

**OPERATION AND MAINTENANCE** 

## Supersedes: 102.20-OM2 (1017)

Form 102.20-OM2 (419)







# **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-prooduct 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, installation, 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 unit.

## **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
Solution XT Air Handling Units Installation and Assembly	102.20-N1
York Custom Air Handling Units Installation and Assembly	102.20-N3
Steps to Protect New Equipment Warranty	102.20-CL1
Air Handling Units Start-up Checklist	100.00-CL1
Long-Term Storage Requirement - Field Preparation - Air Handling Units	50.20-NM3
Long-Term Storage Periodic Checklist and Logs - Air Handling Units	50.20-CL3
Limited Warranty	50.05-NM2
Electric Motor Warranty	50.05-NM2.2
Air Cooled Condensing Unit DX Coil Split System Applications and Piping Guidelines	50.40-ES3
Air Modulator Service & Warranty Procedure	SI0262

## SOLUTION XT UNIT MODEL NOMENCLATURE



**Note:** The terms *skid* and *section* have the same meaning in this document; Variable Speed Drive (VSD) and Variable Frequency Drive (VFD) do as well.

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## SECTION 1 - GENERAL INFORMATION AND SAFETY

## INTRODUCTION

The YORK air handling unit (AHU) is manufactured to the highest design and construction standards to ensure high performance, reliability and adaptability to all types of air handling installations.

## **ABOUT THIS MANUAL**

This manual and any other document supplied with the AHU are the property of Johnson Controls, which reserves all rights. This manual may not be reproduced, in whole or in part, without prior written authorization from an authorized Johnson Controls representative.

In addition, this manual:

- Includes suggested best working practices and procedures, which are issued for guidance only, and they do not take precedence over the above stated individual responsibility and/or local safety regulations.
- Contains all the information required for correct installation and commissioning of the AHU, together with operating and maintenance instructions.
- Should be read thoroughly before attempting to operate or service the AHU.
- Contains detailed procedures, including installation, commissioning and maintenance tasks that must only be performed by suitably trained and qualified personnel.

The manufacturer will not be liable for any injury or damage caused by incorrect installation, commissioning, operation, or maintenance resulting from a failure to follow the procedures and instructions detailed in the manual.

## WARRANTY

Johnson Controls warrants YORK AHUs in accordance with the limited warranty engineered systems equipment procedure. Refer to the *Air Side Limited Warranty and Limited Warranty (Form 50.05-NM2)* for more information. Johnson Controls warrants all equipment and materials against defects in workmanship and materials for a period of 18 months from the date of shipment or 12 months from the date of start-up, whichever comes first, unless labor or extended warranty has been purchased as part of the contract.

The warranty is limited to parts only replacement and shipping of any faulty part or subassembly, which has failed due to defects in workmanship and materials. All claims must be supported by evidence that the failure has occurred within the warranty period, and that the AHU was operated within the designed parameters specified.

All warranty claims must specify the AHU model, serial number, order number, and run hours/starts. Model and serial number information is printed on the AHU identification plate.

The AHU warranty will be void if any modification to the AHU is carried out without prior written approval from Johnson Controls. For warranty purposes, the following conditions must be satisfied:

- Only genuine YORK approved spare parts must be used.
- All of the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel.
- Failure to satisfy any of these conditions will automatically void the warranty. Refer to *Air Side Limited Warranty and Limited Warranty (Form 50.05-NM2)* for details.

## **RESPONSIBILITY FOR SAFETY**

Every care has been taken in the design and manufacture of the AHU to ensure compliance with the safety requirements. However, the individual operating or working on any equipment is primarily responsible for:

- Personal safety, safety of other personnel, and the equipment.
- Correct utilization of the equipment in accordance with the procedures detailed in this manual.

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## **SECTION 2 - START-UP AND OPERATION**



Never use silicone caulk/sealant or caulk/ sealant containing silicone in or on any air handling equipment.

## **BEFORE START-UP**

Perform a general inspection. Identify and perform the appropriate the lock out/tag out and safety rules. Refer to the *AHU Start-up Checklist*, (Form 100.00.CL1) provided with the information package shipped with the AHU.

For more information about the steps below, refer to the Solution XT - Installation and Assembly Manual (Form 102.20-N1) and Custom AHU - Installation and Assembly Manual (Form 102.20-N3). For an AHU equipped with a Variable Frequency Drive (VFD), refer to the specific VFD literature for additional start-up requirements.

- Check for damage to the AHU's interior and exterior.
- Ensure the terminal screws and wiring connections are secure in the control, electric and air modulator panels.
- Verify that the:
  - Equipment was received as ordered.
  - AHU was installed on flat and level surface and with proper clearances.
  - Air hoods are installed properly.
  - Condensate drains are properly trapped.
  - All wiring and tubing connections are complete at shipping splits.
  - All field piping connections are completed.
  - All shipped loose parts are installed.
  - All ductwork is complete and available for full airflow.
  - Installer removed all dirt, debris, hardware, mold, etc. from interior of the AHU and its ducts.
  - Filter gauge is set to zero.

- All shipping splits are sealed and secured properly.
- For outdoor AHUs, Pipe chase floor is sealed at penetrations.
- All shipping bolts and other materials were removed.
- Visually inspect the roof curb for tight seal around the outdoor AHU.
- Ensure clean air filters are installed and secured. properly.
- Inspect all field provided wiring completely.
- Do not remove the functional bolts from the seismic isolators as shown in *Figure 1 on page 15*.



## FIGURE 1 - SOLUTION XT SEISMIC ISOLATOR

- Ensure the damper linkage is tight and is in the correct power *off* position.
- If the return air dampers are closed, loosen the actuator or crank arm on the jackshaft, open the dampers, and retighten the actuator or crank arm.
- Verify the following controls installation are complete:
  - Contractor Furnished Controls Controls contractor is responsible for safe and proper control of the AHU.
  - Factory Furnished Controls Refer to the Factory Engineered Controls/Factory Packaged Controls (FEC/FPC).
- Make sure the termination chart is attached to the inside of the control enclosure door as shown in *Figure 2 on page 16*.

Johnson YORK Solution XT									
		MODEL #	Ŀ	(	COM: 166473	CUSTO	Typical INPUT / OUTPUT TB Wiring		
		OMER CO	Man-						
SERI	AL # / DATE CODE		JOB IDE	<b>TIFICATION</b>	#		NECTION		
	CAAM XT0081								
	SEC								
	(DP-F	S-XA-CC-НМ-НС	C-RF-EE-XA-FR-I	P)			ACTORY CO.		
			UN	IT TAG #			2 MNECTION		
	I/O Wiring			RTU-2A					
Point	Module	Home Run	I/O Pair	Power	Red	Black	Note		
HP-S	FEC2611	-		-	IN5	ICOM5	21 & 22 on CR4		
CLG-W	FEC2611	1	1	1	OUT5	OCOM5			
PH-W	FEC2611	1	2	1	OUT7	OCOM7			
MA-T	FEC2611	1	6	-	IN3	ICOM3			
RA-T	FEC2611	1	8	-	IN2	ICOM2			
RF-O	FEC2611	2	1	-	OUT4	OCOM4	Jumper OCOM# to 24V COM		
RF-C	FEC2611	2	2	-	OUT2	OCOM2			
RF-S_DP	FEC2611	2	3		IN8	ICOM8			
DA-T	FEC2611	3	1	-	IN1	ICOM1			
SF-S_DP	FEC2611	DIRECT	1	-	IN7	ICOM7			
SF-O	FEC2611	DIRECT	2	-	OUT9	ОСОМ9			
SF-C	FEC2611	DIRECT	3	-	OUT1	OCOM1			
LT-S	IOM2721(4)	-		-	IN1	ICOM1	21 & 22 on CR3		
РН-Т	IOM2721(4)	1	4	-	IN3	ICOM3			
PFILT-A	IOM2721(4)	1	5	-	IN2	ICOM2			
RA-H	IOM2721(4)	1	7	1	IN4	ICOM4			
LT-A	ТВ	1	3	-	2023 D	2023 C			
SDR-2	ТВ	2	4	-	4055 D	4055 C			
HP-A	ТВ	3	2	-	2041 C	2041 D			
SDR-1	ТВ	DIRECT	4	-	4054 D	4054 C			
PreTest:	Final Test:								

## FIGURE 2 - EXAMPLE OF A SOLUTION XT TERMINATION CHART

LD16563b

## Inspecting Fan Assembly

Use the following instructions to inspect the fan assembly.

- 1. When the AHU is removed from long term storage, purge the moisture-laden bearing grease, and replenish the AHU with fresh grease, according to the lubrication label.
- 2. Meg the motor to verify that the resistance is at a satisfactory level, compared to the value recorded prior to storage.
- 3. Check the torque for bearings and locking collars as shown in *Table 1 on page 16*.

#### TABLE 1 - TORQUE FOR TIGHTENING SET SCREWS

SETSCREW DIAMETER	HEX SIZE ACROSS	MINIMUM RECOMMEND ED TORQUE			
(IN)	FLATS (IN)	IN LB	FT LB		
1/4	1/8	66 - 85	5.5 - 7.08		
5/16	5/32	126 - 164	10.5 - 13.7		
3/8	3/16	228 - 296	19.0 - 24.7		
7/16	7/32	348 - 452	29.0 - 35.7		
1/2	1/4	504 - 655	42.0 - 54.6		
5/8	5/16	1104 - 1435	92.0 - 119.6		

- 4. Verify that the fan wheel is properly aligned, is tight on the shaft, and moves freely.
- 5. Make sure the fan bearings are properly lubricated. Refer to *SECTION 3 - MAINTENANCE* in this manual for more information.

2

6. On Solution units, verify that the tie down bolts are removed from the four corners of the fan base assembly as shown in *Figure 3 on page 17*. For small AHUs, the tie down bolts may only be applied to three corners of the fan base since one corner is not accessible.





## START-UP



Do not be operate this AHU until after start-up is completed as outlined in these instructions. Do not allow the AHU to run on unreliable temporary power, which could turn the AHU on/off periodically or rapidly, and to protect it from irregular voltages and surges.

It is recommended that the start-up technician use the *AHU Start-up Checklist (Form 100.00-CL1)*, included with the AHU, and record the gathered information in the appropriate fields. If there are questions, refer to *Table 11 on page 53* for inspection requirements.

Install the provided or temporary filter media prior to start-up to adequately protect the components in the air stream and duct system.

If the AHU is equipped with an energy recovery wheel, rotate the wheel when the AHU is in service to prevent clogging.

## **Checking Operation of Fans**

Check of the operation of the fans by:

- 1. Verifying the correct voltage, phase and cycles.
- 2. Energizing the power to the AHU disconnect switch.
- 3. Energizing the fan motor(s), briefly (bump) and check for correct fan rotation.

If the fan rotation is incorrect:

- 1. On three-phase equipment, reverse any two motor leads at the load side of the last starter component.
- 2. On single-phase equipment, follow the wiring diagram on the motor housing or on the inside of the motor terminal box.
- 3. Recheck for correct fan rotation.

## **Checking Operation of Dampers**



Most units are shipped with dampers in closed position. Release and adjustment is to be done by field technician only

Make sure the AHU will not operate with all dampers closed.

Linkage design and/or damper linkage is optional. Airflow control dampers may be operated with pneumatic or electric actuator/controllers.

Prior to occupancy, test the ventilation system to ensure that the outdoor air dampers operate properly in accordance with the system design.

# Back Draft Dampers for Dual Fans and Fan Arrays

The counterbalance is locked into place for shipping as shown in *Figure 6 on page 19*. Before startup, the counterbalance will have to be released. To do this, loosen the set screws and slide the counterbalance off the end of the shaft. Flip the counterbalance and slide it back on the shaft. Rotate the counterbalance above the damper as shown in *Figure 7 on page 19*, and then tighten the set screws. The counterbalance should be free to rotate.



FIGURE 6 - COUNTERBALANCE LOCKED INTO PLACE FOR SHIPPING



FIGURE 7 - COUNTERBALANCE UNLOCKED FOR START-UP

## **Examples of Fan Arrays**



FIGURE 8 - FRONT OF A 2X2 FAN ARRAY



FIGURE 9 - BACK OF A 2X2 FAN ARRAY



FIGURE 10 - FRONT OF A 1X2 FAN ARRAY

## Airflow Control Dampers

Many combinations of damper sizes are available to control the flow. Mixing the return and outside air in the AHU's air inlet section may be supplied as follows:

- 100% outside air, 100% return air.
- 100% outside air, 0% return air.
- 0% outside air, 100% return air.
- Economizer section 100% outside air, 100% return air, 100% exhaust air or mixed air.

Check the dampers, actuators, controls and linkage prior to applying power to the operators, to make sure nothing will obstruct the operation of the dampers.



Do not overdrive the damper actuators because this may damage the dampers.

*Exception: Actuators with over drive preset option.* 

Return air dampers may be closed for shipping. Loosen the actuator or crank arm on the jackshaft, open the dampers, and retighten the actuator or crank arm. The field is responsible for adjustments.

## Air Measuring Device Connections

## **Calculating Flow Rate**

For a Piezoring: CFM = k \*  $\sqrt{(\Delta P)}$ 

 $\Delta P$  = The differential in static pressure across the fan (inches w.g.)

k = See the table below This assumes a standard air density of .075 lbs / cubic foot at sea level.

For a Cometer:  $CFM = k * \Delta P^n$ 

 $\Delta P$  = The differential in static pressure across the fan (inches w.g.)

k = See the table below

n = See the table below This assumes a standard air density of .075 lbs / cubic foot at sea level.

