



# INSTALLATION AND MAINTENANCE MANUAL

## **AUSTART ATS53 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. IT ONLY REFLECTS GENERIC INFORMATION RELATING TO A STANDARD AUSTART ATS53 TURBINE STARTER. VARIOUS OTHER OPTIONS ARE AVAILABLE TO MEET SPECIFIC APPLICATION REQUIREMENTS.**

## FOREWORD

This manual contains instructions for the installation, maintenance and operation of your new ATS53 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 starter equipment and their associated systems.

Throughout this manual you will encounter the words: 'WARNING', 'CAUTION' and 'NOTICE'. These paragraphs are intended to emphasise 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.

Extra copies of this manual are available from your local AUSTART Air Starter distributor or the factory.

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 Pty Ltd direct.

# AUSTART PRODUCT NUMBERING



**MODEL PREFIX CODES:**  
**AS** AUSTART VANE STARTER  
**ATS** AUSTART TURBINE STARTER

Model Prefix	Starter Model	Flange Code	Pinion Code	Special Features
<b>AS50</b>	Austart Air Starter	<b>01</b> SAE 1	<b>09</b> 9TH 3MOD R	<b>B</b> BCB (Beryllium Copper Bronze Pinion)
<b>ATS53</b>	Austart Turbine Starter	<b>02</b> SAE 2	<b>10</b> 10TH 8/10 R	<b>E</b> Threaded Exhaust 1.5"
<b>ATS54</b>	(ATS53 OH) Austart Turbine Starter	<b>03</b> SAE 3	<b>11</b> 11TH 6/8 R	<b>F</b> Threaded Exhaust 2" Bolt On
<b>AS55</b>	(AS50 OH) Austart Air Starter	<b>04</b> SAE 4	<b>12</b> 12TH 8/10 R	<b>G</b> Threaded Exhaust 2"
<b>AS61</b>	Austart Air Starter	Other options available	<b>13</b> 12TH 8/10 L	<b>H</b> Highway Special
<b>ATS63</b>	Austart Turbine Starter		<b>14</b> 11TH 6/8 L	<b>I</b> Inertia Drive
<b>ATS64</b>	(ATS63 OH) Austart Turbine Starter		<b>15</b> 10TH 8/10 L	<b>J</b> Threaded Exhaust Elbow 2"
<b>AS66</b>	Austart Air Starter		<b>16</b> 9TH 3MOD L	<b>K</b> Kelly Spinner Muffler
<b>AS67</b>	Austart Air Starter			<b>M</b> Mining Spec. (Cast Iron)
<b>AS68</b>	(AS6070) Austart Air Starter		Other options available	<b>N</b> Short Nose (Inertia ATS77)
<b>AS69</b>	(AS67OH) Austart Air Starter			<b>P</b> Motor Ports 90°
<b>AS70</b>	Austart Air Starter			<b>R</b> Reduced Muffler
<b>ATS71</b>	Austart Turbine Starter			<b>S</b> Short Muffler
<b>ATS73</b>	Austart Turbine Starter			<b>T</b> Threaded Exhaust 3"
<b>ATS77</b>	Austart Turbine Starter			<b>U</b> U Configuration
<b>AS75</b>	(AS70 OH) Austart Air Starter			<b>V</b> Value Muffler (ATS77)
<b>AS78</b>	(AS7080) Austart Air Starter			<b>X</b> Special – Refer Factory
<b>AS80</b>	Austart Air Starter			
<b>ATS83</b>	Austart Turbine Starter			
<b>ATS84</b>	(ATS83 OH) Austart Turbine Starter			
<b>AS85</b>	(AS80 OH) Austart Air Starter			
<b>AS90</b>	Austart Air Starter			
<b>ATS93</b>	Austart Turbine Starter			
<b>ATS94</b>	(ATS93 OH) Austart Turbine Starter			
<b>AS95</b>	(AS90 OH) Austart Air Starter			
<b>AS100</b>	Austart Air Starter			
<b>ATS103</b>	Austart Turbine Starter			
<b>ATS183</b>	Austart Turbine Starter			

**EXAMPLES OF BASIC STARTER PRODUCT NUMBERING**

ATS63-0110M	PERKINS 1006	SAE1	10TH	MINING SPEC
ATS63-0409M	MWM D916-6	SAE4	9TH	MINING SPEC
ATS73-0311	CUMMINS N14	SAE3	11TH	
ATS73-0314	CUMMINS N14	SAE3	11TH	LH
ATS73-0311I	DETROIT 12V71	SAE3	11TH	INERTIA DRIVE
ATS73-0314I	DETROIT 12V71	SAE3	11TH	INERTIA DRIVE LH
ATS73-0312M	CATERPILLAR 3306	SAE3	12TH	MINING SPEC
ATS83-0311IT	WAUKESHA 7072	SAE3	11TH	INERTIA THREADED EXHAUST

