TV SATELLITE TRACKER

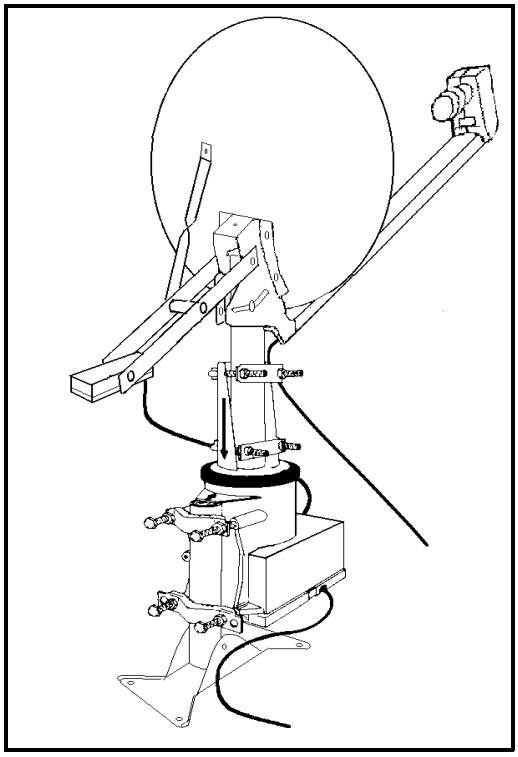
12V, One or Two Axis TV Antenna Drive
PO Box 1582, Beaufort SC 29901-1582 920 Bay St. Beaufort SC 29902
Internet yandina.com Technical Help: tech@yandina.com or call 888-355-2184

★NO ADDITIONAL TV SUBSCRIPTION IS REQUIRED. Uses your existing home satellite subscription account and receiver. Compatible with all small dish satellite systems.. Draws less than 1.5 amps with both motors running, less than 50 milliamps standby. You can use your existing dish however it will be more convenient if you purchase a second dish from your local supplier for permanent mounting on your boat if you use it frequently.

★AZMITH DRIVE Provides horizontal antenna alignment at the dock, at anchor or underway in sheltered water. It remembers the heading and re-acquires the satellite when turned on. The initial alignment and locality adjustments (for travel more than 20 miles) can be performed manually at the antenna. This provides a basic system, adequate for most installations.

★OPTIONAL CONTROL PANEL Allows remote control up to 40 feet from the antenna alignment system. Four direction switches allow azmith and elevation adjustments without having to climb up to the antenna. Indicator lights show motor activity. Ideal for cruising boats whose azmith and elevation change on a regular basis. Various other features become accessible. Plug in add-on at any time.

★OPTIONAL ELEVATION DRIVE KIT Adds a vertical axis drive for improved stability of signal under way and in rougher conditions at anchor. It allows vertical adjustment from the Control Panel, if attached, without having to access the antenna for manual setting. Plug in add-on at any time.



★OPTIONAL NUMERIC DISPLAY PANEL Future planned option adds a numerical readout of the antenna azmith heading, elevation angle and accumulated antenna angle. The readouts help in initially acquiring the satellite using numerical data derived from your latitude and longitude or zip code. Plug in add-on at any time.

ADDITIONAL ITEMS YOU WILL NEED: Any satellite TV subscription, small dish antenna, receiver box, TV set and a 120 Volt AC power source (inverter) for the satellite receiver box and TV. A 12 volt power cable (3 cond 20 gauge) and RG-6 coaxial antenna cable. An on/off switch is required if you do not install a control panel. The tracker mounts on a 1½ to 2" dia vertical pipe as supplied with most dishes.

WARNINGS

The azmith motor and gearbox are quite powerful and although motion is slow damage can be done to personnel, pets or equipment. Be particularly careful of unexpected motion if working in an elevated location. Unanticipated operation will occur when using magnetized tools in the vicinity of the sensor. At any time, removing power or turning the rotor switch to MANUAL will stop all motion. For safety, only tighten the antenna to the rotor sufficiently to resist high winds, allowing it to slip if it encounters an obstruction.

