

GUIDE SPECIFICATIONS: Convertible™ 2-15 Comfort Series Ceiling A/C's

1.0 GENERAL

1.1 SUMMARY

These specifications describe requirements for an air conditioning system. The system shall be designed to maintain temperature and relative humidity conditions within the specified room. The manufacturer shall design and furnish all equipment to be fully compatible with the heat dissipation requirements of the site.

The system shall be manufactured by Skil-aire, a division of Tithe Corporation, in Baltimore, Maryland U.S.A. The system may be approved and labeled by Underwriters Laboratories, Inc. (UL). The system may be New York City MEA (MEA-386-90-E) and Chicago Code Approved.

1.2 DESIGN REQUIREMENTS

The comfort control system shall be a Skil-aire factory assembled Convertible™ model ceiling mounted system. The evaporator section shall be specifically designed for above ceiling installation, unless specified otherwise.

The system shall have a total cooling capacity of _____ BTUH and a sensible cooling capacity of _____ BTUH based on an entering air temperature of _____ °F DB and _____ °F WB. The unit shall be supplied with _____ volt, _____ phase, _____ Hz electrical service. The system model number shall be _____.

2.0 PRODUCTS

2.1 STANDARD FEATURES / ALL SYSTEMS

2.1.1 CABINET

The cabinet and access panels shall be fabricated from sturdy heavy gauge galvanized steel. The panels shall be lined with 2 lb. density thermal/acoustical insulation for whisper quiet operation. The evaporator cabinet shall be equipped with a full condensate pan constructed of stainless steel. Large removable side panels shall provide ease of installation, service and maintenance on the system.

2.1.2 BLOWER ASSEMBLIES

Blowers shall be belt driven double-inlet, dynamically balanced unit with multiple forward curved blades mounted on a solid steel keyed shaft. A heavy-duty V-belt fan drive (sized for 200% of motor nameplate horsepower) with adjustable cast iron pulleys keyed and secured to the blower shaft shall be provided for adjusting fan speed to system requirements.

2.1.3 MOTOR ASSEMBLIES

All fan motors shall be permanently mounted, 1750 or 3450 RPM with overload protection. Motors shall have permanently lubricated ball bearings and be resiliently mounted to an adjustable motor frame. Motor pulleys shall be cast iron, keyed, with variable pitch design to allow for field adjustment of specific airflow and static requirements.

2.1.4 AIR PATTERN - DUCTED

Evaporators and indoor air cooled remote condensing unit sections shall be designed for ducted air distribution. Air inlet and outlet connections shall include factory provided turned-out duct flanges for ease of field duct connection.

2.1.5 FILTERS

The system shall be provided with 2" extended surface pleated disposable type filters rated for a 30% average dust-spot efficiency. The filters shall be removable without shutting down the system.

2.1.6 ELECTRICAL CIRCUITS

The system shall be provided with a factory installed main electrical enclosure per NEC code requirements. A low voltage transformer with integral protection shall be provided to supply 24 VAC to the control circuit. The 24 volt control circuit terminal strips shall be clearly labeled for thermostat wiring and interlock. The fan motor(s), compressor, humidifier and electric heater

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

(if applicable) shall each have their own contactor. A float switch shall be provided in the evaporator section to sense a clogged condensate drain and shall shut unit down to prevent water damage.

DX Compressorized Systems:

Each compressor shall be protected by non-adjustable high and low pressure controls with auto reset and lock out relay.

Self-Contained Systems: (single point power)

Self-Contained systems shall be designed for single point main power connection.

Split DX Systems: (separate power)

Split systems shall require separate main power supplies to the evaporator and condensing unit sections. The evaporator and condensing unit sections shall be electrically interlocked by a field wired 24 volt control signal.

2.1.7 CONTROLS

2.1.7.1 DigiSkil-100™: REMOTE WALL MOUNTED DIGITAL THERMOSTAT

A DigiSkil-100™ model remote wall mounted single stage heat / cool non-programmable thermostat with digital display shall be factory provided for field installation. The thermostat shall include FAN AUTO-ON and COOL-OFF-HEAT selector switches.

