• Thermocouple, RTD, & Process Inputs
• High Accuracy Auto-Tuning PID
• Heating & Cooling Models
• Universal Power Supply 100-240 VAC
• Up to 3 Relays & 2 Analog Outputs
• Digital Input Set Point Selection
• RS-485 Serial Communications Option
• Modbus® RTU/ASCII Communications
• Free Operating & Data Logging Software
• IP55 & IP65 Fronts
• 1/16, 3/16, 1/8, 1/4 DIN Sizes
• 3 Year Warranty

NOVA PD540 Series

PRECISION DIGITAL CORPORATION

www.predig.com
CUSTOM OPERATING DISPLAYS
The Nova Digital Controller has dual four-digit LEDs and can display commonly used setup parameters defined by the user.

Operating Display Navigation
To access additional display information without the need to enter the setup menus, simply press the SET/ENT button.

Main Operating Display
- PV window displays process variable
- SP window displays set point
- Press the SET/ENT button to move to the next display window

Percent Output Display
- PV window displays process variable
- SP window displays the operating level of the control outputs as % of full scale
- Press the SET/ENT button to move to the next display window

User Defined Display 1
- Display any setup parameter
- Parameters are fully functional, and can be set through this display
- Set by the user with parameter US1
- Press the SET/ENT button to move to the next display window

User Defined Display 2
- Display any setup parameter
- Parameters are fully functional, and can be set through this display
- Set by the user with parameter US2
- Press the SET/ENT button to return to the main operating display

EASY SETUP & PROGRAMMING
All programming of a Nova Digital Controller is done through the front panel. No switches or jumpers are required.

Front Panel Buttons
- Press the SET/ENT button to confirm an entered value. Hold the button for 3 seconds to exit or enter the setup groups. Press the SET/ENT button to access the next parameter when in a setup group.
- Press the Up arrow button to increase numerical values or scroll through parameter options and group menus.
- Press the Down arrow button to decrease numerical values or scroll through parameter options and group menus.
- Press the LEFT arrow button to move to the next digit during numerical value programming.

Setup Group Menus
For easy setup parameter navigation, all parameters are grouped by category. To access the group menus, press and hold the SET/ENT button for 3 seconds. Navigate through the group menus using the UP or DOWN arrow buttons as shown. To enter a group menu to access setup parameters, press the SET/ENT button.

<table>
<thead>
<tr>
<th>Button</th>
<th>PV Display</th>
<th>Group Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>▼</td>
<td>G.RE</td>
<td>Auto-Tuning Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.SP</td>
<td>Set Point Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.P Id</td>
<td>P.I.D. Group</td>
</tr>
<tr>
<td>ENT</td>
<td>P*outd</td>
<td>Password</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.Ctl</td>
<td>Control Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.In</td>
<td>Input Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.OUt</td>
<td>Output Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.RLh</td>
<td>Alarm Group</td>
</tr>
<tr>
<td>▲ ▼</td>
<td>G.REt</td>
<td>Retransmission Group</td>
</tr>
<tr>
<td>▲</td>
<td>G.COM*</td>
<td>Communications Group*</td>
</tr>
</tbody>
</table>

*This group menu appears only on models with the serial communications option.

Menu Password
To prevent unauthorized changes to key parameters, a user defined lockout password must be entered to access the group menus that are not commonly used during operation. Enter the password at the prompt when navigating the group menus by pressing the SET/ENT button. The default password is 0.

Easy to Use Menu Structure
Each parameter is located in an associated menu group.

For a complete list of setup parameters, their functions, and setting options, refer to the PD540 Series Instruction Manual.
NOVA PD540 SERIES PROCESS & TEMPERATURE CONTROLLE

PROCESS & TEMPERATURE INPUTS
 Nova Controllers use a single universal input that accepts process and temperature inputs.
 RTD: Pt100 (0.00385), JPt100 (0.00392)
 Process: -10 to 20 mV, 0 to 100 mV
  0.4 to 2 V, 1 to 5 V, 0 to 10 V
  4 to 20 mA input with a resistor shunt

VERSATILE OPERATION
 Powerful standard and optional features such as universal inputs, up to three relays and two analog outputs, two digital inputs, and serial communications make this controller applicable for most process or temperature control applications.