TABLE 2 - AIR MEASURING DEVICE CONNECT	IONS

FAN TYPE	FAN CLASS	FAN SIZE	k	n	FAN TYPE	FAN CLASS	FAN SIZE	k	n
ATLI	2	7x7	3675.20	0.5064	EPFN	1	122	944.92	N/A
ATLI	2	9x6	3919.00	0.5534	EPFN	2	122	944.92	N/A
ATLI	2	9x9	5510.60	0.4857	EPFN	3	122	944.92	N/A
ATLI	2	10x7	5556.20	0.4950	EPFN	1	150	1206.40	N/A
ATLI	2	10x10	5556.20	0.4950	EPFN	2	150	1206.40	N/A
ATLI	2	12x9	6789.70	0.4654	EPFN	3	150	1206.40	N/A
ATLI	2	12x12	8190.10	0.4887	EPFN	1	165	1518.58	N/A
ATLI	2	15x11	11065.00	0.4800	EPFN	2	165	1518.58	N/A
ATLI	2	15x15	11065.00	0.4800	EPFN	3	165	1518.58	N/A
ATLI	2	18x13	11610.00	0.4670	EPFN	1	182	1821.92	N/A
ATLI	2	18x18	13101.80	0.4754	EPFN	2	182	1821.92	N/A
ATLI	1	20x15	7013.10	N/A	EPFN	3	182	1821.92	N/A
ATLI	1	20x20	7300.00	N/A	EPFN	1	200	2185.80	N/A
ATLI	1	22x22	9081.90	N/A	EPFN	2	200	2185.80	N/A
ATLI	1	25x25	12030.00	N/A	EPFN	3	200	2185.80	N/A
ATLI	1	28x28	14450.00	N/A	EPFN	1	222	2713.93	N/A
ATLI	1	32x32	20400.00	N/A	EPFN	2	222	2713.93	N/A
ATLI	1	36x36	28049.90	N/A	EPFN	3	222	2713.93	N/A
ATLI	1	40x40	39236.40	N/A	EPFN	1	245	3285.02	N/A
ATLI	R	7x7	2200.70	0.4952	EPFN	2	245	3285.02	N/A
ATLI	R	9x6	2759.60	0.5155	EPFN	3	245	3285.02	N/A
ATLI	R	9x9	2805.50	0.4783	EPFN	1	270	3997.61	N/A
ATLI	R	10x7	4052.20	0.5091	EPFN	2	270	3997.61	N/A
ATLI	R	10x10	3862.70	0.4658	EPFN	3	270	3997.61	N/A
ATLI	R	12x9	5497.20	0.4996	EPFN	1	300	4945.21	N/A
ATLI	R	12x12	5477.90	0.4496	EPFN	2	300	4945.21	N/A
ATLI	R	15x11	7684.90	0.5195	EPFN	3	300	4945.21	N/A
ATLI	R	15x15	7684.90	0.5195	EPFN	1	330	5968.62	N/A
ATLI	R	18x13	14222.00	0.5236	EPFN	2	330	5968.62	N/A
ATLI	R	18x18	11510.00	0.4763	EPFN	3	330	5968.62	N/A
ATLI	2	20x15	6809.40	N/A	EPFN	1	365	7290.21	N/A
ATLI	2	20x20	7203.90	N/A	EPFN	2	365	7290.21	N/A
ATLI	2	22x22	8793.10	N/A	EPFN	3	365	7290.21	N/A
ATLI	2	25x25	11700.00	N/A	EPFN	1	402	8869.55	N/A
ATLI	2	28x28	14036.00	N/A	EPFN	2	402	8869.55	N/A
ATLI	2	32x32	2015.00	N/A	EPFN	3	402	8869.55	N/A
ATLI	2	36x36	27549.00	N/A	EPFN	1	445	10827.92	N/A
ATLI	2	40x40	38067.70	N/A	EPFN	2	445	10827.92	N/A
ATZAF	1	12x12	2337.50	N/A	EPFN	3	445	10827.92	N/A
ATZAF	2	12x12	2237.30	N/A	EPFN	1	490	13135.01	N/A
ATZAF	1	15x15	3873.60	N/A	EPFN	2	490	13135.01	N/A
ATZAF	2	15x15	3873.60	N/A	EPFN	3	490	13135.01	N/A
ATZAF	1	18x18	4675.00	N/A	EPFN	1	542	16111.75	N/A
ATZAF	2	18x18	4675.00	N/A	EPFN	2	542	16111.75	N/A

## TABLE 2 - AIR MEASURING DEVICE CONNECTIONS (CONT'D)

FAN TYPE	FAN CLASS	FAN SIZE	k	n	FAN TYPE	FAN CLASS	FAN SIZE	k	n
ATZAF	1	20x20	5843.70	N/A	EPFN	3	542	16111.75	N/A
ATZAF	2	20x20	5301.10	N/A	EPLFN	2	122	944.92	N/A
ATZAF	1	22x22	7513.40	N/A	EPLFN	2	150	1206.40	N/A
ATZAF	2	22x22	6624.10	N/A	EPLFN	2	165	1518.58	N/A
ATZAF	1	25x25	9683.90	N/A	EPLFN	2	182	1821.92	N/A
ATZAF	2	25x25	9202.90	N/A	EPLFN	2	200	2185.80	N/A
ATZAF	1	28x28	12856.20	N/A	EPLFN	2	222	2713.93	N/A
ATZAF	2	28x28	11795.00	N/A	EPLFN	2	245	3285.02	N/A
ATZAF	1	32x32	16295.60	N/A	EPLFN	2	270	3997.61	N/A
ATZAF	2	32x32	16295.60	N/A	EPLFN	2	300	4945.21	N/A
ATZAF	1	36x36	19701.70	N/A	EPLFN	2	330	5968.62	N/A
ATZAF	2	36x36	19367.80	N/A	EPLFN	2	365	7290.21	N/A
ATZAF	1	40x40	23374.90	N/A	EPLFN	2	402	8869.55	N/A
ATZAF	1	40x40	25378.40	N/A	EPLFN	2	445	10827.92	N/A
ATZAF	2	40x40	22974.20	N/A	EPLFN	2	490	13135.01	N/A
ATZAF	2	40x40	25044.50	N/A	MPQN	1	122	944.92	N/A
MPQS	1	122	944.92	N/A	MPQN	2	122	944.92	N/A
MPQS	2	122	944.92	N/A	MPQN	3	122	944.92	N/A
MPQS	3	122	944.92	N/A	MPQN	1	150	1206.40	N/A
MPQS	1	150	1206.40	N/A	MPQN	2	150	1206.40	N/A
MPQS	2	150	1206.40	N/A	MPQN	3	150	1206.40	N/A
MPQS	3	150	1206.40	N/A	MPQN	1	165	1518.58	N/A
MPQS	1	165	1518.58	N/A	MPQN	2	165	1518.58	N/A
MPQS	2	165	1518.58	N/A	MPQN	3	165	1518.58	N/A
MPQS	3	165	1518.58	N/A	MPQN	1	182	1821.92	N/A
MPQS	1	182	1821.92	N/A	MPQN	2	182	1821.92	N/A
MPQS	2	182	1821.92	N/A	MPQN	3	182	1821.92	N/A
MPQS	3	182	1821.92	N/A	MPQN	1	200	2185.80	N/A
MPQS	1	200	2185.80	N/A	MPQN	2	200	2185.80	N/A
MPQS	2	200	2185.80	N/A	MPQN	3	200	2185.80	N/A
MPQS	3	200	2185.80	N/A	MPQN	1	222	2713.93	N/A
MPQS	1	222	2713.93	N/A	MPQN	2	222	2713.93	N/A
MPQS	2	222	2713.93	N/A	MPQN	3	222	2713.93	N/A
MPQS	3	222	2713.93	N/A	MPQN	1	245	3285.02	N/A
MPQS	1	245	3285.02	N/A	MPQN	2	245	3285.02	N/A
MPQS	2	245	3285.02	N/A	MPQN	3	245	3285.02	N/A
MPQS	3	245	3285.02	N/A	MPQN	1	270	3997.61	N/A
MPQS	1	270	3997.61	N/A	MPQN	2	270	3997.61	N/A
MPQS	2	270	3997.61	N/A	MPQN	3	270	3997.61	N/A
MPQS	3	270	3997.61	N/A	MPQN	1	300	4945.21	N/A
MPQS	1	300	4945.21	N/A	MPQN	2	300	4945.21	N/A
MPQS	2	300	4945.21	N/A	MPQN	3	300	4945.21	N/A
MPQS	3	300	4945.21	N/A	MPQN	1	330	5968.62	N/A

FAN TYPE	FAN CLASS	FAN SIZE	k	n	FAN TYPE	FAN CLASS	FAN SIZE	k	n
MPQS	1	330	5968.62	N/A	MPQN	2	330	5968.62	N/A
MPQS	2	330	5968.62	N/A	MPQN	3	330	5968.62	N/A
MPQS	3	330	5968.62	N/A	MPQN	1	365	7290.21	N/A
MPQS	1	365	7290.21	N/A	MPQN	2	365	7290.21	N/A
MPQS	2	365	7290.21	N/A	MPQN	3	365	7290.21	N/A
MPQS	3	365	7290.21	N/A	MPQN	1	402	8869.55	N/A
MPQS	1	402	8869.55	N/A	MPQN	2	402	8869.55	N/A
MPQS	2	402	8869.55	N/A	MPQN	3	402	8869.55	N/A
MPQS	3	402	8869.55	N/A	MPQN	1	445	10827.92	N/A
MPQS	1	445	10827.92	N/A	MPQN	2	445	10827.92	N/A
MPQS	2	445	10827.92	N/A	MPQN	3	445	10827.92	N/A
MPQS	3	445	10827.92	N/A	MPQN	1	490	13135.01	N/A
MPQS	1	490	13135.01	N/A	MPQN	2	490	13135.01	N/A
MPQS	2	490	13135.01	N/A	MPQN	3	490	13135.01	N/A
MPQS	3	490	13135.01	N/A	SF	2	165	1361.00	N/A
SF	2	105	592.00	N/A	SF	2	182	1673.00	N/A
SF	2	122	842.00	N/A	SF	2	200	1942.00	N/A
SF	2	135	963.00	N/A	SF	2	222	2454.00	N/A
SF	2	150	1147.00	N/A	SF	2	245	3010.00	N/A

**TABLE 2 -** AIR MEASURING DEVICE CONNECTIONS (CONT'D)

## Air Measuring at the Fan Inlets

- COMETER is a probe attached to the fan bearing support on Comefri Forward Curve fans from size 7 x 7 up to 18 x 18. The probe is located on the outboard side of the housed fan assembly. The probe is piped to the negative (-) port of a factory mounted transducer on the fan wall. The positive (+) port is left open to the fan section. Wiring is not provided to the transducer unless factory packaged controls were selected.
- PIEZORING (PIEZOMETER) is a fitting or series of fittings in the inlet cone(s) of housed fans larger than 18 x 18 and all sizes of Plenum fans that are combined into a single connection piped to the negative (-) port of a factory mounted transducer on the fan wall. The positive (+) port is left open to the fan section. Wiring is not provided to the transducer unless factory packaged controls were selected.



The fan manufacturer does not recommend placement of the flow measuring probes inside the fan inlet cone in the path of airflow. These devices create disturbances and unpredictable performance losses.



FIGURE 11 - HIGH AND LOW CONNECTIONS FOR AN IN FAN AIR MONITORING SYSTEM



**FIGURE 12 -** HIGH AND LOW CONNECTIONS AND ASSOCIATED TUBING FOR FAN MOUNTED AIR MONITORING SYSTEM



FIGURE 13 - PORT LOCATIONS FOR FAN MOUNT-ED AIR MONITORING SYSTEM

## Air Measuring at Unit Outside Air Inlets

AMS-60 used on indoor air handlers usually measure outside air. This can be provided with one or two pairs of positive (+ or High) and negative (- or Low) pressure tube connections. Connect (+) & (-) respectively to the (+) & (-) ports of the transducer(s). Wiring & transducer are not provided unless factory packaged controls were selected.

• EAML used on outdoor air handlers usually to measure outside air. This can be provided with one or two pairs of positive (+ or High) and negative (- or Low) pressure tube connections. Connect (+) & (-) respectively to the (+) & (-) ports of the transducer(s). Wiring & transducer are not provided unless factory packaged controls were selected.

## AMS-60 Damper

## General

The YORK AMS-60 is an airflow monitoring device which combines the functions of control damper and airflow measurement station into one assembly. It is ideally suited for factory installation in air handling units. The YORK AMS-60 is tested to AMCA Standard 611-95 and qualifies to bear the AMCA Ratings Seal for Airflow Measurement Performance.

## Damper Operation

The AMS-60 airflow monitoring damper design incorporates a low leakage control damper with stationary, vertical air monitoring blades and air straightening section into one assembly. The control damper utilized for modulating airflow is the ultra-low leak Ruskin CD-60 with its standard blade and jamb seals used for low leakage. Strategically placed stationary and vertical airflow sensing blades measure the airstream velocity pressure. Air tubing/piping connections are provided to connect the sensing blades to an optional factorymounted transducer. The transducer converts the velocity pressure from the sensing blades to an electrical output signal for the Building Automation System (BAS). The output signal corresponds directly to flow through the damper. The BAS compares this signal to the design CFM setpoint as determined by the particular mode of operation of the HVAC system. In normal operation, this setpoint corresponds to the minimum outside air ventilation required by the system design to meet ASHRAE Standard 62. Based on the difference between the actual CFM reading and the desired setpoint, the BAS would send a signal to the optional, factory-mounted control damper Actuator to position the damper blades as necessary to ensure that the actual outside airflow meets the desired level.

## No Calibration Required

The AMS-60 airflow monitoring damper is factory calibrated. Calibration is not required at the jobsite.

## **Ductwork Inlet Requirements**

When connecting the ductwork to a mixing box with an AMS-60 damper, a minimum of one (1) equivalent duct diameter of straight duct is required before entering the AMS-60 damper.

1 equivalent duct diameter = d



#### FIGURE 14 - DUCTWORK INLET REQUIREMENTS

If one equivalent duct diameter cannot be achieved during installation, the rectangular elbow may be substituted with a radius elbow. The outside radius must have a R/W ratio of 0.75 or more.





## Damper Linkage Arrangements

The AMS-60 mixing box will ship with independent return air and outside air damper actuators if selected in the MB or FM segments.

## Louver/Damper Combination

Outdoor AHU economizer and mixing box sections will utilize an integral rain resistant, airflow sensing louver/damper combination with operation and set-up similar to the AMS-60. The indoor and outdoor AHU designs have the same possible damper configurations.

## Damper Configurations

There are 3 possible damper configurations, 25% Sensing option (Min./Max.), 25%/75% Sensing option, and 100% Sensing option.

• 25% Sensing Option (Min./Max.)



## FIGURE 16 - 25% SENSING OPTION

The 25% Sensing (Min./Max.) option arrangement is a dual damper design and used for measuring the minimum outside air requirement. In this arrangement, the 25% damper would be for monitoring airflow through the first 25% down to 3.75% nominal flow and the 75% damper would have a separate actuator and used for economizer control only.

This option would be the best low cost option for areas in which economizer cycles are not often seen, such as the southeast, and are required to constantly operate in at the minimum outside air position.

• 25/75% Sensing Option



## FIGURE 17 - 25%/75% SENSING OPTION

The 25/75% Sensing option arrangement is similar to the 25% Sensing (Min./Max.) option, but allows you to measure airflow throughout the economizer cycle also. In this arrangement, the 25% damper would be for monitoring nominal airflow through the first 25% down to 3.75% and the 75% damper would be for monitoring the remaining 75%.

• 100% Sensing Option

The 100% sensing arrangement is a single damper design used to measure airflow throughout the full range of the outside air damper down to 15% of nominal airflow.



FIGURE 18 - 25%/75% SENSING OPTION

The 100% sensing option is the lowest cost option, but should not be utilized when minimum airflow to be sensed falls below 15% nominal flow. The 25% Sensing (Min./Max.) and 100% Sensing option arrangements will be the most prevalent.

The 100% Sensing arrangement with the outside and return air dampers tied to a common actuator, will usually be the most common configuration and cost-effective solution. However, areas in which economizer cycles are not often seen and operate primarily in minimum outside air position, the 25% Sensing option should be the preferred option for lowest airflow monitoring and a cost-effective solution.

