

TRW

**Parts, Operation and
Maintenance Manual**

**SMJ Inc.
AFS 1.6 2-STAGE FAN**

250 Horsepower Two Stage Mine Fans

Serial Number: 010116

SMJ INC

SMJ INC

P.O. Box 55034
Grand Junction, CO. 81505 USA

Parts - Operation - Maintenance Manual

Customer: TRW
Order Number: A18992KKLOC
Fan Model: AFS 1.6 2-STAGE SERIES
Serial No: 010116

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Ordering Instructions

Required Information: customer name, customer order number, Fan model and part number.

WARNING

TO UNLOADER, MOVER, STORAGE PERSONNEL AND CONTRACTOR

**FAILURE TO COMPLY WITH THESE INSTRUCTIONS COULD CAUSE SERIOUS
BODILY HARM OR PROPERTY DAMAGE AND WILL VOID ANY
WARRANTIES.**

FAN WARNING STATEMENT

THIS DOCUMENT IS INCLUDED IN ALL PART, OPERATION & MAINTENANCE MANUALS SUPPLIED BY SMJ, INC.

- I. ANY PERSON OR PERSONS MUST BE QUALIFIED IN THE SPECIFIC FIELD OF MAINTENANCE, ELECTRICAL, LOADING & OR UNLOADING, ETC., AND MUST HAVE READ THIS PARTS-OPERATION-MAINTENANCE MANUAL BEFORE ANY WORK IS TO COMMENCE. SERIOUS INJURIES MAY OCCUR WHEN WORK IS NOT PERFORMED CORRECTLY.
- A. ANY MAINTENANCE, INSPECTION, ADJUSTMENT, WORKING ON, OR ANY OTHER ACTS OF WORK ON ELECTRICAL, ROTATING COMPONENTS AND OR ANY OTHER COMPONENT TO THE FAN ASSEMBLY MUST FOLLOW THE CORRECT PROCEDURES.
- B. ALL ELECTRICAL POWER MUST BE SHUT-OFF & LOCKED-OUT TO FAN/MOTOR UNIT IF ANY ACT OF WORK IN ANY CIRCUMSTANCE IS TO BE PERFORMED.
- C. ANY ACT OR ACTS OF WORK IS TO BE PERFORMED IN ACCORDANCE TO BUYERS POLICY AND MUST FOLLOW ALL LOCAL, STATE, FEDERAL, AND OR ANY OTHER AGENCY SAID REQUIREMENTS IN REGARDS TO ELECTRICAL, AND ANY AND ALL SAFETY PROCEDURES SET FORTH BY SAID AGENCIES.
- D. ALL SAFETY DEVICES SUCH AS BUT NOT LIMITED TO, SAFETY SCREENS, COVERS, ADAPTERS, MUST BE REPLACED AS PER DESIGN REQUIREMENTS, BEFORE POWER IS SUPPLIED OR RESUMED TO FAN/MOTOR UNITS OR COMPONENTS FOR OPERATION. IT IS THE TOTAL RESPONSIBILITY OF THE BUYER TO PROVIDE & MAINTAIN ANY AND ALL SAFETY DEVICES.
- E. ALL WORK & ACTS OF WORK OF REPAIR, REPLACEMENT OF COMPONENTS MUST USE ORIGINAL EQUIPMENT, & MUST BE INSTALLED IN THE PROPER MANNER WITHOUT OMITTING ANY PARTS.
- F. THE USAGE, APPLICATION, LOCATION, GAS OR GASSES MOVED, OR MATERIALS, PARTICLES AND OR PARTICLES & GAS OR GASSES MIXTURE, IS THE RESPONSIBILITY OF THE BUYER, FOR THE CORRECT APPLICATION OF ANY FAN & ANY AND ALL COMPONENT USAGE.

SPECIAL NOTES:

ICING OF IMPELLER BLADES IS POSSIBLE DURING PERIODS OF EXTREME WEATHER CHANGES, (TEMPERATURE, HUMIDITY, RAIN, SNOW, ETC.). ICING OF BLADES OCCURS WHEN FAN/MOTOR UNIT IS SHUT-OFF AND WARM MOIST AIR IS ENTERING FAN OUTLET WHILE COOL AIR IS BEING PRESENT AT THE INTAKE OF THE VENTILATION SYSTEM. AS THE BLADES FREELY ROTATE IN THE REVERSE DIRECTION ICE MAY FORM. WHEN ICE FORMS ON THE BLADES THE DEGREE OF DYNAMIC BALANCE OF THE ROTOR ASSEMBLY IS COMPROMISED. THEN WHEN THE FAN/MOTOR UNIT IS ENERGIZED AND THE ROTOR ASSEMBLY IS ROTATING IN THE PROPER DIRECTION A MAJOR DEGREE OF UNBALANCE WILL BE PRESENT, THAT COULD RESULT IN BLADE BREAKAGE, BROKEN MOTOR SHAFT, BROKEN MOTOR BEARINGS, BROKEN MOTOR MOUNTS AS WELL AS BROKEN WELDS DUE TO HIGH VIBRATION. A VIBRA SWITCH IS RECOMMENDED IF THESE CONDITIONS MAY BE PRESENT.

NOTE: FAILURE, BREAKAGE OF ANY AND ALL FAN COMPONENTS ARE NOT COVERED UNDER WARRANTY IF ICING CONDITIONS EXIST.

2. **STALL CONDITIONS:** A STALL CONDITION WILL EXIST WHEN THE FAN UNITS STATED PERFORMANCE VALUE IS EXCEEDED. THERE ARE DIFFERENT DEGREES OF A STALL CONDITION, FROM A LIGHT TO HEAVY STALL CONDITION. A HEAVY STALL CONDITION CREATES VARIOUS FREQUENCIES (VIBRATION) WHICH WILL CAUSE ROTOR FAILURE, AND IN TURN CAUSE OTHER FAN COMPONENT FAILURE. A VIBRA SWITCH IS RECOMMENDED FOR DETECTION OF THIS SCENARIO. **NOTE: FAILURE, BREAKAGE OF ANY AND ALL FAN COMPONENTS ARE NOT COVERED UNDER WARRANTY IF STALL CONDITIONS OCCURRED.**
3. **HIGH MOISTURE AIR:** ALL SCRUBBER SYSTEM DESIGNS USE WATER FOR ASSISTANCE IN DUST REMOVAL. WHERE WATER IS PRESENT IN THE AIR STREAM, FAN IS TO BE OPERATED CONTINUOUS (WITHOUT STARTING-AND STOPPING), AND LUBRICATION ON THE FRONT MOTOR BEARING IS TO BE PERFORMED AT 1 MONTH INTERVALS. REAR MOTOR BEARING IS TO REMAIN AT STANDARD INTERVALS.



SMJ INC
P.O. Box 55034
Grand Junction, CO. 81505 USA

MAINTENANCE LOG:

1. MOTOR LUBRICATION

	DATE	FAN UNIT	PERFORMED BY
1			
2			
3			
4			
5			
6			

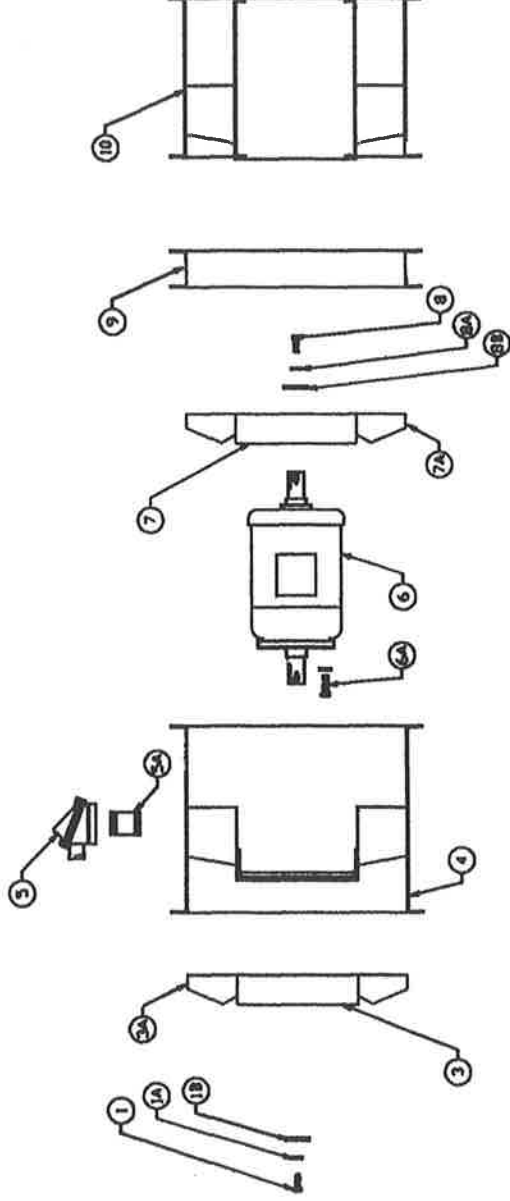
2. IMPELLER ADJUSTMENT LOG

	DATE	FAN UNIT	NEW IMPELLER SETTING	PERFORMED BY
1				
2				
3				
4				

3. AMP DRAW FOR EACH MOTOR LEAD AND VOLTAGE (PHASE TO GROUND)

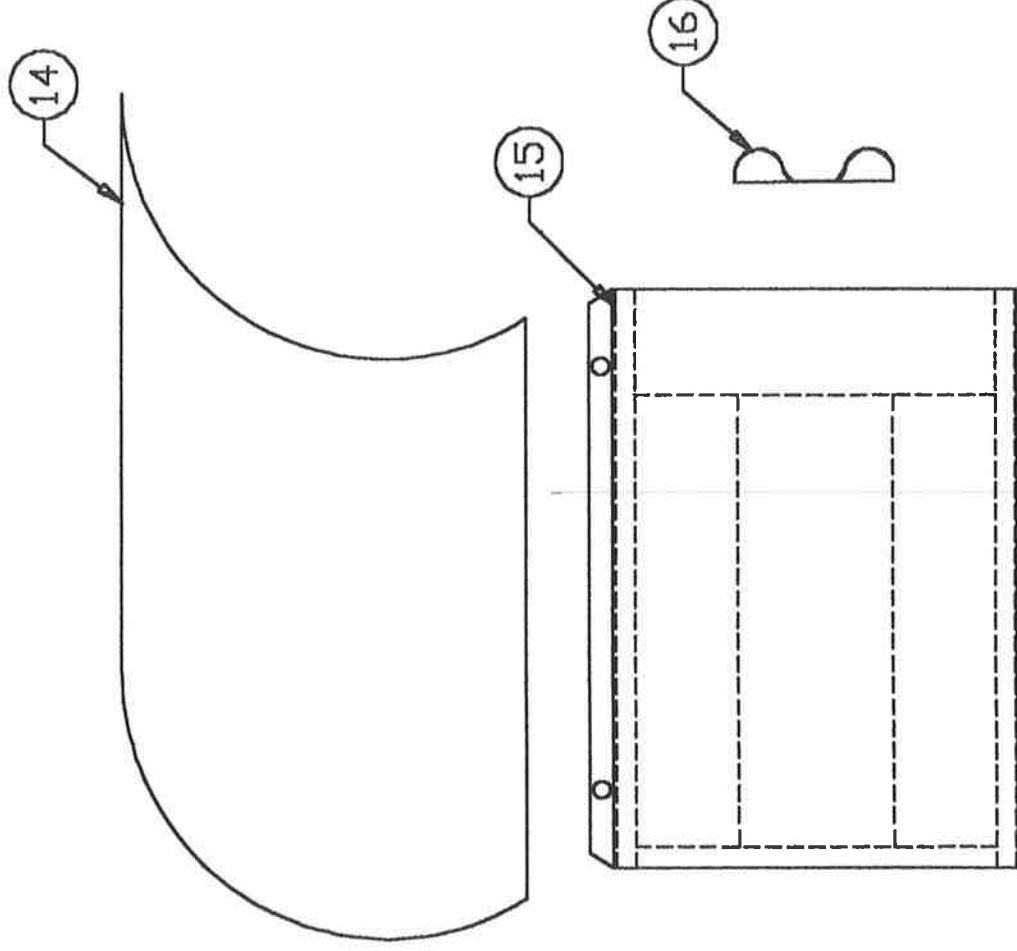
SMJ INC**SMJ INC**P.O. Box 55034
Grand Junction, CO. 81505 USA**FAN PARTS LIST**

ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	RQF-TRW-1	STAGE I IMPELLER BOLT
1A	1	RQF-TRW-1A	STAGE I IMPELLER LOCK WASHER
1B	1	RQF-TRW-1B	STAGE I IMPELLER LOCK
2	1	RQF-TRW-2	GREASE LINE KIT (NOT SHOWN)
3	1	RQF-TRW-3	STAGE I IMPELLER HUB
3A	16	RQF-TRW-3A	STAGE I IMPELLER BLADES
4	1	RQF-TRW-4	FAN CASING
5	1	RQF-TRW-5	MOTOR GLAND
5A	1	RQF-TRW-5A	MOTOR CONNECTION BOX
6	1	RQF-TRW-6	MOTOR
6A	1	RQF-TRW-6A	MOTOR BOLT KIT
7	1	RQF-TRW-7	STAGE II IMPELLER HUB
7A	16	RQF-TRW-7A	STAGE II IMPELLER BLADES
8	1	RQF-TRW-8	STAGE II IMPELLER BOLT
8A	1	RQF-TRW-8A	STAGE II IMPELLER LOCK WASHER
8B	1	RQF-TRW-8B	STAGE II IMPELLER LOCK
9	1	RQF-TRW-9	IMPELLER SECTION
10	1	RQF-TRW-10	STAGE II DOWNSTREAM GUIDE VANE
11	4	RQF-TRW-11	REAR MOTOR SUPPORT BOLTS (NOT SHOWN)



SILENCER PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION
14	8	RFQ-TRW-14	OUTER SHELL
15	8	RFQ-TRW-15	SILENCER BODY
16	1	RFQ-TRW-16	SPINNER CAP (ON SILENCERS WITH PODS)
17	8	RFQ-TRW-17	SILENCER PACKING (NOT SHOWN)



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SPECIAL NOTES ON IMPELLER SETTINGS.

