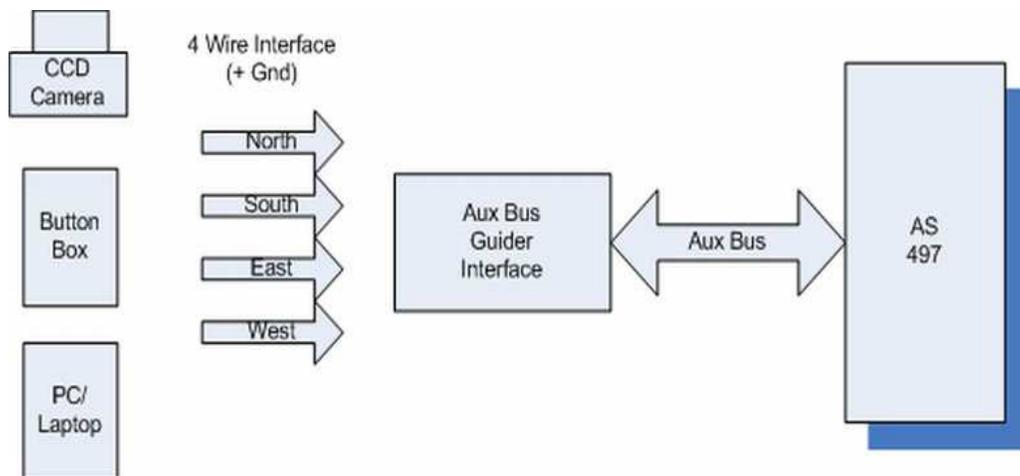


**The AuxBus and guiding a Meade Autostar 497 equipped telescope.
Assembly instructions for PIC based guider only interface**

Overview:..... 1
 How it works:..... 2
 How easy is it to build?..... 2
 Parts list supplied 2
 Assembly steps: 3
 Testing without power supplied:..... 3
 Testing with power supplied but chip not inserted 3
 Testing with chip inserted..... 4
 Figure 1: Component layout showing circuits connected..... 5
 Figure 2: Completed guider 6
 Figure 3: Solder side 7

Overview:



The ST-4 interface supported by Meade telescopes is a 4 wire interface and provides a way to command the telescope to move in small increments based upon bringing a signal line low by an external piece of equipment. The guide rates are approx 10 arcsec/second of time for the AS 497.

Cameras that provide a 4 wire guide output interface are SBIG, Fishcamp and others.

Many telescope models from different manufacturers support this 4-wire guide interface input albeit with different pins or signal polarities.

The 909 offers this capability to owners of 1x90's with Autostar 497 and to all almost all other Meade bases by utilizing patches available to the 497 firmware.

This interface can be directly coupled to cameras that support it or controlled via parallel port, button box, etc. Many programs provide support for this interface to guide your telescope.

The guiding provided by the 909 should be deterministic in that every ~100ms the Autostar asks the 909 if any inputs have been asserted and if they have been the 909 tells the Autostar for how

long the inputs were set. The 909 keeps a running count so even if the Autostar is busy doing something else and an input is asserted the actual amount of time the input was set since the Autostar last asked is returned.

How it works:

There are 4 pins plus ground on this interface

Pin 1 - No Connection

Pin 2 - Ground

Pin 3 - East/Left - Bringing this pin to ground (or 0 Volts) will move the telescope East at ~10arcsec/second

Pin 4 - South/Down - Move the scope South at 10arcsec/second

Pin 5 - Up/North - Move the scope North at 10arcsec/second

Pin 6 - Right/West - Move the scope West at 10 arcsec/second

The guiding interval is a minimum of 100 milliseconds, so if the pin is 'low' for only 10ms it will only command a to move 1 arcsec in the given direction.

The firmware in the guider checks the inputs every 2 milliseconds and updates its running tally 50 times every 100ms.

This unit plugs into your telescope base Aux Port and communicates directly with the Autostar on the Aux bus.

How easy is it to build?

If you have ever done soldering on basic electronic components, then very simple.

Parts list supplied

The parts include:

- 4 - resistors (2x1k, 1x10k, 1x680 ohm)
- 2 - capacitors (0.01uf disc and 10uf teardrop)
- 1 - 8 pin socket
- 1 - PIC 12F629 microcontroller that plugs into the socket
- 1 - 6P6C female jack connector to plug the guide cable into
- 1 - Coily cord with 4P4C connector to plug into the Aux Bus port on your telescope base
- 1 - Circuit board
- 1 - Case for the above.

The case needs to be notched to accept the 6P6C jack and also the coily cord Aux bus cable. The case supplied will come with the outline drawn on the case for the material that needs to be removed.

