



RAS-4 Remote Receiving Antenna Switch

User's Manual

Revision 1.00

November 2020

RAS-4 Included Parts

RAS-4 switch
Mounting bracket with stainless screws and nuts to secure to RAS-4
User's Manual

Specifications

Antenna Selection: 4:1
Dimensions: Approx. 4.5" X 3.5" X 3.25" (11.4 cm X 8.9 cm X 8.3 cm) without bracket
Connector type: F (5)
Unselected port termination: 75 Ω default, 50 Ω , open, shorted. Wire jumper selectable
VSWR: < 1.5:1 from 100kHz to 20MHz.
Insertion loss: < 0.4dB from 100kHz to 20MHz
Port to Port Isolation: > 45dB from 100kHz to 20 MHz
Control Cable: 4 wire
Switch Controller: 12V, Not included

Features

NEMA Rated enclosure with rubber gasket lid
Cable gland to seal cable entrance. Screw terminals for easy field installation
Common mode RF choke on output coaxial connector to minimize common-mode noise
Conformal coating on circuit board for additional protection
Mounting bracket included

Overview

The RAS-4 Remote Antenna Switch is designed to select between four low band, low noise receive antennas. It is designed to use low cost, low loss, RG-6 coax with F connectors. RG6 is a popular feed line coax for receive antennas because of its low loss and low cost.

The RAS-4 is designed to handle the weather. The enclosure is NEMA rated with a gasket sealed over. The control cable enters through a cable gland to prevent insects from entering the switch. Finally, the internal circuit board is given a conformal protective coating as final protection from the elements.

The unselected antenna ports are terminated with 75 Ω resistors. This allows the proper operation of antenna systems such as the bi-directional BevFlex-4X system, which requires terminations of the un-selected coaxes. The impedance can be changed to 50 Ω , open circuit, or center conductor shorted to the shield.

The four ports are isolated from each other, center conductor and shields, to minimize common mode noise pick up from unselected antennas.

Warning!

Always disconnect your antennas from the radio when storms are possible!

The RAS-4 is designed for receive antennas only. Do not transmit into it!

Configuration

In most cases, the user will not have to make changes to the RAS-4. The only user configurable parameter is the termination value of un-selected antenna ports. The default termination is 75Ω. Changing to a different value (50Ω, open circuit, or shorted center conductor to shield) requires cutting a copper PCB trace and soldering in a jumper wire for 50Ω or short circuit.

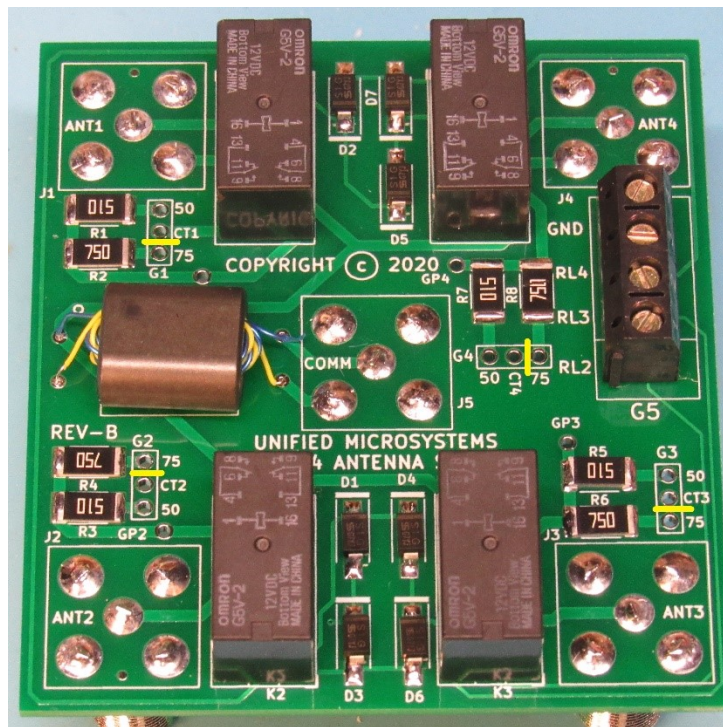


Figure 1. Top of the RAS-4 circuit board. The yellow lines show the cuts needed to change the default 75 ohm termination to a different value.

