

Home

Overview of process

Sourcing intensifier

Instruction booklet

+ve Terminal

-ve Terminal

On/Off Switch

Battery Box

Lead/Acid Battery

Extension Tube

Adding Eyepiece

Use without Scope

Finished Product

***Welcome to a website dedicated to the creation of homemade telescope eyepieces from second hand image intensifiers found cheaply on forums such as ebay.***

The commercial versions of these eyepieces cost £1500 (\$2000) upwards.....here we describe how we made one for £50 (\$80) plus some spare SLR lens/extension tubes lying around the house.



***The main differences that we are aware of between the commercial versions and ours are:-***

- (i) Theirs has a higher resolution - not that we noticed at the eyepiece!
- (ii) Ours has more distortion of the field - oh well you can't have everything!
- (iii) Theirs are a lot lighter...no getting away from that - our version requires a sturdy telescope/mount and 2 inch focuser.

***What we are less sure of is:-***

- (i) Any difference in brightness? Possibly but the image intensifier we used is a 3 stage generation 1 intensifier that gives pretty bright

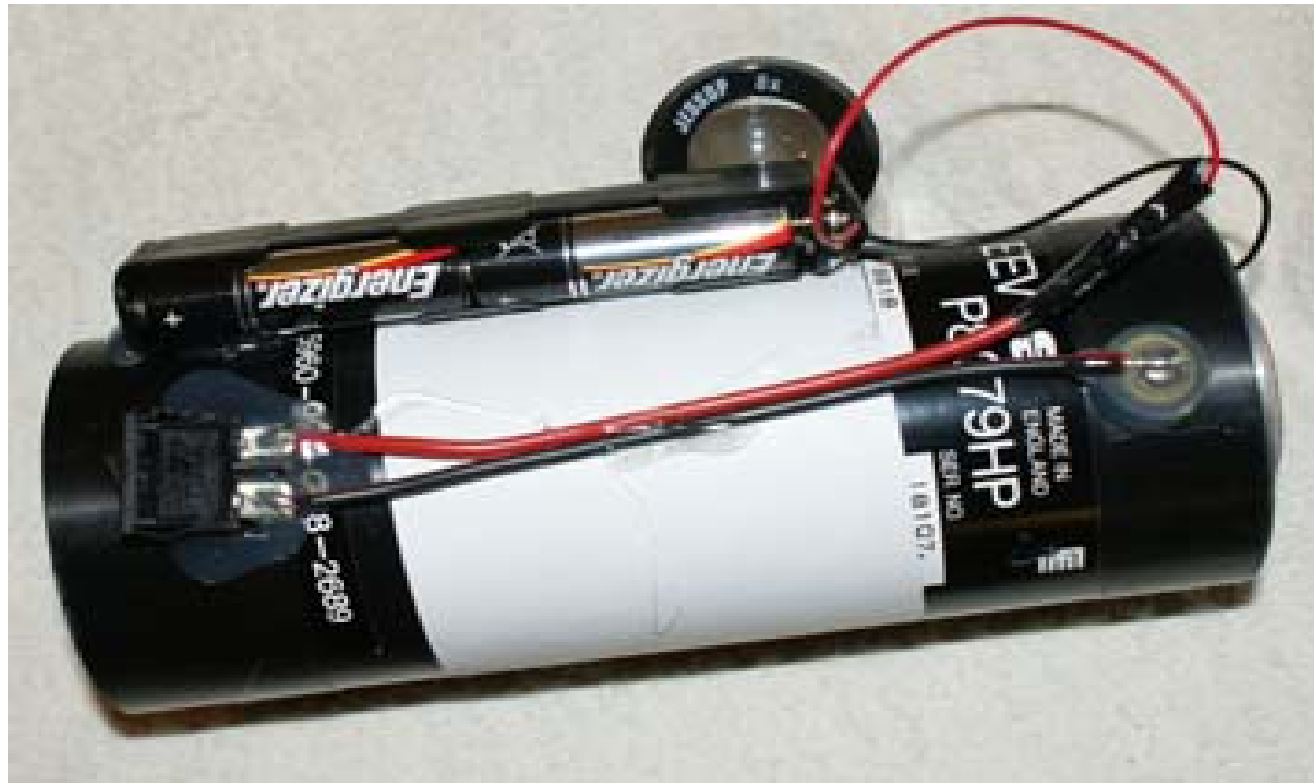
images

(ii) Fun level - ours delivers on the fun side

(iii) Both image intensifiers can be used with an SLR lens without the scope - probably the best bit

(iv) Ours gives you the enjoyment and sense of achievement of having made it yourself

(v) Price difference - this is one aspect of ATM where there is still a really big difference in price between the ATM version and the commercial version!



