Alfa Radio Ltd.
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sales@alfaradio.ca   780-466-5779   www.alfaradio.ca

AlfaSpid ROT2Prog Controller

Revised 1 May 2016

http://www.alfaradio.ca

This manual is for use with units sold by Alfa Radio Ltd. of Edmonton, Alberta, Canada. on or after January 1, 2015.   Units sold by others may have different firmware and may operate from different voltages.

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Table of Contents

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1 Introduction

The ROT2Prog is an electronic controller used for turning rotators. The Controller may be connected to one Azimuth and Elevation rotator and operates with direct current motors.

The ROT2Prog is designed to work with either an AlfaSpid RAS or BIGRAS or a combination of one azimuth rotator RAU, RAK and a REAL rotator.

1.1 Features of the MD-01/02 Controller

Manual, Automatic, Scanning and Programmable modes.

Digital readout with 0.5 degree resolution.

Large, easy to read, soft green LED display.

Supply voltage of 13.8 to 18 VDC @ 2 to 5 Amps/motor

Azimuth can be zeroed at any position to allow for installation inaccuracy or antenna mount slippage.

Generous Azimuth over travel (+/- 180) with electronic limits. Total of 720 degree travel

Small front panel simplifies stacking several units – takes less valuable space.

1 x USB host port for Computer control

1 port to interface with a custom built mouse to control the motors.

Interfaces with most commonly used satellite tracking programs

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1.3 Photos and description

1.3.1 Front MD-01

1. Keyboard.

$\boxed{<}$ - Left (Decrease)

$\boxed{\wedge}$ - Up (Increase)

$\boxed{v}$ -Down (Decrease)

$\boxed{>}$ - Right (Increase)

2. Setup and Function Keys
3. 2 digit function display
4. 4 digit Azimuth display
5. 4 digit Elevation display

1.3.3 Back ROT2Prog USB

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1.3.4 Back ROT2Prog Serial

1.   Power Cord.

2.   Fuse Holder 8 Amps.

3.   Power Switch.

4.   4 pin Elevation Motor Connector.

        Pin 1 - Motor Drive
        Pin 2 - Motor Drive
        Pin 3 - Impulse Sense
        Pin 4 - Impulse Sense

5.   4 pin Azimuth Motor Connector.

        Pin 1 - Motor Drive
        Pin 2 - Motor Drive
        Pin 3 - Impulse Sense
        Pin 4 - Impulse Sense

6.   USB Computer control connector.

7.   RS-232 Computer control connector

8.   Connector for custom built RAS Mouse. See Section 2.3

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2 INSTALLATION ROT2Prog

2.1 Wiring for BIG-RAS or RAS

The rotator unit must be wired to the control unit with an 8-wire cable; 4 wires — azimuth (1,2,3,4) and 4 wires - elevation (5,6,7,8). The gauge of the wires in the cable to connect the control unit to the rotator depends upon the distance between the rotator and the controller. The wire for the impulse sensing may be quite thin - #22 or similar, even for relatively long distances. Motor wire should be as follows:

⚠ TIP:
Before final installation of equipment, it is strongly suggested you check out all functions and connections on a workbench.

Length (distance)	Gauge
10 m (32')	#18 (1.19 mm)
30 m (100')	#16 (1.42 mm)
60 m (200')	#14 (1.75 mm)

⚠ CAUTION:
Do not accidentally switch the motor wires with the impulse wires. Damage to the control unit may occur!

Remove cover from the rotator and make connections as follows:

Azimuth:
1 Motor Drive to Azimuth 1 on controller connector
2 Motor Drive to Azimuth 2 on controller connector
3 Impulse Sense to Azimuth 3 on controller connector
4 Impulse Sense to Azimuth 4 on controller connector

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Elevation:
5 Motor Drive to Elevation 1 on controller connector
6 Motor Drive to Elevation 2 on controller connector
7 Impulse Sense to Elevation 3 on controller connector
8 Impulse Sense to Elevation 4 on controller connector

We suggest that the coax cable from the antenna be made with extra length to allow for the "Over Travel", 720 degrees in total. You may wish to also allow for the coax cable to come off the "South" side of the tower (180 degrees).

Note:
When using Switch mode power supplies, be aware that inrush current from the rotator motor may trip the power supply overcurrent protection circuits.

