# **GENERAL**

Furnish and install ClimateMaster Tranquility® SY water-source heat pumps, as indicated on the plans. Equipment shall be completely assembled, piped, and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other

manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of

the standards for Heating and Cooling Equipment UL 60335-2-40 4th Edition, UL 60335-1 6th Edition for the United States and Can/CSA C22.2 No.

60335-2-40:22, CAN/CSA C22.2 No 60335-1:16 for

Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall be shipped with each unit. **Note: If a unit fails the factory acceptance test, it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.**

# **BASIC CONSTRUCTION**

Horizontal units shall have one of the following air flow arrangements: Left Inlet/Straight (Right)

Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge: or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.

Vertical units shall have one of the following air flow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, as shown on the plans.

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units (horizontal and vertical) must have multiple access panels for serviceability of compressor compartment. **Units having only**

**one access panel to compressor/heat exchangers/ expansion device/refrigerant piping shall not be acceptable.**

Compressor section interior surfaces shall be lined with 1/2-inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 1/2-inch (12.7 mm) thick, 1-1/2 lb/ft3 (24 kg/m3) **foil-faced**,

glass-fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that

will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. **Units without foil-faced insulation in the air handling section will not be accepted.**

The heat pump cabinets shall be fabricated from heavy gauge galvanized steel.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL 181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

All horizontal units to have factory installed 1-inch (25.4 mm) discharge air duct collars, 1-inch (25.4 mm) filter rails with 1-inch (25.4 mm) filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 1-inch (25.4 mm) filter rails with 1-inch (25.4 mm) filters factory installed. **If units with these factory-installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his subcontractor to install these provisions.**

All units must have an insulated panel separating the fan compartment from the compressor compartment. **Units with the compressor in the air stream are not acceptable.** Units shall have a factory installed 1-inch (25.4 mm) wide filter bracket for filter removal from either side. Units shall have a 1-inch (25.4 mm) thick throwaway type glass fiber filter.

**The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of startup.** Filters shall be standard sizes. **If units utilize non-standard filter sizes, then the contractor shall provide 12 spare filters for each unit.**

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply- and return-water connections shall be copper FPT fittings. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. **Contractors shall be responsible for any extra costs involved in the installation of**

**units that do not have this feature.** Contractors must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

**Option: The unit will be supplied with optional field or factory installed 2-inch air filter rails (typically used for free return installation) or 1-inch or 2-inch air filter frames with filter access door and return air duct flanges**

**(typically used for ducted return installation). A corresponding 1-inch or 2-inch throwaway type glass fiber filter will ship with the factory installed filter rails or frame.**

**Option: The contractor shall install 1-inch or 2-inch MERV-rated pleated media disposable air filters on all units.**

**Option: UltraQuiet package shall consist of high technology sound attenuating material that is strategically applied to the compressor and air handling compartment casings**

**and fan scroll in addition to the standard ClimaQuiet system design, to further dampen and attenuate sound transmissions.**

**Option: The unit shall be supplied with extended range insulation option, which adds closed cell insulation to internal water lines,**

**and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.**

# **BLOWER AND MOTOR ASSEMBLY**

Blowers shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan motor shall be an EC variable speed ball bearing type motor. The EC fan motor shall provide soft starting, maintain constant CFM over its static operating range and provide airflow adjustment in 25 CFM increments via its control board. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be

permanently lubricated and have thermal-overload protection. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode may be constant or automatic (humidistat controlled).

Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place. **Ratings based on a dry coil, and/or no air filter, shall NOT be acceptable.**

#  **REFRIGERANT CIRCUIT**

All units shall contain an R-454B sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high-pressure switch, low-pressure (loss-of-charge) switch, water coil low-temperature sensor, and air

coil low-temperature sensor. Access fittings shall be factory installed on high- and low-pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor- supplied disconnect switch. **Units that cannot be reset at the thermostat shall not be acceptable.**

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM

vibration isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with EPDM grommets for maximized vibration attenuation. All units shall include a discharge muffler to further enhance sound attenuation. Compressors shall have thermal- overload protection. Compressors shall be located in an insulated compartment away from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure.

Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be “electro-coated” with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1,000-hour salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness

of 2H (ASTM D3363-92A), crosshatch adhesion of

4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F

(-6.7° to 48.9°C). The reversing valve shall be four- way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail

to function. If the reversing valve solenoid defaults to cooling mode, an additional low-temperature

thermostat must be provided to prevent over-cooling an already cold room.

