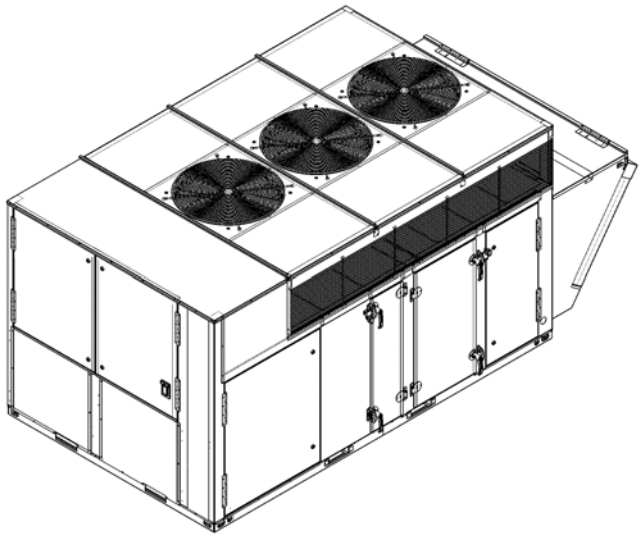
Installation, Operation, and Maintenance

Horizon™ Outdoor Air Unit

Direct Gas-Fired

Model: OAG



Important: *Proper execution of the tasks outlined in this* Installation, Operation, and Maintenance *manual require and assume the technician has been certified as a start up technician for the Horizon Outdoor Air unit. This includes working knowledge of the Tracer TU program.*

⚠SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

April 2015 **OAU-SVX005A-EN**

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE: Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

⚠WARNING

Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical, mechanical and chemical hazards.

- **Before installing/servicing this unit, technicians MUST put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). ALWAYS refer to appropriate Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.**
- **If there is a risk of energized electrical contact, arc, or flash, technicians MUST put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, PRIOR to servicing the unit. NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

Failure to follow instructions could result in death or serious injury.

⚠WARNING

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage. System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

⚠WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury. Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

General Safety Information

⚠WARNING

Safety Alert!

You MUST follow all instructions below. Failure to do so could result in death or serious injury.

If you smell gas:

1. **Open windows.**
2. **Don't touch electrical switches.**
3. **Extinguish any open flame.**
4. **Immediately call your gas supplier.**

Improper installation, adjustment, alteration, service, or maintenance of this equipment can cause death or serious injury, or property damage. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

Start up technician shall perform a gas leak check of the heater's components and internal piping during heater start-up, to verify the gas-tightness of the heater's components and piping under normal operating conditions.

To prevent damage to heater and heating controls:

1. **During any testing of the gas supply system that is performed at pressures above 1/2 psi (3.5 kPa) the heater and its upstream shut-off valve shall be disconnected from the gas supply piping system.**
2. **During any testing of the gas supply piping system that is performed at pressures equal to or less than 1/2 psi (3.5 kPa) the heater's upstream manual shut off valve must be closed.**

Refer to the heater rating plate for determining the minimum gas supply pressure for obtaining the maximum gas capacity for which this heater is specified.

This heater is a listed non-recirculating direct gas-fired industrial air heater. Recirculation of room air to the heater at anytime the heater is operating in the heating mode is not permitted.

Do not install any filters inside the heater cabinet downstream of the direct gas-fired burner.

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Trademarks

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Revision History

OAU-SVX005A-EN (27 Apr 2015)

- First version of this literature

Table of Contents

Model Number Descriptions

O	A	B	D	0	3	6	A	4	-	D	1	A	1	A	0	A	B	-	G	1	C	B	0	A	C	3	A	B	-	A	1	1	B	1	0	2	A	0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39

Horizon Outdoor Air Unit

Digit 1, 2 — Unit Type

OA = Outdoor Air

Digit 3 — Cabinet Size

B = 500 cfm–3,000 cfm
G = 1,250 cfm–7,500 cfm

Digit 4 — Major Design Sequence

D = Revision 1
E = Heat Pump

Digit 5, 6, 7 — Normal Gross Cooling Capacity (MBh)

000 = No Cooling
036 = 3 Tons High Efficiency
048 = 4 Tons High Efficiency
060 = 5 Tons High Efficiency
072 = 6 Tons High Efficiency
084 = 7 Tons High Efficiency
096 = 8 Tons High Efficiency
108 = 9 Tons High Efficiency
120 = 10 Tons High Efficiency
144 = 12 Tons High Efficiency
180 = 15 Tons High Efficiency
210 = 17 Tons High Efficiency
240 = 20 Tons High Efficiency
264 = 22 Tons High Efficiency
300 = 25 Tons High Efficiency
360 = 30 Tons High Efficiency

Digit 8 — Minor Design Sequence

A = Vertical Discharge/Vertical Return
B = Vertical Discharge/Horizontal Return
C = Horizontal Discharge/Vertical Return
D = Horizontal Discharge/Horizontal Return

Digit 9 — Voltage Selection

1 = 115/60/1
2 = 208-230/60/1
3 = 208-230/60/3
4 = 460/60/3
5 = 575/60/3

Digit 10 — Reserved for Future Use

Digit 11 — Evaporator Type

0 = No Cooling
A = DX 3-Row
B = DX 4-Row
C = DX 4-Row Interlaced
D = DX 6-Row Interlaced
E = DX 8-Row
F = Glycol/Chilled Water Coil
G = DX 4-Row with MSP® Technology

Digit 12 — Hot Gas Reheat

0 = No HGRH
1 = Fin and Tube Modulating
2 = Fin and Tube On/Off
3 = Microchannel Modulating
4 = Microchannel On/Off

Digit 13 — Compressor

0 = No Compressors
A = Scroll Compressors
B = Digital Scroll (1st Circuit Only)
C = Digital Scroll (1st and 2nd Circuit)
D = Variable Speed Scroll (1st Circuit Only)
E = Variable Speed Scroll (1st and 2nd Circuit)

Digit 14 — Condenser

0 = No Condenser
1 = Air-Cooled Fin and Tube
2 = Air-Cooled Fin and Tube w/Head Pressure On/Off Control
3 = Water-Cooled DX Condenser Copper/Steel
4 = Air-Cooled Fin and Tube w/Head Pressure Variable Speed
5 = Air-Cooled Microchannel
6 = Air-Cooled Microchannel w/Head Pressure On/Off Control
7 = Air-Cooled Microchannel Variable Speed
8 = Water-Cooled DX Condenser Copper/Nickel

Digit 15 — Refrigerant Capacity Control

0 = No RCC Valve
A = RCC Valve on 1st Circuit
B = RCC Valve on 1st and 2nd Circuit
C = ERCC Valve on 1st Circuit
D = ERCC Valve on 1st and 2nd Circuit
E = HGBP Valve on 1st Circuit
F = HGBP Valve on 1st and 2nd Circuit

Digit 16 — Indoor Fan Motor (IFM)

0 = ECM w/Backward Curved Plenum Fan
1 = Direct Drive w/ VFD
2 = Belt Drive
3 = Belt Drive w/VFD
4 = Special Motor Option

Digit 17 — Indoor Fan Wheel

A = 355
B = 450
C = 450 X 2
D = 12/9 T2 (Single Fan—Belt Drive)
E = 12/9 BT (Dual Fan—Belt Drive)

Digit 18 — Indoor Fan Motor Power (hp)

		ECM	Belt Drive
A	=	1 kW	2 hp
B	=	2 kW	3 hp
C	=	3 kW	5 hp
D	=	4 kW	7.5 hp
E	=		10 hp
F	=		15 hp

Digit 19 — Reserved for Future Use

Digit 20 — Heat Type (PRI/SEC)

0 = No Heat
A = Indirect-Fired (IF)
B = No Primary Heat, Direct-Fired (DF) Secondary
C = Electric—Staged
D = Electric—SCR Modulating
E = Dual Fuel (PRI-IF/SEC-DF)
F = Dual Fuel (PRI-ELEC/SEC-DF)
G = Dual Fuel (PRI-IF/SEC-ELEC)
H = Dual Fuel (PRI-ELEC-SCR/SEC-ELEC)
J = Hot Water
K = Steam
L = No Primary Heat, Secondary ELEC
M = Dual Fuel (PRI-ELEC-STAGED/SEC-DF)
N = Dual Fuel (PRI-ELEC-STAGED/SEC-ELEC)

Digit 21 — Primary Fuel Type

0 = No Heat
1 = Natural Gas
2 = Propane
3 = Electric—Open Coil
4 = Electric—Sheathed Coil
5 = Hot Water
6 = Steam

Model Number Descriptions

Digit 22 — Heat Capacity (Primary Heat Source)

		IF	ELEC
0	=	No Heat	No Heat
A	=	50 MBh	5 kW
B	=	75 MBh	10 kW
C	=	100 MBh	15 kW
D	=	125 MBh	20 kW
E	=	150 MBh	24 kW
F	=	200 MBh	28 kW
G	=	250 MBh	32 kW
H	=	300 MBh	40 kW
J	=	350 MBh	48 kW
K	=	400 MBh	60 kW
L	=	500 MBh	68 kW
M	=	600 MBh	79 kW
N	=		99 kW
O	=		111 kW
P	=		119 kW
X	=	Special Heater Option	

Digit 23 — Heat Capacity (Secondary Heat Source)

		ELEC	DF
0	=	No Heat/No Secondary Heat	
A	=	5 kW	6-in. Burner—Up to 300 MBh
B	=	10 kW	12-in. Burner—Up to 400 MBh
C	=	15 kW	12-in. Burner—Up to 600 MBh
D	=	20 kW	18-in. Burner—Up to 400 MBh
E	=	24 kW	18-in. Burner—Up to 900 MBh
F	=	28 kW	

Digit 24 — Corrosive Environment Package

0 = No Corrosive Package
1 = S/S Interior, S/S Evap Coil Casing
2 = S/S Interior, Eco Coated Coils
3 = S/S Interior, Copper/Copper Evap Coil
4 = S/S Coil Casing
5 = S/S Interior
6 = Eco-Coated Coils
7 = S/S Coil Casing with Eco-Coated Coils
8 = Copper/Copper Evap, HGRH Coils

Digit 25, 26 — Unit Controls

00 = Non-DDC—Electromechanical
AA = Trane—Discharge Air Control w/LON Read-Write w/Display
AB = Trane—Space Control w/LON Read-Write w/Display
AC = Trane—Discharge Air Control w/BACnet® (No Display)
AD = Trane—Space Control w/BACnet (No Display)
AF = Trane—Discharge Air Control w/BACnet w/Display
AG = Trane—Space Control w/BACnet w/Display
AI = Trane—Discharge Air Control w/LON Read-Write (No Display)
AJ = Trane—Space Control w/LON Read-Write (No Display)
AK = Trane—Multi-Zone VAV Control w/LON Read-Write w/Display
AL = Trane—Multi-Zone VAV Control w/BACnet w/Display
AM = Trane—Multi-Zone VAV Control w/LON Read-Write (No Display)
AN = Trane—Multi-Zone VAV Control w/BACnet (No Display)
AO = Trane—Single-Zone VAV Control w/LON Read-Write w/Display
AP = Trane—Single-Zone VAV Control w/BACnet w/Display
AQ = Trane—Single-Zone VAV Control w/LON Read-Write (No Display)
AR = Trane—Single-Zone VAV Control w/BACnet (No Display)
XX = Control Special

Digit 27 — Powered Exhaust Fan Motor (PFM) and Exhaust Dampers

0 = No Powered Exhaust
1 = Direct Drive w/VFD
2 = Direct Drive (VFD by Others)
3 = Belt Drive
4 = Belt Drive w/VFD
5 = Special Motor Option
6 = ECM w/Backward Curved Plenum Fan
7 = ECM w/Backward Curved Plenum Fan and Barometric Relief Damper
8 = ECM w/Backward Curved Plenum Fan and Isolation Dampers w/End Switch
9 = Barometric Relief Dampers (NO PFM)

Digit 28 — Powered Exhaust Fan Wheel

0 = No Powered Exhaust
A = 355
B = 450
C = 450 X 2
D = 12/9 T2 (Single Fan—Belt Drive)
E = 12/9 BT (Dual Fan—Belt Drive)

Digit 29 — Powered Exhaust Fan Motor Power

		ECM	Belt Drive
0	=	No Powered Exhaust	
A	=	1 kW	2 hp
B	=	2 kW	3 hp
C	=	3 kW	5 hp
D	=	4 kW	7.5 hp
E	=		10 hp
F	=		15 hp

Digit 30 — Reserved for Future Use

Digit 31 — ERV (Requires Powered Exhaust)

0 = No ERV
A = ERV-Composite Construction w/Bypass
B = ERV—Composite Construction with Frost Protection w/VFD
C = ERV—Aluminum Construction w/Bypass
D = ERV—Aluminum Construction with Frost Protection w/VFD

Digit 32 — ERV Size

0 = No ERV
1 = 3014
2 = 3622
3 = 4136
4 = 4634
5 = 5856

Digit 33 — Damper Options

0 = 100% OA 2-Position Damper
1 = 100% OA 2-Position Damper w/RA 2-Position Damper
2 = Modulating OA and RA Dampers w/Economizer

Model Number Descriptions

Digit 34 — Filtration Options

A = No Filters
B = MERV-8,30%
C = MERV-13, 80%
D = MERV-14, 95%
= MERV-8 30%, MERV-13 80%
F = MERV-8 30%, MERV-14 95%
G = MERV-8, 30% with UVC
H = MERV-13, 80% with UVC
J = MERV-14, 95% with UVC
K = MERV-8 30%, MERV-13 80%, and UVC
L = MERV-8 30%, MERV-14 95%, and UVC
M = MERV-8 30% and TCACS
N = MERV-13 80% and TCACS
P = MERV-14 95% and TCACS
Q = MERV-8 30%, MERV-13 80%, and TCACS
R = MERV-8 30%, MERV-14 95%, and TCACS
X = Special Filter Options

Digit 35 — Smoke Detector (Factory-Installed)

0 = No Smoke Detector
1 = Supply Smoke Detector
2 = Return Smoke Detector
3 = Supply and Return Smoke Detectors

Digit 36 — Electrical Options

0 = Terminal Block
A = Non-Fused Disconnect Switch
B = Fused Disconnect Switch
C = Non-Fused Disconnect Switch w/Convenience Outlet
D = Fused Disconnect Switch w/Convenience Outlet
E = Dual Point Power
F = Dual Point Power w/Convenience Outlet
G = 65 SCCR Electrical Rating w/Non-Fused Disconnect
H = 65 SCCR Electrical Rating w/Fused Disconnect
J = 65 KAIC Electrical Rating w/Non-Fused Disconnect
K = 65 KAIC Electrical Rating w/Fused Disconnect
L = 65 KAIC Non-Fused w/Convenience Outlet
M = 65 KAIC Fused w/Convenience Outlet
N = 65 SCCR Non-Fused w/Convenience Outlet

Digit 37 — Air Flow Monitoring

0 = No Airflow Monitoring
1 = Airflow Monitoring—IFM Piezo Ring
2 = Airflow Monitoring—PE Piezo Ring
3 = Airflow Monitoring—Outdoor Air with Display and IFM w/Piezo Ring
4 = Airflow Monitoring—IFM Piezo Ring and PE Piezo Ring
5 = Airflow Monitoring—Outdoor Air Monitoring w/Display Supply Air and Exhaust Air w/Piezo Rings
6 = Airflow Monitoring—Outdoor Air Monitoring for Direct-Fired Heat Units

Digit 38 — Accessories

0 = No Options
A = Hailguards
B = Hailguards and LED Service Light in Supply Fan Section
C = LED Service Light in Supply Fan Section
D = Hailguards and LED Service Light in Exhaust Fan Section
E = Hailguards and LED Service Light in Supply and Exhaust Fan Section
F = LED Service Light in Exhaust Fan Section
G = LED Service Light in Supply and Exhaust Fan Section

Digit 39 — Altitude

0 = Sea Level to 1,000 Feet
1 = 1,001 to 2,000 Feet
2 = 2,001 to 3,000 Feet
3 = 3,001 to 4,000 Feet
4 = 4,001 to 5,000 Feet
5 = 5,001 to 6,000 Feet
6 = 6,001 to 7,000 Feet
7 = Above 7,000 Feet

General Information

Overview of Manual

Note: One copy of this document ships inside the control panel of each unit and is customer property. It must be retained by the unit's maintenance personnel.

This booklet describes proper installation, operation, and maintenance procedures for air cooled systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized.

It is important that periodic maintenance be performed to help assure trouble free operation. A maintenance schedule is provided at the end of this manual. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

Model Number Description

All products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code is provided (see "Model Number Descriptions," p. 7). Its use will enable the owner/operator, installing contractors, and service engineers to define the operation, specific components, and other options for any specific unit.

When ordering replacement parts or requesting service, be sure to refer to the specific model number and serial number printed on the unit nameplate.

Unit Nameplate

A Mylar® unit nameplate is located on the unit's corner support next to the control box. It includes the unit model number, serial number, electrical characteristics, refrigerant charge, as well as other pertinent unit data.

Compressor Nameplate

The nameplate for the compressors are located on the side of the compressor.

Unit Description

Before shipment, each unit is leak tested, dehydrated, charged with refrigerant and compressor oil, and run tested for proper control operation.

The condenser coils are aluminum fin, mechanically bonded to copper tubing.

Direct-drive, vertical discharge condenser fans are provided with built-in thermal overload protection.

The Outdoor Air Unit Main Unit Display and ReliaTel™ Control Module (RTRM) are microelectronic control systems. The acronym RTRM is extensively throughout this document when referring to the control system network.

The optional Main Unit Display and the RTRM are mounted in the Main Control Panel. The Main Unit Display and RTRM receive information from sensors and customer binary contacts to satisfy the applicable request for ventilation, cooling, dehumidification and heating.

Indoor Fan Failure Input

The Indoor Fan Failure Switch (IFFS) is connected to verify indoor fan operation.

When there is a call for the indoor fan to be energized, the differential pressure switch, connected to the Main Unit Display, must prove airflow within 60 seconds or the Main Unit Display will shut off all mechanical operations, lock the system out and send a diagnostic alarm to the Unit Display. The system will remain locked out until a reset is initiated through the MCM via the Alarm Reset Function on the Unit Display.

Low Pressure Control ReliaTel Control

This input incorporates the compressor low pressure control (CLP 1/2) of each refrigeration circuit and can be activated by opening a field supplied contact installed on the OAUTS.

If this circuit is open before the compressor is started, the ReliaTel™ control will not allow the affected compressor to operate. Anytime this circuit is opened for 1 continuous second during compressor operation, the compressor is immediately turned "Off." The compressor will not be allowed to restart for a minimum of 3 minutes should the contacts close.

