AutomationDirect

1/16 DIN Series

Operator's Manual

PC35

PID Microprocessor - Based Process Controller

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General Safety Information

Electrical Hazards and Warnings

Prior to connecting the controller, read the user's manual for proper connection and operating information.

Follow National Electrical Code (NEC) safety requirements when wiring and connecting a power source and sensors or other devices to the controller. Failure to do so could result in injury, death or damage to equipment and property.

Make sure the proper input voltage is applied to the controller. Improper voltage will result in damage to the unit.

Use caution when removing the controller from its case, there may be live voltage present at the terminals. This should only be done by a qualified technician.

All terminal screws must be tightened securely. Terminal screws not properly secured can cause an electrical short that may damage property, equipment or cause injury or death. Terminal screws improperly secured may fall into equipment causing possible damage to property or equipment.

This instrument is not intended for use in life safety applications.

Important: For applications where physical injury or equipment damage might occur in the event our product fails, we recommend the installation of independent safety equipment with its own independent sensor that will shut down the process.

Important: Firmware version of controller must match the version indicated on the bottom front cover of this manual.

PC35 Process Controller

Table of Contents

PC 35
1/16 DIN Microprocessor-Based
PID Process Controller

1. MAIN FEATURES

- Universal multi-sensor input without hardware change.
- Accept thermocouples J, K, T, S; RTD-Pt100; 4-20mA; 0-50mV, and 0-5Volts.
- Selectable ºF/ºC temperature.
- RTD-Pt100 with 1º temperature resolution: -328 to 986ºF (-200 to 530ºC), and 0.1º temperature resolution: -199.9 to 986.0ºF (-199.9 to 530.0ºC).
- Programmable Scaling: -1999 to 9999 with selectable decimal point for: mA, mV and Volts sensor input.
- Programmable Ramp & Soak up to 49 segments with alarm output events.
- Square Root Function (selectable input type 19).
- Sensor break protection in any condition.
- Modular Output options: Relay, SSR, Isolated Linear 4-20mA, 0-20mA or Isolated DC Pulsed Output.
- Up to 4 different Set Point alarms can be used on the same I/O output.
- Up to 2 programmable timer alarms.
- Process Variable or Setpoint 0-20mA, 4-20mA isolated analog retransmission, optional. See section 5.6, page 25 (code 11 and 12).
- Auto/Manual "bumpless" transfer.
- One isolated digital input (I/O-5) with programmable functions, optional.
- Linear Remote Setpoint input 0.4V to 2.0V (or 4-20mA using a shunt resistor of 100Ω, 0.1% tolerance), optional. See Section 5.5, page 23.
- Programmable Soft Start: 0 to 9999 seconds.
- Dual Display: PV (red) and SV (green).
- Firmware version displayed during power up.
- Digital serial number.
- Seven levels password protection, via keyboard.

2. SPECIFICATIONS

- Dimensions: 48 x 48 x 106mm (1/16 DIN). Approximate weight: 200g max.
- Panel cut-out: 45.5 x 45.5mm (± 0.3mm)
- Terminal connection: screws, accepting 6.3mm fork lugs.
- Power: 90 to 260Vac, 50/60Hz, Consumption: 7VA max.
- Operating environment: 0 to 50°C (32 to 122°F), humidity: 10 to 85% RH, n.c.
- 1/16 DIN Flame-Retardant ABS Plastic Case.
- Warm-up time: 15 minutes max.

INPUT:

- Keypad selection of input type.
- Display resolution: 0.1ºF/ºC or 1ºF/ºC (RTD-Pt100), -1999 to 9999 fully scalable for mA, mV and Volts input.
- Input sample rate: 5 per second (200 ms).
- Accuracy: Thermocouples J, K, T: 0.2% of span, ±1ºC, ±1 digit.
  Thermocouple S: 0.25% of span, ±3ºC, ±1 digit.
  Pt100: 0.2% of span, ±0.5ºC, ±1 digit.
  Current (4-20mA) and voltage (50mV or 5Vdc max.): 0.2% of span.
- Input impedance: 0-50mV and thermocouples: >10MΩ
  0-5V: >1MΩ
  4-20mA: 100Ω dynamic.
- Pt100 measurement: DIN 43760 standard (α=0.00385).
  3-wire circuit, cable resistance compensation.
  Excitation current: 170μA.
- Optional Remote Set Point (RSP) analog input: 0.4 to 2.0 Vdc (second linear input). "For 4 to 20mA Input, an external resistor shunt of 100 ohms, 0.1% toll. Is required between terminals 3 and 4".

OUTPUT CONTROL OPTIONS:

- Mechanical Relays: Dual‑SPST (without contact suppression).
  Resistive: 3A @ 250VAC / 3A @ 125VAC / 3A @ 30VDC.
  Inductive: 2A @ 250VAC / 2A @ 30VDC.
  Dielectric Strenght: 750Vrms between open contacts (at sea level for 1 min.)
- Dual-Solid State Relay (SSR‑Triac): 1Amp @ 20V to 240VAC, zero crossing (without contact suppression).
- Isolated Single ‑ Logic Pulse for SSR drive: 0/12Vdc @ 15mA max.
- Isolated 0-20mA or 4-20mA for control output, PV or SP retransmission, 1500 levels resolution, 500Ω max. load.
  (For 0/1-5V linear output with external 250Ω - 0.1% (shunt) resistor, to be connected to terminals 5 and 6, optional).

OUTPUT CONFIGURATION:

- **Model PC35-2000-AC:** Two SPST Relays output.
- **Model PC35-0210-AC:** Two Solid State Relay, and One Linear 4-20mA output.
- **Model PC35-2010-AC:** Two SPST Relays, and One Linear 4-20mA output.
- **Model PC35-2110-AC:** Two SPST Relays, One 12Vdc Pulsed, and One Linear 4-20mA output.

Any of the above options can be selected as the main control output and the remaining outputs can be set as alarms.

ALARMS:

Up to 3 output alarms (optional) can be set with 9 different functions for each one. Other alarm features are:

- 2 Timing alarms, programmable from 0 to 6500 sec., with advanced functions.
- Independent power-up inhibition of the 4 alarms
- Programmable hysteresis (deadband) for the 4 alarms

PID CONTROL:

- User-selectable as: ON-OFF w/ hysteresis, or P, PI, PID and PID-Autotune.
- Proportional Band (P): 0 = on-off control; or 0.1% to 500.0% of maximum input span.
- Integral (I): 0 = off; or 0.01 to 25.00 rep/minutes.
- Derivative (D): 0 = off; or 1 to 250 seconds.
- Cycle-Time: 0.5 to 100.0 seconds (for PWM output control mode).
- PID-Autotune: start from the front panel.

INPUT/OUTPUT FEATURES:

The PC35 has several models each with their own standard I/O features.

Check the label on the controller for the actual configuration of the unit.

The features are listed below:

- Linear Remote Set-Point input (RSP). **Check unit label for option.**
- Isolated Digital Input: I/O-5. **Check unit label for option.**
- Two SPST Relay output (Out-1 and Out-2). **Check unit label for option.**
- Two SSR output (Out-1 and Out-2). **Check unit label for option.**
- One isolated Switched-DC Output (I/O-3). **Check unit label for option.**
- Isolated Linear 0/4-20mA Output (I/O-5). **Check unit label for option.**
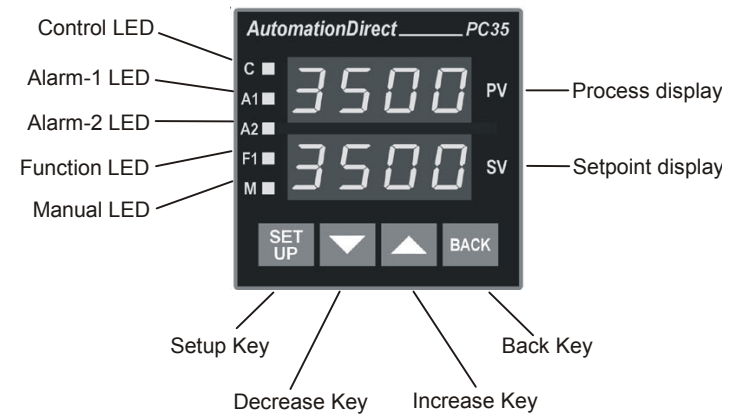
2.1 MAIN DIMENSIONS AND CUTOUT:
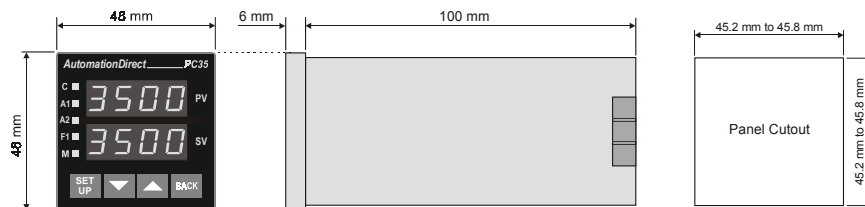
(Not to scale)

(Figure 1)

3. OPERATION

Operator Interface

(Figure 2)

Process display – PV: shows the PV (**P**rocess **V**ariable) value, and used when configuring the parameters of the controller.

