

Lodestar to RJ 12 Adapter

By Alex McConahay

I have written this to make it easier for others who need to repair or replace their Lodestar guiding cable. I know there is a lot of reading here, but I have tried to cover all the eventualities. I have certainly tried to be as accurate as I can be. If something is not right in what I have said here, if you have suggestions, or if you need some advice, contact me. I'd love to help, and certainly do not like to spread misinformation.

One other point: I love my Lodestar. It is a fine camera, finding me many more stars than any other guide camera I have tried.

Alex

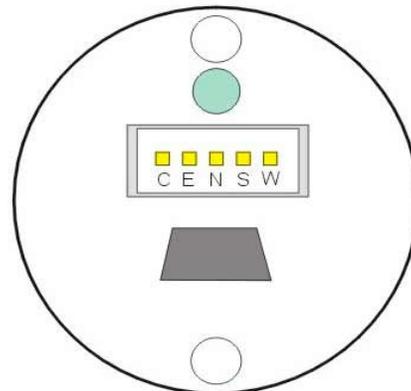
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Introduction: Several users have noted that the Starlight Express Lodestar appears to have a weakness where the guide cable connects to the camera. The cable connects firmly to the camera. It is, however, rather small, and the "strain relief" on the cable does not seem to attach to the connector itself, leaving the strain to act on the thin wires inside the cable. In my opinion, this arrangement is not up to the rigors of regular connecting and disconnecting. It certainly does not appear as rugged as the "standard" RJ 12 autoguider cable known as the "ST-4 Standard." Furthermore, it is rather small, and hard to connect and disconnect. When my connector broke, I faced the choice of



The finished product (above) is an RJ-12 jack connected to a Lodestar-type connector. Here, a standard autoguider cable coming from the jack is taped to the USB-Mini connector to share strain relief on the cables. These cables are then taped to the side of the Lodestar to further eliminate any strain on the connections themselves.

The graphic below shows how the wires output from the Lodestar (on top) must be crossed to match the input connections for the standard guider port (Gemini's shown below).



C = Common ground
E = East (-X)
N = North (+Y)
S = South (-Y)
W = West (+X)

<http://www.starlight-xpress.co.uk/Lodestar.htm>



replacing it with an original, which I felt inadequate, or coming up with a better solution. My goal was to use the existing cables on my mounts. I wanted it to easily attach and detach, but to stay connected while in use.

Background: In various places one can obtain background information for this project. The photo on page 1 shows the output and inputs required for the camera and guider ports. Page 1 of the Lodestar manual (<http://www.starlight-xpress.co.uk/Handbooks/Handbook%20for%20the%20Lodestar.pdf>) describes the connector as:

Output connection - 5 way JST 'ZH' style 1.5mm pitch plug to RJ12 autoguider plug

After a few minutes with Google, I translated that to mean it is five conductor connector, made by a company called JST, and it is a 'ZH' style plug. I could not find such a thing at my local electronics parts supplier, or remote control hobby dealer. But I did find them, among other places, on EBAY. For example:

http://www.ebay.com/itm/Micro-JST-1-5-ZH-5-Pin-Connector-Plug-w-Wire-x-10-sets-/120853150311?pt=Radio_Control_Parts_Accessories&hash=item1c2368ba67

I bought ten sets (male and female ends) of these, with shipping, for a bit more than \$10. When the connectors arrived, they appeared a little shorter than what I remembered the original. They fit very snugly, and, with no tab or other place to grab, had to be removed by slipping a fingernail or small screwdriver to pull them out.

The male plugs (the part I needed), had about 150 mm (5.5 inches) of wire connected. One could connect these wires directly to the original cable, but I felt that would

The “parts kit” above consists of the ZH style plug with extended leads (single, and pack of ten shown here), and a Keystone RJ12 6p6c Voice Jack (center, which comes in many names). The small gray tool is used for pushing the wires into the connectors. You can do without it, but it is nice.

