CUSTOM AIR PRODUCTS & SERVICES, INC.
35 Southbelt Industrial Drive • Houston, Texas 77047
(713) 460-9009 • Fax (713) 460-9499
www.customairproducts.com

HERC RENTALS

20 TON ENTERTAINMENT UNIT/SPECIAL EVENT

16F-0653

QUADBOX, TRANSFORMER, 72KW

R-410A / MAIN BREAKER 125 AMPS MAX

SKID COATED, CASING COATED

460V/3PH/60HZ

GENERAL PURPOSE

-

3/20/2017

INSTALLATION & OPERATION MANUAL

BOOK ASSEMBLED BY: JONATHAN O'MALLEY
DATE: 3/20/2017 Revision: 0

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SECTION

01

JOB SCOPE

Quote No:	DW16-11-17-01 (Final)
Quote Date:	11-17-2016
Project Type:	(25) 20 Ton Vertical Entertainment Unit
Drawing Delivery:	2 weeks after receipt of order
Equipment Delivery:	12-14 weeks After Receipt of Approved Drawings (ARAD)
Freight Terms:	FOB HERC
Payment Terms:	*Net 30* **100% upon completion*

Item	Qty	Description	Net Unit Price	Total Ext. Price

1.	25	CAPS Model # **PPKV-20TD-0NN72KE-5E5-P2-VG2CEUP**
		
		• The unit's structural frame is fabricated from 4" X 10" X 3/16" structural tubing that provides forklift accessibility, fork slots, on all sides.
		• The unit's exterior is fabricated from 16 gauge galvanealed "paint grip" material.
		• Access doors are fabricated from 16 gauge galvanealed "paint grip" and insulated with 1" insulation sound and condensation control.
		• All other surfaces subject to condensation are insulated with 1" insulation.
		• Unit to be coated with a two part primer/polyurethane coating process to match customers required paint scheme.
		• Two (2) scroll compressors with a capacity of 257,000 Btu/hr (21.4 Tons) at a 45F evaporating temperature and 125F condensing temperature utilizing R-410A. Each compressor circuit shall have the following:
		  ○ Auto reset low pressure switch
		  ○ Auto reset high pressure switch
		  ○ Isolation valves on hot gas bypass valve and liquid line filter dryer
		  ○ Thermostatic expansion valves
		  ○ High limit safety for heater elements
		  ○ 1 minute time delay between compressors turning on
		  ○ Liquid line filter dryer
		  ○ Sight glass
		• One (1) dual circuit evaporator coil as follows:
		  ○ 27.5" fin height
		  ○ 78" fin length
		  ○ Copper tubes, aluminum fins
		  ○ 3 rows, 14 fins per inch, ½" tubes
		  ○ EAT – 80F/67F
		  ○ LAT – 57.4F/56.5F
		  ○ Both circuits with hot gas bypass		

Item	Qty	Description	Net Unit Price	Total Ext. Price

		• Two condenser coils as follows:
		  ○ 36” fin height
		  ○ 37” fin length
		  ○ Copper tubes, aluminum fins
		  ○ 4 rows, 12 fins per inch, 3/8” tubes
		  ○ EAT – 95F
		  ○ LAT – 116.1F
		  ○ Condenser coils shall be coated with Energy Guard corrosive resistant coil coating
		• Twin DWDI forward curved fans sized to deliver 7700 CFM at 1.25” total static pressure.
		• 7 ½ HP, TEFC evaporator fan motor with **VFD** for varying the CFM of the unit.
		• Two (2) direct drive condenser fans with 2 HP, TEFC motors.
		• Condenser fan motors shall be equipped with a single VFD, dual high pressure transmitters and a signal splitter. The VFD will provide low speed starts of the condenser fans and vary the CFM based on the ambient conditions.
		• One (1) 72 kW, 2 stage electric heater with thermal cutouts and primary fuses.
		• 304 stainless steel drain pan.
		• NEMA 4 control panel with the following features:
		  ○ Both doors shall be hinged or / and have tension latches (no bolts)
		  ○ Molded case main circuit breaker, three pole, 125A @ 600 VAC
		  ○ Instrument transformer, 460-24 VAC with secondary circuit breaker
		  ○ Two (2) condenser fan motor contactors with motor overloads.
		  ○ Two (2) electric heater contactors.
		  ○ Six (6) 60A fuses for the heater.
		  ○ Two (2) compressor contactors
		  ○ One (1) Johnson Controls T600 temperature controller
		  ○ Phase monitor for phase reversal and presence of phases plus under voltage
		• Selector Switches:
		  ○ “Off/On” for turning power on to the system
		  ○ Evaporator fan speed potentiometer
		• Pilot Lights:
		  ○ Green “Power On”
		  ○ Red “Phase Incorrect”
		  ○ Blue “Cool 1”
		  ○ Blue “Cool 2”
		  ○ Amber “Heat”
		• NEMA 4 control panel with the following features-Cont.:
		  ○ DP switch for monitoring loss of airflow.
		  ○ ACmax ETCLO-830 safety controller with the following features:
		  ○ Microprocessor based controller
		  ○ Random start of 0-60 seconds to avoid simultaneous start of several units after power interruption
		  ○ Anti-short cycle timer delay (0, 3, 5 or 10 minutes)
		  ○ Time delay of 30 seconds between the two compressors
		  ○ Built-in automatic warning flag setting to monitor the fault for a period of 30 minutes from the first fault signal
		  ○ Manual and automatic setting for compressor rotation
		  ○ TRIAC output fault for alarm signal
		  ○ LED status indicators (power and fault)
		• Eight (8) Cam-lok fittings for external power connections and pass through.		

Item	Qty	Description	Net Unit Price	Total Ext. Price
		• One (1) 20A GFI duplex receptacle with circuit breaker, fuses and isolation transformer. • **Quad box / Transformer:** One (1) L21-20 Amp receptacles with 480 x 120 volt isolation transformer, fuses and circuit breaker to serve as "courtesy power" • Condensate drain auxiliary pump mounted in drain pan with external switch. • Two (2) double deflection supply air grilles with gang operated rear horizontal blades • Louvered and hinged return air grille with three (3) 24" X 24" X 2" – 30% throw away filters • Teflon bumpers provided on all four sides of unit exterior. • Tent clamps provided on supply/return side of unit. • Unit overall dimensions to be approximately 36" wide by 91" long by 96" tall. • Unit will be tested, logged and documented at CAPS facility at full load conditions to verify proper operation prior to shipment, with Herc personnel welcome during testing if required. • CAPS will provide and install the Herc decal package as per provided layout drawing by Herc. • Herc Representatives will also have full access to schedules and production progress as units are being manufactured.		
		EXCLUSIONS • Installation, Equipment and Start-up Commissioning by others • Sales tax not included • Freight not included • Overtime not included • Proposal valid for 30 days • Any items not listed in the above scope of work to be performed		

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SECTION

02

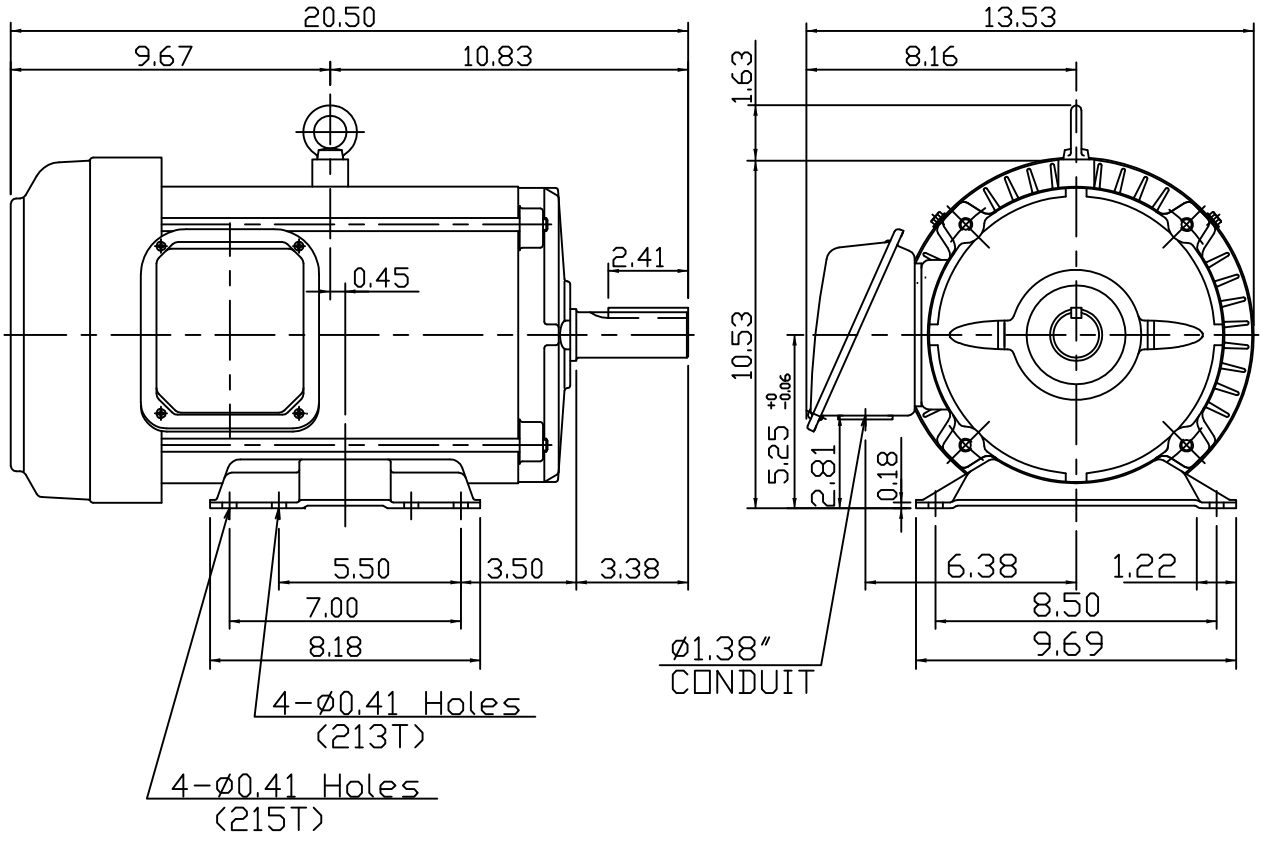
EVAPORATOR FAN & MOTOR SELECTION

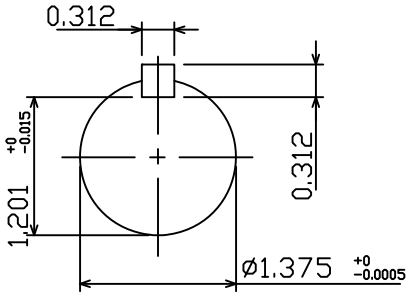
DATE	OUTLINE DIMENSIONS	MOTOR TYPE:
MAY 28, 2009	3-PHASE INDUCTION MOTOR	AEGH
CATALOG # GP7/54		FRAME NO. 213T

Pole	HP	kW	Hz	VOLT	Syn.Speed r/min(rpm)
4	7.5	5.6	60	230/460	1800

Ins	Rating	Dimension in	Approx Weight	Bearings
F	CONT.	inches	117 lbs.	DE: 6208ZZC3 NDE: 6206ZZC3

Totally Enclosed Fan-Cooled Type. Squirrel-Cage Rotor.





DWN.	J.H.LIANG	04-28-08	TECO Westinghouse	DWG NO. 31049R173010
CHKD.	H.C.YAN	05-05-08		
APPD.	M.C.TSAI	05-05-08		

TECO Westinghouse

ISSUED	PERFORMANCE DATA	ENCLOSURE
12/27/13	3-PHASE INDUCTION MOTOR	TEFC
TYPE		CATALOG#
AEGH		GP7/54

NAMEPLATE INFORMATION

OUTPUT HP	OUTPUT KW	POLE	FRAME SIZE	VOLTAGE	HZ	RATED AMBIENT	INS. CLASS	NEMA DESIGN	TIME RATING	SERVICE FACTOR
7.5	5.60	4	213T	230/460	60	40°C	F	B	CONT.	1.15

TYPICAL PERFORMANCE

FULL LOAD RPM	EFFICIENCY				POWER FACTOR			MAXIMUM POWER FACTOR CORRECTION
	FULL LOAD MIN. %	FULL LOAD NOM. %	3/4 LOAD %	1/2 LOAD %	F. L. %	3/4 LOAD %	1/2 LOAD %	
1760	90.2	91.7	91.0	90.5	83.0	79.0	68.0	2.43 KVAR

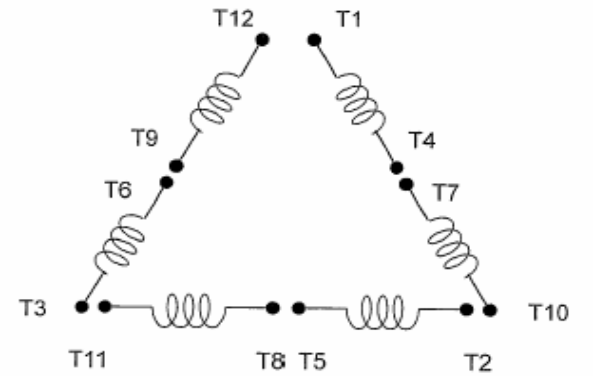
CURRENTS									NEMA KVA CODE LETTER
NO LOAD			FULL LOAD			LOCKED ROTOR			
AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	
5.89	7.20	3.60	20.57	18.50	9.30	114.85	127.00	63.50	H

TORQUE				INERTIA			ACCEL TIME	
FULL LOAD lb-ft	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	ROTOR WR^2 lb-ft^2	NEMA LOAD WK^2 lb-ft^2	MAX ALLOWABLE WK^2 lb-ft^2	NEMA LOAD WK^2 Sec	MAX ALLOWABLE WK^2 Sec
22.37	265	215	330	0.84	39	117	3.77	11.15

SAFE STALL TIME IN SECONDS		ALLOWABLE STARTS PER HOUR		SOUND PRESSURE LEVEL @ 3 FT dB(A)
COLD	HOT	COLD	HOT	
29	20	2	1	64

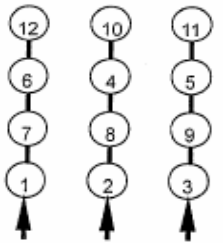
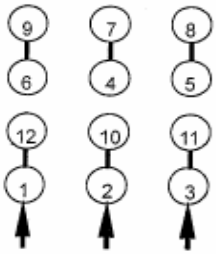
APPROVED:	M. PRATER	DRAWING NO.	31057GP7/54	REVISION 0

DATE: May 28, 2009	CONNECTION DIAGRAM	GP7/54

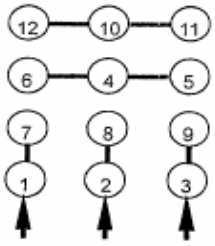
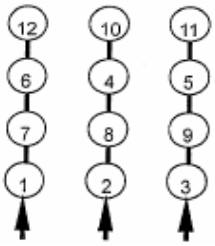
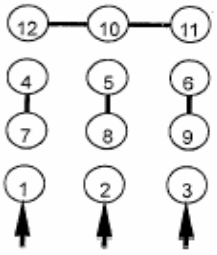
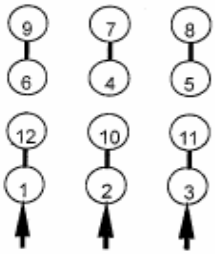


SCHEMATIC - Δ / Y CONNECTION

ACROSS THE LINE CONNECTION

	
LINE 230 VOLT CONNECTION	**LINE 460 VOLT CONNECTION**

WYE START-DELTA RUN CONNECTION

			
LINE 230 VOLT START	**LINE 230 VOLT RUN**	**LINE 460 VOLT START**	**LINE 460 VOLT RUN**

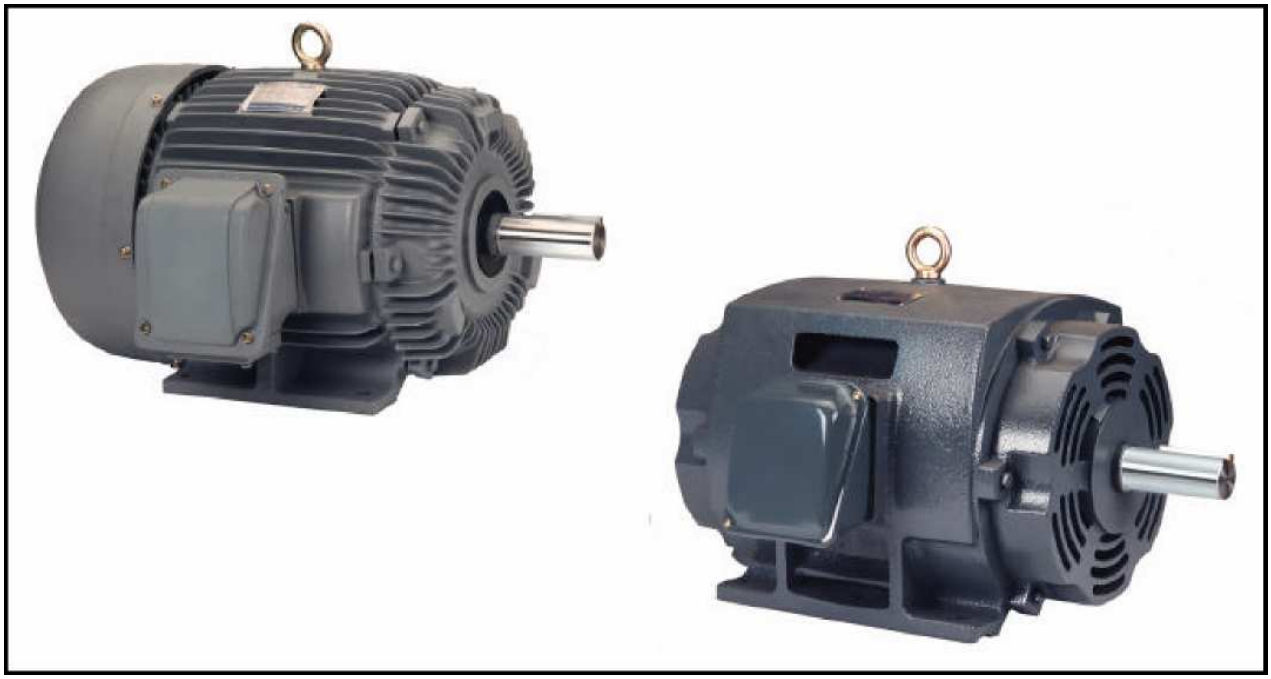
TECO Westinghouse

DWG NO. **DAC-1565-4**

TECO Westinghouse

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR THREE PHASE INDUCTION MOTORS

Frames 143T - 449TZ



5100 North IH 35 Round Rock, Texas 78681

RECEIVING

1. Check nameplate data.
2. Check whether any damage has occurred during transportation.
3. After removal of shaft clamp, turn shaft by hand to check that it turns freely.
4. If motor is to be reshipped (alone or installed to another piece of equipment) the shaft must again be clamped to prevent axial movement.
   Note: Remove the bearing clamp before turning the shaft on 284T-449TZ frame motors.

WARNING
THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED:

1. Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG-1; Safety Standards for Construction and Guide Selection. Installation and Use of Electric Motors and Generators; National Electric Code and all local safety requirements.
2. When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at standstill.
3. Lifting means, when supplied, are intended for lifting the motor only. When two lifting devices are supplied with the motor a dual chain must be used.
4. Suitable protection must be used when working near machinery with high noise levels.
5. Safeguard or protective devices must not be by-passed or rendered inoperative.
6. The frame of this machine must be grounded in accordance with the National Electric Code and applicable local codes.
7. A suitable enclosure should be provided to prevent access to the motor by other than authorized personnel. Extra caution should be observed around motors that are automatically or have automatic re-setting relays as they may restart unexpectedly.
8. Shaft key must be fully captive or removed before motor is started.
9. Provide proper safeguards for personnel against possible failure of motor-mounted brake, particularly on applications involving overhauling loads.
10. Explosion proof motors are constructed to comply with the label service procedure manual, repair of these motors must be made by TECO-Westinghouse Motor Company or U/L listed service center in order to maintain U/L listing.

LOCATION

1. Drip-proof motors are intended for use where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. Totally enclosed motors may be installed where dirt, moisture, or dust are present and in outdoor locations.
3. Explosion-proof motors are built for use in hazardous locations as indicated by Underwriters' label on the motor.
4. Chemical duty enclosed motors are designed for installation in high corrosion or excessive moisture locations.

   Note: in all cases, no surrounding structure should obstruct normal flow or ventilating air through or over the motor.

MOUNTING

1. Mount motor securely on a firm, flat base. All ball bearing normal thrust motors up to and including 256T frame size may be side-wall or ceiling mounted; all others check nearest TECO-Westinghouse office for mounting recommendations.
2. Align motor accurately, using a flexible coupling if possible. For drive recommendations, consult with drive or equipment manufacturer, or TECO-Westinghouse.
3. Mounting bolts must be carefully tightened to prevent changes in alignment and possible damage to the equipment. The recommended tightening torque's for medium carbon steel bolts, identified by three radial lines at 120 degrees on the head, are:

Bolt Size	Recommended Torque (Ft-lb.)	
	Minimum	Maximum
2/8	25	37
1/2	60	90
5/8	120	180
3/4	210	320

4. V-belts Sheave Pitch Diameters should not be less than those shown in Table 1 (NEMA recommended values)
5. Tighten belts only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number	Horsepower at Synchronous Speed, RPM				V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	3600	1800	1200	900	Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
143T	1.5	1	.75	.5	2.2	4.25	2.2	2.25
145T	2-3	1.5-2	1	.75	2.4	4.25	2.4	2.25
182T	3	3	1.5	1	2.4	5.25	2.4	2.75
182T	5	...	...	...	2.6	5.25	2.4	2.75
184T	...	...	2	1.5	2.4	5.25	2.4	2.75
184T	5	...	...	...	2.6	5.25	2.4	2.75
184T	7.5	5	...	...	3.0	5.25	3.0	2.75
213T	7.5-10	7.5	3	2	3.0	6.5	3.0	3.375
215T	10	...	5	3	3.0	6.5	3.0	3.375
215T	15	10	...	...	3.8	6.5	3.8	3.375
254T	15	...	7.5	5	3.8	7.75	3.8	4
254T	20	15	...	...	4.4	7.75	4.4	4
256T	20-25	...	10	7.5	4.4	7.75	4.4	4
256T	...	20	...	...	4.6	7.75	4.4	4
284T	...	...	15	10	4.6	9	4.4	4.625
284T	...	25	...	...	5.0	9	4.4	4.625
286T	...	30	20	15	5.4	9	5.2	4.625

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number	Horsepower at Synchronous Speed, RPM				V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	3600	1800	1200	900	Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
324T	...	40	25	20	6.0	10.25	6.0	5.25
326T	...	50	30	25	6.8	10.25	6.8	5.25
364T	...	...	40	30	6.8	11.5	6.8	5
364T	...	60	...	...	7.4	11.5	7.4	5.785
365T	...	...	50	40	8.2	11.5	8.2	5.785
365T	...	75	...	...	9.0	11.5	8.6	5.785
404T	...	...	60	...	9.0	14.25	8.0	7.25
404T	...	...	...	50	9.0	14.25	8.4	7.25
404T	...	100	...	...	10.0	14.25	8.6	7.25
405T	...	...	75	60	10.0	14.25	10.0	7.25
405T	...	100	...	...	10.0	14.25	8.6	7.25
405T	...	125	...	...	11.5	14.25	10.5	7.25
444T	...	...	100	...	11.0	16.75	10.0	8.5
444T	...	...	...	75	10.5	16.75	9.5	8.5
444T	...	125	...	...	11.0	16.75	9.5	8.5
444T	...	150	...	...	...	16.75	10.5	8.5
445T	...	...	125	...	12.5	16.75	12.0	8.5
445T	...	...	...	100	12.5	16.75	12.0	8.5
445T	...	150	...	...	...	16.75	10.5	8.5

*Max. Sheave width = 2(N-W) - .25

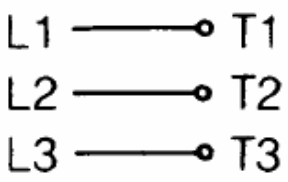
**Max Sheave width = N-W

***Sheave ratios grater than 5:1 and center-to-center distance less than the diameter of the large sheave should be referred to TECO-Westinghouse.

POWER SUPPLY & CONNECTIONS

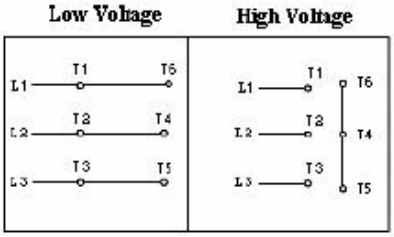
1. Wiring of motor and control, overload protection and grounding should be in accordance with National Electrical Code and all local safety requirements.
2. Nameplate voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within ±10% of nameplate voltage; or frequency with ±5% and with a combined variation not to exceed ±10%. 230-volt motors can be used on 208-volt network systems, but with slightly modified performance characteristics as shown on the nameplate.
3. Dual voltage and single voltage motors can be connected for the desired voltage by following connection diagram shown on the nameplate or inside of the conduit box.
4. All Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent excessive external surface temperature of the motor in accordance with U/L standards. Terminals of thermal protectors (P1 & P2) should be connected to the motor control equipment, according to the connection diagram inside of the conduit box.
5. Standard connection diagram for three phase, not thermally protected, dual rotation motors are shown in diagrams A through E. **(Note: To change rotation, Interchange any two line leads)**

A. 3 Lead, Single Voltage

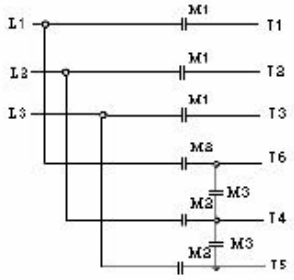


B. 6 Lead, Dual Voltage & Voltage Ration 1 to 3

B-1 Across the Line Start & Run



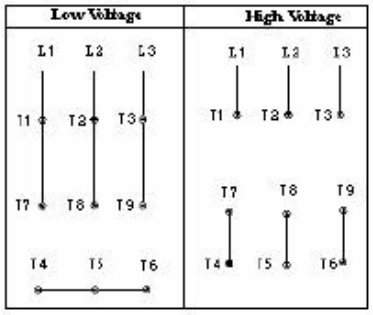
B-2 Wye Start & Delta Run
(Low Voltage only)



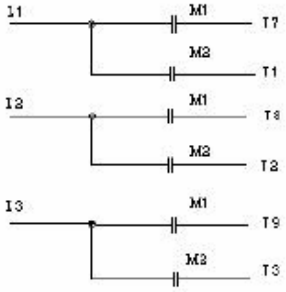
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

C. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Wye Connected

C-1 Across the Line Start & Run



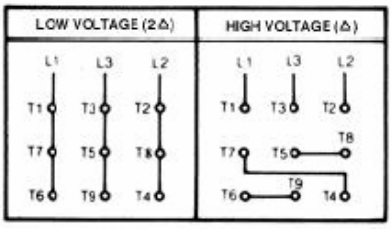
C-2 Part Winding Start
(Low Voltage only)



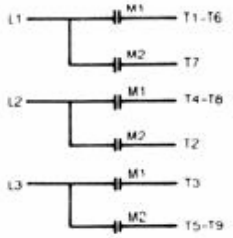
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
Tie Together	(T4-T5-T6)	

D. 9 Leads; Dual Voltage & Voltage Ration 1 to 2, Delta Connected

D-1 Across the Line Start & Run



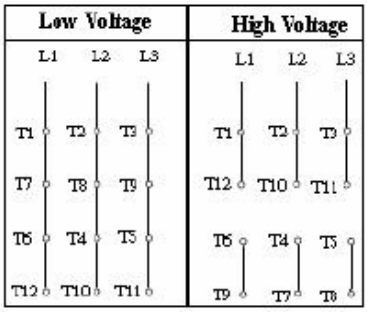
D-2 Part Winding Start
(Low Voltage only)



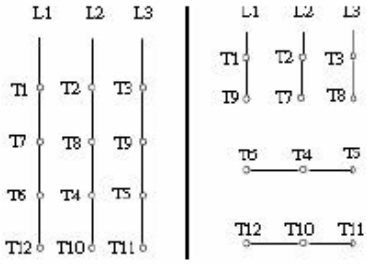
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE

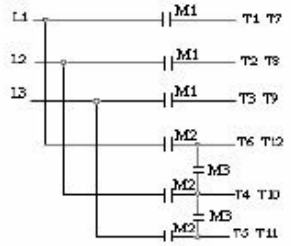
E. 12 Leads, Dual Voltage

E-1 Across the Line Start & Run



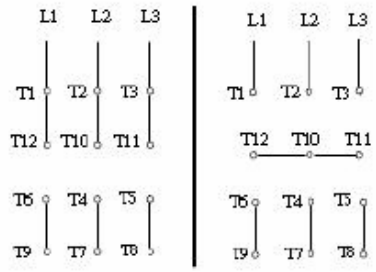
E-2-1 Wye Start & Delta Run (Low Voltage only)

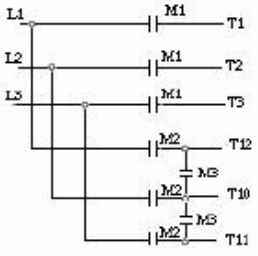




	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

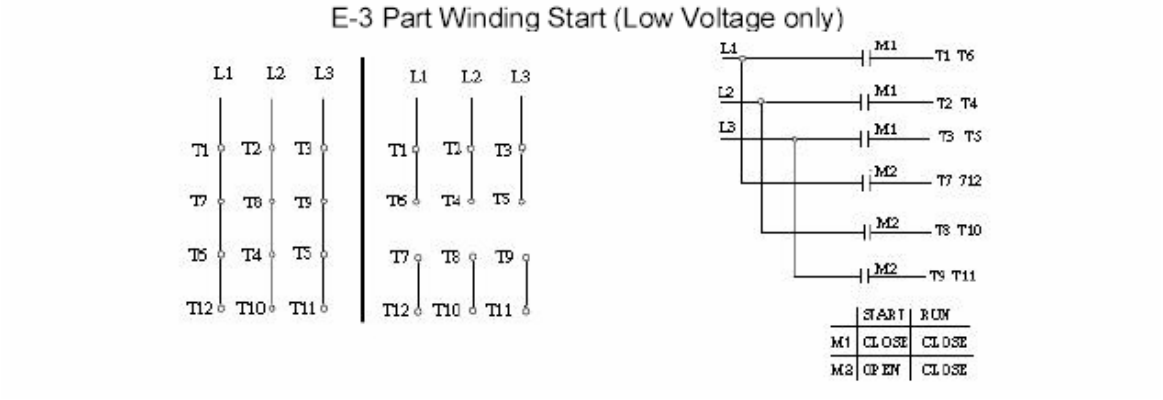
E-2-2 Wye Start & Delta Run (High Voltage only)





	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

Tie Together (T4-T7); (T5-T8); (T6-T9)



*Important: For Part Winding Start, M2 contactor should be closed within two (2) seconds after M1 contactor is closed.
Only 4 pole and above (e.g., 6P, 8P...) motors are satisfactory for Part Winding Start at low voltage.

START UP

1. Disconnect load and start motor. Check direction of rotation. If rotation must be changed, ALLOW THE MOTOR TO STOP COMPLETLEY. Interchange any two leads of a three-phase motor.
2. Connect load. The motor should start quickly and run smoothly. If no, shut power off at once. Recheck the assembly including all connections before restarting.
3. If excessive vibration is noted, check for loose mounting bolts too flexible motor support structure or transmitted vibration from adjacent machinery. Periodic vibration checks should be made; foundations often settle.
4. Operate under load for short period of time and check operating current against nameplate.

TESTING

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megometer. Depending on the length and conditions of storage it may be necessary to regrease or change rusted bearings.
If the resistance is lower than one megohm the windings should be dried in one of the following two ways:

1. Bake in oven at temperatures not exceeding 194°F until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase the current through windings until temperature measured with a thermometer reaches 194°F. Do not exceed this temperature.

MAINTENANCE

INSPECTION

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear.

LUBRICATION

1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need re-lubrication, except on MAX-E1® and MAX-E2® products which have re-greasable features.
2. Frames 280TS, 320-449TZ(TS): Motors having grease fittings and grease discharge devices at brackets. Motors are shipped with grease for initial running. It is necessary to re-lubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 2 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

TABLE 2

Horsepower	Standard Conditions	Severe Conditions	Extreme Conditions
1 Thru 30 Hp, 1800 rpm and below	7 years	3 years	180 days
40 Thru 75 Hp, 1800 rpm and below	210 days	70 days	30 days
100 Thru 150 Hp, 1800 rpm and below	90 days	30 days	15 days
1 Thru 20 Hp, 3600 rpm	5 years	2 years	90 days
25 Thru 75 Hp, 3600 rpm	180 days	60 days	30 days
100 Thru 150 Hp, 3600 rpm	90 days	30 days	15 days

Note:

A. Standard conditions: 8 hours operation per day, normal or light loading, clear and 40°C ambient conditions.
B. Severe conditions: 24-hour operation per day or light shock loading, vibration or in dirty or dusty conditions.
C. Extreme conditions: With heavy shock loading or vibration or dusty conditions.
D. For double shielded bearings, above data (lubrication frequency) means that the bearing must be replaced.

3. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease discharge hole.
4. Use the POLYUREA grease unless special grease is specified on the nameplate.
5. If re-lubrication is to be performed with the motor running, stay clear of rotating parts. After re-greasing, allow the motor to run for ten to thirty minutes.

RENEWAL PARTS

1. Use only genuine TECO-Westinghouse renewal parts or as recommended by TECO-Westinghouse Motor Company.
2. When you order renewal parts please specify complete information to TECO-Westinghouse office/agent such as type, frame no., poles, horsepower, voltage, series no., quantity, etc.

FOR FURTHER INFORMATION PLEASE CONTACT

TECO-WESTINGHOUSE MOTOR COMPANY

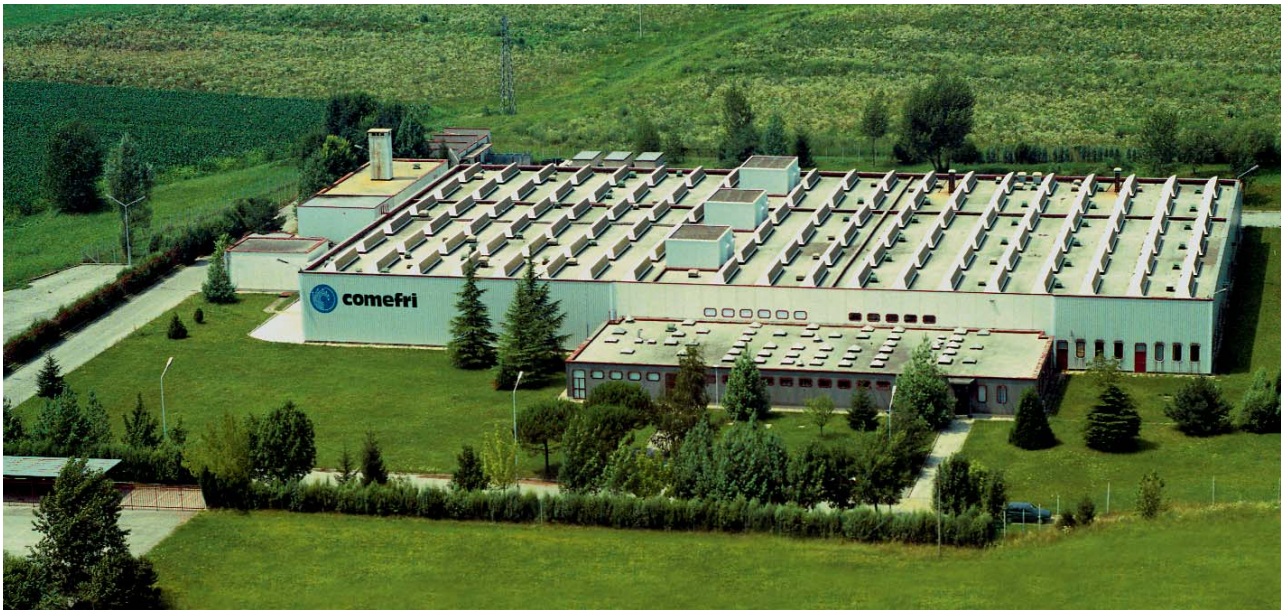
Round Rock, TX **800-873-8326**

ATLI

DOUBLE INLET FORWARD CURVED CENTRIFUGAL FANS

comefri®

COMEFRI SpA factory at Magnano in Riviera (UD) - Italy with 156,000 sq.ft. manufacturing floor space, which produces radial fans for HVAC products.



COMEFRI SpA factory at Artegna (UD) - Italy with 68,000 sq.ft. manufacturing and laboratory floor space for the production of standard and special application industrial fan.
Test facilities: laboratory accredited by AMCA and SINAL.

