ACU1

Antenna Control Unit

ACU1 Antenna Control Unit Overview

The ACU1 Antenna Control Unit, developed by Bradshaw Communication Systems, will provide automatic satellite tracking control of earth station antennas when combined with a Motor Control Unit (MCU), Position Encoders and a Tracking Receiver. The earth station antennas are most commonly steerable parabolic reflectors with two axes of motorized control and an optional motorized feed polarization axis. Control of the antennas usually includes manual pointing ability as well as automatic tracking capabilities for satellites in geosynchronous earth orbit (including inclined orbits with proper options). A typical system configuration is shown in Figure 1 and details interconnection of the ACU1 with the other required system components that comprise a complete antenna control system.

The ACU1 Antenna Control Unit has been designed to replace and upgrade obsolete Electrospace Systems 93C-23 series antenna control units. By upgrading the hardware technology, and adding a new modern look and feel, while still maintaining the same user interface scheme and pin for pin connectivity, simple plug and play upgrades in existing systems can be realized. Many advantages (in both installation costs and system down time) make the ACU1 the clear choice when drop in replacement or upgrade is required. The familiar and easy to operate user interface shortens the time it takes for current operators to be proficient at operation of the new antenna control unit, while new users enjoy the benefits of the easy to learn and established operator interface. The long established performance and reliability record of the Electrospace Systems 93C-23 series ACU's and their positioning / tracking algorithms (that are fundamental in the ACU1) provide the new system operator with the high level of confidence needed in a new ACU from start-up to long term operation.

The ACU1 Antenna Control Unit (shown above) provides the main interface for control and status reporting of the antenna condition at any given time. All control software is resident in the ACU1 and is executed on a robust processing system with real-time execution. The ACU1 performs the computations necessary to determine which direction and velocity is required to point the antenna where it is commanded. It issues axis control signals and measures antenna position and received signal strength to ensure the intended antenna destination is commanded and maintained in the presence of wind or other disturbances. All ACU1 operating controls and indicators are located on the front panel and all interface cable connectors are located on the rear panel. During normal operation, the antenna angular position, signal strength, operating mode, and summary fault / status are continuously shown on an easy to read front panel display. ACU1 operator commands are accepted on the front panel by an intuitively laid out tactile keypad arrangement. The ACU1 is also fully controllable via an ESI 93C-23 compatible RS232C interface allowing remote monitor and control.

The ACU1's ability to interface both new MCU series motor control units and synchro based absolute angular position encoders as well as the legacy Electrospace Systems 83MC-3, 4 & 6 Motor Controllers and Position Transducers provides a new low cost alternative to complete system replacement. Continuous and accurate pointing of the antenna at the satellite is attributed to the robust Steptrack and Memory Track algorithms utilized in the ACU1. With their accurate signal peaking capability and ability to compensate for satellite beacon signal degradation and loss, the ACU1 protects earth station traffic from interruptions caused by antenna mispointing.