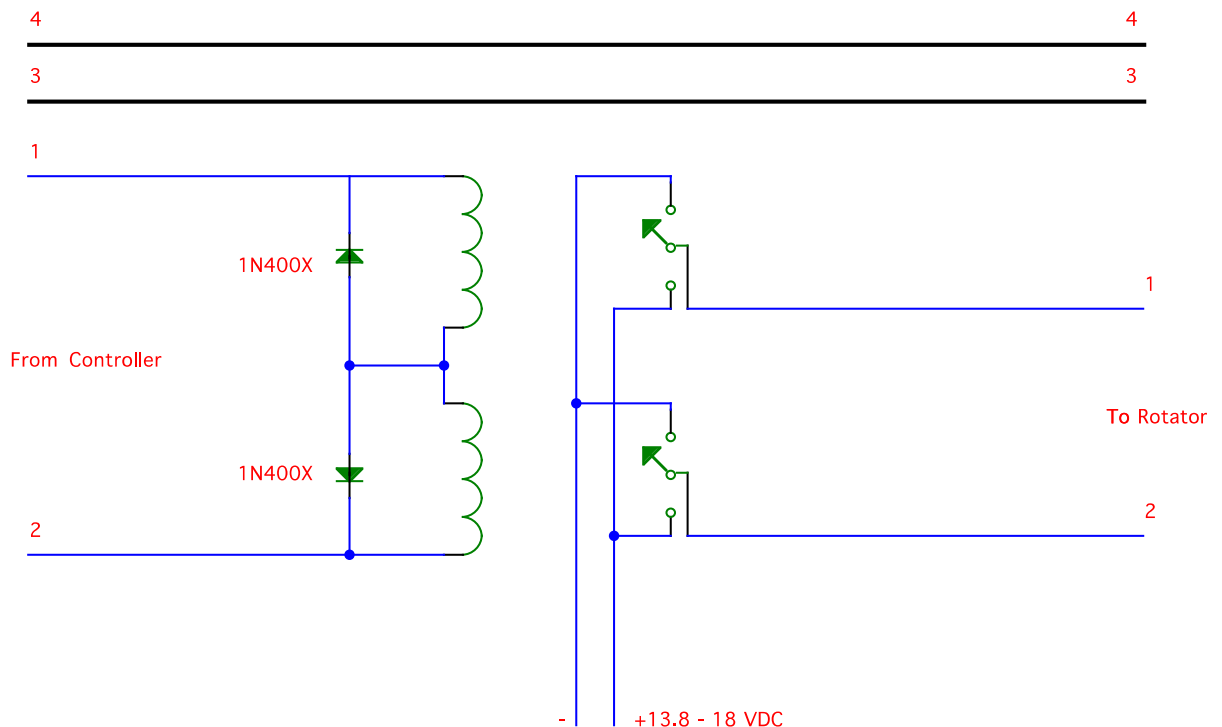In case of trouble, refer to section 3.5 for help.

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2.2 Using the AlfaSpid Rotator on long cable runs

Since the motor uses relatively low DC voltage, a combination of long cable runs and/or thinner than required cable may reduce the voltage at the motor to an unacceptably low value. It may turn in warm weather or light winds, but the power will not be available to rotate under severe conditions.

While it is easy to say to install heavier cable, this may be costly, impractical or both. At his contest station north east of Edmonton, Don Moman VE6JY has a tower that is just over 1700 feet (500 meters) away from the shack. At this distance, the only cost effective alternative was to run 22 gauge underground telephone cable and use relays to switch power from a power supply at the base of the tower. The power supply needs to have enough voltage to supply 15 to 20 volts at the motor at 3 to 5 amps. Don uses a battery that is charged by the remaining unused conductors in the telephone cable.

Relays chosen should be suitable for the proper coil voltage as well as appropriate current carrying capacity of the contacts.

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A relay capable of 5 to 10 amps DC is adequate. The diodes are general-purpose 1 amp style such as the 1N400X series.

This information is presented as a guide, to help the user realize a solution to the long cable run situation.
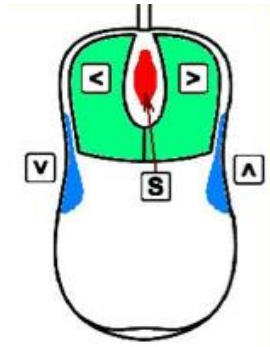
If you do not feel comfortable wiring the basic circuitry to do this, please contact Alfa Radio Ltd. (www.alfaradio.ca) for a pre-wired solution.

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2.3 Mouse Controller

The optional mouse controller allows easy desktop access to the most commonly used front panel controls. These buttons are functionally equivalent to the corresponding front panel controls.