In each of the available configurations, the minimum airflow across the sensing portion of the airflow monitoring station is 300 FPM for the indoor AHU and 345 FPM for the outdoor AHU.

## Factory Mounted Control Option

The AMS-60 airflow monitoring station may be ordered with or without Factory-mounted End Devices. The Optional End Devices must be selected through the YorkWorks program and consist of the following:

- Modulating, Spring Return Actuator(s)
- Low Pressure Transducer(s)

YorkWorks will provide all wiring schematics.

## Jumper Selections

When selected, the AMS-60 factory provided transducers technically provides six (6) jumper selections which allow you to select the appropriate range for your application. However, only three (3) are applicable to the AMS-60 function. The jumper selections are as follows: 0-1", 0-.5", and 0-.25". These are field adjustable. To determine the correct jumper setting for your application, refer to the equation and examples on *Table 3 on page 27* for indoor AHUs and *Table 4 on page 28* for outdoor AHUs.

## Input Power

A 24VAC power supply can be wired into the supply voltage terminals on the Factory-mounted Actuator and Transducer.

## **CFM Input Signal to Damper Actuator**

2-10VDC (BELIMO)

0-10 VDC (JOHNSON CONTOLS)

## **CFM Output Signal from Transducer**

0-10VDC

## Sequence Of Operation

A 0-10 VDC or 2-10VDC control signal is sent to the AMS 60 damper actuator from the Building Automation System (BAS). The BAS maintains the required cfm by modulating the actuator on the control damper. The BAS receives a 0-10 VDC signal back from the transducer, confirming the cfm supplied. Upon loss of power, the AMS-60 actuator returns to a closed position.

## End Devices Requirements\*

It is necessary for an independent contractor to provide controls capable of sending 0-10 VDC or a 2-10VDC signal to the actuator and receiving a 0-10VDC signal back from the transducer. A 24VAC power source must be provided.

\* This paragraph only applies if the actuator and transducer are YORK supplied. Any controls provided by "others" are the contractor's responsibility.

## AHU Airflow Station Specifications

Furnish and install, at locations indicated on plans and/ or schedules, an air monitoring station integral with outside air control damper, stationary airflow sensingdevice, and air straightening section. The integral air monitoring station shall incorporate pressure sensing ports built into the sensing device and shall control the minimum amount of outside air as recommended by ASHRAE 62-2001. The airflow monitoring station must be tested in accordance with AMCA Standard 611-95 in an AMCA registered laboratory. The airflow monitoring station must bear the AMCA Certified Ratings Seal for Airflow Measurement Performance. If airflow station is internally mounted inside air handling unit and incorporates a control damper, the control damper must comply with leakage rates of damper specification.

## If ASHRAE 90.1 is referenced, also include

If airflow station is internally mounted inside air handling unit and incorporates a control damper, the control damper must comply with leakage rates per ASHRAE 90.1-1999. All damper leakage rates must be provided in submittal data on a CFM/FT<sup>2</sup> at 1" w.g. basis.

## AMS-60 (Indoor AHU)

Use the following equation to determine the correct jumper setting for your application:

CFM=(FREE AREA\*Ka)\*Pams (1/m), where Ka = 3213

Pams = Range of transmitter, and (l/m) = 0.54.

#### TABLE 3 - INDOOR UNIT EXAMPLE

	FAN DESIGN	AMS SENSING (%)	AMS O.A.	AMS-60 SENS	AMS SENSING	
	FLOW (CFM)		(CFM)	"A" DIM. (IN.)	"B" DIM. (IN.)	AREA (SQ. FT.)
AHU-01	21370	25	7000	22.5	32.75	5.1

RANGE: 0.0 TO +0.25						
MIN MAX						
0	0.25					

Recommended operating range is 345-2,000 FPM. Operation outside these parameters is not recommended.

VOLTS	PAMS	CFM	FPM
0	0.00	0.0	0.00
1	0.03	2243.0	438.33
2	0.05	3261.3	637.32
3	0.08	4059.5	793.31
4	0.10	4741.8	926.64
5	0.13	5349.0	1045.30
6	0.15	5902.4	1153.45
7	0.18	6414.8	1253.58
8	0.20	6894.4	1347.31
9	0.23	7347.2	1435.78
10	0.25	7777.3	1519.84

## Airflow Monitoring Station with Louvers/ Hoods (Outdoor AHU)

Use the following equation to determine the correct jumper setting for your application:

CFM = (FREE AREA\*Ka)\*Pams (1/m), where Ka = 3833

Pams = Range of transmitter, and (l/m) = 0.52.

#### **TABLE 4 -** OUTDOOR UNIT EXAMPLE

	FAN DESIGN	AMS	AMS O.A. SETPOINT	AMS-60 SENS DIMENSIONS 1	SING DAMPER	AMS SENSING
	FLOW (CFM)	CFM) SENSING (%) (CFM)		"A" DIM. (IN.)	"B" DIM. (IN.)	AREA (SQ. FT.)
AHU-01	21370	25	7000	22.5	32.75	5.1

RANGE: 0.0 TO +0.25						
MIN MAX						
0	0.25					

Recommended operating range is 300-2,000 FPM. Operation outside these parameters is not recommended.

VOLTS	PAMS	CFM	FPM
0	0.00	0.0	0.00
1	0.03	2880.7	564.84
2	0.05	4130.8	809.96
3	0.08	5100.4	1000.07
4	0.10	5923.4	1161.45
5	0.13	6652.2	1304.35
6	0.15	7313.7	1434.06
7	0.18	7924.1	1553.75
8	0.20	8493.9	1665.47
9	0.23	9030.4	1770.66
10	0.25	9538.9	1870.38

## Locating and Installing Actuators

Johnson Controls standard actuators are direct coupled on the damper jackshaft. Refer to the instructions in the Solution XT Air Handling Units - Installation and Assembly Manual (Form 102.20-N1) and York Custom Air Handling Units - Installation and Assembly Manual (Form 102.20-N3) to install the Johnson Controls actuators.

## Damper Blade Orientation

Use the following instructions to orient the damper blades.

## **Return Air and Mixing Dampers**

- 1. Position the blades so that they will be open after the actuator is installed, which will be the dampers spring return position.
- 2. Note whether the damper shaft is rotated clockwise or counterclockwise.

## **Outside Air and Exhaust Air Dampers**

1. Position the damper blades so that they will be closed with the power *off*, which will be the dampers spring return position. Note if the damper shaft is rotated clockwise or counterclockwise.

- 2. With the actuator shaft clamp tightened to the damper jackshaft, and the damper shaft completely rotated to its proper position, manually operate the actuator to its fully actuated position, using the crank arm provided with the actuator.
- 3. Release the spring to allow the damper to go back to its original position, which will verify the actuators spring rotation and stroke.
- 4. Set the damper actuators rotation selector switch to the proper rotation required to actuate the damper. The damper actuator will always be opposite the spring return rotation.

## **Energize Fan Motors**

Use the following instructions to energize the fan motors:

- 1. Observe the fan(s) for smooth operation.
- 2. Check the motor nameplate for the full load amp (FLA) rating.
- 3. Check the current draw of each leg of each motor.

## **Check Doors And Latches**

Refer to the service manual for adjusting and replacing the doors.

Solution XT doors are shipped with metal shipping spacers glued onto the edges of each door. They are located on three edges of each door (top, latch side & bottom) (*Figure 20 on page 29*). The spacers should be left in place until the AHU is placed in its final location and multiple skid AHUs are fully assembled. After AHU installation use a channel lock pliers or a screwdriver to remove the spacers. Do not damage the metal door panel. Slight impressions left on the door gasket by the spacers will rebound in approximately a week.



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## OPERATION



DO NOT penetrate wireways in any manner. These sheet metal channels, which run along the top panel, contain electrical wires and connections. Electrical shock and/or damage to the AHU may result.



Rotating parts and electrical shock hazards exist. Follow the latest lockout/tag out procedures to lockout/tagout the fan motor(s) and heat power disconnects before servicing. ailure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this manual.



Always replace RED metal tab on access doors that provide access to moving parts. This mechanical protection from moving parts is required by UL-1995.

Always replace RED metal tab on access doors that provide access to pressurized areas. This mechanical protection is to prevent accidental release of access doors under positive pressure.

Verify conformance with the total outdoor airflow and space supply airflow requirements of ASHRAE Standard 111, SMACNA's HVAC Systems - Testing, Adjusting and Balancing, 2nd edition, or equivalent.



Do not weld or use torches on the exterior or interior of the AHU housing. The housing contains polyurethane insulation, which, when under combustion, will produce harmful, toxic gases resulting in personal injury or death.



Never use silicone caulk/sealant or caulk/ sealant containing silicone in or on solution air handling equipment.

## **Test And Balance**

## Air Balance

• System air balance should be performed as soon as possible after AHU start-up.

- Failure to perform air balance may result in damage to AHU, generate noise vibration and condensation carryover.
- Qualified air balance technician should perform air balance.

## **Dynamic Balance**

- Dynamic balance has been performed at the factory on the fan assemblies. If any changes were made to the fan assembly (fan, motor, sheaves, belts, isolators, support structure) a vibration analysis must be performed and the fan assembly trim balanced if needed.
- Dynamic balance is affected by operation of the VFD. If a VFD is provided, refer to the caution warnings in the VFD start-up instructions in the VFD operator's manual. Make sure the skip frequencies (jump frequencies) are installed prior to operation of the motors for more than 30 minutes.
- Commercial performance line of product, only has fan balance if option is selected.

## Setting Limits

## Temperature

- Cabinet Panels 200°F
- Standard Motors with (Class B Insulation) 104°F.
- Motors with Class F. Insulation 140°F
- Power Wiring 140°F
- Controls and Control Wiring 140°F.
- Prefilters 150°F.
- High Efficiency Filters 180°F
- Variable Speed Drive ABB Mfg. 140°F
- Damper and Valve Actuators 140°F
- Gasketing 200°F
- Gan Bearings 120°F (FC), 180°F (AF)
- Foam Flash Point 415°F
- Energy Recovery Wheels
  - Thermotech 140°F
  - Innergy tech 122°F
  - NovelAire® Technologies 200°F
  - Airxchange<sup>®</sup> 170°F

### **Static Pressure**

- Solution XT Maximum design cabinet pressure is ± 8 in WC at 1% leakage.
- YORK Custom Maximum design cabinet pressure is ± 10 in WC at 0.5% leakage.
- Access doors are double walled. Doors are provided with adjustable door latches and seals.

## **Checking Motors, Belts and Sheaves**

#### Motors



Do not operate fan motors in overload amperage conditions. Motors are designed to operate within the stated Service Factor (SF) on the motor nameplate.

Motor amperage should be checked again after the connecting ductwork is installed, and an air balance is performed on the air distribution system. If the motor operates at amperage levels above the nameplate limits, discontinue operation and correct the cause, or refer to *SECTION 3 - MAINTENANCE* in this manual

#### Belts

Check belts for correct tension at start-up, and again after 24 hours of operation. On multiple belt adjustable pulleys, check the pitch depth to insure identical belt travel, power transfer and wear. Adjustable motor bases are provided for belt adjustment.

#### Sheaves

If optional adjustable sheaves are provided, replace them with correctly sized fixed sheaves immediately after the system air balance is performed. It is not unusual for an adjustable sheave to create damaging vibration in the fan assembly.

## **Replacing Sheaves**

Use the following instructions to replace the sheaves.

1. Measure the outside diameter of a belt while it is seated into at least one half the circumference of an adjustable sheave groove, which is the sheave pitch diameter.

- 2. Order a good quality, pre-balanced sheave or sheave and bushing assembly that matches the pitch diameter, belt cross section, and bore size from Airside Parts at (800) 545-7814. Provide the following information:
  - Drive tag information as shown in *Figure 40* on page 51. On Solution XT AHUs, label will be located on the fan assembly near the belts.
  - New fan RPM
  - Measurement of pitch diameter at which the adjustable sheave is set.
  - Job Identification Number from the AHU ID label.

A new driver (motor) sheave, or sheave and bushing are usually all that is required to directly replace the current adjustable driver sheave.

V-BELT DRIVE KIT www.emerson	n-ept.com
BANKING 08-187037-10_116174	5
PO. P436048-1	122
KIT 289 24302 201	36.
MTR HP= 10.5	8
FAN RPM= 1154 CD= 16.7 AT 3.00 TRN OPN	ŏ
TENSION INFO- 4.33 LBS 0.25 IN	3
DRIVE'S BELT- BX56	2
MOTOR SHEAVE- 2VP71X 1 5/8	
MOTOR BUSHING- NONE REQUIRED	28
FAN SHEAVE- 28K100X 1 3/8	70
FAN BUSHING- NONE REQUIRED	442
	LD16580

FIGURE 40 - V-BELT DRIVE KIT LABEL

## P-Cone<sup>®</sup>

## **Operation of the P-Cone®**

The P-Cone<sup>®</sup> has no moving parts; it cannot be turned on or off or adjusted. Each of the two piezometer rings on the exterior side of the inlet cone are fitted with a 0.25 union brass tee. The two tees are the connection points for running pneumatic tubing from the P-Cone<sup>®</sup> to an air pressure gauge/switch/readout. This P-Cone<sup>®</sup> will automatically produce a pressure differential signal whenever the fan is moving air. THIS PAGE INTENTIONALLY LEFT BLANK.

## **SECTION 3 - MAINTENANCE**

## **GENERAL REQUIREMENTS**

The maintenance requirements for AHUs are shown below. The procedure is in the left-hand column, and the minimum required frequency is marked is described in the right-hand column.

Refer to ANSI/ASHRAE Standard 62.1-2010 for startup and maintenance practices related to achieving acceptable indoor air quality. ANSI/ASHRAE Standard 62.1-2010 is under continuous maintenance by a Standing Standard Project Committee (SSPC), for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard as shown in *Table 11 on page 53*.

#### EVERY 3 **EVERY 6** EVERY 5 ANNUALLY PROCEDURE MONTHS MONTHS YEARS Maintain filters and air cleaning devices.\* Х Visually inspect or remotely monitor the outdoor air damp-Х ers and actuators for proper function. Clean and maintain humidifiers to limit fouling and microbial Х growth. Visually inspect the dehumidification coils for cleanliness Х and microbial growth. Clean when fouling is observed. Visually inspect drain pans and other adjacent surfaces subject to wetting for cleanliness and microbial growth and Х clean when fouling is observed Visually inspect outdoor air intake louvers, bird screens, mist eliminators, and adjacent areas for cleanliness and Х integrity. Clean, when necessary Verify sensors used for dynamic minimum outdoor air con-Х trol accuracy and recalibrate or replace as necessary. Measure the minimum quantity of outdoor air in the AHUs except for AHUs under 1000 L/s (2000 CFM. If measured minimum airflow rates are less than 90% of the minimum outdoor rate in this manual. they shall be adjusted or Х modified to bring them above 90% or shall be evaluated to determine if the measured rates are in conformance with this ASHRAE standard. Maintain the floor drains located in plenums or rooms that Х serve as air plenums to prevent transport of contaminants from the floor drain to the plenum.\* Keep clear the space provided for routine maintenance Х and inspection around ventilation equipment for equipment component accessibility.\* Investigate and rectify the visible microbial contamination.\* Х Investigate and rectify the water intrusion or accumulation.\* Х

#### **TABLE 11 -** MINIMUM / MAINTENANCE REQUIREMENTS ACCORDING TO ASHRAE

\*Minimum frequencies may be increased or decreased from what is indicated in this table.