If four consecutive open conditions occur during the first three minutes of operation, the compressor will be locked out, and a manual reset will be required to restart the compressor.

Refrigerant Circuits

Units shall incorporate a 4- or 6-row evaporator coil. All circuits shall have thermal expansion valves (TXVs), service pressure ports, sight glass, and refrigerant line filter drier as standard. An area will be provided for replacement suction line driers. Each refrigerant circuit is equipped with a factory installed and preset refrigerant capacity control (RCC) to prevent evaporator coil temperatures below approximately 38°F (114 lb suction). The refrigerant capacity device is not installed when the unit is equipped with a digital scroll.

High Pressure Control ReliaTel Control

The compressor high pressure controls (CHP 1/2) are wired in series between the compressor outputs on RTRM1 (CHP 1/2) and the compressor contactor coils. If one of the high pressure control switches opens, the RTRM senses a lack of current while calling for cooling and locks the compressor out.

Space Temperature / RH Sensor (Optional)

Field installed, wall mounted temperature sensor (BAYSENS036A) and humidity to control space cooling, heating and dew point. Refer to "Space Control with Direct Gas-Fired Heat and Modulating HGRH," p. 15 for specific details.

High Temperature Sensor

The Discharge Air Temperature Sensor (DTC) supplies a continuous signal to the MCM. If the MCM does not sense a signal from the DTC, the unit will go into LOCKOUT and require a manual restart once the proper operation of the DTC has been confirmed. If DAT exceeds Discharge Air High Temperature Cutoff (DHCS) of 125°F for 10 minutes, the unit will shut down and require manual restart.

Outdoor Air Temperature and Relative Humidity Sensor

This factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. Refer to "Sequence of Operation," p. 15 for detailed unit control and operational modes.

Control Input (Occupied / Unoccupied)

Terminals are provided on the terminal strip labeled OAUTS for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes.

Hot Gas Reheat

This option shall consist of a hot-gas reheat coil located on the leaving air side of the evaporator. Refer to the "Sequence of Operation," p. 15 for detailed unit control and operational modes.

100 Percent Outdoor Air Hood with Damper and Filters

Factory-installed and -integrated 100 percent outdoor air hood with damper controlled by a direct coupled actuator.

Through the Base Electrical with Disconnect Switch

Factory installed 3-pole, molded case disconnect switch with provisions for through the base electrical connections will be included. The disconnect switch, with integral overcurrent circuit breaker, will be installed in the unit in a water tight enclosure with access through a hinged door. Factory wiring will be provided from the switch to the unit high voltage terminal block. The switch will be UL/CSA agency recognized.

Hinged Access Doors

Hinged access doors with hold open brackets will be factory-installed.

Unit Inspection

⚠WARNING

Fiberglass Wool!

Product may contain fiberglass wool. Disturbing the insulation in this product during installation, maintenance or repair will expose you to airborne particles of glass wool fibers and ceramic fibers known to the state of California to cause cancer through inhalation. Glass wool fibers may also cause respiratory, skin or eye irritation.

As soon as the unit arrives at the job site:

- ☐ Verify that the nameplate data matches the data on the sales order and bill of lading (including electrical data).
- ☐ Verify that the power supply complies with the unit nameplate specifications.
- ☐ Visually inspect the exterior of the unit, including the roof, for signs of shipping damage.
- ☐ Visually inspect the internal components for shipping damage as soon as possible after delivery and before it is stored. Do *not* walk on the sheet metal base pans.
- ☐ If concealed damage is discovered, notify the carrier's terminal of damage immediately by phone and by mail. Concealed damage must be reported within 15 days.

  Request an immediate joint inspection of the damage by the carrier and the consignee. Do not remove damaged material from the receiving location. Take photos of the damage, if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- ☐ Notify the appropriate sales representative before installing or repairing a damaged unit.

- Avoid breathing fiberglass dust.
- Use a NIOSH approved dust/mist respirator.
- Avoid contact with the skin or eyes. Wear long-sleeved, loose-fitting clothing, gloves, and eye protection.
- Wash clothes separately from other clothing: rinse washer thoroughly.
- Operations such as sawing, blowing, tear-out, and spraying may generate fiber concentrations requiring additional respiratory protection. Use the appropriate NIOSH approved respiration in these situations.

First Aid Measures

Eye Contact

Flush eyes with water to remove dust. If symptoms persist, seek medical attention.

Skin Contact

Wash affected areas gently with soap and warm water after handling.

Storage

Take precautions to prevent condensate from forming inside the unit's electrical compartments and motors if:

- the unit is stored before it is installed; or,
- the unit is set on the roof curb, and temporary heat is provided in the building. Isolate all side panel service entrances and base pan openings (e.g., conduit holes, S/A and R/A openings, and flue openings) from the ambient air until the unit is ready for start-up.

Note: Do not use the unit's heater for temporary heat without first completing the start-up procedure detailed in "Start-Up," p. 29.

The manufacturer will not assume any responsibility for equipment damage resulting from condensate accumulation on the unit's electrical and/or mechanical components.

Unit Clearances

"Unit Clearances, Curb Dimensions, and Dimensional Data," p. 13 contains figures that illustrate the minimum operating and service clearances for either a single or multiple unit installation. These clearances are the minimum distances necessary to assure adequate serviceability, cataloged unit capacity, and peak operating efficiency.

Providing less than the recommended clearances may result in condenser coil starvation, "short-circuiting" of exhaust or recirculation of hot condenser air.

Unit Clearances, Curb Dimensions, and Dimensional Data

⚠WARNING

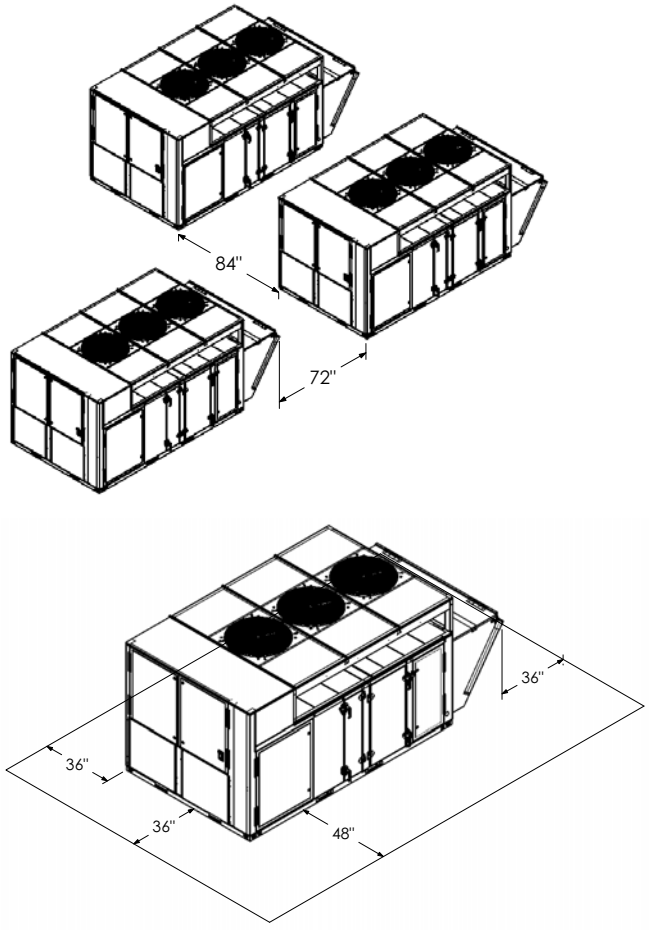
Combustible Materials!

Failure to maintain proper clearance between the unit heat exchanger, vent surfaces and combustible materials could cause a fire which could result in death or serious injury or property damage. Refer to unit nameplate and installation instructions for proper clearances.

Direct-Fired OAG Units

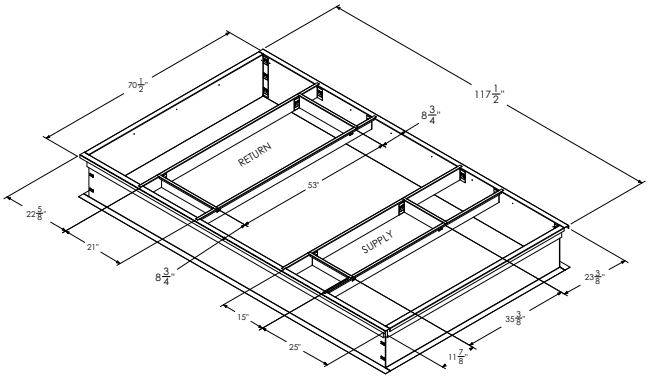
Unit Clearances

Figure 1. Typical installation clearances for direct-fired OAG unit



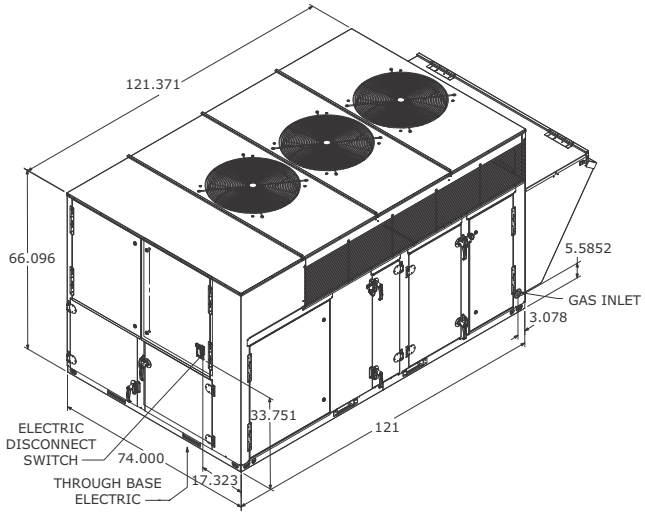
Curb Dimensions

Figure 2. Unit curb data for direct-fired OAG tons (in.)



Dimensional Data

Figure 3. Unit dimensional data for direct-fired OAG



Unit Weight and Rigging

⚠WARNING

Heavy Objects!

Failure to follow instructions below or properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. Ensure that all the lifting equipment used is properly rated for the weight of the unit being lifted. Each of the cables (chains or slings), hooks, and shackles used to lift the unit must be capable of supporting the entire weight of the unit. Lifting cables (chains or slings) may not be of the same length. Adjust as necessary for even unit lift.

⚠WARNING

Improper Unit Lift!

Failure to properly lift unit could result in unit dropping and possibly crushing operator/technician which could result in death or serious injury, and equipment or property-only damage. Test lift unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

Unit Weight

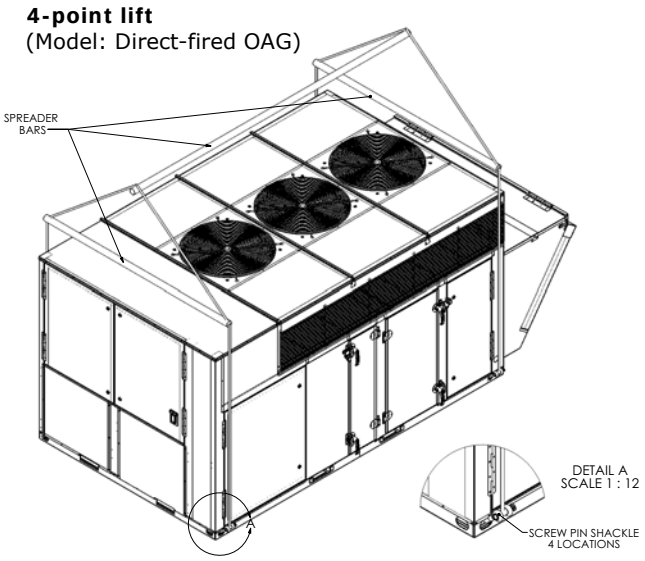
Table 1. Typical unit weight

	Operating Weight (lb)	
Model Number	**Min**	**Max**
OAGD120*	2912	3198
OAGD144*	2912	3198
OAGD180*	2913	3199
OAGD210*	3062	3348
OAGD240*	3134	3439
OAGD264*	3135	3439
OAGD300*	3175	3489
OAGD360*	3186	3500

Note: Minimum and maximum weights vary widely due to the highly configurable nature of the product.

Rigging

Figure 4. Rigging



Before proceeding, refer to Table 1, p. 14 for typical unit operating weights and Figure 4, p. 14 for rigging drawing.

1. Remove the shipping crate from around the unit.
2. Rig the unit as shown in Figure 4, p. 14. Attach adequate strength lifting slings to all four lifting brackets in the unit base rail. Do not use cables, chains, or slings except as shown.
3. Install a lifting bar, as shown in Figure 4, p. 14, to protect the unit and to facilitate a uniform lift. The minimum distance between the lifting hook and the top of the unit should be 7 feet.
4. Test-lift the unit to ensure it is properly rigged and balanced, make any necessary rigging adjustments.
5. Lift the unit and position it into place. Remove fork pockets prior to setting on the curb.
6. Downflow units; align the base rail of the unit with the curb rail while lowering the unit onto the curb. Make sure that the gasket on the curb is not damaged while positioning the unit.

Sequence of Operation

Space Control with Direct Gas-Fired Heat and Modulating HGRH

Sequence of Operation—"Occupied"

Optional space temperature and/or humidity sensors must be installed and wired to unit and configured as "installed" at the main unit controller.

Emergency Stop. When the contacts at Terminal OAUTS 9 and 10 are open, the unit's operation will be in Alarm Status. The Alarm must be reset from either the BAS or the optional on-board unit display.

Alarms must be reset from the optional on-board unit display or remote BAS to restart the control sequence. If optional display is not installed; Tracer TU must be used to diagnose and clear alarm. If Tracer TU is not available, cycle main power to unit to clear alarm.

Important: Cycling power to unit to clear alarm may not resolve alarm condition.

Starting Sequence

When 3-phase is powered to unit the main unit controller and the RTRM will initialize. Initialization process requires approximately 3 minutes.

The unit is placed in occupied operation via either the BAS or by closing connection between unit terminals OAUTS 7 and 8. The unit must not be in lockout.

Starting Sequence with No Return Air Damper Installed

The outdoor air damper will be commanded to open. The damper end switch will make causing the main unit controller to initialize the indoor fan starting sequence by sending a preset run signal (field adjustable between 50 percent and 100 percent) to the indoor fan. If after 30 seconds the indoor fan proving switch does not prove the indoor fan on, the main unit controller will command the indoor fan off and signal an alarm.

Starting Sequence with Optional Return Air Damper Installed

Identical to sequence with no return air damper except the outdoor air and return air dampers will be commanded to move to their preset occupied positions. Outdoor air damper end switch is disabled when the return air damper is installed.

Operating Modes

A. Economizer (Ventilation)

B. Heating

C. Dehumidification

D. Cooling

All modes are enabled by the main unit control module. The control module calculates dewpoint based on sensed air temperature and humidity.

A. Economizer Mode. Economizer mode is enabled based on outdoor air dewpoint. Operation in economizer mode is enabled when the outdoor air dewpoint remains below the outdoor air economizer enable dewpoint setpoint. Operation in economizer mode continues until outdoor air conditions call for either dehumidification, cooling or heating mode. Space call for heating, dehumidification or cooling will cancel call for economizer operation.

B. Heating Mode. Heating is enabled on outdoor air heating enable setpoint. Following successful ignition the unit will control to space temperature heating setpoint.

C. Dehumidification Mode. Dehumidification mode is enabled on outdoor dewpoint setpoint if no call for heating is enabled. The unit's controller will activate the dehumidification mode when space dewpoint is higher than or equal to space dewpoint setpoint. Compressor control is based on evaporator leaving air temperature setpoint. With dehumidification enabled, if evaporator leaving air temperature is above setpoint first stage dehumidification (Compressor 1) will start. If after a 3-minute minimum delay the evaporator leaving air temperature is still above the setpoint, the second, third, and fourth stages of dehumidification (Compressor 2, 3, and 4) will be staged on sequentially following individual 3-minute minimum delays between each call.

Dehumidification mode will remain active if outdoor air is above outdoor air dehumidification setpoint. Space call for heating will cancel outdoor air dehumidification.

During operation in dehumidification mode, the main unit controller will enable hot gas reheat. Hot gas reheat will modulate to maintain the space cooling setpoint.

D. Cooling Mode . Cooling mode is enabled on outdoor cooling setpoint if no call for heating or dehumidification is present. Compressor staging is identical to dehumidification however control temperature is space cooling setpoint.

During operation in cooling mode hot gas reheat is enabled. Hot gas reheat is controlled to maintain space cooling setpoint.

Optional Features

Digital Compressors

Main unit controller will modulate digital compressor to maintain either evaporator leaving or space temperature setpoints depending on mode of operation. Remaining compressors will be staged as described in mode.

Hot Gas Reheat

Following continuous 30-minute hot gas reheat operation at less than 100 percent reheat capacity a purge cycle will be initiated. During the purge cycle the, hot gas reheat signal is set and held at 100 percent for a period of 3 minutes. Following the purge cycle, normal operation resumes.

Sequence of Operation—"Unoccupied"

Emergency Stop. When the contacts at Terminal OAUTS 9 and 10 are open, the unit's operation will be in Alarm Status. The Alarm must be reset from either the BAS or the optional on-board unit display.

Starting Sequence

Indoor fan proving sequence is identical to occupied operation.

Starting Sequence with Optional Return Air Damper Installed

The outdoor air damper will be commanded to close and the return air damper will open. Outdoor air damper end switch is disabled when the return air damper is installed.

Starting Sequence with No Return Air Damper Installed. Identical to occupied sequence no return air damper installed.

Operating Modes

A. Unoccupied Heating

B. Unoccupied Dehumidification

C. Unoccupied Cooling

A. Unoccupied Heating Mode. Unoccupied heating mode is enabled on unoccupied space heating setpoint. The unit will enable the burner controls when the space temperature reaches the Unoccupied Space Heating Setpoint - 2° and disable when the space temperature reaches Unoccupied Space Heating Setpoint + 2°.

B. Unoccupied Dehumidification Mode. When no call for unoccupied heating exists, unoccupied dehumidification is enabled based on unoccupied space dewpoint setpoint. Unoccupied dehumidification is enabled when space temperature reaches unoccupied space dehumidification setpoint + 1°. Dehumidification stops at setpoint - 1°. Unit operation is discontinued when unoccupied space dehumidification is satisfied.

C. Unoccupied Cooling Mode. When no call for unoccupied heating or unoccupied dehumidification exists, unoccupied cooling is enabled based on unoccupied space cooling setpoint. Unoccupied cooling is enabled when space temperature reaches unoccupied space cooling setpoint + 2°. Cooling stops at setpoint - 2°. Unit operation is discontinued when unoccupied space cooling is satisfied.

