



**Chiltern
Model
Steam**

Twin Cylinder Oscillating Steam Engine Assembly Instructions



General Instructions

On receipt of your product set, check that you have received the correct quantity of components as listed in the “Assembly Components List” for the product ordered and relate them to the “exploded” drawing of the engine as supplied. This is also an excellent way to familiarise yourself with the part numbers associated with the items, that in turn are mentioned in the descriptive material.

Make a preliminary inspection of all components to check for machining burrs that may have been missed by our inspectors and eliminate them with fine abrasive paper or needle files before assembly.

When assembling an engine everything should come together easily. If you encounter stiffness in the assembly then backtrack and trace its origin. NEVER try to force a smooth result. With pre-machined components it is most likely to be caused by a machining burr.

If you are concerned that “finger pressure” tightening in the following instructions is insufficient by all means use a tool but remember that the components involved should not be damaged in any way.

When tightening connections with grub screws “wiggle” the shaft as you screw down the grub screw to make sure the secure point of contact is centred on the middle of the flat.

Tools Required

- 3 mm hex set key (supplied)
- Small flat blade screwdriver (not supplied)
- Small adjustable spanner for attaching reversing valve assembly and connecting pressure inlet and exhaust fittings (not supplied)

Other Items Not Supplied

- General Lubricant – suggest a locally available light machine oil
- Steam Oil for Displacement Lubricator – a light grade of special steam oil (Steam Engine Compound Cylinder Oil – sometimes called “Cylinder Oil”) suitable for lubricating at steam temperatures. (see **Oils** below)

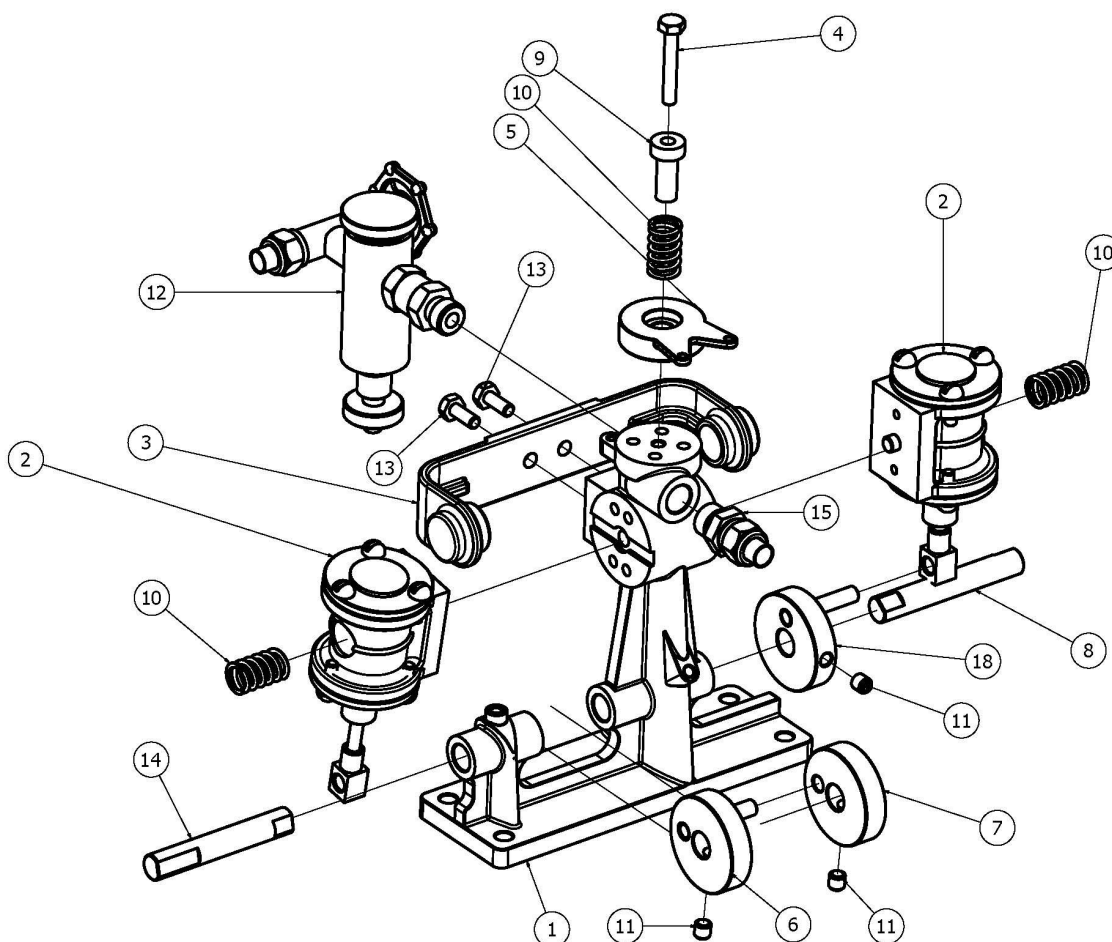
Note: The displacement lubricator is **only** for use in a steam driven system. Running of an engine on compressed air will void your warranty. Please contact us for further information.

