REMOTE CONTROL OF AN HF STATION OVER THE INTERNET

WN3R started in 2007 to remote control his SO2R 2KW station with multiple antennas. Big Mistake.

2007 was a long time ago

- WN3R, an SO2R station that was too complex to operate locally much less remotely.
- Remote controlling two 2KW stations was scary, overwhelming and never successful.
- Internet connections to the mountain location were limited: dial up, satellite, EVDO cellular.
- Internet was slow and unreliable with very long latency times.
- Lacking integrated remote switching systems.

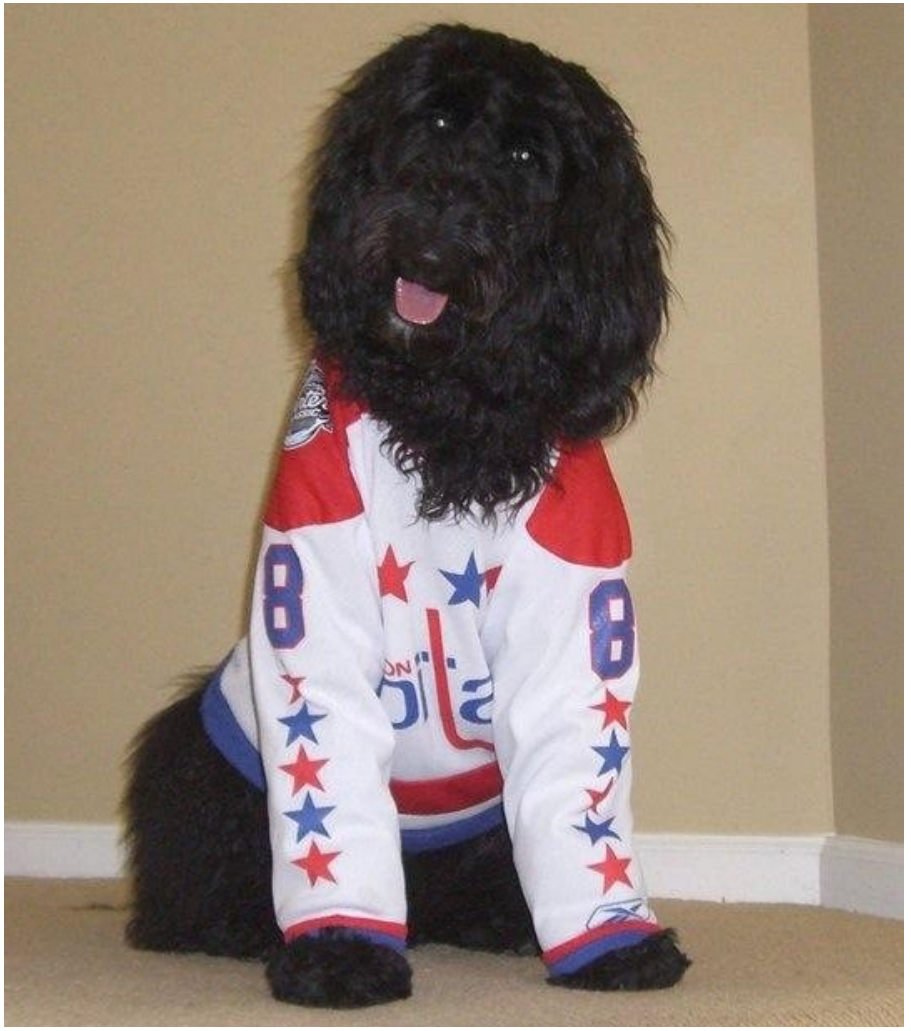
Fast Forward to 2011

- Our 4 mile section of Gambrill Park Road finally received COMCAST broadband
- With reliable internet connectivity, it was time to revisit remote control operation.
- www.RemoteRig.com equipment allowed easy (but not very satisfying) remote operation of an IC-706 with a single HF wire doublet with HA-4 automatic tuner. A dual band V/UHF stick covered 144 and 440.

706 w/Remote Rig (2011)

Human Side

Radio/Antenna Side



Chief Operator – “Wally”

Wally is also a Caps fan.
(He was the only grandchild who showed an interest in radio)

My Concerns

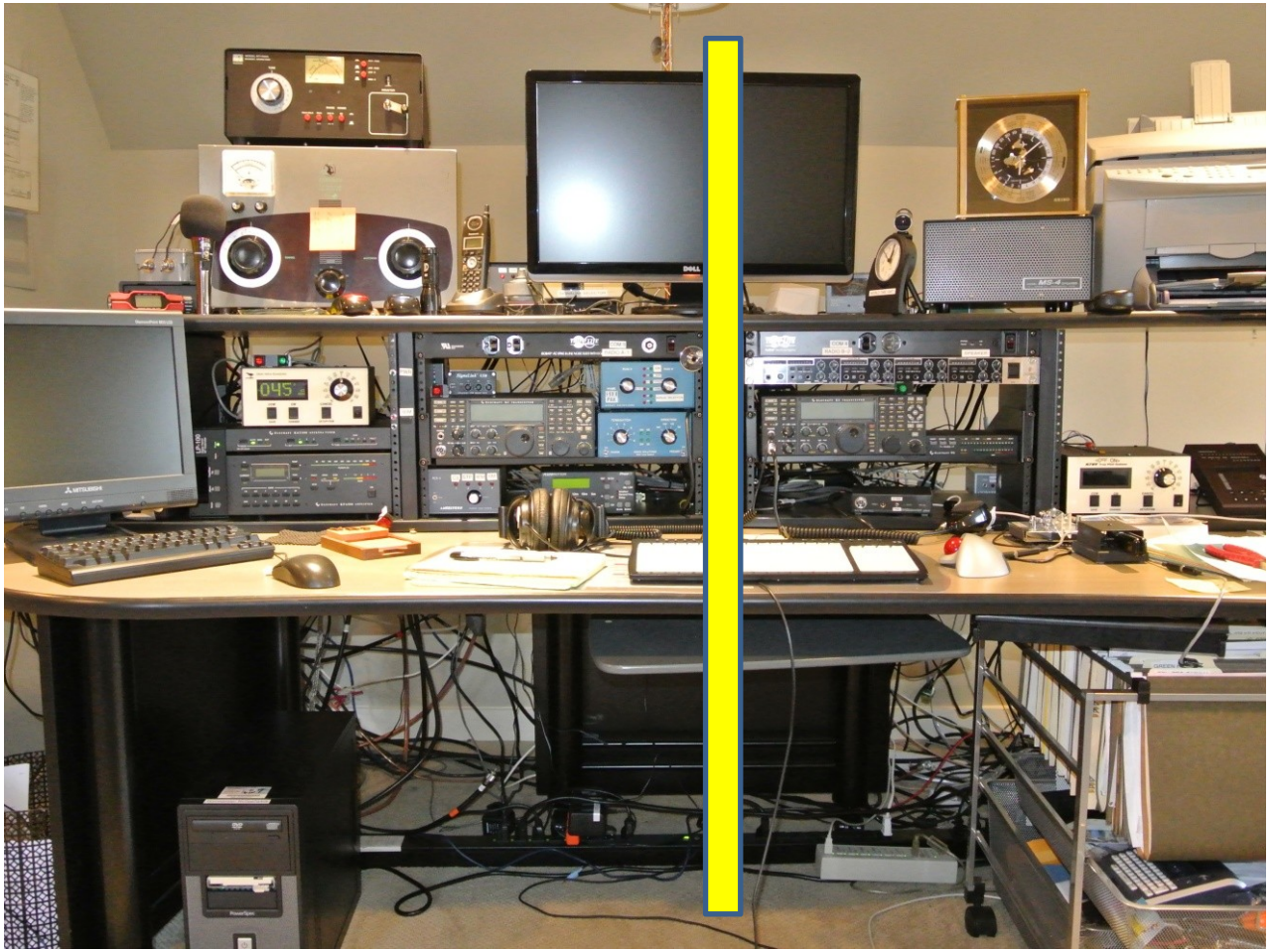
- PC’s are 100% unreliable – freeze up
- Site is UNATTENDED – No one to save the day
- Remote site is an hour away
- Very complex antenna selection scheme
- Controlling amplifiers remotely is frightening
- Too many serial ports on PC can be unreliable
- Generic remote control software can be problematic when using SW defined radios

Remote Control – WHAT?

