

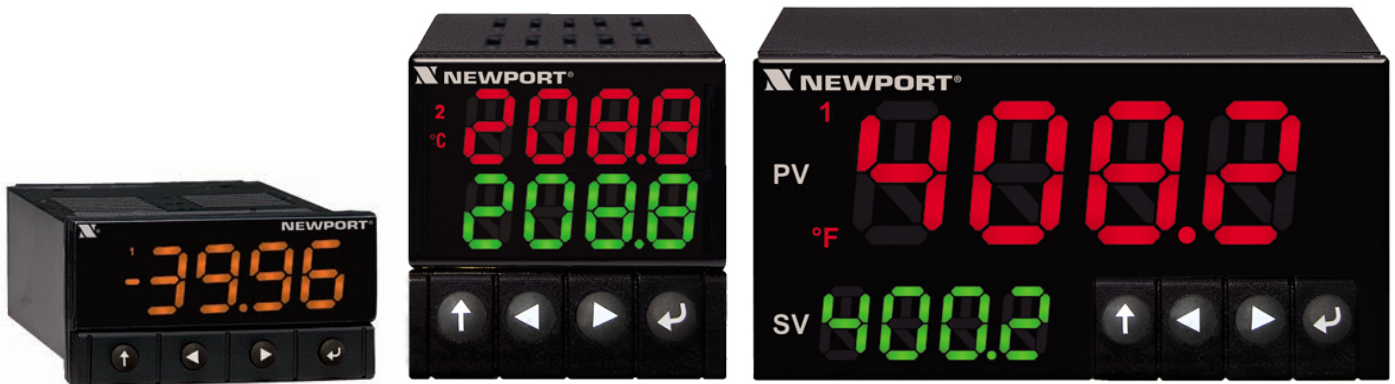
Temperature & Process Controllers

Pt32, Pt16, Pt16D, Pt8Pt, Pt8D

Operator's Manual



PLATINUM[™] Series



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Newport Electronics, Inc.
2229 South Yale Street
Santa Ana, CA 92704

www.newportUS.com
info@newportUS.com

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1. Introduction

1.1 Description

The PLATINUM™ Series controller offers unparalleled flexibility in process measurement. While the controller is extremely powerful and versatile, great care has gone into designing a product that is easy to set up and use. Automatic hardware configuration recognition eliminates the need for jumpers and allows the unit's firmware to automatically simplify itself, eliminating all menu options that do not apply to your configuration.

Each unit allows the user to select the input type from 9 thermocouple types (J, K, T, E, R, S, B, C, and N), Pt RTDs (100, 500, or 1000 Ω , with a 385, 392, or 3916 curve), thermistors (2250 Ω , 5K Ω , and 10K Ω), DC voltage, or DC current. The analog voltage inputs are bidirectional and both voltage and current are fully scalable to virtually all engineering units with a selectable decimal point that is perfect for use with pressure, flow, or other process inputs.

Control is achieved using the PID, on/off, or heat/cool control strategy. PID control can be optimized with an autotune feature; and in addition, a fuzzy logic Adaptive Tuning Mode allows the PID algorithm to be continuously optimized. The instrument offers up to 16 Ramp and Soak segments per Ramp and Soak program (eight each), with auxiliary event actions available with each segment. Up to 99 Ramp and Soak programs can be stored, and multiple Ramp and Soak programs can be chained, creating unmatched ramp and soak programming capability. Multiple Alarms can be configured for above, below, hi/lo, and band triggering using either absolute or deviation Alarm trigger points.

The PLATINUM™ Series controller features a large, three-color, programmable display with the capability to change color every time the Alarm is triggered. Various configurations of mechanical relay, SSR, DC pulse, and analog voltage or current outputs are available. Every unit comes standard with USB communications for firmware updates, configuration management, and data transfer. Optional Ethernet and RS-232 / RS-485 Serial communications are also available. The Analog Output is fully scalable and may be configured as a proportional controller or retransmission to follow your display. The universal power supply accepts 90–240 Vac. The low-voltage power option accepts 24 Vac or 12–36 Vdc.

Additional features usually found only on more expensive controllers make these the most powerful products in their class. Some additional standard features are remote Setpoint for cascaded control setups, High-high/Low-low Alarm functionality, external latch reset, external Ramp and Soak program initiation, combination Heat/Cool Control Mode, configuration save and transfer, and configuration password protection.

1.2 Using This Manual

This initial section of the manual will cover the back panel connections and wiring instructions. A quick overview of how to navigate the PLATINUM™ Series menu structure follows in [Section 2](#). This is followed in [Section 3](#) by the complete PLATINUM™ Series menu tree. Remember, not all commands and parameters in that menu tree will show up on your unit, as those that are not available with your configuration are automatically hidden. Repetitive menu structures are highlighted in gray and only shown once but are used multiple times; examples include scaling process inputs for the different process input ranges, setting up the data communications protocol for each of the communications channels, configuration for multiple outputs, etc.

This manual is optimized for online use. Therefore, the blue entries in the Section 2 menu tree are hyperlinks that take you straight to the corresponding reference section entry when you click on them. The Reference Section—encompassing Initialization Mode in [Section 4](#), Programming Mode in [Section 5](#), and Operating Mode in [Section 6](#)—will provide more detail on what parameter and command choices you have, how they operate, and why you might want to choose a specific value. There are also blue cross-references embedded in the Reference Section (the blue section headers however, are not hyperlinks). In addition, the Table of Contents on pages 3 through 6 is hyperlinked to all of the entries throughout the manual that are listed in it.

1.3 Safety Considerations

This device is marked with the international caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

This instrument is a panel mount device protected in accordance with EN 61010-1:2010, electrical safety requirements for electrical equipment for measurement, control, and laboratory use. Installation of this instrument should be done by qualified personnel.



In order to ensure safe operation, the following instructions must be followed and warnings observed:

This instrument has no power-on switch. An external switch or circuit-breaker must be included in the building installation as a disconnecting device. It must be marked to indicate this function, and it must be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker must comply with the relevant requirements of IEC 947-1 and IEC 947-3 (International Electrotechnical Commission). The switch must not be incorporated in the main supply cord.

Furthermore, to provide protection against excessive energy being drawn from the main supply in case of a fault in the equipment, an overcurrent protection device must be installed.

- Do not exceed the voltage rating on the label located on the top of the instrument housing.
- Always disconnect the power before changing the signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure that the instrument does not exceed the operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install this instrument without exposing the bare wire outside the connector to minimize electrical shock hazards.



EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Beads on signal wires close to the instrument if EMC problems persist.



Failure to follow all instructions and warnings is at your own risk and may result in property damage, bodily injury and/or death. Omega Engineering is not responsible for any damages or loss arising or resulting from any failure to follow any and all instructions or observe any and all warnings.

1.4 Wiring Instructions

1.4.1 Back Panel Connections

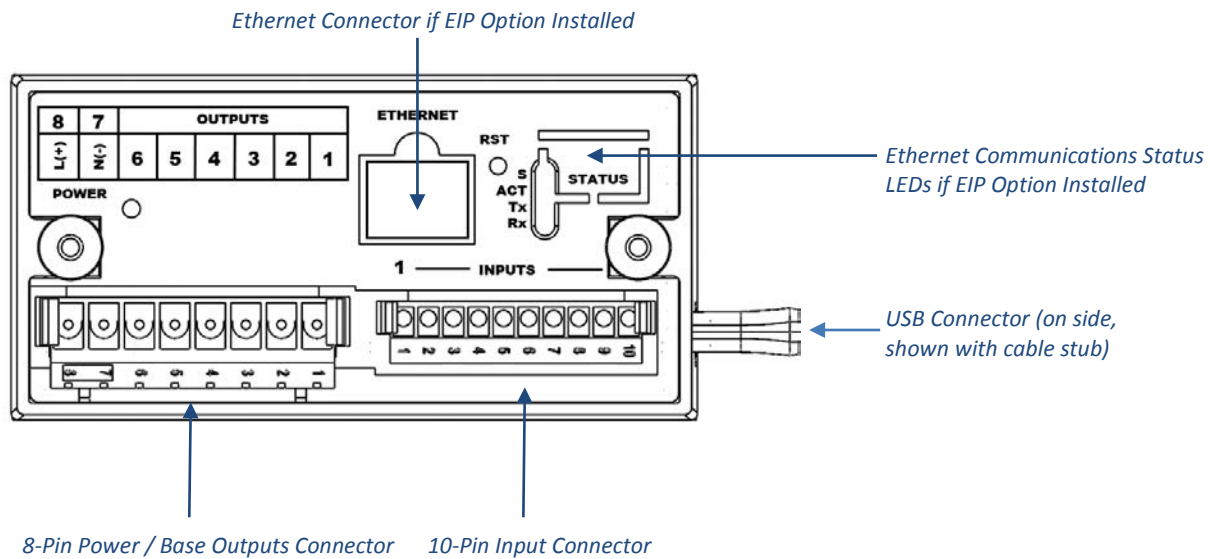


Figure 1.1a – CN8Pt Models: Back Panel Connections (No Isolated Output Expansion Board Installed)

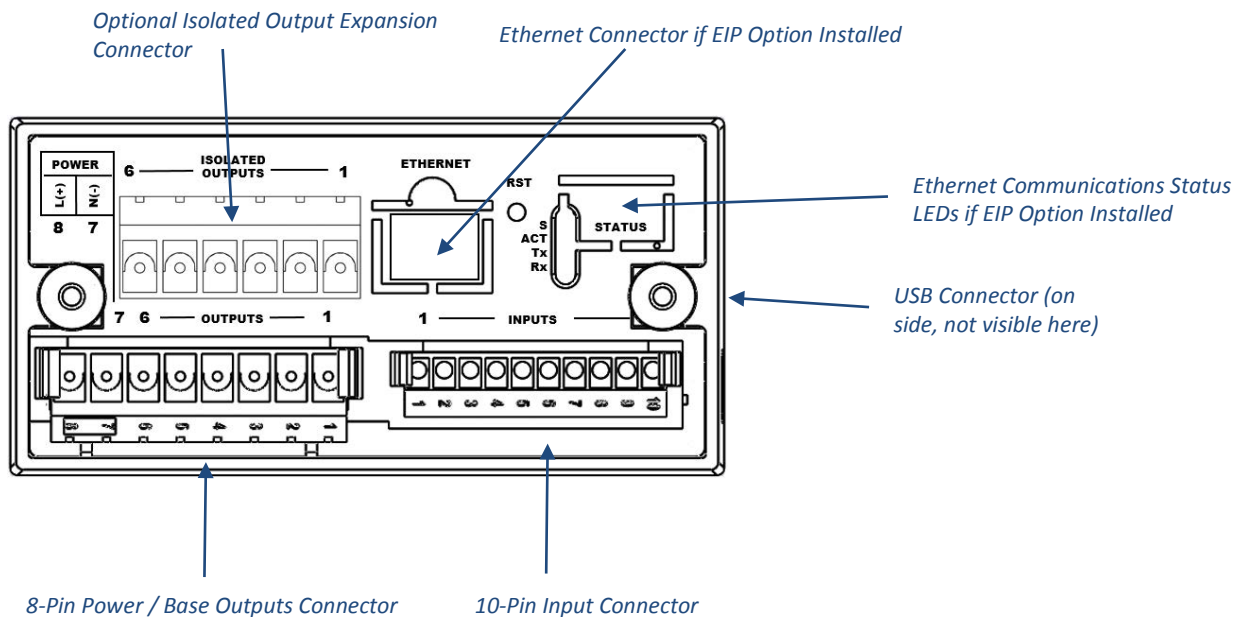


Figure 1.1b – CN8Pt Models: Back Panel Connections (With Isolated Output Expansion Board)

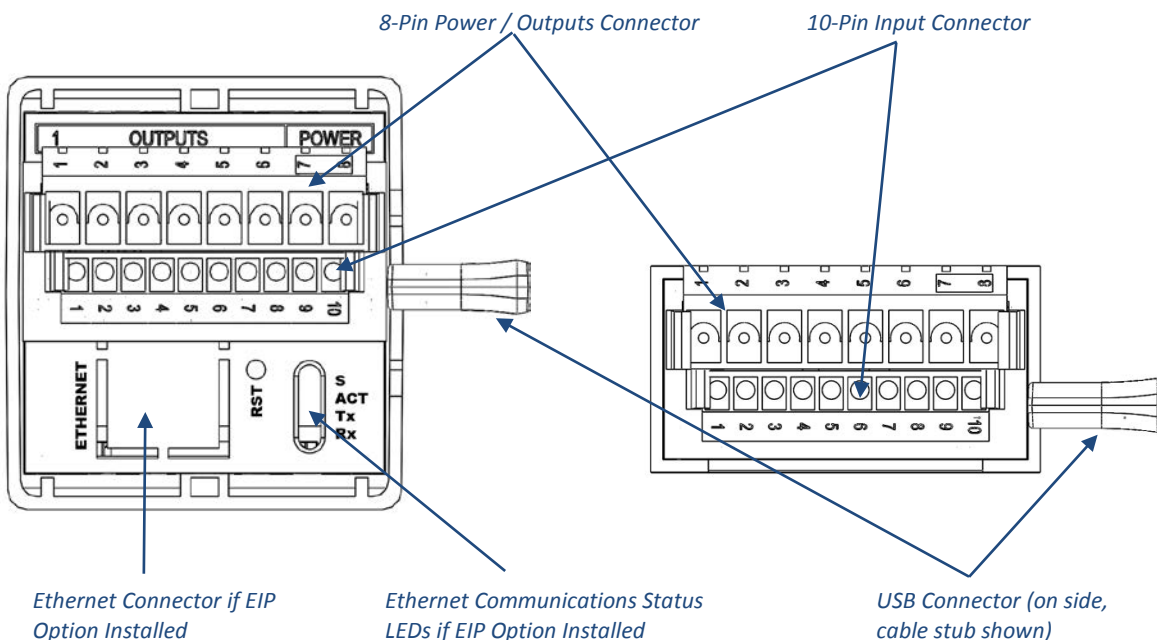
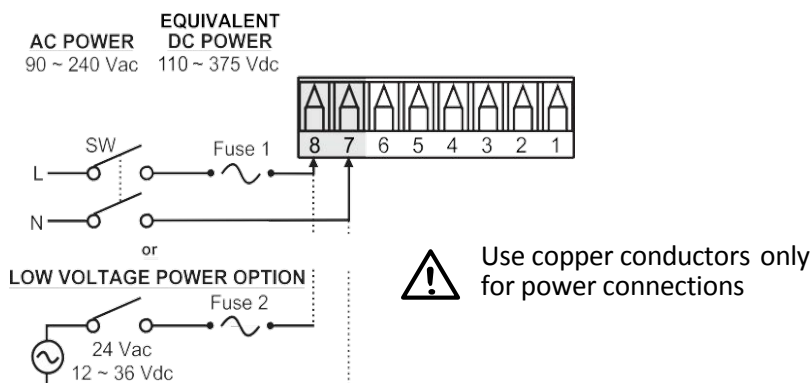


Figure 1.2 – CN16Pt and CN32Pt Models: Back Panel Connections

1.4.2 Connecting Power

Connect the main power connections to pins 7 and 8 of the 8-pin power / output connector as shown in Figure 1.1.