Painting:

If you plan to paint the components of the engine, please be aware that commonly available paints do not consistently adhere to the high quality bronze materials used in the casting sets we supply. To obtain a durable finish for your engine please use an “etch primer” as available in your locality to prepare the engine surfaces before applying the paint of your choice. We recommend that you paint the components before starting the assembly process.

General Assembly Drawing

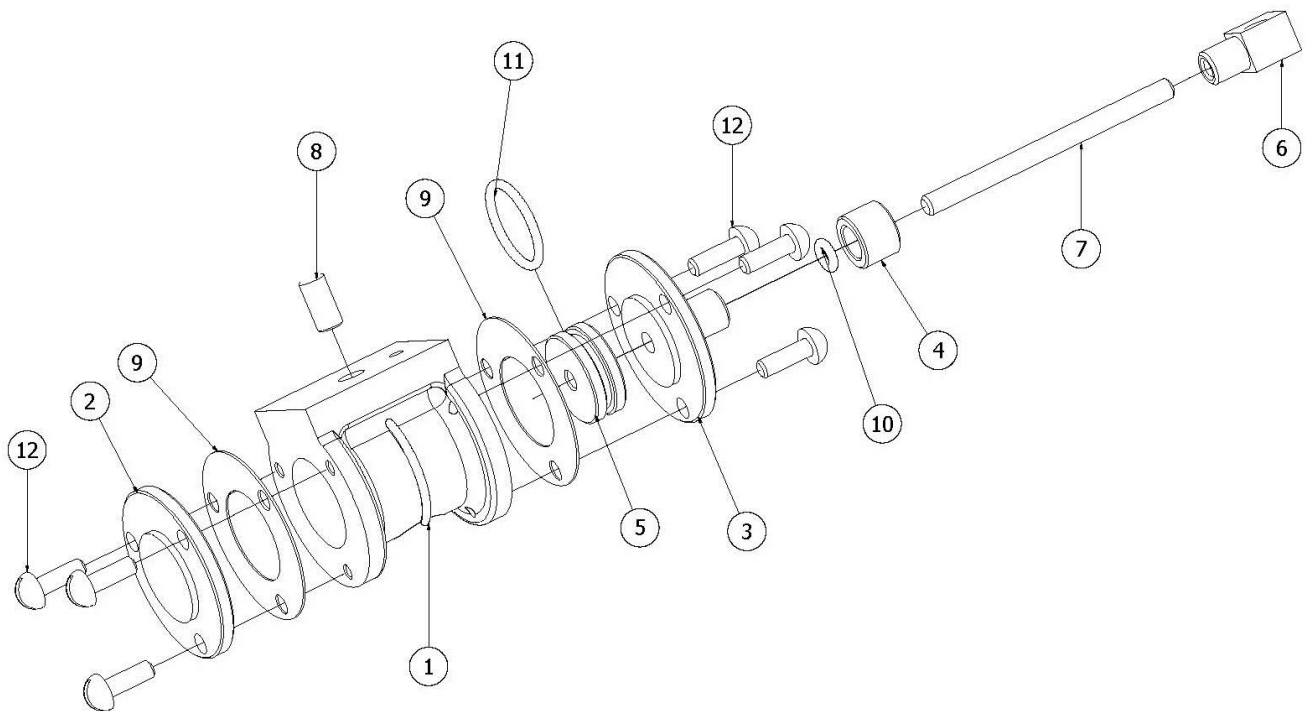
Please note: This drawing is a schematic only and does not show all components. It should be read in conjunction with the Cylinder Sub-assembly Drawing to explore all details of the engine. The "Packing Quantity" column of the



