WINEGARD WV750 SATELLITE ANTENNA SYSTEM

PRODUCT MANUAL 7451041

Revision 2.2

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1. Scope

The purpose of this document is to provide Installers, Technicians and End Users with a complete Winegard WV750 Product manual which fulfills the roles of an Installation Manual, Operation Manual and Service Manual.

2. Warnings and Hazards

Automated Machinery – The outdoor antenna system may start moving anytime the indoor controller is powered on. Lock out/tag out procedures should be followed before servicing. Servicing should only be completed by trained, authorized personnel.

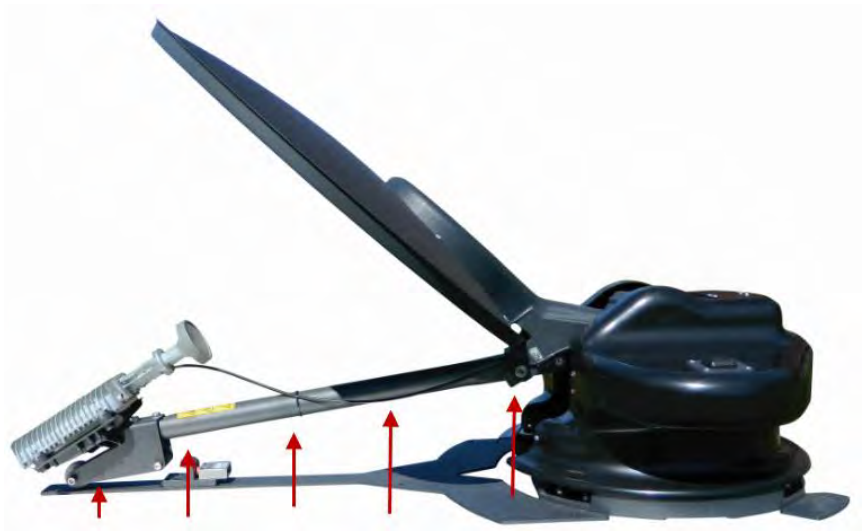
There are no user serviceable parts inside the unit.

Caution – Risk of Danger

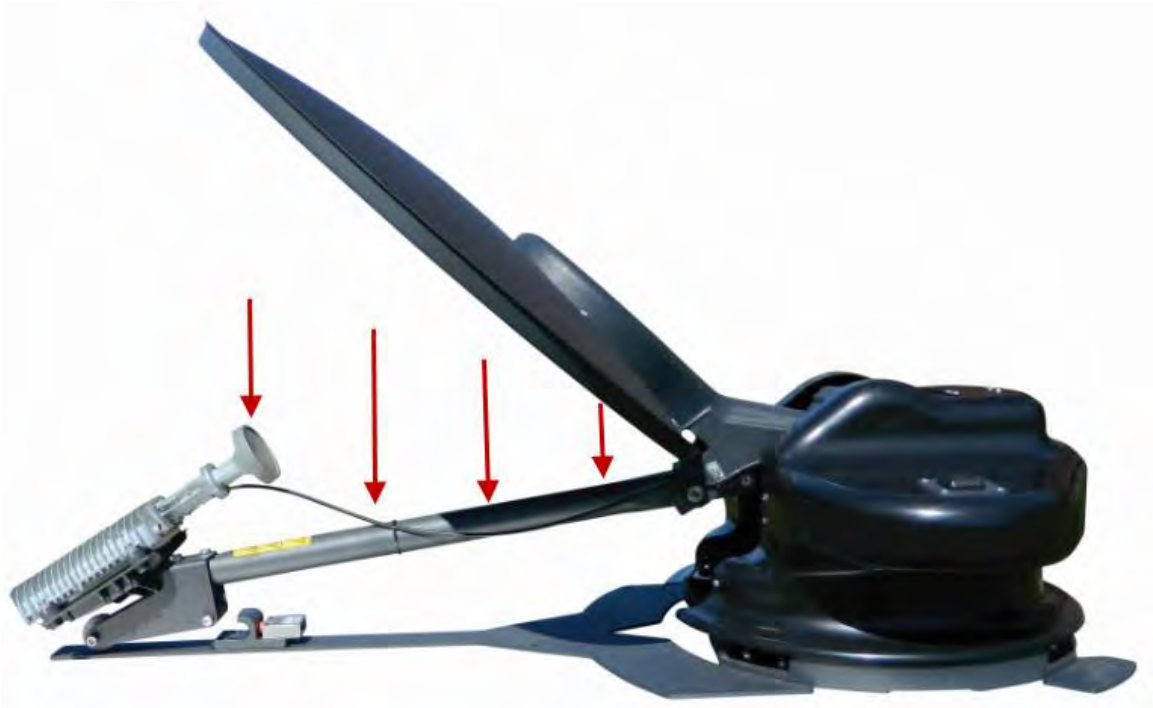
Warning – Bodily Injury Hazard – The antenna assembly may rotate around the mount base. Keep fingers and other body parts away.

Caution – Crush Hazard

Warning – Pinch Hazard, Bodily Injury Hazard – Antenna support and lift mechanism. Keep hands and other body parts away.



Warning – Pinch Hazard, Crush from Above, Bodily Injury Hazard –Feed arms and mounting brackets. Keep hands and other body parts away.



Warning – Pinch Hazard, Crush from Above, Bodily Injury Hazard – Antenna support brackets. Keep hands and other body parts away

Warning:

Automated machinery, the antenna may start moving at any time.

The antenna contains hazardous moving parts. Keep hands and other body parts away. Follow lockout/tagout procedures before servicing equipment.

IDU	**Indoor Unit** The Winegard Indoor Electronics, or IDU, refers to the 2-Way Controller. The term IDU does not include the user supplied modem or Ethernet distribution system. Interchangeable words in the industry: IDU Controller ACU
ODU	**Outdoor Unit** The Winegard Outdoor Electronics Unit, or ODU, refers to The Outdoor electronics manufactured by Winegard which are located on the antenna itself. It does not include the TRIA/ETRIA (Viasat Radio) supplied by the user. Interchangeable words in the industry: ODU Antenna Electronics
Antenna	**Winegard WV750 Antenna** Includes all physical components of the system except the IDU. Motors, hardware links, ODU, Reflector and RF Electronics are all components of the antenna. Interchangeable words in the industry: Antenna Mount
System	**Winegard WV750 System** Includes all components supplied by Winegard. Motors, hardware links, ODU, Reflector, RF Electronics and IDU are all components of the System. Interchangeable words in the industry: System

3. Agency Certifications

FCC Part 15 Class B
The following model(s) have been tested and found to be in compliance with Part 15 of the FCC rules for class B devices. Operation of these devices is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Antenna Systems: WV750
Indoor Control Units: 7750190

CE Marking
The following model(s) have been tested and found to be in compliance with all applicable EC directives.
(See Declaration of Conformity in Section 12 for more details)
Antenna System: WV750
Indoor Control Unit: 7750190

4. General Description

Winegard manufactures several 2-Way Satellite Communication systems which can fill different requirements in the satellite communication industry.

This manual covers the Winegard WV750 Antenna.

The Winegard WV750 series antenna is virtually maintenance free. Inspect the unit regularly for physical damage, damaged wires and loose connections. Inspection intervals will vary depending on usage and environment. Do not use the system if damage is observed and contact Winegard for replacement parts.

The WV750 antenna systems are auto deploy, auto stow systems intended to be mounted on the roof of a vehicle or mobile platform.

The WV750 antenna system consists of a high wind resistant mechanical antenna, Outdoor Unit (ODU) and all wiring and motors required to point the system using the Winegard 2-Way Controller. The model number for the appropriate controller is OPT1018.

The WV750 series antenna accommodates the TRIA or E-TRIA supplied by Viasat.

5. WV750 Series Description & Installation

5.1 Antenna Mount - Main Assemblies

1. **Reflector -**
   The WV750 antenna uses a Viasat reflector.

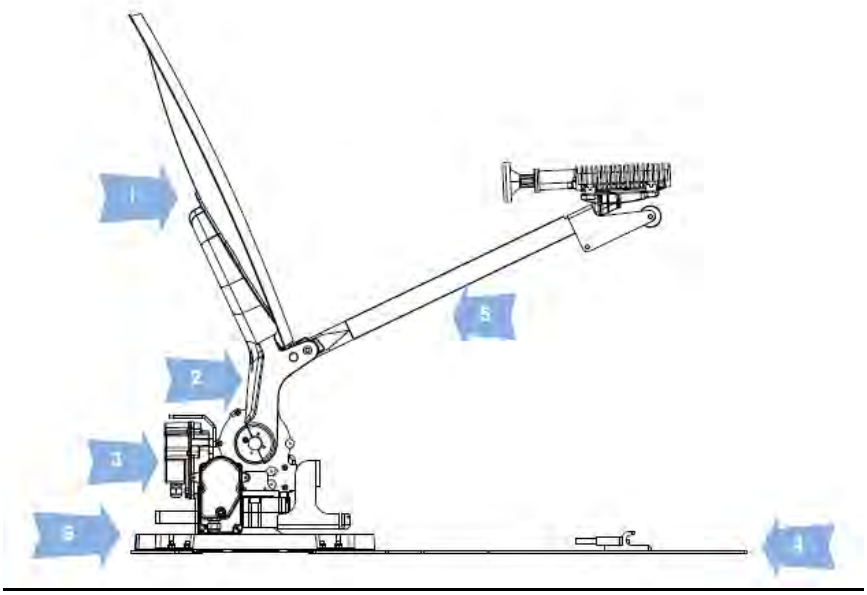
2. **Elevation Motor -**
   The elevation motor is attached to the Reflector back plate and Main Drive Mechanism

3. **Main Drive Mechanism -**
   Houses the AZ motor, EL motor, ODU and wiring.

4. **Installation Rail -**
   These are used to secure the antenna to the vehicle or mobile structure. Hole patterns for installation are available in section 4.2.

5. **Feed Arm -**
   Houses the TRIA/E-TRIA mounting plate which can be used to mount the user supplied radio.

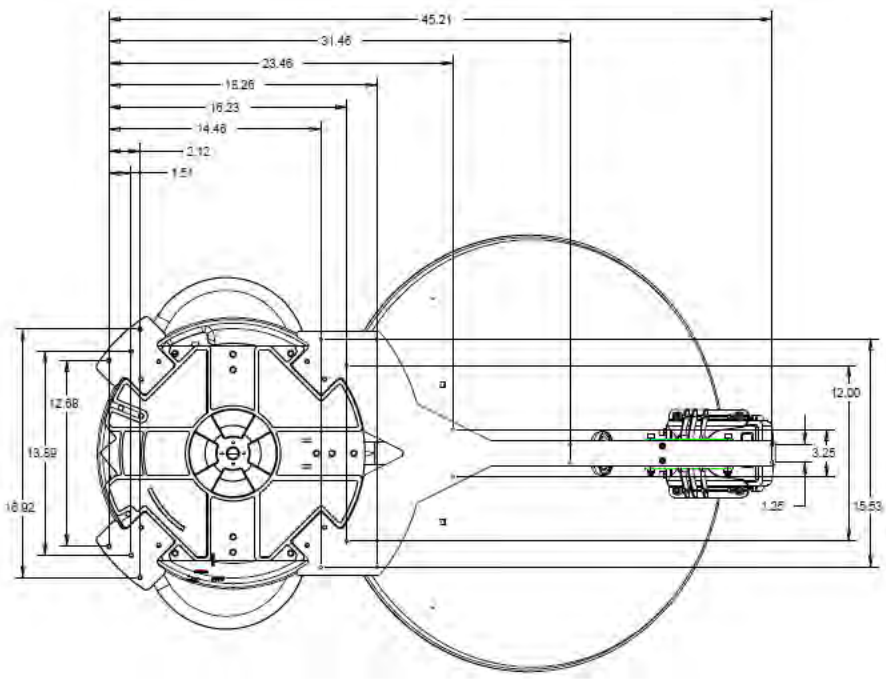
6. **Wiring Plate -**
   The Power/Communication cable (from IDU) and Receive cable (from modem) connect to the Antenna Mount Wiring Plate.



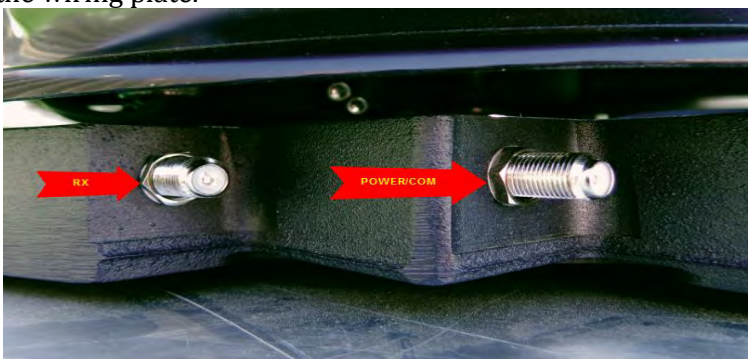
5.2 WV750 Installation Information

The Winegard WV750 antenna should be mounted to a secure platform using the rails provided. The following diagrams show the mounting point dimensions as well as the wiring panel at the base of the antenna.

1. **Mounting points -**
   All mounting points should be connected to a cross member or secure mounting point on the vehicle roof or mobile platform. Use 8 – 3 /8 inch x 1 inch (10 mm x 25 mm) Grade 8 bolts with washers and appropriate lock nut.



2. **Wiring Bulkhead-**
   - The RX cable is F connector terminated to go directly to the modem.
   - The ODU power/communication cable is F connector terminated and connects the antenna to the Winegard 2-Way Controller ODU port. The picture below shows the wiring plate.



