YORK®	WATER-COOLED SELF-CONTAINED UNITS	
INSTALLATION, OPERATION AND MAINTENANCE	Supersedes 145.05-NOM7 (415)	Form 145.05-NOM7 (317)

035-22910-007

MODEL LSWU/LSWD
WITH IPU2 CONTROL
25–105 TON

Issue Date:
March 8, 2017

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, 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 rigging, installation, and 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 rigging, installation, and operating/service personnel. It is expected that these individuals possess 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 shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

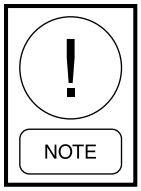
SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:

Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.



Highlights additional information useful to the technician in completing the work being performed properly.

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls QuickLIT website at http://cgproducts.johnsoncontrols.com.

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating/service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

CHANGE BARS

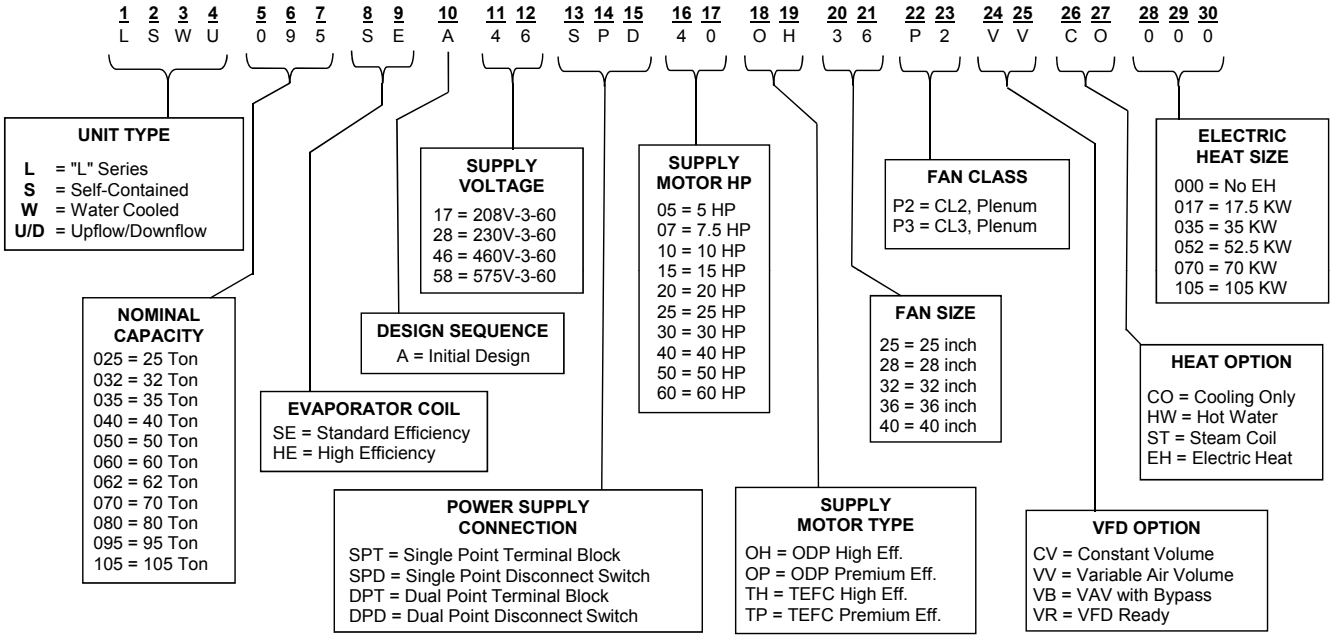
Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Split Shipment Re-assembly	145.05-FA1
Unit Wiring	145.05-W1
Unit Replacement Parts 062-105 Tons	145.05-RP1
Unit Replacement Parts 025-040 Tons	145.05-RP3
Unit Replacement Parts 050-060 Tons	145.05-RP4
Airside Economizer Field Assembly	145.05-FA2
Contractor Start-Up Checklist	145.05-CL1
JCI Technician Start-Up Checklist	145.05-CL2
Expanded JCI Technician Start-Up Checklist	145.05-CL3
Troubleshooting Guide	145.05-M1
Start-Up Guide	145.05-SU7
Special Compressor Isolation Shipping Bracket Removal	145.05-FA3
Shipping Damage Claims Service Policy	50.15-NM

NOMENCLATURE

LSWU(D) PRODUCT MODEL NUMBER



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SECTION 1 – INTRODUCTION

ABOUT THIS MANUAL

This manual applies to Water Cooled Self Contained Units, Models LSWU025 to LSWU105. This manual provides specific instructions for installation, owner maintenances, and troubleshooting.

Due to continuous product improvement and enhancements, the information provided is subject to change without notice.

DESCRIPTION OF UNIT

The water cooled self-contained air conditioner is the ultimate solution addressing the energy efficiency, reliability, indoor air quality, and sound concerns for commercial, industrial and institutional buildings. Johnson Controls offers a simple system design, increases system redundancy by providing individual air conditioning systems per floor, lowers maintenance costs, eases operation and maintenance, and provides the lowest life cycle cost available. Based on these features, the self-contained unit has surpassed the traditional chillers, air handlers and rooftop systems and is now the system of choice.

TABLE 1 - ACRONYM CHART

ACRONYM	TEXT
AO	Analog Output
AFS	Air Flow Switch
DHS	Duct High Static Switch
DSP	Duct High Pressure Sensor
DO	Digital Output
IN	Universal Input
LCD	Logic Controller Display
MSF	Supply Fan Relay
OLSF	Supply Fan Overload
PM	Phase Monitor
PWS	Power Supply
RSF	Supply Fan Relay
S	Toggle Switch
T	Transformer
VFD	Variable Frequency Drive
SAT	Supply Air Temp
MAT	Mixed Air Temp
AFS	Air Flow Switch
DHS	Duct High Static
RAT	Return Air Temp

Models LSWU025 to LSWU105 are factory assembled, refrigerant charged and tested water-cooled packaged air conditioning units designed for ducted applications. They can be purchased to ship split for easy placement in the final location.

Each unit contains:

- Multiple hermetic scroll compressors
- Water cooled condensers
- Multi-circuit evaporator
- Thermal expansion valves
- Interconnecting refrigerant piping
- Plenum supply fan
- Belt drive
- Fan motor
- Pleated filters
- All necessary operating and required safety controls to operate the unit.

All rigging, installation, power and control wiring external to the unit, and condenser water and condensate piping are the responsibility of the installer.

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SECTION 2 – INSTALLATION

APPROVALS

Design certified by ETL for indoor installation only.

LIMITATIONS

The installation of this unit must conform to local building codes as well as the National Electrical Code ANSI/NFPA No. 70 – or latest edition.

Refer to Table 2 for voltage limitations and Table 3 for operating limitations.

TABLE 2 - VOLTAGE LIMITATIONS

UNIT POWER SUPPLY	VOLTAGE VARIATIONS	
	MINIMUM VOLTS	MAXIMUM VOLTS
208/230-3-60	187	253
480-3-60	415	506
575-3-60	518	632

TABLE 3 - OPERATING LIMITATIONS

	MINIMUM	MAXIMUM
Entering Air DX Coil – Dry Bulb	68.0 °F	90.0 °F
Entering Air DX Coil – Wet Bulb	57.0 °F	72.0 °F
DX Cooling Coil Airflow Velocity	200 FPM	600 FPM
Condenser Water Flow	2.0 GPM/TON	3.0 GPM/TON
Entering Cond. Water Temp with Water Economizer	50.0 °F	115.0 °F
Entering Cond. Water Temp W/O Water Economizer	55.0 °F	115.0 °F
Entering Cond Water Temp W/O Condenser Water Cntl Valve	60.0 °F	115.0 °F
Steam Heat – Steam Pressure	5 PSIG	15 PSIG
Hot Water Heat Entering Water Temp	140.0 °F	160.0 °F

If the VAV boxes in the conditioned space have hydronic heating coils installed, it is the responsibility of the installing contractor to take appropriate measures to protect the hydronic coils against low unit supply air temperatures that could result in the freeze up and rupture of the coils.

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 on the carrier's freight bill. A written request for inspection by the carrier's agent should be made at once. *See Shipping Damage Claims Service Policy (Form 50.15-NM) for more information and details.*

To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized Johnson Controls service mechanic or a qualified service person experienced in water cooled self contained equipment 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.

TABLE 4 - LSWU/LSWD MINIMUM CFM

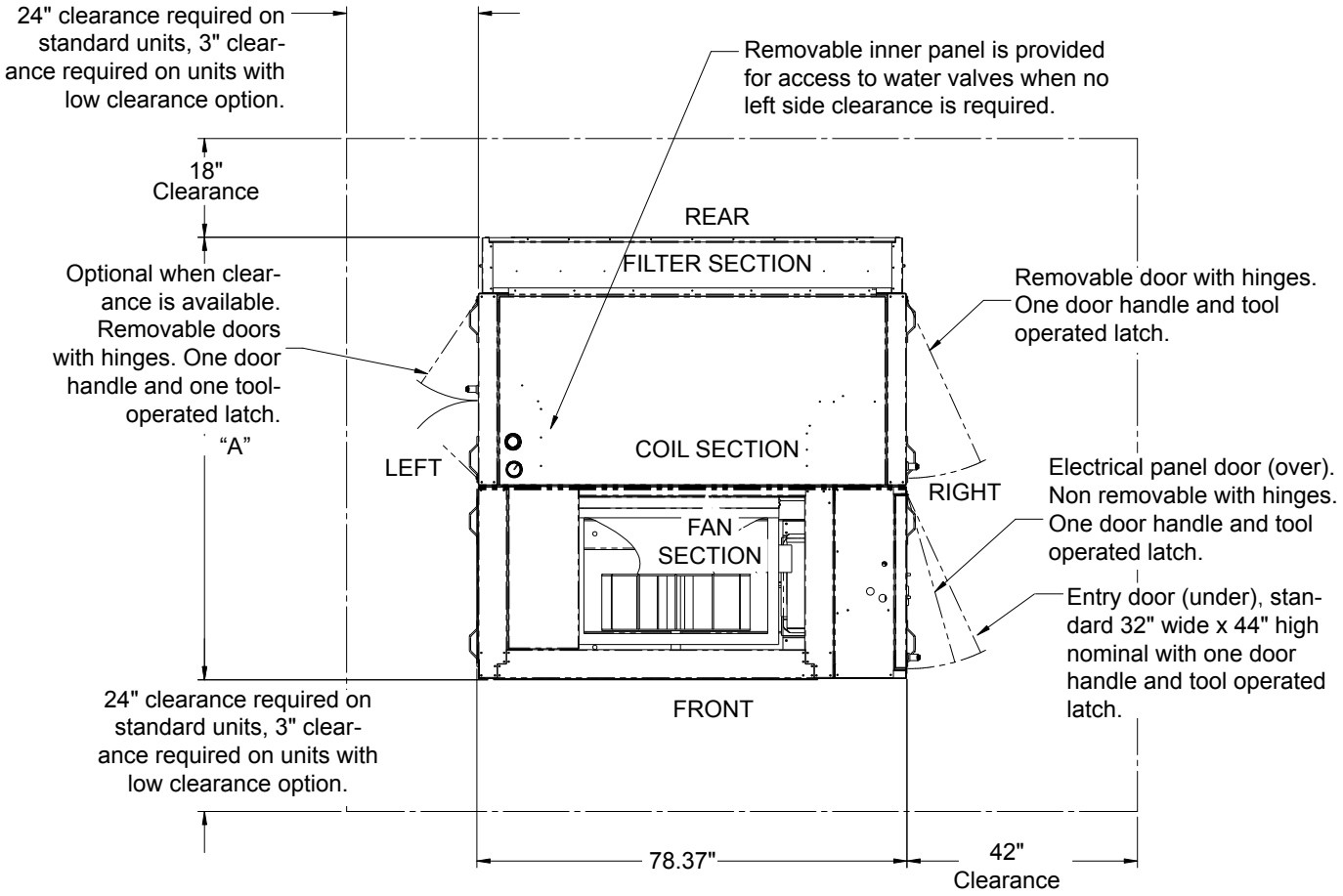
UNIT SIZE	STD EVAP (12 FINS PER INCH)	HI EFF EVAP (17 FINS PER INCH)	EVAP AND WATERSIDE ECONO COIL
25T	4100	3600	3600
32T	5100	4400	4400
35T	6100	5300	5300
40T	5300	5300	5300
50T	8000	8000	8000
60T	8000	8000	8000
70T	11400	9900	9900
80T	11300	11300	11300
95T	12100	12100	12100
105T	12100	12100	12100

In order for the supply fan air proving switch to close the unit must achieve the minimum CFM levels listed in the chart. If the supply fan air proving switch does not close the unit will register a warning or possibly fault and shutdown.

LOCATION AND CLEARANCES

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

- The unit is designed for indoor installation only.
- Verify the floor or foundation is level. For proper unit operation the unit should be level within a 1/16" side to side and 1/8" front to back tolerance. Failure to level the unit properly could result in condensate management problems, such as standing water inside the unit.



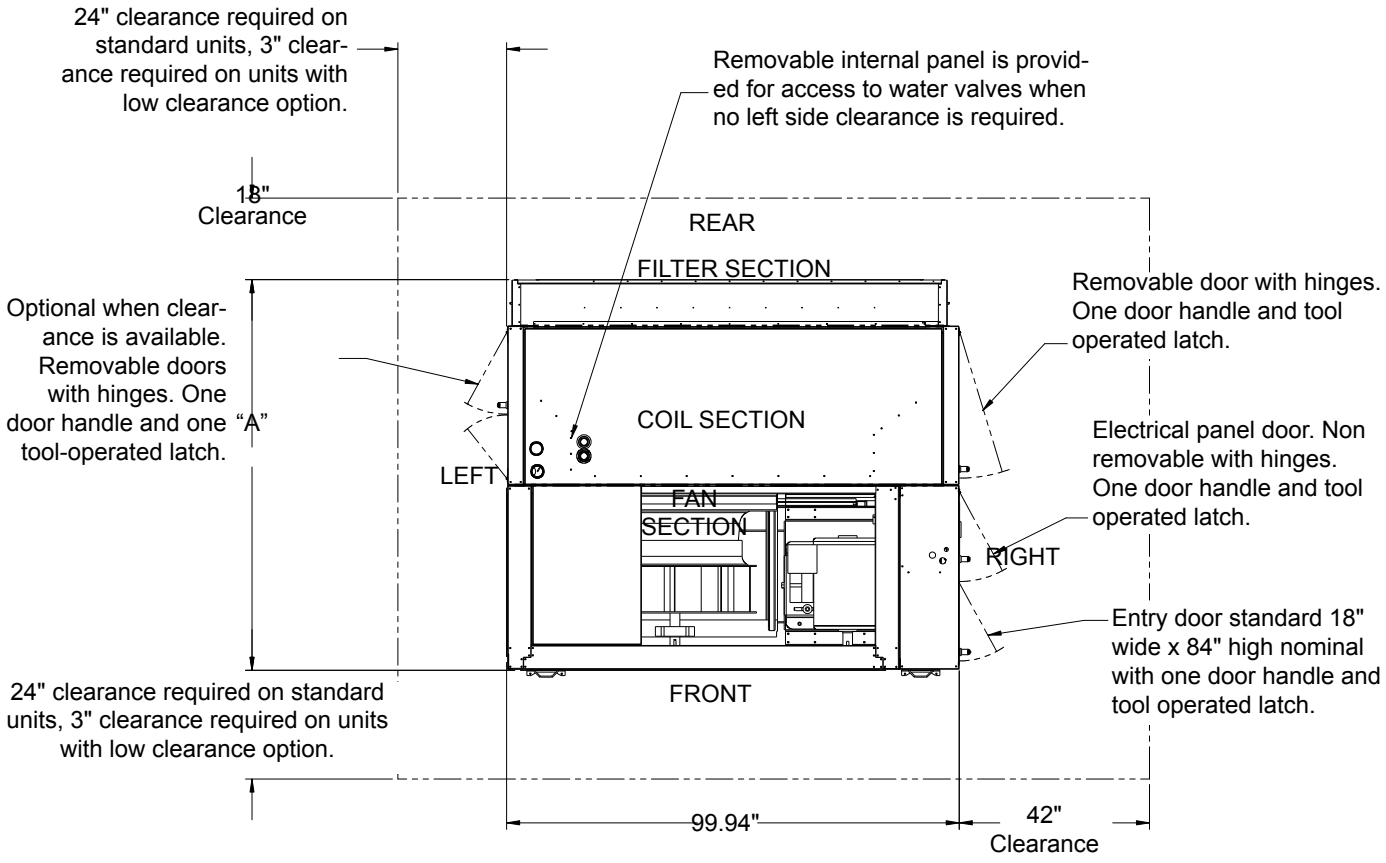
NO.	FILTER OPTIONS	"A"
1	2" Filter	74.43
2	4" Filter	76.43
3	2" Prefilter + 4" High Efficiency Filter	78.68
4	4" Prefilter + 4" High Efficiency Filter	80.68

NOTES:

1. All dimensions are in inches.

FIGURE 1 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE TOP DISCHARGE (LSWU025 - LSWU040)

For installation, service and maintenance access, the following clearances should be followed. Minimum clearances required by local, state, or national codes, such as NEC take precedence over those listed in *Figure 1 on page 14*. Clearance is required to allow room for side filter access, mechanical cleaning of the condenser tubes and water economizer coil, access to expansion valves and other control components and to allow for possible fan shaft or compressor removal. Additional clearance should be considered for component replacement such as condenser, evaporator, water economizer coil and supply fan. Even though there is no vertical clearance specification listed, clearance above the unit may be an advantage during change out of any of the above components.



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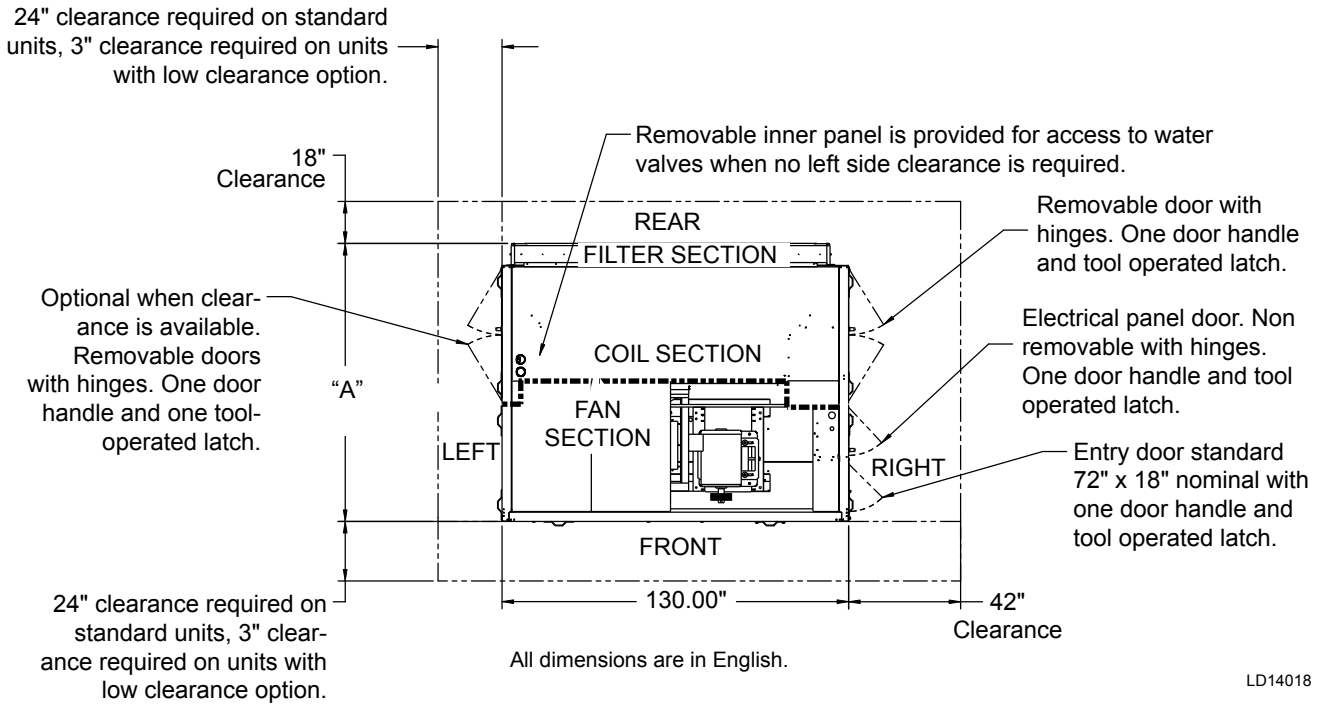
NO.	FILTER OPTIONS	"A"
1	2" Filter	80.00
2	4" Filter	82.00
3	2" Prefilter + 4" High Efficiency Filter	84.25
4	4" Prefilter + 4" High Efficiency Filter	86.25

NOTES:

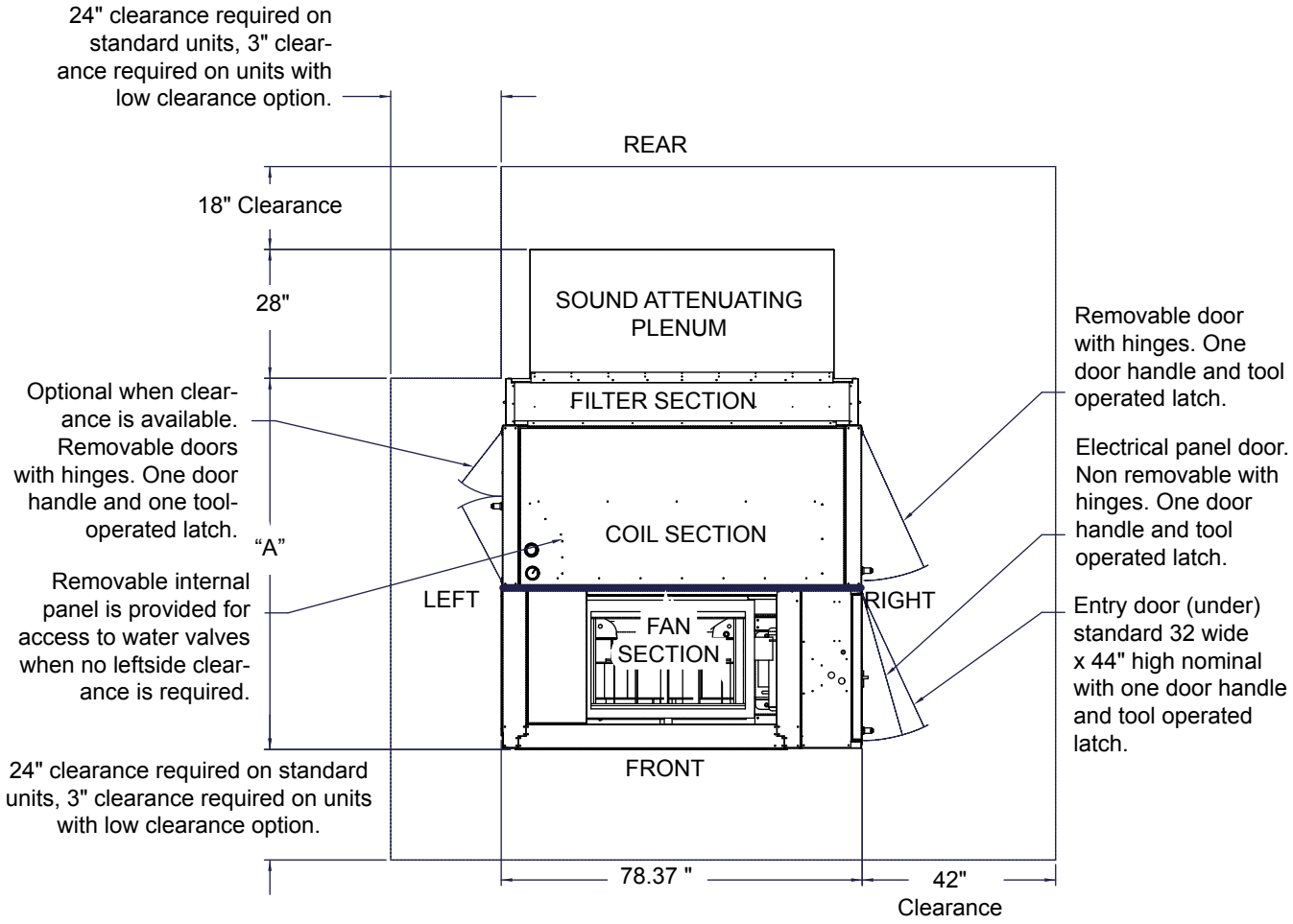
1. All dimensions are in inches.

FIGURE 2 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE TOP DISCHARGE (LSWU050 - LSWU060)



NO.	FILTER OPTIONS	"A"
1	2" DEEP	100.06
2	4" DEEP	102.06
3	2" PRE-FILTER + 4" HIGH EFFICIENCY FILTER	104.31

FIGURE 3 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE TOP DISCHARGE (LSWU065 - LSWU105



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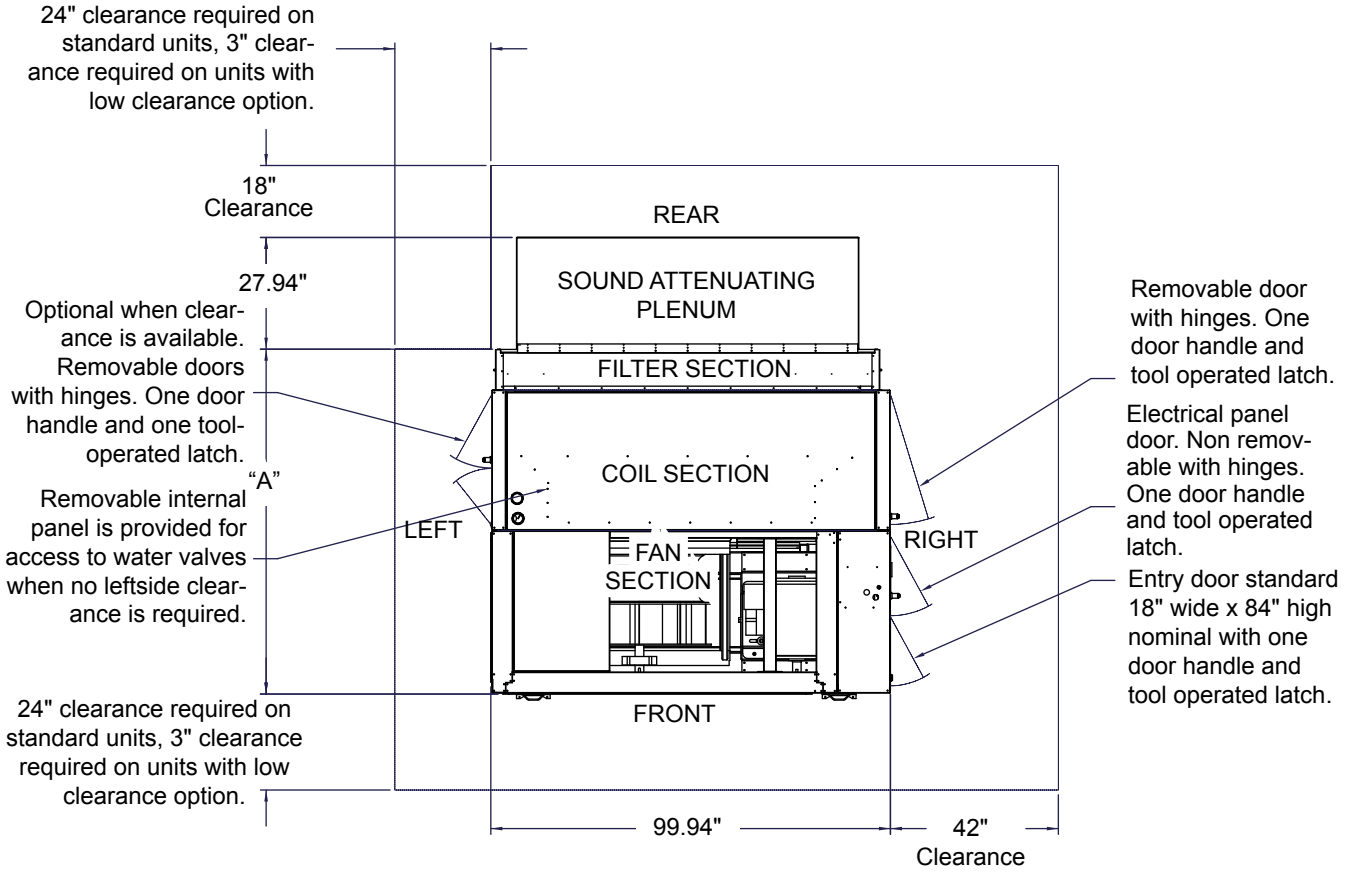
NO.	FILTER OPTIONS	"A"
1	2" Filter	74.43
2	4" Filter	76.43
3	2" Prefilter + 4" High Efficiency Filter	78.68
4	4" Prefilter + 4" High Efficiency Filter	80.68

NOTES:

1. All dimensions are in inches.

FIGURE 4 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH SOUND ATTENUATING PLENUM (LSWU025 - LSWU040)



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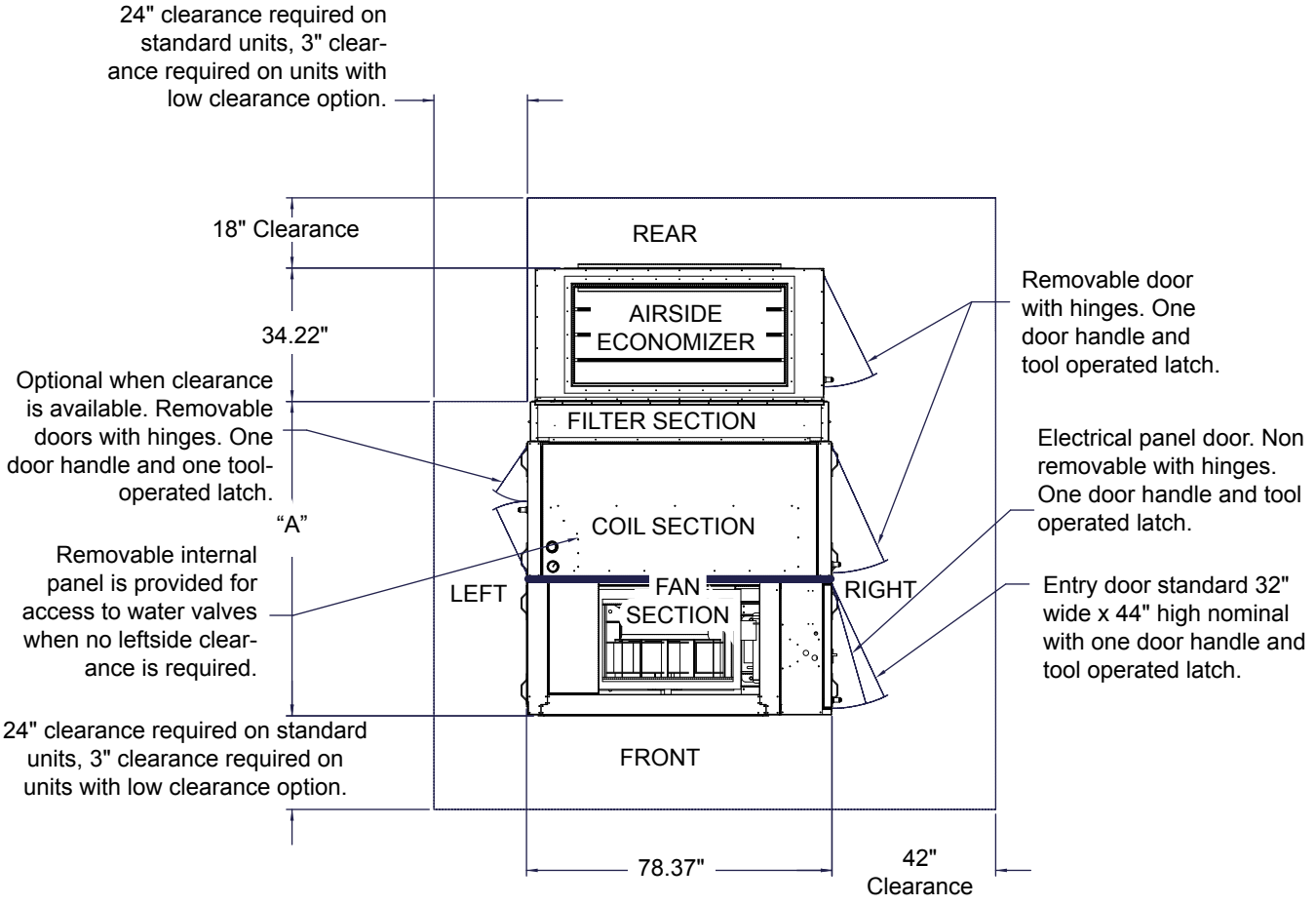
NO.	FILTER OPTIONS	"A"
1	2" Filter	80.00
2	4" Filter	82.00
3	2" Prefilter + 4" High Efficiency Filter	84.25
4	4" Prefilter + 4" High Efficiency Filter	86.25

NOTES:

1. All dimensions are in inches.

FIGURE 5 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH SOUND ATTENUATING PLENUM (LSWU050 - LSWU060)



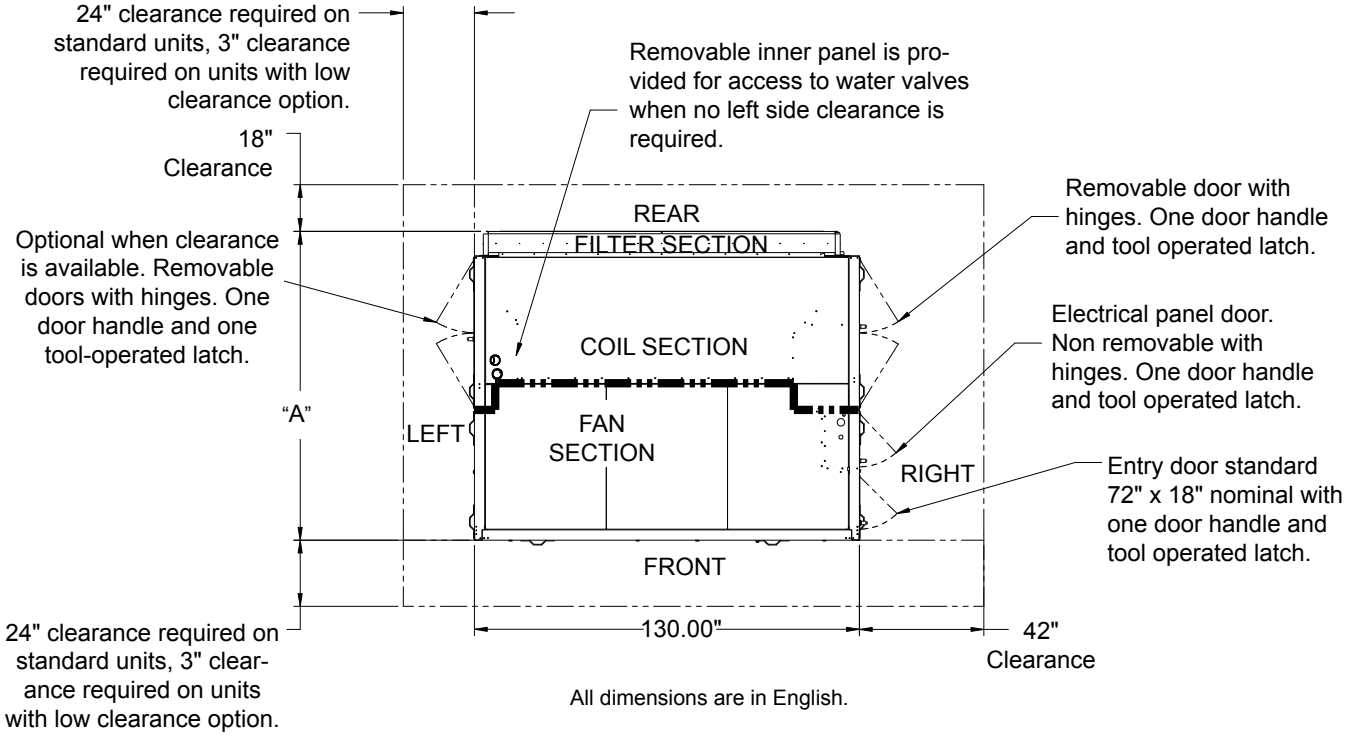
075-83768-909 REV A

NO.	FILTER OPTIONS	"A"
1	2" Filter	74.43
2	4" Filter	76.43
3	2" Prefilter + 4" High Efficiency Filter	78.68
4	4" Prefilter + 4" High Efficiency Filter	80.68

NOTES:

1. All dimensions are in inches.

FIGURE 6 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH AIRSIDE ECONOMIZER (LSWU025 - LSWU040)

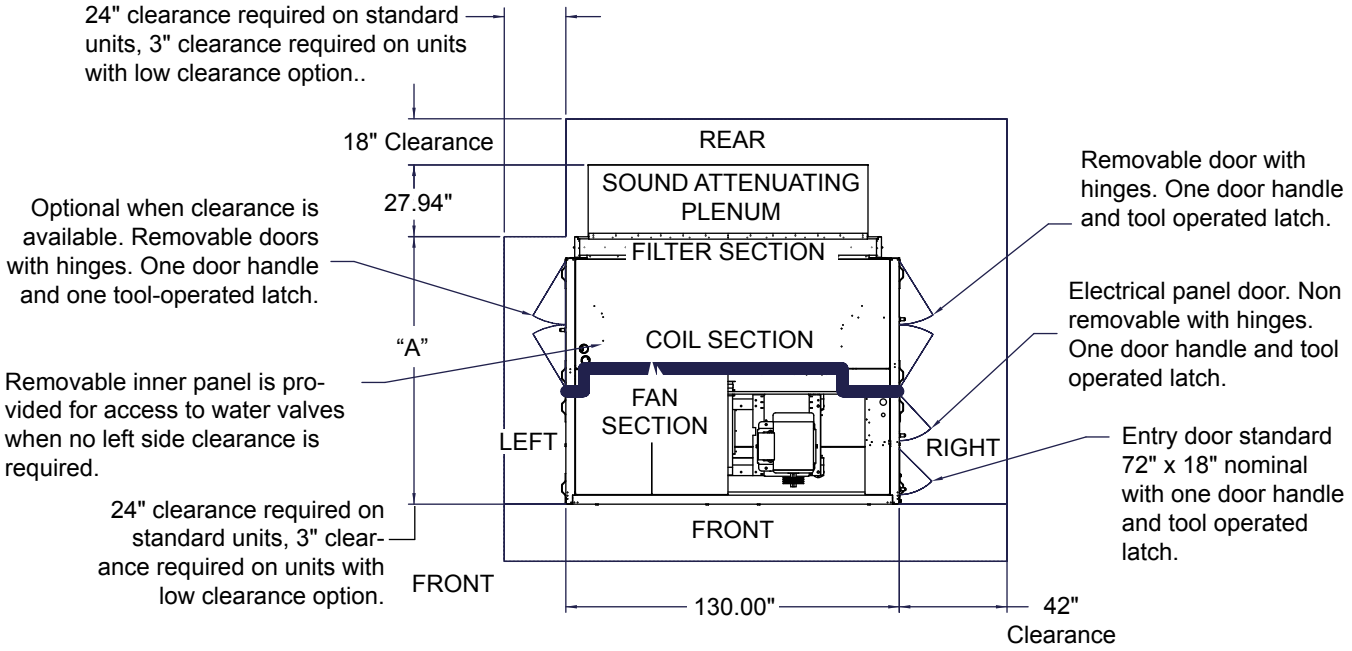


All dimensions are in English.

075-83744-913 REV -

NO.	FILTER OPTIONS	"A"
1	2" Filter	100.06
2	4" Filter	102.06
3	2" Pre-Filter + 4" High Efficiency Filter	104.31
4	4" Pre-Filter + 4" High Efficiency Filter	106.31

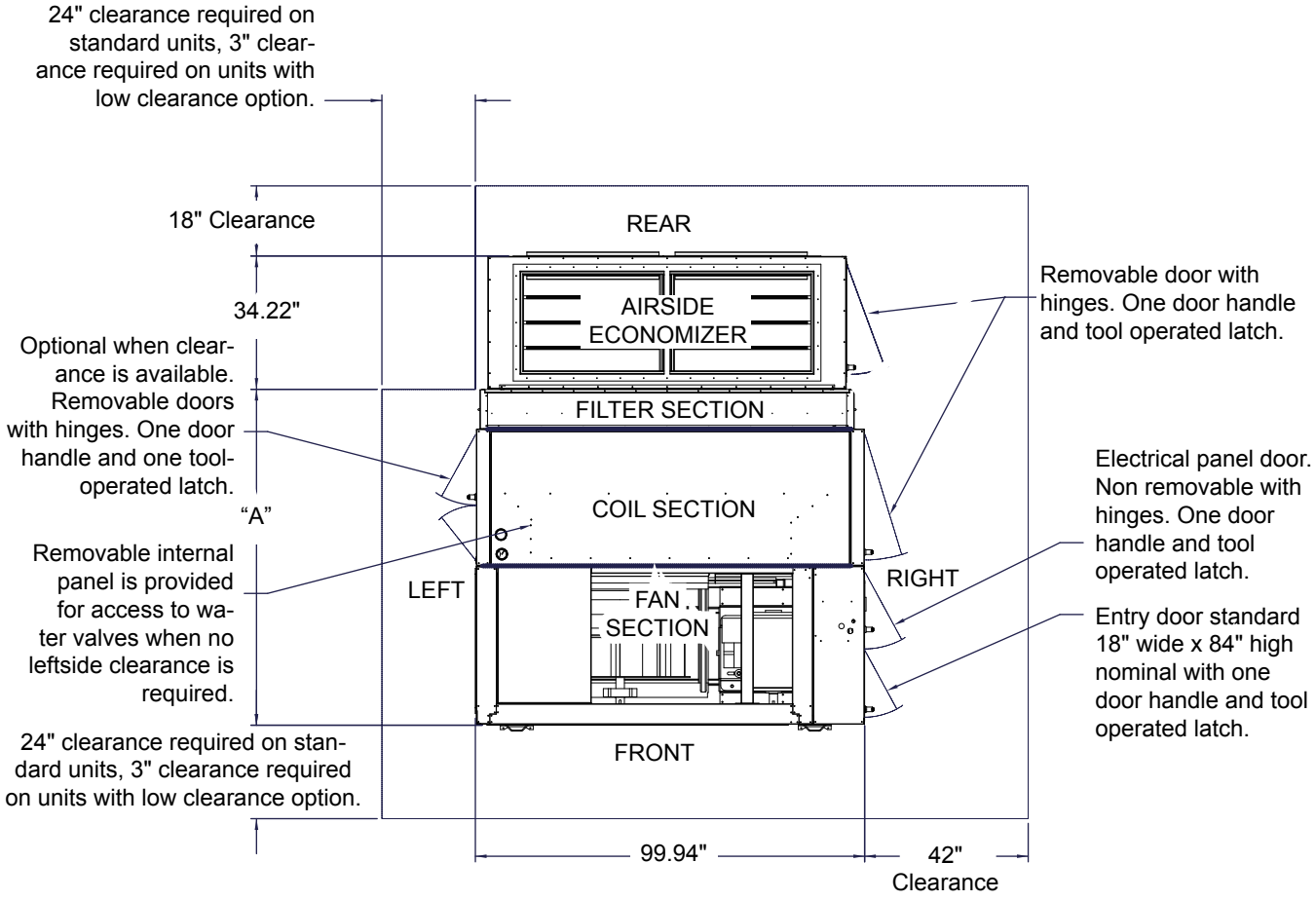
FIGURE 7 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE, FRONT DISCHARGE (LSWU062 - LSWU105)



075-83744-907 REV -

NO.	FILTER OPTIONS	"A"
1	2" Filter	100.06
2	4" Filter	102.06
3	2" Pre-Filter + 4" High Efficiency Filter	104.31
4	4" Pre-Filter + 4" High Efficiency Filter	106.31

FIGURE 8 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH SOUND ATTENUATING PLENUM (LSWU062 - LSWU105)



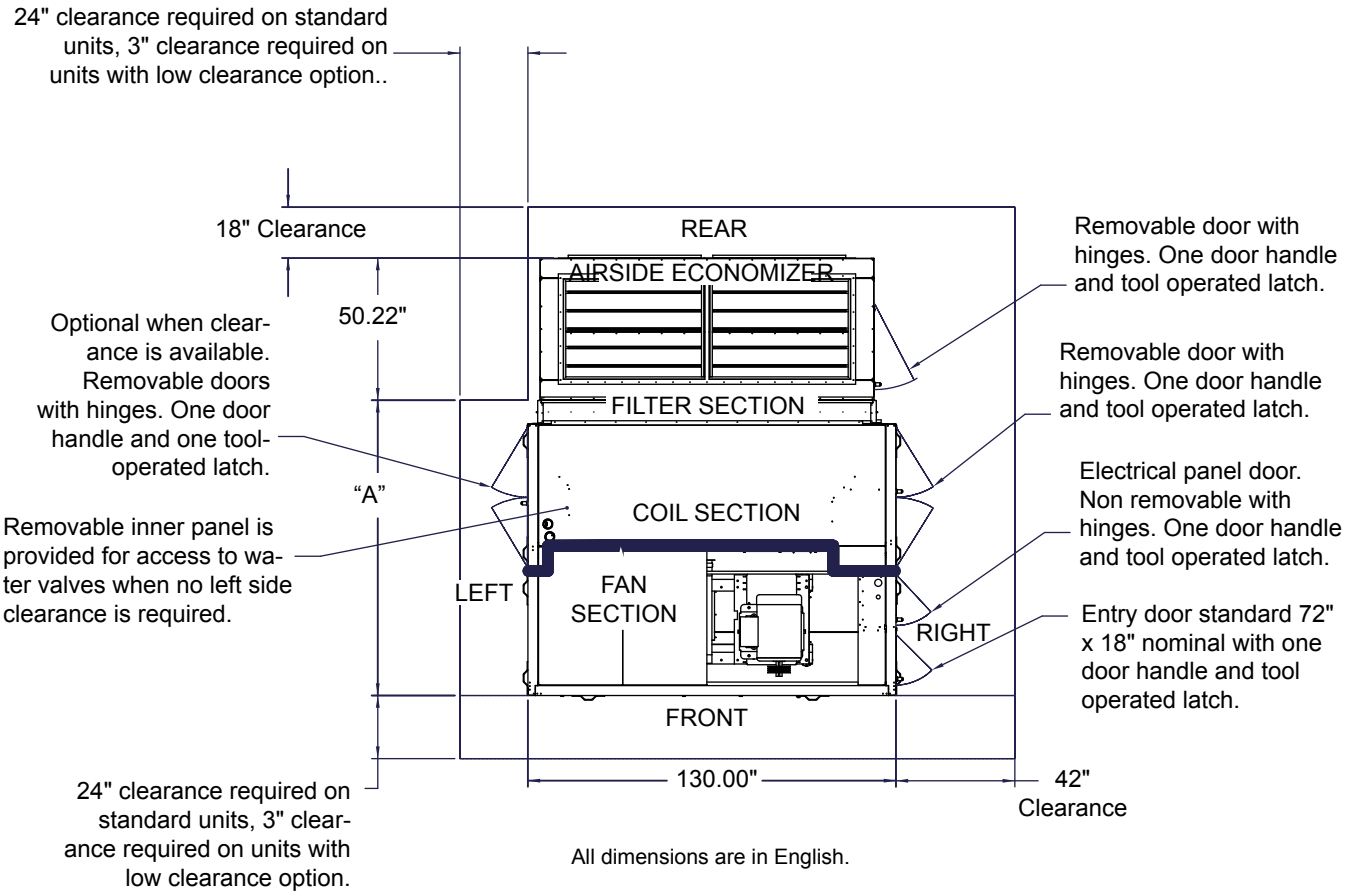
075-83756-907 REV A-

NO.	FILTER OPTIONS	"A"
1	2" Filter	80.00
2	4" Filter	82.00
3	2" Prefilter + 4" High Efficiency Filter	84.25
4	4" Prefilter + 4" High Efficiency Filter	86.25

NOTES:

1. All dimensions are in inches.

FIGURE 9 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH AIRSIDE ECONOMIZER (LSWU050 - LSWU060)



All dimensions are in English.

075-83744-909 REV -

NO.	FILTER OPTIONS	"A"
1	2" Filter	100.06
2	4" Filter	102.06
3	2" Pre-Filter + 4" High Efficiency Filter	104.31
4	4" Pre-Filter + 4" High Efficiency Filter	106.31

FIGURE 10 - RECOMMENDED SERVICE AND MAINTENANCE CLEARANCE WITH AIRSIDE ECONOMIZER (LSWU062 - LSWU105)

RIGGING AND UNIT HANDLING

General

Units are shipped with a protective covering, which should remain in place while the unit is being moved to its final location.

Do not leave the unit exposed to extreme ambient temperatures with protective coating in place. This could cause a high refrigerant pressure situation within the unit.

If the unit will be stored in a location that will experience below freezing temperatures, precautions are required to prevent damage to water carrying components to prevent freezing. Consult the factory for further information.

Never allow any part of the unit to fall during unloading or moving as this may result in serious damage.

Unit weights are listed in *Figure 19 on page 33*. These weights must be referred to when selecting a crane for rigging. Contact your Johnson Controls Sales Office if you have any questions regarding unit weights.

Ensure lifting equipment capacity exceeds unit weight by an adequate safety factor to prevent injury, death, or unit damage.

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

1. Determine the approximate center of gravity for lifting safety before lifting the unit.
2. Always test-lift the unit to determine the exact unit balance and stability before hoisting it to the installation location.
3. Ensure that all rigging and lifting equipment is operated by qualified personnel.
4. Ensure the rigging equipment and material have the required capacity for the job and that all items are in good condition.
5. These instructions are recommendations only as other configurations may be more suitable than shown based on rigging equipment used.
6. Ensure the lifting straps, cables, or chains used, clear the sides and corner edges of the unit. If not damage to the unit may occur.
7. Before listing the unit, remove bolts used to secure the unit to the shipping timbers. Do not lift the unit with the shipping timbers in place.
8. Use 2" strap hook or 3/8" or better shackle.
9. On some coil sections, the filter and filter rack may have to be removed to avoid damage during lifting.
10. The unit base frame will accept dollies or Johnson bars for transporting the unit.
11. Furniture dollies can be placed at both ends of the chassis or at the one end and a Johnson bar used at the other end for maneuvering.

Do not attempt to install dollies in the center of the unit. Units can become unstable and tip over causing injury.

Do not use hooks to lift unit or hook into open channels to lift unit. This could cause unit damage.

Vibration Isolators

LSWU 25–40 ton units are shipped with 12, 2"x 6" x 1" thick vibration isolation pads as shown in *Figure 11*.

CAUTION

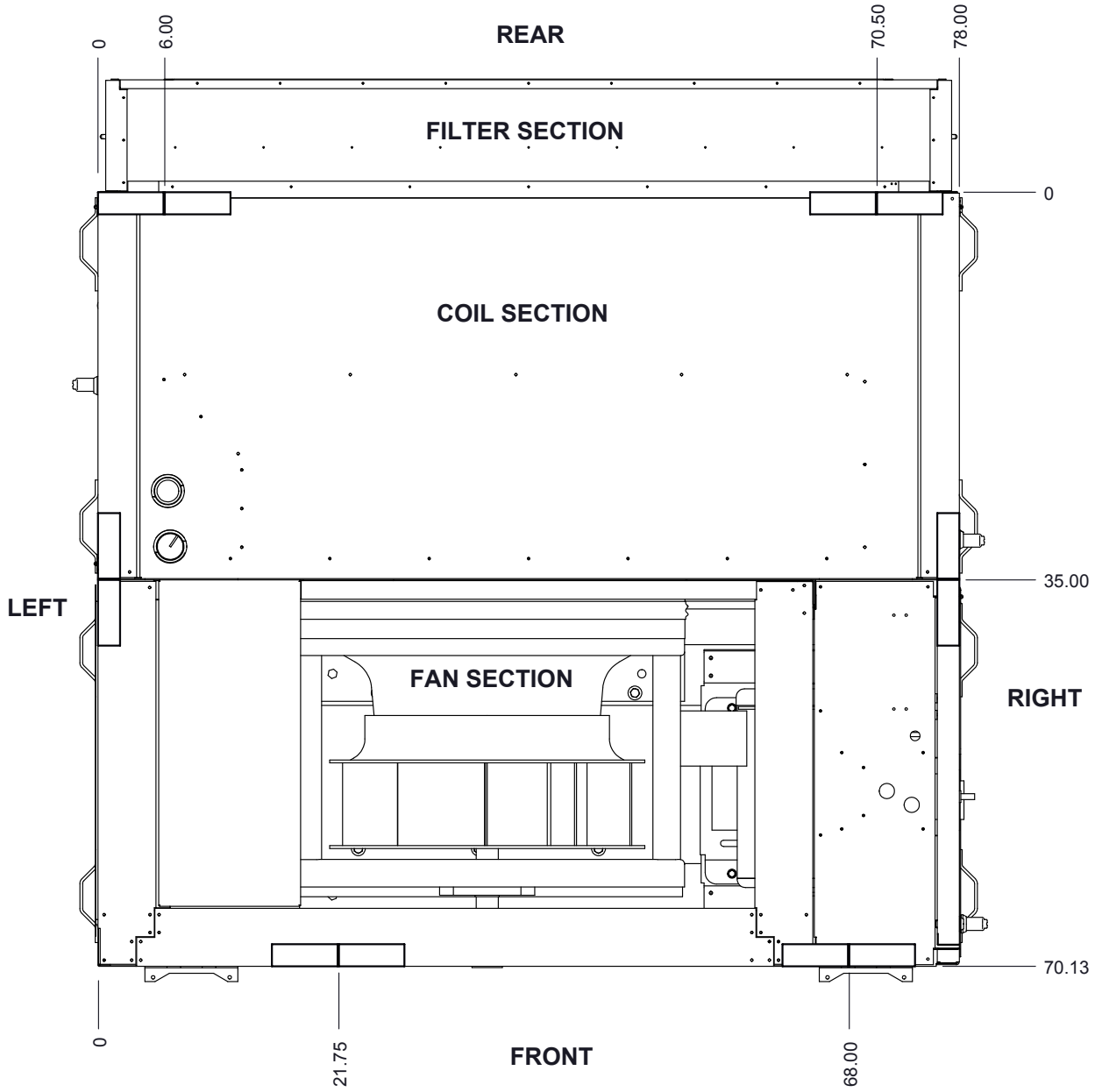
Proper placement of isolation devices under the curb of the LSWU is critical to the operation and noise reduction of the unit. Isolation pads supplied with unit are adequate for most installations when placed and used per unit size diagram.

WARNING

Do not attempt to install dollies in the center of the unit. Units can become unstable and tip over, causing injury.

CAUTION

Do not use hooks to lift unit or hook into open channels to lift unit. This could cause unit damage.



NOTES:

1. All dimensions are in inches.

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FIGURE 11 - VIBRATION ISOLATION PAD LOCATIONS (LSWU025 - LSWU040)

LSWU 50–60 ton units are shipped with 14, 2"x 6" x 1" thick vibration isolation pads as shown in *Figure 12*.

CAUTION

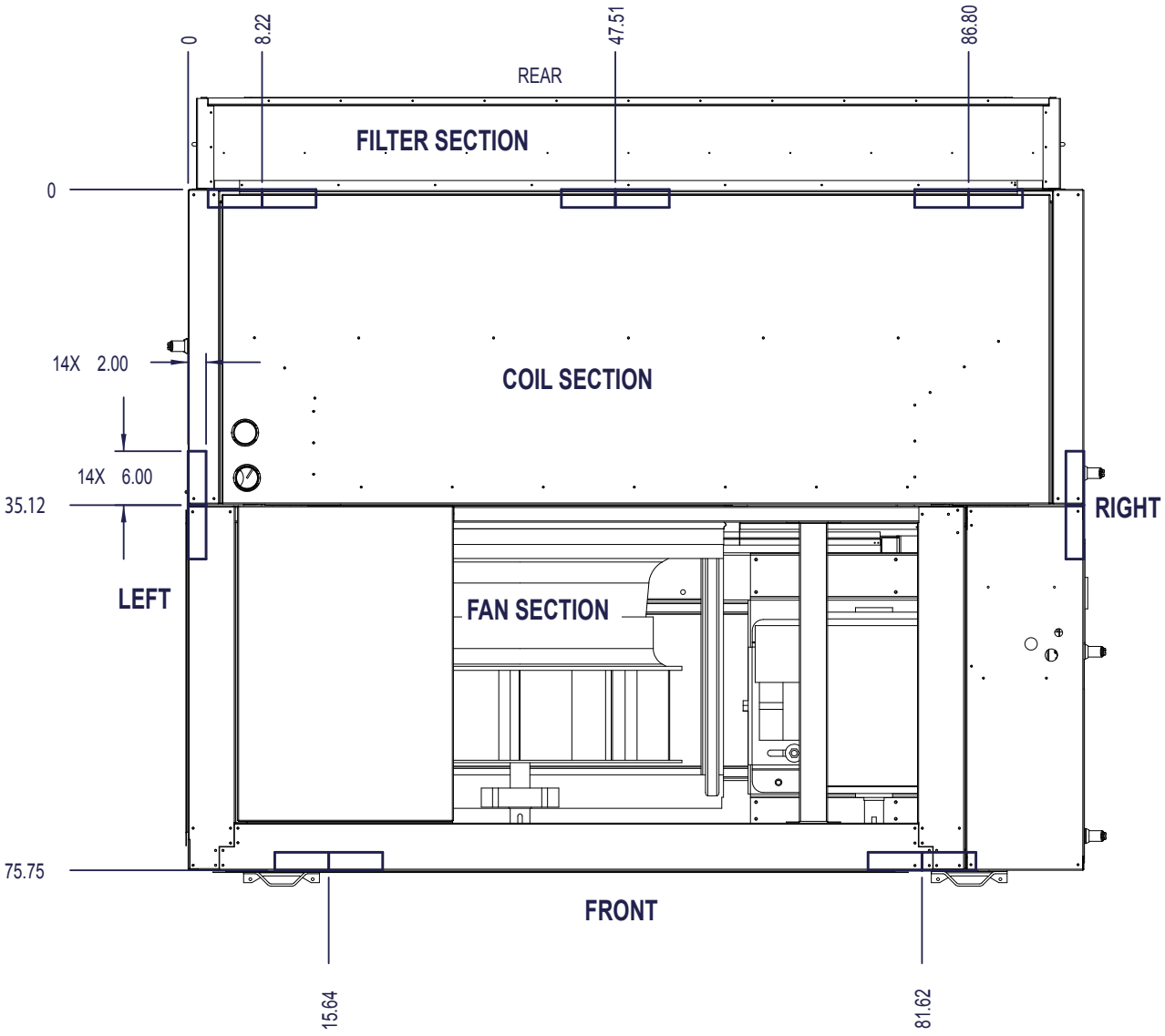
Proper placement of isolation devices under the curb of the LSWU is critical to the operation and noise reduction of the unit. Isolation pads supplied with unit are adequate for most installations when placed and used per unit size diagram.

WARNING

Do not attempt to install dollies in the center of the unit. Units can become unstable and tip over, causing injury.

CAUTION

Do not use hooks to lift unit or hook into open channels to lift unit. This could cause unit damage.



NOTES:

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1. All dimensions are in inches.

FIGURE 12 - VIBRATION ISOLATION PAD LOCATIONS (LSWU050 - LSWU060)

LSWU 62–105 ton units are shipped with 20, 2"x 6" x 1" thick vibration isolation pads as shown in *Figure 13*.

CAUTION

Proper placement of isolation devices under the curb of the LSWU is critical to the operation and noise reduction of the unit. Isolation pads supplied with unit are adequate for most installations when placed and used per unit size diagram.

WARNING

Do not attempt to install dollies in the center of the unit. Units can become unstable and tip over, causing injury.

CAUTION

Do not use hooks to lift unit or hook into open channels to lift unit. This could cause unit damage.

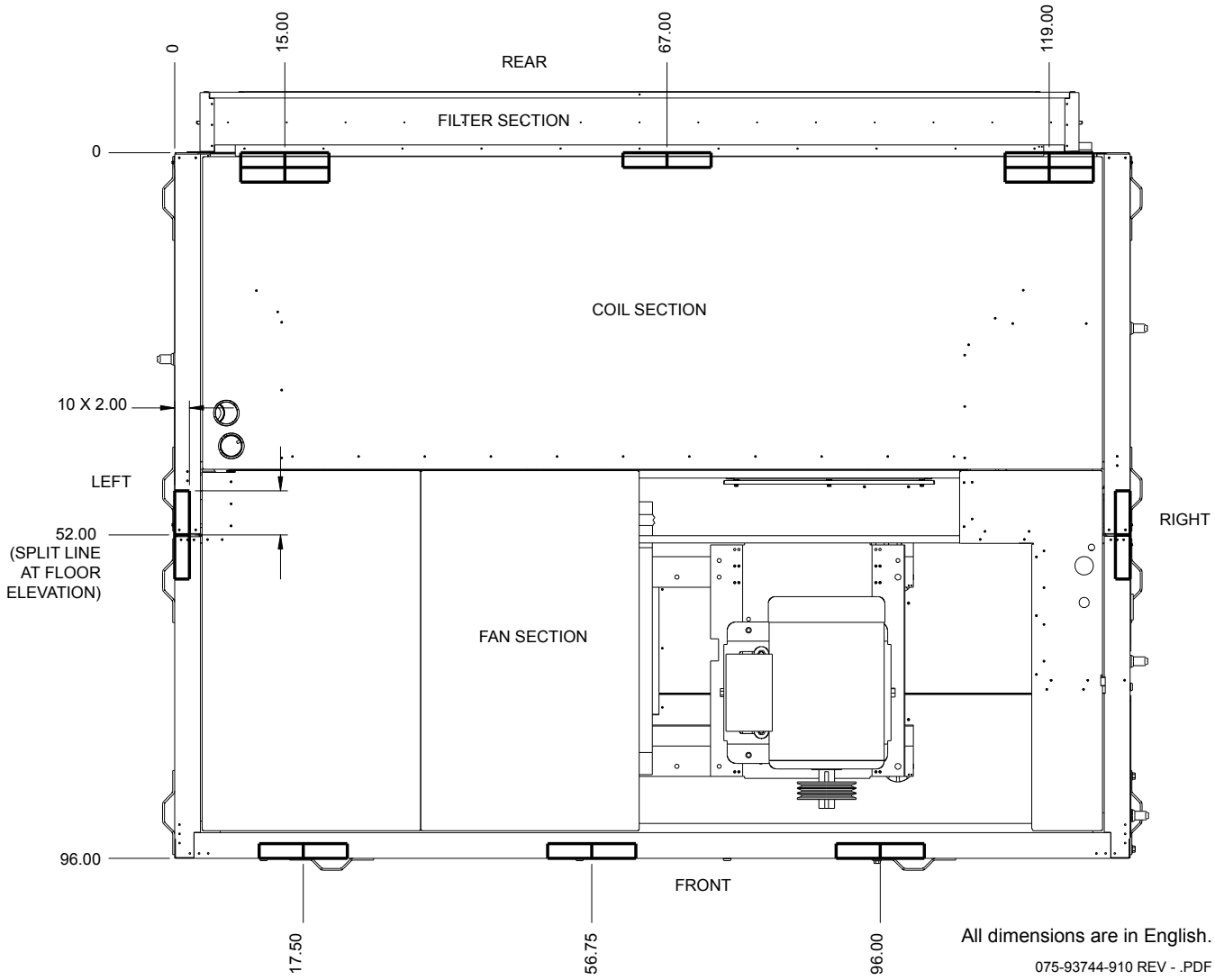
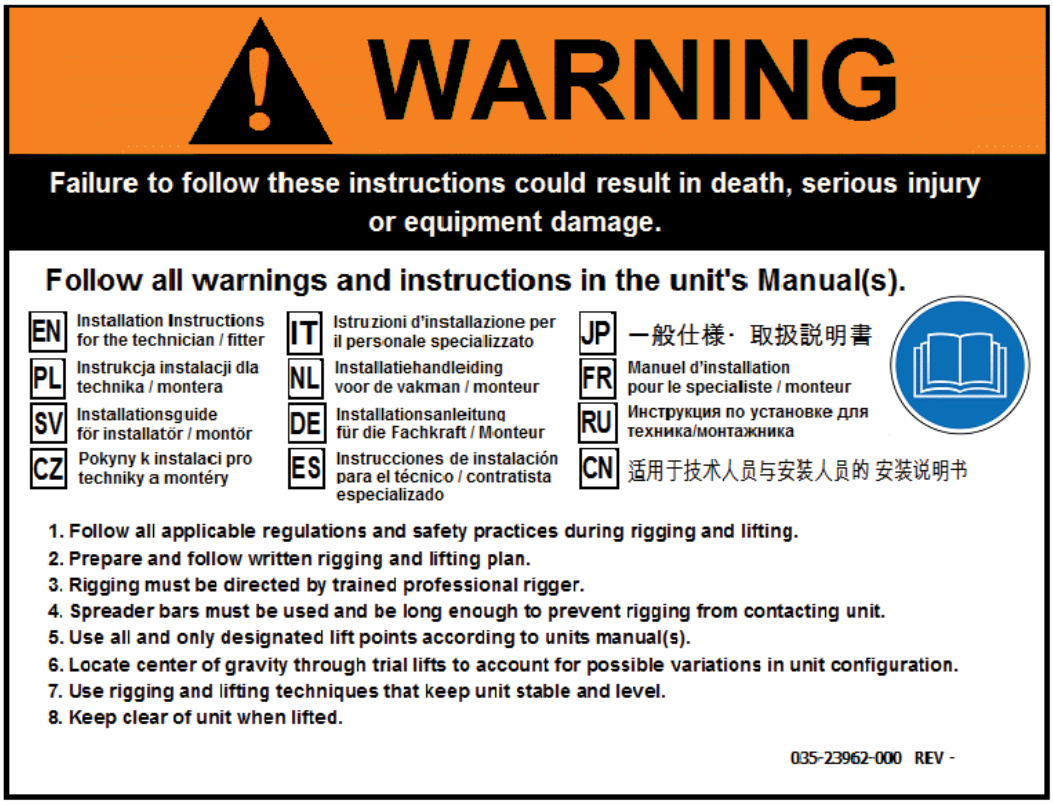


FIGURE 13 - VIBRATION ISOLATION PAD LOCATIONS (LSWU062 - LSWU105)

Detailed Lifting Instructions



LD18108

FIGURE 14 - WARNING LABEL

For units that are shipped split, lift one half of the unit at a time. Do not pre-assemble the unit and lift as one piece. If the unit must be lifted assembled and arrives split, consult the factory.

- Ensure that all rigging and lifting equipment is operated by qualified personnel.
- Ensure that the rigging equipment and materials have the required capacity for the job and that all items are in good condition, are currently qualified (e.g., Inspection is up-to-date), and are properly used.
- Distribute load between lifting lugs equally.
- Ensure that lifting straps, cables, or chains used clear the sides and corner edges of the unit. If not, damage may occur.
- Before lifting unit, remove bolts used to secure unit to the shipping timbers. Do not lift unit with shipping timbers in place.
- Use 1/2-inch or better grade 80 chain and accessories. If substituting for chain, use equivalently rated components.