Programmable Relays
 All PD540 Series controllers have a standard 3 A Form C (SPDT) relay. Up to two additional 1 A Form A (SPST) relays. All relays can be programmed for numerous control or alarm functions.
 - Time-Proportional PID Control
 - On/Off Control
 - High/Low Alarms
 - Set Point Deviation Alarms
 - Fail-Safe and Standby Alarms
 - Alarm Delays and Deadbands

Analog Output Configurations
 Up to two analog outputs are available on all PD540 Series controllers. Each analog output can be programmed independently, and numerous output types are selectable.
 - 4-20 mA PID Control
 - 4-20 mA Retransmitting
 - Time-Proportional PID Voltage Pulse
 - Transmitter Loop Power Supply

Auto-Tuning PID
 A high accuracy auto-tuning function using Fuzzy Logic calculates the PID values for your system with the push of a button, eliminating the need for complex PID calculations and time consuming setup. After several on/off cycles, the PID values will be setup automatically.

Gain Adjustment
 Adjustments to system control characteristics can be done after auto-tuning with the programmable Gain function. Increasing the Gain will increase accuracy and reduce overshoot. Lowering the Gain will let the system reach the set point faster.

Input Bias Adjustment
 Up to five bias points can be used to provide precise offset adjustments at specific input values. The controller will use the offset to create a smooth input value curve leading up to the bias points.

On/Off Timers
 The start timer delays control output operation from power-up. The process timer determines how long the control outputs will run after starting. These timers may run up to 99 hours 59 minutes, or be turned off.

Digital Input Set Point Selection
 Two digital inputs can be added as an optional feature. Digital inputs are activated by closing contacts or low logic levels. The configuration of the two inputs can select which of the 4 programmable set points to run or turn the control outputs on and off while selecting one of two programmable set points.

Serial Communications & Adapters
 Nova controllers with the serial communications option can be used for data acquisition, master/slave set point control, or Modbus communication (RTU and ASCII). Nova controllers transmit via RS-485. The PDA7485 RS-232 to RS-485 and PDA8485 USB to RS-485 converters are available for use with the Nova Multi-Monitoring software or other PC applications.
Sync Master/Slave Set Point Control
PD540 Series Digital Controllers with the serial communications option can use Sync set point control. By connecting controllers together using the RS-485 serial communication capability, one controller can control the set point of an entire string.

Changing the set point of the Sync Master controller will change the set points on all Sync Slave controllers.

NOVA PC SOFTWARE
Any Nova Controller with the serial communications option can be configured to interface with the Nova Multi-Monitoring PC software. Up to 30 controllers can be monitored and operated, and each can use independent data logging.

- Easy to Set Up and Use
- Connect up to 30 Nova Controllers
- View PV, SP, and Alarm Status Simultaneously
- Control Set Points
- Log, View, and Save Data in Spreadsheet Files
- Free Download from www.predig.com

Specifications
System Requirements: Windows® 95/98/ME/2000/XP
Communications: An RS-232 to RS-485 or USB to RS-485 converter may be used for communication with a PC and Nova Multi-Monitoring Software.
Number of Units: Up to 30 Nova Controllers
Baud Rate: 9,600 to 19,200 bps
Data Logging: Graph and save data as .hdr format. Each controller saves graphs independently. Data exportable in spreadsheet format.
Logging Interval: 1 second to 24 hours

Simultaneous Monitoring
Simultaneously monitor up to 30 Nova Controllers and view the PV, SP, and alarm status for all connected controllers. The main view screen also displays the basic model numbers of all connected units. Any series of Nova Controllers with the serial communications option may be monitored with this software.