1. IMPELLER BLADE ANGLE HAS BEEN SET TO THE #3.5 SETTING ON BOTH IMPELLERS.
2. DO NOT EXCEED THIS BLADE SETTING OR THE MAXIMUM AMP DRAW.
3. BOTH IMPELLERS ROTATE IN THE COUNTER-CLOCKWISE DIRECTION.
4. SEE PARTS LIST FOR REPLACEMENT PARTS.

**FULL LOAD MOTOR AMPS 294
334 AMPS WITH 1.15 SERVICE FACTOR
460/60/3**

DON'T OVERLOAD MOTORS.

INSTALLATION AND REMOVAL OF NEW ADJUSTABLE IMPELLER

1.

BLADE ADJUSTMENT NOTE: THE BLADES ARE PRE-SET AT THE FACTORY.
NOTE: ADJUST BLADES ONE AT A TIME.

- A. REMOVE IMPELLER LOCK BOLT AND IMPELLER COVER.
- B. LOOSEN NUTS ON THE INSIDE OF THE HUB.
- C. LOOSEN THE BLADE SEAT WITH A RUBBER HAMMER OR BRASS DRIFT PIN.
- D. ADJUST BLADES UP OR DOWN [ONE BLADE AT A TIME].
TORQUE IMPELLER NUT TO **EXACTLY 100 FT-LBS**.
REPEAT PROCEDURE UNTIL ALL OF THE BLADES HAVE BEEN PROPERLY
ADJUSTED AND RE-TIGHTENED.
- E. REPLACE THE ALUMINUM COVER DISK.
- F. REPLACE THE IMPELLER LOCK.
- G. TORQUE IMPELLER LOCK TO **EXACTLY 95 FT-LBS**.
- H. PLACE A SMALL BEAD OF SILICONE CAULK AROUND THE ALUMINUM COVER,
BOTH O.D. AND I.D.

- I. REPLACE THE INLET COMPONENTS [STEP 1: A-D].

2. REMOVAL OF IMPELLERS

- A. **LOCK OUT ALL POWER TO FAN UNIT.**
 - B. REMOVE INLET SILENCER.
 - C. REMOVE INLET GUIDE VANE.
 - D. REMOVE 3/4" IMPELLER LOCK ASSEMBLY.
 - E. REMOVE OLD IMPELLER AND ANY BUSHINGS AND WASHERS.
3. CLEAN MOTOR SHAFT AND KEY WAY WITH FINE EMERY CLOTH OR ROLL GRIT PAPER.
REMOVE ALL BURS FROM THE MOTOR SHAFT.
- A. PLACE A COAT OF ANTI-SEIZE ON THE MOTOR SHAFT AND IN THE BORE OF
THE NEW ADJUSTABLE IMPELLER ASSEMBLY.
 - B. PLACE THE NEW IMPELLER ON THE MOTOR SHAFT AND REPLACE THE KEY.
REPLACE THE ALUMINUM COVER AND IMPELLER LOCKS.
 - C. REPLACE THE IMPELLER LOCK AND TIGHTEN [USE A TORQUE WRENCH] TO 65
FT-LBS. PLACE A SMALL BEAD OF SILICONE CAULK AROUND THE ALUMINUM
COVER TO SEAL THE IMPELLER.
 - D. REPLACE THE INLET COMPONENTS [STEP 1: A-D].

WARNING: FAILURE TO FOLLOW THESE INSTRUCTIONS WILL VOID THE WARRANTY.

LOCKOUT ALL POWER TO FAN UNIT BEFORE SERVICING.

STORAGE & HANDLING

RECEIVING & UNLOADING: UPON UNLOADING THIS EQUIPMENT, INSPECT IT FOR DAMAGE. IF DAMAGE HAS OCCURRED, FILE A CLAIM IMMEDIATELY AGAINST THE CARRIER. SHORTAGES SHOULD BE REPORTED TO LOCAL SALES REPRESENTATIVE OR FACTORY, WITHIN FIFTEEN (15) DAYS FROM RECEIPT OF SHIPMENT AT DESTINATION.

HANDLING: USE A SLING AROUND LARGE FAN CASINGS, OR INSTALL EYE BOLTS IN FLANGES FOR LIFTING THE SMALLER FAN UNITS. MOST FAN UNITS ARE FITTED WITH LIFTING EYES OR LIFTING POINTS ARE SHOWN. SEVERE IMPACTS COULD DISTORT THE CASING OR POSSIBLY DAMAGE THE MOTOR AND OR MAIN DRIVE BEARINGS.

STORAGE INSTRUCTIONS: IF NOT INSTALLED IN PLACE IMMEDIATELY, THIS FAN SHOULD BE PROTECTED TO REMAIN DRY AT ALL TIMES.

FANS SHOULD BE STORED IN AN AREA WHICH IS CLEAN & DRY WHERE CONTROL OVER TEMPERATURE AND RAPID OR EXTREME CHANGES IN HUMIDITY, SHOCK AND VIBRATION ARE REASONABLY MAINTAINED AS BELOW.

1. FOR EXTENDED STORAGE AND NEGOTIATED EXTENDED WARRANTY, THE FOLLOWING INSTRUCTIONS MUST BE FOLLOWED:

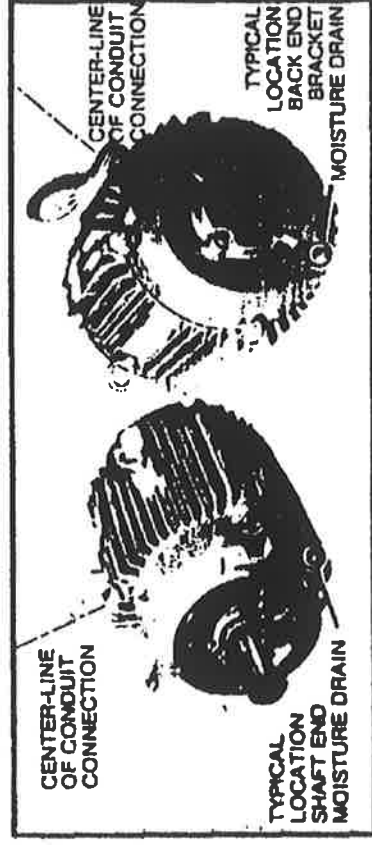
2A. THE STORAGE AREA IS TO BE FREE FROM ANY SHOCK OR VIBRATION OF 2 MILS MAXIMUM AT 60 HERTZ, TO PREVENT MOTOR BEARINGS AND OR BELT DRIVEN MAIN BEARING ASSEMBLIES FROM BRINELLING. EXCEEDING THESE LIMITS WILL REQUIRE VIBRATION DAMPENING MATERIAL UNDER FAN/MOTOR UNITS.

2B. THE STORAGE AREA TEMPERATURES SHOULD NOT BE BELOW +50 DEGREES FAHRENHEIT OR OVER +120 DEGREES FAHRENHEIT AND RELATIVE HUMIDITY SHOULD BE A MAXIMUM OF 60%. ALL UNITS EQUIPPED WITH SPACE HEATERS ARE TO HAVE THE HEATERS CONNECTED IF STORAGE CONDITIONS EXCEED THESE ENVIRONMENTAL LIMITS.

2C. WHEN FAN/MOTOR UNITS ARE IN STORAGE LONGER THAN THREE (3) MONTHS, THE FAN ROTORS ARE TO BE ROTATED MANUALLY SEVERAL REVOLUTIONS AT LEAST ONCE EVERY THREE (3) MONTHS. ROTORS ARE TO BE MARKED SO THAT A DIFFERENT BLADE IS IN THE VERTICAL POSITION AFTER EACH ROTATION. A SMALL AMOUNT OF GREASE (APPROXIMATELY ONE (1) CUBIC INCH) IS TO BE ADDED, AT THE GREASE FITTINGS, EVERY SIX (6) MONTHS. THIS IS TO ENSURE THE BEARINGS ARE ALWAYS COATED WITH LUBRICANT. (SEE: LUBRICATION OF MOTORS AND MAIN BEARING LUBRICATION GUIDES).

STORAGE & HANDLING (CONT.)

2D. ALL MOISTURE DRAINS ARE TO BE FULLY OPERABLE WHILE IN STORAGE, AND OR THE DRAIN PLUGS REMOVED FROM THE MOTOR (SEE DRAWING BELOW). FAN/MOTOR UNITS MUST BE STORED SO THAT THE DRAIN IS AT THE LOWEST POINT. ALL BREATHERS AND AUTOMATIC "T" DRAINS MUST BE OPERABLE TO ALLOW BREATHING,



2E. MOTOR WINDINGS ARE TO BE MEGGERED AT THE TIME OF STORAGE AND ALSO AT THE TIME OF STORAGE REMOVAL WITH THE VALUES RECORDED. (THIS PROCEDURE IS TO BE PERFORMED BY AN AUTHORIZED MOTOR SHOP FOR THE SPECIFIC BRAND OF MOTOR SUPPLIED WITH FAN UNIT. THIS SERVICE/COST IS THE SOLE RESPONSIBILITY OF THE BUYER.) ANY DROP IN RESISTANCE VALUE GREATER THAN 50% WILL NECESSITATE ELECTRICAL OR MECHANICAL DRYING OF THE MOTOR. FURTHER, THE MOTOR BEARINGS SHOULD BE CHECKED FOR MOISTURE. IF MOISTURE IS

PRESENT, REPLACE BEARINGS AND RELUBRICATE UNITS.

(NOTE: IF THIS PROCEDURE IS REQUIRED, IT IS THE RESPONSIBILITY OF THE BUYER, AS WELL AS ANY COST'S INVOLVED). NOTE: INDUSTRY STANDARDS INDICATE THAT A MOTOR SHOULD MEGGER AT LEAST ONE (1) MEGOHM AS NEW. THEREFORE, MEGGER READINGS AFTER STORAGE SHOULD NOT BE LESS THAN 500,000 OHMS.

3. UPON REMOVAL FROM STORAGE, FAN MOTOR BEARINGS AND BELT DRIVEN MAIN FAN BEARINGS ARE TO BE REGREASED.

INSTALLATION AND START-UP

INSTALLATION: ALL SUPPORTING POINTS MUST BE UNIFORMLY LOCATED SO THERE IS NO TWISTING OR DISTORTION THROUGH THE FAN UNIT. ALSO, THE INTAKE SHOULD BE CAREFULLY ARRANGED TO DIRECT A SMOOTH AND UNIFORM AIR FLOW INTO THE FAN INLET/ROTOR ASSEMBLY, THIS IS ALSO REQUIRED FOR THE FAN OUTLET.

