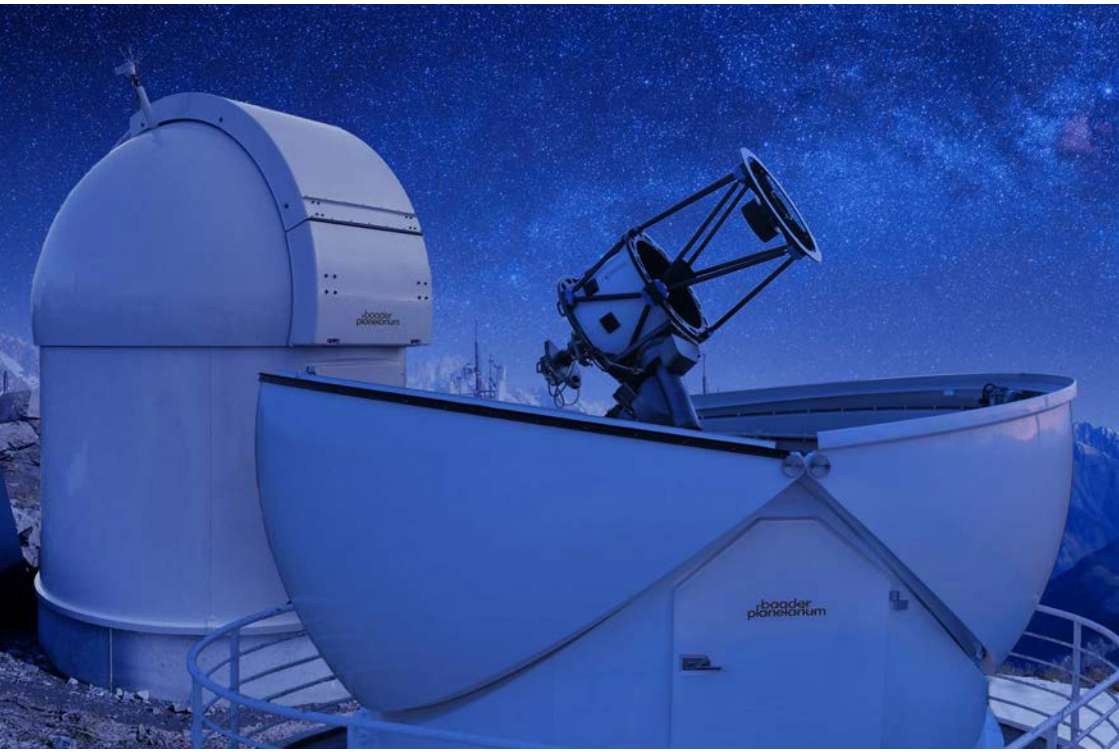
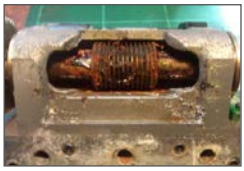
A Telescope for Eternity



Important Care Tips for your Telescope



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Preface

Everybody is proud of his first telescope, and probably everyone thinks about the centuries-old telescopes which can still be used today.

But be warned: even with telescopes, only the good ones have survived, because they were worth preserving and have been looked after. A modern telescope is many times more complex than its brass predecessors: electronics can age and are often not sufficiently protected against damage, and modern production techniques push the limits of materials furher than in the past – there is less "over-engeneering".

A 40-year-old C8 that is today still as good as it was on the first day thanks to good care.

In over 50 years of company history, we have had numerous defective telescopes in our hands. Very often the expensive damage could have been avoided if the owner had known in advance what to look out for. We have put together this small brochure so that you can enjoy your telescope for as long as possible. Because contrary to what some people might think, telescope dealers do not make their money with repairs. Even in normal times, it is not easy to obtain spare parts for current models from manufacturers abroad, and for older devices it is often pretty much impossible – especially if the electronics are damaged.

So please take a look at this brochure so that neither you nor we have to spend our time on costly repairs, but can spend more time with the equipment under the stars.

Whether in mobile use or in a professional dome: If you follow the basic tips in this brochure, your new telescope will give you many years of good service.

Storage

Most amateur telescopes aren't used stationary in an observatory and are thus exposed to more and different influences than permanently installed telescopes. To ensure that they do not suffer during regular assembly and disassembly, you should take the following points into account:

- ☑ ***Keep your telescope in a cool (not cold, but room temperature), dry and dust-free place.*** We have already seen thirty-year-old Schmidt-Cassegrain telescopes whose mirror surfaces were like new due to the protection of the Schmidt corrector plate. However, incorrect (moist) storage, unfavorable observation conditions (salty air, heavy pollen load, etc.) or improper cleaning can irreparably damage a telescope, even in a short time.
- ☑ Especially in fall and winter, the telescope and mount can be soaking wet or covered in frost. ***Condensation*** will form all over the cold telescope at the latest when you bring them into your warm house where the humidity is naturally higher.

  Therefore, place all dust caps on the telescope before bringing it into the warm room and allow it to warm up a little before removing the lens caps again so that any moisture can escape.

  Do not close the storage/transport case before its contents are dry again.
- ☑ ***Dust caps*** are not just for decoration, but serve an important purpose as they protect the interior from dust, pollen, insects and other things. Use them! Not only the optics and the inside of the telescope are at risk, but also the mount. Insects are a real danger, especially for permanently mounted telescopes.
- ☑ ***Insects and other animals*** are an often underestimated danger. Don't leave your telescope case open in the grass – you wouldn't be the first person to accidentally pack a curious snail and be surprised at the slime on the optics of your telescope next time.

