

- Equipment • Installation
- Maintenance • Assembly

Operator's Manual



Tough mining fans for rough mining conditions.

Fan Serial # _____

IMPORTANT!
Maintenance Instructions.
Keep for reference.



SPENDRUP
FAN Co.

Grand Junction, Colorado

A. DESCRIPTION OF EQUIPMENT

A-1 General:

The Spendrup Fan Co. fan is a high performance, variable pitch, vane axial fan. It is a quality product that with proper care should give you many years of satisfactory operation.

A-2 Adjustable pitch - Arrangement 4

The adjustable pitch fan has a fabricated steel hub and individually adjustable cast aluminum airfoil blades. The casings are accurately formed with heavy welded inlet and outlet flanges. Casings are complete with guide vanes and motor mount which is machined to receive a NEMA "C" face electric motor. The adjustable pitch rotor is machined to directly mount on the motor shaft. Blade adjustment is made when the fan rotor is at rest and power is locked out. A "blade position index" is stamped on the hub next to each individually adjustable blade and an index mark is stamped in the skirt of each blade. To change the angle of attack of the blade; merely *loosen* (DO NOT REMOVE) the allen head bolts located at the root of the blade; set the index mark at the required blade setting; and retighten the bolts to torque specified.

Blade base bolt torque:

1/2" Allen bolts - 90 ft.-lbs

5/8" Allen bolts - 125 ft.-lbs.

(CAUTION: Do not set blade angles to a higher setting without checking that the motor amp draw is below the maximum amp rating of the motor.) The major components of the direct drive adjustable pitch fan are detailed on page 4.

A-3 Adjustable Pitch - Arrangement 9

This fan has the same adjustable pitch impeller as the Arrangement 4 fan, but is a V-belt driven unit with the motor mounted on the exterior of the fan casing on an adjustable motor base. The adjustable pitch impeller is machined to directly mount on the shaft. The inner fairing is extended to enclose and protect the fan shaft and bearings. The V-belt drive is isolated from the airstream by a belt tube which is welded to the inner fairing and the fan casing. The major components of the belt drive adjustable pitch fan are detailed on page 4.

A-4 Fixed pitch

Fixed pitch - non adjustable impellers are also used on Arrangement 4 and Arrangement 9 fans. Fans made with fixed pitch impellers are nearly identical to those above except that the impeller does not allow adjustment.

A-5 Accessories

Various accessories are available for the fan.

Inlet Cones and Bells/Outlet Diffusers – must be used to achieve catalogued performance

Duct Adapters – to customer's specified size and type

Skids and Cages

Mounting Feet

Silencer Packages

Nema or X/P enclosed starters

Guard Screens

Power Trickle Dusters

Inlet Buildings

Turning Boxes

B. INSTALLATION AND START-UP

B-1 Receiving

Spendrup Fan Co. equipment is thoroughly inspected at the factory and barring damage in transit, should be in perfect condition upon arrival. When a carrier signs the Spendrup Fan Co.'s bill of lading, the carrier accepts the responsibility for any subsequent shortages or damage, evident or concealed, and any claim must be made against the carrier by the purchaser. Evident shortage or damage should be noted on the carrier's delivery document before signature of acceptance. Inspection by the carrier of evident or concealed damage must be requested. After inspection, issue a purchase order for necessary parts or arrange for return of the equipment to Spendrup Fan Co. factory for repair.

B-2 Handling

Spendrup Fan Co. fans may be handled and moved, using good rigging techniques, being careful to avoid concentrated stresses that will distort any of the parts.

B-3 Safety Precautions

The fan which you have purchased is a rotating piece of equipment and can become a source of danger to life or cause injury if not properly applied. The maximum operating temperature and speed for which this fan is designed must not be exceeded. Consult factory for design limitations.

Personnel who will operate or maintain this fan should be given this bulletin to read and warned of the potential hazards of this equipment.

This pamphlet contains general recommendations, but specific requirements may apply to the individual installation. Such requirements are outlined in the federal, state and local safety codes. Strict compliance with these codes and strict adherence to these installation instructions are the responsibility of the user.

B-4 Storage

If not installed immediately, this fan should be protected to remain dry at all times.