The circuit board will come trimmed to fit in the case. About 3/32 inch will be removed from one side.

Pay attention to the 10uf capacitor polarity. The long leg goes to the + side. (Right side looking down on top of board)

Pay attention to the Zener polarity, the dark band goes to the + side (right side looking down on top of board)

It is recommended to hot glue the wires connected to the board, a small amount at each connection, this will provide for strain relief.

Assembly steps:

Cut the traces on the solder side as shown by red **X's** on diagram. The circuit will work if these are not cut but you will have NO current limiting for the Aux bus pins.

Solder the socket to the board

1. The 'bend and solder's that happen next are fairly immune to error, center the body of the component on the socket then everything to the left and right of the body all go to the same place so even if the touch, as long as the left side does not touch the right side it is good.
2. Bend and solder the 0.01uf capacitor, be careful to not strain the leads where they enter the disc.
3. Bend and solder the 10uf capacitor, be careful to not strain the leads where they enter the tear drop
4. Bend and solder the zener, black band to pin 1. Again do not strain where the leads enter the component.
5. Bend and solder the 1k ohm resistors into the Aux Clk and Aux data lines
6. Bend and solder the 10k ohm resistor

For the next step, you want the body of the 680 ohm resistor to be on the left side of the board, with the lead being short where it enters the board to the Aux Bus 12v input (see figure 2) The long lead to the right will be current limited to 10ma so even if it is shorted directly to ground it just will not work and no smoke will come out.

7. Bend and solder the 680ohm resistor, do not forget to attach the right side of the resistor to the Vcc pin 1 of the socket or any of the other leads that go to pin 1 (see figure 3).
8. Strip and attach the coily cord wires to the board. The cable is quite long so cut it to the size you want , strip off the jacket and then strip the individual wires. Attach as shown in solid colors on figure 1. Be careful when stripping to not nick the wires as this will decrease the strength.
9. Check carefully on the solder side for any solder bridges. The only ones that will really hurt are if the Gnd and 12v are shorted where the curly cord enters the board.

At this point you can test you circuit for correct voltages.

Do NOT insert the chip yet**Testing without power supplied:**

Measure the resistance between the Aux bus Ground (pin 8) input and the Aux bus 12v input to the board. It should be infinite (no connection without chip installed).

Measure the resistance between pins 5 and 6, this should also be infinite. In fact the resistance between any one pin to any other should be infinite except for pins 4 and 1 that has a 10k ohm resistor connecting them.

Testing with power supplied but chip not inserted

Plug the Aux Bus cable into the telescope base

Turn on the telescope

Measure the voltage between pin 1 (red lead of meter +) and pin 8 (black lead -) of the socket, you should see 5.1-5.2 volts If you see less than 5 volts and the voltage drops very slowly you have the 10uf capacitor in backwards. Long leg goes to pin 1 of chip.

Measure the voltage between pin 8 (Gnd) and pin 4, you should see same voltage as between pin 8 and pin 1 = 5.1-5.2v

Measure the voltage on the AuxClk pin 5, you should see around 5 volts.

Measure the voltage on the AuxData pin 6, you should about 4.5 volts but definitely less than pin 5.

Turn off the scope

Insert the chip with pin 1, indicated by the little indented circle on the chip, to the lower right pin of the socket - pin 1 (see Figure 1 below)

Make sure no pins bend during insertion.

Testing with chip inserted

Turn the scope back on.

Measure the voltages at pins 1 through 4 and 7, they should be 5v or greater

Measure the voltages at pin 6, it should be around 3.5 volts (less than what you measured previously) once the Autostar has been on for 15 or so seconds.

This lower voltage is caused by the AS polling the guider every 100ms.

Turn off the scope when all checks are made.

You can now solder in the 6P6C connector leads, attaching the leads as indicated in the color code of the diagram (see figure 1) Do not solder in the white wire, cut off the stripped end only.

Check everything for solder bridges again and you should be ready to go!

You can make a button box to test this.

