

# KF and KFS Series Electric Furnaces

## Installation Instructions



**⚠ DANGER**  
**SHOCK HAZARD: Shut off circuit breaker now**

**“WARNING: RISK OF ELECTRIC SHOCK. CAN CAUSE INJURY OR DEATH. DISCONNECT ALL REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING.”**

**CAUTION:** Turn off power source supplying the heater before attempting installation, maintenance or repairs. Lock or tag circuit breaker or fuse panel door. Failure to do so could result in serious electrical shock, burns, or possible death.

It is **extremely important** to verify the electrical power supply is the same voltage as the heater being installed. **240 and 480 Volt heaters are not interchangeable!** Powering a 480 Volt unit with 240 Volt supply wires will reduce the heater output by approximately 75% resulting in no motor power. Powering a 240 Volt unit with 480 Volt supply wires will destroy the heater and voids all warranties.

**CHECK:** Ensure blower wheel is free-turning and that element assemblies are in place. Be sure filter is in proper position and not torn or damaged. Check that blower housing and motor have not separated from element compartment.

**FIELD WIRING:** King furnaces come equipped with 60 Amp circuit breakers installed for protection of the furnace internal wiring only. They also serve as a disconnection means when required. A 240 Volt single phase circuit must be brought to each circuit breaker in the furnace as shown in the wiring diagram. The terminals are identified as L1-L2, L3-L4, L5-L6 and L7-L8. The kW size of the furnace determines how many circuits are required. The furnace power and electrical rating table indicates how many circuits each model furnace requires, the size of the branch circuit protection at the distribution panel and the wire size required from distribution panel to the furnace. Consult your local and national electric codes for answers to any questions. All wiring used must be approved for a minimum of 75°C. **NOTE:** No wire may have more than 120 VAC potential to ground. This must be checked on installation to avoid motor damage. Unit must be grounded by connection of groundwire from the distribution panel to the terminal provided in furnace. When the line voltage terminal block option is specified for single strike see wiring diagram for wire size and circuit protection requirements.

King furnaces can be installed with a minimum of 1 inch clearance for compact, space-saving installations in either vertical upflow, downflow or horizontal position. **When installed in the downflow position the combustible floor base accessory must be used.**

**NOTE:** The attached Underwriters Laboratories label pertains to the furnace only. It does not cover any air cooler, condensing unit or air cleaner, which may be used with the furnace. The optional QOU cabinets are designed for slip-in addition of an evaporator coil at a later date. Approval of the complete air conditioning system requires compliance with local codes.

**Dimensional Data**

A - 30½"  
B - 37½"

The height of the KFS furnace is the only dimension that changes. Please refer to selection chart to determine the size of unit.

