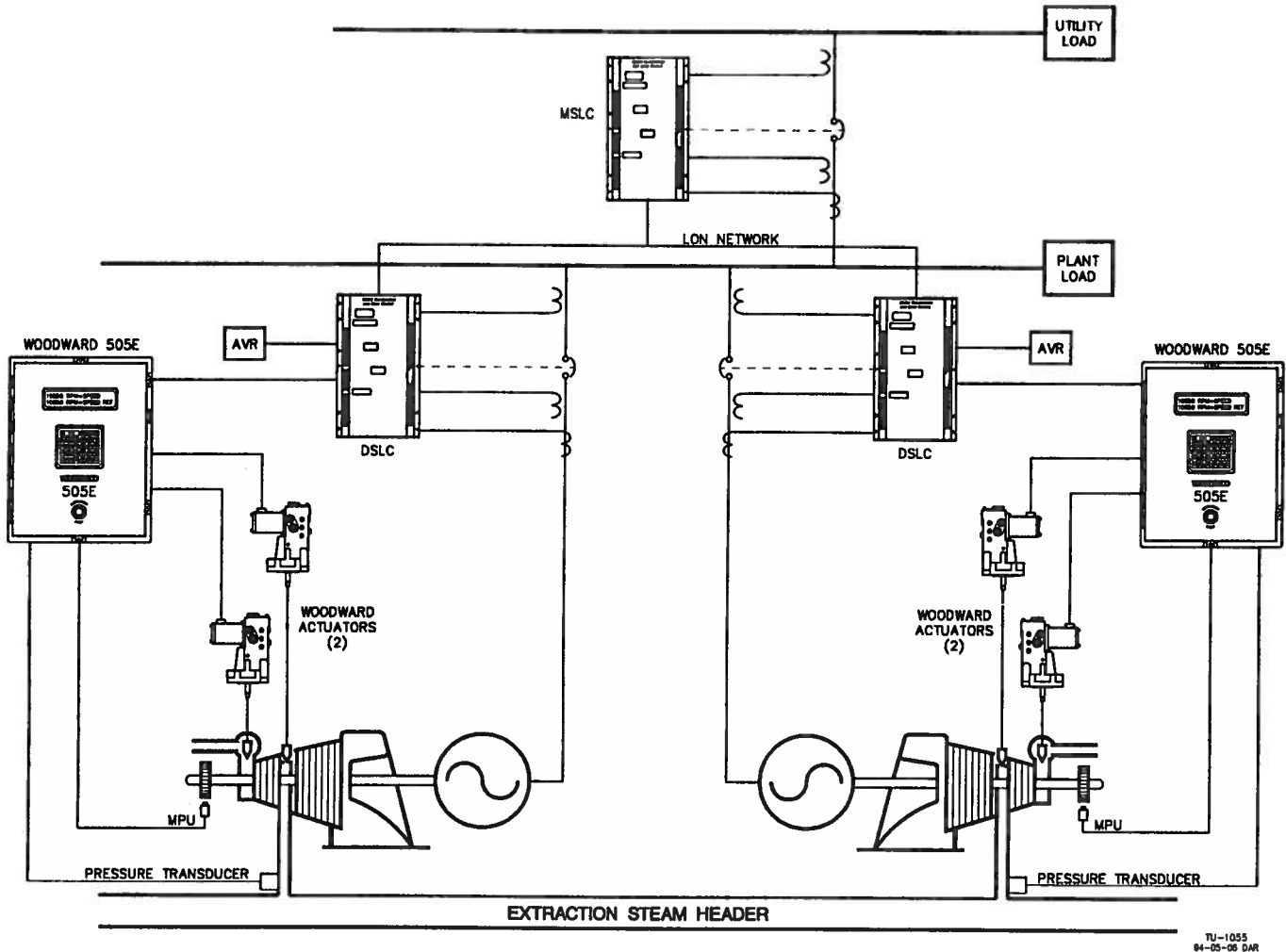
Water Leakage – meets NEMA 4 requirements

Salt Fog – meets NEMA 4X requirements (stainless steel, bulkhead mount only)

Shock – designed to meet MIL-STD-810D, Method 516.3, Procedure I (functional shock, 40g shock with frequencies of 45 Hz to 1 kHz for 6 msec)

Vibration – designed to meet MIL-STD-167, Type I two hour dwell at resonance in each axis with frequency sweeps from 4 to 50 Hz, 1.3 g maximum)