Gene

Clone 909 using PIC 12F629, pin 1 labeled

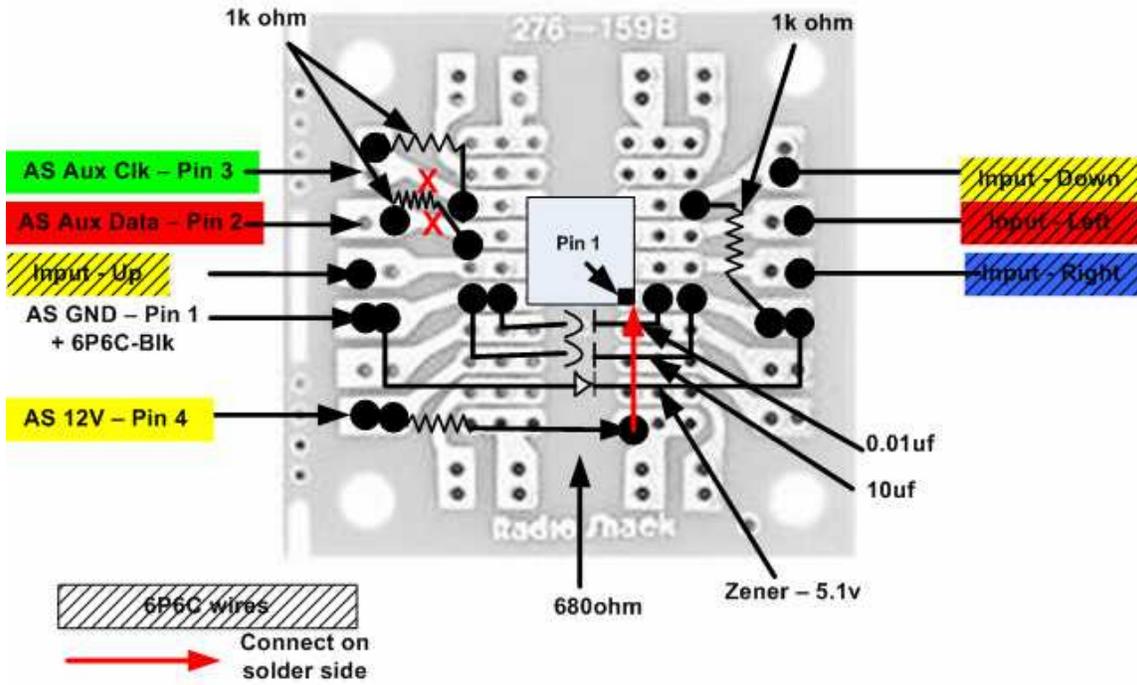


Figure 1: Component layout showing circuits connected