START-UP: BEFORE START-UP, BE SURE THE ROTOR TURNS FREELY AND ALL MATERIAL HAS BEEN REMOVED FROM DUCT OR THE AREA IN FRONT OF THE FAN INLET. THE ROTOR SHOULD ROTATE CLOCKWISE WHEN LOOKING INTO THE FAN INTAKE. AS SOON AS FAN IS UP TO SPEED, CHECK THE MOTOR AMPERAGE ON EACH PHASE LEAD FOR BALANCE AND CORRECT MOTOR LOAD. IN ADDITION A VOLTAGE READING IS REQUIRED, ON A PHASE TO GROUND ON EACH LEAD. THE FULL LOAD AMPS ARE STATED ON PAGE # 7 IN THIS MANUAL, AND MUST NOT BE EXCEEDED.

BLADE ANGLE: ON ALL FANS, THE BLADE ANGLES HAVE BEEN SET AT THE FACTORY FOR THE DUTY REQUIRED. SEE PAGE # 7 FOR IMPELLER ADJUSTMENT, MAINTENANCE AND OR REPLACEMENT. DUE TO THE FACT THAT ONLY ONE HALF HOUR TO ONE HOUR OF LABOR IS REQUIRED TO CHANGE THE BLADE ANGLE SETTING OF ANY ADJUSTABLE PITCH FAN, IT IS THE RESPONSIBILITY OF THE BUYER TO ADJUST OR CHANGE THE BLADE ANGLES ON AN ADJUSTABLE PITCH FAN. THE MOTOR NAMEPLATE CURRENT IS NOT TO BE EXCEEDED WHEN THE VENTILATION SYSTEM IS OPERATED AT ITS HIGHEST POSSIBLE PRESSURE.

BALANCE: THIS UNIT WAS OPERATED AND DYNAMICALLY BALANCED TO A PRECISE DEGREE DURING ASSEMBLY. IF YOU PLACE YOUR HAND OR FINGER UPON THE OUTSIDE OF THIS UNIT, ITS OPERATION SHOULD FEEL SMOOTH AND FREE OF VIBRATIONS. THIS BALANCE MUST ALWAYS BE MAINTAINED TO ASSURE LONG SERVICE. IF OPERATION IS NOT SMOOTH CONTACT YOUR LOCAL SALES REP OR CONTACT FACTORY FOR SERVICE.

LUBRICATION

LUBRICATION: GOOD PREVENTIVE MAINTENANCE REQUIRES PROPER LUBRICATION PRACTICES. USE ONLY THE RECOMMENDED LUBRICANTS SPECIFIED. FOLLOW THE LUBRICATION SCHEDULES AS LISTED.

ALL BEARING CAVITIES AND GREASE LEADS HAVE BEEN PROPERLY LOADED BY SMJ INC. PRIOR TO SHIPMENT. FANS WHICH ARE TO BE INSTALLED PROMPTLY UPON DELIVERY REQUIRE NO ADDITIONAL LUBRICATION. **NOTE: ON SPECIAL DESIGNED FANS FOR A SPECIFIC APPLICATION, WHERE FAN/MOTOR UNIT ARE TO BE ASSEMBLED AT JOB SITE, IT IS REQUIRED FOR THE MAINTENANCE/OPERATIONAL PERSONNEL TO ENSURE GREASE LINES HAVE BEEN FILLED WITH PROPER GREASE. THIS COST IS TO BE AT THE EXPENSE OF THE BUYER.**

NOTE: IF A LUBRICATION INSTRUCTION PLATE IS MOUNTED ON THE OUTSIDE OF THE FAN NEAR ONE OF THE GREASE FITTINGS, FOLLOW THE INSTRUCTIONS ON THAT PLATE, IN LIEU OF THOSE PRINTED BELOW.

FROM THE LUBRICATION SCHEDULES FURNISHED, DETERMINE THE PROPER TIME FOR LUBRICATION AND GREASE ALL FITTINGS WITH LUBRICANT AS SPECIFIED WITHIN THE FOLLOWING PARAGRAPHS. **USE ONLY A HAND OPERATED GREASE GUN. DO NOT OVERGREASE AS THIS CAN BE AS HARMFUL AS TOO LITTLE GREASE.**

LUBRICATION OF ANTI-FRICTION BEARINGS SHOULD BE DONE AS A PART OF PLANNED MAINTENANCE SCHEDULE. THE RECOMMENDED LUBRICATION INTERVAL SHOULD BE USED AS A GUIDE TO ESTABLISH THIS SCHEDULE.

CLEANLINESS IS IMPORTANT IN LUBRICATION. ANY GREASE USED TO LUBRICATE ANTI-FRICTION BEARINGS SHOULD BE FRESH AND FREE OF CONTAMINATION. SIMILARLY, CARE SHOULD BE TAKEN TO PROPERLY CLEAN THE GREASE INLET AREA OF THE MOTOR TO PREVENT GREASE CONTAMINATION.

IF THE FAN UNIT IS HANDLING CONTAMINATED AIR, THE ROTOR SHOULD BE CHECKED PERIODICALLY FOR EXTREME WEAR ON BLADE LEADING EDGES, IF EXTREME WEAR IS PRESENT, A NEW OR REPLACEMENT ROTOR ASSEMBLY IS TO BE INSTALLED. THIS WILL MAINTAIN PROPER PERFORMANCE VALUES.

SHUT THE FAN OFF DURING GREASING. ROTATE THE FAN ROTOR BY HAND WHILE GREASING THE MOTOR ASSEMBLY.

LUBRICATION OF MOTORS

MOTORS: MOTORS FURNISHED IN ALL SMJ INC. FAN SERIES, HAVE BEEN LUBRICATED. IT IS RECOMMENDED THAT THE CUSTOMER CONTINUE TO USE THIS LUBRICANT IN FUTURE LUBRICATIONS. IF THIS GREASE CANNOT BE OBTAINED, CONSULT FACTORY. BELOW ARE A LIST OF OTHER SUGGESTED LUBRICANTS.

OPERATING TEMP. -25° C (-15° F) TO 50° C (120° F)

**CHEVRON SRI 2 GREASE - 10 SHOTS PER ZERK EVERY
THREE (3) MONTHS**

USING A HAND OPERATED GREASE GUN ONLY, PUMP IN THE FOLLOWING RECOMMENDED GREASE VOLUME.

FRAME SIZE	VOLUME IN CUBIC INCHES	
	1800 RPM AND SLOWER	3600 RPM
180 Thru 210	REFER	
250 Thru 280	TO	
320 Thru 360	MOTOR	
400 Thru 440	MANUAL	
5000		

LUBRICATION FREQUENCY PER THE FOLLOWING SCHEDULE

HORSEPOWER	*STANDARD CONDITIONS	**SEVERE CONDITIONS
1 thru 7 1/2 1800 RPM and slower	3 years	1 year
10 thru 75 1800 RPM and slower	2 years	6 to 12 months
100 and greater 1800 RPM and slower	1 year	6 months
All over 1800 RPM	6 months	3 months

* STANDARD CONDITIONS: EIGHT HOURS PER DAY, NORMAL OR LIGHT LOADING, CLEAN, @ 40° C (100° F) MAXIMUM AMBIENT.

** SEVERE CONDITIONS: TWENTY-FOUR HOURS PER DAY OPERATION OR SHOCK LOADING, VIBRATION, ON IN DIRT OR DUST @ 40° - 50° C (100° TO 120° F) AMBIENT.

MOTORS WITH CLASS H, TYPE RN OR CLASS H, TYPE RH INSULATION SYSTEMS, MUST BE LUBRICATED WITH MOBILE HP WITH NO SUBSTITUTIONS PERMITTED.
SOME HIGH HORSEPOWER MOTORS HAVE SPECIAL BEARINGS. THESE FANS HAVE A MOTOR LUBRICATION INSTRUCTION PLATE MOUNTED ON THE OUTSIDE OF THE FAN CASING.
FOLLOW THE INSTRUCTIONS MOUNTED ON THE FAN CASING IN LIEU OF THE STANDARD INSTRUCTIONS PRINTED HERE. SOME SMALL FRAME MOTORS ARE ASSEMBLED WITH SUFFICIENT GREASE IN THE BEARING CAVITIES TO LUBRICATE THE BEARINGS FOR LIFE. THEREFORE, NO GREASE FITTINGS ARE PROVIDED ON THESE MOTORS.

SMJ INC**SMJ INC**P.O. Box 55034
Grand Junction, CO. 81505 USA**TO: TRW ENVIRO SAFETY SYSTEMS, INC.****DATE: 10-AUG-2000****ATTN: MS. KIM DAVIS.****YOUR RFQ# L.V.CS.KL.08/00.133****FAX: 702-295.7921****OUR QUOTE No: 200902-NTS***We appreciate your inquiry and are pleased to offer the following equipment.*

ITEM	QTY	DESCRIPTION
1	1 EA.	AFS-1.6 AFS-1.6 SERIES AXIAL FLOW MINE/TUNNEL FAN, TWO STAGE DESIGN, HORIZONTAL MOUNTED, DIRECT DRIVEN. INCLUDED ARE THE FOLLOWING ITEMS: A. 2 EA. IMPELLER ASSEMBLY: MINE DUTY, ADJUSTABLE AT STANDSTILL. CAST ALUMINUM NON SPARKING BLADES, FABRICATED STEEL MINE DUTY HUB ASSEMBLY. IMPELLER ASSEMBLY IS DYNAMIC BALANCED TO LESS THAN 1 MIL. NON-SPARKING STAINLESS STEEL WEAR STRIPS ARE ATTACHED TO LEADING EDGE OF EACH IMPELLER BLADE. S-STEEL WEAR STRIPS ARE PROVIDED FOR VERY LONG IMPELLER LIFE. B. 1 EA. 1.52 SERIES FAN CASING: 5/16" A-36 PLATE & 0.5" X 4" FAN FLANGES. GUIDE VANE MATERIAL IS 0.25" & 0.375" A-36 PLATE. ALSO INCLUDED: SECOND STAGE IMPELLER SECTION & 2ND STAGE GUIDE VANE ASSEMBLY. FAN UNIT IS PROVIDED WITH LIFTING EYES. EXTERNAL PROTECTED GREASE LINES TO MOTOR BEARINGS. GREASE LINE IS HIGH PRESSURE FLAME PROOF WIRE BRADED HOSE. 1 EA. #550. BALMAC BRAND VIBRATION DETECTION SWITCH WITH 2 LIMITS. READS IN INCHES PER SECOND. C. 1 EA. SILENCER SYSTEM PACKAGE. SILENCER SYSTEM PACKAGE PROVIDED, CONSISTS OF INLET & OUTLET SILENCERS. SILENCERS ARE MINE DUTY & CLEANABLE. LIFTING EYES ARE PROVIDED. D. 2 EA. MATING FLANGES, FOR CUSTOMERS PRESENT ADAPTERS. TO MATE TO: 60" CUSTOMERS ADAPTERS, WITH 24 EA. 9/16" DIA HOLES, ON A BOLT CIRCLE OF 62.75". E. REQUIRED FAN PERFORMANCE: 90,000 CFM @ 14" Pt. W.G. & 120,000 CFM @ 11.0" PRESSURE TOTAL WATER GAUGE AT AN AIR DENSITY OF 0.064 LB/FT³. FAN BHP AT OPERATION IS 249. AVERAGE FAN EFFICIENCY IS 82%. FAN UNIT IS TESTED TO AMCA-210-85. F. ALL STEEL IS CLEANED & COATED WITH 1 COAT OF PRIMER & 2 EA. COATS OF "WHITE" ENAMEL PAINT. G. ALL WELDS ARE CONTINUOUS, AND MEET OR EXCEED AWS STANDARDS. H. FAN UNIT IS "REVERSABLE", SILENCER SYSTEM IS FITTED WITH INLET & OUTLET PODS FOR VERY SMOOTH AIRFLOW.

P.O. # H18992KLOC

Grand Junction, CO. 81505 USA

TO: TRW ENVIRO SA
ATTN: MS. KIM DAVIS.

TO: TRW ENVIRO SAFETY SYSTEMS, INC.

DATE: 10-AUG-2000

YOUR REQ# LV.CS.KL.08/00.133

FAX: 702-295.7921

OUR QUOTE No: 200902-NTS

We appreciate your inquiry and are pleased to offer the following equipment.

ITEM	QTY	DESCRIPTION
ITEM #1 CONTINUED.		

