

400 Series

Spin-on Fuel Filter/Water Separators

Instruction Part Number 22209 Rev F



Overview

400 Series Spin-on Fuel Filter/Water Separators are designed to handle today's tough gasoline and diesel filtration problems and may be used on the vacuum or pressure side of the fuel transfer pump.

Filtration needs should be based on application, fuel quality, operating climates, and maintenance schedules.

If you have questions about this product, contact our Technical Support Department, 8 AM to 5 PM, Pacific Standard Time, Monday through Friday, at (800) 344-3286 ext. 7555.



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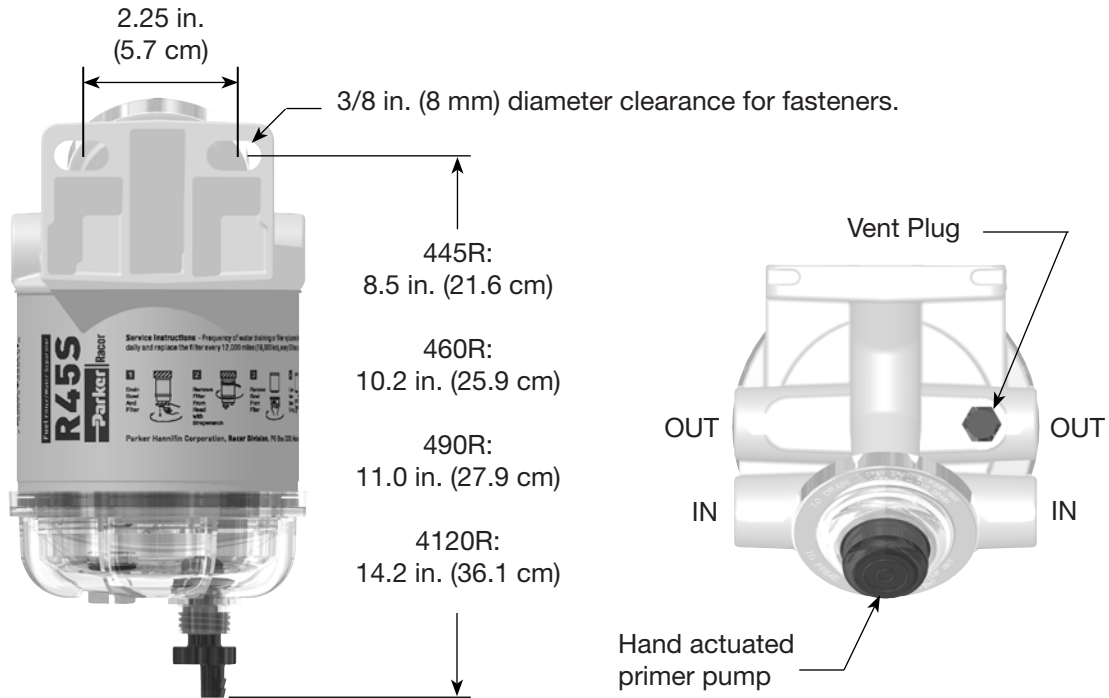
Product Features:

- Hand (palm) operated fuel priming pump
- Proprietary, high-capacity, water-repelling Aquabloc®II filters available in 2, 10, and 30 micron.
- Reusable contaminant collection bowls with self-venting drain.
- 4-port die-cast aluminum head (two inlets, two outlets) and a unitized mounting bracket for installation convenience.
- Optional 12 or 24 volt DC, 200 watt, in-bowl fuel heater, water detection kit, and vacuum gauge available. *Danger! Optional parts are not for use with gasoline applications.*