  The waste heat of modern electronics or the protection of the housing of a mount also attract insects. Even if good circuit boards are coated with protective paint: They are defenceless in the long term against formic acid, for example, and there are many points of attack that cannot offer sufficient resistance to insect building activity.

From our Repair Shop

Although this was not yet a case for our repair shop, it could have become one: After a long night of observation, the optics were free of dew and the cover was put on.

When observing the sun the next day, nothing was visible in the telescope: Enough moist night air had remained in the dew shield, which had later condensed on the lens.

From our Repair Shop

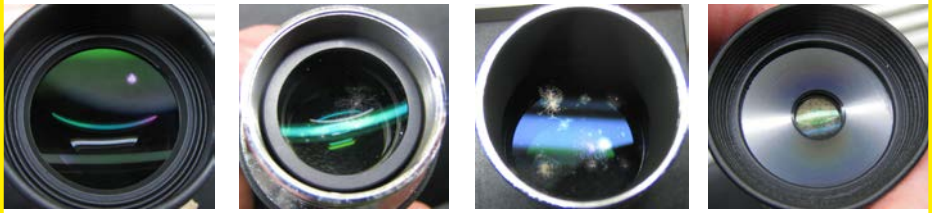
We were also very surprised when we received a broken Paramount ME mount for repair that had fallen victim to a spider: the spider web inside had short-circuited the main board, the spider itself was probably fried by the power socket.

The spider web is located directly at the power input, but on the back of the circuit board. The spider itself could no longer be found. You can also see how the corner is woven in with spider threads.

- ☑ Do not leave the telescope switched off outdoors overnight if you are not using it. If you do, ***at least dismantle the electronics*** (hand controller etc.) as far as possible and cover the mount with a UV-resistant cover (e.g. truck canvas). Important: Do not pack it hermetically, but ***allow air exchange*** – otherwise, you will store it in a greenhouse, which offers the best conditions for rust. If the mount is left outside for several days and is exposed to all kinds of weather (rain, frost, heat), perhaps only covered with a plastic bag (or other non-thermally insulated cover), condensation can form under the cover, which can creep everywhere and even form puddles in the mount itself. Accumulated moisture can be detected during an inspection, e.g. by water marks in the mount housing. This damage is not covered by the warranty.
- ☑ You can also leave your telescope set up in a dry and protected location – regardless of whether this is in a thermally insulated observatory or as decoration in your home. If the telescope is left standing for very long periods, you should occasionally move the axes so that the grease is distributed. For the optics, it doesn't matter whether the telescope is pointing upwards or downwards as long as no dust gets into the tube.
- ☑ Tighten screws with feeling and use the right tool – otherwise screw heads and threads will wear out over time.

From our Repair Shop

Glass fungus can eat away at optical surfaces if they are stored moist and warm. The minerals in glass and coatings are a delicacy for this fungus. The surfaces are irreparable and we do not allow such optics anywhere near our repair shop!



Eyepieces with glass fungus in various stages, from incipient contamination to a completely overgrown lens.

☑ Give the optics ***time to adjust to the temperature***, especially in winter – for example, by placing it in its case on the balcony or in the trunk of the car for a while to acclimatize before unpacking it. This will help you avoid the temperature shock between the cozy apartment and the frosty outside temperatures in winter. Ideally, you should allow up to an hour before opening the case if there are very large temperature differences. It is ideal if a telescope can be stored at approximately the night-time operating temperature – this does not have to be an air-conditioned observatory dome, a cool, dry (!) cellar room is often sufficient. Then the telescope does not have to cool down for a long time during observation, but is quickly in temperature equilibrium.

☑ ***Observe the notes on operating and storage temperature!*** Some instruments such as H-alpha filters for solar observation are sensitive to frost, while lubricants or plastics can outgas at excessively high temperatures, or the heat-conducting paste of electronics can melt so that, for example, the cooling of a camera no longer works.

Electronics and Humidity

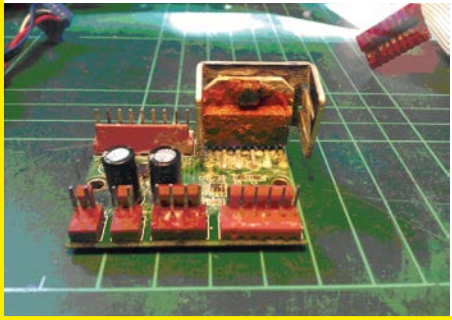
Basically, the following applies to all electronics, regardless of the manufacturer: If you want to protect the mount and the built-in control technology from accelerated aging, short circuits and loss of warranty, you should always make sure that the inner workings of the mount – i.e. main board and motor boards - and especially the handheld controller remain dry.

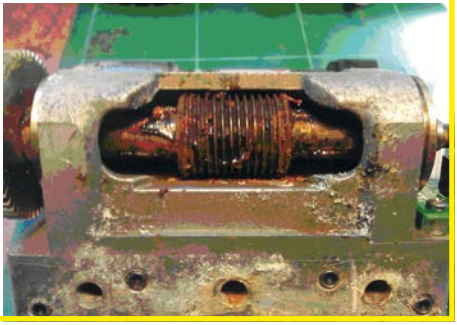
☑ As long as the mount is switched on and it is not raining, the electronics are warm enough to be protected from condensation. The optics are usually sufficiently protected from fogging by dew caps or heating tapes. If it does mist up, allow it to dry indoors and only clean it if necessary as described in the "Care & cleaning" chapter.