5.3 Tria/E-Tria Assembly

1. **Tria Assembly –**

STEP 1

A. REMOVE TWO REAR SCREWS (1) AND CORRESPONDING NUTS (2)
B. REMOVE THE REAR ROLLER (3)

STEP 2

A. REMOVE THE STOW BUMPER ASSEMBLY (4)

STEP 3

A. ALLIGN THE TRIA (5) WITH THE TRIA BRACKET (6)
B. ENSURE THE FEED HORN POINTS TOWARD THE REFLECTOR

STEP 4

A. SECURE THE TRIA (5) TO THE TRIA BRACKET (6) USING THE FOUR SUPPLIED SCREWS (7)
B. APPLY LOCTITE 242 TO THREADS
C. TIGHTEN SCREWS (7) TO 32 IN-LBS EACH

STEP 5

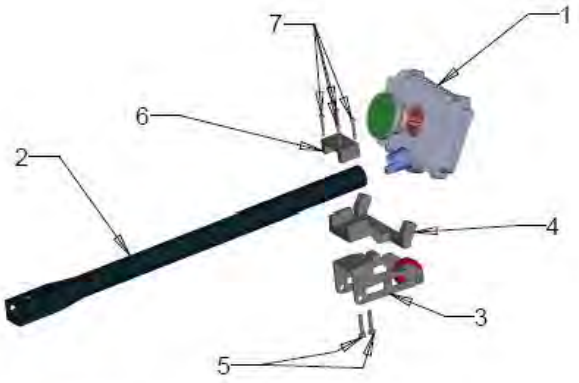
A. PLACE THE STOW BUMPER ASSEMBLY (4) OVER THE VIASAT POLARIZER
B. ALLIGN THE HOLES IN THE STOW BUMPER BRACKET WITH THE HOLES IN THE ROLLER BRACKET (8)

STEP 6

A. REINSTALL THE REAR ROLLER (3) INTO THE ROLLER BRACKET/STOW BUMPER ASSEMBLY
B. SECURE INTO PLACE USING ONE SCREW (1) AND NUT (2) REMOVED IN STEP 1
C. REINSTALL SECOND SCREW (1) AND NUT (2) REMOVED IN STEP 1
D. ENSURE FULL THREAD ENGAGEMENT INTO NUTS (2) BUT DO NOT OVERTIGHTEN

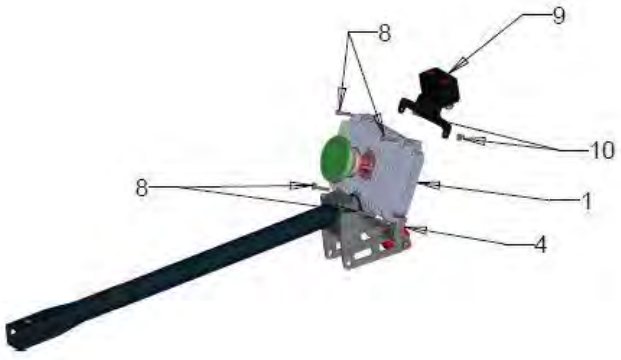
2. ETria Assembly –

STEP 1



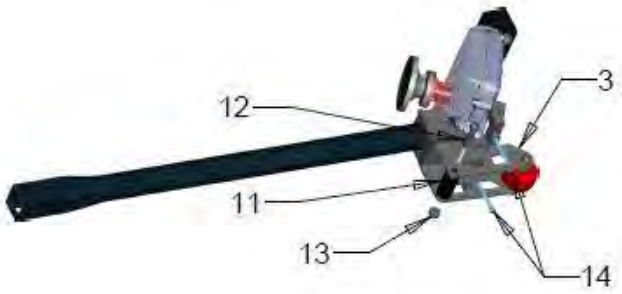
1. ATTACH CABLE FROM INSIDE FEED-ARM TO ETRIA (1) AND TIGHTEN USING A 7/16 WRENCH
2. INSERT ETRIA (1) INTO END OF FEED-ARM (2) AS SHOWN
3. PLACE BOTTOM ETRIA BRACKET (4) UNDER FEED-ARM AND ALLIGN WITH HOLES IN ETRIA (1) AND FEED-ARM (2)
4. PLACE ROLLER BRACKET (3) UNDER ETRIA BRACKET (4) AND ALLIGN WITH HOLES IN STEP 3
5. INSERT TWO M6X30 SCREWS (5) AND TIGHTEN TO 45 IN-LBS
6. PLACE UPPER ETRIA BRACKET (6) OVER FEED-ARM AND ALLIGN HOLES WITH LOWER ETRIA BRACKET (4)
7. APPLY LOCTITE 242 TO SCREWS (7)
8. SECURE UPPER BRACKET (5) TO LOWER BRACKET (4) USING FOUR SCREWS (7). TIGHTEN TO 32 IN-LBS

STEP 2



1. APPLY LOCTITE 242 TO SCREWS (8)
2. SECURE ETRIA (1) TO BOTTOM ETRIA BRACKET (4) USING TWO SCREWS (8)
3. TIGHTEN TO 32 IN-LBS
4. ATTACH STOW BUMPER BRACKET ASSEMBLY (9) TO TOP OF ETRIA (1) USING TWO SCREWS (8) AND TWO NUTS (10)
5. TIGHTEN TO 32 IN-LBS

STEP 3

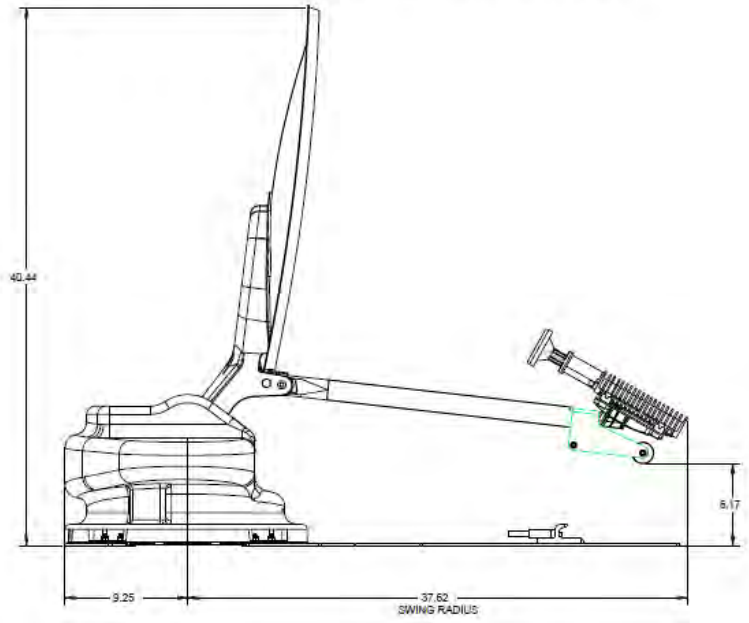


1. ALLIGN REAR ROLLER (11) WITH REAR HOLES IN THE ROLLER BRACKET (3)
2. SECURE TO ROLLER BRACKET (3) USING ONE SCREW (12) AND ONE NUT (13)
3. ENSURE FULL THREAD ENGAGEMENT OF SCREW (12) INTO NUT (13) BUT DO NOT OVERTIGHTEN
4. SECURE ROLLER BRACKET (3) TO BOTTOM ETRIA BRACKET (4) USING TWO SCREWS (14)
5. APPLY LOCTITE 242 TO SCREWS (14)
6. TIGHTEN TO 32 IN-LBS

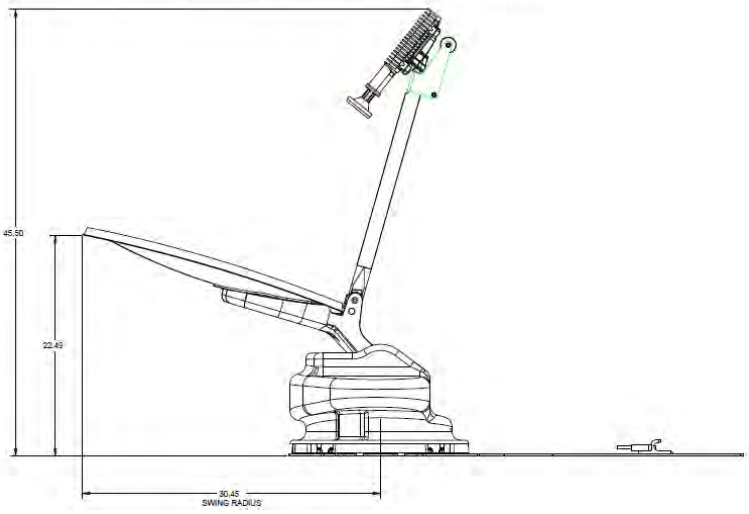
5.4 Max Clearances

The Max Horizontal and Vertical clearances should be considered when deciding where to install the antenna.

MAXIMUM CLEARANCE AT MINIMUM LOOK ANGLE (5*)



MAXIMUM CLEARANCE AT MAX LOOK ANGLE



6. Controller Description & Configuration

The IDU controller is the central decision making center in the Winegard WV750 Satellite Communications System.

The Controller sends commands to the ODU, which in turn moves the motors and keeps records of the motor counts, states etc.

The control data is sent to the ODU thru the Power/Communications Cable which carries the control data as well as power for the ODU.

Data about the antenna type, state, position and calibration is stored in the ODU.

The Winegard 2-Way controller is simple to configure and operate. The system works out of the box with the Viasat modem.

The controller is simple to upgrade using a Flash drive and the built in touch screen.

The Indoor Control Unit (IDU) is rack mountable. It fits in a standard 19 inch rack and is 2 units (3.5 inches) tall.

If the IDU is mounted in a rack the operating ambient temperature of the rack environment may be greater than the ambient room temperature. Care should be taken not to exceed the max IDU operating temperature of 50˚C (120°F). Installation of the IDU controller in a rack should be such that air flow required for safe operation is not compromised.

If mounting the IDU in a rack, use the rack manufacturers recommended mounting hardware. Ensure the mounting is such that a hazardous condition is not achieved due to uneven loading.

Make sure the rear of the IDU is supported when rack mounted (P/N OPT1048).

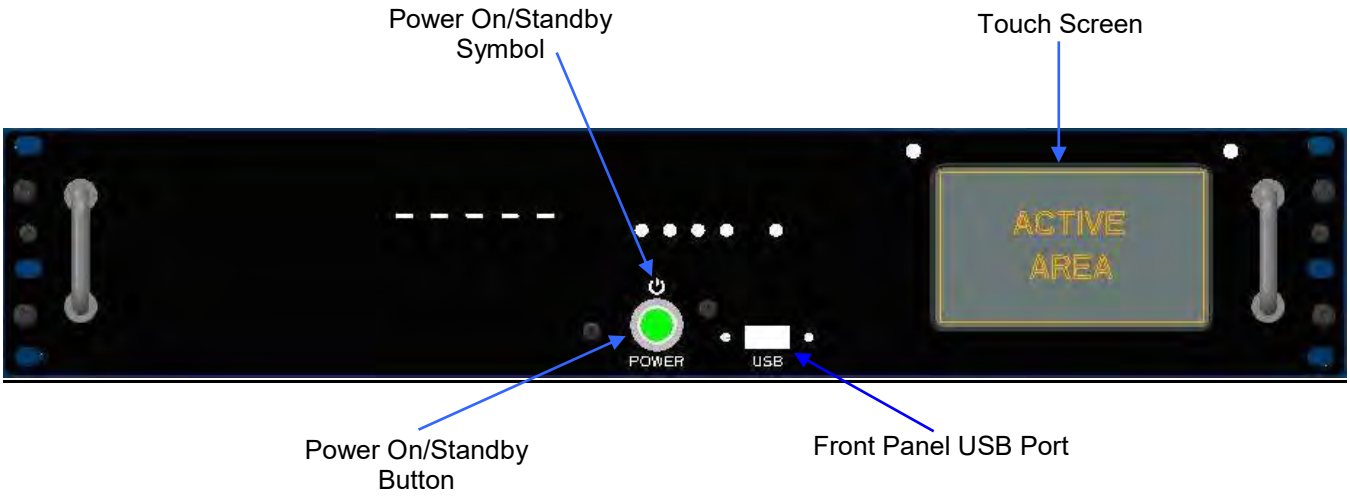
6.1 - Front Panel Connections & Interfaces

The front panel of the controller contains the following components:

1. **Power Button -**
   The Power Button is dark when the controller is in stand by and will illuminate bright green when the controller is powered on. This button does not completely shut power off when in stand by mode. The AC power must be disconnected in order to completely power the system down.

2. **USB Host Connector -**
   The USB host is primarily utilized for firmware updates using a Flash (Thumb) drive but can also host a keyboard or mouse. One additional USB Host Connector is available on the rear panel. Information about updating the software on the controller can be found in the "Update screen" section on page 37.

3. **Touch Screen -**
   The Touch Screen is the main interface to the controller.
   It is a fully interactive color screen which provides User Interaction, Configuration and Troubleshooting screens dynamically depending on the current process.
   Tapping the screen makes selection of functions and decision during configuration a simple and effective process.



6.2 - Rear Panel Connections

1. **Ethernet Ports -**
   The controller features a 3 port 10/100 switch.

2. **Mini USB Port -**
   The USB Mini Port is a client port utilized at the factory.

3. **USB Host Port -**
   Available to connect USB devices such as a Keyboard, Memory Device or Mouse.

4. **Serial RS232 Output Port -**
   The Serial port is used to output system information either while operational or troubleshooting.

5. **ODU Power/Communication Port (ODU) -**
   The Power/Communication Port is a Female F bulkhead connector. This connects to the Power/Communication Port on the Antenna System.

6. **AC Power Plug -**
   The system is supplied with a UL listed 120VAC power cord. See section 10 for power cord specifications. The power cord must be connected to a grounded socket-outlet protected by a 20 amp fuse or circuit breaker. The power cord is the disconnecting device. The socket-outlet for the power cord shall be installed near the equipment and be easily accessible. If the IDU is installed in a rack accessibility must be provided to the power cord or to the fuse or circuit breaker for disconnection.

7. **Remote -**
   Connection for a remote status indicator.

8. **Fuse -**
   5A 32V Fast Acting Type ATF. Winegard P/N 2320020

9. **Model/Serial Number Label**
   This label contains the model number a serial number of the IDU.
   This label contains logos for all agency certifications.

6.3 - Main Menu Interface Screen

The Winegard 2-Way Controller's Main Menu Interface Screen is the primary means for deploying and stowing the system.

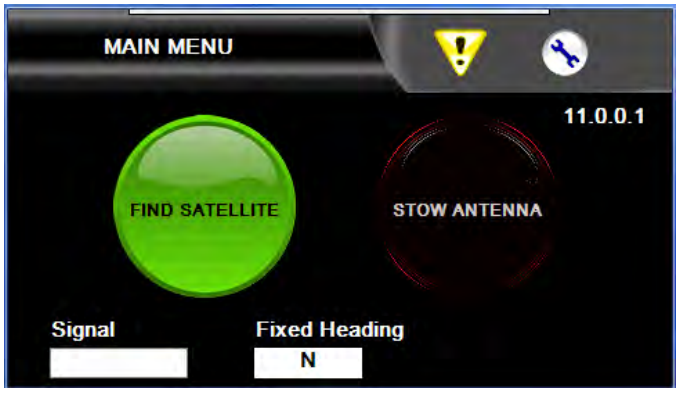
It provides links at the top of the screen to the Authorized Installer menu (yellow triangle) for configuration of the system as well as the Advanced User Data section (wrench) to see live data, network configuration and firmware update screen.

At the bottom of the screen you can see the Signal Strength as well as the Compass Heading and Mode.

The currently running version of the software is listed below the Authorized Installer and Advanced User Data icons.

Deployment and Stow buttons are available in the middle section of the screen.

