



Agile

VEHICLE TECHNOLOGIES

PROTEUS AND H-SERIES
OPERATOR'S MANUAL



**DO NOT REMOVE THIS OPERATOR'S MANUAL FROM THE VEHICLE
 READ THIS MANUAL CAREFULLY IT CONTAINS IMPORTANT SAFETY INFORMATION**

Your vehicle is inherently stable, however if you fail to take proper precautions a collision or rollover can occur quickly, even during routine manoeuvres such as turning and driving on hills, over obstacles or while operating in water.

For your safety, understand and follow all the warnings contained in this Operator's Manual and the labels on your vehicle.

Keep this Operator's Manual with your vehicle at all times.

FAILURE TO FOLLOW THE WARNINGS CONTAINED IN THIS MANUAL CAN RESULT IN SERIOUS INJURY OR DEATH.

Particularly important information is distinguished in the manual by the following notations:

Warning Labels

On Vehicle



The triangular Safety Alert Symbol means ATTENTION! BE ALERT!



The round Blue Book or Information Symbol means READ THE MANUAL

In-Manual

▲ Failure to follow **WARNING** instructions could result in severe injury or death to the machine operator, a bystander, or a person inspecting or repairing the machine.

▲ A **CAUTION** indicates special precautions that must be taken to avoid damage to the machine.

i An **INFORMATION NOTE** provides key information to make procedures easier or clearer.

Revision Summary	
Date	Detail
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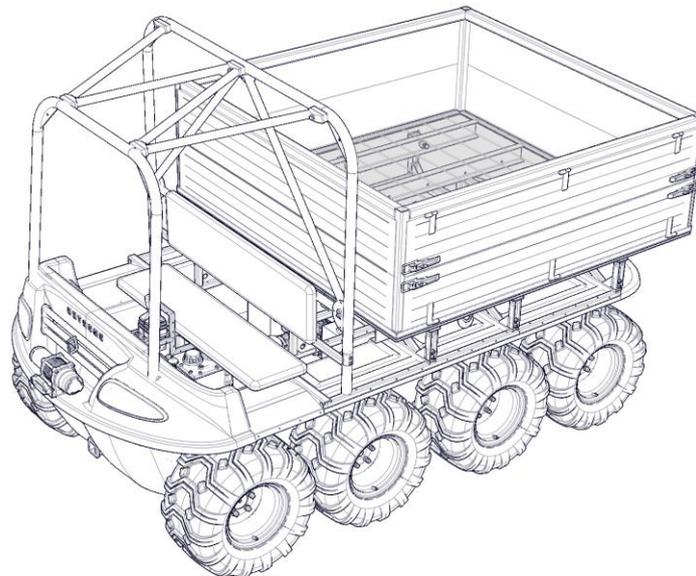


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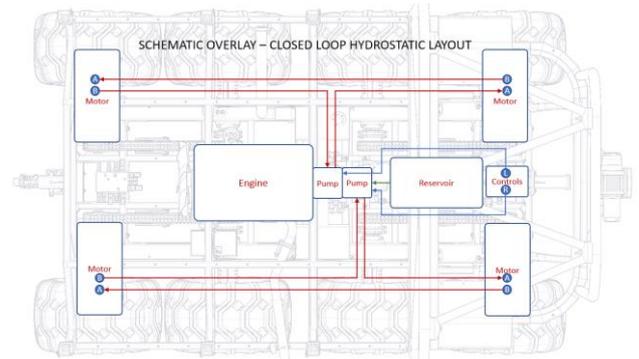


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B. INTRODUCTION

1. Congratulations and thank you for purchasing one of our Agile Extreme All-Terrain Vehicles (ATVs).
2. This manual is provided to ensure that the operator is aware of safe operating procedures. It also includes information about the general care and maintenance of your ATV, please read the manual carefully – it contains guidance and advice that is important for your safety and others.
3. Carefully read the following pages. If you have any questions regarding this ATV, contact an authorized Agile Vehicle Technologies (AVT) dealer or ourselves at the address below for assistance. Remember, only an authorized dealer or AVT have the knowledge to provide you with the best service possible.
4. We advise you to strictly follow the recommended maintenance program as outlined. This preventive maintenance program is designed to ensure that all critical components on this ATV are properly maintained to ensure vehicle safety and cost-effective operation.
5. All information in this manual is based upon the latest product data and specifications available at the time of printing. We reserve the right to make product changes and improvements which may affect illustrations or explanations without notice.

Company and Vehicle Particulars

Company Contact Details:

<p>www.agilevt.com www.agilevt.com/support [online manuals] support@agilevt.com [email]</p>
<p>Agile Vehicle Technologies Limited Orchard Cottage, Main Street, Babcary, Somerton, Somerset TA11 7DZ UK Tel: +44 [TBC]</p>
<p>Agile Vehicle Technologies Inc. 303 Industrial Drive Grand Island NY 14072 USA Tel: +1 [TBC]</p>
<p>PT Agile Vehicle Technologies Nusantara Komplek Industri ADR Desa Kadujaya, Kecamatan gurug Banten 15810 Indonesia Tel: +62 81807366153</p>

Safety

6. The specialist drive mechanism associated with skid-steering means that Agile vehicles handle differently from other vehicles such as 4-wheeled ATVs and cars. In the hands of an insufficiently experienced driver or without due care and attention, manoeuvres that are well within the capability of the vehicle may become dangerous in more extreme terrain. It is essential that drivers are sufficiently well-trained to deal with the types of terrain in which they will be operating the vehicle.

Warnings

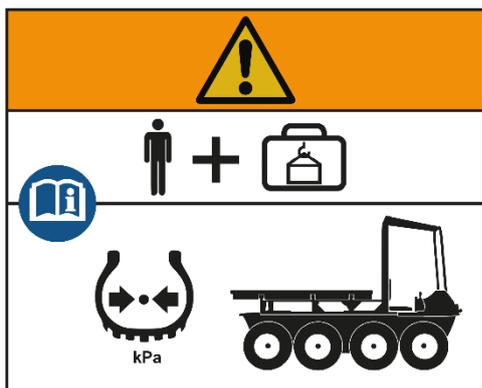


- ▲ **Read this manual and all labels carefully before using the vehicle and follow the operating procedures described.**
- **If you did not receive an owner's manual, please email us with your vehicle details and one will be sent at no charge.**



Drivers and Passengers

- ▲ **No one under the age of 16 should operate this vehicle. Some operators at the age of 16 may not be able to operate an all-terrain vehicle (ATV) safely. Use of the vehicle should always be supervised by a responsible adult. Use should be permitted only if the operator can operate the vehicle safely.**
- ▲ **Always wear the correct Personal Protective Equipment (PPE).**
- ▲ **Do not drink alcohol or take drugs and drive the vehicle.**
- ▲ **Never permit a guest to operate the vehicle unless they have read this manual and all product labels.**
- ▲ **Never carry more passengers than the vehicle is designed to carry.**
- ▲ **Never carry passengers in the cargo area of an ATV at any time.**



Load Capacity

- ▲ Never exceed the stated load capacities and maximum all-up-weights for an ATV. The stated load capacity on land is different than in water as described in this manual.
- ▲ Cargo should be properly distributed and securely attached. Reduce speed and follow the instructions in this manual for carrying cargo or pulling a trailer and allow greater distance for braking.

Tyre Pressures

- ▲ Tyre pressures are critical for safe handling and load carrying so always check before driving that they are set to appropriate pressures for the driving conditions and load being carried.

Water

- ▲ Before entering water over 12"/30cm deep ensure that your drain plugs are properly installed.
- ▲ Guidance on towing in water goes beyond the scope of this manual. It should not be attempted by inexperienced users.
- ▲ Never operate an ATV in rough water or strong current.
- ▲ Never operate your vehicle in water unless the driver and passengers are wearing approved safety and survival equipment.
- ▲ Always make sure that you have a paddle when operating in water.
- ▲ Always ensure that the driver and passengers adjust their positions so that the vehicle is floating level in water.
- ▲ Always enter the water directly via as gentle a slope as possible, Head-On, and very slowly.

Operation

- ▲ Always ensure that driver and passengers fasten their seat belts.
- ▲ Always ensure that driver and passengers *unfasten* their seat belts when operating in water deeper than 12" /30cm.
- ▲ Never operate an ATV without wearing an approved helmet that fits properly. You should also wear eye protection, gloves, boots and long trousers/sleeves.
- ▲ Never consume alcohol or drugs before or while operating an ATV.
- ▲ Never operate at excessive speeds. Always travel at a speed which is appropriate to the terrain, visibility, operating conditions and your experience.

- ▲ Never attempt jumps and other stunts.
- ▲ Always keep both hands and feet inside the vehicle during operation.
- ▲ Always follow proper procedures for turning as described in this manual. Practice turning at slow speeds before attempting to turn at faster speeds. Do not turn at excessive speed.
- ▲ Never accelerate suddenly.
- ▲ Do not use the parking brake to stop the vehicle
- ▲ Always be sure there are no obstacles or people behind you when you operate in reverse. When it is safe to proceed in reverse, go slowly.

Vehicle

- ▲ Always inspect your ATV prior to use, to ensure it is in safe operating condition. Always follow the inspection and maintenance procedures and schedules described in this manual.
- ▲ Always have the vehicle inspected by an authorized dealer if it has been involved in an accident.
- ▲ Always use the size and type of tires specified in this manual.
- ▲ Always maintain proper tire pressure as described in this manual.
- ▲ Ensure accessories are correctly installed/fitted.
- ▲ Only use accessories for their designed/intended use.

Difficult Terrain

- ▲ Always go slowly and with care when operating on unfamiliar terrain. Be alert to changing terrain conditions when operating the vehicle.
- ▲ Avoid excessively rough, slippery, or loose terrain. Be prepared to dismount and check difficult or potentially dangerous terrain.
- ▲ Never apply brakes suddenly when travelling down or traversing a steep decline/slope. If you must brake when going downhill apply them smoothly and gradually.
- ▲ Never operate the vehicle on hills too steep for the vehicle or for your abilities. Practice on smaller hills before attempting larger hills.
- ▲ Always follow proper procedures for climbing hills as described in this manual. Check the terrain carefully before you start up any hill.
- ▲ Never go over the top of any hill at high speed.
- ▲ Always follow proper procedures for going down hills and for braking on hills as described in this manual. Check the terrain carefully before you start down any hill.
- ▲ Never go down a hill at high speed.
- ▲ Avoid going down a hill at an angle which would cause the vehicle to lean sharply to one side. Go straight down hills, where possible.
- ▲ Always follow proper procedures for crossing the side of a hill as described in this manual.
- ▲ Avoid hills with slippery or loose surfaces.
- ▲ Never attempt to turn your vehicle around on any hill until you have mastered the turning techniques described in this manual on level ground.
- ▲ Avoid crossing the side of a steep hill if possible.
- ▲ Always use proper procedures if you stall or roll backward when climbing a hill. To avoid stalling, maintain a steady speed when climbing a hill. If you stall or roll backwards, follow the special procedure

for braking described in this manual. Slowly coast backward using the control levers and to control your descent.

- ▲ Always check for obstacles before operating in a new area.
- ▲ Never attempt to operate over large obstacles, such as large rocks or fallen trees.
- ▲ Always follow proper procedures when operating over obstacles as described in this manual.

- ▲ Always be careful of skidding or sliding. On slippery surfaces, such as ice, go slowly and be very cautious in order to reduce the chance of losing control.

General

Vehicle Layout

7. Agile vehicles have been designed ground up with agile performance and modular reconfigurability in mind. The driver position is well forward providing the driver with excellent visibility of approaching ground and obstacles, allowing precise positioning of the vehicle and detailed awareness.

8. Major assemblies are placed centrally and low to achieve optimal stability and balanced handling. Excellent front and rear access is also achieved.

9. Placing the driver well forward with the engine Central and low releases 75% of the overall vehicle length for load carrying purposes, this area can be configured in any way required, utilising the hard points and superstructure. Typical solutions involve load, specialist role equipment and passenger carrying.

10. Drive configuration allows for considerable flexibility in optimisation of tractive effect, control of ground pressure and transmission mode. Secondary axes can be driven by chain or track or both. The vehicle can be rapidly fitted with full band or halftracks, allowing the particular benefits of either approach to be exploited where ground conditions and track stability dictate. Axle sets 2 and 3 (the middle axes) are set lower than axles 1 and 4 (front and rear axes respectively), reducing ground friction on turns.

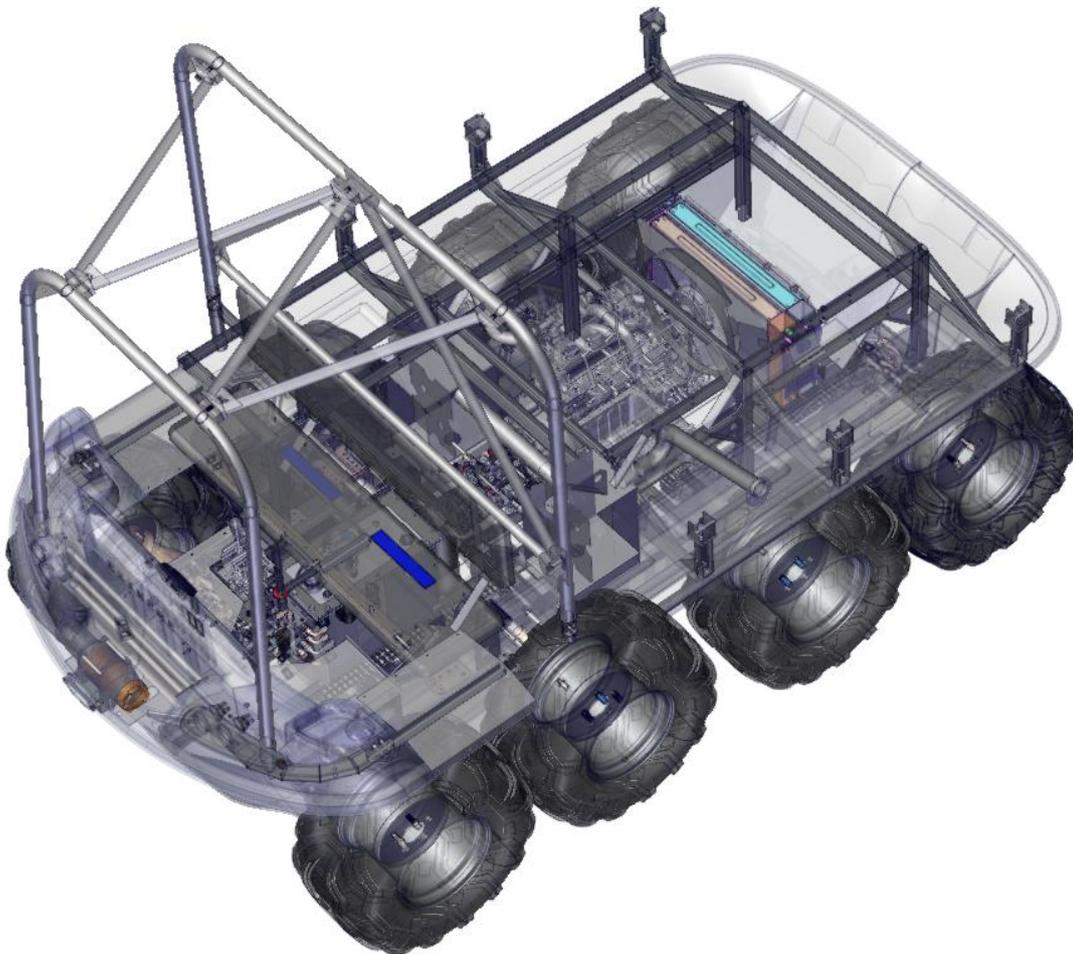


Figure 1. H-Series Cut-Away

11. Users are free to use their own tracks if they wish, however AVT provides a number of specialist solutions that are optimised to the vehicle and to the tyre system providing improved performance. Note that any problems/damage caused by use of tracks that have not been either sold or approved by AVT is not covered by AVT warranty policy.

12. All AVT variants have a metal superstructure, upon which pre-configured and ad-hoc hard points are provided to support a wide range of configurations and fits. The 3D superstructure also provides considerable additional strength

and stiffness to the robust ladder chassis, improves the robustness and resilience of the plastic body shell and provides a structural base for roll over protection.

13. Brakes are built into the drive motors -they are immune to external contamination, fade and damage, greatly simplifying maintenance but more importantly providing a safe, reliable and predictable braking effect.

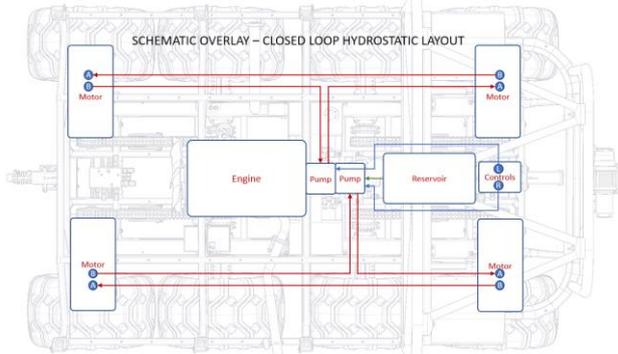


Figure 2. Hydrostatic Layout [4 Motor variants]

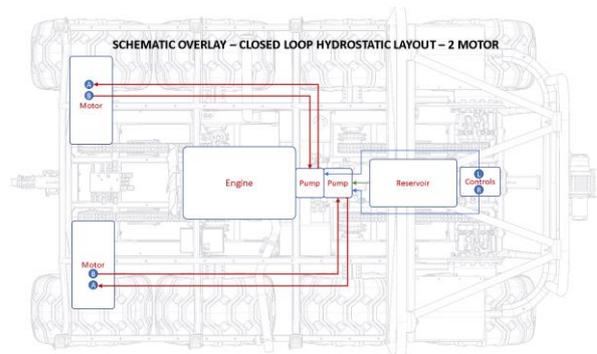


Figure 3. Hydrostatic Layout [2 Motor variants]

14. Directional control is via two compact control levers - the user can choose whether to operate these with one or two hands. Experienced operators will generally find single-handed operation most straightforward and convenient, releasing either the left or right hand for other tasks. Alternatively, the vehicle can be operated with two hands.

