

An HF Remote Base Using a Kenwood TKR-850, IC-7300 and an ARCOM RC210 Controller by Don L. Blanchard - WA7GTU Updated 9-07-20

Authors Note:

Over a period of years I have built eight RC210 controllers from kits. All have worked great. Ken has done a fantastic job with them. I don't think anyone has provided better support than Ken has. I personally own four of the RC210 controllers and built the others for near by amateur groups. One controls a repeater that is linked into another large linked repeater system (not using ARCOM's). Six have been put into use as controllers for Remote Bases starting with a MASTR II, then several Kenwood TKR-820's, then several using TKR-850's. All were interfaced to Kenwood TM-271A's or TM-281A radios. The eighth one was placed into service as an HF Remote Base using my home station, which was a Yaesu FT-857D. It worked just fine, but when Yaesu came out with the FT-991, I purchased one with the intent of using it with the HF Remote. As it turns out the FT-991 could not readily be made to work with the RC210. I then purchased the Icom IC-7300 and after a lot of work finally have it working at my home as an HF Remote Base. The information below is the results of my documentation of the project. And yes, I have a very understanding wife. She has been licensed for nearly 50 years and holds a General Class license, so I am a "Lucky & Old" guy.

Remote Base Interface Wiring

<u>RC210 Link - Port 1</u>		<u>TKR-850/NXR-810 Repeater (ACC)</u>	
Pin 1 – CTCSS Encode	Black*	NC	
Pin 2 – CTCSS Decode	Brown	24	CTCSS Output (Active High)
Pin 3 – PTT Out (Active Low)	Red	16	SEND (Active Low)
Pin 4 – Audio Out (10K Ohm)	Orange	9	TX Audio Input
Pin 5 – Audio In (10K Ohm)	Yellow	11	RX Audio Out
Pin 6 – Gnd Ref	Green	7	GND
Pin 7 – COR Input (Sel Pol)	Blue	25	SQL (Active High)
Pin 8 – Gnd Ref	White	19	GND
Pin 9 – Gnd Ref	Shield	12	GND Shield

*I decided some time ago to standardize on the above color-coding scheme on the DB-9 connectors. This way I know which wire is connected to which pin without having to take the hood off to check. The other end just connects to whatever is needed to make it work. The wire that I use is Belden 9538 and is a little over a dollar a foot, but I like it.

Please Note: The ARCOM RC210 Controller and the RLC Series of controllers use the same I/O pin out with the exception of Pin 1. ARCOM uses Pin 1 as a CTCSS Output to the transmitter and the RLC controllers use Pin 1 as a Ground. By not connecting Pin 1, the cable can be used with either controller. There are still three ground wires without using #1.

<u>RC210 Link - Port 2</u>		<u>IC – 7300 (ICOM Provided ACC Plug)</u>	
Pin 1 – CTCSS Encode	Black*	NC	
Pin 2 – CTCSS Decode	Brown	NC	
Pin 3 – PTT Out (Active Low)	Red	3	ORG SEND (Active Low)
Pin 4 – Audio Out (10K Ohm)	Orange	11	PINK MOD Input
Pin 5 – Audio In (10K Ohm)	Yellow	12	L BLU AF/IF Audio Out
Pin 6 – Gnd Ref	Green	2	RED GND Red/Shield
Pin 7 – COR Input (Sel Pol)	Blue	13	L GRN SQL (Active High)
Pin 8 – Gnd Ref	White	NC	
Pin 9 – Gnd Ref	Shield	NC	

One additional cable is needed to control the IC-7300 with the ARCOM RC210 controller.

RC210 DB-25 (I/O Connector)
Pin 20 (Programming Signal)
Pin 25 (Ground)

IC-7300 Remote Plug
Tip
Sleeve
Ring – No Connection

Programming the IC-7300

The most challenging part of this whole project was programming the IC-7300. I am not an ICOM CI-V Guru so some of this might not be needed, but it is what is working for me. For the RC210 to be able to communicate with the IC-7300 to change frequencies you will need to press Menu, Set, Connectors, DATA MOD **USB**, ACC/USB AF SQL – **ON**, CI-V Baud Rate **9600**, CI-V Address **48h**, CI-V Transceive **ON**, CI-V USB Port Link to [**Remote**], CI-V USB-> REMOTE Transceive Address **48h**, USB Serial Function **CI-V**.

Programming the RC210

The very best way to program the RC210 is using ARCOM's RCP program, which is not free, but there are alternatives, including DTMF. I have included some of the commands below in the event that you might not have RCP available. My systems are quite basic and I have not yet found a need to write any macros although they are available.

Note: Some commands require that the controller be unlocked - other commands normally require that the controller be locked to function. **Exception:** Some normally locked codes can be activated in the unlocked mode by preceding the command with two Asterisks **. All Remote Base commands beginning with A7 DO NOT require the unlock code to function. Commands beginning with an asterisk DO require the unlock code or the Pre-Command prefix (See below). Most of the commands below are not necessary if you use the RCP Software to program the controller.