Setpoint display – SV: shows the SV (**S**etpoint **V**ariable) value, and used when configuring the parameters of the controller.

Control LED – C: indicates that the Controller is active, with control and alarm outputs enabled. If there is a control output programmed as PWM, the output LED will reflect the actual state of the output (ON or OFF).

Alarm 1 – AL1 LED: status of the alarm 1 (LED On = alarm active).

Alarm 2 – AL2 LED: status of the alarm 2 (LED On = alarm active).

Function LED – F1: indicates that digital input I/O-5 is active (LED On), terminals 9 and 10 are closed (not active on PC35-2000-AC).

Manual LED – M: indicates that the controller is in manual mode (LED On). Flashes during auto-tuning execution.

SETUP key: used to set up the menu cycles.

BACK key: go back to the previous displayed parameter.

**DECREASE** and **INCREASE keys**: used to change parameter values.

When the controller is turned on, the firmware version is displayed for approximately 4 seconds, after which the controller starts normal operation. The values of PV and SV are displayed and the outputs are enabled after 6 seconds.

Before the controller is ready to be used in a given process, it requires some basic configuration, such as:

- **Input type** (TC, Pt100, 4-20mA, ...) at the " ⴸⴤⴔⴹⴹ" prompt, according to table 4 (page 24).
- **Output type** (relay, SSR, 0-20mA, 4-20mA or pulse) at "I/O-1", "I/O-2",... "I/O-5" prompts (Table 5, page 25).
- **Setpoint variable SV**. Set the remaining parameters.
- **PID parameters** (or ON/OFF control with hysteresis adjust).
- Other functions, including alarms, ramp and soak, timer, digital input, etc., may be useful for a better system performance.
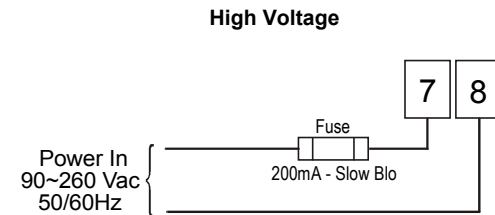
3.1 GENERAL ELECTRICAL CONNECTIONS:

CHECK UNIT LABEL FOR CONFIGURATION
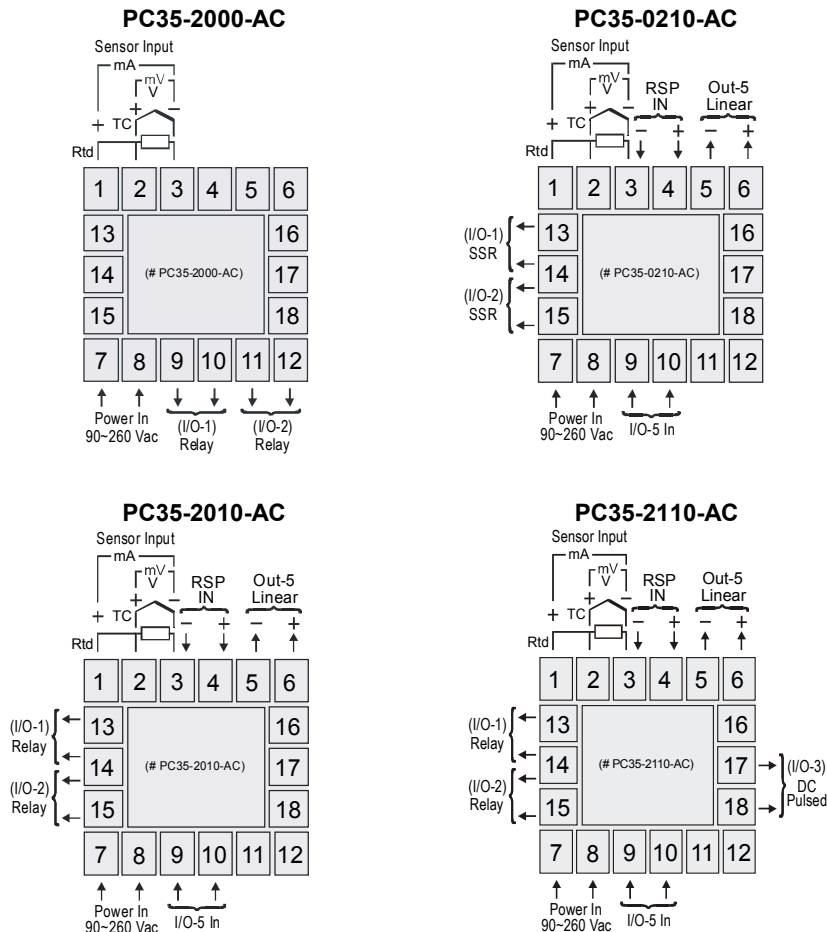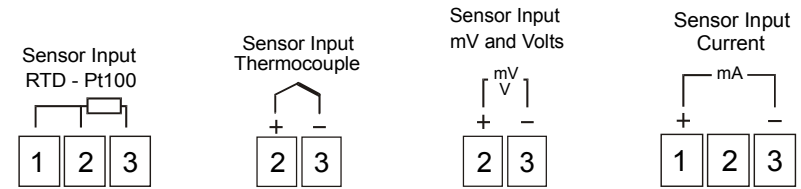

(Figure 3)

3.2 POWER WIRING:

Note: The installation of fuse is optional, depending on level of protection required.

(Figure 4)

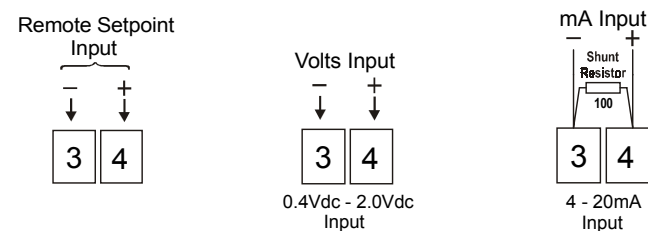Note: Use copper conductors rated for at least 75 ºC, maximum ambient temperature 50 ºC.

3.3 SENSOR INPUT WIRING:

(Figure 5)

Note: For Thermocouple Sensors use appropriate compensated thermocouple wires.
For RTD-Pt100 Sensor

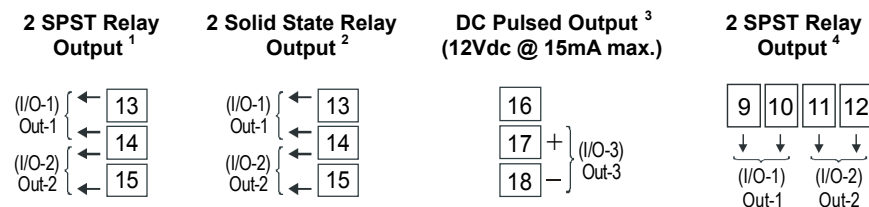## 3.4 LINEAR REMOTE SETPOINT INPUT:

(Figure 6)

Linear Remote Set Point (RSP) analog input: 0.4 to 2.0 Vdc (second linear input).
"For 4 to 20mA Input, an external resistor shunt of 100 ohms, 0.1% toll. Is required between terminals 3 and 4". (NOTE: This option is not available on model PC35-2000-AC).