Manufacturing Facility

COMEFRI USA: Manufacturing and Warehouse facilities in Hopkinsville, KY.

Total facility: 125,000 sqft. Producing centrifugal fans for the HVAC industry

Warehouse Facility

Contents

Fig. 1

1. Standard ATLI fans range

Comefri's ATLI double inlet forward curved centrifugal fan series covers a size range from 7 to 40.
All fans within this range have the following characteristics:

- optimally engineered for HVAC applications;
- high quality, compact design;
- class I and class II versions available (as per AMCA operating limits specification 99-2408-69);
- low power consumption; high efficiency
- quiet operation;
- all fans are fully performance tested and certified in Comefri's own state-of-the-art laboratory in accordance with DIN, ISO, BS and AMCA standards.

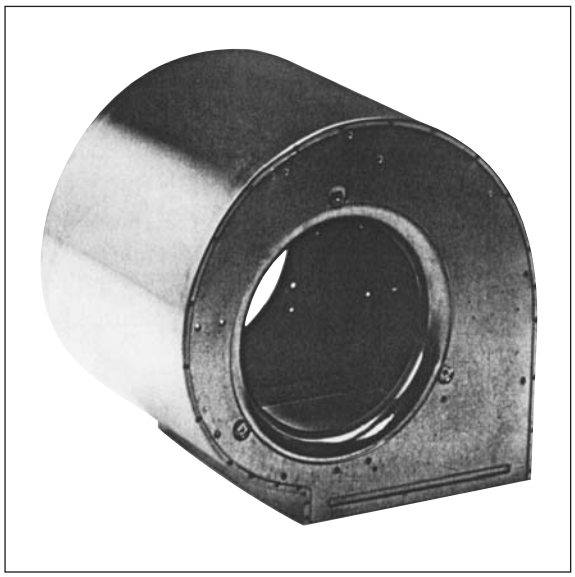


Fig. 2

2. Technical details

2.1. Housing

All fan housings from size 7 to 40 are manufactured in galvanized sheet steel (Fig. 1). From sizes 7 to 18, the fan sideplates are spot welded to the scroll housing (Fig. 2). From sizes 20 to 40 the fan sideplates are locked to the scroll housing through a Pittsbourgh seam (Fig. 3) which ensures a high quality air tight seal, as well as a structurally reinforced housing.
The inlet cones are manufactured in galvanized sheet steel and are part of the housing sideplates.
A series of standard holes are located on the sideplates to allow the installation of frames or mounting base. These holes are positioned in such a way that several standard accessories can be attached with the necessary fixing screws.

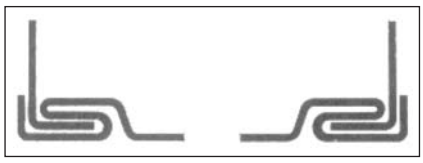


Fig. 3

Fig. 4

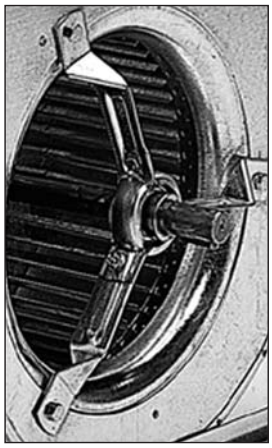


Fig. 5

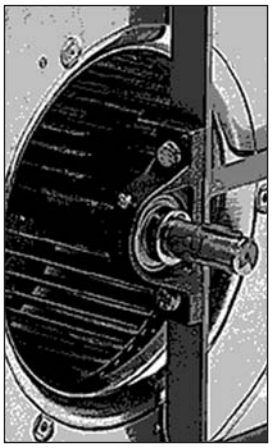


Fig. 6

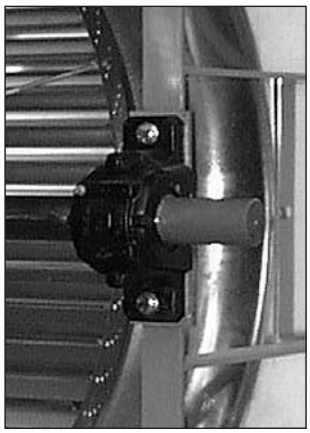


Fig. 7

2.2. Impeller

The impeller is manufactured in galvanized sheet steel with tab locked blades, (Fig. 4).
All wheels are balanced, both statically and dynamically, to an accuracy grade of G = 6.3 in accordance to DIN ISO 1940-1 and ANSI S2.19 – 1989.
All the impellers from size 7-7 to 40-40 are secured to the shaft via a hub.
The hub bore is precision machined and incorporates a keyway and locking screw.

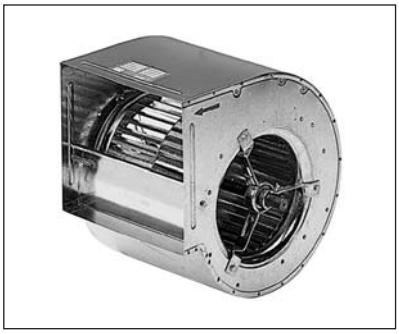
2.3. Shafts

All shafts are designed with a high safety factor and with the first critical speed well in excess of the maximum fan speed.
Made with hardened steel, the shafts are precision ground and polished, and includes keyways for the wheel hub and sheaves.
All shafts are coated with a protective paint for added corrosion protection prior to shipping.

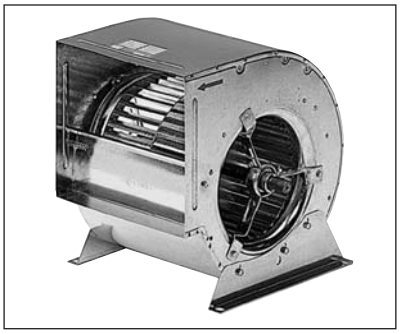
2.4. Bearings

From size 7-7 B to 18-18 B and from size 7-7 R to 28-28 R, bearings are self-aligning, single row, deep groove ball type (Fig. 5). From size 20-15 T1 to 40-40 T1, from size 7-7 T2
to 28-28 T2, bearings are self-aligning, single row, deep groove ball type, in pillow block cast iron housings (Fig. 6).
Size 32-32 T2, size 36-36 T2 and size 40-40 T2 bearings are double row roller bearings in pillow block split cast iron housings (Fig. 7).
All bearings have been selected to guarantee a minimum L_{50} life time of 200,000 hours (as per AFBMA standards).
B and R framed fans have the bearings mounted in a rubber interliner, which in turn, fits in a sturdy three-arm or four-arm spider bracket (Fig. 5). These bearings are permanently lubricated and sealed for the life time of the fan.
T1 and T2 fans have the pillow block bearings mounted on a flat iron bar, welded to the T frame (Fig. 6, 7). These bearings are complete with re-lubrication fitting already installed.
Operating temperatures range from -4°F to +176°F (-20°C to +80°C) for all blowers.

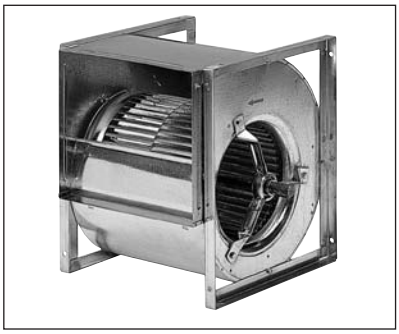
3. ATLI series



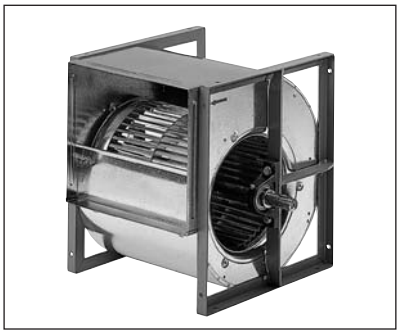
ATLI _ _ _ B
Standard (base) version fan.



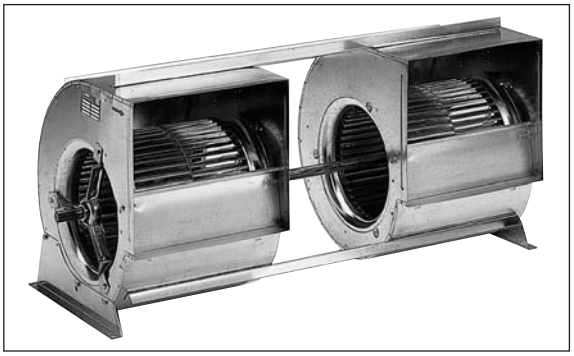
ATLI _ _ _ F
Standard (base) version fan with mounting feet “F”.



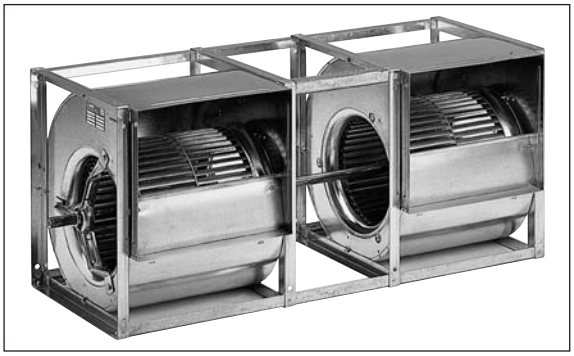
ATLI _ _ _ R
Fan with galvanized steel frame “R”.



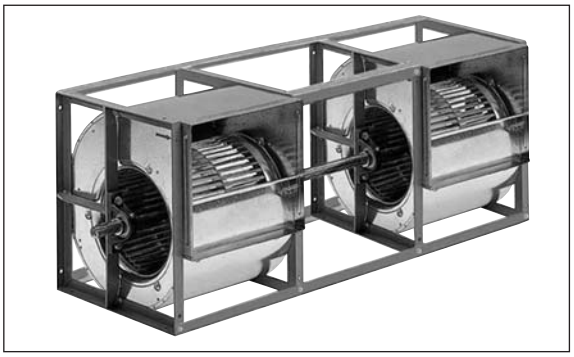
ATLI _ _ _ T1 / ATLI _ _ _ T2
Fan with reinforced angle iron frame “T1 or T2”.



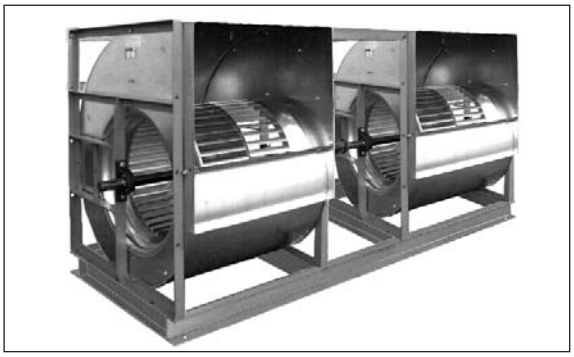
ATLI _ _ _ BL
Twin fan in standard (base) version with mounting feet “F”.



ATLI _ _ _ BP
Twin fan with galvanized steel frames and angular joining galvanized steel stiffeners.

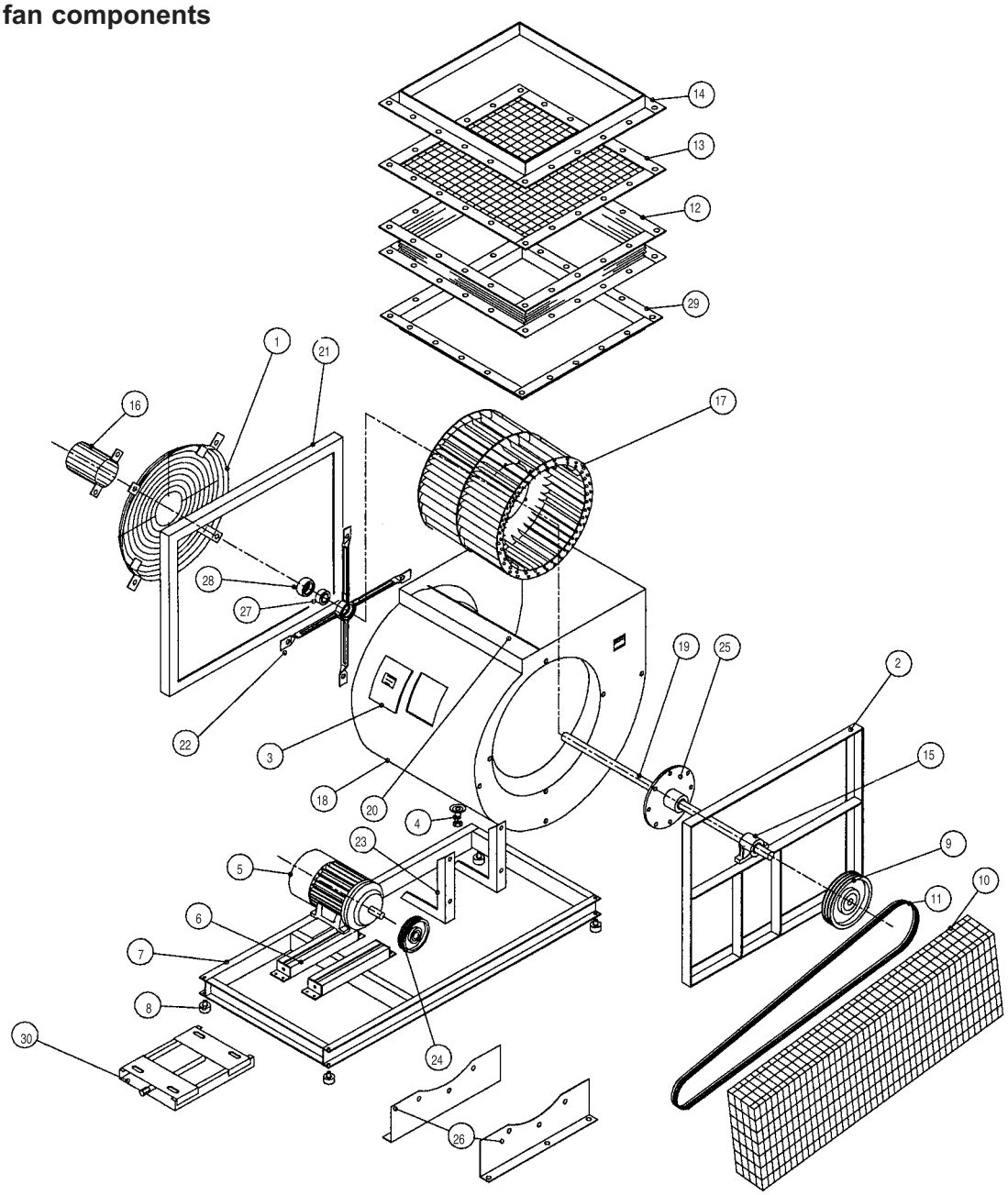


ATLI _ _ _ BT
Twin fan with reinforced angle iron frames and angle iron joining stiffeners.



ATLI _ _ _ BT2/T1
Twin fan with reinforced angle iron frames, angle iron joining stiffeners, common base frame and flexible couplings between the two shafts.

4. Labelling of fan components



1	INLET GUARD	16	SHAFT GUARD
2	FRAME for T EXECUTION	17	WHEEL
3	INSPECTION DOOR	18	HOUSING
4	DRAIN PLUG	19	SHAFT
5	MOTOR	20	CUT OFF
6	MOTOR RAILS SH	21	FRAME for R EXECUTION
7	BASE FRAME	22	BEARING BRACKET for BASE and R EXECUTION
8	ANTIVIBRATION MOUNTING	23	GUARD MOUNT
9	FAN PULLEY	24	MOTOR PULLEY
10	BELT GUARD	25	HUB
11	BELTS	26	FEET
12	OUTLET FLEXIBLE CONNECTION	27	BEARING for BASE and R EXECUTION
13	OUTLET GUARD	28	RUBBER BUSH for BASE and R EXECUTION
14	OUTLET COUNTERFLANGE	29	OUTLET FLANGE
15	BEARINGS for T EXECUTION	30	MOTOR BASE PLATE SY

5. Fan performances

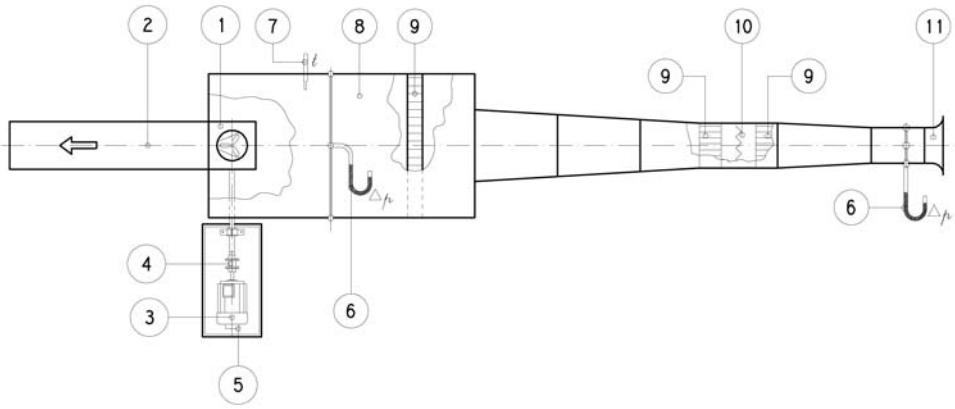
5.1. Performance data

Comefri's laboratory measured the data detailed in the performance chart section with modern, state-of-the-art testing instruments.

Fan performance is measured for an installation type B (ref. AMCA 210-85, par. 7.1.1 installation type), i.e. free inlet and ducted outlet configuration and a reference density of ρ = 0.075 lb/cu.ft

Outlet velocity o.v. and Δp_{dyn} pressure, refer to the flange cross section area at the fan outlet.

Performance test rig according to DIN 24163 / BS 848, Part1 / ISO 5801 / AMCA 210



1. Fan
2. Outlet duct
3. Electric motor drive
4. Torquemeter
5. Tachometer
6. Differential pressure gauge
7. Thermometric probe
8. Test chamber
9. Flow straightener
10. Damper
11. Normalized inlet

The performance curves include the following information:

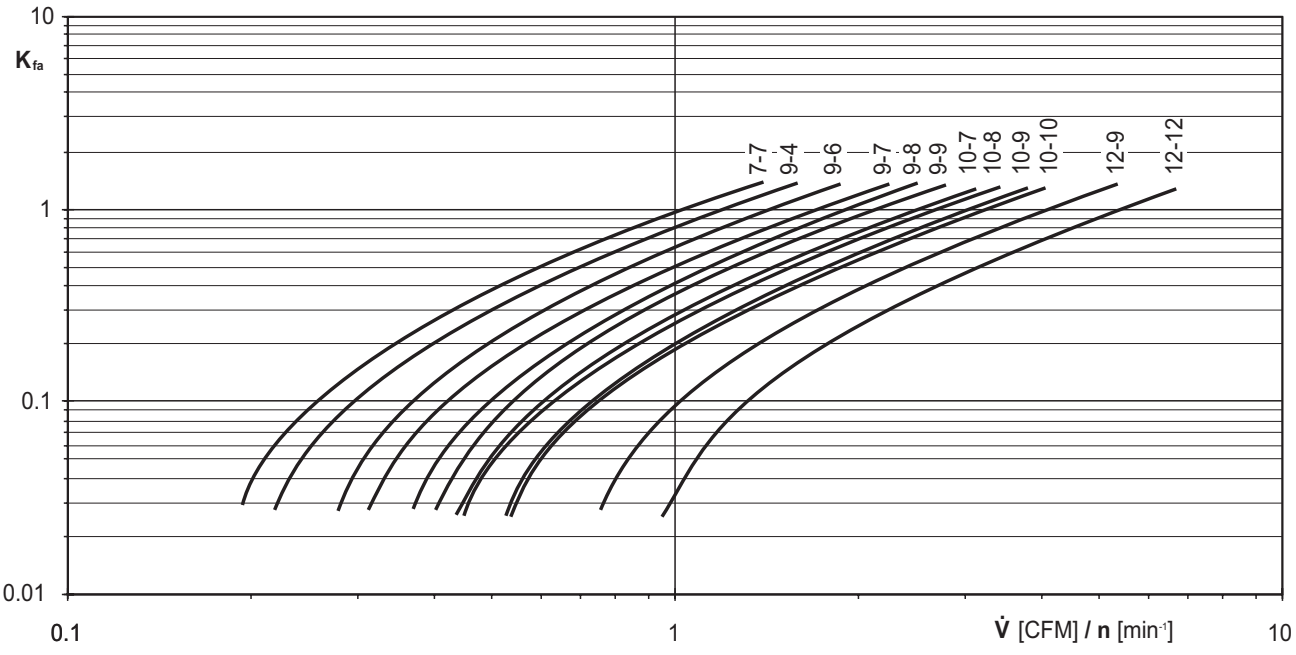
Static pressure	Δp_{stat}	[In.W.G.]	inches water gauge
Dynamic pressure	pdyn	[In.W.G.]	inches water gauge
Volume air flow	$\dot{V}$	[CFM]	cubic feet per minute
Absorbed power on fan shaft	P_w	[BHP]	brake horsepower
Fan speed	n	[RPM]	revolutions per minute
Static Efficiency	η_{stat}	[%]	$\frac{\Delta p_{stat} \cdot \dot{V} \cdot 100}{P_w \cdot 6362}$
Outlet velocity	o.v.	[ft/min]	Feet per minute
Sound Power Level	$L_{wA4;7}$	[dB(A)]	Decibel A

5.2. Free outlet performance (installation type A)

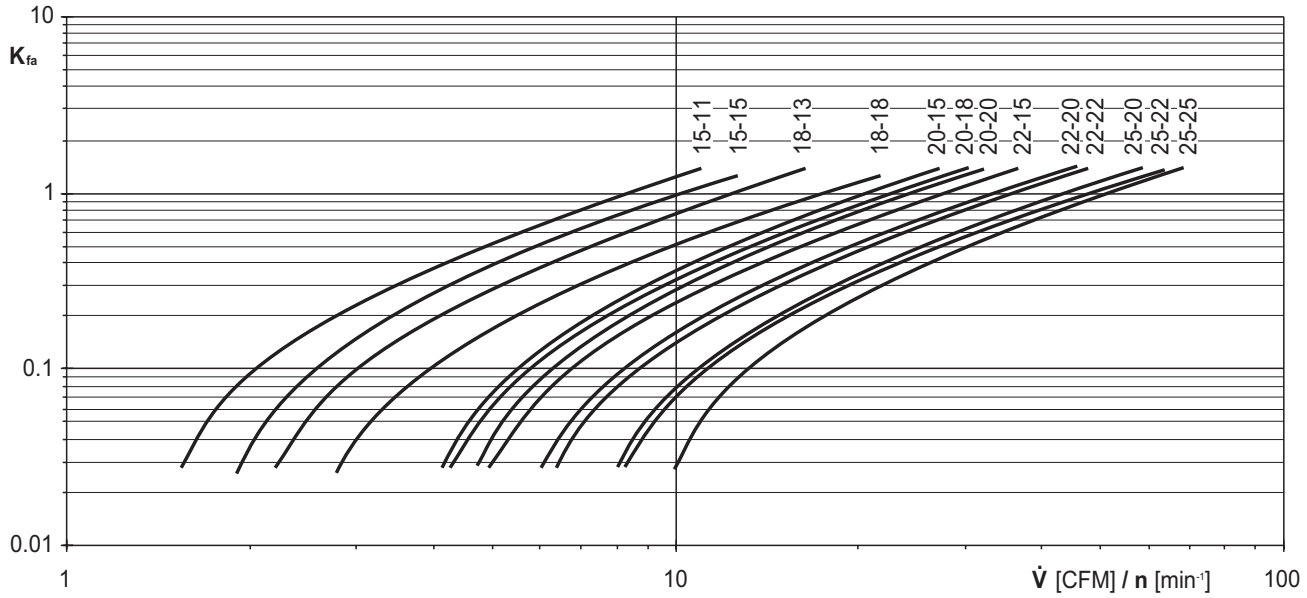
As all data detailed in the fan performance charts refer to the free inlet - ducted outlet configuration, a correction to this data must be applied when a free outlet installation is requested.
In free discharge condition the static pressure Δp_{fa}, for a given fan speed, can be obtained as:

$$\Delta p_{fa} = \Delta p_{stat} - K_{fa} \cdot \Delta p_{dyn}$$

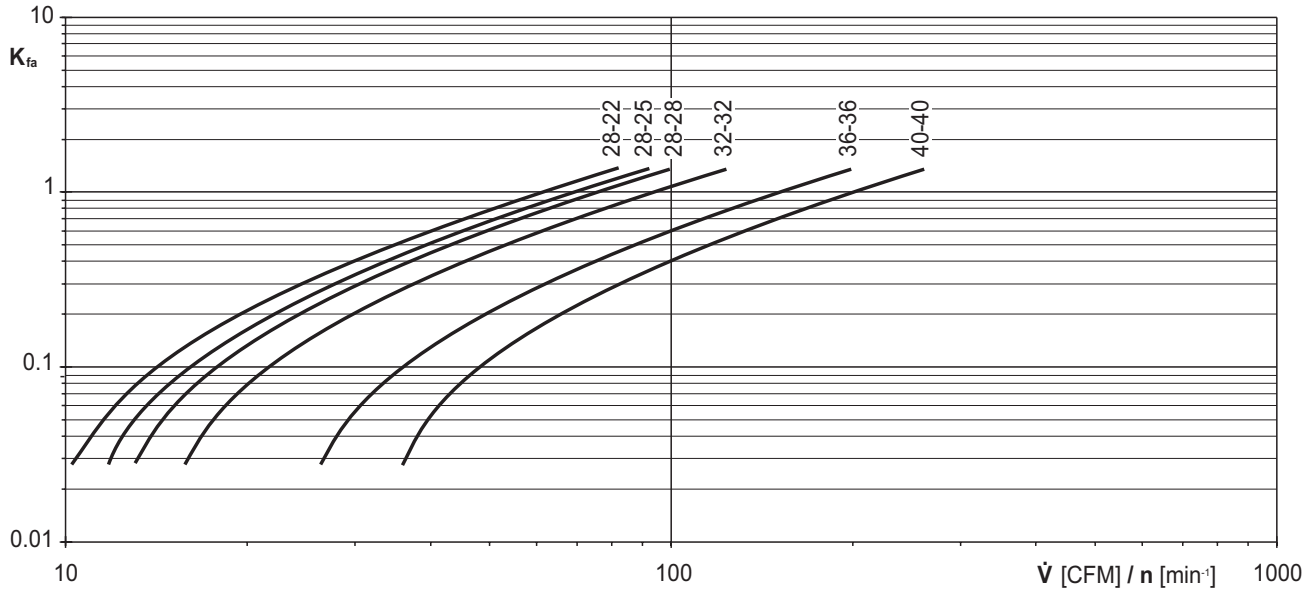
where K_{fa} is a correction factor, function of fan size and $\dot{V}$/ n ratio, which can be found on the graphs 5.2.1, 5.2.2, 5.2.3.
Note that the static pressure obtained is less than the requested pressure.
The final consequence is that, in the free outlet configuration, the fan has to run at a slightly higher speed than in the ducted outlet condition.
Please refer to the Selection Example 6.2, for further details on the correct selection procedure.



Graph 5.2.1



Graph 5.2.2



Graph 5.2.3

5.3. Motor selection

To determine the motor rating P_n, the fan absorbed shaft power P_w must be increased by a factor f_w to accomodate for the drive losses, safety margins,.....etc.

$$P_n = P_W (1 + f_W)$$

The factor f_W can be chosen from the following figures:

$P_W \leq 13.4$ BHP . . . $f_W = 0.20$
$P_W > 13.4$ BHP . . . $f_W = 0.15$

When selecting a suitable motor, the run-up time must be considered.
The run-up time "t_a"can be calculated according to the following formula:

$$t_a = 0.452 \frac{J \cdot n^2}{P_n} 10^{-6}$$

where:			
	t_a	acceleration time	[s]
	J	moment of inertia of the revolving parts	[Lb ft^2]
	n	impeller revolution	[rpm]
	P_n	motor rating	[HP]

If "t_a"exceeds the motor's manufacturer recommendations, a larger motor or a high-torque type must be used.

5.4. Temperature and altitude correction factors

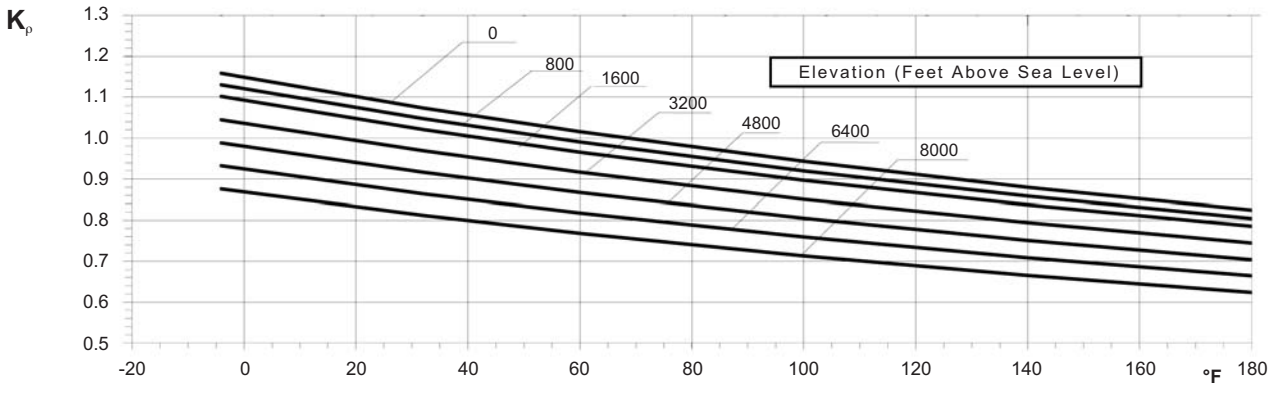
The performance charts refer to the standard air condition, i.e. ρ = 0.075 lb/cu.ft, 68 °F temperature at sea level.
For different operating conditions the data performance must be corrected due to the change in air density.
Fan laws relate to performance variables for any fan of a given design.
Pressure, static and total, varies directly as the ratio of the air densities, K_ρ

$$\Delta p_{stat2} = \Delta p_{stat1} \cdot K_\rho$$

Absorbed power varies directly as the ratio of the air densities, K_ρ

$$P_{w2} = P_{w1} \cdot K_\rho$$

The graph 5.4 contains air density ratios K_ρ for temperatures from - 5 °F to 180 °F and elevations up to 8000 feet above sea level. Please refer to the Selection Example 6.2, for further details on the correct selection procedure.



Graph 5.4.

6. Sound levels

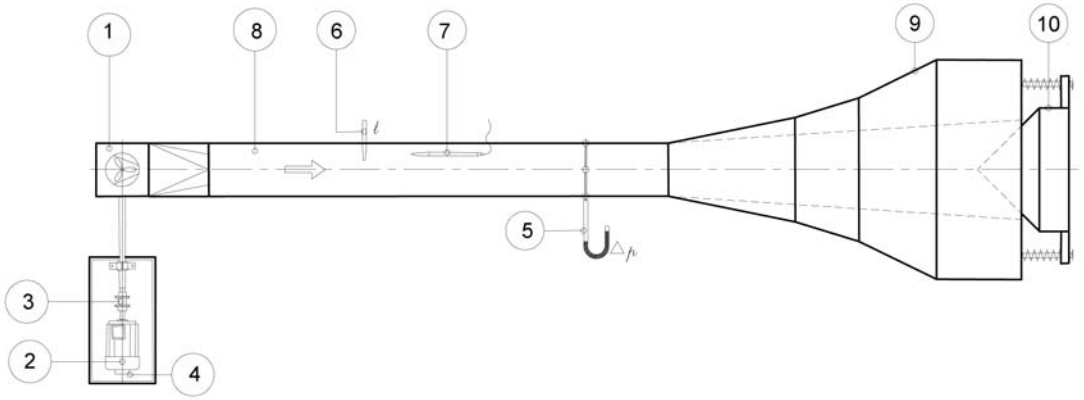
The measurement of noise levels have been made according to ISO, DIN and BS, ANSI / AMCA Standard using a Bruel & Kjaer real-time frequency analyser.

The Sound Power Level L_{wA}, referred to $W_o=10^{-12}$ watt, required for calculation and design of sound attention units, are marked on the performance curves.

Symbols and Formulas:

L_{wA4}	A-weighted Total Sound Power Level inside the outlet duct	[dB(A)]
L_{wA7}	A-weighted Total Sound Power Level at the fan inlet, with ducted outlet	[dB(A)]
L_{woct}	Sound Power Level at a specific Octave Band Mid-Frequency	[dB]
f_m	Octave Band Mid-Frequency	[Hz]
ΔL_{woct4}	Difference between the Total Sound Power Level at a specific Octave Band L_{woct4} and Total Sound Power Level, A-weighted, L_{wA4}	[dB]
ΔL_{w4}	Difference between the Total Sound Power Level L_{w4} and the A-weighted Total Sound Power Level L_{wA4}	[dB]

Sound measurement test rig scheme according to DIN 45635, Part9 / BS 848, Part2 / ISO 5136 / ANSI / AMCA 330



1. Fan
2. Electric motor drive
3. Torquemeter
4. Tachometer
5. Differential pressure gauge
6. Thermometric probe
7. Microphone with turbulence screen
8. Test duct
9. Anechoic termination
10. Adjustable anechoic end

Fan Sound Data is determined as follows:

1. The A-weighted Total Sound Power Level L_{wA4} inside the outlet duct can be read from the Performance Chart, for a given fan performance.

2. The Sound Power Level L_{woct4}, at a specific Octave Band Mid-Frequency, inside the outlet duct can be determined from following formula:

$$L_{woct4} = L_{wA4} + \Delta L_{woct4}$$

3. The Total Sound Power Level inside the outlet duct can be obtained from the following formula:

$$L_{w4} = L_{wA4} + \Delta L_{w4}$$

The values for ΔL_{woct4} and ΔL_{w4} for each fan size can be found in the SOUND DATA TABLES section, considering the relevant Fan Performance Area and the range of fan speed.
Note that sound data is determined according to DIN 45635 Part9, BS 848 Part2, ISO 5136, / ANSI / AMCA 330 – In-duct method.

6.1. Total Sound Power Level at the free outlet, L_{w6}

The value L_{w6}, at the outlet in a free outlet condition, can be considered approximately equal to the Total Sound Power Level outside the termination of the discharge duct. The Total Sound Power Level, outside the termination of the discharge duct, can be calculated with an approximation, using the “End Reflection” concept: part of the sound power generated by the fan at the discharge is reflected back into the duct when there is an abrupt termination. The values in octave band can be obtained subtracting, octave by octave, from the L_{woct4} values the reflected back portion of the sound power. The following table gives the correction factors ΔL_{wcorr}, for each fan size, that has to be added to the corresponding L_{woct4} value:

		Fan size									
		7-7	**9-4**	**9-6**	**9-7**	**9-8**	**9-9**	**10-7**	**10-8**	**10-9**	**10-10**
ΔL_{wcorr} [dB]	**63** [Hz]	-13.5	-13	-13	-13	-13	-13	-12.5	-12.5	-12	-12
	125 [Hz]	-8.5	-8.5	-8.5	-8.5	-8	-8	-8	-8	-7.5	-7.5
	250 [Hz]	-4	-4.5	-4	-4	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5
	500 [Hz]	-2	-2	-1.5	-1.5	-1.5	-1.5	-1.5	-1	-1	-1

		Fan size									
		12-9	**12-12**	**15-11**	**15-15**	**18-13**	**18-18**				
ΔL_{wcorr} [dB]	**63** [Hz]	-12	-12	-10.5	-10	-9.5	-9				
	125 [Hz]	-7.5	-7	-6.5	-6	-5	-4.5				
	250 [Hz]	-3	-3	-2.5	-2	-2	-2				

		Fan size									
		20-15	**20-18**	**20-20**	**22-15**	**22-20**	**22-22**	**25-20**	**25-22**	**25-25**	
ΔL_{wcorr} [dB]	**63** [Hz]	-8.5	-8	-8	-7.5	-7	-7	-6.5	-6.5	-6	
	125 [Hz]	-4	-4	-4	-3.5	-3	-3	-3	-2.5	-2.5	
	250 [Hz]	-1.5	-1	-1	-1	-1	-1	-0.5	-0.5	-0.5	

		Fan size									
		28-22	**28-25**	**28-28**	**32-32**	**36-36**	**40-40**				
ΔL_{wcorr} [dB]	**63** [Hz]	-5.5	-5.5	-5	-5	-4	-3.5				
	125 [Hz]	-2.5	-2	-2	-1.5	-1	-1				
	250 [Hz]	0	0	0	0	0	0				

Please refer to the Selection Example for the detailed procedure to follow.