For extended storage, abide by the following guidelines:

1. Store in an area which is dry, protected from low temperature, rapid and extreme changes in humidity, and free from vibration.
2. Every 90 days, the rotor should be turned several revolutions.
3. Every 6 months, add grease to bearings to purge and replace old grease.
4. If motors are equipped with space heaters, make them operable.
5. Motor windings should be megged at time of storage and at removal from storage. The resistance reading at removal must not have dropped more than 50% of the initial reading. If the drop is more than 50%, the motor must be dried electrically or mechanically.
6. Upon removal from storage, bearings should be regreased with an ample supply of fresh grease to purge and replace old grease.

B-5 Vibration Isolation

When your fan is energized, it will generate a thrust force which causes the fan to be displaced opposite to the direction of air flow. This force must be resisted to maintain duct alignment and to protect the flexible connectors. Some installations, particularly horizontal units with long hanging rods, may require snubbers to limit the fan movement.

B-7 Free Inlet

Fans with open inlets require the use of an inlet bell or inlet cone. Published fan performance is based on the use of these items. Operation of fan unit with bare open inlet will result in decreased performance and increased noise.

B-8 Outlet Cone

The vane axial fan is inherently a high velocity air moving device. It is quite common to utilize a diverging cone on the fan discharge to minimize the velocity pressure loss and regain static pressure. The use of an outlet cone enables more of the fan's pressure capability to be available to overcome system static pressure.

B-9 Flexible Connections

All ducts should be closely aligned with the fan and flexible connections provided between the fan and duct to prevent structure borne noise from being transmitted through the duct work.

Axial fans require the air to enter the impeller unobstructed. Special care must

be taken in the installation of inlet flexible connections. Since the inlet side of the fan is under a negative pressure, connection material tends to be sucked inward disrupting the flow of air to the impeller and causing reduced fan performance. The thrust of the fan aggravates this situation in that the fan tends to move forward against the direction of the air flow when it is operating. Flexible connections made at the large diameter of inlet bells and/or cones eliminate this problem.

B-10 Fan Mounting Hardware

All hardware used in the field for support or connection of your fan should be a minimum of Grade 5 quality.

B-11 Electrical

The motor leads terminate in the conduit box mounted on the exterior of the fan casing. Rigid conduit should be run from the motor starter to the fan with a short section of flexible conduit at the conduit box to allow for fan movement. Wire size and motor overloads should be sized in accordance with the motor nameplate electrical data.

B-12 Start-up Check List

After the equipment has been installed correctly and a check has been made for tightness of all hardware and mounting bolts, the fan will be ready to operate after these final safety checks to prevent injury to personnel or damage to the equipment.

1. Check for correct supply voltage and motor overloads.
2. Remove all tramp material from fan, duct and area in front of fan intake.
3. Check blade pitch setting.
4. If belt driven fan, check alignment of belts and sheaves.
5. "Bump" motor to check fan rotation. Rotation should match rotation arrow welded on fan casing.
6. Start fan. Check motor amperage in each phase for balance and correct motor load.
7. Check for vibration and any unusual noise.

C. MAINTENANCE

C-1 General

The basic design and precision construction of your Spendrup fan is designed for long, trouble-free performance. The impellers are statically and dynamically balanced after assembly and the completely assembled fan is given a running balance check before final inspection and shipment. To ensure long life and trouble free service, routine maintenance and inspec-

tion should be observed. Your fan has been lubricated prior to shipment from the factory and should be relubricated per the proper schedule after start of operation. Motor and bearing manufacturers recommended schedules are packed with the fan. Mixing of lubricants is not recommended.

Cleanliness is important in lubrication. Any grease used should be fresh and free from contamination. Similarly, care should be taken to properly clean the area around the grease inlet to prevent contamination. Maintenance personnel should be alert for excessive vibration or any unusual sounds in the equipment. If the fan is to remain idle for an extended period, it is recommended that the exposed surfaces be covered with a protective coating. Bearings should be protected in line with manufacturer's recommendations and the impeller should be rotated periodically.

C-2 Lubrication - Arrangement 4

In Arrangement 4, the motor is the heart of the unit and particular care should be taken in maintenance of the motor to ensure a long and continuous operating life. The unit should be checked periodically for vibration and any unusual noises. There are two bearings in the motor with grease leads extending from the motor to the outside of the casing. These leads are terminated with standard grease fittings protected inside steel covers.

