

Review: The Ameritron RCS-12C Controller and RCS-10/12 Remote Relay Box
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Introduction

Automatic band decoders read your transceiver's band data or frequency information and output DC control voltages to drive remote relays for automatic antenna selection. The Ameritron RCS-12C controller (Photo A) has some interesting and useful features not found elsewhere. And while it can be used with all external relay boxes, only the Ameritron RCS-10/12 remote relay box (Photo B) is discussed in this review.



Photo A: RCS-12C Controller



Photo B: RCS-10/12 Remote Relay Box

The RCS-12C Controller

The RCS-12C reads Yaesu ABCD TTL band data, Icom band voltage or Kenwood RS232 serial frequency information and provides DC output voltages to control external relays. Supplied accessories include a MFJ-1312D AC adapter, and 6-foot DB9 M/F and 3-foot DIN8 pendant cables. If you build your own cables, the DB9 cable may be cut in half to provide a DB9 female pendant cable for the RADIO INPUT, and a DB9 male pendant cable for the AUX INPUT or AUX OUTPUT. The DIN8 cable is provided so you can splice-in the remote relay interface cable length needed for your set-up. The MFJ-1312D AC adapter provides 12VDC at 500ma which supports most remote relay boxes. However, you can connect external +12VDC to +30VDC power to the RCS-12C 2.1x5.5mm DC power jack if a higher voltage or higher current remote relay box is used.

Note: While Ameritron sells RADIO INPUT cables for most transceivers, the RCS-12C does not currently support automatic switching with Kenwood TS-480 or TS-2000 transceivers. Check with Ameritron for the latest status.

Internal strapping provides some station-specific choices. One strap lets you set the output relay control voltage format to 3-line BCD (default), 4-line BCD or 1-of-8 (all +12VDC to +30VDC at up to 1.5 amps). A second strap connects the input voltage directly to the output control voltage driver transistors (default) which is current limited by the 1.5 amp input fuse, or selects an in-line active 0.8 amp current limiting circuit. The MJF-2955 output drive transistors can handle 10-amps, so the input fuse provides adequate protection. But if you accidentally short an output occasionally, the current limiting circuitry will keep you from blowing the fuse. There is a 1.5V drop across the

current limiting circuit so if the voltage at your remote relay box is marginal, keep the active current limiting strapped out. The last strapping option sets the AUX OUT connector format for band data in 1-of-8 format (default), or the current antenna selected.

On the RCS-12C front panel (Photo A) a MANUAL/AUTO switch selects either manual control of each output via pushbutton switches, or automatic antenna selection when an interconnected transceiver changes bands. Red LEDs indicate the antenna selected, and a yellow LED indicates when the transceiver is keyed.

On the rear panel of the RCS-12C (Photo C) you'll notice the RADIO KEY IN and AMP KEY OUT phono connectors. The transceiver-to-amplifier amp-key line passes through these connectors letting the RCS-12C prevent antenna relays from being switched while the amplifier is keyed. And while the relays are switching, the RCS-12C will delay amplifier keying (50ms default) allowing the relays time to switch and settle. This feature can save antenna relays and even amplifiers during the heat of a contest, especially when multiple operators are frequently changing bands and/or antennas.



Photo C: The back panel of the RCS-12C controller

The RADIO INPUTS DB9M connector pins are associated with band data, band voltage, or serial band data from your transceiver. Your transceiver's amp-key output may be connected to this connector if this output is included in the transceiver's band data connector. Normally you'll use the RADIO KEY IN connector if there is a separate amp-key output on your transceiver. The AUX INPUTS DB9F connector can be used for remote manual or computer control of the RCS-12C. The AUX OUTPUTS DB9F connector provides a TTL 1-of-8 data output and transmit output indication for controlling other devices. And finally the TO RELAY BOX DIN8 connector provides 3-line BCD, 4-line BCD or 1-of-8 outputs normally used to control an external relay box.

The RCS-10/12 Remote Relay Box

The RCS-10/12 (Photo B) provides one RF input port and eight relay-switched antenna ports, and handles 1500 watts from 1.8-50 MHz. A 3-line BCD control format selects the eight ports, requiring just three control wires and one ground wire with a maximum control current of less than 160mA per conductor. None of the RF ports are grounded when unused, but the ANTENNA 1 port is always connected to the input RF port when power is removed. So a shorting plug on the ANTENNA 1 output provides a hard short to the main antenna feed when you turn off the controller.