EMI (electromagnetic interference) – designed to meet MIL-STD-461B, Part 9, engine generators and associated equipment (conducted emissions, 15 kHz-50 MHz, with line filter on power leads; radiated emissions, 14 kHz- 1 GHz with wiring in grounded conduit; radiated susceptibility, 2-400 MHz electric field - 10 V/m, 400 MHz - 10 GHz electric field - 5 V/m)



Typical Enhanced 505E Load Sharing Application

**WOODWARD GOVERNOR COMPANY**  
*TURBOMACHINERY CONTROLS*

3800 N. Wilson Avenue • P.O. Box 3800 • Loveland, CO 80539-3800 • Phone: (303) 663-3900 • Facsimile: (303) 962-7050



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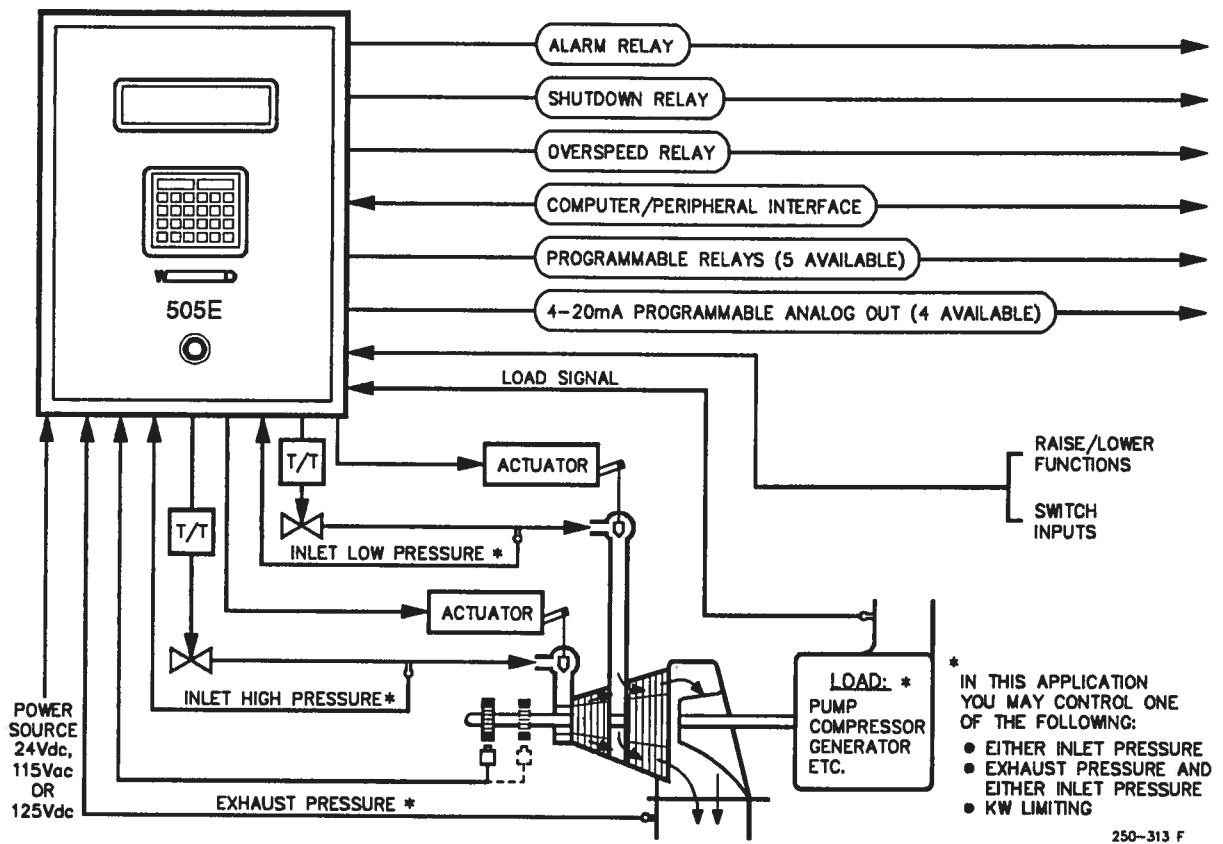
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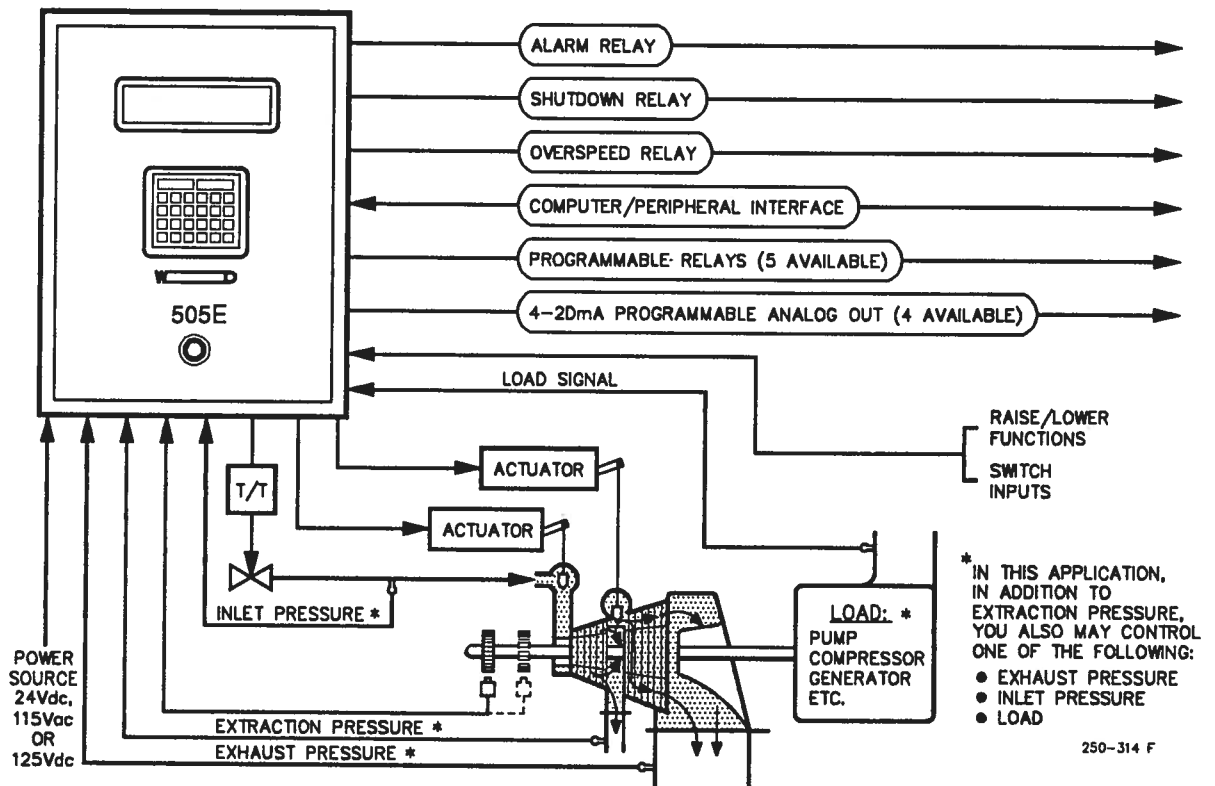
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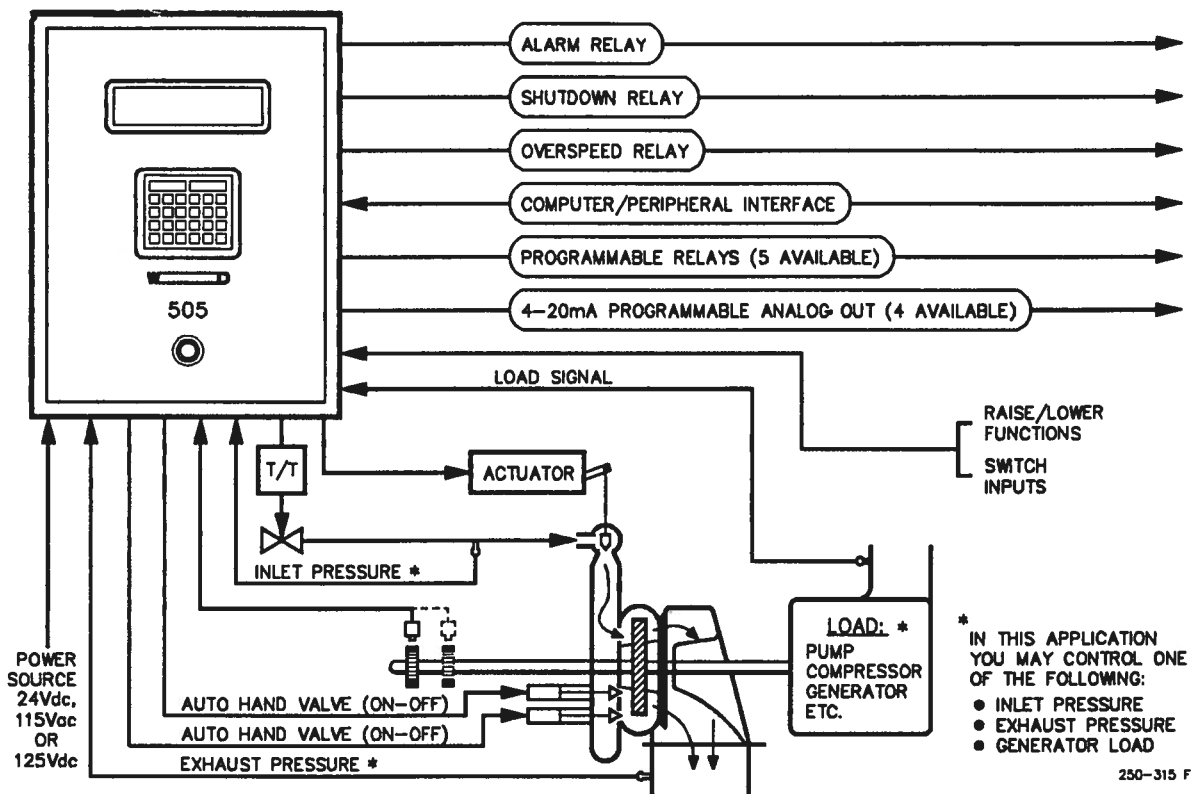
250-313 F