3.5 OUTPUT WIRING: OUT-1, OUT-2, AND OUT-3 OPTIONS:
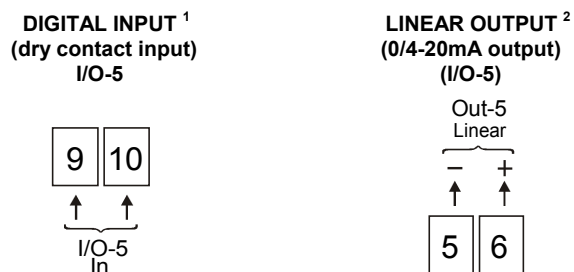
CHECK UNIT LABEL FOR CONFIGURATION

2 SPST Relay Output [1]   **2 Solid State Relay Output [2]**   **DC Pulsed Output [3] (12Vdc @ 15mA max.)**   **2 SPST Relay Output [4]**

(I/O-1) Out-1 ← 13, 14

(I/O-2) Out-2 ← 15

(I/O-1) Out-1 ← 13, 14

(I/O-2) Out-2 ← 15

16, 17 +, 18 − (I/O-3) Out-3

9 10 11 12 (I/O-1) Out-1 (I/O-2) Out-2

(Figure 6)

[1] This output configuration is standard in the **PC35-2010-AC** and the **PC35-2110-AC**.

[2] This output configuration is standard in the **PC35-0210-AC**.

[3] This output configuration is standard in the **PC35-2110-AC**.

[4] This output configuration is standard in the **PC35-2000-AC**.

3.6 WIRING: INPUT I/O-5, AND OUTPUT-5 (I/O-5):

CHECK UNIT LABEL FOR CONFIGURATION

DIGITAL INPUT [1] (dry contact input) I/O-5

9 10

I/O-5 In

LINEAR OUTPUT [2] (0/4-20mA output) (I/O-5)

Out-5 Linear

− +

5 6

(Figure 8)

[1] Digital input I/O-5 (dry contact input) configuration is standard in the **PC35-0210-AC**, **PC35-2010-AC** and **PC35-2110-AC** (see table 5, codes 6 to 10). When this function is used then the 0/4-20mA output (terminals 5-6) cannot be used.

[2] Linear output I/O-5 (0/4-20mA output) configuration is standard in the **PC35-0210-AC**, **PC35-2010-AC** and **PC35-2110-AC** (see table 5, codes 11 to 16). When this function is used then the digital input (terminals 9-10) cannot be used.

[1,2] Those configurations (I/O-5) are not available in the **PC35-2000-AC**.

NOTE: All terminal screws must be tightened securely. Terminal screws not properly secured can cause an electrical short that may damage property, equipment or cause injury or death. Terminal screws improperly secured may fall into equipment causing possible damage to property or equipment.

3.7 PANEL ASSEMBLY:

First remove the mounting clamp and insert the controller into the panel cut out. Place the unit into the panel cut out and slide the mounting clamp from the rear to a firm grip at the panel.
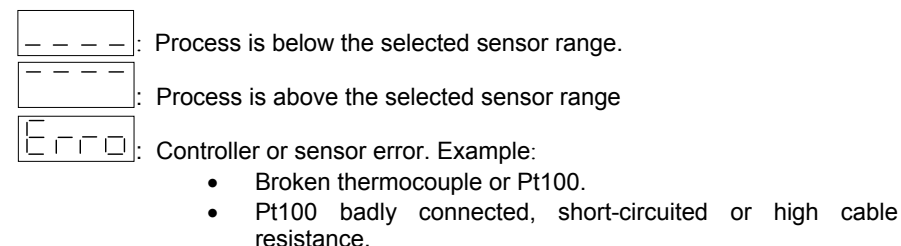
The internal circuitry can be fully removed from the housing without disconnecting any wiring. By using the thumb, just press the tab in the lower part of the front panel, grab the front panel firmly and pull the front face and circuitry from the housing.

Warning: Use caution when removing the controller from its case, there may be live voltage present at the terminals. This should only be done by a qualified technician. It is recommended that power to the controller be disconnected prior to removing the controller from the case.

3.8 ERROR MESSAGES:

The connection and configuration errors for most of the problems encountered in using the controller are shown below. A final revision of parameters will save time and further losses.

Error messages are displayed to help the user to identify possible problems.

| _ _ _ _ |: Process is below the selected sensor range.

| ‾ ‾ ‾ ‾ |: Process is above the selected sensor range

| Erro |: Controller or sensor error. Example:
- Broken thermocouple or Pt100.
- Pt100 badly connected, short-circuited or high cable resistance.

3.9 SERIAL NUMBER ACCESS:

To read the controller's serial number (8 digits), hold down the BACK key for a few seconds. The first four digits will appear in red on the top display and the second four will appear in green on the bottom display.

The serial number is recorded in the factory and cannot be changed.

4. MENU SYSTEM

The Parameter Menu System is organized into seven basic cycles. This is shown in the chart below.

Cycle	Access
1- Operation	Free access parameters
2- Tuning	Reserved access parameters
3- Ramp & Soak Program	
4- Alarms	
5- Input Configuration	
6- I/Os	
7- Calibration	

4.1 INITIAL STARTUP

When the controller is initially energized the Firmware version is displayed for approximately 4 seconds in the PV display after which the controller reverts to the normal operation mode or **Operation** cycle. This is **SETUP Cycle-1.** The upper display, PV, shows the **Process Variable** and the lower display, SV, shows the **Set Point Variable** in this cycle.

Important: Firmware version of controller must match the version indicated on the bottom front cover of this manual.

4.2 MENU CYCLE PARAMETER ACCESS

The Operation Cycle is the default Cycle and all parameters in this menu can be accessed using the **SETUP key** (move forward through the menu) and the **BACK key** (move backward through the menu).

The other Cycles can be accessed by pressing and holding the **BACK key** then pressing the **SETUP key** to move through each Cycle. The first item in the menu of each cycle is shown in the **PV** display, i.e., the **Tuning** Cycle displays *Atun* in the **PV** display and the **Alarms** Cycle displays *FuA1* in the **PV** display, etc. The **SETUP** and **BACK keys** can be used independently to move back and forth through the menu after the Cycle is chosen. After moving through the end of the Cycle menu the controller reverts to the **Operation** Cycle. The chart on the following page shows the parameter menu for each Cycle. To move rapidly through a Cycle menu **press** and **hold** the **SETUP key**.

Important: Disable all outputs prior to programming by pressing the SET UP key until "run" is displayed in the PV display. Then, using the ▲ or ▼ keys select "no" in the SV display. This will keep any information from effecting the process prematurely.

Cycle Parameter Menu

Cycle-1 OPERATION	Cycle-2 TUNING	Cycle-3 R&S Prog.	Cycle-4 ALARMS	Cycle-5 INPUT Conf.	Cycle-6 I/O Conf.	Cycle-7 CALIBRATION
PV Indication (Red Display)	Atun	Pr n	FuA1	tYPE	Io 1	InLC
	Pb	PtoL	FuA2	dPPo	Io 2	InHC
SV Indication (Green Display)	HYSt	PSP0	FuA3	Un It	Io 3	ouLC
	Ir	to	FuA4	oFFS	Io 4	ouHC
	dt	PSP7		SPLL	Io 5	CJL
AUto	Ct		bLA1	SPHL		HtYP
PV Indication (Red Display)	Act	Pt 1	bLA2	rSLL		rSLC
	b IAS	to	bLA3	rSHL		rSHC
	ouLL	Pt 7	bLA4	bAud		
MV Indication (Green Display)	ouHL	PE 1	HYA1	Addr		
	StSt	to	HYA2			
Pr n	SPA1	PE 7	HYA3			
run	SPA2	LP	HYA4			
	SPA3		A It1			
	SPA4		A It2			
			A2t1			
			A2t2			

4.3 CYCLE PROGRAM SECURITY:

Each menu Cycle can be locked (protected) by pressing **BACK** and ▲ **keys** simultaneously for 3 seconds, a short blink of the display confirms the lock cycle. Press **BACK** and ▼ **keys** for 3 seconds to unlock, a short blink of the display confirms the unlock cycle. This will alternately lock or unlock the ▲ and ▼ **keys** to avoid tampering.

5. CONFIGURATION (PROGRAMMING)

The configuration section gives information on parameter settings in each Cycle which help to configure the controller for the desired operation. However, the **first parameter that needs to be set is the Input type (tYPE)** in the **INPUT** Cycle-5 (see 5.5 page 23, and Table 4 page 24). This allows access to those parameters that operate with the designated input. **Output Configuration is the second parameter that needs to be set (see Cycle-6 section 5.6 page 25, and Table 5).**

In each Cycle the PV display shows the menu parameter and the SV display shows the value of that parameter, i.e., **Auto** will be shown in the PV display and **YES** or **no** will be shown in the SV display. Again, the ▲ and ▼ will change the parameter value.