1

1 EA. 250HP, 1,200 RPM, 1.15:SF, CLASS.H. TEAO, C-FACE MOUNTED, 480/60/3, PREMIUM EFFICIENT, DOUBLE SHAFTED, CAST IRON, CHEMICAL DUTY, OVERSIZED CAST IRON CONNECTION BOX, FORGED A SHAFT SEAL, MOISTURE RESISTANT COPPER WINDINGS, TROPICALIZED, RTD'S FOR BEARINGS-100-OHM PLATINUM, ALSO 110V LOW DENSITY SPACE HEATERS.. BALDOR BRAND ELECTRIC MOTOR.

5

SEA, PRINTED, PARTS, OPERATION, MAINTENANCE MANUALS, CONTROL WIRING DIAGRAMS, SINGLE LINE ELECTRICAL DRAWINGS AND P & M MANUALS ARE ALSO SUPPLIED ON 3.5" DISCS, WITH FAN CURVES.

ONE-YEAR WARRANTY PROVIDED ON ALL ITEMS.

1

GUARANTEED NOISE OF FAN UNIT OPERATING AT: 120,000 CFM @ 11.0" PRESSURE TOTAL AT 0.064 LB/FT³, THE SOUND PRESSURE LEVEL WILL NOT EXCEED 78-79dBA UNDERGROUND AT 5' FROM FAN ASSEMBLY. FAN UNIT WHEN TESTED TO AMCA-210-85 FOR REQUIRED FAN PERFORMANCE, NOISE WILL BE MEASURED WITH A CALIBRATED SOUND METER AT A DISTANCE OF NOT MORE THAN 5' FROM FAN UNIT, DURING TESTING. FAN & SILENCER SYSTEM, IS TESTED AT THE SAME TIME. FAN UNIT OPERATING AT REQUIRED PRESSURE IS ESTIMATED AT 76-77 dBA AT 5' FROM FAN UNIT. DURING TESTING IN AN OPEN FREE FIELD (OUR PLANT).

CUSTOMERS COST ██████████ FOR ITEM #1. COMPLETE.

TERMS: NET 30 DAYS.

DELIVERY: 10-12 WEEKS FROM DATE OF ORDER & APPROVAL OF PRINTS.

F.O.B. POINT, GRAND JCT, CO. FREIGHT PREPAID & INCLUDED IN COST.

Any questions concerning above quotation, please call or fax. Thank you for your interest in our products.

The above proposal including Terms & Conditions of Sale stated on page 2 hereto¹ constituting the basis of this proposal are hereby accepted.

Purchaser: _____

Signature

Date: _____

Quenun Spendrup
Quenun Spendrup, SMI, INC.

Purchase Order No: _____

R.O. # A18992KLOC

Catalog Number: ECP44256T-4

Spec Number: 18G21W167
HorsePower: 250
RPM: 1180
Nema Frame: 449T
List Price: 22340
Multiplier: D3
Type: 18164M
C Dimension: 54.37
Eff Full Load: 95.8
Shipping Wt: 2666
Volt Code: G
Voltage: 460
Amps: 294
Phase: 3
Hertz: 60
Pole: 06
Design: B
Ser. F: 1.15
Enclosure: TEFC
Amp Code: H
Mounting: F1
Base Code: RG
D.E. Bearing: 6319
O.D.E. Bearing: 6314
Rotation: R
Rating: 40C
Substitute: ID15H4250-EO
Rec Adj Fctr:
Rec Soft Strt:

Note: Motor Supplied with.

Lea: 110V 1Ø Space Heaters.

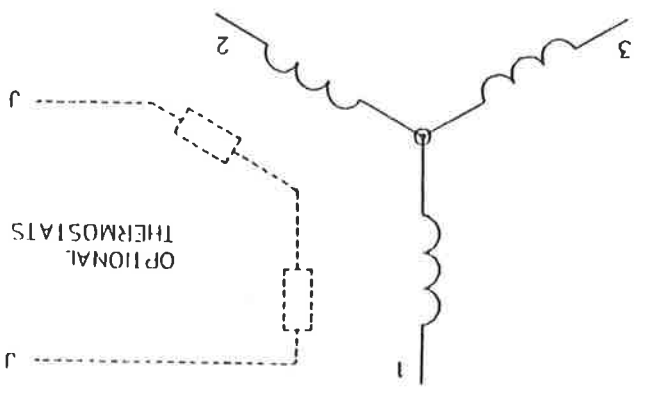
Lea - Red wires Per Heater.

Lea. RTD's for Brgs. 1ea. Per Brg.

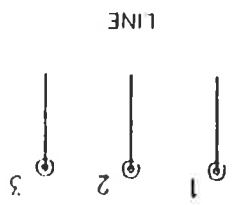
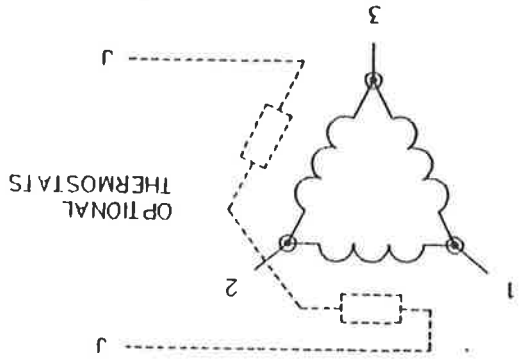
→ ALL: Motor Leads. Space Heater leads,
RTD Leads are located in Conn Box,
on Side of Fan unit.

13
242

TYPICAL WYE-CONNECTED MOTOR



TYPICAL DELTA-CONNECTED MOTOR



CD0006

- NOTES:
1. THREE LEAD MOTOR MAY BE EITHER WYE CONNECTED OR DELTA CONNECTED.
 2. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
 3. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
 4. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.

CD0006

MATERIAL: -		REV: C	UPDATE DRAWING TO ACAD
9000000		SCALE: -	BY: JWF
FILE: AAA00005141		REVISED: 09/20/93	
IDR: 0045960			
BALDOR ELECTRIC Co.			
3PH, 3V, 3 LEADS, WYE OR DELTA CONNECTED			

RATING - NOMINALS

Rated Output	250
Volts	460
Full Load Amps	294
Speed	1180
Hertz	60
Phase	3
NEMA Design Code	B
LR KVA Code	H
Efficiency	95.8
Power Factor	83
Service Factor	1.15
Rating -Duty	40C AMB-CONT

CHARACTERISTICS

Full Load Torque	1105 LB*FT
Break Down Torque	2039 LB*FT
Pull-Up Torque	1100 LB*FT
Locked-Rotor Torque	1452
Starting Current	1690.
No-Load Current	102.
Line-line Resistance @ 25 degrees C	0.0147
Temperature Rise, in degrees C @ F.L.	64

LOAD CHARACTERISTICS - TESTED

% of Rated Load	25	50	75	100	125	150	S.F
Power Factor	52	73	80	83	84	84	84
Efficiency	92.0	95.0	95.6	95.6	95.2	94.6	95.4
Speed (rpm)	1197	1194	1191	1188	1184	1180	1186
Line Amperes	123.	171.	229.	293.	361.	439.	334.

BALDOR ELECTRIC COMPANY

WINDING # 18WG167

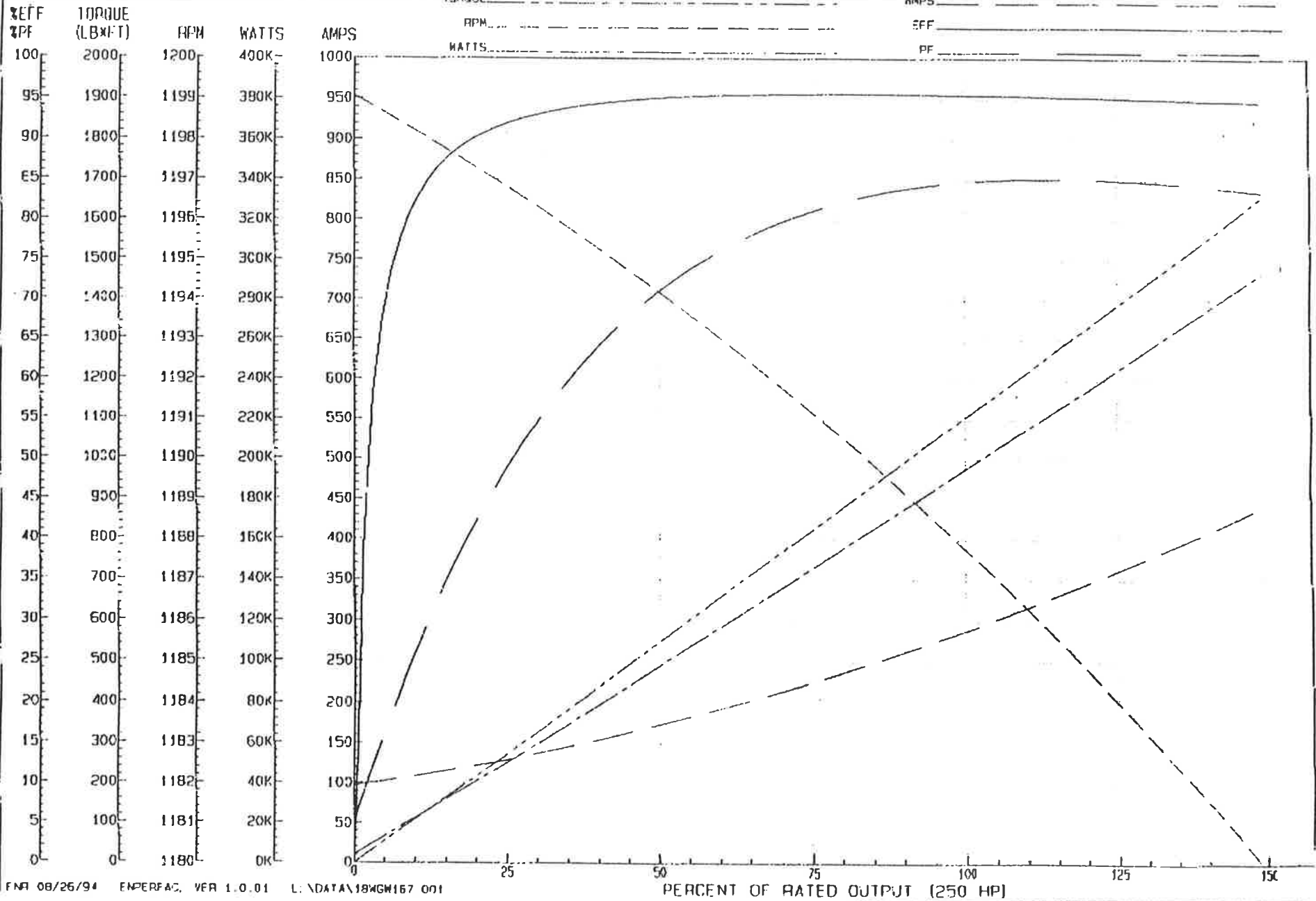
250 HP 3 PH 60 HZ 1180 RPM 460 V 18164M

TORQUES (LB×FT): PO=2039 PU=1100 LR=1452 LRA=1690

Dec-11-00 3:01PM;

801 973 8301;

Sent By: The Evans Group, LLC;



BALDOR **MOTORS AND DRIVES**



Integral Horsepower AC Induction Motors ODP Enclosure TEFC Enclosure Explosion Proof

Installation & Operating Manual

Accessories

The following is a partial list of accessories available from Baldor.
Contact your Baldor distributor for availability and pricing information.

Note: Space heaters and RTD's are standard on some motors.

Bearing RTD

RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor bearing during operation.

Bearing Thermocouples

Used to measure or monitor bearing temperatures.

Bearing Thermostat

Temperature device that activates when bearing temperatures are excessive. Used with an external circuit to warn of excessive bearing temperature or to shut down a motor.

Conduit Boxes

Optional conduit boxes are available in various sizes to accommodate accessory devices.

Cord & Plug Assembly

Adds a line cord and plug for portable applications.

Drains and Breathers

Stainless steel drains with separate breathers are available.

Drip Covers

Designed for use when motor is mounted in a vertical position. Contact your Baldor distributor to confirm that the motor is designed for vertical mounting.

Fan Cover & Lint Screen

To prevent build-up of debris on the cooling fan.

Nameplate

Additional stainless steel nameplates are available.

Roller Bearings

Recommended for belt drive applications with a speed of 1800 RPM or less.

