



# M2 Antenna Systems, Inc.

## Model No: RC2800PXAZ



Controller Overview

Basic Operations

Advanced Operations

Trouble Shooting

### SPECIFICATIONS

MODEL NUMBER .....	RC2800PXAZ
POWER REQUIREMENTS .....	88 ~ 264 VAC 10A
ENCLOSURE SIZE .....	W=8.5" / H=5.5" / D=9"
COLOR .....	Gray Powder Coat
POINTING ACCURACY .....	>0.1°
READOUT ACCURACY .....	>0.5°
MINIMUM COMMANDED MOTION .....	>1.0°
DIGIT SIZE .....	0.5" Heading / .375" Mode / Speed
CONTROL SWITCHES .....	Tactile 0.5" Diameter
MICROPROCESSOR TYPE .....	"Microchip" PIC16F876/20-SP
CONTROLS .....	Power Switch, ON / OFF Speed Buttons, Increments 1-9 Clockwise & Counterclockwise Buttons Up & Down Mode Buttons
MODES .....	(3) Operational / Run Modes and 17 Programs
STANDARD OUTPUT VOLTAGE .....	27VDC @ 3.2A
COMPUTER INTERFACE .....	RS232 Port

### FEATURES

The **M2 RC2800PXAZ** is our Economy Grade single axis controller. The **RC2800PXAZ** was developed for the M2 Azimuth Motor Model (OR2800PX) and our "Commercial Grade" AZ/EL Pedestal Models (AE1000) & (AE1000CB).

The **M2 RC2800PXAZ** uses a Microchip PIC16F876/20-SP for Micro processing user commands, M2 software and EEPROM for memory. User modes include: (3) Operational / Run Modes and (17) configurable modes including (10) programmable presets.

New switching power supply allow operation from 86 ~ 264VAC input.

The **M2 RC2800PXAZ** uses **PWM** (Pulse Width Modulation) for speed control, allowing for full torque at the slowest input speed. Location heading from the motor assembly is supplied via an Open Loop Circuit to the controllers' microprocessor.

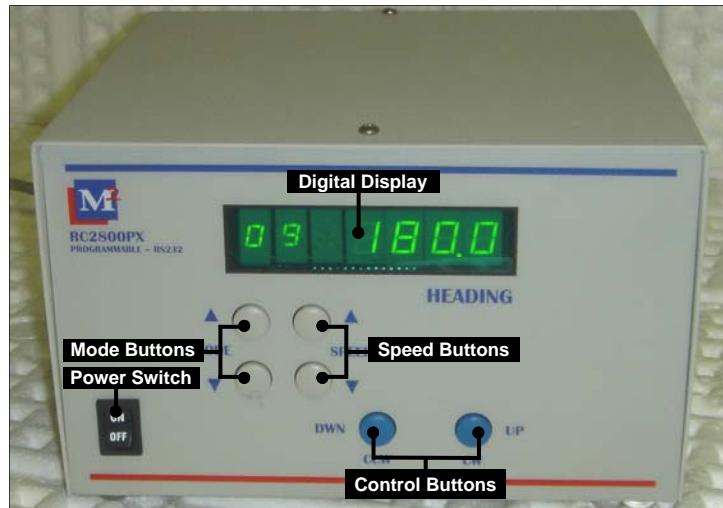
Many off the shelf software packages are available that support the **M2 Software Protocol**, including Ham Radio Deluxe, SATPC 32 and NOVA for window.

Computer interface to the **RC2800PXAZ** is via RS232.

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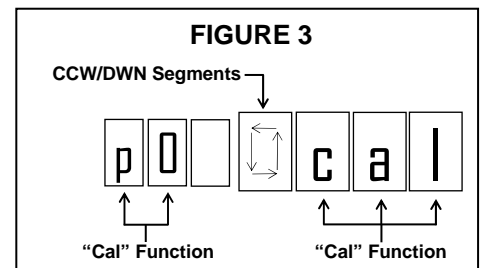
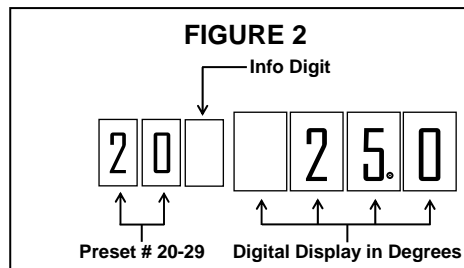
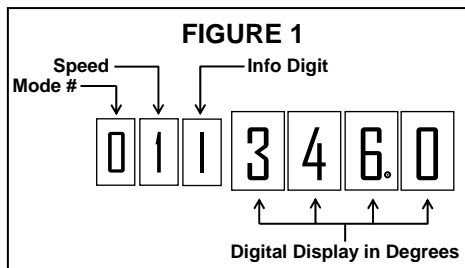
# FRONT PANEL CONTROL OVERVIEW



## ON/OFF (POWER):

This button controls AC power to the control unit.

## UNDERSTANDING YOUR DIGITAL DISPLAY:



## DISPLAY EXPLANATION:

In Mode “0” and “1” the first digit is the Mode # and the second digit is Speed (Figure 1). The third digit in the display in Mode “0” and “1”, is the Info Digit. This is primarily used when approaching a limit “L” or a “-” indicating below zero in Elevation. (Figure 1).

In Mode “2” the first and second digit become your preset numbers from 20-29 (Figure 2).

In “PO Cal” Mode the first two digits indicate the Mode #. The fourth digit or Info Digit indicates CCW/DWN Segments in auto travel and digits 5,6 and 7 indicate the “Cal” function (Figure 3).

## MODE BUTTONS:

The **MODE** buttons are used to cycle through and select among (3) operational or **RUN** modes, 17 **PROGRAM** modes and 10 **PRESETS**. See **RUN MODES** and **PROGRAM MODE** details following this section.

