INSTALLATION AND MAINTENANCE MANUAL

AUSTART ATS73 TURBINE STARTER

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NOTICE

THIS MANUAL CONTAINS IMPORTANT SAFETY INFORMATION. IT IS IMPORTANT THAT THE ENTIRE CONTENTS BE STUDIED BEFORE INSTALLATION AND OPERATION.

FORWARD

This manual contains instructions for the installation, maintenance and operation of your new ATS-73 AUSTART Air Starter Motor. It has been designed to provide you with safe and reliable service. However, it is both a pressure vessel and a piece of rotating machinery. Therefore, operators and maintenance personnel must exercise good judgement and appropriate safety practices to avoid damage to the equipment and prevent personal injury. The instructions in this manual are intended for personnel with a general training in the operation and maintenance of air starter equipment.
It should be understood that the information contained in this manual does not relieve the operating and maintenance personnel of the responsibility for exercising good normal judgement in the operation and care of air start equipment and their associated systems.

Throughout this manual you will encounter the words WARNING, CAUTION and NOTICE.

These paragraphs are intended to emphasis certain areas where personnel safety and satisfactory starter operation may be compromised should the message be ignored. The definitions of these words are as follows -

⚠ WARNING

An operating procedure, practice etc. that if not strictly observed, could result in personal injury.

CAUTION

An operating procedure, condition etc. that if not followed could result in damage to, or the destruction of equipment.

NOTICE

An operating procedure, condition etc. that is essential to highlight and observe.

It is advisable that a safety program be established to address the safety issues detailed within this manual before installing, operating or maintaining this equipment. It is important such a program covers the hazards associated with compressed air.

⚠ WARNING

Do not install this starter other than in accordance with the instructions detailed in this manual.

These instructions should be read completely before beginning installation and should be available to personnel responsible for operating and maintaining this equipment. The unit is capable of trouble free operation when properly applied, installed and maintained.

This manual is designed to cover all situations normally experienced when installing, operating and maintaining this equipment. In the event situations are encountered that are not covered by this manual, consult your AUSTART agent or K.H. Equipment direct on 61-3-9796-4766.

AUSTART PRODUCT NUMBERING

STARTER MODEL			FLANGE CODE		PINION CODE		SPECIAL FEATURES	
50	AS50		**01**	SAE 1	**09**	9TH 3MOD R	**B**	BCB (Beryllium Copper Bronze Pinion)
53	ATS53		**02**	SAE 2	**10**	10TH 8/10 R	**I**	Inertia Drive
54	ATS54	*(ATS53 OH)*	**03**	SAE 3	**11**	11TH 6/8 R	**M**	Mining Spec.(Cast Iron)
55	AS55	*(AS50 OH)*	**04**	SAE 4	**12**	12TH 8/10 R	**P**	Motor Ports 90°
60	AS60	*OBSOLETE*			**13**	12TH 8/10 L	**S**	Short Muffler
61	AS61				**14**	11TH 6/8 L	**T**	Threaded Exhaust 3”
63	ATS63				**15**	10TH 8/10 L	**U**	U Configuration
64	ATS64	*(ATS63 OH)*			**16**	9TH 3MOD L	**G**	Threaded Exhaust 2”
65	AS65	*OBSOLETE*					**K**	Kelly Spinner Muffler
66	AS66							
67	AS67							
68	AS6070							
69	AS69	*(AS67OH)*						
70	AS70							
73	ATS73							
74	ATS74	*(ATS73 OH)*						
75	AS75	*(AS70 OH)*						
78	AS7080							
80	AS80							
83	ATS83							
84	ATS84	*(ATS83 OH)*						
85	AS85	*(AS80 OH)*						
90	AS90							
93	ATS93							
94	ATS94	*(ATS93 OH)*						
95	AS95	*(AS90 OH)*						
100	AS100							
103	ATS103							

EXAMPLES OF BASIC STARTER PRODUCT NUMBERING

630110M	PERKINS	SAE1	10TH	MINING SPEC
630409M	MWM	SAE4	9TH	MINING SPEC
730311	DETROIT	SAE3	11TH	
730314	DETROIT	SAE3	11TH	LH
730311I	DETROIT	SAE3	11TH	INERTIA DRIVE
730314I	DETROIT	SAE3	11TH	INERTIA DRIVE LH
730312M	CATERPILLAR	SAE3	12TH	MINING SPEC

