

Pairing the Array Solutions EightPak and ShackLAN-4 Integrated Controller

We really needed an improved way to handle antenna switching for multiop contests at the K5KG shack. The station had expanded to two complete, independent stations sharing a common set of antennas. Doing a multi-single or a multi-two operation was a challenge because of the need to frequently change antenna feed lines from one station to the other. We tried using coax switches, but anything we tried was fundamentally inefficient from a contesting point of view, since it required manual operator intervention.

At one point, I borrowed an Array Solutions (www.arrayolutions.com) SixPak from K1XX, and its manual switching provided a breakthrough in antenna switching efficiency. The SixPak experience led to conversations with Jay, WXØB, at Array Solutions regarding the SixPak and the EightPak and the differences between the two. Jay pointed out that the EightPak uses newer technology that allows it to be controlled by programmable ShackLAN-4 (www.hamation.com) integrated controllers over a simple four-wire cable. I liked the simplicity of the cabling as well as the idea of programmable controllers that contain the guts of the BandMaster III band decoder, allowing switching to be driven by each radio's band data.

Although somewhat pricey, the EightPak/ShackLAN-4 integrated controller solution became my choice. With this setup, the operator no longer would have to switch antennas manually. When moving from band to band, the controllers handle antenna switching automatically, following the band data from each radio — an Elecraft K3 and a Yaesu FT-950 in the case of K5KG. I chose *not* to automate the switching of band-pass filters, since this would have increased the project costs.

While operators at both stations have automatic access to every antenna via the EightPak, a built-in safeguard insures that an antenna in use by one station is not available to the other. In addition the op can manually select any antenna on the controller, as long as that antenna is not in use by the other station.

The Overall System

The EightPak is connected via a four-

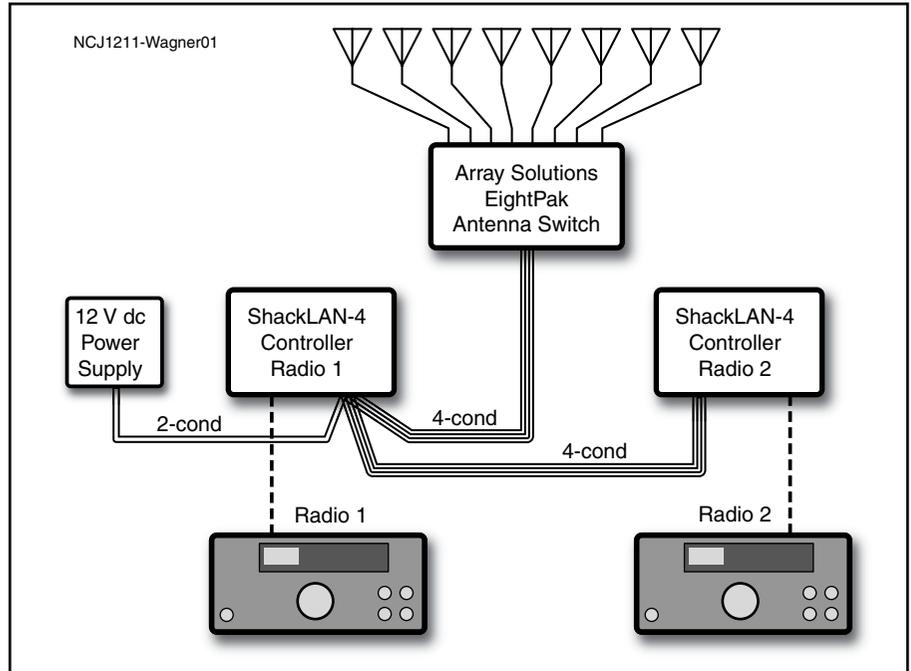


Figure 1 — Basic ShackLAN-4 system layout



Figure 2 — ShackLAN-4 connector wiring detail

¹Notes appear on page 29.

conductor cable to a ShackLAN-4 integrated controller for each radio (see Figure 1). If you use more radios, you can daisy-chain additional controllers off the EightPak. A 12 V dc source powers the controllers and the EightPak via two of the four conductors. Each ShackLAN-4 integrated controller is connected to its radio's band data port via a DB9 cable.¹ While the physical setup of the system is extremely simple, *programming* the controllers and the EightPak is more complicated.