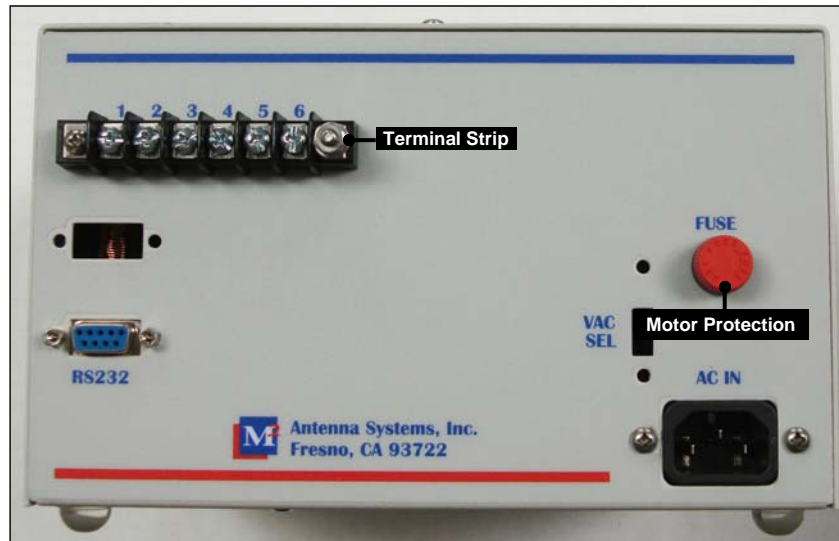
## SPEED BUTTONS:

The **SPEED** buttons control the positioner’s rate of speed in relative increments. “1” is the slowest speed, “9” is the fastest. The top button increases the speed, the lower button decreases the speed. The lowest speed available **DEFAULTS** to “1”, but can be set to any number between “1” and “9”. Speeds can be altered for travel in any of the run modes.

## CONTROL BUTTONS:

The “**CW**” and “**CCW**” or “**UP**” or “**DOWN**” buttons, activate the positioners’ direction in **MODE ‘0’**, **MODE ‘1’** and **MODE ‘2’**. These buttons are also used for “**CAL**” or “**Auto Cal.**”

# REAR PANEL OVERVIEW



## “AC IN”

The supplied (3) prong AC cord plugs into this socket. Connect to a reliable 115 or 230 VAC source. The Main AC input has been designed to filter slight changes to incoming AC.

## “VAC” SELECT

The voltage selection switch is no longer used on this model. We have upgraded from a transformer to a switching power supply that operates from 86 ~ 264VAC.

## “FUSE”

The “Motor Protection” fuse provides electrical protection to the positioner. Replace this fuse with a 125VAC 3A fuse.

## “RS232” INTERFACE PORT

This is a standard (9) pin female (DB9) connector for linking to a computer for automated control. ***Do not use a null modem cable for this application.***

## TERMINAL STRIP

The (6) position terminal strip, serves as your multi-conductor cable interface to the positioner unit. The cable supplies power and data from the positioner. A ground stud is provided at the right end of the terminal for shielded cables. **DISCONNECT THE AC POWER CORD WHEN CONNECTING CABLE LEADS.**

## (6) POSITION TERMINAL STRIP ASSIGNMENTS

TERMINAL NUMBER	FUNCTION	SUGGESTED COLOR	MINIMUM WIRE GAUGE
#1	MOTOR +27VDC (CCW)	BLACK	16 AWG
#2	MOTOR +27VDC (CW)	WHITE	16 AWG
#3	(NOT USED)		
#4	(NOT USED)		
#5	REED SWITCH DC +	ORANGE	24 AWG
#6	REED SWITCH RETURN	BLUE	24 AWG
GROUND STUD	CASE GROUND	BARE	NA

## WIRING AND INSTALLATION HINTS:

Poor quality wiring or cable and wiring errors are the major cause of operational failure. Occasionally this even causes positioner or control box failure. For short runs of 100 feet or less, the wire sizes above are adequate. For runs over 100 feet, we suggest a multi conductor cable manufactured for our Azimuth and Elevation systems called RCS-1812. This is a 4 conductor cable with (2) 14 gauge wires for motor leads, (2) 22 gauge shielded lines for reed switch lines and a single drain wire for grounding.

# BASIC OPERATIONS / RUN MODE DESCRIPTIONS

## RUN MODES:

Modes 0, 1 and 2 are all run modes capable of activating the positioner in both the CCW / DWN and CW / UP direction.

### MODE 0 = MANUAL OPERATION MODE:

Pushing the CCW button activates the positioner in the Counter Clockwise direction, and the Heading count will go down. Pushing the CW button activates the positioner in the Clockwise direction, and the Heading count will go up. Pressing the UP button activates a specific positioner in the Upward direction and the Heading count will go up. Pressing the DWN button activates the positioner in the Downward direction and the Heading count will go down. The positioner runs while CCW / DWN or CW / UP button is depressed, ramping up from minimum programmed speed to the maximum (9) and then again ramping down to speed (1). **When reversing direction, there is a 2-3 second delay before the positioner is activated.** This delay reduces stress on your antenna and positioner.

### NOTE:

Rotation direction, *i.e.*, CCW / DWN or CW / UP is defined as if you are looking down on the positioner / antenna from above. There is NO automatic speed ramp down when operating in Mode 0 except as you approach a limit. Small movements of positioner may not allow full speed to be reached.

### MODE 1 = COMPUTER CONTROL OR MANUAL PRESET MODE:

Computer control or Manual preset mode. When computer control is activated, a "1" automatically appears in the MODE # location on the display. Manually the CW / UP and CCW / DOWN buttons can be used to select a heading on display from the full range of rotation. After the button is released, there is a short delay before the positioner activation allowing time to adjust or "bump" your selection. As the positioner begins to run, the speed ramps up from the minimum programmed speed to the maximum. As the target heading is approached, the speed ramps down to stop. The positioner may then "bump" several times until within .5 degrees of preset. To STOP or cancel a preset any time, touch either mode button.

