

## Rotator Direction Controllers



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About 20 years ago, I built a rotator control for a CD-44 rotator. The circuit was roughly based on some basic ideas of K9AZG's prior work, but it included some significant improvements. It appeared in *73* ("Elegant Rotating," *73 Magazine*, 285 (June, 1984), 60-64). A few years later, when I acquired an HD-73 rotator, I redesigned the controller for that system. It appeared in *CQ* ("An Automatic Beam-Aimer for the HD-73 Antenna Rotator," *CQ*, 47 (January, 1991), 11-16).

Many, but not all, basic rotator control boxes are still somewhat primitive. At the other extreme, I have seen some very sophisticated circuits, a few of which are computer controlled and require only that one type in the DX prefix to re-aim the beam. Somewhere between is a happy medium: the operator simply twists a dial to a desired heading and the rotator completes the job. For rotators that still use a "hold-it-down-until-it-arrives" system, extra circuitry is required.

In the belief that the original simple circuits that I developed for my stations might still be serviceable, I am placing the original pencil schematics here for reference. They are not the clearest in the world. That is the price of scanning pencil lines that are 15-20 years old. However, I think they can be read well enough to get the ideas across. Printing them may require that the page be set "landscape" rather than "portrait" orientation.

Both units use voltage comparators--LM311s in the original. Everything is supplied with +/-12 volts, since power is simple enough to obtain and at least one of the versions needs the dual supply. The comparators drive switching transistors that drive relays. 5-amp contacts are the safest, but 2-amp contacts will do and allow smaller relays. Besides some cross wiring of the output terminals to the original controller, defective driver transistors have been the chief troubleshooting problem. We buy them in cheap batches and solder them in without testing. Hence, some turn up bad, often with very odd symptoms.

In the "CD" version of the rotator control, the third LM311 is needed only if the rotator has a separate braking line. Omit that portion of the circuit for versions without such a line. The circuit shown can be adjust from a fraction of a second to several seconds delay.

The basic principle is simple: we sample the "heading" voltage from the pot in the rotator head. We connect a much higher value pot across this voltage source to create a reference voltage. These two voltages go to the voltage comparators. When the reference is more positive than the heading value, one comparator activates and sends (via the relay) voltage to the rotator motor to rotate the beam until the values match and the comparator shuts down. If the reference is more negative than the heading value, the other comparator activates. When the two voltages are the same--within a user-set adjustment range--nothing happens.