## **INSPECT PARTS**

Inspect the following parts for damage, dirt and debris.

## Cabinet

Clean the exterior of the AHU with a mild, environmental safe detergent and high-pressure water at 2000 psi.

## **Door Hardware and Gaskets**

Inspect the doors, handles, latches and hinges for proper operation, and the door gaskets for damage and if they are properly sealed. Secure any loose parts.

## Panels

Inspect the panels for damage. If the panels show signs of excessive pressure change, they will appear to bulge inward or outward. Refer to *Troubleshooting on page 78* regarding excessive static pressure. If the panel needs to be replaced, use the instructions later in this section.

3

# FAN SEGMENT (SUPPLY, RETURN OR EXHAUST)

## **Removing the Fan**

If necessary, remove the fans for cleaning. Clean the fan with detergent or solvent that is environmentally safe. If water pressure is used, do not direct the water stream onto the bearing seals.



Forward curved fan wheels are more susceptible to dirt accumulation than other wheels. Dirt and debris on fan wheels and shafts may adversely affect the balance of the fan assembly.

Refer to the information later in this section to replace the fan and fan assembly components.

## **Checking the Fan**

Check the following fan parts for damage, wear, loose parts, and debris:

- 1. Fan housing, wheel, shaft, frame and bearings
- 2. Fan base, vibration isolators and optional thrust restraints
- 3. Flex connector. Make sure the fan assembly does not rub the flex material.
- 4. Drive kit, which consists of belts, sheaves and sheave bushings. Check for belt tension.

On Solution XT AHUs, the actual data required by design of each fan assembly is listed on the tag affixed to the fan housing near the belts, as shown in *Figure 43* on page 55.





## **OPERATING ADJUSTABLE MOTOR BASE**

## Standard

- 5. Secure the nut with a wrench placed through the service hole and loosen the bolt. Do this to all four hold down bolt asssemblies, as shown in *Figure* 44 on page 55.
- 6. Make sure the drive bolt assembly threads are lightly lubricated.
- 7. Turn both drive bolt assemblies in the same direction to move motor for belt installation and tensioning.
- 8. Turn drive bolt assemblies independently to move motor for sheave/belt alignment.
- 9. Tighten all four holddown bolt assemblies.

For belt tensioning instruction, refer to *Belt Replacement Tensioning and Sheave Alignment for Top Mount on page 58.* 



# FIGURE 44 - SOLUTION XT ADJUSTABLE MOTOR BASE



Procure replacement drive components locally. A drive label, affixed to the supply fan, lists the drive specifications. However, due to possible changes in the field, replacement parts must be verified against installed parts since the installed parts may not match the label.

## FIGURE 45 - SOLUTION XT ADJUSTABLE MOTOR BASE (TOP MOUNT)



#### **Fan Bearing Lubrication**

If the fans will be down for four weeks or more, properly apply correct grease and rotate monthly to prevent moisture from damaging bearings.

Fan bearings on the AHUs are equipped with standard lubrication fittings. AHUs under 42 in. tall will have either extended lube lines, enabling lubrication of both fan bearings from one side of fan as shown in *Figure 58 on page 61* or optional external lube lines. For AHUs 42 in. tall and above, extended lube lines and external lube lines are optional. Some fans will have permanently lubricated bearings.

![](_page_30_Picture_5.jpeg)

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FIGURE 58 - OPTIONAL LUBRICATION LINES

For specific fan bearing lubrication, check the instruction packet attached to the fan housing. Some forward curved fans are permanently lubricated.

For best results, relubricate the standard pillow block bearings while in operation if it safe to do so. Add grease slowly with the shaft rotating until a slight bead forms at the seals.

If necessary to relubricate while the bearing is stationary, refer to the manufacturer's data for maximum grease capacity for the size bearing.

Relubrication is generally accompanied by a temporary rise in operating temperature. Excess grease will be purged at the seals. Wipe away purged grease after several hours of operation.

## **Recommended Lubricant for Bearings**

Use a lithium/petroleum based grease conforming to an NLGI Grade II consistency. The lubricant must be free of any chemical impurities such as free acid or free alkali, dust, rust, metal particles, or abrasives. This light viscosity, low torque grease is rust inhibited and water resistant, and has a temperature range of  $-30^{\circ}$ F to  $+200^{\circ}$ F with intermittent highs of  $+250^{\circ}$ F. Lubricate bearings as required by the severity of required duty.

#### **Proper Interval and Quantity**

Refer to *Table 12 on page 62* for the proper lubrication intervals for the bearings listed earlier in this section.

![](_page_30_Picture_16.jpeg)

The bearing on the split pillow blocks is 1/3 full when only one side of bearing is completely full of grease.

#### TABLE 12 - FAN BEARING RE-LUBRICATION INTERVALS FOR BALL BEARING PILLOW BLOCKS

<b>RE-LUBRICATION SCHEDULE (MONTHS - ASSUME 24/7 OPERATION)</b>												
SPEED (RPM)	PEED (RPM)         500         1000         1500         2000         2500         3000         3500         4000         4500											
SHAFT DIAMETER (IN)												
1/2 to 1-11/16	6	6	5	3	3	2	2	2	1			
1-15/16 to 2-7/16	6	5	4	2	2	1	1	1	1			
2-11/16 to 2-15/16	5	4	3	2	1	1	1					
3-7/16 to 3-15/16	4	3	2	1	1	1						

**TABLE 13 -** FAN BEARING LUBRICATION INTERVALS FOR SPHERICAL ROLLER BEARING SOLID PILLOWBLOCKS

<b>RE-LUBRICATION SCHEDULE (MONTHS - ASSUME 24/7 OPERATION)</b>											
SPEED (RPM)         500         1000         1500         2000         2500         3000         3500         4000         4500											
SHAFT DIAMETER (IN)											
1/2 to 1-11/16	6	4	4	2	1	1	1	1	1/2		
1-15/16 to 2-7/16	4	2	11/2	1	1/2	1/2	1/2	1/2	1/2		
2-11/16 to 2-15/16	3	1½	1	1/2	1⁄2	1/2	1/2				
3-7/16 to 3-15/16	4	3	2	1	1	1					

<b>TABLE 14</b> - F	AN BEARING LUBI	RICATION INTERV	ALS FOR SPHERI	CAL ROLLER BE	EARING SPLIT PILL	OW
BLOCKS						

RE-LUBRICATION SCHEDULE (MONTHS - ASSUME 24/7 OPERATION)												
SPEED (RPM)	500         750         1000         15000         2000         2500         3000         3500         4000											
SHAFT DIAMETER (IN)												
1/2 to 1-11/16	6	41⁄2	4	4	31⁄2	21⁄2	21⁄2	1	1			
1-15/16 to 2-7/16	41⁄2	4	31/2	21/2	11⁄2	1	1/2					
2-11/16 to 2-15/16	4	4	21/2	1	1/2							
3-7/16 to 3-15/16	4	21⁄2	11⁄2	1								

#### **TABLE 15 -** FAN BEARING LUBRICATION INTERVALS FOR DODGE ISN BEARINGS

SHAFT SIZE		RPM										
(INCHES)	250	500	750	1000	1250	1500	2000	2500	>3000			
1-1/8 to 2	4	3	2	2	1	0.5	0.25	0.25	0.25			
2-3/16 to 2-1/4	3.5	2.5	1.5	1	0.5	0.5	0.25	0.25	0.25			
2-3/8 to 3	3	2	1.5	1	0.5	0.25	0.25	0.25	0.25			
3-3/16 to 3-1/2	2.5	1.5	1	0.5	0.25	0.25	0.25	0.25				
3-11/16 to 4-1/2	2	1.5	1	0.5	0.25	0.25	0.25					
4-15/16 to 5-1/2	1.5	1	0.5	0.25	0.25	0.25						
5-15/16 to 6	1	0.5	0.5	0.25	0.25	0.25						
6-7/16 to 7	1	0.5	0.25	0.25	0.25							

# LUBRICATING THE FAN SEGMENT AND MOTOR

Keep the motor clean, dry, and properly lubricated at all times. On ODP (Open Drip Proof) type motors as shown in *Figure 59 on page 63*, blow dust and dirt out of the windings periodically, using low pressure air

(50 psig). For Totally Enclosed Fan Cooled (TEFC) motors as shown in *Figure 60 on page 63*, blow dust and dirt out of the cooling fan as conditions indicate.

![](_page_32_Picture_2.jpeg)

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FIGURE 59 - OPEN DRIP PROOF (ODP) MOTOR

![](_page_32_Picture_5.jpeg)

FIGURE 60 - TOTALLY ENCLOSED FAN COOLED (TEFC) MOTOR

## Checking Condition of Mounting Hardware, Adjustable Motor Base and Motor

Hardware and Motor Base - Check for loose parts and damage. If the parts are damaged, replace the parts.

**Motor -** Check the motor for leaky bearing seals, damage and dirt, dust, and debris in the motor housing.

## **Checking Electrical Connections**

Check the following:

- 1. Electrical terminations.
- 2. Conduit fittings and clamps for damage or looseness.
- 3. Operating amperage, and compare the number to the number listed on the AHU nameplate.

#### **Keep Motor Bearing Lubricated**

Bearing grease will lose its lubricating ability over time because the lubricating ability depends primarily on the type of grease, size of the bearing, speed at which the bearing operates, and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in this maintenance program:

- 1. Use a high-grade ball or roller bearing grease such as Polyrex EM (Exxon Mobile) for all "T" frame motors.
- 2. Maximum operating temperature for standard motors is 166°F/75°C.
- 3. Recommended lubrication intervals are shown in *Table 16 on page 64*. Refer to all three tables.
- 4. Use the following steps to lubricate the motor.

![](_page_32_Picture_21.jpeg)

To avoid damage to the motor bearings, keep the grease free of dirt. For an extremely dirty environment, contact your distributor or an authorized service center for additional information.

If the AHU is equipped with a grease relief plug, use the following instructions to replace the grease:

- 1. Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult a distributor or an authorized service center if grease other than the recommended type is to be used.
- 2. Clean all grease fittings.
- 3. Remove the grease relief plug.
- 4. If motor is stopped, add the recommended amount of grease.
- 5. If the motor is to be greased while running, add a slightly greater quantity of grease slowly until the new grease appears at the shaft hole in the end plate or relief plug hole.
- 6. Clean off any grease from the grease fitting.
- 7. Run motor for 15–30 minutes with the relief plug removed to warm up the grease.
- 8. Wipe off any grease that was pushed out of the relief plug.
- 9. Reinstall the grease relief plug.

## TABLE 16 - MOTOR BEARING LUBRICATION INTERVALS

	RATED SPEED - RPM (HOURS)									
NEMA / (IEC) FRAM SIZE	10,000	6,000	3,600	1,800	1,200	900				
UP TO 210 INCL. (132)	**	2,700	5,500	12,000	18,000	22,000				
OVER 210 TO 280 INCL. (180)			3,600	9,500	15,000	18,000				
OVER 280 TO 360 INCL. (180)			*2,200	7,400.	12,000	15,000				
OVER 360 TO 5800 INCL. (180)			*2,200	3,500	74,00	10,500				

\* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2. Relubrication interval for 6205 bearing is 1550 hrs, and for 6806 bearing is 720 hrs. (Using grease lubrication)

\*\* For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN410).

## TABLE 17 - MOTOR BEARING SERVICE CONDITIONS

SEVERITY OF SERVICE	AMBIENT TEMPERATURE MAXIMUM	ATMOSPHERIC CONTAMINATION	TYPE OF BEARING
STANDARD	40°C	CLEAN,	DEEP GROOVE
STANDARD	40 C	LITTLE CORROSION	BALL BEARING
SEVERE	50°C	MODERATE DIRT,	
SEVERE	50 C	CORROSION	BALL THRUST, ROLLER
EVTDEME	>50°C* or	SEVERE DIRT,	
	CLASS H INSULATION	ABRASIVE DUST	
LOW TEMPERATURE <-30°C**		CORROSION	

\* Special high temperature grease is recommended. Note that high temperature grease may not mix with other grease types. Thoroughly clean bearing and cavity before adding grease.

\*\*Special low temperature grease is recommended.

## TABLE 18 - MOTOR BEARING LUBRICATION INTERVAL MULTIPLIER

SEVERITY OF SERVICE	MULTIPLIER
STANDARD	1.0
SEVERE	0.5
EXTREME	0.1
LOW TEMPERATURE	1.0

## **UVC EMITTER LAMPS**

If purchased, the contractor is responsible for installing the UV lamps, and connecting a 120 volt power supply as shown in *Figure 61 on page 65*. The Johnson Controls factory provides the following pre-wired parts.

- Internal wiring with a magnetic door safety switch
- A lockable disconnect switch with a *Press to Test* pilot light
- A latching circuit that has to be manually re-energized on the AHU's exterior after a door has been opened and closed.

![](_page_33_Picture_17.jpeg)

Use clean cotton rags, clean jersey or latex gloves to handle the lamps. DO NOT touch UV lamps with bare hands or leather gloves because the oil will damage the lamps.

![](_page_34_Picture_1.jpeg)

![](_page_34_Figure_2.jpeg)

## Three Types of Lamps

Three different types of UV lamps are used in AHUs: V-Mod, V-Ray, and V-Max Grid.

**V-Mod Lamps** - Install the two-pronged lamps into the slotted fixtures as shown in *Figure 62 on page 65*, then rotate the lamp  $90^{\circ}$ .

![](_page_34_Picture_6.jpeg)

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FIGURE 62 - INSTALLING V-MOD LAMP

**V-Ray and V-Max Grid Lamps** - Fit the four-pronged lamp into the clamp mounted on the UV segment where a pigtail is installed. Insert the prongs into the pigtail plug.

![](_page_34_Picture_10.jpeg)

FIGURE 63 - INSTALLING V-RAY AND V-MAX GRID LAMPS

![](_page_34_Picture_12.jpeg)

FIGURE 64 - V-MAX GRID LAMPS

# MAINTAINING AND REPLACING FILTER SEGMENTS

![](_page_34_Picture_16.jpeg)

A list of filter part numbers, sizes and quantities are shown on a label located on each filter segment of each AHU.

**SECTION 3 - MAINTENANCE** 

NOTE	

To ensure adequate seal upon replacement of HEPA filters as part of general maintenance, Johnson Controls recommends that performance shall be recertified via a DOP test on the installed system and classified as UL Class 1 when tested in accordance with UL Standard 586.

Every month, check the cleanliness of the filters, and if necessary, replace them. Filters should be replaced when the pressure drop, measured by a manometer, reaches the prescribed limits for the installation.

