

# tinyCylon

## Assembly Instructions

Let's get started building your very own tinyCylon! I would strongly suggest reading these instructions all the way through at least once before actually starting the build. It will probably take longer to read these instructions than it will to finish building the tinyCylon!

The tinyCylon was designed to be easy to assemble. If you run into any difficulty, take another look at the instructions or ask someone for help. Building the tinyCylon should be a fun activity!

### Quick Start Guide

If you are an experienced kit builder, here's all I need to tell you:

1. Install parts according to height, shortest first.
2. Observe polarity: Square pad is pin 1 or positive.
3. Use extra holes near battery connection as strain relief.

### Detailed Assembly Guide

If you'd like some more hints on how to successfully build the tinyCylon, I have arranged the steps like this:

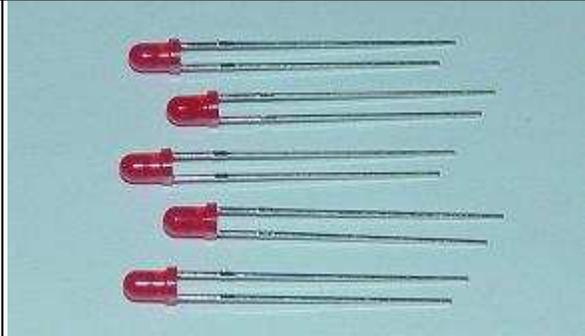
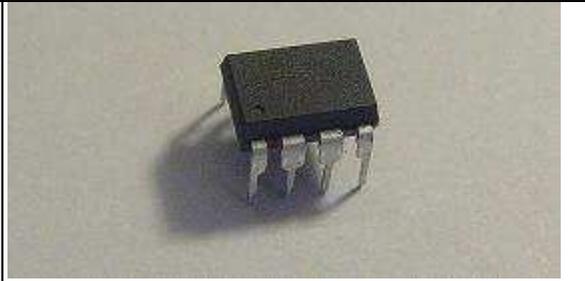
- Step 1 - Parts check: Make sure you have all the parts that come with the kit.
- Step 2 - Tool check: Collect the tools you will need to build the tinyCylon.
- Step 3 - Install the resistor, solder, trim the leads.
- Step 4 - Install the push button, solder, etc.
- Step 5 - Install the computer chip, with notes on determining the right way.
- Step 6 - Install the LEDs, with notes on polarity.
- Step 7 - Install the battery holder.
- Step 8 - Install batteries into battery holder.

That's all there is to it! Good luck!

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

# Step 1 - Parts check

Check the package for all required parts:

|  |  |  |
|--|--|--|
| 5 LEDs   |    |  |
| 1 battery holder                                     |    |  |
| 1 teeny tiny screw that goes with the battery holder |   |  |
| 1 push button  |  |  |
| 1 resistor   |  |  |
| 1 computer chip*                                     |  |  |

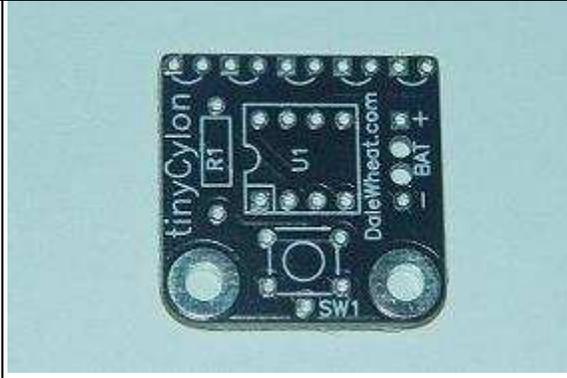
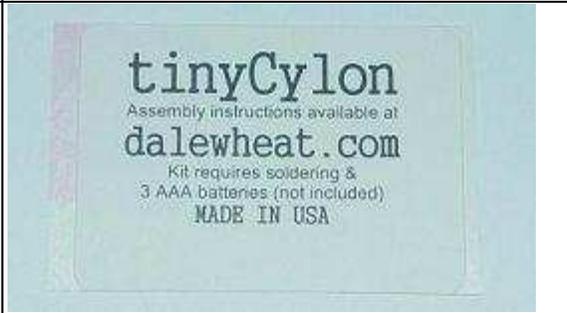
|                               |  |  |
|-------------------------------|--|--|
| 1 printed circuit board (PCB) |  |  |
| 1 tinyCylon sticker           |  |  |