Caution: Do not connect power to your device until you have completed all input and output connections. Failure to do so may result in injury!

Figure 1.3 – Main Power Connections



For the low-voltage power option, maintain the same degree of protection as the standard high-voltage input power units (90–240 Vac) by using a Safety Agency Approved DC or AC source with the same Overvoltage Category and pollution degree as the standard AC unit (90–240 Vac).

The Safety European Standard EN61010-1 for measurement, control, and laboratory equipment requires that fuses must be specified based on IEC127. This standard specifies the letter code “T” for a Time-lag fuse.

1.4.3 Connecting Inputs

The 10-pin universal input connector assignments are summarized in Table 1.0. Table 1.2 provides detail for the specific types of sensors supported. All sensor selections are firmware-controlled (see [4.1 Input Configuration \(INIt > INPt\)](#)) and no jumper settings are required when switching from one type of sensor to another. Figure 1.4 provides more detail for connecting RTD sensors. Figure 1.5 shows the connection scheme for process current input with either internal or external excitation.

Pin No.	Code	Description
1	ARTN	Analog return signal (analog ground) for sensors and remote Setpoint
2	AIN+	Analog positive input
3	AIN-	Analog negative input
4	APWR	Analog power currently only used for 4-wire RTDs
5	AUX	Auxiliary analog input for remote Setpoint
6	EXCT	Excitation voltage output referenced to ISO GND
7	DIN	Digital input signal (latch reset, etc), Positive at > 2.5V, ref. to ISO GND
8	ISO GND	Isolated ground for serial communications, excitation, and digital input
9	RX/A	Serial communications receive
10	TX/B	Serial communications transmit

Table 1.1 – 10-Pin Input Connector Wiring Summary

Pin Number	Process Voltage	Process Current	Thermo-couple	2-Wire RTD	3-Wire RTD	4-Wire RTD	Ther-mistor	Remote Setpoint
1	Rtn			**	RTD2-	RTD2+		Rtn(*)
2	Vin +/-	I+	T/C+	RTD1+	RTD1+	RTD1+	TH+	
3		I-	T/C-			RTD2-	TH-	
4				RTD1-	RTD1-	RTD1-		
5								V/I In

*For Remote Setpoint with an RTD, Pin 1 on the Output Connector must be used for the Rtn instead of Pin 1 on the Input Connector. Remote Setpoint is not available if you are using an RTD sensor and you have an SPDT (Type 3) Output installed.

** Requires external connection to pin 4

Table 1.2 – Interfacing Sensors to the Input Connector

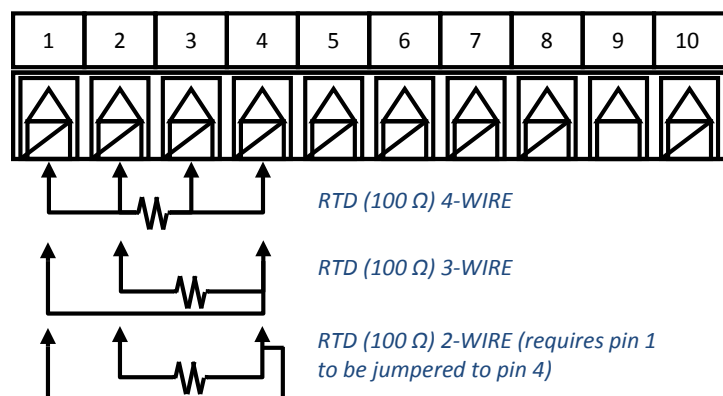


Figure 1.4 – RTD Wiring Diagram

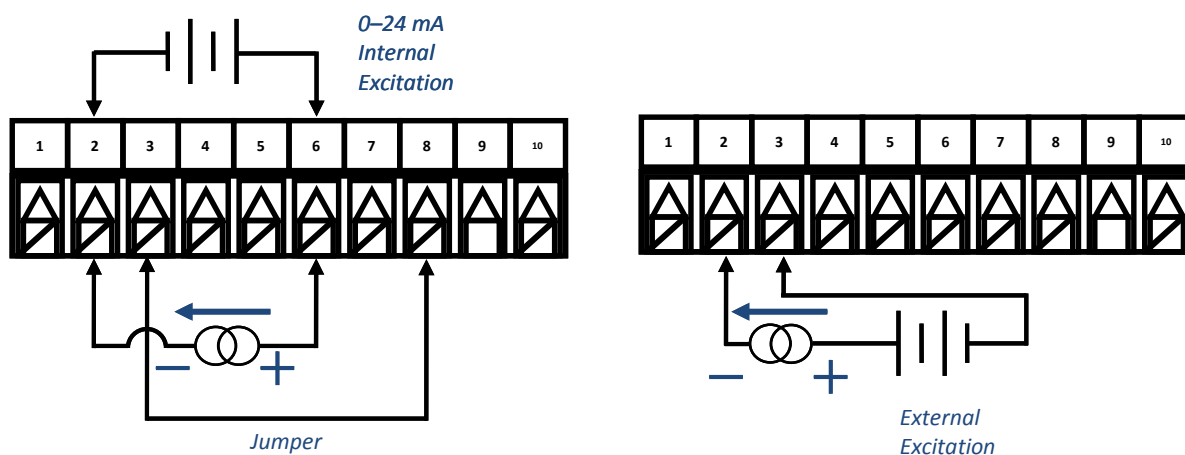


Figure 1.5 – Process Current Wiring Hookup with Internal and External Excitation

1.4.4 Connecting Outputs

The PLATINUM™ Series supports 7 different types of outputs with the model number numeric designations summarized in Table 1.3. Your unit comes preconfigured with up to 3 outputs (up to 6 outputs with 1/8 DIN models). Table 1.4a shows the base output connector connections for the different configurations offered. Your base output configuration is the 3 numeric digits following the first dash in your model number. The optional isolated output expansion board offered on 1/8 DIN models can add 1 or 3 additional isolated outputs with the numeric codes and connection positions shown in Table 1.4b. Table 1.5 defines the abbreviated codes used in Tables 1.4a and 1.4b. Please note that the SPST and SPDT mechanical relays have snubbers built in but only on the normally open contact side.

Code	Output Type
1	3A Mechanical single pole, single throw (SPST) mechanical relay
2	1A Solid state relay (SSR)
3	3A Mechanical single pole, double throw (SPDT) mechanical relay
4	DC pulse for connecting to an external SSR
5	Analog current or voltage
6	Isolated Analog current or voltage (only on output expansion board for 1/8 DIN models)
7	Isolated DC pulse ("IDC" only on output expansion board for 1/8 DIN models)

Table 1.3 – Output Type Designations for Base Output Connector

Config.	Description	Power		Output Pin Number					
		8	7	6	5	4	3	2	1
330	SPDT, SPDT	AC+ or DC+	AC- or DC-	N.O	Com	N.C	N.O	Com	N.C
304	SPDT, DC pulse			N.O	Com	N.C		V+	Gnd
305	SPDT, analog			N.O	Com	N.C		V/C+	Gnd
144	SPST, DC pulse, DC pulse			N.O	Com	V+	Gnd	V+	Gnd
145	SPST, DC pulse, analog			N.O	Com	V+	Gnd	V/C+	Gnd
220	SSR, SSR			N.O	Com	N.O	Com		
224	SSR, SSR, DC pulse			N.O	Com	N.O	Com	V+	Gnd
225	SSR, SSR, analog			N.O	Com	N.O	Com	V/C+	Gnd
440	DC pulse, DC pulse			V+	Gnd	V+	Gnd		
444	DC pulse, DC pulse, DC pulse			V+	Gnd	V+	Gnd	V+	Gnd
445	DC pulse, DC pulse, analog			V+	Gnd	V+	Gnd	V/C+	Gnd

Table 1.4a – 8 Pin Output/Power Connector Wiring Summary by Configuration

Config.	Description	Output Expansion Board Pin Number					
		6	5	4	3	2	1
006	Isolated Analog					V/C+	Gnd
776	IDC, IDC, Isolated Analog	V+	Gnd	V+	Gnd	V/C+	Gnd

Table 1.4b – 6 Pin Output Expansion Board Connector Wiring Summary by Configuration

Code	Definition	Code	Definition
N.O.	Normally open relay/SSR load	AC-	AC power neutral in pin
Com	Relay Common/SSR AC power	AC+	AC power hot in pin
N.C.	Normally closed relay load	DC-	Negative DC power in pin
Gnd	DC Ground	DC+	Positive DC power in pin
V+	Load for DC pulse		
V/C+	Load for analog		

Table 1.5 – Definitions for Abbreviations in Table 1.4

2. PLATINUM™ Series Navigation

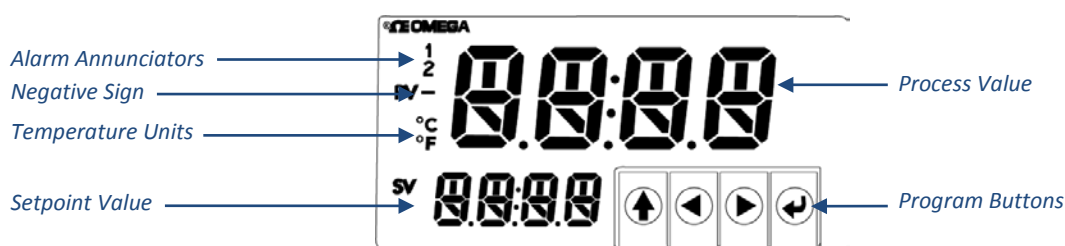


Figure 2.1 – PLATINUM™ Series Display (CN8DPt Shown)

2.1 Description of Button Actions



The UP button moves up a level in the menu structure. Pressing and holding the UP button navigates to the top level of any menu (**oPER**, **PRoG**, or **INIt**). This can be a useful way of reorienting yourself if you get lost in the menu structure.



The LEFT button moves across a set of menu choices at a given level (up in the Section 4 menu structure tables). When changing numerical settings, press the LEFT button to make the next digit (one digit to the left) active.



The RIGHT button across a set of menu choices at a given level (down in the Section 4 menu structure tables). The RIGHT button also scrolls numerical values up with overflow to 0 for the flashing digit selected.



The ENTER button selects a menu item and goes down a level, or it enters a numerical value or parameter choice.

2.2 Menu Structure

The menu structure of the PLATINUM™ Series is divided into 3 main Level 1 groups, which are Initialization, Programming, and Operating. They are described in Section 2.3. The complete menu structure for levels 2-8 for each of the three Level 1 groups is detailed in Section 3.1, 3.2, and 3.3. Levels 2 through 8 represent sequentially deeper levels of navigation. Values with a dark box around them are default values or submenu entry points. Blank lines indicate user-provided information. Some menu items include links to reference information elsewhere in this user manual. The information in the Notes column defines each menu choice.

2.3 Level 1 Menu



INIt Initialization Mode: These settings are rarely changed after initial setup. They include transducer types, calibration, etc. These settings can be password-protected.



PRoG Programming Mode: These settings are frequently changed. They include Setpoints, Control Modes, Alarms, etc. These settings can be password-protected.



oPER Operating Mode: This mode allows users to switch between Run Mode, Standby Mode, Manual Mode, etc.

2.4 Circular Flow of Menus

The following diagram shows how to use the LEFT and RIGHT buttons to navigate around a menu.

Press the **ENTER** button on **oPER** to select and enter **RUN** Mode.

*Press the UP button to
navigate back up a level.*

Press the **LEFT** and **RIGHT** buttons to navigate around the Operating Mode options.

It is possible to cycle through any menu in both directions.

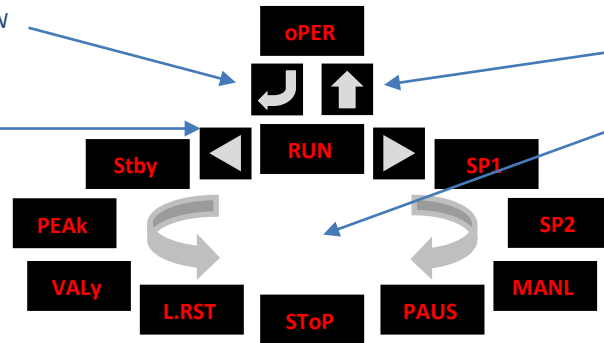


Figure 2.2 – Circular Flow of Menus

3. Complete Menu Structure

3.1 Initialization Mode Menu (INIt)

The following table maps the Initialization Mode (**INIt**) navigation:

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
INPt	t.C.	k					Type K thermocouple
		J					Type J thermocouple
		t					Type T thermocouple
		E					Type E thermocouple
		N					Type N thermocouple
		R					Type R thermocouple
		S					Type S thermocouple
		b					Type B thermocouple
		C					Type C thermocouple
	Rtd	N.wIR	3 wl				3-wire RTD
			4 wl				4-wire RTD
			2 wl				2-wire RTD
		A.CRV	385.1				385 calibration curve, 100 Ω
			385.5				385 calibration curve, 500 Ω
			385.t				385 calibration curve, 1000 Ω
			392				392 calibration curve, 100 Ω
			3916				391.6 calibration curve, 100 Ω
	tHRM	2.25k					2250 Ω thermistor
		5k					5000 Ω thermistor
		10k					10,000 Ω thermistor
	PRoC	4-20					Process input range: 4 to 20 mA
			Note: This Manual and Live Scaling submenu is the same for all PRoC ranges.				
			MANL	Rd.1	_____		Low display reading
				IN.1	_____		Manual input for Rd.1
				Rd.2	_____		High display reading
				IN.2	_____		Manual input for Rd.2
			LIVE	Rd.1	_____		Low display reading
				IN.1	_____		Live Rd.1 input, ENTER for current
				Rd.2	_____		High display reading
				IN.2	_____		Live Rd.2 input, ENTER for current
		0-24					Process input range: 0 to 24 mA
		+10					Process input range: -10 to +10 V
		+1					Process input range: -1 to +1 V
		+0.1					Process input range: -0.1 to +0.1 V

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
RdG	dEC.P	FFF.F					Reading format -999.9 to +999.9
		FFFF					Reading format -9999 to +9999
		FF.FF					Reading format -99.99 to +99.99
		F.FFF					Reading format -9.999 to +9.999
	°F°C	°C					Degrees Celsius annunciator
		°F					Degrees Fahrenheit annunciator
		NoNE					Turns off for non-temperature units
	FLtR	8					Readings per displayed value: 8
		16					16
		32					32
		64					64
		128					128
		1					2
		2					3
		4					4
	ANN.1	ALM.1					Alarm 1 status mapped to "1"
		ALM.2					Alarm 2 status mapped to "1"
		oUt#					Output state selections by name
	ANN.2	ALM.2					Alarm 2 status mapped to "2"
		ALM.1					Alarm 1 status mapped to "2"
		oUt#					Output state selections by name
	NCLR	GRN					Default display color: Green
		REd					Red
		AMbR					Amber
	bRGt	HIGH					High display brightness
		MEd					Medium display brightness
		Low					Low display brightness
ECtN	5 V						Excitation voltage: 5 V
	10 V						10 V
	12 V						12 V
	24 V						24 V
	0 V						Excitation off
CoMM	USb						Configure the USB port
Note: This PRot submenu is the same for USB, Ethernet, and Serial ports.							
		PRot	oMEG	ModE	CMd		Waits for commands from other end
					CoNt	_____	Transmit continuously every ###.# sec
				dAt.F	StAt	No	
						yES	Includes Alarm status bytes

