CATALOG • 1992-93
FANS • BLOWERS & ACCESSORIES

The First Name in Forced Convection Cooling Technology

Comair Rotron's commitment to technological excellence is symbolized by ThermaPro-V™, a revolutionary patented design in forced convection cooling technology allowing for Voltage Regulated, Programmable and Thermally Speed Controlled fans. Currently, Muffin® DC, Sprint® DC, Major® DC, Patriot® DC, Biscuit® DC, Galaxy® DC and Spinnaker™ DC airmovers are equipped with ThermaPro-V™.

The fast changing world of electronics is well served by Comair Rotron's full line of airmovers. The Muffin®, Sprite®, Whisper®, Patriot®, Feather®, Sprint®, Caravel® and others offer the greatest variety and reliability. Comair Rotron holds more than 40 patents and has produced more than 100 million fans...a record of achievement unmatched within the industry.

COMAIR ROTRON
a KLI company

The increasing trend in downsizing equipment and the use of highly complex heat-generating components are closely monitored by Comair Rotron engineers. The most advanced testing facilities in the industry are continuously utilized by our Application Engineers in conjunction with Product Engineers to push to the limit both designs and materials to formulate the next generation of commercial airmovers. In addition to 100% on-line testing, Comair Rotron performs periodic audits on each product to assure precise quality control. Customers are urged to use our airflow acoustical, electrical and life-test facilities to evaluate their own equipment.

This catalog is a thorough introduction to the fans, blowers and capabilities of Comair Rotron. The wide scope of the product line; our knowledgeable Application Engineers; our international pricing structure as well as management's commitment to Total Quality Control (TQC), make Comair Rotron's fans highly reliable and competitive. New products and technical data are added regularly.

The 1992-93 catalog is complete with technical specifications on all standard fans and blowers in the Comair Rotron product line. Our fully integrated CAD system, however, is available for Special Design requirements and Modifications of our existing product line. For engineering assistance please contact Comair Rotron at (619) 661-6688 or contact the nearest Comair Rotron Sales Office.

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*With ThermaPro-V Technology
◊HI-REL Model

Application Engineering Information

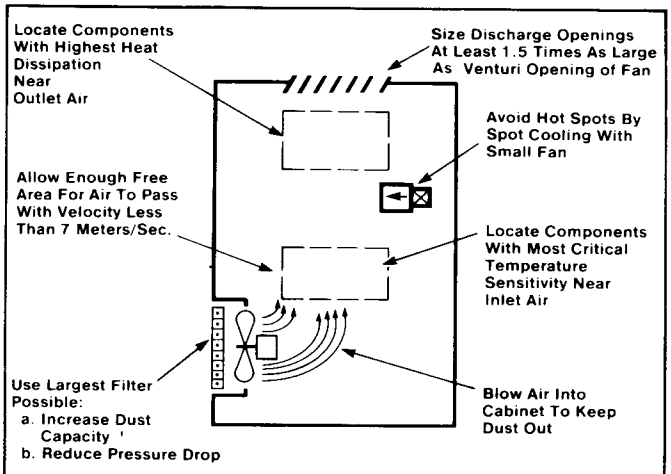
Introduction: Forced Convection Cooling

Of the many ways to dissipate heat in electronic components, forced convection cooling is the most effective. These Engineering notes will discuss several areas of importance in determining the correct fan or blower for any specific application.

Once the decision is made to use forced convection cooling, several points must be considered before a fan can be specified. Forced convection heat transfer can be effected in two ways: evacuation or pressurization of the cabinet. When evacuating a cabinet (fan on the exhaust side), the air distribution inside the cabinet is flexible. Cooling ports can be placed at any position in the cabinet to insure proper cooling in desired locations. Heat from the fan itself is not dissipated into the cabinet. However, filtering the fan on the exhaust side is extremely difficult.

Pressurizing the cabinet is the preferred method, since incoming air can be readily filtered. With the cabinet under pressure, any cracks or crevices will have a small amount of leakage *from* the cabinet and dust will not seep in. The fan is handling cooler, denser air, and it will have a slightly higher pressure capability, Fan life and reliability are increased because the fan ambient temperature is lower. The disadvantage of pressurization is that heat generated by the fan is dissipated into the cabinet.

Cabinet Cooling Hints



1. Locate fan to pressurize the enclosure assuring lowest fan operating temperature.
2. If air flow is to be vertical through the equipment to be cooled place fan at the bottom so that it works to aid natural convection.
3. Place largest heat source toward air exit so that it will have maximum heating effect on air cooling low power areas of the system.
4. If air filters and RFI screens are required in a given application their air impedance must be considered in air mover selection.
5. Avoid as many obstructions in the packaging of the equipment at fan outlet and general air path since more resistance to flow means a larger, more power consuming air moving device. Leave a fan radius between obstructions and the fan inlet and exhaust.

Figure 1

Figure 1 gives some cabinet cooling hints, using pressurization. These should be followed in system design to obtain the most effective cooling.

Establishing Cooling Requirements

Before a fan can be specified, the airflow required to dissipate the heat generated has to be approximated. Both the amount of heat to be dissipated and the density of the air must be known. The basic heat transfer equation is:

$$q = Cp \times W \times \Delta T$$

where q = amount of heat transferred
Cp = specific heat of air
ΔT = temperature rise within the cabinet
W = mass flow

Mass flow is defined as:

$$W = CFM \times Density$$

By incorporating conversion factors and specific heat and density for sea level air, the heat dissipation equation is arrived at:

$$CFM = 3160 \times Kilowatts/\Delta T\ ^\circ F$$

This yields a rough estimate of the airflow needed to dissipate a given amount of heat at sea level. It should be noted that the mass of air, not its volume, governs the amount of cooling.

Determining System Impedance

After the airflow has been determined, the amount of resistance to it must be found. This resistance to flow is referred to as system impedance and is expressed in static pressure as a function of flow in CFM. A typical system impedance curve, in most electronic equipment, follows what is called the "square law," which means that static pressure changes as a square function of changes in the CFM. Figure 2 describes typical impedance curves. For most forced air cooling applications, let n=2; approximating a turbulent system.

Static pressure through complex systems cannot be easily arrived at by calculation. In any system, measurement

Typical Impedance Curves

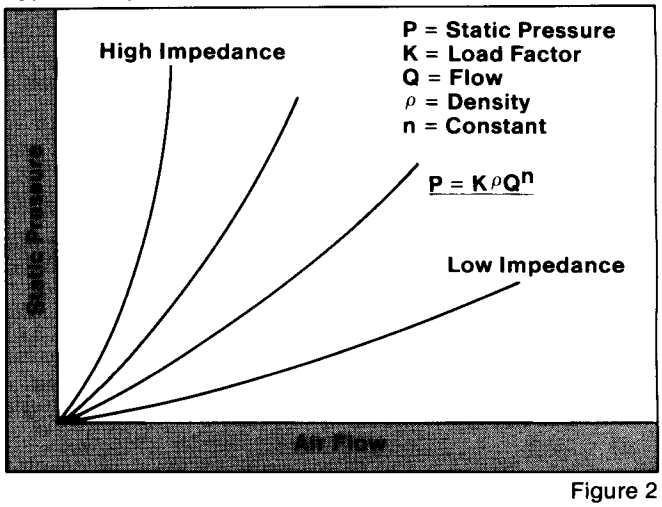


Figure 2

of the static pressure will provide the most accurate result. Comair Rotron makes this type of testing available. Please contact Application Engineering for more information.

System Flow

Once the volume of air and the static pressure of the system to be cooled are known, it is possible to specify a fan. The governing principle in fan selection is that any given fan can only deliver one flow at one pressure in a given system.

Fan/System Interaction

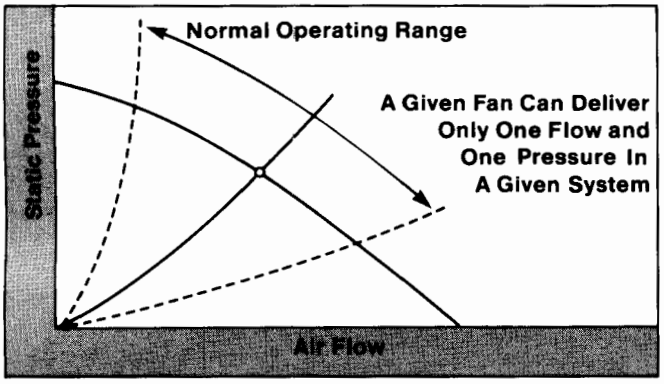


Figure 3

Figure 3 shows a typical fan pressure versus flow curve along with what is considered the normal operating range of the fan. The fan, in any given system, can only deliver as much air as the system will pass for a given pressure. Thus, before increasing the number of fans in a system, or attempting to increase the air volume using a larger fan, the system should be analyzed for possible reduction in the overall resistance to airflow. Other considerations, such as available space and power, noise, reliability and operating environment should also be brought to bear on fan choice.

Impact of Different System Impedances

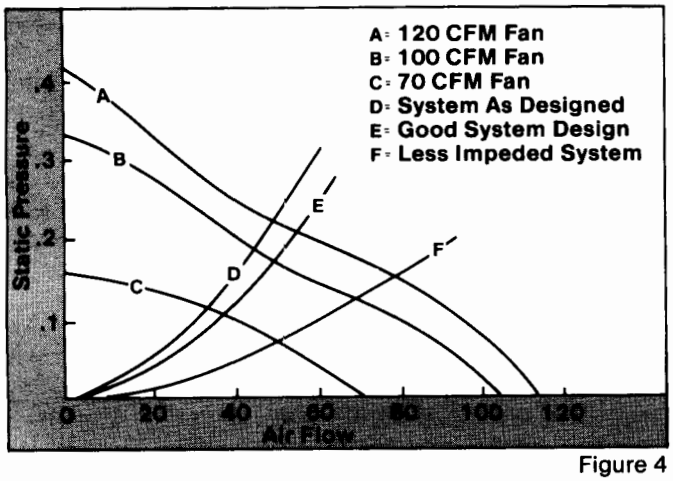


Figure 4

To demonstrate the impact of system resistance on fan performance, Figure 4 shows three typical fans used in the computer industry. A is a 120 CFM fan, B is a 100 CFM fan and C is a 70 CFM fan. Line D represents a system impedance within a given designed system. If 50 CFM of air are needed, fan A will meet the need. However, fan A is a high performance, higher noise fan that will likely draw more power and be more costly. If the system impedance could be improved to curve E, then fan B would meet the 50 CFM requirement, with a probable reduction in cost, noise and power draw. And if the system impedance could be optimized to where curve F were representative, then fan C would meet the airflow requirement, at a dramatically lower power, noise and cost level. This would be considered a well-designed system from a forced convection cooling viewpoint. Keeping in mind that a given fan can only deliver a single airflow at a given system impedance, the importance of system design on fan selection becomes obvious. Comair Rotron urges engineers to design fans into their systems, rather than add them as an afterthought, for best performance, noise, power and cost characteristics.

Series and Parallel Operation

Combining fans in series or parallel can achieve the deired airflow without greatly increasing the system package size or fan diameter. Parallel operation is defined as having two or more fans blowing together side by side. The performance of two fans in parallel will result in doubling the volume flow, but only at free delivery. As Figure 5 shows, when a system curve is overlaid on the parallel performance curves, the higher the system resistance, the less increase in flow results with parallel fan operation. Thus, this type of application should only be used when the fans can operate in a low impedance near free delivery.

Series Vs. Parallel Performance

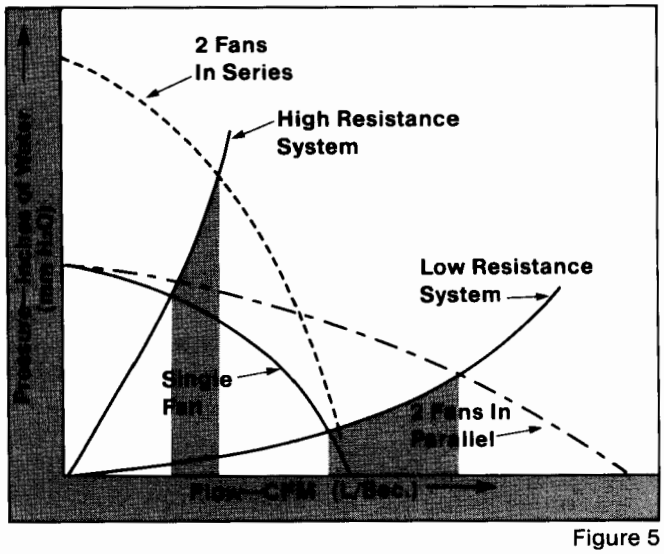


Figure 5

Series operation can be defined as using multiple fans in a push-pull arrangement. By staging two fans in series, the static pressure capability at a give airflow can be increased, but again, not to double at every flow point, as Figure 5 displays. In series operation, the best results are achieved in systems with high impedance.

In both series and parallel operation, particularly with multiple fans (5, 6, 7, etc.), certain areas of the combined performance curve will be unstable and should be avoided. This instability is unpredictable and is a function of the fan and motor construction and the operating point. For multiple fan installations, Comair Rotron strongly recommends laboratory testing of the system.

Application Engineering Information

Speed and Density Changes

By using dimensional analysis and fluid dynamic equations, basic fan laws can be derived giving a relationship between airflow, static pressure, horsepower, speed, density and noise. Figure 6 shows the most useful of these fan laws.

Basic Fan Laws

Variable	When Speed Changes	When Density Changes
Air Flow	Varies directly with speed ratio $CFM_2 = CFM_1 \left(\frac{RPM_2}{RPM_1}\right)$	Does Not Change
Pressure	Varies with square at speed ratio $P_2 = P_1 \left(\frac{RPM_2}{RPM_1}\right)^2$	Varies directly with density ratio $P_2 = P_1 \left(\frac{\rho_2}{\rho_1}\right)$
Power	Varies with cube of speed ratio $HP_2 = HP_1 \left(\frac{RPM_2}{RPM_1}\right)^3$	Varies directly with density ratio $HP_2 = HP_1 \left(\frac{\rho_2}{\rho_1}\right)$
Noise	$N_2 = N_1 + 50 \log_{10} \left(\frac{RPM_2}{RPM_1}\right)$	$N_2 = N_1 + 20 \log_{10} \left(\frac{\rho_2}{\rho_1}\right)$

Figure 6

As an example of the interaction of the fan laws, assume we want to increase airflow out of a fan by 10%. By increasing the fan speed 10%, we will achieve the increased airflow. However, this will require 33% more horsepower from the fan motor. Usually, the fan motor is being fully used and has no extra horsepower capability. Other answers will have to be considered. The fan laws can be extremely useful in predicting the effect on fan performance and specification when certain operating parameters are changed.

Effect of Density on Fan Performance (Speed Constant)

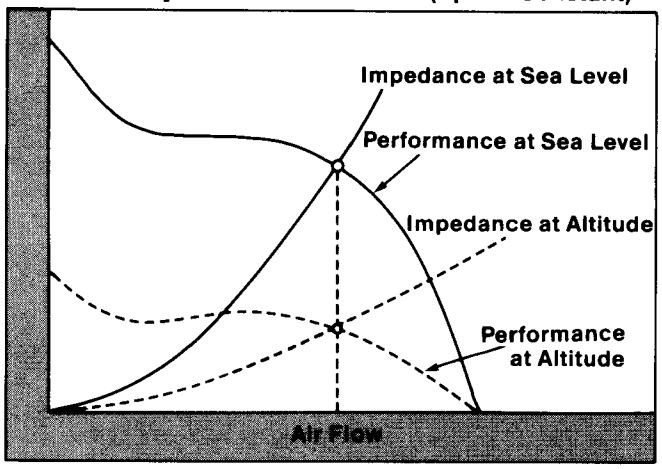


Figure 7

Since a fan is a constant volume machine, it will move the same CFM of air no matter what the density of the air as seen in Figure 7. However, a fan is not a constant mass flow machine. Therefore, mass flow changes as the density changes. This becomes important when equipment must operate at various altitudes. The mass flow is directly proportional to density change, while the volume flow (CFM) remains constant. As air density decreases, mass flow decreases and the effective cooling will dimish proportionately. Therefore, equivalent mass flow is needed for equivalent cooling, or the volume flow (CFM) required at altitude (low density) will be greater than what required at sea level to obtain equivalent heat dissipation.

Acoustic Noise

Noise is, to a great extent, a purely subjective personal phenomen. Perhaps the best definition of it is as an unwanted sound. Noise does, however, have two basic characteristics. The first is the physical phenomenon which can be measured and thus used in technical specification. The second is the psychoacoustical characteristic which attempts to judge the effect of noise on human beings. In industries that use small cooling fans, fan noise simply interferes with the ability of the people working nearby to concentrate on their work. The factors of greatest importance to the system designer are the psychological influences on the person rather than the physical influences of sound on the human ear.

Sound is perceived and measured as minute pressure fluctuations above and below the ambient pressure. The pressure variations of interest for their psychoacoustical effect vary as much as 13 orders of magnitude. Because of this large range of hearing capability, it is convenient to express these values in decibels. Sound Pressure Level (SPL) which is environmentally dependent, is defined as:

$$SPL = 20 \log_{10} (p / p_{ref})$$

where P = pressure
P_{ref} = a reference pressure.

In defining the noise generated by a fan, it is best to define the noise emanating from the source. This is called the Sound Power Level and is independent of the environment. Sound Power Level is defined similarly to sound pressure on a logarithmic scale as:

$$PWL = 10 \log_{10} (W/W_{ref})$$

where W = acoustic power of the source
W_{ref} = an acoustic reference power.

Sound Power Level cannot be measured directly and must be calculated from sound pressure measurements. Sound Power Level, since it is a measurement of noise unaffected by such factors as the fan's distance from the hearer, is used as the basic measurement for comparing noise levels of fans, as well as noise levels at different operating points of the same fan. In practice, another property of noise, its frequency, is also considered. For fans, two types of noise related to frequency are important: wide band noise, in which acoustic energy is continuously distributed over a frequency spectrum; and pure tones, in which the acoustic energy is concentrated over narrow bands in the frequency spectrum.

Since fan noise is predominantly wide band in nature with some pure tones, it is convenient to divide the audible frequency range into bands and to plot the average Sound Power Level in each band. For specification and rating purposes, it is generally acceptable to divide the audible frequency spectrum into eight octave bands, each with an upper limit twice that of the lower limit. These bands are usually designated by their center frequency. Fan noise data is usually plotted as Sound Power Level against the octave frequency bands.

Noise Rating Systems

Comair Rotron uses four rating methods for describing the noise levels in the fans it manufactures.

The data sheets on each fan in this catalog contain noise rating in all four systems.

PSIL

The first system used is Preferred Speech Interference Level. The PSIL is determined as the arithmetic average of the sound pressure level in the three octave bans with center frequencies of 500, 1000 and 2000 Hz. This rating is a good guide to the effect of noise on spoken communications.

dbA

A second rating system is the "A" weighted sound pressure level (dbA) often used by government agencies in determining compliance with such regulations as the Occupational Safety and Health Act (OSHA). The dbA rating is determined directly by a sound level meter equipped with a filtering system which de-emphasizes both the low and high frequency portions of the audible spectrum. This measurement is recorded at a distance of 3 feet from the source.

NPEL

A third rating system is the "A" weighted sound power level referenced to a 1 picowatt and expressed in Bels. This is also referred to as the Noise Power Emission Level (NEPL). NEPL was adopted by the Institute of Noise Control Engineering (INCE) as the preferred unit of measure. The INCE "Recommended Practice for Measurement of Noise Emitted by Air Moving Devices (AMDs) for Computer and Business Equipment" is a guideline for the description and control of noise emitted by components. ANSI S12.11 now includes the procedures called for in the INCE Practice. This is the latest and most technically thorough acoustic test procedure available. Comair Rotron does all acoustical testing per INCE and ANSI S12.11-1987.

Freely Suspended

The fourth rating system used is a method known as Freely Suspended. In this method a fan is suspended from springs in the middle of a Calibrated Reverberant Room. The fan is run at nominal voltage, free delivery, and at a distance of 1 meter. The sound pressure level (dbA) is recorded. (For comparison dbA @ 1 meter + .7778 = dbA @ 3 feet)

Causes of Fan Noise

Since noise in most measuring systems is specified in decibels (DB), it is useful to see how DB changes relate to perceived loudness:

DB Change Apparent Change in Loudness

3 DB	Just noticeable
5 DB	Clearly noticeable
10 DB	Twice (or half) as loud

Noise emanating from axial fans is a function of many variables and causes:

Vortex Shedding

This is a broad band noise source generated by air separation from the blade surface and trailing edge. It can be controlled somewhat by good blade profile design, proper pitch angle and notched or serrated trailing blade edges.

Turbulence

Turbulence is created in the airflow stream itself. It contributes to broad band noise. Inlet and outlet disturbances, sharp edges and bends will cause increased turbulence and noise.

Speed

The effect of speed on noise can best be seen through one of the fan laws:

$$DB_1 = DB_2 + 50\log_{10}(rpm_1/rpm_2)$$

Speed is a major contributor to fan noise. For instance, if the speed of a fan is reduced by 20%, the DB level will be reduced by 5 DB.

Fan Load

Noise varies as the system load varies. This variation is unpredictable and fan dependent. However, fans are generally quieter when operated near their peak efficiency.

Structure Vibration

This can be caused by the components and mechanisms within the fan, such as residual unbalance, bearings, rotor to stator eccentricity and motor mounting. Motor mounting noise is difficult to define. It should be remembered that cooling fans are basically motors and should be treated as such when mounted.

System Effects on Fan Noise

System disturbances are the biggest causes of fan noise. When a fan is designed for low noise operation, it can be very sensitive to inlet and outlet disturbances caused by card guides, brackets, capacitors, transformers, cables, finger guards, filter assemblies, walls or panels, etc.

When placing a fan in an electronic package, great care should be taken in locating components. Trial and error will be needed to determine the system's effect on noise. Different fan types will react differently in the same system. Common sense and intuition play a large role in the fan/system design.

For instance, if it is necessary to place card guides against the face of the fan for card cooling, the fan may develop a large pure tone if it is done on the inlet side; on the discharge side, the effect may be much less.

Figure 8 illustrates how one system component, finger guards, can effect noise.

Impact of Finger Guard on Noise

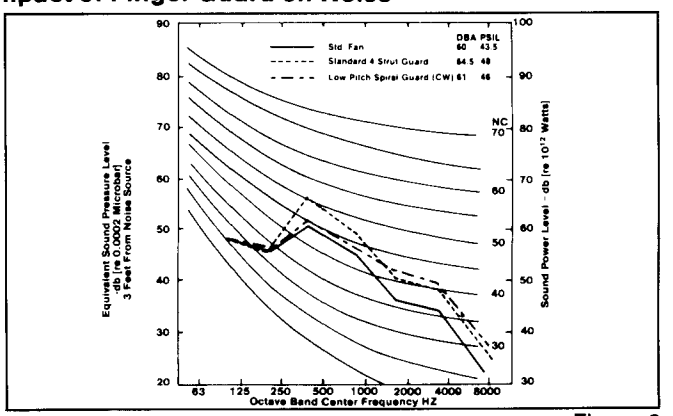


Figure 8

Application Engineering Information

Guidelines for Low Noise

The following guidelines will aid the fan user in minimizing fan noise.

System Impedance

This should be reduced to the lowest possible level so that the least noise for the most airflow is obtained. The inlet and outlet ports of a cabinet can make up to between 60 and 80% of the total system impedance, which is much too high for a low-noise result. And, if a large part of the fan's flow potential is used up by the impedance of the inlet and outlet, a larger, faster and noisier fan will be required to provide the necessary cooling.

Flow Disturbance

Obstructions to the airflow must be avoided whenever possible, especially in the critical inlet and outlet areas. When turbulent air enters the fan, noise is generated, usually in discrete tone form, that can be as much as 10 DB higher and thus cause considerable annoyance.

Fan Speed and Size

Most Comair Rotron fans have several low speed versions. These should be tried and used whenever possible. Various fan sizes should also be explored; quite often a larger, slower fan will be quieter than a smaller, faster fan delivering the same airflow.

Temperature Rise

Airflow is inversely proportional to allowable temperature rise within the system. Therefore, the $\triangle T$ limit placed on a piece of equipment will dictate to a large extent the required flow, and therefore, noise. If the temperature limit can be relaxed even a small amount, a noise reduction may result.

Vibration Isolation

In certain instances, the fan must be isolated from the cabinet to avoid vibration transmission. Because fans operate at a low frequency, and are light in weight, vibration isolators must be soft and flexible. Since the transmission is dependent on the system, trial and error is the best approach to a quiet system/fan interaction. In systems that require 20 CFM or less, noise radiated by the cabinet is the predominant noise. Isolation of the fan is the only practical solution to this type of system noise problem.

Brushless DC

Brushless DC fans are usually available at three nominal voltages: 12V, 24V and 48V. If the system has regulated power supply in one of these, then a brushless DC fan may be selected which will give the exact performance required, regardless of the AC input variables which plague AC fans.

Because the speed and airflow of a typical DC fan is proportional to the voltage supplied, a single product may be used to meet different applications by setting the supply voltage to what will give the desired airflow.

Figure 9 describes the result of varying the DC voltage supplied to a given fan. If, for example, a fan supplies 110 CFM of air at free delivery, 28V may yield 127 CFM, should that be needed. On the other hand, 24V operation may provide too much flow; the supply voltage might then be reduced to a level that yields the desired airflow.

Results of Varying Voltage to Typical DC Fans

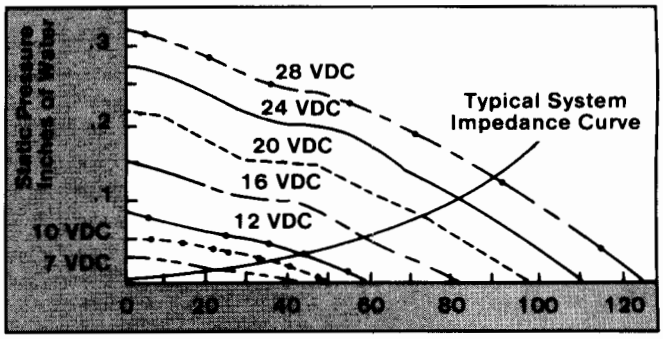


Figure 9

The voltage range that may be applied to the fan to assure satisfactory operation is dependent upon the individual fan design and may be as small as 10-14V for 12V units and up to 12-56V for 48V units.

Current

Brushless DC fans do not draw constant currents. The choice of the power source along with the addition of other peripheral devices will be affected by the type and number of DC fans and their motor current characteristics. Throughout the rotational cycle and particularly at commutation, the currents will fluctuate from minimum to maximum.

The waveform and level of ripple current will vary significantly between fans and motor designs, making specification in narrow terms difficult. An understanding of the power source limitations and how they may be impacted by various brushless dc fans early in the design phase will help prevent problems and allow maximum system flexibility.

Current ripple may be analyzed by waveform measurements using a laboratory-quality oscilloscope and a suitable series resistance (R_1), typically 1 ohm. Note that the current excursions vary from a minimum of 20 mA to a maximum approaching 800 mA while the motor is in a running condition. See Figure 10.

Measuring Running Current

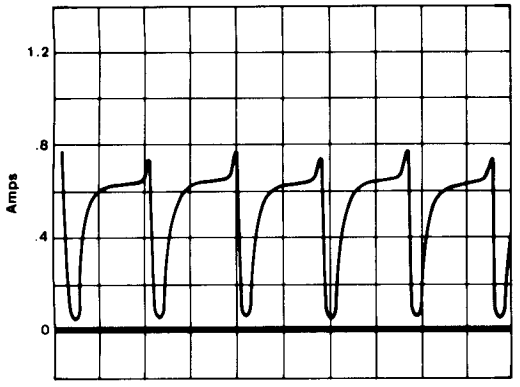
The use of a lab-quality digital multimeter to measure the DC running current will present a small error due to the AC ripple component of the DC motor. While the measured DC current value is an acceptable indicator of running motor current, a more precise method of running current measurement would be to measure the current's true root mean square (TRMS),i.e., to measure both the AC and DC current components. For example:

$$TRMS = \sqrt{DC^2 + AC^2}$$

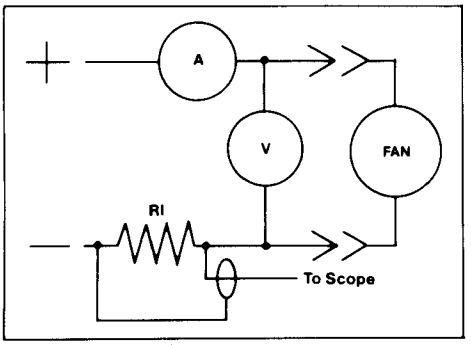
Peak Starting Current

The peak in-rush/peak starting current of a brushless DC fan typically will be a function of circuit resistance and power resource. However, many brushless DC fans incorporate additional filter capacitance for electromagnetic interference (EMI) suppression. Depending on the circuit location, the capacitance may represent a very high instantaneous in-rush current spike. Figure 11 represents the effect of a 47μf aluminum electrolytic capacitor across the input of a brushless DC fan.

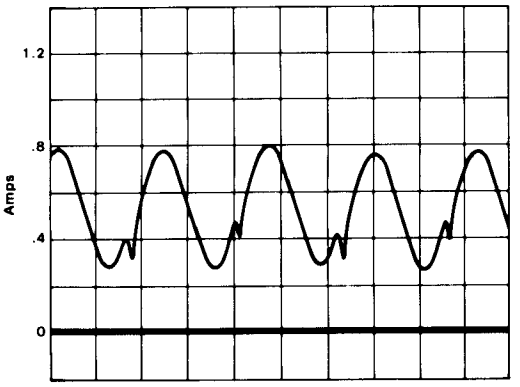
Current Waveshapes



Current ripple of a typical d-c fan motor (vertical = 0.2A/div., horizontal = 5.0ms/div.).



Measurement circuit for fan.



Current ripple of alternate motor design (vertical = 0.2A/div., horizontal = 5.0ms/div.).

Figure 10

Measuring the peak starting current of a brushless DC fan requires that the motor stator be at ambient room temperature prior to the application of power, the rated operative voltage selected and the storage oscilloscope set to trigger on the leading edge of the current waveform using the test circuit shown earlier. Figure 12 illustrates the peak starting currents upon application of power to the brushless DC fan in Figure 11, less the 47μf filter capacitor. The peak currents are one-quarter of Figure 11.

Current Limiting

The power supply limitations must be considered when DC fans are used. Many power supplies incorporate

Typical Peak Starting Current

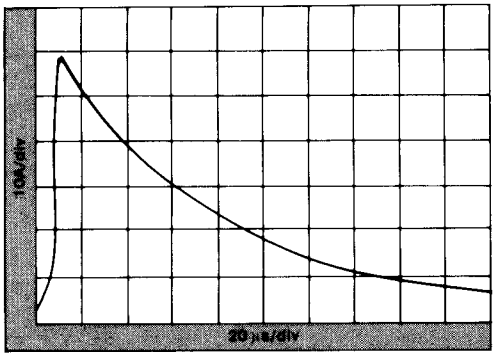


Figure 11

current limiting, current fold-back, or current shutdown protection circuits. Knowing the peak starting currents and maximum ripple currents during motor operation is essential in determining the power supply reserves necessary to maintain other peripherals which may be sharing the same power bus, and to avoid nuisance problems associated with

Typical Peak Starting Current Less Capacitor

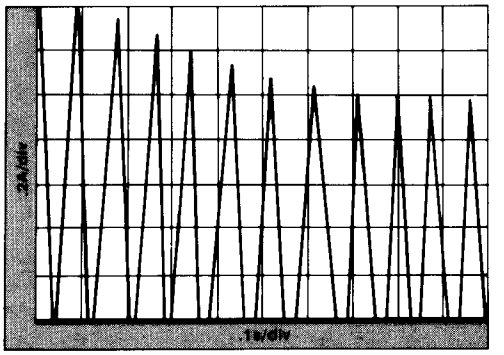


Figure 12

the power supply protection circuitry. Depending on the size and design of brushless DC fan motors, the ratio of peak starting current to running current can be quite large, eg., 4:1 or 5:1. To overcome the stress that would be placed on the power supply, many brushless DC motors incorporate a form of current limit, usually linear or pulse width modulated (PWM). With current limiting, peak current draw typically will be limited to values of 2.5 to 1 or less, as shown in Figure 13. The limiting of current to the brushless DC fan

Typical Peak Starting Current with Current Limitor

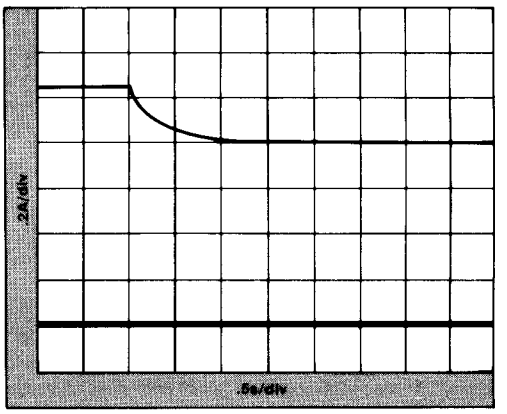


Figure 13

motor will also limit the starting torque of the motor, which will extend the time needed for the fan to reach full speed. Since DC fans have much higher starting torques than their AC counterparts, the time to reach full speed with the use of current limit will be less than equivalent AC models.

When operating more than one fan on the same power bus, the imposed ripple current can become significantly more complex as the currents of each fan add and subtract with each other. Figure 14 illustrates the running current of three fans sharing the same power bus. Under certain operating conditions, this complex ripple current could pose a potential for interference within the system. Bus isolation filtering may be required to assure adequate buffering.

Current Ripple Wave Form of Multiple Fans

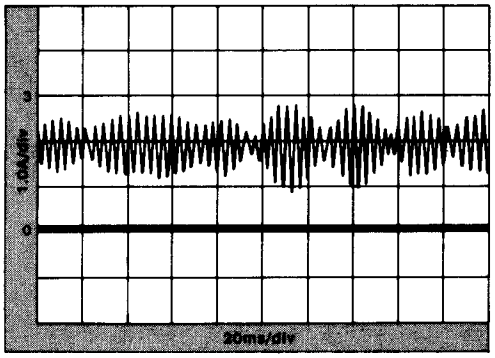


Figure 14

Ripple Current

In brushless DC fans, ripple current is a function of the motor design, electronic switching circuitry, operating voltage and current. The motor does not represent a constant load and may vary considerably from I AVG. as seen in Figure 15.

Typical Ripple Current

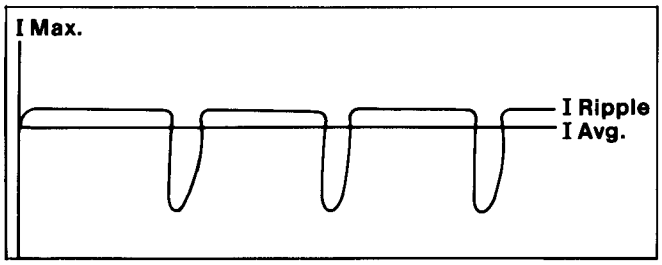


Figure 15

Figure 16 describes various methods of dealing with motor ripple current.

EMI

Identifying the offending interference problem in a system can be difficult. To help in establishing a common language as a basis for understanding interference problems, a discussion of the effects of different types of interference and the possible methods of controlling them follows.

Electromagnetic Interference (EMI) sometimes seems to be the general catch-all term. In fact, it is a generic term for

Methods of Dealing with Motor Ripple Current

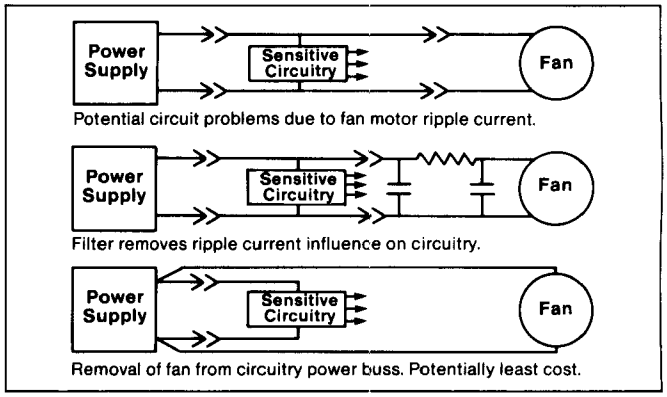


Figure 16

unwanted interference energies conducted as currents or radiated as electromagnetic fields. Radio frequency interference (RFI) is the older term used interchangeably in particular by the regulatory agencies.

The Federal Communications Commission (FCC) and other agencies, such as West Germany's Verband Deutscher Elektrotechniker (VDE) have established rules governing EMI emissions.

The FCC Part 15 Subpart J (Docket 20780) deals with electronic data processing equipment, and applies to devices that generate pulse rates in excess of 10,000 pulses per second and use digital techniques. Equipment covered under Subpart J is broken down into two classes:

Class A—Covers computing devices used in commercial and industrial and business applications.

Class B—Applies to computing devices used in a residential environment.

As Figure 17 demonstrates Class B limits are much more stringent, requiring additional design effort to assure compliance. Every component and subsystem must be carefully scrutinized ahead of time to assure that the goals will be met.

Conducted EMI Analysis of a Typical DC Fan

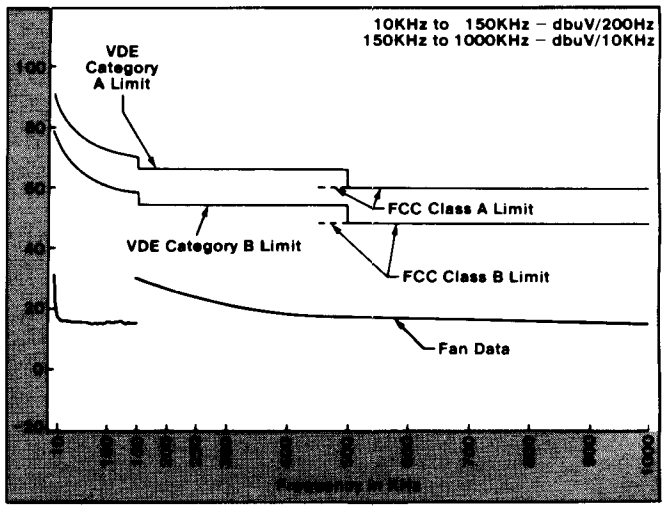


Figure 17

The main design goal is to meet and, if possible, reduce emissions well below Class B, provided costs are within tolerable limits. Frequently, careful design and layout will yield these results at no extra cost.

EMI currents in the fan power leads are referred to as conducted EMI and are usually more of a problem than radiated EMI. In fact, when dealing with brushless DC fans, conducted EMI is normally the only concern. Differential mode EMI is conducted on the power leads of the fan from the power switching transistors used for switching the motor windings.

Radiated EMI is generated by voltages and currents within the circuitry. If not properly suppressed or shielded, it may then be radiated by cables or structures which act as antennae.

The FCC has placed limits on conducted EMI on power lines from .45 MHz through 30 MHz.

Equipment to measure and establish compliance is expensive and verification of compliance is best accomplished by outside facilities specializing in EMI and EMC testing. The engineer can get a fairly good idea of how well the EMI is suppressed in the fan by analyzing the ripple across the power leads with an oscilloscope. See Figure 18.

Typical Current Ripple Comparison

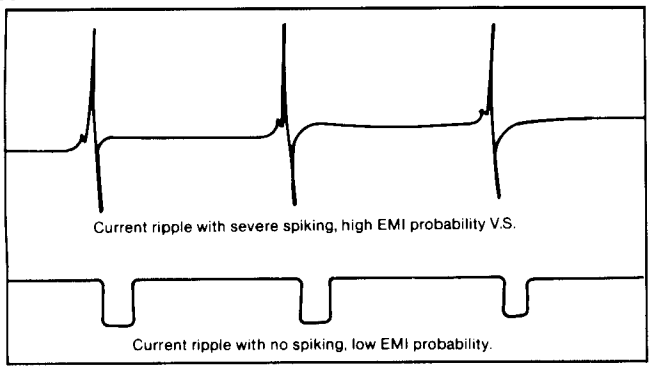


Figure 18

EMC

Electromagnetic compatibility (EMC) can best be described as the ability of equipment to operate without generating unwanted electromagnetic interference that can interfere with the operation of other products, and does not respond to unwanted interference generated elsewhere. If EMC is ignored during the design stages of product development, solutions to problems later become expensive and may yield limited results.

While the main desire is to reduce EMI generated by products, it is important to consider the susceptibility of products to EMI based on potential applications.

A good example is the use of a brushless DC fan for cooling a large switching power supply. Although the fan itself may generate EMI, sensitive control circuits, e.g. comparators, within the fan may be swamped by the EMI present in the power supply, resulting in faulty fan operation. For the power supply designer to resolve the problem would require additional filtering and grounding of the fan at additional cost. If resolved at the fan design level, a simple by-pass capacitor or ferrite bead might resolve the problem.

UMF

Uncontained magnetic fields (UMF) refers to the magnetic field of the permanent magnet and stator windings which extends beyond the boundaries of the DC cooling fan. UMF exists in virtually all fans to some degree, but may appear most troublesome in one mounting plane, and nonexistent in another.

To better understand the potential effects of a fan motor within a system, it is necessary to first evaluate the AC magnetic field levels present. In most brushless DC motor designs, the magnetic fields of the permanent magnet and the stator windings are shrouded within a steel housing which offers at least partial shielding (absorption) of the magnetic field, frequently in two of three possible mounting planes. Generally, mounting the fan with the open end of the motor (no steel) away from the sensitive electronic circuits and CRT's will offer the best protection from UMF.

The UMF can directly interface with the CRT presentation, creating distortion or ripple. If the magnetic levels are not strong enough to directly affect the CRT, magnetically induced voltage in sensitive circuitry, pre-amplifiers and operational amplifiers, may generate interference or degradation of the presentation.

Controlling UMF starts with the fan manufacturer. The use of a drawn steel containment can go a long way toward reducing UMF to tolerable levels. Conservative motor designs will also help. From the user's standpoint, placement and location will be critical factors which will prevent costly problems later. In applications where certain confrontations cannot be avoided, the use of high permeability magnetic shielding material may be formed around critical locations to eliminate interference.

Life and Reliability

Comair Rotron conducts a continous and comprehensive life test program for development purposes as well as for continuous monitoring of production units. The results of the life testing are reflected in continuous improvements in Comair Rotron's products in such critical areas as bearings, lubricants, materials, and insulation systems. The continuous monitoring of production units provides a means of evaluating the adequacy of production methods and quality assurance programs.

Because the primary mode of failure of an airmoving device is bearing failure caused by eventual degradation of the lubricant, Comair Rotron has adopted the method of statistical analysis widely used by the bearing industry, known as the Weibull function analysis. The Weibull function analysis method permits a statistically accurate determination of the failure distribution from a small representative sample of air moving devices. Comair Rotron's practice is to accelerate the life testing by operating its products at several elevated temperatures until enough failures of each sample group have been obtained to establish these statistical distributions. These data are then extrapolated to predict the time at which, in a large population, 90% of the air moving devices will still be operative.

This time is referred to as the "L-10" life, or the time at which 10% of the sample could be expected to fail.

Based upon the results obtained at each of the elevated temperatures, (usually 40°C, 55°C and 72°C) a curve may be drawn which will permit the life to be expected at lower temperatures. The curves presented in this catalog have been determined from tests conducted in the manner described here.

Every model fan, regardless of manufacturer, will exhibit different life characteristics depending on the combination of voltage, frequency, ambient temperature, mounting attitude, environment and restriction to airflow conditions it encounters in an individual application. The normal failure mode is in the bearing system and it is usually related to the total temperature the bearing system sees, although other factors may apply.

Generally speaking, there is not much of a life differential between a sleeve bearing system and its equivalent ball bearing system when the total temperature the bearing system sees is relatively low, but as this total temperature increases, ball bearings give progressively longer life than sleeve bearings.

For normal computer type environments we recommend our sleeve bearing units since they will meet the life requirements, are quieter, are less expensive, and can be used in any mounting attitude. For high ambient temperatures, or other operating conditions which result in the bearing system seeing very high total temperatures, or hostile environments, ball bearings should be considered. If a sleeve bearing model will do the job, we suggest it be used instead of a more expensive, less quiet ball bearing model.

One area that is important to reliability is fan noise and the ability of the bearing system to endure a shock and not become noisier. Sleeve bearing fans, generally speaking, can easily sustain multiple shocks of 80 g's with a duration of 11 msec without impacting noise. The same is not true of ball bearing fans. Figure 19 shows what can happen to ball bearing fan noise if the fan is subjected to 40 g's (11 msec duration). This is important since the equipment manufacturer has no control over how his equipment is treated after the fan is installed, particularly in shipment. It is quite common for a ball bearing fan to be noisy before it is even used just from the handling of the system into which it is installed.

Effect on Fan Noise Due to Damaged Ball Bearing

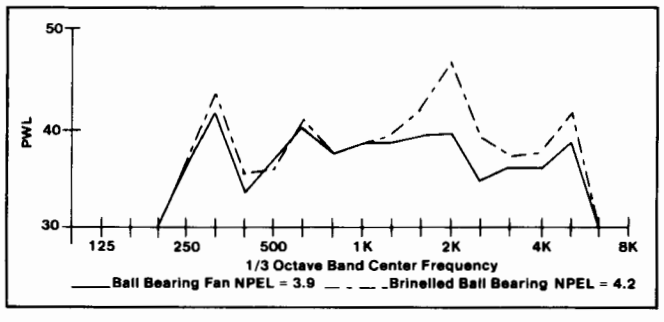
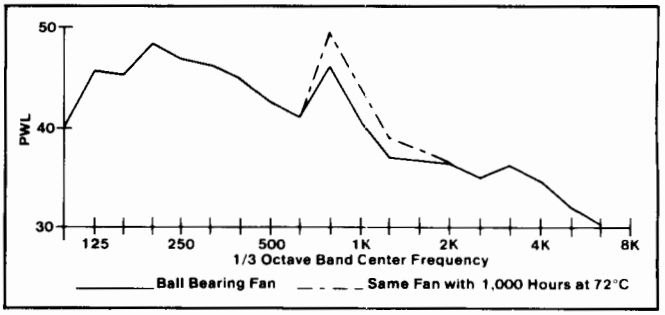


Figure 19

One last important point is what happens to both types of bearing systems versus running time or life. Typically, sleeve bearing fan noise does not increase due to life. This remains true until the system begins to fail due to loss of oil. However, as can be seen in Figure 20, ball bearing fans can begin to get noisy in a very short time. This increase is due to many factors, such as grease channeling, loss of grease, damaged bearings camouflaged by the grease, etc. Also, as time goes on, the grease may begin to dry out which allows for a very noisy fan; the fan will continue to run for a long time. Thus, if usable fan life were defined to end when the fan became noisy, it is possible that the sleeve bearing fan would out-live an equivalent ball-bearing fan.

Effect on Fan Noise Versus Life Figure 20



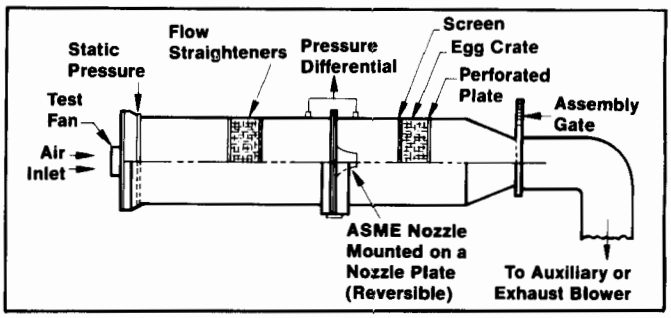
Test Methods

Rotron's Aerodynamic Laboratory is equipped with two testing chambers, illustrated schematically in FIGURE 21. These test chambers are designed to be in accordance with the requirements of figures 4.1 and 52. of Air Moving and Conditioning Association's (AMCA) Standard 210.

The fan under test is mounted on the inlet of the chamber, and flow through the nozzle is varied by the moveable gate assembly. The flow through the calibrated ASME nozzle is determined by measurement of the pressure differential across the nozzle, and simultaneous readings are taken of the static pressure developed by the fan. The function of the auxiliary blower is to provide sufficient pressure drop across the nozzle to allow free delivery flow readings when the static pressure across the fan is zero.

In addition to testing fans, the test chambers may be used for determining impedance of a customer's equipment by using the auxiliary blowers to force air through the equipment. This is the equipment used for the no-charge application engineering service referred to previously.

Rotron Test Set up Figure 21



Capability

DC Fans and Blowers

Comair Rotron's growing brushless DC fan and blower product line is highlighted by the ThermaPro-V™ Technology. ThermaPro-V, currently available on seven fan models (Muffin® DC, Sprint® DC, Major® DC, Patriot® DC, Biscuit® DC, Galaxy® DC and Spinnaker™ DC) — see pages 46-57 — allows fans to be Voltage Regulated, Programmable and Thermally Speed Controlled (see pages 44-45 for an overall discription of TPV.)

Comair Rotron offers the greatest diversity of product in the brushless DC field — from one inch thick Flight™ 60 fan (9-18 CFM) to the Spinnaker™ DC blower with up to 68 CFM and static pressure capabilities of over two inches of water, to the Patriot® DC delivering 260 CFM.

Brushless DC Fans and Blowers offer the designer a number of options not available with AC fans. Portable DC equipment is much better served with the new brushless DC technology which requires lower power drain and has longer life than the former brush type motors. Beside this application there are some areas formerly served by AC fans that now may be better handled by Brushless DC products.

By running the fan on the DC output voltage of the equipment's power supply, there is no need to supply different fans for 115 VAC and 230 VAC. Also, there is no change in performance based on frequency changes from 60Hz to 50Hz.

Variable Performance can be achieved by controlling the input voltage and thus the fan speed and airflow. This allows customizing the fan to the equipment to obtain the lowest possible noise while maintaining the necessary airflow for proper cooling. Speed control can be tied to a temperature sensory system to vary performance as made necessary by increases in equipment temperature, thus combining the lowest noise under normal conditions with the best airflow under adverse conditions.

Since Brushless DC fans already include electronics integral to the fan, additional circuitry can be included that will yield remote warning signals. Fan Performance Sensing (FPS) provides a discreet pass/fail signal that indicates if the fan is rotating above a certain set speed. In addition, Tachometer Output provides the user a pulse train with a frequency proportional to the fan speed that can be conditioned to give a pass/fail signal or used as a feedback loop for speed control.

The combination of lower power, cooler running and lower operating voltages makes Comair Rotron's Brushless DC fans the most desirable in many component cooling applications.

As with Comair Rotron's entire product line, Special Design and Modifications are available. Please contact Application Engineering or your Comair Rotron representative for additional information.

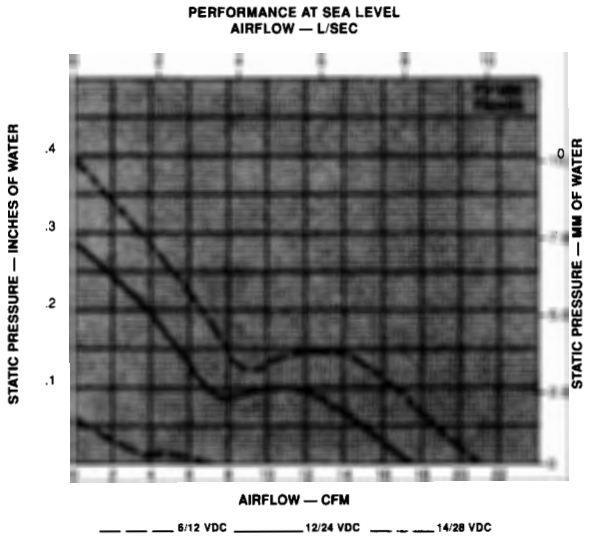
FLIGHT™ II 60 SERIES

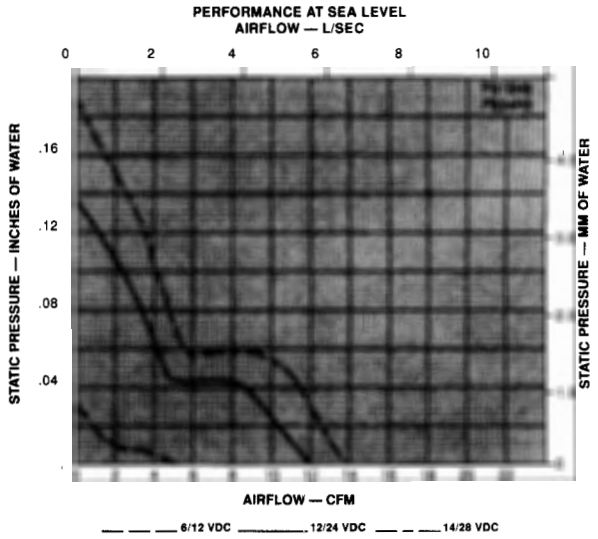
BRUSHLESS DC FAN

FEATURES

- ☐ Size - 2.36" square x 1.00" deep (60.0mm x 25.4mm)
- ☐ 9 to 18 CFM (4 to 9 L/Sec.)
- ☐ 12 and 24 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight - 3.9 oz (.11 Kg)
- ☐ UL Yellow Card Recognized — File No. E31293
- ☐ CSA Certified — File No. L52898

PERFORMANCE



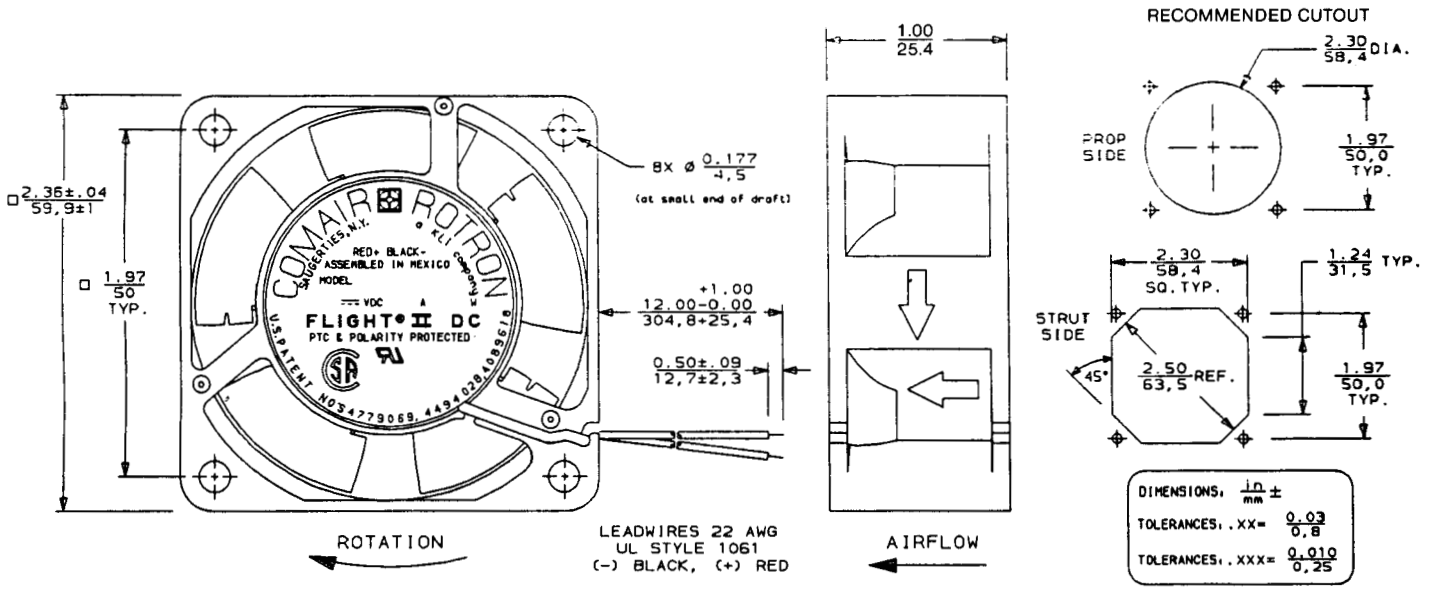


SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.	dBA
* FS12B3	031156	Ball	12	6-14	1.7	142	640	5000	18	8.5	33.9
* FS24B3	031157	Ball	24	12-28	1.9	80	360	5000	18	8.5	33.9
* FS12H3	031158	Ball	12	6-14	1.0	80	185	3500	12	5.7	28.5
* FS24H3	031159	Ball	24	12-28	1.3	55	185	3500	12	5.7	28.5

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
High chromium stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.

CONSTRUCTION

Venturi - PPS (Plastic), black, glass and mineral filled, UL94V-0.
Propeller - PBT (Plastic), black, reinforced, UL94V-0.

EMI

Designed to meet EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emissions.
Designed to meet EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

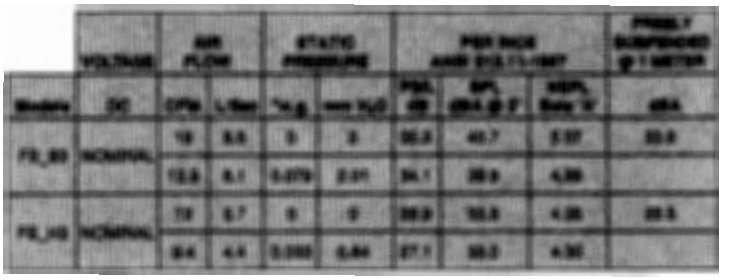
Capable of furnishing Harness assemblies. See page 106.

Tachometer output–see page 60–square wave equal to two pulses per revolution.

6-32 threaded inserts

ACOUSTIC RATINGS

(for definitions see page 5)

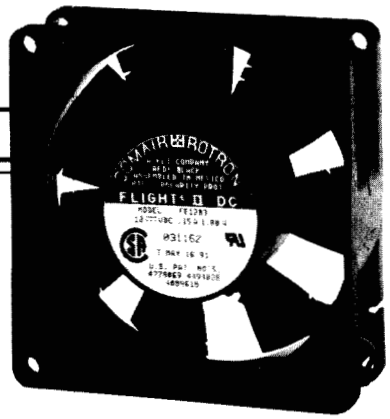


LIFE EXPECTANCY

The Flight Series fan is designed for continuous duty life of 60,000 hours at 25°C. Brushless electronic commutation provided by dependable solid state circuitry. High efficiency brushless DC motor provides for lower internal temperature rise than conventional AC motors.