INSTALLATION AND PREPARATION FOR OPERATION

- Ensure air supply is isolated before installation, removal, maintenance or adjustment of your AUSTART starter.
- Whenever a starter is taken out of service first bleed the Air Receiver of air and any moisture that may have accumulated by opening up the drain valve. Do not bleed by removing Receiver plugs.
- Remove air hoses to ensure complete safety once the air supply has been isolated and the Receiver has been bled.
- The Air Receiver must be manufactured to an applicable pressure vessel code such as AS 1214, SAE J10B or similar.
- Only use air hoses and fittings that are of adequate size as indicated in the installation schematic (page 6)
- Always carry out a pressure test on the complete starting system according to Clause 8 on Page 5 before beginning operation. Do not begin operations until satisfied the unit has been installed correctly.
- Always use recommended lubricants where prescribed by this manual. Under no circumstances use flammable or volatile liquids.
- Ensure all fasteners are torqued to the values prescribed in this manual. Use thread sealant where indicated.
- To ensure warranty provisions are not invalidated use only genuine AUSTART replacement parts. Non-genuine parts may cause service and performance problems and may affect the safe operation of your starter.

PRELIMINARY INSTALLATION REQUIREMENTS

Numbers in Brackets refer to Part Nos, refer to exploded view drawing on page 9

1. Your Austart starter is flange mounted. Before installing the starter carefully study the mating position of the starter and engine flanges and determine whether the air inlet port orientation or Nose Housing (49) geometry will suit your particular installation. If not suitable re-orientate as follows -

- Carefully loosen the Band Clamp (12) but do not remove. The two housings can now be rotated relating to each other without separation.
- Re-orientate the Housings to the desired position and torque the Band Clamp nut to 50 in lb (Nm)

2. Ensure the hoses, fittings and starter ports are clean and free from dirt and foreign objects. Ensure they remain so during installation.
3. For optimum starter performance ensure air supply pipes or hoses have an internal diameter of at least 1” (25mm), refer Installation Schematic on page 6 In the event line length must be longer than 5m, a size of 1-1/2” (40mm) should be used. Keep the number of fittings and the length of piping to a minimum. Avoid the use of reducing bushes and other fittings that could impede air flow.

INSTALLING THE STARTER AND PIPEWORK

Refer to the Starter Installation Schematic drawing on page 6

1. The air supply line should ideally exit from the top or side of the Air Receiver.

CAUTION

Do not connect Line to the bottom of the Air Receiver. Moisture collects at the receiver bottom and can damage starter internals if allowed to pass through. Periodically drain moisture from the Air Receiver using drain valve connected at the Receiver bottom.

2. Install a 100 mesh Y strainer. A strainer installed before the Relay Valve will provide protection to the valve and Starter from contaminants that may have accumulated in the Air Receiver.

NOTICE

Ensure the inlet side of the Strainer faces the Receiver. ie the direction arrow points away from the Receiver.

3. Connect The #R6900 Relay Valve directly on to the Strainer using a 1" Short Nipple.

NOTICE

Ensure the inlet side of the Relay Valve connects to the exit side of the Strainer.

4. Mount the Starter Control Button #342501 onto the vehicle dash-board or appropriate control panel and connect to the Air Receiver using a minimum of ¼" (6mm)line.

