

MODEL 7134

ANTENNA CONTROL SYSTEM



Key Features

- Real-time position readout and fault message reporting

- Multiple control modes

- Step Track control mode

- Memory Track control mode

- Practical, user friendly edit mode

- Encoding system resolution & repeatability of 0.01°

- Battery-backed nonvolatile RAM

- Internal self-diagnostics

- Remote control and data entry via RS-232 or RS-422 serial communication ports.

Product Description

The General Dynamics SATCOM Technologies (GDST) Model 7134 Antenna Control System is a microprocessor-based system incorporating digital technology for accurate antenna positioning with high reliability, maximum flexibility, and a straightforward and practical user interface. This control system is ideally suited for small to medium aperture antenna applications requiring capabilities for automatic multiple satellite access, program track, remote control via an RS-232 or RS-422 communications link, and optionally automatic step track operation and memory track.

The standard product provides 2-speed axis control for AZ and EL with a high/low speed ratio of up to 15:1. This is accomplished by application of user-settable high and low-speed control signals to variable speed AC drives, which in turn control standard 3-phase induction motors. For 3-axis systems, circuitry is provided for the control of an AC synchronous stepping polarization motor. The AZ and EL motor controllers employ integral electronic protection. The drive cabinet includes NEMA-rated circuit protection devices for each motor/motor controller, which are sized appropriately for each application.

7134 Standard Components

The standard product is provided as a 2-speed system for AZ and EL. This is accomplished by application of user-settable high and low speed control signals to variable speed AC drives (housed in the 7150 Antenna Drive Unit), which in turn control standard 3-phase induction motors. For 3-axis systems, circuitry is provided for the control of a variety of polarization motors. The AZ and EL motor controllers employ integral electronic protection, and the drive cabinet includes NEMA-rated circuit protection devices for each motor/motor controller, sized appropriately for each application. The drive cabinet housing is foot-mounted and comes standard as a NEMA 4X-rated enclosure for outstanding corrosion protection.

Adaptive Step Track (AST)

The GDST Adaptive Step Track (AST) algorithm performs the function of conventional step track peak signal level optimization but without the random “guessing” errors associated with predetermined fixed scan patterns. AST employs alternate AZ and EL peaking operations based upon a mathematical relationship relating the change in received signal level to a given change in angular position. For each axis, an initial fixed size step is taken, and signal strength levels before and after the step are used to determine the magnitude and direction of the corrective (peaking) step required.

Once the peak position is determined, flags are set, indicating the direction of travel of the spacecraft so that the initial step for the next peaking operation will tend to move the antenna along the satellite ephemeris. This feature greatly reduces the errors introduced by the “wrong” guess made during significant portions of the daily satellite drift by algorithms which consistently make initial steps in a given direction.

Enhanced Memory Track (EMT)

The GDST Enhanced Memory Track algorithm allows the controller to predict the position of a spacecraft based upon its previous motion. AST data is stored in an orbit table (residing in non-volatile RAM), and is available for download over the serial ports. The satellite is tracked from memory only when the signal power level drops below a user determined threshold.

Intelsat Track

The Intelsat 11-Element (IESS412) Tracking Mode uses ephemeris data to predict the location of a spacecraft. The antenna is positioned at these predicted locations and is regularly repositioned to maintain accuracy within the current deadband. Intelsat sets can be uploaded and viewed over the serial ports.

Antenna Drive Unit (ADU)

The drive cabinet housing is foot-mounted and comes standard as a NEMA 4X-rated aluminum enclosure for outstanding corrosion protection even in the harshest of environments.