When switching from Manual to Automatic, make sure your compass and any steel tools are removed from the vicinity of the sensor box or an incorrect azmith may be recorded and unexpected motion may occur.

Some solvents may soften the control panel overlay. Use only water based cleaners.

Low level electrical interference may radiate from the electronics, motors or cables which may impact on adjacent equipment. External electrical or magnetic interference, especially from transmitters may interfere with the Satellite Tracker operation. Check adjacent equipment before permanent installation. Relocate cables, equipment and/or antennas if problems occur.

Check that the 3 pin power connectors on the azmith drive and the remote control panel are aligned correctly when inserting. They can be forced on the wrong way which will do no electrical harm but may blow fuses and crack the connector housing. Check that the waterproof connectors on the sensor are in the correct sockets. They can be forced in the wrong sockets. When inserted correctly the locking ring rotates about 120° and stops to make a watertight seal.

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DESCRIPTION

WHAT IT IS

The Satellite Tracker corrects for vessel motion to allow you to use your home satellite TV system on your yacht. You can borrow the receiver box from your house and use your *existing subscription.* Either transfer the antenna from your house or install a separate one permanently on your yacht. Spare dishes can usually be purchased economically from your local installer. All your subscription programs are available and pay per view programs can still be purchased away from the dock by calling manually on your cellular phone. Since it uses your existing satellite dish it is compatible with all satellite TV services.

An optional remote control panel allows realignment without having to climb up to the antenna. Four directional LED lights show motor activity.

An optional elevation motor kit improves performance if you want greater signal reliability while underway or in rougher weather at a dock or mooring, especially if you are subject to rocking and the satellite is on your beam. Additionally the elevation motor allows adjustment of the elevation angle from the remote control panel when you change location.

HOW IT WORKS

A small sensor box mounted behind the antenna dish contains an electronic compass and tilt sensor. As the boat moves, motors turn the antenna left or right and optionally up or down to make the vector equal to the one recorded in memory. Rotation speed is 6° per second so turns underway faster than this will lose signal briefly. Vertical motion is 8° per second, however in rough conditions smaller boats may rock faster than the vertical motor can compensate resulting in momentary signal loss.

Once you align the antenna, it stores the setting in memory. If you cruise to locations which require readjustment of the satellite vector, an optional control panel is available which provides remote adjustment without having to climb up and manually align it. The control panel also provides access to other control features.

It is primarily intended for use when not underway. The underway performance will be more acceptable on larger and slower vessels where their inertia keeps the motion within the capabilities of the motor(s). Smaller boats underway will experience momentary signal loss when they exceed the capabilities.

INSTALLATION

See the separate assembly drawing and instructions. After installation and first alignment, use the manual control switch to set the sensor box so it is approximately level when the antenna is aligned on the satellite in your area.

OPERATION

ALIGNING THE ANTENNA

Even if you have a control panel, use this procedure for the initial alignment and major re-alignments.

You should be familiar with the alignment procedure outlined in the instructions that were supplied with your satellite antenna. Most systems have an on-screen and audio signal strength meter. If the TV is too far away, a portable meter can be purchased from West Marine, Model # 373920.

Set the rotor switch on MANUAL and align the antenna with the compass heading you obtained from the zip code or latitude and longitude entry on your TV screen. Set the elevation angle using the antenna angle adjustment. (If you have the elevation kit installed you can gently raise or lower the antenna by hand.) ***Any cable twist should be removed as much as possible before performing this alignment***. Achieve maximum signal strength and switch to AUTOMATIC before any boat motion moves the antenna. If you do not have a control panel, switching to MANUAL always sets the HIGH azmith sensitivity setting so you may need to turn off and on again to restore LOW sensitivity. See page 3.

CONTROL PANEL SWITCHES

ON/OFF SWITCH

Press the ON switch to turn the Satellite Tracker on. (It must be on for 8 seconds minimum before it can be turned off.)

Press the OFF switch to turn the Satellite Tracker off. It will then untwist the cables before turning off to provide maximum range for the next use.