## **Filter Types**

Flat, angle, rigid, bag, HEPA and charcoal are the typical filter types as shown in *Figure 65 on page 65*. If your AHU has HEPA filters, the filter frames, bulkheads and segment panels are factory sealed, and must remain sealed for NO air bypass.

![](_page_34_Picture_23.jpeg)

## **Replacing the Filters**

- 1. Check filter sizes and quantities. Refer to the filter label located on each filter segment.
- 2. Remove filter frame end cover as shown in *Figure* 66 on page 66and Figure 67 on page 66.
- 3. Remove old filters, if present.
- 4. Make sure gaskets at both ends of the side load filter tracks are in place. The gaskets are normally found on inside of filter frame end covers.
- 5. Slide the correct size new filters into tracks.
- 6. On bag filters (in FF segments), leave banding in place until filters are installed; then remove. Install the bag filters so that the pocket dividers are vertical if the filters are over 12 in. high.
- 7. Airflow arrows must point downstream (in direction of the airflow).
- 8. Install all pleated filters with pleats positioned vertically.
- 9. Reinstall the filter frame end cover.

![](_page_35_Figure_12.jpeg)

FIGURE 66 - INSTALLING ANGLE FILTERS

![](_page_35_Figure_14.jpeg)

FIGURE 67 - INSTALLING SIDE LOAD FILTERS

## **Cleaning Procedure**

- 1. Clean dehumidification coils annually or when air pressure drop exceeds 125% of design.
- 2. Cover electrical components such as fan motors, damper motors, compressors, thermostats, etc. with plastic. Care should be taken on interior coil cleaning. Remove filters; cover fan bearings and any insulation to keep these items free of water damage. Condensate drain piping should be screened to allow coil-cleaning water to flow freely. Screening keeps traps and drain lines from clogging with debris washed from the coils.
- 3. Prior to any application of wet cleaning materials, use a wide soft bristle paint brush to dust off any heavy dust, leaves, bugs or other foreign matter that may be on the coil fin surface.
- 4. Safety glasses should be worn when cleaning coils.
- 5. When possible, remove dirt lodged in the depth of the coil by using clean oil-free air under pressure. Caution should be taken not to use extreme highpressure air as this may cause fin surface damage. Direct the air straight at the openings between the fins and never at an angle, which may bend the fins against one another. Always apply the air from the air leaving side of the coil.
- 6. On heavily soiled coils, use a safe commercial grade coil cleaner.
- 7. Follow the safety and mixing instructions as noted on or with the cleaning agent.
- 8. Spray the cleaning agent on both sides of the coil to be cleaned. Allow the cleaning agent to remain in contact with the dirty surface for about 5 minutes or as recommended by the agent instructions. Then flush the coil with clean water from a hose (with spray nozzle or from pressure washer). Flush from the air leaving side of the coil. Caution should be taken, as extreme water pressure may result in fin surface damage. Direct the water straight at the openings between the fins and never at an angle, which may bend the fins against one another. This process will wash away surface dirt on the air entering side of the coil, and prevent it from loading within the depth of the coil.

- 9. Most cleaners are concentrated detergents and can be diluted with up to 10 parts water. Dilute as per cleaning agent instructions and coil condition. Respray both sides of the coil with cleaner. Allow to stand five minutes and flush as described previously. Finish flushing from both sides of the coil.
- 10. Follow the cleaning agent instructions. Agent should meet environmental and OSHA standards.
- 11. Some extreme oil and dirt conditions may require steam cleaning. Most steam equipment can be adjusted to provide a mixture of water and steam at a moderate pressure. Steam alone without the presence of water does not work well with most cleaning agents. Cleaning the coils with steam should be done as described previously.
- 12. Comb out any bent or flattened areas of the fin surface.
- 13. Restore the equipment to its operational state.

# CONDENSATE DRAIN PAN, TRAP AND LINE CLEANING

#### **Tools, Equipment and Materials**

- · Toilet bowl brush or similar utility cleaning brush
- Cleaning agent (safe, commercial, disinfecting)
- · Rags and trash bags
- Garden hose with spray nozzle or power washer
- Scraper
- Screening
- Wet vacuum

## Schedule and Conditions

- 1. Clean condensate drain pan, trap, drain line and adjacent wetted surfaces at least annually or as often as required to retard growth of microbial substances.
- 2. **Test Drain Pans** To minimize conditions of water stagnation that may result in microbial growth, field test drain pans under normal operating conditions to ensure proper drainage.
- 3. Exception Field testing drain pans is not required if units with factory-installed drain pans have been certified (attested in writing) by the manufacturer for proper drainage when installed as recommended.

## **Cleaning Procedure**

- 1. Cover any nearby components such as motors, control devices or wiring.
- 2. Sweep, gather and remove debris from drain pan, auxiliary pans and splash guards.
- 3. Scrape loose and remove any clinging substances.
- 4. Cover drain pan outlet with screening to prevent drain clogging.
- 5. Prepare cleaning agent per manufacturer's instructions.
- 6. Apply cleaning agent with spray applicator or brush.
- 7. Apply cleaner to *ALL* surfaces including: underside of coil, header and return bends if in air stream, coil supports, coil wall or bulkhead, auxiliary drain pans, splash guards, any other surfaces subject to wetting by condensation dripping or carried by normal airflow, drain pan and outlet.
- 8. Add ample amount of cleaning agent to drain line and trap.
- 9. Allow cleaner to stand for time required by manufacturer's instructions.
- 10. Flush with clean water from pressure washer or garden hose with spray nozzle.
- 11. Apply as much water under pressure as possible to drain outlet to clean trap and drain line.
- 12. Remove water from any puddle areas with wet vacuum.
- 13. Wipe down if necessary to remove any stubborn material.
- 14. Restore equipment to operational state.

## **Coil Freeze Protection**

All chilled water, hot water and steam coils can be damaged during freezing weather. Take the following re-cautionary measures to prevent freezing:

- For year round operation, glycol and other antifreeze solution must be circulated.
- During winter operation and shutdowns such as power failure, night shutdown and weekend shutdown, the controls must be installed so the valves will go to the full heat position, and all fresh air dampers go to the full closed position. The wa-

ter circulation pumps must keep circulating water through the coils and/or auxiliary heat must be maintained inside the AHU cabinet.

- Draining each coil and related piping such as traps and making sure that all low areas also drain.
- After draining, flush the coils with an antifreeze solution such as propylene glycol. A solution of 50% glycol and 50% water will protect from freezing to approximately 35°F below zero at sea level. Use adequate mixture for the geographic area of the installation.
- Winterizing Drain Traps
- During the winter months when the cooling system is turned off, and the unit is exposed to freezing conditions, an anti-freeze solution, which is environmentally friendly and safe for the roof can be poured in the condensate drain trap to prevent freezing and possible damage. The condensate drain trap may also be removed as well as heat traced and insulated.

## **SECTION 4 - SERVICE AND REPAIR**

![](_page_38_Picture_1.jpeg)

Rotating parts and electrical shock hazards exist. Lock out and tag out the fan motor(s) and heat power disconnects before servicing. FOLLOW THE LATEST "LOCKOUT TAGOUT" PROCEDURE. Failure to follow proper safety precautions may result in serious injury or death. Refer to general safety guidelines and safety symbols located at the front of this manual.

Always replace RED metal tab on access doors that provide access to moving parts. This mechanical protection from moving parts is required by UL-1995.

Always replace RED metal tab on access doors that provide access to pressurized areas. This mechanical protection is to prevent accidental release of access doors under positive pressure.

Do not weld or use torches on the exterior or interior of the AHU housing. The housing contains polyurethane insulation, which, when under combustion, will produce harmful, toxic gases resulting in personal injury or death.

DO NOT PENETRATE WIREWAYS in any manner. These sheet metal channels, which run along the top panel, contain electrical wires and connections. Electrical shock and/or damage to the AHU may result.

![](_page_38_Figure_7.jpeg)

Never use silicone caulk/sealant or caulk/ sealant containing silicone in or on any AHU. The only exception is when the AHU is provided with hight temperature gas heat venting.

## SERVICE TOOLS AND EQUIPMENT

- Complete set of Mechanics Hand Tools
- Observation Mirror
- Fin Comb (straightener)
- Heat Gun
- Straightedge
- Tachometer
- Manometers, capable of 0.01-36 in. combined
- Digital Manometer (replaces Magnehelic Gauge). Cat. #475-1 FM-AV, Series: 475-1 Mark III, with a range: of 0 to 19.99 in. WC from Dwyer Instruments, Inc.
- Pitot Tube
- Duct Hood
- Velometer and Psychrometer
- Combustion Efficiency Analyzer.
- Standard refrigeration gauges/manifold
- Refrigerant reclaimer
- Refrigerant leak detector
- Vacuum pump
- Gas torches (soldering and/or brazing)
- Fire extinguisher
- Electronic Temperature Meter (min. 3 leads)
- · Megohm and Phase Meters
- · Capacitor Analyzer.
- Clamp-on Ammeter.
- Multi-Meter or Meters, capable of reading the following:
  - One Thousand Volts AC/DC
  - Amperes
  - Ohms.
  - Milli-volts
  - Milli-amps.
  - Microfarad

## SERVICE INFORMATION

All necessary tags and decals to aid in service or to indicate caution areas are provided. Electrical wiring diagrams are attached to the control panel access door. Installation, operation, and maintenance manuals are supplied with each AHU.

This AHU offers unlimited unit access with completely removable panels. All of the AHU panels, including the top panels, can be completely removed. Removing the top panels allows the use of overhead cranes and gantries to remove and service the components. Fan and filter segments come equipped with doors.

## TROUBLESHOOTING

An HVAC air system includes the AHU and the entire air circuitry through which airflows. Included are the following parts/assemblies:

- Ductwork, Fittings, and Branch Ducts
- Dampers
- Heat Exchangers
- Air Filters and Sound Traps
- Coils
- Elbows and Diffusers
- Grilles, VAVs, and MITs
- Other items through which airflows or which offer obstruction to airflow.

While differences in temperature and humidity may cause air movement, it may be considered very slight compared to the positive circulation required in an air conditioning system. To accomplish this air movement, a fan performs two functions:

- Produce sufficient pressure or head to accelerate the mass of air from a state of rest to the required velocity.
- Produce sufficient pressure to overcome any resistances to the flow of air.

Determining these pressures is important when troubleshooting an air conditioning system. The generally accepted standard instrument for measuring these unit pressures is the pitot tube as shown in *Figure 80 and Figure 81 on page 78*. The pitot tube is used in conjunction with an inclined manometer, magnehelic gauge, or a tube manometer.

![](_page_39_Figure_19.jpeg)

## FIGURE 80 - CONSTRUCTION OF PITOT TUBE

When the pitot tube is used in conjunction with these instruments, one is able to read velocity pressure (VP), static pressure (SP), and total pressure (TP) within the system.

![](_page_39_Figure_22.jpeg)

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## FIGURE 81 - PITOT TUBE

## **PITOT TUBE**

The pitot tube consists of an impact tube within a larger static tube. When the impact tube is pointed directly into the air stream, the small static pressure holes are perpendicular to the air stream and are not affected by air velocity as shown in *Figure 81 on page 78*.

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To read velocity pressure, the total pressure tap at the end of the pitot tube is connected to one leg of a manometer and the static pressure tap at the other leg of the manometer, as shown in *Figure 82 on page 79*.

![](_page_40_Picture_3.jpeg)

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#### FIGURE 83 - MINIHELIC FILTER GAUGE

![](_page_40_Figure_6.jpeg)

#### FIGURE 82 - INCLINED MANOMETER

### FILTER GAUGE

The filter gauge, a diaphragm-operated gauge, has several advantages over a liquid manometer.

Unless extreme accuracy is required, this instrument may replace the manometer for average air conditioning work, and like the manometer, is available in a variety of ranges. A minehelic guage is only two in. in diameter and has a limited scale. A magnehelic gauge is four in. in diameter and has a limited scale. Several instruments may be required to cover the normal ranges encountered in average air conditioning jobs as shown in *Figure 83 on page 79*.

## FIGURE 84 - MAGNEHELIC FILTER GUAGE

The filter gauge should be factory-installed level. Adjust indicator to zero with no airflow or pressure difference across the sensors. The adjustment screw is located at the bottom behind the plastic cover. When replacing the cover, do not over tighten. The cover could "bottom out," causing the indicator to stick. When the airflow is initiated, the indicator should move to the right. If it moves in the opposite direction, reverse the tubes.

#### **U-TUBE MANOMETER**

Pressure is defined as force per unit area. The best way to measure air pressure is to balance a column of liquid of known weight against the air pressure, and measure the height of liquid columns so balanced. The units of measure commonly used are inches of mercury (in. Hg.), using mercury as the fluid; and inches of water (inches wg), using water or oil as the fluid.

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Instruments employing this principle are called manometers. The simplest form is the basic and wellknown U-tube manometers as shown in *Figure 85 on page 80*. This device indicates the difference between two pressures or between a single pressure and atmosphere, when one side is open to atmosphere. If a U-tube is filled to the halfway point with water, and air pressure is exerted on one of the columns, the fluid will be displaced. Thus, one leg of water column will rise and the other will fall. The difference in height, h, which is the sum of the readings above and below the halfway point indicated the pressure in inches of the water column.

![](_page_41_Figure_4.jpeg)

The U-tube manometer is a primary standard because the difference in height between the two columns is always a true indication of the pressure regardless of the variations in the internal diameter of the tubing.

For use on all air units, the manometers should cover at least a 26 in. range as shown in *Figure 86 on page 80*.

![](_page_41_Picture_7.jpeg)

FIGURE 86 - SLACK TUBE MANOMETER

## **REQUESTING ASSISTANCE**

When contacting AirFixture for assistance, provide the following information:

- AirFixture Order Number
- Job Name (not contractor)
- Unit Model Number
- Customer's Unit ID
- Design and actual data
  - Fan RPM.
  - Unit SP (across fan).- Unit CFM
  - Pressure drop of water across cooling coil (PSIG)
  - Air pressure drop across cooling coil
  - Temperature differential across cooling coil.
  - Motor voltage and amperes

## **SECTION 5 - WIRING DIAGRAMS**

![](_page_43_Picture_2.jpeg)

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

![](_page_43_Picture_4.jpeg)

Do not penetrate the wireways in any manner. These sheet metal channels, which run along the top panel, contain electrical wires and connections. Electrical shock and/or damage to the unit may result.

![](_page_43_Picture_6.jpeg)

The purpose of drawings in this section is to aid in installation, start-up and troubleshooting. Actual wiring configuration may deviate from these drawings and are subject to change without notice.

![](_page_43_Picture_8.jpeg)

Never use silicone caulk/sealant or caulk/sealant containing silicone in or on any air handling equipment.