5.1 CYCLE 1 - OPERATION:

|	PV AND SV INDICATION: The status display shows the present value of PV (Process Variable). The parameter display shows SV (Set Point Variable). SV **cannot** be adjusted if **Pr n** Ramp & Soak Program is a value other than **0** (zero).
PV Indication (Red) SV Indication (Green)	The status display shows **- - - -** whenever PV exceeds the maximum range or there is no signal at the input. In case of hardware error the status display will show **Erro**, where n is the error code number in the SV display. If an erro code number is displayed, the controller's hardware is damaged. Consult factory for repair or replacement.
Auto	CONTROL MODE: **YES** indicates automatic control mode (closed loop, PID or ON/OFF). **no** indicates manual control mode (open loop). Bumpless transfer from auto ↔ to manual mode is available. If in doubt program **YES**.
	MANIPULATED VARIABLE VALUE (MV): The upper display shows PV value and the lower display shows the percentage of MV applied to the control output. When in manual control (open loop) the MV value can be manually changed. When in auto mode the MV value can only be viewed.
PV Indication (Red) MV Indication (Green)	To distinguish the MV display from the SV display, the MV is shown flashing intermittently. MV is the percentage of control output, i.e.; if 4-20mA is the control output and 50 (50%) is the value in the SV display then the output will be 12mA. If a relay (any PWM) is used as the control output and the Cycle Time (**Ct**) is set for 10 seconds and 50 (50%) is the value in the SV display then the relay will be ON (closed) for 5 seconds and OFF (open) for 5 seconds.
Pr n	RAMP AND SOAK PROGRAM SELECTION: Selects the ramp and soak program to be executed (7 programs possible). To disable function set to **0**. Refer to Cycle 3, page 16 section 5.3, for R&S programming. Default value: **0**
run	CONTROL ENABLE: **YES** indicates that the control output and alarms are enabled and **no** indicates they are disabled.

5.2 CYCLE 2 - GENERAL TUNING:

Atun	AUTO-TUNE: **YES** enables the auto tuning of the PID parameters, and **no** disables it (manual tune). **Default: no**
Pb	PROPORTIONAL BAND: 0 to 500% of maximum input span. Select **0** (zero) for ON/OFF control w/ hysteresis. **Default: 0.0**
HYSt	CONTROL HYSTERESIS (engineering units): This parameter is only shown for ON/OFF control (Pb=0). **Default: 0**
Ir	INTEGRAL RATE: 0.00 to 25.00 = Integral time constant in repetitions per minute (Reset). **Default: 0.00**
dt	DERIVATIVE TIME: 0 to 250 = Derivative time constant, in seconds. **Default: 0**
Ct	CYCLE TIME: PWM period in seconds. Can only be changed if proportional band is other than zero. **Default: 8.0**
Act	CONTROL ACTION: For Auto Mode only. • Reverse Action set: **rE**, usually used for heating. • Direct Action set: **d Ir,** usually used for cooling. **Default: rE**
bIAS	Offset (manual reset) for MV (Manipulated Variable, or % of Output Control). Range: -100% to +100%. Default: **0.0**.
ouLL	OUTPUT LOW LIMIT: minimum percentage value for MV (% of Output Control) when in automatic control and PID. Default: **0.0**%
ouHL	OUTPUT HIGH LIMIT: Maximum percentage value for MV (% of Output Control) when in automatic control and PID. Default: **100.0**%
StSt	SOFT START: Time in seconds during which the controller limits the MV (% of Output Control) value progressively from 0 to 100%. It is enabled at power up or when the control output is activated. "To disable function set to **0**. " Default: **0**
SP.A1	ALARM 1 PRESET: Tripping point for alarm 1. **Default: - 150**
SP.A2	ALARM 2 PRESET: Tripping point for alarm 2. **Default: - 150**
SP.A3	ALARM 3 PRESET: Tripping point for alarm 3. **Default: - 150**
SP.A4	ALARM 4 PRESET: Tripping point for alarm 4. **Default: - 150**

5.3 CYCLE 3 - RAMP AND SOAK PROFILE PROGRAMMING:

Pr n	PROGRAM TO BE VIEWED: Selects the ramp and soak profile program to be edited/viewed in the following cycle prompts (7 programs available). **Default:** *1*
PtoL	RAMP AND SOAK TOLERANCE: maximum deviation between PV and SV. Whenever this deviation is exceeded the time counter is halted until deviation lowers to within the tolerance. Set zero to disable this function. **Default:** *0*
PSP0 to **PSP7**	RAMP AND SOAK SET POINTS (0 to 7): Set of 8 SV values which define the ramp and soak profile segments. See also **Pt 1** to **Pt 7** and **PE 1** to **PE 7** below. **Default:** *- 150*
Pt 1 to **Pt 7**	RAMP AND SOAK SEGMENTS TIME (1 to 7): Set of 7 time intervals in minutes (9999 max.) for the 7 segments of the ramp and soak program. **Default:** *0*
PE 1 to **PE 7**	RAMP AND SOAK EVENT (1 to 7): Set of 7 Event programs with 15 possible codes that define which alarms must be activated during a ramp and soak program segment. Alarm function depends on **r5** setting (see: Table 1 – R&S Event Alarm Function). **Default:** *0*
LP	LINK TO PROGRAM: Number of the next profile program to be linked to follow the current profile. Profiles can be linked to make larger programs of up to 49 segments. **Default:** *0*

Seven ramp and soak profiles with up to 7 segments each can be programmed. Longer profiles of up to 49 segments can be created by linking 2 or more profiles.
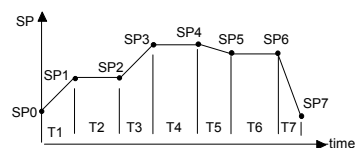
Example of a complete ramp and soak profile

(Figure 9)
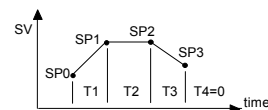
Example of a profile with fewer segments. (T4 is set 0).

(Figure 10)

To execute a profile with fewer segments just program 0 (zero) for the time intervals that follow the last segment to be executed.

The program tolerance " **PtoL** " defines the maximum deviation between PV and SV for the execution of the profile. If this deviation is exceeded, the program will be interrupted until the deviation falls to within the tolerance band. Programming 0 (zero) at this prompt disables the tolerance and the profile execution will not to be halted even if PV does not follow SV (time priority as opposed to SV priority).
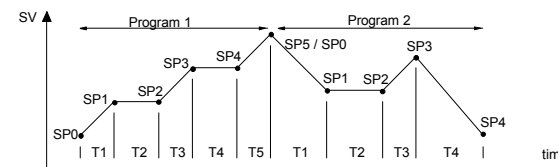
(Figure 11)

Example of two linked programs

Ramp & Soak Program, and Event Alarm:

Table 1 – Ramp & Soak Event alarm function

Code	Alarm 1	Alarm 2	Alarm 3	Alarm 4
0				
1	X			
2		X		
3	X	X		
4			X	
5	X		X	
6		X	X	
7	X	X	X	
8				X
9	X			X
10		X		X
11	X	X		X
12			X	X
13	X		X	X
14		X	X	X
15	X	X	X	X

To configure and execute a Ramp and Soak program:

- Set Control Mode to manual in the Operation Cycle (Cycle-1).
- Set the Control Enable run to no in the Operation Cycle (Cycle-1).
- Program the Tolerance value $PtoL$, Set Point PSP, Segment Time Pt, and Event PE (if required) in the Ramp & Soak Program Cycle (Cycle-3).
- Set the Control Mode to automatic in the Operation Cycle.
- Select Ramp and Soak program Prn to be executed (1 to 7) in the Operation Cycle.
- Set the Control Enable run to YES in the Operation Cycle to start the process.

Before executing the program the controller waits for PV to reach the first set point $PSP0$ if $PtoL$ is different than zero.

If any power failure occurs then the controller will resume at the beginning of the previous segment.

Ramp and Soak event alarms:
The ramp and soak event function is used to activate alarms at any segment of program 1. This applies only to program 1.

