

Important Care Tips for astronomical instruments

Telescopes and mounts are precision instruments which, if treated carefully, will give you many years of pleasure. In this document we would like to make you aware of the most important things so that your telescope works as desired. Improper handling will invalidate not only the warranty but also the functionality, while with a little attention many problems can be avoided.

Please note: Although telescope optics and mounts are of course designed for outdoor use, the electronics in particular are still sensitive to humidity or extreme temperatures and temperature changes. If your mount is exposed to the elements for long periods of time without protection or if it is stored under adverse conditions, it may be damaged by weathering. Moisture can not only cause rapid ageing of the surfaces of telescope mirrors and coatings on all kinds of optical elements, but also damage the mechanics and electronics of mounts. If you follow the following tips, your telescope and mount will provide you with many years of faithful service, even if the warranty period has long since expired. On the other hand, mishandling or incorrect storage will quickly lead to damage to the optics and mount that is no longer covered by the warranty. Treat your mount as you would any other high-quality electronics: Use it, but do not subject it to unnecessary hardships.

Please observe the following instructions to protect your mount to avoid damage or even loss of warranty. Furthermore, we expressly refer to the regulations regarding warranty in our general terms and conditions under www.baader-planetarium.com/en/terms-and-conditions.

Risks due to overvoltage / short circuit:

1. Opening the housing or the mounting electronics during the warranty period leads – as with many other technical devices – to the warranty becoming void. Even outside the warranty period, under no circumstances may you disconnect or connect cables of motors or circuit boards inside the mount 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 for Celestron-mounts: No Response 16/17). The cause of damage can be identified during an inspection and is not covered by the warranty.
2. Connection cables must not be interchanged. Even if the cables of some mounts fit into the same sockets, e.g. for hand controllers and motors, the internal wiring may be different. Incorrect wiring can therefore lead to short circuits, which can irreversibly damage the electronics. This cause of damage is also traceable on the defective board afterwards and can lead to the expiration of the warranty. Therefore always pay attention to the correct wiring. Cover caps (# 889002), which also protect against moisture (see page 3), also reduce the risk of incorrect wiring.
3. Under no circumstances should the motor covers of the encoders (the black housing directly on each DC motor in the mount) be removed without a suitable electronics measuring station (among other things without bright daylight) and without protective sleeves against overvoltage/static charging. Modern electronics in motors and encoders are highly complex and must not be inspected or repaired without suitable tools and without sufficient knowledge about possible damage potential. Curiosity can unfortunately have fatal consequences here. Here, too, the warranty will 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).

Risks or malfunctions due to power supply units with too little power or high voltages:

1. **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.

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 the performance limit. 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.

If this happens repeatedly, it can lead to damage that can be proven. For this reason we strongly recommend not to save on the power supply. You will find on our web pages under „Power Supply and Cables“ (Accessories/Mount Accessories) power supplies with a slightly increased basic voltage that have been tested especially for winter operation.

The above mentioned problem of voltage drop in cold weather is described by customers of cheap indoor power supplies again and again, similar to this real writing:

„Our mount emits „foghornlike noises“ in cold temperatures in the right ascension drive. Your suggestion was to replace the power supply. The outdoor power supply unit you supplied for testing has now arrived, and we have been able to put it into operation successfully.

We would like to purchase the power supply unit.“

(Institute for Physics and Astronomy/ University of Potsdam)

2. **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 because 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 far away from the operating point. The superfluous 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.

3. **EMC (ELECTROMAGNETIC COMPATIBILITY):** Complaints due to malfunctions of electronic devices, CCD cameras and mounts caused by customer's own additional devices that do not comply with the European EMC directive, or the resulting costs of technician time, wasted spare parts or freight costs will be invoiced retroactively if necessary.

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

Many low-cost suppliers of power supplies and other electronic equipment obviously no longer take this formulation seriously. 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 Far East DIY stores. 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. Meanwhile we manufacture a large number of power supplies in Germany ourselves, in order to get this problem under control and to exclude such incidents for the telescopes and mounts we deliver from the beginning.

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 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.

Avoid damage to the electronics by moisture:

1. 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.