NOTICE

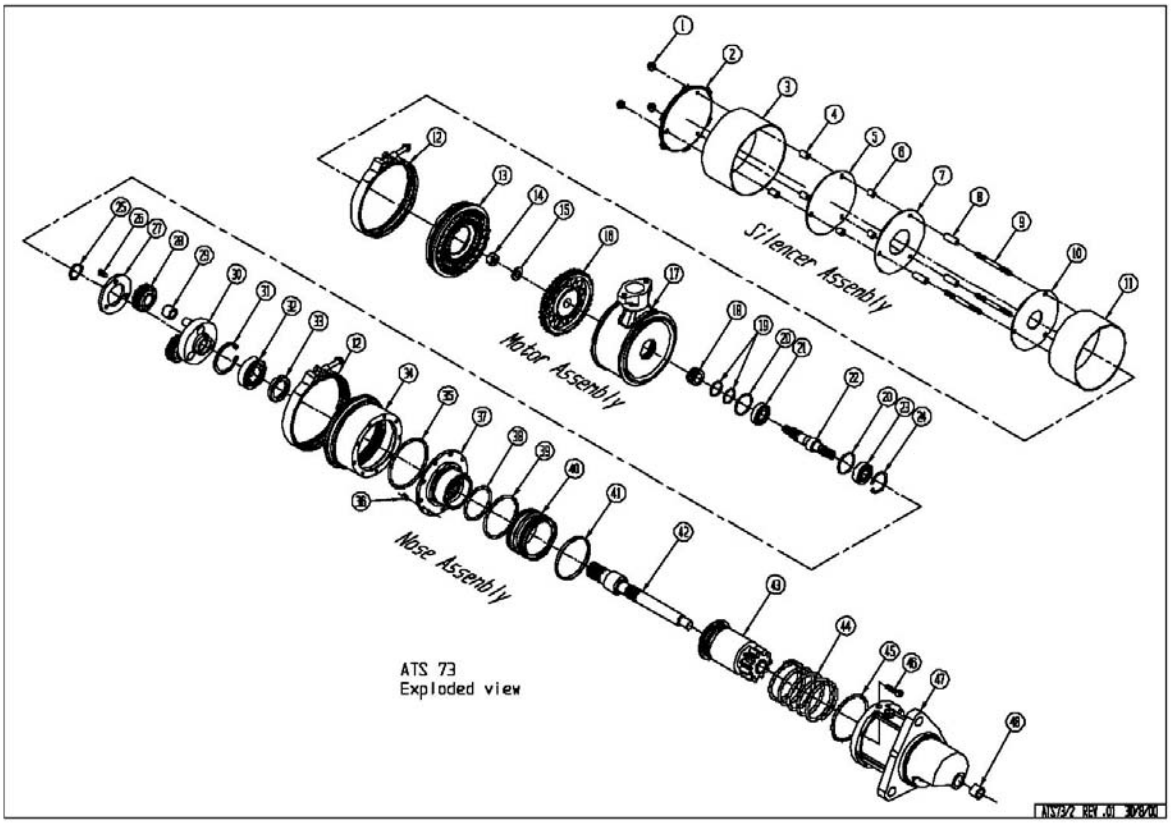
Ensure the inlet side of the Starter Control Button connects to the line from the Receiver. Any Safety "cut-outs" should be installed in this line between the Starter Control Button and the Air Receiver.

5. Determine the practicality of running the 1" air supply hose or pipe from the exit of the Relay Valve to the inlet of the Starter after the starter is mounted. It may be easier to fit hose before the Starter is mounted.

6. Once Starter is mounted fit the remaining ¼" (6mm) control lines from the Starter to the Starter Control Button and the Relay Valve respectively.