Discharge Air Control with Direct Gas-Fired Heat and Modulating HGRH

Sequence of Operation—"Occupied"

Emergency Stop. When the contacts at Terminal OAUTS 9 and 10 are open, the unit's operation will be in Alarm Status. The Alarm must be reset from either the BAS or the optional on-board unit display.

Alarms must be reset from the optional on-board unit display or remote BAS to restart the control sequence. If optional display is not installed; Tracer TU must be used to diagnose and clear alarm. If Tracer TU is not available, cycle main power to unit to clear alarm.

Important: Cycling power to unit to clear alarm may not resolve alarm condition.

Starting Sequence

When 3-phase is powered to unit the main unit controller and the RTRM will initialize. Initialization process requires approximately 3 minutes.

The unit is placed in occupied operation via either the BAS or by closing connection between unit terminals OAUTS 7 and 8. The unit must not be in lockout.

Starting Sequence with No Return Air Damper Installed

The outdoor air damper will be commanded to open. The damper end switch will make causing the main unit controller to initialize the indoor fan starting sequence by sending a preset run signal (field adjustable between 50 percent and 100 percent) to the indoor fan. If after 30 seconds the indoor fan proving switch does not prove the indoor fan on, the main unit controller will command the indoor fan off and signal an alarm.

Starting Sequence with Optional Return Air Damper Installed

Identical to sequence with no return air damper except the outdoor air and return air dampers will be commanded to move to their preset occupied positions. Outdoor air damper end switch is disabled when the return air damper is installed.

Operating Modes

A. Economizer (Ventilation)

B. Heating

C. Dehumidification

D. Cooling

All modes are enabled by the main unit control module. The control module calculates dewpoint based on sensed outdoor air temperature and humidity.

A. Economizer Mode. Operation in economizer mode is enabled when the outdoor air temperature is between the Outdoor Air Cooling Setpoint and the Outdoor Air Heating setpoint and no call for dehumidification exists. Operation in economizer mode continues until outdoor air conditions call for either dehumidification, cooling or heating mode.

B. Heating Mode. Heating mode is enabled on outdoor air heating enable setpoint. Following successful ignition, the unit will modulate the gas valve to maintain the discharge air heating setpoint.

C. Dehumidification Mode. Dehumidification mode is enabled on outdoor air dewpoint enable setpoint if no call for heating is enabled. The unit's controller will activate the dehumidification mode when outdoor air dewpoint is higher than or equal to outdoor air dewpoint setpoint. Compressor control is based on evaporator leaving air temperature setpoint. With dehumidification enabled, if evaporator leaving air temperature is above setpoint first stage dehumidification (Compressor 1) will start. Dehumidification mode will be disabled at outdoor air dewpoint setpoint - 2°.

During operation in dehumidification mode, the main unit controller will enable hot gas reheat. Hot gas reheat will modulate to maintain the discharge air cooling setpoint.

C. Cooling Mode. Cooling mode is enabled on outdoor air cooling setpoint if no call for heating or dehumidification is present. Compressor staging is identical to dehumidification; however, control temperature is discharge air cooling setpoint. Cooling will be disabled at outdoor air cooling setpoint - 2°.

During operation in cooling mode hot gas reheat is enabled. Hot gas reheat is controlled to maintain discharge air cooling setpoint.

Optional Features

Digital Compressors

Main unit controller will modulate digital compressor to maintain either evaporator leaving or discharge air temperature setpoints depending on mode of operation.

Hot Gas Reheat

Following continuous 30-minute hot gas reheat operation at less than 100 percent reheat capacity a purge cycle will be initiated. During the purge cycle the, hot gas reheat signal is set and held at 100 percent for a period of 3 minutes. Following purge cycle normal operation resumes.

Sequence of Operation—"Unoccupied"

Optional space temperature and/or humidity sensors must be installed and wired to unit and configured as "installed" at the main unit controller to enable unoccupied sequences.

Emergency Stop. When the contacts at Terminal OAUTS 9 and 10 are open, the unit's operation will be in Alarm Status. The Alarm must be reset from either the BAS or the optional on-board unit display.

Starting Sequence

Indoor fan proving sequence is identical to occupied operation.

Starting Sequence with Optional Return Air Damper Installed

The outdoor air damper will be commanded to close and the return air damper will open. Outdoor air damper end switch is disabled when the return air damper is installed.

Starting Sequence with No Return Air Damper Installed

Identical to occupied sequence no return air damper installed.

Operating Modes

A. Unoccupied Heating

B. Unoccupied Dehumidification

C. Unoccupied Cooling

A. Unoccupied Heating Mode. Unoccupied heating mode is enabled on unoccupied space heating setpoint. The unit will enable the burner controls. If after successful ignition, the unit will modulate the gas valve to maintain the unoccupied space heating setpoint.

B. Unoccupied Dehumidification Mode. When no call for unoccupied heating exists, unoccupied dehumidification is enabled based on unoccupied space dewpoint setpoint. Unoccupied dehumidification is enabled when space temperature reaches unoccupied space dehumidification setpoint + 1°. Dehumidification stops at setpoint - 1°. Unit operation is discontinued when unoccupied space dehumidification is satisfied.

C. Unoccupied Cooling Mode. When no call for unoccupied heating or unoccupied dehumidification exists, unoccupied cooling is enabled based on unoccupied space cooling setpoint. Unoccupied cooling is enabled when space temperature reaches unoccupied space cooling setpoint + 2°. Cooling stops at setpoint - 2°. Unit operation is discontinued when unoccupied space cooling is satisfied.

Installation

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

Ductwork

Elbows with turning vanes or splitters are recommended to minimize air noise due to turbulence and to reduce static pressure.

When attaching the ductwork to the unit, provide a water-tight flexible connector at the unit to prevent operating sounds from transmitting through the ductwork.

All outdoor ductwork between the unit and the structure should be weather proofed after installation is completed.

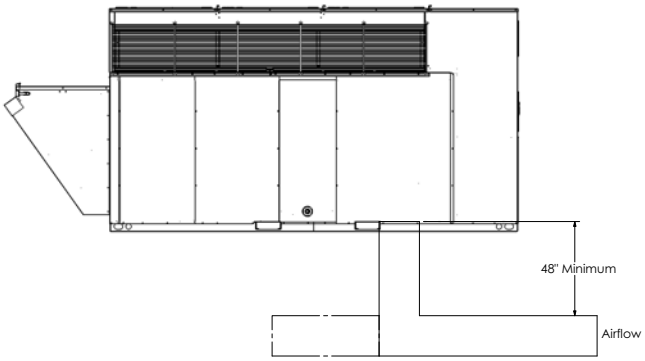
Note: For sound consideration, cut holes in the roof deck only for the ductwork penetrations. Do not cut out the roof deck within the entire curb perimeter. All duct work must be installed and connected to top of roof curb before the unit is set on curb.

If a Curb Accessory Kit is not used:

1. Be sure to use flexible duct connections at the unit.
2. Gaskets must be installed around the curb perimeter flange and the supply and return air opening flanges.

Note: For units will electric heat in the primary heating position, refer to Figure 5.

Figure 5.



Important: Bottom discharge units with open coil electric heater in primary heat location require discharge duct with 90° elbow. This is a MANDATORY installation requirement.

General Unit Requirements

The checklist listed below is a summary of the steps required to successfully install a commercial unit. This checklist is intended to acquaint the installing personnel with what is required in the installation process. It does not replace the detailed instructions called out in the applicable sections of this manual.

- ☐ Check the unit for shipping damage and material shortage. File a freight claim and notify appropriate sales representative if damage or shortage is discovered.
- ☐ Verify that the unit nameplate model, options, and voltage are correct.
- ☐ Verify that the installation location of the unit will provide the required clearance for proper operation.
- ☐ Assemble and install the roof curb (if applicable). Refer to the latest edition of the curb installers guide that ships with each curb kit. Check curb for level installation; if not level, shim as required.
- ☐ Rigging unit (refer to "Unit Weight and Rigging," p. 14).
- ☐ Set the unit onto the curb; check for level.
- ☐ Ensure unit-to-curb seal is tight and without buckles or cracks.
- ☐ Install and connect proper condensate drain line to the evaporator condensate pan drain connection (see Figure 6, p. 20).

Main Electrical Power Requirements

- ☐ Verify that the power supply complies with the unit nameplate specifications.
- ☐ Inspect all control panel components; tighten any loose connections.
- ☐ Connect properly sized and protected power supply wiring to a field-supplied/-installed disconnect switch and to the main power terminal block (HTB1) in the unit control panel.
- ☐ Connect properly-sized earth ground.

Note: All field-installed wiring must comply with NEC and applicable local codes.

Condensate Drain Configuration

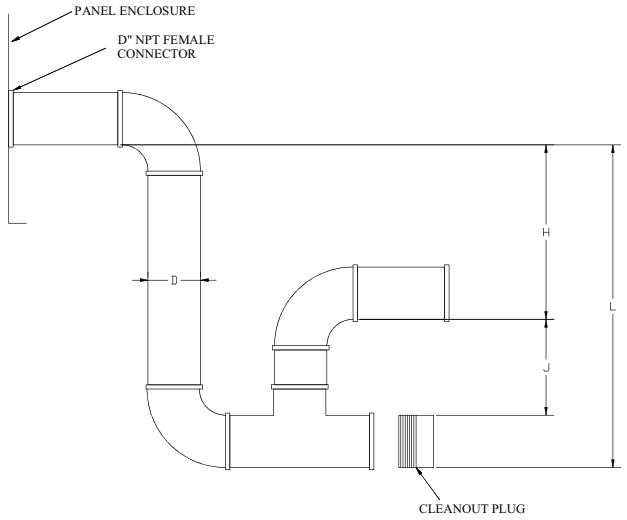
OAU units are selected based on dehumidification capability. As such, condensate can form at a high rate. Therefore, the OAU drain pan and condensate line are sized and designed accordingly. However, an often-overlooked element of proper condensate drainage is proper P-Trap and drain line sizing and installation. An incorrectly-designed and -installed P-Trap can restrict condensate flow or cause water in the condensate drain pan to "spit" or "geyser" which may cause condensate overflow. Carefully install and trap the drain pan to ensure adequate condensate removal under all conditions.

An evaporator condensate drain connection is provided on the unit. Refer to Figure 7, p. 21 for the drain location.

A condensate trap must be installed at the unit due to the drain connection being on the "negative pressure" side of the fan. Install the P-Trap using the guidelines in Figure 6.

Pitch drain lines connected to P-Trap at least 1/2 inch for every 10 feet of horizontal run to assure proper condensate flow. Do not allow the horizontal run to sag causing a possible double-trap condition which could result in condensate backup due to "air lock".

Figure 6. Condensate trap installation



D = Pipe diameter (1 in.)
H = Internal static pressure (in wg) +1 in.
J = H x 0.5
L = H + J +D

Notes:
1. Pitch drain at least 1/2 in. per 10 ft horizontal run.
2. Condensate drain pan will not drain properly if P-trap is not primed and of adequate height to allow for cabinet operating negative pressure.

Filter Installation

⚠ WARNING

Do Not Install Filters or Flammable Components Downstream of Direct-Fired Burner!

Installing filters or flammable components downstream of the direct-fired burner could cause a fire hazard and result in death or serious injury.

Each unit ships with 2-inch permanent filters (mist eliminators) along with the specified MERV-rated pleated filters installed in the air inlet hood. The quantity of filters is determined by unit size. Access to the filters is through the hinged filter access panel on the air intake hood. Filter type, size, and quantity are determined by selected filter option and unit size.

Note: Do not operate the unit without filters. Pleated filters are installed in the inlet hood in the direct-fired unit.

Field Installed Power Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

An overall dimensional layout for the standard field installed wiring entrance into the unit is illustrated in Figure 7, p. 21. To ensure that the unit's supply power wiring is properly sized and installed, refer to the following guidelines.

Figure 7. OAG utility connections

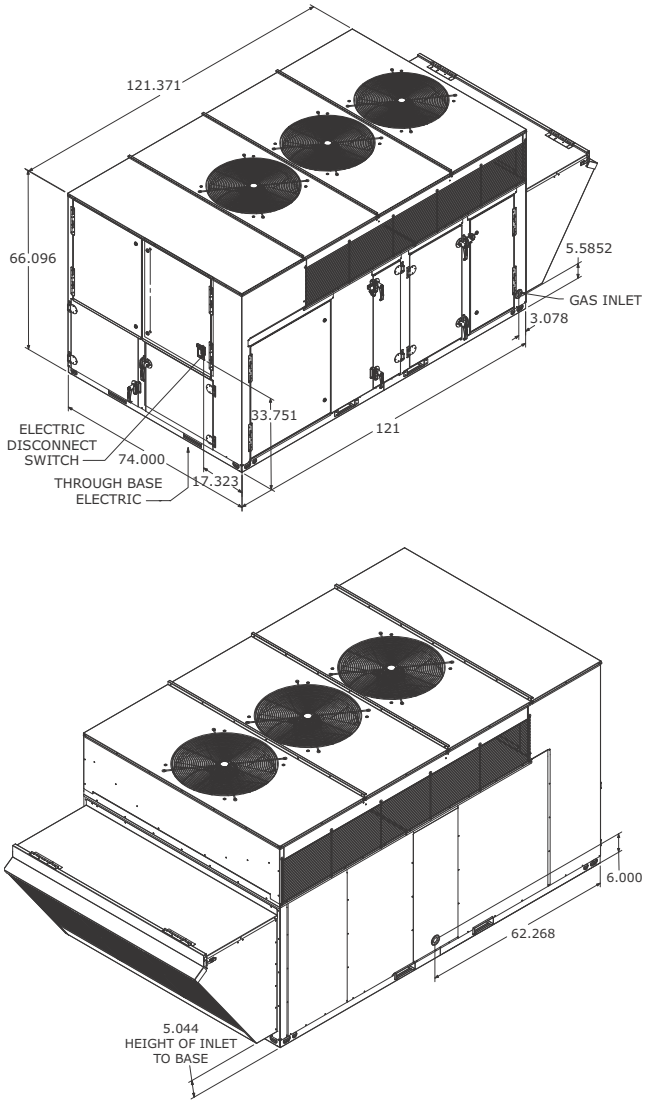


Table 3. OAG Unit

Maximum MBh	Burner Size (in.)	Pipe Connection (in.)
300	6	1
660	12	1
814	18	1-1/4

Note: All field installed wiring must conform to NEC guidelines as well as State and Local codes.

Verify that the power supply available is compatible with the unit's nameplate ratings. The available supply power must be within 10 percent of the rated voltage stamped on the nameplate. Use only copper conductors to connect the power supply to the unit.

Main Unit Power

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

NOTICE:

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

Standard Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

The electrical service must be protected from over current and short circuit conditions in accordance with NEC requirements. Protection devices must be sized according to the electrical data on the nameplate.

1. Location of the electrical service entrance is illustrated in Figure 7. Complete the unit's power wiring connections onto either; the main terminal block HTB1 inside the unit control panel, the factory mounted non-fused disconnect switch (UCD) or circuit breaker (UCB),

or the electric heat non-fused disconnect switch. Refer to the customer connection diagram that shipped with the unit for specific termination points.

2. Provide proper grounding for the unit in accordance with local and national codes.

Use the following checklist in conjunction with the checklist in "General Unit Requirements," p. 19 to ensure that the unit is properly installed and ready for operation.

- ☐ Verify that the correct size and number of filters are in place.
- ☐ Inspect the interior of the unit for tools and debris and install all panels in preparation for starting the unit.
- ☐ Check all electrical connections for tightness and "point of termination" accuracy.
- ☐ Verify condenser airflow is unobstructed.
- ☐ Verify that the condenser and indoor fans turn freely without rubbing and are properly tightened on the shafts.
- ☐ Check motor mounting bolts and inlet cone for tightness. Free spin wheel by hand to check for proper alignment of motor, wheel, and inlet cone. Record motor nameplate amps at unit-rated voltage.
- ☐ Check proper indoor fan wheel rotation. Wheel housing will be marked to indicate direction of proper rotation.
- ☐ With access doors closed and secured, operate blower at 100 percent speed. Check amp readout of amps output to indoor fan at VFD display to confirm operation within motor amp capacity.

Voltage Imbalance

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Three phase electrical power to the unit must meet stringent requirements for the unit to operate properly. Measure each leg (phase-to-phase) of the power supply. Each reading must fall within the utilization range stamped on the unit nameplate. If any of the readings do not fall within the proper tolerances, notify the power company to correct this situation before operating the unit.

Excessive three phase voltage imbalance between phases will cause motors to overheat and eventually fail. The maximum allowable voltage imbalance is 2.0 percent. Measure and record the voltage between phases 1, 2, and 3 and calculate the amount of imbalance as follows:

$$\% \text{ Voltage Imbalance} = 100 \text{ X } \frac{\text{AV - VD}}{\text{AV}} \text{ where;}$$

$$\text{AV (Average Voltage)} = \frac{\text{Volt 1 + Volt 2 + Volt 3}}{3}$$

V1, V2, V3 = Line Voltage Readings

VD = Line Voltage reading that deviates the farthest from the average voltage.

Example: If the voltage readings of the supply power measured 221, 230, and 227, the average volts would be:

$$\frac{221 + 230 + 227}{3} = 226 \text{ Avg.}$$

VD (reading farthest from average) = 221

The percentage of Imbalance equals:

$$100 \text{ X } \frac{226 - 221}{226} = 2.2\%$$

The 2.2 percent imbalance in this example exceeds the maximum allowable imbalance of 2.0 percent. This much imbalance between phases can equal as much as a 20 percent current imbalance with a resulting increase in motor winding temperatures that will decrease motor life. If the voltage imbalance is over 2.0 percent, notify the proper agencies to correct the voltage problem before operating this equipment.

Electrical Phasing (Three-Phase Motors)

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

The compressor motor(s) and the supply fan motor are internally connected for the proper rotation when the incoming power supply is phased as A to L1, B to L2, and C to L3.

Proper electrical supply phasing can be quickly determined and corrected before starting the unit by using an instrument such as an Associated Research Model 45 Phase Sequence Indicator and following these steps:

- ☐ Turn off the main source feeding power to the unit field-supplied or factory-installed main disconnect device (switch or circuit breaker).

- ☐ Close the unit disconnect device cover, leaving disconnect switch in the off position, and turn main source power on.
- ☐ Observe the ABC and CBA phase indicator lights on the face of the sequencer. The ABC indicator light will glow if the phase is ABC. If the CBA indicator light glows, turn main source power off and then open the unit main disconnect device cover and reverse any two power wires.
- ☐ Restore the main source power and recheck the phasing. If the phasing is correct, turn main source power off then open the unit main disconnect device cover, remove the phase sequence indicator, reinstall disconnect device cover and, leaving disconnect device in the off position, turn main power source to unit on.