- K-3
- Antenna Tuner
- Amplifier
- Rotator
- 4-Square Direction
- Yagi Direction
- Antenna Selection – Yagi(s), Dipoles, 4-Square, Inverted-L
- Computer Reboot
- Station AC Power
- SWR Monitoring with HI-SWR automatic shut down
- Station PC (Win 7) and Remote PC (Win XP) -TeamViewer

Fast Forward to 2013

- Elecraft integrated its K-3, Tuner, and 500W amplifier with RemoteRig for remote operation
- Green Heron perfected it’s GH Everywhere system
- My antennas were now selected using remote coax switches. A remote control nightmare
- The dream of SO2R was abandoned



Remote station on left / Local station on right

Please don’t let your eyes drift to the mass of wires behind the gear, desk and on the floor. There is a reason they called it wireless. At least that’s what it was called in the early years.


DELL
MITSUBISHI
045
PowerSpec

Remote Control Setup in Rockville

Yes, each golf ball is another golf course.


ELECRAFT K3 TRANSCEIVER
373000
acer
SONY


W1EZM
K6GIG
W1VI
W9GVR
W3
W3AAU
K9BBC
K4DNW
K4LFZ
W4GXB
W4DRM
W5DYL
W3BBM

My 1958 Novice Station

No, I did not have a VFO in 1958.

The 1959 AM Station

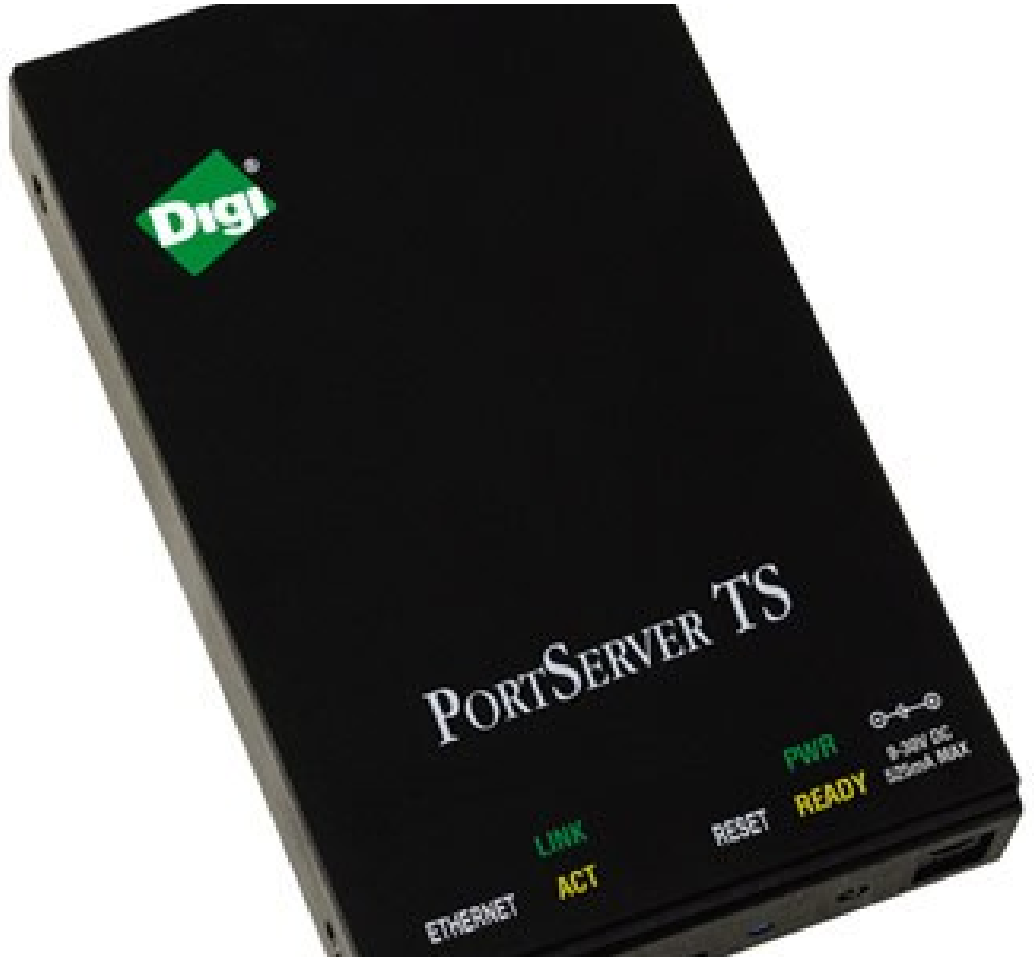
Yes, it all works like new

1970’s Station

On 40 meters the KWM-2A transmits on 3 frequencies simultaneously. I would like some help getting it working properly.

Green Heron Everywhere System

Connects via USB to a dedicated remote PC running a fresh copy of XP. The GH Rotor controller connects to the same PC. The two boxes communicate only with each other using dedicated and internal Wi-Fi radios. The white relay box is designed to be located outside closer to remote antenna switches



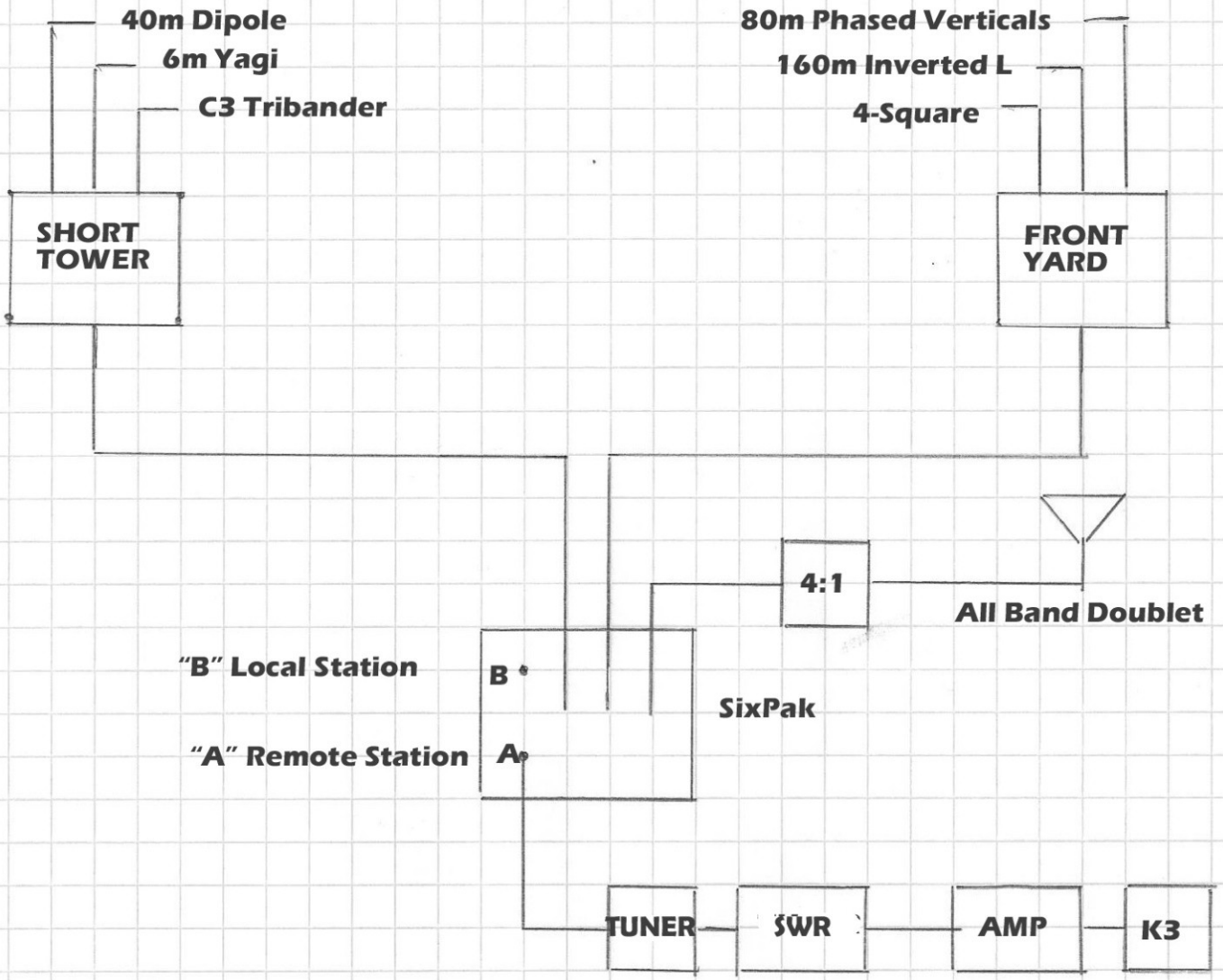
The Secret Sauce – Key to Reliability

Remote controlled ham stations depend more on serial RS-232 connections than on USB. After many tries at adding serial ports to my PC and having them freeze up, a $50 (on eBay) DIGI PortServer solved the problem. Ethernet to 4 serial ports without a computer. Commercial quality – rock solid.

