

# HYDRAULIC RAM MADE FROM STANDARD PLUMBING PARTS

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There are a number of companies that manufacture hydraulic rams. While manufactured rams come pre-assembled and offer the highest degree of convenience and efficiency, they can be quite expensive. Fortunately, inexpensive ram pumps can be assembled from pipe fittings that are commonly available at most hardware and farm stores.

Assembly is fairly quick and easy. All that is needed is a pair of pipe wrenches, Teflon tape or other thread sealant, PVC cleaning solvent and PVC cement. Table 1. lists all of the parts shown in Figure 1. When assembling threaded fittings liberally apply thread sealant, or use 3-4 turns of Teflon tape and tighten all fittings securely to prevent leaks.

All ram pump fittings except the delivery pipe should be made of either of galvanized steel, brass, or schedule 40 or higher PVC. The delivery pipe can be made of any material provided it can withstand the pressure leading to the delivery tank. Make sure that the swing check and the spring loaded check valves are installed as shown in Figure 1. The flow direction arrow on the body of the swing check valve must point down. The valve below the pressure gauge should be kept closed except while making readings in order to protect the gauge from water hammers.

A bike, wheelbarrow or scooter inner tube serves as an air bladder for the pressure tank. Insert the inner tube into the pressure tank and fill it slightly with air (less than 10 psi). Some inner tubes may need to be folded in order to fit them inside the pressure tank casing. The sealed volume of air contained in the tube prevents either water-logged or air-logged conditions in the pressure tank.

There are several nonessential, but useful parts included in this ram assembly. The ball valves, union fittings, and gauge assembly are all optional. The ball valves on both the drive and delivery pipes are helpful for starting the ram and controlling its flow. The union fittings, also on both the drive and delivery pipes, are helpful for removing the ram for maintenance and/or repairs. The gauge assembly is useful for making

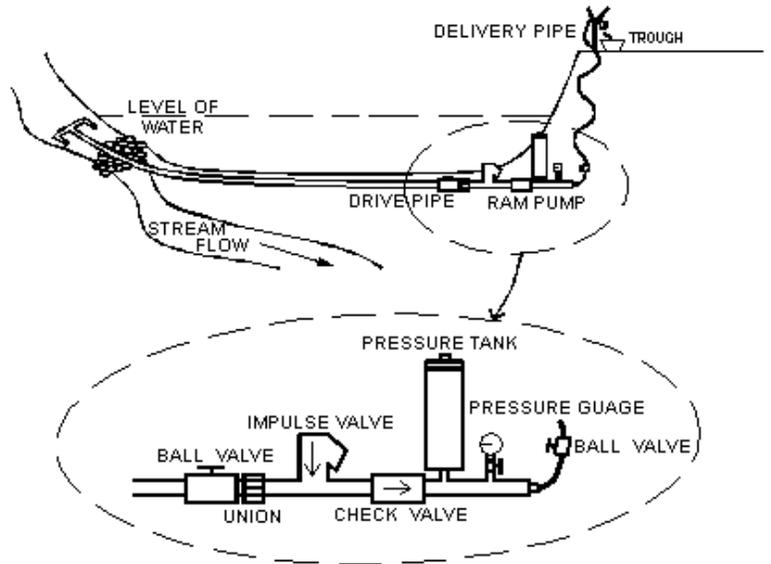


Figure 1. Hydraulic Ram Assembly

pressure readings, especially while starting the ram. Any or all of these fittings can be left out of the ram assembly without affecting pump performance. However, the absence of these parts will make it more difficult to start and maintain the ram.

With the exception of the pressure tank's air bladder, all air trapped in the drive pipe, ram assembly, and delivery pipe must be displaced with water before these rams will pump properly. A few minutes of manual operation, and several re-starts, may be required to displace the trapped air

## Pumping to Low Elevations

If the discharge elevation (delivery head) is less than 30 feet, it may be necessary to install either a ball valve or an adjustable pressure relief valve on the discharge (watering trough) end of the delivery pipe. Either of these valves can be used to regulate the water flow through the delivery pipe, which in turn regulates the back pressure on the ram assembly. A back pressure of up to 10 - 12 psi (as read on the pressure gauge) may be required for proper ram performance.

Table 1. Parts List for Hydraulic Rams Made up of Standard Plumbing Parts

Metal Ram Pump

1. Screened water supply
2. 1/4" drive pipe
2. 1/4" ball valve
3. 1/4" x 2" nipple
4. 1/4" union
5. 1/4" x 2" nipple
6. 1/4" tee
7. 1/4" close nipple
8. 1/4" brass swing check valve
9. 1/4" close nipple
10. 1/4" spring loaded check valve
11. 1/4" x 2" nipple
12. 1/4" tee
13. 1/4" x 2" nipple
14. 4" x 1/4" reducing coupling
15. 4" threaded pipe 36" long
16. Inner tube (slightly inflated)
17. 4" pipe cap
18. 1/4" close nipple
19. 1/4" x 3/4" reducing coupling
20. 3/4" x 2" nipple
21. 3/4" tee
22. 3/4" x 1/4" bushing
23. 1/4" x 2" nipple
24. 1/4" ball valve
25. Pressure gauge
26. 3/4" x 2" nipple
27. 3/4" union
28. 3/4" x 2" nipple
29. 3/4" ball valve
30. 3/4" delivery pipe

PVC Ram Pump

1. Screened water supply
2. 1/4" drive pipe
3. 1/4" ball valve
4. 1/4" union
5. 1/4" slip x male adaptor
6. 1/4" threaded tee
7. 1/4" close nipple
8. 1/4" brass swing check valve
9. 1/4" close nipple
10. 1/4" spring loaded check valve
11. 1/4" slip x male adaptor
12. 1/4" slip x slip female tee
13. 1/4" male adaptor
14. 4" x 1/4" reducing coupling
15. 4" pipe 36" long
16. Inner tube
17. 4" pipe cap
18. 1/4" x 3/4" reducing coupling
19. 3/4" tee
20. 3/4" x 1/4" slip x female bushing
21. 1/4" x 2" nipple
22. 1/4" threaded ball valve
23. Pressure gauge
24. 3/4" union
25. 3/4" ball valve
26. 3/4" delivery pipe

Adjusting the Ram

These rams can be adjusted in one of two ways. The swing check valve may be adjusted by first rotating it so that its pivot is in line with the drive pipe and then twisting the valve and tee away from the vertical by as much as 30 degrees. This allows the swinging flap to partially close, which shortens the stroke period. The other way to adjust these rams is to alter the length of the drive pipe. Lengthening the drive pipe will increase the stroke period. Conversely, shortening the drive pipe will shorten the stroke period.

References

Much of the information contained in this publication is adapted from the following publications:

Rife Manual of Information. 1992. Rife Hydraulic Engine Manufacturing Co., Box 367, Wilkes-Barre, PA, U.S.A.

Stevens-Guille, Peter. 1978. An Innovation in Ram Pumps for Domestic and Irrigation Use. *Appropriate Technology*, Vol. 5 No. 1.

Watt, S.B. 1978. A Manual on the Hydraulic Ram for Pumping Water. *Intermediate Technology Publications*, Southampton Row, London WC1B 4HH, UK.

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