



PACKAGED ROOFTOP AIR CONDITIONING UNITS

INSTALLATION, OPERATION & MAINTENANCE

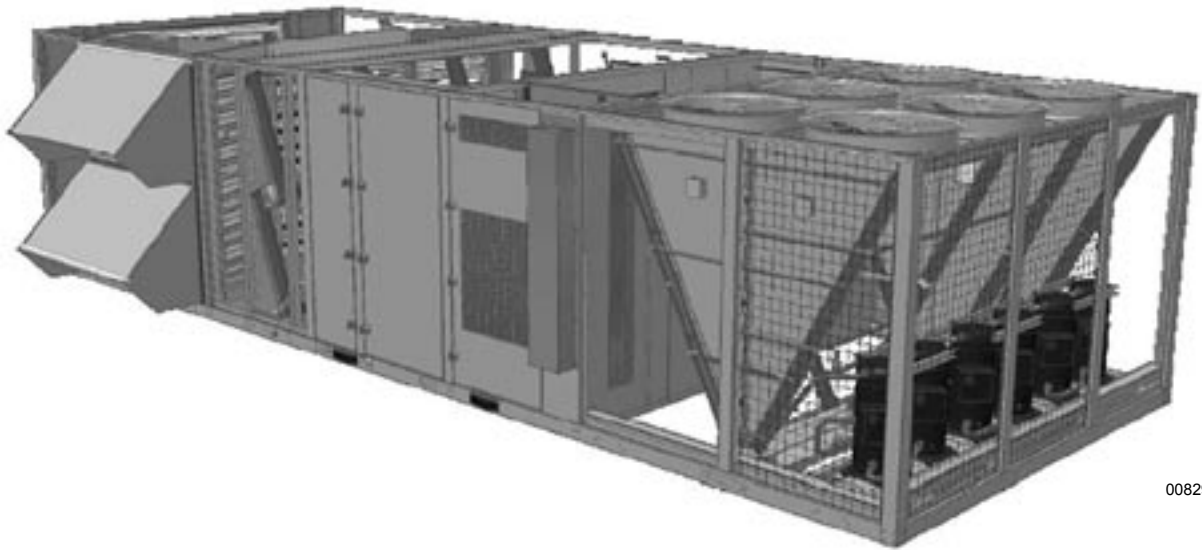
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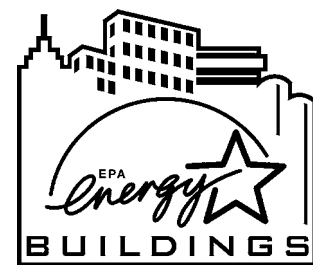
Packaged Rooftop Air Conditioning Units “Mod-E”



00829VIP

106 - 130 TONS
R-22

ASHRAE
90.1
COMPLIANT



ALLY

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation, maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, oils, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in

which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that this individual possesses independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual will have read and understood this document and any referenced materials. This individual will also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to areas of potential hazard:



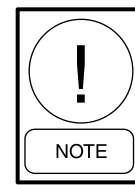
DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.



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



NOTE is used to highlight additional information which may be helpful to you.



External wiring, unless specified as an optional connection in the manufacturer's product line, is NOT to be connected inside the micro panel cabinet. Devices such as relays, switches, transducers and controls may NOT be installed inside the micro panel. NO external wiring is allowed to be run through the micro panel. All wiring must be in accordance with YORK's published specifications and must be performed ONLY by qualified YORK personnel. YORK will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this will void the manufacturer's warranty and cause serious damage to property or injury to persons.

It is the responsibility of operating/service personnel to verify the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

NOMENCLATURE

BASE MODEL NUMBER

3

TABLE OF CONTENTS

CHANGEABILITY OF THIS DOCUMENT	3
NOMENCLATURE	3
BASE MODEL NUMBER	3
TABLE OF CONTENTS	4
LIST OF TABLES.....	11
LIST OF FIGURES.....	12
SECTION 1 – INTRODUCTION.....	15
ECOLOGICAL AND ECONOMICAL DESIGN	15
Lower total cost of ownership.....	15
INDOOR AIR QUALITY (IAQ)	15
Indoor air quality features for the indoor environment	15
Condensing Section.....	16
Heating Section	16
AIR MANAGEMENT.....	17
CONTROLS.....	17
INDOOR AIR QUALITY	17
ELECTRICAL	18
SERVICE AND INSTALLATION.....	18
SECTION 2 – INSTALLATION.....	19
APPROVALS.....	19
LIMITATIONS.....	19
UNIT INSPECTION.....	19
LOCATIONS AND CLEARANCES	19
RIGGING AND HANDLING.....	20
PHYSICAL DATA.....	23
ELECTRICAL DATA.....	26
ELECTRICAL SERVICE SIZING.....	26
Load Definitions:	26
FILTERS	28
CONDENSATE DRAIN.....	28
Condensate Drain Piping.....	28
Condensate Drain Trap	28
AIR HOODS FOR ECONOMIZER.....	29
AIR HOODS FOR FIXED OUTSIDE AIR (UNITS WITHOUT ECONOMIZER)	29
AIR HOODS FOR EXHAUST AIR.....	29
FIELD WIRING	29
Thermostat	29
Space Sensor.....	29
CO ₂ Sensor.....	29
Occupied/Unoccupied Input.....	29
Shutdown Input	29

Continued on next page

TABLE OF CONTENTS (Continued)

SECTION 2 – INSTALLATION (FIELD WIRING - Continued)

Smoke Purge Input.....	30
VAV Heat Relay Output	30
RETURN AIR BYPASS DAMPER.....	30
BACNET COMMUNICATION	31
DIRTY FILTER SWITCH	31
ALARM CONTACTS	31
POWER WIRING	34
ELECTRICAL SERVICE SIZING.....	34
TRANSDUCER PNEUMATIC TUBING	37
Static Pressure Control Plastic Tubing	37
Duct Static Transducer	37
Building Pressure Transducer	37
Static Pressure Probe Installation	37
ROOF CURB INSTALLATION	37
General Information	37
DUCT SYSTEM	38
Duct Connection Guidelines	38
SOUND AND VIBRATION TRANSMISSION	38
SECTION 3 – START-UP.....	39
CRANKCASE HEATERS	39
CHECKING THE SYSTEM PRIOR TO INITIAL START (NO POWER).....	39
Unit Checks.....	39
UNIT CHECKS – POWER APPLIED	41
Verifying Compressor Rotation.....	41
Compressor Oil Level Check.....	41
INITIAL START-UP.....	41
Refrigerant Charge	41
Checking Superheat and Subcooling.....	41
Subcooling (R-22).....	43
Superheat (R-22).....	43
Leak Checking	43
GAS HEAT MODELS	43
Pre-Start Checks:	43
Post Start Checks:.....	44
SECTION 4 – MAINTENANCE	45
GENERAL	45
PERIODIC MAINTENANCE – MONTHLY.....	45
Filters.....	45
Linkages	45
Compressors	45

Continued on next page

TABLE OF CONTENTS

SECTION 4 – MAINTENANCE (PERIODIC MAINTENANCE – MONTHLY - Continued)

Fan Bearing Lubrication 45

Recommended Lubricant For Fan Bearings.....45

Condenser Coils 46

PERIODIC MAINTENANCE – THREE TO SIX MONTHS 46

Motor Bearing Lubrication.....46

Belt Tension 46

PERIODIC MAINTENANCE – YEARLY 46

Entire Unit Inspection 46

Sheave Alignment 46

Belts.....46

Belt Replacement 47

Belt Tensioning:.....47

Filter Drier Replacement.....47

Forward Curved Fans.....48

Fan Motor 48

Fan Shaft Bearings.....49

Bearing Lock Devices 49

Eccentric Type 50

SECTION 5 – SEQUENCE OF OPERATION 53

UNIT TYPE 53

CURRENT OPER MODE 53

Constant Volume Mode.....53

 Staged Input 54

 Zone Temperature Control 54

Variable Air Volume Mode.....55

 Occupied Cooling 55

 Occupied Heating 55

 Unoccupied Cooling 55

 Unoccupied Heating 55

Flexsys 56

ACTIVE SET POINT DETERMINATION 56

Constant Volume 56

 Staged Input Control 56

 Zone Temperature Control 57

Variable Air Volume 57

 Hardwired Sat Reset.....58

 Outside Air Based Sat Reset.....58

 Return Air Based Sat Reset 59

 Supply Fan Speed Based Sat Reset.....59

Flexsys With Bypass Damper 60

Continued on next page

TABLE OF CONTENTS

SECTION 5 – SEQUENCE OF OPERATION (Continued)

Flexsys Without Bypass Damper	60
COMPRESSOR CONTROL	60
COMPRESSOR OPERATION WITH ECONOMIZER	61
No Compressors On When Economizer Becomes Active.....	61
Compressor On When Economizer Becomes Active	61
SUPPLY FAN OPERATION.....	61
Constant Volume Operation	61
Variable Air Volume (VAV)	62
VAV Supply Fan Speed Control.....	63
COMPRESSOR STAGING SEQUENCE.....	64
CONDENSER FAN OPERATION	66
Ambient Control	66
Ambient Plus Discharge Pressure Control	66
ECONOMIZER.....	66
Dry Bulb.....	67
Single Enthalpy.....	67
Dual Enthalpy.....	67
Best Method	67
Nonflexsys Economizer	68
Flexsys Economizer	68
COMPRESSOR OPERATION	68
Compressor Data.....	68
Compressor Ready To Run	68
Compressor Ready To Stop	68
Compressor Safety Circuit	68
Low Pressure Cutout	69
Suction Temperature Monitoring	70
SUPPLY AIR TEMPERING.....	70
Modulating Gas Heat, Hot Water And Steam	70
Staged Gas Or Electric Heat.....	71
COMFORT VENTILATION	71
SYSTEM PUMP DOWN CONTROL.....	72
HIGH DISCHARGE PRESSURE UNLOADING	72
LOW AMBIENT LOCK OUT.....	72
FLEXSYS BYPASS DAMPER OPERATION	73
EVAPORATOR SUPERHEAT CALCULATION.....	74
STAGED INPUT FAULT	74
SYSTEM STABILITY CHECK	74
ELECTRIC HEAT	75

TABLE OF CONTENTS

SECTION 5 – SEQUENCE OF OPERATION (ELECTRIC HEAT - Continued)

Programmed Data.....	75
Heating Control Offset	75
Active SP	75
Heating Control.....	75
STAGED GAS HEAT	76
Programmed Data.....	76
Heating Control Offset	76
Active SP	77
Heating Control.....	77
Staged Gas Heat Mode Of Operation Status.....	77
Staged Gas Heat Ignition Sequence	78
MODULATING GAS HEAT	78
Overview.....	78
Programmed Data.....	79
Active SP	79
Heating Control Offset	79
Modulating Step Size	80
Modulating Gas Heat Mode Of Operation Status	80
Furnace Ignition Sequence.....	81
HOT WATER/STEAM HEAT.....	82
Programmed Data.....	82
Active SP	82
Sequence Of Operation.....	82
Freeze Protection	82
Freeze Fault.....	83
MORNING WARMUP	83
ADAPTIVE MORNING WARM UP	83
Sequence of Operation	84
FLEXSYS UNDER FLOOR TEMPERATURE CONTROL	85
Programmed Data.....	85
Under Floor Heating Sequence Of Operation	85
Occupied Standby	85
Unoccupied Standby	85
Dew Point Reset Sequence Of Operation	85
EXHAUST FAN OPERATION	85
On/off Control Based On Damper Position.....	85
Required Programmed Values	85
Operation	86
On/off Control Based On Building Pressure.....	86
Required Programmed Values	86

Continued on next page

TABLE OF CONTENTS

SECTION 5 – SEQUENCE OF OPERATION (EXHAUST FAN OPERATION - Continued)

Operation	86
Modulating Damper With Fixed Speed Exhaust	86
Required Programmed Values	86
Operation	86
Modulating Exhaust With A VFD	87
Required Programmed Values	87
Operation	87
RETURN FAN OPERATION	87
VFD Return Fan Without Exhaust	87
Required Programmed Values	87
Operation	87
VFD Return Fan With Exhaust	88
Required Programmed Values	88
Operation	88
VENTILATION SYSTEM	88
Overview	88
2-Position Damper	88
Required Program Values	88
Sequence Of Operation	89
Demand Ventilation	89
Required Program Values	89
Sequence Of Operation	89
Fixed Minimum	89
Required Program Values	89
Sequence Of Operation	89
Air Measuring Stations	90
General	90
Required Program Values	90
Minimum Flow IAQ	90
Sequence Of Operation	90
Full Flow IAQ	91
Sequence Of Operation	91
1/3 – 2/3 FLOW IAQ	92
Sequence Of Operation	92
1/3 – 2/3 IAQ Flow Measurement Option, Flow Control	93
Air Measurement Station Auto Zero	93
Air Measurement Station Sensor Faults	93
Full Flow IAQ Air Measurement Station	93
Minimum Flow IAQ Air Measurement Station	93
1/3 – 2/3 IAQ Air Measurement Station	93
SMOKE PURGE	94

Continued on next page

TABLE OF CONTENTS

SECTION 6 – USER INTERFACE CONTROL CENTER.....	95
USER INTERFACE CONTROL CENTER	95
Data Entry Keys	95
Navigation Keys.....	96
Menu Select Keys	96
SETPOINTS.....	112
PROGRAM	112
OPTIONS.....	112
DATE / TIME	112
SCHEDULE	113
OPERATING HOURS / START COUNTER	114
PRINT	115
SERVICE	115
HISTORY	126
PASSWORD	127
POWER UP BANNER.....	128
COMMUNICATION.....	129
Communication Ports	129
BACnet wiring.....	129
Device Object Instance (DE).....	129
Additional Settings.....	130
SECTION 7 – PARAMETER DESCRIPTIONS AND OPTIONS	139
SECTION 8 – SERVICE.....	149
ANALOG INPUT OPERATION	149
Temperature Sensors	149
Duct Pressure Transducer.....	149
Building Pressure Transducer	150
Air measuring Station Pressure Transducer	151
Return Fan Pressure Transducer.....	151
Discharge Pressure Transducer	151
Suction Pressure Transducer.....	151
Humidity Sensors	152
CO ₂ Sensor.....	152
Furnace Status Input.....	152
FAULTS	154
MULTI MEDIA CARD	165

LIST OF TABLES

TABLE 2-1 – VOLTAGE LIMITATIONS	19
TABLE 2-2 – PHYSICAL DATA - MODEL 106, 110, 115, 130, 150	23
TABLE 2-3 – COMPRESSOR DATA — R22	26
TABLE 2-4 – SUPPLY AND EXHAUST FAN MOTOR (ODP OR TEFC)	26
TABLE 2-5 – CONDENSER FAN MOTOR RLA.....	27
TABLE 2-6 – MISCELLANEOUS ELECTRICAL DATA	27
TABLE 2-7 – ELECTRIC HEAT	27
TABLE 2-8 – THREE PHASE POWER SUPPLY CONDUCTOR SIZE RANGE *	35
TABLE 3-1 – TEMPERATURE/PRESSURE CHART – REFRIGERANT R-22	42
TABLE 3-2 – GAS HEAT PERFORMANCE DATA.....	44
TABLE 4-1 – FAN BEARING – LUBRICATION INTERVALS	45
TABLE 4-2 – SETSCREW TORQUE	51
TABLE 5-1 – DIGITAL INPUTS FOR STAGED INPUT STAGED INPUT MODE	54
TABLE 5-2 – ACTIVE SAT SET POINT DETERMINATION, STAGED INPUT	56
TABLE 5-3 – ACTIVE SAT SET POINT DETERMINATION, ZONE TEMPERATURE.....	57
TABLE 5-4 – OA AIR TEMP ABOVE 65° F	64
TABLE 5-5 – OA AIR TEMP BELOW 65° F	65
TABLE 5-6 – ONE COMPRESSOR ON PER ANYSYSTEM.....	66
TABLE 5-7 – TWO COMPRESSOR ON PER ANYSYSTEM	66
TABLE 5-8 – COMPRESSOR SHUT OFF.....	74
TABLE 5-9 – CFM.....	75
TABLE 5-10 – HEAT STAGES.....	75
TABLE 5-11 – CFM	76
TABLE 5-12 – HEAT STAGES.....	76
TABLE 6-1 – STATUS.....	97
TABLE 6-2 – UNIT DATA.....	98
TABLE 6-3 – COOLING.....	100
TABLE 6-4 – COMPRESSOR SYSTEMS (1, 2, OR 3).....	102
TABLE 6-5 – SUPPLY SYSTEM.....	103
TABLE 6-6 – HEATING.....	104
TABLE 6-7 – ECONOMIZER	108
TABLE 6-8 – VENTILATION	109
TABLE 6-9 – EXHAUST	111
TABLE 6-10 – OPERATING HOURS / START COUNTER.....	114
TABLE 6-11 – SERVICE	116
TABLE 6-12 – AVAILABLE COMMUNICATION POINTS	131
TABLE 7-1 – DEFINITIONS.....	139
TABLE 8-1 – TEMPERATURE SENSOR RESISTANCE	149
TABLE 8-2 – DUCT PRESSURE TRANSDUCER.....	150
TABLE 8-3 – BUILDING PRESSURE TRANSDUCER OUTPUT	150
TABLE 8-4 – AIR MEASURING STATION PRESSURE TRANSDUCER OUTPUT	151
TABLE 8-5 – RETURN FAN PRESSURE TRANSDUCER OUTPUT.....	151

Continued on next page

LIST OF TABLES

TABLE 8-6 – PRESSURE TRANSDUCERS 152

TABLE 8-7 – HUMIDITY SENSOR OUTPUTS 152

TABLE 8-8 – CO2 SENSOR OUTPUT 152

TABLE 8-9 – FURNACE STATUS INPUT MODULATING GAS HEAT 153

TABLE 8-10 – FURNACE STATUS INPUT STAGED GAS HEAT 153

TABLE 8-11 – I/O CONTROL BOARD - ANALOG INPUT PIN OUTS..... 159

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY) 160

TABLE 8-13 – DATA LOG ERROR STATE 165

TABLE 8-14 – DATA LOG ERROR LOG DETAIL 166

LIST OF FIGURES

FIG. 1-1 – PACKAGED ROOFTOP AIR CONDITIONING UNIT	15
FIG. 1-2 – DOUBLE SLOPED SS DRAIN PAN.....	17
FIG. 2-1 – UNIT CLEARANCES	20
FIG. 2-2 – UNIT RIGGING	21
FIG. 2-3 – SHIPPING SUPPORT LABEL.....	22
FIG. 2-4 – DRAIN TRAP SHOWING WATER LOCATION DURING DRAW THROUGH OPERATION STAGES...	28
FIG. 2-5 – TRAP DETAIL FOR DRAW THROUGH APPLICATION	28
FIG. 2-6 – FIELD CONTROL WIRING - INPUTS	32
FIG. 2-7 – FIELD CONTROL WIRING - OUTPUTS	33
FIG. 2-8 – SINGLE-POINT POWER SUPPLY WIRING WITH NON-FUSED DISCONNECT	35
FIG. 2-9 – SINGLE-POINT POWER SUPPLY WIRING.....	36
FIG. 2-10 – STATIC PRESSURE PROBE INSTALLATION	37
FIG. 3-1 – FAN ISOLATOR SPRING BOLTS (TOTAL OF 8)	40
FIG. 4-1 – SHEAVE ALIGNMENT.....	46
FIG. 4-2 – FAN DATA PLATE - BELT TENSION	47
FIG. 4-3 – BELT TENSIONING GAUGE.....	47
FIG. 4-4 – EXAMPLE OF FC FAN SHAFT/WHEELMARKING.....	48
FIG. 4-5 – BEARING WITH SETSCREW TYPE LOCKING DEVICE.....	49
FIG. 4-6 – BEARING WITH ECCENTRIC CAM	50
FIG. 4-7 – ECCENTRIC CAM LOCKING COLLAR BEARING INSTALLATION	50
FIG. 4-8 – SPLIT BEARING.....	51
FIG. 5-1 – DIFFERENCES (°F) BETWEEN ZONE TEMPERATURE AND SET POINTS.....	54
FIG. 5-2 – ACTIVE SAT SET POINT VS. SUPPLY AIR TEMP RST VOLTAGE	58
FIG. 5-3 – ACTIVE SAT SET POINT VS. OUTSIDE AIR TEMP.....	58
FIG. 5-4 – ACTIVE SAT SET POINT VS. RETURN AIR TEMP.....	59
FIG. 5-5 – ACTIVE SAT SET POINT VS. SUPPLY FAN SPEED	59
FIG. 5-6 – ACTIVE DSP SET POINT VS. DUCT STATIC PRES RST VOLTAGE.....	63
FIG. 5-7 – MODULATING GAS HEAT STAGING SEQUENCE.....	79
FIG. 5-8 – SAT ERROR	80
FIG. 5-9 – ACTIVE RETURN PLENUM PRESSURE SET POINT VS. EXHAUST OUTPUT.....	88
FIG. 5-10 – MINIMUM FLOW MEASUREMENT ARRANGEMENT	90
FIG. 5-11 – MINIMUM FLOW MEASUREMENT OPTION, FLOW CONTROL	91
FIG. 5-12 – MINIMUM FLOW MEASUREMENT OPTION, ECONOMIZER	91
FIG. 5-13 – FULL FLOW MEASUREMENT ARRANGEMENT	91
FIG. 5-14 – FULL FLOW, MINIMUM, AND 1/3-2/3 MEASUREMENT OPTION, FLOW CONTROL	91
FIG. 5-15 – FULL FLOW, MINIMUM, AND 1/3-2/3 MEASUREMENT OPTION, ECONOMIZER	91
FIG. 5-16 – 1/3-2/3 IAQ FLOW MEASUREMENT OPTION, FLOW CONTROL.....	92
FIG. 5-17 – 1/3 – 2/3 FLOW MEASUREMENT ARRANGEMENT	92
FIG. 5-18 – 1/3-2/3 IAQ MEASUREMENT OPTION, ECONOMIZER	93

Continued on next page

LIST OF FIGURES

FIG. 6-1 – USER INTERFACE CONTROL PANEL 95

FIG. 6-2 – IPU CONTROL BOARD 129

FIG. 6-3 – MAC ADDRESS SWITCHES..... 129

FIG. 8-1 – I/O CONTROL BOARD..... 156

FIG. 8-2 – I/O CONTROL BOARD - BINARY OUTPUTS..... 157

FIG. 8-3 – I/O CONTROL BOARD - BINARY INPUTS..... 158

FIG. 8-4 – I/O CONTROL BOARD - ANALOG OUTPUTS..... 158

FIG. 8-5 – I/O CONTROL BOARD - ANALOG INPUTS (SEE TABLE 8-11 FOR PIN OUTS)..... 158

SECTION 1 – INTRODUCTION

1



FIG. 1-1 – PACKAGED ROOFTOP AIR CONDITIONING UNIT

ECOLOGICAL AND ECONOMICAL DESIGN

Lower total cost of ownership

- High efficiency eco² rooftop units are optimized for HCFC-22 refrigerant. YORK provides the FIRST standard product offering with an HFC-optimized design that meets the latest ASHRAE 90.1 energy efficiency requirements.
- Fully modulating gas heat and greater steps of capacity control offer superior off-design performance while maintaining optimum occupant comfort.
- Accurate ventilation control ensures that no more than the proper amount of ventilation air is utilized. This avoids the energy cost of conditioning excess outside air and simultaneously monitors all other unit functions for maximized energy efficiency.
- Flexible design configurations simplify the design process and allow the Eco² to be applied to virtually any building application.
- Accessibility through double-wall access doors, spacious compartments and supportive floors improves serviceability.

INDOOR AIR QUALITY (IAQ)

Indoor air quality features for the indoor environment

- A double-sloped stainless steel drain pan with a single drain connection ensures that all condensate is voided from the drain pan. It is also visible and accessible for periodic inspection and cleaning required by the ASHRAE 62 IAQ standard.
- Double-wall construction of the roof, floor, doors, and walls prevents insulation fibers from entering the conditioned air. The inner liner also facilitates periodic cleaning of the unit to prevent harmful build-up of bacteria or contaminants.
- The rooftop unit controller control center uses microprocessor logic to analyze and optimize ventilation decisions and perform demand ventilation, and airflow compensation.

Condensing Section

- **Scroll Compressors** – Reliable, efficient, trouble-free operation is the true measure of a packaged rooftop's value. That's why YORK eco² Packaged Rooftop Air Conditioners use established scroll-compressor technology to deliver dependable, economical performance in a wide range of applications. With the eco² Packaged Rooftop, you get the latest generation of compressor enhancements added to the scroll's inherent strengths. The simplicity of a hermetic scroll compressor allows the use of fewer moving parts to minimize breakdown.
- **Multiple Compressor Staging** – Through the use of the scroll compressor, the eco² has the ability to stage its cooling by enabling and disabling multiple single stage compressors on multiple circuits. These compressors are manifolded together in three independent circuits.
- **Compressor Circuiting** – The eco² is designed so that only 2 scroll compressors are in tandem within one refrigeration circuit. This means more reliable compressors, and less equipment down time. With multiple circuits, if a compressor should ever fail on one circuit, the other circuit/s will remain operational to work to maintain occupied loads. The Eco² system has 3 circuits in a unit.
- **Compressor Sound Blankets** – Optional factory installed sound blankets can be installed to further reduce compressor sound attenuation.
- **Replaceable core filter driers** – The optional replaceable core filter driers on the eco² provides a convenient means for maintaining and optimizing the units refrigeration system. Eliminating additional field penetrations into the refrigerant circuit, which could lead to potential problems, reduce the worry of refrigerant circuit contamination.
- **Low ambient** – The standard low ambient control sequence provides mechanical cooling as necessary down to zero degrees on YPAL130 models. The rooftop control monitors compressor discharge pressure and adjusts condenser airflow to maintain the minimum head pressure for reliable compressor operation. The adjustment of condenser airflow also provides energy savings for excellent part load operation and control.
- **Condenser Fan Motors** – The condenser fan motors used on the Eco² unit are Totally Enclosed Air Over (TEAO) to provide maximum durability through any season.
- **Condenser Coils** – are available in various materials and coatings to suit almost any type of application. Aluminum or copper fins, pre-coated or post-coated fins. The coating is applied using an epoxy coating on the aluminum coil. Each coil option is beneficial when the unit must operate under extreme conditions such as seashore or industrial applications.
- **Condenser Coil Protection** – The eco² is available with either a wire mesh covering or louvered panels for optimum coil protection. In applications where unauthorized personnel may have access to the units, or the units may be susceptible to severe weather conditions such as hail, the louvered panel provides protection around the entire condensing section giving the maximum protection to the coils and refrigerant components.

Heating Section

- **Gas heat design and control options** include an unsurpassed 24:1 turndown modulating gas furnace, and staged heating control. A Staged furnace is also available in six step furnaces.
- **Staged gas heat** – The eco² rooftop gas furnace is an induced-draft gas furnace designed for high efficiency and reliability. The furnace uses an aluminumized steel tubular heat exchanger and operates at temperatures sufficient to prevent acidic exhaust gases from condensing in the heat exchanger at low fire rates, unlike drum and tube style furnaces that generate condensation formation.
- **Electric** – The eco² is also available with an electrical heater that can range from 40kW up to 240kW. Depending on the size of the heat required, the Eco² can have 3 to 6 steps of control helping to provide tighter control of the supply and zone conditioned air. With the utilization of this multi step function, the eco² can effectively reduce energy consumption by bringing on smaller stages of heat while maintaining the maximum level of comfort.

AIR MANAGEMENT

The YORK FlexSys Underfloor Air system provides a cutting edge, cost competitive alternative to conventional overhead air distribution systems based on the performance and system flexibility benefits that it can provide. When combined with a YORK eco² Packaged Rooftop Unit, the system offers a completed package that provides an optimum solution for building comfort control.

Flexsys technology uses the open space between the structural concrete slab and the underside of a raised access floor system to deliver conditioned air directly into the occupied zones of office and other commercial buildings. This underfloor plenum incorporates the air distribution system with the building power, telecom, and data cabling in one easily accessed service plenum. The raised access floor concept is a proven design ideal for office buildings that house today's modern business that relies on critical information technologies to maintain high productivity levels. The unmatched flexibility offered by raised floor systems allows for significant costs savings and reduced downtimes when a fast-paced economy demands office space reconfiguration.

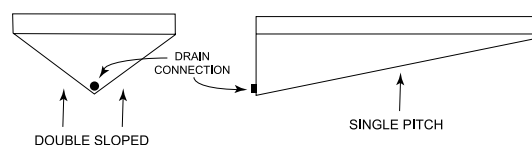
- **DWDI Airfoil fans** – High efficiency fans are used to improve application flexibility, and address sound and application concerns.
- **Building pressure control** – Return fans, exhaust fans, and barometric relief dampers are available to meet building pressure control requirements. Select the most appropriate option for a given application.
- **Low sound options** – allow for application of the Eco2 unit in sound-sensitive applications such as theaters and downtown areas. Contact York for more details on site-specific requirements.
- **Variable Frequency Drives** – when a VAV unit is ordered, the eco2 comes standard with variable frequency drives (vfd's). The VFD can optimize a systems performance by modulating the supply fan motor speed to reduce energy consumption by as much as 40% while maximizing occupant comfort.
- **Fan Spring Isolation** – Two-inch spring isolation is used to prevent vibration transmission from the rooftop unit's supply fan to the building.

CONTROLS

- **Rooftop Controller** – the ColdFire™ processor-based controller uses the latest in processor technology to provide the highest level of rooftop control with BACnet open protocol communication capabilities. An 80-character display and keypad are standard for simple, and easy to understand manipulation of control setpoints and readout of operating parameters and diagnostics. Shutdown and alarm faults are all recorded in memory, and include a time and day stamp for easy troubleshooting.
- **BACnet** – the eco² can be adapted to operate with any building automation system that is BACnet compatible making it the most flexible large commercial rooftop units on the market.

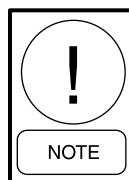
INDOOR AIR QUALITY

- **Double Sloped Stainless Steel Drain Pan** – the eco²'s standard Stainless Steel drain pan meets ASHRAE 62 requirements for condensate drainage to improve indoor air quality. Solid wall liners encase insulation and prevent moisture from damage. Additional benefits include easy cleanability and isolates insulation from conditioned airstream.



LD08022

FIG. 1-2 – DOUBLE SLOPED SS DRAIN PAN



This is a visual reference only. Actual drain pan pitch will vary.

- **Double Wall Construction** – is the standard construction of the eco² and incorporates powder coated pre-fabricated outer panels and corner post for maximum exterior surface protection.

- **Factory Shrinkwrap** – all eco² rooftop units are shipped from the factory with factory-fresh shrink-wrap packaging. No longer does the contractor need to worry about dirt and debris clogging up condenser coils or moisture leaking into the air handler on the units way to the job site or rigging yard.
- **Demand Ventilation** – can be incorporated into the unit to improve indoor air quality and help manage indoor pollutants such as CO₂ or other harmful airborne contaminants out of the occupied spaces for maximum comfort and safety. Activation of this sequence can easily be accomplished using a CO₂ sensor connected to the unit. The rooftop unit controller includes two analog inputs for sensors to sense indoor and/or outdoor CO₂ levels to maintain optimum occupant comfort and safety. CO₂ sensors are typically used with demand ventilation, however other sensors may be applied to control indoor contaminants such as volatile organic compounds (VOCs).
- **Smoke Purge** – is also available through the User Interface to evacuate smoke due to fire from a room or zone.
- **Filtration** – The eco² is configured for various types of filtration to meet the different needs and requirements of today's rooftop applications, including 2-inch throwaway, pleated, carbon, and cleanable filters and 12-inch high efficiency rigid filters.

ELECTRICAL

- **Single Point Power** – The eco² unit comes standard with single point power connections to make installation quick and easy.
- **Dual Point Power** – can be factory installed for

applications that require the mechanical heating and cooling functions to be separated from the air handling functions. This enables the unit to be operated in an emergency condition while minimizing power consumption.

- **Unit-Mounted Disconnect** – is available as an option to minimize time at installation of equipment and to reduce necessary field installed items.

SERVICE AND INSTALLATION

- **Access Doors** – Full-sized access doors provide easy access into the unit for routine maintenance and inspection.
- **Service Valves** – Oversized service valves to provide isolation and quick reclamation and charging of system refrigerant are available to minimize downtime and simplify the service and repair task.
- **Convenience Outlet** – For maintenance tasks requiring power tools, an optional 110V GFCI power supply can power lights, drills or any other power hand tool needed.
- **Factory Run-Tested** – Each unit is subjected to a series of quality assurance checks as well as an automated quality control process before being run-tested. Fans and drives are balanced at the factory during testing. The factory run-test ensures safe proper operation when the unit is installed, and reduces installation and commissioning time.
- **Rain Hoods Rotate into Place** – No bulky, field-installed rain hoods here. Eco2 rain hoods ship flush against the unit, and retract into position with the insertion of a few screws and caulk along the side seams.
- **Replaceable core filter drier option** provides a means to remove moisture, dirt and debris from the refrigeration circuit in the event it is opened.

SECTION 2 – INSTALLATION

APPROVALS

Designed certified by CSA, ETL, CETL as follows:

1. For use as a forced air furnace with cooling unit (gas heat models).
2. For outdoor installation only.
3. For installation on combustible material and may be installed directly on combustible flooring or Class A, Class B or Class C roof covering materials.
4. For use with natural gas or LP.
5. When used with LP propane gas, conversion kit part number 026-36399-000 must be installed before the gas heat section is fired.

Not suitable for use with conventional venting systems.

LIMITATIONS

The installation of this unit must conform to local building codes, or in the absence of local codes, with ANSI Z23.1 Natural Fuel Gas Code and /or CAN/CGA B149 installation codes.

In U.S.A.:

1. National Electrical Code ANSI/NFPA No. 70 - Latest Edition.
2. National Fuel Gas Code Z223.1 - Latest Edition.
3. Gas-Fired Central Furnace Standard ANSI Z21.47 - Latest Edition.
4. Local gas utility requirements.

Refer to Table 2-1 for voltage limitations.

TABLE 2-1 – VOLTAGE LIMITATIONS

UNIT POWER SUPPLY	VOLTAGE VARIATIONS	
	MIN. VOLTS	MAX. VOLTS
575-3-60	518	632
460-3-60	414	506
230-3-60	207	253
208-3-60	180	228

UNIT INSPECTION

Immediately upon receiving the unit, it should be inspected for possible damage, which may have occurred during transit. If damage is evident, it should be noted in the carrier's freight bill. A written request

for inspection by the carrier's agent should be made at once. See "Instruction" manual, Form 50.15-NM for more information and details.



To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized YORK service mechanic or a qualified service person experienced in packaged rooftop installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cut-out settings, design working pressures, and ventilation requirements consistent with the amount and type of refrigerant charge.

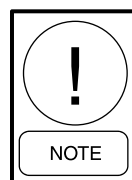
Lethal voltages exist within the control panels. Before servicing, open and tag all disconnect switches.

LOCATIONS AND CLEARANCES

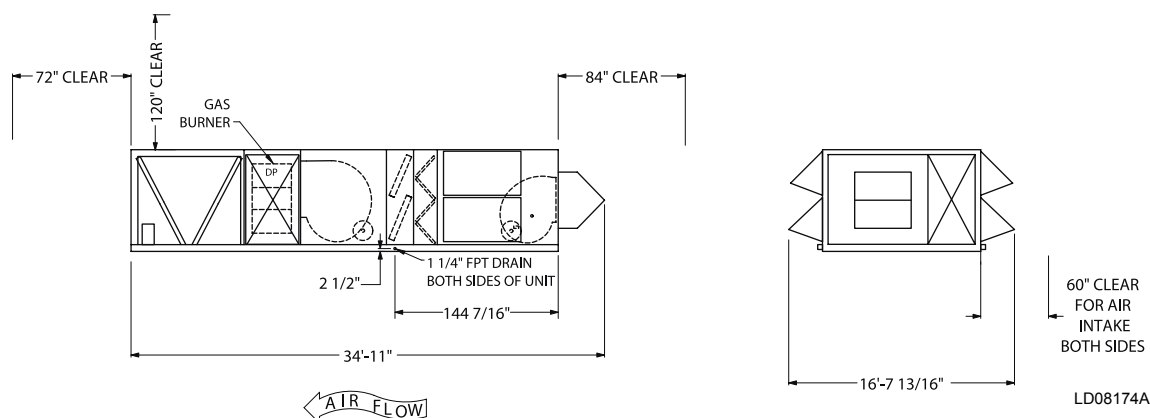
The following guidelines should be used to select a suitable location for unit installation.

1. Unit is designed for outdoor installation only.
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for roof mount on curb.
4. Roof structures must be able to support the weight of the unit and its accessories. Unit must be installed on a solid level roof curb or appropriate angle iron frame.
5. Maintain level tolerance to 1/2 inch across width and 2 inches along the length.

Unit clearances are shown in Figure 2-1.



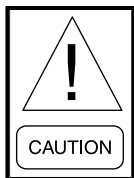
The clearances shown are to provide adequate condenser airflow and service access to inside the unit. Additional clearance should be considered for component replacement such as compressors, evaporator coils, and supply or exhaust fans.



NOTES:

1. 10' clearance minimal over the top of the condensing unit.
2. Only one adjacent wall can exceed unit height.
3. 12' clearance required to adjacent units.
4. 8' service access recommended on one side.
5. Economizer and exhaust hoods, where applicable, are folded inside unit for shipment.
6. Dim. is to outside of lifting lugs.

FIG. 2-1 – UNIT CLEARANCES



While it is a common practice to operate the fan as soon as possible (air movement during construction) on the job site, the incomplete ductwork and missing diffuser grilles will greatly reduce air resistance and will allow the fan to operate beyond design parameters. This practice may result in water carry over and flooding of the unit. Also, the supply fan motor may overamp and become damaged.

RIGGING AND HANDLING

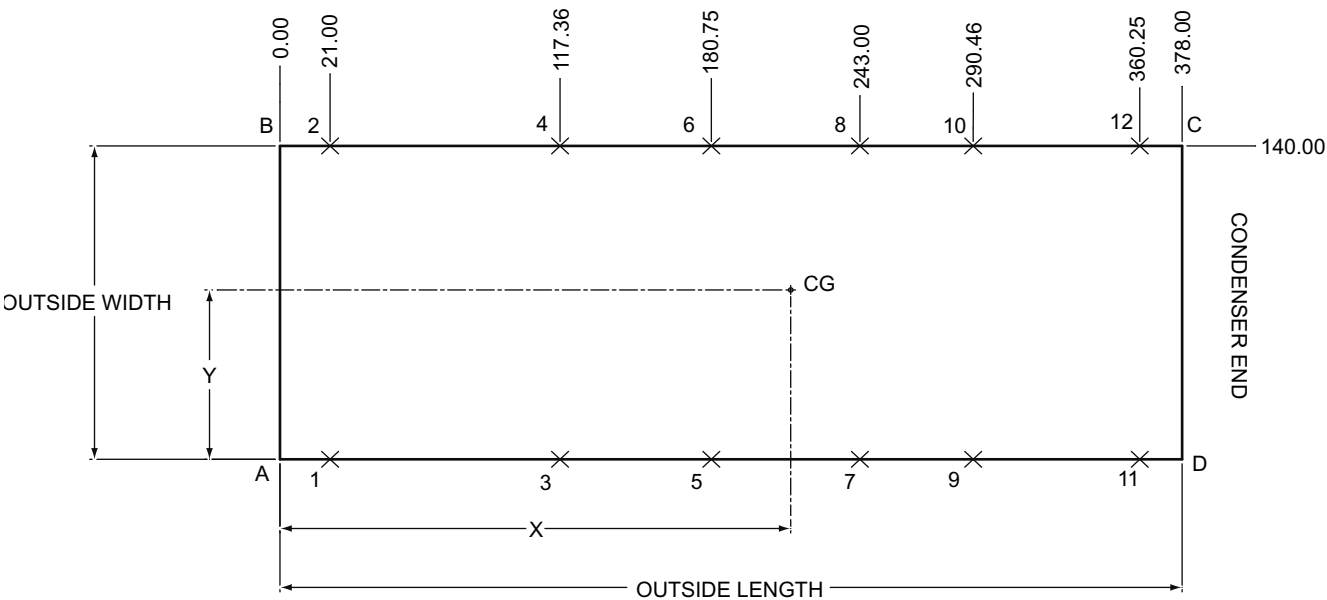
Proper rigging and handling of the equipment is mandatory during unloading and setting it into position to retain warranty status. All lifting lugs must be used to prevent twisting and damage to the unit.

Care must be taken to keep the unit in the upright position during rigging and to prevent damage to the water-tight seams in the unit casing. Avoid unnecessary jarring or rough handling.

Proper spreader bars and cables should be used when rigging - see Figure 2-2. It is also mandatory that an experienced and reliable rigger be selected to handle unloading and final placement of the equipment. The rigger must be advised that the unit contains internal components and that it be handled in an upright position. Care must be exercised to avoid twisting the equipment structure.

Unit weights are listed under Table 2-2 in this manual. These weights must be referred to when selecting a crane for rigging and figuring roof weight loads. Contact your YORK Sales Office if you have any questions regarding unit weights.

In addition, corner loads and lifting lug loads are listed in Fig. 2.2



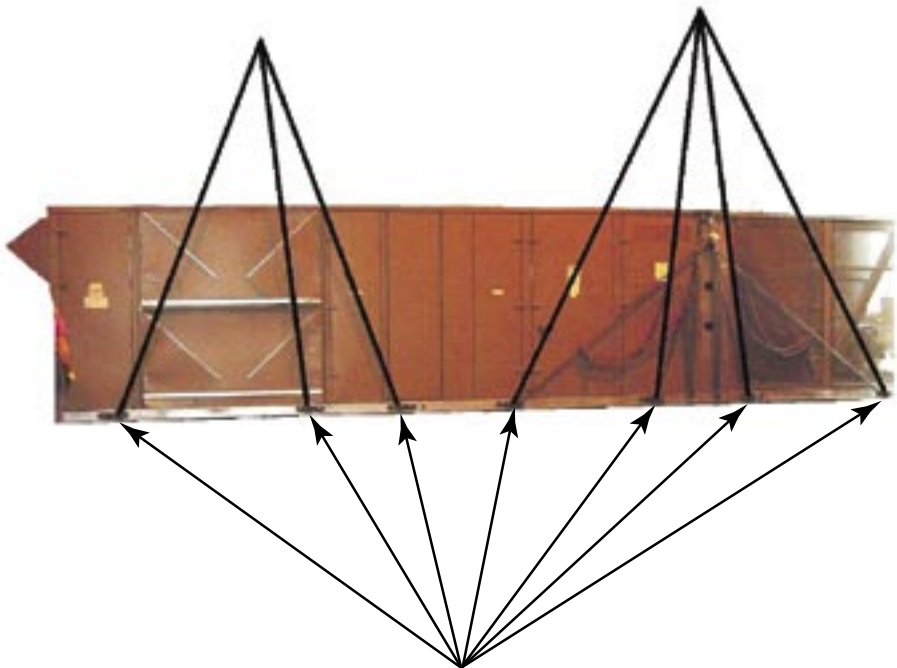
2

UNIT WEIGHTS, CORNER AND LIFTING LUG LOADS

UNIT SIZE	130	115	110	106
WEIGHT, LBF	15,187	14,312	14,192	13,997
CG				
X, INCHES	235.6	232.7	231.7	233
Y, INCHES	71.7	71.9	71.9	72
Z, INCHES	39.5	39	39.1	39

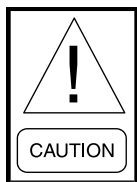
CORNER LOADS				
A	2,792	2,679	2,673	2,610
B	2,929	2,824	2,820	2,760
C	4,846	4,521	4,466	4,434
D	4,619	4,288	4,233	4,193

LIFTING LUG LOADS				
1	477	457	447	447
2	477	457	447	447
3	1740	1642	1632	1566
4	1741	1650	1640	1581
5	2706	2643	2633	2596
6	2738	2679	2669	2635
7	930	910	900	900
8	966	946	936	936
9	818	705	695	695
10	1167	1053	1043	1043
11	713	584	574	574
12	713	584	574	574

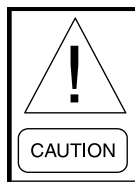


LIFTING LUG POINTS

FIG. 2-2 – UNIT RIGGING



There are eight shipping support rails and spacers installed under the base of the unit. The rails are required for shipping because the unit is wider than the trailer bed and the side rails of the unit are not supported. **THESE RAILS MUST BE REMOVED BEFORE THE UNIT IS PLACED ON THE CURB.** Labels, Figure 2-3, are attached to the base rails to identify the locations of the support rails. The labels are located on both sides of the unit. A single screw positioned six inches in from each side fastens the support rail and spacer to the unit. The best time to remove the screws holding the support and spacer in place is just before the unit is lifted from the trailer bed to the curb. The support rails and spacers should not be removed if the unit is not going to be installed on a curb.



On units with bottom supply, the two shipping support rails in the area of the supply air opening are used to secure a shipping closure panel. The shipping closure panel is attached to the rails and will detach from the unit with the shipping support rails.

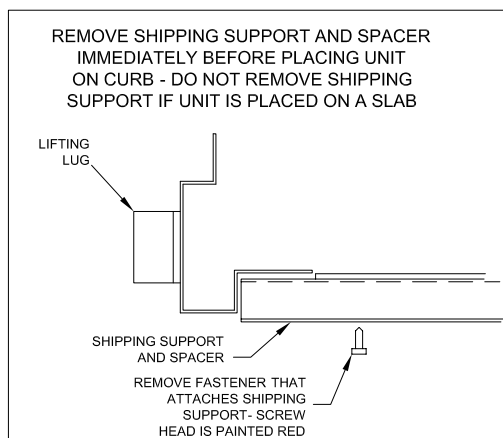


FIG. 2-3 – SHIPPING SUPPORT LABEL

LD10800

PHYSICAL DATA

TABLE 2-2 – PHYSICAL DATA - MODEL 106, 110, 115, 130, 150

MODEL SIZE	106	110	115	130	150
GENERAL DATA					
LENGTH - STANDARD CABINET WITHOUT HOODS (INCHES)	378	378	378	378	
BASE WIDTH WITHOUT HOODS (INCHES)	140	140	140	140	
BASE HIEGHT (INCHES)	90	90	90	90	
WEIGHTS (LBS.) (BASE UNIT, NO OPTIONS)					
BASE CABINET, COOLING ONLY WITH ECONOMIZER	15,538	15,733	15,853	16,728	
OPTION WEIGHTS (LBS.)					
POWER EXHAUST (BLOWER, MTR, MTR BASE, FAN SKID, MOD DAMPER & HOOD)	2,063	2,063	2,063	2,063	
POWER EXHAUST (BLOWER, MTR, MTR BASE, FAN SKID, VFD, BARO DAMPER & HOOD)	2,353	2,353	2,353	2,353	
BAROMETRIC ONLY	538	538	538	538	
375 MBH GAS HEAT	192	192	192	192	
750 MBH GAS HEAT	334	334	334	334	
1125 MBH GAS HEAT	474	474	474	474	
ELECTRIC HEATERS	263	263	263	263	
CONDENSER WIRE GUARD	65	65	65	65	
COPPER CONDENSER COILS (ADDITIONAL)	485	485	485	720	
COPPER EVAPORATOR COILS (ADDITIONAL)	825	1100	1100	1375	
COMPRESSOR DATA					
QUANTITY/SIZE (NOMINAL HP)	6 X 15	6 X 15	2 X 20 4 X 15	6X20	
TYPE	SCROLL	SCROLL	SCROLL	SCROLL	
CAPACITY STEPS (QTY X %)	6 X 16	6 X 16	2 X 20 4 X 15	6 X 16	
SUPPLY FAN AND DRIVE					
QUANTITY	1	1	1	1	
TYPE	FC / AF	FC / AF	FC / AF	FC / AF	
SIZE	36X36 / 40X40	36X36 / 40X40	36X36 / 40X40	36X36 / 40X40	
MOTOR SIZE RANGE (MIN. TO MAZ. HP)	10-75	10-75	10-75	10-75	
AIR FLOW RANGE (MIN. TO MAX. CFM)	27500-46000	27500-46000	30000-46000	33000-46000	
STATIC PRESSURE RANGE (MIN. TO MAX. ESP)	0-6"	0-6"	0-6"	0-6"	
EXHAUST FAN					
QUANTITY	1	1	1	1	
TYPE	FC	FC	FC	FC	
SIZE	32-32	32-32	32-32	32-32	
MOTOR SIZE RANGE (MIN. TO MAZ. HP)	7.5-40	7.5-40	7.5-40	7.5-40	
AIR FLOW RANGE (MIN. TO MAX. CFM)	0-46000	0-46000	0-46000	0-46000	
STATIC PRESSURE RANGE (MIN. TO MAX. ESP)	0-2"	0-2"	0-2"	0-2"	

Continued next page

TABLE 2-2 – PHYSICAL DATA - MODEL 106, 110, 115, 130, 150 (CONTINUED)

MODEL SIZE	106	110	115	130	150
RETURN FAN					
QUANTITY	1	1	1	1	
TYPE	PLENUM	PLENUM	PLENUM	PLENUM	
SIZE	445	445	445	445	
MOTOR SIZE RANGE (MIN. TO MAX. HP)	10-50	10-50	10-50	10-50	
AIR FLOW RANGE (MIN. TO MAX. CFM)	0-46000	0-46000	0-46000	0-46000	
STATIC PRESSURE RANGE (MIN. TO MAX. ESP)	0-3"	0-3"	0-3"	0-3"	
EVAPORATOR COIL					
SIZE (SQUARE FEET)	68.9	68.9	68.9	68.9	
NUMBE OF ROWS / FINS PER INCH	3 / 10	4 / 10	4 / 10	5 / 10	
TUBE DIAMETER / SURFACE	1/2" / ENHANCED	1/2" / ENHANCED	1/2" / ENHANCED	1/2" / ENHANCED	
CONDENSER COIL (R22, AL & CU FIN					
SIZE (SQUARE FEET)	144.7	144.7	144.7	144.7	
NUMBE OF ROWS / FINS PER INCH	2 / 17	2 / 17	2 / 17	3 / 13	
TUBE DIAMETER / SURFACE	3/8"	3/8"	3/8"	3/8"	
CONDENSER FANS					
QUANTITY	6	6	6	6	
TYPE	PROP	PROP	PROP	PROP	
DIAMETER (INCHES)	36	36	36	36	
POWER (HP EACH)	2	2	2	2	
FILTERS - 2" THROWAWAY (PRE-FILTER POSITION)					
QUANTITY	24 / 8	24 / 8	24 / 8	24 / 8	
SIZE (LENGTH X WIDTH) (IN.)	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	94.4	94.4	94.4	94.4	
FILTERS - 2" CLEANABLE (PRE-FILTER POSITION)					
QUANTITY	24 / 8	24 / 8	24 / 8	24 / 8	
SIZE (LENGTH X WIDTH) (IN.)	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 /25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	94.4	94.4	94.4	94.4	
FILTERS - 2" PLEATED, 30% EFFICIENT (PRE-FILTER POSITION)					
QUANTITY	24 / 8	24 / 8	24 / 8	24 / 8	
SIZE (LENGTH X WIDTH) (IN.)	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	94.4	94.4	94.4	94.4	
FILTERS - 12" RIGID 65%, 2" 30% PREFILTER (PRE-FILTER POSITION)					
QUANTITY	10 / 15	10 / 15	10 / 15	10 / 15	
SIZE (LENGTH X WIDTH) (IN.)	20 X 16 / 25 X 20	20 X 16 / 25 X 20	20 X 16 / 25 X 20	20 X 16 /25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	74.3	74.3	74.3	74.3	

Continued next page

TABLE 2-2 – PHYSICAL DATA - MODEL 106, 110, 115, 130, 150 (CONTINUED)

MODEL SIZE	106	110	115	130	150
FILTERS - 12" RIGID 95%, 2" 30% PREFILTER (PRE-FILTER POSITION)					
QUANTITY	10 / 15	10 / 15	10 / 15	10 / 15	
SIZE (LENGTH X WIDTH) (IN.)	20 X 16 / 25 X 20	20 X 16 / 25 X 20	20 X 16 / 25 X 20	20 X 16 / 25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	74.3	74.3	74.3	74.3	
FILTERS - 2" CARBON (PRE-FILTER POSITION)					
QUANTITY	24 / 8	24 / 8	24 / 8	24 / 8	
SIZE (LENGTH X WIDTH) (IN.)	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	25 X 16 / 25 X 20	
TOTAL FILTER FACE AREA (SQUARE FEET)	94.4	94.4	94.4	94.4	
GAS FURNACE					
STAGED FURNACE SIZE (INPUT/OUTPUT/STAGES)	375 MBH / 300 MBH / 2 STAGES				
	750 MBH / 600 MBH / 4 STAGES				
	1125 MBH / 900 MBH / 6 STAGES				
GAS PRESSURE RANGE (MIN. TO MAX. IWG)	4.5 - 14" W.C.				
MODULATING FURNACE SIZES (INPUT/OUTPUT/TURNDOWN)	375 MBH / 300 MBH / 8:1 TURNDOWN				
	750 MBH / 600 MBH / 16:1 TURNDOWN				
	1125 MBH / 900 MBH / 24:1 TURNDOWN				
GAS PRESSURE RANGE (MIN. TO MAX. IWG)	4.5 - 14" W.C.				

ELECTRICAL DATA

ELECTRICAL SERVICE SIZING

In order to use the electrical service required for the cooling only eco² rooftop, use the appropriate calculations listed below from U.L. 1995. Based on the configuration of the rooftop, the calculations will yield different MCA (minimum circuit ampacity), and MOP (maximum overcurrent protection).

Using the following load definitions and calculations, determine the correct electrical sizing for your unit. All concurrent load conditions must be considered in the calculations, and you must use the highest value for any combination of loads.

Load Definitions:

- **LOAD1** is the current of the largest motor – compressor or fan motor.
- **LOAD2** is the sum of the remaining motor currents that may run concurrently with LOAD1.

- **LOAD3** is the current of the electric heaters – zero for cooling only units.
- **LOAD4** is the sum of any remaining currents greater than or equal to 1.0 amp.

Use the following calculations to determine MCA and MOP for units supplied with a single-point power connection:

$$\text{MCA} = (1.25 \times \text{LOAD1}) + \text{LOAD2} + \text{LOAD3} + \text{LOAD4}$$

$$\text{MOP} = (2.25 \times \text{LOAD1}) + \text{LOAD2} + \text{LOAD3} + \text{LOAD4}$$

If the MOP does not equal a standard current rating of an overcurrent protective device, then the marked maximum rating is to be the next lower standard rating. However, if the device selected for MOP is less than the MCA, then select the lowest standard maximum fuse size greater than or equal to the MCA.

TABLE 2-3 – COMPRESSOR DATA — R22

MODEL	COMPRESSOR		NOMINAL VOLTAGE									
	QUANTITY PER UNIT	MODEL	200/3/60		230/3/60		460/3/60		575/3/60		400/3/50	
			RLA*	LRA	RLA*	LRA	RLA*	LRA	RLA*	LRA	RLA*	LRA
106	6	ZR19	54.7	425	48.0	425	23.8	187	21.1	148	23.8	198
110	6	ZR19	55.5	425	48.1	425	24.0	187	21.1	148	24.0	198
115	4	ZR19	56.4	425	48.9	425	24.4	187	19.6	148	24.4	198
	2	ZR250	78.3	505	73.0	505	31.1	225	24.9	180	31.1	225
130	6	ZR250	73.0	505	73.0	505	31.4	225	25.2	180	31.4	225

NOTE: *RLA DATA IS PER COMPRESSOR

TABLE 2-4 – SUPPLY AND EXHAUST FAN MOTOR (ODP OR TEFC)

MOTOR	HIGH EFFICIENCY - ODP					PREMIUM EFFICIENCY - ODP				
	NOMINAL VOLTAGE					NOMINAL VOLTAGE				
	200/3/60	230/3/60	460/3/60	575/3/60	400/3/50	200/3/60	230/3/60	460/3/60	575/3/60	400/3/50
HP	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA
5.0	16.1	13.2	6.6	5.3	8.3	14.9	12.8	6.4	5.2	8.3
7.5	25.0	21.6	10.8	8.2	13.3	21.3	20.0	10.0	7.4	13.3
10.0	33.0	28.0	14.0	11.0	17.5	29.0	25.8	12.9	10.3	17.5
15.0	44.8	40.6	20.3	16.2	24.5	40.7	35.4	17.7	14.1	24.5
20.0	61.0	50.0	25.0	20.0	32.0	54.3	47.0	23.5	18.9	32.0
25.0	74.0	62.0	31.0	23.8	39.0	69.5	60.0	30.0	24.2	39.0
30.0	87.0	72.0	36.0	28.0	46.0	81.0	70.0	35.0	28.0	46.0
40.0	113.0	98.0	49.0	38.8	59.0	111.0	92.0	46.0	37.4	59.0
50.0	144.0	124.0	62.0	49.2	73.0	137.0	114.0	57.0	46.0	73.0
60.0	167.0	144.0	72.0	57.4	87.0	160.0	136.0	68.0	56.0	87.0

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TABLE 2-4 – SUPPLY AND EXHAUST FAN MOTOR (CONTINUED) (ODP OR TEFC)

MOTOR	HIGH EFFICIENCY - TE					PREMIUM EFFICIENCY - TE				
	NOMINAL VOLTAGE					NOMINAL VOLTAGE				
	200/3/60	230/3/60	460/3/60	575/3/60	400/3/50	200/3/60	230/3/60	460/3/60	575/3/60	400/3/50
HP	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA	FLA
5.0	15.2	13.4	6.7	5.4	8.0	14.6	13.0	6.5	5.2	8.0
7.5	24.8	20.4	10.2	8.2	12.0	22.0	20.0	10.0	8.0	12.0
10.0	29.5	28.4	14.2	11.4	17.2	28.5	25.0	12.5	10.0	17.2
15.0	43.7	38.8	19.4	15.5	22.6	42.4	37.0	18.5	14.8	22.6
20.0	60.0	48.0	24.0	19.1	32.5	56.0	48.0	24.0	19.0	32.5
25.0	73.0	60.0	30.0	24.2	39.0	68.4	60.0	30.0	23.9	39.0
30.0	87.0	74.0	37.0	29.6	46.0	83.0	72.0	36.0	29.8	46.0
40.0	113.0	94.0	47.0	38.0	57.0	107.0	94.0	47.0	37.0	57.0
50.0	140.0	118.0	59.0	47.4	72.0	131.0	118.0	59.0	46.0	72.0
60.0	161.0	140.0	70.0	56.0	84.0	159.0	138.0	69.0	55.0	84.0

TABLE 2-5 – CONDENSER FAN MOTOR RLA

MODEL	QUANTITY PER UNIT	NOMINAL VOLTAGE				
		200/3/60	230/3/60	460/3/60	575/3/60	400/3/50
		RLA	RLA	RLA	RLA	RLA
106	6	7.3	6.2	3.1	2.5	3.8
110	6	7.3	6.2	3.1	2.5	3.8
115	6	7.3	6.2	3.1	2.5	3.8
130	6	7.3	6.2	3.1	2.5	3.8

TABLE 2-6 – MISCELLANEOUS ELECTRICAL DATA

DESCRIPTION	NOMINAL VOLTAGE				
	200V	230V	400V	460V	575V
	AMPS	AMPS	AMPS	AMPS	AMPS
Control Transformer, 1.5 kVA	7.5	6.5	3.8	3.3	2.6
Convenience Outlet, 2 kVA	9.6	8.7	5.0	4.4	3.5
Gas Heat, 1.5 kVA	7.5	6.5	3.8	3.3	2.6

TABLE 2-7 – ELECTRIC HEAT

kW	Nominal Voltage			
	208V	240V	480V	600V
	AMPS	AMPS	AMPS	AMPS
40	111.0	96.2	48.1	38.5
80	222.1	192.5	96.2	77.0
100	277.6	240.6	120.3	96.2
120	N/A	288.7	144.3	115.5
160	N/A	N/A	192.5	154.0
200	N/A	N/A	240.6	192.5
240	N/A	N/A	288.7	230.9

Notes:

1. Heaters will be sized as follows: 200V heaters rated at 208V, 230V heaters rated at 240V, 460V heaters rated at 480V, 575V heaters rated at 600V.

FILTERS

Two-inch “throwaway” filters are standard and factory installed in a filter rack located prior to the evaporator coil. Any optional pre-filters ordered with the unit will be shipped inside the unit, but must be field installed.

Pre-filters must always be installed ahead of the evaporator coil. Pre-filters must be kept clean and replaced with the same size and type as shipped with the unit. Dirty filters will reduce the capacity of the unit and may result in frosted coils and safety shutdowns. *Required filter sizes and qualities are shown in Table 2-2.* The unit should never be operated for any length of time without the proper filters installed in the unit.

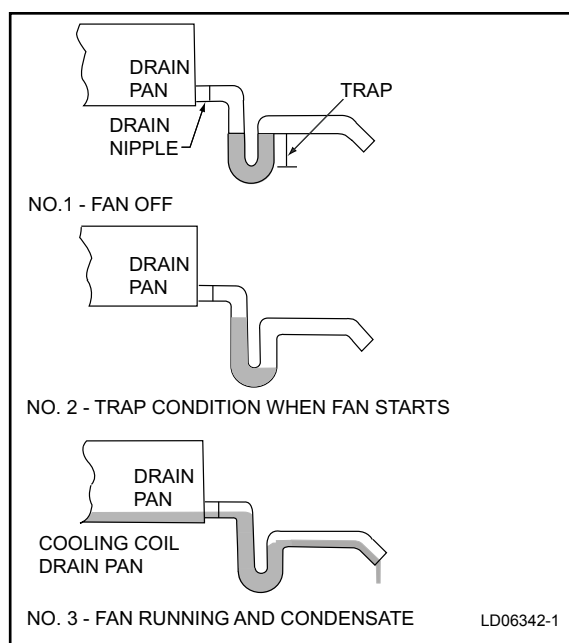


FIG. 2-4 – DRAIN TRAP SHOWING WATER LOCATION DURING DRAW THROUGH OPERATION STAGES

CONDENSATE DRAIN

Condensate Drain Piping

The ECO² cooling coils are located in the units so that the supply air is drawn through them. This results in the condensate being subjected to negative (-) static pressure. Unless some means of pressure equalization

is provided in the condensate drain, the air rushing back through the drainpipe will cause the condensate to build up in the drain pan. As the unit continues to operate, the accumulated water will be carried with the air stream, overflowing the drain pan causing possible water leaks into the supply duct and/or causing water damage in the building. A trap must be installed to prevent this condensate water build-up (see Figures 2-4 & 2-5).