Controlling a remote coax switch was a challenge

How in the world do you remotely turn a ***rotary switch*** on the tower mounted remote antenna switch? One relay box is in the shack; the other two are outside-powered through the coax.


TRIPP LITE
POWER PROTECTION
COM 3
RADIO A–1
ISOBAR® AC SPIKE & LINE NOISE FILTER WITH ISO
MINI-BREAKER
PRESS TO RESET
PWR
80M
SignaLink™ USB
Integrated USB Sound Card
Radio A
Radio B
30M
80M
TOWER
160M
MANUAL SELECTION
SIX PAK
ARRAY SOLUTIONS
ELECRAFT K3 TRANSCEIVER
TERMINATION
DIRECTION
NW
NE
SW
SE
POWER
PREAMP
ARRAY SOLUTIONS
K9AY Loop System
RCS-4
C3
STP
40M
6M
AMERITRON
remote coax switch
FLUIDMOTION
SteppIR
20m
17m
15m
12m
10m
6m
Bi-Dir
On / Off
Amateur
General Freq
Setup
UP
DN
Mode
Select



ANTENNA SWITCH PATHS

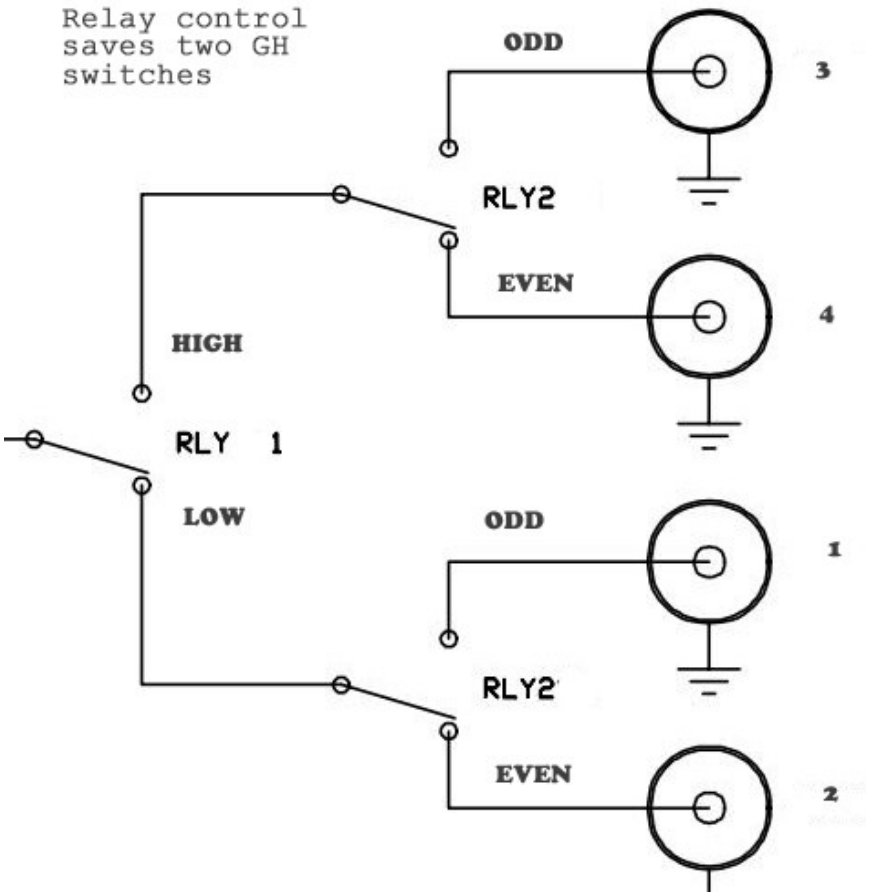
Array Solutions SixPak

This is how antennas are shared between two stations. The first radio to capture an antenna wins. Unfortunately, no indication who won if both switches are left on the same one. This problem is solved with GHE.

It takes 4 GH switches, but I didn’t have but 2

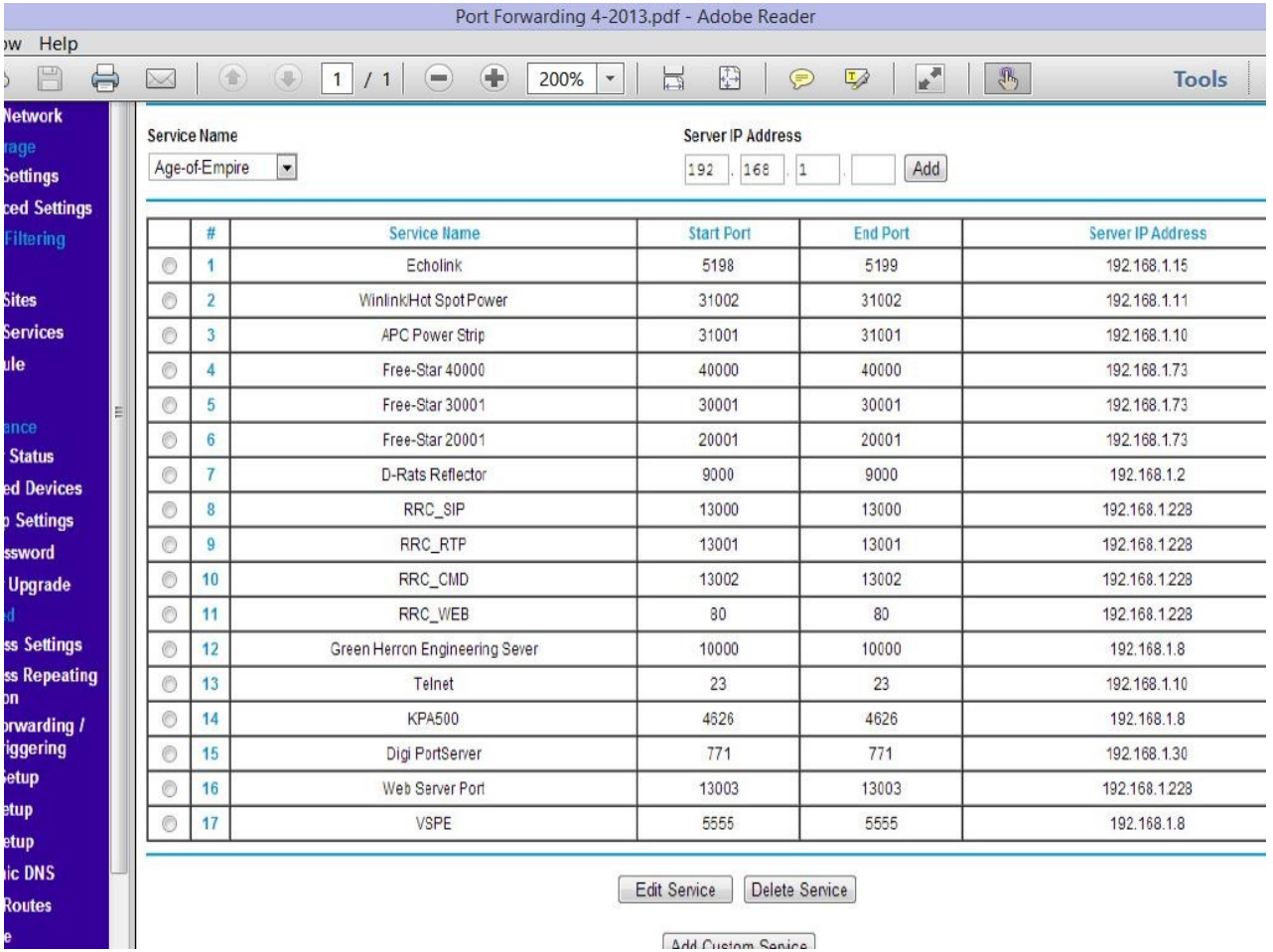
This was clever, even if I do say so myself. Next slide shows the solution.

