AL-4000
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 real-time 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.

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, real-time 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.

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

Ordering Information
AL-4000-XXX-XXX-XXX

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 Telemetry system**
- **Auxiliary display for TTC 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 touch-screen LCD (TFT) color display
- Graphic, programmable scale, error cross-hair window and signal-strength bar displays
- IP interface to local or remote control interface
- Specialized tracking modes for geostationary 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

General Specifications

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