



The Third Doctor's Sonic Screwdriver

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A prop maker discusses the problems of recreating props from movie and TV shows, and illustrates by taking us through the steps he followed to research and uncover the design of the Third Doctor's Sonic Screwdriver.

One area of costuming that I specialize in is prop-making. I have always been fascinated by the props and accessories that help bring costumes to life. If, as Mark Twain says, “clothes make the man” then, to tweak his conclusion, costumers without props have little or no influence on society.

I especially enjoy recreating props from movies and TV shows. One of the biggest challenges is to determine exactly what the prop looks like, its dimensions, and what materials and finishes will reproduce the original. However, recreating movie and TV show props doesn't start out with construction: it starts with research. Without good research, the prop maker has no way to know what to construct, and no guidance about the materials and techniques that were used to create the original that can provide guidance on how to make a reproduction.

For modern props, research is not hard. In many cases, the prop still exists and may be accessible when it appears in a traveling exhibit, like the ones for *Star Wars*, *Star Trek*, or *Lord of the Rings*. In some cases, people who have access to the prop or the plans used to make it may publish the information. Sometimes, the prop even comes up for auction. In other cases, a combination of techniques can be used, including measurements from high-quality photos of the original, and interviews with those who made it. It is often possible to make a close reproduction because so much information is available.

For older props, the situation is different. The prop often no longer exists because it was lost or stolen, the studio destroyed or discarded it, or it was heavily modified later and is no longer useful for reference. Often, there is also a lack of high-quality photos available, and those who want to reproduce a prop have to rely on “screen caps” and second-

Screen-cap of Third Doctor's sonic screwdriver from “The Sea Devils”.



hand sources like interviews with people who had access at one time, or toys makers who sold a version of the prop when the movie or TV show first came out that bears only a passing resemblance to the original.

The important thing to realize with older props is that no amount of research will lead to The Truth. Unless you stumble on the original during your research, any reproduction is only an approximation, and yours is no more or less valid than the next.

A case in point is the Third Doctor's Sonic Screwdriver from the *Doctor Who* series. The original version of this iconic prop was used by Jon Pertwee between 1970 and 1974, and also later by several other incarnations of the Doctor. While not as flashy as ones of later Doctors, its classic design and the fact that it was used for so long makes it attractive as a prop-making project. The fact that it is an older prop also allows me to illustrate some of the methods and also the pitfalls.

Research

One of the first things I do is determine whether the prop still exists and who owns it. This is a great help in locating images and determining whether the original is available to view. In this case, I looked for photos from the “Doctor Who Experience” exhibit currently in Cardiff Bay, Wales. [See the Short Subject on page 53 for details – Ed] The exhibit claims to include many original costumes and props from the show.

Photos from the exhibit (right) show sonic screwdrivers for both the Third, and the Fourth and Fifth Doctors. This is not good news, because most sources say that the Fourth and Fifth Doctor's prop is just a redress of the one used by Third Doctor. If that is so, there is no way both could appear in the exhibit. Consequently, at least one must be a later reproduction, or made especially for the exhibit. Still, they were probably reproduced using some kind of reference material, so I filed them away.

Next, I tried to locate who owns the two screwdrivers on exhibit or failing that, who was behind the props that appeared in the exhibit. After following a number of dead-ends, I finally stumbled a 26 April 2011 entry on the [PurpleBlancMange](#) blog that provided a wealth of information. It was written by a man who was not only involved in the props for an earlier *Doctor Who* exhibit, but is also in the industry, says that he handled the original, and had spoken to many of those involved with the show. The story is fascinating.



Sonic screwdrivers for the Third Doctor (above), and the Fourth and Fifth Doctors (below) from “Doctor Who Experience” exhibit. Both cannot be “original.”



The author of the blog was working on the 1992 *Doctor Who* exhibition with ex-BBC visual effects man Ian Scoones, when Ian told him the story of how the prop came to be in *Doctor Who*.

“He couldn’t recall exactly the year, but settled on the late 1960s, he’d got wind that Gerry Anderson’s Century 21 Studios were selling off all their props and models and thus he was invited to purchase some of the stuff. He jumped in a van and tootled over to the studios with his assistant Mat Irvine and loaded the van to capacity with loads of stuff – much of which would end up in *Doctor Who* in one shape or another. One particular prop would become the Doctor’s trusty Sonic Screwdriver.”

When asked at the opening reception for the exhibition how many screwdrivers there had been, producer John Nathan replied, “Just one.” This confirms the common wisdom that the Third, Fourth, and Fifth Doctors used the same prop. According to the blog's author,

“It’s clear that Sonic Pertwee had is the same that Davison had; on the central grip ring is a large gouge in evidence during “The Carnival of Monsters” – and it’s still in evidence during Davison’s tenure.”

