



EZ-Temp™ Microprocessor Temperature Control Guide



*Direct and Indirect
Fired Water Heaters*



Hot Water Boilers



Commercial Boilers



*Commercial Boiler
Control Packages*

CARLIN. THE TECHNOLOGY LEADER.



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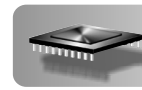


- **Multiple sensor option (1 or 2)**
(Using individual and/or dual sensor assemblies)
- **Easy remote sense**
(Electronic sensors, wired to control)
- **Smart manual reset**
(Manual reset only if operating limit doesn't open)
- **Serviceman reset protection**
(Latch-up after three consecutive lockouts ⁽¹⁾)
- **Power-independent lockout**
(Power cycling won't reset from lockout or latch-up)
- **Diagnostic LED's**
(Power, call for heat, and lockout/latchup)
- **SMC Technology** ⁽²⁾

- (1) Latch-up mode shuts down the control after three consecutive lockouts, and requires a special procedure to reset. This ensures the owner will call in a licensed technician to troubleshoot and correct burner problems.
- (2) The 90000 provides two limit relays. Carlin's patented SMC technology (Safety Monitoring Circuit) monitors the contacts of both relays. Lockout occurs if a limit relay contact is found closed when it should be open.

EZ-Temp™

MODEL 90000



Microprocessor
Temperature Controls

Data sheet

Specifications

- Carlin's Model 90000 microprocessor-operated, multiple-contact temperature limit controls are available in four configurations, described below. Each model provides two contacts — one for operating limit and one from high limit.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90000A 90000AL	Dual limit temperature control <ul style="list-style-type: none"> • Operating and high limit action • Smart manual reset on high limit • 2 electronic sensors (operating and high limit) • Independent operating limit contact • Independent high limit contact
	90000B 90000BL	Temperature limit control <ul style="list-style-type: none"> • Operating and high limit action • Smart manual reset on high limit • 1 electronic sensor • Operating and limit contacts in series
	90000C 90000CL	Redundant limit temperature control <ul style="list-style-type: none"> • Operating and high limit action • Smart manual reset on high limit • 2 electronic sensors (operating and high limit) • Operating and limit contacts in series
	90000CE 90000CEL	Combination operating limit and manual reset high limit control <ul style="list-style-type: none"> • Independent operating and high limit contacts in series • 2 electronic sensors (operating and high limit) • Lockout on diagnostic failure and limit action • Manual reset from lockout • High limit test function

Control model	A/AL	B/BL	C/CL	CE/CEL
Control power input (red-white wire)	120 VAC, 11 VA			
Contacts	2 independent	2 in series		
Contact rating	Full load: 120 VAC, 10 AMPS Locked rotor: 120 VAC, 60 AMPS			
Wires	Quantity: 6	3		
	120 vac Hot / Neutral	red-white / white		
	High limit IN / OUT	black-red / black-yellow	N/A	
	Oper. limit IN / OUT	black-green / black	N/A	
	Limits OUT	NA	black	
Adjustable oper. limit range	Any range between 50°F to 240°F			
Fixed high limit temperature	Any value from 160°F to 240°F		Any value from 160°F to 250°F	
Fixed differential (subtractive)	Any value from 5°F to 100°F			
Operating temperature limits	+32°F to +140°F			
Storage temperature limits	-40°F to +185°F			
Agencies	UL Recognized & Listed United States & Canada			

Model 90000A, B, C, & CE diagnostic LED's

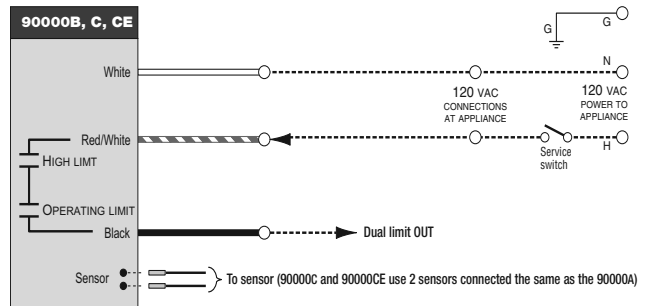
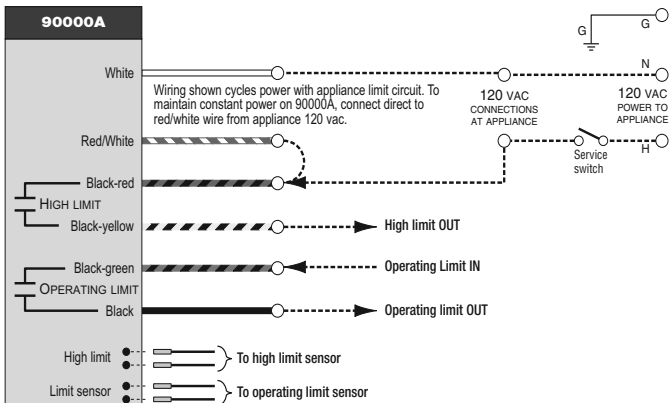
- GREEN **G** – OFF **G** – ON Power **G** – FLASHING (Slow) Latch-up **G** – FLASHING (Fast) Hi-Test
- RED **R** – OFF **R** – ON Lockout
- AMBER **A** – OFF **A** – ON Control call for heat

WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams below for wiring connections.)

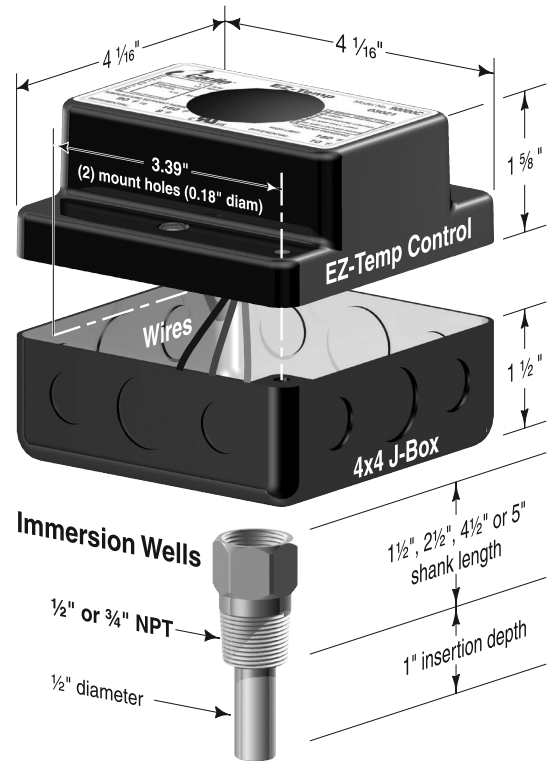
- Power OFF** (G R A) With no power applied to the red-white wire, all lights are off. Power can be wired directly from appliance 120 vac terminal to maintain power at all times. Or jumper red-white wire and black-green wire to cycle power with the appliance limit circuit.
- Power ON** (G R A) When power is applied to the red-white wire, the green LED turns on.
- Self-test** (G R A) When power is applied, the 90000 performs a self-test, checking sensor(s) and microprocessor and verifying limit contacts are open. The power-up test lasts from 3 to 5 seconds. The 90000 continues diagnostic checing during the operating cycle as well. Any self-check failure causes a lockout (see below).
- Operate** (G R A) If the temperature at the operating sensor(s) is below setpoint by at least the fixed differential, the control closes the operating limit contacts. The amber LED turns on.
- Stand-by** (G R A) When the operating sensor(s) see setpoint temperature or above, the 90000 opens the operating limit contact. The amber LED turns off.
- Limit action** (G R A) 90000A, B or C: If the high limit sensor(s) see a temperature above high limit setting, the control opens the high limit contacts, turns on the red LED and checks the operating limit contacts. If the operating limit contacts are open, the control will automatically reset when temperature drops below high limit setting minus differential. The high limit contacts close and the red LED turns off. Diagnostic failures invoke "limit action" until cause is cleared.
- Lockout** (G R A) If the high limit sensor(s) sees a temperature above high limit setting and the 90000A, B, or C model finds the operating limit contacts closed, the high limit contact opens, the red LED turns on and lockout occurs. If the high limit sensor on the 90000CE sees a temperature above the high limit setting, the high limit contact opens, the red LED turns on and lockout occurs. When the temperature drops below high limit setting minus differential, reset the control by pressing the manual reset button. The control will not reset by cycling power off and on.
- Latch-up** (G R A) If the 90000 locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require *licensed serviceman intervention*. During latch-up, the red LED stays on and the green LED flashes slow. Reset as follows:
 - Temperature is less than high limit setting minus differential: Hold reset button at least 10 seconds. The green LED flashes faster.
 - Continue holding button another 20 seconds. The control resets and the red LED turns off.
 - "Hi-Test" mode (90000CE ONLY), used to test "High Limit Reset" at operating boiler temperature. Start test with system operational and calling for heat. Turn setpoint full clockwise to Hi-Test position. Green LED flashes fast. The setpoint now adjusts both the high and operating limits. Turn setpoint slowly counter clockwise until Lockout occurs. Now the setpoint temperature equals the hi-limit sensor temperature. Test is complete, adjust setpoint to the desired operating limit. Remove from lockout.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.



Configurations

- **Control kits** — 90000 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90000 sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available in single and dual configurations.
- **Notice: UL-Listed control** — UL-Listed controls are supplied complete with control, J-Box, well, sensor, and mounting hardware.





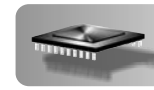
- **Multiple sensors (2 or 3)**
(Using individual and/or dual sensor assemblies)
- **Sensor averaging**
(Average operating limit, high limit or both)
- **Easy remote sense**
(Electronic sensors, wired to control)
- **Smart manual reset**
(Manual reset only if operating limit doesn't open)
- **Serviceman reset protection**
(Latch-up after three consecutive lockouts ⁽¹⁾)
- **Power-independent lockout**
(Power cycling won't reset from lockout or latch-up)
- **Diagnostic LED's**
(Power, call for heat, and lockout/latchup)
- **SMC Technology** ⁽²⁾

(1) Latch-up mode shuts down the control after three consecutive lockouts, and requires a special procedure to reset. This ensures the owner will call in a licensed technician to troubleshoot and correct burner problems.

(2) The 90100 provides two limit relays. Carlin's patented SMC technology (Safety Monitoring Circuit) monitors the contacts of both relays. **Lockout** occurs if a limit relay contact is found closed when it should be open.

EZ-Temp™

MODEL 90100



Microprocessor
Temperature Controls

Data sheet

Specifications

- Carlin's 90100 microprocessor-operated, multiple-contact temperature limit controls are available in three configurations, described below. Each model provides two contacts — one for operating limit and one from high limit.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90100A	Dual limit temperature control <ul style="list-style-type: none"> • operating and high limit action • smart manual reset on high limit • 2 sensors, electronically averaged • 1 contact — operating limit • 1 contact — high limit
	90100B	Dual limit temperature control <ul style="list-style-type: none"> • operating and high limit (<i>smart manual reset</i>) • 2 operating limit sensors, averaged • 1 high limit sensor • 1 contact — operating limit • 1 contact — high limit
	90100C	Dual limit temperature control <ul style="list-style-type: none"> • operating and high limit (<i>smart manual reset</i>) • 1 operating limit sensor • 2 high limit sensors, averaged • 1 contact — operating limit • 1 contact — high limit

Control model		A	B	C
Control power input (red-white wire)		120 VAC, 11 VA		
Contacts		2 independent		
Contact rating	Full load	120 VAC, 10 AMPS		
	Locked rotor	120 VAC, 60 AMPS		
Wires	Quantity	6		
	120 VAC Hot / Neutral	red-white / white		
	Oper. limit IN / OUT	black-green / black		
	High limit IN / OUT	black-red / black-yellow		
Adjustable oper. limit range		Any range between 50°F to 240°F		
Fixed high limit temperature		Any value from 160°F to 240°F		
Fixed differential (subtractive)		Any value from 5°F to 100°F		
Operating temperature limits		+32°F to +140°F		
Storage temperature limits		-40°F to +185°F		
Agencies		UL & ULC recognized component United States & Canada		

Model 90100 diagnostic LED's

- GREEN** (G) – OFF (G) – ON Power (G) – FLASHING Latch-up
RED (R) – OFF (R) – ON Lockout
AMBER (A) – OFF (A) – ON Control call for heat

WARNING **Electrical shock hazard:** Disconnect power to appliance when wiring or servicing any electrical component.

Operation

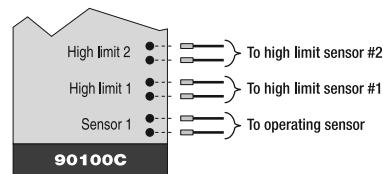
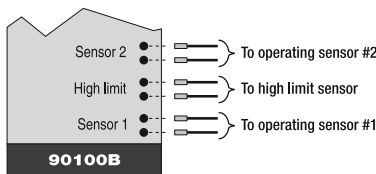
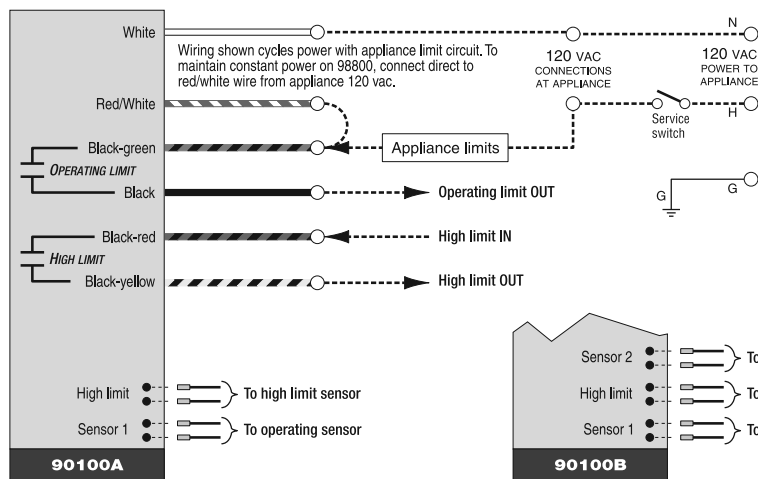
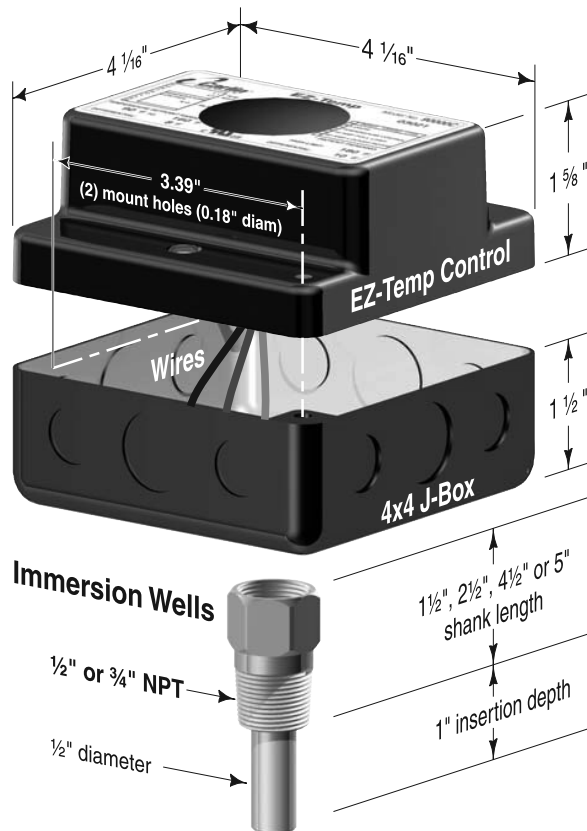
(See wiring diagrams below for wiring connections.)

- (G)(R)(A) Power OFF** With no power applied to the red-white wire, all lights are off. Power can be wired directly from appliance 120 vac terminal to maintain power at all times. Or jumper red-white wire and black-green wire to cycle power with the appliance limit circuit.
- (G)(R)(A) Power ON** When power is applied to the red-white wire, the green LED turns on.
- (G)(R)(A) Self-test** When power is applied, the 90100 performs a self-test, checking sensor(s) and microprocessor and verifying limit contacts are open. The power-up test lasts from 3 to 5 seconds. The 90100 continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- (G)(R)(A) Operate** If the temperature at the operating sensor(s) is below setpoint by at least the fixed differential, the control closes the operating limit contacts. The amber LED turns on.
- (G)(R)(A) Stand-by** When the operating sensor(s) see setpoint temperature or above, the 90100 opens the operating limit contact. The amber LED turns off.
- (G)(R)(A) Limit action** If the high limit sensor(s) see a temperature above high limit setting, the 90100 opens the high limit contacts, turns on the red LED and checks the operating limit contacts. If the operating limit contacts are open, the control will automatically reset when temperature drops below high limit setting minus differential. The high limit contacts close and the red LED turns off.
- (G)(R)(A) Lockout** If the high limit sensor(s) sees a temperature above high limit setting and the 90100 finds the operating limit contacts closed, the red LED turns on and **lockout** occurs. (Lockout also occurs on any diagnostic test failure.) When the temperature drops below high limit setting minus differential, reset the control by pressing the manual reset button. The control will not reset by cycling power off and on.
- (G)(R)(A) Latch-up** If the 90100 locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require **licensed service-man intervention**. During latch-up, the red LED stays on and the green LED flashes. Reset as follows:
 - (G)(R)(A) Temperature must be less than high limit setting minus differential.
 - (G)(R)(A) Hold reset button at least 10 seconds. The green LED flashes faster.
 - (G)(R)(A) Continue holding button another 20 seconds. The control resets and the red LED turns off.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.

Configurations

- **Control kits** — 90100 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90100 sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available in single and dual configurations.

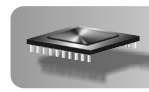




- ▶ **Microprocessor-operated**
 (Processor coordinates limit and diagnostic functions)
- ▶ **Easy remote sense**
 (Electronic sensor, wired to control)
- ▶ **Select from break-on-rise, make-on-rise or SPDT operation**
- ▶ **Self-checking program**
 (Control locks out on diagnostic failure)
- ▶ **Diagnostic/status LED's**
 (LED's indicate power, call for heat, and lockout)

EZ-Temp™

MODEL 90200



Microprocessor
Temperature Controls

Data sheet

Specifications

- Carlin's Model 90200AL, BL, DL and GL microprocessor-operated temperature controls are UL Listed and provided as a complete package, consisting of control, J-box, sensor and well. Model 90200A, B, D or G controls are UL Recognized, and provided as individual components, with J-box, sensor and well available separately.
- Carlin's model 90200 microprocessor-operated temperature controls are available in four configurations described below. Each model provides one limit-duty-rated contact.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications within the available ranges listed below.

	90200AL	Temperature limit control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle
	90200BL	Temperature limit control <ul style="list-style-type: none"> • 1 make-on-rise contact • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle
	90200DL	Temperature limit control <ul style="list-style-type: none"> • SPDT contacts (1 break-/1 make-on-rise) • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle
	90200GL	Temperature limit control <ul style="list-style-type: none"> • 1 break-on-rise isolated contact • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle

Control model	AL	BL	DL	GL
Control power input (red-white wire)	120 VAC, 11 VA			
Contacts (action on temperature rise:)	1 (breaks)	1 (makes)	1 (breaks) 1 (makes)	1 (breaks)
Contact rating	Full load: 120 VAC, 10 AMPS Locked rotor: 120 VAC, 60 AMPS			
Wires	3	3	4	4
120 VAC H & Limit IN / N	red-white / white			
Break-on-rise OUT	black	NA	black	black/ green black
Make-on-rise OUT	NA	blk-white	blk-white	N/A
Adjustable oper. limit range	Any range between 50°F to 240°F			
Fixed differential (subtractive)	Any value from 5°F to 100°F			
Operating temperature limits	+32°F to +140°F			
Storage temperature limits	-40°F to +185°F			
Agencies	UL & ULC Recognized & Listed component United States & Canada			

Model 90200 diagnostic LED's

- GREEN** – OFF – ON *Power on* – FLASHING *Lockout*
- Center AMBER** – OFF – ON *Call for low fire (90200GL only)*
- Right AMBER** – OFF – ON *Control call for heat or high fire*

WARNING **Electrical shock hazard:** Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams below for wiring connections.)

