

Model 5194 User's Manual



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Another quality product from:



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Dear Valued Customer:

Thank you for purchasing a Model 5194 LineIR® infrared heater. We believe it is the finest heating system of its type and are confident you will think so also.

This instruction manual has been carefully prepared to ensure you will be able to easily install and operate the Model 5194 heater and to fully realize all its inherent capabilities. We invite your comments as well as any issues you may have regarding this manual or the Model 5194.

Requirement

Additional information regarding application of the Model 5194 heater or other Research Inc. products.

Ordering additional Research Inc. products or Manuals.

Technical assistance and training.

Appropriate Contact

Your local sales representative.

Your local sales representative or Research, Inc. Customer Service (952) 949-9009

Research Inc. Factory Service (952) 949-9009

Once again, let us welcome you to the growing family of Research Inc. customers. We look forward to working with you in the future.

Sincerely,

Terry Nigon
President
Research Inc.

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Section 1 – INTRODUCTION

The Model 5194 LineIR[®] Infrared line heater is designed for use in any application that requires a clean, responsive, non-contact heat source.

Typical applications for the Model 5194 include:

- Soldering
- Unsoldering
- Drying ink
- Forming plastic
- Curing epoxy
- Heat treating



The Model 5194 includes the following major components:

Heater Module – The heater consists of a specular aluminum reflector that directs the infrared energy generated by one ceramic end-seal ‘T-3 style’ quartz halogen lamp factory-installed in the heater. Heated lengths of 2.56, 2.95, 5, 11, 16, 25, and 38 inches (65, 75, 127, 279, 406, 635, and 965 mm) are offered for the Model 5194. Additional lamps can be ordered separately from the heater.

Water Cooling – Adequate cooling water is required during operation of the Model 5194. Flexible tubing and plumbing fittings are supplied with each heater for easy installation. Required cooling water flow rates are listed in Specifications.

Air Cooling – Clean, dry compressed air cooling must also be supplied to the heater for proper operation if using a quartz window and at all times with the 5194-02 and 5194-04. This cooling air removes excess heat from around the lamp end-seals. Flexible tubing and matching plumbing hardware is included with each heater. Required airflow rates and pressures are listed in the specifications.

Electrical Cable – The Model 5194 heater is electrically wired from the T3 lamp to intermediate terminal block within the heater. An 8-foot (2.4 m) electrical cable is supplied with each heater.

Optional Quartz Window – A quartz window can be ordered along with each size of the Model 5194. When installed in the heater, the quartz window protects the aluminum reflector and lamp from contaminants released in the heating process, resulting in maximum efficiency of the heater.

Optional Ceragold End Reflectors – Ceragold end reflectors are available for installation on the ends of the heater module. These reflectors prevent infrared energy from radiating past the ends of the heater.

Optional Power Control System – The Model 5194 can be ordered with the ‘PC’ option. This configuration consists of the heater, the Model 5420 ControlIR[®] 5420-power controller, and eight feet (2.4 m) of electrical cable connecting the heater to the controller. Please see the Model 5620 ControlIR[®] product data sheet for further detail.



Figure 1-1. Model 5194 with the control Option

Section 2 – FEATURES & BENEFITS

The design and functionality of the Model 5194 supplies a variety of features and related benefits:

Rapid Response – The quartz halogen lamps heat up and cool down instantly in response to power control signals. They reach 90 percent of full operating temperature within three seconds of a cold start. The radiant energy dissipates to ten percent five seconds after the power supply is disconnected.

Continuous Operation – The cast end enclosures and extruded aluminum construction of the Model 5194, combined with the liquid and air-cooling, allows the heater to withstand continuous high temperature operation.

Controllable Energy Output – The infrared energy emitted from the heater can be adjusted to match the heating requirements of a variety of applications.

The Model 5194 ordered with the control option is a complete heating solution designed with a number of features including heater on/off control switching, a potentiometer for local control, with or without a timer, or a remote 4-20 ma control signal.