FURNACE/AIR HANDLER

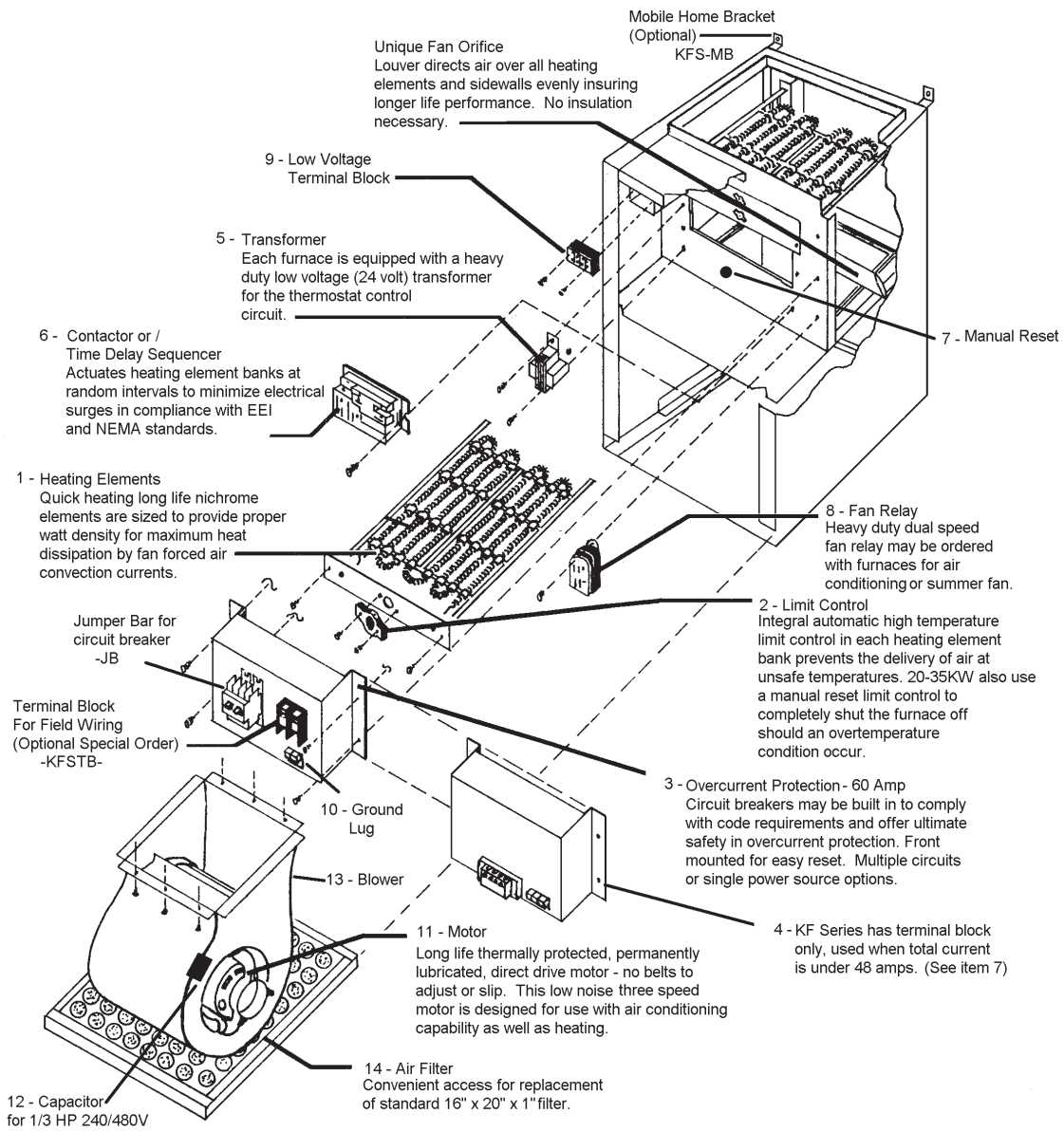
DIMENSIONAL CLEARANCE	
Cabinet sides	1 inch
Cabinet front	0 inches
Exhaust duct within 3 feet of furnace	1 inch
Return air plenum	0 inches

**typical horizontal installation**

**typical downflow installation**

Co-Combustible Floor Base Part No. KFSB

**typical upflow installation**



**ITEM PART NUMBER DESCRIPTION**

1	21-2405-00	Heating Element 5 kW / 240V
	21-2405-07	Heating Element 5 kW / 208V
	21-2405-9	Heating Element 5 kW / 480V
	21-2405-2	Heating Element 5.75 kW / 240V
	21-2405-12	Heating Element 5.75 kW / 240V
	21-2405-1	Heating Element 4 kW / 240V
	21-2405-6	Heating Element 4 kW / 480V
	21-3413-00	Heating Element - 3 Ph 5 kW / 240V
21-3413-01	Heating Element - 3 Ph 5 kW / 480V	
2	60T11-201936	Auto. Limit Control - 60T11
3	QOU260	Circuit Breaker 60 Amp - 1 Ph Square D
	QOU360	Circuit Breaker 60 Amp - 1 Ph Square D
4	EB-200	Input Terminal Block - 1 Ph, 2P, 240V
	ED-2	Input Terminal Block - 1 Ph, 2P, 480V
	ERB-201	Input Terminal Block - 3 Ph, 3P, 240V
5	ED-3	Input Terminal Block - 3 Ph, 3P, 480V
	4000-09-E07K999	Low Volt Transformer 240 / 208
	4000-03-E07J999	Low Volt Transformer 277 / 24
	4000-04-E07K999	Low Volt Transformer 480 / 24