### MODE 2 = PROGRAMMABLE PRESET MODE:

Press the CW / UP and CCW / DOWN buttons to cycle through 10 preset headings you program in Modes 20-29. Heading selections are shown on the display. After a short pause, allowing you to confirm your selection, the positioner will proceed to the displayed heading in the same manner as MODE #1. Typically, these presets are programmed for frequently used headings and or stow positions for parking or extreme weather. To stop or cancel a preset in mid travel, touch either mode button.

# PROGRAM MODE DEFINITIONS AND EXPLANATIONS

## PROGRAM MODES:

Modes P1-P6 are Program modes that permit entering, changing, or reviewing programmed system parameters. Program modes P20 through P29 are reserved for 10 preset headings.

## USING PROGRAMMABLE MODES:

Press and hold the upper mode button for 3 seconds. The display will change to mode P20. P20 is the first of your 10 PRESET headings. Press the lower mode button each time to scroll through modes P6, P5, P4, P3, P2, P1, AND PO CAL. Now press the upper mode button each time to scroll back up through the program modes. The display will show current mode setting. The Factory Defaults are listed below. Most of the time these will never be changed. To program or change any setting, depress the CW / UP or CCW / DOWN buttons until the desired setting is displayed. Change anything or everything in the program mode except P6 and save just once. **Note:** During programming, the numbers change slowly at first then speed up. Releasing the button and pressing it again resets the process of slow to fast number change.

## PROGRAM P6:

Used to correct your heading of the antenna or array when the unit was not setup up correctly during installation or if your mast has slipped in high wind. To change to a new heading, press the CCW / UP or CW / DOWN button until the desired corrected heading is achieved. Press and hold the lower button for 3 seconds to save. Your new heading will appear in Mode 0. **Note:** The use of this mode can cause loss of over travel.

## PROGRAM P5:

Speed / Ramp function. The number (1) is the minimum Speed and Ramp setting. The number (1) gives you full speed and ramp control. **Note:** When trouble shooting a faulty operation, to get good motor voltage and reed switch readings, it is helpful to temporarily set the speed to (9). This eliminates motor pulses and give a steady DC reading for your DVM.

## PROGRAM P4:

The Pulse Divide Ratio is the number of pulses used for the gear ratio of a given positioner. Use the Pulse Divide Ratio chart below for the correct number for your positioner. **Note:** In most cases the Pulse Divide Ratio will be pre-determined from the factory based upon the positioner you have ordered.

AZIMUTH MODEL	PULSE DIVIDE RATIO	ELEVATION MODEL	PULSE DIVIDE RATIO
OR2800PX	3960	MT-1000A	13200
AZ1000	13200	EL1000	13200
		MT-3000A	37500

## PROGRAM P3:

Positioner Orientation Type. This Azimuth configuration determines the positioners' spectrum or travel of use. A "North" stop configuration would be used when 360° of travel is necessary with primarily a southern exposure is needed. A "South" stop configuration would be used when 360° of travel is necessary with a primarily a northern exposure is needed. **Note:** In most cases the positioner orientation type will be set to "North" stop from the factory. **More detailed information can be found in the System Configuration section of this manual.**

## PROGRAM P2:

The (Upper or UP) electronic limit for Elevation. The CW (Clockwise) Limit for Azimuth. In most cases these limits will be preset from the factory. **More detailed information can be found in the System Configuration section of this manual.**

## PROGRAM P1:

The (Lower or DOWN) electronic limit for Elevation. The CCW (Counter Clockwise) Limit for Azimuth. Limit for Azimuth. In most cases these limits will be preset from the factory. **More detailed information can be found in the System Configuration section of this manual.**

# PROGRAM MODE DEFINITIONS AND EXPLANATIONS

## PROGRAM PO CAL:

Automatic Calibration of your positioner when physical limits are installed. To start the automatic calibration process, press and hold the upper mode button for 3 seconds. Program P20 will appear as the first program mode. Now press the lower mode button seven times until "PO Cal" appears on the display. Press and hold the lower mode button for 3 seconds and the automatic calibration will start by showing the small LED segments just left of the "C" moving in the CCW direction. Once the positioner has completed its automatic calibration it will stop and a new heading will be present on the display. ***More detailed information can be found in the System Configuration section of this manual.***

## PROGRAM P20-P29:

User programmable preset headings. To program your favorite headings, press and hold the upper mode button for 3 seconds and the controller will go to program P20. \*Note: We have pre-programmed the presets at the factory. Please see the "Factory" charge below.

EL PRESETS (FACTORY)		EL PRESETS (NEW USER)	
20	0	20	
21	10	21	
22	20	22	
23	30	23	
24	40	24	
25	50	25	
26	60	26	
27	70	27	
28	80	28	
29	90	29	

AZ PRESETS (FACTORY)		AZ PRESETS (NEW USER)	
20	30	20	
21	60	21	
22	90	22	
23	120	23	
24	160	24	
25	210	25	
26	255	26	
27	285	27	
28	315	28	
29	340	29	

Once P20 appears, press the CCW / DOWN or CW / UP buttons until you reach the desired heading. Now press the upper mode button again and P21 will appear. Use the CCW / DOWN or CW / UP buttons until you reach the desired heading. Use the same process to program all presets. Once all of the presets are programmed, press and hold the lower mode button for 3 seconds to save.