Section 3 - SPECIFICATIONS

Specification	5194-02	5194-04	5194-05	5194-10	5194-16	5194-25	5194-38
Weight, Pounds (kg)	2.7 (1.2)	3.3 (1.4)	4.2 (1.9)	6.3 (2.8)	8.7 (3.9)	12.7 (5.7)	18.3 (8.3)
Lamp Type	QIH120-1000R12	QIH120-2000R12	QIH240-1000R12	QIH240-2000R12	QIH240-3000R12	QIH600-5000R12	QIH480-3800R12
Lamp Part Number	106587-001	106587-002	103390-002	103390-004	103390-012	103390-008	103390-010
Lighted Length, Inches (mm)	2.56 (65)	2.95 (75)	5.0 (127)	11.0 (279)	16.0 (406)	25.0 (635)	38.0 (965)
Watt Density (W/in)	390	678	200	182	187.5	142	100
Rated Voltage	120	120	240	240	240	480	480
Total Power Dissipated @ Rated Voltage, Watts	1000	2000	1000	2000	3000	3550	3800
Total Current @ Rated Voltage, Amps	8.3	16.7	4.2	8.3	12.5	7.4	7.9
Cooling Water Flow ¹ , GPM (lpm)	0.15 (0.5)	0.25 (0.9)	0.15 (0.5)	0.25 (0.9)	0.4 (1.5)	0.6 (2.2)	0.45 (1.7)
Cooling Air Flow, SCFH (M ³ /hr.)	30 (0.85) ²	30 (0.85) ²	30 (0.85) ³	40 (1.1) ³	50 (1.4) ³	60 (1.7) ³	50 (1.4) ³

- 1. Cooling water must be used on all Model 5194 heaters while in operation.*
- 2. Cooling air must always be supplied to the Model 5194-02 & 5194-04 while the heater is operational.*
- 3. Cooling air is required on this model if optional quartz window is installed. Cooling airflow is not required if window is not installed on the heater.*