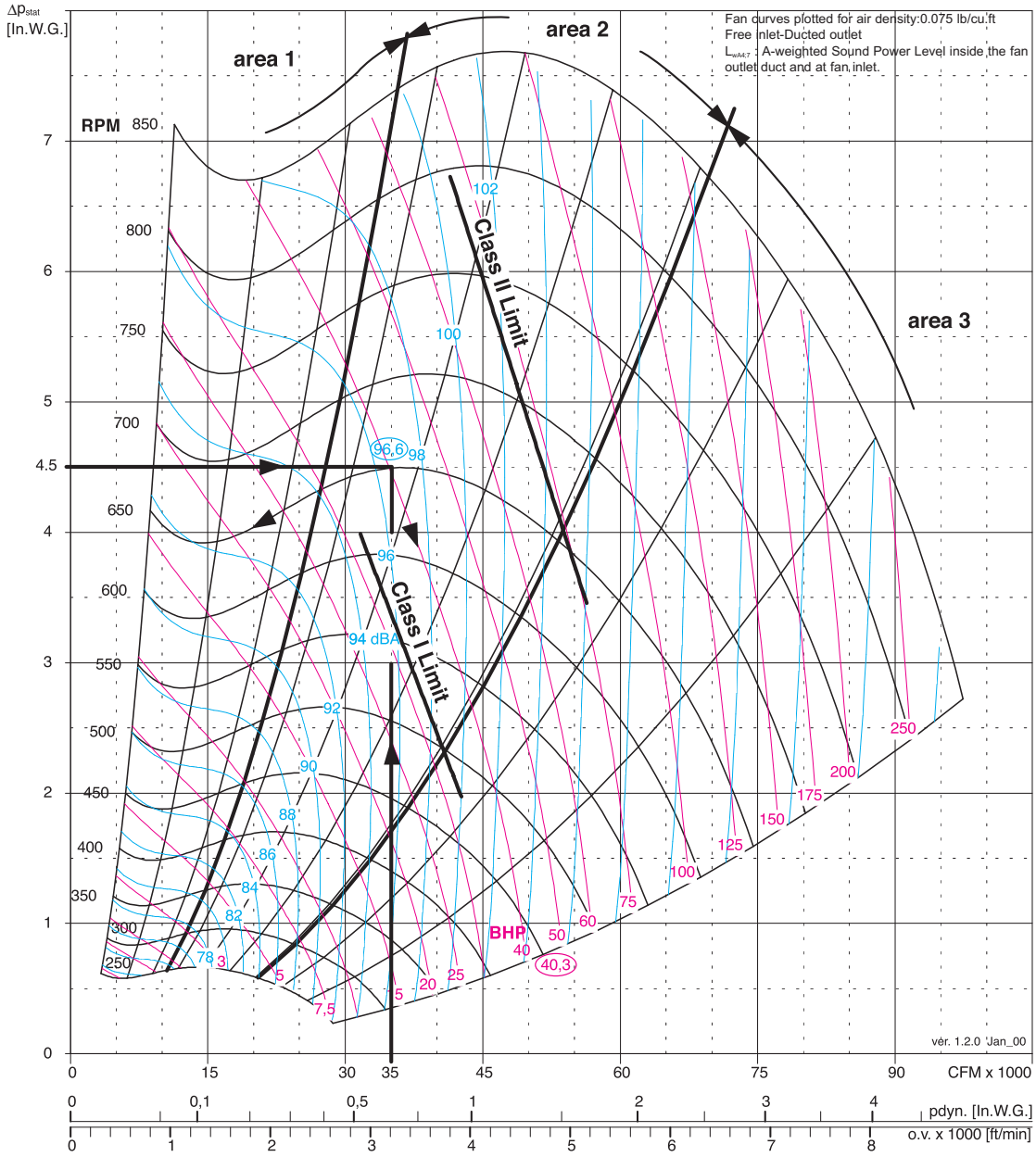
Note that, as L_{w6} is an estimated value, the Class 1 tolerance limit of + 3 dB(A) cannot be applied.
Finally, please consider that the low frequencies (125 Hz and below) are strongly affected by vibrations (drive alignment, pulley unbalance, etc) and by ducts not properly acoustically insulated from the fan; the final effect is the generation of additional low frequency noise.

6.2. Selection Example

Fan selection for the following operating parameters:

Air volume = 35,000 CFM
Δp_{stat} = 4.5 In.W.G.
Operating temperature = 68°F

ATLI 32-32	B	R	T1	T2
Fan Max RPM [min-1]	-	-	675	760
Fan Max BHP	-	-	40	70
Fan Outlet Area O.A. [ft2]	10.91			
Fan weight [Lb]	-	-	564.43	629.95
Wheel diameter [in.]	31.5			
Wheel width [in.]	25.43			
Wheel No. Blades	38			
Wheel Moment of Inertia [Lb ft2]	-	-	142.14	142.85
Wheel weight [Lb]	-	-	132.28	134.48



Selected model and size: ATLI 32-32 T2
n = 651 RPM
n_{max} = 760 RPM
L_{wA4} = 96.6 dB(A)
Δp_{dyn} = 0.64 In.W.G.
BHP = 40.3 HP
o.v. = 3208.2 [ft/min]

a) Sound data

The following steps must be followed to determine the Octave Band values:

a1) Read on the Sound Data Table for ATLI 32-32 T2, for each octave band and consider the selected fan performance zone and speed (AREA 2, n > 562 RPM) the appropriate values for ΔL_{woct4}:

0 -3 -3 -2 -5 -9 -13 -20

a2) Apply these corrections to L_{wA4} = 96.6 dB(A) (add the ΔL_{woct4} values) to obtain values of L_{woct4}:

96.6	93.6	93.6	94.6	91.6	87.6	83.6	76.6	rounded off to:
97	94	94	95	92	88	84	77	

a3) To obtain the L_{w4} Total Sound Power value, add to L_{wA4} the ΔL_{w4} value

$$L_{w4} = L_{wA4} + \Delta L_{w4} = 96.6 \text{ dB(A)} + 5 = 101.6 \text{ dB (rounded off to 102 dB)}$$

a4) To obtain the A-weighted Octave Band values, apply to each octave-band value the correction factor listed below:

Octave Band Mid Frequency	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
A- weighting	-26	-16	-9	-3	0	+1	+1	-1

(Values rounded off)

L_{woctA4}, A-weighted values, are consequently $L_{woctA4} = L_{woct4}$ - (A-weighting):

71 78 85 92 92 89 85 76

b) Free-outlet selection

If the same fan must be selected in a free-outlet configuration (type A installation) the step will be:

b1) Calculated the value of Δp_{fa} as explained at section 5.2.

Being $\dot{V}/n$ equal to 35,000 / 651 = 54, from the relevant graph 5.2.3 the value Kfa of 0.5 is read:

$$\Delta p_{fa} = \Delta p_{stat} - K_{fa} \cdot \Delta p_{dyn} = 4.5 - 0.5 \cdot 0.64 = 4.18 \text{ In.W.G.}$$

The real obtainable Δp_{stat} pressure is 4.18 In.W.G., 0.32 In.W.G. less than required.

b2) To obtain a Δp_{stat} pressure of 4.5 In.W.G., in a free-outlet configuration, the fan must be selected at:

$$\Delta p_{stat} = 4.5 + 0.32 = 4.82 \text{ In.W.G.}$$

b3) With this new value for Δp_{stat} pressure, fan's performance parameters are now:

n = 674 RPM, L_{wA6} 97.2 dB(A) (rounded off 97 dB(A)), Δp_{dyn} = 0.64 In.W.G. and BHP = 42.89 HP.

c) Free - outlet sound data

From the relevant table, for a ATLI 32-32, the following values for ΔL_{wcorr} can be obtained:

-5 dB at 63 Hz; -1.5 dB at 125 Hz; 0 dB at 250 Hz

As a consequence, the values of L_{woct4}, in a free-outlet configuration, are now:

92 92 94 95 92 88 84 77

Following the same steps as in a4), the A-weighted values can be obtained:

66 76 85 92 92 89 85 76

d) Temperature and altitude correction

If the temperature and altitude, at which the fan will operate are not standard, the pressure values used for the selection must be corrected.

Let's consider the following parameters:

Required Δp_{stat} pressure: 3.6 In.W.G. referred to the following conditions:
Operating temperature: 100°F
Altitude: 4800 ft. a.s.l.
Air volume: 35,000 CFM

From Kρ Air Density Correction Factor table (Graph 5.4) the value of 0.8 is read.

The corrected pressure, to be used for the selection on the performance chart, is therefore:

$$\Delta p_{stat1} = \Delta p_{stat2} / K\rho = 3.6 / 0.8 = 4.5 \text{ In.W.G.}$$

Selection should be made with a Δp_{stat1} equal to 4.5 In.W.G.

We obtain the following operation parameters:

Selected model and size: ATLI 32-32 T2, n = 651 RPM,

$$\text{effective } \Delta p_{dyn2} = \Delta p_{dyn1} \cdot K\rho = 0.64 \text{ In.W.G.} \cdot 0.8 = 0.51 \text{ In.W.G.}$$

Effective absorbed power on fan shaft (corrected value) at that altitude and temperature, will be:

$$P_{w2} = BHP \cdot K\rho = 40.3 \text{ HP} \cdot 0.8 = 32.24 \text{ HP}$$

7. Performance charts

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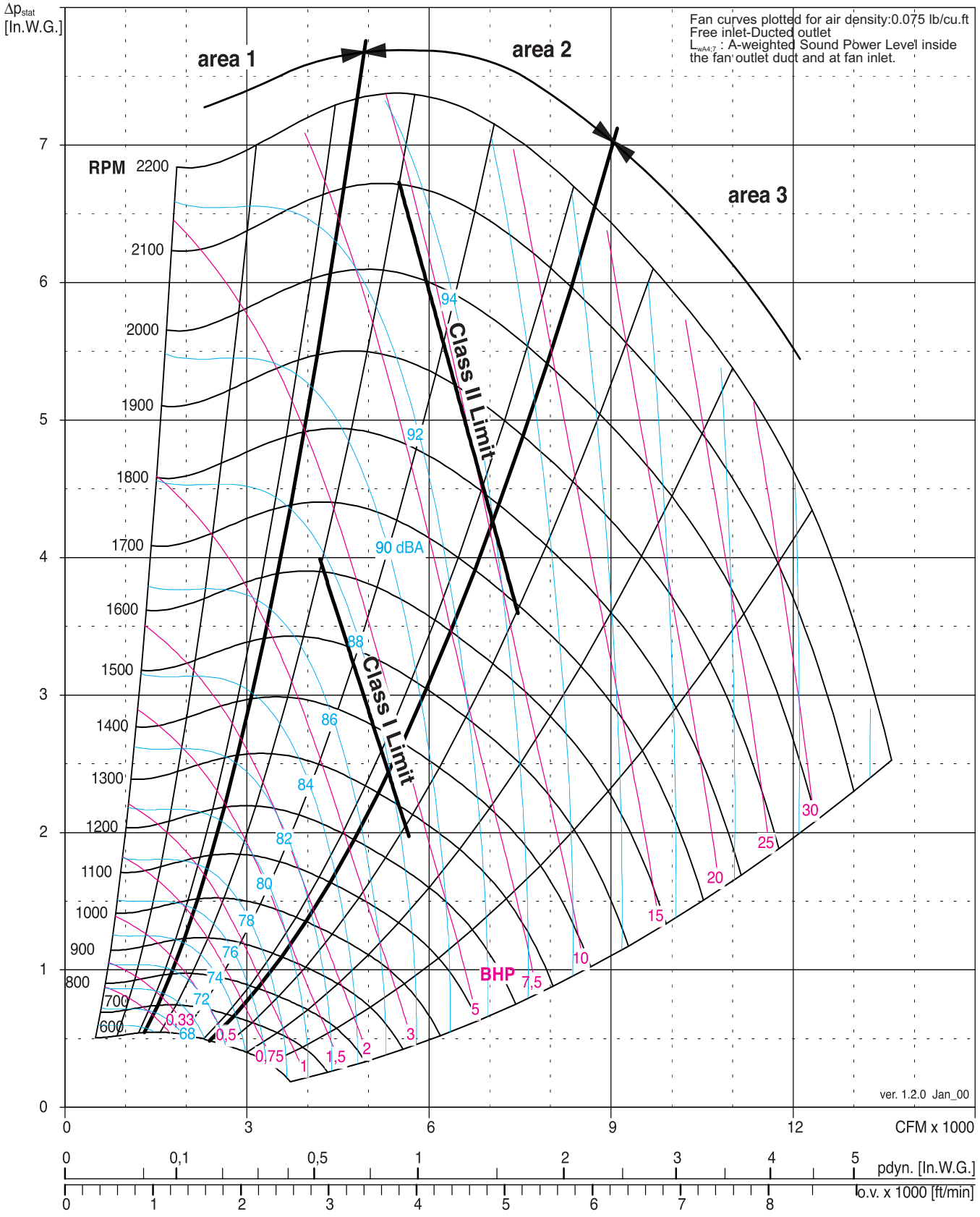
ATLI 12-12	B	R	T1	T2
Fan Max RPM [min^{-1}]	1900	1900	-	2115
Fan Max BHP	4	5	-	12
Fan Outlet Area O.A. [ft^2]	1.45			
Fan weight [Lb]	39.7	50.6	-	70.6
Wheel diameter [in.]	12.8			
Wheel width [in.]	11.46			
Wheel No. Blades	48			
Wheel Moment of Inertia [Lb ft^2]	3.37	3.37	-	3.37
Wheel weight [Lb]	13.85	13.85	-	13.85



ATLI 12-12 B / R / T2

Δp_{stat} [In.W.G]																												
V	0.25		0.5		0.75		1		1.5		2		2.5		3		3.5		4		4.5		5		5.5		6		6.5	
[CFM]	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1000	405	0.06	582	0.14	721	0.23	838	0.33	1031	0.58	1190	0.86	1328	1.19																
1400	414	0.1	573	0.18	707	0.27	823	0.38	1021	0.64	1186	0.93	1329	1.26	1458	1.63	1574	2.02	1682	2.44	1783	2.88	1877	3.35						
1800	435	0.16	579	0.25	702	0.35	812	0.46	1005	0.73	1172	1.03	1318	1.37	1450	1.74	1570	2.14	1681	2.57	1785	3.02	1882	3.5	1974	4	2061	4.51		
2000	448	0.2	587	0.29	704	0.4	810	0.51	999	0.78	1164	1.09	1310	1.44	1443	1.81	1564	2.22	1676	2.65	1781	3.11	1880	3.59	1973	4.09	2061	4.61		
2200	461	0.24	596	0.35	709	0.45	811	0.58	994	0.85	1156	1.16	1302	1.51	1435	1.89	1557	2.3	1670	2.74	1776	3.2	1875	3.68	1970	4.19	2059	4.72		
2400	477	0.29	607	0.41	717	0.52	815	0.65	992	0.92	1151	1.24	1295	1.59	1427	1.98	1549	2.39	1663	2.84	1769	3.3	1869	3.79	1964	4.3	2055	4.84		
2600	493	0.35	619	0.47	726	0.6	821	0.73	993	1.01	1147	1.33	1289	1.69	1420	2.08	1541	2.5	1655	2.95	1761	3.42	1862	3.91	1958	4.43	2049	4.96		
2800	512	0.42	631	0.55	736	0.68	829	0.82	995	1.11	1146	1.44	1284	1.8	1413	2.19	1534	2.62	1647	3.07	1753	3.54	1854	4.04	1950	4.56	2042	5.1		
3000	533	0.49	645	0.63	747	0.77	838	0.92	1000	1.22	1146	1.56	1282	1.92	1408	2.32	1527	2.75	1639	3.2	1745	3.68	1846	4.18	1942	4.71	2034	5.26		
3200	555	0.58	659	0.73	759	0.88	848	1.03	1006	1.34	1149	1.69	1281	2.06	1405	2.46	1522	2.89	1633	3.35	1738	3.84	1838	4.34	1934	4.87	2026	5.42	2114	6
3400	578	0.68	674	0.83	771	0.99	859	1.15	1014	1.48	1153	1.83	1282	2.21	1403	2.62	1518	3.05	1627	3.52	1732	4	1831	4.52	1926	5.05	2018	5.61	2106	6.18
3600	603	0.78	691	0.95	785	1.12	871	1.28	1023	1.63	1159	1.99	1285	2.38	1403	2.79	1516	3.23	1624	3.7	1726	4.19	1825	4.71	1919	5.24	2010	5.8	2098	6.39
3800	628	0.9	709	1.07	799	1.25	883	1.43	1032	1.79	1166	2.16	1289	2.56	1405	2.98	1516	3.42	1621	3.9	1722	4.39	1820	4.91	1913	5.46	2003	6.02	2090	6.61
4000	654	1.04	728	1.21	813	1.4	896	1.59	1043	1.96	1174	2.35	1295	2.75	1408	3.18	1517	3.64	1620	4.11	1720	4.62	1816	5.14	1908	5.69	1997	6.25	2084	6.84
4200	681	1.19	749	1.36	829	1.56	909	1.76	1054	2.15	1183	2.55	1301	2.96	1413	3.4	1519	3.86	1621	4.35	1718	4.85	1813	5.38	1904	5.94	1992	6.51	2078	7.1
4400	708	1.35	771	1.53	846	1.73	923	1.94	1066	2.35	1193	2.76	1309	3.19	1419	3.64	1523	4.11	1623	4.6	1719	5.11	1812	5.65	1901	6.2	1989	6.78	2073	7.38
4600	735	1.52	793	1.71	863	1.92	938	2.14	1078	2.57	1203	3	1318	3.44	1426	3.9	1528	4.37	1626	4.87	1720	5.39	1811	5.93	1900	6.49	1986	7.08	2069	7.68
4800	763	1.72	817	1.9	882	2.12	953	2.35	1090	2.8	1214	3.24	1327	3.7	1433	4.17	1534	4.66	1630	5.16	1723	5.69	1813	6.24	1900	6.8	1984	7.39	2067	8
5000	791	1.92	841	2.11	902	2.34	970	2.57	1103	3.04	1226	3.51	1338	3.98	1442	4.46	1541	4.96	1636	5.47	1727	6.01	1815	6.56	1901	7.14	1984	7.73	2066	8.34
5200	819	2.15	866	2.34	923	2.57	987	2.81	1117	3.3	1238	3.79	1348	4.27	1451	4.77	1549	5.28	1642	5.8	1732	6.35	1819	6.91	1903	7.49	1985	8.09	2065	8.71
5400	848	2.39	892	2.59	945	2.82	1005	3.07	1131	3.58	1250	4.09	1359	4.59	1461	5.1	1558	5.62	1649	6.15	1738	6.71	1823	7.28	1906	7.87	1987	8.47	2066	9.1
5600	876	2.66	918	2.86	968	3.09	1024	3.34	1146	3.87	1263	4.4	1371	4.92	1472	5.44	1567	5.98	1658	6.53	1745	7.09	1829	7.67	1911	8.27	1991	8.88	2068	9.51
5800	905	2.94	944	3.14	991	3.38	1045	3.64	1161	4.18	1276	4.73	1383	5.27	1483	5.81	1577	6.36	1666	6.92	1752	7.49	1835	8.08	1916	8.69	1995	9.31	2071	9.95
6000	933	3.24	971	3.45	1015	3.68	1065	3.95	1177	4.51	1290	5.08	1395	5.64	1494	6.2	1587	6.76	1676	7.33	1761	7.92	1843	8.52	1922	9.13	2000	9.76	2075	10.4
6200	962	3.56	998	3.77	1040	4.01	1087	4.28	1194	4.86	1304	5.45	1408	6.03	1506	6.6	1598	7.18	1686	7.77	1770	8.37	1851	8.98	1929	9.6	2006	10.2	2080	10.9
6400	991	3.9	1025	4.12	1065	4.36	1110	4.63	1212	5.22	1318	5.83	1421	6.43	1518	7.03	1609	7.62	1696	8.22	1779	8.84	1859	9.46	1937	10.1	2012	10.7	2086	11.4
6600	1020	4.26	1053	4.49	1090	4.73	1133	5.01	1230	5.61	1333	6.24	1434	6.86	1530	7.47	1621	8.09	1707	8.7	1789	9.33	1868	9.96	1945	10.6	2020	11.3	2092	11.9
6800	1049	4.65	1081	4.88	1116	5.13	1157	5.41	1249	6.02	1349	6.66	1448	7.31	1543	7.94	1633	8.57	1718	9.21	1799	9.84	1878	10.5	1954	11.2	2028	11.8		
7000	1079	5.06	1109	5.29	1143	5.55	1181	5.83	1269	6.45	1365	7.11	1462	7.77	1556	8.43	1645	9.08	1729	9.73	1810	10.4	1888	11.1	1963	11.7				
7200	1108	5.49	1137	5.73	1169	5.99	1206	6.27	1289	6.9	1382	7.58	1477	8.26	1569	8.94	1657	9.61	1741	10.3	1821	11	1898	11.6						
7400	1137	5.95	1165	6.19	1196	6.45	1231	6.74	1310	7.38	1400	8.07	1492	8.77	1583	9.47	1670	10.2	1753	10.9	1833	11.5								
7600	1166	6.43	1193	6.68	1223	6.95	1256	7.24	1332	7.88	1418	8.58	1508	9.31	1597	10	1683	10.7	1766	11.4										
7800	1196	6.94	1222	7.19	1251	7.46	1282	7.76	1355	8.41	1437	9.12	1524	9.86	1612	10.6	1697	11.3												
8000	1225	7.48	1250	7.73	1278	8.01	1309	8.3	1378	8.96	1457	9.69	1541	10.4	1627	11.2	1710	12												
8200	1255	8.04	1279	8.3	1306	8.58	1335	8.88	1401	9.54	1477	10.3	1558	11.1	1642	11.8														
8400	1284	8.63	1308	8.89	1334	9.18	1362	9.48	1425	10.2	1498	10.9	1577	11.7																
8600	1314	9.25	1337	9.52	1362	9.81	1389	10.1	1450	10.8	1519	11.5																		
8800	1343	9.9	1366	10.2	1390	10.5	1416	10.8	1474	11.5																				
9000	1373	10.6	1395	10.9	1418	11.2	1443	11.5																						
9200	1402	11.3	1424	11.6	1446	11.9																								

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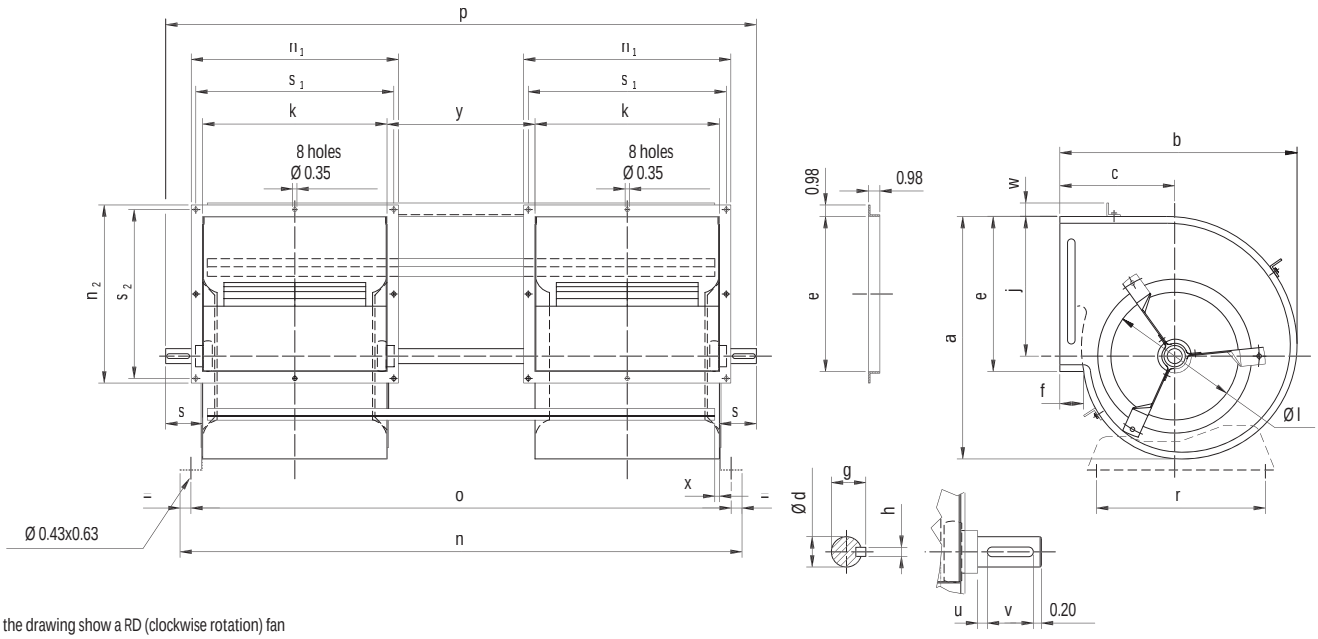
SOUND DATA TABLE

Fan Model and Size	Fan Performance Area	Range of fan speed	ΔL_{W4}	ΔL_{wct4} 63	ΔL_{wct4} 125	ΔL_{wct4} 250	ΔL_{wct4} 500	ΔL_{wct4} 1000	ΔL_{wct4} 2000	ΔL_{wct4} 4000	ΔL_{wct4} 8000
ATLI 12-12	Area 1	RPM < 444	**15.7**	15	5	1	-4	-6	-12	-20	-29
		445 <RPM< 888	**15.6**	15	5	-2	-2	-5	-12	-20	-29
		889 <RPM< 1750	**14.1**	13	6	0	-5	-5	-10	-15	-24
		RPM > 1751	**14.3**	13	7	1	-6	-5	-8	-12	-21
	Area 2	RPM < 444	**11.7**	10	3	3	-3	-5	-10	-16	-26
		445 <RPM< 888	**11.5**	10	4	-2	-2	-5	-10	-15	-26
		889 <RPM< 1750	**7.3**	5	-1	-3	-5	-4	-9	-12	-19
		RPM > 1751	**7.1**	5	-2	-3	-6	-7	-6	-9	-16
	Area 3	RPM < 444	**8.9**	7	0	-1	-4	-5	-8	-10	-19
		445 <RPM< 888	**8.7**	7	0	-5	-4	-5	-8	-9	-18
		889 <RPM< 1750	**7.9**	6	-1	-4	-6	-5	-7	-9	-13
		RPM > 1751	**6.0**	3	-1	-5	-8	-7	-6	-8	-12

13.1. ATLI 9-4 BL to 18-18 BL



note: the drawing show a RD (clockwise rotation) fan

	a	b	c	Ø d	e	f	g	h	j	k	Ø l	n	n_1	n_2
ATLI 9-4 BL	15.22	15.03	7.36	3/4" RI	10.30	1.57	0.83	3/16"	8.46	6.81	7.80	20.93	8.78	12.01
ATLI 9-6 BL	15.22	15.03	7.36	3/4" RI	10.30	1.57	0.83	3/16"	8.46	8.27	7.80	24.99	10.24	12.01
ATLI 9-7 BL	15.22	15.03	7.36	3/4" RI	10.30	1.57	0.83	3/16"	8.46	9.13	7.80	27.40	11.10	12.01
ATLI 9-8 BL	15.22	15.03	7.36	3/4" RI	10.30	1.57	0.83	3/16"	8.46	10.43	7.80	31.02	12.40	12.01
ATLI 9-9 BL	15.22	15.03	7.36	3/4" RI	10.30	1.57	0.83	3/16"	8.46	11.73	7.80	34.72	13.70	12.01
ATLI 10-7 BL	17.42	16.84	8.07	3/4" RI	11.36	1.57	0.83	3/16"	9.80	9.69	8.78	28.94	11.65	13.15
ATLI 10-8 BL	17.42	16.84	8.07	3/4" RI	11.36	1.57	0.83	3/16"	9.80	10.43	8.78	30.83	12.40	13.15
ATLI 10-9 BL	17.42	16.84	8.07	3/4" RI	11.36	1.57	0.83	3/16"	9.80	12.24	8.78	36.06	14.21	13.15
ATLI 10-10 BL	17.42	16.84	8.07	3/4" RI	11.36	1.57	0.83	3/16"	9.80	13.03	8.78	38.07	15.00	13.15
ATLI 12-9 BL	20.61	19.40	9.09	1" RI	13.45	1.57	1.11	1/4"	11.65	12.17	10.24	35.71	14.13	15.16
ATLI 12-12 BL	20.61	19.40	9.09	1" RI	13.45	1.57	1.11	1/4"	11.65	15.55	10.24	45.63	17.52	15.16
ATLI 15-11 BL	23.94	22.36	10.39	1" RI	15.87	1.57	1.11	1/4"	13.46	14.69	12.52	42.83	16.65	17.60
ATLI 15-15 BL	23.94	22.36	10.39	1" RI	15.87	1.57	1.11	1/4"	13.46	18.54	12.52	54.25	20.51	17.60
ATLI 18-13 BL	29.06	26.89	12.36	1" RI	18.78	1.57	1.11	1/4"	16.34	17.36	15.47	50.31	19.33	20.51
ATLI 18-18 BL	29.06	26.89	12.36	1" RI	18.78	1.57	1.11	1/4"	16.34	21.93	15.47	63.82	23.90	20.51

	o	p	r	s	s_1	s_2	u	v	w	x	y	max RPM	max BHP
ATLI 9-4 BL	19.99	24.80	11.81	2.92	7.99	11.22	0.44	1.77	0.59	0.079	5.34	2250	2.00
ATLI 9-6 BL	24.04	28.94	11.81	2.96	9.45	11.22	0.48	1.77	0.59	0.079	6.49	2215	2.50
ATLI 9-7 BL	26.46	31.22	11.81	2.89	10.31	11.22	0.41	1.77	0.59	0.079	7.17	2250	3.00
ATLI 9-8 BL	30.07	34.96	11.81	2.96	11.61	11.22	0.48	1.77	0.59	0.079	8.18	2200	3.00
ATLI 9-9 BL	33.78	38.70	11.81	2.97	12.91	11.22	0.49	1.77	0.59	0.079	9.29	2000	3.00
ATLI 10-7 BL	27.99	33.27	13.39	3.15	10.87	12.36	0.67	1.77	0.59	0.079	7.60	2100	3.00
ATLI 10-8 BL	29.88	35.43	13.39	3.29	11.61	12.36	0.81	1.77	0.59	0.079	7.99	2100	3.00
ATLI 10-9 BL	35.12	40.55	13.39	3.23	13.43	12.36	0.75	1.77	0.59	0.079	9.60	1900	3.00
ATLI 10-10 BL	37.13	42.68	13.39	3.29	14.21	12.36	0.81	1.77	0.59	0.079	10.04	1700	3.00
ATLI 12-9 BL	34.76	39.61	16.06	2.93	13.35	14.37	0.63	1.77	1.18	0.079	9.41	1900	4.00
ATLI 12-12 BL	44.69	49.45	16.06	2.89	16.73	14.37	0.59	1.77	1.18	0.079	12.56	1500	4.00
ATLI 15-11 BL	41.89	46.57	19.49	2.85	15.87	16.81	0.55	1.77	1.18	0.079	11.50	1600	4.00
ATLI 15-15 BL	53.31	58.15	19.49	2.93	19.72	16.81	0.63	1.77	1.18	0.079	15.20	1100	4.00
ATLI 18-13 BL	49.37	55.12	23.94	3.39	18.54	19.72	0.49	2.36	1.18	0.079	13.62	1100	4.00
ATLI 18-18 BL	62.87	68.90	23.94	3.52	23.11	19.72	0.63	2.36	1.18	0.079	17.99	750	4.00

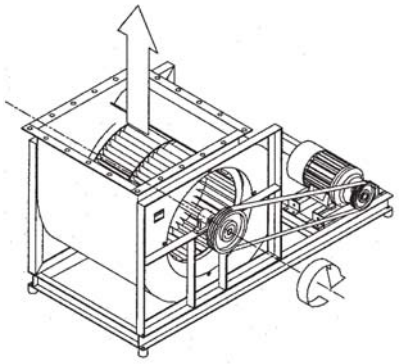
RI = self-aligning bearings, single row, deep groove ball type with eccentric locking ring mounted in a **R**ubber **I**nterliner

14. Rotation, discharge and accessory positions

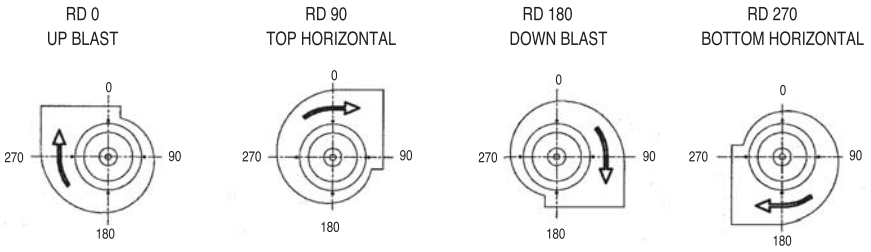
14.1. Rotation and discharge position

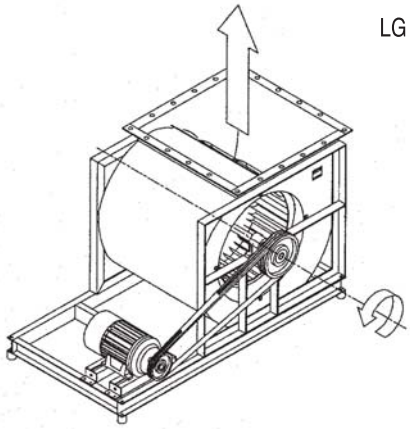
The fan direction of rotation, when seen from drive side is:
a) clockwise, if indicated with the symbol RD, or
b) counter-clockwise if indicated with the symbol LG

The fan discharge position is indicated by the rotation symbol (RD or LG) and, then, by the angle with respect to the reference line perpendicular to the mounting surface(e.g. RD 90)

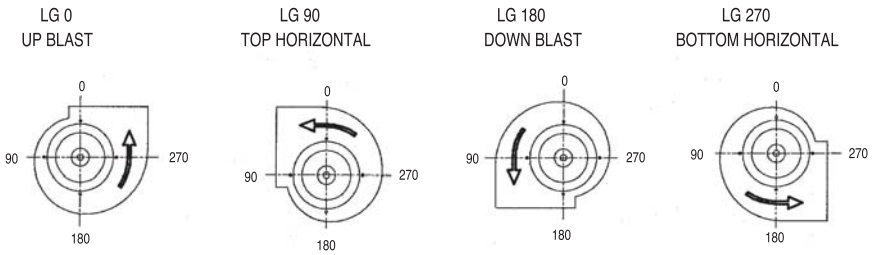


RD - CLOCKWISE

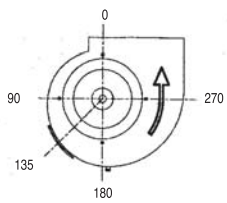




LG - COUNTER CLOCKWISE



LG 0



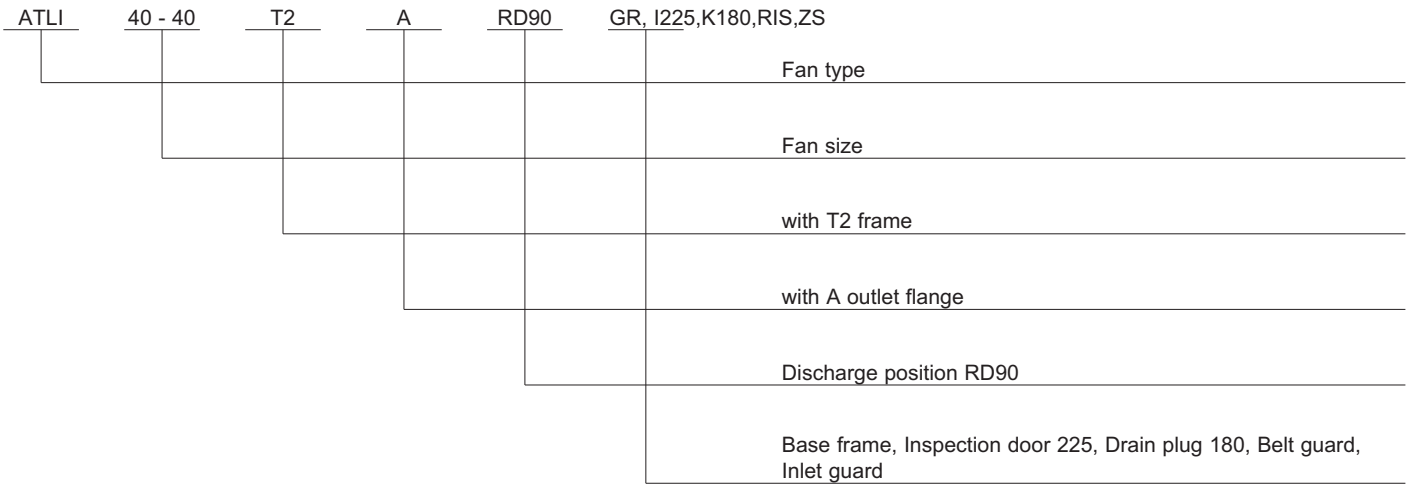
14.2. Accessory Positions

The position indicated, gives the rotation RD or LG, by the angle measured in degrees, with respect to the reference perpendicular line to the mounting surface.