☑ ***Telescope electronics must never be handled carelessly.*** Condensation water or rainwater in the housings will destroy even the circuit boards of very expensive

From our Repair Shop

Under an airtight cover, an outdoor mount only appears to be protected – underneath there is a greenhouse climate that will destroy even high-quality materials in the long term. This circuit board and the drive worm look as if the mount had been stored in a lake and not under a protective canvas.





mounts in the long run, although practically all manufacturers of amateur or semi-professional telescopes use protective coated circuit boards. Even with stationary mounts, you should store the main electronics in a warm place if there is no qualified protective structure such as a double-walled observatory dome with a dehumidifier. This way, only the "hardware" is stored outdoors or in an unair-conditioned, but preferably dry protective structure.

Cover caps prevent moisture from getting into unused sockets or cables from being connected incorrectly and causing short circuits.

Alternatively, the entire control unit (PC, hand control, ...) can remain permanently under power to prevent dew from causing damage inside. However, make sure that the tracking does not run even though the mount electronics are switched on.

☑ ***Cable entries*** that lead into the mount or the handcontrol from above can, in the case of dew condensation, transport astonishing amounts of water along the cable directly into the enclosure and cause short circuits. For this reason, cables should always be routed from bottom to top into mount enclosures and hand controllers when leaving the mount outdoors or placing it in a wet case. Even well-known telescope manufacturers often forget water outlets in the control boxes, so that the control slowly fills up.

☑ ***Seal unused sockets with protective caps against dust, moisture and incorrect wiring.*** For the widely used RJ45 and RJ11 sockets (e.g. autoguider sockets), we offer a set with protective caps (5x RJ11, 2x RJ45) under order number *#889002*. They also reduce the risk of plugging accessories into the wrong socket and thus short-circuiting the mount.

It is often not made sufficiently clear that modern mounts usually have as much electronics inside as a laptop computer, for example. You would not store a laptop or a tablet PC outdoors or put them wet in a suitcase. These devices are also not waterproof and are still used outdoors – but they are usually treated with greater care.

In our experience, the vast majority of damage to handcontrollers and defective boards of mount controls is due to short circuits and premature aging caused by moisture ingress. If you follow the precautions listed above, you will be able to enjoy many years of trouble-free operation of your control electronics beyond the warranty period.

Tips for Permanent Installations

Although the telescope and mount are designed for outdoor use, they are not intended to be stored unprotected from the elements. If you do not want to dismantle the mount after use, but leave it until the next use, please note the following points.

- ☑ Cover the equipment if you do not have an observatory, but ***do not use an airtight tarpaulin***. A certain amount of air circulation must be possible, otherwise you are practically placing the mount in a greenhouse and the first rust will not be long in coming.
- ☑ The best protection against condensation is provided by the waste heat from the running mount: the electronics become warm enough that dew or even frost condenses on the housing, but not on the electronics. It is therefore advisable to leave the mount switched on – with tracking deactivated!
- ☑ If possible, lay the cables so that the sockets point downwards so that no ***condensation*** can run into the housing and onto the circuit boards. If possible, close unused sockets with a cover such as the protective cap set *#889002* or simply with sticky or insulating tape.
- ☑ Condensation can even form in an observatory if it is not heated/cooled or is insufficiently ventilated.
- ☑ Insects are an underestimated danger, especially for permanently installed telescopes. An ***insect-proof protective construction*** is a sensible investment if the equipment is not protected indoors or in a box.
- ☑ When using ***shelters*** such as roll-up roofs or domes, remember that they only protect against snow and rain. Without ventilation or air conditioning and suitable exterior paints, extreme temperatures are reached inside during the day, leading a greenhouse climate in which equipment quickly rots. Protection against insects is practically impossible, so you also have to clean an observatory regularly. The building materials can have unexpected effects: Metal cladding or unshielded cables cause unwanted interference currents (see p. 13).

Even a shelter such as a simple roller roof hut only protects against the weather, but not against cold, damp or insects.

Normal ageing: A galvanized stainless steel flange after one year in a ventilated, non-air-conditioned hinged roof shed. The material eventually becomes completely matt due to environmental influences, but does not rust.

In the event of moisture damage due to improper storage the warranty claim expires!

Transportation and Packing

The telescope and mount are precision instruments, which must be taken into account during transportation. Avoid bumps and knocks!

Packing telescopes and accessories

☑ The ***original packaging offers the best protection*** against damage. If possible, use it for transportation or at least keep it during the warranty period so that you can return the telescope for repair if necessary.

The protective foam inlay of the original packaging offer the best protection. The transport box can be replaced by a ready-made transport bag (left) or a customized flight case (right), for example.

☑ Special bags into which the original packaging fits provide optimum protection. With equatorial mounts, the polar axis must always be reset to the original value, so an individual solution is usually more practical. Professional case inserts made of solid foam can now be custom-made.

Raster foam is only suitable for eyepiece cases and light accessories; it cannot withstand the weight of a mount or telescope for long.

A special, padded transport bag for a telescope

☑ You should not skimp on the case or bag, after all, your equipment is not only valuable but also heavy. Cheap DIY store cases with side panels that are only attached to aluminum rails will fail sooner or later. Robust bags with double seams or even customized flight cases from the accessories market for music and event technology are the better choice.

☑ The same applies to telescopes as to mounts, except that the transport packaging is often easier to fit into existing bags or cases. Special transport bags from manufacturers often also offer compartments for accessories.

☑ If the original packaging is not suitable for your needs, you can also wrap the tube in bubble wrap or foam to absorb shocks. If possible, allow new foam to outgas before using it.

☑ ***Avoid bolt containers/twist packs for eyepieces*** – these act like miniature greenhouses when the eyepieces are packed damp after a cold night of observation.

From our Repair Shop

We cannot offer individual, customized mount cases in which everything has its place. This solution for the Celestron Advanced VX was implemented by a customer and described at www.celestron.de/blog/ein-koffer-fuer-die-celestron-avx-advanced-vx (German only). There is room for everything in the case, including the PowerTank and the tripod tray.