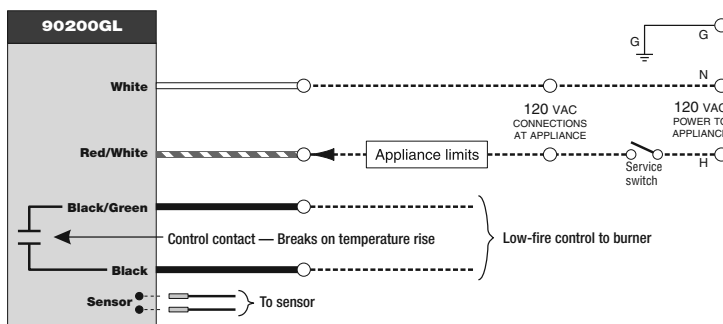
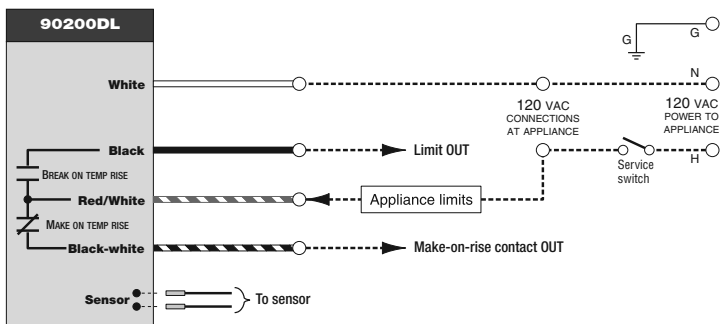
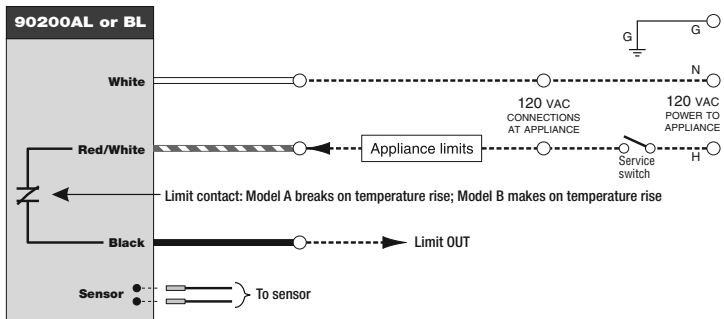
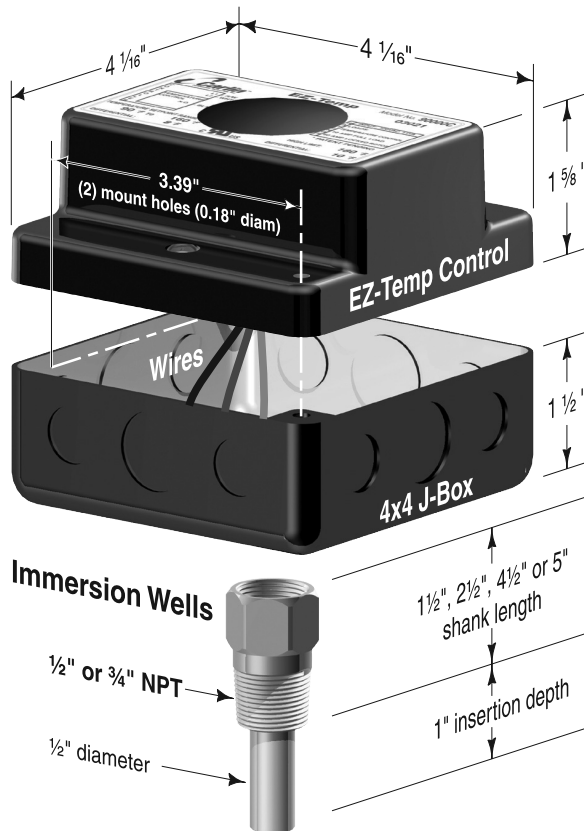
Indicator LED's **90200** controls have a green LED (power/lockout indicator) and center amber LED (Low Fire indicator only present on 90200GL) right amber LED (operation or High Fire indicator).

- Power OFF** With no power applied to the red-white wire, all lights are off.
- Power ON** When power is applied to the red-white wire, the green and center amber LED's (only present on 90200GL) turn on.
- Self-test** When power is applied, the 90200 performs a self-test, checking the sensor and microprocessor. The power-up test lasts from 3 to 5 seconds.
The 90200 continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- Call for heat or high fire** When the temperature at the operating sensor is at or below setpoint minus fixed differential, the control powers the limit relay (break-on-rise contact closes; make-on-rise contact opens). The center amber LED (if present) turns off, the right amber LED turns on.
- Stand-by or low fire** When the operating sensor reaches setpoint temperature or above, the 90200 turns off the relay (break-on-rise contact opens; make-on-rise contact closes). The center amber LED (if present) turns on and the right amber LED turns off.
- Lockout** If the control detects a diagnostic failure, **lockout** occurs. During lockout, the green LED flashes.
After the temperature drops below high limit setting minus differential, reset the control by turning power off, then back on. The green LED will stop flashing.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.

Configurations

- **Mounting** — 90200AL, BL, DL, and GL controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90200AL, BL, DL, and GL sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available separately for 90200A, B, D, and G only. The sensor is supplied with 90200AL, BL, DL, and GL.
- **NOTICE** — UL Listed model 90200AL, BL, DL, GL controls must be shipped complete with a sensor, well and J-box. Only UL recognized component models 90200A, B, D, and G controls can be purchased as individual components.





- Microprocessor-operated**
 (Processor coordinates limit and diagnostic functions)
- Easy remote sense**
 (Electronic sensor, wired to control)
- Break-on-rise operation**
- Self-checking program**
 (Control locks out on diagnostic failure)
- Diagnostic/status LED's**
 (LED's indicate power and lockout)

EZ-Temp™

MODELS **90200E** & **90200EL**

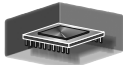


Manual Reset High Limit

Data sheet

Specifications

- Model 90200EL control is UL listed and provided as a complete package consisting of control, J-box, sensor and well. Model 90200E control is UL recognized, and provided as individual components, with J-box, sensor and well available separately.
- Carlin's Model 90200E and 90200EL microprocessor-operated temperature controls are described below. The 90200E and 90200EL provide a single contact (break-on-rise) with manual reset.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90200E 90200EL	Temperature limit control <ul style="list-style-type: none"> break-on-rise contact lockout on diagnostic failure & limit action manual reset from lockout no reset from power interruption
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Control model	90200E & 90200EL
Control power input (red-white wire)	120 VAC, 11 VA
Contacts	1 break-on-rise
Contact rating Full load	120 VAC, 10 AMPS
Locked rotor	120 VAC, 60 AMPS
Wires Quantity	3
120 VAC Neutral	white
120 VAC HOT & Limit IN	red-white
Limit OUT	black
Adjustable limit range	Any range between 100°F to 250°F
Fixed differential (subtractive)	Any value from 5°F to 100°F
Operating temperature limits	+32°F to +140°F
Storage temperature limits	-40°F to +185°F
Agencies	UL & ULC Recognized & Listed component United States & Canada

Model 90200E/EL diagnostic LED's

GREEN – OFF – ON Power on – FLASHING Lockout pending
RED – OFF – ON Lockout

WARNING **Electrical shock hazard:** Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams below for wiring connections.)

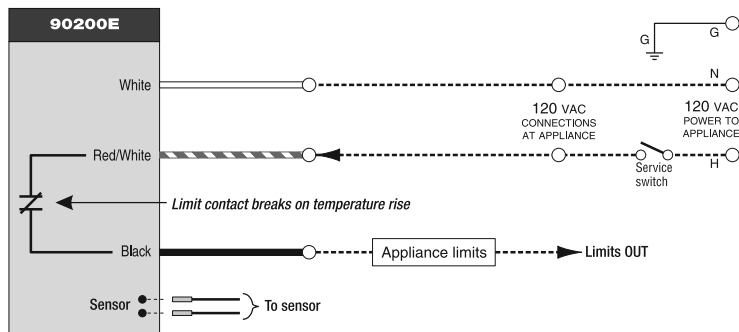
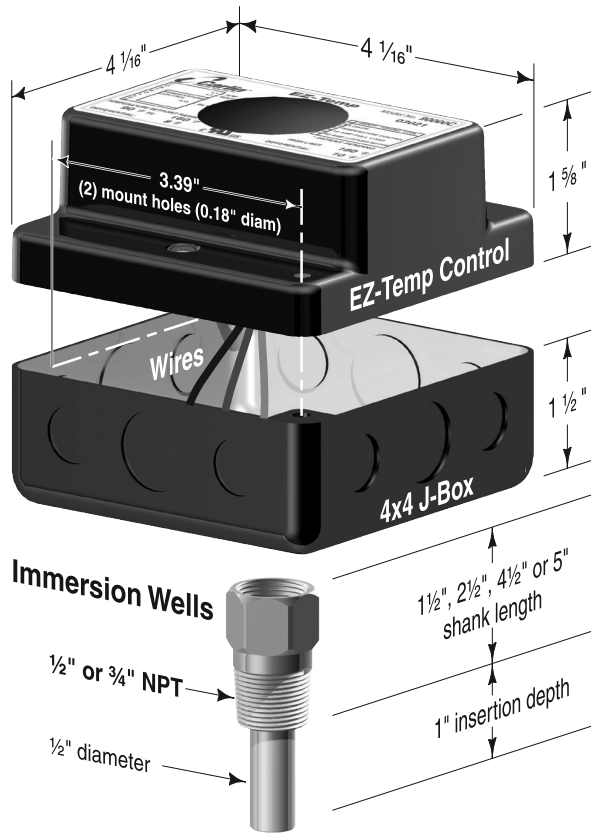
Indicator LED's **90200E and 90200EL** controls have a green LED (power/lockout-pending indicator) and red LED (lockout).

- Power OFF** With no power applied to the red-white wire, all lights are off.
- Power ON** When power is applied to the red-white wire, the green LED turns on.
- Self-test** When power is applied, the 90200E/EL performs a self-test, checking the sensor and microprocessor. The power-up test lasts from 3 to 5 seconds.
The 90200E/EL continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- Call for heat** When the temperature at the operating sensor is below setpoint minus fixed differential, the control powers the limit relay (the break-on-rise contact closes).
- Lockout pending** If a diagnostic failure occurs or the sensor temperature rises above the limit setting, the green LED will flash for 5 seconds. If the condition still exists after 5 seconds, the control will enter lockout. (If the condition corrects before 5 seconds, the green LED will return to normal.)
- Lockout** During lockout, the green LED stops flashing and stays on, and the red LED turns on.
After the temperature drops below high limit setting minus differential, reset the control by pressing the reset button.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to fail to operate.

Configuration

- Mounting** — 90200E/EL controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to the well with hardware supplied, or panel mount. See below for dimensions.
- Well kits** — Wells for 90200E/EL sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- Sensors** — Sensors are available separately for 90200E only. The sensor is supplied with 90200EL.
- NOTICE** — UL listed Model 90200EL controls must be shipped complete with a sensor, well and J-box. Only UL recognized component Model 90200E controls can be purchased as individual components.





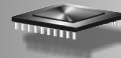
90200H shown — 90200HT also available (with terminal strip on front for low-voltage connections)

- **135-ohm proportional output**
(For regulating 135-ohm modulating devices)
- **Microprocessor-operated**
(Processor coordinates operation and diagnostic)
- **Easy remote sense**
(Electronic sensor, wired to control)
- **Self-checking program**
(Control locks out on diagnostic failure)
- **Diagnostic/status LED's**
(LED's indicate power, call for heat, and lockout)

EZ-Temp™

MODEL 90200H

135-Ohm Modulating control



Microprocessor
Temperature Controls

Data sheet

Features

- 1 Electronic sensor input
- 1 *operating temperature* adjustment
- 1 fixed *temperature differential*
- 1 *modulating band* adjustment
- Lockout on diagnostic failure
- Latch-up on hardware failure
- Isolated proportional 135-ohm modulating control output:
90200H — on 3 wires in J-box
90200HT — on 3 terminals on front of control.

Specifications

- Carlin's Model 90200H microprocessor operated temperature control is designed to operate 135-ohm modulated devices, replicating older slidewire devices, and is available in configurations described below. Note that 90200H/HT controls require a 120-volt power input. The 135-ohm circuit is isolated.
- For electronic mod motor control systems, such as Siemens SQ5, consult manufacturer.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications (within the available ranges listed below).

Model	90200H	90200HT
Input power (L1-L2)	120 VAC, 2 VA	
Modulating output Control Max drive Balance circuit	3.5 +/- 0.5 VDC, 4.2 +/- 0.2 mA 20 VDC O.C., 6 mA S. C. Adjustment on rear of control	
Connections:	5 wires (no terminals)	2 wires (120 VAC) 3 terminals (mod)
120 VAC H/N	Red/White & White wires	
To "W" on device To "R" on device To "B" on device	Yellow/White wire Yellow/Red wire Yellow/Black wire	"White" terminal "Red" terminal "Black" terminal
Operating temp. range	Adjustable (any range between 40°F and 250°F)	
Temp. differential range	Fixed (any value between 1°F and 10°F)	
Modulating band range	Adjustable (Any range between 10°F and 100°F)	
Ambient temp. limits	+32°F to +140°F (0°C to +60°C)	
Storage temp. limits	-40°F to +185°F (-40°C to +85°C)	
Agencies	UL & ULC Recognized & Listed Component US and Canada	

Model 90200H/HT diagnostic LED's

90200H/HT controls have a green LED (power & fault indicator) and amber LED (firing rate percent & fault indicator). See LED conditions below.

- GREEN** **G** – OFF **G** – ON (*Indicates control is operational*)
G – Short on/Long off flash **G** – Long on/Short off flash
G – FLASH uniformly (about once per second, equal on/off durations)
- AMBER** **A** – OFF **A** – ON
A – Short on/Long off flash **A** – Long on/Short off flash
A – ON time equals firing rate percentage

Operation

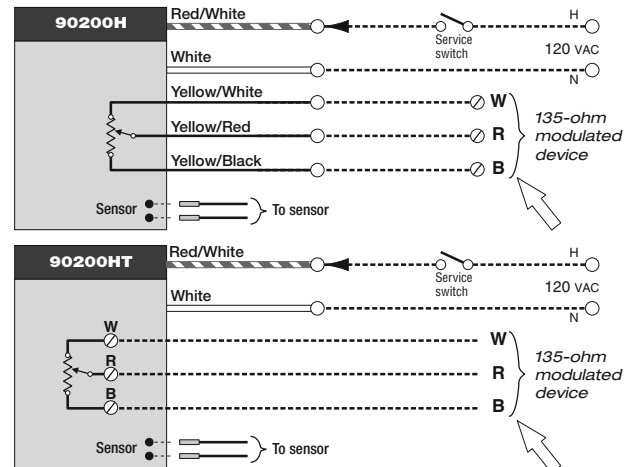
LED's	Control status
G A	Power Off: When no power is applied to the Red-White wire, the modulating output is at LOW FIRE.
G A	Power On: When power is applied to the Red-White wire, the circuit is energized starting the Fault Log Display followed by the Self Test. When these are complete the control becomes operational and turns the Green LED on steady
See Fault log display below — faults will display when power is applied. NOTE: When flashing, the LED's flash once every second in Fault display mode. The green LED flashes once every 3 seconds when in Self Test mode.	
G A	Self Test: When the fault log display is complete, the self test checks the sensor and the microprocessor and internal circuits. This test lasts up to 6 seconds before the control becomes fully operational. During the self test the green LED flashes on once every 3 seconds.
G A	Burner @ High-Fire: When the sensor temp is at or below the <i>operating temp</i> minus 1/2 the <i>modulating band</i> , the modulation signal is at High-fire. The Amber LED is full on.
G A	Burner @ Low-Fire: When the sensor temp is at or above the <i>operating temp</i> plus 1/2 the <i>modulating band</i> , the modulation signal is at Low-fire. The Amber LED is full off.
G A	Burner in Proportional Modulation: When the sensor temperature is in the <i>modulating band</i> (1/2 the band setting either side of the <i>operating temp</i>), the control modulation signal varies proportionally between high and low fire. The Amber LED flashes proportionally. The percentage of time the LED is on equals the modulating output percentage.
G A	Lockout: The control goes into lockout on ANY of the fault code conditions and Logs the fault code indicated below under "Fault log display." While in lockout, the Motor modulation output is at low fire. The Amber LED is off. The green LED flashes uniformly once per second. Reset from Lockout: The control automatically resets from Lockout when ALL conditions return to normal. The control returns to whatever state is defined by its inputs.
G A	Latch-up: Control goes into Latch-up on hardware failure. Control should be replaced. The green LED is off. The amber LED is on. (This will occur immediately if power is turned off and back on again in control is in latch-up.)

Fault log display (based on LED status)

If the control has detected a fault condition, it will display the fault conditions when power is turned off, then turned on again. Each fault code will occur 4 times. The control will then display the next fault code, if any. The fault log is erased after displaying the results. The codes will display in the following sequence:

1	G A	Internal control microprocessor failure.
2	G A	Temperature sensor is shorted.
3	G A	Temperature sensor is open. (Repeats the same code)
4	G A	Internal control microprocessor — pin is open.
5	G A	Modulating band internal circuit is open.
6	G A	Operating temperature internal circuit is open. (Repeats the same code)
7	G A	Control internal diagnostic failure.

Figure 1 Wiring connections

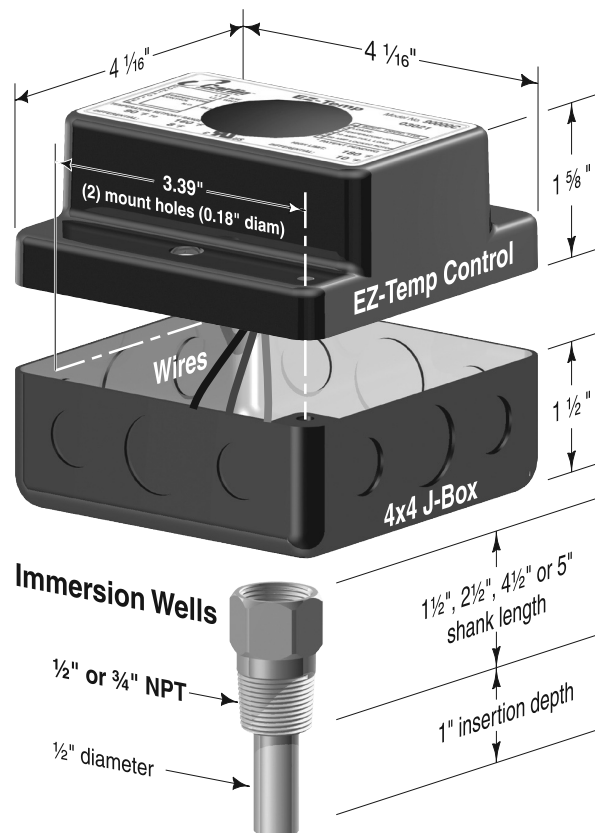


Swap connections to B and W to reverse the motor direction.

Configurations

- Control kits** — 90200H/HT controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See Figure 2 for dimensions.
- Well kits** — Wells for 90200H sensors are available in the sizes shown in Figure 2. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- Sensors** — Sensors are available in single configurations.

Figure 2 Mounting the 90200H/HT





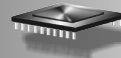
90200H shown — 90200HT also available (with terminal strip on front for low-voltage connections)

- **135-ohm proportional output**
(For regulating 135-ohm modulating devices)
- **Microprocessor-operated**
(Processor coordinates operation and diagnostic)
- **Easy remote sense**
(Electronic sensor, wired to control)
- **Self-checking program**
(Control locks out on diagnostic failure)
- **Diagnostic/status LED's**
(LED's indicate power, call for heat, and lockout)

EZ-Temp™

MODEL 90200H

135-Ohm Modulating control



Microprocessor
Temperature Controls

Instructions

Features

- 1 Electronic sensor input
- 1 *operating temperature* adjustment
- 1 fixed *temperature differential*
- 1 *modulating band* adjustment
- Lockout on diagnostic failure
- Latch-up on hardware failure
- Isolated proportional 135-ohm modulating control output:
90200H — on 3 wires in J-box
90200HT — on 3 terminals on front of control.

Specifications

- Carlin's Model 90200H microprocessor operated temperature control is designed to operate 135-ohm modulated devices, replicating older slidewire devices, and is available in configurations described below. Note that 90200H/HT controls require a 120-volt power input. The 135-ohm circuit is isolated.
- For electronic mod motor control systems, such as Siemens SQ5, consult manufacturer.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications (within the available ranges listed below).