15. The H84, H82 and Minerva agricultural load-carrying Proetus variants are not designed for amphibious use; they have not been sealed for such use and are not fitted with safety features such as bilge pumps, do not attempt to float these vehicles without taking detailed AVT advice on preparation.

▲ **Do not attempt to float H84, H82 or Minerva variants without detailed AVT advice.**

16. The base Proteus vehicle is designed to be amphibious - it is balanced, sealed and capable of self-propulsion under specified 'afloat' loads. Pay particular attention to the guidance on amphibious operations; variations from the base configuration can have significant effects on load capacity and stability.

General Description

Vehicle Identification

17. Agile ATVs have one primary 17-digit Product Identification Number (PIN) which is attached to the chassis, and major sub-assemblies such as engine, hydraulic pump and motors will also have individual serial numbers attached. These are also recorded on vehicle documentation.

18. These numbers are required by the dealer to complete warranty claims properly. No warranty will be allowed by AVT if the Vehicle or other relevant identification numbers have been removed or mutilated in any way.

19. Always provide your vehicle model name, PIN, Engine Identification Number and hydraulic pump Identification Number when contacting AVT, a dealer or an approved supplier for parts, service, accessories, or warranty.

Hydrostatic Drive System

20. H-Series and Proteus vehicles utilise a closed loop hydraulic system for transmission and control. The primary pump is a Hansa TPV unit with augmented feedback systems to provide an optimised control response. The default control input is via hydro mechanical levers that replicate traditional skid steer tillers, providing optimal intuitive response for this class of vehicle. Pressure is generated by a twin pump, with one pump driving each side of the vehicle.

21. The drive motors are hub mounted and incorporate internal drive shafts, allowing multiple axles to be driven from a single motor via chain. Each motor can develop in excess of 3000 Nm of torque in its low speed setting and drive at speeds up to 40 kph (25 mph) with 26" tyres. There are three basic motor configurations; 4-motor with a motor at each corner wheel station, two motor front and two motor rear.

22. **Hydraulic Reservoir.** The hydraulic reservoir mounted beneath the driver's seat fulfils a number of important functions - it provides a working reservoir of 25 ltr of fluid, the unit is baffled to provide an extended flow path during which fluid mixing can take place, bubbles can separate, and some cooling can occur.

23. **High Pressure Circuits.** High pressure flow to each side is generated by two separate swash-plate controlled pumps driven at engine revs. The combination of engine speed and swash plate setting controlling flow, and resistance to movement reacted from the ground through the transmission, realises this as pressure in the high-pressure lines.

24. The swash-plated pumps can generate flow in either direction seamlessly, allowing full-spectrum control without gears.

25. On the 4-motor version the two motors on each side are driven in series, the flow from the pump passing through the front motor and then the rear motor before returning to the pump. On two motor variants each pump drives a single motor and traction is transferred to other wheel stations via chain.

26. Charge Pressure Circuit. Charge pressure at 20-25 Bar is used to release parking brakes, provide control circuit pressure and actuate the two-speed system. The charge pump draws fluid from the pickup return filter mounted on the top of the reservoir. Pressure is generated at port G and then passed into the forward manifold block where it is managed to provide all aspects of control.

27. Manifold Control. The forward manifold incorporates two solenoid-controlled shuttle valves. One of these dumps charge pressure to tank when deactivated, which causes the parking brakes to remain applied and denies control pressure to the control circuit. This allows the engine to be run without allowing vehicle movement. When activated charge pressure can build up in the manifold gallery, releasing the brakes and actuating the control circuit. The second shuttle valve directs charge pressure to the motor 2-speed shuttle valves, switching them to speed 2.

28. Cooling Circuit and Flushing. The cooling circuit is driven by a gear pump mounted at the front of the main pump. This draws filtered fluid from the rear of the tank and thence through the oil cooler, where part of the flow is tapped off to flush through the motors. The main return flow enters the reservoir through a return filter, the primary output of which is directed to feed the charge pump. The balance of flow returns to the reservoir as cooled, filtered fluid.

29. Flushing and Drain Circuits. Drain circuits direct internal leakage and cooling flow back to the front of the reservoir, where they enter via the front manifold and a diffuser.

30. Brakes. Hydraulic motors provide two modes of braking:

a. **Hydraulic braking.** The closed loop hydraulic system provides a direct coupling between engine and drive at a ratio dictated by the position of the steering levers. When travelling forwards, as the levers are pulled backwards towards the neutral position, forward motion is progressively braked, as the levers reach the neutral point the hydraulic system is effectively locked out. This is the usual form of braking, which is implicit in the control of the vehicle. Similarly in reverse, when the levers are pushed forwards towards the neutral point when travelling in reverse, the vehicle is progressively braked.

b. **Parking and Emergency Brakes.** Each hydraulic motor has an integrated brake pack capable of locking the motor, even under drive. These are designed for static braking only, they are applied as a fail-safe if hydraulic pressure is lost, and automatically when the engine is switched off. They can also be applied manually using the dash mounted switch, however never apply the parking brakes when moving, except in an emergency situation.

c. Applying the brakes immediately locks the wheels, negating the control inputs and causing the vehicle to stop rapidly. Applying these brakes in motion can damage the motors, each motor has a

lifetime allowance of 10 applications in motion, following which the brake pack must be replaced.

- ▲ **Never apply the parking brakes when moving, except in an emergency situation.**

Vehicle Load Capacities

31. On-Board Loads. The basic vehicle structure is immensely strong, with an internal superstructure that allows considerable weight to be carried without loading the body-shell. The two main hydrostatic variants are differentiated by the strength of the rear superstructure module:

- a. Proteus utilizes a lightweight rear superstructure that is capable of bearing loads up to 1000kg (2205 lbs).
- b. By contrast the much heavier H-Series superstructure is capable of bearing loads in excess of 2500kg (5512 lbs).

32. In both cases, however, the determination of maximum safe load will depend on the nature of the load, its size, its centre of gravity, disposition, security and the ground – or water – over which it is to be moved.

33. Whilst other Proteus variants are fully amphibious, the H8x series is heavier and has not been prepared for amphibious use. If amphibious use is required then additional preparations for propulsion, flotation/freeboard displacement, stability and bilge pumps are required.

Towing Loads

34. Use a trailer and towing equipment that are compatible to this ATV. Never use a trailer hitch bracket that provides a trailer coupler location lower than the centre of the rear wheels.

35. Make sure cargo weight is evenly distributed between the right and left sides of the trailer and properly secured.

- ▲ **Make sure that the load in the trailer is properly secured and will not shift while moving. Also, do not overload the trailer.**

36. When loading a trailer properly, two items are critical: Gross Trailer Weight and Trailer Tongue Weight.

- a. Gross Trailer Weight is the weight of the trailer plus cargo. Gross Trailer Weight should never exceed 4000kg (8819 lbs).
- b. Trailer Tongue Weight is the downward force exerted on the hitch by the trailer coupler when the trailer is fully loaded and the coupler is at its normal towing height. Approximately 60% of the cargo load must be located in front of the axle of the trailer. Spread the cargo in the trailer so the Trailer Tongue Weight is approximately 10% of the Gross Trailer Weight.

- ▲ **Always maintain a slow speed when towing a trailer and avoid sudden accelerations, quick manoeuvres, and sudden stops. Braking distance will be affected when towing a trailer. When towing a trailer, always maintain slow speed and allow longer stopping distance than when not towing a trailer.**

37. Driving this vehicle without extra caution when towing a trailer will be hazardous. Trailer towing can affect handling and braking; tow only at low speeds (below 16 kph/10 mph). Avoid sudden acceleration and deceleration of the vehicle. Do not make quick manoeuvres. Avoid uneven surfaces, steep inclines and hills. Allow more stopping distance than when not towing a trailer.

38. **Towed Loads.** The hydrostatic drive motors on the 2 and 4 motor variants can develop torques in excess of 3000 Nm apiece and are therefore able to develop massive tractive effort. The maximum load that can be safely towed will therefore generally be dictated by the nature of the load itself. As a rule of thumb:

- a. Unbraked loads should not exceed the gross weight of the towing vehicle.
- b. Braked loads may exceed the weight of the towing vehicle but should not exceed 4000kg (8819 lbs).

39. Where heavy loads are to be carried or towed routinely, we advise the use of bead-locked rims to ensure that tractive effort is transferred without tyre-rim slippage.

40. Vehicle weights will depend on the precise configuration of the vehicle, the base weights are:

- a. Proteus: 1100kg (2425 lbs).
- b. H-Series: 1300kg (2866 lbs).

Aluminium Rear Load Bed

41. The agricultural load carrying variant will usually be supplied with an aluminium load bed capably of carrying 2.1T. This may or may not be fitted with a power lifting ram.

42. The load bed is a modular component, designed to be readily added to or removed from the vehicle. The mounting arrangement is simple; six ball joints on the rear load bed sit in six matching cups and are retained there with locating pins.

▲ All six load-bed pins must be correctly inserted and retained by clips to ensure security of the rear load bed and avoid injury or damage to the vehicle.

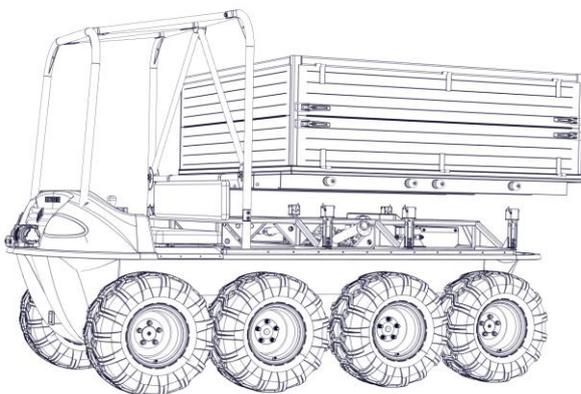


Figure 4. Real Load Bed Lifted Clear of Cups

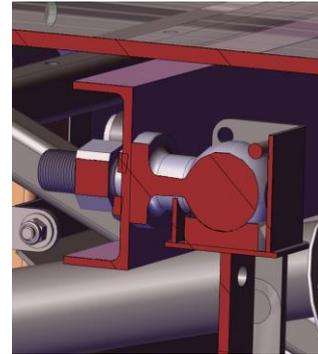


Figure 5. Cross Section Showing Pinned Ball and Socket Mount

43. The load bed is designed to allow tipping in 3 directions; left, right and rearwards, depending upon which pins have been removed:

- a. To tip left remove pins 1B, 2B, 4B
- b. To tip right remove pins 1A, 2A, 4A
- c. To tip Rearwards remove pins 1A, 2A, 1B, 2B

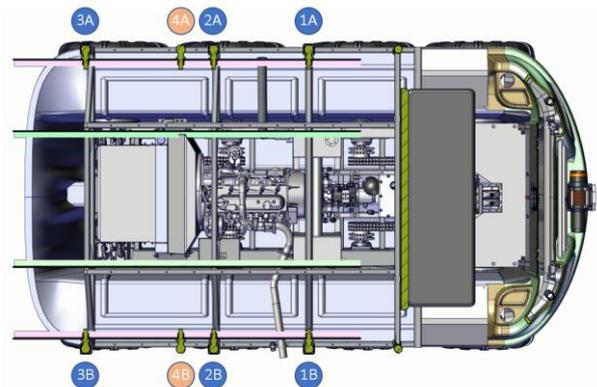


Figure 6. Ball and Socket Pinning for Tipping

44. It is also possible to set the load bed towards the rear for access to drive system components: lift the load bed and relocate balls 1A and 1B into sockets 2A and 2B. Balls 4A and 4B will sit in sockets 3A and 3B.

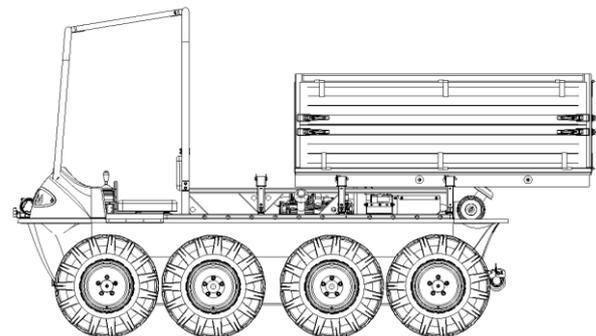


Figure 7. Load Bed Moved to Rear for Access

Vehicle Description

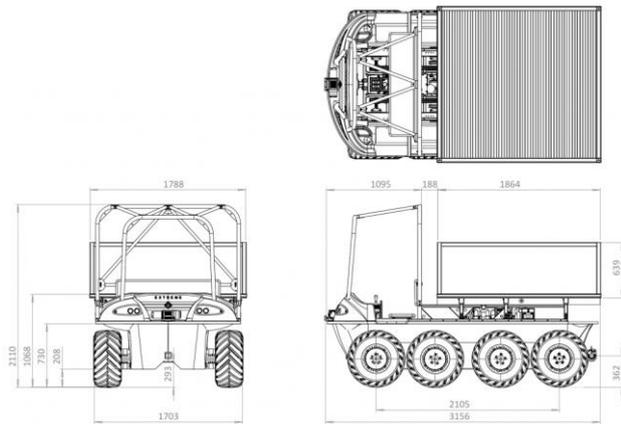


Figure 8. H-Series

H-Series

Length 8x8: 3121mm [122.9ins]
 Length 6x6: 2432mm [95.7ins]
 Width (Body rim): 1675mm [65.9ins]
 Load Length: 1864mm [73.4ins]
 Load Width: 1788mm [70.4ins]
 Ground clearance: 293mm [11.5ins]
 Body rim height: 730mm [28.7ins]
 Body height: 1068mm [42ins]
 ROPS height: 2110mm [83.1ins]

Load Cap Land: 2100kg [4628.4lb]
 Load Cap Water: 0kg [0lb]
 Towed capacity: 4000kg [8816lb]
 Passengers (max): 2pers [2pers]
 Fuel inboard: 35L [9.2US Gal]

Hydraulic System: Closed loop
 Hydraulic Motors: Radial piston
 Steering Transmission: Skid steer - infinitely variable
 Steering Control: Control levers
 Throttle: Progressive Fixed
 Service & Parking Brake: Hydrostatic & internal disk
 Chassis: Steel ladder frame
 Chain: ANSI 60-2
 Body: HDPE
 Hydraulic Oil grade: ISO VG 46
 Hydraulic Oil capacity: 40L [10.6US Gal]

Speed land: 40kph [24.9mph]
 Speed water: 5kph [3.1mph]
 Turning Circle: 0m [0ft]
 Forging Depth: 0.73m [3.1ft]
 Approach angle: 61.8deg
 Departure angle: 72.8deg
 Under Veh/Breakover angle: 95deg
 Stability tilt angle: 58deg
 Gap crossing (square ditch): 1.75m
 Grade: 30deg [57.7%]
 Tyre dia (max): 660.4mm [26ins]
 Tyre width (min): 304.8mm [12ins]

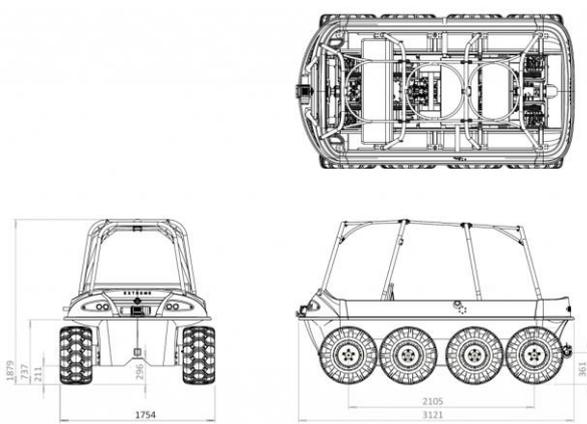


Figure 9. Proteus

Proteus

Length 8x8: 3121mm [122.9ins]
 Length 6x6: 2432mm [95.7ins]
 Width (Body rim): 1675mm [65.9ins]
 Load Length: 2000mm [78.7ins]
 Load Width: 1788mm [70.4ins]
 Ground clearance: 293mm [11.5ins]
 Body rim height: 730mm [28.7ins]
 Body height: 1068mm [42ins]
 ROPS height: 1879mm [74ins]

Load Cap Land: 1200kg [2644.8lb]
 Load Cap Water: 300kg [661.2lb]
 Towed capacity: 4000kg [8816lb]
 Passengers (max): 8pers [8pers]
 Fuel inboard: 35L [9.2US Gal]

Hydraulic System: Closed loop
 Hydraulic Motors: Radial piston
 Steering Transmission: Skid steer - infinitely variable
 Steering Control: Control levers
 Throttle: Progressive Fixed
 Service & Parking Brake: Hydrostatic & internal disk
 Chassis: Steel ladder frame
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 Stability tilt angle: 58deg
 Gap crossing (square ditch): 1.75m
 Grade: 30deg [57.7%]
 Tyre dia (max): 660.4mm [26ins]
 Tyre width (min): 304.8mm [12ins]

Operating Instructions

Precautions

45. Before driving your vehicle, carefully read, understand, and observe all the information in Parts A and B of the manual. Being properly prepared means safer and more enjoyable operation.



46. Always use Personal Protective Equipment (PPE) and clothing together with related apparel when operating an ATV. Recommended items include a helmet, eye protection, arm and leg protection and boots.