Below is a capture of the Main Menu Screen:



6.4 - Configuration

The Winegard 2-Way Controller is a versatile system that allows connection to and operation of the WV750 Antenna System.

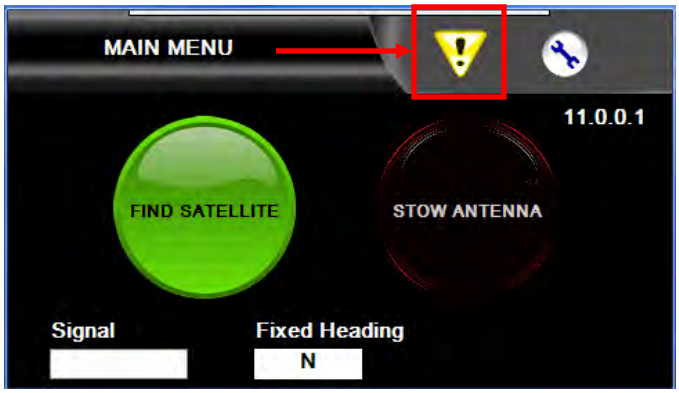
6.4.1 - Configuring the Controller

Configuring the Winegard Controller is a rather simple process which is based on two sections of configuration that run concurrently.

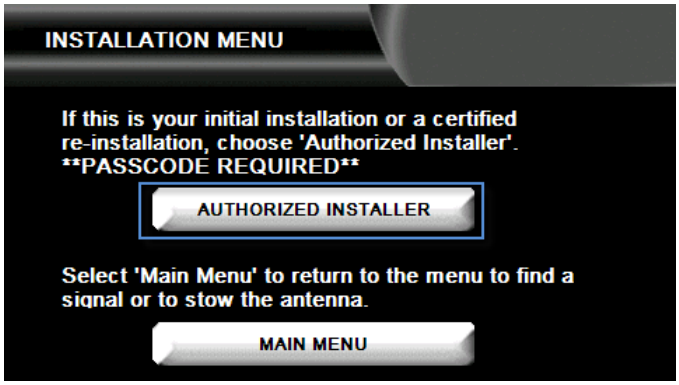
The first section consists of question screens asking if the user wants to move the antenna or perform calibrations and the second section is primarily centered on the modem and service parameters for the search.

How to Configure the Controller

1. Tap the Authorized Installer Menu Icon in the Main Menu.



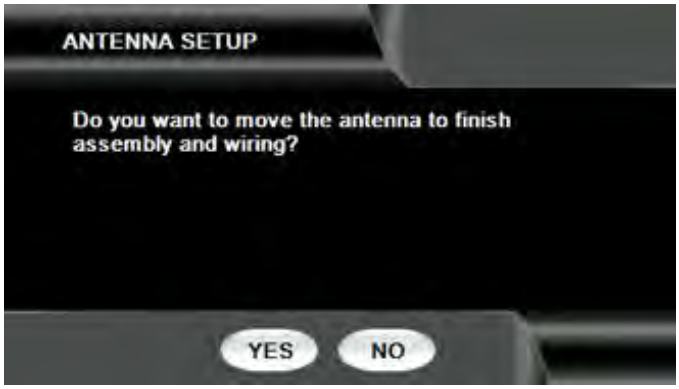
2. The controller will enter the Installation menu section. The INSTALLATION MENU screen asks if you want to select "AUTHORIZED INSTALLER" for configuration purposes or "MAIN MENU" to back out of the Installation menu.
   Tap the "AUTHORIZED INSTALLER" button.



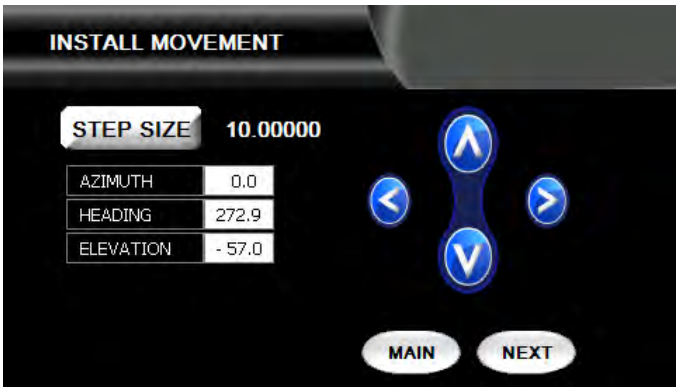
3. ENTER PASSCODE screen -
   The next screen that appears is a numerical pad requesting input of the Passcode. The Passcode is set from the factory to a default of "1234".
   If an incorrect value is entered, the DEL button will allow you to backspace one character per tap.

After entry of the pass code “1234”, press the “NEXT” button to continue the configuration.

4. ANTENNA SETUP screen -
The next screen that appears is the ANTENNA SETUP screen.
This step of the configuration asks if you want to perform movement of the antenna for installation purposes. It is not necessary to perform antenna movement to configure the controller.

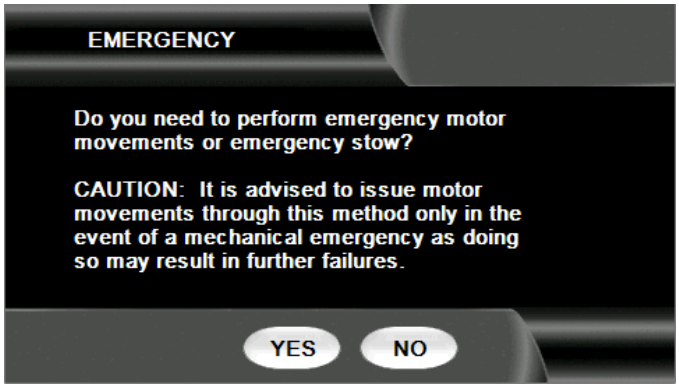


a) If you select “NO” you will be taken to the EMERGENCY screen on item 5.
b) If you select “YES” the following screen will appear:

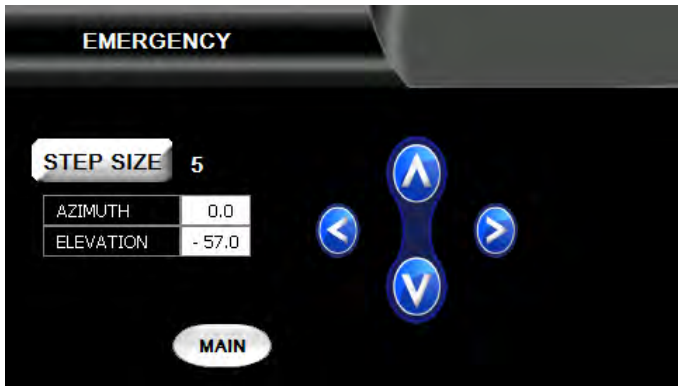


The INSTALL MOVEMENT screen allows for manual jogging of the antenna for assembly, wiring and even pointing purposes used in testing. However, if in Generic mode, please note that after movements are accomplished in this screen the only choice available is to tap on the "NEXT" button which will then require that the system is stowed.
If the system is already configured on any mode except Generic, the "MAIN" button will be available to exit the manual movement screen back to the main menu without changes to your jogging movements being nulled.
The step rates available here are .1, .5, 1, 5 and 10 degrees per button selection.

5. EMERGENCY screen -
If you have selected "NO" on the ANTENNA SETUP screen then you will move forward to the EMERGENCY movement screen. This screen asks if you want to perform emergency movement of the motors for stowing purposes. It is not necessary to perform emergency motor movement to configure the controller.



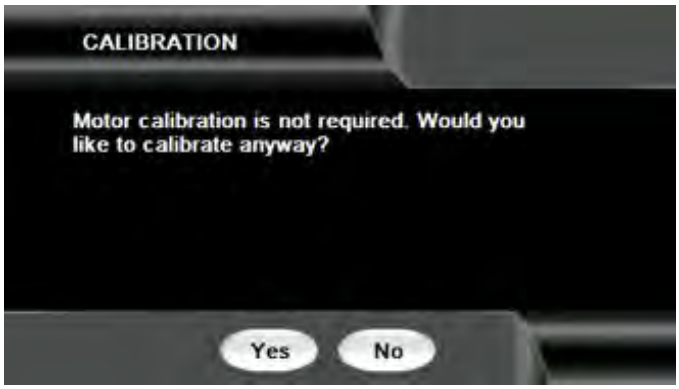
a) If you select "NO" you will be taken to the CALIBRATION screen on item 6.
b) If you select "YES" the following screen will appear:



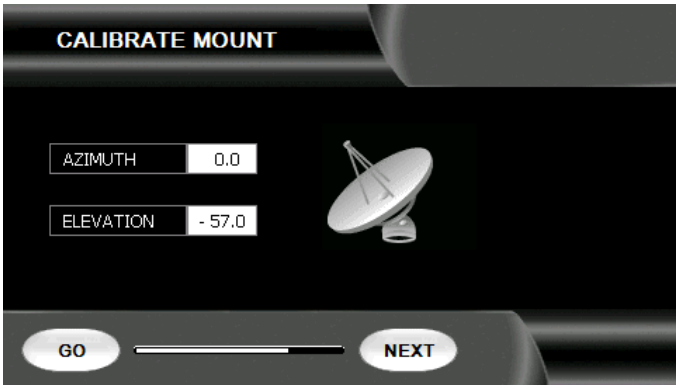
The EMERGENCY screen allows for manual movement of the antenna intended for Emergency stowing.
Warning, the system will allow unsafe movements of the Elevation motor in order to stow the system. Verify that the Antenna System is pointed in a safe azimuth position before moving the elevation motor.

The step rates available here are 0.1, 0.5, 1, 5, 10, 25 and 45 degrees per button selection.

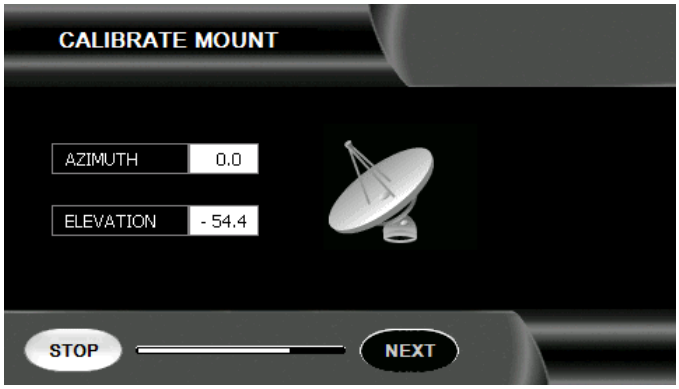
6. CALIBRATION screen -
This screen should show that a calibration is not required because a calibration was performed at the factory prior to shipping.



a) If you select "No" you will be taken to the HEADING screen on item 7.
b) If you select "Yes" the following screen will appear:

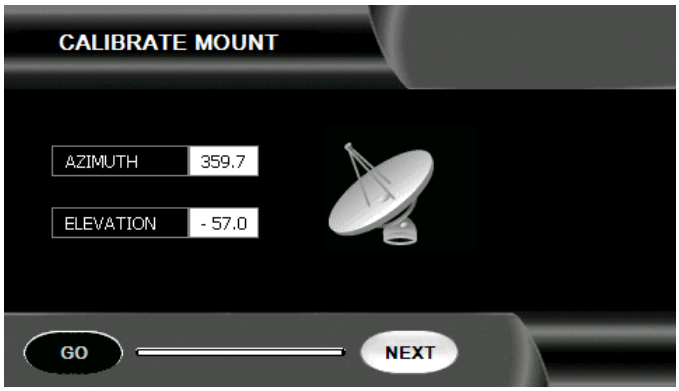


i. If "NEXT" is selected, the controller will exit the Calibration without Moving the antenna and proceed to the next step in the configuration described on item 7.
ii. If you select "GO" then the Calibration will begin.



The "GO" button will change to a "STOP" button and the "NEXT" button will become grayed out. The Controller will tell the ODU to move the antenna motors in all axis sequentially, first elevation, then azimuth before stowing the antenna.

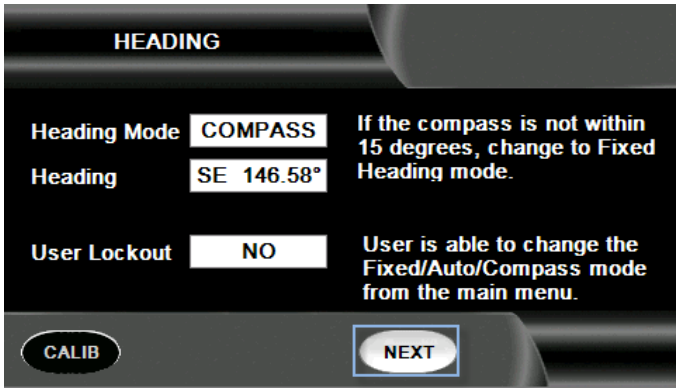
iii. Once both motors have been processed thru the calibration, the "NEXT" button will become available again.



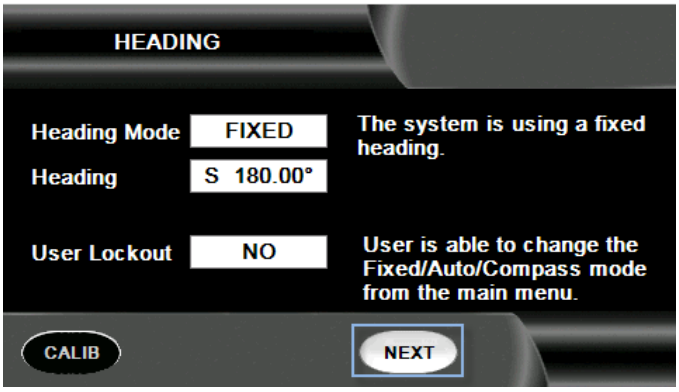
If this happens then the system completed a successful calibration. Tapping the "NEXT" button will move the configuration to the next step on item 7.

7. HEADING screen -
After the CALIBRATION screen the system continues to the HEADING screen.

a) The WV750 Antenna System's Heading Mode should be in Compass mode. This is the factory default setting.
At this time select "NEXT" to go to step 8.



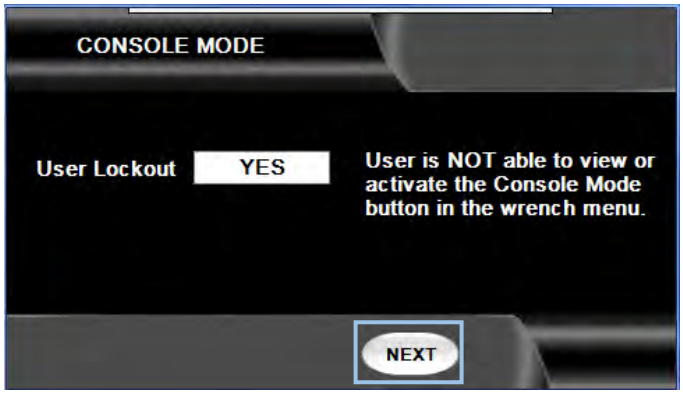
b) If the system is in Fixed Mode it can be changed back to Compass Mode by touching the Heading Mode button on the touch. Warning, using the WV750 Antenna System in fixed mode will significantly increase acquisition time.