Units charged with 62 ounces or greater of R-454B shall be supplied with a Refrigerant Detection System (RDS) with sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS disables compressor operation, and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants. **Units charged with 62 ounces or greater of R-454B that do not have an RDS shall not be acceptable.**

**Option: The unit will be supplied with a cupro-nickel coaxial water to refrigerant heat exchanger.**

**Option: The refrigerant to air heat exchanger shall be tin-plated.**

**Option: The Refrigerant Detection System (RDS) package shall consist of the RDS module and sensors to be strategically placed within the cabinet. In the event of a refrigerant leak, the RDS triggers an alert through the DDC control system, disables compressor operation, and the unit blower runs to disperse any concentration of leaked refrigerant in compliance with UL 60335-2-40 safety standards for flammable refrigerants (Optional for sizes 024-048).**

#  **DRAIN PAN**

The drain pan shall be constructed of corrosion resistant polymer material. The drain outlet shall be connected from pan using provided polymer

coupling and clamps that meet UL 2043 as required for discrete products by the IMC and UMC when located in a plenum. If steel material is used for drain pan it shall be fully insulated on all sides and must meet the stringent 1,000-hour salt spray test per ASTM B117. Drain outlet shall be located at pan as to allow unobstructed drainage of condensate. Drain outlet shall be connected from pan directly to plumbing via a rubber coupling that couples to

¾-inch schedule 40/80 PVC fitting. No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted. The unit as standard will be supplied with solid-state electronic condensate overflow protection. **Mechanical float switches will NOT be accepted.**

**Option: The drain pan shall be constructed of 304 stainless steel and drain connection will be 3/4-inch MPT. The stainless-steel drain pan shall be fully insulated on all sides.**

# **ELECTRICAL**

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer, 24V activated, two or three-pole

compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. The control box on sizes 024 through

060 shall have a door to protect the internal components. The entire control box shall be capable of rotating out of the unit to allow access to the components behind the control box. Low voltage wires shall enter the box through a hole in the lower left side and high voltage wires shall enter the box through a hole in the upper left side. Reversing valve and blower motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers.

Unit controls shall be 24V and provide heating or cooling as required by the remote thermostat/sensor.

**Option: Disconnect Switch, Non-Fused, classified as motor disconnect**

#  **SOLID STATE CONTROL SYSTEM (DXM2.5)**

Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall have the following features:

1. Anti-short cycle time delay on compressor operation.
2. Random start on power-up mode.
3. Low-voltage protection.
4. High-voltage protection.
5. Unit shutdown on high- or low-refrigerant pressures.
6. Unit shutdown on low water temperature.
7. Condensate-overflow electronic protection.
8. Option to reset unit at thermostat or disconnect.
9. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs three times sequentially without thermostat meeting

temperature, then lockout requiring manual reset will occur.

1. Ability to defeat time delays for servicing.
2. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
3. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
4. 24V output to cycle a motorized water valve or other device with compressor contactor.
5. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
6. Water coil low-temperature sensing (selectable for water or antifreeze).
7. Air coil low-temperature sensing.
8. Removable thermostat connector.
9. Night setback control.
10. Random start on return from night setback.
11. Minimized reversing-valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.).
12. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
13. Dry contact night setback output for digital night setback thermostats.
14. Ability to work with heat pump (Y, O) or heat/ cool (Y, W) type thermostats.
15. Ability to work with heat pump thermostats using O or B reversing valve control.
16. Emergency-shutdown contacts.
17. Boilerless system heat control at low loop water temperature.
18. Ability to allow up to three units to be controlled by one thermostat.

ab. Relay to operate an external damper.

ac. Ability to automatically change fan speed from multi-stage thermostat.

ad. Relay to start system pump.

ae. 75VA control transformer. Control transformer shall have load side short circuit and overload protection via a built in circuit breaker.

**NOTE: Units not providing the eight safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge),**

**air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.**

**NOTE: To achieve full benefit of the two-stage compressor and EC fan, a 2-Heat/2-Cool thermostat (or a 3-Heat/2-Cool thermostat when electric backup heat is required) should be employed.**

When DXM2.5 is connected to AWC99U01 communicating thermostat or handheld service tool, the installer/service technician can; check and set CFM and check DIP switch S1, S2, and S3 settings;

run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures - water coil (LT1), air coil (LT2), compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults. When the AWC99U01 communicating thermostat is used this same functionality can be viewed and adjusted remotely with the only portal or mobile

app. Systems not providing remote access, diagnosis, and adjustment functionality will not be accepted.