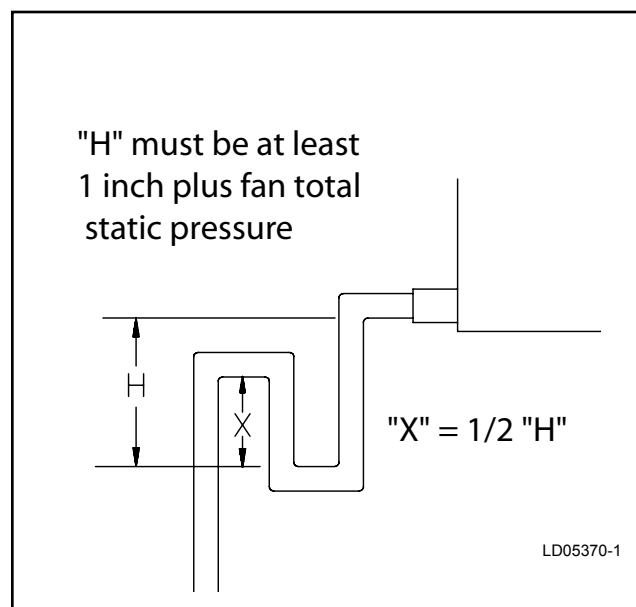
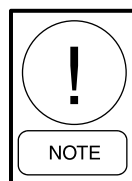


FIG. 2-5 – TRAP DETAIL FOR DRAW THROUGH APPLICATION

Condensate Drain Trap

For “Draw-through” applications, install a trapped condensate drain line at unit drain connection (see Figure 2-5) according to all governing codes. “H” dimension must be at least 1 inch greater than design Total Static Pressure (TSP) of fan.

The trap and drain lines should be protected from freezing. Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain lines from the 1-1/4 inch NPT female connections on the unit to an open drain.



The unit must be properly trapped and charged with water before the units are started.

AIR HOODS FOR ECONOMIZER

There are two (2) economizer outside air intake hoods provided with the unit. The hoods are made operational per the following instructions:

- Remove the screws holding the economizer hood shipping covers in place. Discard covers.
- Apply a bead of RTV sealer along the edge of both hoods and each pivot joint to prevent water leakage.
- Rotate the hoods out (each hood is hinged). Secure the hoods with screws along the top and sides.
- Seal any unused screw holes with RTV or by replacing the screw.

AIR HOODS FOR FIXED OUTSIDE AIR (UNITS WITHOUT ECONOMIZER)

These hoods are made operational per the above procedure. The dampers may be adjusted by loosening the thumb screw, turning the lever to the desired position, and retightening the thumb screw.

AIR HOODS FOR EXHAUST AIR

When furnished, these hoods and dampers are factory installed.

FIELD WIRING

Figure 2-6 & 2-7 show the field control wiring to CTB1. All field control wiring is field supplied and installed.

Thermostat

A thermostat (2 stage cool or 2 stage heat) can be used on CV units. On CV units the thermostat is the primary means of control for the unit. The thermostat should be mounted on an inside wall approximately 56" above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances.

Space Sensor

The space sensor (if used) can be used on either CV or VAV units. The space sensor can be used for unit control

in lieu of a thermostat. Even if a thermostat is wired to the rooftop unit, the space sensor will supply space air temperature values if connected. When mounting a space sensor, it should be located on an inside wall approximately 56" above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. **Shielded Wire must be used that is grounded at control panel only.**

CO₂ Sensor

The optional CO₂ sensor is used for demand ventilation and must be wired to the field control wiring terminal block using two-conductor shield wire. **Shielded Wire must be used.**

Occupied/Unoccupied Input

A contact-closure input is provided for hard-wiring an external device such as a central time clock, a thermostat with scheduling or BAS system, or a manual switch.

Contact Closure = Occupied

Contacts Open = Unoccupied

Note that 24 volts (R), terminal 1 of the terminal block CTB1, must be used as the 24 volt AC source for switching the contact to the unit controller Occupied/Unoccupied input. Use of any power source external to the controller will result in damage to the unit controller.

Shutdown Input

A contact-closure input is provided for emergency shutdown of the unit. When this circuit is open, the unit shuts down with supply fan, exhaust fan turned off, and outside air dampers are closed. This state is maintained until the input is activated (contacts closed).

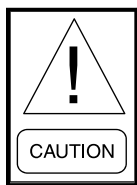
Contact Closed = Normal Operation

Contacts Open = Shutdown

Note that a jumper is installed at the factory between terminals 3 (R) and terminal 4 (SD) of the low voltage terminal block CTB1. When a field shutdown input is used, the jumper must be removed and the external dry contact connected between terminal 3 and 4. The connection of an external power supply to these terminals will result in damage to the Primary Unit Controller.

Smoke Purge Input

There are three field connection points for Smoke Purge operation, “Smoke Purge 1”, “Smoke Purge 2” and “Smoke Purge 3”. When a field supplied dry contact is closed between terminal 3 (R) and terminal 6 (SMK1) the unit will initiate whatever smoke purge sequence has been programmed into the Primary Unit Controller for Smoke Purge Sequence 1. When a field supplied dry contact is closed between terminal 3 (R) and terminal 7 (SMK2) the unit will initiate whatever smoke purge sequence has been programmed into the Primary Unit Controller for Smoke Purge Sequence 2. When a field supplied dry contact is closed between terminal 3 (R) and terminal 8 (SMK3) the unit will initiate whatever smoke purge sequence has been programmed into the Primary Unit Controller for Smoke Purge Sequence 3. *Refer to the SMOKE PURGE information contained in Section 5 of this manual for additional programming information.* The Smoke Purge operating state will be maintained until the contact is opened.

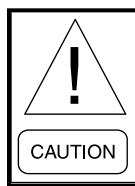


No external power source may be used when field wiring any of the above inputs. The 24 volt AC source on terminal 3 (R) of the Terminal Block CTB1 must be used as the power source when field wiring these inputs, as shown in Fig. 2-6 & 2-6. Failure to do so will result in improper unit operation and damage to the unit controller.

VAV Heat Relay Output

This is a field wired *OUTPUT* that is used to command the VAV boxes to full open during smoke purge operation. This 24VAC signal should have a maximum current draw not to exceed 20VA. If the VA requirement of the VAV boxes approaches 20VA, isolation relays should be field supplied and installed to avoid overloading the unit power supply.

Note that this signal is used to drive the VAV boxes open in purge operations. Failure to drive the VAV boxes open during this mode of operation can cause unit shutdown and/or damage to the ductwork due to overpressurization.



The VAV Heat Relay Output cannot exceed a current draw of 20VA. If the power requirements of the VAV boxes exceed this amount, isolation relays must be field supplied and installed to prevent overloading the unit controller power supply.

RETURN AIR BYPASS DAMPER

Units built with the Flexsys option will have an opening in the base of the unit between the evaporator coil and the supply air blower. A Flexsys unit requires a means to bypass return air and mix it with the air off the evaporator coil. York does have a special curb with the return duct bypass and bypass damper built into the curb. The purpose of the damper is to temper the supply air to the under floor system by mixing return air with the air off the evaporator coil. After the system is initialized, the mixed air damper modulates based ratio of the difference between the mixed air temperature minus the supply air temperature compared to the return air temperature minus the supply air temperature. As the mixed air temperature decreases, the damper opens allowing more air to bypass the evaporator coil resulting in a higher mixed air temperature supply to the under floor system.

The mixed air damper must be wired and installed into the system in the field. The wires to connect the actuator are located in the supply fan section, in the proximity of the actuator in the supply fan section floor, opposite the supply fan motor side. The plug assembly/wires are attached with an elastic band and must be wired to the actuator, and the “plugs” mated together. Connect the wires to the motor as follows:

- Wire labeled “412” to terminal 1 in the actuator
- Wire labeled “403” to terminal 2 in the actuator
- Wire labeled “411” to terminal 5 in the actuator

BACNET COMMUNICATION

The eco² rooftop unit can communicate to any building automation system using BACnet MSTP communication protocol.

The field connections are made by connecting shielded three-wire cable to Port 1 on the IPU control board.

Refer to the "COMMUNICATION" section in Section 6 of the manual for additional information.

DIRTY FILTER SWITCH

On units with a dirty filter switch option, an adjustable differential pressure switch is installed to monitor the pressure drop across the filters. When the pressure drop across the filters exceeds the setting of the switch the switch closes sending a 24-volt signal to the Primary

Unit Controller. The Primary Unit Controller posts a trouble fault in the service memory buffer; but will not shut down the unit.

ALARM CONTACTS

The Primary Unit Controller has three sets dry Alarm Contacts that are closed during a fault. If the unit experiences a Supply Fan Fault, the Primary Unit Controller will close a set of dry contacts between terminals 28 and 29 of the low voltage terminal block (CTB1). If the unit experiences a Cooling/Heating Fault, the Primary Unit Controller will close a set of dry contacts between terminals 30 and 31 of the low voltage terminal block (CTB1). If the unit experiences a Sensor/Misc. Fault, the Primary Unit Controller will close a set of dry contacts between terminals 32 and 33 of the low voltage terminal block (CTB1).

CTB1 Field Control Wiring (Inputs)

Wiring Notes:

1. Wiring shown indicates typical wiring. Refer to the I.O.M. manual for more detailed wiring methods and options.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24 VAC terminal is 40 VA.
4. Use shielded wire where shown.
5. Potentiometer application shown. As an alternative, signal inputs can be driven from an analog output of a third party controller. Note: Input load resistance is 15K ohms.

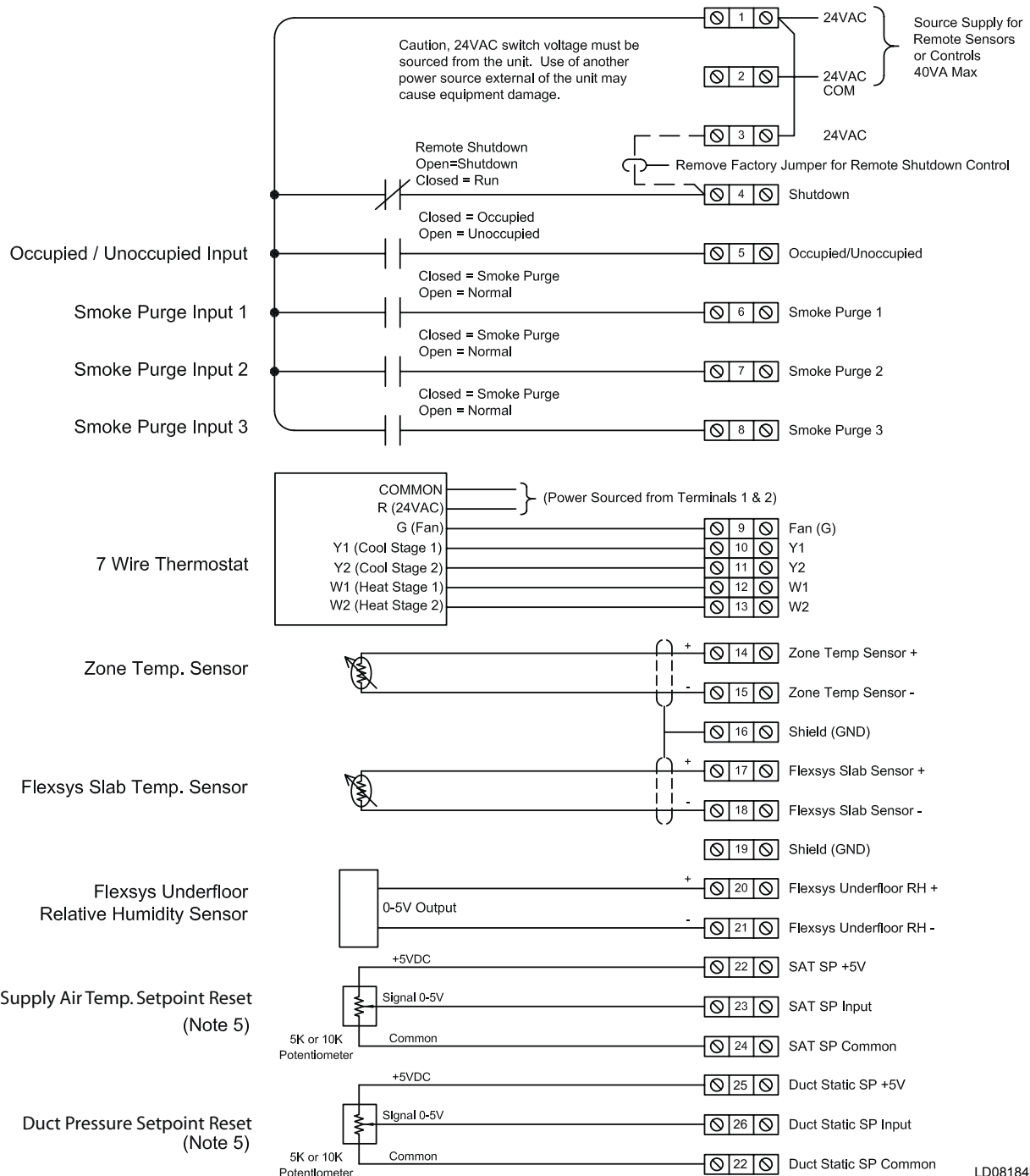


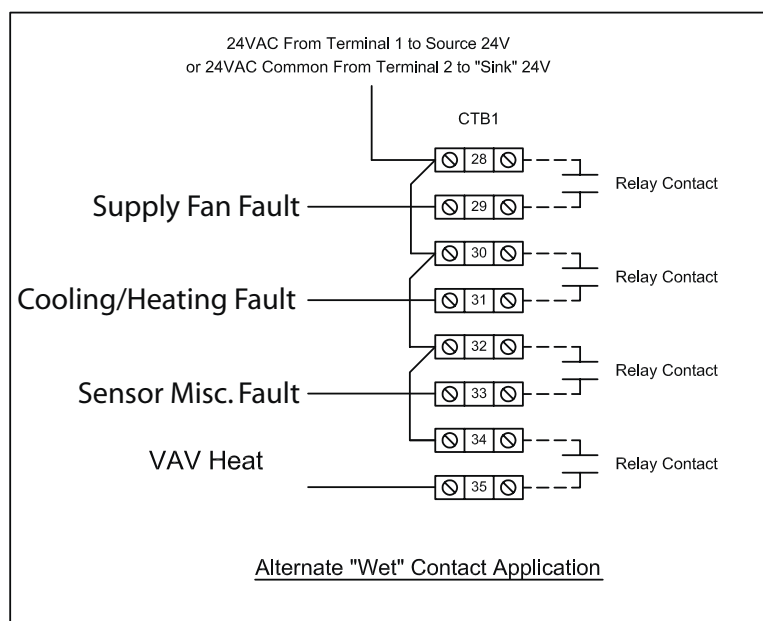
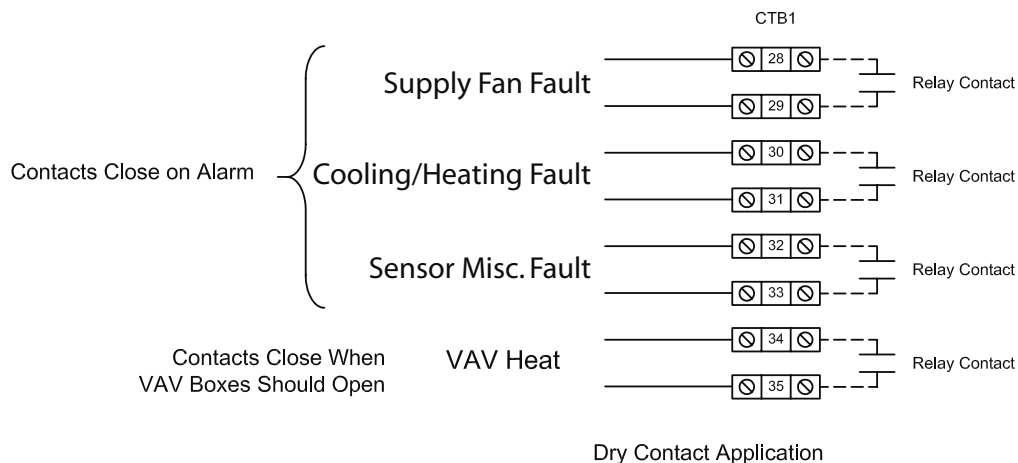
FIG. 2-6 – FIELD CONTROL WIRING - INPUTS

CTB1 Field Control Wiring (Outputs)

Wiring Notes:

1. Wiring shown indicates typical wiring. Refer to the I.O.M. manual for more detailed wiring methods and options.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24 VAC terminal is 40 VA.
4. Use shielded wire where shown.
5. Relay contacts suitable for pilot duty to 1A from 24VAC to 120VAC

2



LD08186B

FIG. 2-7 – FIELD CONTROL WIRING - OUTPUTS

POWER WIRING

Field wiring to the unit must conform to provisions of National Electrical Code (NEC) ANSI / NFPA 70-Latest Edition and / or local ordinances. The unit must be electrically grounded in accordance with the NEC and / or local codes. Voltage tolerances, which must be maintained during starting and running conditions, are indicated on the unit data plate.

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

Power supply to the unit must be NEC Class 1 and must comply with all applicable codes. A disconnect switch must be provided (factory option available). The switch must be separate from all other circuits. Wire entry at knockout openings requires conduit fittings to comply with NEC and/or Local Codes.

Refer to Figures 2-8 & 2-9 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

ELECTRICAL SERVICE SIZING

Electrical service required for the cooling only eco² rooftop, use the appropriate calculations listed below from U.L. 1995. Based on the operating mode and configuration of the rooftop, the calculations will yield different MCA (minimum circuit ampacity), and MOP (maximum overcurrent protection). ***MCA and Overcurrent Protection Device Data is supplied on the unit data plate. Also, refer to Tables 2-3 through 2-7, Electrical Data.***

The following calculations apply to electrical data for the rooftop unit. All concurrent load conditions must be considered in the calculations, and you must use the highest value for any combination of loads.

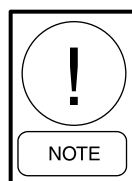
Minimum Circuit Ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 440-34.

The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C.

Maximum overcurrent protection is based upon 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per N.E.C. Article 440-22. If the maximum overcurrent protection does not equal a standard current rating of an overcurrent protective device, then the marked maximum rating is to be the next lower standard rating. However, if the device selected for maximum overcurrent protection is less than the MCA, then select the lowest standard maximum fuse size greater than or equal to the MCA.

Figures 2-8 & 2-9 show the power wiring that must be field supplied and installed.

For dual point power connections, PTB1 in the power panel supplies the all unit compressors and condenser fans. PTB2 in the power panel supplies power to the unit supply, return and exhaust fans, and control circuitry.



All wiring must conform to the National Electrical Code (NEC) and local codes that may be in addition to NEC.

TABLE 2-8 – THREE PHASE POWER SUPPLY CONDUCTOR SIZE RANGE *

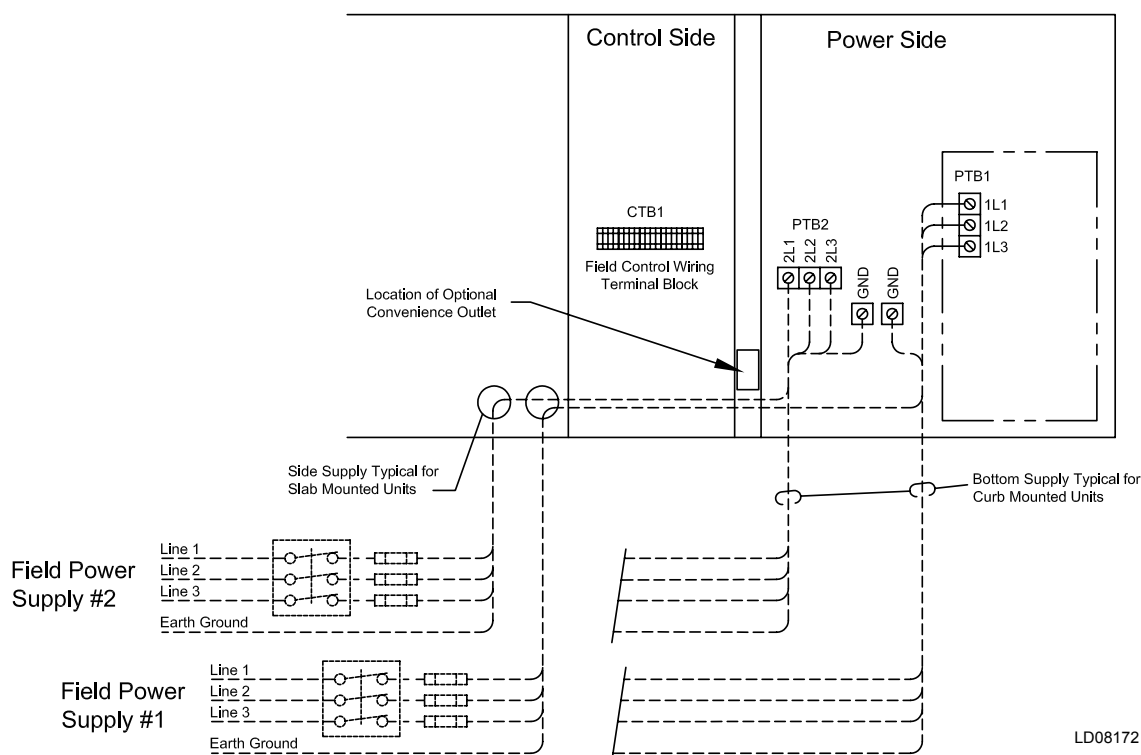
130 Ton Unit				
Supply Voltage	Single Point TB	Single Point Disconnect	Dual Point TB TB 1	TB 2
208V	(2*) 250 kcmil-500 kcmil	(2*) 2 AWG-500 kcmil	6 AWG-400 kcmil	6 AWG-350 kcmil
230V	(2*) 250 kcmil-500 kcmil	(2*) 2 AWG-500 kcmil	6 AWG-400 kcmil	6 AWG-350 kcmil
380V-60	6 AWG-400 kcmil	6 AWG-350 kcmil	14 AWG-2/0	14 AWG-2/0
460V	6 AWG-400 kcmil	6 AWG-350 kcmil	14 AWG-2/0	14 AWG-2/0
575V	6 AWG-400 kcmil	6 AWG-350 kcmil	14 AWG-2/0	14 AWG-2/0

* Note, indicates supply connection with multiple connection points per phase. (2 for 2* and 3 for 3*).

The actual size of the conductor will depend on the total ampacity of the unit and length of the conductor run. The above table gives the conductor size range for the terminal block lugs in the unit.

UNIT POWER SUPPLY WIRING, OPTIONAL DUAL POINT

Electrical / Controls Box

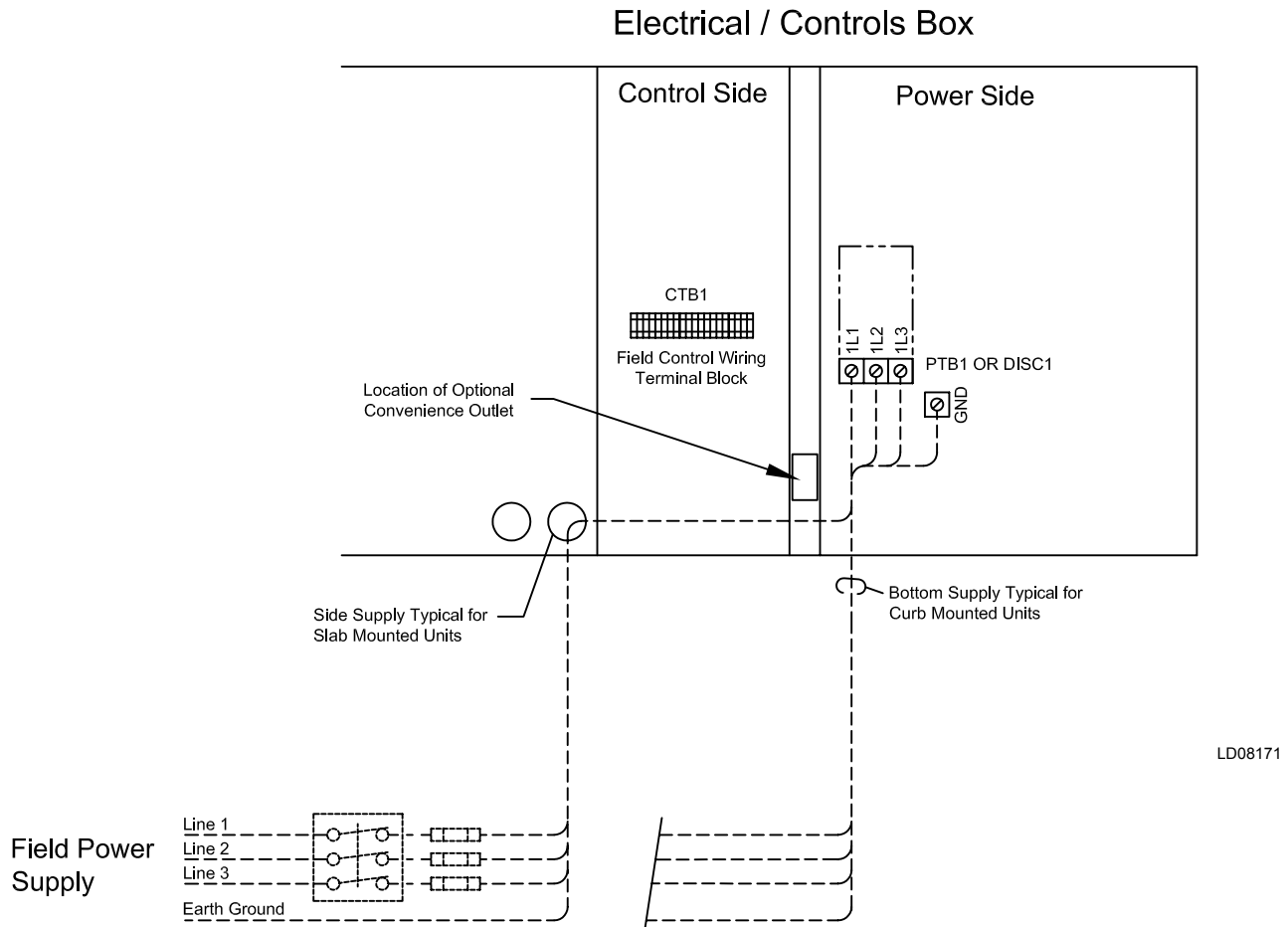


NOTES:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and/or local code requirements.
3. Consult the I.O.M manual or unit nameplate data to determine Minimum Circuit Ampacities (MCA) and recommended Dual Element fuse sizes.
4. Minimum Circuit Ampacity (MCA) is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
5. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22).
6. The "Incoming Wire Range" is the minimum and maximum wire sizes that can be accommodated by the unit wiring lugs. A (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on N.E.C.
7. Use copper conductors only.
8. On units with an optional disconnect switch, the supplied disconnect switch is a "Disconnecting Means" as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a Load Break Device.

FIG. 2-8 – SINGLE-POINT POWER SUPPLY WIRING WITH NON-FUSED DISCONNECT

UNIT POWER SUPPLY WIRING, STANDARD SINGLE POINT, W/ OR W/O DISCONNECT



NOTES:

1. All field wiring must be provided through a field-supplied fused disconnect switch to the unit terminals (or optional molded disconnect switch).
2. All electrical wiring must be made in accordance with all N.E.C. and/or local code requirements.
3. Consult the I.O.M manual or unit nameplate data to determine Minimum Circuit Ampacities (MCA) and recommended Dual Element fuse sizes.
4. Minimum Circuit Ampacity (MCA) is based on U.L. Standard 1995, Section 36.14 (N.E.C. Section 440.34).
5. Maximum Dual Element Fuse size is based on U.L. Standard 1995, Section 36.15 (N.E.C. Section 440.22)
6. The "Incoming Wire Range" is the minimum and maximum wire sizes that can be accommodated by the unit wiring lugs. A (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on N.E.C.
7. Use copper conductors only.
8. On units with an optional disconnect switch, the supplied disconnect switch is a "Disconnecting Means" as defined in the N.E.C. Section 100, and is intended for isolating the unit from the available power supply to perform maintenance and troubleshooting. This disconnect switch is not intended to be a Load Break Device.

FIG. 2-9 – SINGLE-POINT POWER SUPPLY WIRING

TRANSDUCER PNEUMATIC TUBING

Static Pressure Control Plastic Tubing (Pneumatic Tubing)

Duct static transducers (all VAV units) and any unit with an optional building pressure control transducer, require pneumatic tubing to be field supplied and installed. **The “High” side** of the respective transducer must be routed to the location in the building or ductwork where a constant pressure is desired. Both the duct static transducer (VAV only) and optional building pressure transducer are mounted in the unit control box. All wiring from the transducers is factory installed.

Duct Static Transducer

Plastic tubing (3/16" ID) must be run from the high pressure tap of the transducer to a static pressure tap (field supplied) in the supply duct, located at a point where constant pressure is desired. This is normally 2/3rds of the way down the duct.

Building Pressure Transducer

Plastic tubing (3/16" ID) must be run from the high pressure tap of the building static pressure transducer to a static pressure tap (field supplied), located in the conditioned space or return air duct at a point where constant pressure is desired.

Static Pressure Probe Installation

On units with duct static transducers (VAV units) and any unit with an optional building pressure, a factory supplied Static Pressure Probe must be field installed at the vertical post by the control compartment.

The factory supplied atmospheric pressure probe and associated mounting hardware are shipped inside the unit control panel. The hardware consists of a mounting bracket and a short section of pneumatic tubing. ***The pneumatic tubing must be field installed from a factory pressure tap (next to the mounting location for the static pressure probe) to the atmospheric pressure probe (see Installation Instructions, Form 100.50-N15)***

If the unit is equipped with both a building pressure transducer and a duct static transducer, a “tee” will be factory installed, and both the duct static pressure transducer and building pressure will be connected to the “tee” - both building static pressure transducer and duct static transducer will use the same factory supplied atmospheric pressure probe.

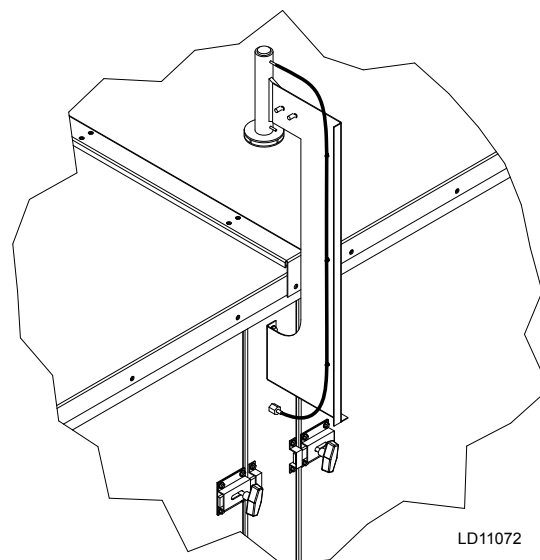
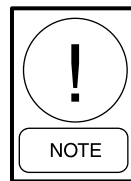


FIG. 2-10 – STATIC PRESSURE PROBE INSTALLATION



The “low” side connection of the duct static or building pressure transducers are shipped with the pneumatic tubing factory installed and routed, to the external factory pressure tap.

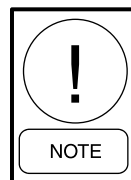
ROOF CURB INSTALLATION

General Information

When ordered, the roof curb is shipped knocked-down in a separate container and needs to be field assembled and installed. *Refer to Installation Manual that is shipped with the roof curb for specific instructions.*

On full perimeter roof curb the opening in the roof should not extend under the condenser section of the curb. The condenser section of the roof curb is not insulated and could result in condensation build up under the condenser section as well as higher than normal sound levels in the conditioned space.

The roof curb drawings contained in the York literature are not intended as construction documents for the field fabrication of a roof curb. York will not be responsible for the unit fit up, leak integrity, or sound level with field fabricated roof curbs.



Wood or Fiber Cant Strips, Roofing Felts, Roofing Material, Caulking and Curb-To-Roof Fasteners are to be field supplied.

DUCT SYSTEM

Duct Connection Guidelines

All intake and discharge air duct connection to the unit may be made directly to the unit. These air duct connections should be on flexible material and should be installed so they are sufficiently loose. Duct runs and transitions must be made carefully to hold friction loss to a minimum. Avoid short turns, and duct elbows should contain splitters or turning vanes.

Ductwork connected to the supply discharge should run in a straight line for at least **two** equivalent outlet diameters. Never deadhead the discharge into the flat surface of a plenum.



Installation of elbows, discharge damper and other abrupt flow area changes installed directly at the fan outlet will cause system losses. These losses must be taken into account during the design phase and must be added to any field measurements.

SOUND AND VIBRATION TRANSMISSION

All roof mounted air handling units generate some sound and vibration, that may or may not require some special treatment of the air conditioned space. The noise generated by the air handling unit is dependent on the speed of the fan, the amount of air the fan is moving, the fan type and the static efficiency of the fan. In applications where sound and vibration transmissions may be objectionable, good acoustical engineering practices must be incorporated in the system design.

SECTION 3 – START-UP



To protect warranty, this equipment must be installed and serviced by an authorized YORK service mechanic or a qualified service person experienced in air handling and condenser unit installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cut-out settings, design working pressures and ventilation requirements consistent with the amount and type of refrigerant charge.

Lethal voltages exist within the Control Panel. Before servicing, open and tag all disconnect switches.

Reference publication Form ??? "Quick Startup Guide" for additional information.

CRANKCASE HEATERS

With power applied to the rooftop unit, the crankcase heater for each compressor will be ON whenever the compressor is not running. The heater is interlocked into the compressor motor contactor and is not controlled by the microprocessor.

The purpose of the crankcase heater is to prevent the migration of refrigerant to the crankcase during shutdown, assuring proper lubrication of the compressor on start-up.

Anytime power is removed from the unit for more than an hour, the crankcase heater should be left on for 24 hours prior to start.

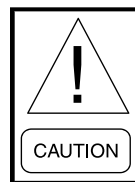


Power must be applied to the rooftop unit 24 hours prior to starting the unit compressors. Failure to observe this requirement can lead to compressor damage and voiding of the compressor warranty.

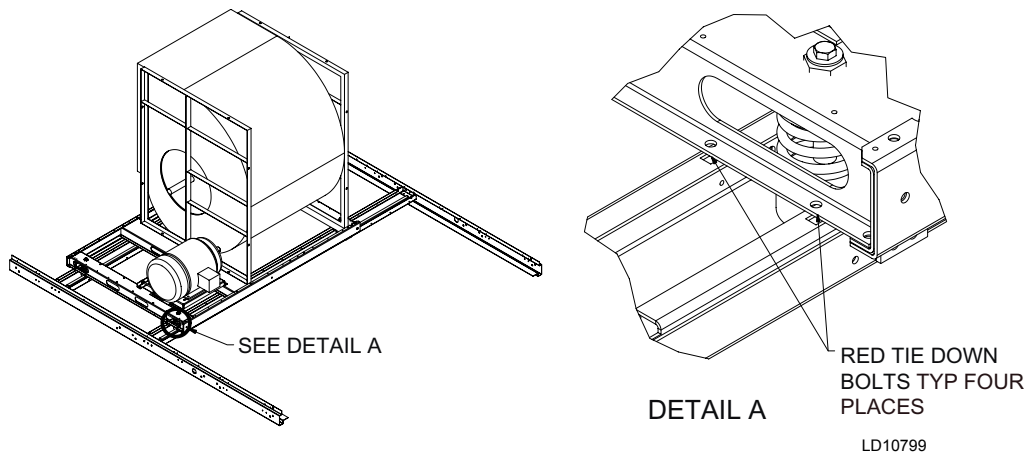
CHECKING THE SYSTEM PRIOR TO INITIAL START (NO POWER)

Unit Checks

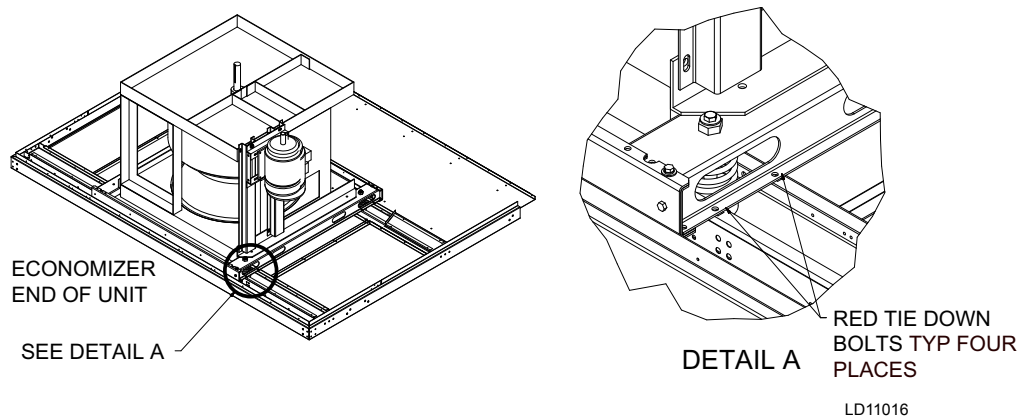
1. Inspect the unit for shipping or installation damage.
2. Visually check for refrigerant piping leaks.
3. The compressor oil level should be maintained so that an oil level is visible in the sight glass. The oil level can only be tested when the compressor is running in stabilized conditions, guaranteeing that there is no liquid refrigerant in the lower shell of the compressor. In this case, the oil must be between 1/4 and 3/4 in the sight glass. At shutdown, the oil level can fall to the bottom limit of the oil sight glass.
4. Check the control panel to assure it is free of foreign material (wires, metal chips, etc.).
5. Visually inspect field wiring (power and control). Wiring MUST meet N.E.C. and local codes.
6. Check tightness of terminal lugs inside the power panel on both sides of the contactors, overloads, fuses, and power connections.
7. Verify fuse sizing in main circuits.
8. Verify field wiring for thermostat (if applicable), optional zone sensor, and optional CO₂ sensor.
9. Verify all applicable pneumatic tubing has been field installed for duct static pressure transducers (VAV units), optional building pressure transducer for power exhaust option, and outdoor static pressure probe.
10. Supply, exhaust, and return fan isolator spring bolts removed (refer to Figure 3-1).



The supply, exhaust and return fans have tie down bolts installed at the factory to prevent movement in the fan assemblies during shipment. THESE HOLD DOWN BOLTS MUST BE REMOVED PRIOR TO OPERATION OF THE ABOVE FANS. There are eight bolts per assembly two at each corner of the fan skids, front and rear. The bolt locations are shown in Figure 3-1. The bolt heads are red in color and a label identifies their location in the unit.



SUPPLY & EXHAUST FAN ASSEMBLIES



RETURN FAN ASSEMBLY

FIG. 3-1 – FAN ISOLATOR SPRING BOLTS (TOTAL OF 8)

11. *Verify proper bearing and locking collar torque values on supply and exhaust fans (refer to Section 4 "Maintenance" in this manual).*
12. *Verify proper drive alignment of supply and exhaust fans (refer to Section 4 "Maintenance" in this manual).*
13. *Verify proper belt tension of supply fan, exhaust fan or return fan (refer to Section 4 "Maintenance" in this manual).*
Belts must be checked after 24 hours of initial operation.
14. *Manually rotate condenser fan blades, supply exhaust and return blower wheels and motors, to assure freedom of movement.*
15. *Verify proper condensate drain trap installation (refer to Figure 2-3). Fill traps with water prior to unit start-up.*
16. *If applicable, verify installation of air filters (refer to Section 2 "Installation" for size and quantity).*
17. *Verify Variable Frequency Drive setpoints for VAV units and optional Variable Frequency Drive Exhaust or Return Fans. Both VFD's are located in the supply blower section of the unit. Refer to separate manual for VFD operation and programming, supplied with the rooftop unit (Form 100.40-N04 (LSO2)).*
18. *If equipped, open suction line ball valve, discharge line ball valve, and liquid line ball valve for each refrigerant system.*

UNIT CHECKS – POWER APPLIED

1. Apply 3-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage.
2. Verify programmed units Setpoints (*refer to “Quick Start-Up Guide”, Form 100.50-SU1*).
3. Verify correct fan rotation – fan should rotate in direction of arrow on fan housing.
4. Insure proper compressor rotation - *see following instruction on Verifying Compressor Rotation.*

Verifying Compressor Rotation



This unit uses scroll compressors, which will only operate in one direction. Failure to observe these steps could lead to compressor failure.

The eco² rooftop unit uses hermetic scroll compressors, which only pump in one direction. Therefore, it is necessary to verify proper rotation at unit start-up. Operation of the compressor in the reverse direction will not produce any capacity, and cause the compressor to cycle on internal overload. Operating the compressor in reverse for “extended” periods can result in failure of the compressor.

To verify proper rotation, monitor the suction and discharge pressures of the respective refrigerant circuit while the compressor cycles on. If the discharge pressure increases and suction pressure decreases as the compressor cycles on, the compressor is properly phased and operating in the correct rotation.

Suction and discharge pressure may be monitored with the User Interface display if the optional suction and discharge pressure transducers are installed. If the optional transducers are not installed, pressures must be monitored with a manifold gauge connected to the service valves located on the suction and discharge lines.

Compressor Oil Level Check

The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running in stabilized conditions, the oil level must be between 1/2 and 3/4 in the oil sight glass. *Note: at shutdown, the oil level can fall to the bottom limit of the oil sight glass.*

INITIAL START-UP

After all of the preceding checks have been completed and the control panel has been programmed as required, the unit may be placed into operation.

1. Place the Unit Switch in the control panel to the ON position.
2. With a demand, the supply fan will cycle on, and permit compressor operation if the air proving pressure switch for the supply fan has closed.
3. The first compressor will start. After several minutes of operation, a flow of refrigerant will be noted in the sight glass, the vapor in the sight glass will clear, and there should be a solid column of liquid visible in the sightglass when the TXV stabilizes.
4. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop.
5. Check the system operating parameters by checking evaporator superheat and condensing subcooling. Connect a gauge manifold set to the Schrader service valve connections on the liquid and common suction line in the condensing section of the unit. After the system is running and the pressures have stabilized, measure the temperature at the liquid and common suction lines near the Schrader service valves. Calculate evaporator superheat and condensing subcooling. Both should be approximately 15 degrees, *Refer to “Checking Superheat and Subcooling” section below for information on how to calculate evaporator superheat and condenser subcooling.* Repeat the above process for each of the refrigerant systems.
6. With an ammeter, verify that each phase of the condenser fans, compressors, supply fan, and exhaust fan are within the RLA/FLA as listed on the unit data plate.

Refrigerant Charge

This rooftop unit comes fully charged from the factory with refrigerant R-22 as standard.

Checking Superheat and Subcooling

R-22 temperature charts list the associated *saturation* temperature in one column, with the associated pressure in another column. As a result, only one temperature/pressure column is needed to show the relationship.

TABLE 3-1 – TEMPERATURE/PRESSURE CHART – REFRIGERANT R-22

This chart shows characteristics of Refrigerant R-22 (Monochlorodifluoromethane) when in the ‘saturated’ state.

Temperature (F)	Pressure (PSIG)	Temperature (F)	Pressure (PSI)
0	24.0	92	173.7
2	25.6	94	179.1
4	27.3	96	184.6
6	29.1	98	190.2
8	30.9	100	195.9
10	32.8	102	201.8
12	34.7	104	207.7
14	36.7	106	213.8
16	38.7	108	220.0
18	40.9	110	226.4
20	43.0	112	232.8
22	45.3	114	239.4
24	47.6	116	246.1
26	50.0	118	252.9
28	52.4	120	259.9
30	54.9	122	267.0
32	57.5	124	274.3
34	60.1	126	281.6
36	62.8	128	289.1
38	65.6	130	296.8
40	68.5	132	304.6
42	71.5	134	321.5
44	74.5	136	320.6
46	77.6	138	328.3
48	80.8	140	337.3
50	84.0	142	345.8
52	87.4	144	354.5
54	90.2	146	363.3
56	94.3	148	372.3
58	97.9	150	381.5
60	101.6	152	390.8
62	105.4	154	400.3
64	109.3	156	410.0
66	113.2	158	419.8
68	117.3	160	429.8
70	121.4		
72	125.7		
74	130.0		
76	134.5		
78	139.0		
80	143.6		
82	148.4		
84	153.2		
86	158.2		
88	163.2		
90	168.4		

SUCTION**DISCHARGE**

Borders mark typical operating ranges that can be expected for suction and discharge pressures under moderate to full load, 44°F setpoint, with ambient air temperatures between 90-100°F. This is only a guideline and readings beyond these ranges will occur.

Vapor entering compressor should be superheated 12-15°F.
Liquid from condenser should be subcooled 12-15°F.

Subcooling (R-22)

The subcooling temperature of each system can be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the liquid line saturation temperature at the liquid stop valve (liquid line saturation temp. is converted from a temperature/pressure chart) (*See Table 3-1*).

Example:

$$\begin{array}{rcl} \text{Liquid line pressure} & = & 102^{\circ}\text{F} \\ 202 \text{ PSIG converted to} & & \\ \text{Minus liquid line temp.} & = & - 87^{\circ}\text{F} \\ \text{Subcooling} & = & 15^{\circ}\text{F} \end{array}$$

The subcooling should be adjusted to 15°F at design conditions.

After the subcooling is verified, the suction superheat should be checked. The superheat should be checked only after steady state operation of the unit has been established, and the unit is running in a fully loaded condition.

Superheat (R-22)

The superheat is calculated as the difference between the actual temperature of the returned refrigerant gas in the suction line entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart in Table 3-1.

Example:

$$\begin{array}{rcl} \text{Suction Temp} & = & 46^{\circ}\text{F} \\ \text{Minus Suction Press} & & \\ 60 \text{ PSIG converted to Temp} & = & - 34^{\circ}\text{F} \\ \text{Superheat} & = & 12^{\circ}\text{F} \end{array}$$

When adjusting the expansion valve, the adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes)

between adjustments for the system and the thermal expansion valve to respond and stabilize.

Assure that superheat is set at 15°F.

Leak Checking

Leak check compressors, fittings and piping to assure no leaks. Verify the evaporator distributor tubes do not have bare copper touching each other or are against a sheet metal edge.

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the unit controls are functioning properly, the rooftop unit is ready to be placed into operation.

GAS HEAT MODELS

3

Pre-Start Checks:

- Startup of gas heat includes verification of incoming gas line pressure and leak checks in the field installed gas line, are the responsibility of the installing contractor, but should be verified prior to unit start-up. Correct values are located later in this section.
- Verify wiring inside the burner compartment to insure the wiring/terminals are tight and securely connected to the components, such as the ignition control, flame sensor, gas valve, rollout switches and igniter.
- Check that the transformer is wired for the correct voltage. The transformer has two (2) taps, one for 208 volts and one for 240 volts. Check that the wire terminal is on the correct terminal on the transformer (on 208 volt units, the tap should be on the 208 terminal of the transformer; for all other voltages, it should be on the 240 volt terminal).

- The control will look for the remote flame sensor proving flame.
- If it does prove, the burners will continue; if not, the gas valve will be closed, there will be a 30 second purge period; the igniter will again energize and gas valve will open for seven seconds; there will be three tries for ignition; after three tries, the control will lock out.
- The control will also restart the process if the roll-out switch(es) (two switches, located above the burners) opened and have been reset, indicating burning inside the burners and/or outside of the heat exchanger tubing.
- Rollout switches are manual reset, and need to physically reset if they open for any reason. This is because the problem is usually blockage of the flue passages and service personnel needs to observe the passages first hand.
- The control circuit is tested in the factory to insure that all of these steps are followed, however, natural gas is not actually introduced to the system in the plant; nitrogen is used in its place.

Gas pressures should be as follows:

- Entering pressure to the gas valve:
Natural Gas
4.5" WC min, 13.5" WC maximum
Propane
11" WC min, 13.5" WC maximum
- Manifold Pressure (leaving gas valve):
Natural
Low Fire, manifold pressure = 1.2" WC.
High Fire, manifold pressure = 3.5" WC.
Propane
Low Fire, manifold pressure = 2.4" WC.
High Fire, manifold pressure = 10.0" WC.
- All pressures have a tolerance of +/- 0.3" WC.

TABLE 3-2 – GAS HEAT PERFORMANCE DATA

UNIT	GAS INPUT CAPACITY (BTU/HR X 1000)	MAXIMUM OUTPUT CAPACITY (BTU/HR X 1000)	AIRFLOW		TEMP. RISE (°F)
			MIN.	MAX.	
130	375	300	6,950	27,750	10-40
	750	600	11,150	27,750	20-50
	1125	900	15,150	33,325	25-55

Post Start Checks:

When a signal is received at the gas heat control module from the Primary Unit Controller, verify:

- Combustion blower starts and runs for 30 seconds.
- Spark igniter sparks continuously.
- Gas valve opens.
- Burners light from right to left, in a 2-5 second time frame, that each one lights in sequential order from right to left, establishes stable flame immediately upon ignition.
- Flame is stable, with ignition starting at the end of the burner and that no burning is occurring inside the burner.

- There may also be some smoke thru the flue, due to tooling oil burning off of the heat exchanger tubing.

Ignition control operation is as follows:

- Once the control receives a signal from the Primary Unit Controller for heat, the combustion blower starts for a 30 sec. pre-purge.
- The spark igniter is then energized with the gas valve opening; it will try for ignition for 7 seconds.

SECTION 4 – MAINTENANCE



Make sure power is removed from the unit before performing the maintenance items contained in this section.

GENERAL

A planned program of regularly scheduled maintenance will return dividends by averting possible costly and unexpected periods of down time. It is the responsibility of the owner to provide the necessary maintenance for the air handling units and coils. If a system failure occurs due to improper maintenance during the warranty period, YORK will not be liable for costs incurred to return the unit to satisfactory operation.

PERIODIC MAINTENANCE – MONTHLY

Filters

Check the cleanliness of the filters and replace or clean as required.

Linkages

Examine the damper and operator linkages to insure that each is free and operating smoothly.

Compressors

Oil Level Check: The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running in stabilized conditions, the oil level must be between 1/4 and 3/4 in the oil sight glass. *Note: at shutdown, the oil level can fall to the bottom limit of the oil sight glass.*

Oil Analysis: Use York Type “R” mineral oil (tinted yellow) for units charged with R-22 refrigerant. The

type of refrigerant and amount per system is listed on the unit rating plate. A change in the oil color or odor may be an indication of contaminants in the refrigeration system. If this occurs, an oil sample should be taken and analyzed. If contaminations are present, the system must be cleaned to prevent compressor failure. This can be accomplished through the installation of oversized suction and liquid line driers. The driers may have to be changed several times to clean up the system depending on the degree of contamination.



Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so will cause internal arcing of the compressor motor, which will result in failure of compressor.

Fan Bearing Lubrication

Add grease slowly with shaft rotating until a slight bead forms at the seals. If necessary, re-lubricate while bearing is stationary. The fan data plate (attached to the fan scroll) lists the type of grease that must be used for lubricating the bearings. *Refer to Table 4-1 for lubricating schedule.*

Re-lubrication is generally accompanied by a temporary rise in operating temperature. Excess grease will be purged at seals.

Recommended Lubricant For Fan Bearings

A Lithium / Petroleum base grease conforming to an NLGI Grade II consistency is normally used. Lubricant must be free of any chemical impurities such as free acid or free alkali, dust, rust, metal particles or abrasive. This light viscosity, low torque grease is rust inhibited and water resistant, has a temperature range of -30°F to +200°F with intermittent highs of +250°F. Lubricate bearings as required by the severity of required duty.

TABLE 4-1 – FAN BEARING – LUBRICATION INTERVALS

RELUBRICATION SCHEDULE (MONTHS) BALL BEARING PILLOW BLOCKS									
SPEED (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
SHAFT DIA									
1/2" thru 1-11/16"	6	6	5	3	3	2	2	2	1
1-15/16" thru 2-7/16"	6	5	4	2	2	1	1/2	1/4	1/4
2-11/16" thru 2-15/16"	5	4	3	2	1	1/2	1/2		
3-7/16" thru 3-15/16"	4	3	2	1	1/2	1/2			

Condenser Coils

Dirt should not be allowed to accumulate on the condenser coil surfaces. Cleaning should be as often as necessary to keep coil clean.

PERIODIC MAINTENANCE – THREE TO SIX MONTHS



Disconnect and lockout power from the unit anytime service is being performed on the fan section. Failure to do so could result in serious injury or death due to the fan turning on while work is in progress.



Squealing belts during starting is caused by slipping belts that are not tensioned properly.

Motor Bearing Lubrication

Bearings must be re-lubricated periodically to assure long life. Motor bearing should be lubricated yearly, but may need lubrication more frequently, depending on severe operating conditions.

Belt Tension

Adjust the belt tension if necessary. Required belt tension data is supplied on the fan “skid” data plate, attached to the fan housing. Never use a belt dressing on the belts. If belts slip with the proper tension, use a good grade of belt cleanser to clean the belts. *Refer to Figures 4-2 & 4-3.*



Never use excessive belt tension, as this could result in damaging the bearing, motor pulleys or motor base. See drive label on fan housing adjacent to drive for specific details on tension.

When it is necessary to replace one belt in a given set, the entire set of belts must be replaced.

PERIODIC MAINTENANCE – YEARLY

Check the fan wheels and inspect the drain pan for sludge and foreign material. Clean if required.

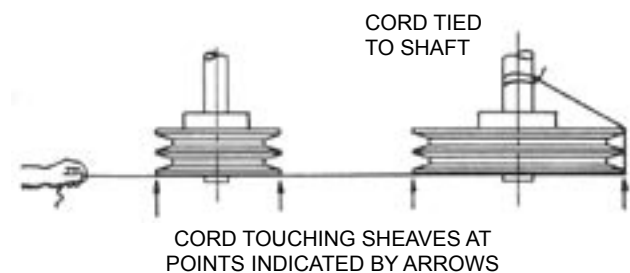
Observe the operation of all dampers and make any necessary adjustments in linkage and blade orientation for proper operation.

Entire Unit Inspection

In addition to the checks listed in this section, periodic overall inspections of the unit should be accomplished to ensure proper equipment operation. Items such as loose hardware, component operation, refrigerant leaks, unusual noises, etc. should be investigated and corrected immediately.

Sheave Alignment

To check sheave alignment, a straight edge or a piece of string can be used. If the sheaves are properly aligned, the string or straight edge will touch at all points, as indicated in Fig. 4-1. Rotating the sheaves will determine if the sheave is wobbly or the drive shaft is bent. Alignment error must be corrected to avoid bearing and belt failure.



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FIG. 4-1 – SHEAVE ALIGNMENT

Belts

New belts should be re-checked after 24 hours of operation. On multiple belt adjustable pulleys, the pitch depth should be checked to insure identical belt travel, power transfer and wear. Adjustable motor bases are provided for belt adjustment.

Motor pulleys and blower shaft pulleys are locked in position with either setscrews or split taper lock bushings. All setscrews and/or taper lock bolts must be checked for tightness and alignment before putting equipment into operation.

An incorrectly aligned and tensioned belt can substantially shorten belt life or overload blower and motor bearings, shortening their life expectancy. A belt tensioned too tightly can overload the motor electrical, causing nuisance tripping of the motor overloads and/or motor failure and/or shaft failure.

Belt Replacement

Always replace belts as a set. Follow the steps below to replace belts:

1. Release the tension on the belts by loosening the adjusting nuts on the motor base.
2. Remove old belts and recheck the sheave alignment with a straight edge.
3. Install the new belts on the sheaves.

Never place the belts on the sheaves by using a screwdriver to pry the belt over the rim of the sheave. This will damage the belts permanently.

Belt Tensioning:

Belt tension information is included on the fan skid data plate as shown in Fig. 4-2. Sample data plate shows 4.3 lbs pressure at .30 inches deflection.

A Browning Belt tension gauge is used in Fig. 4-3 to properly tension belts.

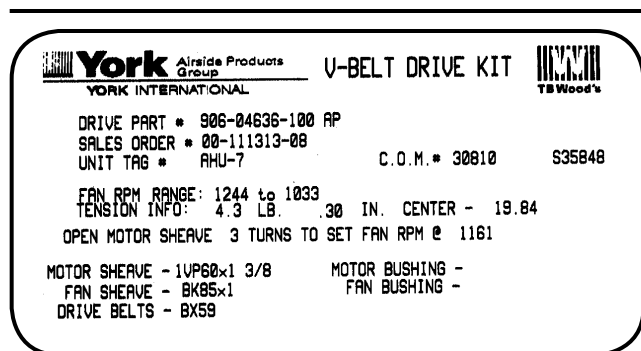
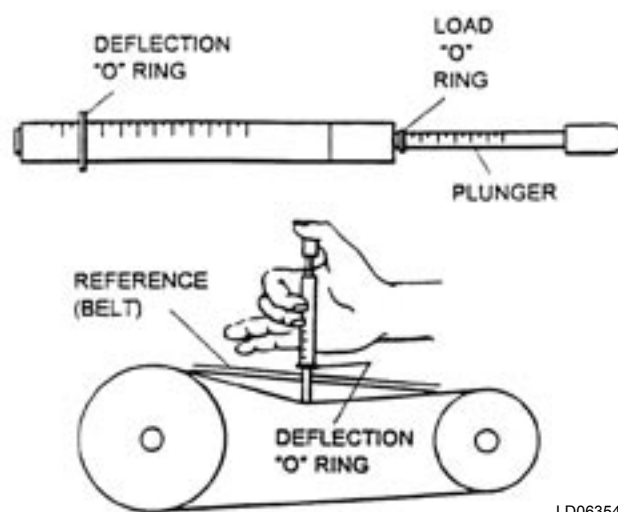


FIG. 4-2 – FAN DATA PLATE - BELT TENSION

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FIG. 4-3 – BELT TENSIONING GAUGE

Filter Drier Replacement

The filter/drier must be replaced any time work is performed on the refrigerant circuit. The rooftop unit comes with sealed type (non-replaceable) cores as standard. If the unit is not equipped with the optional valve package (suction, discharge, & liquid line valves), the refrigerant will need to be recovered with a recovery machine to replace the filter/drier.

If the unit is equipped with a valve package, the unit can be pumped down by closing the liquid line ball valve (prior to the filter/drier) while the unit is running, initiating a unit pump-down. The unit will shut off when the mechanical low-pressure switch opens. When the unit shuts down, close the ball valve located after the filter/drier and remove power from the unit to prevent the unit from running. Once the filter/drier core has been replaced, the filter/drier section should be evacuated via the Schrader access valve located next to the filter/drier prior to opening the ball valves and restoring the unit to normal operation.



Never shut the discharge valve while the unit is running. Doing so could cause a rupture in the discharge line or components, resulting in death or serious injury.



Never close the suction line ball valve with the compressor running. Doing so will cause the compressor to pump-down into a vacuum and damage the compressor due to internal arcing.

Forward Curved Fans

The forward curved fan wheel must be removed through the fan discharge opening. The location of other clamps, fan wheel, and shaft must be marked so each of these components can be reassembled in the same location - see *Figure 4-4*. This will preserve the balance of the rotating assembly. Proceed with the following steps:

1. Disconnect all ductwork or guards attached to the blower housing to permit unobstructed access.
2. Remove the cut off plate attached at the discharge or blast area of the blower housing.
3. Thoroughly, clean the shaft of all grease and rust inhibitor. Be careful not to contaminate the bearing grease. Use emery cloth to remove all rust or the wheel may become "locked" to the shaft.
4. Loosen and remove setscrews on both bearing locking collars. Inspect and, if necessary, replace.
5. Loosen and remove setscrews from both sides of the wheel hub. Inspect and, if necessary, replace.
6. Using a rubber mallet or brass bar, slowly drive the shaft in one direction until the setscrew marks on the shaft are fully exposed. File the marks completely smooth. Drive the shaft in the opposite direction and file smooth the setscrew marks. Continue to clean the shaft of all dirt and residuals.
7. To remove the key, use a rubber mallet or brass bar to drive the shaft and wheel in one direction. Drive the key in the opposite direction using a nail set or smaller size key stock until the key is completely free of the wheel. Be sure that key does not get bent by allowing it to ride up the key way edge. The slightest bend will prevent quick assembly. Should this occur, replace the key stock.

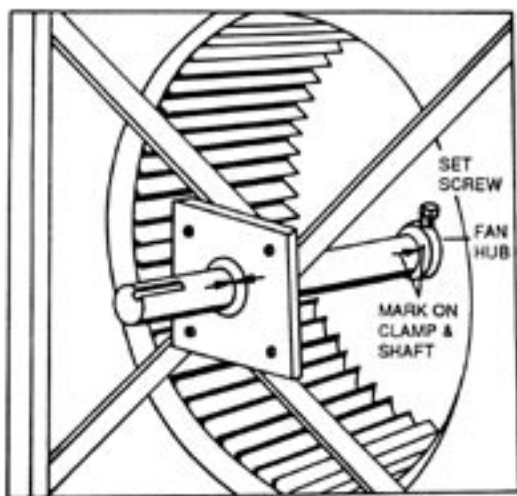
8. Remove the shaft, supporting the weight of the wheel, particularly for larger diameter wheels. Do not allow the weight of the shaft to be supported by one bearing as you disassemble.
9. Remove the wheel through the discharge or outlet area of the blower housing.
10. Reassemble in reverse order, centering the wheel between the edges of the inlet venturi. If bearings were removed or replaced, be sure to reuse any shim stock found between the mounting support/plate and bearing housings.
11. Torque all hardware.



Disconnect and lockout power from the unit anytime service is being performed on the fan section. Failure to do so could result in serious injury or death due to the fan turning on while work is in progress.

Fan Motor

1. Shut off unit power and lock out.
2. Disconnect and tag power wires at motor terminals.
3. Loosen motor brace-to-mounting-rail attaching bolts.
4. Mark belt as to position. Remove and set aside belts.
5. Remove motor bracket hold down bolts.
6. Remove motor pulley and set aside.
7. Remove motor.
8. Install new motor. Reassemble by reversing steps 1 - 6. Be sure to reinstall multiple belts in their original position. Use a complete new set if required. Do not stretch belts over sheaves. Review the sections on motor and sheave installation, sheave alignment, and belt tensioning discussed previously.
9. Reconnect motor leads and restore power. Check fan for proper rotation as described in Start-Up Check List.