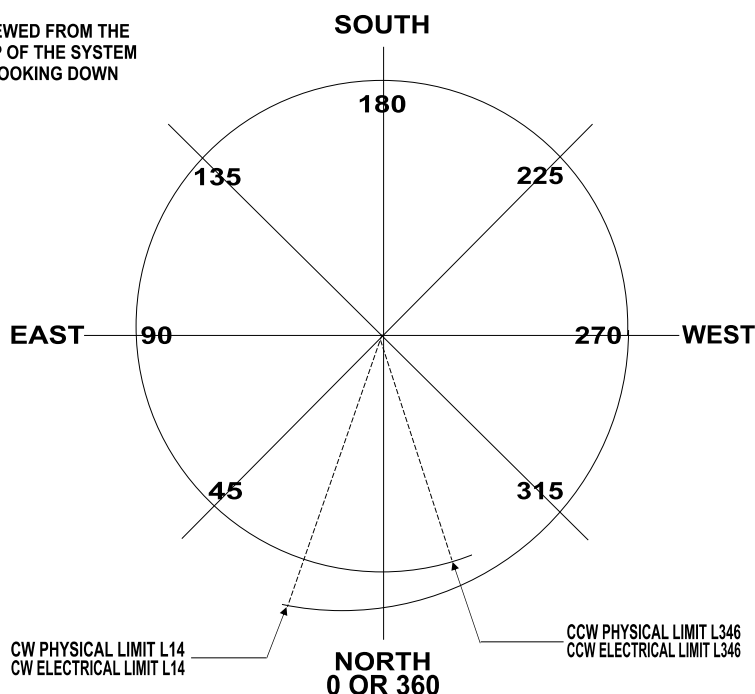


# AZIMUTH SYSTEM CONFIGURATION (OR2800PX)

## OR2800PX CONFIGURATION:

The RC2800PXAZ needs to be configured for a spectrum of use and position of limits. The programmable limits in the RC2800PXAZ control, give the ability to specify the amount of travel around a spectrum of use. The OR2800PX positioner has physical limits CCW or CW. The limits provide physical stops for safety due to control box failure. The CCW or CW limits also create a reference return when using the "Auto Cal" feature during remote / computer or manual control. Below we have provided a visual explanation of some common azimuth configurations complete with suggested electrical and physical limits an spectrum of use.

VIEWS FROM THE  
TOP OF THE SYSTEM  
LOOKING DOWN



## OR2800PX AZIMUTH OPTION #1

Characteristics: Azimuth (North Stop)  
Spectrum of use: +360°  
Program P1 setting: 14.0° (CW Limit)  
Program P2 setting: L14.0° (CCW Limit)  
Program P3 setting: 0.00

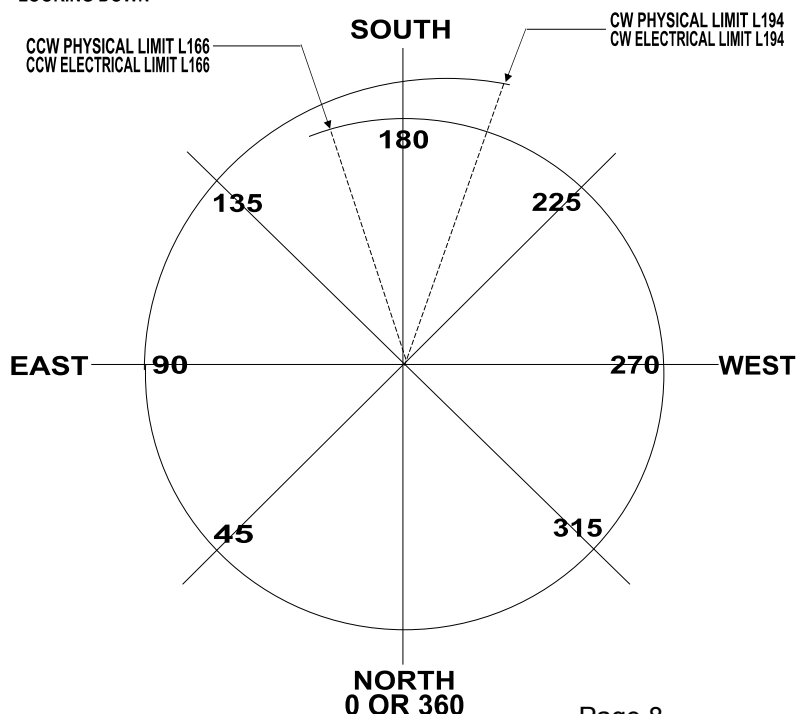
### OVERVIEW:

This azimuth configuration may be used when 360° of travel is necessary with primarily a southern exposure and avoids limits where most of the operations are being performed. Note the position of the physical limits. Ultimately, this provides safety when and if a control box fails.

### SETUP:

No setup is needed for this configuration. The RC2800PXAZ Controller is pre-set from the factory with a (North Stop) setting. After performing an "PO Cal" run the OR2800PX in the CW direction to 0.0° and install the unit into your tower. Install the front of your antenna or array facing North.

VIEWS FROM THE  
TOP OF THE SYSTEM  
LOOKING DOWN



## OR2800PX AZIMUTH OPTION #2

Characteristics: Azimuth (South Stop)  
Spectrum of use: +360°  
Program P1 setting: L194.0° (CW Limit)  
Program P2 setting: L166.0° (CCW Limit)  
Program P3 setting: 180.0

### OVERVIEW:

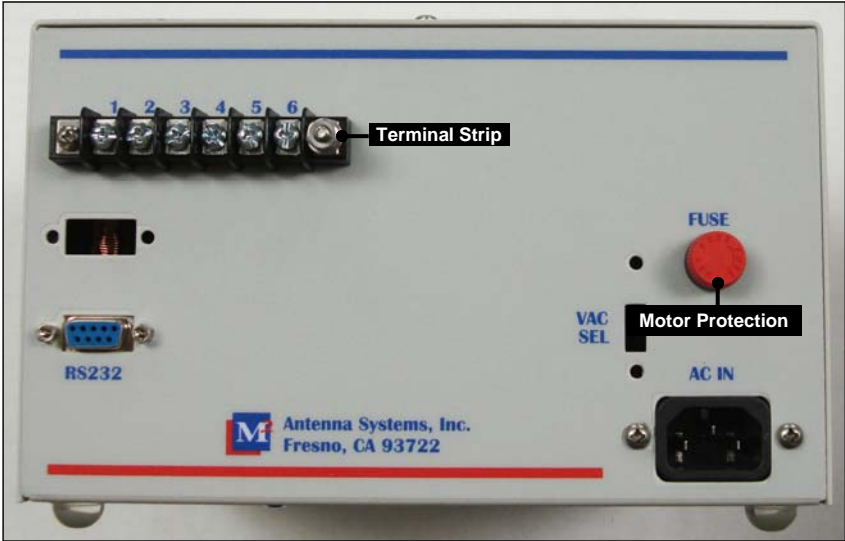
This azimuth configuration may be used when 360° of travel is necessary with primarily a northern exposure and avoids limits where most of the operations are being performed. Note the position of the physical limits. Ultimately, this provides safety when and if a control box fails.