Apparently, not only did Pertwee keep nicking it with his rings, but Tom Baker kept damaging the prop, usually by bending the emitter head, so it was always being bent back into shape. It was eventually refurbished, its paint touched up, and it was given a bit of a polish. According to the

blog's author, "the prop was made of metal, so naturally it'd be very durable and it's no wonder that it survived pretty much intact."

At that point, producer John Nathan let loose with a real shocker: "Remember the original was on my desk? Well someone waltzed in one day and nicked it!"

So not only do we have confirmation that the same prop was used by the Third, Fourth, and Fifth Doctors, we also know that it was refurbished at least once, that it was made of metal, and that the original was acquired from the Gerry Anderson Studios around 1960. Finally, we now know that it had been stolen from producer John Nathan's desk before 1992. Neither the props in the current exhibit is "original" and it is unlikely that there are any high-quality reference photos of it from *Doctor Who* for reference.

Is there any evidence of the original prop in a Gerry Anderson production that might be helpful? According to the blog's author, there is.

"Sometime later, a matter of months maybe, *Thunderbirds* had returned to our screens and was suddenly all the rage with children up and down the country. My brother came home with a bunch of episodes and some of the films on VCD and so we



Barrel of the "sonic screwdriver" was a regular screwdriver prop from *Thunderbirds are Go!*

watched them together over a few weekends. *Thunderbirds are Go!* was one of the films and to my amazement as we were watching, there for all to see was the Sonic Screwdriver in its original form – it was just a normal screwdriver being used by one of the *Thunderbirds* team to repair a doomed space ship." (above)

The next question is, whether this was a custom piece or something commercially available. There has been much speculation about whether it was some kind of medical device or something from a DIY store that Anderson's crew purchased.

According to the blog's author, he first asked *Thunderbirds are Go!* Director David Lane, who remembered the prop and said that they had it made by someone on staff whose job was to produce all the metal pieces for the show. The man who was in charge of the props and model department said that the prop man's name was Tony

Dunsterville. "He was given some pictures and some drawings and told to come up with a quick little prop based on these items." According to the blog's author, Dunsterville had passed away and his wife, who worked with him, was reluctant to talk about it.

So, according to reliable, named sources, the original screwdriver handle really was a hand-made, metal prop screwdriver used in *Thunderbirds are Go!* movie. No other information is likely to be available unless the prop itself or the pictures and drawings used to build it are found eventually.

The blog writer also notes:

"When Jon Pertwee inherits the prop as the Doctor's Sonic Screwdriver in 'The Sea Devils', it's been modified a little with pin striping tape, heat shrink and various other oddments to break up the bland silver mass of the piece (this being the early 1970s when designers used a rich and vibrant colour palette for almost everything), but the most notable addition is that of a bullet type affair with a ringed halo surround added to the top. It remains looking like this for just five stories, after that, all the adhesive material is removed, quite possibly due to it having started to peel off with handling in the course of making the episodes."



Sonic Screwdriver with and without pin striping tape, heat shrink, and other oddments.



At left are images of Pertwee holding the Third Doctor's sonic screwdriver with and without the added embellishments.

The community owes a debt of gratitude to PurpleBlancMange for sharing what he knows about this prop on his blog. Highly recommended.

Dimensioning

We now know everything we're likely to know about the prop, so it's time to start dimensioning it. Dimensioning is the process of drafting the replica prop and determining its original shape and size. For modern props that are still available, the franchise will often allow a toy or collectables company to scan the original. Unless there is some special change required (e.g. for electronics or mechanical integrity), measuring the replica prop can be a good substitute for directly measuring the original since it is much more available.

High-quality photos can also be useful for deriving the size and shape of the prop, and can provide a wealth of details from many different angles. Determining the shape and proportions from photos in fairly straight-forward. The trick when working with images is to identify a reliable *scale* for the prop so that it is not only the same shape but also the same size.

Dimensioning forward

The most common way to determine the scale in a set of photos of the prop is to identify *scale items* in the photos that will

enable you to determine the scale of the prop itself. I call this *dimensioning forward*.

If you are lucky enough to have a ruler in the photo, you can scale the photo from that, and then either print it and measure with a ruler, or use on-screen tools to determine dimensions. Otherwise, you will need to determine scale using a combination of scale items in the photo whose sizes are known or fall into a narrow range. To do this, pick one of the scale items and compute the scale based on it. Then repeat the process for other scale items in the photo.