Using the RCS-12C

Start by building or buying cables for transceiver- and remote relay box-interfacing, and set the relay control voltage strap to match your remote relay box interface requirements. Next you'll program the RCS-12C. All antenna indicator LEDs flash sequentially when no antenna is programmed for a given band. To program the desired antenna, simply select the band on your transceiver and then hold the correct antenna-select pushbutton on the RCS-12 for two seconds. You can assign up to eight antennas to any band by holding other RCS-12 pushbuttons for the required two seconds. If you assign more than one antenna to a given band, the last antenna used on that band is automatically selected, and the LED or LEDs associated with the other antenna(s) will flash. Select any other programmed antenna on that band by pushing the appropriate antenna button. You can remove a programmed antenna from any band by selecting that antenna and then holding in that pushbutton for two seconds.

I use two transceivers with the RCS-12C. The first is an Icom IC-706MKIIG. Ameritron sells a cable for this interface (Ameritron DB-13D), but the information in the manual made it easy for me to make the cable. The only issue is that the Icom band voltage output is the same for 15- and 17-meters, and for 12- and 10-meters. All other bands including 30- and 6-meters are individually recognized. I programmed both a 20/15/10 meter trap dipole and a 17/12 meter trap dipole into both the 15/17- and 10/12-meter positions on the RCS-12C. The last antenna used is automatically selected when I go to either 15/17-meters or 12/10 meters.

My main transceiver is an Elecraft K3. The RCS-12 manual doesn't address the K3, but the Elecraft K3 Accessory Connector provides BAND 0, BAND 1, BAND 2, and BAND 3 outputs that are exactly compatible with the Yaesu ABCD band data outputs. However, you must incorporate the Elecraft TTL modification if you have an early K3 as early K3 radios only had open-drain band data outputs. Finally, I used the K3 amp-key phono output rather than the K3 Accessory Connector pin 10 KEY OUT.

My K3-to-RCS12 cable wiring is shown in Figure 1, and the parts needed are listed in Table 1. I elected to build my own cable rather than use the DB9 M/F cable supplied with the RCS-12C. To interface to the RCS-10/12 relay box, I bought a DIN8 plug and made this cable as well. I used CAT5 cable for both cables.

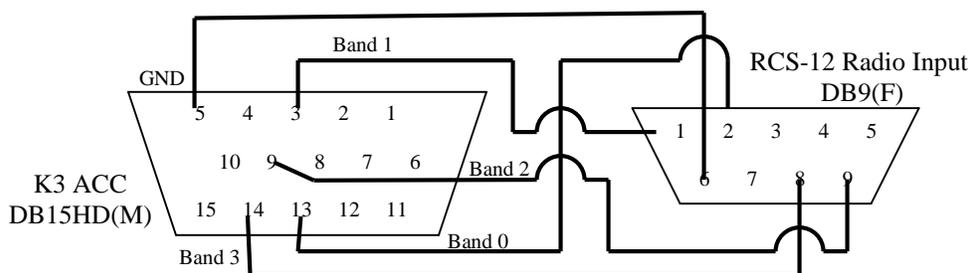


Figure 1: Elecraft K3 to RCS-12 cable. The connectors are viewed from the solder pin side.

Table 1: K3/RCS-12 and RCS-12/Relay Box cable parts

<u>QTY</u>	<u>Description</u>	<u>Source/Part Number</u>	<u>Price ea.</u>
1	HD15 Plug	Mouser 156-1815-E	\$1.80
1	DB9 Receptacle	Mouser 156-1309T-E	\$0.66
2	DB9 Hoods	Mouser 156-2009-E	\$0.65
1	DIN8 Plug	Mouser 171-0278	\$0.74
Miscl. CAT-5 cable, length as needed			

My four antenna coax runs feed through the wall into my ham shack so I mounted the RCS-10/12 relay box under my operating bench. A shorted PL-259 plug on ANTENNA 1 shorts the radio input to ground when power is removed. A high power dummy load connects to ANTENNA 8 and is programmed into all band positions along with the appropriate antenna selections so I can quickly select the dummy load on any band.

Once all antenna connections were programmed into the RCS-12C, I found operation to be a “no brainer”. All I do is change bands on my transceiver and the proper antenna is automatically selected. Pretty neat!

How about voltage transient protection?

For outdoor relay box applications Ameritron sells the RCS-12L which consists of the RCS-12C controller with the RCS-10/12L relay box which has 1500V gas discharge tubes across each of the antenna ports. However, there is no transient voltage protection for the RCS-12C controller 90-volt rated output driver transistors (and Ameritron recommends that you disconnect the DIN8 cable from the RCS-12C when it is not being used). A good way to protect the RCS-12C is to use relay isolation. Figure 2, Photos D & E, and Table 2 detail a voltage transient protection box I built. As you can see, all relay DC control voltages are completely isolated from the RCS-12C controller, and a transient voltage protection diode and gas discharge tube even provide protection for the DC relay voltage input. I power the RCS-12C from my station power supply, and provide the relay voltage from the MFJ-1312D AC adapter to provide even more isolation. I used three relays and a 5-pin DIN plug/jack for the relay box interface since the RCS-10/12 uses 3-line BCD control and only four control/ground wires are needed. For 4-line BCD or 1-of-8 control, you’ll need 4- or 8-relays and/or a higher density connector set. In any case, this is inexpensive protection that will give you some peace-of-mind.