8. CONSOLE MODE screen

The default setting for console mode (User Lockout) is YES. The console mode is for remote operation and should not be changed.

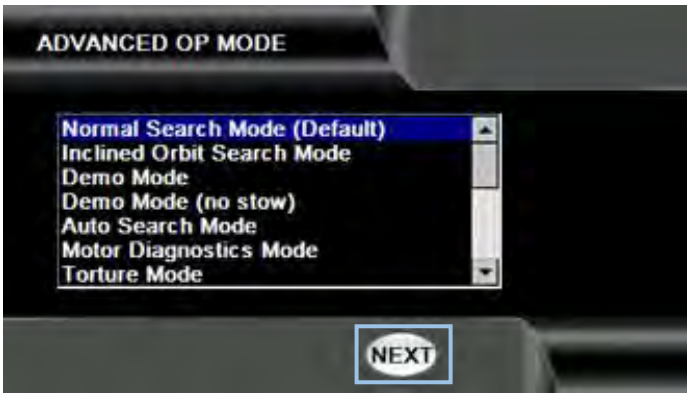
a) Leave the User Lockout setting to YES and press next.



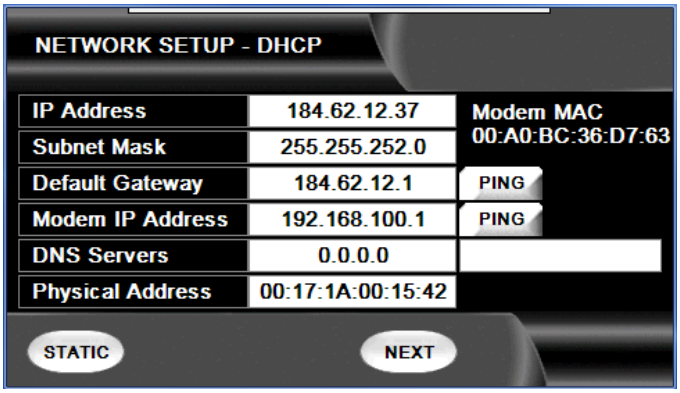
9. ADVANCED OP MODE screen-
After completing the Compass Heading screen on the previous page, the controller will advance to the ADVANCED OP MODE screen.
In this screen there is only one mode supported for field deployment, Normal Search Mode.

Normal Search Mode (Default) -
As the name implies, Normal Search Mode is the factory default setting.

If the "Normal Search Mode" is not highlighted select it and press the "NEXT" button to advance to the MODEM SELECTION screen.



10. NETWORK SETUP screen -
At the top of the NETWORK SETUP screen the header section details if the Network Adapter is currently in DHCP or STATIC mode.



The Network Adapter can be placed in either DHCP or STATIC mode. Network parameters such as IP, Mask, Gateway and DNS address are available when the system is in STATIC mode.

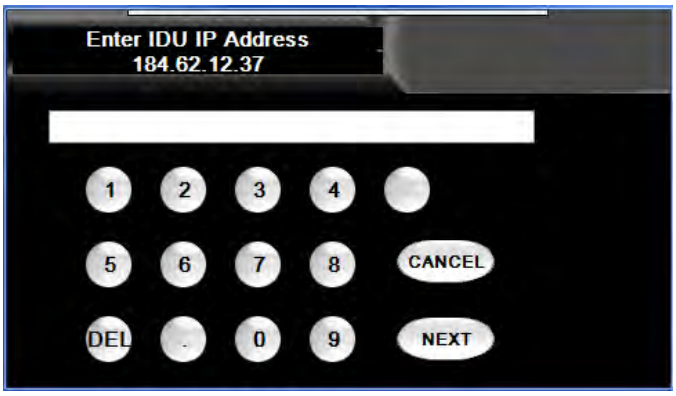
The button at the bottom left hand corner of the screen is basically a toggle switch which changes the Network Adapter from DHCP to STATIC, or vice versa.

DHCP -

a) If the modem, with which the controller is being configured, has DHCP enabled then ensure first that the display at the top of this screen states NETWORK SETUP - DHCP. If not, then tap on the “DHCP” button on the bottom left hand corner of the screen.
b) IP, Mask, Gateway and DNS information being distributed by the modem should populate the main screen after a few seconds.
c) Once DHCP data is present and verified, proceed to step 11.

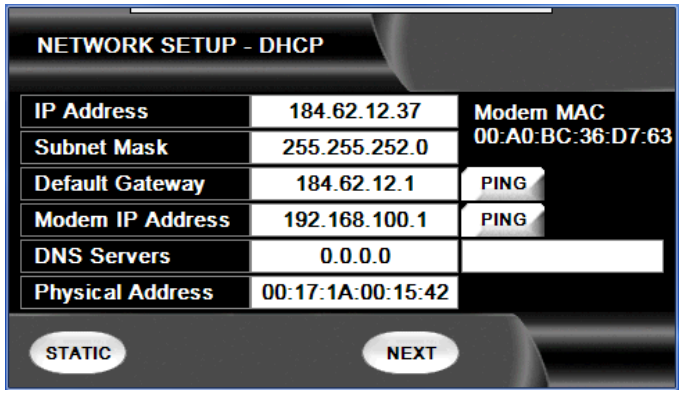
STATIC -

a) If the modem, with which this controller is being configured, does not have DHCP enabled then ensure first that the display at the top of this screen states NETWORK SETUP - STATIC. If not, then tap on the “STATIC” button on the bottom left hand corner of the screen.
b) After the Network Adapter is changed to Static mode, IP data can be entered by tapping on each line of information at a time.
c) After the tap a numeric pad screen will appear allowing entry of the IP information with a NEXT button available to exit out of the numeric pad for each entry.
d) If an incorrect value is entered, the DEL button will backspace one character per tap.

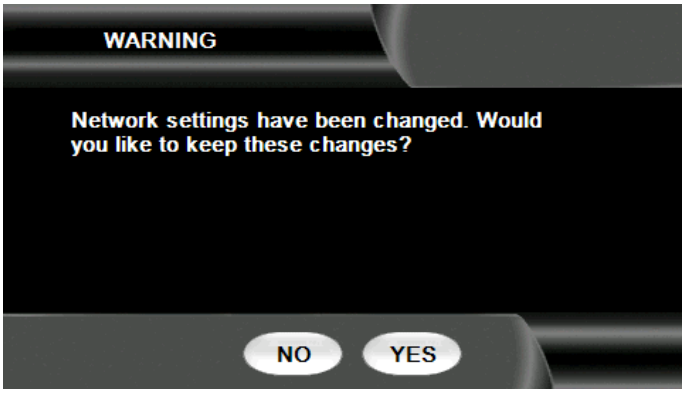


After the network configuration information has been entered and verified, tap on the NEXT button to return to the NETWORK SETUP screen.

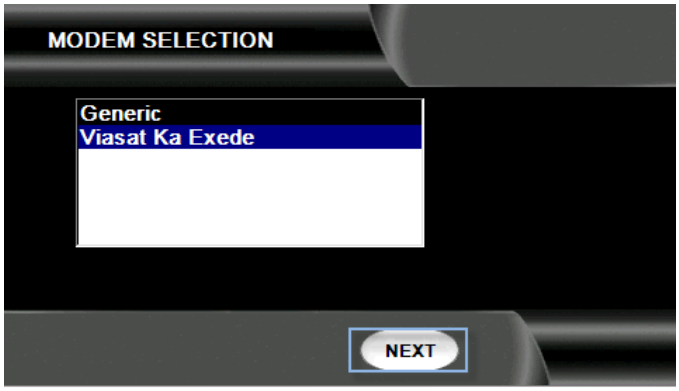
Press the NEXT button on the NETWORK SETUP screen to continue.



If changes to the network have been made the YES button must be selected in order to save the changes.

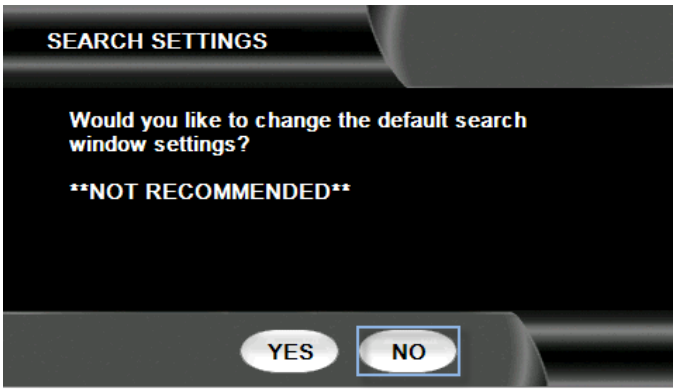


11. The MODEM SELECTION screen allows one selection to interface with a Viasat Ka modem. Verify this is highlighted and press NEXT.



12. The SEARCH SETTINGS screen asks if you would like to make changes to the default Search Window settings. Changing the default search window will negatively impact acquisition time and should not be changed. The default settings are:

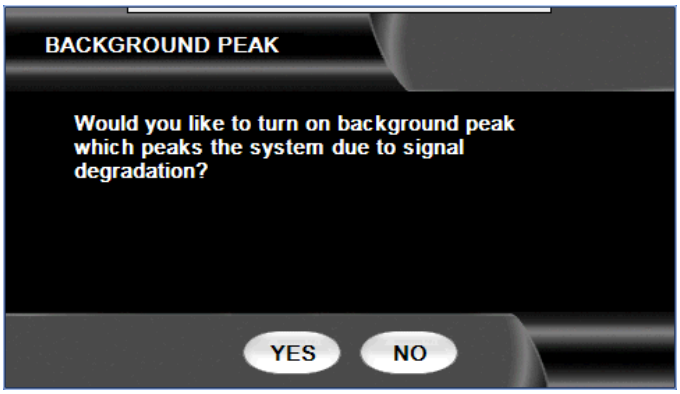
Window Width = 5 Deg
Window Height = 6 Deg
Elevation Spacing = .5 Deg
Azimuth Speed = 5 Deg per second
Select "No" to continue the configuration.



13. The BACKGROUND PEAK screen asks if you would like to turn on BACKGROUND PEAK.

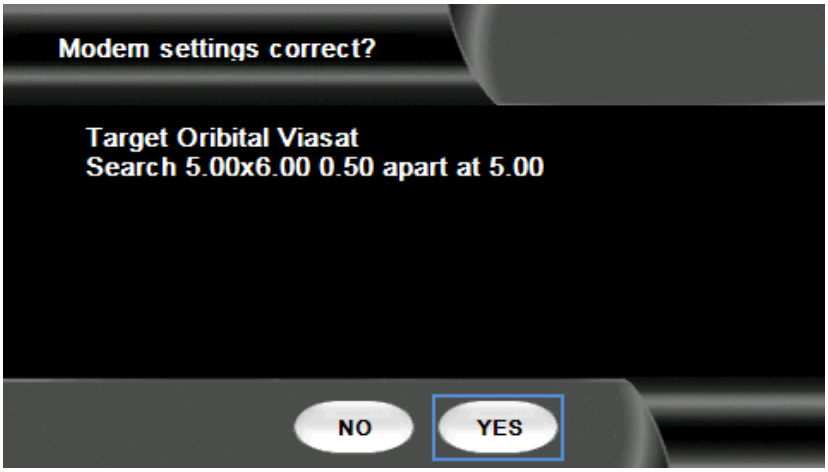
BACKROUND PEAK is not needed for normal operation and should only be turned on by an authorized factory technician.

Select the NO button.



14. The MODEM SETTINGS screen will allow one final review of the settings for this Viasat Ka Exede modem search. Selecting "YES" here will write the configuration

selections to the configuration memory and return the system back to the Main Screen.



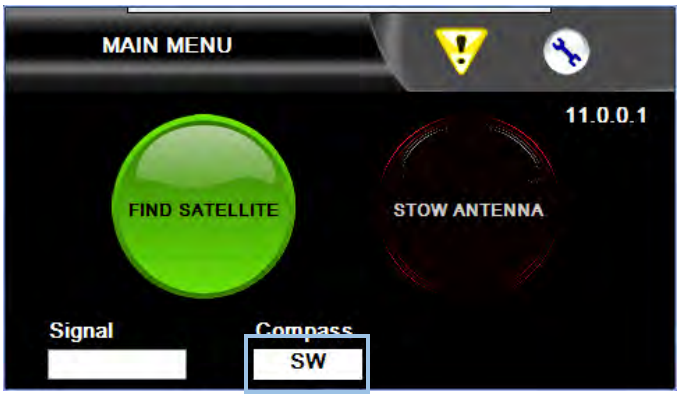
15. Final configuration notes -
The controller is now configured to work with the Viasat Ka Exede modem selected for this installation.

6.5 - Compass Screen & Fixed Heading Mode

The Winegard 2-Way Controller offers two modes to operate the system.
Compass Mode, which derives its heading from the compass built into the ODU and Fixed Heading Mode. Fixed Heading can be used when the GPS compass fails to obtain a heading.

6.5.1 - HEADING screen

Access the HEADING screen by tapping the Compass reading on the MAIN menu.



1. HEADING SCREEN (Compass Mode) -
   The image below shows a system that is currently in Compass Mode.

6.5.2 - FIXED Heading

Fixed Heading Mode should not be used with a WV750 Antenna System under normal operating conditions.

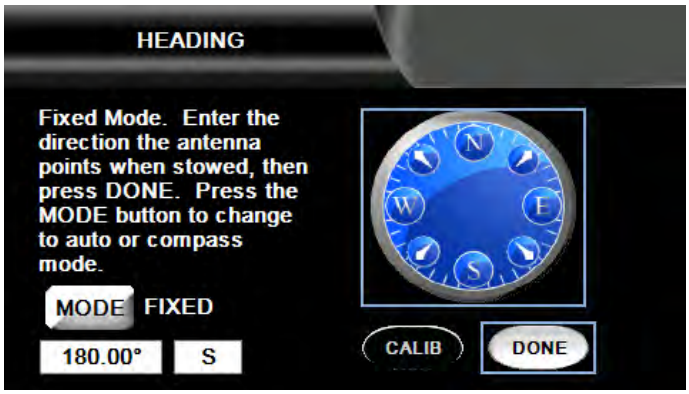
Warning, changing to the Fixed Heading Mode will significantly increase satellite acquisition time.