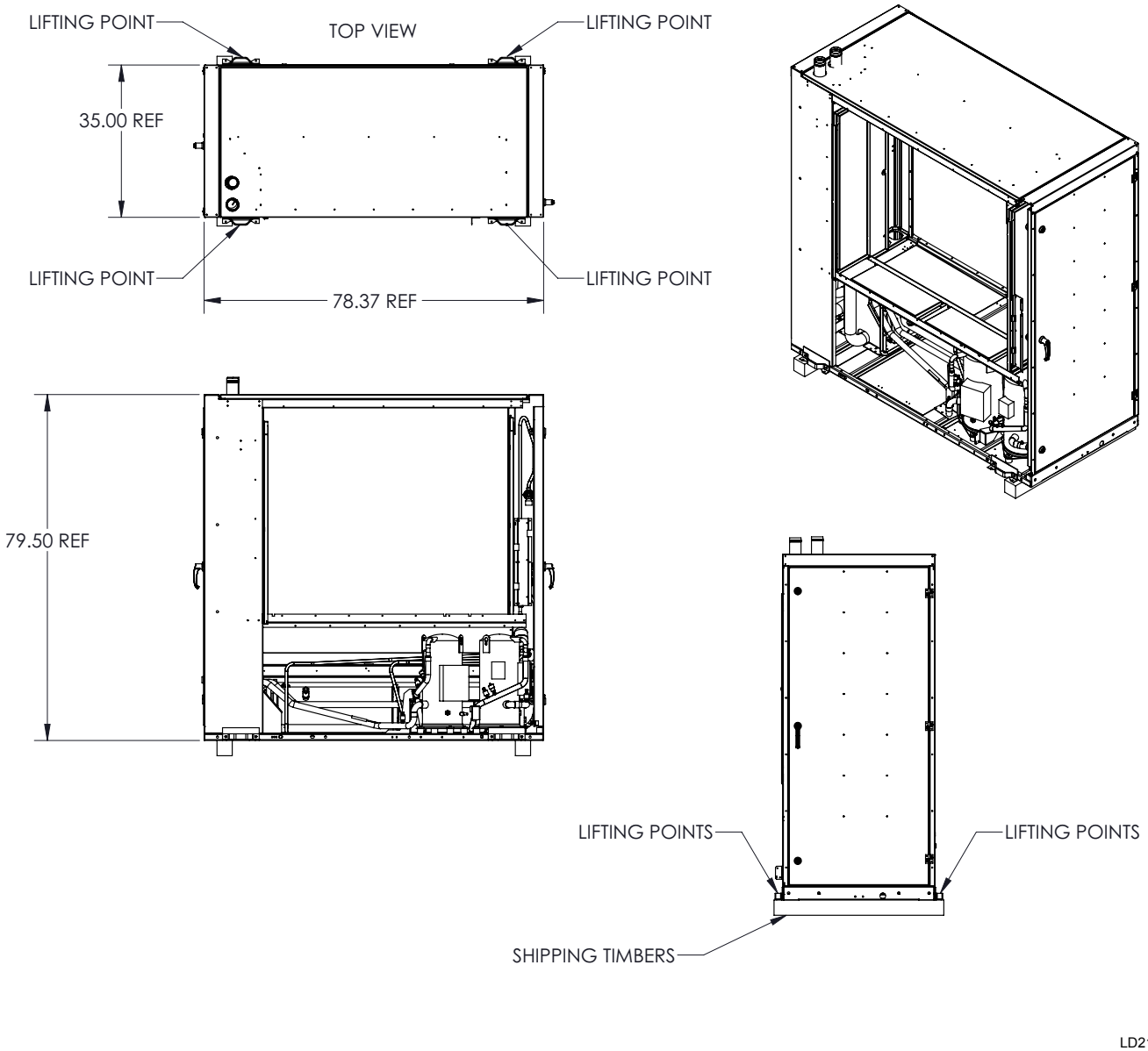


FIGURE 15 - LIFTING RECOMMENDATIONS, COIL SECTION ONLY (LSWU025 - LSWU040)

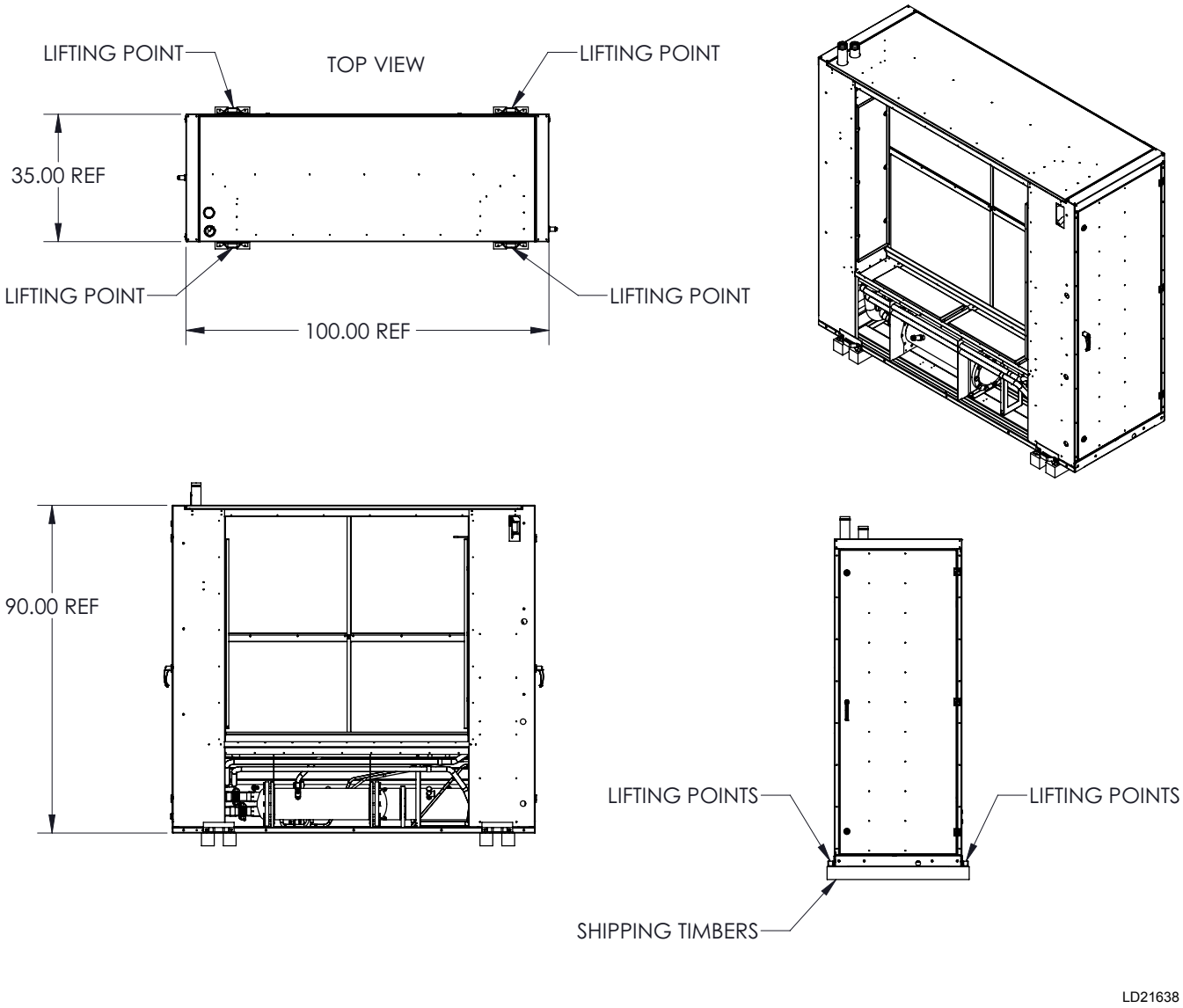


FIGURE 16 - LIFTING RECOMMENDATIONS, COIL SECTION ONLY (LSWU050 - LSWU060)

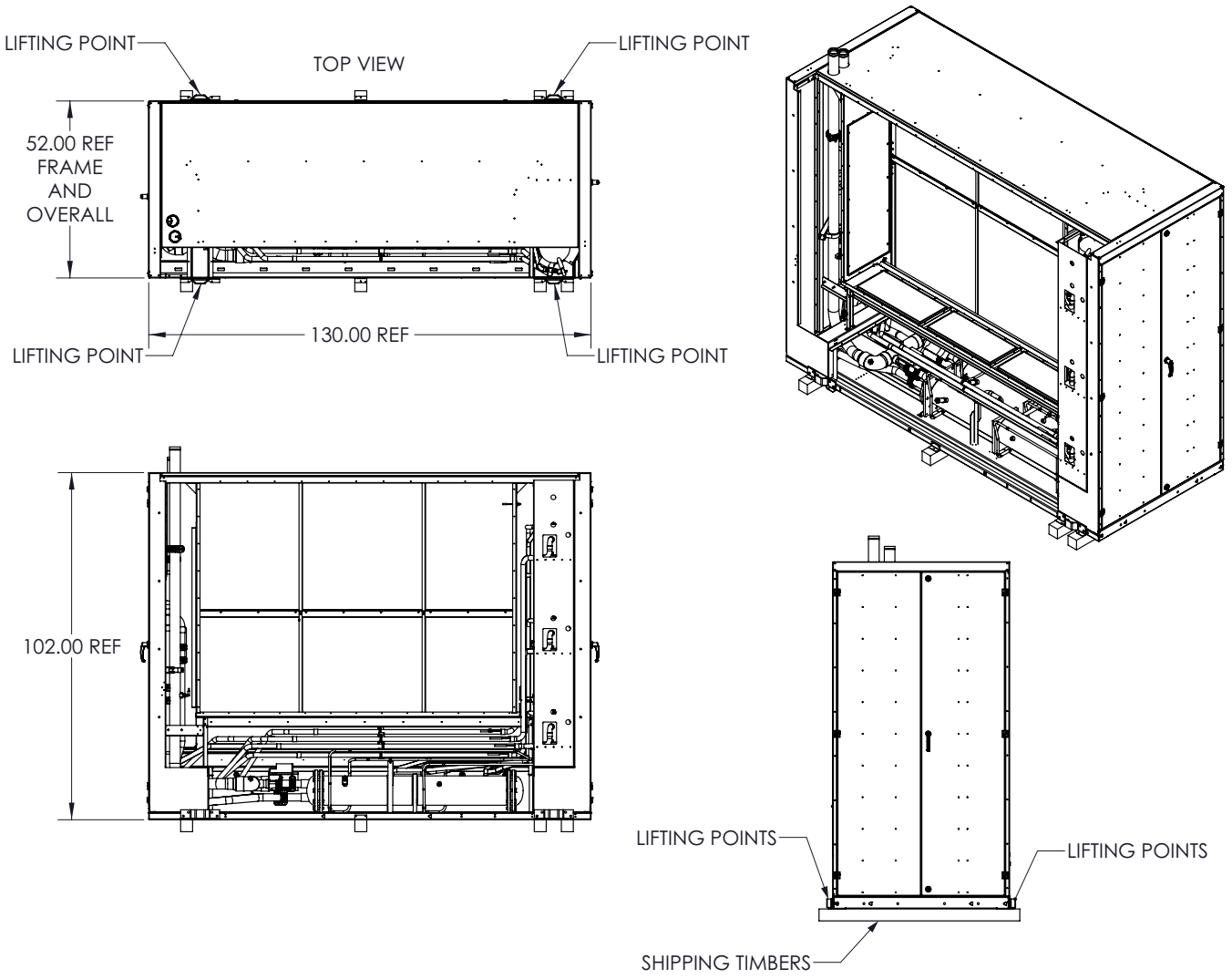


FIGURE 17 - LIFTING RECOMMENDATIONS, COIL SECTION ONLY (LSWU062 - LSWU105)

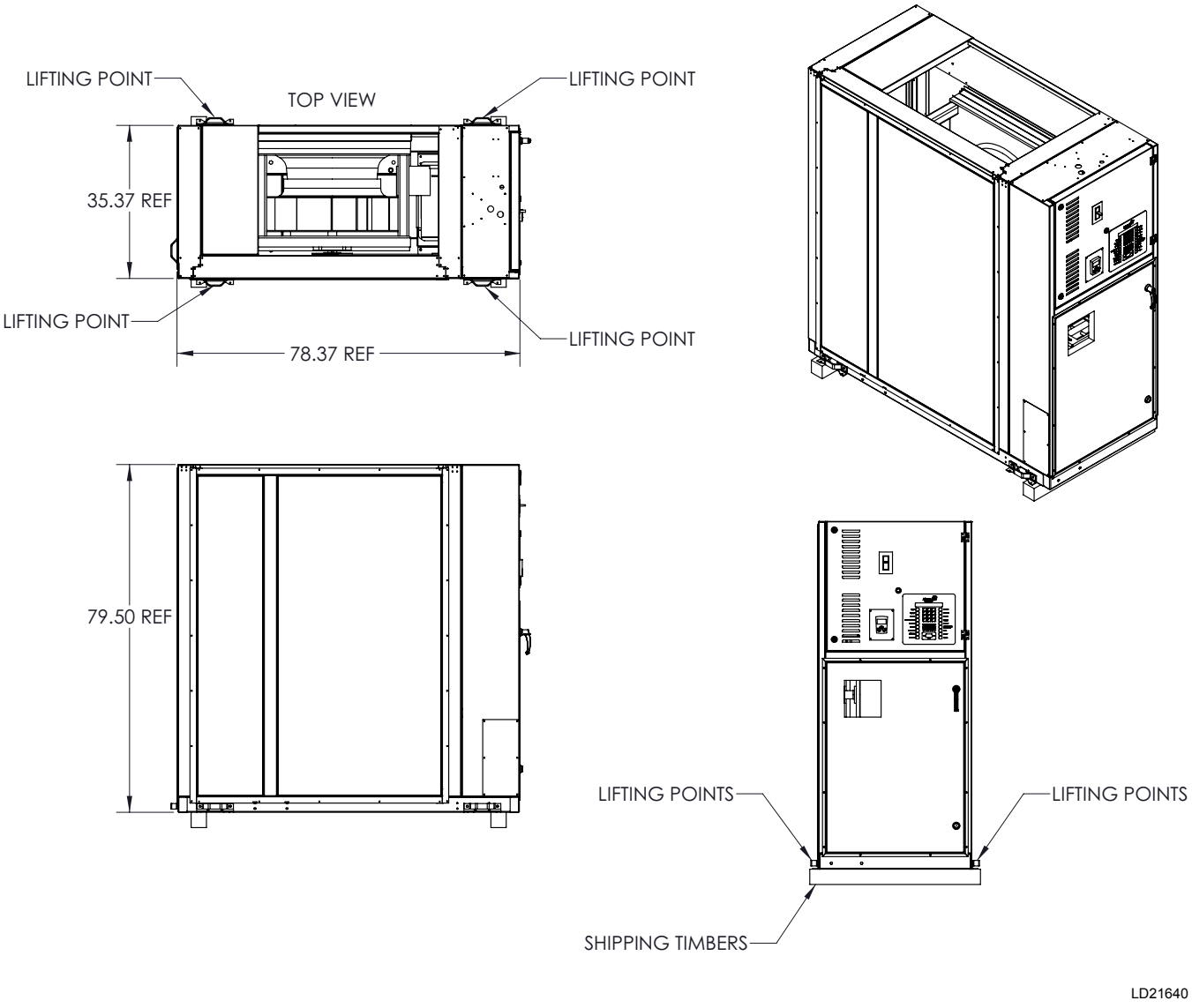


FIGURE 18 - LIFTING RECOMMENDATIONS, FAN SECTION ONLY (LSWU025 - LSWU040)

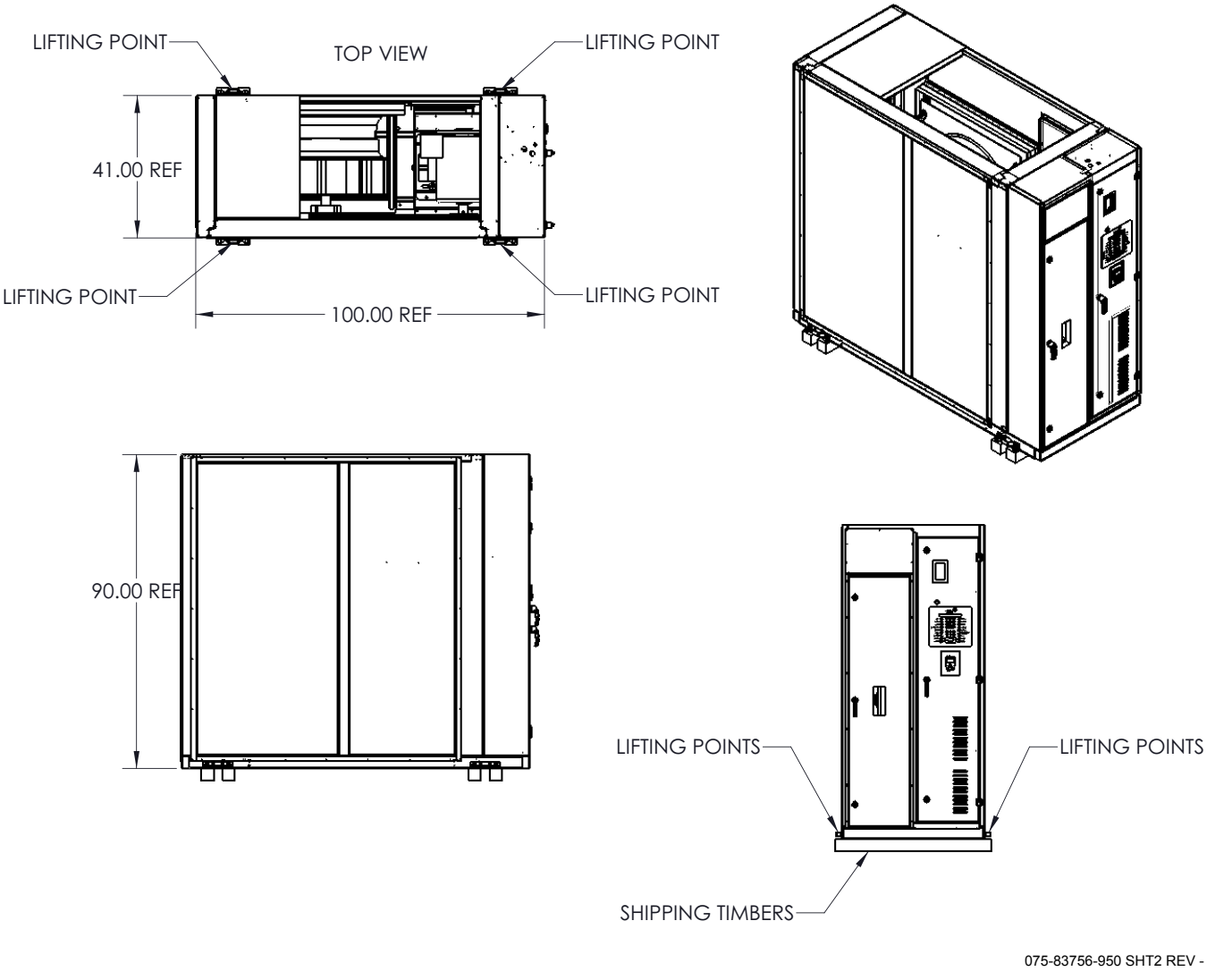


FIGURE 19 - LIFTING RECOMMENDATIONS, FAN SECTION ONLY (LSWU050 - LSWU060)

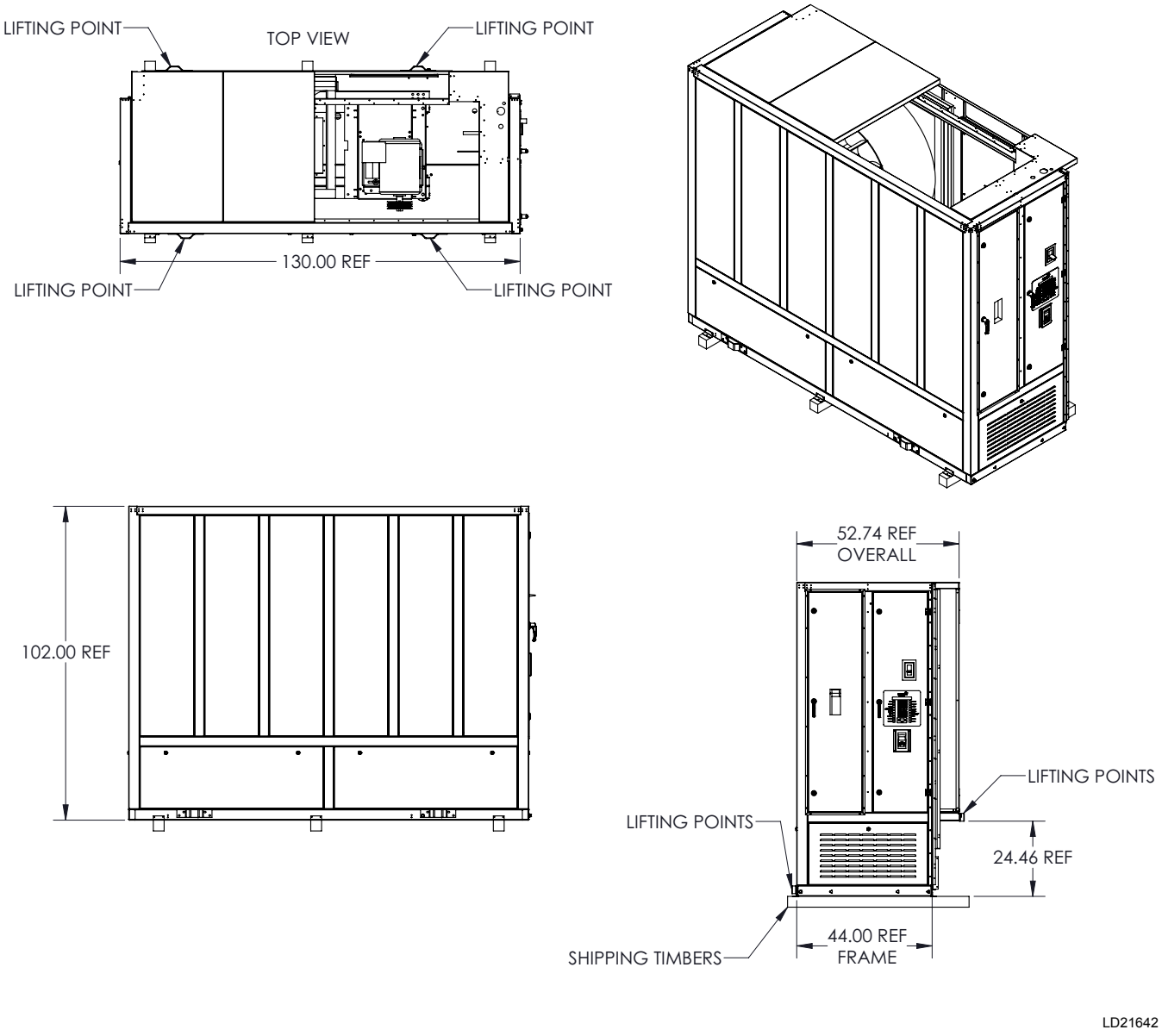


FIGURE 20 - LIFTING RECOMMENDATIONS, FAN SECTION ONLY (LSWU062 - LSWU105)

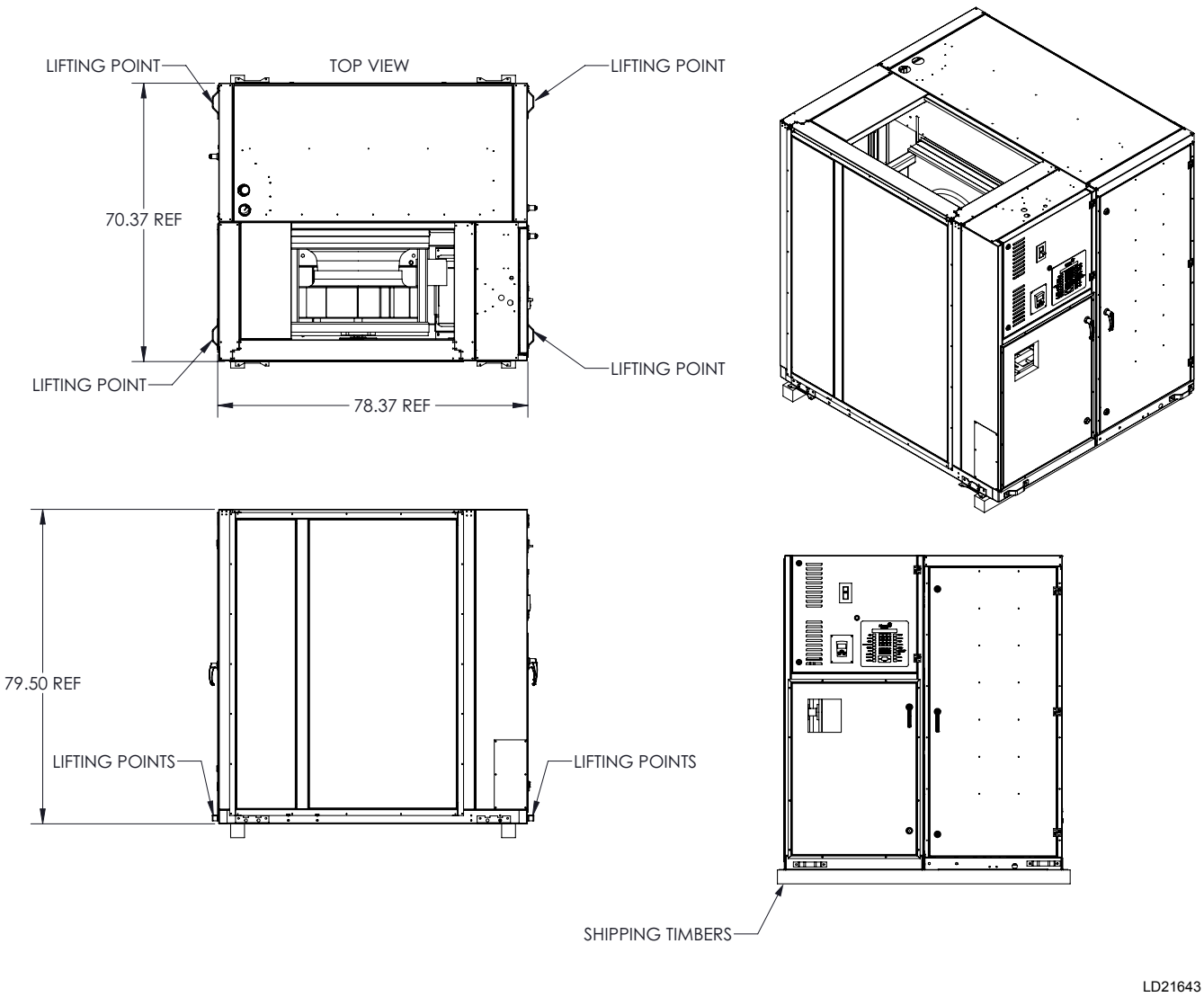


FIGURE 21 - LIFTING RECOMMENDATIONS, FAN AND COIL SECTION COMBINED (LSWU025 - LSWU040)

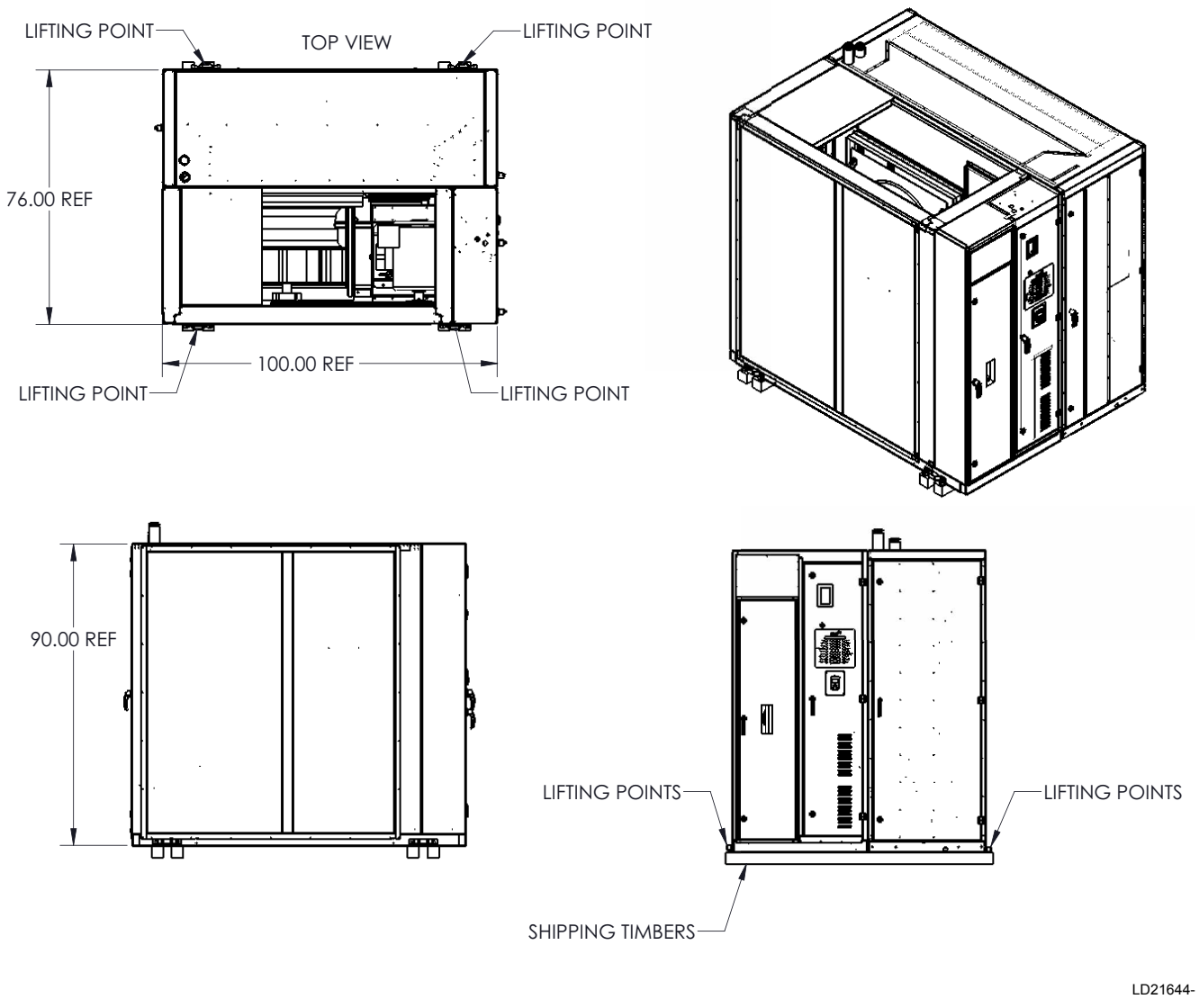


FIGURE 22 - LIFTING RECOMMENDATIONS, FAN AND COIL SECTION COMBINED (LSWU050 - LSWU060)

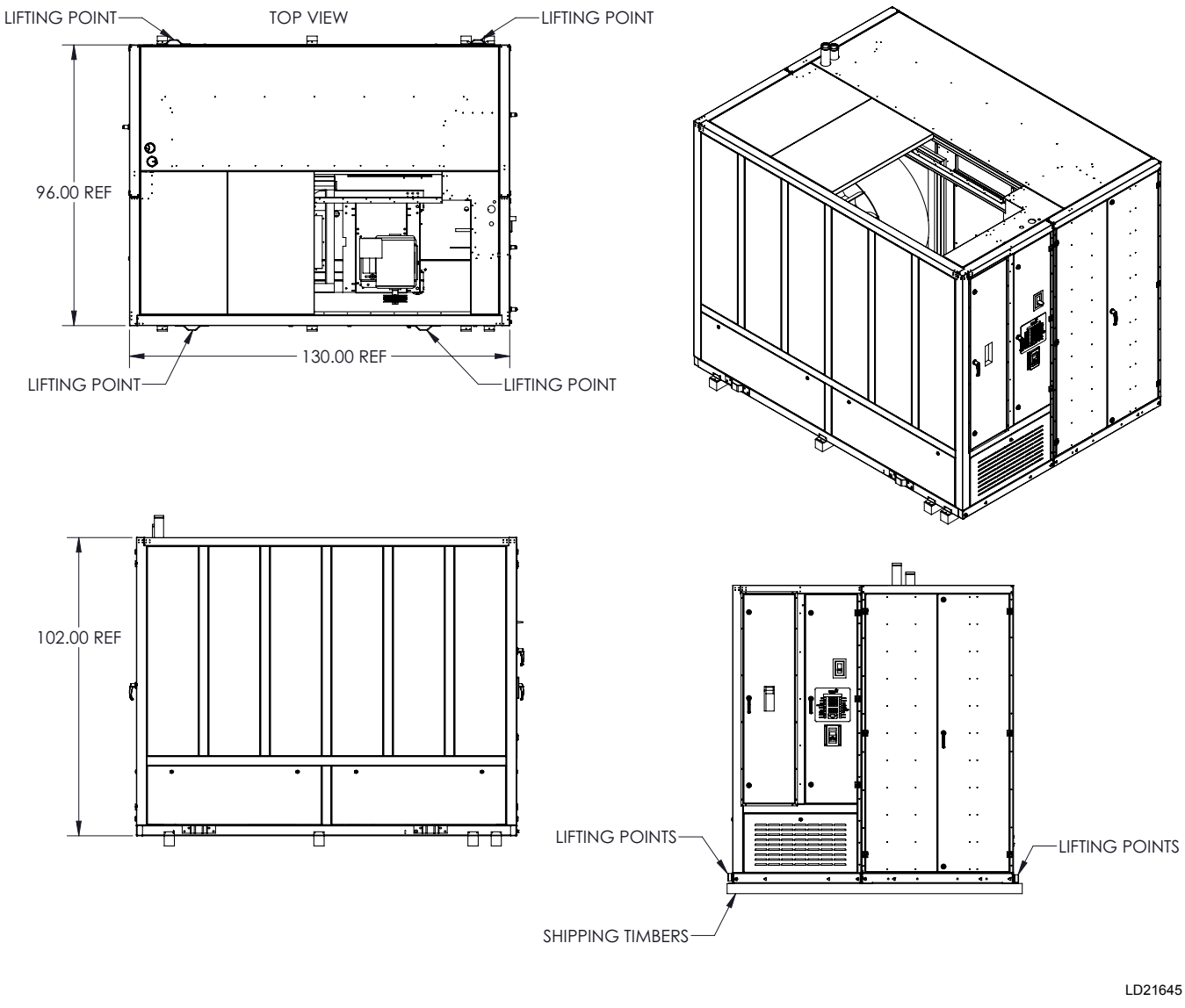


FIGURE 23 - LIFTING RECOMMENDATIONS, FAN AND COIL SECTION COMBINED (LSWU062 - LSWU105)

TABLE 5 - OPERATING WEIGHTS (LSWU025 - LSWU060)

MODEL	LSWU025	LSWU032	LSWU035	LSWU040	LSWU050	LSWU060
Coil Section	1,832	1,890	1,941	2,032	3,536	3,656
Water Economy Coil Option	320	378	442	442	711	711
High Efficiency Option	20	25	30	45	70	80
Fan Section	984	984	984	984	1,380	1,380
Supply Fan						
25 Inch Class II	N/A	358	358	358	N/A	N/A
28 Inch Class II	273	273	273	273	N/A	N/A
32 Inch Class II	N/A	N/A	N/A	N/A	427.9	428
36 Inch Class II	N/A	N/A	N/A	N/A	582.59	583
40 Inch Class II	N/A	N/A	N/A	N/A	N/A	N/A
Filter Section						
2" 30-35% Efficiency (MERV 8)	131	131	131	131	151	151
4" 30-35% Efficiency (MERV 8)	156	156	156	156	205	205
4" 60-65% Efficiency (MERV 11)	178	178	178	178	265	265
4" 60-65% Eff + 2" 30-35% Eff Prefilter (MERV 11 + 8)	263	263	263	263	371	371
4" 90-95% Eff + 2"30-35% Eff Prefilter (MERV 14 + 8)	263	263	263	263	371	371
4" 60-65% Eff + 4" 30-35% Eff Prefilter (MERV 11 + 8)	288	288	288	288	391	391
4" 90-95% Eff + 4"30-35% Eff Prefilter (MERV 14 + 8)	288	288	288	288	391	391
Plenums						
Inlet Plenum - Sound Attenuating	246	246	246	246	290	290
Air Economizer	678	678	678	678	866	866
Outlet Plenum - Half	295	295	295	295	355	355
Outlet Plenum - Full	386	386	386	386	415	415

TABLE 6 - SUPPLY FAN MOTOR WEIGHTS

HP	ODP		TEFC	
	HI-EFF	PREMIUM EFF	HI-EFF	PREMIUM EFF
5 HP	160	175	169	199
7.5 HP	193	207	219	260
10 HP	220	238	239	341
15 HP	327	327	349	365
20 HP	317	367	389	421
25 HP	385	470	572	538
30 HP	427	512	580	573
40 HP	532	614	595	742
50 HP	540	622	729	900
60 HP	637	848	877	964

Notes:

1. All weights are in Lbs.
2. Add Waterside Economizer weight, if selected, to Coil Section.
3. Add selected fan, motor, and VFD weight to the Fan Section weight to get total fan weight.
4. Add Coil Section, Fan Section and Filter Section weights together to obtain total unit weight.

TABLE 7 - SUPPLY FAN VARIABLE FREQUENCY DRIVE WEIGHTS

HP	Lbs
5 HP	61
7.5 HP	81
10 HP	81
15 HP	96
20 HP	96
25 HP	115
30 HP	115
40 HP	115
50 HP	190
60 HP	190

Notes:

1. All weights are in Lbs.
2. Add Waterside Economizer weight, if selected, to Coil Section.
3. Add selected fan, motor, and VFD weight to the Fan Section weight to get total fan weight.
4. Add Coil Section, Fan Section and Filter Section weights together to obtain total unit weight.

FACTORY-SUPPLIED PLENUM

The unit is provided with an optional acoustical discharge plenum shipped loose for field installation. A Half Plenum and a Full Plenum option are available. The Half Plenum can be ordered with factory openings on the two long sides. The Full Plenum option can be ordered with factory openings on any of the four sides. Openings in either plenum can be cut in the field.

The plenums come with the required gasket material and mounting hardware. See *Figure 33 on page 53,* through *Figure 36 on page 56* for the proper placement of the plenum on the unit. Use a forklift, slings, or other suitable lifting means to position the plenum on top of the unit. Prior to placing the plenum on the top of the unit attach the foam rubber gasket material to the bottom of the plenum. Carefully set the plenum and attached with the provided mounting hardware. If openings are field cut in the plenum take precaution to prevent fiberglass from the cut opening from entering the air stream.

TABLE 8 - OPERATING WEIGHTS (LSWU062 - LSWU105)

MODEL	LSWU062	LSWU070	LSWU085	LSWU095	LSWU105
Coil Section	4,223	4,316	4,456	5,331	5,452
Water Economy Coil Option	676	783	1,036	1,036	1,036
Fan Section	2,040	2,040	2,040	2,040	2,040
Supply Fan					
36 Inch Class II	685	685	685	685	685
40 Inch Class II	920	920	920	920	920
40 Inch Class III	1065	1065	1065	1065	1065
Supply Fan Motor					
15 HP	326	326	326	326	326
20 HP	368	368	368	368	368
25 HP	495	495	495	495	495
30 HP	519	519	519	519	519
40 HP	602	602	602	602	602
50 HP	-	-	673	673	673
Variable Frequency Drive					
15 HP	96	96	96	96	96
20 HP	96	96	96	96	96
25 HP	115	115	115	115	115
30 HP	115	115	115	115	115
40 HP	115	115	115	115	115
50 HP	-	-	144	144	144
Filter Section					
4 Inch Filter Rack with 30% MERV 8 Filters.	257	257	257	257	257
4 Inch Filter Rack with 60% MERV 11 Filters.	306	306	306	306	306
4 Inch Filter Rack with 90% MERV 15 Filters.	306	306	306	306	306
2 Inch Prefilter and 4 Inch High Efficiency Filters	487	487	487	487	487
Plenums					
Inlet Plenum - Sound Attenuating	439	335	335	335	335
Outlet Plenum - Half	415	341	341	341	341
Outlet Plenum - Full	556	455	455	455	455

All weights are in Lbs.

Please add Waterside Economizer weight, if selected, to Coil Section.

Please add selected fan, motor, and VFD weight to the fan section weight to get total Fan weight.

Please add Coil Section, Fan Section and Filter Section weights together to obtain total unit weight

SEGMENTED UNIT ASSEMBLY

For ease of handling and transport in a freight elevator the Water Cooled Self Contained product can be split and shipped in three segments. The unit was assembled and tested at the factory prior to shipment. The sections were then separated for shipment. The three segments are as follows:

- Compressor / Condenser / Coil section
- Control and supply air fan section
- Filter or filter and hydronic heat section (optional)

REMOVE SHIPPING RESTRAINTS

Mechanical restraints are used to secure the spring mounted supply fan during shipment *(see Figure 24)*.

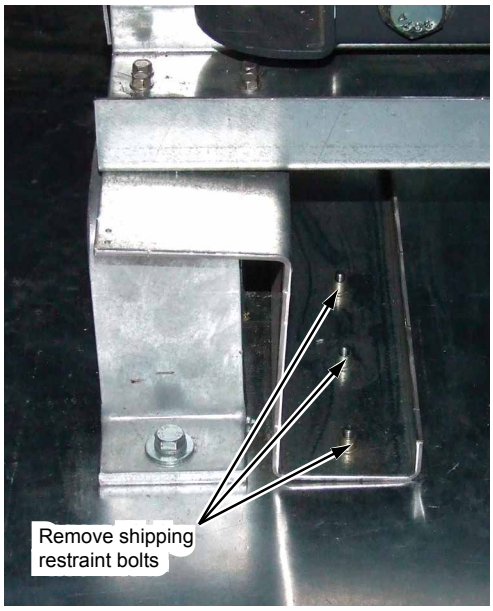
NOTE

Restraining bolts must be removed after unit has been set in its final location.

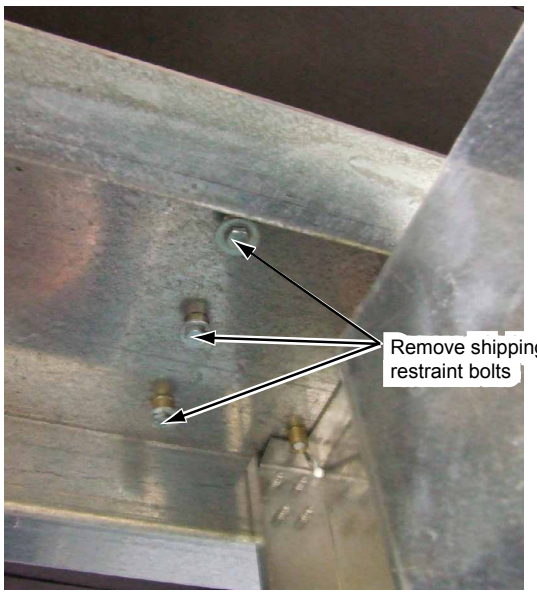
NOTE

Do not remove seismic guide pins if unit came with this option. Refer to factory order form or option tag.

The shipping restraints are accessible from underneath the blower compartment. The blower and motor assemblies mount on two rails that run from the left to right side of the unit. The two rails are tied down to the blower compartment support rails by 3 bolts in the vicinity of each of the isolator springs, positioned at the four corners of the assembly. To release the shipping restraints remove the three bolts from each location.



BLOWER RESTRAINTS FROM ABOVE



BLOWER RESTRAINTS FROM BELOW

LD14022

FIGURE 24 - SHIPPING RESTRAINT LOCATIONS

PHYSICAL DATA

TABLE 9 - WATER-COOLED SELF-CONTAINED UNIT DATA (LSWU025 - LSWU060)

MODEL NOMINAL TONS		025	032	035	040	050	060
Nominal Capacity, Tons		25	32	35	40	50	60
Air Flow Range	Maximum Design Air Flow - Standard - CFM	10,500	13,300	15,500	16,000	20,000	24,000
	Maximum Design Air Flow- High Efficiency - CFM	8,600	11,000	13,200	13,200	20,000	20,000
	Minimum Design Air Flow - Standard - CFM	7,200	9,000	10,800	10,800	16,000	16,000
	Minimum Design Air Flow - High Efficiency CFM	6,300	7,800	9,400	9,400	14,100	14,100
Cabinet Dimensions	Depth (Excluding Filter Section) - Inches	70	70	70	70	76	76
	Length - Inches	78	78	78	78	100	100
	Height - Inches	79.5	79.5	79.5	79.5	90	90
EER		14.1	13.1	13.1	12.7	13.3	12.6
EER - High Efficiency		15.8	14.7	14.2	13.6	14.9	14.2
Cooling Coil 3/8" OD	Face Area - Square Feet	17.8	22.2	26.7	26.7	40.1	40.1
	Rows	4	4	4	6	6	5
	Fins Per Inch (Standard/ High Efficiency)	12/17	12/17	12/17	12/17	12/17	12/17
Supply Fan	Fan Type	Airfoil Plenum Fan (SWSI)					
	Diameter - Inches/Class - Standard	25/ Class II	25/ Class II	28/ Class II	28/ Class II	32/ Class II	36/ Class II
	Fan Motor HP	5 - 20	10 - 25	10 - 25	10 - 25	15-40	15-40
Filters	2 Inch Deep - Medium Efficiency 20X20X2 / 24X20X2 / 24X24X2	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	0 / 6 / 6	0 / 6 / 6
	4 Inch Deep - Medium Efficiency 20X20X2 / 24X20X2 / 24X24X4	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	0 / 6 / 6	0 / 6 / 6
	4 Inch Deep - High Efficiency 20X20X2 / 24X20X2 / 24X24X4	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	6 / 3 / 0	0 / 6 / 6	0 / 6 / 6
Compressors	Type	Scroll / *Scroll with Capacity Modulation					
	Compressor Quantity / Nominal HP	10* + 10	15* + 11	15* + 13	15* + 15	15*+2-11	15*+2-15
Number of Capacity Steps		6	6	6	6	9	9
Refrigerant (R410A)	Charge (Lbs) Circuits A/B/C	20.0/20.0	21.5/21.5	23.0/23.0	27.0/27.0	28.5/25.0 /25.0	28.5/28.5 /28.5
Condensers	Type	Shell and Tube					
	Quantity (2 refrigerant circuits per condenser)	1	1	1	1	2	2
Condenser Water Connections	Water In and Out Copper Victaulic Connections - Inches	2.625	2.625	2.625	2.625	2.625	2.625

TABLE 9 - WATER-COOLED SELF-CONTAINED UNIT DATA (LSWU025 - LSWU060) (CONT'D)

MODEL NOMINAL TONS		025	032	035	040	050	060
Waterside Economizer Coil 1/2" OD	Face Area - Square Feet	17.8	22.2	26.7	26.7	40.1	40.1
	Rows/Fins Per Inch	4/12	4/12	4/12	4/12	4/12	4/12
Heating	Hot Water Coil Face Area - Square Feet	8.8	12.0	15.2	15.2	23.3	23.3
	Hot Water Coil Rows/Fins Per Inch	1/12	1/12	1/12	1/12	1/12	1/12
	Steam Coil	Consult Factory					
	Electric Heat - KW - 240/3/60 Nominal	17.5	17.5/35.0	17.5/35.0	17.5/35.0	35.0/52.5	35.0/52.5
	Electric Heat - KW - 480/3/60 Nominal	17.5	17.5/35.0	17.5/35.0	17.5/35.0	35.0/52.5	35.0/52.5
	Electric Heat - KW - 600/3/60 Nominal	17.5	17.5/35.0	17.5/35.0	17.5/35.0	35.0/52.5	35.0/52.5

TABLE 10 - WATER-COOLED SELF-CONTAINED UNIT DATA (LSWU062 - LSWU105)

MODEL NOMINAL TONS		062	070	085	095	105
Nominal Capacity		62	70	85	95	105
Air Flow Range	Maximum Design Air Flow - Standard - CFM	24,400	29,800	33,900	36,100	36,100
	Maximum Design Air Flow- High Efficiency - CFM	20,300	24,800	28,200	30,100	30,100
	Minimum Design Air Flow - CFM	16,300	19,900	22,600	24,200	24,200
Cabinet Dimensions	Depth (Excluding Filter Section) - Inches	96	96	96	96	96
	Length - Inches	130	130	130	130	130
	Height - Inches	102	102	102	102	102
EER		13.2	12.8	13.1	12.6	12.6
EER - High Efficiency		15.4	14.5	14.1	13.4	14.2
Cooling Coil 3/8" OD	Face Area - Square Feet	40.7	49.7	56.5	60.3	60.3
	Rows	4	4	5	5	6
	Fins Per Inch (Standard/High Efficiency)	12/17	12/17	12/17	12/17	12/17
Supply Fan	Fan Type	Airfoil Plenum Fan (SWSI)				
	Diameter - Inches/Class - Standard	36/ Class II	36/ Class II	36/ Class II	40/ Class II	40/ Class II
	Diameter - Inches/Class - High Capacity Fan	None	40/ Class II	40/ Class II	40/ Class III	40/ Class III
	Fan Motor HP	15 - 40	15 - 40	15 - 40	20 - 50	20 - 50
Filters	2 Inch Deep - Medium Efficiency 20X20X2 / 24X20X2	8 / 12	8 / 12	8 / 12	8 / 12	8 / 12
	4 Inch Deep - Medium Efficiency 20X20X2 / 24X20X2	8 / 12	8 / 12	8 / 12	8 / 12	8 / 12
	4 Inch Deep - High Efficiency 20X20X2 / 24X20X2	8 / 12	8 / 12	8 / 12	8 / 12	8 / 12
Compressors	Type	Scroll				
	Compressor Quantity / Nominal HP	2 - 15 + 2 - 11	2 - 15 + 2 - 13	4 - 15	6 - 13	6 - 15

TABLE 10 - WATER-COOLED SELF-CONTAINED UNIT DATA (LSWU062 - LSWU105) (CONT'D)

MODEL NOMINAL TONS		062	070	085	095	105
Condensers	Type	Shell and Tube				
	Quantity (2 refrigerant circuits per condenser)	2	2	2	3	3
Condenser Water Connections	Water In and Out Copper Victaulic Connections - Inches	3.125	3.125	3.125	3.125	3.125
Waterside Economizer Coil 1/2" OD	Face Area - Square Feet	40.7	49.7	56.5	60.3	60.3
	Rows/Fins Per Inch	4/12	4/12	4/12	4/12	4/12
Heating	Hot Water Coil Face Area - Square Feet	29.3	35.8	40.6	43.3	43.3
	Hot Water Coil Rows/Fins Per Inch	1/12	1/12	1/12	1/12	1/12
	Steam Coil	Consult Factory				
	Electric Heat - KW	Consult Factory				

TABLE 11 - ELECTRIC HEAT FOR LSWU

ITEM	UNIT MODEL	ELECTRIC HEAT KW AT NOMINAL VOLTAGES		ELECTRIC HEATER DIMENSIONS				AIR FLOW - CFM	
		DEFAULT	OPTIONAL	LENGTH* - A	WIDTH* - B	DEPTH - C	AREA SQ-FT	MAXIMUM	MINIMUM
1	LSWU025	17.5	N/A	41.0	28.0	3.0	7.97	10,000	3,500
2	LSWU032	35.0	17.5	41.0	28.0	3.0	7.97	12,800	4,500
3	LSWU035	35.0	17.5	41.0	28.0	3.0	7.97	16,000	5,400
4	LSWU040	35.0	17.5	41.0	28.0	3.0	7.97	16,000	5,400
5	LSWU050	52.5	35.0	51.5	33.5	4.0	11.98	24,000	8,100
6	LSWU060	52.5	35.0	51.5	33.5	4.0	11.98	24,000	8,100

ITEM	UNIT MODEL	COIL FACE AREA	FACE VELOCITY - FPM		WATT DENSITY WATTS/ SQ IN (MAXIMUM)	TEMPERATURE RISE - DEG F	
			MAXIMUM	MINIMUM		MAXIMUM	MINIMUM
1	LSWU025	17.78	1,254	439	14.00	14.44	4.13
2	LSWU032	22.22	1,606	564	28.00	22.46	6.46
3	LSWU035	26.67	2,007	677	28.00	18.72	5.17
4	LSWU040	26.67	2,007	677	28.00	18.72	5.17
5	LSWU050	40.10	2,003	676	27.95	18.72	5.17
6	LSWU060	40.10	2,003	676	27.95	18.72	5.17

NOTES:

(*) All Dimensions are inside clear opening in inches

All heaters have one inch flange on 3 sides. The junction box is 4 inches wide.

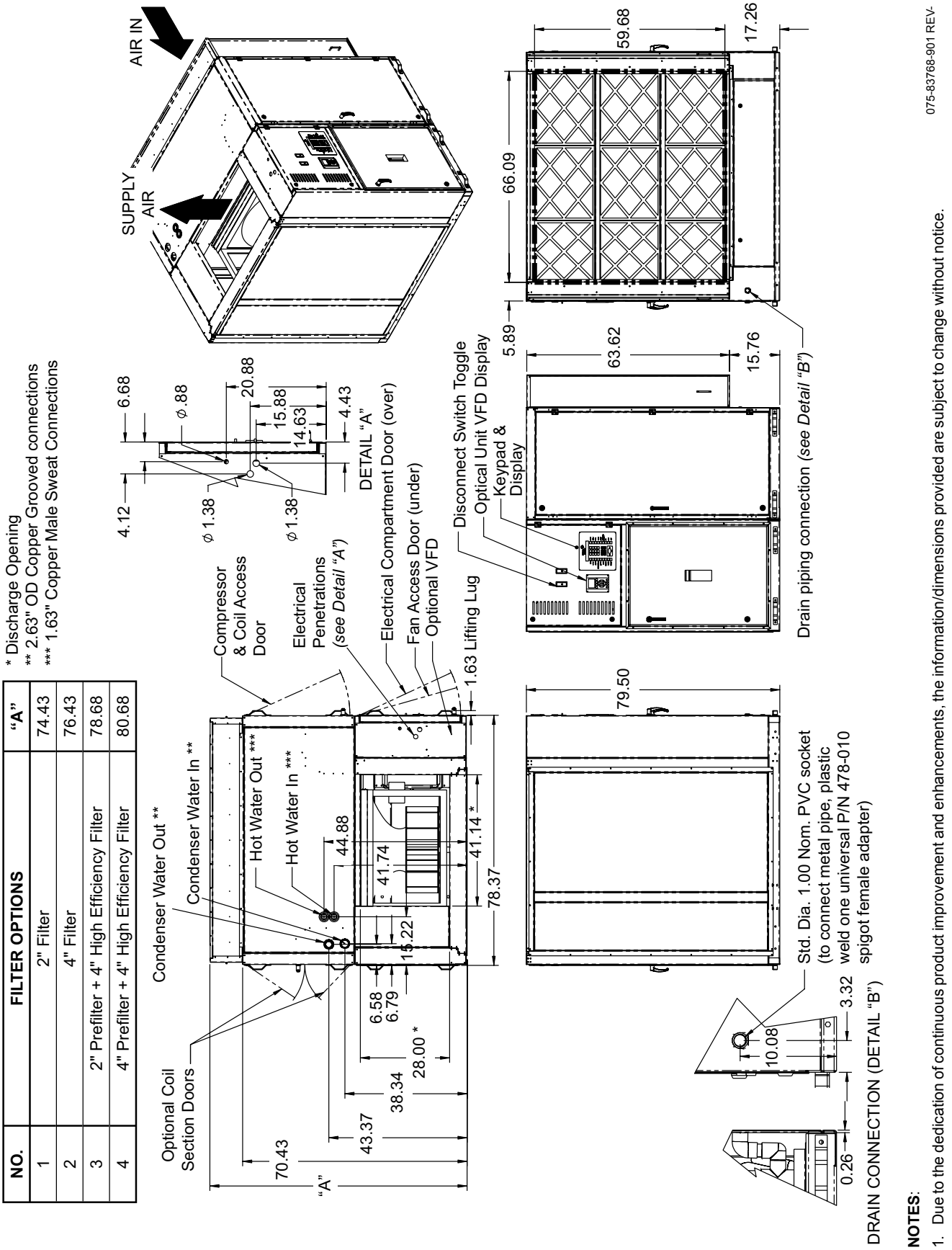
Air Flow is Vertical.

Nominal Heater Voltages: 240/3/60, 480/3/60, and 600/3/60.

Heater Manufacturer - Indeeco.

See Drawing Tab for more dimensional information.

DIMENSIONS



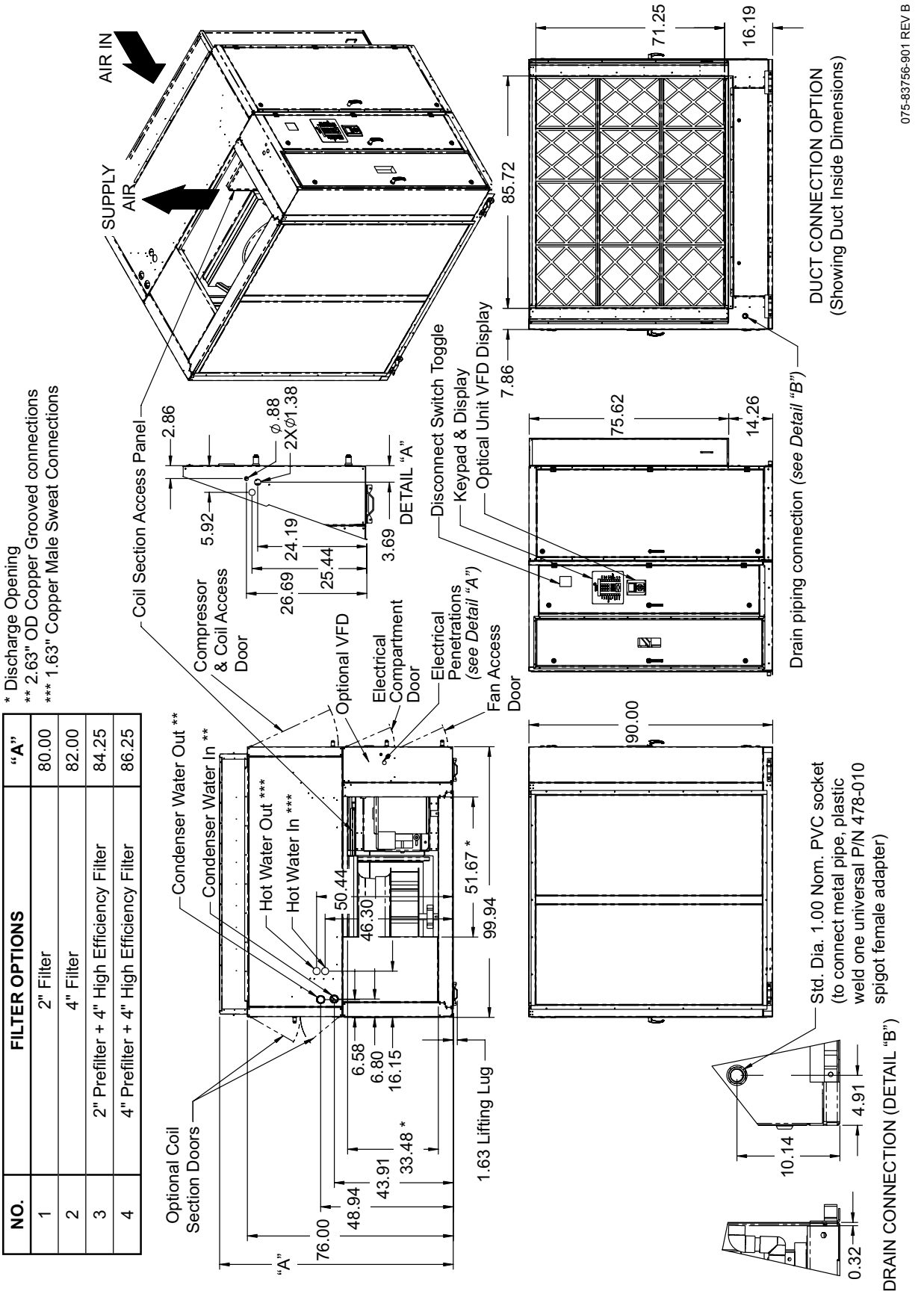
* Discharge Opening
** 2.63" OD Copper Grooved connections
*** 1.63" Copper Male Sweat Connections

NO.	FILTER OPTIONS	"A"
1	2" Filter	74.43
2	4" Filter	76.43
3	2" Prefilter + 4" High Efficiency Filter	78.68
4	4" Prefilter + 4" High Efficiency Filter	80.68

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. All dimensions are in inches.

FIGURE 25 - UNIT DIMENSIONS, TOP DISCHARGE (LSWU025–LSWU040)



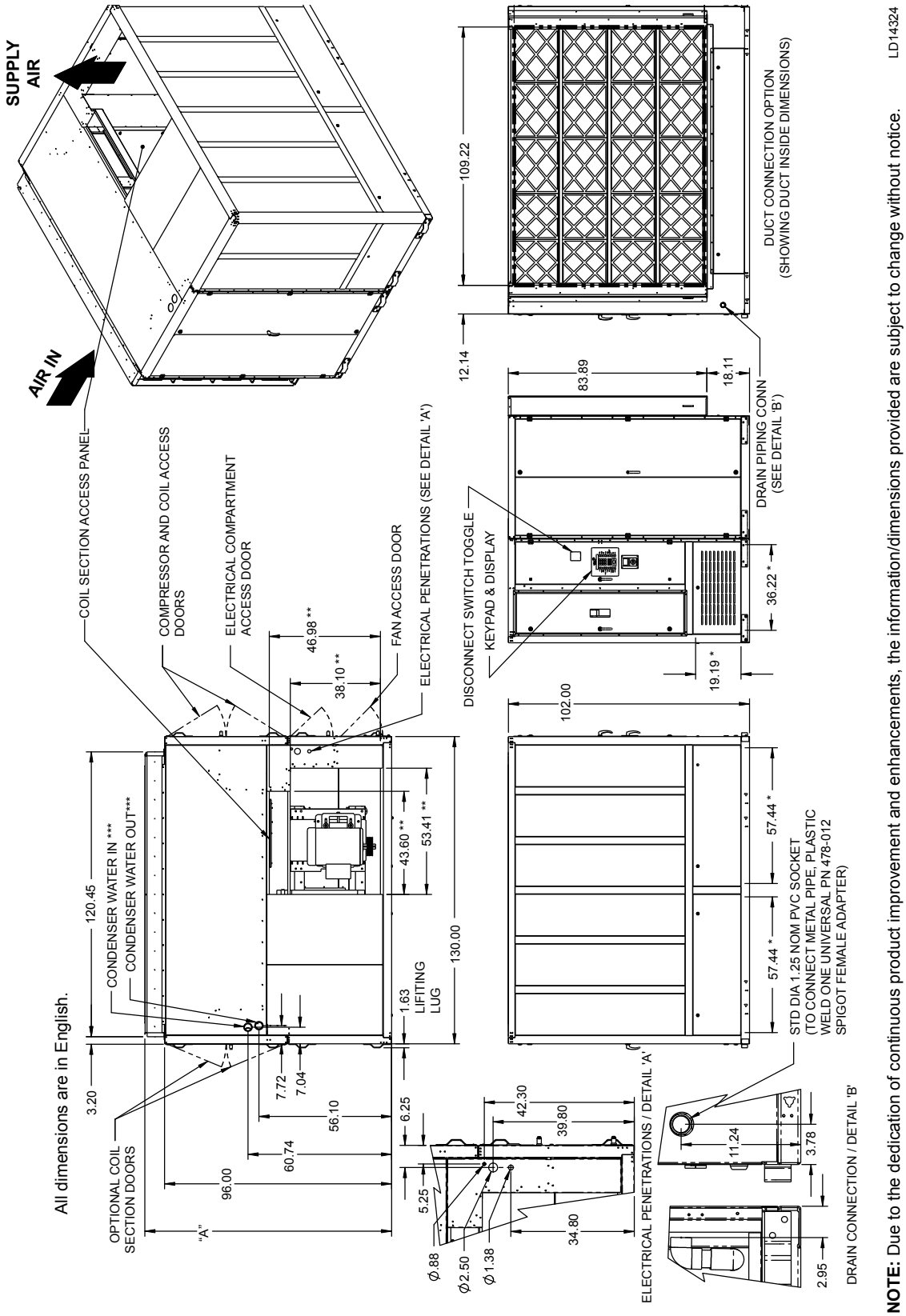
NO.	FILTER OPTIONS	"A"
1	2" Filter	80.00
2	4" Filter	82.00
3	2" Prefilter + 4" High Efficiency Filter	84.25
4	4" Prefilter + 4" High Efficiency Filter	86.25

* Discharge Opening
** 2.63" OD Copper Grooved connections
*** 1.63" Copper Male Sweat Connections

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. All dimensions are in inches.

FIGURE 26 - UNIT DIMENSIONS, TOP DISCHARGE (LSWU050–LSWU060)

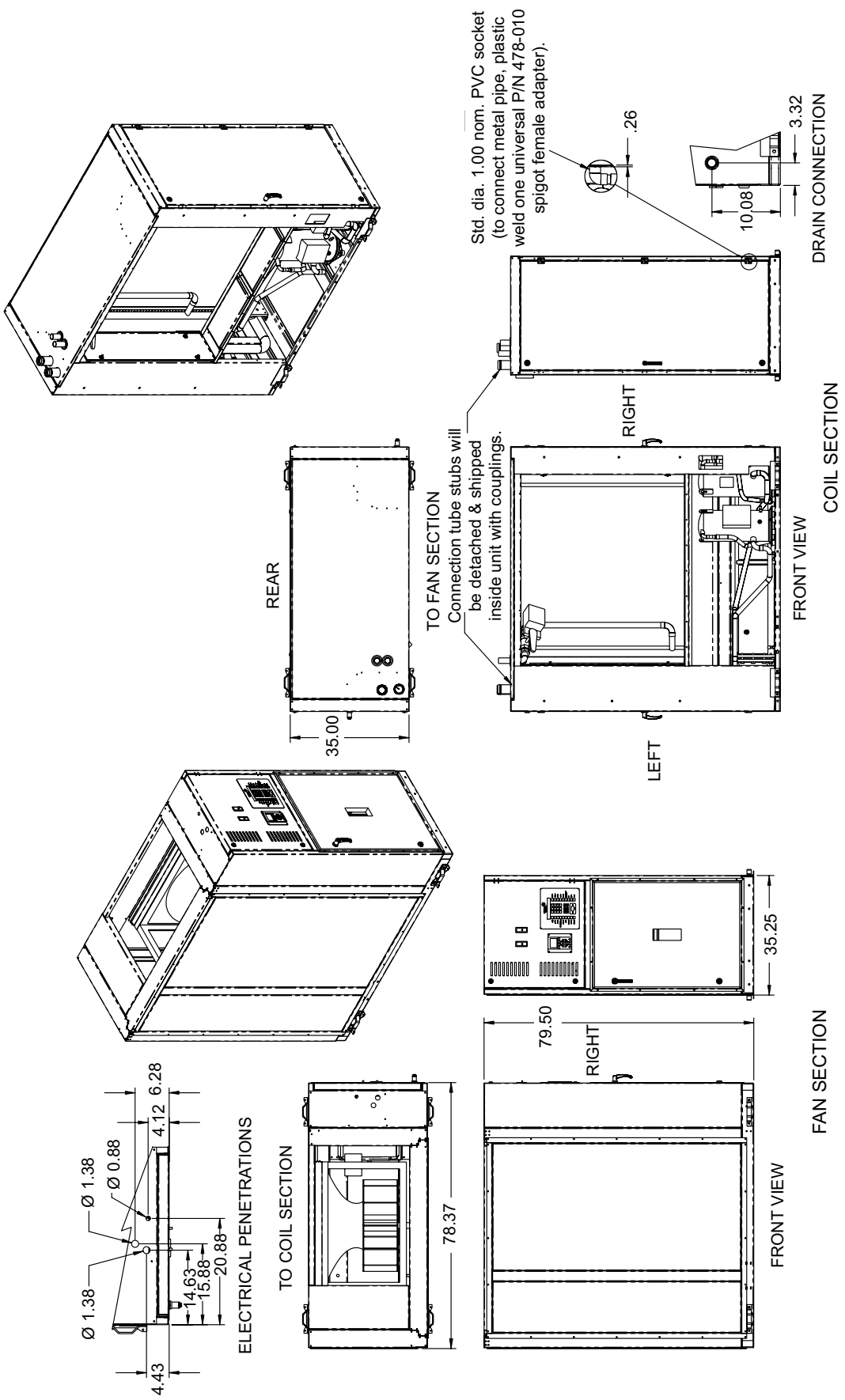


NO.	FILTER OPTIONS	"A"
1	2" FILTER	100.06
2	4" FILTER	102.06
3	2" PRE-FILTER + 4" HIGH EFFICIENCY FILTER	104.31
4	4" PRE-FILTER + 4" HIGH EFFICIENCY FILTER	106.31

* LOWER ACCESS OPENING
** DISCHARGE OPENING
*** 3.125" OD COPPER GROOVED CONNECTIONS

NOTE: Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice. LD14324

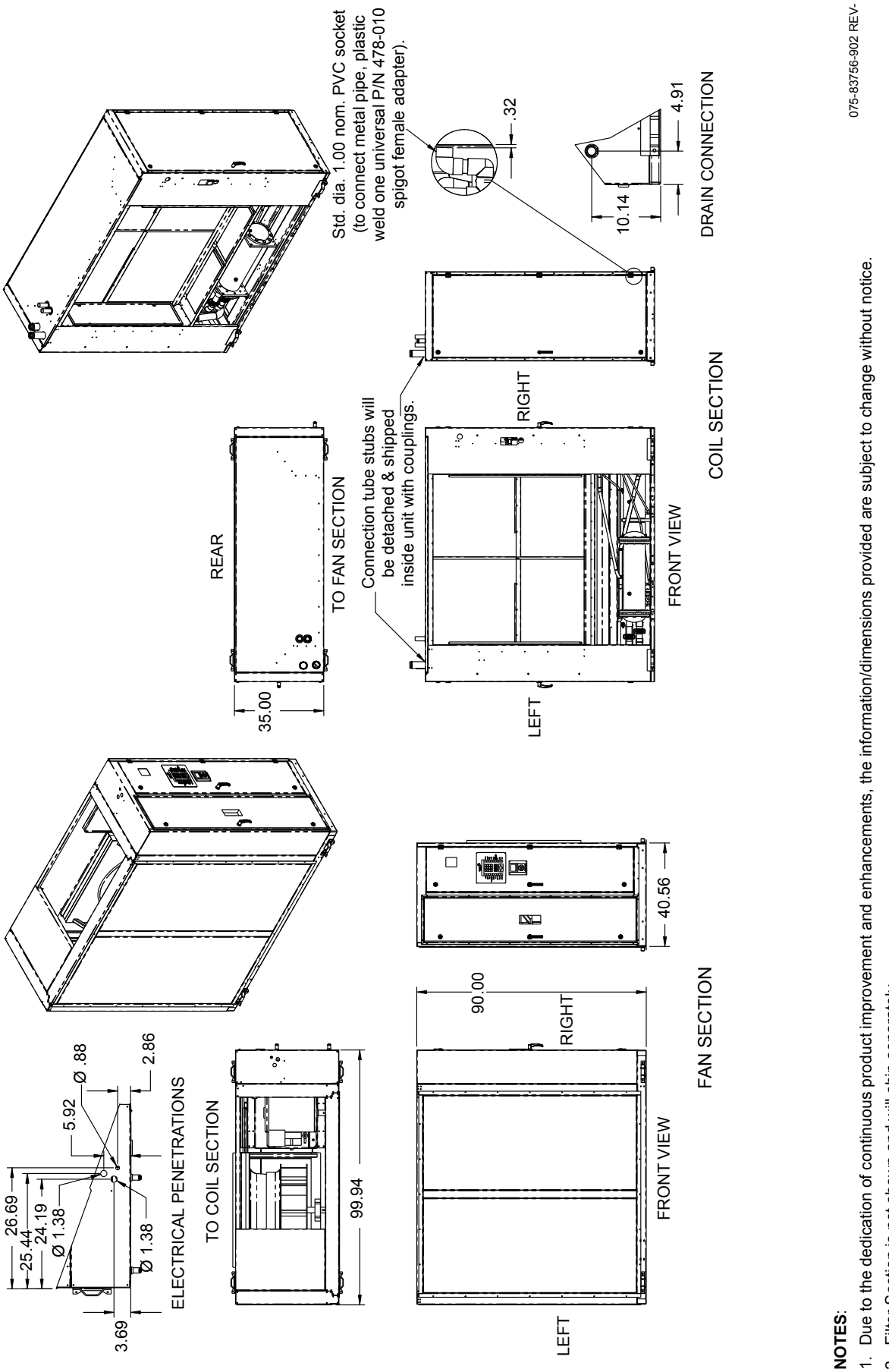
FIGURE 27 - UNIT DIMENSIONS ALL MODELS, TOP DISCHARGE, ASSEMBLED (LSWU062–LSWU105)



NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Filter Section is not shown and will ship separately.
3. All dimensions are in inches.