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
					RdNG	yES	Includes process reading
						No	
					PEAk	No	
						yES	Includes highest process reading
					VALy	No	
						yES	Includes lowest process reading
					UNIT	No	
						yES	Send unit with value (F, C, V, mV, mA)
				LF	No		
					yES		Appends line feed after each send
				ECHo	yES		Retransmits received commands
					No		
				SEPR	_CR_		Carriage Return separator in CoNt
					SPCE		Space separator in CoNt Mode
			M.bUS	RtU			Standard Modbus protocol
				ASCI			Omega ASCII protocol
		AddR	_____				USB requires Address
	EtHN	PRot					Ethernet port configuration
		AddR	_____				Ethernet "Telnet" requires Address
	SER	PRot					Serial port configuration
		C.PAR	bUS.F	232C			Single device Serial Comm Mode
				485			Multiple devices Serial Comm Mode
			bAUD	19.2			Baud rate: 19,200 Bd
				9600			9,600 Bd
				4800			4,800 Bd
				2400			2,400 Bd
				1200			1,200 Bd
				57.6			57,600 Bd
				115.2			115,200 Bd
			PRty	odd			Odd parity check used
				EVEN			Even parity check used
				NoNE			No parity bit is used
				oFF			Parity bit is fixed as a zero
			dAtA	8bIt			8 bit data format
				7bIt			7 bit data format
			StoP	1bIt			1 stop bit
				2bIt			2 stop bits gives a "force 1" parity bit
		AddR	_____				Address for 485, placeholder for 232

Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Notes
SFty	PwoN	dSbL					RUN's automatically on power up
		ENbL					Power on: oPER Mode, ENTER to run
	RUN.M	dSbL					ENTER in Stby , PAUS , StoP runs
		ENbL					ENTER in modes above displays RUN
	SP.LM	SP.Lo	_____				Low Setpoint limit
		SP.HI	_____				High Setpoint limit
	LPbk	dSbL					Loop break timeout disabled
		ENbL	_____				Loop break timeout value (MM.SS)
	o.CRk	ENbl					Open Input circuit detection enabled
		dSbL					Open Input circuit detection disabled
t.CAL	NoNE						Manual temperature calibration
	1.PNt						Set offset, default = 0
	2.PNt	R.Lo					Set range low point, default = 0
		R.HI					Set range high point, default = 999.9
	ICE.P	ok?					Reset 32°F/0°C reference value
SAVE	_____						Download current settings to USB
LoAd	_____						Upload settings from USB stick
VER.N	1.00.0						Displays firmware revision number
VER.U	ok?						ENTER downloads firmware update
F.dFt	ok?						ENTER resets to factory defaults
I.Pwd	No						No required password for INIt Mode
	yES	_____					Set password for INIt Mode
P.Pwd	No						No password for PRoG Mode
	yES	_____					Set password for PRoG Mode

3.2 Programming Mode Menu (PRoG)

The following table maps the Programming Mode (**PRoG**) navigation:

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
SP1	_____				Process goal for PID, default goal for oN.oF
SP2	ASbo				Setpoint 2 value can track SP1 , SP2 is an absolute value
	dEVI				SP2 is a deviation value
ALM.1	Note: This submenu is the same for all other Alarm configurations.				
	tyPE	oFF			ALM.1 is not used for display or outputs
		AboV			Alarm: process value above Alarm trigger
		bELo			Alarm: process value below Alarm trigger
		HI.Lo.			Alarm: process value outside Alarm triggers
		bANd			Alarm: process value between Alarm triggers

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
	Ab.dV	AbSo			Absolute Mode; use ALR.H and ALR.L as triggers
		d.SP1			Deviation Mode; triggers are deviations from SP1
		d.SP2			Deviation Mode; triggers are deviations from SP2
	ALR.H	_____			Alarm high parameter for trigger calculations
	ALR.L	_____			Alarm low parameter for trigger calculations
	A.CLR	REd			Red display when Alarm is active
		AMbR			Amber display when Alarm is active
		GRN			Green display when Alarm is active
		dEFt			Color does not change for Alarm
	HI.HI	oFF			High High / Low Low Alarm Mode turned off
		oN	_____		Offset value for active High High / Low Low Mode
	LtCH	No			Alarm does not latch
		yES			Alarm latches until cleared via front panel
		both			Alarm latches, cleared via front panel or digital input
		RMt			Alarm latches until cleared via digital input
	CtCL	N.o.			Output activated with Alarm
		N.C.			Output deactivated with Alarm
	A.P.oN	yES			Alarm active at power on
		No			Alarm inactive at power on
	dE.oN	_____			Delay turning off Alarm (sec), default = 1.0
	dE.oF	_____			Delay turning off Alarm (sec), default = 0.0
ALM.2					Alarm 2
oUt1					oUt1 is replaced by output type
	Note: This submenu is the same for all other outputs.				
	ModE	oFF			Output does nothing
		PId			PID Control Mode
		oN.oF	ACtN	RVRS	Off when > SP1 , on when < SP1
				dRCt	Off when < SP1 , on when > SP1
			dEAd	_____	Deadband value, default = 5
			S.PNt	SP1	Either Setpoint can be used of on/off, default is SP1
				SP2	Specifying SP2 allows two outputs to be set for heat/cool
	ALM.1				Output is an Alarm using ALM.1 configuration
	ALM.2				Output is an Alarm using ALM.2 configuration
	RtRN	Rd1	_____		Process value for oUt1
		oUt1	_____		Output value for Rd1
		Rd2	_____		Process value for oUt2
		oUt2	_____		Output value for Rd2
	RE.oN				Activate during Ramp events

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
		SE.oN			Activate during Soak events
	CyCL	_____			PWM pulse width in seconds
	RNGE	0–10			Analog Output Range: 0–10 Volts
		0–5			0–5 Volts
		0–20			0–20 mA
		4–20			4–20 mA
		0–24			0–24 mA
oUt2					oUt2 is replaced by output type
oUt3					oUt3 is replaced by output type (1/8 DIN can have up to 6)
PId.S	ActN	RvRS			Increase to SP1 (i.e., heating)
		dRcT			Decrease to SP1 (i.e., cooling)
	A.to	_____			Set timeout time for autotune
	AUto	StRt			Initiates autotune after StRt confirmation
	GAIN	_P_	_____		Manual Proportional Band setting
		I	_____		Manual Integral Factor setting
		d	_____		Manual Derivative Factor setting
	%Lo	_____			Low clamping limit for Pulse, Analog Outputs
	%HI	_____			High clamping limit for Pulse, Analog Outputs
	AdPt	ENbL			Enable fuzzy logic adaptive tuning
		dSbL			Disable fuzzy logic adaptive tuning
RM.SP	oFF				Use SP1 , not remote Setpoint
	oN	4–20			Remote analog Input sets SP1 ; range: 4–20 mA
			Note: This submenu is the same for all RM.SP ranges.		
			RS.Lo	_____	Min Setpoint for scaled range
			IN.Lo	_____	Input value for RS.Lo
			RS.HI	_____	Max Setpoint for scaled range
			IN.HI	_____	Input value for RS.HI
		0–24			0–24 mA
		0–10			0–10 V
		0–1			0–1 V
M.RMP	R.CtL	No			Multi-Ramp/Soak Mode off
		yES			Multi-Ramp/Soak Mode on
		RMt			M.RMP on, start with digital input
	S.PRg	_____			Select program (number for M.RMP program), options 1–99
	M.tRk	RAMP			Guaranteed Ramp: soak pnt must be reached in ramp time
		SoAk			Guaranteed Soak: soak time always preserved
		CYCL			Guaranteed Cycle: ramp can extend but cycle time can't
	tIM.F	MM:SS			“Minutes : Seconds” default time format for R/S programs

Level 2	Level 3	Level 4	Level 5	Level 6	Notes
		HH:MM			"Hours : Minutes" default time format for R/S programs
	E.Act	StOP			Stop running at the end of the program
		HOLd			Continue to hold at the last soak setpoint at program end
		LiNk	_____		Start the specified ramp & soak program at program end
	N.SEG	_____			1 to 8 Ramp/Soak segments (8 each, 16 total)
	S.SEG	_____			Select segment number to edit, entry replaces # below
			MRT.#	_____	Time for Ramp number, default = 10
			MRE.#	oFF	Ramp events on for this segment
				oN	Ramp events off for this segment
			MSP.#	_____	Setpoint value for Soak number
			MSt.#	_____	Time for Soak number, default = 10
			MSE.#	oFF	Soak events off for this segment
				oN	Soak events on for this segment

3.3 Operating Mode Menu (oPER)

The following table maps the Operating Mode (**oPER**) navigation:




Level 2	Level 3	Level 4	Notes
RUN			Normal Run Mode, process value displayed, SP1 in optional secondary display
SP1	_____		Shortcut to change Setpoint 1, current Setpoint 1 value in main display
SP2	_____		Shortcut to change Setpoint 2, current Setpoint 2 value in main display
MANL	M.CNt	_____	Manual Mode, the RIGHT and LEFT buttons control output, displays M###.#
	M.INP	_____	Manual Mode, the RIGHT and LEFT buttons simulate the input for testing
PAUS			Pause and hold at current process value, display flashes
StoP			Stop controlling, turn off outputs, process value rotating flash, Alarms remain
L.RSt			Clears any latched Alarms; Alarms menu also allows digital input reset
VALy			Displays the lowest input reading since the VALy was last cleared
PEAk			Displays the highest input reading since the PEAk was last cleared
Stby			Standby Mode, outputs, and Alarm conditions disabled, displays Stby

4. Reference Section: Initialization Mode (INIt)


Use Initialization Mode to set the following parameters and perform the following functions:



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4.12	Password-Protect Initialization Mode Access (INIt > I.Pwd).....	36
4.13	Password-Protect Programming Mode Access (INIt > P.Pwd).....	36

4.1 Input Configuration (INIt > INPt)




	Select the Input parameter (INPt) to configure the input.
	Navigate to the correct setting. Settings include the following: <ul style="list-style-type: none"> • t.C. – Thermocouple Temperature Sensor (entry point) • Rtd – Resistance Temperature Detector (RTD) • tHRM – Thermistor Temperature Sensor • PRoC – Process Voltage or Current Input
	Select the indicated setting.

4.1.1 Thermocouple Input Type (INIt > INPt > t.C.)



	Select Thermocouple (t.C.) as the input type (factory default). Then specify a specific type of thermocouple or the last selected type will be used.
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	<p>Navigate to the installed thermocouple type. Supported types are as follows:</p> <ul style="list-style-type: none"> • k – Type K (factory default) • J – Type J • t – Type T • E – Type E • N – Type N • R – Type R • S – Type S • b – Type B • C – Type C
	Select the indicated type.


4.1.2 Resistance Temperature Detector (RTD) Input Type (INIt > INPt > Rtd)

	Select Rtd as the input type. Factory default configuration settings are three-wire, 100 Ω , using the European standard 385 curve. Note that the 392 and 3916 curves are only available for 100 Ω RTDs. If Rtd is selected and a specific configuration is not changed, the last saved configuration will be used.
	<p>Navigate to the desired configuration parameter:</p> <ul style="list-style-type: none"> • N.wIR – Firmware selection of the number of wires for RTD connection (no jumpers needed) • A.CRV – Calibration curve covering both the international standard and the resistance of the RTD
	Select the option.

4.1.2.1 Number of RTD Wires (INIt > INPt > Rtd > N.wIR)




	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • 3 wI – Three-wire RTD (factory default) • 4 wI – Four-wire RTD • 2 wI – Two-wire RTD
	Select the indicated option.

4.1.2.2 Calibration Curve (INIt > INPt > Rtd > A.CRV)






	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • 385.1 – European and most common standard at the conventional resistance of 100 Ω (factory default) • 385.5 – European curve for 500 Ω • 385.t – European curve for 1000 Ω • 392 – Old US standard (rarely used), at 100 Ω only • 3916 – Japanese standard, at 100 Ω only
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	Select the indicated option.
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4.1.3 Thermistor Input Type Configuration (INIt > INPt > tHRM)




	Select Thermistor (tHRM) as the input type. This sets up the unit for thermistor-based temperature measurement and then the specific thermistor type can be specified. If no thermistor type is specified, the last selected type is used.
	Navigate to the correct setting. Settings include the following: <ul style="list-style-type: none"> • 2.25k – 2,250 Ω thermistor (factory default) • 5k – 5,000 Ω thermistor • 10k – 10,000 Ω thermistor
	Select the indicated option.

4.1.4 Process Input Type Configuration (INIt > INPt > PRoC)




	Select Process (PRoC) as the input type. Then select the process input range and scale it. If you stop after selecting the PRoC input type, the last selected input range and scaling is used.
	Navigate to the voltage or current range of the process input. Any signal input outside of the specified hardware input range will result in an “out-of-range” error (code E009). Input range choices include the following: <ul style="list-style-type: none"> • 4–20 – 4 mA to 20 mA (factory default) • 0–24 – 0 mA to 24 mA • +–10 – -10 V to +10 V • +–1 – -1 V to +1 V • +–0.1 – -1 mV to +1 mV
	Select the desired range.
	Choose either manual or live scaling. The scaling functions translate process values to engineering units and are available for all process input ranges. The defaults for each input range are the hardware minimum and maximum. Scaling methods include the following: <ul style="list-style-type: none"> • MANL – User manually enters all four scaling parameters • LIVE – User manually enters the low and high display values (RD.1 and RD.2) but reads the input signal directly to set the low and high input values (IN.1 and IN.2) <p>Using either MANL or LIVE to set up scaling, scaled values are then calculated as: Scaled Value = Input * Gain + Offset, where: Gain = (Rd.2 – Rd.1) / (IN.2 – IN.1) Offset = Rd.1 – (Gain * IN.1)</p> <p>Therefore scaling can be done over a subset of the applicable range as this scaling calculation linearly extrapolates in both directions.</p>
	Select the scaling method to be used.

	<p>Navigate to the desired scaling parameter. Options include the following:</p> <ul style="list-style-type: none"> • Rd.1 – Reading low value corresponding to IN.1 signal • IN.1 – Input signal corresponding to RD.1 • Rd.2 – Reading high value corresponding to IN.2 signal • IN.2 – Input signal corresponding to RD.2 <p>In Manual Mode, IN.1 and IN.2 are entered manually for scaling; in Live Mode, IN.1 and IN.2 activate a read of the input signal for scaling.</p>
	Select the scaling parameter to change.
	For manual inputs, set the selected scaling parameter to the desired value.
	Confirm the value for the selected scaling parameter in Manual Mode (MANL), or read and accept the input signal for either IN.1 or IN.2 in Live Mode (LIVE).


4.2 Display Reading Formats (INIt > RdG)

	Select Reading Formats (RdG) to configure the front panel display.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • dEC.P – Decimal-point format (entry point) • °F°C – Temperature units • FLtR – Filter (readings displayed per second) • ANN.1 – Annunciator 1 setting • ANN.2 – Annunciator 2 setting • NCLR – Normal color (default display color) • bRGt – Display brightness
	Select the indicated setting.

