

Environmental Control

Skil-aire™

Do It Up! *A Division of Tithe Corporation*

Excellence In Ceiling and Floor
Air Conditioning Systems

**Installation, Operations
& Maintenance Manual**

**Floor Mounted
Precision A/C's
3-10 Tons**



Guardian-I™

INTRODUCTION



Thank you for your selection of an Skil-aire floor mounted Guardian-II precision air conditioner by Skil-aire A/C's.

Skil-aire floor mounted air conditioners are designed and constructed using the finest available materials and components for years of trouble free service.

INSPECTION OF EQUIPMENT

Upon receipt of the unit, inspect for visible or concealed damage.

Report any damage to the freight carrier, and file a damage claim. Call 800-625-7545 to request a fax of our written freight damage procedure. In the event even slight (cosmetic) damage is noted, IMMEDIATELY perform an inspection of the interior of the units paying particular attention to the major braze points on the coils, the set screws on the pulleys, and the connection to any interior valves. These are the areas most affected by G force impact and are the most common concealed damage sustained. REPORT ANY CONCEALED DAMAGE TO THE FREIGHT CARRIER AS SOON AS IT IS FOUND. If you do not know the carrier, please call customer support at 800-625-7545 with unit serial number, they will provide the carrier's name and phone number to you.

All pulleys and belts must be checked to assure they have not loosened during transit. Set screws must be confirmed for tightness. Remove all foreign objects from the equipment. This includes accessories as they are often packed in the cabinets for shipment. Warranty documentation and Operation and Maintenance manuals are also shipped within the equipment (in their own zip-lock bag) and must be removed.

SELECTION OF INSTALLATION SITE

Before unit is installed, a thorough study should be made of the structure. Careful consideration must be given to the location of wiring, condensate disposal, ductwork, and proper accessibility to the unit for maintenance and servicing. It is recommended that a minimum of 36" clearance space be allowed from the front of the unit unit to accommodate maintenance and servicing.

UNIT MOUNTING

Up-Flow air pattern indoor evaporator sections are designed to be installed directly onto a slab floor. Down-Flow air pattern indoor evaporators are designed to be installed on the optional floor stand for raised floor applications. Condensers and drycoolers are designed to to be installed remotely from the evaporator section - indoors or outdoors - see remote condenser or drycooler installation manuals for more information.

Refer to submittal drawings for detailed dimensional data.

Refrigerant Piping Guidelines

All refrigerant piping should comply with ASHRAE, Local and National Code requirements. Use only refrigerant grade pipe, piping joints should be high temperature brazed.

Discharge and suction lines should be sized to maintain sufficient oil return to the compressor by maintaining high gas velocities while keeping the refrigerant pressure drop within recommended ranges.

The risers must be properly sized to ensure proper oil return. Vertical runs require a trap every 20 feet or less of rise; they also should be trapped at the bottom and the top of the riser.

Riser traps should be small as possible to limit excessive oil trapping.

Piping should be adequately supported and should allow for vibration and normal expansion.

All refrigerant **gas** piping high and/or low pressure should slope in direction of refrigerant flow.

The discharge line connection should loop above the condenser hot gas header on remote heat exchangers.

RECOMMENDED REFRIGERANT R410A OR R407C LINE SIZES						
Equivalent Length ft. (m)	Line Type	BTUH CAPACITY (per circuit)				
		36,000	48,000	60,000	90,000	120,000
50 (15)	Discharge (horizontal)	7/8	7/8	7/8	7/8	1 1/8
	Discharge (vertical)	5/8	5/8	5/8	7/8	7/8
	Suction	7/8	7/8	1 1/8	1 1/8	1 1/8
	Liquid	3/8	3/8	1/2	5/8	5/8
	Flooded Condenser to Receiver	1/2	5/8	5/8	5/8	7/8
100 (30)	Discharge (horizontal)	7/8	7/8	1 1/8	1 1/8	1 1/8
	Discharge (vertical)	5/8	5/8	7/8	7/8	7/8
	Suction	7/8	1 1/8	1 1/8	1 1/8	1 3/8
	Liquid	3/8	1/2	1/2	5/8	7/8
	Flooded Condenser to Receiver	1/2	5/8	5/8	7/8	7/8
150 (45)	Discharge (horizontal)	7/8	7/8	1 1/8	1 1/8	1 1/8
	Discharge (vertical)	5/8	5/8	7/8	7/8	7/8
	Suction	7/8	1 1/8	1 1/8	1 1/8	1 3/8
	Liquid	1/2	1/2	5/8	7/8	7/8
	Flooded Condenser to Receiver	5/8	5/8	7/8	7/8	7/8
200 (60)	Discharge (horizontal)	7/8	1 1/8	1 1/8	1 1/8	1 3/8
	Discharge (vertical)	5/8	7/8	7/8	7/8	1 1/8
	Suction	1 1/8	1 1/8	1 3/8	1 3/8	1 5/8
	Liquid	1/2	5/8	5/8	7/8	7/8
	Flooded Condenser to Receiver	5/8	5/8	7/8	7/8	7/8

ELECTRICAL WIRING

Units are completely internally wired at the factory for normal supply voltages. Check unit specification plates for required voltages wire and fuse sizing.