FLIGHT™ II 80 SERIES

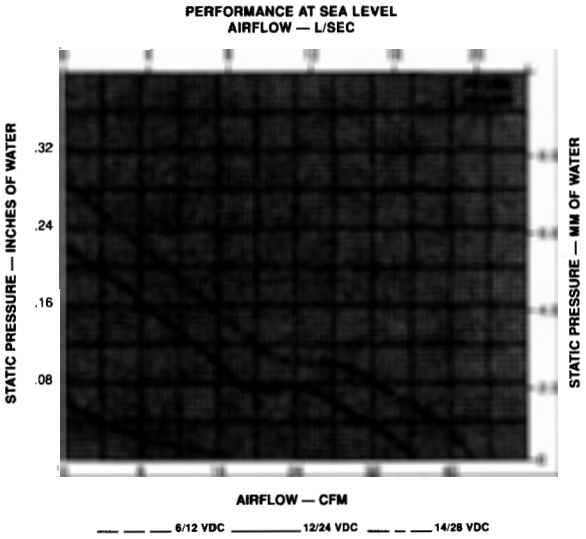
BRUSHLESS DC FAN

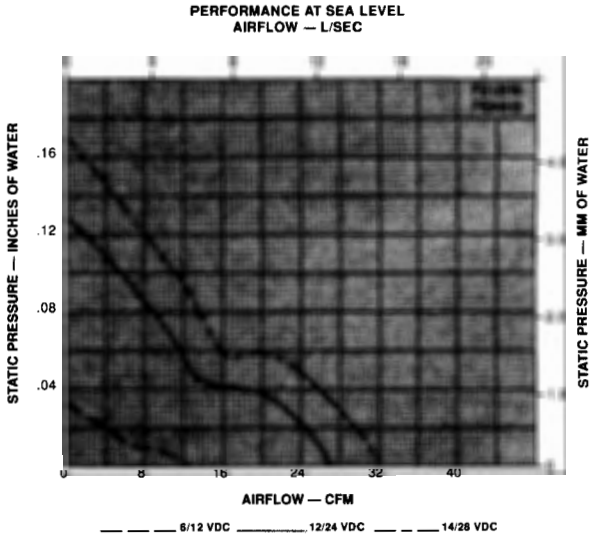


FEATURES

- ☐ Size - 3.15" square x 1.00" deep (80.0mm x 25.4mm)
- ☐ 20 to 37 CFM (10 to18 L/Sec.)
- ☐ 12 and 24 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight - 4.6 oz. (.13Kg)
- ☐ UL Yellow Card Recognized — File No. E31293
- ☐ CSA Certified — File No. L52898

PERFORMANCE





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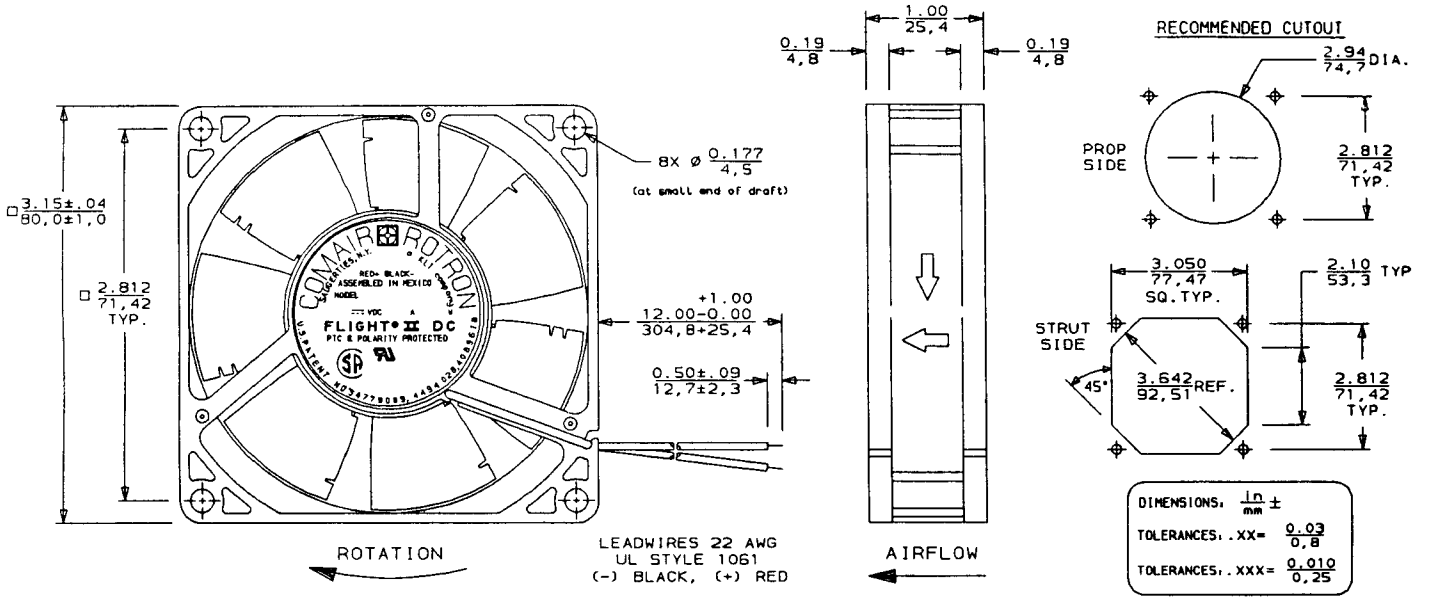
* FE12B3	031162	Ball	12	6-14	1.9	160	500	3600	37	18	36.2
* FE24B3	031163	Ball	24	12-28	2.2	90	280	3600	37	18	36.2
* FE12H3	031164	Ball	12	6-14	1.1	90	290	2700	27	13	28.9
* FE24H3	031165	Ball	24	12-28	1.4	60	165	2700	27	13	28.9

* Distributor Item.

All figures are nominal free delivery values at sea level.



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MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
High chromium stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.

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Venturi - PPS (Plastic), black, glass and mineral filled, UL94V-0.
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Designed to meet EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emissions.
Designed to meet EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

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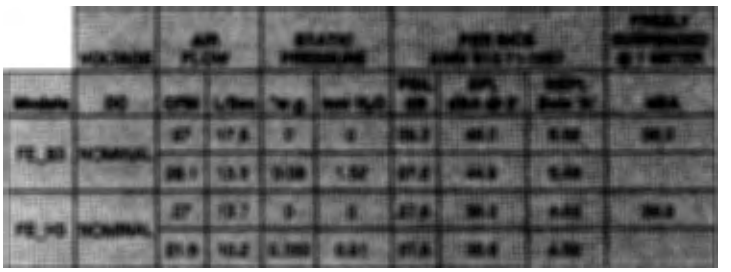
Tachometer output–see page 60–square wave equal to two pulses per revolution.

6-32 threaded inserts

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

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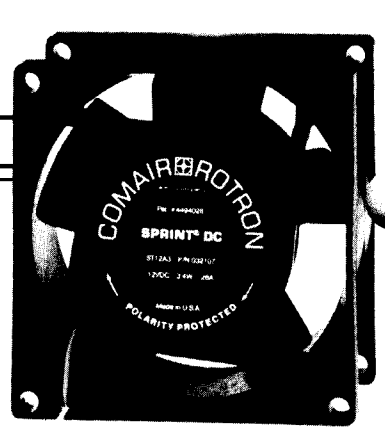
SPRINT® DC

BRUSHLESS DC FAN

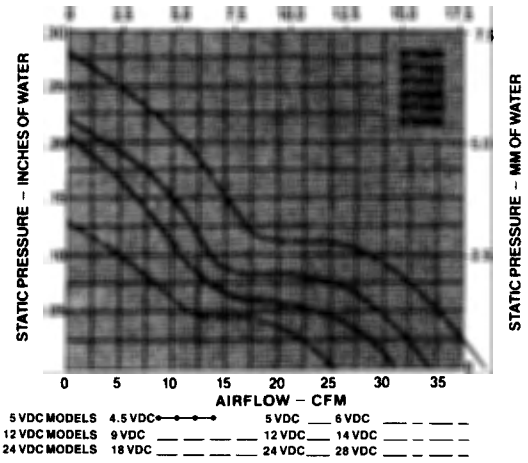


FEATURES

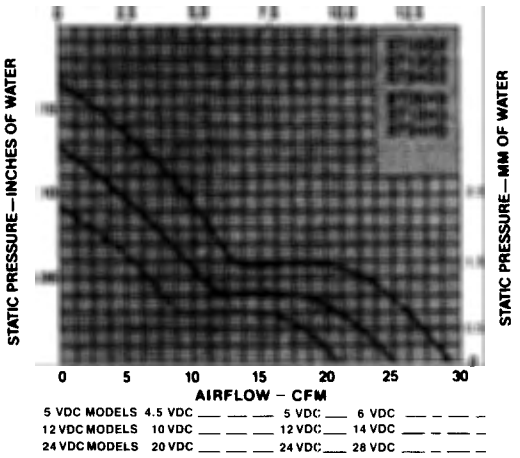
- ☐ Size - 3.15″ square × 1.25″ deep (80.0 mm × 32.0 mm)
- ☐ 12 to 45 CFM (8 to 21 L/Sec.)
- ☐ 5, 12 or 24 VDC (Nominal)
- ☐ High reliability ball or sleeve bearings
- ☐ Low noise level
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 6.3 oz. (.18 (Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 0730, License R97229

PERFORMANCE

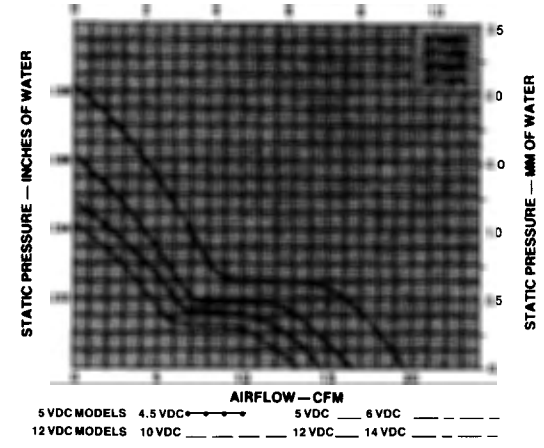
PERFORMANCE AT SEA LEVEL
AIRFLOW-L/SEC.



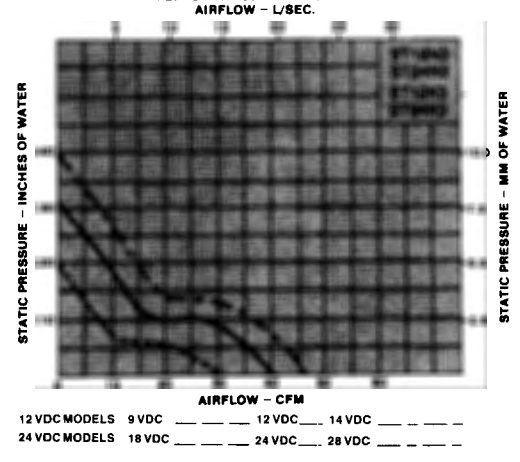
PERFORMANCE AT SEA LEVEL
AIRFLOW—L/SEC



PERFORMANCE AT SEA LEVEL
AIRFLOW — L/SEC.



PERFORMANCE AT SEA LEVEL
AIRFLOW – L/SEC.

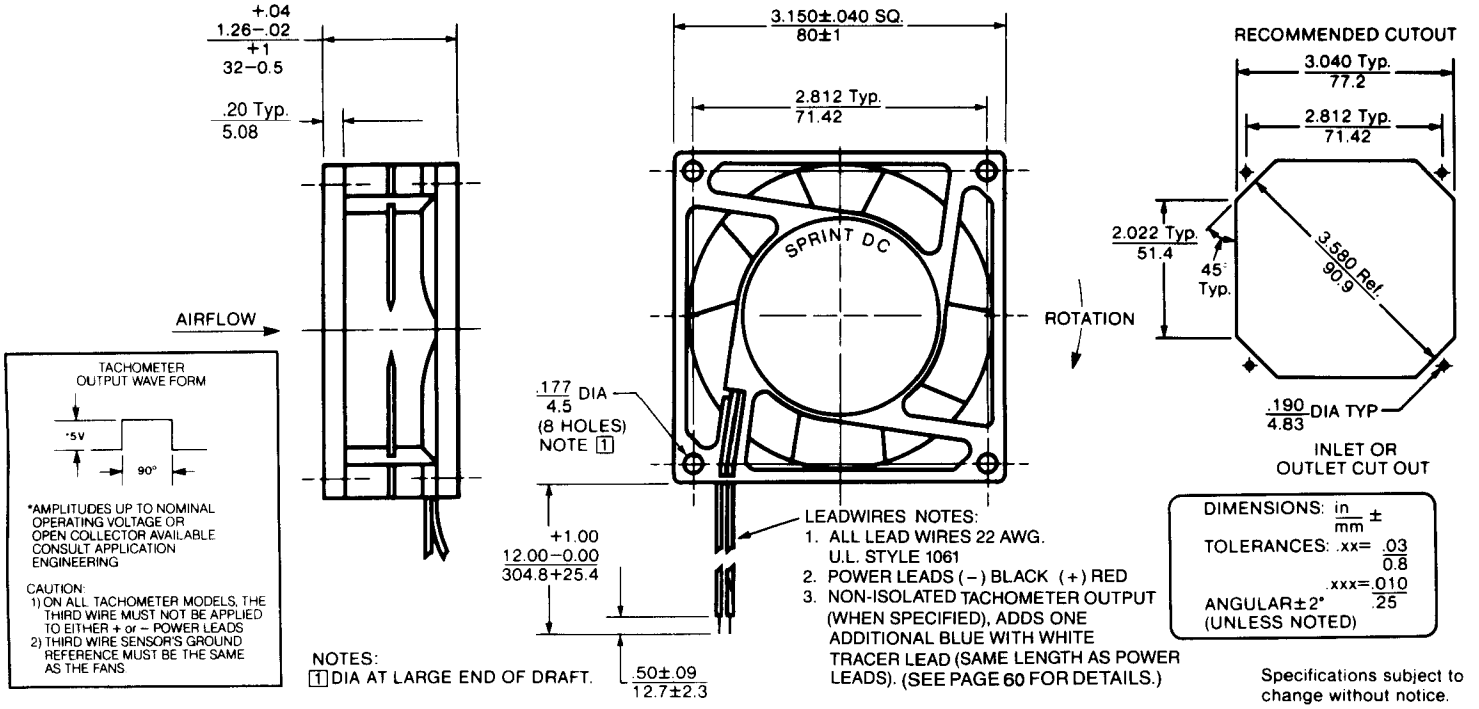


SPECIFICATIONS

SLEEVE BEARINGS		BALL BEARINGS										
Model No.	Part No.	Model No.	Part No.	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
ST12N3	032195	ST12K3	030613	12	6-14	5.0	420	960	960	4200	40	19
ST24N3	032247	ST24K3	030614	24	12-28	5.3	220	480	480	4200	40	19
ST05A3	030826	ST05B3	030829	5	4.5-6.0	2.9	575	2100	2100	3400	33	16
*ST12A3	032107	*ST12B3	030615	12	6-14	3.4	280	700	700	3400	33	16
*ST24A3	032127	*ST24B3	030616	24	12-28	3.3	140	400	400	3400	33	16
ST05G3	030827	ST05H3	030830	5	4.5-6.0	1.8	350	1050	1050	2500	24	11
*ST12G3	032126	ST12H3	030617	12	6-14	1.4	120	400	400	2500	24	11
*ST24G3	032128	ST24H3	030618	24	12-28	1.9	80	200	200	2450	24	11
ST05E3	030828	ST05F3	030831	5	4.5-6.0	1.0	200	520	520	1700	16	8
*ST12E3	032162	ST12F3	030676	12	6-14	.8	70	200	200	1700	16	8

*Distributor item

All figures are nominal delivery values at sea level



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.

Sintered bronze sleeve or stainless steel ball bearings.

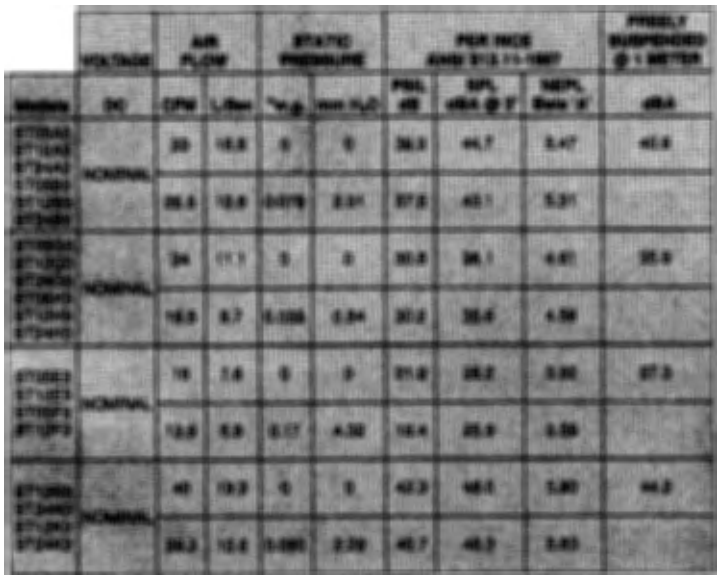
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.

Electronic locked rotor protection (P.T.C.) or impedance protected.

Automatic restart capability.

Polarity protected.

ACOUSTIC RATINGS (for definitions see page 5)



CONSTRUCTION

Venturi - Glass filled nylon, black, meeting UL94V-0 flammability rating.

Propeller - Injection molded polypropylene, black, meeting UL940V-0 flammability rating.

EMI

Meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emission.

Meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

Capable of furnishing:

Tachometer output - square wave output equal to two pulses per revolution. Various amplitudes available. See page 60.

Harness assemblies. See page 106.

6-32 Threaded inserts

ThermaPro-V: See pages 44 and 45

Thermal Speed Control

Programmable

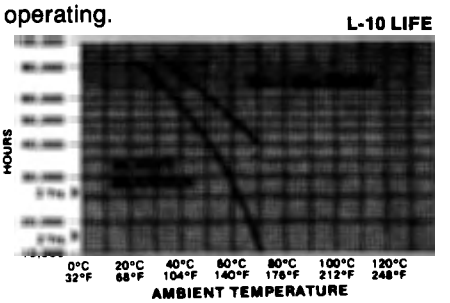
Voltage Regulated

48 VDC models available in ThermaPro-V. See page 46.

Go/No-Go Fan Performance Sensor. See page 58.

LIFE EXPECTANCY

The curve represents the continuous duty life of Sprint DC fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When a ball bearing unit is run at 40°C ambient, 90% of the units will still be running after 78,000 hrs. continuous duty.

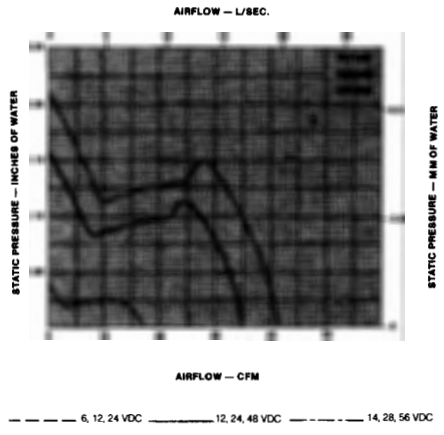
SPRITE® DC

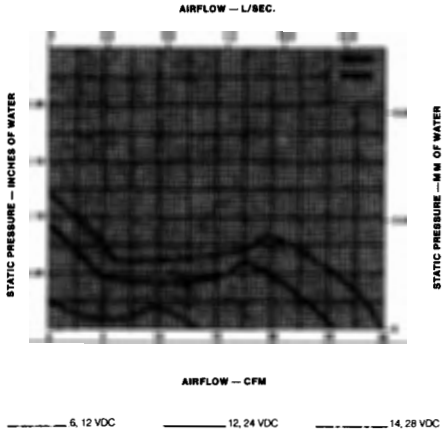
BRUSHLESS DC FAN

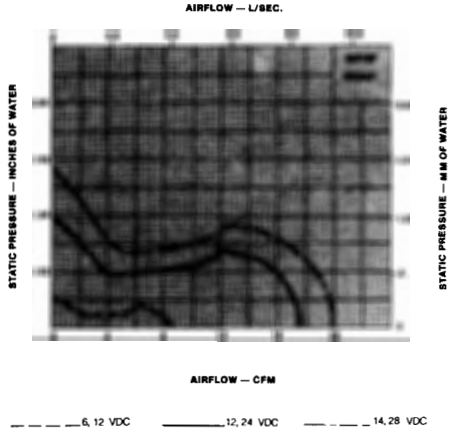
FEATURES

- ☐ Size - 3.14" square x 1.645" deep (79.8mm x 41.8mm)
- ☐ 17 to 35 CFM (8.0 to 16.5 L/Sec.)
- ☐ 12, 24 and 48 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: −10° C to +70°C
- ☐ Weight - 18 oz. (.51 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA Certified—File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 730; License R9071193

PERFORMANCE







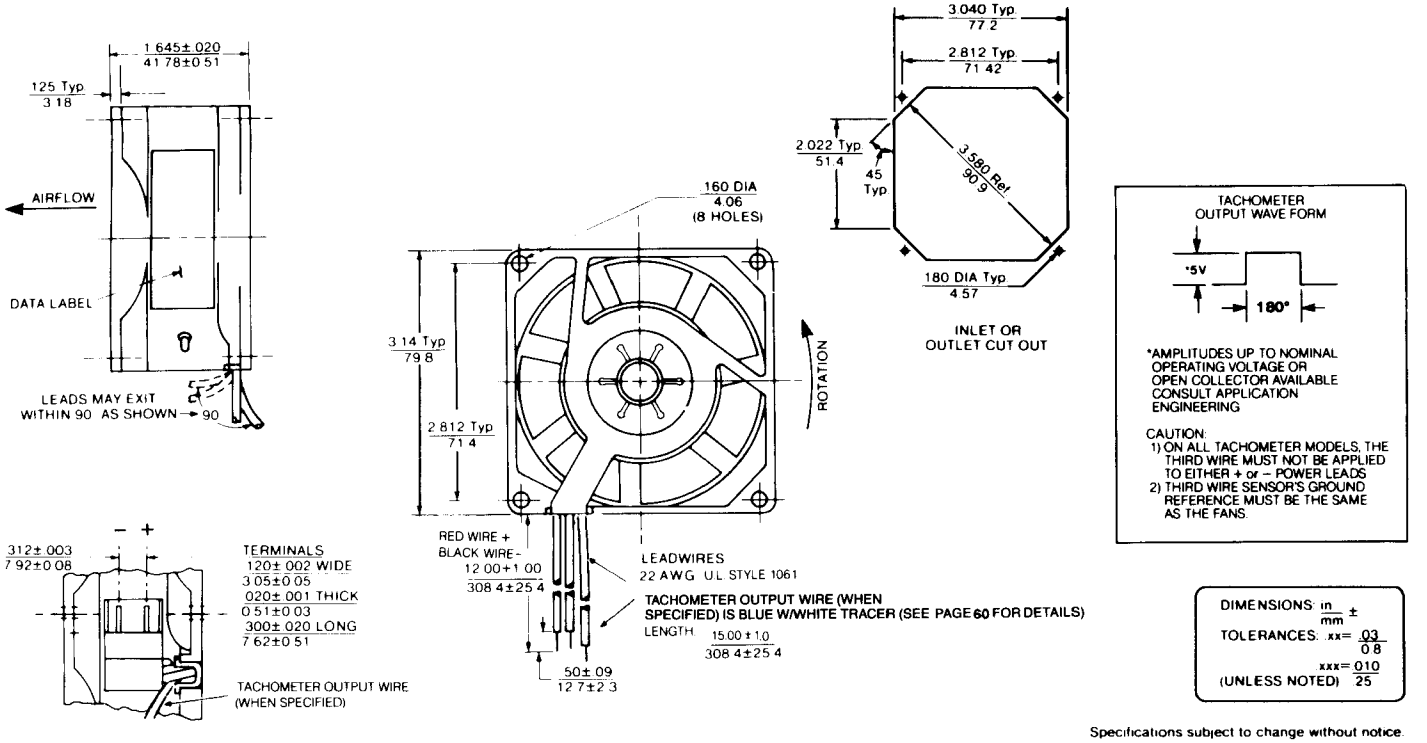
SPECIFICATIONS

LEADWIRES		TERMINAL											
Model No.	Part No.	Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
*SD12B1	028933	*SD12B2	032001	Ball	12	6-14	3.1	260	1000	1000	3500	35	16.5
†SD12B5	030767	†SD12B9	030753	Ball	12	6-14	3.1	260	1000	1000	3500	35	16.5
*SD24B1	028934	*SD24B2	032002	Ball	24	12-28	3.1	130	500	500	3500	35	16.5
†SD24B5	030768	†SD24B9	030754	Ball	24	12-28	3.1	130	500	500	3500	35	16.5
*SD48B1	028935	*SD48B2	032003	Ball	48	24-56	3.1	65	250	250	3500	35	16.5
†SD48B5	030769	†SD48B9	030755	Ball	48	24-56	3.1	65	250	250	3500	35	16.5
SD12H1	030745	SD12H2	030756	Ball	12	6-14	2.0	160	**660**	**660**	2600	26	12.3
†SD12H5	030746	†SD12H9	030757	Ball	12	6-14	2.0	160	**660**	**660**	2600	26	12.3
SD24H1	030747	SD24H2	030758	Ball	24	12-28	2.0	80	300	300	2600	26	12.3
†SD24H5	030748	†SD24H9	030759	Ball	24	12-28	2.0	80	300	300	2600	26	12.3
SD12F1	030749	SD12F2	030760	Ball	12	6-14	1.0	80	250	250	1700	17	8.3
†SD12F5	030750	†SD12F9	030761	Ball	12	6-14	1.0	80	250	250	1700	17	8.3
SD24F1	030751	SD24F2	030762	Ball	24	12-28	1.0	40	150	150	1700	17	8.3
†SD24F5	030752	†SD24F9	030763	Ball	24	12-28	1.0	40	150	150	1700	17	8.3

All figures are nominal delivery values at sea level

*Distributor Item

†Tachometer Output Models (see page 60 for description)



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection. (P.T.C.) SD_B_versions
Impedance protected SD_H_and SD-F-versions
Automatic restart capability
Polarity protected.
Power transistors heat sunk to metal housing.
Stainless steel shaft.

CONSTRUCTION

Venturi - one piece die-cast zinc alloy, painted black.
Propeller - flame retardant polypropylene, black, meets UL94V-0 flammability rating

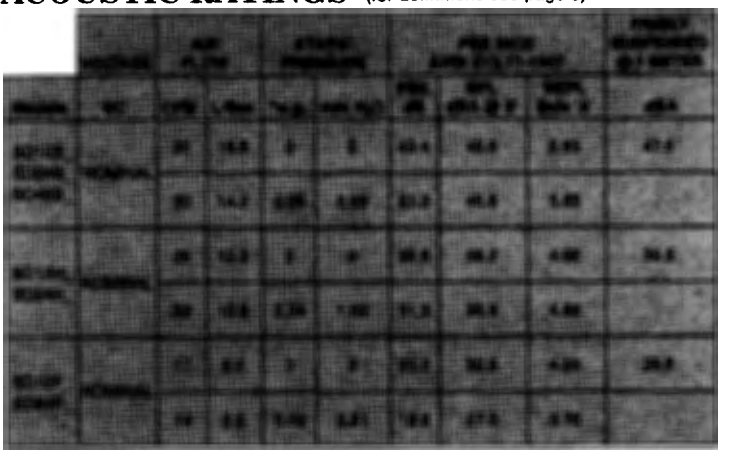
EMI

Per MIL STD 461, meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emission, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

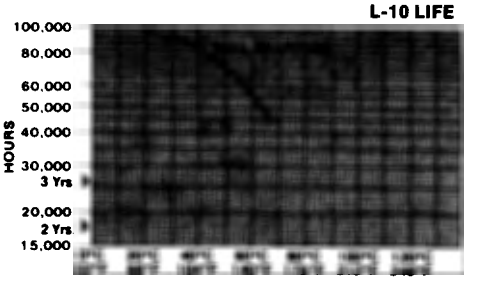
Capable of furnishing:
Reverse flow
Sleeve or ball bearing models
Choice of leadwires or terminal block
Tachometer Output - see page 60 - square wave output equal to one pulse per revolution. Two pulses available as "special" only.
Harness assemblies - see page 106
Fan Performance Sensor - see page 58

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

The curve represents the continuous duty life of Sprite DC fans at a given temperature, after which 90% of the units will still be operating.



Example: When run at 40°C ambient, 90% of ball bearing units will still be running after 83,000 hours continuous duty.

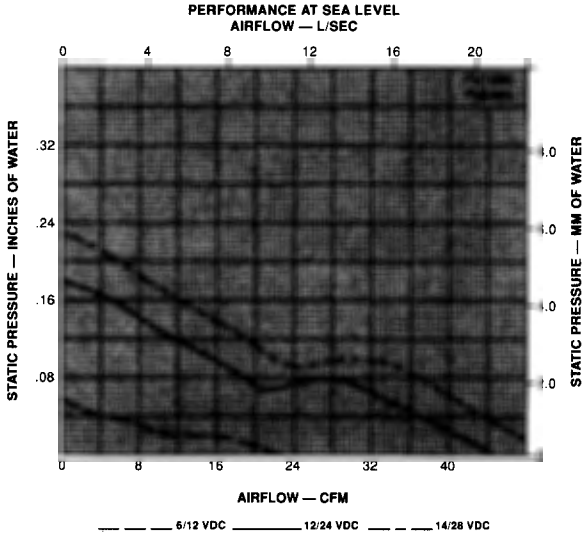
FLIGHT™ II 90 SERIES

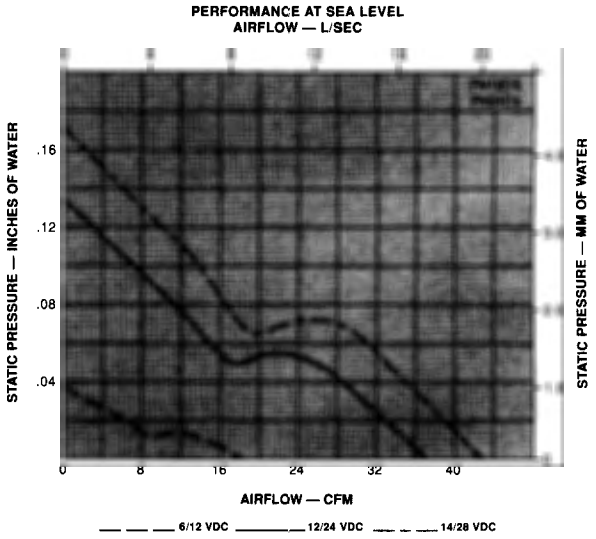
BRUSHLESS DC FAN

FEATURES

- ☐ Size - 3.62″ square x 1.00″ deep (92 mm x 25.4 mm)
- ☐ 25 to 45 CFM (12 to 22 L/Sec.)
- ☐ 12 and 24 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight - 5.2 oz. (.15 Kg)
- ☐ UL Yellow Card Recognized — File No. E31293
- ☐ CSA Certified — File No. L52898

PERFORMANCE



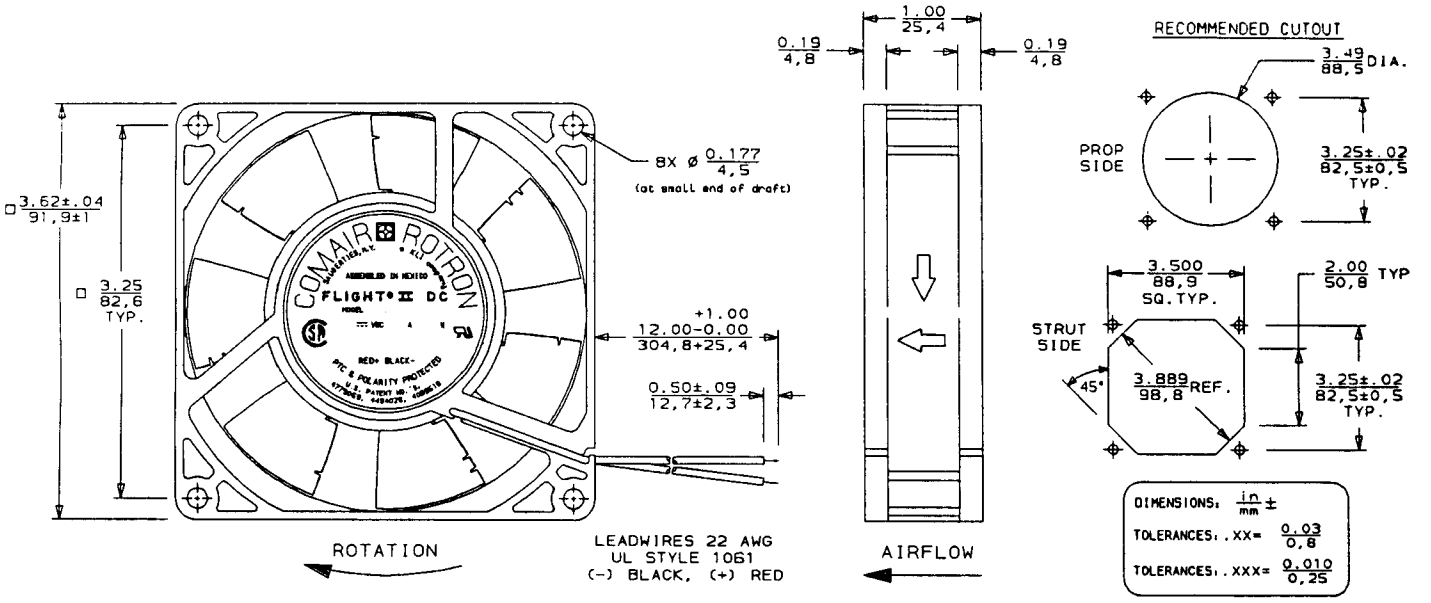


SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.	dBA
* FN12B3	031168	Ball	12	6-14	2.6	220	440	2800	45	21	38.1
* FN24B3	031169	Ball	24	12-28	2.6	110	250	2800	45	21	38.1
* FN12C3	031170	Ball	12	6-14	1.6	130	270	2350	37	18	34.3
* FN24C3	031171	Ball	24	12-28	1.7	70	165	2350	37	18	34.3

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
High chromium stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.

CONSTRUCTION

Venturi - PPS (Plastic), black, glass and mineral filled, UL94V-0.
Propeller - PBT (Plastic), black, reinforced, UL94V-0.

EMI

Designed to meet EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emissions.
Designed to meet EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

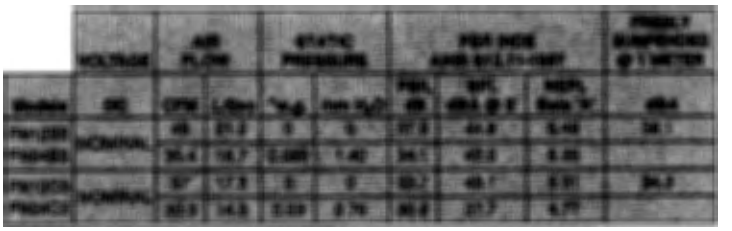
OPTIONS

Capable of furnishing Harness assemblies. See page 106.

Tachometer output–see page 60–square wave equal to two pulses per revolution.

6-32 threaded inserts

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

The Flight Series fan is designed for continuous duty life of 60,000 hours at 25°C. Brushless electronic commutation provided by dependable solid state circuitry. High efficiency brushless DC motor provides for lower internal temperature rise than conventional AC motors.

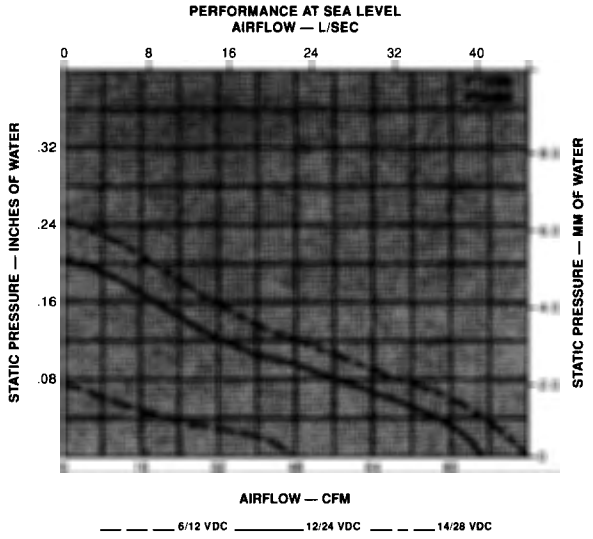
FLIGHT™ II 120 SERIES

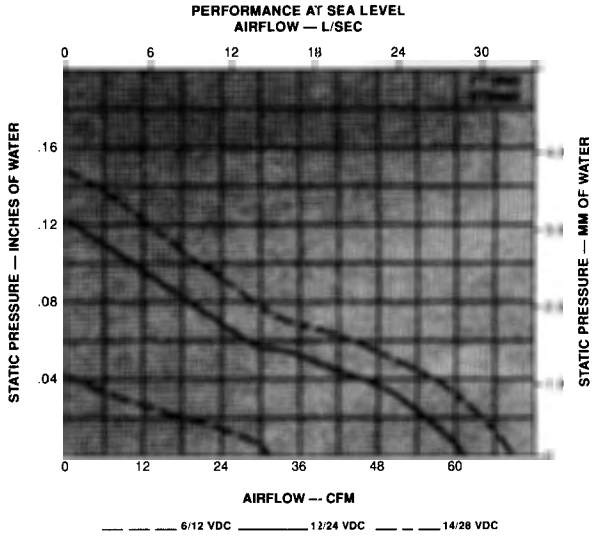
BRUSHLESS DC FAN

FEATURES

- ☐ Size - 4.73" square x 1.00" deep (120.0mm x 25.4mm)
- ☐ 50 to 86 CFM (24 to 42 L/Sec.)
- ☐ 12 and 24 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight - 7.0 oz. (.20 Kg)
- ☐ UL Yellow Card Recognized — File No. E31293
- ☐ CSA Certified — File No. L52898

PERFORMANCE



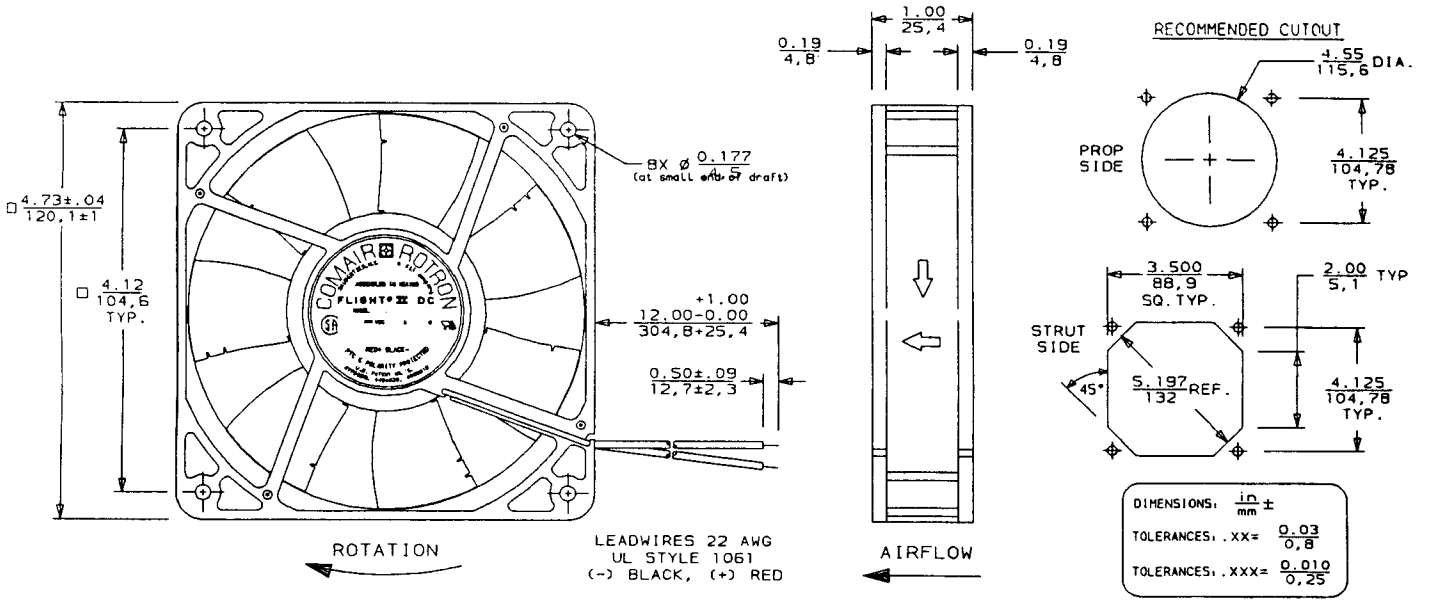


SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.	dBA
* FT12B3	031174	Ball	12	6-14	4.3	360	700	2950	86	41	42.9
* FT24B3	031175	Ball	24	12-28	4.3	180	375	2950	86	41	42.9
* FT12M3	031176	Ball	12	6-14	1.6	130	275	2000	61	29	34.3
* FT24M3	031177	Ball	24	12-28	1.9	80	160	2000	61	29	34.3

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
High chromium stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.

CONSTRUCTION

Venturi - PPS (Plastic), black, glass and mineral filled, UL94V-0.
Propeller - PBT (Plastic), black, reinforced, UL94V-0.

EMI

Designed to meet EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emissions.
Designed to meet EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

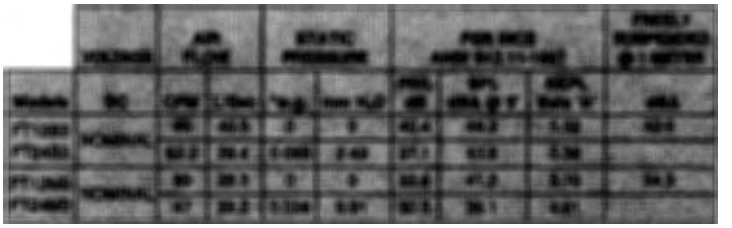
OPTIONS

Capable of furnishing Harness assemblies. See page 106.

Tachometer output–see page 60–square wave equal to two pulses per revolution.

6-32 threaded inserts

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

The Flight Series fan is designed for continuous duty life of 60,000 hours at 25°C. Brushless electronic commutation provided by dependable solid state circuitry. High efficiency brushless DC motor provides for lower internal temperature rise than conventional AC motors.

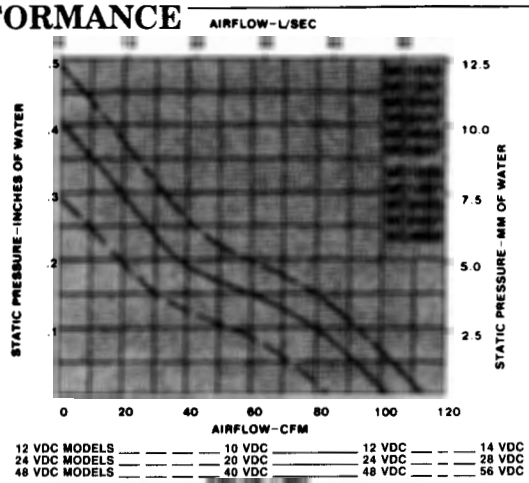
MUFFIN® DC

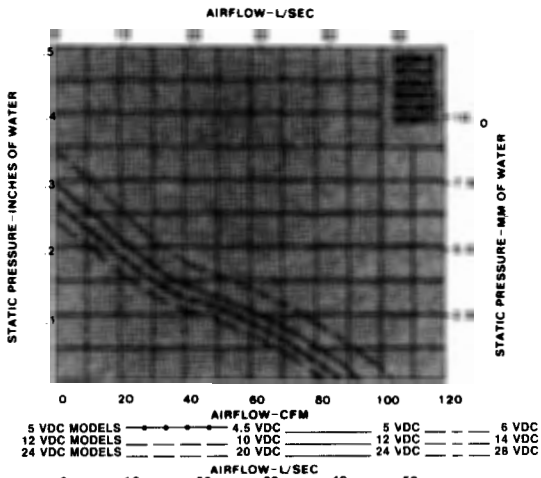
BRUSHLESS DC FAN

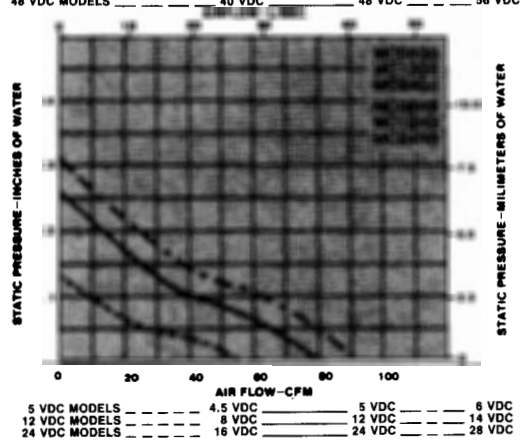
FEATURES

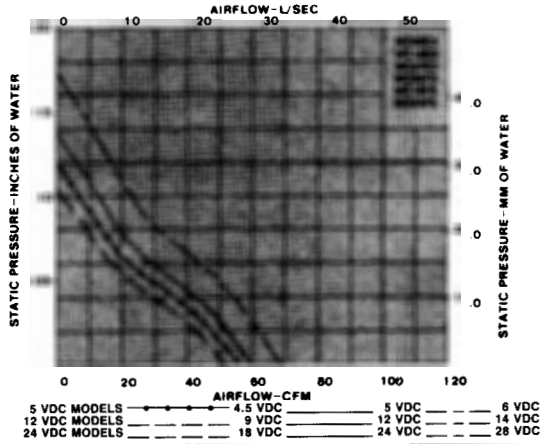
- ☐ Size - 4.73″ square x 1.26″ deep (120 mm x 32 mm)
- ☐ 50 to 112 CFM (24 to 48.1 L/Sec.)
- ☐ 5, 12, 24 or 48 VDC (Nominal)
- ☐ High reliability ball or sleeve bearing
- ☐ Low noise level
- ☐ Operating temperature range: −10° to +70°C
- ☐ Weight - 8.5 oz. (.24 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 0730, License R97229

PERFORMANCE









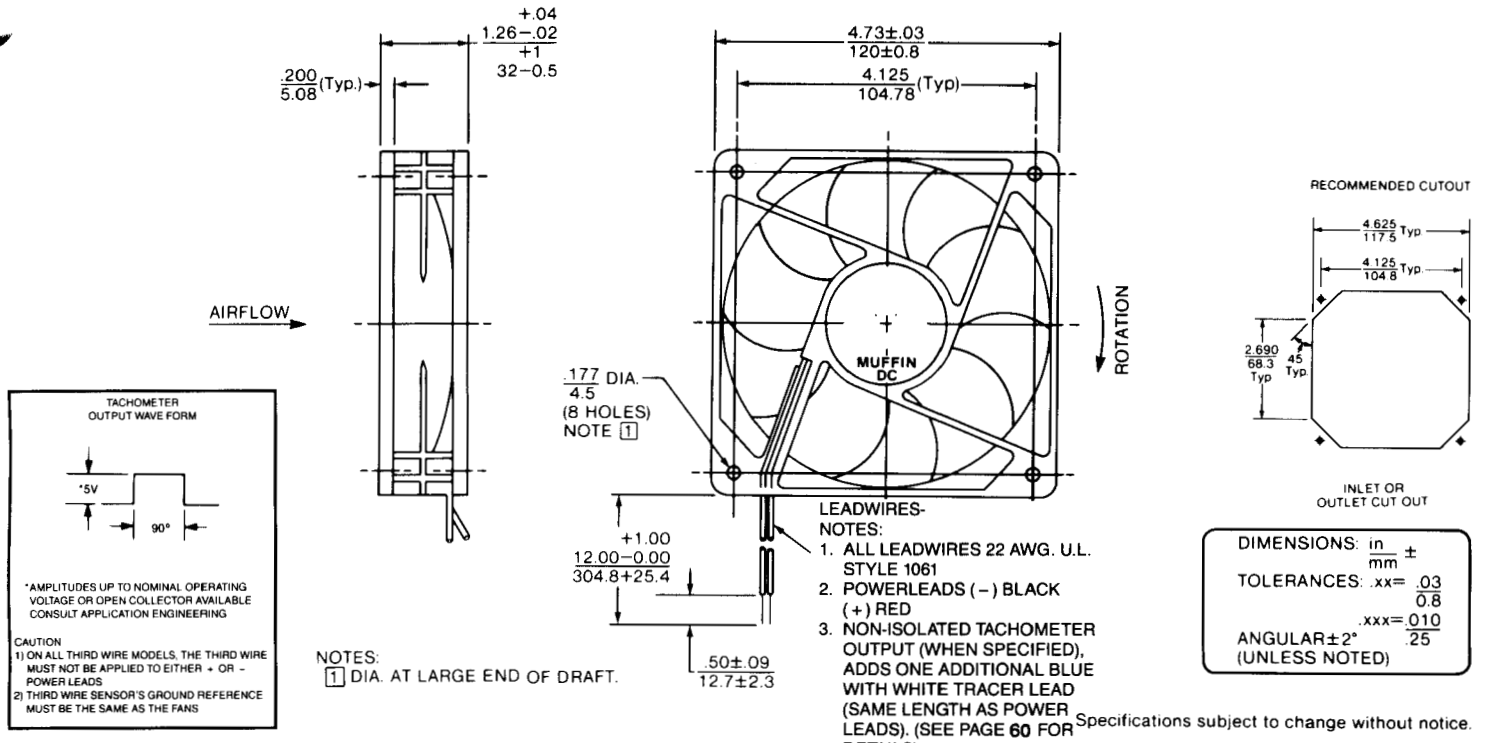
SPECIFICATIONS

SLEEVE BEARINGS		BALL BEARINGS										
Model No.	Part No.	Model No.	Part No.	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
*MC12A3	032207	*MC12B3	032489	12	6-14	7.9	660	1300	1300	3700	102	48
†MC12A7	032228	†MC12B7	030598	12	6-14	7.9	660	1300	1300	3700	102	48
*MC24A3	032208	*MC24B3	030572	24	12-28	6.7	280	700	700	3700	102	48
†MC24A7	032244	†MC24B7	030599	24	12-28	6.7	280	700	700	3700	102	48
MC48A3	032242	*MC48B3	030573	48	22-56	9.6	200	350	350	3700	102	48
*MC05J3	030832	MC05C3	030835	5	4.5-6.0	5.0	1000	2300	2300	3250	91	43
*MC12J3	032167	MC12C3	030574	12	6-14	6.6	550	1030	1030	3250	91	43
MC24J3	032168	*MC24C3	030575	24	12-28	5.5	230	550	550	3250	91	43
MC05G3	030833	MC05H3	030836	5	4.5-6.0	3.8	750	1800	1800	2850	80	38
*MC12G3	032141	MC12H3	030576	12	6-14	3.8	320	640	640	2850	80	38
MC24G3	032143	*MC24H3	030577	24	12-28	4.0	170	430	430	2850	80	38
MC05E3	030834	MC05F3	030837	5	4.5-6.0	1.8	350	350	950	2150	58	27
*MC12E3	032140	*MC12F3	030578	12	6-14	2.2	180	400	400	2150	58	27
*MC24E3	032142	*MC24F3	030579	24	12-28	2.1	85	200	200	2150	58	27

*Distributor Item

All figures are nominal delivery values at sea level

† Tachometer output models (see page 60 for description)



Specifications subject to change without notice.

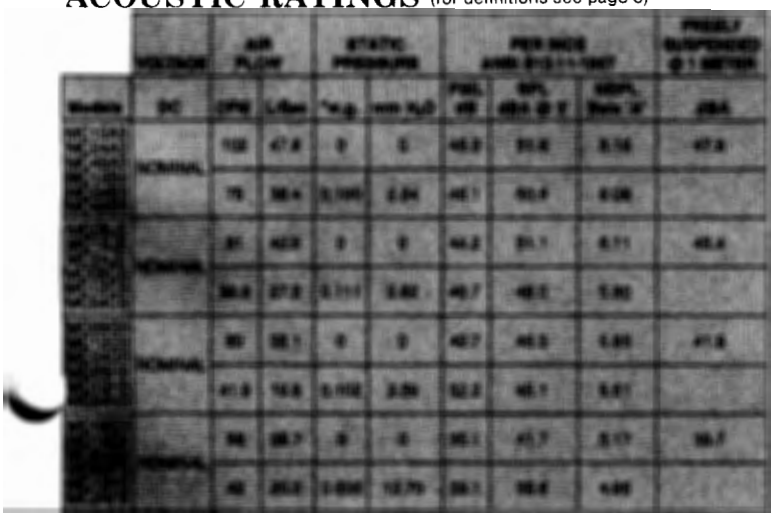
MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Sintered bronze sleeve or stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection (P.T.C.) or impedance protection.
Automatic restart capability.
Polarity protected.

CONSTRUCTION

Venturi-Glass filled nylon, black, meeting UL94V-0 flammability rating.
Propeller - Injection molded polypropylene, black, meeting UL94V-0 flammability rating.

ACOUSTIC RATINGS (for definitions see page 5)

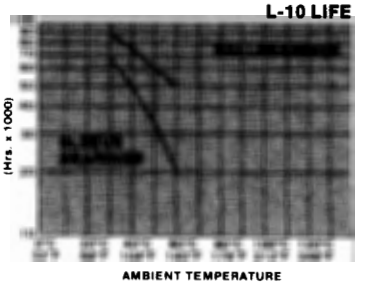


OPTIONS

Go/No-Go Fan Performance Sensor. See page 58.
Tachometer output—square wave output equal to two pulses per revolution. Various amplitudes available. See page 60 for details.
Harness assemblies—See page 106
6-32 Threaded inserts
ThermaPro-V: See pages 44 and 45
Thermal Speed Control
Programmable
Voltage Regulated

LIFE EXPECTANCY

The curve represents the continuous duty life of Muffin DC fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When a ball bearing unit is run at 40°C ambient, 90% of the units will still be running after 78,000 hrs. continuous duty.

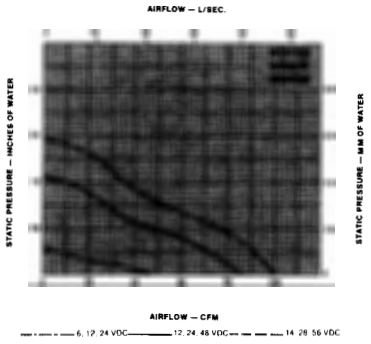
WHISPER® XL DC

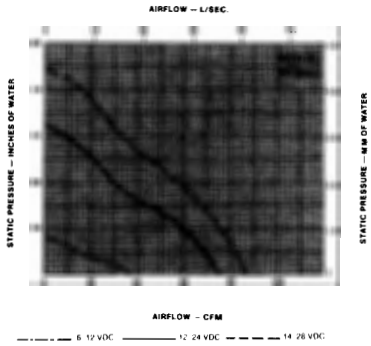
TUBEAXIAL FAN

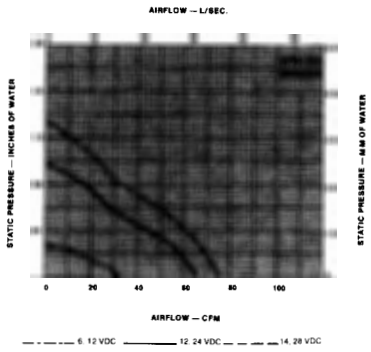
FEATURES

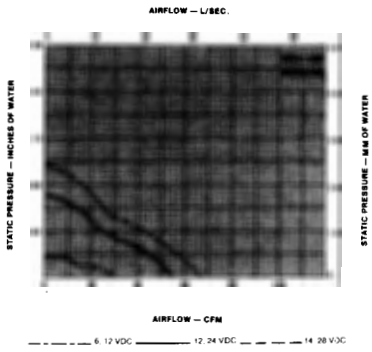
- ☐ Size - 4.69" square x 1.54" deep (119.1 mm x 39.1 mm)
- ☐ 55 to 85 CFM (26.0 to 40.1 L/Sec.)
- ☐ 12,24 and 48 VDC (Nominal)
- ☐ Feathered Edge™ for lower noise
- ☐ Operating Temperature range: -10°C to +70°C
- ☐ Weight - 21.5 oz (.61 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA certified—File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 730; License R9071193

PERFORMANCE









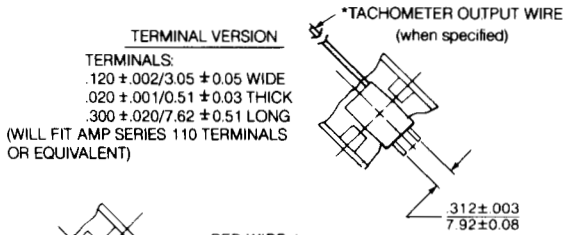
SPECIFICATIONS

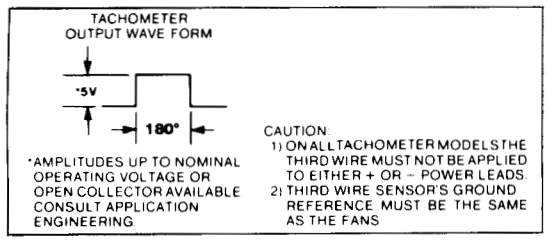
LEADWIRES		TERMINAL											
Model No.	Part No.	Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
WD12B3	030709	WD12B4	030727	Ball	12	6-14	3.4	280	750	750	2525	85	40.1
†WD12B7	030710	†WD12B8	030728	Ball	12	6-14	3.4	280	750	750	2525	85	40.1
WD24B3	030711	WD24B4	030729	Ball	24	12-28	3.4	140	310	310	2525	85	40.1
†WD24B7	030712	†WD24B8	030730	Ball	24	12-28	3.4	140	310	310	2525	85	40.1
WD48B3	030713	WD48B4	030731	Ball	48	24-56	3.4	70	160	160	2525	85	40.1
†WD48B7	030714	†WD48B8	030732	Ball	48	24-56	3.4	70	160	160	2525	85	40.1
*WD12C3	030715	WD12C4	030733	Ball	12	6-14	2.4	200	660	660	2230	75	35.4
†WD12C7	030716	†WD12C8	030734	Ball	12	6-14	2.4	200	660	660	2230	75	35.4
*WD24C3	030717	WD24C4	030735	Ball	24	12-28	2.4	100	310	310	2230	75	35.4
†WD24C7	030718	†WD24C8	030736	Ball	24	12-28	2.4	100	310	310	2230	75	35.4
WD12H3	030719	WD12H4	030737	Ball	12	6-14	1.8	150	450	450	1930	65	30.1
†WD12H7	030720	†WD12H8	030738	Ball	12	6-14	1.8	150	450	450	1930	65	30.1
WD24H3	030721	WD24H4	030739	Ball	24	12-28	1.7	67	183	183	1930	65	30.1
†WD24H7	030722	†WD24H8	030740	Ball	24	12-28	1.7	67	183	183	1930	65	30.1
*WD12M3	030723	WD12M4	030741	Ball	12	6-14	1.2	100	330	330	1635	55	26.0
†WD12M7	030724	†WD12M8	030742	Ball	12	6-14	1.2	100	330	330	1635	55	26.0
*WD24M3	030725	WD24M4	030743	Ball	24	12-28	1.2	52	135	135	1635	55	26.0
†WD24M7	030726	†WD24M8	030744	Ball	24	12-28	1.2	52	135	135	1635	55	26.0

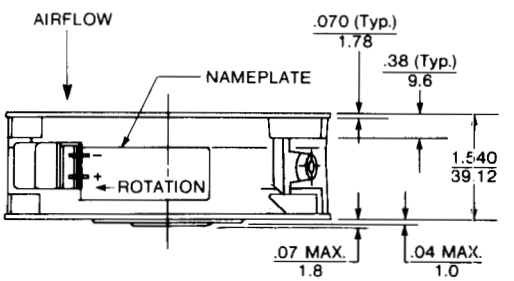
*Distributor Item

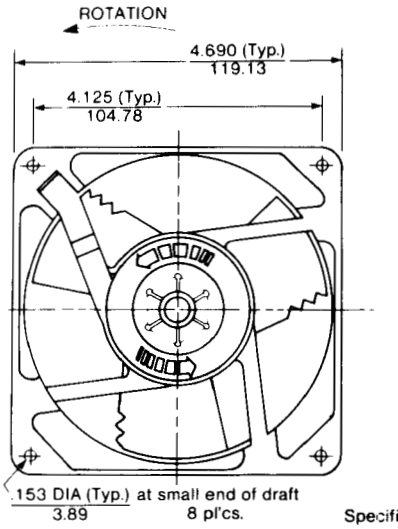
All figures are nominal delivery values at sea level

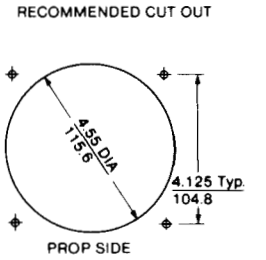
† Tachometer Output Models (see page 60 for description)

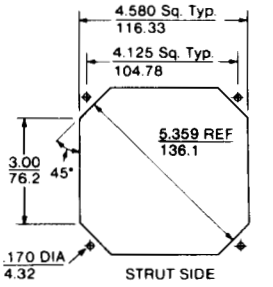












DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
ANGULAR±2° (UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection. (P.T.C.) WD_B_versions
Impedance protected WD_C_, WD_H_ and WD_M_versions
Automatic restart capability.
Polarity protected.
Power transistors heat sunk to metal housing.
Stainless steel shaft.

CONSTRUCTION

Venturi - one piece die-cast zinc alloy, painted black.
Propeller - flame retardant polypropylene,
Meets UL 94V-O flammability rating.

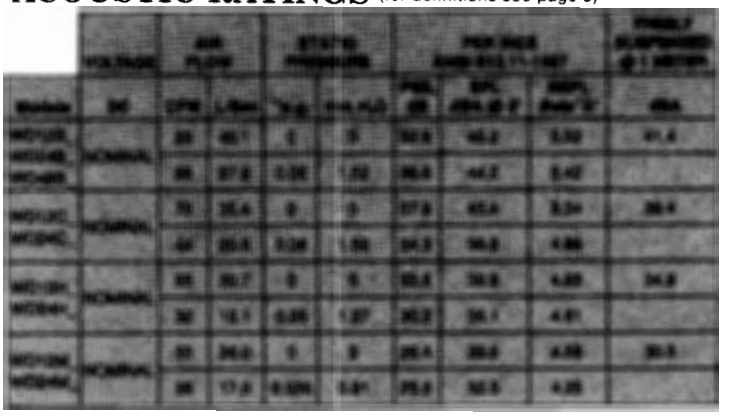
EMI

Per MIL STD 461, meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emission, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

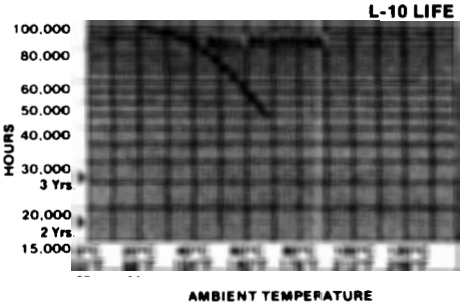
Capable of furnishing:
Reverse flow.
Sleeve or ball bearing models.
Choice of leadwires or terminal block.
Tachometer output see page 60 - square wave output equal to one pulse per revolution. Two pulses available as "special" only.
Harness assemblies. See page 106.
Fan Performance Sensor see page 58.