# INSTALLATION AND PREPARATION FOR OPERATION



- Maximum pressure for AUSTART starting equipment is 150psi (standard operating pressure is 100psi).
- Ensure air supply is isolated before installation, removal, maintenance or adjustment of your AUSTART starter.
- Before any 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 the 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 AS1210 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.
- Do not initiate a start until all components have stopped rotating, this includes the engine and starter motor.
- 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 items numbers on Exploded View drawing on page 8.***

1. Your AUSTART Starter is flange mounted. Before installing the starter carefully study the mating position of the AUSTART starter and engine flanges to determine whether the air inlet port orientation or nose housing (38) geometry will suit your particular installation. If not suitable re-orientate as follows -
  - Carefully remove the 6 screws (29) and rotate the nose housing (38). The nose housing (38) can be indexed in 30 degree increments. Squeeze together gear adaptor (28) and nose housing (38) being careful not to damage o' ring (37) then insert screws (29).
2. Ensure pinion is suitable for engine application ie. correct pitch, diameter and number of teeth.
3. Check flange to ring gear (FRG) spacing is correct and that flange spacers are not required. Pinion should be FRG less 1/8" (3mm) when at rest.
4. Check AUSTART starter clears all obstacles and the flange mounts to flywheel housing squarely without using undue force.
5. Ensure the hoses, fittings and starter ports are clean and free from dirt and foreign objects. Ensure they remain so during installation.
6. For optimum AUSTART starter performance, ensure air supply pipes or hoses have an internal diameter of at least 3/4" (19mm) refer Installation Schematic on page 6. In the event line, length must be longer than 15ft (5m) a size of 1" (25mm) 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 air supply line to the bottom of the air receiver. Moisture and system contaminants collect at the receiver bottom and can damage the AUSTART starter internals if allowed to pass through. Periodically drain moisture from the air receiver using a drain valve connected at the receiver bottom.**

2. Install a 100 mesh 'Y' strainer. A 'Y' strainer installed before the relay valve will provide protection to the valve and AUSTART starter from contaminants that may have accumulated in the air receiver. Fitting of an inline 'Y' strainer (as described above) is also required to ensure the AUSTART starter is covered by our product warranty.