Table 1. Parts List

\*The computer chip may already be inserted into the PCB:

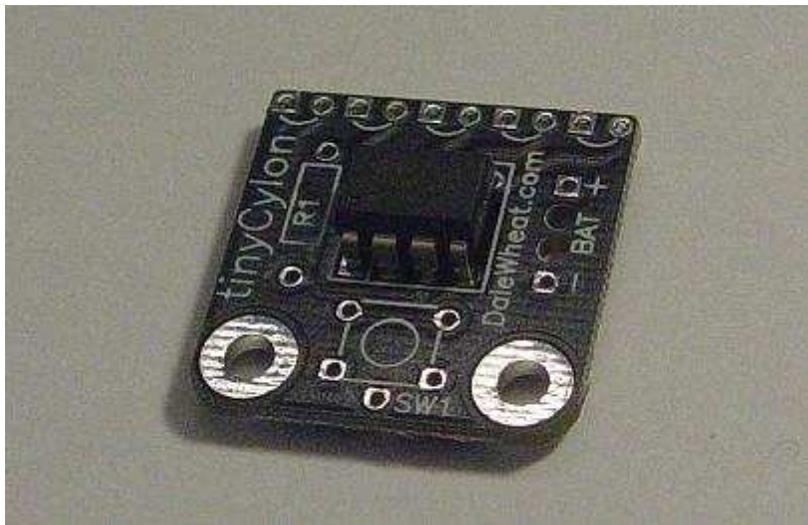


Photo 1. The computer chip might already be installed the right way on the PCB.

## Step 2 - Tool check

Collect the tools needed to assemble the tinyCylon:

- Soldering iron and some 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 laying right on top of the PCB. There is no right or wrong way to install it. It will work either way.

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. 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 laying flat against the PCB. Solder the other lead of the resistor 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

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 pushbutton 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.

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.

If your tinyCylon 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. 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.

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 laying 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, but do not cut into the actual solder connection.

## Step 6 - Install the LEDs

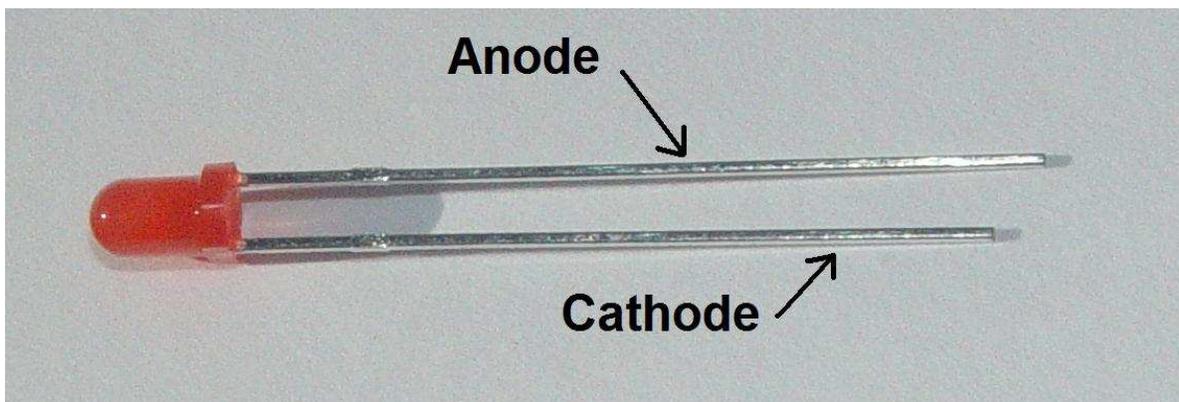


Photo 2. The LED is polarized and will only work right if installed the right way. The longer lead is the anode and the shorter lead is the cathode.

