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INSTALLATION

Fitting the cannon

The water cannon comes with a 2-inch BSP connection on the base standard, or an optional table D flange made to order. With the standard 2-inch BSP option the cannon screws onto a firmly mounted water pipe. Pipe sealant should be used (rather than thread tape) when mounting as it has the additional benefit of locking the thread. When using pipe sealant, and if removal is required a gentle heat applied to the fitting will weaken the sealant enough for easy removal. Do not overheat the cannon. The base of the cannon should be quenched after the sealant lets go. The sealant will let go at around 220 degrees or so. The supporting pipe work should be securely mounted and should not be vibration prone. Too much vibration may affect bearing life. The water valve can be fitted anywhere in the line and controlled using the joystick switch. The joystick switch will supply the truck battery voltage to a solenoid operated pilot valve.

Fitting the controller

Carefully remove the controller cover. Choose a position that suits. Drill and screw it in place. Check that all controller wires are still connected and replace the cover ensuring no wires are pinched between the cover and the base.

Power connection

A power cable is supplied. It is the **5 metre long m12 2 pin female**. Red is the positive connection and black is ground. Screw this cable into its socket. Ensure the power switch is off and rout the cable to the power supply. Trim to length if needed and connect. Power to run the cannon should be taken from the **fuse box** to protect the power wire. If this is not possible a 5 amp **inline fuse** should be used. Ensure the connections are secured properly. The controller power connection has reverse voltage protection. If connected to the power incorrectly the controller will not be harmed, and it will not run.

The water cannon is designed to run on 24 volts (recommended,) however it will run on 12 volts (high speed is reduced at 12v). All controller power out connections are fuse protected by the controller's internal fuse. There is a glass (M205 quick blow glass) 20mm x5 mm, 5 amp fuse inside the controller which protects all wiring leaving the controller only. The internal fuse can be accessed by unscrewing the controller cover. To avoid short circuits be sure to isolate the controller before removing the cover. This can be done by unscrewing the power cable.

Water valve connection

The cannon controller has a water control button on the top of the joystick. The water connection socket on the controller has power and earth. Power is switched on and off by pressing the joystick button. Run the **M12 20 metre 2 pin male cable** from your controller to the water valve solenoid and connect it according to the manufacturer's instructions. Red wire is positive and black wire is negative. (trim or long route any excess wire). **The switched voltage is the same as the supply voltage** that the controller is connected to (24v if the truck is 24v). If you are in doubt about your solenoid valve voltage consult the supplier. Water is fuse protected by the 5 amp fuse inside the controller.

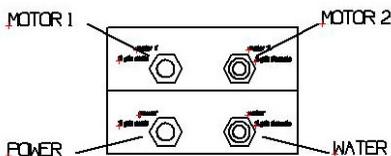
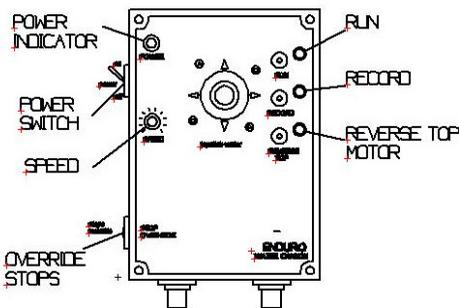
Routing motor and water cables

2 off M12 8 pin motor cables are provided. They are both **20 metres long**. One is **male** and one is **female**. For cab over vehicles the motor and water cables should be run into the cab following the axis of the pivot point from the side to side for at least 600mm to allow the cable to flex comfortably when the cab is raised. Allow sufficient cable slack for the cab to rise. Avoid sharp edges and pinch points.

Run the cables in a protected place inside the chassis rails and secure firmly and often. Rout from the cannon and work back toward the controller and secure with cable ties as you go. Leave some slack at the cannon mount points to avoid stressing the cables. Stop when you get to the chassis.

Run the motor cables from the controller toward the cannon and secure. Run

any excess cable out along the chassis rails to keep it straight, neat and compact. Avoid coiling any excess as it becomes a snag point and may form an inductor. If the cables are too short an extension can be added at either end. M12 male to female cables are available in a variety of lengths and are readily available. Or **See spare parts online** to get them from enduro water cannon.



