

tinyCylon

Assembly Instructions

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Read these instructions all the way through at least once.

Introduction

How to go from this...



Photo 1. tinyCylon kit

... to this!



Photo 2. tinyCylon assembled

Let's get started building your very own tinyCylon!

Quick Start Guide

Impatient? In a hurry? If you've got the skills, here's the short version:

1. Dump parts on table; make sure everything is there (see Photo 3).
2. Install parts according to height, shortest parts first.
3. Observe polarity: Square pad is pin 1 or positive.
4. Use the extra holes near battery connection as strain relief for battery wires.

Detailed Assembly Guide

If you'd like some more help on how to successfully build your tinyCylon, you're in luck! I have arranged the steps in this order:

1. Make sure you have all the parts that are supposed to come with the kit (see Photo 3).
2. Collect the tools that you will need to build the tinyCylon.
3. Install the resistor. Solder and trim the leads.
4. Install the push button. Solder and trim the leads.
5. Install the computer chip. I've included some important notes about the right way to do this.
6. Install the LEDs. They only work when installed the right way. I'll show you how.
7. Attach the battery holder.
8. Put some batteries in the battery holder.

That's all there is to it! Each of the steps is described in detail. Good luck!

Let me know if you have any questions, suggestions or comments about these instructions.

Step 1 – Parts Check

Open the tinyCylon kit carefully. There are several small parts that would like to play hide & seek with you if you're not careful. Make sure you have all the parts you see in Photo 3.

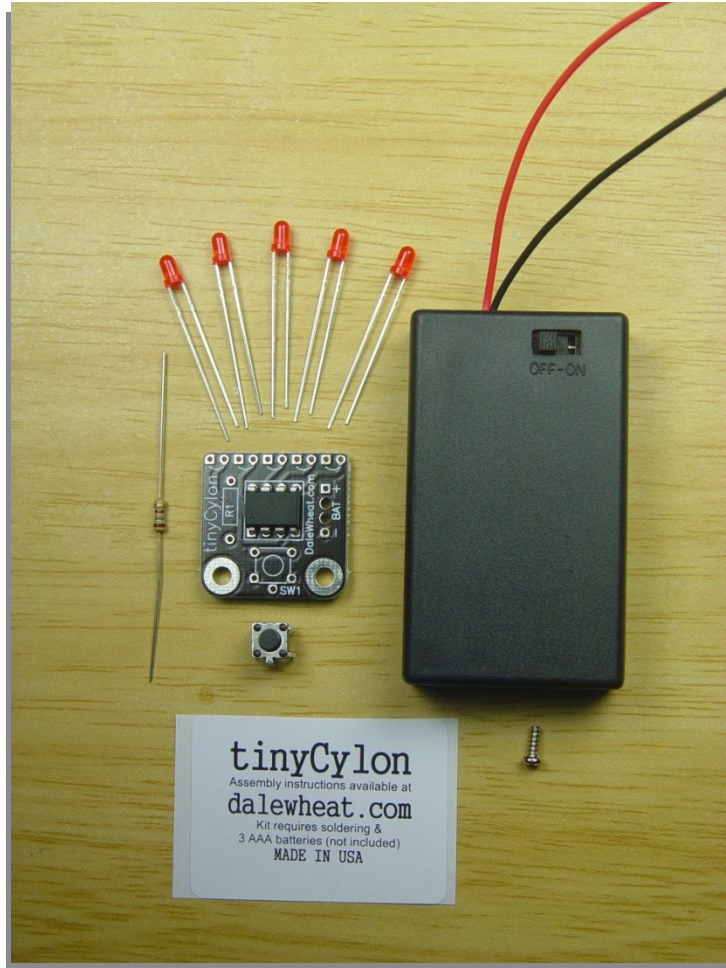


Photo 3. The contents of the tinyCylon kit

Here is the list of all the parts that come with the tinyCylon kit:

1. Five red LEDs
2. Battery holder for 3 × AAA cells
3. Teeny tiny screw for holding battery holder cover in place
4. Push button for selecting display modes
5. Resistor
6. tinyCylon label
7. tinyCylon printed circuit board (PCB) with computer chip inserted

Since this is an open source project, it's entirely possible that your kit might have different parts. It all depends on where you got your kit and more importantly, where *they* got their kits.

Step 2 – Tool Check

Collect the tools that you will need to assemble the tinyCylon:

- Soldering iron
- Solder
- Wire cutters
- Small Phillips screw driver (maybe)

Step 3 – Install the Resistor

Find the resistor. It is one of the smaller parts included in the kit. Hold the resistor between two fingers and bend the leads down with your other hand. Look at the PCB and find the place where the resistor is supposed to go, which is marked on the PCB as "R1". Install the leads into the holes in the PCB and push the resistor all the way down until it is lying right on top of the PCB. There is no right or wrong way to install it. It will work either way. In fact, since this part is symmetrical, you can even install it on either side of the PCB and it will still work correctly.