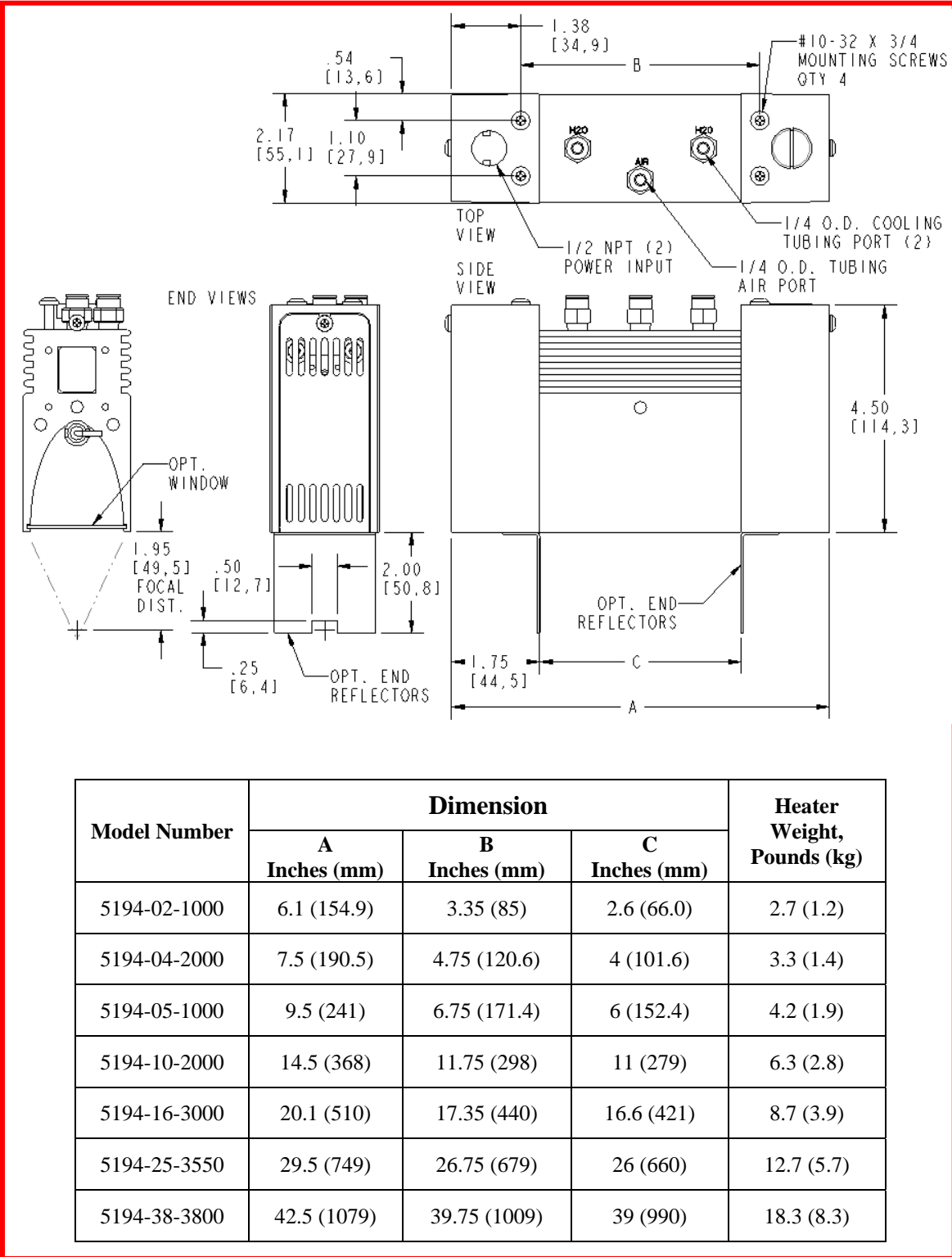


Figure 3-1. Model 5194 Dimensions

Ordering Information – Model 5194

Model	Product Description			
5194	Infrared Line Heater (Installed lamp included)			
Code	Length	Lighted Lamp Length	Reflector Length	Overall Heater Length
02-1000	2 Inches (51 mm)	2.56 Inches (65 mm)	2.6 Inches (66 mm)	6.1 Inches (155 mm)
04-2000	4 Inches (102 mm)	2.95 Inches (75 mm)	4 Inches (102 mm)	7.5 Inches (191 mm)
05-1000	5 Inches (127 mm)	5 Inches (127 mm)	6 Inches (152 mm)	9.5 Inches (241 mm)
10-2000	10 Inches (254 mm)	11 Inches (279 mm)	11 Inches (279 mm)	14.5 Inches (368 mm)
16-3000	16 Inches (406 mm)	16 Inches (406 mm)	16.6 Inches (421 mm)	20.1 Inches (510 mm)
25-3550	25 Inches (635 mm)	25 Inches (635 mm)	26 Inches (660 mm)	29.5 Inches (749 mm)
38-3800	38 Inches (965 mm)	38 Inches (965 mm)	39 Inches (990 mm)	42.5 Inches (1079 mm)
Code	Optional Control Equipment			
00	No optional controls.			
02	Controller including potentiometer			
03	Controller including potentiometer and timer			
04	Controller including an input for a remote 4-20 mA control signal			

Ordering Example – Model 5194

	Model	Heating Chamber Length	Optional Equipment
Typical Model Number:	5194	16-3000	03-00

Accessories, Spare & Replacement Parts – Model 5194

Model	Description
106586-001	Quartz Window Kit, Model 5194-02
106586-002	Quartz Window Kit, Model 5194-04
106586-003	Quartz Window Kit, Model 5194-05
106586-004	Quartz Window Kit, Model 5194-10
106586-005	Quartz Window Kit, Model 5194-16
106586-006	Quartz Window Kit, Model 5194-25
106586-007	Quartz Window Kit, Model 5194-38
106587-001	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-02
106587-002	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-04
103390-002	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-05
103390-004	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-10
103390-012	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-16
103390-008	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-25
103390-010	Quartz-Halogen Infrared Lamp, Ceramic End Seal, Model 5194-38
106684-001	Electrical Power Cable, 8-foot (2.4 m) length
034766-001	Ceragold End Reflectors (set of 2)
106686-001	Air-Cooling Supply Kit (Includes flexible tubing and plumbing fixtures for connection to compressed air supply)
C100-1	Water-Cooling Supply Kit (Includes flexible tubing and plumbing fixtures for connection to cooling water supply)
KFS-5420	Foot switch for remote start

Section 4 – SAFETY

GENERAL: The Model 5194 heater is designed for safe operation. Nevertheless, installation, maintenance, and operation of the heater can be dangerous for a careless operator or maintenance person. For your safety and the safety of others, read the instructions in this Instruction Manual and follow these safety practices to help prevent accident or injury.

INFRARED RADIATION - CAUTION! Continuous exposure to high intensity infrared radiation at close proximity could be harmful to eyes or skin. Although infrared lamps emit negligible ultra violet electromagnetic radiation, harmful burns can still result if an operator is in close contact with lamps being operated at high intensity.

Because of the brilliant light emitted by infrared lamps at full intensity, it is recommended that eyes be shielded from the glare if observing the lamps for an extended period of time. Use suitable shaded lenses or dark glasses.

HIGH TEMPERATURES: Parts of the heater may exceed 500°F (260°C). Contact with the lamps, reflector, or metal parts near the lamps may cause severe burns.