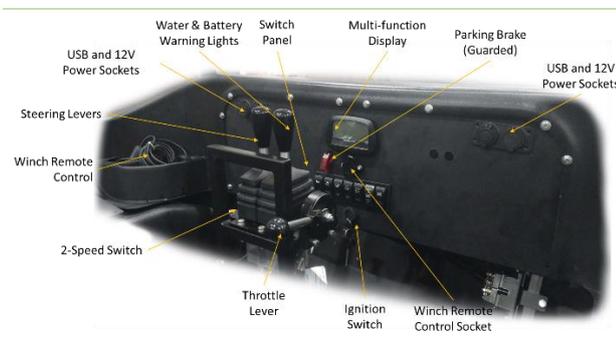
- ▲ If your vehicle is equipped with a roll bar or roll cage----Make sure all occupants put on their seat belts and adjust them correctly.
- ▲ Beginners and inexperienced operators must read and understand this operator's manual before being allowed to operate the vehicle

Cabin Layout

47. The cabin is designed to allow the operator to adopt a variety of positions, novices and individuals who prefer to use two hands to control the vehicle may choose to sit astride the steering levers. Alternatively, the operator may choose to control the vehicle with one hand manipulating both levers - this is a more advanced skill but is readily achieved with a small amount of experience. The operator can sit either to the left or the right-hand side of the controls according to preference.

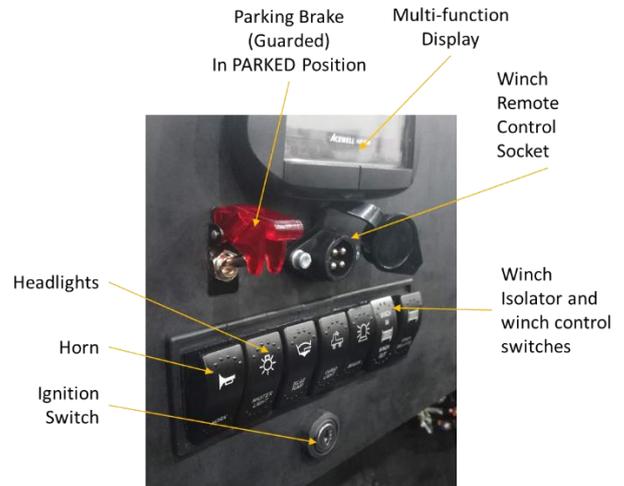
48. Primary controls and switches are placed adjacent to the steering controls - these include the 2-speed switch (when enabled), horn and throttle. Other controls and instruments are placed on the dash panel.

Dash Panel and Controls



Ignition Switch

49. The ignition switch is of a standard type, with Pre-heat, Off, Run and Start positions. Turn the switch counter-clockwise to the pre-heat position and hold there for 10 seconds or until the pre-heat light extinguishes, then start the engine.



Parking Brake Switch

50. The parking brake switch has a red safety guard, the guard is intended to prevent accidental application of the parking brake when driving. The switch is located centrally and low on the dash panel.

- a. To apply the parking brake, move the switch to the 'up' position and the guard raised.
- b. To release the parking brake, move the switch to the 'down' position and close the safety guard.

51. When the parking brake is applied all hydraulic controls are disabled.



Figure 11 Brake Off



Figure 12 Brake On

- ❗ The parking brake guard is intended to prevent accidental application of the parking brake when driving.

2-Speed Switch (if fitted)

52. The two-speed switch actuates speed 2 on the motors. The switch is located adjacent to the steering levers. (refer to paragraphs 81 and 82 later in this manual for details on switching speeds)

Throttle Lever

53. H-Series variants are fitted with a variable throttle lever, this provides a high degree of precision control for engine power and speed settings. The throttle lever is

mounted adjacent to the steering levers. Moving the lever forwards increases engine speed.

Winch Switches

54. Two winch switches are mounted on the dash panel, one isolates the winch (on-off), the other is a 3-position rocker switch to release or draw in the winch cable.

Remote Winch Control

55. A remote winch control is provided to allow operation of the winch from a safe distance, with the operator away from the line of pull, able to see other vehicles or obstacles more clearly, or where occupation of the cabin is impractical.

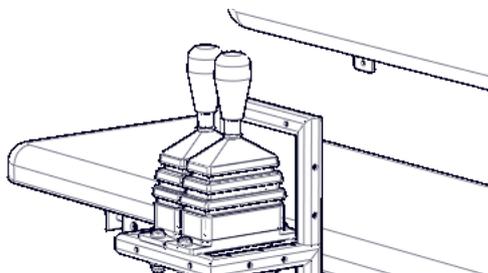
56. The winch remote control can be plugged into the covered socket on the dash between the MFD and switch bank.



Figure 13. Winch Remote Control

Control Levers

57. All directional control is made via two centrally mounted control levers; these provide exact, precision control over the movement of left and right wheel-sets respectively. They can be operated using one hand or two hands according to the preference of the driver. This allows very precise control of movement and allows power to be applied precisely and completely independently to either side of the vehicle.



58. The levers are sprung centrally and when released will return to the central neutral position, braking and halting the vehicle in the process.

59. As a lever is moved forwards or backwards from the neutral position the wheels on that side rotate forwards or backwards respectively, and at a rate governed by the distance moved. Power is delivered automatically up to a maximum level depending on throttle setting.

60. No other controls are necessary to manoeuvre the vehicle. Gear changes are not necessary and there are no clutches, brakes, differentials, or CV drives that can affect driven behaviour of the vehicle.

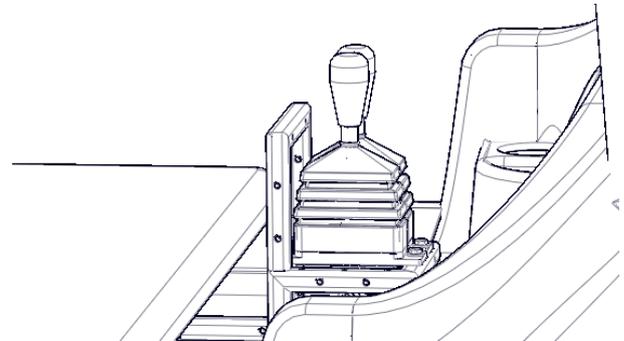
Vehicle Horn

61. The horn switch is located on the left of the switch bank.

Pre-Start Inspection

Always inspect the vehicle before it is used to make sure it is in safe operating condition. Perform the following checks with the engine off.

62. **Control Levers.** Check smoothness by moving the left and right control levers fully backwards and forwards. Check that there is no binding, restriction, free-play, or looseness in control levers.



63. **Tire/Air Pressure.** Check each tire for air pressure, the required pressure will depend on intended usage but will normally be within the range 3.5-15 psi. Check that each tire has no cracks, rips, or other damage. Check that tread wear is not significant (treads should be at least 1.5mm or 1/16" deep for safe usage).

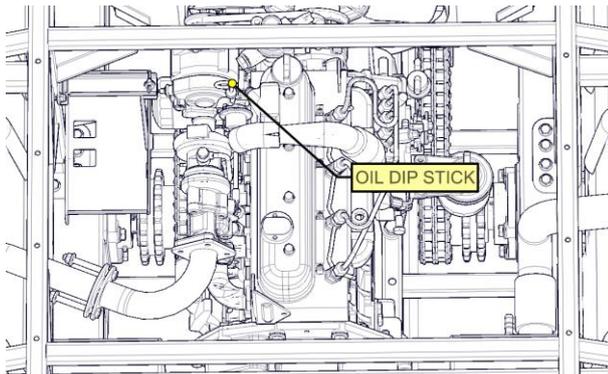
64. **Fuel.** Check the fuel level in the tank from dash display. Check fuel hoses for any damage and make sure the fuel filler neck cap is secured. Look for evidence of fuel leakage in the tub or a strong fuel smell.

- ▲ Do not refuel the machine with the engine running.
- ▲ Any spillages should be cleaned up - particularly if fuel has been allowed to seep into the lower body tub.

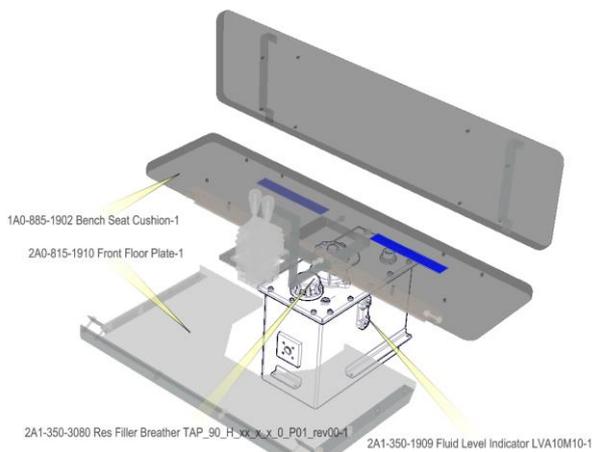
65. **Lighting.** Check that all lights are working properly.

66. **Ignition Switch.** Check that the ignition switch moves freely and smoothly in all positions.

67. **Engine Oil.** Check the engine oil dipstick for proper oil level. Add if needed. The recommended engine oil for your vehicle depends on the type of engine installed into it. Consult the engine operator's manual, which is supplied in addition to this Operator's Manual. [SAE 15W40]



68. Hydraulic Oil. The hydraulic fluid reservoir is located under the driver's seat in the centre of the vehicle. The level gauge is on the left side. The hydraulic fluid level should be checked using the tube gauge indicator on the side of the hydraulic fluid reservoir before using the vehicle. Top-up with filtered fluid as necessary. Check for leaks from pipes and joints and look out for evidence of hydraulic oil collecting in the tub.



69. Chain Tensioners. Check that chain tensioners are in place and correctly seated without signs of damage.

70. Coolant. Check radiator coolant level and if necessary, top up.

71. General Condition. Check the general condition of the entire vehicle. There should be no loose components and no evidence of damage. All fasteners should be tight and secure.

72. Starting the Engine. To start the engine, use the following procedure:

- a. Perform the Pre-Start Inspection.
- b. Ensure that the Parking/Auxiliary Brake is applied.
- c. Test the control levers by pulling back on them and pushing forward on them. They should feel firm when they reach the limit of their forward and backward travel.
- d. For diesel units turn the ignition key to the left (anticlockwise) for 10 sec until the ignition light extinguishes, then turn the ignition key to the 'Start' position; the starter motor will engage. If the

engine does not start within 4 seconds turn off the ignition, wait for 2 minutes and repeat.

e. If the engine does not start after 5 attempts leave for 15 minutes and then try again. If it still fails to start further diagnostic will be necessary (see engine manual).

- ▲ Do not start the engine if the brake systems are not functioning properly (if the parking brake and control levers do not have proper travel or correct feel), or if the Parking/Auxiliary Brake does not lock the wheels have the motors overhauled by an AVT approved engineer prior to operating the vehicle. Serious personal injury or even death may occur if the brake systems are not operating properly.
- ▲ If the throttle control lever does not function properly, DO NOT ATTEMPT TO START THE ENGINE.
- ⚠ It is important that the engine is properly warmed up before subjecting the engine to high RPM operation or heavy loads. The engine should be allowed to idle for 3-4 minutes before it is operated at more than ½ throttle. In cold conditions, the warm-up time will be longer. Damage caused by insufficient warm-up will not be covered by warranty.
- ▲ Never carry more passengers than the vehicle is configured to safely accommodate.
- ⚠ Avoid operating the vehicle on dry paved surfaces including sidewalks, driveways, parking lots, and streets for extended periods of time - hard dry surfaces will increase the rate of tyre/track wear.

73. After making sure that the engine is warm, release handbrake or Auxiliary Brake to automatically release its locking mechanism

74. Braking. When operating the vehicle, keep in mind that the main braking system is hand controlled via the steering levers. Its effectiveness relies on proper operation of the Transmission and the chains and sprockets. If the Transmission does not have the proper amount and type of fluid it may fail causing the main braking system to be inoperable. The same is true if the chains are worn or not adjusted properly. If the main braking system does fail you will lose steering control, however the Parking/Auxiliary Brake system will provide adequate braking and should be used if the main braking system fails.

- ▲ Make sure the chains are adjusted properly. If they aren't, the main braking system may fail, causing the main braking system to be inoperable.
- ▲ If your vehicle is in a turn or on a hill the brakes should be used with caution so that the vehicle does not overturn.
- ⚠ Make sure the Transmission has the proper type and amount of fluid in it.
- ⚠ The parking brake switch should only be used to stop the vehicle in an emergency. Multiple application of the parking brake when in motion will degrade the internal brake packs, causing damage that will invalidate the motor warranty.

75. To stop the vehicle, apply braking using the control levers by easing the levers toward the central neutral position. In the case of an emergency (control lever malfunction) use the emergency/parking brake.

Hydraulic System Overview

76. In order to get the best from the Agile hydrostatic system it is helpful to understand the basic principles of how it works.

Hydraulic Control and Drive System - The Basics

77. The heart of the hydrostatic system is the pump, or in this case a tandem pump, one for each side of the vehicle. Each rotation of the pumps will deliver a measured volume of hydraulic fluid to the motors on one side.

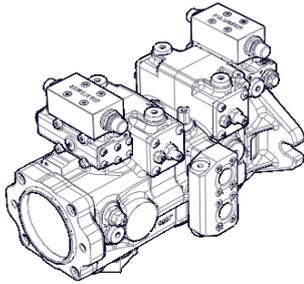


Figure 14. Hansa TPV1500 Tandem Pump

The radial motors are fixed displacement units and will rotate at a speed that depends on the flow of fluid from the pump. But the amount of fluid pumped by each can be adjusted using a swash plate attached to the control levers.

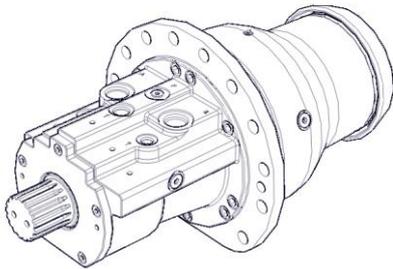


Figure 15. Radial Drive Motor with Inboard Drive Shaft

78. As a control lever is pushed forward the pump on that side will progressively increase the pumped volume, hence making the wheels rotate more quickly. The effect is rather like changing up a gear, this is an important point to understand, more of which later. Bear in mind that the engine must now work harder to pump additional fluid and make the vehicle go faster.

79. Similarly, if the lever is pulled backwards past the neutral point, the direction of pumped flow is reversed and the wheels on that side turn backwards. Vehicle direction is reverse when both control levers are moved backward past the neutral point.

80. As the engine speed is increased, so the pumps turn more quickly, the hydraulic fluid flow rate increases accordingly, and the motors turn more quickly. With the engine at maximum revs and the pumps at maximum displacement we achieve the maximum hydraulic fluid flow rate driving the motors and wheels at their maximum speed.

81. So as a lever is moved, say, from fully forwards to fully backwards, the wheels will initially rotate forward at a rate dictated by the product of the engine speed and the maximum displacement of the pump, then gradually slow as the control lever approaches its neutral position and begin to rotate in reverse as the lever is pulled further backwards, until maximum reverse speed is achieved with the lever fully to the rear.

82. How does this affect the way we drive? The feature that will catch out most new drivers is what to do when you attempt to climb a steep bank or hill; the natural inclination is to push the sticks forward, however pushing the stick forward has an affect akin to changing up a gear and will likely as not cause the vehicle to stall if the engine throttle setting is not high enough. The correct approach is to move the throttle forward to increase available power and ease back gently on the control levers as you begin to climb. The further back the levers are pulled towards the neutral point, the lower the effective gear.

83. The other advantage of this arrangement is the precision of braking effect and control. Pulling the levers backwards causes the wheels to be braked by the precise amount required and the braking effect becomes progressively stronger as the levers approach the neutral position. When at the neutral position, the wheels are hydraulically locked.

84. This makes it possible to stop precisely where and when required, and to resume movement and manoeuvre exactly as required without the risk of loss of tractive effect associated with differentials, clutches or disk brakes.

85. This arrangement gives you great precision of control under all circumstances, it is inherently safer and more flexible than can be achieved with mechanically driven systems.

86. Whilst the explanation may seem long winded, the effect is a highly intuitive, precise and agile control system that is capable of handling great torque and power with immense precision.

Two Speed system

87. The hydraulic motors can operate in two speed ranges - speed 1 will be used in most circumstances, providing the best balance between precision and power. Speed 2 can be viewed as being akin to overdrive, when selected the wheels will double their speed for a given rate of pumped hydraulic fluid, causing the vehicle to move more quickly. Useful in particular for high speed transit over level terrain.

88. Some care is necessary in switching between speeds, if undertaken without due attention to speed and engine power setting the vehicle can lurch uncomfortably. Practice the use of switching between speed 1 and 2 under different load and speed conditions, but it is usually more comfortable to reduce vehicle and engine speed as much as possible before switching up or down.

89. If the vehicle is lightly loaded it can be driven forward in speed 2 from a standing start. However, avoid reversing or undertaking severe steering manoeuvres from a standing start in speed 2.

Driving Techniques

90. The following is a summary of important driving techniques. For additional detail, refer to the Safety Section, Active Driving. Steering Controls

91. The compact, centrally-mounted steering controls provide a range of options for the driver:

- a. **Two handed control.** Less experienced drivers will generally start by sitting astride the control and operating them with two hands, one on the left tiller and the other on the right,
- b. **Single-Handed Control.** Most experienced drivers prefer to control the vehicle with one hand. The steering levers can be easily manipulated with just one hand to achieve the full range of manoeuvrability. The driver can sit on the right or the left of the controls depending on which hand they prefer to use to control the vehicle.

Turning

92. To turn the vehicle, the driver must use the correct technique. Because this vehicle uses a specialized Transmission, the left and right wheels are controlled independently. The wheels on the left-hand side are controlled by the left control lever. The wheels on the right-hand side are controlled by the right control lever. In order for your vehicle to turn, the wheels on the inside of the turn must slow down relative to the wheels on the outside of the turn. When moving Forward, the driver must ease back on the control lever on the same side as the inside of the turn and keep the other control lever further forward. In order for this to happen when in Reverse the driver must push forward on the control lever on the same side as the inside of the turn and ease the other control lever backward.