Rotation Arrow Labels

Rotation arrows are supplied on motors designed to operate in one direction only. Additional rotation arrows are available.

Space Heater

Added to prevent condensation of moisture within the motor enclosure during periods of shut down or storage.

Stainless Hardware

Stainless steel hardware is available. Standard hardware is corrosion resistant zinc plated steel.

Winding RTD

RTD (Resistance Temperature Detector) devices are used to measure or monitor the temperature of the motor winding during operation.

Winding Thermocouples

Used to measure or monitor winding temperatures.

Winding Thermostat

Temperature device that activates when winding temperatures are excessive. Used with an external circuit to warn of excessive winding temperature or to shut down a motor.

Note: On some motors, leads for accessory devices are brought out to a separate conduit box located on the side of the motor housing (unless otherwise specified).

Table 3-5 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local Baldor service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load.
	Single Phasing.	Reduce load or replace with motor of greater capacity.
	Improper ventilation.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
		Check external cooling fan to be sure air is moving properly across cooling fins.
	Unbalanced voltage.	Excessive dirt build-up on motor. Clean motor.
		Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten "Thru Bolts".
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately $\frac{3}{4}$ filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately $\frac{3}{4}$ filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your Baldor Service Center.
	Resonance.	Tune system or contact your Baldor Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor.
Growing or whining	Bad bearing.	Check insulation integrity. Clean ventilation openings. Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately $\frac{3}{4}$ filled.

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Section 1 General Information

Overview

This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements. A Warning statement indicates a possible unsafe condition that can cause harm to personnel. A Caution statement indicates a condition that can cause damage to equipment.

Important:

This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your Baldor distributor for more information or clarification.

Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators
- The National Electrical Code
- Local codes and Practices

Limited Warranty

1. Baldor Electric motors are warranted for a period of one (1) year, from date of shipment from the factory or factory warehouse against defects in material and workmanship. To allow for stocking and/or fabrication period and to provide one year of actual service, the warranty period is extended for an additional period of six (6) months for a total of eighteen (18) months from the original date of shipment from the factory or factory warehouse stock. In no case will the warranty period be extended for a longer period. Baldor extends this limited warranty to each buyer of the electric motor for the purpose of resale and to the original purchaser for use.
2. Baldor will, at its option repair or replace a motor which fails due to defects in material or workmanship during the warranty period if:
 - a. the purchaser presents the defective motor at or ships it prepaid to, the Baldor plant in Fort Smith, Arkansas or one of the Baldor Authorized Service Centers and
 - b. the purchaser gives written notification concerning the motor and the claimed defect including the date purchased, the task performed by the Baldor motor and the problem encountered.
3. Baldor will not pay the cost of removal of any electric motor from any equipment, the cost of delivery to Fort Smith, Arkansas or a Baldor Authorized Service Center, or the cost of any incidental or consequential damages resulting from the claimed defects. (Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion may not apply to you.) Any implied warranty given by laws shall be limited to the duration of the warranty period hereunder. (Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.)
4. Baldor Authorized Service Centers, when convinced to their satisfaction that a Baldor motor developed defects in material or workmanship within the warranty period, are authorized to proceed with the required repairs to fulfill Baldor's warranty when the cost of such repairs to be paid by Baldor does not exceed Baldor's warranty repair allowance. Baldor will not pay overtime premium repair charges without prior written authorization.
5. The cost of warranty repairs made by centers other than Baldor Authorized Service Centers **WILL NOT** be paid unless first authorized in writing by Baldor.
6. Claims by a purchaser that a motor is defective even when a failure results within one hour after being placed into service are not always justified. Therefore, Baldor Authorized Service Centers must determine from the condition of the motor as delivered to the center whether or not the motor is defective. If in the opinion of a Baldor Authorized Service Center, a motor did not fail as a result of defects in material or workmanship, the center is to proceed with repairs only if the purchaser agrees to pay for such repairs. If the decision is in dispute, the purchaser should still pay for the repairs and submit the paid invoice and the Authorized Service Center's signed service report to Baldor for further consideration.
7. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Note that **Baldor Super-E® Premium Efficiency** electric motors are warranted for a period of three (3) years. All other terms and conditions of the Limited Warranty statement apply.

safety notice:

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

- WARNING:** Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.
- WARNING:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.
- WARNING:** Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.
- WARNING:** This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.
- WARNING:** Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.
- WARNING:** Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.
- WARNING:** Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.
- WARNING:** Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.
- WARNING:** Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.
- WARNING:** Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.
- WARNING:** Do not use these motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

Safety Notice Continued

- WARNING:** Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate.
- Specific service conditions for these motors are defined in NEC 70-599.
- WARNING:** UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.
- Caution:** To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.
- Caution:** Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load from the motor shaft before moving the motor.
- Caution:** If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.
- Caution:** To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.
- Caution:** If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG-1 and MG-2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Storage

If the motor is not put into service immediately, the motor must be stored in a clean, dry and warm location. Several precautionary steps must be performed to avoid motor damage during storage.

1. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
2. Do not lubricate bearings during storage. Motor bearings are packed with grease at the factory. Excessive grease can damage insulation quality.
3. Rotate motor shaft at least 10 turns every two months during storage (more frequently if possible). This will prevent bearing damage due to storage.
4. If the storage location is damp or humid, the motor windings must be protected from moisture. This can be done by applying power to the motors' space heater (if available) while the motor is in storage.

Inpacking

Each Baldor motor is packaged for ease of handling and to prevent entry of contaminants.

1. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.
2. When the motor has reached room temperature, remove all protective wrapping material from the motor.

Landing

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft.
2. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. Do not lift using the motor lugs or eye bolts provided.

If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Section 2

Installation & Operation

Overview

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

The motor should be installed in an area that is protected from direct sunlight, corrosives, harmful gases or liquids, dust, metallic particles, and vibration. Exposure to these can reduce the operating life and degrade performance. Be sure to allow clearance for ventilation and access for cleaning, repair, service and inspections. Ventilation is extremely important. Be sure the area for ventilation is not obstructed. Obstructions will limit the free passage of air. Motors get warm and the heat must be dissipated to prevent damage.

These motors are not designed for atmospheric conditions that require explosion proof operation. They must NOT be used in the presence of flammable or combustible vapors or dust.

1. ODP motors are suitable only for indoor applications.
2. TEFC motors are suitable for indoor or outdoor standard service applications.

Mounting

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

The standard motor base is designed for horizontal or vertical mounting. Adjustable or sliding rails are designed for horizontal mounting only. Consult your Baldor distributor or authorized Baldor Service Center for further information.

Accurate alignment of the motor with the driven equipment is extremely important.

Alignment

1. **Direct Coupling**
For direct drive, use flexible couplings if possible. Consult the drive or equipment manufacturer for more information. Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between coupling hubs should be maintained as recommended by the coupling manufacturer.
2. **End-Play Adjustment**
The axial position of the motor frame with respect to its load is also extremely important. The motor bearings are not designed for excessive external axial thrust loads. Improper adjustment will cause failure.
3. **Pulley Ratio**
The pulley ratio should not exceed 8:1.
4. **Belt Drive**
Align sheaves carefully to minimize belt wear and axial bearing loads (see End-Play Adjustment). Belt tension should be sufficient to prevent belt slippage at rated speed and load. However, belt slippage may occur during starting.

Caution: Do not over tension belts.

SMJ INC

P.O. Box 55034
Grand Junction, CO 81506
Phone: (970) 243-6134; (970) 243-4328
Fax: (970) 243-1213; (970) 243-6134
Email: qspend@smjfans.com

Final Assembly Inspection Report

Fan Serial #: 010116
Impeller Dia.: 1592 mm
Hub Dia.: 33.5" 00
of Blades: 16 EA
Model/Type of 1 BOLT ADJ. - 1" x 3 1/2 SET S&L
blades: Casting # L007.52
Final Blade settings: Prelim 3 1/2 = 22.5"
Bore Dia: 3 3/8" + .015"
Key Way Size: 7/16" DEPTH x 7/8"
Key Length: 7/8" x 5"
Spinner Cap/AL Cover: 3/16" x 32" O.D.
Impeller Hold down bolt: 3/4" DC x 2 1/2 GR8 (N)
Torque to: 150 ft lb
Bushings or Shoulder FRONT - 2 1/16 LONG
Washers: BACK - 2 1/4 LONG
Hub Width: 6 1/2", Bore Length - 5 5/16"
Inspected By: J. New Art Madero
Impeller adjustment N/A
Motor horsepower: 250
RPM: 1180
Frame: 449TCZ TEAO
Mounting: FOOT / C FACE
SF: 1.15
Class: H
Voltage: 460 / 60/3
Brand: BALDOR
C-FACE BOLTS - 3/4" DC x 2 1/2 GR8
TORQUED TO 140 FT LB 8EA

Motor:
Serial #: N 110/0111-0011283Z
XP #: N/A
Cable: N/A
Free Amps: _____
Load Amps: Full Load 294
Protective hose: N/A
Starter Brand: _____
Model #: _____
Serial #: _____
Horsepower: _____
Voltage: _____
Breaker _____
Settings: _____
Heaters: _____
Ins By: _____
Assem. By: _____
Run By: _____
Ins By: _____
Customer: TEW
P.O. #: A18992KLOC
KEN SCHULENBURG
Contact: KIMBERLY DAVIS 702-295-5596
Date of Order: 9 / 15 / 00
NOTES: GREASE ON TAG POLYREX EM
BEG RTD 100 OHM RADIUM

CLASS F RISE AT 1.15 2000 CFM
R30
GREASE USED - CHEVRON SRI-2
(POLYUREA)

Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment. Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

Conduit Box

For ease of making connections, an oversize conduit box is provided. The box can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

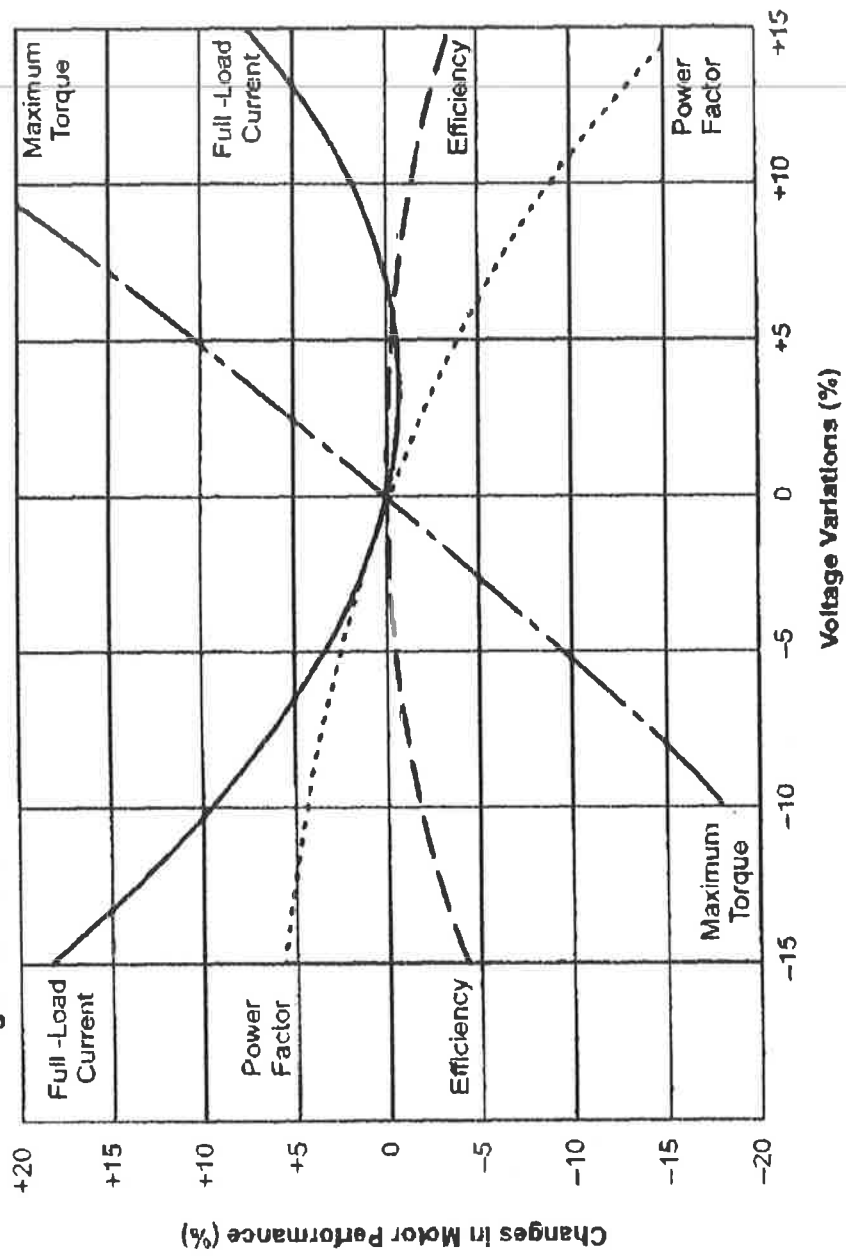
AC Power

Connect the motor leads as shown on the connection diagram located on the name plate or inside the cover on the conduit box. Be sure the following guidelines are met:

1. AC power is within $\pm 10\%$ of rated voltage with rated frequency. (See motor name plate for ratings).
- OR
2. AC power is within $\pm 5\%$ of rated frequency with rated voltage.
- OR
3. A combined variation in voltage and frequency of $\pm 10\%$ (sum of absolute values) of rated values, provided the frequency variation does not exceed $\pm 5\%$ of rated frequency.