6	R8330	Sequencer (used prior to 1981)
	15SH22-30956	Sequencer (used after 1981)
	R8229A	Relay 28 Amp
	R8246A	Relay 46 Amp
7	60T25-330976	Manual Reset Limit
	10935H3	Manual Reset Button
8	9100233Q999	Dual Speed Fan Relay
9	ELD-5-034	Low Voltage Terminal Block
10	CA4SP	Ground Lug
11	5KSP39FGW057AS	1/5 HP 240V Motor
	5KSP39FGW244AS	1/5 HP 480V Motor
	5KCP39MGE250AS	1/3 HP 240V Motor
	5KSP39FGG136S	1/3 HP 480V Motor
	4M207G	1/2 HP 240V Motor
12	5KCP39M6J185S	1/2 HP 480V Motor
	DAO-3GJ005	Capacitor 3MP 370V
	DAO-3GJ007.5	Capacitor 7.5MF 370V
	DAO-3GJ010	Capacitor 10MF 370V
13	FURNACE BLOWER SMALL	Blower Small for 1/5 HP Motors
	FURNACE BLOWER LARGE	Blower Large for 1/3, 1/2 HP Motors
	120-8T-DD-.50PP	Blower X-Large for 1/2 HP Motors
14		Air Filter 1" x 16" x 20"