## NOTICE

**Ensure the inlet side of the 'Y' strainer faces the receiver ie. the direction arrow points away from the receiver.**

3. Connect the RV1000 relay valve directly onto the 'Y' strainer using a 1" short nipple.

## NOTICE

**Ensure the inlet side of the relay valve connects to the exit side of the 'Y' strainer.**

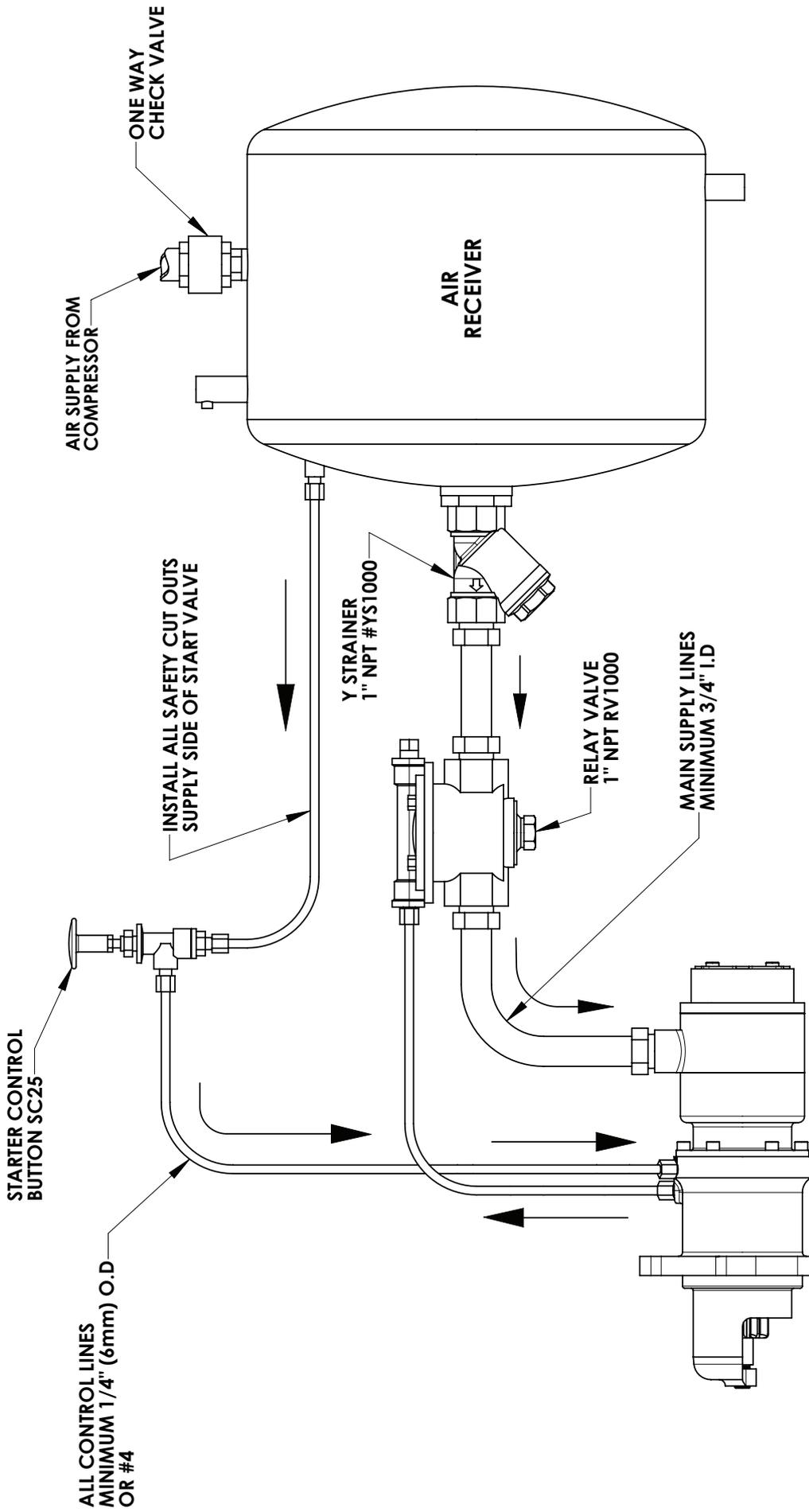
4. Mount the starter control button SC25 onto the vehicle dash-board or appropriate control panel and connect to the air receiver using a minimum of 1/4" (6mm) line.

## NOTICE

**Ensure the inlet side of the starter control button connects to the line from the receiver. Any safety 'switches' should be installed in this line between the starter control button and the air receiver.**

5. Determine the practicality of running the main air supply hose or pipe from the exit of the relay valve to the inlet of the AUSTART starter after the AUSTART starter is mounted. It may be easier to fit the hose before the AUSTART starter is mounted in position.
6. Once the AUSTART starter is mounted, fit the remaining 1/4" (6mm) control lines from the AUSTART starter to the starter control button and relay valve respectively (refer page 6).
7. Make all hose or pipe connections leak proof using a suitable thread sealant.
8. Once the connections have been made, pressurise the system and check for leaks using 'soapy' water or similar solution.