The following procedure should be followed for proper lubrication:

1. Stop motor and lock out the switch.
2. Locate the grease inlet and relief fittings. Clean the area thoroughly, remove steel caps from grease fittings and pipe plugs from relief fittings.
3. Fill with the recommended volume of the recommended lubricant using a hand operated grease gun. If possible, rotate fan impeller by hand during greasing.
4. Remove excess grease and purged grease from area and replace grease fitting caps.
5. Run motor for at least one hour.
6. Clean up any purged grease and replace pipe plugs in relief lines.
7. Return unit to operation.

The various motor manufacturers have different recommended volumes and types of grease. Check the motor manufacturer's instructions, packed with the fan, before lubricating the motor.

C-3 Lubrication - Arrangement 9

In Arrangement 9, both the fan bearings and the motor bearings need to be included in your planned maintenance schedule. The fan unit should be

inspected periodically for any unusual noises or change in vibration. The two fan bearings have grease leads extended to the outside of the fan casing. These leads are fitted with standard grease fittings.

The following procedure should be followed for proper lubrication:

1. Stop motor and lock out the switch.
2. Locate the grease inlets and reliefs on the motor and clean the area of dirt and contaminated grease. Grease the motor per the recommendation of the motor manufacturer.
3. Locate the grease inlets in the fan casing and clean the area of dirt and contaminated grease. Remove cap from grease fitting.
4. Lubricate the bearings per the manufacturer's instruction packed with the fan.
5. Add lubricant slowly and rotate fan impeller during lubrication, when possible and where good safety practice permits.
6. Replace grease fitting caps and clean excess grease from area.
7. Return unit to operation. Unit should be watched for several hours for proper operation.

C-4 Grease Lead Location

On the Arrangement 4 fan, the grease fittings are located on the outside of the fan casing within 15° of the electrical conduit box. Both fittings are in the same area. The inlet leads have standard grease fittings.

On the Arrangement 9 fan, the grease leads are brought to the outside of the fan through the belt tunnel. The grease fittings are attached to clips which are welded to the adjustable motor base.

D. DISASSEMBLY AND ASSEMBLY

D-1 Arrangement 4

Warning: Disconnect all power sources from fan to avoid electrical shock and personal injury from rotating parts.

D-1a Impeller Removal and Disassembly

1. Remove inlet attachment.
2. Remove hex head bolt securing impeller to shaft.
3. Remove hub and blade assembly.
4. If blades are to be removed from hub, matchmark each blade and blade backing plate so they can be replaced in the same blade socket. Note the blade angle before removing.
5. Remove aluminum disc from hub.
6. Remove blade retaining bolts from base of wing.
7. Remove blades.

D-1b Impeller Reassembly

1. If blades have been removed from hub, replace in their previously marked sockets. Torque blade retaining bolt to torque specified. Blade base bolt torque:
 - 1/2" Allen bolts - 90 ft.-lbs
 - 5/8" Allen bolts - 125 ft.-lbs.
2. Place impeller assembly on shaft, install impeller lock, lock-washer and bolt. Torque impeller lock bolts to following values:
 - 1/2" - 90 ft/lbs.
 - 5/8" - 125 ft/lbs.
 - 3/4" - 150 ft/lbs.
3. Replace aluminum disc (seal disc to hub with silicone, loctite disc bolts)
4. Replace fan inlet pieces.
5. Follow start-up checklist (Section B-12)

D-1c Motor Removal

In order to remove the motor from your fan, Arrangement 4, it is necessary to have access to both the inlet and discharge of the unit.

1. Remove hub and blade assembly per instruction in Section D-1a
2. Remove conduit box cover, disconnect all wiring.
3. Remove remainder of conduit box from fan casing.
4. Disconnect conduit pipe between fan casing and motor and remove. Be careful in removing conduit that motor leads are not damaged.
5. Disconnect and remove external lubrication lines.
6. Some large horsepower motor have "stay bolts" between fan casing and motor at the "opposite-shaft" end of motor. Remove stay bolts if applicable.
7. Block motor securely so it is not damaged when motor mounting bolts are removed.
8. Remove motor mounting bolts. If motor is C-face mounted, bolts are removed from inlet side of fan. Bolts extend through the motor mounting plate into the C-face of the motor. If motor is foot mounted, both inlet and outlet side of fan will need to be accessed. Bolts extend through motor foot and motor mounting plate.
9. Remove motor from fan casing through discharge end of fan.