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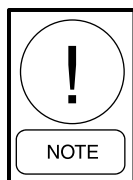
**FIG. 4-4 – EXAMPLE OF FC FAN SHAFT/
WHEELMARKING**

Fan Shaft Bearings

General – When removing and replacing the bearings, care should be taken to ensure that the area where the bearings fit on the shaft does not become scored or damaged. The shaft in this area should be thoroughly cleaned before the bearing is removed and again before the new bearing is installed.

Mounting Details –

1. Check the shaft - it should be straight, free of burrs and full size. Be sure the bearing is not seated on a worn section of shafting.
2. Make certain any setscrews are not obstructing the bearing bore.
3. Align the bearing in its housing and slide the bearing into position on shaft - never hammer the ends of the inner race. If necessary, use a brass bar or pipe against the inner race to drift bearing into place - never hit the housing, as bearing damage may result. Make sure there is lubricant between the bearing outer ring and the housing.
4. Fasten the bearing housing to the unit mounting support with hex head cap screws, washers, new lock washers and hex nuts before securing the bearing to the shaft. This permits the bearing to align itself in position along the shaft and eliminates any possibility of cramping loads.
5. Rotate the shaft to make certain it turns freely.
6. Bearings may employ one of several different methods to lock the bearing to the shaft.



Shaft should be free from burrs. If old shaft is used, be sure a ball bearing is not seated on worn section and shaft is not bent.

There are various degrees of self-alignment in bearings of the same manufacturer. The force required for the self-alignment of the bearings used in YORK manufactured units has been specified and is closely monitored at the factory. If it is necessary to purchase a bearing locally, be sure it can be worked around in the housing with a short shaft made of wood or other soft material placed in the bearing.

Prior to installing the bearing on the shaft, it should be worked around in the housing to make sure that self-alignment will be obtained where the bearing is installed. After the shaft journal has been inspected for cleanliness, metal chips or burrs, the bearing is slipped, not forced, onto the shaft. Forcing the bearing onto the shaft by the use of flange, pillow block, or outer ring will damage the bearing internally. Force applied in this way transmits the load to the inner race through the balls in the bearing. Since the bearings are not designed for axial loading, the sides of the races in which the balls turn can be damaged. If the bearing cannot be made to slip onto the shaft by pressing on the inner ring of the bearing, check the shaft for burrs. Install the bearing so the part of the inner race, which receives the locking collar or contains setscrews, is toward the outside of the unit.

If the grease fitting must be changed on bearings that utilize a locking pin under the fitting, it is important to properly replace it. If an adapter or grease fitting of improper size and length is used, the locking pin may be either too tight or loose and can affect the alignment and re-lubrication of the bearing.

Bearing Lock Devices

Various types of locking devices are used to secure bearing(s) to the fan shaft. *Refer to the instructions packed with bearings for special information. Figure 4-5 is a typical bearing with a setscrew-type locking device.* The various locking devices can be classified under basic types: eccentric locking type, concentric locking type, and Skwezloc type.

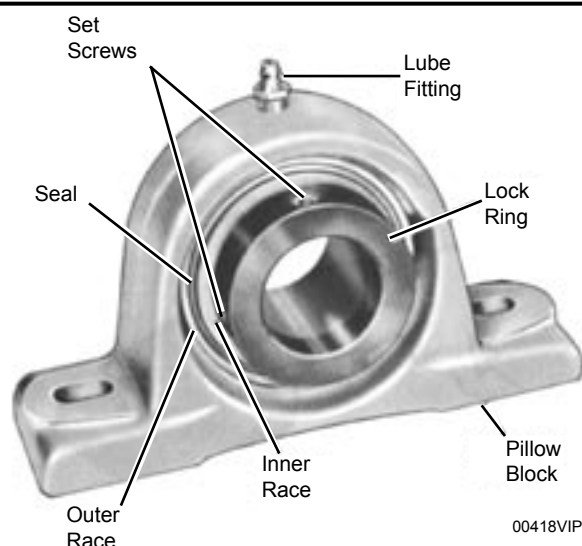
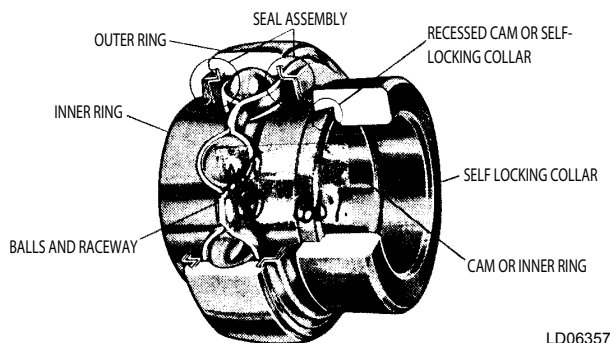


FIG. 4-5 – BEARING WITH SETSCREW TYPE LOCKING DEVICE

Eccentric Type

An eccentric self-locking collar is turned and driven with a punch in the direction of shaft rotation to lock the bearing inner ring to the shaft. See Figure 4-6 & 4-7.

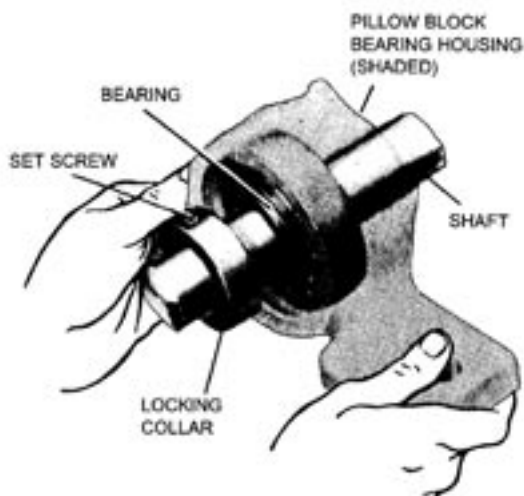


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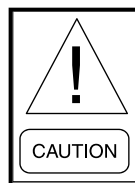
FIG. 4-6 – BEARING WITH ECCENTRIC CAM

When the eccentric collar is engaged to the cam on the bearing inner ring and turned in direction of rotation, it grips the shaft with a positive binding action. The collar is then locked in place with the setscrew provided in the collar.

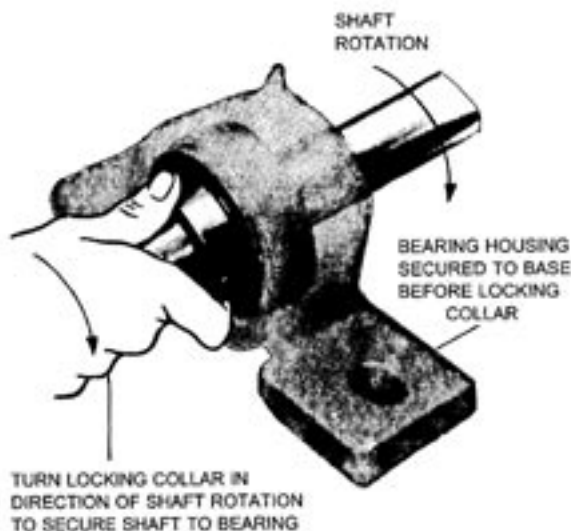
The self-locking collar is placed on the shaft with its cam adjacent to the cam on the end of the bearing's wide inner ring. In this position, with collar and bearing cams disengaged, the collar's bore is concentric with that of the bearing's inner ring. The wide inner ring is loose on the shaft. By turning the collar in the direction of normal shaft rotation, the eccentric recessed cam will drop over and engage with the corresponding cam on the bearing inner, causing it to grip the shaft tightly with a positive binding action. See Figure 4-6 & 4-7. Make sure the two cams engage smoothly and the locking collar is down flat against the shoulder of the inner ring. The wide inner ring is now locked to the shaft. Using a punch or similar tool in the drilled hole of the collar, tap the tool lightly to lock the collar in the direction of normal shaft rotation.



NOTE: Do Not apply excessive force to the bearing housing (pillow block or flange) when installing the bearing on the shaft.



Do not apply excessive force to the bearing housing (pillow block or flange) when installing the bearing on the shaft.



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FIG. 4-7 – ECCENTRIC CAM LOCKING COLLAR BEARING INSTALLATION

As a final step, the setscrew is tightened. *Torque per Table 4-2.* It exerts a wedging action to hold the collar always in the engaged position, even under shock and reversing loads.

To disassemble, loosen the setscrew and tap the collar in the direction opposite shaft rotation.

TABLE 4-2 – SETSCREW TORQUE

SET SCREW DIA.	HEX. SIZE ACROSS FLATS LBS.	MIN. RECOMMENDED TORQUE	
		INCH LBS.	FOOT LBS.
1/4 1/8	66 - 85	5.5 - 7.2	
5/16	5/32	126 - 164	10.5 - 13.7
3/8 3/16	228 - 296	19.0 - 24.7	
7/16	7/32	348 - 452	29.0 - 37.7
1/2 1/4	504 - 655	42.0 - 54.6	
5/8 5/16	1104 - 1435	92.0 - 119.6	



After proper installation of the bearing(s), run the unit for 10 to 15 minutes. Shut the unit down and lock it out. Check for proper engagement of locking collar and tightness of setscrew(s).

When replacing split bearings, *refer to manufacturer's instruction provided with the bearing.* It is extremely important to ensure that proper radial clearances are observed between the roller bearings and outer face. Failure to make proper adjustments will cause premature failure of the bearing.



FIG. 4-8 – SPLIT BEARING

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SECTION 5 – SEQUENCE OF OPERATION

UNIT TYPE

The primary unit controller is capable of being programmed for three different “UNIT TYPE” which establish the mode of operation. The “UNIT TYPE” is set through the OPTIONS key, UNIT DATA subsection of the User Interface. The three options are:

- “CONSTANT VOLUME”
- “VARIABLE AIR VOLUME”
- “FLEXSYS”

CURRENT OPER MODE

The “CURRENT OPER MODE”, occupied or unoccupied, is a derived value and can be established in three ways:

- Digital Input “OCCUPANCY STATE” on /off input – “ON” occupied / “OFF” unoccupied. The Digital input is made through a connection between “R” and “OCC” on the unit field low voltage terminal block.
- Serial Input “OCCUPANCY COMMAND” usually originates from a BAS system
- Internal Time Clock “OCCUPANCY SCHEDULE” the internal clock can be turned ON and OFF through the SCHEDULE subsection of the User Interface. The occupied / unoccupied schedule can be programmed through the SCHEDULE key of the User Interface

Within the “CURRENT OPER MODE” are twenty-one sub-modes of operation:

- “OCCUPIED COOLING”
- “OCCUPIED COOLING LOW”
- “OCCUPIED COOLING HIGH”
- “OCCUPIED COOLING HIGH WITH BYPASS”
- “OCCUPIED COOLING WITHOUT BYPASS”
- “OCCUPIED HEATING”
- “OCCUPIED HEATING LOW”
- “OCCUPIED HEATING HIGH”
- “OCCUPIED STANDBY”
- “UNOCCUPIED COOLING”

- “UNOCCUPIED COOLING LOW”
- “UNOCCUPIED COOLING HIGH”
- “UNOCCUPIED HEATING”
- “UNOCCUPIED HEATING LOW”
- “UNOCCUPIED HEATING HIGH”
- “UNOCCUPIED STANDBY”
- “COMFORT VENT COOLING”
- “COMFORT VENT HEATING”
- “NIGHT SET BACK”
- “MORNING WARM UP”
- “POWER UP STANDBY”

The “CURRENT OPER MODE” can be viewed at the STATUS screen

The operation of the unit in each of the above modes of operation will be defined later in this manual.

The Primary Unit Controller monitors the switching from the standby mode to an active cooling or heating mode. The unit must be in the standby mode for 3 minutes before the control will allow it to switch to an active heating or cooling mode.

The Primary Unit Controller also monitors the switching between the active cooling and heating modes. The unit must remain in one of the active heating or cooling modes for 30 seconds before it can be turned off or switched.

Constant Volume Mode

A “CONSTANT VOLUME” unit will be controlled by one of three “CONTROL METHOD”:

- “STAGED” (Thermostat)
- “WIRED ZONE TEMP” (Hardwired)
- “COMM ZONE TEMP” (Communicated)

The “CONTROL METHOD” is entered into the Primary Unit Controller through the OPTION key, UNIT DATA subsection of the User Interface.

TABLE 5-1 – DIGITAL INPUTS FOR STAGED INPUT STAGED INPUT MODE

Y1 LOW COOL	Y2 HIGH COOL	W1 LOW HEAT	W2 HIGH HEAT	CURRENT OPER MODE	UNIT MODE
ON	OFF	OFF	OFF	OCCUPIED	OCCUPIED COOLING LOW
ON/OFF	ON	OFF	OFF	OCCUPIED	OCCUPIED COOLING HIGH
OFF	OFF	ON	OFF	OCCUPIED	OCCUPIED HEATING LOW
OFF	OFF	ON/OFF	ON	OCCUPIED	OCCUPIED HEATING HIGH
OFF	OFF	OFF	OFF	OCCUPIED	OCCUPIED STANDBY (SEE ALSO COMFORT VENTILATION OPERATION)
ON	OFF	OFF	OFF	UNOCCUPIED	UNOCCUPIED COOLING LOW
ON/OFF	ON	OFF	OFF	UNOCCUPIED	UNOCCUPIED COOLING HIGH
OFF	OFF	ON	OFF	UNOCCUPIED	UNOCCUPIED HEATING LOW
OFF	OFF	ON/OFF	ON	UNOCCUPIED	UNOCCUPIED HEATING HIGH
OFF	OFF	OFF	OFF	UNOCCUPIED	UNOCCUPIED STANDBY

Staged Input

The unit requires the following digital inputs in order to operate in the “*STAGED INPUT*” mode of operation. The inputs are made at the low voltage terminal block of the unit.

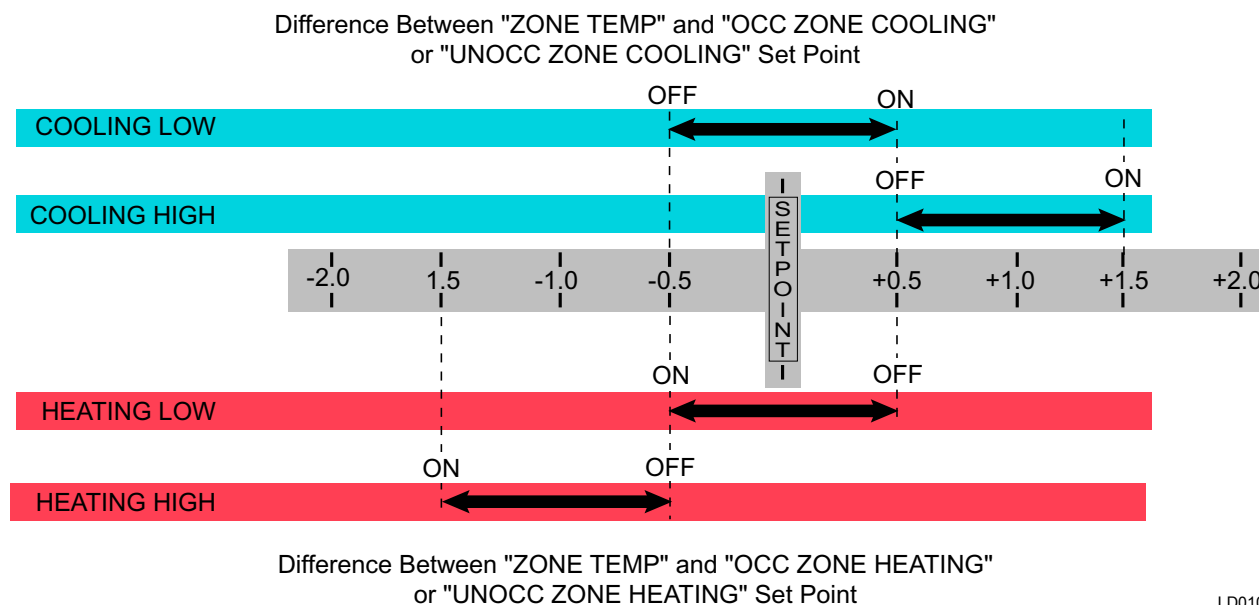
- W1 LOW HEAT
- W2 HIGH HEAT
- Y1 LOW COOL
- Y2 HIGH COOL

Table 5-1 shows what the Unit Mode would be, based on the digital inputs.

**Zone Temperature Control
(Hardwired Or Communicated)**

The unit compares the analog “*ZONE TEMP*” input to the “*OCC ZONE COOLING*”, “*OCC ZONE HEATING*”, “*UNOCC ZONE COOLING*”, or “*UNOCC ZONE HEATING*” set points to determine the sub-mode of operation. The following parameters must be programmed through the User Interface:

- “*OCC ZONE COOLING*” – SETPOINT key / COOLING subsection
- “*UNOCC ZONE COOLING*” – SETPOINT key / COOLING subsection
- “*OCC ZONE HEATING*” – SETPOINT key / HEATING subsection
- “*UNOCC ZONE HEATING*” – SETPOINT key / HEATING subsection



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FIG. 5-1 – DIFFERENCES (°F) BETWEEN ZONE TEMPERATURE AND SET POINTS

Figure 5-1 shows what the UNIT MODE would be, based on the difference between the zone temperature and the zone temperature set points.

The only difference between Hard Wired and Communicated is the method the Primary Unit Controller uses to determine the “*ZONE TEMP*”. In the Hard Wired mode the input is an analog input to the control. In the Communicated mode the input is a serial input from a BAS control system.

Variable Air Volume Mode

Occupied Cooling

In the OCCUPIED COOLING mode the Primary Unit Controller monitors the “*RA TEMP*” and compares it to the “*RAT COOLING SP*” Set Point. The “*RAT COOLING SP*” Set Point is entered into the Primary Unit Controller through the SET POINT key COOLING subsection of the User Interface. If the “*RA TEMP*” is equal to or greater than the “*RAT COOLING SP*” Set Point plus 0.5° F the Primary Unit Controller will place the unit in the OCCUPIED COOLING mode.

The unit will remain in the OCCUPIED COOLING mode until the “*RATEMP*” is equal to or less than the “*RAT COOLING SP*” set point minus 0.5°F.

Occupied Heating

In order for OCCUPIED HEATING to function, the “*OCC HEATING*” setting must be set to ENABLED. This can be set through the PROGRAM key HEATING subsection of the User Interface.

In the OCCUPIED HEATING mode the Primary Unit Controller monitors the “*RA TEMP*” and compares it to the “*RAT HEATING SP*” Set Point. The “*RAT HEATING SP*” Set Point is entered into the Primary Unit Controller through the SET POINTS key HEATING subsection of the User Interface. If the “*RA TEMP*” is equal to or LESS than the “*RAT HEATING SP*” Set Point minus 0.5° F the Primary Unit Controller will place the unit in the OCCUPIED HEATING mode.

The unit will remain in the OCCUPIED HEATING mode until the “*RATEMP*” is equal to or greater than the “*RAT HEATING SP*” set point plus 0.5°F.

Unoccupied Cooling

In order for the UNOCCUPIED COOLING to function, the “*NIGHT SET UP*” setting must be set to ENABLE. This can be done through the PROGRAM key, COOLING subsection of the User Interface.

In the UNOCCUPIED COOLING mode the Primary Unit Controller will monitor the “*ZONE TEMP*” and compare it to the “*UN-OCC ZONE COOLING*” set point. The “*UN-OCC ZONE COOLING*” set point is set through the SET POINTS key, COOLING subsection of the User Interface. If the “*ZONE TEMP*” is equal to or greater than the “*UN-OCC ZONE COOLING*” temperature plus 0.5° F, the Primary Unit Controller will place the unit in the UNOCCUPIED COOLING mode.

The unit will remain in the UNOCCUPIED COOLING mode until the “*RATEMP*” is equal to or less than the “*UN-OCC ZONE COOLING*” set point minus 0.5°F.

Unoccupied Heating

In order for the UNOCCUPIED HEATING to function, the “*NIGHT SET BACK*” setting must be set to ENABLED. This can be done through the PROGRAM key, HEATING subsection of the User Interface.

In the UNOCCUPIED HEATING mode the Primary Unit Controller will monitor the “*ZONE TEMP*” and compare it to the “*UN-OCC ZONE HEATING*” setpoint. The “*UN-OCC ZONE HEATING*” set point is set through the SET POINTS key, HEATING subsection of the User Interface. If “*ZONE TEMP*” is equal to or less than the “*UN-OCC ZONE HEATING*” minus 0.50 F, the Primary Unit Controller will place the unit in the UNOCCUPIED HEATING mode.

The unit will remain in the UNOCCUPIED HEATING mode until the “*ZONE TEMP*” is equal to or greater than the “*UN-OCC ZONE HEATING*” set point plus 0.5°F.

Flexsys

A FlexSys unit is a modified VAV system. In a FlexSys system the supply air from the unit is distributed through an underfloor air distribution system. In order to temper the air a by-pass duct between the unit return and supply duct is installed in the curb, and return air is used to temper the supply air. A damper is installed in the by-pass duct in order to control the amount of by-pass return air.

The modes of operation are the same as a VAV unit with the exception of OCCUPIED COOLING. With FlexSys units there are two OCCUPIED COOLING modes, OCCUPIED COOLING without BY-PASS and OCCUPIED COOLING with BY-PASS. The Primary Unit Controller determines which mode of operation based on the relationship between the “*RA TEMP*” and the “*MIXED SUPPLY AIR TEMP*”. If the “*RA TEMP*” is equal to or greater than the “*MIXED SUPPLY AIR TEMP*” set point plus 10 degrees, the “*OCC COOLING W/ BY-P*” is used. If the “*RA TEMP*” is less than the “*MIXED SUPPLY AIR TEMP*” set point plus 10 degrees, “*OCC COOLING W/O BY-P*” is used. The “*MIXED SUPPLY AIR TEMP*” is set using the SETPOINTS key, COOLING subsection of the User Interface.

When the unit is in the OCCUPIED COOLING without BY-PASS mode the compressors are controlled to maintain the “*MIXED SUPPLY AIR TEMP*” set point. When the unit is in the OCCUPIED COOLING with BY-PASS mode, the compressors are controlled to maintain the “*EVAP LEAVING AIR TEMP HIGH*” or

“*EVAP LEAVING AIR TEMP LOW*” set points. The “*EVAP LEAVING AIR TEMP HIGH*”, and “*EVAP LEAVING AIR TEMP LOW*” set points are set through the SET POINT key, COOLING subsection of the User Interface.

ACTIVE SET POINT DETERMINATION

Constant Volume

On a Constant Volume unit the Control Method (Staged or Zone) does not have a direct effect on the control of the compressor and heating stages. In stead the input from the Staged (usually a thermostat) or Zone (hard wired or communicated) is only used to determine the “*UNIT MODE*”. The staging of the compressor and heating stages is always based on the “*ACTIVE SP*”.

Staged Input Control

When the “*CONTROL METHOD*” is set to “*STAGED*”, the “*ACTIVE SP*” is determined by the “*Y1 LOW COOL*”, “*Y2 HIGH COOL*”, “*W1 LOW HEAT*,” and “*W2 HIGH HEAT*” inputs. Table 5-2 shows what the “*ACTIVE SP*” would be for each staged input combination.

The “*STG 1 - LOW*” and “*STAGE 2 - HIGH*” set points are programmed into the User Interface through the SETPOINTS key COOLING subsection. The “*STG 1 (W1) HEATING SETPOINT*” and “*STG 2 (W2) HEATING SETPOINT*” set points are programmed into the User Interface through the SETPOINTS key HEATING subsection.

TABLE 5-2 – ACTIVE SAT SET POINT DETERMINATION, STAGED INPUT

Y1 LOW COOL	Y2 HIGH COOL	W1 LOW HEAT	W2 HIGH HEAT	OCC. MODE	UNIT MODE	ACTIVE SP
ON	OFF	OFF	OFF	OCCUPIED	OCCUPIED COOLING LOW	STAGE 1 - LOW
ON/OFF	ON	OFF	OFF	OCCUPIED	OCCUPIED COOLING HIGH	STAGE 2 - HIGH
OFF	OFF	ON	OFF	OCCUPIED	OCCUPIED HEATING LOW	STG 1 (W1) HEATING SETPOINT
OFF	OFF	ON/OFF	ON	OCCUPIED	OCCUPIED HEATING HIGH	STG 2 (W2) HEATING SETPOINT
OFF	OFF	OFF	OFF	OCCUPIED	OCCUPIED STANDBY (SEE ALSO COMFORT VENTILATION OPERATION)	NONE
ON	OFF	OFF	OFF	UNOCCUPIED	UNOCCUPIED COOLING LOW	STAGE 1 - LOW
ON/OFF	ON	OFF	OFF	UNOCCUPIED	UNOCCUPIED COOLING HIGH	STAGE 2 - HIGH
OFF	OFF	ON	OFF	UNOCCUPIED	UNOCCUPIED HEATING LOW	STG 1 (W1) HEATING SETPOINT
OFF	OFF	ON/OFF	ON	UNOCCUPIED	UNOCCUPIED HEATING HIGH	STG 2 (W2) HEATING SETPOINT
OFF	OFF	OFF	OFF	UNOCCUPIED	UNOCCUPIED STANDBY	NONE

Zone Temperature Control

When the “*CONTROL METHOD*” is set to Zone Temperature Control (either hard-wired or communicated), the “*ACTIVE SP*” is determined by the difference between the “*ZONE TEMP*” and the appropriate set point. Table 5-3 shows the parameters that are used to determine the “*ACTIVE SP*”:

Where

ΔT_{oc} = “*ZONE TEMP*” – “*OCC ZONE COOLING*” Set Point

ΔT_{oh} = “*ZONE TEMP*” – “*OCC ZONE HEATING*” Set Point

ΔT_{uc} = “*ZONE TEMP*” – “*UNOCC ZONE COOLING*” Set Point

ΔT_{uh} = “*ZONE TEMP*” – “*UNOCC ZONE HEATING*” Set Point

TABLE 5-3 – ACTIVE SAT SET POINT DETERMINATION, ZONE TEMPERATURE

ΔT_{oc} OCC COOL	ΔT_{oh} OCC HEAT	ΔT_{uc} UNOCC COOL	ΔT_{uh} UNOCC HEAT	OCCUPANCY MODE	UNIT MODE	ACTIVE SP
> 0.5 °F	---	---	---	OCCUPIED	OCCUPIED COOLING LOW	STAGE 1 - LOW
> 1.5 °F	---	---	---	OCCUPIED	OCCUPIED COOLING HIGH	STAGE 2 - HIGH
---	< -0.5 °F	---	---	OCCUPIED	OCCUPIED HEATING LOW	STG 1 (W1) HEATING SETPOINT
---	< -1.5 °F	---	---	OCCUPIED	OCCUPIED HEATING HIGH	STG 2 (W2) HEATING SETPOINT
---	---	---	---	OCCUPIED	OCCUPIED STANDBY (SEE ALSO COMFORT VENTILATION OPERATION)	NONE
---	---	> 0.5 °F	---	UNOCCUPIED	UNOCCUPIED COOLING LOW	STAGE 1 - LOW
---	---	> 1.5 °F	---	UNOCCUPIED	UNOCCUPIED COOLING HIGH	STAGE 2 - HIGH
---	---	---	< -0.5 °F	UNOCCUPIED	UNOCCUPIED HEATING LOW	STG 1 (W1) HEATING SETPOINT
---	---	---	< -1.5 °F	UNOCCUPIED	UNOCCUPIED HEATING HIGH	STG 2 (W2) HEATING SETPOINT
---	---	---	---	UNOCCUPIED	UNOCCUPIED STANDBY	NONE

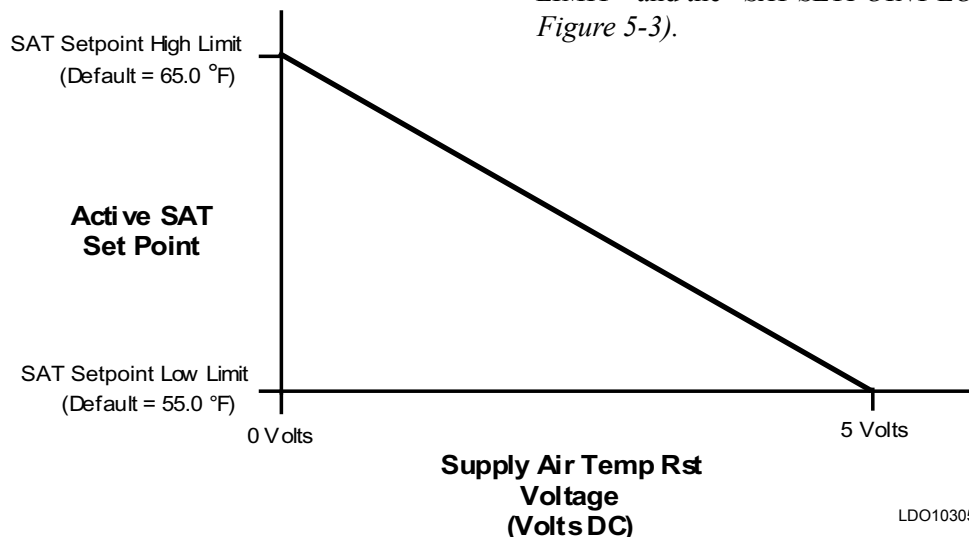
Variable Air Volume

The “*ACTIVE SP*” is always derived from three programmed parameters “*SAT SETPOINT HIGH LIMIT*”, “*SAT SETPOINT LOW LIMIT*” and the “*SAT RESET METHOD*”. The Primary Unit Controller determines the derived “*ACTIVE SP*” value to use based on the reset command sent to the controller. There are four options available to select from for the reset command method. “*SAT RESET METHOD*” can be set for “*HARDWIRED INPUT*”, “*OUTSIDE TEMP*”, “*RETURN TEMP*”, or “*SUPPLY FAN SPEED*”. If “*HARDWIRED INPUT*” is used and no input is available, the Primary Unit controller will control to the “*SAT SETPOINT HIGH LIMIT*”. The following parameters are programmed through the User Interface:

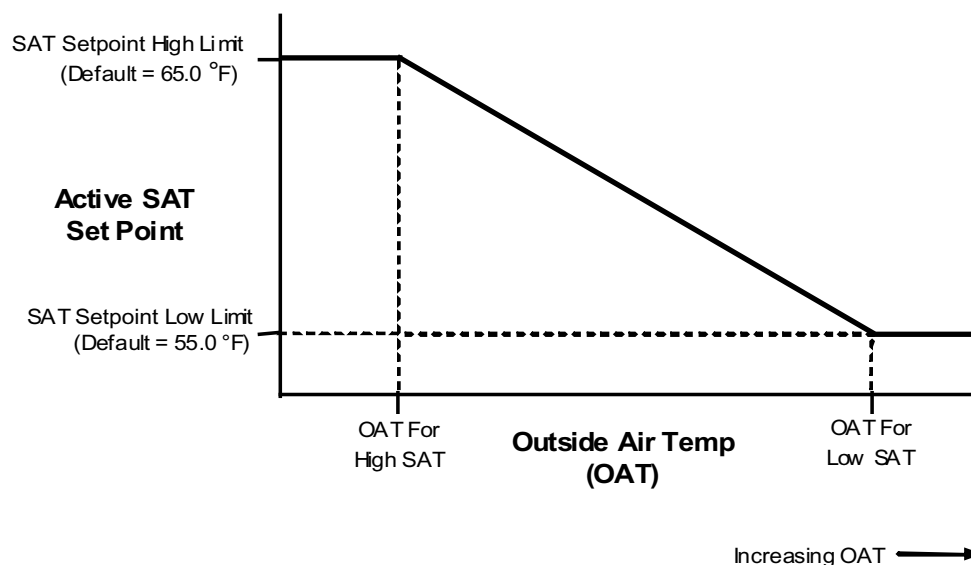
- “*SAT RESET METHOD*” – OPTIONS key / UNIT DATA subsection
- “*SAT SETPOINT LOW LIMIT*” – SETPOINTS key / COOLING subsection
- “*SAT SETPOINT HIGH LIMIT*” – SETPOINTS key / COOLING subsection
- “*OAT FOR SAT SP LOW LIMIT*” - SETPOINTS key / COOLING subsection
- “*OAT FOR SAT SP HIGH LIMIT*” - SETPOINTS key / COOLING subsection
- “*RAT FOR SAT SP LOW LIMIT*” - SETPOINTS key / COOLING subsection
- “*RAT FOR SAT SP HIGH LIMIT*” - SETPOINTS key / COOLING subsection
- “*FAN SPEED FOR SAT LOW LIMIT*” - SETPOINTS key / COOLING subsection
- “*FAN SPEED FOR SAT HIGH LIMIT*” - SETPOINTS key / COOLING subsection

Hardwired Sat Reset

When the "SAT RESET METHOD" is set to "HARDWIRED INPUT", the Primary Unit Controller monitors the "SUPPLY AIR TEMP RST". If the "SUPPLY AIR TEMP RST" is equal to 0.00 volts, the "ACTIVE SP" is the "SAT SET POINT HIGH LIMIT". If the "SUPPLY AIR TEMP RST" is equal to 5.00 volts, the "ACTIVE SP" is the "SAT SETPOINT LOW LIMIT". When the "SUPPLY AIR TEMP RST" is between 0.00 and 5.00 volts, the "ACTIVE SP" is linearly interpolated between the "SAT SETPOINT HIGH LIMIT" and the "SAT SETPOINT LOW LIMIT" (see Figure 5-2).



LDO10305

FIG. 5-2 – ACTIVE SAT SET POINT VS. SUPPLY AIR TEMP RST VOLTAGE

Increasing OAT →

FIG. 5-3 – ACTIVE SAT SET POINT VS. OUTSIDE AIR TEMP

LDO10306

Return Air Based Sat Reset

When the “*SAT RESET METHOD*” is set to “*RETURN TEMP*”, the controller monitors the “*RA TEMP*” and sets the “*ACTIVE SP*” to a value between the “*SAT SETPOINT HIGH LIMIT*” and the “*SAT SETPOINT LOW LIMIT*”. If the “*RA TEMP*” is equal to or greater than the “*RAT FOR SAT SP LOW LIMIT*”, the “*ACTIVE SP*” shall be the “*SAT SETPOINT LOW LIMIT*”. If the “*RA TEMP*” is equal to or less than the “*RAT FOR SAT SP HIGH LIMIT*”, the “*ACTIVE SP*” shall be the “*SAT SETPOINT HIGH LIMIT*”. When the “*RA TEMP*” is between the “*RAT FOR SAT SP HIGH LIMIT*” and the “*RAT FOR SAT SP LOW LIMIT*” the “*ACTIVE SP*” shall be linearly interpolated between the “*SAT SETPOINT HIGH LIMIT*” and the “*SAT SETPOINT LOW LIMIT*” (see Figure 5-4).

Supply Fan Speed Based Sat Reset

When the “*SAT RESET METHOD*” is set to “*SUPPLY FAN SPEED*”, the Primary Unit Controller will monitor the “*SUPPLY VFD SPEED*” command and set the “*ACTIVE SP*” to a value between the “*SAT SETPOINT HIGH LIMIT*” and the “*SAT SETPOINT LOW LIMIT*”. If the “*SUPPLY VFD SPEED*” is equal to or greater than the “*FAN SPEED FOR SAT LOW LIMIT*”, the “*ACTIVE SP*” shall be the “*SAT SETPOINT LOW LIMIT*”. If the “*SUPPLY VFD SPEED*” is equal to or less than the “*FAN SPEED FOR SAT HIGH LIMIT*”, the “*ACTIVE SP*” shall be the “*SAT SETPOINT HIGH LIMIT*”. When the “*SUPPLY VFD SPEED*” is between the “*FAN SPEED FOR SAT LOW LIMIT*” and the “*FAN SPEED FOR SAT HIGH LIMIT*”, the “*ACTIVE SP*” shall be linearly interpolated between the “*SAT SETPOINT HIGH LIMIT*” and the “*SAT SETPOINT LOW LIMIT*” (see Figure 5-5).

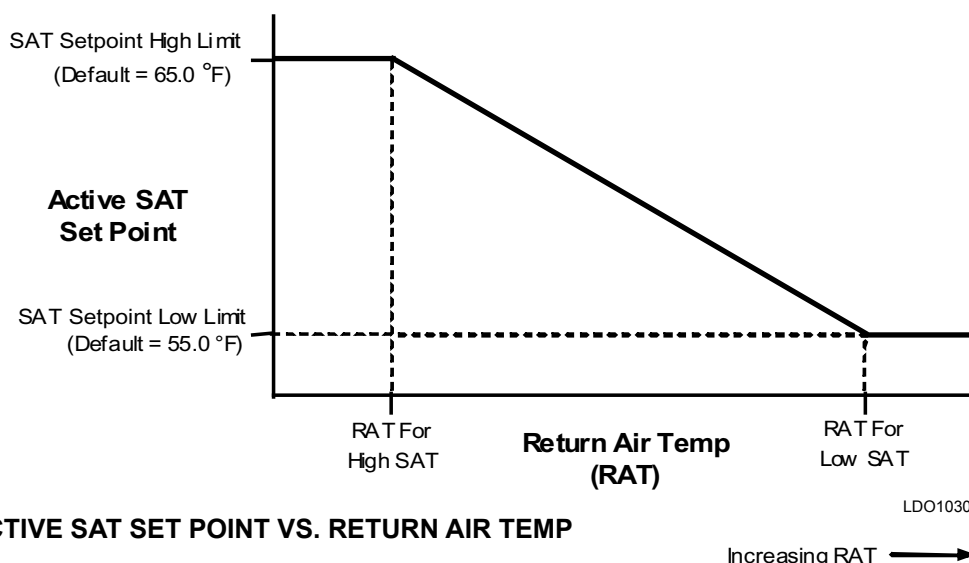


FIG. 5-4 – ACTIVE SAT SET POINT VS. RETURN AIR TEMP

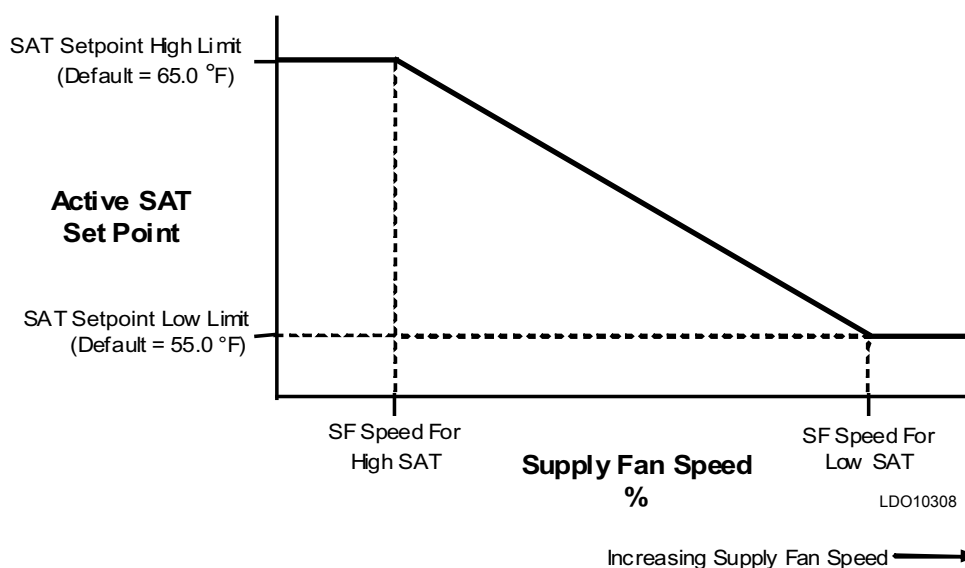


FIG. 5-5 – ACTIVE SAT SET POINT VS. SUPPLY FAN SPEED

Flexsys With Bypass Damper

The “*ACTIVE SP*” will be the “*EVAP LEAVING AIR TEMP HIGH*” set point if either of the following is true:

- The Return Air Humidity sensor is not reliable
- The Return air Enthalpy is < 32.0 btu/lb

The “*ACTIVE SP*” will be the “*EVAP LEAVING AIR TEMP LOW*” set point if any of the following is true:

- The Return air Enthalpy is $\geq$ 32.0 btu/lb
- The slab Temperature is approaching or below the dew point of the supply air

The following parameters are programmed through the User Interface:

- “*EVAP LEAVING AIR TEMP LOW*” – SETPOINTS key / COOLING subsection
- “*EVAP LEAVING AIR TEMP HIGH*” – SETPOINTS key / COOLING subsection

Flexsys Without Bypass Damper

The “*ACTIVE SP*” is the “*MIXED SUPPLY AIR TEMP*”. The “*MIXED SUPPLY AIR TEMP*” is programmed through the SETPOINTS key / COOLING subsection of the User Interface.

COMPRESSOR CONTROL

Whenever a change in the unit cooling status is made, compressor turned on, compressor turned off, etc., a 3-1/2 minutes Interstage Delay Timing is initiated. During the countdown of the timer no compressor can be staged on or off until the timer has timed down. The only exception to this would be if the compressor protection circuit experienced a fault.

On CONSTANT VOLUME, VARIABLE AIR VOLUME, AND FLEXSYS units with the Current Operating mode set to Without Bypass Damper; when the Primary Unit Controller enters an active cooling mode, the Primary Unit Controller sets the “*COOLING CONTROL OFFSET*” to 2.0° F. The Primary Unit Controller compares the current Supply Air Temperature (SAT) to the “*ACTIVE SP*” + or – the “*COOLING CONTROL OFFSET*”. If the SAT temperature is greater than the “*ACTIVE SP*” plus the “*COOLING CONTROL OFFSET*” and all the compressors are not ON the Pri-

mary Unit Controller will initiate a call for compressor or additional compressor operation based on the “*NEXT STAGE TO ENABLE*” (see Tables 5-4 & 5-5).

If the SAT temperature is less than the “*ACTIVE SP*” minus the “*COOLING CONTROL OFFSET*” and all the compressors are not OFF the Primary Unit Controller will turn a compressor OFF based on the “*NEXT STAGE TO DISABLE*” (see Tables 5-4 & 5-5).

On a FLEXSYS unit with the Current Operating mode set to Bypass Damper, when the Primary Unit Controller enters an active cooling mode, the Primary Unit Controller sets the “*COOLING CONTROL OFFSET*” to 2.0° F. The Primary Unit Controller compares the current “*FLEX EVAP TEMP*” to the “*ACTIVE SP*” + or – the “*COOLING CONTROL OFFSET*”. If the “*FLEX EVAP TEMP*” temperature is greater than the “*ACTIVE SP*” plus the “*COOLING CONTROL OFFSET*” and all the compressor are not ON the Primary Unit Controller will initiate a call for compressor or additional compressor operation based on the “*NEXT STAGE TO ENABLE*”.

If the “*FLEX EVAP TEMP*” temperature is less than the “*ACTIVE SP*” minus the “*COOLING CONTROL OFFSET*” and all the compressor are not OFF the Primary Unit Controller will turn a compressor OFF based on the “*NEXT STAGE TO DISABLE*”.

When the Primary Unit Controller turns a compressor ON or OFF, it records the SAT temperature just prior to the time the compressor is started or stopped. After the 3-1/2 minute Interstage Delay Timer has expired the Primary Unit Controller records the SAT temperature again. The Primary Unit Controller then calculates the change in the SAT temperature SAT_{CH} . The Primary Unit Controller uses the $SAT_{(CH)}$ and FORMULA 1 to calculate a new “*COOLING CONTROL OFFSET*” if either of the following conditions are met:

- When a compressor is turned off and 3-1/2 minutes later the SAT temperature is greater then the “*ACTIVE SAT SETPOINT*” plus the current “*COOLING CONTROL OFFSET*”
- When a compressor is turned on and 3-1/2 minutes later the SAT temperature is less then the “*ACTIVE SAT SETPOINT*” minus the current “*COOLING CONTROL OFFSET*”

$$“COOLING CONTROL OFFSET” = \frac{SAT (change) + 1^{\circ} F}{2}$$

FORMULA 1

If a new “*COOLING CONTROL OFFSET*” is calculated, it is rounded up to the next half degree.

After a “*COOLING CONTROL OFFSET*” calculation is made the Primary Unit Controller initiates a 45 minute Cooling Control Offset Timer. If no compressor is turned ON or OFF before the Cooling Control Offset Timer has expired, the “*COOLING CONTROL OFFSET*” will be reset to 2.0 F.

COMPRESSOR OPERATION WITH ECONOMIZER

If the economizer is suitable, the Primary Unit Controller will set the “*COOLING CONTROL OFFSET*” to 4.5° F. As long as the economizer remains active, the Primary Unit Controller will not recalculate the “*COOLING CONTROL OFFSET*” and it will remain at the 4.5° F setting.

No Compressors On When Economizer Becomes Active

Compressors will be turned ON, based on the “*NEXT STAGE TO ENABLE*”, when all the following are satisfied:

- The “*CONTROL OUTPUT*” to the economizer must be greater than 95% for 30 seconds. This value can be viewed under the ECONOMIZER key of the User Interface.
- The “*SUPPLY AIR TEMP*” must be greater than or equal to the “*ACTIVE SP*” plus the “*COOLING CONTROL OFFSET*”(4.5° F).
- The Inter-Staged Delay Timer has expired.

Compressors will be turned OFF, based on the “*NEXT STAGE TO DISABLE*”, when all the following are satisfied:

- The “*CONTROL OUTPUT*” to the economizer is less than 5% for 30 seconds.
- The “*SUPPLY AIR TEMP*” must be less than or equal to the “*ACTIVE SP*” minus the “*COOLING CONTROL OFFSET*” (4.5° F).
- The Inter-Staged Delay Timer has expired.

Compressor On When Economizer Becomes Active

A compressor will be staged off and then the sequenced outlined above will be followed.

SUPPLY FAN OPERATION

Constant Volume Operation

The Supply Fan will be turned ON if the following conditions are met:

- The Supply Fan has been OFF for at least 60 seconds and one of the following conditions apply.

The FAN (G) digital input is high, 24 volts is present at terminal “G” of the unit low voltage terminal block.

Or the “*UNIT MODE*” is other than OCCUPIED STANDBY OR UNOCCUPIED STANDBY.

Or the unit is in the MORNING WARMUP mode

Or the unit modes of operation are CONTINUOUS VENTILATION and OCCUPIED. “*CONTINUOUS VENTILATION*” is ENABLED through the PROGRAM key VENTILATION subsection of the User Interface. This energizes the Supply Fan on a CONSTANT VOLUME unit any time the operating mode is Occupied.

The Supply Fan will be turned OFF if all of the following conditions are met:

- The Supply Fan has been ON for at least 60 seconds.
- The unit is in the OCCUPIED OR UNOCCUPIED STANDBY mode
- The FAN (G) digital input is low, 24 volts is not present at “G” of the low voltage terminal block.
- The INACTIVE HEATING TIME is greater than or equal to 60 seconds
- The INACTIVE COOLING TIME is greater than or equal to 60 seconds
- The SUPPLY AIR TEMP is less than or equal to 85.0° F
- And either:

CONTINUOUS VENTILATION is OFF

Or the CURRENT OPER MODE is set to UNOCCUPIED

The Primary Unit Controller monitors the operation of the Supply Fan by checking the status of a digital input from an air proving switch. After 45 seconds of operation, the Primary Unit Controller looks for a high state (24 volt input) from the air proving switch circuit at terminal block TB7 pin 10 of the Primary Unit Controller. It then examines the current state for 10 seconds. If the input does not go to a high state during this time frame the Primary Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

A SUPPLY FAN LOCKOUT will also be declared if the input goes low during normal Supply Fan operation.

The Primary Unit Controller also monitors the Supply Fan operation in the off cycle. 60 seconds after the digital output from the Primary Unit Controller Supply Fan circuit goes low (0 volts) the Primary Unit Controller checks the status of the digital input from the air proving switch 10 seconds. If the state of this circuit remains high (24 volts) during this 10-second window the Primary Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

Variable Air Volume (VAV)

The Supply Fan will be turned ON if the following conditions are met:

The Supply Fan has been OFF for at least 60 seconds and one of the following conditions apply:

- The FAN (G) digital input is high, 24 volts is present at terminal “G” of the unit low voltage terminal block.
- Or the CURRENT OPER MODE is set to OCCUPIED
- Or the unit is in the MORNING WARMUP mode
- Or the UNIT MODE is UNOCCUPIED HEATING OR UNOCCUPIED COOLING

The Supply Fan will be turned OFF if all the following conditions are met:

- The Supply Fan has been ON for at least 60 seconds
- The unit is in the UNOCCUPIED STANDBY mode
- The FAN (G) digital input is low, 24 volts is not present at “G” of the unit low voltage terminal block.
- The INACTIVE HEATING TIME is greater than or equal to 60 seconds
- The INACTIVE COOLING TIME is greater than or equal to 60 seconds
- The SUPPLY AIR TEMP is less than or equal to 85.0° F

The Primary Unit Controller monitors the operation of the Supply Fan by checking the status of a digital input from an air proven switch. After 45 seconds of operation, the control looks for a high state (24 volt input) from the air proving switch circuit at terminal block TB7 pin 10 of the Primary Unit Controller. It then examines the current status for 10 seconds. If the input does not go to a high state during this time frame the Primary Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

A SUPPLY FAN LOCKOUT will also be declared if the input goes low during normal Supply Fan operation.

The Primary Unit Controller also monitors the Supply Fan operation in the off cycle. 60 seconds after the digital output from the Primary Unit Controller Supply Fan circuit goes low (0 volts) the Primary Unit Controller checks the status of the digital input from the air proving switch for 10- seconds. If the state of this circuit remains high (24 volts) during this 10- second window the Primary Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

The Primary Unit Control uses a proportional-integral control algorithm to maintain the “DUCT STATIC PRESSURE” by varying the speed of the supply fan. As the pressure goes up, the speed goes down.

VAV Supply Fan Speed Control Set Point Determination

The following parameters must be set through the User Interface:

- “*DUCT PRESS TRANSDUCER SPAN*” – OPTIONS key / SUPPLY SYSTEM subsection.
- “*DUCT STATIC RESET - LOW LIMIT*” – SETPOINTS key / SUPPLY SYSTEMS subsection
- “*DUCT STATIC RESET - HIGH LIMIT*” – SETPOINTS key / SUPPLY SYSTEMS subsection

The “*DUCT PRESS TRANSDUCER SPAN*” can be set for 1.00 “WC, 2.50” WC, or 5.00” WC based on the system static you are trying to control.

The Duct Static Limit can be varied through the “*DUCT STATIC PRES RESET*”, a 0.00 to 5.00 volt analog input to the Primary Unit Controller. When the “*DUCT STATIC PRES RESET*” analog input is 0.00 volts the “*ACTIVE DSP SETPOINT*” is the “*DUCT STATIC RESET - HIGH LIMIT*” value. When the “*DUCT STATIC PRESSURE RESET*” analog input is 5.00 volts the “*ACTIVE DSP SETPOINT*” is the “*DUCT STATIC RESET - LOW LIMIT*” value. When the “*DUCT STATIC PRESSURE RESET*” is between 0.00 and 5.00 volts, the “*ACTIVE DSP SETPOINT*” is linearly interpolated between the “*DUCT STATIC RESET - LOW LIMIT*” and the “*DUCT STATIC RESET - HIGH LIMIT*”

The “*DUCT STATIC RESET HIGH LIMIT*” can never be greater than the programmed “*DUCT PRESS TRANSDUCER SPAN*” (1.00” WC, 2.50” WC or 5.00” WC).

The Primary Unit Controller then varies the 0-10 volt analog output to the VFD to maintain the “*DUCT STATIC PRESSURE ACTIVE SETPOINT*”.

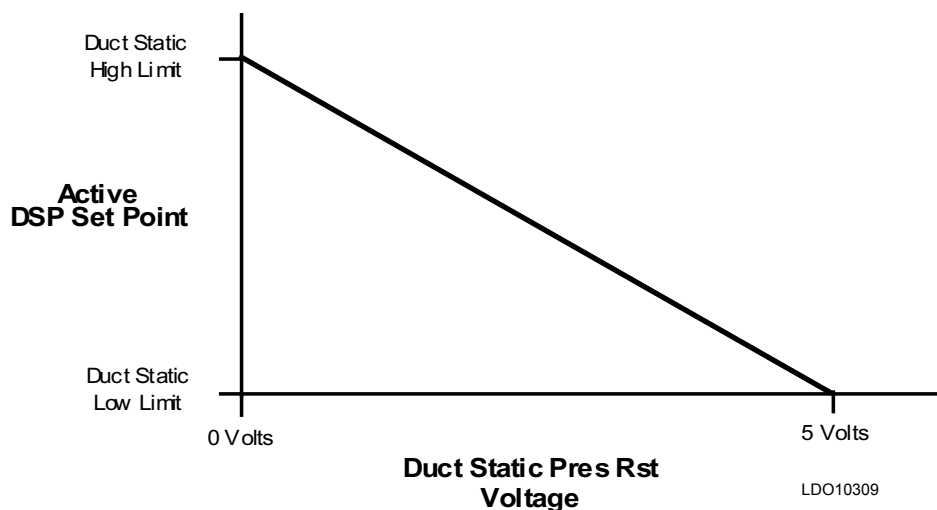


FIG. 5-6 – ACTIVE DSP SET POINT VS. DUCT STATIC PRES RST VOLTAGE

COMPRESSOR STAGING SEQUENCE

Compressors are staged up or down to control the “*SUPPLY AIR TEMP*” to the “*ACTIVE SP*”

The compressor staging sequence is determined by the unit size. This parameter is set through the User Interface as follows:

- “*UNIT SIZE*” – OPTIONS key / UNIT DATA subsection

Because of the arrangement of the six condenser fans the 110 to 150 ton unit the compressor staging changes based on outdoor ambient (*see Tables 5-4 & 5-5*).

TABLE 5-4 – OA AIR TEMP ABOVE 65° F

STAGING UP	NEXT STAGE TO ENABLE
STAGE 0 TO 1	IF COMPRESSOR 1A READY TO RUN AND COMPRESSOR 1B READY TO RUN ARE BOTH TRUE, THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER 1A OR 1B, WHICH EVER COMPRESSOR HAS THE SMALLEST NUMBER OF STARTS.
STAGE 1 TO 2	IF COMPRESSOR 2A READY TO RUN, COMPRESSOR 2B READY TO RUN, COMPRESSOR 3A READY TO RUN AND COMPRESSOR 3B READY TO RUN ARE ALL TRUE, THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER 2A, 2B, 3A, OR 3B, WHICH EVER COMPRESSOR HAS THE SMALLEST NUMBER OF STARTS.
STAGE 2 TO 3	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER THE A OR B COMPRESSOR FROM THE REMAINING SYSTEM WITHOUT A COMPRESSOR ON. FOR EXAMPLE, IF A COMPRESSOR IS ON FROM SYSTEM 1 AND SYSTEM 3, THEN THE NEXT COMPRESSOR ON WOULD BE EITHER 2A OR 2B, WHICHEVER HAS THE SMALLEST NUMBER OF STARTS.
STAGE 3 TO 4	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO THE COMPRESSOR REMAINING FROM THE STAGE 0 TO 1 TRANSITION.
STAGE 4 TO 5	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO THE COMPRESSOR REMAINING FROM THE STAGE 1 TO 2 TRANSITION.
STAGE 5 TO 6	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO THE COMPRESSOR REMAINING FROM THE STAGE 2 TO 3 TRANSITION.

STAGING DOWN	NEXT STAGE TO DISABLE
STAGE 6 TO 5	IF COMPRESSOR 3A READY TO STOP, COMPRESSOR 3B READY TO STOP, COMPRESSOR 2A READY TO STOP AND COMPRESSOR 2B READY TO STOP ARE ALL TRUE, THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO EITHER 3A, 3B, 2A, OR 2B, WHICH EVER COMPRESSOR HAS THE FEWEST NUMBER OF STARTS.
STAGE 5 TO 4	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO EITHER THE A OR B COMPRESSOR FROM SYSTEM 2 OR 3 WITH TWO COMPRESSORS ON. FOR EXAMPLE, IF SYSTEM 3 HAS BOTH COMPRESSORS ON, THE PRIMARY UNIT CONTROL WILL SET THE NEXT STAGE TO DISABLE TO EITHER 3A OR 3B, WHICHEVER HAS THE FEWEST NUMBER OF STARTS.
STAGE 4 TO 3	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO EITHER 1A OR 1B, WHICHEVER HAS THE FEWEST NUMBER OF STARTS.
STAGE 3 TO 2	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE REMAINING COMPRESSOR ON THE SYSTEM THE TRANSITIONED FROM 2 COMPRESSORS TO 1 COMPRESSOR DURING THE STAGE 6 TO 5 OPERATION.
STAGE 2 TO 1	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE REMAINING COMPRESSOR ON THE SYSTEM THE TRANSITIONED FROM 2 COMPRESSORS TO 1 COMPRESSOR DURING THE STAGE 5 TO 4 OPERATION.
STAGE 1 TO 0	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE COMPRESSOR REMAINING FROM SYSTEM 1.

TABLE 5-5 – OA AIR TEMP BELOW 65° F

STAGING UP	NEXT STAGE TO ENABLE
STAGE 0 TO 1	IF COMPRESSOR 1A READY TO RUN AND COMPRESSOR 1B READY TO RUN ARE BOTH TRUE, THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER 1A OR 1B, WHICH EVER COMPRESSOR HAS THE SMALLEST NUMBER OF STARTS.
STAGE 1 TO 2	IF COMPRESSOR 2A READY TO RUN, COMPRESSOR 2B READY TO RUN, COMPRESSOR 3A READY TO RUN AND COMPRESSOR 3B READY TO RUN ARE ALL TRUE, THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER 2A, 2B, 3A, OR 3B, WHICH EVER COMPRESSOR HAS THE SMALLEST NUMBER OF STARTS.
STAGE 2 TO 3	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO EITHER THE A OR B COMPRESSOR FROM THE REMAINING SYSTEM WITHOUT A COMPRESSOR ON. FOR EXAMPLE, IF A COMPRESSOR IS ON FROM SYSTEM 1 AND SYSTEM 3, THEN THE NEXT COMPRESSOR ON WOULD BE EITHER 2A OR 2B, WHICHEVER HAS THE SMALLEST NUMBER OF STARTS.
STAGE 3 TO 4	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO ENABLE TO THE COMPRESSOR REMAINING FROM THE STAGE 0 TO 1 TRANSITION. WHEN THE "OA TEMP" IS LESS THAN 65°F, IT IS DESIRED TO RUN TWO COMPRESSORS PER SYSTEM FOR THE 4 TH AND 5 TH STAGES. WHEN SWITCHING TO THE 4 TH STAGE, SYSTEM 1 WILL BE STARTED AND THE REMAINING COMPRESSOR FROM THE STAGE 2 TO 3 OPERATION WILL BE STARTED 15 SECONDS LATER. THE COMPRESSOR OPERATING FROM THE STAGE 1 TO 2 OPERATION SHALL BE TURNED OFF 15 SECONDS LATER.
STAGE 4 TO 5	THE PRIMARY UNIT CONTROL WILL SET THE NEXT STAGE TO ENABLE TO THE A OR B COMPRESSOR FROM THE SYSTEM TURNED OFF IN THE STAGE 3 TO 4 OPERATION. IN ADDITION, WHEN THE 5 TH STAGE IS REQUIRED, BOTH COMPRESSORS FROM THE SYSTEM SHALL BE STARTED WITH A 15 SECOND DELAY BETWEEN THEM.
STAGE 5 TO 6	THERE SHALL BE NO 6 TH STAGE.

STAGING DOWN	NEXT STAGE TO DISABLE
STAGE 6 TO 5	THERE SHALL BE NO 6 TH STAGE.
STAGE 5 TO 4	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO EITHER 3A, 3B, 2A, OR 2B COMPRESSOR WITH THE SMALLEST NUMBER OF STARTS. WITH THIS STAGE, HOWEVER, BOTH COMPRESSORS FROM THE SYSTEM, WHICH THE NEXT STAGE TO DISABLE COMPRESSOR IS SELECTED FROM, SHALL BE TURNED OFF.
STAGE 4 TO 3	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO EITHER THE A OR B COMPRESSOR FROM THE SYSTEM OTHER THAN SYSTEM 1, WHICHEVER HAS THE SMALLEST NUMBER OF STARTS. WITH THIS STAGE, THE COMPRESSOR SELECTED SHALL BE TURNED OFF ALONG WITH THE 1A OR 1B COMPRESSOR, WHICHEVER HAS THE SMALLEST NUMBER OF STARTS, 15 SECONDS LATER. IN ADDITION, THE A OR B COMPRESSOR (WHICHEVER HAS THE SMALLEST NUMBER OF STARTS) FROM THE SYSTEM TURNED OFF DURING THE STAGE 5 TO 4 OPERATION SHALL BE TURNED ON.
STAGE 3 TO 2	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE COMPRESSOR FROM SYSTEM 2 OR 3 THAT WAS NOT TURNED ON DURING THE STAGE 4 TO 3 OPERATION.
STAGE 2 TO 1	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE COMPRESSOR TURNED ON DURING THE STAGE 4 TO 3 OPERATION.
STAGE 1 TO 0	THE PRIMARY UNIT CONTROL WILL SET NEXT STAGE TO DISABLE TO THE COMPRESSOR REMAINING FROM SYSTEM 1.

CONDENSER FAN OPERATION

The condenser fan outputs are cycled on and off based on two schemes: Ambient Control or Ambient Control plus Discharge Pressure Control. If the "PRESS TRANS PKG" is set to "SYSTEM 1-2 AND 3" the Primary Unit Controller will use Ambient Control plus Discharge Pressure Control. If the "PRESS TRANS PKG" is set other than "SYSTEM 1-2 AND 3"; or "DISCHARGE PRESS 1", "DISCHARGE PRESS 2", or "DISCHARGE PRESS 3" are unreliable the Primary Unit Controller will use Ambient Control.

Ambient Control

The condenser fans will be turned on whenever a compressor from any system is turned on. Which fans are turned on will be based on "OA TEMP" and the number of compressors on per system. Tables 5-6 & 5-7 detail the relationship between the "OA TEMP", number of compressors per system, and the number of condenser fans on. There is a 1° F dead band below the turn on temperature that will be used to turn the fan off. For example if the turn on temperature is 30° F, the turn off point would be 29° F.