**Please note we accept no liability for damage or injury incurred from following our instructions** (its just what we did) and we make no guarentee that this will work for you. Please let us know if you find a better way of constructing your eyepiece so we can update this website. You will need to source components - a difference image intensifer should work but you will need to modify the instructions. Plus - please note neither of us have had a chance to compare our version with the commercial versions.

andrew at thornett dot net

**We hope you have great fun making your image intensified eyepiece!**

Andy & Damian

Creating your own Image Intensifier Eyepiece for your telescope

Home

Overview of process

Sourcing intensifier

Instruction booklet

+ve Terminal

-ve Terminal

On/Off Switch

Battery Box

Lead/Acid Battery

Extension Tube

Adding Eyepiece

Use without Scope

Finished Product

On this website we describe the production of an image intensifier eyepiece using a ca. 30 year old ex-military 1st Generation Image Intensifier.

We use photos from the construction of two eyepieces - as we didn't take enough photos first time around! Although a similar construction technique was used for both, there are slight differences in detail which demonstrate changes that can be made dependent upon your preferences and what is available to you.

The first one took us about 15 hours but the second only an hour once we had worked out the process.

The final design still has one flaw - namely that a lot of weight is held by a glued joint near the front of the intensifier - the whole device's weight is held by this joint when the image intensified eyepiece is in the telescope. For this reason we recommend that you add a lanyard to your final eyepiece and attach this to your scope when in use - if the joint then fails the eyepiece will be stopped by the lanyard from falling to the floor. Image intensifiers are designed around cathode ray tubes which are quite fragile. Likewise take care during construction that your image intensifier tube (round) does not roll off the table.

Creating your own Image Intensifier Eyepiece for your telescope

Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

The image intensifier used in this project was sourced from [www.ebay.co.uk](http://www.ebay.co.uk) and entering "image intensifier" into the search box.

[http://cgi.ebay.co.uk/GENUINE-EX-MILITARY-IMAGE-INTENSIFIER-TUBE-1ST-GEN\\_W0QQitemZ350284234049QQcmdZViewItemQQptZUK\\_Collectables\\_Militaria\\_LE?hash=item518e913d41](http://cgi.ebay.co.uk/GENUINE-EX-MILITARY-IMAGE-INTENSIFIER-TUBE-1ST-GEN_W0QQitemZ350284234049QQcmdZViewItemQQptZUK_Collectables_Militaria_LE?hash=item518e913d41)

*The photo below shows the P8079HP Generation 1 Image Intensifier*



The image intensifier is a P8079HP generation 1 ex-military version. It operates on 3-6 volts, is 18.5cm long, housed in a 6.25cm diameter tube, with 20mm optics.

*The P8079HP Image Intensifier showing the sensor window.*



Other image intensifiers will probably work but we have not tried them. It is likely you will need to make simple modifications to instructions to use these various alternatives.

Creating your own Image Intensifier Eyepiece for your telescope

- Home
- Overview of process
- Sourcing intensifier
- Instruction booklet
- +ve Terminal
- ve Terminal
- On/Off Switch
- Battery Box
- Lead/Acid Battery
- Extension Tube
- Adding Eyepiece
- Use without Scope
- Finished Product

[Click here to access the instuction booklet](#) that came with the image intensifier.

If you experience problems opening this link then you may need to [download Abode Acrobat Reader](#)

Creating your own Image Intensifier Eyepiece for your telescope

Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

The positive terminal is accessed via a small hole in the side of the image intensifier. This hole is threaded. Soldering directly onto the hole is risky because the internal connection is soldered and the heat from the soldering iron might cause this connection to loosen. Adding a screw means that you can solder onto the screw reducing the likelihood of this occurring.



In the photo above, the screw has been added. Below, solder is put on the head of the screw.





A dab of superglue is put around base of screw to stop it from coming loose during the rest of the project (later a glue gun will be used to further protect this joint).