![](_page_43_Picture_10.jpeg)

Rotating parts and electrical shock hazards exist. Follow the lates lock out and tag out procedures for the fan motor(s) and heat power disconnects before servicing. Failure to follow proper safety precautions may result in serious injury or death. Refer to the general safety guidelines and safety symbols located at the front of this manual. 5

![](_page_44_Figure_2.jpeg)

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#### FIGURE 93 - FULL VOLTAGE STARTER

![](_page_45_Figure_2.jpeg)

FIGURE 93 - FULL VOLTAGE STARTER (CONT'D)

![](_page_46_Figure_2.jpeg)

## FIGURE 94 - FULL VOLTAGE STARTER WITH SINGLE POINT POWER CONNECTION (204195)

![](_page_47_Figure_2.jpeg)

LD09684

## FIGURE 94 - FULL VOLTAGE STARTER WITH SINGLE POINT POWER CONNECTION (204195) (CONT'D)

- TERMINAL POINT
 - REMOTE DEVICE (BY OTHERS)

5

![](_page_48_Picture_2.jpeg)

## FIGURE 95 - OUTSIDE AIR DAMPER KIT (RELAY INSTALLATION)

## **INSTALLING KIT (IF APPLICABLE)**

- 1. This kit will be required for some of Johnson FEC control standards (100% outside air).
- 2. Install relay (P/N 025-39136-001) on the DIN rail provided in the panel.
- 3. Wire the relay as shown in s shown in *Figure 95* on page 92, using the wire called for in the kit.

Johnson Controls         MOREL 5         COM: (sec1)           MOREL 5         COM: (sec1)         SECONDARISE (SECONDARISE (SEC								
Johnson Controls         MODEL #         COM: 166(7)           MODEL #         COM: 166(7)         COM: 166(7)           SERIAL # / DATE CORE         DEBURATIFICATION #         DEBURATIFICATION #           GAM X198         DESUMENT IDEXTIFICATION #         DESUMENT           BESIAL # / DATE CORE         DESUMENT IDEXTIFICATION #         DESUMENT           BESIAL # / DATE CORE         DESUMENT IDEXTIFICATION #         DESUMENT           BESIAL # / DATE CORE         DESUMENT IDEXTIFICATION #         DESUMENT           DO Write         DE USA         DECLAN         DESUMENT           DO Write         DE USA         DECLAN         DESUMENT           DO Write         DE USA         DECLAN         DECLAN           DO Write         DE USA         DESUMENT         DESUMENT           DATE SECOND         DESUMENT         DESUMENT         DESUMENT           DATE SECOND         DESUMENT         DESUMENT         DESUMENT           DESUMENT         DESUMENT         DESUMENT         DESUMENT           DATE SECOND         DESUMENT         DESUMENT         DESUMENT           DESUMENT         DESUMENT         DESUMENT         DESUMENT           DESUMENT         DESUMENT         DESUMENT         DESUMENT								
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Johnson Controls         MORE / SUBJUST         Control           MORE / SERIAL #/ DATE CORE         NO PARSON (SASI) 464         COM: (647)         Norther of the second of the second of								
Johnson Controls         MORE Solution           SERIAL # / DATE CODE SERIAL # / DATE CODE CAAM X1981         JOB DENTIFICATION # DOBENTIFICATION # DOBENTIFICATION DEPASAACC-HIM-HIC-RF-REXAPRIFIC DD Wring         DOBENTIFICATION # DOBENTIFICATION         DOBENTIFICATION # DOBENTIFICATION           DD Wring         DO Wring         DOI: 56/02         DOI: 56/02           DD Wring         DOI: 10/07         DOCOME         DOI: 56/02           NAA-T         FRC2611         1         0/075         SCOME           PH-W         FRC2611         1         0/075         SCOME         DOI: 56/07           MAA-T         FRC2611         1         0/075         SCOME         DOI: 56/07         DOI: 56/07           RA-T         FRC2611         1         0         0/075         SCOME         DI: 8/27 erc 28/2           PH-W         FRC2611         1         0         0/075         SCOME         DI: 8/27 erc 28/2           RA-T         FRC2611         1         0         8/2         0/077         SCOME         DI: 8/27 erc 28/2           RA-T         FRC2611         1         8/2         0/077         SCOME         JA/2         SCOME         JA/2         JA/2         SCOME         JA/2         JA/2         SCOME         JA/2								
Softnisson Controls         YORK Solution           SUBJELS         COM: (64/7)           STO-296X81666           STO-296X81666           STO-296X81666           COM: (64/7)           STO-296X81666           COM: (64/7)           CAAM XT0981         DIBENTIFICATION 5           SIGMENT IDENTIFICATION           IDENTIFICATION           DIST TAGE           DIST TAGE           INTO 260           Module         Memory colspan="2">Memory colspan="2"           Module         Memory colspan="2"           Module         Memory colspan="2"           Module         Memory colspan="2"           Module         Memory colspan="2"           Memory fields to the field to th		-						
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Print         Model #         Controls         YORK Solution           MODEL #         COM: 164/1         Nore 000000000000000000000000000000000000	_					1000	-	and the second
Johnson         YORK Solution           YORK Solution           NERIAL # / DATE CODE           NERIAL # / DATE CODE           SECMENT IDENTIFICATION           CAAM XT000           SECMENT IDENTIFICATION           CAAM XT000           SECMENT IDENTIFICATION           UNIT TAG #           ID Wiring           NET TAG #           ID Wiring           NET TAG #           NET TAG # <td>1. II</td> <td>No.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	1. II	No.						
MODEL #         COM: (56473)         YORK Solution           SERIAL # / DATE CODE         JOB IDEXTIFICATION #	Johnson /	N.C						
MODEL #         COM. (64/25)           SERIAL # / DATE CODE         JOB IDENTIFICATION #           CAAM XT0881         JOB IDENTIFICATION #           SEGMENT IDENTIFICATION #         JE-339866.42           SEGMENT IDENTIFICATION #         JE-339866.42           DO Wining         JUNI TAG #           DO Wining         RTU-5a           Paints         Mediale           HIP-5         FEC.3611           PACCLG-W         JUNI TAG #           DO Wining         RTU-5a           Paints         Mediale           HIP-5         FEC.3611           PRC2611         1           1         1           00175         OCOME           MA-T         FEC.2611           1         2           MA-T         FEC.2611           1         4           00173         OCOME           RF-C         FEC.2611           2         3           NB-F         1           3         1           4B-F         UNT           RF-S DP         FEC.2611           3         1           SF-S DP         FEC.2611           3         1	Controls		Sector States				YC	RK Solution
COM: 1964/13           SERIAL # / DATE CODE         JOB IDENTIFICATION #           SEGMENT DENTIFICATION #           SEGMENT DENTIFICATION #           SEGMENT DENTIFICATION #           UNT TAG #           DO Wiring           UNT TAG #           DO Wiring           UNT TAG #           Bed Back         Name           DO Wiring         UNT TAG #           UNT TAG #           Bodded#         Hame Run         LO Pair         Preser         Ref         Back         Num           DO Wiring         UNT TAG #           UNT TAG #           PIEW         FEC2611         1         OUT 7           PIE-VE FEC2611         1         OUT 7         OUT 7         OUT 7 </td <td></td> <td></td> <td>MODEL #</td> <td></td> <td></td> <td></td> <td></td> <td>and controlling</td>			MODEL #					and controlling
JOR IDEATIFICATION 3           ICAAM XT0081         IE-330886.42           SEGMENT IDENTIFICATION           IDP 45-XA-CC-IIM-HIC-ATION 3           UNIT TAG 3           IDO Wiring         IDO Wiring           IDO Wiring         IDO Wiri	S.F.	PLAT A L PLAT A L PLAT	XTG-096X096-0	Q5KH146.5		COM: 166473		And Designation of the local division of the
IE-DAM & 1981           SEGMENT IDENTIFICATION           (DP-FS-XA-CC-HM-HIC-RF-EE-XA-FR-HP)           UNIT TAG #           IDO Wiring         UNIT TAG #           NTU-2A           Prime         Mediale         Hame Run         IOO Pair         Prime         Ref         Basis         Non           HP-S         FEC2611         1         1         1         OUTS         OCOMES         Difference           PH-W         FEC2611         1         1         1         OUTS         OCOMES         Difference         Difference           MA-T         FEC2611         1         6         -         INS         Mcould         Amper OK ONES           MA-T         FEC2611         1         6         -         INS         Mcould         Amper OK ONES           RA-T         FEC2611         2         1         -         INS         Mcould         Amper OK ONES           RA-T         FEC2611         2         1         -         INS         Mcould         Amper OK ONES         DIF           RA-T         FEC2611         2         1         -         INS         Mcould <t< td=""><td></td><td>CAAM NY CODE</td><td></td><td>JOB IDE</td><td>NTIFICATION</td><td>1</td><td>1</td><td></td></t<>		CAAM NY CODE		JOB IDE	NTIFICATION	1	1	
SIGMENT DENTIFICATION           (DP JFS XACC-HIM-HIC-RF-FE-XA-JFR-IP)           UNIT TAG #           UNIT TAG #           ID Wiring           ID Viring           NIT TAG #           RTU-2A           Paint         Module         Home Run         DO Pair         Paser         Ref         Back         Smith           MP-S         FEC2611         1         1         1         00175         OC0MS         21 & 22 or CB           PH-W         FEC2611         1         2         1         OUT5         OC0MS           PH-W         FEC2611         1         2         1         OUT5         OC0MS           MA-T         FEC2611         1         8         .         103         RC0M0           RA-T         FEC2611         2         2         -         OUT4         OC0ME is 2010           RA-C         FEC2611         2         3         1         -         101         -         101         -           RA-C         FEC2611         3         1         -         101         -         101         -         101		CAAM ATOMI			TE-334486-42	-		
IDF 35 XA CC -HM-HIC-RF-FE-XA-PR-IP)           UNIT TAG #           UO Wiring         INT TAG #           Point         Medule         Home Ron         I/O Pair         Pastr         Red         Basis         San           HP-S         FEC2611         -         -         DN5         I/COMS         D1 & 22 or CM           CLG-W         FEC2611         1         1         1         00175         OC0865           PH-W         FEC2611         1         2         1         OUT7         OC0865           MA-T         FEC2611         1         8         -         IN52         ICOME           MA-T         FEC2611         1         8         -         IN52         ICOME           MA-T         FEC2611         2         1         -         OUT3         OC0865           IRF-C         FEC2611         2         3         IN8         ICOME         IN7           IRF-C         FEC2611         3         1         -         IN7         ICOME         IN7           RF-S DP         FEC2611         DIRECT         2         -         OUT3         OC089           SF-G DP         FEC		51	GMENT IDENTIF	BEATION		1 1000		170
UNIT TAG #           Print         Module         Home Run         DO Pair         Press         Red         Black         Note           HP-S         FEC2611         -         -         285         60085         13.4.22 or CBa           PH-W         FEC2611         1         1         1         0017         00085           PH-W         FEC2611         1         4         -         183         Block         Note           MA-T         FEC2611         1         4         -         183         Block         Note           RA-T         FEC2611         1         4         -         183         Block         Auger CR CMER in 247           MA-T         FEC2611         1         4         -         183         Block         Auger CR CMER in 247           MA-T         FEC2611         1         4         -         182         Block         Auger CR CMER in 247           RF-G         FEC2611         2         1         -         00174         00034         Auger CR CMER in 247           RF-S         DF         FEC2611         3         1         -         INT         EC035           SF-S         D			IS-XA-CC-IIM-HC	-RF-FE-XA-FR-I	P)			1 21
Praise         Module         Hame Run         LO Pair         Peser         Red         Black         Nut           HP-S         FEC2611         -         -         INS         6C045         31.4.22 or CBa           PH-W         FEC2611         1         1         1         0075         00085           PH-W         FEC2611         1         2         4         0017         00085           MA-T         FEC2611         1         6         -         180         8C046           RA-T         FEC2611         1         6         -         180         8C045           RA-T         FEC2611         1         8         -         182         8C042           RF-C         FEC2611         2         1         -         00172         00084           RF-C         FEC2611         2         3         188         10088         -           DA-T         FEC2611         1         3         1         -         181         8C081           SF-S         P         FEC2611         DIRECT         1         -         181         40081           SF-S         P         FEC2611         DIRECT         <		1/O Wiring		105	TT TAG#			12 3
Point         Module         Hame Run         I/O Pair         Paser         Red         Black         Solid           HP-S         FEC2611         -         -         I/O S         6C0085         31 & 22 or CBs           PH-W         FEC2611         1         1         0.0175         0C0085         31 & 22 or CBs           MA-T         FEC2611         1         2         1         0.0175         0C0085           MA-T         FEC2611         1         6         -         IN3         ICOM5           RA-T         FEC2611         1         6         -         IN3         ICOM5           RA-T         FEC2611         1         8         -         IN3         ICOM5           RA-T         FEC2611         2         1         -         OUT7         OC081         Jeonger OCOM5           RF-C         FEC2611         2         3         DN         ISS         ICOM1         Jeonger OCOM5           DA-T         FEC2611         DIRECT         1         -         INT         ICOM1         Jeonger OCOM5           SF-S_DP         FEC2611         DIRECT         2         -         OUT1         OCOM5 <td< th=""><th></th><th></th><th></th><th></th><th>RTU-ZA</th><th>_</th><th></th><th></th></td<>					RTU-ZA	_		
HP-S         FEC3611         -         -         INS         SCOME         II & II	Point	Module	Home Run	1/O Pair	Pawer	Red	Black	-
CLCs-W         FEC2611         1         1         1         0UT5         0COMS           PH-W         FEC2811         1         2         1         0UT5         0COMS           MA-T         FEC2811         1         6         -         IN3         ICOMS           RA-T         FEC2811         1         6         -         IN3         ICOMS           RA-T         FEC2811         1         8         -         IN2         ICOMS           RF-O         FEC2811         2         1         -         OUT4         OCOME           RF-S         FEC2811         2         3         IN8         ICOME           RF-S         FEC2611         2         3         IN8         ICOME           DA-T         FEC2611         3         1         -         IN7         ICOME           SF-S         FEC2611         DIRECT         2         -         OUT9         OCOME           SF-O         FEC2611         DIRECT         2         -         OUT9         OCOM9           SF-C         FEC2611         DIRECT         3         -         IN1         ICOM1         21.4.22 mCM3           ILT-S	HP-S	FEC2611				1965	ICOME	11 & 12 er CH4
PH-W         PEC2811         1         2         1         OUT7         OCOMP           MA-T         FEC2811         1         6         -         185         RCOMP           RA-T         FEC2811         1         6         -         185         RCOMP           RA-T         FEC2811         1         8         -         192         RCOMP           RF-O         FEC2811         2         1         -         0014         00084         Aumper 05.0008 in 249           RF-C         FEC2611         2         3         DNB         RCOMP         Aumper 05.0008 in 249           RF-S.DF         FEC2611         2         3         DNB         RCOMP         Aumper 05.0008 in 249           DA-T         FEC2611         2         3         DN         NO         Aumper 05.0000           SF-S.DP         FEC2611         DIRECT         1         -         N7         RCOMP           SF-C         FEC2611         DIRECT         2         -         OUT1         OCOM1           SF-C         FEC2611         DIRECT         3         -         IN1         ICOM1         21.4.22 m CM3           ILT-S         IOM2721(4)	CLG-W	FEC2611	1	1	1	0015	OCOME	
SIA-1         FR.2811         1         6         -         150         10080           RA-T         FEC2811         1         8         -         152         FC082           HF-O         FEC2811         2         1         -         0014         00084         Jamper 05.088 is 24%           HE-C         FEC2811         2         2         -         0072         00082           RF-S_DP         FEC2611         2         3         DN         DN         ICOMB           DA-T         FEC2611         3         1         -         INI         ICOMB           SF-S_DP         FEC2611         DIRECT         1         -         INI         ICOMB           SF-G         FEC2611         DIRECT         2         -         0079         OC099           SF-O         FEC2611         DIRECT         3         -         0071         OC099           SF-C         FEC2611         DIRECT         3         -         0071         OC091           SF-C         FEC2611         DIRECT         3         -         INI         ICOM1         214.22mC03           HT-S         IOM2721(4)         1         4	PH-W	FEC2611	1	1	1	OUT7	OCOMT	
RC-1         FRC2811         J         8         -         US2         RC082           RF-0         FEC2811         2         1         -         OU14         OC084         Jamper (SC088) is 24%           RF-C         FEC2811         2         2         -         OU172         OC082           RF-S DF         FEC2611         2         3         DS8         EC088         Amper (SC088) is 24%           DA-T         FEC2611         2         3         DN         ISC087           SF-S DF         FEC2611         DIRECT         1         -         IN1         ISC087           SF-G         FEC2611         DIRECT         2         -         OUT9         OC099           SF-C         FEC2611         DIRECT         3         -         IN1         ICO81         21.4.22 m CR5           LT-S         IOM12721(4)         -         -         IN1         ICO81         21.4.22 m CR5           PH-T         IOM2721(4)         1         4         -         IN3         ICO84           PFILT-A         IOM2721(4)         1         5         IN2         ISC084           PH-T         IOM2721(4)         1         7	MA-I	FEC2611	1			153	ICOM5	
RF-0         FEC.2611         2         1         -         0014         00.084         Jacops Colles is 24°           RF-5         DF         FEC.2611         2         3         DN         OCOME           DA-T         FEC.2611         3         1         -         DN         ECOME           SF-5         DF         FEC.2611         3         1         -         DN         ECOME           SF-5         DF         FEC.2611         DIRECT         1         -         DN         ECOME           SF-6         PF         FEC.2611         DIRECT         2         -         OUT1         OCOME           SF-6         PFEC.2611         DIRECT         2         -         OUT1         OCOME           SF-7         PEC.2611         DIRECT         3         -         DUT1         OCOME           SF-6         PEC.2611         DIRECT         3         -         OUT1         OCOME           SF-7         IOM2721(4)         1         4         -         IN1         ICOM1         21.4.22 m/CR3           PH-7         IOM2721(4)         1         4         -         IN2         ICOM3           PFILT-A	RAFT	FRC 2611		-		1702	ICOM2	
RF-5_DF         FEC2611         2         3         DN         BCOME           DA-T         FEC2611         3         1         -         INI         BCOME           SF-5_DF         FEC2611         3         1         -         INI         BCOME           SF-5_DF         FEC2611         DIRECT         1         -         INT         BCOME           SF-6_DF         FEC2611         DIRECT         2         -         OUTF         OCOME           SF-6_DF         FEC2611         DIRECT         2         -         OUTF         OCOME           SF-6_DF         FEC2611         DIRECT         2         -         OUTF         OCOME           SF-6_DF         FEC2611         DIRECT         3         -         OUTF         OCOME           SF-6_DF         FEC2611         DIRECT         3         -         OUTF         OCOME           SF-7         FEC2611         DIRECT         3         -         INI         ICOMI         214.22mCR3           LT-5         HOM2721(4)         1         4         -         INS         ICOM4           PFILT-A         HOM2721(4)         1         7         I         I	10-0	FEC.2011	1			OUTS	OCOM!	Jumper OCOMP to 34Y C
DA-T         FEC2611         3         1         -         INI         ICOMD           SF-5_DP         FEC2611         DIRECT         1         -         INI         ICOMD           SF-6_DP         FEC2611         DIRECT         1         -         INI         ICOMD           SF-6_DP         FEC2611         DIRECT         2         -         ORT9         OCOMP           SF-6_D         FEC2611         DIRECT         2         -         ORT9         OCOMP           SF-6_D         FEC2611         DIRECT         3         -         00T1         OCOMP           SF-6_D         FEC2611         DIRECT         3         -         00T1         OCOMP           LT-5         IOM2721(4)         -         -         1N1         ICOM1         21.4.22m/CR3           PHLT         IOM2721(4)         1         4         -         1N2         ICOM3           PFILT-A         IOM2721(4)         1         7         1         IN4         ICOM4           RA-H         IOM2721(4)         1         7         1         IN4         ICOM4           RA-H         IOM2721(4)         1         3         -         2823	REA DE	FECTER	2	1		ONE	ICOMP	
Bref         Direct         1         -         IN7         BCGM7           SF-5_DP         FEC2611         DIRECT         1         -         IN7         BCGM7           SF-6         FEC2611         DIRECT         2         -         OUT9         OC009           SF-6         FEC2611         DIRECT         3         -         OUT1         OC001           SF-6         FEC2611         DIRECT         3         -         OUT1         OC001           LT-5         IOM2721(4)         -         -         IN1         ICOM1         21.4.22m/C85           PH-T         IOM2721(4)         1         4         -         IN3         ICOM3           PFILT-A         IOM2721(4)         1         5         -         IN2         ICOM4           RA-H         IOM2721(4)         1         7         I         IN4         ICOM4           RA-H         IOM2721(4)         1         7         I         IN4         ICOM4           RA-H         IOM2721(4)         1         7         I         IN4         ICOM4           RA-H         IOM2721(4)         1         3         -         2023.C         Intercentententen	DAT	FECTAL	1	i	1 12	INI	HCOM1	
SF-O         FEC2611         DIRECT         2         -         OUT9         OCOM9           SF-C         FEC2611         DIRECT         3         -         OUT1         OCOM9           LT-S         IOM2721(4)         -         -         INI         BCOM1         21.4.22m/CR3           PH-T         IOM2721(4)         1         4         -         INS         BCOM3           PFILT-A         IOM2721(4)         1         5         -         IN2         BCOM3           PFILT-A         IOM2721(4)         1         5         -         IN2         BCOM4           RA-H         IOM2721(4)         1         7         I         IN4         ECOM4           SDR-2         TB         2         4         20433.0         2043.0	SKE DP	FEC 2611	DIRECT	1		IN7.	ICOM7	
NF-O         FEC2611         DIRECT         3         -         OUT1         OCOM1           LT-S         IOM2721(4)         -         -         INI         ICOM1         21.4.22 m/CR3           PH-T         IOM2721(4)         1         4         -         INS         ICOM1         21.4.22 m/CR3           PH-T         IOM2721(4)         1         4         -         INS         ICOM2           PFILT-A         IOM2721(4)         1         5         -         IN2         ICOM4           RA-H         IOM2721(4)         1         7         I         IN4         ICOM4           SDR-2         TB         2         4         -         4655 D         4655 C           SDR-2         TB         3         2         -         2041 C<	ST-S DF	FRC2611	DIRECT	2 2		OUTS	OCOMP	
LT-S         IOM2721(4)         -         INI         SCONI         21.4.22.seCR3           PH-T         IOM2721(4)         1         4         -         INS         ICOM3           PFILT         IOM2721(4)         1         5         -         INS         ICOM3           PFILT-A         IOM2721(4)         1         5         -         INS         ICOM4           RA-H         IOM2721(4)         1         7         I         IN4         ICOM4           SDR-1         TB         2         4         -         4655 D         4655 C           SDR-2         TB         3         2         -         2041 C         2041 D	SEC	FEC 2611	DIRECT	3		OUTI	OCOM1	
PH-T         IOM2721(4)         I         4         -         IN3         ICOM3           PFILT         IOM2721(4)         I         5         -         IN2         ICOM3           PFILT-A         IOM2721(4)         I         5         -         IN2         ICOM3           RA-H         IOM2721(4)         I         7         I         IN4         ICOM4           RA-H         IOM2721(4)         I         3         -         2023.0         2023.0           ILT-A         TB         2         4         -         4055.0         4054.0           SDR-2         TB         3         2         -         2041.0         2041.0	ITE	10542721(4)	14		1	INI	ICOMI	21 & 22 m CR3
PFILT-A         IOM2721(4)         1         5         -         IN2         ICOM2           RA-B         IOM2721(4)         1         7         1         IN4         ICOM2           RA-B         IOM2721(4)         1         7         1         IN4         ICOM2           LT-A         TB         1         3         -         2425 D         2925 C           SDR-2         TB         2         4         -         4465 D         4855 C           HP-A         TB         3         2         -         2641 D	HILT.	10M2721(4)	1	-4		153	3COM3	
RA-H         IOM2721(4)         J         -7         I         IN4         ICOM4           RA-H         IOM2721(4)         J         -7         I         IN4         ICOM4           LT-A         TB         I         3         -         2423 D         2925 C           SDR-2         TB         2         4         -         4465 D         485 C           HP-A         TB         3         2         -         2941 C         2041 D           HP-A         TB         DIRECT         4         -         4054 D         4054 C	PHU	IOM2721(4)	1	5		1N2	REDM2	
RACD         TB         I         3         -         2023 B         2023 C           LT-A         TB         I         3         -         2023 B         2023 C           SDR-2         TB         2         4         -         4055 D         4059 C           HP-A         TB         3         2         -         2041 D         2041 D           HP-A         TB         DIRECT         4         -         4054 D         4054 C	PILIA	10512721(4)	1	17	1	194	BCOM4	
L1 0X         TB         2         4         4855 D         4855 C           SDR-2         TB         3         2         -         2641 D           HP-A         TB         3         2         -         2641 D           HP-A         TB         01RECT         4         -         4654 D         4054 C	RA-D	TB	1	3		2923 0	4045.0	
SDF2         TB         3         2         -         2017         2017           HP-A         TB         3         2         -         2017         20	ET-A	TH	3	4	-	4455 D	2641 D	
HP-A TP DIRECT 4 - HEAD -	SDR-2	TB	3	2		2941 C	4054 C	
	HP-A	TR	DIRECT	4	-	and a		