TABLE 5-6 – ONE COMPRESSOR ON PER ANY-SYSTEM

OUTSIDE AIR TEMP	CONDENSER FAN OUTPUT				
	1	2	3	4	5&6
0° F THRU 30° F	ON	OFF	OFF	OFF	OFF
30° F THRU 60° F	ON	ON	OFF	OFF	OFF
60° F THRU 75° F	ON	ON	ON	OFF	OFF
75° F THRU 90° F	ON	ON	ON	ON	OFF
90° F +	ON	ON	ON	ON	ON

TABLE 5-7 – TWO COMPRESSOR ON PER ANY-SYSTEM

OUTSIDE AIR TEMP	CONDENSER FAN OUTPUT				
	1	2	3	4	5&6
0° F THRU 30° F	ON	ON	OFF	OFF	OFF
30° F THRU 60° F	ON	ON	ON	OFF	OFF
60° F THRU 75° F	ON	ON	ON	ON	OFF
75° F +	ON	ON	ON	ON	ON

Ambient Plus Discharge Pressure Control

In order for Discharge Pressure control to function the "PRES TRANS PKG" must be set to "SYSTEM 1-2 AND 3" this parameter is set through the OPTIONS key / COMPRESSOR SYSTEMS subsection of the User Interface.

When a compressor starts on any system, the initial number of condenser fans that are turned on will follow the guidelines in tables 5-6 & 5-7.

After a 5-minute time delay, to allow the system to stabilize, the Discharge Pressure for all systems that have a compressor ON will be monitored.

The condenser fan output number will increase if the highest Discharge Pressure of any system is greater than or equal to 300 psig (R-22) 480 psig (R-410A) and the lowest pressure for any system is no less than 235 psig (R-22) 376 psig (R-410A).

The condenser fan output number will decrease if the lowest Discharge Pressure of any system is less than or equal to 200 psig (R-22) 320 psig (410A) and the highest Discharge Pressure of any system is no greater than 285 psig 456 psig (R-410A).

Whenever a condenser fan is turned on or off, a Cycle Delay timer of sixty seconds must be satisfied before another condenser fan can be turned back on or off.

ECONOMIZER

Economizer is used in cooling mode only. As soon as the UNIT MODE switches to "OCCUPIED COOLING" or "UNOCCUPIED COOLING" and the conditions are within the programmed guidelines for economizer operation the Primary Unit Controller will attempt to use outdoor air to lower the supply air temperature to the "ACTIVE SAT SETPOINT". The following parameters must be programmed into the Primary Unit Controller through the User Interface to enable economizer operation:

- "ECONOMIZER SYSTEM" – PROGRAM key / ECONOMIZER subsection

The choices are "ENABLED" or "DISABLED", it must be set to "ENABLED" for economizer operation.

- "ECONOMIZER METHOD" - OPTIONS key / ECONOMIZER subsection.

The choices are "DRY BULB", "SINGLE ENTHALPY", "DUAL ENTHALPY", "BEST METHOD".

- “*OUTSIDE AIR ENTHALPY LIMIT*” - SETPOINTS key ECONOMIZER subsection.

Dry Bulb

When the “*ECONO METHOD*” is set to “*DRY BULB*”, the Primary Unit Controller will reference the “*OA TEMP*” only to determine the “*ECONO SYS STATUS*”.

The “*ECONO SYS STATUS*” will be NORMAL - ACTIVE if all of the following conditions are met:

- The “*OA TEMP*” is less than or equal to the “*ACTIVE SP*” + 8° F.
- The current “*UNIT MODE*” is OCC COOLING or UNOC COOLING.

Once the “*ECONO SYS STATUS*” is NORMAL ACTIVE, the “*ECONO SYS STATUS*” is set to NORMAL - INACTIVE if any of the following are met:

- The “*OA TEMP*” is greater than or equal to the “*ACTIVE SP*” + 10° F.
- The current “*UNIT MODE*” is not OCC COOLING or UNOCC COOLING.

Single Enthalpy

When the “*ECONO METHOD*” is set to “*SINGLE ENTHALPY*”, the controller will reference the “*OA TEMP*” and “*OA ENTHALPY*” (derived from the “*OA TEMP*” and “*OA RH*”) to determine the “*ECONO SYS STATUS*”.

The “*ECONO SYS STATUS*” will be NORMAL - ACTIVE if all of the following conditions are met:

- The “*OA TEMP*” is less than or equal to the “*ACTIVE SP*” + 8° F.
- The “*OA ENTHALPY*” is less than or equal to the “*OUTSIDE AIR ENTHALPY LIMIT*”.
- The current “*UNIT MODE*” is OCCUPIED COOLING or UNOCCUPIED COOLING

Once the “*ECONO SYS STATUS*” is NORMAL ACTIVE, the “*ECONO SYS STATUS*” is set to NORMAL - INACTIVE if any of the following are met:

- The “*OA TEMP*” is greater than or equal to the “*ACTIVE SP*” + 10° F.
- The “*OA SP ENTHALPY*” is greater than or equal to the “*OUTSIDE AIR ENTHALPY LIMIT*” plus 1 BTU/LB.

- The current “*UNIT MODE*” is not OCC COOLING or UNOCC COOLING

Dual Enthalpy

When the “*ECONO METHOD*” is set to “*DUAL ENTHALPY*”, the Primary Unit Controller will reference the “*OA TEMP*”, “*OA ENTHALPY*” (derived from “*OA TEMP*” and “*OA RH*”), and “*RA ENTHALPY*” (derived from “*RA TEMP*” and “*RA RH*”) to determine the “*ECONO SYS STATUS*”.

The “*ECONO SYS STATUS*” will be NORMAL ACTIVE if all of the following conditions are met:

- The “*OA TEMP*” is less than or equal to the “*ACTIVE SP*” + 8° F.
- The “*OA ENTHALPY*” is less than or equal to the “*RA ENTHALPY*” – 1 BTU/LB.
- The current “*UNIT MODE*” is OCC COOLING or UNOCC COOLING.

Once the “*ECONO SYS STATUS*” is NORMAL ACTIVE, the “*ECONO SYS STATUS*” is set to NORMAL INACTIVE if any of the following are met:

- The “*OA TEMP*” is greater than or equal to the “*ACTIVE SP*” + 10° F.
- The “*OA ENTHALPY*” is greater than or equal to the “*RA ENTHALPY*”.
- The current “*UNIT MODE*” is not OCC COOLING or UNOCC COOLING.

Best Method

When the “*ECONO METHOD*” is set to “*BEST METHOD*”, the Primary Unit Controller will determine the “*ECONO METHOD*” based on the sensor that installed and reliable. The “*DRY BULB*” method will be used if only the “*OAT SENSOR RELIABLE*” is true. The Single Enthalpy method will be used if both the “*OAT SENSOR RELIABLE*” and the “*OA HUMIDITY SENSOR RELIABLE*” are true. The Dual Enthalpy method shall be used if the “*OAT SENSOR RELIABLE*”, “*RET SENSOR RELIABLE*”, “*OA HUMIDITY SENSOR RELIABLE*” and the “*RA HUMIDITY SENSOR RELIABLE*” are all true.

With this setting, all of the above logic for Dry Bulb, Single enthalpy, and Dual Enthalpy apply.

Nonflexsys Economizer

Once the *"ECONO SYS STATUS"* is *"NORMAL ACTIVE"* the Primary Unit Controller will use the economizer *"CONTROL OUTPUT"* to control the return and outdoor damper to maintain the *"ACTIVE SP"*.

Flexsys Economizer

The FlexSys economizer suitability is the same as the above except for the *"OA TEMP"* requirement. On FlexSys units the *"OA TEMP"* must be at least 2° F below the *"MIXED SUPPLY AIR TEMP"* in order for the economizer to become NORMAL ACTIVE.

When the economizer is *"NORMAL - ACTIVE"* it will go *"NORMAL INACTIVE"* if the *"OA TEMP"* is equal to or above the *"MIXED SUPPLY AIR TEMP"*.

Also when economizer is active, the Set Point for the economizer *"CONTROL OUTPUT"* will be the *"MIXED SUPPLY AIR TEMP"* setting and the Feedback will be the *"MIXED SUPPLY AIR TEMP"*.

COMPRESSOR OPERATION

Compressor Data

In order to assist the Service Technician and to assure equal wear on all the compressors in the unit the Primary Unit Controller records the following data pertinent to compressor operation for each compressor:

COMPRESSOR STARTS – Each time one of the compressors state transitions from OFF to ON the *"COMPRESSOR # STARTS"* will be incremented by one, where # will vary to match the compressor number the data is being recorded for, 1A, 1B, 2A etc. This data can be view under the OPERATING HOURS / START COUNTER key of the User Interface.

COMPRESSOR OPERATING HOURS – While the compressor is in the ON state the *"COMPRESSOR # OPER HRS"* will be incremented once for every hour of operation. This value will be accumulated over the lifetime of the compressor. # will vary to match the compressor number the data is being recorded for, 1A, 1B, 2A etc. This data can be view under the OPERATING HOURS / START COUNTER key of the User Interface.

COMPRESSOR RUN TIME – while the compressor is in the ON state the *"COMPRESSOR # RUN TIME"* shall be incremented once per minute. The value will only be accumulated during the current run state and will be reset to zero when the COMPRESSOR RUN STATE switches from ON to OFF. # number will vary to match the compressor number the data is being recorded for. This data can be viewed under the COMPRESSOR SYSTEMS key of the User Interface.

Compressor Ready To Run

In order to determine if a compressor is ready to run the Primary Unit Controller monitors the following derived data while the *"COMPRESSOR # STATE"* is OFF to make the determination:

- *"HIGH DP UNLOAD"*
- *"LOW AMBIENT INHIBIT"*
- *"LOW SUCTION TEMP UNL"*
- *"COMPR # SAFETY TRIP"*
- *"COMPR # SAFETY FAULT"*
- *"COMPR # STAFETY LOCK OUT"*

If all of the above parameters are FALSE (not active) and the minimum off time has been satisfied, the compressor will be placed in the ready to run state.

number will vary to match the compressor number the data is being recorded for, 1A, 1B, 2A etc.

Compressor Ready To Stop

The Primary Unit Controller will set the *"COMPRESSOR # READY TO STOP"* to true when the MINIMUM ON TIMER (3-1/2 minutes) has been satisfied.

number will vary to match the compressor number the data is being recorded for, 1A, 1B, 2A etc.

Compressor Safety Circuit

Each compressor system is equipped with external circuitry monitoring hardware intended to protect the compressors in case the operating characteristics of the refrigeration system fall outside the safe operating envelope for the compressors.

The following safeties comprise the safety circuit:

- Compressor Solid State Motor Protector
- Compressor Overload (Circuit Breaker or Manual Motor Starter)
- High Pressure Cut Out

(The unit also has a low-pressure cutout and monitors the suction line temperature to protect against liquid flood back to the compressor. These items will be discussed later in this section.)

The above safety circuit supplies a digital 24-volt signal to the Primary Unit Controller. The input for compressor System 1 is terminal block TB7 pin 1, System 2 TB7 pin 2, and System 3 TB7 pin 4. If one of the safeties opens, the signal is lost. When this occurs the Primary Unit Controller turns off both compressors of the compressor system having the fault. The Primary Unit Controller then records the time it takes for the safety circuit to reestablish the 24-volt circuit to the Primary Unit Controller. The time to reset is displayed in the history buffer and is identified as *"COMP STATUS (1, 2, OR 3) CLEAR TIME"*. The length of time it takes to reset is an indication of which of the safeties opened. For example, the Compressor Solid State Motor Protector takes 30 minutes to reset. The High Pressure Cutout usually resets in less than a minute, and the Manual Motor Starter must be reset by hand. If the reset time is greater than 60 minutes, as would be the case with the Manual Motor Starter, after 60 minutes the history buffer will replace *"COMP STATUS (1, 2, OR 3) CLEAR TIME"* with *"COMPRESSOR SYSTEM (1, 2, OR 3) TIME OUT."*

The safety circuit input is ignored when both compressors of the system are off. If either or both of the compressor are active and the 24-volt safety circuit input is lost to the Primary Unit Controller for two seconds, the Primary Unit Controller turns off the active compressors for that system. The compressor system will be made active again when the safety circuit is reestablished. However, the event will be stored in the History buffer. During the time the safety circuit is open the User Interface will display the following messages:

- STATUS screen - *"COMPR SYS # STATUS - SAFETY TRIP"*
- COMPRESSOR SYSTEM # screen - *"SAFETY TRIP"*
- The HISTORY buffer will store and display the following - *"COMP # SAFETY TRIP (1 OR 2)"* depending if this is the first or second trip

If the safety circuit opens three times in a 120-minute window, the Primary Unit Controller will lock out the compressor system having the fault and prevent further operation of that compressor system until the system is manually reset. The User Interface will display the following messages:

- STATUS screen - *"COMPR SYS # STATUS - SAFETY LOCKOUT"*
- COMPRESSOR SYSTEM # screen - *"SAFETY LOCKOUT"*
- The HISTORY buffer will store and display the following - *"COMP # SAFETY LOCKOUT"*

Low Pressure Cutout

The operation of the low pressure cutout is the same as the other safety controls described in the above section except the Primary Unit Controller ignores the input from the Low Pressure cutout circuit during the first 45 seconds following the start up of the compressor system. This allows the system pressure to rise during startup particularly if the unit has the pump down option installed. The input to the Primary Unit Controller is a 24-volt digital input at terminal block TB7 pin 5 for System 1, TB7 pin 7 for System 2, and TB7 pin 8 for System 3.

The Low Pressure Safety circuit input is ignored when both compressors of the system are off. If either or both of the compressor are active and the 24-volt signal is lost to the Primary Unit Controller for two seconds, the Primary Unit Controller turns off the active compressors for that system. The compressor system will be made active again when the safety circuit is reestablished. However, the event will be stored in the History buffer. During the time the safety circuit is open the User Interface will display the following messages:

- STATUS screen - *"COMPR SYS # STATUS - SAFETY TRIP"*
- COMPRESSOR SYSTEM # screen - *"SAFETY TRIP"*
- The HISTORY buffer will store and display the following - *"COMP # LPCO SAFETY TRTP (1 OR 2)"* depending if this is the first or second trip.

If the Low Pressure safety circuit opens three times in a 120-minute window, the Primary Unit Controller will lock out the compressor system having the fault and prevent further operation of that compressor system until the system is manually reset. The User Interface will display the following messages:

- STATUS screen - *"COMPR SYS # STATUS - SAFETY LOCKOUT"*
- COMPRESSOR SYSTEM # screen - *"SAFETY LOCKOUT"*
- The HISTORY buffer will store and display the following - *"COMP # LPCO SAFETY LOCKOUT"*

Suction Temperature Monitoring

If either or both compressors of a system are active, the Primary Unit Controller will monitor the analog input from the suction line temperature sensors for the system. If the suction line temperature drops below the *"SUCTION LOW LIMIT"* setting, (34.0° F for R-22 and 37.0° F for R-407C and R-410A) for 10 continuous seconds the Primary Unit Controller will post the following messages, under the STATUS key *"COMP SYS (1,2, OR 3) STATUS - LOW SUCT TEMP UNLOAD"*; COMPRESSOR SYSTEM (1,2, or 3) key *"SYSTEM STATUS LOW SUCT TEMP UNL"*; and under the HISTORY key *"LOW SUCTION TEMP (1,2, OR 3) TRIP"*. The analog suction temperature inputs enter the Primary Unit controller through J3 pin 1 for System 1, J3 pin 4 for System 2 and J3 pin 7 for System 3

If both compressors were operative at the time of the fault, the Primary Unit Controller will turn off the compressor with the longest Compressor Run Time. The primary Unit Controller will then wait one minute and then check the analog input from the suction line temperature sensor. If the suction line temperature drops below the setting, (34.0° F for R-22 and 37.0° F for R-407C and R-410A) for 10 continuous seconds the Primary Unit Controller will turn off the other compressor of the system with the fault and display under the STATUS key *"COMP SYS (1,2, OR 3) STATUS - SAFETY TRIP"*; COMPRESSOR SYSTEM (1,2, or 3) key *"SYSTEM STATUS SAFETY TRIP"*; and under the HISTORY key *LOW SUCTION TEMP (1,2, or 3) TRIP*.

The fault will be cleared for each compressor when the suction line temperature is greater than the *"SUCTION LOW LIMIT"* setting plus 10° F for 10 minutes.

SUPPLY AIR TEMPERING

In some installations the ventilation requirements combined with low outdoor temperature can result in the Supply Air Temperature dropping below the *"ACTIVE SP"* resulting in an over cooling of the space. Supply Air Tempering uses the units heating source to raise the Supply Air Temperature to an acceptable level.

In order for Supply Air Tempering to be active, the following items must be programmed into the Primary Unit Control. Under the PROGRAM key, HEATING subsection *"HEATING SYSTEM"* must be set to ENABLE. Under the PROGRAM key, COOLING subsection *"SUP AIR TEMPERING"* must be set to ENABLE.

The Supply Air Tempering logic will vary depending on the type of heat installed in the unit. A description of each of the operating logics follows.

Modulating Gas Heat, Hot Water And Steam

In order for the Supply Air Tempering to be enabled, the following conditions must be met:

- Operating Conditions

For CV and VAV units the *"SUPPLY AIR TEMP"* must be $\leq$ to the *"ACTIVE SP"* minus 5.0° F for 5 minutes

For FlexSys without Bypass the *"SUPPLY AIR TEMP"* must be $\leq$ to the *"MIXED SUPPLY AIR TEMP"* MINUS 5.0° F for 5 minutes.

For FlexSys with Bypass the *"BYPASS DAMPER POSITION"* must be $\geq$ to the *"MAXIMUM BYPASS"* minus 5%

- Economizer Output must be $\leq$ to 5%
- Compressor operation must have been off for 10 minutes

On modulating hot water and steam, the following criteria must be met to terminate the Supply Air Tempering:

- Operating Conditions

For CV and VAV units the *"SUPPLY AIR TEMP"* must be $\geq$ to the *"ACTIVE SP"* for 5 minutes.

For FlexSys with or without Bypass the *"SUPPLY AIR TEMP"* must be $\geq$ to the *"MIXED SUPPLY AIR TEMP"* for 5 minutes.

- The *"HW / STEAM HEAT - VALVE POSITION"* must be $\leq$ to 2%.

On modulating gas heat, the following criteria must be met to terminate the Supply Air Tempering:

- Operating Conditions

For CV and VAV units the “*SUPPLY AIR TEMP*” must be $\geq$ to the “*ACTIVE SP*” plus 4.0° F for 5 minutes.

For FlexSys with or without Bypass the “*SUPPLY AIR TEMP*” must be $\geq$ to the “*MIXED SUPPLY AIR TEMP*” plus 4.0° F for 5 minutes.

- The “*MOD FURNACE OUTPUT*” must be at 0 %.

Staged Gas Or Electric Heat

In order for the Supply Air Tempering to be enabled, the following conditions must be met:

- Operating Conditions

For CV and VAV units the “*SUPPLY AIR TEMP*” must be $\leq$ to the “*ACTIVE SP*” minus 5.0° F for 5 minutes

For FlexSys without Bypass the “*SUPPLY AIR TEMP*” must be $\leq$ to the “*MIXED SUPPLY AIR*” MINUS 5.0° F for 5 minutes.

For FlexSys with Bypass the “*BYPASS DAMPER POSITION*” must be $\geq$ to the “*MAXIMUM BYPASS*” minus 5%

- Economizer Output must be $\leq$ to 5%
- Compressor operation must have been off for 10 minutes
- The “*HEAT ENTERING TEMP*” must be $\leq$ to the “*ACTIVE SP*” minus 5.0° F for 5 minutes.

The stage heat will stage up and down based on the following criteria:

- The heat section will stage up if the “*SUPPLY AIR TEMP*” is $\leq$ to the “*ACTIVE SP*” minus 5.0° F.
- The heat section will stage down if the “*SUPPLY AIR TEMP*” is $\geq$ to the “*ACTIVE SP*” plus 5.0° F.

The following criteria must be met to terminate the Supply Air Tempering:

- The “*HEAT ENTERING TEMP*” must be $\geq$ to the “*ACTIVE SP*” for 5 minutes.

COMFORT VENTILATION

In order for this mode of operation to function the following parameters must be programmed into the Primary Unit Controller through the User Interface:

- “*UNIT TYPE*” must be set to “*CONSTANT VOLUME*” using the OPTIONS key – UNIT DATA subsection of the User Interface
- “*COMFORT VENTILATION*” must be ENABLED using the PROGRAM key – VENTILATION subsection of the User Interface.
- “*OCC ZONE COOLING*” must be set using the SETPOINTS key – COOLING subsection of the User Interface.
- “*OCC ZONE HEATING*” must be set using the SETPOINTS key – HEATING subsection of the User Interface.

When “*COMFORT VENTILATION*” is selected, the Primary Unit Controller monitors the “*SUPPLY AIR TEMP*” and uses it to energize mechanical cooling or heating even though the thermostat or zone sensor satisfies the normal heating or cooling demand. This prevents the space temperature from getting out of bounds before mechanical heating or cooling is energized. This is usually used when there is a large demand for outdoor air for ventilation.

If the “*SUPPLY AIR TEMP*” is equal to or greater than the “*OCC ZONE COOLING*” set point plus 5° F the Primary Unit controller will enter the COMFORT VENT COOLING mode and initiate compressor operation.

If the “*SUPPLY AIR TEMP*” is equal to or less than the “*OCC ZONE HEATING*” set point minus 5° F, the Primary Unit controller will enter the COMFORT VENT HEATING mode and initiate heating operation.

The Primary Unit controller will terminate COMFORT VENT mode if:

- The “*SUPPLY AIR TEMP*” is less than the “*OCC ZONE COOLING*” set point minus 5° for 5 minutes.
- The “*SUPPLY AIR TEMP*” is greater than the “*OCC ZONE HEATING*” set point plus 5° for 5 minutes.
- The unit switches into the OCCUPIED HEATING OR OCCUPIED COOLING mode as a result of a space sensor demand for cooling or heating.

SYSTEM PUMP DOWN CONTROL

In order for the pump down cycle to work the unit must have a liquid line solenoid valve installed in the main liquid line of each compressor system at the factory. In addition, "*PUMP DOWN*" must be set to **ENABLED** through the User Interface. To do this you would enter the **PROGRAM KEY**, **COMPRESSOR SYSTEM** subsection and scroll to "*PUMP DOWN*" and enter **ENABLED**.

Whenever either compressor of a compressor system is turned on the Primary Unit Control will energize the digital output to "*PUMP DOWN LLSV (1,2 OR 3)*". This digital output can be found at terminal 2 of terminal block TB5 for system 1, terminal 4 of terminal block TB5 for system 2, and terminal 6 of terminal block TB5 for system 3. Terminal Block TB5 is located on the Primary Unit Controller. This is done regardless of whether pump down is enabled or not.

When the last compressor of a compressor system is shut off and pump down is enabled the Primary Unit Control will deenergize the "*PUMPDOWN LLSV*" for that system, start a 30-second Pump Down Monitor Timer, and set the internal Pump Down Active flag to **ON**. The compressor will continue to operate until the Pump Down Active flag is turned **OFF**. The Pump down Active flag will be turned off if either of the following conditions is met:

- The **COMPRESSOR LPCO** (low pressure cutout) for that system opens
- The 30-second Pump Down Monitor timer has timed out

If the liquid line solenoid valve is installed but "*PUMP DOWN*" is set to **DISABLED** the internal Pump Down Active flag will remain off when the last compressor of the system is shut off and the compressor will shut off and the solenoid valve will close as soon as the call for compressor operation is terminated.

If the compressor is shut down due to a Refrigerant System Safety fault the compressor will shut down immediately and the system will not pump down.

HIGH DISCHARGE PRESSURE UNLOADING

By unloading compressors before the discharge pressure reaches the high pressure cutout setting we can help prevent systems lock outs because of high pressure cut out, and continue to provide some cooling with high outside air temperatures, overcharged systems, or dirty condenser coils.

The High Discharge Pressure Unloading set point "*SYSTEM UNLOADING PRESSURE*" is programmed through the User Interface **SETPOINT**, subsection **COMPRESSOR SYSTEMS** key.

In order for this feature to be active the unit must have a discharge pressure transducer installed on each system where High discharge Pressure Unloading is intended to function. The operation of the High Discharge Pressuring Unloading feature is as follows:

- Both compressors must be active in the system before High Discharge Pressure Unloading can occur.
- The system discharge pressure must be $\geq$ to the "*SYSTEM UNLOADING PRESSURE*" for 10 seconds.
- The Primary Unit Controller will then turn off one of the compressor from the system with the fewest number of starts.
- At the point the compressor is turned off the Primary Unit Control will record the Outdoor Temperature.
- The Primary Unit Control will then compare the current Outdoor Air Temperature to the Outdoor Temperature at the time the compressor shut down.
- If the Current Outdoor Temperature is $\leq$ to the Outdoor Temperature at the time of shut down minus 5° F the Primary Unit Control will remove the High Pressure Unloading fault and allow the compressor to restart.

During the time the High Discharge Pressure is active the **STATUS** display of the User Interface will show "*HIGH DP UNLOAD*" under the **COMP SYS (1, 2 OR 3) STATUS** subsection. The **SYSTEM STATUS** subsection of the **COMPRESSOR SYSTEM (1, 2, or 3)** key will also show "*HIGH DP UNLOAD*"

LOW AMBIENT LOCK OUT

If the unit has a "*PRESSURE TRANS PKG*" installed for the system the Primary Unit Controller will allow compressor operation down to 0.0 ° F. If the unit is shipped without "*PRESSURE TRANS PKG*" the minimum outdoor temperature is 50.0° F. However the decision can be made to prevent compressor operation above this minimum allowable setting. This feature allows the lockout of compressor operation above the 0.0° or 50.0° F temperature.

The Lock Out Temperature (*“MECH CLG LOCKOUT TEMP”*) value is programmed under the SETPOINT, subsection COOLING key of the User Interface. The *“MECH COOL LOCKOUT TEMP”* can never be set lower than 0.0° F.

The Primary Unit Control will derive an *“ACTIVE MECH COOL LOCKOUT TEMP”* value based on the following criteria:

- If the Discharge Pressure Transducer is unreliable the *“ACTIVE MECH COOL LOCKOUT TEMP”* is the higher of the *“MECH CLG LOCKOUT TEMP”* or 50.0° F.
- If the Outdoor Temperature sensor is unreliable all compressor operation is prohibited.
- If the Discharge Pressure Transducer and the Outdoor Temperature sensor are reliable the *“ACTIVE MECH COOL LOCKOUT TEMP”* will be the higher of the *“MECH CLG LOCKOUT TEMP”* or 0.0° F.
- If a *“PRESSURE TRANS PKG”* is not installed and the Outdoor Temperature sensor is reliable the *“ACTIVE MECH COOL LOCKOUT TEMP”* will be the higher of the *“MECH CLG LOCKOUT TEMP”* or 50.0° F.

If the Outside Air Temperature is $\leq$ to the *“ACTIVE MECH COOL LOCKOUT TEMP”* for 10 seconds the Primary Unit Control will turn off all the compressors for the system.

If the Outside Air Temperature is $\geq$ to the *“ACTIVE MECH COOL LOCKOUT TEMP”* plus 2.0° F for 10 seconds and the compressor minimum off time has been satisfied the compressors will be allow to restart.

During the time the Low Ambient Lock Out is active the STATUS display of the User Interface will show *“LOW AMB INHIBIT”* under the COMP SYS (1, 2 OR 3) STATUS subsection. The SYSTEM STATUS

subsection of the COMPRESSOR SYSTEM (1, 2, or 3) key will also show *“LOW AMB INHIDIT”*.

FLEXSYS BYPASS DAMPER OPERATION

On some FlexSys installations, a bypass damper may be installed to temper the air going to the underfloor or overhead delivery system. The bypass damper mixes return air with the air leaving the evaporator coil in order to meet the programmed *“MIXED SUPPLY AIR TEMP”* going to the conditioned space.

To determine the *“ACTIVE RETURN AIR BYPASS SP”*, the controller uses the *“MIXED SUPPLY AIR TEMP”*, *“ACTIVE SP”*, and the *“RA TEMP”* to calculate the *“ACTIVE RETURN AIR BYPASS SP”* using formula 1.

If the *“ACTIVE RETURN AIR BYPASS SP”* is calculated to be greater than the *“MAXIMUM BYPASS”*, the *“ACTIVE RETURN AIR BYPASS SP”* shall be equal to the *“MAXIMUM BYPASS”*.

The following logic is used in the control of the Bypass Damper:

- If the *“EVAPORATOR AIR TEMP 1”* is $<$ the *“MIXED SUPPLY AIR TEMP”* set point for 10 minutes the control will set the bypass damper to 0%.
- If the *“EVAPORATOR AIR TEMP 1”* is $<$ the *“MIXED SUPPLY AIR TEMP”* set point and a compressor has been started or stopped in the last 7 minutes the bypass damper is held at its current position.
- If the *“EVAPORATOR AIR TEMP 1”* is $<$ the *“MIXED SUPPLY AIR TEMP”* set point and the difference between the *“EVAPORATOR AIR TEMP 1”* and the *“ACTIVE EVAPORATOR AIR SP”* is $\leq$ or $=$ to the *“COOLING CONTROL OFFSET”* divided by 2 closing and opening of the bypass damper is allowed.

$$\text{“ACTIVE RETURN AIR BYPASS SP”} = \frac{\text{“MIXED SUPPLY AIR TEMP”} - \text{“ACTIVE SP”}}{\text{“RA TEMP”} - \text{“ACTIVE SP”}} * 100$$

FORMULA 1

$$\text{“ACTIVE BYPASS PERCENTAGE”} = \frac{\text{“SUPPLY AIR TEMP”} - \text{“EVAPORATOR AIR TEMP 1”}}{\text{“RA TEMP”} - \text{“EVAPORATOR AIR TEMP 1”}} * 100$$

FORMULA 2

- If the “*EVAPORATOR AIR TEMP 1*” is < the “*MIXED SUPPLY AIR TEMP*” set point and the difference between the “*EVAPORATOR AIR TEMP 1*” and the “*ACTIVE EVAPORATOR AIR SP*” is > then “*COOLING CONTROL OFFSET*” divided by 2 closing and the “*EVAPORATOR AIR TEMP 1*” is > “*ACTIVE EVAPORATOR AIR SP*” opening of the of the bypass damper is allowed.
- If the “*EVAPORATOR AIR TEMP 1*” is < the “*MIXED SUPPLY AIR TEMP*” set point and the difference between the “*EVAPORATOR AIR TEMP 1*” and the “*ACTIVE EVAPORATOR AIR SP*” is > then “*COOLING CONTROL OFFSET*” divided by 2 and the “*EVAPORATOR AIR TEMP 1*” is < or = to “*ACTIVE EVAPORATOR AIR SP*” closing of the of the bypass damper is allowed.
- If opening is allowed and the “*ACTIVE BYPASS PERCENTAGE*” is 2.5% > then the “*ACTIVE RETURN AIR BYPASS SP*” the damper will open.
- If closing is allowed and the “*ACTIVE BYPASS PERCENTAGE*” is 2.5% < then the “*ACTIVE RETURN AIR BYPASS SP*” the damper will close
- If the “*ACTIVE BYPASS PERCENTAGE*” is within +/- 2.5% of the “*ACTIVE RETURN AIR BYPASS SP*” the damper will remain in the hold position.

EVAPORATOR SUPERHEAT CALCULATION

In order to make it easier for the Service Technician to set the proper superheat at the expansion valves the Primary Unit Controller has the capability to calculate Evaporator Superheat.

In order to perform the calculation the compressor system must have a suction pressure transducer installed. If the suction pressure transducer and the suction line temperature sensor are reliable the Primary Unit Controller will display the derived “*SUPERHEAT*” value under the COMPRESSOR SYSTEMS key of the User Interface

STAGED INPUT FAULT

This can only occur on Constant Volume units with the CONTROL METHOD set to “*STAGED*”. If the Primary Unit Controller receives a digital input for either Y1 or Y2 and W1 or W2 at the same time the Primary Unit Controller will declare a STAGED INPUT FAULT. When a STAGED INPUT FAULT is active the Primary Unit Controller will lockout all cooling and heating operation. If either the Y1, Y2 or the W1, W2 digital input is removed for 10 seconds the STAGED INPUT FAULT will be removed.

While the STAGED INPUT FAULT is active the SENSOR / MISC subsection under the STATUS key will display “*SAFETY LOCKOUT*”. In addition a “*STAGED INPUT FAULT*” will be recorded and displayed under the HISTORY key.

SYSTEM STABILITY CHECK

This is a cooling mode feature and is used when two units are twinned together in a master/slave arrangement.

The Primary Unit Controller will initiate “*UNSTABLE SYSTEM*” operation when either of the following conditions are met:

- The “*SUPPLY AIR TEMP*” is less than or equal to 45.0° F for one minute
- The “*SUPPLY VFD SPEED*” command has dropped by the “*FAN SPEED INSTABLE LIMIT*” within the “*FAN SPEED INSTABLE TIME*”

The above values are programmed under the SETPOINT subsection, SUPPLY SYSTEM key of the User Interface.

When the above conditions are met the Primary Unit Controller will turn off half the remaining compressors, according to the Table 5-8.

TABLE 5-8 – COMPRESSOR SHUT OFF	
NUMBER OF COMPRESSORS RUNNING	NUMBER OF COMPRESSORS TO SHUT OFF
6	3
5	2
4	2
3	1
2	1
1	0

The “*UNSTABLE SYSTEM*” flag is turned off as soon as the compressors are turned off and then the Primary Unit Controller will return to normal operation. However, because of the compressor off timer none of the compressors can be brought back on for 5 minutes.

ELECTRIC HEAT

Programmed Data

The following parameters must be programmed into the Primary Unit Controller:

- “*HEATING SYSTEM*” must be set to ENABLE through the PROGRAM key subsection HEATING of the User Interface
- “*HEAT SYSTEM TYPE*” must be set to ELECTRIC HEAT through the OPTIONS key subsection HEATING of the User Interface.
- “*ELECTRIC HEAT CAPACITY*” must be set to the nameplate capacity through the OPTIONS key subsection HEATING of the User Interface.
- “*STG 1 (W1) HEATING SETPOINT*” must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface
- “*STG 2 (W2) HEATING SETPOINT*” must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface
- “*HEATING SAT*” must be programmed for VARIABLE AIR VOLUME and FLEXSYS units through the SETPOINTS key HEATING subsection of the User Interface.

Heating Control Offset

The Primary Unit Control calculates a “*HEAT CONTROL OFFSET*” (HCO) using the following formula:

$$HCO = \frac{KW * 3414}{2.16 * CFM * STAGES}$$

Where

- HCO = “*HEAT CONTROL OFFSET*”
- KW = “*ELECTRIC HEAT CAPACITY*”
- CFM = (See Table 5-9)
- STAGES = Derived value based on the “*ELECTRIC HEAT CAPACITY*”. See Table 5-10 for number of stages

The “*HEATING CONTROL OFFSET*” will be rounded up to the nearest half degree. If the “*HEATING CONTROL OFFSET*” is calculated to be less than 2.0° F, it will be set at 2.0° F.

When the UNIT MODE is “*COMFORT VENT HEATING*” or “*SUP AIR TEMPERING*” is active, the “*HEATING CONTROL OFFSET*” will be fixed at 5.0° F and the heat will be staged up or down as required.

TABLE 5-9 – CFM

UNIT SIZE	CV UNITS CFM	VAV UNITS FLEXSYS UNITS CFM
50 – 55 TON	15000	7500
60 – 65 TON	18000	9000
70 – 75 TON	21000	11500
80 – 85 TON	24000	12000
90 – 95 TON	27000	13500
105 TON	31000	15500
115 TON	34000	17000
130 TON	39000	19500
150 TON	45000	22500

TABLE 5-10 – HEAT STAGES

“ELEC HEAT CAPACITY” (KW)	MAXIMUM STAGES
40	2
40 (200V)	3
80	4
80 (200V)	5
100	5
100 (200V)	6
120	6
160	4
200	5

Active SP

See Tables 5-2 and 5-3 to determine what the “*ACTIVE SP*” value is for CONSTANT VOLUME units.

On VARIABLE AIR VOLUME and FLEXSYS units, the “*ACTIVE SP*” is the “*HEATING SAT*”.

Heating Control

The Primary Unit Control uses the “*SUPPLY AIR TEMPERATURE*” as described below, to determine when to cycle stages on and off:

- If the “*SUPPLY AIR TEMP*” is less than the “*ACTIVE SP*” minus the “*HEATING CONTROL OFFSET*” additional stages will be brought on after an Interstage Delay timer has expired.
- If the “*SUPPLY AIR TEMP*” is greater than the “*ACTIVE SP*” plus the “*HEATING CONTROL OFFSET*” additional stages will be turned off after an Interstage Delay timer has expired.

During the initial call, the Primary Unit Controller uses the following formula to determine how many stages of electric heat to bring on. After which the Primary Unit Controller uses the procedure above for staging additional capacity on or off.

$$N = \frac{SAT - SATSP}{2 * HCO}$$

Where:

- N = Number of Heat Stages Required (Rounded Down to the Nearest Integer)
- SAT = "SUPPLY AIR TEMP"
- SATSP = "ACTIVE SP"
- HCO = "HEATING CONTROL OFFSET"

If the Number of Heat Stages required calculates to less than 1, the Number of Stages is set to 1.

If the Number of Heat Stages required calculates to be greater than the derived "HEAT STAGES" value the Number of Heat Stages required will be set to the "HEAT STAGES" derived value.

When the UNIT MODE is "COMFORT VENT HEATING" or "SUP AIR TEMPERING" is active the initial number of heating stages will not be estimated. Instead, one stage of heat will be brought on at a time.

STAGED GAS HEAT

Programmed Data

The following parameters programmed into the Primary Unit Control:

- "HEATING SYSTEM" must be set to ENABLE through the PROGRAM key subsection HEATING of the User Interface
- "HEAT SYSTEM TYPE" must be set to STAGED GAS FURNACE through the OPTOPNS key subsection HEATING of the User Interface
- "GAS HEAT CAPACITY" must be set to the rating plate value through the OPTIONS key subsection HEATING of the User Interface
- "HEAT LIMIT TEMPERATURE" must be programmed using the SETPOINTS key HEATING subsection of the User Interface.
- "STG 1 (W1) HEATING SETPOINT" must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface

- "STG 2 (W2) HEATING SETPOINT" must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface
- "HEATING SAT" must be programmed for VARIABLE AIR VOLUME and FLEXSYS units through the SETPOINTS key HEATING subsection of the User Interface.

Heating Control Offset

The Primary Unit Control calculates a "HEAT CONTROL OFFSET" (HCO) using the following formula

$$HCO = \frac{180000}{2.16 * CFM * STAGES}$$

Where:

- HCO = "HEAT CONTROL OFFSET"
- CFM = (See Table 5-11)
- STAGES = Derived value based on the "GAS HEAT CAPACITY". See Lockout for number of stages

The "HEAT CONTROL OFFSET" will be rounded up to the nearest half degree. If the "HEAT CONTROL OFFSET" is calculated to be less than 2° F, it will be set at 2.0° F.

When the UNIT MODE is "COMFORT VENT HEATING" or "SUP AIR TEMPERING" is active, the "HEATING CONTROL OFFSET" will be fixed at 5.0° F and the heat will be staged up or down as required

TABLE 5-11 – CFM

CV UNITS CFM	UNIT SIZE	VAV UNITS FLEXSYS UNITS CFM
15000	50 – 55 TON	7500
18000	60 – 65 TON	9000
21000	70 – 75 TON	11500
24000	80 – 85 TON	12000
27000	90 – 95 TON	13500
31000	105 TON	15500
34000	115 TON	17000
39000	130 TON	19500
45000	150 TON	22500

TABLE 5-12 – HEAT STAGES

"GAS HEAT CAPACITY" (MBH)	MAXIMUM STAGES
375	2
750	4
1125	6

Active SP

See Tables 5-2 and 5-3 to determine what the “*ACTIVE SP*” value is for CONSTANT VOLUME units.

On VARIABLE AIR VOLUME and FLEXSYS units, the “*ACTIVE SP*” is the “*HEATING SAT*”.

Heating Control

The Primary Unit Control uses the “*SUPPLY AIR TEMPERATURE*” as described below, to determine when to cycle stages on and off.

- If the “*SUPPLY AIR TEMP*” is less than the “*ACTIVE SP*” minus the “*HEATING CONTROL OFFSET*” additional stages will be brought on after an Interstage Delay timer has expired.
- If the “*SUPPLY AIR TEMP*” is greater than the “*ACTIVE SAT SP*” plus the “*HEATING CONTROL OFFSET*” additional stages will be turned off after an Interstage Delay timer has expired.
- If the “*SUPPLY AIR TEMP*” plus 2 times the “*HEATING CONTROL OFFSET*” is $\geq$ to the “*HEAT LIMIT TEMPERATURE*” the Primary Unit Control will prevent any heat stages from being energized.

During the initial call the Primary Unit Control uses the following formula to determine how many stages of gas heat to bring on. After which the Primary Unit Control uses the procedure above for staging on or off additional capacity.

$$N = \frac{SAT - SATSP}{2 * HCO}$$

Where:

- N = Number of Heat Stages Required (Rounded Down to the Nearest Integer)
- SAT = “*SUPPLY AIR TEMP*”
- SATSP = “*ACTIVE SP*”
- HCO = “*HEATING CONTROL OFFSET*”

If the Number of Heat Stages required calculates to less than 1, the Number of Stages is set to 1.

If the Number of Heat Stages required calculates to be greater than the derived “*HEAT STAGES*” value the Number of Heat Stages required will be set to the “*HEAT STAGES*” derived value.

When the UNIT MODE is “*COMFORT VENT HEATING*” or “*SUP AIR TEMPERING*” is active, the initial number of heating stages will not be estimated. Instead, one stage of heat will be brought on at a time.

Staged Gas Heat Mode Of Operation Status

The Primary Unit Control monitors the time it takes to go between stages of operation (prepurge, ignition, on, purge, etc) and the specified operating state (off, low fire, high fire) to monitor and display the current mode of operation for each gas heat sections

The following information can be viewed for each of the gas heat sections (“*FURNACE 1 MODE*”, “*FURNACE 2 MODE*”, “*FURNACE 3 MODE*”) by pressing the HEATING key of the User Interface:

- OFF
- POST PURGE
- IGNITION
- PURGE
- ON-LOW
- ON-HIGH
- SAFETY TRIP
- SAFETY FAULT
- SAFETY LOCKOUT

“*FURNACE 1 MODE*”, “*FURNACE 2 MODE*”, or “*FURNACE 3 MODE*” will be determined as follows:

- If the “*GAS HEAT CAPACITY*” is set to 375 MBH, the display shall show the “*FURNACE 1 MODE*” data.
- If the “*GAS HEAT CAPACITY*” is set to 750 MBH, the display shall show the “*FURNACE 1 MODE*” and “*FURNACE 2 MODE*” data.
- If the “*GAS HEAT CAPACITY*” is set to 1125 MBH, the display shall show the “*FURNACE 1 MODE*”, “*FURNACE 2 MODE*” and “*FURNACE 3 MODE*” data.

When a heating fault is registered by the Primary Unit Controller, the control turns off the gas heat operation for that section and places that gas heat section in a “*SYSTEM LOCKOUT*” mode. The Primary Unit Controller then initiates a call to the next available heating

section. The “*SYSTEM LOCKOUT*” will remain in effect for one hour or until the Primary Unit Controller is reset. A “*SYSTEM LOCKOUT*” can be reset by turning the “*LOCAL STOP*” switch off for 5 seconds and then back on or by switching the “*HEATING SYSTEM*” parameter from “*ENABLED*” to “*DISABLED*” for 5 seconds and then back to “*ENABLED*”. This can be done through the PROGRAM key HEATING subsection of the User Interface. The faulted heat section will then initiate an ignition sequence, provided the heating demand is still present.

Staged Gas Heat Ignition Sequence

1. The Primary Unit Controller sends a 24-volt signal to the furnace section ignition control from Terminal Block TB3 Terminals 2, 4, or 7.
2. The furnace section ignition control sends a 230-volt signal to the inducer motor
3. When the inducer comes up to speed, the heat section pressure switch closes
4. The ignition control waits 30 seconds and then starts a high voltage spark for 7 seconds. This allows for a prepurge of the heat exchanger.
5. At the same time the ignition control sends a 24-volt signal to low fire solenoid of the gas valve
6. The ignition control then checks for a flame rectification signal, if the signal is present for 15 seconds, an analog signal is sent to the Primary Unit Controller identifying proper operation of the heat section. The 0.0 to 5.0 volt signal enters the Primary Unit Controller through pin 18 of the J5 connector.
7. If ignition control does not receive a flame rectification signal in 7 seconds, it closes the gas valve, turns off the spark and waits 30 seconds.
8. The ignition control then energizes the gas valve and initiates the spark for a 7 second period. If flame rectification is recognized for 15 seconds, an analog signal is sent to the Primary Unit Controller identifying proper operation of the heat section. The 0.0 to 5.0 volt signal enters the Primary Unit Controller through pin 18 of the J5 connector.
9. If the ignition control does not receive a flame rectification signal in 7 seconds, it closes the gas valve, turns off the spark and waits 30 seconds.
10. The ignition control then energizes the gas valve and initiates the spark for a 7 second period. If flame rectification is recognized for 15 seconds, an analog signal is sent to the Primary Unit Controller identifying proper operation of the heat section. The 0.0 to 5.0 volt signal enters the Primary Unit Controller through pin 18 of the J5 connector.
11. If the ignition control does not receive a flame rectification signal in 7 seconds, it closes the gas valve, turns off the inducer, and locks out the operation of that heat section. The heat section remains locked out until the 24-volt power to the ignition control is removed, or 1 hour which ever occurs first
12. The primary unit control will then try to energize the next available heat section and will show the status of that heat section as “*SAFETY LOCKOUT*”
13. If the “*SUPPLY AIR TEMP*” continues to be less than the “*ACTIVE SP*” minus the “*HEATING CONTROL OFFSET*”, the Primary Unit Control energizes the high fire solenoid of the gas valve and the heat section switches to high fire operation. This 24-volt signal originates at Terminal Block TB-3, Terminals 3, 5, or 8 of the Primary Unit Controller.
14. If the “*SUPPLY AIR TEMP*” continues to be less than the “*ACTIVE SP*” minus the “*HEATING CONTROL OFFSET*” additional gas heat sections, if available, are energized. The sequence of operation for the additional heat sections is the same as discussed above.

MODULATING GAS HEAT

Overview

Modulating gas heat can be ordered with a minimum of two gas heat stages (1 heat exchanger section) and a maximum of 6 stages (three heat exchanger sections).

Figure 5-7 shows the staging sequence for the modulating heat stages. As can be seen from the chart, Heat section 1A (modulating) is always the first section on and the last section off. Heat section 1B is always the last section on and the first section off. The number of stages between 1A and 1B operation is depended on the number of heating sections installed in the unit. The modulating heat section, 1A, must always modulate to full fire before any additional stages can be brought on. When additional stages are required, the modulating heat section will go to minimum fire and the next stage of heating will be brought on. If there continues to be a demand for additional heat, the modulating heat section remodulates to high fire before any additional stages can come on. During a decrease in heating demand, the modulating heat section must be at a minimum fire condition before any stages are turned off.

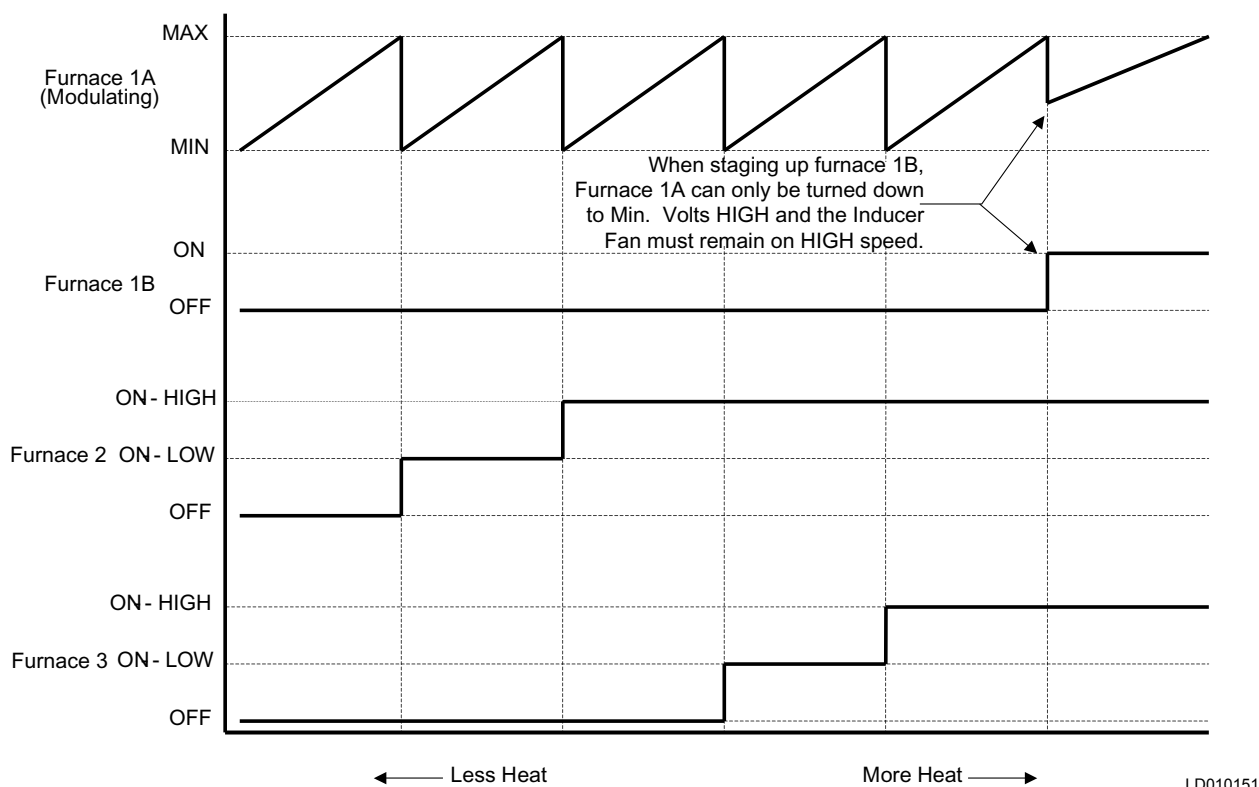


FIG. 5-7 – MODULATING GAS HEAT STAGING SEQUENCE

Programmed Data

The following parameters programmed into the Primary Unit Control:

- “*HEATING SYSTEM*” must be set to **ENABLE** through the **PROGRAM** key subsection **HEATING** of the User Interface.
- “*HEATING SYSTEM TYPE*” must be set to “**MODULATING FURNACE**” through the **OPTIONS** key subsection **HEATING** of the User Interface.
- “*GAS HEAT CAPACITY*” must be set to the rating plate value through the **OPTIONS** key subsection **HEATING** of the User Interface.
- “*HEAT LIMIT TEMPERATURE*” must be programmed using the **SETPOINTS** key **HEATING** subsection of the User Interface.
- “*STG 1 (W1) HEATING SETPOINT*” must be programmed for **CONSTANT VOLUME** units through the **SETPOINTS** key **HEATING** subsection of the User Interface.
- “*STG 2 (W2) HEATING SETPOINT*” must be programmed for **CONSTANT VOLUME** units through the **SETPOINTS** key **HEATING** subsection of the User Interface.

- “*HEATING SAT*” must be programmed for **VARIABLE AIR VOLUME** and **FLEXSYS** units through the **SETPOINTS** key **HEATING** subsection of the User Interface.

Active SP

See Tables 5-2 and 5-3 to determine what the “*ACTIVE SP*” value is for **CONSTANT VOLUME** units.

On **VARIABLE AIR VOLUME** and **FLEXSYS** units, the “*ACTIVE SP*” is the “*HEATING SAT*”.

The modulating heat becomes active as soon as the unit transitions into an **OCCUPIED HEATING** or **UNOCCUPIED HEATING** mode.

Heating Control Offset

The Primary Unit Control uses the “*SUPPLY AIR TEMP*” as described below, to determine when to increase or decrease the heating capacity:

- If the “*SUPPLY AIR TEMP*” is less than the “*ACTIVE SP*” minus the “*HEATING CONTROL OFFSET*” the Primary Unit Control will be set to the **Increase Mode**.

- If the “*SUPPLY AIR TEMP*” is greater than the “*ACTIVE SP*” plus the “*HEATING CONTROL OFFSET*” the Primary Unit Control will be set to the Decrease Mode
- If the “*SUPPLY AIR TEMP*” is within the range of the “*ACTIVE SP*” +/- the “*HEATING CONTROL OFFSET*” the Primary Unit Control will be set to the Hold Mode
- The “*HEATING CONTROL OFFSET*” is programmed at 1-1/2° F.

Modulating Step Size

During the modulating sequence of furnace Section 1A the Heating Valve is stepped UP or DOWN as required. The amount or magnitude of each step increment is determined using the following equation:

$$\text{STEP} = \frac{\text{VHIGH} - \text{LOW}}{\text{INCREMENTS}} \quad (1)$$

And

$$\text{INCREMENTS} = \frac{\text{RAMPTIME}}{\text{CYCLETIME}} \quad (2)$$

Where:

- STEP = Step Voltage of the HEATING VALVE (VDC).
- VHIGH = Programmed Variable Maximum Voltage High (VDC) - 8.5 volts high fire, 6.6 volts low fire.
- VLOW = Programmed Variable Minimum Voltage Low (VDC) - 4.0 volts high fire, 1.0 volt low fire.
- RAMPTIME = Time required to modulate HEATING VALVE from Minimum to Maximum.
- CYCLE TIME = Algorithm Cycle Time – 1 second.

RAMPTIME will vary based on the difference between the “*SUPPLY AIR TEMP*” and the “*ACTIVE SP*”. If the difference is large, the RAMPTIME shall be relatively fast. If the difference is small, the RAMPTIME shall be relatively slow. The following chart shows the relationship between RAMPTIME and SAT error (difference between the “*SUPPLY AIR TEMP*” and the “*ACTIVE SP*”).

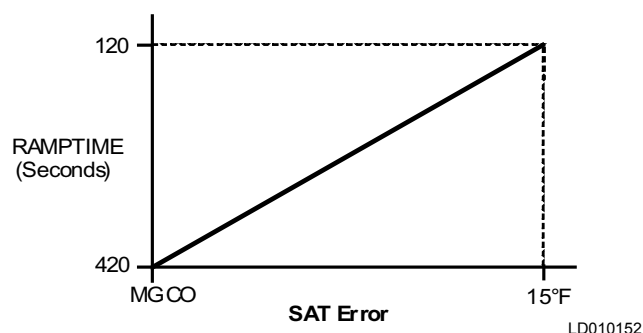


FIG. 5-8 – SAT ERROR

Modulating Gas Heat Mode Of Operation Status

The Primary Unit Control monitors the time it takes to go between stages of operation (prepurge, ignition, on, purge, etc) and the specified operating state (off, low fire, high fire) to monitor and display the current mode of operation for each gas heat sections.

The following information can be viewed for each of the gas heat sections (“*FURNACE 2 MODE*”, “*FURNACE 3 MODE*”) by pressing the HISTORY key of the User Interface:

- OFF
- PURGE
- TRY FOR IGNITION
- ON-LOW
- ON-HIGH
- SAFETY TRIP
- SAFETY FAULT
- SAFETY LOCKOUT

The following information is displayed for gas heat sections “*FURNACE 1A MODE*” and “*FURNACE 1B MODE*”:

- OFF
- PURGE
- TRY FOR IGNITION
- ON
- SAFETY TRIP
- SAFETY FAULT
- SAFETY LOCKOUT

"FURNACE 1A, 1B, 2, OR 3 MODE" will be determined as follows:

- If the *"GAS HEAT CAPACITY"* is set to 375 MBH, the display shall show the *"FURNACE 1A MODE"* and *"FURNACE 1B MODE"* data.
- If the *"GAS HEAT CAPACITY"* is set to 750 MBH, the display shall show the *"FURNACE 1A MODE"*, *"FURNACE 1B MODE"* and *"FURNACE 2 MODE"* data.
- If the *"GAS HEAT CAPACITY"* is set to 1125 MBH, the display shall show the *"FURNACE 1A MODE"*, *"FURNACE 1B MODE"*, *"FURNACE 2 MODE"* and *"FURNACE 3 MODE"* data.

When a heating fault is registered by the Primary Unit Controller, the control turns off the gas heat operation for that section and places that gas heat section in a *"SYSTEM LOCKOUT"* mode. The Primary Unit Controller then initiates a call to the next available heating section. The *"SYSTEM LOCKOUT"* will remain in effect for one hour or until the Primary Unit Controller is reset. A *"SYSTEM LOCKOUT"* can be reset by turning the *"LOCAL STOP"* switch off for 5 seconds and then back on or by switching the *"HEATING SYSTEM"* parameter from *"ENABLED"* to *"DISABLED"* for 5 seconds and then back to *"ENABLED"*. This can be done through the PROGRAM key HEATING subsection of the User Interface. The faulted heat section will then initiate an ignition sequence, provided the heating demand is still present. If furnace section 1A is in a *"SYSTEM LOCKOUT"* mode furnace section 1B will also be locked out.

Furnace Ignition Sequence

1. The Primary Unit Controller sends a 24-volt signal to start heat section 1A heat section through Terminal Block TB3 - Terminal 2.
2. The Primary Unit controller sends a 24-volt signal to place the inducer and gas valve on high fire through Terminal Block TB3 – Terminal 3.
3. When the inducer comes up to speed the low fire and high fire pressure switches closes.
4. The ignition control waits 30 seconds and then starts a high voltage spark for 7 seconds. The 30 seconds delay allows for a prepurge of the heat exchanger.
5. At the same time, the ignition control sends a 24-volt signal to the low and high fire solenoids of the gas valve and ramps the modulating gas valve to minimum high fire.

6. The ignition control then checks for a flame rectification signal, if the signal is present for 15 seconds, an analog signal is sent to the Primary Unit Controller identifying proper operation of the heat section. The 0.0 to 5.0 volt signal enters the Primary Unit Controller through pin 18 of the J5 connector.
7. If the ignition control does not receive a flame rectification signal in 7 seconds, it closes the gas valve, turns off the spark and waits 30 seconds.
8. The ignition control then energizes the gas valve and initiates the spark for a 7 second period. If flame rectification is recognized for 15 seconds, an analog signal is sent to the Primary Unit Controller identifying proper operation of the heat section. The 0.0 to 5.0 volt signal enters the Primary Unit Controller through pin 18 of the J5 connector.
9. If the ignition control does not receive a flame rectification signal in 7 seconds it closes the gas valve, turns off the inducer, and places the 1A and 1B heat sections in a *"SYSTEM LOCKOUT"*.
10. The Primary Unit Controller will then try to energize the next available heat section.
11. If the ignition module receives a rectification signal for 15 seconds the Primary Unit Controller switches the inducer to low speed, turns off the high fire solenoid and ramps the modulating gas valve to minimum low fire.
12. The 1A heat section is now in the modulating mode of operation.
13. If the Primary Unit Controller is in the increase mode it will ramp up the modulating gas valve to high low fire. The Primary Unit Controller then energizes the inducer on high speed and energizes the high fire solenoid of the gas valve. The 1A heat section is now in the minimum high fire mode of operation.
14. If the Primary Unit Controller continues in the increase mode it will ramp the gas valve up to maximum high fire mode of operation.
15. If the Primary Unit Controller continues in the increase mode and the modulating gas valve has been at maximum high fire for 30 seconds it will then bring on the staged heat sections 2 and/or 3 if available. As soon as the Primary Unit Controller receives conformation of heat section 2 or 3 operation, it will modulate the 1A heat section back down to minimum low fire.

16. The modulating heat section must modulate from the minimum low fire to the maximum high fire and maintain maximum high fire operation for 30 seconds between each step of the staged operation.
17. After all the available staged heating capacity is energized and the 1A heat section is on maximum high fire and there is a call for additional capacity the Primary Unit Controller ramps the modulating gas valve to minimum high fire and starts the ignition sequence of the 1B heat section. This ignition sequence is the same as staged gas heat.
18. If additional capacity is required the modulating 1A heat section will ramp up to maximum high fire.
19. At this point the unit is operating at its maximum heat capacity.
20. The de-staging sequence is the reserves of the above sequence with the requirement that the modulating heat section (1A) must always but at minimum low fire before another heat section is turned off.

HOT WATER/STEAM HEAT

Programmed Data

The following parameters programmed into the Primary Unit Controller:

- “HEATING SYSTEM” must be set to ENABLE through the PROGRAM key HEATING subsection of the User Interface.
- “HEAT SYSTEM TYPE” must be set to HOT WATER HEAT or STEAM HEAT through the OPTION key HEATING subsection of the User Interface.
- “HW VALVE ACTION” must be set to “DIRECT” OR REVERSE” through the PROGRAM key HEATING subsection of the User Interface.
- “STG 1 (W1) HEATING SETPOINT” must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface.
- “STG 2 (W2) HEATING SETPOINT” must be programmed for CONSTANT VOLUME units through the SETPOINTS key HEATING subsection of the User Interface.
- “HEATING SAT” must be programmed for VARIABLE AIR VOLUME and FLEXSYS units through the SETPOINTS key HEATING subsection of the User Interface.

Active SP

See Tables 5-2 and 5-3 to determine what the “ACTIVE SP” value is for CONSTANT VOLUME units.

On VARIABLE AIR VOLUME and FLEXSYS units the “ACTIVE SP” is the “HEATING SAT”.

The STEAM or HOT WATER heat becomes active as soon as the unit transitions into an OCCUPIED HEATING or UNOCCUPIED HEATING mode.

Sequence Of Operation

The Primary Unit Control uses the “SUPPLY AIR TEMP” as described below, to determine when to increase or decrease the heating capacity:

- If the “SUPPLY AIR TEMP” is less than the “ACTIVE SP” the Primary Unit Controller will increase the amount of heat.
- If the “SUPPLY AIR TEMP” is greater than the “ACTIVE SP” the Primary Unit Controller will decrease the amount of heat.