# INSTALLATION SCHEMATIC



TITLE

**ATS53-Schematic**

SCALE: 1:3

DATE: 22-3-13

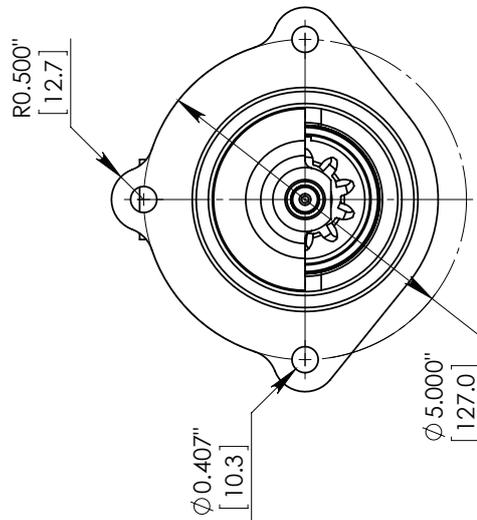
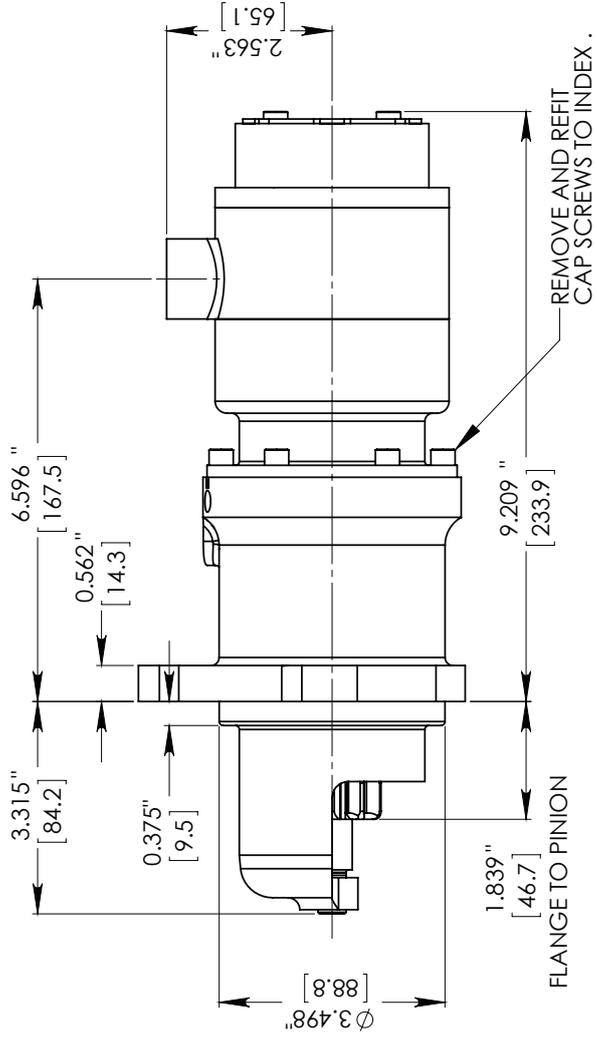
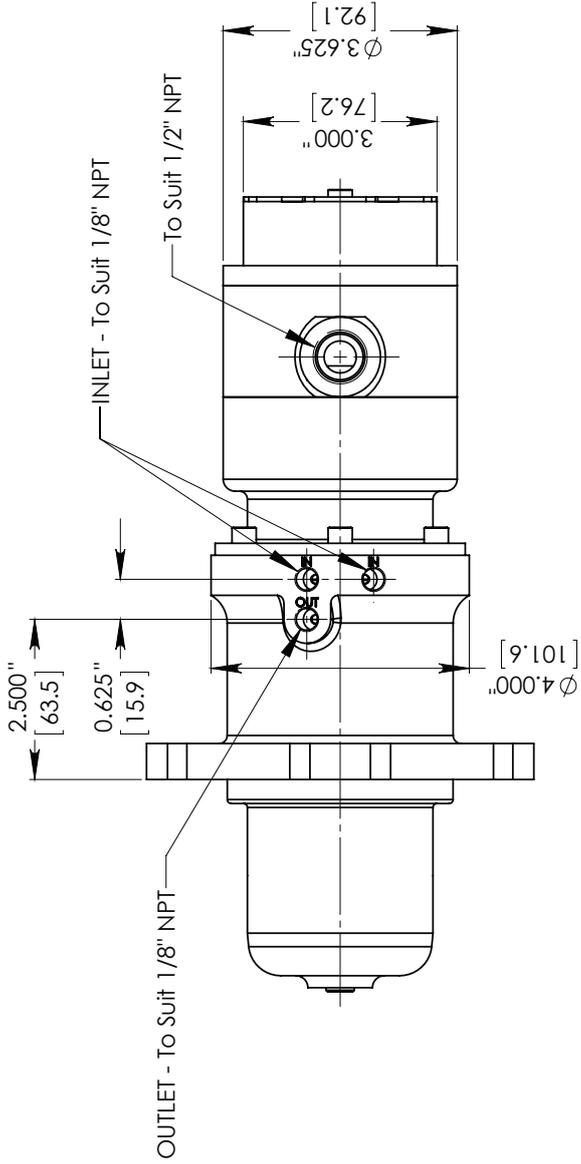
DO NOT SCALE DRAWING