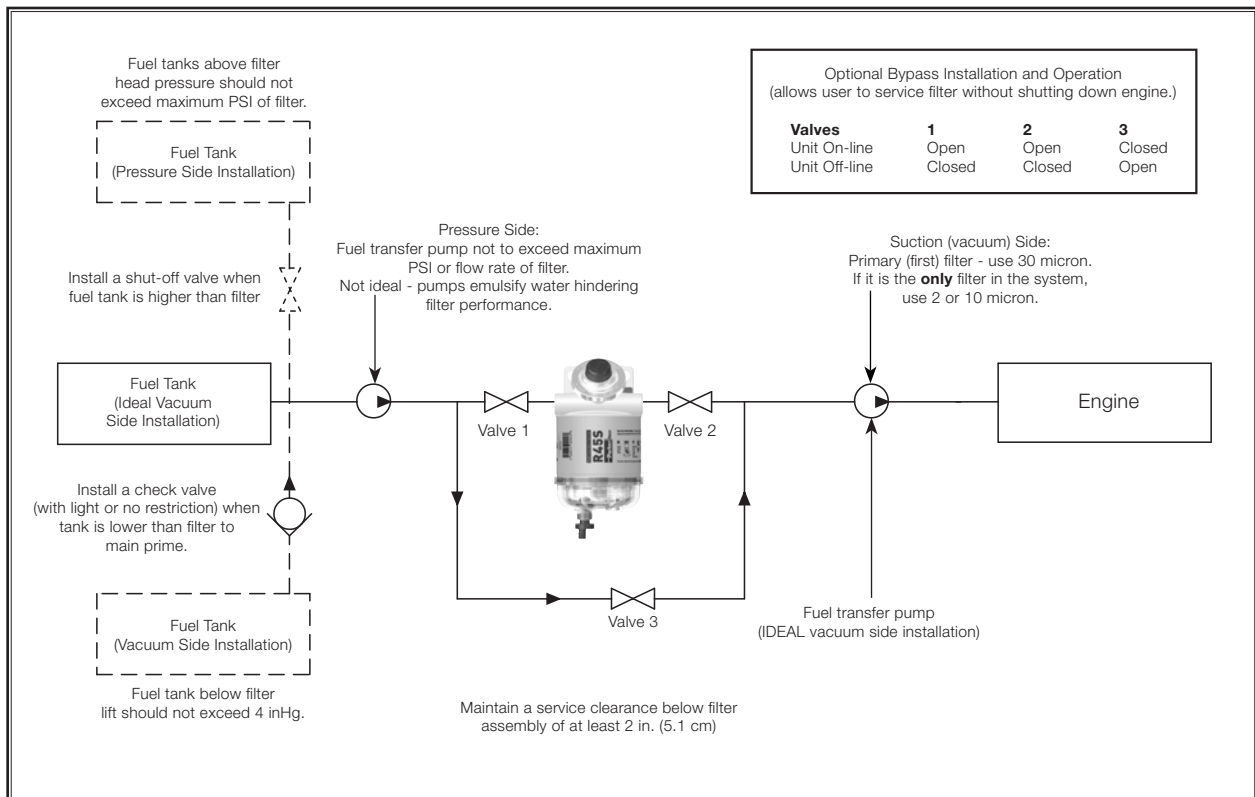


ENGINEERING YOUR SUCCESS.

Mounting



Installation Diagram



Installation Guidelines

Refer to Mounting Instructions and Installation Diagram and install as follows:

1. Make sure engine is off and cool to touch.
2. 445R, 460R and 490R: Apply thread sealant to NPT fittings (do not use thread tapes as particles may break off and contribute to clogging element). 4120R: Apply motor oil or diesel fuel to O-ring on UNF fittings.
3. Thread fittings into appropriate fuel ports and tighten snugly. Plug unused ports (if any) with port plugs and tighten snugly.
4. Mount filter vertically in a protected area and away from heat sources. Maintain at least 2.0" (5.1 cm) of clearance below filter for draining water and servicing element.
5. Attach fuel lines to filter. Avoid tight bends and rubbing areas when routing hose.
6. Connect water probe and heater wires (if equipped).
7. Open vent plug and operate hand primer pump until fuel purges from vent.
8. Close vent plug and start engine. Correct as necessary with engine off.

Service

Element replacement frequency is determined by contamination level in fuels. Fuel flow to engine becomes restricted as element gradually plugs with contaminants, resulting in noticeable power loss and/or

hard starting. As a guideline, change element every 500 hours, 10,000 miles, every other oil change, annually, or at first indication of power loss, whichever occurs first. Always carry extra replacement elements as one tankful of excessively dirty fuel can quickly plug a filter.