Compressor Crankcase Heaters

⚠WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

To prevent injury or death from electrocution, it is the responsibility of the technician to recognize this hazard and use extreme care when performing service procedures with the electrical power energized.

Each compressor shall be equipped with a crankcase heater. The proper operation of the crankcase heater is important to maintain an elevated compressor oil temperature during the "Off" cycle to reduce oil foaming during compressor starts. Oil foaming occurs when refrigerant condenses in the compressor and mixes with the oil. In lower ambient conditions, refrigerant migration to the compressor could increase.

When the compressor starts, the sudden reduction in crankcase pressure causes the liquid refrigerant to boil rapidly causing the oil to foam. This condition could damage compressor bearings due to reduced lubrication and could cause compressor mechanical failures.

Before initial start up, or if main power has been off for an extended period of time, compressor crankcase heater(s) should be operated for a minimum of 8 hours prior to compressor operation. With main power OFF, remove jumper between OAUTS terminals 9 and 10 (E-Stop). Turn main power to energize crankcase heater(s). At end of warm up period turn main power off, install 9-10 jumper, turn main power on, and resume normal operation.

Following crankcase heater warm-up, turn main power disconnect off, and install jumper on E-Stop terminals 9 and 10.

Turn Main disconnect "On".

Main Unit Display and ReliaTel Controls

When first powered "On", the controls perform self-diagnostic initialization to check that all internal controls are functional. The Status LED located on the Main Unit Display and the Liteport LED located on the RTRM module is turned "On" within one second of power-up if internal operation is okay.

Field-Installed Control Wiring

⚠WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

An overall layout of the various control options available with the required number of conductors for each control device is illustrated in Figure 8, p. 25.

Note: All field wiring must conform to NEC guidelines as well as state and local codes.

Control Power Transformer

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

The 24-volt control power transformers are to be used only with the accessories called out in this manual. Transformers rated greater than 50 VA are equipped with internal circuit breakers. If a circuit breaker trips, turn "Off" all power to the unit before attempting to reset it.

The transformers are located in the control panel. The circuit breaker is located on the left side of the transformers and can be reset by pressing in on the black reset button.

Controls Using 24 Vac

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

NOTICE:

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

Before installing any connecting wiring, refer to Figure 7, p. 21 for the electrical access locations provided on the unit and Table 4 for AC conductor sizing guidelines, and:

1. Use copper conductors unless otherwise specified.
2. Ensure that the AC control wiring between the controls and the unit's termination point does not exceed three (3) ohms/ conductor for the length of the run.

   Note: Resistance in excess of 3 ohms per conductor may cause component failure due to insufficient AC voltage supply.
3. Be sure to check all loads and conductors for grounds, shorts, and mis-wiring.
4. Do not run the AC low-voltage wiring in the same conduit with the high-voltage power wiring.

Table 4. 24 Vac conductors

Distance from Unit to Control	Recommended Wire Size
000–460 feet 000–140 m	18 gauge 0.75 mm^2
461–732 feet 104–223 m	16 gauge 1 mm^2

Controls Using DC Analog Input/Output (Standard Low Voltage Multiconductor Wire)

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

Before installing any connecting wiring between the unit and components utilizing a DC analog input\output signal, refer to Figure 7, p. 21 for the electrical access locations provided on the unit.

1. Table 5 lists the conductor sizing guidelines that must be followed when interconnecting the DC binary output devices and the system components utilizing a DC analog input\output signal to the unit.

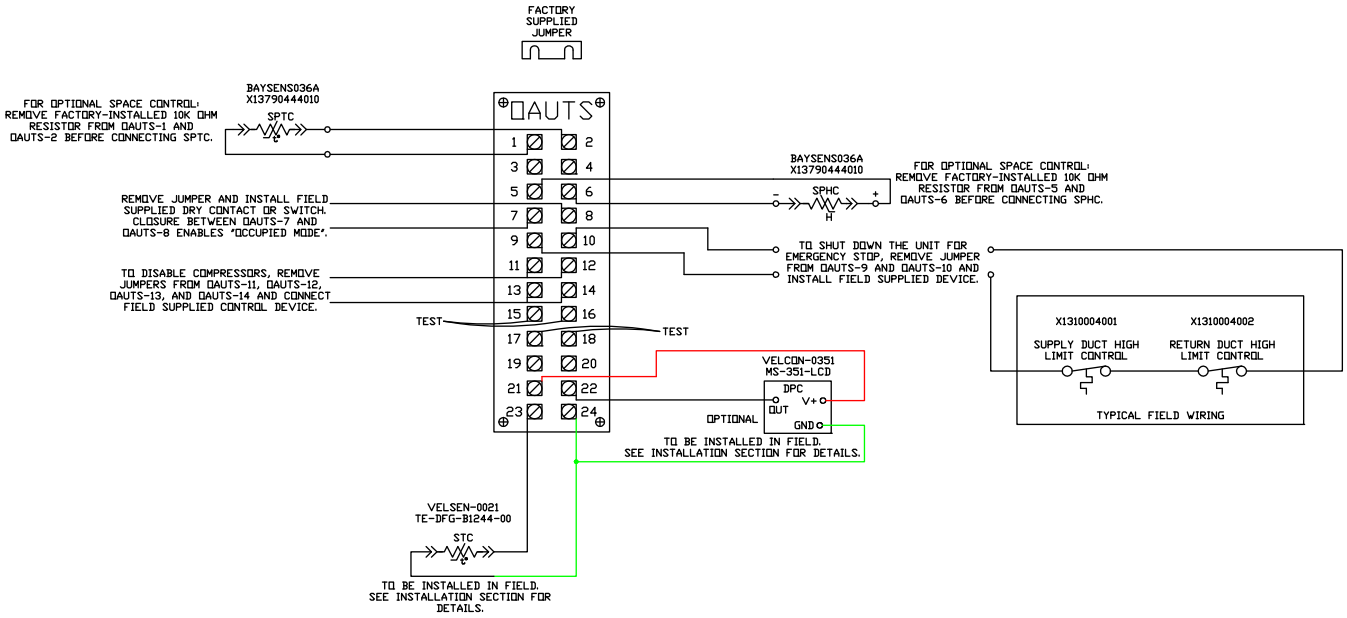
   Note: Resistance in excess of 2.5 ohms per conductor can cause deviations in the accuracy of the controls.
2. Ensure that the wiring between controls and the unit's termination point does not exceed 2.5 ohms/ conductor for the length of the run.
3. Do not run the electrical wires transporting DC signals in or around conduit housing high voltage wires.

DC Conductors

Table 5. Zone sensor module wiring

Distance from Unit to Control	Recommended Wire Size
000–150 feet 0–45.7 m	22 gauge 0.33 mm^2
151–240 feet 46–73.1 m	20 gauge 0.50 mm^2
241–385 feet 73.5–117.3 m	18 gauge 0.75 mm^2
386–610 feet 117.7–185.9 m	16 gauge 1.3 mm^2
611–970 feet 186.2–295.7 m	14 gauge 2.0 mm^2

Figure 8. OAUTS Connection B



System Configuration and Pre-Start

The following procedure must be completed prior to performing the start-up procedure in the system Start-Up section in this document. This section describes procedures to navigate the various displays on the Unit Display and configure the Outdoor Air Unit Main Unit Display system setpoints and operating parameters.

Important: This section is intended to provide guidelines for navigation through the remote operator display screens. For additional control system information, refer to Integration Guide: Tracer™ UC600 Programmable Controller for Packaged Outdoor Air Unit *(BAS-SVP18*-EN). The unit is configured at the factory with the default settings as described in "Sequence of Operation—"Unoccupied"," p. 17; also refer to "Sequence of Operation," p. 15 for details concerning setup and operating setpoints.*

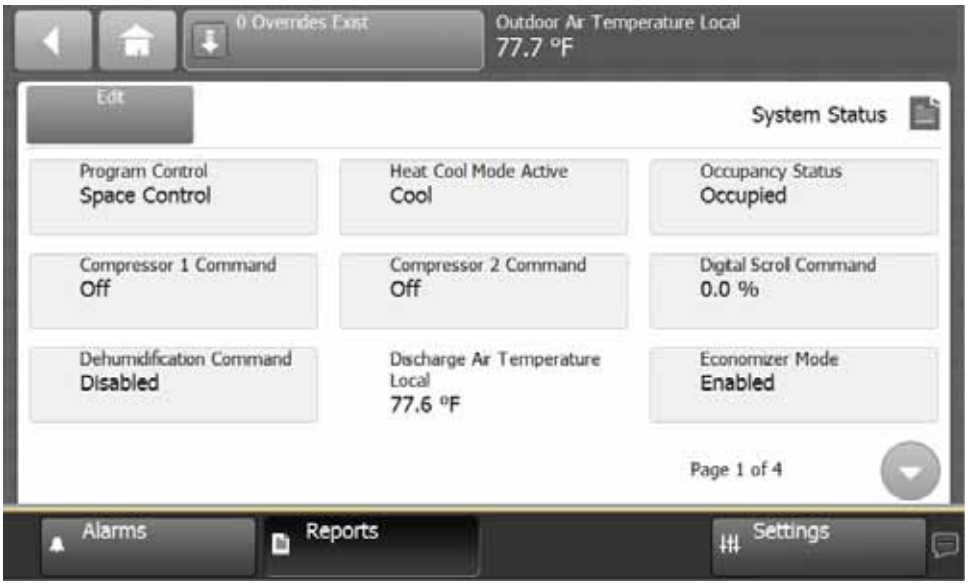


Table 6. Menu descriptions

Screen	Menu	Point List	Min / Inactive	Default	Max / Active	BAS Point?
Alarms	Active Alarms	List of all active alarms				
	All Alarms	List of all previous alarms				
Reports (continued on next page)	Custom Graphics	*NOT USED*				
	System Status	Program Control	Discharge Air Control	Space Control	Space Control	Y
		Heat Cool Mode Active	Heat	---	Cool	N
		Occupancy Status	Occupied|Unoccupied|Occupied Bypass|Occupied Standby|Unknown			Y
		Compressor 1 Command	Off	---	On	N
		Compressor 2 Command	Off	---	On	N
		Digital Scroll Command	0%	---	100%	N
		Dehumidification Command	Disabled		Enabled	N
		Discharge Air Temperature Local	Analog Input			
		Economizer Mode	Disabled		Enabled	N
		Evap Leaving Temp Local	Analog Input			
		Heat Capacity	0%	---	100%	N
		Heating Output Command	0%	---	100%	N
		Heat 1 Command	Off	---	On	N
		Heat 2 Command	Off	---	On	N
		Inducer Command	Off	---	On	N
		Gas Valve Status	Binary Input			
		HGRH Command	0%	---	100%	N
		OA Damper End Switch	Binary Input			
		Outdoor Air Damper Command	Closed	---	Open	N
		OAD Position Local	Binary Input			
		Outdoor Air Relative Humidity Local	Analog Input			
		Outdoor Air Temperature Local	Analog Input			
		Space Dewpoint Active	Analog Input			
		Space Temperature Local	Analog Input			
		Supply Fan Start Stop Command	Off	---	Off	N
		Filter Status	Clean	---	Dirty	N
		System Lockout	Normal	Normal	Lockout	N
		UNOCC Cooling Mode	Off	---	On	N
		UNOCC Dehumid Mode	Off	---	On	N
		UNOCC Heating Mode	Off	---	On	N
		Discharge Airflow Local	Analog Input			
		ERV Leaving Air Humidity Local	Analog Input			

Table 6. Menu descriptions (continued)

Screen	Menu	Point List	Min / Inactive	Default	Max / Active	BAS Point?
Reports (continued from previous page)	System Setpoints	DAT High Temp Cutout	100°F	125°F	150°F	Y
		DAT Low Temp Cutout	35°F	35°F	50°F	Y
		DAT Temp Cutout Time	10 min.	10 min.	25 min.	Y
		Discharge Air Cooling Setpoint	55°F	55°F	75°F	Y
		Discharge Air Heating Setpoint	65°F	85°F	90°F	Y
		EVAP Leaving Temp Setpoint	45°F	53°F	70°F	Y
		IVFD Signal	50%	100%	100%	Y
		Maximum Discharge Air Temperature	70°F	90°F	100°F	Y
		Minimum Discharge Air Cooling Setpoint	40°F	50°F	65°F	Y
		Minimum Discharge Air Heating Setpoint	50°F	55°F	60°F	Y
		Maximum OA Damper Position	0%	100%	100%	Y
		Minimum OA Damper Position	0%	100%	100%	Y
		Occupied Space Cooling Setpoint	65°F	74°F	90°F	Y
		Occupied Space Heating Setpoint	60°F	70°F	75°F	Y
		Outdoor Air Cooling Setpoint (OACS)	70°F	75°F	85°F	Y
		Outdoor Air Dewpoint Setpoint (OADS)	49°F	58°F	65°F	Y
		Outdoor Air Heating Setpoint (OAHS)	40°F	70°F	70°F	Y
		Space Dewpoint Setpoint (SPDS)	50°F	59°F	68°F	Y
		UNOCC Space Cooling Setpoint	60°F	80°F	90°F	Y
		UNOCC Space Dewpoint Setpoint	49°F	65°F	68°F	Y
		UNOCC Space Heating Setpoint	50°F	60°F	70°F	Y
	System Setup	Program Control	Discharge Air Control	Space Control	Space Control	Y
		Compressor Count	0	0	4	N
		Heater Count	0	0	2	N
		Split Manifold Burner	Not Installed	Installed	Installed	N
		Return Air Damper Option	Not Installed	Installed	Installed	N
		Space Temp/Humidity Sensor Installed	Not Installed	Installed	Installed	N
		Heat Type	No Heat|Gas Heat|Electric Heat|Other			N
		Alarm Reset	Off	Off	On	Y
		Supply Fan Failure Reset	Off	Off	On	Y
	Override Summary	List of active overrides - same as selecting Override button at top of screen				
	All Point Report	List of all points (AO/AI/BO/BI/MS/etc …) in the configuration file				
	About	Controller Name listed is the version of the program installed in the UC600				
	Expansion Modules	Provides status of expansion modules				
	TGP2 Programs	List of all TGP2 programs loaded on the UC600				
Data Graphs	*NOT USED*					
Settings	Schedules - Refer to UC600 IOM for scheduling functions					
	Display Preferences					
	Language					
	Date and Time					
	Clean Touchscreen					

Start-Up

Direct Gas-Fired Heating Start-Up

⚠WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.

- **Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.**
- **Do not attempt the following procedures until all electrical and gas connections to the unit have been completed and the outdoor air damper and evaporator fan operation have been verified and are operating correctly.**

⚠WARNING

Hazard of Explosion!

Failure to follow proper safe leak test procedures could result in death or serious injury or equipment or property-only-damage. NEVER use an open flame to detect gas leaks. You MUST use a leak test solution for leak testing.

Notes:

1. BEFORE OPERATING, leak test all gas piping up to heater gas valve. Smell around the unit area for gas. If gas is smelled, do NOT attempt to place heater in operation until source of gas leak is identified and corrected.
2. Use only hand force to operate the gas control lever to the “ON” position. NEVER use tools. If lever does not operate by hand, replace gas valve prior to staring the unit. Forcing or attempting to repair the gas valve may result in fire or explosion.
3. Do not attempt to operate unit, if there is indication that any part or control has been under water. Any control or component that has been under water must be replaced prior to trying to start the unit.

Refer to “Sequence of Operation,” p. 15 for additional information.

Direct Gas-Fired Heating Start-Up Procedure

The following procedure must be followed for the unit heating section to function properly. The following procedures are to be performed after all electrical and gas connections to the unit have been completed and the outdoor air damper and evaporator fan operation have been verified and are operating satisfactorily.

Refer to “Sequence of Operation,” p. 15 and “Alarms and Troubleshooting,” p. 46 for additional information.

Tools Required

- Voltage Meter (μA)
- Amp Meter
- Gas Pressure Gauge
- Tachometer
- Temperature Probe
- Anemometer
- Service Mirror
- Small Refrigeration Screwdriver
- 5/16-in. Nut Driver
- 1/2-in. Open End Wrench

1. Confirm Unit Airflow

Important: Accurate airflow readings require clean inlet filters. If required clean or replace filters before proceeding.

All Horizon direct gas-fired heaters are factory-adjusted to achieve design airflow pressure drop (ΔP) of -0.625 in. wc across the burner profile opening at ordered unit SCFM airflow. The burner baffles should not be adjusted. Outdoor Air conditions will cause the measured ΔP to vary. Refer to Table 7 to see the acceptable measured pressures that may be read at various outdoor air conditions. Measure and record burner pressure drop.

Table 7. Acceptable measured pressures

OAT (°F)	Burner Pressure Drop (in. wc)
0	0.720
5	0.712
10	0.705
15	0.697
20	0.690
25	0.683
30	0.676
35	0.669
40	0.663
45	0.656
50	0.650
55	0.643
60	0.637
65	0.631
70	**0.625[a]**
75	0.619
80	0.613
85	0.608
90	0.602
95	0.597
100	0.592

(a) 0.625-in. design pressure drop at standard air conditions.

Note: If burner pressure drop is not within the range shown in Table 7, refer to "Airflow Troubleshooting," p. 48.

2. Check Inlet Gas Pressure and Confirm Gas Flow to Unit

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. Do NOT expose gas controls to pressures above 1/2 psi (3.5 kPa). Refer to "General Safety Information," p. 3.

Confirm gas flow and gas supply pressure to heater. The Manual Shut-Off valve (MSO1) can be used to bleed the supply line as needed.

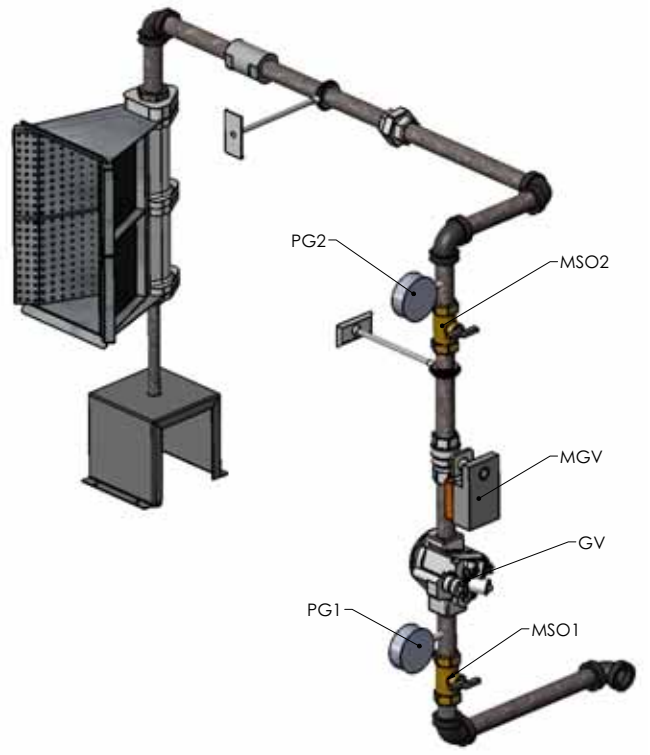
After confirming gas flow to unit , verify and record gas pressure at PG1.