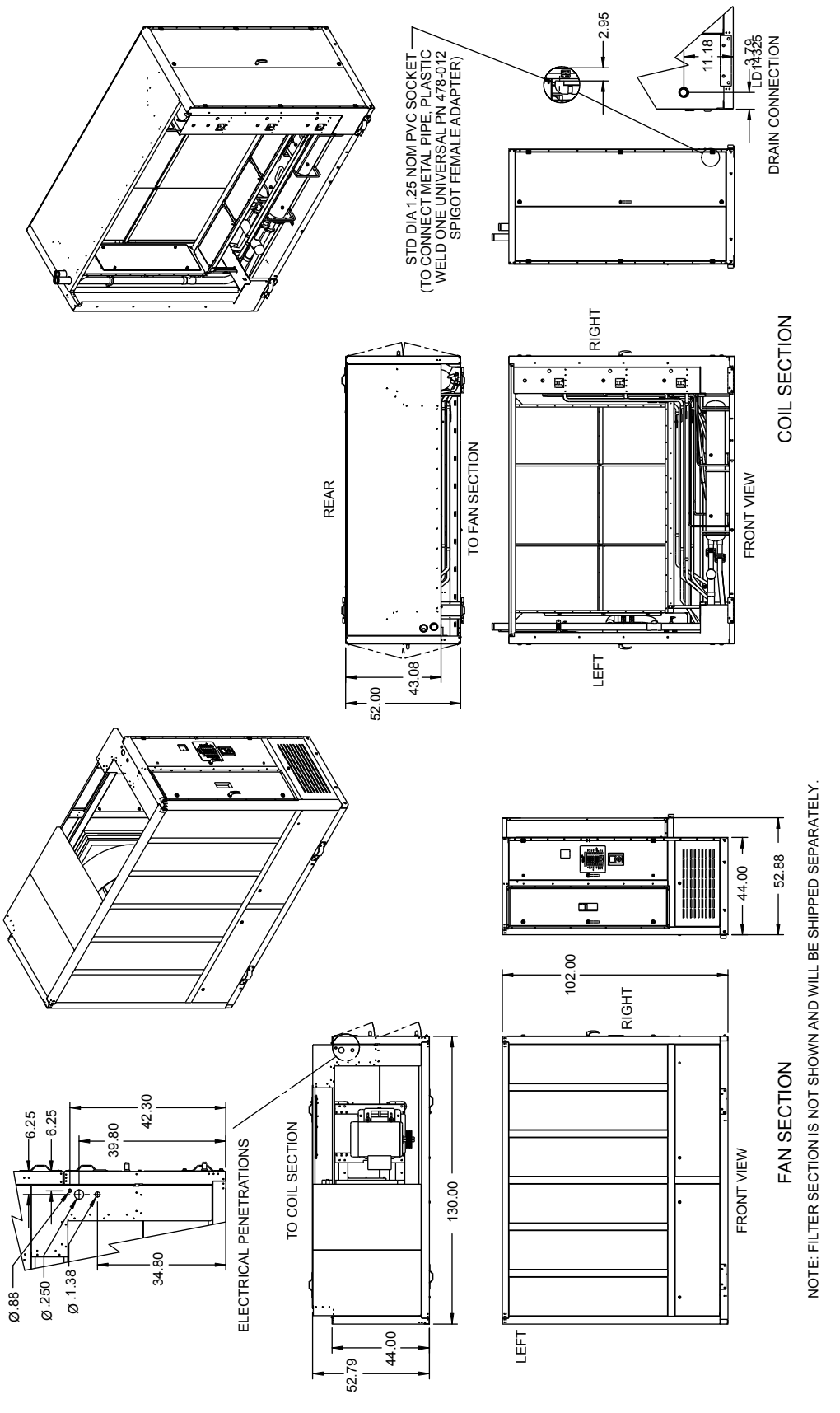
FIGURE 28 - UNIT DIMENSIONS TOP DISCHARGE, SEGMENTED (LSWU025– LSWU040)



NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Filter Section is not shown and will ship separately.
3. All dimensions are in inches.

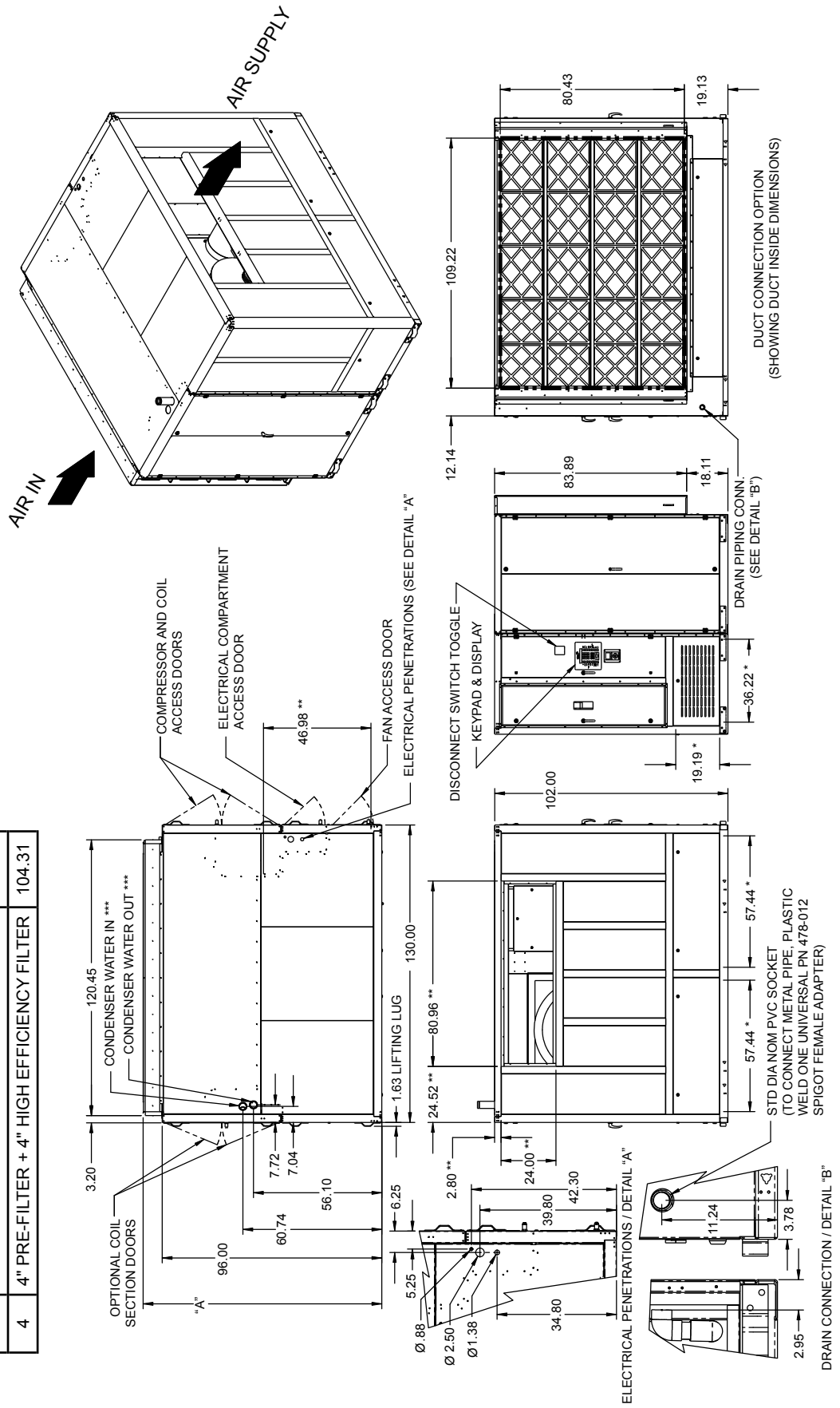
FIGURE 29 - UNIT DIMENSIONS TOP DISCHARGE, SEGMENTED (LSWU050– LSWU060)



All dimensions are in English.

Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.

FIGURE 30 - UNIT DIMENSIONS TOP DISCHARGE, SEGMENTED (LSWU062 - LSWU105)



NO.	FILTER OPTIONS	"A"
1	2" FILTER	100.06
2	4" FILTER	102.06
3	2" PRE-FILTER + 4" HIGH EFFICIENCY FILTER	104.31
4	4" PRE-FILTER + 4" HIGH EFFICIENCY FILTER	104.31

FIGURE 31 - UNIT DIMENSIONS ALL MODELS, FRONT DISCHARGE, ASSEMBLED (LSWU062 - LSWU105)

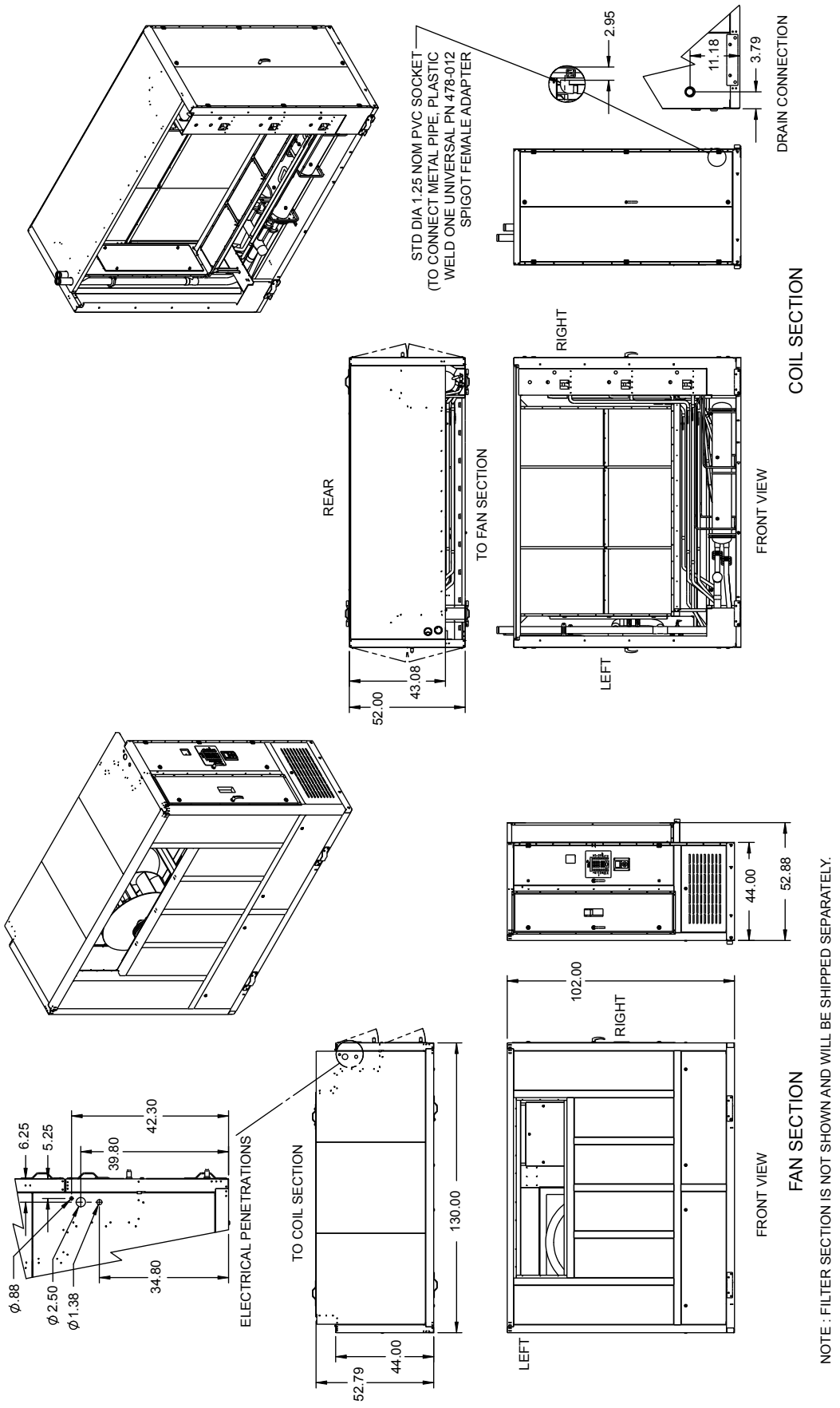
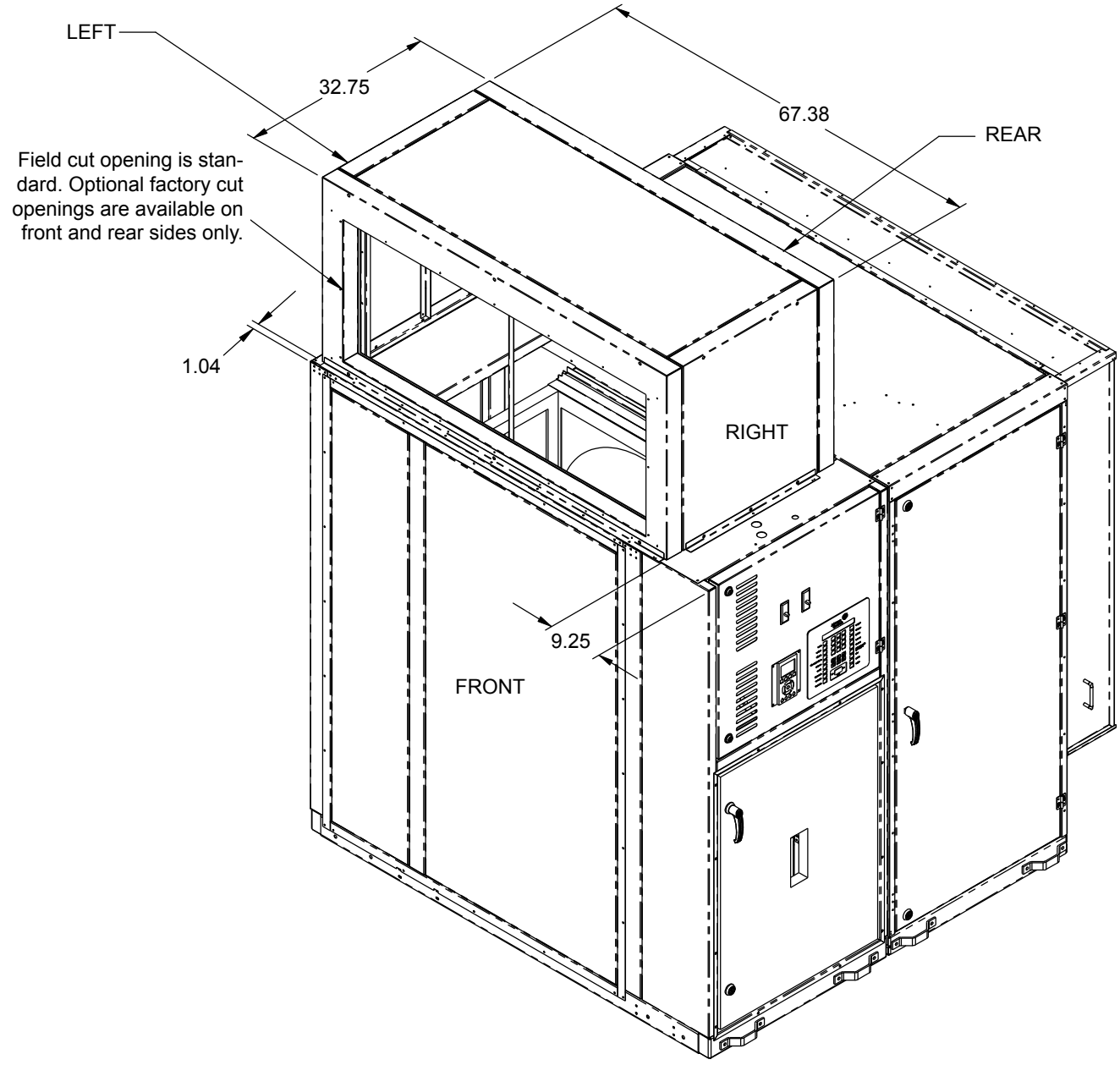


FIGURE 32 - UNIT DIMENSIONS ALL MODELS, FRONT DISCHARGE, SEGMENTED (LSWU062 - LSWU105)



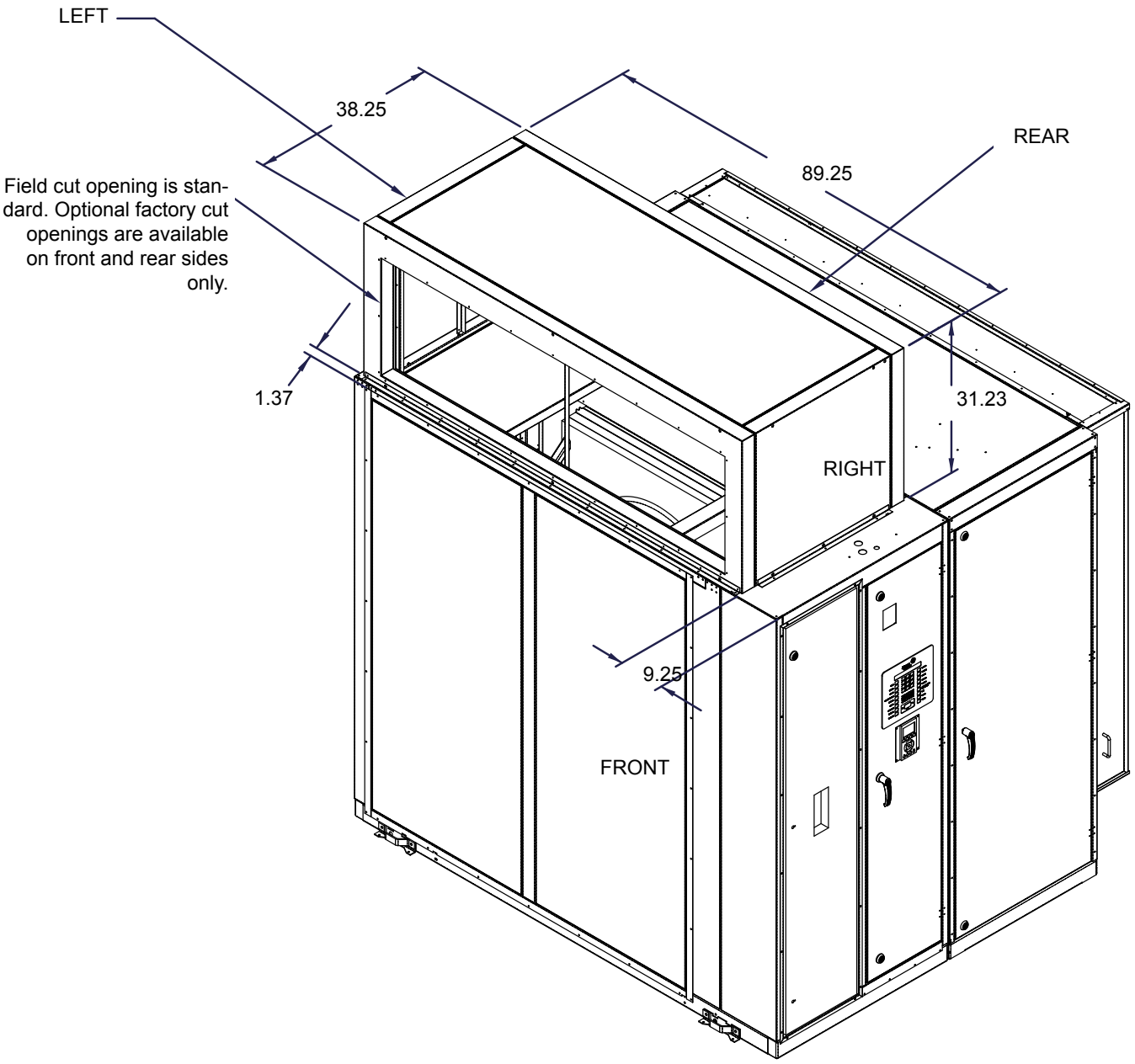
OPTIONAL HALF PLENUM
(Positioned over Fan Section only)

075-83768-905 REV-

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. All dimensions are in inches.

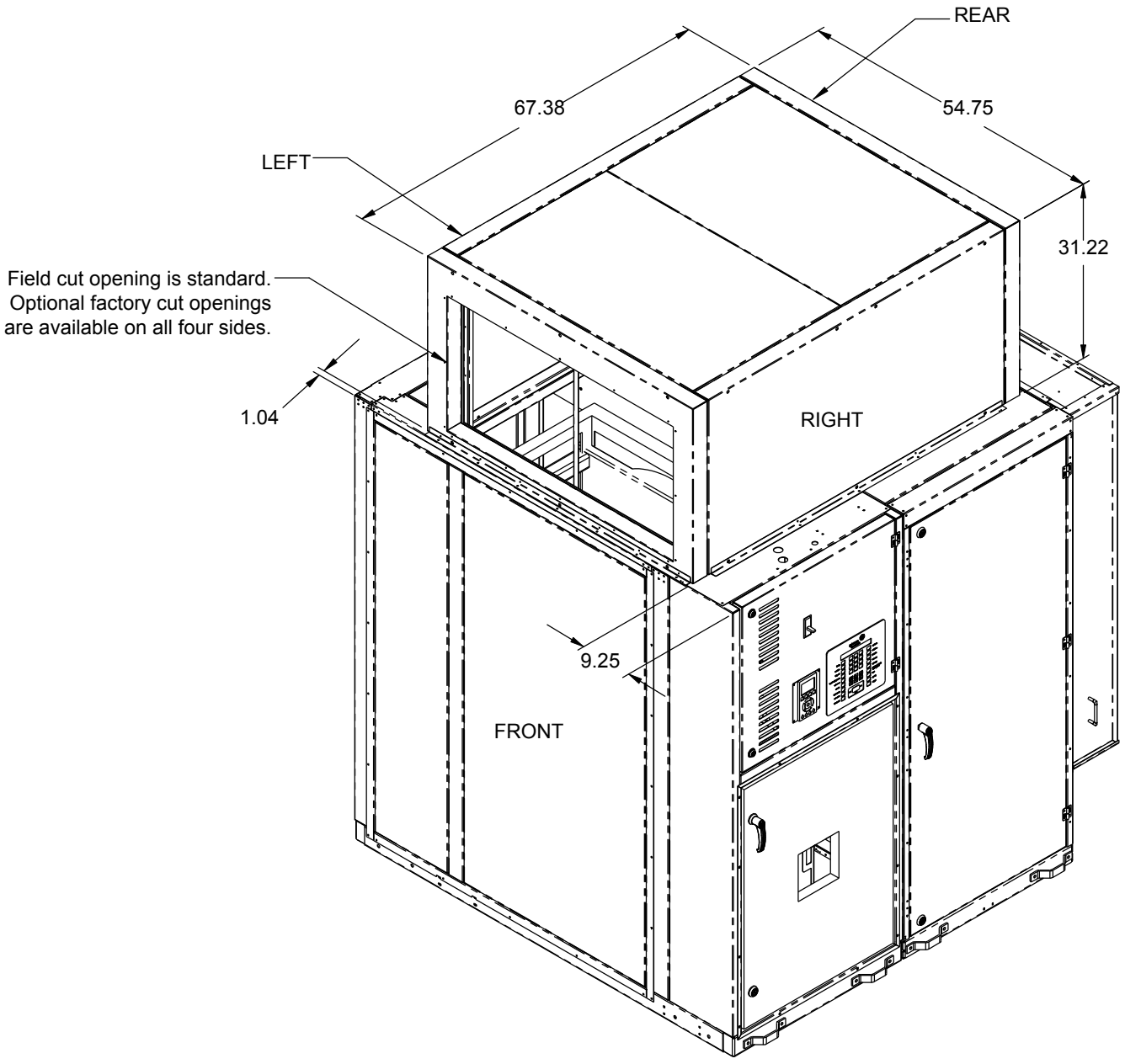
FIGURE 33 - HALF OUTLET PLENUM OPTION (LSWU025 - LSWU040)



NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. All dimensions are in inches.

FIGURE 34 - HALF OUTLET PLENUM OPTION (LSWU050 - LSWU060)



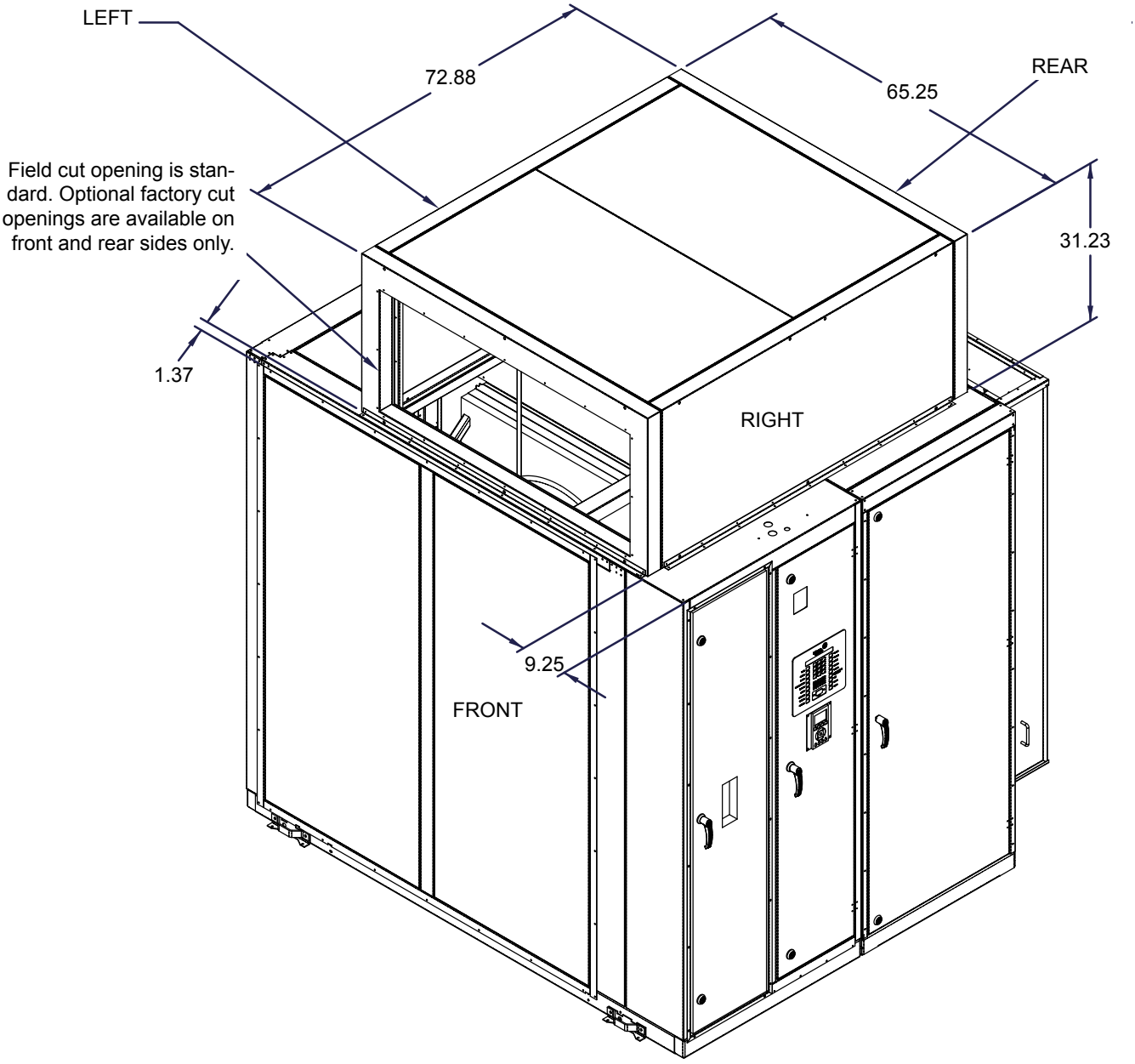
OPTIONAL FULL PLENUM

075-83768-904 REVA

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Optional Hot water piping will be inside Full Plenum.
3. All dimensions are in inches.

FIGURE 35 - FULL OUTLET PLENUM OPTION (LSWU025 - LSWU040)



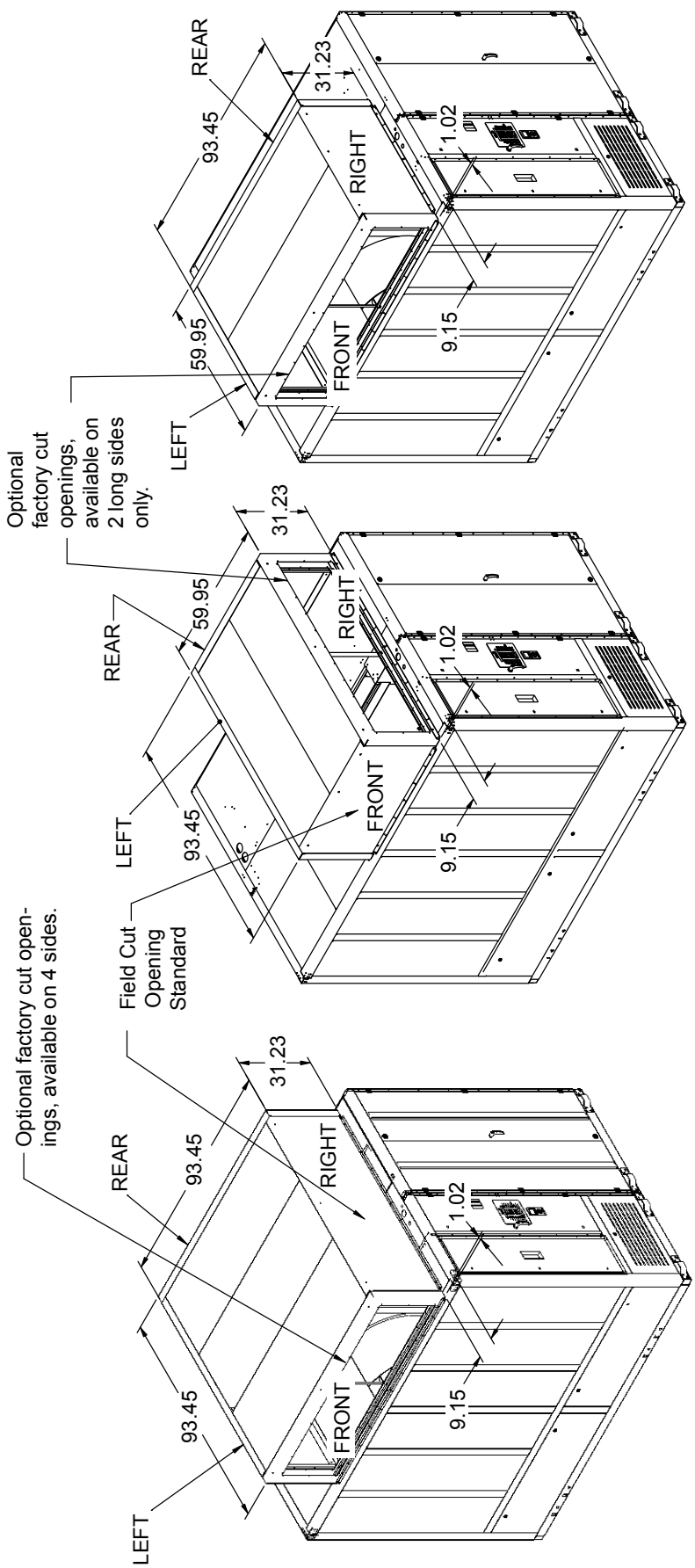
OPTIONAL FULL PLENUM

075-83756-904 REV -

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Optional Hot water piping will be inside Full Plenum.
3. All dimensions are in inches.

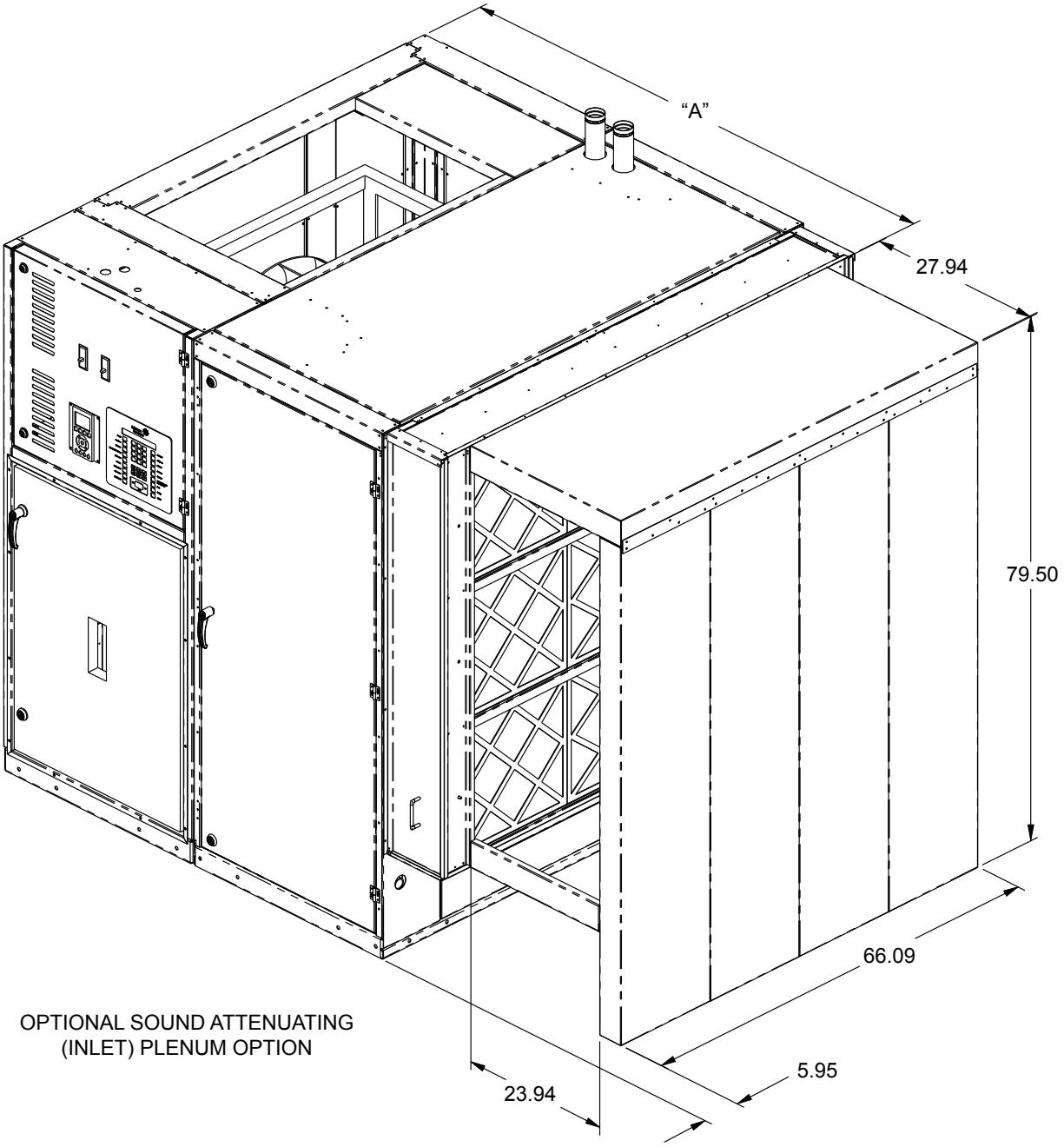
FIGURE 36 - FULL OUTLET PLENUM OPTION (LSWU050 - LSWU060)



FACTORY CUT DUCT OPENINGS	
HEIGHT OPTIONS	**LENGTH OPTIONS**
12"	36"
14"	42"
16"	48"
18"	54"
20"	60"
22"	66"
24"	72"

Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.

FIGURE 37 - UNIT DIMENSIONS ALL MODELS, DISCHARGE PLENUM (LSWU062 - LSWU105)



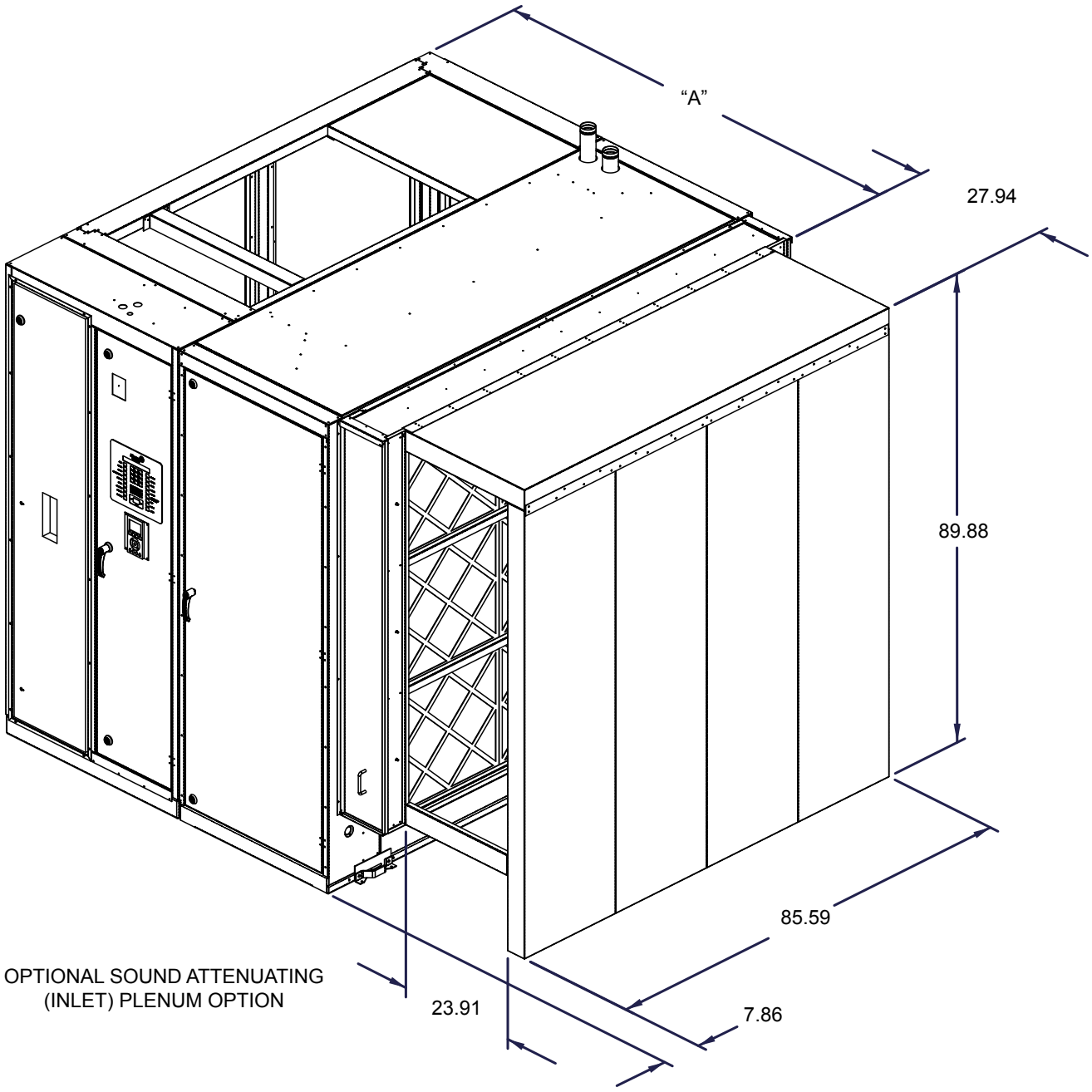
075-83768-906 REV-

NO.	FILTER OPTIONS	"A"
1	2" Filter	100.06
2	4" Filter	102.06
3	2" Pre-Filter + 4" High Efficiency Filter	104.31
4	4" Pre-Filter + 4" High Efficiency Filter	106.31

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Sound-attenuating plenum option can be combined with any filter section option.
3. Sound-attenuating plenum ships separately from base unit segment(s).
4. Option is not available with ducted connections.
5. With this option the top row of filters can only be removed from the end of the filter rack.
6. All dimensions in inches.

FIGURE 38 - UNIT DIMENSIONS SOUND ATTENUATING PLENUM OPTION (LSWU025 - LSWU040)



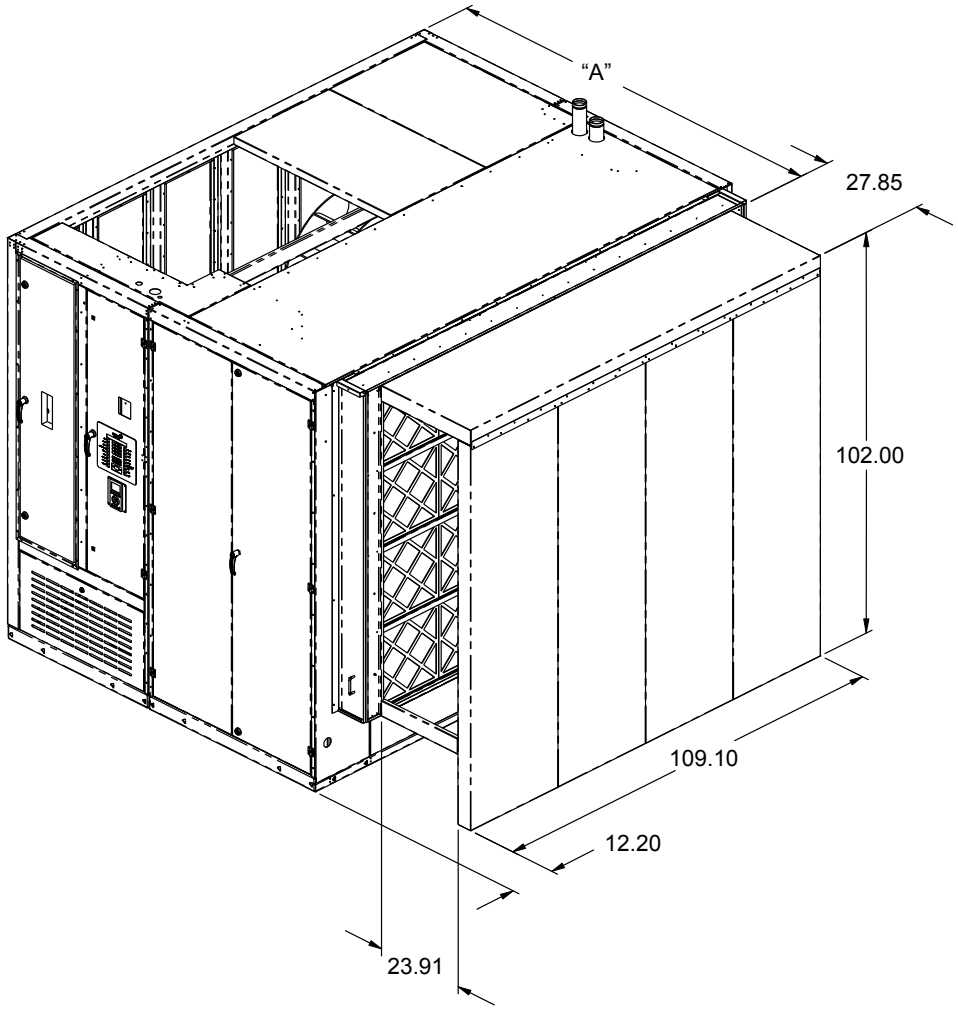
075-83756-908 REV-

NO.	FILTER OPTIONS	"A"
1	2" Filter	80.00
2	4" Filter	82.00
3	2" Pre-Filter + 4" High Efficiency Filter	84.25
4	4" Pre-Filter + 4" High Efficiency Filter	86.25

NOTES:

1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Sound-attenuating plenum option can be combined with any filter section option.
3. Sound-attenuating plenum ships separately from base unit segment(s).
4. Option is not available with ducted connections.
5. With this option the top row of filters can only be removed from the end of the filter rack.
6. All dimensions in inches.

FIGURE 39 - UNIT DIMENSIONS SOUND ATTENUATING PLENUM OPTION (LSWU050 - LSWU060)



OPTIONAL SOUND-ATTTENUATING (INLET) PLENUM

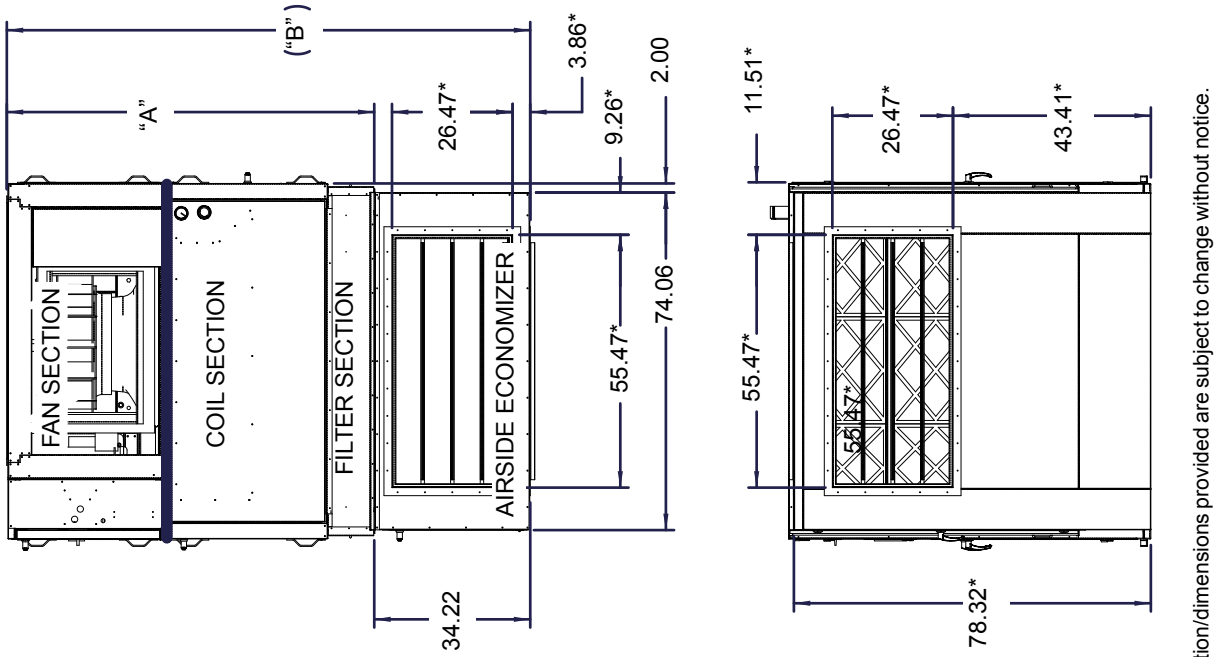
LD14352

NO.	FILTER OPTIONS	"A"
1	2" Filter	100.06
2	4" Filter	102.06
3	2" Pre-Filter + 4" High Efficiency Filter	104.31
4	4" Pre-Filter + 4" High Efficiency Filter	106.31

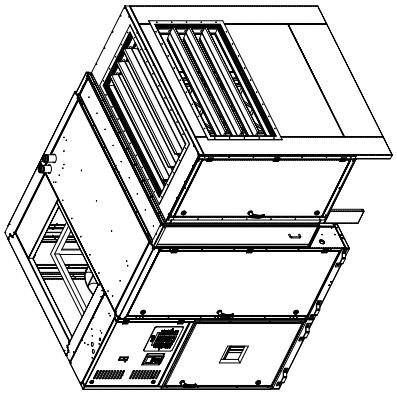
NOTES:

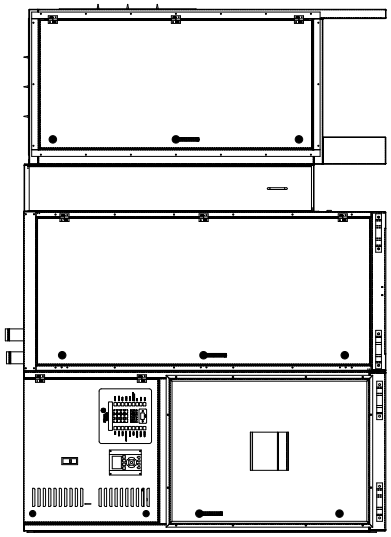
1. Sound-attenuating plenum option can be combined with any filter section option.
2. Sound-attenuating plenum ships separately from base unit segment(s).
3. Option is not available with ducted connections.
4. With this option the top row of filters can only be removed from the end of the filter rack.
5. All dimensions are in English.
6. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.

FIGURE 40 - UNIT DIMENSIONS ALL MODELS, INLET PLENUM (LSWU062 - LSWU105)



NO.	FILTER OPTIONS	"A"	"B"
1	2" Filter	74.43	108.65
2	4" Filter	76.43	110.65
3	2" Prefilter + 4" High Efficiency Filter	76.89	112.90
4	4" Prefilter + 4" High Efficiency Filter	80.68	114.90



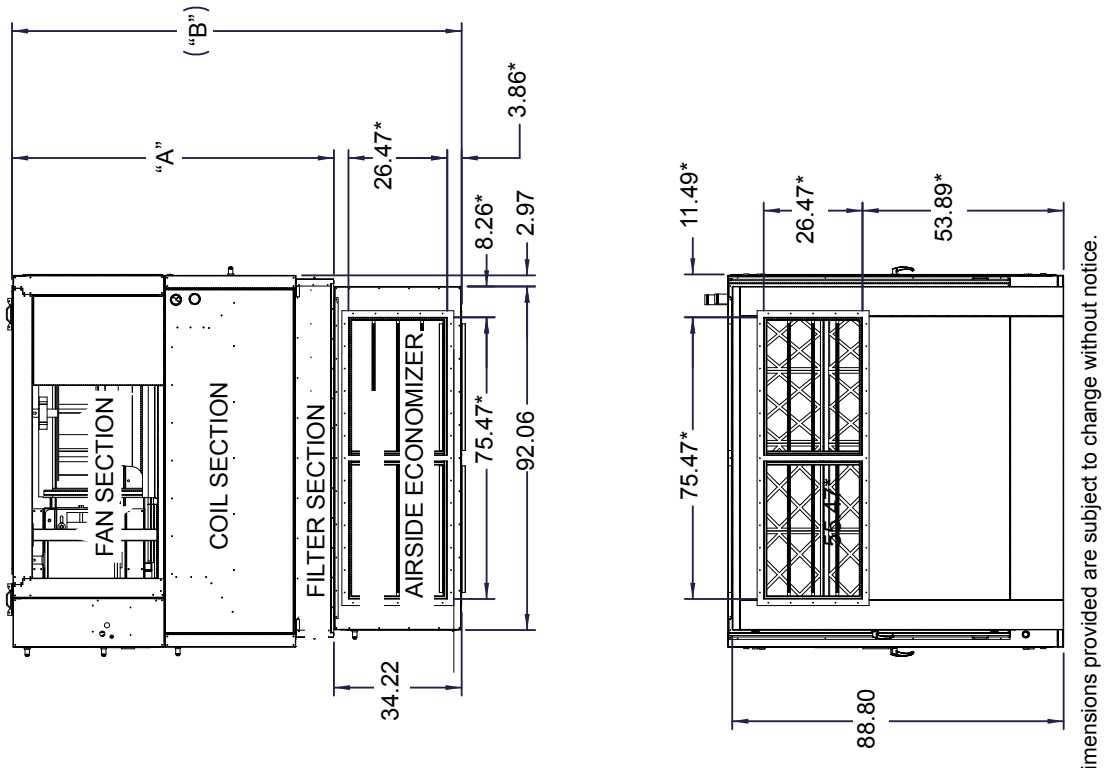


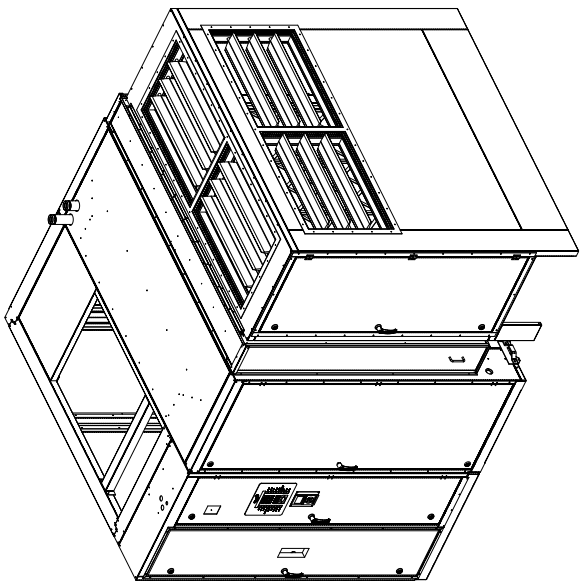
NOTES:

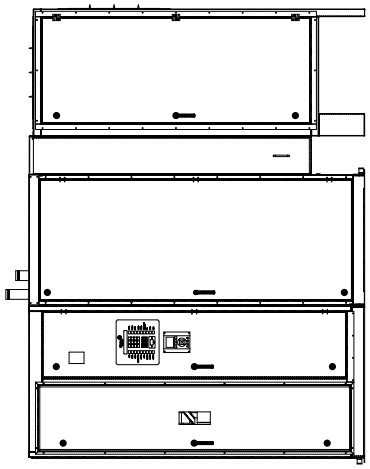
1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Airside Economizer will be shipped separately.
3. * Minimum interior duct dimensions.
4. All dimensions are in inches.

075-83768-908 REV A

FIGURE 41 - UNIT DIMENSIONS AIRSIDE ECONOMIZER OPTION (LSWU025 - LSWU040)





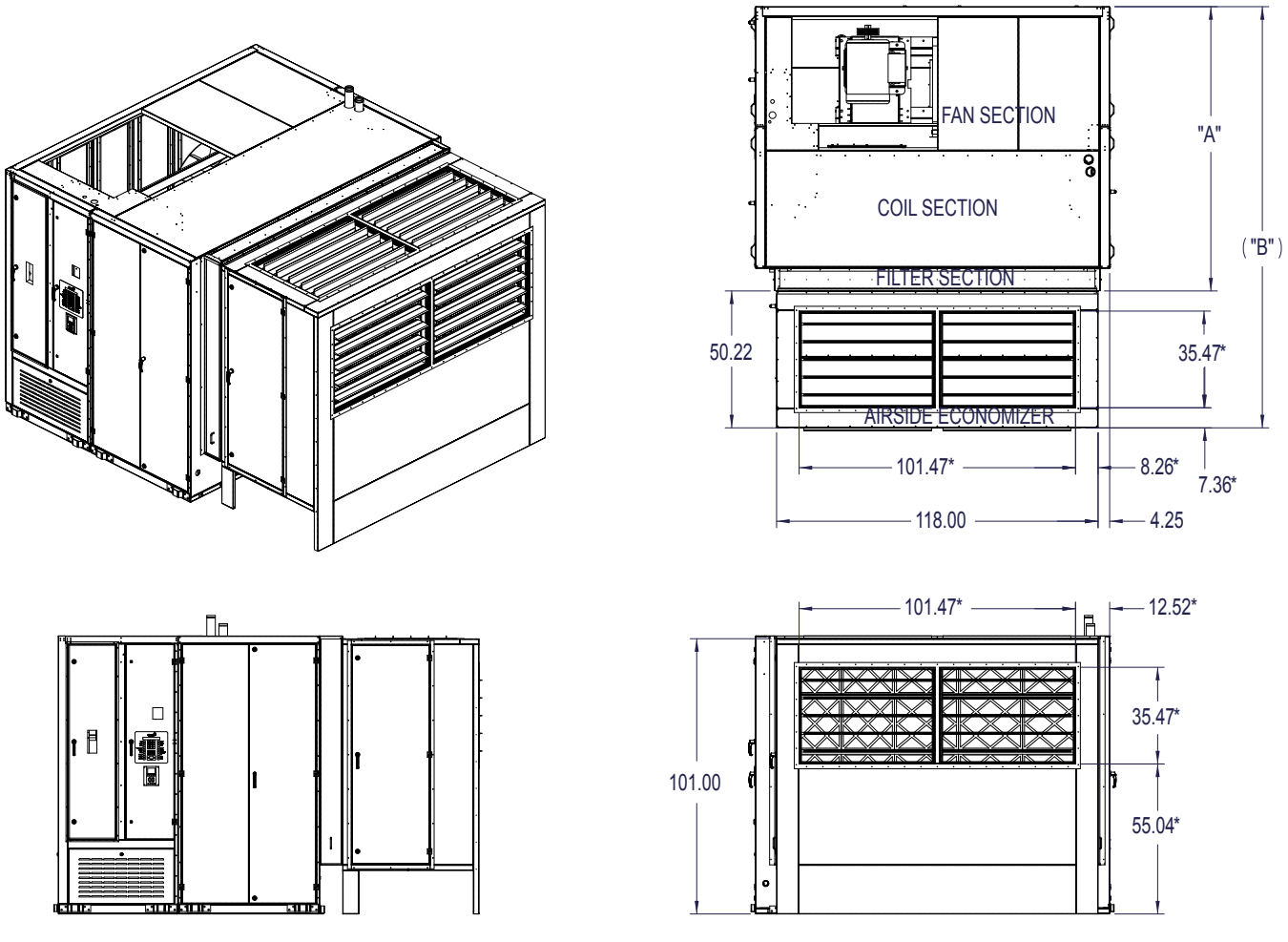


NO.	FILTER OPTIONS	"A"	"B"
1	2" Filter	80.00	114.22
2	4" Filter	82.00	116.22
3	2" Prefilter + 4" High Efficiency Filter	84.25	118.47
4	4" Prefilter + 4" High Efficiency Filter	86.25	120.47

NOTES:
1. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
2. Airside Economizer will be shipped separately.
3. * Minimum interior duct dimensions.
4. All dimensions are in inches.

075-83756-906 REV A

FIGURE 42 - UNIT DIMENSIONS AIRSIDE ECONOMIZER OPTION (LSWU050 - LSWU060)



LD14583

NO.	FILTER OPTIONS	"A"	"b"
1	2" Filter	100.06	150.28
2	4" Filter	102.06	152.28
3	2" Pre-Filter + 4" High Efficiency Filter	104.31	154.53
4	4" Pre-Filter + 4" High Efficiency Filter	106.31	106.31

NOTES:

1. All dimensions are in English.
2. Due to the dedication of continuous product improvement and enhancements, the information/dimensions provided are subject to change without notice.
3. * Minimum interior duct dimensions.
4. Airside economizer will be shipped separately.

FIGURE 43 - UNIT DIMENSIONS AIRSIDE ECONOMIZER OPTION (LSWU062 - LSWU105)

ELECTRICAL DATA

Field Power Wiring

Wiring must comply with all applicable codes and ordinances.

A single point power terminal block is provided as standard and wiring within the unit is done in accordance with the National Electrical Code. All branch circuits within the control panel are individually fused. A single field supplied disconnect is required, or a unit mounted non-fused disconnect can be ordered with the unit.

Holes are located in the top of the control compartment for the entry of the power wiring. There is also a 7/8" diameter hole in the same location of the control wiring.

Field power wiring connected to incoming power termination point must be copper conductor only. Aluminum wire cannot be connected to the incoming power termination point.

Disconnect

Disconnecting means are addressed by Article 440 of the National Electrical Code (NEC), which requires "disconnecting means capable of disconnecting air conditioning and refrigerant equipment including motor-compressors, and controllers, from the circuit feeder." The disconnect switch should be selected and located with the NEC guidelines. Location requirements per NEC are that the disconnect be located in a readily accessible position within sight (50 feet) of the unit.

Electrical Service Sizing

In order to determine the electrical service required for the unit, use the appropriate calculations listed below from the National Electrical Code. Based on the configuration of the unit, the calculations will yield different MCA (Minimum Circuit Ampacity), and MOP (Maximum Overcurrent Protection).

The MCA value is used to size the wire for the power service to the unit. The MOP is used to size either the breaker or fuse for the entire unit.

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

MCA

For units with cooling capability (all concurrent loads) with or without hot water or steam heat:

MCA = 1.25 (largest motor RLA or FLA) plus other loads plus 2 amps.

For units with cooling capability and non-concurrent electric heat the following calculations are required. In the cooling mode, the loads are composed of the compressors and supply fan motor loads. In the heating mode, the loads are composed of the supply fan motor and the electric heaters. The MCA is calculated for the unit in the cooling mode and in heating operation. The highest value obtained is used for the MCA.

For unit in the cooling mode:

MCA = 1.25 (largest motor RLA or FLA) plus other loads plus 2 amps.

For units in the heating mode:

With Electric Heater KW 50 KW or less:

MCA = 1.25 (electric heat FLA plus supply fan motor amps) plus 2 amps.

With Electric Heater KW greater than 50KW:

MCA = 1.25 (supply fan motor amps) plus electric heat FLA plus 2 amps.

MOP

For units with cooling capability (all concurrent loads) with or without hot water or steam heat:

MOP = 2.25 (largest motor RLA or FLA) plus other loads plus 2 amps.

For units with cooling capability and non-concurrent electric heat the following calculations are required. In the cooling mode, the loads are composed of the compressors and supply fan motor loads. In the heating mode, the loads are composed of the supply fan motor and the electric heaters. The MOP is calculated for the unit in the cooling mode and in heating operation. The highest value obtained is used for the MOP.

For unit in the cooling mode:

MOP = 2.25 (largest motor RLA or FLA) plus other loads plus 2 amps.

For units in the heating mode:

With Electric Heater KW 50 KW or less:

MOP = 2.25(electric heat FLA plus supply fan motor amps) plus 2 amps.

With Electric Heater KW greater than 50KW:

MOP = 2.25 (supply fan motor amps) plus electric heat FLA plus 2 amps.

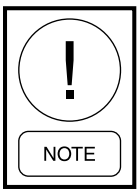
Contact the factory for electric heat full load amp data.

FIELD WIRING

Figure 44 on page 67 shows the field control wiring to CTB1. All field control wiring is field supplied and installed.

Space Sensor

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

Occupied / Unoccupied Input

There are several ways to place the unit in the Occupied mode. The unit has a three position rocker switch identified as OFF, AUTO, ON. When the switch is in the ON position the OCC terminal on the terminal strip is energized through the rocker switch. This places the unit in the Occupied mode. With the rocker switch in the AUTO position the unit can be placed in the Occupied mode by a communicated input through a BAS system internal schedule, or by closing a circuit between 24V and OCC on the terminal strip. A hardwired external device like a time clock or manual switch could be used to close this circuit.

Contact Closure = Occupied

Contact Open = Unoccupied

Note that 24 volts (24VAC), terminal 1 of the terminal block CTB1, must be used as the 24VAC source for the external contact. Use of any power source external to the controller will result in damage to the Unit Controller.

Shutdown Input

The unit has a three position rocker switch identified as OFF, AUTO, ON. When the switch is in the AUTO or ON position the SD terminal on the terminal strip is energized through the rocker switch. When the circuit is open, the unit turns OFF the supply fan and terminates all normal operation.

This same circuit can be used as a means of instituting an external shutdown command. Wire 261 can be removed from terminal 3 (SD) of terminal block CTB1 and connected to a wire running to a normally closed contact of the external shutdown device. A wire can then be connect to the other side of the normally closed external contact to terminal 3 (SD) of terminal block CTB1.

Contact Closed = Normal Operation

Contact Open = Shutdown

VAV Heat Relay Output

This is a field wired output that is used to command the VAV boxes to full open during morning warm up 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.

Failure to drive the VAV boxes open during this mode of operation can cause unit shutdown and/or damage to the ductwork due to over-pressurization.

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.

BACNET COMMUNICATION

The Water Cooled Self Contained Unit can communicate to any building automation system using BACNET MSTP communication protocol.

The field connections are made by connecting shielded two-wire cable to TB1 on the IPU control board.

Refer to Communication on page 157 for additional information.

PUMP START OUTPUT

The Unit Controller has a dry contact that can be used to close a circuit to the condenser water pump. The contact is located at terminal block TB-1 - terminal 11 and 12. The rating of the contact is 24 to 120VAC, 40MA to 1 AMP. This feature is provided as a convenience. The condenser water pump does not have to be connected and operated in this way.

The relay contact will be closed whenever the UNIT MODE is as follows:

- OCCUPIED STANDBY
- OCCUPIED COOLING
- UNOCCUPIED COOLING

ALARM CONTACTS

The Unit Controller has a set of dry Alarm Contacts that are closed during a fault. If the unit experiences a Fault, the Unit Controller will close a set of dry contacts between terminals 7 and 8 of the low voltage terminal block (CTB1). *Refer to SECTION 8 – SERVICE for a listing of the unit faults that will generate the alarm output.*

ISOLATION DAMPER CONTROL

On some units, dampers are used to keep the unit isolated from the supply and return duct systems. On these systems, the Isolation Damper must be opened before the Supply Fan Output can be turned on, and it must be turned off once the Supply Fan Output is turned off.