< - Left (Decrease)

∧ - Up (Increase)

∨ - Down (Decrease)

> - Right (Increase)

S Setup Mode or STOP

⚠ The mouse controller is a highly modified computer mouse. You cannot use a regular mouse with the AlfaSpid rotator nor vice-versa.

The mouse ball serves no function.

3 SETUP ROT2Prog controller

3.1 ROT2Prog Controller configuration.

[S]   Setup Mode

The [S] button steps through the setup menu, for modes other than manual control operate as **STOP**. The display cycles through each of the setup menu items.

8 *1.00* *1.00* - Rotator Transmission

8S *S8* - Program Simulation

88 *0.0* *0.0* - Heading Adjust

8H - Programmable High Limit, Default "DOT" flashing 180

8L - Programmable Low Limit, Default "DOT" not flashing 180

8 *1.00* *1.00* - Rotator Transmission

This value defines the resolution of controller operation.

1.0 means operating with 1 degree accuracy, 0.5 means 0.5 degree accuracy. On customized units this may be some other value.

0.25, 0.5, 1.0

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`PS` `88S8` `8888` – Program Simulation

Program Simulation allows the user to set the serial communication protocol used by the rotator. When set to emulate another brand of rotator, the AlfaSpid will respond to commands.

If your favourite software supports a rotator, chances are, the AlfaSpid will be able to interface to your software. There are 2 modes available:

`PS` `88S8` `8888` – AlfaSpid

`PS` `889A` `8888` – Yaesu

(GS232 protocol, 600 baud N, 1, 8 bits)

(Data rate 600, 1 STOP bit, no even parity bit)

Operating mode change `<`, `>`.

`PP` `880.0` `880.0` – Heading Adjust

This setting can be used to make minor heading adjustments without causing the rotator to turn. If you notice that the heading displayed on the controller to a known signal source is out by a few degrees, you can change the heading displayed on the LED readout to match the known heading, rather than having to turn back to North and reset the controller. These settings are made by `<`, `^`, `v`, `>` buttons.

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3.2 Computer Communication

ROT2Prog controllers sold prior to January 2015 were equipped with a DB9 Female connector. This connector can be connected to a PC or a USB to RS232 adapter, using a standard straight thru serial cable.

ROT2Prog controllers sold after January 2015 are equipped with a USB connector. This connector can be connected to a PC using an A to A USB cable.

Most operating systems (Windows 7 and up, OS X and Linux) have drivers already installed or drivers that will install automatically when the USB cable is plugged in. The Controller is equipped with a FTDI FT232RL USB to Serial chip. If the operating system used does not have a driver installed or automatically loaded, it will be the user's responsibility to load the appropriate driver and get it to work.

Install Guidelines are available from FTDI at http://www.ftdichip.com/Support/Documents/InstallGuides.htm. Drivers can be obtained at http://www.ftdichip.com/Drivers/VCP.htm

To determine the communications port on the PC:

Windows: Open the Device Manager and expand the "Ports(COM & LPT)" to find out the comm port assigned to the Controller.

Linux: Open the terminal program.

Type "ls /dev/ttyUSB*". A list of ports will appear. The Controller port will appear like this, "/dev/ttyUSBX" where X is digit starting at 0

Mac OSX: Open the terminal in the utilities directory.

Type "ls /dev/tty.*". A list of ports will appear. The Controller port will appear like this, "/dev/tty.usbserial-XXXXXXXX" where XXXXXXXX is an 8 Alphanumeric serial number of the FTDI chip.

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3.3 Rotator Testing

It is highly recommended that the rotator controller and rotator be setup on the bench before installing on a tower. This will rule out any damage that may have been caused in transit, and will give the operator a chance to become familiar with the equipment.

The controller is normally expected to be operated from a 13.8 Volt DC supply, however it may be operated from other unregulated DC or AC sources as well. The output of supply source must be from 13.8 to 24 V, 6 Amps minimum.

The polarity of the power to the control box input leads is not critical, as a full wave bridge rectifier on the input will provide the proper polarity to the electronics.

TIP: *Because of several steering diodes in the motor path, the voltage delivered to the motor (neglecting wire loss)* **will be about 1.4 volts less than the power supply voltage.** *For longer runs and/or thin wiring, a higher voltage (up to approx 24V) to the control unit is beneficial. A simple way to estimate if the voltage to the motor is adequate is by timing the rotation. Under no or a very small load, the 360 degree rotation time with 12V DC at the motor is about 120 seconds (2 minutes). With 24 V DC is about 60 seconds (1 minute). A DC Ammeter in the motor lead is also useful. It should indicate between 2 and 3 amps with a small load. On windy days or heavy load, the current may fluctuate up to 3 to 5 amps per motor.*

⚠ It is highly recommended to ground the Control Box.