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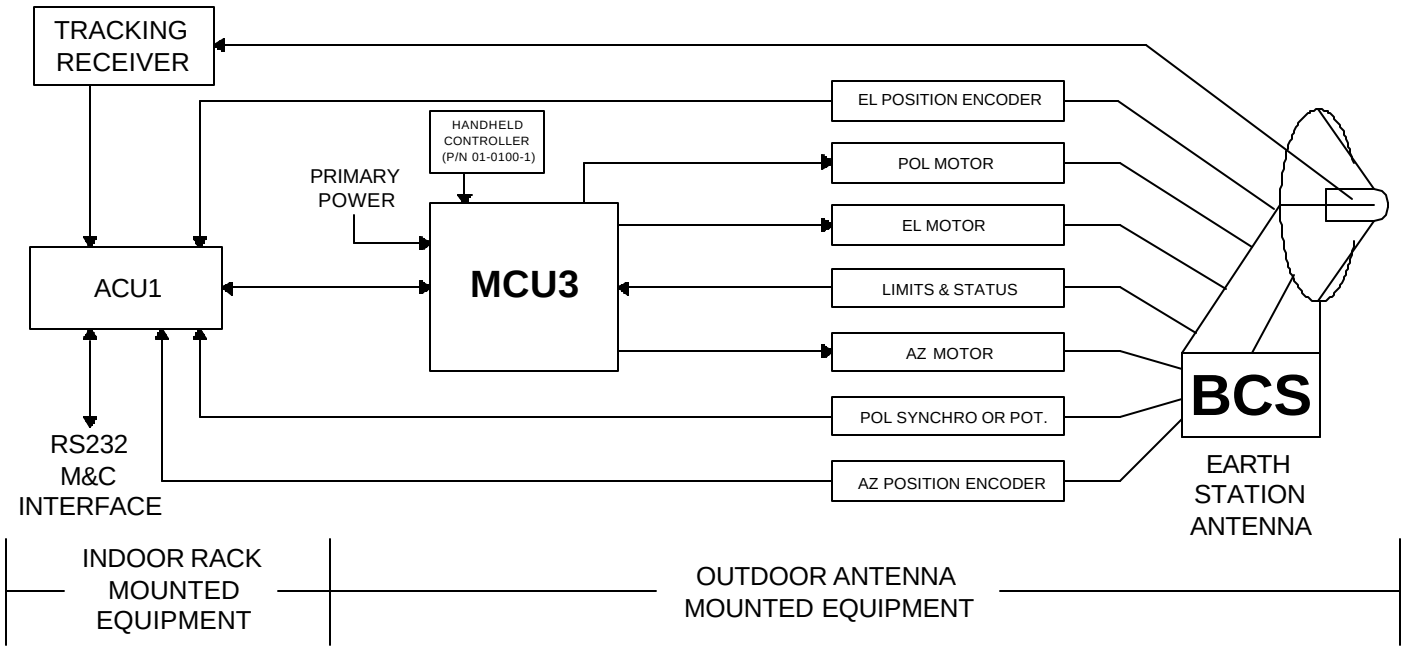

TYPICAL SYSTEM CONFIGURATION
FIGURE 1

ACU1 Antenna Control Unit Features

- Precision Position Loop Control with Response Profiling
- AZ & EL Single or Dual Speed Control Capability
- Feed Polarization Control Capability
- Tracking & Trajectory Modes
  - Steptrack (with position feedback independent peaking)
  - Memory Track (compliments Steptrack mode to provide inclined orbit trajectory tracking)
  - Program Track (programmable stored table pointing)
- Manual & Automatic Positioning Modes
  - Manual Jog (allows antenna axes movement manually)
  - 40 Satellite Mode (preprogramming up to 40 satellites)
  - SAT A & SAT B Fast One Button Control Mode
- Safety & Convenience Features
  - Software Adjustable Position Encoder Offsets
  - Software "Box" Limits
  - Self Diagnostics & "Watch Dog" Circuit
  - Non-Volatile Parameter & Track Table Storage
  - RS232C Serial M&C Port (93C-23 Series Compatible)
  - Form C Summary Alarm Contacts
  - Automatic Alternate Tracking Source Input
  - Continuous Fault/Status Monitoring & Reporting
  - Emergency Stop/Standby Switch
  - Manual Override Microprocessor Bypass Control
  - Position Encoder Fault Monitoring
- Dual Analog Tracking Signal Inputs
- Antenna Local Control Indication
- Absolute Angular Position Feedback
- ACU1 Front Panel Display Capabilities
  - AZ, EL, & POL Angular Position
  - Receive Signal Strength
  - Antenna Travel Limits, Fault & Status Alarms
  - Operational Mode
  - Parameter Recall & Store
- Compatible with Various Motor Controls
  - BCS MCU4 AZ, EL Single Speed 3 ∅ AC
  - BCS MCU4 AZ, EL Dual Speed 3 ∅ AC
  - BCS MCU3 AZ, EL Dual Variable Speed 1 or 3∅
  - Electrospace Systems Legacy 83MC-3, 4, & 6
- Compatible with Legacy ESI Converters & Receivers
  - 63R-1, 2, & 5 C & Ku Band Down Converters
  - 43S-2 and -7 Beacon Receivers
- BCS L, C, & Ku Band Tracking Receiver Compatible
- Operation, Installation & Support Materials
  - Operators Manuals Supplied
  - Installation & Maintenance Manuals Supplied
  - M&C Serial Port Protocol Document Supplied