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

The curve represents the continuous duty life of Whisper XL DC fans at a given temperature, after which 90% of the units will still be operating.



Example: When run at 40°C ambient, 90% of Whisper XL DC ball bearing units will still be running after 83,000 hours continuous duty.

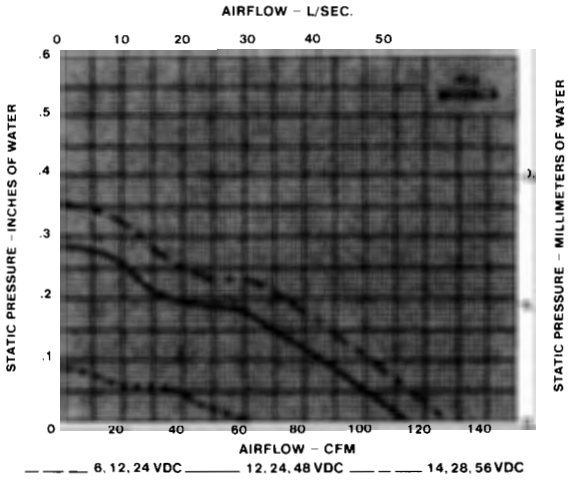
MUFFIN® XL DC

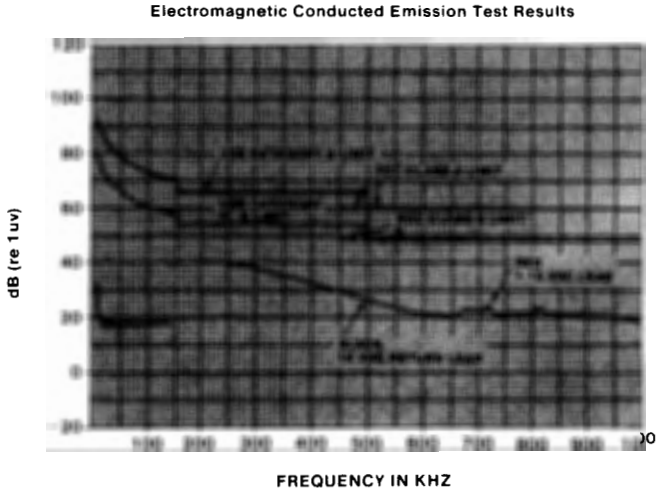
BRUSHLESS DC FAN

FEATURES

- ☐ Size - 4.69" square x 1.54" deep (119.1 mm x 39.1 mm)
- ☐ 40 to 120 CFM (18.9 to 56.6 L/Sec.)
- ☐ 12,24 and 48 VDC (Nominal)
- ☐ Feathered Edge™ for lower noise
- ☐ Operating Temperature range: −10°C to +70°C
- ☐ Weight - 21.5 oz (.61 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 730; License R9071193

PERFORMANCE





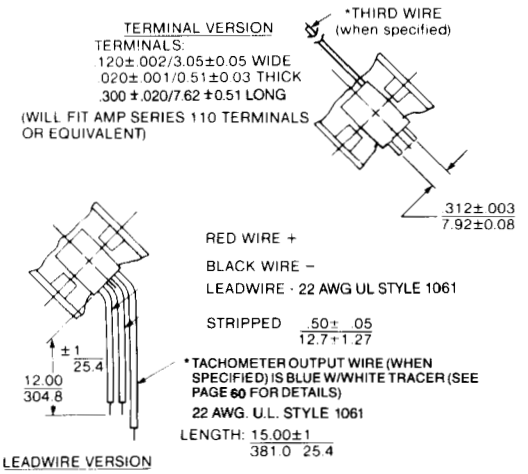
SPECIFICATIONS

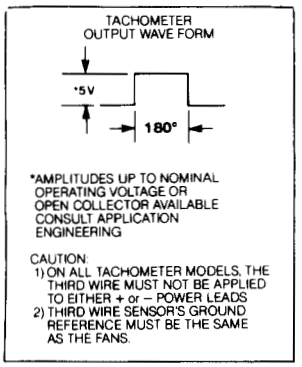
LEADWIRES		TERMINAL											
Model No.	Part No.	Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
*MD12B1	028865	*MD12B2	028868	Ball	12	6-14	6	500	1500	1500	3100	110	51.9
†MD12B5	028885	†MD12B9	028888	Ball	12	6-14	6	500	1500	1500	3100	110	51.9
*MD24B1	028866	*MD24B2	028869	Ball	24	12-28	6	250	750	750	3100	110	51.9
†MD24B5	028886	†MD24B9	028889	Ball	24	12-28	6	250	750	750	3100	110	51.9
*MD48B1	028867	*MD48B2	028870	Ball	48	24-56	6	125	400	400	3100	110	51.9
†MD48B5	028887	†MD48B9	028890	Ball	48	24-56	6	125	400	400	3100	110	51.9

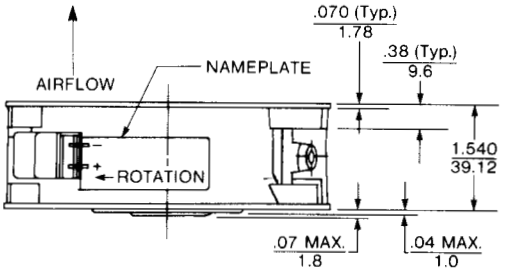
All figures are nominal delivery values at sea level

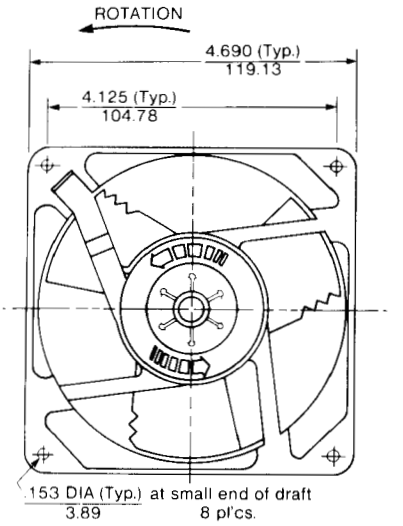
* Distributor Item.

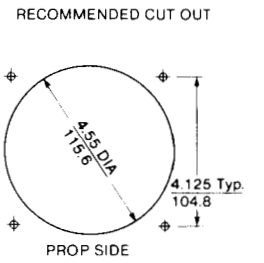
† Tachometer Output Models (see page 60 for description)

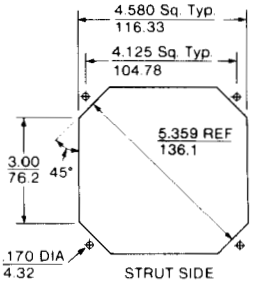












DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
ANGULAR±2°
(UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection (P.T.C.).
Automatic restart capability.
Polarity protected.
Stainless steel shaft.

CONSTRUCTION

Venturi - one piece die-cast zinc alloy, painted black.
Propeller - flame retardant polypropylene, black.
Meets UL 94V-O flammability rating.

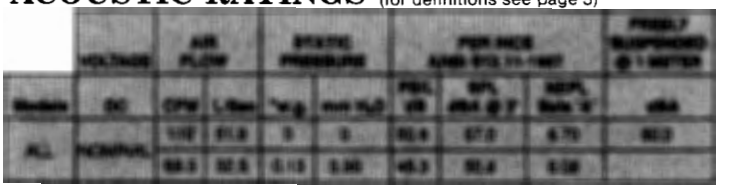
EMI

Per MIL STD 461, meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emission, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

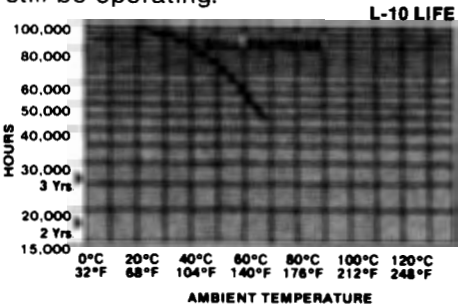
Capable of furnishing:
Reverse flow.
Sleeve or ball bearing models.
Choice of leadwires or terminal block.
Tachometer output see page 60 - square wave output equal to one pulse per revolution. Two pulses available as "special" only.
Harness assemblies. See page 106.
Fan Performance Sensor see page 58.

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

The curve represents the continuous duty life of Muffin XL DC fans at a given temperature, after which 90% of the units will still be operating.



Example: When run at 40°C ambient, 90% of Muffin XL DC bearing units will still be running after 83,000 hours continuous duty.

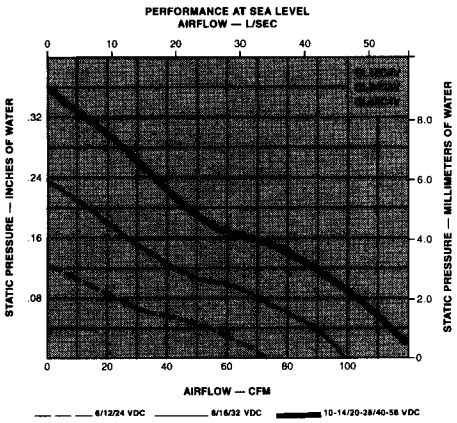
GALAXY® DC

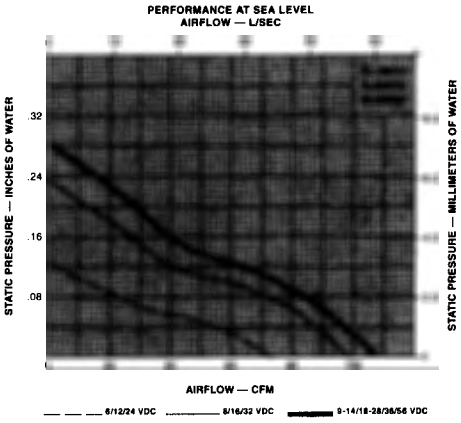
TUBEAXIAL FAN

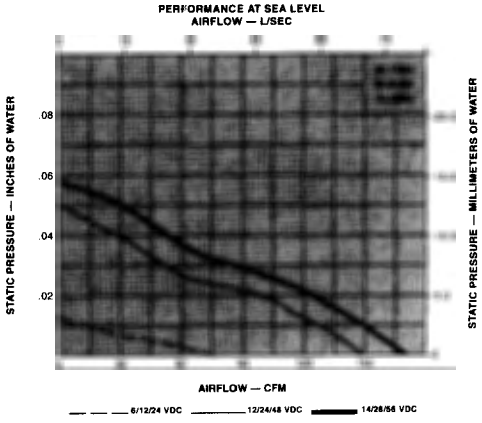
FEATURES

- ☐ Size - 5.0" square × 1.5" deep (127 mm × 38.1 mm)
- ☐ 90 to 165 CFM (42 to 77.9 L/Sec.)
- ☐ 12,24,48 VDC (Nominal)
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight: 1 lb. 6 oz. (.62 Kg)
- ☐ High reliability ball bearings
- ☐ Available with ThermaPro-V
- ☐ UL Yellow Card Recognized–File No. E31293
- ☐ CSA Certified–File No. LR52898
- ☐ TUV approval pending

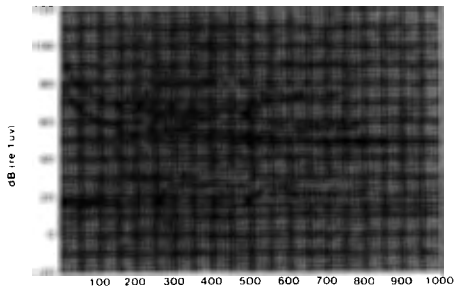
PERFORMANCE







ELECTROMAGNETIC CONDUCTED EMISSION TEST RESULTS



SPECIFICATIONS

Terminal Version

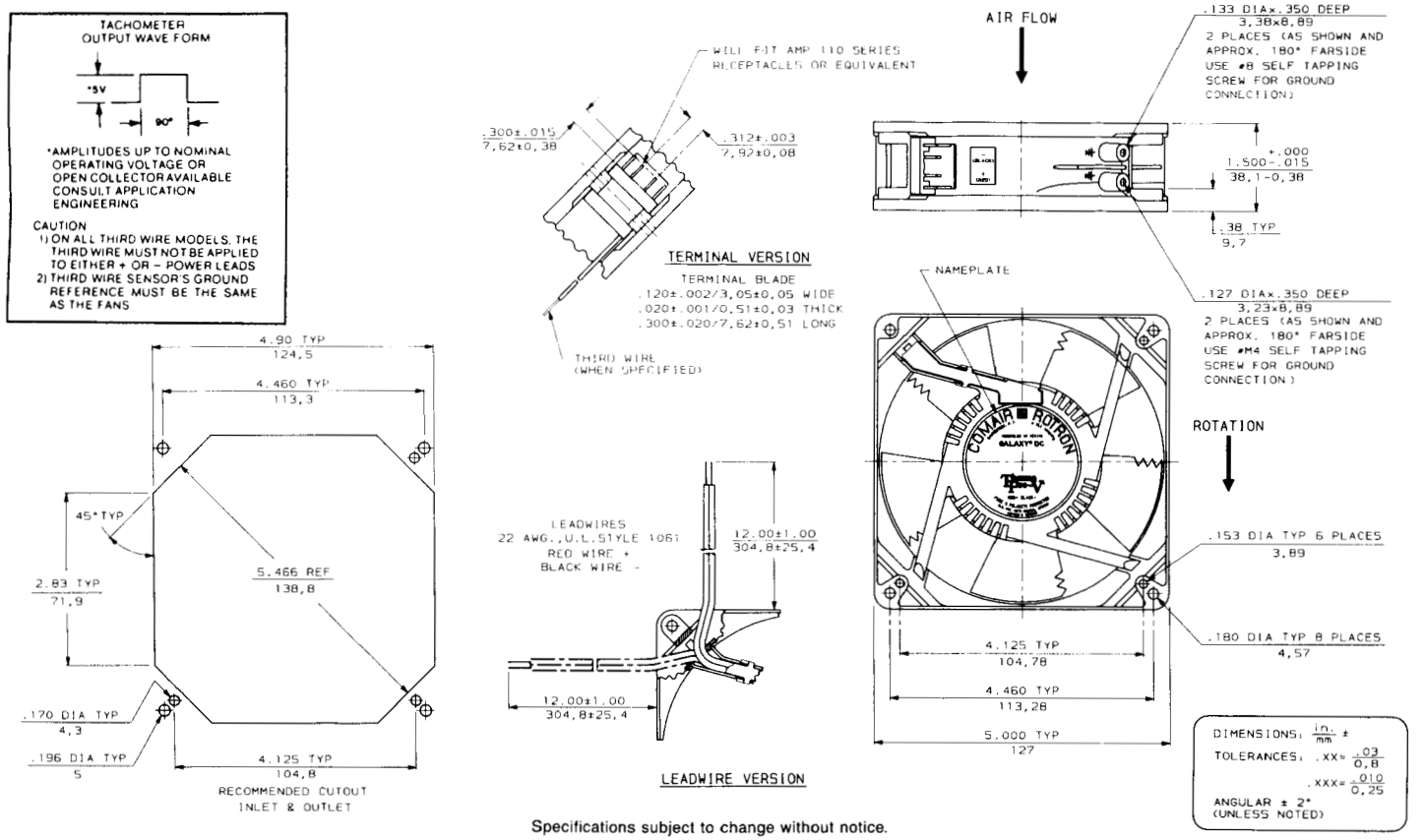
Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.
GL12B4	031074	Ball	12	6-14	15	1250	2600	3250	150	71
GL24B4	031075	Ball	24	12-28	15	625	1150	3250	150	71
GL48B4	031076	Ball	48	24-56	15	310	775	3250	150	71
*GL12C4V	031077	Ball	12	11-14	10	850	2500	2700	125	59
*GL24C4V	031078	Ball	24	20-28	10	420	1000	2700	125	59
*GL48C4V	031079	Ball	48	38-56	10	210	770	2700	125	59
*GL12H4V	031080	Ball	12	10-14	9	750	2700	2400	110	52
*GL24H4V	031081	Ball	24	18-28	9	360	1000	2400	110	52
*GL48H4V	031082	Ball	48	35-56	9	180	715	2400	110	52

All figures are nominal free delivery values at sea level.

*ThermaPro-V voltaged regulated

See catalog pg. 44 for description

* Distributor Item.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.
Power transistor heat sunk to metal housing.

CONSTRUCTION

Venturi — die-cast zinc alloy, painted black.
Propeller — polycarbonate, black, meeting UL94V-0 flammability rating.

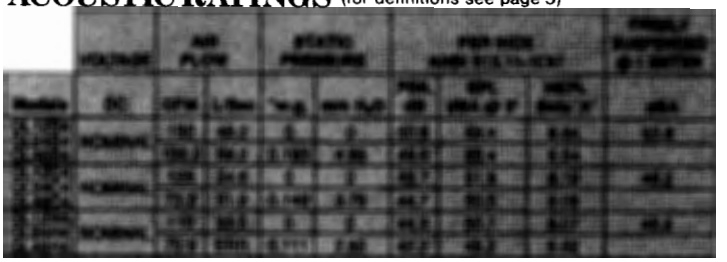
EMI

Per MIL STD 461 meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emissions, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

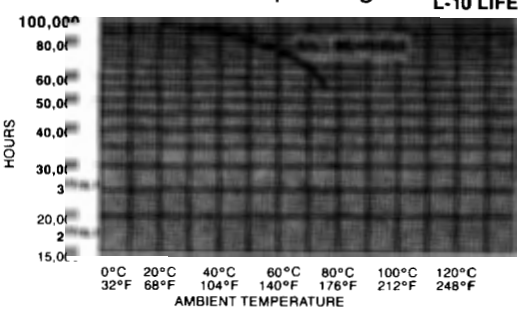
Capable of furnishing:
Thermal speed control, programmability (See pages 44 and 45) Isolated tachometer output — square wave output equal to two pulses per revolution.
Harness assemblies. See page 106.
Leadwire version.

ACOUSTIC RATINGS (for definitions see page 5)



LIFE EXPECTANCY

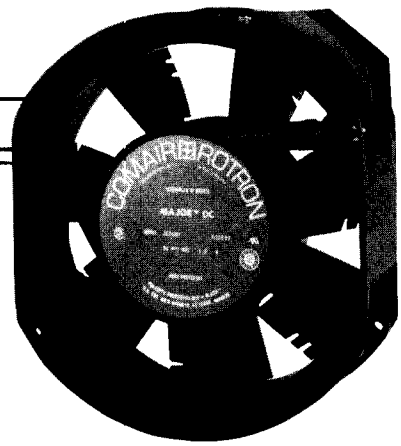
The curve represents the continuous duty life of Galaxy DC tubeaxial fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run at 50°C ambient, 90% of the Galaxy DC units will still be running after 82,500 hours continuous duty.

MAJOR® DC (QUIET)

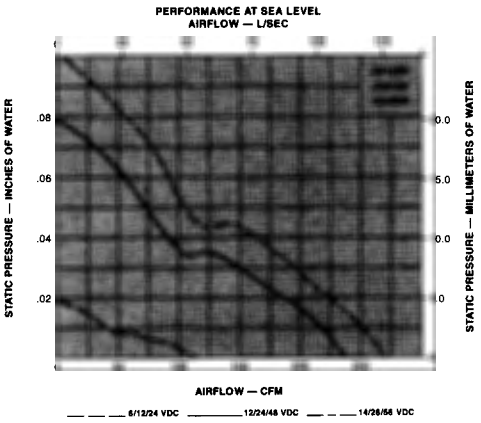
BRUSHLESS DC FAN

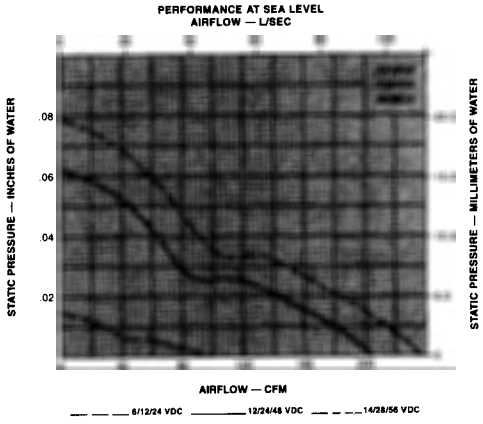


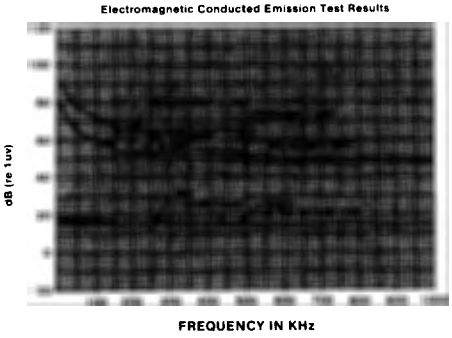
FEATURES

- ☐ Size - 6.75″ x 5.92″ x 2.00″ deep (171.5 mm x 150.4 x 50.8 mm)
- ☐ 100 to 260 CFM (47.2 to 123 L/Sec.)
- ☐ 12, 24 and 48 VDC (Nominal)
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: – 10°C to + 70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

PERFORMANCE





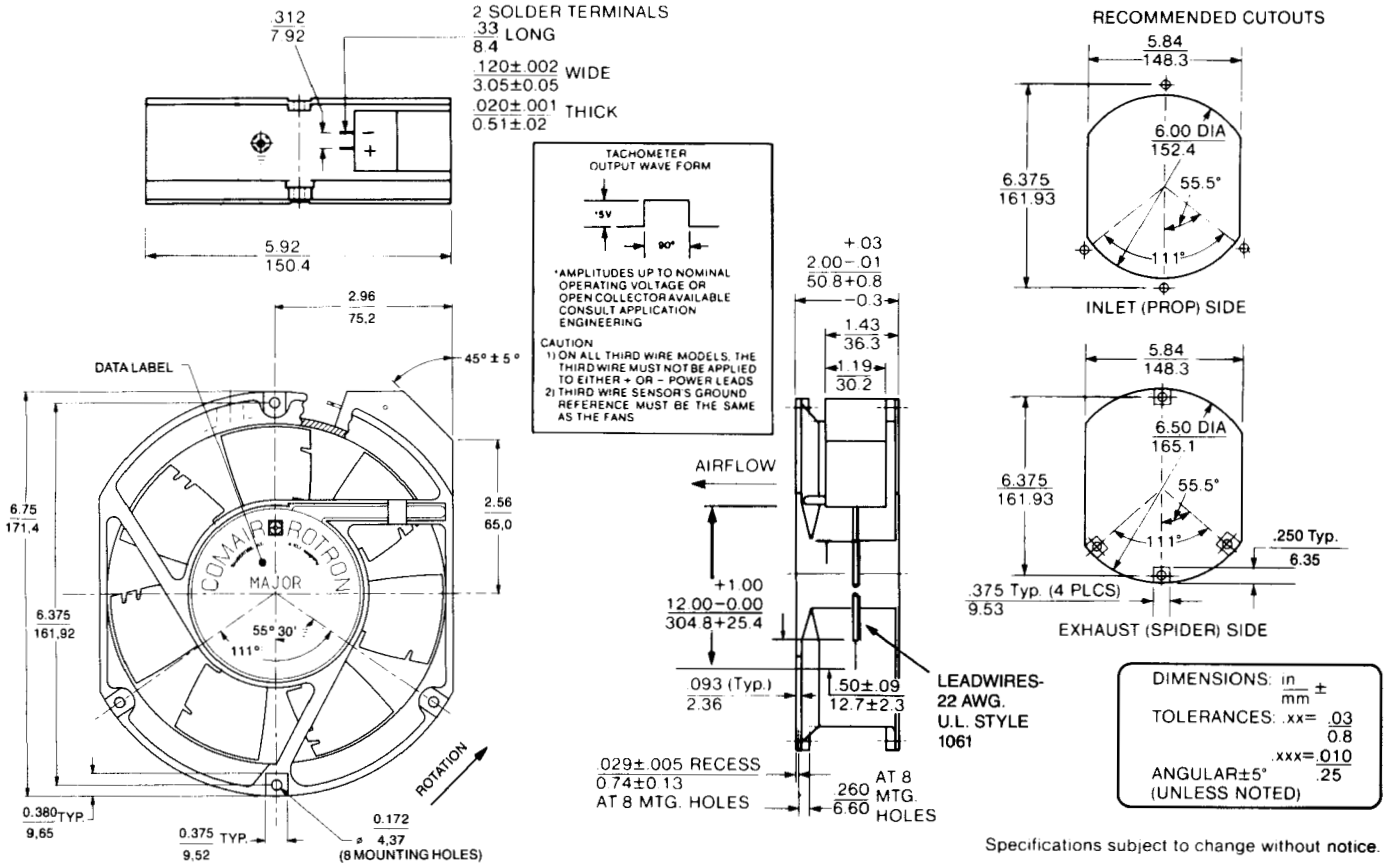


SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.
JQ12B4	031089	Ball	12	9-14	26.3	2200	3500	3500	235	111
JQ24B4	031090	Ball	24	12-28	20.3	850	1500	3500	235	111
* JQ48B4	031091	Ball	48	24-56	20.1	420	700	3500	235	111
* JQ12C4	031092	Ball	12	9-14	14.6	1215	2700	3000	200	95
* JQ24C4	031093	Ball	24	12-28	15.7	660	1500	3150	210	99
JQ48C4	031094	Ball	48	24-56	13.7	290	700	3150	210	99

All figures are nominal free delivery values at sea level.

* Distributor Item.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection. (Current limited)
Automatic restart capability.
Polarity protected.
Power transistor heat sunk to metal housing.

CONSTRUCTION

Venturi - single piece, die-cast aluminum, painted black. Propeller and Terminal Cover - polycarbonate, black, meeting UL94V-0 flammability rating.

EMI

Per MIL STD 461 meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emissions, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

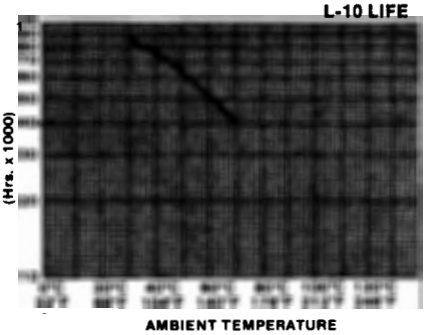
OPTIONS

Capable of furnishing:
Terminal or leadwire versions.
Thermal speed control. See pages 44 and 45.
Isolated Tachometer output - square wave output equal to two pulses per revolution. See page 60.
Various Fan Performance Sensor (FPS) options. See page 58.
Harness assemblies. See page 106.

ACOUSTIC RATINGS (for definitions see page 5)

LIFE EXPECTANCY

The curve represents the continuous duty life of Major DC (Quiet) fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run at 50°C ambient, 90% of the Major DC (Quiet) units will still be running after 62,000 hours continuous duty.

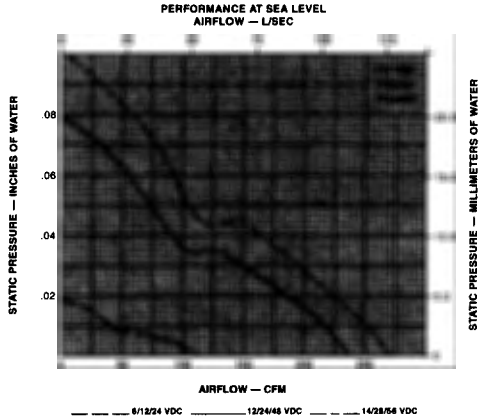
PATRIOT® DC (QUIET)

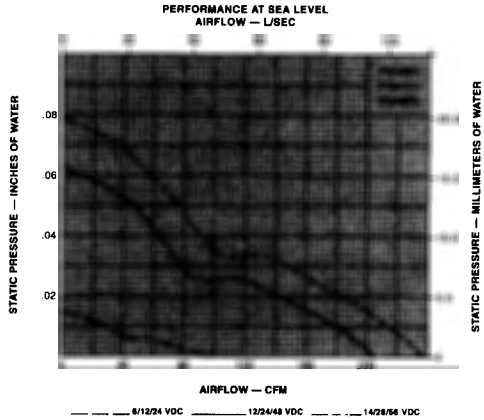
BRUSHLESS DC FAN

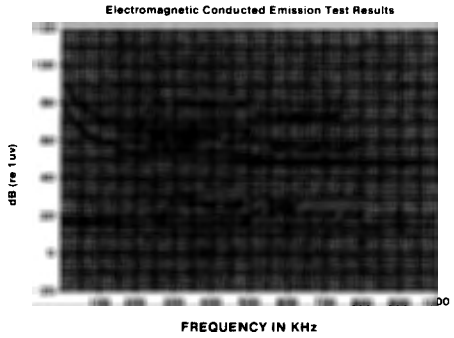
FEATURES

- ☐ Size - 6.75″ x 2.00″ deep (171.5 mm x 50.8 mm)
- ☐ 100 to 260 CFM (47.2 to 123 L/Sec.)
- ☐ 12, 24 and 48 VDC (Nominal)
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: -10°C to +70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

PERFORMANCE





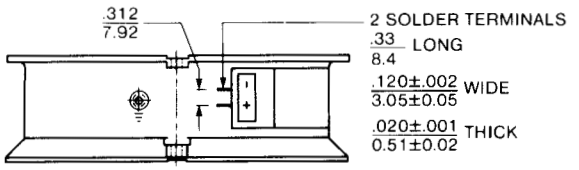


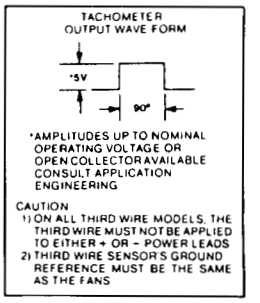
SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.
PQ12B4	031083	Ball	12	9–14	26.3	2200	3500	3500	235	111
* PQ24B4	031084	Ball	24	12–28	20.3	850	1500	3500	235	111
* PQ48B4	031085	Ball	48	24–56	20.1	420	700	3500	235	111
* PQ12C4	031086	Ball	12	9–14	14.6	1215	2700	3000	200	95
* PQ24C4	031087	Ball	24	12–28	15.7	660	1500	3150	210	99
* PQ48C4	031088	Ball	48	24–56	13.7	290	700	3150	210	99

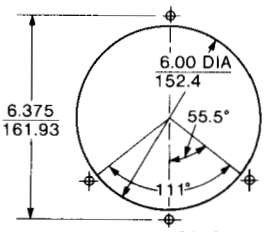
All figures are nominal free delivery values at sea level.

* Distributor Item

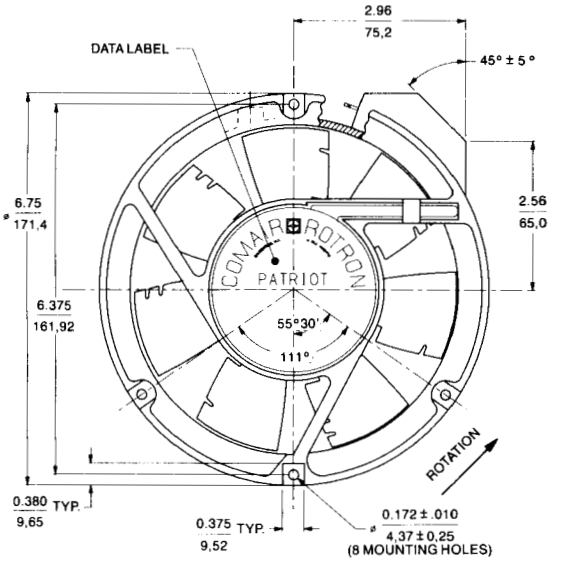


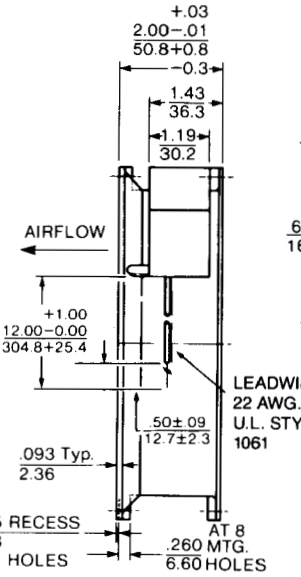


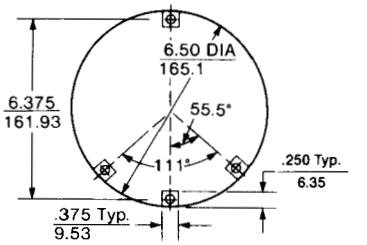
RECOMMENDED CUTOUTS



INLET (PROP) SIDE







EXHAUST (SPIDER) SIDE

DIMENSIONS:	in / mm ±
TOLERANCES: .xx=	.03 / 0.8
.xxx=	.010 / .25
ANGULAR±5° (UNLESS NOTED)	

Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection. (Current limited).
Automatic restart capability.
Polarity protected.

CONSTRUCTION

Venturi - single piece, die-cast aluminum, painted black.
Propeller and Terminal Cover - polycarbonate, black, meeting UL94V-0 flammability rating.

EMI

Per MIL STD 461 meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emissions, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

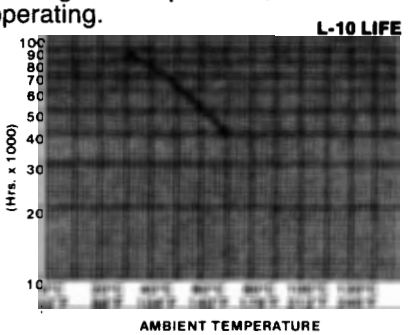
OPTIONS

Capable of furnishing:
Terminal or leadwire versions.
Thermal speed control. See pages 44 and 45.
Isolated Tachometer output - square wave output equal to two pulses per revolution. See page 60.
Various Fan Performance Sensor (FPS) options. See page 58.
Harness assemblies. See page 106.

ACOUSTIC RATINGS (for definitions see page 5)

LIFE EXPECTANCY

The curve represents the continuous duty life of Patriot DC (Quiet) fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run at 50°C ambient, 90% of the Patriot DC (Quiet) units will still be running after 62,000 hours continuous duty.

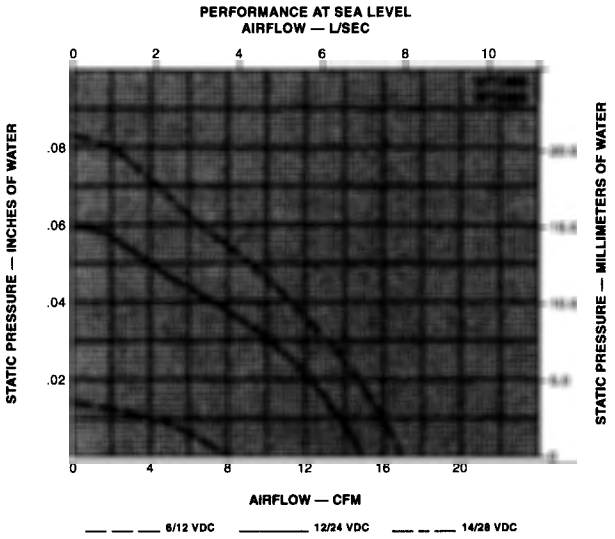
WHIFFET® DC

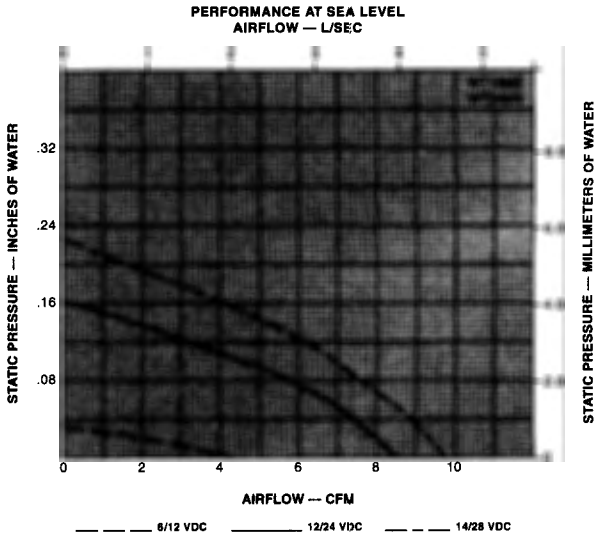
BRUSHLESS DC BLOWER

FEATURES

- ☐ Size - 3.14" square × 1.26" deep (80 mm × 32 mm)
- ☐ 4 to 16 CFM (1.9 to 66 L/Sec.)
- ☐ 12 and 24 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 5.9 oz. (.19 Kg)
- ☐ High reliability ball bearings

PERFORMANCE





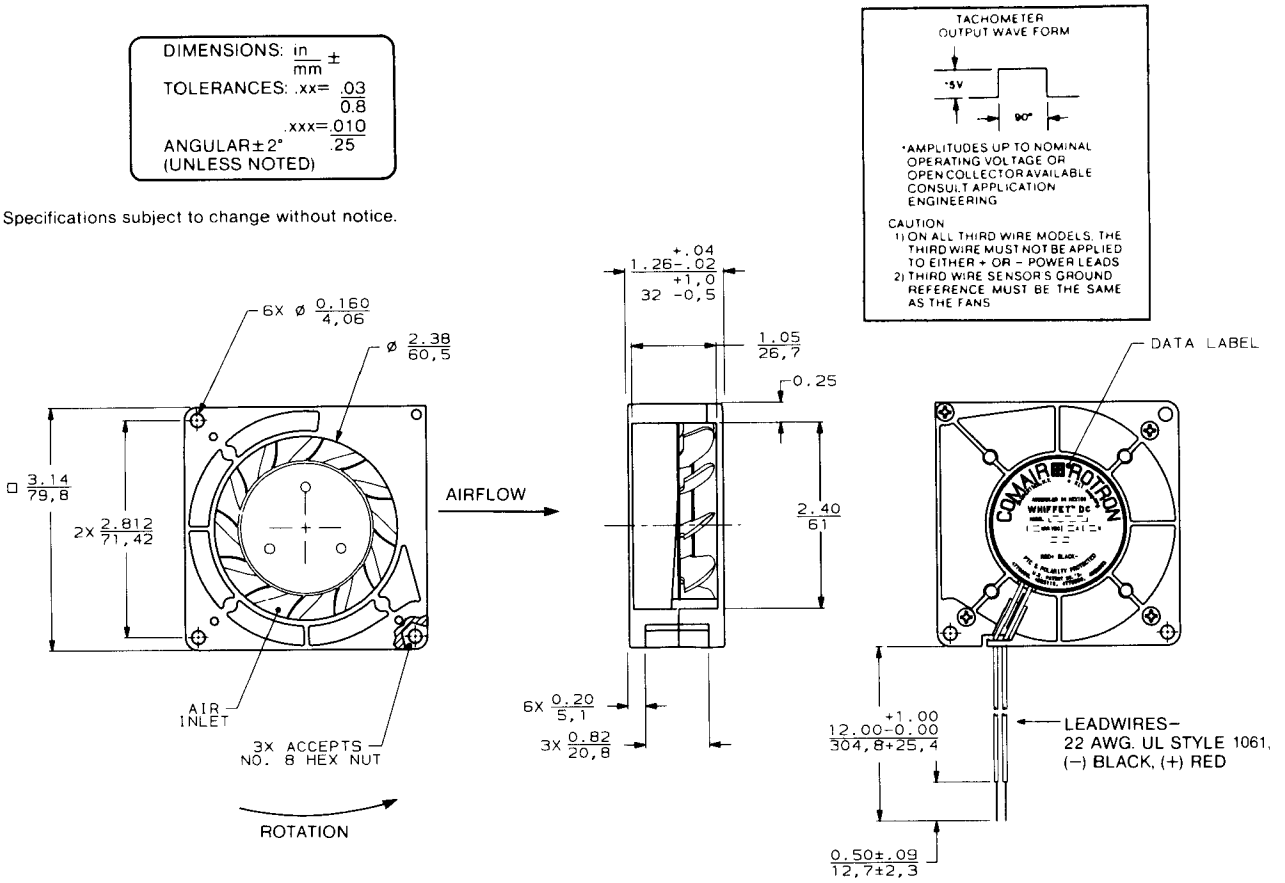
SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.
WT12B3	031101	Ball	12	6-14	5.1	420	950	4050	15.0	31.7
WT24B3	031102	Ball	24	12-28	5.1	200	525	4050	15.0	31.7
WT12M3	031103	Ball	12	6-14	1.2	100	280	2360	8.7	18.4
WT24M3	031104	Ball	24	12-28	1.2	50	165	2360	8.7	18.4

All figures are nominal free delivery values at sea level.

DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
ANGULAR±2°
(UNLESS NOTED)

Specifications subject to change without notice.



MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.

High reliability ball bearings.

100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.

Electronic locked rotor protection.

Polarity protected.

CONSTRUCTION

Housing - polyester, glass filled, black, meeting UL94V-0 flammability rating.

Propeller - polyester, black, meeting UL94V-0 flammability rating.

EMI

Designed to meet EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A or B radiated and conducted emissions.

Designed to meet EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

OPTIONS

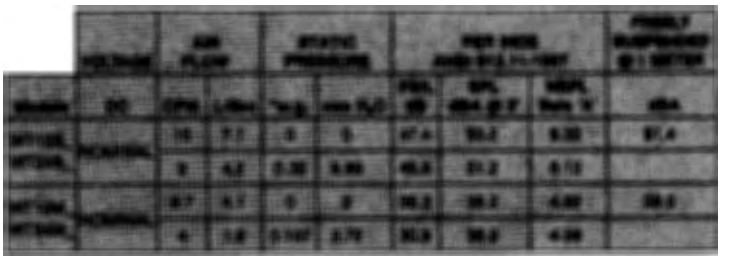
Capable of furnishing harness assemblies. See page 106.

Tachometer output – square wave output equal to two pulses per revolution. See page 60.

Go/No-Go Fan Performance Sensor. See page 58.

ACOUSTIC RATINGS

(for definitions see page 5)

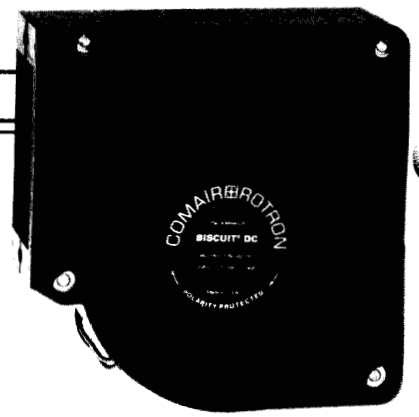


LIFE EXPECTANCY

The Whiffet brushless DC blower is designed for continuous duty life of 80,000 hours at 25°C. Brushless electronic commutation provided by dependable solid state circuitry. High efficiency brushless DC motor provides for lower internal temperature rise than conventional AC motors.

BISCUIT® DC

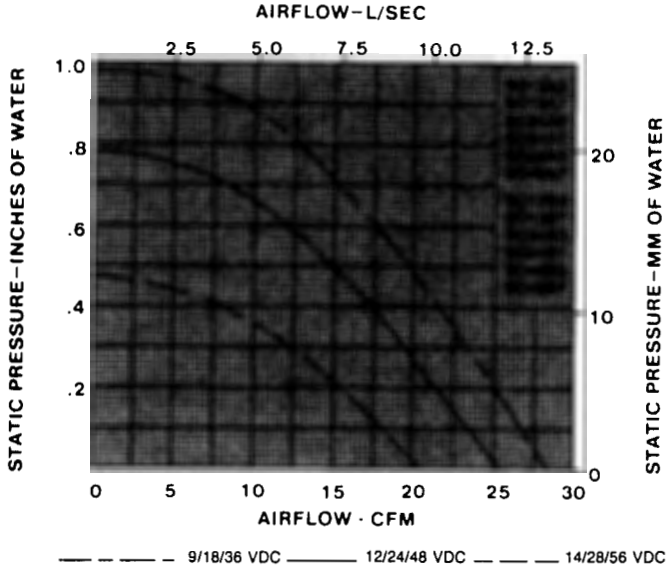
BRUSHLESS DC BLOWER

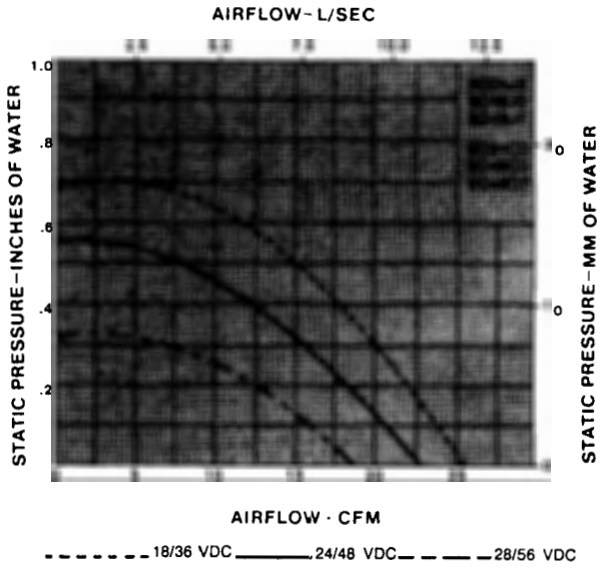


FEATURES

- ☐ Size - 4.75″ square x 1.22″ deep (120.7 mm x 31.0 mm)
- ☐ 18 to 28 CFM (8.5 to 13.2 L/Sec.)
- ☐ 12, 24, and 48 VDC (Nominal)
- ☐ High reliability ball or sleeve bearings
- ☐ Low noise level
- ☐ Operating temperature range: – 10°C to + 70°C
- ☐ Weight - 10 oz. (.28 Kg)
- ☐ UL Yellow Card Recognized file No. E31293
- ☐ CSA certified-file No. LR52898
- ☐ TUV Approved to IEC 950, VDE 0730, License R97229

PERFORMANCE





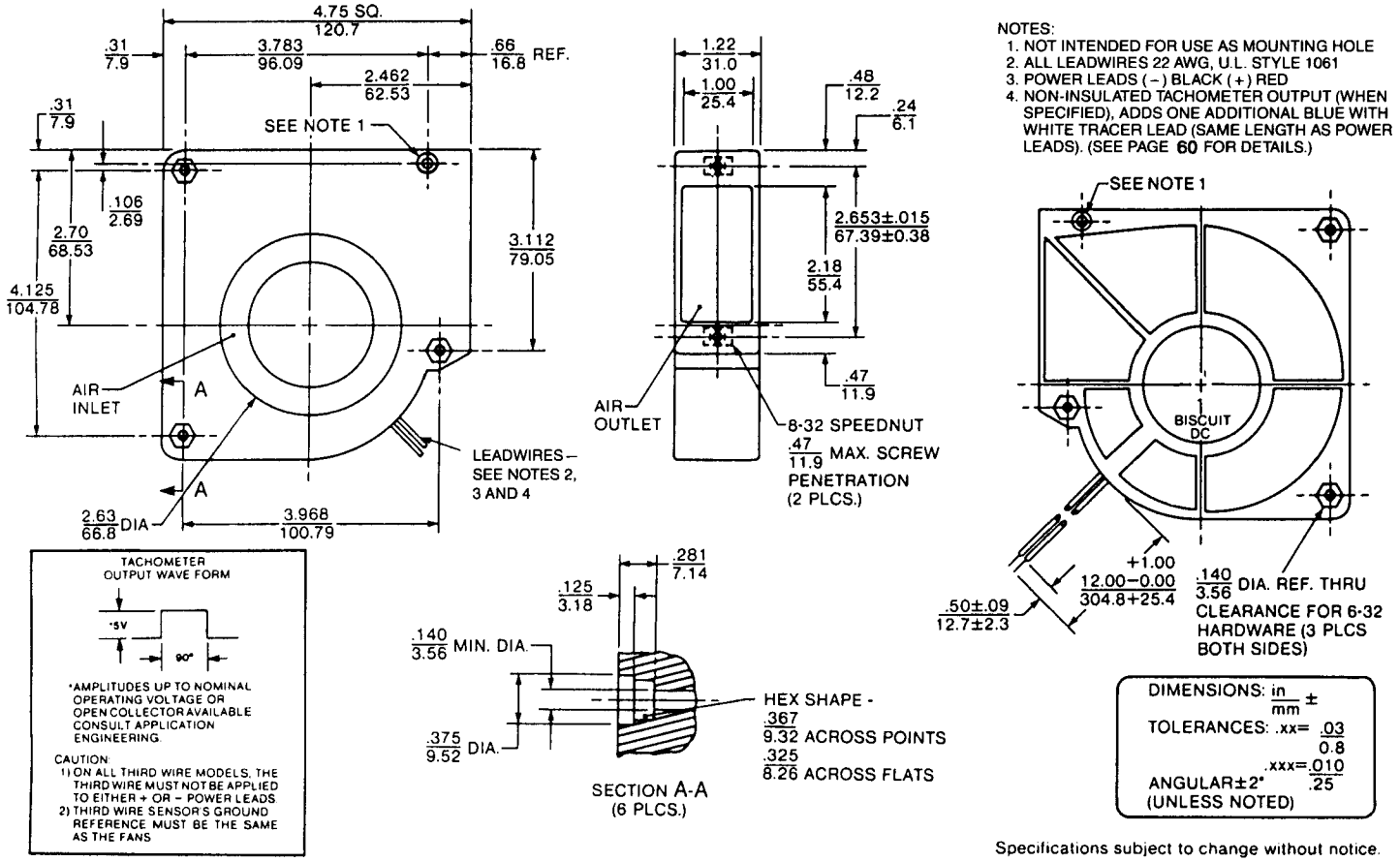
SPECIFICATIONS

SLEEVE BEARING Model No.	SLEEVE BEARING Part No.	BALL BEARING Model No.	BALL BEARING Part No.	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
*BD12A3	032176	*BD12B3	030619	12	9-14	11	900	1700	1700	3050	25	11.8
†BD12A7	032263	†BD12B7	030620	12	9-14	11	900	1700	1700	3050	25	11.8
*BD24A3	032179	*BD24B3	030621	24	18-28	11	480	850	850	3050	25	11.8
†BD24A7	032254	†BD24B7	030622	24	18-28	11	480	850	850	3050	25	11.8
BD48A3	030633	*BD48B3	030637	48	32-56	16	350	550	550	3050	25	11.8
†BD48A7	030634	†BD48B7	030638	48	32-56	16	350	550	550	3050	25	11.8
*BD24J3	032230	*BD24C3	030623	24	18-28	7.2	300	600	600	2650	22	10.0
BD48J3	030635	BD48C3	030639	48	32-56	11	220	350	350	2650	22	10.0
†BD48J7	030636	†BD48C7	030640	48	32-56	11	220	350	350	2650	22	10.0

All figures are nominal delivery values at sea level

*Distributor item

† Tachometer Output Models (see page 60 for description)



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.

Sintered bronze sleeve or stainless steel ball bearings.

100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.

Electronic locked rotor protection (Current limited).

Automatic restart capability.

Polarity protected.

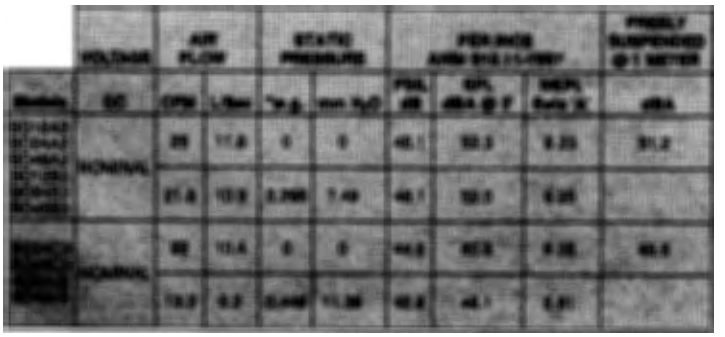
CONSTRUCTION

Housing - Mineral filled nylon, black, meeting UL94V-0 flammability rating.

Impeller - polypropylene, black, meeting UL94V-0 flammability rating.

ACOUSTIC RATINGS

(for definitions see page 5)



OPTIONS

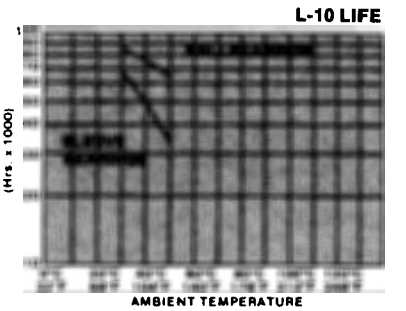
Go/No-Go Fan Performance Sensor. See page 58.

Tachometer output-square wave output equal to two pulses per revolution. Various amplitudes available, see page 60.

Harness assemblies — See page 106.

LIFE EXPECTANCY

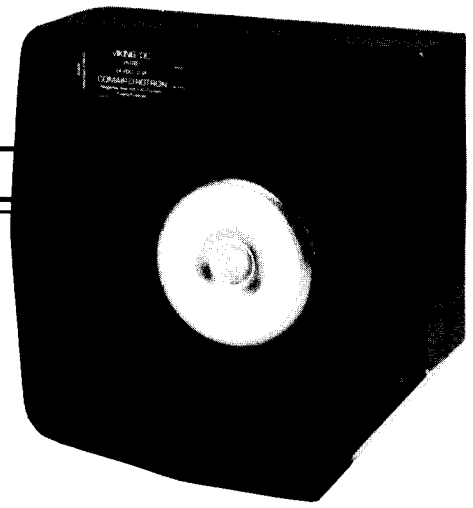
The curve represents the continuous duty life of Biscuit DC blowers at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When a ball bearing unit is run at 40°C ambient, 90% of the Biscuit DC units will still be running after 78,000 hours continuous duty.

VIKING® DC

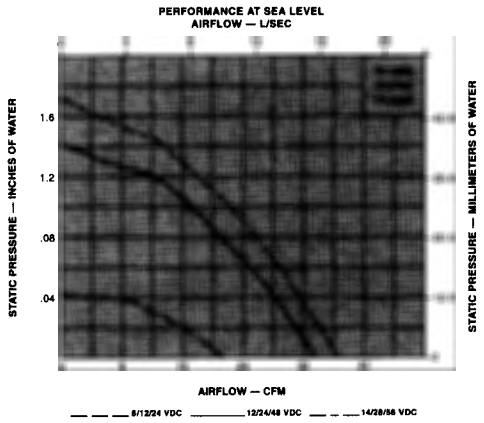
BRUSHLESS DC BLOWER

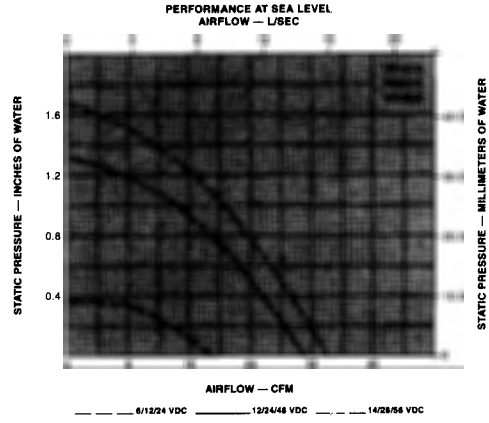


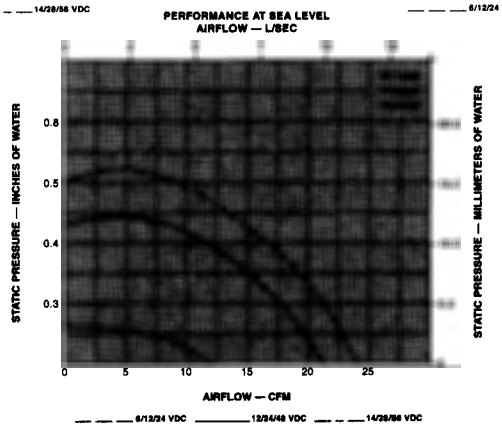
FEATURES

- ☐ Size - 5.0″ square × 1.6″ deep (127 mm × 40.6 mm)
- ☐ 16 to 40 CFM (7.5 to 18.9 L/Sec.)
- ☐ 12, 24, 48 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: – 10°C to + 70°C
- ☐ Weight - 14.5 oz. (.45 Kg)
- ☐ High reliability ball bearings

PERFORMANCE







SPECIFICATIONS

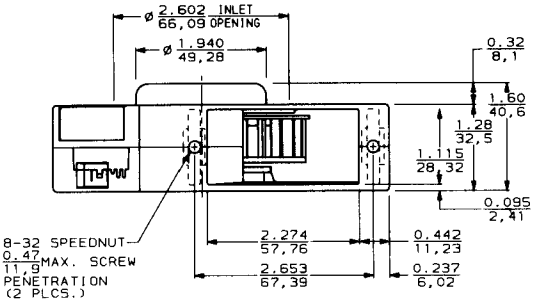
Leadwire Version

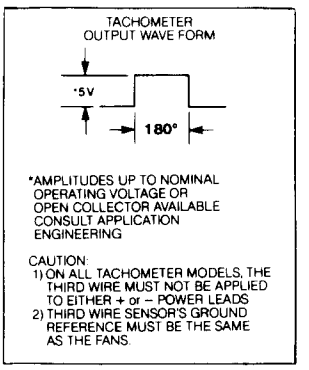
Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Watts	Running Current mA	Locked Rotor mA	RPM	CFM	L/Sec.
VK12B3	031047	Ball	12	6-14	20	1670	4000	4000	36	17.0
VK24B3	031048	Ball	24	12-28	20	830	2000	4000	36	17.0
VK48B3	031049	Ball	48	24-56	20	420	1000	4000	36	17.0
VK12C3	031050	Ball	12	6-14	13.2	1100	2000	3400	30	14.2
VK24C3	031051	Ball	24	12-28	13.2	550	1000	3400	30	14.2
VK48C3	031052	Ball	48	24-56	13.2	280	500	3400	30	14.2
VK12M3	031053	Ball	12	6-14	5	420	800	2500	22	10.4
VK24M3	031054	Ball	24	12-28	5	210	400	2500	22	10.4
VK48M3	031055	Ball	48	24-56	5	105	200	2500	22	10.4

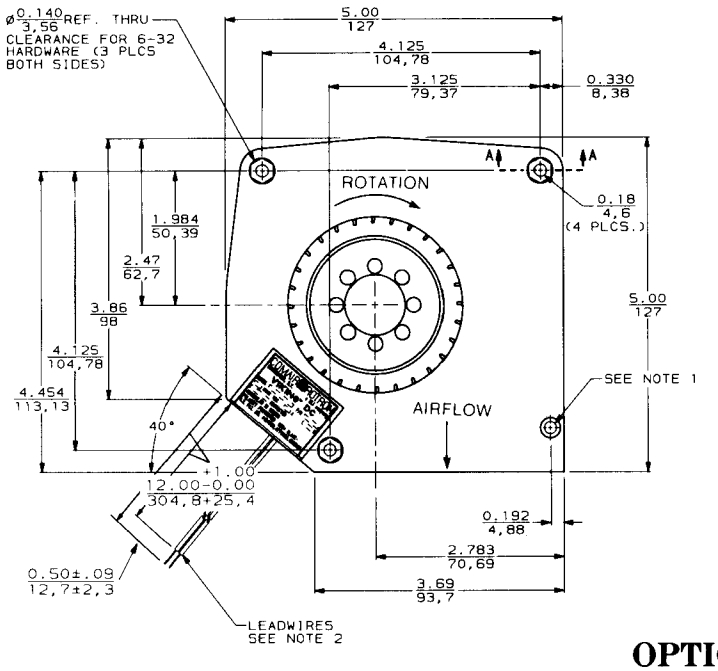
All figures are nominal free delivery values at sea level.

DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx= .010 / .25
ANGULAR ± 2°
(UNLESS NOTED)

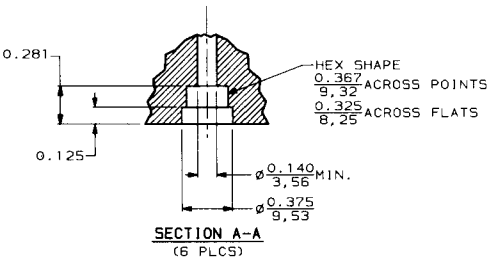
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.