How to Override the Compass

1. Access the HEADING screen as described in section 6.5.1.
2. Look at the Compass Mode and choose a path below:

   A. If the controller is currently set to FIXED heading mode, proceed to step 3.
   B. If the controller is currently set to COMPASS mode, tap the "MODE" button to switch the controller to FIXED mode then proceed to step 3.

3. As long as the controller is in FIXED mode, the sections of the compass will be available to manually set a heading.



Tap the direction that the antenna is facing when the system is stowed. This will set the True and Rough headings to the correct heading.

Alternately you can also tap on the true heading display and enter an exact heading value.

The Fixed heading process works the same for all Winegard antennas. This will tell the system to use the entered value above to make the calculation of the target satellite vector.

4. After the correct direction is set, press the “DONE” button to return to the Main Screen.

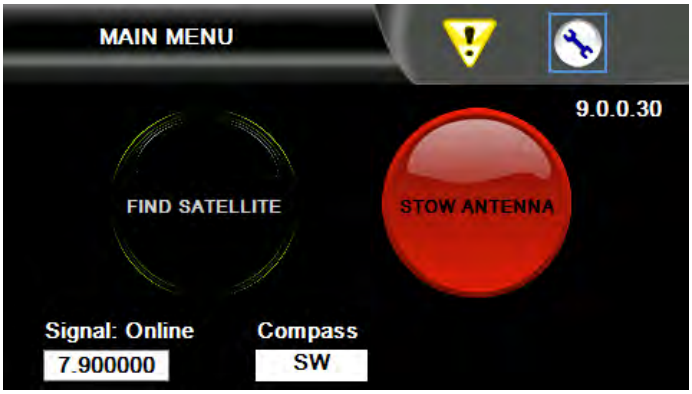
5. The system will remain in Fixed Heading mode until it is changed back to Compass Mode. If the system is in Fixed Heading mode the heading will need to be adjusted each time the system is moved.

6.6 - Advanced User Data

The Advanced User menu is denoted by the Wrench Icon on the Main screen.
Here the controller displays sensor data, network information, software versions and allows for calibration of the motors and updating of the firmware.
In the Advanced User Data screens, pressing the Main Menu will take you out of the Advanced User Data section and return to the Main Screen.

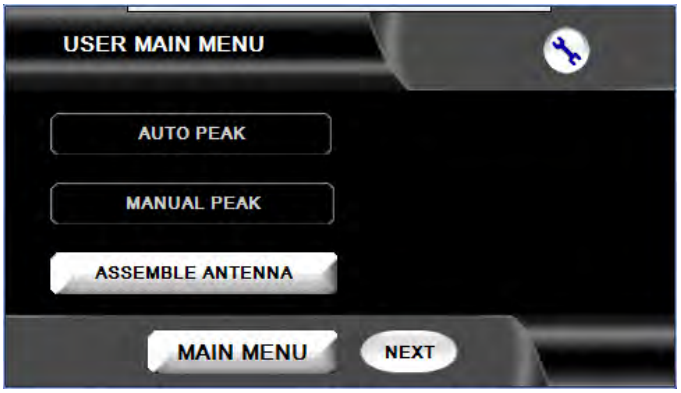
6.6.1 - Accessing the Advanced User Data

1. Tapping the Wrench Icon in the Main Menu enters the display into the Advanced User Data screens.

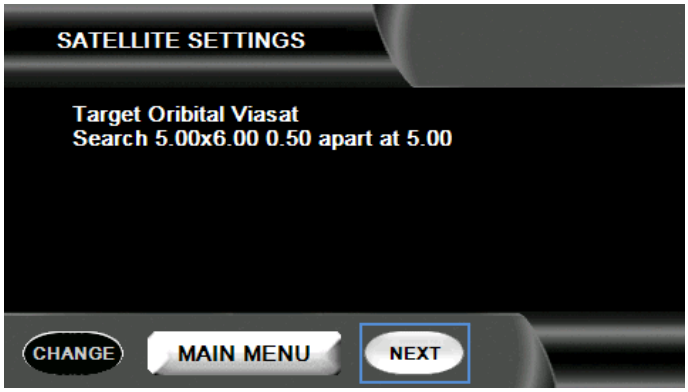


2. USER MAIN MENU screen-

   The USER MAIN MENU is the first available screen in the USER MAIN MENU section. Auto Peak and Manual Peak are accessable from this screen. The CONSOLE MODE button will exit the application and enter the debug screen.

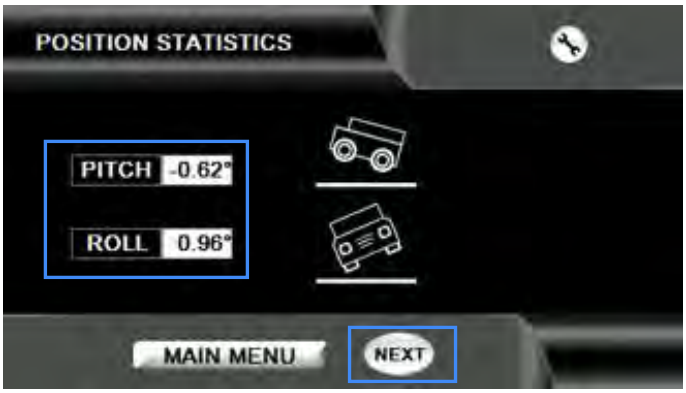


3. SATELLITE SETTINGS screen –
This screen reviews the search settings. Select “NEXT” to advance.

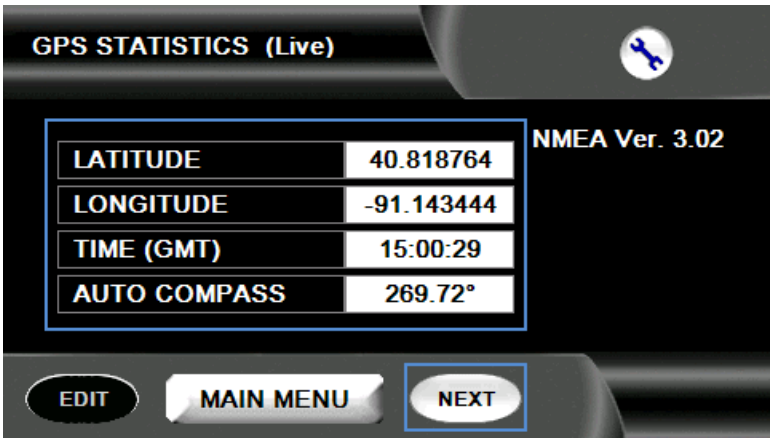


4. POSITION STATISTICS screen-

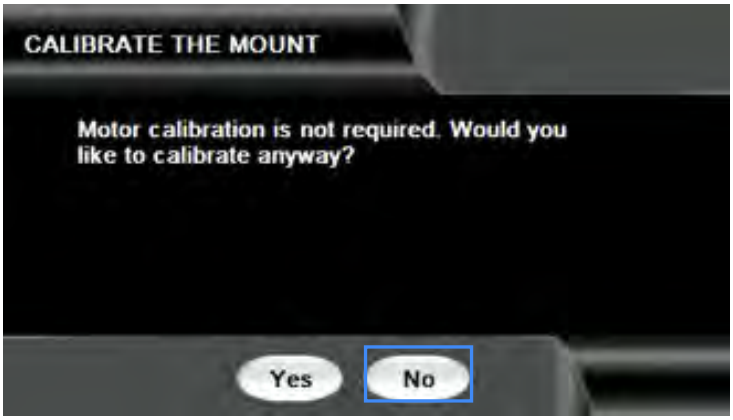
The POSITION STATISTICS screen displays live Pitch and Roll data from the antenna Tilt Sensors.
Select “NEXT” to advance to more data.



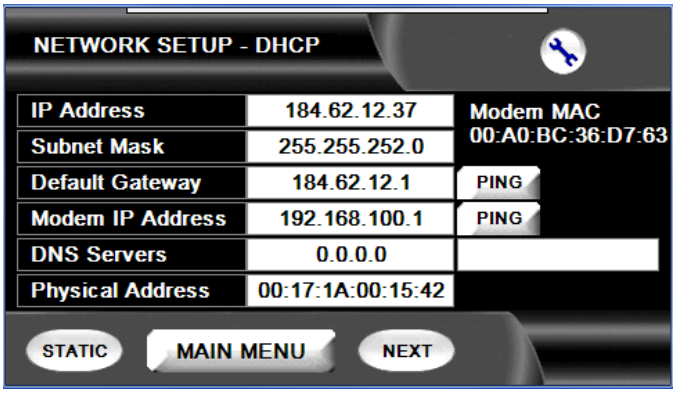
5. GPS STATISTICS screen -
   The GPS STATISTICS screen displays GPS data. The heading will display either (Live) or (Saved) depending on the state of the GPS input.
   If GPS acquisition was not able to complete (indoors, etc) the system would ask at boot time if the user wants to use Saved coordinates. In that case the display here would change to Saved and the Edit button would be available to override coordinates. Select "NEXT" to advance.



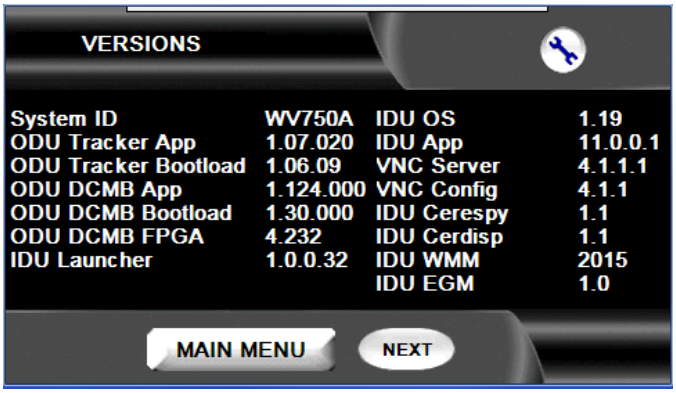
6. CALIBRATE THE MOUNT screen -
   As stated on this screen, Calibration is not required since the system is calibrated at the factory but can be performed any time without any danger of problems. The new calibration data will simply override the older data. Please ensure that the system is capable of moving without interference from obstructions if a calibration is performed. Select "NO" to advance.



7. NETWORK SETUP screen –
   Network setup is described in section 6.4.1 Configuring the Controller (step 10). Select "NEXT" to advance.



8. VERSIONS screen -
   The VERSIONS screen displays current software for both the Controller (IDU) and Outdoor Electronics (ODU).
   Select "NEXT" to advance.

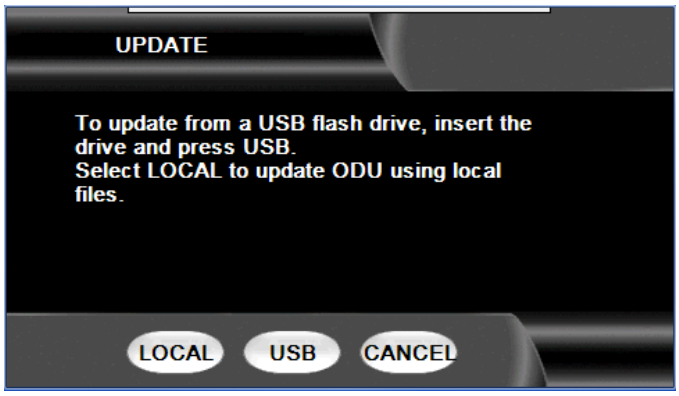


9. UPDATE screen -
   The UPDATE screen allows the user to update the antenna controller firmware.

a) UPDATE NOW -
Selecting the UPDATE NOW button, from the “UPDATE” screen, will display the screen below.

1) Local button – Pressing the LOCAL button will update the software in the ODU using firmware saved in the IDU controller.
2) USB button – Pressing the USB button will update the firmware in the IDU controller and the ODU using firmware saved on the root directory of a USB memory devise.
3) CANCEL button – The CANCEL button will abort the update process and return the user to the Main menu.

Do not interrupt power while the firmware flash is in process.

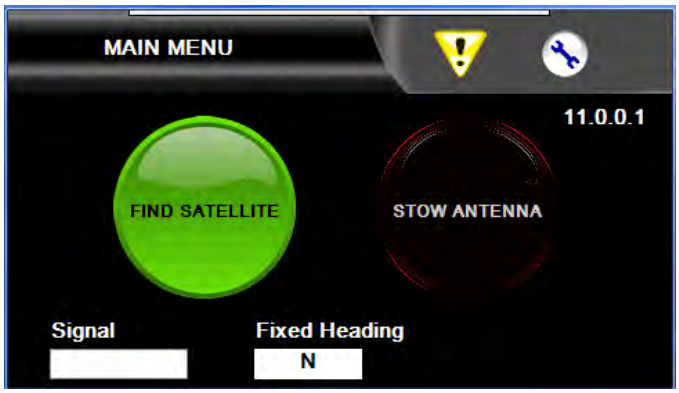


7. Operation

The Controller’s main functions, such as deployment and stowing are handled at the Main Screen.
The controller will display button options dependent on the current state of the antenna and conditions.
Find Satellite is only available when the antenna is stowed or the controller has been rebooted but a carrier is not present. The Stow button is only available when the system is not in a stowed position etc.
Always ensure that compass heading and mode are accurate before performing a search.

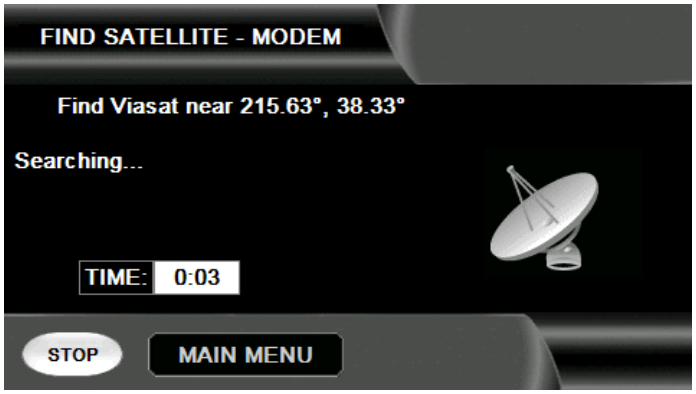
7.1 - Find Satellite

1. When the controller has booted to the Main screen, tap the Find Satellite button to deploy the system and acquire the satellite carrier.

