

M² RC2800 Rotor Control System

Software Developers Guide

Firmware Version 2.4

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I. Overview

The RC2800 system can be controlled via its RS232 port by external software. There are some changes to this protocol from prior versions. This document covers the specifications required by software developers to interface with the RC2800 control unit.

NOTE: These specifications are for version 2.4. A future version will provide more features targeted at computer based control. These will be covered in the 'Upcoming Features' section.

The RC2800 has a female DB-9 connector on the rear configured as a DCE device (Requires only a straight thru [modem] cable). The port is configured as follows:

Baud Rate	9600
Bits	8
Stop Bits	1
Parity	None
Handshake	None. (DTR,CTS pulled high)

All commands are upper case (lower case are acceptable).

All commands terminated by a carriage return (cr).

When an RS232 command is received, the unit is switched to MODE 1 automatically.

The RC2800 Azimuth Controller can be slaved with the MT Series elevation control box. In this configuration, both units accept commands through the Azimuth RS232 port. Internally, the Elevation controller is wired so that it both units will receive any RS232 command but only the "active / selected" unit will respond. To keep the units from interfering with each other, the RS232 protocol has been designed so that each unit's command is prefixed with an 'A' or 'E' (Azimuth or Elevation).

II. RS232 Output Formats

All RS232 output is ASCII terminated by a carriage return. Upon system power up, the controller will output it's software version information in the following format.

*M2AZEL 2.4.2 AZ (KO6YD)

This indicates the firmware 'M2AZEL' (Control software for the M2 AZ and EL system). Version 2.4.2. The 'AZ' indicates this is firmware for the Azimuth unit only. The Elevation unit would contain an 'EL' in this location. Any information following this is subject to change and may contain additional information in future versions.

If you also have an elevation unit connected, a second line will contain the same information for that unit as follows:

*M2AZEL 2.4.2 EL (KO6YD)

Unit position reports.

The output format for each unit (AZ or EL) will be the same with minor exceptions (mainly to identify which unit is 'talking').

Basic format: {A|E}=hhh.h S=s {M|S}

{A E}	Indicates a single character which is an 'A' (Azimuth Unit) or 'E' (Elevation Unit) that is reporting.
'='	Equal Sign
hhh.h	Heading / Elevation in degrees.
'S='	Label for unit Speed
S	Motor speed. When running, indicates the current speed of the motor. (0-9) This value will change as the unit ramps up when started and down as it approaches the target position.
{M S}	Indicates if the motor is running 'M' or has stopped 'S'.

Examples:

A=10.1 S=4 M

Azimuth unit, 10.1 degrees, motor speed is 4 and motor is running ('M')

A=25.0 S=8 S

Azimuth unit, 25.0 degrees, max motor speed setting is 8 and motor is stopped ('S')

Errors

The following errors may be displayed also.

A ERR=01 Indicates that the unit did not detect a motor pulse when starting. The motor contains a small magnet and switch assembly that generates 'pulses' when the motor is turning. This is used to determine the position of the antenna. When starting the motor, the unit will apply power to the motor then after a short delay it must detect pulses to indicate the motor is running. If no pulses arrive within this startup period, this error is generated.

This could indicate a broken sensor wire or can also indicate that the startup current to the motor (or speed setting) is too low. This can change for example when the weather gets colder or when the rotator has been idle for some time.

A ERR=05 This is sent whenever the system detects a low voltage condition. This is sent whenever you power down the unit. It's at this time the unit also saves all it's settings and current position as it's powering down.

III. RS232 Commands

The following is a summary of commands used by the RC2800 unit.

Function	Command	Description
Select	A or E	Selects Azimuth (A) controller or Elevation (E) unit. This is used when you have both Azimuth and Elevation units slaved together. Once issued, and future commands will be limited to the 'selected' controller.
Speed (Max)	S#	Where # = a speed value from 1 (minimum) through 9 (maximum)
Goto	A# or E#	Where # is an Azimuth (for 'A') or Elevation (for 'E') value. Also leaves the commanded unit as the 'selected' unit.
Bump + (see note)	+	Bumps approximately .5 degrees CW (AZ) / UP (EL) This is for use when using the controller connected to a 'dumb' terminal. Software control should always use the Goto command. <i>* NOTE, This command should not be used by software, you should always send a commanded position with the 'Goto' command above. This command may be phased out in future versions. Also, in version 2.4.1, this feature is not working. You must enter the value manually 'A###.#' / 'E###.#'.</i>
Bump - (see note)	-	Bumps approximately .5 degrees CCW (AZ) / DN (EL) This is for use when using the controller connected to a 'dumb' terminal. Software control should always use the Goto command. <i>* NOTE, This command should not be used by software, you should always send a commanded position with the 'Goto' command above. This command may be phased out in future versions. Also, in version 2.4.1, this feature is not working. You must enter the value manually 'A###.#' / 'E###.#'.</i>
Stop	S	An 'S' will stop the motor on the current selected unit.