The Primary Unit Control sends a 0 to 10 volt DC signal to the hot water or steam valve as described below:

- If the unit is configured for “DIRECT” an increase in heating demand results in an increase in output voltage to the valve.
- If the unit is configured for “REVERSE” an increase in heating demand results in a decrease in output voltage to the valve.

Freeze Protection

If the control is not in an active heating mode but the Supply Fan Air Proving Switch is closed the Primary Unit Controller will control the modulating valve to prevent the supply air temperature from dropping below 38° F

If the Supply Fan Air Proving Switch is open (unit off) and the Outdoor Air Temperature is less than 40° F, a voltage signal will be sent to the modulating valve to open to 100% or 0 % if the valve Action is programmed for “REVERSE”.

Freeze Fault

The Primary Unit Controller monitors the status of the “*HOT WATER FRZ STATUS*” through Terminal Block TB7 Terminal 14. If 24 volts is present, closed contact, for 10 seconds a voltage signal will be sent to the modulating valve to open to 100% or 0 % if the valve Action is programmed for “*REVERSE*”. The Primary Control will start a 5 minute Freeze Trip Timer. The freeze stat closes at 35° F. The STATUS screen of the User Interface will display “*SENSOR / MISC SAFETY TRIP*” and the HISTORY screen will show “*HYDRONIC FREEZESTAT TRIP*”

If the “*HOT WATER FRZ STATUS*” goes low, open contact, during this period the Primary Unit Control will resume normal operation.

If the “*HOT WATER FRZ STATUS*” remains high, closed contact, at the end of this period the Primary Unit Control will shut the unit down and generate a “*LOCK-OUT-HW FREEZE*” fault. The STATUS screen of the User Interface will display “*SENSOR / MISC SAFETY LOCKOUT*” and “*UNIT OVERALL – UNIT LOCK-OUT*”. The HISTORY screen will show “*HYDRONIC FREEZESTAT LOCKOUT*”.

MORNING WARMUP

Morning Warm Up can be initiated in three ways:

1. Hardwired digital signal to the W1 input
2. A Morning Warm Up command from a BAS system
3. Self initiated through the internal “*ADAPTIVE MORN WARM UP ACTIVE*” mode.

The Morning Warm Up operation will be the same for all unit configurations except Constant Volume units using the Staged Control option. Constant Volume units using Staged Control will never enter Morning Warm UP.

Morning Warm Up function will be active if the following conditions are met:

- “*MORNING WARM UP*” is set to ENABLED. “*MORNING WARM UP*” can be found under the PROGRAM key HEATING subsection of the User Interface.
- The Occupancy mode is UNOCCUPIED STANDBY.
- And one of the following is true:
 1. There is a W1 input.
 2. A Morning Warm Up command is received from a BAS system.
 3. “*ADAPT MORN WARM UP ACTIVE*” is set to ENABLED. “*ADAPT MORN WARM UP*” can be found under the PROGRAM key HEATING subsection of the User Interface.

Morning Warm Up function will be inactive if any of the following conditions are met:

- “*MORNING WARM UP*” is set to DISABLED
- The occupancy mode is OCCUPIED
- The W1 low heat input is lost and the Morning Warm Up command from a BAS system is lost.

ADAPTIVE MORNING WARM UP

Adaptive Morning Warm Up can only be used when the internal Schedule function is employed to switch the unit from Unoccupied to Occupied mode. The Primary Unit Control calculates the start time for the heat to ensure the Return Air Temperature is within 0.5° F of the “*RAT HEATING SETP*” set point when the unit switches to the occupied mode. To do this the Primary Unit Control calculates the “*MORN WARM UP OPTIMUM TIME*” by averaging the time it takes to bring the “*RA TEMP*” to within 0.5° F of the “*RAT HEATING SETP*” set point for three consecutive days. The three warm up times are averaged and added to a 10 minute offset. The new time is used as the “*MORN WARM UP OPTIMUM TIME*” for the next day.

In order to use Adaptive Morning Warm Up the Primary Control must be configured as follows:

- The “*OCCUPANCY SCHEDULE*” must be programmed for the Occupied, Unoccupied start and stop times. This is done through the SCHEDULE key of the User Interface.
- The “*OCCUPANCY SCHEDULE*” must be ENABLED. This is done through the SCHEDULE key of the User Interface.
- “*MORN WARM UP*” must be set to ENABLED. This can be done through the PROGRAM key HEATING subsection of the User Interface.
- “*ADAPT MORN WARM UP*” must be set to ENABLED. This can be done through the PROGRAM key HEATING subsection of the User Interface.

- “*RAT HEATING SETP*” must be set. This can be done through the SETPOINTS key HEATING subsection of the User Interface.
- “*MORNING WARM UP MAX TIME*” must be set. This can be done through the SETPOINTS key HEATING subsection of the User Interface.

The following limitations apply:

- If the “*MORN WARM UP OPTIMUM TIME*” exceeds the “*MORN WARM UP MAX TIME*” the “*MORN WARM UP OPTIMUM TIME*” shall be “*MORN WARM UP MAX TIME*”.
- If the “*MORN WARM UP OPTIMUM TIME*” is determined to be less than 15 minutes, the “*MORN WARM UP OPTIMUM TIME*” shall be set to 15 minutes.
- The default values for “*DAILY WARM UP TIME DAY 1*”, “*DAILY WARM UP TIME DAY 2*”, and “*DAILY WARM UP TIME DAY 3*” shall initially be set at 60 minutes. These values can be reset to the default values by turning the “*MORN WARM UP*” to DISABLED and then back ENABLED.

Sequence of Operation

1. If the Return Air Temperature is not $\leq$ to the “*RAT HEATING SETP*”- 1.0° F the Primary Unit Control sets the daily warm up time to 5 minutes and energizes the heating sequence.
2. If the Return Air Temperature is $\leq$ to the “*RAT HEATING SP*”- 1.0° F the Primary Unit Control uses the “*OPTIMUM WARM UP TIME*” and energizes the heating sequence.
3. The Primary Unit Control sets the “*ACTIVE SP*” as follows:
 - VAV units it is the “*HEATING SAT*”
 - CV units it is the “*STG 2 (W2) HEATING SETPOINT*”
4. The heat source remains energized until the Return Air Temperature is $\geq$ to the “*RAT HEATING SETP*”+ 0.5° F or the unit goes into the occupied mode.
5. The Primary Unit Control records the time the heat source is energized as described below:
 - If the heat source was terminated because it was within 0.50 F of the “*RAT HEATING SETP*” the Primary Unit Control replaces the Day 3 time with the Day 2 time; the Day 2 times with the Day 1 time and replaces the Day 1 time with the current value. It then averages the three values and adds 10 minutes and this becomes the new “*OPTIMUM WARM UP TIME*” for the next day.
 - If the heat source does not bring the “*RA TEMP*” up to the “*RAT HEATING SETP*” before the Morning Warm Up is stopped the Primary Unit Control calculates a approximate daily warm up time using the following formula.

$$\text{Warm Up Time} = \left\{ \frac{\text{TIME}}{\text{TEMP 2} - \text{TEMP 1}} \right\} * (\text{Setpoint} - \text{Temp1})$$

Where:

- Warm Up time = time to be recorded as the Daily Warm Up Time.
- Time = Elapsed time when Warm Up Stopped.
- TEMP2 = “*RA TEMP*” when the Warm Up stopped.
- TEMP1 = “*RA TEMP*” when the Warm Up started.
- Set Point = “*RAT HEATING SETP*”.

If the time from when heat is started and Morning Warm Up is stopped is less than 10 minutes, the Primary Unit Control will use the daily warm up time for the previous day and will not approximate a warm up time.

If the approximate daily warm up time exceeds the “*MORN WARM UP MAX TIME*”, the daily warm up time will be set equal to the “*MORN WARM UP MAX TIME*”.

FLEXSYS UNDER FLOOR TEMPERATURE CONTROL

Programmed Data

The following parameters must be programmed into the Primary Unit Controller:

- “*ACTIVE SLAB CONTROL*” must be set to **ENABLED** under the PROGRAM key COOLING subsection of the User Interface.
- “*DEW POINT RESET*” must be set to **ENABLED** under the PROGRAM key COOLING subsection of the User Interface.
- “*HEATING SYSTEM*” must be set to **ENABLED** under the PROGRAM key HEATING subsection of the User Interface.

Under Floor Heating Sequence Of Operation

Occupied Standby

1. The Primary Unit Control checks the “*UNDER FLOOR TEMP*” immediately after transitioning from Unoccupied to Occupied Standby mode
2. If the “*UNDER FLOOR TEMP*” is less than or equal to the “*MIXED SUPPLY AIR TEMP*” minus 2.0° F, the “*UNDER FLOOR TEMP OVERRIDE*” shall be set to **ACTIVE**.
3. The “*UNDER FLOOR TEMP CONTROL SP*” is set to the “*MIXED SUPPLY AIR TEMP*” plus 10.0° F.
4. The Primary Unit Control then generates a call for one stage of heat for staged heat operation or controls the “*SUPPLY AIR TEMPERATURE*” to the “*UNDER FLOOR TEMP CONTROL SP*” for modulating heat.
5. Heating operation will continue until:
 - The “*UNDER FLOOR TEMP*” rises to or above the “*MIXED SUPPLY AIR TEMP*”
 - Or 20 minutes has elapsed

Unoccupied Standby

1. The Primary Unit Control checks the “*UNDER FLOOR TEMP*” immediately after transitioning from Occupied to Unoccupied Standby mode.

2. If the “*UNDER FLOOR TEMP*” is less than the “*RA TEMP*” minus 2.0° F, the “*UNDER FLOOR TEMP OVERRIDE*” shall be set to **Active**.
3. The “*UNDER FLOOR TEMP CONTROL SP*” is set to the present instantaneous “*RA TEMP*” plus 10.0° F.
4. The Primary Unit Control then generates a call for one stage of heat for staged heat operation or controls the “*SUPPLY AIR TEMPERATURE*” to the “*UNDER FLOOR TEMP CONTROL SP*” for modulating heat.
5. Heating operation will continue until:
 - The “*UNDER FLOOR TEMP*” rises to or above the “*RA TEMP*” plus 1.0° F
 - Or 20 minutes has elapsed

Dew Point Reset Sequence Of Operation

The Primary Unit Control uses the “*SUPPLY AIR TEMP*” and the “*UNDER FLOOR HUMIDITY*” to calculate the “*UNDER FLOOR DEW POINT*”

If the “*UNDER FLOOR DEW POINT*” is less than the “*UNDER FLOOR TEMP*” PLUS 2.0° F for 120 seconds the Primary Unit Control will switch to the “*EVAP LEAVING AIR TEMP LOW*” set point.

EXHAUST FAN OPERATION

On/off Control Based On Damper Position

Required Programmed Values

“*POWER EXHAUST*” must be set to **ENABLED**. This is set through the PROGRAM key EXHAUST subsection of the User Interface.

“*POWER EXHAUST TYPE*” must be set to “*ON-OFF DAMPER CONTROL*” through the OPTION key EXHAUST subsection of the User Interface.

“*ECONO OUPUT FOR FAN START*” must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

“*ECONO OUPUT FOR FAN STOP*” must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

Operation

This option is only available on Constant Volume units. The fixed speed motor is turned on and off based on the position of the outside air damper. The Exhaust Motor is turned on when the damper position is $\geq$ to the *"ECONO OUTPUT FOR FAN START"* setting and turns off when the damper position is $\leq$ to the *"ECONO OUTPUT FOR FAN STOP"*.

On/off Control Based On Building Pressure**Required Programmed Values**

"POWER EXHAUST" must be set to ENABLED. This is set through the PROGRAM key EXHAUST subsection of the User Interface.

"POWER EXHAUST TYPE" must be set to *"ON-OFF PRESS CONTROL"* through the OPTION key EXHAUST subsection of the User Interface.

"BUILDING PRESSURE SETPOINT" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"BLDG PRESSURE CNTRL OFFSET" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

Operation

This option is only available on Constant Volume units. The fixed speed exhaust motor is turned on and off based on the building pressure. When the Building Static Pressure input is equal to or greater than the *"BUILDING PRESSURE SETPOINT"* plus the *"BLDG PRESSURE CNTRL OFFSET"*, the exhaust fan will turn on. When the Building Static Pressure input is equal to or less than the *"BUILDING PRESSURE SETPOINT"* minus the *"BLDG PRESSURE CNTRL OFFSET"* the exhaust fan will turn off.

Modulating Damper With Fixed Speed Exhaust**Required Programmed Values**

"POWER EXHAUST" must be set to ENABLED. This is set through the PROGRAM key EXHAUST subsection of the User Interface.

"POWER EXHAUST TYPE" must be set to *"VFD MODULATED FAN"* through the OPTION key EXHAUST subsection of the User Interface.

"BUILDING PRESSURE SETPOINT" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"BLDG PRESSURE CNTRL OFFSET" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"EXHAUST OUTPUT FOR FAN START" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"EXHAUST OUTPUT FOR FAN STOP" must be set using the SETPOINTS key EXHASUT subsection of the User Interface.

Operation

This option is available on all units. A variable voltage analog output from the Primary Unit Control controls the position of the exhaust damper. The output is based on the difference between the actual building pressure and *"BUILDING PRESSURE SETPOINT"*. If the actual building pressure is greater than the *"BUILDING PRESSURE SETPOINT"* the Primary Unit Control will initiate a voltage ramp to the exhaust damper. The rate at which the (voltage) increases will vary based on the difference between the actual building pressure and the *"BUILDING PRESSURE SETPOINT"*, and the *"BLDG PRESSURE CNTRL OFFSET"*. The User Interface will show this output as a %. 0 volts is 0% and 10 volts is 100%. This output can be found at terminals 3 and 4 of terminal block TB9 of the Primary Unit Control. An increase in the pressure difference or reprogramming the *"BLDG PRESSURE CNTRL OFFSET"* to a higher value will result in a quicker ramp in the voltage output.

When the percentage output to the exhaust damper is $\geq$ to the *"EXHAUST OUTPUT FOR FAN START"* the Primary Unit Control will send a binary signal to the exhaust motor and the motor will start. This binary output originates at terminal 4 of terminal block TB1 of the Primary Unit Controller.

The exhaust damper will then modulate to maintain the *"BUILDING PRESSURE SETPOINT"*.

When the percentage output to the exhaust damper is $\leq$ to the *"EXHAUST OUTPUT FOR FAN STOP"* the Primary Unit Control will remove the binary signal to the exhaust motor and the motor will stop.

Modulating Exhaust With A VFD

Required Programmed Values

"POWER EXHAUST" must be set to ENABLED. This is set through the PROGRAM key EXHAUST subsection of the User Interface.

"POWER EXHAUST TYPE" must be set to *"VFD MODULATED FAN"* through the OPTION key EXHAUST subsection of the User Interface.

"BUILDING PRESSURE SETPOINT" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"BLDG PRESSURE CNTRL OFFSET" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"EXHAUST OUTPUT FOR FAN START" must be set using the SETPOINTS key EXHAUST subsection of the User Interface.

"EXHAUST OUTPUT FOR FAN STOP" must be set using the SETPOINTS key EXHASUT subsection of the User Interface.

Operation

This option is available on all units. A variable voltage analog output from the Primary Unit Control varies the speed of the VFD exhaust motor. The output is based on the difference between the actual building pressure and *"BUILDING PRESSURE SETPOINT"*. If the actual building pressure is greater than the *"BUILDING PRESSURE SETPOINT"* the Primary Unit Control will initiate a voltage ramp to the VFD. The rate at which the (voltage) increases will vary based on the difference between the actual building pressure and the *"BUILDING PRESSURE SETPOINT"*, and the *"BLDG PRESSURE CNTL OFFSET"*. The User Interface will show this output as a %. 0 volts is 0% and 10 volts is 100%. This output can be found at terminals 3 and 4 of terminal block TB9 of the Primary Unit Control. An increase in the pressure difference or reprogramming the *"BLDG PRESSURE CNTL OFFSET"* to a higher value will result in a quicker ramp in the voltage output.

When the percentage output to the VFD is $\geq$ to the *"EXHAUST OUTPUT FOR FAN START"* the Primary Unit Control will send a binary signal to the exhaust fan VFD and the motor will start. This binary output originates at terminal 4 of terminal block TB1 of the Primary Unit Controller.

The speed of the VFD will then modulate to maintain the *"BUILDING PRESSURE SETPOINT"*.

When the percentage output to the VFD is $\leq$ to the *"EXHAUST OUTPUT FOR FAN STOP"* the Primary Unit Control will remove the binary signal to the exhaust fan VFD and the motor will stop.

RETURN FAN OPERATION

VFD Return Fan Without Exhaust

Required Programmed Values

"POWER EXHAUST" must be set to ENABLED. This is set through the PROGRAM key EXHAUST subsection of the User Interface.

"POWER EXHAUST TYPE" must be set to *"RETURN FAN W/O EXHAUST"* through the OPTION key EXHAUST subsection of the User Interface.

"SUPPLY SYSTEM TYPE" must be set to *"SUPPLY + RETURN FANS"* through the OPTIONS key SUPPLY SYSTEM subsection of the User Interface.

Operation

The Return Fan is started and stopped with the Supply Fan, if the Supply Fan is on the Return Fan will also be energized. The speed of the Return Fan will be controlled by the Return Fan Plenum Pressure Control Loop to maintain the Active Return Plenum Pressure Set Point. The Active Return Plenum pressure Set Point will be set to the Minimum Plenum Pressure of 0.05" of WC.

VFD Return Fan With Exhaust

Required Programmed Values

“*POWER EXHAUST*” must be set to **ENABLED**. This is set through the **PROGRAM** key **EXHAUST** subsection of the User Interface.

“*POWER EXHAUST TYPE*” must be set to “*RETURN FAN W EXHAUST*” through the **OPTION** key **EXHAUST** subsection of the User Interface.

“*SUPPLY SYSTEM TYPE*” must be set to “*SUPPLY + RETURN FANS*” through the **OPTIONS** key **SUPPLY SYSTEM** subsection of the User Interface.

“*BUILDING PRESSURE SETPOINT*” must be set using the **SETPOINTS** key **EXHAUST** subsection of the User Interface.

“*BLDG PRESSURE CNTRL OFFSET*” must be set using the **SETPOINTS** key **EXHAUST** subsection of the User Interface.

Operation

The Return Fan is started and stopped with the Supply Fan, if the Supply Fan is on the Return Fan will also be energized. The speed of the Return Fan will be controlled by the Return Fan Plenum Pressure Control Loop to maintain the Active Return Plenum Pressure Set Point. The Active Return Plenum Pressure Set Point will vary based on the value of the Exhaust Output. The Exhaust Output value is generated by a proportional control algorithm using the “*BUILDING PRESSURE SETPOINT*” and “*BLDG PRESSURE CNTRL OFFSET*” (see Figure 5-9).

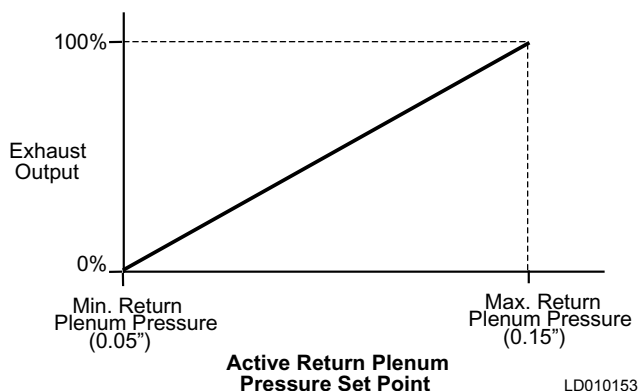


FIG. 5-9 – ACTIVE RETURN PLENUM PRESSURE SET POINT VS. EXHAUST OUTPUT.

VENTILATION SYSTEM

Overview

The Primary Unit Controller can be configured for several different damper and ventilation options. The damper options are:

- None
- 2-Position Damper
- Standard Dampers
- Minimum Flow IAQ
- Full Flow IAQ
- 1/3 – 2/3 Flow IAQ

Everything except the **NONE** and **2-POSITION DAMPER** can be configured for:

- Demand Ventilation
- Fixed Minimum

In order for the Ventilation System to be active the following must occur:

- The unit mode must be **OCC STANDBY**, **OCC COOLING**, **OCC COOLING LOW**, **OCC COOLING HIGH**, **OCC HEATING**, **OCC HEATING LOW**, or **OCC HEATING HIGH**.
- There must be a 24-volt output from the Primary Unit Controller to the Supply Fan control circuit. This output is contained at Terminal Block TB1-Terminal 2.
- There must be a 24-volt input to the Primary Unit Controller from the Supply Fan Air Proving Switch to verify Supply Fan operation 30 seconds after the Supply Fan circuit is energized. This input is contained at Terminal Block TB7 – Terminal 10.
- When the economizer becomes active the position of the dampers are controlled by the Economizer PI logic and can move the dampers beyond the Active Ventilation Minimum Position; however, the Economizer PI logic can never close the dampers less than the Active Ventilation Minimum Position.

2-Position Damper

Required Program Values

“*DAMPER HARDWARE*” must be set to “*2-POSITION DAMPER*”. This is set through the **OPTIONS** key **VENTILATION** subsection of the User Interface.

“VENTILATION SYSTEM” must be set to ENABLED. This is set through the PROGRAM key VENTILATION subsection of the User Interface.

Sequence Of Operation

The analog output to the Outdoor damper is 10.0 volts when the Ventilation System Status is active. The analog output to the Outdoor damper is 0.0 volts when the Ventilation System Status is inactive. The amount of outdoor air is set by adjusting the damper linkage.

Demand Ventilation

Required Program Values

“VENTILATION CONTROL” must be set to *“DEMAND”*. This is set through the OPTIONS key VENTILATION subsection of the User Interface.

“DAMPER HARDWARE” must be set to *“STANDARD DAMPERS”*, *“MINIMUM FLOW IAQ”*, *“FULL FLOW IAQ”*, or *“1/3 – 2/3 FLOW IAQ”*. This is set through the OPTIONS key VENTILATION subsection of the User Interface.

“VENTILATION SYSTEM” must be set to ENABLED. This is set through the PROGRAM key VENTILATION subsection of the User Interface.

“INSIDE-OUTSIDE CO2 OFFSET” must be set through the SETPOINTS key VENTILATION subsection of the User Interface.

On units configured as *“STANDARD DAMPERS”* the *“OA DAMPER MIN POSITION 1”* and *“OA DAMPER MIN POSITION 2”* must be set through the SETPOINTS key VENTILATION subsection of the User Interface.

On units configured as *“MINIMUM FLOW IAQ”*, *“FULL FLOW IAQ”*, or *“1/3 – 2/3 FLOW IAQ”* the *“MIN FLOW DEMAND VENTILATION”* and *“MAX FLOW DEMAND VENTILATION”* must be set through the SETPOINTS key VENTILATION subsection of the User Interface.

Sequence Of Operation

The position of the outdoor air damper is determined by the difference of the CO2 level in the return air versus the CO2 level of the outdoor air. When the indoor CO2 level becomes $\geq$ to the outdoor CO2 level plus the

“INSIDE-OUTSIDE CO2 OFFSET” the Primary Unit Controller will use a PI algorithm to open the outside air damper from the *“OA DAMPER MIN POSITION 1”* or *“MIN FLOW DEMAND VENTILATION”* towards the *“OA DAMPER MIN POSITION 2”* or *“MAX FLOW DEMAND VENTILATION”* setting. The Primary Unit Controller will then modulate the damper to lower the indoor CO2 level between the minimum and maximum settings.

Fixed Minimum

Required Program Values

“VENTILATION CONTROL” must be set to *“FIXED MINIMUM”*. This is set through the OPTIONS key VENTILATION subsection of the User Interface.

“DAMPER HARDWARE” must be set to *“STANDARD DAMPERS”*, *“MINIMUM FLOW IAQ”*, *“FULL FLOW IAQ”*, or *“1/3 – 2/3 FLOW IAQ”*. This is set through the OPTIONS key VENTILATION subsection of the User Interface.

“VENTILATION SYSTEM” must be set to ENABLED. This is set through the PROGRAM key VENTILATION subsection of the User Interface.

On units configured as *“MINIMUM FLOW IAQ”*, *“FULL FLOW IAQ”*, or *“1/3 – 2/3 FLOW IAQ”* the *“MINIMUM OA FLOW SET POINT”* must be set through the SETPOINTS key VENTILATION subsection of the User Interface.

On units configured as *“STANDARD DAMPERS”* the *“OA DAMPER MIN POSITION 1”* and *“OA DAMPER MIN POSITION 2”* must be set through the SETPOINTS key VENTILATION subsection of the User Interface.

Sequence Of Operation

On unit with air measuring stations, configured for *“MINIMUM FLOW IAQ”*, *“FULL FLOW IAQ”*, or *“1/3 – 2/3 FLOW IAQ”* the damper minimum position is the programmed *“MINIMUM OA FLOW SET POINT”*.

On units configured for *“STANDARD DAMPERS”* and the Unit Type is set to CONSTANT VOLUME the damper minimum position is the programmed *“OA DAMPER MIN POSITION 1”*.

On units configured for “*STANDARD DAMPERS*” and the Unit Type is set to VARIABLE AIR VOLUME or FLEXSYS the minimum position will vary between the “*OA DAMPER MIN POSITION 1*” and “*OA DAMPER MIN POSITION 2*” based on the speed of the VFD Supply Fan. As the fan speed decreases the damper position will increase.

The following formula is used to calculate the damper position:

$$MP = \left[\frac{MP_1 - MP_2}{50} \right] VFD + 2 (MP_2 - MP_1) = MP_1$$

Where:

- MP = Active Minimum Air Flow
- MP_1 = “*OA DAMPER MIN POSITION 1*”
- MP_2 = “*OA DAMPER MIN POSITION 2*”
- VFD = Output to supply Fan VFD

Air Measuring Stations

General

The use of Air Measuring Stations (AMS) is the most effective way to comply with exact ventilation requirements regardless of the speed of the VFD Supply Fan.

There are three AMS options available on this product Minimum Flow IAQ, Full Flow IAQ, and 1/3-2/3 Flow IAQ

On Minimum and Full Flow IAQ a differential pressure transducer is used to measure a differential pressure across the Air Measuring Station (AMS), which corresponds to an average velocity through the AMS. The measured differential pressure is converted by the Primary Unit Controller to an approximate airflow.

On 1/3-2/3 Flow IAQ two differential pressure transducers, one for each AMS, are used. This allows the Primary Unit Controller to calculate the airflow through each of the AMS stations.

The Primary Unit Controller applies a correction factor to the above values based on altitude and outdoor temperature.

Required Program Values

“*DAMPER HARDWARE*” must be set to “*MINIMUM FLOW IAQ*”, “*FULL FLOW IAQ*”, or “*1/3-2/3 FLOW IAQ*”. This is set through the OPTIONS key VENTILATION subsection of the User Interface.

“*VENTILATION SYSTEM*” must be set to ENABLED. This is set through the PROGRAM key VENTILATION subsection of the User Interface.

“*UNIT INSTALLED ALTITUDE*” is set using the SETPOINT key VENTILATION subsection of the Unit Controller.

Minimum Flow IAQ

Sequence Of Operation

Minimum Flow IAQ is an approach where only the minimum required OA flow is measured. This is accomplished by using a small Air Measurement Station (AMS) capable of only measuring 33% of the full flow capability of the unit. This is a somewhat less expensive flow measurement option and provides reasonable accuracy at low flows. However, only airflows up to 33% are measurable by the system. This may be acceptable since verifying that the minimum ventilation requirement is being met is most important.

This arrangement consists of an AMS sized for 33% total unit flow and a separate economizer damper sized for the remaining 67%. Figure 5-10 details this arrangement and indicates the three independently controlled dampers required for this option. Damper #2 and #3 shall be arranged Normally Closed (0V = Closed, 10V = Open) and Damper #1 shall be arranged Normally Open (0V = Open, 10V = Closed).

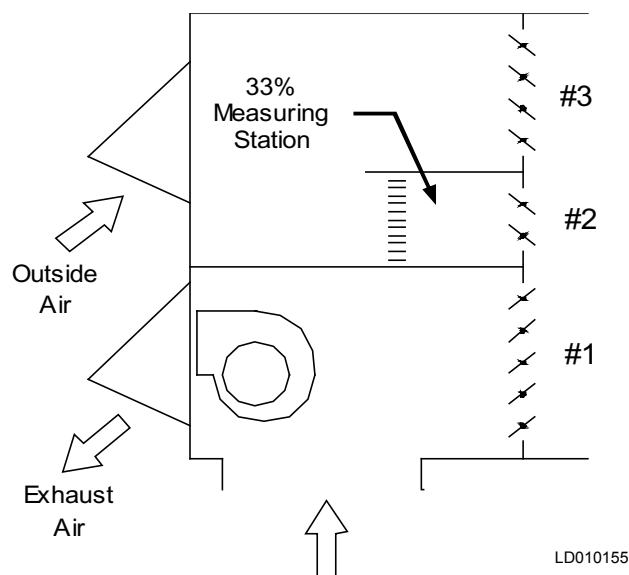


FIG. 5-10 – MINIMUM FLOW MEASUREMENT ARRANGEMENT

Figure 5-11 shows the relationship between the damper output voltages versus the Flow Control PI for airflows up to 33%.

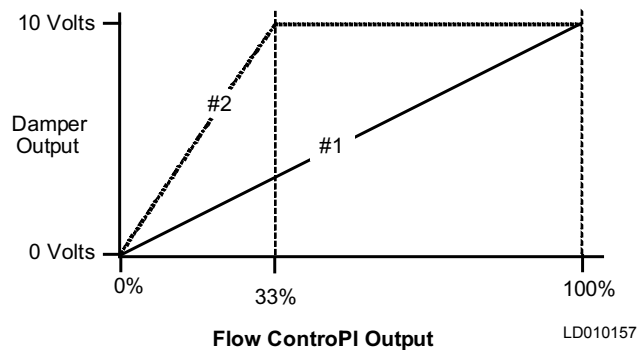


FIG. 5-11 – MINIMUM FLOW MEASUREMENT OPTION, FLOW CONTROL

Damper #3 shall remain closed at all times unless OA conditions are suitable for economizing. When OA conditions are suitable for economizing, damper #3, in addition to damper #1 and #2, shall be controlled per the Economizer PI output. Figure 5-12 details the relationship between damper output voltages versus the Economizer PI.

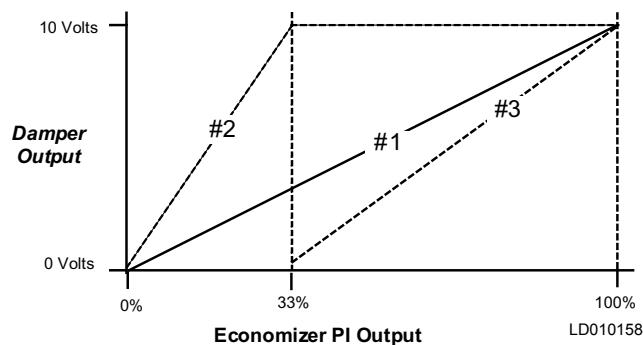


FIG. 5-12 – MINIMUM FLOW MEASUREMENT OPTION, ECONOMIZER

Full Flow IAQ

Sequence Of Operation

Full Flow Measurement is an approach where the full OA flow is measured by one large AMS. This approach is more expensive than the Minimum Flow Measurement approach because the AMS is larger; however, full OA flow is measurable. The only disadvantage to this approach is that flow measurement accuracy decreases as flow rate decreases and the inaccuracies can become quite substantial at relatively moderate flow rates.

This arrangement consists of one large AMS sized for 100% total unit flow. Figure 5-13 details this arrangement. With this arrangement, the outside and return air dampers are mechanically tied together. Only one Analog Output is required for this option.

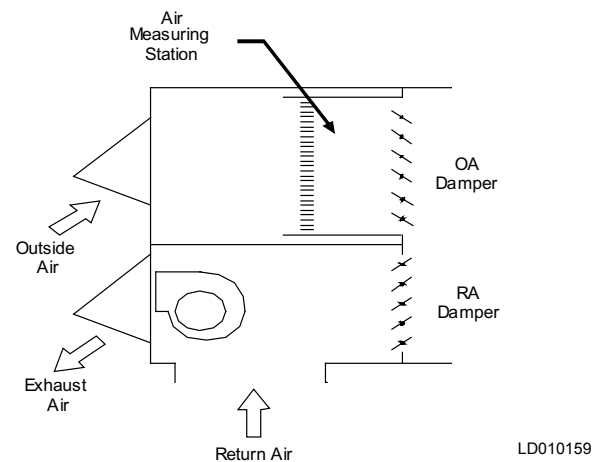


FIG. 5-13 – FULL FLOW MEASUREMENT ARRANGEMENT

When Ventilation Status is ACTIVE, damper output #1 shall be controlled per the Flow Control PI Output. Figure 5-14 details the relationship of the Damper Output voltage vs. the Flow Control PI Output.

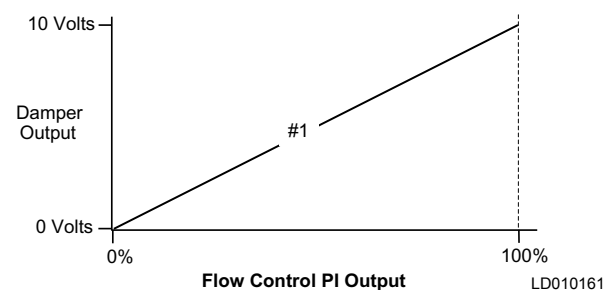


FIG. 5-14 – FULL FLOW, MINIMUM, AND 1/3-2/3 MEASUREMENT OPTION, FLOW CONTROL

When OA conditions are suitable for economizing Damper Output #1 shall be controlled per the Flow Control PI Output. Figure 5-15 details the relationship of the OA Damper voltage vs. the Economizer PI Output.

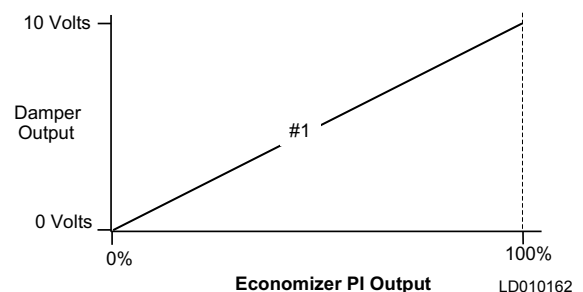


FIG. 5-15 – FULL FLOW, MINIMUM, AND 1/3-2/3 MEASUREMENT OPTION, ECONOMIZER

1/3 – 2/3 FLOW IAQ**Sequence Of Operation**

1/3 – 2/3 Flow Measurement is an approach that utilizes two separate Air Measurement Stations to measure the full OA flow. This approach is the most expensive because it requires two individual AMS's; however, reasonable measurement accuracy is available at all but the very smallest flow rates.

This arrangement consists of two separate Air Measurement Stations, one sized for 1/3 system flow and the other sized for 2/3 system flow. These flow measurement stations will be staged throughout the full flow range to increase measurement accuracy at low flow rates. Figure 5-17 details this arrangement. As with the Minimum Flow Measurement option, this option consists of three independently controlled dampers. Damper #2 and #3 shall be arranged Normally Closed (0V = Closed, 10V = Open) and Damper #1 shall be arranged Normally Open (0V = Open, 10V = Closed).

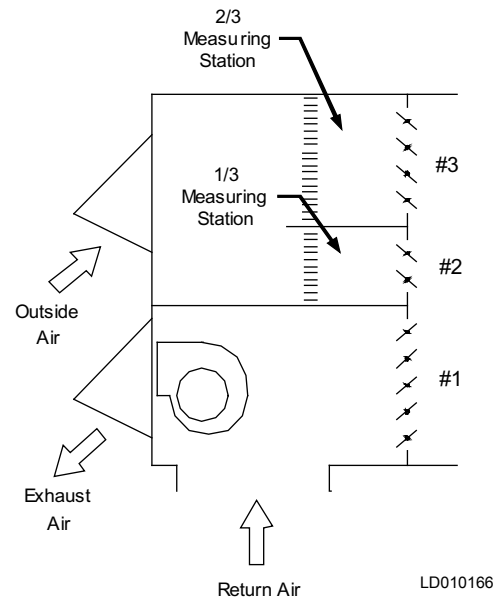


FIG. 5-17 – 1/3 – 2/3 FLOW MEASUREMENT ARRANGEMENT

When Ventilation Status is ACTIVE, damper output #1 shall be controlled per the Flow Control PI Output. Figure 5-16 details the relationship of the Damper Output voltage vs. the Flow Control PI Output

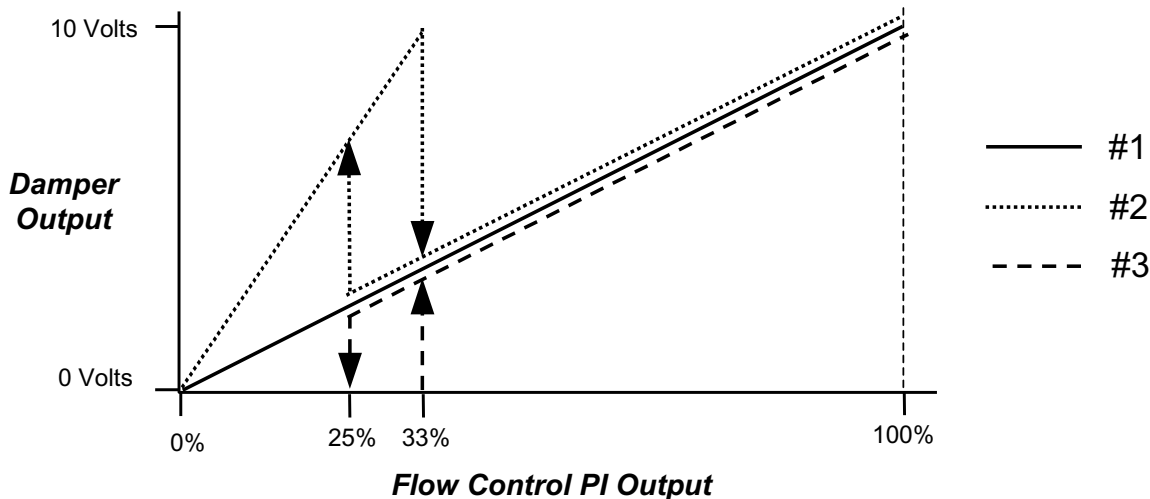


FIG. 5-16 – 1/3-2/3 IAQ FLOW MEASUREMENT OPTION, FLOW CONTROL

1/3 – 2/3 IAQ Flow Measurement Option, Flow Control

When OA conditions are suitable for economizing Damper Output #1 shall be controlled per the Flow Control PI Output. Figure 5-18 details the relationship of the OA Damper voltage vs. the Economizer PI Output.

Air Measurement Station Auto Zero

The Primary Unit Control will conduct a Auto Zero process every 12 hours provided the following criteria has been met:

- The unit has a Minimum, Full, or 1/3 – 2/3 IAQ station installed.
- The BI output to the Supply Fan is off for 10 minutes.
- 12 hours have elapsed since the last auto-zero attempt.

The Primary Unit Control, during a 15-minute period calculates the average and standard deviation of each sensor. It then uses this information to make adjustments to future calculations.

Air Measurement Station Sensor Faults

Full Flow IAQ Air Measurement Station

A “*OA FLOW PRS IWARNING*” will be displayed in the HISTORY buffer and a “*SENSOR / MISC WARNING*” will be posted under the STATUS key of the Primary Unit Controller if:

- The OA Flow Pressure #1 input is $\leq$ to 117 FPM and the damper #1 output is $\geq$ 50% for 10 seconds.
- Or the OA Flow Pressure #1 input is $\geq$ to 686 FPM For 10 seconds.
- Or the OA Flow Pressure #1 Zero is $\geq$ to 82 for 10 seconds.

Minimum Flow IAQ Air Measurement Station

A “*OA FLOW PRS IWARNING*” will be displayed in the HISTORY buffer and a “*SENSOR / MISC WARNING*” will be posted under the STATUS key of the Primary Unit Controller if:

- The OA Flow Pressure #1 input is $\leq$ to 117 FPM and the damper #1 output is $\geq$ 25% for 10 seconds
- Or the OA Flow Pressure #1 input is $\geq$ to 2686 FPM For 10 seconds
- Or the OA Flow Pressure #1 Zero is $\geq$ to 82 for 10 seconds

1/3 – 2/3 IAQ Air Measurement Station

A “*OAFLOW PRS IWARNING*” will be displayed in the HISTORY buffer and a “*SENSOR / MISC WARNING*” will be posted under the STATUS key of the Primary Unit Controller if:

- The OA Flow Pressure #1 input is $\leq$ to 117 FPM and the damper #1 output is $\geq$ 25% for 10 seconds.

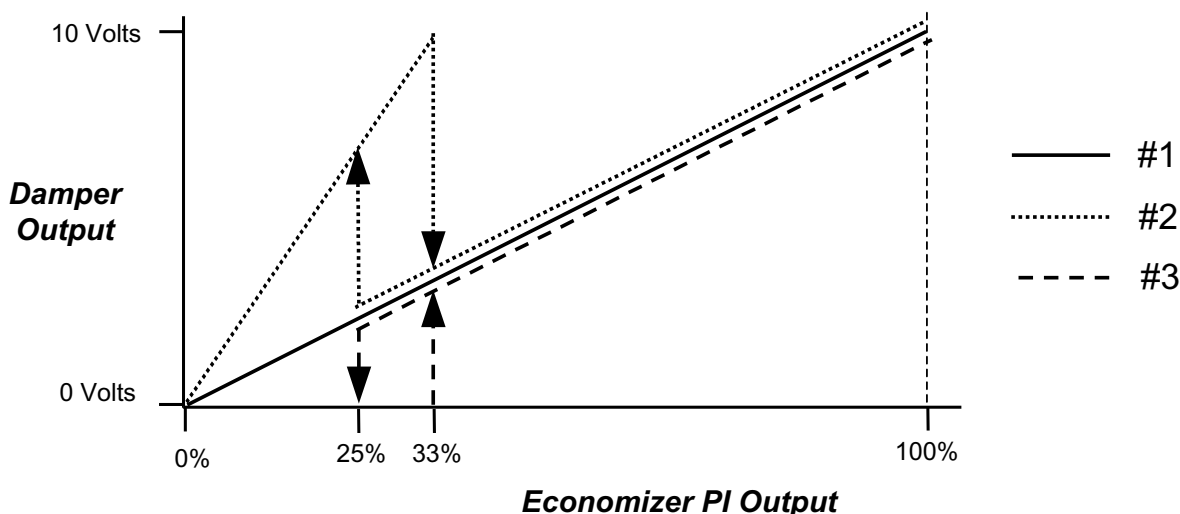


FIG. 5-18 – 1/3-2/3 IAQ MEASUREMENT OPTION, ECONOMIZER

- Or the OA Flow Pressure #1 input is $\geq$ to 2686 FPM For 10 seconds.
- Or the OA Flow Pressure #1 Zero is $\geq$ to 82 for 10 seconds.

A “OAFLOW PRS 2WARNING” will be displayed in the HISTORY buffer and a “SENSOR / MISC WARNING” will be posted under the STATUS key of the Primary Unit Controller if:

- The OA Flow Pressure #1 input is $\leq$ to 117 FPM and the damper #1 output is $\geq$ 65% for 10 seconds
- Or the OA Flow Pressure #1 input is $\geq$ to 2686 FPM For 10 seconds.
- Or the OA Flow Pressure #1 Zero is $\geq$ to 82 for 10 seconds.

SMOKE PURGE

The following parameters must be programmed into the Primary Unit Controller:

- “SMOKE PURGE SEQ 1” can be set to “PURGE”, “PRESSURIZATION”, or “EVACUATION” through the OPTIONS key UNIT DATA subsection of the User Interface.
- “SMOKE PURGE SEQ 2” can be set to “PURGE”, “PRESSURIZATION”, or “EVACUATION” through the OPTIONS key UNIT DATA subsection of the User Interface.
- “SMOKE PURGE SEQ 3” can be set to “PURGE”, “PRESSURIZATION”, or “EVACUATION” through the OPTIONS key UNIT DATA subsection of the User Interface.

Whenever a Smoke Purge sequence is started, all normal heating and cooling functions are stopped, regardless of control inputs. This will occur within 2 seconds after the Smoke Purge signal is received.

“SMOKE PURGE SEQ 1”, “SMOKE PURGE SEQ 2”, and “SMOKE PURGE SEQ 3” are initiated through a digital input to the Primary Unit controller. The input for “SMOKE PURGE SEQ 1” is at Terminal Block TB8 – Terminal 4. The input for “SMOKE PURGE SEQ 2”

is at Terminal Block TB8 – Terminal 5. The input for “SMOKE PURGE SEQ 3” is at Terminal Block TB8 – Terminal 7.

“SMOKE PURGE SEQ 1” will have the highest priority, “SMOKE PURGE SEQ 2” will have medium priority, and “SMOKE PURGE SEQ 3” will have the lowest priority.

“PURGE” – purge shall be used to displace the air inside the space with fresh outside air. When this sequence is started the following will occur:

- Start the Supply Fan, if not already ON
- Start the Return Fan, if not already ON
- Start the Exhaust Fan, if not already ON
- Set all Outside Air Damper Output(s) to 100%
- Set the Return Air Damper to 0%
- Set the Exhaust Damper Output to 100%

“PRESSURIZATION” – purge shall be used to pressurize the building or space in order to force the air inside the space through the walls to adjacent spaces or outside the building envelope. When this sequence is started the following will occur:

- Start the Supply Fan, if not already ON
- Start the Return Fan, if not already ON
- Stop the Exhaust Fan if ON
- Set all Outside Air Damper Output(s) to 100%
- Set the Return Air Damper to 0%

“EVACUATION” – purge shall be used to evacuate (negatively pressurize) the building or space in order to draw air through the walls from adjacent spaces or outside the building envelope. When this sequence is started the following will occur:

- Stop the Supply Fan if ON
- Start the Return Fan, if not already ON
- Start the Exhaust Fan, if not already ON
- Set all Outside Air Damper Output(s) to 0%
- Set all Return Air Dampers to 100%
- Set the Exhaust Damper Output to 100%

SECTION 6 – USER INTERFACE CONTROL CENTER

USER INTERFACE CONTROL CENTER

The User Interface is used to commission, monitor, and troubleshoot the rooftop unit. It provides access to operational data, parameter programming, and access to past “history” information that was recorded at the time of a unit or system fault.

The User Interface is installed in the low voltage control compartment of the rooftop unit.

The User Interface uses a flexible membrane style keypad and has an 80 character (2 lines of 40 characters) liquid crystal display. The display has a lighted background for night viewing and can be viewed in direct sunlight. The backlighting will energize when any button is pressed.

The keypad allows complete control of the system from a central location. The keypad offers a multitude of

commands available to access displays, program parameters, and initiate system commands. The keypad consists of thirty-six keys, that are divided into three categories, Data Entry, Navigation, and Menu Selection keys. A description of each of the keys is contained below.

Data Entry Keys

The Data Entry Keys provide a means to enter values for items that support edits. The keys available to support numeric input are the 0 through 9 keys, the decimal key, the +/- key, the ✕ key and the ✓ key. The keys available to support choice input are the ◀ key, the ▶ key, the ✕ key, and the ✓ key. Editing is started by pressing the ✓ key. **Once editing has started, the user must press either the ✓ key or the ✕ key.** Any other key press will result in the “Press ✓ or ✕ to Exit” message displayed for two seconds. If you try to edit an item that is view only it will be ignored by the menu system.

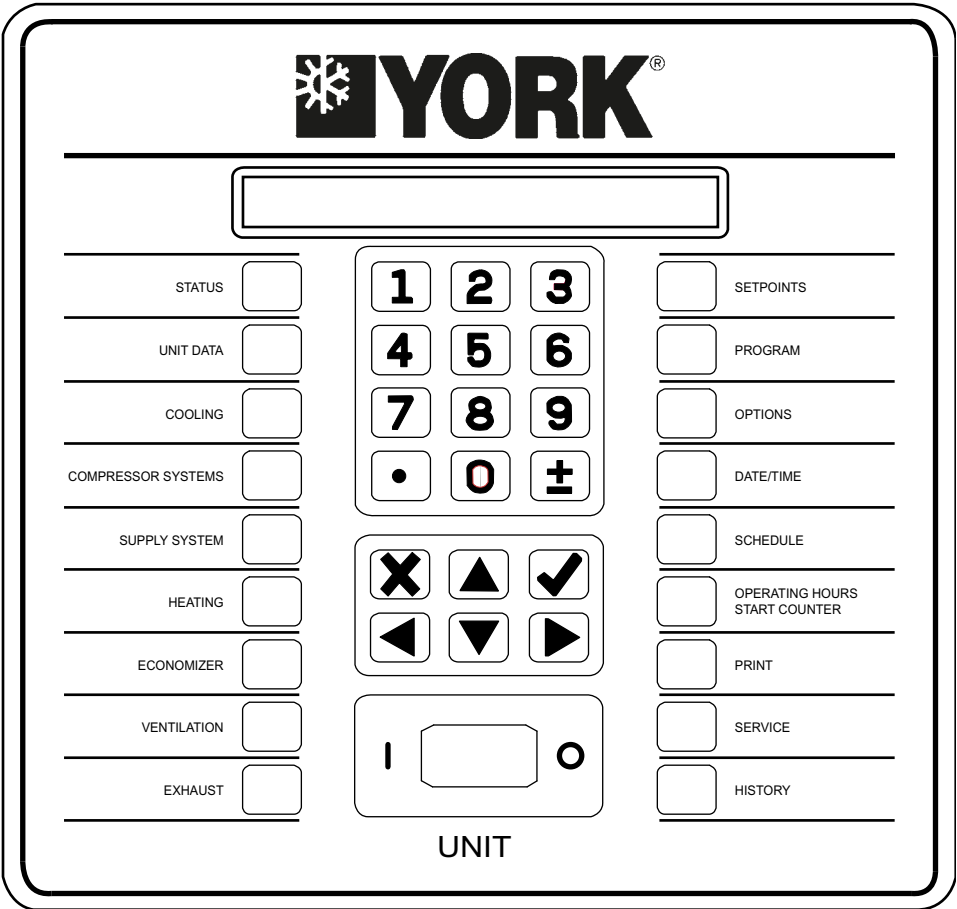


FIG. 6-1 – USER INTERFACE CONTROL PANEL

When a numeric value that can be modified is displayed, the Default, High, and Low prompt will be shown in the upper right portion of the display. The cursor will be shown at the digit to be changed. The cursor will be shown after editing has started. After the desired numeric value has been entered, press the ✓ key to save the new value and exit the edit mode. Pressing the ◀ key will fill in the default value. Edits will only be accepted when followed by pressing the ✓ key. Pressing the ✕ key while in the edit mode will cancel the edit mode and leave the value unchanged. If an out of range value is entered, the Default, High and Low prompt is replaced by the “Out of Range” message for two seconds.

When a choice value that can be modified is displayed, the ◀ ▶ prompt will be shown in the upper right portion of the display. The cursor will be shown after editing has been started. The ◀ key or the ▶ key will allow the different choices to be viewed. When the desired choice is displayed, press the ✓ key to save the new value and exit the edit mode. Pressing the ✕ key while in the edit mode will cancel the edit mode and leave the value unchanged.

Navigation Keys

The Navigation Keys provide a means to browse items within a menu. The keys currently available to support navigation are the Menu Select keys, the ▲ key, the ▼ key, the ◀ key, and the ▶ key.

Pressing a Menu Select key brings the user to the first screen under that menu. The screens within each menu are arranged in a circular list. The user may browse through the screens using the ▲ key and the ▼ key. Pressing the ▼ key will advance through the screens in order from top to bottom until the bottom screen has been reached. When the bottom screen is displayed, pressing the ▼ key will wrap the display to the top screen of the menu. Pressing the ▲ key will move through the screens in order from bottom to top until the top screen has been reached. When top screen is displayed, pressing the ▲ key will wrap the display to the bottom screen of the menu. Once either the ▲ key or the key ▼ is pressed, pressing any Menu Select key will bring the user to the first screen under that menu (even if it is the same menu being viewed).

Navigation through the circular list of items can also be achieved by repeated presses of the same Menu Select key, as long as no other keys are pressed. For example, pressing the UNIT DATA key three times will bring the user to the third screen of the UNIT DATA menu; pressing the UNIT DATA key once, then pressing the ▼ key, then pressing the Unit Data key again will bring the user to the first screen of the UNIT DATA menu.

The ◀ key and the ▶ key are used to scroll “sideways” between the same displays for each system. For example, when viewing the Sys 1 Pressures under the COMPRESSOR SYSTEMS key, pressing the ▶ key will scroll “sideways” to the Sys 2 Pressures display and pressing the ◀ key will scroll “sideways” to the Sys Pressures display for the last system on the unit.

When programming numeric or non-numeric values, the ▼ key and the ▲ key are used to scroll forward (down) and backward (up) through the items to be programmed or set.

Menu Select Keys

The following menu keys are available on the User Interface; Status, Unit Data, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, Exhaust, Setpoints, Program, Options, Date/Time, Schedule, Operating Hours / Start Counter, Print, Service, and History.

Each of the above menu keys gives access to a list of specific items contained in that menu. To minimize clutter, only the items applicable to the current unit configuration will be displayed. Pressing any of the menu select keys at any time will send the user to the first item of the associated menu, provided the user is not editing an item in the current menu key item or the menu key is being used to navigate through a list of items.

Tables 6-1 through 6-9 list the information that is contained under the Status, Unit Data, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, and Exhaust menu selection keys of the User Interface. The tables contain the Displayed Text, Pass Word Level (if applicable), Range of Values (if applicable), Default Value (if applicable), what key (Setpoints, Program, Options) to use to change the value (if applicable), and under what circumstances the item is displayed.