Note the connector block on the top right. One GH switch powers the ODD/EVEN relay 1-3, 2-4. An the other selects HIGH/LOW: 3-4, 1-2.



Look familiar?

This is the same circuit as the tower mounted remote coax switch.



There's more to come but I didn't want to forget…

The magic to controlling a station over the internet is to **PORT FORWARD** to all the devices: AC power strip, DIGI Port Server, Green Heron switcher, Telnet, VSPE, RemoteRig, Telnet, KPA500, etc.

Service Name: Age-of-Empire

Server IP Address: 192 . 168 . 1 . [ ] Add

	#	Service Name	Start Port	End Port	Server IP Address
○	1	Echolink	5198	5199	192.168.1.15
○	2	WinlinkHot Spot Power	31002	31002	192.168.1.11
○	3	APC Power Strip	31001	31001	192.168.1.10
○	4	Free-Star 40000	40000	40000	192.168.1.73
○	5	Free-Star 30001	30001	30001	192.168.1.73
○	6	Free-Star 20001	20001	20001	192.168.1.73
○	7	D-Rats Reflector	9000	9000	192.168.1.2
○	8	RRC_SIP	13000	13000	192.168.1.223
○	9	RRC_RTP	13001	13001	192.168.1.223
○	10	RRC_CMD	13002	13002	192.168.1.223
○	11	RRC_WEB	80	80	192.168.1.223
○	12	Green Herron Engineering Sever	10000	10000	192.168.1.8
○	13	Telnet	23	23	192.168.1.10
○	14	KPA500	4626	4626	192.168.1.8
○	15	Digi PortServer	771	771	192.168.1.30
○	16	Web Server Port	13003	13003	192.168.1.223
○	17	VSPE	5555	5555	192.168.1.8

Edit Service Delete Service

Add Custom Service

Port triggering mon
address of the com
forwarded to the trig

Using the Port Forw
different services (f
CU-SeeMe).

Port forwarding is d
from the Internet ar

Port triggering allow
Internet games.

Port Forwarding

For the services, ap
address. Otherwise
by clicking the **Add**

Port Assignment

You can make up to
you can select a se
with the software or

For Internet Servic

Before starting, you
provide those servi

To set up a comput

1. Select the In
2. Type the IP
3. Click **Add**.

Note: You might ha
service, and type th

For Internet Games

Before starting, you

Technical Keys to Remote Control

- Proper Router Configuration
- Reliable Broadband connectivity
- Static IP Address / Service
- Well integrated radio hardware
- Properly designed application software
- Good support from providers
- A good comprehensive plan
- Friends who have been there before you
- Lots of free time
- TEST – TEST – TEST – TEST AGAIN

Get a **Static IP** Address - My**StaticIP**Address.com
www.my**staticip**address.com/
Static IP Addresses for your home or office computer.

Intuit® Merchant **Services** - intuitpayments.com
www.intuitpayments.com/Merchant-**Service** 1 (877) 890 0182
Intuit® Merchant **Services** - Site! Take Credit Cards in QuickBooks Now
QuickBooks Desktop Users - Process Credit Cards - QuickBooks Online Users

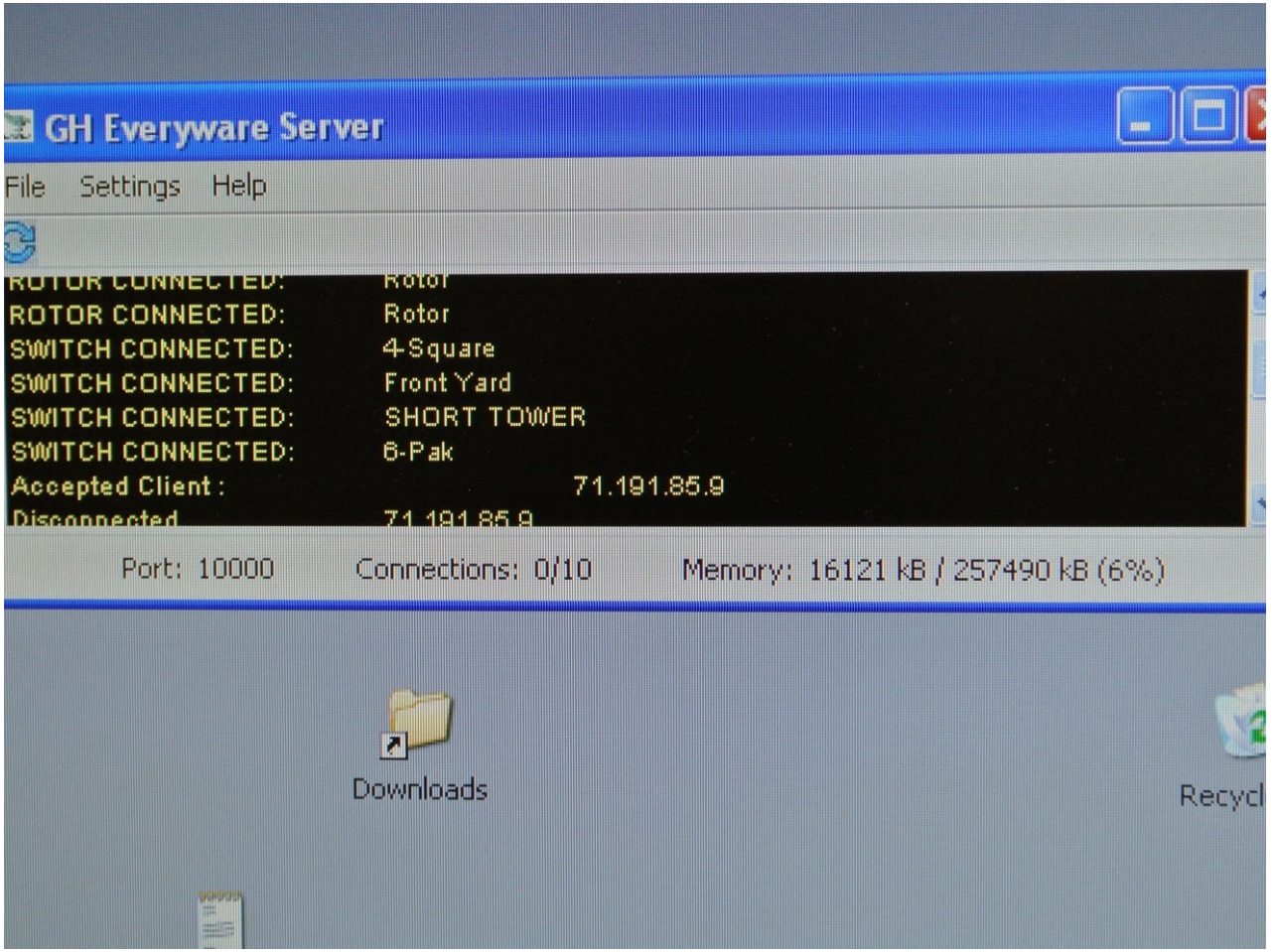
No-**IP**: Free Dynamic DNS - Managed DNS - Managed Email ...
www.noip.com/ No-IP
Free Dynamic DNS and Managed DNS Provider trusted since 1999 with 100% uptime history. Our Free DDNS **service** points your dynamic **IP** to a free **static** ...
Sign In - Sign Up - Download - Why Us?

Static IP Hosting | Tackle Your Advanced Hosting Needs - GoDaddy
www.godaddy.com/ssl/**static-ip**.aspx Go Daddy
Get a dedicated **IP** address for your hosting account today. We have the control you need for all of ... Professional **Services** · Web Design **Services** · eCommerce ...

Dynamic DNS: Bridging The Gap Between Dynamic & **Static IP's** | Dyn
dyn.com › Blog Home › DNS Traffic Management Dyn
Aug 7, 2012 - In this example, each VPN Gateway is provided with **Static IP** addresses. ... the connection problem, leading to expensive on site **service** calls.