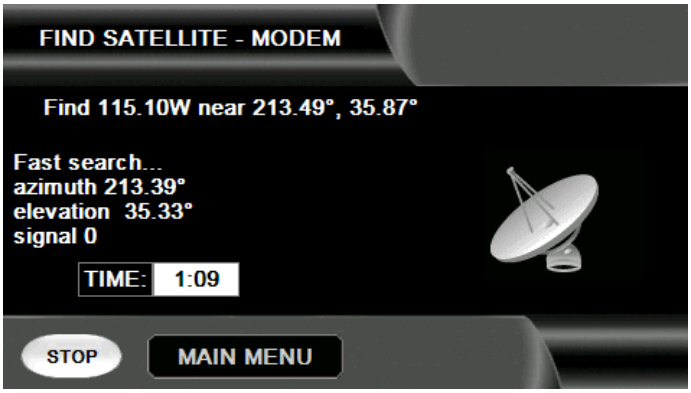


2. The antenna will move to the calculated pointing angle.

3. The controller will move and test the calculated location for a modem lock. If a lock is found at that location, the controller will begin to peak the carrier.



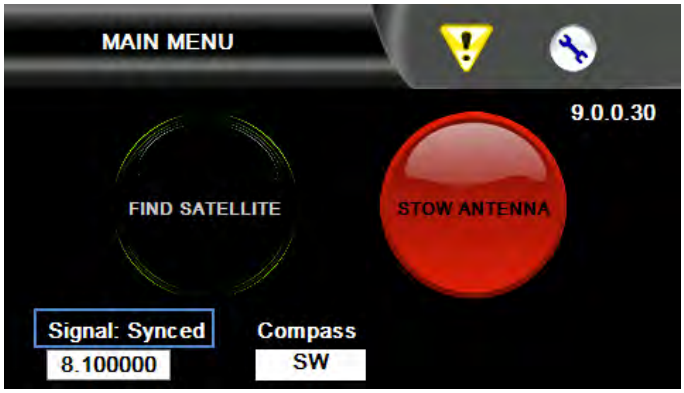
4. If no lock is detected when at the calculated location, the controller will begin searching the target window. The screen will read “Fast Search”.

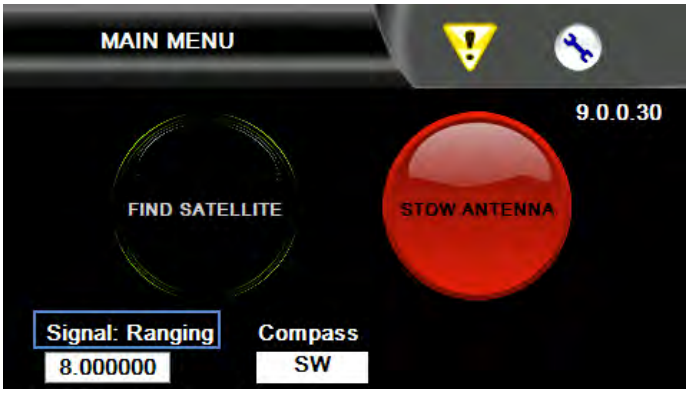


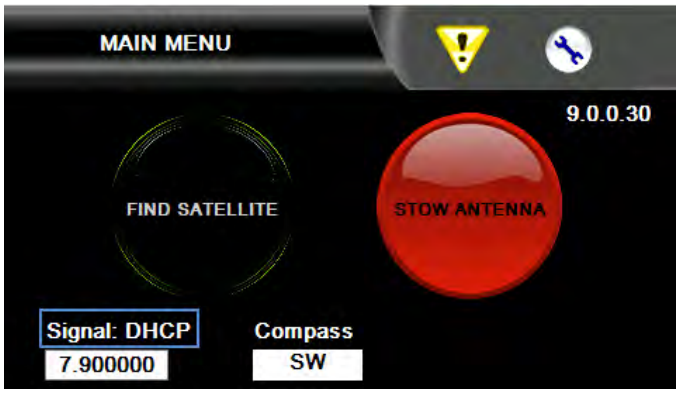
5. Once the controller sees a lock during the fast search, the screen will display "Testing for modem rx lock". The controller is moving the antenna back to the location where it received a lock status and is attempting to find the lock again.

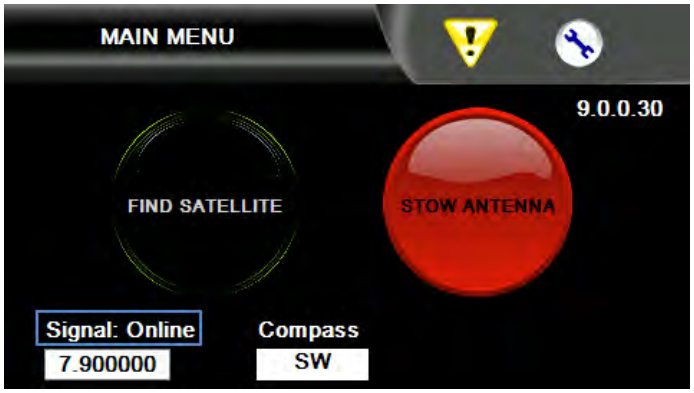
6. Once a Lock is found, the Controller will start peaking. The controller will first peak the antenna in Azimuth and then in Elevation before stopping all movement.

7. When the antenna is completely peaked, the controller will return to the Main Menu screen and the modem will begin to come into the network. Above the Signal Strength indicator you will see modem status information (Syncing, Ranging, DHCP and Online).


MAIN MENU
9.0.0.30
FIND SATELLITE
STOW ANTENNA
Signal: Synced
8.100000
Compass
SW


MAIN MENU
9.0.0.30
FIND SATELLITE
STOW ANTENNA
Signal: Ranging
8.000000
Compass
SW

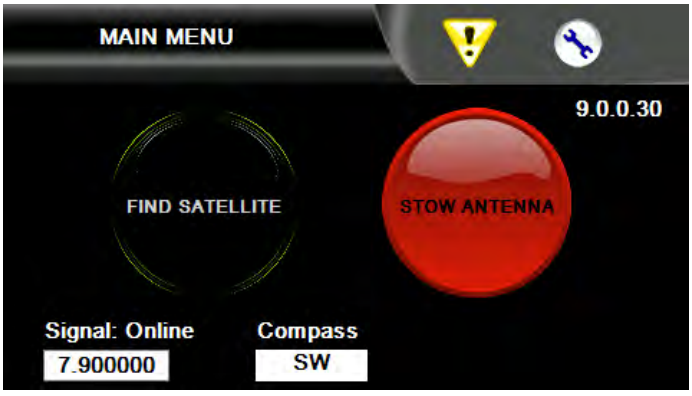

MAIN MENU
9.0.0.30
FIND SATELLITE
STOW ANTENNA
Signal: DHCP
7.900000
Compass
SW



8. The acquisition process is complete.

7.2 - Stowing

1. The antenna can be stowed by tapping the STOW ANTENNA button on the Main menu.



2. The controller first makes a request to the modem to shut off the Transmitter. Once a reply has been received that the Transmitter is offline, the controller will begin moving the antenna back into the stowed position.

3. When the antenna is finished stowing, the screen will return to the Main Menu with the Find Satellite button enabled.

4. Warning: Do not turn off power until the system returns to the Main Menu Screen.

5. The stow process is complete.

8. Service and Troubleshooting

8.1 - Theory Of Operation

Theory of operation describes the logic and functionality of the Winegard WV750 Satellite Internet System and is pertinent to all antenna and controller models.

8.1.1 - Antenna Drive Mechanism

The Winegard WV750 Satellite Internet Antenna Systems have been modularly designed for easy troubleshooting and repair.

8.1.2 - Modem and Power

The WV750 Antenna System requires a Viasat internet modem and suitable 110/220 volt AC power source to operate. The modem is required to power the TRIA.

8.1.3 - Cabling and Communication

The modem is connected to the Controller (IDU) through an Ethernet cable and to the antenna system through an RG6 (or equivalent) coaxial cable.
The RG6 cables are terminated with environmentally sealed F-connectors.
As mentioned above, the modem supplies the DC voltage necessary to power the TRIA.
The IDU supplies 48 volts DC to the antenna's Outdoor Unit (ODU) through an RG6 (or equivalent) cable terminated with F connectors.
Communication between the IDU and the ODU are carried over the antenna's power cable utilizing Bluetooth Protocol. This cable is terminated with F connectors.

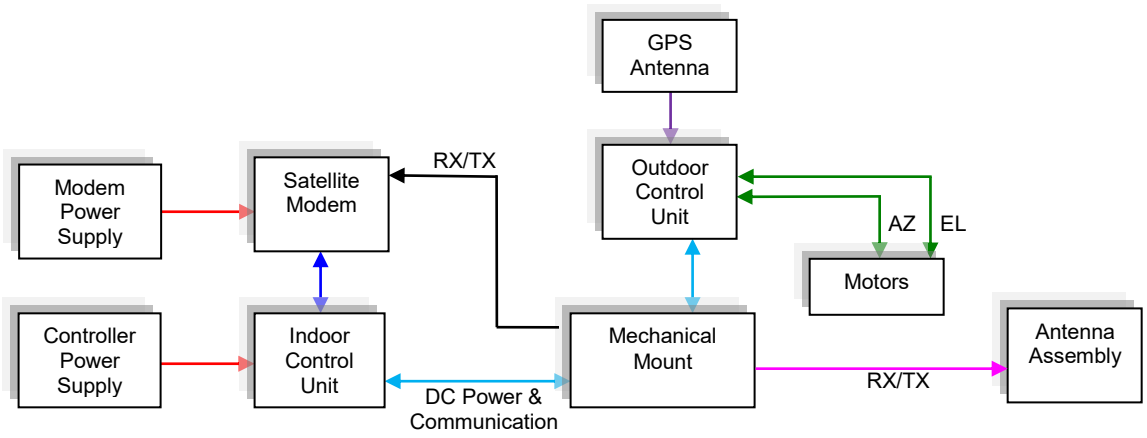
8.1.4 - Sensors

The system is designed with an onboard GPS receiver to determine antenna location and heading. These coordinates are utilized when calculating initial elevation angles.
The pointing angles are also compensated by pitch and roll sensors.
The software provides for input of manual heading information. This override is called Fixed Heading Mode and is not recommended.

8.1.5 - Software

There are several safety features built into the antenna system. These features automatically stow the antenna if certain criteria are met. These include loss of receive signal lock and detected motion (pitch, roll, velocity).

8.1.6 - Functional Block Diagram



Legend

- Ethernet
- DC Wiring Harness
- RF Wiring Harness
- Power
- GPS
- Control
- Modem Rx/Tx

Antenna Assembly –
Contains the TRIA and the antenna reflector.

Motors –
The motor block contains the Azimuth motor and the Elevation motor.

Outdoor Control Unit (ODU) –
The ODU controls all motor movements.

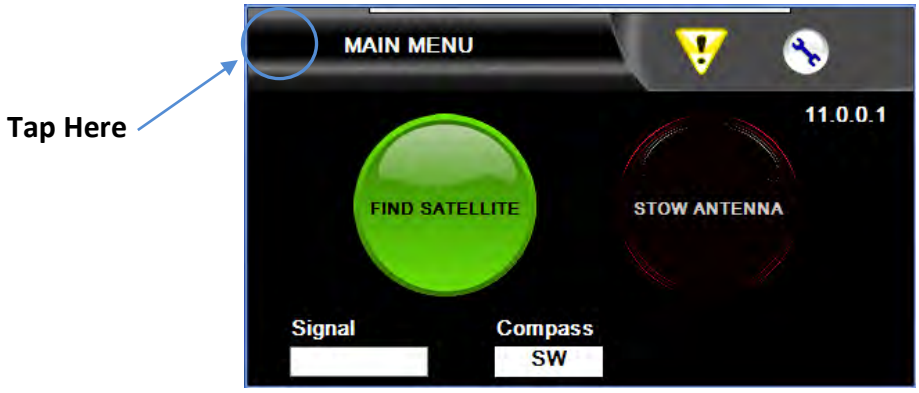
8.2 - Global Procedures

The global procedures described below show the end user how to perform functions such as checking version of software, ID information and how to access the tracker (trk>) prompt.
These procedures may be referenced to while performing other processes so they are described here to familiarize the user with these operations prior to entering other functional sections of the manual.

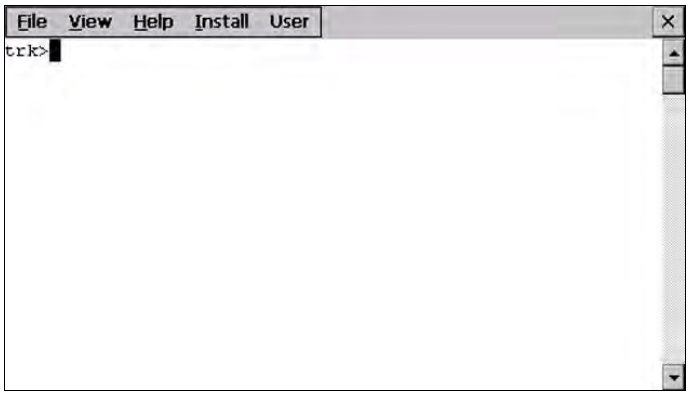
8.2.1 - Accessing trk> prompt (Debug mode)

The debug prompt allows interaction with the controller using a command line type interface.
In the debug prompt you can perform any function you would using the GUI. Warning, the debug interface should only be used by (or as directed by) a factory authorized technician.

1. Tap three times on the upper left hand corner of the screen.



2. Do this repeatedly until the screen turns white as seen below.



8.2.2 - Serial Number

There are several serial numbers assigned to all 2-Way antenna systems manufactured by Winegard.
The antenna itself has 2 serial numbers on it, one on the antenna base next to the where the feed arm is attached and one on the ODU.
The IDU serial number is located on the back of the main controller housing near the rear panel connections.
All serial numbers start with the model number of the system followed by the serial number.

8.2.3 - System Identification

The System ID is a software model number flashed onto the ODU to tell the ODU how it should move the motors based on the type of antenna it is controlling.
The ID is stored in the Outdoor Control Unit.
This System ID is important for troubleshooting purposes and can be viewed on the "VERSIONS" screen in the GUI.
The information below describes how to obtain the System ID.

1. Turn the controller on.
2. Allow the controller to boot to the Main Menu screen.
3. Click on the Wrench icon on the upper right hand corner of the screen.
4. Navigate through the screens until you reach the"Versions" screen.
5. The System ID should be displayed here on the first line along with other information.

8.2.4 - Software Versions

In addition to the serial number and System ID the software versions can also be an important piece of information when troubleshooting.
The software versions can be obtained at the screens listed below.

1. Main Menu Screen
2. Versions Screen
3. Software "UPDATE" Screen

8.3 - Maintenance Procedures

The Maintenance Procedures described below should be performed by trained service technicians. If at any time the procedure becomes unclear or you feel continuing on with a procedure could cause damage or corrupt the system software or mechanics, please stop and seek assistance from the re-seller who sold you the product.

8.3.1 - IDU Software Update

The following procedure describes the methods which can be implemented to perform a Software Update.