3. Heating Starting Sequence for Gas Input Rating ≤ 400 MBh

Important: Open shut off vales at MSO1, MSO2, and Main Gas Valve (MGV) before proceeding.

Refer to Figure 9.

Figure 9. Burner gas train



Burner Gas Train

- Manual Shut-off Valves (2) (MSO1 and MSO2)
- Main Gas Valve—Automatic Safety On-Off with Main Gas Regulator
- Modulating Gas Valve (MGV)
- Gas Pressure Gauges
- Main Gas Inlet Pressure (PG1)
- Burner Inlet Pressure (PG2)

- The Main Gas Valve/Pressure Regulator (GV) and Modulating Gas Valve (MGV) have been factory set to achieve both proper maximum and proper minimum fuel input to the direct gas-fired burner.
- Gas supply train includes (2) factory installed pressure gauges. Gauge 1 (PG1) reads the main gas supply pressure. Gauge 2 reads the outlet pressure to the burner from the MGV.
- See Heater Burner Data Plate for factory pressure settings.
- Electrical control panel includes control relays with pilot lights which, when illuminated, indicate the relay is energized. For this starting sequence relays controlling Outdoor Air Damper (R1), Indoor Fan (R2), Heating Call (R6), Burner Proving (R7) and Burner ON (R8) will be used.
- Starting Sequence

Note: In the event Outdoor Air Conditions or Unit Controls are such that the unit will not automatically enter the desired operating modes, refer to "Alarms and Troubleshooting," p. 46 for Control Override Procedures. For initial heating start-up, it may be necessary to remove and repeat the call for heat until the internal gas piping system is bled.

- R1 ON—OA damper OPEN
- R2 ON—Indoor Fan ON
- R6 ON—Call for Heating ON
- R7 ON—Ignition Process begins and requires proof of flame at burner to continue
- R8 ON—Ignition Process Proven

4. Test Operating Heating Modes

Note: Heating default control signal is 25 percent for 90 seconds following successful ignition.

Important:

- *This test is designed to assure adequate stable gas pressure is available when burner is firing at maximum capacity. Refer to unit nameplate rating for "Minimum Gas Supply Pressure Required to Achieve Maximum Temperature Rise."*
- *Depending on outdoor temperature, it may be necessary to bypass the manual reset High Temperature Limit control during this test.*

a. High Fire Test Following Normal Burner Starting Sequence

i. At ROD override, Heating Control Signal to 100 percent.

ii. When pressure at PG2 stabilizes, confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate.

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. To avoid damage to unit if PG1 or PG2 exceed data plate pressures +5 percent, disable incoming gas using the manual shutoff valves and ensure incoming pressure is within nameplate data BEFORE enabling the gas.

iii. Record Gas Pressures

- PG1
- PG2

iv. At ROD, read and record

- Outdoor Air Temperature
- Discharge Air Temperature
- Burner ΔP

v. Release Heating Control Signal Override

b. Low Fire Test Following Normal Burner Starting Sequence

i. Override Heating Control Signal to 0 percent

ii. Confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate

iii. Allow a minimum of 5 minutes of operation at 0 percent heating signal

iv. At ROD read and record

- Outdoor Air Temperature
- Discharge Air Temperature
- Burner ΔP

v. Record Gas Pressures

- PG1
- PG2

c. Ignition Cycle Test

i. Release Heating Control Signal Override

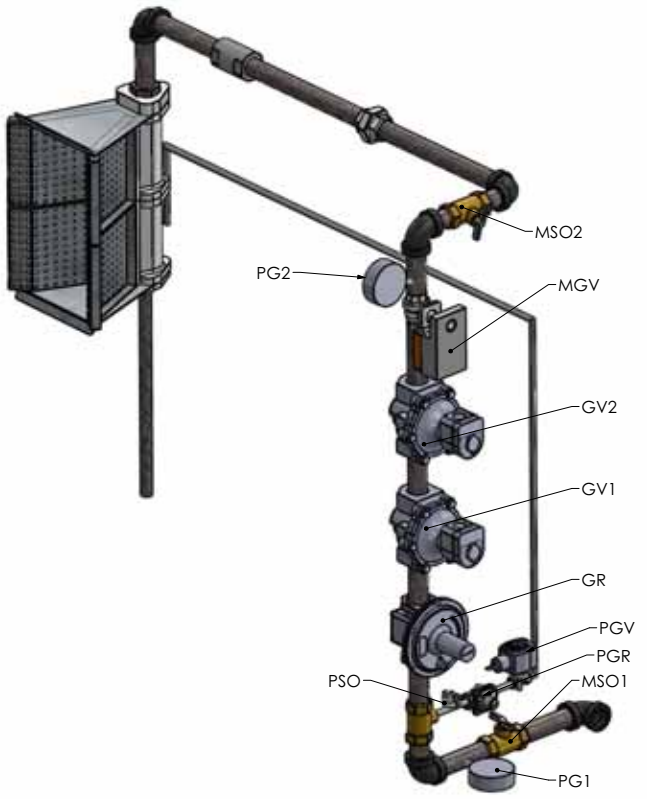
ii. Complete at least (5) calls for heat

- At each call for heat default heating start-up, signal is 25 percent
- Following each ignition test and before attempting the next test monitor analogue Heating Control Signal at ROD to be sure heat signal is released at end of each 90-second warm-up period

5. Burner Gas Train, Ignition Controls and Starting Sequence for Gas Input Rating > 400 MBh

Refer to Figure 10.

Figure 10. > 400 MBh Gas train



a. Pilot Gas Train
   i. Manual Shut-Off Valve (PSO)
   ii. Pilot Gas Regulator (PGR)
   iii. Pilot On-Off Valve (PGV)

b. Burner Gas Train
   i. Manual Shut-off Valves (2) (MSO1 and MSO2)
   ii. Main Gas Regulator (1) (GR)
   iii. Main Gas Valves—Automatic Safety On-Off Control (2) (GV1 and GV2)
   iv. Modulating Gas Valve (MGV)
   v. Gas Pressure Gauges
      – Gas Supply Pressure (PG1)
      – Burner Inlet Pressure (PG2)

c. Burner Control Operation

   The RM7895, EC7895, and RM7896 have the operating sequence as shown in Figure 11 and Figure 12, p. 33. The LED provides positive visual indication of the program sequence for power, pilot, flame, main, and alarm.

Initiate

The relay module enters the initiate sequence when it is powered. The RM7895A/B/C/D, EC7895A/C and RM7896A/B/C/D can also enter the initiate sequence if the relay module verifies voltage fluctuations of +10/-15 percent or frequency fluctuations of ±10 percent during any part of the operating sequence. The initiate sequence lasts for 10 seconds unless the voltage or frequency tolerances are not met. When not met, a hold condition is initiated and displayed on the optional KDM for at least five seconds. When met, the initiate sequence restarts. If the condition is not corrected and the hold condition exists for 4 minutes, the flame relay module locks out.

Causes for a hold condition in the initiate sequence are as follows:

- AC line dropout detection.
- AC line noise that can prevent a sufficient reading of the line voltage inputs.
- Low line voltage brownouts.

Standby

The flame relay module is ready to start an operating sequence when the operating control input determines a call for heat is present. The burner switch, limits, operating limit control and all microcomputer-monitored circuits must be in the correct state for the relay module to continue into the “pre-purge” sequence.

Normal Start-up Pre-purge

The module provides 30-second ”pre-purge” timing with power applied and the operating control indicating a call for heat.

- The airflow interlock, burner switch, and all microcomputer-monitored circuits must also be in the correct operating state.
- The pre-purge sequence begins on call for heating.
- Failure to establish airflow at unit airflow proving switch within 15 seconds of indoor fan enable discontinues ignition.

Ignition Trials

The pilot flame establishing period (PFEP) begins when:

- The pilot valve and ignition transformer, terminals 8 and 10, are energized. The RM7895A/B, EC7895A, and RM7896A/B modules have an intermittent pilot valve, (terminal 8). The RM7895C/D, EC7895C, and RM7896C/D modules have an interrupted pilot valve (terminal 8).
- Flame must be proven by the end of the 15-second PFEP (4 seconds if configuration jumper, JR1, is clipped) to allow the sequence to continue. If a flame is not proven by the end of PFEP, a safety shut down occurs.

With flame proven, the ignition, terminal 10, is energized. This main flame establishing period (MFEP) begins when:

- After ignition trials, and with the presence of flame, the main fuel valve, terminal 9, is powered. If a flameout occurs, the relay module locks out or recycles (depending on status of jumper JR2) within 0.8 or

3 seconds, depending on the flame failure response time (FFRT) of the amplifier.

- The RM7895C/D, EC7895C, and RM7896C/D modules have a 10-second MFEP. After ignition trials and with the presence of flame, the main fuel valve, terminal 9, is powered. If the flameout occurs, the relay module locks out within 0.8 or 3 seconds, depending on the amplifier FFRT.

Run

The RM7895C/D, EC7895C, RM7896C/D has a delayed main valve that is energized once the "run" period is entered.

The relay module is now in "run" and remains in "run" until the controller input, terminal 6, opens, indicating that the demand is satisfied or a limit has opened.

Run/Test Switch (RM7895C/D, EC7895C, RM7896C/D only). The "run/test switch" is located on the top side of the relay module. This switch allows the burner sequence to be altered as follows:

- In the measured "pre-purge" sequence, the "run/test switch," placed in the "test" position, causes the prepurge timing to stop.
- In the "pilot flame establishing period" sequence, the "run/test switch," placed in the "test" position, stops the timer during the first 8 seconds of a 10-second PFEP selection, or during the first 3 seconds of a 4-second PFEP.
- It also allows for pilot turn-down test and other burner adjustments. This activates a 15-second flameout timer that permits pilot flame adjustment without nuisance safety shutdowns. The run/test/switch is ignored during PFEP for the C and D relay modules if terminals 8 and 9, or 9 and 21 are jumpered.

Note: When the relay module is switched to the "test" mode, it stops and holds at the next run/test switch point in the operating sequence. Ensure that the run/test switch is in the "run" position before leaving the installation.

Figure 11. Sequence status LEDs

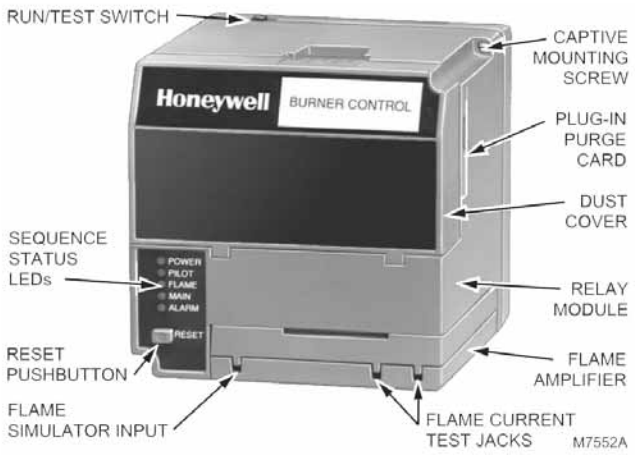
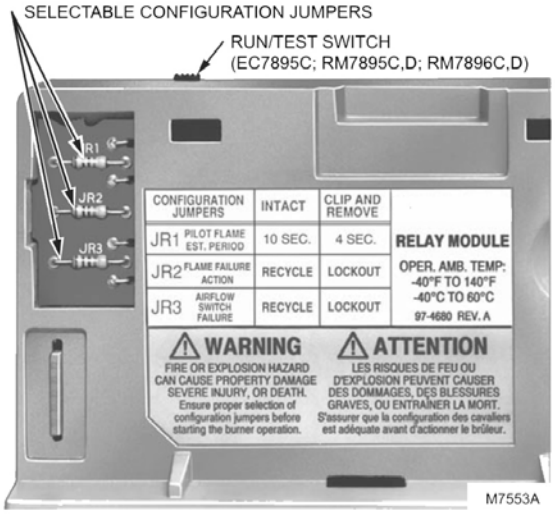


Figure 12. Selectable site-configurable jumpers



Settings and Adjustments

The relay module has three site-configurable jumper options.

Table 8. Jumper options

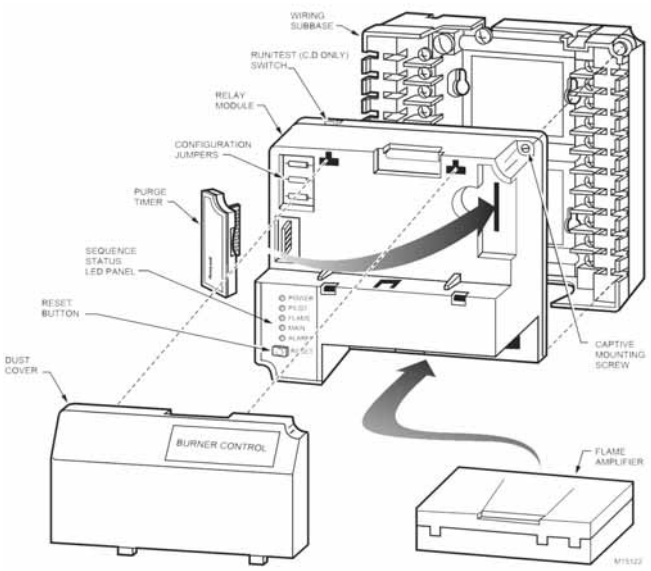
Jumper #	Description	Intact	Clipped
JR1	Pilot Flame Establishing Period (PFEP)	10 seconds	4 seconds
JR2	Flame Failure Action	Recycle	Lockout
JR3	Airflow Switch (1LK) Failure	Recycle	Lockout

If necessary, clip the site-configurable jumpers with side cutters and remove the resistors from the relay module.

Notes:

- *Clipping and removing a site-configurable jumper enhances the level of safety.*
- *Clipping and removing a jumper after 200 hours of operation causes a non-resettable fault 100. The relay module must then be replaced.*

Figure 13. Relay module plug-in diagram



⚠WARNING

Combustible Materials!

Failure to maintain proper clearance between the unit heat exchanger, vent surfaces and combustible materials could cause a fire which could result in death or serious injury or property damage. Refer to unit nameplate and installation instructions for proper clearances.

Operation of the Direct Spark Ignition Control Gas Valve

On a call for heat, a 30-second pre-purge is initiated. Upon completion of the pre-purge, the gas valve and 60 Hz spark are energized. When flame is detected, the control enters the steady state heating condition. Steady state heating will continue until the call for heat is satisfied.

If ignition is not achieved within 10 seconds, the control valve shuts off the gas and locks out. If the trial for ignition has been accomplished without ignition, the control shuts off all outputs and enters lockout. Reset is accomplished by cycling the power off for a minimum of 5 seconds.

If flame is lost once it has been established, the control will shut off the gas valve within 0.8 seconds and locks out.

If flame is sensed during a purge period when no flame should be present, the control will remain in a purge with the gas valve off until the false flame disappears.

If the gas valve is found to be powered when it should be off, or not powered when it should be on, the control will enter lockout with all outputs off. Reset is accomplished by cycling the power off for a minimum of 5 seconds.

- High Fire Test Following Normal Burner Starting Sequence
  - At ROD override, Heating Control Signal to 100 percent.
  - When pressure at PG2 stabilizes, confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate.

⚠WARNING

Hazard of Explosion!

Failed gas components could explode or leak flammable gas which could cause a fire resulting in death or serious injury or property damage. To avoid damage to unit if PG1 or PG2 exceed data plate pressures +5 percent, disable incoming gas using the manual shutoff valves and ensure incoming pressure is within nameplate data BEFORE enabling the gas.

  - Record Gas Pressures
    - PG1
    - PG2
  - At ROD, read and record
    - Outdoor Air Temperature
    - Discharge Air Temperature
    - Burner ΔP
  - Release Heating Control Signal Override
- Low Fire Test Following Normal Burner Starting Sequence
  - Override Heating Control Signal to 0 percent
  - Confirm PG1 and PG2 pressures are within ±5 percent of the pressures shown on Burner Data Plate
  - Allow a minimum of 5 minutes of operation at 0 percent heating signal
  - At ROD read and record
    - Outdoor Air Temperature
    - Discharge Air Temperature
    - Burner ΔP
  - Record Gas Pressures
    - PG1
    - PG2
- Ignition Cycle Test
  - Release Heating Control Signal Override
  - Complete at least (5) calls for heat
    - At each call for heat default heating start-up, signal is 25 percent
    - Following each ignition test and before attempting the next test monitor, analogue Heating Control Signal at ROD to be sure heat signal is released at end of each 90-second warm-up period

Maintenance

Make sure all personnel are standing clear of the unit before proceeding. The system components will start when the power is applied.

Monthly Maintenance

Before completing the following checks, turn the unit OFF and lock the main power disconnect switch open.

⚠ WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

Filters

- Inspect the return air filters. Clean or replace them if necessary. Refer to the unit Service Facts for filter information.

Supply/Return Air Smoke Detector Maintenance

Airflow through the unit is affected by the amount of dirt and debris accumulated on the indoor coil and filters.

To insure that airflow through the unit is adequate for proper sampling by the return air smoke detector, complete adherence to the maintenance procedures, including recommended intervals between filter changes, and coil cleaning is required.

Periodic checks and maintenance procedures must be performed on the smoke detector to insure that it will function properly.

For detailed instructions concerning these checks and procedures, refer to the appropriate section(s) of the smoke detector Installation and Maintenance Instructions provided with the literature package for this unit.

Cooling Season

- Check the unit's drain pans and condensate piping to ensure that there are no blockages.
- Inspect the evaporator and condenser coils for dirt, bent fins, etc. If the coils appear dirty, clean them according to the instructions described in "Condenser Coil Cleaning," p. 35.
- Manually rotate the condenser fan(s) to ensure free movement and check motor bearings for wear. Verify that all of the fan mounting hardware is tight.
- Inspect the F/A-R/A damper hinges and pins to ensure that all moving parts are securely mounted. Keep the blades clean as necessary.
- Verify that all damper linkages move freely; lubricate with white grease, if necessary.
- Check supply fan motor bearings; repair or replace the motor as necessary.
- Check the fan shaft bearings for wear. Replace the bearings as necessary.
- Verify that all wire terminal connections are tight.
- Remove any corrosion present on the exterior surfaces of the unit and repaint these areas.
- Generally inspect the unit for unusual conditions (e.g., loose access panels, leaking piping connections, etc.).
- Make sure that all retaining screws are reinstalled in the unit access panels once these checks are complete.
- With the unit running, check and record the: ambient temperature; compressor suction and discharge pressures; superheat; Record this data on an "operator's maintenance log" like the one shown in Table 12, p. 41. If the operating pressures indicate a refrigerant shortage, measure the system superheat.