Additional Commands

These commands are used for system configuration maintenance.

Function	Command	Description
Calibrate	CAL	Entering the 'CAL' command causes the unit to enter the 'Auto Calibrate' mode. This will rotate the motor unit CCW (Counter Clockwise) until it reaches the physical stop in the unit. Once this is hit, the controller will calibrate itself to the CCW limit position.

IV. Command Details

The following covers the details of each command and its use. Note that all commands are terminated by a Carriage Return (<cr>).

Unit Selection (A or E)

Each unit in the system (AZ or EL) must be 'selected' prior to processing a command. This is due to the physical connection of the units. Internally, everything sent by the computer is received by BOTH units. Also, since there is only one RS232 port for both units, a method must be used to make sure the units don't 'talk' (transmits RS232 data) at the same time. This is done by 'selecting' the unit from the PC software. To select the unit (which will cause the unit to transmit a position report), you need to send the unit code 'A' or 'E' followed by a carriage return. In a dual system (AZ and EL), your software would need to transmit the sequence 'A' <cr> followed by 'E' <cr> continually to obtain both the current AZ and EL positions. When in motion, ONLY the selected active unit will transmit. You can switch active units anytime with the A or E command.

Example:

A<cr> - Selects the Azimuth Unit. Also returns the current position.

E<cr> - Selects the Elevation Unit. Returns the current antenna position.

Speed Setting (S#)

The speed setting determines the MAXIMUM speed of the unit. When a new heading is requested, the motor will start on the low speed defined in the setup mode and will increase speed over about 15 degrees to this speed setting. This is the same setting as you would adjust from the speed buttons on the front panel of the RC2800. The command is the letter S followed by a single digit from 0 to 9.

Example:

S1<cr> - Selects speed 1

S6<cr> - Selects speed 6

Position command (A###.# or E###.#)

This command is used to command the RC2800 to move the antenna to a new position. This is done by sending the letter 'A' or 'E' followed by the desired position. The position can contain a whole degree value or can have a single decimal (10ths) place. Once you issue a goto command, the unit will make the commanded unit the active unit. That is, it will have the same affect as the 'A' and 'E' commands above. The unit will also issue a position report and will continue as the antenna is in motion. If you select the opposite unit, the automatic position updates will stop (for the running unit) until it is again selected.

Example:

A25.5<cr> - Move antenna azimuth to 25.5 degrees.

A45<cr> - Move azimuth to 45 degrees

E12.8<cr> - Move elevation to 12.8 degrees off the horizon.

Stop (S)

Sending an 'S' on a line by itself will cause the active unit to stop. Once you issue a 'goto' command and the motor has started, you can stop it at any time with this command.

Example:

S<cr> - Stop the motor

A<cr> - Select the Azimuth unit

S<cr> - then stop it.

V. Upcoming Features

The following enhancements to the protocol are currently being developed. They are provided as a guide for developers if they wish to implement them in to match future releases. The version number for that will contain these new features will be 2.5 and above.

The following is a summary of future commands for version 2.5.

Function	Command	Description
Continuous Update.	U	Sets system to a continuous update mode. As motor is on, the RS232 will output the AZ or EL position from the current selected unit.
Manual Update	N	Sets 'Request Update' mode. Use '?' to retrieve position.
Query Position	?	Returns a COMBINED Azimuth and Elevation position report. (Only in N-Request Update Mode).

REMEMBER *** These features are not available in version 2.4.1 only future 2.5 version.

Continuous Update

This puts the unit into the same command and output mode as the current 2.4 version. When selected, the unit will output it's current position whenever it changes.

Manual Update

In this new mode, the controller units will remain quiet until they are queried for their position status. Command input will not change but when a command is entered, there will not be any position feedback. The status/position is retrieved by using the 'Query Position' command.

Query Position

The future 2.5 version and above will support the Query Position command. This provides a better controlled method for controlling software to obtain the position status of BOTH AZ and EL units with a single command. To use this feature, set the manual update (command M) feature and issue a '?' update command periodically to get the combined rotor system status.

When entered, the Query Position (?) command will cause one of the units to output a position report immediately. If there is another attached unit (AZ/EL Setup), the second unit will 'hold off' reporting it's position to give time for the first unit the will output it's position. This allows the single command '?' to retrieve a complete rotor system status without having to programmatically toggle back and forth between the two units.