AL-4000

Dual Processor Antenna Controller
for Mission-Critical Applications

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## Dual Processor Antenna Controller for Mission-Critical Applications

Antenna Control Unit

The AL-4000 Antenna Control Unit (ACU) facilitates the operation and monitoring of tracking systems. It features a dual-CPU architecture to ensure realtime response for mission-critical data acquisition, as well as a graphical touch interface that can be easily customized to support a wide range of tracking applications. The ACU remotely interfaces over IP which makes it an ideal solution for mission and control centers.

Dual CPU Architecture

A dedicated CPU running Linux™ guarantees real-time tracking and data acquisition with robust performance under the most demanding scenarios. A second CPU running MS-Windows® is dedicated to the graphical touch user interface, which can be easily modified according to the operator's preferences and the required application. Standard Ethernet protocol is used for communication between the two processors, simplifying the deployment of remote or redundant interfaces as well as monitoring by 3rd party management systems.

AL-4000 Antenna Control Unit

GUI
Touch
Screen

**Microsoft
Windows**
GUI
Processor

IP

Linux
Real Time Data
Acquisition
Processor

IP Cloud
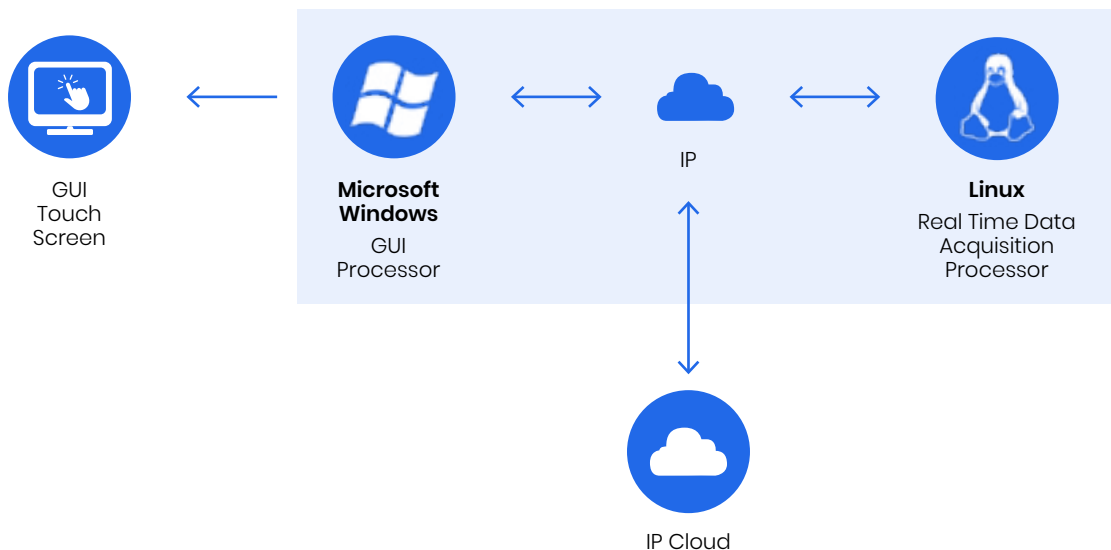
The Reliability You Need for Critical Data Acquisition

A serial digital interface to the Digital Servo Amplifier (DSA) maximizes system reliability by reducing the number of communication cables and increasing immunity to potential signal crosstalk. Moreover, realtime CPU guarantees robust data acquisition and tracking under all circumstances, even when the GUI is offline.

Customized Touch Interface

The ACU display can be easily modified by the operator according to individual preferences and specific application needs. Screen modes can be optimized to support aeronautical telemetry, earth observation (LEO satellites tracking), UAV command and control, and other applications. Large data input and control panels appear when needed, facilitating single-touch access to system parameters and operation while freeing valuable display space when not required.

Supports 3rd Party Pedestal Systems

The ACU controller can interface with most common 3rd party pedestals using Orbit's innovative Pedestal Interface Unit (PIU). By combining the PIU and ACU, customers can upgrade their legacy pedestals by phasing out analog control systems while reducing CAPEX allocated to new equipment purchases.