Note: Do NOT release refrigerant to the atmosphere! If adding or removing refrigerant is required, the service technician must comply with all federal, state and local laws.

Heating Season

- Inspect the unit's air filters. If necessary, clean or replace them.
- Check supply fan motor bearings; repair or replace the motor as necessary.
- Inspect both the main unit control panel and heat section control box for loose electrical components and terminal connections, as well as damaged wire insulation. Make any necessary repairs.
- Refer to "Heater Maintenance," p. 39 and "Inspection and Maintenance of Gas Ports," p. 40.

Condenser Coil Cleaning

Regular coil maintenance, including annual cleaning, enhances the unit's operating efficiency by minimizing: compressor head pressure and amperage draw; evaporator water carryover; fan brake horsepower, due to increase static pressure losses; airflow reduction.

At least once each year, or more often if the unit is located in a "dirty" environment, clean the condenser coils using the instructions outlined below. Be sure to follow these instructions as closely as possible to avoid damaging the coils.

Microchannel (MCHE) Coils

NOTICE:

Coil Damage!

Failure to follow instructions below could result in coil damage.
DO NOT use any detergents with microchannel condenser coils. Use pressurized water or air ONLY, with pressure no greater than 600psi.

For additional information regarding the proper microchannel coil cleaning procedure, refer to service bulletin RT-SVB83-EN.*

Due to the soft material and thin walls of the MCHE coils, the traditional field maintenance method recommended for Round Tube Plate Fin (RTPF) coils does not apply to microchannel coils.

Moreover, chemical cleaners are a risk factor to MCHE due to the material of the coil. The manufacturer does not recommend the use of chemical cleaners to clean microchannel coils. Using chemical cleaners could lead to warranty claims being further evaluated for validity and failure analysis.

The recommended cleaning method for microchannel condenser coils is pressurized water or air with a non-pinpoint nozzle and an ECU of at least 180 with pressure no greater than 600 psi. To minimize the risk of coil damage, approach the cleaning of the coil with the pressure washer aimed perpendicular to the face of the coil during cleaning. Optimum clearance between the sprayer nozzle and the microchannel coil is 1 in.–3 in.

Round Tube Plate Fin (RTPF) Coils

To clean refrigerant coils, use a soft brush and a sprayer (either a garden pump-up type or a high-pressure sprayer). A high-quality detergent is also required; suggested brands include "SPREX A.C.", "OAKITE 161", "OAKITE 166" and "COILOX". If the detergent selected is strongly alkaline (pH value exceeds 8.5), add an inhibitor.

⚠ WARNING

Hazardous Chemicals!

Failure to follow all safety instructions below could result in death or serious injury. Coil cleaning agents can be either acidic or highly alkaline and can burn severely if contact with skin occurs. Handle chemical carefully and avoid contact with skin. ALWAYS wear Personal Protective Equipment (PPE) including goggles or face shield, chemical resistant gloves, boots, apron or suit as required. For personal safety refer to the cleaning agent manufacturer's Materials Safety Data Sheet and follow all recommended safe handling practices.

1. Remove enough panels from the unit to gain access to the coil.
2. Protect all electrical devices such as motors and controllers from any over spray.
3. Straighten any bent coil fins with a fin comb.

⚠ WARNING

Hazardous Pressures!

Failure to follow safety precautions below could result in coil bursting, which could result in death or serious injury. Coils contain refrigerant under pressure. When cleaning coils, maintain coil cleaning solution temperature under 150°F to avoid excessive pressure in the coil.

4. Mix the detergent with water according to the manufacturer's instructions. If desired, heat the solution BUT DO NOT EXCEED 150ºF maximum to improve its cleansing capability.
5. Pour the cleaning solution into the sprayer. If a high-pressure sprayer is used:
   a. do not allow sprayer pressure to exceed 600 psi.
   b. the minimum nozzle spray angle is 15°.
   c. maintain a minimum clearance of 6 in. between the sprayer nozzle and the coil.
   d. spray the solution perpendicular (at 90°) to the coil face.
6. Spray the leaving-airflow side of the coil first; then spray the opposite side of the coil. Allow the cleaning solution to stand on the coil for five minutes.
7. Rinse both sides of the coil with cool, clean water.
8. Inspect both sides of the coil; if it still appears to be dirty, repeat Step 6 and Step 7.
9. Reinstall all of the components and panels removed in Step 1 and any protective covers installed in Step 2.

Direct-Fired Unit Maintenance Schedule

Periodic maintenance is essential to the efficient operation and extended service life of the direct fired equipment. Failure to provide maintenance as recommended may void the equipment warranty.

⚠ WARNING

Hazardous Service Procedures!

Failure to follow all precautions in this manual and on the tags, stickers, and labels could result in death or serious injury.
Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the following instructions: Unless specified otherwise, disconnect all electrical power including remote disconnect and discharge all energy storing devices such as capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks.

⚠ WARNING

Hazardous Gases and Flammable Vapors!

Failure to observe following instructions could result in death or serious injury. Exposure to hazardous gases from fuel substances have been shown to cause cancer, birth defects or other reproductive harm. Improper installation, adjustment, alteration, service or use of this product could cause flammable mixtures or lead to excessive carbon monoxide. To avoid hazardous gases and flammable vapors follow proper installation and set up of this product and all warnings as provided in this manual.

1. After 8 hours of operation:
   a. Check that the fan belts are tight and sheaves are aligned. The fan belts should be checked every 30 days after the first 60 days of new belt run-in.
   b. Check set-screws and bolts on the fan, bearings, and burner assembly.

NOTICE:

Belt Over-Tension!

Over-tensioning the belt could result in equipment damage as it reduces fan and motor bearing life, accelerates belt wear, and can cause shaft failure.

2. Monthly:
   a. Check all valves, piping and connections for leaks.
   b. Check the flame setting.
   c. Check the fuel pressure in the fuel supply line to each heater.
   d. Check the burner manifold pressure at full fire.
   e. Clean the flame sensor(s) or UV sight tube(s).
   f. Inspect filters. Clean or replace as necessary.
   g. Inspect the main fan bearings.
   h. Check all dampers, damper actuators and linkages. Adjust and tighten if necessary.
   i. Ensure that there are no obstruction blocking the air supply to the heater or the air discharge from the heater.
   j. Inspect the area and make sure that no combustible or hazardous material has been stored within the clearances as shown on the unit nameplate.
3. Quarterly:
   a. Complete the monthly maintenance schedule.
   b. Check the belt tension for the main fan(s) and adjust if necessary.
   c. Check the alignment of the sheaves and adjust if necessary.
   d. Inspect all bearings, set-screws for tightness and lubricate bearings if necessary.
   e. Check the pilot electrical system. Adjust if necessary.
   f. Check the pilot assembly. Clean and adjust if necessary.
   g. Inspect the burner carefully. clean and adjust if necessary.
   h. Check voltages and amp draw on main fan motor.
   i. Check the operation of all safety controls individually.
   j. Check the operation of the automatic gas shut-off valves and check them for leakage at the pressure test ports provided.
   k. On vertical units, inspect burner drip leg and drain if necessary.
4. Off-Season/Yearly:
   a. Complete the monthly and quarterly maintenance schedule.
   b. Inspect all fan wheels and housings. Clean if necessary.
   c. Check that all fan wheels and sheaves are securely set on the shaft.
   d. Inspect all bearings and alignment. Adjust if necessary.
   e. Inspect all V-belts. Replace if necessary.
   f. Inspect all electrical components, connections, and terminals. Clean and tighten where necessary.
   g. Test ignition spark. Adjust gap if necessary.
   h. Clean ignition electrodes and check for cracks.
   i. Test flame safeguard relay and replace components if necessary.
   j. Inspect all regulators, relief valves, motorized valves, solenoid valves, vent valves, manual shut-

off valves and safety shut-off valves. Check their operation and clean as necessary.

k. Ensure all vents to the atmosphere are clean and free from obstruction.

l. Inspect and clean all drip legs in the fuel line.

m. Lubricate fan motor as directed by motor manufacturer.

n. Inspect fan motor wiring for loose connections.

o. Lightly oil all door latches.

p. Check that the cabinet is weather-tight. Replace door gaskets and re-caulk as necessary.

Note: It is important to keep screened air intakes clear of obstructions at all times.

Lubrication Requirements

Some blower motors require lubrication while others do not. Those that require lubrication can be identified by the presence of grease plugs in the motor casing at each end. Motors that do not have grease plugs cannot be greased and are lubricated for the life of the motor bearing.

Table 9. Lubrication instructions

Item	Manufacturer	Bearing Type
All 3-PH Fan Motors (1 HP to 100 HP) ODP, TEFC	U.S., Baldor™ or Equal	Single Row Ball Bearings
All 1-PH Motors (Fractional HP) ODP, TEFC or TEAO	Century™, G.E.™, or Equal	Bronze Sleeve Bearings
Franctional HP 1-PH ODP or TEFC	Century, G.E., or Equal	Bronze Sleeve Bearings
Fan Shaft Bearings	Fafnir or Equal	Self-aligning, Single Row or Double Row Ball Bearings, Resilient Mounted
Dampers	Applied Air™ or Equal	Sleeve

Lubrication of motors should be done while the motor is warm and at a standstill. Remove and clean all grease plugs and insert a grease fitting in the upper hole in the motor casing at each end (viewed as if motor were sitting horizontally on its base). There may be one or two plugs in each end casing of the motor. Add a small amount of a clean, good grade ball bearing grease (such as Exxon® Polyrex™ EM or equal, with a low pressure grease gun. Run the motor five minutes before removing the grease fittings and replacing the plugs.

NOTICE:

Bearing Overheating!

Excess grease could result in overheating the bearings which could result in equipment damage.

Note: On totally enclosed fan cooled (TEFC) motors, the rear end fan housing must be removed to expose the grease plugs.

Pillow Block Bearings

Pillow block bearings are used on supply blower(s). Bearings have been pre-lubricated with a number 2 lithium based greased. Re-lubrication should be done with a similar grease using a low pressure grease gun. Wipe all grease fittings clean before adding grease. Grease should be added slowly, in small amounts at frequent intervals while the shaft is being manually rotated.

A slight showing of grease at the seals with accompanying normal bearing temperature indicates proper lubrication. Normal temperature can range from “cool” to “hot to the touch” depending on size, speed and surrounding conditions. Excessive bearing temperature indicates faulty lubrication. An insufficient amount of grease is suggested by a bearing showing no grease at the seals, and a higher than normal temperature and noise level. Excessive leakage of grease at the seals, and a high operating temperature suggest too much grease.

Important: Grease twin blower inner bearing on same schedule as two outer bearings.

Frequency of Lubrication

Frequency of lubrication depends upon operating conditions. The bearing operating temperature is the best index for determining a re-lubrication schedule. Table 10 gives the frequency of re-lubrication based upon continuous operation for various operating temperatures and can be used as a satisfactory guide for determining when all ball and roller bearings should be lubricated.

Table 10. Frequency of lubrication

Speed (rpm)	Temp. (°F)	Cleanliness	Interval
100	Up to 125	Clean	6 Months
500	Up to 150	Clean	2 Months
1000	Up to 210	Clean	2 Weeks
1500	Over 150	Clean	Weekly
Any Speed	Up to 150	Dirty	1 Week
Any Speed	Over 150	Dirty	Daily to 1 Week
Any Speed	Any Temp.	Very Dirty	Daily to 1 Week
Any Speed	Any Temp.	Extreme Conditions	Daily to 1 Week

Dampers

Dampers should be inspected monthly (daily in icy weather) for securely fastened linkages, and smooth operation. If dampers are binding or excessively noisy, then lubrication may be required. Place one drop of #20 weight machine oil on each blade bearing, and linkage ball joint. Do not over lubricate, and wipe any excess from the area. Ensure to note that dampers over 49 inches long have intermediate bearings which require lubrication.

Air Filters

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

All filter banks should be equipped with a manometer or differential pressure switch to indicate when the filters are dirty. Filters should be replaced when the differential pressure across them reaches the manufacturer's recommended final value. Dirty filter elements should be replaced with a clean element of the same type and size. In addition, it is strongly advised that the air filters be checked every 30 days and replaced with new filters (throw-away type) or cleaned (washable type) as required. Cleanable filters should be given new application of filter coating after washing to maintain optimum performance.

Belt Tensions and Adjustments

Belt tension is adjusted during the initial run-in and test periods at the factory. However, belts are run as slack as possible to prevent excessive damage to the bearings, yet tight enough to prevent slippage.

If necessary, tighten all belts during the first few months of operation, and verify proper tension weekly during the first 60 days, after which, 30-day check intervals are sufficient.

NOTICE:

Motor Failure!

Tightening any belt or belts by changing the pitch of an adjustable pulley will change the speed of a driven pulley. This could cause the unit to be rendered out of air balance which could result in improper unit operation or motor failure could result.

Suggested Belt Tension Method

1. Check tension frequently during the first 24 to 48-hours of run-in operation. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over tensioning shortens belt and bearing life.
2. To properly tension a conventional V-belt drive, use the following method:
   a. Measure the span length.
   b. At the center of the span, apply a force perpendicular to the span to deflect the belt 1/64 inch for every inch of span length. For example: for a 40-inch span, apply a force that will deflect the belt 40/64 in. or 5/8 in.
   c. Compare the force applied with the values given in Table 11. If the force is between the values for normal tension and 1-1/2 times normal tension, the belt tension should be satisfactory. If the belt tension is not within this range, it can be adjusted by loosening the motor mounting bolts and adjusting the position of the motor along its base.

Note: A new drive can be tightened to two times the minimum value shown to allow for normal drop in tension during the run-in period.

Table 11. Belt tension specifications

Small pulley diameter range (in.)	3.4–4.2	4.4–4.6	5.8–8.6
Belt manufacturer and belt type	Gates Hi-Power		
Pounds of force for normal tension	4.4	4.9	5.8
Pounds of force for 1-1/2 times normal tension	6.6	7.4	8.7

Note: For recommendations of other belt types, consult respective manufacturers.

Gaskets

Gaskets are used on doors, inspection covers, some filter racks and some outdoor air dampers. Inspect gaskets periodically and repair or replace as required.

⚠WARNING

Check Gas Tightness of Safety Shut-Off Valves Annually!

Gas tightness of the safety shut-off valves must be checked at least on an annual basis. Failure to ensure gas tightness of the safety shut-off valves could result in an explosion which could result in death or serious injury.

Annual Maintenance

1. Inspect the tightness of the gas safety shut-off valves for the furnace by turning off the manual valve upstream of the appliance combination control.
2. Remove the 1/8 in. pipe plug on the inlet side of the combination control and connect a manometer to the tapping.
3. Turn the manual valve ON to apply pressure to the combination control.
4. Record the pressure reading on the manometer, then turn the valve OFF.

A loss of pressure indicates a leak. If a leak is detected, use a soap solution to check all threaded connections. If no leak is found, the combination control may be faulty and must be replaced before placing the appliance back in service.

Heater Maintenance

At least a yearly inspection is recommended for heating installations and more frequently for process applications in year-round operation. Experience is the best guide in

determining frequency of inspection, but as a minimum, the following procedure should be followed.

⚠WARNING

Hazardous Voltage!

Failure to disconnect power before servicing could result in death or serious injury. Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power can not be inadvertently energized.

⚠WARNING

Combustible Materials!

Failure to maintain proper clearance between the unit heat exchanger, vent surfaces and combustible materials could cause a fire which could result in death or serious injury or property damage. Refer to unit nameplate and installation instructions for proper clearances.

1. Shut the system down totally, disconnecting or locking out power supply.
2. Inspect the burner carefully, including upstream and downstream sides of mixing plates as well as burner body face.

Note: The complete burner assembly may have to be removed for proper inspection and cleaning. Any accumulation of scale or foreign material on either side of the mixing plates should be removed with a wire brush. Visually check that no holes in the mixing plates are blocked. If burner ports are plugged (even partially) clear with a piece of wire. See maintenance of gas ports.

NOTICE:

Equipment Performance!

Do not enlarge burner ports; doing so could adversely affect equipment performance.

3. If any mixing plates are loose or missing fasteners, tighten/replace as necessary. Always use zinc plated or stainless fasteners

Note: The missing plates on the burner may display hairline cracks. These cracks are normal and caused by thermal stresses occurring during combustion. The presence of these hairline cracks in no significant way affects the combustion efficiency or performance of the heater. Should a large opening develop, the specific mixing plate or plates must be replaced. Otherwise, it may cause difficulties in cross ignition of flame across the face of the burner.

4. Place the system back into operation and view burner while cycling through full firing range. This will give a visual check for blocked burner spots.
5. Inspect the flame rod and ignition electrode for dirt and moisture. Wipe off if necessary. Examine for any evidence of premature arcing. If in doubt, check continuity of flame rod to be sure it is not grounding out. Replace if required.
6. The porcelain on the ignition electrode must be intact (not cracked). The spark gap should be 1/8 in.
7. Replace all access panels which have been removed and operate the unit for a test period.
8. Check for normal response and function of all controls.
9. Check all gas piping for possible leaks using a soap bubble solution.

⚠WARNING

Hazardous Gases and Flammable Vapors!

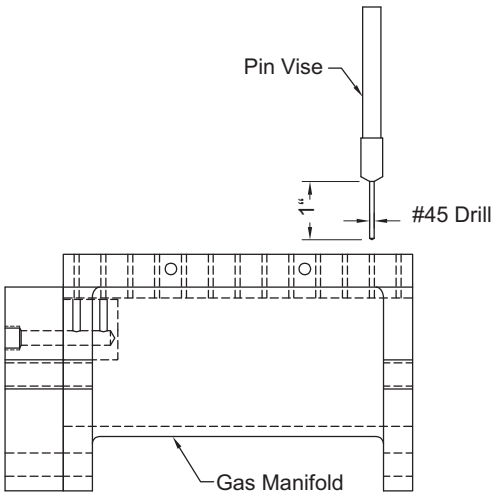
Failure to observe following instructions could result in death or serious injury. Exposure to hazardous gases from fuel substances have been shown to cause cancer, birth defects or other reproductive harm. Improper installation, adjustment, alteration, service or use of this product could cause flammable mixtures or lead to excessive carbon monoxide. To avoid hazardous gases and flammable vapors follow proper installation and set up of this product and all warnings as provided in this manual.

10. Inspect the support means to be sure that everything is firmly anchored in-place.

Inspection and Maintenance of Gas Ports

Conduct initial inspection within the first month after commissioning. Visually check the gas ports of the new burner assemblies for any piping scale or debris. Use pin vise with drill bit to remove.