93. Maintain a steady engine speed. Turns will be smoother if you maintain a steady power setting, however for slower or tighter turns you will generally need to increase engine power slightly.

- ❗ **The turning procedure when in Reverse Gear is different than when in Forward Gear. The control levers will provide braking when eased backwards when in Forward Gear, however when in Reverse Gear the control levers must be eased forward to provide braking.**

94. To turn the vehicle in Forward Gear use the following technique:

- a. Ease off engine speed as you approach the turn to slow down.
- b. Ease back gently on the control lever appropriate for the direction you are turning. (Pull back the left control lever to turn left and the right control lever to turn right)
- c. Maintain a steady engine speed. Turns will be smoother if you maintain a steady engine speed (though at slow speeds or on tight turns, increase it slightly) when you ease back on one of the control levers. Additional engine speed enables you to “power” through turns.

d. For sharper turns additional engine power will usually be desirable, so increase engine revs as you begin the manoeuvre.

e. Gradually increase your speed as you come out of the turn and ease the control lever forward.

f. If the vehicle starts to tip or slip while turning, reduce the engine speed and make the turn wider.

95. Turns from a standing start in forward gear are possible using the following technique:

96. Increase engine revs.

97. Ease back the lever on the inside of the turn all the way back and forward on the control lever on the outside of the turn.

98. To turn the vehicle in reverse, use the following technique:

a. Ease off engine speed as you approach the turn to slow down.

b. Ease forward gently on the control lever appropriate for the direction you are turning. (Push the left control lever to turn left and the right control lever to turn right)

c. Maintain a steady engine speed. Turns will be smoother if you maintain a steady engine speed (or at slow speeds and on tight turns increase it slightly) when you push forward on one of the control levers. Engine speed enables you to “power” through turns.

d. If your vehicle starts to tip or slip while turning, reduce the engine speed by either reducing revs or easing back on the sticks and make the turn wider.

99. Turns from a standing start in reverse are possible using the following technique:

a. Ease forward on the control lever on the inside of the turn and back on the control lever on the outside of the turn whilst advancing the throttle gently.

Special Manoeuvres

100. The simplicity and precision of control allows for great sophistication of manoeuvre as drivers become more experienced, greatly exceeding that possible with a mechanical transmission.

101. Some basic manoeuvres that users may wish to attempt are described below. Attempt them initially with low engine revs to gauge control input and response. When confident, use slightly higher revs to increase the power available and gauge the effect on control input and response.

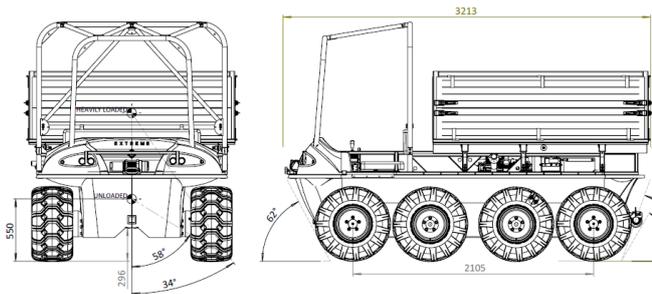


Figure 16. Slope Angles

Neutral Turn

102. The basis of this manoeuvre is to cause the wheels on opposite sides of the vehicle to rotate in opposite directions. If the wheels rotate at a similar speed, then the vehicle will spin on the spot about its centre. Reversing the direction of sticks causes the same effect in the opposite direction. This manoeuvre on its own is extremely useful when changing direction in a tight space, whether on land or afloat. However, variations on the manoeuvre, with one stick moved further than the other allow a range of finely controlled turns to be made. This mode of turning can also reduce the degree of ground friction associated with skid steer turning, minimising wear and tear on tyres and reducing the energy required to turn.

103. You will find that you need higher revs to successfully complete this manoeuvre, however it will generally be possible to complete it successfully at lower power settings provided stick displacement is kept small and the vehicle turned slowly.

Hill Starts and Stops

104. The vehicle can be brought to a precise and complete stop even on the most difficult of slopes, allowing time to observe, assess and manoeuvre without the inherent challenges of other drive systems. Select an uphill slope that you are comfortable with, approach it square on, and part way up the slope ease back in the steering until the controls are in the neutral position and the vehicle has stopped. Now gently ease the sticks forward until the vehicle starts to move again. Turn around and repeat this exercise going downhill, this time also attempting to reverse back up the hill.

Mound and Boulder crossing

105. In the first instance identify a mound that is relatively narrow compared to the length of the vehicle, say 1m (approx. 3 feet) or so across and 30-40cm (12-16in) high. Drive the vehicle onto the mound so that it is balanced on wheels 2 and 3 (the two centre tyres on the 8x8 model). Now gently ease the vehicle forward slowly so that the nose dips towards the ground on the far side. Slowly continue the manoeuvre until the front wheels gently touch the ground, leaning forward as you do so, so that you can observe the ground immediately in front of you.

106. When you have touched the ground, stop and then gently reverse so that the vehicle climbs back up the mound and then ease it backwards until the rear wheels contact the ground. Experiment with control in this situation to get a feel for how the vehicle responds to

your inputs. This precision of manoeuvre is particularly important when crossing difficult obstacle fields, allowing you to approach drop-offs closely without committing, observe ground conditions beyond and then back off if appropriate, safely and under seamless control.

Slope Crossing

107. Crossing slopes should be avoided whenever possible, however sometimes it is necessary to extricate ones-self from a difficult or dangerous situation. In these cases, it is important that you understand how the vehicle will behave. Identify a bank with a side slope of between 10-15 deg, measure it if you can using a level gauge or phone app. With the vehicle unloaded, approach the bank edge-on with the bank on the driver's side. Gently ease the vehicle forward and up the bank so that the vehicle begins to tilt sideways. Continue until the lower wheels are on the bottom of the slope. Stop and get a feel for the angle. Apply the parking brake and climb out of the vehicle on the uphill side, then gently rock the vehicle sideways from the uphill side to gauge the stability of the vehicle.

108. On a 15 deg slope the vehicle should feel rock solid. Now practice a manoeuvre to achieve a safer orientation, with the nose of the vehicle pointing directly up the slope.

- a. Re-enter the vehicle and gently conduct a neutral turn, with the up-slope wheels turning backwards and the downhill wheels forwards until the vehicle is pointed up the slope.
- b. Now proceed either up or down the slope as you prefer.

109. As you gain confidence and begin to test the limitations of the vehicle and develop your own capabilities you can repeat this on steeper slopes, though not exceeding 30 deg, beyond which engine oil starvation may occur.

Skidding/Sliding

110. Skidding - To overcome skidding when braking, follow this technique: Adjust the speed of the wheels to match the speed of travel using the steering levers until tyres stop skidding and you regain control. Then gently push/pull the levers to engage the hydraulic drive to steer the vehicle.

111. Sliding - To overcome sliding when turning, use the following technique:

- a. Turn into the slide.
- b. Maintain a steady engine speed.
- c. Resume your course as soon as the vehicle straightens out.

Operation on Hills

- ▲ Never operate on hills too steep for the vehicle or for operator abilities. Practice on smaller hills before trying larger hills.
- ▲ Do not operate on angles greater than 30 degrees.

Climbing a Hill

112. To climb a hill front-on, use the following technique:

- a. Approach the hill at a slow and cautious pace.
- b. Ease back on the levers as you begin to climb and if necessary, increase engine speed. Remember that easing back on the levers has the effect of shifting to a lower gear ratio for increased climbing power.
- c. Maintain a steady pace during climb.
- d. Slow down when approaching the top.
- e. If the vehicle loses forward momentum, ease back on the control levers and stop the vehicle.
- f. If the terrain allows turn around or allows the vehicle to reverse down the hill slowly, keep in mind that you can stop the vehicle by pushing forwards on the control levers.

Descending a Hill

113. To descend a hill in Forward gear, use the following technique:

- a. Check the terrain carefully for any obstacles before starting down the hill.
- b. Point straight downhill.
- c. Start down the hill and use hydraulic braking to maintain descent at a slow speed.
- d. Avoid going down a hill at an angle that would cause the vehicle to lean sharply to one side. Go straight down a hill whenever possible.

Traversing a Slope

114. To traverse a slope, use the following technique:

- a. Keep your speed slow and consistent.
- b. Steer slightly uphill, if necessary, to maintain a straight course.

Driving Over Obstacles

115. If an obstacle cannot be avoided, use the following technique:

- a. With the obstacle straight in front, approach at slow speed.
 - b. Move slowly straight ahead until your front tires touch it.
 - c. Increase throttle pressure and keep it steady until you are up and over it.
- ▲ **Some obstacles are too high for an ATV or for the operator abilities. If not sure about safely crossing an obstacle, find another path that you feel is safer.**

Operations in Water and the Littoral

116. The base Proteus vehicle is amphibious by design and can float and self-propel without preparation other than installing the drain plugs. However the H84 and H82 [Minerva] variants are not amphibious, the instructions in this section are not applicable to these variants.

117. However, operations between land and water and whilst afloat are inherently more challenging than operations on land alone. Extra care should be taken when preparing for operations on or near water.

118. Some general rules:

- ▲ **If seat belts are fitted, they should be removed by all occupants prior to entering water.**
- ▲ **Occupants should wear approved buoyancy aids.**
- ▲ **Ensure that loads are evenly distributed as low as possible and properly secured. Loads should not exceed safe limits.**
- ▲ **Avoid operations in strong currents or high winds. The vehicle can make headway of 3 to 6 kmh in still water.**
- ▲ **When crossing large bodies of water stay close to the edge wherever possible. Be prepared to head for safer waters if conditions change or a leak is detected.**
- ▲ **Plan for difficulties. Carry a paddle. If the vehicle does not have bilge pumps fitted carry a bucket or bailing cannister.**
- ▲ **Ensure that drain plugs are fitted and that the lower body has not been punctured**
- ▲ **Under no circumstances should you operate an ATV in frozen or open waters with a snow plow attached.**
- ▲ **Before and after operations in water check outboard bearing seal integrity and gaskets. Ensure that bearing housings are fully greased.**

119. Hydrostatic Skid Steer Transmission braking systems are not affected by water use, and the control levers will still operate normally, even if there is water inside the vehicle.

Entering Water

120. Always seek a gently sloping entry wherever possible. When entering water do so square on. If the front is more heavily loaded than the rear, then consider entering deep water rearwards to avoid the risk of breaching the rim and taking on water.

121. When entering calm water, drive slowly and steady, only enter water at an angle of 25 degrees or less to make sure you do not allow water to flow into the vehicle. Do not operate in waters with a current, or open water such as large lakes and oceans.

- ▲ **Smaller tyres will reduce the overall buoyancy of the vehicle.**
- ▲ **Do not allow the vehicle to remain in water for extended periods of time. Gradual ingress will damage bearings and initiate corrosion. Always check integrity of seals for ingress following longer periods of use in water.**

Driving in Shallow Water (Less Than 100mm/4 inches Deep)

122. When driving in water less than 100mm/4" deep, use the following technique:

- a. Proceed at a slow cautious pace.
- b. Continue at a slow pace.
- c. If you contact an obstacle, back up and try to find another way around it.
- d. If you must pass over the obstacle you should go forward until your front tires touch it.
- e. Then you should increase the throttle slightly until you are over it.

Driving in Deep Water (More Than 300mm/12 inches Deep)

- ▲ If you enter water more than 300mm/12 inches deep or there is a risk that you might enter the water unexpectedly through tipping, subsidence or sliding, make sure that all occupants unfasten their seatbelts.
123. When driving in water more than 300mm/12 inches deep, use the following technique:
- a. Lean toward the inside of a turn.
 - b. If you feel the vehicle contact an obstacle you should reduce speed, then back up and try to find a way to avoid the obstacle.
 - c. If you must pass over the obstacle you should go forward until your front tires touch it, then you should increase the speed of the wheels slightly until you are over it.
 - d. If you feel the vehicle is going to tip over, you should back up and get clear of the obstacle.

Operation with Tracks installed

124. If your ATV is equipped with optional tracks, follow this method.
- a. When starting from a standstill advance the steering levers gently
 - b. If you are not making progress back off the tillers slightly to reduce wheel speed so that you don't lose traction.
 - c. If you do get stuck, back off and try to find another way around.

Driving in Cold Weather

- ▲ Check that all controls move freely. Make sure that the control levers and switches are free of ice and snow.
125. Start the engine and make sure the throttle operates normally. If it is frozen it must be thawed out before operating the vehicle.
- a. As long as the throttle and controls operate normally, try to drive the vehicle. If it does not move with the normal amount of power applied the tires may be frozen to the ground.
 - b. If the tires are frozen to the ground, pour warm water around them to melt the ice.
- ▲ Go slowly and be extra careful when driving on snow-covered or ice-covered terrain. Always be alert to changing terrain conditions when operating the vehicle.
- c. Practice driving in an open snow-covered or ice-covered area at slow speeds before driving on snow-covered or ice-covered trails.
 - d. Learn how the vehicle responds to steering and braking on the type of terrain to be encountered on the drive.

Driving in Reverse

- ▲ When reversing, first make sure there are no obstacles or people behind. When it is safe, back up slowly.
126. Stop the vehicle:
- a. Check to make sure there is nothing behind.
 - b. Pull the control levers backwards.
 - c. Gently increase engine speed
- ▲ When driving in reverse, go slowly and turn carefully.

Extended Deployed Use

127. When planning to undertake extended operations ensure that the vehicle is properly prepared, appropriate equipment, consumables and spares are carried, that the route and timings have been planned and that appropriate trusted 3rd parties have been notified.

128. We recommend that the following should be carried:

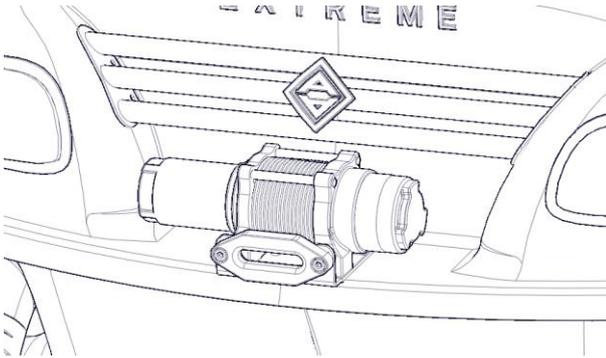
- a. Food
- b. Water
- c. Basic toolkit
- d. Spare fuel
- e. First aid kit
- f. Survival equipment including provision for shelter and sleep
- g. Fire lighting equipment
- h. Spare battery packs
- i. Flares
- j. Communications equipment
- k. Spare clothing
- l. Torch and lantern
- m. Magnetic compass
- n. GPS device
- o. Maps (paper)

Along with any other equipment appropriate to conditions.

Operating the Winch

129. Vehicles are supplied with a 3500lb (1588 kg) winch fitted as standard. This is intended primarily as a self-recovery device, however there are many other uses to which winches may be put, the details of which we cannot explicitly address in this guide. The user must exercise extreme caution when using the winch since incorrect or inappropriate use can be dangerous to individuals and cause damage to the vehicle.

- ▲ Always observe Winch Safety guidance below



Winch Safety

130. **Wear Gloves.** When handling or rewinding rope, always use hand protection to eliminate the possibility of cuts or friction burns.

131. **Secure Vehicle.** Be sure to secure vehicle in position before using the winch and after moving an item with the winch secure the item. Do not rely on the winch to hold it for an extended period as the winch does not have a locking mechanism. Apply blocks (such as a wheel chock) to vehicle when parked on an incline.

132. **Drum Rope.** Do not apply load to winch when the rope is fully extended. Always make sure that there are at least 5 complete turns of rope left on the drum before starting to winch. Take care to ensure the rope is re-spooled correctly.

133. Keep Hands & Fingers Clear of Rope & Hook When Operating Winch

- a. Never put your finger through the hook when reeling in the last few feet. If your finger gets trapped in the hook or rope, you could lose it. Never guide the wire rope under tension onto the drum with your hand. Always keep hands and body away from the fairlead (cable intake slot) when operating the winch.

134. Never Hook the Rope Back onto Itself

- a. Hooking the rope back onto itself creates an unacceptable strain, breaking individual strands, which in turn weakens the entire rope.

135. Keep Pulling Durations as Short as Possible

- a. The winch is designed for intermittent use and cannot be used in constant duty applications. Do not pull for more than one minute at or near the rated load. If the motor becomes too hot to touch, stop and let it cool off for a few minutes. If the motor stalls, then cut off the power immediately.

136. **Do Not Overload.** Always use the winch at its rated capacity for your safety and better performance of the winch. Do not use inappropriate attachments in an attempt to exceed its rated capacity.

- a. Avoid Continuous Pulls from Extreme Angles, this will cause the rope to pile up at one end of the drum. When feasible, get the rope as straight as possible to the direction of the object.

Never Operate the Winch Without the Rope Fairlead Fitted. Operator injury or winch damage can result if a fairlead is not installed.

Staying Safe

137. This section is intended to give you the basics of ATV safety. More specific information that will help you “PASS” the safety test is covered in the immediately following sections of this Operator’s Manual. The idea is that if ATV drivers “had only known” safe driving techniques, things to check, and things to watch for, they could have avoided accidents, injuries, and death.

Prevention is:

138. Wearing the right kit
- Wearing proper Personal Protective Equipment, clothing and gear.
 - Helmet and Eye Protection.
 - Long Trousers.
 - Long Sleeve Shirt.
 - Gloves.
 - Boots / Knee / Ankle Protection.
139. Checking the condition of your vehicle every time you drive:
- Controls
 - Tyre pressure and condition
 - Fluids – Fuel, oils, water
 - Electrical - Lights
 - Miscellaneous - Air filter, battery, tighten nuts and bolts.
140. Using CLOT to remember parts to check.
- C- Controls
 - L- Lights and Electric System
 - O- Oil and Fuel
 - T- Tyres and Wheels
141. Keeping first aid and survival supplies on board.
- Tools, bulbs, duct tape, rope, spark plug, drive belt and spare parts.
 - Water
 - Identification and Money
 - Maps
 - Emergency Kit. Flashlight, matches, flares, First Aid Kit.