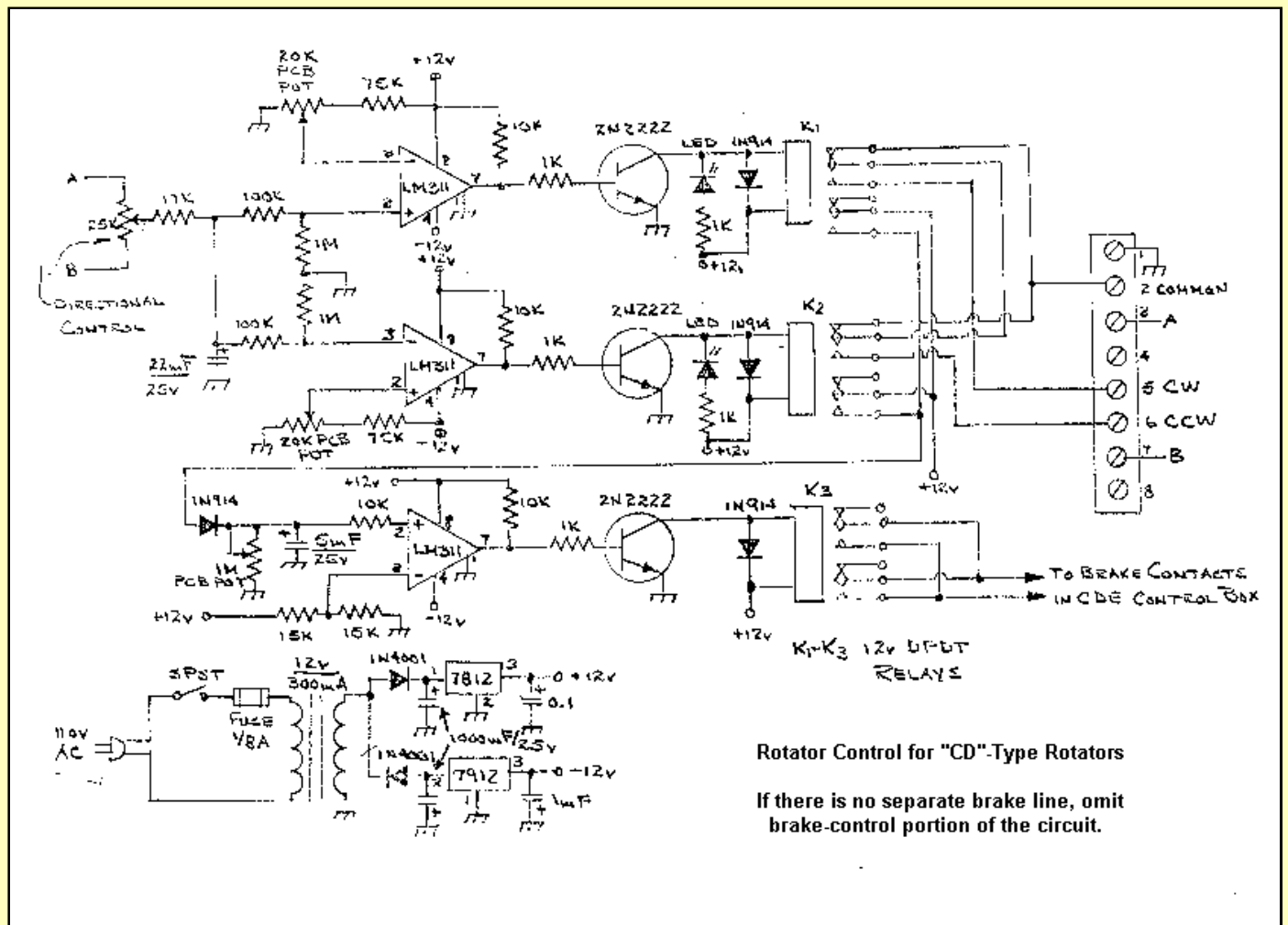
The two systems differ in this way. The CD-type rotator uses a 26-volt indicator spread. Hence, reference and control voltage can go directly to the comparator input pins. The HD-type uses a very low positive voltage for the heading meter value. Hence, we add a combination DC amplifier and difference circuit between the two source values and the comparator pins. These two variations on a theme should suffice to allow redesign for whatever kind of system might be encountered. For example, you might wish to use solid state devices rather than relays, although you would have to ensure that they do not create stressful voltage drops in the motor operating voltage.

There are in both circuits all kinds of trimmer pots for initial set-up to permit smooth operation. The HD unit contains a power interlock system that I would now incorporate into the CD unit. The key to satisfying operation, however, is the quality of the reference pot, which will have panel marks to indicate the desired beam direction. It must be linear, and the smaller the amount of dead (no change in value) space at the ends of rotation, the wider the spacing between heading marks in the center region. I have heard of continuous rotation pots that eliminate the dead-region problem, but my own unit uses a standard high quality pot of normal design.