Power wiring to the evaporator and condenser units must come through fused disconnects. Minimum circuit ampacity and maximum fuse sizes for the condensing unit are shown on the unit nameplates. Power wiring to the evaporator section must be 14 gauge (copper) minimum. Refer to specification plate for evaporator motor current and fuse size per the National Electrical Code.

For low voltage wiring:

18 gauge wire may be used for up to 50 feet lengths

16 gauge wire for up to 100 feet lengths

CONDENSATE DRAINS

Units are equipped with two 3/4" OD drains; one for the evaporator condensate and one for the condensing section when installed in those applications which may permit rain to enter the unit. It is **EXTREMELY IMPORTANT** that the lines attached to these connections contain a TRAP, to ensure positive draining. This equipment is a draw-thru design, which creates a slight negative pressure within the cabinet; therefore, it is highly recommended that the trap be primed with water prior to start-up of the unit.

MicroSkil-200 ADVANCED MICROPROCESSOR CONTROLS

Refer to separate MicroSkil-200 Advanced Microprocessor Controller operations manual for detailed information.

FILTERS

Throwaway filters are supplied with the unit and are an Underwriters Laboratories class 2 pleated extended surface type. Filters should be checked monthly for dirt accumulation and changed when necessary. Replacement filters must be the same as originally supplied. An auto-ship program is available which will provide replacement filters to the installation site on a regularly scheduled basis to provide both the filters and the reminder to change them. **Call 800-625-7545 to arrange for this handy service.**

Remove the filter access panel located on the right front corner of the unit.

AIR FLOW

Units are equipped with adjustable motor and blower combinations for varied static pressures and airflow requirements. The drives have been selected such that, at the mid-position of the adjustable sheaves, the units will supply airflow based on cataloged data.

The drives may be adjusted for different static pressures. If such an adjustment is made, check that the motor current amp draw does not exceed the motor nameplate current by more than ten percent. On units with three phase fan motors, check for proper blower rotation at start-up. If the blower runs backwards, interchange two of the incoming power leads; this will reverse the direction of the motor.

MAINTENANCE PROCEDURES

BLOWERS

Check that the blower wheel is tight on the shaft and does not make contact with the housing. The squirrel cage should rotate freely. Check for restrictions or foreign material in the air circuit.

BELTS

Drive belts should be examined prior to start-up and then

monthly for wear and for correct tension. A too tight belt can cause bearing wear; a too loose belt will cause slippage and or noise. If the two legs of the belt are pressed in, midway between the pulley and the sheave, a properly tensioned belt will result in 1 inch to 1 ½ inches of movement. Belt tension can be adjusted by means of the adjusting bolt attached to the motor bracket. Larger units may have motors mounted to a support on the bottom pan, which requires loosening of four nuts to adjust the motor location and change belt position.

REFRIGERATION SYSTEMS

All systems contain a liquid line sight glass on each circuit. If bubbles appear in the sight glass, the system is either under-charged with refrigerant, or there may be a restriction in the liquid line up stream of the sight glass. The sight glass contains a moisture indicator, which changes color when moisture is present in the system. **If sight glass appearance is abnormal, servicing is required to determine the cause.**

EVAPORATOR AND CONDENSER COILS

Check semi-monthly the condition of the face of both the evaporator and condenser coils. A dirty condenser coil will cause high condensing pressures, resulting in higher power consumption and possibly system shut down by the high-pressure safety control. A dirty evaporator coil will reduce unit capacity and eventually will cause shut down by the low-pressure safety control.

IMPORTANT INFORMATION

Add R410A or R407C refrigerant charge to the system to compensate for the additional interconnecting tubing, as follows:

¼" OD Liquid Line = .20 oz per ft.

5/16" OD Liquid Line = .36 oz per ft.

3/8" OD Liquid Line = .55 oz per ft.

½" OD Liquid Line = 1.07 oz per ft.

If additional charge is needed, add this prior to releasing the factory charge into the low side. If less charge is needed, recover the excess R410A or R407C during the final charge adjustment. Use the factors above to determine the installed liquid line charge needed.

IMPORTANT: Use only refrigerant which is certified to meet ARI standard 700. Used refrigerant may cause compressor damage, and will void the warranty. (Most portable machines cannot clean used refrigerant well enough to meet this ARI standard.