Active Driving is:

142. Learning basic ATV manoeuvres.
- Starting
 - Braking
 - Steering
 - Parking
143. Driving
- Turns

- Driving Uphill
- Driving Downhill
- Crossing Obstacles

144. Knowing how to use safe driving techniques in special situations.

- Reversing
- Skidding or Sliding
- Stopping on a Hill
- Operating in Water

Sound Judgment is:

145. Understanding the environment
- Weather-Know the forecast
 - Terrain-Know possible hazards.
 - Night Riding-Don’t do it.
 - Be aware of conditions and other users.
146. Being aware of those around you.
- Keep a safe distance from others and don’t carry excess passengers
 - Make yourself visible and watch for others.
 - Expect people to be in unexpected places.
 - Respect the environment.
147. Driving within the ability of your equipment.
- Vehicle Maintenance - Driving only when your vehicle is in good condition.
 - Cargo Limitations - weight limits, load distribution and speed.
148. Making personal choices that affect your safety.
- Alcohol and Drug Consumption - Do not consume alcohol, medication, or illegal/mood altering drugs before or during your drive.
 - Your Physical Condition - Don’t drive if you’re tired.
 - Reckless Driving - Respect ATV limitations.
 - Laws and Regulations - Learn local and state/provincial laws and regulations.
 - Group Behaviour - Avoid risky group situations.
 - Underage Drivers - Never let anyone under the age of 16 operate your vehicle
149. Using SPIDER to evaluate yourself, your vehicle, and your environment.
- S - Scan/Search
 - P - Predict
 - I - Identify Hazards
 - D - Decide course of action
 - E - Execute
 - R - Repeat from the top

Supervision

150. Taking responsibility for others that use your ATV.

- a. Inexperienced Drivers: Keep them off your ATV
- b. Experienced Drivers: Get them familiar with the controls and characteristics of your ATV.
- c. Underage Drivers: Do not permit anyone, experienced or not, to drive your vehicle if they are under the age of 18

Prevention – Better than a Cure

151. When using an ATV, prevention is the name of the game. “Had you only known” something could go wrong, you would have prevented it. If you don’t notice your conditions and surroundings before driving your ATV, you give up control over the situation. Using ATV prevention techniques helps you forecast potential hazards before they injure you or damage your machine.

152. Following the safety instructions and warnings in this manual will help you “P.A.S.S.” the safety test. P.A.S.S. stands for “Prevention,” “Active driving,” “Sound judgment,” and “Supervision.” Remembering P.A.S.S. and what it stands for will help you have a safe, predictable drive every time you go out on your ATV.

Clothing

153. It important to dress correctly for ATV driving. This is the minimum protection you need to wear during every drive:

- a. Helmet
- b. Eye Protection
- c. Long Pants
- d. Long sleeve shirt
- e. Gloves
- f. Boots / Ankle Protection

154. Take due account of the weather. Wear a hat under your helmet and a snowmobile suit in the winter, and lighter protective clothing in the summer.

Head Protection

155. There are several types of helmets on the market, but make sure you wear a helmet that complies with the standards of the U.S. Department of Transportation (DOT), The Snell Memorial Foundation, the American National Standards Institute (ANSI), or ECE (Economic Commission for Europe) standard, R 22.05. Helmets that comply with one or more of these agency’s standards have a sticker on the inside or outside of the helmet.

156. Helmets should have one of these:

- a. D.O.T. Label
- b. SNELL Label
- c. ANSI Z901 Label
- d. ECE 22.05 Label

157. If you drop or damage your helmet, get a new one immediately. Your helmet may not protect your head from

injury if it has cracks, fissures, or other damage to its outside or core padding.

158. And remember, your helmet won’t do you any good if the chin strap isn’t fastened.

Eye Protection

159. Wear eye protection, such as safety glasses or goggles designed to resist impact. Sunglasses are not recommended.

Arms and Leg Protection

160. The goal is to protect your body from branches, long grass, airborne objects, or anything else that could cause you damage. The thicker and more durable the material, the better protection it will provide.

Gloves

161. Your hands are targets for flying objects and branches. Along with providing skin protection, gloves will shield your hands from harsh weather. Wear gloves that are weather resistant and have a gripping surface to keep them from sliding off the control levers.

Boots / Ankle Protection

162. Wear a boot that covers your ankle and provides good support. Choosing boots with low heels and a good tread will help prevent your feet from slipping on the floorboard in wet or rugged conditions, or getting hurt if they get hit by rocks, dirt or branches.

Vehicle Condition

163. The second step in Prevention is checking the condition of your machine. Chances are good that you’ll be using your ATV in some rough terrain, and there’s no way you want to lose control over difficult terrain. You need to check the following parts on your ATV before each drive:

- a. Brakes
- b. Throttle
- c. Tyres and Wheel Rims
- d. Fluids
- e. Lights
- f. Electrical
- g. Controls and Cables
- h. Chassis
- i. Miscellaneous

164. One easy way to remember what parts you need to check is by using the acronym “CLOT”. It stands for:

- a. C-Controls
- b. L-Lights and Electric System
- c. O-Oil and Fuel
- d. T-Tires and Wheel Rims

Brakes

165. Check:

- a. Control Levers

- b. Parking/Auxiliary Brake
- c. Locking Mechanism for Parking/Auxiliary Brake

Tires and Wheel Rims

166. Check:

- a. Tire pressure
- b. Tire surface (tread and sidewalls)
- c. Correct tire pressure is crucial. Consult the Maintenance section of this Operator's Manual for tire pressure guidelines.
- d. Incorrect tire pressure can cause poor handling, instability and a loss of vehicle control.
- e. While checking the tire pressure, inspect the tread and sidewalls of the tires for cracks, cuts, or other damage that could indicate they need to be replaced.

Fluids

167. Check:

- a. Fuel
- b. Engine Oil
- c. Coolant
- d. Transmission Fluid or Hydraulic Oil

168. Start with a full tank of fuel before every drive and make sure that the engine oil, coolant and hydraulic and transmission fluid are at the proper level.

Lights

169. Check:

- a. Headlights
- b. Taillights

170. Turn the headlights on and off to make sure they work. At the same time check that the taillights (if fitted) work. Don't drive your vehicle unless the headlights and taillights are working.

Electrical

171. Check:

- a. Ignition Switch in "pre-heat" position
- b. Ignition Switch in "Off" position
- c. Ignition Switch in "Lights-Run" position
- d. Ignition Switch in "Run" position
- e. Ignition Switch in "Start" position

172. Check to make sure all four positions operate properly.

Controls

173. Check :

- a. Forward
- b. Forward Left Turn
- c. Forward Right Turn
- d. Neutral

- e. Reverse
- f. Reverse Left Turn
- g. Reverse Right Turn

Chassis/Body

174. Check:

- a. Chains
- b. Belt
- c. Axles

Grass, leaves and other debris can get caught in your chains or axles. Clear and clean the chains and axles.

Miscellaneous

175. Check:

- a. Air Filter
- b. Battery
- c. Tighten parts, nuts and bolts.

176. Inspect your air filter. You're looking for debris or damage that may indicate you need to replace it. A clogged filter can stop an engine. Check your battery terminals for corrosion. Refer to the maintenance section of this Owner's Manual for cleaning instructions. Also, be sure to tighten any loose parts, nuts or bolts.

First Aid and Survival

177. You should prepare for the unexpected. Emergencies and accidents are traumatic enough, but they're even worse when you're not prepared for them. At the minimum, during every ATV drive, you should have the following items on board:

- a. Tools
- b. Water
- c. Identification
- d. First Aid Kit.

178. For drives that are longer in duration and distance, the following additional items are recommended:

- a. Money
- b. Maps
- c. Emergency Kit (with flashlight and First Aid Kit).

Tools

179. Routine maintenance will generally eliminate the need for emergency repairs. But just when you think you're safe, that tree trunk you crossed a few miles back has knocked some bolts loose and you need to make minor adjustments—where's that wrench? Especially on long drives, carrying the right tools can prevent inconveniences from becoming crises.

Water

180. Water is so important that you need to carry it regardless of the duration of your drive. Heat exhaustion and heat stroke creep up suddenly and they take you out

of commission; if you become dehydrated, you could find yourself physically unable to safely operate your vehicle.

Identification

181. If something does happen to you, emergency personnel will want to know who you are and who to contact. It's possible you may be in no condition to give them that information. Put your I.D. in your pocket before you drive. Without it, you're anonymous.

Communications

182. Radio, mobile phone, consider the extent of cellular coverage in the areas you will be operating. Leave a copy of your intended route with someone you can trust.

Money

183. So many uses!

Maps and Navigation Devices

184. Maps are unnecessary when you're familiar with the area. But when you're driving on unfamiliar trails, it's good to know where you are, what's coming up, and how to get back - you can't always rely on GPS coverage.

Emergency Kit with Flashlight and First Aid Kit

185. Carry these items:

- a. Flashlight and spare batteries
- b. Matches
- c. Flares
- d. First Aid Kit.

Active Driving

186. "Active driving" is the second part of P.A.S.S. It involves an understanding of how balance, gravity, and weights of you and your passengers affect the handling of your vehicle. Making sure that your load is balanced and that you and your passengers remain seated is necessary to minimize the possibility of rolling or flipping the machine. This is true on both land and in water.

Basic Operating Manoeuvres

Active driving and basic manoeuvres are the foundation of your ATV drive. Without basic skills, it's impossible to move to the next level---active driving. These are your basic manoeuvres:

- a. Handling the Vehicle – Driving & Steering
- b. Braking/stopping.
- c. Parking.

Handling the Vehicle

187. Active driving involves using your steering and braking controls as well as understanding momentum and balance to maintain control. Your safety depends on using safe driving techniques. You are much more likely to have an accident when you first start driving your vehicle than after you have some experience.

188. Safe driving techniques cover:

a. Driving

- i. Once the engine is warm, your vehicle is ready to go.
- ii. Make sure all occupants put on their seat belts (unless entering water).
- iii. Release the parking/auxiliary brake.
- iv. Increase engine speed.
- v. Push both control levers forward.

b. Turns

- i. Ease off the throttle as you approach the turn to slow down.
- ii. Ease back gently on the control lever appropriate for the direction you are turning. (Pull the left control lever to turn left and the right control lever to turn right)
- iii. Maintain a steady engine speed. Turns will be smoother if you maintain a steady throttle pressure when you pull back on one of the control levers. Higher revs enable you to "power" through turns.
- iv. For sharper turns you will have to pull back on the control lever a little harder.
- v. For quicker turns you will have to pull back firmly on the control lever and add a little extra engine speed.
- vi. Gradually increase your speed as you come out of the turn and ease the control lever forward.
- vii. Turns from a standing start are possible using the following technique:
 1. Neutral Turn. Set engine speed and power to a level appropriate to the weight of the vehicle and ground friction. Gently pull back on the lever in the direction that you want to turn (the 'inside' lever) and push forward on the other 'outside' lever. If you balance the power correctly you can pivot on the spot.
 2. Normal Turn. Hold the inside lever in neutral and push forward the outside lever.

c. Driving Uphill. Manoeuvring on hills is challenging and difficult, even for experienced operators, so use extreme caution. A direct approach is favoured. Angling across the gradient of a hill makes the vehicle more vulnerable to sliding or rolling over. Follow this method for driving uphill.

- i. If you are unfamiliar with the terrain and cannot see your route clearly, dismount and recce on foot before committing
- ii. Approach the hill at a slow and cautious pace.
- iii. Keep your control levers pushed forward.
- iv. Maintain a steady pace.

1. If you lose speed, increase it slightly by increasing engine power.

d. **Driving Downhill.** Making a turn while going downhill can be dangerous.

- i. Control of hydrostatic vehicles during descent is comparatively straightforward since precise control of speed of wheels is provided by the hydrostatic system.
- ii. If engine power is lost during a descent the hydrostatic system will cause the vehicle to stop.
- iii. Beware of allowing your weight to bear forward onto the levers during steep or rocky descents as this may cause unintended control inputs
- iv. Do not apply brakes suddenly while going downhill, it could cause your vehicle to overturn.
- v. Approach the hill at a slow and cautious pace.
- vi. Set the throttle low and use engine / hydrostatic braking to keep your vehicle at a slow speed

e. **Traversing Hills.** Traversing Hills is an advanced skill; it can be tricky and unpredictable. So, whether your skills are advanced or not, try to avoid this kind of driving. If you're in a situation in which you absolutely have to traverse a hill, follow this method:

- i. Keep your speed low and consistent.
- ii. Steer as though you're driving into the hill.
- iii. If your vehicle feels like it's tipping, steer downhill. If that's not possible because of terrain or other conditions, or if it just doesn't work, stop and remove your passengers and then yourself from your vehicle. Exit your vehicle on the uphill side while maintaining the balance of the vehicle

f. **Crossing Obstacles.** Crossing obstacles is risky; avoid doing so if possible. Driving over logs, rocks, and ruts requires a cautious and direct approach. In certain situations (for instance a heavily rutted ditch) angling across works better. Experience will be your best teacher in these matters.

- i. Stop and evaluate the obstacle.
- ii. Move slowly straight ahead until your front tires make contact.
- iii. Increase engine revs as necessary, move slowly and cautiously onto the obstacle, pausing as necessary to assess progress.

g. **Operation in Water.** If the Agile vehicle model is amphibious (Proteus), remember that its effective water speed using wheels alone is about 6 kph (3.7 mph). With that in mind, don't try to run against a strong wind or fast current.

- ▲ **Remember- Always insert your drain plugs before entering water. You risk a chance of drowning if you don't.**

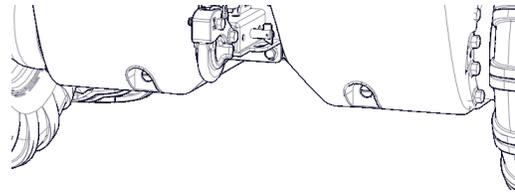


Figure 17. Rear Drains

h. Entering water

- i. When entering water, you should take as direct an approach as possible. If the entrance to the water is steep or rough, you could slide or rollover.
- ii. Proceed at a slow cautious pace.
- iii. Continue until you are in the water.

i. Driving in shallow water (Less than 10 cm/4 inches deep)

- i. When you're in shallow water your ATV won't start floating until the water is in excess of 30 cm (12 inches) deep. You won't be able to see hidden objects under the water so you should drive slowly and be ready to react to a rock or log that might be hiding under the surface.
- ii. Proceed at a slow cautious pace.
- iii. If you do make contact with an obstacle, back up and try to find a way around it.
- iv. If you must pass over the obstacle you should go forward until your front tires touch it.
- v. Then you should increase the power slightly until you are over it.

j. Driving in deep water (more than 30 cm/12 inches deep)

- i. Your ATV will start to float when the water gets above 30 cm (12 inches) deep. As soon as it starts to float you will notice whether or not your vehicle is properly balanced. If it is leaning to one side, then you or your passenger(s) should shift their weight slightly away from that side until the vehicle is floating level. If your vehicle is leaning forward or backward you and your passenger(s) should lean their upper bodies in the opposite direction of the lean. If your vehicle is still unbalanced after everyone has shifted their weight, then you should return to land and redistribute the load.
- ii. When you are in deep water there is always a chance that there is a hidden obstacle under the water and there is a chance that your tires will start to climb it and tip or capsize your vehicle.
- iii. Use this method for operating in deep water:

1. For maximum water speed squeeze the throttle or toggle engine speed halfway.

2. Pull one control lever back when turning and keep the motor revving at half throttle.
3. Lean toward the inside of the turn.
4. If you feel your vehicle start to make contact with an obstacle you should reduce forward speed and back up the vehicle, then try to find a way to avoid the obstacle.
5. If you must pass over the obstacle you should go forward until your front tires touch it.
6. Then you should increase the throttle pressure / drive slowly until you are over it.
7. If you feel your vehicle is going to tip over, you should back up and get clear of the obstacle.

k. **Driving Tips.** Here are a few situations that require special attention:

- i. **Reversing.** It's difficult to see things behind you. They often appear while you're looking the other way.
 1. Go slowly. It's hard to see behind you.
 2. Pull back both control levers.
 3. Remember that to stop you will have to push the control levers forward back toward the neutral position.
- ii. **Skidding or sliding.** If you lose control after hitting sand, ice, oil or water:
 1. Turn into the slide.
 2. Maintain a steady throttle setting.
 3. Resume your course as soon as your vehicle straightens out.
 4. If your ATV doesn't turn and skids straight ahead: Here's how to handle it:
 - a. Reduce your speed by pulling back on the steering levers or releasing the throttle slightly.
 - b. Once you regain traction, start to turn your vehicle.
 - c. Proceed on course.
- iii. **Parking on a hill.** You should avoid parking on a hill, but if you do:
 1. Apply and lock the parking/auxiliary brake.
 2. Find something to chock the rear tyres.
- iv. **Stalling on a hill.** It is unlikely that this will happen but if it does:
 1. Apply the parking/auxiliary brake.
 2. Re-start your engine and continue up or down the hill.

v. **Crossing roads.** Crossing roads on your ATV is a bad idea, so avoid it. If you can't:

1. Stop completely on the shoulder of the road.
2. Check both directions for traffic.
3. Crossing near a blind corner or intersection is dangerous; don't do it.
4. Drive straight across to the opposite shoulder.
5. Take into account that your ATV could stall while crossing; give yourself enough time to get off the road.
6. You have to assume that oncoming cars don't see you, and if they do, they won't be able to predict your actions.
7. It's illegal to cross public roads in some places. Know your local laws.

vi. **Operation with Tracks Fitted.** Your vehicle may be equipped with Tracks. These tracks will allow you to go through conditions that will stop an ATV with only tyres installed. You should avoid sharp (aggressive) turns so that you don't damage the body when the tracks shift as you turn. Follow this method:

- vii. When starting from a standstill apply power gently.
- viii. If you start to get stuck reduce power slightly so that you don't lose traction.
- ix. If you do get stuck, back away and try to find another way around.