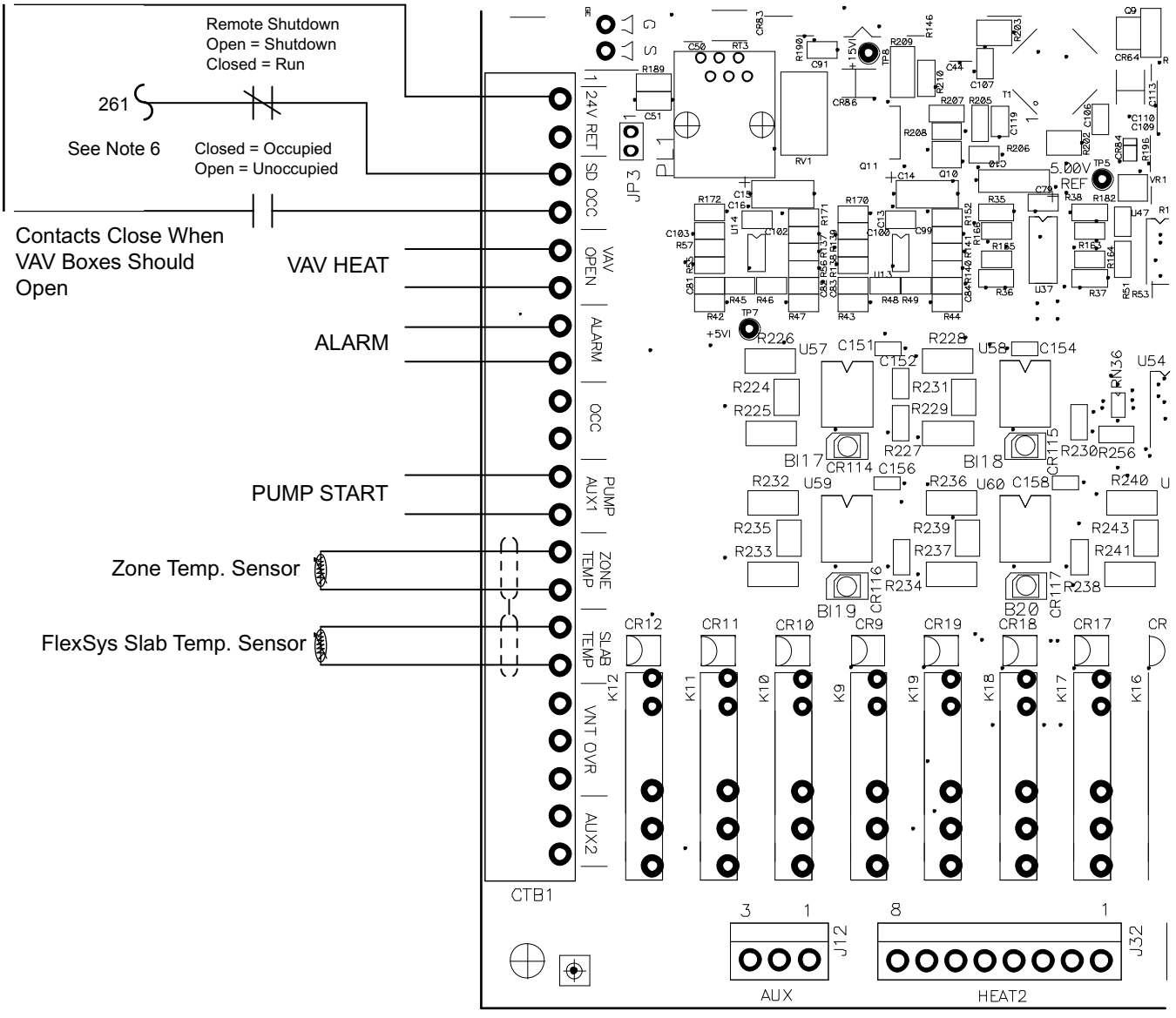
If the Isolation Damper Control is User Enabled, the PUMP/AUX contacts will be turned on when the preceding conditions are met and remain in force for 120 seconds. The Supply Fan Output will be energized after being delayed for 120 seconds to assure any dampers are fully open; the PUMP/AUX contacts will remain on for 60 seconds after the Supply Fan Output turns off, allowing the static pressure to decrease.

The relay contact will be closed whenever the Unit Mode is OCCUPIED STANDBY, OCCUPIED COOLING, or UNOCCUPIED COOLING.

CTB1 FIELD CONTROL WIRING (INPUTS)

CAUTION

24VAC switch voltage must be sourced from the unit. Use of another power source external of the unit may cause equipment damage.



LD13325 mod

Wiring Notes:

1. Wiring shown indicates typical wiring.
2. All wiring is Class 2, low voltage.
3. Maximum power available from the 24VAC terminal is 40VA.
4. Use shielded wire where shown.
5. Relay contacts suitable for pilot duty to 1A from 24VAC to 120VAC.
6. Wire 261 must be removed from the SD terminal and connected to one side of a field installed normally closed contact. The other side of the normally closed contact is connected to the SD terminal.

FIGURE 44 - CTB1 FIELD CONTROL WIRING

PHASE MONITOR

The unit can be ordered with a factory installed Phase Monitor. The monitor checks the 3-phase power to the unit for low voltage, single phasing, or phase reversal. If a fault occurs the Phase Monitor interrupts the 24-VAC power to the SD input at terminal 3 (SD) on terminal block CTB1. The "Unit–Overall Status" at the User Interface will indicate "Local Stop" when the Phase Monitor detects a problem.

The Phase Monitor will restore power to the SD terminal when the fault condition is corrected and the Unit Controller will resume normal unit operation.

DUCTING

Supply Air

For connection of supply ductwork directly to the unit, a duct collar must be mounted at the unit outlet. When connecting ductwork to the unit, a canvas type connecting collar is recommended. It is also recommended to have turning vanes or long radius duct work, especially if duct work turns close to the unit discharge. If the duct work goes in two different directions, two transducers should be used.

If a field fabricated plenum is used, canvas type connectors are recommended at the duct connection to the plenum.

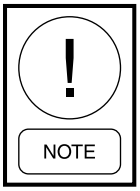
Units are also available with a factory provided discharge plenum. Supply duct connections to the plenum opening(s) should include a canvas type connector. Plenum opening sizes and locations will be indicated on the job submittal drawing.

Return Air

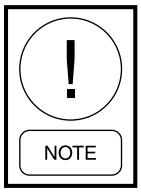
Return air to the unit can be arranged in two ways.

Ducted Return

All ductwork connected to the unit should be of adequate size and construction for the application. A canvas type connecting collar is also recommended where the duct penetrates the machine room wall(s). This will prevent vibration generated by air movement in the duct from being transmitted out to the occupied spaces.



Failure to use the recommended duct collars could result in noise transmission into the occupied space.



Do not obstruct unit access panel located below the return opening.

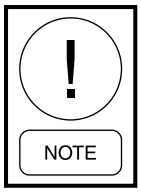
Free Return

The mechanical equipment room may be used as a return plenum with no hard connection at the unit.

Some building codes do not allow the use of mechanical rooms as a return plenum. Applicable local codes should be checked for each installation.

WATER PIPING

General



Piping must comply with local plumbing codes and ordinances.

Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. They can supply the installer with the proper building and safety codes required for a safe and proper installation. The water piping should be installed with a minimum number of bends and elevation changes for best performance. Piping should contain

1. Vibration eliminators to reduce vibration and noise transmission to the building.
2. Shutoff valves to isolate the unit from the piping system during unit servicing.
3. Manual or automatic air vent valves at the high points of the system.
4. Some means of maintaining adequate system water pressure (e.g., expansion tank or regulating valve).
5. Temperature and pressure indicators, and/or P & T Plugs, located at the unit to aid in servicing and checking water flow.

6. A strainer to remove foreign matter from the water before it enters the pump. It should be placed far enough upstream to prevent cavitations at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and help maintain system performance.
7. A strainer with a #30 mesh or finer to remove foreign matter from the water before it enters the unit.
8. Size piping to minimize system pressure drop.
9. All piping must be supported independent of the unit.
10. To aid in service the unit should have a union in the water inlet and outlet water lines.

Condenser Connections

(See *Figure 45*)

1. Condenser water connections enter the unit from the top.
2. All condensers are factory piped for a common condenser water supply and common condenser water return connection.
3. The condenser water supply and return lines are manufactured to allow the use of Victaulic couplings to connect the field piping to the unit. The connections between the unit and the field piping can also be made with a sweat connection. This can be accomplished by cutting off the grooved section of the factory supplied copper tube, intended for the Vitaulic coupling, and then using a copper coupling to sweat the field piping to the unit.

   On units ordered with the limited access option it is recommended that Vitaulic couplings be used for the connection of the field piping to the unit. Access to these joints is achieved by removing the access panel between the blower and evaporator coil compartment and then removing the access panel on the left hand side of the evaporator coil compartment. This restricted access would make it very difficult to make a quality sweat joint.
4. Reference the Unit Dimension drawings (*Figure 25 on page 45 through Figure 43 on page 63*) for the exact location of the supply and return water line connections.

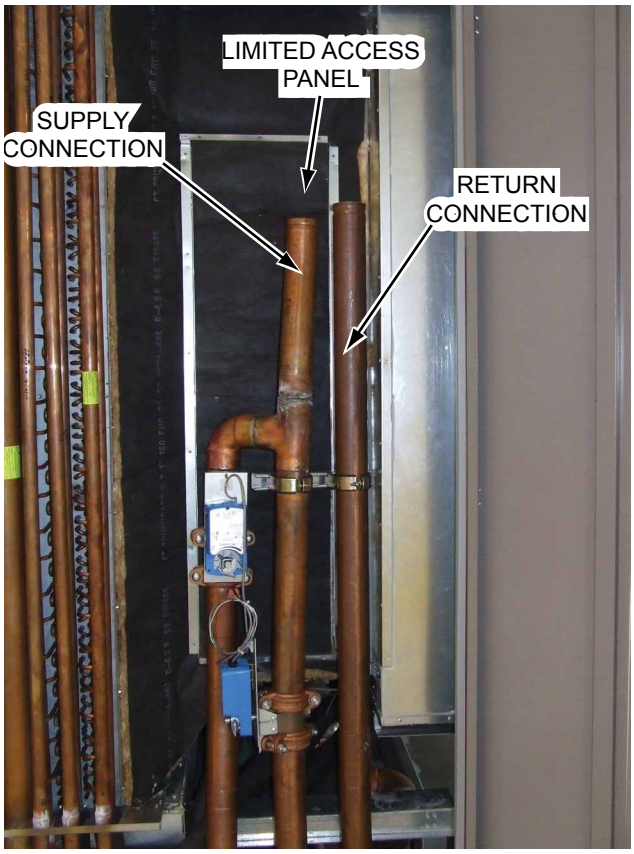
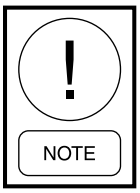


FIGURE 45 - CONDENSER CONNECTIONS

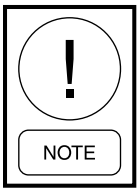
5. Units with factory mounted waterside economizer should not require head pressure control. The economizer will typically elevate the water temperature by 5.0–10.0 °F before entering the condenser, allowing suitable condenser water temperatures whenever the tower supply temperature is 50.0 °F or higher.
6. Head pressure control must be provided if entering condenser water temperatures will go below 45.0 °F.
   a. Fan cycling and/or modulating discharge dampers on the cooling tower, or a three-way bypass around the tower are often used to maintain condenser water temperature. Cooling tower control to maintain the temperature greater than 45.0 °F is generally more cost effective if multiple units are in the loop.
   b. If valves are installed on the individual units, a single water regulating valve controlled by the lowest discharge pressure of the operating compressor(s) will control head pressure.

c. If the water regulating valve is placed in series with the condenser, it should be installed in the water line leaving the condenser and should shut down to prevent water from siphoning out of the condensers.

d. For systems where a constant pumping head is required, the water regulating valve may be installed in a bypass line around the condensers. It must be open on falling discharge pressure. These typical systems, depending on the specific application, must maintain a constant condensing pressure regardless of temperature conditions and must provide adequate head pressure for proper thermal expansion valve operation.



Condenser tube water velocities must not exceed 10 feet per second to prevent erosion of the pipe.



After condenser water has been supplied to the system and prior to unit operation any trapped air must be removed from the condensers. To do this remove the 3/8 inch pipe plug from top of the head of the condenser on the end opposite the piping connection (control box side of the unit) and leave it open until water starts to come out the connection. Reinsert the plug. This sequence must be performed on each of the condensers.

Cooling Towers

Cooling tower control affects the unit cycle rates. Condenser water temperature swings from 10.0–15.0 °F may cause excessive compressor, water valve and unit cycling. Be sure to set the tower controls to minimize compressor unit cycling.

Water Quality

An LSWU water-cooled self-contained unit may be successfully applied in a select range of commercial and industrial applications. It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations.

Water Treatment: Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment. The heat exchangers in the units are tube and shell construction consisting of steel and copper. The water piping to the heat exchanger is copper. There may be other materials in the building's piping system that the designer may need to take into consideration when deciding the parameters of the water quality. If an antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water: In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Waterside Piping Arrangements

Install a condenser water pump between the cooling tower (either open or closed) and the self-contained unit. Lay out the remainder of the system's condenser piping in reverse returns. This helps balance the system by equalizing the length of supply and return pipes. Multistory buildings may use a direct return system with balancing valves at each floor.

Install the supply riser and its return in close proximity. Furnish both with permanent thermometers to check the waterside balance during start-up and routine maintenance checks. Also, include strainers at each pump inlet and unit. Install drain valves at the riser's base to allow drainage points for system flushing during start-up and routine maintenance. For condenser draining and header removal, include a shutoff/balancing valve on the entering and leaving waterside pipes, drain tees, and unions of each unit. Also, install a shutoff valve on the unit entering water pipe for condenser draining.

Water Temperature Requirements

On units without a waterside economizer, do not allow the condensing water temperature to drop below 55.0 °F. Water temperatures below this value will cause the compressors to shut down and the mechanical cooling function will lock out.

On units with waterside economizer the condensing water temperature can drop to 50.0 °F without effecting the operation of the compressors.

Condensate Drain Connections

The condensate drain connection is 1" PVC and is located on the return end of the unit. The drain is internally trapped (no external trap is required). The condensate line should be pitched away from the unit with a minimum slop of 1/8" per foot.

The drain pan and the trap should be kept clean through periodic cleaning. A clean-out is provided, as standard, as part of the trap assembly to aid in cleaning.

LD14015

FIGURE 46 - CONDENSER TRAP

STATIC PRESSURE TRANSDUCER INSTALLATION (VAV UNITS ONLY)

All units provided with a VFD include a factory mounted static pressure transducer (SPS1). The unit can also have an optional second static pressure transducer, (SPS2). The second static pressure transducer would be used if the main supply duct split into two main branches. The control can be programmed to maintain the lowest input, highest input or the average of the two. The sensor is factory wired and requires field installation of 1/4" ID sensor tubing to the selected duct location. A field supplied static pressure probe and tubing must be installed in the field prior to unit start up.

NOTE

Be sure that tubing complies with local code requirements. Flame retardant plastic or metal tubing may be required. Carefully select the ductwork sensing point for the pressure sensor. Improper location of the sensing point will result in unsatisfactory operation of the entire variable air volume system.

The following guidelines should be adhered to:

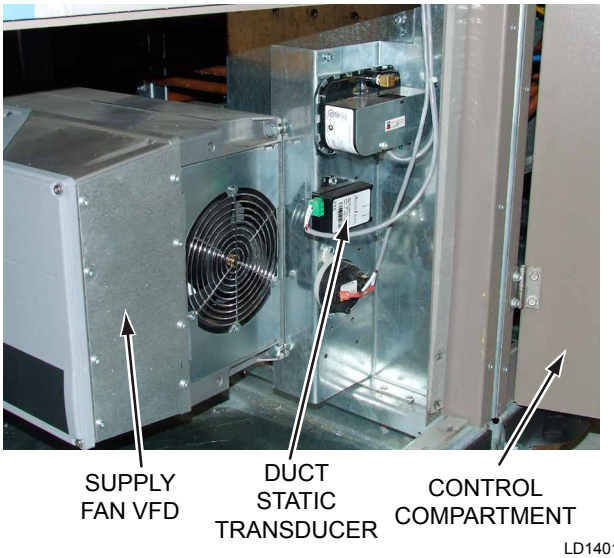
1. Plastic tubing (1/4" ID) must be run from the high pressure tap of the duct static pressure transducer to a static pressure tap (field supplied) in the supply duct. The static pressure probe should be mounted two-thirds of the way down the duct prior to any take off.
2. The sensing probe should be located in a non turbulent flow area of the duct. Keep several duct widths away from bends or neck downs.

Mounting Instructions

1. Drill a hole in the duct in a location per the above guidelines and mount the field supplied duct static sensor.
2. Run the tubing from the duct static probe back to the unit. This tube should be connected to the high port on the transducer.
3. A second tube must be run and positioned in an area that will provide an atmospheric reference to the low side port of the transducer. This is particularly critical on units where the equipment room is used as the return.
4. The duct static transducer(s) (see *Figure 48 on page 72*), are located in the electric compartment. The tubing can be routed through a 7/8" hole in the top of the control enclosure. Make sure to use tie-wraps to keep the pneumatic tubing away from the electrical components and wiring.

NOTE

To avoid confusion between "high" and "low" tubing, it is recommended that two different tubing colors be used and that this information be recorded, along with the sensing point location, on the master building blueprints.

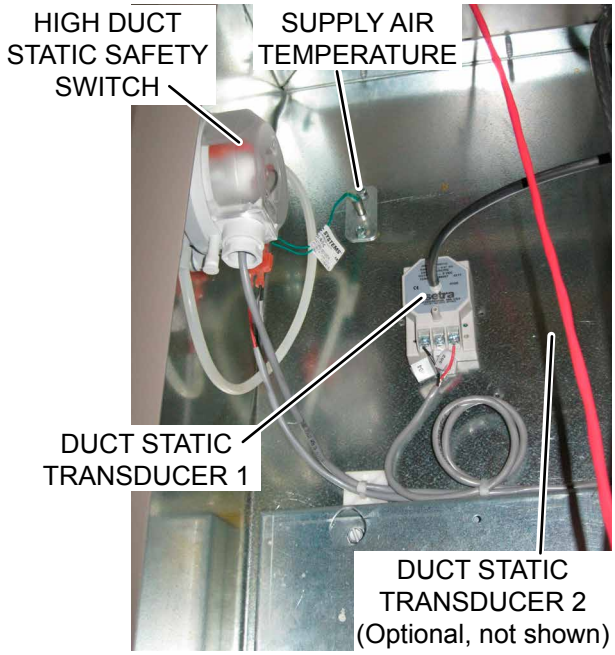


LD14016

FIGURE 47 - DUCT STATIC TRANSDUCER LOCATION

STATIC PRESSURE TRANSDUCER INSTALLATION (FLEXSYS™ UNITS ONLY)

All FlexSys™ units include a factory mounted static pressure sensor (SPS1). The unit can also have an optional second static pressure sensor, (SPS2). The second static pressure sensor would be used to get an average of the static pressure in the under floor space. When two static pressure sensors are used the control can be programmed to maintain the lowest input, highest input, or the average of the two inputs. The sensors are factory wired and require field installation of 1/4" ID sensor tubing to the selected under floor location. A field supplied static pressure probe and tubing must be field installed prior to the start up of the unit.



LD14416

FIGURE 48 - DUCT STATIC TRANSDUCER LOCATIONS

NOTE

Be sure that tubing complies with local code requirements. Flame retardant plastic or metal tubing may be required. Carefully select the ductwork sensing point for the pressure sensor. Improper location of the sensing point will result in unsatisfactory operation of the entire variable air volume system.

Installation Instructions

1. Run the tubing from the duct static probe in the underfloor space back to the unit. This tube should be connected to the high port on the transducer.
2. A second tube must be run and positioned in an area that will provide an atmospheric reference to the low side port of the transducer. This is particularly critical on units where the equipment room is used as the return.
3. The duct static transducer(s), (see *Figure 48 on page 72*) are located in the electric compartment. The tubing can be routed through a 7/8" hole in the top of the control enclosure. Make sure to use tie-wraps to keep the pneumatic tubing away from the electrical components and wiring.

NOTE

To avoid confusion between "high" and "low" tubing, it is recommended that two different tubing colors be used and that this information be recorded, along with the sensing point location, on the master building blueprints.

DUCT HIGH PRESSURE SAFETY KIT

The unit can be ordered with a Duct High Pressure Safety Kit. The kit contains an adjustable differential pressure switch that monitors the pressure between the positive pressure in the blower compartment and atmosphere. The switch has a range of 0.08 to 4.0 "W.C. There is a tap with a 1/8 inch FNPT thread on the post to the right of the control compartment. A factory tube is connected between this fitting and the low side of the switch. If the equipment room is being used as a return, an adapter should be installed in this fitting and tubing run outside the equipment room.

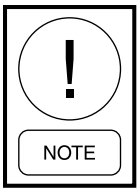
DIRTY FILTER SWITCH

The unit can be ordered with a Dirty Filter Switch. The kit contains an adjustable differential pressure switch that monitors the pressure drop across the filter. The switch has a range of 0.08 to 4.0 "W.C. There is a tap with a 1/8 inch FNPT thread on the corner post on the right hand side of the unit. A factory tube is connected between this fitting and the low side of the switch. If the equipment room is not being used as a return, an adapter should be installed in this fitting and tubing run to the return duct.

When the pressure drop across the filters exceeds the setting of the switch, the switch closes sending a 24-volt signal to the Unit Controller. The Unit Controller posts a warning in the service memory buffer; but will not shut down the unit. The factory default setting for the Dirty Filter Switch is 1.0 "W.C.

STATIC PRESSURE TRANSDUCER INSTALLATION (FLEXSYS™ UNITS ONLY)

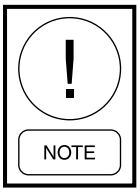
All FlexSys units include a factory mounted static pressure sensor (SPS1). The unit can also have an optional second static pressure sensor, (SPS2). The second static pressure sensor would be used to get an average of the static pressure in the under floor space. When two static pressure sensors are used the control can be programmed to maintain the lowest input, highest input, or the average of the two inputs. The sensors are factory wired and require field installation of 1/4" ID sensor tubing to the selected under floor location. A field supplied static pressure probe and tubing must be field installed prior to the start up of the unit.



Be sure that tubing complies with local code requirements. Flame retardant plastic or metal tubing may be required. Carefully select the ductwork sensing point for the pressure sensor. Improper location of the sensing point will result in unsatisfactory operation of the entire variable air volume system.

Installation Instructions

1. Run the tubing from the duct static probe in the underfloor space back to the unit. This tube should be connected to the high port on the transducer.
2. A second tube must be run and positioned in an area that will provide an atmospheric reference to the low side port of the transducer. This is particularly critical on units where the equipment room is used as the return.
3. The duct static transducer(s) (see *Figure 47 on page 71*) are located in a compartment below the supply air blower and to the left of the control compartment. The tubing can be routed through a 7/8" hole in the top the control enclosure, down the left side of the control compartment and through the partition to the duct static transducer(s). Make sure to use tie-wraps to keep the pneumatic tubing away from the electrical components and wiring.



To avoid confusion between "high" and "low" tubing, it is recommended that two different tubing colors be used and that this information be recorded, along with the sensing point location, on the master building blueprints.

RETURN, OUTDOOR, SUPPLY AIR, AND MIXED AIR SENSORS

Return Air Sensor

All units require the installation of a return air sensor. However, because of the variation of the return air arrangements for this product the return air sensor is shipped loose in the control enclosure and must be field installed and wired to the Unit Controller. The sensor is supplied with 25 foot leads terminated to plug onto the Unit Controller. If a longer length is required, inline butt splices can be used to increase the length. It is important the return air sensor be located so it senses the true return air temperature. The sensor is connected at the J9 terminal strip, terminals 3 and 4.

Supply Air Sensor

All units come with a supply air sensors that are factory wired. The supply air sensor is wired to the Unit Controller and mounted in the supply air section of the unit.

Mixed Air Sensor

All units come with mixed air sensors that are factory wired. The mixed air sensor is wired to the Unit Controller and mounted in the inlet section of the unit.

Freezestat

Units equipped with a waterside economizer coil, hot water coil, or steam coil come with a non-averaging type freezestat installed on the inlet section of the unit. *See Freezestat Operation on page 123 for information on the operation of the freezestat.*

Outdoor Air Sensor

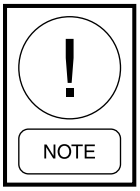
The outdoor air sensor is optional and can be ordered with the unit. The sensor is standard when the air side economizer option is ordered. The outdoor air sensor is shipped loose in the control enclosure and must be field installed and wired to the Unit Controller. The sensor is supplied with 25 foot leads terminated to plug onto the Unit Controller. If a longer length is required, inline butt splices can be used to increase the length. It is important the outdoor air sensor be located so it senses the true outdoor air temperature. The sensor is connected at the J9 terminal strip, terminals 5 and 6.

STEAM HEAT

Specification

The steam coil is a factory installed option and is located at the supply air outlet of the unit. The wiring for the valve is connected to the Unit Controller and routed to the steam heating coil; however, the steam heat control valve is not shipped with the unit. The valve needs to be selected based on the type of heat, capacity, and steam pressure. The valve should operate off 24VAC power supply with a 2–10VDC control signal. The Unit Controller can be configured for direct acting (2VDC closed, 10VDC open) or reverse acting (2VDC open, 10VDC closed).

Steam Piping



Piping must comply with local plumbing codes and ordinances.

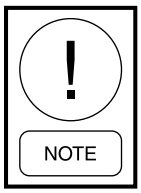
Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. They can supply the installer with the proper building and safety codes required for a safe and proper installation.

HOT WATER HEAT

Specification

The hot water coil is a factory installed option and is located on the leaving side of the evaporator coil. The piping connections are made through the top of the unit. The unit can be ordered with a factory installed two-way modulating valve package. The valve package includes the valve, actuator, wiring, and piping internal to the unit.

Hot Water Piping



Piping must comply with local plumbing codes and ordinances.

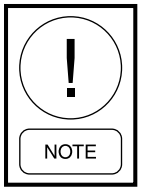
Due to the variety of piping practices, it is advisable to follow the recommendations of local authorities. They can supply the installer with the proper building and safety codes required for a safe and proper installation.

ELECTRIC HEAT

The unit can be ordered with a factory installed two stage electric heat section. The electric heat option is installed on the leaving side of the evaporator coil. The electric heat assembly, including the controls, is contained within the evaporator coil department.

FILTERS

Standard filters are 30% 2 inch. As an option, 4 inch filters can be ordered with efficiencies up to 90%. A 30% 2 inch prefilter can also be ordered with the 4 inch high efficiency filter option. The filters are factory installed in the filter coil section of the unit, prior to the evaporator coil. Filters must always be installed ahead of the evaporator coil. The 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.



The unit should* never *be operated for any length of time without the proper filters installed in the unit.

SECTION 3 – START-UP

(See 145.05-SU7)

To protect warranty, this equipment must be installed and serviced by an authorized Johnson Controls 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.

CRANKCASE HEATERS

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.

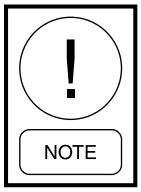
The heater is interlocked with the compressor contactor and is not controlled directly by the microprocessor. When the compressor is OFF, a normally closed auxiliary contact on the compressor contactor closes the circuit and applies power to the crankcase heater.

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 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.

PRE-STARTUP REQUIREMENTS

1. Inspect the unit for shipping or installation damage.
2. Verify the unit is completely and properly installed with ductwork connected. Verify that all construction debris is removed and filters are clean.
3. With all electrical disconnects open, check all electrical connections to be sure they are tight.
4. Visually check for refrigerant piping leaks.
5. Verify the unit condenser water connections and condensate drain connections have been piped.
6. Check for proper water flow according to *Determining Water Flow (Condenser Only) on page 85* and *Determining Water Flow (Waterside Economizer Active) on page 85.*
7. 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 there is no liquid refrigerant in the lower shell of the compressor. With the compressor running, the oil should 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.



Not all compressors will come with an oil sight glass. Most compressors use an oil level port located a few inches up from the bottom.

8. Check the control panel to assure it is free of foreign material (wires, metal chips, etc).
9. Visually inspect field wiring (power and control). Wiring must meet NEC and local codes.
10. Verify fuse sizing in main circuits.
11. On VAV and FlexSys units verify the pneumatic tubing has been field installed between the pressure transducer in the unit and the probe(s) in the ductwork or underfloor space.
12. Check the tightness of setscrews in bearings, drives, and fan wheels *(see Table 12)*.
13. Verify the supply fan shipping restraint bolts have been removed *(refer to Figure 24 on page 41)*.
14. Verify the supply fan rotates freely. Verify proper drive alignment of the supply fan. *Refer to page 80 and 81 for proper procedure.*
15. Verify the entering and leaving condenser water temperature sensors are mounted.
16. Verify the return air temperature sensor and optional outdoor temperature sensors have been installed and that the wiring has been made to the Unit Controller Board. *Refer to Unit Wiring Diagram.*

TABLE 12 - SETSCREW TORQUES

SETSCREW DIAMETER	TORQUE MIN. (FT.- LBS)
#10	4.3
1/4"	10.0
1"	20.0
3/8"	25.0

17. Verify that all mechanical and electrical inspections have been completed per local codes.
18. Make sure the trap for the main evaporator drain pan has been primed by pouring water in the pan until water exits the condensate drain line.
19. Read Section 5 of this manual in order to understand the sequence of operation and Section 6 to understand how to navigate through the User Interface.

UNIT CHECKS – POWER APPLIED

1. Apply 3-phase power to the unit and verify it falls within the voltage range given in *Table 2 on page 13*.
2. Check for voltage imbalance. Voltage imbalance should not exceed 2% of the average voltage.
3. Use the "Force" function of the Unit Controller to energize the supply fan. Verify that it rotates in the proper direction.
4. Insure proper compressor rotation *(see the following instructions 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 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 pressure of each compressor system. Use the "Factory Run Test" feature of the Unit Controller to turn on one compressor system at a time. If there is a rise in the discharge pressure and a decrease in the suction pressure when the compressor is energized, the compressor is properly phased and operating in the correct rotation.

If the suction and discharge pressure remain approximately the same the rotation is not correct and the phasing to the compressor must be changed. To do this turn off the power to the unit and switch any two of the three leads on the load side of the contactor for that compressor.

Reenergize the compressor per above and verify the discharge pressure rises and the suction pressure decreases.

Suction and discharge pressure may be monitored under the COMPRESSOR SYSTEMS key of the User Interface or a refrigerant manifold gauge set can be connected to each system.

INITIAL START-UP

After all the other preceding checks have been completed the unit may be placed in operation.

1. Place the "ON – AUTO – OFF" switch in the ON position.
2. The supply fan will cycle ON and permit compressor operation if the air proving switch for the supply fan has closed.
3. If there is a demand for cooling, 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 sight glass 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. The leaving condenser water temperature should be between 85.0 °F and 95.0 °F when checking subcooling. Connect a gauge manifold set to the Schrader service valve connections on the suction and liquid lines of the refrigerant system to be checked. After the system is running and the pressures have stabilized, measure the temperature of the liquid line between the liquid line drier and the expansion valve and the suction line

temperature on the suction line leaving the evaporator coil. Calculate the evaporator superheat and the condensing subcooling. The evaporator superheat should be between 6.0 °F and 11.0 °F. The condenser subcooling should be between 5.0 °F and 12.0 °F. *Refer to the next section 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 supply fan motor and compressors are within the RLA/FLA as listed on the unit data plate.

Refrigerant Charge

This unit comes fully charged from the factory with R-410A. *Table 13 on page 78* is a Pressure/Temperature chart for R-410A.

All compressor systems should be ON and operating at full capacity when checking subcooling and superheat.

Subcooling (R-410A)

When the refrigerant charge is correct, there will be no vapor in the liquid sight glass with the system operating with all the compressors ON.

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 saturation temperature listed in Table 10, for the corresponding discharge pressure. If the unit does not have an access port for liquid access, subtract the condenser coil pressure drop value from the table on this page from the discharge pressure to determine the equivalent saturation temperature.

Example:

The liquid pressure is 355 PSIG and the liquid temperature is 96.0 °F

Saturation Temperature for 355 PSIG = 108.0 °F

Minus the liquid line temp = 96.0 °F

Liquid Line Subcooling of = 12.0 °F

The subcooling should be between 5.0 °F to 12.0 °F with all compressors ON.

Superheat (R-410A)

The superheat should be checked only after steady state operation of the unit has been established, the discharge air temperature has been pulled down to within the control range, and the unit is running with all compressors ON.

The superheat is calculated as the difference between the actual temperature of the refrigerant gas in the suction line and the temperature corresponding to the Suction Pressure as shown in *Table 13 on page 78*.

Example:

The suction pressure is 130 PSIG and the suction line temperature is 56.0 °F.

Suction Line Temperature = 56.0 °F

Saturation Temperature for 130 PSIG = 45.0 °F

Evaporator Superheat = 11.0 °F

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.

The superheat setting should be adjusted to between 6 and 11.0 °F with all compressors ON.

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 you are leak checking a unit charged with R-410A make sure the leak test device is capable of sensing refrigerant R-410A.

NOTE

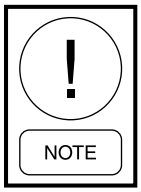
If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the unit controls are functioning properly, the unit is ready to be placed into operation.

TABLE 13 - R410-A PRESSURE / TEMPERATURE CHART

PSIG	TEMP ˚F	PSIG	TEMP ˚F
0	-60	78	20
2	-58	80	21
4	-54	85	24
6	-50	90	26
8	-46	95	29
10	-42	100	32
12	-39	105	34
14	-36	110	36
16	-33	115	39
18	-30	120	41
20	-28	125	43
22	-26	130	45
24	-24	135	47
26	-20	140	49
28	-18	145	51
30	-16	150	53
32	-14	160	57
34	-12	170	60
36	-10	180	64
38	-8	190	67
40	-6	200	70
42	-4	210	73
44	-3	220	76
46	-2	225	78
48	0	235	80
50	1	245	83
52	3	255	85
54	4	265	88
56	6	275	90
58	7	285	92
60	8	295	95
62	10	305	97
64	11	325	101
66	13	355	108
68	14	375	112
70	15	405	118
72	16	500	134
74	17	600	149
76	19	700	159

SECTION 4 – MAINTENANCE

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



Not all compressors will come with an oil sight glass. Most compressors use an oil level port located a few inches up from the bottom.

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, Johnson Controls 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

If the unit is equipped with an air side economizer examine the damper and the 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. At shutdown, the oil level can fall to the bottom limit of the oil sight glass.

Oil Analysis

Use YORK Type "V" POE oil (clear) for units charged with R-410A refrigerant. The type of refrigerant and amount per system is listed in *SECTION 2 – INSTALLATION* and on the unit rating plate. A change in oil color or odor may be an indication of contaminates in the refrigerant system. If this occurs, an oil sample should be taken and analyzed. If contaminates 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. *Refer to Table 14 for lubricating schedule.*

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

TABLE 14 - FAN BEARING – LUBRICATION INTERVALS

SHAFT SIZE INCHES	OPERATING SPEED (RPM)									
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
	LUBRICATION CYCLE (MONTHS)									
1/2 Thru 1	6	6	6	6	6	6	4	4	2	2
1-1/16 Thru 1-7/16	6	6	6	6	6	6	4	4	2	1
1-1/2 Thru 1-3/4	6	6	6	4	4	2	2	2	1	1
1-7/8 Thru 2-3/16	6	6	4	4	2	2	1	1	1	-
2-1/4 Thru 2-7/16	6	4	4	2	2	1	1	1	-	-
2-1/2 Thru 3	6	4	4	2	1	1	1	-	-	-
3-7/16 Thru 3-1/2	6	4	2	1	1	1	-	-	-	-
3-15/16 Thru 4	6	4	2	1	1	-	-	-	-	-

TABLE 15 - BELT TENSION DATA

BELT CROSS SECTION	SMALLEST SHEAVE DIAMETER RANGE	RPM RANGE	BELT DEFECTION FORCE			
			SUPER GRIPBELTS AND UNNOTCHED GRIPBANDS		GRIPNOTCH BELTS AND NOTCHED GRIPBANDS	
			USED BELTS	NEW BELTS	USED BELTS	NEW BELTS
5V, 5VX	4.4 – 6.7	550 – 1749	-	-	10.2	15.2
		1750 – 3000	-	-	8.8	13,2
		3001 – 4000	-	-	5.6	8.5
	7.1 – 10.9	500 – 1740	12.7	18.9	14.8	22.1
		1741 – 3000	11.2	16.7	13.7	20.1
	11.8 – 16.0	500 – 1740	15.5	23.4	17.1	25.5
		1741 – 3000	14.6	21.8	16.8	25.0

Sheave Diameter – Inches; Deflection force – Lbs

Recommended Lubricant for Fan Bearings

The following manufacturers and grease types are approved for use on this equipment:

SHELL – Alvania EP Grease No. 2
TEXACO – Molytex Grease No. 2
MOBIL Mobilux EP2
GULF – Golfcrown Grease No. 2
AMERICAN Amolith Grease No. 2

PERIODIC MAINTENANCE – THREE TO SIX MONTHS

Disconnect and lock-out 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 listed in Table 15*. Never use belt dressing on the belts. If belts slip with the proper tension, use a good grade belt cleanser to clean the belts.

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 wheel and inspect the drain pans for sludge and foreign material. Clean if required.

If unit has an air side economizer, 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 *Figure 49 on page 81*. 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.

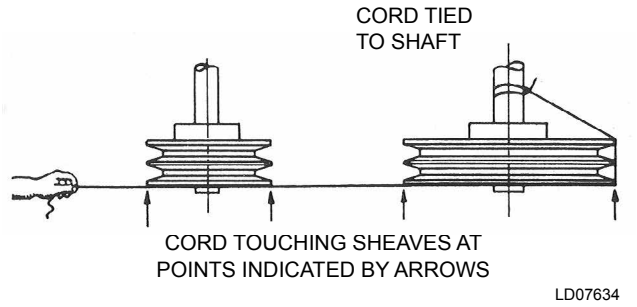


FIGURE 49 - SHEAVE ALIGNMENT

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 set screws or split taper lock bushings. All set screws 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 fan motor.
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

A Browning Belt tension gauge is used in *Figure 50* to properly tension belts.

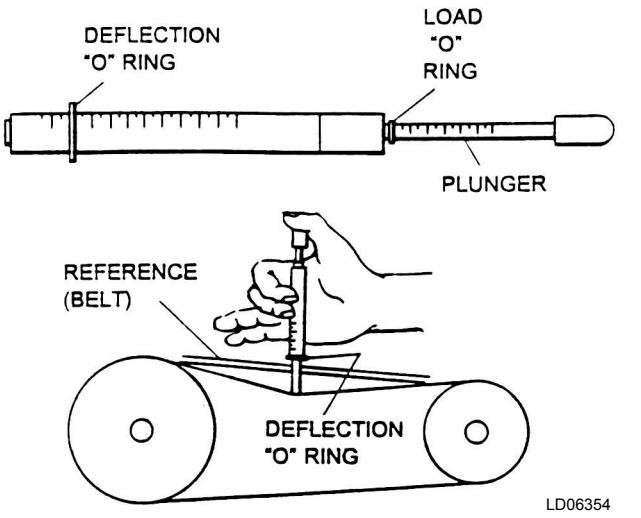


FIGURE 50 - BELT TENSIONING GAUGE

Filter Drier Replacement

The filter drier should be replaced any time a refrigerant system is open. The unit comes with sealed (non-replaceable) solid core driers. The filter driers are sized for factory installation resulting in a smaller drier than would normally be used in the field. When replacing the drier in the field, select a replacement drier based on the tonnage of the system and not the drier that was shipped with the unit.

Supply Fan

In the unlikely event that the supply fan needs to be replaced the following procedure should to be followed:

1. There is an access panel to the right of the blower assembly in the blower compartment that allows access to the rear bearing.
2. 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.
3. Loosen and remove the setscrews on both bearing locking collars. Inspect and, if necessary, replace.
4. Loosen and remove the two setscrews from the Condenser / Compressor side of the supply fan wheel.
5. Using a rubber mallet or brass bar, slowly drive the shaft in one direction until the set screw 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.

6. 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 the key does not get bent by allowing it to ride up the key way edge. The slightest bend will prevent quick assembly. Should it occur, replace the key stock.
7. Remove the shaft, supporting the weight of the wheel. Do not allow the weight of the wheel to be supported by only one bearing during the disassembly process.
8. Remove the wheel through the blower compartment access door.
9. Reassemble in reverse order, centering the wheel over the inlet cone. If bearings were removed or replaced, be sure to reuse any shim stock found between the mounting support / plate and bearing housings.
10. Torque all hardware.
11. Reassemble the Control / Blower section to the Compressor / Condenser section.

Disconnect and lock-out 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

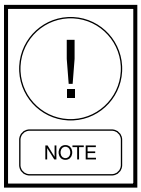
1. Shut off unit power and lock out.
2. Disconnect and tag power wires at motor terminals.
3. Loosen motor brace-to-mounting-rail attaching bolts.
4. Mark belt as to position. Remove and set aside belts.
5. Remove motor bracket hold down bolts.
6. Remove motor pulley and set aside.
7. Remove motor.
8.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

Fan Shaft Bearings

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 set screws 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 Johnson Controls 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 Locking 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.* The various locking devices can be classified under basic types:

- Setscrew-type locking type
- Eccentric locking type
- Concentric locking type
- Skwezloc type.

Condenser Coil Cleaning

The condenser water pressure drop tables can be used to determine proper water flow during unit start up. In addition, they can be used as one of several factors, refrigerant pressures, compressor amps, etc in determining if the unit has a buildup of scale and sludge in the condenser. The following procedure should be used to clean the waterside of the condenser section if required.

1. Shut down the unit.
2. Utilize the appropriate lock out tag out procedure.
3. Open the low point external drain to remove water from the condenser.
4. Remove the condenser access panel from the control compartment side of the unit.
5. Remove the lower drain plug from the cover of the condenser to drain any remaining water from the condenser.
6. Remove the bolts from the condenser shell cover and remove the cover.
7. Clean the condenser tubes with a cable type tube cleaner. The tubes are 5/8" OD.

   Refer to the Renewal Parts Manual (Form # 145.05-RP2, -RP3 or -RP4) for the correct part number for the gasket.
8. Replace the cover and use a crossing pattern in replacing the bolts. The bolts should be torqued to 60 FT/LBS.
9. Refill the waterside of the condenser and purge the air.
10. Open the shut off isolation valves.
11. Inspect the condenser cover and gasket for leaks.
12. Reinstall the condenser access panel.
13. Return the unit to normal operation.

Waterside Economizer Coil Cleaning

The following procedure should be used to clean the waterside economizer coil if required.

1. Shut down the unit.
2. Utilize the appropriate lock out tag out procedure.
3. Open the low point external drain to remove water from the condenser.
4. Open the compressor compartment door.
5. Remove the coil clean out plugs.

A back up wrench must be utilized on the condenser tube while removing the clean out plug to prevent damage to the condenser tube.

6. Clean the tubes with a cable type tube cleaner. The tubes are 1/2" OD.

7. Inspect the O-ring gasket on the clean out plugs. Replace any that shows signs of damage or permanent set.
8. Reinstall the condenser clean out plugs using a back up wrench.

Do not over tighten.

9. Refill the waterside of the condenser and purge the air.
10. Open the shut off isolation valves.
11. Inspect the waterside coil clean-out plug for leaks.
12. Return the unit to normal operation.

WATER PRESSURE DROP TABLES

TABLE 16 - CONDENSER WATER PRESSURE DROP (LSWU025 - 040), FEET OF W.C.

WATER FLOW GPM	CONDENSER ALL MODELS	ADDITIONAL WATERSIDE ECONOMIZER - WHEN ACTIVE			
		LSWU025	LSWU032	LSWU035	LSWU040
50	4.93	2.30	2.08	2.00	2.00
60	6.77	3.19	2.87	2.77	2.77
70	8.86	4.20	3.78	3.63	3.63
80	11.18	5.33	4.79	4.60	4.60
90	13.73	6.58	5.90	5.67	5.67
100	16.49	7.95	7.12	6.84	6.84
110	19.47	9.43	8.43	8.10	8.10
120	22.66	11.02	9.84	9.45	9.45
130	26.06	12.72	11.34	10.89	10.89
140	29.65	14.52	12.94	12.42	12.42
150	33.44	16.44	14.63	14.03	14.03
160	37.43	18.45	16.41	15.74	15.74

NOTES: 1 foot water (60 °F) (ftAq) = 0.43 Psi (Psi)

TABLE 17 - CONDENSER WATER PRESSURE DROP (LSWU050 - 060), FEET OF W.C.

WATER FLOW GPM	CONDENSER ALL MODELS	ADDITIONAL WATERSIDE ECONOMIZER - WHEN ACTIVE	
		LSWU050	LSWU060
100	8.21	2.23	2.23
110	9.71	2.65	2.65
120	11.31	3.10	3.10
130	13.03	3.57	3.57
140	14.84	4.08	4.08
150	16.76	4.61	4.61
160	18.77	5.18	5.18
170	20.89	5.77	5.77
180	23.10	6.40	6.40
190	25.41	7.05	7.05
200	27.81	7.73	7.73
210	30.30	8.43	8.43

TABLE 18 - CONDENSER WATER PRESSURE DROP, FEET OF W.C. (LSWU062 - 105)

WATER FLOW GPM	CONDENSER ALL MODELS	ADDITIONAL WATERSIDE ECONOMIZER - WHEN ACTIVE				
		LSWU062	LSWU070	LSWU085	LSWU095	LSWU105
100	3.2	2.0	1.7	1.5	1.4	1.4
120	4.3	2.8	2.4	2.1	2.0	2.0
140	5.7	3.7	3.1	2.7	2.6	2.6
160	7.2	4.7	4.0	3.5	3.4	3.4
180	8.8	5.9	5.0	4.4	4.2	4.2
200	10.6	7.1	6.1	5.4	5.1	5.1
220	12.5	8.5	7.3	6.4	6.2	6.2
240	14.6	10.0	8.5	7.6	7.2	7.2
260	16.8	11.7	9.9	8.8	8.4	8.4
280	19.1	13.4	11.4	10.1	9.7	9.7
300	21.5	15.2	12.9	11.5	11.0	11.0
320	24.1	17.2	14.6	13.0	12.5	12.5
340	26.8	19.2	16.3	14.6	14.0	14.0
360	29.6	21.4	18.1	16.3	15.5	15.5
380	32.6	23.7	20.0	18.0	17.2	17.2
400	35.7	26.1	22.1	19.8	19.0	19.0

DETERMINING WATER FLOW (CONDENSER ONLY)

1. Be sure that the condenser valve is 100% open and the economizer is 100% closed.
2. Determine the differential water pressure between inlet and outlet.
3. Multiply the difference by 2.31(constant).
4. This answer is the feet of W.C. that is flowing through the unit.
5. Refer to Pressure Drop Tables (*Table 17 on page 84 and Table 18 on page 85.*
6. Locate feet of W.C. from Step 4 in the Condenser All Models column.
7. Cross to the left of the chart to find the GPM.
8. The unit requires 2–3 GPM/ton to operate correctly. See *Table 3 on page 13*.
9. If the flow is low or high, adjustments should be made to the pump/water system to correct.

DETERMINING WATER FLOW (WATERSIDE ECONOMIZER ACTIVE)

1. Be sure that the condenser valve is 100% open and the economizer is 100% open.
2. Determine the differential water pressure between the inlet and outlet.
3. Multiply the difference by 2.31(constant).
4. This answer is the feet of W.C. that is flowing through the unit.
5. Refer to Pressure Drop Tables (*Table 17 on page 84 and Table 18 on page 85.*
6. Take the Condenser flow feet of W.C. from above and add the additional from under the Additional Waterside Economizer - When Active column. This determines total flow with Condenser and Economizer valves 100% open.
7. Cross to the left of the chart to find the GPM.
8. The unit requires 2–3 GPM/ton to operate correctly. See *Table 3 on page 13*.
9. If the flow is low or high, adjustments should be made to the pump/water system to correct.

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SECTION 5 – SEQUENCE OF OPERATION

UNIT TYPE

The Unit Controller is capable of being programmed for three different UNIT TYPES, 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

CONSTANT VOLUME (CV) MODE OPERATION

Current Oper Mode

The "CURRENT OPER MODE," OCCUPIED or UNOCCUPIED, is a derived value and can be established in four ways:

- Placing the ON / AUTO / OFF toggle switch, located below the keypad and display, from the OFF to ON position. This closes a circuit between "24VAC" and "OCC" on the CTB1 terminal block.
- Placing the ON / AUTO / OFF toggle switch from the OFF to AUTO position and supplying a digital input, ON occupied / ON / AUTO / OFF unoccupied. The digital input is made through a connection between "24VAC" and "OCC" on the CTB1 terminal block.
- Placing the ON / AUTO / OFF toggle switch from the ON / AUTO / OFF to AUTO position and supplying a serial input "OCCUPANCY COMMAND." This would usually originate from a BAS.
- Placing the ON / AUTO / OFF toggle switch, from the ON / AUTO / OFF to AUTO position and using the Internal Time clock "OCCUPANCY SCHEDULE." The Internal Time clock can be turned ON and OFF through the PROGRAM key 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 20 submodes of operation:

- "OCCUPIED COOLING"
- "OCC COOLING LOW"
- "OCC COOLING HIGH"
- "OCC COOLING W/ BYP"
- "OCC COOLING W/O BYP"
- "OCCUPIED HEATING"
- "OCC HEATING LOW"
- "OCC HEATING HIGH"
- "OCCUPIED STANDBY"
- "UNOCCUPIED COOLING"
- "UNOC COOLING LOW"
- "UNOC COOLING HIGH"
- "UNOCCUPIED HEATING"
- "UNOC HEATING LOW"
- "UNOC HEATING HIGH"
- "UNOCCUPIED STANDBY"
- "COMFORT VENT COOLING"
- "COMFORT VENT HEATING"
- ''MORNING WARM UP"
- ''UNDER FLOOR TEMP OVERRIDE"
- ''AIR TEMPERING"
- ''FLUSHING ECONO COIL"

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 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 Unit Controller also monitors the switching between the active COOLING or 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.

Return Air Temperature Sensor

All units require the installation of a return air sensor. However, because of the variation of the return air arrangements for this product, the return air sensor is

shipped loose in the control enclosure and must be field installed and wired to the Unit Controller. The sensor is supplied with 25-foot leads terminated to plug onto the Unit Controller. If a longer length is required, in-line butt splices can be used to increase the length. It is important the return air sensor be located so it senses the true Return Air Temperature (RAT). The sensor is connected at the J9 terminal strip, terminals 3 and 4.

Occupied Standby

The Unit Controller determines there is no demand for cooling or heating based on the Current Zone Temperature, through either a WIRED ZONE TEMP (Hardwired) or COMM ZONE TEMP (Communicated) connection to the unit. The cooling or heating operation will start to stage on or off depending on the setpoints shown in *Figure 51 on page 89*.

Unoccupied Standby

The Unit Controller determines there is no demand for cooling or heating based on the Current Zone Temperature, through either a WIRED ZONE TEMP (Hardwired) or COMM ZONE TEMP (Communicated) connection to the unit. The cooling or heating operation will start to stage on or off depending on the setpoints shown in *Figure 51 on page 89*.

Constant Volume Mode

A Constant Volume unit will be controlled by one of two "CONTROL METHODS."

- WIRED ZONE TEMP (Hardwired)
- COMM ZONE TEMP (Communicated)

The "CONTROL METHOD" is entered into the Unit Controller through the PROGRAM key, UNIT DATA subsection of the User Interface.

Supply Fan Operation In Constant Volume Operation

The Supply Fan will be turned ON if the Supply Fan has been OFF for at least 60 seconds and one of the following conditions apply:

- The UNIT MODE is OCCUPIED
- Or the unit is in the MORNING WARMUP mode

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, and the unit is in the UNOCCUPIED STANDBY mode.
- 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 Unit Controller monitors the operation of the Supply Fan by checking the status of a digital input from an air proving switch. After 120 seconds of operation, the Unit Controller looks for a high state (24 volt input) from the air proving switch circuit at terminal block J13 pin 2 of the 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 Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

Zone Temperature Control

(Hardwired or Communicated)

The unit compares the analog WIRED ZONE TEMP or COMM ZONE TEMP input to the "OCC ZONE COOLING," "OCC ZONE HEATING," "UNOCC ZONE COOLING," or "UNOCC ZONE HEATING" setpoints to determine the sub-mode of operation. The following parameters must be programmed through the User Interface:

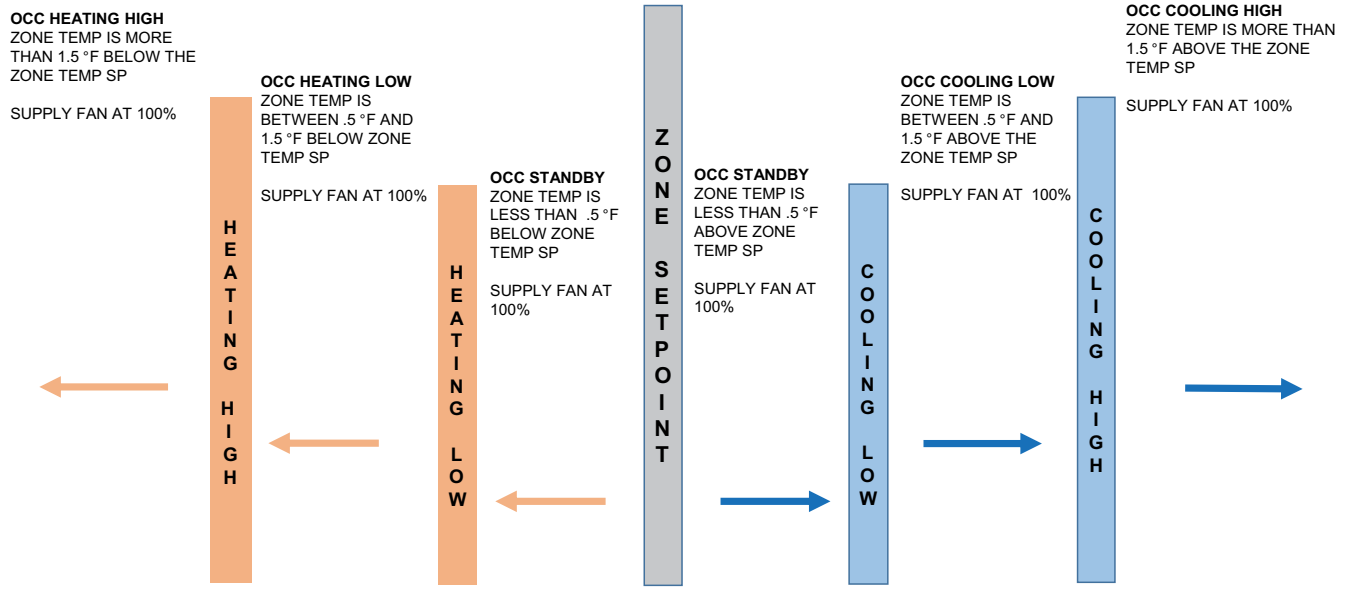
- SETPOINTS key, COOLING subsection:
  - "OCC ZONE COOLING SETPOINT"
  - "UNOCC ZONE COOLING SETPOINT"
- SETPOINTS key, HEATING subsection:
  - "OCC ZONE HEATING SETPOINT"
  - "UNOCC ZONE HEATING SETPOINT"

Figure 51 on page 89 shows what the UNIT MODE would be based on the difference between the zone temperature and the zone temperature setpoints.

The only difference between Hardwired and Communicated is the method the Unit Controller uses to determine the ZONE TEMP. In the HARDWIRED mode, the input is an analog input to the control. In the COMMUNICATED mode, the input is a serial input from a Building Automated control system.

NOTE

A COMM ZONE TEMP (Communicated) connection to the unit will keep the last temperature input from the Building Automation System (BAS) if the communications is interrupted.



NOTES:
1- WHENEVER THE UNIT ENTERS AN ACTIVE COOLING OR HEATING MODE, THE UNIT CONTROLLER WILL UTILIZE AS MANY OR AS FEW STAGES OF COOLING or HEATING THAT IT NEEDS TO ACHIEVE AND MAINTAIN THE ACTIVE SUPPLY AIR TEMP SP.

2- UNOCCUPIED SEQUENCE WILL BE THE SAME AS ABOVE EXCEPT THE ZONE TEMP SPs USED WILL BE THE UNOCC SP's VALUES.

3- UNIT MODES WILL STAGE DOWN WHEN THE ZONE TEMP IS .5 °F UNDER SPs FOR COOLING AND .5 °F OVER SPs FOR HEATING.

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FIGURE 51 - CONSTANT VOLUME SETPOINT DETERMINATION

5

Constant Volume

A Constant Volume unit with the Zone Control Method will not have a direct effect on the control of the compressor and heating stages. Instead the Zone (hardwired or communicated) input is only used to determine the UNIT MODE. The staging of the compressors and factory optioned heat source is always based on the "SUPPLY AIR TEMP ACTIVE SP."

Zone Temperature Control

When the "CONTROL METHOD" is set to Zone Temperature Control (either hardwired or communicated), the "SUPPLY AIR TEMP ACTIVE SP" is determined by the difference between the ZONE TEMP and the appropriate zone setpoint. *Table 19 on page 90* shows the parameters that are used to determine the "SUPPLY AIR TEMP ACTIVE SP."

Where: ΔTOC = "ZONE TEMP" – "OCC ZONE COOLING SETPOINT," ΔTOH = "ZONE TEMP" – "OCC ZONE HEATING SETPOINT," ΔTUC = "ZONE TEMP" – "UNOCC ZONE COOLING SETPOINT," and ΔTUH = "ZONE TEMP" – "UNOCC ZONE HEATING SETPOINT"

TABLE 19 - ACTIVE SAT SETPOINT DETERMINATION, ZONE TEMPERATURE

ΔT_{OC} OCC COOL	ΔT_{OH} OCC HEAT	ΔT_{UC} OCC COOL	ΔT_{UH} OCC HEAT	OCCUPANCY MODE	UNIT MODE	ACTIVE SP
Greater than 0.5 °F				Occupied	Occupied Cooling Low	1st stage cooling setpoint
Greater than 1.5 °F				Occupied	Occupied Cooling High	2nd stage cooling setpoint
	Less than -0.5 °F			Occupied	Occupied Heating Low	1st stage heating setpoint
	Less than -1.5 °F			Occupied	Occupied Heating High	2nd stage heating setpoint
				Occupied	Occupied Standby (See also *Comfort Ventilation on page 90*)	None
		Greater than 0.5 °F		Unoccupied	Unoccupied Cooling Low	1st stage cooling setpoint
		Greater than 1.5 °F		Unoccupied	Unoccupied Cooling High	2nd stage cooling setpoint
			Less than -0.5 °F	Unoccupied	Unoccupied Heating Low	1st stage heating setpoint
			Less than -1.5 °F	Unoccupied	Unoccupied Heating High	2nd stage heating setpoint
				Unoccupied	Unoccupied Standby	None

Comfort Ventilation

When “COMFORT VENTILATION” is selected, the Unit Controller monitors the Supply Air Temp and uses it to energize mechanical cooling or heating even though the 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.

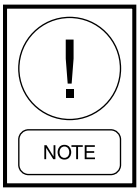
This is usually used when there is a large demand for outdoor air for ventilation. If the Supply Air Temp is equal to or greater than the “OCC ZONE COOLING SETPOINT” plus 5.0 °F, the Unit Controller will enter the COMFORT VENT COOLING mode and initiate compressor operation. If the Supply Air Temp is equal to or less than the “OCC ZONE HEATING SETPOINT” minus 5.0 °F, the Unit Controller will enter the COMFORT VENT HEATING mode and initiate heating operation.

The Unit Controller will terminate COMFORT VENT mode if the Supply Air Temp is less than the “OCC ZONE COOLING SETPOINT” minus 5.0 °F for 5 minutes; the Supply Air Temp is greater than the “OCC ZONE HEATING SETPOINT” plus 5.0 °F for 5 minutes; or the unit switches into the OCCUPIED HEATING OR OCCUPIED COOLING mode as a result of a space sensor demand for cooling or heating.

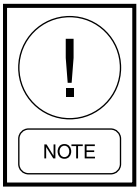
In order for this mode of operation to function, the following parameters must be programmed into the Unit Controller through the User Interface.

- OPTIONS key, UNIT DATA subsection: UNIT TYPE must be set to CONSTANT VOLUME
- PROGRAM key, VENTILATION subsection: “COMFORT VENTILATION must be USER ENABLED
- SETPOINTS key, COOLING subsection: “OCC ZONE COOLING SETPOINT” must be set
- SETPOINTS key, HEATING subsection: “OCC ZONE HEATING SETPOINT” must be set

VARIABLE AIR VOLUME (VAV) MODE OPERATION



For proper operation of the supply fan a delay may need to be added to the unit to allow for the VAV boxes to fully open before the supply fan starts. This can be done through the BAS by delaying the occupied command.



For proper operation the VAV box minimum positions must be set to equal or exceed the minimum VAV flow of the unit. If the minimum VAV flow set points are not greater than the minimum airflow for the unit, nuisance supply fan lockouts could occur.

The "CURRENT OPER MODE," OCCUPIED or UNOCCUPIED, is a derived value and can be established in four ways:

- Placing the ON / AUTO / OFF toggle switch, located below the keypad and display, from the OFF to ON position. This closes a circuit between "24VAC" and "OCC" on the CTB1 terminal block
- Placing the ON / AUTO / OFF toggle switch from the OFF to AUTO position and supplying a digital input, ON occupied / ON / AUTO / OFF unoccupied. The digital input is made through a connection between "24VAC" and "OCC" on the CTB1 terminal block
- Placing the ON / AUTO / OFF toggle switch from the ON / AUTO / OFF to AUTO position and supplying a serial input "OCCUPANCY COMMAND." This would usually originate from a BAS
- Placing the ON / AUTO / OFF toggle switch, from the ON / AUTO / OFF to AUTO position and using the Internal Time clock "OCCUPANCY SCHEDULE." The Internal Time clock can be turned ON and OFF through the PROGRAM key of the User Interface. The occupied / unoccupied schedule can be programmed through the SCHEDULE key of the User Interface

Variable Air Volume (VAV) Supply Fan

The Supply Fan will be turned ON if the Supply Fan has been OFF for at least 60 seconds and one of the following conditions apply:

- 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 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 Unit Controller monitors the operation of the Supply Fan by checking the status of a digital input from an air proving switch. After 60 seconds of operation, the control looks for a high state (24 volt input) from the air proving switch circuit at terminal block J13, pin 2 of the 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 Unit Controller will set a SUPPLY FAN LOCKOUT and shut down all unit system operation.

The Unit Controller 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, and in turn as the duct pressure goes down, the fan will speed up to maintain a DUCT STATIC PRESSURE.

This unit also has a SUPPLY FAN LIMIT LOCKOUT. UNIT TYPE is set to VARIABLE AIR VOLUME or FLEXSYS and the SUPPLY FAN VFD BYPASS is set to USER DISABLED. When the SUPPLY FAN VFD SPEED in parentage is < SUPPLY FAN LOCKOUT LIMIT, the supply fan will stay in operation. Otherwise, LOCKOUT-SUPPLY FAN will go into effect when SUPPLY FAN OUTPUT shows ON and SUPPLY FAN STATUS has been STOPPED for 30 seconds. LOCKOUT-SUPPLY FAN shall be cleared when the set conditions are no longer present if the unit has been shut down.

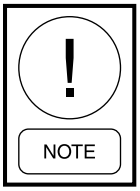
Supply Fan VFD Bypass

This feature allows the unit to be placed in the VFD BYPASS mode through the Unit Interface the following parameters must be set through the User Interface:

- "SUPPLY FAN VFD BYPASS" – OPTIONS key, SUPPLY SYSTEM subsection. This can be set to INSTALLED or NOT INSTALLED.
- "SF VFD BYPASS MODE" – PROGRAM key, SUPPLY SYSTEM subsection. This can be set to BYPASSED.

Sequence of Operation

When "SF VFD BYPASS" is set to"INSTALLED and "SF VFD BYPASS MODE" is set to BYPASSED, the Unit Controller will close contact at connector J17 – terminal 6 to switch the VFD bypass into BYPASS mode.



The bypass VFD is a standard Variable Frequency Drive packaged with an additional set of contactors. When BYPASS mode is activated, contactors route power around the VFD, connecting the indoor fan motor directly to the supply voltage. At this point, the motor will go to full RPM regardless of the duct pressure signal because the VFD is out of the loop, and there is a potential for over pressuring the ducts. The supply fan proving switch will be active when VFD BYPASS is ENABLED.

The air balancer must set maximum duct static / CFM to stay within a static pressure that the ductwork of that installation can tolerate when the motor is at full RPM, considering that the VAV boxes, if they are part of the system, may not be fully open. If the duct system includes VAV boxes, they must be driven open in BYPASS mode. Failure to do so could result in damage to the ductwork and the building structure.

VAV Supply Fan Speed Control

Set point Determination

The following parameters must be set through the User Interface on the display of the unit:

- "DUCT PRESS TRANSDUCER SPAN" – SETPOINTS key, SUPPLY SYSTEM subsection. This can be set for 0.25 "W.C., 1.25 "W.C., 2.50 "W.C., or 5.00 "W.C. based on the span of duct static pressure transducer installed; this will need to be verified by the technician in the field.
- SETPOINTS key, SUPPLY SYSTEMS subsection:
  - "DUCT STATIC RESET LOW SETP"
  - "DUCT STATIC RESET HIGH SETP"
- OPTIONS key, SUPPLY SYSTEMS subsection: "DP SENSOR 2" set to INSTALLED or NOT INSTALLED
- PROGRAM key, SUPPLY SYSTEMS subsection: "DUCT PRESS CNTRL" set to AVERAGE, LOWEST, HIGHEST, or DUCT PRESS 1 ONLY

Sequence of Operation

The "DUCT STATIC PRESS ACTIVE SP" can be varied through the communicated input, DSP_RST_BAS, AV05.

If DSP_RST_BAS is set to 0%, "DUCT STATIC PRESS ACTIVE SP" is the "DUCT STATIC RESET HIGH SETP."

If the DSP_RST_BAS is set to 100%, the "DUCT STATIC PRESS ACTIVE SP" is the "DUCT STATIC RESET LOW SETP."

When DSP_RST_BAS is between 0% and 100%, the "DUCT STATIC PRESS ACTIVE SP" is linearly interpolated between "DUCT STATIC RESET HIGH SETP" and the "DUCT STATIC RESET LOW SETP."

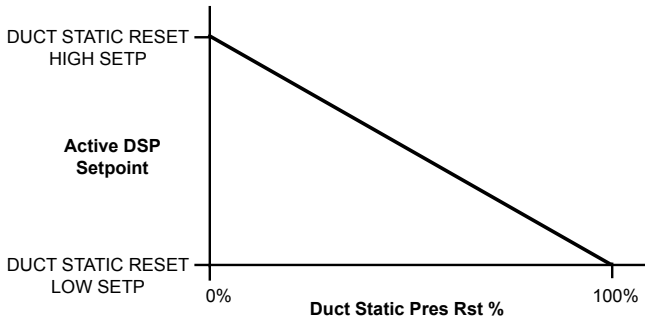


FIGURE 52 - ACTIVE DSP SETPOINT VS. DUCT STATIC PRES RST VOLTAGE

The "DUCT STATIC HIGH SETP" can never be greater than the programmed "DUCT PRESS TRANSDUCER SPAN" (0.25 "W.C., 1.25 "W.C., 2.50 "W.C., or 5.00 "W.C.).

The Unit Controller then varies the 0–10 Volt analog output to the VFD to maintain the “DUCT STATIC PRESS ACTIVE SP.”

If “DUCT PRESS SENSOR 2” is set to DISABLED, the Unit Controller will use the analog input identified as “DUCT STATIC PRESS – CURRENT 1” found at connector J10 – terminal 2 as the active duct static input.

Secondary Duct Pressure Transducer Installed

The Unit Controller can be set up to use a second Duct Pressure Transducer if the building's system requires it due to layout and use of duct work. The duct static input depends on the setting of “DUCT PRESS SENSOR 2” (OPTIONS key, SUPPLY SYSTEM subsection) set to ENABLED.

The “DUCT STATIC HIGH SETP” can never be greater than the programmed “DUCT PRESS TRANSDUCER SPAN” (0.25 "W.C., 1.25 "W.C., 2.50 "W.C., or 5.00 "W.C.). In this case, both duct transducers have to be identical for voltages and operating ranges.

If “DUCT PRESS SENSOR 2” is set to DISABLED, the Unit Controller will use the analog input identified as “DUCT STATIC PRESS – CURRENT 1” found at connector J10 – terminal 2 as the active duct static input.

If “DUCT PRESS SENSOR 2” is set to ENABLED and “DUCT PRESS CNTRL” is set to “HIGHEST,” the Unit Controller will use the higher of analog inputs identified as “DUCT STATIC PRESS – CURRENT 1” found at connector J10 – terminal 2 and “DUCT STATIC PRESS – CURRENT 2” found at connector J10 – terminal 5 as the active duct static input.

If “DUCT PRESS SENSOR 2” is set to ENABLED and “DUCT PRESS CNTRL” is set to “LOWEST,” the Unit Controller will use the lower of analog inputs identified as “DUCT STATIC PRESS – CURRENT 1” and “DUCT STATIC PRESS – CURRENT 2” as the active duct static input.

If “DUCT PRESS SENSOR 2” is set to ENABLED and “DUCT PRESS CNTRL” is set to “AVERAGE,” the Unit Controller will use the average of analog inputs identified as “DUCT STATIC PRESS – CURRENT 1”and “DUCT STATIC PRESS – CURRENT 2” as the active duct static input.

The “DUCT STATIC PRESS ACTIVE SP” can be varied through the communicated input, DSP_RST_BAS, AV05. If DSP_RST_BAS is set to 0%, “DUCT STATIC PRESS ACTIVE SP” is the “DUCT STATIC RESET HIGH SETP.” If the DSP_RST_BAS is set to 100%, the “DUCT STATIC PRESS ACTIVE SP” is the “DUCT STATIC RESET LOW SETP.” When DSP_RST_BAS is between 0% and 100%, the “DUCT STATIC PRESS ACTIVE SP” is linearly interpolated between “DUCT STATIC RESET HIGH SETP” and the “DUCT STATIC RESET LOW SETP.”

The Unit Controller then varies the 0–10 Volt analog output to the VFD to maintain the “DUCT STATIC PRESS ACTIVE SP.”

Supply Fan VFD Frequency

The User Interface will show the approximate frequency of the supply fan VFD under the SUPPLY SYSTEMS key.

When the Supply Fan binary output is OFF, the SUPPLY FAN VFD FREQUENCY will show as 0HZ.