This control system coupled with a multi-stage thermostat will better dehumidify room air by automatically running the heat pump’s fan at lower speed on the first stage of cooling thereby

implementing low sensible heat ratio cooling. On the need for higher cooling performance the system will activate the second stage of cooling and automatically switch the fan to the higher fan speed setting.

This system may be further enhanced with a humidistat. Units not having automatic low sensible heat ratio cooling will not be accepted; as an alternate a hot gas reheat coil may be provided with a control system for automatic activation.

# **DIGITAL NIGHT SETBACK WITH PUMPRESTART (DXM2.5 WITH ATP32U03C/04C, AWC99U01)**

The unit will be provided with a Digital Night Setback feature using an accessory relay on the DXM2.5 controller with an ATP32U03C/04C or AWC99U01 thermostat and an external, field-provided time clock. The external time clock will initiate and terminate the night setback period. The thermostat will have a night setback override feature with a programmable override time period. An additional accessory relay on the unit DXM2.5 controller will energize the building loop pump control for the duration of the override period. (Note: This feature requires additional low voltage wiring. Consult Application Drawings for details.)

#  **REMOTE SERVICE SENTINEL**

The solid-state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault

condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose units from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout.

Upon cycling the G (fan) input three times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc.

Units that do not provide this remote service sentinel shall not be acceptable.

**Option: MPC (Multiple Protocol Control) Interface System**

Units shall have all the features listed above and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/ TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

1. Space temperature.
2. Leaving-water temperature.
3. Discharge-air temperature.
4. Command-of-space temperature setpoint.
5. Cooling status.
6. Heating status.
7. Low-temperature sensor alarm.
8. Low-pressure sensor alarm.
9. High-pressure switch alarm.
10. Condensate-overflow alarm.
11. High-/low-voltage alarm.
12. Fan “ON/AUTO” position of space thermostat as specified above.
13. Unoccupied / occupied command.
14. Cooling command.
15. Heating command.
16. Fan “ON/AUTO” command.
17. Fault-reset command.
18. Itemized fault code revealing reason for specific shutdown fault (any one of seven).

# **WARRANTY**

ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (whichever occurs first).

**Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.**

**Option: Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.**

**Option: Extended 4-year control board warranty covers the DXM2.5 control board for a total of 5 years.**

# **FIELD-INSTALLED OPTIONS**

**Hose Kits**

All units shall be connected with hoses. The hoses shall be 2-feet (61 cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

**Valves**

The following valves are available and will be shipped loose:

1. Ball valve; bronze material, standard port full flow design, FPT connections.
2. Ball valve with memory stop and PT port.
3. “Y” strainer with blowdown valve; bronze material, FPT connections.
4. Motorized water valve; slow acting, 24V, FPT connections.
5. Hose Kit Assemblies
6. The following assemblies ship with the valves already assembled to the hose described:
7. Supply and return hoses having ball valve with PT port.
8. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
9. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
10. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

# **THERMOSTATS**

The thermostat shall be a ClimateMaster mechanical or electronic type thermostat as selected below with the described features:

1. **Thermostat (Communicating) (AWC99U01)**

An electronic communicating web-enabled touchscreen thermostat shall be provided. The thermostat shall offer three stages of heating and two stages of cooling with precise temperature control and have a four-wire connection to the unit. The thermostat shall be capable of manual or

automatic change-over operation and shall operate in standard or programmable mode. An integrated humidity control feature shall be included to

control a humidifier and/or a dehumidifier. The thermostat shall include a utility demand reduction feature to be initiated by an independent time program or an external input. The thermostat shall provide access to via the web portal or mobile application to include temperature adjustment, schedule adjustment including occupied/ unoccupied, entering-water temperature, leaving- water temperature, water-coil temperature, air- coil temperature, leaving-air temperature, and compressor-discharge temperature. A graphical system layout to be provided with real-time operating mode information of the temperature sensors for easy diagnostics. The thermostat shall display system faults with probable cause and troubleshooting guidance.

The system shall provide in clear language the

last five faults, time of faults, operating temps at time of fault, and possible reasons for the fault. The thermostat shall provide access for immediate manual control of all outputs via the web portal/ mobile application for rapid troubleshooting.