Press and hold the OFF switch for three seconds for an **EMERGENCY STOP**. This will turn the Satellite Tracker off without untwisting the cables.

LEFT, RIGHT, UP & DOWN BUTTONS

Each time a direction button is pressed, the satellite vector setting is adjusted by 1 degree. If you hold the button down, the antenna will move slowly in the selected direction. Motion is intentionally slow to allow time for your on-screen signal strength monitor to respond.

RAIN FADE RECOVERY

"Rain Fade" is the loss of satellite signal due to rain between the satellite and your antenna which initially occurs quite some time before it reaches the ground. At the onset of rain fade, the immediate temptation is to adjust your antenna vector settings. When you fail to recover the signal you check the sky and discover you have rain fade but by now you have modified and lost your antenna setting.

By pressing the RIGHT and LEFT buttons simultaneously the antenna settings will be restored to the vector existing when you ***last turned on*** or were last in MANUAL.

MANUAL SEARCH FOR SATELLITE

If you have changed location, since your last acquisition, the azmith and/or elevation may need slight adjustment to obtain optimum signal. With the signal strength option selected on your receiver, you can use the four direction buttons to jog the antenna to the best position. More detailed instructions on setting the best vector are under "LOSS OF SIGNAL" on page 4. If you do not have the control panel, you need to adjust for maximum signal by hand using the MANUAL mode at the antenna, see "Aligning the Antenna" on page 3.

AUTOMATIC SEARCH FOR SATELLITE

Requires the control panel and elevation motor kit. The antenna must start within 5° of the satellite. Enter the automatic satellite search mode by pressing all four directions buttons at the same time. While in the search mode the ON/OFF and any direction lights will flash. The computer will repeatedly execute a scan around its initial vector. Watch the signal strength on your TV and press **any of the four direction buttons** momentarily to cancel the scan. Final tweaking should now be done by jogging the direction buttons for maximum signal.

AZMITH SENSITIVITY ADJUSTMENT

There are two levels of azmith sensitivity. Whenever you turn on from the control panel or apply 12 Volt power, it starts with LOW sensitivity. The low level is adequate for most situations but in some locations, the high setting may be required to prevent loss of signal. The high level will cause increased activity of the azmith motor. With a control panel, pressing UP and DOWN simultaneously sets HIGH sensitivity. Without a control panel, any time you switch to MANUAL and back to AUTOMATIC, the sensitivity goes to HIGH. To return to LOW sensitivity you should turn OFF and back ON.

THE HOMING FUNCTION

The computer keeps track of how much rotation there has been so that the cables do not get twisted round the mounting due to boat motion. After slightly more than two complete revolutions in either direction from the home position, the tracker will automatically go into an untwist mode and signal will be lost for 60 seconds while it backs off one revolution to protect the cables. While the antenna is untwisting, the four direction lights will sequence in a circle corresponding to a top view of the direction of rotation. With the range available this should rarely happen with most viewing sessions.

When you turn off using the control panel, it automatically goes into the HOMING mode and untwists the cables before stopping. The homing function is not available without a control panel. The home or "untwisted" position is where the arrows cast into the rotor and housing are aligned. You can prevent this function by holding your finger on the ON/OFF button for three seconds to do an immediate stop.

If you are at a dock where the boat does not rotate significantly with the wind or tide, there will be no tendency for the cables to wind up around the antenna post so for quickest acquisition of the signal it is better to leave the antenna where it was by using the EMERGENCY stop. At anchor or on a mooring, use the normal stop to start the next session with the cables untwisted.

Switching to MANUAL resets the twist counter, ***so always untwist the cables before switching back to AUTOMATIC***. When turned off and in the HOME position, you can untwist cables and align the antenna where desired for traveling without losing the

satellite vector setting.

TROUBLE SHOOTING AND SERVICE

LIGHTS ON BUT DOESN'T WORK

If any switches are closed by hand or due to a mechanical problem on the control panel when 12 volt power is applied, it enters a lamp test mode. See the Control Panel Switch Adjustment on page 5. Re-apply power to exit the test mode.