The antenna ports are individually configured through a cluster of solder pads. Each port will have a three pad jumper row labeled Gn. G1 is for ANT1, G2 is for ANT2, etc. The termination for that antenna port is made by connecting the pad marked CTn to 75 (default), 50, GPn for zero ohms, and no connection for an open circuit.

Table 1. Antenna Port Terminator Configurations

Antenna	75 Ohm	50 Ohm	Zero Ohm	Open Circuit
ANT1	CT1-75	CT1-50	CT1-GP1	No connection on CT1
ANT2	CT2-75	CT2-50	CT2-GP2	No connection on CT2
ANT3	CT3-75	CT3-50	CT3-GP3	No connection on CT3
ANT4	CT4-75	CT4-50	CT4-GP4	No connection on CT4

Note: All configurations other than 75 Ohms require cutting the copper trace between CTn and adjacent pad labeled 75.

Installation

The RAS-4 must be mounted with the coax connectors facing down unless additional protection from the elements is provided. The RAS-4 can be mounted under a horizontal shelf with the mounting holes on the enclosure flange. An L bracket is provided for mounting on a pole or tower leg. Stainless steel hardware to secure the bracket to the RAS-4 flanges is included. The hardware to attach the RAS-4 assembly to a post, tower, or other mounting point is not included.

A four wire cable is required to control the RAS-4. CAT-5 computer networking cable is inexpensive. It will work a couple of hundred feet for a single strand per port, providing spares, or the twisted pairs used together for longer distances. Use CAT-5 rated for outdoor use if the RAS-4 is mounted outdoors. You can use other types of control cables.

Cut the outer insulation back about 2 inches, then strip the wire insulation about 3/8 inches. Slide the cable through the cable gland opening and allow enough length to reach the connector J4. Turn the cable gland end cap until the cable is held tightly. If your cable is too small, build it up with high quality electrical tape. Insert the bare ends into connector G5. The ground return wire goes to the pin marked on the circuit board as GND. The wire to select ANT2 goes to the pin labeled RLY 2. The wire to control ANT3 goes to RLY 3, and ANT4 uses RLY 4. Remember that ANT1 is selected by default when no other antenna port is activated.

Connect the coax from the antennas to the antenna ports. The coax back to the radio goes to the center connector labeled COM. Seal all the connectors and any unused ports.

The coaxes must go towards the ground from the RAS-4 to keep water away from the connectors. Provide a drip loop if the coax is coming from a horizontal direction. Limit the strain on the coax connector and RAS-4 connector by providing strain relief on the connection coax cables.

Controller Switch

A controller switch for the RAS-4 is not included. A simple commercial or home brew switch can be used with the RAS-4. The schematic for a simple switch is below.

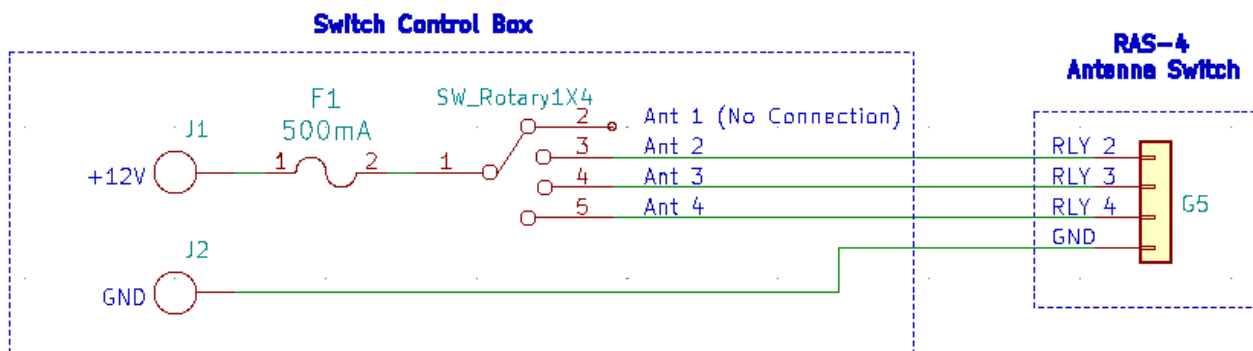


Figure 2. Typical control switch to use with the RAS-4

Note that ANT 1 is the default selection with no power applied to the RAS-4. Applying +12V to the RLY2, RLY3, or RLY4 connections will select the corresponding antenna. The power source polarity must be as shown for the proper operation of the RAS-4. Note that the fourth wire labeled GND is required for the relay DC control return because the shield of the coaxial cable back to the shack is isolated from the control circuitry to minimize noise pickup.

