

# Starters

## What you will learn

When you have finished this module, you should



- know the main parts of a manual starter
- change the starter cord on your engine
- use an emergency starter cord.

## Things you need before you start

### Materials

Spare starter cord



### Tools

Wrench/spanner



Small pliers



Small screwdriver



# Types of starters

A starter on an engine is just a way of turning the engine so that the induction/compression/ignition/exhaust cycle will begin inside the engine.

Electric starters use an electric motor to turn gears on the engine flywheel. Cars, trucks and some more powerful small engines use these. Electric starters are heavy – and they need a big battery and thick wires to make them work.

Motor bikes can use a kick-start lever – or you may be able to ‘push-start’ them in gear – and then jump on!

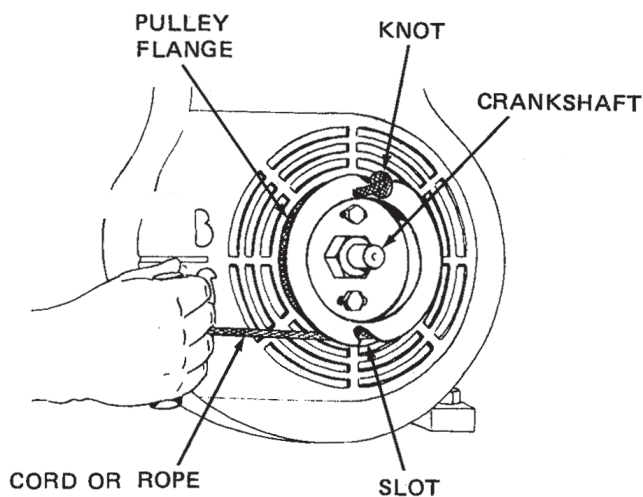
Most small engines use a starter cord that you pull by hand. The cord is attached and wound around the flywheel or a pulley attached to the crankshaft

In this course, we will only look at cord-start engines. If you have an electric-start engine, get your tutor to show you how it works – and how to look after it.

## Pull-cord starters

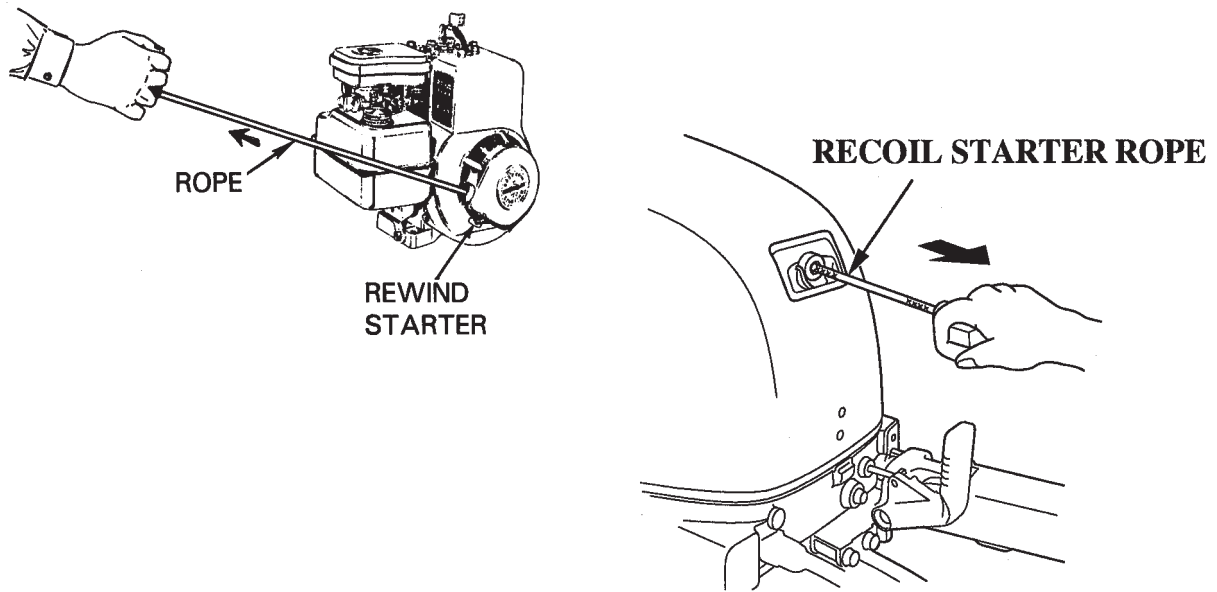
Most **small engines** used in lawn mowers, brush cutters, chainsaws and outboards use cord starters.