189. **Braking/Stopping:**

- a. The vehicle has two braking systems. One is initiated by the control levers and the other is controlled by the Parking/Auxiliary Brakes built into the hydraulic hub motors.
- b. Coming to a stop should be a slow, steady process. Always allow plenty of room and time to stop smoothly. Sometimes quick stops are inevitable, so always be prepared. Whether you're stopping slowly or stopping quickly, do this:
 - c. In Forward pull back gently and evenly on both the right- and left-hand control levers to apply both left and right braking.
 - d. In Reverse push forward gently and evenly on both the right- and left-hand control levers to apply both the left and right braking.

190. **Parking:**

- a. Try to park only on level surfaces.
- b. Stop the engine, using the ignition switch.
- c. Apply and lock the parking/auxiliary brake.

The Importance of Sound Judgment

191. The first "S" in "P.A.S.S." stands for "Sound Judgment". Sound judgment is what prevents you from speeding along a trail in the middle of the night and slamming into a tree.

192. Do you consider yourself to be pretty conservative or, are you a heavy risk-taker? Before continuing with this section on sound judgment, check your Risk Factor by doing this short survey. For each question add 0=never, 1=sometimes, 2=often

- a. Do you drive over 60 mph on the highway?
- b. Are you more daring around your friends than you are when alone?
- c. Do you drive your car when the gas gauge is on empty?
- d. Do you feel that no matter what you do, you won't get hurt?
- e. Do you drink or use drugs before you drive your car?
- f. Do you drive your car even if it has a major problem with the brakes, tires, or engine?
- g. Do you thrive on the adrenaline rush you get from speeding and dangerous situations?
- h. Do you hurt yourself because you do things that are out of your ability range?
- i. Do you tailgate other drivers when you think they're driving too slowly?
- j. Do you disregard weather reports before you do outside activities, like swimming, camping, fishing, or boating?

193. Add the totals from these 10 questions. YOUR RISK FACTOR IS:

- a. 0-5: You're pretty conservative. Chances are good that the consistently safe choices you make will help you avoid hurting yourself and the people around you.
- b. 6-10: You're straddling the fence. Depending on your mood or who you're with, the choices you make may help you or hurt you.
- c. 11-20: You're taking your chances. Time to reconsider a lot of the judgments you make...you leave too much of your personal safety up to luck, whim, and the draw of the cards. You're destined to put yourself in dangerous situations and potentially hurt yourself and the people around you.

194. **The Environment.** The environment controls you, not the other way around. And there's nothing you can do about it except respect it.

195. **Weather.** You need to consider the weather - think about the last time you ignored that thunderhead, gusting wind or black sky and "did it anyway". If you can't

remember the last time, keep it that way. If the last time was yesterday, you're a menace to yourself.

196. **Terrain.** Terrain is inherently unpredictable, it will change with weather, light and use and it will often present challenges that are new or unexpected. Treat the terrain you must cross with respect. Even if you think you know it well, take time to understand it and to anticipate problems that might arise, do not assume that conditions will not change. Plan for and expect the worst.

197. **Night Driving.** Don't do it if you can avoid it. It's a lot more difficult to see what's ahead.

198. **Paved Surfaces.** Avoid. The vehicle isn't designed for pavement. Its handling becomes more difficult on paved surfaces and your tires won't last very long.

199. **Trail Driving.** Use sound judgment when trail driving; that means driving on a trail that fits your ability level.

- a. Make yourself visible by using headlights and taillights and pull completely off the trail if you need to stop.
- b. It also helps to know which trails you can drive and who else might be on those same trails.

200. **Those around You.** People do all kinds of things that you can't predict or control.

201. **Passengers.** Keep in mind that your passengers may behave unpredictably, especially if they are unfamiliar with the challenges of extreme terrain. Brief them well and make sure they remain under control or don't take them along.

202. **Driving companions.** Keep your distance - dust and obstructions make rapid braking a constant issue.

203. **Other Vehicles.** Do not assume that you have the place to yourself, watch out for other vehicles. Respect the presence of cars if you're crossing roads or driving in public areas and make yourself be seen. If you can't see other vehicles coming, that means you're invisible, too.

204. **Hikers.** People can and do get to unexpected places. Keep your eyes open.

205. **Animals and Nature.** Tread lightly and leave it as you found it.

206. **Equipment.** All mechanical equipment can fail. If you are going to a remote place, take appropriate tools and emergency equipment - best of all, travel with other ATVs or support vehicles if you can.

207. **Vehicle Maintenance.** For reliable performance you must properly maintain your vehicle. The Maintenance section of this Operator's Manual tells you about taking care of your ATV. If there's something you don't know, give your dealer or AVT a call.

208. **Passenger and Cargo Limitations.** Your vehicle is inherently stable, but the way you load it can make it less so, with implications for handling and stability. There are two things that are important:

- a. Weight

b. Balance

To determine the maximum weight you can carry, you will have to add the weights of the driver, passenger(s), accessories and cargo. The weights of accessories are shown in the specifications section of this Operator's Manual.

209. Bear in mind that it's possible to be within the weight limits on land but overloaded for water use.

210. Driver and Passenger location can throw off the weight and balance of the machine if it's not balanced properly. For instance, when you are in water by yourself you should stay seated in the middle of the seat, so your vehicle doesn't lean to one side. When you are taking others with you in the water make sure that you don't have all the weight off to one side because if you do your vehicle will lean and might even tip. This is true on land as well.

211. The vehicle is equipped with a trailer hitch but there are limits to the amount of weight you can put on it.

212. Cargo has such an enormous effect on handling that you need to pay extra attention to your speed. Even on very flat surfaces you should keep it under 10 mph if you've got a trailer attached. Avoid uneven terrain. Also, consider that your braking distance is going to increase, the more weight you are pulling.

Personal Choices

213. **Alcohol and Drug Consumption.** Alcohol is related to 30% of all hospital admissions due to ATV accidents in the U.S. This isn't an issue of morality. It's extremely dangerous to drink alcoholic beverages and drive...it's also very foolish.

214. Be aware of prescription and over-the-counter medications that may cause drowsiness or affect your reactions. Don't use alcohol or drugs before or during your ATV drive.

215. **Your Physical Condition.** ATV operation can be physically and mentally demanding, avoid doing so when fatigued, and if you must do so exercise extreme care in manoeuvring and route selection.

216. **Reckless Driving.** Accidents arising from reckless ATV use result in hospital-admissible injuries in 25% of cases. In remote, inaccessible or difficult locations the risks of fatal consequences are much greater.

217. **Laws and Regulations.** Ignorance of the law is no defence. Check out your local, state, or provincial ATV laws before driving. The quickest way to have access denied is by driving over the regulations.

218. **Group Behaviour.** Push yourself to extremes only in well-controlled situations. Avoid boy-racers.

219. **Scan – Predict – Identify – Decide – Execute -- Repeat [SPIDER].** By themselves, none of these safe behaviours and sound judgments will go very far. But when you put them all together...when you're paying attention to how you feel, you're monitoring the

movements of your ATV, and you're constantly evaluating your environment, then you're practicing SPIDER. SPIDER is an acronym that stands for:

S - SCAN/SEARCH
 P - PREDICT WHAT WILL HAPPEN
 I - IDENTIFY HAZARDS
 D - DECIDE WHAT TO DO
 E - EXECUTE THE DECISION
 R - REPEAT FROM THE TOP

Supervision

220. **Overview.** You're responsible for supervising those who drive your ATV. Your wisdom is valuable. It'll bring them all back safely—your friends, your family, your colleagues, and your ATV. It's crucial that you consider yourself as the 'vehicle commander', responsible for others that may use or travel in your vehicle. Whether you accept personal responsibility or not you will generally be responsible under law.

221. **Taking Responsibility.** You're to the last letter in "P.A.S.S."... "Supervision." You've just gone through the manual. And you've seen what's involved. That puts you in a good position to be confident about what you know. So now it's time to use your knowledge and supervise others who drive your ATV.

222. **Inexperienced/Untrained Drivers.** Don't let people drive your ATV who don't know what they're doing.

223. **Experienced/Trained Drivers.** If anyone is going to borrow your ATV, you are responsible for their supervision. Before they drive, make sure they read the operator's manual. You are responsible for ensuring that they have a sufficient level of training to operate safely.

224. ATVs are all a little different, from the handling, to the stability, to the controls. So regardless of how much experience other drivers may have with ATVs, they don't necessarily have experience with *your* ATV. Allow experienced drivers to become familiar with your ATV—show them the basics before they take off.

225. And remember that regardless of experience, you should never let anyone under the age of 16 operate your ATV. A potential hazard that could result in serious injury or death.

C. OPERATION - MAINTENANCE

226. This ATV Operator's Manual should be considered a permanent part of the vehicle and must remain with it upon resale. If the vehicle changes ownership more than once, contact our Service Department for proper registration information.

227. You have chosen a quality product designed and manufactured to give dependable service. Be sure, as the owner/operator of this ATV, to become thoroughly familiar with its basic operation, maintenance, and storage procedures. Read and understand the entire Operator's Manual before operating the vehicle to ensure safe and proper use of your new ATV. Always operate the vehicle within your level of skill and current terrain conditions.

228. This part of the manual covers operator-related maintenance, operating instructions, and storage instructions. If repair or service is required, contact a dealer if there is one in your area or contact AVT to find out who to take it to.

229. At the time of publication, all information, photographs, and illustrations were technically correct. Because AVT constantly refines and improves its products, no retroactive obligation is incurred.

Parts and Accessories

230. When in need of replacement parts or accessories for the vehicle, be sure to use only GENUINE Agile Vehicle Technologies PARTS AND ACCESSORIES. Only genuine parts and accessories are engineered to meet the standards and requirements of the vehicle. For a complete list of accessories, refer to the current Agile Vehicle Technologies website or brochure.

General Information

Vehicle Reception Process

231. Following receipt of your vehicle it will be necessary to undertake preparation and checks before first use, depending on the mode of transport used.

Air Freight

232. Vehicles shipped by air are subject to rigorous safety constraints. These include:

- a. Fully degassed fuel tanks (new, unused tanks will usually be fitted following factory checks and before crating).
- b. Battery disconnected or removed (in some cases).
- c. Engine Oil drained (in some cases).
- d. Hydraulic systems drained (in some cases).

Items a and b will apply in all cases, items c and d may occur in some cases. We will endeavour to notify you if items c and d apply, however we may not always be aware of actions undertaken by agents on-route, so it is essential that all system levels are checked upon receipt, prior to usage.

233. **Fuel System.** Whilst some fuel may remain in fuel lines and engine systems, air locks will have been introduced, so before the engine can be started the fuel system must be re-primed. This involves clearing through the fuel lines of residual air from fuel tank to engine.

234. **Operation – Remove from Crate.** The crate is designed to be readily disassembled. Carefully remove top and side panels and remove any equipment stowed in the body of the machine. Inflate tires to correct operating pressure and fit as necessary, remove the vehicle from the crate base onto level hard-standing.

All Freight Types

235. **Operation – Apply handbrake and ensure transmission is set to neutral.** (Hydrostatic model – levers set to middle position, other models – drive disengaged).

236. **Operation – Visual Inspection.** Conduct a visual inspection of the vehicle, looking for items that may have been damaged in transit. Remove access panels as necessary to check chain runs and tension, hydraulic hoses and engine accessories. Examine the outer body for signs of impact or damage.

237. **Operation – Reconnect Battery.** Reconnect the battery leads, which will be taped and secured adjacent

to the battery or fit a replacement battery as necessary. Take care in observing polarity.

238. **Operation – Check Hydraulic and Water levels.** Conduct a complete hydraulic and water levels check as outlined in the user manual for your machine. Top-up or replace fluids as necessary using only the specified grades and types.

239. **Operation – Fill the fuel tank and prime the system.**

- a. Fill the fuel tank with the appropriate grade of fuel for the engine type (see engine user handbook for additional guidance).
- b. Gasoline engines (Carburettor or Electronic Fuel Injection (EFI)) and Diesel engine supplied with Proteus are designed to self-prime.
 - i. Cycle the ignition key to the 'on' position 3 or 4 times, each for 3 seconds. The electronic fuel pump will run and pump fuel into the system, this should be sufficient to prime the fuel system.
 - ii. Turn the ignition key to the 'Start' position; the starter motor will engage. If the engine does not start within 4 seconds turn off the ignition, wait for 2 minutes and repeat.
 - iii. If the engine does not start after 5 attempts leave for 15 minutes and then try again. If it still fails to start further diagnostic will be necessary (see engine manual).
 - iv. Allow the engine to run until it reaches normal operating temperature.

240. **Operation – Test Hydraulics (hydrostatic variants).** Ensure the vehicle is in a clear area. Release handbrake and lightly operate tiller levers until control response is observed from right and left tiller.

241. **Operation – First Use.** At this stage the vehicle is ready to use. Take the time to familiarize yourself with the vehicle and its controls. The vehicle does not *need* to be run-in, though moderate handling and diligent user checks/adjustments during its early life will allow you to get the very best from it.

Transporting Your Vehicle

242. When transporting the vehicle, we recommend that it should be in its normal operating position (on all six or eight wheels)

- a. Apply and lock the parking/auxiliary brake.
- b. Move the fuel shutoff valve (if fitted) to the OFF position
- c. Secure your vehicle with hold-down straps.
- d. Use a minimum of 4 hold-down straps.

⚠ **Suitable hold-down straps should be acquired. Ordinary rope is not recommended because it is difficult to pre-tension and can stretch under load.**

📌 **When transporting your vehicle, make sure that the Parking/Auxiliary Brake is applied and locked (All variants).**

Run-In Procedure

243. New vehicles and overhauled engines benefit from a “run-in” period. The first month is most critical to the life of your vehicle. Proper operation during this run-in period will help assure maximum life and performance from the vehicle.

244. During the first 10 hours of operation always use less than ½ throttle. Varying the engine speed during this period allows the components to “load” (aiding the mating process) and then “unload” (allowing components to cool). Although it is essential to place some stress on the engine components during run-in, care should be taken not to overload the engine too often. Do not pull a trailer during the run-in period.

245. When the engine starts, allow it to warm up properly. Idle the engine for several minutes until the engine has reached normal operating temperature. Do not idle the engine for excessively long periods of time.

246. During the run-in period, a maximum of ½ throttle is recommended; however, brief full-throttle accelerations and variations in driving speeds contribute to good engine run-in.

247. The hydraulic transmission requires no special run in procedures.

▲ Do not attempt sudden stops with the parking auxiliary brake or put yourself into a situation where a sudden stop will be required.

248. After 50 hours the engine oil and oil filter should be changed. Check all prescribed adjustments and tightness of all fasteners. At the discretion and expense of the owner/operator, the vehicle may be taken to a dealer for this initial service.

Air Filter

249. The air filter must be kept clean to provide good engine power and fuel consumption. If your vehicle is used under normal conditions, service the air filter at the intervals specified in the engine operator’s manual. If dusty, wet, or muddy conditions are encountered, inspect and either clean or replace the air filter more frequently.

General Maintenance

- ❶ Proper maintenance of your vehicle’s important for optimum performance. Follow the Maintenance Schedule, Periodic Maintenance Checklist, and all ensuing Maintenance Instructions/Information.
- ❶ A separate Engine Operator’s Manual is supplied with each Agile vehicle. Consult the engine operator’s manual for maintenance schedules and information.
- ▲ If, at any time abnormal noises, vibrations, or improper functioning of any component are detected, DO NOT OPERATE THE VEHICLE. Take your vehicle to an authorized workshop or dealer for inspection and adjustment or repair.

250. If the owner/operator does not feel qualified to perform any of these maintenance procedures or checks, return the vehicle to an authorized dealer for professional service. If you do not have an authorized

dealer in your area contact your regional AVT representative directly.

- ❶ The following instructions and information refer to specific items in the maintenance and care of your Agile vehicle.

Personal Protective Equipment

251. Before undertaking any work on the vehicle, operators should ensure that necessary Personal Protective Equipment is worn - this may include, but will not be limited to:

- a. Overalls
- b. Gloves, heat and oil resistant
- c. Goggles or shields for protection of eyes and face
- d. Non slip footwear with toe protection
- e. Ear defenders



- ▲ Ejected pressurized hydrostatic fluid may penetrate the skin and cause serious injuries

Maintenance Procedures

252. The maintenance Schedule is published at the beginning of this section. Observe correct and timely maintenance and your vehicle will serve you well.

Jacking and Lifting the Vehicle

253. The vehicle has multiple hard points, however some areas of the lower body are more susceptible to damage than others, so care is necessary in selecting jacking points that are braced against structure.

254. The outer chassis rails run along the edge of each side of the base of the tub. These are the preferred jacking points for routine use.