CATALOG #	PHASE	KILO-WATTS	BTU (000)	VOLTS	AMPS*	CIRCUIT PROTECTION				75° WIRE SIZE				# OF ELEM.	MOTOR		TEMPERATURE RISE			CABINET SIZE	WT. (lbs.)	
						L1 L2	L3 L4	L5 L6	L7 L8	L1 L2	L3 L4	L5 L6	L7 L8		VOLTS	HP	LOW	MED.	HIGH			
KFS2003-1	1	3	10.2	208	17.8	20					#10				1	208	1/5	12°	11°	9°	DIM. A	57
KFS2404-1	1	4	13.6	240	20	20					#10				1	240	1/5	16°	15°	13°	DIM. A	57
KFS2005-1	1	5	17.1	208	27.2	40					#8			1	208	1/5	20°	18°	16°	DIM. A	57	
KFS2405-1				240	24.2	30			#10													
KF4805-1				480	12.1	15					#14											
KFS2006-1	1	6	20.5	208	32.2	40					#8			2	208	1/5	24°	22°	19°	DIM. A	57	
KFS2010-1	1	10	34.1	208	51.4	60					#6			2	208	1/5	41°	37°	32°	DIM. A	65	
KFS2410-1				240	45	60			#6													
KF4810-1				480	22.5	30			#10													
KFS2412-1	1	11.5	39.2	240	51.3	70					#8	#10		2	240	1/5	47°	42°	36°	DIM. A	65	
KF4812-1				480	25.7	40			#8													
KFS2015-1	1	15	51.2	208	75.5	40	60				#8	#6		3	208	1/5	61°	55°	47°	DIM. A	74	
KFS2415-1				240	65.9	30	60		#10	#6												
KF4815-1				480	32.9	50			#6													
KFS2418-1	1	17.25	58.8	240	75.2	40	60				#8	#6		3	240	1/5	70°	63°	55°	DIM. A	74	
KF4818-1				480	37.6	50			#6													
KFS2020A-1	1	20	68.3	208	99.5	60	60				#6	#6		4	208	1/5	81°	73°	63°	DIM. B	76	
KFS2420A-1				240	86.7	60	60		#6	#6												
KF4820A-1				480	43.4	60	60		#6													
KFS2020-1	1	20	68.3	208	99.4	60	60				#6	#6		4	208	1/3	57°	51°	41°	DIM. B	76	
KFS2420-1				240	86.5	60	60		#6	#6												
KFS4820-1				480	43.4	60	60		#6													
KFS2422-1	1	22.5	76.8	240	96.9	60	60				#6	#6		4	240	1/3	57°	51°	41°	DIM. B	76	
KF4822-1				480	48.6	60	60		#6													
KFS2025-1	1	25	85.3	208	123.4	30	60	60			#10	#6	#6	5	208	1/3	72°	63°	51°	DIM. B	81	
KFS2425-1				240	107.4	30	60	60	#10	#6	#6											
KF4825-1				480	53.8	20	60	60	#12	#6												
KFS2030-1	1	30	102.4	208	147.4	60	60	60			#6	#6	#6	6	208	1/3	86°	76°	62°	DIM. B	85	
KFS2430-1				240	128.2	60	60	60	#6	#6	#6											
KF4830-1				480	65.7	30	60	60	#10	#6												
KFS2435-1	1	34.5	117.7	240	146.9	15	60	60	60		#14	#6	#6	#6	6	240	1/3	99°	87°	71°	DIM. B	85
KF4835-1				480	73.6	40	60	60	#8	#6												
CATALOG #	PHASE	KILO-WATTS	BTU (000)	VOLTS	AMPS*	CIRCUIT PROTECTION				75° WIRE SIZE				# OF ELEM.	MOTOR		TEMPERATURE RISE			CABINET SIZE	WT. (lbs.)	
						L1 / L2 / L3				L1 / L2 / L3					VOLTS	HP	LOW	MED.	HIGH			
KFS2405-3	3	5	17.1	240	15.4	20				#10				3	240	1/5	30°	25°	20°	DIM. A	74	
KF4805-3				480	7.7	10																
KFS2009-3	3	9	30.7	208	28.3	40				#8				3	208	1/5	37°	33°	28°	DIM. A	74	
KF2009-3				480	13.7	40				#8												
KFS2410-3	3	10	34.1	240	27.4	40				#8				3	240	1/5	41°	37°	32°	DIM. A	74	
KF4810-3				480	13.7	40				#8												
KFS2012-3	3	11.25	38.4	208	34.6	40				#8				3	208	1/5	46°	41°	35°	DIM. A	74	
KF2012-3				480	16.1	40				#8												
KFS2412-3	3	12	40.9	240	32.3	40				#8				3	240	1/5	49°	44°	38°	DIM. A	74	
KF4812-3				480	16.1	40				#8												
KFS2015-3				3	15	51.2	208	43.5	60				#6									3
KFS2415-3	240	45	50				#6															
KF4815-3	480	21.4	30				#10															
KFS2418-3	3	17.25	58.8	240	44.8	60				#6				3	240	1/5	70°	63°	55°	DIM. A	74	
KF4818-3				480	22.4	40				#8												
KFS2420-3	3	20	68.3	240	51.3	70				#6				4	240	1/3	57°	51°	41°	DIM. B	74	
KF4820-3				480	25.7	30				#12												
KFS2022-3	3	22.5	76.8	208	65.6	100				#3				6	208	1/3	64°	56°	46°	DIM. B	85	
KFS2424-3	3	24	81.6	240	60.9	75				#4				6	240	1/3	69°	61°	49°	DIM. B	85	
KF4824-3				480	30.5	50				#6												
KFS2030-3	3	30	102.4	208	86.5	110				#2				6	208	1/3	86°	76°	62°	DIM. B	85	
KFS2430-3				240	75.3	100				#3												
KF4830-3				480	37.3	50				#6												
KFS2434-3	3	34.5	117.7	240	86.2	110				#2				6	240	1/3	99°	87°	71°	DIM. B	85	
KF4834-3				480	43	60				#6												

\* Includes motor load

## CONVERSION OF TORQUE TO HORSEPOWER

The power requirements for the Direct Drive curves in this section are stated in torque units of ounce-inches and ounce to feet.