Termination Chart

FIGURE 96 - SOLUTION XT TERMINATION CHART INSIDE ENCLOSURE DOOR

![](_page_50_Figure_2.jpeg)

LD17195

## FIGURE 97 - TYPICAL FPC WIRING DIAGRAM

## FIGURE 97 - TYPICAL FPC WIRING DIAGRAM (CONT'D)

TB3-1013 TB3-1013 80 00  $\rightarrow$ LOCATED IN AF/NB Al OA-F TB-1014 TB3-1014 BUH ∞≏ Đ to D R LOCATED IN AF/NB FILT-A BI TB3 -2007TB3-200 BLK ő TS 14 LOCATED IN AF/NB AO RAD-0 TB3-3041 183-3041 R -OO-LOCATED IN AF/NB AO O-DAO TB3-3042 TB3--3042 BLK 5 LOCATED IN EH BO HTC1-C 4063 TB3-4063 TB3 (←© ©→><del>BLK</del> R R D LOCATED IN VC AO TB3-3019 TB3-3019 C LOCATED IN VC ,AJ -,₩XX→>>BLK TB3-1003 TB3-1003 R R ñ LOCATED IN FS AI ( WAY A BLK TB3-102 TB3-1027 R D LOCATED IN FS Al DA-T TB3-1035 TB3-1035 11/10->> BLK 붛 LOCATED IN 15 Al нли-н, ( WWW >>> TB3-1095 TB3-1095 80 ĉ LOCATED IN IG Bi FVR-C TB3-2096 TB2-4047 4047 TB3-2096 TB2+ BLK -0 E D B DRY CONTACT LOCATED IN IC LEGEND PH-T SF-S BI HO-S TB3-2097 TB3-2097 SA-H LP-A LT-A SDR SENSOR 限 BU 0 MAD-O DRY CONTACT CIFF PRE ELAY FILT OA-LOCATED IN 10 TRANSDUCER OA-F DIFF FRESS. TRANSDUCER LIOW PRESS. RAD-ES DAI/PER-BIO SWITCH SF-0 FAN VOLUME CONTROL SF-3 FAN VOLUME CONTROL SF-3 FAN VOLUME CONTROL FEEDE PIR-C FAN OUERFIDE HIL-A HUMOTY HIGHLIMIT HIG-0 HIGH TRESSURE CUTOUT HIG-0 HIGH PRESSURE CUTOUT HIG-1C HEAT ING STARG HIG-4 HIGH TEMPERATURE CUTOUT AO HTG-0 TB3-305 TB3-3061 FIELD WRING. FACTORY WRING FACTORY WRING IN REMOTE PANEL CONTROL FEEDBACK D DEVICE NOT MOUNTED IN LOCATED IN IG TERMINAL STRIP PANEL PROPORTIONAL CONTROL 80 HTG-C 1B3-4073 TB3-4073 J-JUMPER, THIS JUMPER IS REMOVED WHEN WIRING OPTION IS INSTALLED

53

LOCATED IN AF/NB

MQA-F

AI

5

![](_page_52_Figure_2.jpeg)

LD09691

## FIGURE 98 - TRANSFORMER ENCLOSURE WIRING DETAIL (SHOWN OPEN)

![](_page_53_Figure_2.jpeg)

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![](_page_55_Figure_2.jpeg)

FIGURE 100 - UV CONTROL PANEL WIRING (8 AMPS)

58

![](_page_56_Figure_2.jpeg)

![](_page_57_Figure_3.jpeg)

Sequence of Operation:

Discounnecting Means of UV lighting will be accomplished by "CB1" internal to the panel. "CB1" is cable of being locked out by panel latching mechanism.

"SW1" is a proximity switch with a magnet, which will close a set of normally open contracts. The magnet will engage the "SW1" contact whenever it is within 1/2" of the switch.

"TDR1" is one second (1sec) time delay relay having normally open contacts. When power is initiated, its contacts will close for one second then re-open. To reset, power, power must be removed from "TDR1"

"C1" is a dpdt 24 vac control relay, used to seal-in its coil and provide interlocking means to the UV lights.

If all doors are closed, all the "SW1"s will allow "C1" to energize, as long as power is available.

By selecting "CS-1" to the "on" position, the 24vac control power circuit will be energized. As long as all doors with door switches (SW1) are closed and upon detection of power to the 1 second time-delay realy (TDR-1), the "TDR-1" normally open contracts will close for one second, energizing the contactor "C1" will remain energized. Should any one door having "SW1" mounted, were to open, "C1" will de-energize, deactivating the UV lamps. Closing all doors will not turn on UV lights. "CS-1" will be required, to be cycled "Off" then back "On" to allow the lights to come back on. If the power is removed from the UV control panell and re-energized (such as when power fluctuates off then back on), the UV lights will reactivate automatically. The "IL" "UV Light In USe" indcator lamp will alow the user to know if the lights have been energized.