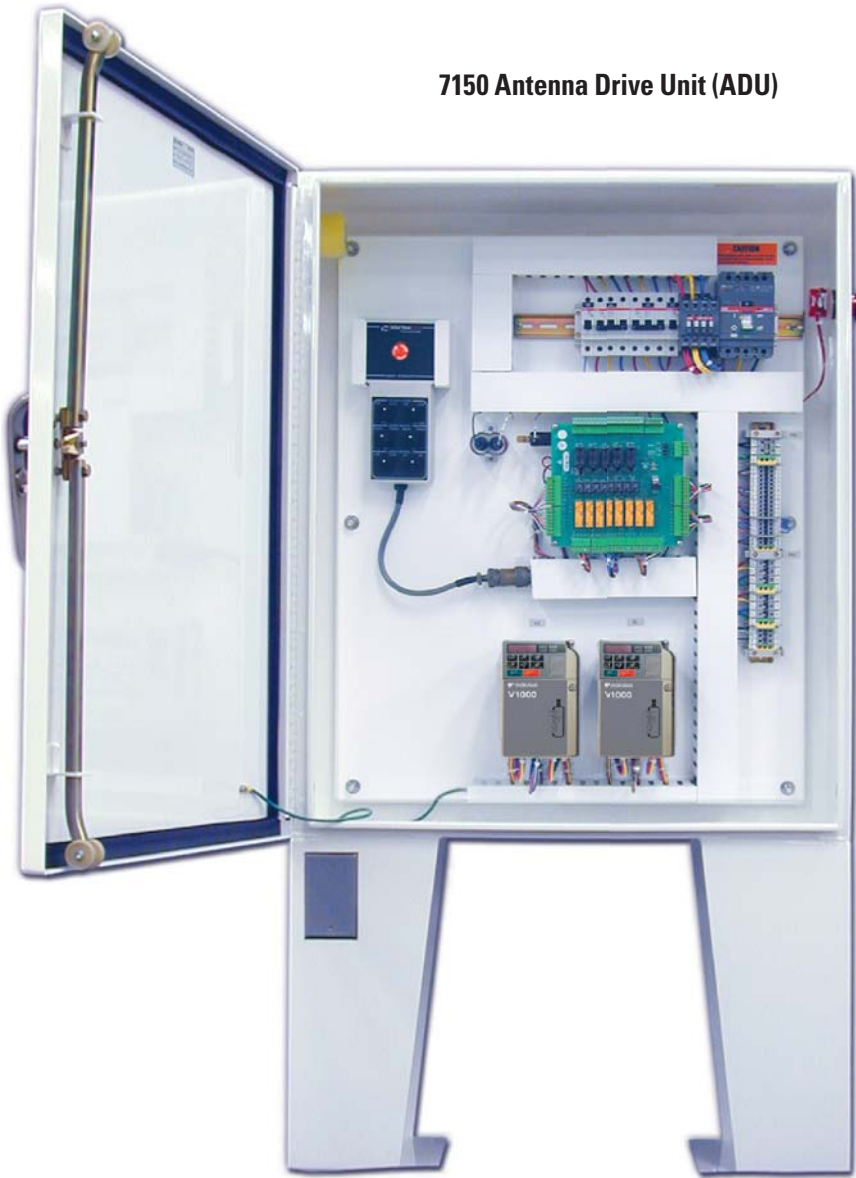
The 7150 Antenna Drive Unit allows complete manual control of each antenna axis from the drive cabinet via the Portable Maintenance Control Unit (PMCU). The PMCU also includes a 50-foot extension cord for complete control during maintenance operations on or near the antenna structure.



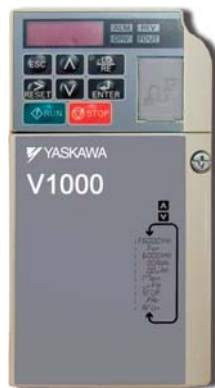
The 7134 system offers standard single speed brushless size-11 resolvers for position encoding accuracy.