Water cannon Controller layout

OPERATION

The power on/off switch

It is located on the left side front of the controller. When the controller is switched on the left front green power led will glow.

Joystick

The operation of the water cannon is very simple. It has a 4-way joystick for direction control. Only one axis can be rotated at a time. Water on-off is also on the joystick. Press the top center button once for water on and once for water off. **The water switch is available at all times during any operation.** The bottom axis can be rotated about 500 degrees. The top axis can be adjusted to suit the operators' needs. *See adjust stops*

When operating the cannon, the joystick should be released before the power is turned off. Turning the power off while running may affect the counters a little. The top counter will reset when the top axis is driven to the full down stop, and the bottom axis is reset when its magnet passes the bottom axis sensor around the center of rotation going left. Counter zero is automatically updated whenever this position is passed or met during manual operation.

Speed control

A speed control knob is located near then joystick on the left side. Speed can be adjusted at any time running in manual and auto mode, during record or while stationary, and is immediately effective. The minimum speed is about 3 min and 45 seconds per revolution, and the maximum speed is about 17 seconds per revolution. Speed control is smooth transition through 216 possible speeds.

Reverse top motor

When operating your cannon, you may find that the rotation limit for the bottom axis is inconveniently placed. Not allowing a full sweep on the bottom axis. To solve this reverse top motor has been included. You can rotate the bottom axis to point the jet away from your target area and flip the top axis over to point at it again. This faces the cannon with the rotation limit away from the sweep required. Up is now down on the joystick. Press the reverse top motor button (located in the button array on the right side of the controller) and joystick operation will be corrected so that up and down are correct for this position. An amber led will glow when reverse top motor is active. **Reverse top motor** can be performed at any time. To restore normal operation simply rotate the cannon back and press the reverse top motor button again. The amber led will now be off.

Record routine

When watering turf or a fill area it may be beneficial to train the cannon to do a lot of the work for you. It can be trained to perform a one step or two step routine. To record a two axis routine, you need to move on both axis once only each. To record the routine, press the record button. The red record led will come on. Move one axis once and then the other any distance is fine. And any axis first is fine. When two steps are complete the red record led will go out. record always takes **two steps**. The return path is plotted by the water cannon. The routine will begin as soon as the **run button** is pressed and end as soon as two steps are completed. The routine can be started and stopped at any time by pressing the run button. Water on-off will still operate and the joystick can be used to move the routine. *See drag routine*

To record a one **axis routine** press record. The record led will come on. Choose the axis you wish to rotate and move it the distance you wish to sweep. Follow this movement with another movement on the **“same axis”** in either direction. The red record led will turn off and the single axis recording is complete. Press the run button to start the single axis routine.

The routine is numerically controlled. It achieves 100% repeatability in workshop test periods of 6 hours or more at all speeds. The record button is disabled when the routine is running. And the run routine button is disabled when the record button is active.

If power is turned off during a routine the controller will save all information, power down and switch the water off. Routine can be restarted.

Drag routine

The routine is movable without other change to its path. This is done using the joystick while the routine is running. The routine can be moved in all directions as far or as little as you like. Both one and two axis routines can be dragged into new positions without other change.

With the routine is running move the joystick in the direction that suits. The routine position will be offset by the amount you move it and in the direction you move it. Release the joystick and the routine will continue in this new position. It can be dragged in any direction at any time.

To adjust the sweep of a routine a new routine must be recorded. The routine will be saved to eeprom (long term memory) and will remain available until recorded over. If an old routine is recalled using the run routine button be sure where it is set where you want it to be before turning the water on. Water can be switched on or off at any time during the routine and routine drag.

Routine is dragged against stop

In this case the axis will not pass that stop and that routine rotation may be shortened to prevent rotation past the stop. It is fine to run the routine like this. If the other axis is also dragged against a stop, the controller will stop the routine and return to manual control. Running a routine against two stops at the same time is disallowed. The routine is no longer useable in this case, and to resume auto mode a new routine must be recorded.

