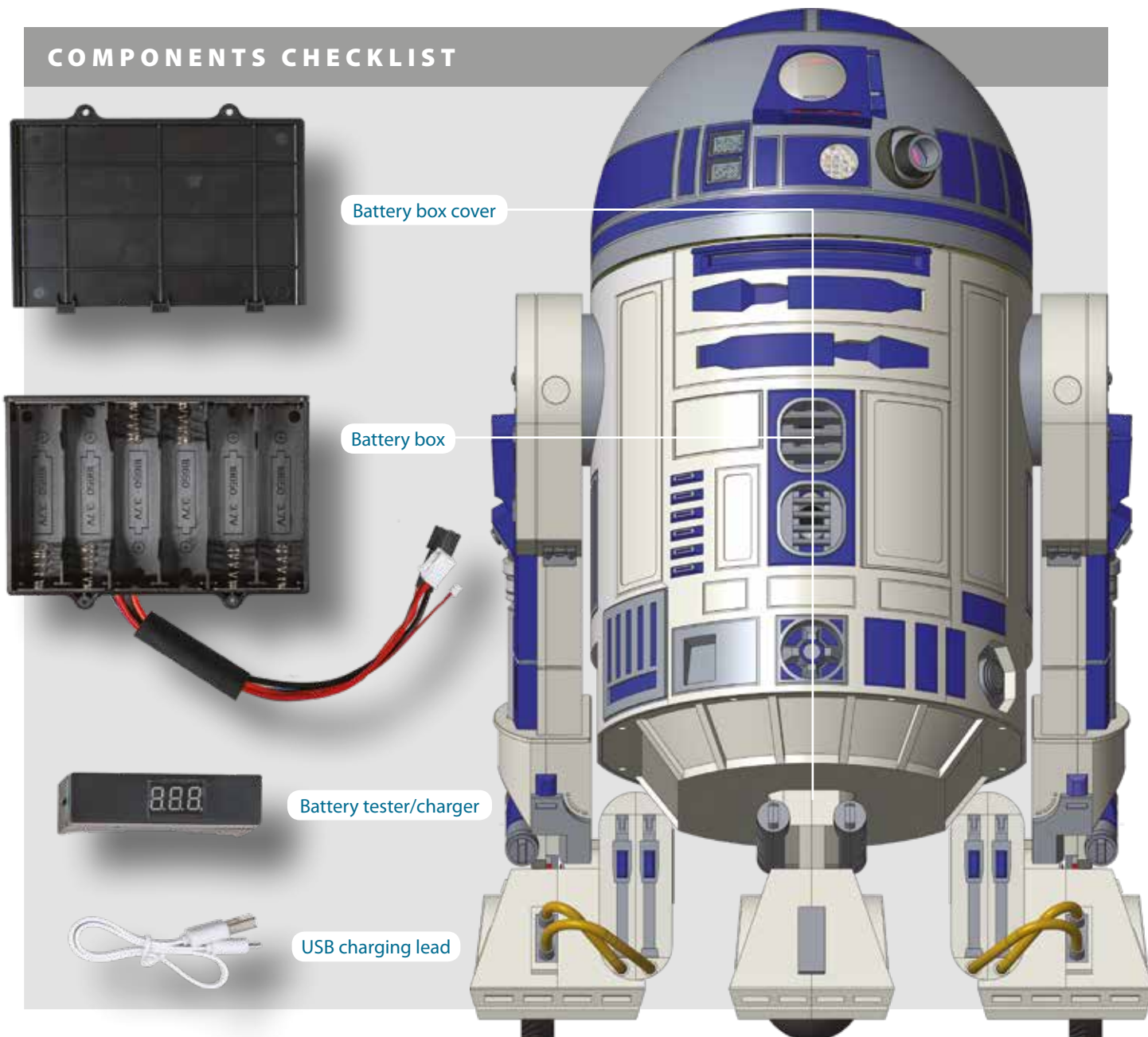


STAGE 92 PARTS

Battery box and charger

This issue's parts are used to set up R2-D2's power supply. He is powered by six rechargeable batteries (which must be bought separately) that you prepare using the tester/charger and USB lead provided. In order to ensure the maximum performance, the batteries must have the correct specification, and be installed as a matched set in the battery box.