When the Supply Fan binary output is ON, the SUPPLY FAN VFD FREQUENCY will follow.

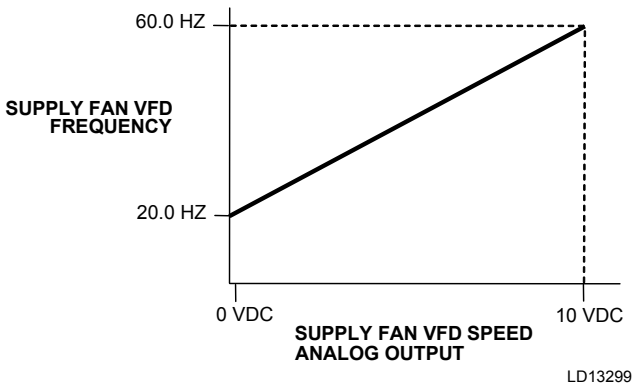


FIGURE 53 - SUPPLY FAN VFD FREQUENCY

For example, when the analog output to the Supply Fan VFD is 0VDC, SUPPLY FAN VFD FREQUENCY will show as 20HZ. When the analog output is 5VDC, SUPPLY FAN VFD FREQUENCY will show as 40HZ. When the analog output is 10VDC, SUPPLY FAN VFD FREQUENCY will show as 60HZ.

High Duct Static Switch Option

The unit can be supplied with a high duct static switch option. The factory installed switch monitors the differential pressure across the supply fan. The high duct static switch is field adjustable 0.08–4.0 "W.C. The input to the Unit Controller is located at connector J13 – terminal 8.

The following parameter must be programmed through the User Interface:

- OPTIONS key, SUPPLY SYSTEM subsection: "DUCT HIGH STATIC SWITCH" must be set to ENABLED

Sequence of Operation

If the duct high static switch input is lost for 5 seconds, the Unit Controller will initiate a "WRN – HIGH DUCT PRESSURE 1" fault and shut down the unit.

If the duct high static switch input is not reestablished after 60 seconds, the Unit Controller will initiate a "LOCKOUT HIGH DUCT PRESS" fault.

If the duct high static switch is reestablished within 60 seconds, the unit will remove the "WRN – HIGH DUCT PRESSURE 1" fault, resume normal operation, and set the HIGH STATIC COUNTER to 1.

If the duct high static switch input is not lost during the next 60 minutes, the HIGH STATIC COUNTER is reset to 0.

If the duct high static switch input is lost for 5 seconds a second time within 60 minutes, the Unit Controller will initiate a "WRN – HIGH DUCT PRESSURE 2" fault, shut down the unit, and set the HIGH STATIC COUNTER to 2.

If the duct high static switch input is lost for 5 seconds a third time within 60 minutes, the Unit Controller will initiate a "LOCKOUT HIGH DUCT PRESS" fault and shut down the unit.

A "LOCKOUT HIGH DUCT PRESS" fault can only be reset by cycling power to the control by using the shutdown input.

Supply Fan Airflow Measurement

The LSWU unit can be ordered with an airflow measuring device installed at the factory and labeled on the unit's option tag. The piezometer must be enabled and set up using the Unit Interface.

How It Works: The System is based on the principle of a flow nozzle. The inlet cone of the fan is used as the flow nozzle, and the flow can be calculated by measuring the static pressure drop through the inlet cone. The pressure drop is measured from the tap located on the face of the inlet cone to the piezometer ring in the throat. The inlet tap is connected to the high-pressure side of the transducer and the piezometer ring is connected to the low-pressure side. The transducer sends a DC signal to the control board on CTB1-20, and the program calculates a CFM rating for air flow.

If "SUPPLY FAN PIEZOMETER" is set to NOT INSTALLED (OPTIONS key, SUPPLY FAN subsection), SUPPLY AIRFLOW will not be calculated or displayed. If it is set to INSTALLED, the following is used to calculate SUPPLY AIRFLOW.

- SETPOINT key, SUPPLY FAN subsection: the "PIEZOMETER K-FACTOR" will need to be set using the range 0.00 to 10,000 (default is 8869)

The calculations are derived for the supply air density by using SUPPLY AIR TEMP CURRENT and UNIT INSTALLED ALTITUDE. Interpolate using *Table 26 on page 130.*

TABLE 20 - PIEZOMETER AIRFLOW MEASUREMENTS

CABINET SIZE	MODEL	FAN TYPE	FAN DIAMETER	FAN MODEL	FAN VENDOR	FAN ONLY	FAN W/ PIEZORING	K FACTOR	EXAMPLE CALCULATED AIRFLOW @ 4.0 IN.WG.
			INCHES			P/N	P/N	k	CFM
									CFM = KX√(IN.WG)
Small	LSWU025	Airfoil Plenum Fan (SWSI)	25	NAPAF 25	COMEFRI	026 42640 100	026 42640 TBD	4608.2	9216
			28	NAPAF 28		026 42641 100	026 42641 TBD	6277.8	12556
	LSWU032		25	NAPAF 25	COMEFRI	026 42640 100	026 42640 TBD	4608.2	9216
			28	NAPAF 28		026 42641 100	026 42641 TBD	6277.8	12556

TABLE 20 - PIEZOMETER AIRFLOW MEASUREMENTS (CONT'D)

CABINET SIZE	MODEL	FAN TYPE	FAN DIAMETER	FAN MODEL	FAN VENDOR	FAN ONLY	FAN W/ PIEZORING	K FACTOR	EXAMPLE CALCULATED AIRFLOW @ 4.0 IN.WG.
			INCHES			P/N	P/N	k	CFM
									CFM = KX√(IN.WG)
Small	LSWU035	Airfoil Plenum Fan (SWSI)	25	NAPAF 25	COMEFRI	026 42640 100	026 42640 TBD	4608.2	9216
			28	NAPAF 28		026 42641 100	026 42641 TBD	6277.8	12556
	LSWU040		25	NAPAF 25	COMEFRI	026 42640 100	026 42640 TBD	4608.2	9216
			28	NAPAF 28		026 42641 100	026 42641 TBD	6277.8	12556
Medium	LSWU 050		32	NAPAF 32	COMEFRI	026 42644 100	026 42644 TBD	7847.3	15695
			36C	NAPAF 36C		026 42645 100	026 42645 TBD	10017.8	20036
	LSWU 060		32	NAPAF 32	COMEFRI	026 42644 100	026 42644 TBD	7847.3	15695
			36C	NAPAF 36C		026 42645 100	026 42645 TBD	10017.8	20036
Large	LSWU062		36	9 blade EPF wheel, special housing	TWIN CITY	026 42645 101	026 42645 101	7032.01	14064
			36	12 blade EPQ wheel, special housing	TWIN CITY	026 42645 102	026 42645 101	7032.01	14064
			40	9 blade EPF wheel, special housing	TWIN CITY	026 42646 101	026 42646 101	8555.41	17111
			40	12 blade EPQ wheel, special housing	TWIN CITY	026 42646 102	026 42646 101	8555.41	17111
	LSWU070		36	9 blade EPF wheel, special housing	TWIN CITY	026 42645 101	026 42645 101	7032.01	14064
			36	12 blade EPQ wheel, special housing	TWIN CITY	026 42645 102	026 42645 101	7032.01	14064
			40	9 blade EPF wheel, special housing	TWIN CITY	026 42646 101	026 42646 101	855.41	1711
			40	12 blade EPQ wheel, special housing	TWIN CITY	026 42646 102	026 42646 101	855.41	1711
	LSWU080		36	9 blade EPF wheel, special housing	TWIN CITY	026 42645 101	026 42645 101	7032.01	14064
			36	12 blade EPQ wheel, special housing	TWIN CITY	026 42645 102	026 42645 101	7032.01	14064
			40	9 blade EPF wheel, special housing	TWIN CITY	026 42646 101	026 42646 101	8555.41	17111
			40	12 blade EPQ wheel, special housing	TWIN CITY	026 42646 102	026 42646 101	8555.41	17111

TABLE 20 - PIEZOMETER AIRFLOW MEASUREMENTS (CONT'D)

CABINET SIZE	MODEL	FAN TYPE	FAN DIAMETER	FAN MODEL	FAN VENDOR	FAN ONLY	FAN W/ PIEZORING	K FACTOR	EXAMPLE CALCULATED AIRFLOW @ 4.0 IN.WG.	
			INCHES			P/N	P/N	k	CFM	
									CFM = KX√(IN.WG)	
Large	LSWU095	Airfoil Plenum Fan (SWSI)	36	9 blade EPF wheel, special housing	TWIN CITY	026 42645 101	026 42645 101	7032.01	14064	
			36	12 blade EPQ wheel, special housing	TWIN CITY	026 42645 102	026 42645 101	7032.01	14064	
			40	9 blade EPF wheel, special housing	TWIN CITY	026 42646 101	026 42646 101	8555.41	17111	
			40	12 blade EPQ wheel, special housing	TWIN CITY	026 42646 102	026 42646 101	8555.41	17111	
	LSWU105		36	9 blade EPF wheel, special housing	TWIN CITY	026 42645 101	026 42645 101	7032.01	14064	
			36	12 blade EPQ wheel, special housing	TWIN CITY	026 42645 102	026 42645 101	7032.01	14064	
			40	9 blade EPF wheel, special housing	TWIN CITY	026 42646 101	026 42646 101	8555.41	17111	
			40	12 blade EPQ wheel, special housing	TWIN CITY	026 42646 102	026 42646 101	8555.41	17111	
								855.4	1710.8	Min
								10017.8	20035.6	Max

Return Air Temperature Sensor

All units require the installation of a return air sensor. However, because of the variation of the return air arrangements for this product, the return air sensor is shipped loose in the control enclosure and must be field installed and wired to the Unit Controller. The sensor is supplied with 25-foot leads terminated to plug onto the Unit Controller. If a longer length is required, inline butt splices can be used to increase the length. It is important the return air sensor be located so it senses the true Return Air Temperature. The sensor is connected at the J9 terminal strip, terminals 3 and 4.

Occupied Standby

The Unit Controller determines there is no demand for cooling or heating based on the Current RAT and the corresponding Cooling RAT and Heating RAT setpoints. The Supply Fan will be ON and controlling the active duct static pressure setpoint.

Unoccupied Standby

The Unit Controller determines there is no demand for cooling or heating based on the Current RAT and the corresponding Cooling RAT and Heating RAT setpoints. The Supply Fan will be ON and controlling the Active duct static pressure setpoint.

Occupied Cooling

In the OCCUPIED COOLING mode, the Unit Controller monitors the RETURN AIR TEMP and compares it to the “RAT COOLING SETPOINT.” The “RAT COOLING SETPOINT” is entered into the Unit Controller through the SETPOINTS key, COOLING subsection of the User Interface. If the RETURN AIR TEMP is equal to or greater than the “RAT COOLING SETPOINT” plus 0.5 °F, the Unit Controller will place the unit in the OCCUPIED COOLING mode until the RETURN AIR TEMP is equal to or less than the “RAT COOLING SETPOINT” minus 0.5 °F.

Occupied Heating

In the OCCUPIED HEATING mode, the Unit Controller monitors the RETURN AIR TEMP and compares it to the “RAT HEATING SETPOINT.” The “RAT HEATING SETPOINT” is entered into the Unit Controller through the SETPOINTS key, HEATING subsection of the User Interface. If the RETURN AIR TEMP is equal to or less than the “RAT HEATING SETPOINT” minus 0.5 °F, the Unit Controller will place the unit in the OCCUPIED HEATING mode.

The unit will remain in the OCCUPIED HEATING mode until the RETURN AIR TEMP is equal to or greater than the "RAT HEATING SETPOINT" plus 0.5 °F.

Unoccupied Cooling

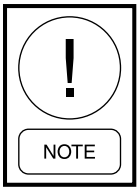
In order to operate in the UNOCCUPIED COOLING mode, "NIGHT SET BACK" must be set to USER ENABLE using the PROGRAM key, HEATING subsection of the User Interface. In the UNOCCUPIED COOLING mode, the Unit Controller will monitor the ZONE TEMP and compare it to the "UNOCC ZONE COOLING SETPOINT." The "UNOCC ZONE COOLING SETPOINT" is set through the SETPOINTS key, COOLING subsection. If the ZONE TEMP is equal to or greater than the "UNOCC ZONE COOLING SETPOINT" temperature plus 0.5 °F. the Unit Controller will place the unit in the UNOCCUPIED COOLING mode.

The unit will remain in the UNOCCUPIED COOLING mode until the ZONE TEMP is equal to or less than the "UNOCC ZONE COOLING SETPOINT" minus 0.5 °F.

Unoccupied Heating

In order to operate in the UNOCCUPIED HEATING mode, "NIGHT SET BACK" must be set to USER ENABLE using the PROGRAM key, HEATING subsection. In the UNOCCUPIED HEATING mode, the Unit Controller will monitor the ZONE TEMP and compare it to the "UNOCC ZONE HEATING SETPOINT" of the User Interface. The "UNOCC ZONE HEATING SETPOINT" is set through the SETPOINTS key, HEATING subsection of the User Interface. If ZONE TEMP is equal to or less than the "UNOCC ZONE HEATING SETPOINT" minus 0.5 °F, the 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 "UNOCC ZONE HEATING SETPOINT" plus 0.5 °F.



A zone temperature signal must be present for the unit to function. If the unit is set for "NIGHT SET BACK" and goes unoccupied without a zone temperature signal, it will shut down.

Variable Air Volume

The "SUPPLY AIR TEMP ACTIVE SP" is always derived from three programmed parameters: "SAT HIGH SETPOINT," "SAT LOW SETPOINT," and the "SAT RESET METHOD." The Unit Controller determines the "SUPPLY AIR TEMP 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 NONE, OUTSIDE AIR, RETURN AIR, or SUPPLY FAN SPEED. If NONE is used and no input is available, the Unit Controller will control to the "SAT HIGH SETPOINT." The following parameters are programmed through the User Interface:

- PROGRAM key, COOLING subsection: "SAT RESET METHOD"
- SETPOINTS key, COOLING subsection:
  - "SAT LOW SETPOINT"
  - "SAT HIGH SETPOINT"
  - "OAT SETPOINT FOR LOW SAT"
  - "OAT SETPOINT FOR HIGH SAT"
  - "RAT SETPOINT FOR LOW SAT"
  - "RAT SETPOINT FOR HIGH SAT"
  - "FAN SPEED SETP FOR LOW SAT"
  - "FAN SPEED SETP FOR HIGH SAT"

(SAT = Supply Air Temperature)

(SP = Setpoint)

Communicated SAT Reset

When the "SAT RESET METHOD" is set to "NONE," the Unit Controller monitors the communicated input, SAT_RST_BAS, AV28, to determine the value of the "SUPPLY AIR TEMP ACTIVE SP." If SAT_RST_BAS is set to 0.0, the "SUPPLY AIR TEMP ACTIVE SP" is the "SAT HIGH SETPOINT." If SAT_RST_BAS is set to 5.0, the "SUPPLY AIR TEMP ACTIVE SP" is "SAT LOW SETPOINT." When SAT_RST_BAS is between 0.0 and 5.0, the "SUPPLY AIR TEMP ACTIVE SP" is linearly interpolated between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT" (see *Figure 54 on page 98*).

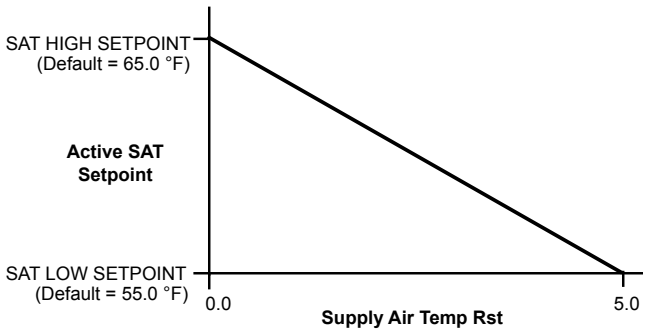


FIGURE 54 - ACTIVE SAT SETPOINT VS. SUPPLY AIR TEMP RST VOLTAGE

Outside Air Based SAT Reset

When the "SAT RESET METHOD" is set to OUTSIDE AIR, the Unit Controller monitors the OUTSIDE AIR TEMP and sets the "SUPPLY AIR TEMP ACTIVE SP" to a value between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT." If the OUTSIDE AIR TEMP is equal to or less than the "OAT SETPOINT FOR HIGH SAT," the "SUPPLY AIR TEMP ACTIVE SP" is the "SAT HIGH SETPOINT." If the OUTSIDE AIR TEMP is equal to or greater than the "OAT SETPOINT FOR LOW SAT," the "ACTIVE SAT SP" is the "SAT LOW SETPOINT." When the OUTSIDE AIR TEMP is between the "OAT SETPOINT FOR HIGH SAT" and the "OAT SETPOINT FOR LOW SAT," the "SUPPLY AIR TEMP ACTIVE SP" is linearly interpolated between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT" (see *Figure 55 on page 98*).

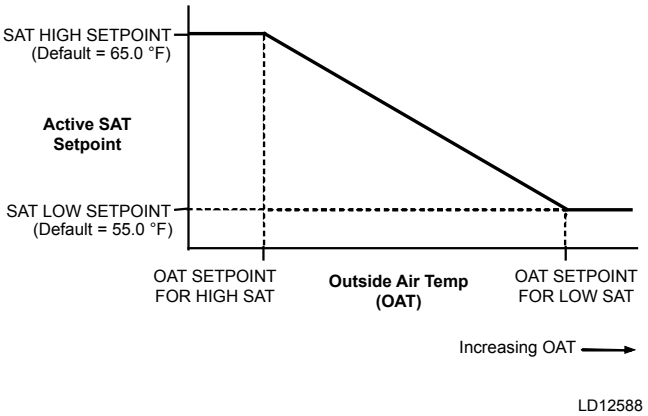


FIGURE 55 - ACTIVE SAT SETPOINT VS. OUTSIDE AIR TEMP

Supply Fan Speed Based SAT Reset

When the "SAT RESET METHOD" is set to "SUPPLY FAN SPEED," the Unit Controller will monitor the "SUPPLY FAN VFD SPEED" command and set the "SUPPLY AIR TEMP ACTIVE SP" to a value between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT." If the "SUPPLY FAN VFD SPEED" is equal to or greater than the "FAN SPEED SETP FOR LOW SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be the "SAT LOW SETPOINT." If the "SUPPLY FAN VFD SPEED" is equal to or less than the "FAN SPEED SETP FOR HIGH SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be the "SAT HIGH SETPOINT." When the "SUPPLY FAN VFD SPEED" is between the "FAN SPEED SETP FOR LOW SAT" and the "FAN SPEED SETP FOR HIGH SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be linearly interpolated between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT"(see *Figure 56 on page 98*).

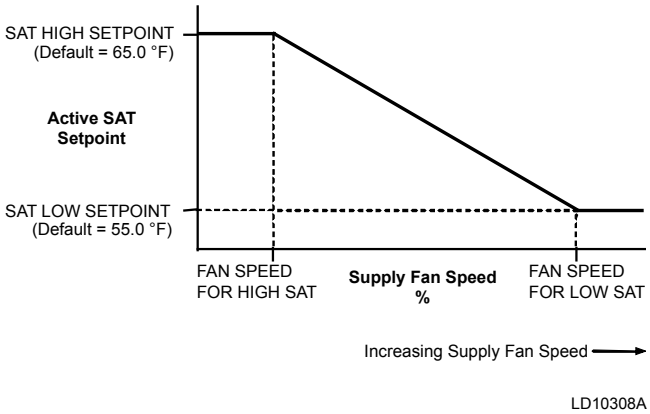


FIGURE 56 - ACTIVE SAT SETPOINT VS. SUPPLY FAN SPEED

Return Air Based SAT Reset

This is the most popular operation. When the "SAT RESET METHOD" is set to "RETURN AIR," the controller monitors the RETURN AIR TEMP and sets the "SUPPLY AIR TEMP ACTIVE SP" to a value between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT." If the RETURN AIR TEMP is equal to or greater than the "RAT SETPOINT FOR LOW SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be the "SAT LOW SETPOINT." If the RETURN AIR TEMP is equal to or less than the "RAT SETPOINT FOR HIGH SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be the "SAT HIGH SETPOINT." When the RETURN AIR TEMP is between the "RAT SETPOINT FOR HIGH SAT" and the "RAT SETPOINT FOR LOW SAT," the "SUPPLY AIR TEMP ACTIVE SP" shall be linearly interpolated between the "SAT HIGH SETPOINT" and the "SAT LOW SETPOINT" *(see Figure 57 on page 99).*

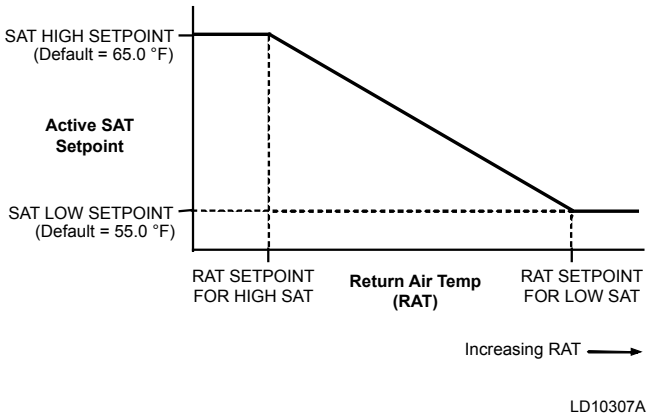


FIGURE 57 - ACTIVE SAT SETPOINT VS. RETURN AIR TEMP

COMPRESSOR CONTROL AND SEQUENCING

Whenever a change in the unit's cooling demand occurs (compressor turned ON, compressor turned OFF, etc.), a 3-1/2 minute Interstage Delay Timer is initiated. During the countdown of the timer, no compressor can be staged ON or OFF until the timer has expired. The only exception would be if the compressor protection circuit experiences a fault.

On CONSTANT VOLUME and VARIABLE AIR VOLUME, when the Unit Controller enters an active COOLING mode, the Unit Controller sets the "COOLING CONTROL OFFSET" to 2.0 °F. The Unit Controller compares the SUPPLY AIR TEMP CURRENT to the "SUPPLY AIR TEMP ACTIVE SP" plus or minus the "COOLING CONTROL OFFSET." If the SUPPLY AIR TEMP CURRENT is greater than the "SUPPLY AIR TEMP ACTIVE SP" plus the "COOLING CONTROL OFFSET" and all of the compressors are not ON, the Unit Controller will initiate a call for compressor or additional compressor operation based on the "NEXT STAGE TO ENABLE."

If the SUPPLY AIR TEMP CURRENT is less than the "SUPPLY AIR TEMP ACTIVE SP" minus the "COOLING CONTROL OFFSET" and all of the compressors are not OFF, the Unit Controller will turn a compressor OFF based on the "NEXT STAGE TO DISABLE."

Compressor Staging Sequence

Compressors are staged up and down to control the SUPPLY AIR TEMP CURRENT to the "SUPPLY AIR TEMP ACTIVE SP," but only if the unit goes into COOLING mode when the Return Air Setpoint RAT is 0.5 °F higher than its setpoint found in the COOLING key on the unit's display.

The compressor staging sequence is determined by the unit size, compressor staging sequence, and the number of starts. Two compressors cannot be brought on at the same time, and there will always be at least a 15 second time delay between starting compressors.

System A Compressor (25–60 Ton Units Only)

The compressor used in System A on 25–60 ton units is a Copeland scroll compressor with digital unloading. The digital unloading feature allows the compressor to operate at approximately 1/3 of capacity, 2/3 of capacity, and full capacity. The compressor requires an additional control to monitor and control the unloading of the compressor. In order to energize the compressor, a binary signal originates at the J16-1. A 1–5VDC analog output is also required at J12-2 and J12-3. The + output is contained at J12-2 and the common at J12-3. *Table 21 on page 99* shows the relationship between the voltage output and the compressor capacity.

TABLE 21 - SYSTEM A COMPRESSOR CAPACITY (25–60 TON)

VDC OUTPUT	COMPRESSOR CAPACITY
1.0 VDC	0 Capacity
2.32 VDC	1/3 Capacity
3.64 VDC	2/3 Capacity
5 VDC	Full Capacity

System A Compressor Unloading Operation (25–60 Ton Units Only)

The compressor unloads by allowing the scrolls to separate. This is accomplished by bypassing the discharge gas so that it does not put pressure on the top of the scrolls. When the pressure is removed, the scrolls open. The Unit Controller uses a 15 second duty cycle to maintain the capacity. If the compressor is at 1/3 (33%) capacity, the compressor will be unloaded for 10 seconds and loaded for 5 seconds (see *Figure 58 on page 100)*. If the compressor is at 2/3 (67%) capacity, the compressor will be unloaded for 5 seconds and loaded for 10 seconds (see *Figure 59 on page 100)*. In the 15-second cycle, the loaded portion of the cycle will occur first before it unloads.

During operation, the solenoid is not energized during the loaded state of the compressor. When the compressor is unloaded, the solenoid is energized via the controller with 24VAC. If the solenoid fails, the compressor will default to 100% loaded capacity.

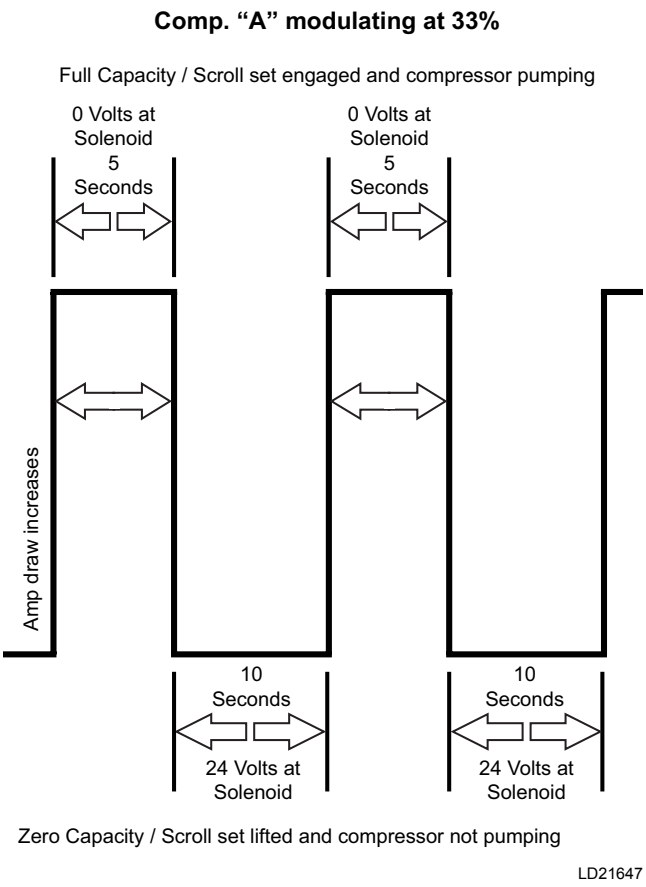


FIGURE 58 - SYSTEM A COMPRESSOR AT 1/3 CAPACITY

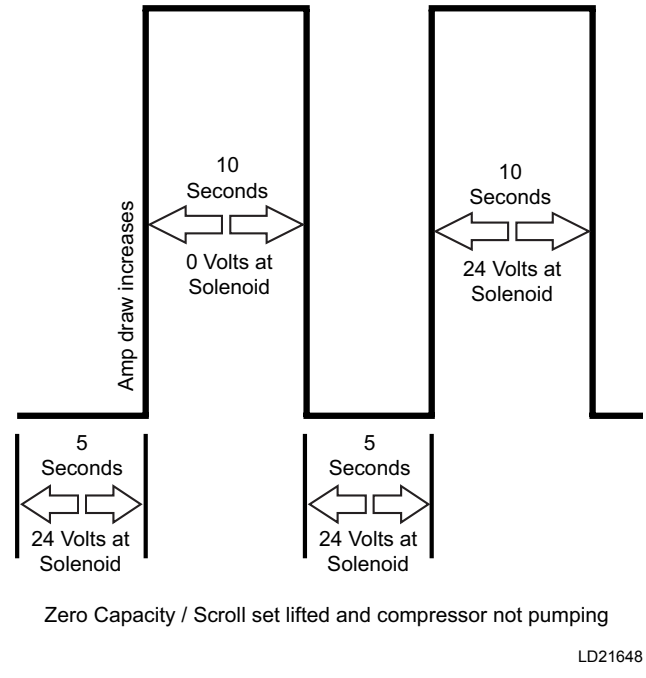


FIGURE 59 - SYSTEM A COMPRESSOR AT 2/3 CAPACITY

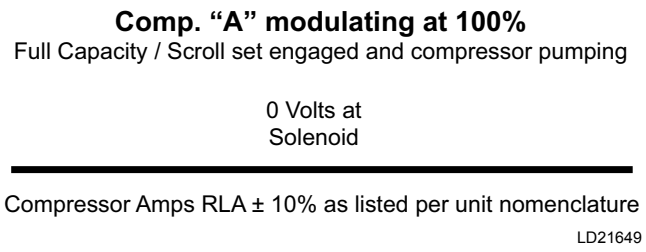


FIGURE 60 - SYSTEM A COMPRESSOR AT FULL CAPACITY

The Digital Compressor Controller always unloads the compressor for 0.1 seconds at each start up. After this brief unloading period, the unloader solenoid will be de-energized and the compressor will run loaded according to the level of the demand input signal. Each time the compressor shuts down, the Digital Compressor Controller will run the compressor unloaded for 0.5 seconds. Energizing the unloader solenoid for this period of time will allow the discharge and suction pressure to equalize, minimizing scroll reverse rotation.

Discharge Pressure Monitored

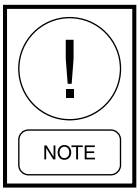
The Unit Controller uses discharge pressure to control the water flow through the condenser. Since the discharge pressure for System A will vary when the compressor is at part load capacity, the Unit Controller will calculate a 15 second rolling average for System A discharge pressure.

The Unit Controller also uses a suction pressure input to protect the compressor against low suction pressure. Since the suction pressure for System A will vary when the compressor is at part load capacity, the Unit Controller will calculate a 15 second rolling average for the System A suction pressure.

If a non-digital unloading compressor should fault, the staging proceeds as best it can without it (the failing compressor will just not be available, and adequate cooling may not be achievable). If that compressor later becomes available again, it will be staged in at the appropriate time if more cooling is required.

If the digital unloading compressor should fault, the staging is done simply by choosing the compressor with fewest starts as required. If the digital unloading compressor returns to service, it will immediately be staged in (as if it were the first cooling stage) if more cooling is requested. If less cooling is required, one of the other compressors will first be stopped, and then the digital unloading compressor will be started and "COMPRESSOR A LOAD" immediately set to "DIG COMP LOAD PT 2," which is about two-thirds loaded.

The "SAFETY INPUT CHAIN A" shall be ignored until "COMPRESSOR A LOAD" has been set above 0% for 5 seconds. It should be ignored again once the "COMPRESSOR A LOAD" has been set to 0%.



If reducing or increasing cooling can be done by changing the "COMPRESSOR A LOAD," the number of running compressors will not change. Compressor "A" will modulate in the range of 33% to 100%. In this case, other control algorithms that need to know when staging has been accomplished (Condenser Water Control, Condenser Valve with Economizer, etc.) will require a recalculated algorithm in the controller for proper operation.

The Digital Compressor Controller has a POWER, UNLOADER, and ALERT LED. Refer to *Digital Compressor Controller Fault Codes on page 186* for a detailed explanation for each of these LEDs.

Two Compressor Units (025, 032, 035, 040 Models)

UNIT SIZE must be set through the User Interface, OPTIONS key, UNIT DATA subsection. The correct unit size is selected from the available options.

STAGING UP	NEXT STAGE TO ENABLE
Stage 0 to 1	Compressor “A” at 33% of Capacity
Stage 1 to 2	Compressor “A” at 66% of Capacity
Stage 2 to 3	Compressor “A” Fully Loaded
Stage 3 to 4	Compressor “B” with Compressor “A” at 33% of Capacity
Stage 4 to 5	Compressor “B” with Compressor “A” at 66% of Capacity
Stage 5 to 6	Compressor “B” with Compressor “A” at Full Capacity
STAGING DOWN	**NEXT STAGE TO DISABLE**
Stage 6 to 5	Compressor “B” with Compressor “A” at Full Capacity
Stage 5 to 4	Compressor “B” with Compressor “A” at 66% of Capacity
Stage 4 to 3	Compressor “B” with Compressor “A” at 33% of Capacity
Stage 3 to 2	Compressor “A” Fully Loaded
Stage 2 to 1	Compressor “A” at 66% of Capacity
Stage 1 to 0	Compressor “A” at 33% of Capacity

Three Compressor Units (050 and 060 Models)

UNIT SIZE must be set through the User Interface, OPTIONS key, UNIT DATA subsection. The correct unit size is selected from the available options.

STAGING UP	NEXT STAGE TO ENABLE
Stage 0 to 1	Compressor “A” at 33% of Capacity
Stage 1 to 2	Compressor “A” at 66% of Capacity
Stage 2 to 3	Compressor “A” Fully Loaded
Stage 3 to 4	Compressor “B” or “C” (Based on Fewest Number of Starts) with Compressor “A” at 33% of Capacity
Stage 4 to 5	Compressor “B” Or “C” with Compressor “A” at 66% of Capacity
Stage 5 to 6	Compressor “B” Or “C” with Compressor “A” at Full Capacity
Stage 6 to 7	Compressor “B” and “C” with Compressor “A” at 33% of Capacity
Stage 7 to 8	Compressor “B” and “C” with Compressor “A” at 66% Of Capacity
Stage 8 to 9	Compressor “B” and “C” with Compressor “A” at Full Capacity
STAGING DOWN	**NEXT STAGE TO DISABLE**
Stage 9 to 8	Compressor “B” and “C” with Compressor “A” at Full Capacity
Stage 8 to 7	Compressor “B” and “C” with Compressor “A” at 66% Capacity
Stage 7 to 6	Compressor “B” and “C” with Compressor “A” at 33% Capacity
Stage 6 to 5	Compressor “B” or “C” (Based on Fewest Number of Starts) with Compressor “A” at Full Capacity
Stage 5 to 4	Compressor “B” Or “C” with Compressor “A” at 66% Of Capacity
Stage 4 to 3	Compressor “B” Or “C” with Compressor “A” at 33% of Capacity
Stage 3 to 2	Compressor “A” Fully Loaded
Stage 2 to 1	Compressor “A” at 66% of Capacity
Stage 1 to 0	Compressor “A” at 33% of Capacity

See *Compressor Staging Sequence on page 99*.

Four Compressor Units (062, 070, 085 Models)

UNIT SIZE must be set through the User Interface, OPTIONS key, UNIT DATA subsection. The correct unit size is selected from the available options.

STAGING UP	NEXT STAGE TO ENABLE
Stage 0 to 1	Compressor C or D with the fewest number of starts.
Stage 1 to 2	Compressor C or D not on.
Stage 2 to 3	Compressor A or B with the fewest number of starts.
Stage 3 to 4	The remaining compressor that is off.

STAGING DOWN	NEXT STAGE TO DISABLE
Stage 4 to 3	Compressor A or B with the fewest number of starts.
Stage 3 to 2	Compressor A or B that is on.
Stage 2 to 1	Compressor C or D with the fewest number of starts.
Stage 1 to 0	The remaining compressor that is off.

Six Compressor Units (095, 105 Models)

UNIT SIZE must be set through the User Interface, OPTIONS key, UNIT DATA subsection. The correct unit size is selected from the available options.

STAGING UP	NEXT STAGE TO ENABLE
Stage 0 to 1	Compressor E or F with the fewest number of starts.
Stage 1 to 2	Compressor E or F not on.
Stage 2 to 3	Compressor C or D with the fewest number of starts.
Stage 3 to 4	Compressor C or D not on.
Stage 4 to 5	Compressor A or B with the fewest number of starts.
Stage 5 to 6	The remaining compressor that is off.

STAGING DOWN	NEXT STAGE TO DISABLE
Stage 6 to 5	Compressor A or B with the fewest number of starts.
Stage 5 to 4	Compressor A or B that is on.
Stage 4 to 3	Compressor C or D with the fewest number of starts.
Stage 3 to 2	Compressor C or D that is on.
Stage 2 to 1	Compressor E or F with the fewest number of starts.
Stage 1 to 0	The remaining compressor on.

COMPRESSOR OPERATION

Compressor Data

In order to assist the Service Technician and to assure equal wear on all of the compressors in the unit, the 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 (A, B, C, etc.). This data can be viewed 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. The # symbol will vary to match the compressor number the data is being recorded for (A, B, C etc.). This data can be viewed 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. The # symbol 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 Unit Controller monitors the following derived data while the "COMPRESSOR # STATE" is OFF to make the determination:

- "WRN-LOW WATER TEMP"
- "WRN-LOW WATER FLOW"
- "WRN-SUCT PRESS XDCR#"
- "WRN-DISC PRESS XDCR#"
- "LOCKOUT-LOW PRESS SYS #"
- "SUPPLY FAN STATUS"
- "AUTO RESET-COMPRESSOR SYSTEM #-TRIP 1"
- "AUTO RESET-COMPRESSOR SYSTEM #-TRIP 2"
- "AUTO RESET-COMPRESSOR SYSTEM #-CLEAR"
- "LOCKOUT-COMP SAFETY SYS #"

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.

The # symbol will vary to match the compressor number the data is being recorded for (A, B, C, etc.).

Compressor Status Display

The compressor status will always display the following:

- "READY" – Indicates the compressor is OFF and ready for use
- "COMP ON" – Indicates a binary output is being sent for compressor operation
- "OFF-ASCD" – Indicates the compressor is OFF but not ready to run because the minimum OFF time of 3-1/2 minutes has not been met
- "USER DISABLED" – Indicates the compressor has been disabled through the PROGRAM key
- "SAFETY TRIP 1" – Indicates the compressor has experienced an initial Compressor Safety Circuit trip. See *Compressor Safety Circuit on page 103*.
- "SAFETY TRIP 2" - Indicates the compressor has experienced a second Compressor Safety Circuit trip within 120 minutes. See *Compressor Safety Circuit on page 103*.
- "SAFETY LOCKOUT" – Indicates the compressor has experienced a third Compressor Safety Circuit trip within 120 minutes and is locked out. See *Compressor Safety Circuit on page 103*.
- "LOW PRESS LOCKOUT" – Indicates the suction pressure for the compressor had fallen below the SUCTION PRESSURE LIMIT and remained at that level beyond the calculated TRIPTIME. See *Low Pressure Monitoring on page 105* for a detailed explanation.
- "INHIBITED" – Indicates one of the following is active:
  - "WRN-LOW WATER TEMP"
  - "WRN-LOW WATER FLOW"
  - "WRN-SUCT PRESS XDCR#"
  - "WRN-DISC PRESS XDCR#"
  - "LOCKOUT-LOW PRESS SYS #"
  - "SUPPLY FAN STATUS"

Because conditions can occur that more than one of the above criteria was active concurrently, the following priority level in *Table 22 on page 103* is used to determine which of the above to display. The greater the number, the higher the priority. The highest priority criteria will be displayed.

TABLE 22 - COMPRESSOR STATUS PRIORITY LEVEL

PRIORITY LEVEL	MESSAGE
1	Ready
2	Comp On
3	Off-Ascd
4	Inhibited
5	Safety Trip 1
6	Safety Trip 2
7	User Disabled
8	Safety Lockout
9	Low Press Lockout

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 refrigerant system fall outside the safe operating envelope for the compressors. *Table 23 on page 104* identifies which of the following safeties are contained in the system.

High Pressure Cutout

The high pressure cutout is mounted on the discharge line and is an automatic reset device. The switch opens at 500 PSIG and resets at 375 PSIG.

External Compressor Motor Protector

The external motor protector is contained in the compressor control box and monitors a sensor imbedded in the windings of the compressor. If the protection module opens, it takes 30 minutes plus or minus 5 minutes for it to reset depending on how hot the motor is and the ambient temperature. To troubleshoot the protector, check the resistance of the sensor:

- Normal resistance is 250 to 2250 Ohms
- Trip resistance is more than 4500 Ohms plus or minus 20%
- Reset resistance is less than 2750 Ohms

Internal Compressor Line Break (Compressor System A (25–60 Ton))

If the compressor goes offline because of the internal line break, it will indicate a Fault Code 3 on the Digital Compressor Controller and will result in the opening of the compressor safety circuit. This situation should be picked up by the Compressor Motor Protection Module, but the problem could still exist and can be determined by doing an Ohm reading on the motor.

Internal Compressor Line Break (Compressor System B–F)

If the compressor goes offline because of the internal line break, it will not result in the opening of the compressor safety circuit and will not show up in the compressor status screen. The Unit Controller will continue to send a 24VAC binary signal to the compressor contactor. When the internal Compressor Line Break resets, the compressor will come back online provided there is still a call for its operation. This situation should be picked up by the Compressor Motor Protection Module, but the problem could still exist and can be determined by doing an Ohm reading on the motor.

Digital Compressor Controller

Refer to *SECTION 8 – SERVICE* in this manual for a detailed explanation on the operation of the Digital Compressor Controller. If the Digital Compressor Controller interrupts the operation of the compressor, it will result in the opening of the compressor safety circuit.

Circuit Breaker (Compressor System A (25–60 Ton))

If the compressor "A" goes offline because of the circuit breaker, it will indicate a Fault Code 3 on the Digital Compressor Controller and will result in the opening of the compressor safety circuit. The circuit breaker must be manually reset, as well as resetting the Compressor lockout through the Unit Controller before the compressor will be able to operate.

Circuit Breaker (Compressor Systems B–F)

If the compressor goes offline because of the circuit breaker, it will not result in the opening of the compressor safety circuit and will not show up in the compressor status screen. The Unit Controller will continue to send a 24VAC binary signal to the compressor contactor. The circuit breaker will have to be manually reset in order to operate the compressor.

The safety circuit supplies a binary 24VAC input to the Unit Controller. The input for Compressor System A is connector J21, pin 2; the input for Compressor System B is connector J21, pin 5; the input for Compressor System C is connector J22, pin 2G; the input for Compressor System D is connector J22, pin 5; the input for Compressor System E is connector J23, pin 2; and the input for Compressor System F is connector J23, pin 5.

TABLE 23 - COMPRESSOR SAFETIES

UNIT	COMP	HIGH PRESSURE CUT OUT	EXTERNAL COMPRESSOR MOTOR PROTECTOR	INTERNAL COMPRESSOR LINE BREAK	DIGITAL COMPRESSOR CONTROLLER	CIRCUIT BREAKER
025	A	Yes	No	Yes	Yes	Yes
025	B	Yes	No	Yes	No	Yes
032	A	Yes	Yes	No	Yes	Yes
032	B	Yes	No	Yes	No	Yes
035	A	Yes	Yes	No	Yes	Yes
035	B	Yes	Yes	No	No	Yes
040	A	Yes	Yes	No	Yes	Yes
040	B	Yes	Yes	No	No	Yes
050	A	Yes	Yes	No	Yes	Yes
050	B	Yes	No	Yes	No	Yes
050	C	Yes	No	Yes	No	Yes
060	A	Yes	Yes	No	Yes	Yes
060	B	Yes	Yes	No	No	Yes
060	C	Yes	Yes	No	No	Yes

If one of the safeties opens, the signal is lost. When this occurs, the Unit Controller turns off the compressor. The Unit Controller then records the time it takes for the safety circuit to reestablish the 24VAC safety circuit to the Unit Controller. The time to reset is displayed in the HISTORY buffer and is identified as "COMP STATUS (A, B, C, etc. . . .) CLEAR TIME." The length of time it takes to reset is an indication of which safeties opened. For example, the External Motor Protector takes 30 minutes to reset. The High Pressure Cutout usually resets in less than a minute. If time to reset is greater than 60 minutes, the HISTORY buffer will replace the "COMP STATUS (A, B, C, etc. . . .) CLEAR TIME" with "COMPRESSOR SYSTEM (A, B, C, etc. . . .) TIME OUT."

The safety circuit input is ignored when the compressor is OFF. If the compressor is ON and the 24 volt safety circuit input is lost to the Unit Controller for two seconds, the Unit Controller turns OFF the compressor. 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 – "COMP SYS # STATUS – SAFETY TRIP"
- COMPRESSOR SYSTEM # screen – "SAFETY TRIP (1 or 2)"
- The HISTORY buffer will store and display "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 Unit Controller will lock out the compressor having the fault and prevent further operation of the compressor until the system is manually reset. The User Interface will display the following messages:

- STATUS screen – "COMP SYS # STATUS – SAFETY LOCKOUT"
- COMPRESSOR SYSTEM # screen – "SAFETY LOCKOUT"
- The HISTORY buffer will store and display "COMP # SAFETY LOCKOUT"

The # symbol will vary to match the compressor number the data is being recorded for (A, B, C, etc.)

Low Pressure Monitoring

The units use a Suction Pressure Transducer in lieu of a Low Pressure Cutout. The Unit Controller monitors the suction pressure in each active compressor system and compares it to a SUCTION PRESSURE LIMIT (90PSIG on this R410A unit).

Since the System A 25–60 ton compressor can vary the capacity which could affect the suction pressure, the Unit Controller calculates a 15 second rolling average pressure. This average pressure is then compared against the SUCTION PRESSURE LIMIT.

Sequence of Operation

If the suction pressure falls 15 PSIG below the SUCTION PRESSURE LIMIT for 5 seconds, the unit will turn off the compressor and declare a "LOCKOUT – LOW PRESS SYS (A, B, C, etc. . . .)" fault.

When the suction pressure falls below the SUCTION PRESSURE LIMIT, the Unit Controller starts an incremental timer and calculates a trip time based on an algorithm in the Unit Controller.

Because the suction pressure may change over time, the triptime will be continuously calculated during which the triptime could increase with a rise in pressure or decrease with a loss of pressure. If the incrementing timer grows to a value greater than or equal to the calculated triptime value, the Unit Controller will turn off the compressor and declare a "LOCKOUT – LOW PRESS SYS (A, B, C, etc. . . .)" fault.

If the suction pressure rises above the SUCTION PRESSURE LIMIT before the incrementing timer overtakes the triptime, the timer will be reset to zero and will not be allowed to start timing again unless the suction pressure falls below the SUCTION PRESSURE LIMIT.

Compressor Lockout

If a compressor lockout has occurred, such as "LOCKOUT – LOW PRESS SYS (A, B, C, etc...)" fault, it can only be reset using the PROGRAM key, COMPRESSOR SYS (A, B, C, etc...) and changing COMP SYS (A, B, C, etc...) STATE from LOCKOUT to RUN.

The following procedure is an example for Fault Reset for compressors, supply system, etc.

NOTE

In the figures below, Compressor System B is used for example only. Other faults and warnings can be found under HISTORY key and traced back to its specific location on the Unit Interface.

1. Select HISTORY key, and enter password 9725.

LD21620

2. Select ▼ key and then the ◄ key or the ► key to select the fault. In this case, "COMPRESSOR B."

LD21621

3. Select ▼ key until the fault is shown. In this case, the safety chain was open and could be cause by several factors (e.g., high pressure switch, motor protection, a broken wire). The wiring diagram can be used for troubleshooting.

LD21622

4. If the fault has been corrected, the compressor must be programmed back ON. Select the PROGRAM key, then the ◄ key or the ► key to "COMPRESSORS," as shown below.

LD21623

5. Push the ✓ key, and the "L" of "LOCKOUT" will be highlighted.

LD21624

6. Select the ◄ key or the ► key to "RUN," and then push the ✓ key to engage the compressor to run.

LD21625

7. If the fault in the safety chain has been corrected, the "RUN" state will stay on. If it changes back to "LOCKOUT" immediately, the fault still exists.

LD21626

NOTE

The compressor might come on when the compressor state is "RUN" if the cooling demand is present and it has exceeded its time delay. There may be other variables built into the logic on the board that might delay the compressor from actually running.

8. Select the COMPRESSOR SYSTEMS key, and use the ◄ key or the ► key to "COMPRESSOR B" if necessary. The status will either show READY or RUN if all safeties are clear.

LD21627

9. Select ▼ key to display the following if all safeties are met.

LD21628

NOTE

If the display shows the compressor state as "COMP ON" and the compressor is not running, the compressor over amp protection may be tripped on the motor starter in the control cabinet.

LD21629

Low Condenser Water Temperature

In order to protect the compressor from damage, the Unit Controller will monitor the entering water temperature and shut off all active compressors if the entering water temperature drops below the lower limit.

Sequence of Operation

If “COND VALVES INSTALL” option is NONE or the “COND WATER CONTROL” setting is set to USER DISABLED, the low limit temperature shall be 50.0 °F. If the “COND VALVES INSTALL” option is COND ONLY or COND W/ BYPASS and the “COND WATER CONTROL” setting is set to USER ENABLED, the low limit temperature shall be 35.0 °F

If the “ENT WATER TEMP” falls below the limit temperature for 30 seconds, a “WRN-LOW WATER TEMP” will be declared and all active compressors will be turned OFF.

If a “WRN-LOW WATER TEMP” is active, it will be reset when the “ENT WATER TEMP” rises above the low limit temperature plus 1.0 °F for 120 seconds.

Water Flow Switch (Factory Installed Option)

When units are equipped with this option, the Unit Controller monitors the status of the binary input from the condenser water flow switch. The 24VAC input can be found at the connector J13 – terminal 10. A 24VAC input at this input indicates adequate condenser water flow.

The following parameter must be programmed through the User Interface:

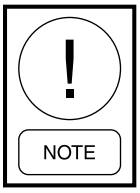
- OPTIONS key, CONDENSER subsection: "WATER FLOW SWITCH" must be set to "INSTALLED"

Sequence of Operation

If the UNIT MODE is OCCUPIED or UNOCCUPIED COOLING and the 24VAC input is lost for 10 seconds a "WRN-LOW WATER FLOW" will be declared and all active compressors will be turned OFF.

After a "WRN-LOW WATER FLOW" is declared, the 24VAC input must be reestablished for 30 seconds before compressor operation will be reinstated.

When "WRN-LOW WATER FLOW" is active, no compressors will be able to run and each compressor status will read "INHIBITED."



Do not apply power to unit with factory installed flow switch if condenser piping has no fluid in it for heat transfer.

WATER COOLED CONDENSER OPERATIONS

The LSWU unit can be ordered with no condenser water valves installed from the factory if regulating refrigerant discharge pressure for proper compressor operation is needed. A water flow sequence would need to be set up on site using third party controls, such as binary or analog controls or BAS (building automation system). Otherwise, no recommendations are made for this except for having the factory ordered controls.

This section will describe the different control and operation scenarios the LSWU unit could have depending on what is factory installed and how the unit is set up through the OPTIONS, PROGRAM, and SETTINGS keys on the Unit Interface.

The following types of valve and piping options are available from the factory:

- No Valve installed
- Condenser Valve only
- Condenser Valve with Bypass
- Condenser Valve with Waterside Economizer

It is recommended that the Technician verify what type of condenser piping is used in the LSWU unit and verify how it is programed for operation under the previously mentioned keys on the unit's User Interface. The Technician needs to verify if the unit is using an economizer for cooling operation, and this will need to be set up in the unit's User Interface.

Condenser Water Control

This setting indicates what type of water system the unit is connected to. It is used to determine what position the water valves should be in when the unit is on but not in an active COOLING mode.

No Valve

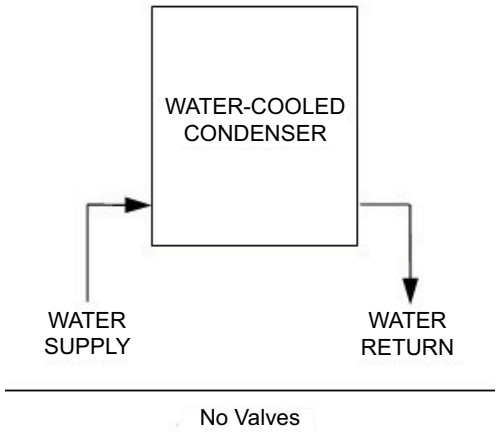


FIGURE 61 - CONDENSER ONLY PIPING DIAGRAM WITH NO VALVES FROM THE FACTORY

5

Condenser Valve Only

Under this mode of operation, the unit has an actuator driven water valve that controls the flow of condenser water through the water-cooled condenser.

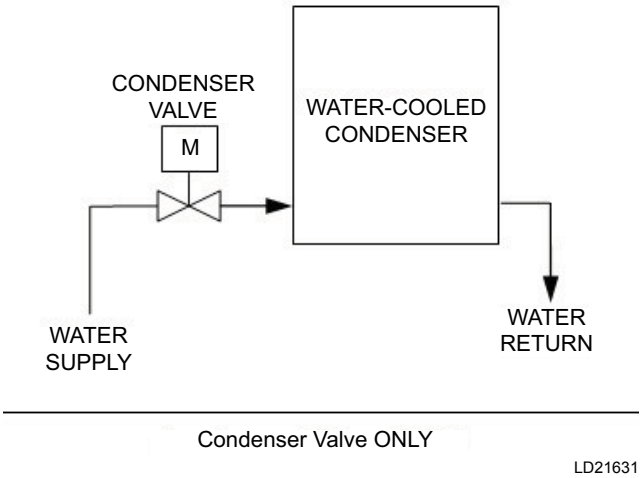


FIGURE 62 - CONDENSER AND PIPING DIAGRAM W/ CONDENSER ONLY VALVE FROM THE FACTORY

COND WATER CONTROL: This setting shall indicate that the controller shall control the water flow through the condenser by modulating the condenser water valve and condenser bypass valves (if field installed).

COND VALVE MIN POS: This setpoint shall be the minimum valve position that the condenser water valve shall maintain whenever a compressor is ON.

COND BYPASS MAX POS: This setpoint shall be the maximum valve position that the condenser water bypass valve can be opened to during operation.

The following parameters must be programmed into the Unit Controller through the User Interface:

Default Settings can be used.

- OPTIONS key, CONDENSER subsection:
  - "COND VALVES INSTALLED" should be set to COND ONLY
  - "CONDENSER TYPE" should be set to WATER COOLED
- PROGRAM key, CONDENSER subsection:
  - "COND WATER CONTROL" should be set to ENABLED
  - "COND WATER SYSTEM" can be set to either VARIABLE FLOW or CONSTANT FLOW depending on the building system
  - FLUSH CYCLE can be set to either ENABLE or DISABLE depending on the building system
- SETPOINTS key, CONDENSER subsection:
  - "COND VALVE MIN POS"
  - "DISCHARGE PRESSURE SP MIN" (default is 225 PSIG)
  - "DISCHARGE PRESSURE SP MAX" (default is 400 PSIG)

If a flow switch is installed, then follow below.

Sequence of Operation

The condenser actuator driven valve is inverse acting. When the voltage output to the valve is 10VDC, the valve is closed. When the voltage output to the valve is 2VDC or less, the valve is wide open. The CONDENSER WATER VALVE analog output is located at J15-8. "DISCHARGE PRESSURE SP MAX" – SETPOINTS key, CONDENSER subsection.

Analog Output to the Valve

No Cooling Needed: The COND WATER VALVE analog output will be 10VDC (0%) when the unit is NOT Cooling and unit's display will show OCCUPIED or UNOCCUPIED STANDBY and the valve will be closed when there is no compressors running.

Cooling Becomes Active: The COND WATER VALVE analog output will be 2VDC (100%) open when "CURRENT OPER MODE" is UNOCCUPIED or OCCUPIED COOLING, compressor is ON.

The CONDENSER PRESSURE PI OUTPUT is based on the lowest of the "AVG PRESS – DISCHARGE A" when active for 60 seconds, "COMP SYSTEM B DISCHARGE PRESSURE" when active for 60 seconds, and any additional compressor discharge pressures when active for 60 seconds. The Unit Controller compares the minimum pressure of each of the active compressor systems to the programmed "DISCHARGE PRESSURE SETPOINT" (default value is 225 PSIG) and generates DISCHARGE PRESSURE MINIMUM demand.

Because some of the compressors used in these units employ internal line break protection, the Unit Controller could think that a compressor is active when it is physically offline. This would cause the Unit Controller to calculate a DISCHARGE PRESSURE MINIMUM demand based on a compressor that was not operating, which could result in a discharge high pressure fault. To prevent nuisance discharge high pressure faults,

the Unit Controller also compares the maximum discharge pressure of the active compressor systems to the programmed "DISCHARGE PRESSURE SP MAX." The default value is factory set to 400 PSIG. The Unit Controller then generates a DISCHARGE PRESSURE MAXIMUM demand.

The Unit Controller uses the greater of the DISCHARGE PRESSURE MINIMUM and the DISCHARGE PRESSURE MAXIMUM demands for the control of the condenser water valve.

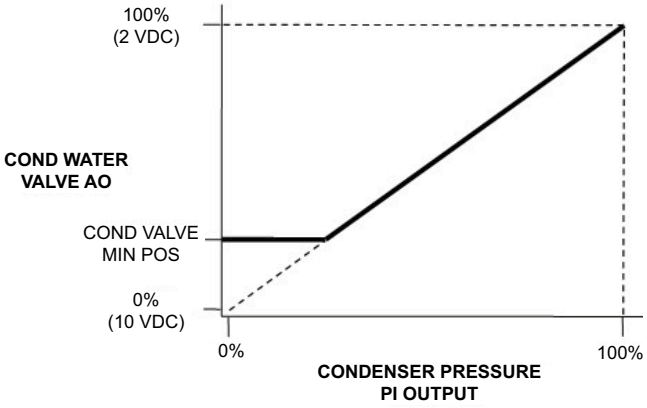


FIGURE 63 - COND WATER VALVE VS. CONDENSER PRESSURE PI OUTPUT

The following two settings are based on the building and system design. These two systems pertain to the building operation, and the unit can be programmed to work with these two systems.

- **Variable Flow:** Condenser water pressure and gallons per minute (GPM) are varied by a variable speed drive (VSD) on the system pump.
- **Constant Flow:** The condenser water system will maintain a set pressure and GPM based on the pumps running at full speed.

CONDENSER WATER SYSTEM is Variable Flow

The COND WATER VALVE analog output shall be closed (0%) when all three of the following conditions are present:

- "CURRENT OPER MODE" is in STANDBY and UNOCCUPIED COOLING, UNOCC COOLING LOW, UNOCC COOLING HIGH, OCCUPIED COOLING, OCC COOLING LOW, OCC COOLING HIGH, OCC COOLING W/ BYP, OCC COOL W/O BYP, or COMFORT VENT COOLING
- Compressors have been OFF for at least 60 seconds
- COND WATER SYSTEM is Variable Flow

CONDENSER WATER SYSTEM is Constant Flow

The COND WATER VALVE analog output shall be open (100%) when all three of the following conditions are present:

- "CURRENT OPER MODE" is in STANDBY and UNOCCUPIED COOLING, UNOCC COOLING LOW, UNOCC COOLING HIGH, OCCUPIED COOLING, OCC COOLING LOW, OCC COOLING HIGH, OCC COOLING W/ BYP, OCC COOL W/O BYP, or COMFORT VENT COOLING
- Compressors have been OFF for at least 60 seconds
- COND WATER SYSTEM is Constant Flow

The CONDENSER PRESSURE PI shall be enabled and CONDENSER PRESSURE PI OUTPUT coupled to the condenser valve output (COND WATER VALVE) when both of the following conditions are satisfied:

- "COND WATER CONTROL" is USER ENABLED
- At least one compressor has been ON for at least 60 seconds

The COND WATER VALVE analog output shall be opened 100% in all other cases.

Condenser Valve with Bypass Valve

Under this mode of operation, the unit has an actuator driven water valve that controls the flow of condenser water through the water condenser and a bypass water valve. This will be two separate valves. Be sure to verify the unit is not using a waterside economizer for operation since that option will also have two valves.

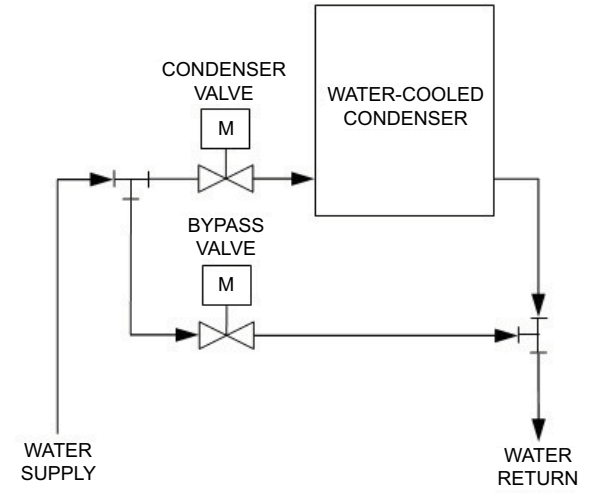


FIGURE 64 - CONDENSER OPERATION AND PIPING DIAGRAM W/ CONDENSER AND BYPASS VALVES

5

The following parameters must be programmed into the Unit Controller through the User Interface:

- OPTIONS key, CONDENSER subsection:
  - "COND VALVES INSTALLED" should be set to COND W/ BYPASS
  - "CONDENSER TYPE" should be set to WATER COOLED
- PROGRAM key, CONDENSER subsection:
  - "COND WATER CONTROL" should be set to ENABLED
  - "COND WATER SYSTEM" can be set to either VARIABLE FLOW or CONSTANT FLOW depending on the building system
  - FLUSH CYCLE can be set to either ENABLE or DISABLE depending on the building system
- SETPOINTS key, CONDENSER subsection:
  - "COND VALVE MIN POS" (default is 30%)
  - "COND BYPASS MAX POS" (default is 50%)
  - "DISCHARGE PRESSURE SP MIN" (default is 225 PSIG)
  - "DISCHARGE PRESSURE SP MAX" (default is 400 PSIG)

Sequence of Operation

The condenser actuator driven valve is inverse acting. When the voltage output to the valve is 10VDC, the valve is closed. When the voltage output to the valve is 2VDC or less, the valve is wide open. The CONDENSER WATER VALVE analog output is located at J15-8.

The bypass actuator driven valve is direct acting. When the voltage output to the valve is 2VDC or less, the valve is closed. When the voltage output to the valve is 10VDC, the valve is wide open. The BYPASS WATER VALVE analog output is located at J15-14.

Analog Output to the Valve

No Cooling Needed: The COND WATER VALVE analog output will be 10VDC (0%), the BYPASS WATER VALVE will be set at the "COND BYPASS MAX POS" using the SETPOINT key, CONDENSER subsection when the unit is NOT cooling, the unit's display will show OCCUPIED or UNOCCUPIED STANDBY, and there are no compressors running.

- "CURRENT OPER MODE" is UNOCCUPIED or OCCUPIED COOLING STANDBY (default is 50%)

Cooling Becomes Active:

The COND WATER VALVE analog output will be 2VDC (100%) and the BYPASS WATER VALVE at 2 VDC (0%) when a call for cooling using the compressors becomes active.

The COND WATER VALVE analog output will be 10VDC (0%) when the unit is NOT COOLING OCCUPIED or UNOCCUPIED STANDBY, and the valve will be closed when there are no compressors running.

The COND WATER VALVE analog output will be controlled by the CONDENSER PRESSURE PI OUTPUT when:

- "CURRENT OPER MODE" is UNOCCUPIED or OCCUPIED COOLING and one of the compressors is ON. The BYPASS WATER VALVE analog output will be controlled per *Figure 65 on page 110.*

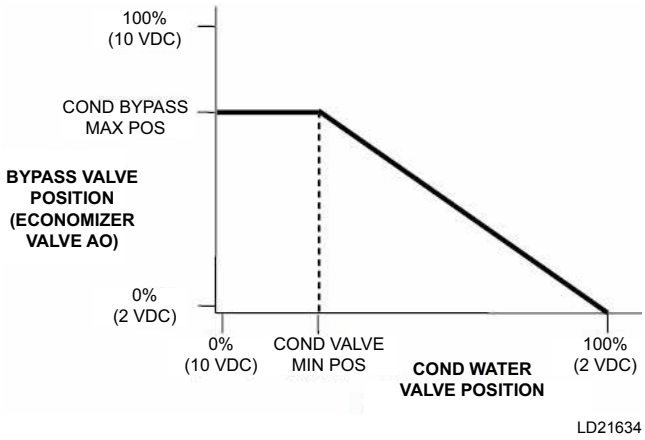


FIGURE 65 - BYPASS VALVE POSITION VS. COND WATER VALVE POSITION

The CONDENSER PRESSURE PI OUTPUT is based on the lowest of the "AVG PRESS – DISCHARGE A" when active for 60 seconds, "COMP SYSTEM B DISCHARGE PRESSURE" when active for 60 seconds, and any additional compressor discharge pressures when active for 60 seconds. The Unit Controller tries to maintain the pressure to the programmed "DISCHARGE PRESSURE SETPOINT."

Because some of the compressors used in these units employ internal line break protection, the Unit Controller could think that a compressor is active when it is physically offline. This would cause the Unit Controller to calculate a DISCHARGE PRESSURE MINIMUM demand based on a compressor that was not operating, which could result in a discharge high pressure fault. To prevent nuisance discharge high pressure faults, the Unit Controller also compares the maximum discharge pressure of the active compressor systems to the programmed "DISCHARGE PRESSURE SP MAX."

The default value is factory set to 400 PSIG. The Unit Controller then generates a DISCHARGE PRESSURE MAXIMUM demand.

The Unit Controller uses the greater of the DISCHARGE PRESSURE MINIMUM and the DISCHARGE PRESSURE MAXIMUM demands for the control of the condenser water valve.

WATERSIDE OR AIR ECONOMIZER OPERATION

The function of the economizer is, as its name implies, to "economize" or save on cooling costs. Obviously, it costs money to operate the compressor. If the compressor can be shut down and the system can still provide adequate cooling, energy savings can be realized.

The unit will decide when to use the ECONOMIZER function based on parameters and setpoints entered either through the Unit Interface or communicated through a BAS.

The economizer is used in COOLING mode only. When the UNIT MODE switches to OCCUPIED COOLING or UNOCCUPIED COOLING and the conditions are met within the programmed guidelines for economizer operation, the Unit Controller will attempt to use outdoor air or the building's cooling water to lower the Supply Air Temperature to the "ACTIVE SAT SETPOINT."

When the unit has an AIR ECONOMIZER, the colder outside air is drawn in through a factory provided set of dampers, and the return is usually exhausted outside since bringing more air in from the outside will over pressurize a building.

Operation of AIR ECONOMIZER is described in the section *Air Economizer Operation on page 118*.

When the unit has a WATERSIDE ECONOMIZER, the water that is used for the water-cooled condenser barrel in the unit is cold enough; the condenser water will be circulated through the factory air coil for cooling, and this will cool the ducted air to the space.

Economizer

The following parameters must be programmed into the Unit Controller through the User Interface to enable economizer operation:

- OPTIONS key, ECONOMIZER subsection: "ECONO INSTALLED" and the choices are NONE, DRYBULB, SINGLE ENTHALPY, DUAL ENTHALPY, and WATERSIDE
- PROGRAM key, ECONOMIZER subsection: "ECONO METHOD TO USE" and the choices are DRYBULB, SINGLE ENTHALPY, DUAL ENTHALPY, BEST AVAILABLE, and WATERSIDE
- SETPOINTS key, ECONOMIZER subsection "WATER ECONO MIN POSITION" (default is 15%)

  "WATER ECONO DELTA" (default is 5.0 °F)

  "OUTSIDE AIR ENTHALPY SETPOINT" for an air economizer

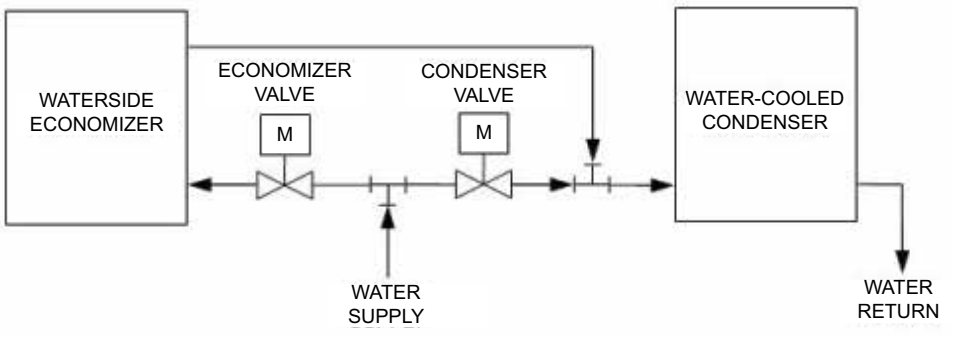
Condenser and Water Economizer Valve

Under this mode of operation, the unit has an actuator driven water valve that controls the flow of condenser water through the water condenser and an economizer water valve controlling a factory installed water economizer coil. The options tag on the front of the unit will show this option if it was ordered with the unit, or a factory order form (FOF) will have to be obtained from the local Johnson Controls agent or branch.

Once the "ECONO SYS STATUS" is "NORMAL - ACTIVE," the Unit Controller will use the "ECONOMIZER CONTROL OUTPUT" to control the return and outdoor damper or water economizer valve to maintain the "SUPPLY AIR TEMP ACTIVE SP."

NOTE

All waterside economizers will have a factory installed freezestat that must be set as ENABLED under the OPTIONS key, UNIT DATA subsection. See Freezestat Operation on page 123.