All software updates require that the version you want to load onto the controller is unzipped and copied to a USB drive.
Winegard publishes current copies of the software on its support web site located at http://www.satellitesupport.net
An account is required to log into the site and download software and other related documents, manuals and white papers.
If an account is required, please go to the support site and request an account or contact support at 877-704-1112

1 – GUI "UPDATE" Screen

The "UPDATE NOW" button can be found on the Winegard controller's "Update" screen of the Advanced User Data section of the pointing software.
This process automatically updates the software on the ODU.
The following files must be located in the root directory of the USB memory device used for the update in order for the process to work properly using the "Update Now" button:

DT740.tmp
Launcher.exe
Launcher.tmp
trk_app.bin

Procedure:

1. Turn on the controller.
2. When the "Main Menu" screen is displayed, insert the USB drive into one of the USB ports on the back of the controller.
3. Press the "Wrench" button on the controller's main menu screen and navigate through the user status screens until the "Update" screen is displayed.
4. Press the "Update Now" button to begin the update. The system will ask if you would like to update from files locally or on a USB drive.
5. The system will automatically search the root directory of the attached USB drive or on the local drive and if the software listed above is found, the system will automatically update the software with the version on the USB drive or locally stored.

6. The software will show a progress bar and indicate when it is finished updating. Do not go to step 8 until this finished status is displayed.
7. Cycle the power on the controller when the system returns to the Main Menu.
8. Check the version of the software by navigating to one of the screens described in section 7.3.

8.4 - Calibration

There are several different systems that require calibration. The first group of calibration procedures are factory set calibrations and will only be required if the Outdoor Unit (ODU) or the Azimuth Position Sensor are replaced.
These procedures include calibration of the azimuth position sensor or calibration of the Vehicle Attitude Board (pitch and roll).
The second calibration procedure involves systems that may require periodic calibration. This includes setting the antenna system's home position. This procedure can be accomplished using either the USB keyboard or the Indoor Unit (IDU) in normal operation.

8.4.1 - Calibration of the Azimuth Home Position

This procedure should be performed if the LNB arm does not line up with the stow position bracket or an AZ sensor error is detected during a stow routine. This procedure requires a USB keyboard (or alternate method). The system must be in debug mode as described earlier in this document.

It is very important that the antenna elevation is high enough that the LNB arm will clear all obstacles.

1. The IDU screen should display "trk>".
2. Hold down the control key (ctrl), press "t", release both keys and then press enter.
    a. The IDU screen should change to the capital "TRK>" prompt.
3. Type "dc" and press enter.
    a. The IDU prompt should change to "DC>"
4. Type "v 2 100" and press enter.
    a. The LNB arm should lift off of the stow tray.
5. Type "s" and press enter to stop the motor.
    a. Verify that the LNB arm will not hit any obstacles when the azimuth motor is engaged.
    b. If the LNB arm must be raised farther, type "v 2 100". Continue raising the antenna until the LNB arm is at a safe elevation.
6. Center the azimuth.
    a. Visually inspect the front of the antenna assembly to see if the unit is aligned in the middle of the stow tray.
    b. If the unit is aligned, skip to step 6.
    c. At the "DC>" prompt, type "p 0 -500" and press enter. This will rotate the azimuth motor clockwise past the magnetic sensor.

d. At the “DC>” prompt, enter the command “p 0 +100” and press enter. This will rotate the azimuth counterclockwise back towards the center of the tray.
e. Continue to rotate the azimuth towards the center. It may be necessary to decrease the amount of travel by entering values less than 100 in order to stop at exactly the center position.
f. The system must be brought to the center position from this direction. If the system overshoots the center position, it will be necessary to start back at step 5c above.

7. Calibrate the center (0) position.
   a. From the “DC>” prompt, type “calib” and press enter.
   b. Then type “y” when asked if the azimuth is at 0 (do not press enter).
   c. The azimuth should move in both directions. It may not return to the centered position.
8. From the “DC>” menu, type “home” and press enter.
   a. The IDU screen should change to the “HOME>” prompt.
9. At the “HOME>” prompt type “h” and press enter.
   a. The system should go through a motor calibration.
   b. Verify that when the system stows it is centered on the stow tray.
   c. If the system is not centered, it will be necessary to return to step 3 and repeat this procedure.

8.4.2 - Calibrating Pitch and Roll

This procedure requires the use of a digital inclinometer that is accurate to at least +/- 0.1 degrees.

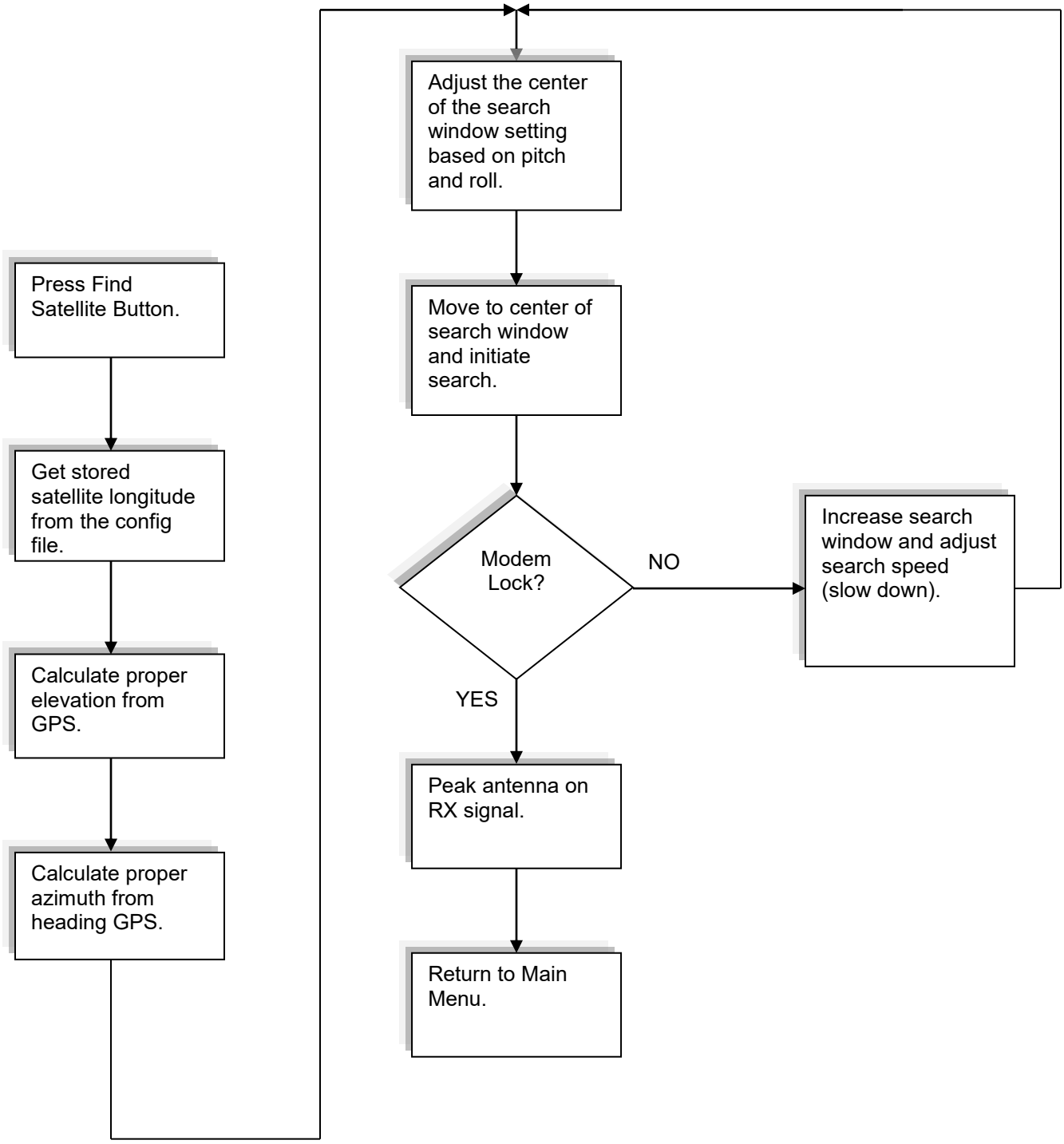
The system should be stowed. Enter the debug menu as described above.

1. The IDU screen should display “trk>”.
2. Hold down the control key (ctrl), press “t”, release both keys and then press enter.
   a. The IDU screen should change to the capital “TRK>” prompt.
3. At the “TRK>” prompt type “tilt” and press enter.
   a. The IDU screen should now display the “TILT>” prompt.
4. At the “TILT>” prompt type “mount [pitch] [roll]” and press enter.
   a. [pitch] and [roll] are the values obtained using the inclinometer (see figures below).
   b. The command for the following example would be “mount -0.5 -0.4”
   c. The IDU will display the message “Is the antenna stowed with p=[pitch], r=[roll]? y/n”
   d. Selecting “n” will cancel the calibration.
   e. Selecting “y” will display the message “Calibration Successful”.
5. The pitch and roll should be verified. Type “att” and press return.
   a. The IDU should now display the “ATT>” prompt.
6. Type “att” and press return.
   a. Values for pitch, roll, and heading will now be displayed on the IDU screen.
   b. Press any key to stop.
   c. The pitch and roll should be +/- 0.2 degrees from the values entered.

Pitch – If the front of the system is higher than the rear, the pitch is a positive value. The front of the system is the antenna dish and the rear is the actuator.		Pitch – In this example the front of the system is lower than the rear, so the pitch is -0.5 degrees.
Roll – If the left side of the system (looking from the rear) is higher than the right side, the amount of roll is a positive value.		Roll – In this example the left side of the dish is lower than the right side. The roll is -0.4 degrees.

8.5 - Search Routine Flowchart

This example is for a Modem search.



8.6 - Troubleshooting

Symptom	Troubleshooting
Antenna searches in the wrong part of the sky.	Stow the antenna and navigate back to the main menu. Press the wrench (advanced user menu) and verify the antenna heading. Verify the compass mode is set for desired operation. If the compass is set for fixed heading mode verify that the proper heading has been selected.
System takes longer than 20 minutes to find satellite.	Stow the antenna and check antenna heading, compass setting, GPS and pitch/roll. Verify power to the modem and that it is connected to the Winegard Indoor Control unit. Verify that the cables are securely connected to the back of the modem and are in the proper position. Verify that the cables are securely attached to the base plate of the antenna mount (outside) and are in the proper position. Verify that the receive cable to the TRIA is securely fastened. The TRIA sticks out from the end of the dish when the antenna is stowed. Disconnect the RX LNB cable. There should be between 11 to 18 volts DC on the cable. Stow the dish and turn the system off. Power cycle the modem.
System stops during the GPS portion of the Initializing screen (when power is turned on to the system).	It sometimes takes several minutes for the GPS system to acquire the number of satellites it needs for proper positioning.
“VAB or Tilt sensor not found” error during system initialization.	Power cycle the controller.
System stops during Comm portion of the Initializing screen. This can also show up as a BT No-Connection Error during operation.	Verify that the cable and connector are properly installed on the back of the Winegard Indoor Control Unit. Verify that the cable and connector are properly installed on the base plate of the antenna. Verify that there is 48 VDC at the F connector of the ODU.

The IDU doesn't respond for several seconds.	This happens when the IDU is not communicating with the modem. Verify that the IDU is connected to the proper modem. Turn the entire system off. Turn the modem on and wait several seconds before turning the IDU on. Verify that the IDU is getting the proper DHCP address (or static address).
"Homing Sequence Needed" message appears on the IDU screen. OR Dish raises but will not move in azimuth. This may happen when calibrating the motors or normal operation.	This will happen if the antenna loses power while moving or a possible motor fault. Try and perform a motor calibration first. If a motor calibration does not clear the error, enter the debug menus and try to move the motors individually. See appendix A. Determine if any motor indicates an invalid position command. Verify motor positioning is working through the DC> debug commands.

8.7 - Motor Controls

There are several motor processes that can be completed using the debug interface. It is sometimes necessary to move the system during troubleshooting. The proper precautions must be taken when moving the system through the debug interface.

Caution: There are several safety features which are disabled during some commands such as the motor stall timer and azimuth lock out. Make sure the system can move in all axis and unintended movements will not damage the antenna or surrounding structures. Make sure the antenna is raised to a safe elevation before moving the azimuth motor. The MOTOR commands require a minimum elevation (>10°) before the other axis can be rotated. This is not the case for velocity commands (DC). Stay clear of the system during all system movements. Typing "s" and pressing enter at any time from the debug menus MOTOR>, DC>, and HOME> will stop both motors.

There are 3 major types of motor commands. Each is described below.

7.7.1 - Angular Movement

The first type of movement is an angular movement command that is done from the "MOTOR>" menu. Movements are given using angular commands. Below is an excerpt of what you will see in the debug screen. The "motor" command was issued from the "TRK" prompt and the "a" command (angle) displays the current motor angles.

Important Note: Typing "s" and pressing enter at any time stops all motors.

```
MOTOR>s
  AZ stopped.
  EL stopped.

MOTOR>

TRK>motor
MOTOR>a
  AZ = 355.93°  wrap = -4.07°
  EL =  29.52°

MOTOR>
```

Each motor is identified by a number. The azimuth is motor 0 and the elevation is motor 2. The format for a motor movement command is "a [motor#] [angle].

Use the command “a 2 35” to raise the elevation motor to 35 degrees.

```
MOTOR>a 2 35
  Angle = 30.00°
MOTOR>a
  AZ = 359.97°  wrap = -0.03°
  EL =  34.91°

MOTOR>
```

Use the command “a 0 315” to rotate the azimuth counter clockwise from zero 45 degrees.

```
MOTOR>a 0 315
  Angle = 315.00°
MOTOR>a
  AZ = 314.96°  wrap = -45.04°
  EL =  29.91°

MOTOR>
```

Use the command “a 0 45” to rotate the azimuth clockwise from zero 45 degrees.

```
MOTOR>a 0 45
  Angle = 45.00°
MOTOR>a
  AZ =  44.99°  wrap = 44.99°
  EL =  29.91°

MOTOR>
```

8.7.2 - Positional Movement

The second type of movement command is called positional movement. The position is based on the number of individual steps per revolution (motor pulse counts). This position is reset when the system performs a motor calibration (homing routine). This command is entered from the “DC>” prompt in the debug mode. The format is similar to the motor movement command described above. If a “p” is entered, the system will respond with the current motor position.

```
DC>p
  AZ = 15193
  EL =  2636

DC>
```

Each motor is identified by a number. The azimuth is motor 0 and the elevation is motor 2. The format for a positional movement command is "p [motor#] [position].

The number of possible motor positions (steps per revolution) for the WV750 is 24750. In this case 24750 is the same as 0.