7. Make all hose or pipe connections leak proof. Use a suitable thread sealant.

8. Once the connections have been made pressurise the system and check for leaks using "soapy" water.



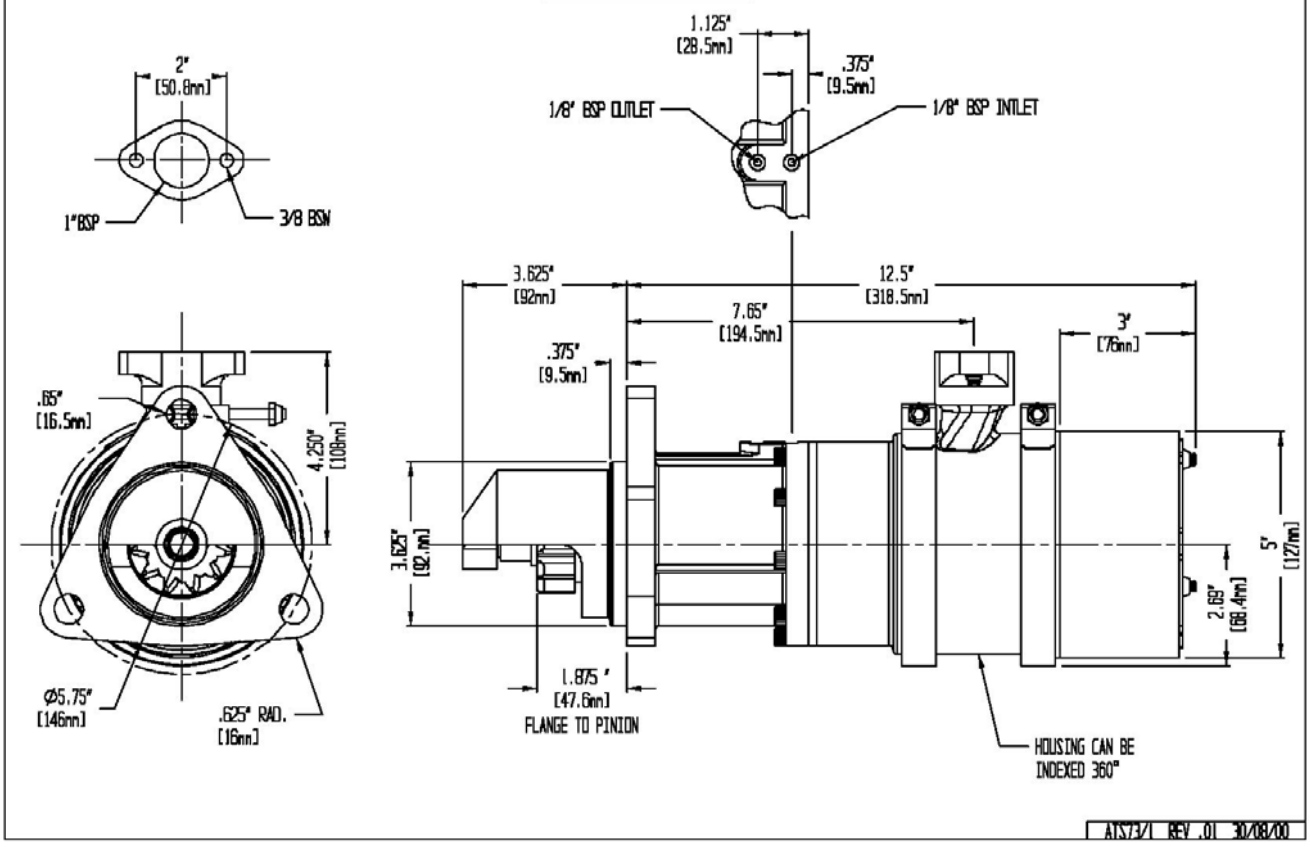
AUSTART ATS-73

General Build List Aluminium Housings

ITEM	PART NO.	EXT.	DESCRIPTION		QTY	ITEM	PART NO.	EXT.	DESCRIPTION		QTY
1	3029	000	NUT		3	29	7315	000	BEARING	+	3
2	3007	100	END COVER MUFFLER		1	30	7316	900	SPIDER HUB ASSY		1
3	3006	100	OUTER SLEEVE		1	31	7020	000	CIRCLIP	+	1
4	3009	100	SPACER (0.624")		3	32	7021	000	BEARING	+	1
5	3004	100	BAFFLE SOLID		1	33	7022	000	SEAL	+	1
6	3010	100	SPACER (0.435")		3	34	7317	100	GEAR CASE		1
7	3003	100	BAFFLE LARGE HOLE		1	35	7023	000	O RING	+	1
8	3012	100	SPACER (1.050")		3	36	6115	000	COUNTERSUNK SCREW		2
9	3011	100	STUD		3	37	7025	300	BEARING HOUSING		1
10	7308	100	BAFFLE SMALL HOLE		1	38	7026	000	O RING	+	1
11	3005	100	BAFFLE SLEEVE		1	39	7027	000	O RING	+	1
12	7322	000	BAND CLAMP		2	40	7028	100	PISTON		1
13	7321	300	END COVER		1	41	7029	500	SEAL	+	1
14	7301	000	SPECIAL NUT		1	42	7030	100	DRIVE SHAFT		1
15	7304	000	WASHER		1	43	7031	XXX	DRIVE ASSY		1
16	7314	300	TURBINE ROTOR		1	44	6734	000	SPRING		1
17	7302	930	TURBINE HOUSING		1	45	7033	000	O RING	+	1
18	7312	100	SEAL SLEEVE		1	46	6018	000	SCREW		6
19	7313	000	PISTON RING		2	47	7034	XXX	NOSE HOUSING		1
20	7309	000	O RING	+	2	48	7036	000	BEARING	+	1
21	6611	000	BEARING	+	1						
22	7303	100	ROTOR SHAFT		1						
23	7004	000	BEARING	+	1						
24	6612	000	CIRCLIP	+	1						
25	7018	000	CIRCLIP	+	1		7340	900	SERVICE KIT CONSIST AS MARKED	+	A.R.
26	6305	000	COUNTERSUNK SCREW		3						
27	7306	100	RETAINER		1						
28	7307	100	PLANET GEAR		3						