Remote Control Set Points
Program each of the 4 set points through a detailed operation screen available for every connected controller. In addition, control outputs can be set to run or stop, auto tuning enabled, and automatic or manual control established.

Data Acquisition
PV and SP data can be logged independently for each unit. This data can be graphed using the Data Viewer for quick and clear analysis. Logged data can be exported into spreadsheet format.

View Logged Data Graphs and Export Data
CONNECTIONS
PD540 & PD541

**PD540 & PD541**

**PD542 & PD543**

Open circuit voltage: approximately 5 VDC

Logic levels:
LO = 0 to 0.8 VDC
HI = 4.7 to 28 VDC

NO switches (external excitation not required) or open collector transistor

Open circuit voltage: approximately 5 VDC

Logic levels:
LO = 0 to 0.8 VDC
HI = 4.7 to 28 VDC

NO switches (external excitation not required) or open collector transistor
NO switches (external excitation not required) or open collector transistor

Open circuit voltage: approximately 5 VDC

Logic levels:
LO = 0 to 0.8 VDC
HI = 4.7 to 28 VDC

MAX: 19200bps

Rating: 250 VAC @ 1 A
30 VDC @ 1 A

POWER

100 - 240 VAC 50/60 Hz

4-20 mA or Voltage Pulse

NO switches (external excitation not required) or open collector transistor

Open circuit voltage: approximately 5 VDC

Logic levels:
LO = 0 to 0.8 VDC
HI = 4.7 to 28 VDC

MAX: 19200bps

Rating: 250 VAC @ 1 A
30 VDC @ 1 A
MODEL NUMBER GUIDE

The following guide describes the possible PD540 Series Nova Digital Process & Temperature Controller model numbers. Refer to the price list for the complete list of models and accessories.

Digital Controller

Size - DIN Cutout
- 0, 1 = 1/16 DIN
- 2, 3 = 1/8 DIN (H)
- 4, 5 = 3/16 DIN
- 6, 7 = 1/8 DIN (V)
- 8, 9 = 1/4 DIN

Power
- 6 = 100-240 VAC

Display
- R = Red LED

Main Control Outputs
PD540, PD541, PD544, PD545:
- A = 1 relay & 1 analog output
PD542, PD543, PD546 to PD549:
- B = 1 relay & 2 analog outputs

Options
- 00 = None
- PD540, PD541:
  - 11 = 1 relay & 2 digital inputs
  - 14 = 1 relay & RS-485
  - 31 = 1 analog output & 2 digital inputs
  - 34 = 1 analog output & RS-485
- PD544, PD545:
  - 04 = RS-485
  - 51 = 2 relays, 1 analog output & 2 digital inputs
  - 54 = 2 relays, 1 analog output & RS-485
- PD542, PD543, PD546 to PD549:
  - 21 = 2 relays & 2 digital inputs
  - 24 = 2 relays & RS-485
DIMENSIONS AND PANEL CUTOUTS

**PD540 & PD541**
1/16 DIN (48 x 48)

**PD542 & PD543**
1/8 DIN (H) (96 x 48)

**PD544 & PD545**
3/16 DIN (72 x 72)

**PD546 & PD547**
1/8 DIN (V) (48 x 96)

**PD548 & PD549**
1/4 DIN (96 x 96)

Units: inches (mm)
**SPECIFICATIONS**

Except where noted all specifications apply to operation at +25°C.

**General**

Display: Dual 4 digits, red LED. -1999 to 9999

<table>
<thead>
<tr>
<th>DIN Sizes</th>
<th>PV Display Inch (mm)</th>
<th>SP Display Inch (mm)</th>
<th>Weight oz (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>0.45 (11.3)</td>
<td>0.37 (9.5)</td>
<td>7.0 (198)</td>
</tr>
<tr>
<td>3/16</td>
<td>0.55 (14.0)</td>
<td>0.47 (12.0)</td>
<td>11.4 (324)</td>
</tr>
<tr>
<td>1/8 (H)</td>
<td>0.78 (19.8)</td>
<td>0.45 (11.5)</td>
<td>10.8 (306)</td>
</tr>
<tr>
<td>1/8 (V)</td>
<td>0.54 (13.6)</td>
<td>0.41 (10.5)</td>
<td>10.7 (304)</td>
</tr>
<tr>
<td>1/4</td>
<td>0.81 (20.5)</td>
<td>0.43 (11.0)</td>
<td>13.7 (389)</td>
</tr>
</tbody>
</table>