Front Panel

The front panel of the AL-4000 provides all controls and indicators needed for standalone operation, enabling the operator to activate the different modes of operation, while monitoring system parameters and indicators. It also enables the user to configure the parameters shown on the various display zones.
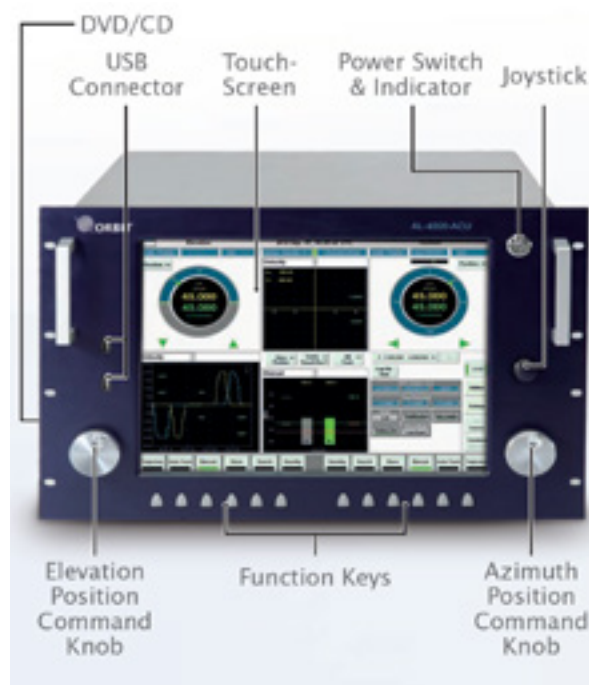
Rear Panel

The rear panel of the AL-4000 provides connectivity to multiple external components depending on the application: up to eight telemetry receivers, networks, GPS, IMUs. The AC power source is universal (95 – 240 VAC). DC supply is also available.
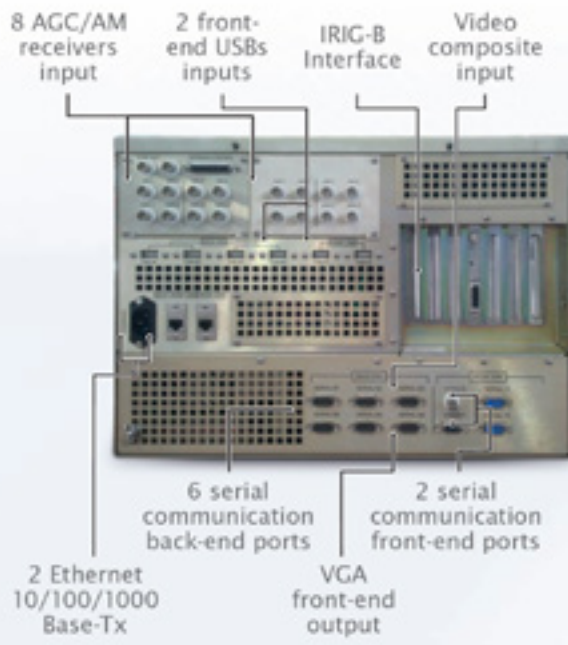
Ordering Information

AL-4000- `Option` **-** `Option` **-** `Option`

Basic Kit Includes:

- 8 serial ports RS-232/422
- 4 AGC/AM receivers input for auto-track
- Electrical Ethernet 10/100 base-T interface connection
- CD-ROM documentation set: Operation and maintenance manuals
- Windows® operating system
- Linux™ real-time operating system

OPTIONS:

(Customer may specify more than one option separated by dash between the options)

Option 001
Fiber Optic Interface to DSA

Option 002
Reserved for future use

Option 003
Extra 4 AGC/AM receivers input auto-track

Option 004
IRIG-B time synchronization module integrated into the ACU

Option 005
Video grabber to support on screen view of camera's input

Option 020
Extended Warranty: Extend depot warranty from 1 year to 3 years

Option 021
Additional Manual Set (CD format)

AL-4000 Modes of Operation

Manual

The ACU provides several ways to manually control the pedestal position and slew rate such as shaft encoder knobs, joystick, predefined position points and immediate designate commands.

Search

The pointing angle of the antenna is scanned for target acquisition.

- **Raster scan:** Synchronized movement of azimuth scans and elevation steps.
- **Zig-zag scan:** Unsynchronized movement of azimuth and elevation scans.
- **Sinusoidal scan:** Sinusoidal pattern movement of azimuth and elevation.

Target Acquisition and Auto-Track

The ACU supports Conical Scan, Monopulse or Electronic Scan feeds and provides auxiliary functions to overcome momentary auto-track disruptions.

- **Multiple receivers tracking:** Automatically selects the highest signal strength received from up to 8 tracking receivers' AGC levels.
- **Dual antenna tracking:** Automatically selects between two antennas for optimal target acquisition and tracking performance as well as side-lobe locking prevention.
- **Backup:** If the target is lost, the ACU reverts to programmable backup mode.
- **Position memory:** Brings the antenna back to the point where the target was initially acquired.
- **Rate memory:** Upon loss of track, continues movement of both azimuth and elevation with extrapolated velocities.
- **Launch acquisition:** Enables better accuracy by preventing the elevation axis from moving downwards for a predefined amount of time after launch.
- **Zenith pass:** Moves the antenna to the point where the target is estimated to exit the Zenith cone, re-acquires it and renews Auto-Track.

- **Adaptive threshold:** Allows the auto-track acquisition level to follow slow changes in the AGC signals.
- **Multi-Path Clipping:** Prevents locking on a reflected signal when tracking targets at low elevation angles. The tracking will be enabled only above a predefined elevation angle.

Step-Tracking

Periodic jogging of the antenna Up/Down and CW/CCW for repositioning to the point of maximum reception level.

Program-Track

Tracking according to preloaded trajectory or a script file.

- **Orbit Tracking:** Predefined trajectory files.
- **Satellite:** Set of ephemeris data of specific LEO/MEO satellite (NORAD TLE format).
- **Solar:** Sun tracking for accurate "northing" and system calibration.

Slave-Track

The ACU can act in slave mode for different resources such as:

- **Host Computer via Communication Link:** using standard RS-232/422 or Ethernet interface.
- **GPS:** Receiver attached to the tracked target transmitting its accurate position.

Shipboard Stabilization:

The ACU is capable of receiving yaw, pitch and roll angles from IMU or GPS-compass devices and keeping the AZ/EL positioner axes stabilized on a predefined constant angle in space when operating on a moving platform (e.g., ship).
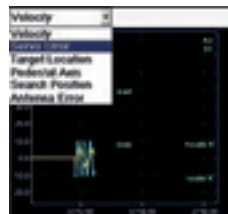
Remote Operation: The ACU is capable of operating in remote mode, using ORBIT's GUI based application installed on a remote PC.

Alternatively, customers may develop their own software to control the ACU remotely via proprietary interface supplied by ORBIT.

Flexible Touch Interface
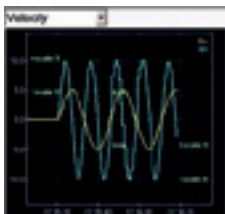
Graphic logger display selection

Pop-up touch menus

Auxiliary display for TTC system

Auxiliary display for Telemetry system

I/O Interfaces

Electrical	Up to 8 tracking receivers (AGC & AM) 4 USB ports: 2 front and 2 rear (for external keyboard, joystick, mouse, etc.) 2 Ethernet ports 8 RS-232/422 serial ports
Network	10/100 Base-T Ethernet port using SNMP/FTP connection protocol. 100 Base-Fx optical interface is an option
Time Reference	Supported time source: GPS, IRIG-B. Customization is available

