WOODWARD

Product Manual 85565
(Revision E)
Original Instructions



Peak® 150 Digital Control for Steam Turbines

9905-857/858/860/861/863/864/866/867

Installation and Operation Manual

Chapter 1.
General Information

This manual describes the Woodward Peak 150 digital control for steam turbines and the hand-held programmer (9905-292) used to program it. The following topics are covered in the chapter indicated:

- Installation & Hardware (Chapter 2)
- Overview of Turbine System Operation (Chapter 3)
- Peak 150 Inputs & Outputs (Chapter 4)
- Peak 150 Control Functions (Chapter 5)
- Explanation of Operating Procedures (Chapter 6)
- Overview of Hand Held Programmer and Menus (Chapter 7)
- Set up of Configuration menus (Chapter 8)
- Set up of Service menus (Chapter 9)
- Detailed Functional Block Diagram (Chapter 10)
- Modbus Communications (Chapter 11)
- Troubleshooting (Chapter 12)
- Service Options (Chapter 13)
- Program Worksheets (Appendix)

Parameter names are shown in all capital letters and match the syntax as seen on the Hand Held Programmer or the plant wiring diagram.

The Peak 150 control is CSA Listed for the US and Canada (cCSAus) for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

⚠WARNING

EXPLOSION HAZARD—The Peak 150 control box should not be opened when a hazardous atmosphere is present. Wiring connections which could cause sparks are exposed inside the cabinet.

NOTICE

Do NOT attempt to operate the turbine until the Peak 150 control has been programmed. To do so could cause equipment damage.

The scope of this manual is to provide information on programming, operation and troubleshooting of the Peak 150 control. This manual was written for the program and specifications of the 5-digit display version of the Peak 150 control. This manual can also be used for the 4-digit display version of the Peak 150 control. For the 4-digit version there may be slight differences in the program. However, all aspects of the 4-digit version are covered by this manual.

Chapter 4.
Wiring

Inputs and Outputs

All inputs and outputs to the Peak 150 control are made through terminal blocks inside the Peak 150 control enclosure. Wiring passes through two wiring ports on the bottom of the control.

Inputs and outputs to the control are:

- Power Supply Input
- Analog Input
- Analog Outputs
- Discrete Inputs
- Discrete Outputs
- Speed Sensor (magnetic pickup) Inputs
- Modbus communications (optional)
- A service port for the hand-held programmer

⚠WARNING

EXPLOSION HAZARD—The Peak 150 control box should not be opened when a hazardous atmosphere is present. Wiring connections which could cause sparks are available inside the cabinet.

Power Supply

Figure 4-1 shows the power-supply connections. The following tables show the Input voltages and frequencies for the different versions of the Peak 150 control. Maximum power consumption is 38 W.

cCSAus Version	NEMA 4 Part Number	NEMA 4X Part Number
24 Vdc	9905-857	9905-863
24 Vdc w/Modbus	9905-860	9905-866
ac/dc	9905-858	9905-864
ac/dc/ w/Modbus	9905-861	9905-867

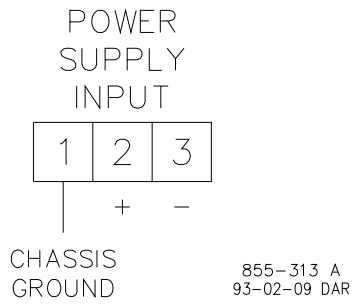


Figure 4-1. Power Supply Input

Version	Input Voltage	Frequency
1 (24 Vdc)	18–32 Vdc	NA
2 (ac/dc)	90–150 Vdc	NA
	88–132 Vac	47–63 Hz

No power switch is provided, the unit operates whenever power is applied. Input over-or under-voltage shutdown is not provided; if the +5 Vdc supply in the unit goes below 4.7 volts, the microprocessor will be reset.

Discrete Outputs

There are four hermetically-sealed relays. Two are dedicated, and two are user-configurable:

- Output #1 = TRIP RELAY (programmed energize or de-energize for trip)
- Output #2 = ALARM RELAY (de-energizes for alarm)
- Output #3 = CONFIG RELAY #1 (energizes for function)
- Output #4 = CONFIG RELAY #2 (energizes for function)

If required the configurable relays can be programmed as an additional Trip (using Option 2) or Alarm (Option 1) function. See Functional Block Diagram (Chapter 10) or Relays section of Configuration Menu (Chapter 8) for options.