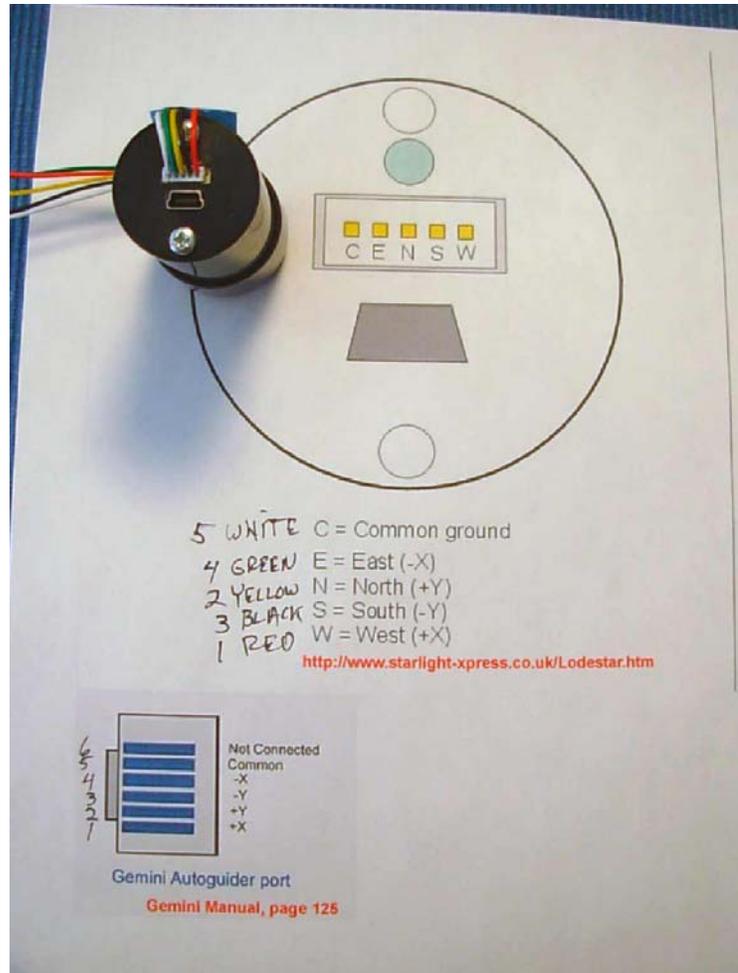


leave me in essentially the same position I had been originally, only without what little strain relief the original cable had provided.

A trip to my local electronics supplier provided me with an RJ12 Keystone jack. (Keystone jacks are made for home networking, theater, phones, and so forth. You can get one faceplate with standard size square holes, and then can buy any variety of Cat-6, phone, audio, visual, HDMI, whatever, jacks that fit snugly in the holes.) This jack was from Philmore-Data, labeled "CAT3 (Voice) Jack"(Riverside's Main Street Electronics, \$3.16). Similar jacks are available at local hardware stores..

Assembly: Get your parts together, including your camera.