To enable this event function the alarms to be activated must be selected for rS function and are programmed at the $PE1$ to $PE7$ prompts. The number to be programmed at the prompt defines the alarms to be activated.
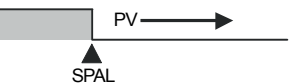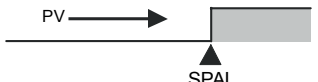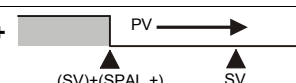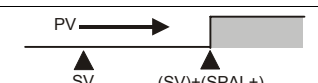
5.4 CYCLE 4 – ALARMS CONFIGURATION:

$FuA1$	ALARM 1 FUNCTION: Select options from Table 2 (page 20). **Default: oFF.**
$FuA2$	ALARM 2 FUNCTION: Select options from Table 2. **Default: oFF**
$FuA3$	ALARM 3 FUNCTION: Select options from Table 2. **Default: oFF**
$FuA4$	ALARM 4 FUNCTION: Select options from Table 2. **Default: oFF**
$bLA1$ $bLA2$ $bLA3$ $bLA4$	ALARM BLOCK 1 TO 4: This function blocks the alarm at power-up when the unit is first energized. YES enables and no inhibits this blocking function. When enabled the alarm will not be active at power-up waiting for PV (Process Variable) to reach a non-alarm situation. From this point on the alarm will be free to actuate should a new alarm situation occur.
$HYA1$	ALARM 1 HYSTERESIS: Defines the differential range between the PV value at which the alarm is turned on and the value at which it is turned off (in engineering units). **Default: 0**
$HYA2$	ALARM 2 HYSTERESIS: Same as above.
$HYA3$	ALARM 3 HYSTERESIS: Same as above.
$HYA4$	ALARM 4 HYSTERESIS: Same as above.
$A1t1$	ALARM 1 TIME 1[1]: Defines the time (6500 sec. max.) during which the alarm 1 output will be on when alarm 1 is active. Program zero to disable this function. **Default: 0**
$A1t2$	ALARM 1 TIME 2[1]: Defines the oFF state time for the alarm 1 output, after being on during the time selected on ALARM 1 TIME 1. Program zero to disable this function. **Default: 0**
$A2t1$	ALARM 2 TIME 1[1]: Defines the time (6500 sec. max.) during which the alarm 1 output will be on when alarm 1 is active. Program zero to disable this function. **Default: 0**
$A2t2$	ALARM 2 TIME 2[1]: Defines the time during which the alarm 2 output will be, after being on during the time selected on ALARM 2 TIME 1. Program zero to disable this function. **Default: 0**

[1]Table 3, page 22, shows the advanced features that can be achieved with this time function.

The controller has optional up 3 alarms (check unit label for option). Only alarms 1 and 2 have front panel LED's associated to them. The alarms can be configured to operate in any of the nine functions listed on Table 2.

Table 2 - Alarm functions

TYPE	PROMPT	ACTION
Disabled	oFF	No active alarm. This output can be used as a digital output to be set by the serial communication.
Sensor Break (Input **Err**or)	IErr	Alarm will be ON if PV sensor breaks, input signal is out of range or Pt100 is shorted.
Event Alarm (**R**amp and **S**oak)	rS	Can be activated at a specific segment of ramp and soak program.
Factory Reserved	rFR IL	Don't use (Factory Reserved)
Low Alarm (Low Process Alarm)	Lo	Low SPAL
High Alarm (High Process Alarm)	H I	High SPAL
Differential **LO**W (Deviation Low)	d IFL	Dif-Low SPAL+ Dif-Low SPAL-
Differential **HI**GH (Deviation High)	d IFH	Dif-High SPAL+ Dif-High SPAL-
Differential (Band Alarm)	d IF	Dif-SPAL+ Dif-SPAL-

(where SPAL means: SPR 1 , SPR2 , SPR3)

Alarm Functions:

Low Alarm: Activates at present value, independent of main setpoint (SV). Low process-alarm activates at and below alarm setting.

High Alarm: Activates at present value, independent of main setpoint (SV). High process-alarm activates at and above alarm setting.

Differential Low: Activates at present deviation (negative or positive) value from main setpoint (SV). Low deviation-alarm activates below alarm setting. Figure 12(a) below gives a graphical description of this.

Differential High: Activates at present deviation (negative or positive) value from main setpoint (SV). High deviation-alarm activates above alarm setting. This is represented in Figure 12(b).

Differential: Activates when the process exceeds a specified band-alarm centered around the main setpoint (SV). See Figure 12(c).
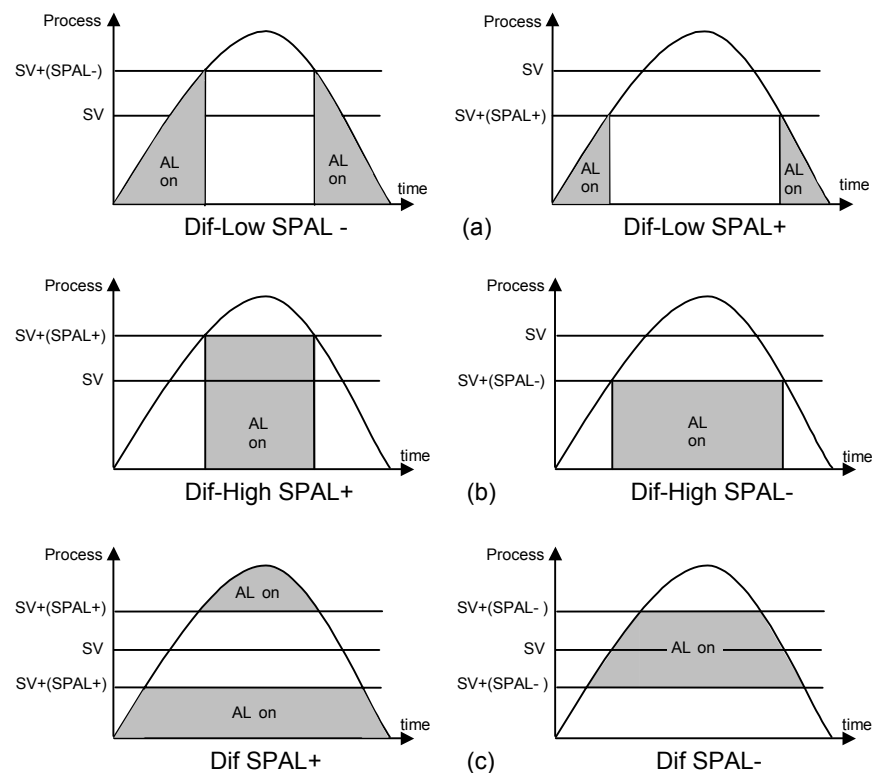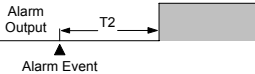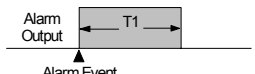

(Figure 12)

Alarms 1 and 2 can be programmed to have timer functions. The 4 modes of operation are: Normal, Pulsed, Delayed, or Oscillator.
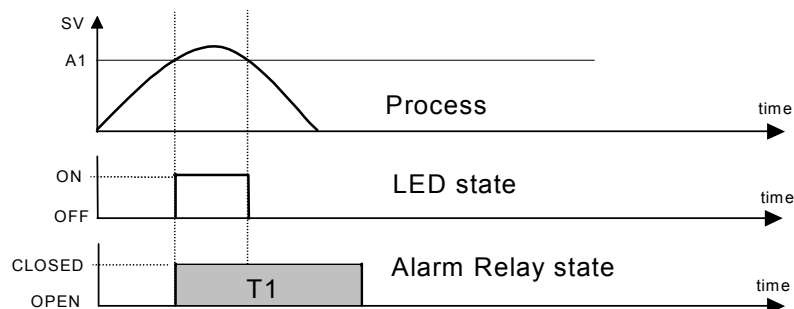
The desired function can be achieved programming the parameters "A1t1", "A1t2", "A2t1" and "A2t2" (see Table 3).

Table 3 - Advanced Timer Alarm (for alarm 1 and alarm 2)

Alarm Function	T1	T2	ACTION
Normal	0	0	Alarm Output / Alarm Event
Delayed	0	1s to 6500s	Alarm Output, T2 / Alarm Event
Pulse	1s to 6500s	0	Alarm Output, T1 / Alarm Event
Oscillator	1s to 6500s	1s to 6500s	Alarm Output, T1, T2, T1 / Alarm Event

The initial blocking option inhibits the alarm from being recognized if an alarm condition is present when the controller is first energized. The alarm will activate only after the occurrence of a non-alarm condition followed by a new occurrence for the alarm.

Under Pulsed, Delayed, or Oscillator alarm operation the LED's associated to the alarms will only light during the actual process state, i.e., when the process is in alarm situation. The alarm relay, however, will remain closed throughout the time delay set by the operator.   Under Normal operation both the LED's and alarm relays will coincide. Figure 13 shows a process with a Pulsed alarm relay where A1 is the alarm setpoint and T1 is the alarm pulse (0 – 6500s). In this figure the alarm relay T1 is ON (closed) over a time span that exceeds the actual process alarm A1 and its associated LED.