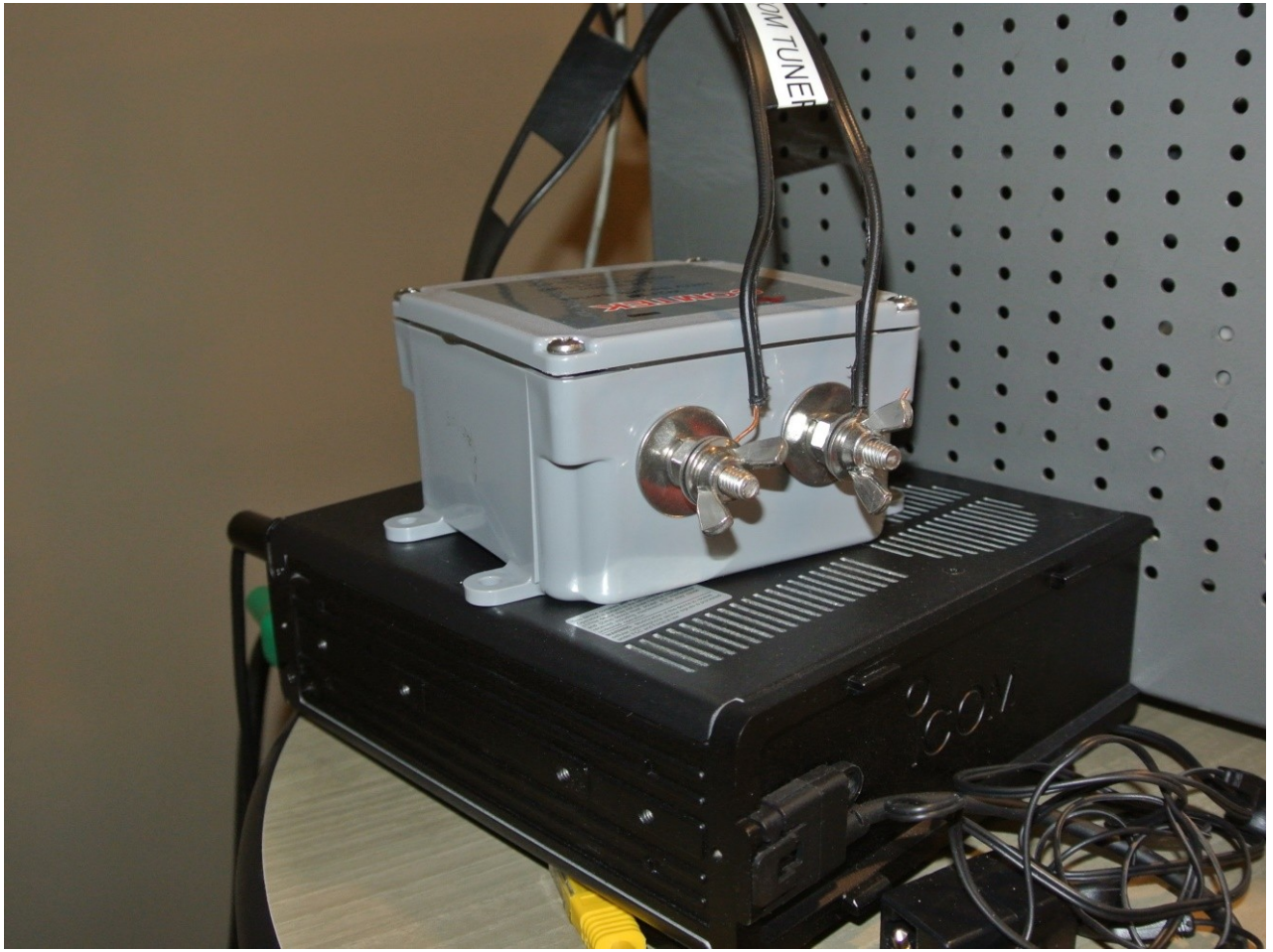
Static IP | High Speed Internet | Optimum Online Business
www.optimumbusiness.com › Optimum Online
Call 1-866-580-1559 to order **Static IP** from Optimum Business for high speed ... SIP Trunking can save you up to 50% over traditional T1-based **services**.

Free Dynamic DNS, **Static** DNS for Dynamic **IP**



The shack PC is dedicated to Green Heron

Green Heron Everywhere controls the Rotor, 4-Square, Front Yard coax switch, Short tower coax switch, and the Array solution 6-Pak to switch the radio to the right antenna directly or to the remote coax switches.

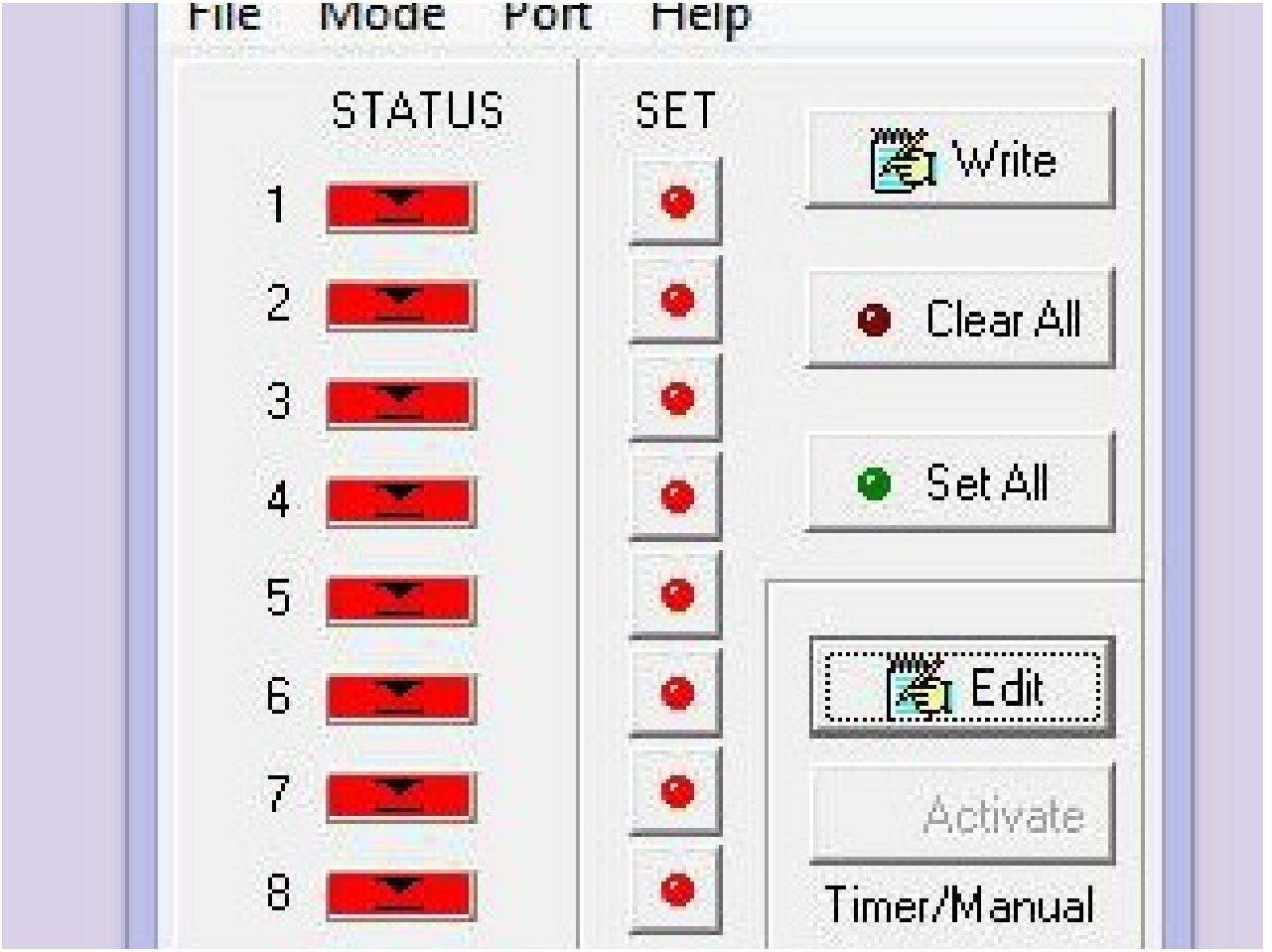


This is the 4:1 balun for the 80 Meter Doublet

The new Elecraft tuner is between the amplifier and all of the antennas. There is an LP-100 SWR meter with HI-SWR cut off between the amp and the tuner. No chance of destroying the amp or tuner.