Solder should be added to bare ends of wires before soldering them in place on the screw to reduce heat applied to screw and reduce risk of internal connection becoming loose.



Finally a dab of hot glue is applied by a glue gun to protect the joint.



Creating your own Image Intensifier Eyepiece for your telescope

Home

Overview of process

Sourcing intensifier

Instruction booklet

+ve Terminal

-ve Terminal

On/Off Switch

Battery Box

Lead/Acid Battery

Extension Tube

Adding Eyepiece

Use without Scope

Finished Product

The negative terminal is located on a ring adjacent to the image sensor. In the military the image intensifier is placed in a tube and pressure applied to push the terminal against a contact. It is difficult to solder and easily comes apart. We found that using a grinder attachment to a drill cleans and also abrades the ring and makes it easier to solder to.



Having used the grinder, apply solder all around the ring, as per below.



Then solder the negative wire to the ring - solder a long length of wire all around the ring to maximise the chance of this staying intact.



Below is a photo of the negative wire soldered onto the ring.



The following photo shows both positive and negative wires soldered onto the image intensifier. At this point you can test the intensifier by attaching the wires to 6 volt DC power supply.





Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

A small rocker switch makes it convenient to turn the eyepiece on and off - and can easily be mounted on the side of the tube. We used the "N19CL" switch from Maplin in the UK - approx 80 pence.



Solder the wire from the positive terminal to the switch - make sure you have enough wire to allow the switch to be mounted where you want it to go on the tube! I made that mistake.....





Ensure the solder connections are sound with good contact - it is worth ensuring the scope will switch on and off before you mount the switch on the tube.



A glue gun comes in handy again to mount the switch - one blob and you are done! I used low temperature glue and experienced no problems - I am not sure of the temperature but it looks as though it is probably around 80 degrees - managed to burn my fingers anyway - so be careful when using a glue gun!



Creating your own Image Intensifier Eyepiece for your telescope

Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

We used two alternative methods of providing 6 volt power. The most convenient is a battery box that will house AA size 1.5 volt batteries and can be glued onto the side of the tube.



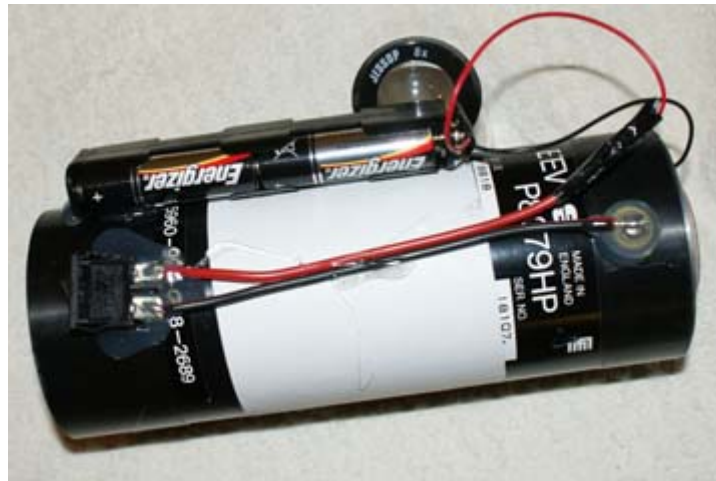
Below shows the tube with the battery box wired into place and being tested before being mounted onto the tube. We covered all bare connections with electrical insulating tape to avoid electrical shorts.



The box was mounted onto the side of the tube using the glue gun. Note I used red and black wires to ensure I did not mix up the connections at any point. Perhaps someone could tell me - will you damage an image intensifier tube if you connect the positive and negative wires the wrong way around?



Mounted battery box. The Jessop eyepiece it is leaning on will be discussed later.



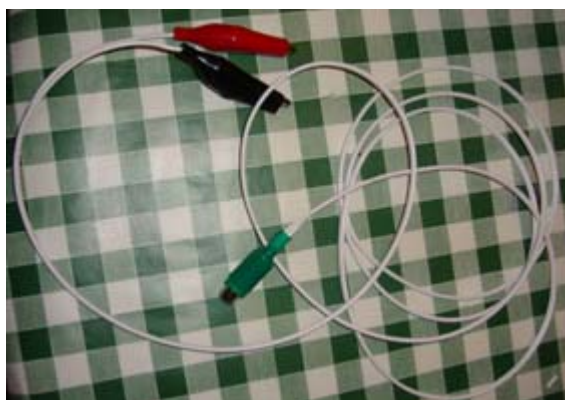
Creating your own Image Intensifier Eyepiece for your telescope

Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

An alternative way of powering the image intensifier tube is via an off tube lead acid battery pack such as this one.