NOTES:
1. NOT INTENDED FOR USE AS MOUNTING HOLE.
2. ALL LEADWIRES TO BE: 22AWG, UL STYLE 1061, (–) BLACK, (+) RED, TACHOMETER BLUE/WHITE.



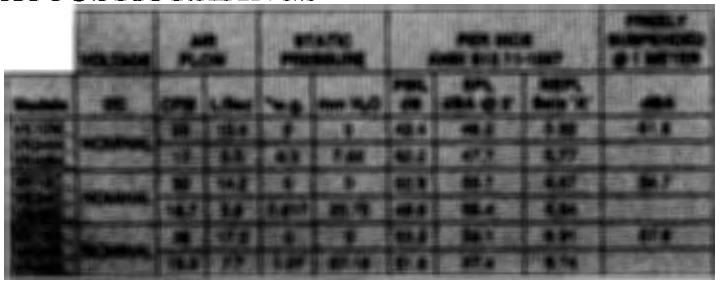
MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.
Electronic locked rotor protection.
Polarity protected.

CONSTRUCTION

Housing – polyester, glass filled, black, meeting UL94V-0 flammability rating.
Impeller – polypropylene, black, meeting UL94V-0 flammability rating.

ACOUSTIC RATINGS (for definitions see page 5)



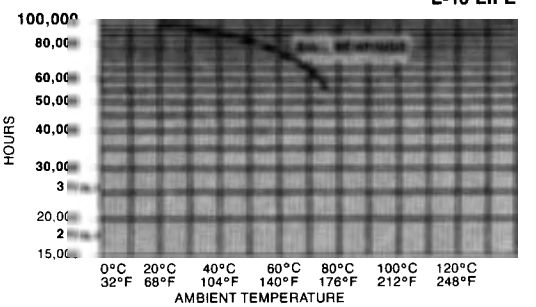
OPTIONS

Capable of furnishing:
Tachometer output – square wave output equal to one pulse per revolution. Various amplitudes available. See page 60. Two pulses available as "special" only.
Harness assemblies. See page 106.
Terminal connection. See page 106.

LIFE EXPECTANCY

The curve represents the continuous duty life of Viking DC blowers at a given temperature, after which 90% of the units will still be operating.

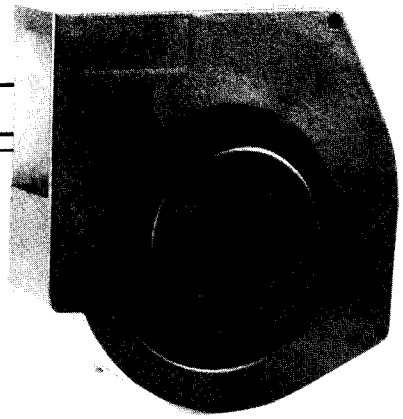
L-10 LIFE



EXAMPLE: When run at 40°C ambient, 90% of Viking DC bearing units will still be running after 83,000 hours continuous duty.

SPINNAKER™ DC

BRUSHLESS DC BLOWER

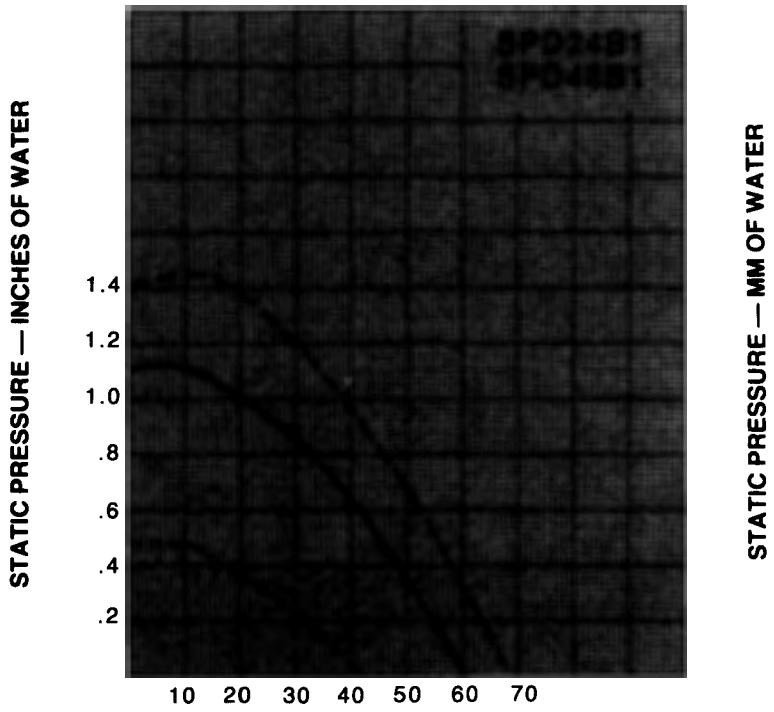


FEATURES

- ☐ Size - 6.37″ square x 1.60″ deep (161.8 mm x 40.6 mm)
- ☐ 29 to 68 CFM (14 to 32 L/Sec.)
- ☐ 24 and 48 VDC (Nominal)
- ☐ Low noise level
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 2.1 lbs. (.953 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

PERFORMANCE

PERFORMANCE AT SEA LEVEL
AIRFLOW — L/SEC.

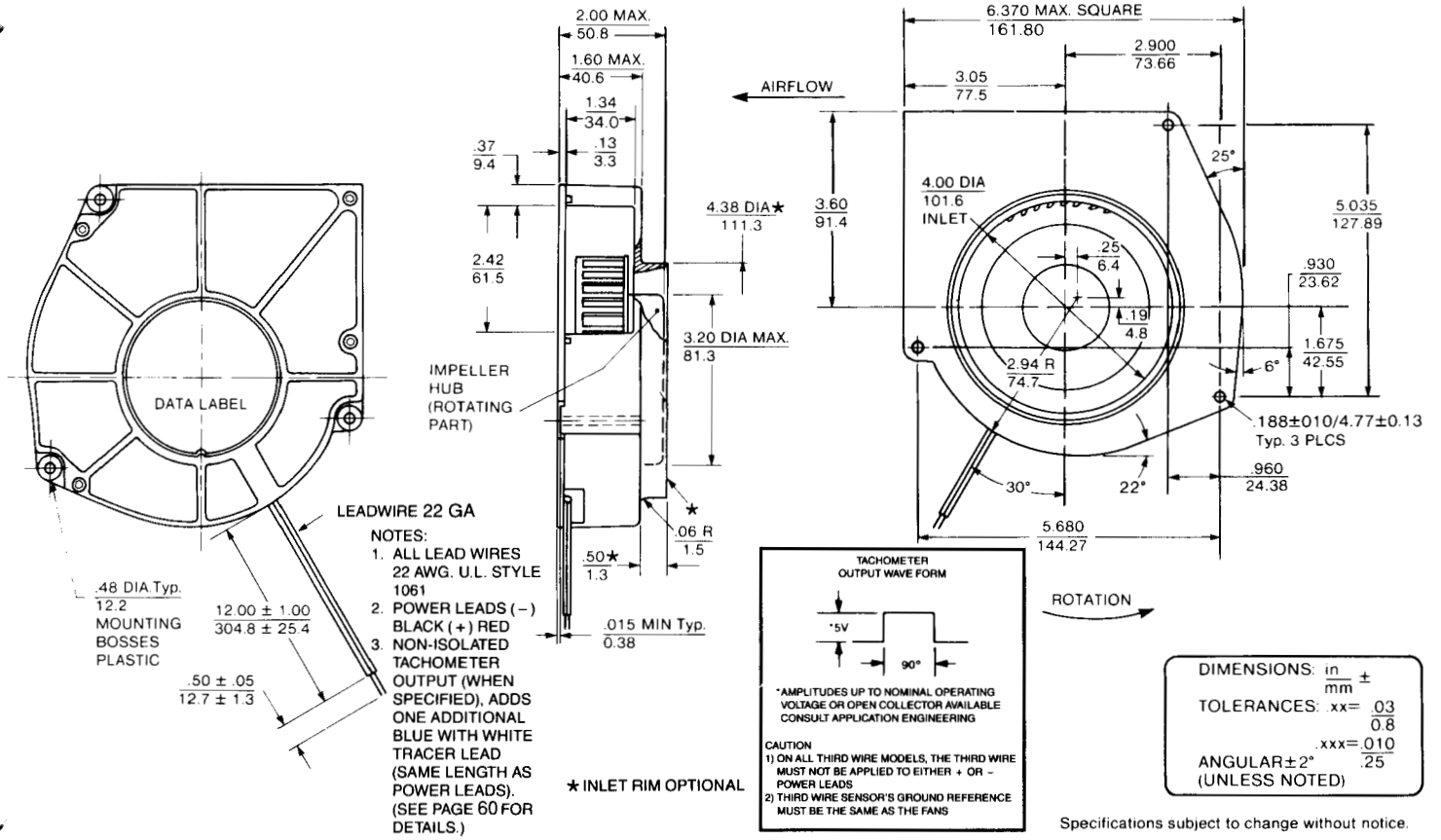


SPECIFICATIONS

Model No.	Part No.	Bearing	Nominal VDC	Range VDC	Power Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/Sec.
*SPD24B1	032183	Ball	24	12-28	30	1300	1800	2000	2500	60	28.3
SPD48B1	032196	Ball	48	24-56	30	600	900	1000	2500	60	28.3

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Brushless electronic commutation provided by dependable solid state circuitry.
Stainless steel ball bearings.
Electronic locked rotor protection (current limited).
Automatic restart capability.
Polarity protected.
Power transistors heat sink to metal housing.
100% dielectric tested at 600 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Backplate - single piece die-cast zinc alloy.
Housing and Impeller - polycarbonate, black meets UL94V-0 flammability rating.

EMI

Per MIL STD 461 meets EMI standards per FCC Part 15, Subpart J of Docket 20780, Class A and B radiated and conducted emissions, meets EMI standards per VDE Specification 0871/6.78 for category A and B requirements.

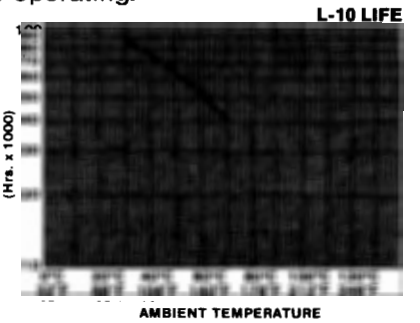
OPTIONS

Capable of furnishing:
Optional Inlet rim
Optional .124 diameter mounting holes
Thermal speed control
Various Fan Performance Sensor (FPS) options, see page 58.
Harness assemblies — See page 106.
Tachometer output-square wave output equal to two pulses per revolution, see page 60.

ACOUSTIC RATINGS (for definitions see page 5)

LIFE EXPECTANCY

The curve represents the continuous duty life of Spinnaker DC Blowers at a given temperature, after which 90% of the units will be operating.



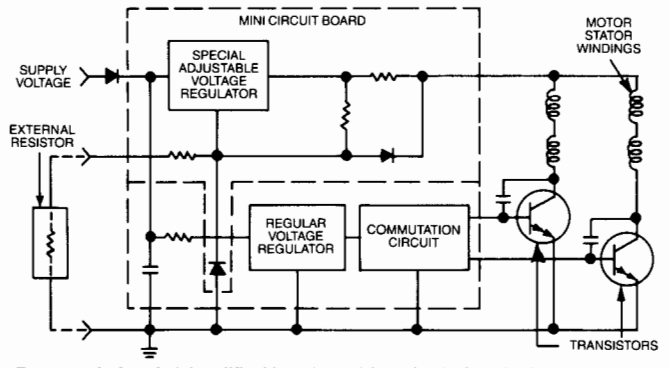
EXAMPLE: When run at 50°C ambient, 90% of the Spinnaker DC units will be running after 62,000 hours continuous duty.

ThermaPro-V™ Technology

Thermal Speed Controlled, Programmable, Voltage Regulated DC Fans & Blowers

At the top of their class.

Give Comair Rotron fans some extra credit. Our unique ThermaPro-V™ circuitry makes them the most precise and versatile airmovers in the industry. To say nothing of how amazingly quiet they are. You can count on TPV to reach your optimal cooling point with minimal noise — without adding on to your system. Now you can design-in Voltage Regulated, Programmable, Thermally Speed Controlled brushless DC fans for completely reliable cooling.

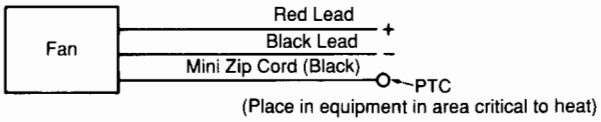


Patented circuit (simplified here) enables single fan design to run at different loads under control of operator.

ThermaPro-V capabilities are achieved through the use of a patented circuit design. A small voltage regulator is placed in series with the motor windings. An additional lead from the control leg of the voltage regulator is brought out of the fan to enable the customer to adjust the voltage to the windings and control the speed of the fan.

Hook Ups

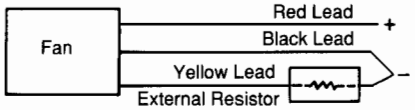
Thermal Speed Control



(Place in equipment in area critical to heat)

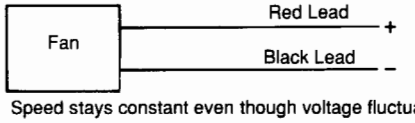
Speed increases as temperature at PTC location increases.

Programmability



Speed is determined by the value of the external resistor.

Voltage Regulation



Speed stays constant even though voltage fluctuates.

Thermal Speed Control

Advanced degrees are no sweat.

With TPV's closed loop Thermal Speed Control capability, a small thermistor is used to program the fan's voltage regulator to change airflow automatically as a function of temperature. It automatically provides needed cooling in extreme environments and a minimum of noise and power consumption at all times. This results in complete efficiency for your system. And, with two power leads, plus a control and return lead (zip cord) to the PTC thermistor, there's no chance of system shut-down.

Should the sensor fail open, the fan reaches maximum airflow, avoiding any possible damage to sensitive equipment. That means complete reliability for your system.

Programmability

One right answer to the multiple choice question.

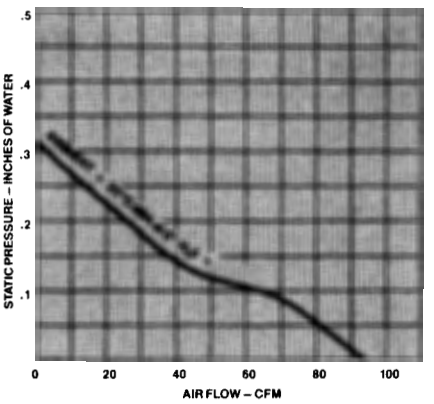
You can now specify a single fan to cover a broad range of airflow needs. TPV Programmability lets you easily control the airflow. In fact, it's elementary. External resistors, pulse width modulated signals, zener diodes, thermistor response and other techniques can be used to change fan speed through a single, added control lead wire connected to ground. So forget about expensive circuit redesign or taking the heat from voltage dropping devices. One TPV Programmable fan gives you a vastly extended performance range, simplified system circuitry, reduced specification needs and highly flexible programming options.

Voltage Regulation

Current events — they're history.

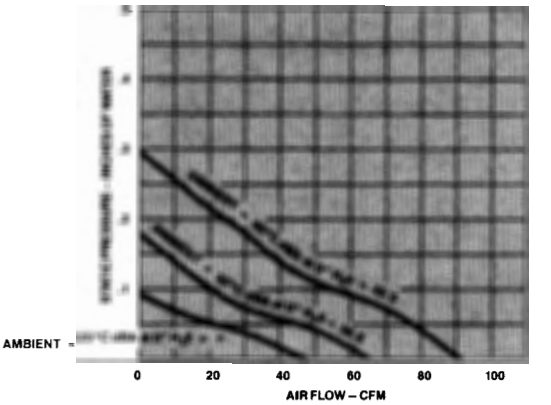
ThermaPro-V solves the problem of power supply voltage fluctuation forever. Internal Voltage Regulation circuitry automatically regulates the input voltage to the motor windings to compensate for any fluctuation caused by a change in the power supply load. With TPV, you always get just the airflow you need — with predictable noise and power levels. And its current limiting circuits keep start-up and locked rotor currents low.

Before ThermaPro-V



For most applications, the lower performance was acceptable. Since the fan was specified for worst case conditions, the higher performance fan was used, creating unnecessary noise and power consumption.

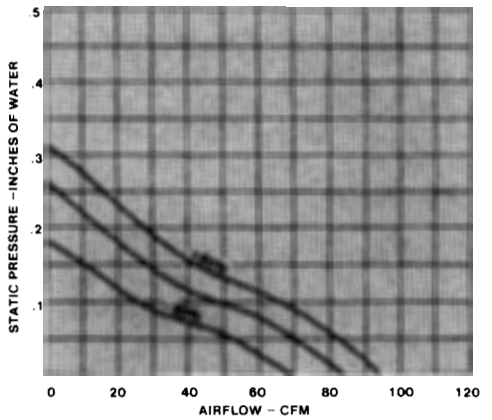
After ThermaPro-V



ThermaPro-V™ Thermally Speed Controlled fans, such as the Muffin® DC allow minimum noise for most applications, while automatically providing needed cooling in extreme environments.

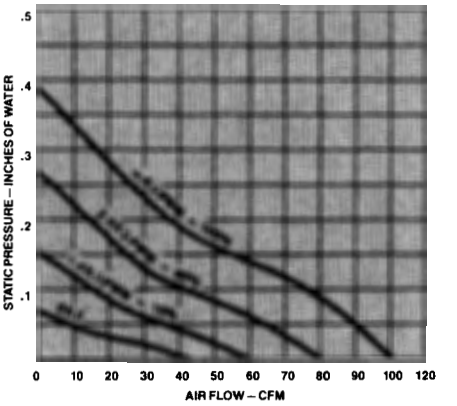
* Data below ambient (measurable) level.

Before ThermaPro-V



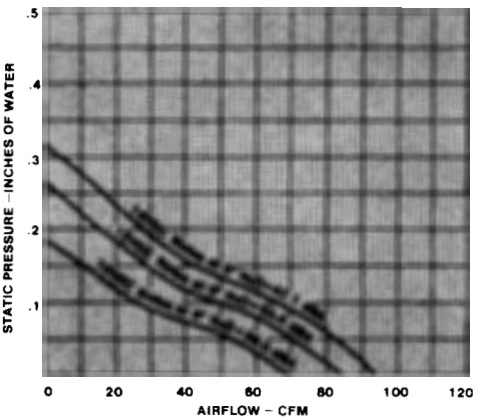
Typical 4.7" brushless DC fan. Maximum performance range ± 20%.

After ThermaPro-V



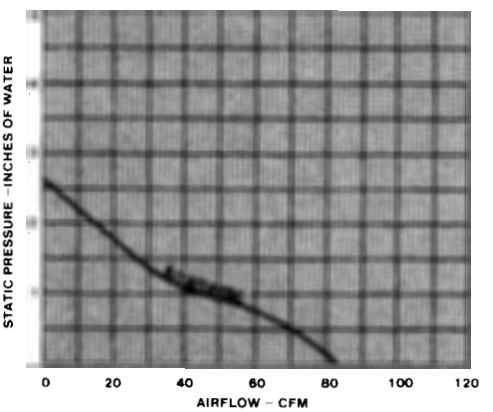
ThermaPro-V™ Programmable Muffin® DC has greatly increased performance range, reducing user inventories. Single fan may be customized over wide number of applications.

Before ThermaPro-V



Typical 4.7" brushless DC fan performance changes resulting from power supply voltage fluctuation.

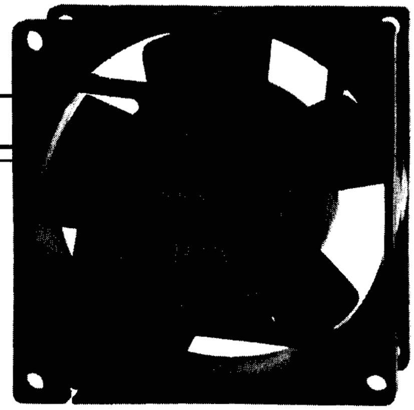
After ThermaPro-V



Typical Muffin® DC fan with ThermaPro-V™ Technology. Performance remains constant in regulated voltage range, even if power supply output voltage fluctuates.

ThermaPro-V™

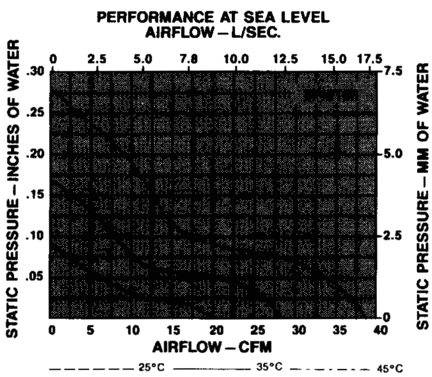
SPRINT® DC

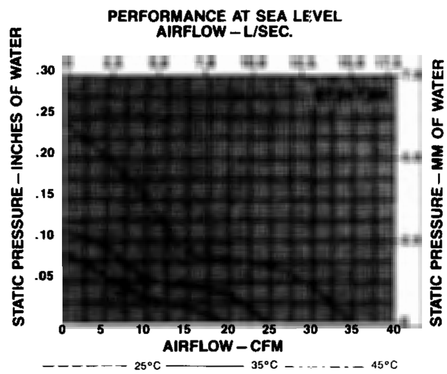


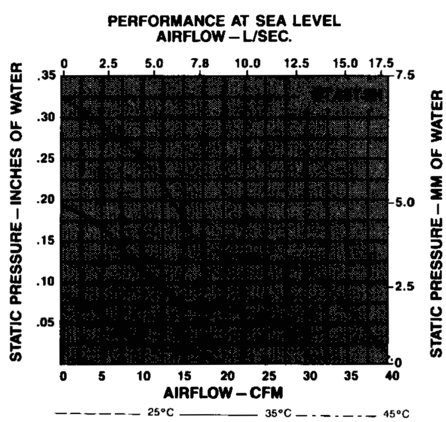
FEATURES

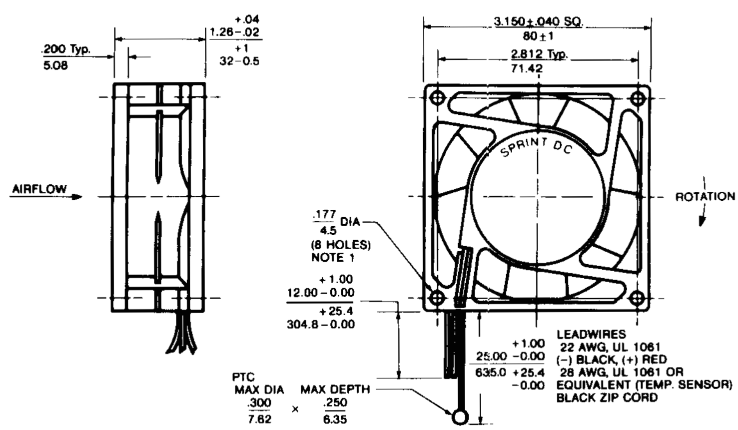
- ☐ Thermal Speed Control-change airflow as function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic restart capability
- ☐ Current Limited
- ☐ Size - 3.15″ square x 1.25″ deep (80.0 mm x 32.0 mm)
- ☐ 7.5 to 43 CFM (3.5 to 20 L/Sec)
- ☐ Weight - 6.3 oz (18 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA Certified—File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730 , License R97229

THERMAL SPEED CONTROL









NOTE 1: DIA AT LARGE END OF DRAFT

SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level dBA	Operating Temp. Range°C
					45	12-14	5.0	420	1050	1050	3900	38	18	42.7	−10 to +70
*ST12T3H	032396	Sleeve	12	6-14	35	9-14	3.6	300	950	950	2900	28	13	37.8	−10 to +70
					25	7-14	2.9	240	750	750	2100	20	10	30.0	−10 to +70
					45	24-28	3.8	160	440	440	3500	34	16	40.2	−10 to +70
*ST24T3H	032397	Sleeve	24	12-28	35	17-28	2.9	120	390	390	2500	24	11	34.2	−10 to +70
					25	12-28	2.3	95	320	320	2100	20	10	30.0	−10 to +70
					45	44-56	6.5	135	200	200	4250	41	19	44.5	−10 to +70
*ST48T3H	032398	Sleeve	48	24-56	35	31-56	4.3	90	200	200	3150	31	14	39.2	−10 to +70
					25	19-56	2.9	60	160	160	2100	20	10	30.0	−10 to +70

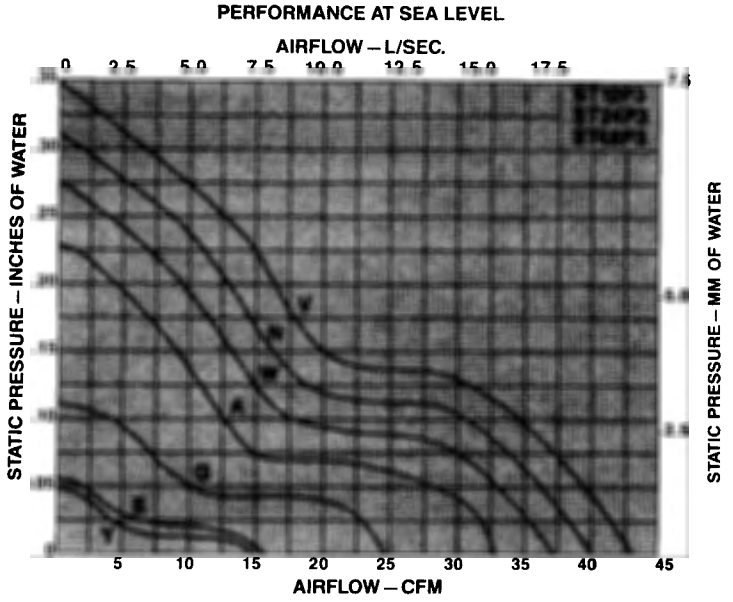
All figures are nominal, free delivery values at sea level.

† 3′ (0.91M) from fan

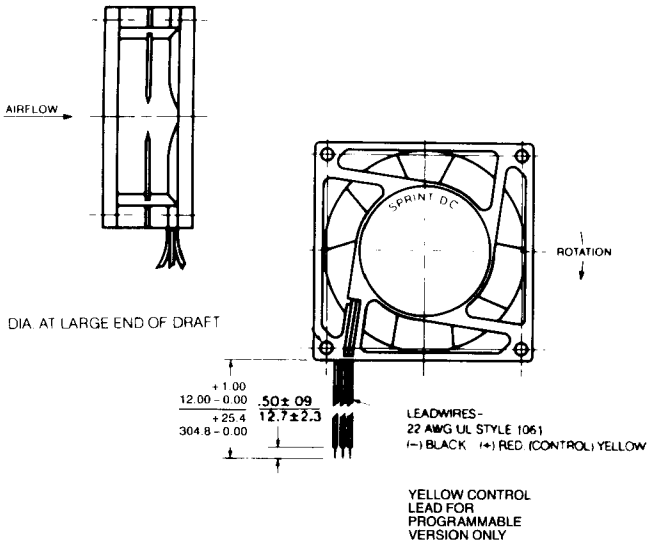
* Distributor Item.

All specifications subject to change without notice.

PROGRAMMABILITY



NOTE: REFER TO STANDARD SPRINT DC FOR DIMENSIONS



SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range°C
					∞	N/A	N/A	5.0	420	1050	1050	W	3850	37	18	42.1	– 10 to + 70
					3.3	90%	12-14	4.4	370	1000	1000	A	3400	33	16	39.9	– 10 to + 60
ST12P3	032386	Sleeve	12	6-14	1.6	20%	10-14	3.1	260	850	850	G	2500	24	11	34.2	– 10 to + 60
					.2	10%	8-14	2.4	200	580	580	E	1700	16	8	20.9	– 10 to + 60
					0	N/A	6-14	2.2	180	540	540	Y	1600	15	7	*	– 10 to + 60
					∞	N/A	N/A	4.8	200	450	450	N	4100	40	19	44.0	– 10 to + 70
					16.5	90%	22-28	3.8	160	430	430	A	3400	33	16	39.9	– 10 to + 60
ST24P3	032387	Sleeve	24	12-28	6.0	20%	17-28	2.6	110	390	390	G	2500	24	11	34.2	– 10 to + 60
					.8	10%	12-28	2.2	90	280	280	E	1700	16	8	20.9	– 10 to + 60
					0	N/A	12-28	1.9	80	250	250	Y	1600	15	7	*	– 10 to + 60
					∞	N/A	N/A	6.2	130	210	210	V	4450	43	20	47.1	– 10 to + 70
					13.0	N/A	38-56	4.6	95	200	200	A	3400	33	16	39.9	– 10 to + 60
ST48P3	032388	Sleeve	48	24-56	6.0	N/A	30-56	3.4	70	180	180	G	2500	24	11	34.2	– 10 to + 60
					.4	N/A	24-56	2.4	50	130	130	E	1700	16	8	20.9	– 10 to + 60
					0	N/A	24-56	2.4	50	120	120	Y	1600	15	7	*	– 10 to + 60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3' (0.91M) from fan
*Data below background
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range°C
ST12A3V	032406	Sleeve	12	6-14	12-14	4.4	370	1000	1000	A	3400	33	16	39.9	– 10 to + 60
ST24A3V	032407	Sleeve	24	12-28	22-28	3.8	160	430	430	A	3400	33	16	39.9	– 10 to + 60
ST48A3V	032408	Sleeve	48	24-56	38-56	4.6	95	200	200	A	3400	33	16	39.9	– 10 to + 60
ST12G3V	032409	Sleeve	12	6-14	10-14	3.1	260	850	850	G	2500	24	11	34.2	– 10 to + 60
ST24G3V	032410	Sleeve	24	12-28	17-28	2.6	110	390	390	G	2500	24	11	34.2	– 10 to + 60
ST48G3V	032411	Sleeve	48	24-56	30-56	3.4	70	180	180	G	2500	24	11	34.2	– 10 to + 60
ST12E3V	032412	Sleeve	12	6-14	8-14	2.4	200	580	580	E	1700	16	8	20.9	– 10 to + 60
ST24E3V	032413	Sleeve	24	12-28	12-28	2.2	90	280	280	E	1700	16	8	20.9	– 10 to + 60
ST48E3V	032414	Sleeve	48	24-56	24-56	2.4	50	130	130	E	1700	16	8	20.9	– 10 to + 60

All figures are nominal, free delivery values at sea level.

† 3' (0.91M) from fan
All specifications subject to change without notice

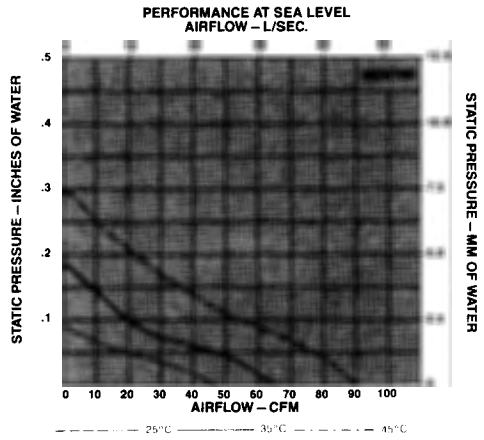
ThermaPro-V™

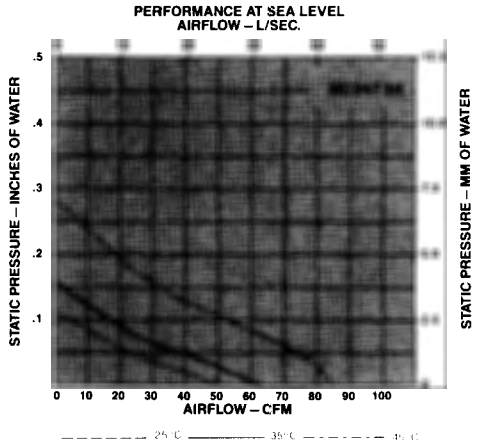
MUFFIN® DC

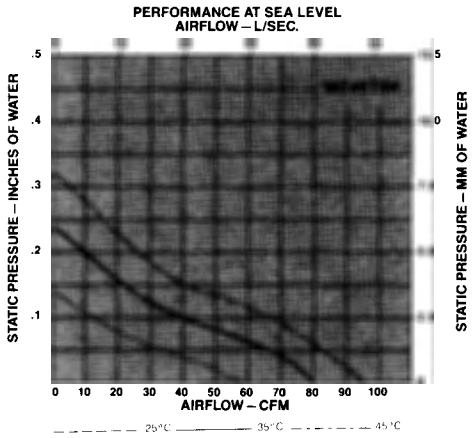
FEATURES

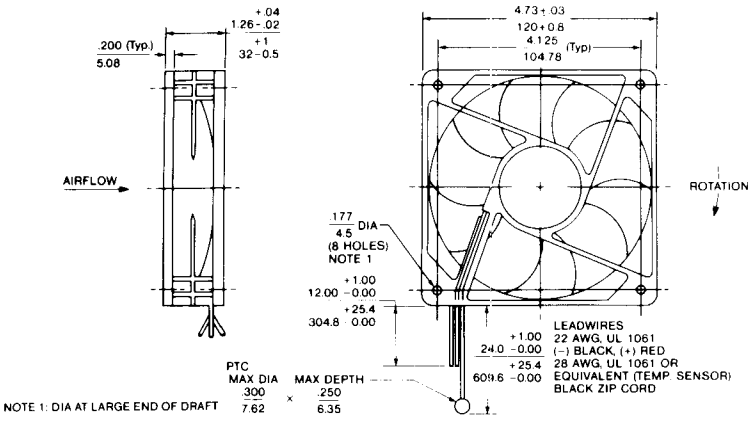
- ☐ Thermal Speed Control-change airflow as function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic Restart Capability
- ☐ Current Limited
- ☐ Size - 4.73″ square x 1.26″ deep (120 mm x 32 mm)
- ☐ 22 to 106 CFM (10 to 50.2 L/sec)
- ☐ Weight - 8.5 oz (.24 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA certified—File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 0730, License R97229

THERMAL SPEED CONTROL









SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					45	N/A	6.4	540	1000	1000	3200	90	42	45.0	– 10 to + 70
* MC12T3H	032399	Sleeve	12	6-14	35	10-14	4.1	350	810	810	2300	64	30	36.6	– 10 to + 70
					25	7-14	2.8	230	610	610	1700	47	22	*	– 10 to + 70
					45	19-28	5.2	220	400	400	3000	84	40	43.7	– 10 to + 70
* MC24T3H	032400	Sleeve	24	12-28	35	13-28	3.7	150	360	360	2200	61	29	34.0	– 10 to + 70
					25	12-28	3.1	130	325	325	1800	50	24	*	– 10 to + 70
					45	45-56	8.0	170	200	200	3400	95	45	45.5	– 10 to + 70
* MC48T3H	032401	Sleeve	48	24-56	35	36-56	6.5	140	200	200	2850	80	38	42.2	– 10 to + 70
					25	22-56	4.3	90	175	175	2000	56	26	27.0	– 10 to + 70

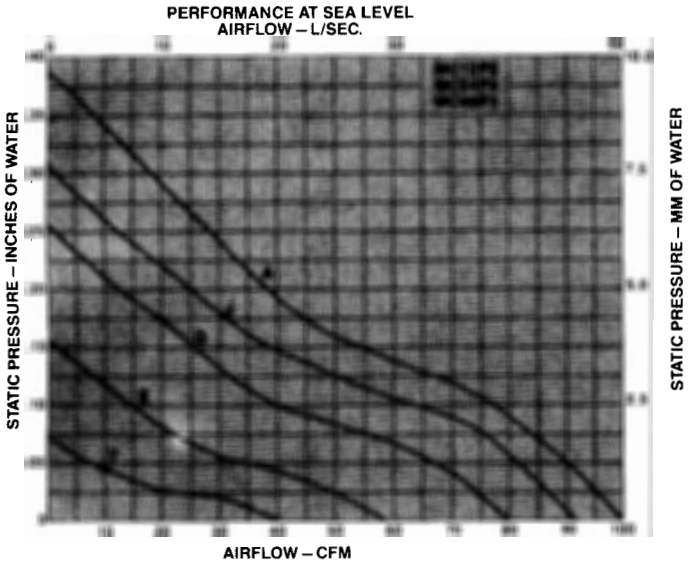
All figures are nominal, free delivery values at sea level.

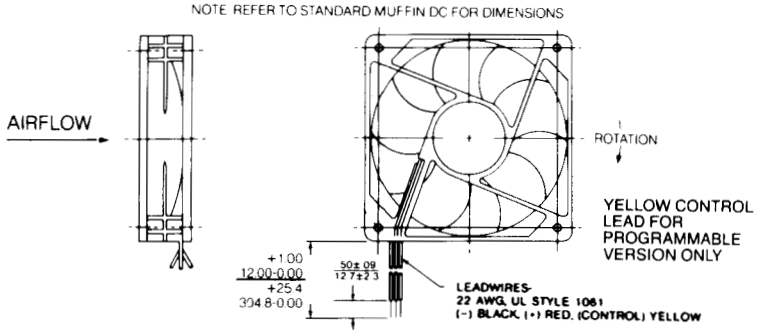
† 3′ (0.91M) from fan
*Data below background

* Distributor Item.

All specifications subject to change without notice.

PROGRAMMABILITY





SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					∞	100%	N/A	6.2	510	1050	1050	J	3250	91	43	45.2	– 10 to + 70
					2.4	60%	11-14	5.5	460	970	970	G	2850	80	38	42.2	– 10 to + 55
MC12P3	032389	Sleeve	12	6-14	1.4	10%	10-14	3.6	300	770	770	E	2150	58	27	33.7	– 10 to + 55
					0	N/A	7-14	2.4	200	510	510	Y	1450	40	19	*	– 10 to + 55
					∞	100%	N/A	6.6	275	460	460	A	3500	97	46	46.0	– 10 to + 70
					16.5	85%	22-28	6.0	250	450	450	J	3250	91	43	45.2	– 10 to + 60
MC24P3	032390	Sleeve	24	12-28	10.2	60%	18-28	4.8	200	440	440	G	2850	80	38	42.2	– 10 to + 55
					4.4	10%	16-28	3.4	140	360	360	E	2150	58	27	33.7	– 10 to + 55
					0	N/A	10-28	2.4	100	260	260	Y	1450	40	19	*	– 10 to + 55
					∞	N/A	N/A	8.2	170	210	210	A	3600	100	47	46.5	– 10 to + 70
					16.0	N/A	39-56	6.7	140	205	205	J	3250	91	43	45.2	– 10 to + 60
MC48P3	032391	Sleeve	48	24-56	11.5	N/A	34-56	5.5	115	200	200	G	2850	80	38	42.2	– 10 to + 55
					6.4	N/A	26-56	4.3	90	180	180	E	2150	58	27	33.7	– 10 to + 55
					0	N/A	18-56	2.9	60	125	125	Y	1450	40	19	*	– 10 to + 55

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

†3' (0.91M) from fan
*Data below background
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
MC12J3V	032415	Sleeve	12	6-14	11-14	6.2	510	1050	1050	J	3250	91	43	45.2	– 10 to + 60
MC24J3V	032416	Sleeve	24	12-28	22-28	5.9	250	450	450	J	3250	91	43	45.2	– 10 to + 60
MC48J3V	032417	Sleeve	48	24-56	39-56	6.7	140	205	205	J	3250	91	43	45.2	– 10 to + 60
MC12G3V	032418	Sleeve	12	6-14	11-14	5.5	460	970	970	G	2850	80	38	42.2	– 10 to + 55
MC24G3V	032419	Sleeve	24	12-28	18-28	4.8	200	440	440	G	2850	80	38	42.2	– 10 to + 55
MC48G3V	032420	Sleeve	48	24-56	34-56	5.5	115	200	200	G	2850	80	38	42.2	– 10 to + 55
MC12E3V	032421	Sleeve	12	6-14	11-14	3.6	300	770	770	E	2150	58	27	33.7	– 10 to + 55
MC24E3V	032422	Sleeve	24	12-28	16-28	3.4	140	360	360	E	2150	58	27	33.7	– 10 to + 55
MC48E3V	032423	Sleeve	48	24-56	26-56	4.3	90	180	180	E	2150	58	27	33.7	– 10 to + 55

All figures are nominal, free delivery values at sea level. All specifications subject to change without notice.

† 3' (0.91M) from fan

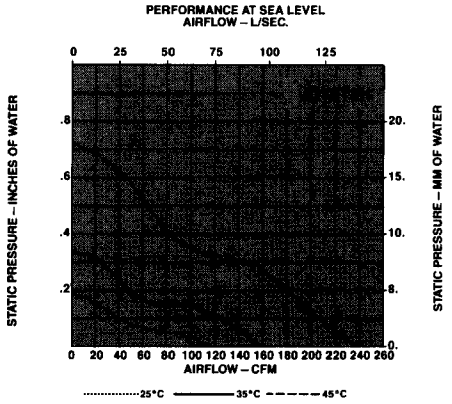
ThermaPro-V™

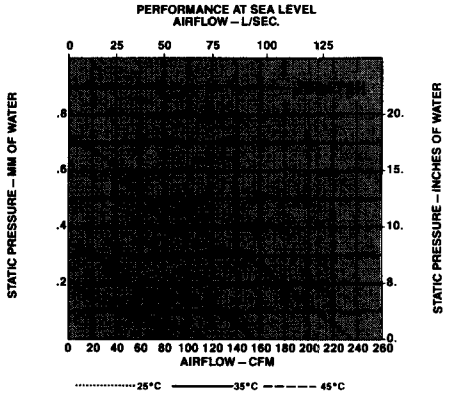
MAJOR® DC, ALSO AVAILABLE IN MAJOR® DC (QUIET)

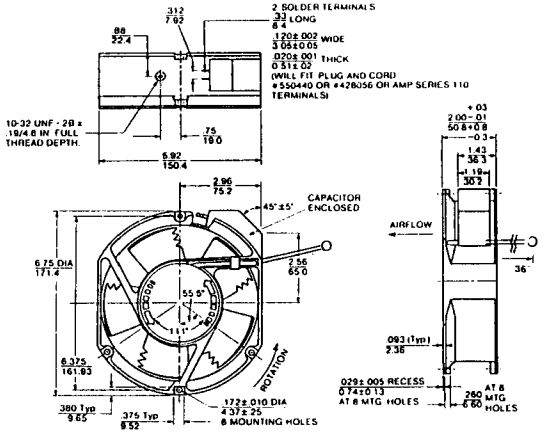
FEATURES

- ☐ Thermal Speed Control-change airflow as function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic restart capability
- ☐ Current Limited
- ☐ Size - 6.75″ x 5.92″ x 2.00″ deep (171.5mm x 150.4mm x 50.8mm)
- ☐ 80 to 240 CFM (38 to 113 L/sec)
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA certified—File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

THERMAL SPEED CONTROL





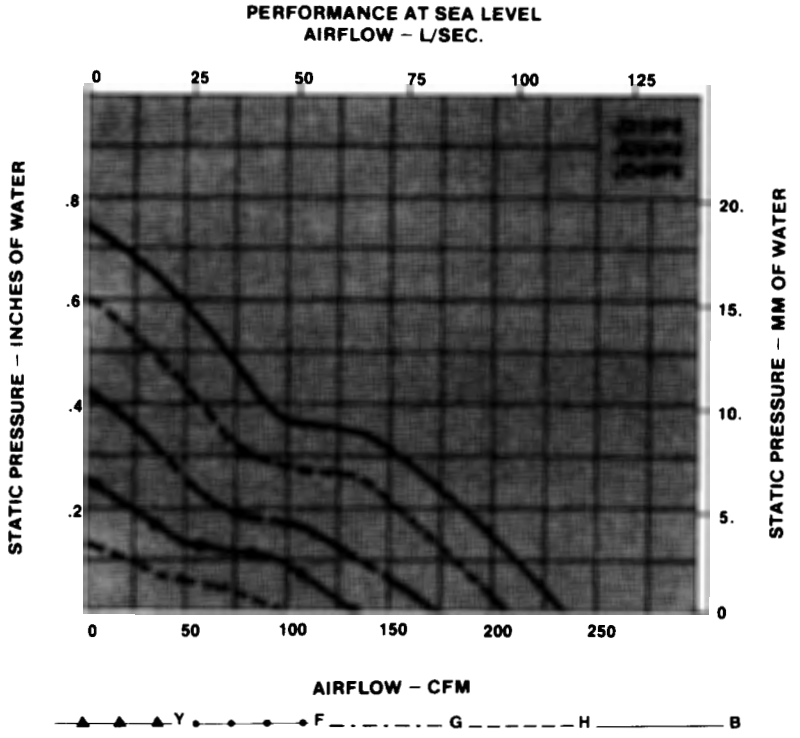


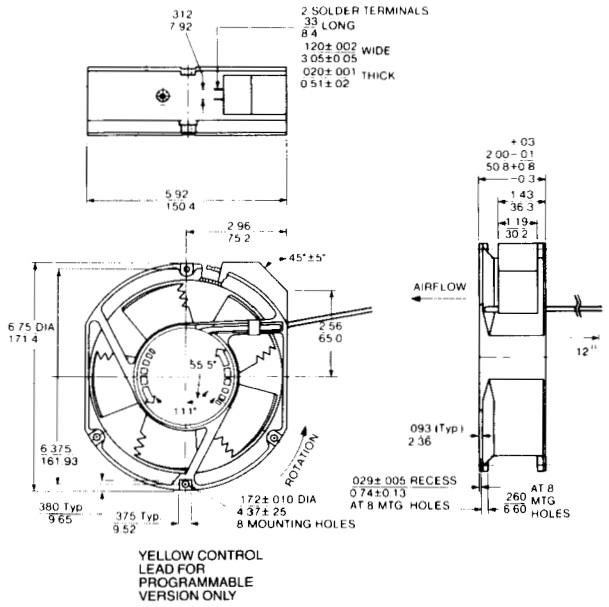
SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					45	12-14	25	2100	3700	3700	3300	232	110	55	– 10 to + 70
* JD12T2H	030661	Ball	12	6-14	35	8-14	15	1275	3700	3700	2250	153	72	46	– 10 to + 70
					25	7-14	11	900	3450	3450	1700	113	53	44	– 10 to + 70
					45	24-28	23	1000	1600	1600	3350	235	111	55	– 10 to + 70
* JD24T2H	030606	Ball	24	12-28	35	15-28	13	540	1725	1725	2250	153	72	46	– 10 to + 70
					25	11-28	9	390	1600	1600	1700	113	53	44	– 10 to + 70
					45	44-56	21	450	760	760	3350	235	111	55	– 10 to + 70
* JD48T2H	030607	Ball	48	24-56	35	35-56	13	260	810	810	2250	153	72	46	– 10 to + 70
					25	26-56	10	210	750	750	1700	113	53	44	– 10 to + 70

* Distributor Item. All figures are nominal, free delivery values at sea level. All specifications subject to change without notice. † 3′ (0.91M) from fan

PROGRAMMABILITY





SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (See above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range°C
					∞	100%	N/A	29	2400	3400	3400	B	3350	235	111	55	– 10 to + 70
					4.8	80%	12-14	26	2150	3400	3400	H	3050	205	97	52	– 10 to + 60
JD12P2	030662	Ball	12	6-14	3.2	65%	10-14	19	1600	3350	3350	G	2500	170	80	48	– 10 to + 60
					1.8	10%	8-14	14	1200	3200	3200	F	1950	135	64	45	– 10 to + 60
					0	N/A	6-14	8	650	2500	2500	Y	1200	80	38	42	– 10 to + 60
					∞	100%	N/A	24	1000	1600	1600	B	3350	235	111	55	– 10 to + 70
					12.0	80%	22-28	21	890	1600	1600	H	3050	205	97	52	– 10 to + 60
JD24P2	030663	Ball	24	12-28	7.8	65%	18-28	16	670	1500	1500	G	2500	170	80	48	– 10 to + 60
					4.5	10%	14-28	12	500	1200	1200	F	1950	135	64	45	– 10 to + 60
					0	N/A	12-28	7	290	1100	1100	Y	1200	80	38	42	– 10 to + 60
					∞	100%	N/A	22	450	900	900	B	3350	235	111	55	– 10 to + 70
					33.5	80%	42-56	20	410	860	860	H	3050	205	97	52	– 10 to + 60
JD48P2	030664	Ball	48	24-56	21.0	65%	34-56	15	310	820	820	G	2500	170	80	48	– 10 to + 60
					10.5	10%	28-56	11	230	810	810	F	1950	135	64	45	– 10 to + 60
					0	N/A	18-56	7	140	580	580	Y	1200	80	38	42	– 10 to + 60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

†3' (0.91M) from fan
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see Above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range°C
JD12H2V	030665	Ball	12	6-14	12-14	26	2150	3400	3400	H	3050	205	97	52	– 10 to + 60
JD24H2V	030666	Ball	24	12-28	22-28	21	810	1600	1600	H	3050	205	97	52	– 10 to + 60
JD48H2V	030667	Ball	48	24-56	42-56	20	410	860	860	H	3050	205	97	52	– 10 to + 60
JD12G2V	030668	Ball	12	6-14	10-14	19	1600	3350	3350	G	2500	170	80	48	– 10 to + 60
JD24G2V	030669	Ball	24	12-28	18-28	16	670	1500	1500	G	2500	170	80	48	– 10 to + 60
JD48G2V	030670	Ball	48	24-56	42-56	15	310	820	820	G	2500	170	80	48	– 10 to + 60
JD12F2V	030671	Ball	12	6-14	8-14	14	1200	3200	3200	F	1950	135	64	45	– 10 to + 60
JD24F2V	030672	Ball	24	12-28	14-28	12	500	1200	1200	F	1950	135	64	45	– 10 to + 60
JD48F2V	030673	Ball	48	24-56	26-56	11	230	810	810	F	1950	135	64	45	– 10 to + 60

All figures are nominal, free delivery values at sea level. All specifications subject to change without notice.

† 3' (0.91M) from fan

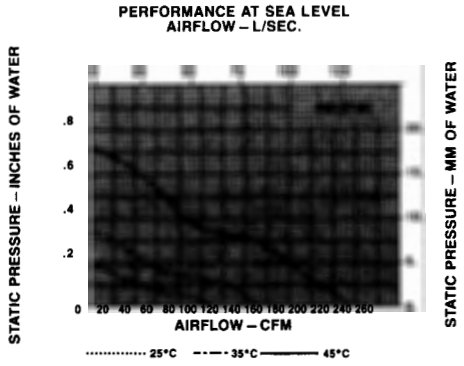
ThermaPro-V™

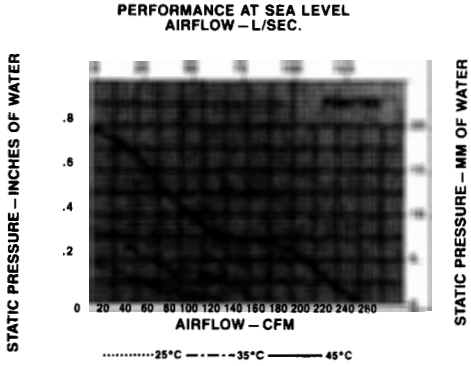
PATRIOT® DC, ALSO AVAILABLE IN PATRIOT® DC (QUIET)

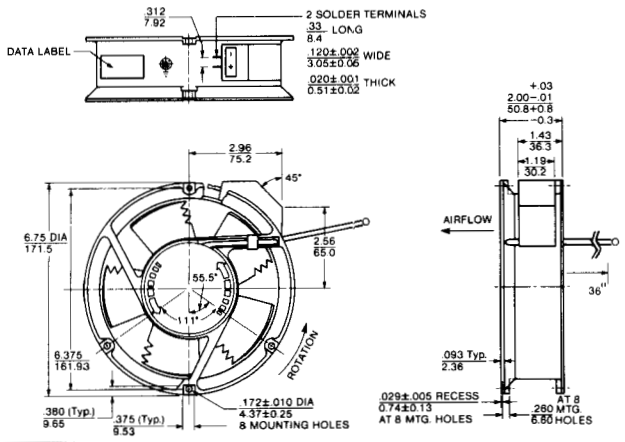
FEATURES

- ☐ Thermal Speed Control-change airflow as function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic restart capability
- ☐ Current Limited
- ☐ Size - 6.75″ diameter x 2.00″ deep (171.5mm x 50.8mm)
- ☐ 80 to 240 CFM (38 to 113 L/sec)
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA certified—File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

THERMAL SPEED CONTROL







SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					45	12-14	25	2100	3700	3700	3300	232	110	53	– 10 to + 70
• PD12T2H	030647	Ball	12	6-14	35	8-14	15	1275	3700	3700	2250	153	72	44	– 10 to + 70
					25	7-14	11	900	3450	3450	1700	113	53	42	– 10 to + 70
					45	24-28	24	1000	1600	1600	3350	235	111	53	– 10 to + 70
• PD24T2H	030642	Ball	24	12-28	35	15-28	13	540	1725	1725	2250	153	72	44	– 10 to + 70
					25	11-28	9	390	1600	1600	1700	113	53	42	– 10 to + 70
					45	44-56	21	450	760	760	3350	235	111	53	– 10 to + 70
• PD48T2H	030648	Ball	48	24-56	35	35-56	13	260	810	810	2250	153	72	44	– 10 to + 70
					25	26-56	10	210	750	750	1700	113	53	42	– 10 to + 70

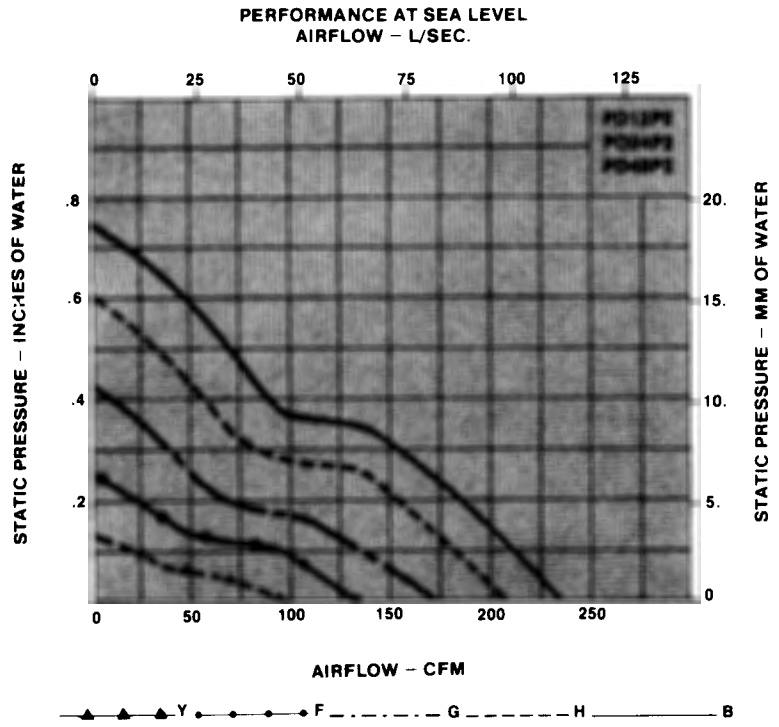
All figures are nominal, free delivery values at sea level.

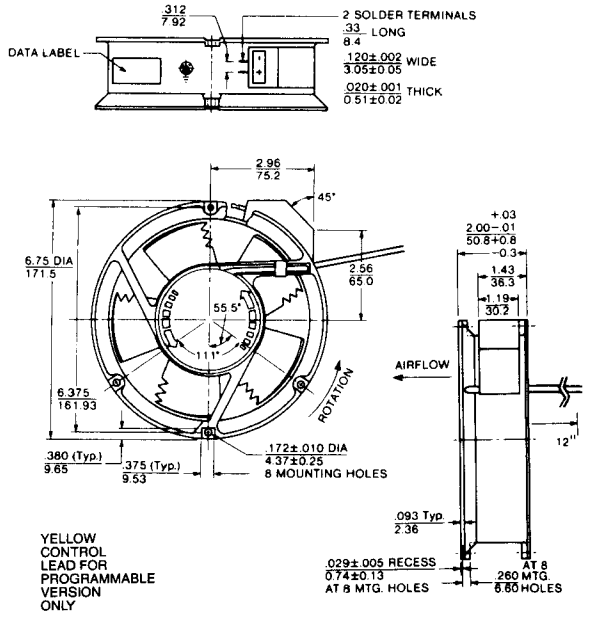
† 3′ (0.91M) from fan

* Distributor Item.

All specifications subject to change without notice.