WARNING!

NEVER place hands under or in front of the heating elements.

ALWAYS allow heating element to cool at least three minutes before touching the lamps or adjacent parts.

ELECTRICAL SAFETY: There is danger of electrical shock when servicing the heater.

CAUTION! Observe all applicable local and national electrical codes and ensure that a safe electrical ground system is installed before attempting to operate the heater. Refer to the Section 5 for proper installation procedures.

WARNING!

ALWAYS disconnect the external power lines prior to servicing the heater.

ALWAYS disconnect the power lines AND any optional interlock circuits before installing or changing lamps.

NEVER operate the heater with end covers removed.

FIRE SAFETY:

1. Obey the same fire-safety rules you observe when working with hot plates, propane or acetylene torches, soldering irons, and other equipment that operates at extremely high heat.
2. Remove all solids, liquids, and gases that burn easily from the area around the heater.
3. Know where the nearest fire extinguisher is located and how to use it.
4. Know how to put out fire from all the types of material near the heater.

Section 5 – INSTALLATION

5.1 UNPACK AND CHECK FOR DAMAGE: Remove the Model 5194 heater from its shipping container and associated packaging. Check the unit for any potential damage due to shipping. In the unlikely event damage has occurred, keep all shipping containers and materials in order to file a damage claim with the shipping company responsible for shipping the unit.

5.2 MOUNTING THE HEATER: The Model 5194 heater should be mounted to a framework or structure that is designed to support the weight of the heater and provide stability to the unit. Four #10-32 threaded holes are located on the top surface of the heater and are designed for mounting the heater (see Figure 3-2).

Note: All Research Inc. lamps associated with the Model 5194 heater are designed for vertical operation, except for the lamps used in the 5194-02 and 5194-04.

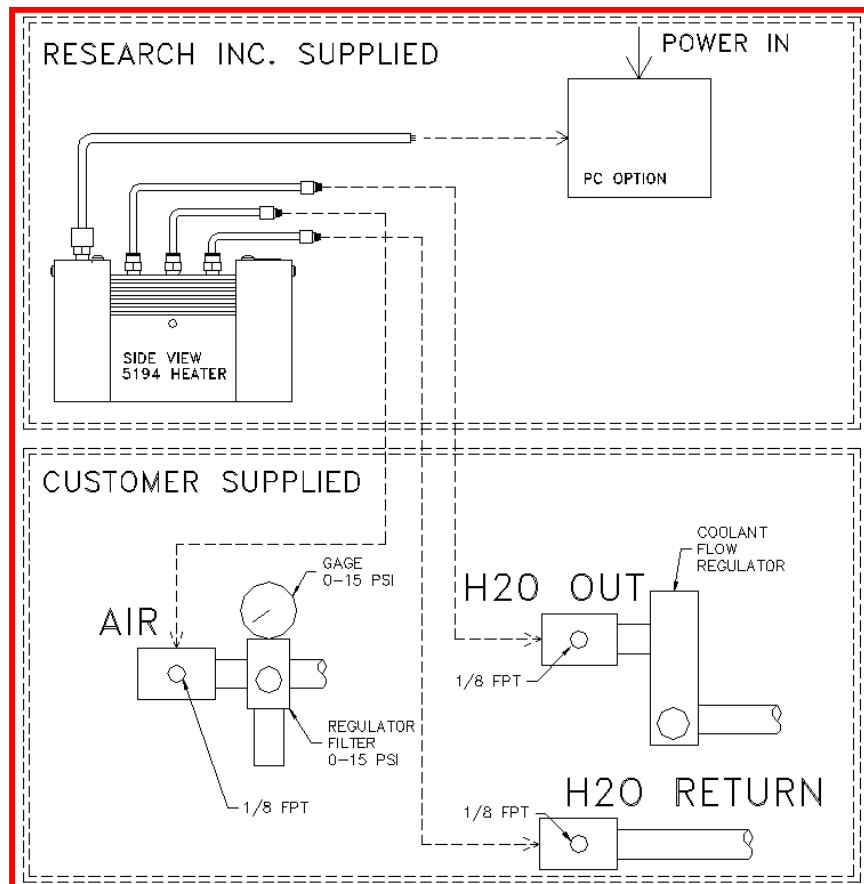


Figure 5-1. Typical Model 5194 Installation.