(Figure 13)

5.5 CYCLE 5 - INPUT CONFIGURATION:

"Input Type is the first parameter that needs to be set"

tYPE	INPUT TYPE: Selects the input signal type to be connected to the process variable input. Refer to Table 4, page 24. *This is the first parameter to be set. The second parameter that needs to be set is the Output Control in the I/O Configuration Cycle (Cycle-6). See page 25 section 5.6 and Table 5.*
dPPo	DECIMAL POINT POSITION: For linear input types 16, 17, 18 and 19 only. Selects the decimal point position to be viewed in both PV and SV. **Default: oFF**
Un1t	TEMPERATURE INDICATION IN ºC OR ºF: Selects the display indication to be in ºC or ºF. Only available if input type is other than 16, 17, 18 or 19. **Default: C**
oFFS	SENSOR OFFSET: Offset value to be added to the PV to compensate sensor error. **Default**: 0
SPLL	SET POINT LOW LIMIT: - Linear inputs: Sets the lower range for SV and PV indication. - T/C and Pt100 inputs: sets the lower range for SV. **Default: -150**
SPHL	SET POINT HIGH LIMIT: - Linear inputs: Sets the upper range for SV and PV indication. - T/C and Pt100 inputs: sets the upper range for SV. **Default: 1370**
rSLL	REMOTE SET POINT (RSP) LOW LIMIT: Selects the lower range for indication of the Remote Setpoint. **Default: -150**
rSHL	REMOTE SET POINT (RSP) HIGH LIMIT: Selects the upper range for indication of the Remote Setpoint. **Default: 1370**
bAud	DIGITAL COMMUNICATON BAUD RATE SELECTION: **NOT AVAILABLE**
Addr	SLAVE ADDRESS SELECTION: **NOT AVAILABLE**

Linear Remote Set Point (RSP) Input:

The Remote Setpoint (RSP) is enabled by an external digital signal in (dry contact input, terminals 9-10) I/O-5, when programmed with the code 8 (*Select Remote SP input*).

NOTE: Linear Remote Setpoint (RSP) analog input is 0.4 to 2.0 Vdc. To obtain 4 to 20mA RSP Input, an external resistor shunt of 100Ω, 0.1% tolerance is required between terminals 3 and 4.

Sensor Types Input:

Table 4 - Input Types

Select the input type (in parameter **type**) from Table :

TYPE INPUT	CODE	CHARACTERISTICS
Tc. J	0	range: -110 to 760 °C (-166 to 1400ºF)
Tc. K	1	range: -150 to 1370 °C (-238 to 2498ºF)
Tc. T	2	range: -160 to 400 °C (-256 to 752ºF)
Tc. S	5	range: 0 to 1760 °C (32 to 3200ºF)
Pt100	6	range: -199.9 to 530.0 °C (-199.9 to 986.0ºF)
Pt100	7	range: -200 to 530 °C (-328 to 986ºF)
4 to 20 mA	8	Tc. J linearization. Programmable range: -110 to 760°C
4 to 20 mA	9	Tc. K linearization. Programmable range: -150 to 1370°C
4 to 20 mA	10	Tc. T linearization. Programmable range: -160 to 400°C
4 to 20 mA	13	Tc. S linearization. Programmable Range: 0 to 1760°C
4 to 20 mA	14	Pt100 linearization. Prog. Range: -199.9 to 530.0°C
4 to 20 mA	15	Pt100 linearization Prog. Range: -200 to 530°C
0 to 50mV	16	Linear. Programmable indication -1999 to 9999
4 to 20 mA	17	Linear. Programmable indication -1999 to 9999
0 to 5 Volts	18	Linear. Programmable indication -1999 to 9999
4 to 20mA	19	Square Root Extraction

Wires Sensor Input
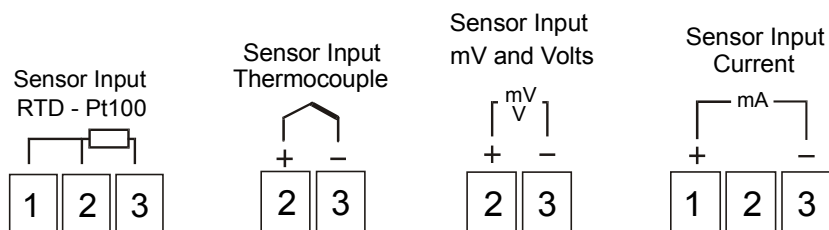
(Figure 14)

Notes:

1) For Thermocouple Sensors use appropriate compensated thermocouple wires.

2) Use copper conductors only rated at least 75 ºC (except on T/C).

5.6 CYCLE 6 - I/O CONFIGURATION FOR OUTPUTS AND DIGITAL INPUTS:

The controller input/output channels can assume multiple functions, depending on configuration: control output, alarm output, digital input, and PV or SV analog retransmission. These channels are identified as I/O-1, I/O-2, I/O-3, and I/O-5.

The function code of each I/O can be selected among the options in Table 5. Only valid function codes are displayed for each I/O (for example, I/O1, which is a relay, can be configured with functions 0 to 5 only; and I/05 can perform all 16 functions). See page 26 for a description of codes.

To configure a relay output (any PWM output) for main control select code **5** for " **Io 1**" or " **Io 2**". To configure Pulsed DC output for main control select code **5** for " **Io 3**" (I/O-3 is only available in the **PC-2110-AC** and must be enabled in Cycle-7, see I/O Defaults below) . To configure linear output (analog) for main control select codes **11** or **12** for " **Io 5**".

"This is the second parameter to be set"

Table 5 - Code functions for I/O-1 to I/O-5

| CODE	I/O Type	I/O Function
0	Off	No Function
1	Alarm Output	Alarm 1 Output
2	Alarm Output	Alarm 2 Output
3	Alarm Output	Alarm 3 Output
4	Alarm Output	Not Available
5	Control Output	PWM CONTROL Output (Relays, SSR, or Pulsed DC)
6	Function Input	Automatic/Manual mode change
7	Function Input	Run/Stop mode change
8	Function Input	Select Remote Set Point Input
9	Function Input	Executes/Holds selected Ramp & Soak profile
10	Function Input	Enable/Disable R&S profile 1 selection
11	Analog Control Output	0 to 20mA Analog control output
12	Analog Control Output	4 to 20mA Analog control output
13	PV Analog Output	0 to 20mA PV retransmission
14	PV Analog Output	4 to 20mA PV retransmission
15	SP Analog Output	0 to 20mA SP retransmission
16	SP Analog Output	4 to 20mA SP retransmission

The description for the functions follows:

- **CODE 0 - no function** - The I/O channel programmed with code 0 will not be used by the controller.

- **CODES 1 to 3 - Alarm output** - Available for all I/O channels. The selected channel can be used as output for alarms 1 to 3.

- **CODE 5 - PWM (Pulse Width Modulation: Relay, SSR, Pulsed DC) control output** - Available for all I/O channels.

- **CODE 6 - Digital input - I/O5:**
  Contact Closed: Manual control (open loop control)
  Contact Open: Automatic control

- **CODE 7 - Digital input - I/O5:**
  Run/Stop input ("run": YES / no).
  Contact Closed: outputs enabled
  Contact Open: outputs disabled

- **CODE 8 - Digital input - I/O5:**
  Contact Closed: linear Remote Setpoint input active (external linear setpoint input).
  Contact Open: main SP active (internal programmed SP)

- **CODE 9 - Digital input - I/O5:**
  Contact Open: enables "Ramp & Soak" program
  Contact Closed: holds "Ramp & Soak" program

- **CODE 10 - Digital input -I/O5:**
  Selects Ramp & Soak program 1. Used to alternate between the main Setpoint and a second Setpoint defined by the **"Ramp & Soak" program 1.**
  Contact Closed: selects program 1
  Contact Open: uses main Setpoint

- **CODE 11 - Analog control output** - I/O5 only, 0-20mA control output.

- **CODE 12 - Analog control output** - I/O5 only, 4-20mA control output.

- **CODES 13 to 16 - Analog retransmission** - I/O5 only. Configures I/O5 to output a 0-20mA or 4-20mA analog signal proportional to PV or SP.

NOTE: Codes 6 to 16 are not available in the model PC35-2000-AC.