1. Make sure engine is off and cool to touch.
2. Close all fuel valves, if applicable, to make sure excess fuel does not spill during servicing.
3. Disconnect water probe and heater connectors, if equipped.
4. Open vent plug on mounting head.
5. Drain unit of fuel.
6. Remove bowl and element. Dispose of element properly. Bowl is reusable.
7. Lubricate new element seals with motor oil or clean fuel and install only with new element.
8. Re-install bowl and tighten by hand only - do not use tools.
9. Connect water probe and heater connectors, if equipped.
10. Open all fuel valves, if applicable.
11. Operate hand primer pump until fuel purges from vent.
12. Close vent plug and start engine. Correct as necessary with engine off.

Draining the Collection Bowl

Water is heavier than fuel and will settle to bottom of bowl and appear different in color if collected in a clear jar. In high

humidity environments, check bowl frequently (daily if a poor fuel source is suspected). 400 Series bowls are equipped with a water sensor port that will accept a water probe (sold separately) and will alert operator of a high water condition in the filter.

Do NOT use water probe electronics in gasoline applications - an explosion could occur.

1. Make sure engine is off and cool to touch.
2. Open vent plug.
3. Drain water from filter by opening self-venting drain. Close as soon as all water has evacuated.

If drain is open too long, the entire filter may drain completely of water and fuel.

4. Follow priming instructions.

Priming

1. Prime filter by operating hand primer pump until fuel spills out of vent port.
2. Close vent plug snugly.
3. Verify all other connections are tight.
4. Start engine and check for leaks. Correct as necessary with engine off.

Trouble Shooting

If filter fails to hold prime, first check vent plug, drain valve, fittings, head, element, and bowl are properly tightened. Next, check fuel line connections and verify they are free of pinches or unnecessary bends and check to see if fuel tank strainer (or pick-up tube) is clogged. If problems persist and element is new, call Racor Technical Support at 800-344-3286, 8 AM to 5 PM, Pacific Standard Time.

Installing Optional Features

Optional In-Bowl Heater:

The in-bowl heater is a cold weather starting aid with an internal automatic thermostat that turns the heater on if fuel temperature drops below 45°F (7°C). Heat is supplied just below the filter to melt wax crystals and allow fuel to efficiently pass through. The heater will automatically turn off at about 75°F (24°C). The 200 watt heater is available in 12 or 24 vdc (volts, direct current). The heater is operated by turning on the ignition switch for a minimum of 5 minutes prior to starting the engine.

Customer Supplied Items:

1. Because of the heater power demand, 20 amps for the 12 vdc and 10 amps for the 24 vdc, an additional relay is recommended for the safest method of installation. Racor offers two relay kits, available from your dealer, RK 11861

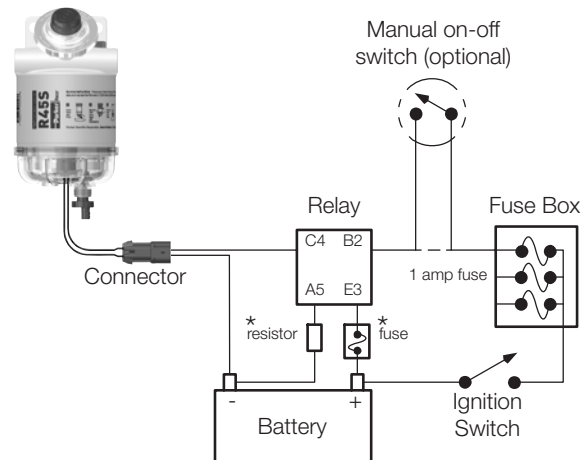
for the 12 vdc systems or RK 11862 for the 24 vdc systems. These kits include an in-line fuse holder (and fuse) and the RK 11862 kit also includes a resistor. Use the 25 amp fuse with the 12 vdc and the 15 amp fuse (and resistor) with the 24 vdc systems. See page 11 for more details.

2. An on-off toggle switch may be used to control power to heater relay. This allows the operator to cut power to heater relay during summer.