Front Panel: Panel gasket provided. 1/16 & 1/8 DIN: IP65, 3/16 & 1/4 DIN: IP55

Programming Methods: Four front panel buttons and Modbus

Number of Set Points: Four programmable set points

Noise Filter: Programmable 1 to 120 seconds or off

Display Update Rate: 4/second

Password: Restrictions apply to programmable settings.

Non-Volatile Memory: Settings stored for a minimum of 10 years.

Power: 100-240 VAC, 50/60 Hz, 10 W

Required Fuse: UL Recognized, 1 A, 250 V, slow-blow

Isolation: 2300 V input/output-to-power line; 4 kV relay output-to-input/output/power line.

Operating Temperature: 10 to 50°C

Storage Temperature: -40 to 85°C

Relative Humidity: 20 to 90% non-condensing

Enclosure: 1/16, 3/16, 1/8 (H), 1/8 (V), 1/4 DIN; impact-resistant plastic; color: black

Approvals: UL & C-UL Recognized, CE Compliant

UL File Number: E244207; Process Control Equipment

Warranty: 3 years parts & labor

Extended Warranty: 1 or 2 years, refer to Price List for details.

**Temperature Inputs**

Inputs: Factory calibrated, field selectable: J, K, T, E, B, R, S, L, U, N, W, Platinum II thermocouples, and 100Ω platinum RTD (0.00385 or 0.00392 curve)

Cold Junction Reference: Automatic or off

Offset Adjustment: Four programmable input bias zones

Sensor Break: Up or down scale, user selectable; display reads S.OPN; alarm relays will follow the up or down scale selection.

<table>
<thead>
<tr>
<th>Thermocouple</th>
<th>Type</th>
<th>Range (°C)</th>
<th>Range (°F)</th>
<th>Accuracy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>-200 to 1370</td>
<td>-300 to 2500</td>
<td>&gt;0°C: ±0.1% FS ±1 count</td>
<td>&lt;0°C: ±0.2% FS ±1 count</td>
</tr>
<tr>
<td>K</td>
<td>-199.9 to 999.9</td>
<td>0 to 2300</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>-199.9 to 999.9</td>
<td>-300 to 2300</td>
<td>±0.15% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>-199.9 to 400.0</td>
<td>-300 to 750</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-199.9 to 999.9</td>
<td>-300 to 1800</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0 to 1800</td>
<td>32 to 3300</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>0 to 1700</td>
<td>32 to 3100</td>
<td>±0.15% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>0 to 1700</td>
<td>32 to 3100</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>-199.9 to 900.0</td>
<td>-300 to 1600</td>
<td>&gt;0°C: ±0.1% FS ±1 count</td>
<td>&lt;0°C: ±0.2% FS ±1 count</td>
</tr>
<tr>
<td>U</td>
<td>-199.9 to 400.0</td>
<td>-300 to 750</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-200 to 1300</td>
<td>-300 to 2400</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>0 to 2300</td>
<td>32 to 4200</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>Platinel II</td>
<td>0 to 1390</td>
<td>32 to 2500</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>RTD</td>
<td>-199.9 to 850.0</td>
<td>-300 to 1560</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>PiB</td>
<td>-199.9 to 500.0</td>
<td>-199.9 to 999.9</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>PIC</td>
<td>-199.9 to 99.99</td>
<td>-4.0 to 212.0</td>
<td>±0.2% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>JPIA</td>
<td>-199.9 to 500.0</td>
<td>-199.9 to 999.9</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
<tr>
<td>JPIIB</td>
<td>-150.0 to 150.0</td>
<td>-199.9 to 300.0</td>
<td>±0.1% FS ±1 count</td>
<td></td>
</tr>
</tbody>
</table>

**Process Inputs**

Inputs: Field selectable: 0.4 to 2.0 V, 1 to 5 V, 0 to 10 V, -10 to 20 mV, 0 to 100 mV. 4-20 mA input requires 100Ω resistor connected across input terminals (order P/N: PD5-RES1).