☑ ***Do not place the telescope or accessories in an airtight case while they are still wet.*** Put the caps on the telescope before you bring it out of the cold night into the warm house, so that no additional dew is deposited on the optics. Remove the dust caps for a while when the telescope has returned to room temperature so that residual moisture in the dew cap or tube can escape.

Take Care during Transportation

Even if your equipment is perfectly packed: ***avoid bumps and knocks.***

☑ To prevent the mechanics in the mount from being damaged during transportation, loosen the ***motor couplings and axle clamps*** so that the motor gears are not connected to the axles and the axles can move freely. This prevents shocks from being transmitted to the gear wheels and motor gears. To remove the mount from the transport packaging, clamp the axles again.

☑ Larger Schmidt-Cassegrain telescopes have ***mirror locks***. You should tighten these for transportation – but don't forget to loosen them again before use so that you can focus.

☑ Even if cold does not harm a telescope, you should ***avoid strong, fast thermal shocks***, which can cause tension. This applies in particular – but not only – to optics with lenses (refractor objectives, eyepieces, reducers, Barlow elements, correctors), as several optical elements sit close together. However, coatings can also suffer from temperature shocks. Fluorite optics (CaF2) are particularly at risk, as they can become so distorted by temperature shocks that they crack.

Drying Agents

The more dustproof and waterproof a case is, the more important it is to keep it dry. Especially in the fall, condensation quickly collects on the telescope, which then gets into the case.

☑ Desiccants such as our reusable silica gel with color indicator *# 1905160* protect against moisture in the case. But be careful: Make sure that the bag with the desiccant cannot fall onto the optics or into the telescope. Always place the dust caps on the telescope and eyepieces and stow any desiccants so that they remain securely in place without sliding around in the case.

The correct Cabling

In theory, it's simple: always plug the right cables into the right sockets. In practice, however, there are plenty of pitfalls, not least because many plugs are identical and invite incorrect wiring – especially if you don't use them every day.

Incorrect wiring – for example between the hand controller and autoguider – can easily lead to short circuits that damage the electronics! Label all cables so that you know which cable and power supply belongs where, even after a long break.

Cable Management

The Celestron PowerTanks can be attached directly to the tripod

- ☑ Place all cable connections so that no cables lie directly on the floor or around the tripod or column. If cables have to be routed away from the mount, do not lay them in your main direction of observation if possible – this will avoid tripping hazards.

  Otherwise, you could trip over one of the cables and in the worst case scenario, you could knock over the entire telescope including the mount and tripod, or hurt yourself.
- ☑ Power packs that can be attached to the tripod legs or suspended from the tripod avoid tripping hazards.
- ☑ Power supply units and sockets should not lie in the grass, but if possible on a shelf or under tripod/column. This also applies to permanently installed telescopes in an observatory, where cables can also be routed to the column under the floor, for example.
- ☑ ***Avoid free-hanging and screwed cables.***
  Even with a fixed telescope, which nobody can accidentally knock over, a camera can be torn out of the focuser – or the socket out of the circuit board in the mount or camera. The risk also exists if the mount slews! We therefore also advise against permanently screwed power connections; better are plug connections where only the power connection is interrupted, but the devices themselves are not damaged. We offer the Baader Protective-Disconnect Elbowed Plug *#2457634* for this purpose.

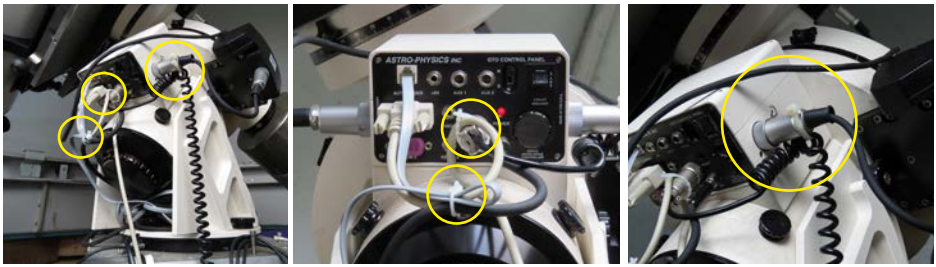
  Strain relief can also improve guiding, as there can be no unexpected load changes when cables come under tension.

Cable protection on an H-alpha fiter: Looped, strain-relieved cables for USB 3.0 and power supply, attached to the clamping screw of the focuser

Strain relief for the power cable, which is tied up to the mount with Velcro tape. This also prevents contact losses due to loose contacts.

Short cables on a fixed distributor, here the Celestron dew control with integrated power distribution for other devices.

- ☑ Use a cable loop to relieve the strain on all cables on connectors that are connected to an electronics module on the mount.
- ☑ Place those cables which end in connectors in loops and secure the loop with a cable tie. In this way you can prevent cable breaks caused by bending the cable directly at the connector and prevent damage to the connectors on today‘s filigree connectors such as USB 3.0 on video modules or the RJ 11 connectors for car or self-guiding ports. With „bulky, hard“ cables (cold temperatures, see figure on the right) it is often sufficient to feed the cable through a loop, e.g. via a clamping screw or the drive of the eyepiece extension to the corresponding port on the mount or camera.
- ☑ Faults in connectors (e.g. guiding, RJ 11) often occur for a long time only as loose contacts and make a fault determination extremely time-consuming.
- ☑ If you use a portable setup or change the camera or other devices frequently, use either cable ties that can be opened again (knot ties) or Velcro straps that can remain firmly attached to the cable.



Secured cabling on an AstroPhysics mount. Center: Detailed view of the combined RS-232, guiding and power cables as well as the strain relief on the plug of the hand controller. Right: Detailed view of the strain relief of the very heavy spiral cable of the hand controller at the plug of the RA motor cable.