The formula listed below may be used to convert torque to horsepower.

### TORQUE IN OZ-IN

$$HP = \frac{\text{Torque (oz-in)} \times \text{RPM}}{1,008,400}$$

### TORQUE IN OZ-FT

$$HP = \frac{\text{Torque (oz-ft)} \times \text{RPM}}{84,033}$$

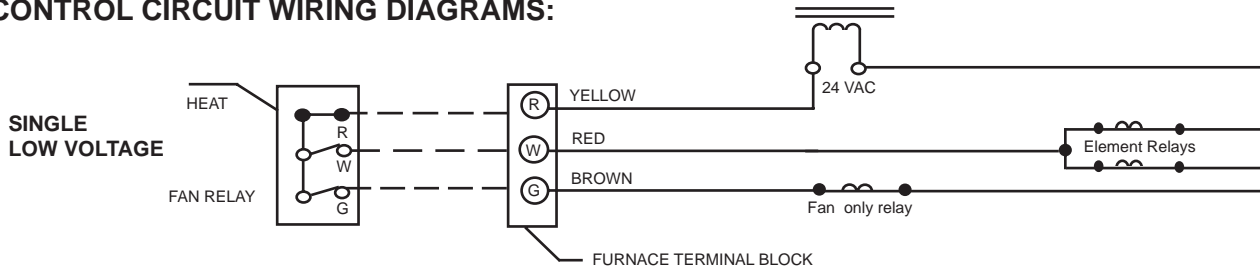
## HORSEPOWER FOR DIRECT DRIVE BLOWER WHEELS

RPM	TORQUE:								
	(Upper value in Oz-In)			(Lower value in Oz-Ft)					
		60 5	120 10	180 15	240 20	300 25	360 30	420 35	480 40
1200	0.04	0.07	0.14	0.21	0.29	0.36	0.43	0.50	0.57
1100	0.03	0.07	0.13	0.20	0.26	0.33	0.39	0.46	0.52
1000	0.03	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48
900	0.03	0.05	0.11	0.16	0.21	0.27	0.32	0.38	0.43
800	0.02	0.05	0.10	0.14	0.19	0.24	0.29	0.33	0.38

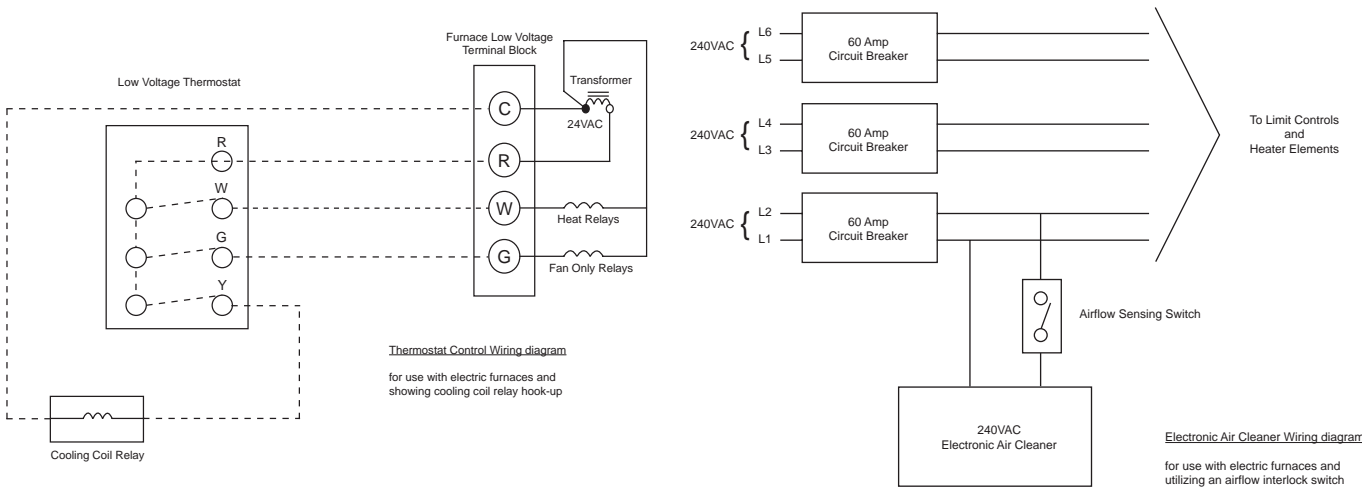
RPM	TORQUE:								
	(Upper value in Oz-In)			(Lower value in Oz-Ft)					
	600 50	720 60	840 70	960 80	1080 90	1200 100	1320 110	1440 120	1560 130
1200	0.71	0.86	1.00	1.14	1.29	1.43	1.57	1.71	1.86
1100	0.66	0.79	0.92	1.05	1.31	1.31	1.44	1.57	1.70
1000	0.59	0.71	0.83	0.95	1.19	1.19	1.31	1.43	1.55
900	0.54	0.64	0.75	0.86	1.07	1.07	1.18	1.29	1.39
800	0.48	0.57	0.67	0.76	0.95	0.95	1.05	1.14	1.24