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ACU1 Antenna Control System Specifications

- **Tracking Accuracy**
  - 10% of the receive 3 dB beamwidth, RMS, or better for beamwidths ≥0.20° and up to 3° orbit inclinations in Steptrack mode.
  - Approaches 7% of the receive 3 dB beamwidth, RMS, or better for beamwidths ≥0.20° and up to 6° orbit inclinations with valid track table in Memory Track mode.
- **Absolute Position Encoding Accuracy**
  - 0.02° RMS Azimuth & Elevation
  - 0.08° RMS Polarization
- **Front Panel Display Resolution**
  - 0.01° Azimuth & Elevation
  - 0.1° Polarization
- **Absolute Position Encoding Repeatability**
  - Typically 1 LSB at 14 Bits
- **Position Encoder / Transducer Input**
  - 4:1 Position Encoders (azimuth & elevation axes)
    Size 11 Synchro Transmitter (polarization axis)
- **Hardware Fault & Status Reporting**
  - Azimuth CW & CCW Limits
  - Elevation Up & Down Limits
  - Polarization CW & CCW Limits
  - Emergency Stop / System Interlock
  - Azimuth & Elevation Circuit Breaker Tripped
  - Azimuth, Elevation, & Polarization Interlocks
  - Azimuth & Elevation VFD Fault (MCU3 only)
  - AZ, El, or POL Position Encoder Fault
  - Local Control Status
  - ACU1 RAM/ROM Fault
  - ACU1 Parameter Corruption Fault
- **Environmental**
  - +32° F to +122° F, 90% humidity, non-condensing
    (-0° C to +50° C, 90% humidity, non-condensing)
- **Physical**
  - Rack Mount ANSI/EIA 2 Rack Height Chassis
  - Dimensions
    3.5” high x 19.0” wide x 13.5” deep
    (88.9mm high x 482.6mm wide x 342.9mm deep)
  - Weight
    13.5 LBS (6.12 Kg)
- **Power Requirements**
  - 90-264VAC / 47-63Hz / 0.75 Amps Max
- **Display & Keyboard**
  - Alphanumeric 20 Character Vacuum Florescent
  - 17 Key, Tactile Feedback
- **Tracking Receiver Interface**
  - DC Signal Proportional to Receive Signal Strength
  - ±10V Analog, 0.1 to 1.0 V/dB Gradient
  - Primary & Secondary Tracking Signal Inputs
- **M&C Interfaces**
  - RS232C Serial M&C Port (ESI 93C-23 Compatible)
  - Summary Alarm - Form C, 24V @ 1A Max.
- **Approvals**
  - The ACU1 has been designed to meet or exceed CE and UL 508 requirements.

ACU1 Antenna Control Unit Configuration & Options

- **ACU1 Antenna Control Unit**
  - P/N 99-01000-1
    ACU1 w/ Memory Track (No Polarization Control)
  - P/N 99-01000-2
    ACU1 w/ Memory Track & Polarization Control
  - P/N 99-01000-3
    ACU1 w/ 40 Satellite Programmability, Program Track & Polarization Control

All ACU1 standard part numbers come with the following:

- Steptrack Mode
- SAT A & SAT B Fast One Button Control Mode
- Manual Jog Mode
- All Features Listed Under "Safety & Convenience"
- AZ & EL Single & Dual Speed Control Ability
- AZ & EL Axis Mechanical Brake Control Ability
- Dual Analog Tracking Signal Inputs
- NEMA 15P Power Cord - 6FT Long
- All Mating Connectors

Conclusion

With over 40 years of combined experience in the Satellite Communications Industry, Bradshaw Communication Systems (BCS) has the solution to get your job done right and on time. By providing extremely high quality products and services at economical prices, BCS has become a respected name in the industry and the right choice when it comes to satellite earth station antenna products and services. BCS has provided custom solutions for numerous customers and stands ready to provide components, systems, and services to best fit your specific requirements. Please contact BCS today regarding your requirements.

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