Avoid Short-Circuits!

Many manufacturers use the same connector types for different devices. For example, Celestron hand controllers (which are powered by the mount) use the same connector as autoguiders with ST-4 connection (which use their own power supply).

Therefore, never connect an autoguider or other accessory with its own power supply to the HC/AUX port! Feeding external power into the HC/AUX port (which is actually intended for supplying power to connected devices) will cause irreparable damage to the electronics of the main board.

To protect the electronics of the mount from accidental damage, always keep the AUX port of the mount covered when it is not in use. This will reduce the risk of accidentally connecting a powered device – such as an autoguider – to the AUX port.

Celestron is not the only manufacturer who uses the same plugs for incompatible devices. Make sure not to switch cables, and cover all un-used ports.

Your mount will be a good companion for many years to come if you are careful not to plug a cable into the wrong socket on the mount.

Interference Currents & Electromagnetic Compatibility as a Source of Faults

Poorly shielded cables are a popular source of electronic problems – these can be caused by the house electrics of the observatory as well as the cables and power supply units that supply your devices.

The EMC Directive defines electromagnetic compatibility as follows: The ability of an apparatus to operate satisfactorily in the electromagnetic environment without itself causing electromagnetic disturbance which would be unacceptable to any apparatus present in that environment.

This directive is obviously no longer taken seriously by many low-cost suppliers of power supplies and other electronic equipment. Recently, there have been an increasing number of cases where high-quality telescope electronics, especially CCD cameras and mount electronics, suffer completely inexplicable failures. We are astonished to find that many of these mysterious cases are due to improperly suppressed voltage transformers and power supplies from small stores in the Far East. If you switch off or remove all cheap electrical equipment around the telescope, many problems disappear. Sometimes days of work flow into such puzzles, with great frustration on both sides. For this reason, we always insist that the power supply used must be returned for inspection. We now manufacture a large number of power supply units ourselves in Germany in order to deal with this problem and to rule out such faults for the telescopes and mounts we supply from the outset.

Basic information about the EMC regulation: Especially non-resistive devices like voltage converters, inverters and power supplies are critical in their application – and this is the case when the 230V AC mains or even 12V DC battery voltage, which

is completely compatible on all sides, is converted or chopped by switching power supplies, inverters, voltage converters or even by nearby machines with simple electric motors. Especially the cheap imports that have recently become more frequent and do not comply with the European standards (EMC directive) are generating such disturbances due to a „particularly cost-saving primitive design“.

The grid filter #*2455025* is used to protect sensitive astronomical devices from voltage fluctuations

The steep voltage flanks generated during the chopping process generate harmonics and excite high to very high frequencies, which can radiate from even the smallest metal parts. Even with professionally protected CCD cameras and telescope electronics with well-filtered line inputs (without mains contamination by return currents via the connecting cable) there is a considerable interference potential. It is therefore legally required that not the consumers must remain unaffected by interference radiation, but that the emitters must in any case comply with the existing EMC directive. This means that the polluter-pays principle applies, i.e. the causes of interference must first be eliminated before faulty equipment can be classified as defective. It is only possible to get to the bottom of such time-consuming interference problems against reimbursement of costs. It is better if you first switch off or remove all possible sources of interference as a test in order to rule out this type of radio interference problem before any repairs or warranty claims are made.

Please note: Complaints due to malfunctions of electronic devices such as cameras or mounts caused by the customer's own additional devices that do not comply with the European EMC Directive, or costs incurred as a result of technician time, spare parts used in vain or freight costs may also be charged retrospectively.

From our Repair Shop

In a Swedish observatory we had the case that a CDK700 was damaged. It was located under an old heavy metal dome that was moved by very powerful motors. The resulting starting currents destroyed the modern electronics - this can also be caused by other power-hungry consumers in the same network that cause voltage peaks. The original old telescope with its simple, robust tracking drive worked under these conditions, but the modern electronics didn't stand a chance.

Problems with the Power Supply

Many problems when operating telescopes can be traced back to the power supply. It is actually quite simple: only ever use power supply units with the correct polarity, the exact voltage (volts) and at least the electric current (amperes) specified. When operating with rechargeable batteries instead of batteries, there is a risk that they will supply too low a voltage – so pay attention to the information on the battery.

The correct Power Supply

Using the wrong power supply unit does not necessarily have to damage your mount; it can also have more subtle effects. If possible, ***label your power supply units*** so that there can be no confusion. Incidentally, this is also recommended for all cables that accumulate over the course of an astronomer's life.

Label your power supply units to avoid confusion.

Too low a voltage (well below 12 V) leads to „starvation“ of the electronics. The servo motor gets too little voltage and the motor electronics are forced to compensate for the resulting lack of pulling power by allowing the current consumption to rise sharply to increase the power. Most 12V devices can tolerate a slightly higher voltage, and common 12V power supplies also supply a slightly higher voltage (e.g. 12.8V) to compensate for losses due to longer cables or cold temperatures.

Especially in cold temperatures and/or with poor weight contribution on both axles (balance), both the motor management and the motor itself very quickly reach their performance limits. As a consequence, the motor stops and possibly howls loudly, because the power limitation of the motor controller has to limit from a certain current level onwards, if the torque is not sufficient for a movement, e.g. in case of incorrect weight contribution. In this case, the electricity is converted completely into heat, since no power is involved in the movement. Such stress can permanently damage the components involved, and if this happens repeatedly, it can lead to damage that can be detected.

For this reason, we strongly recommend that you do not save on the power supply unit. On our website under Power and cables (Accessories/Mounting accessories) you will find power supply units with a slightly higher basic voltage that have been specially tested for winter operation.