**AUSTART**

**A3**

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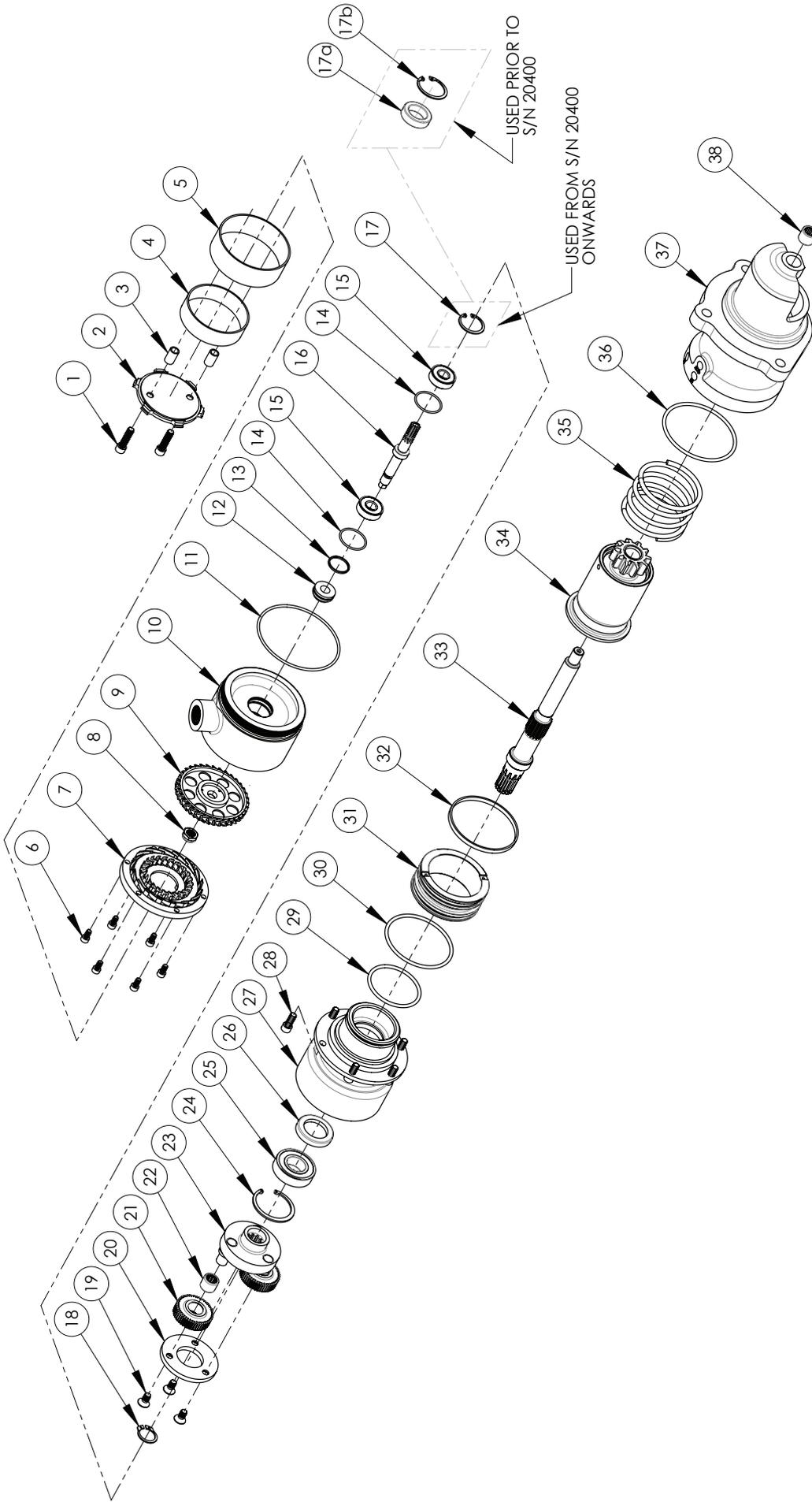
# GENERAL ARRANGEMENT



SAE 1 FLANGE

TITLE	SCALE: 1:2
<b>ATS53-General Arrangement</b>	DATE: 22-3-13
	DO NOT SCALE DRAWING
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<b>A3</b>	

# EXPLODED VIEW



TITLE

**AT553-Exploded View**

SCALE: 1:4  
 DATE: 14-5-14  
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 DRAWING

