Fix-It-Kit
DIY Wheelchair Maintenance

GOAT - Grassroots Open Assistive Tech

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The GOAT Fix-it-Kit

Your walker, rollator, wheelchair, scooter, or powerchair will work better, and last longer, with regular maintenance. This free custom kit and guide from GOAT can help you keep your gear in good shape!

You can also be ready for some basic emergency repairs.

And finally, regular attention to your mobility devices, and what you learn here, may give you good ideas for do-it-yourself improvements to your own devices. Customize your wheelchair or walker, to make it fit your needs!

Useful Information

If your device breaks, you can be prepared to fix it, get new parts, or replace it, with the information you record here. This info will be useful for you to communicate with whoever made the device, or with an organization that may help you repair it.

Write down information about your gear on these pages!

What is it? Wheelchair, walker, scooter, powerchair, rollator?

Make & Model _____

Serial number(s) _____

Manufacturer, vendor_____

Year made _____Year you got it _____ New or Used?

Phone numbers for support _____

Dimensions _____

Bolts & screws _____

Wheel size(s)_____

Tires _____Air or Solid? Tire Pressure____

Fuses _____

Battery type_____ Watt Hours (Wh) _____

Charger details _____

Other _____

You also can search online for service manuals and spare parts for your particular gear. And, by figuring out details like the sizes of bolts and fasteners that hold your device together, you can decide on the exact tools that will come in handy to do maintenance.

Tools checklist

The free fix-it-kit from GOAT has some basics for you to attach to your mobility device or carry with you every day. You may want to add to it! Or replace these tools with ones that fit your needs.

You will have to figure out what size bolts or screws are used in your gear. See the “Fasteners” section of this zine for more info! Label loose hex keys or sockets with tape and a permanent marker.

At home, you might develop a bigger toolbox for more complicated repairs or maintenance. You can keep full socket wrench and hex key sets, a battery tester, cleaning supplies, machine oil or grease, in a larger toolkit.

Basic kit

- ▫ Philips screwdriver
- ▫ Adjustable/crescent wrench
- ▫ Allen wrench/hex keys
- ▫ Bolts, washers, nuts, screws
- ▫ Gaffer tape or duct tape
- ▫ Velcro “one-wrap” straps
- ▫ Cable ties, rubber bands
- ▫ Reflective stickers
- ▫ Cleaning cloth
- ▫ Pen or pencil, permanent marker
- ▫ This booklet!

Extra tools

- ▫ Tracker tag like Tile or AirTag
- ▫ Mini air pump, tire patch kit
- ▫ Mini socket wrench set
- ▫ T-handle for wrench/screwdrivers
- ▫ Ruler, tape measure, or calipers
- ▫ Voltmeter or battery tester
- ▫ Cleaning rags, sponge, toothbrush
- ▫ Oil, such as Tri-Flow grease
- ▫ Flashlight, whistle, pepper spray
- ▫ _____

Inspect your device

Take time every week to get out your repair kit, extra tools, and cleaning supplies, and then inspect at all the parts of your mobility gear.

Here's a basic checklist you can customize and use in your maintenance routine!

This regular attention can make your gear last longer. It might also help to prevent emergency breakdowns!

- ▫ Check fasteners like screws and bolts
- ▫ Check folding parts to make sure they work smoothly
- ▫ Check cushions, backrests, headrests, and accessories
- ▫ Check reflectors and lights
- ▫ Check brakes for manual chair or rollator
- ▫ Footrests, fenders, and bumpers
- ▫ Charger works and cables are in good condition
- ▫ Check battery life with a voltmeter - is it time to replace it?
- ▫ Check your Fix-it-Kit tools and materials!

Wheels:

- ☐ Check tire pressure
- ☐ Clean out hair and dirt from the casters and wheels
- ☐ Front and rear wheels spin true
- ☐ Forks spin well (for manual chair front casters)
- ☐ Check push rims for sharp edges
- ☐ _____
- ☐ _____

The next few pages of this booklet will outline cleaning and small maintenance tasks. Basically, you can inspect, then do a wipe down and check that all your bolts are tight, tires inflated, and everything in good working order

Clean it!

Clean your mobility device regularly to keep it in good condition. Spray cleaner and a rag or sponge, a toothbrush to scrub in tight places, and another rag or towel to dry, should work well.

Launder: If you have a seat cushion, it may have a removable cover which you can take off and hand-wash in a sink. Let it air dry and put it back on the cushion.

Velcro: Clean out the junk that collects in velcro with your fingernails, a comb, or a pin. This will extend the life of the velcro.

Disassemble and reassemble. If your gear folds, or comes apart, check that the mechanisms are working and clean them out if they need it.