2.2 DIRECT EXPANSION SYSTEM COMPONENTS

2.2.1 EVAPORATOR COILS

The evaporator coil shall be quality construction of seamless drawn rifled copper tube, mechanically bonded to tempered aluminum fins with galvanized coil end plates. The coil shall have ____ sq. ft. face area, ____ rows deep. The coil shall be factory pressure tested and the refrigeration system sealed prior to shipment. A stainless steel drain pan shall be provided to cover the entire coil area.

2.2.2 COMPRESSORS

The compressor shall be the heat pump duty reciprocating hermetic type with "Rotolock" fittings. The compressor shall be mounted on vibration isolators and located in the condensing section out of the evaporator air stream. The compressor shall be complete with reversible positive oil pump, charging and service ports, internal spring isolation, and discharge gas vibration eliminator.

2.2.3 REFRIGERATION CIRCUIT

The refrigeration circuit shall be pre-piped with type "L" refrigerant copper tubing. The refrigeration system shall include, but not be limited to: expansion valve with external equalizer and rapid bleed-through capacity. Features shall include filter dryer, sight glass, pressure fittings and high pressure/low pressure safety cutouts.

2.3 CHILLED WATER SYSTEMS

2.3.1 CHILLED WATER AIR HANDLERS (Models PCA)

The system shall be a chilled water air handling unit. The chilled water coil shall be of quality construction of seamless drawn rifled copper tube, mechanically bonded to tempered aluminum fins with galvanized coil end plates. The coil shall be factory pressure tested. The coil shall have ____ sq. ft. face area, ____ rows deep. The coil shall be factory pressure tested and the refrigeration system sealed prior to shipment. A stainless steel drain pan shall be provided to cover the entire coil area. The coil shall be controlled by a factory installed 2-way chilled water control valve. The coil shall be designed to distribute water into the entire coil face area. The coil shall be supplied with ____ °F entering water temperature with a ____ °F temperature rise. The coil shall require ____ GPM of chilled water and the pressure drop shall not exceed ____ Ft. w.g.

2.4 STANDARD FEATURES - INDIVIDUAL SYSTEMS

2.4.1 AIR COOLED SYSTEMS

2.4.1.1 AIR COOLED, SELF-CONTAINED

(Models PAA)

The system shall be self-contained with integral factory installed air cooled condensing unit. The condensing unit shall be a direct driven, centrifugal blower type. The condenser coil shall be constructed of copper tubes and aluminum fins. The condensing unit shall be sized for full heat of rejection at 95°F ambient and be capable of operation to ___ °F low ambient air temperature. The condensing unit shall be factory tested, charged with refrigerant, sealed and be capable of being connected to the evaporator section directly when the units are close coupled or using pre-charged refrigerant lines sets when the condensing unit is mounted remote from the evaporator.

Models PAA-024 thru 096 shall ship from the factory as a one-piece unit as standard. Models PAA-120 thru 180 shall ship split from the factory for field rigging purposes.

(Note: PAA-024/096 packaged units are designed to be field converted to split systems via refrigerant quick disconnects and Stub-Kit Option for field provided interconnecting piping.)

2.4.1.2 OUTDOOR, REMOTE PROPELLER FAN, AIR COOLED CONDENSING UNIT

(FU models)

The remote air cooled condensing unit shall be a direct drive, propeller fan type arranged for vertical air discharge. The condensing unit shall be sized for full heat of rejection at 95°F ambient and be capable of operation to ___ °F. The condenser coil shall be constructed of copper tube and aluminum fins. The coil shall be factory tested, and refrigeration system sealed prior to shipment. The condenser fan motor shall have permanently lubricated bearings and inherent internal overload protection.

2.4.1.3 DX - AIR HANDLING UNIT ONLY

(Models BAA)

The system shall be a split DX - Air Handling Unit designed for field connection to a remote condensing unit. The air handling unit shall include, but not be limited to: evaporator coil, stainless steel condensate drain pan, adjustable belt-driven blower, blower motor, thermal expansion valve with external equalizer, refrigerant service valves, refrigerant sight glass / moisture indicator, filter drier, refrigerant quick connect fittings, 24 volt terminal connection and 2" filters.

(Note: When purchased without a Skil-aire™ condensing unit, BAA systems ship from the factory with a dry nitrogen holding charge. When purchased with a Skil-aire™ condensing unit, BAA systems ship from the factory with a full R22 refrigerant operating charge.)