D-1d Installing Motor

1. Place motor into fan casing through the discharge end of the fan. If C-face mounted, the C-face of the motor fits into the motor mounting plate. If foot mounted the motor will set onto motor mounting

- plate. (Note: Foot mounted motor must be accurately centered in fan casing.)
2. Secure motor with mounting bolts. If original bolts are not used, insure that replacement bolts are Grade 8 quality.
 3. Replace "stay bolts," if required.
 4. Replace and connect external lubrication lines.
 5. Thread motor leads through conduit pipe and replace and connect conduit pipe to motor and fan casing.
 6. Replace conduit box and reconnect all wiring.
 7. Replace conduit box cover.
 8. Replace impeller assembly per Section D-1b.
 9. Follow start-up checklist (Section B-12)

D-2 Adjustable Pitch - Arrangement 9

Warning: Disconnect all power sources from fan to avoid electrical shock and personal injury from rotating parts.

D-2a Impeller Removal

Impeller removal for Arrangement 9 fans is done per instructions in Section D-1a

D-2b Impeller Re-Assembly

See Section D-1b.

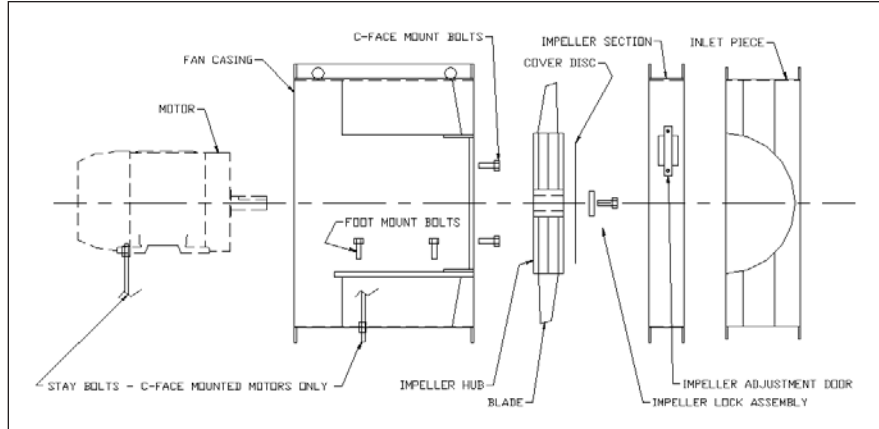
D-2c Bearing Removal

1. Drive end bearing can be replaced without removing impeller from shaft if care is taken in removing it. Replacement of impeller end bearing requires impeller to be removed per Section D-1a.
2. Remove inner fairing cover from drive-end of fan and disconnect and remove V-belt.
3. Remove fan sheave from shaft.
4. If drive-end bearing only is to be removed, follow instructions in 4a-4c.
 - 4a. Block shaft securely to prevent damage to impeller-end bearing when drive-end bearing is removed.
 - 4b. Loosen allen head bolts in bearing locking collar.
 - 4c. Remove bearing mounting bolts and carefully slide bearing from shaft. NOTE: Mark & save any shims for reassembly.
5. If both bearings are to be removed, follow instructions in 5a-5e.
 - 5a. Remove impeller assembly per Section D-1a.
 - 5b. Remove fairing cover plates.
 - 5c. Loosen allen head set screws

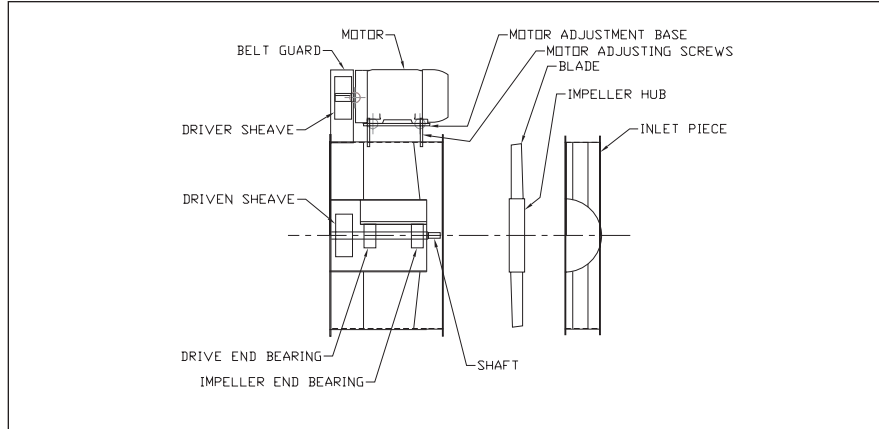
- in bearing locking collars.
- 5d. Slide shaft from bearings.
- 5e. Remove bearing mounting bolts and remove bearings. NOTE: Mark & save any shims for reassembly.
6. Some fans may use larger pillow block bearings that require more detailed instructions for service. Please read supplement to this service bulletin or call Spendrup Fan Co.