Figure 4-2 shows the relay terminals.

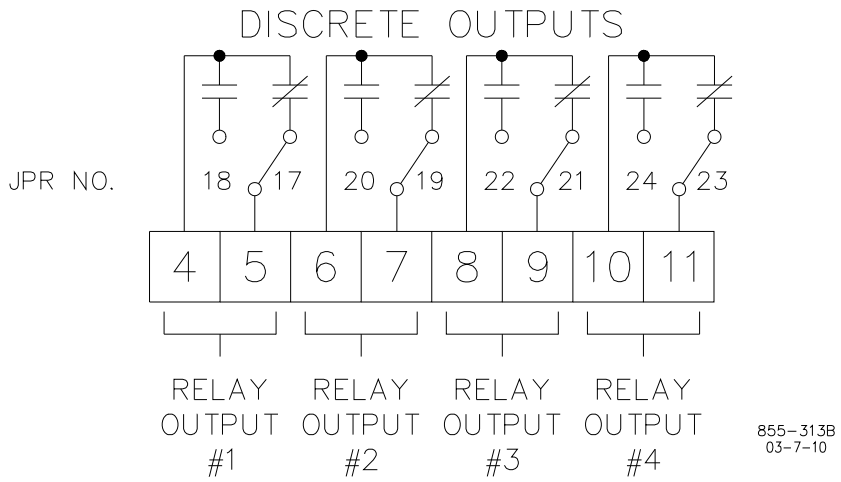


Figure 4-2. Relay Outputs

Internal jumpers provide a choice of normally open or normally closed contacts (see Figure 4-9 for jumper option chart).

Relay Contact Output Ratings

- 2 A Resistive @ 28 Vdc
- 0.3 A Resistive @ 115 Vac

IMPORTANT **An interposing relay is required if more current is needed.**

Discrete Inputs

There are eight discrete inputs (shown in Figure 4-3), powered either by an internal 24 Vdc supply or by an external 5–28 Vdc supply:

- Input #1 = LOWER SPEED
- Input #2 = RAISE SPEED
- Input #3 = EXTERNAL TRIP
- Input #4 = START
- Input #5 = RESET
- Input #6 = IDLE / MIN GOV
- Input #7 = REMOTE SPEED ENABLE
- Input #8 = HI DYN SELECT or (OVERSPEED TEST)

IMPORTANT **A jumper or external shutdown switch must be installed across Input #3.**

As shown in Figure 4-4, internally powered contact inputs (dry contacts) use Jumper 15 and +24 Vdc from analog Outputs Terminal 33 or 39). Externally powered contact inputs use Jumper 16 and an external + 24 Vdc supply.