### SETUP:

With the RC2800PXAZ controller in the (North Stop) setting, perform the "PO Cal" function. Then run the OR2800PX in the CW direction to 0.0°. Go to Program P3 and change the setting from 0.0° to 180.0° by pressing the CW button. Press and hold the lower mode button for 3 seconds to save. Now install the unit into the tower. Install the front of your antenna or array facing South.



## CONNECTIONS AND START UP



### CONNECTIONS:

Once the Azimuth and Elevation units have been wired up at the positioner end, start the process of wiring the correct color wires to the rear of the control unit. Use the table below for proper wire color and terminal number. Each individual (6) position terminal strip has been clearly marked to help with proper connection points.

## (6) POSITION TERMINAL STRIP ASSIGNMENTS

TERMINAL NUMBER	FUNCTION	SUGGESTED COLOR	MINIMUM WIRE GAUGE
#1	MOTOR +27VDC (CCW)	BLACK	16 AWG
#2	MOTOR +27VDC (CW)	WHITE	16 AWG
#3	(NOT USED)		
#4	(NOT USED)		
#5	REED SWITCH DC +	ORANGE	24 AWG
#6	REED SWITCH RETURN	BLUE	24 AWG
GROUND STUD	CASE GROUND	BARE	NA

Unwrap the AC power cord and plug it into the AC plug on the rear of the control unit. Plug the AC cord into a reliable 115VAC or 230VAC source.

**CUSTOMER NOTE AREA:**

[illegible]

# ADVANCED OPERATIONS / COMPUTER CONTROL

## CONNECTIONS TO COMPUTER:

Connect the appropriate cable from your computer to the Control Unit's DB9 connector on the rear panel. (A standard RS232 cable is sufficient to run the controller. **Note:** Do not use a Null cable.

All computers have a "Hyper Terminal" or equivalent capability for "Talking" to the control unit. To setup the "Hyper Terminal" do the following: Click start, programs, accessories, communications and then "Hyper Terminal."

The next screen you will see is called "Connection Description." It will ask you to enter a name (IE. Positioner) and choose an icon, then click OK.

The next screen will read "Connect To." Scroll to the last box and click on "Connect Using." Choose direct to Com1 (or whatever Com port you have available) and then click OK.

Baud Rate	Bits	Stop Bits	Parity	Handshake
9600	8	1	None	Present, not used

Click OK and your terminal is now setup and accessible from your desk top icon.

If computer control is desired and a program like NOVA or Ham Radio Deluxe is used, their instructions cover the interface to the RC2800PXAZ. If you are using a program that currently does not work with RC2800PXAZ, send the author a copy of this page and the following two pages regarding writing software.

## HYPER TERMINAL OPERATION:

- A. Commands in upper or lower case are acceptable.
- B. All commands are followed by an Enter (carriage return / cr).
- C. Remote operation (Mode 1) is initiated automatically from the terminal. Once the terminal is attached to the RC2800PXAZ, turn on the RC2800PXAZ. If it has been turned on before, turn it off. Wait 5 seconds and turn it back on. The "Hyper Terminal" will display the following:

\*M2AZEL 2.4.5 AZ (KO6YD)

A=180.00 S=9 S

\*M2AZEL 2.4.2 EL (KO6YD)

E=45.0 S=9 S

The 2.4.5 is the version of software and (KO6YD) is the author.

A= Azimuth Heading S=Speed S=Stopped

The 2.4.2 is the version of software and (KO6YD) is the author.

E= Elevation Heading S=Speed S=Stopped

- D. To move to a new heading in Elevation, say 90°, type E90 and press the "Enter" key. To move to a new heading in Azimuth, say 180°, type A180 and press the "Enter" key. **Note:** In "Hyper Terminal" you must give the "E" or "A" command before the heading. The "Hyper Terminal" will display as:

E=65.0 S=1 M ("M" indicates positioner movement)

E=70.0 S=3 M

E=75.0 S=5 M

E=80.0 S=7 M

E=85.0 S=9 M

E=90.0 S=9 S ("S" indicates positioner stop)

A=155.0 S=1 M ("M" indicates positioner movement)

A=160.0 S=3 M

A=165.0 S=5 M

A=170.0 S=7 M

A=175.0 S=9 M

A=180.0 S=9 S ("S" indicates positioner stop)

If you turn the RC2800PRKX off, the last message would be: A=180.0 / E=90.0 ERR=05. The error code ERR=05 means that the unit has saved all volatile data and is experiencing a "Low 12 volts." Other ERR messages can be found in the "Software Programming" section of this manual.

# ADVANCED OPERATIONS / SOFTWARE COMMANDS

## SUMMARY OF CONTROLLER COMMANDS FOR USER INTERFACE:

Typed commands in lower or upper case, cr = Enter or carriage return, + = real number including tenths.

Function	Command	Description
Select:	A or E (cr)	Where A=Azimuth, E=Elevation
Speed:	S# (cr)	Where S=1 (minimum speed) through 9 (maximum)
Go To:	# (cr)	Where # = A number within your programmed parameters. Numbers less Than 1.0 must be preceded by a 0.#, (0.3)
Increment:	+ (cr)	Where + = bump + approximately .5°
Decrement:	- (cr)	Where - = bump - approximately .5°
Stop	S (cr)	Where S = Stop Movement
Update	(cr)	Where (cr) gives one line of Position, Speed and Movement Status
Calibrate	CAL (cr)	Where "Cal" starts the positioner moving slowly in the CCW direction to The physical limit switch in the positioner and then resets to L346.0

## HOW THE COMMANDS WORK:

The RC2800PXAZ is always in a continuous updated mode.