Diagnostics

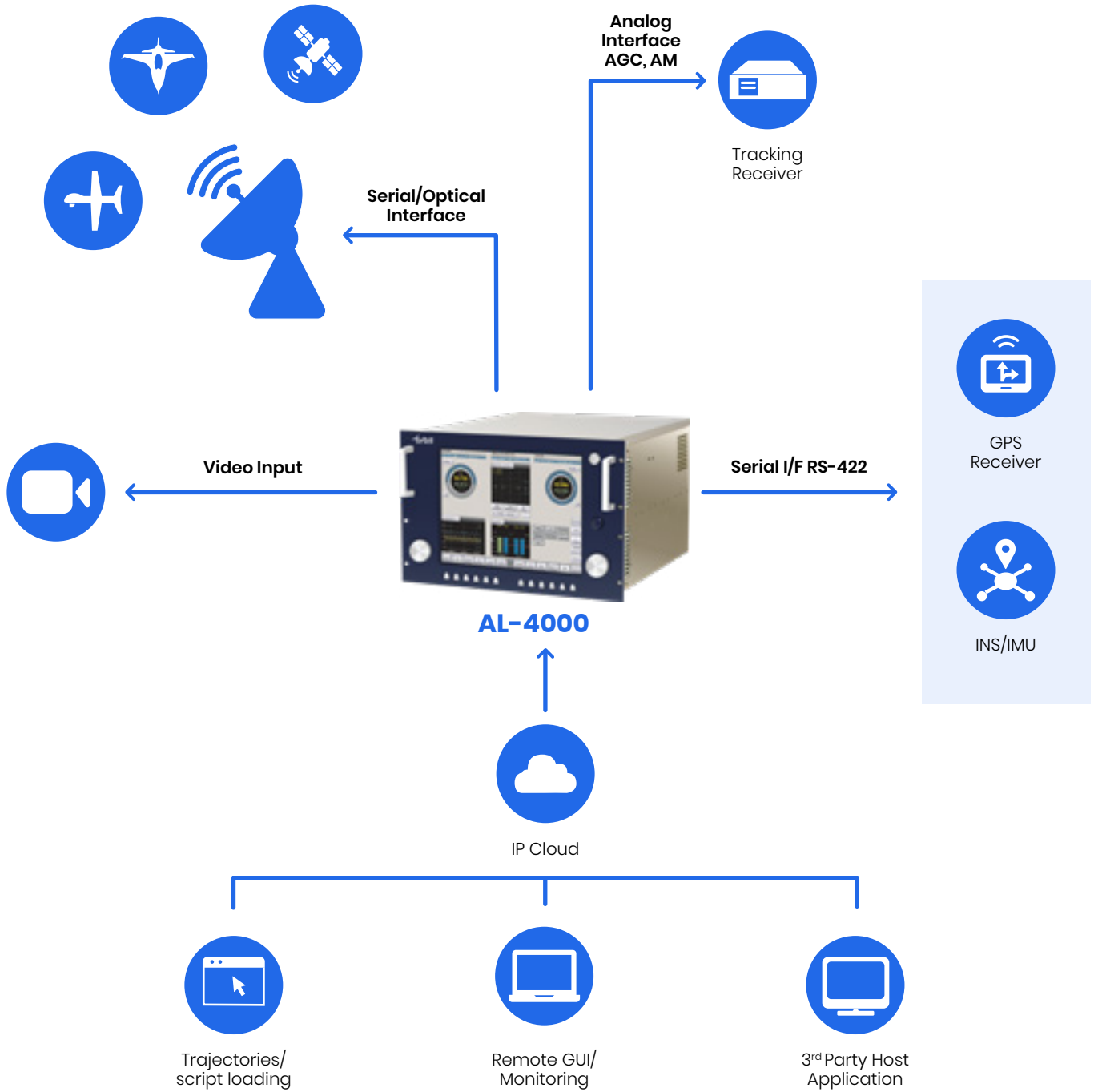|	
Real-time Built-in Test	On-line monitoring of pedestal/DSA functions such as: bus voltages, current, motor phases, encoder, Hall Effect channels, temperature
Parameters / Tracking data file	Logging of user-defined data such as AZ/EL angles, time, signal levels, etc.

Setup

Auxiliary Area	Configurable user-defined function buttons in auxiliary screen area
Program Track	Configure satellites' TLE ephemeris sets, sun tracking, and trajectory script files
Predefined Point	AZ/EL angles and STOW angles
Search	Raster, Zig-zag, Sinusoidal scanning patterns
System	General system settings, such as IP settings, serial ports setup and simulation modes
Receivers	Tracking receivers AGC level and on-the-fly threshold calibration

Features

- Dual-CPU architecture for real-time data acquisition

- 15-inch LCD touch-screen (TFT) color display

- Graphic, programmable scale, error cross-hair window and signal-strength bar displays

- IP interface to local or remote control interface

- Specializedtracking modes for geo-stationary satellites, low-orbit satellites and fast moving targets

- Dynamic stabilization mode for operation on marine platforms

- Reliable, non-volatile memory

- Clock synchronization to external time reference

- System control switches for pedestal power, antenna feed power, antenna selection, antenna polarization and more

- Available also as replacement controller for non-Orbit systems

AL-4000 Communication Interfaces

Analog Interface AGC, AM → Tracking Receiver

Serial/Optical Interface

Video Input

AL-4000

Serial I/F RS-422 → GPS Receiver

INS/IMU

IP Cloud

Trajectories/ script loading

Remote GUI/ Monitoring

3rd Party Host Application

General Specifications

Processor	2 independent Intel processors
Display	15" TFT LCD color touch screen
Storage	Back-End: solid-state disk Front-End: Hard Disk for data logs DVD/CD - RW, USB Disk-on-Key
Operating System(s)	Windows® and Linux™
Pedestal Control Interface	RS-232/422, Fiber optic (optional)
Support Feed Types	Electronic scan, Conical scan, Monopulse
External Interfaces	2 Ethernet ports, 8 RS-232/422, 4 USB
Power	90VAC - 264VAC. Max 500W (for the basic configuration)
Temperature	Operational: 32°F to 130°F; Storage: -4°F to 140°F
Humidity	20-90% non-condensing (indoor)
Dimensions	Depth: 20.9" x Width: 19" x Height: 7U
Weight	44 lbs

orbit

Connectivity in Motion

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