ALL FIVE LIGHTS FLASH

This indicates that the computer has detected a failure and has shut down the motors. Without a control panel, shutdown is the only symptom. Often the failure mode can be cleared by removing and restoring 12 volt power. If this doesn't work you will have to switch to MANUAL, untwist the cable and do a satellite realignment. For diagnosis, you can count how many flashes occur in each group and look up the failure mode cause in the list on page 6. The possible causes of a failure lockout are:

- The antenna rotated 360 degrees without acquiring the stored vector. This occasionally could be due to the antenna trying to follow the rotation of your vessel as it turned a full circle at about the same speed.
- The antenna motor was turned on but rotational motion was not detected, usually due to a mechanical obstruction.
- Antenna rotation exceeded 2 ½ revolutions during a cable untwist or during a homing function.
- Illegal data is stored in memory due to electrical interference.

"ON" LIGHT

See the ON light flashing pattern identification on page 6. Nearly all user correctable problems relate to checking the electrical connections and 12 volt power. A short circuit can trip the thermal fuse. The power should be removed for 30 seconds to reset the fuse after correcting the problem.

ON LIGHT FLASHING RAPIDLY

A continuous rapid flashing, indicates communications have not been established between the sensor and the remote panel. During communications failure the satellite tracking may continue normally since the control panel is an optional extra and not required for operation.

WON'T STAY ON

At times of particularly bad 12 volt power supply, the Satellite Tracker will turn itself off to protect data and hardware.

If the cable run is too long or the wire gauge is too small, you could be having power supply problems at the rotor especially if the problem coincides with the motor starting and braking. Power RF sources such as SSB, radar or UHF antennas in the vicinity of the cable could be interfering with the communications line. Try moving the power cable or using a shielded cable, especially if the problem coincides with radio transmissions. Using a shielded cable reduces the maximum length of run to about 30 feet.

WON'T TURN ON OR OFF

Make sure you are not in the Control Panel Switch Adjustment mode described on page 5. Note that the MANUAL mode using the switch on the rotor overrides all controls at the remote panel and the ON light flashes every 2 seconds.

LOSS OF SIGNAL

If boat motion exceeds the speed response of the motor(s), signal may be lost momentarily. Signal will be lost for 60 seconds during a cable untwist cycle.

Usually signal loss is caused by not having the optimum vector stored in memory. Setting the antenna carefully in MANUAL as described on page 3 gives the best accuracy. When using the control panel and you are close to the setting, adjust the vertical position first (since it has some influence on the azmith setting due to the tilt of the Earth's magnetic field). The accuracy of the signal strength meter can be poor at high signal strength, so alignment should be performed by jogging left and right until the it falls off and then jogging back half way. If you have the vertical motor kit this procedure should be repeated at adjacent vertical positions until the best setting is found.

If necessary, switch to the high azmith sensitivity setting, see page 3. At this setting magnetic noise results in increased azmith motor motion.

There is a slight temperature sensitivity in the electronic compass. After large outdoor temperature changes, a 1 or 2 degree jog may be necessary to restore maximum signal strength.

AZMITH

DOESN'T RUN

If the antenna is already aligned with the satellite when you turn it on, no movement will take place. If you do not have a control panel, it may be in a failure mode, see "ALL FIVE LIGHTS FLASH" on page 4.

UNSTABLE ALL THE TIME

At the HIGH azmith sensitivity setting, nearly continuous motor activity is common. On the LOW setting, activity should diminish when the boat is stable. Since the Earth's magnetic flux lines are not horizontal, slight boat rocking can change the apparent vector and start the motor. If the boat is quite stable but the azmith motor oscillates back and forth, check for any loose hardware or loose fasteners on the mounting, rotor or sensor which could move as the motor reverses and cause mechanical feedback.

UNSTABLE AT CERTAIN POSITIONS OR TIMES

Due to local magnetic fields, there are often positions where the magnetic flux lines are not uniform so noise pickup and exaggerated response may cause instability at these angles. There may be steel objects, magnetized or not, which are distorting the Earth's local magnetic field. Inspect all objects within two feet of the sensor position where it is unstable to see if there is a steel object which can be moved. If it cannot be moved, try demagnetizing it with a bulk tape eraser. If the motion coincides with other 12 volt equipment, check for electrical conductors carrying high currents in the vicinity of the sensor which can cause an unstable magnetic field.