Notes – *testing and troubleshooting*

Azimuth:

Pressing ▷ should make the rotator move clockwise.

Pressing ◁ should make the rotator move counter-clockwise.

If rotation is reversed, switch lines 1 and 2 on the back of the controller.

Impulse sense lines (3 & 4) have no polarity concerns.

Elevation:

Pressing ∧ should make the rotator move up.

Pressing ∨ should make the rotator move down.

If rotation is reversed, switch lines 5 and 6 on the back of the controller.

Impulse sense lines (7 & 8) have no polarity concerns.

Part of the overload protection circuitry involves removing motor power, if the controller receives no sense indication. If the motor turns for a few seconds and then you hear the relay in the control box drop out, the motor has either stalled or there is a problem in the impulse sense wiring. The controller has not detected motor movement.

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3.4 Resetting the Controller

Turn the unit OFF.

While holding the ⬚F button depressed, turn control unit back on. This will now show ⬚⬚ ⬚⬚⬚0.0⬚⬚⬚0.0 on the display. *This feature can be used if, for any reason, the direction of the antenna becomes incorrect. This may be caused by antenna to mast slippage or incorrect initial alignment.* Re-alignment may be necessary.

IMPORTANT:

Azimuth

In order to set the limits for both the Azimuth and the Elevation sections of the rotator, first always start by setting up the azimuth section by pointing the rotator to 0 degrees or true north. Now reset the controller as previously outlined above. The controller is now set for azimuth.

The *AlfaSpid* rotator is now set at the counter-clockwise end of its normal rotation range. Normal rotation range is in a clockwise direction for 360 degrees.

From the reset position, you can rotate counter-clockwise an additional 180 degrees in over-travel, as well 360 degrees clockwise, plus an additional 180 degrees into clockwise over-travel.

Counter-clockwise over-travel is indicated by a steady dot above the over-travel icon ⬚<->. ⬚<->. Rotation past 359 degrees into the clockwise over-travel is indicated by a blinking dot above the over-travel icon. ⬚<->

Elevation

Elevation must be set to zero. To do this the controller and rotator must be positioned to zero degrees, both electronically and mechanically. Using the display down arrow (or the mouse) move the rotator to the full travel, which should be about (-21.0). If the rotator stops and the display is not -21.0 then

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the mechanical stop in the rotator has been activated. After display on the controller reads -21.0 (or its lowest value) reset the unit by pressing the "F" button and turning on the power at the same time. Again, using the display down arrow (or the mouse) move the rotator to the full travel, which should be about (- 21.0). Repeat this until there is no more travel.

Press the display up arrow until the 10.0 degree mark is met. Do a reset. Test for a full 180 degrees of travel. If travel is 180 degrees or more then setup is correct. If it is not then repeat the process until it is.   See section on "PP" for minor adjustments

3.3   Rotator Troubleshooting

Before contacting Alfa Radio Ltd. Please make the following tests:

NOTE: ON THE ELEVATION ROTATOR THERE ARE MECHANICAL SWITCHES WHICH OPEN THE POWER WHEN THE END LIMIT IS REACHED. A DIODE IS PLACED IN SERIES WITH THE MOTOR.   TO TEST FOR THIS, REVERSE THE POWER TO THE MOTOR.

The following are some trouble shooting tips, if for some reason your AlfaSpid will not operate correctly.

It is important to confirm correct operation before installing the rotator on the tower. This will rule out any damage that may have been caused by the shipping company.

Check the Limits - PH and PL settings and rule out overlap.

Simple resistance tests can reveal incorrect or shorted wiring.

Pins 1 and 2 are the motor winding and will have a low resistance. Typically 2-3 ohms.

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Pins 3 and 4 are the sense lines and typically will have either an open circuit or have about 1200 ohms depending on the status of the reed switch in the rotator and the length and gauge of used wire.

There should be no conductivity between 1 and 3 or 1 and 4, or between 2 and 3 or 2 and 4

All lines should have **no** conductivity to ground.

Be careful not to over wind the coax with the next test, as there will be no protection from over turning.

Find a small 12 volts supply which will deliver 3 to 4 amps. (A small 12 Volt battery will work just fine)
To confirm that the motor runs, you may connect 12 volts D.C. to the lines that go to the motor, pins 1 and 2. It should turn. Reversing the 12 Volts D.C. should cause the motor to turn in the reverse direction.