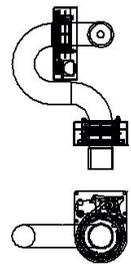
Override the stops

When maintenance or stop adjustments are carried out, the cannon may be set on the wrong side of the stops and can't be moved to the correct side. Because of this possibility an '**override the stops button**' has been included. **It is not for general use.** The purpose of the stops is to prevent any damage due to excessive rotation (cables, jets, motors, etc.). Override the stops is there for maintenance purposes only. It should not be used to get a little bit more rotation.

The top motor is confined by adjustable magnets. If the top motor is for any reason on the wrong side of one of these it must be moved to the correct side. To move to the correct side of the **top motor stops** press and hold the stop override button and operate the joystick until the axis is on the correct side of the stop concerned. The **magnetic fields are quite large** so be sure to be well inside the correct rotation area. Release the button and operate the top motor to its **full down and up position**. Down magnet resets the top motor counter. The top axis is now reset.

The bottom motor has a center reference. It will reset its center position when the magnet (located on the sensor ring) passes the center position sensor. It does this in manual mode only. If the **bottom motor stops** are out press and hold the stop override button and use the joystick to rotate the bottom axis to its mechanical center position. Operate the joystick for a good distance in both directions and if now working properly swing 90 degrees past the stop in one direction, then 90 degrees past in the other. The bottom motor axis is now reset. If only one direction of rotation is possible press stop override and rotate further to pass the center position by 90 degrees. Rotate back and forth past the sensor to reset the stop position.

Record a new routine before running in auto as the previously recorded routine is now in an unknown position.



bottom axis centre position

Adjust the stops

The stops are magnetically controlled. The magnet or magnets are located on the sensor ring under each cover and can be accessed without removing the covers. **Top motor** adjustment. Move the axis well away from the stop to be adjusted to keep the axis between the stops after adjustment. To adjust a stop position, loosen the M3 cap screws and slide the magnet into the new position. Tension the screws. For greater movement remove the cover and remove the magnet. Fit it in the new position and replace the cover.

Ensure that the new stop positions are correct and that they are protecting the water cannon from any possible damage due to mechanical impact. Reset the top axis counter by traveling to the down stop. In the case of **the bottom axis** move the magnet to the new position and sweep well past the sensor in both directions. Ensure that the cable is not pulled tight on the bottom axis. And adjust the cable as required. There is a 100mm wrap on the top axis cable available for this purpose. Ensure it will not tangle on any hardware. **Moving the bottom stop is not recommended.**

Add an accessory

Both a 12 volt and a 24volt output are included for this. They are both fused through the controllers' internal 5-amp maximum fuse. Space for additional cable glands (P7 up to 6.5mm cable) is provided at the rear of the control box. It must be drilled and fitted by the user. Any switch required can be installed in a convenient location on the side of the box close to the bottom and clear of any mechanical or electrical parts. It is recommended to have an electrician perform this work.

The 24v output is capable of 3 amps continuous output.

The 12v output is not suited to long term power draw. It is only meant for brief periods of load (the few seconds necessary to set a device). Maximum draw is 1 amp.

Service

Your water cannon should be greased regularly. For extended bearing and seal life. Use only **calcium sulphonate complex** grease INDGREASE CX 152 WR NLGI2. The cannon is supplied greased with calcium sulphonate grease. One grease cartridge is supplied in the kit. There are two grease nipples, one on each axis. They are located on the face of the seal housings (on the seal wafer) and are easy to access without the removal of any covers. When the housing is full grease and any accumulated water will squeeze past the seals. Lubricating the seals also. Keep the bearing housings full. This ensures that the bearings and seals are well lubricated and helps to dampen vibration also, further extending bearing life. Do not mix grease types. It should need only 2 -4 pumps every 3 months. When greasing the top axis rotate the axis to put the grease nipple in the lowest possible position.

Remove the covers periodically and visually inspect. To remove the bottom cover it is necessary to position the cannon so that the s-bend is well clear of the high point of the cover. Look for wear of wiring insulation, and for visual signs of water damage to the motors. Look for grease around the gearbox and output shaft. If needed the motor/gearbox can be easily removed and grease added to the gear box. Use lithium grease for this purpose.