4.2.1 Decimal Point Format (INIt > RdG > dEC.P)

	Select Decimal Point (dEC.P) and then select the desired decimal-point format. Only the FFF.F and FFFF formats work for temperature inputs but all four can be used with process inputs. While this parameter sets the default format, the numeric display will autorange (automatically shift the decimal point) if necessary.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • FFF.F – One decimal place (factory default) • FFFF – Zero decimal places • FF.FF – Two decimal places (not a choice with temperature inputs) • F.FFF – Three decimal places (not a choice with temperature inputs)
	Select the indicated format.

4.2.2 Temperature Units (INIt > RdG > °F°C)

	Select the Temperature Units (°F°C) parameter, and the current temperature unit selection is then displayed.
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	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • °C – Degrees Celsius (factory default), °C annunciator turned on • °F – Degrees Fahrenheit, °F annunciator turned on • NoNE – Default for INPt = PRoC, both temp unit annunciators turned off; if the process level input signal corresponds to a temperature (temperature transmitters for example), the appropriate temperature type annunciator can be chosen
	Select the indicated option.

4.2.3 Filter (INIt > RdG > FLtR)

	Select the Filter (FLtR) parameter. Filtering averages multiple input analog to digital conversions, which can suppress noise in the input signal. This should be set to an appropriate value depending on the response time of the input.
	<p>Navigate to the desired setting corresponding to the number of readings per displayed value. Settings include the following (calculated times between display value updates are shown for each setting as well):</p> <ul style="list-style-type: none"> • 8 – 0.4 s (factory default) • 16 – 0.8 s • 32 – 1.6 s • 64 – 3.2 s • 128 – 6.4 s • 1 – 0.05 s • 2 – 0.1 s • 4 – 0.2 s
	Select the indicated option.

4.2.4 Annunciator Settings (INIt > RdG > ANN.1/ANN.2)

	<p>Select the Annunciator 1 (ANN.1) parameter. This controls which Alarm or output status activates the “1” annunciator on the front display. In general, the default values for both annunciators should be used (status for Alarm configuration 1 for annunciator 1 and status for Alarm configuration 2 for annunciator 2). However, it can be useful during troubleshooting to map the on/off status of one or two outputs to the annunciators.</p> <p>The ANN.1 and ANN.2 parameters work the same way except that they control the “1” and the “2” front display annunciators, respectively, and have different default values.</p>
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	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • ALM.1 – The configuration defined by PRoG > ALM.1 determines the state of the annunciator. The annunciator turns on when the Alarm condition exists (factory default for ANN.1). • ALM.2 – The configuration defined by PRoG > ALM.2 determines the state of the annunciator (factory default for ANN.2). • oUt# – “oUt#” is replaced by a list of the names of all outputs that are not analog outputs. For example, the output choices dtR.1 and dC.1 are listed for a “145” configuration, and ANG.1 is not listed.
	Select the indicated option.

4.2.5 Normal Color (INIt > RdG > NCLR)

	Select the Normal Color (NCLR) parameter. This controls the default display color, which can then be overridden by Alarms.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • GRN – Green (factory default) • REd – Red • AMbR – Amber
	Select the indicated option.






4.2.6 Brightness (INIt > RdG > bRGt)

	Select the Brightness (bRGt) parameter.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • HIGH – High display brightness (factory default) • MEd – Medium display brightness • Low – Low display brightness
	Select the indicated option.




4.3 Excitation Voltage (INIt > ECtN)

	Select the Excitation Voltage (ECtN) parameter.
	<p>Navigate to the correct setting. Settings include the following:</p> <ul style="list-style-type: none"> • 5 V – 5 Volt excitation voltage (factory default) • 10 V – 10 Volt excitation voltage • 12 V – 12 Volt excitation voltage • 24 V – 24 Volt excitation voltage • 0 V – Excitation turned off
	Select the indicated option.




4.4 Communication (INIt > CoMM)

	Select the Communication Type (CoMM) to configure. Only installed communications options show up for configuration (USB is always present). If more than one communications option is installed, any or all of them can be configured for simultaneous operation.
	Navigate to the correct option. Options include the following: <ul style="list-style-type: none"> • USb – Universal Serial Bus (USB) communications • EtHN – Ethernet communications configuration • SER – Serial (either RS232 or RS485) communications configuration
	Select the indicated option.
	Navigate to the desired parameter submenu. Options include the following: <ul style="list-style-type: none"> • PRot – Protocol • AddR – Address <p>Note: The serial communications (SER) option above also includes the following parameter:</p> <ul style="list-style-type: none"> • C.PAR – Communications parameters only applicable to serial communications
	Select the indicated option.




4.4.1 Protocol (INIt > CoMM > USb, EtHN, SER > PRot)

	Select the Protocol (PRot) parameter.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • oMEG – (factory default) Omega's Protocol, using standard ASCII encoding. Further detail on this format is covered in the Communications Manual. • M.bUS – Modbus protocol, available as Modbus RTU (RtU, default) or Modbus/ASCII (ASCI). The Ethernet option supports Modbus/TCP/IP. More detail on using this protocol can be found in the Communications Manual.
	Select the desired setting.

4.4.1.1 ASCII Parameters (INIt > CoMM > USb, EtHN, SER > PRot > oMEG)

	Select oMEG to configure Omega ASCII mode communications parameters. These configuration settings are the same for USB, Ethernet, and Serial communications.
	<p>Navigate to the desired parameter. Parameters and sub-parameters include the following:</p> <ul style="list-style-type: none"> • ModE – Choose the Mode for initiating ASCII data transfer: <ul style="list-style-type: none"> ○ CMd – Data is sent after receiving a prompt command from the connected device (factory default). ○ CoNt – Data is sent as it is collected; you can set the seconds between data sends (###.#), default = 001.0. In Continuous Mode, sending a CTRL/Q to the unit suspends transmission and sending a CTRL/S restarts transmission. • dAt.F – Data Format; select yES or No for the following settings: <ul style="list-style-type: none"> ○ StAt – Alarm status bytes are sent with the data ○ RdNG – Sends the process reading ○ PEAk – Sends the highest process reading so far ○ VALy – Sends the lowest process reading so far ○ UNIt – Sends the unit with the value (F, C, V, mV, mA) • _LF_ – Select yES or No; yES sends a line feed between each data block to format the output in a more readable fashion. • ECHo – Select yES or No; yES echoes each received command to allow verification. • SEPR – Determines the separation character between each data block: <ul style="list-style-type: none"> ○ _CR_ – A carriage return sent between data blocks (factory default). ○ SPCE – A space character is sent between each data block.
	Select the indicated option, and manage submenus and parameters as required.

4.4.2 Address (INIt > CoMM > USb, EtHN, SER > Addr)

	Select the Address (Addr) parameter.
	Set the Address value. The Modbus protocol requires an address field to correctly identify the selected device. The Omega protocol supports an optional address field which is required for Serial channels configured for RS485.
	Accept the entered value.

4.4.3 Serial Communications Parameters (INIt > CoMM > SER > C.PAR)

	Select C.PAR . Then, select individual parameters to configure the serial communications.
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	Navigate to the correct setting. Settings include the following: <ul style="list-style-type: none"> • bUS.F – Specify RS232 or RS485 serial communications • bAUd – Baud rate (transmission rate) • PRty – Parity (used for transmission error checking) • dAtA – Number of bits per data point • StoP – Number of stop bits between data points
	Select the desired setting.

4.4.3.1 Serial Bus Format (INIt > CoMM > SER > C.PAR > bUS.F)

	Select the Bus Format (bUS.F) parameter.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • 232C – Allows one-to-one serial communications (factory default) • 485 – Allows multiple devices to operate on a single pair of wires
	Select the indicated option.

4.4.3.2 Baud Rate (INIt > CoMM > SER > C.PAR > bAUd)

	Select the Baud Rate (bAUd) parameter. The device being communicated to determines how fast you can set the Baud Rate.
	Navigate to the desired setting for Baud rate (bits per second): <ul style="list-style-type: none"> • 19.2 – 19,200 Baud (factory default) • 9600 – 9,600 Baud • 4800 – 4,800 Baud • 2400 – 2,400 Baud • 1200 – 1,200 Baud • 57.6 – 57,600 Baud • 115.2 – 115,200 Baud
	Select the indicated option.

4.4.3.3 Parity (INIt > CoMM > SER > C.PAR > PRty)

	Select the Parity (PRty) parameter.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • odd – Odd parity used to verify communications (factory default) • EVEN – Even parity used to verify communications • NoNE – Parity is not used to verify communications
	Select the indicated option.

4.4.3.4 Data Bits (INIt > CoMM > SER > C.PAR > dAtA)

	Select the number of Data Bits (dAtA).
--	---

◀▶	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • 8bit – 8 bits used per data character (factory default) • 7bit – 7 bits used per data character
☑	Select the indicated option.

4.4.3.5 Stop Bits (INIt > CoMM > SER > C.PAR > StoP)

☑	Select the number of Stop Bits (StoP).
◀▶	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • 1bit – 1 stop bit (factory default) • 2bit – 2 stop bits (provides a “force 1” parity bit)
☑	Select the indicated option.

4.5 Safety Features (INIt > SFty)

☑	Select Safety Features (SFty).
◀▶	Navigate to the desired parameter. Parameters include the following: <ul style="list-style-type: none"> • PwoN – Requires confirmation before running automatically at startup • oPER – User must select RUN when exiting from the Stby, PAUS, or StoP Modes • SP.LM – Setpoint limits can be set to limit the values that can be entered • LPbk – Loop break enable/disable and timeout value • o.CRk – Open circuit detection enable/disable
☑	Select the indicated option.

4.5.1 Power On Confirmation (INIt > SFty > PwoN)





☑	Select Power On Confirmation (PwoN).
◀▶	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • dSbL – Program runs automatically at startup (factory default) • ENbL – The unit powers on and then displays RUN; press the ENTER button to run the program
☑	Select the desired setting.

4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)






☑	Select the Operating Mode Confirmation (oPER) parameter.
◀▶	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • dSbL – Pressing the ENTER button in Stby, PAUS, or StoP Modes will start running the current program immediately (factory default) • ENbL – Pressing the ENTER button in any Operating Menu Mode will display RUN; pressing the ENTER button again will start running the current program
☑	Select the desired setting.

4.5.3 Setpoint Limits (INIt > SFty > SP.LM)




☑	Select Setpoint Limits (SP.LM) to set limits on the values that can be used for the all Setpoints.
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	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> SP.Lo – Set the minimum possible Setpoint value SP.HI – Set the maximum possible Setpoint value
	Select the desired setting.
	Set the Setpoint limit value.
	Confirm the value.




4.5.4 Loop Break Timeout (INIt > SFty > LPbk)

	Select the loop break (LPbk) parameter. When enabled, this parameter specifies the amount of time in Run Mode without a change in input value that would signify a sensor malfunction. For example, if there were a problem in a thermocouple, the input would not change over time.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> dSbL – No loop break timeout protection (factory default) ENbL – Set loop break timeout value
	Select the indicated setting.
	If ENbL , Set the loop break timeout value in minutes and seconds (MM.SS)
	Confirm the value.


4.5.5 Open Circuit (INIt > SFty > o.CRk)

	Select the open circuit (o.CRk) parameter. When o.CRk is enabled, the unit will monitor Thermocouples, RTD, and Thermistors for an open circuit condition.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> ENbL – Open circuit conditions will stop the program and display oPEN (factory default) dSbL – No open circuit protection (may be necessary when using high impedance infrared thermocouples or thermistors).
	Confirm the value.




4.6 Manual Temperature Calibration (INIt > t.CAL)

	Select the Manual Temperature Calibration (t.CAL) submenu. This parameter allows you to manually adjust the thermocouple, RTD, or Thermistor calibration curves provided with the unit. Once a curve has been manually adjusted, this setting can be set to NoNE to disable the manual adjustment (resetting to factory defaults will remove any manually adjustment factors).
	Navigate to the desired setting. Settings include: <ul style="list-style-type: none"> NoNE – No manual calibration (factory default) 1.PNt – Manually create a 1-point calibration 2.PNt – Manually create a 2-point calibration ICE.P – Manually create a 1-point calibration at 0°C
	Select the indicated option.






4.6.1 No Manual Temperature Calibration Adjustment (INIt > t.CAL > NoNE)

	Select NoNE to use the standard temperature sensor calibration curves. This mode will be used by most users.
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4.6.2 Manual Temperature Calibration Offset Adjustment (INIt > t.CAL > 1.PNt)

	Select 1.PNt to manually adjust the offset of the calibration curve base on the current reading.
	Set the Manual Thermocouple Calibration Offset value in degrees.
	Confirm the Offset value and pair it with the current input reading.



4.6.3 Manual Temperature Calibration Offset and Slope Adjustment (INIt > t.CAL > 2.PNt)


	Select 2.PNt to use 2 points to manually adjust both the offset and slope of the calibration curve.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> R.Lo – Set low point in degrees, default = 0, and associate with input reading R.HI – Set high point in degrees, default = 999.9, and associate with input reading
	Select the indicated setting.
	Set the Temperature for R.Lo or R.HI .
	Confirm the value and pair it with the current input reading.

4.6.4 Temperature Ice Point Calibration (INIt > t.CAL > ICE.P)




	Select ICE.P to calibrate the zero point for the temperature sensor. This function basically operates the same as a 1.PNT offset adjustment restricted to a measurement at the freezing point of water.
	The LED display shows ok? and requires confirmation. Confirm the Ice Point reset.

4.7 Save Current Configuration for All Parameters to a File (INIt > SAVE)


	Select Save Current Configuration Settings (SAVE) as the command to execute. If no thumb drive is present the failure code E010 is displayed. Otherwise, a numeric designation for the save file is then specified and confirmed before the SAVE command executes. Important Note: The configuration file is a tab separated text file with a ".TXT" extension. It can be loaded onto a PC, read into Excel then modified there. Once modified, save it back as a tab separated .TXT file and it can then be loaded back into the unit using the INIt > LoAd command. This capability can be especially useful for editing complex multi ramp and soak programs. For more information on the configuration file format, see the " Load and Save File Format Manual ".
	Select a numeric file name from the range 0–99.

	Confirm the SAVE command. This saves the configuration to the file number specified. If the SAVE operation fails, the failure code w004 is displayed. If the SAVE operation is successful, doNE is displayed.
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4.8 Load a Configuration for All Parameters from a File (INIt > LoAd)

	Select the Load a Configuration (LoAd) command. If no thumb drive is present the failure code E010 is displayed. Otherwise, a numeric designation for the file to be loaded is then specified and confirmed before the LoAd command executes.
	Select a numeric file name from the range 0–99.
	Confirm the LoAd command. This loads the configuration from the file number specified. If the LoAd operation fails, the failure code w003 is displayed. If the LoAd operation is successful, doNE is displayed.