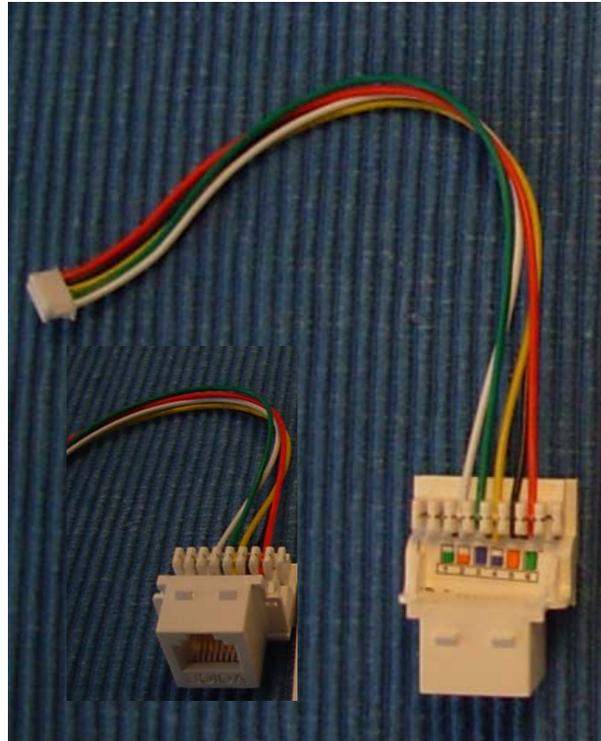
1. Print a nice clean copy of the graphic (on page 1 of this document) showing the pinout connections.
2. Insert one of the ZH connectors in your camera with the wires extended. (See Image this page)
3. Align your camera so that it matches the Lodestar pinout. On your pinout graphic, label which color wire relates to which function. (On mine, the white one is the first one on the left and the graphic labels it as C for Common, so I wrote "white" next to Common.) Use the colors on *your* ZH connector, which may be different than the ones that came with mine.
4. Check your mount's guider pinout (the Gemini's is provided). If your current mount uses the stock Lodestar cable, the configuration here will work. Nearly all mounts use +X, -X,+Y, -Y, and a common. If your mount uses a different configuration than the Gemini listed here, just substitute your information for which terminal is



Above is my worksheet for the Lodestar and my Gemini. You can get a clean copy of this document by printing page 1 of this document. Be sure to use your colors for the wires coming out of the Lodestar. What is important is matching the order, not my colors.

which. Note that the order of the cables going into the mount are not necessarily in the same order as those coming out of the Lodestar.

5. Label which color wire goes to which pin on your mount's jack. (E.G., Common from the Lodestar (first pin on left) goes to Common on the Gemini (post 5) , -X goes to 4, etc.)
6. Double Check.
7. Remove the ZH connector and wires from your camera so they will be easier to work with.
8. On the Keystone Jack, gently remove the protective plastic cover that hides the terminals (clear plastic swing-cover). This will give you access to the terminals. (Note that your Jack may have a different shape or cover for the terminals.)
9. Determine which terminal is "1." Jacks may be different, and they are not consistent. They may have been molded for network connections (with 8 contacts) but fitted only for voice (with 6). One jack I used has three different designations for which "Terminal" was which. To make the determination, place the terminal on the table with the RJ-12 side away from you, tab-clip up. Look from the back (at the terminals, not the RJ 12 side). See which terminals actually are active (i.e., actually have metal contact points in them). Terminal 1 will be on the left of the active terminals (when viewed from this orientation). Also, study the pictures on this and the previous page.
10. Insert the colored wire you have for the jack's pin 1 into the terminal for pin 1. In the illustration I provided, this means the red wire (+X) goes to terminal 1, but the color of the wire coming out of your Lodestar's ZH adapter, rightmost position (W) may not be red. Press this into the terminal. A small plastic punchdown tool is made for this job, but you can do it with a thin screwdriver.



Above is a completed adapter. The clear plastic cover has not been restored. The red wire is attached to the rightmost of the active terminals. The attached label says this is terminal 6, but we are considering it number 1. From a slightly different angle (inset) one can see that it is the rightmost active terminal when looking from the front, and with the clip-tab pointing upward.

11. Proceed with the remaining terminals, in order.

12. Restore the protective plastic cover. Your "adapter" is done. You will need a "Standard" ST-4 guider cable (RJ-12, 6p6c, (6 conductor), all wires connected, but reversed) to hook this adapter to your mount.

Additional Strain Relief: As an additional step, you may wish to tape your wires and jack to the side of your Lodestar. After doing this, any strain on the wires will pull on the hardier RJ12 connector. For additional protection, while in use, tape the guider cable to your USB cable, and both of them to the side of the camera for the ultimate in strain relief. Note that these steps can be taken with the stock cable, and will help. However, one of the places people have had trouble with the stock cables is when attaching and detaching them from the camera. The ZH style connector is just too small and tight for many to work with easily.