Expanding the RAS-4

Daisy chaining multiple RAS-4 switches can increase the number of selectable antennas. An additional RAS-4 switch will add three extra antennas. Figure 3 shows two cascaded RAS-4 switches. The select antenna lines and the ground line

would go to a controller similar to the one shown in Figure 2, but with an eight pole switch.

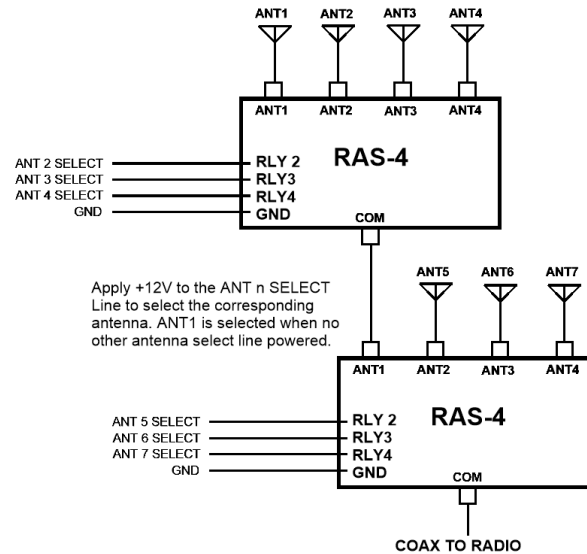


Figure 3. Cascading two RAS-4 Switches to select up to seven antennas

Using the RAS-4 with two BevFlex-4X systems

The RAS-4 is ideal for use with two Unified Microsystems BevFlex-4X systems. The BevFlex-4X can be configured as a Beverage, Beverage On Ground (BOG), Flag, EWE, or VE3DO receive antenna. Each configuration can be switched between the forward and reverse directions. Using two BevFlex-4X antennas at right angles permits hearing weak DX through the noise in all four quadrants. The configurations of the two antennas do not have to be the same. For example, a Beverage antenna configuration could be used for the NE/SW antenna directions, and an EWE antenna configuration could be used for the NW/SE antenna directions.

A typical two BevFlex-4X Beverage or BoG configuration would have one antenna directed NE in the forward direction and the reverse direction SW. The second would be at right angles with the forward direction SE and the reverse direction NW. This configuration will provide coverage to all four quadrants, NE, SE, SW, and NW. The RAS-4 provides the proper 75Ω termination to the un-selected coax cables from the Feed Unit and eliminates the BevFlex-4X direction Switching Units.

Since the BevFlex-4X Beverage and BOG configurations can be fed at any point, the BevFlex-4X Feed Units can be placed at the antennas' point of closest approach and connect to the RAS-4. A single coax and control line cable then go back to the shack.