Model	90200H	90200HT
Input power (L1-L2)	120 VAC, 2 VA	
Modulating output Control Max drive Balance circuit	3.5 +/- 0.5 VDC, 4.2 +/- 0.2 mA 20 VDC O.C., 6 mA S. C. Adjustment on rear of control	
Connections:	5 wires (no terminals)	2 wires (120 VAC) 3 terminals (mod)
120 VAC H/N	Red/White & White wires	
To "W" on device To "R" on device To "B" on device	Yellow/White wire Yellow/Red wire Yellow/Black wire	"White" terminal "Red" terminal "Black" terminal
Operating temp. range	Adjustable (any range between 40°F and 250°F)	
Temp. differential range	Fixed (any value between 1°F and 10°F)	
Modulating band range	Adjustable (Any range between 10°F and 100°F)	
Ambient temp. limits	+32°F to +140°F (0°C to +60°C)	
Storage temp. limits	-40°F to +185°F (-40°C to +85°C)	
Agencies	UL & ULC Recognized & Listed Component US and Canada	

Model 90200H/HT Microprocessor Temperature Controls – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Model 90200H/HT diagnostic LED's

90200H/HT controls have a green LED (power & fault indicator) and amber LED (firing rate percent & fault indicator). See LED conditions below.

- GREEN** **G** – OFF **G** – ON (Indicates control is operational)
G – Short on/Long off flash **G** – Long on/Short off flash
G – FLASH uniformly (about once per second, equal on/off durations)
- AMBER** **A** – OFF **A** – ON
A – Short on/Long off flash **A** – Long on/Short off flash
A – ON time equals firing rate percentage

Operation

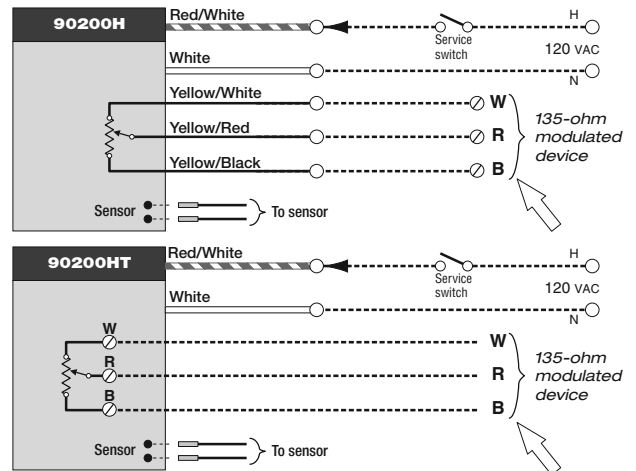
LED's	Control status
G A	Power Off: When no power is applied to the Red-White wire, the modulating output is at LOW FIRE.
G A	Power On: When power is applied to the Red-White wire, the circuit is energized starting the Fault Log Display followed by the Self Test. When these are complete the control becomes operational and turns the Green LED on steady
See Fault log display below — faults will display when power is applied. NOTE: When flashing, the LED's flash once every second in Fault display mode. The green LED flashes once every 3 seconds when in Self Test mode.	
G A	Self Test: When the fault log display is complete, the self test checks the sensor and the microprocessor and internal circuits. This test lasts up to 6 seconds before the control becomes fully operational. During the self test the green LED flashes on once every 3 seconds.
G A	Burner @ High-Fire: When the sensor temp is at or below the <i>operating temp</i> minus 1/2 the <i>modulating band</i> , the modulation signal is at High-fire. The Amber LED is full on.
G A	Burner @ Low-Fire: When the sensor temp is at or above the <i>operating temp</i> plus 1/2 the <i>modulating band</i> , the modulation signal is at Low-fire. The Amber LED is full off.
G A	Burner in Proportional Modulation: When the sensor temperature is in the <i>modulating band</i> (1/2 the band setting either side of the <i>operating temp</i>), the control modulation signal varies proportionally between high and low fire. The Amber LED flashes proportionally. The percentage of time the LED is on equals the modulating output percentage.
G A	Lockout: The control goes into lockout on ANY of the fault code conditions and Logs the fault code indicated below under "Fault log display." While in lockout, the Motor modulation output is at low fire. The Amber LED is off. The green LED flashes uniformly once per second. Reset from Lockout: The control automatically resets from Lockout when ALL conditions return to normal. The control returns to whatever state is defined by its inputs.
G A	Latch-up: Control goes into Latch-up on hardware failure. Control should be replaced. The green LED is off. The amber LED is on. (This will occur immediately if power is turned off and back on again in control is in latch-up.)

Fault log display (based on LED status)

If the control has detected a fault condition, it will display the fault conditions when power is turned off, then turned on again. Each fault code will occur 4 times. The control will then display the next fault code, if any. The fault log is erased after displaying the results. The codes will display in the following sequence:

1	G A	Internal control microprocessor failure.
2	G A	Temperature sensor is shorted.
3	G A	Temperature sensor is open. (Repeats the same code)
4	G A	Internal control microprocessor — pin is open.
5	G A	Modulating band internal circuit is open.
6	G A	Operating temperature internal circuit is open. (Repeats the same code)
7	G A	Control internal diagnostic failure.

Figure 1 Wiring connections

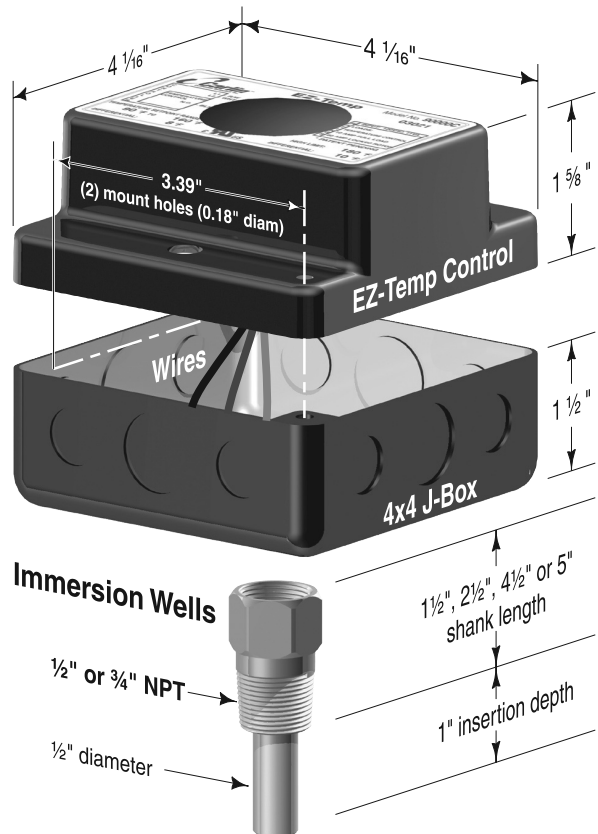


Swap connections to B and W to reverse the motor direction.

Configurations

- Control kits** — 90200H/HT controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See Figure 2 for dimensions.
- Well kits** — Wells for 90200H sensors are available in the sizes shown in Figure 2. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- Sensors** — Sensors are available in single configurations.

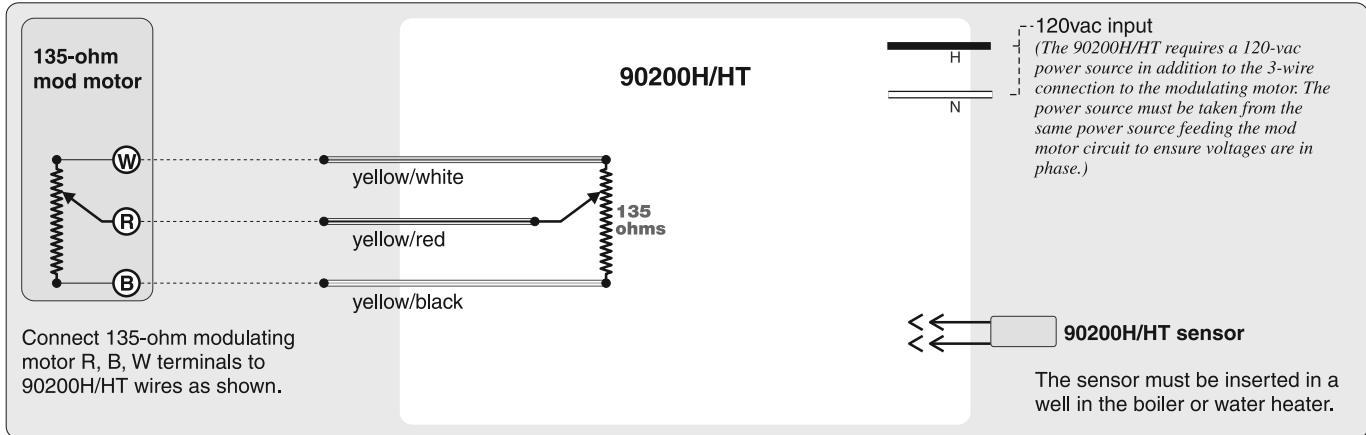
Figure 2 Mounting the 90200H/HT



Model 90200H/HT Microprocessor Temperature Controls – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Figure 3 90200H Equivalent circuit diagram



Wiring connections

Line voltage power to control

1. 90200H and 90200HT controls require a 120 VAC power source as shown in Figure 3. The power must be taken from the appliance line voltage power source to ensure correct phasing.

Modulating terminal wiring

1. Connect the modulating device's **R**, **B** and **W** terminals to the three 90200H/HT wires as shown in Figure 3.

Setup Procedure:

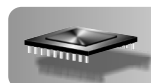
- Mount the control so there will be access to the back when the system is powered up. Be careful when making rear adjustments as circuits will have power.
- PWM Setup to guarantee burner "Full on" position:
 1. Set the rear calibration potentiometer to the full cw position.
 2. Set the Modulation Band setpoint to its **min** value.
 3. Set the Operating Temperature setpoint to its **mid** value.
 4. Power up control with the 3 striped yellow wires connected to the burner's proportional throttle motor. Apply power to the throttle motor. The throttle arm should move toward Hi-Fire. (If not, power down & reverse the connections to the B & W pins on the motor).
- 5. When the throttle arm stops moving and the Amber LED is full ON (if not full on, the water temperature is too hot — wait for it to cool), turn the **rear** calibration pot slowly ccw until the arm just starts to move away from Hi-Fire.
- 6. When the arm stops, slowly turn the pot cw until the arm just starts to move toward Hi-Fire.
- 7. Setup is complete. Remove power, re-mount the control for operation, then Set Band and Operating temperature setpoints to desired operating settings.
 - PWM Setup to guarantee burner "Full off" position:
 1. Perform steps 1-4 from "full on" setup above.
 2. Allow the burner to heat the vessel, and when the Amber LED starts flashing (vessel temperature is in proportional band), set the Operating temperature setpoint to its **min** value. The Amber LED should turn off.
 3. Set the rear calibration potentiometer to the **full ccw** position.
 4. When the throttle arm stops moving at Lo-Fire, turn the **rear** calibration pot slowly cw until the arm just moves away from Lo-Fire.
 5. When the motor stops, turn the pot ccw slowly until the motor starts to move toward Lo-Fire.
 6. Setup is complete. Remove power, set Band Temperature and Operating temperature setpoints to desired operating settings.



- **24VAC**
- **Microprocessor-operated**
(Processor coordinates operation and diagnostic)
- **Easy remote sense**
(Electronic sensor, wired to control)
- **Select from break-on-rise or make-on-rise operation**
- **Self-checking program**
(Control locks out on diagnostic failure)
- **Diagnostic/status LED's**
(LED's indicate power, call for heat, and lockout)

EZ-Temp™

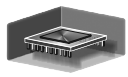
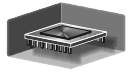
MODEL 90224



Microprocessor
Temperature Controls

Specifications

- Carlin's Model 90224 microprocessor-operated temperature controls are available in two configurations, described below. Each model provides one contact (either normally-open or normally-closed).
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90224A	Temperature control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle
	90224B	Temperature control <ul style="list-style-type: none"> • 1 make-on-rise contact • 1 electronic sensor • lockout on diagnostic failure • reset from lockout via power cycle

Control model	A	B
Control power input (black-red wire)	24 VAC, 1 VA	
Contacts (action on temperature rise:)	1 (breaks)	1 (makes)
Contact rating	24 VAC, 1 AMP	
Wires Quantity	2	2
Contact IN / OUT	black-red / black-yellow	
Adjustable operating range	Any range between 50°F to 240°F	
Fixed differential (subtractive)	Any value from 5°F to 100°F	
Operating temperature limits	+32°F to +140°F	
Storage temperature limits	-40°F to +185°F	
Agencies	UL & ULC recognized component United States & Canada	

Model 90224 diagnostic LED's

- GREEN** **G** – OFF **G** – FLASH Slowly (every 3 seconds) *Power on*
 G – FLASH Rapidly (every second) *Lockout*
- AMBER** **A** – OFF **A** – ON *Control call for heat*

Operation

(See wiring diagrams below for wiring connections.)

Indicator LED's

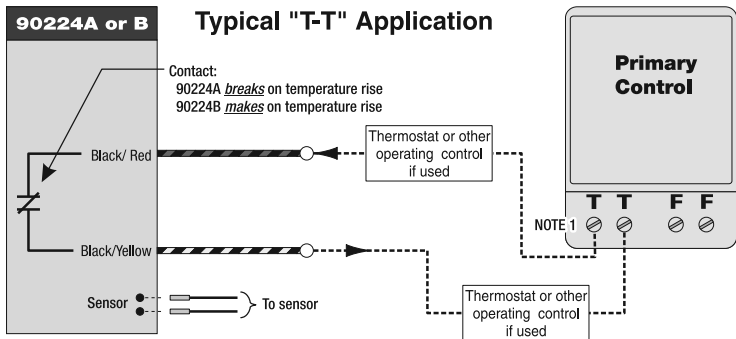
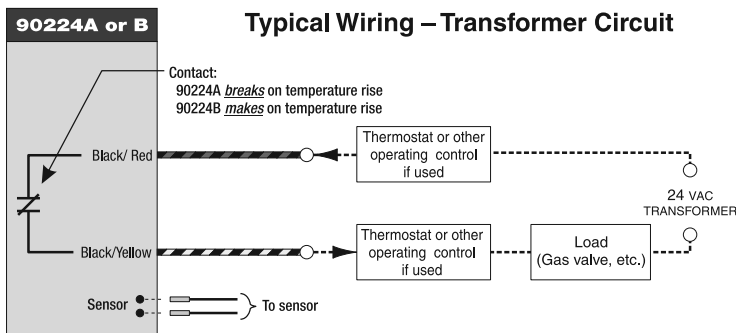
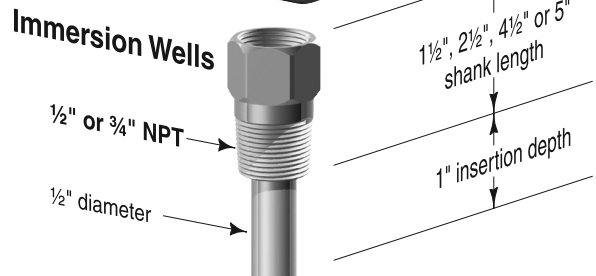
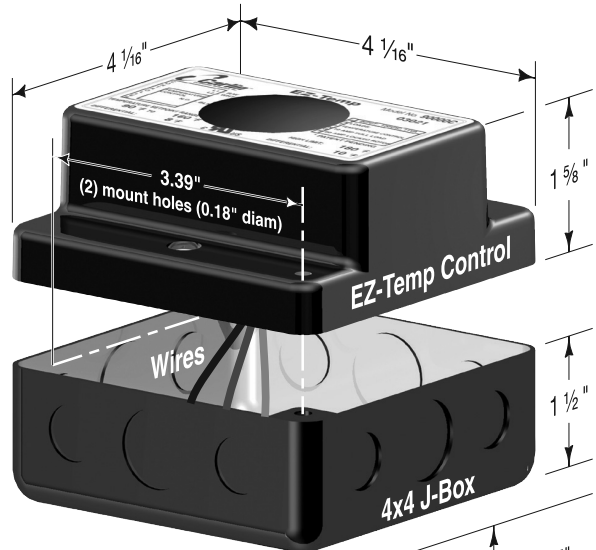
90224 controls have a green LED (power/lockout indicator) and amber LED (operation indicator).

- G A Power OFF** With no power applied to black/red wire, all lights are off.
- G A Power ON** When power is applied to the black/red wire, the green LED turns on, flashing every 3 seconds.
- G A Self-test** When power is applied, the 90224 performs a self-test, checking the sensor and microprocessor. The power-up test lasts from 3 to 5 seconds.
 The 90224 continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- G A Call for heat** When the temperature at the operating sensor is below setpoint minus fixed differential, the 90224 break-on-rise contact is closed, or the make-on-rise contact is open. The amber LED is on.
- G A Stand-by** When the 90224 operating sensor reaches setpoint temperature or above, the 90224 break-on-rise contact opens; or the make-on-rise contact closes. The amber LED turns off.
- G A Lockout** If the control detects a diagnostic failure, lockout occurs. During lockout, the green LED flashes every second.
 After the temperature drops below setpoint minus differential, reset the control by turning power off, then back on. The green LED will flash more slowly, every 3 seconds.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.

Configurations

- **Control kits** — 90224 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90224 sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available in single configurations.



NOTICE The 90224 is polarity-sensitive with some controls. If the 90224 goes to lockout on power up, disconnect power. Swap the wires coming to the black/red and black/yellow lead wires. Restore power and restart.



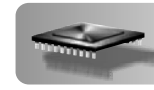
- **Multiple sensor option (3)**
(Using individual and/or dual sensor assemblies)
- **Sensor Redundancy**
(Higher temperature of two operating sensors used)
- **Easy remote sense**
(Electronic sensors, wired to control)
- **Smart manual reset**
(Manual reset only if operating limit doesn't open)
- **Serviceman reset protection**
(Latch-up after three consecutive lockouts ⁽¹⁾)
- **Power-independent lockout**
(Power cycling won't reset from lockout or latch-up)
- **Diagnostic LED's**
(Power, call for heat, and lockout/latchup)
- **SMC Technology** ⁽²⁾

(1) Latch-up mode shuts down the control after three consecutive lockouts, and requires a special procedure to reset. This ensures the owner will call in a licensed technician to troubleshoot and correct burner problems.

(2) The 90300 provides two limit relays. Carlin's patented SMC technology (Safety Monitoring Circuit) monitors the contacts of both relays. **Lockout** occurs if a limit relay contact is found closed when it should be open.

EZ-Temp™

MODEL 90300

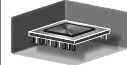


Microprocessor
Temperature Controls
with Sensor Redundancy

Data sheet

Specifications

- Carlin's Model 90300 microprocessor-operated, multiple-contact temperature limit controls are available as described below. The model provides two contacts — one for operating limit and one from high limit.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90300B	Dual limit temperature control <ul style="list-style-type: none"> • operating and high limit action • smart manual reset on high limit • operating limit sensors, redundant • high limit sensor • operating and limit contacts in series
---	---------------	--

Control model	B
Control power input (red-white wire)	120 VAC, 11 VA
Contacts	2 in series
Contact rating	Full load 120 VAC, 10 AMPS Locked rotor 120 VAC, 60 AMPS
Wires	Quantity 3
	120 VAC Hot / Neutral red-white / white
Limits OUT	black
Adjustable oper. limit range	Any range between 50°F to 240°F
Fixed high limit temperature	Any value from 160°F to 240°F
Fixed differential (subtractive)	Any value from 5°F to 100°F
Operating temperature limits	+32°F to +14 0°F
Storage temperature limits	-40°F to +18 5°F
Agencies	UL & ULC recognized component United States & Canada

Model 90300 diagnostic LED's

- GREEN** (G) – OFF (G) – ON Power (G) – FLASHING Latch-up
RED (R) – OFF (R) – ON Lockout
AMBER (A) – OFF (A) – ON Control call for heat

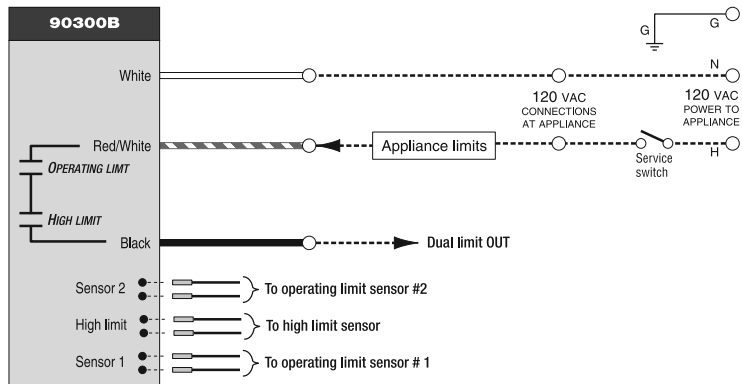
WARNING **Electrical shock hazard:** Disconnect power to appliance when wiring or servicing any electrical component.

Operation

(See wiring diagrams below for wiring connections.)