*5100 hhmss	Set Time	*5101 mmddy	Set Date
*1700	Say Time. Does not function until time is programmed.		
*1701	Say Date. Does not function until date is programmed.		
*2083x	Set Radio Type. Use "2" for ICOM		
1120	Port 1 Carrier Access		
*1121	Port 1 CTCSS Access		
*2109X	Pre Command Prefix. Allows the use of some commands that normally require the unlock code. Example: *2109A1 sets pre command prefix to "A1". I recommend that you use this – it really keeps things simple.		
*1300	Port 1 To Port 2 Off	Not really needed if you use A1 A10 below	
*1301	Port 1 To Port 2 On	Not really needed if you use A1 A11 below	
*2300	Port 2 To Port 1 Off	Not really needed if you use A1 A10 below	

*2301	Port 2 To Port 1 On	Not really needed if you use A1 A11 below
*A10	UnLink Port 1 & Port 2	Precede command with A1, if set
*A11	Link Port 1 & Port 2	Precede command with A1, if set

Example: A1 A11 Connects Ports 1 and 2. A1 A10 Disconnects Ports 1 and 2

The use of the RC210 memories is highly recommended, but individual frequencies and tones can be set as indicated below. Again, using the RCP program makes setting up memories very easy. If you need more than 10 memories, adding the Real Time Clock module gives you 30 more memories for a total of 40 plus some additional Macros.

A71x...x Remote Base Frequency. Example: A710072722 = 7.272 no offset
A710141952 = 14.195 no offset

A73x Mode Entry 1 = LSB, 2 = USB, 3 = CW, 4 = FM, 5 = AM

Programming the Kenwood TKR-850

There are some parameters that need to be set up in TKR-850 to make it work properly with the RC210 controller. In my case I use AUX 5 I/O pin 24 **TOR Active High** and AUX 6 pin 25 **COR Active High**. I set AUX In/Out 4 to **QT/DQT Enc Enable**. There are Version 1 and Version 2 repeaters. I believe that most of the differences are within the internal controller. Since we are not using the internal controller, they both work fine and there is no need to spend the extra money on a Version 2. The setup procedures and wiring diagram can also be found on the ARCOM site at:

http://www.arcomcontrollers.com/images/documents/rc210/rc210_tkr.pdf

If the repeater did not come with the 15 pin Molex connector, you might want to pick one up. The only thing that it does in this application is to jumper pins 9 and 12 together to provide speaker output to the front panel. I would recommend setting the repeater output power to 25 watts to protect the final transistor.

WA7GTU - HF Remote Base - Control Operator Guide 448.400 MHz - CTCSS - 100 Hz - Unlock Code (Zip Code makes it easy)

A10	Un-Link Port 1 & Port 2 (Must be in un-lock mode or use A1).
A11	Link Port 1 & Port 2 (Must be in un-lock mode or use A1).
A71x...x	Set Remote Base Frequency and offset. Examples: A710072722 = 7272 kHz No offset, A710141952 = 14.195 no offset. The last 2 sets No offset.
A73x	1 = LSB, 2 = USB, 3 = CW, 4 = FM, 5 = AM
*2086x	To program memories, enter frequency into radio using A71x...x

Unlock the controller and use *2086x. The (x) selects the memory location. Memories are stored in the controller. Ten memories are available in the controller, forty are available if you are using the RTC Module.

*1401 Interrogate Port 1 *1402 Interrogate Port 2
(Only available with Version 7.46 or later)

Zip Code Unlock Code # Lock Code

*21999 Reset Controller *29999 Version # (Unlock)

A7 Read Remote Base Frequency.

A75xx Select Remote Base Pre-Programmed Memories. (Examples)

01 - 7272 kHz	SSB	06 - 14.250 kHz USB
02 - 3902 kHz	SSB	07 -
03 - 3878 kHz	SSB	08 -
04 - 3920 kHz	SSB	09 -
05 - 5.00 MHz	AM WWV	10 - 10.00 MHz AM WWV

Using the WWV signals can give you a quick time check as well as an idea how propagation is working.

Additional Notes:

I have verified that this setup also works just fine with the newer version NXR-810 repeaters. Programming software is becoming an issue with Kenwood, but it is possible to "Wideband" the NXR-910 if you can get the proper software (KPG-129D_V150_CD). The KPG-129DN_V320_CD will not allow you to do "Wideband". Note: No "N" for the Wide-Band version.

It is possible to program one of the other TKR-850 Memories to the same frequency and settings but set it to use the Internal controller (Repeat). Changing to this channel would allow the repeater to remain operational in case the RC210 failed. You will need to program a couple of the Function Keys to change the channel. It would not have the features of the RC210, but it could remain operational. I also program the right-most button to open the squelch which is sometimes helpful. There is also a place to program a CW call when using the Internal controller.