GENERAL ASSEMBLY COMPONENTS LIST

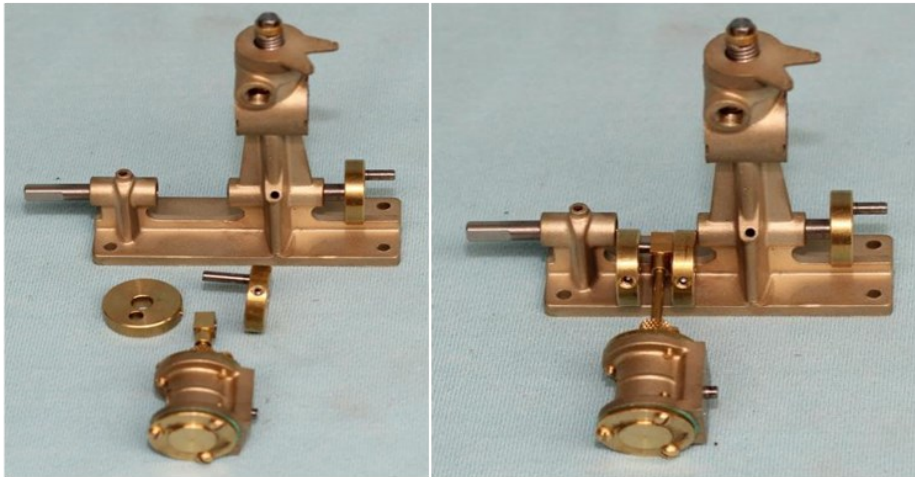
ITEM	PACKING QUANTITY	ASSEMBLY QUANTITY	PART NUMBER	DESCRIPTION
1	1	1	1101M	Trunk
2	0	2	5214	Cylinder Sub-assembly
3	1	1	1105M	Cylinder Holding Bracket
4	1	1	9438	7BA x 5/8" Hex Bolt
5	1	1	1104M	Reversing Control
6	1	1	5102-B	Flywheel With Long Pin
7	1	1	2108	Flywheel With Clearance Hole
8	1	1	2110	Crankshaft A (Flats @ 90 Degrees)
9	1	1	2112	Reversing Control Collar
10	3	3	2115	Spring
11	3	3	9200	Grub Screw - M3 x 3
12	1	1	5034	Lubricator Sub-assembly
13	2	2	9667	7BA x 1/4" Hex Head Screw
14	1	1	2111	Crankshaft B (Flats in same plane)
15	2	2	2595	Nut 1/4" x 40
16	2	2	2582	Tail 5/32" Pipe
17	1	1	2375	1/4" x 40 Spigot
18	1	1	5102-A	Flywheel With Short Pin

Cylinder Sub-assembly



<u>CYLINDER SUB-ASSEMBLY</u>				
ITEM	PACKING QUANTITY	Per ITEM QTY	PART NUMBER	DESCRIPTION
1	2	1	5104	Cylinder With Pivot Pin
2	2	1	2101	Top Cylinder Cover
3	2	1	2102	Bottom Cylinder Cover
4	2	1	2103	Gland Nut
5	2	1	2104	Piston
6	2	1	2105	Piston Big End
7	2	1	2106	Piston Rod
8	0	0	2114	Pivot Pin
9	4	2	2116	Gasket
10	2	1	9130	Gland Packing
11	2	1	9103	O-Ring
12	12	6	2113	Round Head Screws

Crankshaft Assembly



This procedure can be tricky so on your first attempt to do an assembly, please work through the following instructions carefully.

The pictures above show the components used in assembling the crankshaft. Please note that the General Assembly Drawing shows a different orientation of the flywheels shown in the left picture. The engine will work either way but the following procedure is advised as the best option.