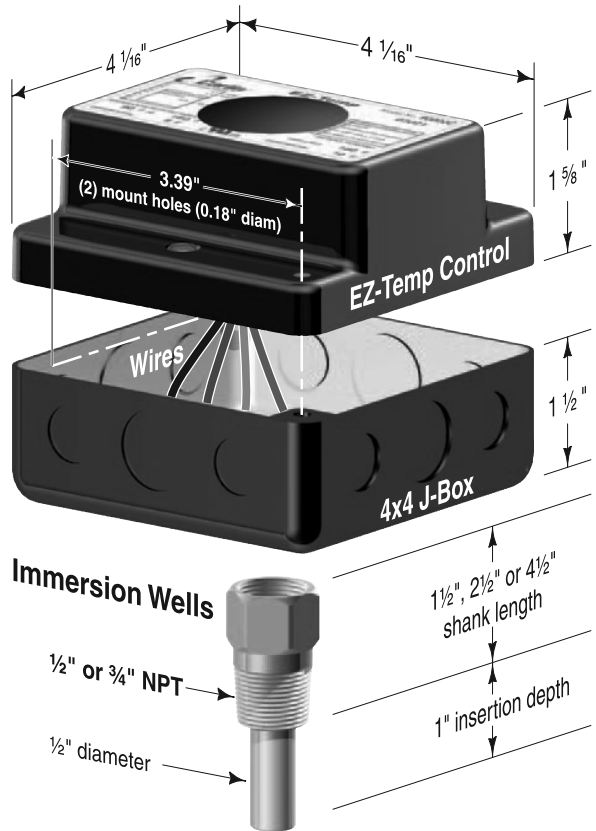
- (G)(R)(A) Power OFF** With no power applied to the red-white wire, all lights are off. Power can be wired directly from appliance 120 vac terminal to maintain power at all times.
- (G)(R)(A) Power ON** When power is applied to the red-white wire, the green LED turns on.
- (G)(R)(A) Self-test** When power is applied, the 90300 performs a self-test, checking sensor(s) and microprocessor and verifying limit contacts are open. The power-up test lasts from 3 to 5 seconds. The 90300 continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- (G)(R)(A) Operate** If the temperature at both operating sensors is below setpoint by at least the fixed differential, the control closes the operating limit contacts. The amber LED turns on.
- (G)(R)(A) Stand-by** When either operating sensor sees setpoint temperature or above, the 90300 opens the operating limit contact. The amber LED turns off.
- (G)(R)(A) Limit action** If the high limit sensor sees a temperature above high limit setting, the 90300 opens the high limit contacts, turns on the red LED and checks the operating limit contacts. If the operating limit contacts are open, the control will automatically reset when temperature drops below high limit setting minus differential. The high limit contacts close and the red LED turns off.
- (G)(R)(A) Lockout** If the high limit sensor sees a temperature above high limit setting and the 90300 finds the operating limit contacts closed, the red LED turns on and **lockout** occurs. (Lockout also occurs on any diagnostic test failure.) When the temperature drops below high limit setting minus differential, reset the control by pressing the manual reset button. The control will not reset by cycling power off and on.
- (G)(R)(A) Latch-up** If the 90300 locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require **licensed serviceman intervention**. During latch-up, the red LED stays on and the green LED flashes. Reset as follows:
 - (G)(R)(A) Temperature must be less than high limit setting minus differential.
 - (G)(R)(A) Hold reset button at least 10 seconds. The green LED flashes faster.
 - (G)(R)(A) Continue holding button another 20 seconds. The control resets and the red LED turns off.

NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.



Configurations

- **Control kits** — 90300 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90300 sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available in single and dual configurations.





- **Multiple sensor option (3)**
(Using individual and/or dual sensor assemblies)
- **Sensor Redundancy**
(Higher temperature of two operating sensors used)
- **Easy remote sense**
(Electronic sensors, wired to control)
- **Smart manual reset**
(Manual reset only if operating limit doesn't open)
- **Serviceman reset protection**
(Latch-up after three consecutive lockouts ⁽¹⁾)
- **Power-independent lockout**
(Power cycling won't reset from lockout or latch-up)
- **Diagnostic LED's**
(Power, call for heat, and lockout/latchup)
- **SMC Technology ⁽²⁾**

- (1) Latch-up mode shuts down the control after three consecutive lockouts, and requires a special procedure to reset. This ensures the owner will call in a licensed technician to troubleshoot and correct burner problems.
- (2) The 90320 provides two limit relays. Carlin's patented SMC technology (Safety Monitoring Circuit) monitors the contacts of both relays. **Lockout** occurs if a limit relay contact is found closed when it should be open.

EZ-Temp™

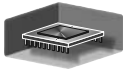
MODEL 90320

Microprocessor
Temperature Controls
with Sensor Redundancy

Data sheet

Specifications

- Carlin's Model 90320 microprocessor-operated, multiple-contact temperature limit controls are available as described below. The model provides two contacts — one for operating limit and one for high limit.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

	90320B	Dual limit temperature control <ul style="list-style-type: none"> • operating and high limit action • smart manual reset on high limit • operating limit sensors, redundant • high limit sensor • operating and limit contacts in series
--	---------------	--

Control model	B
Control power input (red-white wire)	240 VAC, 50/60 hz, 12 VA
Contacts	2 in series
Contact rating	240 VAC, 50/60 hz, 1 HP 120/240 VAC, 50/60 hz, 15 AMPS
Wires	Quantity
	240 VAC Hot / Neutral
	Limits OUT
Adjustable oper. limit range	Any range between 50°F to 240°F
Fixed high limit temperature	Any value from 160°F to 240°F
Fixed differential (subtractive)	Any value from 5°F to 100°F
Operating temperature limits	+32°F to +140°F
Storage temperature limits	-40°F to +185°F
Agencies	—

Model 90320 diagnostic LED's

- GREEN** (G) – OFF (G) – ON *Power* (G) – FLASHING *Latch-up*
RED (R) – OFF (R) – ON *Lockout*
AMBER (A) – OFF (A) – ON *Control call for heat*

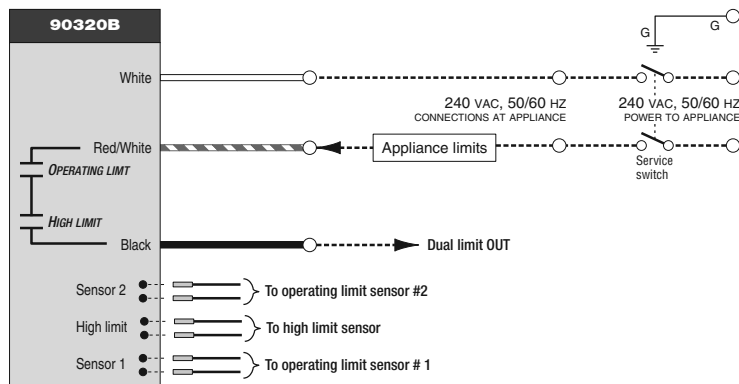
WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation

(See wiring diagrams below for wiring connections.)

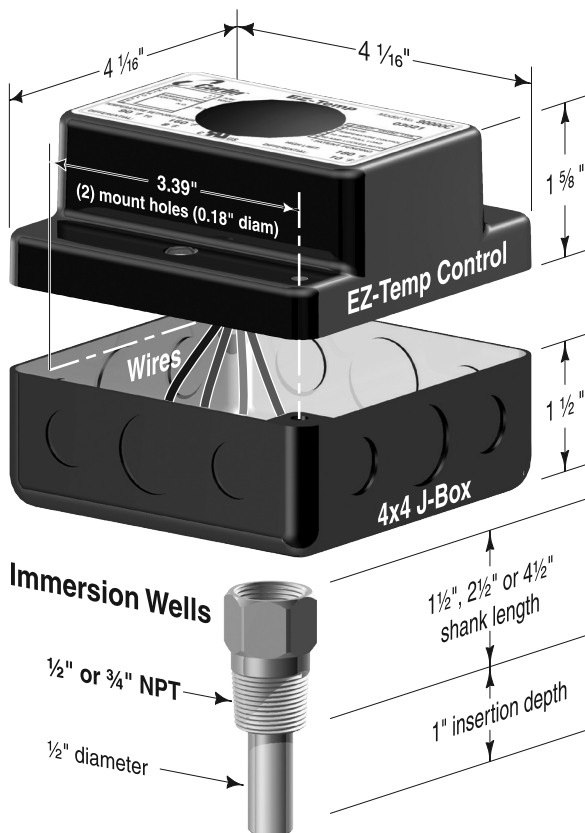
- (G)(R)(A) Power OFF** With no power applied to the red-white wire, all lights are off. Power can be wired directly from appliance 240 vac terminal to maintain power at all times.
- (G)(R)(A) Power ON** When power is applied to the red-white wire, the green LED turns on.
- (G)(R)(A) Self-test** When power is applied, the 90320 performs a self-test, checking sensor(s) and microprocessor and verifying limit contacts are open. The power-up test lasts from 3 to 5 seconds. The 90320 continues diagnostic checking during the operating cycle as well. Any self-check failure causes a lockout (see below).
- (G)(R)(A) Operate** If the temperature at both operating sensors is below setpoint by at least the fixed differential, the control closes the operating limit contacts. The amber LED turns on.
- (G)(R)(A) Stand-by** When either operating sensor sees setpoint temperature or above, the 90320 opens the operating limit contact. The amber LED turns off.
- (G)(R)(A) Limit action** If the high limit sensor sees a temperature above high limit setting, the 90320 opens the high limit contacts, turns on the red LED and checks the operating limit contacts. If the operating limit contacts are open, the control will automatically reset when temperature drops below high limit setting minus differential. The high limit contacts close and the red LED turns off.
- (G)(R)(A) Lockout** If the high limit sensor sees a temperature above high limit setting and the 90320 finds the operating limit contacts closed, the red LED turns on and lockout occurs. (Lockout also occurs on any diagnostic test failure.) When the temperature drops below high limit setting minus differential, reset the control by pressing the manual reset button. The control will not reset by cycling power off and on.
- (G)(R)(A) Latch-up** If the 90320 locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require *licensed serviceman intervention*. During latch-up, the red LED stays on and the green LED flashes as follows:
 - (G)(R)(A) Temperature must be less than high limit setting minus differential.
 - (G)(R)(A) Hold reset button at least 10 seconds. The green LED flashes faster.
 - (G)(R)(A) Continue holding button another 20 seconds. The control resets and the red LED turns off.

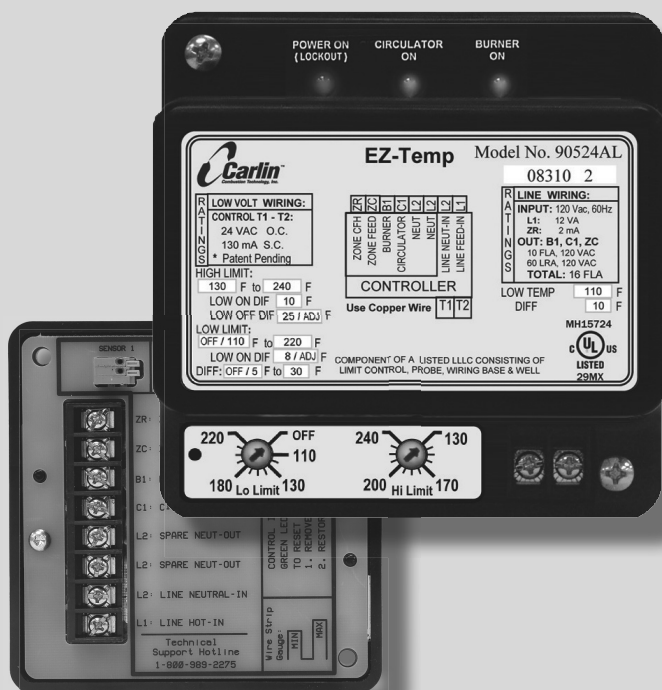
NOTICE Power must flow through the contacts in the direction shown. Changing flow direction will cause the control to lockout or fail to operate.



Configurations

- **Control kits** — 90320 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See below for dimensions.
- **Well kits** — Wells for 90320 sensors are available in the sizes shown below. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- **Sensors** — Sensors are available in single and dual configurations.



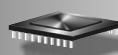


- ▲ **Easy-wire terminal strip**
- ▲ **Microprocessor-operated**
(Processor coordinates operation and diagnostic)
- ▲ **Easy remote sense**
(Electronic sensor, wired to control)
- ▲ **Self-checking program**
(Control locks out on diagnostic failure)
- ▲ **Diagnostic/status LED's**
(LED's indicate power, call for heat, and lockout)
- ▲ **SMC technology on burner relay** (lockout when welded contact sensed)

EZ-Temp™

MODEL 90524A

**Triple limit or
Cold-start control**



Microprocessor
Temperature Controls

Data sheet

Functions

- Carlin's 90524 triple limit control provides high limit function and can also provide:
 - Minimum water temperature control for operation with a tankless heater in a boiler. (Function can be turned off by turning LOW LIMIT setting to "OFF.")
 - Low temperature limit to prevent flow through boiler if temperature is below preset minimum — for preventing condensation in conventional boilers.
 - Operates as a cold-start control when Low Limit is in "OFF" position.
- Provides input from zone controllers or relays and output to enable circulators.
- Provides operation of burner/gas valve and heating circulator.

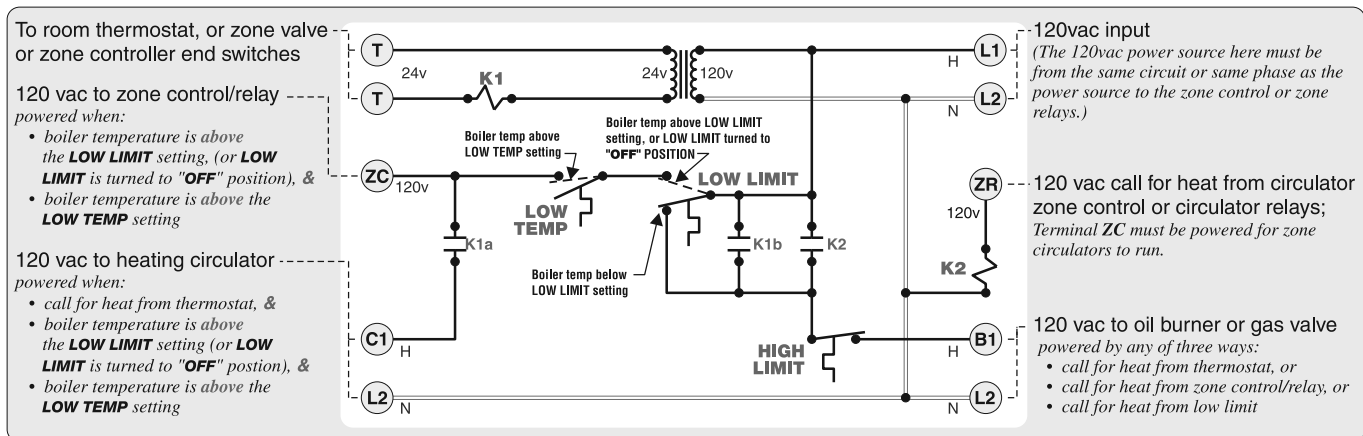
Specifications

- Carlin's Model 90524 microprocessor-operated temperature controls are described below.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

Model	90524A
Input power (L1-L2)	120 VAC, 10 VA, 60 Hz
Control power (T-T)	24 VAC, 130 mA
High limit range	Adjustable
High limit differential	Fixed if low limit is used or if differential setpoint is OFF Adjustable if low limit is turned OFF
Low limit range	Adjustable with OFF position
Low limit differential	Adjustable (fixed if differential setpoint is OFF)
Low temp function	Fixed
Low temp differential	Fixed
Temperature ranges	
Setting —	Any value/range between 50° & 250°
Differential —	Any value/range between 5°F and 100°F
Contact ratings	
Full load	Burner, circulator and ZC contacts 120 VAC, 10 amps (total current on all contacts not to exceed 16 amps)
Locked rotor	120 VAC, 60 amps (total current on all contacts not to exceed 96 amps)
Ambient temperature	+32°F to +140°F (0°C to +60°C)
Storage temperature	-40°F to +185°F (-40°C to +85°C)
Agencies	UL Listed US and Canada

Model 90524 Microprocessor Temperature Controls — Data sheet

Figure 1 Equivalent circuit diagram (the 90524 controls power to the burner and circulators as in the simplified circuit below)



Model 90524 diagnostic LED's

- LED's** 90524 controls have a green LED (power/lockout indicator) and amber LED's (operation indicator) for Burner and Circulator.
- GREEN**
- ⓐ — OFF ⓐ — ON *Power on*
 - ⓐ — FLASH Slowly (once per second) *Soft lockout*
 - ⓐ — FLASH Rapidly (twice per second) *Hard lockout*
- AMBER**
- ⓐ — OFF ⓐ — ON *Burner on or Circulators powered*

LED indications

- ⓐ ⓐ ⓐ **Power OFF** — With no power applied, the thermostat (TT) circuit and all output contacts are de-energized. All LED's are off.
- ⓐ ⓐ ⓐ **Power ON** — When power is applied to the L1/L2 terminals, the thermostat circuit is energized. Voltage (24 VAC) is applied to the thermostat terminals. The 90524 starts a self test to check the sensor and the microprocessor, and to verify that the limit contacts are open. The 90524 becomes fully operational after this 2-second self test.
- ⓐ ⓐ ⓐ or ⓐ ⓐ ⓐ **Soft lockout** — Green light flashing once per second, burner light off, burner contact open, and circulator light on or off — occurs if control senses internal failure or sensor problem (open or shorted sensor). The control will revert to normal operation if the problem is corrected within 15 seconds. Otherwise, the control enters hard lockout.
- ⓐ ⓐ ⓐ **Hard lockout** — Green light flashing twice per second, burner light off and burner contacts open, circulator light on and circulator contacts closed — occurs when burner contact is sensed closed, and does not clear after two attempts. Reset by cycling power off/on.
- ⓐ ⓐ ⓐ **Latchup** — Green light off, burner light off, B1 contact open, circulator light on, and ZC and C1 contacts closed — occurs when burner contact is sensed closed, and does not clear after three attempts. Not resettable — requires control replacement.

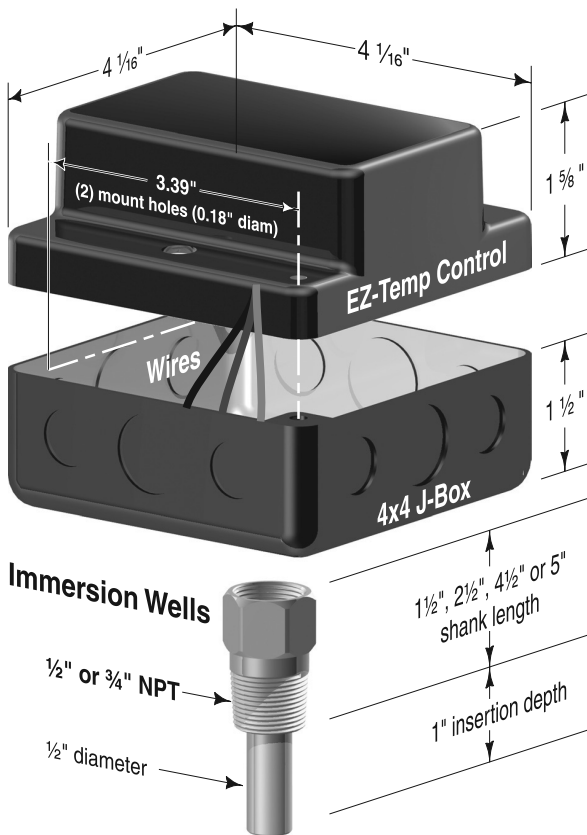
Fault log

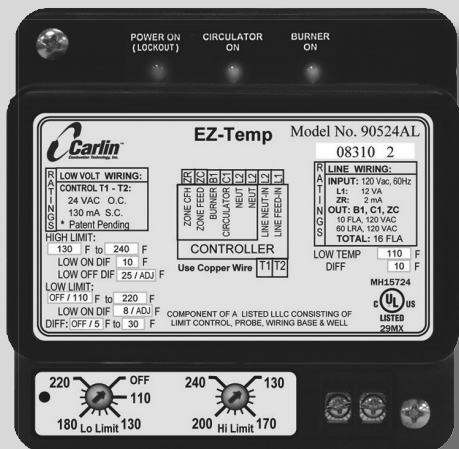
90524 controls self monitor and indicate fault conditions with the LED's. Fault conditions are recorded in the retrievable fault log. For applications that might encounter unexplainable control outages, contact Carlin Technical Support for instructions to access the fault log and interpret the results.

Configurations

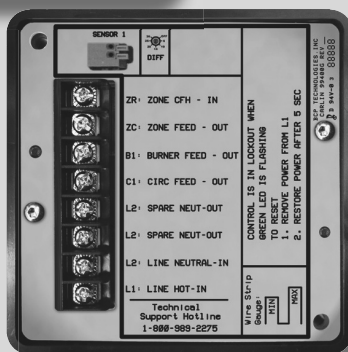
- Control kits — 90524 controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See Figure 2 for dimensions.
- Well kits — Wells for 90524 sensors are available in the sizes shown in Figure 2. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- Sensors — Sensors are available in single configurations.