AIR DELIVERY CHART								
MOTOR HP	MOTOR SPEED							
	MOTOR LOAD		LOW		MED		HIGH	
	VOLTAGE	AMPS	CFM	FPM	CFM	FPM	CFM	FPM
1/5	230	3.4	775	570	860	630	1000	735
	380 / 460	1.7						
1/3	230	3.2	1100	810	1250	920	1540	1130
	380 / 460	1.7						
1/2	230	3.8	1250	920	1540	1130	1750	1285
	380 / 460	1.9						
MOTOR WIRE COLOR			RED	BLUE	BLACK			
Air Volume = Cubic Feet Per Minute (CFM) Air Velocity = Feet Per Minute (FPM)								

## CONTROL CIRCUIT WIRING DIAGRAMS:



Heat Anticipatory Setting:  
Model KF or KFS 5 thru 18 = .4 amps  
Model KFS 20 thr 35 = .8 amps



**CONTROL WIRING:** Connect thermostat to terminals R and W for heating, R and G for cool air only. This can be done with a single stage heat-cool thermostat or a single stage heat-only thermostat and a separate fan-only switch to control the optional fan-relay installed on furnaces. Some models of furnace have optional two stage operation and are provided with terminals W1 and W2. If a single stage thermostat is used it should be connected to terminals R and W1 and a jumper wire installed from terminals W1 to W2 (*see enclosed control circuit wiring diagram*). Some models of furnace have the 24 VAC power available between terminal C and R for use with the external air conditioning blower relay option.

**OPERATION:** When the control thermostat is turned up to demand heat the blower and heating elements should be energized. Furnaces with sequences installed will have up to 30 seconds delay in start-up. When turned to cool position heat-cool thermostats should bring on the blower only for cooling air.

**MAINTENANCE**

**"CAUTION" Disconnect power at the main service panel before inspecting or cleaning this heater. Lock or tag breaker to prevent accidental shock.**

Because of its rugged design, superior engineering and quality craftsmanship and manufacturing the King KF-KFS Furnace requires little maintenance. With proper care your electric furnace should last a lifetime. To maintain the efficiency of the heater King recommends changing the air intake filter at least twice a year and checking the motor and blower for excessive dust / lint accumulation - your environment may require more frequent changes.