Alternatives: You can take other routes...

You could simply attach the ZH connector directly to your old cable, do a little soldering, and have essentially the original cord. However, the ZH connectors I was using were much more difficult to remove, and would not be a good solution if you need to attach and remove your cables on a regular basis. Furthermore, although the strain relief on the stock cables did not adequately do the job, there is no strain relief at all on the replacement ZH fittings.

Other Notes:

Difficult to Remove: The ZH plug that I used was very snug in the Lodestar. This is good. But it means it is harder to remove. For that reason, consider your "Adapter" a permanent piece of the camera, and connect your camera only through the RJ 12 guider cable.

ST-4 Standard Autoguider Cable: Fact is, although these are "standards," they are far from standardized. There appears to be no "Standard" guider cable. There may not even need to be one. As long as you connect your grounds properly, connecting the activating lines (+X,-X,+Y,-Y) may not matter as much as we think. Calibration in our autoguiding software is there to figure out what the different lines do, and the rotation of your guider and reflections and so forth of the optics will determine what is north, south, and so forth. For a fascinating discussion of "ST-4 standard," see <http://forum.shoestringastronomy.com/viewtopic.php?f=3&t=288>

RJ-11, RJ 12? At the end of your guider cables, you will find little plastic connectors, with embedded contacts. They are called RJ-12 (R(egistered) J(ack) 12). The RJ system is supposed to rely on specifications as to the wiring connections, and one would

think (incorrectly) as to size of the connector. Even the experts can get confused among RJ 11, RJ 12, and others. Fact is, they are interchangeable to some extent, and since the manufacturers do not always stick to the same specifications it can be even more confusing. For our purposes just get one that has six positions and six conductors (6P6C), usually called an RJ12, but commonly called RJ3 (Voice) and RJ11. How do you figure it all out? Take your current Lodestar cable to Home Depot, Lowes, Ace, or your local electronics store (not Radio Shack) and get a jack that mates with it and has six contact wires in it.

RENEWING A GUIDING CABLE: If your guiding cable has lost a clip-tab (that holds it tight to the RJ-12 jack on the mount), or broken a wire in the connection at the end, or, of course, has broken off of its original Lodestar connector, it is easy enough to renew the cable. You will need a crimping tool (As little as \$15-20 at most hardware stores) and a supply of RJ-12 connectors (Home Depot Ideal Telephone Plugs RJ11 6P6C Box of 25 for \$5.97). Be sure to note whether your cable is straight through or reversed. Hold the wires so that the connectors are next to each other, pointing the same way, with the clips in the same positions (clip-tabs down). Look at the colors of the wires inside. In the "standard" configuration, the white wire will be on one side in one clip and on the other side in the other. Match this in your new cable. Then just cut off the broken connection, strip back some insulation, and crimp them up!!! (Follow the directions on the back of your new crimping tool!)

Disclaimer: Mine works fine. I don't know about yours. And I am certainly not responsible if yours blows up your camera, your mount, and that of every amateur AstroImager at the star party you are attending. Remember you got this free advice off the Internet—so it must be true, right?

Seriously, I thought this out, like I do all my projects. However, unlike most of my projects, this one actually worked. But there may be better ways of doing it, and ideas I have not thought about. And certainly I could have made mistakes or said something incorrectly.

But, as I said in the intro.....if I can help, please contact me by email. And if something here is wrong or misleading, please tell me. I wrote this to help.

(PS....the leftover ZH connectors I got from way across the ocean have been donated to my club—the Riverside Astronomical Society, and will be for sale at RTMC Astronomy Expo.....(I don't have any more!!!—Sorry!!!))

I suppose I should say that Lodestar, Gemini, Keystone, and other trademarked names are used here only for educational purposes. They don't know me, and none of us endorses the others.