Check the chain tension. It should not be tight, but it should not have slack. When setting the chain tension, operate the cannon and check the chain tension in multiple places. If it is a little tighter in one place set the tension, there. To set the tension... loosen the three M4 bolts holding the motor mount bracket to the motor mount posts (do not remove). Rotate the motor gently by hand to take out any slack and tighten the bolts. A reasonably firm nip is enough. (it is a lubricated bolt so not more than 2Nm) Just tight enough not to come undone or for the plate to slip. Check the chain tension again you should be able to push on it and very slight play be felt. Over tensioning the chain may damage the gearbox bearing. A little under tension is ok. Operate the cannon and check in several places.

Lubricate the chain with a sticky chain lube. Too much is never a bad thing. A lubricant which does not attract dust may be a good choice.

Fit the covers, ensure the cover screws are dirt free and lubricate with never seize if needed. Tension to a firm reasonable tension about 3 Nm.

Maintenance

Before you start

After many years of use it will eventually become time to overhaul your water cannon. Bearings, seals, chain, and O-rings are available via any bearing retailer. You can order a service kit, or source your own parts. No special tools are required but you will need a center drilled cap to fit the bearing adaptor and a 2 and 3 way wheel puller to remove the bearing housings. You will also need some M7 screws. These too you can source yourself or order as a spare part. A full rebuild kit is available. It will be advantageous to have a 2-inch BSP pipe stand to make your rebuild easy. You can order anything you need from us.

Tools required

The minimum tools needed are listed here

A secure stand to hold the cannon in its upright position (see drawing)

18mm ring/open end spanner

10mm ring/open end spanner (some older models)

8mm ring/open end spanner

7mm ring/open end spanner

6mm ring/open end spanner

Metric allen keys

4-8mm punch steel (if a bearing removal punch is not available)

10mm Aluminium punch (approximate)

Wheel puller 3 way suit 90mm PCD

3 off 7mm x 1mm pitch 100mm long set screws with heavy washers

A cap for the bearing adaptor supporting the bearings (see drawing)

Straight external circlip plyers to suit 60mm circlip

Very fine emery paper and red polishing scotch brite

Never seize thread lubricant

A 73.5mm OD 61mm ID 50mm long would be an advantage...

removal

Unscrew the m12 wire cables from both motors and tie them out of the way if necessary. If sealant was used when fitting the cannon, you can warm the lower part of the fitting to about 220-250 degrees. A medium propane torch or low flame on an oxyacetylene torch is sufficient for this process. You will smell the clue when it breaks down. Do not spread the heat around. Keep it localized in lower half of the fitting. Have wet rags nearby so that the cannon base can be cooled once the sealant lets go.

Disassembly

Clean up the threads on the bottom of the cannon and screw it onto a stand. Take note of the parts and their orientation. Progressive photos are a good idea. Remove the top cover. Slide the plastic motor cap back and unplug the cable. Unscrew the motor mount bracket (3 off m4 hex set screws with spring and flat washers). There should be enough room to work the motor assembly out of the chain and then remove the motor and bracket assembly. Remove the chain and the posts from the axis assembly. Remove the M12 male plug retaining nut and the magnetic sensor mounted with 2 m3 cap screws with flat and spring washers.

Undo the 3 of m5 clamping bolts with spring washers and remove the top seal-elbow assembly carefully remove the seal and try not to mark the bore. Do not use a screwdriver to remove it will scratch the sealing surfaces. A small crowbar is a better option. It won't mark the bore or face.

Remove the sensor ring.

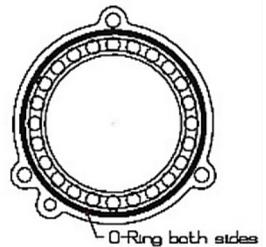
There is a circlip holding the single bearing and housing in place. Remove it carefully. Do not scratch the top bearing adaptor if the seal area is scratched it must be polished out before reassembly to prevent leakage. Clean the bearing adaptor and bearing face thoroughly. Ensure the extraction threads in the bearing housing are clean and fit the puller with 3 off m7 bolts. Slip the adaptor cap into place and wind in the center screw of the puller until it makes contact. Ensure that the puller is sitting well centered and parallel. Apply a little oil to the bearing adaptor and mindfully tighten the bearing puller to remove the bearing from the bearing adaptor. Carefully remove the remaining circlip and sprocket wafer. Remove the seal from the sprocket wafer.