PROGRAMMABILITY





SPECIFICATIONS

Model No.	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					∞	100%	N/A	29	2400	3400	3400	B	3350	235	111	53	−10 to +70
					4.8	80%	12-14	26	2150	3400	3400	H	3050	205	97	50	−10 to +60
PD12P2	030649	Ball	12	6-14	3.2	65%	10-14	19	1600	3350	3350	G	2500	170	80	46	−10 to +60
					1.8	10%	8-14	14	1200	3200	3200	F	1950	135	64	43	−10 to +60
					0	N/A	6-14	8	650	2500	2500	Y	1200	80	38	40	−10 to +60
					∞	100%	N/A	24	1000	1600	1600	B	3350	235	111	53	−10 to +70
					12.0	80%	22-28	21	890	1600	1600	H	3050	205	97	50	−10 to +60
PD24P2	030650	Ball	24	12-28	7.8	65%	18-28	16	670	1500	1500	G	2500	170	80	46	−10 to +60
					4.5	10%	14-28	12	500	1200	1200	F	1950	135	64	43	−10 to +60
					0	N/A	12-28	7	290	1100	1100	Y	1200	80	38	40	−10 to +60
					∞	100%	N/A	22	450	900	900	B	3350	235	111	53	−10 to +70
					33.5	80%	42-56	20	410	860	860	H	3050	205	97	50	−10 to +60
PD48P2	030651	Ball	48	24-56	21.0	65%	34-56	15	310	820	820	G	2500	170	80	46	−10 to +60
					10.5	10%	28-56	11	230	810	810	F	1950	135	64	43	−10 to +60
					0	N/A	18-56	7	140	580	580	Y	1200	80	38	40	−10 to +60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

†3' (0.91M) from fan
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
PD12H2V	030652	Ball	12	6-14	12-14	26	2150	3400	3400	H	3050	205	97	50	−10 to +60
PD24H2V	030653	Ball	24	12-28	22-28	21	890	1600	1600	H	3050	205	97	50	−10 to +60
PD48H2V	030654	Ball	48	24-56	42-56	20	410	860	860	H	3050	205	97	50	−10 to +60
PD12G2V	030655	Ball	12	6-14	10-14	19	1600	3350	3350	G	2500	170	80	46	−10 to +60
PD24G2V	030656	Ball	24	12-28	18-28	16	670	1500	1500	G	2500	170	80	46	−10 to +60
PD48G2V	030657	Ball	48	24-56	42-56	15	310	820	820	G	2500	170	80	46	−10 to +60
PD12F2V	030658	Ball	12	6-14	8-14	14	1200	3200	3200	F	1950	135	64	43	−10 to +60
PD24F2V	030659	Ball	24	12-28	14-28	12	500	1200	1200	F	1950	135	64	43	−10 to +60
PD48F2V	030660	Ball	48	24-56	26-56	11	230	810	810	F	1950	135	64	43	−10 to +60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3' (0.91M) from fan

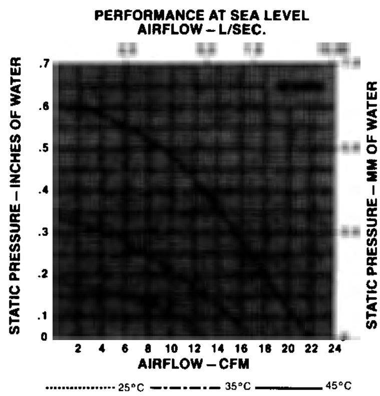
ThermaPro-V™

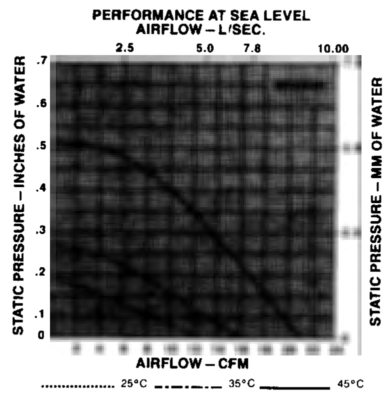
BISCUIT® DC

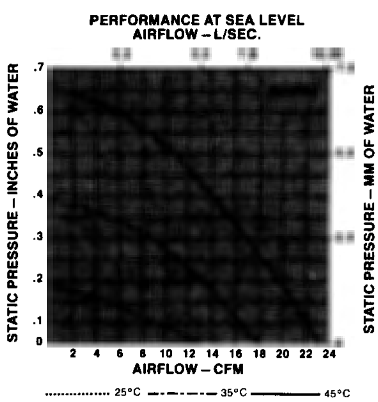
FEATURES

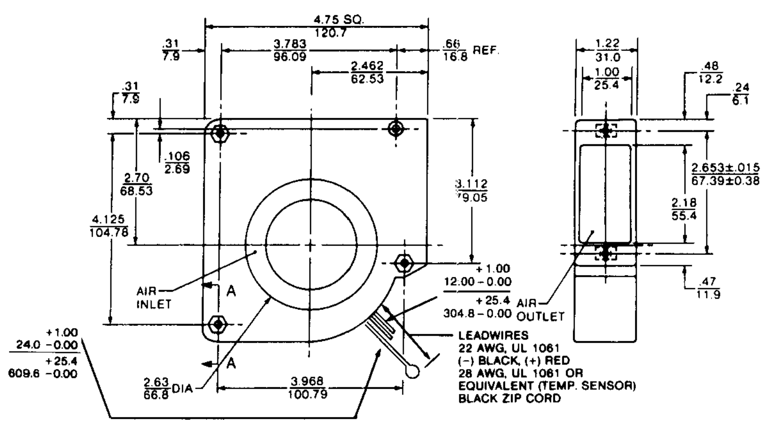
- ☐ Thermal Speed Control—change airflow as a function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic restart capability
- ☐ Current limited
- ☐ Size - 4.75″ square x 1.22″ deep (120.7 mm x 31.0 mm)
- ☐ 18 to 28 CFM (8.5 to 13.2 L/Sec.)
- ☐ Weight - 10 oz. (.28 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA Certified—File No. LR52898
- ☐ TUV Approved to IEC 950, VDE 0730, License R97229

THERMAL SPEED CONTROL









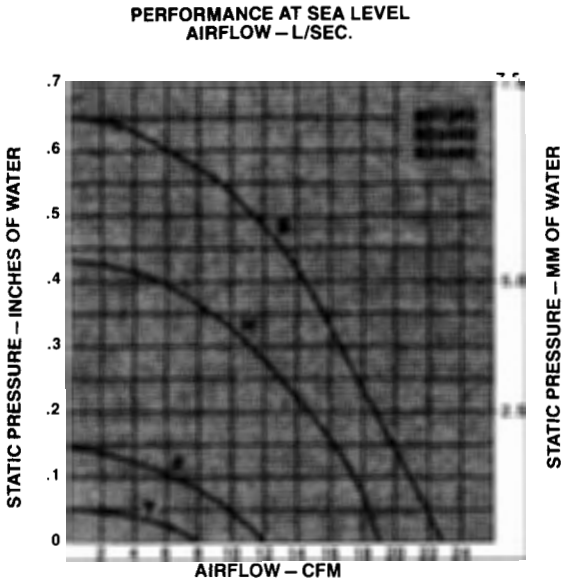
SPECIFICATIONS

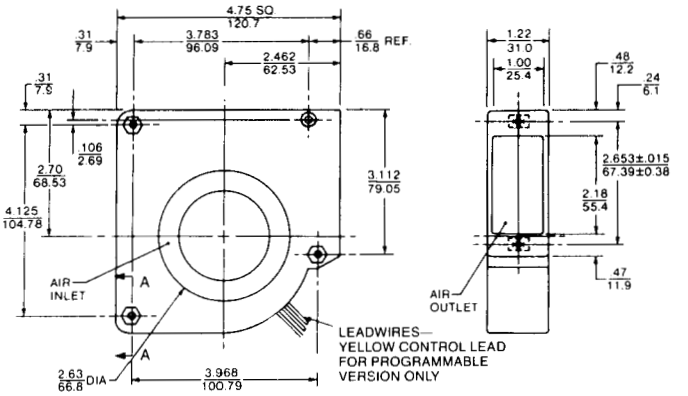
Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
• BD12S3H	030960	Ball	12	6-14	45	N/A	7.8	650	1050	1050	2650	22	10.4	44.3	– 10 to + 70
					35	9-14	5.1	430	890	890	2050	17	8.0	39.6	– 10 to + 70
					25	7-14	3.3	280	630	630	1650	13	6.1	33.2	– 10 to + 70
• BD24S3H	030961	Ball	24	12-28	45	20-28	6.3	260	440	440	2450	21	9.9	43.2	– 10 to + 70
					35	14-28	4.3	180	380	380	1925	16	7.6	38.7	– 10 to + 70
					25	12-28	3.4	145	320	320	1650	13	6.1	33.2	– 10 to + 70
• BD48S3H	030962	Ball	48	24-56	45	45-56	8.9	185	210	210	2800	23	10.9	45.9	– 10 to + 70
					35	30-56	6.1	130	190	190	2200	18	8.5	40.8	– 10 to + 70
					25	20-56	4.1	85	160	160	1650	13	6.1	33.2	– 10 to + 70

All figures are nominal, free delivery values at sea level. All specifications subject to change without notice. † 3′ (0.91M) from fan

* Distributor Item.

PROGRAMMABILITY





SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
					∞	100%	N/A	7.7	640	1070	1070	B	2800	23	10.9	45.9	– 10 to + 70
					3.3	85%	10-14	6.3	520	1000	1000	H	2300	19	9.0	42.6	– 10 to + 70
BD12R3	030963	Ball	12	6-14	1.0	60%	7-14	3.1	260	600	600	F	1500	12	5.7	30.7	– 10 to + 70
					0	N/A	6-14	2.0	170	400	400	Y	1100	8	6.1	*	– 10 to + 70
					∞	100%	N/A	8.3	350	530	530	B	2800	23	10.9	45.9	– 10 to + 70
					12.0	85%	18-28	5.5	230	420	420	H	2300	19	9.0	42.6	– 10 to + 70
BD24R3	030964	Ball	24	12-28	1.2	60%	13-28	2.9	120	290	290	F	1500	12	5.7	30.7	– 10 to + 70
					0	N/A	12-28	2.6	110	240	240	Y	1100	8	6.1	*	– 10 to + 70
					∞	100%	N/A	9.1	190	210	210	B	2800	22	10.9	45.9	– 10 to + 70
					15.5	85%	32-56	6.3	130	200	200	H	2300	19	9.0	42.6	– 10 to + 70
BD48R3	030965	Ball	48	24-56	5.3	60%	24-56	3.6	75	140	140	F	1500	12	5.7	30.7	– 10 to + 70
					0	N/A	24-56	2.3	50	90	90	Y	1100	8	6.1	*	– 10 to + 70

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

†3' (0.91M) from fan
*Data below background
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

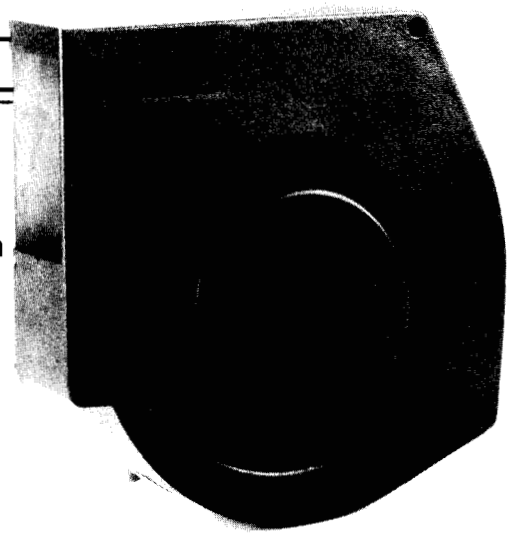
Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
BD12B3V	030966	Ball	12	6-14	12-14	7.7	640	1070	1070	B	2800	23	10.9	45.9	– 10 to + 70
BD24B3V	030967	Ball	24	12-28	24-28	8.3	350	530	530	B	2800	23	10.9	45.9	– 10 to + 70
BD48B3V	030968	Ball	48	24-56	48-56	9.1	190	210	210	B	2800	23	10.9	45.9	– 10 to + 70
BD12H3V	030969	Ball	12	6-14	10-14	6.3	520	1000	1000	H	2300	19	9.0	42.6	– 10 to + 70
BD24H3V	030970	Ball	24	12-28	18-28	5.5	230	420	420	H	2300	19	9.0	42.6	– 10 to + 70
BD48H3V	030971	Ball	48	24-56	32-56	6.3	130	200	200	H	2300	19	9.0	42.6	– 10 to + 70
BD12F3V	030972	Ball	12	6-12	7-14	3.1	260	600	600	F	1500	12	5.7	30.7	– 10 to + 70
BD24F3V	030973	Ball	24	12-28	13-28	2.9	120	290	290	F	1500	12	5.7	30.7	– 10 to + 70
BD48F3V	030974	Ball	48	24-56	24-56	3.6	75	140	140	F	1500	12	5.7	30.7	– 10 to + 70

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3' (0.91M) from fan

ThermaPro-V™

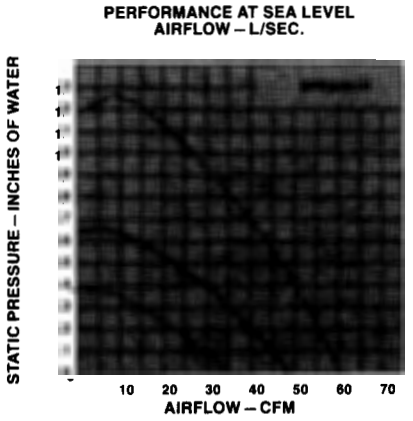
SPINNAKER™ DC

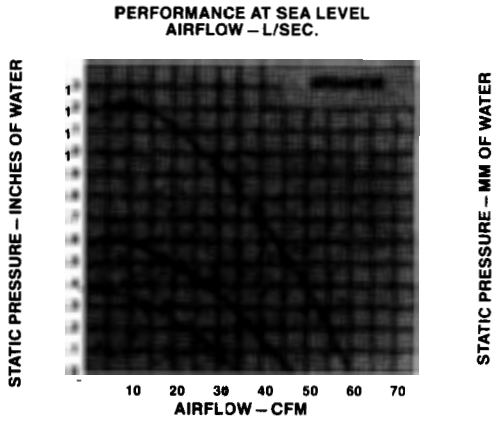


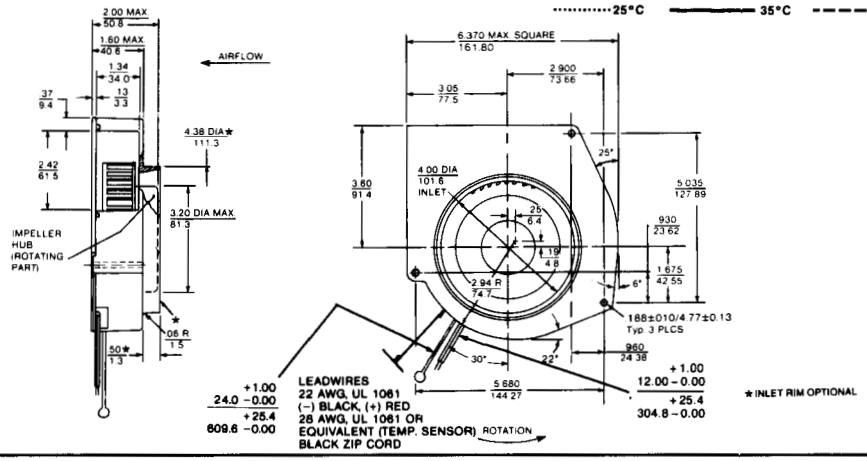
FEATURES

- ☐ Thermal Speed Control-change airflow as a function of temperature
- ☐ Programmability—change airflow via programming resistors, pulse width modulation
- ☐ Voltage Regulation—internal voltage regulating circuit integral to the fan
- ☐ Automatic restart capability
- ☐ Current limited
- ☐ Size - 6.37″ square x 1.60″ deep (161.8 mm x 40.6 mm)
- ☐ 29 to 72 CFM (14 to 34 L/Sec.)
- ☐ Weight - 2.1 lbs. (.953 Kg)
- ☐ UL Yellow Card Recognized—File No. E31293
- ☐ CSA Certified—File No. LR52898
- ☐ TUV approved to IEC 950, VDE 0730, Licenses R97152 and R97188

THERMAL SPEED CONTROL







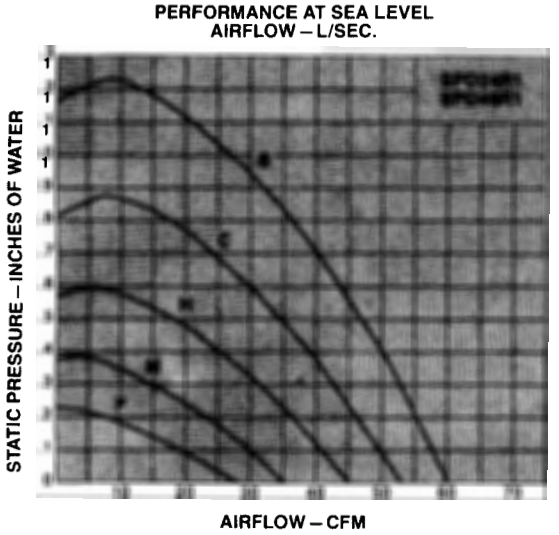
SPECIFICATIONS

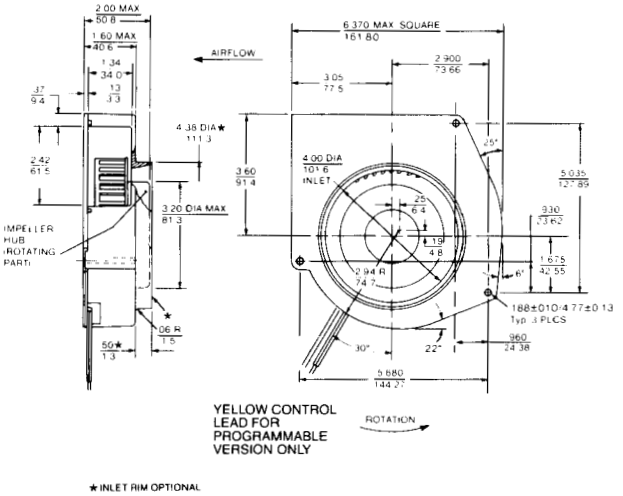
Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Ambient Temp. °C	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
SPD24S1H	030929	Ball	24	12-28	45	N/A	24	1000	1700	1700	2500	60	28.3	56.0	– 10 to + 70
					35	18-28	17	710	1690	1690	2000	48	22.7	51.1	– 10 to + 70
					25	14-28	13	520	1625	1625	1600	35	16.5	45.3	– 10 to + 70
SPD48S1H	030930	Ball	48	24-56	45	46-56	22	450	840	840	2500	60	28.3	56.0	– 10 to + 70
					35	32-56	15	320	820	820	1925	46	21.7	50.2	– 10 to + 70
					25	24-56	12	240	790	790	1600	35	16.5	45.3	– 10 to + 70

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3′ (0.91M) from fan

PROGRAMMABILITY





SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Programming Method R(KΩ)	Programming Method PWM**	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range°C
					∞	100%	N/A	23	950	1700	1700	B	2500	60	28.3	56.0	– 10 to + 70
					8.2	85%	20-28	20	830	1670	1670	C	2200	53	25.0	52.2	– 10 to + 60
SPD24R1	030931	Ball	24	12-28	4.8	60%	18-28	15	640	1625	1625	H	1900	45	21.2	48.6	– 10 to + 60
					2.7	10%	15-28	12	520	1600	1600	M	1600	37	17.5	45.3	– 10 to + 60
					0	N/A	11-28	9	380	1250	1250	F	1200	28	13.2	38.8	– 10 to + 60
					∞	100%	N/A	24	490	850	850	B	2500	60	28.3	56.0	– 10 to + 70
					22.5	85%	39-56	19	390	820	820	C	2200	53	25.0	52.2	– 10 to + 60
SPD48R1	030932	Ball	48	24-56	14.0	60%	35-56	16	340	800	800	H	1900	45	21.2	48.6	– 10 to + 60
					7.5	10%	26-56	12	260	775	775	M	1600	37	17.5	45.3	– 10 to + 60
					0	N/A	24-56	9	180	580	580	F	1200	28	13.2	38.8	– 10 to + 60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3′ (0.91M) from fan
**Pulse width modulated signal percentage on time at 20 kHz.

VOLTAGE REGULATION SPECIFICATIONS

Model No	Part No	Bearing	Voltage Nominal	Voltage Range	Regulated Voltage Range	Watts	Running Current mA	Locked Rotor mA	Inrush Current mA	Code (see above curves)	RPM	CFM	L/S	Sound Pressure Level† dBA	Operating Temp. Range °C
SPD24B1V	030933	Ball	24	12-28	24-28	23	950	1700	1700	B	2500	60	28.3	56.0	– 10 to + 60
SPD48B1V	030934	Ball	48	24-56	48-56	24	490	850	850	B	2500	60	28.3	56.0	– 10 to + 60
SPD24C1V	030935	Ball	24	12-28	20-28	23	830	1670	1670	C	2200	53	25.0	52.2	– 10 to + 60
SPD48C1V	030936	Ball	48	24-56	39-56	19	390	820	820	C	2200	53	25.0	52.2	– 10 to + 60
SPD24H1V	030937	Ball	24	12-28	18-28	15	640	1625	1625	H	1900	45	21.2	48.6	– 10 to + 60
SPD48B1V	030938	Ball	48	24-56	33-56	16	340	800	800	H	1900	45	21.2	48.6	– 10 to + 60

All figures are nominal, free delivery values at sea level.
All specifications subject to change without notice.

† 3′ (0.91M) from fan

DC Fan Performance Sensor (FPS)

For DC Fans and Blowers

Thermal management of electronic packages is increasingly challenging as package sizes decrease and circuit complexities increase. In order to avoid critical internal temperature increases within the electronic system, it is necessary to make provisions for a continuous supply of cooling airflow by monitoring and remote warning of potential airflow interruption.

Comair Rotron supplies a variety of Fan Performance Sensor-equipped fans which provide both monitoring and remote warning capabilities. Should cooling airflow be reduced or interrupted due to a drop in RPM, these FPS systems allow for backup cooling devices to go on line, or for less critical equipment, for system shutdown in order to avoid excessive internal temperature rise.

ISOLATED OR NON-ISOLATED

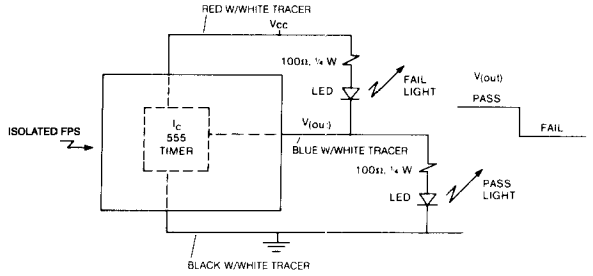
In addition to the options listed below, the Fan Performance Sensor is offered with either isolated or non-isolated circuitry. The isolated FPS has three leads (+), (−) and (output), in addition to the two power leads or terminals for the motor circuit, and is therefore electrically isolated from the motor circuit. The non-isolated FPS has only the (output) lead in addition to the motor connections. The (+) and (−) that power the sensor circuit are derived internally from the motor circuit. Each output is designed around a Hall Device, which generates a square-wave output. This output signal is then conditioned internally by additional electronic circuitry to yield a discrete pass or fail signal.

LEADWIRE CONFIGURATION

Isolated	5 Leads	(+) Fan Power	Red
		(−) Fan Ground	Black
		(+) FPS Power	Red w/White Tracer
		(−) FPS Ground	Black w/White Tracer
		(Sensor) FPS Sensor	Blue w/White Tracer
Non-Isolated	3 Leads	(+) Fan Power	Red
		(−) Fan Ground	Black
		(Sensor) FPS Sensor	Blue w/White Tracer

NOTE: Terminals may replace the (+) (−) fan power leadwires.

TYPICAL FPS APPLICATION EXAMPLE



NOMENCLATURE FOR THE FPS

EXAMPLE: PD48B2 Q D N

OUTPUT

DELAY FEATURES

LATCH FEATURES

FPS is denoted by a 3-letter suffix.

Go/No-Go is denoted by a 1-letter suffix.

OUTPUT

Q = Open Collector—The signal is derived from the collector of the output transistor. The output is high on pass, low on fail, and is set to trip at a certain RPM level. Downstream electronics can be tied between the supply voltage (V_{cc}) and output only.

N = Inverted Open Collector—The signal is derived from the collector of the output transistor. The output is low on pass, high on fail, and is set to trip at a certain RPM level. Downstream electronics can be tied between the supply voltage (V_{cc}) and output only.

B = Bipolar—The signal is generated from a 555 Timer. The output signal is high on pass, low on fail, and is set to trip at a certain RPM level. Downstream electronics (e.g. LEDs) can be tied between output and supply voltage (V_{cc}) and/or output and ground.

T = TTL Compatible—This is the same as an open collector output, but has an internal pull-up resistor tied between the supply voltage (V_{cc}) and the collector of the output transistor. The output signal is high on pass (logical 1) and low on failure (logical 0), and is set to trip at a certain RPM level. Downstream electronics can be tied between the supply voltage (V_{cc}) and/or output and ground.

R = Inverted TTL Compatible—This is the same as an open collector output, but has an internal pull-up resistor tied between the supply voltage (V_{cc}) and the collector of the output transistor. The output signal is low on pass (logical 0) and high on failure (logical 1) and is set to trip at a certain RPM level. Downstream electronics can be tied between the supply voltage (V_{cc}) and/or output and ground.

G = Go-NoGo — The signal is derived from the collector of the output transistor. The output is low on pass, high on fail and will signal a failure caused by a seized or obstructed rotor that has stopped rotating. (No latch or delay available.)

DELAY FEATURES

D = 10±4 second delay -- The failure signal is delayed approximately 10 seconds, thereby eliminating temporary or nuisance failure indication such as at fan start up.

N = < 1 second delay

LATCH FEATURES

L = Latched -- Once the sensor outputs a failure signal, that signal is latched on even if the fan goes back into a pass condition. The latch is reset by interrupting the power to the FPS and the output load.

N = No Latch.

CIRCUIT OPERATION

The circuit (previous page) utilizes the bipolar signal output option with delay feature (10 +– 4 seconds) and latch feature. The output signal is used to power two LEDs: one labelled to indicate proper operation of the cooling fan and one labelled to indicate failure. Failure indication is determined as the fan rotational speed falls below the nominal 1900 RPM for less than 10 seconds. Rotational speed less than nominal value may be caused by a reduced applied voltage to the fan, a physical obstruction impeding fan rotation, or failure of the motor or bearing.

Should the fan then speed up above minimum speed, the failure indicator would remain on. The latch feature maintains the failure indication until a system operator resets the FPS. The FPS is reset by interrupting the FPS supply voltage and output load for more than 40 milliseconds.

An advantage of this FPS design is the continual fan status indication. Because of the latch feature chosen in this example, the user need not constantly monitor the pass/fail LED indicators in order to determine if a failure has occurred.

The delay feature specified in this example will not allow a failure indiction on start-up unless the fan fails to reach the specified minimum nominal rotational speed (1900 RPM) within ten seconds. If the delay option had not been specified, the failure indicator would have been lit until the fan reached minimum speed. The pass indicator will be lit during normal operation.

SPECIFICATIONS

			MAJOR DC, PATRIOT DC, SPINNAKER DC, GALAXY DC				MUFFIN XL DC, WHISPER XL DC, SPRITE DC, VIKING DC				WHIFFET DC **SPRINT DC MUFFIN DC BISCUIT DC**
Parameter	**Conditions**		**Bipolar Output B**	**Open Collector Q**	**TTL Output T**	**Inverted Open Collector N**	**Open Collector Q**	**TTL Output T**	**Inverted Open Collector N**	**Go/ No-Go G**	**Go/ No-Go G**
Voltage Requirement*			5–15Vdc				5–15Vdc			N/A	N/A
Supply Current (Quiescent)	V_{cc} = 5Vdc		15mA MAX				15mA MAX			N/A	N/A
	V_{cc} = 15Vdc		30mA MAX				30mA MAX			N/A	N/A
Inrush Current	V_{cc} = 5Vdc		50mA mAX				50mA MAX			N/A	N/A
Temperature	Non-Operating (Storage)		– 28°C TO + 70°C				– 28°C TO + 70°C				– 28°C TO + 70°C
	Operating		0°C TO + 70°C				0°C TO + 70°C				0°C TO + 70°C
Alarm Signal	No Delay		< 1SEC				< 1SEC				N/A
	Delay		10 ± 4SEC				10 ± 4SEC			N/A	N/A
Alarm-Set Point**	V_{cc} = 5Vdc		1900 ± 300RPM				1900 ± 300RPM			N/A	N/A
Low-Level Output Voltage	V_{cc} = 15 Vdc	IOL = 10mA	.25V MAX	N/A			N/A				N/A
		IOL = 100mA	2.75V MAX								
	V_{cc} = 5vdc	IOL = 5mA	.35V MAX	N/A			N/A				N/A
		IOL = 8mA	.5V MAX								
Hi-Level Output Voltage	V_{cc} = 15Vdc	IOH = 100mA	12.75VMIN	N/A			N/A				N/A
	V_{cc} = 5Vdc	IOH = 100mA	2.75V MIN								
V_c Collector-Emitter	MAX		N/A	28Vdc		N/A	30Vdc	N/A	30Vdc	28Vdc	28Vdc
I_c Continuous Collector Current	MAX		N/A	100mA		N/A	16mA	N/A	16mA	100mA	100mA
V_{ce} (SAT) Collector-Emitter SAT Voltage	I_C = 10mA I_C = 100mA		N/A	100mV(TYP) 200mV(TYP)		N/A	N/A	N/A	N/A	100mV(TYP) 200mV(TYP)	100mV(TYP) 200mV(TYP)
	I_C = 4mA		N/A	N/A		N/A	250mV(TYP)	N/A	250mV(TYP)	N/A	N/A

* Isolated versions (other input voltages available)
** Other trip points available
N/A Not Applicable

DC FPS

Model	Sensor Circuit Isolation: Isolated	Sensor Circuit Isolation: Non-Isolated	Output: Open Collector	Output: Inverted Open Collector	Output: Bipolar	Output: T.T.L. Compatible (5V Amplitude)	Output: Inverted TTL Compatible (5V Amplitude)	Output: Go/No-Go
Letter Designation	–	–	Q	N	B	T	R	G
Sprint DC	N/A	S	N/A	N/A	N/A	N/A	N/A	O
Sprite DC	S	O	O	O	O	O	O	O
Muffin DC	N/A	S	N/A	N/A	N/A	N/A	N/A	O
Whisper XL-DC	S	O	O	O	O	O	O	O
Muffin XL-DC	S	O	O	O	O	O	O	O
Major DC	S	O	O	O	O	O	O	N/A
Patriot DC	S	O	O	O	O	O	O	N/A
Biscuit DC	N/A	S	N/A	N/A	N/A	N/A	N/A	O
Spinnaker DC	S	O	O	O	O	O	O	N/A
Viking DC	S	O	O	O	O	O	O	O
Whiffet DC	N/A	S	N/A	N/A	N/A	N/A	N/A	N/A
Galaxy DC	N/A	S	N/A	N/A	N/A	N/A	N/A	N/A

S = Standard O = Optional N/A = Not Available

Tachometer Output Option

For Speed And Fan Failure Sensing In DC Fans And Blowers

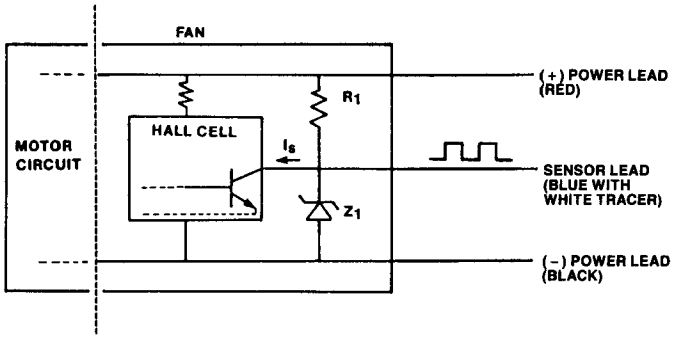
Brushless DC airmovers use a commutating sensing circuit for motor operation. An additional Hall Device may be added to the PC board from which digital pulses can be derived and supplied to the design engineer via a third lead referenced to ground. This will allow direct pulse to speed relationships to be derived. These digital pulses can then be conditioned to provide alarms for fan failures such as lights, buzzers, etc.

ISOLATED OR NON-ISOLATED

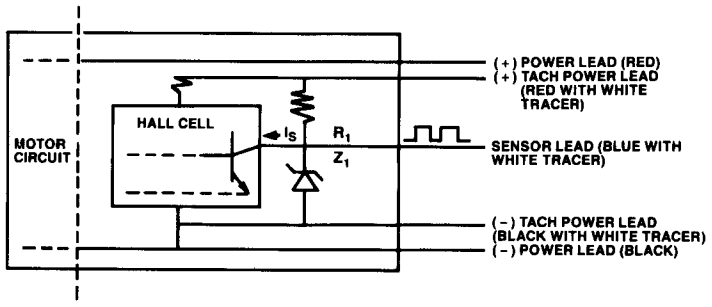
The standard tachometer output is offered with non-isolated circuitry. The non-isolated tachometer output fan has three leadwires. The power for the tachometer circuit is derived internally from the motor circuit. (See Diagram #1) The isolated tachometer output fan has 5 leadwires. The tachometer circuit is powered separately and therefore isolated from the motor circuit. (See Diagram #2)

Each output is designed around a Hall Device which generates a square-wave output. This output signal must then be conditioned externally by the customer's electronic circuitry to yield a discrete pass or fail signal. The non-isolated tachometer output must be used with the same ground reference as the fan.

NON-ISOLATED TACHOMETER OUTPUT

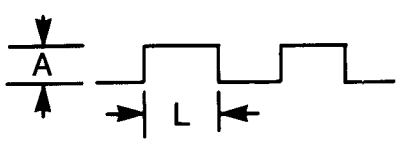


ISOLATED TACHOMETER OUTPUT



I_S = The sink capability of the collector of the hall cell = 15 mA maximum. R_1 and Z_1 are added to Tachometer Output fans to produce a fixed amplitude of V_{OUT}.

NOTE: 5V tach out ⇨ R_1 = 10K
Open Collector ⇨ Omit R_1 and Z_1



Tachometer Output Waveshape

A = Amplitude of Tachometer Output. Fixed amplitude of Tachometer Output, available at any voltage up to input voltage for fan. Contact Comair Rotron Application Engineering Department.

$$L\,[ms] = \left(\frac{60{,}000\ ms}{RPM\ of\ fan} \right) / 2x(Pulses\ per\ Revolution)$$

DC TACHOMETER OUTPUT

Model	Sensor Circuit Isolation: Isolated	Sensor Circuit Isolation: Non-Isolated	Output: Open Collector	Output: T.T.L. Compatible (5V Amplitude)	Output: Fixed Voltage	Output: Pulses Per Revolution
Sprint DC	N/A	S	O	S	O	2
Sprite DC	O	S	O	S	O	1
Muffin DC	N/A	S	O	S	O	2
Whisper XL-DC	O	S	O	S	O	1
Muffin XL-DC	O	S	O	S	O	1
Major DC	O	S	O	S	O	2
Patriot DC	O	S	O	S	O	2
Biscuit DC	N/A	S	O	S	O	2
Spinnaker DC	O	S	O	S	O	2
Flight II DC	N/A	S	O	S	O	2
Viking DC	O	S	O	S	O	1
Galaxy DC	N/A	S	O	S	O	2
Whiffet DC	N/A	S	O	S	O	2

S = Standard O = Optional N/A = Not Available

Caution:

On all Tachometer models, the output wire must not be applied to either + or − power leads.

ADJUSTABLE RPM TRIP POINT CIRCUIT

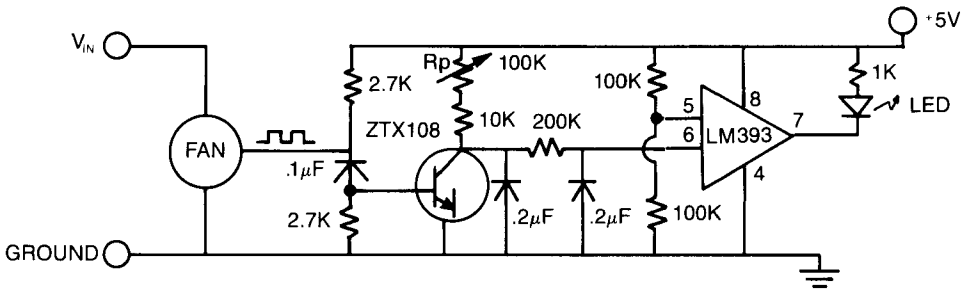


Figure 1

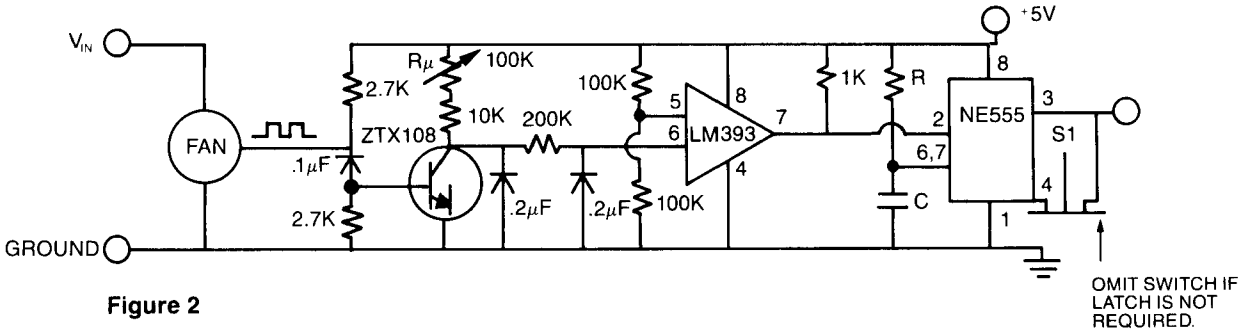


Figure 2

NOTE: R and C must be selected to determine the length of the delay

Figure 1 suggests one method that may be incorporated to set a pass/fail trip point relating to a specific speed, the low level digital pulses from the fan are coupled to the speed sensing circuitry. The trip point is adjustable from approximately 800 RPM to 2500 RPM by adjusting Rp. This configuration provides a low level TTL signal on pass and a high lvel signal on fail. If higher level signals are necessary for interfacing, a driver circuit may be added to this configuration. (See Figure 2.)

Capability

AC Fans and Blowers

One of the industry's widest selections of both small and large AC fans is available from Comair Rotron. From 3.14" square to 10.00" diameter and from 20 CFM to 550 CFM, Comair Rotron has a product for every airmoving requirement.

New are the Hi-Rel Major® and Patriot® AC fans. These fans offer 10% cooler bearing temperature and provide as much as five years longer life for continuous duty operation.

High reliability, precisely engineered, the Hi-Rel fans continue the tradition of providing quality designed products at a competitive price structure.

Comair Rotron, through 40 years of testing and research, offers both lightweight metals and high strength venturis as well as the quietest and most reliable sleeve bearing system available. Computer designed fan blades such as the patented Feathered Edge design reduce noise levels and increase efficiency.

Special design orders and modifications of our standard product line are available. For use of Comair Rotron's state-of-the-art testing facilities please consult the factory or call your Comair Rotron representative for additional information.

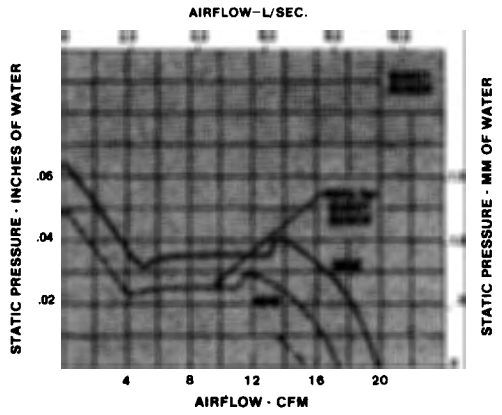
SPRITE® AC

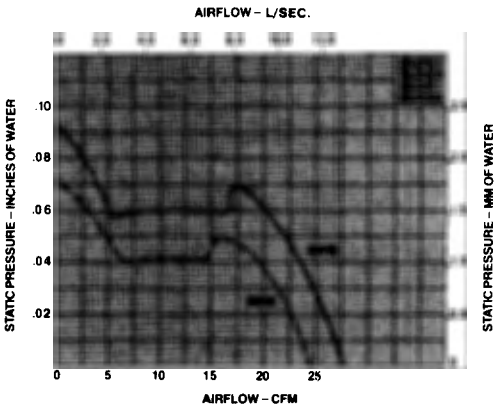
TUBEAXIAL FAN

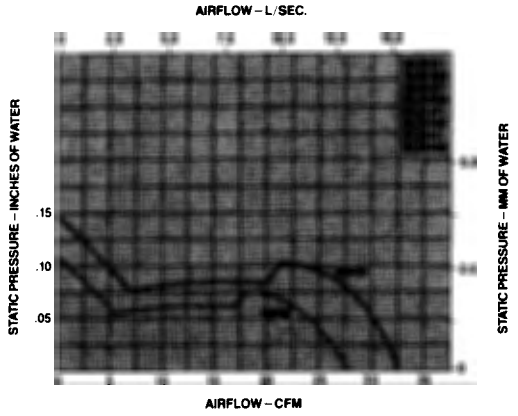
FEATURES

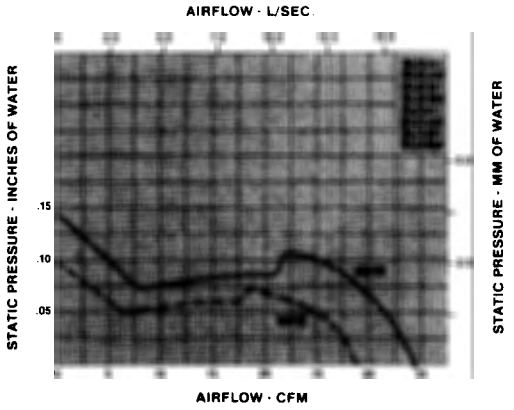
- ☐ Size - 3.14" square x 1.645" deep (79.8 mm x 41.8 mm)
- ☐ 20 to 34 CFM (9.5 to 16.0 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 18 oz. (.51 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models
- ☐ VDE Marks License No. 1126 - all models

PERFORMANCE







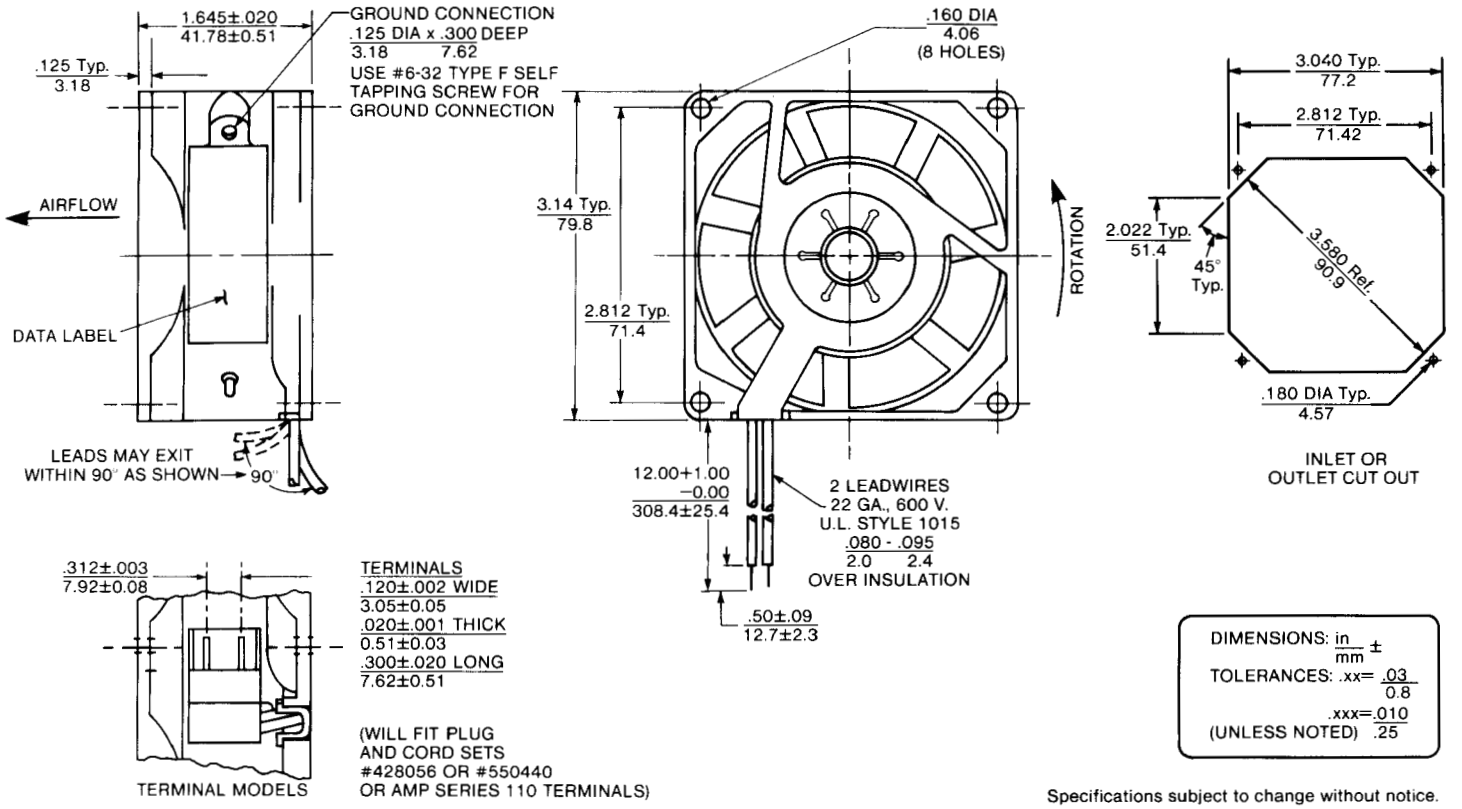


SPECIFICATIONS

LEADWIRES		TERMINALS										
Model No.	Part No.	Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*SU2C1	028270	*SU2C5	028281	Sleeve	115	50/60	7/6	.07/.06	.08/.07	1750/1900	17/20	8.0/9.5
*SU2E1	028275	*SU2E5	028282	Sleeve	115	50/60	7/6	.08/.07	.09/.08	2200/2600	23/27	10.7/12.7
SU3E1	028276	SU3E5	028283	Sleeve	220/230	50/60	11/10	.07/.06	.08/.07	2200/2600	23/27	10.7/12.7
SU2G1	028278	SU2G5	028406	Sleeve	115	50/60	10/9	.11/.10	.14/.13	2700/3150	27/32	12.7/15.1
SU2H1	028379	SU2H5	030426	Ball	115	50/60	10/9	.11/.10	.14/.13	2700/3150	27/32	12.7/15.1
SU3G1	028872	SU3G5	028424	Sleeve	220/230	50/60	10/9	.07/.06	.08/.08	2700/3150	27/32	12.7/15.1
SU3H1	030425	SU3H5	030427	Ball	220/230	50/60	10/9	.07/.06	.08/.08	2700/3150	27/32	12.7/15.1
*SU2A1	028267	*SU2A5	028279	Sleeve	115	50/60	13/11	.19/.15	.23/.21	2750/3250	28/34	13.2/16.0
*SU2B1	028268	*SU2B5	028410	Ball	115	50/60	13/11	.19/.15	.23/.21	2750/3250	28/34	13.2/16.0
*SU3A1	028269	*SU3A5	028280	Sleeve	220/230	50/60	14/13	.09/.08	.11/.10	2750/3250	28/34	13.2/16.0
*SU3B1	028331	*SU3B5	028460	Ball	220/230	50/60	14/13	.09/.08	.11/.10	2750/3250	28/34	13.2/16.0

* Distributor Item.

All figures are nominal free delivery values at sea level.



DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
(UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

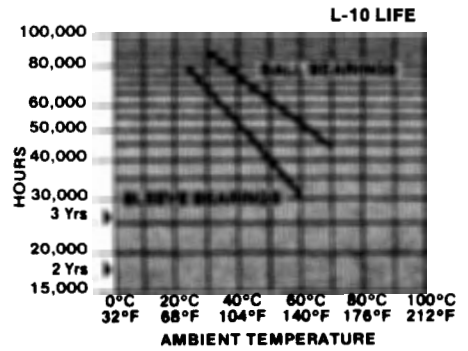
Two-pole shaded pole induction motor.
Insulation IEEE Class 130.
Sintered bronze sleeve or stainless steel ball bearings.
Impedance protected.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Venturi and Spider - zinc alloy, painted black.
Propeller - flame retardant black polypropylene.

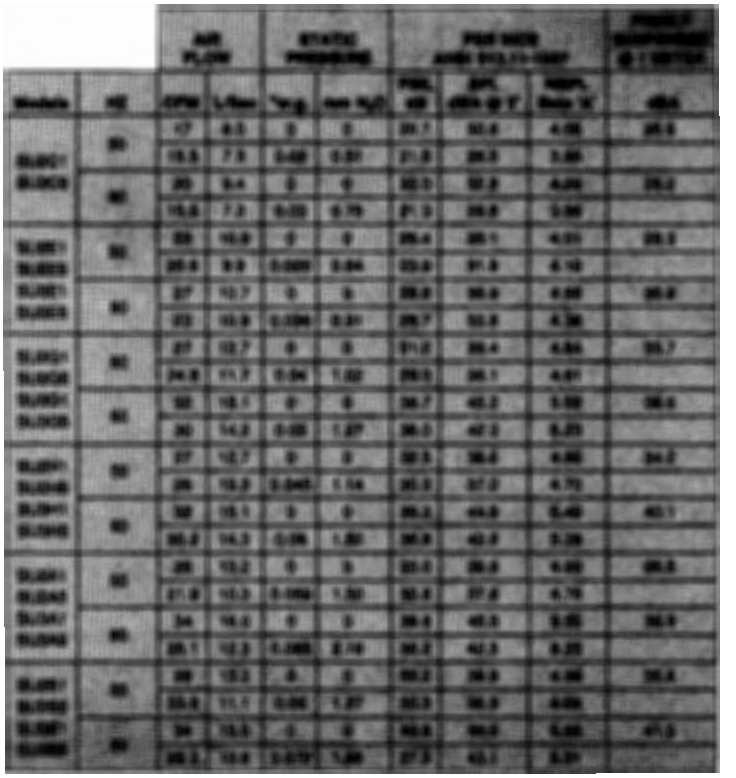
LIFE EXPECTANCY

The curve represents the continuous duty life of Sprite fans at a given temperature, after which 90% of the units will still be operating.



Example: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS (for definitions see page 5)

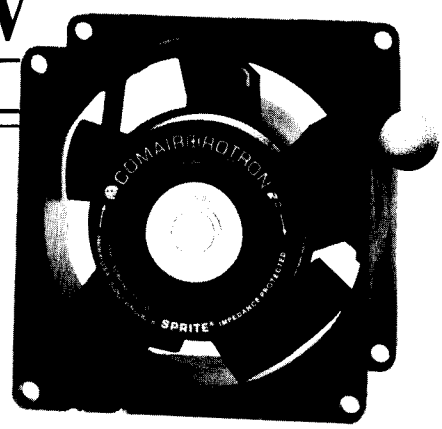


OPTIONS

Capable of furnishing harness assemblies. See page 106.

SPRITE® AC REVERSE FLOW

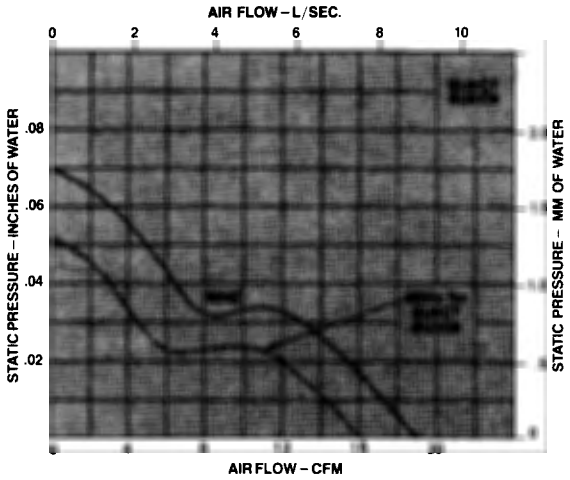
TUBEAXIAL FAN

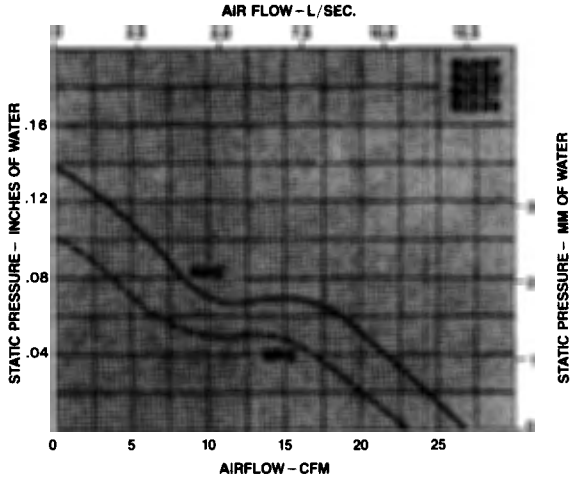


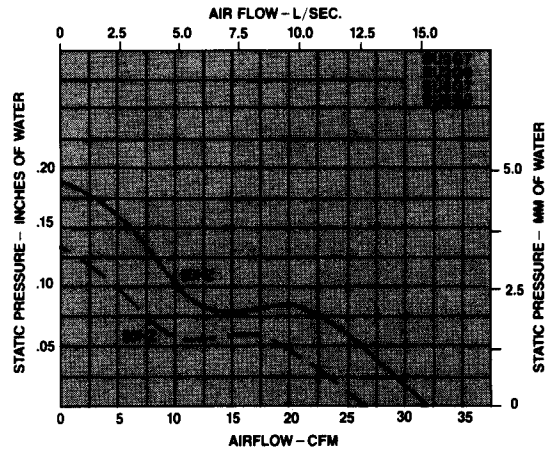
FEATURES

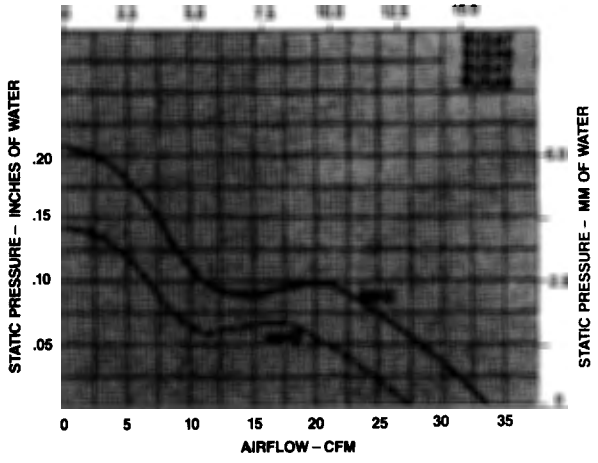
- ☐ Size - 3.14" square x 1.645" deep (79.8 mm x 41.8 mm)
- ☐ 20 to 33 CFM (9.5 to 15.8 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 18 oz. (.51 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models
  VDE Marks License No. - 1126 - all models

PERFORMANCE







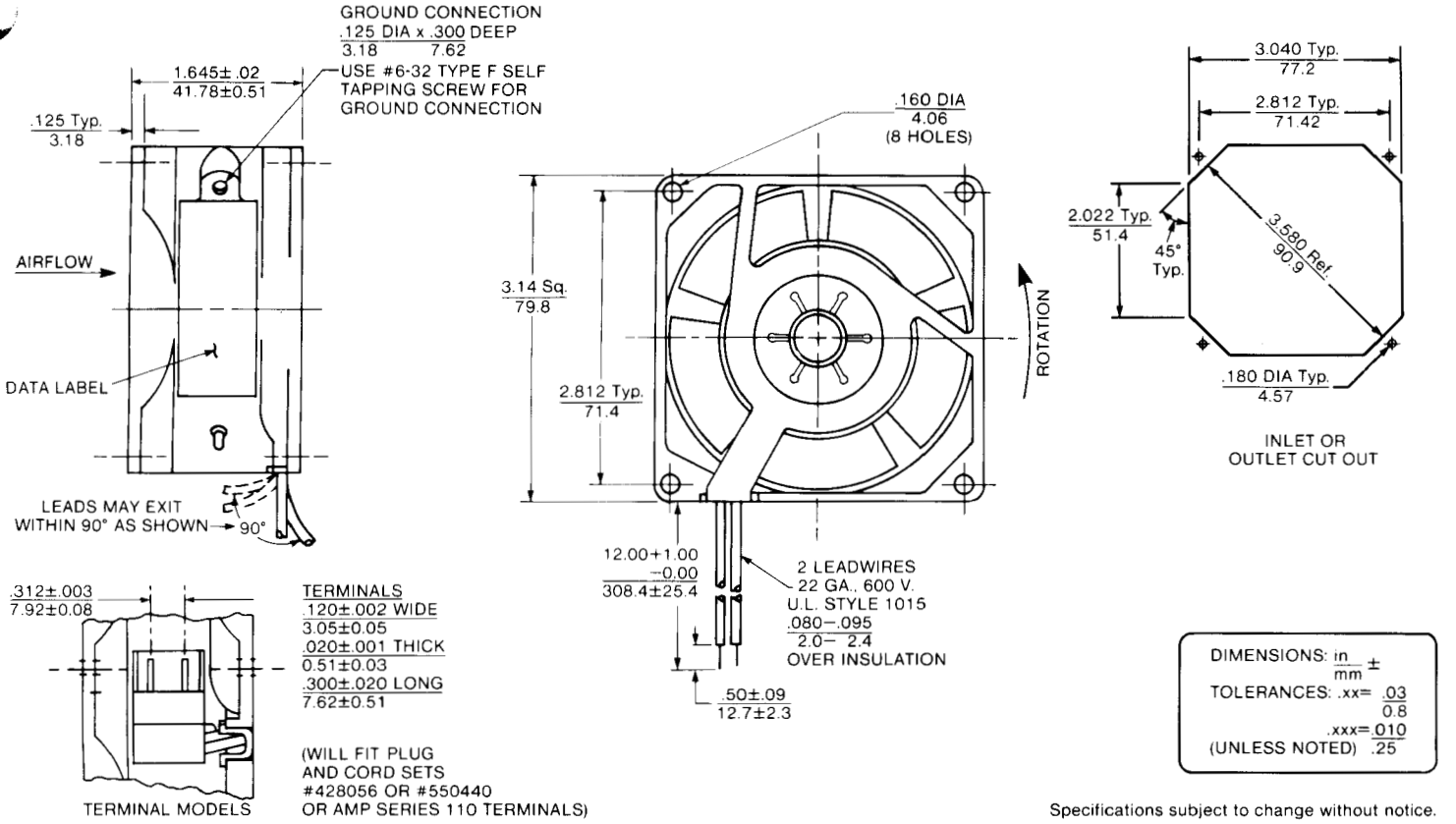


SPECIFICATIONS

LEADWIRES		TERMINALS										
Model No.	Part No.	Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*SU2C7	030270	SU2C9	030395	Sleeve	115	50/60	7/6	.07/.06	.08/.07	1700/1950	15/18	7.1/8.5
SU2E7	030271	SU2E9	030482	Sleeve	115	50/60	7/6	.08/.07	.09/.08	2370/2750	23/27	10.7/12.6
SU3E7	030273	SU3E9	030396	Sleeve	220/230	50/60	11/10	.07/.06	.08/.07	2370/2750	23/27	10.7/12.6
SU2G7	030384	SU2G9	030433	Sleeve	115	50/60	10/9	.11/.10	.14/.12	2700/3150	26/32	12.2/15.1
SU3G7	030385	SU3G9	030485	Sleeve	220/230	50/60	10/9	.07/.06	.08/.07	2700/3150	26/32	12.2/15.1
*SU2A7	030272	SU2A9	030458	Sleeve	115	50/60	13/11	.19/.15	.23/.21	2780/3350	27/33	13.0/15.8
*SU3A7	030274	SU3A9	030481	Sleeve	220/230	50/60	14/13	.09/.08	.11/.10	2780/3350	27/33	13.0/15.8

*Distributor Item.

All figures are nominal free delivery value at sea level.
Contact factory for ball bearing availability.



Specifications subject to change without notice.

MOTOR

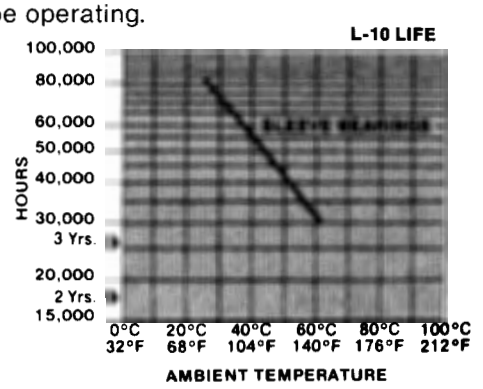
Two-pole shaded pole induction motor.
Insulation IEEE class 130.
Sintered bronze sleeve bearings.
Impedance protected.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Venturi and Spider - zinc alloy, painted black
Propeller - flame retardant black polypropylene.