On some really simple engines, you just fit a knot in the cord to a notch or slot on the flywheel, wind the cord around 2 or 3 times – and pull. The cord comes off the flywheel as it gets to the end. You have to attach and wind the cord for every pull.

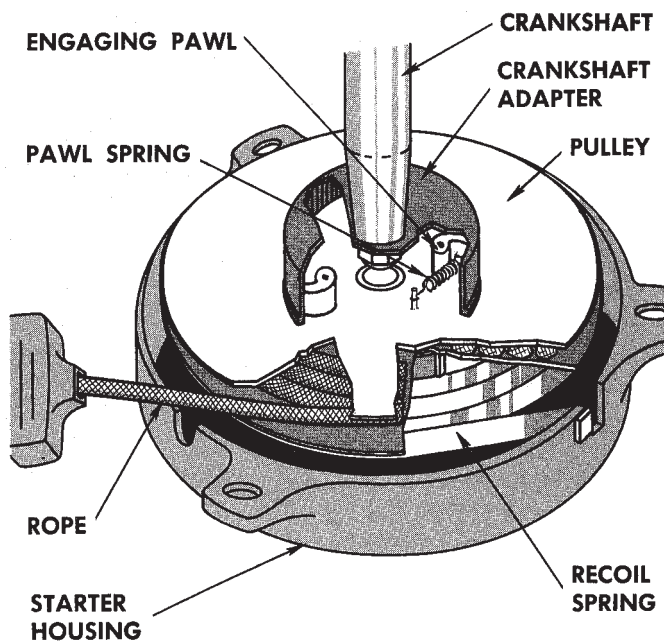


Most engines use a re-coil starter (sometimes called rewind starter). The pull-cord is attached to a pulley and spring in a case on top of the flywheel housing. The cord is attached inside and rewinds itself after each pull.

There are many different styles of these starters.



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Inside the starter there is a long spring that unwinds as you pull the cord. The spring then recoils its self and pulls the cord back into the starter and onto a pulley.

A simple clutch or levers/pawls let the pulley catch the crankshaft in only one direction so the pulley is free when the engine starts.

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These are simple and reliable starters – but the cords eventually wear and break (usually at the worst possible moment!). Check the cord regularly – pull it out as far as it will go and check the whole length for damage or fraying. If you find serious wear, change the cord – before it breaks.

When the cord breaks, you have two problems:

- You can not start the engine. Mowers, chainsaws, generators and the like usually have no other way to start the engine. Most outboards do have an emergency way to get the engine going – we will look at that later.
- You have to take the starter apart to replace the cord with a new one.

This can be a fiddly job with springs and small nuts or screws that can fly everywhere!

## Replacing a pull-cord

When you replace a pull-cord (or rope), use the right type and thickness of cord if you can. Pieces of the wrong type, or lengths of plastic string may slip – and will soon break or get tangled inside the starter.

Look at the engine makers' information for the right type and size to use.

Most engine makers have their own design and their starters are different in the way you remove the starter and fit new cord.

Get your tutor to show you what type of starter you have, and how to:

- Replace the starter cord and
- Re tension the recoil spring

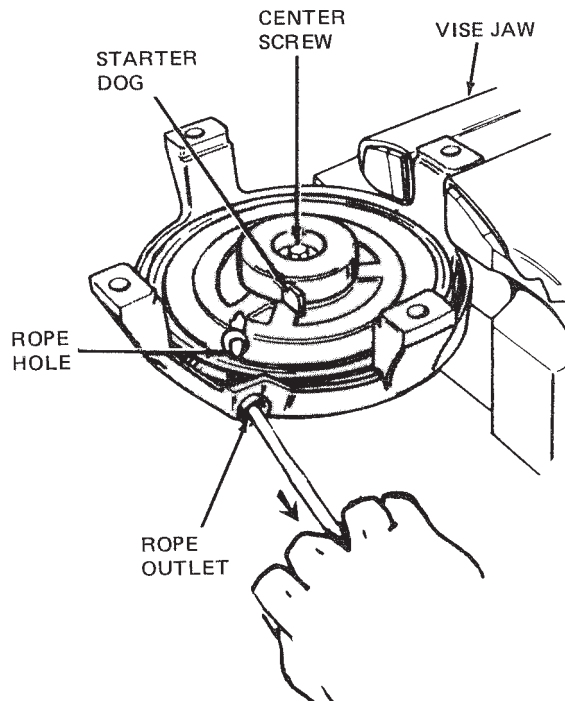
## Here are the important steps that you can follow on many engines

Take the starter assembly off the engine. It is usually attached with 3 or 4 small screws or bolts. You may need to take off a cover first on some engines.

Turn the starter over, put it on a bench or flat work surface. You need to find some way to hold the outer case while you pull the cord. A vice is ideal – or a clamp.

### Example 1:

If you can now see the cord and the knot where it is fixed to the pulley – you don't need to take any more apart.

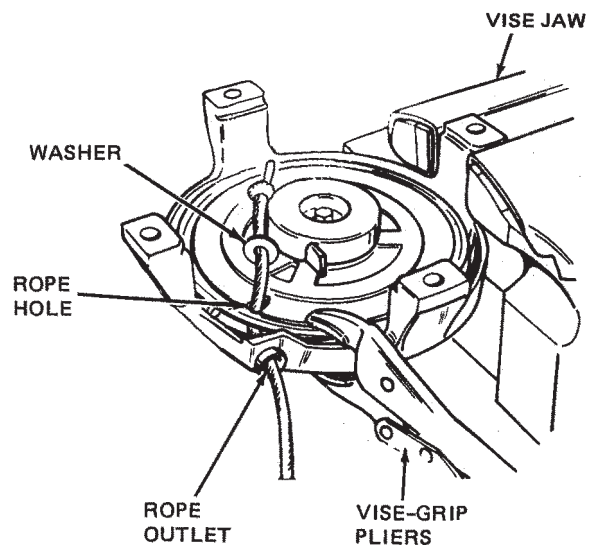


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### To replace a cord that is not broken:

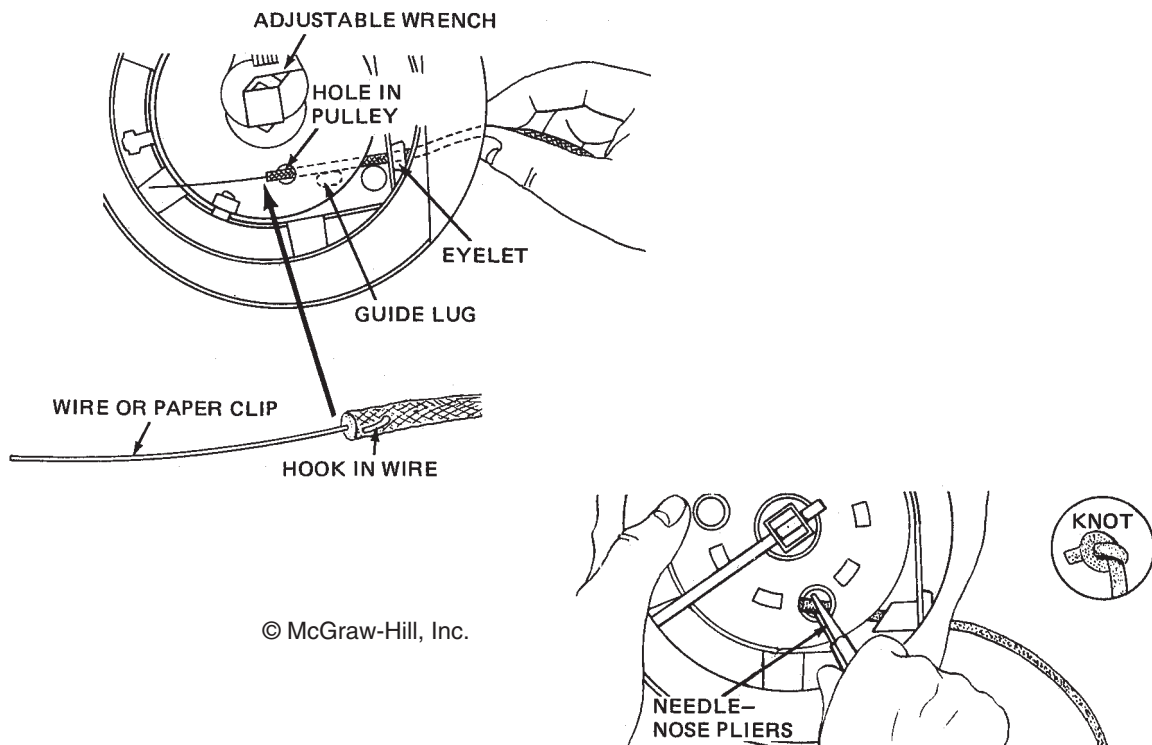
1. Pull the cord gently until it is all the way out – you will be pulling against the spring.
2. Get the knot-hole in the pulley as near as you can to the outlet hole in the casing.

Fix the pulley so that it can't move – the spring will be trying to rewind it!  
Use vice – grip pliers or a clamp.



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3. Undo the knot in one end of the cord and take the cord out of the casing and pulley. There might be a washer or other fixing round the cord. If there is – remember where it goes.
4. Thread a new cord through the casing outlet and pulley hole (and any washers). Use a piece of wire or small pliers to help pull the cord through.



**Remember**

The cord should be same size and length as the old one. Singe/melt the ends of the cord with a match or flame. It stops them fraying and can make it easier to get through the holes.

5. Tie knot in the cord and pull it into place on the pulley. Tie the other end to the handle.
6. Undo the clamp holding the pulley and let the spring pull the cord into the starter.

Pull the cord a few times to make all move easily.

7. Refit the starter assembly to the engine – make sure the pawls/clutch engage with the crankshaft or flywheel correctly. Check the starter works OK.

If you use the right length of cord, the handle should just pull tight to the outlet on the casing. You can adjust the know in the handle to take up 2-3cm slack in the cord. Any more spare or loose cord than that will mean the spring needs more tension – this is described later.

### To replace a broken cord

Take off the starter assembly as above. Remove all the old cord. Remember to take note of any washers and where they go.

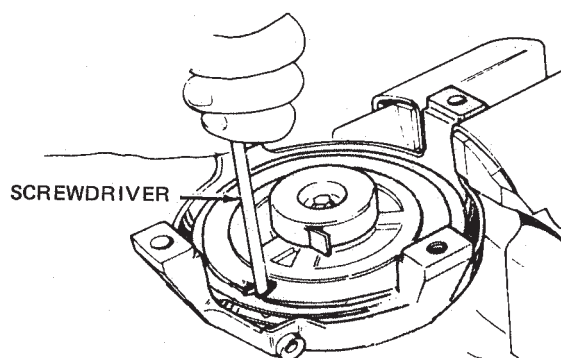
The spring will have lost its tension and needs to be rewound/tension.

### Re-tension the spring

On many starters, you can ‘wind’ the spring by turning the pulley with a wrench, or using a small screw-driver in the cord hole.

Turn the pulley until the spring is tight and then undo the pulley up to 1 turn until the cord holes in pulley and casing are in line. Clamp the pulley. It usually takes about 5-6 turns of the pulley to fully wind a spring.

Then carry on as from step 4 on page 6.



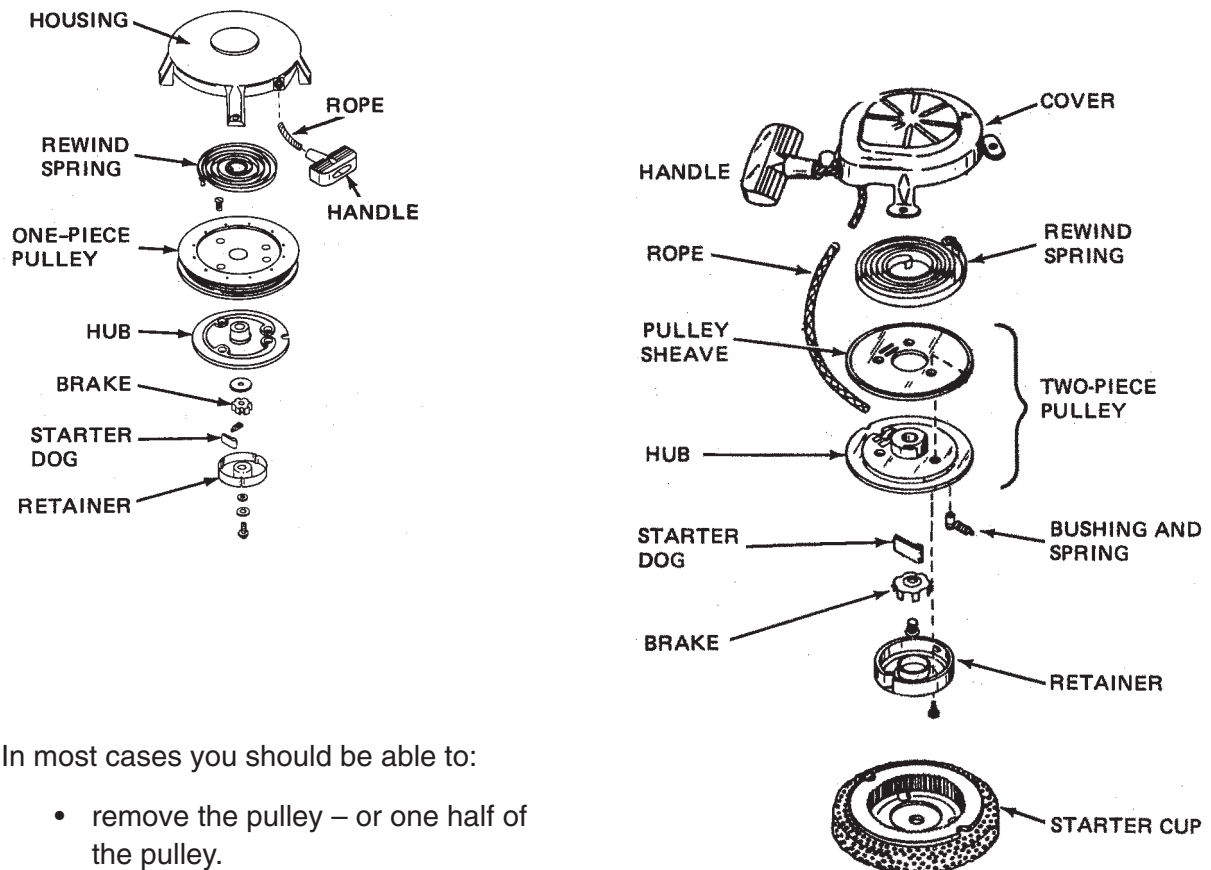
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## Example 2:

When you look at the starter assembly you have removed from the engine, if you cannot see the cord and knot where it is fixed to the pulley – you will need to take the starter apart.

If your cord has not broken, untie the handle and let the cord go into the starter. It is important that all tension is out of the spring.

There are many different designs of pulley and how the springs are attached to them:



In most cases you should be able to:

- remove the pulley – or one half of the pulley.
- Remove the old cord. Then tie on a new one and wind it around the pulley.
- Refit the pulley.
- Tension the spring as in example one. Clamp the pulley.
- Feed the cord end out through the casing outlet hole and tie on the handle.
- Unclamp the pulley.
- Refit the starter.

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# Outboard motor - emergency start

A broken starter cord – or starter mechanism – when you are out at sea can be a real emergency.

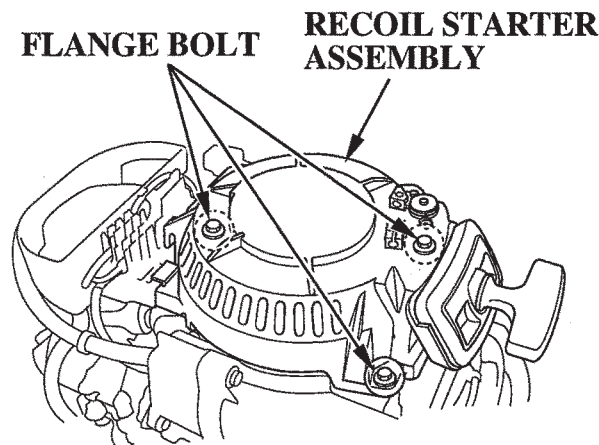
If this happens:

remove the engine top cover

unbolt the starter mechanism so that you can get at the flywheel

make sure the motor is in N neutral position (the no-start-in-gear device may not work with the engine cover and starter removed)

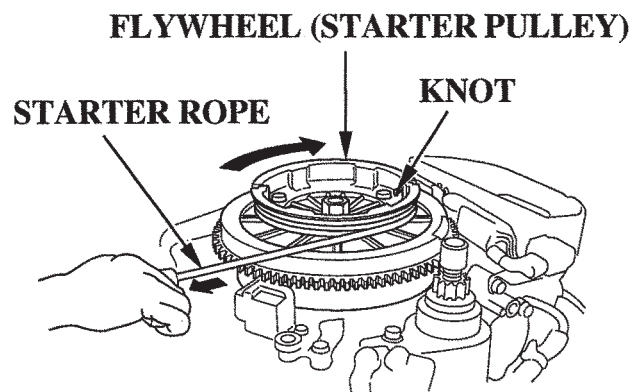
find the notch or slot in the rim of the flywheel.



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Use your spare or emergency starter cord, tie a large knot in one end.

Put the knot into the flywheel notch, wind the cord clockwise around the flywheel for two turns (clockwise – means going from left to right on the side furthest away from you. There may be an arrow on the flywheel to show you.)



Pull the cord to start the engine.

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Whenever you go out, always make sure you have with you a **spare cord** and **the right tools** to take off the casing and starter assembly.

**Warning**

With the covers and starter removed there are lots of exposed moving and electrical parts. Keep your hands, hair, tools and clothing out of the way when starting and running an engine this way.

Once you have the engine running, *do not* try to refit the starter – this could be very dangerous. Refit the engine cover if you can do so safely.

**Activity – starters**

**Find out and write down**

What type of starter does your engine have?

**Things to do:**

- ✓ replace your starter cord
  
- ✓ re-tension your recoil spring
  
- ✓ **Outboards:** Start your outboard with an emergency start