2.4.1.4 INDOOR (OPTIONAL OUTDOOR) REMOTE CENTRIFUGAL BLOWER AIR COOLED CONDENSING UNIT

(Models CAA)

The system shall be an indoor (*outdoor - optional*) remote air cooled condensing unit designed for field connection to a dx air handling unit. The condensing unit shall be a direct driven, centrifugal blower type. The condensing unit shall be sized for full heat of rejection at 95°F ambient and be capable of operation to ___ °F low ambient air temperature. The condensing unit shall be factory tested, charged with refrigerant, sealed and be capable of being connected to the evaporator section directly when the units are close coupled or using pre-charged refrigerant lines sets when the condensing unit is mounted remote from the evaporator.

(Note-1: When purchased without a Skil-aire™ evaporator unit, CAA systems ship from the factory with a dry nitrogen holding charge. When purchased with a Skil-aire™ evaporator unit, CAA systems ship from the factory with a full R22 refrigerant operating charge.)

Note-2: CAA condensing units can be configured for outdoor installation via outdoor weather protection kit option.)

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

2.4.2 WATER COOLED CONDENSERS (PWA models)

Water cooled systems shall have a coaxial, counter flow liquid condenser with adjustable 2-way water regulating valve per circuit to maintain head pressure with condenser water flow. The unit shall require ____ GPM of ____ °F water and have a maximum pressure drop of ____ Ft. w.g.

2.4.3 GLYCOL COOLED CONDENSER (PGA models)

Glycol cooled systems shall have a coaxial, counter flow liquid condenser with adjustable 2-way glycol regulating valve to maintain head pressure with condenser glycol flow. The unit shall require ____ GPM of ____ °F glycol and have a maximum pressure drop of ____ Ft. w.g.

2.4.4 DRY COOLER & SIMPLEX PUMP PACKAGE (FCPP models)

The drycooler shall be complete with field mounted expansion tank and aquastat to control fan motor operation. The coil shall have seamless copper tubes bonded to aluminum fins for high transfer efficiency. The motor(s) shall have permanently lubricated bearings with inherent overload protection on 1 Phase motors and three coil overloads on 3 Phase motors.

The pump package shall include controls to operate the drycooler and the pump. The pump package shall be enclosed in a weatherproof housing. The pump shall be rated for ____ GPM at ____ Ft. of head, and operate on ____ volt, ____ PH, 60 Hz.

2.5 OPTIONS

2.5.1 AIR COOLED CONDENSER - LOW AMBIENT CONTROL

2.5.1.1 0°F AMBIENT - FAN CYCLING (FU Propeller Fan Models)

Condenser fan cycling controls shall be factory provided for field installation to allow for low ambient condenser operation to 0°F minimum air temperature.

2.5.1.2 0°F - LOW AMBIENT DAMPER (PAA, CAA Centrifugal Blower Condensing Units)

A low ambient inlet damper shall be provided for the condenser section to allow operation to 0°F minimum air temperature. The damper shall include an actuator that is controlled directly by the condensed liquid line pressure. The damper shall be field mounted with all control piping furnished by the installer.

2.5.1.3 -20°F VARIABLE SPEED FAN (FU Propeller Fan Models)

Variable speed head pressure controls shall be factory provided for field installation to allow for low ambient condenser operation to -20°F minimum air temperature.

2.5.1.4 -30°F FLOODED CONDENSER (PAA, CAA & FU Models)

A flooded condenser system shall be provided to allow for low ambient condenser operation to -30°F. The flooded system shall included a factory installed liquid refrigerant receiver and head pressure control valve.

2.5.2 WATER / GLYCOL COOLED - HEAD PRESSURE CONTROL VALVES

2.5.2.1 3-WAY WATER / GLYCOL HEAD PRESSURE CONTROL VALVES (PWA & PGA Models)

Each refrigerant circuit's head pressure shall be controlled by a factory provided 3-way water/glycol regulating valve rated for 150 psig w.w.p.

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

2.5.2.2 350 PSI HIGH PRESSURE - WATER/GLYCOL HEAD PRESSURE CONTROL VALVES

Each refrigerant circuit's head pressure shall be controlled by a factory provided high pressure rated ____ (2 or 3) -way water/glycol regulating valve rated for 350 psig w.w.p.