Too high a voltage can also cause the power electronics to burn out (both the servo motor controller on the motor itself and the motor board).

This process can happen very quickly if too high a voltage is applied. You should therefore ensure before using any power supply that the recommended voltage range cannot be significantly exceeded. Usually 16V is the maximum that 12V electronics can handle. So-called laboratory power supplies are particularly dangerous, because they have a large power reserve and an accidental turn of a knob suddenly pumps many times the voltage – in combination with a current limit that is set much too high

– into the electronics of the mount. Too high a voltage alone does not usually lead to immediate failure of the mount‘s electronics, because many of these circuits have a voltage limiter built in. But even then, this overvoltage creates a stress situation with a dangerous load on the electronics, which can be permanently damaged when operated far away from the operating range. The excess power is inevitably converted into heat, which can also cause damage to the semiconductor at certain points due to overheating. Such damage is also not covered by the warranty if it is determined that the failure was caused by the input-side overload of the electronics. Therefore, special care is required when using a controllable laboratory power supply or a power supply with too high voltage and power reserve.

Reverse polarity must be avoided at all costs. Many cheaper accessories have no polarity reversal protection, and some older control units still use a different polarity than is usual today.

Connection cables must not be mixed up. Even if the cables, e.g. for hand controllers and motors or autoguiders, fit into the same sockets on some mounts, the assignment may be different. Incorrect cabling can therefore lead to short circuits, which can irreversibly damage the electronics. If, for example, you plug an autoguider into the socket of the hand controller, the circuit board will be reliably destroyed. This cause of damage can also be traced on the defective circuit board afterwards and may invalidate the warranty. Therefore, always ensure that the wiring is correct. Cover caps (*# 889002*), which also protect against moisture ingress, reduce the risk of incorrect wiring.

Length of Cables

Avoid using excessively long connection or extension cables between the power supply unit and the load. Cables have their own line resistance, which means that less voltage may end up at the device than expected.

When using Y cables, make sure that the power supply unit has enough power for all connected devices – even if they are operating at maximum power. Some devices briefly draw more current than specified, particularly when they are switched on.

Even if professionally manufactured by a licensed electrician, cables that are too long (or e.g. if the strands are too thin) can cause a voltage drop, for example, which is interpreted as a fault by the mount and, in the worst case, can even cause damage; this can lead to electronic components overheating, among other things. Repair and transportation costs caused by this are not covered by the warranty. We would also like to expressly point out that the use of an unauthorized power supply unit may also invalidate the warranty.

Maintenance & Cleaning

It goes without saying that an optical and mechanical precision instrument such as a telescope or mount needs to be treated with care. But even with careful treatment, it ages: Bare metal rusts, brass develops verdigris, plastics become brittle or fade under UV radiation, or they become sticky if the plasticizers cannot evaporate due to a lack of ventilation.

- ☑ You can protect bare metal and screws by occasionally rubbing them with a cloth containing acid-free grease (Vaseline). Anodized aluminium and stainless steel of modern telescopes are better protected against these environmental influences. The application of graphite oil – several times if necessary – has proven effective against rust film, by rubbing the oil in with a cloth.
- ☑ The non-optical surfaces of the telescope and mount, e.g. the outside of the tube, can be cleaned as usual with a soft cloth and mild cleaning agents. Make sure that no liquids can get into the interior.
- ☑ ***Do not use compressed air from cans*** to remove dust from optical surfaces. On the one hand, it often contains impurities that make it act like a sandblaster, on the other hand, the air flow can be so fast that existing dirt is pressed onto the surfaces and thus also sandblasted. Use a hand blower from the photo accessories to remove dust.
- ☑ Most of our filters now have the Life-Coat™ coating. Filters with this hard coating are insensitive to damage from normal cleaning methods. You can therefore ***clean filters in the same way as an eyepiece***: Use our Optical Wonder™ *#2905007* cleaning fluid and a microfiber cloth, an original Kleenex cloth (without any other cleaning additives!) or a cotton ball and carefully clean the surface of the filter. Do not rub, but move the cloth in such a way that any dust is removed from the surface and does not end up between the cloth and the filter.

  Our filters are not first coated and afterwards cut out of a glass plate; instead, each filter is coated individually. This means that the filter coating is flush with the surface and is protected against ageing, e.g. by moisture penetration.
- ☑ For ***cleaning optical surfaces***, we recommend our Optical Wonder™ *#2905007* cleaning fluid. Detailed information on its application can be found at

  www.baader-planetarium.com/en/optical-wonder

☑ Finally, a somewhat brutal tip for cleaning optics: Particularly with zoom eyepieces, dust can be sucked into the interior due to the moving mechanism and deposit itself on the lenses so that it is clearly visible but out of reach. Then place a soft cloth in several layers (at least half a centimeter thick) on the table and hit the eyepiece with the flat side on the cloth – not too hard, but not too gently either. The blows can loosen the dirt and collect it on the edge of the eyepiece.

You should only use this method if the dust is really annoying and cannot be removed in any other way. It is only recommended if cleaning by the manufacturer costs more than a new eyepiece. Never take an eyepiece apart. If you do not have a clean room, you will end up with more dust in the eyepiece than before – and we are constantly receiving desperate inquiries about how the lenses should be fitted in an eyepiece.

☑ Anodized metal also tends to seize up. You can ***prevent adapters from seizing*** either by using a plastic spacer ring or by lightly greasing the threads (e.g. with Vaseline). Some adapters and filter sliders come with matching rings, for the T-2 system you can also use the T-2 tuning rings (set of 15) # 2458102. Please note the length of the spacer rings if necessary.