LD16609

## APPENDIX A – START-UP CHECKLIST

![](_page_58_Picture_2.jpeg)

## **AIR HANDLING UNITS**

Supersedes: 100.00-CL1 (909)

Form 100.00-CL1 (313)

## AIR HANDLER START-UP CHECKLIST

OFFICE LOCATION	unit tag #
Qualified TECHNICIAN	unit model #
JOB NAME	UNIT SERIAL #
YORK JOB ID OR CONTRACT #	START DATE
JOB SITE LOCATION	
JOB SITE CONTACT AND PHONE #	

IMPORTANT SAFETY REQUIREMENT: FOLLOW THE LATEST"LOCK OUT TAG OUT" PROCEDURE.

#### **GENERAL UNIT INSPECTION**

Identify and perform appropriate "lock out/tag out" and safety rules. For details on points below see appropriate section of the Installation Instruction provided with each air handler.

Serious damage to the AHU and/or system is eminent if the AHU is operated under any of the following conditions:

![](_page_58_Picture_12.jpeg)

## **PRE START-UP**

For VFD equipped air handlers, refer to the VFD forms for additional requirements.

- With smoke dampers closed.
- During a fire alarm or smoke purge test.
- Any airflow restriction greater than normal.

Solut	ion AH Units Form 102.20-OM1	Air Modulator VFD Quick Start Form 100.42-NO1			
Custo	AH Units Form 100.31-NOM1				
	Equipment received as ordered.	Unit installed with proper clearances.			
	Unit checked for damage to interior and exterior.	Visually inspect roof curb for tight seal around unit.			
	Unit installed on flat and level surface. Outdoor unit mounted within roof slope limitations where applicable.	<ul> <li>All penetrations MUST be sealed. All conduits MUST be sealed internally.</li> </ul>			
	Terminal screws and wiring connections secure in control, electric and Air Modulator panels.	<ul> <li>Clean air filters installed properly and secured.</li> </ul>			
	Air hoods installed properly.	<ul> <li>Filter gauge set to zero.</li> </ul>			
	Condensate drain properly trapped.	<ul> <li>All field wiring complete and inspected.</li> </ul>			
	All wiring and tubing connections made at shipping splits.	All shipping splits sealed and secured properly.			
	All field piping connections complete.	Pipe chase floor sealed at penetrations.			
	All shipped loose parts installed.	<ul> <li>All shipping bolts and other material have been removed.</li> <li>(Fan, VIFB, Energy Recovery Wheel, Damper).</li> </ul>			
	Installer has cleaned out interior.	Damper linkage is tight and in correct "power off" position.			
	Verify all plug-ins and wire connections are tight on UV equipment.	<ul> <li>Controls installation complete.</li> </ul>			
	Verify Energy Recovery Wheel turns freely and wheel segments are fully engaged.	Verify all spacers removed from door edges.			
	Verify all ductwork is complete and available for full air flow.	<ul> <li>Verify correct piping of split system. Reference Section 2 of Solution IOM &amp; Split System Application Guide (050.40-ES3).</li> </ul>			

Fan	INSPECTION	
	Check bearings and locking collars for properly tightened setscrews, bolts and nuts.	Fan wheel properly aligned, tight on shaft and freely moving.
	Sheaves properly aligned and tight on shaft.	Check fan base isolators and thrust restraints for proper
	Belt tension adjusted properly per drive pkg. label on fan.	adjustment. Note: Do not remove functional bolts from seismic isolators.
	Check fan alignment with unit discharge. Adjust with isolation.	Fan bearings have been re-lubricated properly.

## **START-UP**

## PERFORM THE FOLLOWING STEPS IN ORDER:

Refer to safety standards. Ensure all door latches are secured before starting.

<ul> <li>1. With all Electric Power off, all disconnect switches open and fuses removed, check each circuit with an Ohm meter to ground observing no continuity. Reinstall fuses.</li> </ul>	<ul> <li>8. Immediately check current draw of each leg of each motor.</li> </ul>
2. Energize power to the unit disconnect switch.	9. VFD, refer to manufactures start up guide
3. Verify correct voltage, phase and cycles.	10. Check doors and latches for air leaks.
<ul> <li>4. Energize fan motor(s) briefly (bump) and check for correct fan rotation.</li> </ul>	11. Check for obvious audible leaks.
<ul> <li>5. Check operation of dampers. Insure unit will not operate with all dampers closed.</li> </ul>	12. Apply steam to cold coils slowly to prevent damage.
□ 6. Energize fan motor(s). Observe fan(s) for smooth operation.	13. Observe energy recovery wheel rotation is correct.
7. Check motor nameplate Full Load Amp rating.	14. Purge on energy recovery wheel is set to specification.

#### **RECORD DATA**

POWER SUPPLY:	Unit Nameplate V	PH CYC, \	/erify V _	//	/
DATA	SUPPLY FAN MOTOR		EX	HAUST/RETURN F	AN MOTOR
Nameplate	Volts Amp	S	Volt	s	_ Amps
Run Amps	//	/		/	/
Catalog Number		····			
Spec Number					
Horse Power		····			
RPM	Nameplate	Actual	Na	meplate	_ Actual
Frame size					
Service Factor					
Jump (Skip) Frequencies	/	/		//	/
	SUPPLY FAN		EX	HAUST/RETURN F	AN
Manufacture Name					
Type or Model Number					
Code or Shop Order Number		····			
Serial Number	<b></b>	·····			
	SUPPLY FAN DRIVE KI	г	EX	HAUST/RETURN F	AN DRIVE KIT
Belts (Qty & ID #)					
Belt Tension	Tag A	ctual	Тар	J	Actual
Fan RPM (DN)	Tag A	ctual	Тад	J	_ Actual
OTHER UTILITIES					
Steam Pressure	Heating Coils	PSI,		Humidifier	_PSI
Hot Water Pressure/Temp.	Supply	PSI,°F,		Return	_PSI,°F
Chilled Water Pressure/Temp	p. Supply	PSI,°F,		Return	_PSI,°F
Potable Water Pressure		PSI,	Pneumati	c Air Pressure	_PSI

## MAINTENANCE

Upon completion of start-up the customer assumes responsibility for periodic maintenance of this equipment in order to continue warranty. Refer to the Installation Operation and Maintenance Manual (Form 102.20-OM1).

Customer's agent signature:	Date:	
8 8		

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## **APPENDIX B – LONG-TERM STORAGE**

![](_page_62_Picture_2.jpeg)

## LONG-TERM STORAGE REQUIREMENT - FIELD PREPARATION AIR HANDLING UNITS

SERVICE POLICY & PROCEDURES

Supersedes 50.20-NM3 (307)

Form 50.20-NM3 (909)

Failure to comply with these requirements will render any written or implied YORK warranty null and void.

![](_page_62_Picture_8.jpeg)

Upon completion of the long term storage period, the warranty commences:

- Solution 18 months parts only. (not to exceed 36 months from ship date with delayed start up).
- Custom 18 months factory parts (not to exceed 18 months from ship date).
- Labor 12 months only w/delayed start up.

## I. Supplementary Documentation

The following documentation is required to FULLY COMPLY with the Long-Term Storage requirements.

- A. Long-Term Storage Requirements GENERAL (refer to Form 50.20-NM1)
- B. Long-Term Storage PERIODIC CHECKLIST AND LOGS,

AIR HANDLING UNITS (refer to Form 50.20-CL3).

## II. Field Preparation for Long-Term Storage

- A. GENERAL
  - 1. Remove and dispose of shipping materials.
  - 2. Perform a visual inspection of the equipment.

## **Indoor Units**

It is Johnson Controls' intention that a shipping wrapper be applied to unpainted indoor units for protection from weather, road dirt, etc. during inland transit and that the wrapper be removed at the time of delivery to allow for a thorough inspection, both inside and out. Visible damage should be noted on the signed and dated bill of lading with a request that the carrier inspect the damage within 72 hrs of notification. The shipping wrapper must be removed and replaced with a tarp or similar protective covering. Any concealed damaged reported after 15 days will compromise a claim settlement. Inspection requests may be done by telephone or in person, but should be confirmed in writing. If assistance is needed with the claim process, contact your Johnson Controls Sales person.

## **Outdoor Units**

Outdoor units are not fully wrapped. Exposed openings are covered for protection from weather, road dirt, etc. during inland transit. A thorough inspection, both inside and out, should be done at the time of delivery. Visible damage should be noted on the signed and dated bill of lading with a request that the carrier inspect the damage within 72 hrs of notification. Concealed damage must be reported within 15 days of delivery with a request that the carrier inspect the damage within 72 hrs of notification. Any concealed damaged reported after 15 days will compromise a claim settlement. Inspection requests may be done by telephone or in person, but should be confirmed in writing. If assistance is needed with the claim process, contact your Johnson Controls Sales person.

- 3. Touch up any paint that has worn or chipped off using paint supplied in ship loose items. Prepare the surface as required using a wire brush.
- 4. Verify that all ship loose items are present. Note any missing items on the Periodic Check List and Log Sheet (50.20-CL3).
- 5. Locate unit(s) so that passing traffic will not damage shafts, coil connections, damper linkages or unit panels.

В

- 6. Refrigerant coils must be evacuated and pre-charged with 5 PSIG nitrogen holding charge. DO NOT damage or disturb these coils and connections.
- 7. Water coils must have all inlet and outlet connections capped or closed tight to prevent foreign materials and liquids from gaining entrance during the storage period.
- B. ELECTRICAL EQUIPMENT AND COMPO-NENTS (Control Panels, Power Panels, Option Panels, Motors, etc.)
  - 1. Electrical Equipment and Components shall not be stored or left in an outdoor environment.
  - Electrical Equipment and Components shall not be stored or left in a wet or damp environment. Components sealed in plastic shrinkwrap are not exempt from this requirement. Moisture will collect inside the plastic, resulting in corrosion of the cabinet, the electronic components and/or copper bus bars.
  - 3. Cortec® spray (Part VpCL-248) shall be applied to all components in the motor terminal box. The spray shall be applied to all exposed areas of concern.
  - 4. YORK Vapor Emitter(s) shall be installed inside each electrical and electronic components cabinet(s) to protect against corrosion.

Openings in cabinets shall be taped closed to minimize air infiltration during the storage period. The quantity of emitters is determined by measuring the gross volume of the component space occupied. YORK Part Number 026-37705-000 will protect a volume up to 5 cubic feet. YORK Part Number 026-37706-000 will protect a volume up to 11 cubic ft. Both emitters have a service life of 12 months.

- 5. A Vapor Type Corrosion inhibitor must be installed in the following equipment and components:
  - a. Place one corrosion inhibitor, YORK part number 026-37706-000, inside the power panel.
  - b. Place one corrosion inhibitor, YORK part number 026-37705-000, inside the control panel.
  - c. Place one corrosion inhibitor, YORK part number 026-37705-000, inside each VFD panel.

## C. MECHANICAL

- 1. Spray all exposed shafts and sheaves with anti-corrosion spray, YORK part number 026-37707-007.
- 2. Disconnect belts and wrap all motors and sheaves in plastic with a YORK vapor emitter, part number 026-37705-000.

BY JOHNSON CONTROLS	LONG-TERM STORAGE PERIODIC CHECKLIST AND LOGS AIR HANDLING UNITS			
SERVICE POLICY & PROCEDURES	Supersedes: 50.20-CL3 (507)	Form 50.20-CL3 (909)		
Contract No Job Name Serial No Unit Model No	Date Delivered Date of Storage Prep Condition of Unit Delivered Explain:	d		

# Failure to comply with these requirements will render any written or implied Johnson Controls warranty null and void.

#### I. Supplementary Documentation

The following documentation is required to FULLY COMPLY with the long term storage requirements.

- A. Long-Term Storage Requirements GENERAL (refer to Form 50.20-NM1).
- B. Long-Term Storage Requirement LONG -TERM STORAGE REQUIREMENT FIELD PREPARATION, AIR HANDLING UNITS (refer to Form 50.20-NM3).

### II. Checks

#### 1.0 Monthly Checks

- 1.1 Visually inspect Air Handler for damage.
  - 1.1.1 Motors/Drives The motors and sheaves should be inspected externally for evidence of damage to the protective covering. An inspection is necessary only if it is apparent that the control protection has been disturbed. If this is found, the motor should be re-protected by wrapping and tightly sealing the control with plastic and inserting a desiccant to absorb moisture.
- 1.2 Refrigerant Coils Check holding charge pressure monthly to be sure that the pressure has not dropped. If pressure has dropped, the unit should be inspected for signs of visible damage which may have caused the loss of pressure. If pressure drops more than 2 psi, the unit should be pressure tested to locate the leak, the leak repaired, and the unit recharged with nitrogen to 5 psig pressure. Note this in the comments section of the monthly log sheet (see page 2 of this document).
- 1.3 Rotate fan shaft several revolutions by hand every month.

## 2.0 Quarterly Checks

- 2.1 Complete Assembly The unit should be checked quarterly to see that no damage has occurred to the protective covering. Any apparent damage to the covering or units should be noted in the comments section of the quarterly log sheet (see page 3 of this document).
- 2.2 Grease bearings every three months. The greasing procedure is explained in the product service manual.

#### 3.0 Semi Annual Checks

3.1 None

#### 4.0 Annual Checks

- 4.1 Unwrap all electrical cabinets and install new Vapor Emitters (YORK P/N 026-37705-000); reseal.
- 4.2 Re-spray all exposed shafts and sheaves with anti-corrosion spray, YORK P/N 026-37707-007.

	1.0 Monthly						
	Rotate Shafts	5 PSI Coil Pressure	Motor Belts & Drives Protected and Dry	Comments			
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							
Date							
Initial							

2.0 Quarterly						
	Grease Bearings	Inspect Protective Covering	Comments			
Date						
Initial						
Date						
Initial						
Date						
Initial						
Date						
Initial						

4.0 Annual							
	Install New Vapor Emitters	Re-spray Exposed Shafts and Sheaves	Comments				
Date							
Initial							

The following factors can be used to convert from English to the most common SI Metric values.

## TABLE 21 - SI METRIC CONVERSION

MEASUREMENT	MULTIPLY ENGLISH AHU	BY FACTOR	TO OBTAIN METRIC AHU
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (I/s)
Longth	Feet (ft)	0.3048	Meters (m)
Length	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

## TEMPERATURE

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example:  $(45.0^{\circ}F - 32^{\circ}) \ge 0.5556 = 7.22^{\circ}C$ 

To convert a temperature range (i.e., a range of  $10^{\circ}$ F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example:  $10.0^{\circ}$ F range x  $0.5556 = 5.6^{\circ}$ C range

FORM 102.20-OM2 ISSUE DATE: 04/01/2019

## NOTES

![](_page_69_Picture_0.jpeg)

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