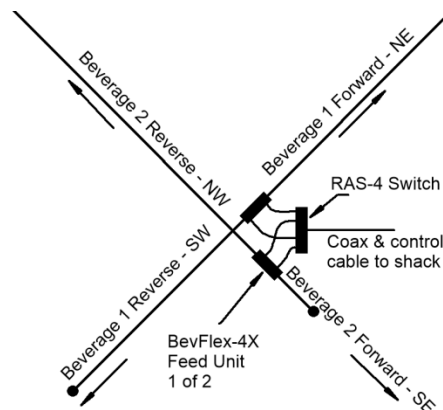


Figure 4. Dual BevFlex-4X Beverage configuration using RAS-4 Switch

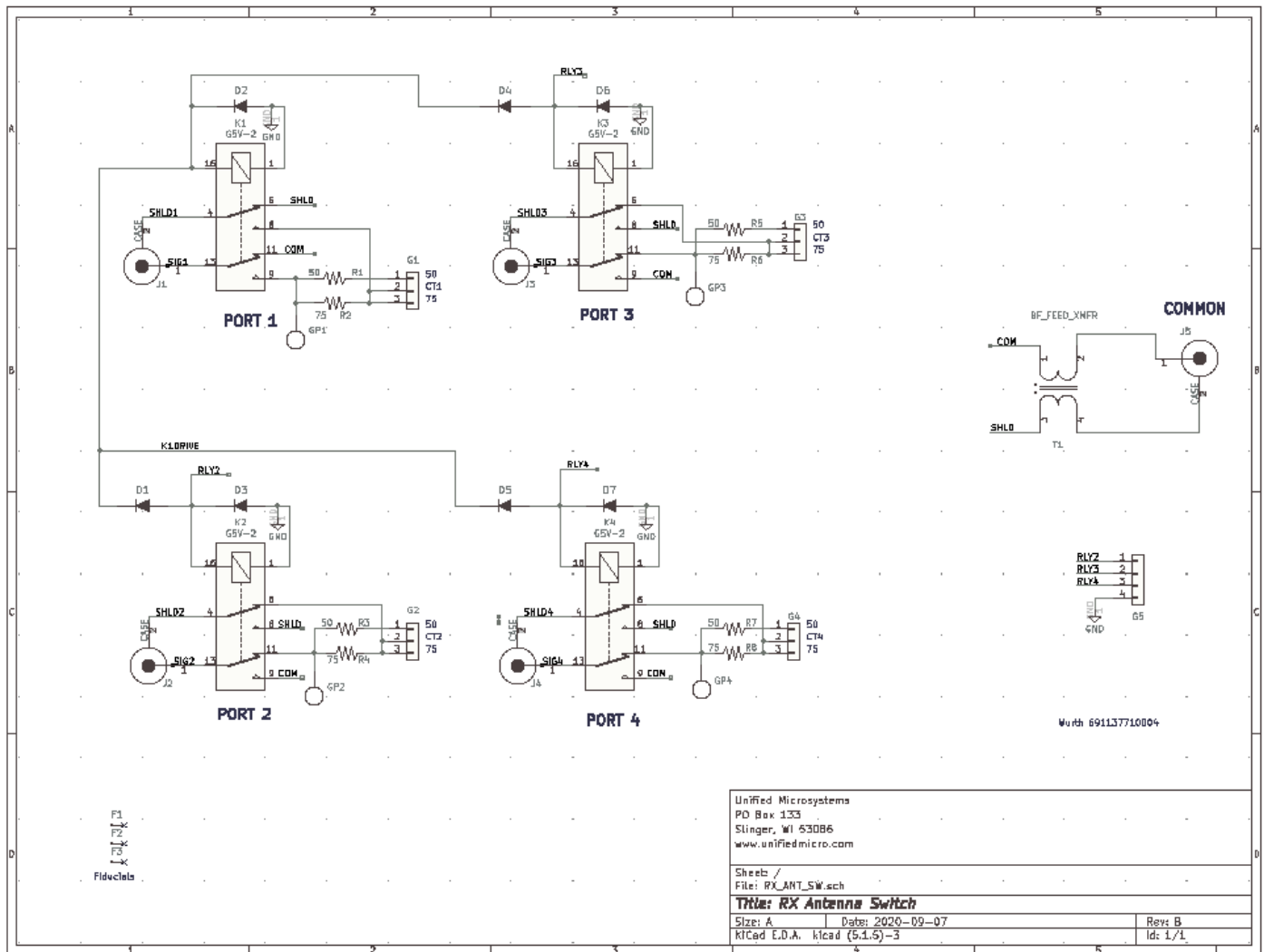
Warranty Information

Unified Microsystems warrants the components and workmanship of the RAS-4 for a period of 1 year from the date of purchase. A copy of the receipt must be included with any units returned for warranty repairs. Damage from improper installation, abuse, and lightning is not covered. Unified Microsystems is not responsible for damage to connected equipment or personal injury during installation.

Unified Microsystems will, at its option, repair or replace defective units returned during the warranty period. Unified Microsystems reserves the right to change the specifications of any product at any time without notice.

If you have questions or need help, email w9xt@unifiedmicro.com. Please put "RAS-4" in the subject line for the fastest response.

Schematic



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