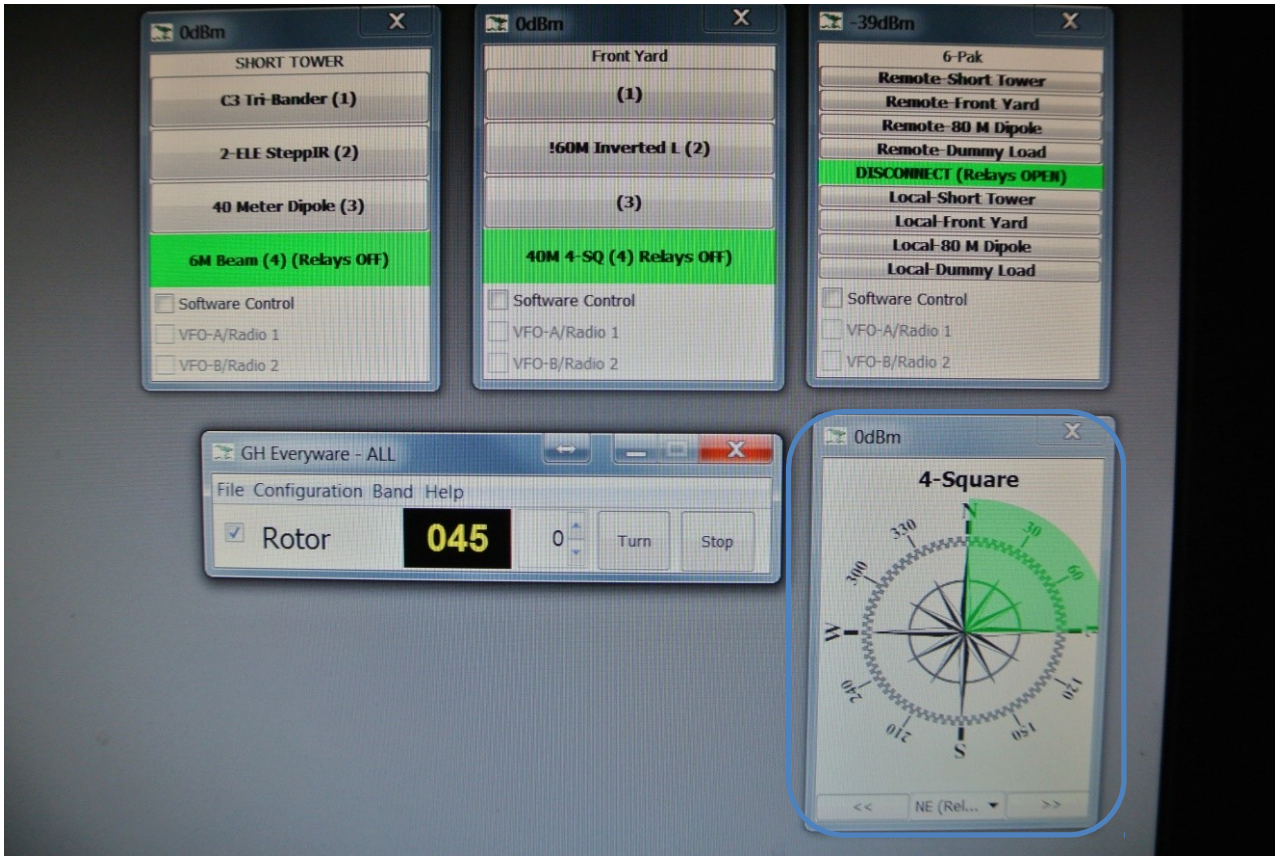
The expensive stuff

Dedicated PC. SWR Meter, 500W amplifier, tuner, rotator control box



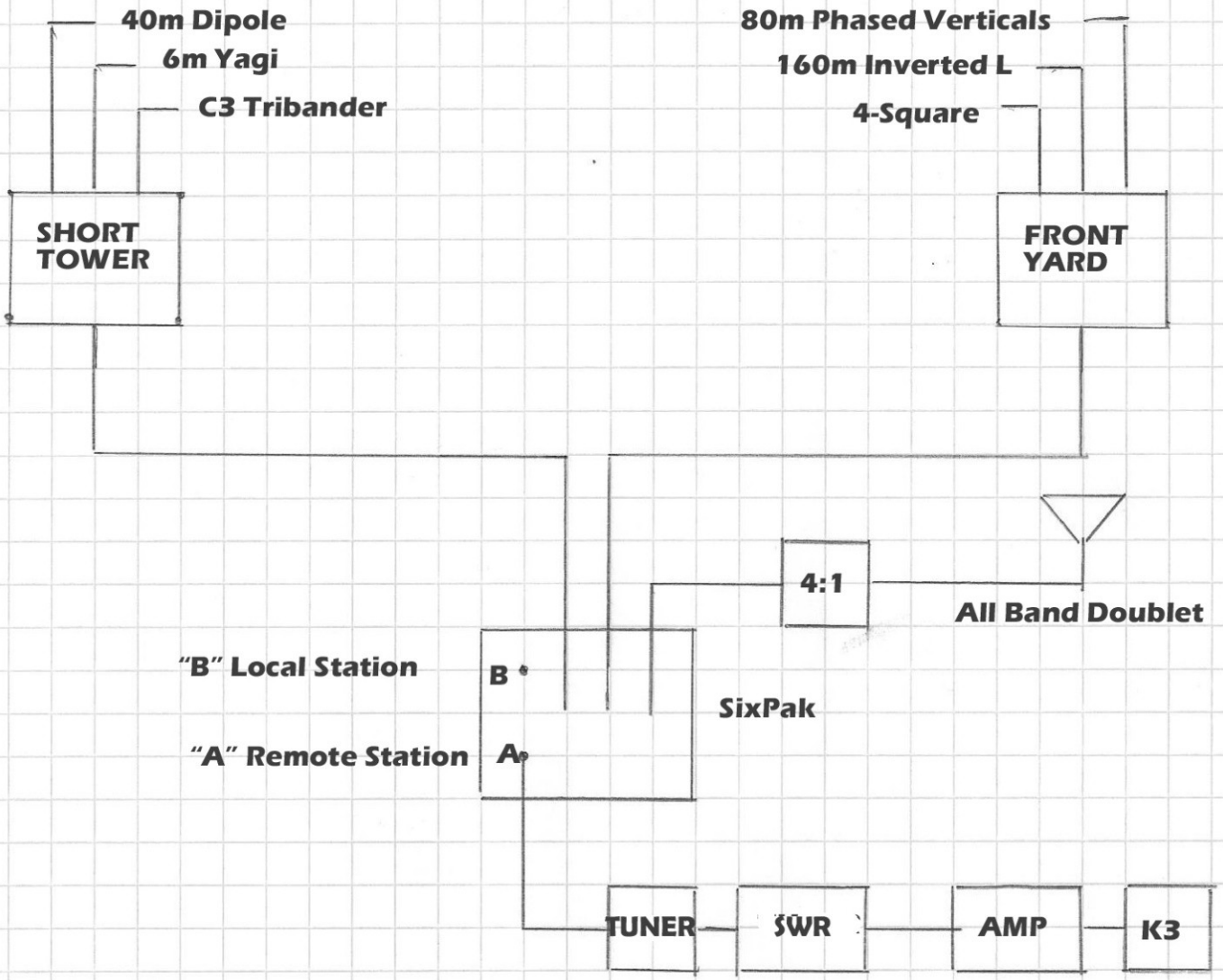
Typical Application to control a Generic USB Serial Board

This was my first attempt at trying to select antennae, etc. I even wrote a basic program which operated several switches in a single command, but I never figured out how to remotely indicate the status of each switch. My feedback on settings was a webcam. The hams at GHE did it right.