Control Modes	
Manual	Jog positioning controls for each axis, including 2-speed AZ and EL control, provides fast and accurate “on-the-fly” positioning. Manual track “jump” mode allows rapid positioning to a set of direct-entry coordinates.
Target Track	Automatic positioning via manual command, to any of 50 pre-programmed look-angle sets.
Program Track	Automatic sequential positioning to as many as 99 time-tagged pre-programmed look-angle sets over a one week period
Adaptive Step Track	Automatic positioning based on optimization of a proportional tracking voltage input. Adaptive nature of Step Track algorithm provides improved performance with inclined orbit satellites.
Enhanced Memory Track	Automatic positioning based on a twenty-four hour orbit table built with data from Step Track. This provides the ability to track satellites when the beacon signal is unavailable.
Intelsat Track	Automatic tracking to AZ and EL coordinate sets calculated internally from Intelsat 11 parameter coefficients and site latitude and longitude data.

7150 Antenna Drive Unit (ADU)



Portable Maintenance Control Unit (PMCU)



Yaskawa V1000 Motor Controller Drives

7134 ACS Technical Specifications

Specifications		Physical Dimensions (Standard Configuration)	
Tracking Accuracy	Better than 10% of receive beamwidth, RMS, for beamwidths $\geq 0.3^\circ$ and in applications with orbit inclinations of up to 5° (orbit inclination $\leq 9 \times 3$ dB beamwidth).	7134 ACU: Dimensions (in.)	5.25H 19W 19D (3 EIA Rack Units)
Position Encoding	Absolute, single-speed brushless (size-11) resolvers and LSI resolver-to-digital conversion IC's (4 volt, 2500 Hz reference signal).	Weight	14 lbs.
Position Encoding Resolution	16-bit (.0055 $^\circ$) internal resolution 0.01 $^\circ$ front panel display resolution for AZ and EL angles	7150 Drive Cabinet: Dimensions (in.)	36H 30W 10D (54H total with legs)
Absolute Position Encoding Accuracy	0.05 $^\circ$ RMS (Standard)	Weight	Varies, 100-150 lbs avg.
Position Encoding Repeatability	0.01 $^\circ$	Environmental	
Input Power Requirements	Drive Cabinet: 208-240 or 380-415 VAC, 3-phase, 50-60 Hz, 5-wire WYE. Current requirements determined by motor horsepower. ACU: 100-240 VAC, 50-60 Hz, auto-sensing * Other line voltage interfaces available per specification.	Rack-mounted Equipment Temperature	0 to 50 $^\circ$ C
Horsepower Range	1/2 to 10 HP (Others available per special order).	Humidity	90% Noncondensing
ACU Tracking Receiver Interface	Dual 0-10 VDC analog inputs, slope 1.0 V/dB to 0.1 V/dB Contact closure outputs for selecting up to 4 tracking signals.	Outside Equipment Temperature	-40 to 50 $^\circ$ C (Low temp. package necessary below -10 $^\circ$ C)
Remote Communications Interface	RS-232 or RS-422 serial communications for remote monitor and control.	Humidity	100% Condensing
Summary Alarm Output	Normally closed dry contacts, rated 24 VDC at 1 amp.	Ordering Information	
Required System Interconnect Cabling	- ACU/Drive cabinet Interface (1) 25/C, #22 AWG - Resolver/ACU (2) 3-shielded pair, #22 AWG (2-axis systems) - (3) 3-shielded pair, #22 AWG (3-axis systems) * System includes 100 feet of interconnect cabling * Additional cabling available up to a max. length of 500 ft.	Specify: 1) For the Antenna Control System, specify 2-axis or 3-axis system and AZ and EL motor horsepower ratings as well as ambient temperature ranges. Specify 3-phase line voltage and frequency for the control system. 2) For 3-axis systems, specify polarization motor type and voltage. 3) Specify length of cables required for the controller, drive cabinet and resolver interfaces (100 ft. provided).	
(May be provided by GDST or CFE)			



The rear panel of the 7134 accommodates all I/O for the unit including drive interface, serial communications, axis interfaces and communications with other tracking equipment.

GENERAL DYNAMICS
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