4.9 Display Firmware Revision Number (INIt > VER.N)

	Select the Display Firmware Revision Number (VER.N) function. The currently installed version number is displayed in the format 1.23.4 where “1” is the major revision number, “23” is the minor revision number, and “4” is the bug fix update number.
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4.10 Update Firmware Revision (INIt > VER.U)

	Select the Update Firmware Revision (VER.U) function. Note that updating your firmware will reset the unit to factory defaults as well. If you want to keep your configuration settings, save them before installing new firmware.
	The LED display shows ok? and requires confirmation. Confirm the firmware update. New firmware will then be read from a thumb drive connected to the USB port.

4.11 Reset to Factory Default Parameters (INIt > F.dFt)

	Select the Reset to Factory Default Parameters (F.dFt) function. The LED display shows ok? and requires confirmation.
	Confirm the parameter reset.

4.12 Password-Protect Initialization Mode Access (INIt > I.Pwd)

	Select the Password Protect Initialization Mode Access (I.Pwd) function.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> No – Do not require a password for INIt Mode (factory default) yES – Require a password for INIt Mode; users will be prompted for this password when selecting INIt
	Select the indicated setting.
	If yES , set the numeric password from the range 0000–9999.
	Confirm the password.

4.13 Password-Protect Programming Mode Access (INIt > P.Pwd)

	Select the Password Protect Programming Mode Access (P.Pwd) function.
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	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> No – Do not require a password for PRoG Mode (factory default) yES – Require a password for PRoG Mode; users will be prompted for this password when selecting PRoG
	Select the indicated setting.
	If yES , set the numeric password from the range 0000–9999.
	Confirm the password.

5. Reference Section: Programming Mode (PRoG)

Use Programming Mode to set the following parameters and perform the following functions:

5.1	Setpoint 1 Configuration (PRoG > SP1).....	37
5.2	Setpoint 2 Configuration (PRoG > SP2).....	37
5.3	Alarm Mode Configuration (PRoG > ALM.1, ALM.2).....	38
5.4	Output Channel 1–4 Configuration (PRoG > oUt.1–oUt.4).....	42
5.5	PID Configuration (PRoG > PId).....	45
5.6	Remote Setpoint Configuration (PRoG > RM.SP).....	48
5.7	Multi-Ramp/Soak Mode Parameters (PRoG > M.RMP).....	50




5.1 Setpoint 1 Configuration (PRoG > SP1)

	Select the Setpoint 1 (SP1) parameter.
	Set the process goal value for PId or oN.oF control.
	Confirm the value.




5.2 Setpoint 2 Configuration (PRoG > SP2)

	Select the Setpoint 2 (SP2) parameter. SP2 is used with Alarm functions and with on/off control when setting up for Heat/Cool Control Mode.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> ASbo – The value for SP2 is specified in Absolute Mode (factory default) dEVI – The value specified for SP2 indicates an offset (positive or negative) from SP1; this allows SP2 to track any changes to SP1 automatically
	Select the indicated setting.
	Set the correct value.
	Confirm the value.

5.3 Alarm Mode Configuration (PROM > ALM.1, ALM.2)

	Select Alarm Configuration 1 (ALM.1) or Alarm Configuration 2 (ALM.2) in order to set up, change, enable, or disable Alarms. Either or both Alarms can be assigned to trigger display color changes, annunciators, and / or outputs. Either or both Alarm configurations can be assigned to multiple outputs. The ALM.1 and ALM.2 configuration menus have all of the same settings and function in the same manner.
	<p>Navigate to the Alarm setting you want to change. Settings include the following:</p> <ul style="list-style-type: none"> • tyPE – Alarm type absolute or deviation • Ab.dV – Alarm references values (ALR.H and ALR.L) or deviation from SP1 or SP2 • ALR.H – Alarm high parameter, used for Alarm trigger calculations • ALR.L – Alarm low parameter, used for Alarm trigger calculations • A.CLR – Alarm color indication • HI.HI – High High / Low Low offset value • LtCH – Alarm latching • CtCL – Alarm action (normally open or normally closed) • A.P.oN – Alarm power-on behavior • dE.oN – Time delay for Alarm trigger unless the condition persists, default = 1.0 s • dE.oF – Time delay for cancelling Alarms after being triggered; prevents Alarm “chatter,” default = 0.0 s
	Select the indicated setting.

5.3.1 Alarm Type (PROM > ALM.1, ALM.2 > tyPE)

	Select the Alarm Type (tyPE) parameter. This parameter will control the basic behavior of the selected alarm.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • oFF – Alarm is off (factory default) • AboV – Alarm is triggered when the process value exceeds ALR.H (Absolute Mode) or the specified Setpoint plus ALR.H (Deviation Mode) • bELo – Alarm is triggered when the process value is less than ALR.L (Absolute Mode) or the specified Setpoint minus ALR.L (Deviation Mode) • HI.Lo. – Alarm is triggered when the process value is outside the ALR.L–ALR.H range (Absolute Mode) or the range defined by the band around the specified Setpoint as determined by ALR.L and ALR.H (Deviation Mode) • bANd – Alarm is triggered when the process value is within the ALR.L–ALR.H range (Absolute Mode) or within the band around the specified Setpoint as determined by ALR.L and ALR.H (Deviation Mode) <p>Note: Table 5.1 compares the Alarm range options, and Figure 5.1 represents the Alarm range options graphically.</p>
	Select the indicated setting.

Setting	Absolute (AbSo)	Deviation (d.SP1)	Deviation (d.SP2)
AboV	> ALR.H	> SP1 + ALR.H	> SP2 + ALR.H
bELo	< ALR.L	< SP1 - ALR.L	< SP2 - ALR.L
HI.Lo.	< ALR.L or > ALR.H	< SP1 - ALR.L or > SP1 + ALR.H	< SP2 - ALR.L or > SP2 + ALR.H
bANd	> ALR.L and < ALR.H	> SP1 - ALR.L and < SP1 + ALR.H	> SP2 - ALR.L and < SP2 + ALR.H

Table 5.1 – Alarm Range Option Comparison

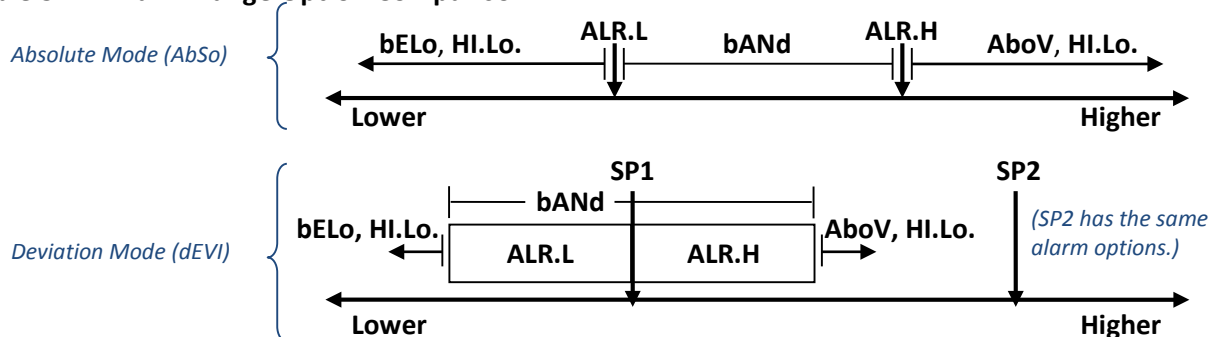


Figure 5.1 – Alarm Range Option Diagram

5.3.2 Absolute or Deviation Alarm (PRoG > ALM.1, ALM.2 > tyPE > Ab.dV)

<input checked="" type="checkbox"/>	Select the Absolute or Deviation Alarm (Ab.dV) parameter.
<input checked="" type="checkbox"/>	Navigate to the correct setting. Settings and subsettings include the following: <ul style="list-style-type: none"> AbSo – Alarm is triggered using calculations based on the absolute values of ALR.H or ALR.L used as specified by the tyPE parameter d.SP1 – Alarm is triggered using calculations based on values relative to SP1 as specified by the tyPE parameter d.SP2 – Alarm is triggered using calculations based on values relative to SP2 as specified by the tyPE parameter
<input checked="" type="checkbox"/>	Select the desired setting.

5.3.3 Alarm High Reference (PRoG > ALM.1, ALM.2 > tyPE > ALR.H)

<input checked="" type="checkbox"/>	Select the Alarm High Reference (ALR.H) parameter.
<input checked="" type="checkbox"/>	Set the Alarm High Reference value.
<input checked="" type="checkbox"/>	Confirm the value.

5.3.4 Alarm Low Reference (PRoG > ALM.1, ALM.2 > tyPE > ALR.L)

<input checked="" type="checkbox"/>	Select the Alarm Low Reference (ALR.L) parameter.
<input checked="" type="checkbox"/>	Set the Alarm Low Reference value.
<input checked="" type="checkbox"/>	Confirm the value.

5.3.5 Alarm Color (PRoG > ALM.1, ALM.2 > A.CLR)

	Select the Alarm Color (A.CLR) parameter.
	Navigate to the desired option. Options include the following: <ul style="list-style-type: none"> • REd – Alarm conditions are displayed in red (factory default) • AMbR – Alarm conditions are displayed in amber • GRN – Alarms conditions are displayed in green • dEFt – Alarms do not affect the default display color
	Select the desired option.

5.3.6 Alarm High High / Low Low Offset Value (PRoG > ALM.1, ALM.2 > HI.HI)

	Select the Alarm Offset Value (HI.HI) parameter. This parameter allows an offset to be added to the Alarm trigger point(s) which will flash the display when exceeded. Depending on the Alarm type the offset can apply above the trigger point, below it, or both. This is illustrated in Figure 5.2. HI.HI works with both absolute and deviation Alarms.
	Navigate to the correct option. Options include the following: <ul style="list-style-type: none"> • oFF – High High / Low Low function disabled (factory default) • oN – Display will flash in the color determined by the A.CLR parameter when the Process Value is greater than the HI.HI offset value away from the Alarm condition settings (in either direction)
	Select the indicated option.
	For oN , set the offset value.
	Confirm the value.

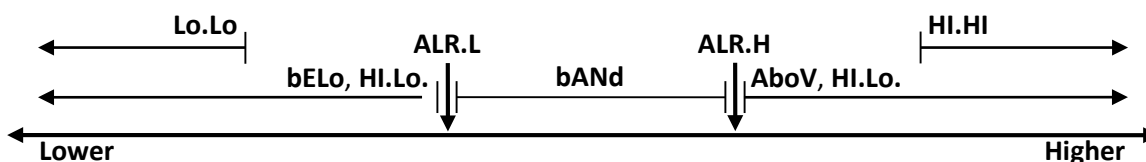





Figure 5.2 – Alarm HI.HI parameter




5.3.7 Alarm Latching (PRoG > ALM.1, ALM.2 > LtCH)

	Select the Alarm Latching (LtCH) parameter.
	Navigate to the desired option. Options include the following: <ul style="list-style-type: none"> • No – Alarm does not latch (factory default); the Alarm turns off when the Process Value returns to a non-Alarm condition • yES – Alarm latches; even if the Process Value returns to a non-Alarm condition, the Alarm condition remains active and must be unlatched using oPER > L.RSt • boTH – Alarm latches and can be unlatched either by using oPER > L.RSt from the front panel or via the digital input • RMt – Alarm latches and can be unlatched only via the digital input
	Select the indicated option.




5.3.8 Alarm Normally Closed, Normally Open (PRoG > ALM.1, ALM.2 > CtCL)

	Select the Alarm Normally Open or Normally Closed (CtCL) parameter.
	Navigate to the desired option. Options include the following: <ul style="list-style-type: none"> • N.o. – Normally open: output is activated when the Alarm condition is met (factory default) • N.C. – Normally closed: output is activated in normal conditions, but turned off in the Alarm condition
	Select the indicated option.




5.3.9 Alarm Power-On Behavior (PRoG > ALM.1, ALM.2 > A.P.oN)

	Select the Alarm Power-On Behavior (A.P.oN) parameter.
	Navigate to the desired option. Option include: <ul style="list-style-type: none"> • yES – Alarms are active at power-on and do not require crossing the Setpoint (factory default) • No – Alarms are inactive at power-on; the process reading must cross the Alarm condition before being activated
	Select the indicated option.





5.3.10 Alarm On Delay (PRoG > ALM.1, ALM.2 > dE.oN)

	Select the Alarm On Delay (dE.oN) parameter.
	Set the number of seconds to delay triggering the Alarm. (The default is 0.) This setting can be used to prevent false Alarm triggering when the Process Value only briefly enters an Alarm condition.
	Confirm the value.


5.3.11 Alarm Off Delay (PRoG > ALM.1, ALM.2 > dE.oF)



	Select the Alarm Off Delay (dE.oF) parameter.
	Set the number of seconds to delay cancelling the Alarm. (The default is 0.) This setting can be used to prevent Alarm chatter.
	Confirm the value.

5.4 Output Channel 1–6 Configuration (PRoG > oUt.1–oUt.6)

	<p>Navigate to the desired output channel. The number and type of output channels on the PLATINUM™ Series are automatically recognized by the device. The following output names are what you can see on the panel display replacing the generic oUt.1 through oUt.3 references used in this document:</p> <ul style="list-style-type: none"> • StR1 – Single Throw Mechanical Relay number 1 • StR2 – Single Throw Mechanical Relay number 2 • dtR1 – Double Throw Mechanical Relay number 1 • dtR2 – Double Throw Mechanical Relay number 2 • SSR1 – Solid State Relay number 1 • SSR2 – Solid State Relay number 2 • dC1 – DC Pulse output number 1 • dC2 – DC Pulse output number 2 • dC3 – DC Pulse output number 3 • ANG1 – Analog output number 1 • IdC1 – Isolated DC Pulse output number 1 • IdC2 – Isolated DC Pulse output number 2 • IAN1 – Isolated Analog output number 1 <p>Note: All output channels have the same menu structure. However, only those parameters that apply for the type of output being configured appear in that output's menu.</p>
	<p>Select the indicated output channel.</p>
	<p>Navigate to the desired submenu. Submenus include the following:</p> <ul style="list-style-type: none"> • ModE – Allows the output to be set up as a control, Alarm, retransmission, or Ramp/Soak event output; the output can also be turned off • CyCL – PWM pulse width setting for DC pulse, mechanical relay, and solid state relay outputs • RNGE – Sets the voltage or current range for analog outputs
	<p>Select the indicated setting.</p>

5.4.1 Output Channel Mode (PRoG > oUt1–oUt3 > ModE)


	<p>Select Output Channel Mode (ModE) to configure the specified output.</p>
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	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • oFF – Turn off the output channel (factory default) • PId – Set the output to Proportional-Integral-Derivative (PID) Control Mode • oN.oF – Set the output to On/Off Control Mode • ALM.1 – Set the output to be an Alarm using the ALM.1 configuration • ALM.2 – Set the output to be an Alarm using the ALM.2 configuration • RtRN – Set up the output for Retransmission • RE.oN – Turn on the output during Ramp events • SE.oN – Turn on the output during Soak events
	Select the indicated setting.