E=45 S=5 M      A=180 S=5 M

Selected Controller (E or A) heading and other status is continually streaming down the "Hyper Terminal" screen while the positioner is moving. Once (E) Elevation or (A) Azimuth is selected, the (E or A) command is no longer needed. All commands that follow will affect only the selected positioner.

## ELEVATION OR AZIMUTH CONTROL:

Type one of the commands below and follow with an "Enter" (cr):

For Elevation, type the letter (E)

For Azimuth, type the letter (A)

Once Elevation or Azimuth is selected, the (E or A) command is no longer needed. All commands that follow will affect only the selected positioner.

## INCREASE OR DECREASE SPEED: (Assumes E or A has been entered)

Type the command and follow with an "Enter" (cr). Speed changes may be entered while the positioner is moving or stopped.

For Minimum speed, type (S1)

For Maximum speed, type (S9)

Commands S1 through S9 are available. For instance, (S4) will set speed to 40% of maximum. The positioner will return a confirmation with "S=4" and update at the time of command.

# ADVANCED OPERATIONS / SOFTWARE COMMANDS

## **RETURNED VALUES:**

All strings, including updates and error conditions returned to the terminal by the controller are followed by a line feed (OA) and a (cr) (OD). No echoes are returned.

## **ERROR CODES:**

There are a number of error conditions returned by the controller to the terminal as shown below:

ERR=03:

“Unexpected Character” returned when the received command is unknown.

ERR=04:

“Unexpected Byte” returned when the number of bytes received exceeds the buffer space.

ERR=05:

“Low 12 volts” returned when the controller has detected a low 12 volt condition and has saved the current position and speed in a non-volatile memory. If the positioner was moving when this condition occurred, pulses could be lost causing a slight error in the saved position.

# TROUBLESHOOTING

## TROUBLESHOOTING GUIDE:

### PROBLEM:

### POSSIBLE CAUSE:

### SOLUTION:

When pressing the (CCW/DWN) or (CW/UP) button the positioner runs just for a second and then stops and "E1" appears in the mode column of the display.	The protective MOV (metal oxide varistor) inside the control unit may be leaky or shorted.	With the Control Unit in the off position, remove the pulse wires from terminal 5 & 6 from the back of the control unit. Using a digital volt meter set at Ohms reading, check the resistance. If the resistance is less than 5000 Ohms, this means the MOV across terminals 5 & 6 inside the control unit is leaky or shorted. Call the factory for a replacement part.
When pressing the (CCW/DWN) or (CW/UP) button the positioner runs just for a second and then stops and "E1" appears in the mode column of the display.	The positioner is not returning pulses to the RC2800PXAZ Control Unit.	With the Control Unit in the off position, remove the pulse wires from terminal 5 & 6 from the back of the control unit. Using a digital volt meter set at VDC reading, measure the voltage that is present between terminal 5 & 6 for about 1 second while commanding the control unit to move in either (CCW/DWN) or (CW/UP) direction. 11.3 VDC should be present across terminals 5 & 6. If the 11.3 VDC is not present, move to the next column below for further testing.
When pressing the (CCW/DWN) or (CW/UP) button the positioner runs just for a second and then stops and "E1" appears in the mode column of the display.	Faulty reed switch in positioner. Control cable damage or issues.	With the Control Unit in the off position, connect a digital volt meter set at Ohms reading, attach the leads to the two reed switch leads coming from the positioner. Two states can exist. The reading will either be a total open of 10 Meg Ohms or more OR a total short measuring only the resistance of the wires running to the positioner. With the meter leads still connected and measuring Ohms, turn on the control unit and press the (CCW/DWN) or (CW/UP) and make the positioner move. Watch the meter to see the state of the reed switch. Each motor revolution will open and close the reed switch two times so you should see the meter change from open to close. This may take a few tries as the reed switch is open about 60% of the time. If you see no change of state, you either are not on the reed switch wires or there is a break in the wires between the positioner and the control unit or you have a faulty reed switch. Most of the time this problem is due to a wiring or connection problem. Use common sense when troubleshooting your wiring. If you have determined that the reed switch in the positioner is faulty, please contact M2 Antenna Systems, Inc. at (559) 432-8873 for a return authorization to have your positioner tested and repaired.

