Servo System – ACU 8100

TECHNICAL DESCRIPTION

The Antenna Control Unit (ACU) 8100 Series, developed by Vertex Antennentechnik, is a state-of-the-art controller for antennas and pedestals. It has been particularly designed for antennas tracking low orbit satellites and for scientific and similar applications which require high precision and/or high velocity performance.

The ACU 8100 Series is in operation for several decades and has undergone several improvements in both hardware and software. It has been integrated into more than 250 precision antenna systems worldwide.

The Antenna Control Unit 8100 represents the central part of a complete servo system, which optionally also provides 2 channel (true) monopulse tracking. Optionally it supports polarization or frequency diversity.

The ACU 8100 can be supplied as part of a fully integrated servo system by Vertex Antennentechnik or retrofitted into an existing servo system to provide enhanced performance and/or operational capabilities.

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Hardware Platform

The ACU 8100 is a rack mounted 19"/6HU unit. In principle it is a PC based system. For reliability and availability purposes, however, only industrial, commercially available, PC components are implemented in the ACU. A rugged Compact PCI backplane bus is used as the internal bus system.

A 12.1" colour touch screen panel is integrated into the ACU front panel as a Local User Interface.

The CPU is based on one of the latest processors and uses a real-time operating system. Using such a system allows multitasking, accurate interrupt timing and exhaustive debugging features. The real-time kernel requires only a small amount of memory, both in the non-volatile memory and during operation in the RAM. A sensitive mass storage device (e.g. HDD) is not required. The software is stored on an on-board silicon disk.

Features

- Softkey controlled user interface
- Position control for up to four axes
- Display of all information related to operational mode
- Different user levels for parameter adjustment
- Adjustable parameters for search modes
- Satellite tracking with orbital elements
- Time and position offsets
- Odometer with maintenance alerts
- Software on non-volatile memory cards
- Optical isolation of process interface
- Multi-purpose test outputs (e.g. position, tracking error etc.) with adjustable scaling, to be used e.g. for recording with data recorder etc.
- Flexible interfaces

Typical tasks of the Antenna Control Unit 8100

- Control of operating modes
- Position readout (encoder interface)
- Position and velocity loops (fully digital drive control)
- Operator interface
  - locally at ACU
  - remote control from host computer
- Time synchronization
- Pointing error model
- Refraction correction

Operating Modes

PRESET	Movement to predefined position. Active position control is maintained.
RATE	Movement at user-defined constant velocity.
STOW	Movement to survival position.
SECTOR SCAN	A user defined sector is scanned horizontally or vertically. Scan direction, speed and line distance are selectable. 10 sectors can be stored.
PROGRAM TRACK	Tracking of an object along a pre-defined path. The path may be defined by a sequence of position/time samples or by its two-line elements.
STAR TRACK	Tracking of astronomical targets.
SUN TRACK	Tracking of the sun.
TWO LINE TRACK	Tracking of a satellite, the trajectory being defined by its NORAD Two-Line elements.
STEP TRACK	Tracking of a GEO satellite using beacon or AGC signal provided by a tracking receiver.
ORBIT PREDICTION TRACK (OPT):	Incorporates Steptrack pointing data to determine satellite's orbital parameters. Minimizes Antenna motion; trajectory model is developed during learning phase. Provides long-term pointing in absence of tracking signal.
AUTOTRACK	Tracking of an object using the tracking error signals of a monopulse tracking receiver. A "lock-on signal" is required to indicate whether the RF signal strength is sufficient. If it is not, the ACU will automatically switch over to the selected back-up mode.

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Available Back-up Modes for Autotrack

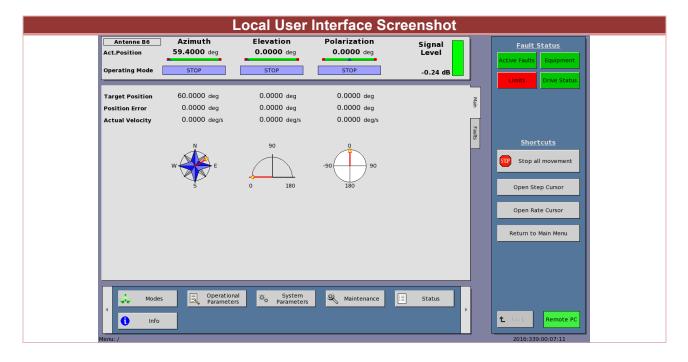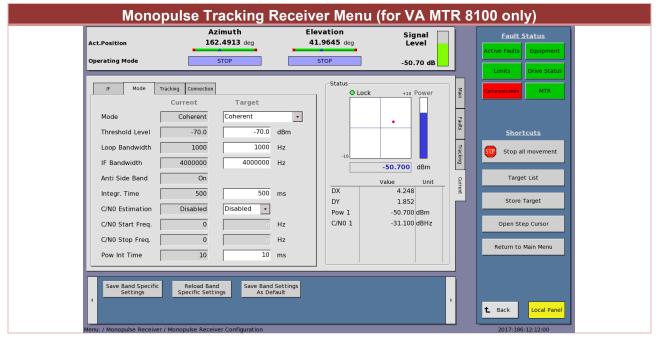|	
PRESET	Movement to a selected position.
POSITION MEMORY	Movement to the last actual position before the lock-on was lost.
RATE MEMORY	The last actual speed is maintained.
SEARCH SPIRAL	A pulsating spiral around the last actual position is performed.
PROGRAM TRACK / TLE	A predefined path is tracked (see PROGRAM TRACK mode).
PROGRAM TRACK/SEARCH SPIRAL	A search spiral is superimposed to the PROGRAM TRACK path.