Figure 2 Mounting the 90524





Front

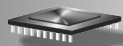
Rear
(size reduced)

- ▲ **Easy-wire terminal strip**
- ▲ **Microprocessor-operated**
(Processor coordinates operation and diagnostic)
- ▲ **Easy remote sense**
(Electronic sensor, wired to control)
- ▲ **Self-checking program**
(Control locks out on diagnostic failure)
- ▲ **Diagnostic/status LED's**
(LED's indicate power, call for heat, and lockout)
- ▲ **SMC technology on burner relay**
(lockout when welded contact sensed)

EZ-Temp™

MODEL 90524A

Triple limit or Cold-start control



Microprocessor
Temperature Controls

Instructions

Functions

- Carlin's 90524A can be operated as either a triple limit control or a cold-start control, determined by the setting of the LOW LIMIT adjustment.
- Triple limit operation (LOW LIMIT on): Provides adjustable high limit setting and maintains an adjustable minimum temperature in the boiler (low limit setting) while in stand-by (no space heating call); used for tankless heater applications. (See Figure 3 , page 4.)
- Cold-start operation (LOW LIMIT off): Provides adjustable high limit setting and low temperature protection (delays circulator start until the boiler is heated above the fixed minimum temperature setpoint); used to prevent condensation in the boiler on cold start. (See Figure 4 , page 4.)
- The 90524A provides input from zone controllers or relays (ZR contact) and output to enable circulators (C1 contact) or zone controllers (ZC contact). The gas valve/burner output is on the B1 terminal. Call for heat input is on the T-T terminals.

Specifications

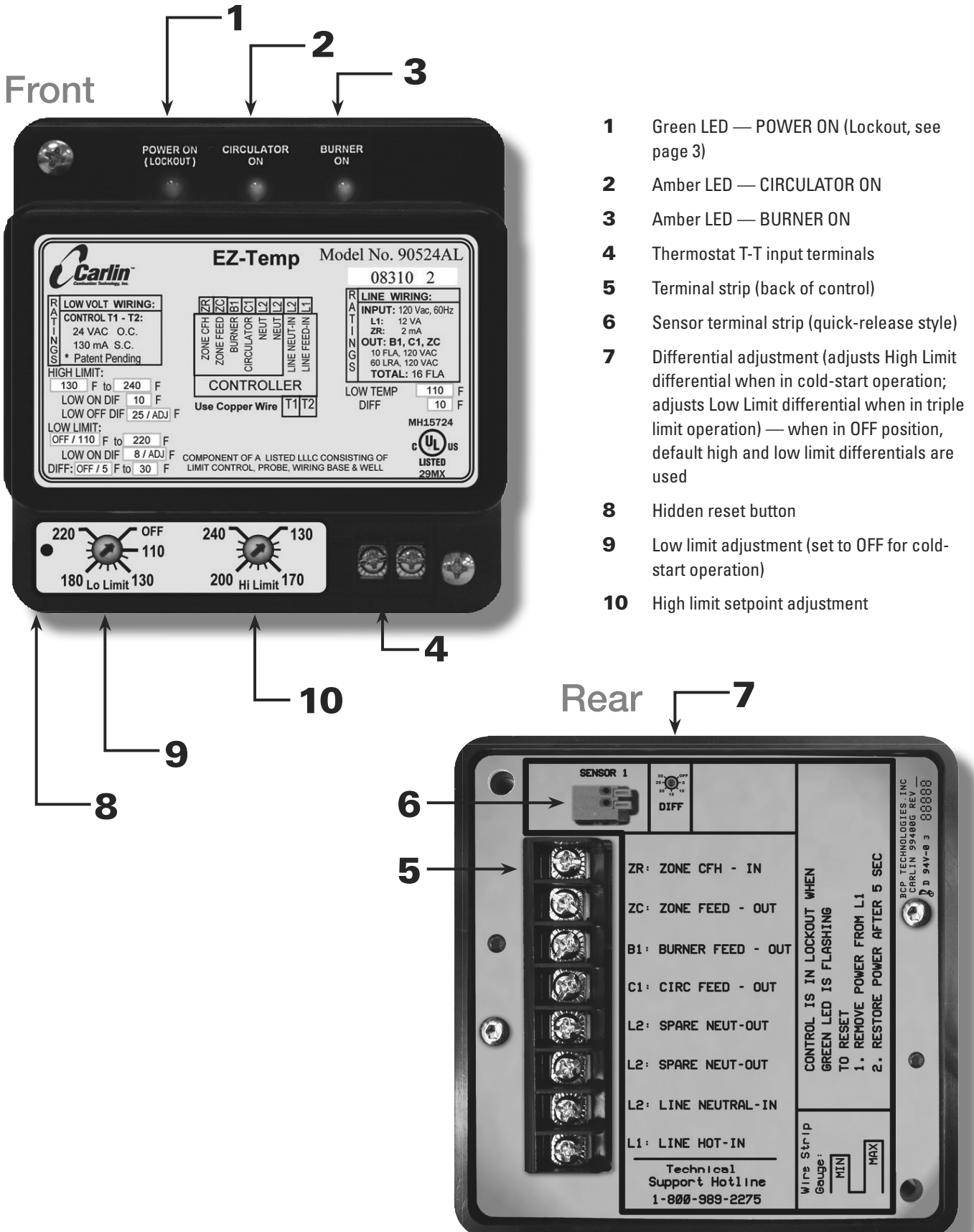
- Carlin's Model 90524A microprocessor-operated temperature controls are described below.
- Refer to separate product listing sheets for pre-defined models, or request a control to meet your specifications, within the available ranges listed below.

Model	90524A
Input power (L1-L2)	120 VAC, 10 VA, 60 Hz
Control power (T-T)	24 VAC, 130 mA
High limit range	Adjustable
High limit differential	Adjustable (fixed if low limit is used or if differential setpoint is OFF)
Low limit range	Adjustable with OFF position
Low limit differential	Adjustable (fixed if differential setpoint is OFF)
Low temp function	Fixed
Low temp differential	Fixed
Temperature ranges	
Setting —	Any value/range between 50° & 250°
Differential —	Any value/range between 5°F and 100°F
Contact ratings	
Full load	Burner, circulator and ZC contacts 120 VAC, 10 amps (total current on all contacts not to exceed 16 amps)
Locked rotor	120 VAC, 60 amps (total current on all contacts not to exceed 96 amps)
Ambient temperature	+32°F to +140°F (0°C to +60°C)
Storage temperature	-40°F to +185°F (-40°C to +85°C)
Agencies	UL Listed US and Canada

Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Figure 1 90524A components



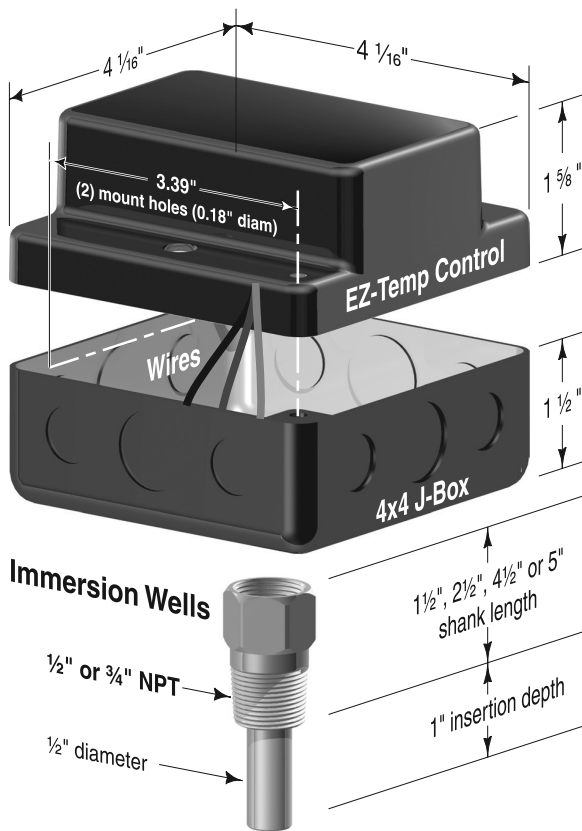
Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Configurations

- Control kits — 90524A controls mount to a standard 4x4 J-box, supplied with the control. Mount the box directly to a well (new or existing) with hardware supplied, or panel mount. See Figure 2 for dimensions.
- Well kits — Wells for 90524A sensors are available in the sizes shown in Figure 2. Well kits include sensor mounting hardware designed to hold sensor securely in position.
- Sensors — Sensors are available in single configurations.

Figure 2 Mounting the 90524A



Definitions

- High limit** Shut-off temperature during space heating (call for heat at T-T or ZR).
- Setpoint is adjustable at lower front center of control.
 - Differential is fixed when in triple limit operation (LOW LIMIT on).
 - Differential is adjustable on back of control when in cold start operation (LOW LIMIT set to OFF).
- Low limit** Temperature maintained during stand-by (no call for heat at T-T or ZR) when in triple limit operation (LOW LIMIT on).
- The setpoint for the low limit (minimum temperature in the boiler during standby) is adjustable with the lower left adjustment.
 - The differential for low limit is adjustable with the adjustment on the back of the control.
 - The circulator output at C1 is activated only when the temperature in the boiler is above the low limit setting.
- Low temp** Boiler condensation protection setting when in cold-start operation (LOW LIMIT set to OFF).
- This setting is fixed.
 - The differential is fixed.
 - The circulator outputs are disabled until the boiler temperature rises above the low temp setting.

Model 90524A diagnostic LED's

90524A controls have three LED's, as explained below. See following pages for operating sequence and LED behavior.

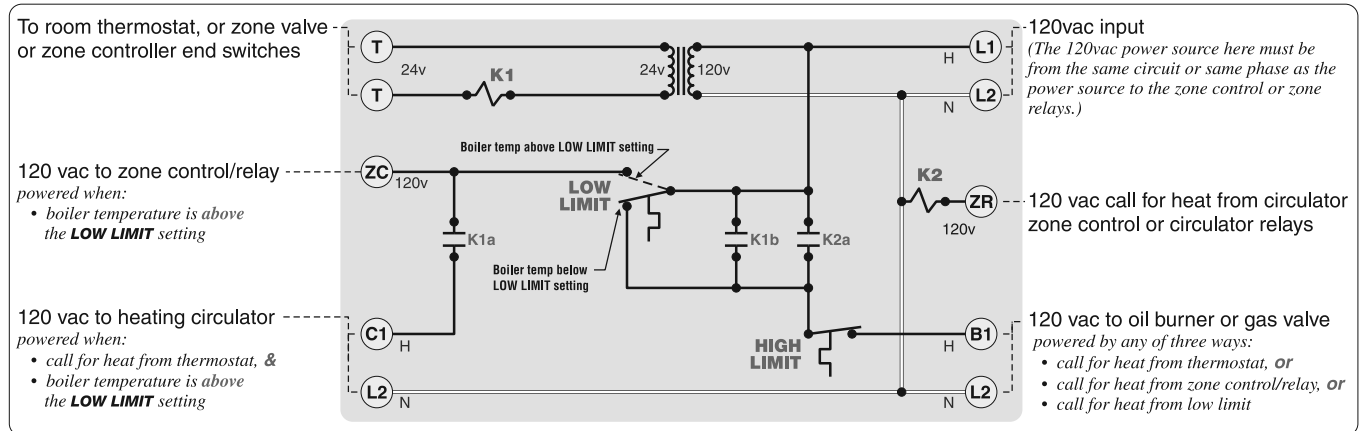
Left LED POWER ON	Center LED CIRCULATOR ON	Right LED BURNER ON
ⓐ green	ⓐ amber	ⓐ amber
The LED's can be off, on or flashing. The symbols below are used in this manual to show the state of these LED's during operation of the control.		
Green LED	ⓐ OFF ⓐ – ON <i>Power on</i> ⓐ FLASH Slowly (once per second) <i>Soft lockout</i> ⓐ FLASH Rapidly (twice per second) <i>Hard lockout</i>	
Amber LED's	ⓐ OFF ⓐ – ON <i>Burner on or Circulators powered</i>	
*	Indicates the LED in this position can be either on or off.	

LED status	Indicates the following:
ⓐ ⓐ ⓐ Power OFF	With no power applied, the thermostat (TT) circuit and all output contacts are de-energized. All LED's are off.
ⓐ ⓐ ⓐ Power ON	When power is applied to the L1/L2 terminals, the thermostat circuit is energized. Voltage (24 VAC) is applied to the thermostat terminals. The 90524A starts a self test to check the sensor and the microprocessor, and to verify that the limit contacts are open. The 90524A becomes fully operational after this 2-second self test.
ⓐ* ⓐ Soft lockout	Green LED flashing once per second, burner LED off, B1 contact open, and circulator LED on or off — occurs if control senses internal failure or sensor problem (open or shorted sensor). The control will revert to normal operation if the problem is corrected within 15 seconds. Otherwise, the control enters hard lockout. See "Fault log" information below.
ⓐ ⓐ ⓐ Hard lockout	Green LED flashing twice per second, burner LED off and B1 contacts open, circulator LED on and circulator contacts closed — occurs when burner contact is sensed closed, and does not clear after two attempts or soft lockout has timed out. Reset by cycling power off/on.
ⓐ ⓐ ⓐ Latchup	Green LED off, burner LED off, B1 contact open, circulator LED on, and ZC and C1 contacts closed — occurs when burner contact is sensed closed, and does not clear after three attempts. Not resettable — requires control replacement.
Fault log	90524A controls self monitor, and can indicate fault conditions with the LED's. Fault conditions are recorded in the retrievable fault log. Two conditions, caused by sensor detection problems, are shown below. Other LED conditions displayed in the fault log are related to internal control problems. Reset the control as explained above. Controls in latchup cannot be reset. They must be replaced. To access the fault log, press the hidden reset button (located left of the LOW LIMIT adjustment on the front of the control). Hold for one second or longer. All three LED's will come on for 1 second, then go off for 1 second. If any error codes have been logged since the last error code display, the LED's will flash a pattern four times for each error code, then proceed to the next. After all codes have been shown, the error code log will automatically clear. For applications that might encounter unexplainable control outages, contact Carlin Technical Support for instructions to access the fault log and interpret the results.
ⓐ ⓐ ⓐ Sensor open	Sensor OPEN fault code. The sensor is detected OPEN (resistance more than 60 Kohms).
ⓐ ⓐ ⓐ Sensor shorted	Sensor SHORTED fault code. The sensor is detected SHORTED (resistance less than 300 ohms).

Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Figure 3 Equivalent circuit diagram — Triple limit operation (*LOW LIMIT on*)



Triple limit operation – Setup & adjustment

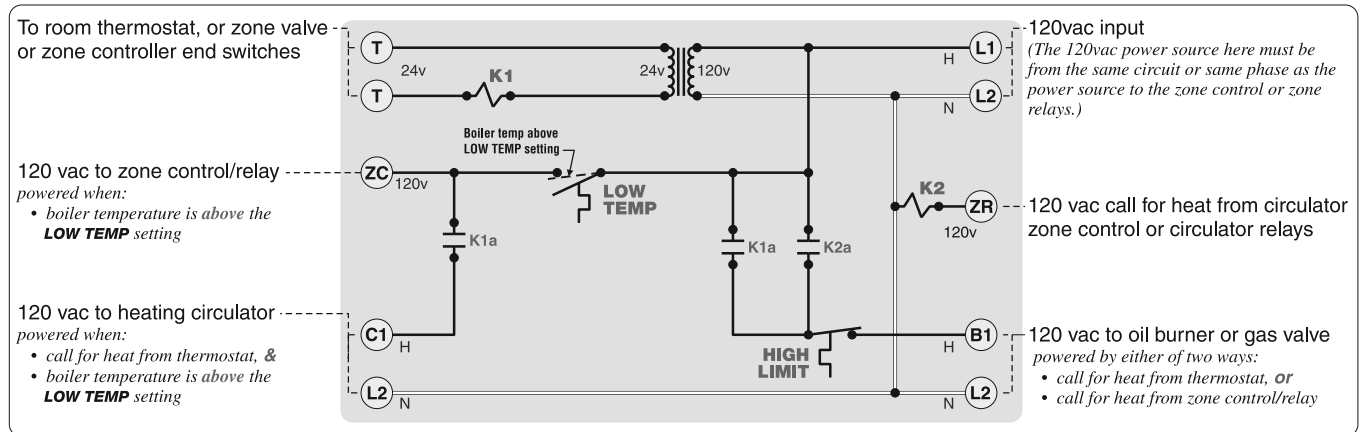
- Set low limit setpoint on front of control (item 9, page 2). Set low limit differential at the adjustment potentiometer on the back of the control (item 7, page 2). The differential range is shown on the control label. Rotate the potentiometer fully counterclockwise for minimum setting, fully clockwise for maximum setting.
- Set high limit setpoint on front of control (item 10, page 2). High limit differential is fixed.

Triple limit sequence of operation

- Burner turns ON when sensor temp is below the high limit (minus high limit differential) — AND — sensor temp is below low limit setting (minus low limit differential) OR there is a call for heat at T-T or ZR.

- Burner turns OFF when sensor temp is above high limit setting — OR — when sensor temp is above the low limit AND there is no call for heat at T-T or ZR.
- Circulator turns ON when sensor temp is at or above low limit — AND — there is a call for heat at T-T.
- Circulator turns OFF when the sensor temp goes below the low limit setting (minus the low limit differential) — OR — there is no call for heat at T-T.
- Zone feed (terminal ZC) turns ON when sensor temp is at or above the low limit.
- Zone feed (terminal ZC) turn OFF when sensor temp goes below the low limit setting (minus the low limit differential).

Figure 4 Equivalent circuit diagram — Cold-start operation (*LOW LIMIT set to OFF*)



Cold-start operation – Setup & adjustment

- Set low limit adjust on front of control to OFF (item 9, page 2). This activates the low temp setting. Low temp and its differential are fixed settings.
- Set high limit setpoint on front of control (item 10, page 2). Set high limit differential at the adjustment potentiometer on back of the control (item 7, page 2).

Cold start sequence of operation

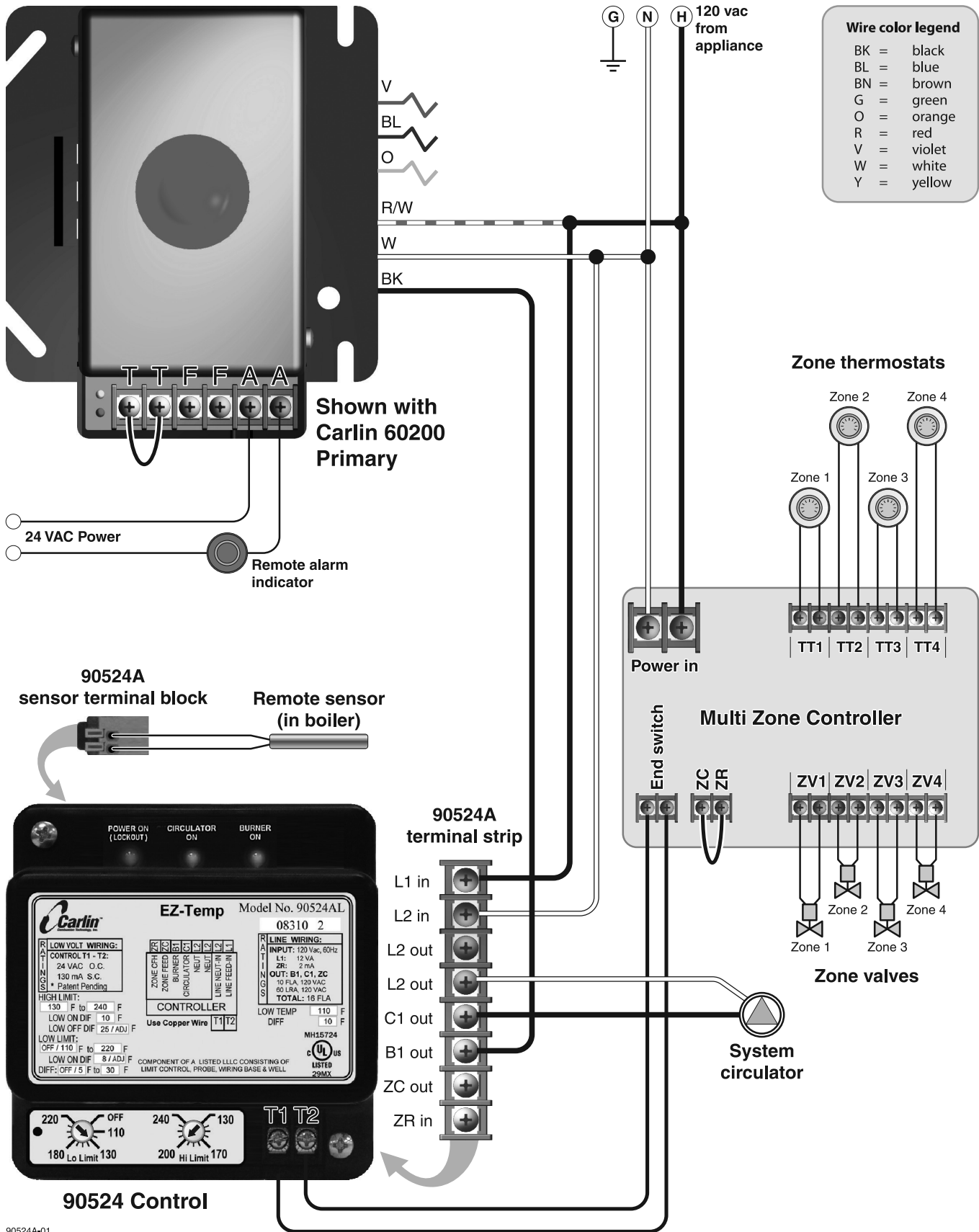
- Burner turns ON when sensor temp is below the high limit (minus high limit differential) — AND — there is a call for heat at T-T or ZR.

