



- The "Fan Off If Supply Air Temp Below" setting will shut down the unit when the discharge air temperature goes below the "Fan Off If Supply Air Temp Below" setting for longer than 5 minutes.
- Optional "Energy Alert" building underpressure control (patented).
 - a. During the Occupied Mode:
 1. The "Energy Alert" building pressure override control shall be activated if the pressure drops .01" wc [.02 mbar] below the setting of the Building Pressure Control.
 2. An on-delay timer will be activated and start a ten minute time-out period.
 3. After the time-out, an alarm will sound and an indicator light will be activated indicating "LOW BUILDING PRESSURE". An Alarm Silence Switch shall be provided which automatically resets with the Energy Alert controls.
 4. The OA damper will close and the RA damper will go to full open.
 5. The Control System shall go to the "Unoccupied Setback Temp" setpoint.
 6. After a 20 minute period, or immediately when the pressure returns to the pressure setpoint, the damper control and building temperature will return to the normal Occupied setpoints.

UNOCCUPIED PERIOD (SETBACK) CONTROL:

- a. COOLING SEQUENCE (Unoccupied Mode):
 1. The fan is shut down.
 2. The burner is shut off.
- c. HEATING SEQUENCE (Unoccupied Mode):
 1. While the space temperature is above the "Unoccupied Setback Temp" setpoint, the fan and burner controls shut down and the dampers return to their normal positions.
 2. When the space temperature falls below the "Unoccupied Setback Temp" setpoint, the fan starts, burner ignites and modulates to maintain the "Unoccupied Setback Temp" setpoint, and the dampers operate in the same manner as for the Occupied Period.

FLUSH MODE CONTROL (OPTIONAL) (Sensor Locations as Indicated on Drawing):

- When the carbon monoxide (CO) (or other sensor) level reaches its Level I setpoint, a five minute time delay will energize. This occurs whether the air handler is in the Off, On or Auto Modes.
- Upon a continued alarm after the time delay, the RA damper will modulate to 0% and the OA damper will position to 100%.

EXHAUST MODE CONTROL (OPTIONAL):

- When the CO (or other sensor) level reaches its Level II setpoint, another five minute time delay will energize. This occurs whether the air handler is in the Off, On or Auto Modes.

- Upon a continued alarm after the Level II time delay, the burner shuts off, RA damper modulates to 100% open, exhaust damper modulates to 100% open, discharge damper modulates to 0% open, and OA damper modulates to 0% open.
- After the CO (or other sensor) indicates a return to normal, the controls will reset the air handler to normal operation.

HUMIDITY CONTROL (OPTIONAL):

- The sensors measure space air temperature and humidity.
- If the space air humidity is greater than the user-selectable set point, the burner ignition sequence is initiated and the burner modulates to maintain the room temperature at a temperature which reduces the humidity to the selected level.
- When the space air humidity is less than the user-selectable set point, the burner is de-energized.
- This monitoring and control sequence is maintained at all times during air handler's Occupied Mode.

6. Conventional Electronic Controls System:

1. Temperature Controller: Provide amplifier with room temperature control, room temperature sensor and discharge air temperature sensor.
2. Pressure switch: Provide a null position pressure switch for controlling the mixing dampers.
3. Pilot (Indicating) Lights (Optional): Install UL labeled lights in panel door (for indoor air handlers) or inside panel door (for outdoor air handlers) to indicate operation of control components as follows:
 - Power on
 - Low temperature limit switch
 - Power to fan starter
 - Fan on
 - High temperature limit switch
 - High gas pressure switch
 - Low gas pressure switch
 - Fan airflow switch
 - Ignition
 - Pilot valve
 - Power to valves
 - Power to temperature control
4. Remote Control Panel (one for each unit): Mount unit operating switches and pilot lights, as follows:
 - Solid state temperature control system, including occupied and unoccupied switches and room temperature thermostats.
 - Programmable electronic 7 day time clock with minimum of 4 on/off schedules per day and emergency battery power source (optional).
 - Remote burner reset control (optional).
 - Burner alarm horn with silence switch (optional).
 - SUMMER/WINTER switch.
 - ON-OFF-Auto switch.
 - Pilot lights for Fan on/off and Burner on/off.
- H. InfinityPro™ and ICS IV Control System (Direct Digital Controls):
 1. General: Regardless of air handler type, cooling or heating system type, the Controller shall be identical. The current Controller version shall be compatible

AIR HANDLER GUIDE SPECIFICATION

with all previous versions.