5.4.1.1 Turn Off Output Channel (PRoG > oUt1–oUt3 > ModE > oFF)

	Turn off this output (oFF).
---	--------------------------------------

5.4.1.2 PID Control Mode (PRoG > oUt1–oUt3 > ModE > PId)

	Select PID Control Mode (PId) for this output (factory default). PID parameters are set outside the specific output submenus, as more than one output can be used for PID control at a time. See 5.5 PID Configuration (PRoG > PID) .
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5.4.1.3 On/Off Control Mode (PRoG > oUt1–oUt3 > ModE > oN.oF)

	Select On/Off Control Mode (oN.oF) for this output. More than one output can be set up for oN.oF control. For Heat / Cool control set the output connected to the heater with ACtN equal to RVRS and the output connected to the cooling device with ACtN set to dRCt .
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • ACtN – Determines the action direction for control • dEAd – Sets the deadband value; the deadband value is applied in the same units as the process variable to one side of Setpoint as determined by the ACtN direction • S.PNt – Allows either Setpoint 1 or Setpoint 2 to be specified as the target value; Setpoint 2 can be set to track Setpoint 1 using the deviation (dEVI) option (5.2 Setpoint 2 (PRoG > SP2))—a useful feature when setting up for heat/cool operation
	Select the indicated setting.

	<p>For ACtN, select the correct setting. Settings include the following:</p> <ul style="list-style-type: none"> • RVRS – Off when Process Value is > Setpoint, and on when Process Value is < Setpoint (e.g., heating); deadband is applied below Setpoint (factory default) • dRCt – Off when Process Value is < Setpoint, and on when Process Value is > Setpoint (e.g., cooling); deadband is applied above Setpoint <p>For dEAd, set the desired value. (The default is 5.0.)</p>
	Select the indicated ACtN setting, or confirm the dEAd value.

5.4.1.4 Output as Alarm 1 (PРоG > oUt1-oUt3 > ModE > ALM.1)

	Select this Output to be an Alarm using the Alarm 1 (ALM.1) configuration.
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5.4.1.5 Output as Alarm 2 (PРоG > oUt1-oUt3 > ModE > ALM.2)

	Select this Output to be an Alarm using the Alarm 2 (ALM.2) configuration.
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5.4.1.6 Retransmission (PРоG > oUt1-oUt3 > ModE > RtRN)

	Select Retransmission (RtRN) as the Operating Mode for the output. This option is only available for analog outputs. Scaling is performed using absolute values—not calculated counts. The retransmission signal type (voltage or current and range) is set for this output using the 5.4.3 Analog Output Range (PРоG > oUt1-oUt3 > RNgE) parameter. The retransmission signal is then scaled using the following 4 parameters. The unit will display the first scaling parameter, Rd1 , after RtRN is selected.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • Rd1 – Process reading 1; the process reading that corresponds to the output signal oUt1 • oUt1 – The output signal that corresponds to the process value Rd1 • Rd2 – Process reading 2; the process reading that corresponds to the output signal oUt2 • oUt2 – The output signal that corresponds to the process value Rd2
	Select the indicated setting.
	Set the desired value.
	Confirm the value.




5.4.1.7 Set Output to Ramp Event Mode (PRoG > oUt1-oUt3 > ModE > RE.oN)

	Activate Output to Ramp Event Mode (RE.oN) during Ramp segments in Ramp and Soak programs when the Ramp Event flag is set for that Ramp segment. This can be used to turn on auxiliary devices such as fans or stirrers, secondary heaters, etc.
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5.4.1.8 Set Output to Soak Event Mode (PRoG > oUt1-oUt3 > ModE > SE.oN)

	Activate Output to Soak Event Mode (SE.oN) during Soak segments in Ramp and Soak programs when the Soak Event flag is set for that Soak segment. This can be used to turn on auxiliary devices such as fans or stirrers.
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5.4.2 Output Cycle Pulse Width (PRoG > oUt1-oUt3 > CyCL)

	Select the Output Cycle Pulse Width (CyCL) parameter. This parameter is used to set the control signal pulse width in seconds for DC pulse, mechanical relay, and solid state relay (SSR) outputs.
	Set a value. Note: For DC pulse and SSR outputs, choose a value between 0.1 and 199.0. (The default is 0.1s.) For mechanical relays, choose a value between 1.0 and 199.0. (The default is 5.0s.)
	Confirm the value.

5.4.3 Analog Output Range (PRoG > oUt1-oUt3 > RNGE)

	Select the Output Range (RNGE) parameter. This menu choice is only available for analog outputs. The RNGE parameter is used for both Control and Retransmission Modes and generally must be matched to the input range for whatever device the analog output is driving.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • 0-10 – 0 to 10 Volts (factory default) • 0-5 – 0 to 5 Volts • 0-20 – 0 to 20 mA • 4-20 – 4 to 20 mA • 0-24 – 0 to 24 mA
	Select the desired range setting.

5.5 PID Configuration (PRoG > PId.S)

	Select PId.S to configure the PID control settings. These settings apply to all outputs that have had their Control Mode set to PID (5.4.1.2 PID Control Mode (PRoG > oUt1-oUt4 > ModE > PId)). PID control can be optimized in a variety of ways. The suggested way is to initiate an autotune command (5.5.3 Autotune (PRoG > PId.S > AUto)) and then enable adaptive tuning (5.5.7 Adaptive Tuning (PRoG > PId.S > AdPt)). The PID parameters may also be set manually or manually adjusted after an autotune command has been executed.
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	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • ACtN – Action direction allows you to move up or down to SP1 • A.to – Autotuning Timeout sets a maximum amount of time for autotuning • AUto – Initiates autotuning • GAIN – Select the proportional, integral, and derivative factors for manual tuning • %Lo – Low clamping limit for Pulse and Analog outputs • %HI – High clamping limit for Pulse and Analog outputs • AdPt – Fuzzy logic adaptive tuning
	Select the desired parameter.

5.5.1 Action Response (P_{RoG} > P_{Id} > ACtN)

	Select the ction Direction (ACtN) parameter.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • RVRS – “Reverse Action”: Increase to SP1, such as heating (factory default) • dRct – “Direct Action”: Decrease to SP1, such as cooling
	Select the indicated setting.






5.5.2 Autotune Timeout (P_{RoG} > P_{Id} > A.to)

	Select the Autotune Timeout (A.to) parameter.
	Set the amount of time before the autotune process gives up and times out in Minutes and Seconds (MM.SS). Slowly responding systems should have a longer time out setting.
	Select the indicated setting.




5.5.3 Autotune (P_{RoG} > P_{Id} > AUto)

	Select the Autotune (AUto) command. The unit displays StRt .
	Confirm Autotune activation. The unit attempts to optimize the P , I , and d settings by stimulating the system and measuring the response. If the A.to time out period expires before the autotune operation can complete, the unit displays a failure message E007 . If the autotune operation completes successfully, the unit displays the message “ doNE ”.




5.5.4 PID Gain Settings (PRoG > PId > GAIN)

	<p>Select Gain (GAIN) to manually adjust the PID factors. Setting I to zero sets the controller for “PD” control, setting d to zero sets the controller for “PI” control, and setting both I and d to zero sets the controller for “proportional” control. Most of the time you are better off using autotune and adaptive tuning and letting the system optimize its own PID factors. The P, I, and d factors are used to calculate output power according to the following equation:</p> $\%On = P * e + I * SUM(e) + d * (de/dt)$ <ul style="list-style-type: none"> • %On = %Power for Analog Outputs or %On Width for PWM Outputs • e = Error Function = Setpoint – Process Value • SUM(e) = A summation of the Error Function over time • de/dt = The rate of change of the Error Function over time <p>The P, I, and d factors can initially be set using the autotune function and then fine-tuned.</p>
	<p>Navigate to the desired manual parameter. Parameters include the following:</p> <ul style="list-style-type: none"> • _P_ – Proportional Factor. The proportional factor amplifies the error function (process value minus Setpoint) to accelerate progress towards to the Setpoint. (The default value is 001.0.) • _I_ – Integral Factor. The integral term amplifies the integrated error function over time and can increase the acceleration towards the Setpoint faster than the Proportional factor (and potentially result in more “overshoot”). This factor is sometimes referred to by its reciprocal, “Reset.” • _d_ – Derivative Factor. The derivative term (sometimes referred to by its reciprocal, “Rate”) senses the rate of rise or fall of the input measurement and throttles the PID algorithm accordingly. A higher value for this factor can speed up or slow down the response of the system even faster than an increase in the Integral Factor will.
	Select the indicated setting.
	Set the desired value.
	Confirm the value.




5.5.5 Low Output Clamping Limit (PRoG > PId > %Lo)

	Select the Low Output Clamping Limit (%Lo) parameter (0 to 100%). This parameter sets the lower limit of %Power applied to an analog output, or %On time for PWM (pulse width modulated) control used with the other output types. (The default setting is 000.0%.)
	Set the desired value.
	Confirm the value.










5.5.6 High Output Clamping Limit (PRoG > PId > %HI)

	Select the High Output Clamping Limit (%HI) parameter (0 to 100%). This parameter sets the upper limit for %power to analog outputs or %on time for PWM control with the other output types. (The default setting is 100.0%.)
	Set the desired value.
	Confirm the value.

5.5.7 Adaptive Tuning (P_{RoG} > P_{Id} > AdPt)

	Select the Adaptive Tuning (AdPt) parameter.
	Navigate to the desired setting. When adaptive tuning is enabled, the PID parameters are continually optimized based on the process input changes caused by the current output control parameters. This is the easiest way to optimize the PID algorithm for a wide variety of systems. Settings include the following: <ul style="list-style-type: none"> • ENbL – Enables fuzzy logic adaptive tuning (factory default) • dSbL – Disables fuzzy logic adaptive tuning
	Select the indicated setting.

5.6 Remote Setpoint Configuration (P_{RoG} > RM.SP)

	Select the Remote Setpoint Configuration (RM.SP) parameter.
	Navigate to the desired setting. A remote signal can then be used to set and/or change the Setpoint value using an analog input. This function can be used for a variety of applications where direct access to the controller for Setpoint manipulation is a problem (hazardous environments, lack of proximity, etc). It can also be used to configure the controller in a cascaded control scheme. Settings include the following: <ul style="list-style-type: none"> • oFF – Do not use a remote Setpoint (factory default) • oN – Remote Setpoint replaces Setpoint 1 <p>Note: oFF has no sub-parameters, but oN requires scaling of the remote Setpoint input.</p>
	Select the indicated setting.
	If oN , navigate to the desired input range. Options include the following: <ul style="list-style-type: none"> • 4–20 – 4.00–20.00 mA input signal range • 0–24 – 0.00–24.00 mA input signal range • 0–10 – 0.00–10.00 V input signal range • 0–1 – 0.00–1.00 V input signal range
	Select the desired input signal range to proceed to the scaling parameters starting with RS.Lo .
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • RS.Lo – Minimum Setpoint value (entry point). Setpoint 1 is set to this value when the analog input signal is IN.Lo. • IN.Lo – Input value in mA or V for RS.Lo • RS.HI – Maximum Setpoint value. Setpoint 1 is set to this value when the analog input signal is IN.HI. • IN.HI – Input value in mA or V for RS.HI
	Select the indicated setting.
	Set the desired value.
	Confirm the value.

5.6.1 Cascade Control using Remote Setpoint

The remote Setpoint feature of the PLATINUM™ Series controllers can be used in a variety of applications where Setpoints can be sent to the controllers from remote devices such as a manual pots, transmitters, computers, etc. This feature can also be used to set up a “cascade control” system, where the remote Setpoint input is generated by another controller. Figure 5.3 shows a generic diagram of a cascade control system and Figure 5.4 shows a typical example, in this case a heat exchanger application.

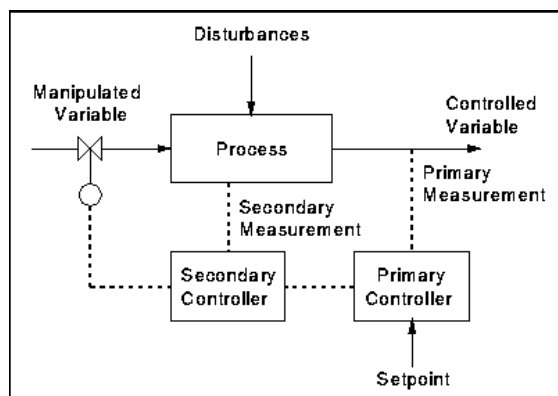


Figure 5.3 Generic Cascade Control Diagram

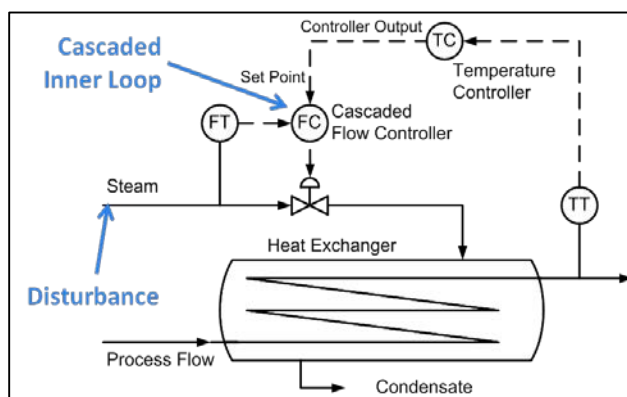





Figure 5.4 Heat Exchanger with Cascade Control

Cascade control schemes can provide tighter control of a process when you have two linked variables, one of which has a much slower (typically 4X or more) response than the other. The slower responding variable is used as the input to the primary or master controller, and the faster responding variable is used as the input to the secondary or slave controller. The output of the primary controller is scaled to be used as the Setpoint for the secondary controller.




In the heat exchanger application in Figure 2, the primary goal of the application is to control the temperature of the effluent. Therefore, the desired effluent temperature becomes the Setpoint for the primary controller, which is a temperature controller (TC). The process input for the temperature controller is the measured temperature of the effluent (TT). The output of the temperature controller is the flow Setpoint for the secondary controller, which is a flow controller (FC). The process input for the secondary (flow) controller is the flow rate of the steam that is used to heat the process flow through the heat exchanger (FT). The output of the secondary (flow) controller is a control signal for the proportional valve controlling the flow of the steam.

By isolating the slowly changing effluent temperature control loop from the rapidly changing flow control loop, a more predictable, robust, and tighter control scheme results.