Repeat this process on the bottom stage of the cannon noting that the circlips are between the 2 bearing housings. Place the housings on a firm surface that won't mark the faces and tap out the bearings. Clean and inspect all 3 bearing housings for damage.

Assembly

Clean all parts thoroughly and inspect. Ensure all mating surfaces are bur free. Mating surfaces can be lapped on a flat surface with oil and very fine emery paper.

Bearings must be non-sealed to allow grease flow. If your bearings are sealed remove the seals and grease. Lubricate the bearing and housing with calcium sulphonate grease. The bearings will tap easily into



Bearing Wafer

position in the wafer. Apply calcium sulphonate grease to the O-ring grooves and fit the O-rings. The grease helps to keep them in position. No need to pre-pack the bearing.

Seals are located in the sprocket wafers and in the seal wafers. A nitrile TC 60 75 8 seal is used in the sprocket wafer, and an FKM TC 60 75 8 seal must be used in the seal wafer assembly. The FKM seal can be used for both. The seal in the sprocket wafer must face toward the bearings and the seals in the seal wafer must face the water pressure side.

Before installing the seals remove the metal clamping ring from the seal and fit the replacement O-ring BS036N70. To fit the seal in the water seal wafer, lightly grease the seal and the recess. Push into place. This can be done by starting the seal by hand and then pushing it home on a clean flat surface. Your seal should sit about 1mm proud when in place. Apply grease inside the seal between the lips. Fit the BS041N70 O ring.

The sprocket wafer seal must be pushed to the bottom of the seal cavity. Do not

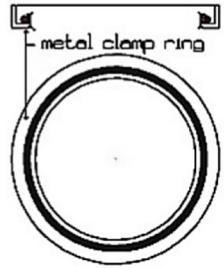
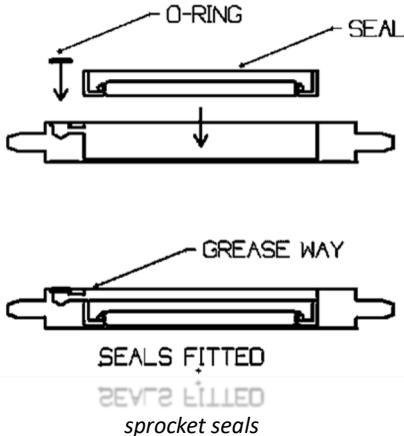
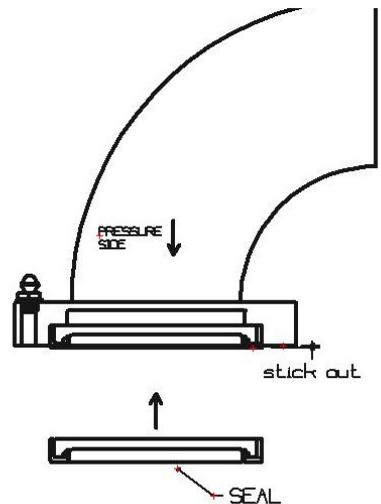


Figure 1 TC 60 75 8 Seal



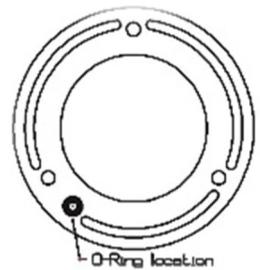
use a punch. A correctly sized cylinder or disc should and a pushing force should be used for this purpose. The grease port should be visible. Grease the seal lips. Apply grease generously and fit the grease port O-ring OR005x1.5N70. Slide the sprocket wafer onto the bearing adaptor ensuring it is the right way up and that the seal is not damaged on the circlip grooves when sliding past.



