About this Article

This material was included with the downloadable supplemental content accompanying the *ARRL Antenna Book*.

You may print a copy of this material for personal use. Any other use of the information requires permission from the ARRL.

CONVERTED C-BAND TVRO DISHES

The following material was extracted from earlier editions. Figure and Equation sequence references are those from the 21st edition of *The ARRL Antenna Book*

In working with larger, converted C-band TVRO dishes for AO-40, some operators have used only the polar mount with its jack-screw mechanism. See **Fig 66**. This dish is called *Big Ugly Dish* or just "BUD" by their users. Only using the polar mount mechanism limits the operator in the range of motion, as previously discussed. WØLMD provides for a greater degree of articulation of these dishes through several mechanisms. One of these is a sector-gear elevation drive, shown in **Fig 67**.

For the azimuth motion of our satellite antennas, most use motorized rotator drives, mainly the commercial sources previously mentioned. Most antennas are tower-mounted, allowing the placement of the rotator inside the tower. For the large wind loads of satellite antennas, these commercial rotators become rather expensive.

High loads are also prominent with the use of BUD

Fig 66—A TVRO dish-drive system is shown on its polar mount, using a protected drive-screw mechanism. (*WØLMD photo*.)

Fig 67—A modified TVRO dish mount is shown using an Az-El mount and a sector-gear drive for the elevation. (*WØLMD photo*.)

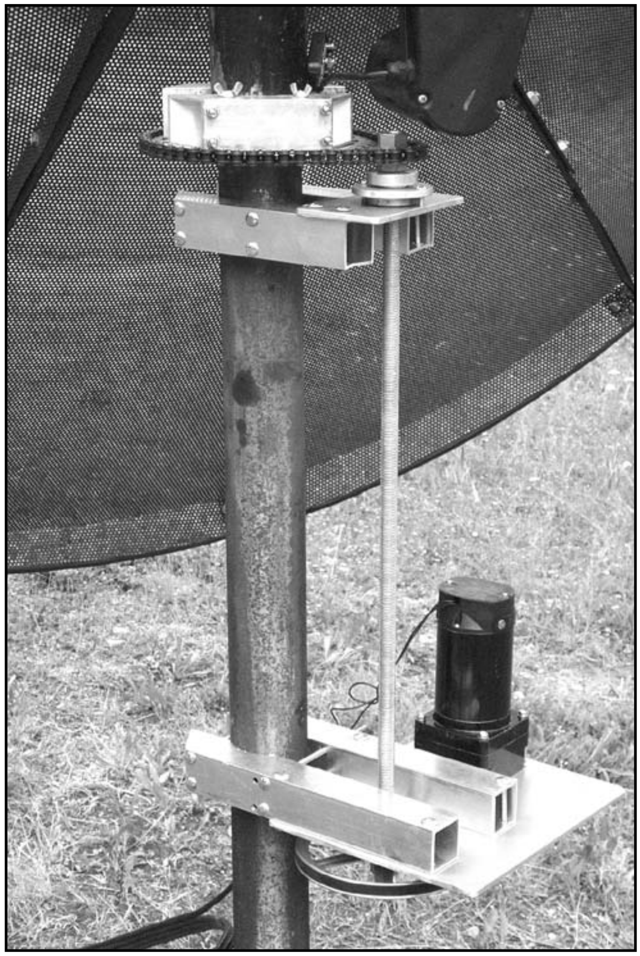

Fig 68—WØLMD constructed a very robust and low-cost Az drive mechanism. (*WØLMD photo*.)

antennas, and WØLMD has again engineered some very robust mechanisms using combinations of motorcycle-chain drives, V-belt drives and gear-head motors, as seen in **Fig 68**. An overall view of one of his BUD antennas is shown in **Fig 69**, showing the Az drive with an El drive that uses a jackscrew mechanism.

Operators through the years have employed many methods for the control of their antenna positions, ranging from true *arm-strong* manual positioning, to manual operation of the powered antenna azimuth and elevation rotators, to fully automated computer control of the rotators. While computer control of the rotators is not essential, life is greatly assisted with their use. For many years, one of the keystone control units for rotators has been the *Kansas City Tracker* (KCT) board installed in your computer. Most satellite-tracking programs can connect to the KCT with ease. One difficulty with the KCT unit is that they are 8-bit digital units, providing positioning precision of 0.35° in elevation and 1.41° in azimuth. For the larger dishes, with their narrow beamwidths, these values of precision are unacceptable. There are other options to replace the KCT unit.

A recent trend for amateur antenna control has been evolving in the form of a standalone controller that translates computer antenna-position information into controller commands with an understanding of antenna-position limits. These boxes, represented by the *EasyTrak* unit, **Fig 70**, from the Tucson Amateur Packet Radio (TAPR) group, have made this capability readily available for many amateurs. This unit is a 10-bit encoder, providing precisions of 0.09° in elevation and 0.35° in azimuth. The computer can also control the operation of your station transceiver through the radio interface provided in *EasyTrak*; you will not need any other radio interface.

Other position readout and control options are available. For many years ham operators have employed synchros, or *selsyns*, for their position readouts. These are

Fig 69—A completed TVRO dish Az-El mounting system is shown, using a jackscrew elevation drive. (*WØLMD photo.*)

Fig 70—The EasyTrak automated antenna rotator and radio controller by TAPR. (*WD4FAB photo.*)

specialized transformers, using principles developed over sixty years ago and employed in such devices as surplus "radio compass" steering systems for aircraft. While the position readout of these devices can be quite precise, in general they only provide a visual position indication, one that is not easily adapted to computer control. I8CVS employs such a system at his station and his elevation synchro can be seen in Fig 64, using a weighted arm on the synchro to provide a constant reference to the Earth's gravity vector.

The more up-to-date, computer-friendly position readout methods used these days are usually based on preci-

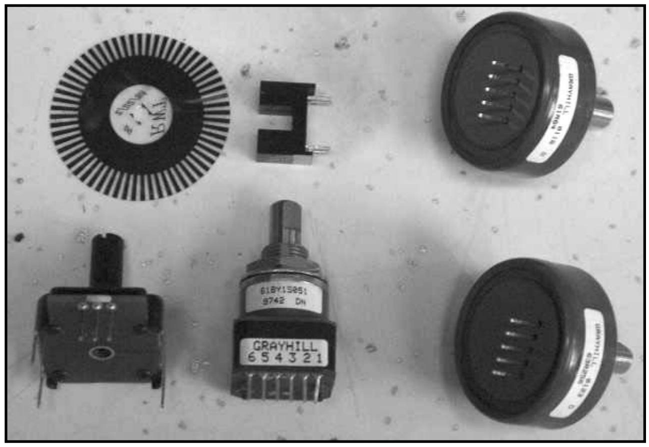

Fig 71—WØLMD has experimented with highly precise optical encoders for his antenna position systems. See text. (*WØLMD photo.*)

sion potentiometers or digital code wheels. **Fig 71** shows such a digital code-wheel system employed by WØLMD. He notes that such systems, while providing a very high precision of angular position, they are not absolute systems and that once calibrated, they must be continually powered so they do not lose their calibration. Precision potentiometers, on the other hand, provide an absolute position reference, but with a precision that is limited to the quality of the potentiometer, typically 0.5% (0.45° in El and 1.80° in Az) to 1.0%. So the choices have their individual limits, unless a lot of money is spent for very precise commercial systems.