Putting it Together

The instructions in this article are unique to the K5KG installation but essentially apply to any Array Solutions EightPak/ShackLAN-4 integrated controller setup. The first step is to connect the controller to the EightPak via a four-conductor cable, attaching the wires to the green connector block as follows: GND = black; A = green; B = white, and +12 = red. The 12 V dc supply connects between GND and +12 on the green connector block (see Figure 2). Connect the appropriate control cable for the specific radio model from the controller's RADIO port (DB9 male) to the radio's BAND DATA port.

The ShackLAN-4 integrated controller first must be programmed to recognize the radio's band data and to assign the controller to Radio 1 or Radio 2. Download and run the *Band Decoder* configuration software for the BandMaster III² from Array Solutions' Web site (www.arrayolutions.com/Products/bandmaster.htm). Follow these steps to set up the ShackLAN-4 integrated controller (it's not necessary to remove the ShackLAN-4 integrated controller from its case).

1. Plug in the green connector block to supply 12 V dc to the controller, but do *not* yet connect the four-conductor cable to the EightPak.

2. Connect a USB cable from the ShackLAN-4 USB port to a USB port on the computer that runs the *Band Decoder* configuration software.

3. For the Elecraft K3 and Yaesu FT-950, set the following parameters via the *Band Decoder* software:

- **Com Port:** Select the correct COM port. To determine which COM port to use, go to *Windows Device Manager* to see which COM port is associated with the USB serial port. Click on "Connect" when the correct COM port has been selected; the red "Disconnected" indicator will turn green and show "Connected."

- **Address:** 1
- **Model:** Band Data
- **Icom Addr:** (ignore)
- **Baud Rate:** 9600
- **Interface:** RS232-TTL
- **Radio ID:** Set up one ShackLAN-4 for Radio 1 and the other for Radio 2.³

- **Band Configuration:** Default Antenna 1 (all bands).

Click on "Set Radio." If the controller has been set up correctly, it will display the band to which the radio is tuned.⁴ Figure 3 shows the selector set to AUTO. The other eight switch positions may be used to manually select antenna ports 1 through 8.

It's necessary to program the EightPak to determine which band(s) will be connected to each of the 8 antenna ports. To do this, you must first remove the EightPak from its case. Then, connect the DB9 connector on the EightPak to a known COM port on the computer (our example uses COM3).

Download the *EightPak Switch Interface V2.1* program (*EightPak.exe*) from Array Solutions. The first time the program runs, the "Comm" and "Switch" indicators will be red (ie, *no* communication between the COM port and the EightPak). Select the

COM port in use (COM3 in this example). Then, select "Address 1," the address of the specific EightPak switch, and click on "Configure." Packet messages will scroll in the white window.

Once communication has been established between the computer's COM port and the EightPak, the "Configure" button will change to "Operate." The window will change to display "Messages" and "Antenna Selections." "Comm" and "Switch" will change to green,⁵ and messages will scroll in the black window.

Choose the antenna selections to match the bands to specific antenna ports. For an unused band (such 60 meters), set the antenna selection to "0." Click "Update Switch" and "Operate" to load the antenna selections into the EightPak (Table 1 show the antenna assignments programmed for K5KG).

Final Testing

To make sure the controller and switch work properly with each radio, disconnect the COM port cable from the EightPak, and connect each controller to its respective radio and to the EightPak. Turn on the 12 V dc supply. Change bands on each radio and make sure each controller's LEDs follow the band changes. As you change bands on the radios, listen for the relays clicking in the EightPak.

Check for continuity between the Radio 1 port and the corresponding antenna port on the switch. Check every band to make sure it will connect to the correct antenna port. Do the same for the Radio 2 port. At this point, you can put the EightPak switch back into its case and mount the switch in its permanent location.