Find the five (5) LEDs and take a closer look at them. See Photo 2. Each one 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.

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. 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.

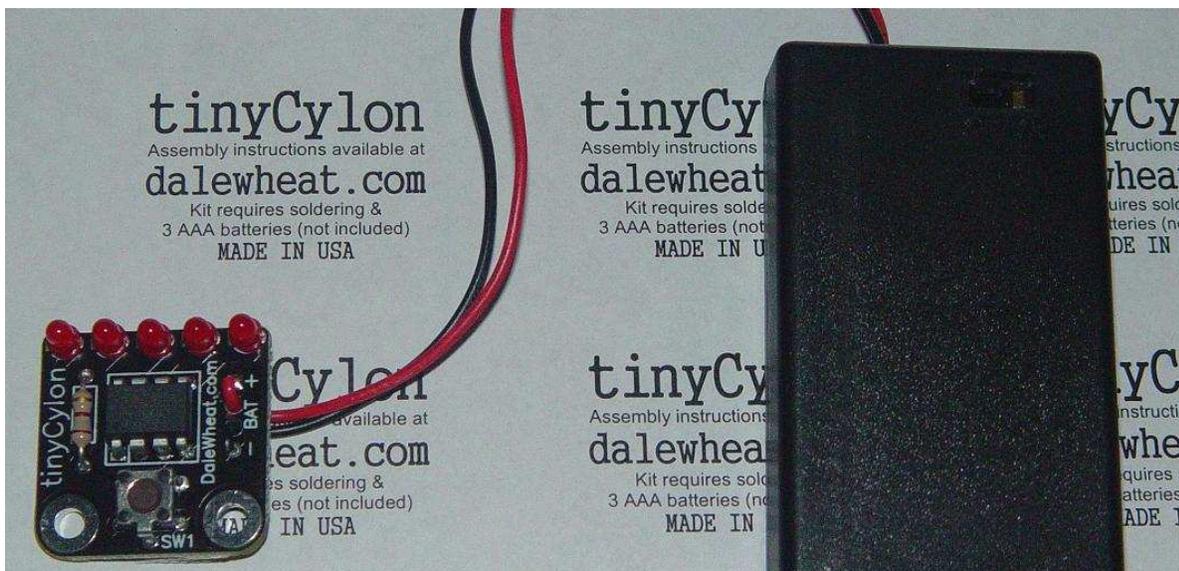


Photo 3. The assembled tinyCylon kit in the "classic" configuration, with all parts on one side. The battery holder is installed in the next step.

OK, that's how you make the classic tinyCylon, but that's not the only way that you can put it together. As long as you make sure to match up the long lead with the hole that has the square shape and the short lead with the hole that has the round shape, nobody says that you have to mount the LEDs flush with the PCB. You can leave them sticking out so that you can bend and

twist the LEDs into different shapes; just don't let the leads touch each other or it won't work right.

You can also mount the LEDs from either side of the PCB as long as the long-leg-square-hole rule is followed. The only component that can't be mounted on either side of the PCB is the computer chip. The chip must be installed on the side of the PCB with the drawing of the chip on it. The push button, the resistor and the battery holder leads can be installed correctly from either side. This flexibility lets you have all the LEDs on one side and all the other components on the other side.

## Step 7 - Install 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. Solder the red wire to the PCB.

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. Solder the black wire to the PCB. 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 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 the batteries

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                   | Can't happen. You double checked this, remember? Good luck unsoldering all eight (8) pins without destroying the IC. It's possible, but unlikely.  |
|  | 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 work, some don't                             | 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.  |
|  | LED leads touching each other            | Straighten out the leads so that none of them are touching.  |
| One LED is always on when any of the other LEDs are on | 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.  |