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**A3**

# AUSTART ATS53

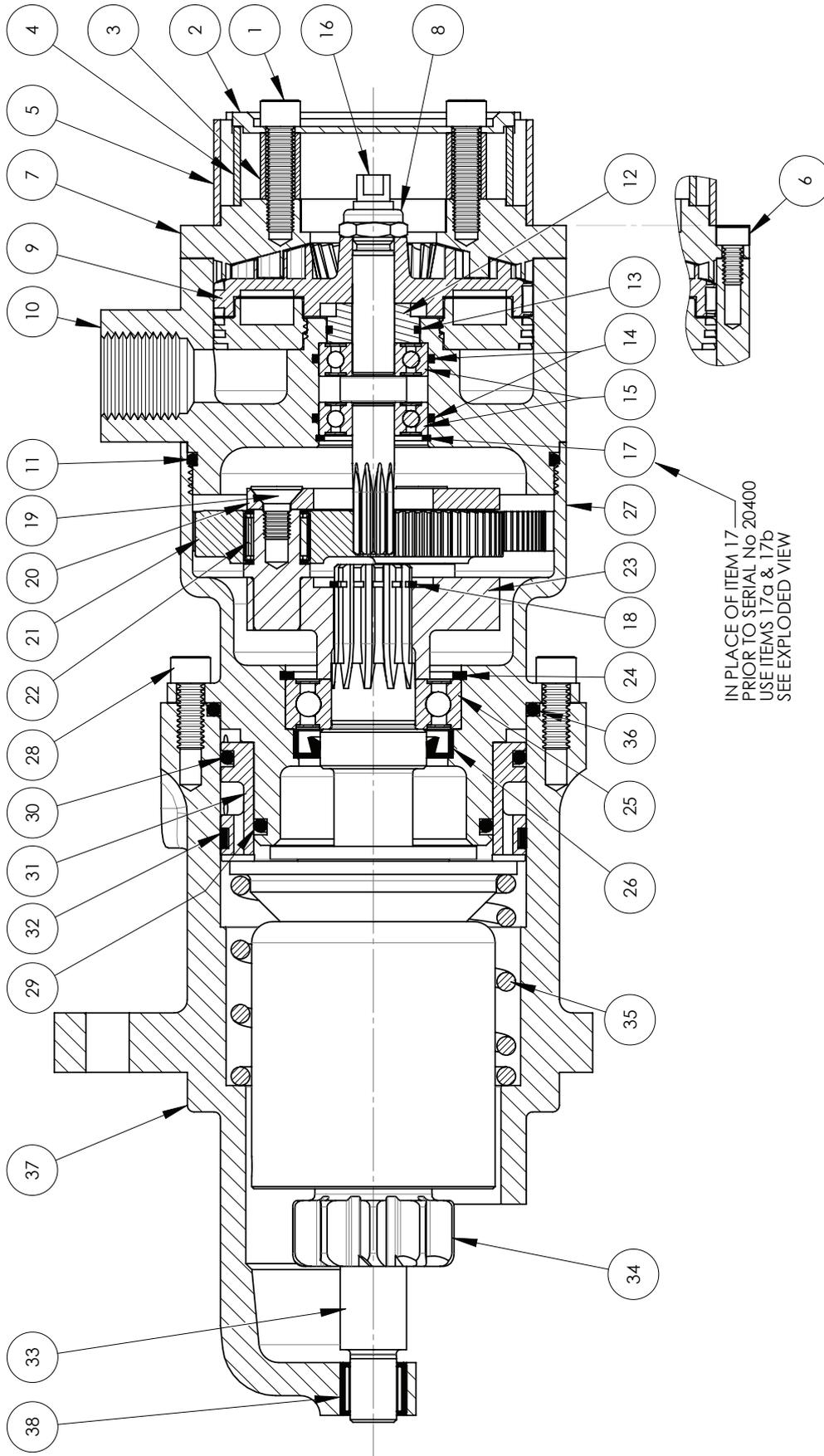
## General Build List

ITEM	PART NO.	EXT.	DESCRIPTION	QTY	ITEM	PART NO.	EXT.	DESCRIPTION	QTY
1	7318	000	SCREW		28	6005	000	SCREW	6
2	3026	100	END CAP (MUFFLER)		29	6730	000	O'RING	+ 1
3	3009	100	SPACER		30	6732	000	O'RING	+ 1
4	5319	100	BAFFLE SLEEVE		31	6726	100	PISTON	1
5	5320	100	OUTER SLEEVE		32	6733	500	SEAL	+ 1
6	6001	000	SCREW		33	6725	xxx	DRIVE SHAFT	1
7	5316	300	END COVER		34	6748	xxx	DRIVE ASSY	1
8	5301	000	SPECIAL NUT		35	6734	000	SPRING	1
9	5314	300	ROTOR		36	6731	000	O'RING	+ 1
10	5302	930	TURBINE HOUSING		37	6728	xxx	NOSE HOUSING	1
11	5304	000	O'RING	+	38	6022	000	BEARING	+ 1
12	5312	100	SEAL SLEEVE						
13	6313	000	PISTON RING						
14	5309	000	O'RING	+					
15	5026	000	BEARING	+					
16	5303	100	ROTOR SHAFT						
17	5322	000	CIRCLIP (Used after S/N 20400)	+					
17a	5305	100	SPACER (Used before S/N 20400)						
17b	5308	000	CIRCLIP (Used before S/N 20400)	+					
18	6617	000	CIRCLIP	+					
19	6305	000	SCREW						
20	6306	100	RETAINING RING						
21	6307	100	PLANET GEAR						
22	6315	000	BEARING	+					
23	6311	900	SPIDER HUB ASSY						
24	6619	000	CIRCLIP	+					
25	6012	000	BEARING	+					
26	6621	000	SEAL	+					
27	5317	100	GEAR						
						5340	900	Service Kit Consist as marked +	A.R