1. Place the Trunk (1101M) in front of you with the "tower" on your right. Identify the two crankshafts (2110 & 2111). Crankshaft (2110) has the flats on each end machined at 90 degrees and is fitted on the right side of the Trunk. Crankshaft (2111) has the flats machined in the same plane and is used on the left side of the Trunk (output side).
2. Two of the three Crankshaft Flywheels (5102 A & B) supplied, has a crankshaft flywheel pin pressed in. Flywheel (5102 A) has a shorter pin (seen clearly as it is fitted in step 4 below), while Flywheel (5102 B) has a longer pin (see left hand picture above). The third (2108) has a clearance hole to accommodate the matching pin (see left hand picture above). Each of the crankshaft flywheels are secured to the crankshafts with a 3M x 6 mm grub screws (9200) that has been factory fitted. An Allen key is supplied to enable tightening.
3. When fitting the flywheels to the crankshafts, position the grub screws so that the shaft can only enter the crankshaft flywheel when a flat is underneath the grub screw. This will ensure correct timing of the crankshaft, flywheel and piston sub-assembly.
4. Take Flywheel (5102 A) and insert one end of Crankshaft (2110) in the centre hole and tighten the grub screw onto the crankshaft's machined flat such that the end of the crankshaft is flush with the face of the flywheel. Lightly lubricate the crankshaft and insert it into the main bearing from the right hand side of the trunk. The free end of the crankshaft should not protrude past the main bearing. (See above pictures)
5. Lightly lubricate the other Crankshaft (2111) and insert the end with the shorter flat into the outrigger bearing on your left, ensure that it is turning freely in the bearing and set it so that the inside end of the shaft is not projecting beyond the bearing (See above pictures)
6. Lay out the Cylinder Sub-assembly (5104), Flywheel with long pin (5102 B) and Flywheel with the hole (2108) as illustrated in the left hand picture above.
7. Slip the big end onto the flywheel pin on the right hand side and the hole of the flywheel on the left hand to make an assembly as shown in the right hand picture above.
8. Move the assembly into the gap between the bearings and position it so that:
 - you can insert the end of the right hand crankshaft into the flywheel with the long pin
 - then do the same with the left hand crankshaft
 - lift the cylinder and align the cylinder pin with the matching hole in the trunk
 - hold the cylinder snugly against the matching surface of the trunk
 - position the two crankshaft ends so that they are flush with the inside surface of the flywheel
 - tighten the grub screws onto the centre of the flats of each crankshaft
 - check firm but free movement of the flywheels through several rotations
9. Take the second cylinder sub-assembly, insert the cylinder Pivot Pin (2114) into the top right hand bearing of the "Trunk Tower" at the same time slipping the Piston Big End (2105) onto the pin of Flywheel (5102 A)
10. Once again check for firm but smooth rotation of the engine while holding the cylinders against the trunk and fix any binding problems

11. Take the Cylinder Holding Bracket (1105M) and insert the Springs (2115) into the recesses inside the ends of the Holding Bracket.
12. Identify the side of the tower that has the two holes for securing the holding bracket and lay the engine down with that side pointing up.
13. Firmly grip the holding bracket and locate one spring on the prepared surface of one cylinder.
14. Fully compress the selected spring and ease the holding bracket and the Spring at the other end onto the second cylinder. It should happen without tools but you may need a flat screwdriver to ease the second spring into position.

Reversing Valve

Take the Reversing Control (1104M) and insert the Reversing Control Collar (2111) in so that the head fits snugly into the recess machined in the Reversing Control, then place the spring (2115) on the projecting spigot on the other side of the control. Insert the control bush bolt (9438) and fit the assembly to the top of the Trunk tower. Tighten the bolt to provide gentle spring pressure on the Reversing Control.

Final Assembly

The 1/4" 40 ME threaded steam inlet and exhaust ports are fully interchangeable in that the Reversing Control is used to control rotation direction. Attach the Displacement Lubricator (5034) to the most convenient port and the Spigot (2375) to the other port. Connect the supply/exhaust piping using the 1/4" 40 Nuts (2595) and 5/32" Tails (2582) supplied.

Installation & Running In

1. It is very important that the engine be installed on a firm flat surface. The engine components are built to very fine tolerances to ensure maximum performance. Any uneven pressure on the Trunk base can cause binding and reduced performance.
2. Please run the engine for at least three "standard fill" boiler sessions to run in the engine before expecting maximum performance. It is designed to run on steam pressures in the region of 30-40psi.
3. At the recommended pressures there should be no steam leakage. All steam interfaces are lapped before delivery. If leakage occurs after step 2 is complete, it may be necessary to dismantle the cylinders and clean and/or re-lap the off-fending surfaces. Ask us for advice if you encounter this problem.
4. The reversing valve surfaces should not be lubricated. They are lapped before delivery and will provide a better seal if left "dry".
5. Although it will work with compressed air, the engine is **NOT** designed to use this power supply for prolonged periods. The Displacement Lubricator only works with steam.

Running In Guidelines for Factory Assembled Engine:

Your assembled engine has been carefully tested before delivery, but because of the close tolerances used in its manufacture, it may be a little "stiff" when you receive it. Before dispatch we have lubricated the piston/cylinder with a "rubber lubricant" to minimise initial stiffness. This lubricant will dissolve during early running and the special steam oil used in the displacement lubricator will take over to minimise your possible frustration during the "running in" phase of your ownership. Some stiffness will remain for the first few "boiler loads" of running.

Important Note

Steam oil should only be used in the displacement lubricator. We recommend a light steam oil with an International Grade 220 or 460.

