# **GEnEral**

Furnish and install ClimateMaster

Tranquility (ST) Rooftop Series 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 43.3°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 factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit.

**NOTE: If unit fails the factory acceptance test, it shall not be allowed to ship. Unit serial number shall be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.**

# **BaSiC ConSTruCTion**

Units shall be designed for outdoor installation and usage and shall be ETL or UL tested to withstand UL rain test standards.

All exterior and other painted surfaces shall be constructed of galvanized steel finished with both sides having powder paint coated surfaces. This corrosion protection system shall meet the stringent 1,000-hour salt spray test per ASTM B117.

Roof shall be constructed of a single piece of steel as described above (except on largest of unit sizes in

which case shall be a maximum of two pieces joined by a standing seam construction). All roof edges shall overlap sides of unit and have a 45º lip extending away from unit sides so that rainwater drippage shall not fall on top of access doors.

Access to filters, indoor blower, electrical controls, compressor compartment, and damper section shall be provided by double wall construction for access doors and noncorrosive hardware.

The compressor and electrical control compartment shall be isolated from the system air streams.

Bottom base pan of entire unit shall have no penetrations by bolts or screws. All base pan edges and any openings shall contain one-inch upturns at all edges and shall be sealed with silicone caulking to prevent water from dripping through base pan.

All interior surfaces shall be lined with 1-inch-thick

(25 mm), 1-1/2 lb/ft3 (24 kg/m3) acoustic-type fiberglass insulation. Insulation placement shall be designed

in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the airstream. All air-handling compartments shall utilize foil-faced insulation for ease of cleaning.

Standard cabinet panel insulation must meet 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.**

Entire unit base shall be insulated on the underneath side to provide condensation protection and noise attenuation. The unit shall be furnished with 2-inch (50 mm) filter rails and one set 2-inch (50.8 mm) throwaway filters. Filter rails shall be field convertible without the need for additional parts to accept

4-inch (101.6 mm) filters.

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# **fan anD MoTor aSSEMBly**

The blower assembly shall come with an aluminum, backwards-curved centrifugal impeller and a galvanized inlet cone. The motorized impeller is statically and dynamically balanced according to DIN ISO 21940-11 at least with quality level G6.3.

The motor shall be an EC external-rotor design with sealed, long-term, lubricated ball bearings and is made of die-cast aluminum. The motor shall be at least IP54 with class F insulation. The motor shall exceed IE5 class efficiency per IEC 60034-30-2. The motor shall be three-phase with internal over/under voltage and over-temperature detection as well as locked-rotor monitoring.

The fan and motor assembly must be capable of overcoming the external static pressures, up to and including as shown in the unit submittal. Airflow/ Static pressure rating of the unit shall be based on a wet coil with a clean filter in place. Fan and motor assembly shall be mounted on an easily-removable, slide-out assembly with safety stop for easy access and maintenance; motor shall be factory wired with wire of sufficient length to allow fan/motor assembly to be removed from unit and be placed on roof of unit for servicing.

# **REFRIGERANT CIRCUIT**

All units shall contain an R-454B sealed refrigerant circuit including a high-efficiency scroll compressor (dual-scroll compressors for units larger than 7 tons/ 24.6 kW) 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.

The two-stage scroll compressor (036-072) or two single-stage scroll compressors (096-240) will be mounted on external grommets specifically selected for maximized vibration attenuation. Compressor(s) shall be mounted on a double-isolation compressor deck, to further reduce vibration transmission

to unit base. Compressor(s) shall have thermal overload protection and 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 650 PSIG (4,481 kPa) refrigerant working pressure. Refrigerant-to-water heat exchangers shall be of copper inner water tube that is deeply fluted, and steel refrigerant outer tube co-axial design, rated to withstand 650 PSIG (4,481 kPa) working refrigerant pressure and 300 PSIG (2,068 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 hours

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 type 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). 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.

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**Option: The unit will be supplied with internally factory mounted two-way water valve with end switch for variable speed pumping requirements. A factory-mounted or field- installed high pressure switch shall be installed in the water piping to disable compressor operation in the event water pressures build due to water freezing in the piping system.**

**Option: vFlow® — The unit will be supplied with internally factory mounted modulating water valve with** **T control. The factory built-in valve shall modulate water flow through unit based on a field adjustable water temperature difference between the entering and leaving water. The valve shall automatically adjust for operating mode, source water temperature and variations in external head pressure. The valve will also act as a shut-off valve to prevent water flow**

**through the unit when the unit is not activated and will have a minimum position capability.**

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

**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 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 size 036, mandatory for sizes 048-240).**

# **DRAIN PAN**

The drain pan shall be constructed of 304 stainless steel. This corrosion protection system shall meet the stringent 1,000-hour salt spray test per ASTM B117. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain pan outlet side field selectable/convertible. Drain outlet shall be connected from pan directly to FPT fitting.

**No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted.**

# **ELECTRICAL**

A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer with load side circuit breaker protection, 24V-activated, three-pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan 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 24 Volt and provide heating or cooling as required by the remote thermostat/

sensor. Two compressor units shall have a solid-state time delay relay and random start to prevent both compressors from starting simultaneously.

**Option: Disconnect Switch, Non-Fused Option: Disconnect Switch, Non-Fused and**

**unpowered 115 VAC GFI convenience outlet**

**(separate 115 VAC circuit required by others).**

**Option: Circuit Breaker**

**Option: Circuit Breaker and unpowered 115 VAC GFI convenience outlet (separate 115 VAC circuit required by others).**

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# **OUTDOOR AIR**

The unit shall be supplied as standard with no outdoor air provisions (100% return air).