- Burner turns OFF when sensor temp is above high limit setting — OR — there is no call for heat at T-T or ZR.
- Circulator turns ON when sensor temp is at or above low temp — AND — there is a call for heat at T-T.
- Circulator turns OFF when the sensor temp goes below the low temp setting (minus the low temp differential) — OR — there is no call for heat at T-T.
- Zone feed (terminal ZC) turns ON when sensor temp is at or above the low temp.
- Zone feed (terminal ZC) turn OFF when sensor temp goes below the low temp setting (minus the low temp differential).

Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Figure 5 Typical — Triple limit operation (**LOW LIMIT ON**) — Multi-zone controller, zoning with zone valves

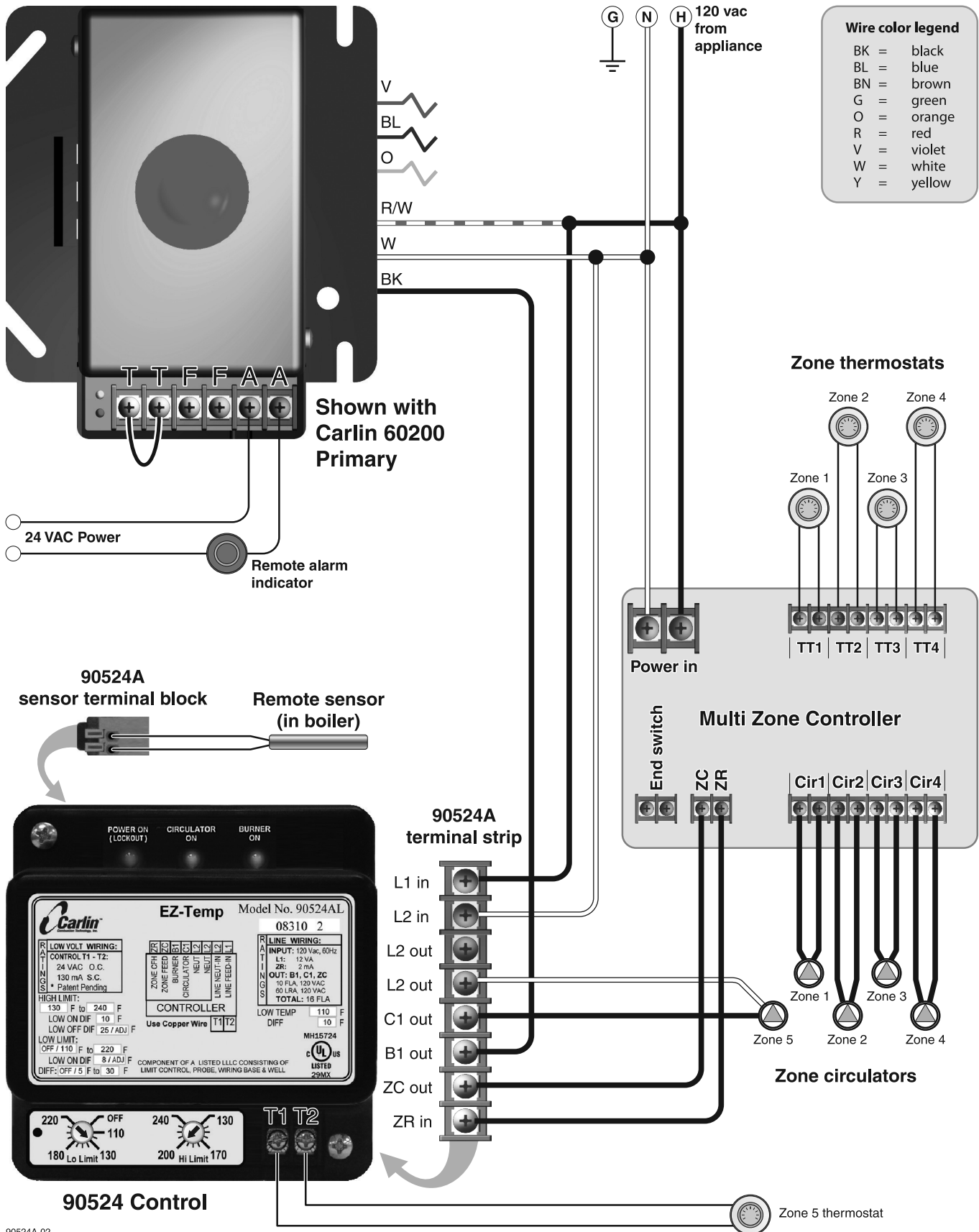


90524A-01

Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

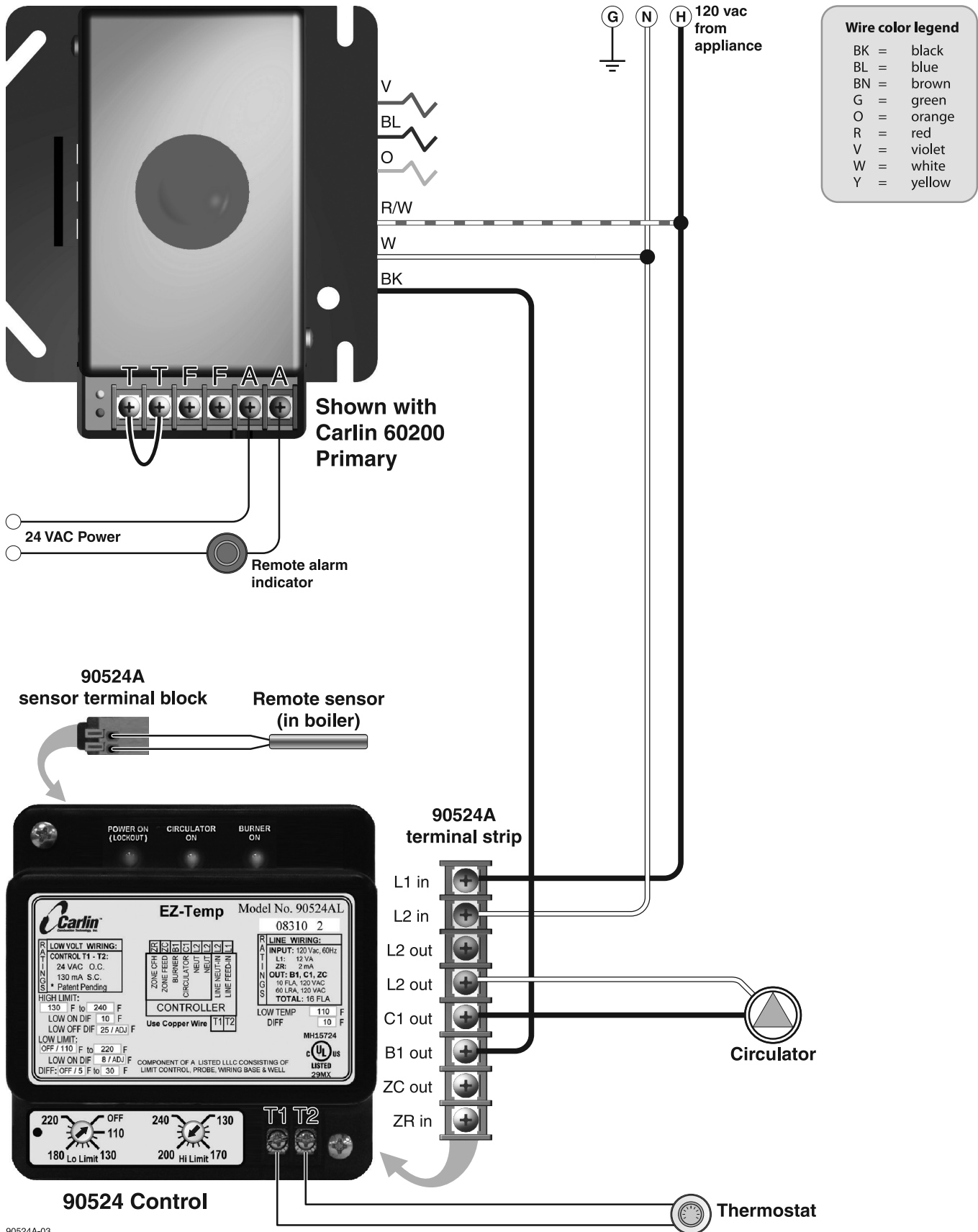
Figure 6 Typical — Triple limit operation (**LOW LIMIT ON**) — Multi-zone controller, zoning with circulators



Model 90524A Triple limit or cold-start control – Instructions

Where appliance instructions differ from this manual, follow the appliance instructions.

Figure 7 Typical — Cold-start operation (LOW LIMIT OFF) — Delays circulator until boiler has heated above LOW TEMP setting



90524A-03



EZ-Temp™

Model 99000A

On-Off Mode of Operation

Data sheet



Microprocessor-operated
(Processor coordinates limit and diagnostic functions)

Easy Remote Sense
(Electronic sensors, wired to control)

Break-on-Rise Operation

Self-checking Program
(Control locks out on diagnostic failure)

Diagnostic/status LED's
(LED's indicate "Power", "Call for Heat", and "Lockout")

Specifications

- The EZ-Temp Commercial Boiler Package controls are provided as an assembled package. Pre-assembled and pre-wired operating limit and manual reset high limit temperature controls for commercial boilers and similar applications. Includes EZ-Temp model 90200EL manual reset high limit temperature control and EZ-Temp model 90200AL operating temperature limit control, mounted and wired on a two-gang J-box with terminal strips, one dual sensor, 3/4" immersion well (1.55" length) and mounting hardware.
- Model 90200AL and 90200EL microprocessor-operated temperature controls are UL Listed. The 90200AL provides a single contact (break-on-rise) and the 90200EL provides a single contact (break-on-rise) with a manual reset.
- The 90200A and 90200E are UL Recognized and may be purchased separately for replacement.

	90200AL	Temperature limit control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • Lockout on diagnostic failure • Reset from lockout via power cycle
	90200EL	Manual reset high limit control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • Lockout on diagnostic failure and limit action • Manual reset from lockout • No reset from power interruption

Control model	AL	EL
Power input	120 VAC, 11 VA	
Contacts (action on temperature rise)	1 break-on-rise	1 break-on-rise
Contact Rating	Full load	120 VAC, 10 AMPS
	Locked rotor	120 VAC, 60 AMPS
Wires	Quantity	3
	120 VAC Neutral	White
	120 VAC Hot or Limit IN	Red-White
	Break-on-rise OUT	Black
Adjustable operating limit range	50°F to 240°F	50°F to 250°F
Fixed differential (subtractive)	Any value from 5°F to 100°F	
Operating temperature limits	+32°F to +140°F	
Storage temperature limits	-40°F to +185°F	
Agencies	Individual controls are UL Listed for United States & Canada	

Model 90200AL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout
 AMBER **A** – OFF **A** – ON Control call for heat

Dimensions



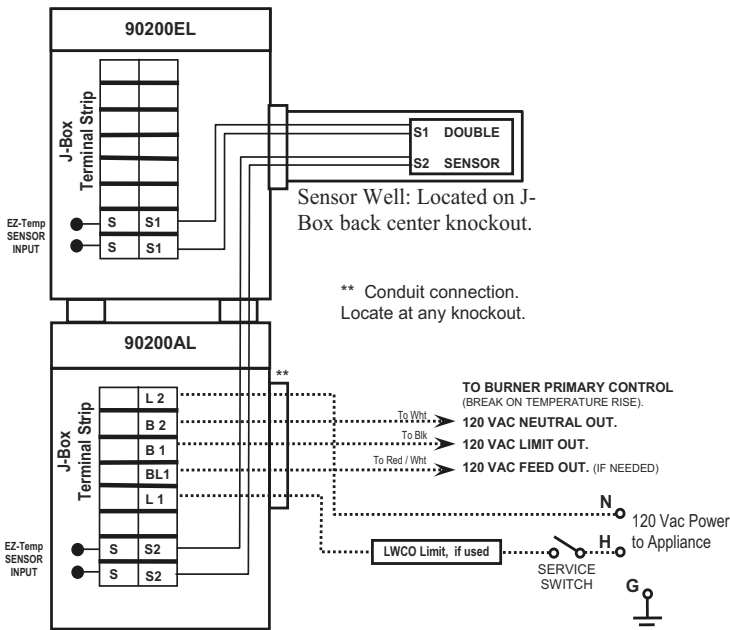
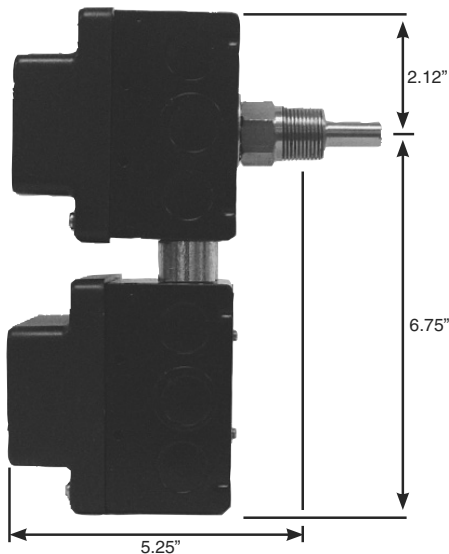
Model 90200EL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout Pending
 RED **R** – OFF **R** – ON Lockout

WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams for connections)

- G** Power Indicator When power is applied to unit, the green LED is turned ON.
- G** Lockout Pending 90200EL: If a diagnostic failure occurs or the sensor temperature rises above the high limit setting, the green LED will flash for 5 seconds. If the condition still exists after 5 seconds, the control will enter lockout requiring manual reset. The red LED turns ON and the limit contact opens. (If the condition corrects before 5 seconds, the green LED will return to normal).
- R** Lockout Indicator
- G** Lockout Indicator 90200AL: When a diagnostic failure occurs, the LED blinks and the contact opens. The control will reset when the failure is removed and power is cycled.
- A** Call for Heat 90200AL: When the temperature at the sensor is at or below set point minus fixed differential, the control powers the limit relay (break-on-rise contact closes). The Amber LED turns ON. When temperature is at or above set point, the contact opens.



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Microprocessor-operated
(Processor coordinates limit and diagnostic functions)

Easy Remote Sense
(Electronic sensors, wired to control)

Break-on-Rise Operation

Self-checking Program
(Control locks out on diagnostic failure)

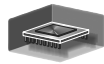
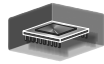
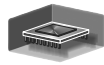
Diagnostic/status LED's
(LED's indicate "Power", "Call for Heat", and "Lockout")

EZ-Temp™ Model 99000B

Lo-Hi-Lo Mode of Operation
Data sheet

Specifications

- The EZ-Temp Commercial Boiler Package controls are provided as an assembled package. Pre-assembled and pre-wired operating limit, manual reset high limit temperature and two position step modulating controls for commercial boilers and similar applications. Includes EZ-Temp model 90200AL operating temperature limit control, EZ-Temp model 90200EL manual reset high limit temperature control, and EZ-Temp model 90200GL two position step modulating Lo-Hi-Lo temperature control, mounted and wired on a three-gang J-box with terminal strips, one triple sensor, 3/4" immersion well (1.55" length) and mounting hardware.
- Carlin's model 90200AL, 90200EL, and 90200GL micro-processor-operated temperature controls are UL Listed. Each control provides a single contact (break-on-rise).

	90200AL	Operating limit control <ul style="list-style-type: none"> 1 break-on-rise contact 1 electronic sensor Lockout on diagnostic failure Reset from lockout via power cycle
	90200EL	Manual reset high limit control <ul style="list-style-type: none"> 1 break-on-rise contact 1 electronic sensor Lockout on diagnostic failure and limit action Manual reset from lockout No reset from power interruption
	90200GL	Two position step modulating Lo-Hi-Lo control <ul style="list-style-type: none"> 1 break-on-rise contact 1 electronic sensor Lockout on diagnostic failure Reset from lockout via power cycle

Control model	AL	EL	GL	
Power input	120 VAC, 11 VA			
Contacts (action on temperature rise)	1 break-on-rise	1 break-on-rise	1 break-on-rise	
Contact Rating	Full load	120 VAC, 10 AMPS		
	Locked rotor	120 VAC, 60 AMPS		
Wires	Quantity	3	3	4
	120 VAC Neutral	White		
	120 VAC Hot or Limit IN	Red-White		
	Break-on-rise OUT	Black		
	Modulating IN	N/A	N/A	Black/Green
Adjustable operating limit range	50°F to 240°F	50°F to 250°F	50°F to 240°F	
Fixed differential (subtractive)	Any value from 5°F to 100°F			
Operating temperature limits	+32°F to +140°F			
Storage temperature limits	-40°F to +185°F			
Agencies	Individual controls are UL Listed for United States & Canada			

Model 99000B Commercial Boiler Control Package for Lo-Hi-Lo Mode – Data Sheet

Model 90200AL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout
 AMBER **A** – OFF **A** – ON Control call for heat

Model 90200EL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout Pending
 RED **R** – OFF **R** – ON Lockout

Model 90200GL diagnostic LED's

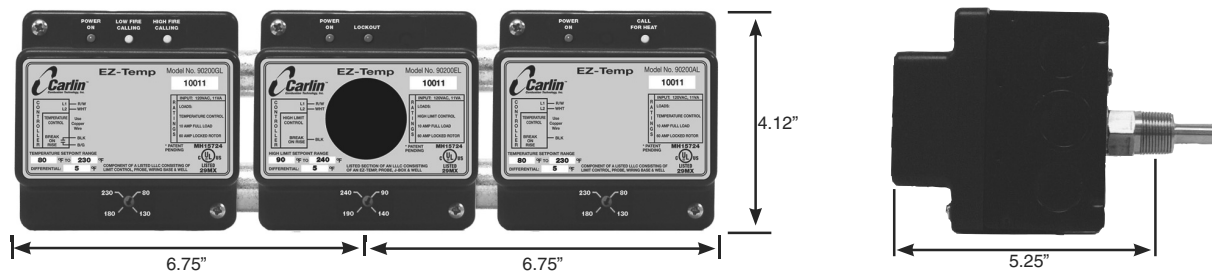
GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout
 AMBER **A** – OFF **A** – ON Low Fire Calling
 AMBER **A** – OFF **A** – ON High Fire Calling

WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams for connections)

- G** Power Indicator When power is applied to unit, the green LED is turned ON.
- G** Lockout Pending 90200EL: If a diagnostic failure occurs or the sensor temperature rises above the high limit setting, the green LED will flash for 5 seconds. If the condition still exists after 5 seconds, the control will enter lockout requiring manual reset. (If the condition corrects before 5 seconds, the green LED will return to normal).
- R** Lockout Indicator
- G** Lockout Indicator 90200AL and 90200GL: When a diagnostic failure occurs, the LED blinks and the contact opens. The control will reset when the failure is removed and power is cycled.
- A** Call for Heat When the temperature at the sensor is below set point minus fixed differential, the control powers the limit relay (break-on-rise contact closes). On the 90200GL, the High Fire LED turns ON and the Low Fire LED turns OFF. On the 90200AL, the Amber LED turns ON. When temperature is at or above set point, the contact opens. On the 90200GL, the High Fire LED is turned OFF and the Low Fire LED is turned ON. On the 90200AL, the Amber LED turns OFF.