5.3 HEATER COOLING CONNECTIONS: Each Model 5194 is designed with three ‘quick-disconnect’ fittings protruding from the top of the heater cover. The two fittings located at the outer ends of the heater are the inlet/outlet cooling water ports. The single fitting located at the center of the heater is the cooling air inlet port.

All three fittings accept 1/4-inch outer-diameter flexible nylon tubing. A 30-ft. (9.1 m) length of tubing and three additional quick-disconnect fittings are shipped with each Model 5194 heater. The tubing should be cut to specific lengths so that both cooling water and compressed air can be supplied to the heater. The additional fittings should be used for connecting the tubing directly to the cooling water and compressed air source.

Once cut to the appropriate lengths, each individual tube length should be inserted into the appropriate fittings on both the heater and the cooling water and compressed air sources. Figure 5-2 details a typical installation for the Model 5194 heater.

Proper coolant flow must be maintained during operation of the heater. See Section 3 – Specifications for required cooling water and compressed air flow for each Model 5194 heater size.

5.4 ELECTRICAL CONNECTIONS: The T3 lamp of the Model 5194 is electrically wired to an intermediate terminal block within the heater.

Each heater is supplied with an 8-foot (2.4 m) electrical cable. If ordered with the controller option, this cable is directly hard wired into the Model 5420 power controller.

Section 6 – MAINTENANCE

The repair and maintenance of the Model 5194 includes replacement of the T3-style lamp and quartz window and cleaning of the reflector.

6.1 LAMP REMOVAL/REPLACEMENT/INSTALLATION: The T3-style lamp is installed into the Model 5194 heater when shipped from the factory. The following procedure details the process to replace the lamps in the Model 5194 (reference Figure 6-1, 6-2, & 6-3):

Note:

- *Remove all power from the heater BEFORE attempting to install/replace the lamp.*
- *Allow a minimum of 1/2-inch (12 mm) of slack in the lamp lead so that the lead is not taut when inserted into the lamp terminal block.*
- *Always take care to handle all lamps by the ceramic end seals and use clean cotton or latex gloves to prevent contamination of the quartz lamp envelope.*

1. Remove end-cover screws (2 per end cover).
2. Remove end covers on both ends of the heater.

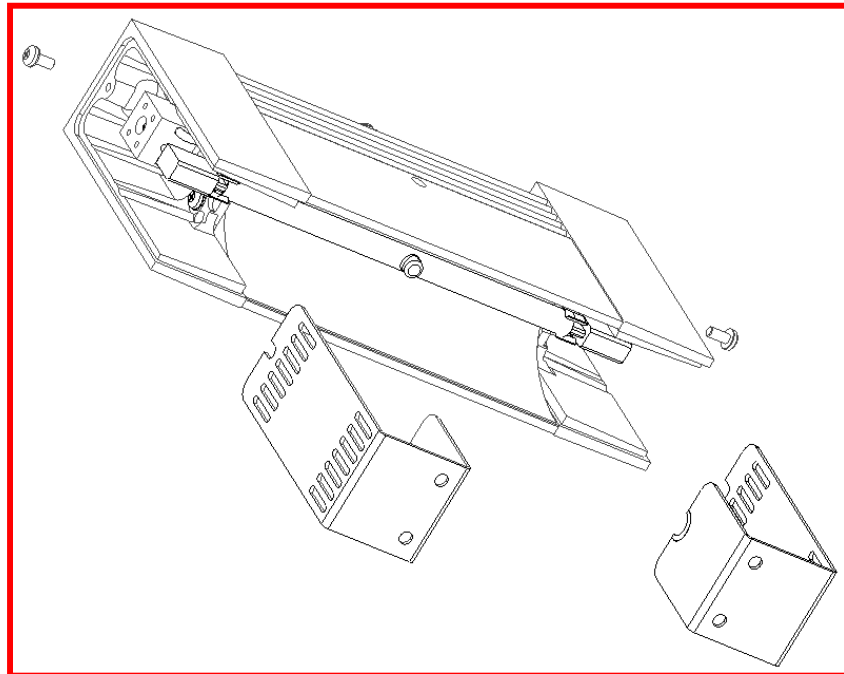


Figure 6-1. Model 5194 End Cover Removal.

3. If installed in the heater, remove the quartz window from the heater by sliding the window out of the slots machined into the reflector body (see Figure 6-2). Take this opportunity to clean the window using isopropyl alcohol and a clean, soft cotton cloth (see Section 6-2).