In this case you will need to make an appropriate cable to connect the battery to the tube such the one we made below - note the use of phono plugs to allow cables to be disconnected from the tube for convenience or storage.



Creating your own Image Intensifier Eyepiece for your telescope

[Home](#)  
[Overview of process](#)  
[Sourcing intensifier](#)  
[Instruction booklet](#)  
[+ve Terminal](#)  
[-ve Terminal](#)  
[On/Off Switch](#)  
[Battery Box](#)  
[Lead/Acid Battery](#)  
[Extension Tube](#)  
[Adding Eyepiece](#)  
[Use without Scope](#)  
[Finished Product](#)

We used M42 extension tubes for the nosepiece. The reasons for this choice were:-

- (i) Already threaded to accept readily available cheap second hand M42 SLR lens to allow image intensifier to be used without a scope.
- (ii) With a small amount of tape wrapped around the extension tube it can be made to fit quite snugly into a 2 inch focuser.
- (iii) It fits neatly just outside of image sensor.
- (iv) They are cheap to buy!
- (v) An SLR lens should be 35mm from the image sensor. Using a set of extension tubes means we didn't have to measure this accurately but simply change tubes to suit what we wanted to look at and how far away it is - some folks reading this may be horrified at this slap dash attitude but it works!...and is easier.



The photo above shows an M42 extension tube. They come in sets of three and you should purchase a set of three to give you flexibility in use of the intensifier/eyepiece.

The tube (aka new nosepiece of the image intensifier eyepiece) will be mounted over the negative terminal ring. We therefore cut out an insulating ring of plastic to put between that ring and the extension tube. Some of our scopes are steel construction (Lightbridges) and we did not want accidental electrical shorts.

The insulating ring was constructed from an old plastic carton - start by cutting out a square from the bottom of the carton.



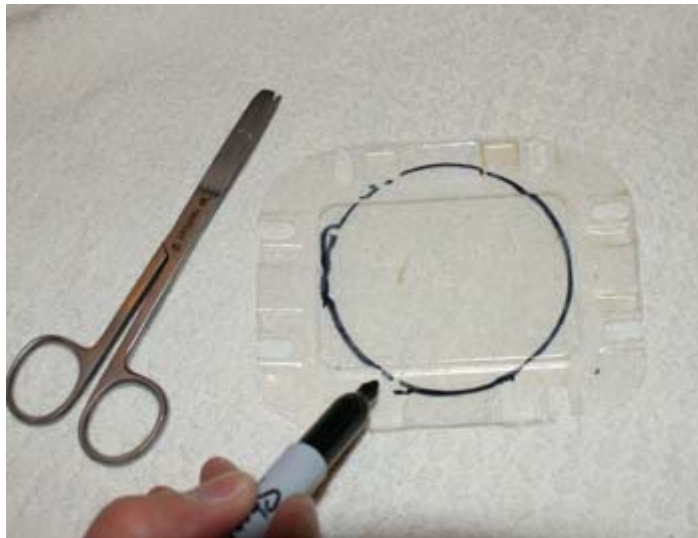
Here is the square once cut out:-



Then draw around the image intensifier tube on the plastic to give an outer ring which should be cut out.



Outer ring ready to be cut out:-



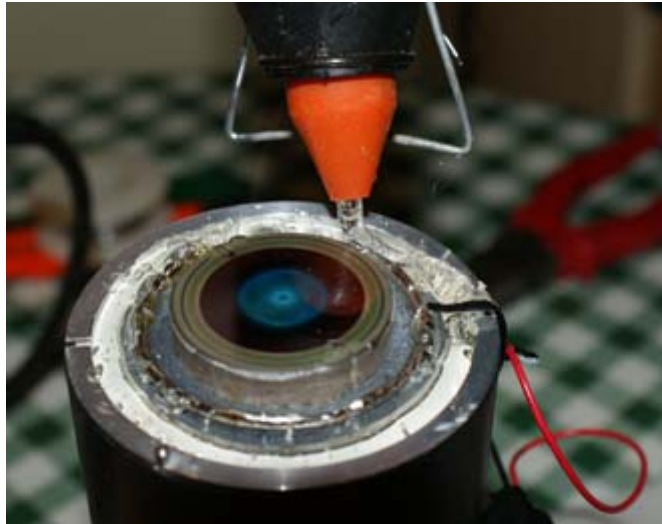
Once cut out draw around the INSIDE of one of the extension tubes in the centre of the ring and cut this out too. It should be just big enough to fit snugly over the edge of the sensor on the image intensifier tube and no larger.