A plastic ring over the thread prevents the seizing of adapters

Unlocking Seized Adapters

Time and again, adapters – even those made of anodized aluminium – seize up. The obvious solution is to use pliers. However, this only results in the parts becoming deformed and even more difficult to remove.

You can achieve much better results by sticking a piece of double-sided adhesive tape on a table, placing the adapter on it and turning the counterpart from above, preferably with the flat of your hand. This makes it easy to separate many parts without deforming them or damaging them with pliers. A rubber mat can also be used as a base, but depending on how sharp-edged the adapter is, it can easily be damaged.

From our Repair Shop

Where brute force is useless: Even with a pipe wrench, these adapter rings could only be scratched but not loosened.

Pressed onto double-sided adhesive tape with the flat of the hand, however, it was no problem to remove the rings without destroying them.

Treatment of Fogged Optics and of Dew in Telescopes

Occasionally, customers complain above all about Schmidt Cassegrain optics because the Schmidt plate and/or the main mirror are „fogged up“ on the inside and this fog no longer disappears. With the exception of a few cases, these are the residues of condensed air humidity that has entered the tube due to unfavourable weather conditions and incorrect handling of the optics.

From physics textbooks we know: „The absorption capacity of air for water vapour increases with higher and decreases with lower temperature.“

Especially during a period of muggy-warm summer climate, there is therefore a lot of humidity in the air outside in nature. If, for example, a Schmidt Cassegrain telescope is opened on the eyepiece side before the observation night, humid air enters the tube. If the tube is then placed outside at night for observation, the water vapour condenses on the tube walls, the mirror, but specially on the Schmidtplate, while the instrument cools down. When the device is brought back into the warm house at the end of the night, it will fog up on the inside. It is very difficult for the moisture to come out, since the only opening through which it can escape is the visual back. The SC tube is practically a „moisture trap“.

C14 EdgeHD with foggy Schmidt plate
(in the right third, diagonally)

Often this moisture dissolves in the air inside the tube over the course of hours as the tube slowly warms up - the fogging disappears at least temporarily. However, there often remain „edges“ or „cloudy“ structures that can only be seen from a certain angle and can only be removed by cleaning. The effect is the same as with any other surface (e.g. the window of a car). However, there it only becomes noticeable after a long time if enough mist residues have „accumulated“. With a car you simply clean the window. With telescope optics such mist is much more noticeable, because you look at it much more critically. Cleaning the glass is also not so easy here, as the inside of the optical tube is not so easily accessible. This should be done by a specialist and costs several hundred Euros, depending on the size of the optic. It is therefore essential to make sure that no moisture gets into the tube.

And if it does happen, you should place the tube in your home with the eyepiece socket open for a longer period of time. It can take many days until the tube is completely dry again on the inside, because even behind the primary mirror a considerable amount of moisture can condense. A drying cartridge or a small cloth bag with silica gel, which you put into the eyepiece socket, will speed up the process. This is available on our website under order no. *#905160*, or under Accessories/Optical Accessories/Collimation & Maintenance.

These pictures show the view into a Schmidt-Cassegrain, which was stored for several years in a warm and humid climate by the sea. Even the closed tube of an SC could not provide protection against fungal attack under these conditions.

But – as already mentioned – over the years, fogging residues which do not disappear when drying will always form on all optical surfaces. This is inconveniant with closed optical systems such as SC telescopes, because it is difficult to reach the surface to be cleaned. On the other hand you can see very well how much better a closed optical system protects the sensitive mirror surfaces from aging than an open tube. If one compares the reflectance of an SC telescope and a Newtonian mirror system after 10 years of use, one can see that the closed optics is in much better condition and brings much more light into the focus – despite all traces of fogging. A fogging on a Schmidt plate is aesthetically unattractive, but it has much less effect on the imaging performance of the optics than an aged, tarnished primary mirror on a Newtonian telescope.

Silica gel can be filled into a cloth bag and absorb moisture.

Cleaning and Opening Eyepieces

As mentioned in the instructions for our Optical Wonder (p. 17), you can easily clean eyepieces – but resist the temptation to soak the lenses with cleaning fluid, as this can otherwise attack the seals or flow between the lenses. This will allow dirt to get into the eyepiece, where it can no longer be removed.

Never open an eyepiece without access to a suitable antistatic and clean room (flow box)! Otherwise you will not only have the problem of re-installing the lenses correctly – without suitable precautions, the lenses will also magically attract dust. Professional cleaning of a complete eyepiece therefore easily costs more than a new eyepiece.

Without all the optical aids (e.g. the auxiliary tools for opening eyepieces and mainly an antistatic "flow box" with ionized air flow for dust-free work, as well as the right cleaning agents for the respective lens set or the mechanics), such a cleaning project becomes a Sysiphus task. Unfortunately, we repeatedly receive calls for help from users who have dismantled an eyepiece and are absolutely unable to reassemble it dust-free because the lenses become statically charged during cleaning and the dust only bounces back and forth between the lens surfaces, but cannot be completely removed.

We have all the necessary equipment, but unfortunately the necessary working time (approx. 1.5 - 2 hours per eyepiece) is now more expensive than a new eyepiece of the same type. As hard as it is, professional cleaning of an eyepiece is not economically viable, which is why we do not offer this service.

Many eyepieces are also filled with dry nitrogen ex works against fogging, even if this is not specifically highlighted, as it can slowly escape over the decades. When an eyepiece is opened or its seals are attacked by aggressive cleaning agents such as acetone, this filling quickly softens.

Particularities of Schmidt-Cassegrain-Telescopes

Occasionally we receive complaints about Schmidt-Cassgrain telescopes where the focusing is blocked or when there are even damages at the edge of the main mirror. These complaints were always due to the fact that a too long screw was screwed laterally into the tube at main mirror height, thus blocking the movement of the main mirror. We expressly warn against this!