Linear Remote Set Point (RSP) Input:

The Linear Remote Set Point is a function that enables the operator to change the set point remotely via a linear signal (0.4Vdc – 2Vdc or 4–20mA). To enable the use of the RSP, select code **8** (Select Remote Set Point Input) for **Io 5** in Cycle-6. Then connect a discrete input (dry contact) across terminals 9-10 as shown in figure 15(a) on the following page. A linear input signal must then be connected to terminals 3-4 as shown in Figures 15(b) or 15(c). The Remote Set Point function (RSP) is enabled when terminals 9-10 are closed. When this function is used then the 4-20mA Analog Output (terminals 5-6) cannot be used.
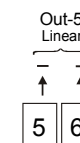
REMOTE SET POINT WIRING
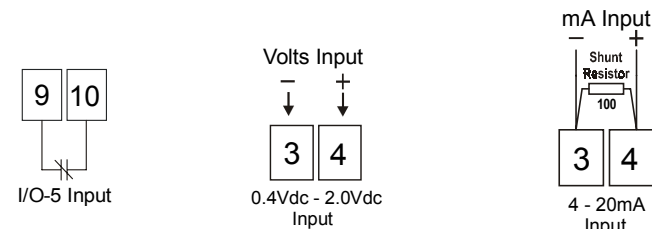
(Figure 16)

OUTPUT WIRING
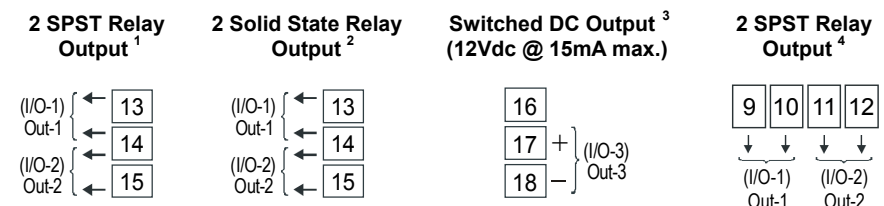
(Figure 16)

0/4-20mA Linear Output [5] I/O-5

(Figure 17)

[1] This output configuration is standard only in the **PC35-2010-AC** and **PC35-2110-AC**.

[2] This output configuration is standard only in the **PC35-0210-AC**.

[3] This output configuration is standard only in the **PC35-2110-AC**.

[4] This output configuration is standard only in the **PC35-2000-AC**.

[5] This output configuration is standard only in the **PC35-0210-AC, PC35-2010-AC** and **PC35-2110-AC**.

5.7 CYCLE 7 - CALIBRATION:

NOTE: All input and output types are factory calibrated. Experienced personnel only should access this cycle. If in doubt do not press the ▼ or ▲ keys in this cycle. To access this cycle press and hold the SETUP and BACK keys for approximately 6 seconds while (in Cycle-6, I/O Configuration), until " InLC " is shown in the PV display.

InLC	INPUT LOW CALIBRATION: Sets the Process Variable low calibration (offset). Several keystrokes at ▼ or ▲ might be necessary to increment one digit.
InHC	INPUT HIGH CALIBRATION: Sets the Process Variable span calibration (gain).
ouLC	OUTPUT LOW CALIBRATION: Sets the analog current output low calibration (offset).
ouHC	OUTPUT HIGH CALIBRATION: Sets the analog current output span calibration (gain).
CJ L	COLD JUNCTION OFFSET CALIBRATION: Sets the cold junction in °F or °C offset calibration. A good thermometer or a temperature simulator should be used to properly adjust this parameter.

HtYP	HARDWARE TYPE: Configures the controller to recognize the actual installed optional hardware (I/O-3 and I/O-4 module). The parameters menu will show the parameters relative to the optional hardware:
	
	    0 - I/O-3 and I/O-4 disabled.
	    1 - I/O-3 active.
	    2 - I/O-3 and I/O-4 active.
	    3 - Factory reserved (don't use).

rSLC	REMOTE SET POINT LOW CALIBRATION: Sets the Remote Set Point low calibration (offset). Several keystrokes at ▼ or ▲ might be necessary to increment one digit.
rSHC	REMOTE SET POINT HIGH CALIBRATION: Sets the Remote Set Point span calibration (gain). Several keystrokes at ▼ or ▲ might be necessary to increment one digit.

6. PID AUTO TUNE

During auto tune the process is controlled in ON/OFF mode at the programmed Set Point (SV). Depending on the process characteristics large oscillations above and below SV may occur and auto-tuning may take several minutes to be concluded. The following page gives the standard procedure for auto-tune.

The standard auto-tune procedure is as follows:
- Disable the control output at the **run** prompt in the Operation Cycle (Cycle-1) by selecting **no**.
- Select auto mode operation at the **Auto** prompt in Cycle-1 by selecting **YES**.
- Disable the ramp and soak function by setting **Pr n** to **0** in Cycle-1, then program the setpoint (SV) variable close to the desired process variable (PV).
- Enable auto tuning at the **Atun** prompt in the Tuning Cycle (Cycle-2) by selecting **YES.**
- Enable the control output at the **run** prompt in Cycle-1 by selecting **YES**.

During auto-tune the "M" LED flashes. Once auto-tune is complete the "M" LED turns off.

Note: During the auto tune procedure the soft-start function will not operate and large oscillations will be induced around the setpoint depending on the process characteristics. Make sure the process can accept these oscillations and fast control output changes without being damaged.

The **recommended** auto-tune procedure is as follows:
- Follow the procedure above **except**, program a setpoint 10 – 20% below the final desired value.
- After auto-tune is complete (the "M" LED is off) change the setpoint to the final desired value.

If auto-tuning results are not satisfactory refer to section 7 and Table 6 for manual fine tuning procedure.

NOTE: Certain processes behave in very irregular manners. In these cases, control type "On/Off with hysteresis adjust" is recommended.

7. PID MANUAL TUNE

The operator may choose to tune the controller manually for optimum process perfomance once all parameters are set. This can be achieved by using Table 6 below or by determining the values for the propotional band **Pb**, integral rate **Ir** and derivative time **dt** by following the steps on page 30. **The procedure on page 29 should only be done on processes that will not be damaged by large fluctuations in the process variable (PV).**

Table 6 - Suggestions for manual tuning of PID parameters

PARAMETER	RESPONSE	SOLUTION
Proportional Band	Slow Response	Decrease
Proportional Band	Large Oscillation	Increase
Integral Rate	Slow Response	Increase
Integral Rate	Large Oscillation	Decrease
Derivative Time	Slow Response or Instability	Off (**dt = 0**)
Derivative Time	Large Oscillation	Increase

Step 1. Disable all outputs in Cycle-1 by changing `run` to `no`. Change the setpoint to the desired process variable (PV) in the Operation Cycle. This value should be below (PV) if overshoot will cause damage to the process.

Step 2. Make sure `Pb` is set to `0` in Cycle-2, page 15. This places the controller in ON/OFF control.

Step 3. Enable all outputs by changing `run` to `YES` in Cycle-1. Once the outputs are enabled the process variable (PV) will approach and eventually overshoot the setpoint (SV). At this point the operator should note the following values (see Figure 18):

- The value from the highest point of overshoot to the lowest point of undershoot, **X**.
- The cycle time of the oscillation, **T** = cycle repetitions per minute.

Using the following information and the values above the operator can determine the PID setting for the process:

- `Pb` = **X** ÷ scale range x 100
- `Ir` = **T** = cycle repetitions per minute
- `dt` = **T** ÷ 6
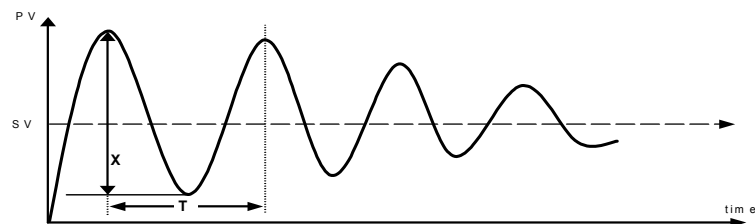
(Figure 18)

The operator may then lock access to Cycle-2 to keep the PID parameters from being changed, see Program Security section 4.3 page 13.

8. OPTIONAL SERIAL COMMUNICATION

An optional RS485 serial communication interface is available which allows up to 247 controllers in a network to communicate to a master device.

RS-485 Serial Communication Interface
- Compatible signals with RS485 standard.
- Two-wire connection from master to up to 247 slave controllers in a multidrop bus.
- Maximum communication distance: 3280 feet (1000 meters).
- Optically isolated serial interface
- Programmable Baud rate: 1200, 2400, 4800, 9600 or 19200bps.
- Data Bits: 8
- Parity: None
- Stop Bits: 1

# PC35 Quick PID Setup Reference

Key and Display Functions

C LED: Indicates that the Control Output is energized.