2. Third Party / External Control Interface: Via an external signal (from any 120 V switched device), the Controller can be forced into Occupied, Flush or Exhaust Modes (optional feature). (Exhaust mode only available for ICS IV)
3. Space Temperature Control System: The temperature control system shall utilize a factory supplied temperature sensor to be mounted in the space by the installing contractor where indicated on the plans. Additional sensors mounted in the air handler discharge and inlet shall be used to monitor the discharge and outdoor temperatures.
4. Automatic Building Pressure Control with Manual Override: For modulating outdoor air type air handlers, an automatic pressure control shall be used to sense the room pressure and modulate the OA and RA dampers to maintain the building pressure setpoint. The pressure transducer shall be mounted on the air handler and have a span of -3" to +3" wc.
5. Low Temperature Limit Control: The fan shall shut down when cold air is discharged from the air handler for more than five minutes. The Low Supply Air Temp Below " setpoint may be selected between 30 °F and 50 °F.
6. Information and Control Functions: Individual Controllers shall be capable of communicating information to and receiving control instructions from a remote device or handheld keypad.
7. PC Graphical Interface (Optional): When the Controller(s) are connected with a shielded twisted pair communications cable per the manufacturer's instructions to a Windows™-based computer, the following monitoring and control features are available:
 - a. The DDC controller shall provide a Windows™-style color graphic display of each individual air handler, the entire system / group of air handlers (spreadsheet format), and all digital I/O points. All schedules, setpoints and limit settings shall be readily adjustable by "pointing and clicking" on the air handler graphic.
 - b. All setpoints and actual values for temperatures, building pressure, heating/cooling capacity, damper position, and fan/ burner status information shall be displayed on the graphic and automatically stored on the PC hard disk in user-defined intervals for reference or exporting for further analysis.
 - c. All controller status and analog I/O information shall be readily visible on a graphic.
 - d. The interface shall conveniently display air handler configuration, heating and cooling system type, as well as all mechanical options.
 - e. Fan runtime, number of fan starts, daily electrical usage and daily gas usage shall all be easily available for reference or exporting for further analysis.
 - f. All operational errors shall be reported to the PC, including date, time and full description. Information for the last 4 errors shall be retained in

the Controller memory.

- g. A complete digital Troubleshooting Guide, Wiring Schematic and Installation, Operation and Service Manual shall be included with the graphic software.
8. Handheld Interface (Optional): The RAPID® Remote Station allows complete monitoring and control capability of individual air handler(s), including all of the Information and Control Functions above, except energy usage.
9. Interoperability (Optional): All of the information and control functions above shall be available to a host control interface using either the BACNet®, ModBus®, N2 Bus® or LONWorks®, etc. protocol.