Such mishandling can also be reliably detected at the edge of the main mirror by means of scraping marks. In unfortunate cases, mirrors have already been sent in with chips on the edge of the mirror – declared as „manufacturer error“. In all cases, however, these damages were caused by impermissibly long screws. Under no circumstances may the longer screws, with which e.g. a viewfinder base was fixed, be screwed directly into the tube without the viewfinder base – for this purpose there are shorter „blind screws“. When you look into the tube, you can easily see if a screw is too long and protrudes over the edge of the mirror – or sits on it when it is in an awkward position.

Also make sure that any existing mirror lock (especially with EdgeHD telescopes) is unlocked – do not focus with force!

Working on the Mount

Even if it is tempting to tinker with a new mount yourself, this may invalidate the warranty and there is always a risk of causing further damage.

As with many other technical devices, opening the housing or the mount electronics during the warranty period will invalidate the warranty. Even outside the warranty period, you must never disconnect or connect cables inside the mount from motors or circuit boards as long as the mount is connected to a power source. This also applies to exposed connecting cables to motors or hand controllers. This precaution applies to almost all mounts currently available on the market from various manufacturers, as disconnecting these connections can destroy the motor controller, for example (possible error message at Celestron: No Response 16/17). The cause of the damage can be detected during the inspection and is not covered by the warranty.

The motor housings of the encoders (the black housing directly on each DC motor in the mount) must never be removed without a suitable electronics measuring station (e.g. without bright daylight) and without protective sleeves against overvoltage/static charge. Modern electronics in motors and encoders are highly complex and must not be inspected or repaired without suitable tools and without sufficient knowledge of possible damage potential. Curiosity can unfortunately have fatal consequences here. Here too, the warranty may be invalidated if, for example, it is discovered during the incoming inspection that an attempt has been made to open the motor cover (i.e. the encoder mounted above the motor).

Important Note about Spare Parts

We can only ensure the function of spare parts if we install and check them ourselves or if sensitive repairs are carried out by specialist workshops authorised by us at selected dealers. Unfortunately, a fault is not always attributable to just one part. The defective part may also have affected other components, even if this is not immediately apparent. In the worst case, a replacement part will also be destroyed again by other defective parts during the repair attempt. Under certain circumstances, different software versions of the new parts can also lead to problems. For this reason, we do not usually sell individual electronic spare parts or optical components, but carry out these repairs at our premises if possible or discuss each case with your responsible dealer and provide him with the necessary parts for each individual case.

If you still want to carry out a sensitive repair yourself, we can therefore only sell you the spare parts against prepayment, without warranty and without the right of return. The installation is at your own risk. The warranty expires automatically if a spare part was not installed properly by a specialist workshop.

Since spare parts are not available in unlimited quantities, we can only pass them on to our own customers or to customers of authorized German dealers. To verify this, we need proof of purchase (copy of invoice) for your unit. For spare parts for devices purchased from abroad, please contact your dealer or supplier. Please also see the T&C / warranty conditions. You can find these on our website under

www.baader-planetarium.com/en/terms-and-conditions.

General Tips on Software-Problems

Important Note on all Firmware-Updates

Updates for software or firmware are provided by the manufacturer of the instruments. Please note that Baader Planetarium cannot accept any liability for possible software or hardware damage, even if these files are made available for download by us.

Before updating, please ensure that the selected software is compatible with your mount/control type.

For safety reasons, remove all other devices connected to the PC before the update, e.g. USB cameras, and only connect the device which shall be updated directly to the PC (do not use any USB hubs in between).

If you are using a notebook, use its power supply unit, even if the battery still shows sufficient charge.

Do not press any button on the handheld controller during the update and do not disconnect the connection between the PC and the mount/controller! Otherwise the electronics may be permanently damaged. This represents incorrect operation. Repairs due to this are not covered by warranty.

Troubleshooting Computer Hand Controls

Modern computer controls offer a wide range of setting options. Unfortunately, it can happen that a telescope does not behave the way you expect it to. A possible reason may be that two selected options do not harmonize with each other. Try resetting the software to the factory settings – please refer to the user manual of your telescope for instructions.

Even if the software of the handheld controller does not boot (e.g. the error message “Boot Loader Error” on Celestron mounts), it is possible that just one bit in the memory is flippeded. In this case try a firmware update, usually the error is fixed.

Beware of Automatic Updates

Problems can always occur when using a computer, even if a PC has been running smoothly for a long time. The automatic Windows update is a perennial problem child. Many mounts are still based on the RS232 interface and use a built-in USB/RS232 converter. In 2022, the automatic Windows update caused problems because it replaced the working driver 3.8.38.0 (prolific v204) with version v3.8.40.0 – which did not work; Windows automatically installed an incorrect driver. The result: Numerous mounts could no longer be addressed and the error was sought in the mount.

These mounts could be operated with the mount manufacturer's driver – but only if the MS Windows update function was deactivated.

Only when the driver 3.9.1.0 was provided by the chip manufacturer of the RS232 adapter did everything work again without Windows automatically installing a non-functioning driver.

Operating system and software updates are used for security and stability, but can also lead to compatibility problems.

As is so often the case in IT: Never change a running system. In industry, old computers are therefore often used because they work reliable – but they are not connected to the Internet for security reasons. Of course, it does not make sense to do without security updates on a production computer with internet access. If possible, however, you should use a stand-alone computer to control your telescope, whose configuration is not regularly changed by other programs. A mini PC that remains connected to the mount, can be accessed via a VPN (in the home network, without any further connection to the outside world) and can also control cameras is a good solution.

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