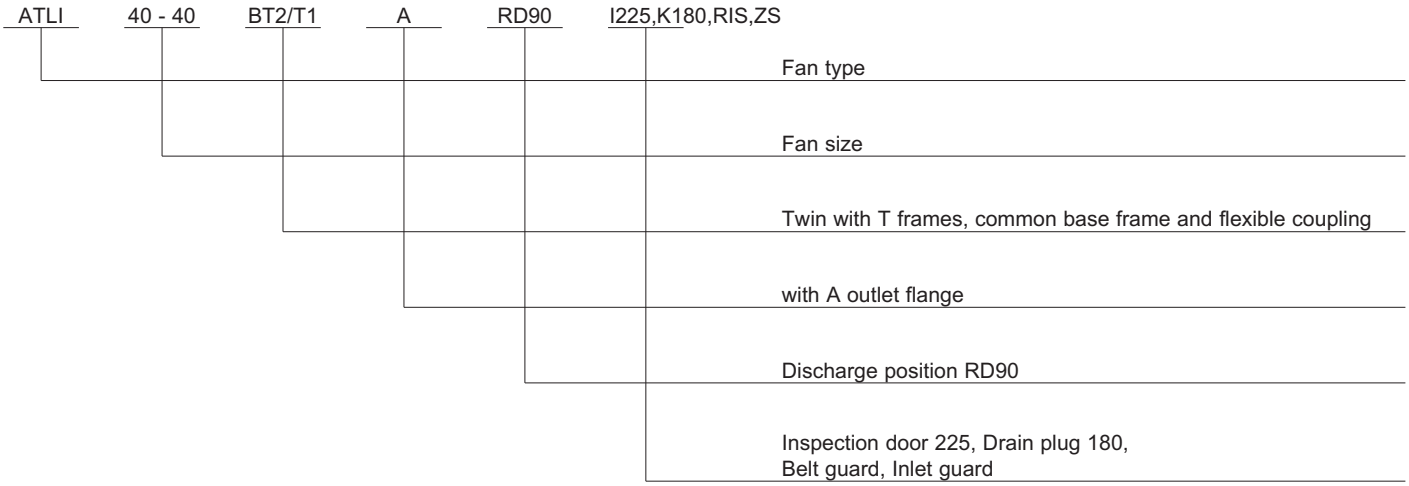
Example: Fan LG 0
Drain plug 180
Inspection door 135

15. Reference code / example

Double inlet forward curved fan - ATLI



Twin forward curved fan - ATLI-B



CUSTOM AIR PRODUCTS & SERVICES, INC.
35 Southbelt Industrial Drive • Houston, Texas 77047
(713) 460-9009 • Fax (713) 460-9499
www.customairproducts.com

SECTION

03

EVAPORATOR COIL

Customer:	Custom Air Products	Date:	2/16/2015
Contact:	Mr. Andrew Hubley	From:	Matthew Merrill
Telephone:	713-460-9009	Company:	DE McElhany and Assoc
Cell:		Return Tel:	817-251-1708
Fax:	713-460-9499	Return Fax:	817-251-1904
Job:	20 Ton Jetson Evap	Email:	matthew.merrill@luvatasales.com
Quote #:			

Construction

Item:	20 Ton Evap
Coils Per Bank:	1
Tube OD IN:	1/2
Style:	EJ
Fins Per Inch:	Optimize
Rows:	6
Fin Surface:	Optimize ABC
Fin Height (IN):	25.00
Finned Length (IN):	36.00
Tubing Mat. (IN):	0.016 Copper Rifled
Fin Mat. (IN):	0.0060 Aluminum
Circuiting:	-15
Face Area (SQ FT):	6.25

Air Side

Air Flow (Sft^3/min)	2770.0
Altitude FT:	0.00
Ent. Air DB/WB °F:	95.00 / 80.00
Lvg. Air DB/WB °F:	0.00 / 0.00
Total / Sensible MBH:	255.0 / 0.00
Max Air PD "H2O:	0.00

Refrigerant Side

Refrigerant:	410A
Super Heat °F:	20.00
Saturated Suction Temp °F:	45.00
Liquid Temp °F:	110.0

OUTPUT DATA				OPTIONS	
Model Number:		4EJ1306C		Casing Material:	Galvanized
Air Velocity:	(Sft/min)	443.2		Casing Type:	Flanged
Total Capacity:	MBH	258.9		Hand:	Right
Sens. Capacity:	MBH	125.2		Connection Material:	Copper
Lvg. Air DB:	°F	53.15		ByPass Kit Quantity:	2
Lvg. Air WB:	°F	53.15		ByPass Kit Size:	0
Standard APD	"H2O	0.83		Label Kit:	No
Code 18/19:		7008/10		Coating: None	
Code 18/19_2:		7007/10		Mounting Holes:	No
Suction Conn.:	IN	(2) 1.375		Drain Headers:	No
Distributor Conn 1:	IN	(1) 0.875		Boxed Headers:	No
Distributor Conn 2:	IN	(1) 0.875			
Refg. PD:	lbf/in^2	3.48			
Refg. Velocity:	ft/min	1396.3			
Internal Volume:	in^3	1033.0			
Weight:	lbm	122.5			
Notes:		CJMU			

Notes:

C) Coil is NOT certified by AHRI.
J) Coil Will Be Supplied With Multiple Distributors.
M) Coil rating valid for Heatcraft coils only.
U) User-entered circuiting. Check circuiting for dropped tubes or opposite-end connections

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CUSTOM AIR PRODUCTS & SERVICES, INC.
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www.customairproducts.com

SECTION

04

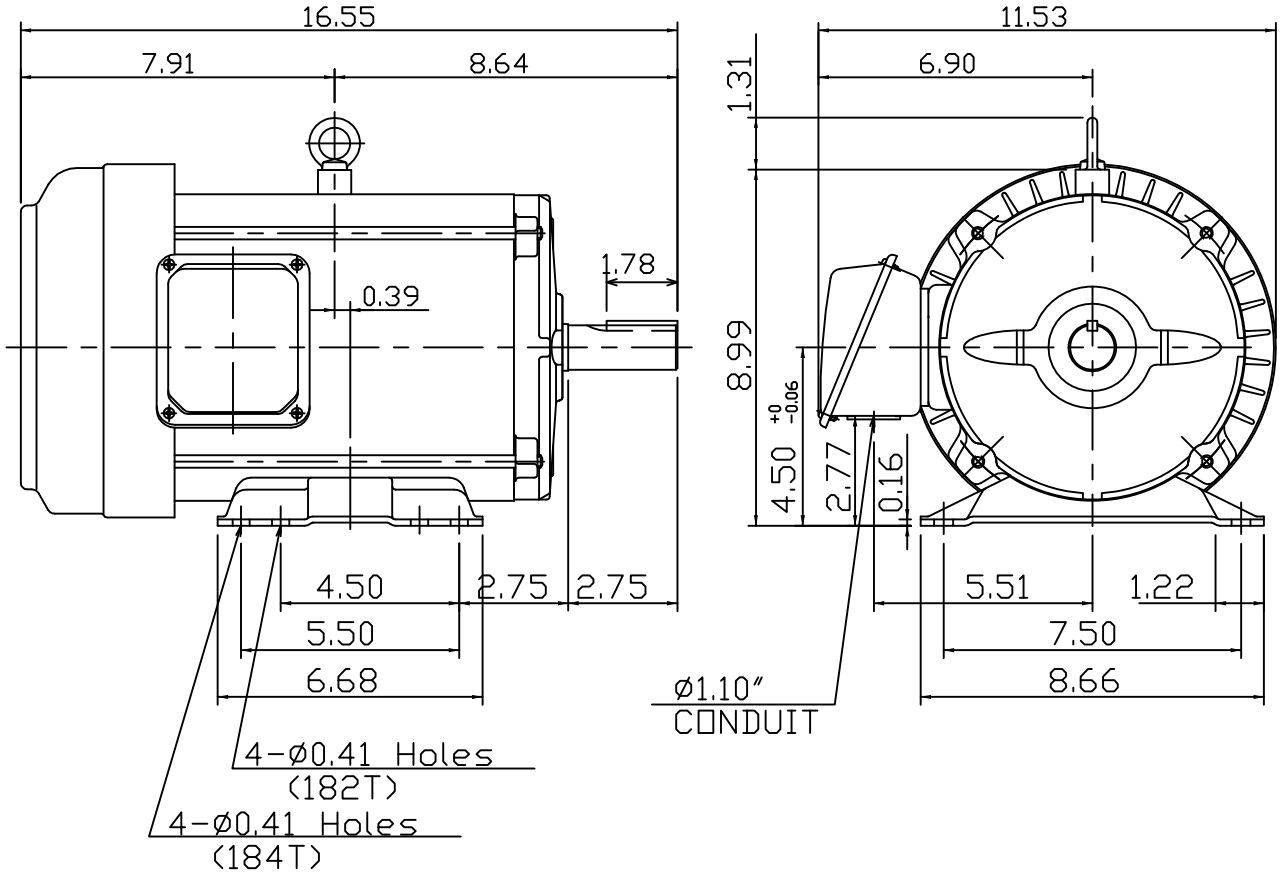
CONDENSOR FAN & MOTOR SELECTION

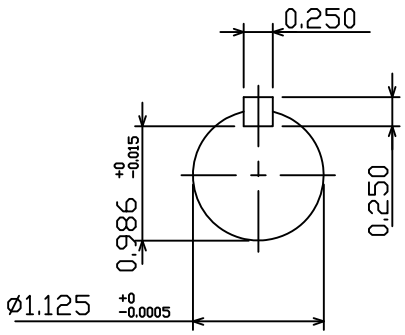
DATE	OUTLINE DIMENSIONS	MOTOR TYPE:
MAY 28, 2009	3-PHASE INDUCTION MOTOR	AEGH
CATALOG # GP0026		FRAME NO. 184T

Pole	HP	kW	Hz	VOLT	Syn.Speed r/min(rpm)
6	2	1.5	60	230/460	1200

Ins	Rating	Dimension in	Approx Weight	Bearings
F	CONT.	inches	84 lbs.	DE: 6206ZZC3 NDE: 6205ZZC3

Totally Enclosed Fan-Cooled Type. Squirrel-Cage Rotor.





0				

DWN.	J.H.LIANG	04-28-08	TECO Westinghouse	DWG NO. 31049R171010
CHKD.	H.C.YAN	05-05-08		
APPD.	M.C.TSAI	05-05-08		

TECO Westinghouse

ISSUED	PERFORMANCE DATA	ENCLOSURE
12/27/13	3-PHASE INDUCTION MOTOR	TEFC
TYPE		CATALOG#
AEGH		GP0026

NAMEPLATE INFORMATION

OUTPUT HP	OUTPUT KW	POLE	FRAME SIZE	VOLTAGE	HZ	RATED AMBIENT	INS. CLASS	NEMA DESIGN	TIME RATING	SERVICE FACTOR
2	1.49	6	184T	230/460	60	40°C	F	B	CONT.	1.15

TYPICAL PERFORMANCE

FULL LOAD RPM	EFFICIENCY				POWER FACTOR			MAXIMUM POWER FACTOR CORRECTION
	FULL LOAD MIN. %	FULL LOAD NOM. %	3/4 LOAD %	1/2 LOAD %	F. L. %	3/4 LOAD %	1/2 LOAD %	
1165	86.5	88.5	87.5	85.5	64.5	53.0	41.0	1.52 KVAR

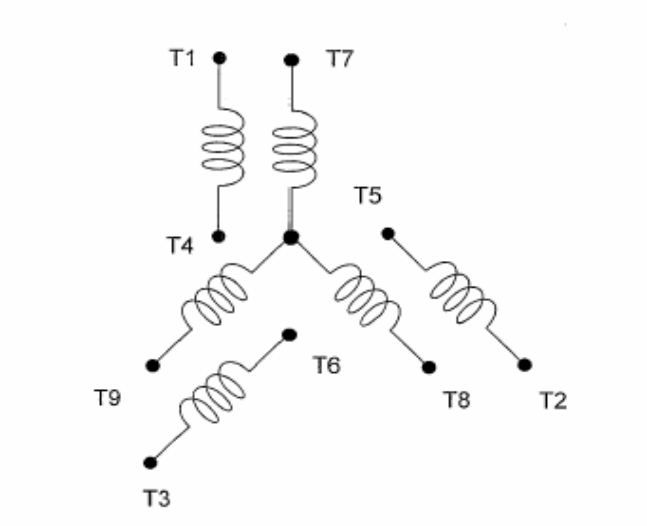
CURRENTS									NEMA KVA CODE LETTER
NO LOAD			FULL LOAD			LOCKED ROTOR			
AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	
3.68	4.50	2.25	7.25	6.56	3.28	45.22	50.00	25.00	L

TORQUE				INERTIA			ACCEL TIME	
FULL LOAD lb-ft	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	ROTOR WR^2 lb-ft^2	NEMA LOAD WK^2 lb-ft^2	MAX ALLOWABLE WK^2 lb-ft^2	NEMA LOAD WK^2 Sec	MAX ALLOWABLE WK^2 Sec
9.01	160	150	270	0.419	30	90	6.23	18.52

SAFE STALL TIME IN SECONDS		ALLOWABLE STARTS PER HOUR		SOUND PRESSURE LEVEL @ 3 FT dB(A)
COLD	HOT	COLD	HOT	
95	67	2	1	50

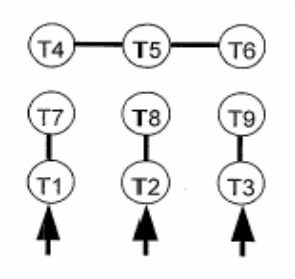
APPROVED:	M. PRATER	DRAWING NO.	31057GP0026	REVISION 0

DATE: May 29, 2009	CONNECTION DIAGRAM	CATALOG NO.: GP0026

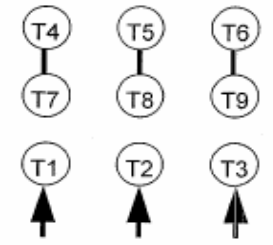


SCHEMATIC - 2Y/Y CONNECTION

ACROSS THE LINE CONNECTION



LINE
230 VOLT CONNECTION



LINE
460 VOLT CONNECTION

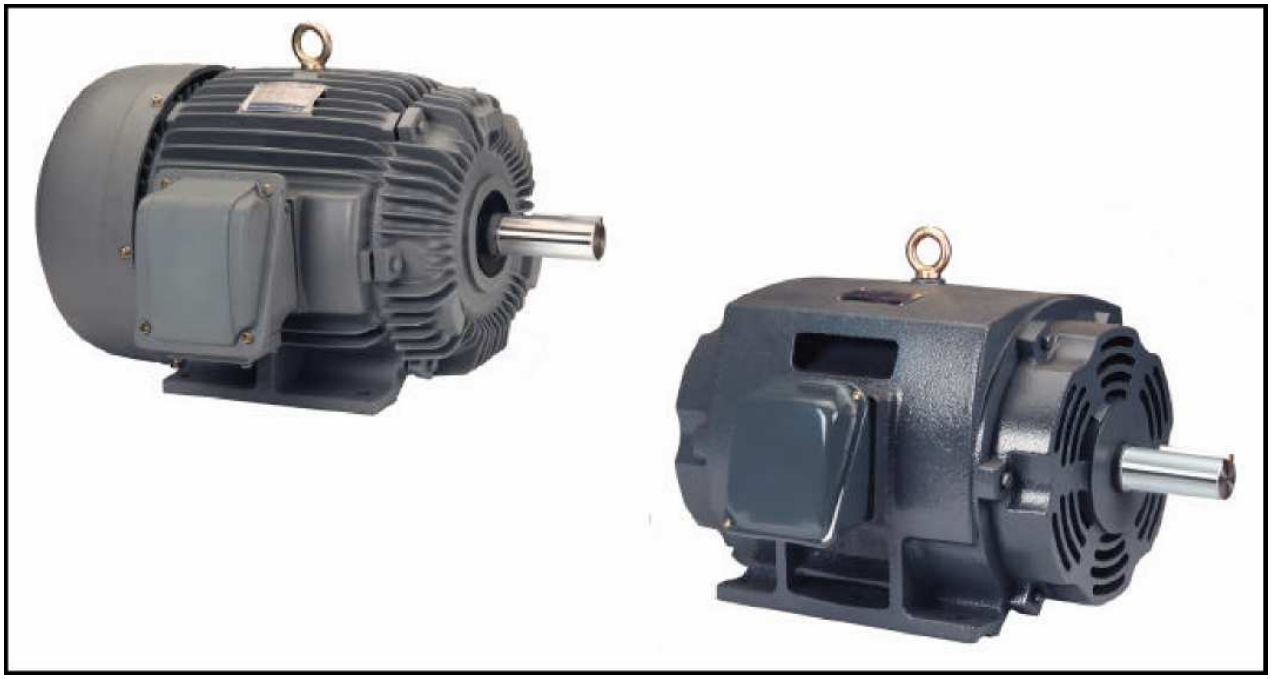
TECO Westinghouse

DWG NO.
DAC-1566-2

TECO Westinghouse

INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR THREE PHASE INDUCTION MOTORS

Frames 143T - 449TZ



5100 North IH 35 Round Rock, Texas 78681

RECEIVING

1. Check nameplate data.
2. Check whether any damage has occurred during transportation.
3. After removal of shaft clamp, turn shaft by hand to check that it turns freely.
4. If motor is to be reshipped (alone or installed to another piece of equipment) the shaft must again be clamped to prevent axial movement.
   Note: Remove the bearing clamp before turning the shaft on 284T-449TZ frame motors.

WARNING
THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED:

1. Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG-1; Safety Standards for Construction and Guide Selection. Installation and Use of Electric Motors and Generators; National Electric Code and all local safety requirements.
2. When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at standstill.
3. Lifting means, when supplied, are intended for lifting the motor only. When two lifting devices are supplied with the motor a dual chain must be used.
4. Suitable protection must be used when working near machinery with high noise levels.
5. Safeguard or protective devices must not be by-passed or rendered inoperative.
6. The frame of this machine must be grounded in accordance with the National Electric Code and applicable local codes.
7. A suitable enclosure should be provided to prevent access to the motor by other than authorized personnel. Extra caution should be observed around motors that are automatically or have automatic re-setting relays as they may restart unexpectedly.
8. Shaft key must be fully captive or removed before motor is started.
9. Provide proper safeguards for personnel against possible failure of motor-mounted brake, particularly on applications involving overhauling loads.
10. Explosion proof motors are constructed to comply with the label service procedure manual, repair of these motors must be made by TECO-Westinghouse Motor Company or U/L listed service center in order to maintain U/L listing.

LOCATION

1. Drip-proof motors are intended for use where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. Totally enclosed motors may be installed where dirt, moisture, or dust are present and in outdoor locations.
3. Explosion-proof motors are built for use in hazardous locations as indicated by Underwriters' label on the motor.
4. Chemical duty enclosed motors are designed for installation in high corrosion or excessive moisture locations.

   Note: in all cases, no surrounding structure should obstruct normal flow or ventilating air through or over the motor.

MOUNTING

1. Mount motor securely on a firm, flat base. All ball bearing normal thrust motors up to and including 256T frame size may be side-wall or ceiling mounted; all others check nearest TECO-Westinghouse office for mounting recommendations.
2. Align motor accurately, using a flexible coupling if possible. For drive recommendations, consult with drive or equipment manufacturer, or TECO-Westinghouse.
3. Mounting bolts must be carefully tightened to prevent changes in alignment and possible damage to the equipment. The recommended tightening torque's for medium carbon steel bolts, identified by three radial lines at 120 degrees on the head, are:

Bolt Size	Recommended Torque (Ft-lb.)	
	Minimum	Maximum
2/8	25	37
1/2	60	90
5/8	120	180
3/4	210	320

4. V-belts Sheave Pitch Diameters should not be less than those shown in Table 1 (NEMA recommended values)
5. Tighten belts only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number	Horsepower at Synchronous Speed, RPM				V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	3600	1800	1200	900	Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
143T	1.5	1	.75	.5	2.2	4.25	2.2	2.25
145T	2-3	1.5-2	1	.75	2.4	4.25	2.4	2.25
182T	3	3	1.5	1	2.4	5.25	2.4	2.75
182T	5	...	...	...	2.6	5.25	2.4	2.75
184T	...	...	2	1.5	2.4	5.25	2.4	2.75
184T	5	...	...	...	2.6	5.25	2.4	2.75
184T	7.5	5	...	...	3.0	5.25	3.0	2.75
213T	7.5-10	7.5	3	2	3.0	6.5	3.0	3.375
215T	10	...	5	3	3.0	6.5	3.0	3.375
215T	15	10	...	...	3.8	6.5	3.8	3.375
254T	15	...	7.5	5	3.8	7.75	3.8	4
254T	20	15	...	...	4.4	7.75	4.4	4
256T	20-25	...	10	7.5	4.4	7.75	4.4	4
256T	...	20	...	...	4.6	7.75	4.4	4
284T	...	...	15	10	4.6	9	4.4	4.625
284T	...	25	...	...	5.0	9	4.4	4.625
286T	...	30	20	15	5.4	9	5.2	4.625

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number	Horsepower at Synchronous Speed, RPM				V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	3600	1800	1200	900	Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
324T	...	40	25	20	6.0	10.25	6.0	5.25
326T	...	50	30	25	6.8	10.25	6.8	5.25
364T	...	...	40	30	6.8	11.5	6.8	5
364T	...	60	...	...	7.4	11.5	7.4	5.785
365T	...	...	50	40	8.2	11.5	8.2	5.785
365T	...	75	...	...	9.0	11.5	8.6	5.785
404T	...	...	60	...	9.0	14.25	8.0	7.25
404T	...	...	...	50	9.0	14.25	8.4	7.25
404T	...	100	...	...	10.0	14.25	8.6	7.25
405T	...	...	75	60	10.0	14.25	10.0	7.25
405T	...	100	...	...	10.0	14.25	8.6	7.25
405T	...	125	...	...	11.5	14.25	10.5	7.25
444T	...	...	100	...	11.0	16.75	10.0	8.5
444T	...	...	...	75	10.5	16.75	9.5	8.5
444T	...	125	...	...	11.0	16.75	9.5	8.5
444T	...	150	...	...	...	16.75	10.5	8.5
445T	...	...	125	...	12.5	16.75	12.0	8.5
445T	...	...	...	100	12.5	16.75	12.0	8.5
445T	...	150	...	...	...	16.75	10.5	8.5

*Max. Sheave width = 2(N-W) - .25

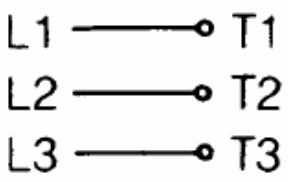
**Max Sheave width = N-W

***Sheave ratios grater than 5:1 and center-to-center distance less than the diameter of the large sheave should be referred to TECO-Westinghouse.

POWER SUPPLY & CONNECTIONS

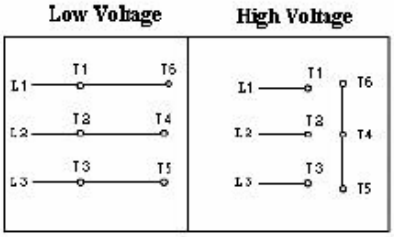
1. Wiring of motor and control, overload protection and grounding should be in accordance with National Electrical Code and all local safety requirements.
2. Nameplate voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within ±10% of nameplate voltage; or frequency with ±5% and with a combined variation not to exceed ±10%. 230-volt motors can be used on 208-volt network systems, but with slightly modified performance characteristics as shown on the nameplate.
3. Dual voltage and single voltage motors can be connected for the desired voltage by following connection diagram shown on the nameplate or inside of the conduit box.
4. All Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent excessive external surface temperature of the motor in accordance with U/L standards. Terminals of thermal protectors (P1 & P2) should be connected to the motor control equipment, according to the connection diagram inside of the conduit box.
5. Standard connection diagram for three phase, not thermally protected, dual rotation motors are shown in diagrams A through E. **(Note: To change rotation, Interchange any two line leads)**

A. 3 Lead, Single Voltage

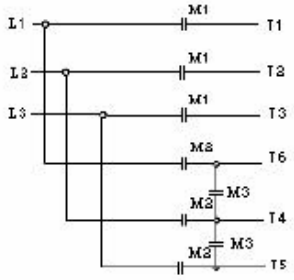


B. 6 Lead, Dual Voltage & Voltage Ration 1 to 3

B-1 Across the Line Start & Run



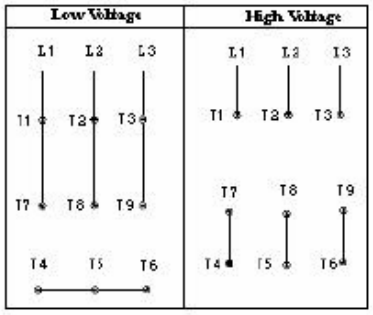
B-2 Wye Start & Delta Run
(Low Voltage only)



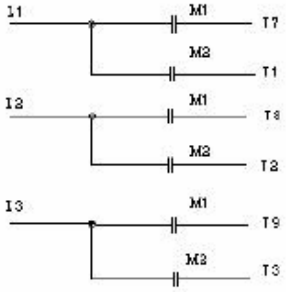
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

C. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Wye Connected

C-1 Across the Line Start & Run



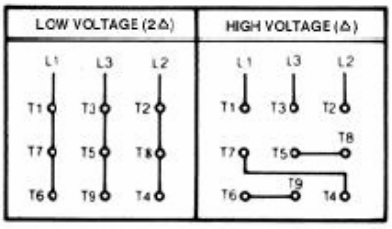
C-2 Part Winding Start
(Low Voltage only)



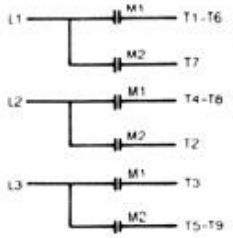
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
Tie Together	(T4-T5-T6)	

D. 9 Leads; Dual Voltage & Voltage Ration 1 to 2, Delta Connected

D-1 Across the Line Start & Run



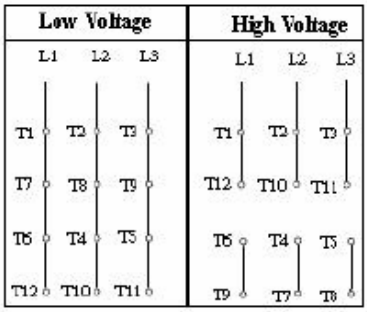
D-2 Part Winding Start
(Low Voltage only)



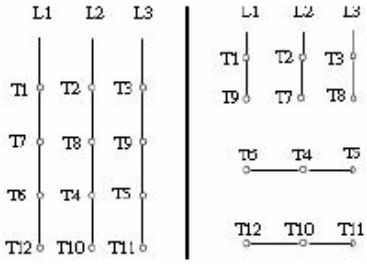
	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE

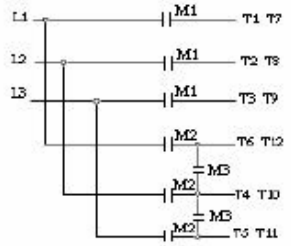
E. 12 Leads, Dual Voltage

E-1 Across the Line Start & Run



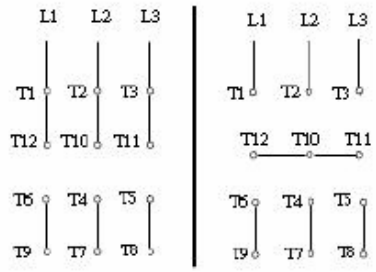
E-2-1 Wye Start & Delta Run (Low Voltage only)

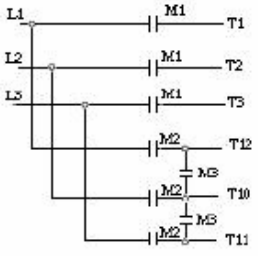




	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

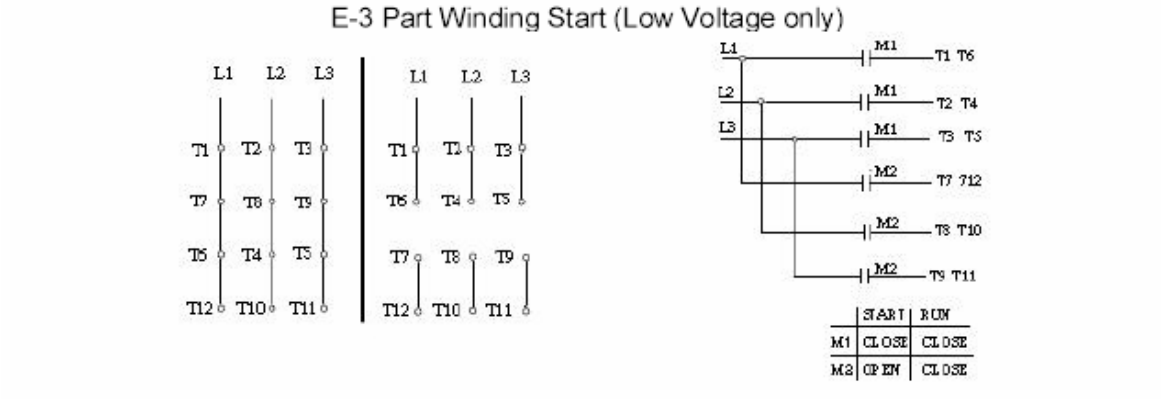
E-2-2 Wye Start & Delta Run (High Voltage only)





	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
M3	CLOSE	OPEN

Tie Together (T4-T7); (T5-T8); (T6-T9)



*Important: For Part Winding Start, M2 contactor should be closed within two (2) seconds after M1 contactor is closed.
Only 4 pole and above (e.g., 6P, 8P...) motors are satisfactory for Part Winding Start at low voltage.

START UP

1. Disconnect load and start motor. Check direction of rotation. If rotation must be changed, ALLOW THE MOTOR TO STOP COMPLETLEY. Interchange any two leads of a three-phase motor.
2. Connect load. The motor should start quickly and run smoothly. If no, shut power off at once. Recheck the assembly including all connections before restarting.
3. If excessive vibration is noted, check for loose mounting bolts too flexible motor support structure or transmitted vibration from adjacent machinery. Periodic vibration checks should be made; foundations often settle.
4. Operate under load for short period of time and check operating current against nameplate.

TESTING

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megometer. Depending on the length and conditions of storage it may be necessary to regrease or change rusted bearings.
If the resistance is lower than one megohm the windings should be dried in one of the following two ways:

1. Bake in oven at temperatures not exceeding 194°F until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase the current through windings until temperature measured with a thermometer reaches 194°F. Do not exceed this temperature.

MAINTENANCE

INSPECTION

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear.

LUBRICATION

1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need re-lubrication, except on MAX-E1® and MAX-E2® products which have re-greasable features.
2. Frames 280TS, 320-449TZ(TS): Motors having grease fittings and grease discharge devices at brackets. Motors are shipped with grease for initial running. It is necessary to re-lubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 2 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

TABLE 2

Horsepower	Standard Conditions	Severe Conditions	Extreme Conditions
1 Thru 30 Hp, 1800 rpm and below	7 years	3 years	180 days
40 Thru 75 Hp, 1800 rpm and below	210 days	70 days	30 days
100 Thru 150 Hp, 1800 rpm and below	90 days	30 days	15 days
1 Thru 20 Hp, 3600 rpm	5 years	2 years	90 days
25 Thru 75 Hp, 3600 rpm	180 days	60 days	30 days
100 Thru 150 Hp, 3600 rpm	90 days	30 days	15 days

Note:

A. Standard conditions: 8 hours operation per day, normal or light loading, clear and 40°C ambient conditions.
B. Severe conditions: 24-hour operation per day or light shock loading, vibration or in dirty or dusty conditions.
C. Extreme conditions: With heavy shock loading or vibration or dusty conditions.
D. For double shielded bearings, above data (lubrication frequency) means that the bearing must be replaced.

3. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease discharge hole.
4. Use the POLYUREA grease unless special grease is specified on the nameplate.
5. If re-lubrication is to be performed with the motor running, stay clear of rotating parts. After re-greasing, allow the motor to run for ten to thirty minutes.

RENEWAL PARTS

1. Use only genuine TECO-Westinghouse renewal parts or as recommended by TECO-Westinghouse Motor Company.
2. When you order renewal parts please specify complete information to TECO-Westinghouse office/agent such as type, frame no., poles, horsepower, voltage, series no., quantity, etc.

FOR FURTHER INFORMATION PLEASE CONTACT

TECO-WESTINGHOUSE MOTOR COMPANY

Round Rock, TX **800-873-8326**

CUSTOM AIR PRODUCTS & SERVICES, INC.
35 Southbelt Industrial Drive • Houston, Texas 77047
(713) 460-9009 • Fax (713) 460-9499
www.customairproducts.com

SECTION

05

CONDENSOR COIL

** PDF file created with demo version of the ComponentOne VSPDF8 control. **

Customer:		Date:	3/31/2014
Contact:		From:	Larry Novak
Telephone:		Company:	Custom Air Products
Cell:		Return Tel:	(713) 460-9009
Fax:		Return Fax:	
Job:		Email:	larryn@customairproducts.com
Quote #:			

Construction

Item :	Condenser
Coils Per Bank :	1
Duty :	Condenser
Style :	CN
Condensing Sections :	1
Tube OD IN:	3/8
Fins Per Inch:	12
Rows :	4
Fin Surface :	B
Circuiting :	Optimize
Fin Height IN:	36.00
Finned Length IN:	37.00
Tubing Material:	0.012 Copper Rifled
Fin Material:	0.0075 Aluminum
Face Area (SQ FT):	9.25

Air Side

Air Flow -S ft^3/min:	7,450.00
Altitude FT:	0
Ent. Air DB °F:	95.00
Lvg. Air DB °F:	0.00
✓ Total Capacity MBH:	164.30
Max Air PD "H2O:	0.00

Refrigerant Side

Refrigerant Type:	410A
Condensing Temp. °F:	125.00
Vapor Temp. °F:	189.00
Subcooling Temp. °F:	15.00
% Condensing Load:	

OUTPUT DATA		Most Economical			Specified Coil		
		Coil 1	Coil 2	Coil 3	Coil 4 ✓	Coil 5	Coil 6
Model Number					**3CN1204B**		
Air Velocity -S	ft/min				**805.41**		
Total Capacity	MBH				**165.36**		
Leaving Air DB	°F				**115.47**		
Standard APD	"H2O				**0.81**		
Refrigerant PD	lbf/in^2				**4.09**		
Refg. Mass Flow	lbm/hr				**1841.05**		
Leaving Refg.	°F						
Circuits					**9.00**		
Subcooling Temp.	°F				**15.02**		
Fixed Subcool	MBH				**0.00**		
Liquid Conn. Size	IN				**(1) 0.88**		
Vapor Conn. Size	IN				**(1) 1.13**		
Tubes of Liquid					**15.49**		
Internal Volume					**626.37**		
Weight	lbm				**125.81**		
Notes					**M**		

Notes:

M) Coil rating valid for Heatcraft coils only.

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SECTION

06

COMPRESSOR SELECTION

ZP122KCE-TFD-XXX

460 Volts, 60 Hz, 3 Phase
R-410A, Dew-Point, Air Conditioning

Emerson Climate Technologies

Summary

Electrical

Median Voltage (V)	High Voltage (V)	Phase	Frequency (Hz)	RPM	
	460	3	60	0	

Maximum Continuous Current - MCC (Amps)	Maximum Operating Current (Amps)	Rated Load Amps - RLA		Locked Rotor Amps - LRA		
		MCC / 1.4: Use For Contractor Selection	MCC / 1.56: Use For Breaker & Wire Size Selection	Low	High	Half Winding
25	21.6	17.9	16.0		140.0	

Mechanical

Overall Dimensions			Mounting Dimensions			Suction Connection		Discharge Connection	
Length (in)	Width (in)	Height (in)	Length (in)	Width (in)	Height (in)	Size (in)	Type	Size (in)	Type
10.61	10.33	22.02	7.50	7.50	22.77	1-1/8	Sweat	0.875	Sweat

Displacement

No. of Cylinders	Bore (in)	Stroke (in)	Displacement (in³/Revolution)	Displacement (ft³/hr)	Horse Power (HP)	Drawing	Weight (lb)
			6.85	832.80		497-1128-00	108

Oil Type	Initial Charge (oz)	Recharge (oz)	Agency Information		
			UL File No.	UL File Date	CSA File No.
3MA	85	81			

Sound and Vibration

Average Sound Power Level (dBA)	Maximum Sound Power Level (dBA)	Average Vibration Peak-Peak (mils)	Maximum Vibration Peak-Peak (mils)	Average Discharge Pulse Peak-Peak (psig)	Maximum Discharge Pulse Peak-Peak (psig)

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Emerson Climate Technologies

March 28, 2014

Performance: Specific Point

Rating Conditions

20 °F Superheat
15 F Subcooling
95 °F Ambient Air Over

Compressor Information

Compressor Model:	ZP122KCE-TFD	Phase:	3
Refrigerant:	R-410A - Dew Pt.	Frequency (Hz):	60
Volts:	460	Application:	Air Conditioning
RLA (MCC/1.4) (Amps):	17.9	MCC (Amps):	25.0
RLA (MCC/1.56) (Amps):	16.0	LRA:	140
HP:	NA		

Inputs

Condensing Temperature (°F):	125.0	Evaporator Superheat (°F):	20.0
Evaporator Temperature (°F):	45.0	Compressor Superheat (°F):	20.0
Return Gas Temperature (°F):	65.0	Total Subcooling (F):	15

Results

Compressor Capacity (Btu/hr):	129,000	Refrigerant Flow Rate (lb/hr):	1,835.0
Net Refrigeration Effect (Btu/hr):	129,000	Current (Amps):	16.2
Power (W):	10,350	Isentropic Efficiency (%):	76.0
Compressor EER (Btu/Wh):	12.46	Liquid Temp. (°F):	109.8
Evaporator EER (Btu/Wh):	12.46	Discharge Temp. (°F):	189.0
		Condenser Heat Rejection (Btu/hr)	164,325

Noties Neti Refrigeration Capacitiy is tihe amounti of useful cooling delivered tio refrigeratied space

Discharge Temperatiure Estimation Accuracy ±10 °F.