As a final-*final* test, connect all antennas and check for proper operation with each radio. Key the transmitter with low power to make sure antenna selections are cor-



Figure 3 — Controller sitting atop an Elecraft K3, following the radio's frequency

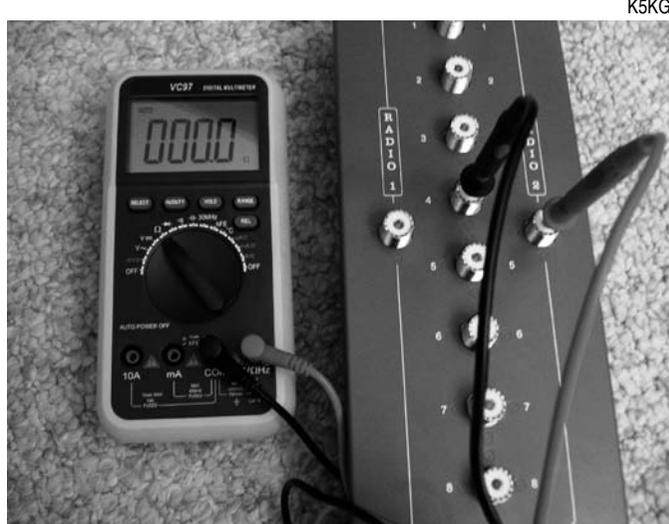


Figure 4 — Check continuity to ensure proper port selection.

rect and that there's no unexpected high VSWR on any antenna. If every selection appears to be correct, test each switch position at 100 W. Then, test each radio with an amplifier, if you use one.

Powering Down

When both radios are turned off, and no band data stream is being sent to the controllers, no antennas will be selected, and all antenna ports will be grounded. Removing 12 V dc from the EightPak switch and controllers also will ground all antenna ports.

The Acid Test

The maiden voyage for the EightPak system was the 2012 CQ WPX CW contest. Five ops (K1TO, K4LQ, K5KG, N4EEB, WD4AHZ, and WØBH) put the system to the test. I'm happy to report *no* failures of the EightPak or the automated controllers occurred. Every band change on both stations — and there were many — always got the correct antenna.

In addition there were no station failures; it was a flawless multi-two operation that ended with a score of 16.6 million points. The joy for me personally was that I did not have to switch a *single* coax cable during the entire contest weekend!

Acknowledgements

I'd like to acknowledge the patient and helpful assistance to this project from Larry, K7MI, of Hamation, and Jay, WXØB, and Bob, W5OV, of Array Solutions.

Notes

- ¹ On the K3, the band data appear on the ACC port. Set CONFIG, KI03 to "nor," so that band data will be present on the ACC port. Band data on the FT-950 appear on the 10 pin DIN connector.
- ² Do not attempt to use the *Bandmaster II* software, as I mistakenly did!
- ³ Once the controllers have been programmed, you'll have no way of knowing which is which. Label one controller "Radio 1" and the other "Radio 2" to keep from mixing them up.
- ⁴ In the AUTO position, the controller's LEDs display the band and *not* the antenna. In the manual switch positions, the controller's LEDs display the selected antenna.
- ⁵ Communication between the COM port and the EightPak is at 57,600 bps. The *EightPak Switch Interface V2.1* program (*EightPak.exe*) is programmed to run at this speed.

Table 1
Antenna assignments at K5KG

EightPak Port	Band	Position	Antenna
1	160	Auto	160 inverted L
2	40	Auto	40 meter Yagi
3	30	Auto	SteppIR Big Vert
3	12	Auto	SteppIR Big Vert
4	20	Auto	C31 Yagi
4	17	Auto	C31 Yagi
4	15	Auto	C31 Yagi
4	10	Auto	C31 Yagi
5	80	Auto	80 meter inverted V
6	10	6	10 meter monoband Yagi
7	n/a	7	Unused
8	60/6	8	Dummy load



Figure 5 — The completed installation



Figure 6 — K5KG and second op in his comfortable shack

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