TABLE 6-1 – STATUS

DISPLAY TEXT	RANGE	DEFAULT	SETTING LOCATION	SHOWN WHEN
UNIT - OVERALL	LOCAL STOP / RUN / UNIT TRIP / UNIT FAULT / UNIT LOCKOUT / SMK PURGE #-PRESS / SMK PURGE #-PURGE / SMK PURGE #-EVAC / UNSTABLE SYSTEM	DERIVED		ALWAYS
CURRENT OPER MODE	OCC STANDBY / OCC COOLING LOW / OCC COOLING HIGH / OCC HEATING LOW / OCC HEATING HIGH / UNOCC STANDBY / UNOCC COOLING LOW / UNOCC COOLING HIGH / UNOCC HEATING LOW / UNOCC HEATING HIGH / MORNING WARM-UP / COMFORT VENT COOLING / COMFORT VENT HEATING	DERIVED		UNIT TYPE EQUALS CV
CURRENT OPER MODE	OCCUPIED STANDBY / OCCUPIED HEATING / OCCUPIED COOLING / UNOCCUPIED STANDBY / UNOCCUPIED HEATING / UNOCCUPIED COOLING / MORNING WARM-UP	DERIVED		UNIT TYPE EQUALS VAV
CURRENT OPER MODE	OCCUPIED STANDBY / OCCUPIED HEATING / OCC COOLING W/O BYP / OCC COOLING W/ BYP / UNOCCUPIED STANDBY / UNDER FLOOR TEMP OVERRIDE	DERIVED		UNIT TYPE EQUALS FLEXYS
SUPPLY SYS STATUS	NORMAL - ACTIVE / NORMAL INACTIVE / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT	DERIVED		ALWAYS
COMP SYS 1 STATUS	NORMAL - COMP A ON / NORMAL - COMP B ON / NORMAL - BOTH ON / NORMAL - BOTH OFF / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / LOW AMB INHIBIT / LOW SUCT TEMP UNL / HIGH DP UNLOAD / USER DISABLED	DERIVED		ALWAYS
COMP SYS 2 STATUS	NORMAL - COMP A ON / NORMAL - COMP B ON / NORMAL - BOTH ON / NORMAL - BOTH OFF / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / LOW AMB INHIBIT / LOW SUCT TEMP UNL / HIGH DP UNLOAD / USER DISABLED	DERIVED		ALWAYS
COMP SYS 3 STATUS	NORMAL - COMP A ON / NORMAL - COMP B ON / NORMAL - BOTH ON / NORMAL - BOTH OFF / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / LOW AMB INHIBIT / LOW SUCT TEMP UNL / HIGH DP UNLOAD / USER DISABLED	DERIVED		UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON, 130 TON, OR 150 TON
HEATING SYS STATUS	NORMAL - ACTIVE / NORMAL - INACTIVE / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / USER DISABLED / NONE	DERIVED		ALWAYS
ECONO SYS STATUS	NORMAL - ACTIVE / NORMAL - INACTIVE / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / USER DISABLED / NONE	DERIVED		ALWAYS
VENT SYS STATUS	NORMAL - ACTIVE / NORMAL - INACTIVE / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / USER DISABLED / NONE	DERIVED		ALWAYS
EXHAUST SYS STATUS	NORMAL - ACTIVE / NORMAL - INACTIVE / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / USER DISABLED / NONE	DERIVED		ALWAYS
SENSOR / MISC	NORMAL / WARNING / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT	DERIVED		ALWAYS
FILTERS	OKAY / CHANGE	DERIVED		ALWAYS

TABLE 6-2 – UNIT DATA

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS:
UNIT TYPE	2	CONSTANT VOLUME / VARIABLE AIR VOLUME / FLEXSYS	CONSTANT VOLUME	OPTIONS / UNIT DATA	ALWAYS
UNIT SIZE	2	50 TON, 55 TON, 60 TON, 65 TON, 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON, 130 TON, 150 TON	50 TON	OPTIONS / UNIT DATA	ALWAYS
REFRIGERANT TYPE	2	R22 / R407C / R410A	R-22	OPTIONS / UNIT DATA	ALWAYS
CONTROL METHOD	1	STAGED / WIRED ZONE TEMP / COMM ZONE TEMP	STAGED	OPTIONS / UNIT DATA	UNIT TYPE EQUALS CV
SAT RESET METHOD	1	HARDWIRED INPUT, OUTSIDE TEMP, RETURN TEMP, SUPPLY FAN SPEED	HARDWIRED INPUT	OPTIONS / UNIT DATA	UNIT TYPE EQUALS VAV
SUPPLY AIR TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		ALWAYS
ACTIVE SP		50° F TO 150° F	DERIVED		
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUAL OCCUPIED
OCC ZONE COOLING		62° F TO 85° F	72.0° F		
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		TYPE EQUALS CV AND CV CON- TROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUALS UNOCCUPIED
UNOCC ZONE COOLING		62° F TO 95° F	85.0° F		

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TABLE 6-2 – UNIT DATA (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS:
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV AND CV
OCC ZONE HEATING		60° F TO 73° F	68.0° F		CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUAL OCCUPIED
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT MODE EQUALS UNOCCUPIED
UNOCC ZONE HEATING		50° F TO 78° F	60.0° F		
SMOKE PURGE SEQ 1	1	PURGE / PRESSURIZA- TION / EVACUATION	PURGE	OPTIONS / UNIT DATA	ALWAYS
SMOKE PURGE SEQ 2	1	PURGE / PRESSURIZA- TION / EVACUATION	PRESSUR- IZATION	OPTIONS / UNIT DATA	ALWAYS
SMOKE PURGE SEQ 3	1	PURGE / PRESSURIZA- TION / EVACUATION	EVACUA- TION	OPTIONS / UNIT DATA	ALWAYS
COMM BAUD RATE	1	9600 - 14400, 19200	19200		ALWAYS
DISPLAY LANGUAGE	1	ENGLISH / SPANISH	ENGLISH	OPTIONS / UNIT DATA	ALWAYS
DISPLAY UNITS	1	IMPERIAL / SI / SI CANADA	IMPERIAL		ALWAYS

TABLE 6-3 – COOLING

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
SUPPLY AIR TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS CONSTANT VOLUME OR VARIABLE AIR VOLUME
ACTIVE SP		50.0° F TO 150.0° F	DERIVED		
FLEX EVAP TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS FLEXYS AND CURRENT OPER MODE IS OCC COOLING W/ BYP
ACTIVE SP		50.0° F TO 150.0° F	DERIVED		
COOLING CONTROL OFFSET		1.0° F TO 100.0° F	DERIVED		
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUAL OCCUPIED
OCC ZONE COOLING		60.0° F TO 85.0° F	72.0° F		
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUALS UNOCCUPIED
UNOC ZONE COOLING		60.0° F TO 95.0° F	85.0° F		
RA TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS VAV
RAT COOLING SETP		RAT HEATING SETP +2° F TO RAT FOR HIGH SAT	70.0° F		
RA TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS FLEXYS
MIXED SUPPLY AIR TEMP		50.0° F TO 65.0° F	60.0° F		
RETURN AIR BYPASS					
CURRENT		0 TO 100%	DERIVED		UNIT TYPE EQUALS FLEXYS
ACTIVE SP		0 TO 100%	DERIVED		
BYPASS DAMPER POSITION		0 TO 100%	DERIVED		UNIT TYPE EQUALS FLEXYS
UNDERFLOOR AIR					
SUPPLY AIR TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS FLEXYS AND DEWPOINT RESET EQUALS ENABLED
HUMIDITY		0 TO 100%	DERIVED		
UNDERFLOOR SLAB					
UNDERFLOOR TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT TYPE EQUALS FLEXYS AND DEWPOINT RESET EQUALS ENABLED
DEWPOINT		30.0° F TO 100.0° F	DERIVED		
MAXIMUM BYPASS	1	20.0 TO 40.0%	40%	SETPOINTS/ COOLING	UNIT TYPE EQUALS FLEXYS
DEW POINT RESET	1	ENABLE - DISABLED	DISABLED	PROGRAM/ COOLING	UNIT TYPE EQUALS FLEXYS
ACTIVE SLAB CONTROL	1	ENABLE - DISABLED	DISABLED	PROGRAM/ COOLING	UNIT TYPE EQUALS FLEXYS

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TABLE 6-3 – COOLING (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
STAGE 1 - LOW	1	55.0° F TO 60.0° F	60.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS CV
STAGE 2 - HIGH	1	50.0° F TO 60.0° F	55.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS CV
OCCUPIED ZONE	1	62.0° F TO 85.0° F	72.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS CV
UNOCCUPIED ZONE	1	62.0° F TO 95.0° F	85.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS CV OR VAV
SAT SETPOINT LOW LIMIT	1	50.0° F - 60.0° F	55.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV
SAT SETPOINT HIGH LIMIT	1	55.0° F - 65.0° F	65.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV
OAT FOR SAT SP LOW LIMIT	1	70.0° F - 90.0° F	80.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS OUTSIDE TEMP
OAT FOR SAT SP HIGH LIMIT	1	60.0° F - 80.0° F	70.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS OUTSIDE TEMP
RAT FOR SAT SP LOW LIMIT	1	RAT FOR SAT SP HIGH LIMIT +5° F	80.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS RETURN TEMP
RAT FOR SAT SP HIGH LIMIT	1	RAT COOLING SETP TO RAT FOR SATSP LOW LIMIT -5° F	90.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS RETURN TEMP
FAN SPEED FOR SAT LOW LIMIT	1	70 - 100%	90%	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS SUPPLY FAN SPEED
FAN SPEED FOR SAT HIGH LIMIT	1	50 - 80%	70%	SETPOINTS/ COOLING	UNIT TYPE EQUALS VAV AND SAT RESET METHOD EQUALS SUPPLY FAN SPEED
MIXED SUPPLY AIR TEMP	1	50.0° F - 65.0° F	60.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS FLEXYS
EVAP LEAVING AIR TEMP HIGH	1	50.0° F - 60.0° F	60.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS FLEXYS
EVAP LEAVING AIR TEMP LOW	1	50.0° F - 60.0° F	50.0° F	SETPOINTS/ COOLING	UNIT TYPE EQUALS FLEXYS
NIGHT SET UP	1	ENABLE - DISABLED	ENABLED	PROGRAM/ COOLING	UNIT TYPE EQUALS CV OR VAV
SUP AIR TEMPERING	2	ENABLE - DISABLE	ENABLED	PROGRAM/ COOLING	UNIT TYPE EQUALS VAV OR FLEXYS
MECH CLG LOCKOUT TEMP	1	45.0° F - 65.0° F	45.0° F	SETPOINTS/ COOLING	ALWAYS

TABLE 6-4 – COMPRESSOR SYSTEMS (1, 2, OR 3)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
SYSTEM STATUS		NORMAL - COMP A ON / NORMAL - COMP B ON / NORMAL - BOTH ON / NORMAL - BOTH OFF / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / LOW AMB INHIBIT / LOW SUCTION TEMP UNL / HIGH DP UNLOAD / USER DISABLED	DERIVED		ALWAYS
CONDENSER FAN 1A / 1		OFF / ON	DERIVED		
CONDENSER FAN 1B / 2		OFF / ON	DERIVED		
CONDENSER FAN 2A / 3		OFF / ON	DERIVED		
CONDENSER FAN 2B / 4		OFF / ON	DERIVED		
CONDENSER FAN 3A / 5		OFF / ON	DERIVED		UNIT SIZE EQUALS 70 TON, 75 TON, 80 TO, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON 130 TON, OR 150 TON
CONDENSER FAN 3B / 6		OFF / ON	DERIVED		UNIT SIZE EQUALS 70 TON, 75 TON, 80 TO, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON 130 TON, OR 150 TON
SAFETY INPUTS					
LPCO		ON - OFF	DERIVED		ALWAYS
CHAIN		ON - OFF	DERIVED		
SUCTION TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		PRESS TRANS PKG INDICATES THAT TRANSDUCERS ARE NOT INSTALLED FOR THE APPLICABLE SYSTEM
PRESSURES					
SUCTION		0 TO 200 PSIG (R22/R407C) - 0 TO 320 PSIG (R410A)	LOOK UP TABLE		PRESS TRANS PKG INDICATES THAT TRANSDUCERS ARE IN- STALLED FOR THE APPLICABLE SYSTEM
DISCHARGE		0 TO 500 PSIG (R22 / R407C) - 0 TO 800 (R410A)	LOOK UP TABLE		
TEMPERATURES					
SUCTION		-20.0° F TO 180.0° F	LOOK UP TABLE		PRESS TRANS PKG INDICATES THAT TRANSDUCERS ARE IN- STALLED FOR THE APPLICABLE SYSTEM
SUPERHEAT		0.0° F TO 50.0° F	DERIVED		
CURRENT RUN TIME					
COMP A		HH:MM:SS	DERIVED		ALWAYS
COMP B		HH:MM:SS	DERIVED		
PUMPDOWN	2	ENABLED - DISABLED	ENABLED	PROGRAM/ COMP SYS.	ALWAYS
READY TO RUN					
COMP A		YES - NO	DERIVED		ALWAYS
COMP B		YES - NO	DERIVED		

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TABLE 6-4 – COMPRESSOR SYSTEMS (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
READY TO STOP					
COMP A		YES - NO	DERIVED		ALWAYS
COMP B		YES - NO	DERIVED		
SYSTEM UNLOADING PRESSURE	2	250 - 450 PSIG	400 PSIG	SETPOINTS/ COMP SYS	PRESS TRANS PKG DOES NOT EQUAL NONE
PRESS TRANS PKG	2	NONE / SYSTEM 1 ONLY / SYSTEM 1 AND 2 / SYSTEM 1-2 AND 3	NONE	OPTIONAL/ COMP SYS	ALWAYS

TABLE 6-5 – SUPPLY SYSTEM

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
SUPPLY SYSTEM STATUS		NORMAL - ACTIVE NORMAL - INACTIVE SAFETY TRIP SAFETY FAULT SAFETY LOCKOUT			
SUPPLY FAN STATUS					
OUTPUT		ON - OFF	DERIVED		ALWAYS
PROOF		YES - NO	DERIVED		
SUPPLY VFD SPEED		0.0 TO 100%	DERIVED		UNIT TYPE EQUALS VAV OR FLEXYS
DUCT STATIC PRESS					
CURRENT		0.00 TO 5.00 INWC	LOOK UP TABLE		UNIT TYPE EQUALS VAV OR FLEXYS
ACTIVE SP		0.00 TO 5.00 INWC	DERIVED		
RETURN FAN STATUS					
OUTPUT		ON - OFF	DERIVED		SUPPLY SYSTEM TYPE EQUALS SUPPLY + RETURN FANS
PROOF		YES - NO	DERIVED		
RETURN FAN VFD		0.0 TO 100%	DERIVED		SUPPLY SYSTEM TYPE EQUALS SUPPLY + RETURN FANS
RETURN FAN PRESSURE					
CURRENT		-1.00 TO +1.00 INWC	LOOK UP TABLE		SUPPLY SYSTEM TYPE EQUALS SUPPLY + RETURN FANS
ACTIVE SP		0.00 TO +1.00 INWC	DERIVED		
DUCT PRESS TRANS- DUCER SPAN	2	1.00 IN-WG + 0 5.00 IN-WG	5.00 IN-WG	OPTIONS / SUPPLY SYSTEMS	UNIT TYPE EQUALS VAV OR FLEXYS

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TABLE 6-5 – SUPPLY SYSTEM (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
DUCT STATIC RESET LOW LIMIT	1	0 - 1 IN-WG - SPAN 0 IN-WG TO DUCT STATIC RESET HIGH	1.5 IN-WG	SETPOINTS / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS
DUCT STATIC RESET HIGH LIMIT	1	DUCT STATIC RESET LOW LIMIT TO SPAN	2.5 IN-WG	SETPOINTS / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS
DUCT STATIC OVER PRESSURE	2	0 - 1 IN-WG - 5 IN-WG	3.0 IN-WG	SETPOINTS / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS
FAN SPEED INSTABILITY TIME	2	15 - 300 SEC	120 SEC	SETPOINTS / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS
FAN SPEED INSTABILITY LIMIT	2	10 - 50%	25%	SETPOINTS / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS
STABILITY MONITOR	2	ENABLED - DIS- ABLED	ENABLED	PROGRAM / SUPPLY SYSTEM	UNIT TYPE EQUALS VAV OR FLEXYS

TABLE 6-6 – HEATING

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
HEATING SYS STATUS		NORMAL - ACTIVE / NORMAL - INACTIVE / FAULTED / USER DISABLED / UNDER FLOOR CONTROL / NONE	DERIVED		HEAT TYPE DOES NOT EQUAL NONE
HEATING SYSTEM TYPE	2	NONE / ELECTRIC HEAT/ STAGED GAS FURNACE / MODU- LATING FURNACE / HOT WATER HEAT / STEAM HEAT	NONE	OPTIONS / HEATING	ALWAYS
GAS HEAT CAPACITY	2	375 MBH / 750 MBH / 1125 MBH	375 MBH	OPTIONS / HEATING	HEAT TYPE EQUALS STAGED GAS FURNACE OR MODULAT- ING FURNACE
ELEC HEAT CAPACITY	2	40 KW / 80 KW / 100 KW / 108KW / 120 KW / 150 KW / 160 KW / 200 KW / 240 KW / 250 KW	40 KW	OPTIONS / HEATING	HEAT TYPE EQUALS ELECTRIC HEAT
SUPPLY AIR TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE DOES NOT EQUAL NONE
ACTIVE SP		50.0° F TO 120.0° F	DERIVED		

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TABLE 6-6 – HEATING (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUALS SOC- CUPIED
OCC ZONE HEATING	1B	60° F TO 73° F	68° F	SETPOINTS / HEATING	
ZONE TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT; MODE EQUALS UNOC- CUPIED
UNOCC ZONE HEATING	1	50° F TO 78° F	60 F	SETPOINTS / HEATING	
RA TEMP					
CURRENT		-20.0° F TO 180.0° F	LOOK UP TABLE		UNIT EQUALS VAV
RAT HEATING SETP	1	55.0° F - 74.0° F	68.0° F	SETPOINTS / HEATING	
HEATING ENTERING TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		HEAT TYPE EQUALS STAGED GAS FURNACE
STAGED HEAT STATUS					
STGS ON		0 TO 6	DERIVED		HEAT TYPE EQUALS ELEC- TRIC HEAT OR STAGED GAS FURNACE
STGS AVAIL		2 TO 6	DERIVED		
HW STEAM HEAT					
VALVE POS		0.0 TO 100%	DERIVED		HEAT TYPE EQUALS HOT WA- TER HEAT OR STEAM HEAT
FREEZE STAT		OK TRIPPED	DERIVED		
HEATING CONTROL OFFSET		1° F TO 100.0° F	DERIVED		
MOD FURNACE OUTPUT					
RELATIVE		0.0 TO 100%	DERIVED		HEAT TYPE EQUALS MODU- LATING GAS
APPROX RATE		37.5 TO 900.0 MBH	DERIVED		
FURNACE 1A MODE		OFF / PURGE / IGNI- TION / ON - LOW / ON - HIGH / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / FAULT - L/O	DERIVED		HEATING TYPE EQUALS MODULATING GAS
FURNACE 1A MODE					
RELATIVE		0 TO 100%	DERIVED		HEAT TYPE EQUALS MODU- LATING GAS
APPROX RATE		37.5 TO 150.0 MBH	DERIVED		

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TABLE 6-6 – HEATING (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
FURNACE 1B MODE		OFF / PURGE / IGNITION / ON / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / FAULT -L/O	DERIVED		HEAT TYPE EQUALS MODULATING GAS
FURNACE 1 MODE		OFF / PURGE / IGNITION / ON-LOW / ON - HIGH / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / FAULT -L/O	DERIVED		HEAT TYPE EQUALS STAGED GAS
FURNACE 2 MODE		OFF / PURGE / IGNITION / ON - LOW / ON -HIGH / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / FAULT -L/O	DERIVED		GAS HEAT SIZE EQUALS 750 MBH OR 1125 MBH
FURNACE 3 MODE		OFF / PURGE / IGNITION / ON - LOW / ON -HIGH / SAFETY TRIP / SAFETY FAULT / SAFETY LOCKOUT / FAULT -L/O	DERIVED		GAS HEAT SIZE EQUALS 1125 MBH
MORN WARM UP	1	ENABLED - DISABLED	ENABLED	PROGRAM / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT
ADAPTIVE MORN WARM UP	1	ENABLED - DISABLED	DISABLED	PROGRAM / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND CV CONTROL METHOD DOES NOT EQUAL STAGED INPUT
OCCUPIED HEATING	1	ENABLED - DISABLED	DISABLED	PROGRAM / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE DOES NOT EQUAL CV
NIGHT SET BACK	1	ENABLED - DISABLED	DISABLED	PROGRAM / HEATING	HEAT TYPE DOES NOT EQUAL NONE
HEAT LIMIT TEMPERATURE	2	100.0° F - 150.0° F	130.0° F	SETPOINTS / HEATING	HEAT TYPE DOES NOT EQUAL NONE
HEATING SAT	1	80.0° F - 115.0° F	100.0° F	SETPOINTS / HEATING	HEAT TYPE DOES NOT EQUAL NONE, UNIT TYPE EQUALS VAV, FLEXYS

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TABLE 6-6 – HEATING (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
HW VALVE ACTION	2	DIRECT - REVERSE	DIRECT	PROGRAM / HEATING	HEATING TYPE EQUALS HOT WATER HEAT OR STEAM HEAT
STG 1 (W1) HEATING SETPOINT	1	80.0° F - 95.0° F	85.0° F	SETPOINTS / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV
STG 2 (W2) HEATING SETPOINT	1	95.0° F - 115.0° F	100.0° F	SETPOINTS / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND UNIT TYPE EQUALS CV
RAT HEATING SP	1	55.0° F - 74.0° F	68.0° F	SETPOINTS / HEATING	HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED OR UNIT TYPE EQUALS VAV OR FLEXYS
DAILY WARM UP TIME DAY 1		0 MIN. TO MORNING WARM UP MAX TIME	DERIVED		HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED
DAILY WARM UP TIME DAY 2		0 MIN. TO MORNING WARM UP MAX TIME	DERIVED		HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED
DAILY WARM UP TIME DAY 3		0 MIN. TO MORNING WARM UP MAX TIME	DERIVED		HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED
DAILY WARM UP TIMER		0 MIN. TO MORNING WARM UP MAX TIME	DERIVED		HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED
MORNING WARM UP OPT TIME		0 MIN. TO MORNING WARM UP MAX TIME	DERIVED		HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED
MORNING WARM UP MAX TIME	1	0-240 MIN.	120 MIN.	SETPOINTS/HEATING	HEAT TYPE DOES NOT EQUAL NONE AND MORN WARM UP ENABLED EQUALS ENABLED

TABLE 6-7 – ECONOMIZER

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
ECONO SYS STATUS		NORMAL - ACTIVE / NORMAL - INACTIVE / FAULTED / USER DISABLED / NONE	DERIVED		ECONOMIZER INSTALLED DOES NOT EQUAL NONE
ECONO IN- STALLED	2	NONE / DRYBULB / SINGLE ENTHALPY / DUAL ENTHALPY	NONE	OPTIONS / ECONOMIZER	ALWAYS
ECONO METHOD TO USE	1	DRY BULB / SINGLE ENTHALPY / DUAL ENTHALPY / BEST AVAILABLE	BEST AVAIL- ABLE	OPTIONS / ECONOMIZER	ECONOMIZER INSTALLED DOES NOT EQUAL NONE
ECONO METHOD ACTIVE		DRY BULB / SINGLE ENTHALPY / DUAL ENTHALPY	DERIVED		ECONOMIZER INSTALLED DOES NOT EQUAL NONE
CONTROL OUT- PUT		0 TO 100%	DERIVED		ECONOMIZER INSTALLED DOES NOT EQUAL NONE
OA AIR					
OA TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		ECONOMIZER INSTALLED DOES NOT EQUAL NONE
OA RH		0 TO 100%	LOOK UP TABLE		ECONOMIZER INSTALLED EQUALS SINGLE ENTHALPY OR DUAL ENTHALPY
OA ENTHALPHY		7.2 TO 204.9 BTU/LB	LOOK UP TABLE		ECONOMIZER INSTALLED EQUALS SINGLE ENTHALPY OR DUAL ENTHALPY
RA AIR					
RA TEMP		-20.0° F TO 180.0° F	LOOK UP TABLE		ECONOMIZER INSTALLED EQUALS DUAL ENTHALPY
RA RH		0 TO 100%	LOOK UP TABLE		ECONOMIZER INSTALLED EQUALS DUAL ENTHALPY
RA ENTHALPHY		7.2 TO 204.9 BTU/LB	LOOK UP TABLE		ECONOMIZER INSTALLED EQUALS DUAL ENTHALPY
OUTSIDE AIR ENTHALPY LIMIT	1	22.0 TO 40.0 BTU/LB	28.0 BTU/LB	SETPOINTS / ECONO- MIZER	ECONOMIZER INSTALLED DOES NOT EQUAL NONE
ECONOMIZER SYSTEM	1	ENABLED - DIS- ABLED	DISABLED	PROGRAM / ECONOMIZER	ECONOMIZER INSTALLED DOES NOT EQUAL NONE

TABLE 6-8 – VENTILATION

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
VENT SYS STATUS		NORMAL ACTIVE / NORMAL - INACTIVE / FAULTED / USER DISABLED / NONE	DERIVED		
DAMPER HARDWARE	2	NONE / 2 POSITION DAMPER / STANDARD DAMPERS / MINIMUM FLOW IAQ / FULL FLOW IAQ/ 1/3 - 2/3 IAQ	STAN- DARD DAMPERS	OPTIONS / VENTILATION	ALWAYS
VENTILATION CNTRL	1	FIXED MINIMUM / DEMAND	FIXED MINIMUM	OPTIONS / VENTILATION	DAMPER HARDWARE DOES NOT EQUAL NONE OR 2 POSI- TION DAMPER
OA DAMPER POSITION					
CURRENT		0.0 TO 100%	DERIVED		DAMPER HARDWARE DOES NOT EQUAL NONE
ACTIVE SP		0.0 TO 100%	DERIVED		
IAQ DMPR AIR FLOWS					
OA FLOW 1		0 TO DERIVED SPAN	DERIVED		DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ
OA FLOW 2		0 TO DERIVED SPAN	DERIVED		
OUTSIDE AIR FLOW					
TOTAL FLOW		0 TO DERIVED SPAN	DERIVED		DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ
ACTIVE SP		0 TO DERIVED SPAN	DERIVED		
VENTILATION DEMAND		0-100%	DERIVED		VENTILATION CONTROL EQUALS DEMAND
CO2 LEVELS					
OUTSIDE		0 TO 2000 PPM	LOOK UP TABLE		VENTILATION CONTROL EQUALS DEMAND
INSIDE		0 TO 2000 PPM	LOOK UP TABLE		
CO2 OFFSET					
CURRENT		± 0 TO 2000 PPM	DERIVED		VENTILATION CONTROL EQUALS DEMAND
ACTIVE SP	1	100-1000 PPM	500 PPM	SETPOINTS / VENTILATION	
OA DAMPER MINIMUM POSI- TION	1	0-100%	15%	SETPOINTS / VENTILATION	DAMPER HARDWARE DOES NOT EQUAL NONE OR 2 POSI- TION DAMPER
OA DAMPER MAXIMUM POSI- TION	1	OA DAMPER MINIMUM POSITION TO 100%	30%	SETPOINTS / VENTILATION	DAMPER HARDWARE DOES NOT EQUAL NONE OR 2 POSI- TION DAMPER
CONTINUOUS VENTILATION	1	ENABLED - DISABLED	ENABLED	PROGRAM / VENTILATION	UNIT TYPE EQUALS CV
COMFORT VENTILATION	1	ENABLED - DISABLED	ENABLED	PROGRAM / VENTILATION	UNIT TYPE EQUALS CV

Continued on next page

TABLE 6-8 – VENTILATION (CONTINUED)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
OUTSIDE AIR MINIMUM FLOW	1	0 - DERIVED SPAN	DERIVED SPAN/10	SETPOINTS / VENTILATION	DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ AND VENTILATION CONTROL SET TO DEMAND
OUTSIDE AIR MAXIMUM FLOW	1	OA MIN. FLOW SP1 - DERIVED SPAN	DERIVED SPAN/4	SETPOINTS / VENTILATION	DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ AND VENTILATION CONTROL SET TO DEMAND
MINIMUM OA FLOW SET POINT	1	0-100%	15%	SETPOINTS / VENTILATION	DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ AND VENTILATION CONTROL SET TO FIXED MINIMUM
UNIT INSTALLED ALTITUDE	1	0-99999 FT.	0 FT.	SETPOINTS / VENTILATION	DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ
VENTILATION SYSTEM	1	ENABLED - DISABLED	ENABLED	PROGRAM / VENTILATION	DAMPER HARDWARE DOES NOT EQUAL NONE

TABLE 6-9 – EXHAUST

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN UNIT TYPE IS
EXHAUST SYS STATUS		NORMAL - ACTIVE / NOR- MAL - INACTIVE / FAULTED / USER DISABLED / NONE	DERIVED		POWER EXHAUST DOES NOT EQUAL NONE
POWER EXHAUST TYPE	2	NONE / ON-OFF DAMPER CNTRL / ON-OFF PRESS CNTRL / MODULATING DAMPER / VFD MODULAT- ED FAN / RETURN FAN W/ EXH / RET FAN W/O EXH	SETTING	OPTIONS / EXHAUST	ALWAYS
BUILDING PRESSURE					
CURRENT		-0.50 TO 0.50 INWC	LOOK UP TABLE		POWER EXHAUST DOES NOT EQUAL NONE OR ON-OFF DAMPER CNTRL
ACTIVE SP	1	-0.15 - +0.15 IWC	0.00 IWC	SETPOINTS / EXHAUST	
EXHAUST FAN STATUS					
OUTPUT		ON - OFF	DERIVED		POWER EXHAUST EQUALS ON OFF DAMPERS CNTRL, ON-OFF PRESS CNTRL, MODULATING DAMPER, OR VFD MODULATED FAN
PROOF		YES - NO	DERIVED		
EXHAUST DAMPER POSI- TION		0.0 TO 100%	DERIVED		POWER EXHAUST EQUALS MODULATING DAMPER, OR RETURN FAN W/ EXH
EXHAUST VFD SPEED		0.0 TO 100%	DERIVED		POWER EXHAUST EQUALS VFD MODULATED FAN
BLDG PRESSURE CNTRL OFFSET	1	- 0.01 - 0.15 IWC TO +0.05	0.00 IWC	SETPOINTS / EXHAUST	POWER EXHAUST EQUALS ON - OFF PRESS CNTRL
ECONO OUTPUT FOR FAN START	1	ECONO OUTPUT FOR FAN STOP TO 100%	10 %	SETPOINTS / EXHAUST	POWER EXHAUST EQUALS ON - OFF DMPR CNTRL
ECONO OUTPUT FOR FAN STOP	1	0 TO ECONO OUTPUT FOR FAN START	5%	SETPOINTS / EXHAUST	POWER EXHAUST EQUALS ON - OFF DMPR CNTRL
EXHAUST OUTPUT FOR FAN START	1	EXHAUST OUTPUT FOR FAN STOP TO 100%	10%	SETPOINTS / EXHAUST	POWER EXHAUST EQUALS MODULATING DAMPER, OR VFD MODULATED FAN
EXHAUST OUTPUT FOR FAN STOP	1	0 - TO EXHAUST OUTPUT FOR FAN START	5%	SETPOINTS / EXHAUST	POWER EXHAUST EQUALS MODULATING DAMPER, OR VFD MODULATED FAN
POWER EXHAUST	2	ENABLED - DISABLED	DIS- ABLED	PROGRAM / EXHAUST	POWER EXHAUST DOES NOT EQUAL NONE

SETPOINTS

All "Setpoints" values are numeric. Setpoints parameters can be viewed under their respective menu key on the left side of the keypad; however, they can only be changed under the Setpoints key using the following procedure. Press the "Setpoints" key to enter the "Setpoints" menu. The Enter Password screen will appear. All Setpoints parameters require the use of a password before they can be changed. *See "Password" in Section 6 for information on how to enter a Password into the User Interface.* If a Level 1 password is entered, only Level 1 setpoints will be available for change. Entering a Level 2 password will make all setpoints available. After the password has been accepted, use the ◀ key or the ▶ key to select the menu category: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Exhaust, that contains the parameter you would like to change. The Setpoints contained under each of these menu categories and their password level is contained in the tables 6-1 thru 6-9. Then use the ▼ key and the ▲ key to navigate to the parameter you want to change. Follow the instructions given in the Data Entry Keys section to change the value.

PROGRAM

All "Program" information is ENABLED/DISABLED values. Program parameters can be viewed under their respective menu key on the left side of the keypad; however, they can only be changed under the Program key using the following procedure. Press the "Program" key to enter the "Program" menu. The Enter Password screen will appear. All Program parameters require the use of a password before they can be changed. *See "Password" in Section 6 for information on how to enter a Password into the User Interface.* If a Level 1 password is entered, only Level 1 "program" information will be available for change. Entering a Level 2 password will make all "program" information available. After the password has been accepted, use the ◀ key or the ▶ key to select the menu category: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, Exhaust, that contains the parameter you would like to change. The parameters contained under each of these menu categories and their password level are contained in Tables 6-1 thru 6-9. Then use the ▼

key and the ▲ key to navigate to the parameter you want to change. Follow the instructions given in the Data Entry Keys section to change the parameter to the desired value.

OPTIONS

All "Options" information is selected from the listed parameter data. Options parameters can be viewed under their respective menu key on the left side of the keypad; however, they can only be changed under the Options key using the following procedure. Press the "Options" key to enter the "Options" menu. The Enter Password screen will appear. All Option parameters require the use of a password before they can be changed. *See "Password" in Section 6 for information on how to enter a Password into the User Interface.* If a Level 1 password is entered, only Level 1 "options" information will be available for change. Entering a Level 2 password will make all "options" information available. After the password has been accepted, use the ◀ key or the ▶ key to select the menu category: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Exhaust that contains the parameter you would like to change. The parameters contained under each of these menu categories and their password level are contained in tables 6-1 thru 6-9. Then use the ▼ key and the ▲ key to navigate to the parameter you want to change. Follow the instructions given in the Data Entry Keys section to change the parameter to the desired value.

DATE / TIME

To change the day, time, and date press the DATE/TIME key. The ▼ key is used to scroll to the next item to be programmed and the ▲ key scrolls to the previous item. The following messages will be displayed. The first line will be an active display and the second line will be the entry line.

Follow the instructions given in the Data Entry Keys

CLOCK	FRI	18 JUN 2004	10:15:33 AM
DAY OF MONTH			=XX

CLOCK	FRI	18 JUN 2004	10:15:33 AM
MONTH			=XX

CLOCK	FRI	18 JUN 2004	10:15:33 AM
YEAR	=XXXX		

CLOCK	FRI	18 JUN 2004	10:15:33 AM
HOUR	=XX		

CLOCK	FRI	18 JUN 2004	10:15:33 AM
MINUTE	=XX		

CLOCK	FRI	18 JUN 2004	10:15:33 AM
DAY OF WEEK	=XXX		

CLOCK	FRI	18 JUN 2004	10:15:33 AM
12 HOUR PERIOD	=XX		

CLOCK	FRI	18 JUN 2004	10:15:33 AM
TIME FORMAT	=XXXXXXX		

CLOCK	FRI	18 JUN 2001	10:15:33 AM
POWER OFF TIME	=XXXXX		

section to change the above values.

SCHEDULE

The "clock schedule" function can be ENABLED/DIS-ABLED by using the schedule screen below.

To set the schedule, press the SCHEDULE key. The display will show the following message:

SCHEDULE	✓ TO EDIT
OCCUPANCY SCHEDULE USER ENABLED	

SCHEDULE	MON	✓ TO EDIT
+START	=06:00 AM	STOP =10:00 PM

SCHEDULE	TUE	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

SCHEDULE	WED	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

SCHEDULE	THU	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

SCHEDULE	FRI	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

SCHEDULE	SAT	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

SCHEDULE	SUN	✓ TO EDIT
START	=06:00 AM	STOP =10:00 PM

To change the start or stop time, press the ✓ key. The line under the 0 is the cursor. If the start time is wrong, it may be changed from the numeric keypad. Once the correct value (hour and minute) is entered, press the ✓ key. The cursor will then move to the AM/PM selection. This value may be chosen by the +/- key and entered by pressing the ✓ key. This process may be followed until the hour, minutes, and meridian of both the START and STOP points are set. Press the ▼ key to get the schedule for the next day to appear. The start and stop time of each day may be programmed differently. If you want to view the schedule without making a change, simply press the ▼ key until the day you wish to view appears. The ▲ key will scroll backwards to the previous screen.

After the SUN (Sunday) schedule appears on the display a subsequent press of the ▼ key will display the Holiday schedule. This is a two-part display. The first reads:

SCHEDULE	HOL
START	=06:00 AM STOP =10:00 PM

The times may be set using the same procedure as described above for the days of the week.

Continue pressing the ▼ key to set the 15 holiday dates. The display will read:

SCHEDULE	MMDD
HOLIDAY 01	= 1225

The month and the day of each holiday are entered in this format. Enter 0000 to not specify a holiday. The MMDD is displayed when the value is being edited to remind the operator what the format of this number is. Eg. 1225 represents December 25.

The line below the empty space is the cursor and will move to the next or previous empty space when the ◀ key or the ▶ key is pressed. To set the Holiday, the cursor is moved to the space following the day of the week of the holiday and the +/- key is pressed. An * will appear in the space signifying that day as a holiday. The Holiday schedule must be programmed weekly. If there is no holiday, the +/- key is used to delete the *. The ✓ key is used to accept the holiday schedule for the next seven days.

OPERATING HOURS / START COUNTER

Compressor Operating hours and Compressor Starts; Supply Fan Operating hours and Supply Fan starts; Exhaust Fan operating hours and Exhaust Fan starts; and Return Fan operating hours and Return Fan starts are displayed via one key press. The maximum value for both hours and starts is 99,999, at which point they will roll over to 0. Following are the displays.

TABLE 6-10 – OPERATING HOURS / START COUNTER

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN
COMPRESSOR 1A OPER HRS COMPRESSOR 1A STARTS	1		DERIVED		
COMPRESSOR 1B OPER HRS COMPRESSOR 1B STARTS	1		DERIVED		
COMPRESSOR 2A OPER HRS COMPRESSOR 2A STARTS	1		DERIVED		
COMPRESSOR 2B OPER HRS COMPRESSOR 2B STARTS	1		DERIVED		
COMPRESSOR 3A OPER HRS COMPRESSOR 3A STARTS	1		DERIVED		NUMBER OF COMPS 6. UNIT CAPACITY EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON, 130 TON, 150 TON.
COMPRESSOR 3B OPER HRS COMPRESSOR 3B STARTS	1		DERIVED		
SUPPLY FAN OPER HRS SUPPLY FAN STARTS	1		DERIVED		
EXHAUST FAN OPER HRS EXHAUST FAN STARTS	1		DERIVED		POWER EXHAUST ON/OFF DMPR / ON/OFF BLDG / VFD.
RETURN FAN OPER HRS RETURN FAN STARTS	1		DERIVED		SUPPLY SYSTEM TYPE EQUALS SUPPLY + RETURN FANS.

Shown below is a typical screen example.

COMPRESSOR 1A	OPER HRS.	XXXXX
	STARTS	XXXXX

PRINT

The PRINT key is used to initiate an operating data, history data, or set points data report. The following message is displayed when the PRINT key is pressed.

PRINT	CHOOSE REPORT	-	SELECT WITH ◀ ▶
+	OPERATING DATA		

The choices for this option are as follows:

- Operating Data (Default)
- All History Buffers
- History Buffer 1
- History Buffer 2
- History Buffer 3
- History Buffer 4
- History Buffer 5
- History Buffer 6
- History Buffer 7
- History Buffer 8
- History Buffer 9
- History Buffer 10
- Setpoints, Program, and Options settings

After pressing the PRINT key, the ◀ key and the ▶ key are used to select a choice from the list above. After selecting the choice, the ✓ key is used to initiate the printout.

SERVICE

To enter Service Mode, press the SERVICE key. The following message is the initial screen and is displayed when the SERVICE key is pressed, unless a Level 2 password is active.

SERVICE
ENTER PASSWORD

The DIGITAL outputs can be toggled/changed by turning OFF the SHUT DOWN switch and entering the Level 2 password and pressing the ✓ key from the initial Service Mode display. If the SHUT DOWN switch is turned back on or you leave Service Mode, outputs will revert to normal control and will not be able to be changed from Service Mode.

The ▶ key can be used to jump to the beginning of the next section of displays and the ◀ key can be used to jump to the beginning of the previous section of displays. The sections of displays are as follows:

- Parameters
- Analog Inputs
- Digital Inputs
- Digital Outputs
- Analog Outputs

The attached SERVICE table lists the Displayed Text, Input or Output type, Primary Unit Control terminal location (ID), Value Range, and when item is displayed.

TABLE 6-11 – SERVICE

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
DATA LOG FORMAT			OFF	ALWAYS	USED TO ACTIVATE THE DATA LOG FEATURE OF THE CONTROL
DATA LOG ERROR	ERROR DETAIL		SEE TABLE 8-14	WHEN ERROR IS PRESENT	DATA LOG ERROR DETAIL
	ERROR STATE		SEE TABLE 8-13	WHEN ERROR IS PRESENT	DATA LOG ERROR STATE
UPDATE FLASH			ON / OFF	ALWAYS	USED TO UPDATE CONTROL SOFTWARE
UPDATE FLASH ERROR				WHEN ERROR IS PRESENT	DESCRIPTION OF THE ERROR
FACTORY RUN TESTER			USER DISABLE / USER ENABLE	ALWAYS	ONLY USED FOR FACTORY RUN TEST
COMPRESSOR 1A	DIGITAL OUTPUT	TB4-2	ON / OFF	ALWAYS	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 1A
COMPRESSOR 1B	DIGITAL OUTPUT	TB4-3	ON / OFF	ALWAYS	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 1B
COMPRESSOR 2A	DIGITAL OUTPUT	TB4-4	ON / OFF	ALWAYS	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 2A
COMPRESSOR 2B	DIGITAL OUTPUT	TB4-5	ON / OFF	ALWAYS	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 2B
COMPRESSOR 3A	DIGITAL OUTPUT	TB4-7	ON / OFF	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 106 TON, 110 TON, 115 TON, 130 TON, 150 TON	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 3A
COMPRESSOR 3B	DIGITAL OUTPUT	TB4-8	ON / OFF	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 106 TON, 110 TON, 115 TON, 130 TON, 150 TON	STATUS OF THE DIGITAL OUTPUT TO COMPRESSOR 3B
CONDENSER FAN 1A/1	DIGITAL OUTPUT	TB4-9	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 1A
CONDENSER FAN 1B/2	DIGITAL OUTPUT	TB4-10	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 1B
CONDENSER FAN 2A/3	DIGITAL OUTPUT	TB6-2	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 2A
CONDENSER FAN 2B/4	DIGITAL OUTPUT	TB6-3	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 2B
CONDENSER FAN 3A/5	DIGITAL OUTPUT	TB6-4	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 3A
CONDENSER FAN 3B/6	DIGITAL OUTPUT	TB6-5	ON / OFF	ALWAYS	STATUS OF DIGITAL OUTPUT TO CONDENSER FAN 3B

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
ELECTRIC HEAT STAGE 1	DIGITAL OUTPUT	TB3-2	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 1
ELECTRIC HEAT STAGE 2	DIGITAL OUTPUT	TR3-3	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 2
ELECTRIC HEAT STAGE 3	DIGITAL OUTPUT	TB3-4	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 3
ELECTRIC HEAT STAGE 4	DIGITAL OUTPUT	TB3-5	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 4
ELECTRIC HEAT STAGE 5	DIGITAL OUTPUT	TB3-7	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 5
ELECTRIC HEAT STAGE 6	DIGITAL OUTPUT	TB3-8	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 6
ELECTRIC HEAT STAGE 7	DIGITAL OUTPUT	TB3-9	ON / OFF	HEAT SYSTEM TYPE equals ELECTRIC HEAT	STATUS OF ELECTRIC HEAT DIGITAL OUTPUT TO STAGE 7
STAGED GAS FURNACE 1 LOW	DIGITAL OUTPUT	TB3-2	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 1 LOW
STAGED GAS FURNACE 1 HIGH	DIGITAL OUTPUT	TR3-3	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 1 HIGH
STAGED GAS FURNACE 2 LOW	DIGITAL OUTPUT	TB3-4	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 2 LOW
STAGED GAS FURNACE 2 HIGH	DIGITAL OUTPUT	TR3-5	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 2 HIGH
STAGED GAS FURNACE 3 LOW	DIGITAL OUTPUT	TB3-7	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 3 LOW
STAGED GAS FURNACE 3 HIGH	DIGITAL OUTPUT	TR3-8	ON / OFF	HEAT SYSTEM TYPE equals STAGED GAS FURNACE	STATUS OF STAGED GAS HEAT DIGITAL OUTPUT TO STAGE 3 HIGH
MOD GAS FURNACE 1A LOW	DIGITAL OUTPUT	TB3-2	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 1A LOW
MOD GAS FURNACE 1A HIGH	DIGITAL OUTPUT	TR3-3	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 1A HIGH
MOD GAS FURNACE 2 LOW	DIGITAL OUTPUT	TB3-4	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 2 LOW
MOD GAS FURNACE 2 HIGH	DIGITAL OUTPUT	TR3-5	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 2 HIGH
MOD GAS FURNACE 3 LOW	DIGITAL OUTPUT	TB3-7	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 3 LOW
MOD GAS FURNACE 3 HIGH	DIGITAL OUTPUT	TR3-8	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 3 HIGH

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
MOD GAS FURNACE 1B	DIGITAL OUTPUT	TR3-9	ON / OFF	HEAT SYSTEM TYPE equals MODULATING GAS FURNACE	STATUS OF MOD GAS HEAT DIGITAL OUTPUT TO STAGE 1B
PUMP DOWN LLSV 1	DIGITAL OUTPUT	TB5-2	ON / OFF	ALWAYS	STATUS OF PUMP DOWN SOLENOID LLSV 1 DIGITAL OUTPUT
PUMP DOWN LLSV 2	DIGITAL OUTPUT	TB5-4	ON / OFF	ALWAYS	STATUS OF PUMP DOWN SOLENOID LLSV 2 DIGITAL OUTPUT
PUMP DOWN LLSV 3	DIGITAL OUTPUT	TB5-6	ON / OFF	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON, 130 TON, 150 TON	STATUS OF PUMP DOWN SOLENOID LLSV 3 DIGITAL OUTPUT
SUPPLY FAN	DIGITAL OUTPUT	TB1-2	ON / OFF	ALWAYS	STATUS OF SUPPLY FAN DIGITAL OUTPUT
EXHAUST FAN	DIGITAL OUTPUT	TB1-4	ON / OFF	POWER EXHAUST TYPE does not equal NONE or ON-OFF DAMPER CNTL OR SUPPLY SYSTEM TYPE equals SUPPLY-RETURN FAN	STATUS OF EXHAUST FAN OR RETURN FAN DIGITAL OUTPUT
VAV HEAT RELAY	DIGITAL OUTPUT	TB1-12	ON / OFF	VAV / FLEXSYS - HEAT OTHER THAN NONE	STATUS OF THE DIGITAL OUTPUT FOR THE VAV HEAT RELAY
SUPPLY FAN VFD	ANALOG OUTPUT	TB9-1	0-10 VOLT DC	VAV / FLEX	ANALOG OUTPUT TO THE SUPPLY FAN VFD
EXHAUST DAMPER	ANALOG OUTPUT	TB9-7	0-10 VOLTS DC	POWER EXHAUST TYPE does not equal NONE or ON-OFF DAMPER CNTL	ANALOG OUTPUT TO THE EXHAUST DAMPER
EXHAUST / RETURN FAN VFD	ANALOG OUTPUT	TB9-3	0-10 VOLTS DC	POWER EXHAUST MOD DAMPER / VFD	ANALOG OUTPUT TO THE EXHAUST OR RETURN FAN VFD
OA DAMPER	ANALOG OUTPUT	TB9-5	0-10 VOLTS DC	ECONOMIZER EXCEPT NONE	ANALOG OUTPUT TO THE ECONOMIZER DAMPERS
HEATING VALVE	ANALOG OUTPUT	TB9-9	0-10 VOLTS DC	HEAT TYPE IS HOT WATER / STEAM OR MODULATING	ANALOG OUTPUT TO THE HEATING VALVE
BYPASS DAMPER	ANALOG OUTPUT	TB9-11	0-10 VOLTS DC	FLEX BYPASS DAMPER	ANALOG OUTPUT TO THE FLEXSYS BYPASS DAMPER
SUPPLY AIR TEMP	ANALOG INPUT	J1-1	0-5 VOLTS	ALWAYS	ANALOG INPUT FROM THE SUPPLY OR MIXED AIR SENSOR
HEAT EXCHANGER TEMP	ANALOG INPUT	J1-2	0-5 VOLTS	HEAT OPTION IS STAGED GAS OR ELECTRIC	ANALOG INPUT FROM THE TEMPERATURE SENSOR POSITIONED BEFORE THE HEAT SECTION
EVAPORATOR AIR TEMP 1	ANALOG INPUT	J1-3	0-5 VOLTS	FLEXSYS	ANALOG INPUT FROM THE TEMPERATURE SENSORS POSITIONED ON THE LEAVING SIDE OF THE EVAPORATOR COIL

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
OA TEMP	ANALOG INPUT	J2-1	0-5 VOLTS	ALWAYS	ANALOG INPUT FROM THE OUTDOOR AIR TEMPERATURE SENSOR
RA TEMP	ANALOG INPUT	J2-2	0-5 VOLTS	VAV AND FLEXSYS	ANALOG INPUT FROM THE RETURN AIR TEMPERATURE SENSOR
OA RH	ANALOG INPUT	J2-3	0-5 VOLTS	ECONOMIZER METHOD SINGLE / DUAL	ANALOG INPUT FROM THE OUTDOOR AIR HUMIDITY SENSOR
RA RH	ANALOG INPUT	J2-4	0-5 VOLTS	ECONOMIZER METHOD DUAL	ANALOG INPUT FROM THE RETURN AIR HUMIDITY SENSOR
SUCTION TEMP #1	ANALOG INPUT	J3-1	0-5 VOLTS	ALWAYS	ANALOG INPUT FROM THE SYSTEM 1 SUCTION LINE TEMPERATURE SENSOR
SUCTION TEMP #2	ANALOG INPUT	J3-2	0-5 VOLTS	ALWAYS	ANALOG INPUT FROM THE SYSTEM 2 SUCTION LINE TEMPERATURE SENSOR
SUCTION TEMP #3	ANALOG INPUT	J3-3	0-5 VOLTS	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 106 TON, 110 TON, 115 TON, 130 TON, 150 TON	ANALOG INPUT FROM THE SYSTEM 3 SUCTION LINE TEMPERATURE SENSOR
SUCTION PRES #1	ANALOG INPUT	J3-4	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1 / SYS 1,2 / SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 1 SUCTION PRESSURE TRANSDUCER
SUCTION PRES #2	ANALOG INPUT	J4-1	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1,2 / SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 2 SUCTION PRESSURE TRANSDUCER
SUCTION PRES #3	ANALOG INPUT	J4-2	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 3 SUCTION PRESSURE TRANSDUCER
DISCHARGE PRES #1	ANALOG INPUT	J4-3	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1 / SYS 1,2 / SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 1 DISCHARGE PRESSURE TRANSDUCER
DISCHARGE PRES #2	ANALOG INPUT	J4-4	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1,2 / SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 2 DISCHARGE PRESSURE TRANSDUCER
DISCHARGE PRES #3	ANALOG INPUT	J4-5	0-5 VOLTS	DISCH PRESS XDCR PKG SYS 1,2,3	ANALOG INPUT FROM THE SYSTEM 3 DISCHARGE PRESSURE TRANSDUCER
FURNACE STATUS	ANALOG INPUT	J5-1	0-5 VOLTS	HEATING TYPE STAGED OR MODULATING GAS HEAT	ANALOG INPUT OF THE FURNACE MULTIPLEXER
FURNACE 1 STATUS	DERIVED	J5-1	ON / OFF	HEATING TYPE IS STAGED GAS	STATUS IOS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLE 8-10
FURNACE 1A STATUS	DERIVED	J5-1	ON / OFF	HEATING TYPE IS MODULATING GAS	STATUS IS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLE 8-9
FURNACE 1A STATUS HIGH	DERIVED	J5-1	ON / OFF	HEATING TYPE IS MODULATING GAS	STATUS IS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLE 8-9
FURNACE 1B STATUS	DERIVED	J5-1	ON / OFF	HEATING TYPE IS MODULATING GAS	STATUS IOS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLE 8-9

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
FURNACE 2 STATUS	DERIVED	J5-1	ON / OFF	HEATING TYPE IS STAGED OR MODULATING GAS	STATUS IOS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLES 8-9 AND 8-10
FURNACE 3 STATUS	DERIVED	J5-1	ON / OFF	HEATING TYPE IS STAGED OR MODULATING GAS	STATUS IOS DERIVED FROM THE FURNACE STATUS ANALOG INPUT REFERENCE TABLES 8-9 AND 8-10
CO2 1 (OUTSIDE)	ANALOG INPUT	J5-2	0-5 VOLTS	VENTILATION OPTION IS DEMAND	ANALOG INPUT OF THE OUTDOOR CO2 SENSOR
CO2 2 (INSIDE)	ANALOG INPUT	J5-3	0-5 VOLTS	VENTILATION OPTION IS DEMAND	ANALOG INPUT FROM THE INDOOR CO2 SENSOR
RETURN FAN PRESSURE	ANALOG INPUT	J6-1	0-5 VOLTS	POWER EXHAUST RETURN W EXH / RETURN W/O EXH	ANALOG INPUT FROM THE RETURN FAN PRESSURE TRANSDUCER
DUCT STATIC PRES	ANALOG INPUT	J6-2	0-5 VOLTS	UNIT TYPE EQUALS VAV/ FLEX	ANALOG INPUT FROM THE SUPPLY AIR PRESSURE TRANSDUCER
BUILDING STATIC PRES	ANALOG INPUT	J6-3	0-5 VOLTS	POWER EXHAUST MOD / DAMPER / VFD / RETURN W EXH	ANALOG INPUT FROM THE BUILDING PRESSURE TRANSDUCER
OA FLOW PRESSURE 1	ANALOG INPUT	J6-4	0-5 VOLTS	DAMPER HARDWARE MIN. IAQ / FULL IAQ / 1/3 - 2/3 IAQ	ANALOG INPUT FROM THE AIR MEASURING STATION PRESSURE TRANSDUCER
OA FLOW PRESSURE 2	ANALOG INPUT	J6-5	0-5 VOLTS	DAMPER HARDWARE 1/3 - 2/3 IAQ	ANALOG INPUT FROM THE AIR MEASURING STATION PRESSURE TRANSDUCER
ZONE TEMP	ANALOG INPUT	J7-1	0-5 VOLTS	CV / VAV	ANALOG INPUT FROM THE ZONE TEMPERATURE SENSOR
UNDER FLOOR TEMP	ANALOG INPUT	J7-2	0-5 VOLTS	FLEX	ANALOG INPUT FROM THE UNDER FLOOR TEMPERATURE SENSOR
UNDER FLOOR HUMIDITY	ANALOG INPUT	J7-3	0-5 VOLTS	FLEX	ANALOG INPUT FROM THE UNDERFLOOR HUMIDITY SENSOR
SUPPLY AIR TEMP RST	ANALOG INPUT	J7-4	0-5 VOLTS	CV / VAV	HARDWIRED ANALOG INPUT TO RESET THE SUPPLY AIR TEMPERATURE SET POINT
DUCT STATIC PRES RESET	ANALOG INPUT	J7-5	0-5 VOLTS	VAV / FLEX	HARDWIRED ANALOG INPUT TO RESET THE DUCT STATIC PRESSURE SET POINT
OCCUPANCY STATE	DIGITAL INPUT	TB8-2	OCCUPIED /	ALWAYS	HARDWIRED DIGITAL INPUT TO PUT THE UNIT INTO THE OCCUPIED MODE
LOCAL STOP	DIGITAL INPUT	TB8-1	RUN / STOP	ALWAYS	DIGITAL INPUT THAT TURNS THE UNIT ON AND OFF
FAN (G)	DIGITAL INPUT	TB8-8	ON / OFF	CV	HARDWIRED DIGITAL INPUT TO TURN THE SUPPLY FAN ON AND OFF
Y1 LOW COOL	DIGITAL INPUT	TB8-10	ON / OFF	CV	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IN FIRST STAGE COOLING MODE
Y2 HIGH COOL	DIGITAL INPUT	TB8-11	ON / OFF	CV	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IN SECOND STAGE COOLING MODE

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
W1 LOW HEAT	DIGITAL INPUT	TB8-13	ON / OFF	CV	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IN FIRST STAGE HEATING MODE
W2 HIGH HEAT	DIGITAL INPUT	TB8-14	ON / OFF	CV	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IN SECOND STAGE HEATING MODE
COMP SYS 1 STATUS	DIGITAL INPUT	TB7-1	OKAY / FAULTED	ALWAYS	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 1 SAFETY CIRCUIT
COMP SYS 2 STATUS	DIGITAL INPUT	TB7-2	OKAY / FAULTED	ALWAYS	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 2 SAFETY CIRCUIT
COMP SYS 3 STATUS	DIGITAL INPUT	TB7-4	OKAY / FAULTED	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 106 TON, 110 TON, 115 TON, 130 TON, 150 TON	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 3 SAFETY CIRCUIT
COMP SYS 1 LPCO	DIGITAL INPUT	TB7-5	OKAY / FAULTED	ALWAYS	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 1 LOW PRESSURE SAFETY CIRCUIT
COMP SYS 2 LPCO	DIGITAL INPUT	TB7-7	OKAY / FAULTED	ALWAYS	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 2 LOW PRESSURE SAFETY CIRCUIT
COMP SYS 3 LPCO	DIGITAL INPUT	TB7-8	OKAY / FAULTED	UNIT SIZE EQUALS 70 TON, 75 TON, 80 TON, 85 TON, 90 TON, 95 TON, 105 TON, 110 TON, 115 TON, 130 TON, 150 TON	DIGITAL INPUT FROM THE COMPRESSOR SYSTEM 3 LOW PRESSURE SAFETY CIRCUIT
SUPPLY FAN STATUS	DIGITAL INPUT	TB7-10	RUNNING / STOPPED	ALWAYS	DIGITAL INPUT FOR THE SUPPLY FAN RUN VERIFICATION CIRCUIT
EXHAUST FAN STATUS	DIGITAL INPUT	TB7-11	RUNNING / STOPPED	POWER EXHAUST TYPE does not equal NONE or ON-OFF DAMPER CNTL	DIGITAL INPUT FROM THE EXHAUST FAN RUN VERIFICATION CIRCUIT
RETURN FAN STATUS	DIGITAL INPUT	TB7-11	RUNNING / STOPPED	SUPPLY SYSTEM TYPE equals SUPPLY - RETURN FAN	DIGITAL INPUT FROM THE RETURN FAN RUN VERIFICATION CIRCUIT
FILTER STATUS	DIGITAL INPUT	TB7-13	OKAY / FAULTED	WHEN DIRTY FILTER OPTION IS INSTALLED	DIGITAL INPUT FROM THE DIRTY FILTER PRESSURE SWITCH
HOT WATER FRZ STATUS	DIGITAL INPUT	TB7-14	OKAY / FAULTED	HEAT HOT WATER / STEAM	DIGITAL INPUT FROM THE HOT WATER FREEZESTAT
SMOKE PURGE 1	DIGITAL INPUT	TB8-4	ON / OFF	ALWAYS	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IS SMOKE PURGE 1 MODE
SMOKE PURGE 2	DIGITAL INPUT	TB8-5	ON / OFF	ALWAYS	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IS SMOKE PURGE 2 MODE
SMOKE PURGE 3	DIGITAL INPUT	TB8-7	ON / OFF	ALWAYS	HARDWIRED DIGITAL INPUT TO PLACE THE UNIT IS SMOKE PURGE 3 MODE
FAN FAULT	DIGITAL OUTPUT	TB1-6	OKAY / FAULTED	ALWAYS	DIGITAL OUTPUT THAT IS GENERATED WHEN THERE IS A SUPPLY FAN FAULT

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
COOLING/HEATING FAULT	DIGITAL OUTPUT	TB1-8	ON / OFF	ALWAYS	DIGITAL OUTPUT THAT IS GENERATED WHEN THERE IS A COOLING/HEATING FAULT
SENSOR/MISC FAULT	DIGITAL OUTPUT	TB1-10	ON / OFF	ALWAYS	DIGITAL OUTPUT THAT IS GENERATED WHEN THERE IS A SENSOR/MISC FAULT
DUCT PRES RST BAS			USER DISABLE / USER ENABLE	ALWAYS	THIS ITEM MUST BE ENABLED IN ORDER TO COMMUNICATE A DUCT STATIC PRESSURE RESET VALUE TO THE UNIT
DUCT STATIC PRES RST BAS			0 TO 100%	ALWAYS	THE DUCT STATIC RESET VALUE BEING COMMUNICATED TO THE UNIT THROUGH THE BAS SYSTEM
FAN G BAS			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED FAN G INPUT
MORNING WARM UP CMD			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED MORNING WARM UP COMMAND
OCCUPANCY COMMAND			OCCUPIED /	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED OCCUPANCY COMMAND
SMOKE PURGE 1 BAS			ON OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED SMOKE PURGE 1 COMMAND
SMOKE PURGE 2 BAS			ON OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED SMOKE PURGE 2 COMMAND
SMOKE PURGE 3 BAS			ON OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED SMOKE PURGE 3 COMMAND
SAT RST BAS			USER DISABLE / USER ENABLE	ALWAYS	THIS ITEM MUST BE ENABLED IN ORDER TO COMMUNICATED A SUPPLY AIR TEMPERATURE RESET VALUE TO THE UNIT
SUPPLY AIR TEMP RST BAS			0 TO 5 VOLTS	ALWAYS	THE SUPPLY AIR TEMPERATURE RESET VALUE BEING COMMUNICATED TO THE UNIT THROUGH THE BAS SYSTEM
SYSTEM STOP			0 - ALL ALLS	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED SYSTEM STOP COMMAND
UNDER FLR HUMI BAS			USER DISABLE / USER ENABLE	ALWAYS	THIS ITEM MUST BE ENABLED IN ORDER TO COMMUNICATE A UNDER FLOOR HUMIDITY VALUE TO THE UNIT
UNDR FLOOR HUMIDITY BAS			0 TO 100%	ALWAYS	THE UNDER FLOOR HUMIDITY VALUE BEING COMMUNICATED TO THE UNIT

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
UNDR FLR TMEP BAS			USER DISABLE / USER ENABLE	ALWAYS	THIS ITEM MUST BE ENABLED IN ORDER TO COMMUNICATE A UNDER FLOOR TEMPERATURE VALUE TO THE UNIT
UNDER FLOOR TEMP BAS			-20 F TO 180 F	ALWAYS	THIS IS THE ACTUAL UNDER FLOOR TEMPERATURE VALUE BEING COMMUNICATED BY THE BAS SYSTEM
UNIT STOP			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATED UNIT STOP COMMAND
W1 LOW HEAT BAS			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATE W1 LOW HEAT COMMAND
W2 HIGH HEAT BAS			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATE W2 HIGH HEAT COMMAND
Y1 LOW COOL BAS			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATE Y1 LOW COOL COMMAND
Y2 HIGH COOL BAS			ON / OFF	ALWAYS	GIVES THE STATUS OF THE COMMUNICATE Y2 HIGH COOL COMMAND
ZONE TEMP BAS			-20 F TO 180 F	ALWAYS	GIVES THE ACTUAL VALUE OF THE COMMUNICATE ZONE TEMPERATURE
FIRMWARE CRC	DERIVED		0 TO 99999	ALWAYS	THIS IS THE SIZE OF THE CODE IN THE SOFTWARE AND IS NOT FOR FIELD USE
REAL TIME UI - PEAK 5 SEC AND AVERAGE	DERIVED			ALWAYS	THE AVERAGE AND PEAK OVER THE LAST 5 SECONDS TIME USED BY THE USER INTERFACE. THIS IS NOT FOR FIELD USE
REAL TIME UI - PEAK AND LOST	DERIVED			ALWAYS	THE LOST AND PEAK TIME USED BY THE USER INTERFACE. THIS IS NOT FOR FIELD USE
REAL TIME CONTROL - PEAK 5 SEC AND AVERAGE	DERIVED			ALWAYS	THE AVERAGE AND PEAK OVER THE LAST 5 SECONDS TIME USED BY THE CONTROL. THIS IS NOT FOR FIELD USE
REAL TIME CONTROL - PEAK AND LOST	DERIVED			ALWAYS	THE LOST AND PEAK TIME USED BY THE CONTROL. THIS IS NOT FOR FIELD USE
DE MODIFIER ADDRESS			-1 TO 41943	ALWAYS	USED TO ENTER A SPECIFIC DE INSTANCE. SEE SECTION 6 - COMMUNICATION
DE MODIFIER OFFSET			-1 TO 99	ALWAYS	USED IN COMBINATION WITH THE DE MODIFIER ADDRESS TO ENTER A SPECIFIC DE INSTANCE. SEE SECTION 6 - COMMUNICATION
P1 BAUD RATE			9600, 19200, 38400, 76800	ALWAYS	ESTABLISHES THE COMMUNICATION BAUD RATE FOR PORT 1
P1 MANUAL MAC ADDRESS			-1 TO 127	ALWAYS	ALLOWS THE MANUAL ENTRANCE OF THE MAC ADDRESS FOR PORT 1. SEE SECTION 6 - COMMUNICATION

Continued on next page

TABLE 6-11 – SERVICE (CONTINUED)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	SHOW WHEN	DESCRIPTION
P2 BAUD RATE			9600, 19200, 38400, 76800	ALWAYS	ESTABLISHES THE COMMUNICATION BAUD RATE FOR PORT 2
P2 MANUAL MAC ADDRESS			-1 TO 127	ALWAYS	ALLOWS THE MANUAL ENTRANCE OF THE MAC ADDRESS FOR PORT 2. SEE SECTION 6 - COMMUNICATION
P2 PARITY			NONE, EVEN, ODD, IGNORE	ALWAYS	ESTABLISHES THE PARITY FOR COMMUNICATION PORT 2
P2 PROTOCOL			TERMINAL, MODBUS I/O, MODBUS SERVER, API, MODBUS CLINET	ALWAYS	ESTABLISHES THE PROTOCOL FOR COMMUNICATION PORT 2
P2 STOP BITS			1 - 2		ESTABLISHES THE STOP BIT SETTING FOR COMMUNICATION PORT 2
P3 BAUD RATE			9600, 19200, 38400, 76800	ALWAYS	ESTABLISHES THE COMMUNICATION BAUD RATE FOR PORT 3
P3 MANUAL MAC ADDRESS			-1 TO 127	ALWAYS	ALLOWS THE MANUAL ENTRANCE OF THE MAC ADDRESS FOR PORT 3. SEE SECTION 6 - COMMUNICATION
P3 PARITY			NONE, EVEN, ODD, IGNORE	ALWAYS	ESTABLISHES THE PARITY FOR COMMUNICATION PORT 3
P3 PROTOCOL			TERMINAL, MODBUS I/O, MODBUS SERVER, API, MODBUS CLINET	ALWAYS	ESTABLISHES THE PROTOCOL FOR COMMUNICATION PORT 3
P3 STOP BITS			1 - 2		ESTABLISHES THE STOP BIT SETTING FOR COMMUNICATION PORT 3
P4 BAUD RATE			9600, 19200, 38400, 76800	ALWAYS	ESTABLISHES THE COMMUNICATION BAUD RATE FOR PORT 4
P4 MANUAL MAC ADDRESS			-1 TO 127	ALWAYS	ALLOWS THE MANUAL ENTRANCE OF THE MAC ADDRESS FOR PORT 4. SEE SECTION 6 - COMMUNICATION
P4 PARITY			NONE, EVEN, ODD, IGNORE	ALWAYS	ESTABLISHES THE PARITY FOR COMMUNICATION PORT 4
P4 PROTOCOL			TERMINAL, MODBUS I/O, MODBUS SERVER, API, MODBUS CLINET	ALWAYS	ESTABLISHES THE PROTOCOL FOR COMMUNICATION PORT 4
P4 STOP BITS			1 - 2		ESTABLISHES THE STOP BIT SETTING FOR COMMUNICATION PORT 4

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Following is an example of an Analog Input display that can be viewed from Service Mode. See Table 6-11 for a listing of the Analog Inputs.

SERVICE AI	PIO	J07-01	XX.X VDC
+ BUILDING STATIC PRES			=XX.XXINWC

Following is an example of a DIGITAL Input display that can be viewed from Service Mode. The XXX is replaced with OFF or ON in this section. See Table 6-11 for a listing of the DIGITAL Inputs.

SERVICE DI	PIO	TB08-01
LOCAL STOP		RUN

Following is an example of a DIGITAL Output display that can be viewed from Service Mode. The XXX is replaced with OFF or ON in this section. The state of these outputs can be changed if the proper password was entered from the initial Service Mode display with the UNIT SWITCH is in the OFF position. If the password was entered followed by the ✓ key, all outputs can be toggled on and off via the ✓ key. See Table 6-11 for a listing of the digital Outputs.

SERVICE DO	PIO	TB03-05
COMPRESSOR 2A		OFF

Following is an example of an Analog Output display that can be viewed from Service Mode. The states of these outputs can be changed if the proper password was entered from the initial Service Mode display with the UNIT SWITCH in the OFF position. If the password was entered followed by the

✓ key, all output voltages can be programmed via the numeric keypad and the ✓ key. See Table 6-11 for a listing of the Analog Outputs

SERVICE AO	PIO	TB08-01	XX.X VDC
+ SYS 1 FEED VALVE OUTPUT			=XXX.X %

HISTORY

The History key gives the user access to WARNING and FAULT information. Many operating parameters and states are saved at the time of a fault. The History information can be viewed after entering the Level 2 password.

When the HISTORY key is pressed, the first active warning will be displayed. If there are not any active warnings, fault number 1 is displayed. If there are not any faults, "NO FAULT" will be displayed. Data is not saved for warnings. Data is saved for faults.

When a warning is displayed, the ► key advances to the next warning or fault 1 after the last warning. The ◀ key returns to the previous warning or the highest fault number before the first warning.

When a fault is displayed, the ► key advances to the next fault or warning 1 after the last fault. The ◀ key returns to the previous fault or the highest warning number before the first fault. Buffer number 1 is the most recent and buffer number 10 is the oldest fault saved. A maximum of 10 faults are saved. The ▲ and ▼ key can be used to scroll forwards and backwards through the history buffer data. The first parameter on the list will be marked with a '+'.