A1 LED: Indicates the status of alarm 1.

A2 LED: Indicates the status of alarm 2.

F1 LED: Indicates that the digital input I/0 5 is active.

M LED: Indicates that the controller is in manual mode. This LED flashes when the controller is operating in Auto Tune.

PV Display: Indicates the process value, program parameters, open sensor, and hardware error.

SV Display: Indicates the set point, output value, program parameter values, and error and alarm codes.

BACK: Used to move backward through a menu Cycle. Pressing and holding the Back key while pressing the SET UP key moves the controller from one program cycle to another.

SET UP: Used to move forward through a menu Cycle.

▼: Used to decrease the value of the displayed parameter.

▲: Used to increase the value of the displayed parameter.

Set Up Cycle Parameter Access

Cycle-1	Cycle-2	Cycle-3	Cycle-4	Cycle-5	Cycle-6	Cycle-7
OPERATION	TUNING	R&S Prog.	ALARMS	INPUT Conf.	I/O Conf.	CALIBRATION
PV Indication (Red Display)	Atun	Pr n	FuA1	type	Io 1	InLC
	Pb	PtoL	FuA2	dPPo	Io 2	InHC
	HYSt	PSP0	FuA3	Un It	Io 3	ouLC
SV Indication (Green Display)	Ir	to	FuA4	oFFS	Io 4	ouHC
	dt	PSP7		SPLL	Io 5	CJL
Auto	Ct		bLA1	SPHL		HtYP
PV Indication (Red Display)	Act	Pt 1	bLA2	rSLL		rSLC
	b IAS	to	bLA3	rSHL		rSHC
	ouLL	Pt7	bLA4	bAud		
MV Indication (Green Display)	ouHL		HYA1	Addr		
	StSt	PE 1	HYA2			
Pr n	SPA1	to	HYA3			
run	SPA2	PE7	HYA4			
	SPA3	LP	A1t1			
	SPA4		A1t2			
			A2t1			
			A2t2			

Quick Set Up

This quick reference setup is intended to be used by experienced users that are familiar with the PC35 set up menu or those that need only basic PID operation. This guide will show how to configure the input, output control and basic alarm function. For detailed programming information refer to the Table of Contents to find the required instructions for a particular function. Follow these steps:

1. **Operation:** Connect power input to proper terminal connections. After power-up the controller is in the Operation Cycle (Cycle-1). See Above Cycle Menu. Disable all outputs by pressing the **SET UP key** until �run is displayed in the PV display. Press the ▲ or ▼ keys until ⎽no is shown in the SV display. The controller outputs are now disabled. Press the **SET UP** key again and values will be shown in the PV and SV displays. To move from one Cycle to the next press and hold the **BACK key** then press the **SET UP key**.

2. **Input Type:** Press and hold the **BACK key** then press the **SET UP key** 4 times (Input Cycle-5) or until **t⎩PE** is displayed in the PV display. Select the Input Type code from Table 4 on page 24 using the ▲ or ▼ keys, i.e., T/C J = 0, T/C K = 1, etc.

3. **Output Control Configuration:** From Input Cycle-5 press and hold the **BACK key** then press the **SET UP key** once to move to the Output Configuration menu (Cycle-6) or until **⎿o 1** is displayed in the PV display. Use the **SET UP key** to move forward through the I/O's and BACK to move backward. There are five optional outputs with the PC35, they include relays, SSR, pulsed DC, and one 0/4-20mA. Outputs 1, 2, 3, 4, and are designated for these outputs. Therefore, **⎿o 1** to **⎿o 4** are the designated outputs for the relays, SSR, pulsed DC, and **⎿o 5** is the designated output for the 0/4-20mA analog output. If **⎿o 1** or **⎿o 2** is to be used for main output control then select code **5** from Table 5 on page 25 for one of the two outputs using the ▲ or ▼ keys otherwise select **0**. If **⎿o 5** (4-20mA) is to be used for main output control then select code **12** using the ▲ or ▼ keys otherwise select **0**.

4. **Output Alarm Configuration:** Once the output control is configured in Cycle-6, then up to 2 alarms can be configured as well. Use Table 5 on page 25 to configure which outputs will be used for alarms. For example, if **⎿o 1** is used as the main output control then **⎿o 2** can be selected for either Alarm 1 through 4 (codes 1 through 4) by pressing ▲ or ▼ keys. The same applies to **⎿o 5**.
    Note: Two I/O's cannot be configured for the same alarm output.

5. **Alarm Functions:** After the Alarms are configured for the designated I/O's the alarm functions can be programmed. Press and hold the **SET UP key** to move rapidly back to the Operation Cycle. Press and hold the **BACK key** then press the **SET UP key** 3 times or until **F⎍R 1** is displayed in the PV display. This is Alarm 1 Function. Select the parameter for this function by using the ▲ or ▼ keys. See Table 2 on page 20 for alarm functions. After the 1st alarm function is selected press the **SET UP** key to move to the next, **F⎍R2** and select the 2nd alarm function from Table 2. A full description of alarm configurations is shown on page 19.

6. **Alarm Set Points:** To set the alarm set points press and hold the **SET UP** key to move back to Cycle 1. Then press and hold the **BACK key** and press the **SET UP key** once or until **Rt⎍n** is displayed in the PV display. This is the General Tuning Cycle (Cycle-2). Use the **SET UP key** to move through the cycle until **SP.R 1** is displayed in the PV display. Use the ▲ or ▼ keys to select the set point for Alarm 1. Press the **SET UP key** again to move to the set point for Alarm 2 and do the same. The Alarm(s) are now configured.

7. **Auto Tune & Cycle Time:** In the General Tuning Cycle use the **BACK key** to move to the top of the menu to **Rt⎍n**. This is the Auto Tuning parameter. Use the ▲ or ▼ keys to select **⎩ES** in the SV display. This enables the PID Auto Tuning function. The default for the Cycle Time in the menu cycle is 16 seconds. If a different Cycle Time is required then press the **SET UP key** until **Ct** is displayed in the PV display. Change the Cycle Time by pressing the ▲ or ▼ keys to the desired setting. The controller is now ready for basic process operation.

8. **Set Point:** Press and hold the **SET UP key** to move rapidly back to Cycle 1. Program the set point in by pressing the ▲ or ▼ keys in the Operation Cycle to increase or decrease the set point to the desired value.

9. **Enable Process Outputs:** Press the **SET UP key** to display **R⎍t⎍** and press the ▲ or ▼ to select **⎩ES**. This allows automatic operation. Press **SET UP key** again until ⎾⎍n is displayed in the PV then press the ▲ or ▼ keys to select **⎩ES**. All outputs are now enabled and the controller is fully operational.

NOTES:

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
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Error Codes Table for Temperature/Process Controllers

Document # C0504

The connection and configuration errors for most of the problems encountered in using the controller are shown below. A final revision of the connections and parameters will save time and further losses.

Error messages are displayed to help the user to identify possible problems.

Error Codes Table

Display Show s	Cause
_ _ _ _	Process or temperature is below the selected sensor range.
- - - -	Process or temperature is above the selected sensor range.
Erro	Sensor error. Example: 1. No connections on the sensor input terminals. 2. Broken thermocouple (open wire) or broken RTD-Pt100. 3. RTD-Pt100 badly connected, short-circuited or high cable resistance.
Err 1	RTD-Pt100 badly connected, short-circuited or high cable resistance.
Err 6	This kind of error is caused when, for instance, a 4-20mA signal goes through the mV or Thermocouples input and can introduce signals of up to 30VDC at the input point and force the Auto/Zero and Auto/Span to work outside the limits that guarantee the precision of the controller. This error goes away when the signal is removed from the input and the connection is fixed (normally, input signals of up to 30VDC do not damage the controller's hardware).
Err 2	Auto/Zero Problem: This error is caused by a wong connection and indicates that a voltage greater than 30VDC was input into the sensor and the Auto/Zero circuit was damaged. It is necessary to revise the controller.
Err 4	Auto/Span Problem: This error is caused by a wrong connection and indicates that a voltage greater than 30VDC was input into the sensor and the Auto/Span circuit was damaged. It is necessary to revise the controller.

NOTE: The controllers do not accept AC-Voltage or AC-Current in the sensor input. This type of signal can damage the controller.