RUNS CONTINUOUSLY IN THE SAME DIRECTION

Make sure the sensor box is mounted correctly with cable connectors facing down and exiting nearest the dish.

A magnetized object rotating with the sensor can mask the Earth's magnetic field and cause continuous motion. Check the dish itself with a hand compass for any strong magnetic fields which should be demagnetized using a bulk tape eraser.

HOME POSITION VARIES

In the home position, the arrow cast in the rotor should approximately line up with the arrow cast in the tab on the base. Due to adjustments, the antenna itself may be at a different position. ***Any time you switch to MANUAL, the cable twist counter is reset so always remove any twist by hand if you switch to MANUAL.***

If the 12 volt supply was interrupted during the homing function, the antenna will remain away from home. Normal operation will resume when it is turned on.

ELEVATION

If UP or DOWN lights turn on momentarily it indicates vertical angle adjustments. If they flash continuously it indicates a stuck drive.

DOESN'T RUN

If the antenna is already aligned vertically with the satellite when you turn it on, no movement will take place. If you do not have a control panel, it may be in a failure mode, see "ALL FIVE LIGHTS FLASH" on page 4.

Check that the elevation motor cable is correctly mated with the sensor connector.

Check that the elevation clamping screws which are normally used for fixed installations on both sides of the mount have not been tightened and that the antenna is quite free for elevation angle motion.

The tilt sensor has a range of +/- 35° from horizontal which is more than adequate to cover access to the satellite from all locations. For maximum range the sensor box should be approximately horizontal when the antenna is pointing up at the angle of the satellite in your location.

ALWAYS RUNS TO LIMIT

Make sure the sensor box is mounted correctly with cable connectors facing down and exiting nearest the dish. It may be trying to set an elevation beyond the available range. Do a MANUAL re-alignment with the sensor box level to be sure you have a legitimate elevation angle stored in memory.

UNSTABLE

The vertical axis sensor is quite sensitive so even small motion will keep the vertical motor responding which is normal. Wind load on the dish will cause nearly constant corrections. If motion seems oscillatory even when the boat is quite stable, there is usually a loose mechanical component which moves each time the vertical motor reverses and causing mechanical feedback. Check the integrity of the mounting system. Check if a more rigid mounting may be necessary. Make sure you have installed the counterweight.

The tilt sensor uses a liquid level which is reasonably immune to vibration however if the instability occurs under particular wind or motion conditions, especially when underway, vibration may be producing false readings.

CONTROL PANEL SWITCH ADJUSTMENT

Switch travel is only about 1/64" so panel distortion during mounting may cause a switch malfunction. If you suspect a switch problem you can put the control panel in a switch test/adjust mode by removing the rear connector and making sure at least one arrow switch is pressed when the panel connector is reinserted. The switches may now be adjusted and tested without affecting the antenna. To exit the test mode, the plug should again removed and restored.

In the test mode, with no switches pressed, all five lights should be on. Pressing any of the four direction switches should cause the light under it to go off. If ON is pressed, the lights should flash instead of being on continuously.

Under the rear aluminum cover are four nylon nuts holding the circuit board in place. Loosening a nut increases the board clearance from the panel in that area and turns stuck switches off. Tightening nuts decreases clearance. Adjust the nuts so all five switches are safely off and so each operates without excessive force.

CAUTION do not damage the panel by over tightening against switch membrane, ½ a revolution covers the whole adjustment range. Avoid shorting electrical components while adjusting with the power on. Use a ¼ inch nut driver.

APPENDIX

SPECIFICATIONS

ENVIRONMENT

VOLTAGE	11 to 16 Volts DC. Reverse polarity protected. Not suitable for 24 volt installations.
TEMPERATURE	*To be Determined*

WATER RESISTANCE

- Sensor unit and cables are waterproof.
- Rotor is rain and splash proof. The bottom cover is not sealed.
- Vertical motor option is rain and splash proof.
- The front of the control panel is waterproof if sealed to a flush panel, the rear is not waterproof.