Important Note: Typing "s" and pressing enter at any time stops all motors.

```
DC>s
  AZ stopped.
  EL stopped.

DC>
```

Caution: The system will move in azimuth regardless of what the elevation is. Make sure the system is at a safe elevation before attempting to move the azimuth or motor. Stay clear of the entire system during movement commands.

Caution: The elevation will raise and lower its full range regardless of the azimuth position. This means it is possible to lower the antenna on either side of the landing ramp possibly causing damage to the antenna mount or surrounding equipment.

Use the command "p 0 100" to move the azimuth motor to position 100.

```
DC>p 0 100
DC>p
  AZ =    98
  EL =  2636

DC>
```

These commands are very useful to test individual motors. They can also be used to test motors that are connected to the system but are not installed for troubleshooting verification.

8.7.3 - Velocity Movements

Each motor is identified by a number. The azimuth is motor 0 and the elevation is motor 2. The format for a velocity movement command is "v [motor#] [velocity]. The velocity is in steps/second with -165 and +165 being the maximum motor speed (approximately 2.5 deg/sec). Any number entered above +165 and below -165 will be defaulted to the maximum speed. Negative numbers move the motors in one direction and positive numbers move the motor in the opposite direction.

Important Note: Typing "s" and pressing enter at any time stops all motors.

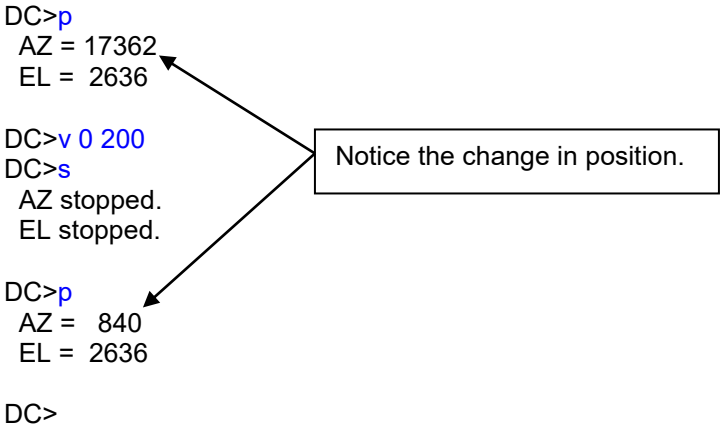
```
DC>s
  AZ stopped.
  EL stopped.

DC>
```

Caution: The system will move in azimuth regardless of what the elevation is. Make sure the system is at a safe elevation before attempting to move the azimuth motor. Stay clear of the entire system during movement commands.

Caution: The elevation will raise and lower its full range regardless of the azimuth position. This means it is possible to lower the antenna on either side of the LNB landing ramp possibly causing damage to the antenna mount or surrounding equipment.

Caution: Once the motor has been given a velocity command, it will continue to rotate until it hits a hard stop or the stop "s" command is given.

To start the azimuth rotating counterclockwise, use "v 0 200". The system will continue rotating until the "s" (stop) command is given.



8.7.4 - Motor Calibration

The system can be "homed" from the debug menu. Type "home" from any capitalized debug prompt and press enter. This should display the "HOME>" prompt.

The system (or individual axis) will need to be "homed" if an "invalid position" indicator shows up in either the angle or position commands.

```
DC>home
HOME>
```

The system can go through a full calibration by typing "h" and pressing enter. The elevation will raise (or lower) to a predetermined elevation. The azimuth will rotate clockwise until it encounters the magnetic position sensor or hits the hard stop. If it hits the hard stop it will rotate counterclockwise until it senses the magnetic sensor. The azimuth will then return to zero degrees. The elevation motor will then lower the dish until it hits the hard stop.

Each axis can be calibrated (homed) individually. In order to calibrate the azimuth motor the system must be at or above a minimum elevation angle (10 degrees). In order to home the elevation motor the azimuth must be at zero degrees.

Each motor is identified by a number. The azimuth is motor 0 and the elevation is motor 2. The format for a specific motor calibration command is "h [motor#].

The following command homes the azimuth. Wait for the system to complete moving before attempting to issue another command.

```
HOME>h 0
HOME>
```

Important Note: Typing "s" and pressing enter at any time stops all motors. The calibration may not be complete.

8.8 - Communications

Communications between the IDU and ODU are established using Bluetooth Protocol over the 48 volt DC power cable.

7.8.1 - Bluetooth (BT) Commands

If the IDU and ODU will not communicate, it is possible that the Bluetooth protocol has not been properly established.

The Bluetooth initialization is completed from the lower case debug prompt. Type “bt” and press return from any lower case debug prompt.

Two commands are necessary in order to set up the BT command structure. These are the inquiry command “inq” and initialization command “i”. The initialization command must be given after a BT connection has been established.

The following is the correct process for establishing a BT connection.

```
bt>inq
  Releasing Link ... Success
  Inquiry (5 Seconds) ... 0 Devices Found
bt>inq
  Inquiry (5 Seconds) ... 1 Devices Found
  * 0800172C0D32 WCS (000000) 3111
  * Remote Name 0800172C0D32 ... WCS Tracker
  * Saving Remote Addr 0800172C0D32 ... Success
bt>i
  * Release Link: BT No Connection
  * Req Establish: Success
  * Link Indicator
  * Success
bt>
```

Note: The “inq” command was given twice because it failed to establish the proper connection the first time. Having to do this 2 or 3 times is not unusual.

9. Reference Materials

9.1 - Upper and Lower case TRK

There are several commands and procedures that may enhance operation and troubleshooting.

1. Pressing ctrl-t and ctrl-i switches between the capitalized debug prompts and the lower case debug prompts. The capital prompts come directly from the ODU and the lower case prompts come from the IDU.

9.2 - Null Modem

A null modem cable can be connected between the IDU and a computer's serial port. The IDU can then be controlled in debug mode using a terminal emulator program. The baud rate should be set to 57600, and the rest of the settings are 8 data bits, No parity, 1 stop bit and no flow control.
There is additional debug information that can be captured using this method.

Enter debug mode as described earlier after the null modem cable is connected. Commands are entered exactly as described in other parts of this document. This replaces the need for a USB keyboard.

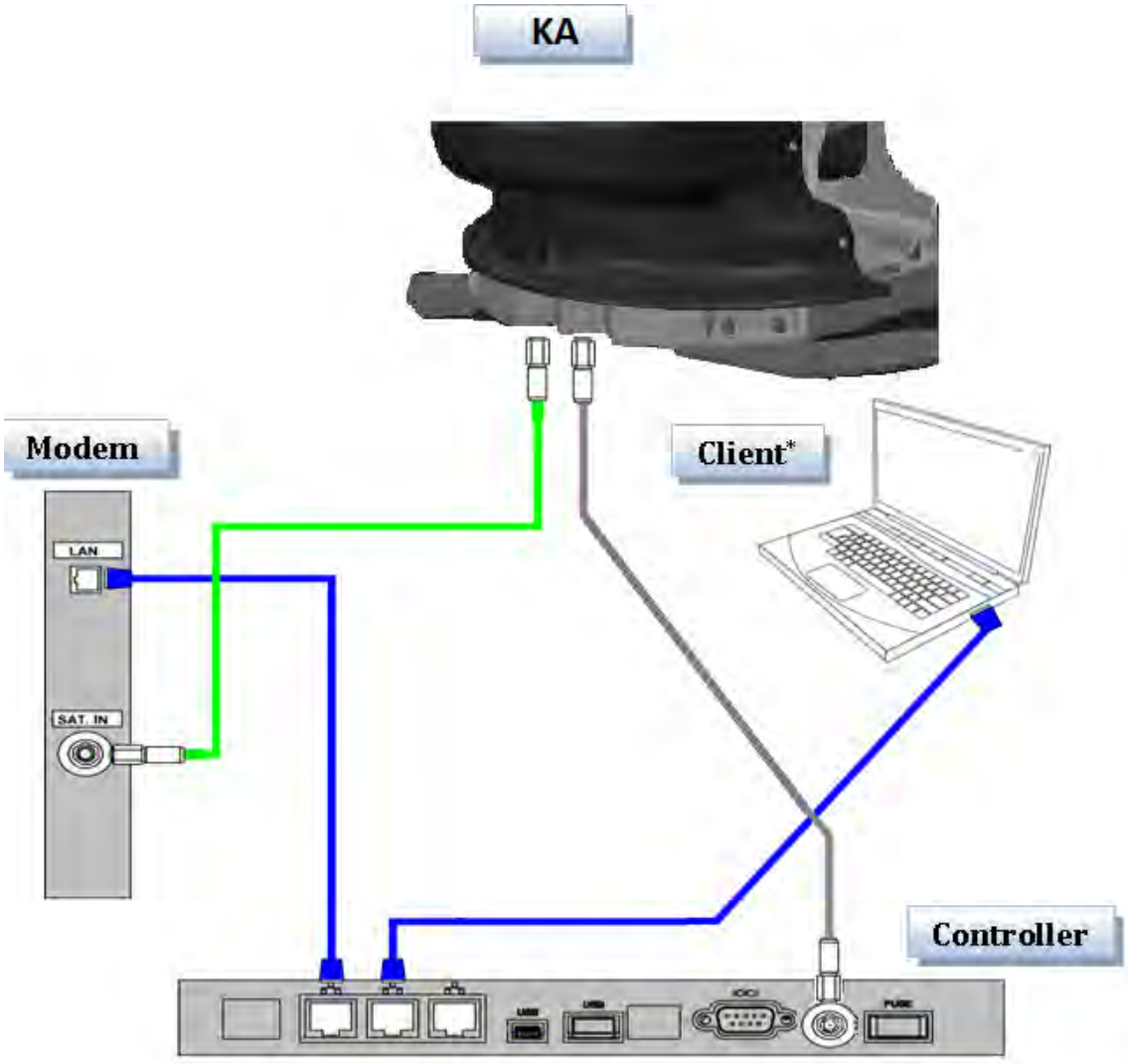
9.3 - On-Screen Keypad (Windows CE)

The touch screen keypad can be activated and used instead of a USB keyboard.
In order to activate the onscreen keypad, the system must be running Windows CE.

1. Turn the system on by pressing the button on the IDU.
   a. A progress bar will scroll across the bottom of the screen.
   b. The screen will flash white and then change color.
2. Start tapping the screen when the screen flashes white and continue tapping the screen when it changes color.
3. The Windows operating screen should be displayed.
4. In the lower right hand of the IDU screen is the keypad icon.
   a. Touching this icon brings up the keypad.
   b. Leave the keypad on the screen during the following commands.
5. Open the My Device folder (double tap).
6. Open the Onboard Flash folder (double tap).
7. Run the DT740.exe program (double tap).

The onboard keypad should now be displayed in front of the antenna program.
The debug mode can be entered as described earlier and the touch keypad can be used instead of a USB keyboard.

9.4 - Wiring Diagram



*User Supplied Device

10. WV750 Technical Specifications

General Information			
	Mount Geometry		Elevation Over Azimuth
Dimensions			
	Physical Dimensions:		48" L x 29.8" W x 11.5" H
	Weight		75 lb.
Mechanical			
Range Of Motion	Azimuth		+/-200°
	Elevation		0-95°
	Speed		0.5° Per Second
Motors:			24V HD Brushless Motor (0.1° Resolution)
Drive Override			None
Environmental			IP65, Salt Fog
WIND		Operational	72 km/h (45 mph)
		Survival	121 km/h (75mph)
Temperature		Operational	-30C to 55C
		Survival	-40C to 60C
Electrical			
Controller	Dimensions		12.5" L x 6.38" W x 1.25" H
Power Supply	Input		100-250V 3A Max
	Running Load		47-63Hz 300W Max
	Output		48V 6.7A Max
	Dimensions		9" L x 4.5" W x 2" H
	Electrical Data Interface*		RG6 40'
	Sensors		GPS Compass Auto Heading +/- 1° Tilt +/- .1°

11. Indoor Control Unit Technical Specifications

Model Numbers

7750190	F Type ODU Power/Communications Jack ECCN Classification 5D992

Environmental

Installation Category II	Transient Over Voltage
Pollution Degree 2	Temporary Conductivity Caused by Condensation
Altitude Limit	N/A
Humidity	90% RH Non-Condensing
Duty Cycle	Continuous
Dimensions	2U Height, x 13.5 inches deep (19in. x 3.5in. x 13.5in.) 7.5lbs.
Temperature	
Operational	-4˚F to 127˚F (-20˚C to 50˚C)
Survival	-58˚F to 176˚F (-50˚C to 80˚C)

Electrical

Power Supply Input	100-240VAC 50-60Hz 5A
Fuse	5A 32V Fast Acting Type ATF Located on rear panel of IDU Winegard P/N 2320020
AC Power Cord - US Type	Longwell LP-31(NEMA1-15P)
Voltage	120VAC 60Hz
Plug Rating	15A 125VAC
Certification	UL
Standard	UL817
	Winegard P/N 2320074
European Power Cord (supplied by installer)	Agency Certified and marked by VDE, HAR or equivalent agency. 250VAC 6A, PVC, VW-1 or FV-1 Flame Rating, Type HO5VVF or equivalent 3 x 0.75^2 Wire Size Must be < 3 meters in length Male Plug Type CEE 7/7 or Agency Certified for other countries.

12. Declaration of Conformity

CE

Declaration of Conformity

Manufacturer: Winegard Company
3000 Kirkwood Street
Burlington Iowa 52601

This Declaration of Conformity covers the following models:
VSAT Antenna System WV750
Antenna System Controller 7750190

The products listed above have been tested and found to be compliant with Low Voltage Directive (LVD) 2006/95/EC and Electromagnetic Compatibility Directive (EMC) 2004/108/EC.

Referenced LVD Standards:

Safety:
IEC 60950-1:2005 (2nd edition)
Am 1:2009 + Am 2:2013
EN 60950-1:2006
A1:2010 + A11:2009 +
A12:2011 + AC:2011 +
A2:2013

IP65:
IEC 60529:1989-11, A1:1999
EN60529:1991-10, A1:2000-02
(Incl. Corrigendum:1993-05)

Referenced EMC Standards:

Class B Emissions:
EN 55022:2010

Harmonics:
IEC 61000-3-2
EN 61000-3-2:2006, A1:2009, A2:2009

Voltage Fluctuations:
EN 61000-3-3:2008

Immunity:
EN 61000-6-2:2005
IEC 61000-4-2
IEC 61000-4-3
IEC 61000-4-4
IEC 61000-4-5
IEC 61000-4-6
IEC 61000-4-8
IEC 61000-4-11

I hereby declare that the equipment specified on this page conforms to the Directives and Standards listed above.

Signature: Melodee G. Kennedy Date: 7-6-2016
Melodee Kennedy, Treasurer