2.5.3 CONTROL OPTIONS

2.5.3.1 DigiSkil-200™: 7-Day Programmable Wall Mounted Digital Heat / Cool Thermostat

A DigiSkil-200™ model remote wall mounted deluxe 7-day programmable heat pump ready thermostat with digital display shall be factory provided for field installation. The thermostat shall include FAN AUTO-ON, COOL-OFF-HEAT-EM (emergency heat), SET and PROG/MAN selector switches.

2.5.3.2 MicroSkil-100™: Microprocessor Temperature Humidity Controller with Alarms

The system shall be provided with a MicroSkil-100™ model Microprocessor based Temperature and Humidity controller with Alarms. Centered in the remote wall mounted controller shall be a graphic LCD display with characters to show the operating mode, time, set points and actual readings. The temperature and humidity sensors shall be internal to the remote display. The controller shall be capable of three different set points: normal, temporary and night per day, 7 days per week.

The controller shall include the following visual and audible alarm indications (if applicable):

- High and Low Temperature
- High and Low Humidity
- Dirty Filter
- Sensor Failure
- Common Alarm Failure

The controller shall include the following system operations (if applicable):

- Unit Operational Status Indication - Cooling, Heating, Humidifying, Dehumidifying (if applicable)
- Fan - continuous or on demand
- Auto-restart upon power loss
- Remote stop/start connection
- Short cycle protection
- Cold start time delay
- Heat pump operation with aux. heat

2.5.3.3 MicroSkil-200™, Advanced Microprocessor Temperature & Humidity Controller with Alarms

The system shall be provided with a MicroSkil-200™ advanced microprocessor based temperature and humidity controller with alarms.

Select Features/Benefits:

- 4x20 Character Liquid Crystal Alpha-numerical Display
- User Configurable
- Run-Time Hours
- Current Unit Mode Status
- Alarm Status
- Digital & Analog Inputs / Outputs
- Temperature Anticipation
- Remote Stop / Start Contact
- Summary Alarm Contact
- Automatic or Manual (selectable) Restart After Power Loss
- Sequential Load After Restart
- Recovery Delay
- Compressor Short Cycle Timers
- Cold Start Time Delay
- Security Password Access
- Self-Diagnostics
- Service Mode

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

Select Options:

- Multi-Unit Sequencing (Optional)
- BMS Communications (Optional)

Unit Status Display

The control system shall display current unit functions and room status (if applicable):

- Current Dry Bulb Temp Set Point
- Current Relative Humidity Set Point
- System ON/OFF
- Cooling
- Heating
- Humidifying
- Dehumidifying - (Available with Satellite™ Series)
- Reheating - (Available with Satellite™ Series)

- Actual Room DB Temperature
- Actual Room Relative Humidity

Alarm Conditions:

Alarm conditions activate an audible and visual indicator plus close a summary alarm dry contact connection. The control system shall alert to the following alarm conditions (if applicable):

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- High Head Press
- Loss of Air Flow
- Loss of Power
- Dirty Filter
- Smoke Detection
- Firestat
- Leak Detection
- Sensor Failure
- Summary Failure

Digital & Analog Control Inputs / Outputs:

The control system shall be capable of both digital (ON/OFF) and analog (proportional integral, PI) input and output control.

2.5.4 HEAT OPTIONS

2.5.4.1 ELECTRIC DUCT HEATER

(Field Installed)

The electric heat shall be a field installed duct heater with nichrome open wire elements, contactors and limit controls. The electric element shall be UL approved. The electric heat shall have a capacity of _____ BTUH and a KW rating of _____ KW.

(Note: Factory installed electric heat is available within the Optional Convertible™ Extended Cabinet Configuration "EXT". Please consult your local representative for details.)

2.5.4.2 STEAM HEAT

(Requires Extended Cabinet for 2-8 Ton Units)

The steam heat coil shall have copper tubes and aluminum fins with capacity of _____ BTUH with _____ Ft. w.g. steam. The system shall be factory pre-piped with a 2-way steam control valve.

2.5.4.3 HOT WATER HEAT

(Requires Extended Cabinet for 2-8 Ton Units)

The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of _____ BTUH when supplied with _____ °F entering water temperature, _____ GPM at _____ Ft. w.g. The system shall be factory pre-piped with a 2-way hot water control valve.