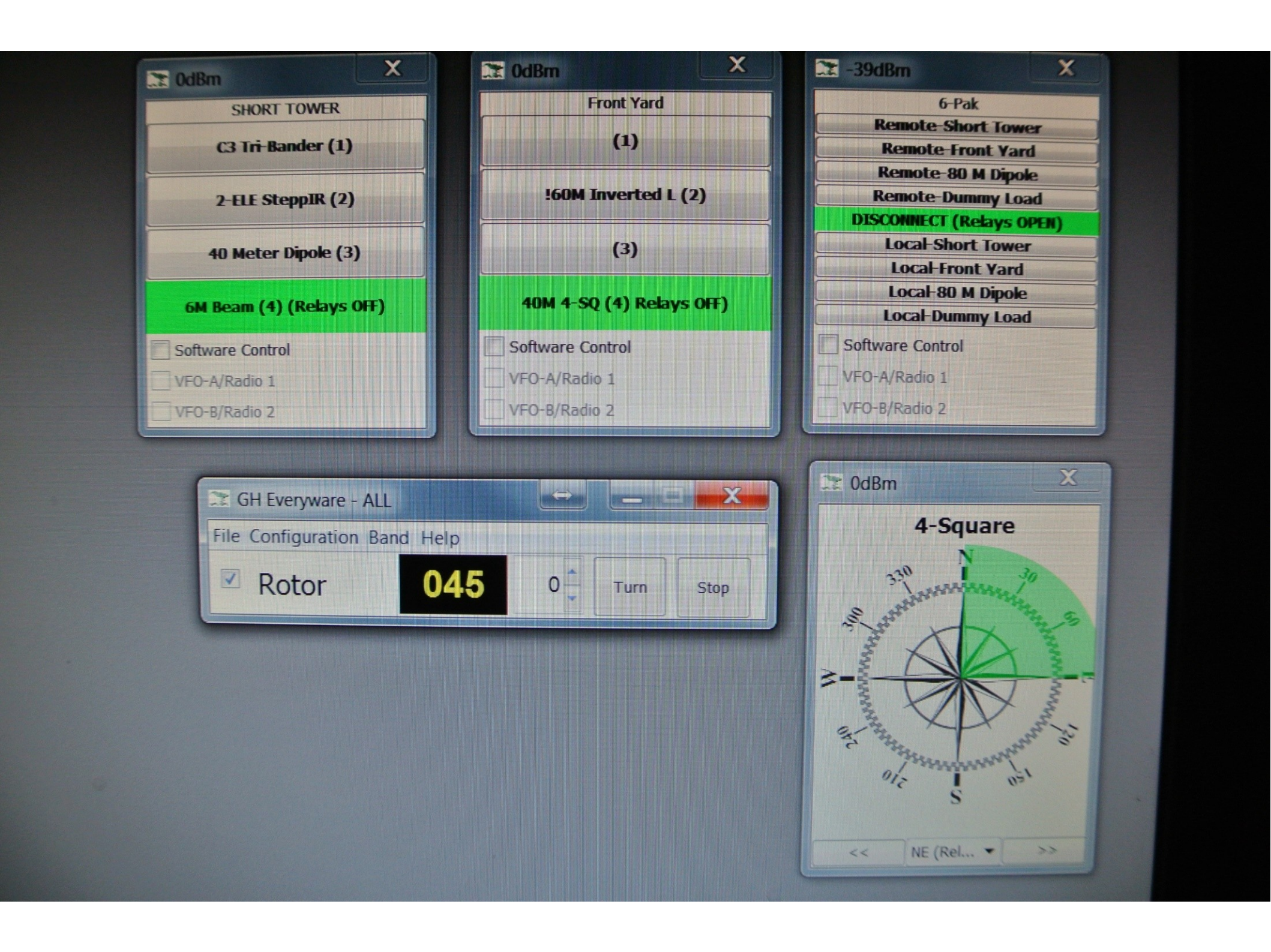


REMOTE STATION SCREEN – GH CONTROL S/W

Next slide will show how 4 directions are controlled with just 2 switches



ANTENNA SWITCH PATHS


0dBm
SHORT TOWER
C3 Tri-Bander (1)
2-ELE SteppIR (2)
40 Meter Dipole (3)
6M Beam (4) (Relays OFF)
Software Control
VFO-A/Radio 1
VFO-B/Radio 2
0dBm
Front Yard
(1)
!60M Inverted L (2)
(3)
40M 4-SQ (4) Relays OFF)
Software Control
VFO-A/Radio 1
VFO-B/Radio 2
-39dBm
6-Pak
Remote-Short Tower
Remote-Front Yard
Remote-80 M Dipole
Remote-Dummy Load
DISCONNECT (Relays OPEN)
Local-Short Tower
Local-Front Yard
Local-80 M Dipole
Local-Dummy Load
Software Control
VFO-A/Radio 1
VFO-B/Radio 2
GH Everyware - ALL
File Configuration Band Help
Rotor
045
0
Turn
Stop
0dBm
4-Square
N
30
60
E
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150
S
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240
W
300
330
<<
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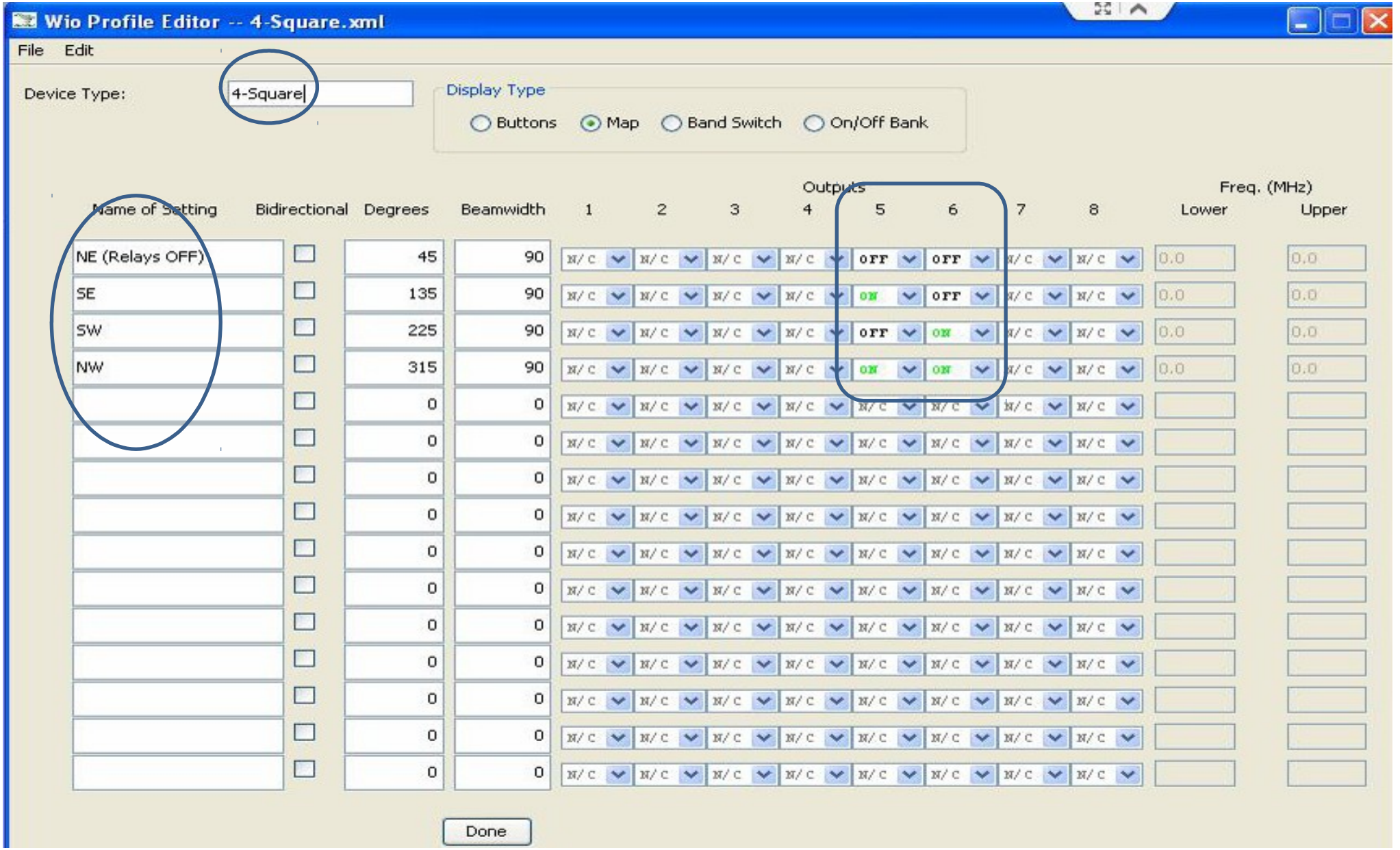
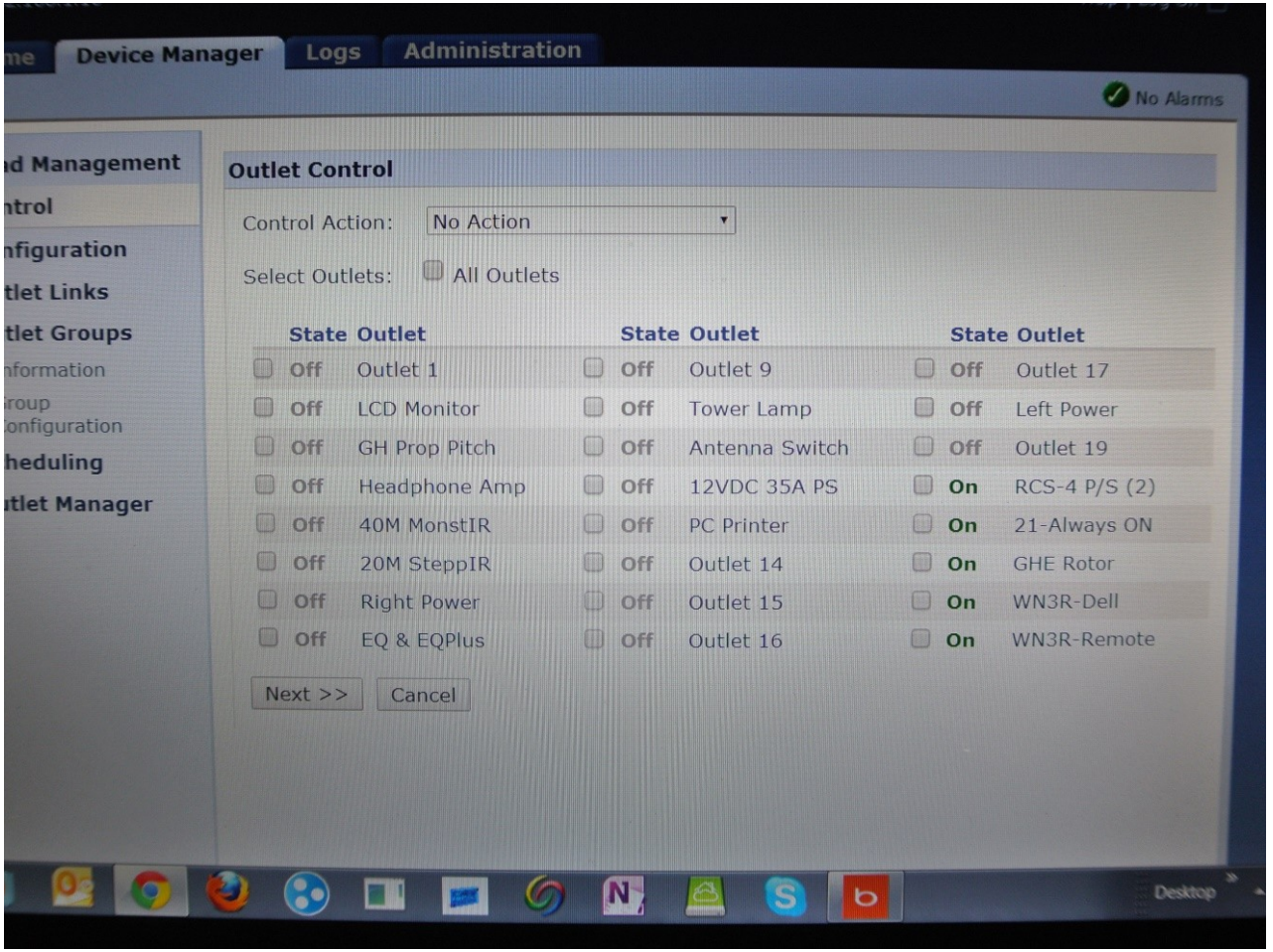
>>