You will eventually arrive at a scale that is in relatively good agreement for all the scale items in the photo. At this point, you have a working scale for the prop itself. Repeat this process for other photos and compare the prop scale derived from each. Give higher weight to scale items that are more reliable. For example, ruler or a coin are relatively reliable scale items, while a hand or finger is much less so unless you know a lot about the person in the photo. In general, use an “average” size of body parts for each gender unless you know otherwise.

Reconciling backward

Once you have scales for the prop from a collection of photos, they should fall within a narrow band, and you will need to determine the final scale from these. Remember, there is no Truth, only evidence and judgement. Just make sure that the scale you come up with is internally consistent with measurements from the photos.

To verify this requires going through a process that I call *reconciling backward*. Take your final scale, go back to each photo, and use the relative size of the prop to the scale items you used earlier to determine their sizes. They may not be what you came up at first, but make sure they all fall within a plausible range, taking into account that there is error inherent in any measurement.

If everything checks out, great! Otherwise, you'll need to go back through your scale item measurements and see where errors may have occurred, then repeat the process to come up with new working and final scales for the prop. Remember, you cannot eliminate all inconsistency: there lies madness. Decide how much inconsistency you're willing to live with, document your decision, and don't look back.

Sources of dimensioning error

There are several sources of errors to watch out for when dimensioning from a photo or screen image.

Precision errors: This is the error in the precision of your measurement device and scale. I recommend always using metric for measurements. Working with 1/16 or 1/32 inch measures is just not worth the headache and potential errors in calculating based on them. If you are using on-screen tools to measure an image, I recommend zooming in as far as practical to improve precision. If you measure a printout, always use a magnifying glass and good light at an angle that won't throw shadows.

Observation errors: These come from your eyes not being incident to the ruler and image. It can result from parallax between your two eyes, but even if you close one eye it is still difficult to eliminate this kind of error. I recommend repeating measurements of scale items frequently to verify previous ones, and average the measurements.

Image errors: This error is caused by problems with the image you are measuring. A common problem is that the prop is not incident to the image plane. If one end of the prop recedes from the camera, the image will be foreshortened. It is possible to roughly compensate for this by estimating the angle and extending the length accordingly. For example, if you estimate the angle to be 25 degrees, increase the measured length by around 10%. The greater the angle, the greater the error from inaccurately estimating the angle. You can also use this angle to adjust other measurements you make from the image. Another problem is a “fish-eye” effect from the camera being too close to the prop and distorting the image. I recommend not using images where the incident angle is too large, and avoiding fisheye images because it is so hard to compensate.

Example

I will show how this works in practice with the Third Doctor's Sonic Screwdriver. There are many replicas out there, but absent direct measurements from the original, their makers followed a very similar process.

Since there do not appear to be publicity photos that show the prop in any detail, I used several frame captures from episodes. This is not uncommon for props from TV shows of that era. The fact that the prop was used for so long gives us a better chance at finding ones with good scale items. I decided to use the *Thunderbirds are Go!* image shown earlier and several *Doctor Who* Pertwee screen caps. I also decided to use higher-resolution images of the prop for the Third Doctor from the “Doctor Who Experience” exhibit. I definitely treated those with some suspicion because so little is known about the prop on display, but it was useful for comparing shapes.

Finally, I decided to use the toy replica recently re-released by Underground Toys. (left) The PurpleBlancMange blog author stated that he provided dimensioning information to the company based on his research and viewing the actual prop before it was stolen. It is reputed to be mostly accurate except that the barrel is said to be slightly larger in diameter to accommodate the electronics when it was first released.

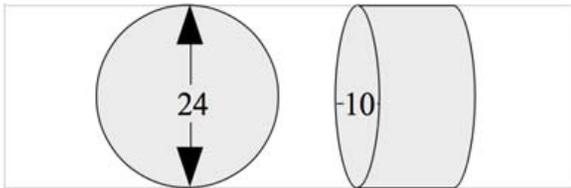


Thunderbirds are Go! Image

The *Thunderbirds* image is one of those rare examples that are nearly ideal to determine both shape and size. It is of good quality and free of “fish-eye” distortion. The angle of incidence is not too great. We know the shaft is circular, but the left end appears as a shallow ellipse, with a ratio of 10:24.

This gives an incident angle of about 25 degrees. That means increasing the length along the shaft measurement by 10% to get its true length, and any features measured from this image will also have to be adjusted from one end to the other.

There are two scale items in this image. The best one is the pair of copper tubes directly behind the handle. Copper tubing comes in standard sizes, and these are very likely copper supply lines with an outside diameter (OD) of 3/8” (10mm). It is a very common dimension and the smallest one used for the purpose. The next size up, 1/2”



Measurements for computing incident angle.