Performance within these voltage and frequency variations are shown in Figure 2-1.

Figure 2-1 Motor Performance VS Voltage Variations



First Time Start Up

Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

1. Make sure that the mechanical installation is secure. All bolts and nuts are tightened etc.
2. If motor has been in storage or idle for some time, check winding insulation integrity with a Megger.
3. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
4. Be sure all shipping materials and braces (if used) are removed from motor shaft.
5. Manually rotate the motor shaft to ensure that it rotates freely.
6. Replace all panels and covers that were removed during installation.
7. Momentarily apply power and check the direction of rotation of the motor shaft.
8. If motor rotation is wrong, be sure power is off and change the motor lead connections. Verify rotation direction before you continue.
9. Start the motor and ensure operation is smooth without excessive vibration or noise. If so, run the motor for 1 hour with no load connected.
10. After 1 hour of operation, disconnect power and connect the load to the motor shaft. Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful.

Coupled Start Up

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start up should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Ongoing and Repeated Starts Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating - Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values. If there is any question regarding safe operation, contact your local Baldor distributor or Baldor Service Center.

Section 3

Maintenance & Troubleshooting

WARNING:

UL rated motors must only be serviced by authorized Baldor Service Centers if these motors are to be returned to a flammable and/or explosive atmosphere.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Keep the motor clean and the ventilation openings clear. The following steps should be performed at each inspection:

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to ensure that the integrity of the winding insulation has been maintained. Record the Megger readings. Immediately investigate any significant drop in insulation resistance.
3. Check all electrical connectors to be sure that they are tight.

Lubrication & Bearings

Bearing grease will lose its lubricating ability over time, not suddenly. The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions. Good results can be obtained if the following recommendations are used in your maintenance program.

Type of Grease

A high grade ball or roller bearing grease should be used. Recommended grease for standard service conditions is Polyrex EM (Exxon Mobil).

Equivalent and compatible greases include:

Texaco Polystar, Rykon Premium #2, Pennzoil Pen 2 Lube and Chevron SRI.

- Maximum operating temperature for standard motors = 110° C.
- Shut-down temperature in case of a malfunction = 115° C.

Lubrication Intervals

Recommended lubrication intervals are shown in Table 3-1. It is important to realize that the recommended intervals of Table 3-1 are based on average use.

Refer to additional information contained in Tables 3-2 and 3-3.

Table 3-1 Lubrication Intervals *

NEMA / (IEC) Frame Size	Rated Speed - RPM					
	10000	6000	3600	1800	1200	900
Up to 210 incl. (132)	**	2700 Hrs.	5500 Hrs.	12000 Hrs.	18000 Hrs.	22000 Hrs.
Over 210 to 280 incl. (180)			3600 Hrs.	9500 Hrs.	15000 Hrs.	18000 Hrs.
Over 280 to 360 incl. (225)			* 2200 Hrs.	7400 Hrs.	12000 Hrs.	15000 Hrs.
Over 360 to 5800 incl. (300)			*2200 Hrs.	3500 Hrs.	7400 Hrs.	10500 Hrs.

* Lubrication intervals are for ball bearings. For roller bearings, divide the listed lubrication interval by 2.

** For 6205 and 6806 bearings. For 6807 bearings, consult oil mist lubrication (MN401).
Relubrication interval for 6205 bearing bearing is 1550Hrs. (using grease lubrication).
Relubrication interval for 6806 bearing bearing is 720Hrs. (using grease lubrication).

Table 3-2 Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40° C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50° C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50° C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<-30° C ^{3W}		

Special high temperature grease is recommended (Darmex 707). Note that Darmex 707 grease does not mix with other grease types. Thoroughly clean bearing & cavity before adding grease.

Special low temperature grease is recommended (Aeroshell 7).

Table 3-3 Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1
Low Temperature	1.0

Table 3-4 Bearings Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (Shaft End) in each frame size)			
	Bearing	OD D mm	Width B mm	Weight of Grease to add * oz (Grams)
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17)
Over 280 to 360 incl. (225)	6313	140	33	0.81 (23)
Over 360 to 449 incl. (280)	NU319	200	45	2.12 (60)
Over 500 to 580 incl. (355)	NU328	300	62	4.70 (130)
Spindle Motors				
76 Frame	6207	72	17	0.22 (6.1)
77 Frame	6210	90	20	0.32 (9.0)
80 Frame	6213	120	23	0.49 (14.0)
				0.99
				3.3

Weight in grams = .005 DB

Lubrication Procedure

Be sure that the grease you are adding to the motor is compatible with the grease already in the motor. Consult your Baldor distributor or an authorized service center if a grease other than the recommended type is to be used.

Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty environment, contact your Baldor distributor or an authorized Baldor Service Center for additional information.

With Grease Outlet Plug

1. Clean all grease fittings.
2. Remove grease outlet plug.
3. If motor is stopped, add the recommended amount of grease.

If motor is to be greased while running, a slightly greater quantity of grease will have to be added. Add grease slowly until new grease appears at shaft hole in the endplate or purge outlet plug.

4. Re-install grease outlet plug.

Without Grease Outlet Plug

1. Disassemble motor.
2. Add recommended amount of grease to bearing and bearing cavity. (Bearing should be about 1/3 full of grease and outboard bearing cavity should be about 1/2 full of grease.)

Note: Bearing is 1/3 full when only one side of bearing is completely full of grease.

3. Assemble motor.

Sample Lubrication Determination

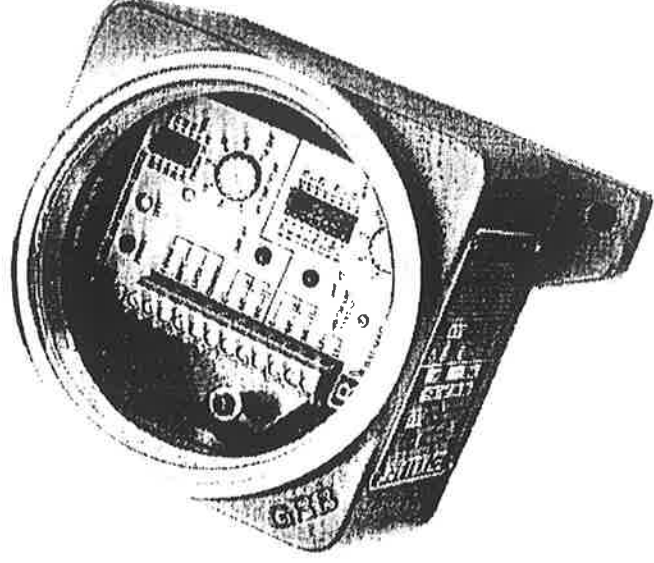
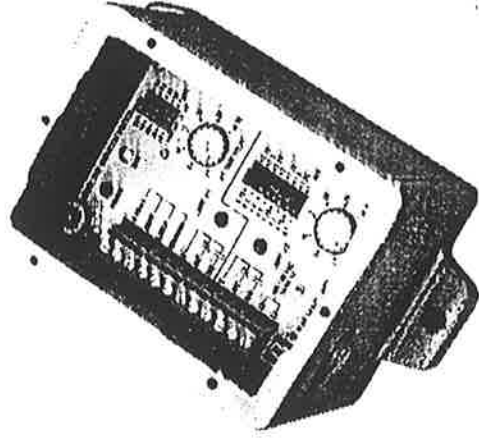
Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43° C and the atmosphere is moderately corrosive.

1. Table 3-1 list 9500 hours for standard conditions.
2. Table 3-2 classifies severity of service as "Severe".
3. Table 3-3 lists a multiplier value of 0.5 for Severe conditions.
4. Table 3-4 shows that 1.2 in³ or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

OPERATION MANUAL

MODEL 550 VIBRATION SWITCH



4010 Main Street Hilliard, Ohio 43026 U.S.A.
Phone: 614-876-1295 Fax: 614-771-5608

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WARNING: Exercise extreme caution when performing any task on rotating machinery. Failure to do so may result in equipment damage or personal injury. Familiarize yourself with the equipment before attempting to perform any operation.

WARNING: ROTATING MACHINERY HAS POTENTIALLY DANGEROUS MOVING PARTS AND SHOULD BE GUARDED IN ACCORDANCE WITH APPLICABLE SAFETY REGULATIONS.

This manual is for the Balmac Vibration Monitor Model 550, 550-X, 550M, and 550M-X.

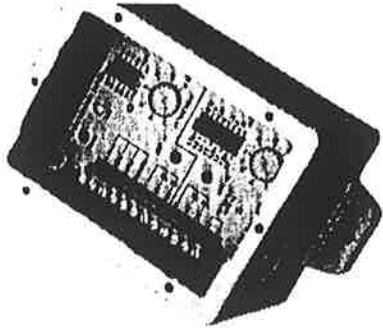


SECTION 1 - INTRODUCTION

Description

The Balmac Model 550 Vibration Switch is an electronic vibration detection limit switch for monitoring rotating machinery. Vibration monitoring using the Model 550 Vibration Switch can help protect machinery from destructive vibration and damage which results in substantial repairs and downtime. The Model 550 Vibration Switches have many superior benefits (user adjustable limits, limit and power indicators, test function, solid-state circuitry, two SPDT relay outputs). They have a built-in piezoelectric vibration sensor (accelerometer) which provides an electrical signal when distorted by vibration.

Balmac Model 550 Vibration Switch

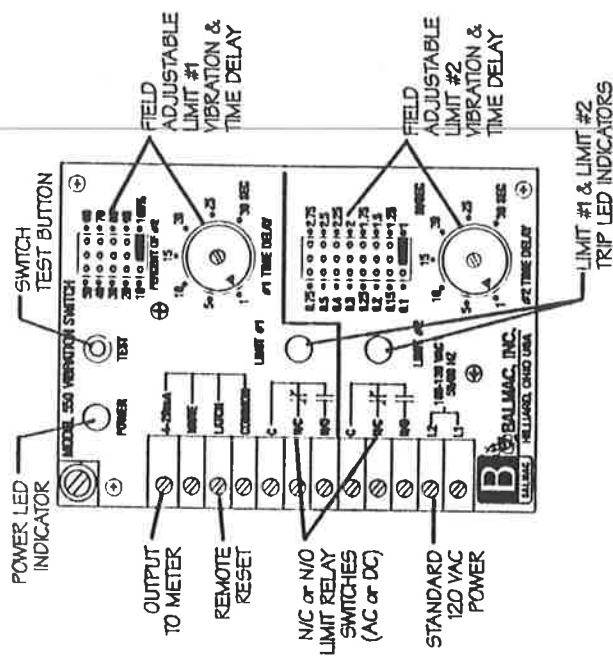


Model 550



Model 550-X

The circuit converts this signal to vibration velocity (calibrated in inches-per-second [or millimeters-per-second for Metric units] - Peak). The vibration switch is sensitive to vibration which is perpendicular to the housing's mounting base. The vibration switch mounts directly to the machinery in any axis direction (omni-directional mounting), i.e., horizontal, vertical, or axial.



The Model 550 and 550-X have internal sensors. The switches are mounted directly on the machinery. They may be mounted in any direction - horizontal, vertical or axial. Units are enclosed in water-tight, industrial housings. (Shown with covers removed.)