ECONOMIZER VALVE vs. COND WATER VALVE

LD21635

FIGURE 66 - CONDENSER AND WATER ECONOMIZER VALVE OPERATION AND PIPING DIAGRAM

Waterside Economizer Becomes Active

To have WATERSIDE ECONOMIZER to be become active, the WATER TEMP ENTERING temperature must be lower than the MIXED AIR TEMP plus WATER ECONO DELTA. This temperature setting is shown in the SETPOINT key, ECONOMIZER subsection. To become inactive, the WATER TEMP ENTERING temperature will be greater than the MIXED AIR TEMP plus WATER ECONO DELTA temperature.

The following parameters must be programmed into the Unit Controller through the User Interface:

- OPTIONS key, CONDENSER subsection:
  - "COND VALVES INSTALLED" should be set to COND ONLY
  - "CONDENSER TYPE" should be set to WATER COOLED
- OPTIONS key, ECONOMIZER subsection:
  - "ECONO INSTALLED" should be set to WATERSIDE
  - "ECONO METHOD TO USE" should be set to WATERSIDE
- PROGRAM key, CONDENSER subsection:
  - "COND WATER CONTROL" should be set to ENABLED
  - "ECONOMIZER CONTROL" should be set to ENABLED
- SETPOINTS key, CONDENSER subsection:
  - "COND VALVE MIN POS" (default is 30%)
  - "DISCHARGE PRESSURE SP MIN" (default is 225 PSIG)
  - "DISCHARGE PRESSURE SP MAX" (default is 400 PSIG)
- SETPOINTS key, ECONOMIZER subsection:
  - "WATER ECONO MIN POS" (default is 30%)
  - "WATER ECONO DELTA" (default is 50.0 °F)

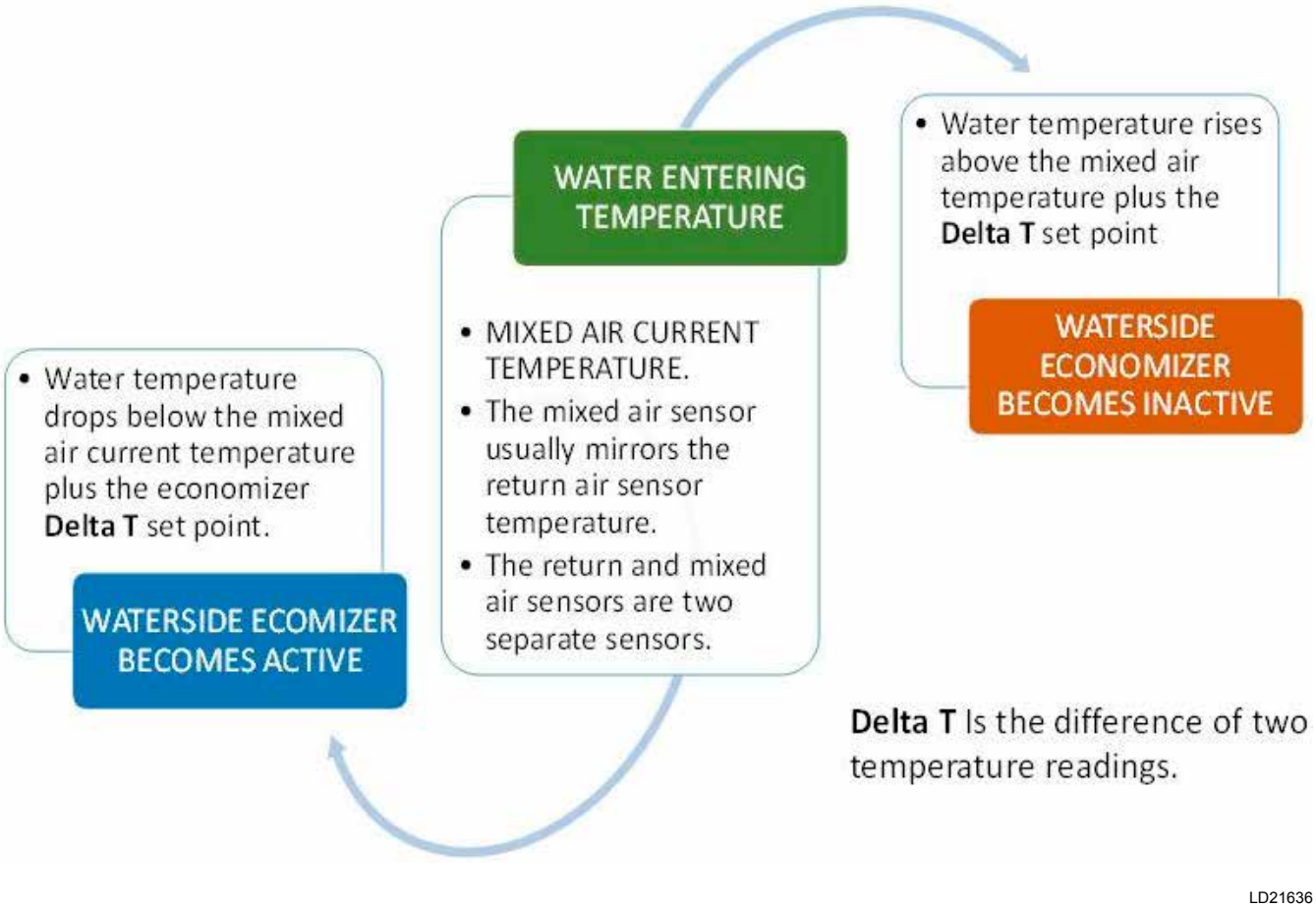


FIGURE 67 - WATERSIDE ECONOMIZER ACTIONS

Control of Compressors with Economizer Enabled

Whenever the WATERSIDE ECONOMIZER is suitable and has been enabled, and the conditions are such that the building's water supply to the units alone are not sufficiently cold enough to maintain the "SUPPLY AIR TEMP~ACTIVE SP" (indicated by a saturated ECONOMIZER CONTROL OUTPUT), the compressors shall be turned ON. The same COOLING CONTROL OFFSET logic (deciding when to turn compressors on and off but not the actual calculation) shall be used when starting and stopping compressors with the additional conditions that the ECONOMIZER CONTROL OUTPUT must be saturated and the COOLING CONTROL OFFSET shall be set held at 4.5 °F.

Compressors shall be turned ON based on the NEXT STAGE TO ENABLE, when all of the following are satisfied:

- The ECONOMIZER CONTROL OUTPUT is > 95% for 30 seconds
- The SUPPLY AIR TEMP CURRENT is greater than or equal to the current "SUPPLY AIR TEMP~ACTIVE SP" plus the "COOLING CONTROL OFFSET"
- The Interstage Delay Timer has expired

Compressors shall be turned OFF based on the NEXT STAGE TO DISABLE, when all of the following are satisfied:

- The ECONOMIZER CONTROL OUTPUT is < 5% for 30 seconds
- The SUPPLY AIR TEMP CURRENT is less than or equal to the current "SUPPLY AIR TEMP~ACTIVE SP" minus the "COOLING CONTROL OFFSET"
- The Interstage Delay Timer has expired

Sequence of Operation

There can be five different operating states when both CONDENSER WATER CONTROL and WATERSIDE ECONOMIZER are enabled. These scenarios will be in effect when the front rock switch is in the ON or AUTO position and the unit is ready to operate.

STATE 1 OPERATION: Press STATUS key, and use the UP▲ or DOWN▼ to navigate to "CURRENT OPER MODE;" the unit display is either OCCUPIED STANDBY or UNOCCUPIED STANDBY.

No Cooling Needed:

- The CONDENSER WATER VALVE analog output will be 10VDC (0%)
- The ECONOMIZER VALVE analog output will be 2VDC (0%)

STATE 2 OPERATION: Press STATUS key, and use the UP▲ or DOWN▼ to navigate to "CURRENT OPER MODE." The unit display is either OCCUPIED STANDBY or UNOCCUPIED STANDBY, Economizer is not active, and no compressors are ON.

When Cooling Operation Becomes Active:

- The CONDENSER WATER VALVE analog output will be set to the "COND VALVE MIN POS"
- The ECONOMIZER VALVE analog output will be 2VDC (0%)

TRANSITION FROM STATE 2 TO 3 (COMP OPERATION ACTIVE): The "ENTERING WATER TEMP" is less than or equal to the "MIXED AIR TEMP" minus the "WATER ECONO DELTA." The current UNIT MODE is OCC COOLING or UNOC COOLING.

- The CONDENSER WATER VALVE analog output will be controlled by the COND PRESSURE PI
- The ECONOMIZER VALVE analog output will be 2VDC (0%)

TRANSITION FROM STATE 2 TO 4 (ECONOMIZER ACTIVE):

- The CONDENSER WATER VALVE analog output will be held at COND VALVE MIN POS for 60 seconds and then set to 10VDC (0%)
- The ECONOMIZER VALVE analog output will be controlled by the ECONOMIZER PI

STATE 3 OPERATION: Press STATUS key, and use the UP▲ or DOWN▼ to navigate to "CURRENT OPER MODE." The unit display is either UNOCCUPIED COOLING or OCCUPIED COOLING, Economizer is not active, and compressors are ON, or Economizer is not active, and one or more compressors have or will be staging ON.

- The CONDENSER WATER VALVE analog output will be controlled by the COND PRESSURE PI

- The ECONOMIZER VALVE analog output will be 2VDC (0%)

TRANSITION FROM STATE 3 TO 2 (COMP TURNED OFF): Demand for mechanical cooling is less.

- The CONDENSER WATER VALVE analog output will be set to the "COND VALVE MIN POS"
- The ECONOMIZER VALVE analog output will be 2VDC (0%)

TRANSITION FROM STATE 3 TO 5 (ECONOMIZER GOING ACTIVE): At this point there's still a demand for cooling, but the condenser water is cold enough for the WATERSIDE ECONOMIZER to assist in cooling the space by the parameters that have been programmed into the User Interface.

Once the "ECONO SYS STATUS" is "NORMAL - ACTIVE," the Unit Controller will use the "ECONOMIZER CONTROL OUTPUT" to control the valve operation on the condenser water inlet for the water economizer coil to maintain the "SUPPLY AIR TEMP ACTIVE SP." One compressor will be turned OFF.

If turning OFF one compressor leaves no compressors ON, the unit is in full waterside economizing.

- The CONDENSER WATER VALVE will be held at its current position for 60 seconds and then set to 10VDC (0%)
- The ECONOMIZER VALVE analog output will be controlled by the ECONOMIZER PI

If turning OFF one compressor still leaves compressors ON:

- The CONDENSER WATER VALVE will be held at its current position for 60 seconds and then set to 10VDC (0%)
- The ECONOMIZER VALVE analog output will be controlled by either the ECONOMIZER PI or the CONDENSER PI, whichever is the lowest

STATE 4 OPERATION: "CURRENT OPER MODE" is UNOCCUPIED or OCCUPIED COOLING, economizer is active, and no compressors are ON.

- The CONDENSER WATER VALVE analog output will be set to 10VDC (0%)
- The ECONOMIZER VALVE analog output will be controlled by the ECONOMIZER PI

TRANSITION FROM STATE 4 TO 2 (ECONOMIZER INACTIVE):

- The CONDENSER WATER VALVE analog output will be set to the "COND VALVE MIN POS"
- The ECONOMIZER VALVE analog output will be 2VDC (0%)

TRANSITION FROM STATE 4 TO 5 (COMPRESSOR TURNED ON):

- The CONDENSER WATER VALVE will remain set to 10VDC (0%)
- The ECONOMIZER VALVE analog output will be controlled by either the ECONOMIZER PI or the CONDENSER PRESSURE PI, whichever is the lowest

STATE 5 OPERATION: "CURRENT OPER MODE" is UNOCCUPIED or OCCUPIED COOLING, Economizer is active, and one or more compressors are ON.

- The ECONOMIZER PI is DISABLED
- The CONDENSER PI is ENABLED
- The COND VALVE analog output is set to closed 10 VDC (0%)
- The ECONOMIZER VALVE AO is coupled to the CONDENSER PRESSURE PI output

TRANSITION FROM STATE 5 TO 4 (All COMPRESSORS TURNED OFF):

- The ECONOMIZER PI will be ENABLED
- The CONDENSER PRESSURE PI shall be DISABLED
- The ECONOMIZER VALVE analog output shall be coupled to the ECONOMIZER CONTROL OUTPUT

TRANSITION FROM STATE 5 TO 3 (ECONOMIZER INACTIVE):

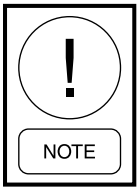
- The CONDENSER WATER VALVE analog output will be controlled by the COND PRESSURE PI
- The ECONOMIZER VALVE analog output will be held at its current position for 60 seconds and then closed 2VDC (0%)

Condenser Enabled / Waterside Economizer Disabled Manually

Under this mode of operation, the unit has an actuator driven water valve that controls the flow of condenser water through the water condenser, but this will DISABLE the waterside economizer valve through the User Interface on the unit.

The following parameters must be programmed into the Unit Controller through the User Interface to achieve this operation:

- OPTIONS key, CONDENSER subsection:
  - "COND VALVES INSTALLED" should be set to COND ONLY
  - "CONDENSER TYPE" should be set to WATER COOLED
- OPTIONS key, ECONOMIZER subsection:
  - "ECONO INSTALLED" should be set to WATERSIDE
  - "ECONO METHOD TO USE" should be set to WATERSIDE
- PROGRAM key, CONDENSER subsection:
  - "COND WATER CONTROL" should be set to ENABLED
  - "ECONOMIZER CONTROL" should be set to ENABLED
- SETPOINTS key, CONDENSER subsection:
  - "COND VALVE MIN POS" (default is 30%)
  - "DISCHARGE PRESSURE SP MIN" (default is 225 PSIG)
  - "DISCHARGE PRESSURE SP MAX" (default is 400 PSIG)



All waterside economizers will have a factory installed freezestat that must be set as ENABLED under the OPTIONS key, UNIT DATA subsection. See Freezestat Operation on page 123.

Sequence of Operation

The condenser actuator driven valve is inverse acting. When the voltage output to the valve is 10VDC, the valve is closed. When the voltage output to the valve is 2VDC or less, the valve is wide open. The CONDENSER WATER VALVE analog output is located at J15-8.

Analog Outputs to the Valves

No Cooling Needed: The COND WATER VALVE analog output will be 10VDC (0%) when the unit's STATUS is "CURRENT OPER MODE" UNOCCUPIED STANDBY or OCCUPIED STANDBY. There is no call for cooling at this moment.

Cooling Becomes Active: The COND WATER VALVE analog output will be 2VDC (100%) when the unit's STATUS is "CURRENT OPER MODE" UNOCCUPIED or OCCUPIED COOLING and no compressors are ON at this moment.

When one of the compressors come ON, the COND WATER VALVE analog output will be controlled by the CONDENSER PRESSURE PI OUTPUT.

The CONDENSER PRESSURE PI OUTPUT is based on the lowest of the "AVG PRESS – DISCHARGE A" when active for 60 seconds, "COMP SYSTEM B DISCHARGE PRESSURE" when active for 60 seconds, and any additional compressor discharge pressures when active for 60 seconds. The Unit Controller tries to maintain the pressure to the programmed "DISCHARGE PRESSURE SETPOINT."

Because some of the compressors used in these units employ internal line break protection, the Unit Controller could think that a compressor is active when it is physically offline. This would cause the Unit Controller to calculate a DISCHARGE PRESSURE MINIMUM demand based on a compressor that was not operating, which could result in a discharge high pressure fault. To prevent nuisance discharge high pressure faults, the Unit Controller also compares the maximum discharge pressure of the active compressor systems to the programmed "DISCHARGE PRESSURE SP MAX." The default value is factory set to 400 PSIG. The Unit Controller then generates a DISCHARGE PRESSURE MAXIMUM demand.

The Unit Controller uses the greater of the DISCHARGE PRESSURE MINIMUM and the DISCHARGE PRESSURE MAXIMUM demands for the control of the condenser water valve.

Waterside Economizer Coil Flush Cycle

In order to minimize contamination and dirt buildup in the waterside economizer coil, the controller can be programmed to flush the water economizer coil daily.

Required Program Values

- PROGRAM key, ECONOMIZER subsection: “FLUSH CYCLE” must be set to ENABLE
- SETPOINTS key, ECONOMIZER subsection: “FLUSH DELAY TIME” must be set for the amount of delay from the time the “FLUSH CYCLE” is activated until the sequence begins (default is 0 minutes)
- OPTIONS key, ECONOMIZER subsection: “ECONOMIZER INSTALLED” must be set to WATERSIDE

Sequence of Operation - Scheduled On/ Off Operation

The following criteria must be met before the controller will initiate a Flush Cycle:

- “FLUSH CYCLE” is ENABLED
- “ECONOMIZER INSTALLED” is set to WATERSIDE

The following must have happened or is in present state:

- Time is between 7:00 PM and 11:59 PM (19:00 and 23:59); this is usually because these are the most common times when units are UNOCCUPIED,

  And

- Unit is in an UNOCCUPIED mode of operation,

  And

- No compressors have been ON in the past 5 minutes,

  And

- 18 hours has elapsed since the last Flush Cycle

Upon initiation of the Flush Cycle, the controller will do the following:

- Start a countdown timer to countdown the time indicated by the “FLUSH DELAY TIME” setpoint. Wait until the timer expires.
- Turn the “PUMP START” BO to ON
- Change the “CURRENT OPER MODE” to “FLUSHING ECONO COIL”
- Drive the “COND WATER VALVE” to 0% (10 VOLTS)
- Drive the “ECONOMIZER WATER VALVE” to 100% (10 VOLTS)
- Wait 3 minutes
- Drive the “COND WATER VALVE” to "COND VALVE MIN POS"
- Drive the “ECONOMIZER WATER VALVE” to “WATER ECONO MIN POSITION”
- Wait 1 minute
- Turn the “PUMP START” DO to OFF

Change “CURRENT OPER MODE” back to previous mode and resume normal operation.

Sequence of Operation - Scheduled 24/7 Operation

The following criteria must be met before the controller will initiate a Flush Cycle:

- “FLUSH CYCLE” is ENABLED
- “ECONOMIZER INSTALLED” is set to WATERSIDE
- Time is 11:59 PM (23:59),

  And

  No compressors have been ON for the past 5 minutes,

  And

  18 hours has elapsed since the last Flush Cycle

Upon initiation of the Flush Cycle, the controller will do the following:

- Turn the “PUMP START” BO to ON
- Change the “CURRENT OPER MODE” to “FLUSHING ECONO COIL
- Drive the “COND WATER VALVE” to 0% (10 VOLTS)
- Drive the “ECONOMIZER WATER VALVE” to 100% (10 VOLTS)
- Wait 3 minutes
- Drive the “COND WATER VALVE” to “COND VALVE MIN POS”
- Drive the “ECONOMIZER WATER VALVE” to “WATER ECONO MIN POSITION”

- Wait 1 minute
- Turn the "PUMP START" DO to OFF

Change "CURRENT OPER MODE" back to previous mode and resume normal operation.

Pump / Aux Output On CTB1
(Also Used For Isolation Damper Control)

The Unit Controller has a dry contact that can be used to close a circuit to a condenser water pump or an isolation damper. The contact is located at terminal block TB1 – terminal 11 and 12. The rating of the contact is 24 to 120VAC, 40MA to 1 AMP. This feature is provided as a convenience.

The condenser water pump does not have to be connected and operated in this way.

The relay contact will be closed whenever the UNIT MODE is as follows:

- OCCUPIED STANDBY
- OCCUPIED COOLING
- UNOCCUPIED COOLING

In addition, the relay contact will be closed if a "WRN-FREEZESTAT TRIP" or "LOCKOUT – HOT WATER FREEZE" fault is active.

When PUMP START turns on, a timer shall begin. For the first 60 seconds after PUMP START is turned on, compressors shall be inhibited from operating. If PUMP START is turned OFF, the compressors will not operate; but again, the use of these contacts are not needed.

In order to ensure that there is sufficient water flowing through the condenser while using the PUMP/ AUX contacts for the condenser water pump, a 60-second timer shall be started when "CURRENT OPER MODE" transitions from a non-cooling to a COOLING mode. Compressors shall be inhibited from operating until this timer has expired.

Isolation Damper Control

On some units, dampers are used to keep the unit isolated from the supply and return duct systems. On these systems, the ISOLATION DAMPER must be opened before the SUPPLY FAN OUTPUT can be turned on, and it must be turned off once the SUPPLY FAN OUTPUT is turned off.

If the ISOLATION DAMPER CONTROL is User Enabled, the PUMP/ AUX contacts will be turned ON when the preceding conditions are met and when these conditions remain in force for 120 seconds. The SUPPLY FAN OUTPUT will be energized after being delayed for 120 seconds to assure any dampers are fully open; the PUMP/ AUX contacts will remain on for 60 seconds after the SUPPLY FAN OUTPUT turns OFF, allowing the static pressure to decrease.

Any time the SUPPLY FAN OUTPUT is turned OFF, the ISOLATION DAMPER shall also be turned OFF if it is ENABLED and active.

- PROGRAM key, UNIT DATA subsection: "ISOLATION DAMPER CONTROL" should be set to ENABLED

If the preceding conditions do not remain in force for 120 seconds, the ISOLATION DAMPER will be turned OFF.

The SUPPLY FAN OUTPUT will be turned OFF if all of the following conditions are met:

- The SUPPLY FAN OUTPUT has been ON for at least 60 seconds of its minimal run time
- All Heating Binary Outputs have been off for at least 60 seconds (ELECTRIC HEAT STG 1 ELECTRIC HEAT STG 2, ELECTRIC HEAT STG 3, and ELECTRIC HEAT STG 4)
- All COMPRESSOR Binary Outputs have been off for at least 60 seconds (COMPRESSOR A, B, C, D, E, and F)
- OCCUPANCY MODE is set to UNOCCUPIED
- "CURRENT OPER MODE" is UNOCCUPIED STANDBY
- UNDER FLR TEMP OVRD is INACTIVE
- SUPPLY AIR TEMP CURRENT is less than or equal to 85.0 °F (if this input is invalid, ignore it)

If HIGH DUCT STATIC is faulted and any of AUTO RESET-DUCT PRESS 1, AUTO RESET-DUCT PRESS 2, or LOCKOUT-HIGH DUCT PRESS SW are active, turn OFF the SUPPLY FAN OUTPUT. Resume normal operation 60 seconds after these conditions clear.

Any time the SUPPLY FAN OUTPUT is turned OFF, the ISOLATION DAMPER will also be turned OFF.

Air Economizer Operation

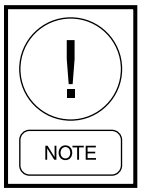
Do not confuse AIR ECONOMIZER with VENTILATION. These operations use the same damper, but they have different operational purpose. The AIR ECONOMIZER is for cooling only, and it will override the damper if the unit is in VENTILATION mode on a call for cooling. In turn, the VENTILATION mode is an act of adding fresh outside air to a building, and this function will override the AIR ECONOMIZER if DEMAND VENTILATION is ENABLED and being used in the unit's configuration based on CO2 levels.

If AIR ECONOMIZER goes inactive, the outside air damper will either go completely closed or it will go to fixed minimum position that has been setup under VENTILATION.

Once the "ECONO SYS STATUS" is "NORMAL - ACTIVE," the Unit Controller will use the "ECONOMIZER CONTROL OUTPUT" to control the return and outdoor damper to maintain the "SUPPLY AIR TEMP ACTIVE SP."

Economizer is used in COOLING mode only. When the UNIT MODE switches to OCCUPIED COOLING or UNOCCUPIED COOLING and the conditions are met within the programmed guidelines for economizer, operation becomes active. The 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 Unit Controller through the User Interface to enable economizer operation:

- OPTIONS key, ECONOMIZER subsection: "ECONO INSTALLED" should be set with these choices: DRY BULB, SINGLE ENTHALPY, DUAL ENTHALPY, BEST AVAILABLE
- PROGRAM key, ECONOMIZER subsection:
  - "ECONOMIZER" should be set to ENABLED
  - "ECONO METHOD TO USE" should be set with these choices: DRY BULB, SINGLE ENTHALPY, DUAL ENTHALPY, BEST AVAILABLE
- SETPOINTS key, ECONOMIZER subsection: set depending on the control method type selected for AIR ECONOMIZER
- SETPOINTS key either using SINGLE ENTHALPY, DUAL ENTHALPY, BEST AVAILABLE. This setpoint will possibly need to be set to "OUTSIDE AIR ENTHALPY SETPOINT" (default is 28 BTU#)



The LSWU units do not normally come with an outdoor temperature sensor or enthalpy controls. This is a separate section of the unit with its own part numbers and factory recommended controls.

Dry Bulb

When the "ECONO METHOD TO USE" is set to DRY BULB, the Unit Controller will reference the OUTSIDE AIR 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 OUTSIDE AIR TEMP is less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" or up to 8.0 °F over the "SUPPLY AIR TEMP ACTIVE SP"
- 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 OUTSIDE AIR TEMP is 10.0 °F or higher than the "SUPPLY AIR TEMP ACTIVE SP"
- The current UNIT MODE is not OCC COOLING or UNOCC COOLING

Single Enthalpy

When the "ECONO METHOD TO USE" is set to SINGLE ENTHALPY, the Unit Controller will reference the OUTSIDE AIR TEMP and OUTSIDE AIR ENTHALPY (derived from the OUTSIDE AIR TEMP and OUTSIDE AIR HUMIDITY) to determine the "ECONO SYS STATUS."

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

- The OUTSIDE AIR TEMP is less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" or up to 8.0 °F over the "SUPPLY AIR TEMP ACTIVE SP"
- The OUTSIDE AIR ENTHALPY is less than or equal to the "OUTSIDE AIR ENTHALPY SETPOINT"
- 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 OUTSIDE AIR TEMP is 10.0 °F or higher than the "SUPPLY AIR TEMP ACTIVE SP"
- The OUTSIDE AIR ENTHALPY is greater than or equal to the "OUTSIDE AIR ENTHALPY SETPOINT" plus 1 BTU/LB
- The current UNIT MODE is not OCC COOLING or UNOCCUPIED COOLING

Dual Enthalpy

When the "ECONO METHOD TO USE" is set to "DUAL ENTHALPY," the Unit Controller will reference the OUTSIDE AIR TEMP, OUTSIDE AIR ENTHALPY (derived from OUTSIDE AIR TEMP and OUTSIDE AIR HUMIDITY), and RETURN AIR ENTHALPY (derived from RETURN AIR TEMP and RETURN AIR HUMIDITY) to determine the "ECONO SYS STATUS."

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

- The OUTSIDE AIR TEMP is less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" or up to 8.0 °F over the "SUPPLY AIR TEMP ACTIVE SP"
- The OUTSIDE AIR ENTHALPY is less than or equal to the RETURN AIR ENTHALPY minus 1 BTU/LB
- 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 OUTSIDE AIR TEMP is 10.0 °F or higher than the "SUPPLY AIR TEMP ACTIVE SP"
- The OUTSIDE AIR ENTHALPY is greater than or equal to the RETURN AIR ENTHALPY
- The current UNIT MODE is not OCCUPIED COOLING or UNOCCUPIED COOLING

Best Available

When the "ECONO METHOD TO USE" is set to BEST AVAILABLE, the Unit Controller will determine the "ECONO METHOD TO USE" based on the sensor that is 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.

Compressor Control

Whenever a change in the unit cooling status is made—compressor turned ON, compressor turned OFF, etc.—a 3-1/2 minute Interstage Delay Timer is initiated. During the countdown of the timer no compressor can be staged ON or OFF until the timer has expired. The only exception would be if the compressor protection circuit experienced a fault.

On CONSTANT VOLUME and VARIABLE AIR VOLUME, when the Unit Controller enters an active COOLING mode, the Unit Controller sets the "COOLING CONTROL OFFSET" to 2.0 °F. The Unit Controller compares the SUPPLY AIR TEMP CURRENT to the "SUPPLY AIR TEMP ACTIVE SP" plus or minus the "COOLING CONTROL OFFSET." If the SUPPLY AIR TEMP CURRENT is greater than the "SUPPLY AIR TEMP ACTIVE SP" plus the "COOLING CONTROL OFFSET" and all the compressors are not ON, the Unit Controller will initiate a call for compressor or additional compressor operation based on the "NEXT STAGE TO ENABLE."

If the SUPPLY AIR TEMP CURRENT is less than the "SUPPLY AIR TEMP ACTIVE SP" minus the "COOLING CONTROL OFFSET" and all the compressors are not OFF, the Unit Controller will turn a compressor OFF based on the "NEXT STAGE TO DISABLE."

Compressor Operation with Economizer

If the economizer is suitable, the Unit Controller will set the "COOLING CONTROL OFFSET" to 4.5 °F. As long as the economizer remains active, the 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 "ECONOMIZER 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 CURRENT must be greater than or equal to the "SUPPLY AIR TEMP ACTIVE SP" plus the "COOLING CONTROL OFFSET" (4.5 °F)
- The Interstage Delay Timer has expired

Compressors will be turned OFF based on the "NEXT STAGE TO DISABLE" when all the following are satisfied:

- The "ECONOMIZER CONTROL OUTPUT" to the economizer is less than 5% for 30 seconds
- The SUPPLY AIR TEMP CURRENT must be less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" minus the "COOLING CONTROL OFFSET" (4.5 °F)
- The Interstage Delay Timer has expired

Compressor ON When Economizer Becomes Active

One compressor will be staged OFF and then the sequence outlined above in the section *No Compressors ON When Economizer Becomes Active on page 120*will be followed.

Supply Air Tempering

This operation only comes into act in the VENTILATION mode if the unit has a factory installed Airside Economizer installed with outside air connected to it.

In some installations, the ventilation requirements combined with low outdoor temperature can result in the Supply Air Temperature dropping below the "SUPPLY AIR TEMP ACTIVE SP," resulting in an over cooling of the space. Supply Air Tempering uses the unit's 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 Unit Controller. Under the PROGRAM key, HEATING subsection, "HEATING SYSTEM" must be set to USER ENABLE. Under the PROGRAM key, COOLING subsection, "SUP AIR TEMPERING" must be set to USER ENABLE.

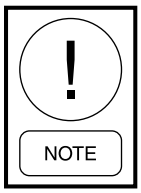
The Supply Air Tempering logic will vary depending on the type of heat installed in the unit. A description of each of the operating logics follows.

Operation In Supply Air Tempering with Hot Water and Steam 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 less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" minus 2.5 °F for 5 minutes



FlexSys operation is mentioned below, but for further examples go to FlexSys™ Operation on page 126.

- For FlexSys without Bypass, the MX SUPPLY AIR TEMP must be less than or equal to the "MX SUPPLY AIR TEMP SETPOINT" minus 2.5 °F for 5 minutes
- For FlexSys with Bypass, the RETURN AIR BYPASS CURRENT must be greater than or equal to the MAXIMUM BYPASS minus 5%
- Economizer Output must be less than or equal 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 greater than or equal to the "SUPPLY AIR TEMP ACTIVE SP" for 5 minutes
- For FlexSys with or without Bypass, the SUPPLY AIR TEMP must be greater than or equal to the MX SUPPLY AIR TEMP for 5 minutes
- The "HW / STEAM – VALVE POS" must be less than or equal to 2%

Operation In Supply Air Tempering with 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 less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" minus 2.5 °F for 5 minutes
- For FlexSys without Bypass, the MX AIR TEMP must be less than or equal to the "MX SUPPLY AIR TEMP SETPOINT" 2.5 °F for 5 minutes
- For FlexSys with Bypass, the RETURN AIR BYPASS CURRENT must be greater than or equal to the MAXIMUM BYPASS minus 5%
- Economizer Output must be less than or equal to 5%
- Compressor operation must have been OFF for 10 minutes
- The MIXED AIR TEMP must be less than or equal to the "SUPPLY AIR TEMP 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 less than or equal to the "SUPPLY AIR TEMP ACTIVE SP" minus 5.0 °F
- The heat section will stage down if the SUPPLY AIR TEMP is greater than or equal to the "SUPPLY AIR TEMP ACTIVE SP" plus two times the "HEATING CONTROL OFFSET" minus 5.0 °F

  If two times the "HEATING CONTROL OFFSET" minus 5.0 °F is less than 5.0 °F, the value will be set to 5.0 °F

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

- The MIXED AIR TEMP must be greater than or equal to the "SUPPLY AIR TEMP ACTIVE SP" for 5 minutes

Comfort Ventilation

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

- OPTIONS key, UNIT DATA subsection: UNIT TYPE must be set to CONSTANT VOLUME
- PROGRAM key, VENTILATION subsection: "COMFORT VENTILATION" must be USER ENABLED
- SETPOINTS key, COOLING subsection: "OCC ZONE COOLING SETPOINT" must be set
- SETPOINTS key, HEATING subsection: "OCC ZONE HEATING SETPOINT" must be set

When "COMFORT VENTILATION" is selected, the Unit Controller monitors the SUPPLY AIR TEMP and uses it to energize mechanical cooling or heating even though the 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 SETPOINT" plus 5.0 °F, the 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 SETPOINT" minus 5.0 °F, the Unit Controller will enter the COMFORT VENT HEATING mode and initiate heating operation. The Unit Controller will terminate COMFORT VENT mode if:

- The SUPPLY AIR TEMP is less than the "OCC ZONE COOLING SETPOINT" minus 5.0 °F for 5 minutes
- The SUPPLY AIR TEMP is greater than the "OCC ZONE HEATING SETPOINT" plus 5.0 °F 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

HEAT OPERATIONS

Electric Heat

Programmed Data

The following parameters must be programmed into the Unit Controller through the User Interface:

- PROGRAM key, HEATING subsection: “HEATING SYSTEM” must be set to USER ENABLE
- OPTIONS key, HEATING subsection:
  - “HEATING SYSTEM TYPE” must be set to ELECTRIC
  - “ELEC HEAT CAPACITY” must be set to the nameplate KW on the unit's tag
- SETPOINTS key, HEATING subsection:
  - For CV units: “1ST STAGE HEATING SETPOINT” (default is 85.0 °F) and “2ND STAGE HEATING SETPOINT” (default is 100.0 °F) must be programmed for CONSTANT VOLUME
  - For VAV and FlexSys units: “HEATING SAT” (default is 100.0 °F) must be programmed for VARIABLE AIR VOLUME or FLEXSYS

Heating Control Offset

Unit Controller will calculate a “HEATING CONTROL OFFSET” (HCO) based on the KW of heat installed, the CFMs (see *Table 24 on page 122*), and the stages of heat (see *Table 25 on page 122*).

The “HEATING CONTROL OFFSET” will be rounded up to the nearest 1/2 degree. If “HEATING CONTROL OFFSET” is calculated to be less than 2.0 °F, it will be set to 2.0 °F.

If the UNIT MODE “COMFORT VENT HEATING” or “SUPPLY AIR TEMPERING” is active, the “HEATING CONTROL OFFSET” will be fixed at 5.0 °F.

Active SAT SP

See *Table 19 on page 90* to determine what the “SUPPLY AIR TEMP ACTIVE SP” value is for Constant Volume units. On VAV and FlexSys units, the “SUPPLY AIR TEMP ACTIVE SP” is the “HEATING SAT” setpoint.

Sequence of Operation

The Unit Controller enters an active HEATING mode:

a. OCC HEATING

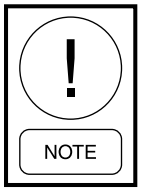
b. UNOCC HEATING

c. COMFORT VENT HEATING

d. SUPPLY AIR TEMPERING

e. MORNING WARM-UP

The Unit Controller determines the initial stages of heat needed and starts the required stages of heat.



COMFORT VENT HEATING and SUPPLY AIR TEMPERING will bring on one stage at a time

After expiration of the 3.5-minute Interstage Delay Timer, the Unit Controller will cycle ON/OFF stages of heat based on the Heating Control Logic.

TABLE 24 - CFM

UNIT SIZE (TON)	CV UNITS (CFM)	VAV UNITS OR FLEXSYS UNITS (CFM)
25	8800	4400
35	12200	6100
40	14000	7000
50	17500	8800
60	21000	10500
62	21000	10500
70	25000	12500
85	27600	13800
95	31500	15700
105	34000	17000

TABLE 25 - HEAT STAGES

ELEC HEAT CAPACITY (KW)	MAXIMUM STAGES
17.5	1
35	2
52.5	3
70	4

Hot Water/Steam Heat

Programmed Data

The following parameters are programmed into the Unit Controller through the User Interface:

- PROGRAM key, HEATING subsection:
  - "HEATING SYSTEM" must be set to USER ENABLE
  - "HW VALVE ACTION" must be set to either DIRECT or REVERSE
- OPTIONS key, HEATING subsection: "HEATING SYSTEM TYPE" must be set to HOT WATER/STEAM
- SETPOINTS key, HEATING subsection:
  - For CV units: "1ST STAGE HEATING SETPOINT" (default is 85.0 °F) and "2ND STAGE HEATING SETPOINT" (default is 100.0 °F) must be programmed for CONSTANT VOLUME
  - For VAV and FlexSys units: "HEATING SAT" (default is 100.0 °F) must be programmed for VARIABLE AIR VOLUME or FLEXSYS

Active SP

See *Table 19 on page 90* to determine what the "SUPPLY AIR TEMP ACTIVE SP" value is for Constant Volume units.

On VAV and FlexSys units, the "SUPPLY AIR TEMP 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 Unit Controller uses the SUPPLY AIR TEMP as described below to determine when to increase or decrease the heating capacity.

- When the SUPPLY AIR TEMP is less than the "SUPPLY AIR TEMP ACTIVE SP," the Unit Controller will increase the amount of heat
- When the SUPPLY AIR TEMP is greater than the "SUPPLY AIR TEMP ACTIVE SP," the Unit Controller will decrease the amount of heat
- When "UNDER FLR TEMP OVRD" is active, the valve is controlled to "UNDERFLOOR TEMP CONTROL SP"

The Unit Controller sends a 0 to 10 VDC 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

Freezestat Operation

If the control is not in an active HEATING mode but the supply fan air proving switch is closed, the Unit Controller will control the modulating valve to prevent the Supply Air Temperature from dropping below 38.0 °F.

If the supply fan air proving switch is open (unit OFF) and the Outdoor Air Temperature is less than 40.0 °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 Unit Controller monitors the status of the Freezestat.

- Freezestat Open = Normal
- Freezestat Closed = Fault (Closes at 35.0 °F)
- Freezestat closed for 10 seconds, Unit Controller will fully open HW/Steam valve:
  - 100% if DIRECT
  - 0% if REVERSE

The Unit Controller starts a 5-minute Freeze Trip timer. If the Freezestat opens during this period, the unit resumes normal operation.

If the Freezestat remains closed after the 5-minute Freeze Trip timer expires, the Unit Controller will shut down the unit and display a "LOCKOUT–HOT WATER FREEZE" fault.

Units with a WATERSIDE ECONOMIZER will have a freezestat installed from the factory that acts the same way as mentioned above. The unit might not have a hot water or steam coil to actuate.

Morning Warm Up

The Morning Warm Up can be initiated in two ways:

1. A Morning Warm Up command from a BAS
2. Self initiated through the internal ADAPTIVE MORN WARM UP ACTIVE mode

The Morning Warm Up operation will be the same for all unit configurations.

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

- PROGRAM key, HEATING subsection: "MORNING WARM UP" is set to USER ENABLED
- The OCCUPANCY mode is UNOCCUPIED STANDBY
- The Morning Warm Up command is received from a BAS

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

- PROGRAM key, HEATING subsection: "MORNING WARM UP" is set to "USER DISABLED"
- The OCCUPANCY mode is OCCUPIED
- The W1 low heat input is lost or the Morning Warm Up command from a BAS is lost.

Sequence of Operation

1. The supply fan starts.
2. After 5 minutes, the Unit Controller compares the Return Air Temperature to the "RAT HEATING SETPOINT."
3. The Unit Controller will not energize the heating sequence if the Return Air Temperature is greater than the "RAT HEATING SETPOINT."
4. The Unit Controller will energize the heating sequence if the Return Air Temperature is less than the "RAT HEATING SETPOINT" by 1.0 °F or more.
5. The Unit Controller sets the "SUPPLY AIR TEMP ACTIVE SP" as follows:
    - VARIABLE AIR VOLUME and FLEXSYS units - "HEATING SAT"
    - CONSTANT VOLUME units - "2ND STAGE HEATING SETPOINT"
6. The heat source remains energized until the Return Air Temperature is greater than or equal to the "RAT HEATING SETPOINT" plus 0.5 °F, the Morning Warm Up command is removed, or the unit switches to OCCUPIED mode.

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 Unit Controller calculates the start time for the heat to ensure the Return Air Temperature is within 0.5 °F of the "RAT HEATING SETPOINT" when the unit switches to the OCCUPIED mode. To do this, the Unit Controller calculates the "MORNING WARM UP OPT TIME" by averaging the time it takes to bring the RETURN AIR TEMP to within 0.5 °F of the "RAT HEATING SETPOINT" for 3 consecutive days. The 3 warm up times are averaged and added to a 10-minute offset. The new time is used as the "MORNING WARM UP OPT TIME" for the next day.

In order to use Adaptive Morning Warm Up, the Primary Control must be configured through the User Interface as follows.

Required Program Values

- SCHEDULE key: the "OCCUPANCY SCHEDULE" must be programmed for the OCCUPIED, UNOCCUPIED start and stop times
- PROGRAM key, UNIT DATA subsection: the "OCCUPANCY SCHEDULE" must be set to USER ENABLED
- PROGRAM key, HEATING subsection:
    - "MORNING WARM UP" must be set to USER ENABLED
    - "ADAPT MORN WARM UP" must be set to USER ENABLED
- SETPOINTS key, HEATING subsection:
    - "RAT HEATING SETPOINT" must be set to a desired temperature to bring on
    - "MORNING WARM UP MAX TIME" must be set with a range of 15 minutes to 240 minutes (default is 120 minutes)

The following limitations apply:

- If the "MORNING WARM UP OPT TIME" exceeds the "MORNING WARM UP MAX TIME," the "MORNING WARM UP OPT TIME" shall be "MORNING WARM UP MAX TIME."
- If the "MORNING WARM UP OPT TIME" is determined to be less than 15 minutes, the "MORNING WARM UP OPT 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 USER DISABLED and then back to USER ENABLED.

Sequence of Operation

1. The supply fan starts.
2. After 5 minutes, the Unit Controller compares the Return Air Temperature to the "RAT HEATING SETPOINT."
3. If the Return Air Temperature is not less than the "RAT HEATING SETPOINT" minus 1.0 °F, the Unit Controller will not energize the heating sequence and it sets the daily warm up time to 5 minutes.
4. If the Return Air Temperature is greater than or equal to the "RAT HEATING SETPOINT," the Unit Controller will energize the heating sequence based on the "MORNING WARM UP OPT TIME."
5. The Unit Controller sets the "SUPPLY AIR TEMP ACTIVE SP" as follows:
   - VARIABLE AIR VOLUME and FLEXSYS units – "HEATING SAT"
   - CONSTANT VOLUME units – "2ND STAGE HEATING SETPOINT"
6. The heat source remains energized until the Return Air Temperature is greater than or equal to the "RAT HEATING SETPOINT" plus 0.5 °F or the unit goes into the OCCUPIED mode.
7. The Unit Controller records the time the heat source is energized as described below:
   a. If the heat source was terminated because it was within 0.5 °F of the "RAT HEATING SETPOINT," the Unit Controller replaces the Day 3 time with the Day 2 time; the Day 2 times with the Day 1 time; and the Day 1 time with the current value. It then averages the 3 values and adds 10 minutes, which becomes the new "MORNING WARM UP OPT TIME" for the next day.
   b. If the heat source does not bring the RETURN AIR TEMP up to the "RAT HEATING SETPOINT" before the Morning Warm Up is stopped, the Unit Controller calculates an approximate daily warm up time using calculation built into the Unit Controller for a new start time for heating operation.

      If the time from when heat is started and Morning Warm Up is stopped is less than 10 minutes, the Unit Controller 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 "MORNING WARM UP MAX TIME," the daily warm up time will be set equal to the "MORNING WARM UP MAX TIME."

VENTILATION SYSTEM

Overview

The following can be used on units that have a recommended Johnson Controls airside economizer installed. The Unit Controller can be configured for several different damper and ventilation options. The damper options are:

- None
- 2-Position
- Standard

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

- The UNIT MODE must be OCCUPIED
- There must be a 24V output from the Unit Controller to the Supply Fan control circuit. This output is contained at connector J17.
- There must be a 24VAC input to the Unit Controller from the supply fan air proving switch to verify Supply Fan operation 120 seconds after the Supply Fan circuit is energized. This input is contained at connector J13 – terminal 2.

- 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

- OPTIONS key, VENTILATION subsection: "DAMPER HARDWARE" must be set to 2-POSITION
- PROGRAM key, VENTILATION subsection: "VENTILATION SYSTEM" must be set to USER ENABLED

Sequence of Operation

The analog output to the Outdoor damper is 10V when the Ventilation System Status is active. The analog output to the Outdoor damper is 0V when the Ventilation System Status is inactive. The amount of outdoor air is set by adjusting the damper linkage manually.

Fixed Minimum

Required Program Values

- OPTIONS key VENTILATION subsection: "DAMPER HARDWARE" must be set to STANDARD
- PROGRAM key, VENTILATION subsection: "VENTILATION SYSTEM" must be set to USER ENABLED
- SETPOINTS key, VENTILATION subsection: "OA DAMPER MINIMUM POSITION" and "OA DAMPER MAXIMUM POSITION" must be set

Sequence of Operation

On units configured with the UNIT TYPE set to CONSTANT VOLUME, the damper minimum position must be programmed using:

- SETPOINTS key, VENTILATION subsection: "OA DAMPER MINIMUM POSITION"

On units configured with the UNIT TYPE set to VARIABLE AIR VOLUME or FLEXSYS, the minimum position will vary between the "OA DAMPER MINIMUM POSITION" and "OA DAMPER MAXIMUM POSITION" based on the speed of the VFD Supply Fan. As the fan speed decreases, the damper position will increase.

DIRTY FILTER SWITCH

The unit can be ordered with a dirty filter switch installed to monitor the pressure drop across the filters. The 24VAC binary input to the Unit Controller can be found at connector J13 – terminal 4.

The following parameter must be programmed into the Unit Controller:

- OPTIONS key, UNIT DATA subsection: "DIRTY FILTER SWITCH" must be set to INSTALLED

Sequence of Operation

When the pressure drop across the filters exceeds the setting of the switch for 1 minute, the switch closes, sending a 24VAC signal to the Unit Controller. The Dirty Filter Switch is field adjustable from 0.8 to 4.0 inches Water Column ("W.C.).

When the 24VAC input is received, the Unit Controller will initiate a "WRN DIRTY FILTER." If the dirty filter switch then opens for 1 minute, the warning will be removed.

During the time the warning is active, the unit will continue normal operation.

The dirty filter switch should be set to a point that will indicate the filters need to be changed. This is done on startup or after the filters have become dirty enough to select a setpoint at which they need to be changed.

FLEXSYS™ OPERATION

Series LSWU units can be configured for FlexSys operation. FlexSys operation is the use of an underfloor plenum to provide conditioned air to a building. Since the conditioned air is delivered up from the floor, the operation differs from that of a typical VAV system. Please review these sections thoroughly before proceeding with unit setup, start-up, and operation.

The design of a FlexSys system is very critical to the proper operation of the LSWU unit. Please review the following areas that create issues with the proper operation of a FlexSys system/unit.

- Plenum Integrity: "If you make a hole, seal a hole." The underfloor plenum must be completely sealed from air leaking out.
- Open Plenum Returns: It is highly recommended that returns be ducted to every room. This allows the warmer return air to properly mix and be at the proper temperature returning to the unit.

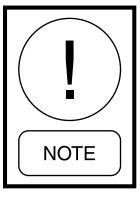
- Six Foot Cooling Zone: When designing a FlexSys system, only the first 6 feet from the floor up is to be conditioned. Above 6 feet, the air needs to be mixed with heat loads. This will ensure that the RAT is at least 78.0 °F. It is has been determined that RATs cooler than 78.0 °F cannot properly raise the temperature of the air leaving the evaporator coil to the recommended MX SAT of 62–64.0 °F. It has been determined than MX SATs lower than 62.0 °F are uncomfortable to occupants of a space.
- Multiple Plenums/One Unit: When designing a system that will serve multiple plenums, it is highly recommended that each plenum have its own volume damper controlled by an actuator. Each plenum should also have its own pressure transducer that controls the actuator driven volume damper. Each plenum should be maintained at 0.05 ”W.C.

The above issues should have been taken into consideration during the design and engineering phase of the project.

Since a FlexSys unit delivers air through an underfloor plenum, some of the setpoints differ from a typical VAV unit. Below are recommended setpoints provided by the Johnson Controls engineering team. There has been a lot of testing and research completed on these systems to arrive at these setpoints. Please be advised that these are recommendations only, and job specific setpoints could be different. We recommend using these setpoints at least as a starting point.

Factory Recommended Setpoints

- RAT Cooling SP: 78.0 °F
- MX SAT SP: 62–64.0 °F (see note below)
- Evap Leaving Air Temp High SP: 58.0 °F
- Evap Leaving Air Temp Low SP: 55.0 °F
- Duct Static SP: 0.05 ”W.C.
- Heating SAT SP: 80.0 °F



On a FlexSys unit, the MX SAT is the temperature of the supply air off the evaporator coil mixed with the warmer return air that is bypassed around the evaporator coil. The bypassed return air is introduced directly under the supply air fan.

FlexSys: Current Operating Mode (Occupied)

The “CURRENT OPER MODE” for a FlexSys configured unit will be decided the same as for a VAV configured unit: by the Return Air Temperature.

- If the RAT is ≥ the COOLING RAT SP by 0.5 °F, the unit will enter the COOLING mode
- If the RAT is ≤ the HEATING RAT SP by 0.5 °F, the unit will enter the HEATING mode
- If the RAT is between the COOLING RAT SP and the HEATING RAT SP, the unit will remain in the STANDBY mode

FlexSys: Fan Operation

The same as a VAV configured unit, the supply fan will be controlled by a VFD. The VFD will control the speed of the supply fan up/down to achieve and maintain the ACTIVE DUCT STATIC SP.

The same as a VAV configured unit, the supply fan will be on whenever the unit is in the OCCUPIED mode and will cycle on/off in the UNOCCUPIED mode with a demand for heating or cooling.

FlexSys: Cooling

Occupied

Whenever a FlexSys unit enters an OCC COOLING mode, it will always start in the OCC COOLING W/O BYPASS mode for the first 30 seconds. After this time delay has expired, the unit controller will determine which mode it needs to be in: OCC COOLING W/O BYPASS or OCC COOLING W/ BYPASS.

Occ Cooling w/o Bypass:

The unit controller will cycle the compressors or modulate the O/A damper to achieve and maintain the MX SAT SP.

- If the economizer is active, the unit will remain in the OCC COOLING W/O BYPASS mode

  OR

- If the RAT ≥ RAT SP plus 0.5 °F but RAT < MX SAT SP + the RA Diff SP (user adjustable between 2–10.0 °F)

Occ Cooling w/ Bypass

If the RAT ≥ RAT SP plus 0.5 °F, AND, RAT > MX SAT SP + the RA Diff SP (user adjustable between 2.0–10.0 °F)

The unit controller will cycle the compressors to maintain either the EVAP LEAVING AIR TEMP HIGH SP or the EVAP LEAVING AIR TEMP LOW SP.

The unit controller will modulate the FlexSys Bypass Damper open/closed to achieve and maintain the MX SAT SP.

Evap Leaving Air Temp High SP:

- R/A Humidity sensor is not reliable

  OR

- R/A Enthalpy < the RESET ENTHALPY SP

Evap Leaving Air Temp Low SP:

- R/A Enthalpy is ≥ RESET ENTHALPY SP

  OR

- Underfloor Slab Dewpoint is ≥ Underfloor Slab Temp – 2.0 °F for 120 seconds (only if Dew Point Reset is USER ENABLED)

Return Air Bypass

Current %: This is the amount of air the unit thinks it is bypassing due to the fact that the MX SAT is not increasing. The unit controller utilizes the current RAT, the Current Evap Leaving Air Temp, and the MX SAT to perform a calculation to arrive at the Current %.

Active SP %: This is how much of the return air the unit thinks it needs to bypass to warm the MX SAT from its current value to the MX SAT SP. The unit controller utilizes the current RAT, the current Evap Leaving Air Temp, and the current MX SAT to perform a calculation to arrive at the Active SP %.

Both of the above numbers are based on internal algorithms and logic built into the Unit Controller. These algorithms and internal logic are not user adjustable.

Bypass Damper Position: This is the actual position of the bypass damper. The bypass damper should be able to drive between 0% and 100%.

Bypass Damper Operation: The operation of the bypass damper is very slow, and the logic that drives the damper is quite complicated. When the unit is in normal operation, it could take up to 40 minutes for the bypass damper to go from 0% to 100%. If the unit is operating properly and the temperatures are in the proper range, the damper will probably never drive to 100%.

Unoccupied

UNOCCUPIED COOLING mode will be initiated by the Current Zone Temp being higher than the UNOCCUPIED ZONE COOLING SP by 0.5 °F. The "NIGHT SET BACK" feature must be USER ENABLED. "NIGHT SET BACK" can be found under the HEATING menu.

1. Supply fan starts. Supply fan VFD is controlled to the ACTIVE DUCT STATIC SP
2. O/A damper is modulated open/closed to achieve and maintain the MX SAT SP

   AND/OR

3. Compressors are cycled on/off to achieve and maintain the MX SAT SP
   a. Bypass damper remains closed
   b. Cooling operation will continue until the Current Zone Temp is less than the UNOCC ZONE COOLING SP by 0.5 °F

FlexSys: Compressor Control

Occupied Cooling w/o Bypass

1. Unit enters an active COOLING mode
2. Unit Controller sets the "COOLING CONTROL OFFSET" to 2.0 °F
3. Unit Controller compares the current MX SAT to the MX SAT SP plus or minus the "COOLING CONTROL OFFSET"
4. If MX SAT is greater than the MX SAT SP plus the "COOLING CONTROL OFFSET," the Unit Controller will:
   a. Start a compressor

      OR

   b. Bring on an additional stage of cooling based on the "NEXT STAGE TO ENABLE"
5. If MX SAT is less than the MX SAT SP minus the "COOLING CONTROL OFFSET," the Unit Controller will stop a compressor based on the "NEXT STAGE TO DISABLE"

Occupied Cooling w/ Bypass

1. Unit enters an active COOLING mode
2. Unit Controller sets the "COOLING CONTROL OFFSET" to 2.0 °F

3. Unit Controller compares the Evap Leaving Air Temp to the active EVAP LEAVING AIR TEMP SP plus or minus the "COOLING CONTROL OFFSET"
4. If Evap Leaving Air Temp is greater than the active EVAP LEAVING AIR TEMP SP plus the "COOLING CONTROL OFFSET," the Unit Controller will:
   a. Start a compressor

      OR

   b. Bring on an additional stage of cooling based on the "NEXT STAGE TO ENABLE"
5. If the Evap Leaving Air Temp is less than the active EVAP LEAVING AIR TEMP SP, the Unit Controller will stop a compressor based on the "NEXT STAGE TO DISABLE"

FlexSys: Economizer

The suitability requirements will be the same as above except for

- Normal-Active OAT must be at least 2.0 °F below the MX SAT SP
- Normal-Inactive OAT is greater than/equal to the MX SAT SP

When conditions are determined suitable for Econo Operation, the Unit Controller will send a 0–10VDC signal to the O/A damper actuator, modulating the dampers open/closed. OA dampers will be modulated to maintain the active MX SAT SP

FlexSys: Heating

OCCUPIED/UNOCCUPIED heating operation will follow the same sequence as a VAV configured unit. It is recommended to limit the HEATING SAT SP to 80.0 °F or 90.0 °F. This will prevent the underfloor concrete slab from becoming too warm and then radiating heat for an extended period of time after heating operation has been terminated.

FlexSys Under Floor Temperature Control

Dew Point Reset

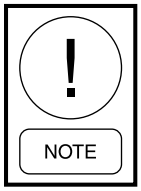
This sequence changes the Active Evaporator Leaving Air Temperature to a lower value when the temperature of the underfloor air approaches its dew point.

- MUST have an underfloor slab temperature sensor AND an underfloor humidity sensor installed. (Field provided and field wired to CTB1. Can also be communicated from the BAS.)
- Dew Point Reset MUST be USER ENABLED
- Unit controller uses the MX SAT and the underfloor humidity to calculate the underfloor dew point
- If Underfloor Air Dew Point ≥ the Underfloor Slab Temp minus 2.0 °F for 120 seconds, the Unit Controller will switch from the EVAP LEAVING AIR TEMP HIGH SP to the EVAP LEAVING AIR TEMP LOW SP
- Unit Controller will continue to use the EVAP LEAVING AIR TEMP LOW SP until the Underfloor Air Dew Point < the Underfloor Slab Temp minus 2.5 °F

Active Slab Control

This sequence allows heat to be turned ON during a transition from one occupancy state to another if the Underfloor Air Temperature is higher than the Underfloor Slab Temp.

- Unit MUST have heat installed
- Heating System MUST be USER ENABLED
- Active Slab Control MUST be USER ENABLED



The unit display shows the Heating System Status as Inactive while in Active Slab Control. The Supply System Status shows as Active.

Unoccupied to Occupied

Unit Controller checks the Underfloor Slab Temp immediately after switching from UNOCCUPIED to OCCUPIED STANDBY (if the Unit Controller calls from OCCUPIED COOLING W/ OR W/O BYPASS during this time, Active Slab Control will be terminated).

If Underfloor Slab Temp ≤ the MX SAT SP minus 2.0 °F, the Underfloor Temp Override will become Active.

- Underfloor Temp Control is set to MX SAT SP plus 10.0 °F

5

- Unit Controller will generate a call for heat
  a. If staged heat (staged gas or electric), Unit Controller will start the first stage of heat
  b. If modulating (modulating gas or hot water/steam), Unit Controller will control the SAT to the UNDERFLOOR TEMP CONTROL SP
- Heating operation will continue until:
  a. The Underfloor Slab Temp ≥ the MX SAT SP

     OR

  b. 20 minutes time has elapsed

Occupied to Unoccupied

Unit Controller checks the Underfloor Slab Temp immediately after switching from an OCCUPIED mode to UNOCCUPIED STANDBY.

If the Underfloor Slab Temp > the RAT minus 2.0 °F, Underfloor Temp Override will become Active.

- The Underfloor Temp Control SP is set to the RAT SP plus 10.0 °F
- Unit Controller will generate a call for heat
  a. If staged heat (staged gas or electric), Unit Controller will start the first stage of heat
  b. If modulating (modulating gas or hot water/steam), Unit Controller will control the SAT to the UNDERFLOOR TEMP CONTROL SP
- Heating operation will continue until:
  a. The Underfloor Slab Temp > RAT plus 1.0 °F

     OR

  b. 20 minutes time has elapsed

FlexSys: All Other Sequences

The other sequences of operation for a FlexSys unit will follow the same procedures as a VAV configured unit.

TABLE 26 - SUPPLY AIR DENSITY FROM TEMPERATURE AND ALTITUDE

UNIT INSTALLED ALTITUDE	SUPPLY AIR TEMP CURRENT							
	40	50	60	70	80	90	100	110
0	0.0787788	0.0769444	0.0751429	0.0736991	0.0722022	0.0708069	0.0695253	0.0684611
1000	0.0759635	0.0741844	0.0724350	0.0710365	0.0695842	0.0682308	0.0669888	0.0659610
2000	0.0732022	0.0714773	0.0697790	0.0684250	0.0670164	0.0657042	0.0645010	0.0635089
3000	0.0705491	0.0688762	0.0672270	0.0659157	0.0645491	0.0632765	0.0621106	0.0611528
4000	0.0678959	0.0662751	0.0646750	0.0634064	0.0620818	0.0608488	0.0597202	0.0587966
5000	0.0654535	0.0638806	0.0623257	0.0610964	0.0598105	0.0586139	0.0575196	0.0566276
6000	0.0630110	0.0614860	0.0599764	0.0587864	0.0575392	0.0563790	0.0553190	0.0544586
7000	0.0606497	0.0591710	0.0577051	0.0565531	0.0553432	0.0542183	0.0531915	0.0523616

SECTION 6 – USER INTERFACE CONTROL CENTER

USER INTERFACE CONTROL CENTER

The User Interface is used to commission, monitor, and troubleshoot the 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 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 **X** key and the ✓ key. The keys available to support choice input are the ◄ key, the ► key, the **X** key, and the ✓ key. Editing is started by pressing the ✓ key. ***Once editing has started, the user must press either the ✓ key or the X key***. Any other key press will result in the "**Press ✓ or X 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.

NOTE

Some changes to the unit's operation may require the unit to be shut down at the control switch on front of the unit before it will accept the change.

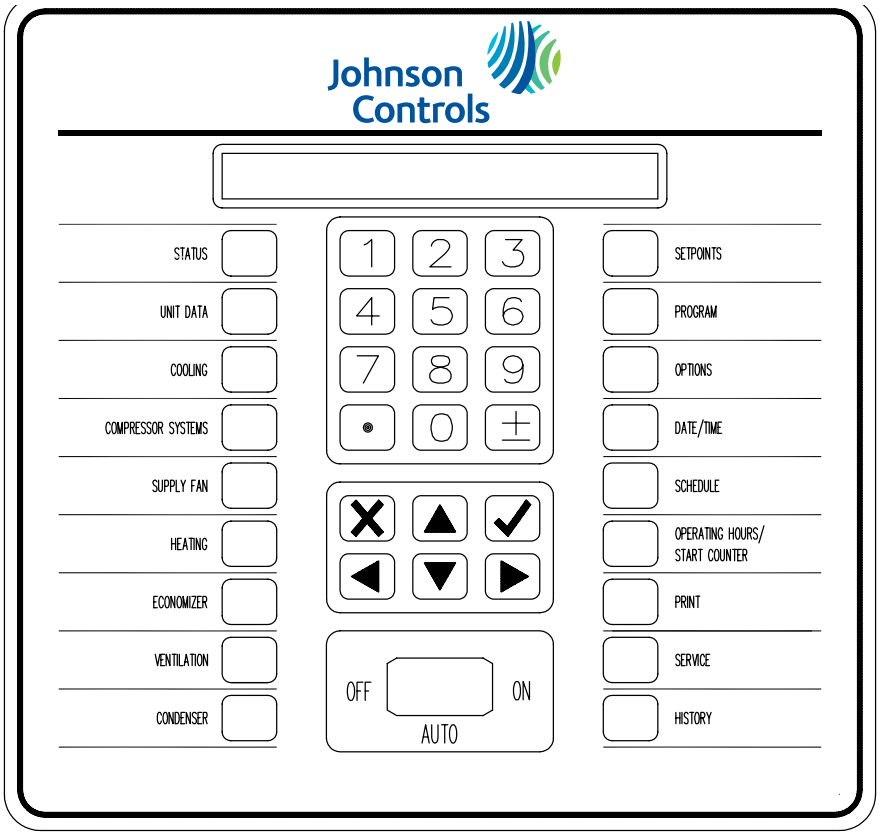


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FIGURE 68 - USER INTERFACE CONTROL PANEL

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 **X** 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 **X** 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 Fan, Heating, Economizer, Ventilation, Condenser, 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.

Table 27 on page 133 through *Table 35 on page 140* list the information that is contained under the Status, Unit Data, Cooling, Compressor Systems, Supply Fan, Heating, Economizer, Ventilation, and Condenser 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 27 - STATUS

DISPLAY TEXT	RANGE	DEFAULT	SHOWN WHEN
Unit - Overall Status	Local stop / run / unit trip / unit fault / unit lockout	Derived	Always
Current Oper Mode	Occ standby / OCC cooling low / OCC cooling high / OCC heating low / OCC heating high / UNOCC stand-by / 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 cool-ing / unoccupied standby / unoccupied heating / unoc-cupied 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 FlexSys
Supply System Status	Normal - active / normal inactive / safety trip / safety FAULT / safety lockout	Derived	Supply Fan difference of 0.12 "W.C.
Comp System A Status	Normal - on / Normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Always
Comp System B Status	Normal - on / normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Always
Comp System C Status	Normal - on / normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Unit size greater than or equal to 39 tons
Comp System D Status	Normal - on / normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Unit size greater than or equal to 39 tons
Comp System E Status	Normal - on / normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Unit size greater than or equal to 100 tons
Comp System F Status	Normal - on / normal - off / safety trip / safety fault / safety lockout / user disabled	Derived	Unit size greater than or equal to 100 tons
Heating System Status	Normal - active / normal - inactive / safety trip / safety fault / safety lockout / user disabled / none	Derived	Always
Econo System Status	Normal - active / normal - inactive / safety trip / safety fault / safety lockout / user disabled / none	Derived	Always
Vent System Status	Normal - active / normal - inactive / safety trip / safety fault / safety lockout / user disabled / none	Derived	Always
Filter Status	Okay / change	Derived	Always
Event Message	Any active warnings will be displayed	Derived	Always

TABLE 28 - UNIT DATA

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS:
Unit Type	2	Constant Volume / Variable Air Volume / FlexSys	Variable Air Volume	Always
Unit Size	2	25 Ton, 32 Ton, 35 Ton, 40 Ton, 50 Ton, 60 Ton, 62, Ton, 70 Ton, 72 Ton, 79 Ton, 80 Ton, 90 Ton, 95 Ton, and 105 Ton	32	Always
Refrigerant Type	2	R22 / R407c / R410a	R-410	Always
Control Method	1	Wire Zone Temp / Comm Zone Temp	Wire Zone Temp	UNIT TYPE equals CONSTANT VOLUME or NIGHT SET BACK is USER ENABLED
Return Air	2	Outside Air / Return Air / Supply Fan Speed / None	None	VAV only
Supply Air Temp				
Current		-20.0º F to 180.0º F	Look Up Table	UNIT TYPE equals CONSTANT VOLUME or VARIABLE AIR VOLUME
Active SP		50º F to 150º F	Derived	
Mixed Supply Air Temp				
Current		-20.0º F to 180.0º F	Look Up Table	UNIT TYPE equals FLEXSYS
Active SP		50º F to 65º F	65º F	
Evap Pres Drop				
Evap PD Limit Override		0.00 to 1.00	0.00	FLEXSYS only
Freezestat Status		Normal/Faulted	Normal	Always if Freezestat is installed

TABLE 29 - COOLING

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Supply Air Temp				
Current		-20.0º F TO 180.0º F	Look up table	UNIT TYPE equals CONSTANT VOLUME or VARIABLE AIR VOLUME
Active Sp	1	50.0º F TO 65.0º F	Derived	
Mixed Supply Air Temp				
Current		-20.0º F TO 180.0º F	Look up Table	UNIT TYPE equals FLEXSYS
Active Sp	1	50.0º F TO 65.0º F	65.0º F	
Flex Evap Temp				
Current		-20.0º F to 180.0º F	Look up Table	UNIT TYPE equals FLEXSYS and Current Oper Mode is OCC COOLING W/BYP
Active Sp	1	50.0º F to 65.0º F	65.0º F	
Cooling Control Offset		1.0º F to 100.0º F	Derived	Always
Return Air Diff SP		6.0º F		
Return Air Diff Active		6.0º F		
Zone Temp				
Current		-20.0º F to 180.0º F	Look up table	UNIT TYPE equals CONSTANT VOLUME or UNIT MODE is OCCUPIED
OCC Zone Cooling Setpoint	1	OCC Zone Heating Plus 2.0º F to 85.0º F	72.0º f	
Zone Temp				
Current		-20.0º F TO 180.0º F	Look up table	Unit is UNOCCUPIED and NIGHT SET BACK is ENABLED
Unocc Zone Cooling Setpoint	1	UNOCC Zone Heating Plus 2.0º F to 95.0º F	85.0º f	
Return Air Temp				
Current		-20.0º F to 180.0º F	Look up table	UNIT TYPE equals VARIABLE AIR VOLUME or FLEXSYS
Rat Cooling Setpoint	1	RAT heating setp PLUS2º F to rat for high sat	70.0º f	
Return Air Bypass				
Current		0 to 100%	Derived	UNIT TYPE equals FLEXSYS
Active Sp		0 to 100%	Derived	
Bypass Damper Position		0 to 100%	Derived	UNIT TYPE equals FLEXSYS
Underfloor Air				
Temp		-20.0º F to 180.0º F	Look up table	UNIT TYPE equals FLEXSYS and Dew Point Reset equals ENABLED
Humidity		0 to 100%	Derived	
Underfloor Slab				
Temp		-20.0º F to 180.0º F	Look up table	UNIT TYPE equals FLEXSYS and Dew Point Reset equals ENABLED
Dew Point		30.0º F to 100.0º F	Derived	
Need to Dehumidify		Yes/No		UNIT TYPE equals FLEXSYS and Heating System Type is ELECTRIC and ENABLED
Under Floor Temp OVRD		Active - Inactive	Derived	Active Slab Control is USER ENABLED
Reset Enthalpy SP		30.00 BTU#		
Reset Enthalpy Active		30.00 BTU#		

TABLE 30 - COMPRESSOR SYSTEMS (A-F)

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Comp Sys* Status		Normal - on / Normal - off / Safety trip / Safety fault / Safety lockout / user disabled	Derived	Always
Compressor A Load*		0%, 33%, 67%, 100%	Derived	Comp A Only
Comp System* State	1	Stop / Run / Lockout / Auto Reset	Derived	Always
Safety Input Chain*		Okay - faulted	Derived	Always
Avg Pressure				
Discharge A		0 to 650 PSIG	Derived	Comp A Only
Suction A		0 to 400 PSIG	Derived	Comp A Only
Pressure				
Discharge *		0 to 650 PSIG	Look Up Table	Always
Suction *		0 to 400	Look Up Table	Always
Current Run Time		HH:MM:SS	Derived	Always
Ready To Run		Yes / no	Derived	Always
Ready To Stop		Yes / no	Derived	Always

* May be A-F.