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Rating Conditions

20 °F Superheat

15 F Subcooling

95 °F Ambient Air Over

60 Hz Operation

AIR CONDITIONING

ZP122KCE-TFD

HFC-410A

COPELAND SCROLL®

TFD 460-3-60

Condensing Temperature °F (Sat. Dew Pt. Pressure, psig)		Evaporating Temperature °F (Sat. Dew Pt. Pressure, psig)									
		-10.0 (36)	**0.0** (48)	**10.0** (62)	**20.0** (78)	**30.0** (97)	**40.0** (118)	**45.0** (130)	**50.0** (143)	**55.0** (156)
150.0 (613)	**C**						93,100	103,500	114,000	125,500
	P						13,950	13,950	13,950	13,950
	A						20.3	20.3	20.3	20.4
	M						1,625	1,790	1,960	2,140
	E						6.7	7.4	8.2	9.0
	%						67.9	70.0	71.9	73.3
140.0 (541)	**C**					83,800	103,500	114,000	125,500	138,000
	P					12,350	12,350	12,350	12,400	12,400
	A					18.4	18.4	18.5	18.5	18.5
	M					1,360	1,650	1,810	1,980	2,160
	E					6.8	8.4	9.3	10.2	11.1
	%					66.8	71.4	73.1	74.4	75.3
130.0 (477)	**C**				74,000	92,100	113,000	124,000	136,500	149,500
	P				10,900	10,900	10,950	11,000	11,000	11,050
	A				16.7	16.8	16.8	16.9	16.9	16.9
	M				1,125	1,385	1,670	1,830	1,995	2,170
	E				6.8	8.5	10.3	11.3	12.4	13.6
	%				65.4	70.6	74.2	75.3	76.0	76.1
120.0 (418)	**C**			64,100	80,800	99,800	121,500	133,500	146,500	160,500
	P			9,600	9,640	9,680	9,730	9,760	9,810	9,870
	A			15.3	15.4	15.4	15.5	15.5	15.6	15.6
	M			924	1,150	1,400	1,690	1,845	2,010	2,190
	E			6.7	8.4	10.3	12.5	13.7	15.0	16.3
	%			63.6	69.4	73.6	75.9	76.3	76.1	75.3
110.0 (365)	**C**		54,300	69,600	87,000	107,000	130,000	142,500	156,500	171,000
	P		8,460	8,510	8,550	8,600	8,670	8,720	8,780	8,860
	A		14.1	14.2	14.2	14.3	14.3	14.4	14.5	14.5
	M		750	946	1,165	1,415	1,700	1,860	2,030	2,200
	E		6.4	8.2	10.2	12.5	15.0	16.4	17.8	19.3
	%		61.2	67.6	72.4	75.3	76.1	75.5	74.3	72.3
100.0 (318)	**C**	44,900	58,800	74,500	92,700	113,500	137,500	151,000	165,500	181,000
	P	7,430	7,500	7,550	7,600	7,660	7,760	7,830	7,910	8,010
	A	13.1	13.2	13.2	13.3	13.3	13.4	13.5	13.6	13.7
	M	597	770	962	1,180	1,425	1,710	1,870	2,040	2,220
	E	6.1	7.9	9.9	12.2	14.8	17.8	19.3	21.0	22.6
	%	57.9	65.1	70.5	74.1	75.4	74.2	72.5	70.0	66.7
90.0 (274)	**C**	48,700	62,800	79,000	97,900	120,000	145,000	159,500	174,500	191,000
	P	6,600	6,660	6,710	6,770	6,860	6,990	7,080	7,180	7,310
	A	12.3	12.4	12.4	12.5	12.5	12.7	12.8	12.9	13.0
	M	614	782	970	1,185	1,435	1,720	1,875	2,050	2,230
	E	7.4	9.4	11.8	14.5	17.5	20.8	22.6	24.3	26.1
	%	61.7	67.9	72.0	74.0	73.5	69.8	66.8	62.8	57.9
80.0 (236)	**C**	51,900	66,300	83,200	103,000	126,000	152,500	167,500	183,500	201,000
	P	5,870	5,920	5,980	6,050	6,170	6,340	6,450	6,580	6,740
	A	11.7	11.7	11.8	11.8	11.9	12.1	12.2	12.3	12.4
	M	622	786	972	1,185	1,435	1,725	1,885	2,050	2,240
	E	8.9	11.2	13.9	17.0	20.4	24.1	26.0	27.9	29.8
	%	64.0	69.0	71.8	71.9	69.0	62.5	57.9	52.2	45.6

C: Capacity (Btu/hr), P: Power (W), A: Current (Amps), M: Mass Flow (lb/hr), E: EER (Btu/Wh), %: Isentropic Efficiency (%)

Nominal Performance Values (±5%) based on 72 hours run-in. Subject to change without notice. Current @ 460 V

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Printed 3/31/2014

Autogenerated Compressor Performance

12-3493

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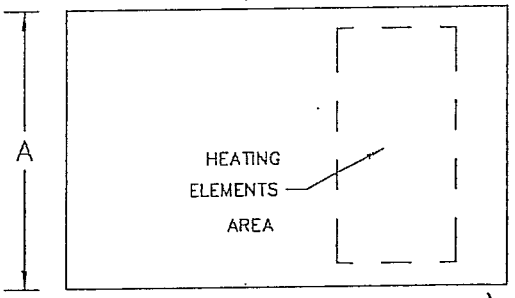
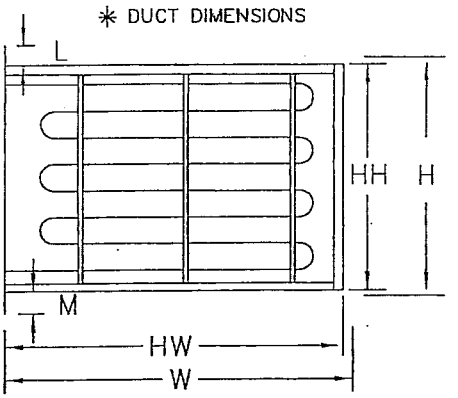
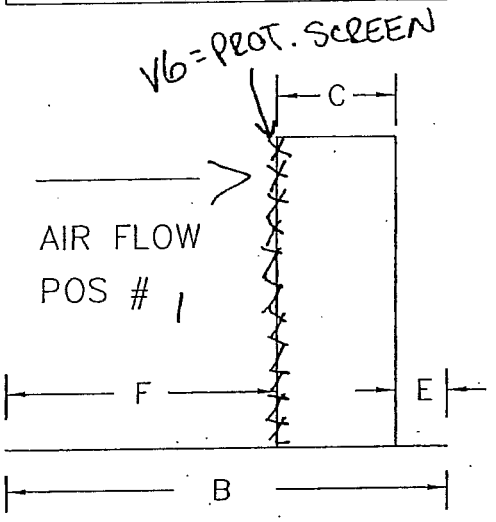
SECTION

07

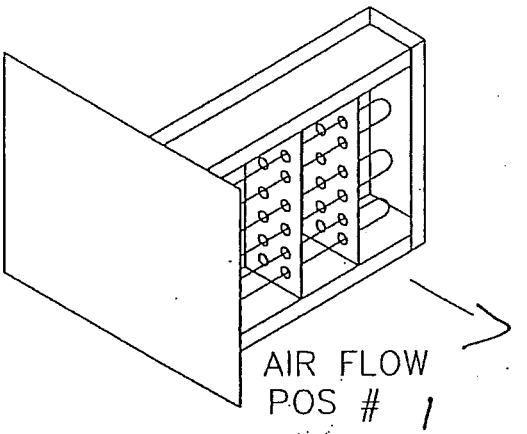
HEATER SELECTION







"FLAT PLATE"



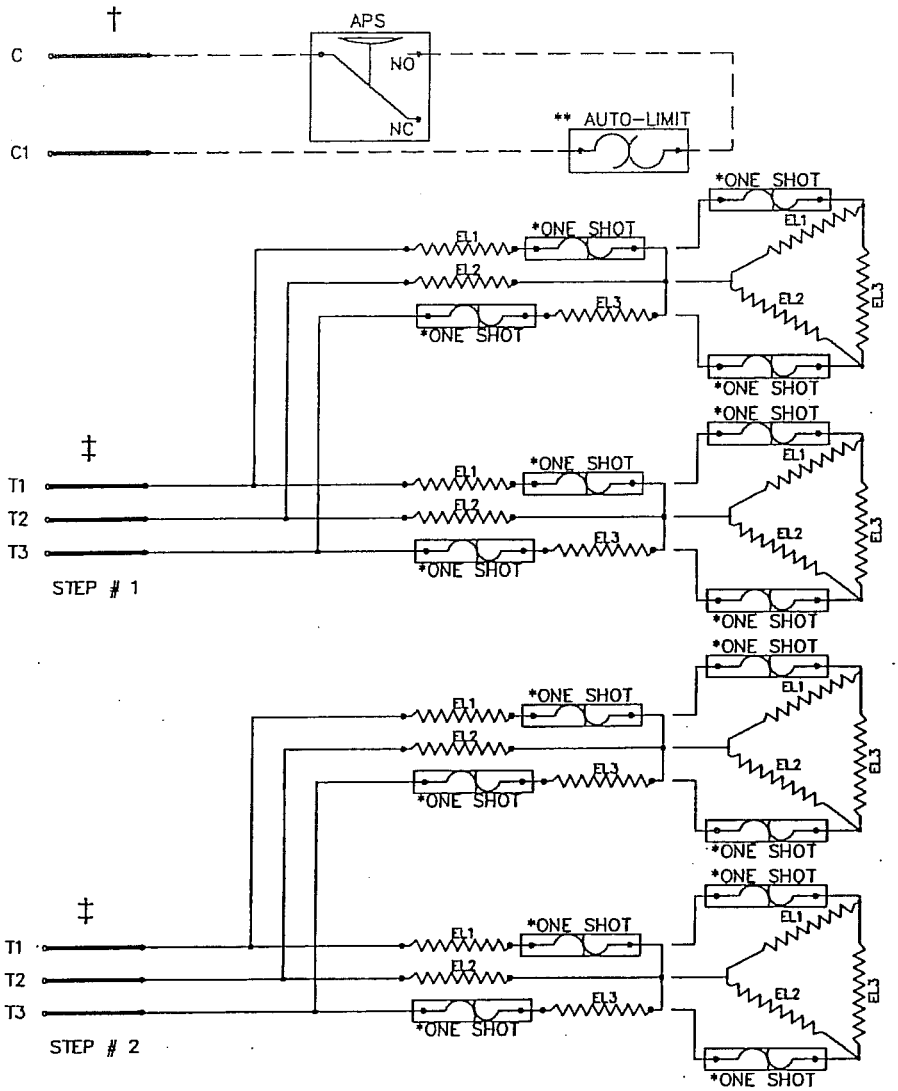
WARREN TECHNOLOGY	
Aprv. by ED TROUT	WRN
Rev. by R. MOLINA	POSITIONAL DRAWING
Date : 01/27/11	

flat plate pos1

ALL DIMENSIONS ARE +/- 1/4"

Customer: COSTOM AIR PRODUCTS Q# I# 211854

Item	A	B MAX	C MAX	D	E	F	L	M	W*	HW	H*	HH
1	10	13	11	0	1	B-(E+C)	0	0	60	$59\frac{3}{4}$	10	$9\frac{7}{8}$



HO ☒
RP ☐
Model # CBK☐

Serial #	211854-1
Kilowatts	72
Volts/Ph/Hz	480 / 3/⏥ / 60
Control Volts	24
Steps	2
Heater Amps	86.6
Heater Fuses	N/A
System Amps.	N/A
VA	5
Min. Vel.	1150 ft/min
Min. Wire Ga. CU	NO. 2 AWG
Control Wiring	- - - - - - - - -
ower Wiring	———
Other Wiring	———

If replacement thermal limits are needed:
* Replace "one shot" safety with L300-60FXX04
** Replace "auto limit" with type 60TX11-L145
*** Replace "manual reset" with type 60TX15-L175

All wiring: use copper wire only suitable for min. 75° C Field Wiring, NEC Class 1.

Conductors between control panel & heater section
† Use qty 2 of 16 AWG for control wiring
‡ Use qty 6 of 6 AWG for power wiring

Conductors for main power to control panel
Use qty 3 of 2 AWG copper only.

Typical Wiring Diagram

WARREN TECHNOLOGY

Aprv. by D. VEGA	WRN
Rev. by M. REEVES	CBK-
Date: 5/27/2011	

211854-1

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SECTION

08

MISC. COMPONENTS

HVAC

1-ABS Series

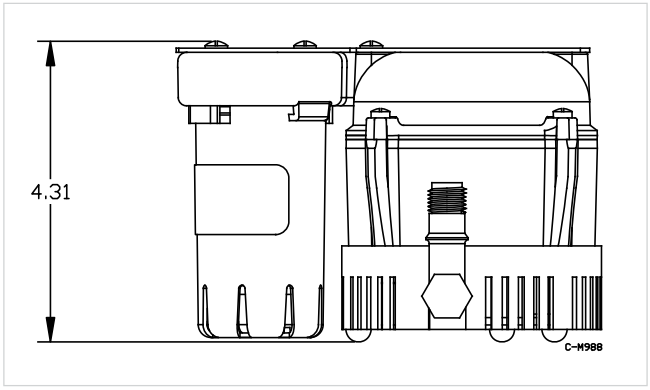
Applications:

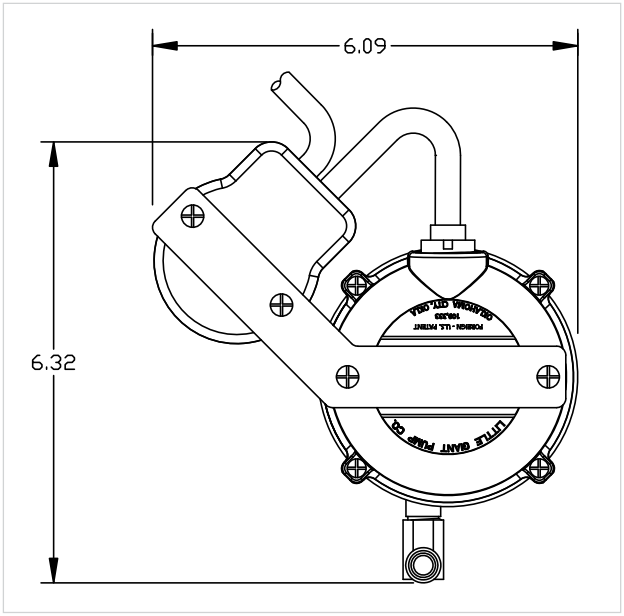
- Ideal for in-pan placement for condensate removal

Features:

- Permanently lubricated and designed to maximize heat dissipation
- Epoxy coated cast aluminum housing
- Automatic, in-pan design
- Advanced non-mercury mechanical switch
- On level: 2.5", Off level: 1.5"
- 1/4" MNPT discharge
- 10' maximum lift

Dimensional Outlines:





Specifications:

Item #	Model	Discharge	HP	Volts	Hertz	Amps	Watts	Performance (GPH @ Head)			Shut Off	PSI	Power Cord	Weight
								1'	3'	5'				
1-ABS	550520	1/4"	1/150	115	60	1.1	70	205	180	145	10'	4.3	9'	3.5
1-ABS	550530	1/4"	1/150	230	50/60	0.6/0.5	70	205	180	145	10'	4.3	11'	3.75

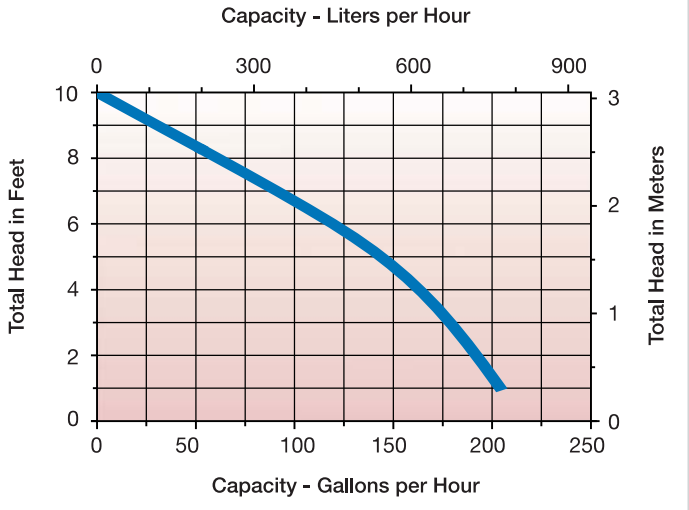
Construction:

Motor: 1/150 HP
Liquid Temperature: Up to 120°
Intake: N/A
Discharge: 1/4" MNPT
Housing: Epoxy coated cast aluminum
Cover: Epoxy coated cast aluminum
Volute: Nylon
Impeller: Nylon
Shaft Seal: Nitrile
Screen: Polyethylene
Switch Bracket: Stainless Steel

Replacement Parts

Volute: 116375
Impeller: 116437
Seal Ring: 928007
Screen: 101376

Performance:



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Little GIANT®
Pumps. People. Partnerships.

VT7600 Series
Programmable & Non-Programmable Thermostats For Commercial HVAC Applications

(Issue Date June 17, 2008 – 028-0132 R8

Product overview

The VT7600 PI thermostat family is specifically designed for single stage and multi-stage control of heating/cooling equipment such as rooftop and self-contained units. The product features an intuitive, menu-driven, back-lit LCD display which walks users through the programming steps, making the process extremely simple. Accurate temperature control is achieved due to the product's PI time proportional control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based thermostats.

Fia.1 - VT7600 Series

All models contain two digital inputs, which can be set by the user to monitor filter status, activate a remote temporary occupancy switch, and/or used as a general purpose service indicator. In addition, depending on the model, up to three remote sensor inputs are available. All models contain a SPST auxiliary switch, which can be used to control lighting or disable the economizer function and a discharge air sensor input. For more advanced applications, an economizer control logic has been integrated onto the thermostat for use with proportional damper economizer actuators.

The additional following documentation is available on www.viconics.com

- Information on the LON models (VT76xxX1000E), is available on document ITG-VT7600-LON-Exx
- Information on the BACnet models (VT76xxX1000B), is available on document ITG-VT7600-BAC-Exx
- Information on the Wireless models (VT76xx0X1000W), is available on documents: *ITG-VWG-40-BAC-Exx* and *LIT-VWG-40-SETUP-Exx*

Models available

Application	1 Heat / 1 Cool	2 Heat / 2 Cool	2 Heat / 2 Cool with economizer	3 Heat / 2 Cool heat pump
Model (programmable)	VT7652A1000	VT7652B1000	VT7656B1000	VT7652H1000
Model (non-programmable)	VT7600A1000	VT7600B1000	VT7605B1000	VT7600H1000

Features and benefits

Features	Benefits
• PI time proportioning algorithm	⇒ Increased comfort , accuracy, and energy savings
• 2 digital inputs	⇒ Adds functionality
• Smart fan	⇒ Saves energy during night mode
• Unique configuration key	⇒ Minimizes parameter tampering
• Lockable keypad	⇒ Tamper proof, no need for thermostat guards
• Freeze protection	⇒ Prevents costly freeze damage
• EEPROM memory	⇒ No loss of program
• 6 hour reserve time for clock	⇒ No need to reprogram day/time after power shortage
• Remote room and outdoor temperature sensor	⇒ Increase flexibility and functionality
• Auxiliary output	⇒ Can be used for lighting and/or economizer override
• Discharge air sensor	⇒ Can be used to monitor unit efficiency
• Intuitive, menu-driven programming (7 day, 2/4 events - on programmable models only)	⇒ Can be used for all types of establishments
• Economizer output (0-10 V d.c.) (on economizer models only)	⇒ Excellent retrofit opportunities
• Low/High balance point (on heat pump models only)	⇒ Protect and optimize systems performances
• 3 Heat/2 Cool (on heat pump models only)	⇒ Support single and two stages heat pump with one auxiliary heat stage

Theory of operation

The VT7600 uses a Viconics proprietary adaptive logic algorithm to control the space temperature. This algorithm controls the heating / air conditioning system to minimize overshoot while still providing comfort. It provides exceptional accuracy due to its unique PI time proportioning control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based on/off thermostats.

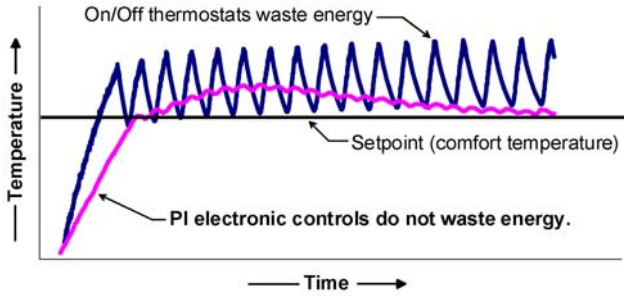


Fig.2 - On/Off mechanical control vs PI electronic control.

Features overview

- 7 day programmable models, 2 or 4 events
- Gas/oil or electric system compatibility for all type of applications
- Remote indoor averaging sensing capability
- Temperature averaging with 2, 3, 4, 9 or 16 sensors
- Remote outdoor sensing capability for added flexibility
  - System mode lock out
  - Heat pump balance point settings
- Remote discharge air sensor input for monitoring purpose
  - System efficiency feedback
- Lockable keypads for tamper proofing. No need for thermostat guards
- Automatic frost protection to prevents costly freeze damage
- Anti short cycle and minimum on/off run time protection. Reduces wear and maximizes life span of mechanical equipment.
- 2 programmable digital inputs for added flexibility. Each input can be programmed as the following:
  - **None:** No function will be associated with the input
  - **Service:** a backlit flashing **Service** alarm will be displayed on the thermostat LCD screen when the input is energized. It can be tied in to the AC unit control card, which provides an alarm in case of malfunction.
  - **Filter:** a backlit flashing **Filter** alarm will be displayed on the thermostat LCD screen when the input is energized. It can be tied to a differential pressure switch that monitor filters
  - **Rem NSB:** remote NSB timer clock input. Will disable the internal scheduling of the thermostat. The scheduling will now be set as per the digital input. The menu part related to scheduling is disabled and no longer accessible. It provides low cost setback operation via occupancy sensor or from a dry contact
  - **RemOVR:** temporary occupancy contact. Disables all override menu function of the thermostat. . The override function is now controlled by a manual remote momentarily closed contact. When configured in this mode, the input operates in a toggle mode.

    With this function enabled it is now possible to toggle between unoccupied & occupied setpoints for the amount of time set by parameter (TOccTime) temporary occupancy time.

- Programmable smart fan operation saves energy during night mode
- Non volatile EEPROM memory prevents loss of parameters during power shortage
- Built in default profile set-up for easier start up and commissioning
- Configurable SPST output relay on programmable models for lighting, exhaust fan or fresh air control
- 6 hour typical reserve time for clock in case of power loss
- 0 to 10 Vdc economizer output for more retrofit opportunities
  - Built in dry bulb economizer logic using outdoor temperature sensor
  - Input for supply/mixed air temperature sensor

Heat pump model specific features

- Selectable single or dual stage compressor stages
- High balance point:
  Locks out auxiliary heating when outside air temperature is above this value
- Low balance point:
  Locks out heat pump compressor operation when outside air temperature is below this value
- Comfort/economy mode:
  In economy mode, heat pump use is maximized before turning On auxiliary heating
- Compressor/auxiliary interlock:
  Adds flexibility by locking out heat pump operation during auxiliary heating to prevent high pressure trip when the coil is downstream of the auxiliary heat source.

Installation

- Remove security screw on the bottom of thermostat cover.
- Open up by pulling on the bottom side of thermostat.
- Remove Assembly and remove wiring terminals from sticker. **(Fig. 3)**
- Please note the FCC ID and IC label installed in the cover upon removal of cover for the wireless products.

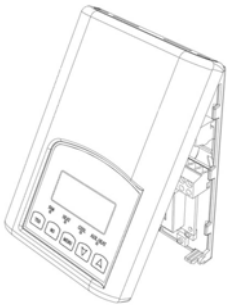


Fig.3

A) **Location:**

1- Should not be installed on an outside wall.
2- Must be installed away from any heat source.
3- Should not be installed near an air discharge grill.
4- Should not be affected by direct sun radiation.
5- Nothing must restrain vertical air circulation to the thermostat.

B) **Installation:**

1- Swing open the thermostat PCB to the left by pressing the PCB locking tabs. **(Fig. 4)**
2- Pull out cables 6" out of the wall.
3- Wall surface must be flat and clean.
4- Insert cable in the central hole of the base.
5- Align the base and mark the location of the two mounting holes on the wall. Install proper side of base up.
6- Install anchors in the wall.
7- Insert screws in mounting holes on each side of the base. **(Fig. 4)**
8- Gently swing back the circuit board on the base and push on it until the tabs lock it.
10- Strip each wire 1/4 inch.
11- Insert each wire according to wiring diagram.
13- Gently push back into hole excess wring **(Fig. 5)**
14- Re-Install wiring terminals in correct location. **(Fig. 5)**
15- Reinstall the cover (top side first) and gently push back extra wire length into the hole in the wall.
16- Install security screw.

Location of PCB retaining tabs

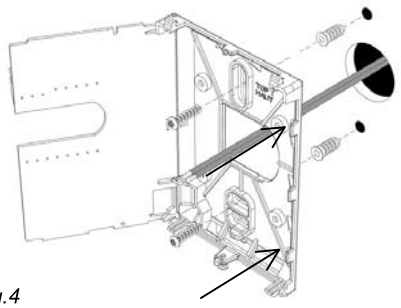


Fig.4

Re-install terminal blocks

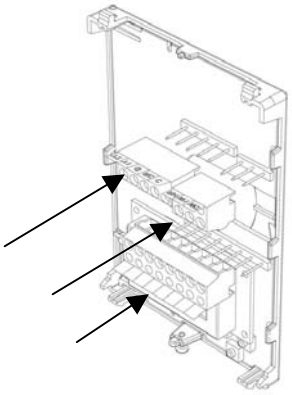


Fig.5

Thermostat assembly
(VT7300F1000 shown)

Fig.6

- If replacing an old thermostat, label the wires before removal of the old thermostat.
- Electronic controls are static sensitive devices. Discharge yourself properly before manipulation and installing the thermostat.
- Short circuit or wrong wiring may permanently damage the thermostat or the equipment.
- Anti-short cycling can be set to 0 minutes for equipment that posses their own anti cycling timer. Do not use that value unless the equipment is equipped with such internal timer. Failure to do so can damage the equipment.
- All VT7600 series thermostats are to be used only as operating controls. Whenever a control failure could lead to personal injury and/or loss of property, it becomes the responsibility of the user to add safety devices and/or alarm system to protect against such catastrophic failures.

Wiring

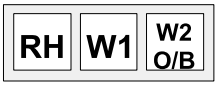
Terminal identification

	Multistage				1H / 1C			Heat Pump	
Part Number	VT7656B	VT7605B	VT7652B	VT7600B	VT7652A	VT7600A	Part Number	VT7652H	VT7600H
Programmable	Yes	No	Yes	No	Yes	No	Programmable	Yes	No
Top left terminal block							**Top left terminal block**		
Y2	X	X	X	X			Y2	X	X
Y1	X	X	X	X	X	X	Y1	X	X
G	X	X	X	X	X	X	G	X	X
RC	X	X	X	X	X	X	RC	X	X
C	X	X	X	X	X	X	C	X	X
Top right terminal block							**Top right terminal block**		
RH	X	X	X	X	X	X	RH	X	X
W1	X	X	X	X	X	X	W1	X	X
W2	X	X	X	X			O/B	X	X
Bottom terminal block							**Bottom terminal block**		
Econo	X	X							
Aux	X	X	X	X	X	X	Aux	X	X
DI1	X	X	X	X	X	X	DI1	X	X
DI2	X	X	X	X	X	X	DI2	X	X
RS	X	X	X	X	X	X	RS	X	X
Scom	X	X	X	X	X	X	Scom	X	X
OS	X	X	X	X	X	X	OS	X	X
MS	X	X	X	X	X	X	MS	X	X

Screw terminal arrangement

5 pole left top connector

3 pole left top connector



8 pole bottom connector

Wiring notes:

Note 1: If the same power source is used for the heating stages, install jumper across RC & RH. Maximum current is 2.0 amps.

Note 2: If auxiliary output is used to toggle occupancy of the electronic control card inside the equipment, configure the relay parameter (Aux cont) to the N.O. setting. A second relay can be added for additional functionality of the occupancy output.

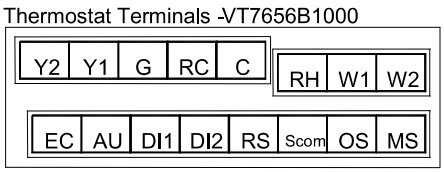
Note 3: Economizer output uses a half bridge rectifier. Reference of the control signal is the common of the power supply of the thermostat. (terminal C)

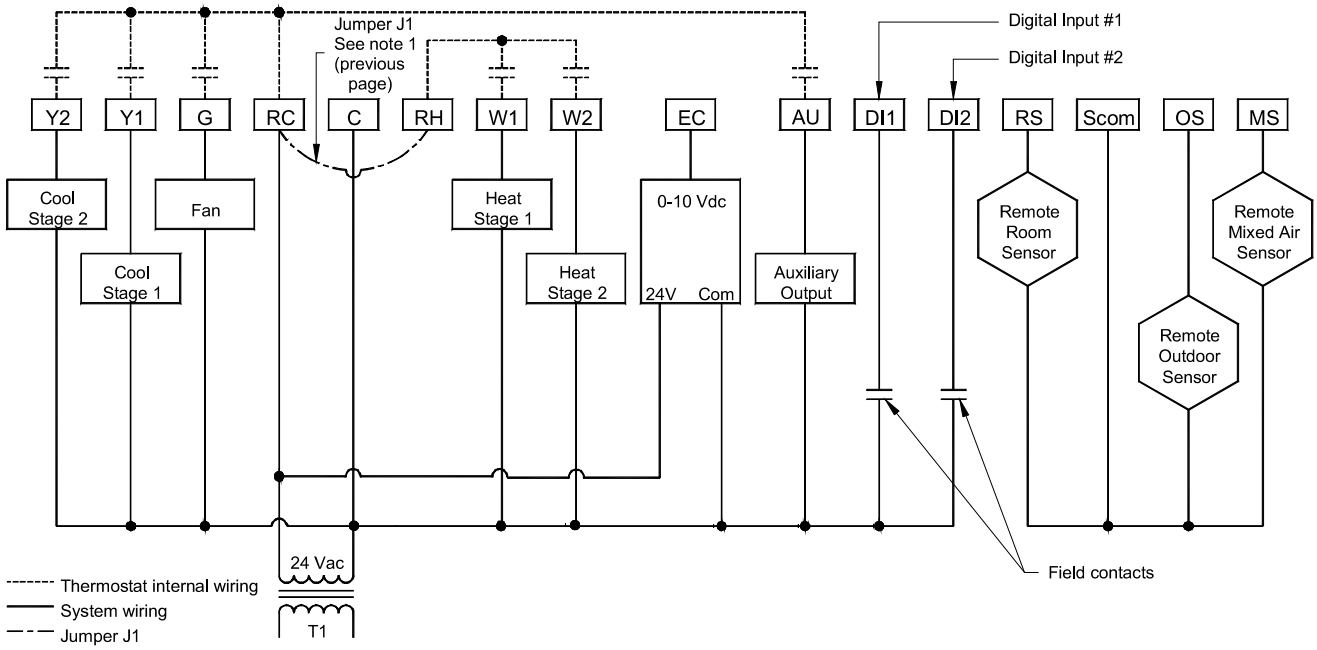
Note 4: Electromechanical contacts are to be used with the digital inputs. Electronic triacs cannot be used as mean of switching for the input. The switched leg to the input for the input to activate is terminal C (common)

Note 5: The transformer of the unit provides power to the thermostat and the additional loads that will be wired to the thermostat.

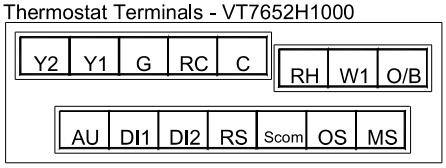
Detailed wiring diagrams for selected models

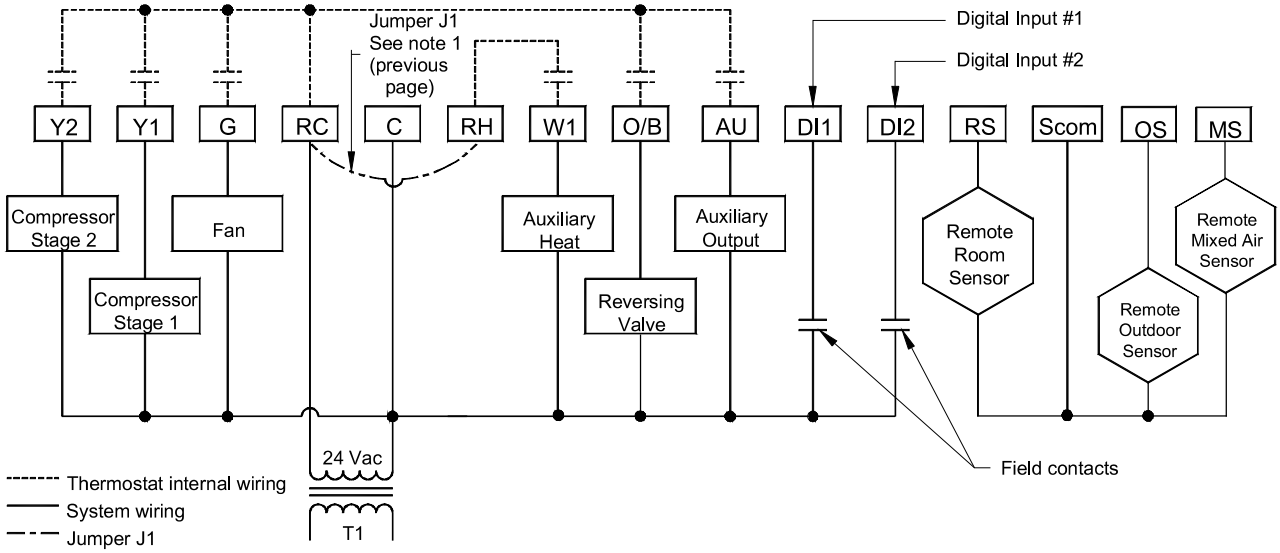
VT7656B1000
2 Heat / 2 Cool / Economizer / Programmable





VT7652H1000
Heat pump / Programmable





Remote sensor accessories

Model no.	Description
S3010W1000	Wall mounted temperature sensor
S3020W1000	Wall mounted temperature sensor with override button and occupancy status LED
S2020E1000	Outdoor temperature sensor
S2060A1000	Averaging temperature sensor
S2000D1000	Duct mounted temperature sensor

Fig.8 – S3020W1000 wall mounted sensor

Remote mount temperature sensors use 10K NTC thermistors.