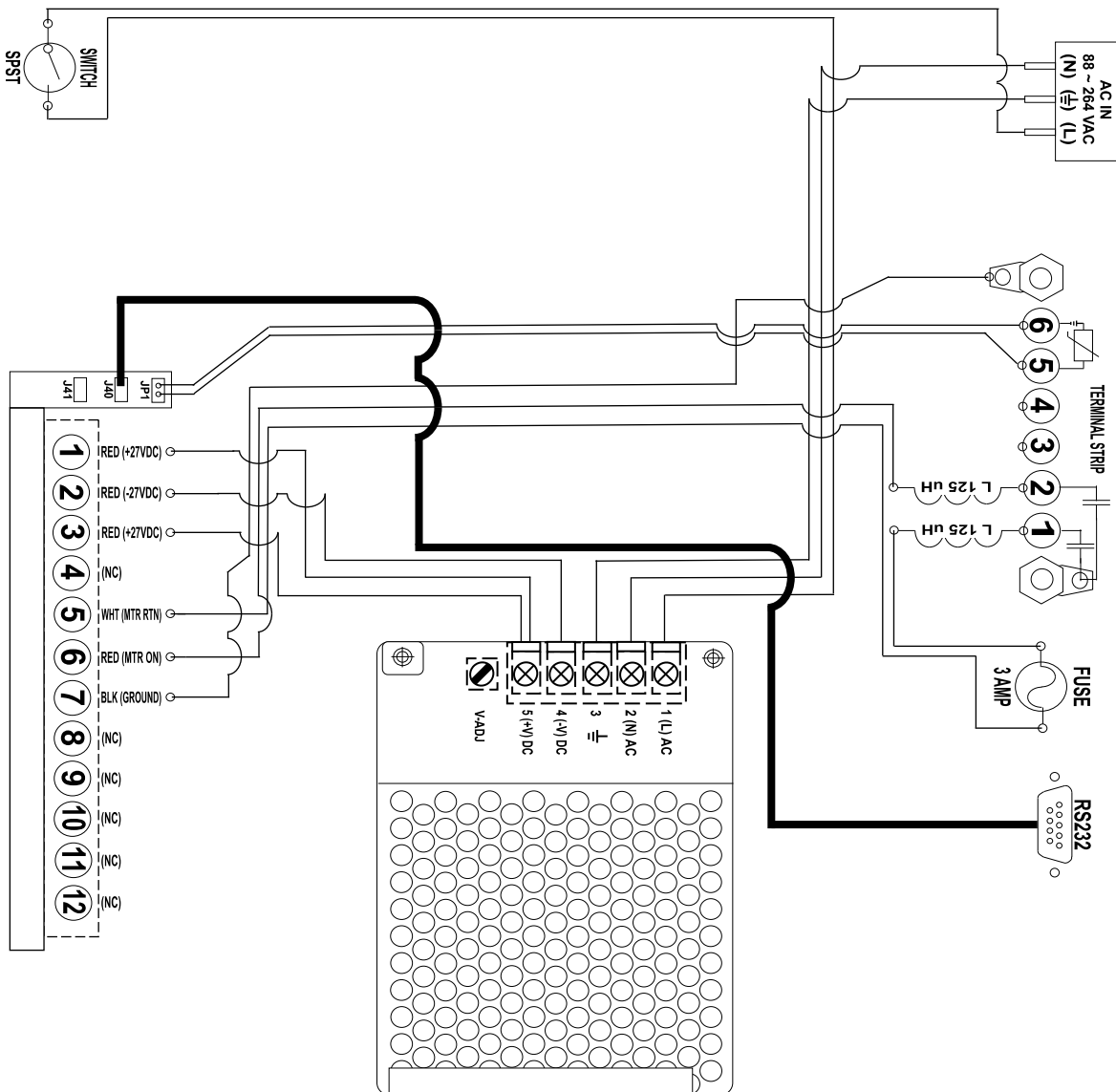
# TROUBLESHOOTING CONTINUED

## TROUBLESHOOTING GUIDE:

PROBLEM:	POSSIBLE CAUSE:	SOLUTION:
Positioner runs immediately after the control Unit is turned on or the positioner runs by itself when pressing the (CCW/DWN) or (CW/UP) button.	One of the motor leads on terminals #1 or #2 is grounded.	With the Control Unit in the off position, remove the motor wire from terminal #1 from the back of the control unit. Using a digital volt meter set at Ohms reading, test the motor wire to ground. If one of your motor wires is grounded, it completes the path to one side of the power supply. Now remove the wire from terminal #2 from the back of the control unit and test it against ground. The microprocessor normally turns on the motor drive chip and then turns on the hexfet and pulls the hexfet to ground and powers the positioner. Now using a digital volt meter set at VDC, test between terminals 1 & 2 on the back of the control unit. If 26-27VDC is present, then either a motor lead is shorted to ground or there is a faulty hexfet on the pc board assembly. Move to the next step to test the hexfet.
Positioner runs immediately after the control Unit is turned on or the positioner runs by itself when pressing the (CCW/DWN) or (CW/UP) button.	Faulty hexfet on pc board assembly.	With the Control Unit in the off position and unplugged, remove the (8) Phillips head screws from the top of the control unit. Remove the control unit lid. With the front of the control unit facing towards you, look at the second component from the right that is attached to the large aluminum heat sink. Using a digital volt meter set at Ohms reading, test between the two outside legs of the device. If the two outside legs are shorted, the hexfet is faulty. Call M2 Antenna Systems, Inc. at (559) 432-8873 for a return authorization to have your control unit tested and repaired.
Positioner operates but readout is erratic or consistently reads higher or lower than where antenna or array is actually pointing.	Control cable damage or issues.	Long runs of cable that have a cut in the jacket can fill with water and significantly increase the inter-wire capacity. This can allow motor spikes to be picked up by the pulse (reed switch lines) and add extra pulses to the count. It can also cause such distortion of the square wave from the reed switch, that the microprocessor cannot read the actual pulse count. Replace the cable or run a separate RG-58U or equivalent line for the reed switch lines. This is not usually an indication that the reed switch itself is faulty. Do not remove the positioner until you are absolutely sure the problem is the positioner.

# RC2800PXAZ CONTROL UNIT WIRING

RC2800PXAZ EL CONTROL UNIT WIRING



## REAR TERMINAL STRIP WIRING

1. MOTOR HOT DC (CCW)
2. MOTOR HOT DC (CW)
3. REED SWITCH RETURN (PULSED WHEN RUNNING)
4. REED SWITCH RETURN (PULSED WHEN RUNNING)
5. REED SWITCH RETURN (PULSED WHEN RUNNING)
6. REED SWITCH RETURN (PULSED WHEN RUNNING)

DRAWN BY: W. LYZENGA

DATE: 08-19-14

M2 Antenna Systems, Inc.