<b>TROUBLESHOOTER</b>		
<b>TROUBLE</b>	<b>POSSIBLE CAUSE</b>	<b>REMEDY</b>
Runs too often, Blows cold air	<ul style="list-style-type: none"> <li>• Thermostat heat anticipator set too low</li> <li>• CFM of motor set too high</li>   <li>• Motor overheating</li> </ul>	<ul style="list-style-type: none"> <li>• Replace with adjustable anticipated thermostat</li> <li>• Lower CFM of motor               <ul style="list-style-type: none"> <li>Red wire - low speed</li> <li>Blue wire - medium speed</li> <li>Black wire - high speed</li> </ul> </li> <li>• KFS5-18 should have 1/5 HP motor; 1/2 and 3/4 HP motors are optional</li> </ul>
Unit short cycles before thermostat calls for off	<ul style="list-style-type: none"> <li>• Thermostat anticipator set too low</li> <li>• Intermittent opening of thermostat or its wires</li> <li>• Heat element burned out</li> <li>• Circuit breaker off</li> <li>• Motor overheating</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust to .04 Amps for each sequencer in furnace</li> <li>• Repair or replace thermostat</li> <li>• Replace</li> <li>• Reset</li> <li>• Motor overheating</li> </ul>
Unit will not start	<ul style="list-style-type: none"> <li>• Thermostat wire is not connected</li> <li>• Circuit breaker is off</li> <li>• 24 Volt transformer burned out</li> <li>• Wire connection off or there are broken wires</li> <li>• Reset button tripped</li> <li>• Wrong voltage</li> </ul>	<ul style="list-style-type: none"> <li>• Repair</li> <li>• Reset</li> <li>• Replace</li> <li>• Repair or replace</li> <li>• Reset</li> <li>• Check the power source</li> </ul>
Motor will not stop	<ul style="list-style-type: none"> <li>• Defective sequencer or contactor</li> </ul>	<ul style="list-style-type: none"> <li>• Replace</li> </ul>
Unit goes off on high limit	<ul style="list-style-type: none"> <li>• Dirty air filter / ducts</li> <li>• Defective sequencer</li> <li>• Defective limit control</li> <li>• Power failure</li> </ul>	<ul style="list-style-type: none"> <li>• Replace</li> <li>• Replace</li> <li>• Replace</li> <li>• Reset manual limit push button 20-35 kW units</li> </ul>
Vibration noise	<ul style="list-style-type: none"> <li>• Blower assembly loose</li> </ul>	<ul style="list-style-type: none"> <li>• Secure blower and motor cage</li> </ul>
Unit has a buzzing sound when not in use	<ul style="list-style-type: none"> <li>• Low voltage transformer defective or loose</li> </ul>	<ul style="list-style-type: none"> <li>• Replace or tighten</li> </ul>
Unit continues to heat after room is up to set temperature - does not shut off	<ul style="list-style-type: none"> <li>• Defective sequencer</li> <li>• Defective thermostat</li> <li>• Thermostat wires to ground</li> <li>• Motor wires to ground</li> <li>• Thermostat accidentally shorted &amp; contacts are welded</li> </ul>	<ul style="list-style-type: none"> <li>• Replace</li> <li>• Replace</li> <li>• Repair</li> <li>• Repair</li> <li>• Replace</li> <li>- Make sure all connections are tight</li> </ul>

NOTE: When converting from oil, gas, etc. to electric, replace your old low voltage fixed-heat anticipator thermostat with one that has an adjustable heat anticipator.

## KING ELECTRIC FURNACE

1. Your King electric furnace has been designed to distribute heated air to your living quarters when connected to appropriate ducting.
2. On models KF5 & larger, the furnace operates under command of a low voltage wall thermostat.
3. Models KFS5 through KFS18 employ one sequencer relay, thus the thermostat heat anticipator should be set at 0.4.
4. Models KFS20 through KFS35 employ two thermal relays, thus the thermostat heat anticipator should be set at 0.8.