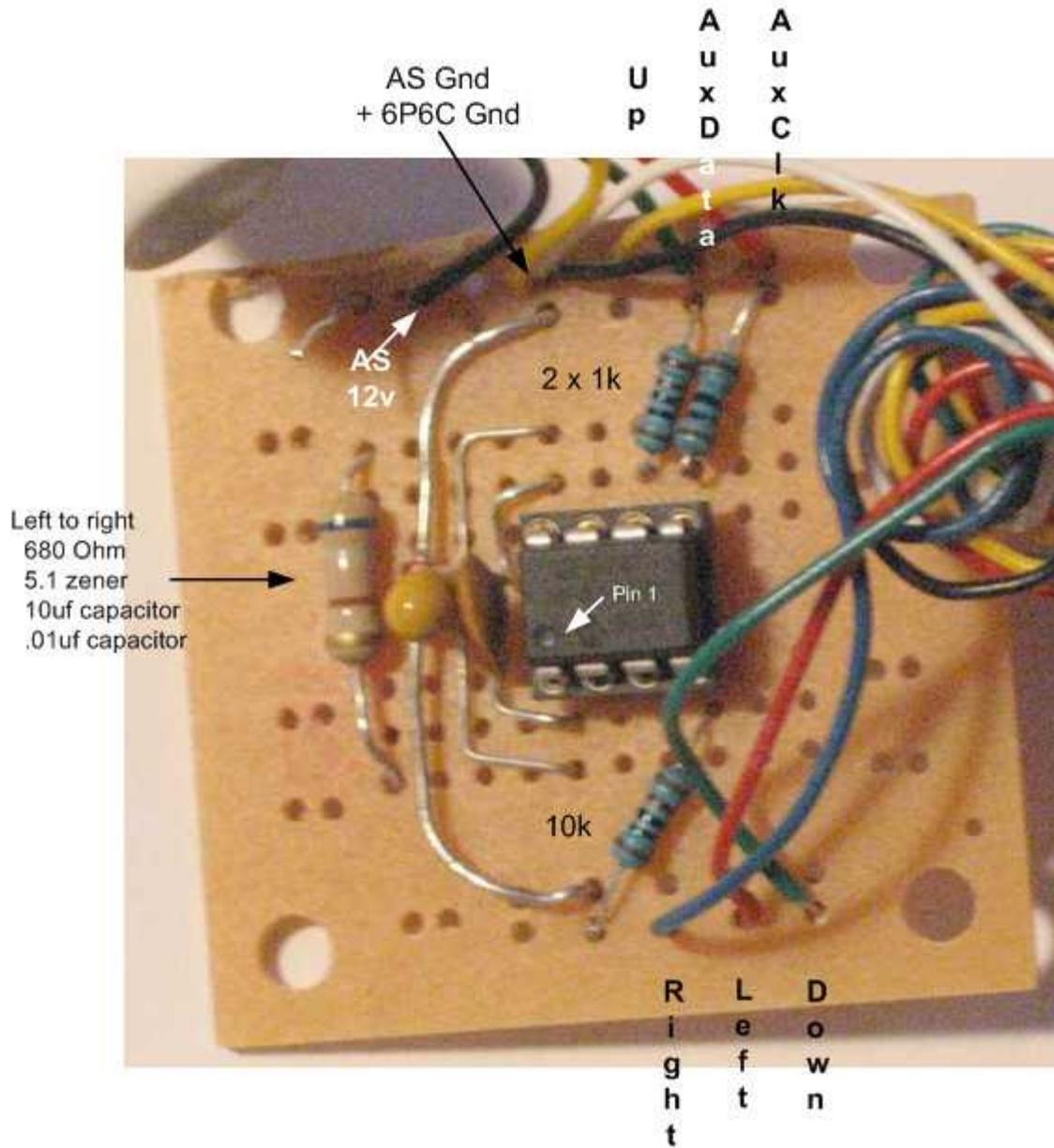


Figure 2: Completed guider

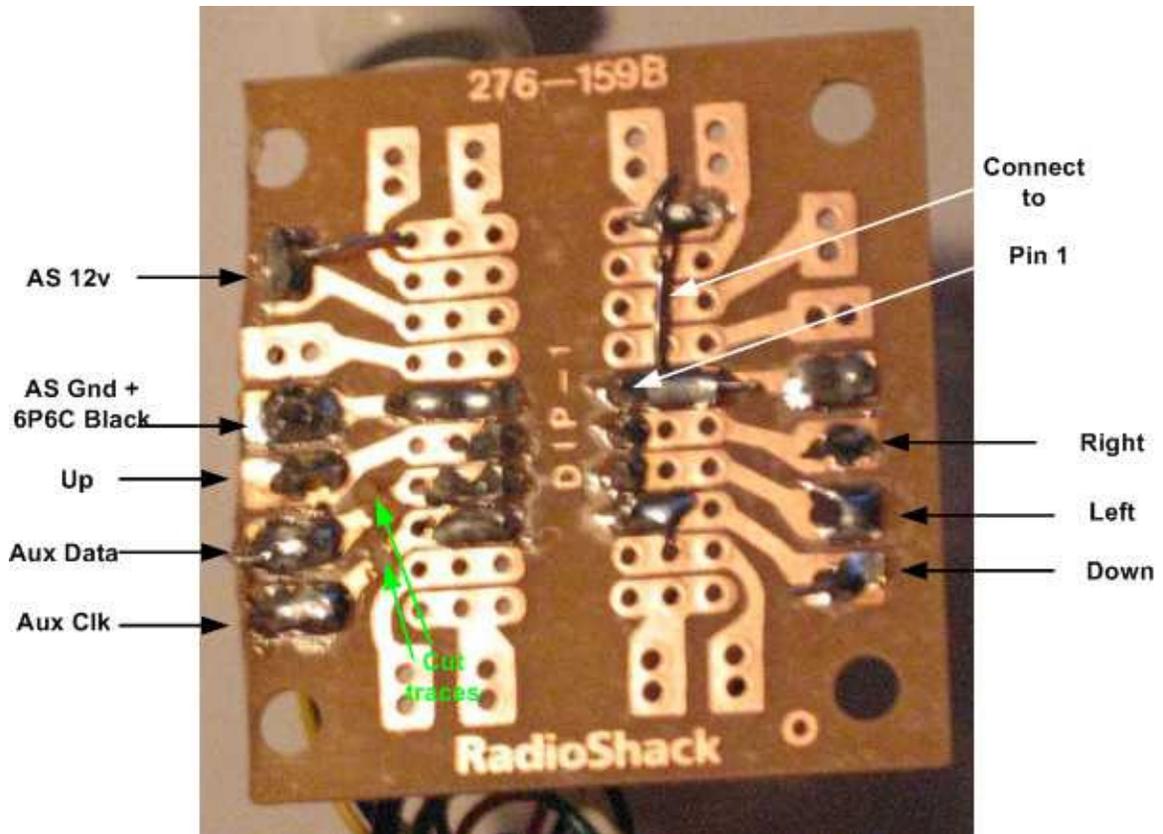


Figure 3: Solder side