Dimensions



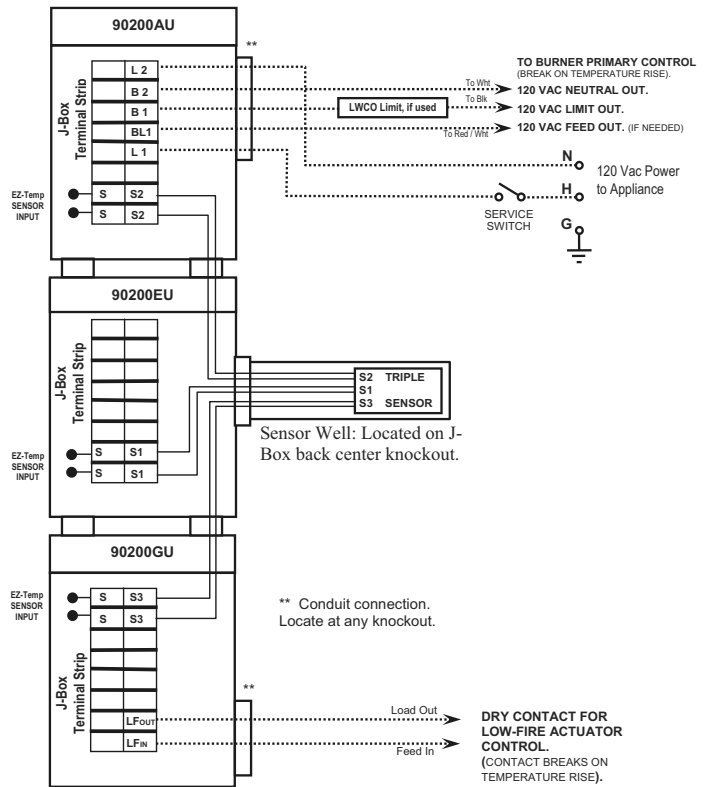
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Microprocessor-operated
(Processor coordinates limit and diagnostic functions)

Easy Remote Sense
(Electronic sensors, wired to control)

Break-on-Rise Operation

Self-checking Program
(Control locks out on diagnostic failure)

Diagnostic/status LED's
(LED's indicate "Power On", "Call for Heat", "Lockout", "High fire Calling" and "Low Fire Calling")

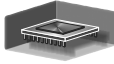
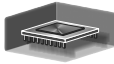
EZ-Temp™ Model 99000C

Lo-Hi-Lo Mode of Operation

Data sheet

Specifications

- The EZ-Temp Commercial Boiler Package controls are provided as an assembled package. Pre-assembled and pre-wired operating limit and manual reset high limit and two position step modulating control for commercial boilers and similar applications. Includes EZ-Temp model 90000CEL combination operating limit and manual reset high limit and EZ-Temp model 90200GL two position step modulating Lo-Hi-Lo temperature controls, mounted and wired on a two-gang J-box with terminal strips, one triple sensor, 3/4" immersion well (1.55" length) and mounting hardware.
- Model 90000CEL and 90200GL microprocessor-operated temperature controls are UL Listed. The 90000CEL provides 2 contacts (break-on-rise) and the 90200GL provides a single contact (break-on-rise).
- The 90000CE and 90200G are UL Recognized and may be purchased separately for replacement.

	90000CEL	Combination operating limit and manual reset high limit control <ul style="list-style-type: none"> • 2 break-on-rise contacts • 2 electronic sensors • Lockout on diagnostic failure and limit action • Manual reset from high limit lockout • No reset from power interruption • High limit test function
	90200GL	Two position step modulating Lo-Hi-Lo control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • Lockout on diagnostic failure • Reset from lockout via power cycle

Control model	CEL	GL
Power input	120 VAC, 11 VA	
Contacts (action on temperature rise)	2 break-on-rise	1 break-on-rise
Contact Rating	Full load	120 VAC, 10 AMPS
	Locked rotor	120 VAC, 60 AMPS
Wires	Quantity	3 4
	120 VAC Neutral	White
	120 VAC Hot & Limit IN	Red-White
	Break-on-rise OUT	Black
	Modulating IN	N/A Black/Green
Adjustable operating limit range	50°F to 240°F	50°F to 240°F
Fixed high limit range	160°F to 250°F	None
Fixed differentials (subtractive)	Any value from 5°F to 100°F	
Operating temperature limits	+32°F to +140°F	
Storage temperature limits	-40°F to +185°F	
Agencies	Individual controls are UL Listed for United States & Canada	

Model 99000C Commercial Boiler Control Package for On-Off Mode – Data Sheet

Model 90000CEL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING (Slow) Latch-up **G** – FLASHING (Fast) Hi-Test

RED **R** – OFF **R** – ON Lockout

AMBER **A** – OFF **A** – ON Call for Heat

Model 90200GL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout

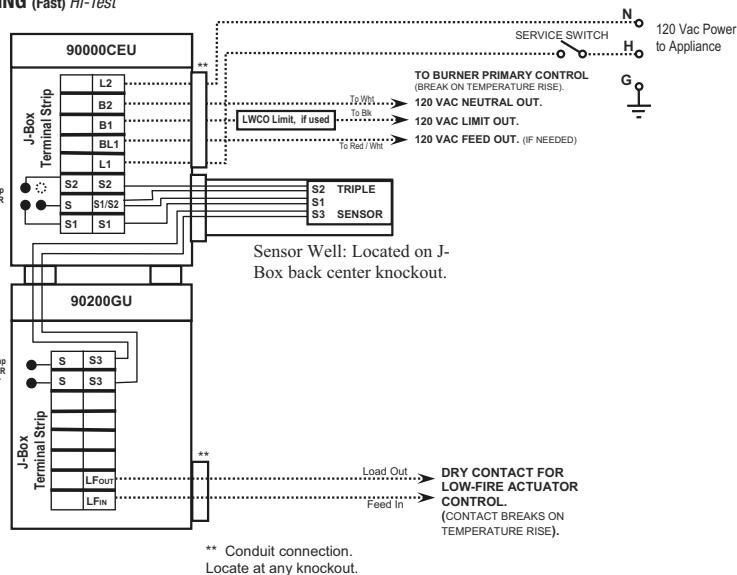
AMBER **A** – OFF **A** – ON Low Fire Calling

AMBER **A** – OFF **A** – ON High Fire Calling

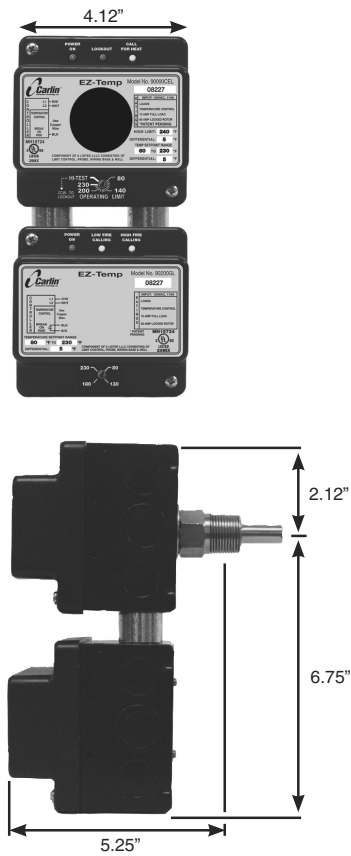
WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams for connections)

- G** Power On When power is applied to unit, the green LED turns ON.
- R** Lockout 90000CEL: When the temperature at the High-Limit sensor reaches the High-Limit set point or a diagnostic fault occurs, the control goes into Lockout. The red LED turns ON and both contacts open. The control will automatically reset when all diagnostic faults are removed. Manual reset is required to resume operation after an over temperature High-Limit Lockout.
- G** Lockout 90200GL: When a diagnostic fault occurs, the control goes into Lockout. The green LED starts flashing and the contact opens putting the control into Low Fire. The control will automatically reset when all faults are removed.
- A** Call for Heat 90000CEL: When the temperature at the Operating-Limit sensor is below the Operating-Limit set point minus the fixed differential, the control powers the operating relay and it's break-on-rise contact closes. The Amber "Call for Heat" LED turns ON.
When the temperature is above the set point, the contact opens and the Amber LED Turns OFF.
- A** High-Fire Calling 90200GL: When the temperature at the sensor is below the Low-Fire set point minus the fixed differential, the control powers the relay and the break-on-rise contact closes. The Amber High-Fire Calling LED turns ON and the Amber Low-Fire Calling LED turns OFF.
- A** Low-Fire Calling
- A** High-Fire Calling When the temperature is above the set point, the contact opens.
- A** Low-Fire Calling
- G R A** Latch-up (90000CEL) If the 90000CEL locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require *licensed serviceman intervention*. During latch-up, the red LED stays on and the green LED slow flashes. Reset as follows:
After boiler is less than high limit setting minus differential:
G R A Hold reset button at least 10 seconds. The green LED flashes faster.
G R A Continue holding button another 20 seconds. The control resets and the red LED turns off.
- G R A** High Limit Test "Hi-Test" mode (90000CEL ONLY), used to test "High Limit Reset" at operating boiler temperature. Start test with system operational and calling for heat. Turn setpoint full clockwise to Hi-Test position. Green LED flashes fast. The setpoint now adjusts both the high and operating limits. Turn setpoint slowly counter clockwise until Lockout occurs. Now the setpoint temperature equals the hi-limit sensor temperature. Test is complete, adjust setpoint to the desired operating limit. Remove from lockout.



Dimensions



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Microprocessor-operated
(Processor coordinates limit and diagnostic functions)

Easy Remote Sense
(Electronic sensors, wired to control)

Break-on-Rise Operation

Self-checking Program
(Control locks out on diagnostic failure)




Diagnostic/status LED's
(LED's indicate "Power", "Call for Heat", and "Lockout")

EZ-Temp™ Model 99000D

Proportional Mode of Operation Data sheet

Specifications

- The EZ-Temp Commercial Boiler Package controls are provided as an assembled package. Pre-assembled and pre-wired operating limit, manual reset high limit temperature and proportional control for commercial boilers and similar applications. Includes EZ-Temp model 90200AL operating temperature limit control, EZ-Temp model 90200EL manual reset high limit temperature control, and EZ-Temp model 90200HL proportional control, mounted and wired on a three-gang J-box with terminal strips, one triple sensor, 3/4" immersion well (1.55" length) and mounting hardware.
- Carlin's model 90200AL, 90200EL, and 90200HL micro-processor-operated temperature controls are described below. The 90200AL and 90200EL each provide a single contact (break-on-rise). The 90200HL provides a proportional modulating control output.

	90200AL	Temperature limit control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • Lockout on diagnostic failure • Reset from lockout via power cycle
	90200EL	Manual reset high limit control <ul style="list-style-type: none"> • 1 break-on-rise contact • 1 electronic sensor • Lockout on diagnostic failure and limit action • Manual reset from lockout • No reset from power interruption
	90200HL	Proportional modulating control <ul style="list-style-type: none"> • 1 electronic sensor • Lockout on diagnostic failure • Auto reset from lockout when fault removed

Control model	AL	EL	HL	
Power input	120 VAC, 11 VA			
Contacts (action on temperature rise)	1 break-on-rise		None	
Contact Rating	Full load	120 VAC, 10 AMPS		
	Locked rotor	120 VAC, 60 AMPS		
Wires	Quantity	3	3	5
	120 VAC Neutral	White		
	120 VAC Hot & Limit IN	Red-White		
	Break-on-rise OUT	Black	N/A	
	Low Fire	N/A	Yellow/White	
	Common	N/A	Yellow/Red	
	High Fire	N/A	Yellow/Black	
Adjustable operating limit range	50°F to 240°F	50°F to 250°F	50°F to 240°F	
Operating zone limits	N/A		5°F to 100°F	
Fixed differential (subtractive)	Any value from 5°F to 100°F		1°F to 20°F	
Operating temperature limits	+32°F to +140°F			
Storage temperature limits	-40°F to +185°F			
Agencies	Individual controls are UL Listed for United States & Canada			

Model 90200AL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout

AMBER **A** – OFF **A** – ON Control Call for heat

Model 90200EL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout Pending

RED **R** – OFF **R** – ON Lockout

Model 90200HL diagnostic LED's

GREEN **G** – OFF **G** – ON Power **G** – FLASHING Lockout

AMBER **A** – OFF Low Fire **A** – ON High Fire **A** – FLASHING % High Fire

WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams for connections)

G Power When power is applied to unit, the green LED is turned ON.

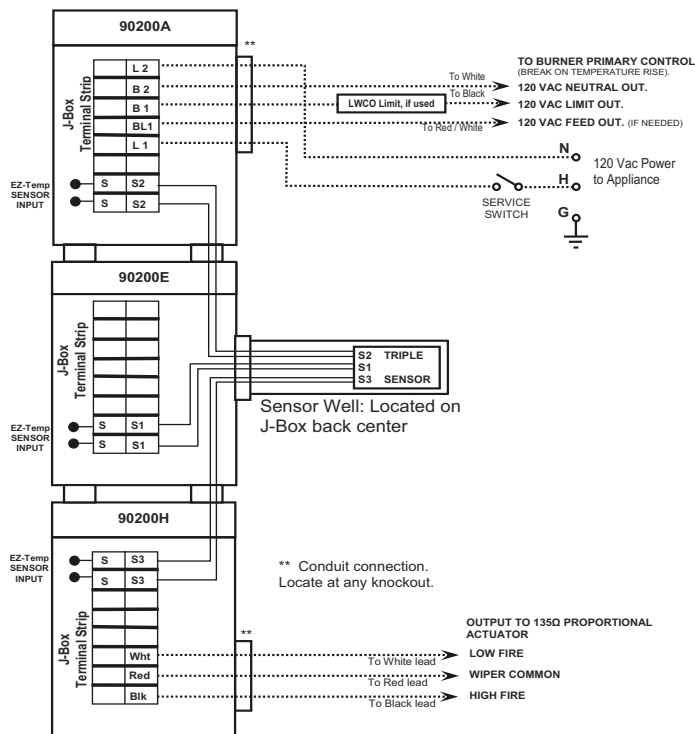
G Lockout 90200EL: If a diagnostic failure occurs or the sensor temperature rises above the limit setting, the green LED will flash for 5 seconds. If the condition still exists after 5 seconds, the control will enter lockout. (If the condition corrects before 5 seconds, the green LED will return to normal).

R Lockout 90200EL: When the sensor temperature reaches the limit set point or a diagnostic failure occurs, the LED turns ON and the contact opens. Manual reset required to resume operation. If lockout was from a diagnostic failure, the control will reset automatically when failure is removed.

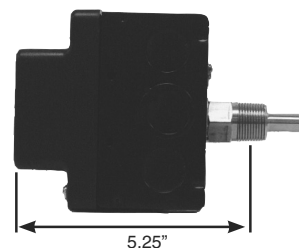
G Lockout When a diagnostic fault occurs, the control goes into Lockout and the green LED starts flashing. On the 90200AL, the contact opens. On the 90200HL, the output goes to full Low Fire. Either control will automatically reset when all faults are removed from it.

A Call for Heat 90200AL: When the temperature at the sensor is below set point minus fixed differential, the control powers the limit relay (break-on-rise contact closes). The Amber LED turns ON. When temperature is at or above set point, the contact opens. The Amber LED turns OFF.

A High Fire 90200HL: When the temperature is at or below the operating temperature minus 1/2 the zone temperature, the control is requesting High Fire and the LED is ON. When the temperature is at or above the operating temperature plus 1/2 the zone temperature, the control is requesting Low Fire and the LED is OFF. In between the control modulates the motor to a position proportional to the sensor temperature. The LED blinks with an ON time proportional to this position.



Dimensions



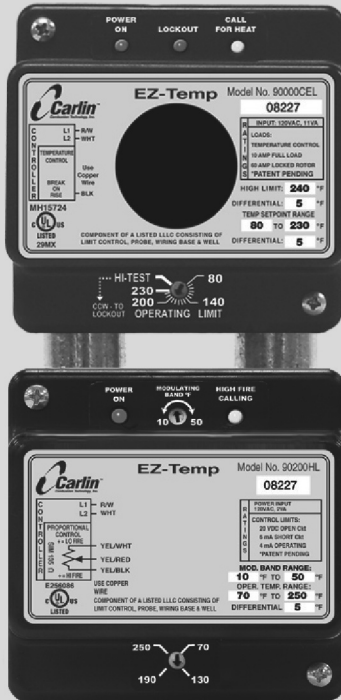
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Microprocessor-operated (Processor coordinates limit and diagnostic functions)

Easy Remote Sense (Electronic sensors, wired to control)

Break-on-Rise Operation

Self-checking Program (Control locks out on diagnostic failure)

Diagnostic/status LED's (LED's indicate "Power On", "Call for Heat", "Lockout", and High Fire Calling")

EZ-Temp™

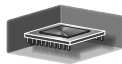
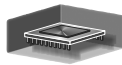
Model 99000E

Full Proportional Mode of Operation

Data sheet

Specifications

- The EZ-Temp Commercial Boiler Package controls are provided as an assembled package. Pre-assembled and pre-wired operating limit and manual reset high limit and proportional modulating control for commercial boilers and similar applications. Includes EZ-Temp model 90000CEL combination operating limit and manual reset high limit and and EZ-Temp model 90200HL proportional modulating temperature controls, mounted and wired on a two-gang J-box with terminal strips, one triple sensor, 3/4" immersion well (1.55" length) and mounting hardware.
- Model 90000CEL and 90200HL microprocessor-operated temperature controls are UL Listed. The 90000CEL provides 2 contacts (break-on-rise). The 90200HL provides a 135 ohm proportional modulating control output.
- The 90000CE and 90200H are UL Recognized and may be purchased separately for replacement.

	90000CEL	Combination operating limit and manual reset high limit control <ul style="list-style-type: none"> 2 break-on-rise contacts 2 electronic sensors Lockout on diagnostic failure and limit action Manual reset from high limit lockout No reset from power interruption High limit test function
	90200HL	Proportional modulating control <ul style="list-style-type: none"> 1 electronic sensor Lockout on diagnostic failure Auto reset from lockout when fault removed

Control model	CEL	HL
Power input	120 VAC, 11 VA	120 VAC, 2 VA
Contacts (action on temperature rise)	2 break-on-rise	None
Contact Rating	Full load	120 VAC, 10 AMPS
	Locked rotor	120 VAC, 60 AMPS
Wires	Quantity	3
	120 VAC Neutral	White
	120 VAC Hot & Limit IN	Red-White
	Break-on-rise OUT	Black
	Low Fire	N/A
	Common	N/A
	High Fire	N/A
Adjustable operating limit range	50°F to 240°F	50°F to 240°F
Fixed high limit range	160°F to 250°F	None
Adjustable band range	N/A	5°F to 100°F
Fixed differentials (subtractive)	Any value from 5°F to 100°F	1°F to 20°F
Operating temperature limits	+32°F to +140°F	
Storage temperature limits	-40°F to +185°F	
Agencies	Individual controls are UL Listed for United States & Canada	

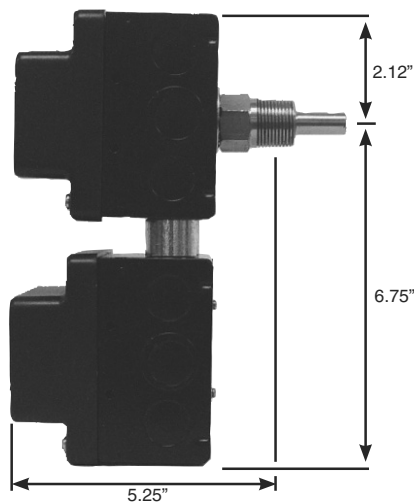
Model 90000CEL diagnostic LED's

- GREEN** (G) – OFF (G) – ON Power (G) – FLASHING (Slow) Latch-up (G) – FLASHING (Fast) Hi-Test
RED (R) – OFF (R) – ON Lockout
AMBER (A) – OFF (A) – ON Call for Heat

Model 90200HL diagnostic LED's

- GREEN** (G) – OFF (G) – ON Power (G) – FLASHING Lockout
AMBER (A) – OFF Low Fire (A) – ON High Fire (A) – FLASHING % High Fire

Dimensions



WARNING Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Operation (See wiring diagrams for connections)

- (G) Power On** When power is applied to unit, the green LED turns ON.
- (G) Self Test** 90200HL: When the fault log display is complete, the self test checks the sensor and the microprocessor and verifies that all systems are operational. This test lasts up to 15 seconds before the control becomes fully operational. During the self test, the green LED blinks at a rate of 3 seconds per blink.
- (R) Lockout** 90000CEL: When the temperature at the High-Limit sensor reaches the High-Limit set point or a diagnostic fault occurs, the control goes into Lockout. The red LED turns ON and both contacts open. The control will automatically reset when all diagnostic faults are removed. Manual reset is required to resume operation after an over temperature High-Limit Lockout.
- (G) Lockout** 90200HL: When a diagnostic fault occurs, the control goes into Lockout. The green LED starts flashing and the control goes into Low Fire. The control will automatically reset when all faults are removed.
- (A) Call for Heat** 90000CEL: When the temperature at the Operating-Limit sensor is below the Operating-Limit set point minus the fixed differential, the control powers the operating relay and it's break-on-rise contact closes. The Amber "Call for Heat" LED turns ON.