2.7 AIR HANDLER OPTIONS AVAILABLE [Select Applicable Options]

- A. Roof Curb: The roof curb shall be 19" (48.2 cm) full-perimeter, formed of minimum 16-gauge galvanized steel as required to support the unit. Roof curb to be used on horizontal air handlers only.
- B. Stand: The stand shall measure appropriate height for efficient airflow on air handler equipped with filters (hood-recirculation style) stand shall be used on vertical air handlers only.
- C. Legs: The legs shall measure [24"(61 cm)/ 36"(91.4 cm)/ 48"(121.9 cm)/ 60"(152.4 cm)/ 72"(182.9 cm)/ 84"(213.4 cm)/ 96"(243.8 cm)] high and be formed of minimum 16 gauge galvanized steel as required to support the unit.
- D. Inlet Hood (Recommended for inlet velocities not exceeding 600 fpm at face of hood): The [painted] [unpainted] inlet hood shall mount on the outdoor air intake and be constructed of galvanized steel. Inlet hood available with [permanent aluminum filters][moisture limiter media]. The inlet hood shall be used on horizontal air handlers only.
- E. Outdoor Air Intake Plenum: Outdoor air intake plenums shall have vertical drift eliminator media mounted on three sides designed to limit entering air velocity to less than 1000 fpm (net). The floor shall be sloped and equipped with drain outlets to the roof.
- F. Insulation: The roof and walls of the cabinet shall be completely lined with 1" (2.5 cm), 1.5 lb/ft² (7.3 kg/m²) density, neoprene coated, glass fiber insulation, which complies with UL181 for erosion and NFPA 90A for fire resistivity. The insulation shall be secured via adhesive and mechanical pin fasteners per SMACNA standards. All exposed edges shall be coated.
- G. Discharge Head: Discharge heads available [one-way] [three-way][four-way] for control of discharge airflow direction. Discharge head shall include [adjustable] [locking]/ [horizontal][horizontal and vertical] deflection blades. Blades are [manually][motorized remote control] adjustable. Optional powered blades allow [two-position] [modulating] control.
- H. Discharge Plate: The discharge plate shall be constructed of 16 gauge galvanized steel and to be suspended below a horizontal air handler with a bottom discharge. Discharge plate shipped loose for installation and with



field provided threaded rod.

- I. Filter Mix Box: The filter mix box shall include a filtration section downstream of both the outdoor air and return air streams. Design shall prevent the mixing of combustion air and return air therefore preventing any return air from passing across the burner.
- J. Outdoor Air Filter Section: The filter section shall only filter outside air and be constructed of aluminized steel.
- K. High Gas Pressure Regulator: The high gas pressure regulator regulates down the inlet gas pressure to a level accepted by the unit manifold.
- L. Dampers: [Inlet][Discharge][Low-Leak Inlet][Exhaust Air] dampers are motorized with end switch to prove position before burner will fire.
 - a. Inlet Damper: Inlet damper shall be factory mounted to the inlet of the air handler.
 - b. Discharge Damper: Discharge damper shall be 16 gauge galvanized steel with frame supporting damper blades to prevent twisting and flexing. Operator is located outside the airstream.
 - c. Low-Leak Damper: Low-leak damper shall be used for air handlers with low pressure drop and minimal noise generation.
 - d. Exhaust Air Damper: Exhaust air damper shall allow for a maximum leakage of 5 CFM per square foot at 4" wc (10 mbar). Air velocity not to exceed 2,000 fpm.
- M. Service Platform: Service platform shall provide minimum 46" (116.8 cm) deep full air handler with platform. Platform shall be constructed of minimum 1" (2.5 cm) thick galvanized steel grating with OSHA approved handrail on three sides and steel safety chain on remaining fourth side. Platforms are available in [vertical – indoor/outdoor][horizontal – basic/outside air filter section/filter section mix box] orientation.
- N. Vibration Isolation: Vibration isolation [platform-mounted] [curb-mounted][suspended] shall utilize a steel housing and a color coded, oil-resistant neoprene element. Element shall be selected for minimum 90% isolation efficiency with a deflection of 0.25" or less. Vibration isolation shall be available for horizontal air handlers only.
- O. Energy Recovery: A housed plate style energy recovery module is placed on the inlet side of the blower (blower/ heated) section(s). The minimum energy transfer efficiency shall be 60% or above. Four access panels positioned at both the inlet and outlet locations of the module are used for cleaning/servicing of both exhaust and outside air streams. Cabinet floor shall incorporate drain pan(s) to remove condensate and assist with proper cleaning procedures. Supply and exhaust compartments include drain pan(s). Housing arrangement accepts a [blow through][draw through] exhaust fan provided by the [air handler manufacturer][by others]. Face and by-pass dampers mounted on the inlet side of the module are dynamically modulating to control frost prevention and economizer control. Traversing frost control is not acceptable.
- P. Double-Wall Construction: The unit walls and ceiling shall be lined with 2" (5 cm), 1.5 lb/ft² (7.3 kg/m²) density, neoprene coated, glass fiber insulation. This insulation shall then be covered by metal liners with a minimum thickness of 20 gauge. All exposed edges shall be covered by metal liners.
- Q. Variable Pitch Sheaves: Variable pitch sheaves allow for adjustable speed [increase][decrease] in rotations per minute of given shaft.
- R. Aluminum [Wheel][Cone]: Aluminum [wheel][cone] shall allow for variation from standard offering. Guards available for inlet cone variation.
- S. Class II Fan Wheel: Class II fan wheels shall allow for higher static pressure capabilities.
- T. Bearing Cooler:
- U. OSHA Standard Belt Guards: Belt guards approved through OSHA standards. Consult factory for any additional internal static pressure.
- V. Paint Options: [Enamel Special Color for exterior use] [Epoxy Coated for or interior] available. Contact factory for standard paint color samples.