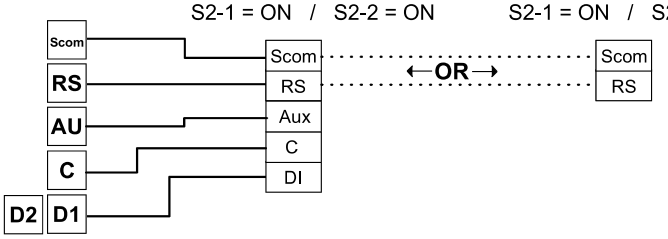
- This sensor can be used for:
- 3 thermistors with 2 dip switches are provided with each sensor for various averaging combinations
- Optional occupancy led
- Optional override key

Wiring example of single remote room sensor:

VT7600 Series Thermostat

1x S3020W1000
Remote wiring 1 sensor
S2-1 = ON / S2-2 = ON

S3010W1000
Remote wiring 1 sensor
S2-1 = ON / S2-2 = ON



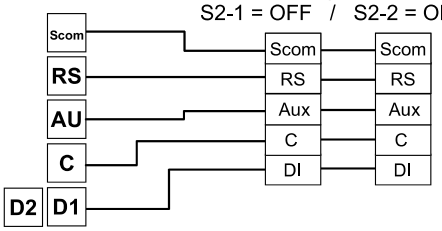
Dip switch setting for: **1 sensor**

S2-1 = ON
S2-2 = ON

Wiring examples of 2 remote room sensors for averaging applications:

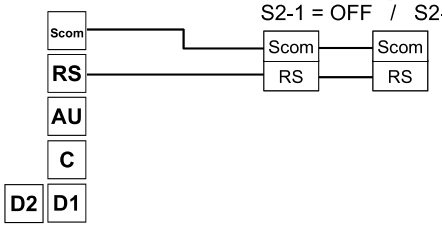
VT7600 Series Thermostat

2x S3020W1000
Remote wiring 2 sensors
S2-1 = OFF / S2-2 = ON



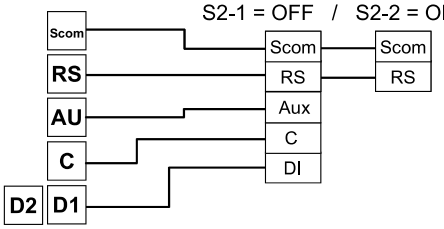
VT7600 Series Thermostat

2x S3010W1000
Remote wiring 2 sensors
S2-1 = OFF / S2-2 = ON



VT7600 Series Thermostat

1x S3010W1000 and 1x S3020W1000
Remote wiring 2 sensors
S2-1 = OFF / S2-2 = ON



Notes for averaging applications:

- S3010W1000 and S3020W1000 can be mixed matched.
- S3010W1000 and S3020W1000 are to be wired in parallel.
- Respect the dip switch setting in each remote sensor.

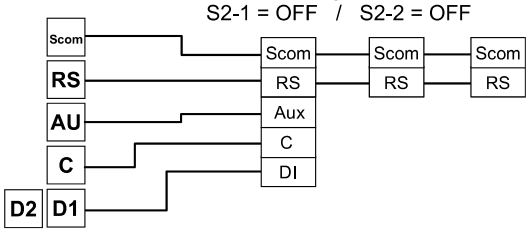
Dip switch setting for: **2 sensors**

S2-1 = OFF
S2-2 = ON

Wiring examples of 3 remote room sensors for averaging applications:

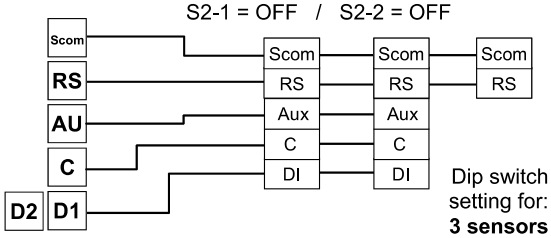
VT7600 Series Thermostat

2x S3010W1000 and 1x S3020W1000
Remote wiring 3 sensors
S2-1 = OFF / S2-2 = OFF



VT7600 Series Thermostat

1x S3010W1000 and 2x S3020W1000
Remote wiring 3 sensors
S2-1 = OFF / S2-2 = OFF



Dip switch setting for: **3 sensors**

S2-1 = OFF
S2-2 = OFF

Temperature vs resistance chart for 10 Kohm NTC thermistor

($R_{25°C}$ = 10KΩ±3% - $B_{25/85°C}$ = 3975K±1.5%)

°C	°F	Kohm	°C	°F	Kohm	°C	°F	Kohm	°C	°F	Kohm	°C	°F	Kohm
-40	-40	324.3197	-20	-4	94.5149	0	32	32.1910	20	68	12.4601	40	104	5.3467
-39	-38	303.6427	-19	-2	89.2521	1	34	30.6120	21	70	11.9177	41	106	5.1373
-38	-36	284.4189	-18	0	84.3147	2	36	29.1197	22	72	11.4018	42	108	4.9373
-37	-35	266.5373	-17	1	79.6808	3	37	27.7088	23	73	10.9112	43	109	4.7460
-36	-33	249.8958	-16	3	75.3299	4	39	26.3744	24	75	10.4443	44	111	4.5631
-35	-31	234.4009	-15	5	71.2430	5	41	25.1119	25	77	10.0000	45	113	4.3881
-34	-29	219.9666	-14	7	67.4028	6	43	23.9172	26	79	9.5754	46	115	4.2208
-33	-27	206.5140	-13	9	63.7928	7	45	22.7861	27	81	9.1711	47	117	4.0607
-32	-26	193.9703	-12	10	60.3980	8	46	21.7151	28	82	8.7860	48	118	3.9074
-31	-24	182.2686	-11	12	57.2044	9	48	20.7004	29	84	8.4190	49	120	3.7607
-30	-22	171.3474	-10	14	54.1988	10	50	19.7390	30	86	8.0694	50	122	3.6202
-29	-20	161.1499	-9	16	51.3692	11	52	18.8277	31	88	7.7360	51	124	3.4857
-28	-18	151.6239	-8	18	48.7042	12	54	17.9636	32	90	7.4182	52	126	3.3568
-27	-17	142.7211	-7	19	46.1933	13	55	17.1440	33	91	7.1150	53	127	3.2333
-26	-15	134.3971	-6	21	43.8268	14	57	16.3665	34	93	6.8259	54	129	3.1150
-25	-13	126.6109	-5	23	41.5956	15	59	15.6286	35	95	6.5499	55	131	3.0016
-24	-11	119.3244	-4	25	39.4921	16	61	14.9280	36	97	6.2866	56	133	2.8928
-23	-9	112.5028	-3	27	37.5056	17	63	14.2629	37	99	6.0351	57	135	2.7886
-22	-8	106.1135	-2	28	35.6316	18	64	13.6310	38	100	5.7950	58	136	2.6886
-21	-6	100.1268	-1	30	33.8622	19	66	13.0307	39	102	5.5657	59	138	2.5926

S3010W1000 remote wall mounted temperature sensor, dip switch location

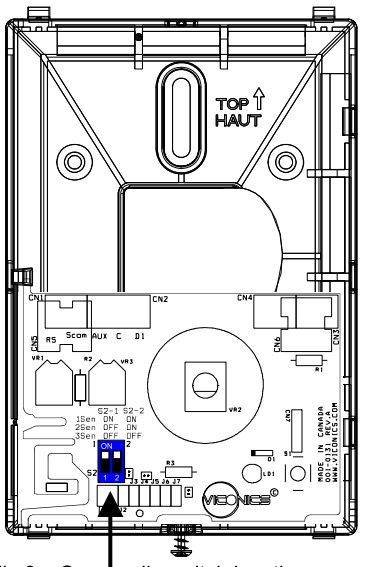


Fig.9 – Sensor dip switch location

S2000D1000, remote duct mounted temperature sensor c/w junction box.

This sensor can be used for:

- Remote return air temperature sensing with the sensor mounted on the return air duct.
- Outside air temperature sensing with the sensor installed in the fresh air plenum.
- Supply air temperature sensor

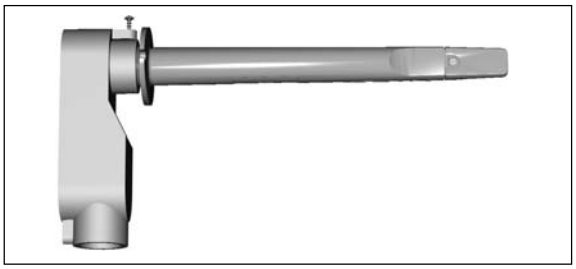


Fig.10 – Remote duct mounted temperature sensor

S2060A1000, remote averaging duct mounted temperature sensor c/w junction box.

This sensor can be used for:

- Remote averaging return air temperature sensing with the sensor mounted on the return air duct.
- Outside air temperature averaging sensing with the sensor installed in the fresh air plenum.
- Mixed air temperature averaging sensor for economizer models with the sensor in the mixing plenum.

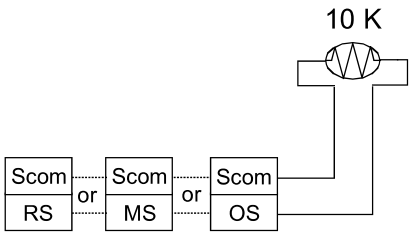
S2020E1000, outdoor air temperature sensor

This sensor can be used for:

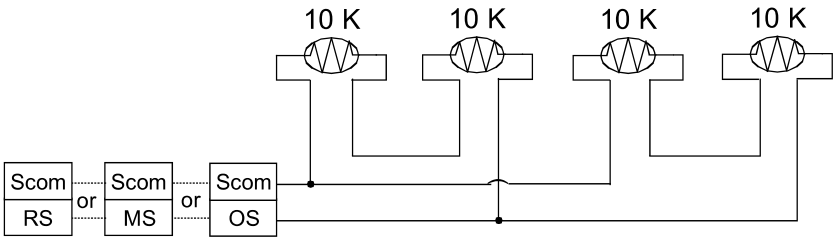
- Outside air temperature sensing with the sensor installed directly exposed to the elements.
- Sensor uses a water resistant NEMA 4 ABS enclosure for outdoor applications

WIRING S2000D1000, S2060A1000 and S2020E1000

Remote wiring 1 sensor

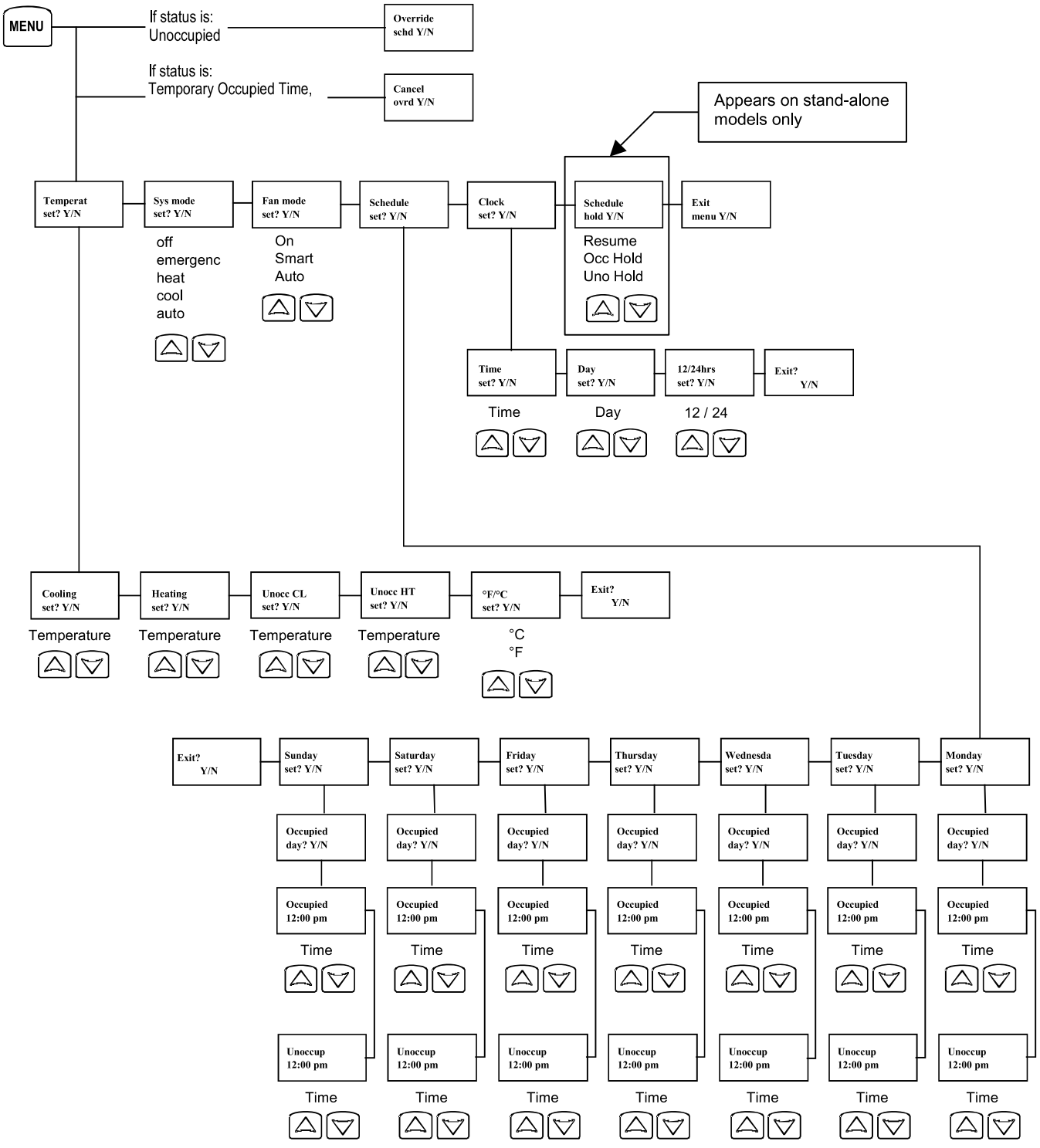


Remote wiring 4 sensors



User menu flow chart:

NOTE: Prompts may not all be present depending on model selected



Programming and status display instructions

1. Status display

The thermostat features a two-line, eight-character display. There is a low level back-light level that is always active and can only be seen at night. When left unattended, the thermostat has an auto scrolling display that shows the actual status of the system. Each item is scrolled one by one with the back lighting off. Pressing any key will cause the back light to come on.

Sequence of auto-scroll status display:

Room temperature	Clock status	System mode	Schedule status	Outdoor temperature	Alarms
RoomTemp x.x °C or °F	Monday 12.00 AM	Sys mode auto	Occupied	Outdoor x.x °C or°F	Service
		Sys mode off	Occupied hold		Frost ON
		Sys mode heat	Unoccup		SetClock
		Sys mode cool	Unoccup hold		Filter
		Sys mode emergenc	Override		

Manual scroll of each menu item is achieved by pressing the Yes (scroll) key repetitively. The last item viewed will be shown on the display for 30 seconds before returning to automatic scrolling. Temperature is automatically updated when scrolling is held.

Outdoor air temperature display is only enabled when outdoor air temperature sensor is connected.

- A maximum range status display of 50 °C (122 °F) indicates a shorted sensor. Associated functions, such as mode lockouts and economizer function are automatically disabled.
- A minimum range status -40 °C (-40 °F) is not displayed and indicates a opened sensor or a sensor not connected. Associated functions, such as mode lockouts and economizer function are automatically disabled.

If alarms are detected, they will automatically be displayed at the end of the status display scroll. During an alarm message display, the back lit screen will light up at the same time as the message and shut off during the rest of the status display. Two alarms maximum can appear at any given time. The priority for the alarms is as follows:

Frost ON	Indicates that the heating is energized by the low limit frost protection room temperature setpoint 5.6 °C (42 °F)
SetClock	Indicates that the clock needs to be reset. There has been a power failure which has lasted longer than 6 hours
Service	Indicates that there is a service alarm as per one of the programmable digital input (DI1 or DI2)
Filter	Indicates that the filters are dirty as per one of the programmable digital input (DI1 or DI2)

Three status LEDs on the thermostat cover are used to indicate the status of the fan, a call for heat, or a call for cooling.

Multistage and single stage models

- When the fan is on, the FAN LED will illuminate.
- When heating is on, the HEAT LED will illuminate.
- When cooling is on, the COOL LED will illuminate.

Heat pump models

- When the fan is on, the FAN LED will illuminate.
- When auxiliary heat is on, the AUX HEAT LED will illuminate.
- When compressor is on, the HEAT-PUMP LED will illuminate.

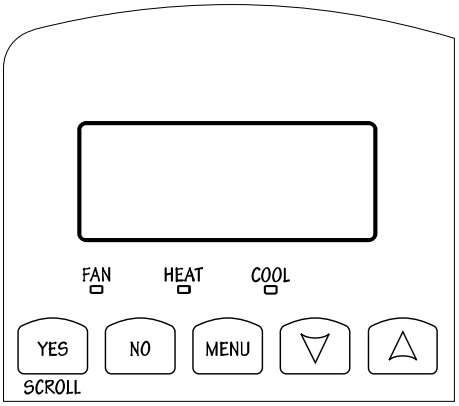


Fig.11 - Multistage and single stage models

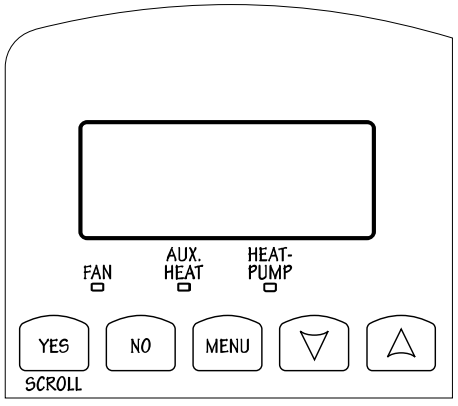


Fig.12 – Heat pump models

2. User programming instructions menu

The VT7600 series of thermostat feature an intuitive, menu-driven, back-lit LCD display that walks users through the programming steps, making the programming process extremely simple. This menu is typically accessed by the user to set the parameters such as temperature and time events, system mode, fan mode, etc.

It is possible to bring up the user menu at any time by depressing the MENU key. The status display automatically resumes after exiting the user-programming menu.

If the user pauses at any given time during programming, **Auto Help** text is displayed to help and guide the user through the usage and programming of the thermostat.

Ex.:	**Press yes key to change cooling temperature setpoint** **Use the up or down arrow to adjust cooling setpoint**

Each of the sections in the menu are accessed and programmed using 5 keys on the thermostat cover.
The priority for the alarms is as follows:

	The YES key is used to confirm a selection, to move onto the next menu item and to manually scroll through the displayed information.
	The NO key is used when you do not desire a parameter change, and to advance to the next menu item. Can also be used to toggle between heating and cooling setpoints.
	The MENU key is used to access the Main User Menu or exit the menu.
	The down arrow key is used to decrease temperature setpoint and to adjust the desired values when programming and configuring the thermostat.
	The up arrow key is used to increase temperature setpoint and to adjust the desired values when programming and configuring the thermostat.

When left unattended for 45 seconds, the display will resume automatic status display scrolling.
To turn on the back light, press any key on the front panel. The back lit display will turn off when the thermostat is left unattended for 45 seconds

Sequence of user menu:

Override Resume	Temperature setpoints	System mode setting	Fan mode setting	Schedules setting	Clock setting	Schedule hold
Override schd Y/N Appears only in unoccupied mode	**Temperat set Y/N**	**Sys mode set Y/N**	**Fan mode set Y/N**	**Schedule set Y/N**	**Clock set Y/N**	**Schedule hold Y/N** Appears only on stand-alone models
Cancel ovrd Y/N Appears only in override mode						

There is a default profile set in the thermostat from the factory.
This enables the thermostat to operate as a non-programmable unit in day mode operation at start up.

Programmed default temperature setpoints:
Occupied cooling setpoint = 24 °C (75 °F)
Occupied heating setpoint = 22 °C (72 °F)
Unoccupied cooling setpoint = 28 °C (82 °F)
Unoccupied heating setpoint = 18 °C (65 °F)
Fahrenheit scale
Setpoint type = permanent

Programmed default modes:
System mode = Auto
Fan mode = Smart (for models with a communication module or programmable stand-alone models) Fan mode = Auto (for non-programmable stand-alone models)
Programmed default schedules:
Monday through Sunday
Occupied time is: 12 00 AM
Unoccupied time is: 11:59 PM

There will be a 1 minute unoccupied period every night at 11:59 PM with this default configuration.

A) Override an unoccupied period

Override schd Y/N

This menu will appear only when the thermostat is in unoccupied mode. The unoccupied mode is enabled either by the internal timer scheduling or by a remote NSB contact via DI1 or DI2.
If DI1 or DI2 is configured to operate as a remote temporary override contact, this menu will be disabled.

Answering yes to this prompt will cause the thermostat to go into occupied mode for an amount of time equal to the parameter "TOccTime" (1 to 12 hours).

B) Resume regular scheduling

Cancel ovrd Y/N

This menu does not appear in regular operation. It will appear only when the thermostat is in Unoccupied override mode.
Answering "Yes" to this question will cause the thermostat to resume the regular programmed setpoints & scheduling.

C) Temperature setpoints

Permanent setpoint changes

Temperat set Y/N

This menu permits the adjustment of all permanent temperature setpoints (occupied and unoccupied) as well as the desired temperature units (°F or °C). Permanent setpoints are written to RAM and EEPROM

Cooling setpoint Occupied mode		Heating setpoint Occupied mode		Cooling setpoint Unoccupied mode		Heating setpoint Unoccupied mode		°F or °C display setting	
Cooling set? Y/N	No next → Yes down ↓	Heating set? Y/N	No next → Yes down ↓	Unocc CL set? Y/N	No next → Yes down ↓	Unocc HT set? Y/N	No next → Yes down ↓	°F or °C set? Y/N	No next → Yes down ↓
Use ▲▼ keys to set value, Yes key to confirm									
Cooling 70.0 °F	Use ▲▼ To set value	Heating 68.00 °F	Use ▲▼ To set value	Unocc CL 80.0 °F	Use ▲▼ To set value	Unocc HT 60.0 °F	Use ▲▼ To set value	Units °F	Use ▲▼ To set value

Temporary setpoint changes

Temporary setpoints can be modified through the Up arrow key (▲) and the Down arrow keys (▼).
User will be prompted with the present mode (Heating or Cooling) of the thermostat and its setpoint.
The Up (▲) arrow key will increment the setpoint by 0.5 degree (F or C).
The Down (▼) arrow key will decrement the setpoint by 0.5 degree (F or C).
Press the Yes key to accept the new setpoint.

Local changes to the heating or cooling setpoints made by the user directly using the up or down arrow are temporary.
They will remain effective for the duration specified by ToccTime.
Setpoints will revert back to their default value after internal timer ToccTime expires.
If a permanent change to the setpoints is required, use the **Temperat set ?** menu

D) System mode setting

Sys mode set Y/N

This menu is accessed to set system mode operation
Use ▲▼ to set value, Yes key to confirm

Sys mode auto	**Automatic mode** Automatic changeover mode between heating and cooling operation
Sys mode cooling	**Cooling mode** Cooling operation mode only
Sys mode heating	**Heating mode** Heating operation mode only
Sys mode emergency	**Emergency heat mode** (heat pump models only) Forced auxiliary heat operation mode only
Sys mode off	**Off mode** Normal cooling or heating operation disabled If enabled in installer parameters, only the automatic heating frost protection at 50 °F (10 °C) is enabled

E) Fan mode setting

Fan mode set Y/N

This section of the menu is permits the setting of the fan mode operation.
Use ▲▼ to set value, Yes key to confirm

Fan mode On	**On fan mode** Fan is on continuously, even when system mode is OFF.
Fan mode Auto	**Automatic fan mode** Fan cycles on a call for heating or cooling for both occupied & unoccupied periods.
Fan mode Smart	**Smart fan mode** During occupied periods, fan is on continuously. In unoccupied mode, fan cycles on a call for heating or cooling. This selection is available on all models with a communication module, on all stand-alone programmable models or if DI1 or DI2 is set to RemNSB on stand-alone non-programmable models

F) Schedule set (2 events)

Scheduling can have 2 or 4 events per day. This is set in the configuration menu as per parameter (2/4event)

Schedule set Y/N

This section of the menu permits the user to set the whether 2 or 4 events is needed. Each day can be tailored to specific schedules if needed.

- 2 events can be programmed per day.
- Occupied & unoccupied periods can be set for each day.

Monday timer Schedule set		Tuesday timer Schedule set		Wednesday timer Schedule set		Other days are identical
Monday set? Y/N	No next → Yes down ↓	Tuesday set? Y/N	No next → Yes down ↓	Wednesda set? Y/N	No next → Yes down ↓	Selects the day to be programmed or modified
Yes key to access day scheduling, No key to jump to next day						
Occupied Day? Y/N	No next → Yes down ↓	Occupied Day? Y/N	No next → Yes down ↓	Occupied Day? Y/N	No next → Yes down ↓	Yes = Daily schedules will be accessed No = Unoccupied mode all day
Yes key to access day scheduling, No key to jump to next day						
		Copy Y/N Previous	Yes next → No down ↓	Copy Y/N Previous	Yes next → No down ↓	Yes = Will copy previous day schedule No = Daily schedules will be accessed
Yes key to copy previous day, No key to set new time value for each day						
Occupied 00:00 AM	Use ▲▼ To set value	Occupied 00:00 AM	Use ▲▼ To set value	Occupied 00:00 AM	Use ▲▼ To set value	Sets Event # 1 Occupied time Will activate occupied setpoints
Use ▲▼ to set value, Yes key to confirm						
Unoccup 00:00 AM	Use ▲▼ To set value	Unoccup 00:00 AM	Use ▲▼ To set value	Unoccup 00:00 AM	Use ▲▼ To set value	Sets Event # 2 Unoccupied time Will activate unoccupied setpoints
Use ▲▼ to set value, Yes key to confirm						

Typical examples of a 2 event office schedule

Note: 12:00 PM = Noon
12:00 AM = Midnight

Ex. #1 Office building closed all weekend

Event	Period #1 - Event #1		Period #1 - Event #2		
	Occupied		Unoccupied		
Setpoint	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Daily Occupancy
Monday	7.00 AM		6.00 PM		Day time only
Tuesday	7.00 AM		6.00 PM		Day time only
Wednesday	7.00 AM		6.00 PM		Day time only
Thursday	7.00 AM		6.00 PM		Day time only
Friday	7.00 AM		6.00 PM		Day time only
Saturday	12.00 PM *		12.00 PM *		Unoccupied
Sunday	12.00 PM *		12.00 PM *		Unoccupied

* Programming consecutive events to the same time will cause the thermostat to choose the last event as the time at which it will set its schedule. In the above example, the thermostat will control to the unoccupied set point until 7:00 AM Monday.

Ex. #2 Commercial building which is occupied all weekend

Event	Period #1 - Event #1		Period #1 - Event #2		
	Occupied		Unoccupied		
Setpoint	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Daily Occupancy
Monday	8.00 AM		5.00 PM		Day time only
Tuesday	8.00 AM		5.00 PM		Day time only
Wednesday	8.00 AM		5.00 PM		Day time only
Thursday	8.00 AM		5.00 PM		Day time only
Friday	8.00 AM		5.00 PM		Day time only
Saturday	12.00 AM **		11.59 PM **		Occupied
Sunday	12.00 AM **		11.59 PM **		Occupied

** To program a day as occupied for 24 hours, set that day Occupied time to 12:00 AM and Unoccupied time to 11:59 PM There will be a 1 minute unoccupied period every night at 11:59 PM with this schedule configuration.

G) Schedule set (4 events)

Schedule set Y/N

This section of the menu permits the user to set the whether 2 or 4 events is needed. Each day can be tailored to specific schedules if needed.

- 4 events can be programmed per day.
- Occupied & Unoccupied periods can be set for each day.
- Programming the 3 rd. & 4 th. events to the same time will cancel the last period.

Monday timer Schedule set		Tuesday timer Schedule set		Wednesday timer Schedule set		Other days are identical
Monday set? Y/N	No next → Yes down ↓	Tuesday set? Y/N	No next → Yes down ↓	Wednesda set? Y/N	No next → Yes down ↓	Selects the day to be programmed or modified
Yes key to access day scheduling, No key to jump to next day						
Occupied Day? Y/N	No next → Yes down ↓	Occupied Day? Y/N	No next → Yes down ↓	Occupied Day? Y/N	No next → Yes down ↓	Yes = Daily schedules will be accessed No = Unoccupied mode all day
Yes key to access day scheduling, No key to jump to next day						
		Copy Y/N Previous	Yes next → No down ↓	Copy Y/N Previous	Yes next → No down ↓	Yes = Will copy previous day schedule No = Daily schedules will be accessed
Yes key to copy previous day, No key to set new time value for each day						
Occupied 00:00 AM	Use ▲▼ To set value	Occupied 00:00 AM	Use ▲▼ To set value	Occupied 00:00 AM	Use ▲▼ To set value	Sets Event # 1 Occupied time Will activate occupied setpoints
Use ▲▼ to set value, Yes key to confirm						
Unoccup 00:00 AM	Use ▲▼ To set value	Unoccup 00:00 AM	Use ▲▼ To set value	Unoccup 00:00 AM	Use ▲▼ To set value	Sets Event # 2 Unoccupied time Will activate unoccupied setpoints
Use ▲▼ to set value, Yes key to confirm						
Occupie2 00:00 AM	Use ▲▼ To set value	Occupie2 00:00 AM	Use ▲▼ To set value	Occupie2 00:00 AM	Use ▲▼ To set value	Sets Event # 3 Occupied time Will activate occupied setpoints
Use ▲▼ to set value, Yes key to confirm						
Unoccup2 00:00 AM	Use ▲▼ To set value	Unoccup2 00:00 AM	Use ▲▼ To set value	Unoccup2 00:00 AM	Use ▲▼ To set value	Sets Event # 4 Unoccupied time Will activate unoccupied setpoints
Use ▲▼ to set value, Yes key to confirm						

Ex. #1 Four event retail establishment schedule

Event	Period 1 - Event 1		Period 1 - Event 2		Period 2 - Event 3		Period 2 - Event 4		
Setpoint	Occupied		Unoccupied		Occupied		Unoccupied		
	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Daily Occupancy
Monday	7.00 AM		5.00 PM		12.00 PM *		12.00 PM *		Day time only
Tuesday	7.00 AM		5.00 PM		12.00 PM *		12.00 PM *		Day time only
Wednesday	7.00 AM		5.00 PM		12.00 PM *		12.00 PM *		Day time only
Thursday	7.00 AM		5.00 PM		7.00 PM		10.30 PM		Day/evening time only
Friday	7.00 AM		5.00 PM		7.00 PM		10.30 PM		Day/evening time only
Saturday	12.00 PM *		12.00 PM *		12.00 PM *		12.00 PM *		Unoccupied
Sunday	12.00 PM *		12.00 PM *		12.00 PM *		12.00 PM *		Unoccupied

* Programming events to the same time will cancel the last period and leave the thermostat in unoccupied mode

Ex. #2 Residential

Event	Period 1 - Event 1		Period 1 - Event 2		Period 2 - Event 3		Period 2 - Event 4		
Setpoint	Occupied		Unoccupied		Occupied		Unoccupied		
	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Cool 72 °F	Heat 70 °F	Cool 80 °F	Heat 62 °F	Daily Occupancy
Monday	6:00 AM		8:00 AM		4:00 PM		10:00 PM		Day/evening time only
Tuesday	6:00 AM		8:00 AM		4:00 PM		10:00 PM		Day/evening time only
Wednesday	6:00 AM		8:00 AM		4:00 PM		10:00 PM		Day/evening time only
Thursday	6:00 AM		8:00 AM		4:00 PM		10:00 PM		Day/evening time only
Friday	6:00 AM		8:00 AM		4:00 PM		11:30 PM		Day/evening time only
Saturday	8:00 AM *		8:00 AM *		8:00 AM *		11:59 PM *		Day time only
Sunday	12:00 AM *		12:00 AM *		12:00 AM *		11:59 PM *		Occupied all day

* Programming consecutive events to the same time will cause the thermostat to choose the last event as the time at which it will set its schedule. In the above example for Saturday, the thermostat will control to the occupied set point from 8:00 AM until 11:59 PM. Since it is desired to be in occupied mode throughout the night, then it is necessary to program the first event on Sunday at 12:00 AM. The thermostat will force a one minute unoccupied period for a one minute period (between 11:59 PM and 12:00 AM on Saturday)

H) Clock/Day Settings

Clock set Y/N

This section of the menu permits the user to set the time and day.

Time setting		Day setting		Time format setting	
Time set? Y/N	No next → Yes down ↓	Day set? Y/N	No next → Yes down ↓	12/24hrs set? Y/N	No = exit Yes down ↓
Time 0:00	Use ▲▼ To set value	Day Monday	Use ▲▼ To set value	12/24hrs 12 hrs	Use ▲▼ To set value

J) Schedule hold

Schedule hold Y/N

This menu

- This menu will only appear on stand-alone thermostat, e.i. without a BACnet / Echelon module.
- This section of the menu permits the user to set a permanent schedule hold, which bypasses the internal thermostat scheduling.
- The permanent schedule hold function is typically used for non-scheduled events that extend for various periods of time.
- Enabling a permanent occupied or permanent unoccupied schedule hold will cancel any active override.
- The use of temporary setpoints during permanent hold is permitted. The duration of the temporary setpoint is as set per the TOccTime parameter. Ex. 3 hours

Use ▲▼ to set value, Yes key to confirm

Schedule resume	**Resume regular scheduling** cancels the permanent hold and re-enables the regular programming as set per internal scheduling or as per remote NSB via one of the DI's configured as remote NSB. This action can also by accomplished by using the Resume menu. Any temporary setpoint that are active will be left active for the duration of the period as set per the TOccTime parameter.
Schedule occ hold	**Hold permanent occupied** forces the thermostat into a permanent occupied mode using the occupied setpoints. All timed scheduling functions are by-passed. The PERMANENT OCCUPIED status will appear in the automatic status scroll. To resume to regular scheduling, user must scroll to the Schedule Hold menu and select the Schedule resume option..
Schedule uno hold	**Hold permanent unoccupied** forces the thermostat into a permanent unoccupied mode using the unoccupied setpoints. All timed scheduling functions are by-passed. The PERMANENT UNOCCUPIED status will appear in the automatic status scroll. To resume to regular scheduling, user must scroll to the Schedule Hold menu and select the Schedule resume option..

Installer configuration parameter menu

Configuration can be done through the network or locally at the thermostat.