D-2d Bearing Replacement

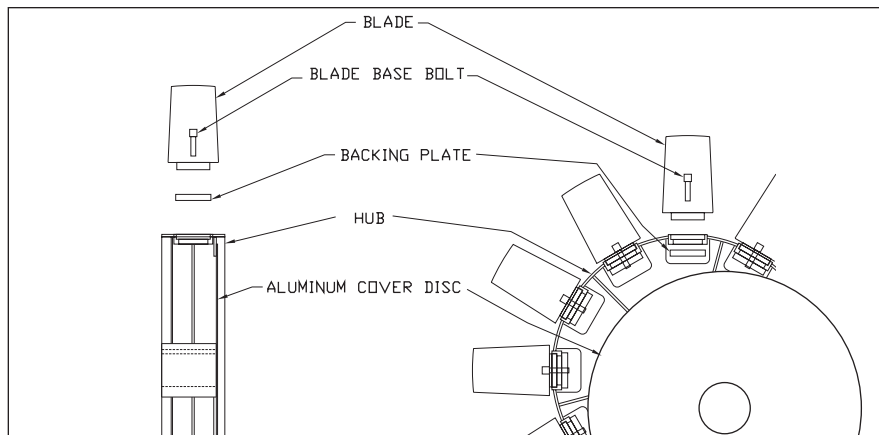
1. Replace bearings and snug-up bearing mounting bolts. Do not tighten securely. If pillow block bearings are used, replace any shims in their proper location.
2. Slide shaft into bearings, position for axial location and tighten set screws in locking collar.
3. Your fan has a close tip clearance between the blade tips and housing so centering of shaft in the housing is critical. Attach "sweep arm" to shaft in impeller tracking area and adjust bearing position to get uniform tip clearance around the housing.
4. Secure bearing mounting bolts.
5. Check axial location of shaft and adjust as necessary.
6. Some fans may use larger pillow block bearings that require more detailed instructions for service. Please read supplement to this service bulletin or call Spendrup Fan Co.
7. Replace impeller assembly per instructions in Section D-1b.
8. Replace and align fan sheave and V-belt drive.
9. Replace inner fairing cover.
10. Follow start-up check list (Section B-12).



DIRECT DRIVEN (ARRANGEMENT 4)



BELT DRIVEN (ARRANGEMENT 9)



IMPELLER

**IF YOU ARE CALLING ABOUT YOUR FAN,
PLEASE HAVE THE FOLLOWING INFORMATION:**

- A. Purchase date.
- B. Fan serial number, welded on fan casing.
- C. Fan model number.
- D. Impeller diameter.

Spendrup Fan Company Guarantee

Seller warrants that the products covered by this contract conform to applicable drawings and specifications accepted in writing by the Seller, will be free from defects in material and workmanship will be merchantable and will perform in accordance with the specifications accepted in writing by the Seller.

All products manufactured by **Spendrup Fan Company** are guaranteed for a period of 18 months from the date the products have been shipped from Grand Junction, Colorado, USA.

Seller's sole responsibility pursuant to the guarantee is to repair, replace such part or product. The cost of removal or reinstallation of the product shall be a cost of Buyer. For purpose of remedying any defects, Buyer agrees to provide Seller with reasonable assistance and access to the work.

Component parts and accessories not of the Seller's manufacture are warranted only to the extent that they are warranted by the manufacturers thereof.

There are no other warranties, express or implied, which extend beyond those set forth above. The warranty of merchantability is limited to the time period specified above.

Seller's warranties are contingent upon the product being stored, installed, maintained, and operated in accordance with good engineering practices and instructions contained in the Seller's operating and maintenance manual.

THIS GUARANTEE DOES NOT COVER:

- A. Unauthorized repairs.
- B. Freight
- C. Incidental or consequential costs or damages.



2768 C 1/2 Road • P.O. Box 4308 • Grand Junction, CO 81502 USA
(970) 243-3429 • FAX: (970) 242-6724 • 1-800-525-1450

REPRESENTED BY: