Small Pulley Frame overview

Note that at the time of writing, 21st October 2026, the small pulley frame hasn't been installed, and it is assumed that there are currently no plans to install it.

The pulleys are motorcycle front wheels, mounted on 12mm shafts, and using the original bearings fitted in the bike wheels. The pulleys are held onto the shaft with circlips, and can be removed if necessary.

Rotary movement is provided by three automotive windscreen wiper motors. These have small drive pulleys mounted on 12mm shafts, and drive the bike wheels via polyurethane belts.

The 12mm shafts have been fitted to the motors by drilling and tapping an M8 internal thread, and also creating a taper using a conical drill. The conical profile allows the shaft to interface with the sloped shoulder on the wiper motor. There is also a 2mm roll pin hammered in place to make sure the shaft remains connected. The other end of the shaft has been secured to the aluminium drive pulley using a larger roll pin hammered in place. The roll pins can be removed with a parallel pin punch if / when necessary.

Note that the motors need the plastic collars to electrically insulate them from the frame, as the motor casings are connected to 0V. This is necessary so that the polarity can be swapped to reverse the motors, and so that different motors can travel in different directions at the same time.

The motors are driven by BTS7960 motor drivers, which allow PWM speed ramping. Ramping the speed will make the motors and other mechanical parts last longer.

No calibration / limit switches required for this item.

Maintenance

If any belts need replacing, 6mm polyurethane belt can be joined by heating up the ends on a large soldering iron tip. The melted ends are then slid off the tip and pressed together.

The motors will eventually need replacing when they wear out. They are very commonly available, with a universal bolt fixing pattern. Replacement motors will need a 2mm hole drilled in the shaft to match the drive shaft, so that a pin can be re-inserted. Omission of the pin will cause the shaft to unscrew.

After 5 years, check the bearings. Add oil via the grease nipples if necessary.

Rotary switch modes

Not applicable.

Things to watch out for

Install out of reach of the public. This item will need a cover if installed at ground level.

Allow clearance between the lowest pulley and the ground, so that it can rotate freely.

Troubleshooting

Check fuses. Note that if a fuse has blown, something caused it to blow, and so replacing the fuse is not necessarily the solution to the issue.

If a motor is running but not the corresponding pulley/s, check belt tension.

An LED and 1K resistor can be used to check the PWM outputs. The LED brightness should fade up and down. Try reversing the LED polarity if it doesn't light up, as the LED has to match the motor direction.

Notable components

Generic 12V automotive windscreen wiper motors (type with 3 bolts)
Generic BTS7960 PWM motor drivers
Generic 6mm PU belt
5A automotive fuses

Colours

Pulleys: 1K cellulose RAL Capri Blue 5019
Aging details on pulleys: 1K cellulose generic satin black
Steel frame: 1K cellulose generic satin black