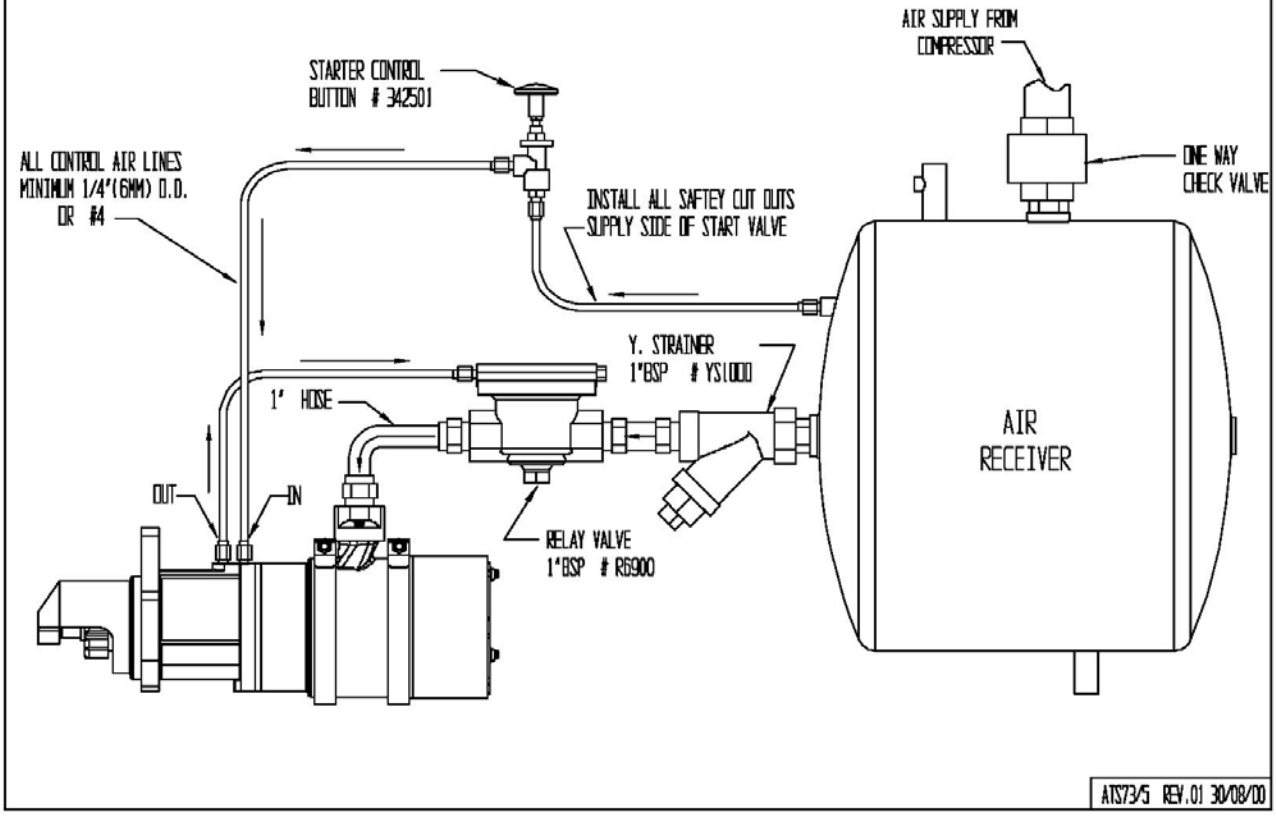
- XXX DENOTES OPTIONS AVAILABLE

ATS73



ATS73/1 REV .01 30/08/00

AUSTART TURBINE STARTER INSTALLATION SCHEMATIC MODEL ATS73



ATS73/5 REV.01 30/08/00

MAINTENANCE

DISASSEMBLY

Refer to the Cross Sectional and the Exploded View drawings on page 8 & 9

Begin by removing the two Band Clamps (12) and separate the three Sub assemblies; the **Nose assembly**, the **Motor Assembly** and the **Silencer Assembly**. Gently tap the assemblies with a soft hammer if necessary.