TABLE 31 - SUPPLY SYSTEM

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DE-FAULT	SHOW WHEN UNIT TYPE IS
Supply System Status		Normal - Active Normal - Inactive Safety Trip Safety Lockout		Always
Supply Fan				
Output		On - Off	Derived	Always
Status		Running Stopped	Derived	
Supply Fan VFD				
Output		0.0 to 100%	Derived	UNIT TYPE equals VARIABLE AIR VOLUME or FLEXSYS
Freq		0.0 to 60Hz	Derived	
Duct Static Press				
Current		0.00 to 5.00 "W.C.	Look Up Table	UNIT TYPE equals VARIABLE AIR VOLUME or FLEXSYS and Duct Pressure Sensor 2 is set to DISABLED
Active SP		0.00 to 5.00 "W.C.	Derived	
Duct Static				
Press 1		0.00 to 5.00 "W.C.	Look Up Table	UNIT TYPE equals VARIABLE AIR VOLUME or FLEXSYS and Duct Pressure Sensor 2 is set to ENABLED
Press 2		0.00 to 5.00 "W.C.	Look Up Table	
Duct Static Press				
Average		0.00 to 5.00 "W.C.	Look Up Table	UNIT TYPE equals VARIABLE AIR VOLUME or FLEXSYS, Duct Pressure Sensor 2 is set to ENABLED, and Duct Press Cntrl is set to AVERAGE.
Active SP		0.00 to 5.00 "W.C.	Derived	
Duct Static Press				
Lowest		0.00 to 5.00 "W.C.	Look Up Table	UNIT TYPE Equals VARIABLE AIR VOLUME or FLEXSYS, Duct Pressure Sensor 2 is set to ENABLED, and Duct Press Cntrl is set to LOWEST.
Active SP		0.00 to 5.00 "W.C.	Derived	
Duct Static Press				
Highest		0.00 to 5.00 "W.C.	Look Up Table	UNIT TYPE Equals VARIABLE AIR VOLUME or FLEXSYS, Duct Pressure Sensor 2 is set to ENABLED, and Duct Press Cntrl is set to HIGHEST.
Active SP		0.00 to 5.00 "W.C.	Derived	

TABLE 32 - HEATING

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Heating Sys Status		Normal - Active / Normal - Inactive / Faulted / User Disabled / Under Floor Control / None	None	Always
Heating System Type	2	None / Electric/ Hot Water/ Steam	None	Always
Elec Heat Capacity	2	11 Kw / 17 Kw / 34 Kw / 68 Kw	68 Kw	Heat System Type equals ELECTRIC
Supply Air Temp				
Current		-20.0 °F to 180.0 °F	Look Up Table	Heat System Type does not equal NONE
Active SP		50.0 °F to 120.0 °F	Derived	
Mx Supply Air Temp				
Current		-20.0 °F to 180.0 °F	Look Up Table	UNIT TYPE equals FLEXSYS
Active SP	1	50.0 °F to 65.0 °F	65.0 °F	
Zone Temp				
Current		-20.0 °F to 180.0 °F	Look Up Table	UNIT TYPE equals CONSTANT VOLUME and unit is OCCUPIED
OCC Zone Heating Setpoint	1	60º F to OCC Zone Cooling Setpoint -2.0 °F	68.0 °F	
Zone Temp				
Current		-20.0 °F to 180.0 °F	Look Up Table	UNIT MODE is UNOCCUPIED and NIGHT SET BACK is ENABLED
UNOCC Zone Heat Setpoint	1	50.0º F to Unocc Zone Cooling Setpoint -2.0 °F	60.0 °F	
Return Air Temp				
Current		-20.0 °F to 180.0 °F	Look Up Table	Heat Type does not equal NONE and unit equals VARIABLE AIR VOLUME or FLEXSYS
RAT Heating Setpoint	1	55.0º F - Rat Cooling Setpoint -2.0 °F	68.0 ºF	
Staged Heat Status				
Stgs On		0 to 6	Derived	Heat Type equals ELECTRIC
Stgs Aval		1 to 6	Derived	
HW / Steam				
Valve Pos		0.0 to 100%	Derived	Heat Type equals HOT WATER/ STEAM
Frz Stat		Ok Tripped	Derived	
Heating Control Offset		1.0 °F to 100.0 °F	Derived	Heat Type does not equal NONE
Daily Warm Up Time Day 1		0 Min. to Morning Warm Up Max Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED
Daily Warm Up Time Day 2		0 Min. to Morning Warm Up Max Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED
Daily Warm Up Time Day 3		0 Min. to Morning Warm Up Max Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED
Morning Warm Up Optime		0 Min. to Morning Warm Up Max Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED
Daily Warm Up Timer		0 Min. to Morning Warm Up Off Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED

TABLE 33 - ECONOMIZER

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Daily Warm Up Timer		0 Min. to Morning Warm Up Max Time	Derived	Heat Type does not equal NONE and Adapt Morn Warm Up equals ENABLED
Econo System Status		Normal - Active / Normal - Inactive / Faulted / User Disabled / None	Derived	Always
Econo Installed	2	None / Dry Bulb / Single Enthalpy / Dual Enthalpy / Waterside	Waterside	Always
Econo Method Active		Dry Bulb / Single Enthalpy / Dual Enthalpy / Waterside	Derived	Economizer Installed is other than NONE
Outside Air Temp		-20.0 °F to 180.0 °F	Look Up Table	Always
Outside Air				
Humidity		0 to 100%	Look Up Table	Economizer Installed equals SINGLE ENTHALPY or DUAL ENTHALPY
Enthalpy		7.2 to 204.9 BTU/Lb	Look Up Table	
Return Air Temp		-20.0 °F to 180.0 °F	Look Up Table	Always
Return Air				
Humidity		0 to 100%	Look Up Table	Economizer Installed equals DUAL ENTHALPY
Enthalphy		7.2 to 204.9 BTU/Lb	Look Up Table	
Entering Water				
Temp		-20.0 °F to 180.0 °F	Look Up Table	Economizer Installed equals WATERSIDE
Setpoint		Mixed Air Temp Minus Water Econo Delta	Derived	
Economizer PI Output		0 to 100%	Derived	Economizer Installed is not NONE
Econo Valve Position		0 to 100%	Derived	Economizer Installed is set to WATERSIDE
Mixed Air Temp		-20.0 °F to 180.0 °F	Look Up Table	Economizer Installed equals WATERSIDE

TABLE 34 - VENTILATION

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Vent System Status		Normal - Active/ Normal - Inactive / Faulted / User Disabled / None	Derived	Always
Damper Hardware	2	None / 2 Position/ Standard	None	Always
OA Damper Position				
Current		0.0 to 100%	Derived	Damper Hardware does not equal NONE
Active SP		0.0 to 100%	Derived	
Comfort Ventilation	1	Enabled / Disabled	Disabled	UNIT TYPE equals CONSTANT VOLUME
Ventilation Control	1	Fixed Minimum	Fixed Minimum	Damper Hardware does not equal NONE
Isolation Damper Control		User Disabled → User Enabled	User Disabled	Always

TABLE 35 - CONDENSER

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SHOW WHEN UNIT TYPE IS
Condenser Type	2	Water Cooled	Water Cooled	Always
Condenser Water Control	2	User Enabled / User Disabled	User Enabled	Cond Valve Installed is not NONE
Cond Valve Installed	2	None / Cond Only / Cond W/ Bypass	Cond Only	Condenser Type is WATER COOLED
Cond Water Valve Pos		Cond Valve Min Pos To 100%	Derived	Cond Valve Installed is COND ONLY or COND W/ BYPASS
Bypass Valve Position		0 % To Cond Bypass Max Pos	Derived	Cond Valve Installed equals COND W/ BYPASS
Discharge Press				
Minimum		0.0 to 650.0 PSIG	Derived	Cond Valve Installed is not NONE
SP Min	1	0.0 to 650.0 PSIG	225 PSIG	
Discharge Press				
Maximum		0.0 to 650.0 Psig	Derived	Cond Valve Installed is not NONE
SP Max	1	0.0 to 650.0 Psig	400 PSIG	
Water Temperature				
Entering		-20.0 °F to 180.0 °F	Look Up Table	Condenser Type is WATER COOLED
Leaving		-20.0 °F to 180.0 °F	Look Up Table	
Cond Water Flow		Yes / No	Derived	Water Flow Switch equals INSTALLED
Condenser Pressure P1 Output		0 to 100%	Derived	Cond Valve Installed is COND ONLY or COND W/ BYPASS
Flush Cycle	1	User Enabled User Disabled	User Disabled	Economizer Installed is WATERSIDE
Flush Delay Time	1	0 to 60 Min.	0	Economizer Installed is WATERSIDE

SETPOINTS

All “Setpoints” values are numeric. To view the values press the SETPOINTS key. After pressing the SETPOINTS key use the ◄ key or the ► key to select the menu subsection: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Condenser, that contains the parameter you would like to view. The parameters contained under each of these menu subsections and their password level is contained in *Table 36*. Use the ▲ and ▼ arrow key to navigate to the parameter within the subsection you want to view.

If you need to change any of the “Setpoints,” press the CHECK key. The Enter Password screen will appear. All “Setpoints” parameters require the use of a password before they can be changed. *See Password on page 156 for information on how to enter a password into the User Interface.* If a Level 1 password is entered, only Level 1 setpoint parameters will be available for change. Entering a Level 2 password will make all setpoint parameters available.

Once a password is entered it will remain active for 15 minutes.

TABLE 36 - SETPOINTS

USER INTERFACE KEY	SUBSECTION	DISPLAYED TEXT	RANGE	DEFAULT VALUE	UNIT SETTING
Setpoint	Cooling	OCC Zone Cooling Setpoint	2.0 °F above OCC Zone Heating Setpoint to 85.0 °F	72.0 °F	
Setpoint	Cooling	UNOCC Zone Cooling Setpoint	2.0 °F above UNOCC Zone Heating Setpoint to 95.0 °F	85.0 °F	
Setpoint	Cooling	RAT Cooling Setpoint	2.0° F above RAT Heating Setpoint to RAT for High SAT	70.0 °F	
Setpoint	Cooling	Maximum Bypass	20.0% to 40.0%	40.00%	
Setpoint	Cooling	Ist Stage Cooling Setpoint (SAT SP for CV)	55.0 °F to 65.0 °F	60.0 °F	
Setpoint	Cooling	2nd Stage Cooling Setpoint (SAT SP for CV)	50.0 °F to 60.0 °F	55.0 °F	
Setpoint	Cooling	SAT Low Setpoint	50.0 °F to SAT High Limit	55.0 °F	
Setpoint	Cooling	SAT High Setpoint	55.0 °F to 65.0 °F	65.0 °F	
Setpoint	Cooling	MX Supply Air Temp Setpoint	50.0 °F to 65.0 °F	60.0 °F	
Setpoint	Cooling	OAT Setpoint for Low SAT	OAT for High SAT to 90.0 °F	80.0 °F	
Setpoint	Cooling	OAT Setpoint for High Sat	60.0 °F to OAT for Low SAT	70.0 °F	
Setpoint	Cooling	RAT Setpoint for Low RAT	RAT Setpoint for High RAT + 5.0 °F to 90.0 °F	80.0 °F	
Setpoint	Cooling	RAT Setpoint for High SAT	RAT Cooling Setpoint to RAT Setpoint for Low SAT - 5.0 °F	70.0 °F	
Setpoint	Cooling	Fan Speed Setpoint for Low SAT	Fan Speed Setp for High SAT to 100.0%	90.00%	
Setpoint	Cooling	Fan Speed Setpoint for High SAT	50.0% to Fan Speed Setpoint for Low SAT	70.00%	
Setpoint	Cooling	Evap Leaving Air Temp High	Evap Leaving Air Temp Low to 60.0 °F	60.0 °F	
Setpoint	Cooling	Evap Leaving Air Temp Low	50.0 °F to Evap Leaving Air Temp High	50.0 °F	
Setpoint	Cooling	Reset Enthalpy SP	25 to 35 BTU/LB	30 BTU/LB	
Setpoint	Cooling	Return Air Diff SP	4.0 °F to 10.0 °F	6.0 °F	

TABLE 36 - SETPOINTS (CONT'D)

USER INTERFACE KEY	SUBSECTION	Displayed Text	Range	DEFAULT VALUE	UNIT SETTING
Setpoint	Supply Fan	Duct Static Reset Low Setpoint	0.0 "W.C. to Duct Static High Limit	1.5 "W.C.	
Setpoint	Supply Fan	Duct Static Reset High Setpoint	Duct Static Low Limit to Duct Static SNS Span	2.5 "W.C.	
Setpoint	Supply Fan	Duct Static Over Pressure	0.0 "W.C. to 5.0 "W.C.	3.0 "W.C.	
Setpoint	Supply Fan	Unit Installed Altitude	0 ft – 7,000 ft	0 FT	
Setpoint	Supply Fan	Piezometer K-Factor	0.00–10,000.00	8,869.55	
Setpoint	Supply Fan	Supply Fan Lockout Limit	50%–95%	60%	
Setpoint	Heating	OCC Zone Heating Setpoint	60.0 °F to 2.0 °F Below the Occupied Zone Cooling	68.0 °F	
Setpoint	Heating	UNOCC Zone Heating Setpoint	50.0 °F to 2.0 °F Below the Unoccupied Zone Heating	60.0 °F	
Setpoint	Heating	RAT Heating Setpoint	55.0 °F to 2.0 °F Below the RAT Cooling Setpoint	68.0 °F	
Setpoint	Heating	Heat Limit Temperature	100.0 °F to 150.0 °F	130.0 °F	
Setpoint	Heating	Heating Sat	80.0 °F to 115.0 °F	100.0 °F	
Setpoint	Heating	1st Stage Heating Setpoint	80.0 °F to 95.0 °F	85.0 °F	
Setpoint	Heating	2nd Stage Heating Setpoint	95.0 °F to 115.0 °F	100.0 °F	
Setpoint	Heating	Morning Warm-up Max Time	15 Min to 240 Min	120 MIN	
Setpoint	Economizer	Outside Air Enthalpy Setpoint	22.0 BTU/# to 40 BTU/#	28 BTU/#	
Setpoint	Economizer	Water Econo Min Position	0.0% to 100%	15.00%	
Setpoint	Economizer	Water Econo Delta	0.00 °F to 10.00 °F	5.00 °F	
Setpoint	Ventilation	OA Damper Minimum Position	0.0 % to OA Damper Maximum Position	15.00%	
Setpoint	Ventilation	OA Damper Maximum Position	OA Damper Minimum Position to 100.0%	30.00%	
Setpoint	Condenser	Cond Valve Min Position	0.0% to 100%	15.00%	
Setpoint	Condenser	Cond Bypass Max Position	0.0% to 100%	50%	
Setpoint	Condenser	Disc Pressure Setpoint Min	0 Psig to 650 Psig	225 PSIG	
Setpoint	Condenser	Disc Pressure Setpoint Max	0 Psig to 650 Psig	400 PSIG	
Setpoint	Condenser	Flush Delay Time	0 to 60 Minutes	0	

NOTE 1: Control Method only shows in Constant Volume Mode. If it needs to be changed to Comm Zone Temp you must change the Unit Type to Constant Volume, make the change and put back to VAV or FlexSys.

PROGRAM

To view the values press the PROGRAM key. After pressing the PROGRAM key use the ◄ key or the ► key to select the menu subsection: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Condenser, that contains the parameter you would like to view. The parameters contained under each of these menu subsections and their password level is contained in *Table 37*. Use the ▲ and ▼ arrow key to navigate to the parameter within the subsection you want to view.

If you need to change any of the "Program" parameters press the CHECK key. The Enter Password screen will appear. All "Program" parameters require the use of a password before they can be changed. *See Password on page 156 for information on how to enter a password into the User Interface.* If a Level 1 password is entered, only Level 1 "Program" parameters will be available for change. Entering a Level 2 password will make all "Program" parameters available.

Once a password is entered it will remain active for 15 minutes.

TABLE 37 - PROGRAM

USER INTERFACE KEY	SUBSECTION	DISPLAYED TEXT	RANGE	DEFAULT VALUE	UNIT SETTING
Program	Unit Data	Display Language	English / Spanish[2]	English	
Program	Unit Data	Display Units	Imperial / Metric	Imperial	
Program	Unit Data	Control Method[1]	Wire Zone Temp / Comm Zone Temp	Wire Zone Temp	
Program	Unit Data	Clock Schedule	User Enabled / User Disabled	User Disabled	
Program	Unit Data	Isolation Damper Control	User Enabled / User Disabled	User Disabled	
Program	Cooling	Active Slab Control	User Enabled / User Disabled	User Disabled	
Program	Cooling	Dew Point Reset	User Enabled / User Disabled	User Disabled	
Program	Cooling	Sat Reset Method	None / Outside Air / Return Air / Supply Fan Speed	Returned Air	
Program	Cooling	Sup Air Tempering	User Enabled / User Disabled	User Disabled	
Program	Cooling	Undr Flr Humi Bas	User Enabled / User Disabled	User Disabled	
Program	Cooling	Undr Flr Temp Bas	User Enabled / User Disabled	User Disabled	
Program	Cooling	FlexSys Reheat	User Enabled / User Disabled	User Disabled	

1. If Night Setback is Enabled, there must be either a Hardwired or Communicated Zone Temp Value present. If there is no Zone Temp value, it is set for Hardwired and Night Setback is Enabled, the unit will fault and shutdown. Control Method will only display when in Constant Volume. If the unit is shipped as VAV or FlexSys you need to change the Unit Type to Constant Volume and change the Control Method to Communicated Zone Temperature control. Then return to the VAV or FlexSys mode. Control Method only shows in the Constant Volume mode.

2. Spanish is a future option. It may not currently be available.

TABLE 37 - PROGRAM (CONT'D)

USER INTERFACE KEY	SUBSECTION	DISPLAYED TEXT	RANGE	DEFAULT VALUE	UNIT SETTING
Program	Comp Systems	Comp System A State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Comp Systems	Comp System B State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Comp Systems	Comp System C State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Comp Systems	Comp System D State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Comp Systems	Comp System E State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Comp Systems	Comp System F State	Lockout / Auto Reset / Stop / Run	Stop	
Program	Supply Fan	SF VFD Bypass Mode	VFD Active / VFD Bypassed	VFD Active	
Program	Supply Fan	Duct Press Cntrl Mode	Lowest / Average / Highest / Duct Pressure 1 Only	Duct Pressure 1 Only	
Program	Heating	Heating System	User Enabled / User Disabled	User Enabled	
Program	Heating	HW Valve Action	Direct / Reverse	Direct	
Program	Heating	Morn Warm Up	User Enabled / User Disabled	User Disabled	
Program	Heating	Adapt Morn Warm Up	User Enabled / User Disabled	User Disabled	
Program	Heating	Night Set Back *(Note 1)*	User Enabled / User Disabled	User Disabled	
Program	Economizer	Economizer System	User Enabled / User Disabled	User Disabled	
Program	Economizer	Econo Method to Use	Dry Bulb / Single Enthalpy / Dual Enthalpy / Waterside	Waterside	
Program	Ventilation	Ventilation System	User Enabled / User Disabled	User Disabled	
Program	Ventilation	Comfort Ventilation	User Enabled / User Disabled	User Disabled	
Program	Condenser	Cond Water Control	User Disabled / User Enabled	User Enabled	
Program	Condenser	Flush Cycle	User Disabled / User Enabled	User Disabled	

NOTE 1: If Night Setback is Enabled, there must be either a Hardwired or Communicated Zone Temp Value present. If there is no Zone Temp value, it is set for Hardwired and Night Setback is Enabled, the unit will fault and shutdown. Control Method will only display when in Constant Volume. If the unit is shipped as VAV or FlexSys you need to change the Unit Type to Constant Volume and change the Control Method to Communicated Zone Temperature control. Then return to the VAV or FlexSys mode. Control Method only shows in the Constant Volume mode.

OPTIONS

The items under the OPTIONS key involve the set up of the unit based on the ordered options. Many of these parameters are preset at the factory based on the unit configuration and should not be changed. To view the values press the OPTIONS key. After pressing the OPTIONS key use the ◄ key or the ► key to select the menu subsection: Unit, Cooling, Compressor Systems, Supply System, Heating, Economizer, Ventilation, or Condenser, that contains the parameter you would like to view. The parameters contained under each of these menu subsections and their password level is contained in *Table 38*. Use the ▲ and ▼ key to navigate to the parameter within the subsection you want to view.

If you need to change any of the "Options" parameters press the CHECK key. The Enter Password screen will appear. All "Program" parameters require the use of a password before they can be changed. *See Password on page 156 for information on how to enter a password into the User Interface.* If a Level 1 password is entered, only Level 1 "Options" parameters will be available for change. Entering a Level 2 password will make all "Options" parameters available.

Once a password is entered it will remain active for 15 minutes.

TABLE 38 - OPTIONS

USER INTERFACE KEY	SUBSECTION	DISPLAYED TEXT	RANGE	DEFAULT VALUE	UNIT SETTING
Options	Unit Data	Unit Type	Constant Volume / Variable Air Volume / FlexSys	Variable Air Volume	
Options	Unit Data	Unit Size	12-105 Ton	25	
Options	Unit Data	Freezestat	Not Installed/Installed	Not Installed	
Options	Unit Data	Refrigerant Type	R22 / R409c / R410a	R410a	
Options	Unit Data	Comp Staging Sequencing	Simple / Mixed	Simple	
Options	Supply Fan	High Duct Static SW	Not Installed / Installed	Not Installed	
Options	Supply Fan	Sf Vfd Bypass	Not Installed / Installed	Not Installed	
Options	Supply Fan	DP Sensor #2	Not Installed / Installed	Not Installed	
Options	Supply Fan	Duct Pressure Signal	0-5 VDC/1-5 VDC	0-5 VDC	
Options	Supply Fan	Duct Pressure Transducer Span	.25/1.25/2.50/5.00 "W.C.	5.00 "W.C.	
Options	Supply Fan	Supply Fan Piezometer	Not Installed / Installed	Not Installed	
Options	Heating	Heating System Type	None / Electric / Hot Water Steam	None	
Options	Heating	Elec Heat Capacity	17.5 Kw / 35 Kw / 52.5 Kw / 70 Kw	17 Kw	
Options	Economizer	Econo Installed	None / Dry Bulb / Single Enthalpy / Dual Enthalpy / Waterside	Waterside	
Options	Ventilation	Damper Hardware	None / 2 Position / Standard	None	
Options	Condenser	Cond Valves Installed	None / Cond Only / Cond W/ Bypass	None	
Options	Condenser	Water Flow Switch	Not Installed / Installed	Not Installed	
Options	Condenser	Condenser Type	Water Cooled / Air Cooled	Water Cooled	

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.

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

Follow the instructions given in the Data Entry Keys section to change the above values.

SCHEDULE

The "clock schedule" function can be USER ENABLED / USER DISABLED 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.

If you want to provide continuous operation from one day to the next the SCHEDULE STOP time should be set to 11:59 PM (23:59), and the SCHEDULE START time of the next day to 12:00 AM (00:00).

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. For example 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. The following table lists the displays.

TABLE 39 - OPERATING HOURS / START COUNTER

DISPLAY TEXT	PASS WORD LEVEL	RANGE	DEFAULT	SETTING LOCATION	SHOW WHEN
Compressor A Oper Hrs **Compressor A Starts**	1		Derived		
Compressor B Oper Hrs **Compressor B Starts**	1		Derived		
Compressor C Oper Hrs **Compressor C Starts**	1		Derived		Unit Size Is More Than Or Equal To 50 Ton

Shown below is a typical screen example.

Hours / Starts Oper Hrs. XXXXX
Compressor 1 Starts XXXXX

PRINTER

The Unit Controller has the capability of being connected though the RS-232 serial port, Port 2, to a computer using Hyper Terminal. A NUL MODEM cable must be used to connect the computer to the Unit Controller.

Set Up

The computer must be connected to Port 2 of the Unit Controller. Use the SERVICE key to verify that Port 2 is configured to "TERMINAL."

Press the PRINT key on the key pad. Use the ▼ key to set the following:

PRINTER BAUD RATE
PRINTER PARITY
PRINTER STOP BITS
PRINTER ROWS PER PAGE

These parameters must be set identical to the settings in Hyper Terminal. In addition the data bits must be set to 8 and Flow Control to None.

To use Hyper Terminal to save a report to a file:

- Select "Transfer – Transfer Text" and enter a file name to save the report in.
- From the Unit Controller panel, select the report you want to print. *See Report Section below to select the report.*
- As the report is uploading from the Unit Controller to the PC, it is displayed in the Hyper Terminal window.
- When the reports finish transferring to the file, select "Transfer – Capture Text – Stop."
- The file can then be printed from an application like Notepad or Word.

To use Hyper Terminal to print a report without saving it to a file:

- Select "Transfer – Capture to Printer."
- From the Unit Controller panel, select the report you want to print. *See Report Section on this page to select the report.*
- As the report is uploading from the Unit Controller to the PC, it is displayed in the Hyper Terminal window.
- After the reports finish transferring to the PC, select "Transfer – Capture to Printer" to send the last page to the printer.

Report Section

Press the PRINT key and enter the password. Press the CHECK key. Use the left or right arrow key to navigate through the menu. The following reports are available to be printed:

STATUS
UNIT DATA
COOLING
COMP SYSTEM
SUPPLY SYSTEM
HEATING
ECONOMIZER
VENTILATION
CONDENSER
SETPOINTS
PROGRAM
OPTIONS
DATE / TIME
SCHEDULE
HOURS / STARTS
SERVICE
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
RUN TEST
PRINT ALL REPORTS

After you have selected the report you want to print press the CHECK key to output the report to the computer.

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

All the DIGITAL outputs (DO) except for the compressors can be forced ON. In order to force the outputs the LOCAL STOP switch must be in the OFF position. To force an output ON use the ◄ or ► key to navigate to the SERVICE DO section. Then use the ▲ or ▼ key to select the output you want to force ON. Press the ✓ key and then use the ► key to switch it from OFF to ON. Press the ✓ key again to energize the output. Repeat the above process in reverse to turn the forced output back to OFF.

All the ANALOG outputs (AO) can be forced ON. In order to force the outputs the LOCAL STOP switch must be in the OFF position. To force an output ON use the ◄ or ► key to navigate to the SERVICE AO section. Then use the ▲ or ▼ key to select the output you want to force ON. Press the ✓ key and then use the numeric key pad to enter the output value. Press the ✓ key again to energize the output. Repeat the above process in reverse to turn the forced output back to 0.0. *Failure to do so will leave the forced output value in place until a different value is initiated by the operation of the unit*.

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
  - Data Log Format
  - Data Log Error
  - Update Flash
  - Update Flash Error
  - Factory Run Test
- Digital Outputs
- Analog Outputs
- Analog Inputs
- Digital Inputs
- Communication
  - BAS Input Status.
  - Unit Controller Internal Data - not for field use.
  - Device Object Instance.
  - Communication Port Setup.
  - Unit Controller Error data - not for field use.

Table 40 on page 149 lists the Displayed Text, Input or Output type, Unit Controller terminal location (ID), Value Range, and when item is displayed.

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TABLE 40 - SERVICE

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
Duct Static Press 1	Analog Input	J10-2	0-5 Volts	I/O Board	Analog Input from the Supply Air Pressure Transducer #1
Duct Static Press 2	Analog Input	J10-5	0-5 Volts	I/O Board	Analog Input from the Supply Air Pressure Transducer #2
Evap Press Temp Current	Analog Input	J10-05	0-5VDC		
Flex Evap Temp Current	Analog Input	J9-10	0-5 Volts	I/O Board	Analog Input from the Temperature Sensors Positioned on the Leaving Side of the Evaporator Coil
Mixed Air Temp	Analog Input	J9-8	0-5 Volts	I/O Board	Analog Input from the Temperature Sensor Positioned before the Evaporator Coil
Mx Supply Air Temp Current	Analog Input	J9-2	0-5 Volts	I/O Board	Analog Input from the Supply or Mixed Air Sensor
Outside Air Humidity	Analog Input	J11-2	0-5 Volts	I/O Board	Analog Input from the Outdoor Air Humidity Sensor

TABLE 40 - SERVICE (CONT'D)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
Outside Air Temp	Analog Input	J9-6	0-5 Volts	I/O Board	Analog Input from the Outdoor Air Temperature Sensor
Piezometer Pressure	Analog Input		0-5 Volts	Tb1-20	The Piezometer measures the amount of CFMs the fan is producing
Pressure Discharge A	Analog Input	J6-1	0-5 Volts	I/O Board	Analog Input from the System A Discharge Pressure Transducer
Pressure Discharge B	Analog Input	J6-3	0-5 Volts	I/O Board	Analog Input from the System B Discharge Pressure Transducer
Pressure Discharge C	Analog Input	J7-1	0-5 Volts	I/O Board	Analog Input from the System C Discharge Pressure Transducer
Pressure Discharge D	Analog Input	J7-3	0-5 Volts	I/O Board	Analog Input from the System D Discharge Pressure Transducer
Pressure Discharge E	Analog Input	J8-1	0-5 Volts	I/O Board	Analog Input from the System E Discharge Pressure Transducer
Pressure Discharge F	Analog Input	J8-3	0-5 Volts	I/O Board	Analog Input from the System F Discharge Pressure Transducer
Pressure Suction A	Analog Input	J6-2	0-5 Volts	I/O Board	Analog Input from the System A Suction Pressure Transducer
Pressure Suction B	Analog Input	J6-4	0-5 Volts	I/O Board	Analog Input from the System B Suction Pressure Transducer
Pressure Suction C	Analog Input	J7-2	0-5 Volts	I/O Board	Analog Input from the System C Suction Pressure Transducer
Pressure Suction D	Analog Input	J7-4	0-5 Volts	I/O Board	Analog Input from the System D Suction Pressure Transducer
Pressure Suction E	Analog Input	J8-2	0-5 Volts	I/O Board	Analog Input from the System E Suction Pressure Transducer
Pressure Suction F	Analog Input	J8-4	0-5 Volts	I/O Board	Analog Input from the System F Suction Pressure Transducer
Return Air Humidity	Analog Input	J11-5	0-5 Volts	I/O Board	Analog Input from the Return Air Humidity Sensor
Return Air Temp Current	Analog Input	J9-4	0-5 Volts	I/O Board	Analog Input from the Return Air Temperature Sensor
Supply Air Temp Current	Analog Input	J9-2	0-5 Volts	I/O Board	Analog Input from the Supply or Mixed Air Sensor
Underfloor Air Humidity	Analog Input	J11-8	0-5 Volts	I/O Board	Analog Input from the Underfloor Humidity Sensor
Underfloor Slab Temp	Analog Input	Tb1-16	0-5 Volts	I/O Board	Analog Input from the Under Floor Temperature Sensor
Vent Override	Analog Input	Tb1-18	0-5 Volts	I/O Board	Analog Input to Control the Economizer Damper
Water Temperature Entering	Analog Input	J9-12	0-5 Volts	I/O Board	Analog Input from the Entering Cond Water Temp Sensor
Water Temperature Leaving	Analog Input	J9-14	0-5 Volts	I/O Board	Analog Input from the Leaving Cond Water Temp Sensor
Zone Temp Current	Analog Input	Tb1-14	0-5 Volts	I/O Board	Analog Input from the Zone Temperature Sensor
Bypass Damper Position	Analog Output	J15-11	0-10 VDC	I/O Board	Analog Output to the FlexSys Bypass Damper
Cond Water Valve	Analog Output	J15-8	2-10 VDC	I/O Board	Analog Output to the Condenser Water Valve

TABLE 40 - SERVICE (CONT'D)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
Economizer Valve	Analog Output	J15-14	2-10 VDC	I/O Board	Analog Output to the Water Economizer Valve
Heating Valve	Analog Output	J15-5	0-10 VDC	I/O Board	Analog Output to the Heating Valve
OA Damper Position	Analog Output	J15-2	2-10 VDC	I/O Board	Analog Output to the Economizer Dampers
Supply Fan VFD Speed	Analog Output	J17-1	0-10 VDC	I/O Board	Analog Output to the Supply Fan VFD
Duct Static Pres Reset BAS	Commun	Port P1	0 to 100%	IPU Board	The Duct Static Reset Valve being Communicate to the Unit through the BAS
Morning Warm Up CMD	Commun	Port P1	On / Off	IPU Board	Gives the Status of the Communicated Morning Warm Up Command
Occupancy Command	Commun	Port P1	Occupied / Unoccupied	IPU Board	Gives the Status of the Communicated Occupancy Command
Reset Enthalpy BAS	Commun	Port P1	User Enabled/Disabled	IPU Board	Enables the Enthalpy Reset to be done through the BAS
Reset Enthalpy SP BAS	Commun	Port P1	30.00BTU#		The Reset Enthalpy SP can be provided through the BAS
RA Diff BAS	Commun	Port P1	User Enabled/Disabled	IPU Board	Enables the Return Air Differential to be done through the BAS
Return Air Diff SP BAS	Commun	Port P1	6.00 degrees F		
Supply Air Temp Reset BAS	Commun	Port P1	0 to 5 Volts	IPU Board	The Supply Air Temperature Reset Value Being Communicated to the Unit through the Bas System
System Stop	Commun	Port P1	0 - Allows all Compressors to Operate; 1 - Turns Off Compressor System 1; 2 - Turns Off Compressor System 2; 3 - Turns Off Compressor System 3	IPU Board	Gives the Status of the Communicated System Stop Command
Undrfloor Air Humidity BAS	Commun	Port P1	0 to 100%	IPU Board	The Under Floor Humidity Value Being Communicated to the Unit
Underfloor Slab Temp BAS	Commun	Port P1	-20 F to 180 F	IPU Board	This is the Actual Under Floor Temperature Value Being Communicated by the BAS System
Unit Stop	Commun	Port P1	On / Off	IPU Board	Gives the Status of the Communicated Unit Stop Command
Zone Temp BAS	Commun	Port P1	-20 F to 180 F	IPU Board	Gives the Actual Value of the Communicated Zone Temperature
Connexsys Error Feature and Detection	Derived				Not for Field Use
Connexsys Error Page and Field	Derived				Not for Field Use

TABLE 40 - SERVICE (CONT'D)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
Connexsys Error Reason and Valve	Derived				Not for Field Use
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 Control - Lost and Peak	Derived				The Lost and Peak Time Used by the Control. This is not for Field Use
Real Time Control - Peak 5 Sec and Average	Derived				The Average And Peak Over The Last 5 Seconds Time Used By The Control. This is not for Field Use
Real Time Problem	Derived				Not for Field Use
Real Time Problem Number	Derived				Not for Field Use
Real Time Problem String	Derived				Not for Field Use
Real Time UI - Lost and Peak	Derived				The Lost and Peak Time Used by the User Interface. This is not for Field Use
Real Time UI - Peak 5 Sec and Average	Derived				The Average And Peak Over the Last 5 Seconds Time Used by the User Interface. This is not for Field Use
Duct High Static Safety	Digital Input	J13-8	On / Off	I/O Board	Digital Input from the Duct High Static Switch
Filter Status	Digital Input	J13-4	Okay / Change	I/O Board	Digital Input from the Dirty Filter Pressure Switch
Hw/Steam Frz Stat	Digital Input	J13-6	Okay / Faulted	I/O Board	Digital Input from the Hot Water Freezestat
Local Stop	Digital Input	Tb01-3	Run / Stop	I/O Board	Digital Input that Turns the Unit On And Off
Alarm	Digital Output	Tb1-7, 8	Okay / Faulted	I/O Board	Digital Output that is Generated when there is an Alarm
Occupancy State	Digital Input	Tb01-4	Occupied / Unoccupied	I/O Board	Hardwired Digital Input to Put the Unit Into the Occupied Mode
Safety Input Chain A	Digital Input	J21-2	Okay / Faulted	I/O Board	Digital Input from the Compressor System A Safety Circuit
Safety Input Chain B	Digital Input	J21-5	Okay / Faulted	I/O Board	Digital Input from the Compressor System B Safety Circuit
Safety Input Chain C	Digital Input	J22-2	Okay / Faulted	I/O Board	Digital Input from the Compressor System C Safety Circuit
Safety Inputs Chain D	Digital Input	J22-5	Okay / Faulted	I/O Board	Digital Input from the Compressor System D Safety Circuit
Safety Inputs Chain E	Digital Input	J23-2	Okay / Faulted	I/O Board	Digital Input from the Compressor System E Safety Circuit
Safety Inputs Chain F	Digital Input	J23-5	Okay / Faulted	I/O Board	Digital Input from the Compressor System F Safety Circuit

TABLE 40 - SERVICE (CONT'D)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
Supply Fan Status	Digital Input	J13-2	Running / Stopped	I/O Board	Digital Input for the Supply Fan Run Verification Circuit
Water Flow Switch	Digital Input	J13-10	On / Off	I/O Board	Digital Input from the Water Flow Switch
Compressor A	Digital Output	J16-1	On / Off	I/O Board	Status of the Digital Output to Compressor A
Compressor A Load	Digital Output	J12-2	1-5Vdc	I/O Board	Analog Output to the Digital Compressor Controller
Compressor B	Digital Output	J16-2	On / Off	I/O Board	Status of the Digital Output to Compressor B
Compressor C	Digital Output	J16-3	On / Off	I/O Board	Status of the Digital Output to Compressor C
Compressor D	Digital Output	J16-4	On / Off	I/O Board	Status of the Digital Output to Compressor D
Compressor E	Digital Output	J16-5	On / Off	I/O Board	Status of the Digital Output to Compressor
Compressor F	Digital Output	J16-6	On / Off	I/O Board	Status of the Digital Output to Compressor F
Electric Heat Stg 1	Digital Output	J31-1	On / Off	I/O Board	Status of Electric Heat Digital Output To Stage 1
Electric Heat Stg 2	Digital Output	J31-2	On / Off	I/O Board	Status of Electric Heat Digital Output to Stage 2
Electric Heat Stg 3	Digital Output	J31-3	On / Off	I/O Board	Status of Electric Heat Digital Output to Stage 3
Electric Heat Stg 4	Digital Output	J31-4	On / Off	I/O Board	Status of Electric Heat Digital Output to Stage 4
OCC/UNOC Indication	Digital Output	Tb1-9, 10	On / Off	I/O Board	Gives the Occupied / Unoccupied Status
Pump Start or Isolation Damper	Digital Output		User Enabled/Disabled	Tb1-11, 12	These functions cannot be combined. One or the other can be used, and the description of their operation can be found in *Table 43 on page 171*
Supply Fan Output (CV)	Digital Output	J17-5	On / Off	I/O Board	Status of Supply Fan Digital Output for Constant Volume
Supply Fan Output (VAV, FLEX)	Digital Output	J17-3 & 4	On / Off	I/O Board	Status of Supply Fan Digital Output For VAV or Flex
Supply Fan VFD Bypass Relay	Digital Output	Tb17-6	On / Off	I/O Board	Digital Output is Turned On when Set to Bypass
VAV Heat Relay	Digital Output	Tb1-12	On / Off	I/O Board	Status of the Digital Output for the VAV Heat Relay
Data Log Error	Error Detail		*See Table 51*		Data Log Error Detail (Only Displayed when Error is Present)
	Error State		See Table 50		Data Log Error State (Only Displayed when Error is Present)
Data Log Format			Off		Used to Activate the Data Log Feature of the Control
DE Modifier Address			-1 to 41943		Used to Enter a Specific DE Instance. *See SECTION 6 – USER INTERFACE CONTROL CENTER*

TABLE 40 - SERVICE (CONT'D)

DISPLAY TEXT	TYPE	ID	VALUE RANGE	LOCATION	DESCRIPTION
DE Modifier Offset			-1 to 99		Used in Combination with the DE Modifier Address to Enter A Specific DE Instance. *See Section 6 - Communication*
Factory Run Tester			User Disable / User Enable		Only Used for Factory Run Test
P1 Baud Rate			1200, 4800, 57600 9600, 19200, 38400, 76800		Establishes the Communication Baud Rate for Port 1
P1 Manual MAC Address			-1 to 127		Allows the Manual Entrance of the MAC Address For Port 1. *See Section 6 - Communication*
P1 Parity			None, Even, Odd, Ignore		Do not Change from Default Value for BACNET
P1 Protocol			BACNET, API		Keep Setting on BACNET
P1 Stop Bits			1-2		Do not Change from Default Value for BACNET
P2 Baud Rate			1200, 4800, 9600, 19200, 38400, 57600		Establishes the Communication Baud Rate for Port 2
P2 Manual MAC Address			-1 to 127		Allows the Manual Entrance of the MAC Address for Port 2. *See Section 6 - Communication*
P2 Parity			None, Even, Odd, Ignore		Establishes the Parity for Communication Port 2
P2 Protocol			Terminal, Modbus I/O, Modbus Server, API, Modbus Client		Establishes the Protocol for Communication Port 2
P2 Stop Bits			1 - 2		Establishes the Stop Bit Setting for Communication Port 2
Update Flash			On / Off		Used to Update Control Software
Update Flash Error					Description of the Error (Only Displayed when Error is Present)

Following is an example of an Analog Input display that can be viewed from Service Mode. *See Table 40 on page 149 for a listing of the Analog Inputs.*

Service AI PIO J10-2 XX.X VDC
+ Duct Static Pres =XX.XXINWC

Following is an example of a DIGITAL Input display that can be viewed from Service Mode. *See Table 40 on page 149 for a listing of the Digital Inputs.*

Service DI PIO TB01-3
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. *See Table 40 on page 149 for a listing of the Digital Outputs.*

Service DO PIO J16-1
Compressor A OFF

Following is an example of an Analog Output display that can be viewed from Service Mode. *See Table 40 on page 149 for a listing of the Analog Outputs.*

Service AO PIO J17-1 XX.X VDC
+ SUPPLY FAN VFD SPEED =XXX.X %

HISTORY

See *History Key Sequence* below.

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, HISTORY 1 is displayed. If there are no 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 HISTORY 1 after the last warning. The ◄ key returns to the previous warning or the highest HISTORY number before the first warning.

When a HISTORY # is displayed, the ► key advances to the next HISTORY # or warning 1 after the last fault. The ◄ key returns to the previous HISTORY # or the highest warning number before the first fault. Buffer number 1 is the most recent and buffer number 10 is the oldest HISTORY # saved. A maximum of 10 HISTORY #'s are saved. The ▲ and ▼ key can be used to scroll forwards and backwards through the HISTORY buffer 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 Fan
- Comp Sys 1
- Comp Sys 2
- Comp Sys 3
- Heating
- Economizer
- Ventilation
- Condenser
- Hours/Starts

TABLE 41 - HISTORY KEY SEQUENCE

HISTORY key pressed

WARNING 1	WARNING 2	FAULT 1	FAULT 2	FAULT 3
		Fault 1 Data	Fault 2 Data	Fault 3 Data

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 **X** 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 **X** 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-low water temp
```

The ► key is pressed to move to the first fault.

```
History 01 31 Oct 2004 12:45:59 AM ◄►
+ LOCKOUT-high duct pressure
```

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-low water temp
```

The ▼ key is pressed to view data saved when fault #3 was detected.

```
History 03 – Status ◄►
Unit-Overall Status 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 **X** or HISTORY key is pressed to go back to the fault display.