SECTION 2 - FEATURES

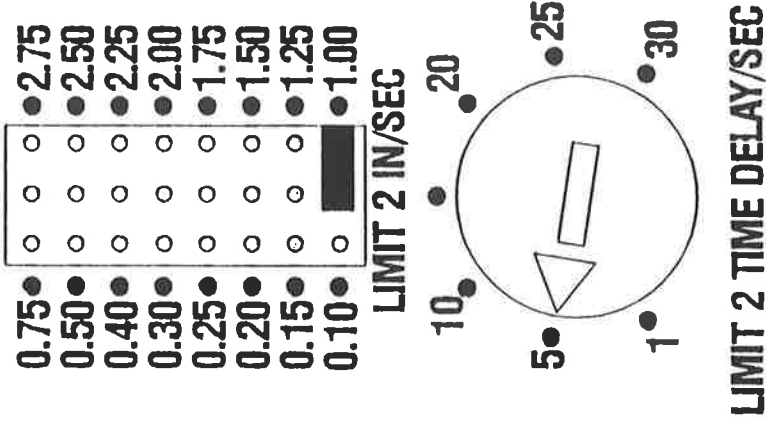
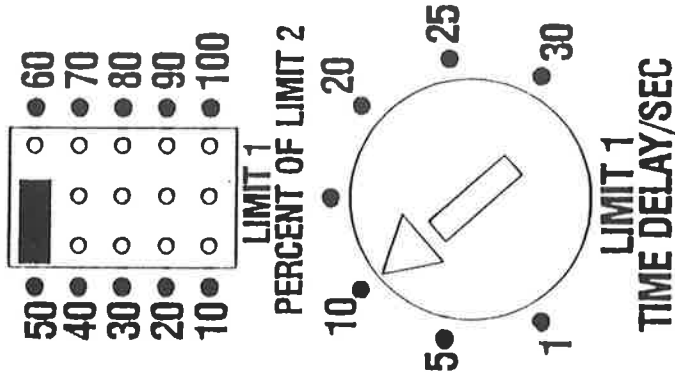
LIMITS

The Model 550 has two adjustable limit set points. Set Limit #2 to the desired maximum vibration level for *shutdown* protection (16 user selectable settings). Set Limit #1 as a percentage of Limit #2 as a *warning* of increasing vibration (10 user selectable settings). Limit #2 is factory calibrated for vibration velocity units in inches-per-second (IN/SEC). Limit #1 is a percentage of Limit #2 setting. Each limit relay acts as a SPDT isolated Form-C relay with one normally-open (N/O) and one normally-closed (N/C) set of contacts. Limit tripping is indicated by an individual red LED trip indicator. The limit relays can be wired to the customer's external circuits to activate alarm or control functions. Limit action occurs when the vibration exceeds the limit for longer than the user adjustable 1 to 30 second time delay setting (or when the TEST button is held depressed).

The output limits can be wired for automatic reset or latching with a remote reset. A circuit closure between the reset (LATCH) and COMMON terminals will reset the limit relays. This is non-latching operation. An open circuit maintains (latches) the limit relays. This is latching operation. (See additional information in Section 6.)

TIME DELAY

Limit triggering occurs after the user adjustable 1 to 30 second delay. This delay prevents false triggering due to transitional vibrations. Vibration from such things as: start-up, momentary power loss, abrupt load changes, and sudden speed changes. The delay allows you to set the limits to a level which will provide the maximum detection.



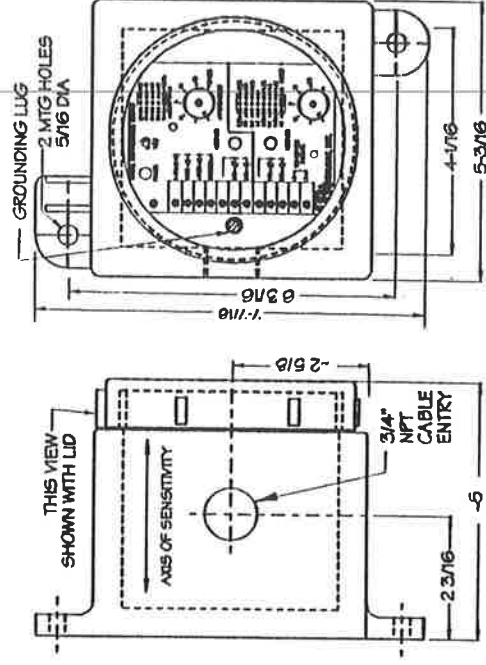
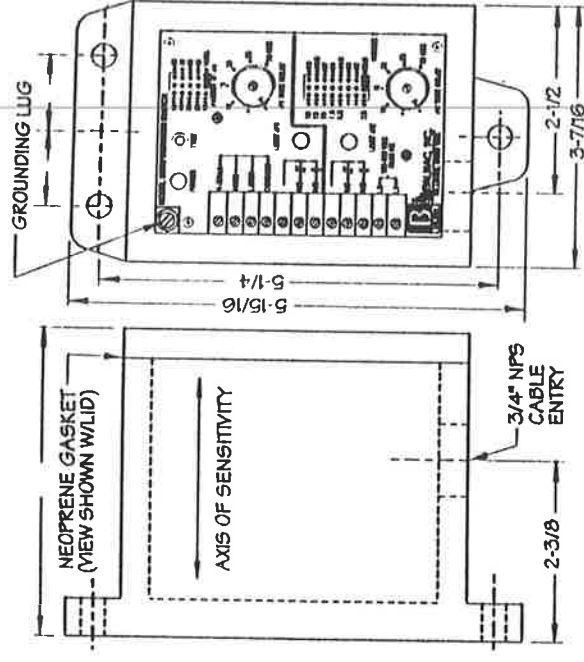
OUTPUT

A 4-20 mA DC output is provided for a remote meter or for interfacing with recording instruments. (No external power source is required in the 4-20 mA circuit.) This signal can be supplied to a PLC, a computer control system, or a data logger. Balmac accessory part number A-11347 Remote Panel Meter has a "0" (Zero) to "100%" scale for the 4-20 mA analog output signal. An output of less than 4 mA is indicated with the 550 powered off, or an open circuit in the output signal circuit.

SECTION 3 - ENCLOSURES

The 550 housing is a cast-aluminum enclosure. This rugged water-tight and dust-tight box meets portions of NEMA 3, 4, and 12 classifications. The 550 cast aluminum box includes cover (held on by six 6-32 Phillips-head screws) and gasket.

The 550-X housing is for hazardous locations. Model 550-X has a cast aluminum housing with threaded screw type cover and gasket. Rated for Class I, Div. 1 & 2, Groups C, D; Class II, Div. 1 & 2, E, F, G; Class III, NEMA 7 C D, 9 E F G. *Note for the 550-X: To prevent ignition of hazardous atmosphere, disconnect the 550-X from the power supply circuit(s) before opening the enclosure. Keep cover tightly closed when circuits are alive. See enclosure label for specifications.*

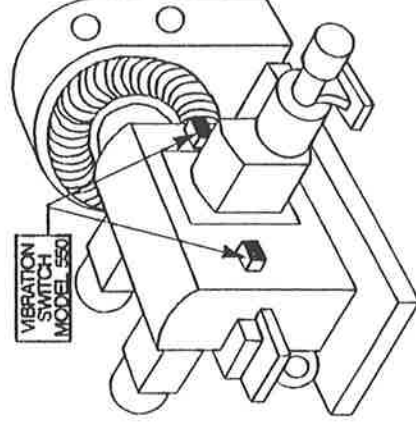
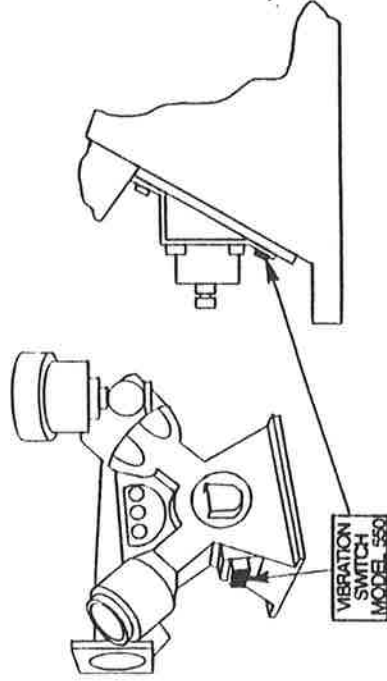


SECTION 4 - INSTALLATION

The installation and setup of the vibration switch is a two-step procedure:

1. **Select the mounting location and install.**
2. **Set the vibration limits.**

The location of the switch on a machine should be selected carefully. It is a good idea to survey the machine with a vibration meter or analyzer. The vibration switch axis of sensitivity is perpendicular to the mounting base. The mounting orientation can be in any position (omni-directional). In most instances, the switch is mounted in a vertical, axial, or horizontal plane close to the centerline of the rotating shaft. This position should be in an area of good vibration signal definition, or where there is a good transfer of the vibration to the vibration switch. This location will vary from machine to machine depending on the type and construction of the machinery and the component of concern. Example, normally worn bearings or unbalance can be detected near the bearing housings and at right angles to the rotating shaft axis.



MOUNTING and MOUNTING PLATES

Mount the enclosure on a flat surface area. The mounting surface must be rigidly attached to the area of the equipment where the vibration is to be monitored. The axis of sensitivity (see arrow on enclosure side) should be parallel to the direction of the anticipated machinery vibration motion.

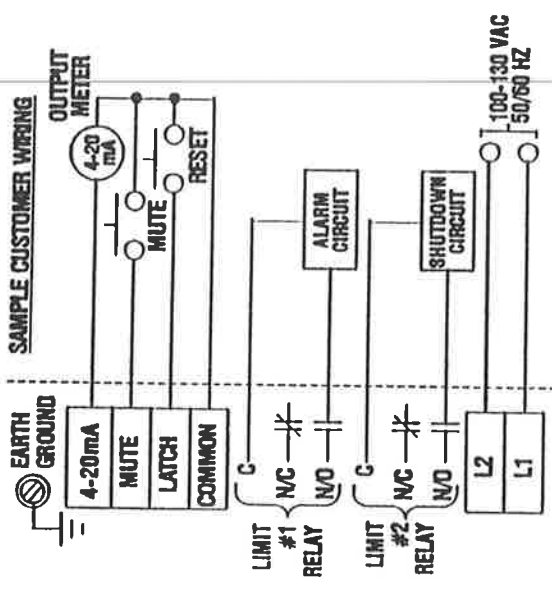
Mounting plates should be used only if the vibration switch cannot be mounted on a flat surface of the machinery. Plates should be as small as possible and rigid by design. Use ½" thick plate that is well re-enforced. Care should be taken in the design of plates and brackets. Insure that their resonant response is not within the frequency range of the vibration switch. You must ensure that the switch and mounting plate are rigidly attached to the monitoring point for the proper sensing of the vibration. Mounting plates should be rigidly attached to the machine by some suitable means like welding, brazing, or bolting.

SECTION 5 - WIRING

The wiring access is provided through a 3/4" NPS cable entry on the Model 550 and a 3/4" NPT cable entry on the 550-X. A Jam Nut must be used to prevent the threads from penetrating the enclosure more than 1/4".

Customer wiring that is subject to physical damage should be adequately protected. When installing electrical conduit use a short length (12") of flexible conduit between the vibration switch and a junction box. This construction will provide some vibration isolation in the conduit line. Conduit and fittings should conform to the environment of the vibration switch location. In hazardous locations the proper explosion proof fittings should be used. Weather-resistant or rain-tight fittings should be used to protect the switch wiring from a humid or corrosive atmosphere.

Vibration Switch covers and the use of metal conduit will help shield the circuits from RFI (radio frequency interference) and EMI (electromagnetic interference).



SECTION 6 - VIBRATION LIMIT SETTINGS

The 550 Vibration Switch monitors machinery vibration in Velocity. Velocity monitoring provides the maximum protection for equipment operating in the 120 to 60,000 RPM range. Users select particular vibration trip levels based on several considerations. Some considerations are:

- machinery type
- equipment location
- machine size
- mounting environment
- service application
- operating environment
- operating speed (s)

There are many standard guides available for setting vibration limits. Two standards are the International Standards ISO 2372 and ISO 3945.

The American National Standard is ANSI S2.41-1985. These standards can be used to evaluate mechanical vibration of machines with service speeds in the range of 120 to 60,000 RPM.