5.7 Multi-Ramp/Soak Mode Parameters (PRoG > M.RMP)

	<p>Select Multi-Ramp/Soak Mode (M.RMP) for activation and configuration. You can configure, store, and load up to 99 Ramp/Soak programs. Each program can have up to 8 Ramps and 8 Soaks including the ability to activate auxiliary (non-control) outputs during any or all Ramp and Soak segments. Any segment soak setpoint can be an increase or a decrease from the previous soak setpoint and the unit will automatically determine the control direction (reverse or direct) for the associated ramp. The end action (E.Act) can be defined as StOP, HOLd, or LiNK. By using LiNK, one program can be specified to start at the end of the previous program, creating an absolute capability to set up a program with 8*99 or 792 ramps and 792 soaks. In addition, a program can be linked to itself to create a continuously cycling profile.</p> <p>Configuration settings files can be edited on a PC in Excel and this can be especially useful when creating / editing complex ramp and soak programs. See INIt > SAVE for further information on this.</p> <p>For an overview of Ramp and Soak programming including examples see Section 5.7.8.</p> <p>Note: When setting up multidirectional ramp and soak programs, only one direction can use PID control as PID control is set to reverse (heating) or direct (cooling) action for any and all outputs assigned to MoDE > PID. PID Autotuning of your system under control will tune only for the PID action direction as the optimum PID parameters for the other action direction may be completely different. On/Off control must be used to set up any output(s) for the other action direction.</p>
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • R.CtL – Activate Multi-Ramp/Soak Mode • S.PRg – Program number • M.tRk – Multi-Ramp/Soak tracking setting • tIM.F – Time format for Ramp/Soak programs • N.SEG – Number of segments • S.SEG – Segment number for editing • E.Act – Determines what happens at the end of a program
	<p>Select the indicated setting.</p>




5.7.1 Multi-Ramp/Soak Mode Control (PRoG > M.RMP > R.CtL)

	<p>Select the Multi-Ramp/Soak Mode Control (R.CtL) parameter.</p>
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • No – Multi-Ramp/Soak Mode off • yES – Multi-Ramp/Soak Mode on; must be started from front panel • RMt – Multi-Ramp/Soak Mode on; front panel or digital input to start
	<p>Select the indicated setting.</p>




5.7.2 Select Program (PRoG > M.RMP > S.PRG)

	Select the Select Program (S.PRG) parameter. The current profile for the selected program number will be loaded and can be used as is or modified.
	Set the number (1–99) corresponding to the Ramp/Soak profile to be loaded for use or editing. (The default is 1)
	Confirm the value.


5.7.3 Multi-Ramp/Soak Tracking (PRoG > M.RMP > M.tRk)



	Select the Multi-Ramp/Soak Tracking (M.tRk) parameter. This parameter has three settings that allow for different ways to manage ramp and soak program tracking.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • RAMP – Guaranteed Ramp Mode. If the soak setpoint is not reached within the specified Ramp Time, the Ramp and Soak cycle will terminate, the outputs are disabled, and a failure message (E008) will be displayed. • SoAK – Guaranteed Soak Mode. If the soak setpoint is not reached within the specified Ramp Time the system will continue to Ramp and not transition to the Soak Mode until the Soak point is reached. The full specified Soak time is preserved. • CYCL – Guaranteed Cycle Mode. If the soak setpoint is not reached within the specified Ramp Time, the unit will continue to ramp until that setpoint is reached. The additional ramp time required is subtracted from the soak time so that the specified cycle time (ramp time + soak time) is preserved. If the soak setpoint is still not reached at the end of total cycle time, the ramp and soak program will terminate, the outputs are disabled, and the failure message (E0008) will be displayed.
	Select the indicated setting.

5.7.4 Time Format (PRoG > M.RMP > tIM.F)




	Select the default Ramp and Soak Time Format (tIM.F) parameter for the current program. The default format can be overridden to create mixed time mode Ramp and Soak programs.
	Navigate to the desired setting. Settings include the following: <ul style="list-style-type: none"> • MM.SS – Time specified in minutes and seconds (factory default) • HH.MM – Time specified in hours and minutes. Indicated by turning on the negative sign to differentiate from MM.SS format when adjusting the MRT.# and MST.# parameters for a given segment.
	Select the indicated option. Note that the default time format can be overridden for any given segment time by pressing the left arrow with that time showing until it sequences through each digit and then the entire time flashes. Pressing the right arrow at that point will change the setting for that segment to the other time format.

5.7.5 Program End Action (PRoG > M.RMP > E.ACT)








	Select the End Action (E.ACT) parameter.
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	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • StOP – Enter standby mode displaying RUN at the completion of this program. • HOlD – Hold at the final soak setpoint at the completion of this program. • LiNK – Link to another stored ramp & soak program at the completion of this program. <ul style="list-style-type: none"> ○ ## – Specify the Program Number to start at the completion of this program (1 to 99). Specifying 0 will repeat the program specified by S.PRg which can provide for cycling through a series of linked programs. Specifying 100 will restart the last program run in a sequence of linked programs.
	Select the indicated setting.

5.7.6 Number of Segments (PRoG > M.RMP > N.SEG)

	Select the Number of Segments (N.SEG) parameter.
	Set the number of segments (1–8). (The default is 1.)
	Confirm the value.

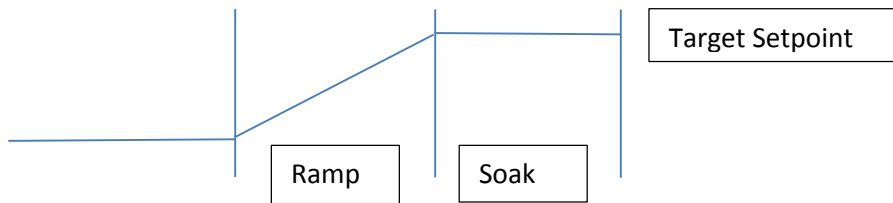
5.7.7 Segment Number for Editing (PRoG > M.RMP > S.SEG)

	Select the Segment Number for Editing (S.SEG).
	Set the segment number to edit for the Program Number. This segment number selection will replace the “#” digit in all of the ramp and soak control parameters for that segment listed below (MRT.# , MSt.# , etc) as you view it on the unit's display. This will help you keep track of where you are when programming multiple ramp and soak segments from the front panel.
	Confirm the segment number.
	<p>Navigate to the desired setting. Settings include the following:</p> <ul style="list-style-type: none"> • MRT.# – Time for Ramp number # (the default is 10). Ramp and Soak times can be as long as either 99 minutes and 59 seconds or 99 hours and 59 minutes. The default format is controlled by the tIM.F parameter setting for this program. The default can be overridden for any segment time as described under tIM.F. • MRE.# – Determine whether to activate Ramp-event-enabled outputs: <ul style="list-style-type: none"> ○ oFF – Disable Ramp events for this segment (factory default) ○ oN – Enable Ramp events for this segment. At least one output must be set to MoDE = RE.oN for an enabled ramp event to actually do anything. • MSP.# – Setpoint value for Soak cycle # • MSt.# – Time for the Soak cycle (the default is 10). See MRT.# for more info. • MSE.# – Determine whether to activate Soak-event-enabled outputs: <ul style="list-style-type: none"> ○ oFF – Disable Soak events for this segment (factory default) ○ oN – Enable Soak events for this segment. At least one output must be set to MoDE = RE.oF for an enabled soak event to actually do anything.
	Select the indicated setting.
	Navigate to the correct setting, or set the desired value.
	Select the indicated setting, or confirm the value.

5.7.8 More on Multi-Ramp/Soak Programming

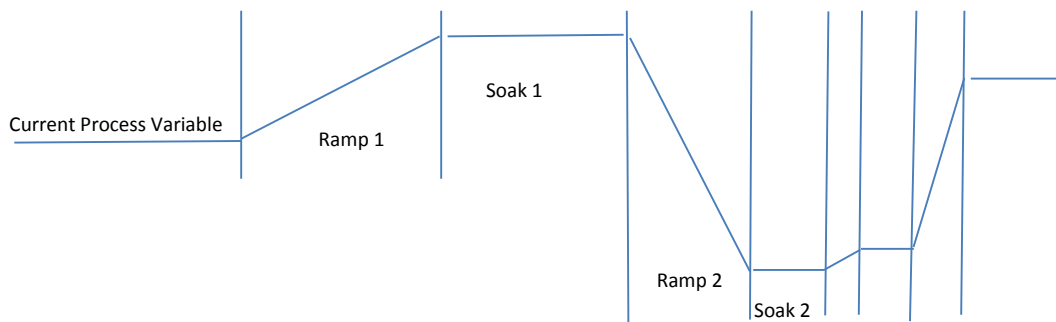
5.7.8.1 Overview

A key feature of the Ramp and Soak mechanism is provided by the ability to 'link' ramp/soak segments together to create a chain of sequences. This allows sequences of up to 792 Ramp/Soak pairs to be defined. A Ramp/Soak segment is defined as a specified increase or decrease (Ramp) of the process variable over a set period of time, followed by holding (Soak) the process variable at a fixed level for a fixed period of time.



These controllers provide a multi-segment/multi-profile Ramp and Soak mechanism with the additional ability to link multiple profiles together to implement extended sequences.

Although the term 'RAMP' is used to indicate the process variable change, there is no restrictions on the direction of change. The Target Setpoint may be above or below the Current process variable for each cycle within a sequence.



The Ramp and Soak times are provided in 1 second increments and may span from 1 second to 99 hours, 59 minutes, 59 seconds. Internally, the time values are tracked within 0.1 second intervals.

The Ramp and Soak function attempts to provide a controlled increase to the process variable such that the target setpoint is reached within the specified time. Options are provided to track the specified RAMP time, the specified SOAK time or the overall CYCLE time.

5.7.8.2 Ramp / Soak Program Linking


LINK parameter		
N	Where N is the number of the current program	Allows continuous cycling of a single program
0	Reload the S.PRg program	Allows continuous process cycling using multiple linked programs
1..99	Load the specified program	Allows linking to a specified program
100	Reload the current program	Allows cycling of the last program in a linked chain of programs

6. Reference Section: Operating Mode (oPER)




Operating Mode is used to activate the unit's monitoring and controlling functions. It also allows shortcut access to the Setpoint parameters while still running. Use Operating Mode to set the following parameters and perform the following functions:

6.1	Normal Run Mode (oPER > RUN).....	54
6.2	Change Setpoint 1 (oPER > SP1).....	55
6.3	Change Setpoint 2 (oPER > SP2).....	55
6.4	Manual Mode (oPER > MANL)	55
6.5	Pause Mode (oPER > PAUS)	55
6.6	Stop Process (oPER > StoP)	56
6.7	Clear Latched Alarms (oPER > L.RSt).....	56
6.8	Display Valley Reading (oPER > VALy).....	56
6.9	Display Peak Reading (oPER > PEAK).....	56
6.10	Standby Mode (oPER > Stby)	56




6.1 Normal Run Mode (oPER > RUN)

-  Select Normal Run Mode (**RUN**). The ENTER button starts the unit operating according to the current input, output, and communications settings. Run Mode will automatically be entered and activated at unit power-on if the Power on Confirmation ([4.5.1 Power On Confirmation \(INIt > Sfty > PwoN\)](#)) parameter is set to **dSbL**. The process value is displayed in the main display, and if the unit uses dual displays, the current Setpoint value is displayed in the secondary display. With the unit remaining active, the **oPER** menu selections can be navigated to using the LEFT and RIGHT buttons.






6.2 Change Setpoint 1 (oPER > SP1)

	Select the Change Setpoint 1 (SP1) parameter. This function allows Setpoint 1 to be changed while remaining in Run Mode. Pressing the ENTER button after changing a Setpoint while in RUN Mode returns you to RUN Mode with no interruption in monitoring, control, or communications operations. If remote Setpoint is enabled, Setpoint 1 cannot be changed here and the display will flash.
	Set the desired value for Setpoint 1. When changing the setpoints from the operating mode menu, the left arrow decreases the value with acceleration and the right arrow increases the value with acceleration. This is different from the decimal place switching numeric change control in other places as changes made here are usually limited.
	Confirm the value.


6.3 Change Setpoint 2 (oPER > SP2)


	Select the Change Setpoint 2 (SP2) parameter. This function allows Setpoint 2 to be changed while remaining in RUN Mode. The current value for Setpoint 2 flashes in the main display. Setpoint 2 is only used for Alarms and as the cooling Setpoint in Heat/Cool Control Mode. See 6.2 Change Setpoint 1 (oPER > SP1) for additional information.
	Set the desired value for Setpoint 2.
	Confirm the value.

6.4 Manual Mode (oPER > MANL)



	Select the Manual Operating Mode (MANL). This mode allows for control output levels or the process input value to be manually changed.
	Navigate to the desired Manual Operating Mode. The choices are as follows: <ul style="list-style-type: none"> • M.CNt – Manually vary the control output(s) • M.INP – Manually simulate change in the process input
	Select the desired Manual Operating Mode.
	Vary the Output or Input manually with the left and right arrows. For M.CNt , the % On value is displayed instead of the process input value. With analog outputs, the % On value specifies the output current or voltage as a percentage of the total scaled range. With DC Pulse and Relay outputs, the % On value controls the width of the PWM (pulse-width modulated) signal. For M.INP , the process input value continues to be displayed but the value can be changed up or down using the RIGHT and LEFT buttons, respectively. This is a “simulated value” and it can be used to test out Alarm configurations, retransmission scaling, etc.
	Exit Manual Mode and return to Run Mode.

6.5 Pause Mode (oPER > PAUS)



	Select the Pause Operating Mode (PAUS) to pause the controller and hold the process input at its current value. If in a Multi-Ramp/Soak program, the timer for the current Ramp or Soak segment is paused as well. The current process value display will flash while in pause mode.
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	Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)).
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6.6 Stop Process (oPER > StoP)

	Select the Stop Operating Mode (StoP) to turn off all control outputs. The current process value remains with flashing digits in this mode. Alarm conditions are maintained.
	Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)).



6.7 Clear Latched Alarms (oPER > L.RSt)

	Select the Clear Latched Alarms command (L.RSt) to clear currently latched Alarms. Alternatively, use digital input to activate the L.RSt command if configured in the PRoG menu as explained in 5.3.4 Alarm Latching (PRoG > ALM.1, ALM.2 > LtCH).
	Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)).



6.8 Display Valley Reading (oPER > VALy)

	Select Display Valley Reading (VALy) to change the process value displayed to the lowest reading since VALy was last cleared.
	Clear the VALy reading buffer. Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)). <i>Note:</i> Using the other buttons to navigate away from VALy does not clear the VALy reading buffer.

6.9 Display Peak Reading (oPER > PEAK)

	Select Display Peak Reading (PEAK) to change the process value displayed to the highest reading since PEAK was last cleared.
	Clear the PEAK reading buffer. Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)). <i>Note:</i> Using the other buttons to navigate away from PEAK does not clear the PEAK reading buffer.

6.10 Standby Mode (oPER > Stby)

	Select Standby Mode (Stby) to disable outputs and Alarm conditions. Stby is displayed until navigating elsewhere. Navigate to any desired initialization or programming settings to change them or to adjust the process.
	Return to RUN Mode or to displaying “ RUN ” depending on the Operating Safety parameter setting (4.5.2 Operating Mode Confirmation (INIt > SFty > oPER)).