- At the end of a days running remove all residual water and oils and lubricate all bearings as above. The following is a guide provided by a client talking to another:

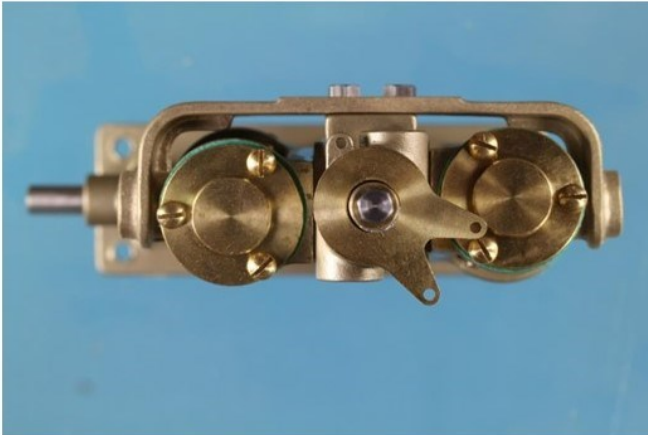
"Lubricate everything on the engine that moves. I think this includes the springs that push the cylinders in, Light machine oil, not steam oil."

Great advice—except the springs should be fine un-lubricated.

Clyde Reversing/throttle Valve Settings

The valve has separate positions for forward and reverse in each of the two facing directions.

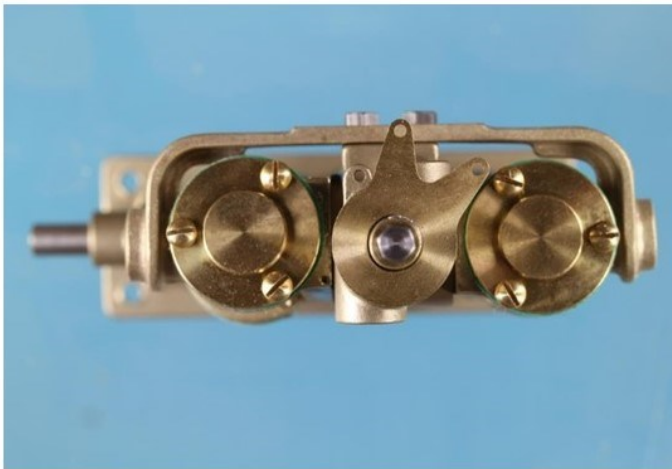
There are four possible neutral positions for the valve - two when the centre of the "Y" is aligned with the crank shaft centreline and two when it is aligned at 90 degrees to the centreline of the crankshaft. (not illustrated)



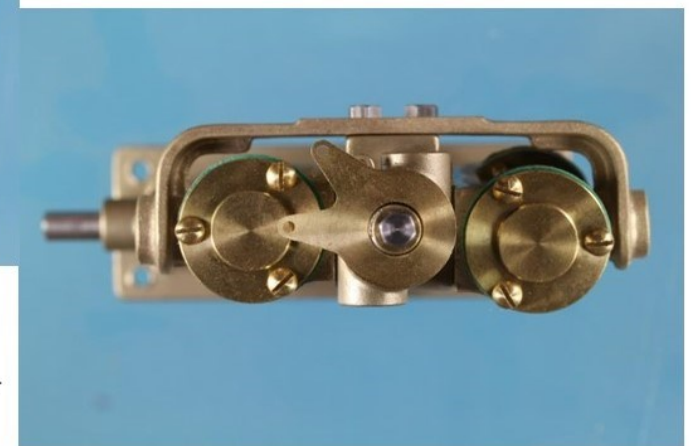
Valve at full power in one direction
← Facing front



Valve at full power in the other direction
→ Facing front



Valve at full power in the one direction
← Facing rear



Valve at full power in the other direction
→ Facing rear

Long Term Storage:

The engine's cast components are made from a marine grade non-corrosive alloy; the crankshaft is made from stainless steel and the remainder of the machined components from brass. This combination provides maximum protection from corrosion during service if the engine is run regularly. However if you are planning to not run it for a prolonged period – say 3 months or more, the residual condensate that will remain in the cylinder after a run may cause some tarnishing of the cylinder bore. This could cause accelerated wear of the "O" rings and increase the internal friction of the engine during initial startup. In these circumstances we recommend that you remove the top and bottom cylinder covers, soak up the condensate, directly lubricate the cylinder bore (preferably with a benign rubber grease) and replace the cylinder covers before storing the engine.