During normal operation of a telescope or mount under a clear sky with an average humidity below the dew point, this is guaranteed in any case, because the inherent heat of the electronic components ensures that no moisture damage occurs due to condensation. The situation is different if the mount is outdoors for days, covered only by a plastic bag (or other thermally uninsulated cover) and exposed to any weather situation (rain, frost, heat). In this case, condensation water can form under the cover, which crawls everywhere and can even accumulate to puddles in the mount itself. Accumulation moisture can be detected during repair, for example by water edges in the mount's housing.

Any such damage will invalidate the warranty.

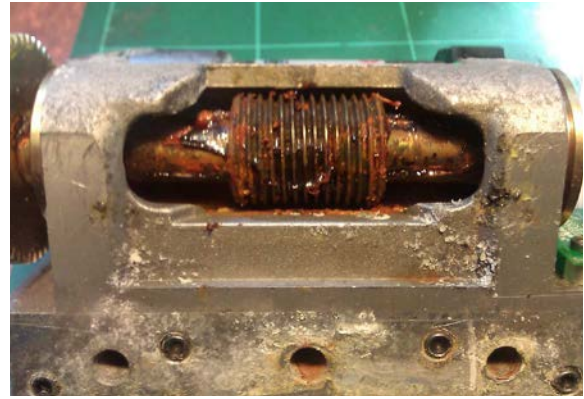
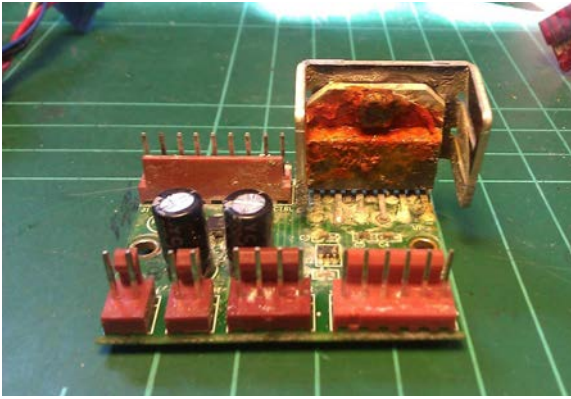
2. Telescope electronics must never be handled carelessly. Condensation water or rainwater in the housing destroys the circuit boards even of very expensive mounts. That's why you can now take the main electronics of most expensive mounts into the house, so that only the „hardware“ remains outside. Alternatively, the whole control unit can be kept under power all the time (like a computer-server), so that no dew causes damage inside. But then make sure that the tracking system is not running even though the mounting electronics are switched on.



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

3. 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 mounting enclosures and manual controls when leaving the mount outdoors or placing it in a wet case.
4. To protect against moisture or incorrect wiring, we recommend that you close unused sockets with protective caps to prevent dust and moisture from accumulating there. For RJ45 jacks (PC connection) and RJ11 jacks (e.g. autoguider jacks and Celestron handheld controllers) we offer a set of protective caps (5x RJ11, 2x RJ45) under order number #889002. These caps also reduce the risk of plugging accessories into the wrong socket in the dark and thus short-circuiting the mount.

Practically all manufacturers of amateur or semi-professional telescopes equip their devices with protective coated circuit boards. However, the mount must not be permanently installed outside without protection. If there is no qualified protective construction such as a double-walled observatory dome with dehumidifier, the devices must be brought inside after an observation night so that the moisture can dry off. If the devices are not stored in the house permanently, the user must take additional protective measures to prevent moisture from penetrating. In the event of moisture damage due to improper storage, the warranty claim is void!



Under normal use, nothing will happen to a mount even on damp nights – but if, as in this case, it is left practically in water for a long time, damage will occur that is not covered by the warranty. Therefore, always store it in a dry place when not in use – either indoors or in an air-conditioned dome, protected from the weather.

It is often not made sufficiently clear that modern mounts usually have as much electronics installed as a laptop computer, for example. You will also 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 the long run, 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.