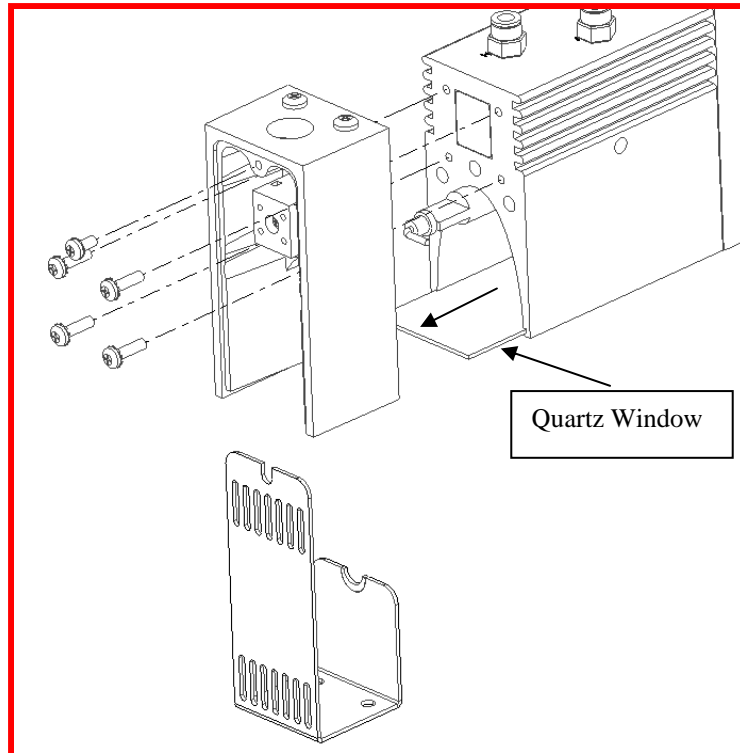


Figure 6-2. Model 5194 Quartz Window Removal.

4. Loosen (do not remove) the setscrews in the ceramic terminal block on each end of the heater (see Figure 6-3).

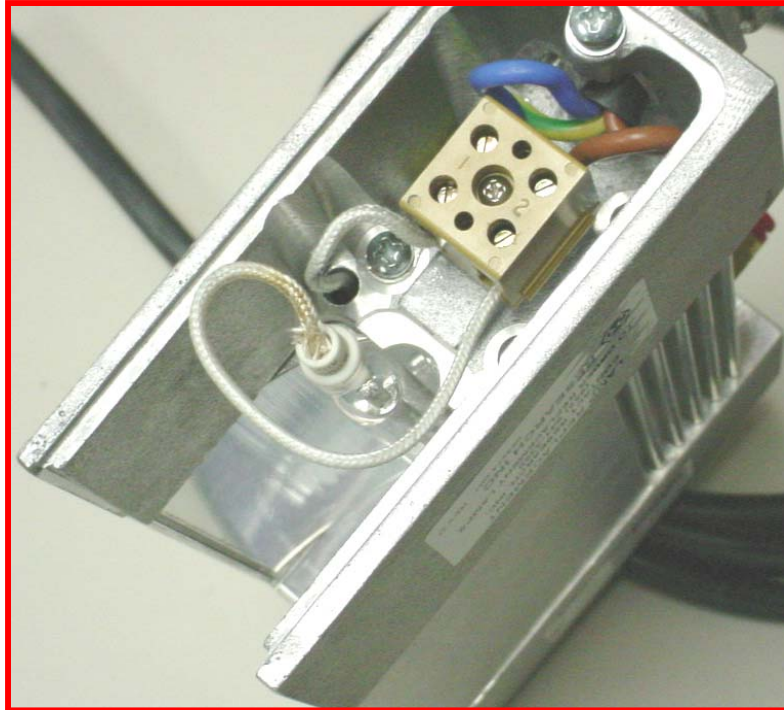


Figure 6-3. Model 5194 Lamp Removal.