```
History 03 30 Oct 2004 02:11:23 PM ◄►
WRN-low water temp
```

From fault display, the **X** 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 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:

- VER.ZZ.YY (control board released version).
- Where C is the Product Classification and stands for Commercial unit.
- VER is the Family Code.
- ZZ = the Product Code.
- YY = the Version Number.

COMMUNICATION

The 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 (*Figure 69 on page 158)* has two serial communication ports. BACNET MS/TP must use Port 1 and Terminal must use Port 2, which is the RS232 Port.

BACNET Wiring

All BACNET devices are "daisy chained" together using a twisted pair, the (+) is connected to the (+) and the (-) to the (-). The connections on the PORT 1 connector are as follows:

1 = + (Transmit)

2 = - (Receive)

3 = R (Return)

4 = S (Shield)

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 I/O board or through the User Interface. The default Device Object Instance (DE) 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 though the SERVICE key of the User Interface. The 8-way binary switch (SW2) 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 70 on page 159*. Switch 8 must always be in the ON position to allow terminal operation.

As stated above the MAC address can also be set using the SERVICE key. Go to parameter "PI MANUAL MAC ACCESS." Press the ✓ key and enter the MAC address number using the numeric keypad and then press the ✓ key 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 ADDRESS." In order to use the above procedure to establish the Device Object Instance (DE) the value for "DE MODIFIER OFFSET" MUST BE SET TO –1.

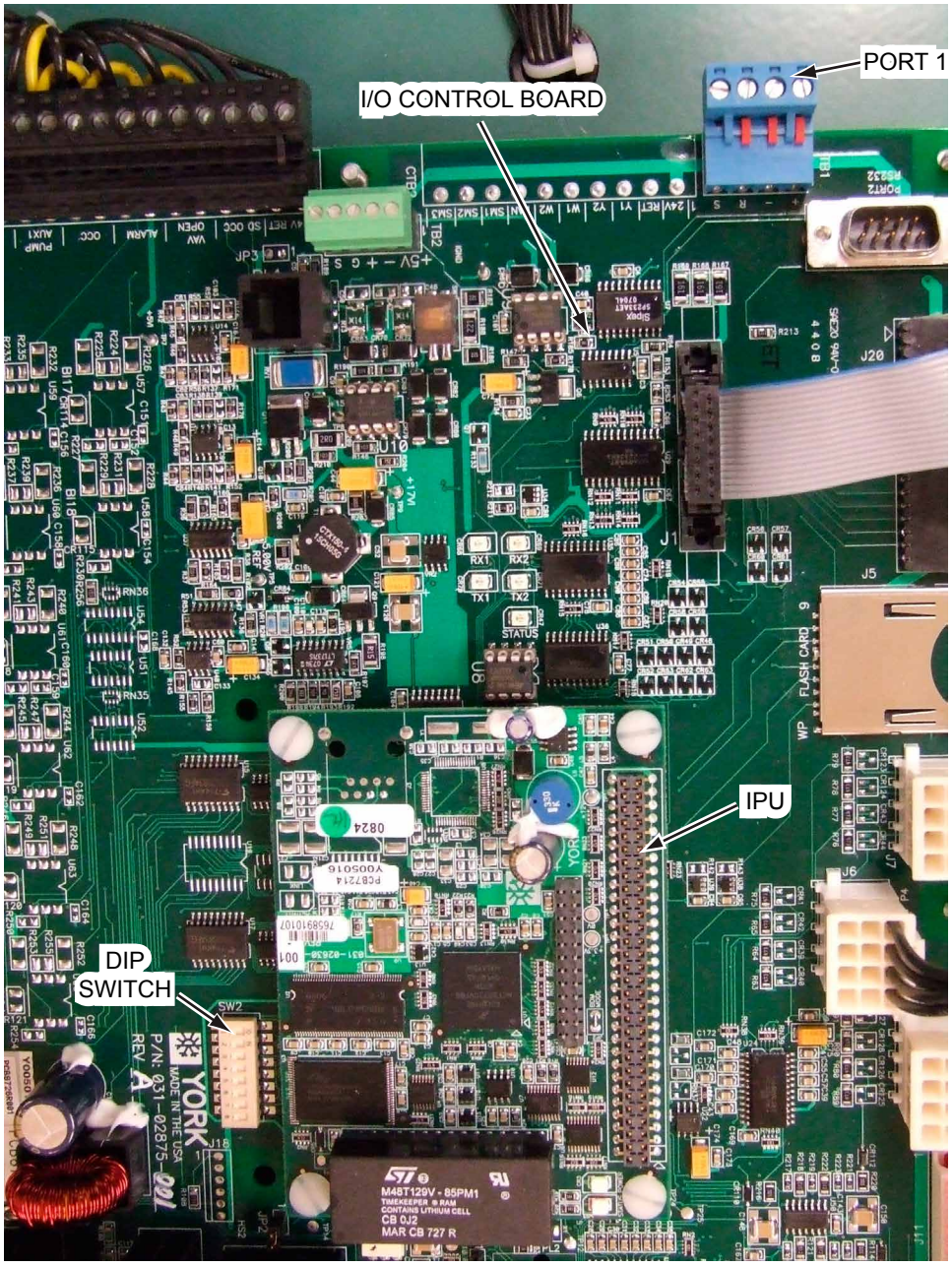

FIGURE 69 - IPU CONTROL BOARD

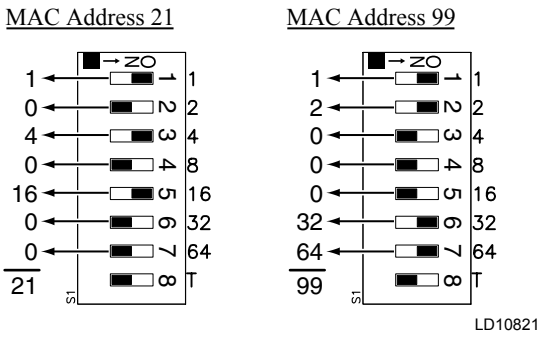

FIGURE 70 - MAC ADDRESS SWITCHES

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" times 100) plus "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 ✓ key to enter the DE Modifier Address number using the numeric keypad, and then press the ✓ key again. Then go to parameter "DE MODIFIER OFFSET." Press the ✓ key to enter the DE Modifier Offset number using the numeric keypad and then press the ✓ key again.

Additional Settings

The following parameters can also be programmed using the SERVICE key:

- PORT 1
- "P1 BAUD RATE"
- "P1 MANUAL MAC ADDRESS"
- "P1 PARITY"
- "P1 PROTOCOL"
- "P1 STOP BITS"
- PORT 2
- "P2 BAUD RATE"
- "P2 MANUAL MAC ADDRESS"
- "P2 PARITY"
- "P2 PROTOCOL"
- "P2 STOP BITS"

Table 42 on page 160 gives the BACNET name, BACNET Object Type and Instance, and the Modbus Register Address for the available communication points.

Any time a change is made to the MAC address using the DIP switches or a change to the above communication parameters using the SERVICE Key of the User Interface the main power to the unit must be cycled OFF and back ON to change the value in memory.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
ACT _DSP_ SP	Duct Static Setpoint	R	AI01	514	A Derived Value the Duct Static is Controlled to ("WG)
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	AI5	1102	Allows the Active Slab Control Feature to be Turned On and Off on FlexSys Units (0 = Off / 1 = On)
ALARM	Alarm	R	BI02	1283	Gives the Status of the Alarm (NFL - No Fault; FLT - Faulted)
AMORN_ WA_ACT	Adapt Morn Warm Up Active	R	BI01	1282	Identifies when Adaptive Morning Warm Up is Active (Off / On)
AV_PRS_A_ SUC	Avg Press Suction A	R	AI5	518	Gives the Average Suction Pressure for the System A Unloading Compressor
AV_PRS_DIS	Avg Press Discharge A	R	AI2	515	Gives the Average Discharge Pressure for the System A Unloading Compressor
BYPASS_ DAMPER	Bypass Damper	R	AI06	519	Actual Bypass Damper Position (%)
BYP_VALV_ POS	Bypass Valve Position	R	AI64	577	The Analog Output from the Control to the Bypass Valve
COMFORT_ VENT	Comfort Ventilation	R/W	AI2	1103	Gives the Status of the Comfort Vent Option and Allows it to be Turned On and Off (0 = Off; 1 = On)
COMP_A	Compressor A	R	BI03	1284	Status of Compressor A, (On/Off)
COMP_B	Compressor B	R	BI04	1285	Status of Compressor B, (On/Off)
COMP_C	Compressor C	R	BI05	1286	Status of Compressor C, (On/Off)
COMP_D	Compressor D	R	BI06	1287	Status of Compressor D, (On/Off)
COMP_E	Compressor E	R	BI07	1288	Status of Compressor E, (On/Off)
COMP_F	Compressor F	R	BI08	1289	Status of Compressor F, (On/Off)
COMP_A_ LOAD	Compressor A Load	R	AI15	528	Gives the Status of the Unloading Compressor in %.
COMP_A_ OPER	Compressor 1A Oper Hrs	R	AI09	522	The Number of Hours Compressor A has been in Operation (Hour)
COMP_B_ OPER	Compressor 1B Oper Hrs	R	AI10	523	The Number of Hours Compressor B has been in Operation (Hour)
COMP_C_ OPER	Compressor 2A Oper Hrs	R	AI11	524	The Number of Hours Compressor C has been in Operation (Hour)
COMP_D_ OPER	Compressor 2B Oper Hrs	R	AI12	525	The Number of Hours Compressor D has been in Operation (Hour)
COMP_E_ OPER	Compressor 3A Oper Hrs	R	AI13	526	The Number of Hours Compressor E has been in Operation (Hour)
COMP_F_ OPER	Compressor 3B Oper Hrs	R	AI14	527	The Number of Hours Compressor F has been in Operation (Hour)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
COMP_A_ STAT	Comp Sys A Status	R	AI66	579	Identifies the Status of the Compressor A (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_B_ STAT	Comp Sys B Status	R	AI67	580	Identifies The Status of the Compressor B (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_C_ STAT	Comp Sys C Status	R	AI68	581	Identifies the Status of the Compressor C (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_D_ STAT	Comp Sys D Status	R	AI69	582	Identifies the Status of The Compressor D (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_E_ STAT	Comp Sys E Status	R	AI70	583	Identifies the Status of the Compressor E (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_F_ STAT	Comp Sys F Status	R	AI71	584	Identifies The Status of the Compressor F (0 - Ready; 1 - Safety Trip 1; 2 - Safety Trip 2; 3 - Comp On; 4 - Low Pressure Lockout; 5 - Inhibited; 6 - Safety Lockout; 7 Off Ascd; 8 - User Disabled).
COMP_ STAT_A	Safety Input Chain A	R	BI12	1293	Status of Compressor A Compressor Safety Circuit (NFL - No Fault / FLT - Faulted)
COMP_ STAT_B	Safety Input Chain B	R	BI13	1294	Status of Compressor B Compressor Safety Circuit (NFL - No Fault / FLT - Faulted)
COMP_ STAT_C	Safety Input Chain C	R	BI14	1295	Status of Compressor C Compressor Safety Circuit (NFL - No Fault / FLT - Faulted)
COMP_ STAT_D	Safety Input Chain D	R	BI67	1348	Status of Compressor D Compressor Safety Circuit (NFL - NO FAULT / FLT - FAULTED)
COMP_ STAT_E	Safety Input Chain E	R	BI68	1349	Status of Compressor E Compressor Safety Circuit (NFL - NO FAULT / FLT - FAULTED)
COMP_ STAT_F	Safety Input Chain F	R	BI69	1350	Status of Compressor F Compressor Safety Circuit (NFL - NO FAULT / FLT - FAULTED)
COMP_STG_ SEQ	Comp Staging Seq	R	AI65	578	This Identifies the Type of Compressor Staging Being Used (0 = Simple; 1 = Mixed)
COND_BYP_ MAX	Cond Bypass Max Pos	R/W	AV41	1066	The Maximum Allowable Opening for the Bypass Valve (%)
COND_BYP_ MIN	Cond Valve Min Pos	R/W	AV42	1067	The Minimum Allowable Opening for the Condenser Water Valve (%)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
COND_PRS_ OUT	Condenser Pressure PI Output	R	AI75	588	This is a Derived Value that Identifies the Output Demand to the Condenser Water Valve (%)
COND_TYPE	Condenser Type	R	AI76	589	This Identifies the Type of Condenser Installed in the Unit (0 = Water Cooled; 1 = Air Cooled)
COND_VAL_ INS	Cond Valves Install	R	AI72	585	Identifies the Condenser Valve Installed (0 = None; 1 = Cond Only; 2 = Cond W/Bypass)
COND_ WTR_CNT	Cond Water Control	R	BI66	1347	Identifies the Status of the Condenser Water Control (0 = Dis; 1 = Ena)
COND_ WTR_FLW	Cond Water Flow	R	AI73	586	Identifies if the Unit is Configured for a Water Flow Switch (0 = None; 1 = Installed)
COND_ WTR_VAL	Cond Water Valve	R	AI74	587	Shows the Position of the Condenser Water Valve (%)
DCT_STAT_ PR1	Duct Static Pres 1	R	AI17	530	Actual Duct Static Pressure Input from Transducer 1 to the Control ("WG)
DCT_STAT_ PR2	Duct Static Pres 2	R	AI77	590	Actual Duct Static Pressure Input from Transducer 2 to the Control ("WG)
DEW_PNT_ RST	Dew Point Reset	R/W	BV4	1105	This Allows the Dew Point Reset Feature to be Turned On and Off on FlexSys Units (0 = Off / 1 = On)
DSP_HI_SP	Duct Static High Setp	R/W	AV03	1028	The Duct Static Upper Setpoint ("WG)
DSP_LO_SP	Duct Static Low Setp	R/W	AV04	1029	The Duct Static Lower Setpoint ("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
ECON_ME_ USED	Economizer Method Active	R	AI18	531	The Economizer Method being Used by the Control (1 - Dry Bulb; 2 - Single Enthalpy; 3 - Dual Enthalpy; 4 - Best Method; 5 - Waterside)
ECONO_IN-STAL	Economizer Installed	R/W	BV5, AV81	1106	Allows the Economizer Feature to be Turned On and Off (0 = Off / 1 = On)
ECONO_ METHOD TO USE	Economizer Method	R/W	AV06	1031	The Economizer Method Selected for Use (0 - Dry Bulb; 1- Single Enthalpy; 2 - Dual Enthalpy; 3 - Best Method)
ECONO_ VALVE	Economized Valve Position	R	AI16	529	Current Output Value to the Waterside Economizer Valve from the Unit Controller.
ECON_STA-TUS	Econo Sys Status	R	AI19	532	Status of the Economizer Option (0 - Installed and Inactive; 1 - Installed and Active; 2 - Not Installed; 3 - Disabled)
EL_AIR_ TMP_H	Evap Leaving Air Temp High Setpoint	R/W	AV07	1032	On a FlexSys Unit with Bypass this is the Supply Air Temperature High Setpoint (F)
EL_AIR_ TMP_L	Evap Leaving Air Temp Low Setpoint	R/W	AV08	1033	On a FlexSys Unit with Bypass this is the Supply Air Temperature Low Setpoint (F)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
EVAP_AIR_ TMP	Flex Evap Temp Current	R	AI20	533	Actual Temperature of Air Leaving the Evaporator Coil on a FlexSys Unit (F)
FILTER_ STATS	Filter Status	R	BI25	1306	Identifies the Status of the Binary Dirty Filter Input (NFL - No Fault; FLT - Faulted)
FLSYS_RE-HEAT	FlexSys Reheat	R/W	BV6-AV82		Allows for FlexSys Reheat to be Turned On and Off (0-Disabled; 1-Enabled)
FREEZESTAT	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)
FURN_ OUT_1	Electric Heat Stage 1	R	BI26	1307	Identifies the Status of the Binary Output to The Indicated Heating Section (Off / On)
FURN_ OUT_2	Electric Heat Stage 2	R	BI27	1308	Identifies the Status of the Binary Output to The Indicated Heating Section (Off / On)
FURN_ OUT_3	Electric Heat Stage 3	R	BI28	1309	Identifies the Status of the Binary Output to the Indicated Heating Section (Off / On)
FURN_ OUT_4	Electric Heat Stage 4	R	BI29	1310	Identifies the Status of the Binary Output to the Indicated Heating Section (Off / On)
HEAT_EN-ABLE	Heating System	R/W	AV83, BV7	1108	A Communicated Input that Allows the Heating Function to be Turned On and Off (1 = Enabled; 0 = Disabled)
HEATING_ SAT	Heating Sat	R/W	AV09	1032	The Heating Sat Setpoint for a VAV or FlexSys Unit (F)
HEATING_ VALV	Heating Valve	R	AI24	537	The Output from the Control to a Hot Water, Steam, or Modulating Gas Heat Valve (%)
HEAT_STAG-ES	Electric Heat Stages	R	AI23	536	Derived Value Showing the Number of Electric or Staged Gas Heat Stages Available (1 - 7)
HEATING_ STAT	Heating System Status	R	AI78	591	Identifies the Status of the Heat (0 - Normal - Inactive; 1 - Normal - Active; 2 - None; 3 - Disabled; 4 - Normal; 5 - Warning; 6 - Safety Trip; 7 Safety Fault; 8 - Safety Lockout; 9 - Air Tempering))
HEAT_VAC-TION	Heating Valve Action	R/W	AV84, BV8	1109	A Communicated Input That Allows the Heating Valve Action To Be Changed (0 = Direct Acting; 1 = Reverse Acting)
LOCAL_ STOP	Local Stop	R	BI34	1315	Identifies the Status of the Hardwired Binary Input of the Local Stop (Run / Stp - Stop)
MAX_BY-PASS	Maximum Bypass	R/W	AV10	1035	The Maximum Allowable Setting for the Bypass Damper in a FlexSys Unit (%)
MIX_AIR_ TEMP	Mixed Air Temp	R	AI79	592	The Temperature of the Air Entering the Evaporator Coil
MIXD_SAT_ SP	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_ WARM_UP	Morning Warm Up Enable	R/W	AV85, BV9	1110	A Communicated Input that Allows Morning Warm Up to be Turned On and Off (0 = Enabled; 1 = Disabled)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
MORN_ WUP_CMD	Morning Warm Up Cmnd	R/W	AV88, BV10	1111	A BAS Generated Command to Allow the Morning Warm Up Feature to be Turned On and Off (0 = Off / 1 = On)
NEED_ DEHUMID	Need for Dehumidification	R/W	BI37		Enables Dehumidification Process-FlexSys Only (On or Off)
NIGHT_SET-BAC	Night Set Back (for Heating)	R/W	AV87, BV11	1112	This Command Allows the Night Set Back Heating Function to be Turned On and Off (0 = Off / 1 = On)
OA_DAMP-ER	OA Damper	R	AI25	538	This is the Position of the Outdoor Damper (%)
OA_DAMP_ MIN	OA Damper Min Position	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 (%)
OA_DAMP_ MAX	OA Damper Max Position	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_EN-THALPY	Outside Air Enthalpy	R	AI26	539	Actual Outside Air Enthalpy (BTU/LB)
OA_ENTH_ SP	OA Enthalpy Setp	R/W	AV18	1043	The Upper Enthalpy Limit to Allow the Use of Outdoor Air for Single or Dual Enthalpy Economizer (BTU/Lb)
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)
OAT_HIGH_ SAT	OAT for High SAT	R/W	AV19	1044	The Outdoor Temperature the Control Uses when Using Outdoor Air SAT Reset to Switch to the SAT High Limit Setpoint (F)
OAT_LOW_ SAT	OAT for Low SAT	R/W	AV20	1045	The Outdoor Temperature the Control Uses when Using Outdoor Air SAT Reset to Switch to the SAT Low Limit Setpoint (F)
OCC_MODE	Occupancy Mode	R	BI35	1316	Identifies the Occupied / Unoccupied Status with Hard Wired, Communicated or Internal Clock Schedule Input (ENA - Enabled-Occupied; DIS - Disabled - Unoccupied)
OCC_STATE	Occupancy State	R	BI36	1317	Identifies the Status of the Hardwired Binary Input (ENA - Enabled - Occupied; DIS - Disabled Unoccupied)
OC-CUPNCY_ CMD	Occupancy Command	R/W	AV88, BV12	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 Setpoint (F)
OCC_ZN_ HEAT	Occupied Zone Heating Setp	R/W	AV22	1047	The Occupied Zone Heating Setpoint (F)
PR_DIS_SP-MIN	Discharge Pressure Sp Min	R/W	AV43	1068	Establishes the Minimum Discharge Pressure Setpoint for Condenser Water Control

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
PR_DIS_SP-MAX	Discharge Pressure Sp Max	R/W	AV46	1071	Establishes the Minimum Discharge Pressure Setpoint for Condenser Water Control
PRS_A_ DISCH	Pressures Discharge A	R	AI31	544	Actual Comp A Discharge Pressure (PSI)
PRS_A_ SUCTION	Pressures Suction A	R	AI32	545	Actual Comp A Suction Pressure (PSI)
PRS_B_ DISCH	Pressures Discharge B	R	AI33	546	Actual Comp B Discharge Pressure (PSI)
PRS_B_ SUCTION	Pressures Suction B	R	AI34	547	Actual Comp B Suction Pressure (PSI)
PRS_C_ DISCH	Pressures Discharge C	R	AI35	548	Actual Comp C Discharge Pressure (PSI)
PRS_C_ SUCTION	Pressures Suction C	R	AI36	549	Actual Comp C Suction Pressure (PSI)
PRS_D_ DISCH	Pressures Discharge D	R	AI80	593	Actual Comp D Discharge Pressure (PSI)
PRS_D_ SUCTION	Pressures Suction D	R	AI83	596	Actual Comp D Suction Pressure (PSI)
PRS_E_ DISCH	Pressures Discharge E	R	AI81	594	Actual Comp E Discharge Pressure (PSI)
PRS_E_ SUCTION	Pressures Suction E	R	AI84	597	Actual Comp E Suction Pressure (PSI)
PRS_F_ DISCH	Pressures Discharge F	R	AI82	595	Actual Comp F Discharge Pressure (PSI)
PRS_F_SUC-TION	Pressures Suction F	R	AI85	598	Actual Comp F Suction Pressure (PSI)
RA_DIFF_ BAS	Return Air Differential BAS	R/W	AV48		A Value can be Provided by the BAS to Provide a Return Air Differential. FlexSys Only.
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)
RAT_HEAT_ SP	RAT Heating Setp	R/W	AV15	1040	On a VAV or FlexSys Unit this is the Return Air Temperature Setpoint Used to Determine when the Unit Should Switch to the Heating Mode (F)
RAT_HIGH_ SAT	RAT for High SAT	R/W	AV24	1049	The Return Temperature the Control Uses when Using Return Air SAT Reset to Switch to the SAT High Limit Setpoint (F)
RAT_LOW_ SAT	RAT for Low SAT	R/W	AV25	1050	The Return Temperature the Control Uses when Using Return Air Sat Reset to Switch to the SAT Low Limit Setpoint (F)
RDY_RUN_ C1A	Ready to Run Comp A	R	BI40	1321	Identifies if Compressor A is Ready to Run if the Compressor is Off (Yes / No)
RDY_RUN_ C1B	Ready to Run Comp B	R	BI41	1322	Identifies if Compressor B is Ready to Run if the Compressor is Off (Yes / No)
RDY_RUN_ C2A	Ready to Run Comp C	R	BI42	1323	Identifies if Compressor C is Ready to Run if the Compressor is Off (Yes / No)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
RDY_RUN_ C2B	Ready to Run Comp D	R	BI43	1324	Identifies if Compressor D is Ready to Run if the Compressor is Off (Yes / No)
RDY_RUN_ C3A	Ready to Run Comp E	R	BI44	1325	Identifies if Compressor E is Ready to Run if the Compressor is Off (Yes / No)
RDY_RUN_ C3B	Ready to Run Comp F	R	BI45	1326	Identifies if Compressor F is Ready to Run if the Compressor is Off (Yes / No)
RDY_STOP_ C1A	Ready to Stop Comp A	R	BI46	1327	Identifies if Compressor A is Ready to Stop if the Compressor is Running (Yes / No)
RDY_STOP_ C1B	Ready to Stop Comp B	R	BI47	1328	Identifies if Compressor B is Ready to Stop if the Compressor is Running (Yes / No)
RDY_STOP_ C2A	Ready to Stop Comp C	R	BI48	1329	Identifies if Compressor C is Ready to Stop if the Compressor is Running (Yes / No)
RDY_STOP_ C2B	Ready to Stop Comp D	R	BI49	1330	Identifies if Compressor D is Ready to Stop if the Compressor is Running (Yes / No)
RDY_STOP_ C3A	Ready to Stop Comp E	R	BI50	1331	Identifies if Compressor E is Ready to Stop if the Compressor is Running (Yes / No)
RDY_STOP_ C3B	Ready to Stop Comp F	R	BI51	1332	Identifies if Compressor F is Ready to Stop if the Compressor is Running (Yes / No)
RET_AIR_ BY_S	Active Bypass Active Sp	R	AI37	550	A Derived Value for the Current Setpoint of the Return Air Bypass Damper on a FlexSys Unit (%)
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)
RST_ENT_ BAS	Reset Enthalpy BAS	R/W	AV47		A Value can be Provided by the BAS to Provide a Reset Enthalpy. FlexSys Only.
SAT_HIGH_ SP	SAT High Setpoint	R/W	AV26	1051	The Upper Limit for the Supply Air Temperature Setpoint on a VAV Unit (F)
SAT_LOW_ SP	SAT Low Setpoint	R/W	AV27	1052	The Lower Limit for the Supply Air Temperature Setpoint 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 Setpoint on VAV Units. 0 Volts Uses SAT High Limit and 5 Volts Uses SAT Low Limit (V).
SAT_TEM-PER	SAT Tempering Enable	R	BI53	1334	Identifies if Supply Air Tempering is Turned On (DIS/ENA)
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)
SF_SPD_H_ SAT	SF Speed for High SAT	R/W	AV29	1054	The Fan Speed the Control Uses when Using Supply Fan Speed SAT Reset to Switch to The SAT High Limit Setpoint (%)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
SF_SPD_L_ SAT	SF Speed for Low SAT	R/W	AV30	1055	The Fan Speed the Control Uses when Using Supply Fan Speed SAT Reset to Switch to the SAT Low Limit Setpoint (%)
SF_VFD_ BYPAS	SF VFD Bypass Mode	R	BI70	1351	Identifies if a VFD Bypass is Installed. DIS = Installed ENA = Not Installed
SF_VFD_ BP_MO	SF VFD Bypass Mode	R	AI86	599	This Gives the Status of the VFD Bypass Mode (0 = VFD Active; 1 = VFD Bypassed)
STG_1_ COOL	Stage 1 Cooling	R/W	AV31	1056	For a Constant Volume Unit this is the Active SAT Setpoint for a First Stage Cooling Demand (F)
STG_1_ HEAT	Stage 1 Heating	R/W	AV32	1057	For a Constant Volume Unit this is the Active SAT Setpoint for a First Stage Heating Demand (F)
STG_2_ COOL	Stage 2 Cooling	R/W	AV33	1058	For a Constant Volume Unit this is the Active SAT Setpoint for a Second Stage Cooling Demand (F)
STG_2_ HEAT	Stage 2 Heating	R/W	AV34	1059	For a Constant Volume Unit this is the Active SAT Setpoint for a Second Stage Heating Demand (F)
SPLY_AIR-FLOW	Piezometer Airflow (Displayed in CFM)	R	AI92	605	Piezometer installed from factory; the unit will produce a value for airflow as cubic feet a Minute (CFM)
SUP_AIR_ TEMP	Supply Air Temp	R	AI46	559	Actual Supply Air Temperature (F)
SUP_FAN_ VFD	Supply Fan VFD	R	AI48	561	The Actual Output to the Supply Fan VFD (%)
SUPPLY_ FAN	Supply Fan	R	BI59	1339	The Status of the Binary Output from the Controller to the Supply Fan Circuit (On / Off)
SUPPLY_ STAT	Supply System Status	R	AI87	600	Identifies the Status of the Supply System (0 - Normal - Inactive; 1 - Normal - Active; 2 - None; 3 - Disabled; 4 - Normal; 5 - Warning; 6 - Safety Trip; 7 Safety Fault; 8 - Safety Lockout)
SYSTEM_ STOP	System Stop	R/W	AV35	1059	A 0- Value Allows all Compressors to Operate; 1 - Turns Off Compressor System A; 2 - Turns Off Compressor System B; 3 - Turns Off Compressor System C
UND_FLR_ DEWP	Under Floor Dew Point	R	AI55	568	The Calculated Dew Point of the Air Under The Floor in a FlexSys System (%)
UND_FLR_ 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_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)

***NOTE:** SUPPLY AIRFLOW has a maximum value of 58,000 CFM. Any value from 3,277 to 58,000 CFM cannot be displayed using Modbus.

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
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
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
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
UNIT_STAT	Unit Overall Status	R	AI88	601	Identifies the Unit Overall Status (0 - Normal - Inactive; 1 - Normal - Active; 2 - None; 3 - Disabled; 4 - Normal; 5 - Warning; 6 - Safety Trip; 7 Safety Fault; 8 - Safety Lockout)
UNIT_STOP	Unit Stop	R/W	AV93, BV17	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 Setpoint (F)
UNOCC_ZN_ HEAT	Unoccupied Zone Heating	R/W	AV39	1064	The Unoccupied Zone Heating Setpoint (F)
VAV_HEAT	VAV Heat	R	BI61	1342	Identifies the Status of the Binary Output TP Energize a VAV Heat Relay (Off / On)
VENT_CONTROL	Ventilation Control	R/W	AV94, BV18	1119	A Communicated Input that Allows the Selection of the Ventilation Function (0 = Fixed Minimum; 1= Demand)
VENT_ENABLE	Ventilation Enable	R/W	AV95, BV19	1120	This Command Allows the Ventilation Function to be Turned On or Off (0 = Off / 1 = On)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

TABLE 42 - BACNET MS/TP, MODBUS, BACNET IP (CONT'D)

BACNET NAME	USER INTERFACE NAME	READ/ WRITE	BACNET OBJECT TYPE AND INSTANCE	MODBUS REGISTER ADDRESS	POINTS LIST DESCRIPTION
VENT_STAT	Vent Sys Status	R	AI89	602	Identifies the Status of the Ventilation System (0 - Normal - Inactive; 1 - Normal - Active; 2 - None; 3 - Disabled; 4 - Normal; 5 - Warning; 6 - Safety Trip; 7 Safety Fault; 8 - Safety Lockout)
WTR_ECN_ DLTA	Water Econo Delta	R/W	AV44	1069	This Item is Used in the Determination of when Waterside Economizer becomes Active (F)
WTR_ECN_ MIN	Water Econo Min Pos	R/W	AV45	1070	The Minimum Allowable Opening for the Water Economizer Valve (%)
WTR_ FLOW_SW	Water Flow Switch	R	BI71	1352	Identifies if a Water Flow Switch is Installed ENA = Not Installed DIS = Installed
WTR_TEMP_ ENT	Water Temp Entering	R	AI90	603	The Temperature of the Condenser Water Entering the Unit
WTR_TEMP_ LEV	Water Temp Leaving	R	AI91	604	The Temperature of the Condenser Water Leaving the Unit
ZONE_TEMP	Zone Temp	R	AI60	573	Zone Temperature the Control is Controlling to (F)
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)

NOTE: The most up to date listing of the standard points mapping can be found in the Johnson Controls website.

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SECTION 7 – PARAMETER DESCRIPTIONS AND OPTIONS

TABLE 43 - DEFINITIONS

MENU ITEM	DEFINITION
1ST STAGE COOLING SETPOINT	This parameter is programmed through the Setpoints key. This value is used in a Constant Volume unit as the Active SAT Setpoint for 1st Stage cooling operation.
1ST STAGE HEATING SETPOINT	This parameter is programmed through the Setpoints key. This value is used in a Constant Volume unit as the Active SAT Setpoint for 1st Stage heating operation.
2ND STAGE COOLING SETPOINT	This parameter is programmed through the Setpoints key. This value is used in a Constant Volume unit as the Active SAT Setpoint for 2nd Stage cooling operation.
2ND STAGE HEATING SETPOINT	This parameter is programmed through the Setpoints key. This value is used in a Constant Volume unit as the Active SAT Setpoint for 2nd Stage heating operation.
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 WARM 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 enable or disable this feature.
AIR FLOW	This is a calculated amount of Cubic Feet of Air (CFM) leaving the blower measured through the Piezometer mounted in the unit. The correct altitude and K-factory will have to be programmed in the unit to read the correct CFM.
ALARM	This is a binary output that could be used to signal that the Unit Controller was identified an alarm condition.
AVG PRESS DISCHARGE A	Compressor a has a 15 second load, unload duty cycle. This is the average discharge pressure over that 15 second period.
AVG PRESS SUCTION A	Compressor a has a 15 second load, unload duty cycle. This is the average suction pressure over that 15 second period
BYPASS DAMPER POSITION	This is a derived value and is the actual position of the bypass damper, by percent open, in a FlexSys unit.
BYPASS VALVE POSITION	This is the analog output from the Unit Controller to the condenser water bypass valve.
CLOCK SCHEDULE	This parameter is programmed through the PROGRAM key. This function is used to turn on the internal clock schedule. The choices are Enabled or Disabled.
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.
COMP STAGING SEQ	This parameter is programmed through the OPTIONS key. This parameter identifies the type of compressor staging the Unit Controller is to use. The choices are Simple or Mixed.
COMP SYS A STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor A system. It is also used to reset a compressor that is locked out. The options are STOP, RUN and LOCKOUT.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
COMP SYS A STATUS	This is the current operating mode of Compressor A The display will show Normal - Inactive, Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMP SYS B STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor B system. It is also used to reset a compressor that is locked out. The options are stop, run and lockout.
COMP SYS B STATUS	This is the current operating mode of Compressor B. The display will show Normal - Inactive, Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMP SYS C STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor C system. It is also used to reset a compressor that is locked out. The options are stop, run and lockout.
COMP SYS C STATUS	This is the current operating mode of Compressor C. The display will show Normal - Inactive, Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMP SYS D STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor D system. It is also used to reset a compressor that is locked out. The options are Stop, Run, Lock Out.
COMP SYS D STATUS	This is the current operating mode of Compressor D. The display will show Normal - Inactive, Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMP SYS E STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor E system. It is also used to reset a compressor that is locked out. The options are stop, run and lockout.
COMP SYS E STATUS	This is the current operating mode of Compressor E. The display will show Normal - Inactive, Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMP SYS F STATE	This parameter is programmed through the PROGRAM key and can be used to manually establish the state of Compressor F system. It is also used to reset a compressor that is locked out. The options are stop, run and lockout.
COMP SYS F STATUS	This is the current operating mode of Compressor F. The display will show Normal - Inactive; Normal - Active, User Disabled, Warning, Safety Trip, Safety Fault, Safety Lockout, Low Amb Inhibit.
COMPRESSOR A LOAD	This is the analog output in volts DC to the digital compressor controller for Compressor A
COND BYPASS MAX POS	This parameter is programmed through the SETPOINTS key and establishes the maximum allowable position for the condenser water bypass valve.
COND VALVE MIN POS	This parameter is programmed through the SETPOINTS key and establishes the minimum allowable position for the condenser water valve.
COND VALVES INSTALLED	This parameter is programmed through the OPTIONS key and identifies the type of condenser water valve that is installed. The options are None, Cond Only, Cond W/Bypass.
COND WATER CONTROL	This parameter is programmed through the PROGRAM key and can be used to turn Condenser Water Control on or off. The options are User Enabled or User Disabled.
COND WATER SYSTEM	This setting indicates what type of condenser water system the unit is connected to. It is used to determine what position the water valves should be in when the unit is on but not actively in the mechanical cooling mode.
COND WATER VALVE	This is the analog output from the Unit Controller to the condenser water control valve.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
CONDENSER PRESSURE PI OUTPUT	This parameter is the demand generated by the Unit Controller from the comparison of the lowest compressor discharge pressure to the Discharge Pressure Setpoint.
CONDENSER TYPE	This parameter is programmed through the OPTIONS key and is used to identify the type of condenser being used by the unit. The options are Water Cooled or Air Cooled.
CONDENSER WATER FLOW	This parameter identifies if the binary input from the condenser water flow switch is on open or closed. The options are ON - flow and OFF - no flow.
CONTROL METHOD	This parameter is programmed through the PROGRAM key and identifies the control method being used on a Constant Volume unit. The choices are Wired Zoned Temp or Comm Zone Temp.
COOLING CONTROL OFFSET	This is a derived value and is the control band the unit is trying to maintain. The control band is the Active Setpoint plus or minus 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 a derived value and is the amount of time the compressor A has been in operation during the current cycle.
CURRENT RUN TIME COMP B	This is a derived value and is the amount of time the compressor B has been in operation during the current cycle.
CURRENT RUN TIME COMP C	This is a derived value and is the amount of time the compressor C has been in operation during the current cycle.
CURRENT RUN TIME COMP D	This is a derived value and is the amount of time the compressor D has been in operation during the current cycle.
CURRENT RUN TIME COMP E	This is a derived value and is the amount of time the compressor E has been in operation during the current cycle.
CURRENT RUN TIME COMP F	This is a derived value and is the amount of time the compressor F has been in operation during the current cycle.
DAILY WARM UP TIME DAY 1	This is a derived value and 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 a derived value and 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 a derived value and 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.
DAILY WARM UP TIMER	This is a derived value and is the time it takes to bring the return air temperature up to setpoint during Adaptive Morning Warm Up. The Primary Unit Controller uses this value in the calculation of Daily Warm Up Time Day 1.
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.
DATA LOG FORMAT	This parameter is set through the Service key and is used to initiate the data logging feature. The options are Off, Uncompressed, Skip Unchanged.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
DE MODIFIER ADDRESS	This parameter is programmed through the Service key. The default value is 230 which results in a DE Instance number of 23000 plus the MAC address. This is the YORK default value. If it is set to -1 all communication is disabled.
DE MODIFIER OFFSET	This parameter is programmed through the Service key. The default value is -1. The DE Instance number can be set manually using the DE Modifier Address and this parameter.
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.
DIG COMP LOAD PT 1	This is the lowest capacity the digital compressor (A) can operate at. The default value is 33%
DIG COMP LOAD PT2	This is the middle capacity the digital compressor (A) can operate at. The default value is 67%
DIG COMP LOAD PT 3	This is the maximum capacity the digital compressor (A) can operate at. The default value is 100%
DISCHARGE PRESSURE MINIMUM	This parameter identifies the lowest discharge pressure of all the active compressors.
DISCHARGE PRESSURE SETPOINT	This parameter is programmed through the SETPOINTS key and is the discharge pressure the Unit Controller will try to maintain by adjusting the condenser water flow.
DISCHARGE PRESSURE SP Min	This parameter is programmed through the SETPOINTS key and is the minimum discharge pressure the unit controller will try to maintain by modulating the condenser water flow.
DISCHARGE PRESSURE SP Max	This parameter is programmed through the SETPOINTS key and is the maximum discharge pressure the unit controller will try to maintain by modulating the condenser water flow.
DISPLAY LANGUAGE	This parameter is programmed through the PROGRAM 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 PROGRAM 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 CNTRL	This parameter is set through the PROGRAM key and is used to specify the type of pressure control to use when the unit is programmed for two duct static pressure transducers. The options are duct press 1 only, highest, lowest and average.
DUCT PRESS SENSOR 2	This parameter is set through the OPTIONS key and is used to identify when two duct static transducer have been installed. The options are Not Installed or Installed.
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.
DUCT STATIC PRES CURRENT 1	This is the actual duct static pressure sensed by static pressure transducer 1 when the Unit Controller is programmed for two duct static inputs.
DUCT STATIC PRES CURRENT 2	This is the actual duct static pressure sensed by static pressure transducer 2 when the Unit Controller is programmed for two duct static inputs.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
DUCT STATIC PRESS AVERAGE	This parameter displays the average duct static pressure input when the Unit Controller is programmed for two duct static inputs.
DUCT STATIC PRESS HIGHEST	This parameter displays the higher of the two duct static pressure inputs when the Unit Controller is programmed for two duct static inputs.
DUCT STATIC PRESS LOWEST	This parameter displays the lower of the two duct static pressure inputs when the Unit Controller is programmed for two duct static inputs.
DUCT STATIC PRESSURE ACTIVE SP	This is the current derived Duct Static Setpoint that the Primary Unit Controller is trying to maintain.
DUCT STATIC PRESSURE CURRENT	This is a derived value and is the actual duct static pressure value.
DUCT STATIC PRES RESET BAS	This value is found under the Service key and identifies the duct static reset signal being communicated from a front end BAS control.
DUCT STATIC RESET - HIGH SETP	This parameter is programmed through the Setpoints key. This is the maximum Duct Static Control point.
DUCT STATIC RESET-LOW SETP	This parameter is programmed through the Setpoints key. This is the minimum Duct Static Control point.
ECONO CONTROL OUTPUT	This is a derived value and is the analog output from the Unit Controller to the Economizer Damper Actuator.
ECONO INSTALLED	This parameter is programmed through the OPTIONS key and tells the Primary Unit Controller what type of economizer is installed, None, Dry Bulb, Single Enthalpy, Dual Enthalpy, Waterside.
ECONO METHOD ACTIVE	This is a derived value an 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, Best Available, Waterside.
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.
ECONOMIZER SYSTEM	This parameter is programmed through the PROGRAM key and is used to turn the economizer option on or off. The options are User Enable or User Disable.
ECONOMIZER VALVE	This is a derived value and is the analog output from the Unit Controller to the waterside economizer valve.
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 11 KW, 17 KW, 34 KW, 68 KW.
ENTERING WATER - ACTIVE SP	This is a derived value and is the Mixed Air Temp minus the Water Econo Delta. When the entering water temperature is less then this value the unit will use waterside economizer.
EVAP LEAVING AIR TEMP HIGH	This parameter is programmed through the Setpoints key. This becomes the Active Supply Air Temperature Setpoint 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 Setpoint for a FlexSys unit when it is in the Under Floor Temperature Over Ride mode.
EVENT MESSAGE	This parameter will identify the most important current active fault or warning.
FACTORY RUN TEST	This feature is initiated through the Service key and is used to verify the operation of the unit by exercising all the binary and analog outputs.
FAN SPEED SETP FOR HIGH SAT	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 Setpoint on a Variable Air Volume Unit will be set to the SAT Set High Setpoint.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
FAN SPEED SETP FOR LOW SAT	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 Setpoint on a Variable Air Volume Unit will be set to the SAT Set Low Setpoint.
FILTER STATUS	This is a derived value and 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 a derived value and is the active evaporator temperature setpoint 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.
FLUSH CYCLE	This allows the economizer coil to go through a flush cycle one time a day during an unoccupied period in order to minimize contamination and dirt buildup in the economizer water coil.
FLUSH DELAY TIME	This is the amount of time between when the controller determines it is time to initiate a flush cycle and the actual start of the cycle.
ISOLATION DAMPER	This is a binary output that closes a dry set of contact that could be used to initiate isolation damper on the unit's duct work. This same connection is used for a PUMP START command programmed through the User Interface on the unit by disabling this function, but they cannot be used together for the same unit.
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 a derived value and is the control band the unit is trying to maintain. The control band is the Active Setpoint plus or minus 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 Setpoint for heating operation. The Primary Unit Controller controls the heating option to try and maintain this temperature.
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	This parameter is set through the PROGRAM key and is used to turn the heating function on or off. The options are User Enabled or User Disabled.
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, Hot Water Heat, or Steam Heat.
HIGH DUCT STATIC SW	This parameter is programmed through the OPTIONS key. This is used to identify if a high duct static switch is installed. The options are Not Installed or Installed
HW / STEAM HEAT - FREEZESTAT	This is a derived value and identifies 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 a derived value and identifies the output from the Primary Unit Controller to the hydronic valve as percent open.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
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 2 volts for off and 10 volts for full capacity. When the parameter is set to REVERSE the output is 10 volts for off and 2 volts for full capacity.
MAXIMUM BYPASS	This parameter is programmed through the Setpoints key. It establishes the maximum allowable position of the bypass damper in a FlexSys unit.
MIXED AIR TEMP	This is the temperature of the air entering the evaporator coil.
MORNING WARM UP	This parameter is programmed through the PROGRAM key. This tells the Primary Unit Controller if the Morning Warm-up 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 CMD	This value is found under the Service key and identifies if a morning warm up command is being communicated from a front end BAS control.
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 exceeds this time, the Morning Warm Up Max Time will be used.
MORNING WARM UP OPT TIME	This is a derived value and is the average of the previous three days Warm Up times plus 10 minutes. This value will be used to determine the Morning Warm Up start time for the next day when the unit is in the Adaptive Morning Warm Up mode.
MX SUPPLY AIR TEMP CURRENT	This is the actual temperature of the supply air supplied by the unit configured for FlexSys operation.
MX SUPPLY AIR TEMP SETPOINT	This parameter is programmed through the Setpoints key. This becomes the Active Supply Air Temperature Setpoint for a FlexSys unit when it is in the Occupied Cooling Without Bypass 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 User Enabled or User Disabled.
OA DAMPER MAXIMUM POSITION	This parameter is programmed through the Setpoints key. This establishes the maximum amount of ventilation air to be used.
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 a derived value and is the damper position setpoint, in percent open, the Primary Unit Controller is trying to maintain.
OA DAMPER POSITION CURRENT	This is a derived value and is the actual output, in percent open to the outdoor air damper.
OAT FOR SAT HIGH SAT	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 Setpoint on a Variable Air Volume Unit will be set to the SAT High Setpoint.
OAT FOR SAT LOW SAT	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 Setpoint on a Variable Air Volume Unit will be set to the SAT Low Setpoint.
OCCUPANCY COMMAND	This value is found under the Service key and identifies if a occupancy command is being communicated from a front end BAS control.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
OCC ZONE COOLING SETPOINT	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.
OCC ZONE HEATING SETPOINT	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.
OUTSIDE AIR ENTHALPY	This is a derived value and indicates the total heat content of the outdoor air.
OUTSIDE AIR ENTHALPY SETP	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 HUMIDITY	This is the outdoor air relative humidity.
OUTSIDE AIR TEMP	This is the outdoor air dry bulb temperature.
P1 BAUD RATE	This parameter is programmed through the Service key. This establishes the speed at which the Unit Controller communicates with a BAS system for communication Port 1.
P1 MANUAL MAC ADDRESS	This parameter is programmed through the Service key. It can be used in place of the dip switches on the I/O board to set the MAC address for Port 1. The default value is -1 which allows the use of the dip switches to set the address.
P1 PARITY	This parameter is programmed through the Service key. It is used to set the Parity for Port 1.
P1 PROTOCOL	This parameter is programmed through the Service key. It is used to set the Protocol for Port 1.
P1 STOP BITS	This parameter is programmed through the Service key. It is used to set the Stop Bits for Port 1.
P2 BAUD RATE	This parameter is programmed through the Service key. This establishes the speed at which the Unit Controller communicates with a BAS system for communication Port 2.
P2 MANUAL MAC ADDRESS	This parameter is programmed through the Service key. It can be used in place of the dip switches on the I/O board to set the MAC address for Port 2. The default value is -1 which allows the use of the dip switches to set the address.
P2 PARITY	This parameter is programmed through the Service key. It is used to set the Parity for Port 2.
P2 PROTOCOL	This parameter is programmed through the Service key. It is used to set the Protocol for Port 2.
P2 STOP BITS	This parameter is programmed through the Service key. It is used to set the Stop Bits for Port 2.
PIEZOMETER RING	The Piezometer Ring Airflow Measuring System is now available as an accessory for housed and plenum fans. The system consists of a Piezometer ring mounted at the throat and a static pressure tap mounted on the face of the inlet cone. A differential pressure transducer and digital display can also be provided.
PRESSURES - DISCHARGE A	This is the discharge pressure for compressor A.
PRESSURES - DISCHARGE B	This is the discharge pressure for compressor B.
PRESSURES - DISCHARGE C	This is the discharge pressure for compressor C.
PRESSURES - DISCHARGE D	This is the discharge pressure for compressor D.
PRESSURES - DISCHARGE E	This is the discharge pressure for compressor E.
PRESSURES - DISCHARGE F	This is the discharge pressure for compressor F.
PRESSURES - SUCTION A	This is the suction pressure for compressor A.
PRESSURES - SUCTION B	This is the suction pressure for compressor B.
PRESSURES - SUCTION C	This is the suction pressure for compressor C.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
PRESSURES - SUCTION D	This is the suction pressure for compressor D.
PRESSURES - SUCTION E	This is the suction pressure for compressor E.
PRESSURES - SUCTION F	This is the suction pressure for compressor F.
PUMP START	This is a binary output that closes a dry set of contact that could be used to initiate condenser water pump operation. This same connection is used for an ISOLATION DAMPER programmed through the User Interface on the unit, but they cannot be used together for the same unit.
RA ENTHALPY	This is a derived value and indicates the total heat content of the return air.
RAT HEATING SETPOINT	This parameter is programmed through the Setpoints key. The Primary Unit Controller compares the return air temperature to this value in determining when to place the unit into heating mode on a VAV or FlexSys unit or into the morning warm up mode.
RAT COOLING SETPOINT	This parameter is programmed through the Setpoints key. The Primary Unit Controller compares the return air temperature to this value in determining when to place the unit into cooling mode on a VAV or FlexSys unit.
RAT SETPOINT FOR HIGH SAT	This parameter is programmed through the Setpoints key. When the return temperature is equal to or less than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit will be set to the SAT High Setpoint.
RAT SETPOINT FOR LOW SAT	This parameter is programmed through the Setpoints key. When the return temperature is equal to or greater than this temperature the Active Supply Air Temperature Setpoint on a Variable Air Volume Unit will be set to the SAT Low Setpoint.
READY TO RUN COMP A	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor A is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP B	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor B is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP C	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor C is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP D	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor D is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP E	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor E is ready to be energized. The User Interface will display either YES or NO.
READY TO RUN COMP F	This is a derived value and means the minimum OFF time has been achieved and all the safety circuits are closed and compressor F is ready to be energized. The User Interface will display either YES or NO.
READY TO STOP COMP A	This is a derived value and means the minimum ON time has been achieved and compressor A ready to be de-energized. The User Interface will display either YES or NO.
READY TO STOP COMP B	This is a derived value and means the minimum ON time has been achieved and compressor B is ready to be de-energized. The User Interface will display either YES or NO.
READY TO STOP COMP C	This is a derived value and means the minimum ON time has been achieved and compressor C ready to be de-energized. The User Interface will display either YES or NO.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
READY TO STOP COMP D	This is a derived value and means the minimum ON time has been achieved and compressor D is ready to be de-energized. The User Interface will display either YES or NO.
READY TO STOP COMP E	This is a derived value and means the minimum ON time has been achieved and compressor E ready to be de-energized. The User Interface will display either YES or NO.
READY TO STOP COMP F	This is a derived value and means the minimum ON time has been achieved and compressor F 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 SETPOINT	This is a derived value and is the position of the by pass damper by percent open the Primary Controller uses as the bypass setpoint on a FlexSys unit.
RETURN AIR BYPASS - CURRENT	This is a derived value and is the current position of the by-pass damper by percent open on a FlexSys unit.
RETURN AIR ENTHALPY	This is a derived value and indicates the total heat content of the return air.
RETURN AIR HUMIDITY	This is a derived value and is the return air relative humidity.
RETURN AIR TEMP CURRENT	This is the actual return air temperature entering the unit.
SAFETY INPUT CHAIN A	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor A. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAFETY INPUT CHAIN B	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor B. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAFETY INPUT CHAIN C	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor C. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAFETY INPUT CHAIN D	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor D. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAFETY INPUT CHAIN E	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor E. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAFETY INPUT CHAIN F	This is a derived value and is the binary input to the Primary Unit Controller from the Compressor Safety Circuit Chain for compressor F. This includes the high pressure cutout and may include the compressor protection module. Okay means the safety circuit is normal and Faulted means it has faulted.
SAT HIGH SETPOINT	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 LOW SETPOINT	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.
SAT RESET METHOD	This parameter is programmed through the PROGRAM 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.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
SF VFD BYPASS	This parameter is programmed through the OPTIONS key and identifies if a VFD bypass is installed in the unit. The options are Not Installed or Installed.
SF VFD BYPASS MODE	This parameter is set through the PROGRAM key and is used to place the supply fan VFD into bypass mode when a supply fan VFD bypass is installed. The options are VFD Active or VFD Bypassed.
STAGED HEAT STATUS - STGS ON	This is a derived value and identifies the number of stages of electric heat that the Primary Unit Controller has energized.
STAGED HEAT STATUS STGS AVAIL	This is a derived value and identifies the number of stages of electric heat that are available.
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 or Occupied Cooling mode to temper the ventilation air entering the space. The choices are Enabled or Disabled.
SUPPLY AIR TEMP - ACTIVE SP	This is a derived value and is the Supply Air Temperature the Primary Unit Controller is trying to maintain.
SUPPLY AIR TEMP RESET BAS	This value is found under the Service key and identifies the supply air temperature reset signal being communicated from a front end BAS control.
SUPPLY AIR TEMP - CURRENT	This is the actual Supply Air Temperature being supplied by the unit.
SUPPLY FAN LOCKOUT LIMIT	When the fan is running and the VFD speed is below Supply Fan Lockout limit and the fan proving switch is OPEN, all the mechanical systems will be inhibited. When the VFD gets above the limit setpoint and the switch still has not moved, the unit will fault out. This is done through the SETPOINTS key, SUPPLY FAN subsection.
SUPPLY FAN OUTPUT	This is the binary output from the Primary Unit Controller to the Supply Fan control system.
SUPPLY FAN STATUS	This is a binary input into the Primary Unit Controller that identifies the Supply Fan is functioning.
SUPPLY FAN VFD FREQUENCY	This parameter shows the approximate frequency of the supply fan VFD.
SUPPLY FAN VFD SPEED	This is a derived value that 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.
SYSTEM STOP	This value is found under the Service key and identifies if a compressor stop signal is being communicated from a front end BAS system.
UNDERFLOOR SLAB TEMP BAS	This value is found under the Service key and identifies the Underfloor Slab Temperature value being communicated from a front end BAS control.
UNDER FLR TEMP BAS	This parameter is programmed through the PROGRAM key and is used to identify to the Unit Controller that it is to use a communicated value for the Underfloor Air Temp instead of a hard wired input.
UNDER FLR TEMP OVRD	This parameter is programmed through the PROGRAM key. This feature allows the Unit Controller to energize the heat to dry out underfloor space when transitioning from Occupied to Unoccupied or Unoccupied to Occupied mode.
UNDERFLOOR AIR - HUMIDITY	This is a derived value and if the humidity level under the floor of a FlexSys installation.
UNDERFLOOR AIR TEMP	This is the temperature of the air going to the under floor space in a FlexSys application
UNDERFLOOR SLAB - DEWPOINT	This is a derived value and is the dewpoint of the air beneath the floor of a FlexSys installation.
UNDERFLOOR SLAB TEMP	This is the temperature of the slab beneath the floor of a FlexSys installation.

TABLE 43 - DEFINITIONS (CONT'D)

MENU ITEM	DEFINITION
UNDERFLOOR AIR HUMIDITY BAS	This value is found under the Service key and identifies the Underfloor Air Humidity value being communicated from a front end BAS control.
UNDERFLR HUMI BAS	This parameter is programmed through the PROGRAM key and is used to identify to the Unit Controller that it is to use a communicated value for the Underfloor Air Humidity instead of a hard wired input.
UNIT INSTALLED ALTITUDE	The height of the unit in relation to sea level or ground level. Normal range is between 50–2,000 ft.
UNIT SIZE	This parameter is programmed through the Options key and identifies the size of the unit. The choices are 12 Ton, 16 Ton, 21 Ton, 25 Ton, 32 Ton, 39 Ton, 48 Ton, 50 Ton, 55 Ton, 60 Ton, 72 Ton, 79 Ton, 90 Ton.
UNIT STOP	This value is found under the Service key and identifies if a unit stop signal is being communicated from a front end BAS system.
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 STATUS	This is the active status of the Unit. The display will show Local Stop, Run, Unit Trip, Unit Fault, Unit Lockout.
UNOCC ZONE COOLING SETPOINT	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.
UNOCC ZONE HEATING SETPOINT	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.
UPDATE FLASH	This parameter is programmed under the Service key and is used to update the software in the Unit Controller from a flash card.
VAV HEAT RELAY	This is a binary output that could be used to signal the VAV boxes to open during Morning Warm Up operation.
VENT OVERRIDE	This field 2 to 10VDC can be used to control the operation of the outdoor air damper.
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 CONTROL	This parameter is programmed through the Options key must be set to Fixed Minimum.
VENTILATION SYSTEM	This parameter is programmed through the PROGRAM key and is used to turn the ventilation function on or off. The options are User Enabled or User Disabled.
WATER ECONO DELTA	This parameter is programmed through the Setpoints key and establishes the how far the Entering Water Temp must be below the Mixed Air Temp to make Waterside Economizer active.
WATER ECONO MIN POS	This parameter is programmed through the Setpoints key and establishes the minimum allowable position for the waterside economizer valve.
WATER FLOW SWITCH	This parameter is programmed through the OPTIONS key and identifies if a condenser water flow switch has been installed. The options are Not Installed or Installed.
WATER TEMP ENTERING	This is the temperature of the condenser water entering the unit.
WATER TEMP LEAVING	This is the temperature of the condenser water leaving the unit.
ZONE TEMP BAS	This value is found under the Service key and identifies the Zone Temp value being communicated from a front end BAS control.
ZONE TEMP CURRENT	This is the temperature in the conditioned space.

SECTION 8 – SERVICE

ANALOG INPUT OPERATION

This section describes the control operation of the (22) twenty-two 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 Unit Controller is contained in *Table 40 on page 149*. 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 J9-1. This is connector J9 – Pin 1. As the Unit Controller board is positioned in the control box the right hand row of the J series connectors is the input, the middle row is the common, and the left hand row is the 5VDC input to the sensor. Also the pin in the lower right hand bottom corner is pin 1.

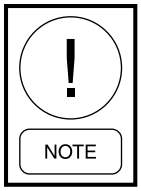
Temperature Sensors

The temperature sensors are all 10K Type III Thermistors. The relationship between the temperature and the voltage output and resistance is contained in *Table 44*. The following analog inputs are of this type: Supply Air Temperature, Flex Evap Temp, Outside Air Temp, Return Air Temp, Zone Temp, Under Floor Temp and Mixed Air Temp. and Leaving Water Temp.

Duct Pressure Transducer

The Duct Pressure Transducer is located in the electrical control box. The purpose of the transducer is to sense and convert the static pressure in the supply-side of the duct to a 1 to 5VDC voltage. The DC voltage is sent to the Unit Controller and compared against the "DUCT STATIC PRESS ACTIVE SP." 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 VDC from the transducer. *Table 45 on page 184* 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 "DUCT PRESS TRANSDUCER SPAN" can be set to .25, 1.25, 2.5 or 5.0 "W.C.

The unit will be shipped with a transducer with a 0 to 5 "W.C. span. In order to use the .25, 1.25 or 2.5 "W.C. span available through the Unit Controller, the transducer would have to be changed. The "DUCT PRESS TRANSDUCER SPAN" must always be set based on the span of the transducer installed.



Units built prior to 2012 used an AutoTran 1-5vdc output transducer for Duct Static Pressure. The AutoTran transducers are no longer available. Units built after the start of 2012 use a Setra 0-5vdc output transducer. If the 1-5vdc transducer is defective, it must be replaced with a 0-5vdc style transducer. Also, the software must be upgraded as the old software version was setup for the 1-5vdc style transducer.

TABLE 44 - 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
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 45 - DUCT PRESSURE TRANSDUCER

1.25 "W.C. SPAN DIFFERENTIAL INPUT PRESS	2.5 "W.C. SPAN DIFFERENTIAL INPUT PRESS	5.0 "W.C. SPAN DIFFERENTIAL INPUT PRESS	VOLTAGE 1-5 VDC	VOLTAGE 0-5VDC
0.0	0.0	0.0	1.0	0.50
0.156	0.312	0.625	1.5	1.00
0.312	0.625	1.25	2	1.50
0.468	0.937	1.875	2.5	2.00
0.625	1.25	2.5	3	2.50
0.781	1.562	3.125	3.5	3.00
0.938	1.875	3.75	4	3.50
1.094	2.187	4.375	4.5	4.00
1.25	2.5	5	5	4.50
				5.00

TABLE 46 - PRESSURE TRANSDUCERS

0-400 PSIG SUCTION PRESSURE TRANSDUCER		0-600 PSIG DISCHARGE PRESSURE TRANSDUCER	
PRESSURE PSIG	VOLTAGE VDC	PRESSURE PSIG	VOLTAGE VDC
0	0.5	0	0.5
50	1.0	75	1.0
100	1.5	150	1.5
150	2.0	225	2.0
200	2.5	300	2.5
250	3.0	375	3.0
300	3.5	450	3.5
350	4.0	525	4.0
400	4.5	600	4.5

Discharge Pressure Transducer

The discharge Pressure Transducer is located in the discharge line for each refrigerant system. 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 Unit Controller where it is used to control the condenser water volume when the unit is in cooling operation. The discharge pressure value, in PSIG, is displayed by the User Interface.

On units with R-410A refrigerant, the Discharge Transducer has a range of 0 to 600 PSIG, with a linear output of 0 to 4.5VDC. *Table 46* 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 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 Unit Controller where it is displayed by the User Interface. When this option is installed the Unit Controller will also calculate and display the Evaporator Superheat value for the system.

On units with R-410A refrigerant, the Suction Transducer has a range of 0 to 400 PSIG, with a linear output of 0 to 4.5VDC. *Table 46* illustrates the DC volt output from the transducer for a given suction pressure.

Humidity Sensors

The humidity sensor outputs a 0 to 5VDC 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 47* gives the relationship between the voltage output of the humidity sensor and the % relative humidity.

TABLE 47 - 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

Digital Thermistor

Compressor (A), the digital unloading compressor has a discharge thermistor to monitor the discharge pressure. *Table 48* shows the temperature to resistance relationship for this thermistor.

TABLE 48 - DISCHARGE THERMISTOR TEMPERATURE / RESISTANCE

DEGREE C	DEGREE F	RESISTANCE (KOHMS)
-40.0	-40.0	2889.60
-35.0	-31.0	2087.22
-30.0	-22.0	1522.20
-25.0	-13.0	1121.44
-20.0	-4.0	834.72
-15.0	5.0	627.28
-10.0	14.0	475.74
-5.0	23.0	363.99
0.0	32.0	280.82
5.0	41.0	218.41
10.0	50.0	171.17
15.0	59.0	135.14
20.0	68.0	107.44
25.0	77.0	86.00
30.0	86.0	69.28
35.0	95.0	56.16
40.0	104.0	45.81
45.0	113.0	37.58
50.0	122.0	30.99
55.0	131.0	25.68
60.0	140.0	21.40
65.0	149.0	17.91
70.0	158.0	15.07

DEGREE C	DEGREE F	RESISTANCE (KOHMS)
75.0	167.0	12.73
80.0	176.0	10.79
85.0	185.0	9.20
90.0	194.0	7.87
95.0	203.0	6.77
100.0	212.0	5.85
105.0	221.0	5.09
110.0	230.0	4.45
115.0	239.0	3.87
120.0	248.0	3.35
125.0	257.0	2.92
130.0	266.0	2.58
135.0	275.0	2.28
140.0	284.0	2.02
145.0	293.0	1.80
150.0	302.0	1.59
155.0	311.0	1.39
160.0	320.0	1.25
165.0	329.0	1.12
170.0	338.0	1.01
175.0	347.0	0.92
180.0	356.0	0.83

DIGITAL COMPRESSOR CONTROLLER FAULT CODES

The Digital Compressor Controller has a green, yellow and red LED.

Power LED (Green)

This LED indicates voltage is present at the 24VAC power terminals. When the two minute anti-short cycle timer is active, the green LED will flash

Unloader LED (Yellow)

This LED indicates the status of the unloader solenoid output. The LED is on when the unloader solenoid is energized.

Alert LED (Red)

This LED communicates an abnormal system condition through a unique flash code. The ALERT LED will flash a number of times consecutively, pause and then repeat the process. The number of consecutive flashes, define as the flash Code, correlates to a particular abnormal condition. The ALERT code will remain active until the reset conditions have been met or 24VAC power has been cycled OFF and ON to the Digital Compressor Controller.

All the LED's flashing at the same rate indicates 24VAC supply is too low for operation. All LED's on solid at the same time indicates a Digital Compressor Controller failure.

Flash Code 2 – High Discharge Temperature

This code indicates the discharge temperature thermistor has measured a temperature above 268.0 °F (130.0 °C) or the thermistor is short circuited (jumpered out). *See Table 48 on page 185 for resistance to temperature values.*

The Digital Compressor Controller will deenergize the compressor contactor and unloader solenoid. The compressor will be allowed to restart after a 30 minute delay and after the thermistor temperature is below 250.0 °F (120.0 °C). The flash code will be reset after the compressor has run for 60 uninterrupted minutes without any other ALERT's.

If five high discharge temperature ALERT's have occurred within four hours, the Digital Compressor Controller will lock out the compressor. The lockout can only be reset by cycling the 24VAC power OFF and ON.

Flash Code 3 – Compressor Protector Trip

This code indicates the demand signal from the Unit Controller is greater than 1.44VDC and there is no compressor current detected. This could be due to the compressor being OFF on internal overload, circuit breaker open, or power disconnected to the compressor contactor.

The Digital Compressor Controller will deenergize the compressor contactor and unloader solenoid. The Digital Compressor Controller will wait for the two minute anti-short cycle timer to time out and if the Unit Controller demand signal is still greater than 1.44VDC, energize the compressor contactor again. If compressor current is detected on the restart, the ALERT code will reset. The Digital Compressor Controller will attempt to restart the compressor as long as the system controller demand is above 1.44VDC. There is no lockout feature for this ALERT.

Flash Code 4 – Locked Rotor

This code indicates a compressor locked rotor condition was sensed by the Digital Compressor Controller on four consecutive start ups. The Digital Compressor Controller will de-energize the compressor contactor and unloader solenoid, wait two minutes and then try to restart the compressor. If the Digital Compressor Controller senses a locked rotor condition on the fourth start it will de-energize the compressor contactor and unloader solenoid and lockout the compressor. The 24VAC power to the Digital Compressor Controller must be turned OFF and then back ON to reset the control.

Flash Code 5 – Demand Signal Loss

This code indicates the demand signal input to the Digital Compressor Controller dropped below 0.5VDC. The Digital Compressor Controller will deenergize the compressor the compressor contactor and unloader solenoid. There is no lockout for this code.

Once the demand signal to the Digital Compressor Controller rises above 0.5VDC, the ALERT code will reset. If the demand signal is above 1.44VDC and the anti-short cycle timer has timed out, the compressor will restart.

Flash Code 6 – Discharge Thermistor Fault

This code indicates the Digital Compressor Controller is not receiving a signal from the discharge temperature thermistor. As long as the Digital Compressor Controller is not receiving an input signal it will continue to operate the compressor at 1/3 capacity. When the discharge temperature thermistor input is restored the Digital Unit Controller will resume normal operation.

Flash Code 8 – Compressor Contactor Fault

This code indicates compressor current is detected when the demand signal input is below 1.44VDC. This would normally be caused by welded contactor contacts. The compressor will continue to run in this condition because the Digital Compressor Controller cannot open the compressor contactor.

The Digital Compressor Controller will energize the compressor contactor. The unloader solenoid will remain energized causing the compressor to run unloaded as long as the input demand signal is less than 1.44VDC. If the demand input is greater than 1.44VDC, the unloader solenoid will de-energize causing the compressor to run loaded.

The ALERT code is reset when current is no longer detected while the demand input is below 1.44VDC.

Flash Code 9 – Low 24VAC Supply

This indicates the supply voltage to the Digital Compressor Controller has dropped below 18.5VAC. The Digital Compressor Controller will de-energize the compressor contactor and unloader solenoid. The ALERT code will reset when the supply voltage to the Digital Compressor Controller rises above 19.5VAC.

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 except for COMPR # LOCKOUT and LOCKOUT - LOW PRESS SYS # can be reset by turning the “LOCAL STOP” switch OFF for 5 seconds and then back ON. A COMPR # LOCKOUT and LOCKOUT - LOW PRESS SYS # must be reset by entering the PROGRAM key and the COMPRESSOR SYSTEMS # subsection, which has the lockout. Then use the ▲ and ▼ key to go to COMP SYS # STATE. The current status will be LOCKOUT. Press the CHECK key (√) and use the right arrow key to change LOCKOUT to RUN.

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 Unit Controller to disable certain functions that may result in the unit operating less efficiently or eliminate certain features.

Table 50 on page 193, *Table 51 on page 194* and *Table 52 on page 195* list 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 STATUS, COMPRESSOR SYSTEM A, COMPRESSOR SYSTEM B, COMPRESSOR SYSTEM C, COMPRESSOR SYSTEM D, COMPRESSOR SYSTEM E, COMPRESSOR SYSTEM F, HEATING SYSTEM, ECONOMIZER SYSTEM, SUPPLY SYSTEM or VENTILATION SYSTEM) 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 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 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 – USER INTERFACE CONTROL CENTER of this manual for additional information on how to navigate through the HISTORY menu.*

In addition to the items listed in *Table 53 on page 197* the following items listed below are contained under the HISTORY key.

"COMPRESSOR SYSTEM (1, 2, OR 3) CLEAR" - *W*henever there is a compressor safety trip the Unit Controller initiates the "COMPR STATUS CLEAR TIME" (A, B, C, D, E, OR F) timer. The Unit Controller records the time it takes for the trip to clear. When the fault clears *"*COMPRESSOR SYSTEM (A, B, C, D, E, OR F) CLEAR" shows the time it took for the fault to clear in the HISTORY buffer.

"COMPRESSOR SYSTEM (A, B, C, D, E, OR F) TIME OUT" – If the "COMPR STATUS CLEAR TIME (A, B, C, D, E, OR F) timer reaches 60 minutes a *"*COMPRESSOR SYSTEM (A, B, C, D, E, OR F) TIME OUT" will be indicated in the HISTORY buffer. The STATUS key will display the message "COMP SYS (A, B, C, D, E, OR F) STATUS" "SAFETY LOCKOUT." The Unit Controller locks out the corresponding compressor system when a "COMPRESSOR SYSTEM (A, B, C, D, E, OR F) TIME OUT" is declared.

"COMPR SYSTEM (A, B, C, D, E, OR F) INHIBIT" – This WARNING indicates the compressor system safety circuit experienced a trip but reset prior to the exploration 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 (A, B, C, D, E, OR F) TIME OUT" message.

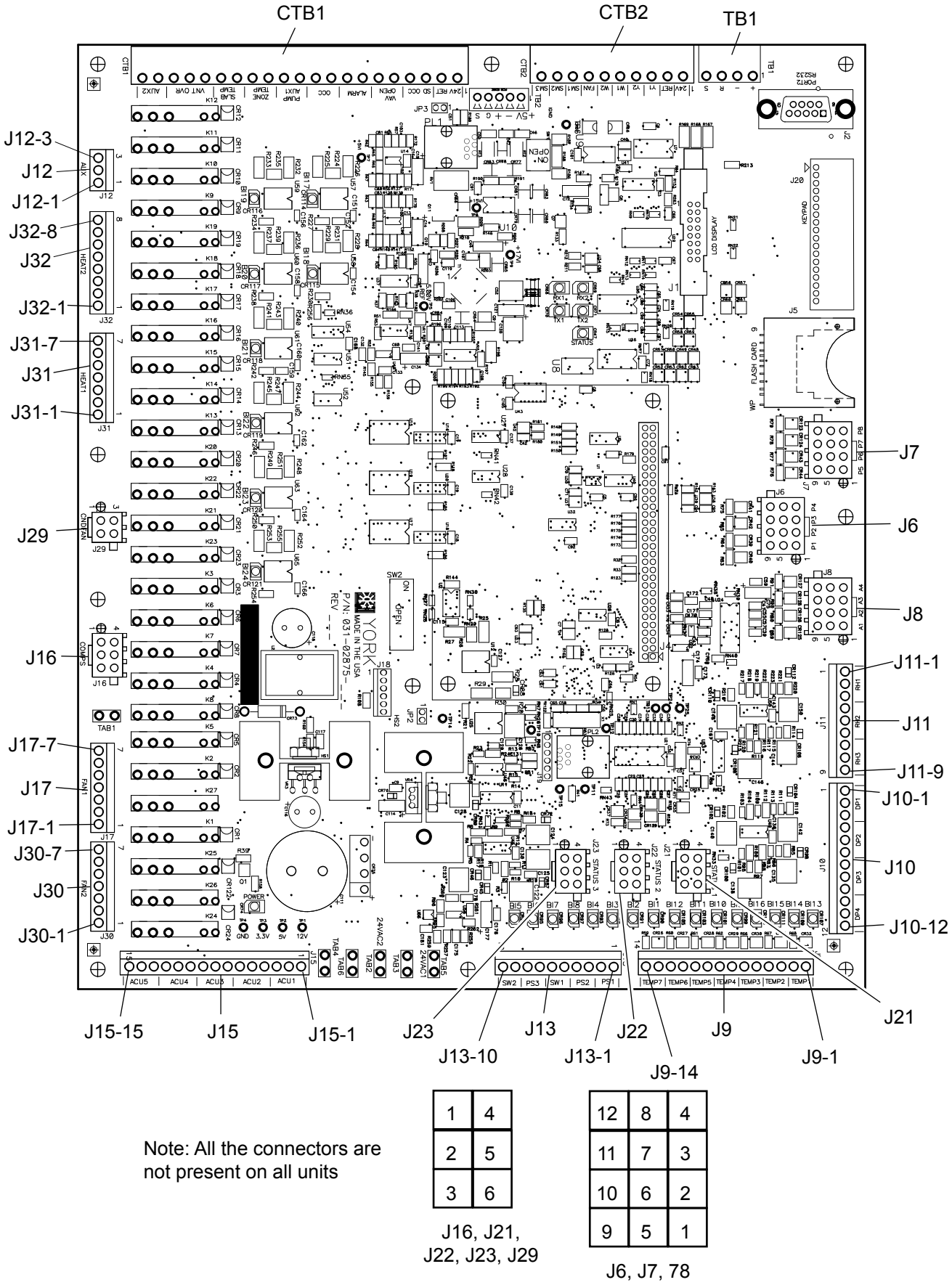


FIGURE 71 - CONTROL BOARD I/O LOCATIONS

TABLE 49 - CONTROL BOARD I/O LOCATIONS

DESCRIPTION	CONN #	PIN #	TYPE	IDENTIFICATION	WIRE #
1st Stage Heat Output	J31	1	BO	HEAT1	211/WHT
24VAC - Common	CTB1	2		RET	FIELD
24VAC - Source	CTB1	1		24VAC	FIELD
2nd Stage Heat Output	J31	2	BO	HEAT1	212/WHT
3rd Stage Heat Output	J31	3	BO	HEAT1	213/WHT
4th Stage Heat Output	J31	4	BO	HEAT1	214/WHT
Air Proving Switch	J13	1	BI	PS1	114/RED
Air Proving Switch	J13	2	BI	PS1	115/WHT
Alarm	CTB1	7	BO	ALARM	FIELD
Alarm	CTB1	8	BO	ALARM	FIELD
Bypass Damper Act - Common	J15	12	AO	ACU4	207/BLK
Bypass Damper Act - VDC	J15	11	AO	ACU4	206/WHT
Bypass Damper Act / 24VAC	J15	10	AO	ACU4	205/RED
Comp Safety Chain Sys A - 24VAC	J21	1	BI	STATUS1	175/RED
Comp Safety Chain Sys A - Comm	J21	3	BI	STATUS1	179/BLK
Comp Safety Chain Sys A - Input	J21	2	BI	STATUS1	178/WHT
Comp Safety Chain Sys B - 24VAC	J21	4	BI	STATUS1	180/RED
Comp Safety Chain Sys B - Comm	J21	6	BI	STATUS1	183/BLK
Comp Safety Chain Sys B - Input	J21	5	BI	STATUS1	182/WHT
Comp Safety Chain Sys C - 24VAC	J22	1	BI	STATUS2	184/RED
Comp Safety Chain Sys C - Comm	J22	3	BI	STATUS2	187/BLK
Comp Safety Chain Sys C - Input	J22	2	BI	STATUS2	186/WHT
Comp Safety Chain Sys D - 24VAC	J22	4	BI	STATUS2	188/RED
Comp Safety Chain Sys D - Comm	J22	6	BI	STATUS2	191/BLK
Comp Safety Chain Sys D - Input	J22	5	BI	STATUS2	190/WHT
Comp Safety Chain Sys E-24VAC	J23	1	BI	STATUS3	246
Comp Safety Chain Sys E-Comm	J23	3	BI	STATUS3	248
Comp Safety Chain Sys E-Input	J23	2	BI	STATUS3	249
Comp Safety Chain Sys F-24VAC	J23	4	BI	STATUS3	250
Comp Safety Chain Sys F-Comm	J23	6	BI	STATUS3	252
Comp Safety Chain Sys F-Input	J23	5	BI	STATUS3	253
Compressor A Load - VDC	J12	2	AO	AUX	371
Compressor A Load - Common	JI2	3	AO	AUX	372
Compressor A Output	J16	1	BO	COMPS	42
Compressor B Output	J16	2	BO	COMPS	43
Compressor C Output	J16	3	BO	COMPS	44
Compressor D Output	J16	4	BO	COMPS	45
Compressor E Output	J16	5	BO	COMPS	216
Compressor F Output	J16	6	BO	COMPS	218
Cond Water Flow Switch	J13	9	BI	SW2	122/RED
Cond Water Flow Switch	J13	10	BI	SW2	123/WHT
Cond Water Valve Act - Common	J15	9	AO	ACU3	204/BLK
Cond Water Valve Act - VDC	J15	8	AO	ACU3	203/WHT
Cond Water Valve Act / 24VAC	J15	7	AO	ACU3	202/RED
Dirty Filter Switch	J13	3	BI	PS2	116/RED
Dirty Filter Switch	J13	4	BI	PS2	117/WHT
Disc Press Sys A - 5VDC	J6	9	AI	P1	141/RED
Disc Press Sys A - Common	J6	5	AI	P1	140/BLK
Disc Press Sys A - Input	J6	1	AI	P1	139/WNT
Disc Press Sys B - 5VDC	J6	11	AI	P3	147/RED
Disc Press Sys B - Common	J6	7	AI	P3	146/BLK
Disc Press Sys B - Input	J6	3	AI	P3	145/WHT

TABLE 49 - CONTROL BOARD I/O LOCATIONS (CONT'D)

DESCRIPTION	CONN #	PIN #	TYPE	IDENTIFICATION	WIRE #
Disc Press Sys C - 5VDC	J7	9	AI	P5	153/RED
Disc Press Sys C - Common	J7	5	AI	P5	152/BLK
Disc Press Sys C - Input	J7	1	AI	P5	151/WHT
Disc Press Sys D - 5VDC	J7	11	AI	P7	159/RED
Disc Press Sys D - Common	J7	7	AI	P7	158/BLK
Disc Press Sys D - Input	J7	3	AI	P7	157/WHT
Disc Press Sys E - 5VDC	J8	9	AI	P9	342
Disc Press Sys E – Common	J8	5	AI	P9	341
Disc Press Sys E – Input	J8	1	AI	P9	340
Disc Press Sys F - 5VDC	J8	11	AI	P11	348
Disc Press Sys F – Common	J8	7	AI	P11	347
Disc Press Sys F – Input	J8	3	AI	P11	346
Duct Static Pressure #1 - Common	J10	3	AI	DP3	125/BLK
Duct Static Pressure #1 - Input	J10	2	AI	DP3	125/WHT
Duct Static Pressure #1 5-VDC	J10	1	AI	DP3	124/RED
Duct Static Pressure #2 - Common	J10	6	AI	DP4	128/BLK
Duct Static Pressure #2 - Input	J10	5	AI	DP4	127/WHT
Duct Static Pressure #2 5-VDC	J10	4	AI	DP4	126/RED
Duct Static Safety Switch	J13	7	BI	PS3	120/RED
Duct Static Safety Switch	J13	8	BI	PS3	121/WHT
Entering Water Temp Sensor	J9	11	AI	TEMP6	110/RED
Entering Water Temp Sensor	J9	12	AI	TEMP6	111/WHT
Flex Evap Temp Sensor	J9	9	AI	TEMP5	108/RED
Flex Evap Temp Sensor	J9	10	AI	TEMP5	109/WNT
Isolation Damper	CTB1	11	BO	PUMP/ISO DMP	FIELD
Isolation Damper	CTB1	12	BO	PUMP/ISO DMP	FIELD
Heat Output Common	J31	5	BO	HEAT1	215/BLK
HW / Steam Freezestat	J13	5	BI	SW1	118/RED
HW / Steam Freezestat	J13	6	BI	SW1	119/WHT
HW / Steam Valve Act - Common	J15	6	AO	ACU2	201/BLK
HW / Steam Valve Act - VDC	J15	5	AO	ACU2	200/WHT
HW / Steam Valve Act / 24VAC	J15	4	AO	ACU2	199/RED
Leaving Water Temp Sensor	J9	13	AI	TEMP7	112/RED
Leaving Water Temp Sensor	J9	14	AI	TEMP7	113/WHT
Mixed Air Temp Sensor	J9	7	AI	TEMP4	106/RED
Mixed Air Temp Sensor	J9	8	AI	TEMP4	107/WHT
OA/RA Damper Act - Common	J15	3	AO	ACU1	198/BLK
OA/RA Damper Act - VDC	J15	2	AO	ACU1	197/WHT
OA/RA Damper Act / 24VAC	J15	1	AO	ACU1	196/RED
Occupied Input	CTB1	4	BI	OCC	FIELD
Outside Air RH - 5VDC	J11	1	AI	RH1	130/RED
Outside Air RH - Common	J11	3	AI	RH1	132/BLK
Outside Air RH Input	J11	2	AI	RH1	131/WHT
Outside Air Temp Sensor	J9	5	AI	TEMP3	104/RED
Outside Air Temp Sensor	J9	6	AI	TEMP3	105/WHT
Piezometer Ring	CTB1	20	AI	PIEZ	
Piezometer Ring	CTB1	21	AI	PIEZ	
Pump Output	CTB1	11	BO	PUMP/ISO DMP	FIELD
Pump Output	CTB1	12	BO	PUMP/ISO DMP	FIELD
Return Air RH - 5VDC	J11	4	AI	RH2	133/RED
Return Air RH - Common	J11	6	AI	RH2	135/BLK
Return Air RH Input	J11	5	AI	RH2	134/WHT

TABLE 49 - CONTROL BOARD I/O LOCATIONS (CONT'D)

DESCRIPTION	CONN #	PIN #	TYPE	IDENTIFICATION	WIRE #
Return Air Temp Sensor	J9	3	AI	TEMP2	102/RED
Return Air Temp Sensor	J9	4	AI	TEMP2	103/WHT
Slab Temp Input	CTB1	15	AI	SLAB TEMP	FIELD
Slab Temp Input	CTB1	16	AI	SLAB TEMP	FIELD
Suct Press Sys A - 5VDC	J6	10	AI	P2	144/RED
Suct Press Sys A - Common	J6	6	AI	P2	143/BLK
Suct Press Sys A - Input	J6	2	AI	P2	142/WHT
Suct Press Sys B - 5VDC	J6	12	AI	P4	150/RED
Suct Press Sys B - Common	J6	8	AI	P4	149/BLK
Suct Press Sys B - Input	J6	4	AI	P4	148/WHT
Suct Press Sys C - 5VDC	J7	10	AI	P6	156/RED
Suct Press Sys C - Common	J7	6	AI	P6	155/BLK
Suct Press Sys C - Input	J7	2	AI	P6	154/WHT
Suct Press Sys D- 5VDC	J7	12	AI	P8	162/RED
Suct Press Sys D - Common	J7	8	AI	P8	161/BLK
Suct Press Sys D - Input	J7	4	AI	P8	160/WHT
Suct Press Sys E – 5VDC	J8	10	AI	P10	345
Suct Press Sys E – Common	J8	6	AI	P10	344
Suct Press Sys E – Input	J8	2	AI	P10	343
Suct Press Sys E – 5VDC	J8	12	AI	P12	351
Suct Press Sys E – Common	J8	8	AI	P12	350
Suct Press Sys E – Input	J8	4	AI	P12	349
Supply Air Temp Sensor	J9	1	AI	TEMP1	100/RED
Supply Air Temp Sensor	J9	2	AI	TEMP1	101/WHT
Supply Fan - Common	J17	7	BO	FAN1	225/BLK
Supply Fan Bypass - 24VAC	J17	6	BO	FAN1	223/RED
Supply Fan Contactor - 24VAC	J17	5	BO	FAN1	220/RED
Supply Fan Run Enable	J17	3	BO	FAN1	218/WHT
Supply Fan Run Enable	J17	4	BO	FAN1	219/BLK
Supply Fan Speed - VDC +	J17	1	AO	FAN1	216/WHT
Supply Fan Speed - VDC -	J17	2	AO	FAN1	217/BLK
Underfloor Air RH - 5VDC	J11	7	AI	RH3	136/RED
Underfloor Air RH - Common	J11	9	AI	RH3	138/BLK
Underfloor Air RH Input	J11	8	AI	RH3	137/WHT
Unit Shutdown Input	CTB1	3	B1	SD	FIELD
Vav Heat	CTB1	5	BO	VAV OPEN	FIELD
Vav Heat	CTB1	6	BO	VAV OPEN	FIELD
Water Econ Valve Act - Common	J15	15	AO	ACU5	210/BLK
Water Econ Valve Act - VDC	J15	14	AO	ACU5	209/WHT
Water Econ Valve Act / 24VAC	J15	13	AO	ACU5	208/RED
Zone Temp Input	CTB1	13	AI	ZONE TEMP	FIELD
Zone Temp Input	CTB1	14	AI	ZONE TEMP	FIELD

TABLE 50 - WARNING DESCRIPTION TABLE

HISTORY SCREEN WORDING	DESCRIPTION	RESET	SHOW WHEN UNIT TYPE IS	STATUS SCREEN WORDING	FAULT OUTPUT TYPE
Wrn-Compr System * Inhibit	*See description at the end of this table*	Auto Reset			
Wrn-Dirty Filter 1	The filter status input is closed for greater than or equal to 1 minute	Auto Reset	Dirty filter switch is Installed	Filter Status Change	
Wrn-Discharge Prs Sensor *	The discharge pressure for that system is out of range for greater than or equal to 10 seconds	Auto Reset	Press Trans Pkg is ON for the System	Compressor System Status Inhibited	
Wrn-Duct Prs Xdcr	Supply fan output ON, supply fan status must be running for 5 minutes, static press current less than or equal (0.333 X DUCT STATIC PRESS ACTIVE SP) for 30 seconds	Auto Reset	UNIT TYPE is VAV or FLEXSYS	Supply Sys Status Warning	Alarm
Wrn-Freezestat Trip	The HW/steam freezestat circuit goes low (open) but goes high (closed) within 5 minutes	Auto Reset	Heating System Type equals HOT WATER/STEAM		
Wrn-High Duct Pressure 1	The optional duct static high pressure switch is open for 5 seconds and then re-closes before 60 seconds and this is the first trip in a 60-minute time frame	Auto Reset	Duct high static switch is ENABLED		
Wrn-High Duct Pressure 2	The optional duct static high pressure switch is open for 5 seconds and then re-closes before 60 seconds and this is the second trip in a 60 minute time frame	Auto Reset	Duct high static switch is ENABLED		
Wrn-Low Water Flow	The optional water flow switch input is open for 5 seconds and the UNIT MODE is OCCUPIED or UNOCCUPIED COOLING	Auto Reset	Water flow switch is ENABLED	Compressor System Status Inhibited	
Wrn-Low Water Temp	The entering Condenser Water Temperature has fallen below the Low Limit Temperature for 30 seconds	Auto Reset	Always	Compressor System Status Inhibited	
Wrn-Outside Air RH	Outside Air Temp greater than or equal to 32.0 °F for 10 seconds, Outdoor Air Humidity less than 5% for 10 seconds	Auto Reset	Econo installed SINGLE ENTHALPY or DUAL ENTHALPY		
Wrn-Return Air RH	Return Air Temp greater than or equal to 32.0 °F for 10 seconds, Return Air Humidity less than 5% for 10 seconds	Auto Reset	Econo installed DUAL ENTHALPY		
Wrn-Slab Temp Sensor	Underfloor slab temp sensor is out of range for greater than or equal to 10 seconds	Auto Reset	UNIT TYPE is FlexSys and Dew Point Reset is USER ENABLED		Alarm
Wrn-Suction Prs Sensor *	Suction pressure out of range for greater than or equal to 10 seconds	Auto Reset	Press Trans Pkg is ON for the System	System Status Inhibited	
Wrn-Under Floor Rh Sensor	Underfloor Air Humidity is less than 5% for greater than or equal to 5 minutes	Auto Reset	UNIT TYPE is FLEXSYS and Dew Point Reset is USER ENABLED		Alarm

* Can be A-F compressors.

TABLE 51 - FAULT AUTO - RESET

HISTORY SCREEN WORDING	DESCRIPTION	RESET	SHOW WHEN UNIT TYPE IS	STATUS SCREEN WORDING	FAULT OUTPUT TYPE
Auto Reset-Compressor System * Clear	*See description below*	Auto Reset			
Auto Reset-Compress System * Trip 1	The safety input chain is open (faulted) for more than two seconds with the compressor of the system on, and this is the first trip in a 120 minute span	Auto Reset		Comp system * status safety trip	Alarm
Auto Reset Compressor System * Trip 2	The safety input chain is open (faulted) for more than two seconds with the compressor of the system on, and this is the second trip in a 120 minute span	Auto Reset		Comp system * status safety trip	Alarm
Auto Reset - MSAT Sensor	MS supply air temp current sensor is out of range for greater than or equal to 10 seconds	Auto Reset	UNIT TYPE is FLEXSYS		Alarm
Auto Reset - Power Fail	Power is lost when the unit operating state is RUN	Auto Reset			
Auto Reset - RAT Sensor	Return air temp current sensor is out of range for greater than or equal to 10 seconds	Auto Reset			Alarm
Auto Reset - Remote I/O Comm	No communication from the I/O board for greater than or equal to 5 seconds	Auto Reset			
Auto Reset - Zone Temp Sensor	Zone temp current sensor is out of range for greater than or equal to 10 seconds. If Night Setback is ENABLED and there is not a valid zone temp sensor value when the unit goes UNOCCUPIED, a fault will become active and prevent the unit from starting.	Auto Reset	UNIT TYPE is VAV and NIGHT SET BACK is USER ENABLED or UNIT TYPE is set to CV and the CONTROL METHOD is set to ZONE SENSOR HARDWIRED		Alarm

* Can be A-F compressors.

TABLE 52 - FAULTS LOCKOUT

HISTORY SCREEN WORDING	DESCRIPTION	RESET	SHOW WHEN UNIT TYPE IS	STATUS SCREEN WORDING	FAULT OUTPUT TYPE
Lockout-Compressor System * Time Out	*See below*	System Lockout		Comp System * - Safety Lockout	Alarm
Lockout - Compressor System *	High press switch, comp motor protector, or overcurrent protector open - 3 times in 120 minutes on comp system *	System Lockout		Comp System * - Safety Lockout	Alarm
Lockout-High Duct Pressure	Duct static press current + duct static over pressure	Unit Lockout	UNIT TYPE is VAV or FLEXSYS	Supply Sys Status Safety Lockout	Alarm
Lockout - Hot Water Freeze	The hydronic freeze stat switch remained closed greater than or equal to 5 minutes	Unit Lockout	Heat Type HOT WATER/STEAM	Heating Sys Status - Safety Lockout	Alarm
Lockout - Low Press Sys *	The suction pressure is below the suction pressure limit and the incrementing timer has timed out	System Lockout	Always	Compressor System Status Low Press Lockout	Alarm
Lockout - Manual Stop *	The compressor system has been placed in the stop mode either through the user interface or by a communicated input	System Lockout		Comp Sys * Status Disabled	
Lockout - Manual Unit Stop	The unit is shut down through the shut down switch on the unit or by an external hardwired or communicated input	Unit Lockout		Unit - Overall Status Local Stop	
Lockout - Sat Sensor	Supply air temp current sensor is out of range for greater than or equal to 10 seconds	Unit Lockout	UNIT TYPE is CONSTANT VOLUME or VARIABLE AIR VOLUME		Alarm
Lockout-Supply Fan	Supply fan proving switch failed to close within 120 seconds of supply fan start, or the supply fan proving switch opened for more than 10 seconds during operation	Unit Lockout		Unit - Overall Status Unit Lockout	Alarm

NOTES: Can be A-F compressors.

“WRN - COMP SYSTEM * INHIBIT” - This WARNING indicates the compressor system safety circuit experienced a trip but reset prior to the exploration of the 60 minute reset time function. If the safety circuit does not reset in 60 minutes it will be replaced with a “LOCKOUT - COMPRESSOR SYSTEM * TIME OUT” message.

“AUTO RESET - COMPRESSOR SYSTEM * CLEAR” - When ever there is a compressor safety trip the Primary Unit Controller initiates the “COMPR STATUS CLEAR TIME *” timer. The Primary Unit Controller records the time it takes for the trip to clear. When the fault clears “COMPRESSOR SYSTEM * CLEAR” shows the time it took for the fault to clear in the HISTORY buffer.

“LOCKOUT-COMPRESSOR SYSTEM * TIME OUT” – If the “COMPR STATUS CLEAR TIME *” timer reaches 60 minutes a “LOCKOUT - COMPRESSOR SYSTEM * TIME OUT” will be indicated in the HISTORY buffer.

See page 13 for minimum CFM setpoints to assure closure of the supply fan proving switch.

MULTI MEDIA CARD

The 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 lost 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 53 on page 197* gives a description of the “DATA LOG ERROR STATE” and *Table 54 on page 197* gives a description of the “DATA LOG ERROR DETAIL.”

TABLE 53 - 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 54 - 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

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