## SEQUENCE OF OPERATION

5. With the thermostat set at 70°F and a temperature drop to about 69°F, the thermostat's internal switch closes its contacts. About 30 seconds later the first heating element and the blower turn "ON". After another 30 seconds the second heating element is turned "ON" continuing in 30 second intervals until all the heating elements in the furnace are "ON".
6. When the thermostat is satisfied the "ON" process is reversed with the last element & blower turning "OFF" simultaneously.
7. Because of the many variables affecting heat loss (cold wall, sun rays, drafts, etc.) you may be more comfortable with the thermostat set higher or lower than 70°F. It will take some experience to find a comfortable setting.
8. Your King electric furnace may be equipped with a cooling coil to accomplish summer cooling. It may also be equipped with an electronic air cleaner to reduce dust, pollen and other household respiratory irritants.
9. If the furnace does not have an electronic air cleaner the filter will need to be replaced several times during the year or whenever it becomes clogged. King recommends changing the filter at least twice yearly.
10. The furnace cannot deliver warm air when:
  - (a) all electric circuit breakers are turned "OFF".
  - (b) the furnace filters are clogged with dirt and dust. Air is the vehicle for heat transfer. In order to deliver warm air an equal amount of cold air must be drawn back to the furnace.
  - (c) the thermostat heat anticipator is set wrong - see *paragraph three and four above*.
  - (d) the furnace cold air return registers are blocked with furniture, throw rugs, etc.
  - (e) the furnace warm air registers are blocked with furniture, throw rugs, etc.
11. If the furnace is equipped with a cooling coil the "Outdoor Condensing Unit" must be turned "ON" when summer cooling is required and the thermostat must be switched to the "Cooling" position with the temperature set around 76°F. Adjust temperature as necessary to find your individual comfort level.
  - (a) On furnaces with cooling provisions the heat-cool thermostat has a HEAT/OFF & COOL position. The fan section has an AUTOMATIC and ON position.
  - (b) For heating the system switch must be moved to HEAT position and the fan section should be set to AUTOMATIC.
  - (c) For cooling set the system to COOL and the fan section to ON. The fan will run constantly with the outdoor condensing unit running only when your thermostat calls for cooling.
  - (e) If the fan needs to run continuously in either HEAT or COOLING set fan system to ON.
  - (f) The OFF position shuts down both heat and cooling and also shuts off the fan.
  - (g) In winter do not leave home with the furnace turned OFF. Instead set the thermostat to about 40°F with the furnace system in the HEAT position. Doing this reduces the possibility of the indoor plumbing freezing.
12. If the furnace is equipped with an electronic air cleaner it must be cleaned several times during the year. You will want to study the HOME OWNER'S MANUAL supplied with the electronic air cleaner.

## MANUFACTURED HOUSING

### DOWNFLOW INSTALLATION

1. Select a suitable, centralized location of the furnace (a closet, alcove or utility room).
2. The site selection must have adequate return air capability and must be located directly above existing or the planned location of the charge plenum.
3. Cut a 15" x 15" opening in the floor exposing discharge plenum (or its intended location).
4. Place the base for combustible floor application into the floor opening. Secure it to the floor with screws (at least one on each side).
5. Put the duct connector into the base opening and mark plenum for cutting where the duct connector rests on it.
6. Remove the duct connector and cut to the outside of marking on plenum. Remove cut metal.
7. Replace duct connector back down through floor base. Bend alternate pre-cut tabs of duct connector 90° outward. Press duct connector into plenum and bend remaining tabs into the plenum so it is firmly attached.
8. If necessary cut the top of duct connector so it is below the top of floor base, approximately 1".
9. Make the air duct tight by applying 2" duct tape to the tabbed-in portion of duct connector at the plenum opening and around the top of duct connected inside the floor base.
10. Attach the duct connector to floor base using four (4) #8 hex head 1/2" self tapping screws.
11. Remove air filter from furnace. Set the furnace onto the combustible floor base with the filter end of the furnace facing upward. Replace filter in furnace.
12. Make sure power is off on electrical circuits.
13. Remove door of furnace and bring proper electrical wiring into an appropriate opening provided and connect wiring per instructions on wiring diagram.

**NOTE:** If needed, make sure any return air grille has a free air area of not less than 196 square inches