CLEARANCE	Horizontal circle, 18" radius required for antenna.
	Vertical height 33" from mounting surface to top of dish.
CONTROL CABLE	3 conductor, 20 gauge or heavier up to 40 feet. Do **not** use shielded cable. 3 Conductor extruded lamp wire is suitable.
	You can use 2 conductors if you do not intend to install the control panel, or numerical display.

PERFORMANCE

CURRENT	Off, without Control panel,	zero.
	Off, with Control panel,	< 20 milliamps.
	On, stationary	<50 milliamps
	On, azmith motor running, add	750 milliamps
	On, elevation motor running, add	500 milliamps
	Momentary motor currents can be higher.	
RESOLUTION	1° horizontal and vertical.	
ROTATION RANGE	+/- 2 full revolutions.	
ROTATION SPEED	6° per second or 1 RPM.	
ROTATION TORQUE	8 ft lbs minimum.	
ELEVATION SPEED	8° per second.	
MAX VERTICAL LOAD	100 lbs.	

WARRANTY

The Satellite Tracker is warranted against manufacturing defects for 3 months.

INDICATOR LIGHT CODES

- ON LIGHT, PERMANENTLY OFF - 12 volt power has been removed.
- ON LIGHT, SHORT FLASH EVERY 20 SECONDS - Satellite Tracker is turned off but power is available.
- ON IS FLASHING RAPIDLY - No communication between antenna and panel.
- ON LIGHT on steady - Satellite Tracker is operating.
- LEFT OR RIGHT LIGHT ON - Indicates azmith rotation of antenna.
- UP or DOWN LIGHT ON - Indicates vertical antenna motion.
- UP or DOWN LIGHT FLASH - Direction vertical motor would run if installed.
- ON LIGHT, SHORT FLASH EVERY 2 SECONDS - MANUAL switch is on.
- ON LIGHT AND ARROW(S) PULSING EVENLY 2 PER SECOND - Automatic satellite search mode is running.
- LEFT, UP, RIGHT AND DOWN rotating in sequence indicates direction of untwisting of antenna cables.
- ALL FIVE LIGHTS FLASHING - System failure detected, see the table below and the troubleshooting section page 4 for explanations.
- ALL FIVE LIGHTS ON - See the Control Panel Switch Adjustment paragraph in the Trouble Shooting section, page 5 for lights while in the switch test mode.

CONTROL SWITCH SUMMARY

EMERGENCY STOP	Hold "OFF" for 3 seconds.
TURN OFF BUT HOLD POSITION	Hold "OFF" for 3 seconds.
TURN OFF AND HOME ANTENNA	Press "OFF".
TURN ON	Press "ON".
JOG LEFT OR RIGHT 1°	Press "LEFT" or "RIGHT".
JOG UP OR DOWN 1°	Press "UP" or "DOWN".
MOVE LEFT OR RIGHT *	Hold "LEFT" or "RIGHT" button.
MOVE UP OR DOWN *	Hold "UP" or "DOWN" button.
RESTORE ORIGINAL VECTOR	Press "LEFT" and "RIGHT" simultaneously.
SET HIGH AZMITH SENSITIVITY	Press "UP" and "DOWN" simultaneously.
SET LOW AZMITH SENSITIVITY	Turn OFF and back ON.
SCAN FOR SATELLITE:	Press all four direction switches .
TERMINATE SCAN	Press any direction button.

* Averages approximately 1° per second.

FAILURE MODE IDENTIFICATION

See "ALL FIVE LIGHTS FLASHING" on page 4

Group of 4 - Cable twist exceeded 2½ revolutions without correction.
Group of 5 - Azmith setting not between 0° and 359°.
Group of 6 - Azmith motor running too long without locating HOME position.
Group of 7 - Azmith motor running too long to acquire satellite.
Group of 8 - Power applied to azmith motor but no rotation.
Continuous flashing Multiple failures. Remove power and re-align satellite in manual.