When the temperature is above the set point, the contact opens and the Amber LED Turns OFF.

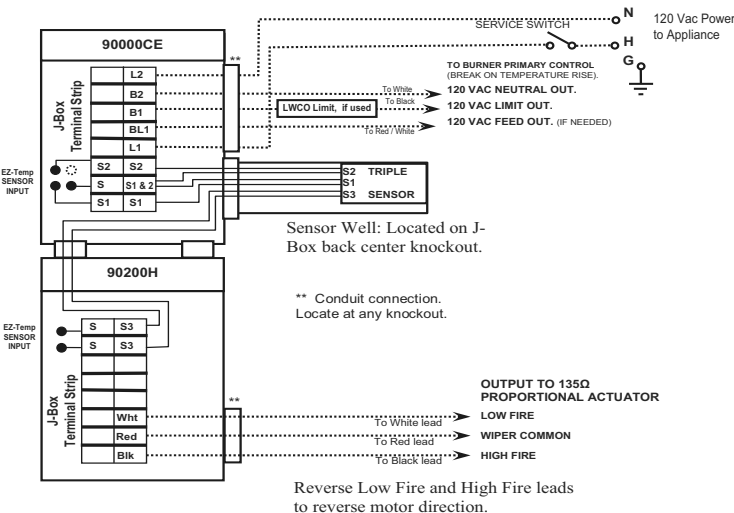
- (A) High-Fire Calling** 90200HL: When the temperature is at or below the operating temperature minus 1/2 the band temperature, the control is requesting High Fire and the LED is ON. When the temperature is at or above the operating temperature plus 1/2 the band temperature, the control is requesting Low Fire and the LED is OFF. In between, the control modulates the motor to a position proportional to the sensor temperature. The LED blinks with an ON time proportional to this position.

- (G)(R)(A) Latch-up (90000CEL)** If the 90000CEL locks out three consecutive times, it enters latch-up. Reset from latch-up requires a special procedure, intended to require *licensed serviceman intervention*. During latch-up, the red LED stays on and the green LED slow flashes. Reset as follows.

After boiler is less than high limit setting minus differential:

- (G)(R)(A)** Hold reset button at least 10 seconds. The green LED flashes faster.
- (G)(R)(A)** Continue holding button another 20 seconds. The control resets and the red LED turns off.

- (G)(R)(A) High Limit Test** "Hi-Test" mode (90000CEL ONLY), used to test "High Limit Reset" at operating boiler temperature. Start test with system operational and calling for heat. Turn setpoint full clockwise to Hi-Test position. Green LED flashes fast. The setpoint now adjusts both the high and operating limits. Turn setpoint slowly counter clockwise until Lockout occurs. Now the setpoint temperature equals the hi-limit sensor temperature. Test is complete, adjust setpoint to the desired operating limit. Remove from lockout.



TECH SUPPORT HOTLINE 800-989-2275



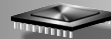
Carlin Combustion Technology, Inc.

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EZ-Temp™



Microprocessor
Temperature Controls

Instruction Manual

E-Clamp Style with red sensor retainer plug



WARNING **Installer/servicer** — Except where specifically stated otherwise, this manual must be used only by a *qualified service technician*. Read and follow all instructions in this manual and in the appliance manual. Failure to comply with this or other requirements in this manual could result in severe personal injury, death or substantial property damage.

WARNING This symbol calls out a hazard that could cause severe personal injury, death or substantial property damage if the instructions given are not followed.

NOTICE **Wiring:** Refer to EZ-Temp data sheet for wiring information.

WARNING **Verify ratings:** Verify the ratings of the control meet the requirements of the appliance as specified in the appliance instructions. Refer to the EZ-Temp control data sheet for required electrical supply and load ratings. Verify that the controls, wiring and installation comply with all applicable codes.

Electrical shock hazard: Disconnect power to appliance when wiring or servicing any electrical component.

Scald hazard: Water hotter than 130°F can cause serious burns or death. Follow water heating appliance manufacturer's guidelines when installing temperature limit controls - **DO NOT** install a control that can be set at a higher temperature than specified. Also verify that the installation includes all water temperature regulating means needed to ensure the safety of building occupants, in compliance with all applicable codes.

Verify operation: Test the controls/appliance to verify the appliance operates as specified in the appliance manual before leaving the installation.

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Install sensor(s)

To install a new immersion well:

1. Turn off power to the appliance and close isolation valves.
2. Follow appliance instructions to drain the appliance so water line is below the insertion tapping.
3. Remove existing well and sensor. Apply a small amount of pipe dope to the new well and secure in tapping.
4. Insert EZ-Temp sensor into well and secure sensor in place as described in the following.
5. Refill appliance with water, following appliance manual procedures.

WARNING When routing sensor wires, avoid sharp edges and use strain relief bushings at penetrations to prevent movement or electrical shorting of the sensor. Sensor wires are not low voltage, and must be routed in conduit.

Configuration A: Sensor and well only

1. Insert the sensor into well (1) until the sensor (2) tip bottoms in the well socket.
2. EZ-Temp well: Slide the rubber retainer (3) over the sensor wires until it firmly contacts the sensor casing. Slide the retainer washer (4) and the jam nut (5) over the wires. Thread the jam nut into the well until snug.
3. Existing well: Press the sensor retainer plug (11) into the well until it securely holds the sensor wires, to prevent movement of the sensor.

Configuration B: Sensor, EZ-Temp well and J-box

1. Insert the sensor into well (1) until the sensor (2) tip bottoms in the well socket.
2. Slide the rubber retainer (3) over the sensor wires until it firmly contacts the sensor casing. Slide the retainer washer (4) over the wires.
3. Slide the lock washer (8), J-box (7), and jam nut (4) over the wires.
4. Thread the jam nut into the well and tighten to secure the J-box and sensor in place.

Configuration C: Sensor, EZ-Temp well and J-box

1. Insert the sensor into well (1) until the sensor (2) tip bottoms in the well socket.
2. Slide the J-box (7) over the wires and secure the J-box in place by snapping the retainer ring (10) onto the well shoulder.
3. Press the sensor retainer plug (11) into the well until it securely holds the sensor wires, to prevent movement of the sensor.

Mount the control

1. Insert sensor wire terminals into the labelled openings on the back of the control. Press into place firmly.
2. Attach the control to the 4x4 J-box or panel mount, as desired.

Wire the control

1. Control wiring (including sensor wires) must be routed through conduit or electrical enclosures. Follow all applicable codes and the appliance manual.
2. Follow the burner and appliance wiring diagrams to connect the control(s) into the appliance limit circuit.
3. For specific applications, contact your Carlin supplier for further information.

Set the control

1. Follow the appliance manual to set the correct limit temperature for the appliance. To adjust the EZ-Temp control:
 - Insert a screwdriver into the setting slot and rotate until the indicator points to the desired temperature.
2. Test the operation of the appliance and the new limit control(s) to verify correct operation.
3. NOTE: EZ-Temp controls have a subtractive differential — control contacts trigger when the temperature setting is reached. Contacts reset after temperature drops below setpoint minus the differential amount.

Configurations

Carlin EZ-Temp components are available in the following configurations, allowing use with existing wells in addition to EZ-Temp wells.

Surface-mount sensors are also available.

Control kits

EZ-Temp controls mount to a standard 4x4 J-box or can be panel mounted. Control kits include the control and sensor(s) (item 2) plus hardware needed for mounting to an existing well (items 10 and 11). To obtain an EZ-Temp well and hardware, obtain an EZ-Temp well kit, below.

Well kits

EZ-Temp wells are available in the sizes shown below. Well kits include a well (item 1), rubber sensor retainer (item 3), retainer washer (item 4), jam nut (item 5), and J-box lock washer (item 8).

Sensor Kits

Sensor kits include only the sensor (item 2). Sensors are available in single and dual configurations (two sensors in the same assembly). For controls that use multiple sensors, obtain separate sensor kits or a sensor kit and a dual sensor.

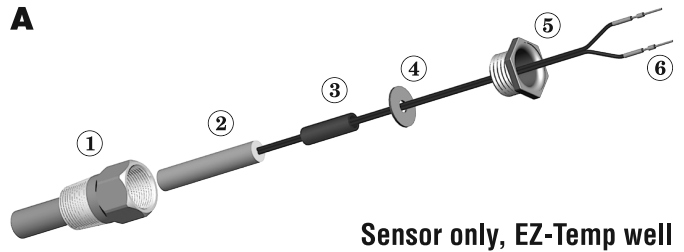


Diagram A: Sensor only, EZ-Temp well

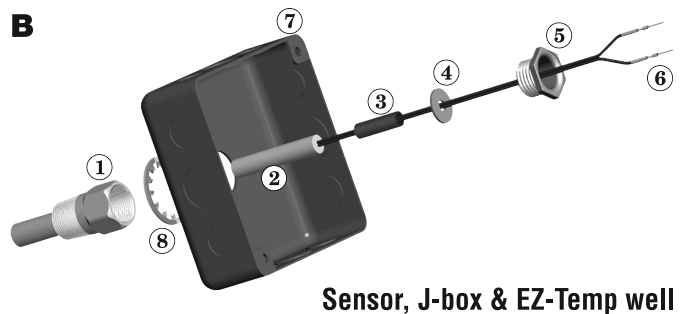


Diagram B: Sensor, J-box & EZ-Temp well

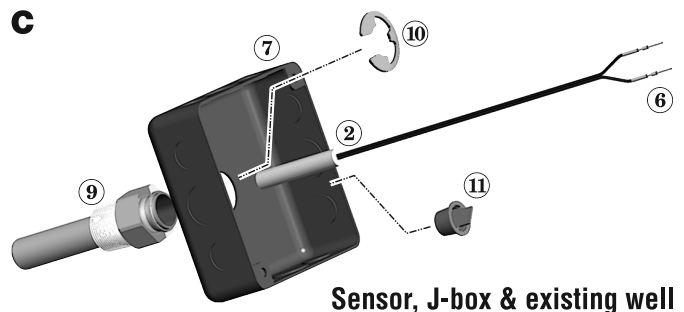
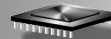


Diagram C: Sensor, J-box & existing well

- | | |
|------------------------|------------------------|
| ① EZ-Temp well | ⑦ J-box, 4 x 4 |
| ② EZ-Temp sensor | ⑧ Lock washer |
| ③ EPDM rubber retainer | ⑨ Existing well |
| ④ Retainer washer | ⑩ Retaining ring |
| ⑤ Jam nut | ⑪ Sensor retainer plug |
| ⑥ Sensor leads | |



EZ-Temp™



Microprocessor
Temperature Controls

Instruction Manual

Well clamp with sensor retainer spring



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2. Follow appliance instructions to drain the appliance so water line is below the insertion tapping.
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4. Insert EZ-Temp sensor into well and secure sensor in place as described in the following.
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WARNING When routing sensor wires, avoid sharp edges and use strain relief bushings at penetrations to prevent movement or electrical shorting of the sensor. Sensor wires are not low voltage, and must be routed in conduit.

Configuration A: Sensor and well only

1. Insert the sensor into well (1) until the sensor (2) tip bottoms in the well socket.
2. EZ-Temp well: Slide the rubber retainer (3) over the sensor wires until it firmly contacts the sensor casing. Slide the retainer washer (4) and the jam nut (5) over the wires. Thread the jam nut into the well until snug.
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Configuration B: Sensor, EZ-Temp well and J-box

1. Insert the sensor into well (1) until the sensor (2) tip bottoms in the well socket.
2. Slide the rubber retainer (3) over the sensor wires until it firmly contacts the sensor casing. Slide the retainer washer (4) over the wires.
3. Slide the lock washer (8), J-box (7), and jam nut (4) over the wires.
4. Thread the jam nut into the well and tighten to secure the J-box and sensor in place.

Configuration C: Sensor, EZ-Temp well and J-box

1. Remove the center knock-out from one side of the J-box (7).
2. Position the well clamp (10) over the end of the well (9) (sensor not yet installed) and slide the well clamp (10) toward the side of the J-box (9) engaging the keyslot opening with the well undercut.
3. Position the flat washer (13) over the open knockout and install the tensioning screw (14) through the flat washer (13) and into the well clamp (10), tighten.
4. Position the rubber retainer (12) over the sensor leads until the retainer stops at the sensor body.
5. Position the retainer spring (11) near the end of the rubber retainer as shown.
6. Slide sensor and retainer/spring assembly into well. Squeeze retainer spring ends together as the spring enters the well. The end of the spring should be within the well bore.

Mount the control

1. Insert sensor wire terminals into the labelled openings on the back of the control. Press into place firmly.
2. Attach the control to the 4x4 J-box or panel mount, as desired.

Wire the control

1. Control wiring (including sensor wires) must be routed through conduit or electrical enclosures. Follow all applicable codes and the appliance manual.
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Configurations

Carlin EZ-Temp components are available in the following configurations, allowing use with existing wells in addition to EZ-Temp wells.

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Control kits

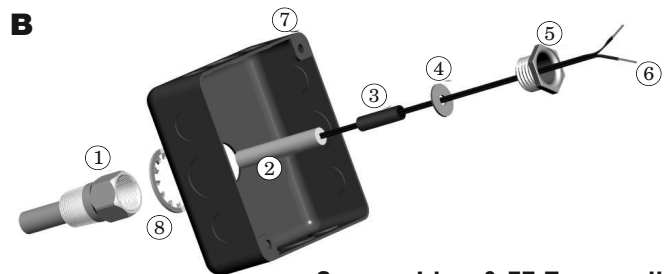
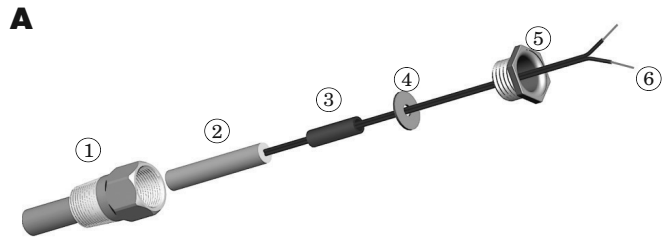
EZ-Temp controls mount to a standard 4x4 J-box or can be panel mounted. Control kits include the control and sensor(s) (item 2) plus hardware needed for mounting to an existing well (items 10 and 11). To obtain an EZ-Temp well and hardware, obtain an EZ-Temp well kit, below.

Well kits

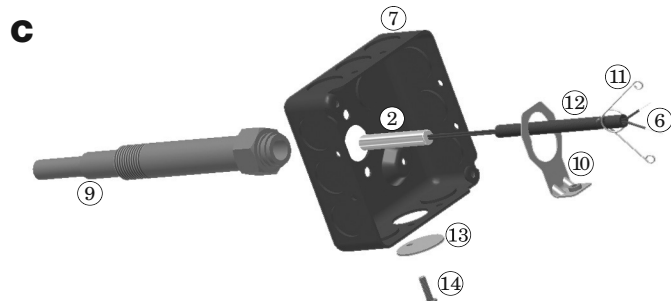
EZ-Temp wells are available in the sizes shown below. Well kits include a well (item 1), rubber sensor retainer (item 3), retainer washer (item 4), jam nut (item 5), and J-box lock washer (item 8).

Sensor Kits

Sensor kits include only the sensor (item 2). Sensors are available in single and dual configurations (two sensors in the same assembly). For controls that use multiple sensors, obtain separate sensor kits or a sensor kit and a dual sensor.



Sensor, J-box & EZ-Temp well



Sensor, J-box & existing well

- | | |
|------------------------|--------------------------|
| ① EZ-Temp well | ⑧ Lock washer |
| ② EZ-Temp sensor | ⑨ Existing well |
| ③ EPDM rubber retainer | ⑩ Well clamp |
| ④ Retainer washer | ⑪ Sensor retainer spring |
| ⑤ Jam nut | ⑫ 3.8" rubber retainer |
| ⑥ Sensor leads | ⑬ Flat washer |
| ⑦ J-box, 4 x 4 | ⑭ Tensioning screw |

Thermistor Resistance – EZ-Temp Sensors

**EZ-Temp Sensor Resistance vs Temperature
(Accuracy $\pm 1^\circ\text{F}$)**

°F	Ohms	°F	Ohms	°F	Ohms
-67.0	963,730	-5.8	102,900	55.4	17,254
-65.2	895,230	-4.0	97,072	57.2	16,462
-63.4	832,040	-2.2	91,613	59.0	15,711
-61.6	773,710	-0.4	86,494	60.8	14,998
-59.8	719,860	1.4	81,689	62.6	14,322
-58.0	670,090	3.2	77,183	64.4	13,680
-56.2	624,090	5.0	72,951	66.2	13,071
-54.4	581,540	6.8	68,977	68.0	12,492
-52.6	542,170	8.6	65,242	69.8	11,942
-50.8	505,710	10.4	61,732	71.6	11,419
-49.0	471,940	12.2	58,431	73.4	10,922
-47.2	440,630	14.0	55,326	75.2	10,450
-45.4	411,600	15.8	52,404	77.0	10,000
-43.6	384,670	17.6	49,654	78.8	9,572
-41.8	359,670	19.4	47,064	80.6	9,165
-40.0	336,450	21.2	44,625	82.4	8,777
-38.2	314,880	23.0	42,326	84.2	8,408
-36.4	294,820	24.8	40,158	86.0	8,057
-34.6	276,170	26.6	38,115	87.8	7,722
-32.8	258,820	28.4	36,187	89.6	7,403
-31.0	242,660	30.2	34,368	91.4	7,098
-29.2	227,610	32.0	32,650	93.2	6,808
-27.4	213,590	33.8	31,029	95.0	6,531
-25.6	200,520	35.6	29,498	96.8	6,268
-23.8	188,330	37.4	28,051	98.6	6,016
-22.0	176,960	39.2	26,684	100.4	5,775
-20.2	166,340	41.0	25,391	102.2	5,546
-18.4	156,430	42.8	24,169	104.0	5,326
-16.6	147,160	44.6	23,012	105.8	5,117
-14.8	138,500	46.4	21,917	107.6	4,917
-13.0	130,410	48.2	20,880	109.4	4,726
-11.2	122,840	50.0	19,899	111.2	4,543
-9.4	115,750	51.8	18,970	113.0	4,368
-7.6	109,110	53.6	18,089	114.8	4,201

Thermistor Resistance – EZ-Temp Sensors

**EZ-Temp Sensor Resistance vs Temperature
(Accuracy $\pm 1^{\circ}\text{F}$)**

°F	Ohms	°F	Ohms	°F	Ohms
116.6	4,042	177.8	1,215	239.0	445.2
118.4	2,889	179.6	1,177	240.8	433.4
120.2	3,742	181.4	1,140	242.6	421.9
122.0	3,602	183.2	1,104	244.4	410.8
123.8	3,468	185.0	1,070	246.2	399.9
125.6	3,340	186.8	1,037	248.0	389.6
127.4	3,217	188.6	1,005	249.8	379.4
129.2	3,099	190.4	973.8	251.6	369.6
131.0	2,986	192.2	944.1	253.4	360.1
132.8	2,878	194.0	915.4	255.2	350.9
134.6	2,774	195.8	887.8	257.0	341.9
136.4	2,675	197.6	861.1	258.8	333.2
138.2	2,579	199.4	835.4	260.6	324.8
140.0	2,488	201.2	810.6	262.4	316.7
141.8	2,400	203.0	786.6	264.2	308.7
143.6	2,316	204.8	763.5	266.0	301.0
145.4	2,235	206.6	741.2	267.8	293.6
147.2	2,157	208.4	719.6	269.6	286.3
149.0	2,083	210.2	698.7	271.4	279.3
150.8	2,011	212.0	678.6	273.2	272.4
152.6	1,941	213.8	659.1	275.0	265.8
154.4	1,876	215.6	640.3	276.8	259.4
156.2	1,813	217.4	622.1	278.6	253.1
158.0	1,752	219.2	604.6	280.4	247.1
159.8	1,693	221.0	587.6	282.0	241.1
161.6	1,636	222.8	571.2	284.0	235.4
163.4	1,582	224.6	555.3	285.8	229.8
165.2	1,530	226.4	539.9	287.6	224.4
167.0	1,479	228.2	525.0	289.4	219.1
168.8	1,431	230.0	510.6	291.2	214.0
170.6	1,385	231.8	496.7	293.0	209.0
172.4	1,340	233.6	483.2	294.8	204.2
174.2	1,297	235.4	470.2	296.6	199.4
176.0	1,255	237.2	457.5	298.4	194.9

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