When it comes to mounting the extension tube onto the intensifier start by putting a generous helping of glue from the glue gun around the sensor, ensuring you avoid getting glue on the sensor itself.

Then push the plastic ring down carefully onto this glue, taking care not to burn yourself on the glue.



Add another copious helping of glue ont top of the plastic ring - then carefully press the M42 extension tube down onto this ensuring it is level with the sensor window as you do it, to reduce distortion of the image when using the intensifer eyepiece later on.



An M42 SLR lens has an external thread so mount the M42 extension tube with the internal thread upwards.



Add more glue around the base of the M42 extension tube to provide extra strength....and add a lanyard to the tube to give added protection in case this glued joint between nosepiece and tube gives way in action.



M42 50mm lens showing threads.



Creating your own Image Intensifier Eyepiece for your telescope

Home  
Overview of process  
Sourcing intensifier  
Instruction booklet  
+ve Terminal  
-ve Terminal  
On/Off Switch  
Battery Box  
Lead/Acid Battery  
Extension Tube  
Adding Eyepiece  
Use without Scope  
Finished Product

The image screen of the image intensifier tube benefits from being magnified for viewing. To do this, an appropriate lens is required and a means of bring the image screen into focus in the lens.

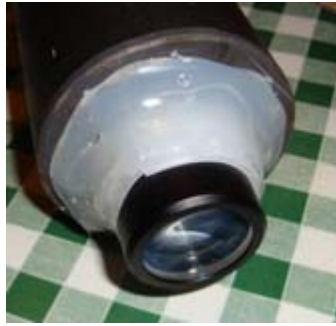
We found that we could unscrew the barrel from a 40mm Plossl eyepiece and that it then focused on the image screen of the image intensifier tube.



The plossl eyepiece is held snugly by a strip of plastic cut from a milk bottle and glued over the intensifier image screen.



This photo shows the plossl eyepiece in position.



An alternative lens is to use the Jessops' negative viewer costing around £5 from Jessops Photography.



The barrel of this lens is rubbed on emery paper until it is reduced in length until the image screen is brought into focus. Removing the rubber eyeguard from the image end of the intensifier tube helps with this.



Creating your own Image Intensifier Eyepiece for your telescope

- Home
- Overview of process
- Sourcing intensifier
- Instruction booklet
- +ve Terminal
- ve Terminal
- On/Off Switch
- Battery Box
- Lead/Acid Battery
- Extension Tube
- Adding Eyepiece
- Use without Scope
- Finished Product

One of the great things about an image intensifier is the option to use it without a scope but with SLR lens instead. M42 fit lens are found very cheaply on the second hand market, and vary from 50mm, like this one, to 500mm. Paired with a 500mm lens, the intensifier becomes an image intensified 500mm scope....and is remarkably useable in that configuration, showing a large number of stars in the Pleides. A flexible option is to use it with a 80-200mm zoom lens. The lens below is a F2.8 50mm lens - this gives a bright image in the intensifier and is great for looking for foxes and other wildlife and wide angle views of the Milky Way.



The completed eyepiece paired with a 50mm M42 lens & 40mm plossl eyepiece.



Creating your own Image Intensifier Eyepiece for your telescope

Home

Overview of process

Sourcing intensifier

Instruction booklet

+ve Terminal

-ve Terminal

On/Off Switch

Battery Box

Lead/Acid Battery

Extension Tube

Adding Eyepiece

Use without Scope

Finished Product

Damian is holding the image intensifier eyepiece attached to 6 volt lead-acid battery. The image window is illuminated with the green glow of the active intensifier tube.



Andy is holding the alternative version with battery box and Jessop viewer.





Creating your own Image Intensifier Eyepiece for your telescope