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4402 N. Seland Ave. Fresno, CA 93722  
PART NAME: RC2800PXAZ / EL (PY2 SCHEMATIC)

FILE NAME: RC2800PXAZ\_EL\_NEW SCHEMATIC



**WARNING:**  
THIS SKEMATIC IS ONLY  
FOR PC BOARDS MADE  
AFTER 05-30-14



## POSITIONER LIST TO BE USED WITH RC2800PXAZ

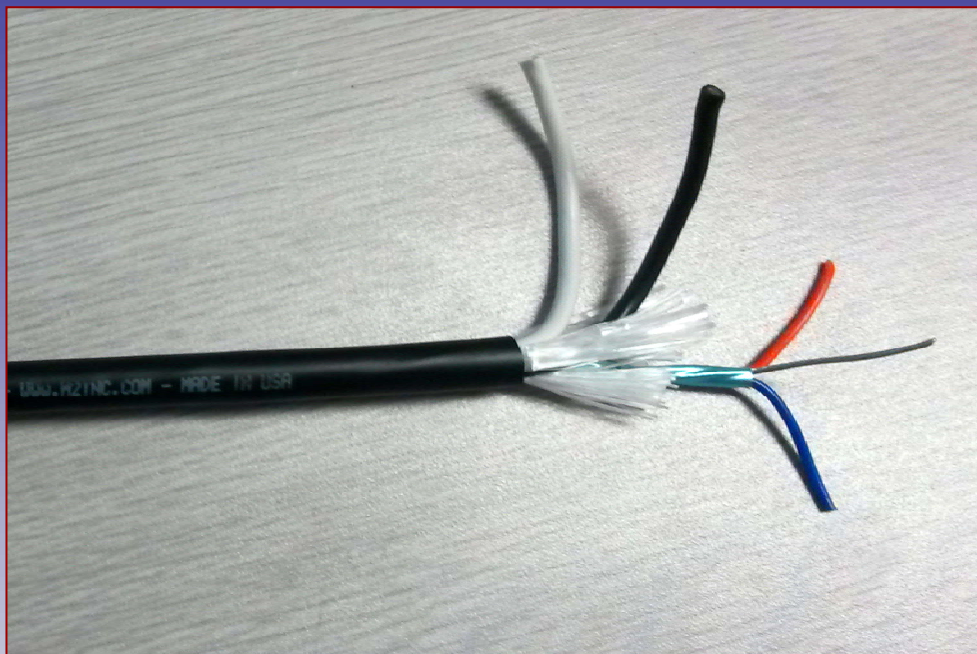


**OR2800PX Azimuth Positioner**



# M2 Antenna Systems, Inc.

## Model No: RCS-1812



### SPECIFICATIONS:

Model .....	RCS-1812	DC Resistance (18 AWG)....	22.3 $\Omega$ /kFT nom @ 20C
Conductors.....	2 ea 18 AWG (16/30 t.c.)	DC Resistance (12 AWG)....	5.58 $\Omega$ /kFT max @ 20C
.....	(Foil shield w/18 AWG drain)	Capacitance (18 AWG Pr) ...	39 pF/FT cond-cond
.....	2 ea 12 AWG (65/30 t.c.)	.....	73 pF/FT cond-shield
Jacket.....	.035" black polyethylene	Voltage Rating .....	600 V max
UV Resistant.....	Yes	Cable OD .....	.375" (9.5 mm)
Weather Resistant .....	Yes	Bend Radius (Rep. Flex) ....	15x Cable OD
Direct Bury .....	Yes	Bend Radius (Static).....	8x Cable OD
RoHS Compliant .....	Yes (2011/65/EU)	Weight.....	85.8 lbs/kFT (39 kg/306 m)

### FEATURES:

Our RCS-1812 Rotator Cable is custom manufactured in the USA to our demanding specifications. This rugged yet lightweight cable is perfect for our OR-2800PX and MT-1000A and MT-3000A rotators or any other rotator using two-wire DC drive and pulse position feedback.

Featuring a direct-bury capable, UV resistant polyethylene jacket, it is the only rotator cable you will need. Two 12 AWG unshielded wires provide low resistance conductors for driving the motor, while a twisted pair of 18 AWG wires are encased in a foil shield, complete with a tinned copper 18 AWG drain to ensure that your pulse position information makes it to the shack reliably.

# RC2800PXAZ CONTROLLER PACKING

DESCRIPTION	QTY
RC2800PXAZ, AZIMUTH CONTROL UNIT .....	1
POWER CORD, 120VAC 10A X 6' .....	1

**Carefully Manufactured by:**

**M<sup>2</sup> ANTENNA SYSTEMS, INC.**  
4402 N. SELLAND AVE.  
FRESNO, CA 93722  
(559) 432-8873 FAX: 432-3059  
[www.m2inc.com](http://www.m2inc.com) Email: [sales@m2inc.com](mailto:sales@m2inc.com)

# 12 MONTH LIMITED WARRANTY

## **RC2800PXAZ RS232 CONTROLLER**



This warranty gives you specific legal rights. You may also have other rights which will vary from state to state or province to province.

**M2** warrants the RC2800PXAZ Control unit against defects in material and workmanship for a **period of 12 months** from date of purchase. During the warranty period, **M2** will, at its option, either repair or replace products or components which prove to be defective. The warranty shall not apply to defects or damage resulting from:

- Improper or inadequate maintenance by user
- Improperly prepared installation site
- Unauthorized modifications or misuse
- Accident, abuse, or misapplication
- Normal wear

**M2** specifically does not warrant this product for any direct, indirect, consequential, or incidental damages arising from the use or inability to use the product. Some state or provinces do not allow the exclusion or limitation of liability for consequential or incidental damages so the above limitation may not apply.

In the event repair or replacement are necessary, purchaser shall contact M2 for return authorization. In many cases this contact can simplify and expedite the repair / replacement process and help reduce costs and downtime.

The purchaser shall be responsible for packing the product properly for return and for charges to ship the product to **M2**. Always include with the shipment, a statement detailing the problem / failure and any other pertinent observations. Insuring the product for shipment is recommended. Use the original packing materials whenever possible. **M2** is responsible for charges (**in the United States**) to return the repaired / replacement product only where warranty service is involved.

***M2 ANTENNA SYSTEMS, INC. 4402 N. SELLAND AVE. FRESNO, CA 93722***