



ROTRON

Technical & Industrial Products

627 Lake Street, Kent, OH 44240-2660 U.S.A.

Telephone: 330-677-3738 Fax: 330-677-3306

AMETEK
Rotron Technical Products
Parts & Service Manual

For

150068-00 / 01

Dual Shaft Blower

REV. A 04/03

Ametek Rotron

Dual Shaft Blower

Part No. 150068-00 / 01

Table of Contents

1. About ECDC Brushless Motors
2. Recommended Maintenance Intervals
3. Troubleshooting Guide
4. Blower Parts Listing
5. Blower Disassembly Instructions
6. Blower Assembly Instructions
7. Typical Maintenance Schedule Figure 5
8. Blower Assembly Drawing 150068-00
9. Blower Assembly Drawing 150068-01
10. Blower Outline Drawing 150068-00
11. Blower Outline Drawing 150068-01



**Electronically Commutated DC Motor
Products for Use in Transit & Tour
Coaches**

**By Henry Roesler
AMETEK Rotron**

ALL E.C.D.C.™

The continued emphasis on customer service and more efficient operation of transit and tour bus fleets has prompted the need to reduce maintenance costs and -improve reliability. Brush DC motors have a long history as maintenance intensive products. Brushless DC or E.C.D.C.™ (Electronically Commutated DC) motor products have been developed to provide low maintenance alternatives to brush DC motor products.

E.C.D.C.™ BASICS

The basic theory of operation of E.C.D.C.™ motors is to accomplish the commutation of the motor current electronically, instead of mechanically (i.e., no sliding contacts). Power transistors replace the traditional copper commutator and carbon brushes used in brush DC motor products. This results in a motor system with no wearing components except for bearings. Bearings will also last longer because there is no brush dust to contaminate them.

From a construction standpoint, brush DC and E.C.D.C.™ motors are the reverse of one another. The brush DC motor employs a permanent magnet (or field wound coil) in the stator. The rotor is a wound copper assembly. As a result, in a brush DC motor, the majority of the power losses (and thus heat) are dissipated in the armature inside the stator. The E.C.D.C.™ motor is essentially an "inside out" construction with a permanent magnet rotor and copper windings on the outer stator portion. This gives rise to one significant performance advantage of the E.C.D.C.™ motor over the brush DC motor; it's superior heat dissipation. Since the windings (which produce 12R power losses) are located on the outer stator, they can dissipate heat much more efficiently than the armatures of brush DC motors. In addition, the permanent magnet rotor causes no losses, and there is no additional heating. The E.C.D.C.™ motor, also, does not have to overcome the friction torque produced by the brush/commutator interface in brush DC motors. This results in a higher efficiency, smaller, lighter weight motor for the same rating.

E.C.D.C.™ APPLICATIONS

E.C.D.C.™ motor products can be used in any application where brush motors are presently in use. All of these applications require significant preventive maintenance when using brush DC motors. With the use of E.C.D.C.™ motors, this can be greatly reduced or eliminated altogether.

ADVANTAGES OF E.C.D.C.™* MOTOR PRODUCTS

The primary advantage to using E.C.D.C.™ motor products is the life cycle cost savings with regard to maintenance. Elimination of brushes and commutators makes E.C.D.C.™ motors less susceptible to environmental conditions and maintenance practices of the operating authority. A typical maintenance schedule is shown on Fig. 5. By following this PM schedule, a Transit Authority will save over \$12,000 per bus for a four motor A/C system over the 12 year life of that bus. If all the brush motors on the bus are replaced with E.C.D.C.™ motors, the Transit Authority would save over \$23,000 per bus over its 12 year life. Copies of the maintenance savings worksheet are available from EG&G Rotron's Transportation Applications Department.

There are also other advantages of using E.C.D.C.™ motors. E.C.D.C.™ motors use a PWM (Pulse Width Modulation) circuit to limit the inrush current on start-up of the motor. While inrush current for a brush motor is limited by only winding impedance (inrush current up to 200 amps instantaneously), the E.C.D.C.™ motor can be limited to currents down to 25% over the full load current. This results in a "soft start" effect on the alternator system, thus relieving it from the high inrush currents of brush DC motors.

With (logic level) electronic control of the motor, it becomes easier to incorporate variable speed control of large loads such as air conditioning, thus adding to the system efficiency (and fuel efficiency) of the bus. This eliminates voltage dropping resistors and associated energy losses.

E.C.D.C.™ motors have no requirement to service brushes, so they can be sealed (typically "O" Ring) more easily to prevent contamination from salt, road chemicals, wash down and humidity.

These advantages, coupled with the life cycle cost savings, result in superior performance from E.C.D.C.™ motor products

*** E.C.D.C.™ is a trademark of EG&G Rotron**

Information for this article has in part come from the "Electronically Commutated DC Motor Products for use in Transit Buses" Paper given at the APTA Bus Operations & Technology Conference, May, 1992, presented by EG&G Rotron.

RECOMMENDED MAINTENANCE

MOTOR

There is no maintenance required for this motor. The motor is uneconomical to rebuild and should be replaced at overhaul.

TROUBLESHOOTING GUIDE

MOTOR WILL NOT OPERATE

1. Check connection to the motor terminals to verify (+) positive and (-) negative leads are connected to the proper supply voltage. If the leads are reversed the unit will not operate. The motor will short to the source. Check circuit breaker to verify it is functioning properly.
2. Check the motor connections with a voltmeter to verify that the proper voltage is being supplied to motor.
3. If the motor has the proper voltage supplied and still does not operate, then there is a problem with the motor. The motor would need to be serviced by an AMETEK approved service facility or returned to AMETEK if it is still under warranty.

MOTOR OPERATES BUT NO OR LOW AIR FLOW

1. Check the motor for its proper operating speed.
2. Check the impeller connections to verify that they are connected and operating properly. Also check to verify the proper rotation impeller is installed and tightened on the shaft.
3. If the motor is operating, but at a reduced speed, check for the correct hookup.
4. If all of the above items have been satisfied and the motor still does

BLOWER & MOTOR REPLACEMENT PARTS LISTING

AMETEK Part No.	Item No.	Quantity	Description
5-4067-1	1	1	Blower Housing RTP1600
5-4067-2	2	2	Impeller, DBL Wheel Plastic
5-4067-4	3	1	Gasket, Motor Mounting
5-4067-5	4	2	Clamp, Impeller
5-4067-6	5	8	Screw, # 10
5-4067-3	6	4	Inlet Ring
150070-00	7	1	Motor, BLDC Dual Shaft, 24 VDC
5-7970	8	4	Screw, Pan Head # 10
48146-00	9	1	Drive Module, for 150068-00
48146-01	9	1	Drive Module, for 150068-01
5-4068	10	2	Bracket, Module Mounting
5-2903	11	4	Spacer, 1.0" Lg.
10-5128	12	1	Cable Tie
80-7984	13	4	Screw, Thread Cutting # 10
Add for 150068-01			
40-5144-24	16	2	Terminal, Female 12 Ga.
40-5144-23	17	2	Terminal, Female 16 Ga.
40-5144-6	18	2	Cable Seal, Blue
40-5144-3	19	2	Cable Seal, Tan
40-5144-19	20	1	Connector Housing, 4 Position

Blower Removal & Disassembly Instructions

- Disconnect the power connector between the Drive Module and the bus wiring harness.
- Remove the blower from the mounting bracket.
- Disconnect the Drive Module connector
- Remove screws (item 8) from the Drive Module mounting plate. Remove the Module.
- Remove the blower screws (item 5) 8 places.
- Separate the two blower halves.
- Remove the Motor & Impeller assembly.
- To change Impellers, remove the clip (item 4) and Replace with a new clip on reassembly of blower.

Blower Assembly & Installation Instructions

- Assemble the Impellers (item 2) onto the motor shafts. Check and verify the proper orientation of the impellers for CCW rotation in the blower.
- Insert the impeller clip (item 4) onto each impeller following drawing 150068-00 instructions.
- Place the motor and impeller assembly into the blower housing (item 1). The gasket (item 3) should be placed between the motor body and the blower motor cradle area.
- Check the motor assembly for proper orientation in the blower. The motor should be centered in the cradle and its impellers should be oriented for CCW rotation.
- Route the lead wires from the motor away from the impeller.
- Put the blower halves together with screws (item 5) 8 places.
- Install the Drive module bracket assembly onto the blower with screws (item 8) 4 places.
- Plug the motor connector into the Drive Module Connector.
- Energize the blower assembly with 27 VDC and test for proper operation and verify that the impellers are rotating in the CCW direction and not rubbing anywhere.
- Install the blower assembly onto the bus-mounting bracket.
- Connect the Drive Module input connector to the bus wire harness connector.
- Energize the bus power to the blower and verify proper operation.
- Close the access cover

12 Year Preventive Maintenance

Brush DC vs. ECDC

Life Cycle Cost Calculation • Air Conditioning Motors

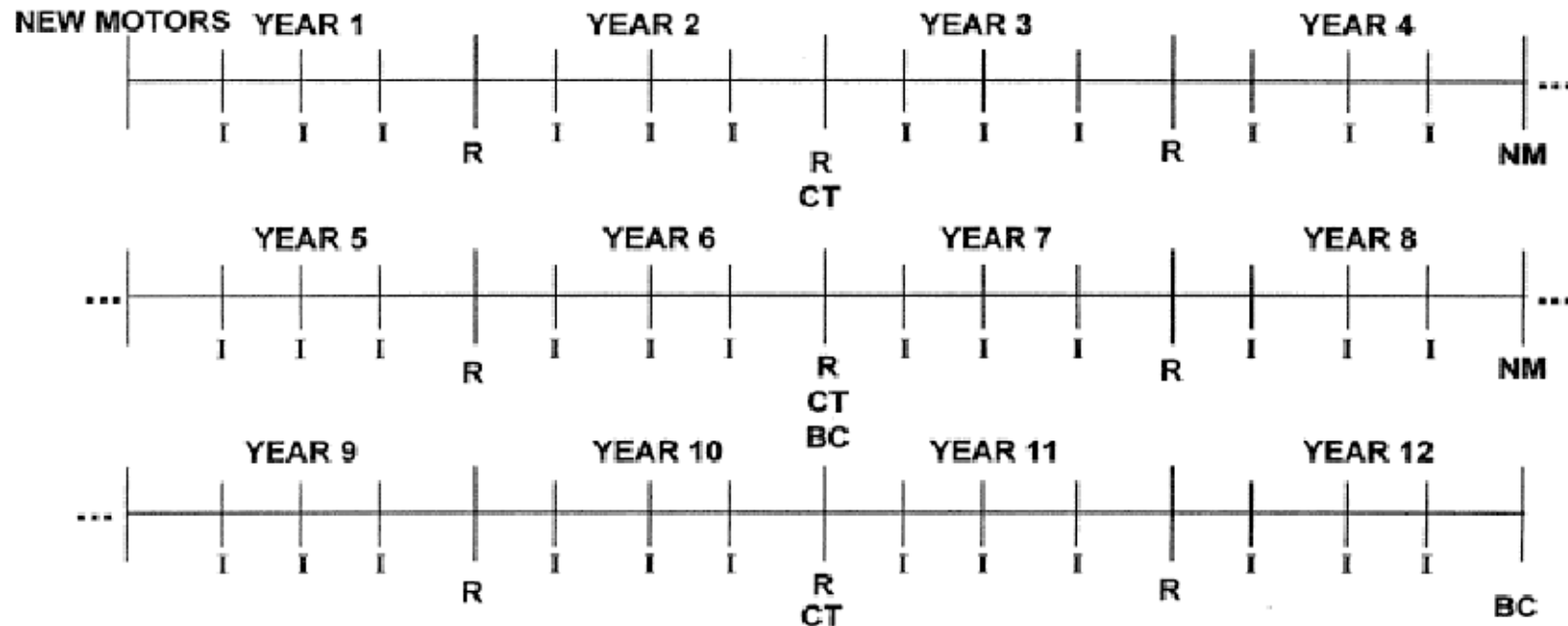


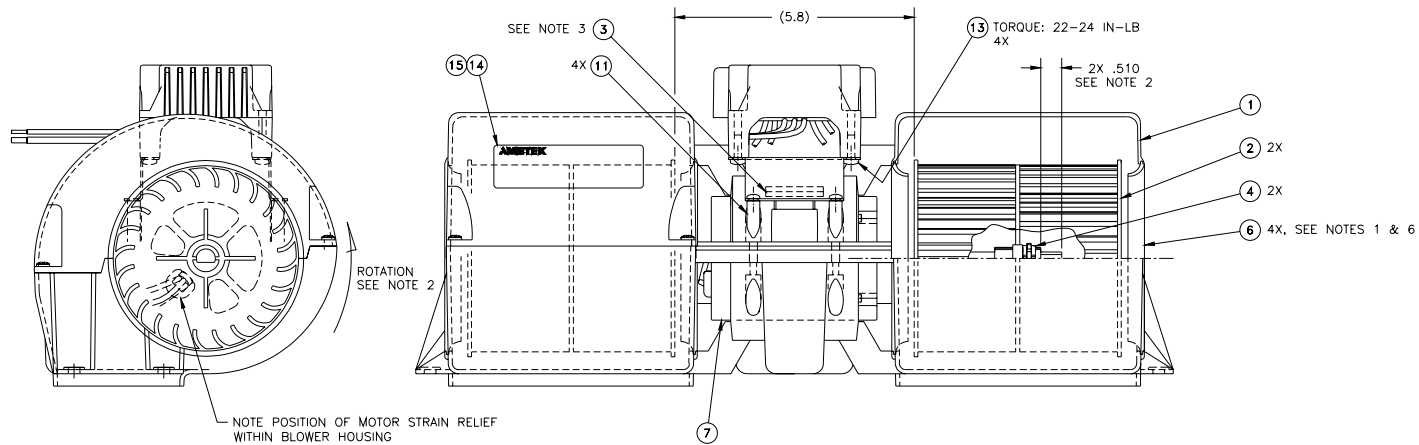
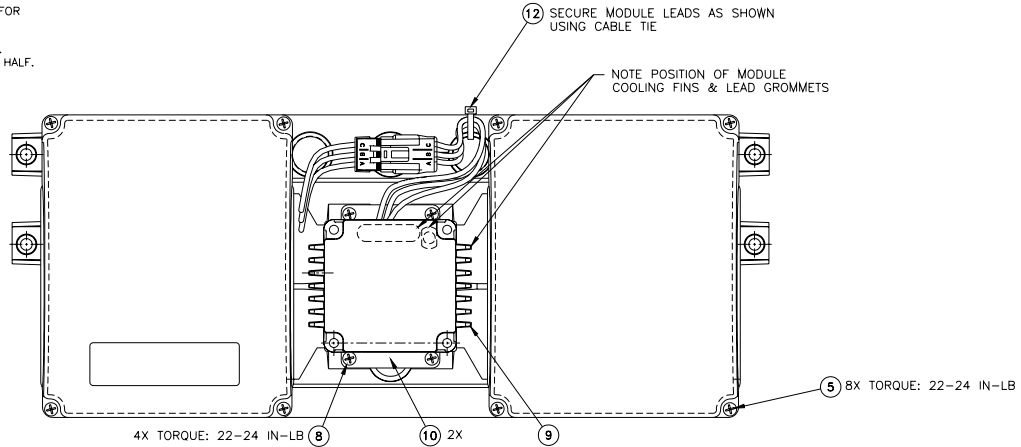
FIGURE 5

I = BRUSH INSPECTION	NM = PURCHASE NEW BRUSH MOTOR
R = BRUSH REPLACEMENT	BC = BEARING CHANGE
CT = COMMUTATOR TURNING	

ASSEMBLE BLOWER PER DETAILS BELOW

NOTES: UNLESS OTHERWISE SPECIFIED.

1. INSTALL IMPELLER CLAMPS (ITEM 4) ON IMPELLER HUBS (ITEM 2), PRIOR TO INSTALLING IMPELLERS ON MOTOR. (1) CLAMP IS TO BE INSTALLED ON EACH IMPELLER AS SHOWN. (CLAMP INSTALLATION PLIERS ROTRON TOOL #205867) PLACE INSIDE INLET RINGS (ITEM 6) OVER SHAFT EXTENSION PRIOR TO INSTALLING IMPELLERS.
2. PRESS IMPELLERS ONTO SHAFT TO DIMENSIONS SHOWN. ENDS OF SHAFT MUST BE FIXTURED DURING PRESSING PROCESS TO PREVENT DAMAGE TO BEARINGS. CHECK ROTATION ARROW IMPRINTED ON CENTER WALL OF EACH IMPELLER. INSURE IMPELLERS ARE ORIENTED FOR CCW ROTATION WHEN VIEWING UNIT FROM LEAD WIRE END OF MOTOR (USE PRESSING TOOL #208190.)
3. PLACE SUB-ASSEMBLED MOTOR/IMPELLERS INTO BOTTOM BLOWER HOUSING HALF (ITEM 1), PLACE TWO (2) MOTOR GASKETS (ITEM 3) BETWEEN MOTOR & TOP BLOWER SECTION AS SHOWN. INSURE MOTOR/IMPELLERS ARE ORIENTED FOR CCW ROTATION VIEWING LEAD END.
4. CENTER MOTOR ASS'Y AXIALLY ON MOTOR CRADLE.
5. ROUTE LEAD WIRES FROM MOTOR INSURING WIRES ARE AWAY FROM IMPELLER.
6. INSERT INLET RINGS INTO GROOVES PRIOR INSTALLING TOP BLOWER HOUSING HALF.
7. TEST UNIT PER PERFORMANCE SPECIFICATION 15-150068-00.

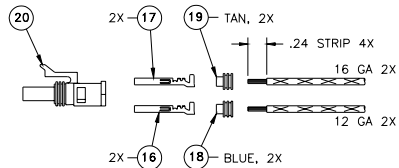


CONTROL CHARACTERISTICS M101-M199-MAJOR REV. ENG. SEC. 1-1			
THIS PRINT AND THE SPECIFICATIONS ARE THE PROPERTY OF AMETEK, ROTRON TECHNICAL & INDUSTRIAL PRODUCTS AND HAS BEEN ISSUED WITH THE UNDERSTANDING THAT IT WILL NOT BE REPRODUCED, REVEALED TO OR USED FOR THE MANUFACTURE FOR OTHERS AND WILL BE RETURNED UPON REQUEST.			
DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH AND Y14.5M-1982 DO NOT SCALE DRAWING			
UNLESS OTHERWISE SPECIFIED	TOLERANCES		
RESUME SURF.	XX	XXX	ANGLES
BREAK SHARP EDGES 0.05/0.20	±.02	±.010	±0°30'
MATERIAL	TREATMENT		
SCALE 3/4"=1"	CODE 75511	FINISH SPEC	
END FILE NAME	NEXT ASSY: 150068-00-0		
DESIGNED BY P. FALGOUTCO	DATE 9-23-02	DRW BY	DATE
DRAWN BY C. ANTBRIGHT	SHEET 9-4-02	CHKD BY	DATE
TITLE DUPLEX BLOWER ASSEMBLY, 27VDC WITH 3" EXTERNAL DRIVE MODULE			
ETCN			SHEET 1 OF 1
AMETEK ROTRON TECHNICAL & INDUSTRIAL PRODUCTS KANSAS CITY, MO			FIG. NO. 150068-00