Wheels, especially front casters, love to pick up hair and lint in the axles. You can get the worst of it out by hand but to really get it clean and running smoothly you should learn to take the wheels off.

Cleaning checklist

- ☐ Wipe down
- ☐ Disassemble or fold
- ☐ Clean in the corners with a brush
- ☐ Clean seat cover or other fabric
- ☐ Main wheels and axles
- ☐ Casters and tilt wheels
- ☐ _____
- ☐ _____

Fasteners: Keep it together!

Manual wheelchairs, powerchairs, walkers, rollators, and scooters usually have a combination of different bolts and screws that hold their parts together. Learn what your device needs and have spare parts on hand.

You can take your device in to a hardware store and ask someone to help you match all the sizes for the bolts, nuts, washers, etc it contains! Then buy a few of each. Label them in small bags or envelopes.

Bolts and tools to fasten them come in either metric or standard sizes. For example, my manual chair has 4mm, 6mm, and 8mm metric bolt sockets for parts of the frame and forks, but the brake assembly uses “standard” bolts with ¼ inch sockets. The numbers above describe the diameter of the bolt’s shaft. There will also be another number that measures the length of the shaft!

The tools you need to fasten or unfasten bolts vary based on the shape of the head of the bolt. You may have hex bolts, with 6 sides, so you need an adjustable wrench or a socket wrench of the correct size to turn it. Or you may have a hexagonal (6 sided) socket or hole in the bolt, which needs a hex key (also called an allen wrench) to turn it.

You may need a second tool to keep a nut steady while you turn the head of the bolt going into it. Another adjustable wrench, or small pliers, are useful for this.

Tips for taking things apart

If you are taking out bolts or screws, take photos first! Make note of what goes where. Are there washers, spacers, lock nuts, or other little doohickeys that must go in a certain order? It's so important to take a photo before you take something apart, and more photos during the process. That will help you remember how to put it back together.

It helps to have a small box, tray, or a magnet to keep these little parts safe while you work on your device. Taping the bolts to a piece of paper in the order they go in, and writing down where they go, is another way to keep everything organized.

If you find a service manual for your device, look for an "exploded diagram" that shows how all the parts fit together.

Attachments and hacks

You may have things attached to your gear, like lights, bags, or cup holders. Check them too, and fix them up when they need it.

For cheap repairs and attaching stuff to other stuff, we have so many options!

Tape is great, but you need to renew it now and then.

Gaffer tape, with fabric built into it, is expensive but very tough and flexible.

Duct tape can be cheaper, and fairly durable, but tears more easily than gaffer tape when it's under stress.

Cable ties are tougher than tape, are very cheap, and easy to use to strap things onto the frame of a mobility device.

Velcro straps and "one-wrap" are another affordable, durable option.

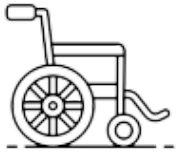
Super glue or epoxy may save a broken plastic part you can't replace. "Sugru" is a moldable plastic that's expensive but useful for small repairs.

Foam or other padding, wrapped with tape, can be a powerful way to repair or modify your device. For example, adding foam pieces to a foot rest with zip ties and strong tape can last for many months.

Fabric skills are super useful - sewing, upholstery, leatherwork, and so on. Wheel covers, silicone, plasti-dip, bike handle grip tape, are also useful things you can find in auto, bike, or hardware stores!

A lot of ***bike and motorcycle accessories*** fit on wheelchair frame tubing. For Permobil and other powerchairs, check online sellers like Etsy for accessories that will attach under the chair arm or over the joystick assembly.

3D printers can quickly make small parts from free, downloadable files online from sites like Printables or Thingiverse.



Wheel maintenance

Wheel maintenance can be complicated!

Learn how to remove your wheels to maintain and clean them.

Maintain your tire pressure regularly with a bike pump.

Grease - For wheel axles, Triflow works well. Don’t use WD-40!

Bearings on manual chairs are inside the forks, front casters, and rear wheel hubs. It’s possible to replace the bearings rather than replacing the entire part. Try a bike or skateboard shop for help!

Spokes on manual chairs can get bent or lose their proper tension. Bike collectives or bike repair shops may be able to teach the basics of spoke tightening. Don’t overtighten your spokes!

Learning more: You can look up videos and online info for your specific model of chair and wheel. And for in person help, a repair tech for wheelchairs or a bike repair shop tech should be able to help you learn to maintain your wheels.

Brakes

Manual chairs and rollators usually have hand brakes.

Study how they are attached to the frame to figure out how they work.