NOTE: R410A refrigerant cylinders contain a dip tube which allows liquid refrigerant to flow with the cylinder in an upright position. R410A refrigerant should be charged in the upright position with the liquid gradually metered into the unit.

NOTE: Installations may be made with up to 100 ft equivalent lengths by installing the recommended tube size and adding the necessary refrigerant, R410A or R407C.

A maximum length of 150 ft of interconnecting tubing is permitted if the following additional steps are taken:

Install a Suction Line Accumulator close to the condensing unit.

Add 3 oz of refrigerant oil for each 10 ft of tubing over 100 ft.

Oil Specifications are: Ultra 22CC POE oil (Synthetic Polyol Ester Oil R410A)

Start-Up Checklist

Before Starting Unit:

Mechanical:

- ☒ Check all unit mounting points and fasteners
- ☒ Check all ductwork connections to and from unit
- ☒ Confirm all dampers and registers open
- ☒ Confirm condensate piping and P-trap in place, sloped down to drain location or connection
- ☒ Check condensate pump operation (if installed)
- ☒ Check belt tension(s)
- ☒ Check refrigerant line connections in split systems
- ☒ Open water valves and check for leaks in water cooled systems and systems with humidifiers

Electrical:

- ☒ Confirm correct voltage of power source
- ☒ Confirm unit(s) have a proper ground connection
- ☒ Confirm fuses or circuit breakers are of correct size
- ☒ Confirm wiring is of adequate size for system specifications
- ☒ Confirm all connections made tightly and correctly
- ☒ Check duct mounted devices (electric heat, smoke detectors, sensors, etc.) installed properly

Upon Start-up, check the following:

- ☒ Direction of blower rotation
- ☒ Compressor operation with gauges attached (if scroll compressor used, check rotation)
- ☒ Air and water flow for obstructions, malfunctions or leaks
- ☒ Total system amperage draw. Compare to unit specifications
- ☒ Test in all modes: fan only, cooling, heating, humidification if equipped, etc.

Skil Aire

Monthly Maintenance Inspection Checklist

Model No. _____

Serial No. _____

Prepared by: _____

Date: ___ / ___ / 200__

Air Filters

___ Check for restricted air flow

Blower Section

- ___ Blower wheel free of debris moves freely
- ___ Check belt tension and condition
- ___ Bearings in good condition
- ___ Check pulleys and motor mounts

Air Distribution Section

___ Check for restriction in grille(s)

Compressor(s)

___ Check for leaks

Refrigeration Cycle/Section

___ Check crank case temperature

Air Cooled Condenser (if applicable)

- ___ Condenser coil clean
- ___ Motor mounts tight
- ___ Motor fan bearings in good condition
- ___ Refrigeration lines properly supported

Water/Glycol Fluid Cooler (if applicable)

- ___ Water regulating valve function
- ___ Check for water/glycol leaks (piping area)

Glycol Pump(s) (if applicable)

- ___ Glycol leaks (pump area)
- ___ Pump operation
- ___ Auto air vent clean of mineral deposits

Condensate Drain and Pump (if applicable)

- ___ Check for water leaks
- ___ Check for restricted air flow
- ___ Pump operation

Steam Generating Humidifier (if applicable)

- ___ Check canister for deposits and water level
- ___ Check condition of steam hose and clamps

Electrical Panel

- ___ Check contactor operation
- ___ Mini DAP control panel operations

Equipment Runtimes

Blower	_____	hrs
Condenser	_____	hrs
Compressor(s)	_____	hrs
Reheat	_____	hrs
Humidifier	_____	hrs
Dehumidification	_____	hrs
Energy Saver	_____	hrs

___ Reset all to read zero runtimes

Temperature/Humidity set at: ___° ___% RH

Notes: _____

Skil Aire

Quarterly Maintenance Inspection Checklist

Model No. _____
Prepared by: _____

Serial No. _____
Date: ____ / ____ / 200__

Air Filters

- ___ Check for restricted air flow
- ___ Check filter differential switch
- ___ Wipe filter rack section clean

Blower Section

- ___ Blower wheel free of debris and moves freely
- ___ Check belt tension and condition
- ___ Bearings in good condition
- ___ Check air flow safety switch operation
- ___ Check pulleys and motor mounts

Air Distribution Section

- ___ Check for restriction in grille(s)

Compressor(s)

- ___ Check for leaks

Refrigeration Cycle/Section

- ___ Check for moisture (site glass)
- ___ Check suction pressure
- ___ Check discharge pressure
- ___ Check hot gas bypass valve operation
- ___ Check thermostatic expansion valve operation
- ___ Check solenoid valve operation

Air Cooled Condenser (if applicable)

- ___ Condenser coil clean
- ___ Motor mounts tight
- ___ Motor fan bearings in good condition
- ___ Refrigeration lines properly supported
- ___ Heated receiver site