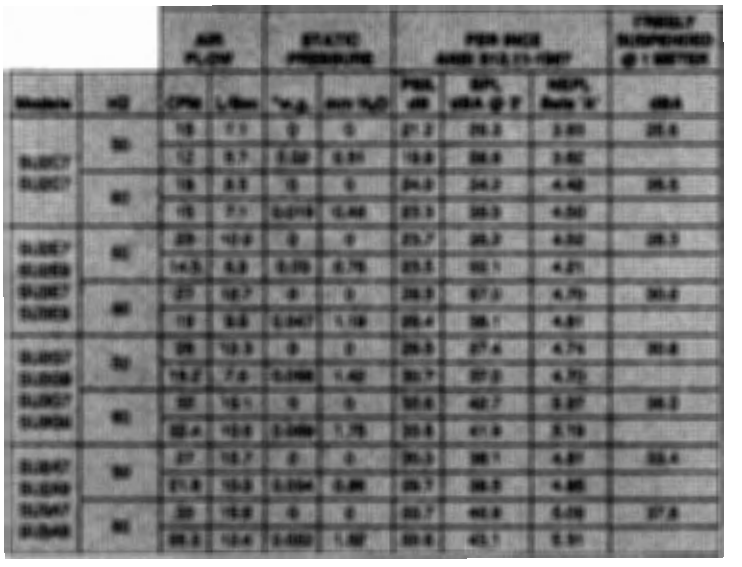
LIFE EXPECTANCY

The curve represents the continuous duty life of Sprite fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Capable of furnishing:
Harness assemblies — See page 106.
Ball bearing versions

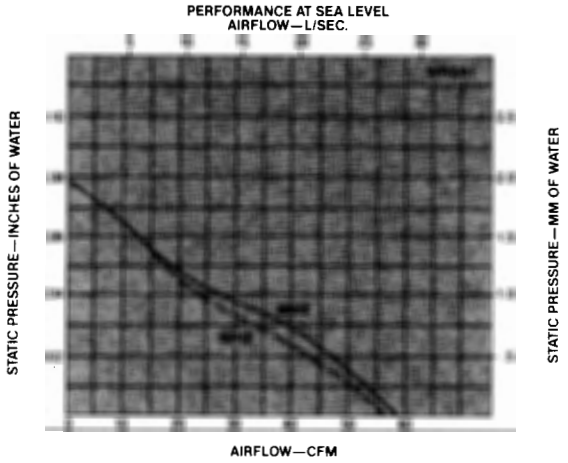
WHISPER® AC

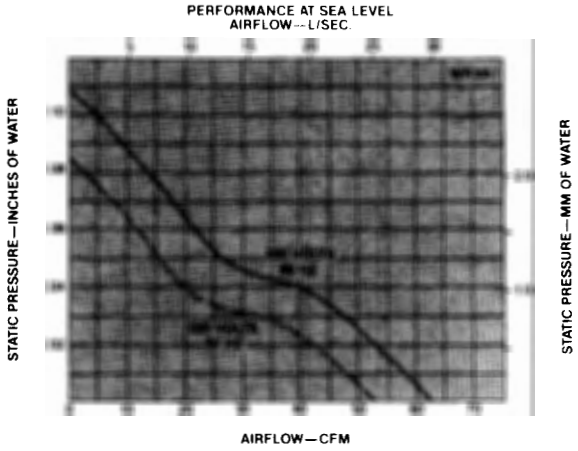
TUBEAXIAL FAN

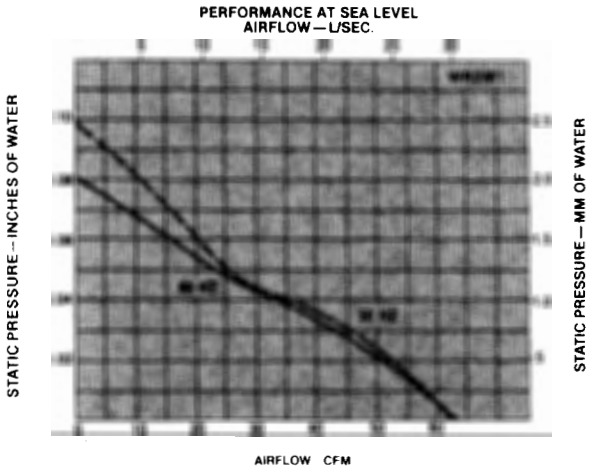
FEATURES

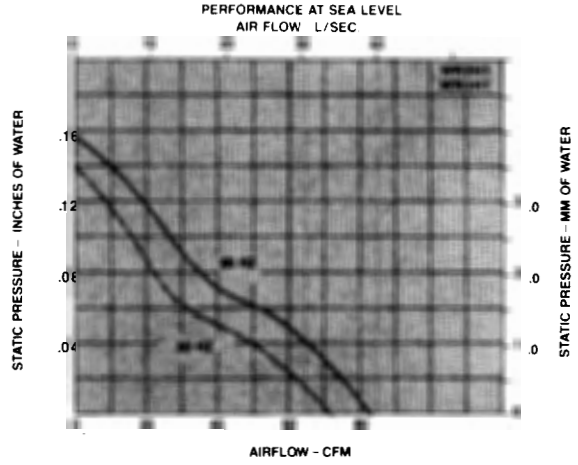
- ☐ Size - 4.71" square x 1.50" deep (119.6 mm x 38.1 mm)
- ☐ 57 to 80 CFM (26.9 to 37.8 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 17 oz. (.49 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models

PERFORMANCE







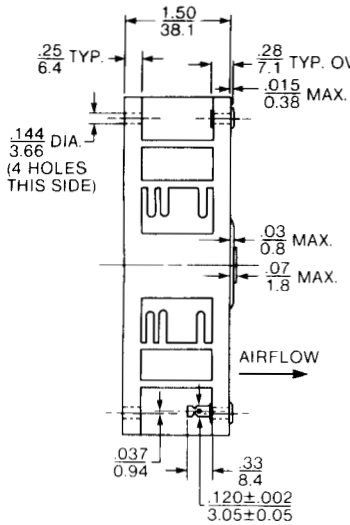


SPECIFICATIONS

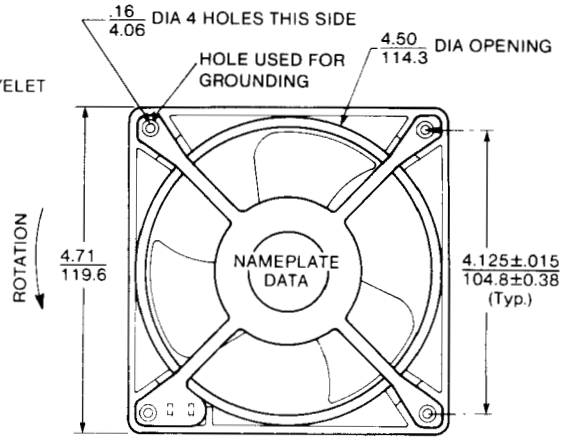
Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
			TERMINALS							
*WR2A1	027117	Sleeve	115	50/60	7/7	.07/.06	.08/.07	1640/1660	55/57	26.0/26.9
*WR3A1	028171	Sleeve	220/230	50/60	12/12	.07/.07	.07/.07	1590/2000	53/62	25.0/29.3
WR2M1	028291	Sleeve	115	50/60	7/7	.07/.07	.08/.08	2000/1960	63/63	29.7/29.7
*WR2H1	027119	Sleeve	115	50/60	11/10	.12/.11	.13/.12	2100/2400	70/80	33.0/37.8
WR3H1	028516	Sleeve	220/230	50/60	12/12	.07/.06	.08/.08	2100/2400	70/80	33.0/37.8

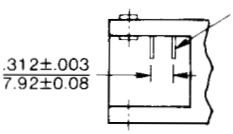
* Distributor Item.

All figures are nominal free delivery values at sea level

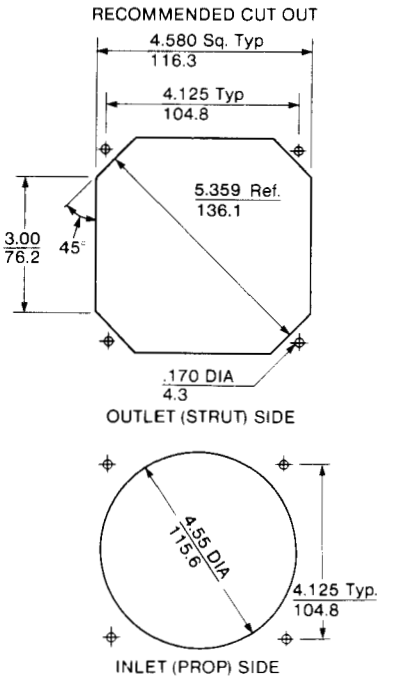


WILL ACCOMMODATE
477663 (FLUSH) OR 477670
(STANDOFF) MOUNTING CLIPS
WITH #6-32 MACHINE SCREW.





TERMINALS
.120±.002 WIDE
3.05±0.05
.020±.001 THICK
0.51±0.03
.300±.020 LONG
7.62±0.51
(WILL FIT PLUG
AND CORD #428056)



DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
(UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

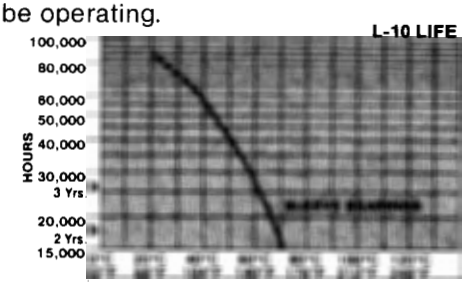
Two-pole shaded pole induction motor.
Insulation IEEE 130 temperature index.
Sintered bronze sleeve or stainless steel ball bearings.
Impedance protected.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Venturi - flame retardant black phenolic.
Spider - zinc alloy, painted black.
Propeller - flame retardant black polypropylene.

LIFE EXPECTANCY

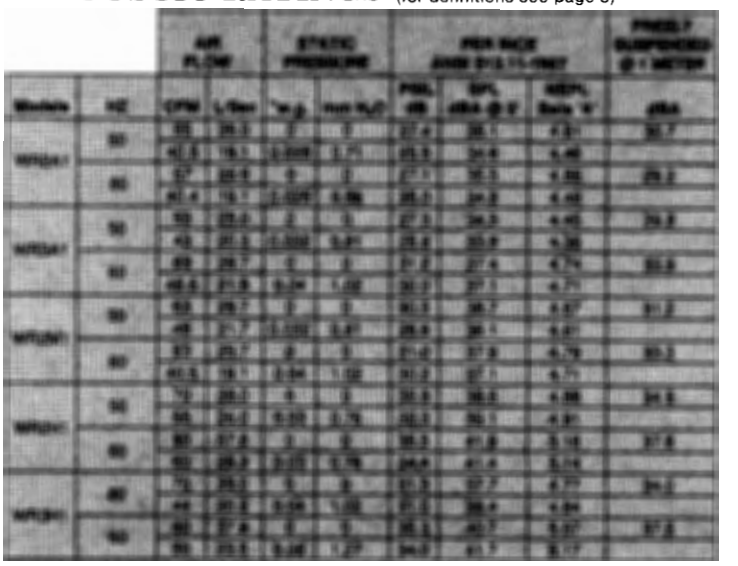
The curve represents the continuous duty life of Whisper fans at a given temperature after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS

(for definitions see page 5)



OPTIONS

Capable of furnishing:
Harness assemblies — See page 106.
Reverse flow models

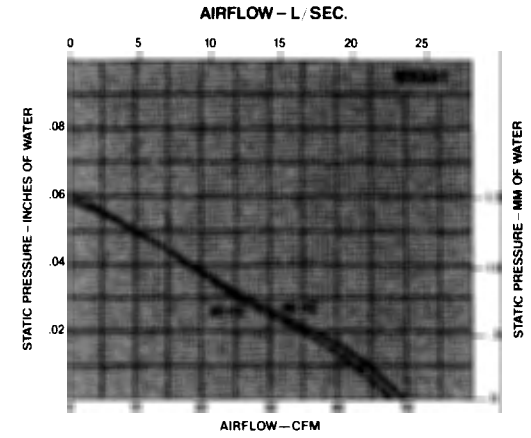
WHISPER® XL AC

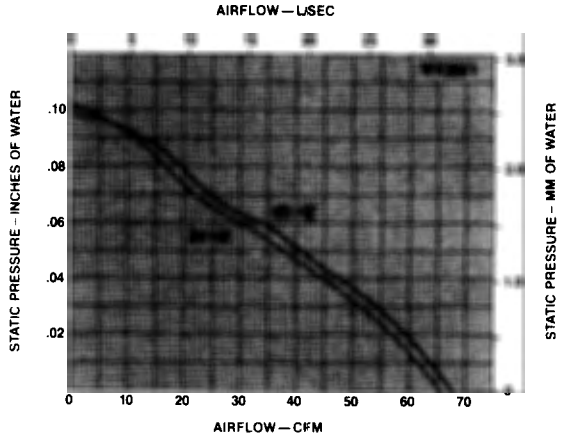
TUBEAXIAL FAN

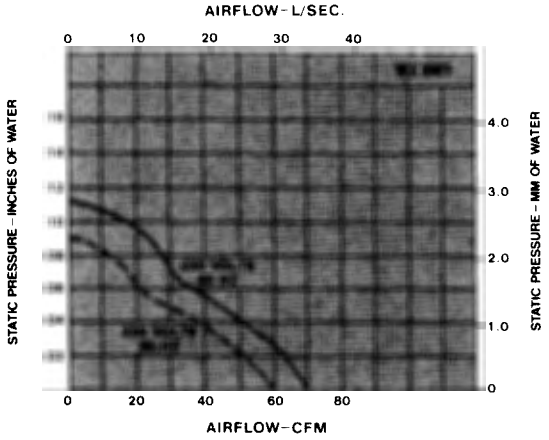
FEATURES

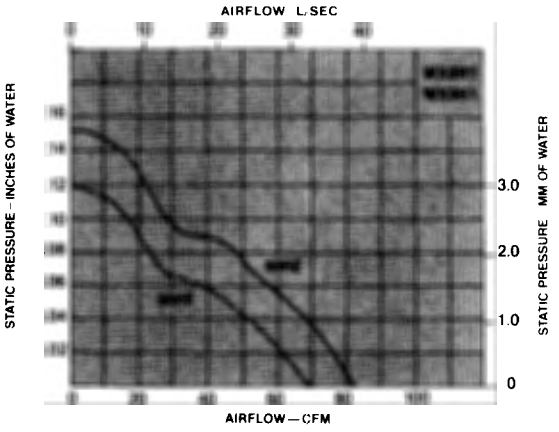
- ☐ Size - 4.69″ square x 1.54″ deep (119.13 mm x 39.12 mm)
- ☐ 50 to 83 CFM (23.5 to 40.0 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 21 oz. (.61 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models
- ☐ VDE Marks License No. 1126 - all models

PERFORMANCE







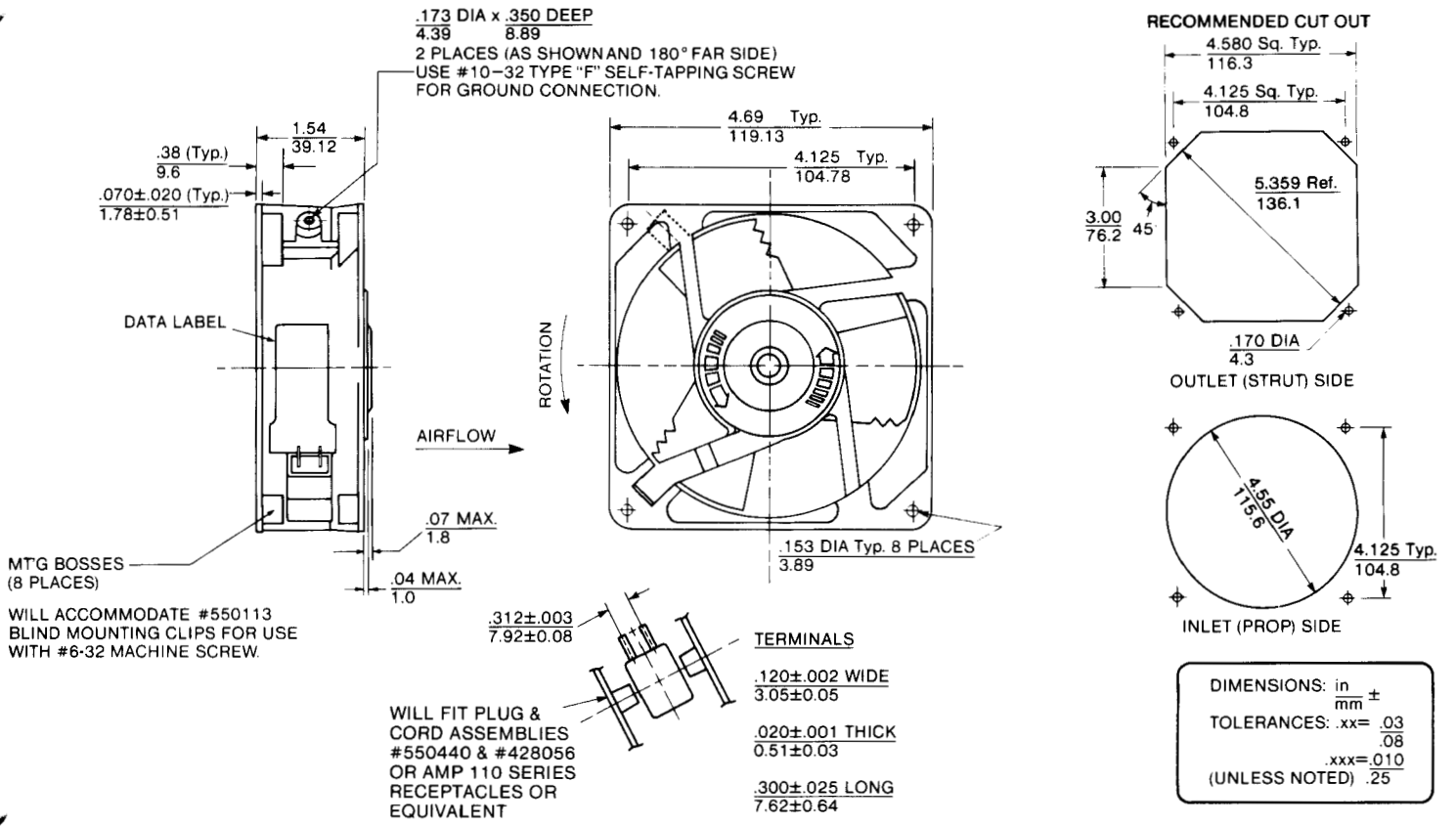


SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*WX2A1	028778	Sleeve	115	50/60	6/6	.07/.06	.08/.07	1450/1500	48/50	22.5/23.5
*WX2M1	028322	Sleeve	115	50/60	10/9	.11/.10	.12/.11	1900/2000	65/70	30.7/33.0
*WX3M1	028330	Sleeve	220/230	50/60	12/11	.07/.06	.07/.06	1800/2000	60/70	28.0/33.0
*WX2H1	028858	Sleeve	115	50/60	15/13	.19/.15	.20/.17	2200/2500	70/83	33.0/40.0
*WX3H1	028860	Sleeve	220/230	50/60	14/13	.10/.09	.11/.10	2200/2500	70/83	33.0/40.0

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

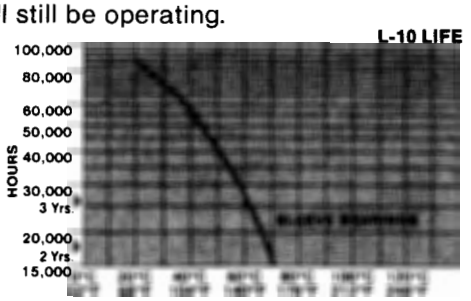
Two-pole shaded pole induction motor.
Insulation IEEE class 130.
Sintered bronze sleeve bearings
Impedance protected.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage

CONSTRUCTION

Venturi and Spider - zinc alloy, painted black
Propeller - flame retardant polypropylene with patented Feathered Edge™.

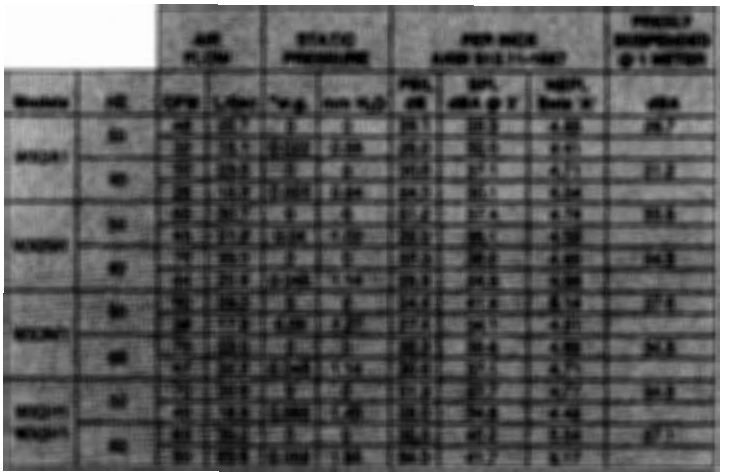
LIFE EXPECTANCY

The curve represents the continuous duty life of Whisper XL fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient. 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Capable of furnishing:
.187 terminals
Harness assemblies — See page 106.
Reverse flow models
Leadwire versions

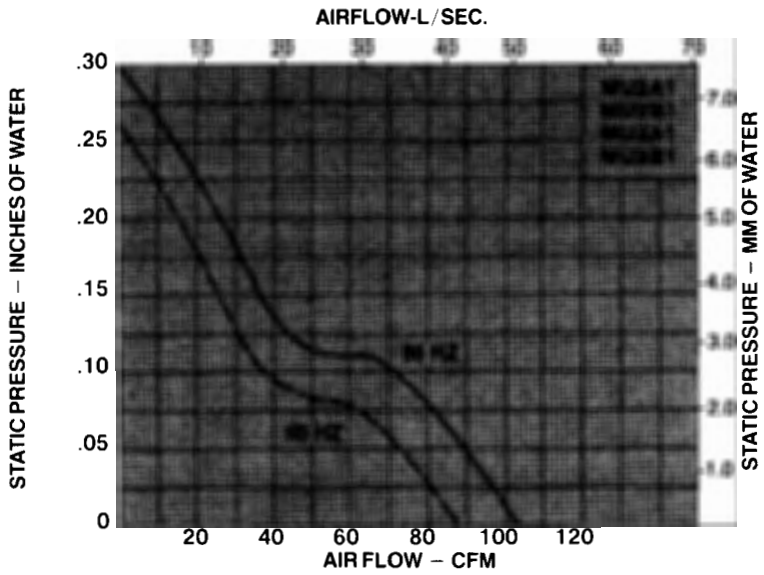
MUFFIN® AC

TUBEAXIAL FAN

FEATURES

- ☐ Size - 4.71″ square x 1.50″ deep (119.6 mm x 38.1 mm)
- ☐ 105 CFM (49.6 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 17.2 oz. (.49 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models

PERFORMANCE

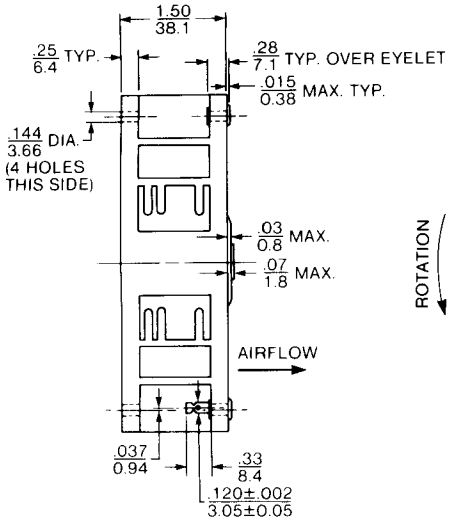


SPECIFICATIONS

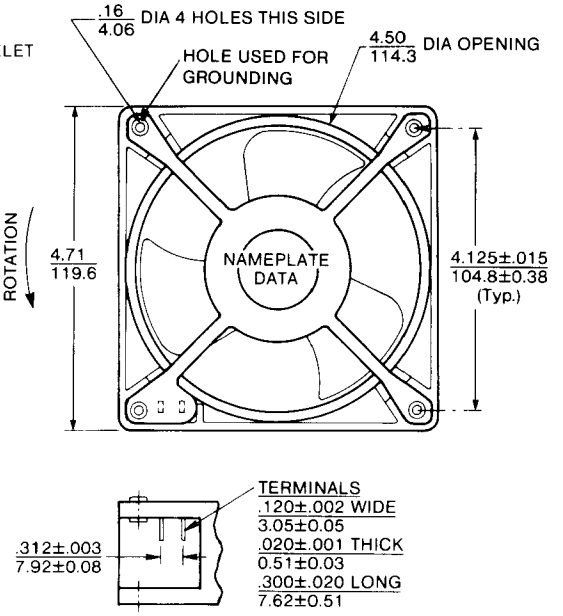
Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*MU2A1	028021	Sleeve	115	50/60	15/14	.19/.16	.26/.24	2650/3100	88/105	41.5/49.6
*MU2B1	028027	Ball	115	50/60	15/14	.19/.16	.26/.24	2650/3100	88/105	41.5/49.6
*MU3A1	028023	Sleeve	220/230	50/60	15/14	.10/.09	.14/.12	2650/3100	88/105	41.5/49.6
*MU3B1	028029	Ball	220/230	50/60	15/14	.10/.09	.14/.12	2650/3100	88/105	41.5/49.6

* Distributor Item.

All figures are nominal free delivery values at sea level.

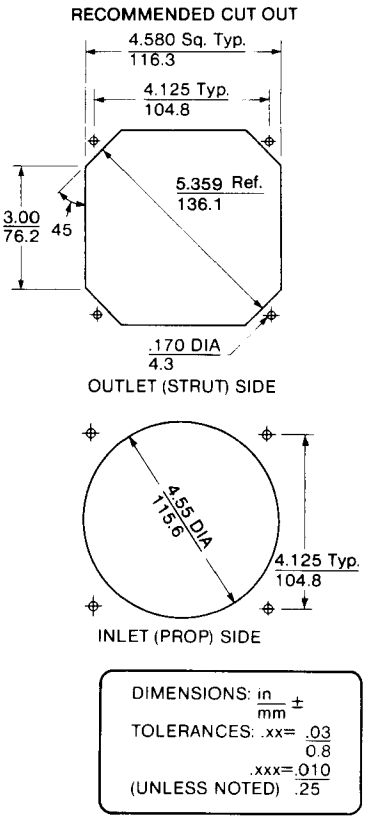


WILL ACCOMMODATE
477663 (FLUSH) OR 477670
(STANDOFF) MOUNTING CLIPS
WITH #6–32 MACHINE SCREW



TERMINALS
.120±.002 WIDE
3.05±0.05
.020±.001 THICK
0.51±0.03
.300±.020 LONG
7.62±0.51

(WILL FIT PLUG AND
CORD ASSEMBLY #428056)



DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
(UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

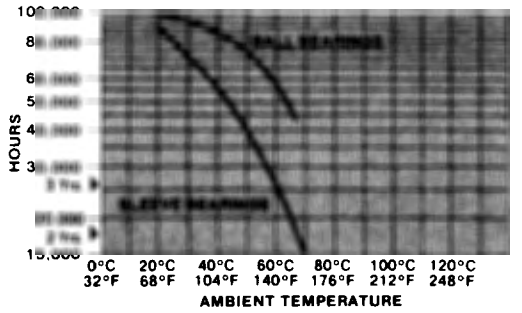
Two-pole shaded pole induction motor.
Insulation system UL recognized Class B
Sintered bronze sleeve or stainless steel ball bearings.
Impedance protected.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Venturi - flame retardant black phenolic.
Spider - zinc alloy, painted black.
Propeller - flame retardant black polypropylene.

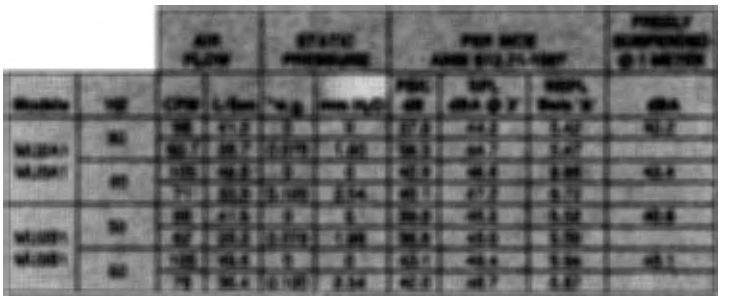
LIFE EXPECTANCY

The curve represents the continuous duty life of Muffin fans at a given temperature after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Capable of furnishing:
Harness assemblies — See page 106.
Reverse flow models

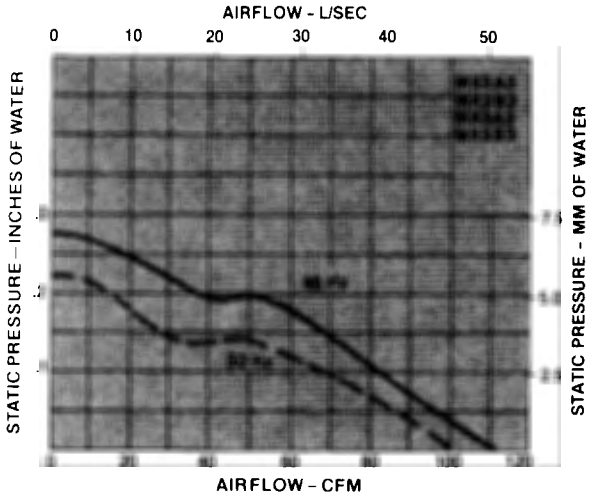
MUFFIN® XL AC

TUBEAXIAL FAN

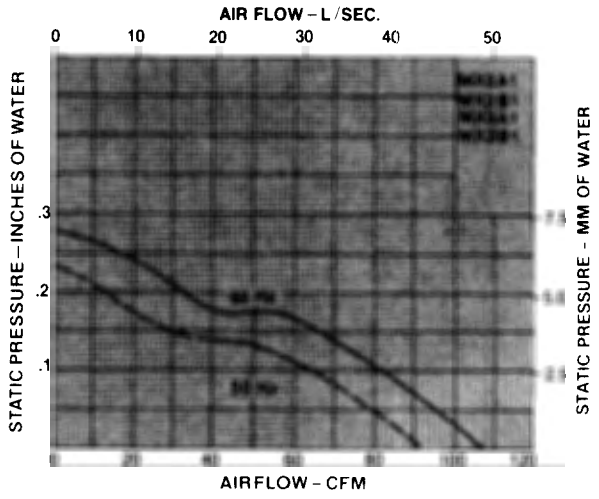
FEATURES

- ☐ Size - 4.69" square x 1.54" deep (119.13 mm x 39.12 mm)
- ☐ 108 to 115 CFM (51.0 to 54.3 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise levels
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 21 oz. (.61 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models
- ☐ VDE Marks License No. 1126 - all models

PERFORMANCE



L – FLOW
AIR IN STRUT, OUT PROPELLER



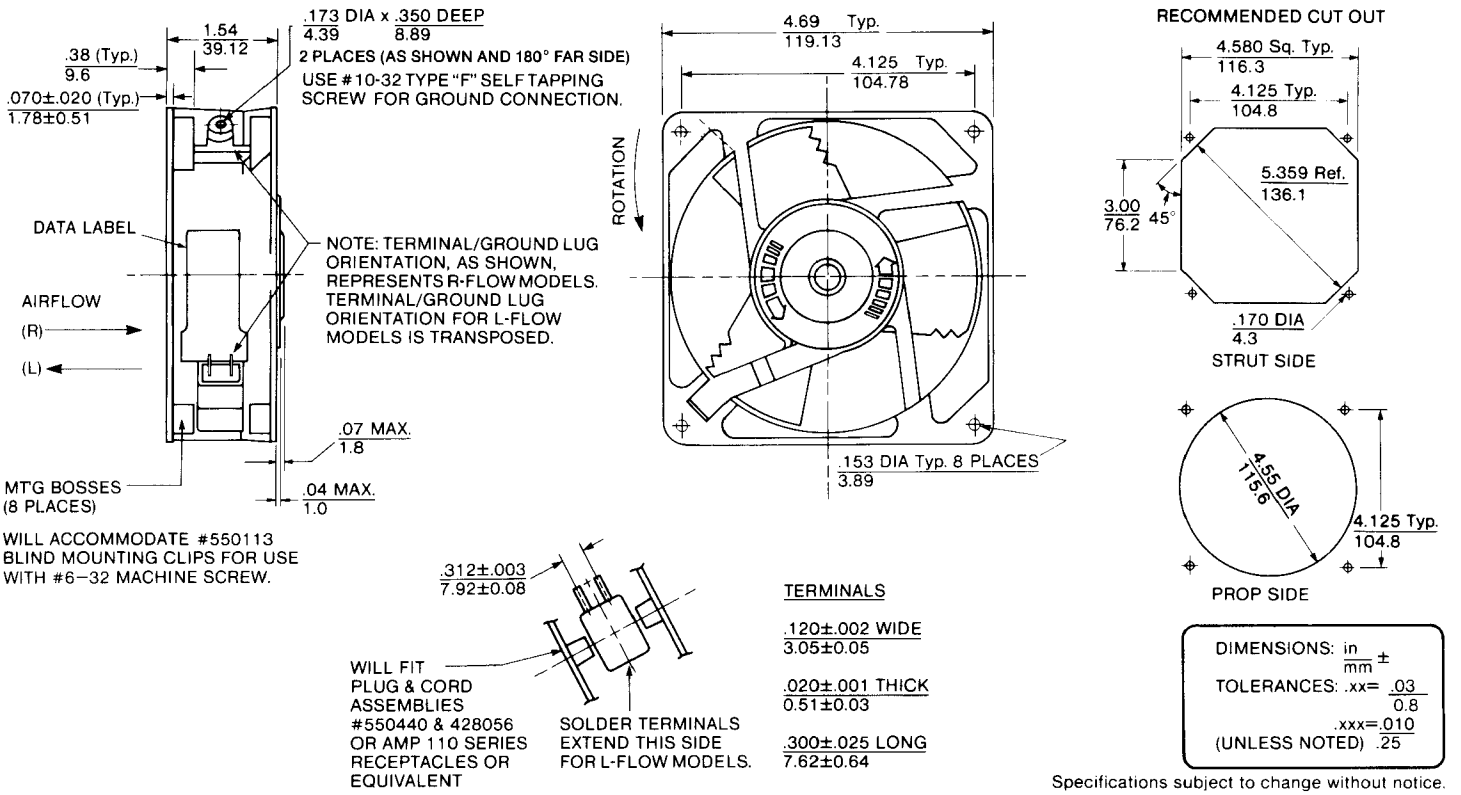
R – FLOW
AIR IN PROPELLER, OUT STRUT

SPECIFICATIONS

Model No.	Flow	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*MX2A1	R	028318	Sleeve	115	50/60	17/15	.20/.18	.26/.24	2700/3100	92/108	43.4/51.0
*MX2B1	R	028420	Ball	115	50/60	17/15	.20/.18	.26/.24	2700/3100	92/108	43.4/51.0
*MX3A1	R	028326	Sleeve	220/230	50/60	17/16	.10/.09	.14/.12	2700/3100	92/108	43.4/51.0
MX3B1	R	028421	Ball	220/230	50/60	17/16	.10/.09	.14/.12	2700/3100	92/108	43.4/51.0
*MX2A3	L	028316	Sleeve	115	50/60	17/15	.20/.18	.26/.24	2700/3100	98/115	46.3/54.3
*MX2B3	L	028422	Ball	115	50/60	17/15	.20/.18	.26/.24	2700/3100	98/115	46.3/54.3
*MX3A3	L	028324	Sleeve	220/230	50/60	17/16	.10/.09	.14/.12	2700/3100	98/115	46.3/54.3
*MX3B3	L	028423	Ball	220/230	50/60	17/16	.10/.09	.14/.12	2700/3100	98/115	46.3/54.3

* Distributor Item.

All figures are nominal free delivery value at sea level.



Specifications subject to change without notice.

MOTOR

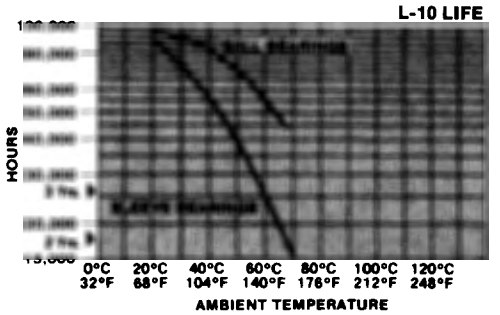
Two-pole shaded pole induction motor.
Insulation system UL recognized Class B.
Sintered bronze sleeve or stainless steel ball bearings.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.
Impedance protected.

CONSTRUCTION

Venturi and Spider - zinc alloy, painted black.
Propeller - flame retardant polypropylene with patented Feathered Edge™.

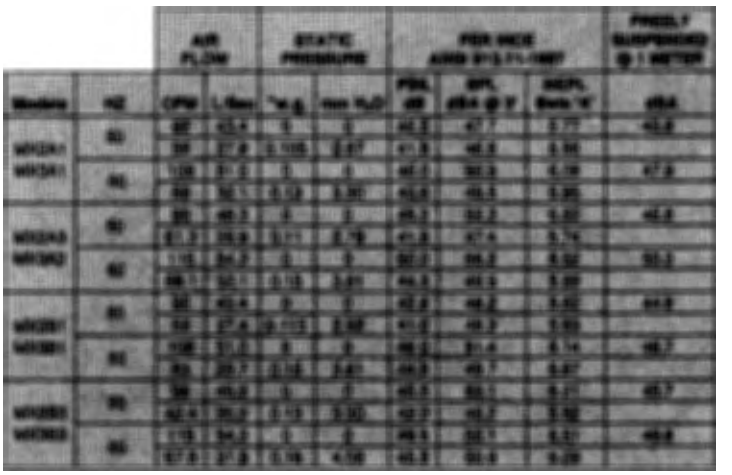
LIFE EXPECTANCY

The curve represents the continuous duty life of Muffin XL fans at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

ACOUSTIC RATINGS (for definitions see page 5)

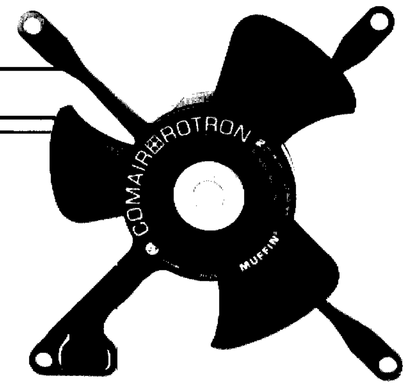


OPTIONS

Capable of furnishing:
.187 terminals
Harness assemblies — See page 106.
Leadwire versions

SKELETON FANS AC

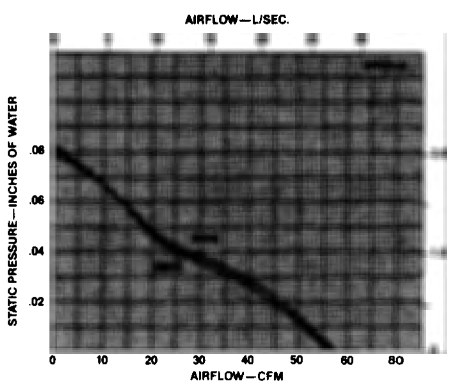
MUFFIN® & WHISPER®

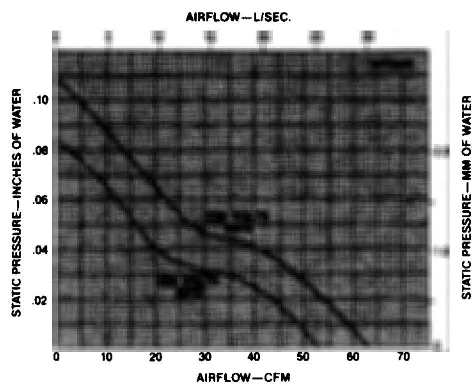


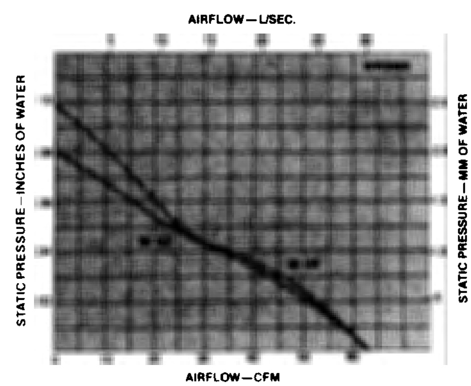
FEATURES

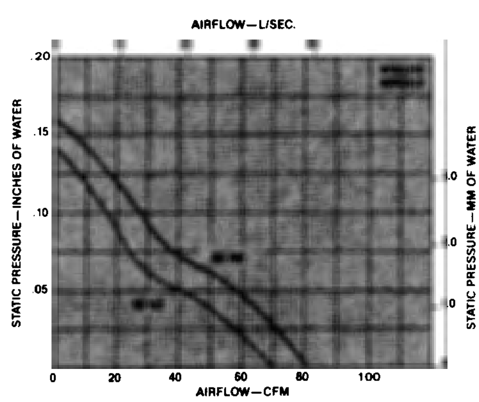
- ☐ Size - 4.50″ square x 1.50″ deep (114.3 mm x 38.1 mm)
- ☐ 57 to 105 CFM (26.9 to 49.6 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −28°C to +70°C
- ☐ Weight - 12.8 oz. (.36 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293 - all models
- ☐ CSA Certified - File No. LR52898 - all models

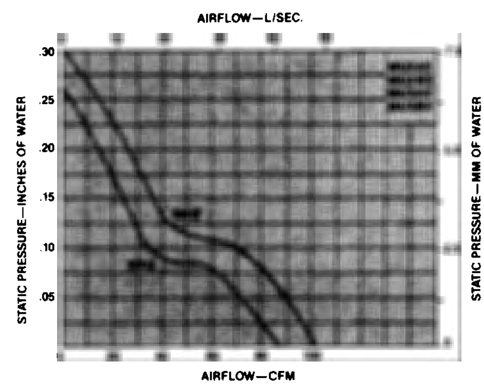
PERFORMANCE







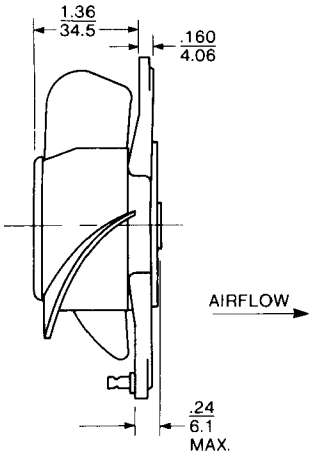


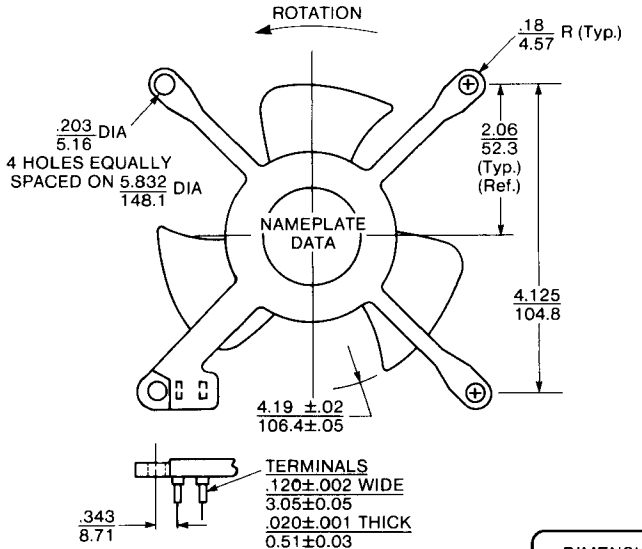


SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
WR2A2	027118	Sleeve	115	50/60	7/7	.07/.06	.08/.07	1640/1660	55/57	26.0/26.9
WR3A2	030021	Sleeve	220/230	50/60	12/12	.07/.07	.07/.07	1800/2000	53/62	25.0/29.3
WR2M2	030104	Sleeve	115	50/60	7/7	.07/.07	.08/.08	2000/1950	63/63	29.7/29.7
WR2H2	027120	Sleeve	115	50/60	11/10	.12/.11	.13/.14	2100/2400	70/80	33.0/31.8
WR3H2	030106	Sleeve	220/230	50/60	12/12	.07/.06	.08/.08	2100/2400	70/80	33.0/37.8
MU2A2	028022	Sleeve	115	50/60	15/14	.18/.16	.26/.24	2650/3100	88/105	41.5/49.6
MU2B2	028028	Ball	115	50/60	15/14	.18/.16	.26/.24	2650/3100	88/105	41.5/49.6
MU3A2	028024	Sleeve	220/230	50/60	15/14	.10/.09	.14/.12	2650/3100	88/105	41.5/49.6
MU3B2	028030	Ball	220/230	50/60	15/14	.10/.09	.14/.12	2650/3100	88/105	41.5/49.6

All figures are nominal free delivery values at sea level with skeleton units mounted in an orifice with the same geometry as the I.D. of the Muffin/Whisper venturi.





DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
(UNLESS NOTED)

SUGGESTED MOUNTING – RECOMMENDED CUTOUT DIAMETER IN CUSTOMER PANEL IS 4.25" (108 MM)

Specifications subject to change without notice.

MOTOR

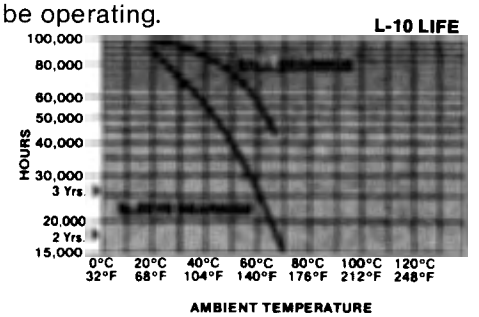
Two-pole shaded pole induction motor
Whisper motor insulation system IEEE Class 130
Muffin system UL recoginzed Class B
Sintered bronze sleeve or stainless steel ball bearings.
Impedance protected
100% dielectric tested at 1800 VAC/1 sec./ 500 microamps maximum leakage.

CONSTRUCTION

Spider - zinc alloy, painted black.
Propeller - flame retardant black polypropylene

LIFE EXPECTANCY

The curve represents the continuous duty life for Skeleton fans at a given temperature after which 90% of the units will still be operating.



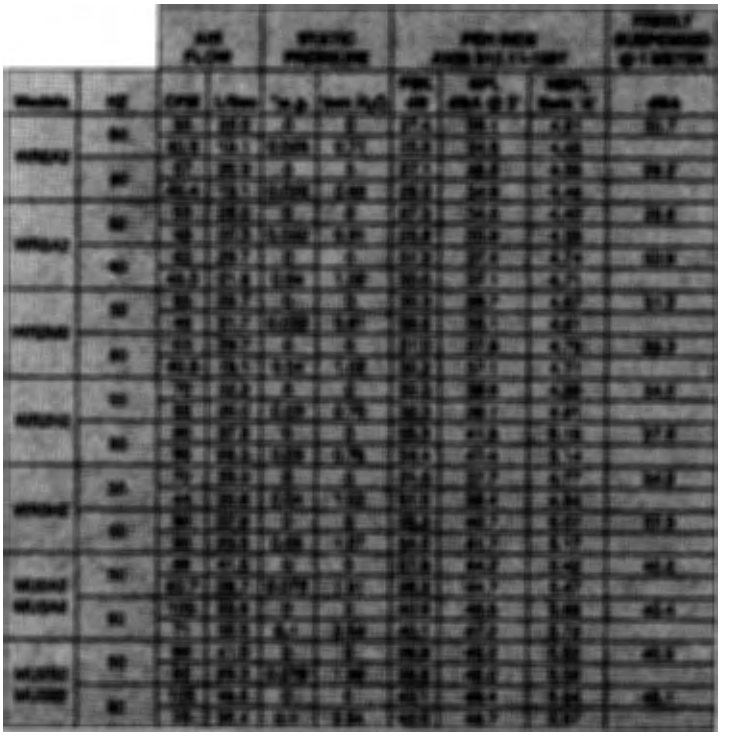
EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

OPTIONS

Capable of furnishing:
Harness assemblies — See page 106.
Reverse flow models

ACOUSTIC RATINGS (for definitions see page 5)

The aero and acoustical data on this page are taken with the skeleton units mounted in an orifice with the same geometry as the I.D. of the Muffin/Whisper venturi.



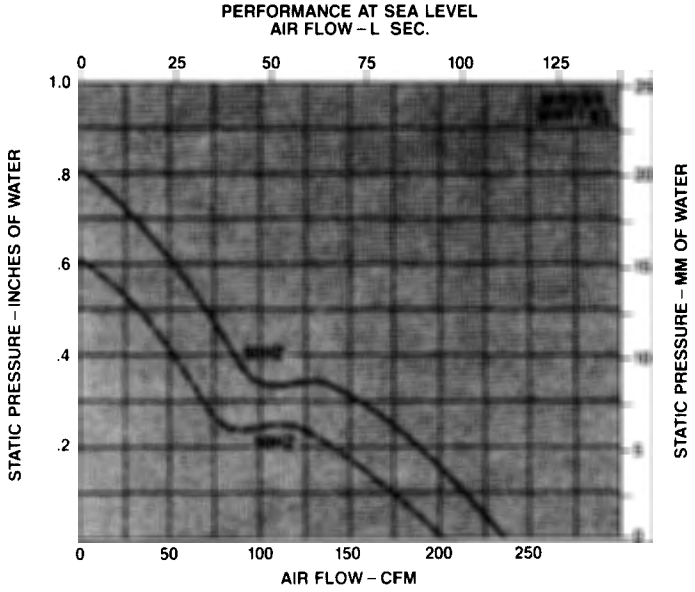
MAJOR® AC

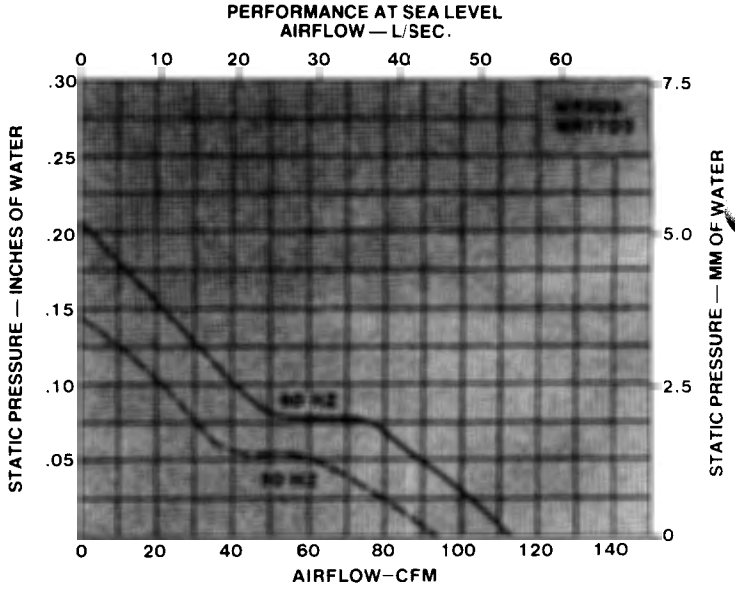
TUBEAXIAL FAN

FEATURES

- ☐ Size - 6.75" x 5.92" x 2.00" deep (171.5 mm x 150.4 mm x 50.8 mm)
- ☐ 114 or 235 CFM (53.8 or 111 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ VDE Marks License No. 1354 - all models

PERFORMANCE



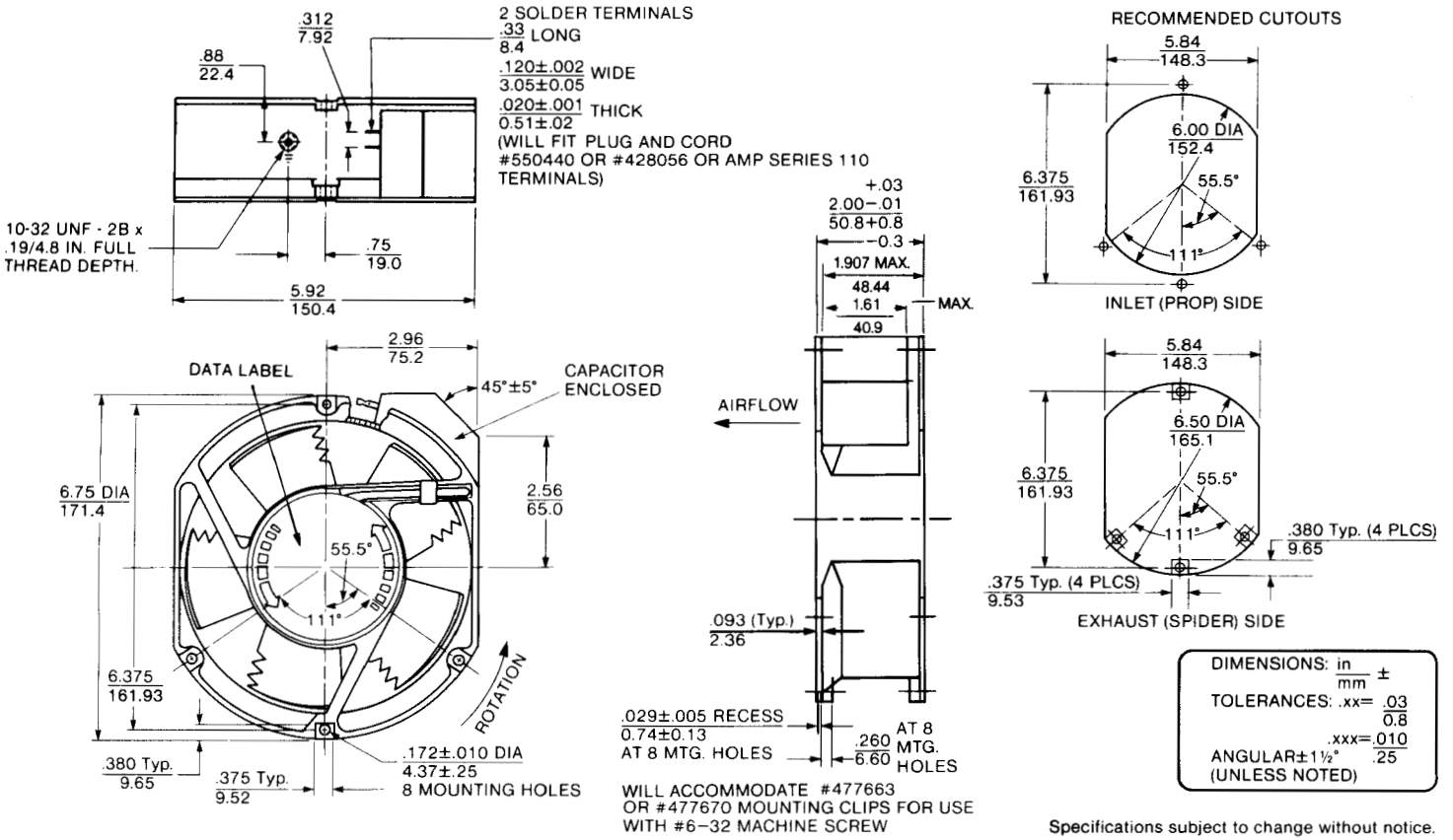


SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*MR2B3	028245	Ball	115	50/60	30/31	.27/.26	.48/.47	2850/3350	200/235	94/111
*MR77B3	028309	Ball	220/230	50/60	26/30	.13/.14	.23/.23	2850/3350	200/235	94/111
MR2D3	032118	Ball	115	50/60	18/16	.17/.15	.21/.20	1400/1700	94/114	44/53.8
MR77D3	032212	Ball	220/230	50/60	16/15	.09/.08	.11/.10	1400/1700	94/114	44/53.8

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

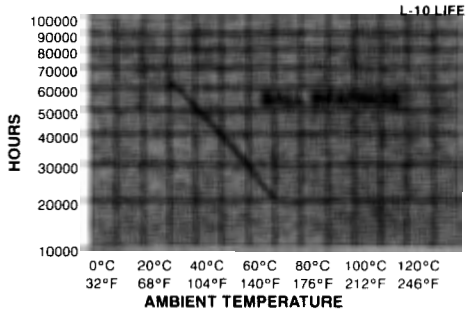
Two-pole permanent split capacitor, 1 phase, 50/60 Hz.
Insulation Class B.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.
Full speed automatic reset thermal protector.
Half speed impedence protected.
Capacitor - Dry polyester film.
Stainless steel ball bearings.

CONSTRUCTION

Venturi - Single piece die-cast aluminum, painted black.
Propeller and Capacitor Cover - Injection molded polycarbonate, black, meets UL94V-0 flammability rating.

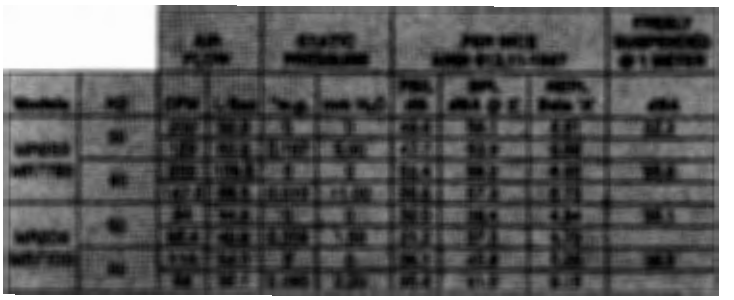
LIFE EXPECTANCY

The curve represents the continuous duty life of Major fans at a given temperature, after which 90% of the units will still be operating.



ACOUSTIC RATINGS

(for definitions see page 5)



OPTIONS

Capable of furnishing:
Various Fan Performance Sensor (FPS) options, see page 92
Harness assemblies — See page 106.
HI-REL version, see page 78.

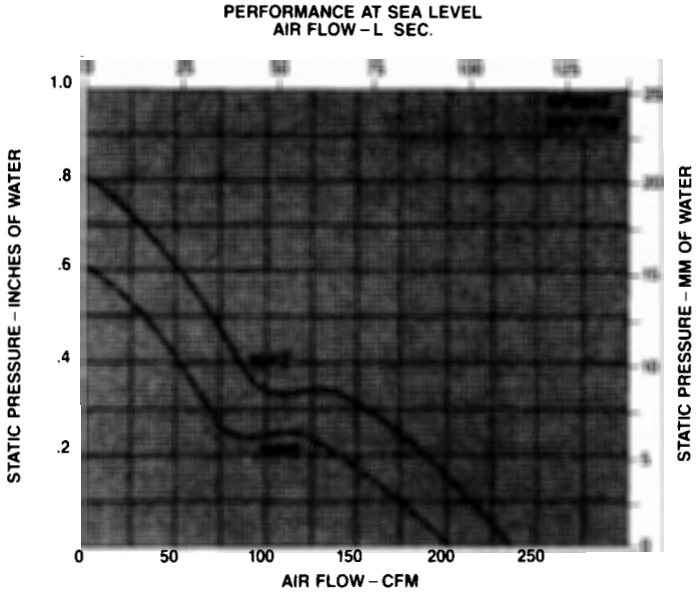
MAJOR® AC HI-REL

TUBEAXIAL FAN

FEATURES

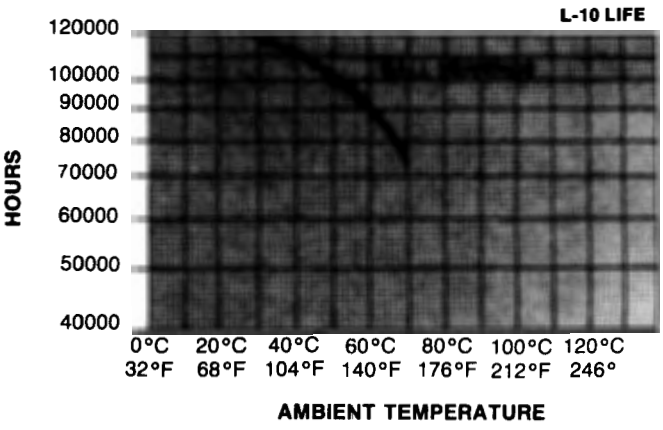
- ☐ Size - 6.75" x 5.92" x 2.00" deep (171.5 mm x 150.4 mm x 50.8 mm)
- ☐ 235 CFM (111 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
  VDE Approval Pending

PERFORMANCE



LIFE EXPECTANCY

The curve represents the continuous duty life of the Major Hi-Rel at a given temperature after which 90% of the units will still be operating.

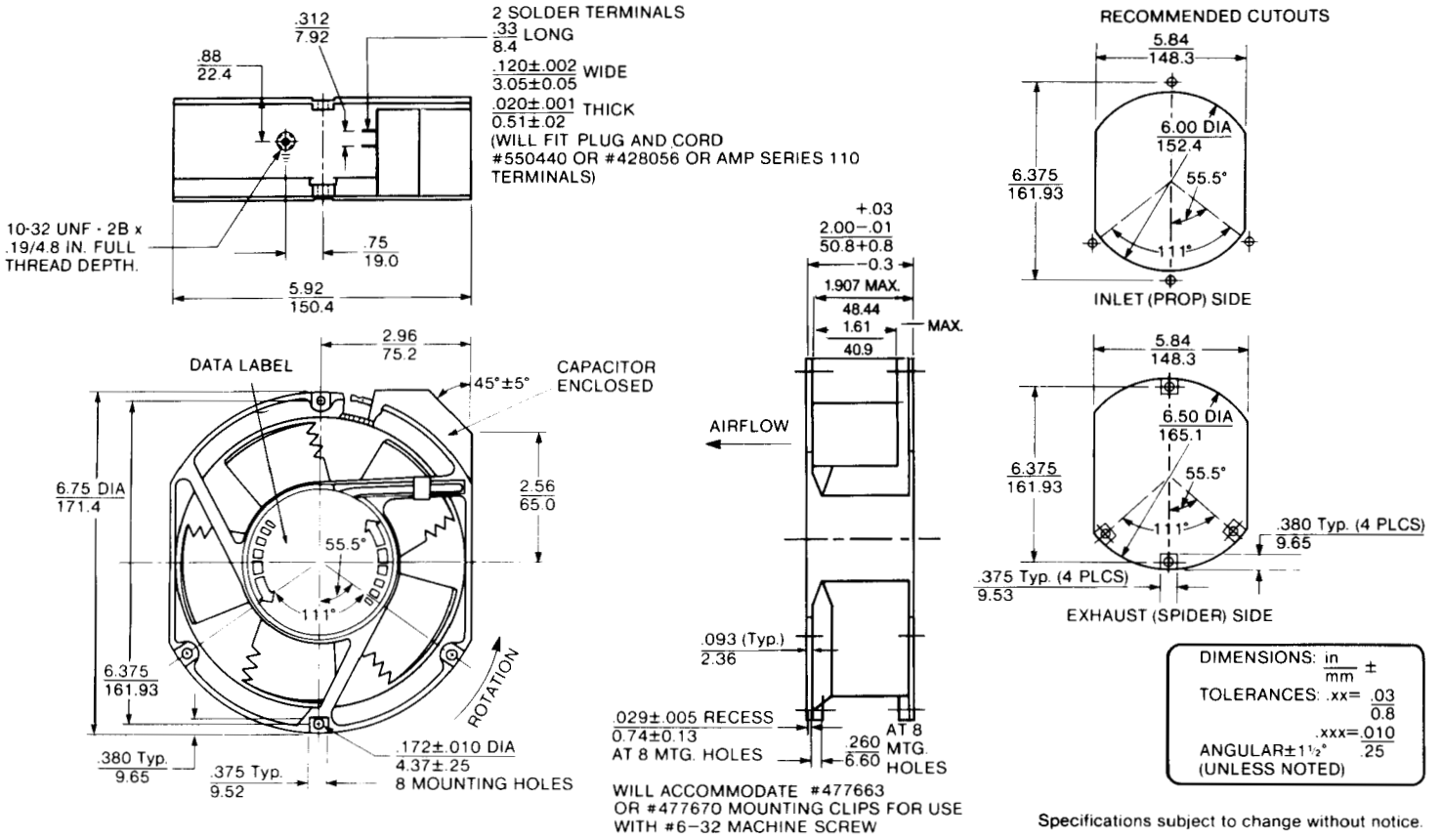


- ☐ Runs Cooler: approximately 10°C cooler bearing temperature than standard Major
- ☐ More Efficient: 10% less power consumption than standard Major
- ☐ Longer Life: as much as 5 years longer continuous operation than standard Major

SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
MR2H3	030683	Ball	115	50/60	27/29	.24/.25	.44/.43	2850/3350	200/235	94/111
MR77H3	030684	Ball	220/230	50/60	25/29	.12/.13	.21/.22	2850/3350	200/235	94/111

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

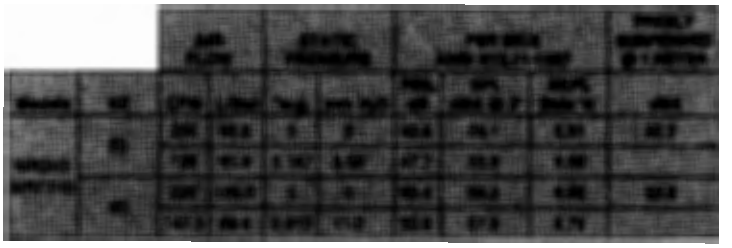
Two-pole permanent split capacitor, 1 phase, 50/60 Hz.
Insulation Class B.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.
Full speed automatic reset thermal protector.
Capacitor - Dry polyester film.
Stainless steel ball bearings.

CONSTRUCTION

Venturi - Single piece die-cast aluminum, painted black.
Propeller and Capacitor Cover - Injection molded polycarbonate, black, meets UL94V-0 flammability rating.

ACOUSTIC RATINGS

(for definitions see page 5)



OPTIONS

Capable of furnishing:
Various Fan Performance Sensor (FPS) options, see page 92.
Harness assemblies — See page 106.

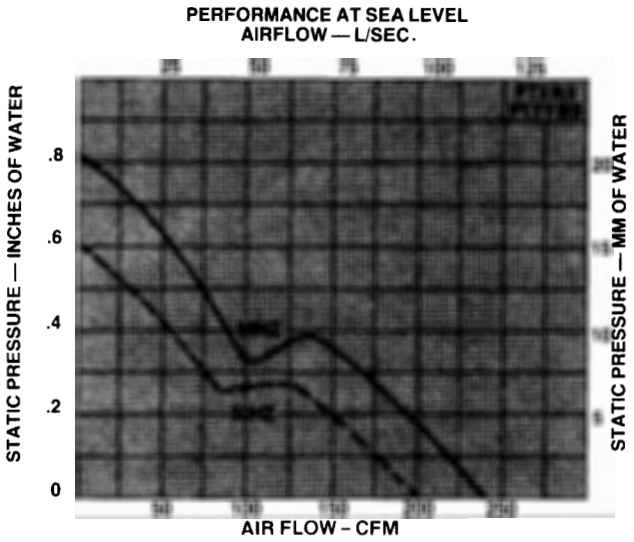
PATRIOT® AC

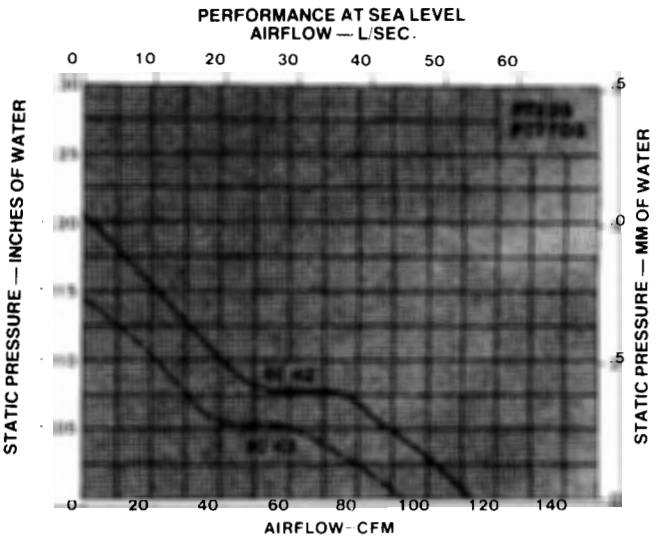
TUBEAXIAL FAN

FEATURES

- ☐ Size - 6.75″ diameter x 2.00″ deep (171.5 mm x 50.8 mm)
- ☐ 114 or 235 CFM (53.8 or 111 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz or 3 phase, 400 Hz model available
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified—File No. LR52898
- ☐ VDE Marks License No. 1354—all models

PERFORMANCE



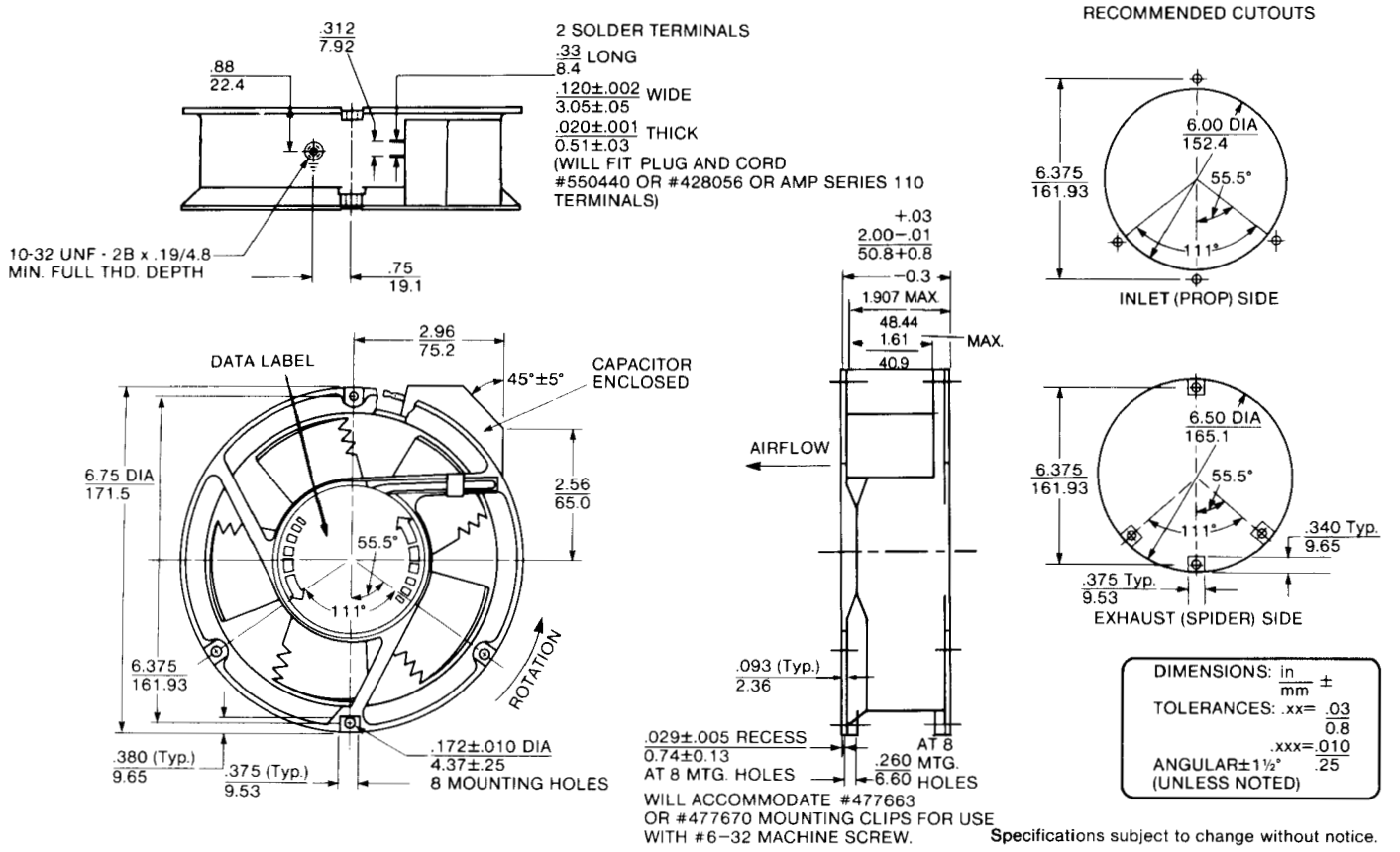


SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*PT2B3	028254	Ball	115	50/60	30/31	.27/.26	.48/.47	2850/3350	200/235	94/111
*PT77B3	028312	Ball	220/230	50/60	26/30	.13/.14	.23/.23	2850/3350	200/235	94/111
PT2D3	032213	Ball	115	50/60	18/16	.17/.15	.21/.20	1400/1700	94/114	44/53.8
PT77D3	032214	Ball	220/230	50/60	15/16	.09/.08	.11/.10	1400/1700	94/114	44/53.8

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

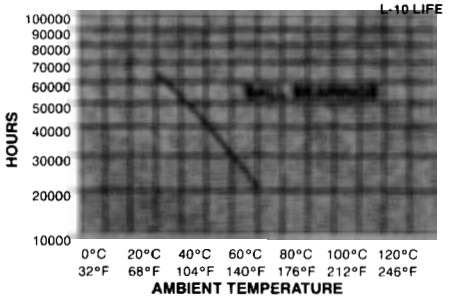
Two-pole permanent split capacitor, 1 phase, 50/60 Hz.
Insulation Class B.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.
Full speed - automatic reset thermal protector.
Half speed - impedance protected.
Capacitor - Dry polyester film.
Stainless steel ball bearings.

CONSTRUCTION

Venturi - single piece die-cast aluminum, painted black.
Propeller and Capacitor Cover - Injection molded polycarbonate, black, meeting UL94V-0 flammability rating.

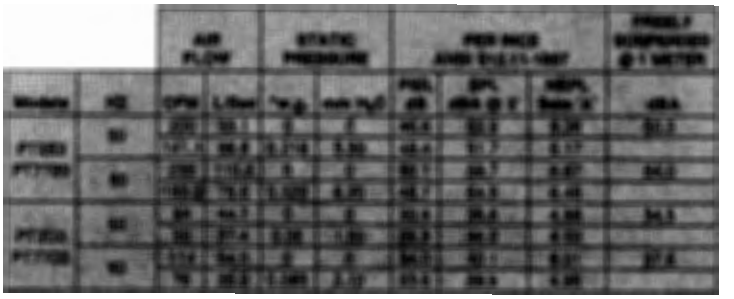
LIFE EXPECTANCY

The curve represents the continuous duty life of Patriot fans at a given temperature, after which 90% of the units will still be operating.



ACOUSTIC RATINGS

(for definitions see page 5)



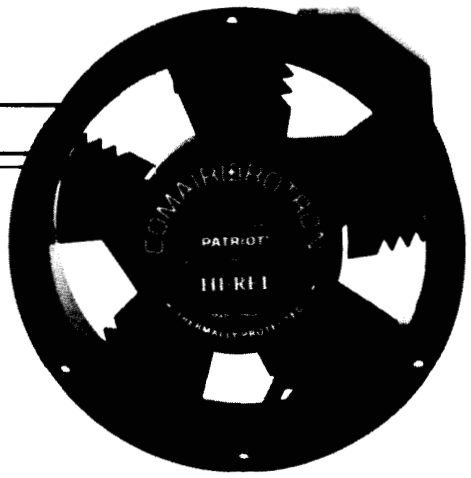
OPTIONS

Capable of furnishing:
Various Fan Performance Sensor (FPS) options, see page 92

Harness assemblies — See page 106.
HI-REL version, see page 82.

PATRIOT® AC HI-REL

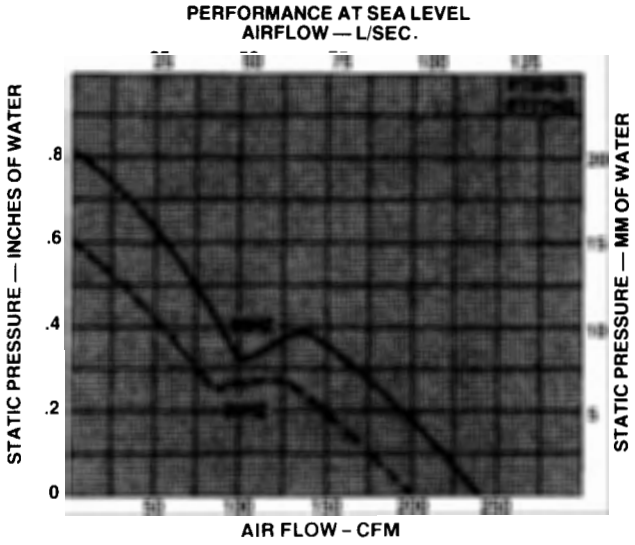
TUBEAXIAL FAN



FEATURES

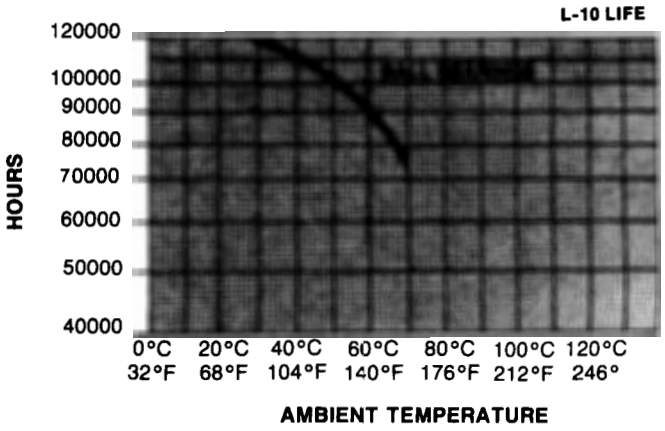
- ☐ Size - 6.75″ diameter x 2.00″ deep (171.5 mm x 50.8 mm)
- ☐ 235 CFM (111 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise
- ☐ Operating temperature range: −10°C to +70°C
- ☐ Weight - 1.84 lbs. (.84 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898
- ☐ VDE Approval Pending

PERFORMANCE



LIFE EXPECTANCY

The curve represents the continuous duty life of the Patriot Hi-Rel at a given temperature after which 90% of the units will still be operating.

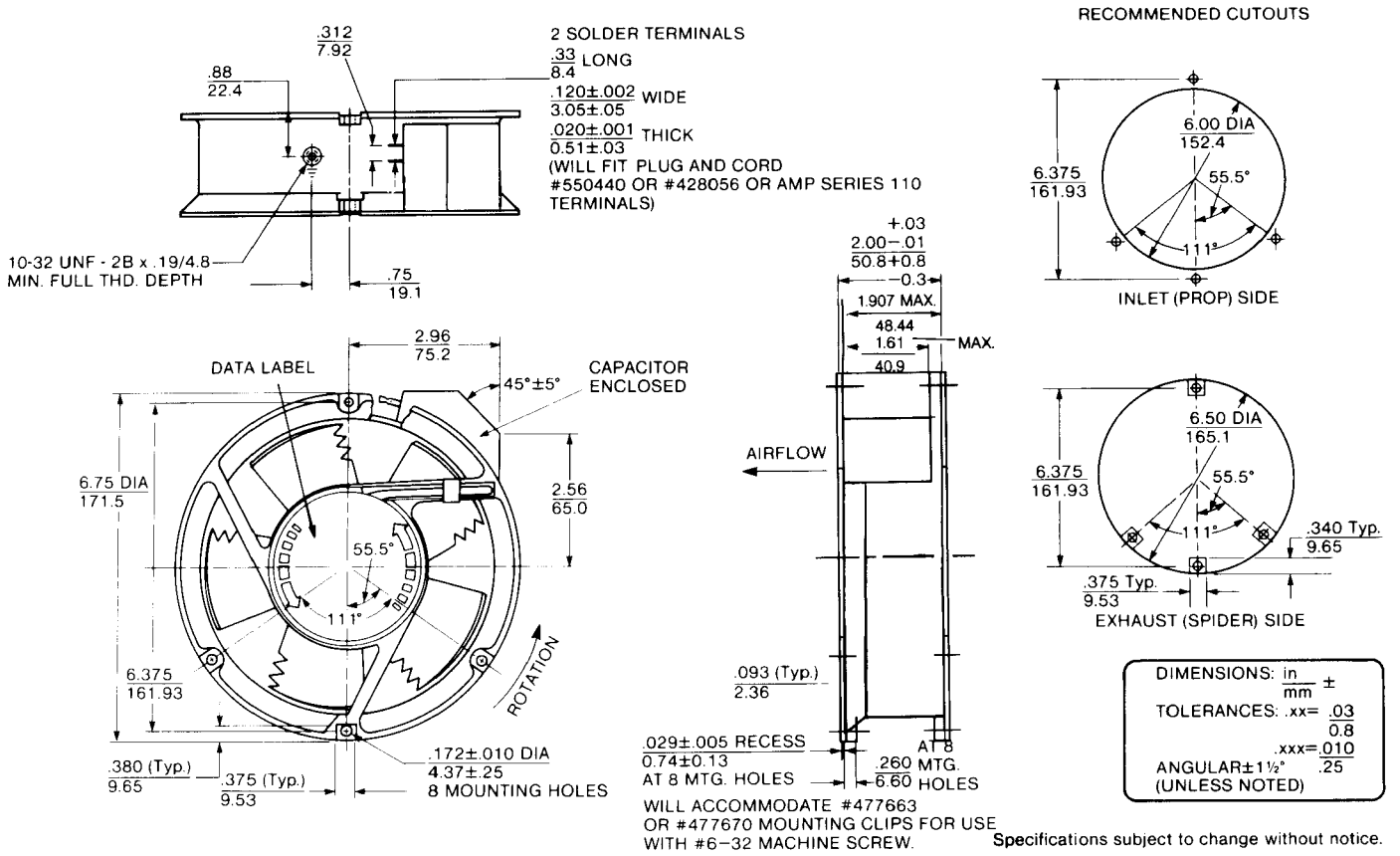


- ☐ Runs Cooler: approximately 10°C cooler bearing temperature than standard Patriot
- ☐ More Efficient: 10% less power consumption than standard Patriot
- ☐ Longer Life: as much as 5 years longer continuous operation than standard Patriot

SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
PT2H3	030681	Ball	115	50/60	27/29	.24/.25	.44/.43	2850/3350	200/235	94/111
PT77H3	030682	Ball	220/230	50/60	25/29	.12/.13	.21/.22	2850/3350	200/235	94/111

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Two-pole permanent split capacitor, 1 phase, 50/60 Hz. Insulation Class B.

100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

Full speed - automatic reset thermal protector.

Capacitor - Dry polyester film.

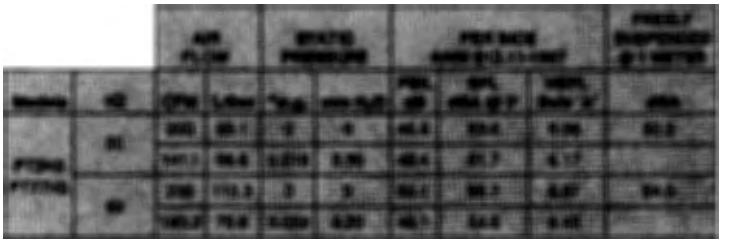
Stainless steel ball bearings.

CONSTRUCTION

Venturi - single piece die-cast aluminum, painted black.

Propeller and Capacitor Cover - Injection molded polycarbonate, black, meeting UL94V-0 flammability rating.

ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Capable of furnishing:

Various Fan Performance Sensor (FPS) options, see page 92

Harness assemblies — See page 106.

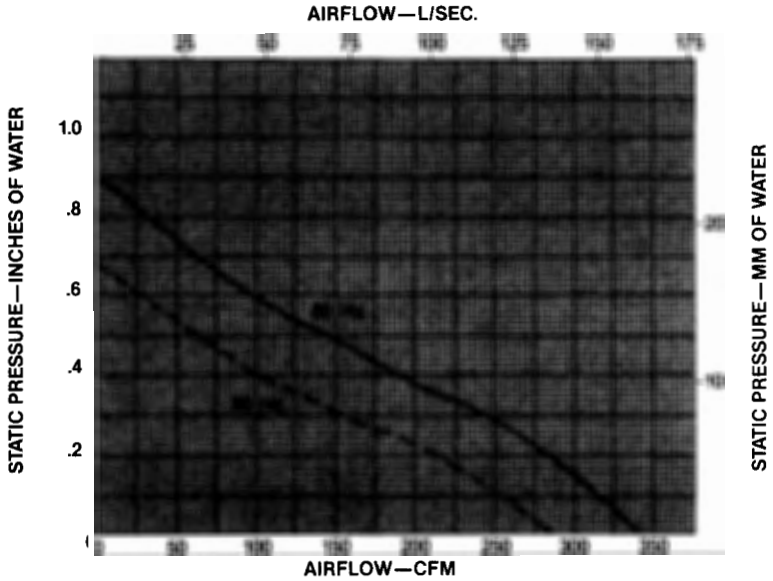
TARZAN® AC

TUBEAXIAL FAN

FEATURES

- ☐ Size - 6.91″ square x 4.40″ deep (175.5 mm x 111.8 mm)
- ☐ 340 CFM (160 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Operating temperature range: −18°C to +60°C
- ☐ Weight - 5 lbs. (2.27 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898

PERFORMANCE

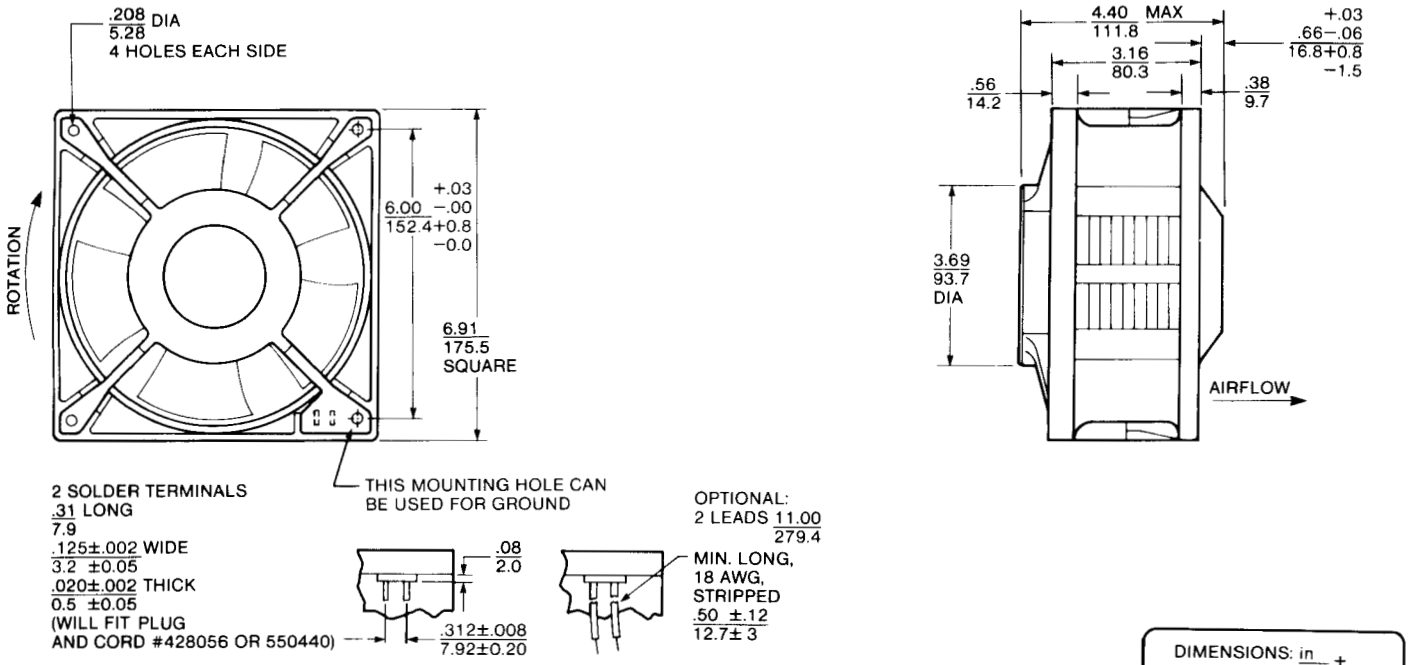


SPECIFICATIONS

LEADWIRES		TERMINALS										
Model No.	Part No.	Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*TN3C2	020169	*TN3A2	020174	Ball	115	50/60	90/85	1.4/1.2	2.4/2.0	2820/3350	280/340	132/160
*TN3C3	020177	*TN3A3	020172	Ball	220/230	50/60	82/85	.65/.60	1.1/.98	2820/3350	280/340	132/160

*Distributor Item.

All figures are nominal free delivery values at sea level.



Suggested Mounting - Recommended cutout diameter in customer panel is 6.75 / 171.4

DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
(UNLESS NOTED)

Specifications subject to change without notice.

MOTOR

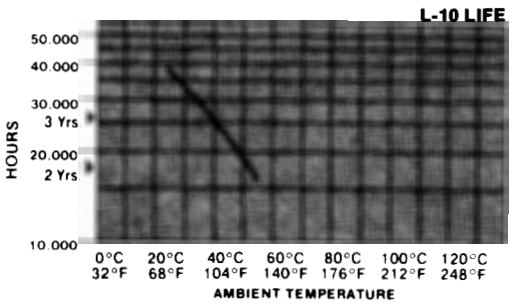
Two-pole shaded pole induction motor.
Class A insulation.
Automatic reset Thermal protector.
Sealed ball bearings.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Venturi - compression molded of flame retardant Thermoset plastic (phenolic), black.
Spider - die-cast aluminum alloy, painted black.
Propeller - Injection moled of flame retardant polycarbonate, black.

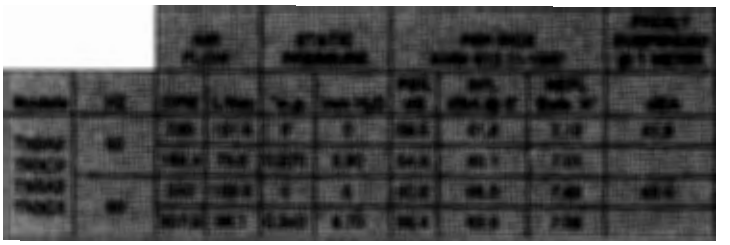
LIFE EXPECTANCY

The curve represents the continuous duty life of Tarzan fans at a given temperature after which 90% of the units will still be operating.



EXAMPLE: When run at 40°C ambient, 90% of units will still be running after 25,000 continuous hours.

ACOUSTIC RATINGS (for definitions see page 5)

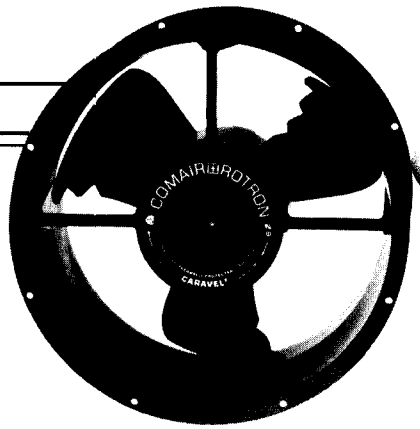


OPTIONS

Capable of furnishing:
Terminals or leadwires
Harness assemblies — See page 106.

CARAVEL® AC

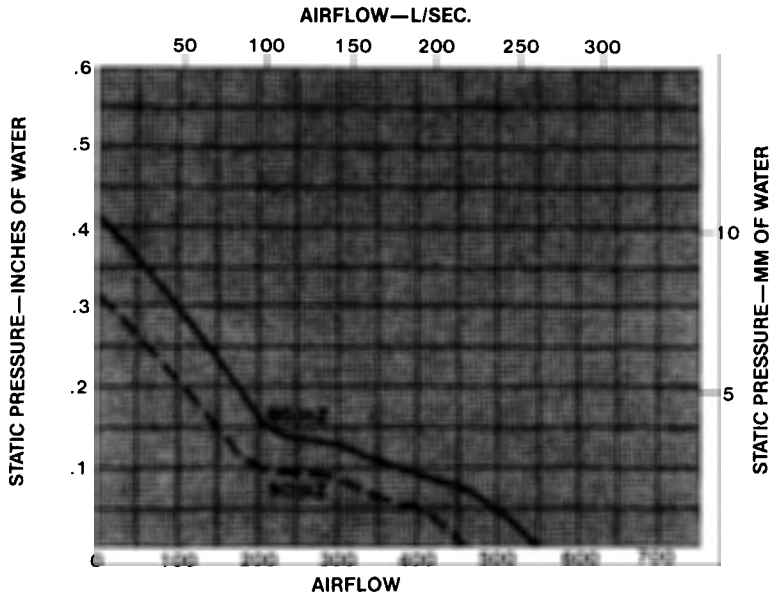
TUBEAXIAL FAN



FEATURES

- ☐ Size - 10.00″ diameter x 3.50″ deep (254.0 mm x 88.9 mm)
- ☐ 550 CFM (260 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Feathered Edge™ for lower noise.
- ☐ Operating temperature range: −30°C to +60°C
- ☐ Weight 4.4 lbs. (2.0 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified -File No. LR52898

PERFORMANCE

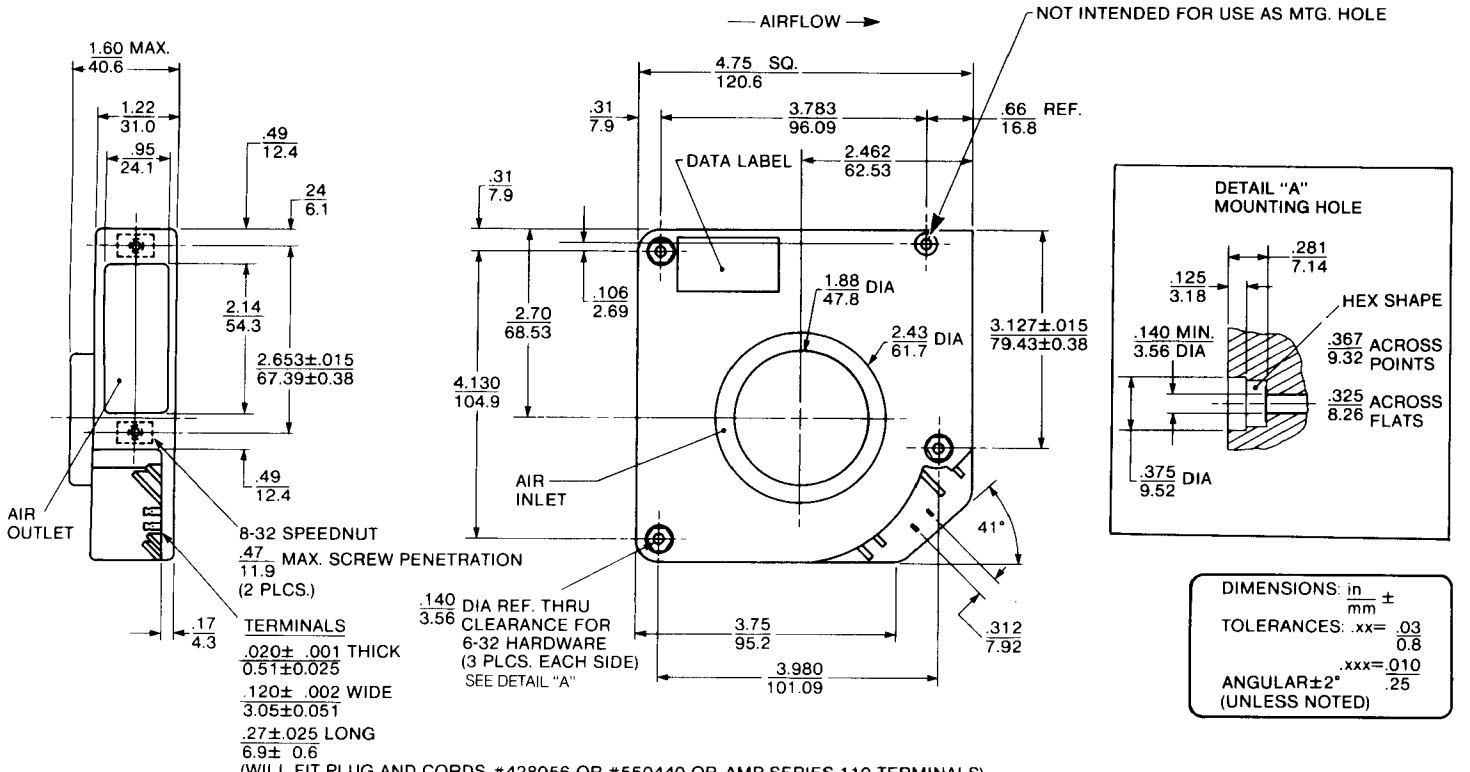


SPECIFICATIONS

LEADWIRES Model No.	LEADWIRES Part No.	TERMINALS Model No.	TERMINALS Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*CL2L2	020188	*CL2T2	020189	Ball	115	50/60	67/61	1.0/.88	1.3/1.1	1400/1650	455/550	215/260
*CL3L2	020190	*CL3T2	020191	Ball	220/230	50/60	60/60	.47/.43	.60/.55	1400/1650	455/550	215/260

* Distributor Item.

All figures are nominal free delivery values at sea level.



Specifications subject to change without notice.

MOTOR

Inside out shaded pole motor
Sintered bronze sleeve bearing or stainless steel ball bearings.
Class B insulation system.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.
Built-in heat sink.
Impedance protected.

CONSTRUCTION

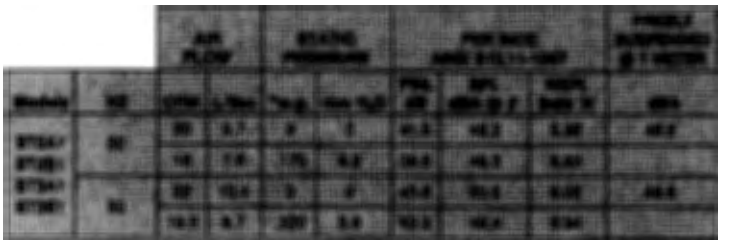
Housing - Glass filled polycarbonate, black, meeting UL94V-0 flammability rating.
Impeller - polypropylene, black, meeting UL94V-2 flammability rating.

OPTIONS

Capable of furnishing harness assemblies. See page 106.

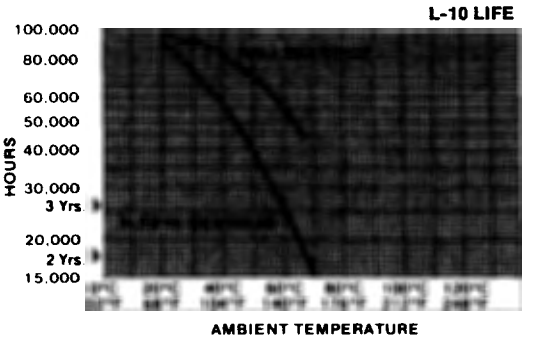
ACOUSTIC RATINGS

(for definitions see page 5)



LIFE EXPECTANCY

The curve represents the continuous duty life of Biscuit blowers at a given temperature, after which 90% of the units will still be operating.



EXAMPLE: When run in 40°C ambient, 90% of sleeve bearing units will still be running after 55,000 hours continuous duty.

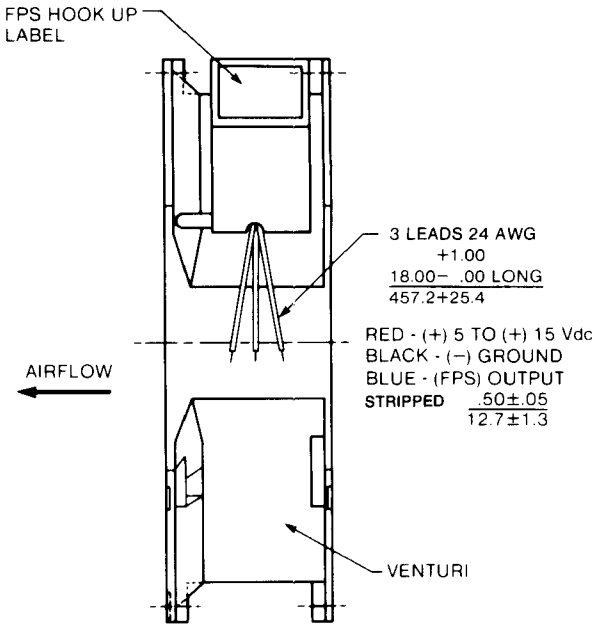
AC Fan Performance Sensor (FPS)

For Major and Patriot AC Fans

Thermal management of electronic packages is increasingly challenging as package sizes decrease and circuit complexities increase. In order to avoid critical internal temperature increases within the electronic system, it is necessary to make provisions for a continuous supply of cooling airflow by monitoring and remote warning of potential airflow interruption.

Comair Rotron supplies a variety of Fan Performance Sensor-equipped Major & Patriot AC fans which provide both monitoring and remote warning capabilities. Should cooling airflow be reduced or interrupted due to a drop in RPM, these FPS systems can trigger back-up cooling devices to go on line, or for less critical equipment, for system shutdown in order to avoid excessive internal temperature rise.

Two different types of Fan Performance Sensors are currently available for the Major & Patriot AC product line. All are designed around an electrically isolated pick-up coil which generates an AC signal with an amplitude proportional to the speed of the fan and the voltage applied to the fan. This output signal is then conditioned by additional electronic circuitry to yield a discrete pass or fail signal.



NOMENCLATURE FOR THE FPS

EXAMPLE: **PT2B3 Q D N**

OUTPUT

DELAY FEATURES

LATCH FEATURES

OUTPUT

Q = Open Collector -- The signal is derived from the collector of the output transistor. The output is high on pass, low on fail. Downstream electronics can be tied between the supply voltage (V_{CC}) and output only.

T = TTL Compatible -- This is the same as an open collector output, but has an internal pull-up resistor tied between the supply voltage (V_{CC}) and the collector of the output transistor. The output signal is high on pass (logical 1) and low on failure (logical 0). Downstream electronics can be tied between the supply voltage (V_{cc}) and/or output and ground.

DELAY FEATURES

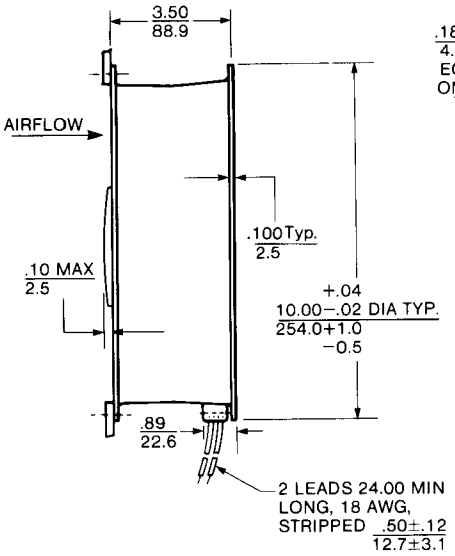
D = 10±4 second delay -- The failure signal is delayed approximately 10 seconds, thereby eliminating temporary or nuisance failure indication such as at fan start-up.

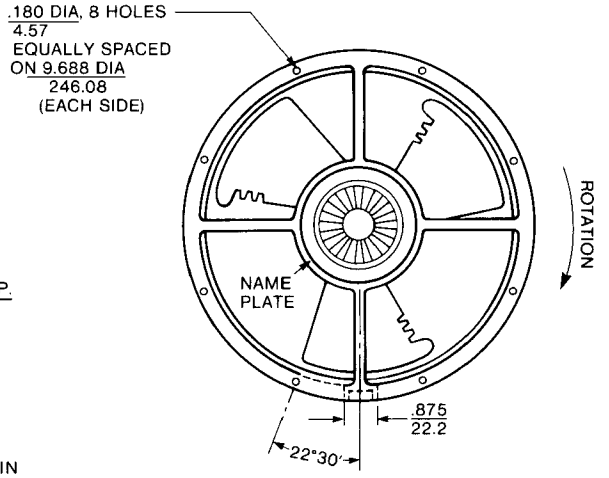
N = < 1 second delay

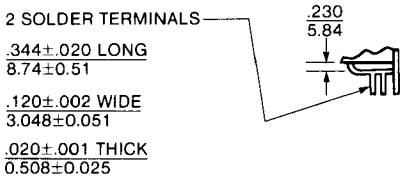
LATCH FEATURES

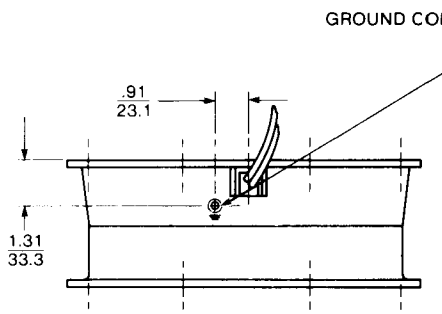
L = Latched -- Once the sensor outputs a failure signal, that signal is latched on even if the fan goes back into a pass condition. The latch is reset by interrupting the power to the FPS and the output load.

N = No Latch.









DIMENSIONS: in / mm ±
TOLERANCES: .xx= .03 / 0.8
.xxx=.010 / .25
ANGULAR±2°
(UNLESS NOTED)

(WILL FIT PLUG & CORD #428056 OR 550440)

RECOMMENDED CUTOUT DIAMETER: 9.12±.06 / 231.6±1.5 DIA

Specifications subject to change without notice.

MOTOR

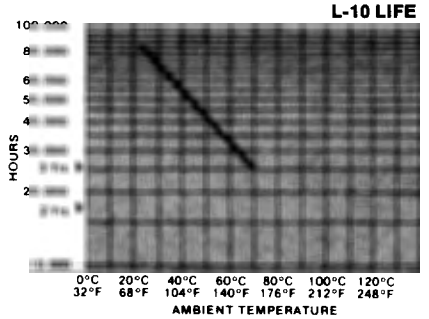
Shaded pole motor.
Class A insulation.
Automatic reset thermal protector.
Sealed ball bearings.
100% dielectric tested at 1800 VAC/1 sec./500 microamps maximum leakage.

CONSTRUCTION

Housing - single piece die cast aluminum, painted black.
Propeller and Terminal Block - Injection molded of flame retardant polycarbonate, black.

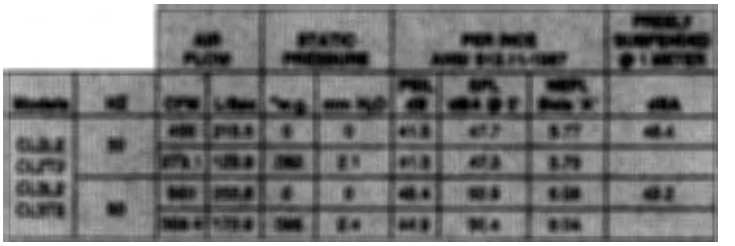
LIFE EXPECTANCY

The curve represents the continuous duty life of Caravel fans at a given temperature after which 90% of the units will still be operating.



EXAMPLE: When run at 40°C ambient, 90% of units will still be running after 54,000 continuous hours.

ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Capable of furnishing:
Terminals or leadwires
Harness assemblies — See page 106.

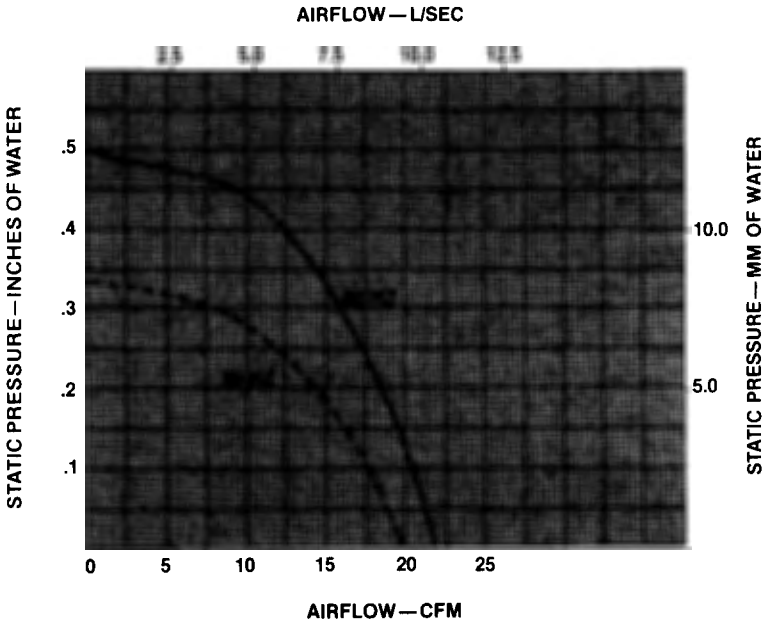
BISCUIT® AC

BLOWER

FEATURES

- ☐ Size - 4.75" square x 1.56" deep (120.6 mm x 39.6 mm)
- ☐ 22 CFM (10 L/Sec.)
- ☐ 115 VAC or 220/230 VAC, 1 phase, 50/60 Hz
- ☐ Low noise level
- ☐ Operating temperature range: −18°C to +60°C
- ☐ Weight - 18 oz. (.51 Kg)
- ☐ UL Yellow Card Recognized - File No. E31293
- ☐ CSA Certified - File No. LR52898

PERFORMANCE



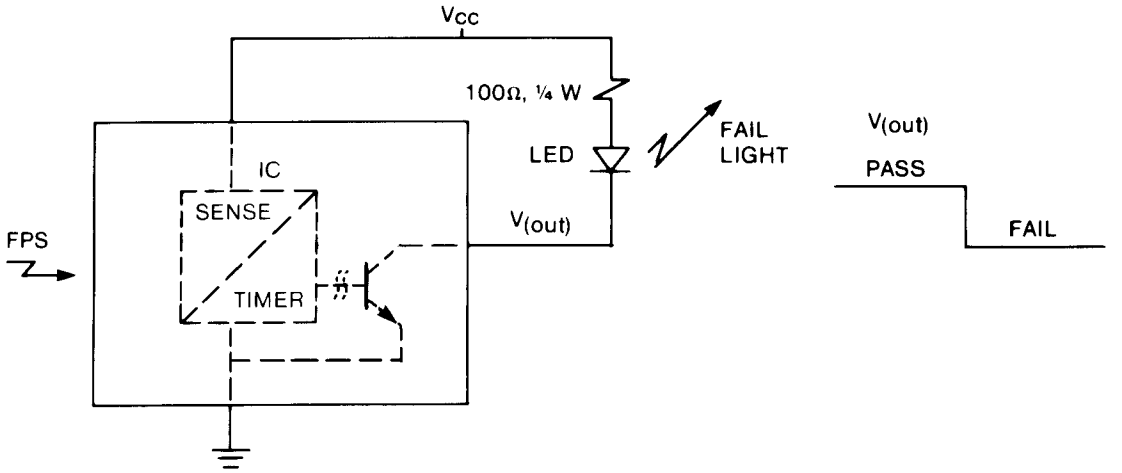
SPECIFICATIONS

Model No.	Part No.	Bearing	Volts	Hz	Watts	Line Amps	Locked Rotor Amps	RPM	CFM	L/Sec.
*BT2A1	028448	Sleeve	115	50/60	17/16	.19/.17	.22/.20	2500/2700	20/22	9.4/10
*BT2B1	028454	Ball	115	50/60	17/16	.19/.17	.22/.20	2520/2700	20/22	9.4/10
*BT3A1	028449	Sleeve	220/230	50/60	15/14	.09/.08	.11/.10	2500/2700	20/22	9.4/10
BT3B1	028732	Ball	200/230	50/60	15/14	.09/.08	.11/.10	2500/2700	20/22	9.4/10

*Distributor Item.

All figures are nominal free delivery values at sea level.

TYPICAL FPS APPLICATION EXAMPLE



CIRCUIT DESIGN

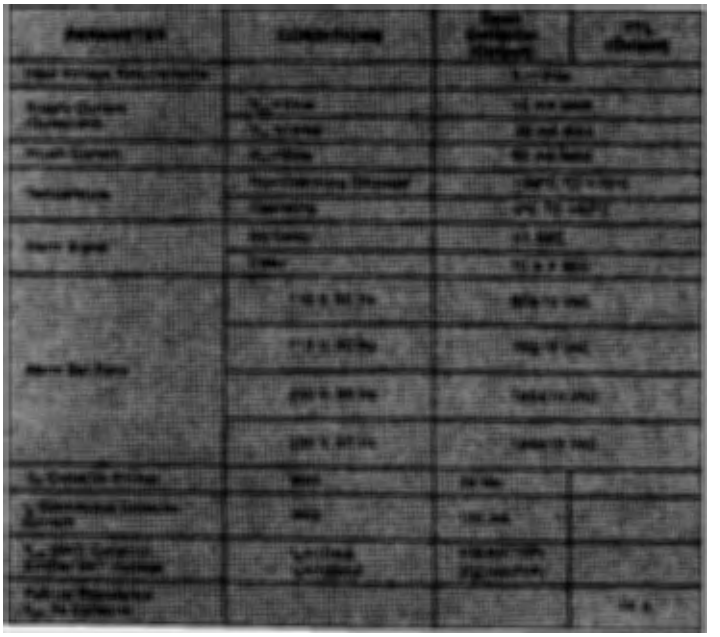
This circuit (above) utilizes the open collector output option with delay feature (10±4 seconds) and latch feature. The output signal is used to power one LED labelled to indicate failure. Failure indication is determined as a fan sees the equivalent of 80 VAC, 60 Hz. Rotational speed less than this nominal value may be caused by a reduced applied voltage to the fan, a physical obstruction impeding fan rotation or failure of the motor or bearing.

CIRCUIT OPERATION

The red FPS lead is applied to the FPS power source (+5 to +15 Vdc), the black FPS lead to ground, and the blue output lead as shown in the above schematic. Power is applied to the fan, which will start and reach full rotational speed (3350 RPM) in five to ten seconds. The delay feature specified in this example will not allow a failure indication on start-up unless the fan fails to reach the specified minimum operating point (80 VAC, 60 Hz.) within ten seconds. If the delay option had not been specified, the failure indicator would have been lit until the fan reached minimum operating level.

Should a failure occur or fan rotational speed drop below the minimum for more than ten seconds, the failure indicator would be illuminated. Should the fan then speed up above the minimum level the failure indicator would remain on. The latch feature maintains the failure indication until a system operator resets the FPS. The FPS is reset by interrupting the FPS supply voltage and output laod for more than 40 milliseconds. An advantage of this FPS design is the continual fan status indication. Because of the latch feature chosen in this example, the user need not constantly monitor the pass/fail LED indicators in order to determine if a failure has occurred.

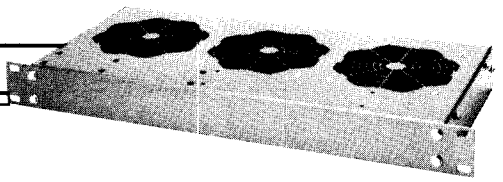
SPECIFICATIONS



NOTES:
1. Specifications presently cover FPS used on 115V or 230V full speed (2 pole) design only. For information on half speed (4 pole) design, contact factory.
2. Sample discussed above mentions voltages that only pertain to 115V models.

MODULAIR® MB 100 AC

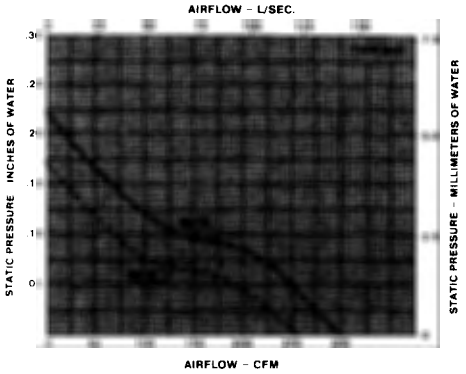
CABINET BLOWER



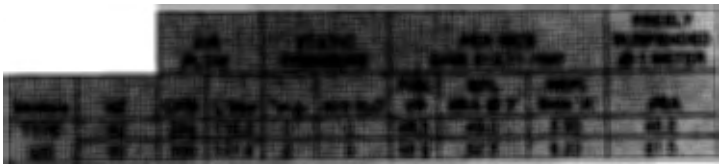
FEATURES

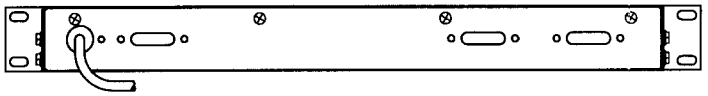
- ☐ 300 CFM (142 L/Sec.)
- ☐ Performance of Rotron's Muffin® fans
- ☐ Fits EIA 19″ rack cabinets
- ☐ Now available in 230 VAC; 12, 24, 48 VDC; reverse flow; and slow speed versions

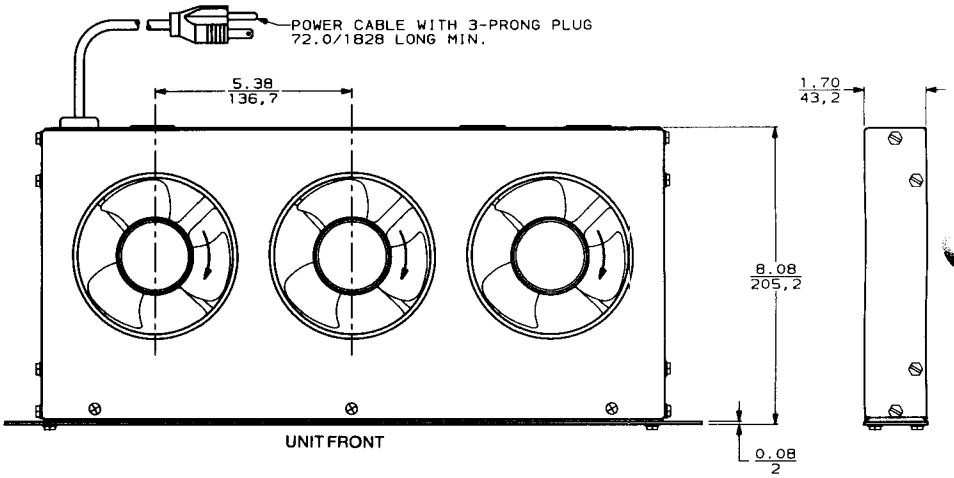
PERFORMANCE

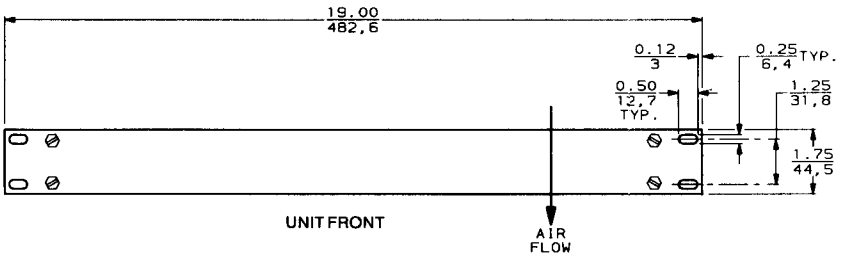


ACOUSTIC RATINGS (for definitions see page 5)









SPECIFICATIONS

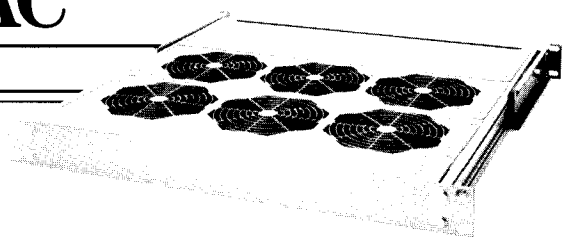
Type	Part No.	No. Fans	Bearing	Weight lb. (Kg)	Volts	Hz	Watts	Line Amps	RPM	CFM	L/Sec.
*320	031038	3	Sleeve	9.0(4.3)	115	50/60	54/44	.60/.54	2700/3100	250/300	118/142

* Distributor Item.

All figures are nominal free delivery values at sea level.

MODULAIR® MB 1000 AC

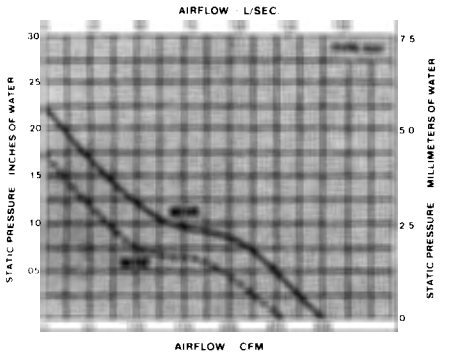
CABINET BLOWER

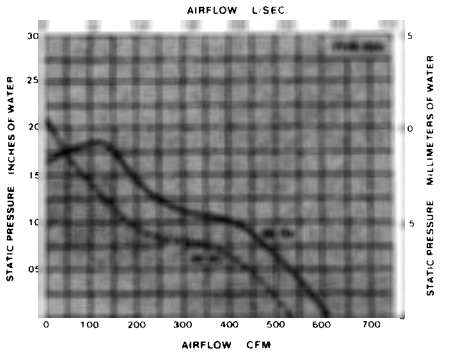


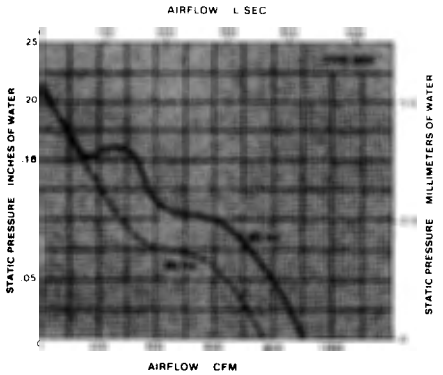
FEATURES

- ☐ 300, 600, to 900 CFM (142, 283 or 425 L/Sec.)
- ☐ Performance of Rotron's Muffin™ fans
- ☐ Each 3-fan strip may be mounted in any of these locations
- ☐ Fits EIA 19″ rack cabinets
- ☐ Now available in 230 VAC; 12, 24, 48 VDC; reverse flow; and slow speed versions

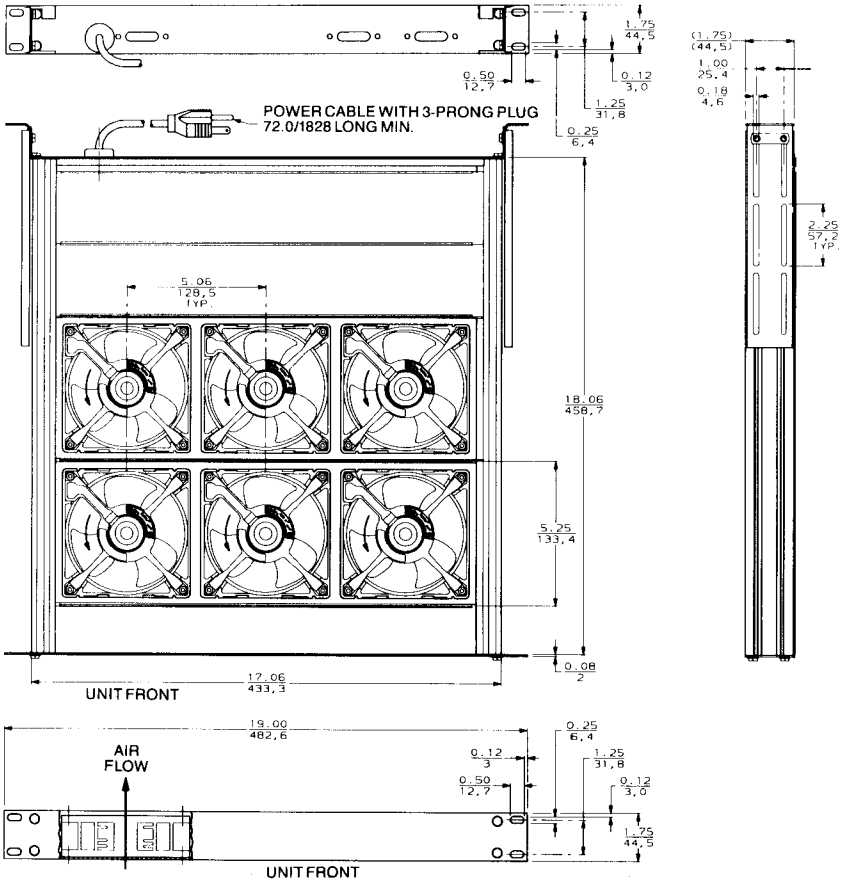
PERFORMANCE







ACOUSTIC RATINGS (for definitions see page 5)



FAN LOCATIONS	REAR TRAY	MIDDLE TRAY	FRONT TRAY
TYPE 520	3 FANS	NONE	NONE
TYPE 820	3 FANS	3 FANS	NONE
TYPE 920	3 FANS	3 FANS	3 FANS

SPECIFICATIONS

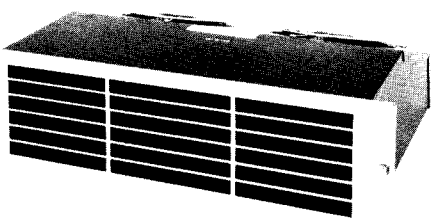
Type	Part No.	No. Fans	Bearing	Weight lb. (Kg)	Volts	Hz	Watts	Line Amps	RPM	CFM	L/Sec.
*520	036368	3	Sleeve	8(3.6)	115	50/60	54/44	.60/.54	2700/3100	250/300	118/142
*820	036367	6	Sleeve	10(4.5)	115	50/60	108/87	1.2/1.1	2700/3100	530/600	250/283
*920	036366	9	Sleeve	13(5.9)	115	50/60	162/130	1.8/1.6	2700/3100	800/900	378/425

* Distributor Item.

All figures are nominal free delivery values at sea level.

MODULAIR® MB 5100 AC

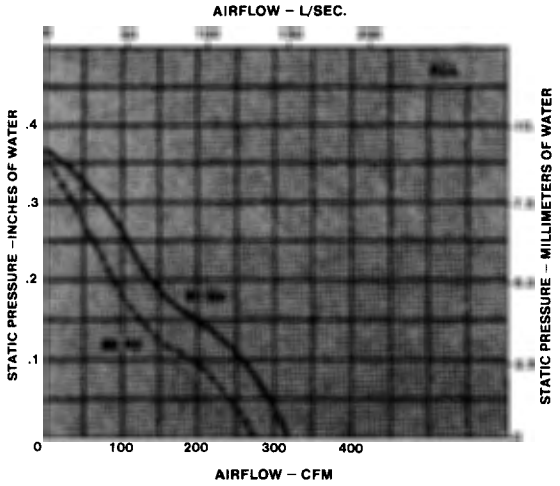
CABINET BLOWER



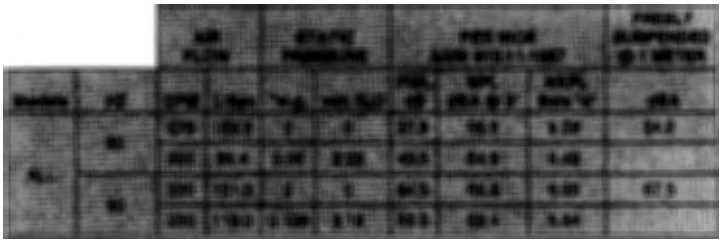
FEATURES

- ☐ 320 CFM (151 L/Sec.)
- ☐ Performance of two Feather® fans
- ☐ Six years continuous duty at 25°C
- ☐ Fits EIA 19″ rack cabinets
- ☐ Weight 13 lb. (5.9 Kg)

PERFORMANCE

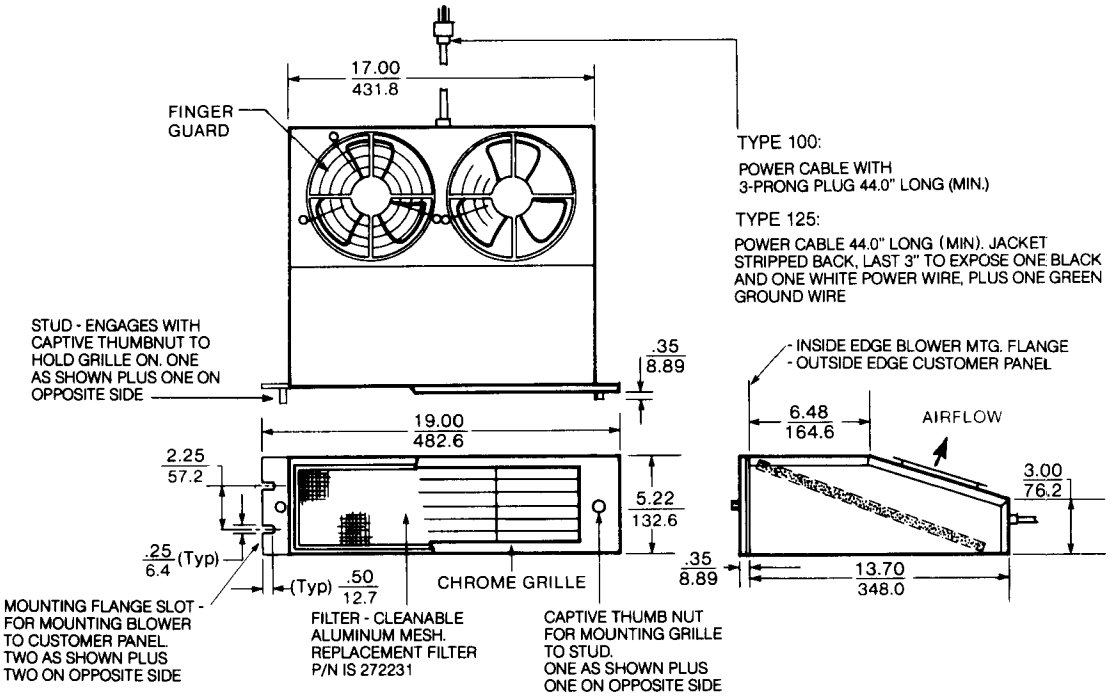


ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

Available with Patriot Fans - Model MB5200
For information regarding non-standard designs, consult Application Engineering Department.



SPECIFICATIONS

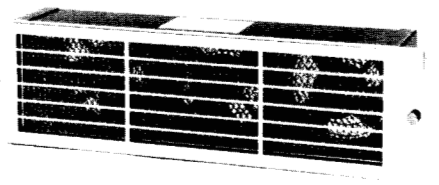
Type	Part No.	No. Fans	Bearing	Volts	Hz	Watts	Line Amps	RPM	CFM	L/Sec.
*100	020099	2	Ball	115	50/60	44/44	.40/.40	2830/3350	275/320	130/151
*125	020100	2	Ball	220/230	50/60	44/44	.19/.19	2830/3350	275/320	130/151

* Distributor Item.

All figures are nominal free values at sea level.

MODULAIR® MB 9100 AC

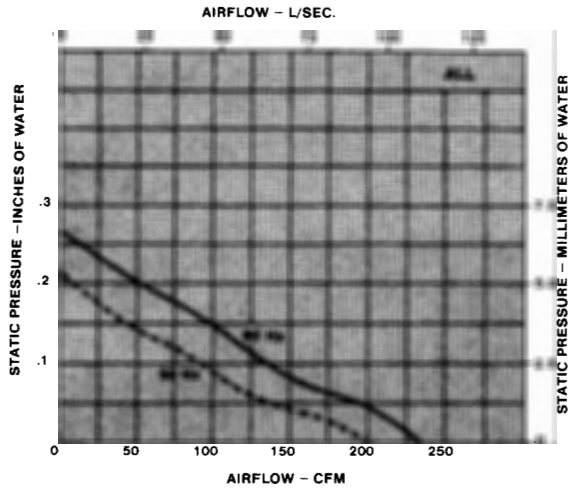
CABINET BLOWER



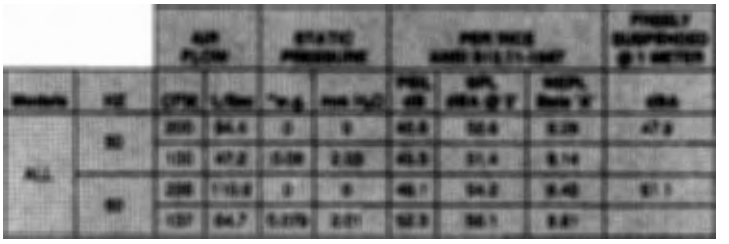
FEATURES

- ☐ 235 CFM (110 L/Sec.)
- ☐ Performance of three Muffin® fans
- ☐ Ten years continuous duty at 25°C
- ☐ Fits E1A 19" rack cabinets
- ☐ Weight - 8 lbs. (3.6 Kg.)

PERFORMANCE

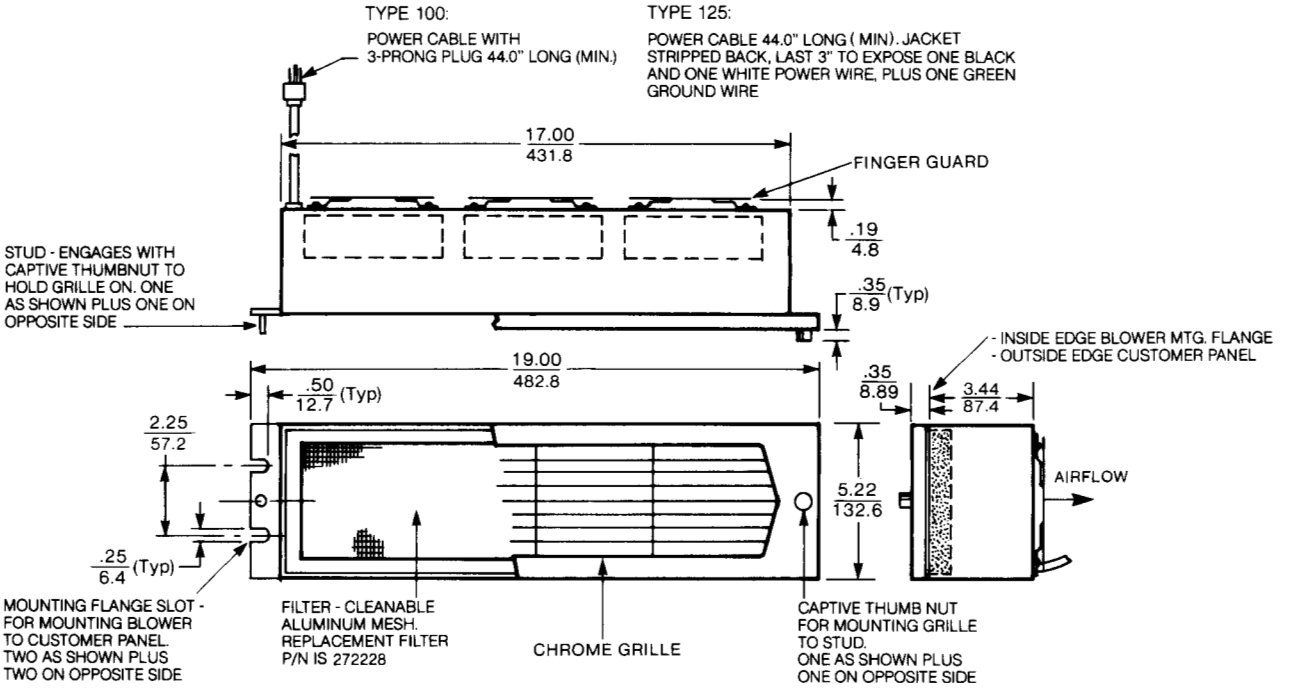


ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

For information regarding non-standard designs, consult Application Engineering Department.



SPECIFICATIONS

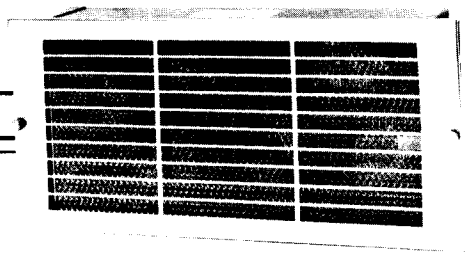
Type	Part No.	No. Fans	Bearing	Volts	Hz	Line Watts	Amps	RPM	CFM	L/Sec.
*100	024475	3	Sleeve	115	50/60	54/44	.66/.54	2700/3100	200/235	95/110
*125	024476	3	Sleeve	220/230	50/60	54/44	.35/.30	2700/3100	200/235	95/110

* Distributor Item.

All figures are nominal free values at sea level.

MODULAIR® MB 9200 AC

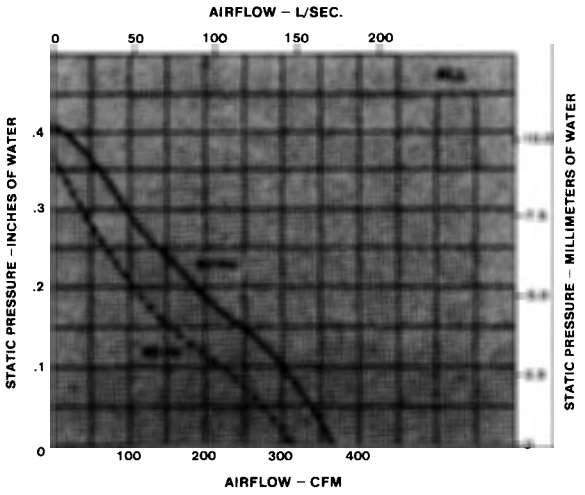
CABINET BLOWER



FEATURES

- ☐ 370 CFM (175 L/Sec.)
- ☐ Performance of two Feather® fans
- ☐ Six years continuous duty at 25°C
- ☐ Fits EIA 19″ rack cabinets
- ☐ Weight - 9 lbs. (4.1 Kg.)

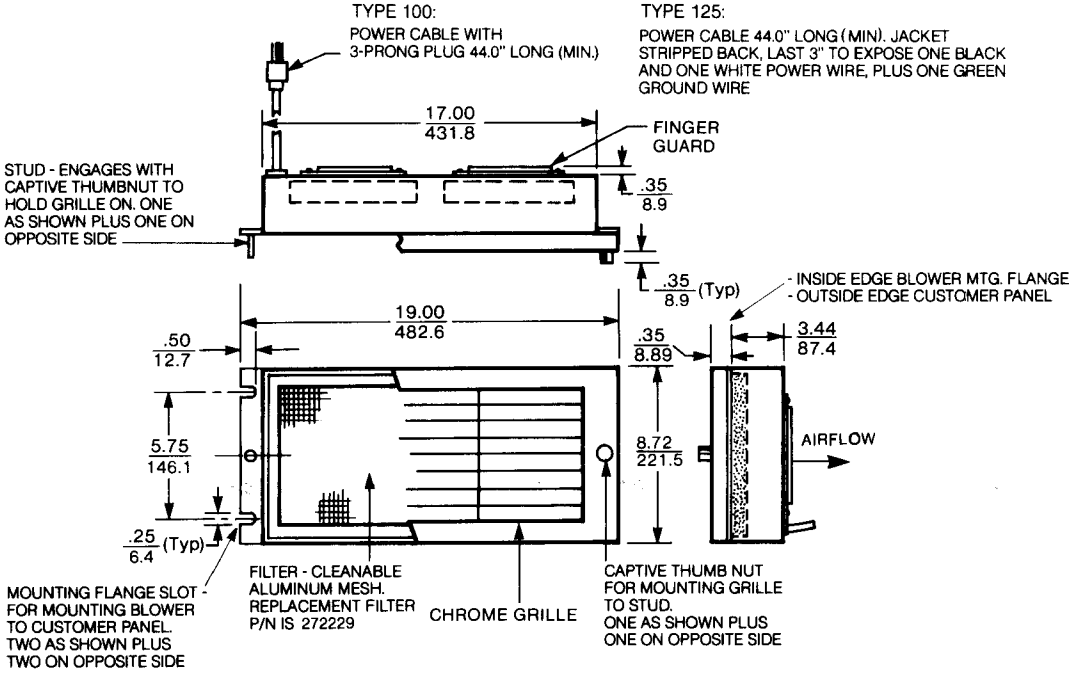
PERFORMANCE



ACOUSTIC RATINGS (for definitions see page 5)

OPTIONS

For information regarding non-standard designs, consult Application Engineering Department.



SPECIFICATIONS

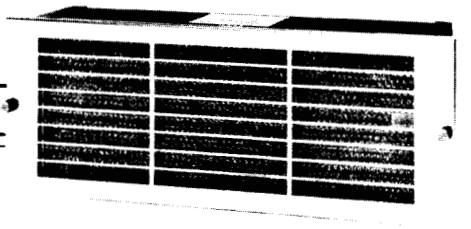
Type	Part No.	No. Fan	Bearing	Volts	Hz	Line Watts	Amps	RPM	CFM	L/Sec.
*100	024488	2	Ball	115	50/60	44/44	.40/.40	2830/3350	310/370	146/175
*125	024489	2	Ball	220/230	50/60	44/44	.19/.19	2830/3350	310/370	146/175

* Distributor Item.

All figures are nominal free delivery values at sea level.

MODULAIR® MB 9300 AC

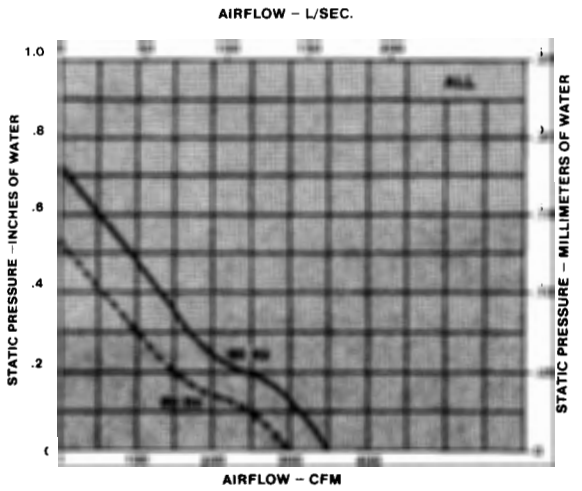
CABINET BLOWER



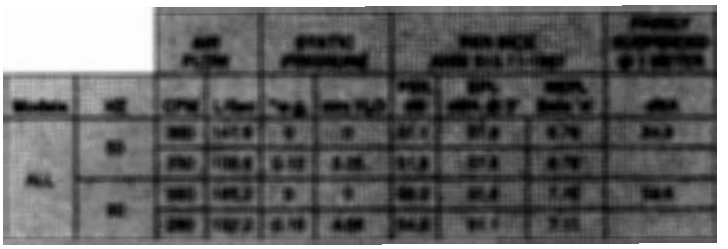
FEATURES

- ☐ 350 CFM (165 L/Sec.)
- ☐ Performance of two Major® fans
- ☐ Five years continuous duty at 25°C
- ☐ Fits EIA 19" rack cabinets
- ☐ Weight - 9.5 lbs. (4.3 Kg.)

PERFORMANCE

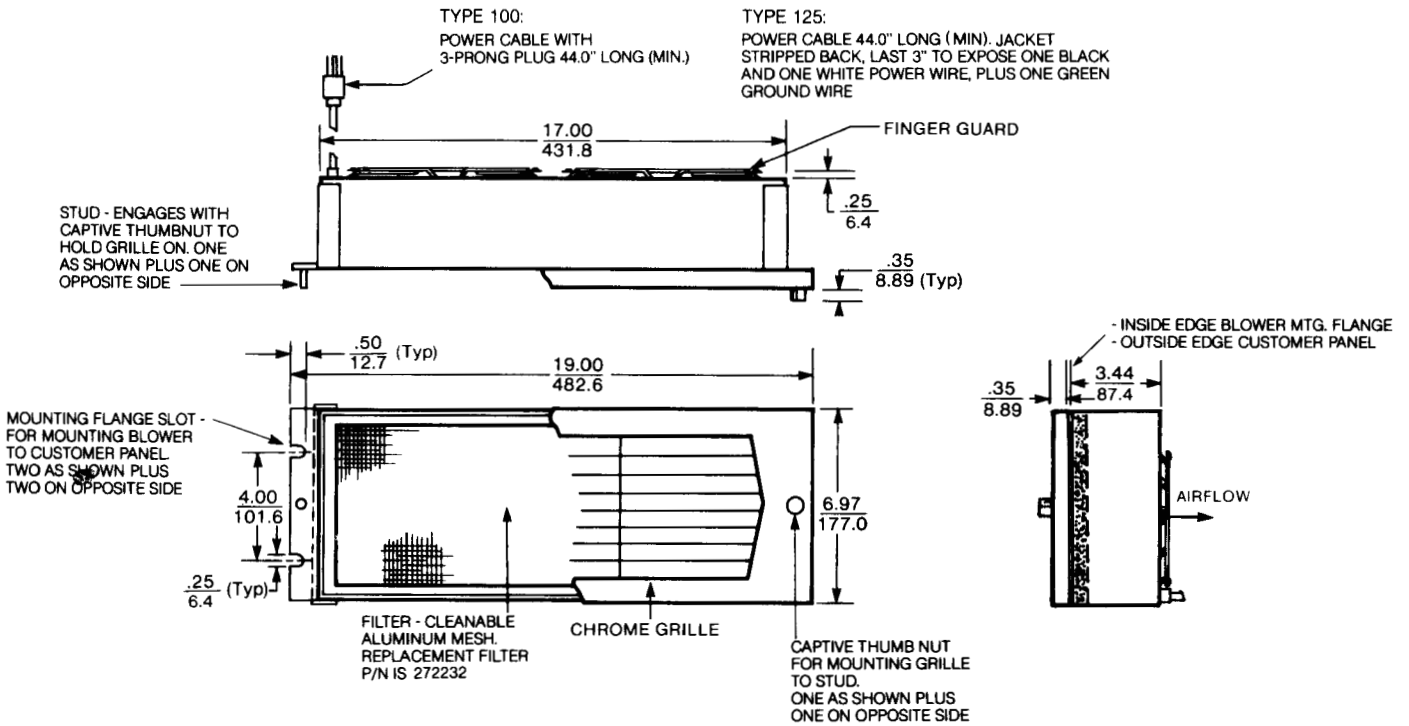


ACOUSTIC RATINGS (for definitions see page 5)



OPTIONS

For information regarding non-standard designs, consult Application Engineering Department.
Available with Patriot Fans - Model MB9400



SPECIFICATIONS

Type	Part No.	No. Fan	Bearing	Volts	Hz	Watts	Line Amps	RPM	CFM	L/Sec.
*100	027384	2	Ball	115	50/60	68/68	.64/.54	2850/3350	300/350	142/165
*125	029069	2	Ball	220/230	50/60	68/68	.35/.30	2850/3350	300/350	142/165

*Distributor Item

All figures are nominal free values at sea level.

NOTES

ACCESSORY GUIDE

		FLIGHT II 60	FLIGHT II 80	SPRINT DC	SPRITE DC	FLIGHT II 90	FLIGHT II 120	MUFFIN DC	WHISPER XL DC	MUFFIN XL DC	GALAXY DC	MAJOR DC	PATRIOT DC	BISCUIT DC	SPRITE	WHISPER	WHISPER XL	MUFFIN	MUFFIN XL	MAJOR	PATRIOT	FEATHER	CARAVEL	TARZAN	BISCUIT	MB5100	MB9100	MB9200	MB9300
FILTERS	**PART NO**																												
Replacement Filter	272228																										●		
Replacement Filter	272229																											●	
Replacement Filter	272231																									●			
Replacement Filter	272232																												●
Filter Assembly	477712																●		●										
Filter Assembly	551590									●	●						●	●	●	●									
Filter Guard Assembly (30 PPI)	557239	●																											
Filter Guard Assembly (45 PPI)	557240	●																											
Filter Guard Assembly (30 PPI)	554141		●	●	●											●													
Filter Guard Assembly (45 PPI)	554142		●	●	●											●													
Filter Guard Assembly (30 PPI)	557218					●																							
Filter Guard Assembly (45 PPI)	557219					●																							
Filter Guard Assembly (30 PPI)	554148						●	●	●	●							●	●	●	●									
Filter Guard Assembly (45 PPI)	554149						●	●	●	●							●	●	●	●									
GRILLES & GUARDS																													
Grille (Spiral)	476015																●		●										
Grille (Expanded Metal)	477727																●		●										
Grille Assembly	478031																●		●										
Screen Guard	550214						●	●	●	●							●	●	●	●									
FINGER GUARDS																													
Finger Guard (Metal)	476042						●	●	●	●							●	●	●	●									
Finger Guard (Metal)	476136																							●					
Finger Guard (Metal)	476143		●	●	●											●													
Finger Guard (Metal)	476323																						●						
Finger Guard (Metal) Rim Mount	476646																					●							
Finger Guard (Metal) Panel Mount	476651																					●							
Finger Guard (Metal)	477626														●										●				
Finger Guard (Metal)	550272												●								●								
Finger Guard (Plastic)	550481						●	●	●	●							●	●	●	●									
Finger Guard (Plastic)	550648		●	●	●											●													
Finger Guard (Plastic)	551147						●	●	●	●							●	●	●	●									
Finger Guard (Plastic)	550651										●																		
Finger Guard (Metal)	551199													●								●							
Finger Guard (Metal)	552934						●	●	●	●							●	●	●	●									
Finger Guard (Metal)	554172					●																							
Finger Guard (Metal)	572621	●																											
Finger Guard (Metal)	557216										●																		
MOUNTING CLIPS																													
Mounting Clips (Bag of 3)	476154																					●							
#6-32 Flush Mounting Clips	477663												●	●			●		●		●	●							
#6-32 Standoff Mounting Clips	477670												●	●			●		●		●	●							
#6-32 Mounting Clips	550113									●	●	●						●		●									
Mounting Clips (Filter/Grille Assembly)	271016																●		●										
PLUG & CORD SETS																													
Straight On Plug and Cord	428023																					●							
Right Angle Plug and Cord	428056															●	●	●	●	●	●	●		●	●	●			
Straight On Plug and Cord	550440															●		●		●	●	●		●	●	●			
Polarized Right Angle Plug and Cord	571064				●				●	●	●																		

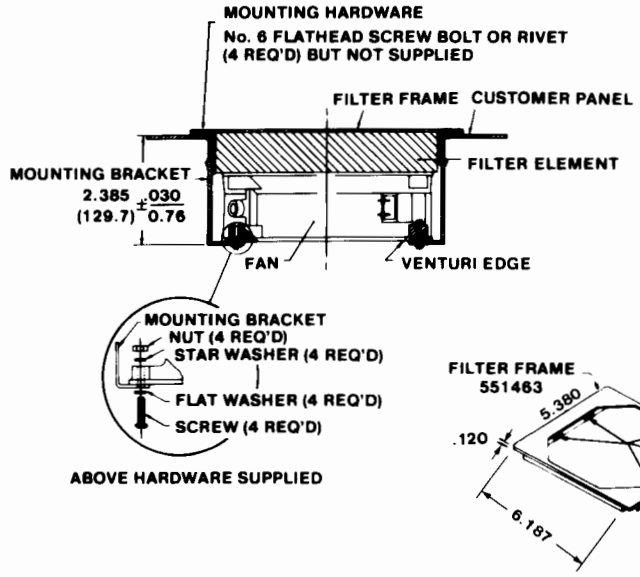
ACCESSORIES

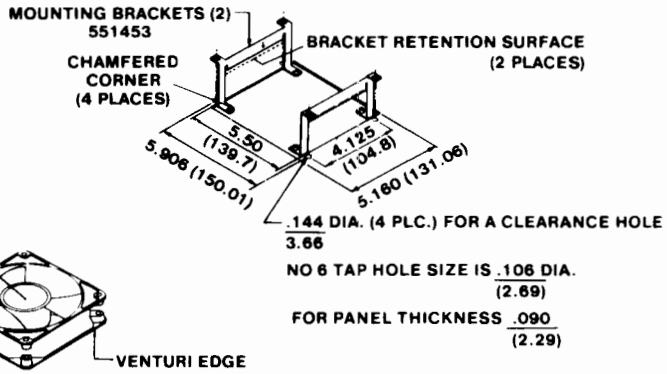
ACCESSORIES

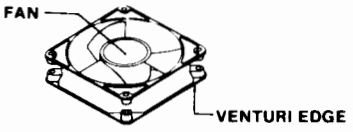
Filter Assembly (Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL)
Part No. 551590

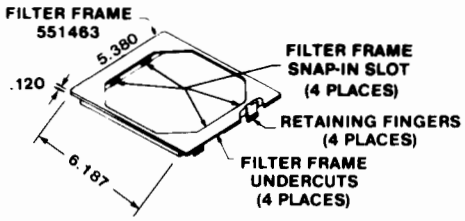
Consists of:
551463 Filter Frame
551494 Filter Element
551453 Mounting Brackets

Recommended cut-out 5.5" x 5.16"







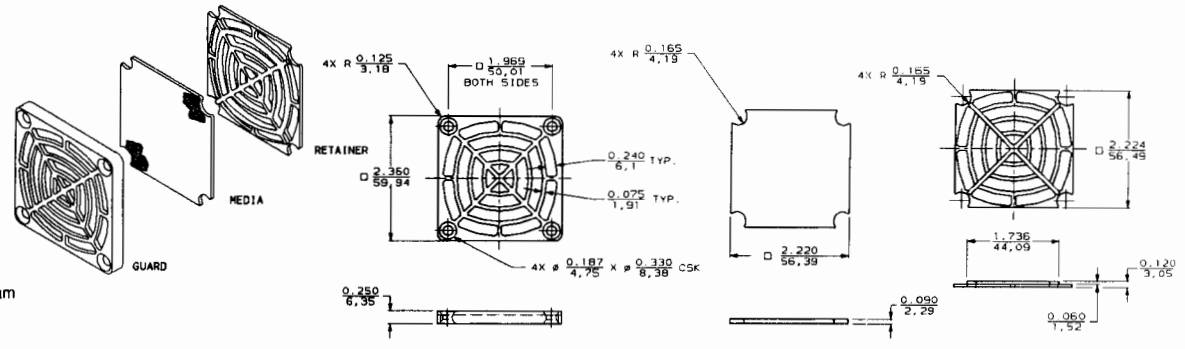


Note: Filters reduce airflow; i.e. a MX2A3's airflow would be reduced to about 87 CFM with P/N 551590 on fan's inlet at 115VAC, 60 Hz.

TOLERANCE: ± .015 (0.38) ON ALL LINEAR DIMENSIONS

Filter Guard Assemby (Flight 60)
Part No. 557239

30 PPI* Replacement Filter Element
Part No. 557241 (pack of 5)
Also available with 45 PPI Filter
Part No. 557240
45 PPI Replacement Filter Element
Part No. 557242 (pack of 5)
Retainer and guard UL94V-0 plastic
Filter element (media) polyurethane foam

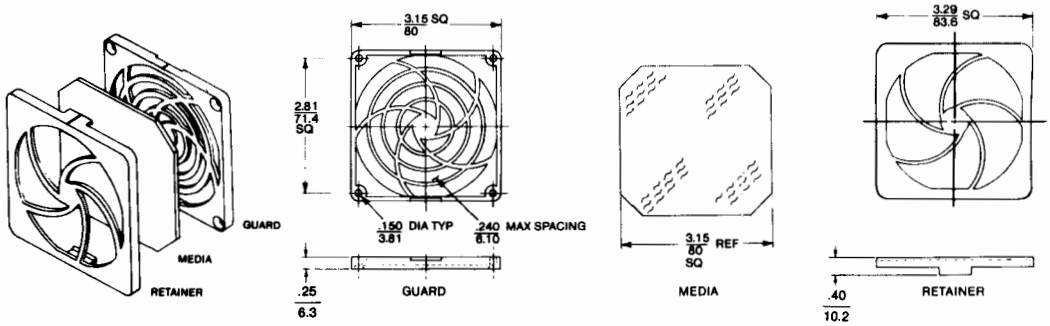


Note: Filters reduce airflow
* PPI denotes "pores per inch"

TOLERANCE B (see page 105)

Filter Guard Assembly (Flight 80, Sprint DC, Sprite DC, Sprite)
Part No. 554141

30 PPI * Replacement Filter Element
Part No. 554139 (Pack of 5)
Also available with 45 PPI Filter
Part No. 554142
45 PPI Replacement Filter Element
Part No. 554140 (Pack of 5)
Retainer and guard UL94V-0 plastic
Replacement filter element (media)
polyurethane foam



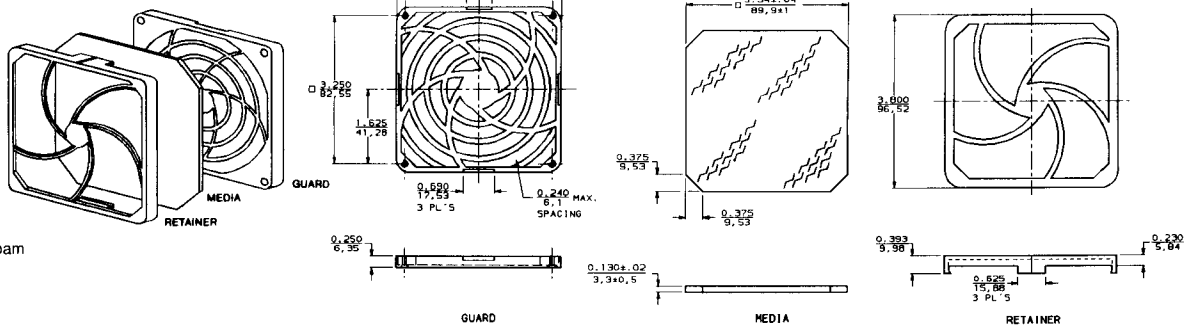
Note: Filters reduce airflow; i.e. a ST12A3's airflow would be reduced to about 25 CFM with P/N 554141 on fan's inlet at 12VDC.

*PPI denotes "pores per inch"

TOLERANCE B (see page 105)

Filter Guard Assembly (Flight 90)
Part No. 557218

30 PPI* Replacement Filter Element
Part No. 557220 (pack of 5)
Also available with 45 PPI Filter
Part No. 557219
45 PPI Replacement Filter Element
Part No. 557221 (pack of 5)
Retainer and guard UL94V-0 plastic
Filter element (media) polyurethane foam

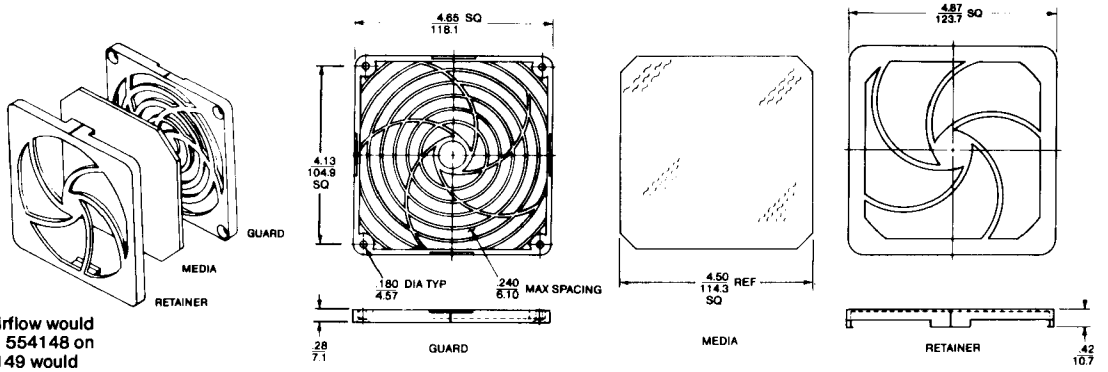


Note: Filters reduce airflow
* PPI denotes "pores per inch"

TOLERANCE B (see page 105)

Filter Guard Assembly (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL)
Part No. 554148

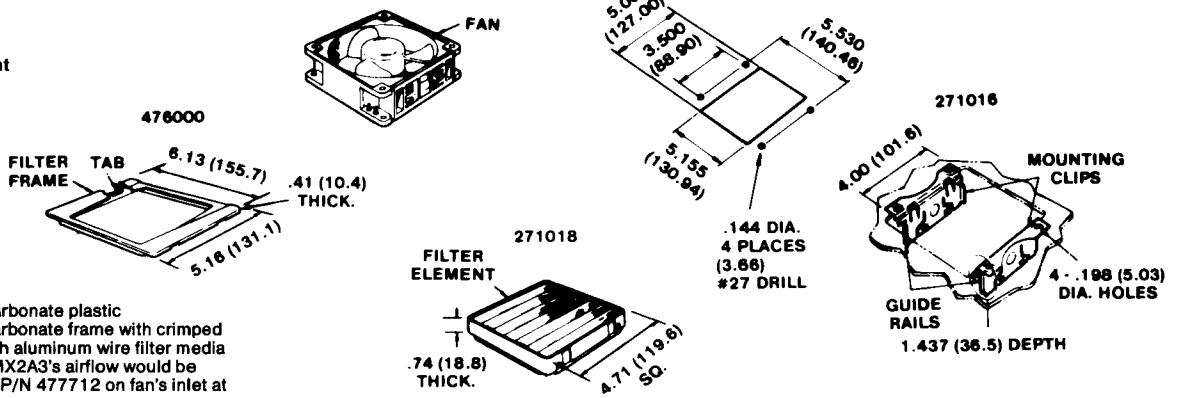
30 PPI * Replacement Filter Element
Part No. 554146 (Pack of 5)
Also available with 45 PPI Filter
Part No. 554149
45 PPI Replacement Filter Element
Part No. 554147 (Pack of 5)
Retainer and guard UL94V-0 plastic
Replacement filter element (media)
polyurethane foam



Note: Filters reduce airflow; i.e. a MX2A3's airflow would be reduced to about 75 CFM with P/N 554148 on fan's inlet at 115VAC, 60 Hz. P/N 554149 would reduce airflow to about 68 CFM.
*PPI denotes "pores per inch"

TOLERANCE B (see page 105)

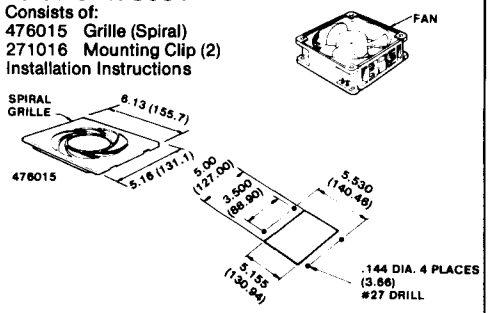
Filter Assembly (Whisper, Muffin)
Part No. 477712
Consists of:
476000 Filter Frame
271018 Washable Filter Element
271016 Mounting Clip (2)
Installation Instructions



Materials: 476000 Black polycarbonate plastic
271018 Black polycarbonate frame with crimped 18 x 14 mesh aluminum wire filter media
Note: Filters reduce airflow; i.e. MX2A3's airflow would be reduced into about 82 CFM with P/N 477712 on fan's inlet at 115VAC, 60 Hz (UP).

TOLERANCE A (see page 105)

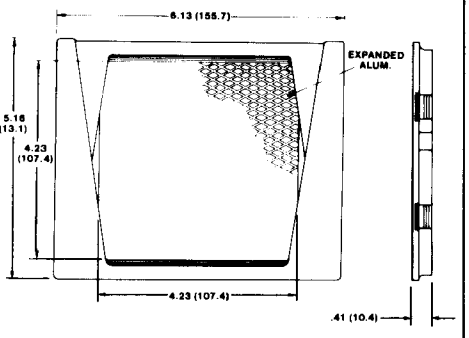
Grille Kit (Whisper, Muffin)
Part No. 478031
Consists of:
476015 Grille (Spiral)
271016 Mounting Clip (2)
Installation Instructions



Materials: Grille—High Impact Polycarbonate Plastic
Clips—.020 (0.5) Thick Spring Steel, black phosphate finish

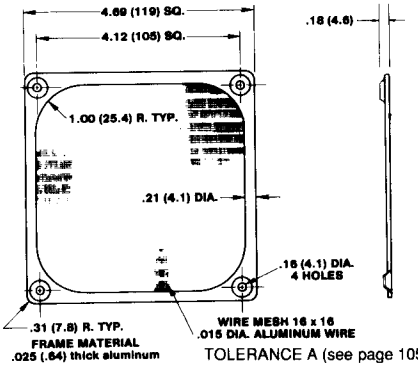
TOLERANCE: ±.015 (0.38) ON ALL LINEAR DIMENSIONS

Metal Grille (Whisper, Muffin)
Part No. 477727
Expanded aluminum mesh - snaps onto fan venturi with use of Part No. 271016 mounting clips. (2 REQ'D)



TOLERANCE A (see page 105)

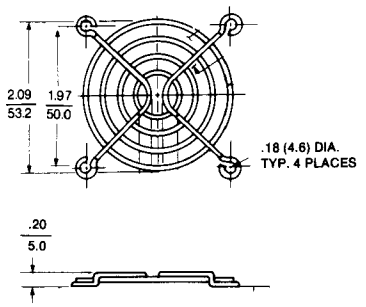
Screen Guard (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL)
Part No. 550214



TOLERANCE A (see page 105)

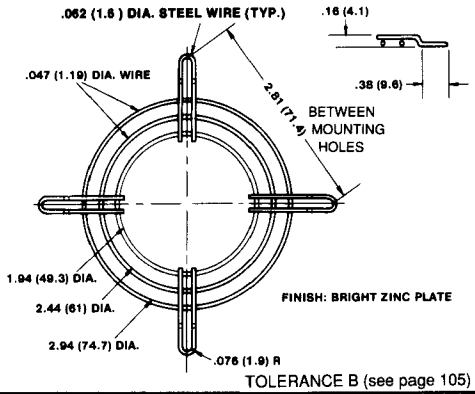
Finger Guard (Flight 60)
Part No. 572621

Steel wire, .062 dia., welded and nickel chrome finish
meets UL, CSA .250/6.35 spacing



TOLERANCE B (see page 105)

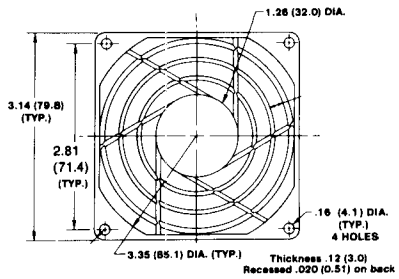
Finger Guard (Flight 80, Sprint DC, Sprite DC, Sprite)
Part No. 476143



TOLERANCE B (see page 105)

Finger Guard (Flight 80, Sprint DC, Sprite DC, Sprite)
Part No. 550648

Meets UL, CSA .250/6.35 spacing



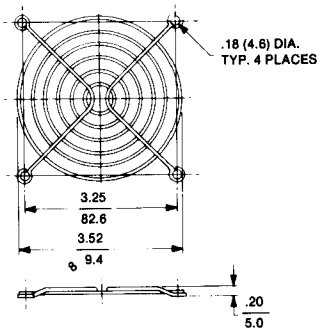
Material: Fiberite RTP 305 glass reinforced polycarbonate or GE Valox 420 polyester rated UL94V-0

Color: Black

TOLERANCE A (see page 105)

Finger Guard (Flight 90)
Part No. 554172

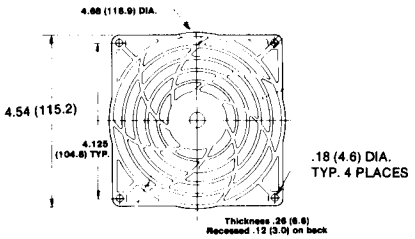
Steel wire, .062 dia., welded and nickel chrome finish
Meets UL, CSA .250/6.35 spacing



TOLERANCE B (see page 105)

Finger Guard (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL, Skeleton)
Part No. 551147

Meets UL, CSA .250/6.35 spacing



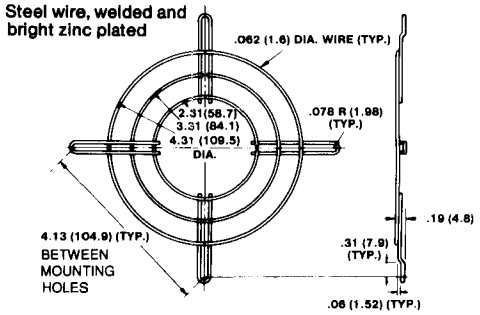
Material: Fiberite RTP 305 glass reinforced polycarbonate or GE Valox 420 polyester rated UL94V-0

Color: Black

TOLERANCE A (see page 105)

Finger Guard (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL, Skeleton)
Part No. 476042

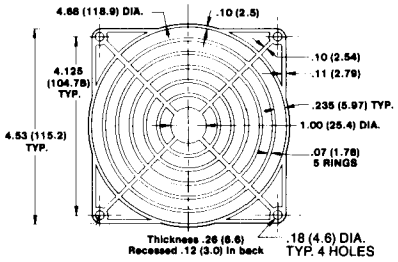
Steel wire, welded and bright zinc plated



TOLERANCE B (see page 105)

Finger Guard (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL, Skeleton)
Part No. 550481

Meets UL, CSA .250/6.35 spacing



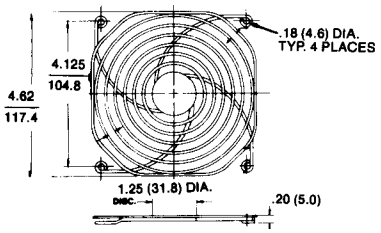
Material: Lexan 500 glass reinforced polycarbonate rated UL94V-0

Color: Black

TOLERANCE A (see page 105)

Finger Guard (Flight 120, Muffin DC, Whisper XL DC, Muffin XL DC, Whisper, Whisper XL, Muffin, Muffin XL, Skeleton)
Part No. 552934

Meets UL, CSA .250/6.35 spacing

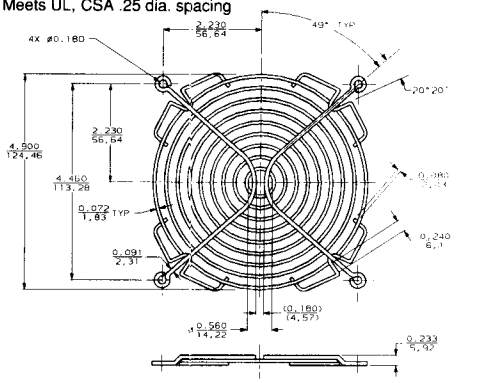


Material: Center Disc: .03 (0.76) THK. C.R.S.
Wire Rings: .062 (1.57) DIA. STEEL
Supports: .080 (2.03) DIA. STEEL
Finish: Bright Zinc Plate with Chromate Treatment

TOLERANCE B (see page 105)

Finger Guard (Galaxy)
Part No. 557216

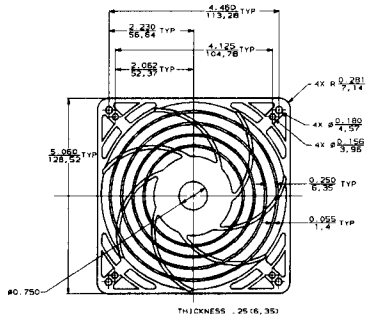
Made of steel wire finished in bright zinc
Meets UL, CSA .25 dia. spacing



TOLERANCE B (see page 105)

Finger Guard (Galaxy)
Part No. 550651

Material: RTP 305 glass reinforced polycarbonate or GE Valox 420 polyester
UL Rating 94V-0

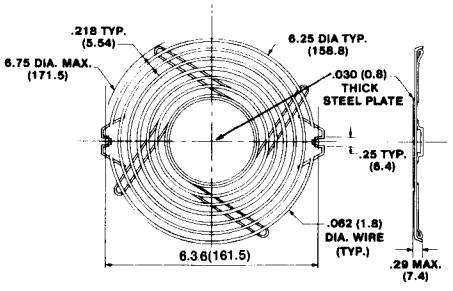


Color: Black

TOLERANCE A (see page 105)

Finger Guard (Patriot DC, Patriot)
Part No. 551199

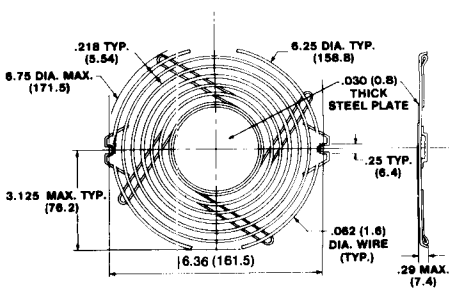
Steel wire, welded and bright zinc plated.
Meets UL, CSA .250/6.35 spacing



TOLERANCE B (see page 105)

Finger Guard (Major DC, Major)
Part No. 550272

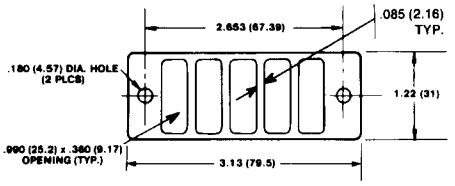
Steel wire, welded and bright zinc plated
Meets UL, CSA .250/6.35 spacing



TOLERANCE B (see page 105)

Finger Guard (Biscuit DC, Biscuit)
Part No. 477626

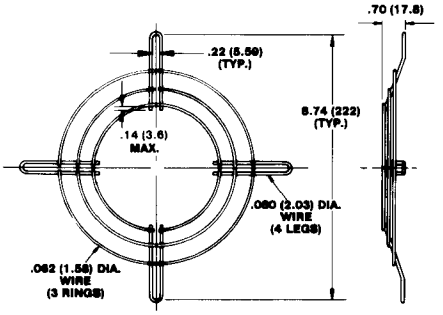
.030 (.76) thick type 302 stainless steel. Screws onto outlet of blower with (2) 8-32 machine screws (not supplied)



TOLERANCE A (see below)

Finger Guard (Tarzan)
Part No. 476136

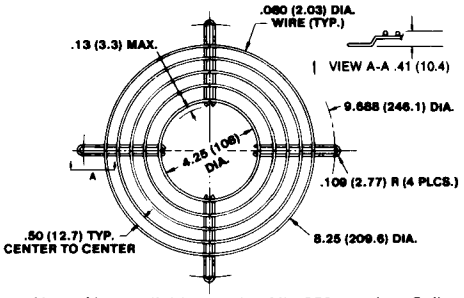
Made of steel wire finished in nickel chrome



TOLERANCE B (see below)

Finger Guard (Caravel)
Part No. 476323

Made of steel wire finished in bright zinc. Mounts using #8 machine screws in the 4 legs equally spaced on 9.688 (246.1) dia.

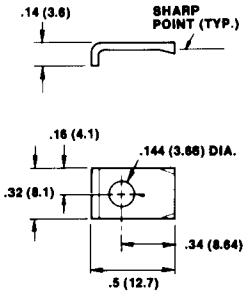


Note: Also available meeting UL .250 spacing. Call factory for specifications on P/N 555985

TOLERANCE B (see below)

Mounting Clip (Feather)
Part No. 476154 (set of 3)

Used with #4 machine screws. Three clips packed in a bag.

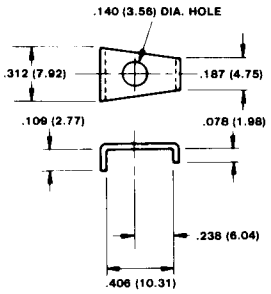


Material: .048 (1.24) thick steel, zinc plated

TOLERANCE B (see below)

Guard Mounting Clips (Feather)
Part No. 476649

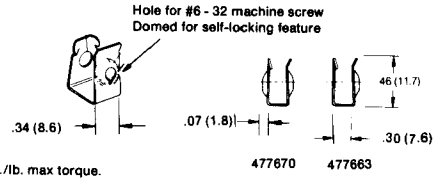
For flush mount of fan onto customer panel, holding flush mount guard no. 476651 to panel. See page 75 for installation details



TOLERANCE B (see below)

Mounting Clips (Major DC, Patriot DC, Whisper, Muffin, Major, Patriot)
Part No. 477663 (Flush)
477670 (Standoff)

Fits over .25/6.35 mounting flanges of above fans



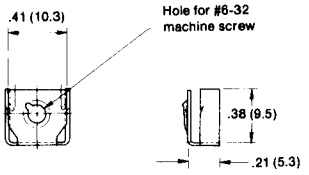
5 in./lb. max torque.

Material: .017 (.43) thick tempered spring steel
Finish: Black phosphate with oil dip

TOLERANCE B (see below)

Mounting Clips (Whisper XL DC, Muffin XL DC, Whisper XL, Muffin XL)
Part No. 550113

Fits over mounting boss of above fans

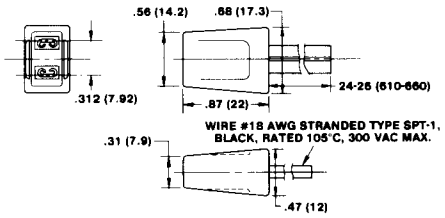


5 in./lb. max torque.

Material: .017 (.43) thick tempered spring steel
Finish: Black phosphate with oil dip

TOLERANCE B (see below)

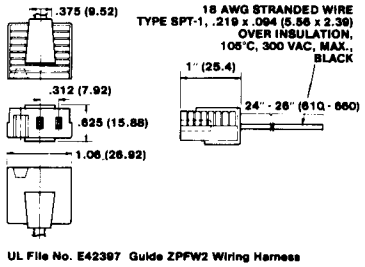
Plug & Cord (Sprite DC, Sprite, Whisper XL, Muffin XL, Skeleton, Major, Patriot, Caravel, Tarzan, Biscuit)
Part No. 550440



UL File No. E42397
GUIDE ZPFW2 Wiring Harness
CSA File No. LR45371

TOLERANCE A (see below)

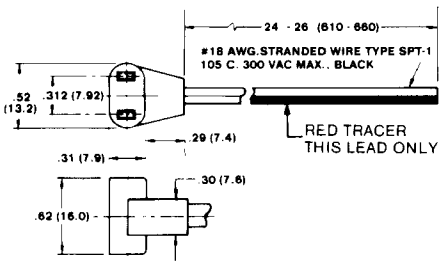
Plug & Cord (Feather)
Part No. 428023



UL File No. E42397 Guide ZPFW2 Wiring Harness

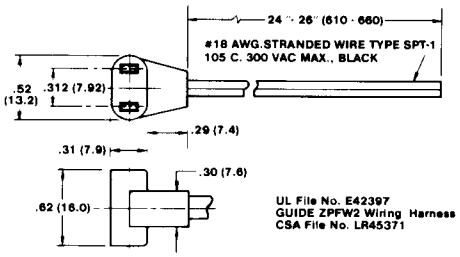
TOLERANCE A (see below)

Plug & Cord (Sprite DC, Galaxy DC, Whisper XL DC, Muffin XL DC)
Polarized with red tracer
Part No. 571064



TOLERANCE B

Plug & Cord (Sprite DC, Sprite, Whisper, Whisper XL, Muffin, Muffin XL, Skeleton, Major, Patriot, Caravel, Tarzan, Biscuit)
Part No. 428056



UL File No. E42397
GUIDE ZPFW2 Wiring Harness
CSA File No. LR45371

TOLERANCE B

TOLERANCE A: .XX = ± .03 (0.8)
.XXX = ± .010 (0.25)

TOLERANCE B: .XX = ± .05 (1.3)
.XXX = ± .015 (0.38)

CONNECTORS:

Connectors By Manufacturer And Part Number

Below is a list of connectors currently being supplied on fan or blower leads by Comair Rotron. Tooling is presently in-house and typically some inventory is available. Other connectors may be selected, however, tooling and connector availability may affect leadtimes.

AMP INC.

Mfg. P/N	Comair Rotron P/N
31269	160077
2-31882-3	200300
2-31882-3 (INSULATED)	200200
31885	551521
31886	552110
31889	160079
2-31889-3	165006
31891	160403
31894	160352
34080	160320
36954	551522
40724	551171
40725	160402
41772	160073
42037-0	160374
42068-1	160337
42713-2	160379
60284-2 (LOOSE)	160471
60433-2 (REEL)	160424
60535-2 (STRIP)	551547
60617-2 (LOOSE)	160370
61116-1 (STRIP)	200310
61117-1 (STRIP)	160305
61118-1	160044
61173-1 (LOOSE)	160281
61174-1 (LOOSE)	160364
61314-4 (STRIP)	160468
61408-1 (STRIP)	165011
62122-1	160394
62274-1	160092
62977-1	160425
62980-1	552412
62981-1	552413
63009-1	160423
66103-1	160288
66103-2 (LOOSE)	160375
66103-4 (LOOSE)	160285
66107-4	160287
66506-4	165097
85969-8	160395
86492-2	160386
1-87175-0	160184
87124-1	160186
87165-2 (LOOSE)	160487
87179-1	160185
87865-7	165041
102241-1	160385
103626-1	160289
103644-4	160239
103645-1	160302
103653-1	160292
103945-1	160343
103945-4	160207
103957-2	160479

Mfg. P/N	Comair Rotron P/N
103997-6	160291
170360-1 (STRIP)	160466
170360-1 (STRIP)	160493
170361-3 (STRIP)	160480
172165-1	160492
172166-1	160481
172233-1	160465
207016-1	160284
207153-1	160286
208979-2	160440
321026	160319
350079-1 (STRIP)	200258
350218-1 (STRIP)	160004
350536-1 (STRIP)	160362
350537-1	160120
350538-3 (STRIP)	165050
350547-1	120188
350570-1	160180
350570-2	165061
350570-6	160273
350689-1	160236
350690-1 (LOOSE)	160199
350699-1 (STRIP)	160071
350705-1 (LOOSE)	160332
350706-2 (LOOSE)	160504
350766-1	160048
350767-1	160066
350777-1	160148
350778-1	160094
350779-1	160158
350781-1	160499
350809-1	160478
350851-1	160159
350851-2	160392
350967-1	160322
1-480303-0	160469
1-480305-0	200181
1-480318-0	160280
1-480319-0	160107
1-480426-0	160033
1-480698-0	160069
1-480700-0	160005
1-480707-0	160232
1-480724-0	160057
1-480763-0	160196
2-520103-2	160376
2-520183-2	160272
2-520264-2	165076
2-520409-2	160345
1-530151-0	160290
640250-5	160511
640252-1 (LOOSE)	160510
640440-2	165075
640440-4	165096
640440-5	160226
640442-2	160461
640456-2	160453
1-640508-0	160323
640551-2	160494
640628-1 (LOOSE)	160401

AMP INC. (CONTINUED)

Mfg. P/N	Comair Rotron P/N
640917-1	160220
641190-5	160399
641219-2	160246
641437-3	160408
643067-2	160247
643182-2	160498
643253-1	160500
770002-1	160378
770018-1	160330
770252-2	160329

DUPONT ELECTRONICS INTERCONNECT & PACKAGING GROUP (BERG)

Mfg. P/N	Comair Rotron P/N
47216-001	160515
48116-000	160513
48236-00	160297
65039-033	165062
65307-001 (POLARIZED)	165064
65406-001	160514
75598-003	165063

HEYCO MOLDED PRODUCTS, INC.

1247	160441

KEYSTONE

1287 (LOOSE)	160429

MALCO

140-8141-052	160035

METHODE ELECTRONICS, INC.

1300-103	570878
3100-3-102-17	160435
3300-302-222 (INS)	160436
3300-303-218	160446

MOLEX INC.

Mfg. P/N	Comair Rotron P/N
1190-T	200010
1380-T	200329
1380-TL (LOOSE)	120284
1381-T	477607
02-06-1103	160192
02-06-2101	272013
02-06-2103 (LOOSE)	160255
02-06-6103	160208
02-09-1118	551427
02-09-2118	551420
03-06-1023	160191
03-06-2023	550108
03-06-2032	160212
03-06-2055	160258
03-50-0106	160459
08-50-0113	160189
03-50-0114	160325
08-50-0115	160241
08-50-0189	160202
08-56-0106	160214
08-70-1028	160227
09-50-3021	160242
09-50-3031	160216
10-01-3026	160228
15-31-1021	160254
15-31-1031	165065
22-01-2027	160188
22-01-3037	160324
22-01-3047	160482
26-03-3021	160203
39-00-0054	160404
39-01-2061	160405
90156-0143	160483
90290-1112	160484

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WESTREP
Tempe, AZ
(602) 820-9932

ARKANSAS
AMMON & RIZOS COMPANY
Tulsa, OK
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WESTREP
Santa Clara, CA
(408) 988-8833

CALIFORNIA
(Los Angeles area)
WESTREP
Anaheim, CA
(714) 527-2822

CALIFORNIA
(San Diego area)
HADDEN ASSOCIATES
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Broomall, PA
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Altamonte Springs, FL
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SEMTRONIC ASSOC.
Ft. Lauderdale, FL
(305) 731-2484

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Fort Wayne, IN
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Indianapolis, IN
(317) 577-0319

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AMMON & RIZOS COMPANY
Richardson, TX
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