5. While holding the lamp, gently pull the lead wires out of the ceramic terminal blocks, out of the lamp clips, and set the old lamp aside for disposal. (Models 5194-02 and 5194-04 do not have lamp clips, but a half-circle groove that the lamp fits in.)
6. While holding the replacement lamp by the ceramic end seals, place the lamp into the lamp clips located on each end of the heater. Orient the lamp so that the gas fill tip, formed into the quartz tube of the lamp, points out away from the reflector.
7. Insert the bare wire of each insulated lamp lead into the ceramic terminal block position that previously held the old lamp. Push each lead wire into the terminal block far enough so, that when tightened, the setscrew will hold the lead securely.
8. Tighten the setscrews in each terminal block so the lead wires are held securely.
Note: tighten the terminal block set screws to a torque of 0.6 Ft.-Lbs. [0.82 N-m].
9. Form a loop within each lead along its length from the top of the cooling manifold and the ceramic terminal block. This loop will act as a strain relief within the lead during normal operation of the heater.
10. Reinstall the quartz window within the heater by carefully sliding the window into the grooves machined into the heater reflector.
11. Reinstall both end covers and secure each to the heater with the two screws per end cover.
Note: tighten the end cover screws to a torque of 1.7 Ft.-Lbs. [2.3 N-m].

6.2 Quartz Window Cleaning and Replacement: The optional quartz window can be replaced or removed from the Model 5194 for periodic cleaning. Use the following procedure to remove/reinstall/clean the quartz window:

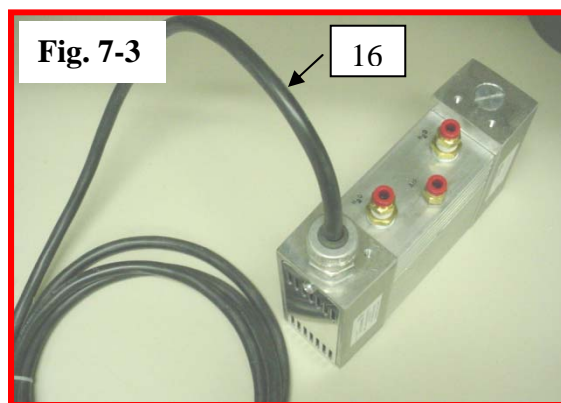
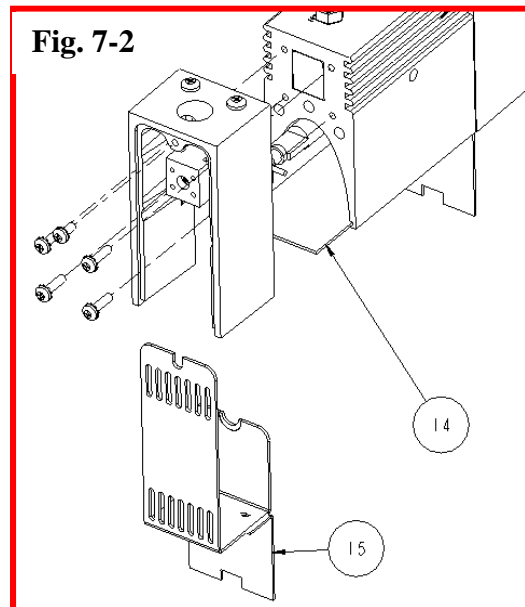
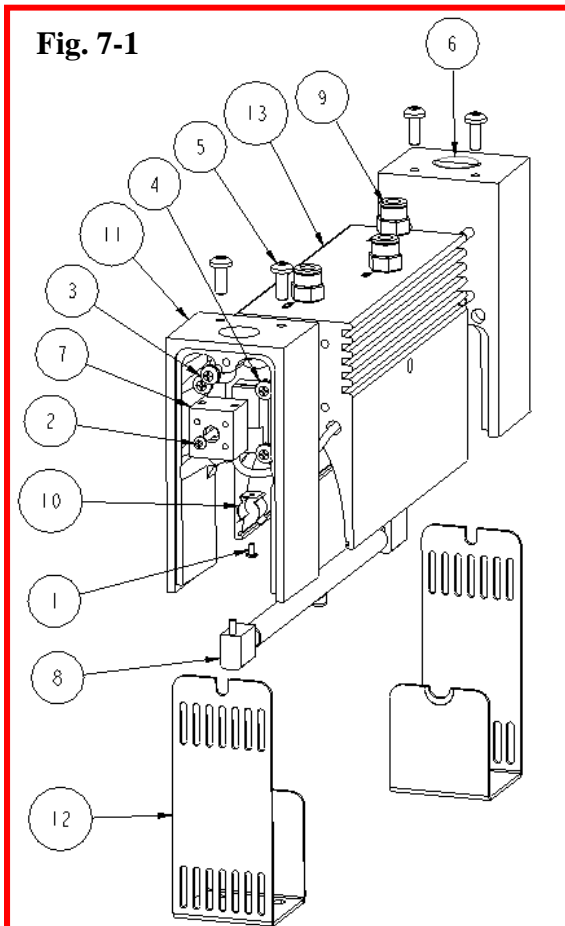
1. Remove the two end-cover screws and the end cover from one end of the heater.
2. Gently slide the quartz window out of the grooves within the heater reflector. Take care so that the quartz window does not bind and subsequently chip or crack as it is removed.
3. If cleaning the window, use isopropyl alcohol and a clean, dry, lint-free cloth. After cleaning, do not touch the inside surface of the window unless wearing cotton gloves.
4. Reinsert the edges of the window into the grooves machined into both sides of the reflector body.
5. Gently push the window into the reflector until it is completely seated against the end cover mounted to the heater.
6. Reinstall the other end cover and secure with the two end cover screws.