Once the resistor is installed flat on the PCB, bend the leads out a little so that the resistor does not accidentally fall out when flipped over, because that's what we're going to do next. Now turn the PCB over and solder one of the leads to the PCB. Now go back and look at the resistor and make sure it is still lying flat against the PCB. Solder the other lead of the resistor to the PCB. After the solder connections have cooled, use the wire cutters to clip the extra leads sticking out into the air. Do not cut into the actual solder connection.

Step 4 – Install the Push Button

Important Note: Your tinyCylon kit may have one of two different kinds of push button switches. One kind has 4 pins (or "legs") and the other kind has 5 pins. They both fit in the space provided. They both work exactly the same in the circuit. Either one will work.

Look at the PCB and find the spot where the push button wants to live. The push button's location is marked "SW1". Look at the push buttons legs and see how they match up with the holes in the PCB. There is only one way that it fits. The push button should snap into the PCB and hold itself there because it has slightly curved pins. It can be a very snug fit so you may have to press hard to get it to snap into place.

Note: Don't let your thumb be a pin-cushion for the pins as they pop through the board! Hold the PCB by the edges when pushing the button into the holes.

The push button, like the resistor, is a symmetrical device and has no polarity. This means that you can install it on either side of the PCB and it will work just fine.

Make sure all the legs of the push button are properly installed through their holes and that the bottom of the push button is laying flat against the PCB. Turn the PCB upside down again and solder the five (5) pins of the push button to the PCB. Once the solder connections have cooled, clip the extra part of the pins that stick out the back of the PCB. Do not cut into the actual solder connection.

Step 5 – Install the Computer Chip

Important Note: Do not handle the computer chip until you are ready to assemble your tinyCylon. It can be damaged by static electricity.

The tinyCylon computer chip really is a computer! It's got everything it needs inside one integrated circuit (IC). If your tinyCylon kit came with the IC already inserted into the PCB, you can skip the next section and just go ahead and solder it in. It is already installed the right way. If not...

Here comes the only tricky part. As stated previously, the computer brain of the tinyCylon comes in a small package called an integrated circuit (IC). The IC is mostly symmetrical and it is possible to install it backwards. It will not work at all if it is installed backwards, so there are extra clues printed on the PCB to show you the right way to install the IC. The IC has eight (8) legs or pins. The main clue is the location of "Pin 1", which is on one corner of the IC. There is a small triangle printed on the top of the IC right next to Pin 1. There is also a small circle-shaped dent molded into the plastic body of the IC as well. Pin 1 on the PCB has a square shape and all the other pins are round. There is also a square white box drawn around Pin 1 on the PCB. Double check the orientation of the chip before soldering it to the PCB. If in doubt, ask someone else to double check for you.

Important: The computer chip must be installed on the front side of the PCB, where all the printed part outlines are. It will not work if installed on the back side. This is the only part that has to be installed in exactly one correct way.

You might have to bend the legs of the chip together just a little bit to get all the legs to line up with the holes on the PCB. Once you've installed the IC on the PCB, flip it over and verify that all the pins made it all the way through their holes and are sticking out the other side.

At this point the computer chip is correctly installed on the PCB. Solder two opposite corner pins and go back and look at the other side of the PCB and make sure that the chip is still lying flat on the PCB. Solder all the rest of the pins to the PCB. Once all the solder connections have cooled, clip off the ends of the IC legs that are poking out, but do not cut into the actual solder connection.

Step 6 – Install the LEDs

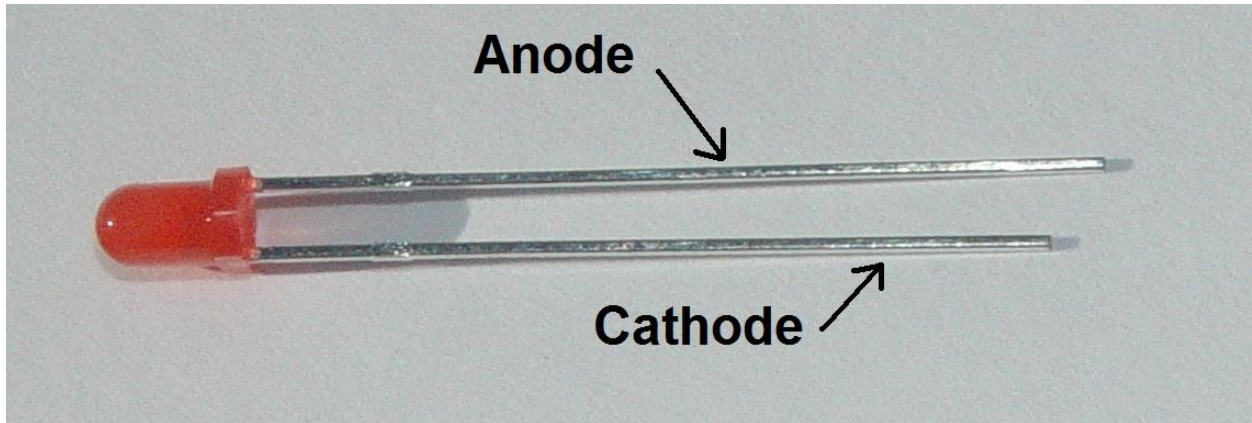


Photo 4. The LED is polarized and will only work if installed the right way. The longer lead is the anode (positive) and the shorter lead is the cathode (negative).