COMPONENTS CHECKLIST



BUYING R2-D2'S BATTERIES: ESSENTIAL INFORMATION

Read this section very carefully before buying batteries for R2-D2.



'Button-top' batteries.



'Flat-top' batteries.

R2-D2 is designed to use rechargeable **18650 lithium ion (Li-ion) batteries**, installed in the battery box provided. You will need to buy six. This type of battery is made by many leading electronics companies – such as LG, Panasonic, Samsung or Sony – as well as less well-known brands. They are widely available online, and in some retail outlets. Popular uses include powering e-cigarettes, flashlights, digital devices, and even some e-cars, such as Tesla.

It is essential to note that the specification of 18650 batteries varies, so the ones you buy must match the points in the panel below.

Some 18650 batteries have **one end terminal raised** (like a regular battery), but others have both ends flat. As a safety measure, R2-D2's battery box is designed so that the button-top type with a raised terminal only make contact when they are fitted into the battery box the correct way round. Batteries with flat ends will not make contact and cannot be used in R2-D2.

It is quite common to find batteries that include internal protection circuitry. **Do not buy the type described as 'protected'**, as R2-D2 has his own protection circuit.

Make sure you buy batteries with a nominal voltage of 3.7V (it is rare to find ones that don't match this). But note that their capacity – in milliamp hours (mAh) – can vary; typically from 1250 to 3600mAh, or even more. You need batteries with a capacity of at least 2000mAh, but we recommend ones between **2600-2800mAh**. The higher the capacity, the longer R2-D2's standby/operating time, but the batteries will take longer to charge fully.

You may find batteries described as 'high drain'/'high discharge' (intended for use in high-power applications such as power tools or vaping devices). These are fine to use, so long as they are the right voltage (3.7V). R2-D2's battery box has protection circuitry that will ensure that the cells are only drained at the correct rate.

CHECKLIST: DO YOUR BATTERIES MEET ALL THESE SPECIFICATIONS?

- | | | | | |
|---|--|---|---|---|
| 1) Type:
18650 lithium ion | 2) Voltage:
3.7V (nominal)* | 3) Terminals:
Button top | 4) Protection:
No protection | 5) Capacity:
2600mAh** |
|---|--|---|---|---|

* The number 3.7V should appear on the battery itself somewhere. 'Nominal' means this is the average voltage: the maximum (charging) is 4.2V, but as the battery is used, the voltage will drop to the minimum, about 3.0V.

** This is an ideal capacity, but R2-D2 will work with a capacity of 2000mAh or over.

Be sure to buy six identical batteries, all at the same time, from the same batch. Read the manufacturer's safety instructions carefully before using them.

INSTALLATION AND CHARGING

It is very important to buy all six batteries at the same time, as a batch from one manufacturer with the same specification. This will ensure that they are all in the same starting condition. It is characteristic of lithium ion batteries that the one with the worst condition will determine the performance of the whole pack. If one of the six batteries is 'bad' (with a very low power level, or coming to the end of its recharge cycle), it has the potential to damage other 'good' cells, and even the protection circuitry.

To prevent this, the parts provided include a single-cell tester/charger that can be plugged into any USB outlet. This both charges and gives a readout of the condition of the

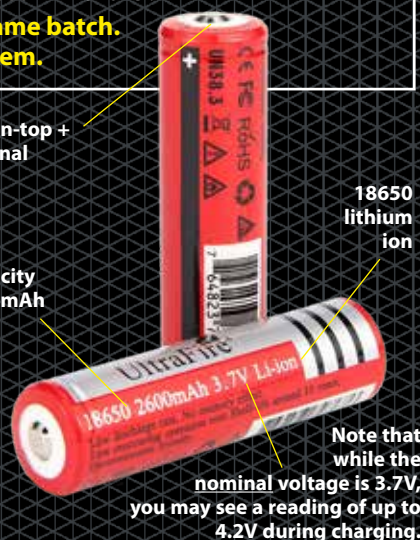
batteries. Using it to set up each of the six before they are put into the battery box will ensure that they are in optimum condition and maximise the performance of the whole battery pack. If you are unlucky enough to find any cells that do not match, do not use them in R2-D2, and be sure to dispose of them safely at a recycling centre.