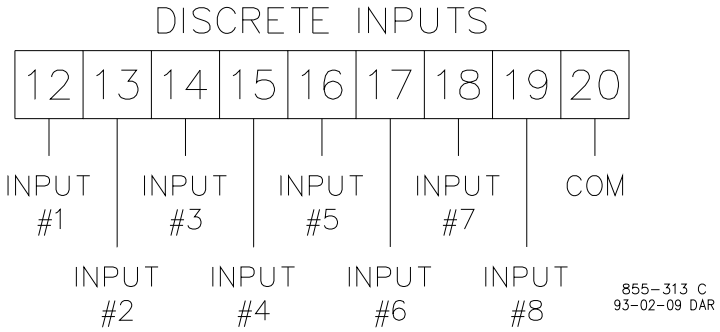


Figure 4-3. Discrete Input Connections

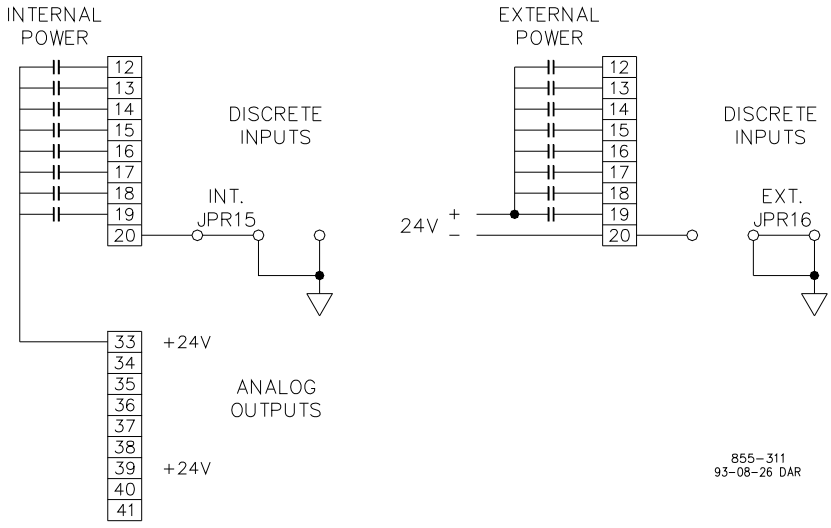


Figure 4-4. Powering Discrete Inputs

Modbus Communications

Figure 4-5 shows the connections for Modbus communications. Refer to Chapter 11 for additional Modbus information.

If terminals 21–34 are not installed, your unit is not capable of Modbus communications.

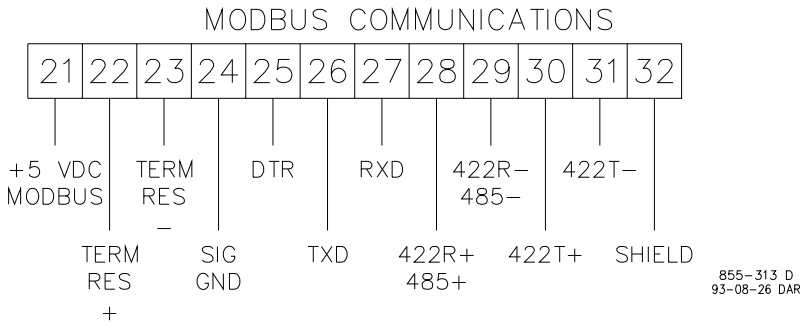


Figure 4-5. Modbus Connections

Analog Outputs

- Analog output #1 = Speed Readout
- Analog output #2 = User Configurable
- Actuator output = Signal to Actuator

Figure 4-6 shows the ANALOG OUTPUT connections. ANALOG OUTPUTs #1 and #2 are 4–20 mA or 0–1 mA, internal jumper selectable (see Figure 4-9 for jumper option chart).

The ACTUATOR OUTPUT (current) can be programmed for 0–200 mA or 0–20 mA. The internal jumpers must be selected to connect the proper current to the actuator driver (see Figure 4-9 for jumper option chart). The maximum load for the 0–200 mA driver is 60 Ω. The maximum load for the 0-20 mA driver is 450 ohms.

The fuel-valve actuator wires will carry a 0–200 mA or 4–20 mA signal and must be fully enclosed in conduit to meet hazardous-environment requirements.

The SPEED READOUT output is included in the control to drive a tachometer either near the turbine or in a control room. The maximum load for the readout circuits is 600 Ω.

The control may be tailored to give accurate readings on the tachometer by making adjustments on the set point programmer (see Configure Menus and Service Menus Chapters).

See Readouts section of Configuration Menus for Configurable Readout options.

Figure 4-6 shows the connections for analog outputs.

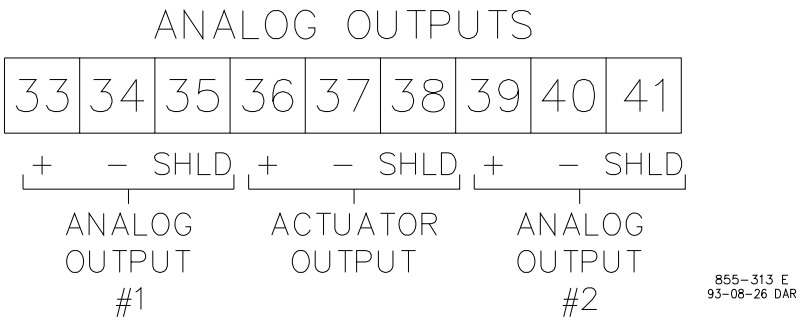


Figure 4-6. Connections for Analog Outputs

Speed Sensor Inputs

Figure 4-7 shows the connections for the two SPEED SENSOR INPUTS. The minimum signal amplitude required for speed sensing is 1 Vrms. The minimum detectable frequency is 200 Hz @ 1 Vrms. The maximum detectable frequency is 15 kHz.