The subassemblies may now be dismantled separately. Disassembly any of these three Subassemblies is detailed in the exploded view on *page 9* and is basically in the order shown. Refer also to the following instructions:

Nose Assembly

1. Remove Retainer (29), Planetary Gears (30) and Bearings (31). If necessary gently tap the three Countersunk Screws (28) to loosen them.
2. Remove six Screws (48) and separate the Gear Case (36) by gently tapping it with a soft hammer if necessary.
3. Remove the two Countersunk Screws (38). The Bearing Housing (39) should spring apart from the Nose Assembly. Gently tap the Housing with a soft hammer to assist it to separate if necessary.
4. Remove Spring (46), Drive Assembly (45) and Piston (42).
5. Remove Circlip (27) using circlip pliers and Spider Hub Assembly (32).
6. Support Bearing Housing (39) in the vertical position and gently press out Drive Shaft (44) from Bearing (34).
7. Remove Circlip (33) using circlip pliers and press out Bearing (34) and Seal (35).
8. Remove Nose Bearing (50) from Nose Housing.

Motor Assembly

1. Remove Special Nut (15) and Washer (16). Difficulty may be experienced and it will be necessary to restrain the Turbine Rotor (17) from turning by using a ring spanner on the special flats provided.
2. Remove Circlip (26) using circlip pliers and press out Rotor Shaft Assy (24) through Rotor.
3. Press out Seal sleeve (20) and Bearing (23) from Turbine Housing (18).
4. Press off Bearing (25) from the Rotor Shaft (24).

Silencer Assembly

Remove the three Nuts (1) and Assembly will easily come apart.

INSPECTION

Refer to the Cross Sectional and the Exploded View drawings on page 8 & 9

1. Visually inspect all parts removed during disassembly for excessive wear or damage. Replace any damaged or questionable parts.
2. Pay particular attention to the vanes on End Cover (13) and Turbine Rotor (17) and look for cracks, delamination, chipping or warpage or excessive wear patterns. Rotor should fit tightly on to the Rotor Shaft (24). Replace any damaged or questionable parts. Remove burrs.
3. Also pay particular attention to all gear teeth and look for cracked or broken teeth or excessive wear. Check the pinion on the Drive assembly (45) for evidence of unusual contact patterns resulting from misalignment or improper engagement. Replace if at all questionable. Remove burrs.
4. Check all roller bearings are free to rotate and do not have excessive play between races. If at all in doubt replace questionable bearings.

CAUTION

Do not wash shielded bearings that are to be reused in solvent or blow with compressed air as it may remove internal lubrication. Bearings that are to be reused should be cleaned by wiping the end shields with a clean cloth.

5. Clean all other parts that are going to be reused using commercially approved solvents.

WARNING

Ensure cleaning operations are carried out in a properly vented area away from naked flames.

6. It is recommended that when servicing your Austart Turbine Starter always replace complete repair kit contents.

REASSEMBLY

Refer to the Cross Sectional and the Exploded View drawings on page 8 & 9

Reassembly of any of the three Subassemblies detailed in the exploded on *page 9* is basically in the reverse order shown. Refer also to the following instructions:

Nose Assembly

1. Begin by pressing the Bearing (50) into Nose Housing (49) using a press with an appropriate drift.
2. Using a drift, drive home the seal (35) into the Bearing Housing (39) until it bottoms.

CAUTION

Ensure the seal is fitted the correct way, ie with the tapered leading edge engaged first. Liberally grease the exposed side of the seal with Lithium based grease such as Valvoline VALPLEX EP Grease 0707.67.