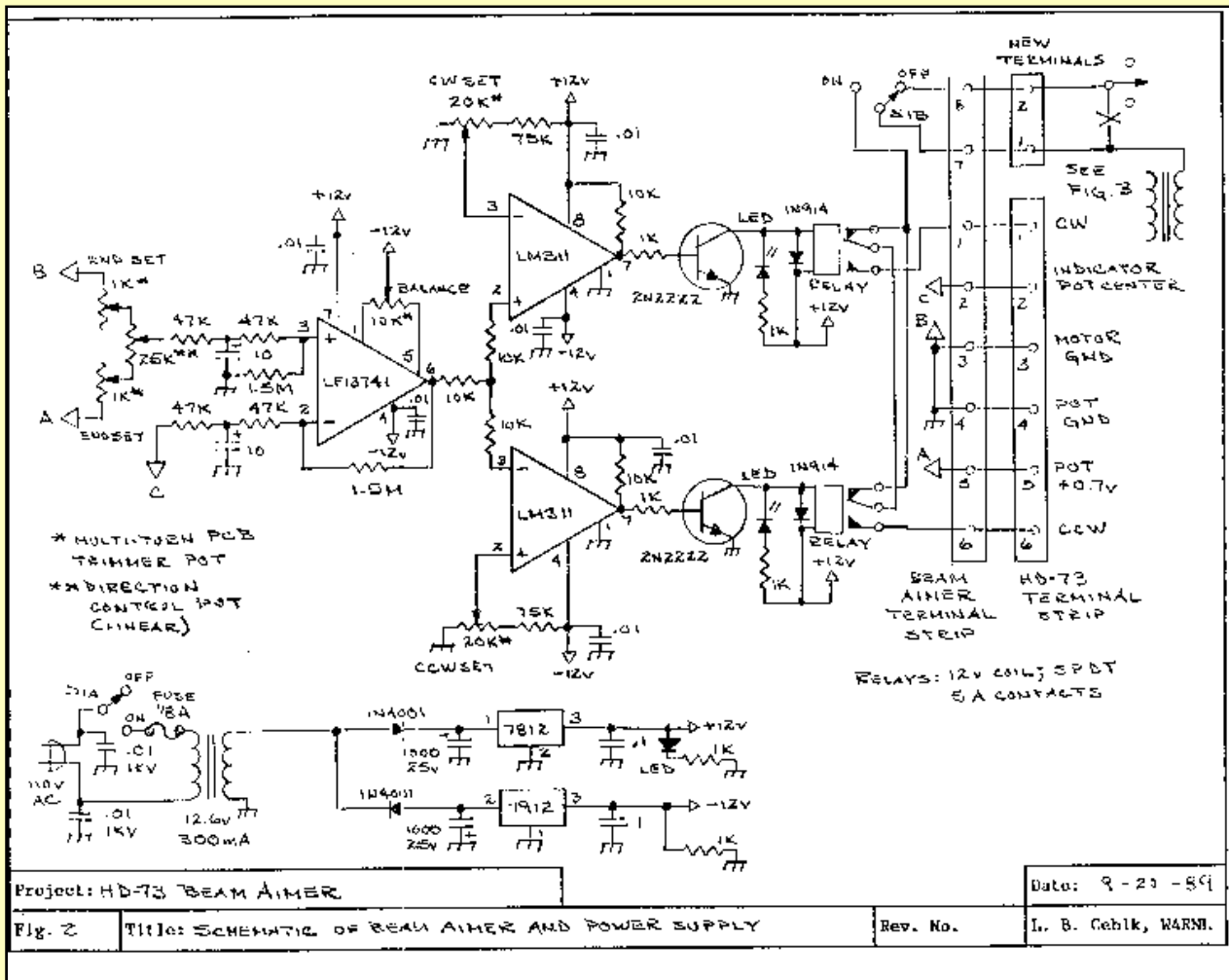
My own HD unit has never required maintenance in 15 years of service, and I have heard of CD units giving equally durable service. Construction layout is not critical. Connections to the rotator box used by the builder are a builder responsibility, since terminal strips and rotator models have undergone changes over the years.

Refer to the original articles for further details of the designs and adjustments. These schematics are provided simply to demonstrate the level of simplicity that can still provide effective control of a rotator for one-twist beam heading settings. However, you still have to know what direction J3 is from your QTH.

### The "CD" Controller



### The "HD" Controller



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