Barrel of screwdriver prop from *Thunderbirds are Go!* scaled to actual size based on water pipe and glove scale items.

(12mm) OD would make the prop too large compared to what we see in photos of it being held.. The other scale item in the image, the glove fingers, also weighs in favor of 3/8” (10mm) as the most likely size because again, the fingers would too large with the larger diameter tubing.

Knowing the actual size of the copper tubing, we can scale the image to actual size, and determine the true length by measuring the image length and increasing that by 10%. This results in a true length of 176mm. Possible inaccuracies in the incidence angle and the scale factor from the copper tube make this length a reasonable guess, but not necessarily the length of the actual prop. Try changing a few things to get an idea of variability.

Jon Pertwee Image

Before deriving other measurements from the length, let's check this against a life-size blowup of Jon Pertwee holding the Sonic Screwdriver from “The Sea Devils” (right). The overall length appears shorter because Pertwee is partially pressing down the ring to activate the Sonic Screwdriver. This causes the assembly to telescope into the handle. Normally, the base of the ring



would be flush with the cone. It appears that about 10mm of the assembly has telescoped into the shaft in this image. The image has been scaled on this basis.

Is the size of Pertwee's hand as a dimensioning item consistent with the computed scale? If I hold the Underground Toys replica in the same position, the distance from the top of my index finger to the bottom of my little finger is about 70mm. From the image, the distance on Pertwee is 80mm. I am 1700mm (5ft 7in) tall, while Pertwee was 1890mm (6ft 2in). Assuming hands scale with stature, the ratios of the distances between Pertwee's and my hand measurements agrees fairly well with the ratios of our heights, so we can say the reconciliation succeeded. I did reconciliations with several other images with similar results.

The Underground Toys replica

My final test was to compare the length computed from the *Thunderbirds* photo and verified with the Pertwee photo with the Underground Toys replica for which the author of the PurpleBlancMange blog said he provided dimensions to the company. A direct measurement of the toy from the base to the end of the cone gives a length of between 177mm and 178mm. This is well within the margin of accuracy for these techniques.



Deriving the other measurements

Deriving the other measurements means going back to the photos and measuring all the features, taking into consideration corrections for image errors. For each one, you use the ratio of something whose measurement you know to one whose measurement you do not. The trick is to avoid accumulating errors by basing one derived measurement on another. In no time at all, accuracy will decrease and subsequent measurements will be further and further off. Instead, it's best to go back to scale items and make other measurements from those wherever possible.

Most of the measurements for the main body were derived from the *Thunderbirds* photo and reconciled with other photos by comparing ratios. The most difficult part of using the *Thunderbirds* image was to correct the sizes of features along the main axis based on the computed angle of incidence. Some advance image packages can do this.

I have not found photos that provide reliable dimensions for the emitter halo, so I relied on measurements from other screen caps based on computed ratios, which are less reliable. That there is wider variation in this part among the various replicas is not surprising.

Finally, I reconciled the individual measurements derived from the screen caps to those taken from the Underground Toys

The emitter halo on the "Doctor Who Adventure" replica is widely thought to be out of scale.

replica. The toy's dimensions agree very well in most aspects with those from the dimensioning process, although the handle is slightly too wide based on my calculations. As I mentioned earlier, this is reportedly to accommodate the electronics.

The scale illustration on the next page shows the dimensions derived from the the *Thunderbirds* and *Doctor Who* screen caps. An image of the Underground Toys replica is used to illustrate. The two other images shown for comparison were corrected for distortion for the purposes of illustration only. Always use uncorrected images for measurements.

Conclusion

I hope that this article has given you an appreciation for what goes into recreating a prop replica before the process of building it begins. In many cases, the research and dimensioning process are the most difficult parts. I also hope that the techniques illustrated here will be useful for your own recreation of a prop from a movie or TV show. It requires a combination of luck, persistence, attention to detail, and knowing when to stop planning and start building. Most important of all is to accept that there is seldom a single, right answer.

Philip Gust enjoys sci-fi and fantasy costuming, and has particular interests in props, special effects, and prosthetic makeup. He also costumes in historical periods, including Regency, Victorian, and early 20th C.

Third Doctor's Sonic Screwdriver

Dimensioned by Philip Gust from *Thunderbirds are Go!* and *Doctor Who* screen caps.



Underground Toys replica show for comparison (closest to screen caps)



"Doctor Who Experience" replica shown for comparison (note problems with upper barrel and emitter halo)



Thunderbirds are Go! original prop shown for comparison (stretched 10% for incident angle distortion)