6.3 Cleaning the Reflector: A clean reflector provides the greatest radiant efficiency. If the reflector surface becomes contaminated, it reflects less energy. The energy that is not reflected is absorbed by the reflector, and removed by the cooling water and air. This energy is lost energy.

The following procedure should be used to clean the Model 5194 reflector:

1. Remove the lamp as described in Section 6.1 – Lamp Removal/Replacement/Installation.
2. Clean the reflector with a mixture of warm water and common household ammonia followed by a thorough wipe-down using a clean, water-dampened flannel cloth.
3. Depending on the type of contamination present on the reflector, a suitable solvent may be required to remove the contamination. The solvent must be selected based on its inability to adversely affect the aluminum reflector.
4. Thoroughly wipe the reflector using the warm water/household ammonia mixture followed by the dampened flannel cloth.
5. Replace the lamps, quartz window (if so desired), and the heater end covers as outlined in Section 6.1 – Lamp Removal/Replacement/Installation.

Section 7 – SPARE & REPLACEMENT PARTS



Figures 7-1, 7-2, 7-3. Model 5194 Parts Identification.

Replacement parts for the Model 5194 are listed below. Reference Figures 7-1, 7-2, and 7-3 when using this list.

ITEM	PART NO.	DESCRIPTION	5194-02	5194-04	5194-05	5194-10	5194-16	5194-25	5194-38
1	054979-001	Panhead Screw, 2-56X3/16	N/A	N/A	2	2	2	2	2
2	054979-026	Panhead Screw, 4-40X3/4	2	2	2	2	2	2	2
3	054979-097	Panhead Screw, 8-32X3/8	2	2	2	2	2	2	2
4	054979-099	Panhead Screw, 8-32X5/8	8	8	8	8	8	8	8
5	054979-123	Panhead Screw, 10-32X.5	4	4	4	4	4	4	4
6	063042-001	Plug, 1/2NPT X 1/4LG	1	1	1	1	1	1	1
7	100571-004	Terminal Block, 20A	2	2	2	2	2	2	2
8	106587-001	Lamp-QIH120-1000W	1						
	106587-002	Lamp-QIH120-2000W		1					
	103390-002	Lamp-QIH240-1000W			1				
	103390-004	Lamp-QIH240-2000W				1			
	103390-012	Lamp-QIH240-3000W					1		
	103390-008	Lamp-QIH600-5000W						1	
	103390-010	Lamp-QIH480-3800W							1
9	103830-001	Fitting-1/8NPT x 1/4"	3	3	3	3	3	3	3
10	103831-001	Spring Clip	N/A	N/A	2	2	2	2	2
11	106584-002	End Casting	2	2	2	2	2	2	2
12	106585-001	End Cover	2	2	2	2	2	2	2
13	106606-001	Reflector-5194-02	1						
	106606-002	Reflector-5194-04		1					
	106606-003	Reflector-5194-05			1				
	106606-004	Reflector-5194-10				1			
	106606-005	Reflector-5194-16					1		
	106606-006	Reflector-5194-25						1	
	106606-007	Reflector-5194-38							1
14	W-5194-02	Option-Quartz Window Kit, 5194-02	1						
	W-5194-04	Option-Quartz Window Kit, 5194-04		1					
	W-5194-05	Option-Quartz Window Kit, 5194-05			1				
	W-5194-10	Option-Quartz Window Kit, 5194-10				1			
	W-5194-16	Option-Quartz Window Kit, 5194-16					1		
	W-5194-25	Option-Quartz Window Kit, 5194-25						1	
	W-5194-38	Option-Quartz Window Kit, 5194-38							1
15	034766-001	Option-End Reflector Kit, 5194-XX	1	1	1	1	1	1	1
16	106684-001	Power Cable Assembly, 8ft	1	1	1	1	1	1	1