History Key pressed

WARNING 1	WARNING 2	FAULT 1	FAULT 2	FAULT 3
		FAULT 1 DATA	FAULT 2 DATA	FAULT 3 DATA

The data following the initial History Fault display, is displayed in the same order and with the same message used under the respective menu function:

- Status
- Unit Data
- Cooling
- Supply System
- Comp Sys 1
- Comp Sys 2
- Comp Sys 3
- Heating
- Economizer
- Ventilation
- Exhaust
- Hours/Starts

Pressing the ▼ key from a History Fault display changes the display to the History Section display format. The ► and ◀ keys are used to select a section. Pressing the History or ✕ key returns to the History Fault display. Pressing the ▼ key displays the next parameter in the selected list. From a parameter display, pressing the History or ✕ key returns to the History Fault display. *See Section 6 "Navigation Keys" for instructions for navigating the parameter display.*

For the following example, assume that there were three faults and one warning logged.

First, the History key is pressed to get the password prompt. If a level 2 password is active, this prompt is skipped.

HISTORY
 ENTER PASSWORD

After entering the Level 2 password, the most recent WARNING is displayed.

HISTORY WARNING ◀►
 + WRN-BUILDING PRS

The ► key is pressed to move to the first fault.

HISTORY 01 31 OCT 2004 12:45:59 AM ◀►
 + LOCKOUT-DUCT PRS XDCR

The ► key is pressed to move to the next older fault (fault # 2).

HISTORY 02 31 OCT 2004 10:42:39 AM ◀►
 AUTO RESET-MSAT SENSOR

The ► key is pressed to move to the next older fault (fault # 3)

HISTORY 03 30 OCT 2004 02:11:23 PM ◀►
 WRN-BUILDING PRS

The ▼ key is pressed to view data saved when fault #3 was detected.

HISTORY 03 – STATUS ◀►
 UNIT-OVERALL RUN

The ▼ key is pressed to view the second STATUS value.

HISTORY 03 – STATUS ◀►
 CURRENT OPER MODE RUN

The ► key is pressed to change to the next data section (UNIT DATA).

HISTORY 03 – UNIT DATA ◀►
 UNIT TYPE CONSTANT VOLUME

The ✕ or HISTORY key is pressed to go back to the fault display.

HISTORY 03 30 OCT 2004 02:11:23 PM ◀►
 WRN-BUILDING PRS

From fault display, the ✕ key can be pressed to return to the Power Up Banner display.

PASSWORD

Passwords are used to allow restricted access to the modification and viewing of certain parameters using the Setpoints, Program, Options, Date/Time, Schedule, Operating Hours / Start Counter, Print, Service, and History menu keys. The menus activated by each of these buttons can only be viewed after an acceptable password is entered. Each parameter is associated with a level of access. Each level of access is associated with a specific password. The access levels available are: Level 1 or Level 2.

- If a parameter is tagged as Level 1, password of 9675 must be entered in order to change the value.
- If a parameter is tagged as Level 2, a password of 9725 must be entered in order to change the value. Entering the Level 2 password will also allow the changing of a Level 1 parameter.

Pressing Setpoints, Program, Options, Date/Time, Schedule, Operating Hours / Start Counter, Print, Service, or History key will take the user to the login prompt. When the user is first presented with the login prompt, the password field will be blank. If the user wishes to change Level 1 or Level 2 parameters, the user must know the appropriate password. At that point, only the parameters changeable under the specific password level will be displayed. For example, if the user presses the Options menu key, and then enters a Level 1 password, the user will be presented with a list of option parameters that have been tagged as Level 1. If the user enters a level 2 password, all parameters are displayed.

The password is entered by pressing the correct sequence of numerical keys (the 0 key through the 9 key), then pressing the ✓ key. As digits are entered, asterisks will be placed in the password field. Once entered, the menu system will compare the password to a list of stored passwords. If the entered password matches one of the stored passwords, the user is allowed access at the specified level, and the display will show the first applicable parameter of the menu list, with the appropriate edit prompts. If the password is not correct, the screen will display "Password Incorrect" for two seconds and then revert back to the Login Prompt. Pressing the X key during password entry will cancel the password entry process and take the user back to the Login Prompt.

Once a password has been accepted, reentry of that password will not be required until either the user presses a menu key other than Setpoints, Program, Options, Date/Time, Schedule, Operating Hours / Start Counter, Print, Service, History or key activity is idle for fifteen minutes. This ensures that the menu system reverts to password protection within an acceptable timeout.

POWER UP BANNER

When power is first applied to the control panel, the following message will be displayed for two seconds:

The top line displays the copyright message. The bottom line displays the software version, and the present date and time.

The software version number will be in the following formats:

- C.ECO.ZZ.YY (control board released version)
- Where C is the Product Classification and stands for Commercial unit
- ECO is the Family Code and stands for YPAL Packaged Rooftop Air Conditioner Control Panel
- ZZ = the Product Code
- YY = the Version Number

COMMUNICATION

The Primary Unit Controller is designed to communicate with a Building Automation System and a printer.

The Building Automation System communication uses BACnet protocol, MS/TP, Modbus I/O, Modbus Server, Modbus Client or Terminal. Other Building Automation system networks can be connected by using a router.

The printer communication uses ASCII protocol and RS-232 hardware

Communication Ports

The IPU Control board has four serial communication ports. BACnet MS/TP must use Port 1 and Terminal must use Port 2, which is the RS232 Port. Other protocols may be selected on Ports 2, 3, or 4.

BACnet wiring

All BACnet devices are “daisy chained” together using a twisted pair, the (+) is connected to the (+) and the (-) to the (-). Connect the (+) to terminal 3 of Port 1 and the (-) to terminal 2 of Port 1.

Device Object Instance (DE)

The unit is shipped to automatically establish the DE address after the MAC address is established using the MAC address switches on the IPU or through the User Interface. The default DE address would be 23000 plus the MAC address.

The MAC address can be set in two ways using the MAC Address Switches on the IPU or through the Service Key of the User Interface. The 8-way binary switch uses seven of the rockers to set the MAC address. The network address must be between 1 and 127. To determine the node address, add the value of each DIP switch in the ON position as shown in Figure 6-3. Switch 8 must always be in the ON position to allow terminal operation.

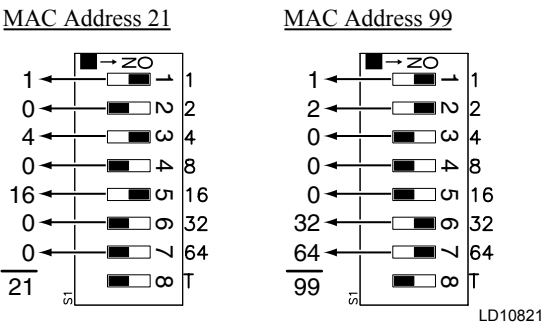


FIG. 6-3 – MAC ADDRESS SWITCHES

LD10821

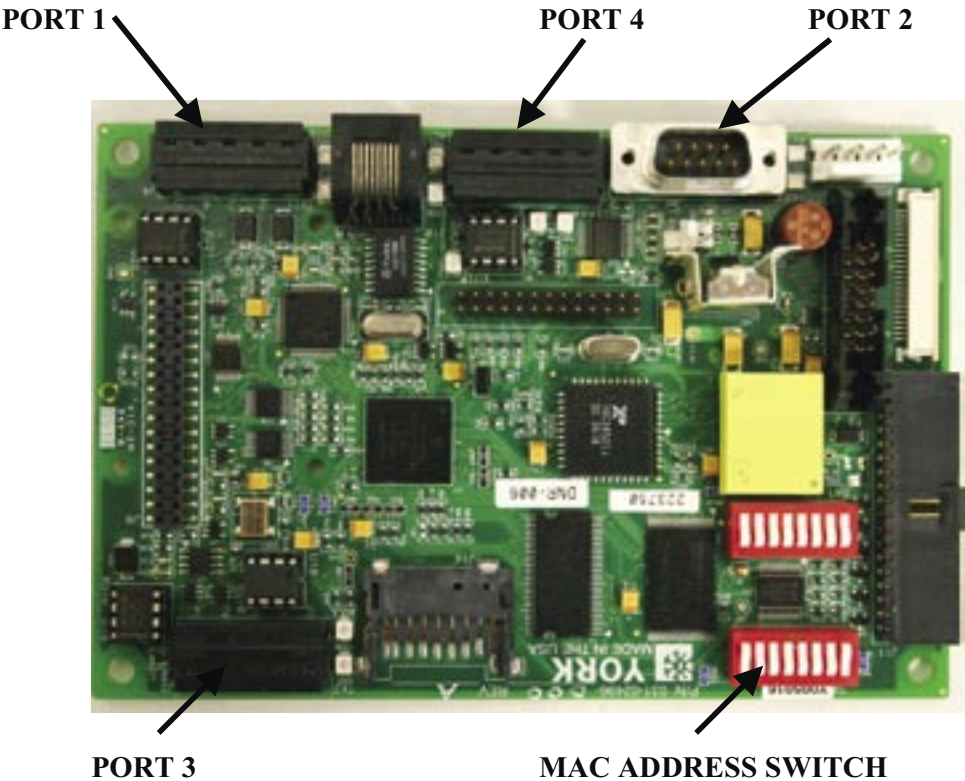


FIG. 6-2 – IPU CONTROL BOARD

LD11197

As stated above the MAC address can also be set using the Service Key. Go to parameter “PI MANUAL MAC ACCESS”. Press the $\square$ enter the MAC address number using the numeric keypad and then press the $\square$ again. The MAC address can be a number from 0 to 127. If the MAC address is entered using the User Interface the control will ignore any values entered through the MAC Address Switches. In order to make the MAC Address switches active again a value of -1 would need to be entered for the “PI MANUAL MAC ACCESS”

In most applications the above procedure allows the Device Object Instance (DE) to be established. Some applications may request that the Device Object Instance (DE) be set to a given value. This can be done through the User Interface. To do this you would use the “DE MODIFIER ADDRESS” in conjunction with the “DE MODIFIER OFFSET”. Using this feature the Device Object Instance (DE) would be the (“DE MODIFIER ADDRESS” X 100) + “DE MODIFIER OFFSET”. For example if you wanted a DE address of 2010 the “DE MODIFIER ADDRESS” to 20 and the “DE MODIFIER OFFSET” to 10. The Device Object instance (DE) is limited to a value between 0 and 4,194,303.

The “DE MODIFIER ADDRESS” and the “DE MODIFIER OFFSET” are both set using the Service key of the user Interface. Go to parameter “DE MODIFIER ADDRESS”. Press the $\square$ enter the DE Modifier Address number using the numeric keypad and then press the $\square$ again. Then go to parameter “DE MODIFIER OFFSET”. Press the $\square$ enter the DE Modifier Offset number using the numeric keypad and then press the $\square$ again.

Additional Settings

The following parameters can also be programmed using the SERVICE Key:

PORT 1

“P1 BAUD RATE”
“P1 MANUAL MAC ADDRESS”

PORT 2

“P2 BAUD RATE”
“P2 MANUAL MAC ADDRESS”
“P2 PARITY”
“P2 PROTOCOL”
“P2 STOP BITS”

PORT 3

“P3 BAUD RATE”
“P3 MANUAL MAC ADDRESS”
“P3 PARITY”
“P3 PROTOCOL”
“P3 STOP BITS”

PORT 4

“P4 BAUD RATE”
“P4 MANUAL MAC ADDRESS”
“P4 PARITY”
“P4 PROTOCOL”
“P4 STOP BITS”

Table 6-12 gives the BACnet name, BACnet Object Type and Instance, and the Modbus Register Address for the available communication points.

TABLE 6-12 – AVAILABLE COMMUNICATION POINTS

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
ACT_DSP_SP	DUCT STATIC SET POINT	R	AI01	514	A DERIVED VALUE THE DUCT STATIC IS CONTROLLED TO ("WG)
ACT_MIN_FLOW	ACTIVE MINIMUM AIR FLOW	R	AI02	515	A DERIVED VALUE THE MINIMUM VENTILATION AIR IS CONTROLLED TO (CFM)
ACT_MIN_POS	ACTIVE MINIMUM POSITION	R	AI03	516	A DERIVED VALUE THE DAMPER IS CONTROLLED TO FOR MINIMUM VENTILATION AIR (%)
ACT_SAT_SP	SUPPLY AIR SETP	R	AI04	517	A DERIVED VALUE THE SUPPLY AIR TEMPERATURE IS CONTROLLED TO (F)
ACT_SLAB_CTL	ACTIVE SLAB CONTROL	R/W	AV(BV)77	1102	ALLOWS THE ACTIVE SLAB CONTROL FEATURE TO BE TURNED ON AND OFF ON FLEXSYS UNITS (0 = OFF / 1 = ON)
BUILD_PRES_SP	BUILDING PRESSURE SP	R/W	AV01	1026	THE BUILDING PRESSURE SET POINT ("WG)
BLD_STAT_PRS	BUILDING STATIC PRES	R	AI05	518	ACTUAL BUILDING PRESSURE INPUT ("WG)
BYPASS_DAMPER	BYPASS DAMPER	R	AI06	519	ACTUAL BYPASS DAMPER POSITION (%)
CO2_1_OUT	CO2 1 (OUTSIDE)	R	AI07	520	ACTUAL OUTDOOR CO2 VALUE (PPM)
CO2_2_INSIDE	CO2 1 (INSIDE)	R	AI08	521	ACTUAL INDOOR CO2 VALUE (PPM)
CO2_OFFSET	CO2 OFFSET	R/W	AV02	1027	THE DIFFERENCE BETWEEN THE INDOOR AND OUTSIDE CO2 MUST EXCEED THIS VALUE TO INITIATE DEMAND VENTILATION (CO2)
COMP_1A	COMPRESSOR 1A	R	BI03	1284	STATUS OF COMPRESSOR 1A, (ON/OFF)
COMP_1B	COMPRESSOR 1B	R	BI04	1285	STATUS OF COMPRESSOR 1B, (ON/OFF)
COMP_2A	COMPRESSOR 2A	R	BI05	1286	STATUS OF COMPRESSOR 2A, (ON/OFF)
COMP_2B	COMPRESSOR 2B	R	BI06	1287	STATUS OF COMPRESSOR 2B, (ON/OFF)
COMP_3A	COMPRESSOR 3A	R	BI07	1288	STATUS OF COMPRESSOR 3A, (ON/OFF)
COMP_3B	COMPRESSOR 3B	R	BI08	1289	STATUS OF COMPRESSOR 3B, (ON/OFF)
COMP_LPCO_1	COMPRESSOR LPCO 1	R	BI09	1290	STATUS OF COMPRESSOR SYSTEM 1 LOW PRESSURE CUTOUT CIRCUIT (NFL - NO FAULT / FLT - FAULTED)
COMP_LPCO_2	COMPRESSOR LPCO 2	R	BI10	1291	STATUS OF COMPRESSOR SYSTEM 2 LOW PRESSURE CUTOUT CIRCUIT (NFL - NO FAULT / FLT - FAULTED)
COMP_LPCO_3	COMPRESSOR LPCO 3	R	BI11	1292	STATUS OF COMPRESSOR SYSTEM 3 LOW PRESSURE CUTOUT CIRCUIT (NFL - NO FAULT / FLT - FAULTED)
COMP_STAT_1	COMPRESSOR STATUS 1	R	BI12	1293	STATUS OF COMPRESSOR SYSTEM 1 COMPRESSOR SAFETY CIRCUIT (NFL - NO FAULT / FLT - FAULTED)
COMP_STAT_2	COMPRESSOR STATUS 2	R	BI13	1294	STATUS OF COMPRESSOR SYSTEM 2 COMPRESSOR SAFETY CIRCUIT (NFL - NO FAULT / FLT - FAULTED)

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
COMP_STAT_3	COMPRESSOR STATUS 3	R	BI14	1295	STATUS OF COMPRESSOR SYSTEM 3 COMPRESSOR SAFETY CIRCUIT (NFL - NO FAULT / FLT - FAULTED)
DCT_ST_PR_RT	DUCT STATIC PRES RST	R	AI16	529	A HARDWIRED ENTERED ANALOG VOLTAGE THAT RESULTS IN A %RESET DOWN FROM THE DUCT STATIC HIGH LIMIT BASED ON A PERCENT OF THE DIFFERENCE BETWEEN DUCT STATIC HIGH LIMIT AND DUCT STATIC LOW LIMIT (%)
DCT_STAT_PRS	DUCT STATIC PRES	R	AI17	530	ACTUAL DUCT STATIC PRESSURE INPUT TO THE CONTROL ("WG)
DEW_PNT_RST	DEW POINT RESET	R/W	AV(BV)80	1105	THIS ALLOWS THE DEW POINT RESET FEATURE TO BE TURNED ON AND OFF ON FLEXSYS UNITS (0 = OFF / 1 = ON)
DSP_HI_LIMIT	DUCT STATIC HIGH LIMIT	R/W	AV03	1028	THE DUCT STATIC UPPER SET POINT ("WG)
DSP_LO_LIMIT	DUCT STATIC LOW LIMIT	R/W	AV04	1029	THE DUCT STATIC LOWER SET POINT ("WG)
DSP_RST_BAS	DUCT STATIC PRES RST BAS	R/W	AV05	1030	A BAS ENTERED VALUE THAT RESULTS IN A %RESET DOWN FROM THE DUCT STATIC HIGH LIMIT BASED ON A PERCENT OF THE DIFFERENCE BETWEEN DUCT STATIC HIGH LIMIT AND DUCT STATIC LOW LIMIT (%). "DUCT PRES RST BAS" MUST BE ENABLED USING THE SERVICE KEY IN ORDER TO USE THIS FEATURE
ECONO_INSTAL	ECONOMIZER INSTALLED	R/W	AV(BV)81	1106	ALLOWS THE ECONOMIZER FEATURE TO BE TURNED ON AND OFF (0 = OFF / 1 = ON)
ECON_ME_USED	ECONOMIZER METHOD	R	AI18	531	THE ECONOMIZER METHOD BEING USED BY THE CONTROL (0 - DRY BULB; 1 - SINGLE ENTHALPY; 2 - DUAL ENTHALPY)
ECON_STATUS	ECONOMIZER SUITABLE ECON INSTALLED	R	AI19	532	STATUS OF THE ECONOMIZER OPTION (0 - INSTALLED AND INACTIVE; 1 - INSTALLED AND ACTIVE; 2 - NOT INSTALLED)
EL_AIR_TMP_H	EVAP LEAVING AIR TEMP HIGH	R/W	AV07	1032	ON A FLEXSYS UNIT WITH BYPASS THIS IS THE SUPPLY AIR TEMPERATURE HIGH SET POINT (F)
EL_AIR_TMP_L	EVAP LEAVING AIR TEMP LOW	R/W	AV08	1033	ON A FLEXSYS UNIT WITH BYPASS THIS IS THE SUPPLY AIR TEMPERATURE LOW SET POINT (F)
EVAP_AIR_TMP	EVAPORATOR AIR TEMP 1	R	AI20	533	ACTUAL TEMPERATURE OF AIR LEAVING THE EVAPORATOR COIL ON A FLEXSYS UNIT (F)
EXHAUST_FAN	EXHAUST FAN	R	BI22	1303	THE STATUS OF THE BINARY OUTPUT FOR THE EXHAUST (ON / OFF)
EXH_FAN_STAT	EXHAUST FAN STATUS	R	BI21	1302	THE STATUS OF THE EXHAUST FAN RUN VERIFICATION CIRCUIT (RUN - ON VERIFICATION CIRCUIT CLOSED / STO - STOP - VERIFICATION CIRCUIT OPEN)

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
EXHAUST_OUT	E X H A U S T OUTPUT	R	AI21	534	CONTROL OUTPUT TO THE EXHAUST DAMPER (%)
HEAT_ENT_TMP	HEAT ENTERING TEMP	R	AI22	535	ACTUAL TEMPERATURE OF THE AIR ENTERING THE STAGED HEAT SECTION (F)
HEATING_SAT	HEATING SAT	R/W	AV09	1032	THE HEATING SAT SET POINT FOR A VAV OR FLEXSYS UNIT (F)
HEAT_STAGES	ELECTRIC HEAT STAGES GAS HEAT STAGES	R	AI23	536	DERIVED VALUE SHOWING THE NUMBER OF ELECTRIC OR STAGED GAS HEAT STAGES AVAILABLE (1 - 7)
HEATING_VALV	HEATING VALVE	R	AI24	537	THE OUTPUT FROM THE CONTROL TO A HOT WATER, STEAM, OR MODULATING GAS HEAT VALVE (%)
HW_FRZ_STAT	HOT WATER FRZ STATUS	R	BI33	1314	THE STATUS OF THE FREEZESTAT CIRCUIT ON UNITS WITH HOT WATER OR STEAM HEAT. (FLT - FAULTED / NFL - NO FAULT)
MAX_BYPASS	M A X I M U M BYPASS	R/W	AV10	1035	THE MAXIMUM ALLOWABLE SETTING FOR THE BY PASS DAMPER IN A FLEXSYS UNIT (%)
MAX_FLOW_DV	M A X F L O W D E M A N D VENTILATION	R/W	AV11	1036	THE MAXIMUM ALLOWABLE AIRFLOW FOR DEMAND VENTILATION WITH AN AIR MEASURING STATION (CFM)
MECH_LCK_ TMP	M E C H C L G LOCKOUT TEMP	R/W	AV12	1037	THE MINIMUM OUTDOOR TEMPERATURE AT WHICH MECHANICAL COOLING IS ALLOWED TO OPERATE (F)
MIN_FLOW_DV	MINFLOWDEMAND VENTILATION	R/W	AV13	1038	THE MINIMUM ALLOWABLE AIRFLOW FOR DEMAND VENTILATION WITH AN AIR MEASURING STATION (CFM)
MIXD_SAT_LIM	MIXED SAT LIMIT	R/W	AV14	1039	ON A FLEXSYS UNIT THIS IS THE SUPPLY AIR SETPOINT WHEN OPERATING WITHOUT A BYPASS DAMPER (F)
MORN_WUP_ CMD	MORNING WARM UP CMND	R/W	AV(BV)86	1111	A BAS GENERATED COMMAND TO ALLOW THE MORNING WARM UP FEATURE TO BE TURNED ON AND OFF (0 = OFF / 1 = ON)
MORN_WUP_ RAT	RAT HEATING SETP	R/W	AV15	1040	ON A VAV OR FLEXSYS UNIT THIS IS THE RETURN AIR TEMPERATURE SET POINT USED TO DETERMINE WHEN THE UNIT SHOULD SWITCH TO THE HEATING MODE (F)
NIGHT_SETBAC	NIGHT SET BACK (FOR HEATING)	R/W	AV(BV)87	1112	THIS COMMAND ALLOWS THE NIGHT SET BACK HEATING FUNCTION TO BE TURNED ON AND OFF (0 = OFF / 1 = ON)
OA_DAMPER	OA DAMPER	R	AI25	538	THIS IS THE POSITION OF THE OUTDOOR DAMPER (%)
O A _ D A M P _ POS1	OA DAMPER MIN POSITION 1	R/W	AV16	1041	THE MINIMUM POSITION FOR THE OUTDOOR AIR DAMPER WHEN USING FIXED VENTILATION CONTROL WHEN THE SUPPLY FAN IS AT FULL SPEED (%)

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
OA _ D A M P _ POS2	OA DAMPER MIN POSITION 2	R/W	AV17	1042	THE MINIMUM POSITION FOR THE OUTDOOR AIR DAMPER WHEN USING FIXED VENTILATION CONTROL WHEN THE SUPPLY FAN IS AT 50% OF FULL SPEED (%)
OA_ENTHALPY	OUTSIDE AIR ENTHALPY	R	AI26	539	ACTUAL OUTSIDE AIR ENTHALPY (BTU/LB)
OA_ENTH_LIMT	OA ENTHALPY LIMIT	R/W	AV18	1043	THE UPPER ENTHALPY LIMIT TO ALLOW THE USE OF OUTDOOR AIR FOR SINGLE OR DUAL ENTHALPY ECONOMIZER (BTU/LB)
OA_FLO_PRS_1	OA FLOW PRESSURE 1	R	AI27	540	THE VELOCITY OF THE AIR AS MEASURED AT A MINIMUM, FULL, OR 1/3 DAMPER SECTION OF AN AIR MEASURING STATION (FPM)
OA_FLO_PRS_2	OA FLOW PRESSURE 2	R	AI28	541	THIS IS THE VELOCITY OF THE AIR AS MEASURED AT THE 2/3 DAMPER SECTION OF AN AIR MEASURING STATION (FPM)
OA_REL_HUMID	OUTSIDE AIR HUMIDITY	R	AI29	542	ACTUAL OUTDOOR AIR RELATIVE HUMIDITY (%)
OA_TEMP	OUTSIDE AIR TEMP	R	AI30	543	ACTUAL OUTDOOR AIR TEMPERATURE (F)
OCCUPNCY_CMD	OCCUPANCY COMMAND	R/W	AV(BV)88	1113	THIS BAS COMMAND ALLOWS THE UNIT TO BE PLACED IN THE OCCUPIED OR UNOCCUPIED MODE (0 = UNOCCUPIED / 1 = OCCUPIED)
OCC_ZN_COOL	OCCUPIED ZONE COOLING SETP	R/W	AV21	1046	THE OCCUPIED ZONE COOLING SET POINT (F)
OCC_ZN_HEAT	OCCUPIED ZONE HEATING SETP	R/W	AV22	1047	THE OCCUPIED ZONE HEATING SET POINT (F)
PRS_1_DISCH	PRESSURES 1 DISCHARGE	R	AI31	544	ACTUAL SYSTEM 1 DISCHARGE PRESSURE (PSI)
P R S _ 1 _ SUCTION	PRESSURES 1 SUCTION	R	AI32	545	ACTUAL SYSTEM 1 SUCTION PRESSURE (PSI)
PRS_2_DISCH	PRESSURES 2 DISCHARGE	R	AI33	546	ACTUAL SYSTEM 2 DISCHARGE PRESSURE (PSI)
P R S _ 2 _ SUCTION	PRESSURES 2 SUCTION	R	AI34	547	ACTUAL SYSTEM 2 SUCTION PRESSURE (PSI)
PRS_3_DISCH	PRESSURES 3 DISCHARGE	R	AI35	548	ACTUAL SYSTEM 3 DISCHARGE PRESSURE (PSI)
P R S _ 3 _ SUCTION	PRESSURES 3 SUCTION	R	AI36	549	ACTUAL SYSTEM 3 SUCTION PRESSURE (PSI)
RAT_COOL_SP	RAT COOLING SETP	R/W	AV23	1048	ON A VAV OR FLEXSYS UNIT THIS VALUE IS USED TO DETERMINE WHEN THE UNIT SHOULD SWITCH TO THE COOLING MODE (F)
RET_AIR_BY_S	ACTIVE BYPASS ACTIVE SP	R	AI37	550	A DERIVED VALUE FOR THE CURRENT SET POINT OF THE RETURN AIR BYPASS DAMPER ON A FLEXSYS UNIT (%)

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
RET_AIR_ENTH	RETURN AIR ENTHALPY	R	AI38	551	ACTUAL RETURN AIR ENTHALPY (BTU/LB)
RET_AIR_HUMD	RETURN AIR HUMIDITY	R	AI39	552	ACTUAL RETURN AIR RELATIVE HUMIDITY (%)
RET_AIR_TEMP	RETURN AIR TEMP	R	AI40	553	ACTUAL RETURN AIR TEMPERATURE (F)
RET_FAN_OUT	EXHAUST/RETURN FAN VFD	R	AI41	554	THE OUTPUT FROM THE CONTROL TO THE EXHAUST OR RETURN FAN VFD (%)
RET_FAN_PRES	RETURN FAN PRESSURE	R	AI42	555	THE ACTUAL PRESSURE THAT IS USED TO CONTROL THE RETURN FAN (IWC)
RET_FAN_STAT	RETURN FAN STATUS	R	BI52	1333	THE STATUS OF THE RETURN FAN RUN VERIFICATION CIRCUIT (RUN - VERIFICATION CIRCUIT CLOSED / STO - STOP - VERIFICATION CIRCUIT OPEN)
SAT_HIGH_LIM	SAT HIGH LIMIT	R/W	AV26	1051	THE UPPER LIMIT FOR THE SUPPLY AIR TEMPERATURE SET POINT ON A VAV UNIT (F)
SAT_LOW_LIM	SAT LOW LIMIT	R/W	AV27	1052	THE LOWER LIMIT FOR THE SUPPLY AIR TEMPERATURE SET POINT ON A VAV UNIT (F)
SAT_RST_BAS	SUPPLY AIR TEMP RST BAS	R/W	AV28	1053	THIS IS AN ANALOG INPUT FROM THE BAS SYSTEM THAT ALLOWS THE RESET OF THE ACTIVE SUPPLY AIR TEMPERATURE SET POINT ON VAV UNITS. 0 VOLTS USES SAT HIGH LIMIT AND 5 VOLTS USES SAT LOW LIMIT (V). "SAT RST BAS" MUST BE ENABLED USING THE SERVICE KEY IN ORDER TO USE THIS FEATURE
SAT_SUC_TMP1	SATURATED SUCTION TEMP (TEMPERATURES 1 SUCTION)	R	AI43	556	THE SATURATION TEMPERATURE OF THE SYSTEM 1 SUCTION GAS BASED ON THE SYSTEM 1 SUCTION PRESSURE (F)
SAT_SUC_TMP2	SATURATED SUCTION TEMP (TEMPERATURES 2 SUCTION)	R	AI44	557	THE SATURATION TEMPERATURE OF THE SYSTEM 2 SUCTION GAS BASED ON THE SYSTEM 2 SUCTION PRESSURE (F)
SAT_SUC_TMP3	SATURATED SUCTION TEMP (TEMPERATURES 3 SUCTION)	R	AI45	558	THE SATURATION TEMPERATURE OF THE SYSTEM 3 SUCTION GAS BASED ON THE SYSTEM 3 SUCTION PRESSURE (F)
SF_PROV_SW	SF PROVING SWITCH	R	BI55	1312	THE STATUS OF THE SUPPLY FAN AIR PROVING CIRCUIT (RUN - VERIFICATION CIRCUIT CLOSED / STO - STOP - VERIFICATION CIRCUIT OPEN)
STG_1_COOL	STG 1 COOLING	R/W	AV31	1056	FOR A CONSTANT VOLUME UNIT THIS IS THE ACTIVE SAT SET POINT FOR A FIRST STAGE COOLING DEMAND (F)

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
STG_1_HEAT	STG 1 HEATING	R/W	AV32	1057	FOR A CONSTANT VOLUME UNIT THIS IS THE ACTIVE SAT SET POINT FOR A FIRST STAGE HEATING DEMAND (F)
STG_2_COOL	STG 2 COOLING	R/W	AV33	1058	FOR A CONSTANT VOLUME UNIT THIS IS THE ACTIVE SAT SET POINT FOR A SECOND STAGE COOLING DEMAND (F)
STG_2_HEAT	STG 2 HEATING	R/W	AV34	1059	FOR A CONSTANT VOLUME UNIT THIS IS THE ACTIVE SAT SET POINT FOR A SECOND STAGE HEATING DEMAND (F)
SUP_AIR_TEMP	SUPPLY AIR TEMP	R	AI46	559	ACTUAL SUPPLY AIR TEMPERATURE (F)
SUP_AIR_TRST	SUPPLY AIR TEMP RST	R	AI47	560	THIS IS EITHER A HARDWIRED OR COMMUNICATED 0 TO 5 VOLT DC INPUT THAT ADJUST THE SUPPLY AIR SET POINT BETWEEN THE SAT LOW AND SAT HIGH LIMIT (V)
SUP_FAN_VFD	SUPPLY FAN VFD	R	AI48	561	THE ACTUAL OUTPUT TO THE SUPPLY FAN VFD (%)
SUPPLY_FAN	SUPPLY FAN	R	BI59	1340	THE STATUS OF THE BINARY OUTPUT FROM THE CONTROLLER TO THE SUPPLY FAN CIRCUIT (ON / OFF)
SYSTEM_STOP	SYSTEM STOP	R/W	AV35	1060	A 0- VALUE ALLOWS ALL COMPRESSORS TO OPERATE; 1 - TURNS OFF COMPRESSOR SYSTEM 1; 2 - TURNS OFF COMPRESSOR SYSTEM 2; 3 - TURNS OFF COMPRESSOR SYSTEM 3
T E M P _ 1 _ SUCTION	TEMPERATURE 1 SUCTION	R	AI49	562	THE ACTUAL TEMPERATURE OF THE SYSTEM 1 SUCTION LINE (F)
T E M P _ 2 _ SUCTION	TEMPERATURE 2 SUCTION	R	AI51	564	THE ACTUAL TEMPERATURE OF THE SYSTEM 2 SUCTION LINE (F)
T E M P _ 3 _ SUCTION	TEMPERATURE 3 SUCTION	R	AI53	566	THE ACTUAL TEMPERATURE OF THE SYSTEM 3 SUCTION LINE (F)
U N D _ F L R _ DEWP	UNDER FLOOR DEW POINT	R	AI55	568	THE CALCULATED DEW POINT OF THE AIR UNDER THE FLOOR IN A FLEXSYS SYSTEM (%)
UND_HUMD_BAS	UNDER FLOOR HUMIDITY BAS	R/W	AV36	1061	THIS ALLOWS THE BAS SYSTEM TO INPUT A UNDER FLOOR HUMIDITY VALUE TO THE CONTROL ON A FLEXSYS SYSTEM (%) "UNDER FLR HUMI BAS" MUST BE ENABLED USING THE SERVICE KEY IN ORDER TO USE THIS FEATURE
U N D _ F L R _ HUMD	UNDER FLOOR HUMIDITY	R	AI56	569	HUMIDITY VALUE OF THE AIR UNDER THE FLOOR THE CONTROL IS CONTROLLING TO IN A FLEXSYS SYSTEM (%)
UND_TEMP_BAS	UNDER FLOOR TEMP BAS	R/W	AV37	1062	THIS ALLOWS THE BAS SYSTEM TO INPUT A UNDER FLOOR TEMPERATURE VALUE TO THE CONTROL ON A FLEXSYS SYSTEM (F). "UNDER FLR TEMP BAS" MUST BE ENABLED USING THE SERVICE KEY IN ORDER TO USE THIS FEATURE

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TABLE 6-12 – AVAILABLE COMMUNICATION POINTS (CONTINUED)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
UND_FLR_TEMP	UNDER FLOOR TEMP	R	AI57	570	TEMPERATURE OF THE AIR UNDER THE FLOOR THE CONTROL IS CONTROLLING TO IN A FLEXSYS SYSTEM (F)
UNIT_MODE	UNIT MODE	R	AI58	571	0 - OCCUPIED COOLING 1 - OCCUPIED COOLING LOW 2 - OCCUPIED COOLING HIGH 3 - OCCUPIED COOLING WITH BYPASS 4 - OCCUPIED COOLING WITHOUT BYPASS 5 - OCCUPIED HEATING 6 - OCCUPIED HEATING LOW 7 - OCCUPIED HEATING HIGH 8 - OCCUPIED STANDBY 9 - UNOCCUPIED COOLING 10 - UNOCCUPIED COOLING LOW 11 - UNOCCUPIED COOLING HIGH 12 - UNOCCUPIED HEATING 13 - UNOCCUPIED HEATING LOW 14 - UNOCCUPIED HEATING HIGH 15 - UNOCCUPIED STANDBY 16 - COMFORT VENT COOLING 17 - COMFORT VENT HEATING 18 - NIGHT SET BACK 19 - MORNING WARM UP 20 - POWER UP STANDBY
UNIT_STOP	UNIT STOP	R/W	AV(BV)93	1118	THIS COMMAND ALLOWS THE UNIT TO BE SHUT DOWN THROUGH THE BAS SYSTEM (0 = NORMAL OPERATION/ 1 = STOPPED)
UNOCC_ZN_COOL	UNOCCUPIED ZONE COOLING	R/W	AV38	1063	THE UNOCCUPIED ZONE COOLING SET POINT (F)
UNOCC_ZN_HEAT	UNOCCUPIED ZONE HEATING	R/W	AV39	1064	THE UNOCCUPIED ZONE HEATING SET POINT (F)
UNSTABLE_SYS	UNSTABLE SYSTEM	R	BI60	1341	THIS INDICATES A UNSTABLE SYSTEM WHEN TWO UNITS ARE TWINNED TOGETHER AND THERE IS A SUDDEN DROP IN SUPPLY AIR TEMPERATURE OR FAN SPEED (YES - UNSTABLE CONDITION / NO - NORMAL OPERATION)
VENT_DEM_OUT	VENTILATION DEMAND P1 OUTP	R	AI59	572	THE VENTILATION OUTPUT BEING GENERATED BY THE DEMAND VENTILATION FEATURE (%)
VENT_ENABLE	VENTILATION ENABLE	R/W	AV(BV)95	1120	THIS COMMAND ALLOWS THE VENTILATION FUNCTION TO BE TURNED ON OR OFF (0 = OFF / 1 = ON)
ZONE_TMP_BAS	ZONE TEMP BAS	R/W	AV40	1065	THIS ALLOWS THE BAS SYSTEM TO INPUT A ZONE TEMPERATURE VALUE TO THE CONTROL ON A CONSTANT VOLUME UNIT WITH COMMUNICATED ZONE CONTROL (F)
ZONE_TEMP	ZONE TEMP	R	AI60	573	ZONE TEMPERATURE THE CONTROL IS CONTROLLING TO (F)

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SECTION 7 – PARAMETER DESCRIPTIONS AND OPTIONS

TABLE 7-1 – DEFINITIONS

MENU ITEM	DEFINITION
ACTIVE SLAB CONTROL	This parameter is programmed through the Program key. This function allows heat to be turned on during the transition from Unoccupied to Occupied mode or Occupied to Unoccupied mode if the under floor conditions of a FlexSys system are right for the growth of mold and mildew. The choices are ENABLED or DISABLED.
ADAPT MORN WRM UP	This parameter is programmed through the Program key. Adaptive Morning Warm Up uses the past three days of warm up times and temperatures to calculate the start time for the current day. This parameter allows the user to ENABLED or DISABLED this feature.
BLDG PRESSURE CNTRL OFFSET	This parameter is programmed through the Setpoints key. The Primary Unit Controller tries to maintain the building pressure within the range of the Building Pressure Active SP +/- the Bldg Pressure Cntrl Offset.
BUILDING PRESSURE ACTIVE SP	This parameter is programmed through the Setpoints key. It identifies the control point for the building pressure.
BUILDING PRESSURE, CURRENT	This is the actual pressure in the conditioned space.
BYPASS DAMPER POSITION	This is the actual position of the bypass damper, by percent open, in a FlexSys unit.
CO2 LEVELS INSIDE	This is the CO2 level of the air in the conditioned space.
CO2 LEVELS OUTSIDE	This is the CO2 level of the outdoor air.
CO2 OFFSET ACTIVE SP	This parameters is programmed through the Setpoints key. The Outside CO2 level must be lower than the Indoor CO2 level plus the CO2 Offset Active SP before the outdoor door damper will start to open for additional ventilation.
CO2 OFFSET CURRENT	This represents the offset value the Primary Unit Controller is currently using to control the damper operation in a Demand Ventilation mode.
COMFORT VENTILATION	This parameter is programmed through the Program key. This function is only used on a Constant Volume unit. The Primary Unit Controller monitors the Return Air Temperature and energizes stages of cooling or heating prior to a demand from the space. This function is only active when the unit is in the Occupied mode. The choices are ENABLED or DISABLED
COMM BAUD RATE	This parameter is programmed through the Options key. This allows the user to select which of the three Baud rates to use in conjunction with a BAS system. The three choices are 9600, 14400, or 19200
COMP SYS 1 STATUS	This is the current operating mode of the system 1 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
COMP SYS 2 STATUS	This is the current operating mode of the system 2 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
COMP SYS 3 STATUS	This is the current operating mode of the system 3 compressors. The display will show Normal - Comp A On, Normal - Comp B On, Normal - Both ON, Normal - Both Off, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit, Low Suct Temp Unl, High DP Unload, or User Disabled.
CONDENSER FAN 1A/1	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 1A /1
CONDENSER FAN 1B/2	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 1B /2
CONDENSER FAN 2A/3	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 2A /3
CONDENSER FAN 2B/4	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 2B/4

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
CONDENSER FAN 3A/5	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 3A /5
CONDENSER FAN 3B/6	This identifies if the Primary Unit Controller has sent a Binary output to Condenser Fan 3B/6
CONTINUOUS VENTILATION	This parameter is programmed through the Program key. This is only used on a Constant Volume unit. When this parameter is enabled the supply blower will operate whenever the unit is in the Occupied mode. The choices are ENABLED or DISABLED.
CONTROL METHOD	This parameter is programmed through the Options key and identifies the control method being used on a Constant Volume unit. The choices are Staged, Zoned, or Comm Zone Temp.
COOLING CONTROL OFFSET	This is the control band the unit is trying to maintain. The control band is the Active Set Point +/- the Cooling Control Offset. If the temperature is above this band additional cooling is required, if the temperature is below this band cooling is decreased.
CURRENT OPER MODE	This is the current operating mode of the unit. The display will show Occ Standby, Occ Cooling Low, Occ Cooling High, Occ Heating Low, Occ Heating High, Unocc Standby, Unocc Cooling Low, Unocc Cooling High, Unocc Heating Low, Unocc Heating High, Morning Warm-up, Comfort Vent Cooling, Comfort Vent Heating, Occupied Cooling, Occupied Heating, Unoccupied Cooling, Unoccupied Heating, Occ Cooling W/O Bypass, Occ Cooling W Bypass, or Underfloor Temp Override
CURRENT RUN TIME COMP A	This is the amount of time the compressor has been in operation during the current cycle. This is shown for each compressor of every compressor system
CURRENT RUN TIME COMP B	This is the amount of time the compressor has been in operation during the current cycle. This is shown for each compressor of every compressor system
DAILY WARM UP TIME	This is the time it takes to bring the Return Air Temperature up to set point during Adaptive Morning Warm Up. The Primary Unit Controller uses this value in the calculation of Daily Warm Up Time Day 1.
DAILY WARM UP TIME DAY 1	This is the Morning Warm Up time the Primary Unit Controller recorded during the previous day 1. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
DAILY WARM UP TIME DAY 2	This is the Morning Warm Up time the Primary Unit Controller recorded during the previous day 2. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
DAILY WARM UP TIME DAY 3	This is the Morning Warm Up time the Primary Unit Controller recorded during the previous day 3. This value is used to calculate the current Morning Warm initiate time for Adaptive Morning Warm Up.
DAMPER HARDWARE	This parameter is programmed through the Options key and identifies the type of ventilation system installed in the unit. The choices are None, 2 Position Damper, Standard Dampers, Minimum IAQ, Full Flow IAQ, 1/3-2/3 Flow IAQ.
DEW POINT RESET	This parameter is programmed through the Program key. This function changes the Active Supply Air Temperature to a lower value when the air beneath the floor of a FlexSys unit approaches the dew point temperature of the air. The choices are ENABLED or DISABLED.
DISPLAY LANGUAGE	This parameter is programmed through the Options key. This allows the user to select the language the Primary Unit Controller will use to display the information at the User Interface. The choices are English or Spanish.
DISPLAY UNITS	This parameter is programmed through the Options key. This allows the user to select which unit of measure the Primary Unit Controller will use to display the information at the User Interface. The choices are Imperial, SI, or SI Canada.
DUCT PRESS TRANSDUCER SPAN	This parameter is programmed through the Setpoints key. This allows the use of three different duct pressure control ranges, 0 to 1.00 in-wg , 0 to 2.50 in-wg , or 0 to 5.00 in-wg .
DUCT STATIC OVER PRES	This parameter is programmed through the Setpoints key. This sets the maximum allowable Duct Static value before the Primary Unit Controller lockouts the unit on an over pressure fault.

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
DUCT STATIC PRESSURE ACTIVE SP	This is the current Duct Static Set Point that the Primary Unit Controller is trying to maintain.
DUCT STATIC PRESSURE CURRENT	This is the actual duct static pressure value.
DUCT STATIC RESET-LOW LIMIT	This parameter is programmed through the Setpoints key. This is the minimum Duct Static Control point.
DUCT STATIC RSET - HIGH LIMIT	This parameter is programmed through the Setpoints key. This is the maximum Duct Static Control point.
ECONO CONTROL OUTPUT	This is the analog output from the Primary Unit Controller to the Economizer Damper Actuator
ECONO INSTALLED	This parameter is programmed through the Program key and tells the Primary Unit Controller what type of economizer is installed, None, Dry Bulb, Single Enthalpy, Dual Enthalpy
ECONO METHOD ACTIVE	This value indicates which of the available economizer methods the Primary Unit Controller is using.
ECONO METHOD TO USE	This parameter is programmed through the Program key and tells the Primary Unit Controller which of the available economizer options to use. The choices are Dry Bulb, Single Enthalpy, Dual Enthalpy, or Best Available
ECONO OUTPUT FOR FAN START	This parameter is set through the Setpoints key and identifies the position of the economizer damper required to turn ON the exhaust fan in an ON/OFF Exhaust Fan option.
ECONO OUTPUT FOR FAN STOP	This parameter is set through the Setpoints key and identifies the position of the economizer damper required to turn OFF the exhaust fan in an ON/OFF Exhaust Fan option.
ECONO SYS STATUS	This is the active status of the economizer system, display will show Normal- Active, Normal-Inactive, Safety Trip, Safety Fault, Safety Lockout, User Disabled; or None
ELEC HEAT CAPACITY	This parameter is programmed through the Options key. This parameter is used to identify the electric heat capacity installed in the unit. The options are 40 KW, 80 KW, 100 KW, 108 KW, 120 KW, 150 KW, 160 KW, 200 KW, 240 KW, or 250 KW.
EVAP LEAVING AIR TEMP HIGH	This parameter is programmed through the Setpoints key. This becomes the Active Supply Air Temperature Set Point for a FlexSys unit when it is in the Occupied Cooling With Bypass mode.
EVAP LEAVING AIR TEMP LOW	This parameter is programmed through the Setpoints key. This becomes the Active Supply Air Temperature Set Point for a FlexSys unit when it is in the Under Floor Temperature Over Ride mode.
EXHAUST DAMPER POSITION	This identifies the percentage output from the Primary Unit Controller to the exhaust damper.
EXHAUST FAN STATUS OUTPUT	This identifies the Primary Unit Controller is sending a Binary output to energize the exhaust fan circuit.
EXHAUST FAN STATUS PROOF	This verifies a Binary input to the Primary Unit Controller is present when the exhaust fan is operating.
EXHAUST OUTPUT FOR FAN START	This parameter is set through the Setpoints key and identifies the position of the exhaust damper required to turn ON the exhaust fan in an ON/OFF Exhaust Fan option.
EXHAUST OUTPUT FOR FAN STOP	This parameter is set through the Setpoints key and identifies the position of the exhaust damper required to turn OFF the exhaust fan in an ON/OFF Exhaust Fan option.
EXHAUST SYS STATUS	This is the active status of the exhaust system. The display will show Normal-Active, Normal-Inactive, Safety Trip, Safety Fault, Safety Lockout, User Disabled, or None
EXHAUST VFD SPEED	This identifies speed output in percentage that is being sent to the exhaust fan VFD

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
FAN SPEED FOR SAT HIGH LIMIT	This parameter is programmed through the Setpoints key. When the supply fan speed is equal to or less than this value the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Set Point High Limit.
FAN SPEED FOR SAT LOW LIMIT	This parameter is programmed through the Setpoints key. When the supply fan speed is equal to or greater than this value the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Set Point Low Limit.
FAN SPEED INSTABILITY LIMIT	This parameter is programmed through the Setpoints key. If two units are twinned together and the second unit comes on there could be a sudden drop in VFD speed on the lead unit. This is the allowable drop in the VFD speed in percent prior to switching into a Unstable System mode.
FAN SPEED INSTABILITY TIME	This parameter is programmed through the Setpoints key. If two units are twinned together and the second unit comes on there could be a sudden drop in VFD speed on the lead unit. This is the amount of time the lead unit has to recover prior to switching into a Unstable System mode.
FILTERS	This is status of the unit filters. A differential pressure switch must be installed to measure the pressure drop across the filters. When the filters are dirty the switch closes sending a Binary signal to the Primary Unit Controller. The User Interface display will show Okay or Change.
FLEX EVAP TEMP ACTIVE SP	This is the active evaporator temperature set point that the Primary Unit Controller is trying to control to. This value is used when a FlexSys unit is in the Occupied Cooling With Bypass mode.
FLEX EVAP TEMP CURRENT	This is the actual air temperature leaving the evaporator coil of a FlexSys unit.
FURNACE 1 MODE	This is the current status of the first heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
FURNACE 1A MODE	This is the current status of the modulating section of the modulating gas heat furnace. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
FURNACE 1B MODE	This is the current status of the non-modulating section of the modulating gas heat furnace. The User Interface will display Off, Purge, Ignition, On, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
FURNACE 2 MODE	This is the current status of the second heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
FURNACE 3 MODE	This is the current status of the third heat exchanger section of a staged gas heat unit. The User Interface will display Off, Purge, Ignition, On-Low, On-High, Safety Trip, Safety Fault, Safety Lockout, or Fault- I/O.
GAS HEAT CAPACITY	This parameter is programmed through the Options key. This parameter is used to identify the gas heat capacity installed in the unit. The options are 375 MBH, 750 MBH, or 1125 MBH.
HEAT ENTERING TEMP	This is the temperature of the supply air entering the staged gas heat section. This value is used to initiate and terminate Supply Air Tempering when Staged Gas Heat is installed.
HEAT LIMIT TEMPERATURE	This parameter is programmed through the Setpoints key. This value determines the maximum allowable Supply Air Temperature when heating is installed. If the temperature goes above this setting the heat section will be shut down.
HEATING CONTROL OFFSET	This is the control band the unit is trying to maintain. The control band is the Active Set Point +/- the Heating Control Offset. If the temperature is below this band, additional heating is required, if the temperature is above this band heating is decreased.
HEATING SAT	This parameter is programmed through the Setpoints key. On a VAV or FlexSys unit this becomes the Active Supply Air Temperature Set Point for heating operation. The Primary Unit Controller controls the heating option to try and maintain this temperature.

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
HEATING SYS STATUS	This is the current operating mode of the Heating Section. The display will show Normal - Active, Normal - Inactive, Safety Trip, Safety Fault, Safety Lockout, Under Floor Control, User Disabled, or None.
HEATING SYSTEM TYPE	This parameter is programmed through the Options key. This parameter is used to identify the type of heat installed in the unit. The options are None, Electric Heat, Stage Gas Furnace, Modulating Furnace, Hot Water Heat, or Steam Heat.
HW / STEAM HEAT - FREEZESTAT	This is the status of the hydronic heat freezestat. This is done through a Binary input to the Primary Unit Controller. The switch is closed for normal operation and opens on failure. The User Interface will indicate OK or TRIPPED
HW / STEAM HEAT - VALVE POS	This is the output from the Primary Unit Controller to the hydronic valve as percent open.
HW VALVE ACTION	This parameter is programmed through the Program key. This parameter controls the output to the hydronic modulating valve. When the parameter is set to DIRECT the output is 0 volts for off and 10 volts for full capacity. When the parameter is set to REVERSE the output is 10 volts for off and 0 volts for full capacity.
IAQ DMPR AIR FLOWS OA FLOW 1	This is the airflow through a Minimum Flow, Full Flow, or the 1/3 section of a 1/3 - 2/3 Flow IAQ
IAQ DMPR AIR FLOWS OA FLOW 2	This is the airflow through the 2/3 section of a 1/3 - 2/3 Flow IAQ.
MAXIMUM BYPASS	This parameter is programmed through the Setpoints key. It establishes the maximum allowable position of the bypass damper in a FlexSys unit.
MECH CLG LOCKOUT TEMP	This parameter is programmed through the Setpoints key. When the outdoor temperature is equal to or less than this temperature, the Primary Unit Controller will prevent the compressors from operating.
MINIMUM OA FLOW SET POINT	This parameter is programmed through the Setpoints key. When air measurement stations are installed and the unit is not in the Occupied mode, this is the minimum allowable airflow.
MIXED SUPPLY AIR TEMP	This parameter is programmed through the Setpoints key. This becomes the Active Supply Air Temperature Set Point for a FlexSys unit when it is in the Occupied Cooling Without Bypass mode.
MOD FURNACE OUTPUT-APPROX RATE	This is the approximate firing rate of the modulating gas heat section in MBH
MOD FURNACE OUTPUT-RELATIVE	This is the output from the Primary Unit Controller to the modulating gas heat section in percent of full capacity.
MORNING WARM UP	This parameter is programmed through the Program key. This tells the Primary Unit Controller if the Morning Warmup option is available or not. When it is programmed to ENABLED, Morning Warm Up is available to be used. When it is programmed to DISABLED, Morning Warm Up is unavailable.
MORNING WARM UP MAX TIME	This parameter is programmed through the Setpoints key. This value is the maximum time the Primary Unit Controller will allow for Morning Warm Up when the unit is in the Adaptive Morning Warm Up mode. If the derived Morning Warm Up Opt Time exceed this time the Morning Warm Up Max Time will be used.
MORNING WARM UP OPT TIME	This is the average of the previous three days Warm Up times plus 10 minutes. This value will be used to determined the Morning Warm Up start time for the next day when the unit is in the Adaptive Morning Warm Up mode.
RAT HEATING SP	On a VAV or FlexSys unit, the Primary Unit Controller monitors the RAT HEATING SP. When the return air temperature is 0.5° F below this value the control switches into the Occupied Heating mode.
NIGHT SET BACK	This parameter is programmed through the Program key. This parameter allows the user to enable or disable Night Set Back. If this parameter is disabled Unoccupied Heating will not be available. The two parameters to choose from are ENABLED or DISABLED.

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
NIGHT SET UP	This parameter is programmed through the Program key. This parameter is used to allow cooling operation on a Constant Volume or Variable Air Volume Unit while in the Occupied mode. The choices are ENABLED or DISABLED.
OA DAMPER MAXIMUM POSITION	This parameter is programmed through the Setpoints key. This establishes the maximum amount of ventilation air to be used in a Demand Ventilation situation.
OA DAMPER MINIMUM POSITION	This parameter is programmed through the Setpoints key. This establishes the minimum amount of ventilation air to be used when the unit is in the Occupied mode.
OA DAMPER POSITION ACTIVE SETPOINT	This is the damper position set point, in percent open, the Primary Unit Controller is trying to maintain.
OA DAMPER POSITION CURRENT	This is the actual output, in percent open to the outdoor air damper
OA ENTHALPY	This indicates the total heat content of the outdoor air.
OA RH	This is the outdoor air relative humidity
OA TEMP	This is the outdoor air dry bulb temperature
OAT FOR SAT HIGH LIMIT	This parameter is programmed through the Setpoints key. When the outdoor temperature is equal to or less than this temperature the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Setpoint High Limit.
OAT FOR SAT LOW LIMIT	This parameter is programmed through the Setpoints key. When the outdoor temperature is equal to or greater than this temperature the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Setpoint Low Limit.
OCCUPIED HEATING	This parameter is programmed through the Program key. If this parameter is disabled Occupied Heating will not be available. This parameter allows the user to enable or disable Occupied Heating. The two parameters to choose from are ENABLED or DISABLED.
OUTSIDE AIR ENTHALPY LIMIT	This parameter is programmed through the Setpoints key and is the upper limit of outdoor enthalpy that can be used for economizer operation. If the outdoor air enthalpy is above this value, the economizer is made inactive.
OUTSIDE AIR FLOW ACTIVE SP	This is the airflow set point that the Primary Unit Controller is trying to maintain.
OUTSIDE AIR FLOW TOTAL FLOW	This is the same as OA Flow 1 for a Minimum Flow or Full Flow IAQ and is the sum of the OA Flow 1 and OA Flow 2 for a 1/3 - 2/3 Flow IAQ.
OUTSIDE AIR MAXIMUM FLOW	This parameter is programmed through the Setpoints key. When air measurement stations are installed and the unit is in the Demand Ventilation mode, this is the maximum allowable airflow value.
OUTSIDE AIR MINIMUM FLOW	This parameter is programmed through the Setpoints key. When air measurement stations are installed and the unit is in the Demand Ventilation mode, this is the minimum airflow value.
POWER EXHAUST TYPE	This parameter is programmed through the Options key and tells the Primary Unit Controller what type of Exhaust is installed. The choices are None, On-Off Damper Cntrl, On-Off Press Cntrl, Modulating Damper, VFD Modulated Fan, Return Fan W/Exh, or Ret Fan W/O Exh
PRESS TRANS PKG	This parameter is programmed through the Options key. This identifies to the Primary Unit Controller which of the compressor systems are configured with suction and discharge pressure transducers. The options are None, System 1 Only, System 1 and 2, or System 1-2 and 3.
PRESSURES - DISCHARGE	This is the discharge pressure and is shown for each compressor system if pressure transducers are installed and configured for the system.
PRESSURES - SUCTION	This is the suction pressure and is shown for each compressor system if pressure transducers are installed and configured for the system.
PUMPDOWN	This parameter is programmed through the Program key. If Pumpdown is ENABLED at the end of the compressor system cycle the solenoid valve to the expansion valves will close and the compressor will continue to operate for 30 seconds or until the low pressure cutout opens. This removes the refrigerant from the low side of the system. The choices are ENABLED or DISABLED. If Pumpdown is ENABLED all compressor system will use Pumpdown.

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
RA ENTHALPY	This is the total heat content of the return air.
RA RH	This is the return air relative humidity
RA TEMP	This is the return air dry bulb temperature
RA TEMP - CURRENT	This is the temperature of the return air entering the unit.
RA TEMP - MIXED SUPPLY AIR TEMP	This parameter is programmed through the Setpoints key. The Primary Unit Controller compares the Return Air Temperature to this value to determine when to switch the unit mode to Occupied Cooling on a FlexSys unit.
RA TEMP - RAT FOR SAT SP HIGH LIMIT	This parameter is programmed through the Setpoints key. The Primary Unit Controller compares the Return Air Temperature to this value to determine when to switch the unit mode to Occupied Heating on a Variable Air Volume Unit.
RA TEMP - RAT FOR SAT SP LOW LIMIT	This parameter is programmed through the Setpoints key. The Primary Unit Controller compares the Return Air Temperature to this value to determine when to switch the unit mode to Occupied Cooling on a Variable Air Volume Unit.
RAT COOLING SP	On a VAV or FlexSys unit, the Primary Unit Controller monitors the RAT COOLING SP. When the return air temperature is 0.5° F above this value the control switches into the Occupied Cooling mode.
RAT FOR SAT HIGH LIMIT	This parameter is programmed through the Setpoints key. When the Return Air Temperature is equal to or LESS than this temperature the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Setpoint High Limit.
RAT FOR SAT LOW LIMIT	This parameter is programmed through the Setpoints key. When the Return Air Temperature is equal to or greater than this temperature the Active Supply Air Temperature Set Point on a Variable Air Volume Unit will be set to the SAT Setpoint Low Limit.
READY TO RUN COMP A	This means the minimum OFF time has been achieved and all the safety circuits are closed and compressor A of the system is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP B	This means the minimum OFF time has been achieved and all the safety circuits are closed and compressor B of the system is ready to be energized. The User Interface will display either YES or NO.
READY TO STOP A	This means the minimum ON time has been achieved and compressor A of the system is ready to be de-energized. The User Interface will display either YES or NO.
READY TO STOP B	This means the minimum ON time has been achieved and compressor B of the system is ready to be de-energized. The User Interface will display either YES or NO.
REFRIGERANT TYPE	This parameter is programmed through the Options key and identifies the type of refrigerant in the unit. The choices are R22, R407C, or R410A.
RETURN AIR BYPASS - ACTIVE SET POINT	This is the position of the bypass damper by percent open the Primary Unit Controller uses as the bypass set point on a FlexSys unit.
RETURN AIR BYPASS - CURRENT	This is the position of the by-pass damper by percent open the Primary Unit Controller uses as the Active Bypass percent set point on a FlexSys unit.
RETURN FAN PRESSURE ACTIVE SP	This is the current mixed air chamber pressure that the Primary Unit Controller is trying to maintain.
RETURN FAN PRESSURE CURRENT	This is the actual pressure in the mixed air chamber of the unit.
RETURN FAN STATUS OUTPUT	This is the Binary output from the Primary Unit Controller to the Return Fan control system.
RETURN FAN STATUS PROOF	This is a Binary input into the Primary Unit Controller that identifies the Return Fan is functioning.
RETURN FAN VFD SPEED	This is a derived value that indicates the output, in percent, to the Return Fan VFD

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
SAFETY INPUTS - LPCO	This is the Binary input to the Primary Unit Controller from the Low Pressure Cutout safety circuit. ON means the safety circuit is normal and OFF means it has faulted. This parameter will be shown for each compressor system.
SAFETY INPUTS CHAIN	This is the Binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain. This includes the high pressure cutout, compressor motor protector, and the external overload or circuit breaker. ON means the safety circuit is normal and OFF means it has faulted. This parameter will be shown for each compressor system.
SAT RESET METHOD	This parameter is programmed through the Options key and identifies the Supply Air Temperature reset method being used on a Variable Air Volume Unit. The choices are Hardwired Input, Outside Temp, Return Temp, or Supply Fan Speed.
SAT SETPOINT HIGH LIMIT	This parameter is programmed through the Setpoints key. This establishes the maximum Active Supply Air Temperature to be used in a Variable Air Volume Unit.
SAT SETPOINT LOW LIMIT	This parameter is programmed through the Setpoints key. This establishes the minimum Active Supply Air Temperature to be used in a Variable Air Volume Unit.
SENSOR / MISC	This is the current status of the Sensors. The display will show Normal, Warning, Safety Trip, Safety Fault, or Safety Lockout.
SMOKE PURGE SEQ 1	This parameter is programmed through the Options key. This allows the user to select which of the three smoke purge sequences to use a sequence 1, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 1 is energized through a Binary input to the Primary Unit Controller.
SMOKE PURGE SEQ 2	This parameter is programmed through the Options key. This allows the user to select which of the three smoke purge sequences to use a sequence 2, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 2 is energized through a Binary input to the Primary Unit Controller.
SMOKE PURGE SEQ 3	This parameter is programmed through the Options key. This allows the user to select which of the three smoke purge sequences to use a sequence 3, Purge, Pressurization, or Evacuation. Smoke Purge Sequence 3 is energized through a Binary input to the Primary Unit Controller.
STABILITY MONITOR	This parameter is programmed through the Program key. This is used when two units are twinned together to reduce the number of compressor in operation during an instability period. The choices are Enable or DISABLED.
STAGE 1 COOLING LOW	This parameter is programmed through the Setpoints key. This value is used in a Constant Column unit as the Active SAT Setpoint for 1st Stage cooling operation.
STAGE 1 HEATING LOW	This parameter is programmed through the Setpoints key. This value is used in a Constant Column unit as the Active SAT Setpoint for 1st Stage heating operation.
STAGE 2 COOLING HIGH	This parameter is programmed through the Setpoints key. This value is used in a Constant Column unit as the Active SAT Setpoint for 2nd Stage cooling operation.
STAGE 2 HEATING HIGH	This parameter is programmed through the Setpoints key. This value is used in a Constant Column unit as the Active SAT Setpoint for 2nd Stage heating operation.
STAGED HEAT STATUS - STGS ON	This identifies the number of stages of gas or electric heat that the Primary Unit Controller has energized.
STAGED HEAT STATUS STGS AVAIL	This identifies the number of stages of gas or electric heat that are available.
SUCTION TEMP	This is the temperature of the suction line leaving the evaporator coil and will be shown for each system. This value is monitored and used to prevent liquid refrigerant from being returned to the compressor.
SUP AIR TEMPERING	This parameter is programmed through the Program key. This parameter is used to allow the heat to operate when the unit is in the Occupied Standby mode to temper the ventilation air entering the space. The choices are ENABLED or DISABLED.
SUPPLY AIR TEMP - ACTIVE SP	This is the Supply Air Temperature the Primary Unit Controller is trying to maintain.
SUPPLY AIR TEMP - CURRENT	This is the current Supply Air Temperature supplied by the unit.
SUPPLY FAN STATUS OUTPUT	This is the Binary output from the Primary Unit Controller to the Supply Fan control system.