3. All wires should be 14 AWG (American Wire Gauge), minimum.

Installation:

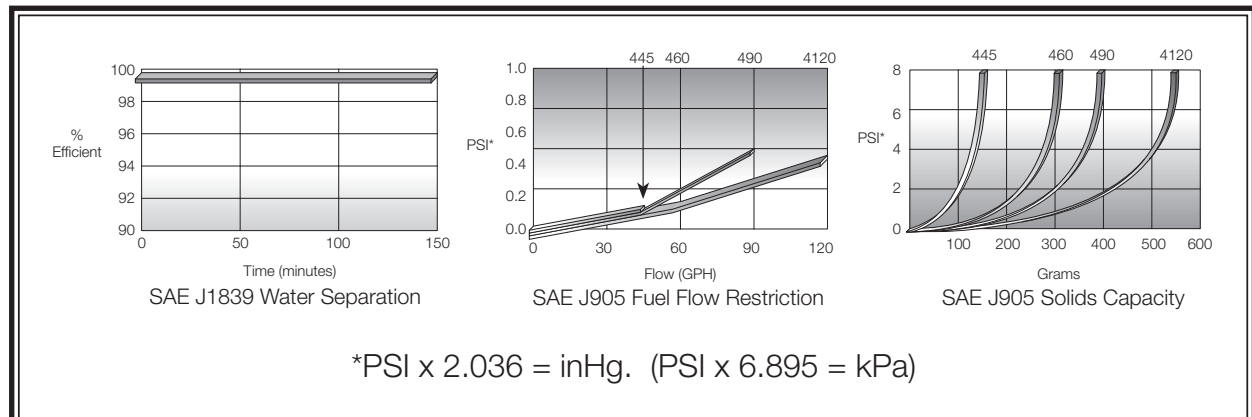
1. Either heater wire may be used for Hot (+) or Ground (-).
2. Wire/terminal connections should be soldered and crimped.
3. Run wires in protected locations. Avoid hot surfaces and places that could pinch or rub on the wires.



* Use the 15 amp fuse and resistor with 24 vdc systems.

Performance Information

Test results are from controlled laboratory testing. Field results may vary.



Specifications



	445R	460R	490R	4120R
Max. Flow Rate	45 GPH (170 LPH)	60 GPH (227 LPH)	90 GPH (341 LPH)	120 GPH (454 LPH)
Fuel Port Size	3/8"-18 NPTF (SAE J476)	3/8"-18 NPTF (SAE J476)	3/8"-18 NPTF (SAE J476)	3/4"-16 SAE (SAE J1926)
Total Number of Ports: (total inlets) (total outlets)	4 2 2	4 2 2	4 2 2	4 2 2
Min. Service Clearance	2.0 in. (5.1 cm)	2.0 in. (5.1 cm)	2.0 in. (5.1 cm)	2.0 in. (5.1 cm)
Center Threads	1"-14	1"-14	1"-14	1"-14
Height	9.3 in. (23.6 cm)	11.0 in. (27.9 cm)	11.8 in. (30.0 cm)	15.0 in. (38.1 cm)
Width	4.5 in. (11.4 cm)	4.5 in. (11.4 cm)	4.5 in. (11.4 cm)	4.5 in. (11.4 cm)
Depth	4.8 in. (12.1 cm)	4.8 in. (12.1 cm)	4.8 in. (12.1 cm)	4.8 in. (12.1 cm)
Weight (dry)	2.5 lb (1.1 kg)	2.7 lb (1.2 kg)	2.9 lb (1.3 kg)	3.9 lb (1.8 kg)
Clean Pressure Drop	0.17 PSI (0.01 bar)	0.39 PSI (0.03 bar)	0.95 PSI (0.07 bar)	0.85 PSI (0.06 bar)
Max. Pressure¹	30 PSI (2.07 bar)	30 PSI (2.07 bar)	30 PSI (2.07 bar)	15 PSI (1.03 bar)
Available Options:² (water sensor) (heater) ³	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Bowl Capacity (water) (with heater)	4.0 oz. (118 ml) 3.5 oz. (104 ml)	4.0 oz. (118 ml) 3.5 oz. (104 ml)	4.0 oz. (118 ml) 3.5 oz. (104 ml)	2.8 oz. (82 ml) 2.4 oz. (70 ml)
Water Removal Efficiency	99%			
Ambient Temp. Range	-40° to +255°F (-40° to +121°C)			
Max. Fuel Temp.	190°F (32°C)			

¹ Pressure installations are applicable up to maximum PSI shown. Vacuum installations are recommended.