Find the five (5) LEDs and take a closer look at them (see Photo 4). Each LED has two long leads but one is a little longer than the other. This is important! The longer lead of each LED, called the "anode", goes in the hole in the PCB with the square shape. The shorter lead, called the "cathode", goes in the hole with the round shape. Now find the line of holes along the edge of the PCB where the LEDs are supposed to be installed. Notice that half of the holes have a round shape and the other half have a square shape. Like the IC, they only work right when they are installed the correct way. If you put them in backwards, they won't work right at all; not even a little bit.

As long as the long lead goes in the hole with the square pad, you can install the LEDs from the front or the back of the PCB. You can even have some LEDs on one side and the rest on the other. You don't even have to install all of the LEDs if you don't want to. The tinyCylon will work just fine either way.

To build the classic tinyCylon, put the long lead in the hole with the square shape and the short lead in the hole with the round shape and push the LED all the way down until it is sitting right on top of the PCB, with most of its leads sticking out the backside. Flip the PCB over and solder just one of the leads to the PCB. This will hold the LED in the PCB and let you flip the PCB back over and check that the LED is still lined up right correctly. If not, you can move the LED around until it is all lined up. Then go back and solder the other lead. Doing it this way is a lot easier than trying to solder both of the leads at once and then trying to go back and unsolder both leads so that you can adjust the position of the LED.

Once the solder connections have cooled, clip off the extra leads sticking out the back. Do not cut into the actual solder connection.

Install one LED at a time. This is a lot easier than trying to install all five (5) LEDs at once.

Remember: Long lead = Square hole!

Step 7 – Attach the Battery Holder

Find the battery holder and locate the red wire and the black wire. Now look at the PCB and find the holes that are labeled "BAT". There are four holes. The top hole is marked "+" and has a square shape. Right below that hole is another hole. Thread the red wire up through that other hole and then back down into the hole marked "+" with the square shape. Leave about a one or two inch loop in the wire. Solder the red wire to the PCB. Pull the excess wire from the loop through the hole.

Now take the black wire and thread it up through the other center hole and back down into the hole marked "-" with the round shape. Leave a one or two inch loop in the wire. Solder the black wire to the PCB. Pull the excess wire from the loop through the hole. Once the solder connections cool, clip off the extra leads that are sticking out. Do not cut into the actual solder connection.

The extra loop of wire through the other holes provides a little bit of strain relief for the battery holder wires. This will extend the life of your tinyCylon.

The teeny tiny screw that came with the kit belongs to the battery holder. It can be used to screw down the sliding cover of the battery holder so that it will not accidentally come off. You don't have to use it if you don't want to. The cover of the battery holder clips into place quite snugly and normally won't fall off all by itself. You will need a small Phillips screwdriver to install the screw. You will also need that same screwdriver any time that you want to change the batteries.

Step 8 – Install Batteries in the Battery Holder

Find 3 AAA batteries and install them in the battery holder. Use rechargeable batteries when possible. Pay attention to the polarity markings on the holder. Replace the cover on the battery holder. Turn on the power switch. Behold the mesmerizing evil of the tinyCylon!

OK, after you are done beholding the mesmerizing evil of the tinyCylon, try pushing the push button. This changes the operating mode of the tinyCylon and causes a different pattern to display. Keep pushing the button to cycle through all the available patterns.

The last "pattern" in the cycle is kind of boring: all LEDs off. Use this to turn the tinyCylon off when you can't get to the normal power switch. Technically, it is still "on" but it is using only a very tiny amount of battery power. Turn the power off with the switch when you are done.

Troubleshooting Guide

Symptom	Possible Causes	Suggested Remedy
Nothing happens at all	Dead batteries	Try new batteries.
	Batteries installed backwards	Double check battery polarity.
	Wrong size batteries	Use AAA size batteries unless you are using a different battery holder.
	Battery holder springs misbehaving	Roll batteries around in holder. Verify they are making contact.
	Battery holder wires connected backwards	Unsolder wires and connect them the right way.
	IC installed backwards	This can't happen. You double checked this, remember? Good luck unsoldering all eight pins without destroying the IC. It's possible, but unlikely.
Some LEDs work, some don't	Every LED installed backwards	Try unsoldering one LED and reinstalling it the right way. Test again. If this LED starts working, you will have to remove and re-install all the other LEDs the right way as well. Since the leads have now been trimmed you can't tell the anode from the cathode. Look for a flat side at the base of the LED. This is the cathode.
	Some LEDs installed correctly, some not	Try removing one of the misbehaving LEDs and installing it the right way. If that fixes the problem, repeat for the other non-working LEDs.
One LED is always on when any of the other LEDs are on	LED leads touching each other	Straighten out the leads so that none of them are touching.
	This LED is installed backwards.	Remove this LED and install it the right way.
Display is very dim	Non-rechargeable batteries	Replace with new batteries.
	Rechargeable batteries	Recharge the batteries.