3. Using a press drive home the Bearing (34) into the Bearing Housing (39) until it bottoms. Then insert Shaft (44) into the Bearing and press home. Ensure the Bearing housing is adequately supported during this operation. Finally fit Circlip (33) using circlip pliers.
4. Slip on Spider Hub Assembly (32) onto Shaft (44) and fit Circlip (27) using circlip pliers.
5. Fit O-Rings (37) and (40) onto Bearing Housing (39).
6. Fit O-Ring (41) and wiper Seal (43) onto Piston (42).
7. Liberally grease Piston (42), the inner portion of the Bearing Housing (39) and Shaft (44) where it extends, then gently slide Piston on to the Bearing Housing without damaging O-ring (40).
8. Slide Drive Assembly (45) onto Shaft (44) and fit Spring (46) over Drive Assembly.
9. Liberally coat the inner regions of Nose Assembly (49) and Bearing (50) with grease and assemble Nose Assembly over Piston (42) taking care not to damage wiper Seal (43). Rotate the Nose assembly until the two countersunk screw holes line up between the six main stud holes.
10. Force together Bearing Housing (39) and Nose Assembly (49) being careful not to damage O-Ring (41) insert Countersunk Screws (28).
11. Slide Gear Casing (36) onto Bearing Housing (39) ensuring O-Ring (37) is not damaged by smearing oil over the O-Ring to allow Gear Case to easily slide over.
12. Line up set screw holes and install six setscrews (48).
13. End for end the assembled Nose Assembly and restrain in the vertical position. Install the three Planet Gears (30) and gear Bearings (31) onto the Spider Hub Assembly (32).

    Coat gear bearings with grease before assembly.

CAUTION

Ensure Planet Gears are installed with the boss side of the Gear facing the Spider Hub.

14. Install Retainer (29) to the Spider Hub Assembly (32) and install the three Countersunk Screws (28).
15. Liberally pack gear teeth with grease.
16. The Nose Assembly is now ready to accept the Motor Assembly.

Motor Assembly

1. Begin by lightly oiling the internals of the Turbine Housing (18) with hydraulic oil and fitting inner O-Ring (22).
2. Evenly press home bearing (23) until it bottoms. Ensure O-Ring (22) is not damaged.
3. Install Piston Rings (21) onto Seal Sleeve (20). Rotate Rings so that the gaps are 180^0 apart.
4. Lightly grease the outside of the Piston Rings on the Seal Sleeve (20) and push home into the Turbine Housing (18) until it bottoms.
5. Press Bearing (25) onto Rotor Shaft (24) using a press and liberally grease top of bearing.
6. Install 2^{nd} O-Ring (22) into Turbine Housing (18) and insert Rotor Shaft assembly (24). This should be achieved with an even push fit.
7. Install Circlip (26) with circlip pliers.
8. Fit Turbine Rotor (17) onto Rotor Shaft extension (24).
9. Lightly oil thread on Rotor Shaft extension (24) and install Washer (16) and Special Nut (15). Tighten Nut against the Turbine Rotor (17) to a torque of 25-30 Ft lb. Prevent the Rotor from turning by using a ring spanner on the special flats provided.

Assembling Nose and Motor Assemblies

1. Apply grease to Planetary Gears and Gear Adaptor Carefully line up spline of Motor Assembly shaft (24) with the Planetary Gears (30) on the Nose Assembly and slide the Nose Assembly home.
2. Line up the Nose Assembly and Motor assembly air inlet ports and install Band Clamp (12). Tighten Band Clamp nut to 6 Nm.
3. Test the operation of the Drive Assembly (45) by introducing air pressure at the control line inlet. The assembly pinion should move freely forward when air pressure is applied and back once the pressure has been relieved. Investigate if this movement is not smooth.
4. The Nose/Motor Assembly is now ready to accept the Silencer Assembly.

Adding Silencer Assemby

1. Install Silencer Assembly to the Turbine Housing (18). Install Band Clamp (12). Tighten Band Clamp nut to 6 Nm.
2. The Air Starter is now assembled and ready for installation. Refer Installation and Operation section of this manual.

WARRANTY POLICY

All Austart Products supplied by K.H. Equipment Pty. Ltd. (herein called "the Manufacturer") is warranted to be free from any defect in workmanship and material under conditions of normal use and service for engine starting applications for a period of 12 months from the date of purchase by the first user. Normal wear and tear is excluded from the warranty cover.

The Manufacturer will replace or repair at their works, without cost, any starter or parts found to be defective or at their discretion choose to refund the purchase price less a reasonable allowance for depreciation in exchange for the starter or part should the item prove impossible to repair or replace.

This warranty shall not apply to any starter or parts which shall have been altered or repaired or purchased outside the Manufacturer and its assigned agents nor to equipment or parts that have been subject to misuse including overloading, neglect, accident or damage, nor to any part or parts improperly applied or installed.

This warranty is in lieu of all other warranties and conditions statutory or otherwise expressed or implied and of all other obligations or liabilities on the Manufacturer's part. The Manufacturer's maximum liability is limited to the purchase price of the starter and is not liable for any consequential damage, loss or expense.