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

2.5.4.4 HEAT PUMP OPTION

(PAH, PWH & PGH models)

The system shall include a heat pump heating cycle including reversing valve and controls. The heating capacity shall be _____ BTU/HR at _____ °F ambient air temperature.

2.5.5 STEAM GENERATING HUMIDIFIER

The humidification system shall be an electrode canister type, complete with fill valve, drain valve, adjustable humidity output, and automatic flush cycle. The humidifier shall have a steam output capacity of _____ lbs/hr.

2.5.6 CONDENSATE PUMP

A condensate pump shall be factory provided for field installation. The condensate pump shall have the capacity of _____ GPH at _____ Ft. of head. The condensate pump shall be complete with integral float switch, pump and motor assembly, check valve and reservoir.

2.5.7 HOT GAS BYPASS

(DX Systems)

Each refrigerant circuit shall be provided with a hot gas bypass system for evaporator freeze-protection and capacity modulation during low load conditions.

2.6.8 MAIN POWER NON-FUSED DISCONNECT

A main power non-fused disconnect shall be factory provided for field installation.

2.6.9 FIRESTAT

A firestat shall be factory provided. The firestat shall immediately shut down the environmental control system when activated. The firestat shall be mounted with sensing element in the return air duct, and wired by the installer to unit control panel.

2.6.10 SMOKE DETECTOR

A duct mounted type smoke detector shall be factory provided. The smoke detector shall immediately shut down the environmental control system when activated. The smoke detector shall be mounted in the return air duct by the installer and wired to the unit control panel.

2.6.11 AIR SIDE ECONOMIZER

(All Model Types)

The system shall be provided with an Air-Side Economizer to include factory provided and field installed air side economizer mixing box and controls per the following sequence of control:

On call for cooling by the indoor space thermostat, the indoor fan and the economizer shall be energized. The outdoor air control shall determine whether the outdoor air is suitable for "free/economizer-cooling". If the outdoor air is suitable, mechanical cooling shall be locked out by the outdoor enthalpy control. The motor actuator shall be energized, operating the outdoor air and the return air dampers. The motor actuator shall be regulated by the mixed air sensor to maintain proper discharge air temperature.

When outdoor air is not suitable for "free/economizer-cooling", the Economizer shall be locked out and the outdoor air damper shall maintain minimum position while the indoor fan is operating. Upon unit shutdown or power loss, the spring return motor actuator shall close the outdoor air damper.

The Economizer shall be automatically locked out during the heat mode (if applicable).

The Air Side Economizer shall include: prewired modulating spring return motor actuator, compressor lockout, minimum position potentiometer, outdoor air control (enthalpy), mixed air sensor, multi-tap transformer and damper linkage.

The Air-Side Economizer and Controls shall ship separately from the unit for field installation. (Note: Refer to supplemental Air Side Economizer dimensional data for more information.)

Guide Specifications

Convertible™ 2-15 Ton Comfort Series Ceiling Mounted A/C

Revised: August 7, 2003

2.6.12 ECX - ECONOMIZER / FREE-COOLING CYCLE (Models PAA/PWA/PGA-ECX)

The system shall be provided with an auxiliary Skil-aire™ ECX economizer cooling coil with a factory mounted 3-way control valve. The ECX coil shall be capable of providing rated sensible capacity without compressor operation when entering water/glycol fluid temperatures are 45°F or below.

(Note: ECX option includes cabinet extension for 2-8 ton systems "EXT", external filter rack for 10-15 ton systems and upgraded fan motor (if required). Consult your local sales representative for details.)

2.6.13 REFRIGERANT STUB KITS (Split DX Systems)

Each refrigerant circuit shall be factory provided with refrigerant stub kits for ease of field refrigerant piping installation. Each stub kit shall include a pair of male and female Suction & Liquid Line refrigerant quick connect couplings matching the couplings factory installed to each respective evaporator and/or condenser section refrigerant circuit.

(Note: In addition to standard Refrigerant Suction and Liquid Line Connections, Stub Kits are available for the Hot Gas Bypass Option Line as well.)

2.6.14 REFRIGERANT LINE-SETS (Split DX Systems)

Refrigerant line-sets shall be factory provided complete with full operating charge and refrigerant quick disconnect end couplings. The refrigerant line-sets shall be ____ Ft. in length.