ASSEMBLE BLOWER PER DETAILS BELOW

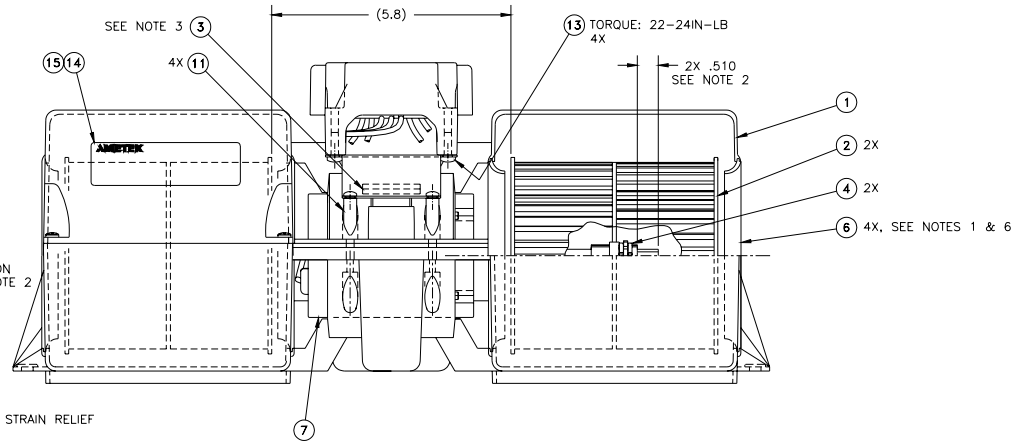
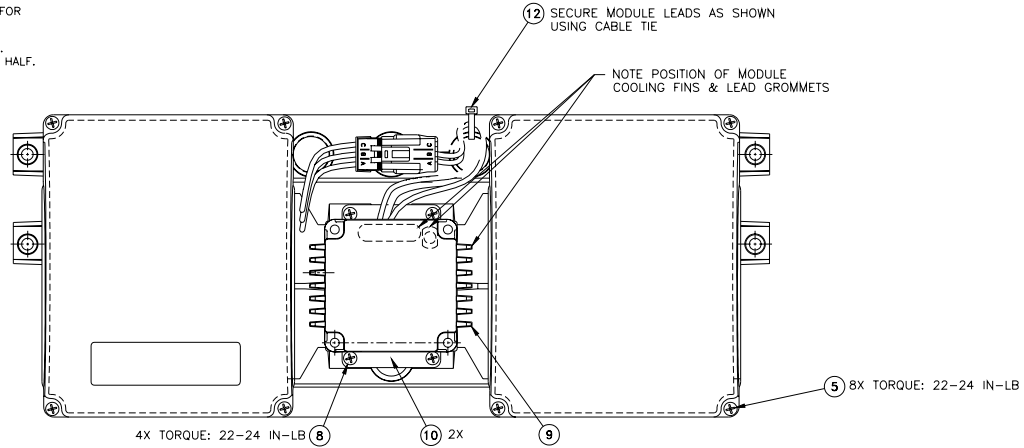
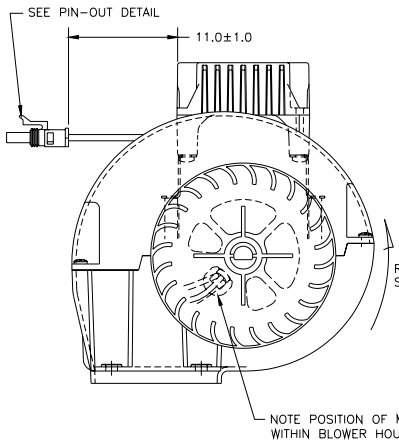
NOTES: UNLESS OTHERWISE SPECIFIED.

1. INSTALL IMPELLER CLAMPS (ITEM 4) ON IMPELLER HUBS (ITEM 2), PRIOR TO INSTALLING IMPELLERS ON MOTOR. (1) CLAMP IS TO BE INSTALLED ON EACH IMPELLER AS SHOWN. (CLAMP INSTALLATION PLIERS ROTRON TOOL #205867) PLACE INSIDE INLET RINGS (ITEM 6) OVER SHAFT EXTENSION PRIOR TO INSTALLING IMPELLERS.
2. PRESS IMPELLERS ONTO SHAFT TO DIMENSIONS SHOWN. ENDS OF SHAFT MUST BE FIXTURED DURING PRESSING PROCESS TO PREVENT DAMAGE TO BEARINGS. CHECK ROTATION ARROW IMPRINTED ON CENTER WALL OF EACH IMPELLER. INSURE IMPELLERS ARE ORIENTED FOR CCW ROTATION WHEN VIEWING UNIT FROM LEAD WIRE END OF MOTOR (USE PRESSING TOOL #208190.)
3. PLACE SUB-ASSEMBLED MOTOR/IMPELLERS INTO BOTTOM BLOWER HOUSING HALF (ITEM 1). PLACE TWO (2) MOTOR GASKETS (ITEM 3) BETWEEN MOTOR & TOP BLOWER SECTION AS SHOWN. INSURE MOTOR/IMPELLERS ARE ORIENTED FOR CCW ROTATION VIEWING LEAD END.
4. CENTER MOTOR ASS'Y AXIALLY ON MOTOR CRADLE.
5. ROUTE LEAD WIRES FROM MOTOR INSURING WIRES ARE AWAY FROM IMPELLER.
6. INSERT INLET RINGS INTO GROOVES PRIOR INSTALLING TOP BLOWER HOUSING HALF.
7. TEST UNIT PER PERFORMANCE SPECIFICATION 15-150068-00.



POSITION	LEAD COLOR (GA)
A	RED (12)
B	BLACK (12)
C	YELLOW (16)
D	ORANGE (16)

CONNECTOR PIN-OUT DETAIL



CONTROL CHARACTERISTICS M101-M199-MAJOR		REV. ENG. SPEC. K-1
CONVENTIONAL		
THIS PRINT AND THE SPECIFICATIONS ARE THE PROPERTY OF AMETEK. TECHNICAL & INDUSTRIAL PRODUCTS AND HAS BEEN ISSUED WITH THE UNDERSTANDING THAT IT WILL NOT BE REPRODUCED, REVEALED OR USED FOR THE MANUFACTURE FOR OTHERS AND WILL BE RETURNED UPON REQUEST.		
DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ANSI Y14.5M-1982		
DO NOT SCALE DRAWING		
UNLESS OTHERWISE SPECIFIED	XX	XXX
REMOVE BURRS	XX	XXX
WIRE/SHARP EDGES .005/.020	± .02	± .010
		± 0°30'
MATERIAL	TREATMENT	
SCALE 3/4"=1"	CODE 75511	FRONT SPEC.
CAD FILE NAME	NEXT ASSY:	150068-01-D
DATE:	DATE:	DATE:
DR. ZALOGOSKI 9-24-02	APP'D:	
DATE: 9-24-02	DATE: 9-24-02	DATE:
CHK'D BY: 9-24-02	CHK'D BY:	
TITLE: DUPLEX BLOWER ASSEMBLY, 27VDC WITH 3" EXTERNAL DRIVE MODULE	REV:	SHEET D
REF: 150068-00	REF: 150068-00	SHEET 1 OF 1
AMETEK	DES. NO. 150068-01	
TECHNICAL & INDUSTRIAL PRODUCTS		
REV. ENG. SPEC.		

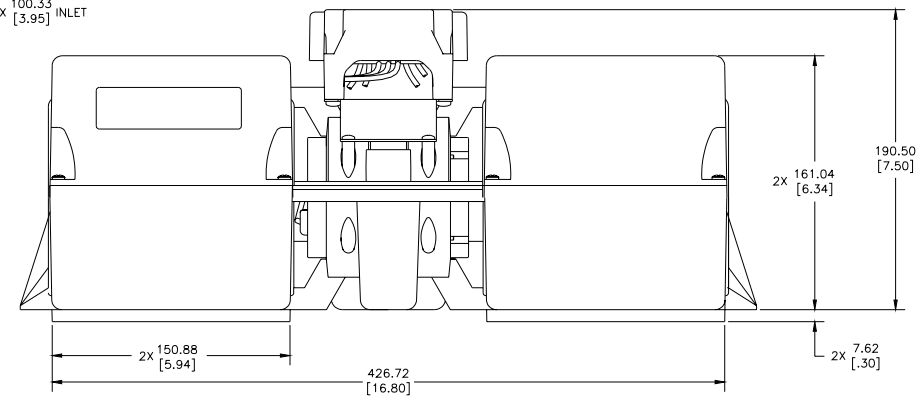
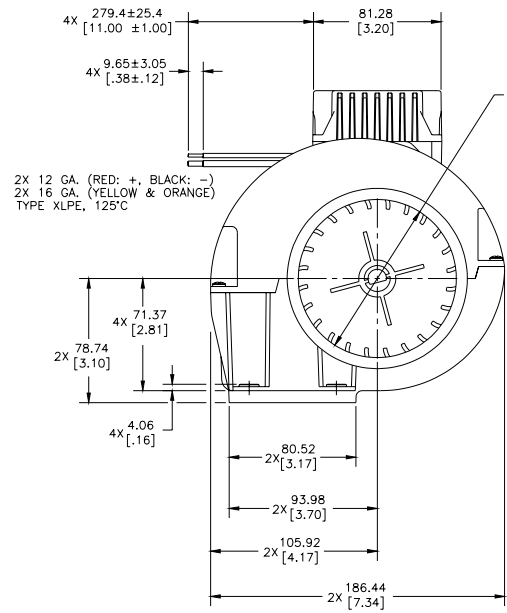
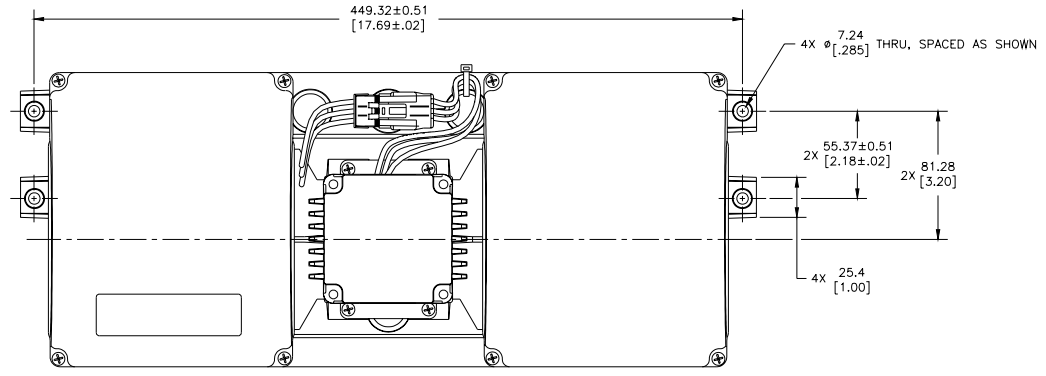
NOTES:

1. ALL CONNECTIONS WITH 27.6V APPLIED BETWEEN (+) AND (-).
2. 10mA MAX. CURRENT CONSUMPTION WITH SPECIFIED VOLTAGE APPLIED.
3. AMETEK RECOMMENDS THE USE OF A SERIES FUSE OR FAST ACTING CIRCUIT BREAKER, ADEQUATELY SIZED TO PROTECT WIRING AND ELECTRONICS, BASED ON END APPLICATION.
4. OBSERVE POLARITY; REVERSED CONNECTION WILL SHORT SOURCE, OPENING SERIES PROTECTION DEVICE (SEE NOTE 3 ABOVE). NORMAL OPERATION WILL COMMENCE WITH CORRECT CONNECTION AND RESET OF PROTECTION DEVICE.

5. INTERNAL SHUTDOWN THERMOSTAT SET AT 90°C. NORMAL OPERATION WILL COMMENCE WHEN INTERNAL TEMPERATURE FALLS BELOW 85°C.
6. REPLACEMENT CONTROLLER PART NO.: 48146-00
7. WIRE TYPE: XLPE, 125°C

DWG. NO. 150068-00-0

REVISIONS			
REV/ECH	NO.	CHANGE	DATE
A	59086	RELEASE TO PRODUCTION	CRA 9-23-02



2X 12 GA. (RED: +, BLACK: -)
2X 16 GA. (YELLOW & ORANGE)
TYPE XLPE, 125°C

BLOWER PERFORMANCE
 VOLTAGE: 27.6VDC
 VOLTAGE (INTERMITTENT): 18-32VDC
 CURRENT: 12 AMPS
 ROTATION: CW (LE)
 TEMP RANGE (SEE NOTE 10): -40°C TO +70°C
 WEIGHT: 7.20 LB/3.26 kg

BLOWER PERFORMANCE (UNRESTRICTED)				
OPERATION (SEE NOTE 1)	RED (+)	YELLOW (10 mA, SEE NOTE 2)	ORANGE (10 mA, SEE NOTE 2)	RPM (NOM.)
HIGH SPEED	+27.6VDC	OPEN	OPEN	2300
MED SPEED	+27.6VDC	+27.6VDC	OPEN	1850
MED/LOW SPEED	+27.6VDC	OPEN	+27.6VDC	1350
LOW SPEED	+27.6VDC	+27.6VDC	+27.6VDC	1000

MILLIMETER [INCH]

CONTROL CHARACTERISTICS M101-M199-MAJOR REF. ENG. SPEC. 4-1	
COMPARTMENT	
THIS PRINT AND THE SPECIFICATIONS ARE THE PROPERTY OF AMETEK. NO PARTS, TOOLS, OR MATERIALS ARE TO BE REPRODUCED OR USED FOR THE MANUFACTURE OF OTHER PRODUCTS WITHOUT THE WRITTEN PERMISSION OF AMETEK. FOR LINES AND BILLS, BE RETURNED UPON REQUEST.	
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE: XX XXX ANGLES	
BLENDE SURFACES SPECIFIED	±.152 ±.051
BREAK SHARP EDGES .005/.020	±.06 ±.020
MATERIAL:	TREATMENT:
SCALE 3/4"=1" CODE 75511	FINISH SPEC:
DWG FILE NAME	NEXT ASSY: 150068-00
DOC: APPR: P. FALUGGIO	DATE: 9-23-02
DATE BY: C. ANTIBRIGHT	DATE BY: 9-5-02
FILE: 3" BLOC. EXTERNAL DRIVE	TYPE: D
AMETEK	
TECHNICAL & INDUSTRIAL PRODUCTS	150068-00-0

DWG NO. 150068-00-0

NOTES:

1. ALL CONNECTIONS WITH 27.6V APPLIED BETWEEN (+) AND (-).
2. 10mA MAX. CURRENT CONSUMPTION WITH SPECIFIED VOLTAGE APPLIED.
3. AMETEK RECOMMENDS THE USE OF A SERIES FUSE OR FAST ACTING CIRCUIT BREAKER, ADEQUATELY SIZED TO PROTECT WIRING AND ELECTRONICS, BASED ON END APPLICATION.
4. OBSERVE POLARITY. REVERSED CONNECTION WILL SHORT SOURCE, OPENING SERIES PROTECTION DEVICE (SEE NOTE 3 ABOVE). NORMAL OPERATION WILL COMMENCE WITH CORRECT CONNECTION AND RESET OF PROTECTION DEVICE.

5. INTERNAL SHUTDOWN THERMOSTAT SET AT 90°C, NORMAL OPERATION WILL COMMENCE WHEN INTERNAL TEMPERATURE FALLS BELOW 85°C.
6. REPLACEMENT CONTROLLER PART NO.: 48146-01
7. WIRE TYPE: XLPE, 125°C

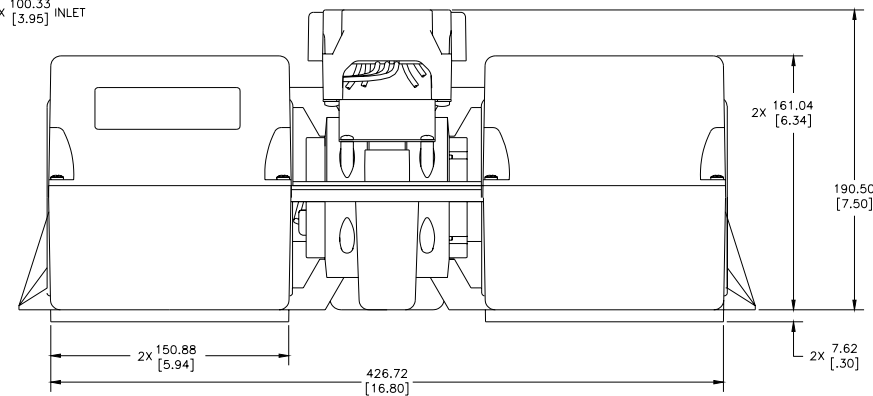
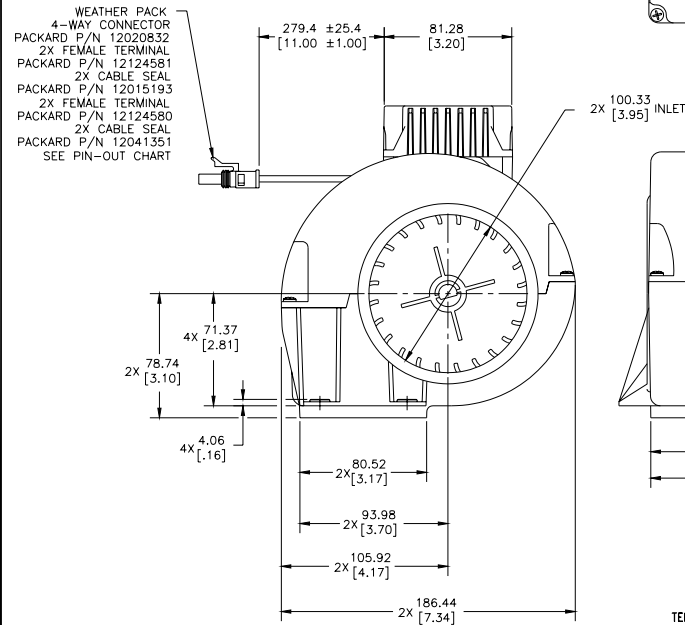
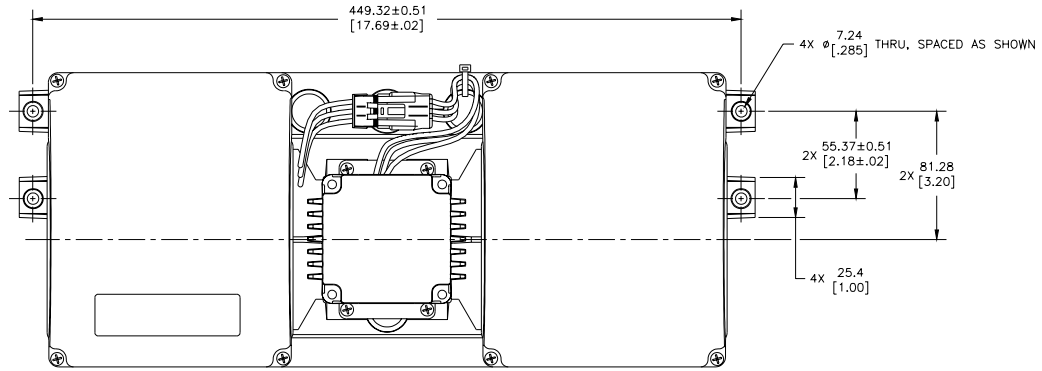
DWG. NO. 150068-01-0

REVISIONS			
REV. NO.	CHANGE	DATE	APP'D.
A	59066 RELEASE TO PRODUCTION	CRA 9-23-02	PF

CONNECTOR PIN-OUT

MATING PACKARD 4-WAY CONNECTOR P/N 12020830
CPA (LOCKING MECH.) PACKARD P/N 12020833

POSITION	LEAD COLOR
A	RED (12 GA)
B	BLACK (12 GA)
C	YELLOW (16 GA)
D	ORANGE (16 GA)



MILLIMETER [INCH]

BLOWER PERFORMANCE

VOLTAGE: 27.6VDC
VOLTAGE (INTERMITTENT): 18-32VDC
CURRENT: 12 AMPS
ROTATION: CCW (LE)
TEMP RANGE (SEE NOTE 10): -40°C TO +70°C
WEIGHT: 7.20 LB/3.28 kg

BLOWER PERFORMANCE (UNRESTRICTED)

OPERATION (SEE NOTE 1)	RED (+)	YELLOW (10 mA, SEE NOTE 2)	ORANGE (10 mA, SEE NOTE 2)	RPM (NOM.)
HIGH SPEED	+27.6VDC	OPEN	OPEN	2300
MED SPEED	+27.6VDC	+27.6VDC	OPEN	1850
MED/LOW SPEED	+27.6VDC	OPEN	+27.6VDC	1350
LOW SPEED	+27.6VDC	+27.6VDC	+27.6VDC	1000

CONTROL CHARACTERISTICS: M101-M199-MAJOR
REV. ENG. SPEC. 4

THIS PRINT AND THE SPECIFICATIONS ARE THE PROPERTY OF AMETEK, AERONAUTICAL & INDUSTRIAL PRODUCTS, AND HAS BEEN ISSUED BY THE UNDERSTANDING THAT IT WILL NOT BE REPRODUCED, RELEASED, OR USED FOR THE MANUFACTURE FOR OTHERS AND WILL BE RETURNED UPON REQUEST.

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:

REMOVE BURRS	±.005	ANGLES	±0.50°
BREAK SHARP EDGES	0.06/0.02	±.150 ± 0.51	±0.50°

DO NOT SCALE DRAWING.

MATERIAL: TREATMENT:

SCALE: 3/4"=1" [0.75] FINISH SPEC:

CAD FILE NAME: NEXT ASSY: 150068-01

DES. APPR:	DATE:	APP'D:	DATE:
P. REVISED:	9-23-02	CHD BY:	DATE:
Q. APPROVED:	9-23-02	DATE:	DATE:

FILE: DUPLEX BLOWER OUTLINE, 27VDC
3" BLDG. EXTERNAL DRIVE

AMETEK SHEET 1 OF 2
AERONAUTICAL & INDUSTRIAL PRODUCTS
REV. ENG. SPEC. 4

150068-01-0

DWG. NO. 150068-01-0 REV. A