Photo D: Inside view of protection box



Photo E: Outside view of protection box

Conclusion

If you've been considering an automatic remote switch controller, take a look at the Ameritron RCS-12C. Its ease of programming, ability to drive most external relay boxes, ability to assign multiple antennas per band, and amplifier and relay hot-switch protection makes it worthy of your consideration.

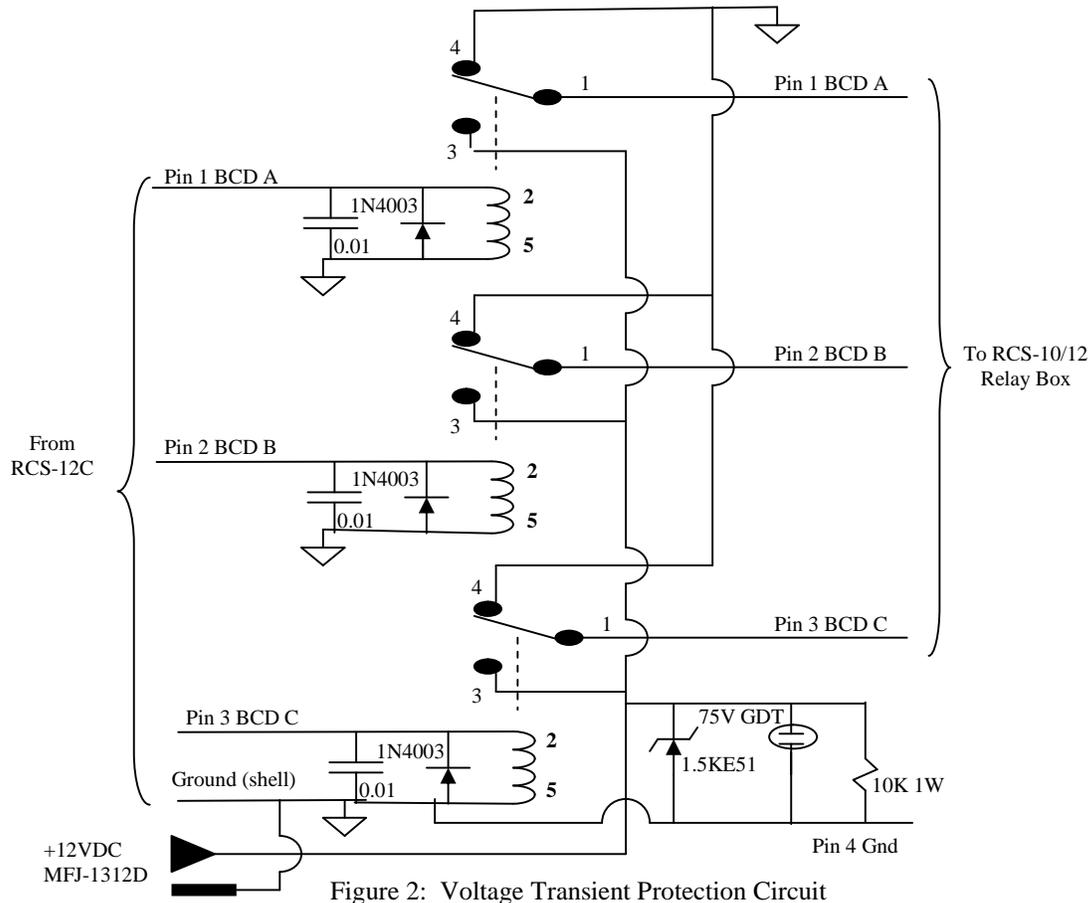


Table 2: Voltage Transient Protection Box components

QTY	Description	Source/Part Number	Price ea
3	SPDT 12V 10A relay	Mouser 653-G5LE-1-DC12	\$0.91
3	0.01µf 100V capacitor	Mouser 581-SR211C103KAR	\$0.12
3	1N4003	Mouser 863-1N4003G	\$0.05
1	DC Jack	Mouser 163-1060-EX	\$0.88
1	AL Box. 3.6x1.5x1"	Mouser 563-CU-5123	\$4.84
1	grommet	Mouser 534-730	\$0.12
1	5-pin DIN jack	Mouser 161-00005-E	\$0.82
1	5-pin DIN plug	Mouser 171-0275	\$0.69
1	10K 1-watt resistor	Mouser 594-5073NW-10K00J	\$0.16
1	51V 1.5KW transient diode	Mouser 625-1.5KE51CA-E3	\$0.46
1	75V gas discharge tube	Mouser 871-EC75X	\$1.41