- XXX DENOTES OPTIONS AVAILABLE

ATS53/3 REV.06 22/05/2014

# SECTION VIEW



TITLE	SCALE: 1:1
<b>ATS53-Section View</b>	DATE: 14-5-14
	DO NOT SCALE DRAWING
<b>AUSTART</b>	<b>A3</b>
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# MAINTENANCE



## DISASSEMBLY

**Refer to the Exploded View and Cross Sectional View drawings on pages 8 & 10.**

Begin by holding nose housing (38) of the air starter in a vice using soft jaws.

Making sure a 1/2" NPT fitting is in the inlet port of turbine housing (10) lightly tap the boss of the inlet port with the fitting secure. The turbine housing (10) is secured onto the gear adaptor by means of left hand thread. Unscrew and separate the two sub assemblies.

The sub assemblies may now be dismantled separately. Disassembly of any of these two sub assemblies is detailed in the exploded view on page 8 and is basically in the order shown. Refer also to the following instructions:

### NOSE ASSEMBLY

1. Remove six screws (29) and separate the gear adaptor (28) by gently tapping it with a soft hammer if necessary. The gear adaptor (28) should spring apart from the nose housing (38).
2. Remove spring (36), drive assembly (35) and piston (32).
3. Hold drive shaft (34) to remove the three countersunk screws (20) which may require a sharp tap to loosen them.
4. Remove retainer (21), planet gears (22) and bearings (23).
5. Support gear adaptor (28) in the vertical position, remove circlip (19) using circlip pliers and gently press out drive shaft (34) from spider hub (24) and bearing (26).

6. Remove circlip (25) using circlip pliers and press out bearing (26) and seal (27).
7. Remove nose bearing (39) from nose housing (38).

### MOTOR ASSEMBLY

1. Begin by removing screws by removing screws (1), end cap (2), spacers (3), baffle sleeve (4) and outer sleeve (5).
2. Remove screws (6) from end cover (7).
3. Using a soft hammer lightly tap the side of the end cover (7) to remove from turbine housing (10).
4. Remove special nut (8) by holding rotor shaft (16) with the two flats provided in a vice.

## CAUTION

***Do not hold rotor shaft (16) by splined end when removing special nut (8). Damage to spline will cause premature gearbox failure.***

5. Remove circlip (18) using circlip pliers and press out rotor shaft (16) through rotor (9) as an assembly.
6. Press out seal sleeve (12) and bearing (15) from turbine housing (10).
7. Press off bearing (15) from the rotor shaft (16).

# INSPECTION

Refer to the Exploded View and Cross Sectional View drawings on pages 8 & 10.

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 (7) and turbine rotor (9) and look for cracks, chipping, warping or excessive wear patterns. Rotor (9) should fit tightly on to the rotor shaft (16). Replace any damaged or questionable parts. Remove burrs.
3. Also pay particular attention to all gear teeth looking for cracked or broken teeth and excessive wear. Check the pinion on the drive assembly (35) for evidence of unusual contact patterns resulting from misalignment or improper engagement. Remove any burrs or replace if questionable.
4. Check all bearings are free to rotate and do not have excessive play between races. If 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 with commercially approved solvents.

## WARNING

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

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

## REASSEMBLY

Refer to the Exploded View and Cross Sectional View drawings on pages 8 & 10.

Reassembly of any of the two sub assemblies detailed in the exploded view on page 8 is basically in the reverse order shown. Refer also to the following instructions:

### NOSE ASSEMBLY

1. Begin by pressing the bearing (39) into nose housing (38) using a press with an appropriate pressing tool.
2. Drive home the seal (27) into the gear adaptor (28) until it bottoms.