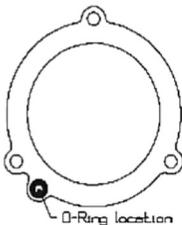
seal wafer water seal

Bearing wafers. Grease the bearing and bearing adaptor housing lightly. The bearing is a light press fit use a soft punch or bearing punch and gently drive the bearing and housing onto the adaptor being careful to maintain even penetration. Do not drive the inner race of the bearing. This will pit the race surface leading to premature failure. Repeat for all bearing adaptor housings. Grease the O-ring grooves and fit BS041N70 shoulder side. BS042N70 race side. Fit the bearing housing with the m7 threaded end and housing shoulder (type A-2 off). The bearing faces down and the shoulder and threads face up. The grease ports must be aligned Push it on using an appropriately sized tube. Check for the second circlip groove and stop as soon as the lower circlip groove is exposed. You should have a 3mm gap between sprocket and bearing wafer. Fit the circlip. When fitting circlips be very careful not to scratch the seal area of the bearing adaptor.

Sensor rings The sensor rings are the same for both axis. But the magnet count is not the same. The bottom axis has only one magnet. It is wise to consider where you want the magnet at this point. This will be the center of rotation. It can be moved later. When moving the magnet be sure to check the motor cable. It must be adjusted to suit the new location. Align the sensor ring hole pattern correctly with the hole pattern of the bearing wafer noting the grease way holes align. If fitted upside down, they will not. Fit the 3mmx3mm grease port O-Ring and use plenty of grease to ensure it stays put. Ensure that all O-R-rings are still in place and fit the second circlip. Lightly grease the bearing adaptor and select the bearing wafer with the m7 tapped holes on the bearing face away from the bearing shoulder. Gently push



Sensor Ring



Seal Support Ring

it almost home (not quite against the sensor ring for easy rotation) and align the grease port and bolt holes. Ensure the O-rings are still in position.

Place the seal retainer on the bearing wafer and fit the O-Ring with plenty of grease. Look for any scratches on the seal area of the bearing adaptor (shaft). If any they can be polished out with ultra fine emery and a red Scotch-Brite.

See tools required. Do not allow grit into the bearing or cavity.

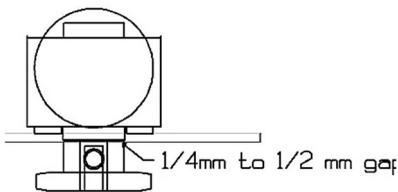
Bottom seal wafer and bend assembly and carefully align all parts. Note the grease way is aligned right through the assembly. The seal support ring must be in place with its O-ring fitted, and the axis cover must be on the S-bend at this time but not in position. It can not be fitted later without s bend removal. Lubricate the threads of the 3 m5 screws with spring washers with never seize. The bottle should start by hand. Carefully draw the parts together and check for smooth easy rotation as you tighten the bolts. Look to see that the parts are pulling up evenly. You may hear the parts creaking together as you tighten the screws.

Top axis

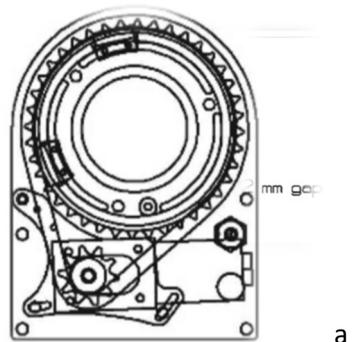
Slide the sprocket wafer onto the top bearing adaptor ensuring that it is oriented correctly and that the O-Ring is fitted (plenty of grease). The grease way drilling should be visible. Fit the first circlip making sure not to scratch the seal area of the top bearing adaptor. The sprocket and bearing wafer orientation of the top axis are the same as that of the bottom axis. This bearing wafer is the same as the first on the bottom stage and goes on bearing face first and will have the bearing shoulder and m7 extraction threads showing. Push the bearing wafer onto the top bearing adaptor as above ensuring that the circlip cavity is facing out and fit the second circlip. *see drawing.*

Place the sensor ring with 2 magnets in position ensuring that the grease way O-ring is fitted with plenty of grease. Fit the top seal wafer assembly. Lubricate and start the bolts. Check that all O-rings are in position then evenly draw closed using the bolts and check for free movement periodically.