255. There are various alternative hard points that may be used as necessary, notably the hitch receiver point(s).

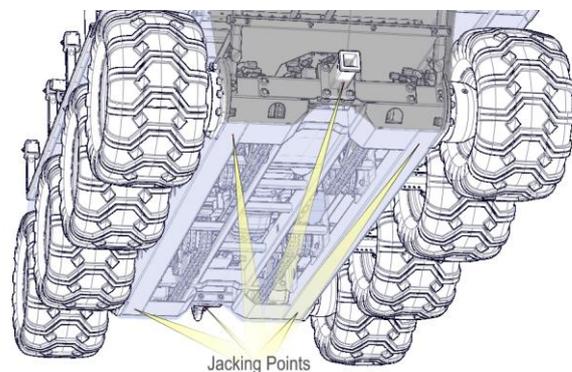


Figure 19. Jacking Points

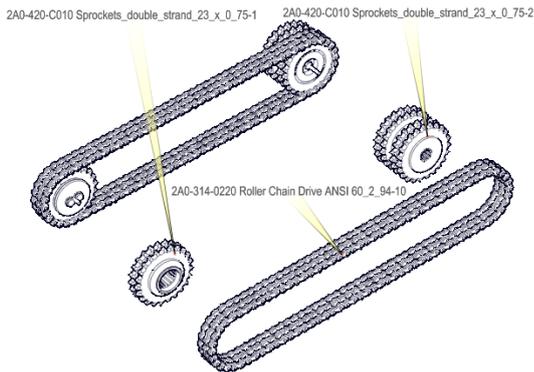
256. Before jacking the vehicle ensure that wooden or similar smooth packing material is placed between the jack and the body to prevent damage to the HDPE skin.
 257. Support the vehicle on axle stands or blocks before undertaking any work on the vehicle.

Chain Life

258. A chain will typically elongate by 2-3% of its original length over its life. As much as 0.5% of this will often happen in the first 15 hours. The chain is not actually stretching, but the pins and bearing surfaces are 'bedding in' and then beginning to wear. The rate of elongation will depend on lubrication, cleanliness and loading, but chain tension is also relevant:

- a. Excessive chain tension will greatly increase loading on chain and running gear, causing more rapid deterioration of each.
- b. Insufficient chain tension will allow snatch take-up and skipping, damaging chain and sprockets.

259. A badly used chain may have a life of only a few hundred hours, a well-maintained chain will last for 1000's of hours. As the chain elongates the pitch between links increases, causing increased wear on the sprockets and eventually skipping.



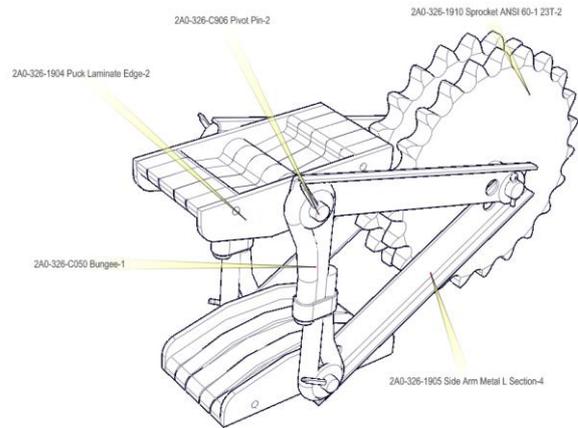
260. Our chain tensioning system takes the guess work out of tensioning and minimizes the need for routine user intervention to adjust the chain. It is also effective for a much greater proportion of the chain's life than many alternatives. In some cases, shortcoming in chain tensioner take-up will make it necessary to discard chains well before they have reached the end of their useful life.

Chain Adjustment

261. Our patented chain adjustment system is designed to take the uncertainty and daily inspection overhead out of chain maintenance. They are also designed to operate efficiently over a greater proportion of chain life, without user intervention.

262. However, their correct function depends upon correct placement and sufficient lubrication. If the chain tensioning system become damaged or displaced, then it or other parts of the system may be damaged and chain tensioning will no longer work effectively.

263. Each chain run has one statically tethered tensioning system fitted. The plastic stator sprocket will be placed adjacent to a drive motor crossmember, with the elasticated puck pair seated towards the middle of the chain run.



264. Check that the stator sprockets and pucks are correctly seated and that there is no excessive wear to puck faces or sprocket teeth.

265. Check that the bungee elastic / shock cord joining the pucks is still under tension.

- a. If the bungee has lost tension but there remains adequate separation between inner faces of the tensioned chain, then replace the bungee elastic. If necessary, use a shorter length bungee loop.
- b. If the chains are touching or close to touching you may need to:
 - i. Adjust the configuration of the tensioner system to take up more slack
 - ii. Replace the chain – if the chain has reached the end of its life.
- c. The nylon pucks on the chain tensioning system should be replaced if they show signs of excessive wear.

Chain Drive System

266. In addition to adjusting and lubricating the front and rear chains at the intervals indicated above, the chains and sprockets should be checked for any signs of wear or damage.

General Lubrication

Chains

267. Keep chains well lubricated using any good quality motorcycle chain lubricant.

Axle Bearings

268. Grease nipples are provided for each axle bearing; grease the outer bearings every 25 hours and the inner bearings every 100 hours using marine grease.

Engine Oil and Filter

Engine oil should be checked at regular intervals and topped up as required. Engine oil and filter changes should be conducted as per the separate engine

manufacturer's Operator's Manual provided with the vehicle.

Hydraulic Fluids

Hydraulic fluid levels should be maintained at the required level at all times and hydraulic fluid should be changed according to the maintenance schedule or following any incident or activity that might introduce gross contamination (including water).

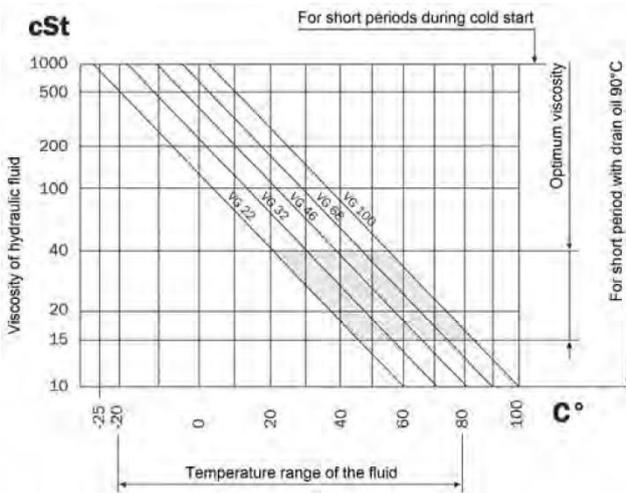
Hydraulic Fluid

269. The hydraulic pump requires the use of hydraulic mineral oil containing wear-proof and foam-proof additives with the following viscosity classes - always use these grades - it is false economy to use alternatives and will invalidate your warranty:

- a. Medium duty: ISO VG46
- b. Heavy duty: ISO VG68

⚠ **Automatic Transmission Fluids should not be used.**

270. Maximum service life and performance will be obtained in optimal viscosity ranges:



271. Optimum operating viscosity is 16/36cSt (mm²/s)
- a. Minimum 10 cSt for short periods with temp < 90 deg C.
 - b. Maximum 1000 cSt for short periods (cold start).

Hydraulic Fluid Cleanliness

272. The approved filter element fitted to 2A1-350-3060 Combined Filter is a 10 micron absolute filter with beta (20)>75. The unit has a bypass and can be fitted with an optional clogging indicator. This filter element cannot be cleaned and must be discarded.

273. The suction strainer filter (2A1-350-3040) is a mesh element filter, which can be cleaned and reinstalled

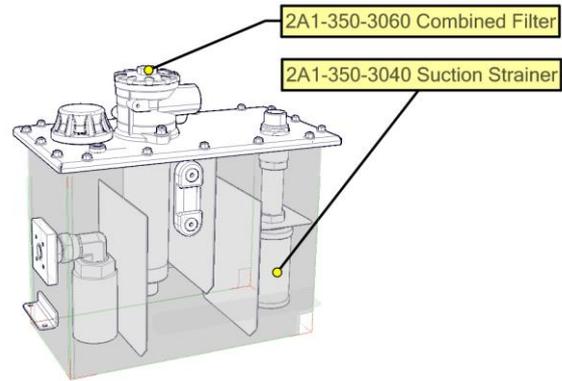


Figure 20. Hydraulic Filters

274. The maximum acceptable contamination level is:
- a. 7 according to NAS 1683.
 - b. 4 according to SAE, ASTM, AIA.
 - c. 18/16/13 according to ISO 4406.

Pump Maintenance

275. Replace hydraulic fluid and filters according to the schedule below, or after repairing/overhauling components of the system.

276. Operation of the pump at temperatures over 80 deg C and 35 MPa will rapidly deteriorate the fluid, therefore replace it sooner.

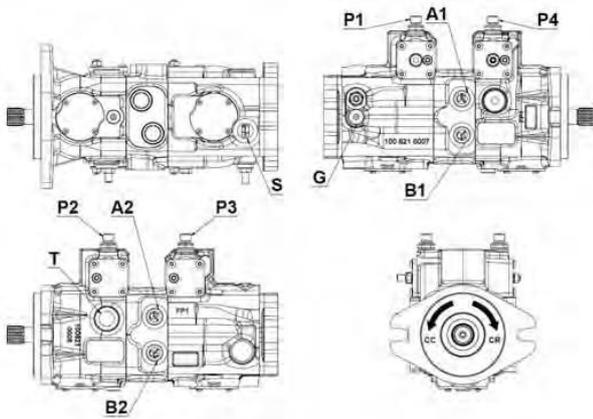
277. Filter and Fluid Changes. The combined filter should be changed after 50 hrs of operation and every 500 hrs thereafter. The suction strainer filter is a mesh filter, it should be changed every 1000 hrs and cleaned and inspected at 500hr intervals. Hydraulic fluid should be changed after 500hrs and then 2000hrs or 2yrs whichever occurs sooner.

	Combined Filter 10µm	Suction Strainer	Fluid
After 50 Hrs	1 st change		~
After 500 Hrs	Change	Clean & Inspect	1 st change
After 1000 Hrs	Change	Change	
After 1500 Hrs	Change	Clean & Inspect	
2000 Hrs / 2 yrs	Change	Change	Change



Dispose of used oils and materials responsibly

Hydraulic Pump - Ports



PORTS		
A1-B1	Main pressure ports 1	1/2" BSPP
A2-B2	Main pressure ports 2	1/2" BSPP
T	Drain	1/2" BSPP
S	Suction	1/2" BSPP
G	Boost system pressure port	1/4" BSPP
P1-P2	Servocontrol ports (male) pump 1	1/4" BSPP
P3-P4	Servocontrol ports (male) pump 2	1/4" BSPP

Vehicle Recovery Notes

278. If the engine has failed or the hydraulic system has been compromised so that charge pressure is lost, then the parking brakes will be automatically applied, and the wheels will be locked by the built-in brake pack. The wheels will also be hydrostatically locked by the fluid in the high-pressure system.

279. In order to allow the wheels to rotate you must release the parking brake and remove the hydrostatic lock.

SB Screw Bypass [Remove Hydrostatic Lock to Motors]

280. The hydraulic pump is fitted with two bypass screws that can be used to connect ports A and B, bypassing the motor(s) on that side (ie one for each side). This can be useful in fault finding or if the vehicle needs to be moved without turning the pump or engine. The bypass is completely open after 4 counter-clockwise rotations of the screw.

281. Activating a bypass valve will remove the hydrostatic lock on that side, but will not release the brakes, these must also be released to move the vehicle (see next section).

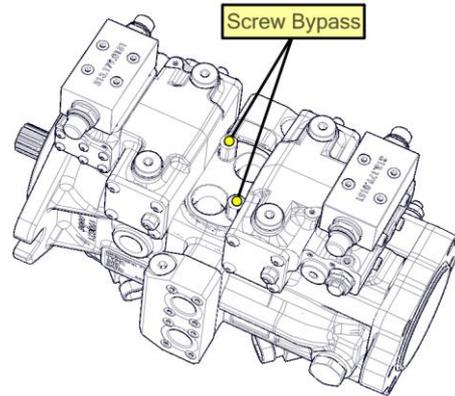


Figure 21. Screw Bypass [SB]

Brake Release

282. In the event of charge pressure loss, which may occur for a number of reasons, parking brakes are applied automatically, immobilizing the vehicle.

283. The simplest failure mode is engine failure, in this case the hydraulic system itself is likely to be intact, meaning that brakes can be released by re-pressurizing the charge pressure circuit using a hand pump located on top of the front manifold.

284. If the engine runs and the hydraulic system appears to be intact then the reason for pressure loss will be more difficult to assess and correct. However, if charge pressure can be generated and directed to appropriate ports then it may still be possible to release the brakes.

285. There are two options to achieve/restore charge pressure to the brake circuit:

- a. Brake System Hand Pump (if fitted). If the charge circuit is intact, then the hand pump mounted on top of the front manifold provides a manual option to pressurize the charge circuit, thus releasing the brakes on all motors. Before pumping, screw in the Manual Override thumb screw fully (clockwise). It will be necessary to periodically top up the pumped pressure to account for any leakage within the system.

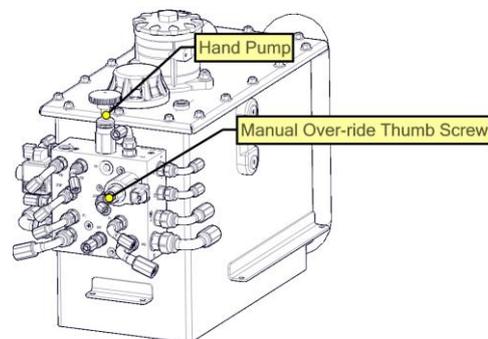


Figure 22. Brake release pump on front manifold

b. If the hydraulic system itself is damaged (gross leakage or fluid loss) then applying charge pressure is likely to be more difficult, depending on the nature of the failure and whether it can be isolated. If charge pressure can be achieved either by re-routing, blanking or some other source then if pressure can be applied to Port Y (or the Alt brake release port, both of which directly access the brake release piston gallery) then brakes will be released. If the charge system has been compromised, then the brake can be released by pressurizing port Y (9/16-18 UNF) to 20 Bar. Alternatively, the brake can be released via the Alt Brake Port, noting that if the charge system has been compromised, it will be necessary to disconnect and plug the Y port.

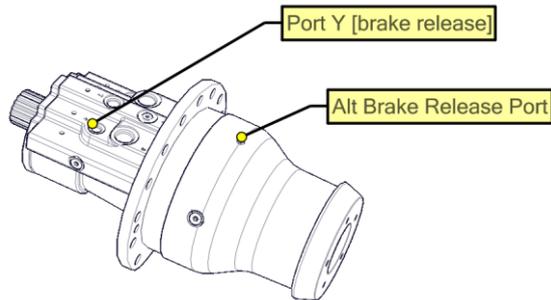


Figure 23. Gen II Motor Brake Release

Fall-Back Option

286. If it does not prove possible to release brakes on hydraulic motors, then a simple fallback option is to remove the wheels from each motor and disconnect internal chains. This will allow the vehicle to be towed on the idler wheel stations using a straight bar.

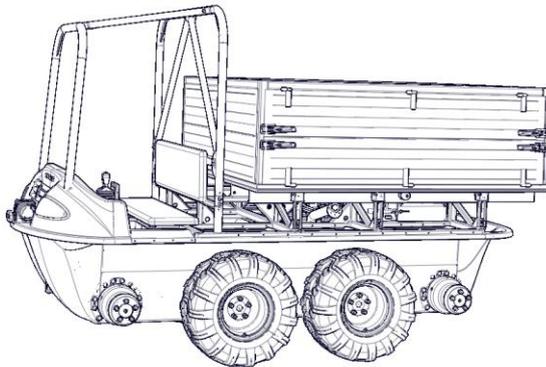


Figure 24. 4-Motor variant prepared for towing with motors braked

287. On the two-motor (rear) variant it is only necessary to remove the front wheels and chains.

288. Tyre Pressures. If possible, increase the tyre pressures on the remaining tyres to at least 10 psi.

Engine

289. Engine inspections, service and maintenance should be undertaken in accordance with the engine manufacturers Operator's Manual.

Fuel Pipes and Clamp Bands

290. Fuel pipes and clamp bands should be checked in accordance with the engine manufacturers Operator's Manual.

Water Separator (if fitted)

291. The engine water separator should be drained and cleaned in accordance with the engine manufacturers Operator's Manual.

Engine Oil

292. Engine oil should be changed in accordance with the engine manufacturers Operator's Manual. (SAE 15W40)

Air Filter

293. The air filter should be cleaned and replaced in accordance with the engine manufacturer's guidance.

Oil Filter Cartridge

294. The engine oil filter cartridge should be replaced in accordance with the engine manufacturer's guidance.

Fuel Filter

295. The engine fuel filter should be cleaned in accordance with the engine manufacturers Operator's Manual.

Fan Belt

296. The engine fan belt tightness should be checked and replaced in accordance with the engine manufacturers Operator's Manual.

Radiator Hoses and Clamp Bands

297. The Engine radiator hoses and clamp bands should be checked in accordance with the engine manufacturers Operator's Manual.

Tyres

298. The vehicle is equipped with low-pressure tubeless tyres of the size and type listed below.

Diameter x Width x Rim size (inches):
 26 x 12 - 12 or
 26 x 14 - 12.

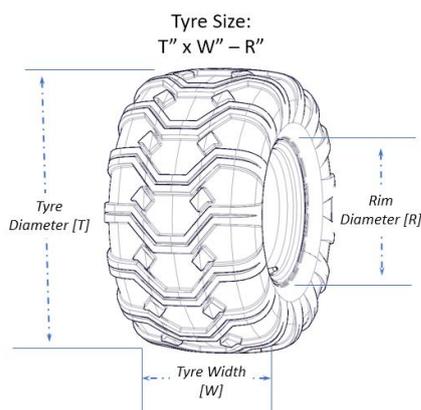


Figure 25. Tyre Dimensions

299. Different sizes of tyre and rim may:

- a. Reduce clearances, with the possibility of damage to tyre and body.
- b. Cause additional loads on axles or motors, beyond design limits.
- c. Prevent the use of tracks.

Which may in turn damage your vehicle or invalidate warranty. If necessary seek technical advice.

300. The vehicle uses low-pressure tubeless tyres. Air is sealed by the contact surfaces of the inner wheel rim and the tyre bead. If either the inner wheel rim or tyre bead is damaged, air may leak. Be extremely careful not to damage these areas when replacing tyres.