Continued on next page

TABLE 7-1 – DEFINITIONS (CONTINUED)

MENU ITEM	DEFINITION
SUPPLY FAN STATUS PROOF	This is a Binary input into the Primary Unit Controller that identifies the Supply Fan is functioning.
SUPPLY FAN VFD SPEED	This indicates the output, in percent, to the Supply Fan VFD
SUPPLY SYS STATUS	This is the active status of the Supply System, display will show Normal- Active; Normal-Inactive; Safety Trip, Safety Fault, or Safety Lockout
SUPPLY SYSTEM TYPE	This parameter is programmed through the Options key. The choices are Supply Fan Only or Supply-Return Fans
SYSTEM UNLOADING PRESSURE	This parameter is programmed through the Setpoints key. If two compressors of the system are operative and the discharge pressure is equal to or greater than this value the Primary Unit Controller will turn off one of the compressors. This feature is only operative when a discharge pressure transducer is installed in the compressor system.
TEMPERATURES SUPERHEAT	This is calculated for each compressor system that has a suction line pressure transducer installed and configured. This is the refrigerant evaporator superheat leaving the evaporator coil.
UNDERFLOOR AIR - HUMIDITY	This is the humidity level under the floor of a FlexSys installation.
UNDERFLOOR SLAB - DEWPOINT	This is the dewpoint of the air beneath the floor of a FlexSys installation.
UNDERFLOOR SLAB - UNDER FLOOR TEMP	This is the temperature of the slab beneath the floor of a FlexSys installation.
UNIT INSTALLED ALTITUDE	This parameter is programmed through the Setpoints key. This is the altitude at which the unit is installed. This is used in the calculation of an airflow correction factory when air measuring stations are installed.
UNIT SIZE	This parameter is programmed through the Options key and identifies the size of the unit. The choices are 50 Ton, 55 Ton, 60 Ton, 65 Ton, 70 Ton, 75 Ton, 80 Ton, 85 Ton, 90 Ton, 95 Ton, 105 Ton, 110 Ton, 115 Ton, 130 Ton, or 150 Ton.
UNIT TYPE	This parameter is programmed through the Options key and identifies the type of unit. The choices are Constant Volume, Variable Volume, or FlexSys
UNIT-OVERALL	This is the active status of the Unit. The display will show Local Stop, Run, Unit Trip, Unit Fault, Unit Lockout, SMK Purge # - Press, SMK Purge #-Purge, Smk Purge #-Evac, or Unstable system.
VENT SYS STATUS	This is the active status of the Ventilation System. The display will show Normal- Active, Normal-Inactive, Safety Trip, Safety Fault, Safety Lockout, User Disabled, or None
VENTILATION CNTRL	This parameter is programmed through the Options key and identifies whether the unit will operate with a Fixed Minimum or Demand ventilation system
VENTILATION DEMAND	This is the output in percent to the outside air damper when the unit is operating in the Demand Ventilation mode.
ZONE TEMP - OCC ZONE COOLING	This parameter is programmed using the Setpoints key. This is the temperature that the Primary Unit Controller compares the actual space temperature to, to decide when to switch into the Occupied Cooling Mode.
ZONE TEMP - OCC ZONE HEATING	This parameter is programmed using the Setpoints key. This is the temperature that the Primary Unit Controller compares the actual space temperature to, to decide when to switch into the Occupied Heating Mode.
ZONE TEMP - UNOCC ZONE COOLING	This parameter is programmed using the Setpoints key. This is the temperature that the Primary Unit Controller compares the actual space temperature to, to decide when to switch into the Unoccupied Cooling Mode.
ZONE TEMP - UNOCC ZONE HEATING	This parameter is programmed using the Setpoints key. This is the temperature that the Primary Unit Controller compares the actual space temperature to, to decide when to switch into the Unoccupied Heating Mode.
ZONE TEMP CURRENT	This is the temperature in the conditioned space.

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SECTION 8 – SERVICE

ANALOG INPUT OPERATION

This section describes the control operation of the (29) twenty-nine analog inputs. These inputs are used by the control to monitor and respond to unit temperatures, pressures, enthalpy, etc. The location of each of these connections on the Primary Unit Controller is contained in TABLE 6-11. Notice that the ID gives the jack connection designated as “J” and then the identifying number of the connector, followed by a – and then the pin number of the connector. For example the SUPPLY AIR TEMPERATURE analog input would be found at J1-1. This is connector J1 – Pin 1. As the Primary Unit Control board is positioned in the control box the top row of the J series connectors is the input, the middle row is the common, and the bottom row is the 5 VDC input to the sensor. Also the pin in the right hand top corner is pin 1.

Temperature Sensors

The temperature sensors are all 10K Type III Thermistors. The relationship between the temperature and the voltage output and resistance is contained in Table 8-1. The following analog input are of this type: Supply Air Temperature, Heat Entering Temp, Flex Evap Temp, OA Temp, RA Temp, Suction Temp #1, Suction Temp #2, Suction Temp #3, Zone Temp, and Under Floor Temp.

TABLE 8-1 – TEMPERATURE SENSOR RESISTANCE

°F	VOLTAGE	RESISTANCE	°C
-25	0.49	139,639	-30.6
-20	0.53	127,453	-28.9
-15	0.60	109,624	-26.1
-10	0.69	94,519	-23.34
-5	0.78	81,665	-20.55
0.0	0.88	70,750	-17.78
5	0.98	61,418	-15.00
10	1.10	53,426	-12.22
15	1.22	46,582	-9.44
20	1.35	40,703	-6.67
25	1.48	35,639	-3.89
30	1.62	31,269	-1.11
35	1.77	27,490	1.67
40	1.91	24,219	4.44
45	2.06	21,377	7.22
50	2.21	18,900	10.00

Duct Pressure Transducer

The Duct Pressure Transducer is located in the unit control box. The purpose of the transducer is to sense and convert the static pressure in the supply-side of the duct to a 0 to 5 volt DC voltage. The DC voltage is sent to the Primary Unit Controller and compared against the “DUCT STATIC PRESSURE ACTIVE SETPOINT”. The transducer is factory wired, but pneumatic tubing must be field supplied and installed (*refer to Section 2 "INSTALLATION" in this manual*). The duct static pressure transducer measures differential pressure between the pressure in the duct and atmospheric pressure. When verifying transducer operation, the technician must insert a tee in the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. Once this pressure is known, a comparison can be made of the duct pressure vs. output volts DC from the transducer. Table 8-2 shows the relationship between the pressure applied to the duct pressure transducer and the output voltage. The output is linear between 0” WC and the SPAN. The SPAN can be set from 1.0” WC to 5.0” WC. The table gives values for a SPAN of 1.0” WC, 2.5” WC and 5.0” WC.

°F	VOLTAGE	RESISTANCE	°C
55	2.36	16,744	12.78
60	2.51	14,681	15.56
65	2.66	13,216	18.33
70	2.80	11,771	21.11
75	2.94	10,502	23.89
80	3.08	9,388	26.67
85	3.21	8,404	29.45
90	3.33	7,537	32.22
95	3.45	6,770	35.0
100	3.56	6,090	37.78
105	3.66	5,487	40.56
110	3.76	4,951	43.34
115	3.85	4,475	46.11
120	3.94	4,050	48.89
125	4.02	3,671	51.66
130	4.09	3,332	54.44
135	4.16	3,029	57.22

TABLE 8-2 – DUCT PRESSURE TRANSDUCER

1.0" WC SPAN DIFFERENTIAL INPUT PRESS	2.5" WC SPAN DIFFERENTIAL INPUT PRESS	5.0" WC SPAN DIFFERENTIAL INPUT PRESS	VOLTAGE VDC
0.10	0.25	0.50	0.50
0.20	0.50	1.00	1.00
0.30	0.75	1.50	1.50
0.40	1.00	2.00	2.00
0.50	1.25	2.50	2.50
0.60	1.50	3.00	3.00
0.70	1.75	3.50	3.50
0.80	2.00	4.00	4.00
0.90	2.25	4.50	4.50
1.00	2.50	5.00	5.00

Span can be adjusted between 1.0 and 5.0" WC

Building Pressure Transducer

The Building Pressure Transducer is located in the unit control box. The purpose of the transducer is to sense and convert the static pressure in the building to a 0 to 5 volt DC voltage. The DC voltage is then sent to the Primary Unit Controller and compared against the *"BUILDING PRESSURE ACTIVE SETPOINT"*. The transducer is factory wired, but pneumatic tubing must be field supplied and installed (*refer to Section 2 "INSTALLATION" in this manual*). The Building Pressure Transducer measures differential pressure in the building and atmospheric pressure. When verifying transducer operation, the technician can inset a tee into

the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. Once this pressure is known, a comparison can be made of the building pressure vs. output volts DC from the transducer. A practical and quick check of this transducer can also be accomplished by removing the pneumatic tubing lines from both the low and high side connections on the transducer. Since both of the inputs will now be exposed to the same pressure, the differential pressure will be zero, and the output 2.5 volts DC according to Table 8-3.

TABLE 8-3 – BUILDING PRESSURE TRANSDUCER OUTPUT

DIFFERENTIAL INPUT PRESSURE - IWC	OUTPUT VOLTAGE - VDC
-0.50	0.00
-0.40	0.50
-0.30	1.00
-0.20	1.50
-0.10	2.00
0.00	2.50
0.10	3.00
0.20	3.50
0.30	4.00
0.40	4.50
0.50	5.00

Air measuring Station Pressure Transducer

The unit can be ordered with an Air Measuring Station. When using the optional Air Measuring Station, either one or two identical pressure transducers are employed. The transducers measure the differential pressure across the Air Measuring Station. The logic in the Primary Unit control uses this pressure data to calculate an airflow through the station. Both the pneumatic tubing and the control wiring are factory installed. The transducer range is 0.00 to 0.25 IWC with an output range in volts DC as shown in Table 8-4.

TABLE 8-4 – AIR MEASURING STATION PRESSURE TRANSDUCER OUTPUT

DIFFERENTIAL INPUT PRESSURE - IWC	OUPTUT VOLTAGE - VDC
0.000	0.00
0.025	0.50
0.050	1.00
0.075	1.50
0.100	2.00
0.125	2.50
0.150	3.00
0.175	3.50
0.200	4.00
0.225	4.50
0.250	5.00

Return Fan Pressure Transducer

If the unit is order with the Return Fan Option the unit will have a Return Fan Pressure Transducer. The transducer is mounted in the return compartment and compares the pressure in the return air compartment to atmospheric pressure. The Primary Unit Controller varies the speed of the Return Fan in order to maintain the correct differential pressure in the return compartment. When verifying transducer operation, the technician can inset a tee into the pneumatic tubing and connect a manometer to the tee to verify the pressure being applied to the transducer. Once this pressure is known, a comparison can be made of the return compartment pressure vs. output volts DC from the transducer. A practical and quick check of this transducer can also be accomplished by removing the pneumatic tubing lines from both the low and high side connections on the transducer. Since both of the inputs will now be exposed to the same pressure, the differential pressure will be zero, and the output 2.5 volts DC according to Table 8-5.

TABLE 8-5 – RETURN FAN PRESSURE TRANSDUCER OUTPUT

DIFFERENTIAL INPUT PRESSURE - IWC	OUPTUT VOLTAGE - VDC
-1.00	0.00
-0.80	0.50
-0.60	1.00
-0.40	1.50
-0.20	2.00
0.00	2.50
0.20	3.00
0.40	3.50
0.60	4.00
0.80	4.50
1.00	5.00

Discharge Pressure Transducer

The discharge Pressure Transducer is located in the common discharge line of the tandem compressors for each refrigerant circuit. The purpose of this transducer is to sense and convert the discharge pressure into a DC voltage. The DC voltage is then sent to the Primary Unit Controller where it is used to control the number of condenser fan when the unit is in cooling operation. The discharge pressure value, in PSIG, is displayed by the User Interface.

The Discharge Transducer has a range of 0 to 500 PSIG, with a linear output of 0 to 5 DC volts. Table 8-6 illustrates the DC volt output from the transducer for a given discharge pressure.

Suction Pressure Transducer

The optional suction pressure transducer is located in the common suction line of the tandem compressors for each refrigerant circuit. The purpose of the transducer is to sense and convert the suction pressure to a DC voltage. The DC voltage is then sent to the Primary Unit Controller where it is displayed by the User Interface. When this option is installed the Primary Unit Controller will also calculate and display the Evaporator Superheat value for the system.

The Scution Transducer has a range of 0 to 200 PSIG, with a linear output of 0 to 5 volts DC. Table 8-6 illustrates the DC volt output from the transducer for a given suction pressure.

TABLE 8-6 – PRESSURE TRANSDUCERS

SUCTION TRANSDUCER		DISCHARGE TRANSDUCER	
PRESSURE PSIG	VOLTAGE VDC	PRESSURE PSIG	VOLTAGE VDC
0	0.50	0	0.50
25	1.00	50	1.00
50	1.50	100	1.50
75	2.00	150	2.00
100	2.50	200	2.50
125	3.00	250	3.00
150	3.50	300	3.50
175	4.00	350	4.00
200	4.50	400	4.50

Humidity Sensors

The humidity sensor outputs a 0 to 5 volts DC in response to the relative humidity sensed. An outdoor air humidity sensor is used whenever the economizer is configured for single or dual enthalpy. A return air humidity sensor is used whenever the economizer is configured for dual enthalpy. A humidity sensor is also used to monitor the humidity in the space between the slab and raised floor system used for FlexSys applications. Table 8-7 gives the relationship between the voltage output of the humidity sensor and the % relative humidity.

TABLE 8-7 – HUMIDITY SENSOR OUTPUTS

% RELATIVE HUMIDITY	OUTPUT- VOLTAGE VDC	% RELATIVE HUMIDITY	OUTPUT- VOLTAGE VDC
5	0.25	55	2.75
10	0.50	60	3.00
15	0.75	65	3.25
20	1.00	70	3.50
25	1.25	75	3.75
30	1.50	80	4.00
35	1.75	85	4.25
40	2.00	90	4.50
45	2.25	95	4.75
50	2.50	100	5.00

CO₂ Sensor

Two CO₂ sensors are used in conjunction with the “*DEMAND VENTILATION*” option. In “*DEMAND VENTILATION*” the Primary unit control monitors the CO₂ level of the outdoor air and the CO₂ level in the conditioned space and varies the amount of ventilation air based on the relationship between these two values. Table 8-8 gives the volts DC output for a given CO₂ level.

TABLE 8-8 – CO2 SENSOR OUTPUT

PPM CO2	OUTPUT VOLTAGE VDC	PPM CO2	OUTPUT VOLTAGE VDC
200	0.20	2800	2.80
400	0.40	3000	3.00
600	0.60	3200	3.20
800	0.80	3400	3.40
1000	1.00	3600	3.60
1200	1.20	3800	3.80
1400	1.40	4000	4.00
1600	1.60	4200	4.20
1800	1.80	4400	4.40
2000	2.00	4600	4.60
2200	2.20	4800	4.80
2400	2.40	5000	5.00
2600	2.60		

Furnace Status Input

The Primary Unit Controller monitors the operation of the Staged and Modulating Gas Heat sections and displays the status through the STATUS screen of the User Interface. The operation of each of the gas heat sections is monitored by a multiplexer installed in the gas heat section. When a gas heat section is energized, it sends a 24-volt signal to the multiplexer. The multiplexer takes the five “ON”/“OFF” inputs and converts them into a 0 to 5 volt DC signal that is sent to the Primary Unit Controller. The Primary Unit Controller then decodes this analog input and displays the furnace section status. Tables 8-9 and 8-10 show the relationship between the DC voltage and the furnace operation status.

TABLE 8-9 – FURNACE STATUS INPUT MODULATING GAS HEAT

MIN VOLTS DC	MAX VOLTS DC	MODULATING FURNACE 1A STATUS	FURNACE 1A HIGH STATUS	FURNACE 2 STATUS	FURNACE 3 STATUS	FURNACE 1B STATUS
0.103	0.129	OFF	OFF	OFF	OFF	OFF
0.241	0.277	ON	OFF	OFF	OFF	OFF
0.379	0.424	OFF	ON	OFF	OFF	OFF
0.516	0.572	ON	ON	OFF	OFF	OFF
0.654	0.719	OFF	OFF	ON	OFF	OFF
0.792	0.867	ON	OFF	ON	OFF	OFF
0.929	1.014	OFF	ON	ON	OFF	OFF
1.067	1.162	ON	ON	ON	OFF	OFF
1.205	1.309	OFF	OFF	OFF	ON	OFF
1.342	1.457	ON	OFF	OFF	ON	OFF
1.480	1.604	OFF	ON	OFF	ON	OFF
1.618	1.752	ON	ON	OFF	ON	OFF
1.755	1.899	OFF	OFF	ON	ON	OFF
1.893	2.047	ON	OFF	ON	ON	OFF
2.030	2.194	OFF	ON	ON	ON	OFF
2.168	2.342	ON	ON	ON	ON	OFF
2.306	2.489	OFF	OFF	OFF	OFF	ON
2.443	2.637	ON	OFF	OFF	OFF	ON
2.581	2.784	OFF	ON	OFF	OFF	ON
2.719	2.932	ON	ON	OFF	OFF	ON
2.856	3.079	OFF	OFF	ON	OFF	ON
2.994	3.227	ON	OFF	ON	OFF	ON
3.132	3.374	OFF	ON	ON	OFF	ON
3.269	3.522	ON	ON	ON	OFF	ON
3.407	3.670	OFF	OFF	OFF	ON	ON
3.545	3.817	ON	OFF	OFF	ON	ON
3.682	3.965	OFF	ON	OFF	ON	ON
3.820	4.112	ON	ON	OFF	ON	ON
3.958	4.260	OFF	OFF	ON	ON	ON
4.095	4.407	ON	OFF	ON	ON	ON
4.233	4.555	OFF	ON	ON	ON	ON
4.371	4.702	ON	ON	ON	ON	ON

TABLE 8-10 – FURNACE STATUS INPUT STAGED GAS HEAT

MIN VOLTS DC	MAX VOLTS DC	FURNACE 1 STATUS	FURNACE 2 STATUS	FURNACE 3 STATUS
0.103	0.129	OFF	OFF	OFF
0.241	0.277	ON	OFF	OFF
0.379	0.424	OFF	ON	OFF
0.516	0.572	ON	ON	OFF
0.654	0.719	OFF	OFF	ON
0.792	0.867	ON	OFF	ON
0.929	1.014	OFF	ON	ON
1.067	1.162	ON	ON	ON

FAULTS

A fault is defined as an abnormal condition, which results in the shutdown of an operating system or the complete unit. The presence of a fault condition indicates a situation in which possible damage to the unit may occur if the unit or system were allowed to continue to operate. There are four types of faults.

- **UNIT LOCKOUT** – The complete unit is shutdown and locked out. A manual reset is required to restart the unit after the fault has been corrected.
- **SYSTEM LOCKOUT** – One of the compressor systems or other component is shutdown and locked out. A manual reset is required to restart the system after the fault has been corrected.
- **UNIT AUTO RESET** – The complete unit is shutdown but the unit will restart automatically when the fault condition is cleared.
- **SYSTEM AUTO RESET** – One of the compressor systems or other component is shut down but the system or component will restart automatically when the fault condition is cleared.

A UNIT LOCKOUT can be reset by turning the “*LOCAL STOP*” switch off for 5 seconds and then back on. If the cause of the lockout has been corrected the unit will reset and begin proper operation.

A SYSTEM LOCKOUT can be reset by turning the “*LOCAL STOP*” switch off for 5 seconds and then back on or by switching the effected system from “*ENABLED*” to “*DISABLED*” for 5 seconds and then back to “*ENABLED*”. If the cause of the lockout has been corrected the system will reset and begin proper operation.

In addition to faults the User Interface will also display warnings. A warning is defined as an abnormal condition under which the unit continues to operate. Warnings will not require the unit to shut down; however, they may require the Primary Unit Controller to disable

certain functions that may result in the unit operating less efficiently or eliminate certain features.

Table 8-12 lists the faults / warnings that will be displayed under the STATUS and HISTORY keys of the User Interface. When a fault is present line two of the effected STATUS screen display (UNIT-OVERALL, COMPRESSOR SYSTEM 1, COMPRESSOR SYSTEM 2, COMPRESSOR SYSTEM 3, HEATING SYSTEM, ECONOMIZER SYSTEM, SUPPLY SYSTEM, EXHAUST SYSTEM, VENTILATION SYSTEM, or SENSOR / MISC) will change nomenclature to indicate a WARNING, SAFETY TRIP, SAFETY FAULT, or SAFETY LOCKOUT is present. A fault / warning description, method of reset and conditions under which the information is displayed is also contained in the table. Additional information for each of the faults is contained under their respective section of Section 5, Sequence of Operation of this IOM.

When a fault is declared, the Primary Unit Controller will record the time of occurrence, the date of occurrence, and a complete unit snapshot at the time of each occurrence in the HISTORY buffer. This data can be retrieved using the HISTORY key of the User Interface.

The HISTORY buffer stores the data from the last ten faults from the most recent (HISTORY 01) to the oldest (HISTORY 10). No fault HISTORY is eliminated once recorded other than being “pushed off” of the end of the list by a new fault when the buffer becomes full.

Warnings are only displayed in the HISTORY buffer while they are active. When the problem that generated the WARNING is corrected the record is removed from the buffer. The Primary Unit Controller does not record the time of occurrence, the date of occurrence, or a complete unit snapshot at the time of occurrence for a WARNING.

The HISTORY buffer is password protected and a level 2 password must be entered in order to view the data.

When the HISTORY key is pressed, the password prompt will appear. After the proper level 2 password has been entered the screen will show the first active warning. If there are no active warnings present, the first fault will be displayed. If there are no faults in the HISTORY buffer, the screen will display “NO FAULT”. See Section 6 MENU NAVIGATION & DISPLAY DESCRIPTION of this manual for additional information on how to navigate through the HISTORY menu.

In addition to the items listed in Table 8-12 the following items listed below are contained under the HISTORY key.

“COMPRESSOR SYSTEM (1,2,or 3) CLEAR” - When ever there is a compressor safety trip the Primary Unit Controller initiates the *“COMPR STATUS CLEAR TIME (1,2, or 3)”* timer. The Primary Unit Control records the time it takes for the trip to clear. When the fault clears *“COMPRESSOR SYSTEM (1,2,or 3) CLEAR”* shows the time it took for the fault to clear in the HISTORY buffer.

“COMPRESSOR SYSTEM (1,2,or 3) TIME OUT” – If the *“COMPR STATUS CLEAR TIME (1,2, or 3)”* timer reaches 60 minutes a *“COMPRESSOR SYSTEM (1,2,or 3) TIME OUT”* will be indicated in the HISTORY buffer. In most cases this indicates the compressor circuit over current protector opened. The compressor circuit over current protector is a manual reset device and the circuit would not reset in the required 60 minute time frame. The STATUS key will display the message *“COMP SYS (1,2,or 3) STATUS”* *“SAFETY LOCKOUT”* The Primary Unit Controller locks out the corresponding compressor system when a *“COMPRESSOR SYSTEM (1,2,or 3) TIME OUT”* is declared.

“COMPR SYSTEM (1,2,or 3) INHIBIT” – This WARNING indicates the compressor system safety circuit experienced a trip but reset prior to the expiration of the 60 minute reset time function. If the safety circuit does not reset in 60 minutes it will be replaced with a *“COMPRESSOR SYSTEM (1,2,or 3) TIME OUT”* message.

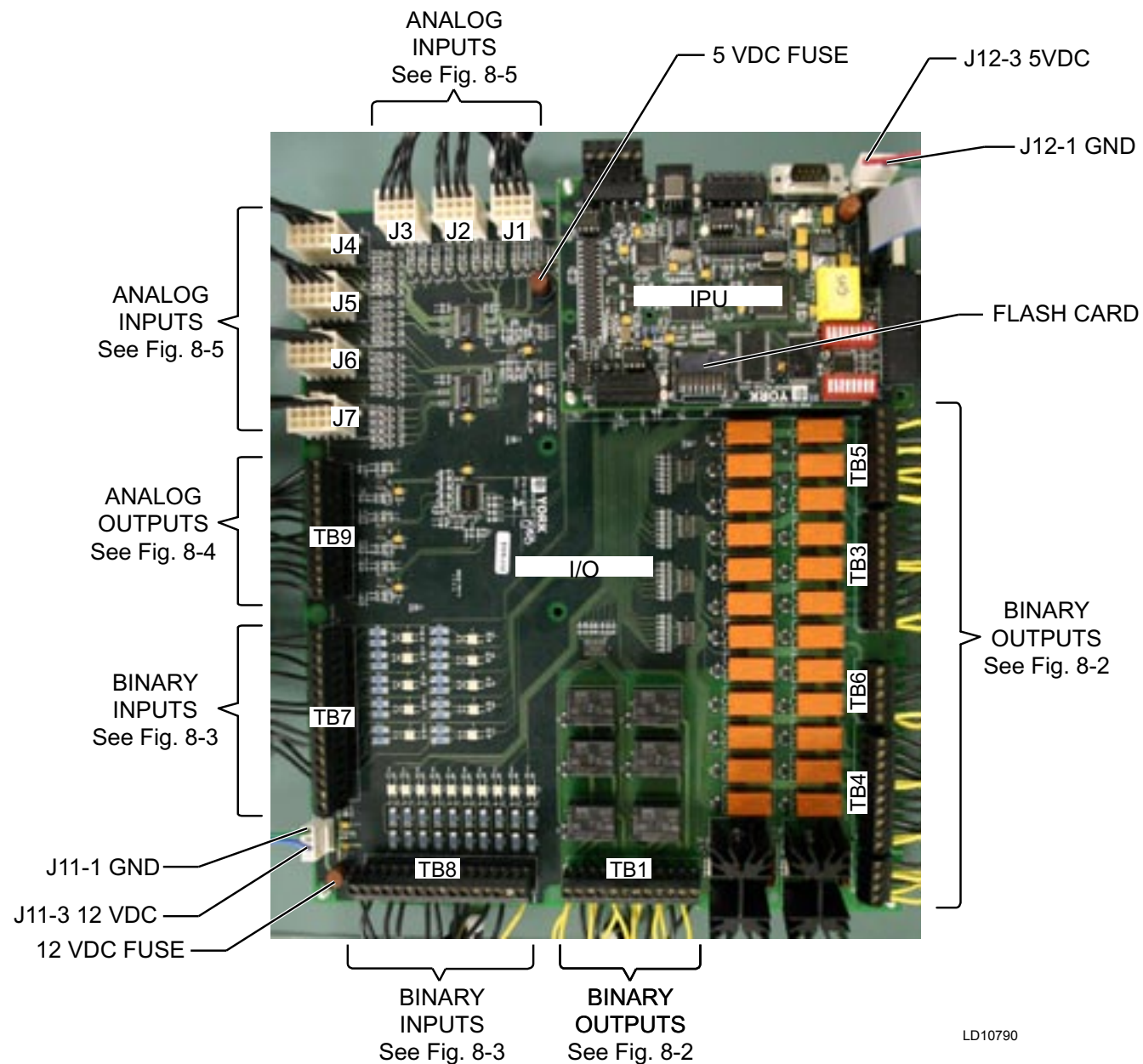


FIG. 8-1 – I/O CONTROL BOARD

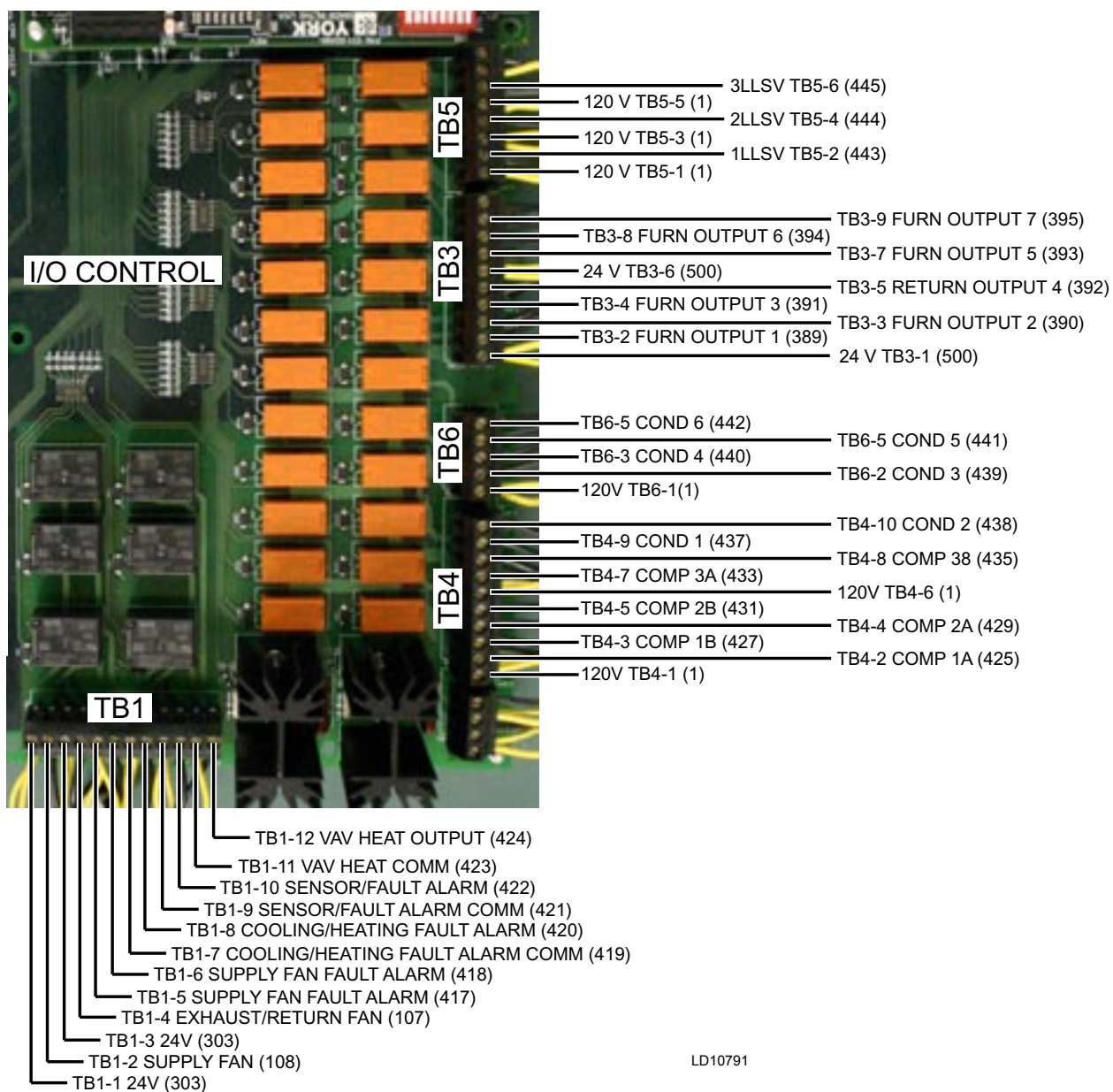
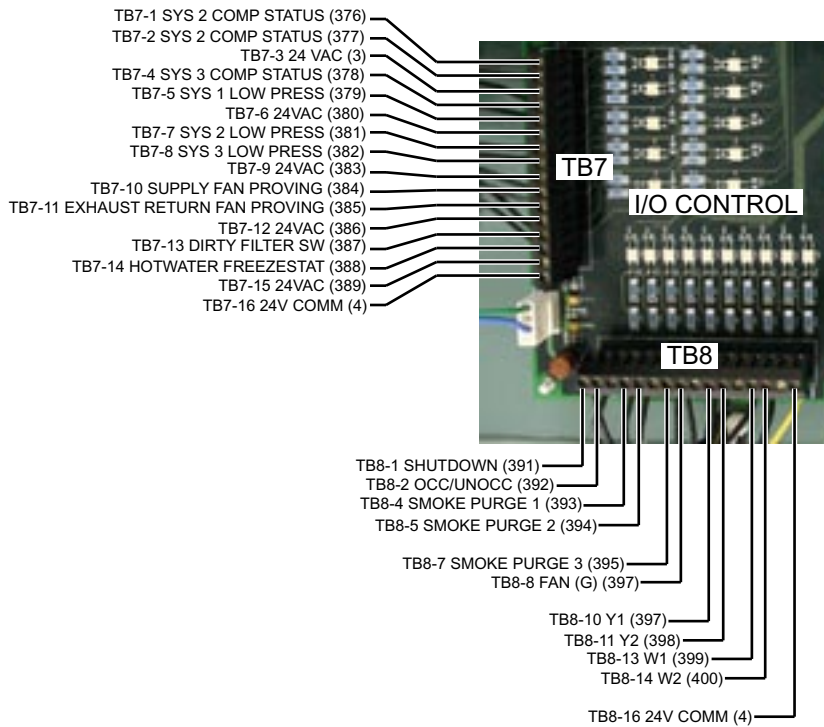
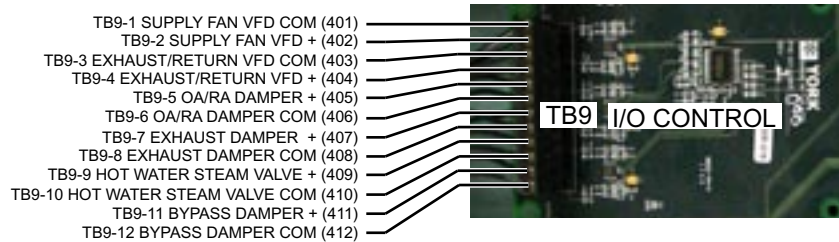


FIG. 8-2 – I/O CONTROL BOARD - BINARY OUTPUTS



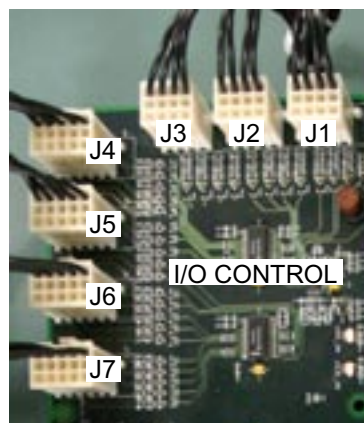
LD10792

FIG. 8-3 – I/O CONTROL BOARD - BINARY INPUTS

LD10793

FIG. 8-4 – I/O CONTROL BOARD - ANALOG OUTPUTS

5	4	3	2	1
10	9	8	7	6
15	14	13	12	11

J4, J5, J6, J7 PINOUTS

4	3	2	1
8	7	6	5
12	11	10	9

J1, J2, J3 PINOUTS

LD10794

FIG. 8-5 – I/O CONTROL BOARD - ANALOG INPUTS (SEE TABLE 8-11 FOR PIN OUTS)

TABLE 8-11 – I/O CONTROL BOARD - ANALOG INPUT PIN OUTS

PIN NO.	SIGNAL	PIN NO.	SIGNAL
J1-1	INPUT SUPPLY AIR TEMP (308)	J4-4	INPUT DISCH PRESS SYS2 (340)
J1-5	SHIELD SUPPLY AIR TEMP	J4-9	COM DISCH PRESS SYS2 (341)
J1-9	REF SUPPLY AIR TEMP 5VDC (309)	J4-14	REF DISCH PRESS SYS2 5VDC (342)
J1-2	INPUT HEAT ENTER TEMP (310)	J4-5	INPUT DISCH PRESS SYS3 (343)
J1-6	SHIELD HEAT ENTER TEMP	J4-10	COM DISCH PRESS SYS3 (344)
J1-10	REF HEAT ENTER TEMP 5VDC (311)	J4-15	REF DISCH PRESS SYS3 5VDC (345)
J1-3	INPUT FLEX EVAP TEMP (312)	J5-1	INPUT GAS HEAT STATUS (542)
J1-7	SHIELD FLEX EVAP TEMP	J5-6	COM GAS HEAT STATUS (543)
J1-11	REF FLEX EVAP TEMP 5VDC (313)	J5-11	REF GAS HEAT STATUS 5VDC (544)
J2-1	INPUT OA TEMP (314)	J5-2	INPUT OA CO2 (348)
J2-5	SHIELD OA TEMP	J5-7	COM OA CO2 (349)
J2-9	REF OA TEMP 5VDC (315)	J5-3	INPUT RA CO2 (350)
J2-2	INPUT RA TEMP (316)	J5-8	COM RA CO2 (351)
J2-6	SHIELD RA TEMP	J6-1	INPUT RETURN FAN PRESS (352)
J2-10	REF RA TEMP 5VDC (317)	J6-6	COM RETURN FAN PRESS (353)
J2-3	INPUT OA HUM (318)	J6-2	INPUT DUCT PRESS (354)
J2-7	COM OA HUM (319)	J6-7	COM DUCT PRESS (355)
J2-4	INPUT RA HUM (320)	J6-3	INPUT BLDG PRESS (356)
J2-8	COM RA HUM (321)	J6-8	COM BLDG PRESS (357)
J3-1	INPUT SUCT TEMP SYS1 (322)	J6-4	INPUT OA AIR PRESS 1 (358)
J3-5	SHIELD SUCT TEMP SYS1	J6-9	COM OA AIR PRESS 1 (359)
J3-9	REF SUCT TEMP SYS1 5VDC (323)	J6-5	INPUT OA AIR PRESS 2 (360)
J3-2	INPUT SUCT TEMP SYS2 (324)	J6-10	COM OA AIR PRESS 2 (361)
J3-6	SHIELD SUCT TEMP SYS2	J7-1	INPUT ZONE TEMP SENSOR (363)
J3-10	REF SUCT TEMP SYS2 5VDC (325)	J7-6	SHIELD ZONE TEMP SENSOR (364)
J3-3	INPUT SUCT TEMP SYS3 (326)	J7-11	REF ZONE TEMP SENSOR 5VDC (362)
J3-7	SHIELD SUCT TEMP SYS3	J7-2	INPUT FLEXSYS SLAB SENSOR (366)
J3-11	REF SUCT TEMP SYS3 5VDC (327)	J7-7	SHIELD FLEXSYS SLAB SENSOR (367)
J3-4	INPUT SUCT PRESS SYS1 (328)	J7-12	REF FLEXSYS SLAB SENSOR 5VDC (365)
J3-8	COM SUCT PRESS SYS1 (329)	J7-3	INPUT FLEXSYS UNDER FLOOR HUM (368)
J3-12	REF SUCT PRESS SYS1 5VDC (330)	J7-8	COM FLEXSYS UNDER FLOOR HUM (369)
J4-1	INPUT SUCT PRESS SYS2 (331)	J7-4	INPUT SAT RESET (371)
J4-6	COM SUCT PRESS SYS2 (332)	J7-9	COM SAT RESET (372)
J4-11	REF SUCT PRESS SYS2 5VDC (333)	J7-14	REF SAT RESET 5VDC (370)
J4-2	INPUT SUCT PRESS SYS3 (334)	J7-5	INPUT DUCT STATIC RESET (374)
J4-7	COM SUCT PRESS SYS3 (335)	J7-10	COM DUCT STATIC RESET (375)
J4-12	REF SUCT PRESS SYS3 5VDC (336)	J7-15	REF DUCT STATIC RESET 5VDC (373)
J4-3	INPUT DISCH PRESS SYS1 (337)		
J4-8	COM DISCH PRESS SYS1 (338)		
J4-13	REF DISCH PRESS SYS1 5VDC (339)		

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY)

HISTORY (A) DISPLAY TEXT	SHOW WHEN FAULT DESCRIPTION PRESENT	RESET	SHOW WHEN UNIT TYPE IS	"LINE 2 STATUS SCREEN WORDING"	ADDITIONAL LINE 2 STATUS SCREEN WORDING
BUILDING PRES FAULT	BUILDING STATIC PRES> 0.45 INWC OR < -0.45 INWC FOR 10 SECONDS POWER EXHAUST REVERTS TO NONE OR ON/OFF	SYSTEM AUTO RESET	POWER EXHAUST OTHER THAN NONE	EXHAUST SYSTEM - SYSTEM FAULT	
CO2 SENSOR 1 WARN	CO2 SENSOR IS OUT OF RANGE FOR >=10 SEC DEMANED VENTILATION BECOMES INACTIVE	WARNING AUTO RESET	VENTILATION CONTROL DEMAND	SENSOR / MISC - WARNING	
CO2 SENSOR 2 WARN	CO2 SENSOR IS OUT OF RANGE FOR >=10 SEC DEMANED VENTILATION BECOMES INACTIVE	WARNING AUTO RESET	VENTILATION CONTROL DEMAND	SENSOR / MISC - WARNING	
COMPR 1 LOCKOUT	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN - 3 TIMES IN 120 MINUTES COMP 1 LOCKOUT	SYSTEM LOCKOUT		COMP SYSTEM 1 - SAFETY LOCKOUT	
COMPR 1 LPCO SAFETY LOCKOUT	LOW PRESSURE CUTOFF OPEN - 3 TIMES IN 120 MINUTES COMP 1 LOCKOUT	SYSTEM LOCKOUT		COMP SYSTEM 1 - SAFETY LOCKOUT	
COMPR 1 LPCO SAFETY TRIP 1	LOW PRESSURE CUTOFF OPEN 1ST TRIP, TURNS OFF SYS 1 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 1 - SAFETY TRIP	
COMPR 1 LPCO SAFETY TRIP 2	LOW PRESSURE CUTOFF OPEN 2ND TRIP, TURNS OFF SYS 1 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 1 - SAFETY TRIP	
COMPR 1 SAFETY TRIP 1	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 1ST TRIP, TURNS OFF SYS 1 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 1 - SAFETY TRIP	
COMPR 1 SAFETY TRIP 2	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 2ND TRIP, TURNS OFF SYS 1 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 1 - SAFETY TRIP	
COMPR 2 LOCKOUT	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN - 3 TIMES IN 120 MINUTES COMP 2 LOCKOUT	SYSTEM LOCKOUT		COMP SYSTEM 2 - SAFETY LOCKOUT	
COMPR 2 LPCO SAFETY LOCKOUT	LOW PRESSURE CUTOFF OPEN - 3 TIMES IN 120 MINUTES COMP 2 LOCKOUT	SYSTEM LOCKOUT		COMP SYSTEM 2 - SAFETY LOCKOUT	
COMPR 2 LPCO SAFETY TRIP 1	LOW PRESSURE CUTOFF OPEN 1ST TRIP, TURNS OFF SYS 2 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 2 - SAFETY TRIP	

Continued on next page

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY) (CONTINUED)

HISTORY (A) DISPLAY TEXT	SHOW WHEN FAULT DESCRIPTION PRESENT	RESET	SHOW WHEN UNIT TYPE IS	“LINE 2 STATUS SCREEN WORDING”	ADDITIONAL LINE 2 STATUS SCREEN WORDING
COMPR 2 LPCO SAFETY TRIP 2	LOW PRESSURE CUTOUT OPEN 2ND TRIP, TURNS OFF SYS 2 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 2 - SAFETY TRIP	
COMPR 2 SAFETY TRIP 1	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 1ST TRIP, TURNS OFF SYS 2 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 2 - SAFETY TRIP	
COMPR 2 SAFETY TRIP 2	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 2ND TRIP, TURNS OFF SYS 2 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 2 - SAFETY TRIP	
COMPR 3 LOCKOUT	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN - 3 TIMES IN 120 MINUTES COMP 3 LOCKOUT	SYSTEM LOCKOUT	UNIT SIZE 70-75, 80-85, 90-105, 164	COMP SYSTEM 3 - SAFETY LOCKOUT	
COMPR 3 LPCO SAFETY LOCKOUT	LOW PRESSURE CUTOUT OPEN - 3 TIMES IN 120 MINUTES COMP 3 LOCKOUT	SYSTEM LOCKOUT	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY LOCKOUT	
COMPR 3 LPCO SAFETY TRIP 1	LOW PRESSURE CUTOUT OPEN 1ST TRIP, TURNS OFF SYS 3 COMPS	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY TRIP	
COMPR 3 LPCO SAFETY TRIP 2	LOW PRESSURE CUTOUT OPEN 2ND TRIP, TURNS OFF SYS 3 COMPS	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY TRIP	
COMPR 3 SAFETY TRIP 1	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 1ST TRIP, TURNS OFF SYS 3 COMPS	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY TRIP	
COMPR 3 SAFETY TRIP 2	HIGH PRESS SW, COMP MOTOR PROTECTOR, OR OVERCURRENT PROTECTOR OPEN 2ND TRIP, TURNS OFF SYS 3 COMPS	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY TRIP	
DISCHARGE PRS SENSOR 1 WARN	CIRCUIT 1 DISCHARGE PRESSURE OUT OF RANGE FOR >= 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCR PKG SYS 1, SYS 1,2 SYS 1,2,3	SENSOR / MISC - WARNING	
DISCHARGE PRS SENSOR 2 WARN	CIRCUIT 2 DISCHARGE PRESSURE OUT OF RANGE FOR >= 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCR PKG SYS 1,2 SYS 1,2,3	SENSOR / MISC - WARNING	
DISCHARGE PRS SENSOR 3 WARN	CIRCUIT 3 DISCHARGE PRESSURE OUT OF RANGE FOR >= 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCR PKG SYS 1,2,3	SENSOR / MISC - WARNING	

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY) (CONTINUED)

HISTORY (A) DISPLAY TEXT	SHOW WHEN FAULT DESCRIPTION PRESENT	RESET	SHOW WHEN UNIT TYPE IS	"LINE 2 STATUS SCREEN WORDING"	ADDITIONAL LINE 2 STATUS SCREEN WORDING
DUCT PRS XDCR LOCK- OUT	DUCT STATIC PRESS <= 0.25 INWC FOR 30 SECONDS OR >= 5.78 INWC FOR 30 SECONDS UNIT LOCKOUT	UNIT LOCK- OUT	UNIT TYPE VAV, FLEXSYS	UNIT-OVER- ALL - UNIT LOCKOUT	SUPPLY SYSTEM - SYSTEM LOCK- OUT
EVAPORATOR AIR TEMP SENSOR LOCKOUT	EVAP TEMP SENSOR OUT OF RANGE FOR >= 10 SEC UNIT LOCKOUT	WARNING AUTO RESET	UNIT TYPE FLEXSYS	SENSOR / MISC - WARN- ING	
EXHAUST FAN LOCKOUT	EXHAUST FAN STATUS IS LOW AND TIME FROM START >= 30 SEC EX- HAUST FAN LOCK OUT	SYSTEM LOCKOUT	POWER EXHAUST VFD	EXHAUST SYSTEM - SYSTEM LOCKOUT	
FURANCE MULTIPLEXER WARN	GAS HEAT STATUS INFORMATION WILL NOT BE AVAILABLE BUT GAS HEAT WILL CONTINUE TO FUNCTION	WARNING AUTO RESET	HEAT TYPE STAGED GAS , MODULATING GAS	SENSOR / MISC - WARNING	
HET SENSOR WARN	HET SENSOR IS OUT OF RANGE FOR >= 10 SECONDS. AIR TEMPERING IS DISABLED	WARNING AUTO RESET	HEAT TYPE STAGED GAS	SENSOR / MISC - WARNING	
HIGH DUCT STATIC PRESS LOCKOUT	DUCT STATIC PRESSURE >= DUCT STATIC OVER PRESS UNIT LOCKOUT	UNIT LOCK- OUT	UNIT TYPE VAV, FLEXSYS	UNIT-OVER- ALL - SAFETY LOCKOUT	SUPPLY SYSTEM - SYSTEM LOCKOUT
HYDRONIC FREEZESTAT LOCKOUT	SWITCH REMAINS CLOSED >= 5 MIN- UTES, UNIT LOCKOUT	UNIT LOCK- OUT	HEAT TYPE STEAM, HOT WATER	SENSOR / MISC - SAFETY LOCKOUT	UNIT OVERALL
HYDRONIC FREEZESTAT TRIP	SWITCH CLOSURES FOR 10 SEC, HYDRONIC VALVE DRIVEN TO 100%	WARNING AUTO RESET	HEAT TYPE STEAM, HOT WATER	SENSOR / MISC - SAFETY TRIP	
LOW SUCTION TEMP 1 TRIP	SUCTION TEMPERATURE BELOW THE FAULT SETTING, TURN OFF BOTH SYS 1 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 1 - SAFETY TRIP	
LOW SUCTION TEMP 2 TRIP	SUCTION TEMPERATURE BELOW THE FAULT SETTING, TURN OFF BOTH SYS 2 COMPS	SYSTEM AUTO RESET		COMP SYSTEM 2 - SAFETY TRIP	
LOW SUCTION TEMP 3 TRIP	SUCTION TEMPERATURE BELOW THE FAULT SETTING, TURN OFF BOTH SYS 3 COMPS	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	COMP SYSTEM 3 - SAFETY TRIP	
MSAT SENSOR LOCKOUT	MSAT SENSOR OUT OF RANGE FOR >= 10 SEC, COOLING OPERATION SHUT DOWN	UNIT LOCK- OUT	UNIT TYPE FLEXSYS	SENSOR / MISC - SAFETY LOCKOUT	UNIT OVERALL

Continued on next page

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY) (CONTINUED)

HISTORY (A) DISPLAY TEXT	SHOW WHEN FAULT DESCRIPTION PRESENT	RESET	SHOW WHEN UNIT TYPE IS	“LINE 2 STATUS SCREEN WORDING”	ADDITIONAL LINE 2 STATUS SCREEN WORDING
OA AIR TEMP SENSOR LOCKOUT	OA AIR TEMP SENSOR OUT OF RANGE FOR >= 10 SEC UNIT LOCK- OUT	SYSTEM LOCKOUT		SENSOR / MISC - SYSTEM LOCKOUT	ECONOMIZER SYSTEM - SYSTEM LOCKOUT; COMPRESSOR SYSTEM # - SYSTEM LOCKOUT
OA FLOW PRS 1 WARN	FLOW SENSOR OUTSIDE OF LIMITS FOR 10 SEC. DAMPER OPERATED AT MIN POSITON SETPOINT	WARNING AUTO RESET	DAMPER HARDWARE MIN IAQ, FULL IAQ, 1/3 - 2/3 1AQ	SENSOR / MISC - WARNING	
OA FLOW PRS 2 WARN	FLOW SENSOR OUTSIDE OF LIMITS FOR 10 SEC. DAMPER OPERATED AT MIN POSITON SETPOINT	WARNING AUTO RESET	DAMPER HARDWARE 1/3 - 2/3 IAQ	SENSOR / MISC - WARNING	
OUTSIDE AIR RH WARN	OAT >= 32.0 F AND OA RH< 5% FOR 10 SEC REVERTS TO DRY BULB ECON	WARNING AUTO RESET	ECONOMIZER METHOD SINGLE / DUAL / BEST	SENSOR / MISC - WARNING	
POWER FAILURE FAULT	POWER WAS LOST WHEN UNIT OPERATING STATE WAS RUN	UNIT AUTO RESET		SENSOR / MISC - SAFETY TRIP	
RAT SENSOR FAULT	RAT SENSOR OUT OF RANGE FOR >= 10 SEC, UNIT SHUT DOWN	SYSTEM AUTO RESET		SENSOR / MISC - SAFETY FAULT	
RETURN AIR RH WARN	RAT >= 32.0 F AND RA RH< 5% FOR 10 SEC REVERTS TO DRY BULB OR SINGLE ECON	WARNING AUTO RESET	ECONOMIZER METHOD DUAL / BEST	SENSOR / MISC - WARNING	
RETURN FAN LOCKOUT	RETURN FAN STATUS IS LOW AND TIME FROM START >= 30 SEC UNIT LOCKOUT	UNIT LOCKOUT	RETURN FAN W EXH / RET FAN W/O EXH	UNIT- OVERALL - UNIT LOCKOUT	SUPPLY SYSTEM - SYSTEM LOCKOUT
RETURN PRS XDCR LOCK- OUT	RET FAN PRESS < -0.95 IN WC OR >0.95 INWC FOR 10 SEC, SUPPLY FAN IS OFF AND RETURN FAN PRESSURE IS <-0.1 INWC OR >0.1 INWC FOR 5 MINUTES UNIT LOCKOUT	UNIT LOCKOUT	RETURN FAN W EXH / RET FAN W/O EXH	UNIT- OVERALL - UNIT LOCKOUT	SUPPLY SYSTEM - SYSTEM LOCKOUT
SAT SENSOR FAULT	SAT SENSOR OUT OF RANGE FOR >= 10 SEC UNIT LOCKOUT	SYSTEM LOCKOUT		SENSOR / MISC - SAFETY LOCKOUT	

TABLE 8-12 – FAULT DESCRIPTION TABLE (STATUS KEY)

HISTORY (A) DISPLAY TEXT	SHOW WHEN FAULT DESCRIPTION PRESENT	RESET	SHOW WHEN UNIT TYPE IS	“LINE 2 STATUS SCREEN WORDING”	ADDITIONAL LINE 2 STATUS SCREEN WORDING
SCTION TEMP SENSOR 1 FAULT	SUCTION 1 TEMPERATURE SENSOR IS OUT OF RANGE FOR ≥ 10 SECONDS, COMPS SYS 1 SHUT DOWN	SYSTEM AUTO RESET		SENSOR / MISC - SAFETY FAULT	COMPRESSOR SYSTEM 1 - SAFETY FAULT
SCTION TEMP SENSOR 2 FAULT	SUCTION 2 TEMPERATURE SENSOR IS OUT OF RANGE FOR ≥ 10 SEC- ONDS, COMPS SYST 2 SHUT DOWN	SYSTEM AUTO RESET		SENSOR / MISC - SAFETY FAULT	COMPRESSOR SYSTEM 2 - SAFETY FAULT
SCTION TEMP SENSOR 3 FAULT	SUCTION 3 TEMPERATURE SENSOR IS OUT OF RANGE FOR ≥ 10 SEC- ONDS, COMPS SYS 3 SHUT DOWN	SYSTEM AUTO RESET	UNIT SIZE 70-75, 80-85, 90-105, 106-130	SENSOR / MISC - SAFETY FAULT	COMPRESSOR SYSTEM 3 - SAFETY FAULT
SLAB TEMP SENSOR WARN	SLAB TEMPERATURE SENSOR IS OUT OF RANGE FOR ≥ 10 SEC EVAP RESET CONTROL REVERTS TO RE- MOTE RESET	WARNING AUTO RESET	UNIT TYPE FLEXSYS	SENSOR / MISC - WARNING	
STAGED INPUT FAULT	THERMOSTAT CV, Y(1 OR 2) AND W(1 OR 2) INPUT AT THE SAME TIME, SHUT DOWN UNIT	SYSTEM AUTO RESET	CONTROL METHOD STAGED	SENSOR / MISC - SAFETY LOCKOUT	
SUCTION PRS SENSOR 1 WARN	CIRCUIT 1 SUCTION PRESSURE OUT OF RANGE FOR ≥ 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCCR PKG SYS 1, SYS 1,2 SYS 1,2,3	SENSOR / MISC - WARNING	
SUCTION PRS SENSOR 2 WARN	CIRCUIT 2 SUCTION PRESSURE OUT OF RANGE FOR ≥ 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCCR PKG SYS 1,2 SYS 1,2,3	SENSOR / MISC - WARNING	
SUCTION PRS SENSOR 3 WARN	CIRCUIT 3 SUCTION PRESSURE OUT OF RANGE FOR ≥ 10 SECONDS	WARNING AUTO RESET	DISCHG PRESS XDCCR PKG SYS 1,2,3	SENSOR / MISC - WARNING	
SUPPLY FAN LOCKOUT	SUPPLY FAN STATUS IS LOW AND TIME FROM START > 30 SEC UNIT LOCKOUT	UNIT LOCKOUT		UNIT-OVER- ALL - SAFETY LOCKOUT	SUPPLY SYSTEM - SYSTEM LOCKOUT
UNDER FLOOR RH SENSOR WARN	UNDER FLOOR RH IS $< 5\%$ FOR ≥ 5 MINUTES EVAP RESET CONTROL REVERTS TO REMOTE RESET	WARNING AUTO RESET	UNIT TYPE FLEXSYS	SENSOR / MISC - WARNING	
ZONE TEMP SENSOR FAULT	ZONE TEMP SENSOR IS OUT OF RANGE FOR ≥ 10 SEC, UNIT SHUT DOWN	SYSTEM AUTO RESET	CONTROL METH ZONE TEMP (HW)	SENSOR / MISC - SAFETY LOCKOUT	

MULTI MEDIA CARD

The Primary Unit Controller is made up of two separate control boards, the PLUG IN I/O board and the IPU board. All the digital and analog inputs and outputs are connected to the PLUG IN I/O control. All the system logic is contained on the PLUG IN I/O board. The IPU board mounts on top of the PLUG IN I/O board and handles the communication between the PLUG IN I/O board and the User Interface. Another feature of this control system is the availability to connect a MULTI MEDIA CARD to the IPU board. The MULTI MEDIA CARD allows operational data to be continuously saved and used for the diagnosis of unit operating problems.

A MULTI MEDIA CARD is similar to a hard drive in a PC. It has a directory structure and files are saved on it. The difference between a hard drive and the MULTI MEDIA CARD is that the MULTI MEDIA CARD is made of non-volatile flash memory. This allows the MULTI MEDIA CARD to be removed from the IPU board and placed in a PC for data analysis without the loss of any data.

The MULTI MEDIA CARD is considered a Service tool and as such is controlled through the SERVICE key of the User Interface. Entry into the SERVICE screen requires a Level 2 password.

Data is continuously stored to the MULTI MEDIA CARD in root and subdirectories. The root directories are set up by month and year, under each of the root directories are subdirectories for each day. For example the data for January 11, 2005 would be stored in a root directory identified by Rm200501, the year followed by the month. The subdirectory for this day would be identified as 20050111.csv, the year followed by the month, followed by the day. Each of these files contains all the data monitored for the day specified by the file name.

All connected Analog Inputs, Analog Outputs, Digital Inputs, Digital Outputs, Serial Data and Derived Data will be collected. The data will be collected once every 5 seconds and stored in the same order as in the History buffer. Each line of data will be timed and date stamped. Each file will include a header line detailing what data is stored in each column.

The collected data can be analyzed using a PC. The MULTI MEDIA CARD can be inserted into a MULTI MEDIA CARD reader attached to the PC. The data can be analyzed using Excel or another data analysis tool.

To install or remove the MULTI MEDIA CARD from the IPU board “*DATA LOG FORMAT*” must be set to off. This is done through the SERVICE screen of the User Interface. When the MULTI MEDIA CARD is installed the operation can be programmed to “*UNCOMPRESSED*” in which case data will be recorded every 5 seconds or “*SKIP UNCHANGED*” which is the same as “*UNCOMPRESSED*” except values are only saved when they change.

If an error occurs when writing to the MULTI MEDIA CARD, “*DATA LOG ERROR STATE* “ and “*DATA LOG ERROR DETAIL*” will appear under the SERVICE screen. “*DATA LOG ERROR STATE* “ indicates what operation failed and “*DATA LOG ERROR DETAIL*” will give the error code from the operation. TABLE 8-13 gives a description of the “*DATA LOG ERROR STATE* “ and TABLE 8-14 gives a description of the “*DATA LOG ERROR DETAIL*”.

TABLE 8-13 – DATA LOG ERROR STATE

DATA LOG ERROR STATE	AN ERROR OCCURRED WHEN DOING THIS:
1	MOUNTING THE FLASH CARD
2	OPENING THE ROOT DIRECTORY
3	READING THE ROOT DIRECTORY
4	CLOSING THE ROOT DIRECTORY
5	OPENING A SUB-DIRECTORY
6	READING A SUB-DIRECTORY
7	CLOSING A SUB-DIRECTORY
8	DELETING AN OLD DIRECTORY
11	CREATING A DIRECTORY
14	CREATING A FILE
15	OPEN A FILE
16	WRITE A FILE
17	DELETE A FILE
18	CLOSE A FILE

TABLE 8-14 – DATA LOG ERROR LOG DETAIL

DATA LOG ERROR DETAIL	THIS ERROR OCCURRED:
1	NOT PERMITTED
2	NO SUCH ENTITY
3	NO SUCH PROCESS
4	OPERATION INTERRUPTED
5	I/O ERROR
6	BAD FILE HANDLE
11	TRY AGAIN LATER
12	OUT OF MEMORY
16	RESOURCE BUSY
19	NO SUCH DEVICE
20	NOT A DIRECTORY
21	IS A DIRECTORY
22	INVALID ARGUMENT
23	TOO MANY OPEN FILES IN SYSTEM
27	FILE TOO LARGE
28	NO SPACE LEFT ON DEVICE
29	ILLEGAL SEEK
30	READ-ONLY FILE SYSTEM
60	FILE NAME TOO LONG

NOTES