² Do not use with gasoline applications.

³ Maximum power requirements for in-bowl heater option: 12 vdc (200 watt) = 16.6 amps,
24 vdc (200 watt) = 8.3 amps. See section on heater relay kits, if needed.

445R, 460R, and 490R Replacement Parts

<u>Part No.</u>	<u>Description</u>
1. RK 10110	Metal Vent Plug Kit (3/8"-24 SAE)
2. RK 22425	Mounting Head Kit (3/8"-18 NPTF Ports) (includes head, #1, #3 and #4)
RK22168-05BP	Mounting Head Kit (16 mm X 1.5 Ports) (includes head, #1, #3 and #4)
3. RK 22798	Bypass Valve
4. RK 20505	Element Gasket Kit
5.	See Replacement Element Chart
6. RK 22333	Bowl Gasket Kit
7.	Replacement Bowl Kits (includes bowl, #6, #8, and #9)
RK 21113-13-11	Clear Bowl Kit
RK 22616-01**	Heated Bowl Kit (Clear bowl with 12 vdc heater)
RK 22616-02**	Heated Bowl Kit (Clear bowl with 24 vdc heater)
8. RK 20126	Plug Kit (1/2"-20 SAE)
9. RK 30476	Self-Venting Drain Kit

Additional Parts (not shown)

RK 22323** Heater Connector Kit

** In-bowl heater may require a Heater Relay Kit.
Maximum power requirements:
12 vdc = 16.6 amps, 24 vdc = 8.3 amps.



4120R

Replacement Parts

<u>Part No.</u>	<u>Description</u>
1. RK 10110	Metal Vent Plug Kit (3/8"-24 SAE)
2. RK 22168	Mounting Head Kit (3/4"-16 SAE Ports) (includes head, #1, #3 and #4)
3. RK 22798	By-Pass Valve Kit
4. RK 20505	Element Gasket (includes #4 and #6)
5. Replacement Elements	
R120S	2 micron
R120T	10 micron
R120P	30 micron
6. RK 22333	Bowl O-ring
7. Replacement Bowl Kits (includes bowl #6, #8 and #9)	
RK 30063	Clear Bowl Kit
RK 30900**	Heated Bowl Kit (Clear bowl with 12 vdc heater)
RK 30925**	Heated Bowl Kit (Clear bowl with 24 vdc heater)
8. RK 20126	Plug Kit (1/2" SAE)
9. RK 30476	Self-Venting Drain Kit

** In-bowl heater may require a Heater Relay Kit.
Maximum power requirements:
12 vdc = 16.6 amps, 24 vdc = 8.3 amps.



Replacement Elements

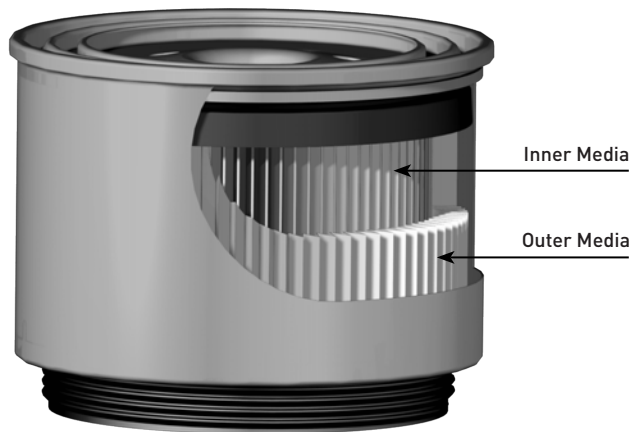
Model Number	2 micron (Final Filtration)	10 micron (Secondary Filtration)	30 micron (Primary Filtration)
445R	R45S or R47S	R45T	R45P
460R	R60S	R60T	R60P
490R	R90S	R90T	R90P
4120R	R120S	R120T	R120P



Optional Dual Layer Media Filter

Dual-layer media offers enhanced dirt-holding capacity, extended filter life, and ensures a more complete removal of all size contaminants. The R47S filter replaces the R45S and provides removal efficiencies of 99.98% (nominal) on 2 micron particles, still much greater than the 50-90% efficiency of most single-stage filters.