The drive chains do not wear much usually but should be inspected for wear washed and lubricated. If they are worn chain adjustment may not be possible. Replacement chain (06BS 3/8 pitch



Gearbox assembly



Drive Assembly

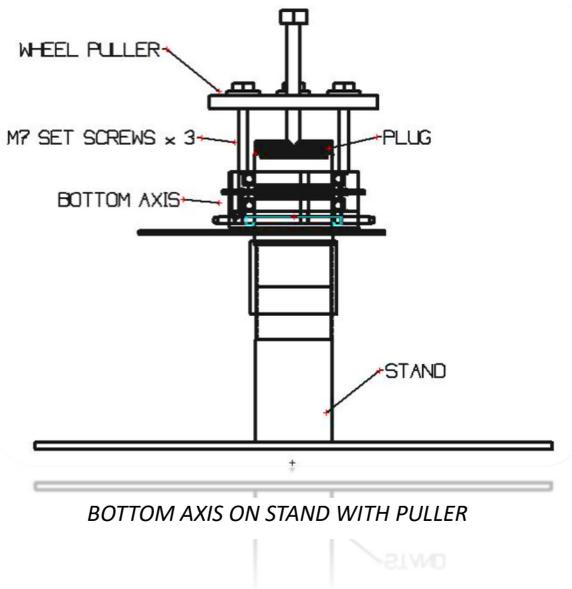
stainless) is easily obtained and available as spare part. Fit both chains.

Assemble the motor mount brackets chains before the motor gearbox assemblies. Fit the 3 off m4 by 20mm long motor support posts using never seize but only finger tight. Slip the motor gearboxes

over the chain meshing the sprocket and drive chain and seat on the 3 posts. Rotate the axis to move the mount holes above the posts and fit the 3 off m4 hex head set screws with spring and flat washers. Use never seize. If the assemblies were separated clean and reassemble. Use never seize on all screws and gear box shaft when fitting the sprocket. Slight clearance must be kept between the sprocket and the gearbox housing (0.1-0.2mm). The motor mount assembly will tuck into the chain. Fit the posts and screws by hand and ensure that the assembly is comfortable. Draw the posts to the motor mount plate and check that the bracket moves freely. Set the chain tension as above (**see service**) and tighten the screws. Fit the motor harness and sensor to both axis. The plug alignment pins always face the square end of the axis. When Both gear harness are fitted screw all cover posts into position loosely and fit the covers. Ensure that the posts align well and tighten all screws. Pump approximately 16 pumps of calcium sulfonate complex grease into the bottom axis and 12 or so pumps into the top axis. When near full air will discharge. 2 or 3 pumps more should be it.

When assembled the sensor on the motor bracket should be between the magnets in the swept rotation of the top axis. Stop positions can be changed at any time. Fit the cannon as described above (**see fitting the cannon**).

Maintenance Stand



Warranty

NC50 Water Cannon

Enduro water cannon are covered under warranty for 12 months from the date of purchase, for both parts and workmanship. The warranty applies to normal use of the product for its intended purpose only. Repair or replacement does not include removal or installation. It should be shipped back to Enduro water cannon in its original or similar crate. Enduro water cannon are factory tested and supplied free from defects and perform as described in this manual. Service must be performed and is the purchaser's responsibility. Service must be performed as outlined in the service section of this manual.

Paint work is performed to an industrial standard. It is an industrial powder coat finish performed to the usual standards. Minor blemishes may exist. Quality of the paint work is to the best standard achievable but is not guaranteed beyond a very satisfactory appearance.

Any damage caused to the water cannon by the purchaser or any third party, be it accidental or through misuse, by failing to service the product as outlined or any damage caused by faulty third-party repair and service is not covered under warranty.

Warranty exclusions

Damage to the drive assemblies or top motor cable due modification of bottom stop position and due to improper allowance for rotation and top motor cable requirements, or due to by-passing the rotation stops is not covered under warranty. If the NC50 passes stops under normal circumstances and causes any damage it is covered under this warranty.

Damage to the drive motors due to submersion or severe sustained flooding of the covered areas caused by misuse is not covered.

However, we will stretch coverage under some circumstances.