Accuracy: ±0.1% FS ±1 count

Decimal Point: Up to 3 decimals: 9.999, 99.99, 999.9, or 9999

Calibration: All inputs are calibrated at the factory

Scale Range: User programmable over entire range

Transmitter Supply: 14 to 18 VDC @ 20 mA; available at terminals OUT2 or OUT3, instead of retransmitting analog output; selection through front panel.

**Relays**

Ratings: 1 Form C (SPDT) standard; rated 3 A @ 30 VDC or 3 A @ 250 VAC resistive load. 1 or 2 Form A (SPST) optional; rated 1 A @ 30 VDC or 1 A @ 250 VAC resistive load.

Relay Operation: Time proportional PID control, on/off control, forward or reverse (fail-safe) alarm, or run status

Cycle Time: 1 to 300 seconds; time proportional PID control only

On/Off Hysteresis: For standard models, 0-10.0% of sensor range for independent high and low hysteresis limit. For heating & cooling models, 0-10.0% of sensor range full hysteresis band.

High/Low Alarm: User may program any alarm for absolute high or low trigger values.

Deviation Alarm: User may program any relay for high, low, or high/low range set point deviation alarm.

Alarm Deadband: 0-100% FS, user selectable

Alarm Delay: 0 to 99 minutes and 59 seconds

Reverse Operation (Fail-Safe): Programmable, independent for each alarm.

Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state.

Forward Operation: Relay coils are energized in alarm condition. In case of power failure, relays will go to non-alarm state.

Auto Alarm Initialization: Normal and standby operation independent for each alarm. Normal alarms will reflect the state of the input to the controller at all times. Standby alarms will not trigger if the change to alarm state is a result of power up cycle, set point change, or alarm configuration change.

Run Status: Relays will energize when PID outputs are running.

**Analog Outputs**

Scaling Range: Retransmitting 4-20 mA outputs can be scaled for any display range.

Accuracy: ±0.1% FS

Availability: 1/16 & 3/16 DIN: 1 standard, 1 optional

1/8 & 1/4 DIN: 2 standard

Output Operation: 4-20 mA PID control, time proportional voltage pulse PID control, or 4-20 mA retransmitting

Ratings: Continuous 4-20 mA PID or retransmitting: 600 Ω max

Time Propotional PID: 15 VDC pulse high, less than 0.1 VDC pulse low; 600 VDC minimum, limited current at 30 mA

Cycle Time: 1 to 300 seconds; time proportional PID control only

Power: Internally powered 4-20 mA output

Isolation: 500 V input-to-output

Output Loop Resistance: 600 Ω max

**Digital Inputs**

Configuration: Two contacts, two operating modes

Contacts: Normally open switches (external excitation not required) or open collector transistor

Open Circuit Voltage: Approximately 5 VDC

Logic Levels: LO = 0 to 0.8 VDC, HI = 4.7 to 28 VDC

Operation Modes: Mode 1: Control output run or stop, selection of set point 1 or 2. Mode 2: Selection of set points 1 to 4.

**Serial Communications**

Compatibility: EIA-485

Protocol: PC, Modbus (ASCII, RTU), Sync (Master/Slave SP Control)

Address: 1 to 99 (Max 31 units connected)

Baud Rate: 600 to 19,200 bps

Transmit Time Delay: 0 to 100 ms

Data: 7 or 8 bit, automatic when using Modbus protocol

Stop Bit: 1 or 2

Parity: None, even, or odd