R47S



Vacuum Gauges

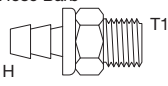
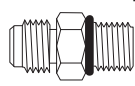
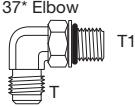
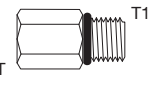
Vacuum gauges are available to monitor element condition and as the filter element slowly becomes clogged with contaminants the restriction (resistance to flow) increases. The fuel pump still tries to draw fuel (suction) but because of restriction, less fuel is delivered to engine and instead more air is pulled from it (fuel de-gassing). Results can cause engine to lose power and eventually stall.

By installing a vacuum gauge in the fuel system on the outlet side of the filter, visual monitoring of element condition is possible.



Specifications	RK 11233	1606B
<i>Description</i>	Silicone dampened, 0-30 inHg. Instrument panel installation.	Includes gauge and two fittings. Instrument panel installation.
<i>Threads</i>	1/4" NPT back bracket mount.	1/4" NPT back bracket mount.
<i>Dimensions</i>	2.0" W x 1.9" D	2.0" W x 1.9" D
<i>Dial</i>	2 in.	2 in.
<i>Weight</i>	0.4 lb (0.2 kg)	0.4 lb (0.2 kg)
Special Notes: For severe vibration applications, mount gauge on stable, remote location and connect using flexible tubing. Additional gauges available - contact your local distributor.		

Fittings

	Description	Hose (H)/ Thread (T)	T1	Part No.
For 445R, 460R, and 490R models	Hose Barb 	3/8" 1/2"	3/8" NPT 3/8" NPT	951-N6-H6 951-N6-H8
For 4120R model		3/4"-16 SAE	3/4" SAE	911-O8-J8
	SAE 37° Elbow 	3/4"-16 SAE 7/8"-14 SAE	3/4" SAE 3/4" SAE	913-O8-J8 913-O8-J10
	NPT Female 	3/8"-18 NPT 1/2"-14 NPT	3/4" SAE 3/4" SAE	911-O8-F6 911-O8-F8

Note: The T1 side of the fitting threads into the mounting head ports.

Water Probe Kits

Racor offers a wide selection of water probes, each designed for use with particular models and installation requirements. These probes are available in various configurations to fit every Racor filter/separator. The water probe is only a component in the water detection system and will not work without a Racor electronic detection module.

RK 30880 has an electronic detection module built-in to its design and has the simplest installation procedure. Wiring instructions are supplied with each water detection module.



Specifications	RK 21069	RK 30964	RK 30880
Threads	1/2"-20 Threads	1/2"-20 Threads	1/2"-20 Threads
Description	One piece design with two wires. Requires a detection module.	Includes detachable 2-wire connector. Requires a detection module.	Includes detachable 3-wire connector, built-in detection electronics and under-dash warning light. Probe sends ground signal to light.
Voltage	12 or 24 vdc	12 or 24 vdc	12 or 24 vdc
Power Draw: (12 volt) (24 volt)	N/A	N/A	5 Milliamps 10 Milliamps
Maximum Load	N/A	N/A	1 Amp
Weight	0.03 lb (0.01 kg)	0.02 lb (0.01 kg)	0.4 lb (0.2 kg)

Caution: Never wire a water probe directly to voltage or another brand of detection module.

Water Detection Modules

Racor Water Detection Kits are available for under dash, in-dash, and remote mount installation. These units may be used with any Racor fuel filter/

water separator and water probe. An electric detection module analyzes electrical resistance at the water probe and determines if water is present. Units reset

automatically after removing water (unless specified). All water detection module kits include an RK21069 water probe.

Under Dash Modules

Specifications	RK 12870	RK 12871
Voltage	12 vdc	24 vdc
Features	Light and Buzzer	
Description	Lamp illuminates and buzzer sounds when water is detected. Water must be drained to reset light and stop buzzer.	
Dimensions	1.4" H x 1.25" D x 1.4" W	
Power Draw	1 Milliamp	
Maximum Internal Load	30 Milliamps	
Weight	0.2 lb (0.1 kg)	

Part Number
RK 12870 or
RK 12871



Note: Additional modules available - contact your Racor distributor.