Once you have carried out the initial testing/charging process, the battery pack can be recharged as a whole using R2-D2's external charging socket. There is no need for any further special maintenance. Keep the tester/charger safely in case you need to replace batteries in the future. If you do, you will need to use it to repeat the installation process with the replacement set.

Button-top + terminal

Capacity 2600mAh

18650 lithium ion



18650 BATTERIES are available cheaply through auction sites, but be wary of buying any described as 'used', 'job-lot', 'pre-owned', etc – or any that are not in their original packaging. We recommend that you shop at a reputable supplier, and only buy a recognised brand.

STAGE 92 ASSEMBLY

Preparing the batteries

As explained on page 13, it's vital to follow this procedure before fitting the battery box to R2-D2.



Carefully following the purchasing advice on the previous page, buy a batch of six suitable 18650 batteries.



Take the first battery and identify the raised positive (+) terminal.



Make sure that the tester/charger is not plugged in, so it will operate as a voltage reader. Fit the battery into the tester/charger this way round, matching up the + terminal markings.



You will see a readout of the battery condition. If a new cell shows a voltage of 3.3V or less (or 'LO'), the battery is highly likely to be 'bad' and should not be used.



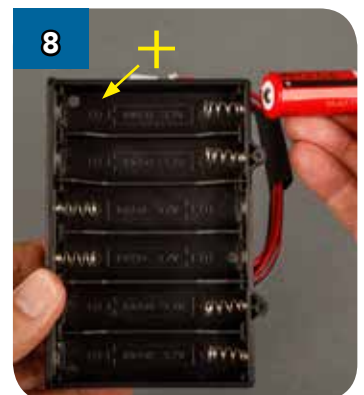
Plug the USB lead's small connector into the tester/charger and plug the other end into a suitable USB socket.



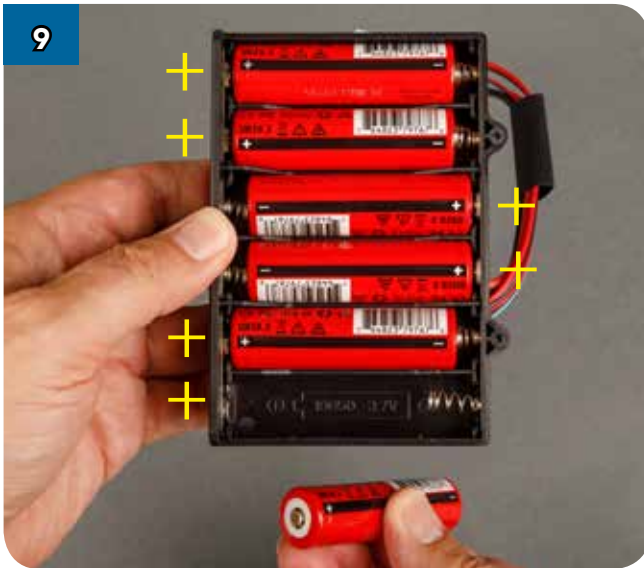
When the lead is plugged in, the last digit of the display will flash, indicating that charging has started.



Leave the charger plugged in until the readout changes to 'FUL' to indicate that the battery is fully charged. Unplug the charger and remove the battery. Please note: if the reading doesn't go up after 30 minutes or so, the battery is likely to be 'bad' and should be discarded.



Fit the battery into the battery box like this, noting which way round the positive (+) terminal goes.



Repeat Steps 3-8 for the other five batteries, noting that the batteries are fitted with their terminals in pairs as shown.



Slide the cover onto the battery box so the three arrowed tabs go into the matching slots.



Fix the cover with two 2.3 x 6mm self-tapping screws.



Now take the battery box cover and two 2.3 x 6mm self-tapping screws.



Press the cover firmly into place.