Notes on cable breaks, damage to electrical connections and connectors for telescope control and electronic accessories such as video modules, heated H-alpha filters and much more

Transportable Telescopes

Place ALL cable connections high up so that no cables are directly on the floor or around the tripod or column. If a power supply cable must lay on the floor, make sure that the corresponding power supply is close to the column or under the tripod and that the power cable to be supplied does not come from your main observation direction.

Otherwise you could trip over one of the cables. Injuries when falling are not impossible, and in the worst case you could tip over the complete telescope with mount and tripod.

Place the cables that end in connectors in loops and secure the loop with a cable tie (Fig. 02 and 03 next page). 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.



*Cable protection on H-alpha filters:
Looped, tensioned cable USB 3.0 and power supply, attached to the clamping screw of the eyepiece extension.*

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, you should use cable ties that can be opened again (Fig. 01). They can be found on the Internet – e.g. at Conrad Elektronik – under the search term „knotted straps“.



Fig. 01: Cable tie that can be opened again (knotted strap). Fig. 02 and 03: Cable loop directly at the USB 3.0 connector of a Skyris camera with knotted strap for securing

Stationary Telescopes

Here the above applies equally without restriction. There is no danger of outlining the telescope. But there is an increased risk that – if you get stuck on a cable – all accessories will be torn out of the focuser or the connected accessories. **GENERALLY**, it is necessary to relieve **ALL** cables on connectors that are connected to an electronic module of the mount with a cable loop. You can use e.g. connector housings as mounting location – but only if the connectors are firmly screwed to the electronics box. Standard cable ties can also be used here – instead of the knotted straps mentioned above.

Some picture examples:

General view of an AstroPhysics GTO 1200 mount. From left to right: merged cables RS 232, guiding and power supply of the GTO, intercepted cable at the connector, manual control and strain relief, spiral cable and manual control at the motor connector RA.

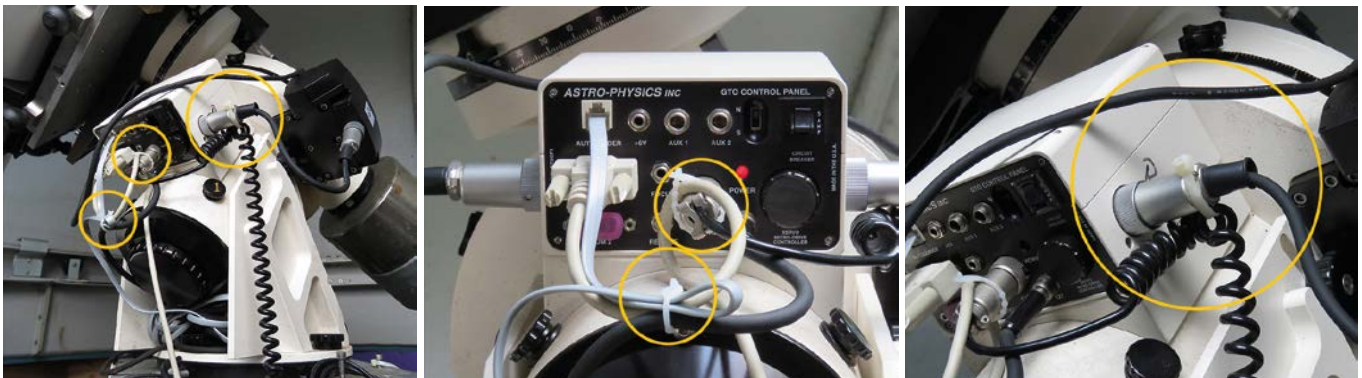


Figure centre: Detailed view of the merged RS 232, guiding and power supply cables of the mount and of the strain relief at the connector of the hand control unit.

Figure right: Detail view of the strain relief of the very heavy spiral cable of the hand control of the mount at the connector of the RA motor cable

Note on storage of electronics

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 suitcases.

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

Picture right: The spider web is located directly at the power input, but on the back side of the board. The little animal could not be found, maybe it crawled into the socket and became a barbecue there. You can also see how it has woven the corner with spinning threads.



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 eyepiece socket. The SC Tube is practically a „moisture trap“. 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 a 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 dealer and costs between € 200,- and € 400,-, 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/adjustment aids, care and cleaning products.