The operating modes are available separately for each axis. They may be activated at the ACU front panel or by the host computer via the remote Interface.

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Interface Choices Available	

Position transducers	Optical encoders
	    resolution 12...37 bit
	    interface types SSI, EnDat, parallel

Remote control interface	Ethernet TCP/IP optional: IEEE488, RS232 / 422 / 485, CAN
Interfaces to drive cabinet	Ethernet TCP/IP digital I/O (option for upgrades)
Interface to servo amplifiers	CAN local bus (fully digital system) analog +/- 10V (option for upgrades)
Interface to Monopulse Tracking receiver	TCP/IP, UDP optional: ±10V)
Real Time Synchronisation	NTP optional: IRIG-B, GPS, CDF77, 1 pps, PTP

Technical Data	
Power supply	115/230 V~ +/- 10%, 50/60 Hz
Environmental temperature	+5 ...+40°C
Humidity	<90%, non-condensing
CPU processor	Core i7, 2.4 GHz or higher
Internal bus system	Compact PCI, 8 slots
Analog test outputs (option)	4 * +/- 10V
Dimensions	19" rack mounted Unit, 6 HU
Operating System	VxWorks

Options
Additional customized operating modes
Control of antenna tilting mechanism; corresponding coordinate transformation for positions
Additional axes, e.g. tilt, polarization, feed indexer, linear axes, etc.
Pointing corrections based on metrology sensors
Coordinate transformation for antenna mounts other than EL over AZ, e.g. XY, inclined axis, hexapod, etc.
Remote service and software download
Control of auxiliary drives like motorized stow pins, automatic lubrication systems, etc.
Polarization, frequency or band diversity
Antenna self-test
Other customized options on request

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Local User Interface Screenshot

Antenne B6	Azimuth	Elevation	Polarization	Signal Level
Act.Position	**59.4000** deg	**0.0000** deg	**0.0000** deg	
Operating Mode	STOP	STOP	STOP	-0.24 dB

Target Position	60.0000 deg	0.0000 deg	0.0000 deg
Position Error	0.0000 deg	0.0000 deg	0.0000 deg
Actual Velocity	0.0000 deg/s	0.0000 deg/s	0.0000 deg/s

Main / Faults

Fault Status
Active Faults | Equipment
Limits | Drive Status

Shortcuts
Stop all movement
Open Step Cursor
Open Rate Cursor
Return to Main Menu

Modes | Operational Parameters | System Parameters | Maintenance | Status
Info

Back | Remote PC

Menu: /   2016:339:00:07:11

Monopulse Tracking Receiver Menu (for VA MTR 8100 only)

	Azimuth	Elevation	Signal Level
Act.Position	**162.4913** deg	**41.9645** deg	
Operating Mode	STOP	STOP	-50.70 dB

IF | Mode | Tracking | Connection

	Current	Target	
Mode	Coherent	Coherent	
Threshold Level	-70.0	-70.0	dBm
Loop Bandwidth	1000	1000	Hz
IF Bandwidth	4000000	4000000	Hz
Anti Side Band	On		
Integr. Time	500	500	ms
C/N0 Estimation	Disabled	Disabled	
C/N0 Start Freq.	0	0	Hz
C/N0 Stop Freq.	0	0	Hz
Pow Int Time	10	10	ms

Status
Lock   +10 Power
-10
-50.700 dBm

	Value	Unit
DX	4.248	
DY	1.852	
Pow 1	-50.700	dBm
C/N0 1	-31.100	dBHz

Main / Faults / Tracking / Current

Fault Status
Active Faults | Equipment
Limits | Drive Status
Communication | MTR

Shortcuts
Stop all movement
Target List
Store Target
Open Step Cursor
Return to Main Menu

Save Band Specific Settings | Reload Band Specific Settings | Save Band Settings As Default

Back | Local Panel

Menu: / Monopulse Receiver / Monopulse Receiver Configuration   2017:186:12:12:00

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