### CAUTION

**Ensure the seal (27) is fitted the correct way ie. with the tapered leading edge engaged first. Liberally grease the exposed side of the seal (27) with lithium based grease such as Valvoline Valplex EP grease or similar.**

3. Using a press drive home the bearing (26) into the gear adaptor (28) until it bottoms. Then insert shaft (34) into the bearing (26) and press home. Ensure the gear adaptor (28) and bearing (26) are well supported during this operation. Finally fit circlip (25) using circlip pliers.
4. Invert the gear adaptor (28) and restrain in the vertical position. Slip on spider hub assembly (24) onto shaft (34) and fit circlip (19) using circlip pliers.
5. Install the three planet gears (22) and gear bearings (23) onto the spider hub assembly (24).

### CAUTION

**Ensure planet gears (22) are installed with the boss side of the gear facing the spider hub assembly (24). Coat gear bearings with grease before assembly.**

6. Fit retainer (21) to the spider hub assembly (24) and install the three countersunk screws (20).
7. Invert partial assembly again to fit o'rings (37) and (30) onto gear adaptor (28).
8. Fit o'ring (31) and wiper seal (33) onto piston (32).
9. Liberally grease piston (32), the inner portion of the gear adaptor (28) and shaft (34) where it extends, then gently slide piston (32) onto the gear adaptor without damaging o'ring (30).
10. Slide drive assembly (35) onto shaft (34) and then fit spring (36) over drive assembly (35).
11. Liberally coat the inner regions of nose housing (38) and bearing (39) with grease and assemble nose assembly over piston (32) taking care not to damage wiper seal (33). Rotate the nose assembly until the six screw holes line up with the gear adaptor (28).
12. Squeeze together gear adaptor (28) and nose assembly (38) being careful not to damage o'ring (37) then insert screws (29).
13. Liberally pack gear teeth with suitable grease such as Valvoline Valplex EP or similar.
14. The nose assembly is now ready to accept the motor assembly.

## MOTOR ASSEMBLY

1. Begin by lightly oiling the internal bore of the turbine housing (10) with hydraulic oil and fitting inner o'ring (14).
2. Evenly press home bearing (15) until it bottoms. Ensure o'ring (14) is not damaged or dislodged.
3. Install piston ring (13) onto seal sleeve (12).
4. Lightly grease the outside of the piston ring (13) on the seal sleeve (12) and push home into the turbine housing (10) until it bottoms.
5. Press bearing (15) onto rotor shaft (16) using a press and liberally grease top of bearing.
6. Install second o'ring (14) into turbine housing (10) and insert rotor shaft (16) and bearing (15) as an assembly. This should be achieved with an even push fit.
7. Insert spacer (17) (used prior to serial number 20400) and install circlip (18) with circlip pliers.
8. Fit turbine rotor (9) onto rotor shaft (16) extension. As this is an interference fit it is necessary to warm the turbine rotor (9) with a heat gun or boiling water before installing.
9. Lightly oil thread on rotor shaft (16) extension and install special nut (8). Tighten nut against the turbine rotor (9) to a torque of 20-25 ft lb. (27-34Nm.) Prevent the turbine rotor (9) from turning by holding the flats provided on the rotor shaft (16) in a vice.

## CAUTION

***Do not hold rotor shaft (16) by splined end when installing special nut (8) as damage can occur.***

10. Install end cover (7), screw (6), baffle sleeve (4), outer sleeve (5), spacer (3), end cap (2) and screws (1).

## ASSEMBLING NOSE & MOTOR ASSEMBLIES

1. Invert nose assembly and hold in a vice using jaws.
2. Apply grease to planet gears (22) and gear case (28). Apply oil to thread and o'ring (11) of motor assembly carefully line up spline of motor assembly shaft (16) with planet gears (22) on the nose assembly and screw together. Note that the motor assembly has a left hand thread.
3. Insert a 1/2" NPT fitting into the boss of the inlet port of motor assembly and tap with a soft hammer to tighten.
4. Test the operation of the drive assembly (35) by introducing air pressure at the control line inlet port. The drive assembly should move freely forward when air pressure is applied and back once the pressure has been relieved. Investigate if this movement is not smooth.

# WARRANTY POLICY

All Austart Products and services 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. A period of 6 months is warranted for all service work. Normal wear and tear is excluded from the warranty cover.

The Manufacturer will replace or repair at their works, without cost, any Austart 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 Austart Starter or parts which 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.

Repeat engine starting attempts must be delayed for 15 seconds to allow all Austart Starter and engine components to stop rotating to avoid damage or adverse wear of components.