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

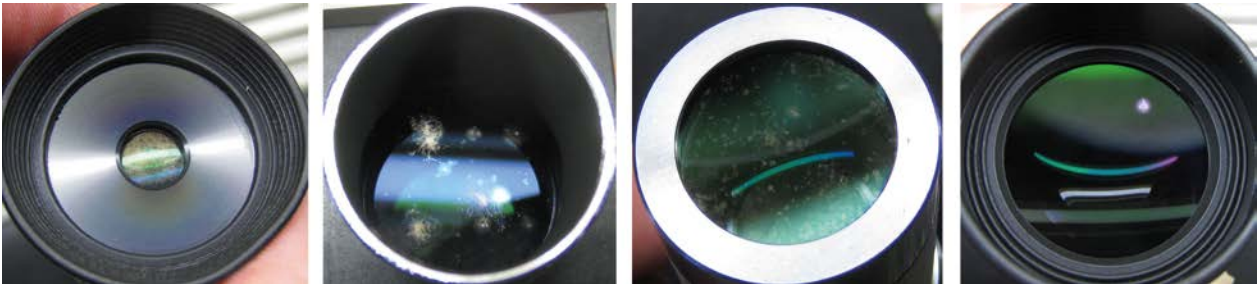
But – as already mentioned – over the years, fogging residues will always form on all optical surfaces, which do not disappear when drying. This is uncomfortable with closed optical systems such as SC telescopes, because it is difficult to reach the surface to be cleaned. On the other hand you can see 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 prove 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.

Important note on storage of optics

In order for your telescope to continue to perform at its full capacity after many years of use, it is important that you store it in a protected and dry 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 or improper cleaning can irreparably damage a telescope, even in a short time.

Even if it does not damage a telescope if it gets cold or wet, you should avoid strong, short-term thermal shocks that can cause tension.

When you bring your telescope from a cold night into your warm house, moisture can condense on it. Leave it to dry with the protective covers removed to allow the moisture to evaporate. The cases for the telescope and eyepieces must of course also remain open, otherwise the moisture will collect in the telescope or its packaging and provide an ideal climate for mould and fungi. Glass fungus refers to a whole range of (mould) fungi that feed on materials used in the manufacture of the optics or that have deposited as dirt on the optics. They can damage the coating and the glass – so store your telescope in a dark, dry, not too



These eyepieces are infested with glass fungus. The eyepiece on the far left is completely overgrown, the right eyepiece has only a small fungal infestation.

warm and well ventilated place to avoid mould. Fungus is very robust and almost impossible to remove; fungal spores have even survived in a vacuum. Damage caused by fungal attack to the coating or glass is not repairable and is not covered by the warranty.

Nevertheless, do not clean your telescope too often. Dust hardly impairs the image quality, while scratches caused by improper cleaning can cause permanent damage and create additional surfaces for fungi to attack. Fingerprints, eyelash grease and pollen, on the other hand, should be removed promptly, as the acids and essential oils they contain can attack the coating. Baader Optical Wonder Cleaning Fluid (# 2905007) has proven to be effective for cleaning, which also has a disinfecting effect against spores. The Optical Wonder series can also be found on our website under

[Accessories/Optical Accessories/Collimation tools, Cleaning and Maintenance Products.](#)



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.

Caution when changing accessories on the Schmidt-Cassegrain or if the focus is blocked

Occasionally we receive complaints about Schmidt-Cassegrain telescopes where the focusing is blocked or 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 released – do not focus with force!

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.

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

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 the statutory warranty.

Important note for troubleshooting with manual computer 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 one bit in the memory is flipped. In this case try a firmware update, usually the error is fixed.

Important note on 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 AGB / warranty conditions. You can find these on our website under

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BAADER PLANETARIUM GM
BH
Zur Sternwarte 4 • D-82291 Mammendorf • Tel. +49 (0) 8145 / 8089-0 • Fax +49 (0) 8145 / 8089-105
www.baader-planetarium.com • kontakt@baader-planetarium.de • www.celestron.de