7. Specifications

7.1 Inputs

Input Types	Thermocouple, RTD, Thermistor, Analog Voltage, Analog Current
Current Input	4 to 20 mA, 0 to 24 mA Scalable
Voltage Input	-100 to 100 mV, -1 to 1 V, -10 to 10 Vdc Scalable
Thermocouple Input (ITS 90)	K, J, T, E, R, S, B, C, N
RTD Input (ITS 90)	100/500/1000 Ω Pt sensor, 2-, 3- or 4-wire; 0.00385 (100 Ω only), 0.00392 (100 Ω only), or 0.003916 (100 Ω only) curves
Configuration	Differential
Polarity	Bipolar
Accuracy	Refer to Table 7.1
Resolution	0.1°F/°C temperature; 10 μ V process
Input Impedances	Process Voltage: 10 M Ω for +/- 100 mV Process Voltage: 1 M Ω for other voltage ranges Process Current: 5 Ω Thermocouple: 10 K Ω max
Temperature Stability	<ul style="list-style-type: none"> • RTD: 0.04°C/°C • TC at 25°C (77°F): 0.05°C/°C (cold junction compensation) • Process: 50 ppm/°C
A/D Conversion	24 bit Sigma Delta
Reading Rate	20 samples per second
Digital Filter	Programmable from 0.05 seconds (filter = 1) to 6.4 seconds (filter = 128)
CMRR	120 dB
Excitation	Firmware selectable (no jumpers to set) to 5, 10, 12, and 24 Vdc @ 25 mA
Setpoint Adjustment	-9999 to +9999 counts
Warm Up to Rated Accuracy	30 min

7.2 Control

Action	Reverse (heat), direct (cool), or heat / cool
Autotune	Operator initiated from front panel
Adaptive Tune	User selectable; fuzzy logic continuous PID tuning optimization
Control Modes	On/off or the following time/amplitude Proportional Control Modes: selectable Manual or Auto PID, Proportional, Proportional with Integral, Proportional with Derivative
Cycle Time	0.1–199 seconds
Ramp and Soak	<ul style="list-style-type: none"> • Up to 99 Saved Ramp and Soak programs • Up to 8 Ramp and 8 Soak segments with individually selectable events per program • Definable End Actions include program linking • Ramp and Soak segment times: 00.00 to 99.59 (for HH:MM and MM:SS)

7.3 Outputs

Analog	Non-isolated, programmable for control or retransmission; Voltage Output 0-10 V output. 500 Ohms Min. Accuracy 0.1% ⁽¹⁾ ; Current Output 0-20 mA output. 500 Ohms Max. Accuracy 0.1% ⁽¹⁾⁽²⁾ ; Step response time 100 ms ⁽³⁾
DC Pulse	Non-Isolated; 10 Vdc at 20 mA
SPST Relay	Single pole, single throw mechanical relay, 250 Vac or 30 Vdc at 3 A (Resistive Load)
SPDT Relay	Single pole, double throw mechanical relay, 250 Vac or 30 Vdc at 3 A (Resistive Load)
SSR	20–265 Vac at 0.05–0.5 A (Resistive Load); continuous
Isolated DC Pulse	1.5 kV Isolation ⁽⁴⁾ ; 10 Vdc at 20 mA
Isolated Analog	1.5 kV Isolation ⁽⁴⁾ , programmable for control or retransmission; Voltage Output 0-10 V output. 500 Ohms Min. Accuracy 0.1% ⁽¹⁾ ; Current Output 0-20 mA output. 500 Ohms Max. Accuracy 0.1% ⁽¹⁾⁽²⁾ ; Step response time 100 ms ⁽³⁾
	(1) At 25C (2) Output scaling required for stated accuracy. Refer to Platinum Current Output Application Note (3) Filter setting of 1 (4) Isolated outputs share common return

7.4 Communications (USB Standard, Optional Serial and Ethernet)

Connection	USB: Female Micro-USB, Ethernet: Standard RJ45, Serial: Screw terminals
USB	USB 2.0 Host or Device
Ethernet	Standards Compliance IEEE 802.3 10/100 Base-T Auto-switching, TCP/IP, ARP, HTTPGET
Serial	Software Selectable RS/232 or RS/485. Programmable 1200 to 115.2 K baud.
Protocols	Omega ASCII, Modbus ASCII / RTU

7.5 Isolation

Approvals	UL, C-UL, and CE (8. Approvals Information)
Power to Input/Output	<ul style="list-style-type: none"> 2300 Vac per 1 min test 1500 Vac per 1 min test (Low-Voltage/Power Option)
Power to Relays/SSR Outputs	2300 Vac per 1 min test
Relays/SSR to Relay/SSR Outputs	2300 Vac per 1 min test
RS-232/485 to Inputs/Outputs	500 Vac per 1 min test

7.6 General

Display	4-digit, 9-segment LED; red, green, and amber programmable colors for process variable, Setpoint, and temperature units <ul style="list-style-type: none"> 10.2 mm (0.40"): 32Pt, 16Pt, 16DPt (Dual Display) 21 mm (0.83"): 8Pt 21 mm (0.83") and 10.2 mm (0.40"): 8DPt (Dual Display)
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Dimensions	<ul style="list-style-type: none"> • 8Pt Series: 48 H x 96 W x 127 mm D, (1.89 x 3.78 x 5") • 16Pt Series: 48 H x 48 W x 127 mm D, (1.89 x 1.89 x 5") • 32Pt Series: 25.4 H x 48 W x 127 mm D, (1.0 x 1.89 x 5")
Panel Cutout	<ul style="list-style-type: none"> • 8Pt Series: 45 H x 92 mm W (1.772" x 3.622"), 1/8 DIN • 16Pt Series: 45 mm (1.772") square, 1/16 DIN • 32Pt Series: 22.5 H x 45 mm W (0.886" x 1.772"), 1/32 DIN
Environmental Conditions	All Models: 0–50°C (32–122°F), 90% RH non-condensing
External Fuse Required	<p>Time-Delay, UL 248-14 listed:</p> <ul style="list-style-type: none"> • 100 mA/250 V • 400 mA/250 V (Low-Voltage Option) <p>Time-Lag, IEC 127-3 recognized:</p> <ul style="list-style-type: none"> • 100 mA/250 V • 400 mA/250 V (Low-Voltage Option)
Line Voltage/Power	<ul style="list-style-type: none"> • 90–240 Vac +/-10%, 50-400 Hz¹ • 110–375 Vdc, equivalent voltage • 4 W: power for 8Pt, 16Pt, 32Pt Models • 5 W: power for 8DPt, 16DPt Models
Low-Voltage/Power Option	<p>External power source must meet Safety Agency Approvals. Units can be powered safely with 24 Vac power, but no certification for CE/UL is claimed.</p> <ul style="list-style-type: none"> • 12–36 Vdc: 3 W power for 8Pt, 16Pt, 32Pt • 20–36 Vdc: 4 W power for 8DPt, 16DPt
Protection	<ul style="list-style-type: none"> • NEMA-4x/Type 4x/IP65 front bezel: 32Pt, 16Pt, 16DPt • NEMA-1/Type 1 front bezel: 8Pt, 8DPt
Weight	<ul style="list-style-type: none"> • 8Pt Series: 295 g (0.65 lb) • 16Pt Series: 159 g (0.35 lb) • 32Pt Series: 127 g (0.28 lb)

¹ No CE compliance above 60 Hz

Input Type	Description	Range	Accuracy
Process	Process Voltage	+/-100 mV, +/-1, +/-10 Vdc	0.03% FS
Process	Process Current	Scalable within 0 to 24 mA	0.03% FS
J Type T/C	Iron-Constantan	-210 to 1200°C / -346 to 2192°F	0.4°C / 0.7°F
K Type T/C	CHROMEGA®-ALOMEGA®	-270 to -160°C / -454 to -256°F	1.0°C / 1.8°F
		-160 to -1372°C / -256 to 2502°F	0.4°C / 0.7°F
T Type T/C	Copper-Constantan	-270 to -190°C / -454 to -310°F	1.0°C / 1.8°F
		-190 to 400°C / -310 to 752°F	0.4°C / 0.7°F
E Type T/C	CHROMEGA®-Constantan	-270 to -220°C / -454 to -364°F	1.0°C / 1.8°F
		-220 to 1000°C / -364 to 1832°F	0.4°C / 0.7°F
R Type T/C	Pt/13%Rh-Pt	-50 to 40°C / -58 to 104°F	1.0°C / 1.8°F
		40 to 1788°C / 104 to 3250°F	0.5°C / 0.9°F
S Type T/C	Pt/10%Rh-Pt	-50 to 100°C / -58 to 212°F	1.0°C / 1.8°F
		100 to 1768°C / 212 to 3214°F	0.5°C / 0.9°F
B Type T/C	30%Rh-Pt/6%Rh-Pt	100 to 640°C / 212 to 1184°F	1.0°C / 1.8°F
		640 to 1820°C / 1184 to 3308°F	0.5°C / 0.9°F
C Type T/C	5%Re-W/26%Re-W	0 to 2320°C / 32 to 4208°F	0.4°C / 0.7°F
N Type T/C	Nicrosil-Nisil	-250 to -100°C / -418 to -148°F	1.0°C / 1.8°F
		-100 to 1300°C / -148 to 2372°F	0.4°C / 0.7°F
RTD	Pt, 0.00385, 100 Ω, 500 Ω, 1000 Ω	-200 to 850°C / -328 to 1562°F	0.3°C / 0.5°F
RTD	Pt, 0.003916, 100 Ω	-200 to 660°C / -328 to 1220°F	0.3°C / 0.5°F
RTD	Pt, 0.00392, 100 Ω	-200 to 660°C / -328 to 1220°F	0.3°C / 0.5°F
Thermistor	2252 Ω	-40 to 120C / -40 to 248F	0.2°C / 0.35°F
Thermistor	5K Ω	-30 to 140C / -22 to 284F	0.2°C / 0.35°F
Thermistor	10K Ω	-20 to 150C / -4 to 302F	0.2°C / 0.35°F

Table 7.1 – Ranges and Accuracies for Supported Inputs

Code	Error Code Descriptions
E001	File not found during load operation
E002	Bad file format during load operation
E003	File read error during load operation
E004	File write error during save operation
E005	Device not found for read or write operation
E006	Loop break timeout
E007	Autotune timeout
E008	Ramp and Soak program tracking error
E009	Input signal out of range
E010	Communications device not ready (USB, Serial, etc)
E011	Communications install error
E012	Failed attempt to open a communications device
E013	Failed attempt to read from a communications device
E014	Failed attempt to write to a communications device
E015	Bad reboot, attempt to reboot from an unknown source
E016	Signal too unstable to perform autotune
E017	Can't autotune because input signal is on wrong side of setpoint

Table 7.2 – Error Code Descriptions

8. Approvals Information



This product conforms to the EMC directive 89/336/EEC amended by 93/68/EEC and with the European Low-Voltage Directive 72/23/EEC.

Electrical Safety EN61010-1:2010

Safety requirements for electrical equipment for measurement, control, and laboratory

Double Insulation; Pollution Degree 2

Dielectric withstand Test per 1 min

- Power to Input/Output: 2300 Vac (3250 Vdc)
- Power to Input/Output²: 1500 Vac (2120 Vdc)
- Power to Relays/SSR Output: 2300 Vac (3250 Vdc)
- Ethernet to Inputs: 1500 Vac (2120 Vdc)
- Isolated RS232 to Inputs: 500 Vac (720 Vdc)
- Isolated Analog to Inputs: 500 Vac (720 Vdc)
- Analog/Pulse to Inputs: No Isolation

Measurement Category I

Category I includes measurements performed on circuits not directly connected to the Mains Supply (power). Maximum Line-to-Neutral working voltage is 50Vac/dc. This unit should not be used in Measurement Categories II, III, and IV.

Transients Overvoltage Surge (1.2 / 50uS pulse)

- Input Power: 2500 V
- Input Power³: 1500 V
- Ethernet: 1500 V
- Input/Output Signals: 500 V

EMC EN61326:1997 + and A1:1998 + A2:2001

Immunity and Emissions requirements for electrical equipment for measurement, control, and laboratory are as follows:

- EMC Emissions Table 4, Class A of EN61326
- EMC Immunity⁴ Table 1 of EN61326

UL File Number: E209855

² Low-voltage DC power option: Units configured for external low power DC voltage, 12–36Vdc.

³ Ibid.

⁴ I/O signal and control lines require shielded cables, and these cables must be located on conductive cable trays or in conduits. The length of these cables should not exceed 30 meters.

Warranty/Disclaimer

NEWPORT Electronics, Inc. warrants this unit to be free of defects in materials and workmanship for a period of **one (1) year** from the date of purchase. In addition to NEWPORT's standard warranty period, NEWPORT Electronics will extend the warranty period for **four (4) additional years** if the warranty card enclosed with each instrument is returned to NEWPORT.

If the unit should malfunction, it must be returned to the factory for evaluation. NEWPORT's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by NEWPORT, if the unit is found to be defective it will be repaired or replaced at no charge. NEWPORT's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of NEWPORT's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

NEWPORT is pleased to offer suggestions on the use of its various products. However, NEWPORT neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by NEWPORT, either verbal or written. NEWPORT warrants only that the parts manufactured by it will be as specified and free of defects. NEWPORT MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of NEWPORT with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall NEWPORT be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by NEWPORT is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, or used on humans, or misused in any way, NEWPORT assumes no responsibility as set forth in our basic WARRANTY / DISCLAIMER language, and additionally purchaser will indemnify NEWPORT and hold NEWPORT harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

Return Requests/Inquiries

Direct all warranty and repair requests/inquiries to the NEWPORT Customer Service Department. **BEFORE RETURNING ANY PRODUCT(S) TO NEWPORT, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM NEWPORT'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS).** The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available **BEFORE** contacting NEWPORT:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult NEWPORT for current repair charges. Have the following information available **BEFORE** contacting NEWPORT:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

NEWPORT's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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1-800-6397678[®]
1-800-NEWPORT

Newport Electronics, Inc.
2229 South Yale Street • Santa Ana, CA • 92704 • U.S.A.
TEL: (714) 540-4914 • FAX: (203) 968-7311
Toll Free: 1-800-639-7678 • www.newportUS.com • e-mail: info@newportUS.com
ISO 9001 Certified

Newport Technologies, Inc.
976 Bergar • Laval (Quebec) • H7L 5A1 • Canada
TEL: (514) 335-3183 • FAX: (514) 856-6886
Toll Free: 1-800-639-7678 • www.newport.ca • e-mail: info@newport.ca

Newport Electronics, Ltd.
One Omega Drive • River Bend Technology Centre
Northbank, Irlam • Manchester M44 5BD • United Kingdom
Tel: +44 161 777 6611 • FAX: +44 161 777 6622
Toll Free: 0800 488 488 • www.newportuk.co.uk • e-mail: sales@newportuk.co.uk

Newport Electronics B.V. - Benelux
Managed by the United Kingdom Office
TEL: +31 20 3472121 • FAX: +31 20 6434643
Toll Free: 0800 0993344 • www.newport.nl • e-mail: info@newport.nl

Newport Electronics spol s.r.o.
Frystatska 184, 733 01 Karviná • Czech Republic
TEL: +420 59 6311899 • FAX: +420 59 6311114
Toll Free: 0800-1-66342 • www.newport.cz • e-mail: info@newport.cz

Newport Electronics GmbH
Daimlerstrasse 26 • D-75392 Deckenpfronn • Germany
TEL: 49 7056 9398-0 • FAX: 49 7056 9398-29
Toll Free: 0800 / 6397678 • www.newport.de • e-mail: sales@newport.de

Newport Electronique S.A.R.L. - France
Managed by the United Kingdom Office
TEL: 01 57 32 48 17 • FAX: 01 57 32 48 18
Toll Free: 0805 541 038 • www.newport.fr • e-mail: sales@newport.fr

Mexico and Latin America
FAX: 001 (203) 359-7807
TEL En Español: 001 (203) 359-7803

NEWPORTnetSM On-Line Service www.newportUS.com	Internet e-mail info@newportUS.com
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