301. It is very important to use the proper tools when repairing or replacing tyres to prevent damage to the tyre bead or wheel rims. If proper tools and related items are not available, have this maintenance performed by an authorized dealer.

Tyre Inflation

302. Use a low-pressure gauge to measure the air pressure in the tyres. Check the air pressure in all tyres before each use of the vehicle.

303. Tyre pressure for Proteus variants should be in the range 3 – 20 psi depending on intended loading and ground conditions.

Tyre Pressures

304. The tyres are designed to work over a wide pressure range, so that they can be optimised to ground and load conditions:

- a. In general when the vehicle is lightly loaded it will be appropriate to use lower pressures in the range 5-10 psi:
 - i. If travelling over very soft terrain, or terrain that requires best tyre grip for traction use pressures in the lower part of this range: 5-8 psi.
 - ii. If travelling over firm ground or tracks, or operating over distances, then a slightly higher pressure is justified to reduce ground friction and tyre wear, in this case 7-10 psi is appropriate.

b. When the vehicle is heavily loaded, is required to pull a heavy load or it will be necessary to apply large torques (eg. loaded steep climbs) then inflate the tyres to a greater extent to carry the load. Pressures in the range of 10-20 psi are acceptable:

- i. When the vehicle is lightly loaded (up to 1T) then pressures in the range 10-15 psi are sufficient.
- ii. When heavily loaded it may be desirable to increase tyre pressure to 18psi.

c. Excessively high tyre pressures will generally give a poor ride and will subject vehicle and passengers to an unnecessarily rough ride.

d. If pressures are very low then there is an increased chance of bead separation through side impact when skid steering, leading to deflation of tyres.

305.

Tubeless Tyre Repair

306. In the event of puncture, the tyre may be repaired using a plug-type patch. If the damage is from a cut or if the puncture cannot be repaired using a plug, the tyre must be replaced. When operating your vehicle in areas where transportation or service facilities are not readily available, it is strongly recommended to carry a plug-type repair kit and a tyre pump.

Wheel Removal and Replacement

307. As follows:

- a. Park your vehicle on level ground and apply and lock the parking/auxiliary brake.
- b. Loosen the lug nuts on the wheel to be removed.
- c. Elevate your vehicle by placing a jack under the lower body.
- d. Use a piece of wood or similar object to prevent the jack from scratching the lower body.
- e. Remove the lug nuts/bolts.
- f. Remove the wheel.
- g. Install the wheel and install the lug nuts.
- h. Tighten the lug nuts in a crisscross pattern to 54 Nm (40 ft-lb).
- i. Remove the jack.

Wind-Up

308. AVT tyres are manufactured to high tolerances, nevertheless some degree of variation in tyre diameter is to be expected as tyres wear, as pressures vary and as part of the normal manufacturing process.

309. Differences in tyre diameter can cause chain wind-up in wheels that are moving over hard ground or are constrained by tracks - the effect is to generate very high tensile forces on one side of the chain run, resulting in more difficult steering, greater wear on chains and sprockets, chain breakage and possible damage to transmission components.

310. Wind up can be avoided by controlling tire pressures or careful selection and placement of tyres.

Wheel Geometry – Kick-up

311. All Agile vehicles feature ‘kick up’ in their wheel geometry. The wheels at stations 2 & 3 are set 7mm (1/4”) lower than the wheels at stations 1 and 4.

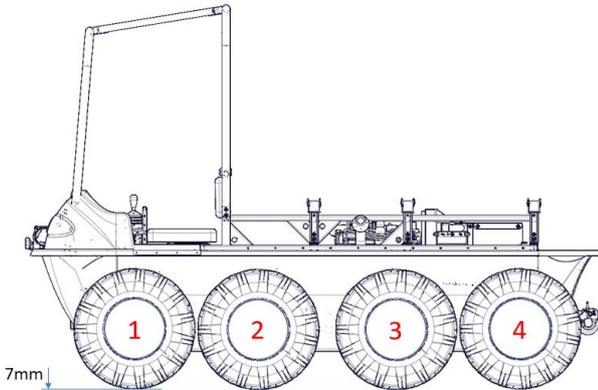


Figure 26. Kick-up

312. Kick-up is intended to place the weight of a properly balanced vehicle more firmly on the centre two axles than the front and rear. This improves steering dynamics by reducing the sideways drag frictional forces exerted by the front and rear tyres during turning. It also reduces wear and tear on the front and rear tyres.

313. Kick-up has other benefits, notably it can be beneficial in helping to reduce wind-up caused by difference in tyre sizes (with no tracks fitted).

Tyre Placement

314. Correct placement of tyres will substantially reduce the risk of wind up and associated damage and deterioration. Follow this approach:

- a. Inflate all tyres to a common pressure. The selected pressure matters not, though choose a figure in the range that suits intended usage of the vehicle.
- b. Measure the circumference of each tyre around the centre of the tread pattern and record it [tip – write it on the tyre wall].
- c. Now mark the tyre A to H with A being the largest and H the smallest.

315. Optimal placement of tyres will depend on intended wheel and track configuration as follows:

	Part	Starboard	Rationale
Wheel Station	1 2 3 4	1 2 3 4	
Wheels Only	H F B D	G E A C	Matched larger pairs on Rear, matched smaller pairs on front
Half Tracks	G H D C	F E A B	More closely matched pairs, larger on rear
Half Tracks Cogged	G H D C	F E A B	Remove Chains
Full Band Track	H B D F	G A C E	Matched smaller front and rear, larger on 2 & 3
Full Band Track Cogged	H B D G	F A C E	More closely matched front and rear

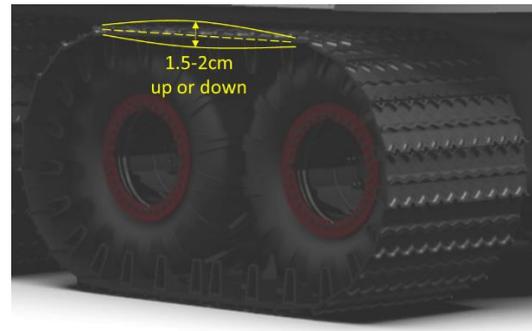
Figure 27. Tyre Placement Table

Track Installation

316. **Operation – How to Install Tracks.**

- a. **Assembly.** The tracks lengths are designed to suit the wheel size chosen and are normally supplied with track guides already fitted. Tracks may be supplied in half-track lengths (4 per vehicle) or full-loop lengths (2 per vehicle).

- b. **Fitting.** Lay the unconnected tracks in front of the vehicle.
 - i. Drive the vehicle forward onto the open tracks until the rear wheel is 1m past the end of either the 2nd or 4th wheel, depending on track type..
 - ii. Lift the rear of the track end around the rearmost wheel and adjust so that the end rests in the gap at the mid point of the track.
 - iii. Feed the front part of the track backwards over the wheels until it meets the rear part of the track.
 - iv. Let the air out of the tires at the front and back of the track section.
 - v. Mate the stitching brackets and insert the wire or metal pin, making sure the lacing lines up. Ensure track pin is fully inserted (a protruding end represents a safety risk to persons operating in the vicinity of the machine).
 - vi. Secure both ends of the track pin.
 - vii. Inflate the four tyres to working pressure, taking care not to over-tighten the track as tyre diameter expands
 - viii. When a half track is correctly fitted it should be possible to move the track upwards or downwards from the rest position by 1-5 to 2cm



- ix. For a full length track measure track deflection between the 2nd and 3rd wheels.

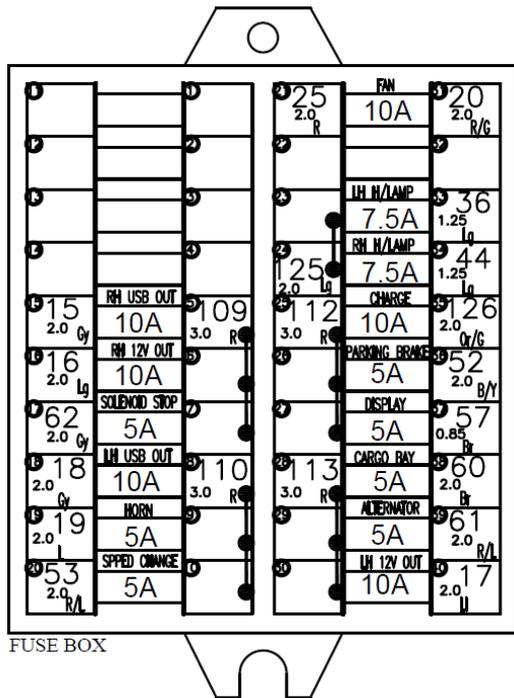
Electrical System

317. **Lights.** All lights on the vehicle use LED technologies which have very long operating lives in excess of 20,000 hours thereby providing long maintenance free operation.

318. If a light fails to operate, first check to see if a fuse has blown and if a fuse has blown check to see that there are no damaged wires causing short circuits that have caused this. If all is well, replace the fuse and check operation of the light. If the Lights still fails to operate or if the fuse hasn't blown, check that connections to the light are secure and there is good electrical continuity to the light. If after all these checks the light fails to operate, replace the unit using only genuine Agile Vehicle Technologies parts

319. **Fuses.** The vehicle is provided with a centralised fuse box which is located inside the dash. The cover of

the fuse box identifies the individual fused circuits and the rating of fuse that must always be used.



FUSE BOX

320. In addition to the fuse box, there is also a 65A ignition circuit fuse which is located to the rear of the starboard fuel tank on the chassis..

321. **Relays.** There is one 70A relay which switches power to the fuse box. It is located alongside the fuse box behind the dash panel.

Trouble Shooting

Hydraulic Pump

PROBLEM	CAUSE	REMEDY	
The vehicle does not move in any direction	Oil level is insufficient	Top up tank	
	Suction has been interrupted	Check and repair	
	Filter is clogged	Replace cartridge	
	Pump coupling is broken or not connected	Check and repair	
	Safety valve are dirty or faulty	Repair or replace	
	Wrong direction of rotation	Reverse rotation	
	Hydraulic motor is faulty. Check drainage	Repair or replace motor	
	Coupling of hydraulic motor is broken or not connected	Check and repair	
	Control levers are faulty	Check and repair	
	Vehicle moves too late, slowly and/or makes too much noise	Foam has formed, oil level is insufficient	Top up tank
Air has entered the suction duct		Check and repair	
Filter is clogged		Replace cartridge	
Safety valves are dirty or faulty		Repair or replace	
Hydraulic motor is faulty. Check drainage		Repair or replace motor	
Vehicle does not have sufficient traction power in both directions		Transmission is insufficiently sized for load applied	Decrease overload condition
	Primary motor is faulty or is not turning at a suitable speed	Check and if necessary, repair	
	Valve calibration is not correct, valves are dirty or faulty	Check and clean/repair/replace as is the case	
	Supply pressure is insufficient	Resume correct supply pressure	
	Oil temperature is too high	Check level of oil and is necessary top up. Check efficiency of exchanger or decrease load	
	Primary motor has overheated	Power of motor is insufficient	Adapt power of motor or decrease load
		Motor is faulty	Check and repair motor
Temperature of oil is too high (over 60°C)		Oil level is insufficient	Top up tank
	There is air in the suction line	Check and repair	
	Safety valves are dirty or faulty	Check and repair	
	Hydraulic motor is faulty. Check drainage.	Repair or replace motor	
	Drainage pipe is connected directly to tank and not to heat exchanger	Install an exchanger and/or modify connection	
	Radiant surface is clogged	Check and clean	
	Vehicle does not reach maximum speed	Suction filter is clogged	Check and clean
Main motor does not turn at maximum rated speed		Check and repair	
Supply pressure is too low		Check and repair	
Supply pump is faulty		Repair or replace	
Transmission ratio is not correct		Check and resize	
Dimensions and pressure of tyres is not correct		Check and repair	

D. WARRANTY

Identification Numbers Record.

Vehicle I.D. (17-digit PIN) Number _____

Engine Serial Number _____

Transmission Serial Number _____

Record your Vehicle Identification Number, Engine Serial Number and Transmission Serial Number in the spaces provided to assist you in ordering spare parts or for reference in case the vehicle is lost or stolen.

AVT LIMITED CUSTOMER WARRANTY POLICY

Limited Warranty. Agile Vehicle Technologies Inc. ("AVT") warrants that the products manufactured by it are free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of purchase by the original purchaser, OR 500 HOURS USE, WHICHEVER OCCURS FIRST, which is not transferable.

Engines sold with each new Agile vehicle model are warranted by the engine manufacturer to be free from defects in material and workmanship under normal use and service for a period of two years from the date of purchase by the original purchaser. See the engine manufacturer's warranty for specific details.

If during the warranty period the Product becomes defective under normal use and service, AVT will, without charge, as its sole obligation and owner's exclusive remedy, repair or, at its option, replace with a new or reconditioned part, any part found defective.

This warranty does not cover defects, damage, or deterioration due to normal use, wear and tear, or exposure; normal maintenance services; replacement of service items; deterioration of upholstery, trim or appearance items; damage or defect due to misuse, alteration, negligence, or accident; or any Product modified or operated contrary to the instructions in this Operator's manual. Rental machines are not covered by warranty.

AVT shall not be liable for any loss or damage by reason of its failure to discover, repair, report, or modify latent defects inherent in the design of any Product.

THIS WARRANTY IS THE ONLY EXPRESS WARRANTY MADE BY AVT APPLICABLE TO NEW PRODUCTS MANUFACTURED BY IT. NO PERSON IS AUTHORIZED TO CREATE ANY OTHER OBLIGATION OR LIABILITY IN CONNECTION WITH THE PRODUCT. THIS WARRANTY IS IN LIEU OF, AND AVT EXPRESSLY DISCLAIMS, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

WARRANTY

Limitation of Liability. THE SOLE AND EXCLUSIVE REMEDIES OF THE OWNER SHALL BE THOSE SPECIFICALLY SET FORTH IN THE WARRANTIES SECTION HEREOF. THE MAXIMUM LIABILITY OF AVT FOR ANY AND ALL CLAIMS ARISING DIRECTLY OR INDIRECTLY, WHETHER OR NOT OCCASIONED BY ITS NEGLIGENCE, SHALL NOT IN THE AGGREGATE EXCEED THE PURCHASE PRICE OF THE PRODUCT. AVT SHALL NOT BE LIABLE FOR LOSS OF USE OF PRODUCTS, LOSS OF TIME, INCONVENIENCE, TOWING, RENTAL OR SUBSTITUTE TRANSPORTATION, COMMERCIAL DAMAGES, LOSS OF BUSINESS OR PROFIT OR ANY OTHER INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES. THE FOREGOING CONSTITUTES THE SOLE LIABILITY FOR AVT AND THE EXCLUSIVE REMEDY OF CUSTOMER WHETHER OR NOT BASED UPON NEGLIGENCE, BREACH OF CONTRACT, BREACH OF WARRANTY, STRICT LIABILITY, TORT, OR ANY OTHER COURSE OF ACTION.

Indemnification. AVT does not warrant that the Products comply with any or all national, federal, state, municipal, or other governmental statutes, laws, or regulations, and the owner assumes all risk and liability whatsoever resulting from the use of the Products. AVT has no control over, and is not responsible for, the manner in which the Products will be used by the Owner. The Owner assumes all responsibility for any and all sums which AVT and/or the owner may be obligated to pay including, without limitation, for bodily injury or property damage, caused by or resulting directly or indirectly from the use of the Products and indemnifies and holds AVT harmless from and against any and all actions, claims, and demands arising out of or in any way connected with the use of the Products.

Governing Law and Jurisdiction. "By using the Product, Owner hereby understands and agrees that any dispute which arises between the parties shall be governed by and construed under the laws of the United Kingdom without reference to provisions of conflict of laws. UK courts shall have exclusive jurisdiction to adjudicate any dispute

between the parties. The parties hereto each consent to: (I) the personal jurisdiction of UK courts, and (II) service of process being effected upon it by registered mail sent to the following address:

Agile Vehicle Technologies Limited, Orchard Cottage, Main Street, Babcary, SOMERTON, Somerset, UK. TA11 7DZ

Notes:

Warranty may be offered on ex-demonstrator vehicles; in no case will this exceed 30 days from the date of resale.

Items not covered by this warranty:

- Battery (manufacturer's warranty applies)
- Tyres (manufacturer's warranty applies if available)
- Bent or broken axles or wheels (damage of this kind indicates that the vehicle was operated in an overloaded condition, or under conditions or in a manner in which the vehicle was not designed to operate).
- Vehicles or components damaged or lost during shipment.
- Normal maintenance or adjustments to the vehicle.
- Normal replacement of service and consumable items, such as air and oil filters, lubricants, hydraulic oil, chains and bearings.
- Accessory items not supplied or manufactured by AVT.
- Damages resulting from:
 - Misuse, accident, theft or fire.
 - Use of improper or insufficient fuel, fluids or lubricants.
 - Use of parts, components, or accessories (such as tracks, winches, snow plows, etc.) which were not supplied by AVT.
 - Any modification, alteration, tampering or any improper repair performed by any party.

It is the customer's responsibility to transport the vehicle to the closest dealer or authorized repair facility for warranty service. Any parts required for warranty that are not in the dealer's inventory will be shipped to the servicing dealer via surface or priority consignment at AVT discretion.

Products which AVT determines violate such warranty shall be returned to the customer at the customer's expense.

This shall constitute the complete and only warranty given by AVT and except as specifically set forth in the foregoing paragraphs, AVT shall not, in any event, be liable for any losses, damages, or costs, whether special, incidental, consequential or otherwise, in any way related to any vehicle or its sale.

The above warranty is exclusive and AVT hereby expressly disclaims all other warranties, expressed or implied, including those as to the merchantability, and/or fitness for a particular purpose. Only the warranty expressed in this Warranty Policy shall apply and no distributor, dealer, corporation, or individual is authorized to amend, modify or extend this warranty in any way on resale.