## Two Valve Multi-Stage Turbine

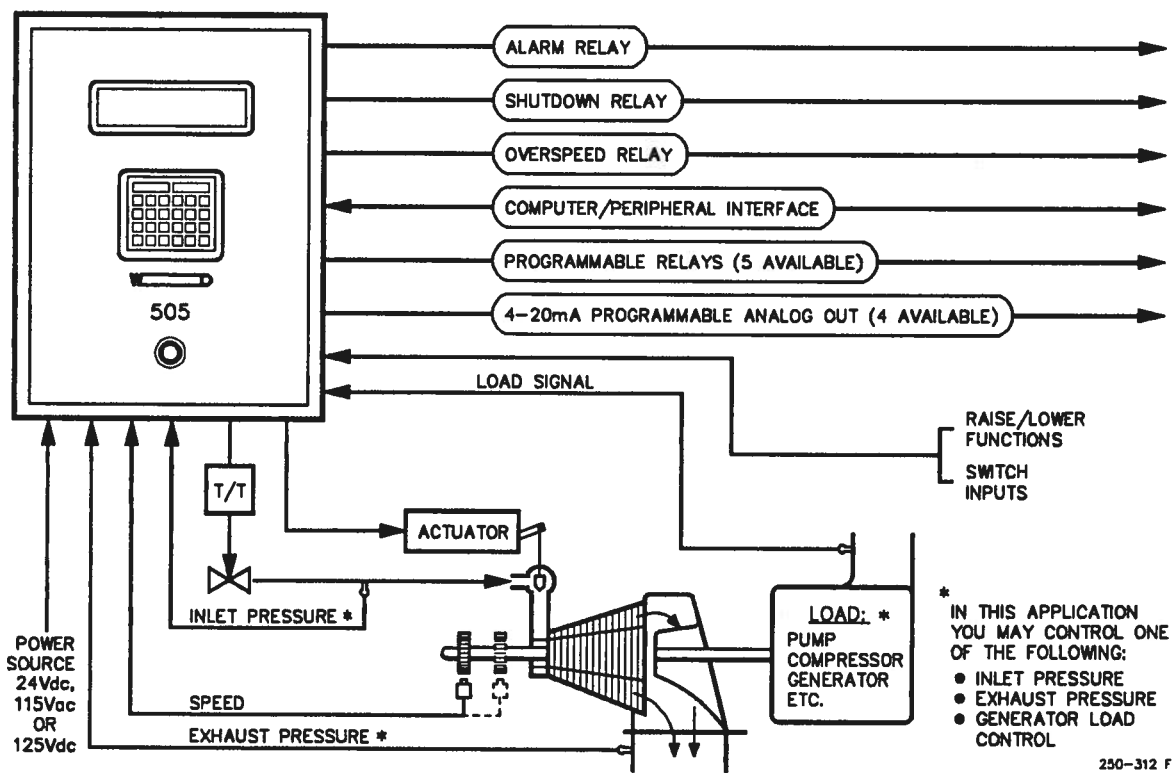


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## Controlled Extraction Steam Turbine



## Single Valve Single Stage Steam Turbine (Automatic Hand Valve)



## Single Valve Multi-Stage Turbine