- To enter configuration, press and hold the middle button (**Menu**) for 8 seconds
- Press the same middle button repetitively to scroll between all the available parameters
- Use the up and down key to change the parameter to the desired value.
- To acknowledge and save the new value, press the middle button again.
- The next listed parameter is now displayed

Configuration parameters	Significance Default value	Adjustments
DI 1	Digital input no.1 configuration Open contact input = function not energized Closed contact input = function energized **Default value =** None	**None**, No function will be associated with the input **Rem NSB**, remote NSB timer clock input. Will disable the internal scheduling of the thermostat. The scheduling will now be set as per the digital input. The time is still displayed as information, but the menu part related to scheduling is disabled and no longer accessible. Open contact = occupied setpoints Closed contacts = unoccupied setpoints **RemOVR** Temporary override remote contact. Disables all override menu function of the thermostat. The override function is now controlled by a manual remote momentarily closed contact. When configured in this mode, the input operates in a toggle mode. With this function enabled it is now possible to toggle between unoccupied & occupied setpoints for the amount of time set by parameter (TOccTime) temporary occupancy time. When Override is enabled, an Override status message will be displayed **Filter,** a back-lit flashing **Filter** alarm will be displayed on the thermostat LCD screen when the input is energized **Service,** a back-lit flashing **Service** alarm will be displayed on the thermostat LCD screen when the input is energized
DI 2	Digital input no. 2 configuration Default value = **None**	Same as above. It is possible to configure both inputs to have the same function.
lockout	Keypad lockout levels Default value = **0 No lock**	0 = No lock 1 = Low level 2 = High level

Level	Resume/ Override scheduling	Permanent Occupied and Unoccupied Setpoints	Temporary setpoints using arrows	System mode setting	Fan mode setting	Schedules setting	Clock setting	Permanent hold
	Resume sched Y/N	RoomTemp set Y/N	Up key (▲) Down key (▼)	Sys mode set Y/N	Fan mode set Y/N	Schedule set Y/N	Clock set Y/N	Schedule hold Y/N
0	Yes access	Yes access	Yes access	Yes access	Yes access	Yes access	Yes access	Yes access
1	Yes access	No access	Yes access	No access	No access	No access	Yes access	No access
2	No access	No access	No access	No access	No access	No access	Yes access	No access

pwr del	Power-up delay Default value = **10 seconds**	On initial power up of the thermostat (each time 24 Vac power supply is removed & re-applied) there is a delay before any operation is authorized (fan, cooling or heating). This can be used to sequence start up multiple units / thermostat in one location. **10 to 120 seconds**

Frost pr	Frost protection enabled Default value = **Off** On **heat pump** models the system mode will be forced to EMERGENCY mode if frost protection is activated	**Off:** no room frost protection **On:** room frost protection enabled in all system mode at: 42 °F (5.6 °C) Frost protection is enabled even in system **Off** mode **Off or On**
heat max	Maximum heating setpoint limit Default value = **90 °F (32 °C)**	Maximum occupied & unoccupied heating setpoint adjustment. Heating setpoint range is: **40 to 90 °F (4.5 to 32.0 °C)**
cool min	Minimum cooling setpoint limit Default value = **54 °F (12 °C)**	Minimum occupied & unoccupied cooling setpoint adjustment. Cooling setpoint range is: **54 to 100 °F (12.0 to 37.5 °C)**
Anticycle	Minimum on/off operation time for stages Default value = **2 minutes** Anti-short cycling can be set to 0 minutes for equipment that posses their own anti cycling timer. Do not use that value unless the equipment is equipped with such internal timer. Failure to do so can damage the equipment.	Minimum On/Off operation time of cooling & heating stages. ***IMPORTANT,*** *anti-short cycling can be set to 0 minutes for equipment that posses their own anti cycling timer. Do not use this value unless the equipment is equipped with such internal timer. Failure to do so can damage the equipment.* **0, 1, 2, 3, 4 & 5 minutes**
Heat cph	Heating stages cycles per hour Default value = **4 C.P.H.** **For multi stage models, heat cph applies to W1 & W2** **For heat pump models, heat cph applies to W1 only (Emergency heat)**	Will set the maximum number of heating stage cycles per hour under normal control operation. It represents the maximum number of cycles that the equipment will turn ON and OFF in one hour. Note that a higher C.P.H will represent a higher accuracy of control at the expense of wearing mechanical components faster. **3, 4, 5, 6,7 & 8 C.P.H.**
cool cph	Cooling stages cycles per hour Default value = **4 C.P.H.** **For multi stage models, cool cph applies to Y1 & Y2** **For heat pump models, cool cph applies to Y1 & Y2 in cooling and heating independently of the reversing valve position**	Will set the maximum number of cooling stage cycles per hour under normal control operation. It represents the maximum number of cycles that the equipment will turned on and off in one hour. Note that a higher C.P.H will represent a higher accuracy of control at the expense of wearing mechanical components faster. **3 or 4 C.P.H.**
Deadband	Minimum deadband Default value = **2.0 °F (1.1 °C)**	Minimum deadband value between the heating and cooling setpoints. If modified, it will be applied only when any of the setpoints are modified. **2, 3 or 4 °F (1.0 to 2.0 °C)**
fan cont	Fan control Default value = **On** **For multi stage models, fan control applies to W1 & W2** **For heat pump models, fan control applies to W1 only (Emergency heat)**	Fan control in heating mode. When selecting **On**; the thermostat in all cases will always control the fan (terminal G). Valid for On or Auto fan mode When selecting **Off**; the fan (terminal G), when heating stages (terminals W1 & W2) are solicited, will not be energized. The fan in this case will be controlled by the equipment fan limit control. Valid only for Auto fan mode. On fan mode will leave the fan always on. **On or Off**

fan del	Fan delay Default value = **Off**	Fan delay extends fan operation by 60 seconds after the call for heating or cooling ends. Valid only for Auto fan mode. “On” fan mode will leave the fan always on. **Off or On**
Com Addr	Thermostat networking address Default value = **4** **Range is:** 0 to 254 • For BACnet MS-TP models valid range to use is from 1 to 127 • For wireless models valid range is 0 to 254 with a maximum of 30 thermostat per VGG	**Conditional parameter to BACnet MS-TP models (VT76xxX1000B)** **Conditional parameter to Wireless models (VT76xxX1000W)** This parameter will only appear when a BACnet or wireless network adapter is present. If the thermostat is installed as a stand-alone unit or with an Echelon adapter, this parameter will not be used or displayed
ToccTime	Temporary occupancy time Default value = **3 hours**	Temporary occupancy time with occupied mode setpoints when override function is enabled When the thermostat is in unoccupied mode, function is enabled with either the menu or DI1 or DI2 configured as remote override input. **0,1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 & 12 hours**
cal RS	Room air temperature sensor calibration Default value = **0.0 °F or °C**	Offset that can be added/subtracted to actual displayed room temperature **± 5.0 °F (± 2.5 °C)**
cal OS	Outside air temperature sensor calibration Default value = **0.0 °F or °C**	Offset that can be added/subtracted to actual displayed outside air temperature **± 5.0 °F (± 2.5 °C)**
H stage	Number of heating stages. Applicable to 2 stage models only Default value = **2 stages** **For heat pump models, H stage is limited to 1 stage only (W1 – Aux. Heat)**	Will revert the operation of 2 stages thermostat to single stage operation only when the second heating step is not needed. **1 or 2 stages**
C stage **Or** **HP stage**	Number of cooling stages 2 stages model only Default value = **2 stages** **For heat pump models, HP stage selects the number of compressor stages**	Will revert the operation of 2 stage thermostat to single stage operation only when the second cooling step is not needed. **1 or 2 stages**
H lock	Outside air temperature heating lockout Default value = **120 °F (49 °C)**	Disables heating stage operation based on outdoor air temperature. Function will only be enabled if OS (outside air temperature sensor) is connected. **From -15 °F up to 120 °F (-26 °C up to 49 °C)**
C lock	Outside air temperature mechanical cooling lockout. Default value = **-40 °F (-40 °C)**	Disables cooling stage operation based on outdoor air temperature. On economizer model, free cooling will not be disabled by this function. Function will only be enabled if OS (outside air temperature sensor) is connected. **From -40 °F up to 95 °F (-40 °C up to 35 °C)**

<table>
<tr><td>2/4event</td><td>Number of events configuration
Default value = 2 event</td><td>2 events, will set up programming for the following
Event 1 is for Occupied setpoints
Event 2 is for Unoccupied setpoints
4 events, will set up programming for the following
Event 1 is for Occupied setpoints
Event 2 is for Unoccupied setpoints
Event 3 is for Occupied setpoints
Event 4 is for Unoccupied setpoints</td></tr>
<tr><td>aux cont</td><td>Auxiliary contact configuration
Default value = N.O. normally open</td><td>This contact can be used to energize peripheral devices such as: lighting equipment, exhaust fans, economizers, etc.
This contact will operate in parallel with the internal occupied/unoccupied schedule of the thermostat or the remote NSB contact if DI1 or DI2 is used.
When the system is in OFF mode, the contact will remain in its unoccupied status independently of the occupied / unoccupied schedule.
<table>
<tr><th>Configured</th><th>Contact occupied status</th><th>Contact unoccupied status</th></tr>
<tr><td>N.O.</td><td>Closed</td><td>Opened</td></tr>
<tr><td>N.C.</td><td>opened</td><td>Closed</td></tr>
</table></td></tr>
<tr><td>Prog rec</td><td>Progressive recovery enabled
Default value = Off
Progressive recovery is automatically disabled if DI 1 and / or DI 2 are configured remote NSB</td><td>Off, = no progressive recovery
The programmed occupied schedule time is the time at which the system will restart.
On, = progressive recovery active.
The programmed occupied schedule time is the time at which the desired occupied temperature will be attained. The thermostat will automatically optimize the equipment start time.
In any case, the latest a system will restart is 10 minutes prior to the occupied period time.</td></tr>
<tr><td colspan="3">Heat Pump models only</td></tr>
<tr><td>high bp</td><td>High balance point
Default value = 90 °F (32.0 °C)
Function will only be enabled if OS (outside air temperature sensor) is connected.</td><td>In Heating or Auto mode, it is the outside air temperature value at which the auxiliary heat will be cut off. Above that value, only the heat pump will be used to maintain the heating setpoint
34 to 90 °F (1.0 to 32.0 °C)</td></tr>
<tr><td>low bp</td><td>Low balance point
Default value = -12 °F (-24 °C)
Function will only be enabled if OS (outside air temperature sensor) is connected.</td><td>In Heating, Cooling or Auto mode, it is the outside air temperature value at which the heat pump operation will be cut off. Below that value, only the auxiliary heat will be used to maintain the heating setpoint
-40 to 30 °F (-40 to -1.0 °C)</td></tr>
</table>

Comf/eco	Comfort or economy mode Default value = **Comfort**	Sets the operation and interaction mode of the heat pump with the auxiliary heat. **Comfort mode**. In *Heating mode.* If the heat pump is not able to satisfy the heating setpoint, the auxiliary heat will be energized to satisfy the same heating setpoint. **Economy mode**. In *Heating mode.* If the heat pump is not able to satisfy the heating setpoint, the auxiliary heat will be energized to satisfy only when the temperature has dropped 2.0 °F (1.1 °C) below the heating setpoint. Selecting economy mode will add a deadband between the heatpump & auxiliary heat in heating mode. The actual temperature maintained will be lower than the true heating setpoint to maximize the heat pump operation. When the outdoor air temperature drops below the *low balance point,* the deadband will be eliminated and the auxiliary heat will maintain the true heating setpoint alone. **Economy mode**. In *Emergency mode.* If *Emergency heat mode* is selected, the setpoint maintained, will be the heating setpoint.
re valve	Reversing valve operation O/B Default value = **O**	Heat pump reversing valve operation **O** will energize the valve in cooling operation. **B** will energize the valve in heating operation **O or B**
comp/aux	Compressor/auxiliary interlock Default value = **Off**	Sets the operation and interaction mode of the heat pump with the auxiliary heat. **Interlock Off**. In *Heating mode.* If the heat pump is not able to satisfy the heating setpoint, the auxiliary heat will be energized at the same time as the heat pump stage. Typically applies when the air handler heat pump coil is installed before the auxiliary heat. (all electric systems) **Interlock On**. In *Heating mode.* If the heat pump is not able to satisfy the heating setpoint, the auxiliary heat will be energized and the heat pump will be cut off. Typically applies when the air handler heat pump coil is installed after the auxiliary heat. (add on systems) There is a 2 minute delay to restart the heat pump, when the auxiliary heat is shut down **Off or On**

Notes for Heat Pump models:
When the outside air sensor is not connected or is shorted, the thermostat bypasses:

- The heating lockout
- The cooling lockout
- The low balance point
- The high balance point

Heat Pump model when set in Emergency mode bypasses heating lockout and permits auxiliary heating whenever a heating demand occurs.

<table>
<tr><th colspan="3">Economizer Model only</th></tr>
<tr><td>Chngstpt</td><td>Changeover setpoint

Default value = 55 °F (13.0 °C)</td><td>In Cooling mode.
The outside air temperature value at which the cooling will be switched over from mechanical (compressor) to free cooling (economizer)
14 to 70 °F (-10.0 to 21.0 °C)</td></tr>
<tr><td>min pos</td><td>Minimum position

Default value = 0%

<table>
<tr><th>Outside air percentage</th><th>0%</th><th>5%</th><th>10%</th><th>15%</th><th>20%</th><th>25%</th><th>30%</th></tr>
<tr><td>Setting for 0-10 Vdc Autuator</td><td>0%</td><td>5%</td><td>10%</td><td>15%</td><td>20%</td><td>25%</td><td>30%</td></tr>
<tr><td>Setting for 2-10 Vdc Autuator</td><td>0 to 20%</td><td>24%</td><td>28%</td><td>32%</td><td>36%</td><td>40%</td><td>44%</td></tr>
</table>
</td><td>Outside air damper minimum position.
Will be active only when fan is on (G terminal) and the internal or remote scheduling is in occupied mode.
When internal or remote scheduling is in unoccupied mode and/or fan is off, minimum position will be set to 0%
0 to 100 % = 0 to 10 Vdc output range</td></tr>
<tr><td>C mech</td><td>Mechanical cooling allowed

Default value = Off</td><td>In Cooling mode.
Allows the operation of the mechanical cooling if the free cooling (economizer) cannot maintain the cooling setpoint.

Off Typically applies when the MS (mixed air temperature sensor) is installed after the mechanical cooling refrigeration coils. In this case, mechanical cooling will never operate at the same time as free cooling.

On Typically applies when the MS (mixed air temperature sensor) is installed before the mechanical cooling refrigeration coils in the mixing plenum. In this case, mechanical cooling is allowed when the free cooling (economizer operation) cannot maintain the cooling setpoint.

Off or On</td></tr>
<tr><td>mix stpt</td><td>Mixed air setpoint

Default value = 55 °F (13.0 °C)</td><td>Free cooling mixed air setpoint when economizer mode is enabled.

50 to 90 °F (10.0 to 32.0 °C)</td></tr>
<tr><td>MS dis</td><td>Display mixed air temperature

Economizer model only, only if sensor is installed</td><td>Used as diagnostic / service help to troubleshoot and diagnose economizer operation.</td></tr>
</table>

Wireless Model only		
PAN ID	Personal Area Network Identification Default value = 0 **Range is:** 0 to 500	**Conditional parameter to Wireless models (VT76xxX1000W)** This parameter will only appear when a wireless network adapter is present. If the thermostat is installed as a stand-alone unit or with a BACnet or Echelon adapter, this parameter will not be used or displayed This parameter (Personal Area Network Identification) is used to link specific thermostats to a single specific Viconics wireless gateway (VWG) For every thermostat reporting to a gateway (maximum of 30 thermostats per gateway), be sure you set the ***SAME*** PAN ID value both at the gateway and the thermostat(s). The default value of 0 is ***NOT*** a valid PAN ID. The valid range of available PAN ID is from 1 to 500
Channel	Channel selection Default value = 10 **Range is:** 10 to 26	**Conditional parameter to Wireless models (VT76xxX1000W)** This parameter will only appear when a wireless network adapter is present. If the thermostat is installed as a stand-alone unit or with a BACnet or Echelon adapter, this parameter will not be used or displayed This parameter (Channel) is used to link specific thermostats to specific Viconics wireless gateway(s) (VWG) For every thermostat reporting to a gateway (maximum of 30 thermostats per gateway), be sure you set the ***SAME*** channel value both at the gateway and the thermostat(s). ***Viconics recommends using only the 2 last channels (25-2575MHz and 26-2580MHz)*** The default value of 10 is ***NOT*** a valid channel. The valid range of available channel is from 11 to 26
Get From	Thermostat Get From another device configuration utility Default value = **0** **Range is:** 0 to 254	**Conditional parameter to Wireless models (VT76xxX1000W)** This parameter / function is not currently supported by the wireless thermostats.

Troubleshooting guide

All models

Symptom	Possible Cause	Corrective Action
No display on the thermostat	Absent or incorrect supply voltage	1. Check power supply voltage between C & RC to be from 19-30 Vac 2. Check for tripped fuse or circuit breaker
	Overloaded power transformer	Verify that the transformer used is powerful enough (enough VA's) to supply all controlled devices including the thermostat
Keyboard menu does not access all functions	Keyboard locked	Change configuration parameter LOCKOUT to value "0" to access all levels of the menu
Temperature setpoints revert to original value after a certain time period	Temporary setpoint option selected	1. The thermostat needs to be in Permanent setpoint mode for the new setpoint to be kept and memory and used all the time 2. Go to the Set temperature menu. 3. The last prompt is setpoint type. Set it to Permanent setpoint
Thermostat will not call for heating	Wrong mode selected	Select heating mode
	Thermostat in Unoccupied mode	Select Occupied Hold in Schedule hold or Override to force the thermostat Occupied heating setpoint
	Anticycle delay active	Wait, the anticycling period will end and the equipment will start
	Heating setpoint is satisfied	Raise the Heating setpoint
	Heating lockout attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter H Lock to value 120 °F (49 °C) to by-pass lockout
	Wiring error	1. Start the Fan by forcing the Fan ON mode 2. Put a jumper across terminals RH & W1. The heating should come ON. If it does not, verify wiring and check if a jumper is required between RC & RH
Thermostat will not call for cooling	Wrong mode selected	Select cooling mode
	Thermostat in Unoccupied mode	Select Occupied Hold in Schedule hold or Override to force the thermostat Occupied cooling setpoint
	Anticycle delay active	Wait, the anticycling period will end and the equipment will start
	Cooling setpoint is satisfied	Lower the cooling setpoint
	Cooling lockout attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter C Lock to value -40 °F (-40 °C) to by-pass lockout
	Wiring error	1. Start the Fan by forcing the Fan ON mode 2. Put a jumper across terminals RC & Y1. The cooling should come ON. If it does not, verify wiring
The thermostat will not turn on the fan	Wrong mode selected	1. Start the Fan by forcing the Fan ON mode 2. Put a jumper across terminals RC & G. The fan should come ON. If it does not, verify wiring
	Wiring error	
Digital display shows missing digits or erratic segments	Defective display	Replace thermostat

Troubleshooting guide

Heatpump models

Auxiliary heat does not operate	Wrong mode selected	Select emergency heat mode
	Thermostat in Unoccupied mode	Select Occupied Hold in Schedule hold or Override to force the thermostat Occupied heating setpoint
	Anticycle delay active	Wait, the anticycling period will end and the equipment will start
	Heating setpoint is satisfied	Raise the Heating setpoint
	High Balance point attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter High BP to value 90 °F (32 °C) to by-pass lockout
	Heating lockout attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter H Lock to value 120 °F (49 °C) to by-pass lockout
	Wiring error	1. Start the Fan by forcing the Fan ON mode 2. Put a jumper across terminals RH & W1. The heating should come ON. If it does not, verify wiring and check if a jumper is required between RC & RH
Heat pump does not operate in heating mode	Wrong mode selected	Select heating mode
	Thermostat in Unoccupied mode	Select Occupied Hold in Schedule hold or Override to force the thermostat Occupied heating setpoint
	Anticycle delay active	Wait, the anticycling period will end and the equipment will start
	Heating setpoint is satisfied	Raise the Heating setpoint
	Low Balance point attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter Low BP to value -12 °F (-24 °C) to by-pass lockout
	Heating lockout attained	1. Mode is locked out based on outside air temperature 2. Change configuration parameter H Lock to value 120 °F (49 °C) to by-pass lockout
	Wiring error	1. Start the Fan by forcing the Fan ON mode 2. Put a jumper across terminals RH & W1. The heating should come ON. If it does not, verify wiring and check if a jumper is required between RC & RH
	Wrong reversing valve configuration	1. Wrong selection of parameter Re Valve 2. Select O will energize the valve in cooling operation. Valve is normally heat. 3. Select B will energize the valve in heating operation. Valve is normally cool.

Specifications

Thermostat power requirements:	19-30 Vac 50 or 60 Hz; 2 VA (RC & C) Class 2 RC to RH jumper 2.0 Amps 48 VA maximum
Operating conditions:	0 °C to 50 °C (32 °F to 122 °F) 0% to 95% R.H. non-condensing
Storage conditions:	-30 °C to 50 °C (-22 °F to 122 °F) 0% to 95% R.H. non-condensing
Sensor:	Local 10 K NTC thermistor
Resolution:	± 0.1 °C (± 0.2 °F)
Control accuracy:	± 0.5 ° C (± 0.9 °F) @ 21 °C (70 °F) typical calibrated
Occupied and unoccupied setpoint range cooling:	12.0 to 37.5 °C (54 to 100 °F)
Occupied and unoccupied setpoint range heating:	4.5 °C to 32 °C (40 °F to 90 °F)
Room and outdoor air temperature range	-40 °C to 50 °C (-40 °F to 122 °F)
Proportional band for room temperature control:	Both outputs: 1.1°C (2.0°F)
Digital inputs:	Relay dry contact only across C terminal to DI1 or DI2
Contact output rating:	Each relay output: (Y1, Y2, G, W1, W2 & AU) 30 Vac, 1 Amp. maximum 30 Vac, 3 Amp. in-rush
Economizer analog output rating:	0 to 10 Vdc into 2KΩ resistance min.
Economizer analog output accuracy:	± 3% typical
Wire gauge	18 gauge maximum, 22 gauge recommended
Dimensions:	4.94” x 3.38” x 1.13”
Approximate shipping weight:	0.75 lb (0.34 kg)
Agency Approvals all models:	**UL:** UL 873 (US) and CSA C22.2 No. 24 (Canada), File E27734 with CCN XAPX (US) and XAPX7 (Canada) **Industry Canada:** ICES-003 (Canada)
Agency Approvals Stand-Alone, BACnet & LON models	**FCC:** Compliant to CFR 47, Part 15, Subpart B, Class A (US) **CE:** EMC Directive 89/336/EEC (Europe Union) **C-Tick:** AS/NZS CISPR 22 Compliant (Australia / New Zealand) Supplier Code Number N10696
Agency Approvals Wireless models	**FCC:** Compliant to: Part 15, Subpart C

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Drawing & dimensions

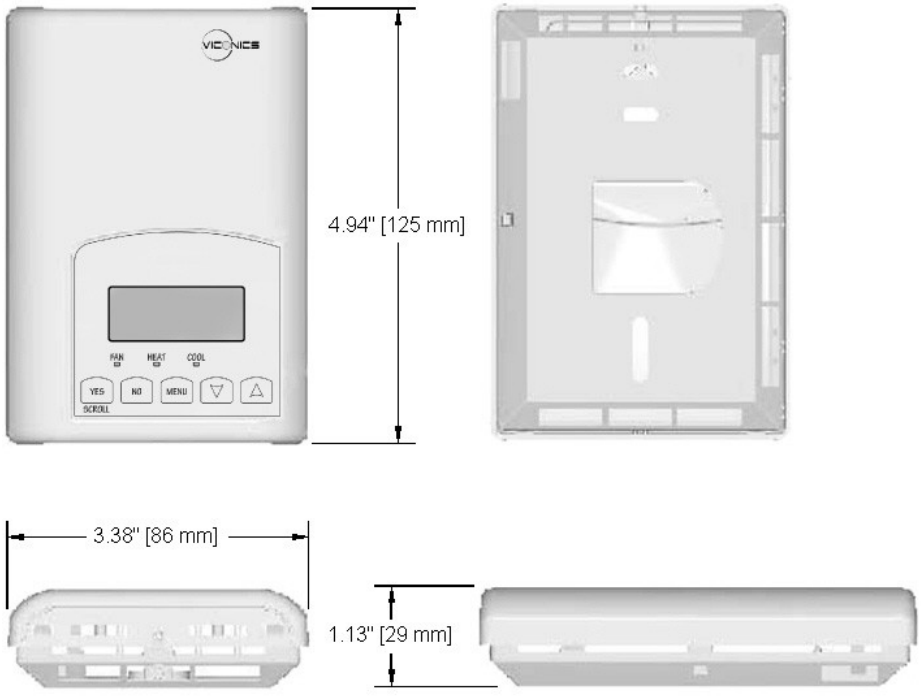


Fig.13 – Thermostat dimensions

Important notice

All VT7600 series controls are for use as operating controls only and are not safety devices. These instruments have undergone rigorous tests and verifications prior to shipment to ensure proper and reliable operation in the field. Whenever a control failure could lead to personal injury and/or loss of property, it becomes the responsibility of the user / installer / electrical system designer to incorporate safety devices (such as relays, flow switch, thermal protections, etc…) and/or alarm system to protect the entire system against such catastrophic failures. Tampering of the devices or miss application of the device will void warranty.

CUSTOM AIR PRODUCTS & SERVICES, INC.
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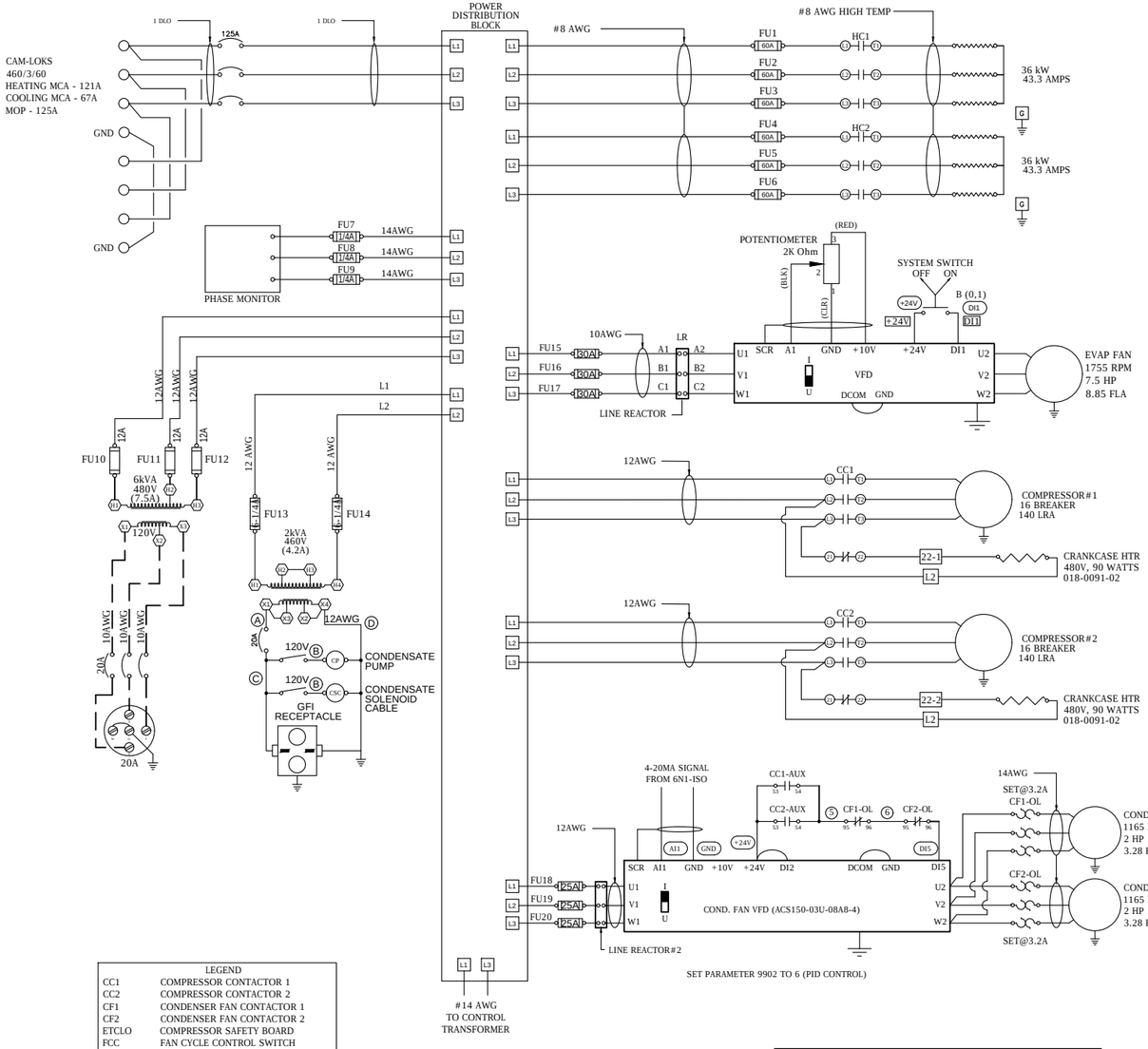
(713) 460-9009 • Fax (713) 460-9499
www.customairproducts.com

SECTION

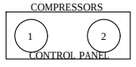
09

ELECTRICAL DRAWINGS



LEGEND	
CC1	COMPRESSOR CONTACTOR 1
CC2	COMPRESSOR CONTACTOR 2
CF1	CONDENSER FAN CONTACTOR 1
CF2	CONDENSER FAN CONTACTOR 2
ETCLO	COMPRESSOR SAFETY BOARD
FCC	FAN CYCLE CONTROL SWITCH
FU	FUSE
HC1	HEAT CONTACTOR 1
HC2	HEAT CONTACTOR 2
HPS	HIGH PRESSURE SWITCH
HM1	HOUR METER 1
HM2	HOUR METER 2
ICM	DOM TIMER
LPS	LOW PRESSURE SWITCH
OL	OVERLOAD RELAY
PDS	PRESSURE DIFFERENTIAL SWITCH
PM	PHASE MONITOR
POT	POTENTIOMETER
VFD	DRIVE

COMPRESSORS

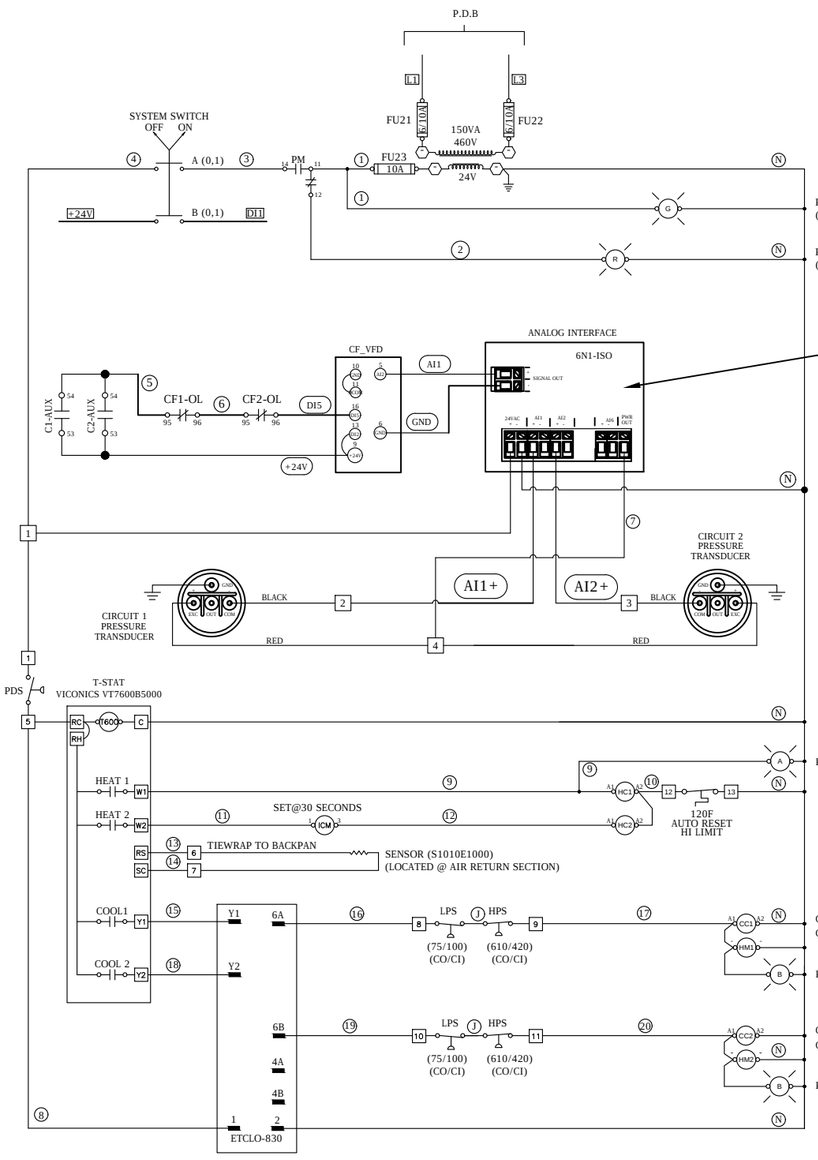


WIRING NOTES

208/120VAC	480/277VAC	24VDC
PHASE A - BLACK	PHASE A - BROWN	POSITIVE - DARK BLUE
PHASE B - RED	PHASE B - ORANGE	NEGATIVE - GRAY
PHASE C - BLUE	PHASE C - YELLOW	
NEUTRAL - WHITE	NEUTRAL - GRAY	24VAC
GROUND - GREEN	GROUND - GREEN	PHASE A - RED
		NEUTRAL - BROWN

INTRINSICALLY SAFE WIRING 18AWG LIGHT BLUE AND MUST BE SEPARATED FROM OTHER WIRING BY MINIMUM OF 2". IF CABLE USED IT MUST BE SHIELDED.

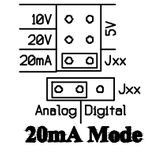
IF VAC WIRING GAUGE NOT SPECIFIED USE 18 AWG
IF VDC WIRING GAUGE NOT SPECIFIED USE 18 AWG



NOTE:
SET DIP SWITCHES AS FOLLOWS:

MODE DIP SWITCH SETTINGS - BLOCK SW1			
MODE	DIPswx1	DIPswx2	DIPswx3
HIGH	OFF	OFF	ON
INPUTS USED	DIPswx4	DIPswx5	DIPswx6
1 & 2	OFF	OFF	OFF

OUTPUT TYPE DIP SWITCH SETTINGS - BLOCK SW2		
OUTPUT TYPE	DIPswx1	DIPswx2
CURRENT OUT	ON	OFF
OUTPUT TYPE	DIPswx3	DIPswx4
0-5V/0-20mA	ON	OFF



REV#	DATE	DESIGNER	DESCRIPTION
0	12/06/2016	DN	FOR CUSTOMER APPROVAL
1	12/19/2016	DN	REVISE P&ID
2	02/23/2017	J.OMALLEY	CORRECTIONS FROM RED-LINES

CUSTOM AIR PRODUCTS & SERVICES, INC.
35 SOUTHBELT INDUSTRIAL DR., HOUSTON, TX. 77047
PHONE: (713) 460-9009 FAX: (713) 460-9499
TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM NUMBER F-14008

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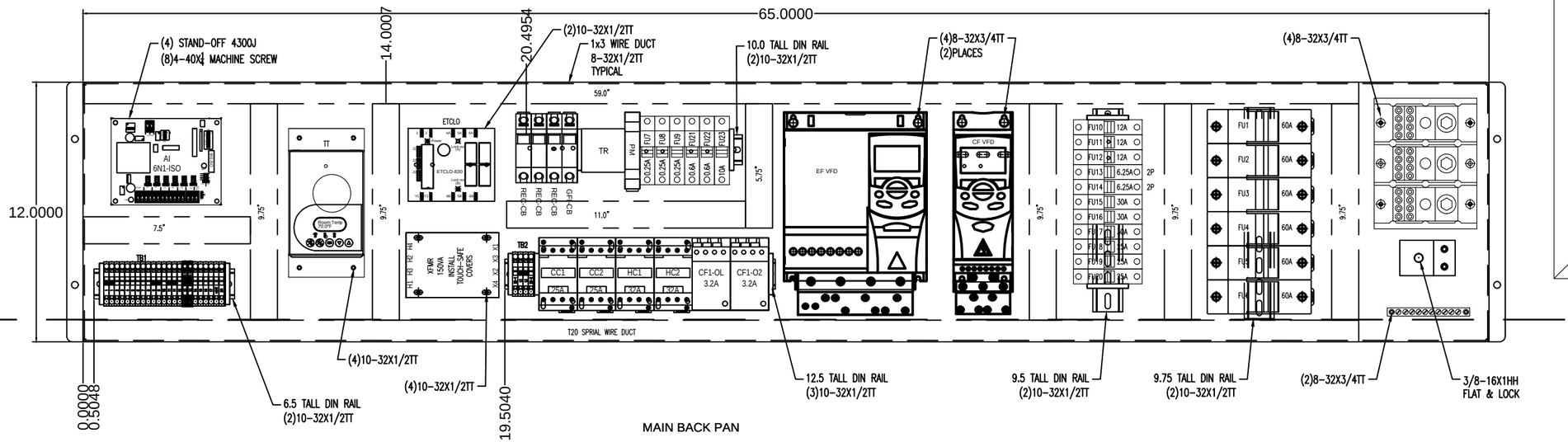
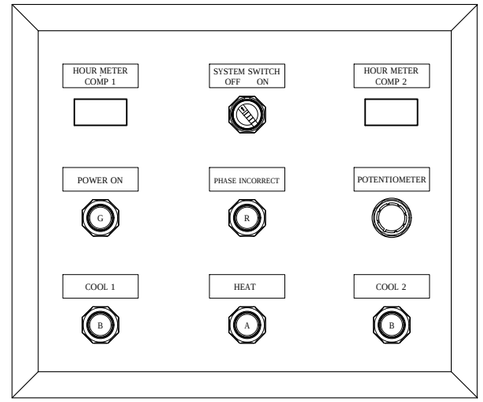
CAPS NO.:	DRAWING:	DRAWN BY:	DATE:
16F-0653	AE1	DAVID NGUYEN	12/06/2016
CUST. PO#:	**SHEET:** 1 OF 4	**CHECKED BY:** J.OMALLEY	**DATE:** 02/23/2017
SIZE: B	**REV:** 2	**APPROVED BY:** JOHN PHAN	**DATE:** 02/23/2017

CUSTOMER: HERC RENTALS

(25) 20 TON ENTERTAINMENT UNIT WITH 72KW HEAT
AND QUADBOX PLUGS, TRANSFORMERS
460/3/60
ELECTRICAL DESIGN
HVAC WIRING DIAGRAM



MAIN BACK PAN



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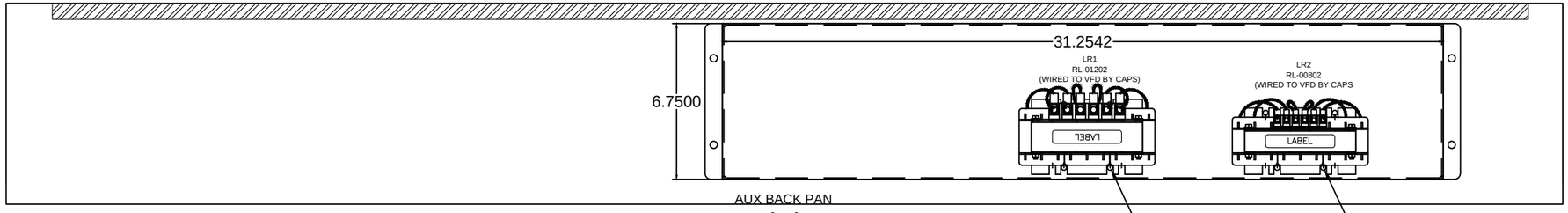
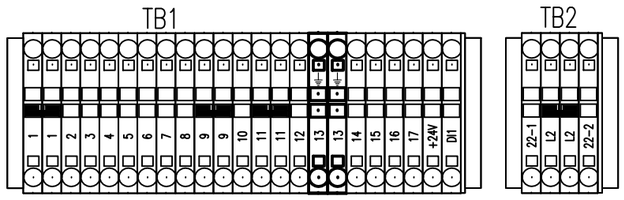
PM	PHASE MONITOR
POT	POTENTIOMETER
TR	RELAY TIMER
VFD	DRIVE



AUX BACK PAN

A-A

AUX BACK PAN



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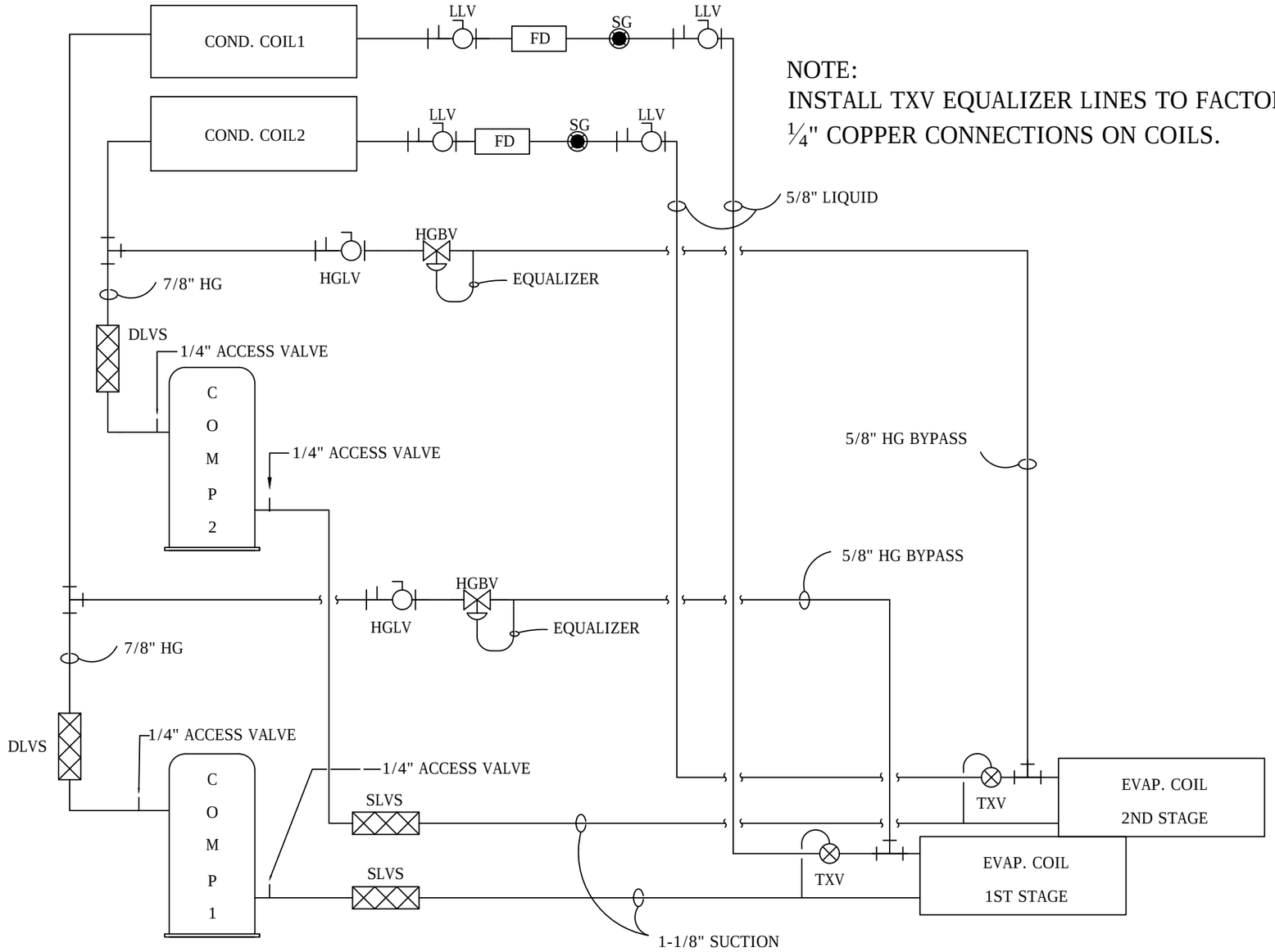
CAPS NO.: 16F-0653	DRAWING: AE2	DRAWN BY: DAVID NGUYEN	DATE: 12/06/2016	CUSTOMER: HERC RENTALS	
CUST. PO#:	SHEET: 2 OF 4	CHECKED BY: J.OMALLEY	DATE: 02/23/2017	(25) 20 TON ENTERTAINMENT UNIT WITH 72KW HEAT AND QUADBOX PLUGS, TRANSFORMERS 460/3/60	
SIZE: B	REV: 2	APPROVED BY: JOHN PHAN	DATE: 02/23/2017	ELECTRICAL DESIGN CONTROL PANEL LAYOUT	



NOTE:
INSTALL TXV EQUALIZER LINES TO FACTORY
¼" COPPER CONNECTIONS ON COILS.