1. **CM500 – Color-Touchscreen Display, Multi- stage, Automatic or Manual Changeover, 7-day Programmable with Wi-Fi and Humidity Control (AVB32V03C/R)**

The thermostat shall have color-resistive touchscreen display with space temperature, relative humidity, setpoints, mode, status indication and local weather (if connected to Wi-Fi). Residential version shall be 7-day programmable with up to four setpoints

per day. The commercial version shall be 7-day programmable with four occupied/

unoccupied periods per day with up to 4-hour override. Multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL- AUTO-EM HEAT system settings and fan ON- AUTO settings, Wi-Fi, pre-occupancy purge fan option, customizable screen saver and background displays, indicator-on display indicates a heating or cooling demand, set- point lock, title 24 compliant, openADR2.0b certified with Skyport web portal. Compatible with condensate-overflow warning systems –

lockout compressor with message on the display. Capable of being monitored by third-party software. Compatible with AST014 Wi-Fi remote sensor. Configurator mobile app or web portal for easy setup. Separate dehumidification and humidification setpoints shall be configurable

for discreet outputs to a dehumidification option and/or an external humidifier. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12- or 24-hour clock. The thermostat shall provide permanent memory of setpoints without batteries. The thermostat shall provide heating setpoint-range limit, cooling setpoint-range limit, temperature display offset, dead-band range setting, and inter-stage differential settings. The thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. The thermostat shall provide access to a web portal and mobile app for installer setup for configuring options. The thermostat shall have menu-driven selections for ease-of-use and programming.

1. **CM300 – Multi-stage, Automatic or Manual Changeover, 7-day Programmable with Wi-Fi and Humidity Control (AVB32V02C/R)**

The residential version shall be 7-day programmable with up to four setpoints per day. The commercial version shall be 7-day programmable with four occupied/unoccupied

periods per day with up to 4-hour override. Multi- stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system

settings and fan ON-AUTO settings, Wi-Fi, pre- occupancy purge fan option, nighttime control of display backlight, bi-color LED indicates a heating or cooling demand, keypad lock, title 24 compliant, openADR2.0b certified with Skyport web portal. Compatible with condensate- overflow warning systems – lockout compressor with message on.

1. **CM100 – Multi-stage Automatic or Manual Changeover digital thermostat (ATA32V01)**

Multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. The thermostat shall have a green backlit LED display with temperature, setpoints, mode, and status indication via a green (cooling) or red(heating) LED. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12- or 24-hour clock. The thermostat shall provide permanent memory of setpoints without batteries. The thermostat shall provide heating-setpoint range limit, cooling-setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter- stage differential settings. The thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. The thermostat shall provide an installer setup for configuring. Thermostat navigation shall be accomplished via four buttons (Mode/fan/down/up) with menu-driven selections for ease of use and programming.

1. **Multi-stage Digital Automatic Changeover (ATA22U01)**

The thermostat shall be multi-stage (2H/2C), manual or automatic changeover with HEAT- OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. The thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for ºF or ºC. The thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to indicate specific fault condition(s). The thermostat shall provide temperature- display offset for custom applications. The thermostat shall allow unit to provide better dehumidification by automatically using

lower fan speed on stage-1 cooling (higher

latent cooling) as main cooling mode, and automatically shifting to high-speed fan on stage-two cooling.

1. **Multi-stage Automatic or Manual Changeover Programmable 7-Day (ATP32U03C)**

The thermostat shall be 7-day programmable (with up to four setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. The thermostat

shall have a blue backlit dot matrix LCD display with temperature, setpoints, mode, and status indication. The temperature indication shall

be selectable for ºF or ºC. Time display shall be selectable for 12- or 24-hour clock. Fault identification shall be provided to simplify

troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. The thermostat shall provide heating-setpoint range limit, cooling-setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. The thermostat shall provide progressive recovery

to anticipate time required to bring space temperature to the next programmed event. The thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information.

The thermostat shall allow the use of an accessory remote and/or outdoor-temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/ left/select) with menu-driven selections for ease of use and programming.

1. **Multi-stage Automatic or Manual Changeover Programmable 7-Day with Humidity**

**Control (ATP32U04C)**

The thermostat shall be 7-day programmable (with up to four setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system

settings and fan ON-AUTO settings. Separate dehumidification and humidification setpoints shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow the thermostat to operate with EC fan dehumidification mode via settings changes. The thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, setpoints, mode, and status indication. The temperature indication shall be selectable for ºF or ºC. Time display shall be selectable for 12- or 24-hour clock. Fault identification shall

be provided to simplify troubleshooting by

providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. The thermostat shall provide progressive recovery to anticipate

time required to bring space temperature to the next programmed event. The thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name

and contact information. The thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

# **DDC SENSORS**

ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional interface system described above. Several types as described below:

1. Sensor only with no display (MPC).
2. Sensor with setpoint adjustment and override (MPC only).
3. Sensor with setpoint adjustment and override, LCD display, status/fault indication (MPC).

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