NOTE: ON THE ELEVATION ROTATOR, THERE ARE MECHANICAL SWITCHES WHICH REMOVE THE POWER TO THE MOTOR WHEN THE END LIMIT IS REACHED. A DIODE IS PLACED IN SERIES WITH THE MOTOR.   TO TEST FOR THIS, REVERSE THE POWER TO THE MOTOR. THE UNIT SHOULD TURN.

To confirm that the sense circuit in the rotator is working, connect an ohm meter to the senses lines pins 3 and 4, apply 12 volts to the motor lines pins 1 and 2; you should see the ohm meter reading alternate between open circuit and about 1200 ohms.

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Pin on Rotator not controller	Typical Reading	Your reading	
Pins 1 to 2	About 2 to 4 Ohms	_____	Depends on the length of wire to rotator
Pins 3 to 4	Open or 1200 Ohms	_____	Depends on the status of the read switch
Pins 1 to 3	Open	_____	
Pins 2 to 3	Open	_____	
Pins 2 to 4	Open	_____	
		_____	
Pin 1 to Ground	Open	_____	
Pin 2 to Ground	Open	_____	
Pin 3 to Ground	Open	_____	
Pin 4 to Ground	Open	_____	
		_____	
Voltage on controller			
Pins 1 to 2	About 12 volts with motor running		Depends on the supply voltage (14 volt applied)
Pins 3 to 4	About 8.5 volts or 2.5 volts		Depends on the status of the read switch and the Supply voltage

4   Operation

F   Function Mode

The F button steps through the function menus. The leftmost character on the display indicates the function mode you are currently in.

⎡88⎤ ⎡88 0.0⎤⎡88 0.0⎤ - Normal Operations Mode

⎡A8⎤ ⎡88 0.0⎤⎡88 0.0⎤ - Half Auto Mode

⎡A8⎤ ⎡88 0.0⎤⎡88 0.0⎤ - CPU Mode

⚠ The 0 in the displays to the left will be replaced by your actual beam heading.

⎡88⎤ ⎡88 0.0⎤⎡88 0.0⎤ Normal Operations Mode

In Normal Operations Mode, the <, ∧, ∨, > buttons cause rotation as long as the buttons are pressed. Pressing S while in normal operations mode will take you to setup mode.

⎡A8⎤ ⎡88 0.0⎤⎡88 0.0⎤- Half Auto Mode

In Half Auto Mode, the <, ∧, ∨, > buttons can be used to pre-select the desired beam heading. The heading displayed on the controller will rapidly change in the direction of desired rotation. Once the desired beam heading is shown on the display, release the key. Approximately ½ of a second after no key presses have been detected, the display will revert back to the actual beam heading, and rotation towards the desired heading will take place. Pressing any key while in transit to the desired heading will cancel the action.

⎡A8⎤ ⎡88 0.0⎤⎡88 0.0⎤- Auto (CPU) Mode

In Auto Mode, the controller will respond to commands from control software running on an attached computer.

The ⬜, ⬜, ⬜, ⬜ buttons can still be used, but pressing any of them will cause the data from software to be cancelled.

12 MONTH LIMITED WARRANTY

AlfaSpid Rotators and controllers

Alfa Radio Ltd. warrants to original purchaser of the product, that the product will be free from defects in material and workmanship for the following periods after such date of purchase: Material - 12 months Workmanship - 12 months.

Alfa Radio Ltd. will, at its discretion, repair or replace free of charge such defective products subject to the following conditions:

1. Delivery of the product **prepaid** to Alfa Radio Ltd. or its authorized dealer.
2. Determination by the Alfa Radio Ltd. that a defect exists and is covered by the limited warranty.
3. Defects due to alteration, repair by an unauthorized person, misuse, accidental damage, lightning strikes, use of the equipment for purposes other than those for which it was designed, and the like, are NOT COVERED by this limited warranty. Repairs in these cases will be subject to normal service charges.
4. Damage to an AlfaSpid rotator or controller caused by using said rotator or controller with a rotator or controller manufactured by any other manufacturer will NOT BE COVERED by this limited warranty.
5. Repairs and replacement parts are covered under this limited warranty only for the remaining term of the original limited warranty.
6. Under no circumstances is Alfa Radio Ltd. liable for consequential damages to person(s) or property by the use of this product.
7. Alfa Radio Ltd. reserves the right to make changes or improvements in design or manufacture without incurring any obligations to install such changes in any of the products previously manufactured.
8. All claims of defect or shortage should be sent prepaid to:

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and must be accompanied by a letter describing the problem in detail along with a copy of your proof-of-purchase.

Contact Alfa Radio Ltd. before sending.