REV#	DATE	DESIGNER	DESCRIPTION
0	12/06/2016	DN	FOR CUSTOMER APPROVAL
1	12/19/2016	DN	REVISE P&ID
2	02/23/2017	J.OMALLEY	CORRECTIONS FROM RED-LINES

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TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM NUMBER F-14008

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CAPS NO.: 16F-0653	DRAWING: AE3	DRAWN BY: DAVID NGUYEN	DATE: 12/06/2016	CUSTOMER: HERC RENTALS	
CUST. PO#:	SHEET: 3 OF 4	CHECKED BY: J.OMALLEY	DATE: 02/23/2017	(25) 20 TON ENTERTAINMENT UNIT WITH 72KW HEAT AND QUADBOX PLUGS, TRANSFORMERS 460/3/60 ELECTRICAL DESIGN P&ID	
SIZE: B	REV: 2	APPROVED BY: JOHN PHAN	DATE: 02/23/2017		

The general parameter setting procedure in the Short parameter mode:

1.To go to the Main menu, press if the bottomline shows OUTPUT; otherwise press repeatedly until you see MENU at the bottom.

LOC rEF
MENU FWD

2.Press keys until you see PArS on the display.

LOC PAr S
MENU FWD

3.Press . The display shows a parameter of the Short parameter mode.

LOC 9902 s
PAR FWD

4.Find the appropriate parameter with keys .

LOC 9907 s
PAR FWD

5.Press and hold for about two seconds until the parameter value is shown with under the value.

LOC 60.0 Hz
PAR SET FWD

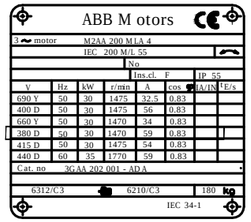
6.Change the value with keys . The value changes faster while you keep the key pressed down.

LOC 60.0 Hz
PAR SET FWD

7.Save the parameter value by pressing .

LOC 9907 s
PAR FWD

Enter the motor data from the motor nameplate:



Note: Set the motor data to exactly the same value as on the motor nameplate. Wrong motor settings of parameter group 99 may result in incorrect operation of the drive.
For example, if the motor nominal speed is 1440 rpm on the nameplate, setting the value of parameter 9908 MOTOR NOM SPEED to 1500 rpm results in the wrong operation of the drive.

- motor nominal voltage (parameter 9905 MOTOR NOM VOLT) - follow steps given above, starting from step 4.

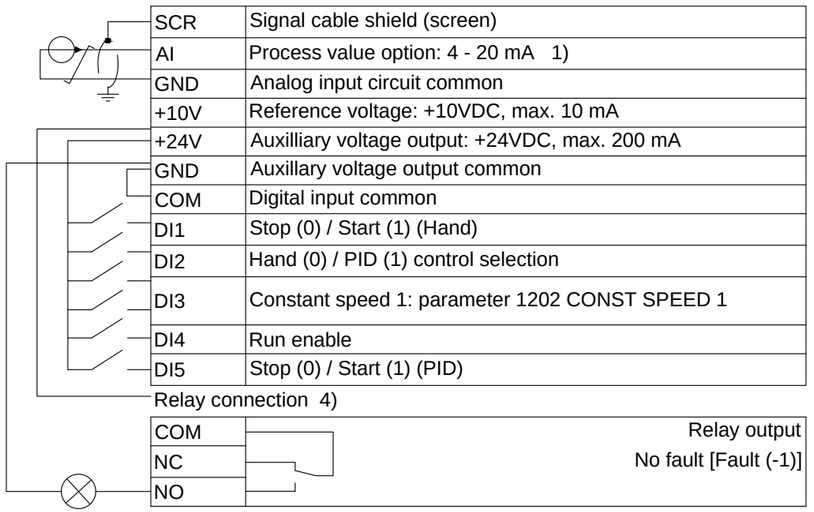
LOC 9905 s
PAR FWD

- motor nominal current (parameter 9906 MOTOR NOM CURR)

LOC 9906 s
PAR FWD

Note: Parameter 2108 START INHIBIT must remain in the default setting 0 (OFF).

Default I/O connections



1) Hand: frequency reference comes from the integrated potentiometer
PID: Process reference comes from the integrated potentiometer.

2) 360 degree grounding under a clamp.

3) Tightening torque: 0.22 N ·m / 2 lbf·in

4) Tightening torque: 0.5 N ·m / 4.4 lbf·in

Programming for Condenser Fan Speed Control for low ambient operation

(Note: Pressure Transmitter is 0 to 750 psig with a 4 to 20 mA output. Setpoint is 400 psig)

SELECT APPLICATION MACRO AT POWER UP
9902 - 6 (PID CONTROL)
9905 - "460"
9906 - "6.8"
9907 - "60"
9908 - "1200"

1102 - 7 (EXT2)
1105 - 60 HZ (REF1 MAX)
1601 - 0, RUN ENABLE (NOT SEL)
1401 (Relay Output 1) - "4=FAULT", Energize relay when a fault is active
2008 - 60 HZ (MAX FREQUENCY)
2202 - 5 SEC (ACCEL TIME)
2203 - 5 SEC (DECEL TIME)
3408 - 0128, PID1 SETPOINT (SIGNAL 2 PARAMETER)
3415 - 0130, PID1 FEEDBACK (SIGNAL 3 PARAMETER)
3418 - 9 [DIRECT] (OUTPUT 3 DECIMAL POINT)
4001 - 1, PID GAIN
4002 - 7.5, INTEGRATION TIME
4005 - 1 [YES], INVERTED, A DECREASE IN FEEDBACK DECREASES DRIVE SPEED
4006 - 4, Units - "%"
4007 - 0, Unit Scale (NO DECIMAL POINTS)
4008 0% Value - "0.0"
4009 100% Value - "750"
4010 - Set Point Select, 19 (INTERNAL)
4011 55% = 400 PSI, Internal Setpoint
4016 - 1, AI1
4019 - 100%

Evaporator VFD ABB ACS310 Parameters:
1105 - 60hz
1106 - 2
1301 - 20%
1601 - 0
1611 - 3
1810 - 60hz
2007 - 30hz
2008 - 60hz
2101 - 6
2102 - 2 ramp stop
2113 - 0 seconds
2202 - 30sec

REV#	DATE	DESIGNER	DESCRIPTION
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2	02/23/2017	J.OMALLEY	CORRECTIONS FROM RED-LINES

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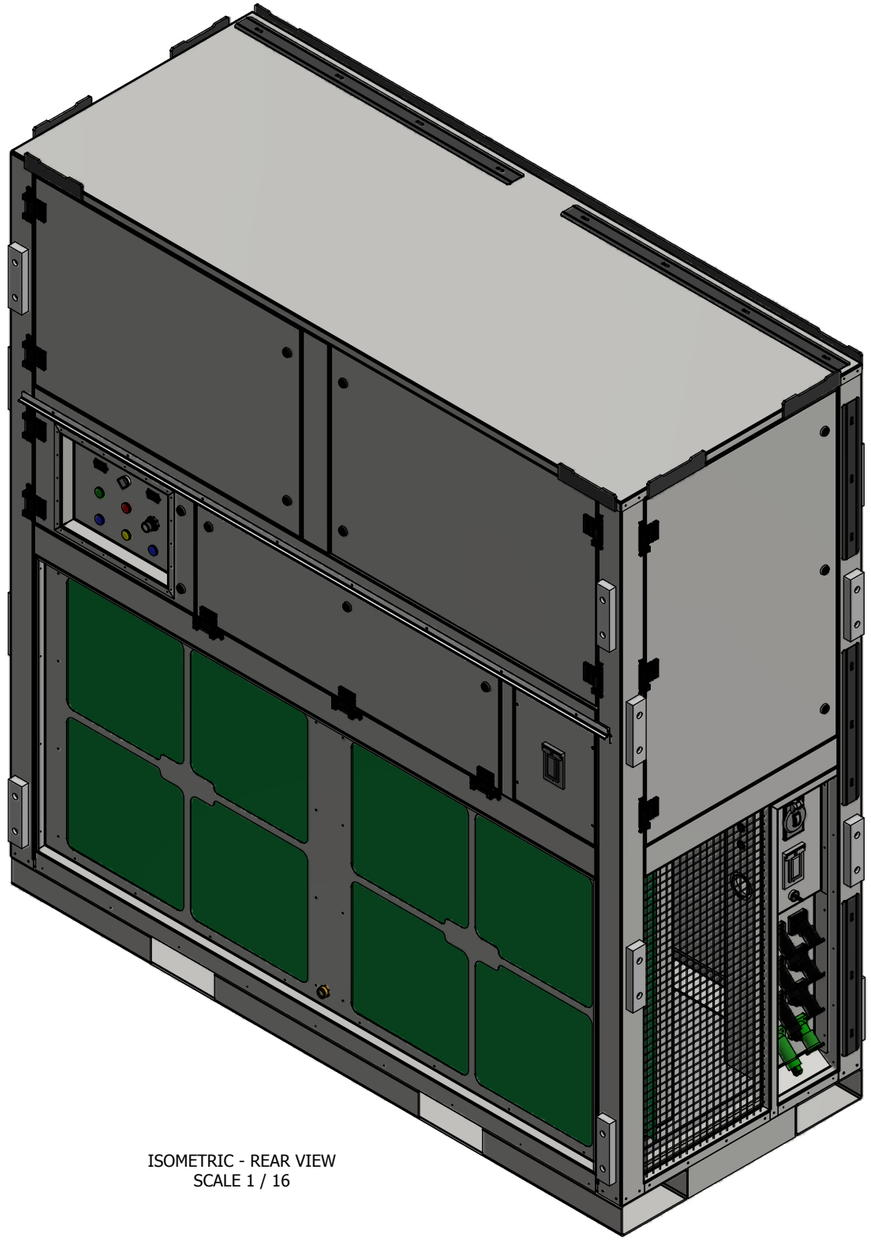
CAPS NO.:	DRAWING:	DRAWN BY:	DATE:
16F-0653	AE4	DAVID NGUYEN	12/06/2016
CUST. PO#:	SHEET: 4 OF 4	CHECKED BY: J.OMALLEY	DATE: 02/23/2017
SIZE: B	REV: 2	APPROVED BY: JOHN PHAN	DATE: 02/23/2017

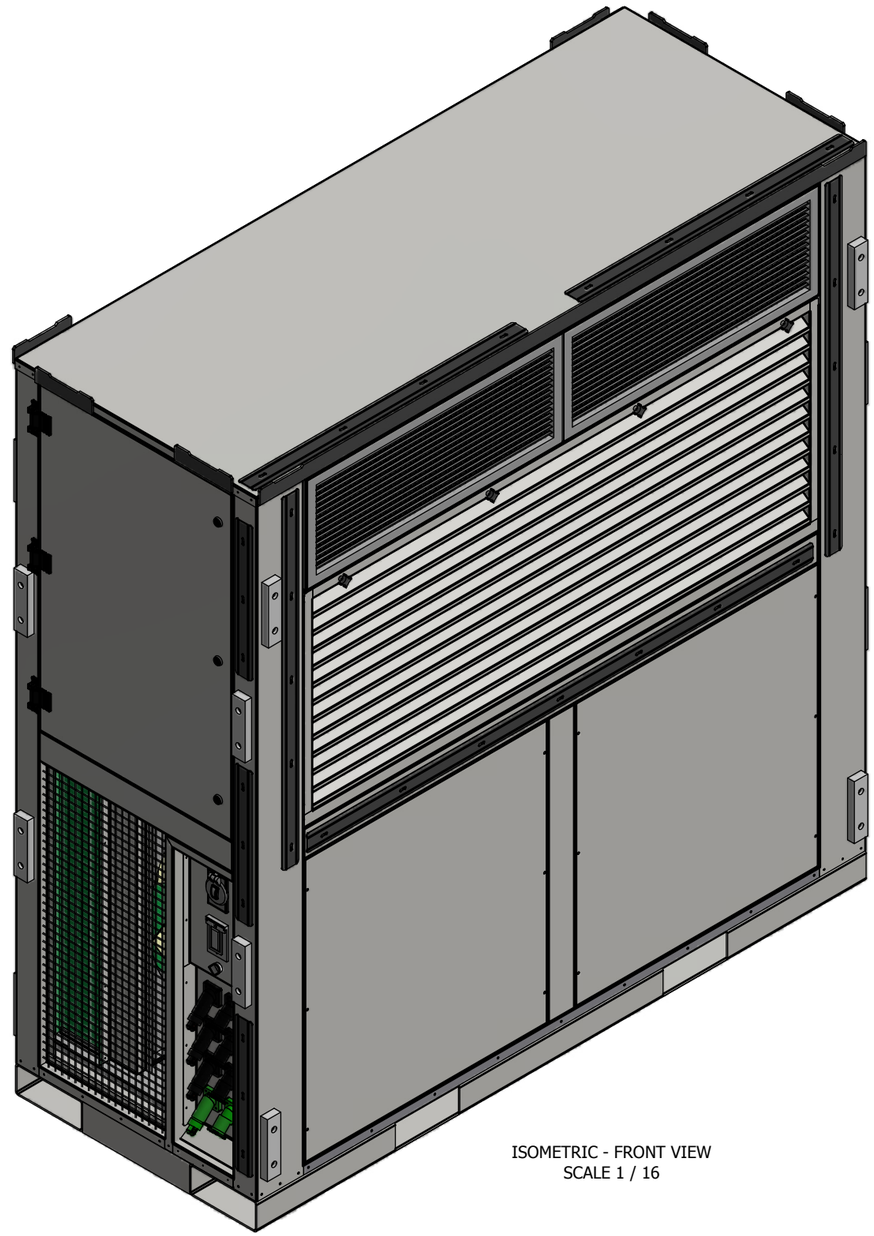
CUSTOMER: HERC RENTALS

(25) 20 TON ENTERTAINMENT UNIT WITH 72KW HEAT AND QUADBOX PLUGS, TRANSFORMERS
460/3/60
ELECTRICAL DESIGN
VFD PROGRAMMINGS

20 TON SPECIAL EVENT UNITS



ISOMETRIC - REAR VIEW
SCALE 1 / 16



ISOMETRIC - FRONT VIEW
SCALE 1 / 16

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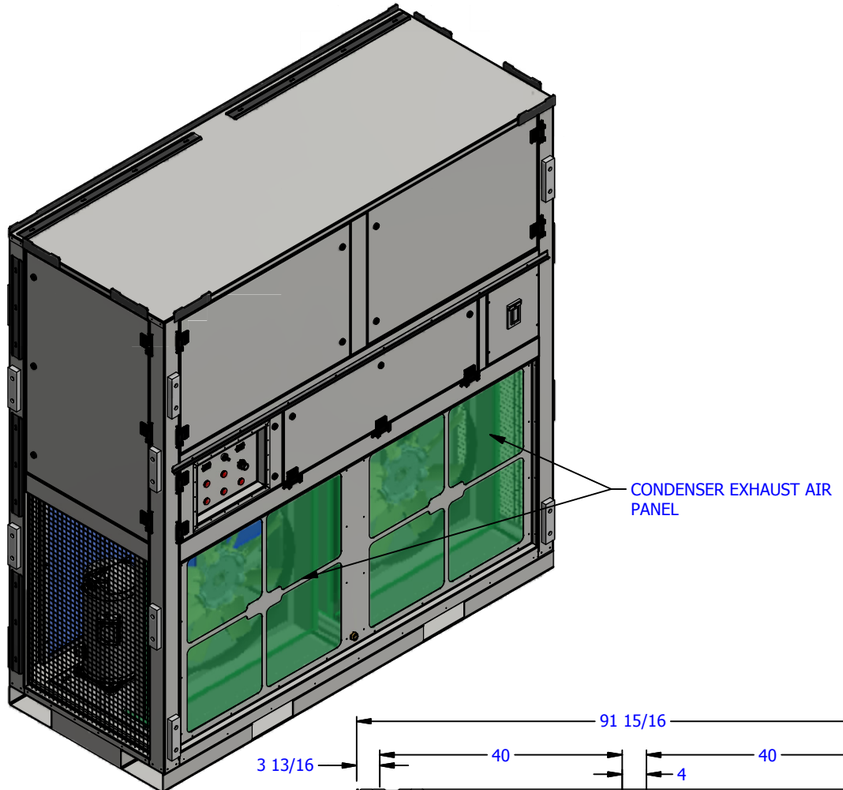
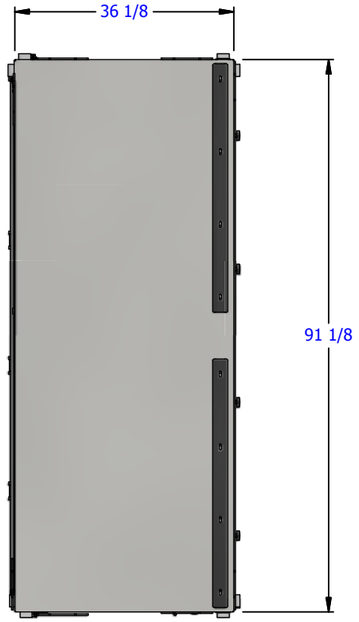
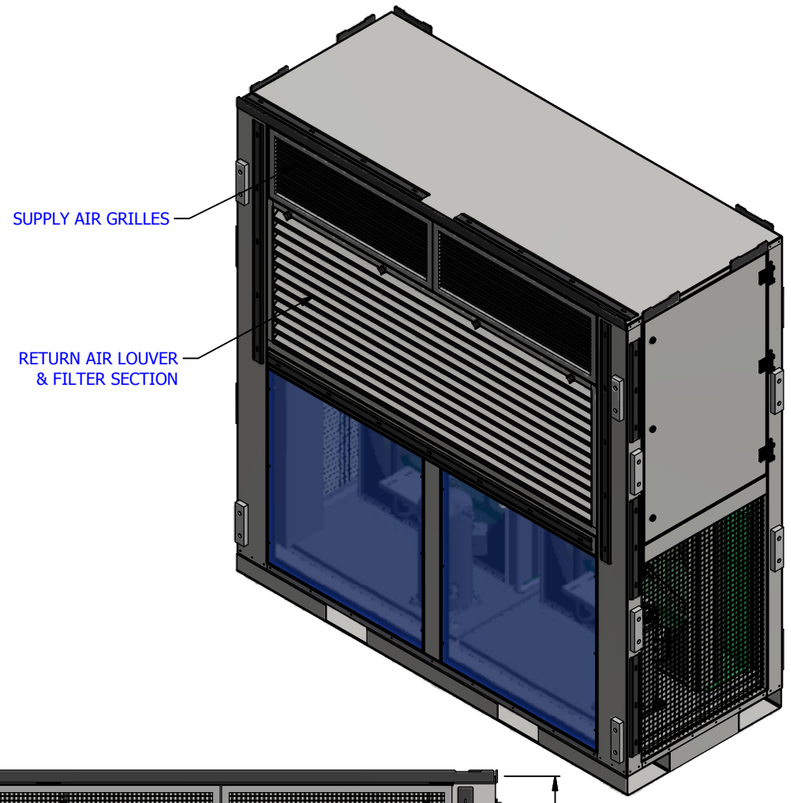
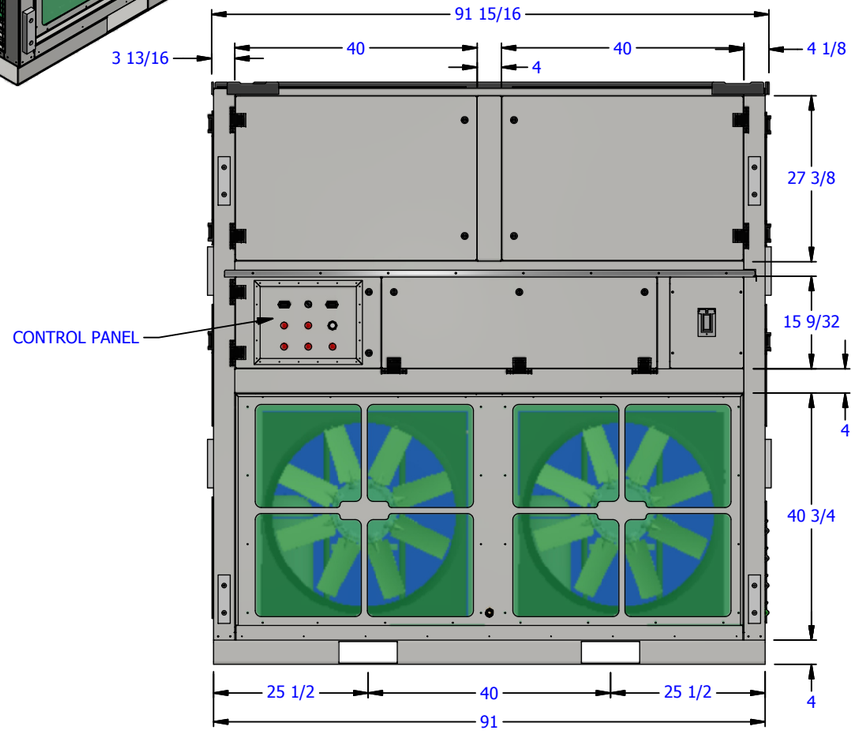
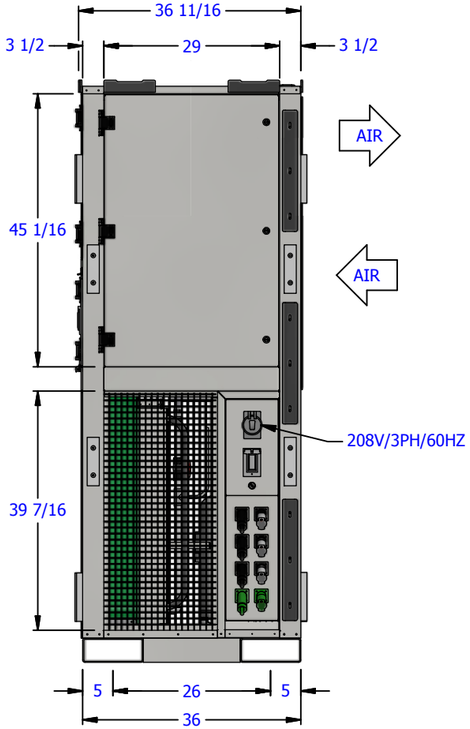
CAPS NO.:	DRAWING:	DESIGNER:	DATE:	CUSTOMER:
16F-0653	M1	TIEN NGUYEN	9/29/2016	HERC RENTALS
CUST. PO#:	SHEET: 1 OF 84	CHECKER: WAYNE REVIS	DATE: 11/30/2016	20 TON SPECIAL EVENT/ENTERTAINMENT UNIT COATED SKID, COATED HOUSING 460V/3PH/60HZ, GP, 36 KW HEAT MECHANICAL DESIGN GENERAL ARRANGEMENT
SIZE: B	REV: R10	APPROVER: JOHN PHAN	DATE: 11/30/2016	

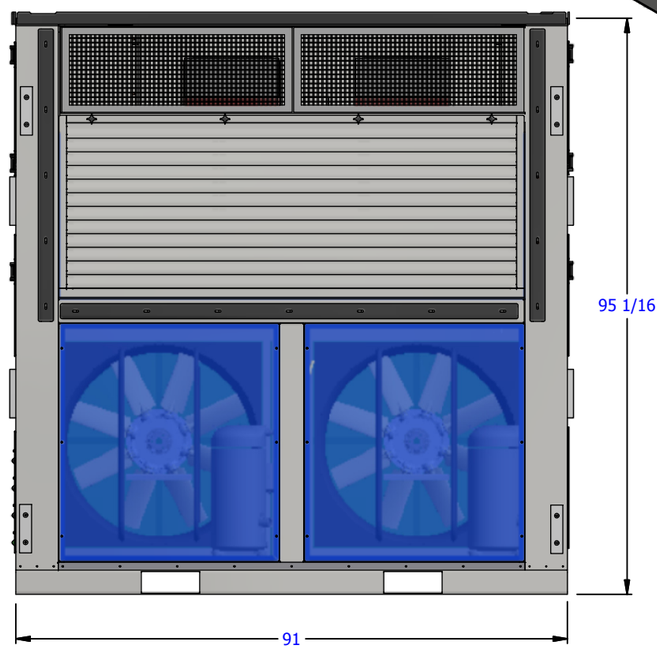












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CAPS NO.: 16F-0653	DRAWING: M1	DESIGNER: TIEN NGUYEN	DATE: 9/29/2016	CUSTOMER: HERC RENTALS
CUST. PO#:	SHEET: 3 OF 84	CHECKER: WAYNE REVIS	DATE: 11/30/2016	20 TON SPECIAL EVENT/ENTERTAINMENT UNIT COATED SKID, COATED HOUSING 460V/3PH/60HZ, GP, 36 KW HEAT MECHANICAL ARRANGEMENT GENERAL DIMENSIONS
SIZE: B	REV: R10	APPROVER: JOHN PHAN	DATE: 11/30/2016	

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SECTION

10

STORAGE & HANDLING PROCEDURE

STORAGE & HANDLING PROCEDURE

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DOCUMENT NUMBER	**ENG-PRO-0010**	REVISION	**0**
BUSINESS DIVISIONS	**ENGINEERING**		
DOCUMENT DESCRIPTION	**Preservation Procedure for Air Cooled Package Air Conditioning Units**		

REVISION RECORD

Revision	Date (mm/dd/yyyy)	Reason for issue	Prepared	Checked	Approved
0	03/29/2017	First Issue	J Phan	L Novak	J Phan

1. Purpose:

The purpose of this procedure is to provide a guidance to ensure that equipment and system are kept preserved during all phases of the project before taken into use.

2. Scope:

Air cooled package air conditioning units.

3. Procedure:

3.1. Safety Precautions:

DO...

1. Make sure unit is stopped and electrical power is disconnected and locked out before putting hands into the fan inlet or outlet opening or near rotating parts. We recommend a LOCK-OUT/TAG-OUT procedure and a warning sign on the start switch cautioning not to start the unit.
2. Follow maintenance instructions.
3. Take special care not to open any fan or system access panels while the system is under pressure (negative or positive).
4. Never allow untrained or unauthorized persons to work on equipment.
5. Take special care when working near electricity. Also insure the power is off and cannot be turned on while servicing the fan.
6. Keep area near equipment clean.

CAUTION...

1. **NEVER** put hands near or allow loose or hanging clothing to be near belts or sheaves while the unit is running.
2. **NEVER** put hands into inlet or outlet while unit is running. It is sometimes difficult to tell whether or not the unit is running ... be sure it is not running and cannot be operated before doing any inspection or maintenance work.
3. NEVER attempt to stop a rotating impeller with a foreign object or by hand. It is dangerous and can cause damage to the impeller eventually resulting in fan failure
4. **NEVER** take chances.

3.2. Shipping & Receiving:

1. This product was shipped F.O.B. shipping point. It is therefore to the interest of the buyer to carefully inspect all shipments before they are accepted from the carrier. Upon delivery, be sure that all items listed on the combination bill of lading and packing list (inserted in envelope attached to shipment) have been received.

2. Exposed shafts are normally coated with grease to prevent corrosion. V-belt driven units with the drive sheave shipped separately have the key taped to the fan shaft.

3. Prior to shipping, all items that have been internally preserved will be tagged/marked. Tagging will indicate the type of preservative used. Tagging/marking shall be affixed to remain in place and be clearly visible throughout the construction period. Tags shall be embossed stainless steel or engraved plastic and attached to the item using stainless steel straps.

4. If necessary, the HVAC control panel shall be protected with protective plastic and packed with suitable corrosion inhibitors with moisture indicator.

5. Accessories are sometimes shipped separately due to handling or space requirements.

6. Even though all equipment is carefully inspected and prepared for shipment at the factory, rough handling enroute may cause damage to the fan and drive parts.

7. Any shortage, breakage or damage noticed at the time of delivery should be indicated on the carrier's freight bill and signed by the driver or carrier's representative.

8. Damage noticed after delivery, should be reported to the carrier at once. Request their inspection of the shipment and fill out a concealed damage inspection report.

***NOTE:* Receiver MUST note any damage on the carrier's bill of lading and file a claim with the carrier immediately.**

3.3. Storage:

Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion. If it is necessary to store outdoors or within a building under construction, special care must be taken to prevent moisture, corrosion, dirt or dust accumulation. Coat the shaft with grease or rust preventative compound. Cover and seal bearings to prevent entrance of contaminants. Impeller should be rotated at least once a month to circulate the grease in bearings. If stored outdoors over seven (7) days, cover completely with a tarp or heavy waterproof paper. Electrical connections and leads must be protected from moisture. Block impeller to prevent natural rotation. Do not allow material of any kind to be piled on top or inside of fan.

3.4. Surface Protection:

Most fans are available with special paint finished to protect the fan against a wide variety of adverse conditions. The standard finish furnished without additional charge is well suited for indoor use. Fans installed in severe outdoor applications (i.e., coastal areas, etc.) may require additional surface protection. The outdoor finish must be compatible with Alkyd base paint. Architecturally pleasing colors are available from many paint manufacturers. Fans that are to be mounted internal to the facility it is serving must be stored in a climate controlled facility equal to the planned final installation. Fans that are to be mounted in the elements may require tarping or physical protection from the elements prior to installation.

3.5. Long Term Storage (Over 30 Days):

1. To prevent corrosion and brinelling, all bearings should be rotated monthly. Turn the wheel by hand while greasing bearing until a bead of grease appears on each side of the bearing. Storage records should be kept to assure proper maintenance. Failure to complete long term storage maintenance shall void all warranties associated with the drive components.

2. Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion.

3. If shock or vibration will be present during storage, the unit may need to be placed on some type of vibration dampening material to aid in preventing brinelling of the bearing surfaces

4. If it is necessary to store outdoors or within a building under construction, special care shall be taken to prevent moisture, corrosion, dirt or dust accumulation. Coat the shaft with grease or rust preventative compound. Cover and seal bearings to prevent entrance of contaminants.

NOTE:

A. Impeller should be rotated at least once a month to circulate the grease in the bearings and to avoid bearings lock-up issue.

B. Block impeller to prevent natural rotation to avoid unwanted wear and tear to the bearings.

5. Do not allow material of any kind to be piled on top or inside of unit.

6. Equipment which is to be installed, but not operated for several months, should first be blocked to take the weight off of the vibration isolators (if provided), and then given the same protection, periodic inspection and maintenance as a unit in storage.

3.6. Bearing Protection:

Fans equipped with standard duty bearings have been test run at the factory. These bearings are pre-lubricated and should not require any additional grease for startup. However, if unit is not put in service immediately, it is advisable to add lubricant so as to expel any air voids in the bearing reservoir which may ultimately collect condensation or moisture. The excess lubricant which is expelled at startup through the seals should not be replaced. This purging action will permit cooler operation and remaining grease will be adequate to properly lubricate the bearing. During the inactive period, the bearing should be protected from the elements by a securely attached plastic film and rotated several turns once a month. On belt driven units, it is advisable to protect the bearings from contamination by covering with a suitable material. Belts should be removed from the motor sheave and stored in the unit. This will allow the motor to be completely covered with a waterproof material.

1. Lightly seat one setscrew or eccentric locking collar on each bearing to hold in the approximate marked position.
2. Mount the shaft/bearing assembly in the fan with bolts.
3. Snug up bolts, but do not tighten.
4. Center the shaft in the housing (both ends) as closely as possible. (The fan propeller or wheel may need to be temporarily installed for equal clearances.)
5. Tighten the bearing mounting bolts.
6. Torque all bearing/shaft setscrews to manufacturers specifications.
7. Tighten any other locking devices (as applicable - Griptite bearings).
8. Reinstall the lube lines (if applicable).
9. Install bearing cover, propeller and belts and adjust the motor to get proper belt tension. Also, make sure that the sheaves are properly aligned.
10. Motor bearings should be lubricated as recommended by the motor manufacturer.
11. See also Note A & B of section 3.5 for long term storage.

4. Long Term Storage Preventive Maintenance Log:

1. To prevent corrosion, all bearings should be rotated monthly. Turn the wheel by hand while greasing bearing until a bead of grease appears on each side of the bearing.
2. Store in a dry, protected area being sure fan shaft, bearings and impeller are protected against dust and corrosion.
3. If shock or vibration will be present during storage, place unit on vibration dampening material to prevent brinelling of the bearing surfaces.
4. See also Note A & B of section 3.5 for long term storage.

Fan Tag #	Date Lubricated	Grease Type	Completed By	Verified By