Figure 14. Gas port inspection



Annual inspections are normally adequate once the initial debris is removed. The operating conditions of the burner will determine how frequently maintenance is actually

required. Use of an electric drill motor is not recommended unless both pin vise and drill (see Figure 14) can be chucked-up in a variable-speed drill unit. Care should be given in this instance due to the nature of drill bits and their ability to easily snap off in a port when using a drill motor. Removal of broken bits from the gas port is difficult.

Alternate drill sizes to be used are 5/64 in. (for #47) and 1/16 in. (for #50).

Final Process

For future reference, you may find it helpful to record the unit data requested below in the blanks provided.

(1) Complete Unit Model Number:

____

____

____

(2) Unit Serial Number:

____

____

____

(3) Wiring Diagram Numbers (from unit control panel)

— schematic(s)

____

____

____

____

____

— connection(s)

____

____

____

Table 12. Sample maintenance log

Date	Current Ambient Temp F / C	Refrigerant Circuit #1						Refrigerant Circuit #2					
		Compr. Oil Level	Suct. Press. Psig / kPa	Disch. Press Psig / kPa	Liquid Press Psig / kPa	Super-heat F / C	Sub-cool F / C	Compr. Oil Level	Suct. Press. Psig / kPa	Disch. Press Psig / kPa	Liquid Press Psig / kPa	Super-heat F / C	Sub-cool F / C
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					
		- ok - low						- ok - low					

Performance Data

Table 13. OAGD General Data—Cooling 10–17 Tons High Efficiency

	10 Tons	12 Tons	15 Tons	17 Tons
	OAGD120A	OAGD144A	OAGD180A	OAGD210A
Cooling Performance				
Gross Cooling Capacity, Btu (kW)	150,692 (44.16)	165,990 (48.65)	206,544 (60.53)	230,212 (67.47)
CFM				
Nominal cfm (m^3/h)	1250–2500 (2124–4248)	1500–3000 (2549–5097)	1875–3750 (3186–6371)	2125–4250 (3610–7221)
Compressor				
Number	2	2	2	2
Type	Scroll	Scroll	Scroll	Scroll
Outdoor Coil				
Type	High Performance	High Performance	High Performance	High Performance
Tube Size—OD, in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
Face Area, ft^2 (m^2)	25 (2.32)	25 (2.32)	25 (2.32)	25 (2.32)
Rows	2	2	2	2
FPI	14	14	14	14
Indoor Coil				
Type	High Performance	High Performance	High Performance	High Performance
Tube Size—OD, in. (mm)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)
Face Area, ft^2 (m^2)	10.0 (0.93)	10.0 (0.93)	10.0 (0.93)	12.0 (1.11)
Rows	4 6	4 6	4 6	4 6
FPI	12	12	12	12
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Size, in. (mm)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used	2	2	2	3
Diameter, in. (mm)	27 (685.8)	27 (685.8)	27 (685.8)	27 (685.8)
Drive Type	Direct	Direct	Direct	Direct
No. Speeds	1	1	1	1
CFM (m^3/h)	14,000 (23,786)	14,000 (23,786)	14,000 (23,786)	21,000 (35,679)
Number Motors	2	2	2	3
Motor HP (kW), per motor	1 (0.75)	1 (0.75)	1 (0.75)	1 (0.75)
Motor RPM	1,140	1,140	1,140	1,140
Indoor Fan				
Type	Backward Curved	Backward Curved	Backward Curved	Backward Curved
Number Used	1–2	1–2	1–2	1–2
Diameter	Varies	Varies	Varies	Varies
Drive Type	Direct or Belt Drive	Direct or Belt Drive	Direct or Belt Drive	Direct or Belt Drive
Number Motors	1–2	1–2	1–2	1–2
Motor HP (kW), Standard–Oversized	2–12 (1.49–8.95)	2–12 (1.49–8.95)	2–12 (1.49–8.95)	2–12 (1.49–8.95)
Motor RPM, Standard–Oversized	Varies	Varies	Varies	Varies
Filters				
Type Furnished Number Size Recommended	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55
Refrigerant Charge, lb of R-410A	See Nameplate	See Nameplate	See Nameplate	See Nameplate

Table 14. OAGD General Data—Cooling 20–30 Tons High Efficiency

	20 Tons	22 Tons	25 Tons	30 Tons
	OAGD240A	OAGD264A	OAGD300A	OAGD360A
Cooling Performance				
Gross Cooling Capacity, Btu (kW)	286,302 (83.91)	319,026 (93.50)	368,012 (107.85)	395,596 (115.94)
CFM				
Nominal cfm (m^3/h)	2500–5000 (4248–8495)	2750–5500 (4672–9345)	3125–6250 (5309–10619)	3750–7500 (6371–12743)
Compressor				
Number	2	2	2	2
Type	Scroll	Scroll	Scroll	Scroll
Outdoor Coil				
Type	High Performance	High Performance	High Performance	High Performance
Tube Size—OD, in. (mm)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)
Face Area, ft^2 (m^2)	37 (3.44)	37 (3.44)	37 (3.44)	37 (3.44)
Rows	2	2	2	2
FPI	14	14	14	14
Indoor Coil				
Type	High Performance	High Performance	High Performance	High Performance
Tube Size—OD, in. (mm)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)
Face Area, ft^2 (m^2)	12.0 (1.11)	12.0 (1.11)	15.0 (1.39)	15.0 (1.39)
Rows	4 6	4 6	4 6	4 6
FPI	12	12	12	12
Refrigerant Control	TXV	TXV	TXV	TXV
Drain Connection Size, in. (mm)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)	3/4 (19.1)
Outdoor Fan				
Type	Propeller	Propeller	Propeller	Propeller
Number Used	3	3	3	3
Diameter, in. (mm)	27 (685.8)	27 (685.8)	27 (685.8)	27 (685.8)
Drive Type	Direct	Direct	Direct	Direct
No. Speeds	1	1	1	1
CFM (m^3/h)	21,000 (35,679)	21,000 (35,679)	21,000 (35,679)	21,000 (35,679)
Number Motors	3	3	3	3
Motor HP (kW), per motor	1 (0.75)	1 (0.75)	1 (0.75)	1 (0.75)
Motor RPM	1,140	1,140	1,140	1,140
Indoor Fan				
Type	Backward Curved	Backward Curved	Backward Curved	Backward Curved
Number Used	1–2	1–2	1–2	1–2
Diameter	Varies	Varies	Varies	Varies
Drive Type	Direct or Belt Drive	Direct or Belt Drive	Direct or Belt Drive	Direct or Belt Drive
Number Motors	1–2	1–2	1–2	1–2
Motor HP (kW), Standard–Oversized	2–12 (1.49–8.95)	2–12 (1.49–8.95)	2–12 (1.49–8.95)	2–12 (1.49–8.95)
Motor RPM, Standard–Oversized	Varies	Varies	Varies	Varies
Filters				
Type Furnished Number Size Recommended	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55	Refer to "OAU Filter Guide" in "Appendix," p. 55
Refrigerant Charge, lb of R-410A	See Nameplate	See Nameplate	See Nameplate	See Nameplate

Superheat and Refrigeration Circuit Data

Figure 15. Refrigeration diagram: Single compressor without reheat

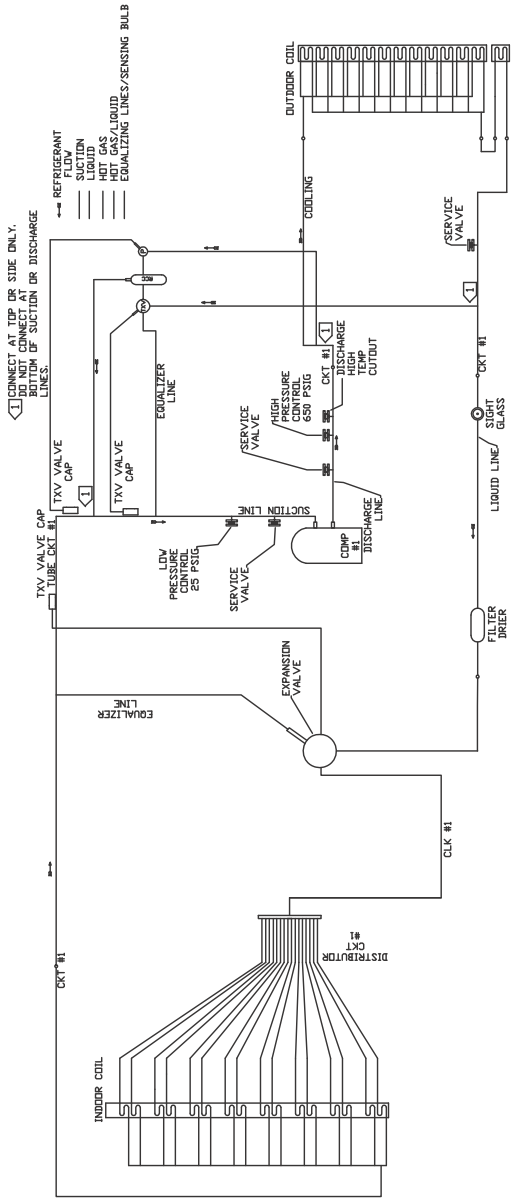


Figure 16. Refrigeration diagram: Single compressor with reheat

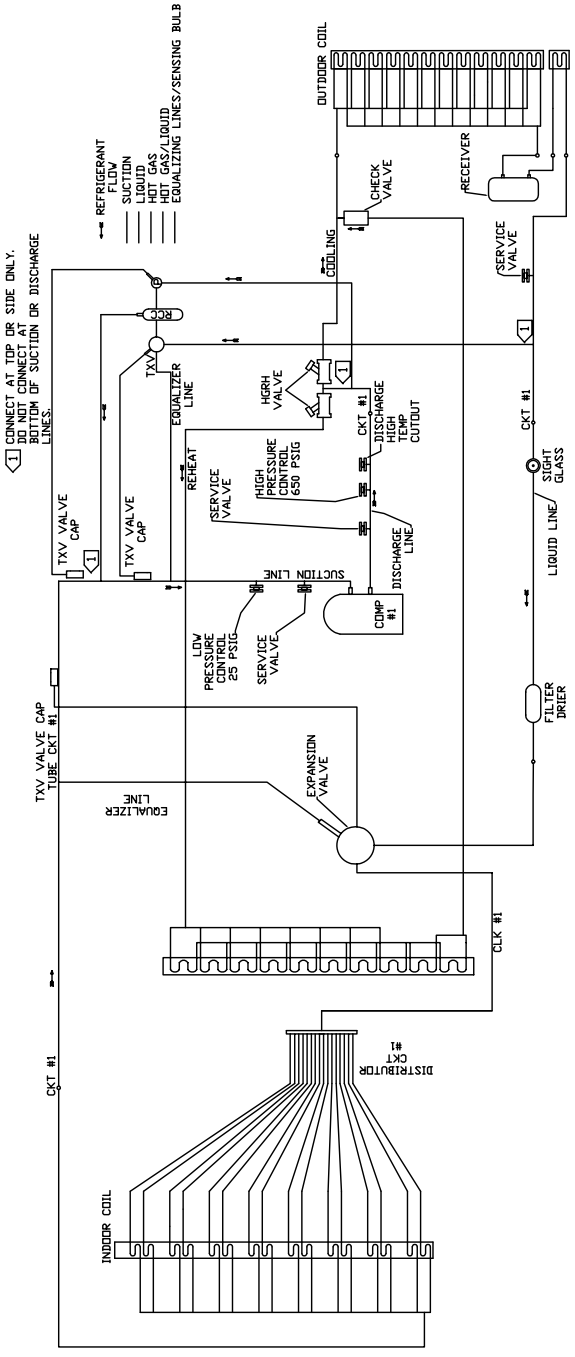


Figure 17. Refrigeration diagram: dual compressor no reheat

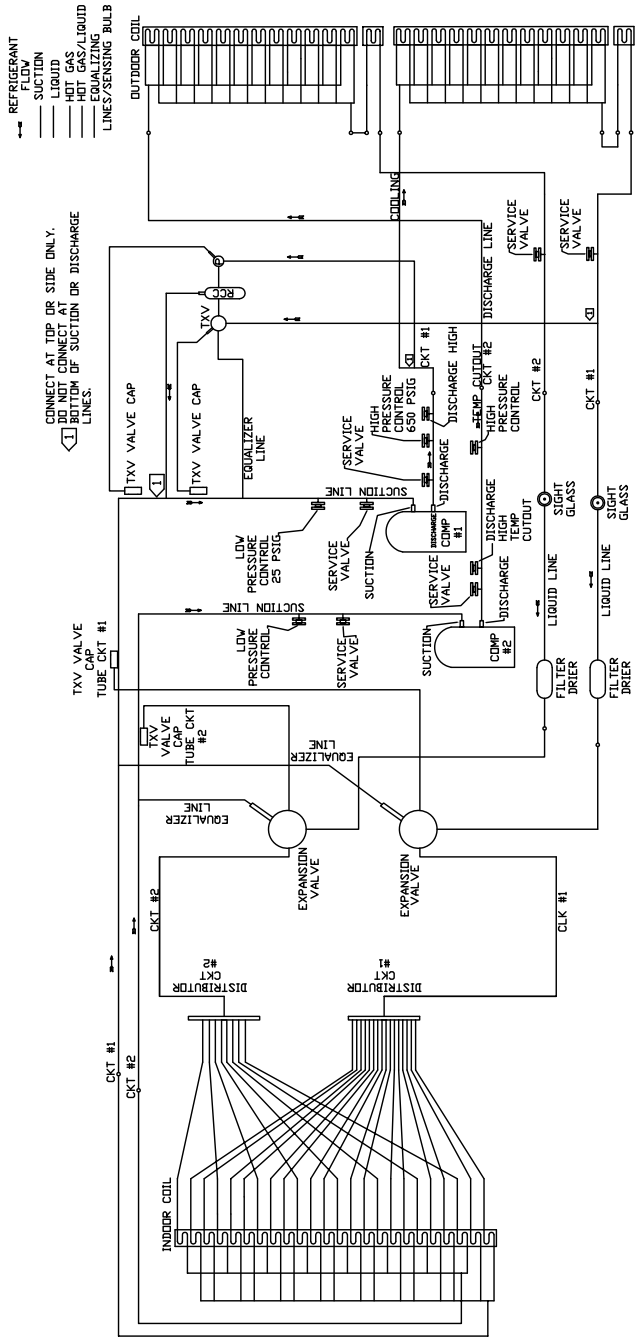
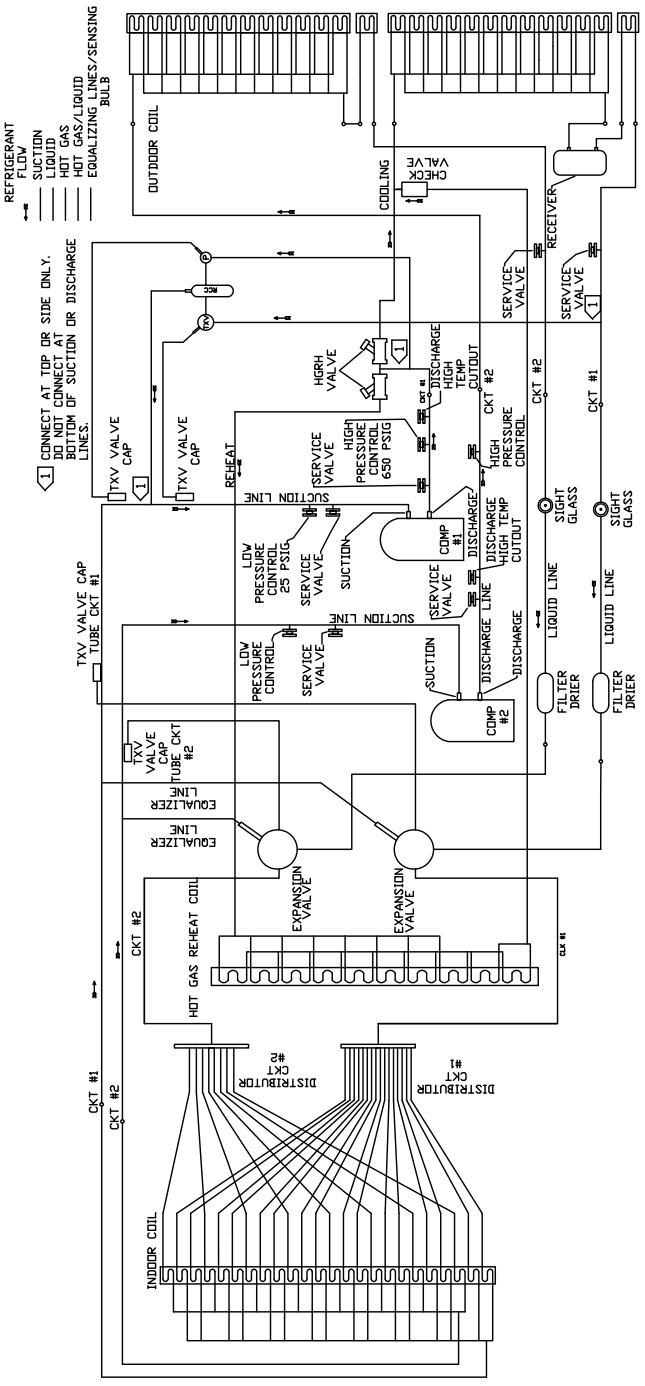


Figure 18. Refrigeration diagram: dual compressor with reheat



Alarms and Troubleshooting

Microprocessor Control

The Main Unit Display and RTRM have the ability to provide the service personnel with some unit diagnostics and system status information.

⚠ WARNING

Hazardous Service Procedures!

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1. Verify that the Liteport LED on the RTRM is burning continuously. If the LED is lit, go to Step 3.
2. If the LED is not lit, verify that 24 Vac is presence between J1-1 and J1-2. If 24 Vac is present, proceed to Step 3. If 24 Vac is not present, check the unit main power supply, check transformer (TNS1). Proceed to Step 3 if necessary.
3. Utilizing "Method 1" in the RTRM "System Status Checkout Procedure", check the following:
   - System status
   - Cooling status

   If a System failure is indicated, proceed to Step 4. If no failures are indicated, proceed to Step 5.
4. If a System failure is indicated, recheck Step 1 and Step 2. If the LED is not lit in Step 1, and 24 Vac is present in Step 2, the RTRM has failed. Replace the RTRM.
5. If no failures are indicated, use one of the override options to start the unit. Following the Override procedure will allow you to check all of the operating modes, and all of the external controls (relays, contactors, etc.) for each respective mode.
6. Refer to the sequence of operations for each mode, to assist in verifying proper operation. Make the necessary repairs and proceed to Step 7.
7. If no abnormal operating conditions appear in the Override mode, release the override and turn the power "Off" at the main power disconnect switch.