DRAFT

2. PERFORMANCE

A. See Schedule on plans

Part 3: EXECUTION

3.1 INSTALLATION

- A. Install equipment in strict accordance with manufacturer's instructions and in accordance with applicable governmental regulations buy a contractor qualified in the installation of the manufacturer's product.
- B. Install per NFPA 90A.
- C. Install per NFPA 54 (ANSI Z223.1) by providing connection to fuel gas system.
- D. Units which are shipped in multiple sections shall be assembled on the job site by the installing contractor. Assembly includes caulking all seams weather tight and extending electrical power and network control wires to the terminals provided, reconnecting the motor and control wiring between sections to create a complete and operable installation (per air handler manufacturer's recommendations).
- E. Contractor shall extend pressure sensing tubes to inside and to outside of building as recommended by the air handler manufacturer.
- F. Contractor shall provide a proper gas service drip leg and a lockable, lever hand gas shut-off valve. A high pressure regulator shall be installed if manifold pressure exceeds 5 psig.
- G. Furnish Contractor with field wiring diagram and electrical data to permit power wiring connections to the unit.
- H. Installation contractor is to provide equipment check, test and commissioning in strict accordance with manufacturer's instructions. Provide a copy of start-up records to the engineer. Copies provided by factory authorized personnel, not by installing contractor unless factory certified personnel are employed by the installing contractor.

- I. Provide the owner's operating personnel with instruction on proper use of the air handler and controls.
- J. Contractor shall supply all necessary hanger rods and install the discharge head or plate (if provided) in accordance with manufacturer's instructions.
- K. Contractor shall level the roof curb and install a cant strip and wood nailer per applicable details on the plans.
- L. Install [carbon monoxide][carbon dioxide][smoke detector] sensors in the vicinity of the source contaminant (e.g., an operating vehicle), preferable at the breathing level of the occupants. Do not install sensors in confined ("dead") spaces.

3.2 SCHEDULES

- A. See plans.

DRAFT

Installation Code and Annual Inspections:

All installation and service of RAPID® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by Rapid Engineering LLC and conform to all requirements set forth in the Rapid Engineering LLC manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment. To help facilitate optimum performance and safety, Rapid Engineering LLC recommends that a qualified contractor conduct, at a minimum, annual inspections of your RAPID® equipment and perform service where necessary, using only replacement parts sold and supplied by Rapid Engineering LLC.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through RAPID® representatives. Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

This product is not for residential use.

This document is intended to assist licensed professionals in the exercise of their professional judgement.

Rapid Engineering LLC

1100 Seven Mile Road NW
Comstock Park, MI 49321
Telephone: 616.784.0500
Toll Free: 800.536.3461
Fax: 616.784.1910

www.rapidengineering.com

© 2015 Rapid Engineering LLC

All rights reserved. No part of this work covered by the copyrights herein may be reproduced or copied in any form or by any means – graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems – without written permission of Rapid Engineering LLC.