LIMIT #1 PERCENT OF #2 VIBRATION SETTING

The Limit #1 percent of Limit #2 vibration is selected by using a push-on jumper. Limit #1 has 10 available settings. A jumper is placed between the center row pin and the selected percentage.

Example

With Limit #2 set at 0.2 IN/SEC and Limit #1 set at 50 %, then the Limit #1 vibration amount is 0.1 IN/SEC. Only one jumper can be used to select the percent setting. Spare jumpers are provided with each new Vibration Switch shipment.

VIBRATION SEVERITY CHART

Class-1: Individual components, integrally connected with the complete machine in its normal operating condition.
Small Electric Motors, Precision Machines, Turbines

Class-2: Medium size machinery without special foundations, rigidly mounted engines, or machines on special foundations.
Gear Boxes, Pumps, M-G Sets, Fans

Class-3: Large prime movers mounted on heavy, rigid foundations.
Compressors, Blowers, Hammer mills, Engines

Class-4: Large prime movers mounted on relatively soft, light-weight structures.
Crushers, Reciprocating Machinery, Vibrating Conveyors

VIBRATION VELOCITY		CLASS OF MACHINERY			
Vibration (ips)	Class-1	Class-2	Class-3	Class-4	
0.01 ips	GOOD	GOOD	GOOD	GOOD	
0.02 ips	GOOD	GOOD	GOOD	GOOD	
0.03 ips	GOOD	GOOD	GOOD	GOOD	
0.06 ips	FAIR	GOOD	GOOD	GOOD	
0.08 ips	FAIR	FAIR	GOOD	GOOD	
0.1 ips	ROUGH H	FAIR	FAIR	GOOD	
0.2 ips	N/A	ROUGH H	FAIR	FAIR	
0.4 ips	N/A	N/A	ROUGH H	FAIR	
0.6 ips	N/A	N/A	N/A	ROUGH H	
0.8 ips	N/A	N/A	N/A	N/A	
1.0 ips	N/A	N/A	N/A	N/A	

LIMIT #1 PERCENT OF #2 VIBRATION SETTING

10	0.01	.015	0.02	.025	0.03	0.04	0.05	.075	0.1	.125	0.15	.175	0.2	.225	0.25	.275
20	0.02	0.03	0.04	.05	0.06	0.08	0.1	.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55
30	0.03	.045	0.06	.075	0.09	0.12	0.15	.225	0.3	.375	0.45	.525	0.6	.675	0.75	.825
40	0.04	0.06	0.08	0.1	0.12	0.16	0.2	.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1
50	0.05	.075	0.1	.125	0.15	0.2	0.25	.375	0.5	.625	0.75	.875	1	1.12	1.25	1.37
60	0.06	0.09	0.12	0.15	0.18	0.24	0.3	.45	0.6	0.75	0.9	1.05	1.2	1.35	1.5	1.65
70	0.07	.105	0.14	.175	0.21	0.28	0.35	.525	0.7	.975	1.05	1.22	1.4	1.57	1.75	1.92
80	0.08	0.12	0.16	0.2	0.24	0.32	0.4	.6	0.8	1	1.2	1.4	1.6	1.8	2	2.2
90	0.09	.135	0.18	.225	0.27	0.35	0.45	.675	0.9	1.12	1.35	1.57	1.8	2.02	2.25	2.47
100	0.1	0.15	0.2	0.25	0.3	0.4	0.5	0.75	1	1.25	1.5	1.75	2	2.25	2.5	2.75
#1% Limit	#2 0.1	#2 0.15	#2 0.2	#2 0.25	#2 0.3	#2 0.4	#2 0.5	#2 0.75	#2 1	#2 1.25	#2 1.5	#2 1.75	#2 2	#2 2.25	#2 2.5	#2 2.75

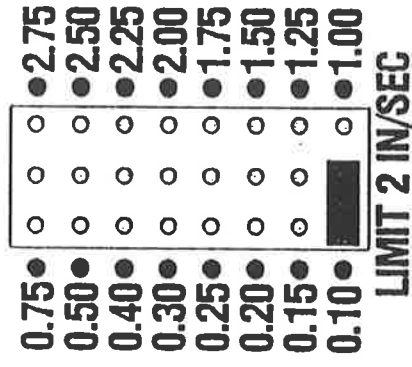
LIMIT #2 MAXIMUM VIBRATION SETTING

The Limit #2 Vibration Limit is selected by using a push-on jumper. Limit #2 has 16 available settings. A jumper is placed between the center row pin and the selected vibration limit pin.

Example: (see diagram at right)

The jumper is located between the center row pin and the pin for the 0.1 IN/SEC setting. The Limit #2 vibration limit would be then at 0.1 IN/SEC.

Once the vibration exceeded 0.1 in/sec and the time delay, the limit relay will trip. Only one jumper can be used to select the limit.



SECTION 7 - TESTING

Two methods are available for testing the 550 Vibration Switch operation.

1. Depress and hold the TEST button. This will trip the limits after the set time delay.
2. Set limits to minimum values. In this position, any vibration will cause a trip condition. Note the 550 must be vibrated longer than the limit time delay.

The LED trip indicators (2) should glow once the limit has tripped and remain glowing until the limit is reset. Monitor the 4-20 mA output for the proper vibration measurement response.

SECTION 8 - SERVICE and WARRANTY INFORMATION

Customer support and service for vibration switches is available at Balmac, Inc.

Telephone 614-876-1295 is available Monday through Friday 8:00 A.M. to 5:00 P.M. Eastern Time.

Fax 614-771-5608 is on-line 24 hours a day.

For information on our warranty refer to our WARRANTY printed in our catalog, or on the back cover of this manual. When returning products for service, either normal or warranty, include details on the nature of the problem and the service desired. Equipment returned for service should be package in suitable containers for safe shipment. Return freight prepaid to:

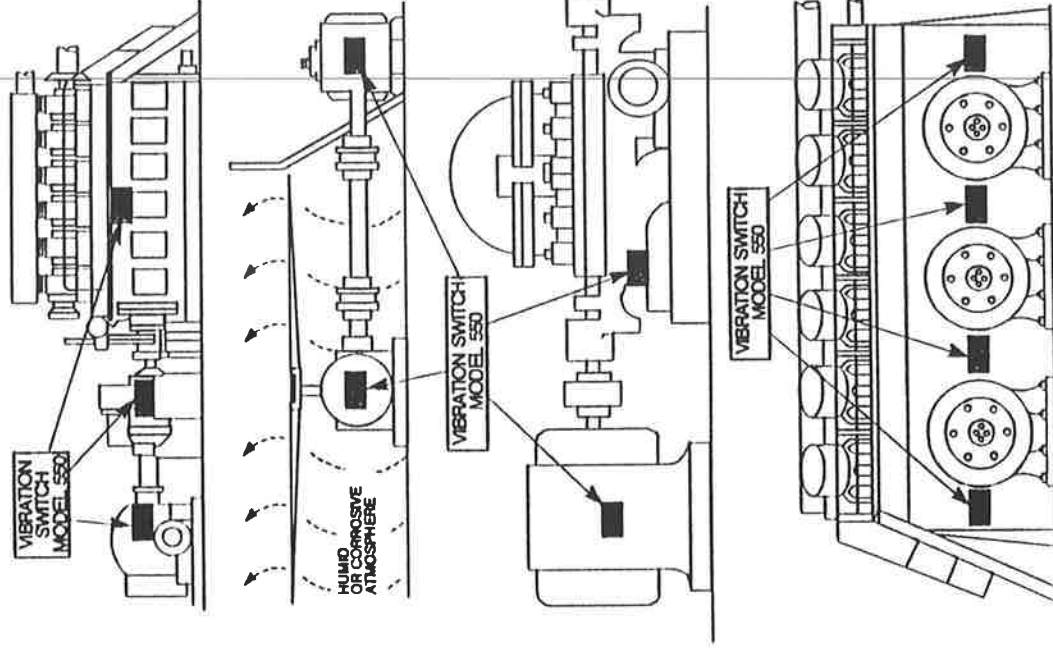
BALMAC, INC.
4010 MAIN STREET
HILLIARD, OHIO 43026 USA

SECTION 9 - APPLICATIONS

Applications:

Motors
Engines and Gearboxes
Pumps and Mills
Compressors and Centrifuges
Fan, Blowers, and Drives
HVAC Systems
Cooling Towers
Dust Collector Systems

Samples:



SECTION 10 - SPECIFICATIONS (Model 550, 550M & 550-X, 550M-X)

FEATURE	DESCRIPTION
Velocity Range	550 & 550-X = 0.1 to 2.75 in/sec Peak (English Units) 550M & 550M-X = 2.5 to 70 mm/sec Peak (Metric Units)
Frequency Range	2 to 1,000 Hertz (120 to 60,000 RPM)
Limits	Two user adjustable limits. Push-on Jumpers (2 spare jumpers provided) <i>Limit #1</i> (warning) 10 to 100% of Limit #2 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 <i>Limit #2</i> (shutdown) 0.1 to 2.75 in/sec [2.5 to 70 mm/sec] 0.1, .15, .2, .25, .3, .4, .5, .75, 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75 in/sec 2.5, 4, 5, 6.5, 7.5, 10, 13, 19, 25.5, 32, 38, 44.5, 51, 57, 63.5, 70 mm/sec
Limit Outputs	Industrial Sealed Form-C Type Relay (Dry-Contact) SPDT Each limit has one normally-open (N/O -) & one normally-closed (N/C -) 5 - Ampere @ 125 VAC, 5 - Ampere @ 28 VDC
Limit Indicator	LED (red) energize on limit-trip (Limit #1 & #2)
Time Delay	Two user adjustable limit-trip time delay of 1 to 30 seconds. Labeled Selections: 1, 5, 10, 15, 20, 25, 30
Limit Latch (Remote Reset) & Mute	Circuit closure between Latch & Common terminals will reset the limits. An open circuit maintains (latches) the limit relays. Short the Latch & Common for non-latching operation (automatic reset). Circuit closure between Mute & Common disables limits.
Analog Output	4-20 mA DC into 500 ohms. Optional remote panel meter P/N A-11347
Sensitive Axis	Perpendicular to the mounting base. Omni-directional mounting.
Input Power	L1 & L2: 100-130 VAC 50/60 Hertz (190-250 VAC optional)
Enclosure 550 & 550M	Cast Aluminum box with cover (six 6-32 Phillips-head screws) and gasket. Water-tight and dust-tight, NEMA 3, 4, and 12
Enclosure 550-X & 550M-X	Cast Aluminum with threaded screw type cover and gasket. Class I, Div. 1 & 2, Groups C, D; Class II, Div. 1 & 2, E, F, G; Class III NEMA 7 C D, 9 E F G.
Mounting	550 - ¼" Hardware - 3-places mounting bolt hole lugs (bosses). 550-X - ¼" Hardware - 2-places mounting bolt hole lugs (bosses).
Electrical	¾" NPS (550) / NPT (550-X). Conduit Fitting Entry with Captive Terminals for #12 AWG Wire
Size 550 & 550M	3.44" x 5.94" x 4" (8.74 cm x 15.09 cm x 10.16 cm) Weight: 3.75 lbs. (1.7 kg)
Size 550-X & 550M-X	4.81" x 6.75" x 4.5" (12.22 cm x 17.15 cm x 11.43 cm) Weight: 5.5 lbs. (2.5 kg)
Temperature	-30 F to 165 F (-34 C to 74 C)



WARRANTY

Balmac, Inc. warrants each instrument of its manufacture to be free of defects in materials and workmanship for a period of two years from the date of purchase. Instruments covered by this warranty will be serviced provided the instrument is returned freight prepaid to Balmac, Inc. This warranty does not apply to batteries, fuses, lamps, or any other products or parts which have been subject to misuse, neglect, accident or abnormal conditions of operation.

Instruments and parts other than those manufactured by Balmac, Inc. will carry the original manufacturer's warranty.

This warranty is expressly in lieu of all other obligations or liabilities on the part of Balmac, Inc. and Balmac, Inc. neither assumes nor authorizes any person to assume for them any other liability in the connection with sale and/or use of Balmac, Inc. products.

SERVICE INFORMATION

When returning products for service, either normal or warranty, include details on the nature of the problem and/or service desired. To insure a thorough checkout of equipment, return all accessories used with the instrument. Equipment returned for service should be packaged in suitable containers for safe shipment. For service contact Balmac, Inc. in Hilliard, Ohio. (Hilliard is a suburb of Columbus, Ohio.)

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