System Alarms

The Main Unit Display has built in alarms to help the operator troubleshoot system failures. This section will describe these alarms and provide a guide to troubleshooting the all unit operating modes.

Comprehensive system alarms and diagnostics are accessed through the Alarms icon at the unit display discussed later in the section, or through Tracer TU programming on connected computer. Sensor failures may be viewed through the Alarms icon.

If an alarm is present, the main indicator light on the UC600 will blink red. If the optional unit display is installed, the Alarm icon on the display will register ALARM, illuminate red and flash.

Important: The space temperature sensor (SPTC) and space relative humidity sensor (SPHC) will read failed if they are not connected; they will Alarm as "In Fault."

Sensor Failure Alarm Display

Press the Alarm button on the Home display of the Unit Display to display system sensor status as described in Table 15 and Table 16, p. 47.

Table 15. TOAU UC600 alarms

Point	Diagnostic	Possible Cause
1	Indoor Fan Failure	VFD not operating
		Outdoor and/or Return Air Dampers not Operating Properly
		Indoor Fan Motor Failure
		Indoor Fan Failure Switch IFFS (pressure) Failure
		IFFS Tubing damaged or not properly connected
		Refer to startup procedure
3	OAD Proving Switch	No voltage at actuator
		Failed OAD power transformer
		No continuity thru end switch (check at UC)
		Note: If unit optional RA damper is installed, send switch on OAD is always proven
6	Discharge Air Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation
8	Fire Shutdown	BAS ONLY
10	Low Temp Lockout	Heat Overridden OFF
		Compressor(s) Overridden ON
		Setpoint Failures Incorrect
		DAT sensor malfunction
		Reference Table 16, p. 47 for heat failure issues

Table 15. TOAU UC600 alarms (continued)

Point	Diagnostic	Possible Cause
11	Space Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation
13	OA Temp Source Failure	BAS communication down
		Failed sensor or improper sensor installation
14	OA Humidity Source Failure	BAS communication down
		Failed sensor or improper sensor installation
		Humidity Wiring is polarity sensitive
15	High Temp Lockout	Heat Overridden ON
		Low discharge air volume
		Dirty air filters
		High gas heater manifold pressure
		OA/RA damper position incorrect
		High temp limit not properly installed or wired
		DAT sensor malfunction
17	System Lockout	Check all Alarms
		External safety device failed open
19	Space RH Source Failure	BAS communication down
		Failed sensor or improper sensor installation
		Humidity Wiring is polarity sensitive
42	Heat Failure	Applies to 5:1 and 10:1 Gas Heaters Only
		Trips after heat command "ON" and no GV status offer 1 minute
		Refer to unit "Service Facts" heat control LED status legend
		No gas, low gas pressure or high gas pressure to unit
		Unit Manual shutoffs closed
		Heater inducer failure
		Heat relay failure
		Loose or incorrect wiring

Table 16. TOAU UC600 troubleshooting

Trouble	Possible Cause
Unit Not Running	No power supply to unit disconnect switch
	Power disconnect tripped
	Lockout alarm mode
	Emergency Stop condition exists
	Unit in Unoccupied mode
	Discharge air sensor failed or not installed and connected to unit

Table 16. TOAU UC600 troubleshooting (continued)

Trouble	Possible Cause
No Heat	No gas supply to unit
	Unit manual gas valve(s) closed
	Heater high limit tripped
	Heat relay not energized
	Conditions do not warrant call for heat
	Heater control module malfunction
	Roll out switch trip
	Main gas on-off switch OFF
	Inducer fan failure
	Heater air proving switch not making or failed
No Compressor	Compressor limit switch(es) open
	Compressor relay not energized or failed
	Conditions do not warrant call for cooling or dehumidification
Wide Discharge Temp Swings	Discharge air sensor position must be at least 4 ft.-0 in. away from unit outlet
	Min and Max gas heater manifold pressures not set correctly
Space too Hot, Cold or Humid	Setpoints no adjusted properly
	Space sensors not correctly located or wired
	Malfunctioning space sensor
IFM or PEX VFD OC Trip	Overcurrent alarm requires max Hz setting on VFD be checked and set to not exceed motor nameplate amps
EX VFD only run to Min HZ Setting	If supplied with RA pressure transducer and modulating damper setup is not installed or properly wired.
Unit Trips Heater High Limit	High fire gas manifold pressure too high
	Supply fan speed too low
	Dirty or clogged filters
	Restricted discharge air duct
	Temperature of air entering heater too high
	Defective high limit
Protonode Not Communicating	Change Baud rate on UC600 to 38,400

RTRM Failure Modes

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury. When necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Following is the listing of RTRM failure indication causes.

System Failure

Check the voltage between RTRM terminals 6 and 9 on J6, it should read approximately 32 Vdc. If no voltage is present, a System failure has occurred. Refer to Step 4 in "Microprocessor Control," p. 46 for the recommended troubleshooting procedure.

Cooling Failure

- CLP1 has opened during the 3 minute minimum "on time" during four consecutive compressor starts, check CLP1 by testing voltage between the J1-8 and J3-2 terminals on the RTRM and ground. If 24 Vac is present, the CLP has not tripped. If no voltage is present, CLP has tripped.

System Failure

Measure the voltage between terminals J6-9 and J6-6.

Normal Operation = approximately 32 Vdc

System Failure = less than 1 Vdc, approximately 0.75 Vdc

Cool Failure

Measure the voltage between terminals J6-8 and J6-6.

Cool Operating = approximately 32 Vdc

Cool Off = less than 1 Vdc, approximately 0.75 Vdc

Cooling Failure = voltage alternates between 32 Vdc and 0.75 Vdc

Airflow Troubleshooting

Table 17. Airflow troubleshooting

	Profile Opening Width (in.)		
Airflow	**6-in. Burner**	**12-in. Burner**	**18-in. Burner**
1250	10		
1500	11-1/4		
1750	12-1/2		
2000	13-3/4		
2250	14-3/4		
2500	16	14	
2750	17-1/4	15	
3000	18-1/2	15-3/4	14-1/4
3250	19-3/4	16-3/4	15
3500	21	17-1/2	15-1/2
3750	22	18-1/4	16-1/4
4000	23-1/4	19-1/4	17
4250	24-1/2	20	17-1/2
4500	25-3/4	21	18-1/4
4750	27	21-3/4	18-3/4
5000		22-1/2	19-1/2
5250		23-1/2	20-1/4
5500		24-1/4	20-3/4
5750		25	21-1/2
6000		26	22
6250		26-3/4	22-3/4
6500		27-3/4	23-1/2
6750		28-1/2	24
7000		29-1/4	24-3/4
7250		30-1/4	25-1/4
7500		31	26

Direct-Fired Unit Flame Relays ≤ 400 MBh

⚠ WARNING

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Table 18. Lockout models B, H D, and J only—Green LED status codes

Green LED Flash Code[a]	Indicates	Next System Action	Recommended Service Action
OFF	No "Call for Heat"	Not applicable	None
Flash Fast	Power up - internal check	Not applicable	None
Heartbeat	Normal startup - ignition sequence started (including prepurge)	Not applicable	None
4 Seconds ON then "x" flashes	Device in run mode. "x" = flame current to the nearest µA.	Not applicable	None
2	Lockout - Failed trial for ignition	Remain in lockout until "Call for Heat" is cycled.	Check gas supply, pilot burner, spark and flame sense wiring, flame rod contaminated or out of position, burner ground connection.
3	Recycle - Flame failed during run	Initiate new trial for ignition. Flash code will remain through the ignition trial until flame is proved.	If system fails to light on next trial for ignition, check gas supply, pilot burner, flame sense wiring, contamination of flame rod, burner ground connection.
4	Flame sensed out of sequence	If situation self corrects within 10 seconds, control returns to normal sequence. If flame out of sequence remains longer than 10 seconds, control will resume normal operation 1 hour after error is corrected.	Check for pilot flame. Replace gas valve if pilot flame present. If no pilot flame, cycle "Call for Heat." If error repeats, replace control.
6	Control Internal Error	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Cycle "Call for Heat". If error repeats, replace control.
7	Flame rod shorted to ground	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check flame sense lead wire for damage or shorting. Check that flame rod is in proper position.Check flame rod ceramic for cracks, damage or tracking.
8	Low secondary voltage supply	Control remains in wait mode. When the fault corrects, control resumes normal operation.	Check transformer and AC line for proper input voltage to the control. Check with full system load on the transformer.

(a) Flash Code Descriptions:
- Flash Fast: Rapid blinking.
- Heartbeat: Constant 1/2 second bright, 1/2 second dim cycles.
- 4 second solid on pulse followed by "x" 1 second flashes indicates flame current to the nearest µA. This is only available in run mode.
- A single flash code number signifies that the LED flashes X times at 2 Hz, remains off for two seconds, and then repeats the sequence.

Flame Current Measurement

Flame current of the device can be measured using a standard micro-ammeter by simply inserting the meter probes into the holes labeled FLAME CURRENT.

- Flame current must be measured with pilot valve lit but no main gas flowing.
- Disconnect MV leadwire from the control before measuring flame current.
- Set meter to DC µAmp scale.
- Ensure meter leads are positioned correctly [+/-].

Note: Trying to measure the pilot flame current in series with the wiring will not be accurate.

Recommended Minimum Pilot Only Flame Current:

- Must read steady 1 µAmp DC minimum.
- Flame current should be 2 µAmp or greater for reliable appliance operation.

Direct-Fired Unit Flame Relays > 400 MBh

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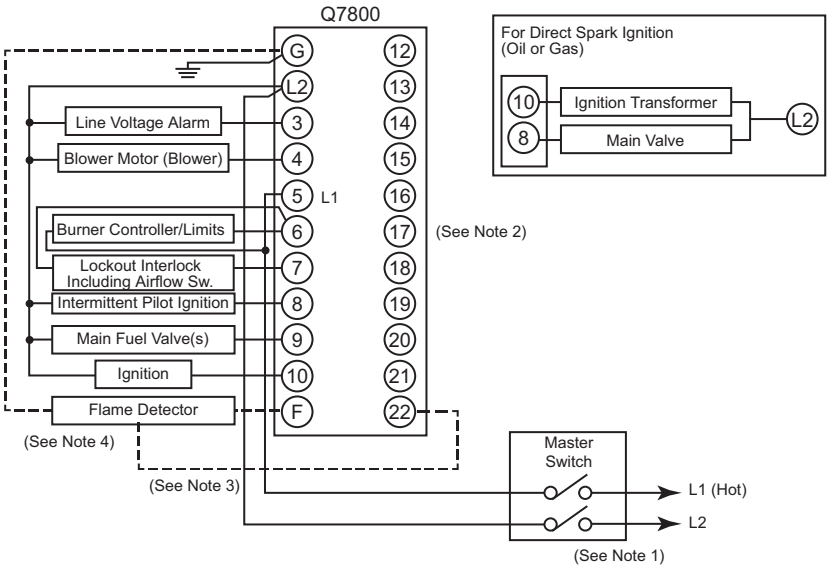
Table 19. Troubleshooting guide for flame relays during problem of safety shutdown (lockout)

Occurs In	Occurs If
Initiate Period	• Purge card is not installed or removed • Purge card is bad • Configuration jumpers have been changed (after 200 hours) • AC line power errors occurred; see Step c, p. 32 • Four minute INITIATE period has been exceeded
Standby Period	• Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing • Flame signal is detected after 30 seconds • Ignition/pilot valve/intermittent pilot valve terminal is energized • Main valve terminal is energized • Delayed (2nd stage) main valve terminal is energized (RM7895C, D/EC7895C, RM7896C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad
Prepurge Period	• Airflow lockout feature is enabled and the airflow switch opens • Ignition/pilot valve terminal is not energized • No flame present at end of PFEP • Main valve terminal is energized • Delayed main valve terminal is energized (RM7895C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad
Pilot Flame Establishing Period (PFEP)	• Airflow lockout feature is enabled and the airflow switch does not close after 10 seconds or within the specified purge card timing • Flame signal is detected after 30 seconds • Ignition/pilot valve/intermittent pilot valve terminal is energized • Main valve terminal is energized. • Delayed (2nd stage) main valve terminal is energized (RM7895C/D, EC7895C, RM7896C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad

Table 19. Troubleshooting guide for flame relays during problem of safety shutdown (lockout) (continued)

Occurs In	Occurs If
Main Flame Establishing Period (MFEP) -RM7895C/D, EC7895C, RM7896C/D	• Airflow lockout feature is enabled and the airflow switch opens • Ignition terminal is energized • Ignition/pilot valve terminal is not energized • Main valve terminal is not energized • Delayed main valve terminal is energized • No flame present at end of MFEP • Internal system fault occurred • Purge card is removed • Purge card is bad
Run Period	• No flame present • Airflow lockout feature is enabled and the airflow switch opens • Interrupted pilot valve terminal is energized (RM7895C/D,EC7895C, RM7896C/D) • Main valve terminal is not energized • Delayed (2nd stage) main valve terminal is not energized (RM7895C/D,EC7895C, RM7896C/D) • Internal system fault occurred • Purge card is removed • Purge card is bad

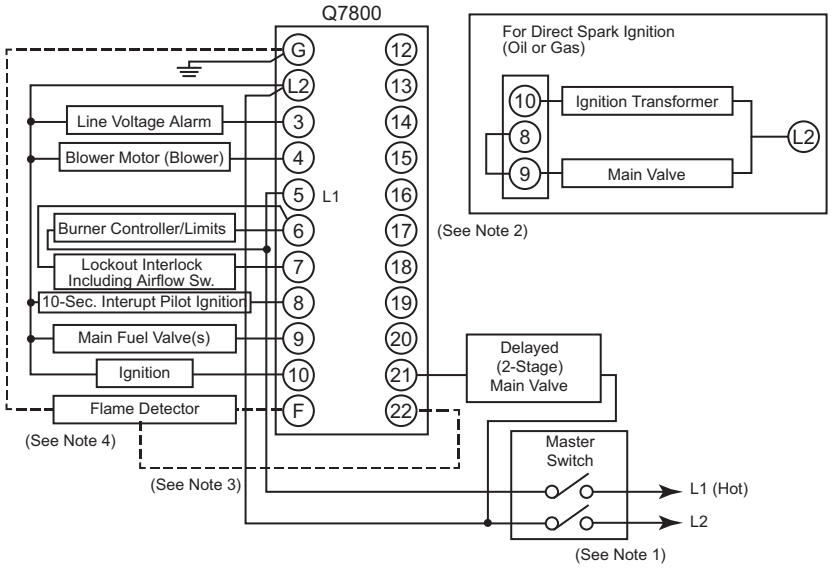
Figure 19. Wiring subbase and sequence chart for RM7895A/B, EC7895A, RM7896A/B



1. RM7895, RM7896; 120 Vac, 50/60 Hz; EC7895; 220–240 Vac, 50/60 Hz Power Supply. Provide disconnect means and overload protection as required.
2. Do not connect any wires to unused terminals.
3. For EC7895, A 220 to 240 Vac to 120 Vac, 10 VA minimum stepdown transformer (not provided) must be used to drive the shutter.
4. See flame detector specifications for correct wiring.
5. For RM7896A1048 (only), Ignition Terminal 1 is de-energized when flame is proven.
6. Airflow switch check feature is for the RM7895, RM7896B.
7. RM7896A,B (only).

	Initiate	Standby	Start	Time Purge	PFEP 4-10 Sec.	Run	Post Purge[7] 15 Sec.	Standby
LED Display	● Power ○ ○ ○ ○	● Power ○ ○ ○ ○	● Power ○ ○ ○ ○	● Power ○ Pilot ○ Flame ○ Main ○ Alarm	● Power ● Pilot ● Flame ○ Main ○ Alarm	● Power ● Pilot ● Flame ● Main ○ Alarm	● Power ○ Pilot ○ Flame ○ Main ○ Alarm	● Power ○ Pilot ○ Flame ○ Main ○ Alarm
Burner Start			Burner/Blower Motor (4)				Note 7	
				(10)	Ignition[5]			
					Ignition/Pilot (8)			
						Main Valve	(8)	
Operating Controls and Interlocks			Limits and Burner Controller Closed (L1) to (6)					
	Airflow Switch Check[6]		Lockout Interlock Closed (6) to (7)					AFSC
Flame Signal		Safe Start Check				Flame Proving		SSC

Figure 20. Wiring subbase and sequence chart for RM7895C/D, EC7895C/D, RM7896C/D



1. RM7895, RM7896; 120 Vac, 50/60 Hz; EC7895; 220–240 Vac, 50/60 Hz Power Supply. Provide disconnect means and overload protection as required.
2. Do not connect any wires to unused terminals.
3. For EC7895, A 220 to 240 Vac to 120 Vac, 10 VA minimum step down transformer (not provided) must be used to drive the shutter.
4. See flame detector specifications for correct wiring.
5. Airflow switch check feature is for the RM7895D, RM7896D.
6. RM7896C,D (only).
7. RM7895C1020, RM7896C1036 PFEP 10 seconds (only).
8. RM7895C1020, RM7896C1036; during first 8 seconds of PFEP. When a flame signal is detected, Terminal 10 is de-energized. If flame signal is lost, Terminal 10 will re-energize.

	Initiate	Standby	Start	Time Purge	PFEP[7] 4-10 Sec.	MFEP	Run	Post Purge[6] 15-Sec	Standby
LED Display	● Power ○ ○ ○ ○	● Power ○ ○ ○ ○	● Power ○ ○ ○ ○	● Power ○ Pilot ○ Flame ○ Main ○ Alarm	● Power ● Pilot ● Flame ○ Main ○ Alarm	● Power ● Pilot ● Flame ● Main ○ Alarm	● Power ● Pilot ● Flame ● Main ○ Alarm	● Power ○ Pilot ○ Flame ○ Main ○ Alarm	● Power ○ Pilot ○ Flame ○ Main ○ Alarm
Burner Start			Burner/Blower Motor (4)						Note 6
					Ignition[8] (10)				
					Ignition/Pilot		(8)		
						Main Valve (9)			
						2nd Stage Main (21)			
Operating Controls and Interlocks			Limits and Burner Controller Closed (L1) to (6)						
	Airflow Switch Check[5]		Lockout Interlock Closed (6) to (7)						AFSC
Flame Signal		Safe Start Check				Flame Proving			SSC

Appendix

OAU Filter Guide

Table 20. OAG Units

Outside Air				
Thickness	**MERV**	**Qty**	**Height**	**Width**
2 in.	Mist Eliminators	6	16	24
2 in.	8, 13	6	16	24
4 in.	14	6	16	24

Note: 2 in. mist eliminators and 2 in. MERV 8 filters are standard; MERV 13 and MERV 14 filters are optional.

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