- Input #1 = MAGNETIC PICKUP # 1
- Input #2 = MAGNETIC PICKUP # 2

Maximum control speed = 15 000 rpm.

The MPU cable must have two wires from the MPU plus a shield. The shield is grounded at the control only: it must not be grounded at the MPU. The integrity of the shield must be maintained between the MPU and the control. Polarity of the signal wires from the MPU to the control is not important.

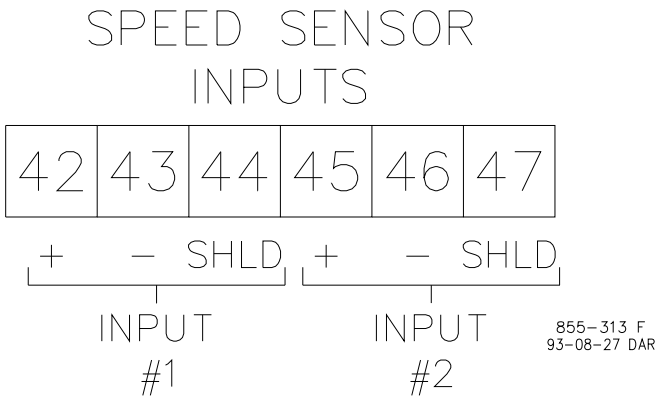


Figure 4-7. Connections for Speed Sensing

Analog Input

There is one analog input: the remote speed setting input. Figure 4-8 shows the connections for the analog input.

There is a jumper option for the Analog Input for either 4–20 mA or 1–5 Vdc. When 4–20 mA is selected, the ANALOG INPUT drives a 250 Ω load (see Figure 4-9 for jumper option chart).

Peak 150 Control Specifications

Inputs	
Magnetic Pickup Inputs (2)	Two identical inputs, high-signal-selected Minimum input voltage 1 Vrms, minimum frequency 200 Hz, maximum frequency 15 kHz
Analog Input (1)	Remote Speed Setting signal (4–20 mA or 1–5 Vdc, internal jumper selectable)
Discrete Inputs (8)	Remote (isolated, 5–28 Vdc)
Options	Raise speed Lower speed Emergency stop Alarm reset Remote speed set enable Start Idle/minimum governor Select high dynamics or overspeed test
Outputs	
Analog Outputs (2)	Actual speed output (scalable, 4–20/0–1 mA) Configurable readout (scalable, 4–20/0–1 mA)
Options	Actual speed Speed setpoint Actuator output Remote speed setpoint Valve ramp value
Actuator Output (1)	4–20 or 0–200 mA (internal jumper selectable)
Relay Outputs (4)	Internal jumpers provide choice of normally-open or normally-closed contacts
Contact ratings are	2 A resistive @ 28 Vdc 0.3 A resistive @ 115 Vac
	Shutdown (de-energizes or energizes for shutdown) Alarm (de-energizes for alarm) Configurable Relay #1 Configurable Relay #2
Options	Alarm Trip output Shutdown Remote control Speed control MPU failure Overspeed trip Overspeed test Remote signal OK Speed switch #1 Speed switch #2 Hand valve #1 Hand valve #2
Operator Control Panel	
Keypad Switches (6)	
Options	Raise speed Lower speed Emergency trip Start Overspeed test Alarm reset
LED Indicators (6)	Remote speed setting signal status Shutdown status MPU #1 status MPU #2 status CPU status Overspeed test status
Digital Display	Five-digit LED speed display

Power	
Input	Models are available with these input power requirements: 24 Vdc 90–150 Vdc or 88–132 Vac, 47–63 Hz
Maximum power consumption, all models:	38 W
Environmental Specifications	
Operating Ambient Temperature	–25 to +60 °C (–13 to +140 °F)
Storage Ambient Temperature	–40 to +85 °C (–40 to +185 °F)
Humidity	Designed to meet US MIL-STD-810D, Method 507.2, Procedure II, induced, non-hazardous, cycle 5 (fifteen 24-hour cycles, varying 19–75% humidity, over 33–63 °C)
Vibration	US MIL-STD-167, Type 1
Shock	US MIL-STD-810C, Method 516.2, Procedure 1
Dimensions	
Width	483 mm (19 inches)
Height	310 mm (12.2 inches)
Depth	105 mm (4.1 inches)