Check the angle at which the brakes are hitting the wheel rims

Loosen bolts, adjust brakes to hit correctly, re-tighten bolts

Check the brake pads for wear

Because some kinds of hand brakes are similar to the brakes on bicycles, you may be able to get help learning about brake maintenance and repair from a bike shop!

Resources

For help with your mobility gear, here are some ideas for resources.

Independent Living Centers

Senior or Disabled Services on the U.S. county level

Assistive Tech lending libraries (usually these are state-run)

Repair and reuse organizations

University or community college engineering and design departments

Maker spaces, community workshops, fabrication labs

Auto, Bike, and motorcycle repair shop

Churches (for donated / free chairs)

Bicycle shops and community bike collectives or other organizations may be very helpful. They may have members or employees willing to teach you useful skills, let you use tools, or fix your gear for a reduced rate or for free.

Auto body or motorcycle shops, maker and hacker spaces, and fabrication shops or labs may also have resources or friendly communities. Auto upholstery shops are a fairly affordable way to add durable, weatherproof cushioning to a device.

In the San Francisco Bay Area, the Independent Living Center San Francisco and the Center for Independent Living in Berkeley both have free assistive and mobility tech repair programs. Silicon Valley Independent Living Center may also be helpful!

Easy Does It, in the East Bay, has a 24 hour emergency road repair and rescue service.

Free wheelchair repair in SF via ILRCSF: call or text Vincent Lopez, (415) 609-2555. Working hours only. (Not 24/7)

Bike Kitchen: https://bikekitchen.org. 650 Florida St. Suite H, SF. A friendly bike repair collective with evening hours.

CIL assistive tech/repair (East Bay): Repair help and coordination, AT lending library, many other resources

Bike collectives in the East Bay: Spokeland, Biketopia, Missing Link, and many more!

Right to Repair

Across the world, people are working to make repairability, and maintainability, the default for things we use in our daily lives. For example, cell phones should not be built to break and be thrown away in a year or two. It should be possible to change their batteries, repair their screens, and fix other common problems to extend the life of the phone. We not only want to have the right to fix our own devices, we want repair shops to exist and be affordable.

Several U.S. States have “right to repair” laws in place, especially for electronics. And more legislation is underway. Check out ***https://fighttorepair.org*** or ***repair.org*** for more info on this movement!

In California, there are two laws in effect for this. The Right to Repair Act of July 1, 2024 covers electronic devices made, sold, or used in California after July 1, 2021, and the device cost more than $50. Companies are required to provide (for sale or free) repair materials - documentation, parts, and tools - for 3-7 years.

The second California law went into effect Jan 1, 2025. It adds more details about power wheelchairs. Previously, wheelchair manufacturers allowed only official repairers they authorized to service a device. Now, “unauthorized” repairers - including the owner of the device - can do repairs. The manufacturers are required to provide service manuals, diagnostic tools, and parts. They can charge for parts.

How does this affect you? Well, you can ask the vendor or manufacturer of your device for replacement parts. If they don’t sell them, they are required to make them available to you for free.

If this doesn’t work, you can file a complaint. There is a great guide to filing complaints here on ***repair.org***:

https://www.repair.org/know-your-rights

If you are working with a repair tech on your powerchair, let them know about SB 244, and they may be able to help you talk with your chair’s manufacturer!

About GOAT

Grassroots Open Assistive Tech's purpose is to document, curate, preserve, make accessible, and freely share
assistive technology designs and information under open licenses, as well as providing coordination and education to affiliated communities.

We support disabled inventors and others in making their designs and builds available for public good, and in having free designs, maintenance, diagnostic, and repair information available to them for their own use. Our vision is for a thriving ecosystem or marketplace for building, repair, and reuse of assistive tech.

Events and outreach

We host workshops, hackathons, reverse engineering meetups, and other events with local nonprofits. We also give out free repair kits and tools. And, we work to connect people locally with free or low cost mobility gear, and to keep it working!

Connections

GOAT is working to connect open source, open hardware, copyleft movements and organizations with disability rights and justice movements & communities, and vice versa! We also are writing up a series of interviews with other nonprofits and people creating free, open, or DIY assistive tech.

Archiving

Our GOAT librarian crew is digitizing and preserving DIY information. We catalog the paper material, add tags and other useful info, scan and digitize complete texts, and upload them to the Internet Archive, available for anyone to read, for free.

Some of the DIY assistive tech designs we are digitizing are low tech, low cost, maybe made from wood, bamboo, PVC, or other materials that a handy person can assemble with a few tools. Other designs are simple switches made with basic electronics and everyday household objects. Find out more on ***openassistivetech.org***!

Please support our work and donate to GOAT!