In-Dash Modules

Specifications	RK 20726
Voltage	12 or 24 vdc
Features	Light and Buzzer
Description	Red DRAIN lamp illuminates continuously and buzzer sounds momentarily when water is detected. Power-up self diagnosis feature and circuit protection included.
Dimensions¹	2.2" Diameter x 3.2" Depth
Power Draw: (12 volt) (24 volt)	3 Milliamps 13 Milliamps
Maximum Internal Load	30 Milliamps
Weight	0.4 lb (0.2 kg)

¹ Cut 2.0" diameter hole to mount gauges in instrument panel.

Part Number
RK 20726



Note: Additional modules available - contact your Racor distributor.

Remote Mount Modules

Specifications	RK 14329	RK 14321
Voltage	12 vdc	24 vdc
Features	Sends Hot (+) Signal	Sends Hot (+) Signal
Description	Receives signal from water probe or vacuum switch (not included) then sends a signal to horn or lamp. Must use with relay if power draw is over 1 amp.	Same as RK14329 but sends 24 vdc hot (+) signal.
Dimensions¹	0.7" H x 2.5" D x 2.8" W	1.0" H x 1.5" D x 2.0 W
Power Draw:	14 Milliamps	10 Milliamps
Maximum Internal Load	30 Milliamps	30 Milliamps
Weight	0.3 lb (0.1 kg)	0.4 lb (0.2 kg)

Part Number
RK 14329



Part Number
RK 14321



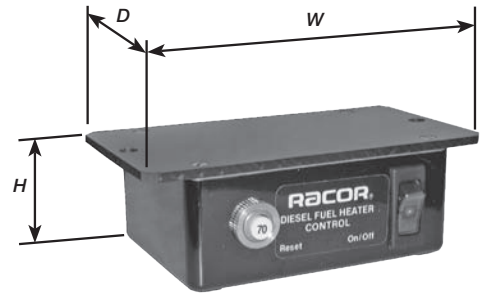
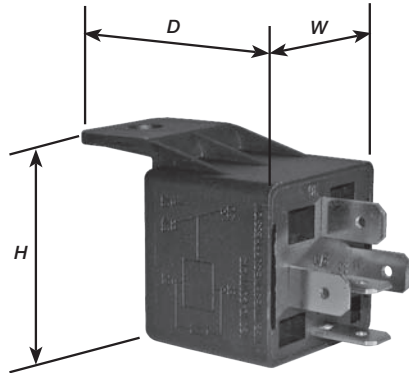
Note: Additional modules available - contact your Racor distributor.

Electrical Heater Relay Kits

The following relay kits may be necessary when installing Racor Heater Kits due to power demand. Standard OE fuses,

wiring and alternators may be unable to carry the load without overheating or shorting, creating a serious condition. Wire/

terminal connections should be soldered and crimped.



Specifications	RK 11861	RK 11862	RK 19490-12	RK 19490-24
<i>Description</i>	Heater Relay Kit, Includes fuse and holder.	Heater Relay Kit, Includes fuse and holder.	Heavy-Duty Relay Kit	Heavy-Duty Relay Kit
<i>Voltage</i>	12 vdc	24 vdc	12 vdc	24 vdc
<i>Detection Module</i>	Remote Mount	Remote Mount	Under Dash	Under Dash
<i>Maximum Watts</i>	300	360	600	900
<i>Maximum Amps</i>	25	15	50	37
<i>Dimensions</i>	1.3" H x 1.6" D x 1.1" W	1.3" H x 1.6" D x 1.1" W	1.7" H x 2.9" D x 5.1" W	1.7" H x 2.9" D x 5.1" W
<i>Weight</i>	0.3 lb (0.1 kg)	0.3 lb (0.1 kg)	1.6 lb (0.7 kg)	1.6 lb (0.7 kg)

Caution: If you are uncertain if your electrical system can provide the additional power draw, consult your equipment distributor or qualified electrician.

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