**Option: Manual outside air damper with rain hood and bird screen sized for a maximum capacity of 20% of the total unit air volume for outside air volume.**

**Option: Two-position motorized outside air damper (opens outside air damper upon compressor contactor activation).**

**Option: Fully modulating enthalpy controlled economizer, supplied with large diameter ABS gear driven outdoor air and return air dampers. Solid-state economizer logic module shall be Honeywell W7220 series with Honeywell M7215 actuator. The economizer package shall also be supplied with gravity relief damper.**

**Option: Optional demand control ventilation when optional CO2 sensor is added to economizer.**

# **ENHANCED SOLID STATE**

**CONTROL SYSTEM (CXM2)**

Unit sizes 096 through 240 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 interface with a heat pump type thermostat. 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. Option to reset unit at thermostat or disconnect.
8. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
9. Ability to defeat time delays for servicing.
10. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
11. 24V output to cycle a motorized water valve or other device with compressor contactor.
12. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
13. Water coil low temperature sensing (selectable for water or anti-freeze).
14. Air coil low temperature sensing.
15. 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).
16. Emergency shutdown contacts.
17. Entering and leaving water temperature sensing.
18. Leaving air temperature sensing.
19. Compressor discharge temperature sensing.

**NOTE: Units not providing the 7 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge),**

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

When CXM2 is connected to AWC99U01 thermostat or handheld service tool, the installer/service technician can; check DIP switch S2 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.

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When the AWC99U01 communicating thermostat is used this same functionality can be viewed and adjusted remotely in the web portal or mobile app.

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

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

This control system is a communicating controller for use on unit sizes 036 through 072 only.

DXM2.5 controller shall have the above-mentioned features of the CXM2 control system along with the following expanded features:

1. Removable thermostat connector.
2. Night setback control.
3. Random start on return from night setback.
4. Override temperature control with two-hour timer for room occupant to override setback temperature at the thermostat.
5. Dry contact night setback output for digital night-setback thermostats.
6. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
7. Ability to work with heat pump thermostats using O or B reversing valve control.
8. Boilerless system heat control at low loop water temperature.
9. Ability to allow up to three units to be controlled by one thermostat.
10. Relay to operate an external damper.
11. Relay to start system pump.
12. 75 VA control transformer. Control transformer shall have load side short circuit and overload protection via a built-in circuit breaker.

**NOTE: Units not providing the 7 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge),**

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

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

# **DIGITAL NIGHT SETBACK WITH PUMP RESTART (DXM2.5 W/ 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 (CXM2/DXM2.5)**

Solid-state control system shall communicate with thermostat to display (at a compatible 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 unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout.

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Upon cycling the G (fan) input 3 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, 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 two-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

Units shall have all the features listed above (either CXM2 or DXM2.5) 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 two-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. Hi/low-voltage alarm
11. Fan “ON/AUTO” position of space thermostat as specified above
12. Unoccupied/occupied command
13. Cooling command
14. Heating command
15. Fan “ON/AUTO” command
16. Fault reset command
17. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load-side, short-circuit and overload protection via a built-in circuit breaker.

# **WARRANTY**

ClimateMaster shall warranty equipment for a period of 12 months from startup or 18 months from shipping (which ever 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.**

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# **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 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. **Single-Stage Digital Auto or Manual Changeover (ATA11U01)**

Thermostat shall be a single-stage, digital, auto- or manual-changeover with HEAT-OFF- COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display

with temperature and setpoint(s) in ºF or ºC. The Thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.

1. **Multi-stage Manual Changeover Programmable 5/2 Day (ATP21W02)**

Thermostat shall be 5-day/2-day programmable (with up to four setpoints per day), multi-stage (2H/1C), manual changeover with HEAT-OFF- COOL-EM HEAT system settings and fan ON- AUTO settings. 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. Thermostat shall provide convenient override feature to temporarily change setpoint.

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

Thermostat shall be 7-day programmable (with up to 4 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. 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 (when used with ClimateMaster CXM2 or DXM2.5 controls)

to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall

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

information. 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. **Multistage Automatic or Manual Changeover Programmable 7-Day with Humidity Control (ATP32U04C)**

Thermostat shall be 7-day programmable (with up to 4 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. 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 (when used with ClimateMaster CXM2 or DXM2.5 controls)

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. Thermostat shall provide progressive recovery to anticipate time

required to bring space temperature to the next programmed event. Thermostat shall provide

an installer setup for configuring options and for setup of servicing contractor name and contact information. 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. **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. 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. 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. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. 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. **CM300 – Multi-stage, Automatic or Manual Changeover, 7-day Programmable with Wi-Fi and Humidity Control (AVB32V02C)**

Commercial version shall be 7-day programmable with 4 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, night time 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.

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

Thermostat shall have color resistive- touchscreen display with space temperature, relative humidity, setpoints, mode, status indication and local weather (if connected to Wi-Fi). Commercial version shall be 7-day programmable with 4 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. Capable of being monitored by 3rd-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.

Thermostat shall provide heating-setpoint range

limit, cooling-setpoint range limit, temperature display offset, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide access to a web portal and mobile app for installer setup for configuring options. Thermostat shall have 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).

# **ROOF CURBS**

A 14-inch-high (356 mm) knockdown roof curb for flat roofs is available as standard in down-

discharge configuration. Other curbs are available by special request.

**Option: A 24-inch-high (610 mm) knockdown roof curb for flat roofs with downward discharge configuration.**

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