Water/Glycol Fluid Cooler (if applicable)

- ___ Water regulating valve function
- ___ Check solution ____%
- ___ Check for water/glycol leaks (piping area)
- ___ Water/Glycol flow switch operational

Glycol Pump(s) (if applicable)

- ___ Glycol leaks (pump area)
- ___ Pump operation
- ___ Auto air vent clean of mineral deposits

Condensate Drain and Pump (if applicable)

- ___ Check for water leaks and restricted flow
- ___ Pump operation

Steam Generating Humidifier (if applicable)

- ___ Check canister for deposits and water level
- ___ Check condition of steam hose and clamps
- ___ Check drain and fill valve for deposits

Reheat (if applicable)

- ___ Check reheat element(s) for dust
- ___ Check high limit switch operation

Electrical Panel

- ___ Check fuses
- ___ Check contactor operation
- ___ Check all electrical connections
- ___ Check operation sequence
- ___ Check calibration of change over thermostat (Energy Saver System Only)

Mini DAP control panel operations

- ___ Check calibration of temperature sensor (31*)
- ___ Check calibration of humidity sensor (35*)
- * Mini DAP menu options

Equipment Runtimes

Blower	_____	hrs
Condenser	_____	hrs
Compressor(s)	_____	hrs
Reheat	_____	hrs
Humidifier	_____	hrs
Dehumidification	_____	hrs
Energy Saver	_____	hrs

___ Reset all to read zero runtimes

Temperature/Humidity set at: ____ ° ____ % RH

Notes: _____

Superheat and Suction Pressure Trouble Shooting Guide

Low Suction Pressure and High Superheat

1. Moisture, dirt, wax
2. Undersized valve*
3. High superheat adjustment
4. Gas charge condensation
5. Dead thermostatic element charge
6. Wrong thermostatic charge
7. Evaporator pressure drop - no external equalizer
8. External equalizer location
9. Restricted or capped external equalizer
10. Low refrigerant charge
11. Liquid line vapor
 - a. Vertical lift
 - b. High friction loss
 - c. Long or small line
 - d. Plugged drier or strainer
12. Low pressure drop across valve
 - a. Same as #11 above
 - b. Undersized distributor nozzle or circuits
 - c. Low condensing temperature

High Suction Pressure - Low Superheat

1. Oversized valve*
2. TXV seat leak
3. Low superheat adjustment
4. Bulb installation
 - a. Poor thermal contact
 - b. Warm location
5. Wrong thermostatic charge
6. Bad compressor - low capacity
7. Moisture, dirt, wax
8. Incorrectly located external equalizer

Low Suction Pressure - Low Superheat

1. Low load
 - a. Not enough air
 - b. Dirty air filters
 - c. Coil icing
2. Poor air distribution
3. Poor refrigerant distribution
4. Improper compressor-evaporator balance
5. Evaporator oil logged
6. Flow from one TXV affecting another's bulb

* Data Aire has ensured that valves are sized properly as the unit ships from the factory.

Temperature Pressure Chart

<u>Temperature (°F) R-22</u>	<u>_____</u>	<u>R-407C</u>	<u>R-410A</u>
26	50.0	43.6	89.7
27	51.2	44.7	91.6
28	52.4	45.9	93.5
29	53.7	47.1	95.5
30	54.9	48.4	97.5
31	56.2	49.6	99.5
32	57.5	50.9	101.6
33	58.8	52.1	103.6
34	60.2	53.4	105.7
35	61.5	54.8	107.9
36	62.9	53.2	110.0
37	64.3	57.5	112.2
38	65.7	58.9	114.4
39	67.1	60.3	116.7
40	68.6	61.7	118.9
41	70.0	63.1	121.2
42	71.5	64.6	123.6
43	73	66.1	125.9
44	74.5	67.6	128.3
45	76.1	69.1	130.7
46	77.6	70.6	133.2
47	79.2	72.2	135.6
48	80.8	73.8	138.2
49	82.4	75.1	140.7
50	84.1	77.1	143.3
55	92.6	106.0	156.6
60	101.6	116.2	170.7
65	111.3	127.0	185.7
70	121.5	138.5	201.5
75	132.2	150.6	218.2
80	143.7	163.5	235.9
85	115.7	177.0	254.6
90	168.4	191.3	274.3
95	181.9	206.4	295.0
100	196.0	222.3	316.9
105	210.8	239.0	339.9
110	226.4	256.5	364.1
115	242.8	274.9	389.6
120	260.0	294.2	416.4
125	278.1	314.5	444.5
130	297.0	335.7	474.0
135	316.7	357.8	505.0
140	337.4	380.9	537.6
145	359.1	405.1	571.7
150	381.7	430.3	607.6

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