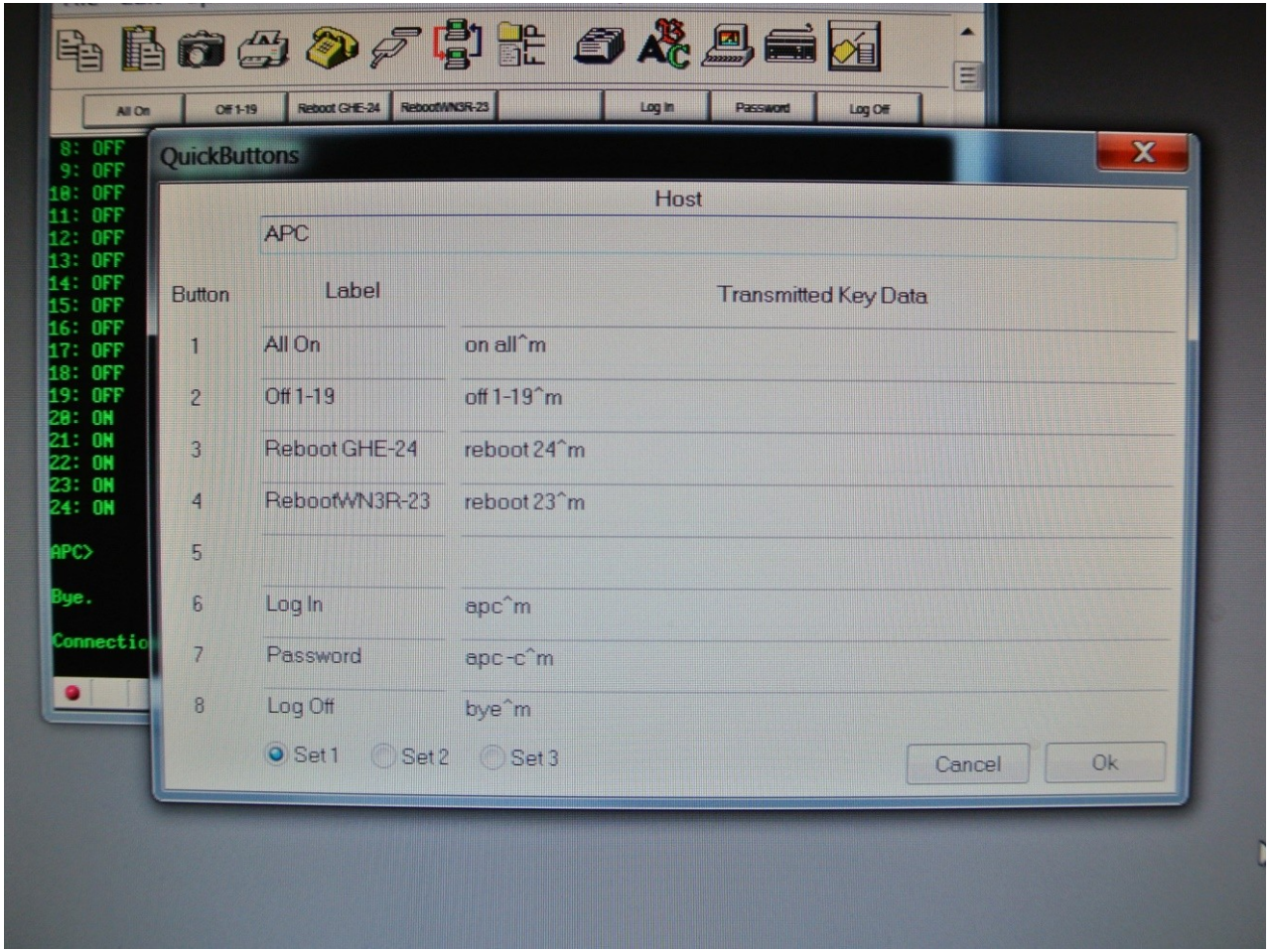


4-Square direction is controlled by just TWO switches, #5 and #6.
OFF-OFF > NORTHEAST (0,0) OFF-ON > SOUTHWEST (0,1)
ON-OFF > SOUTHESAST (1,0) ON-ON > NORTHWEST (1,1)



Every AC outlet can be turned ON/OFF or REBOOTED

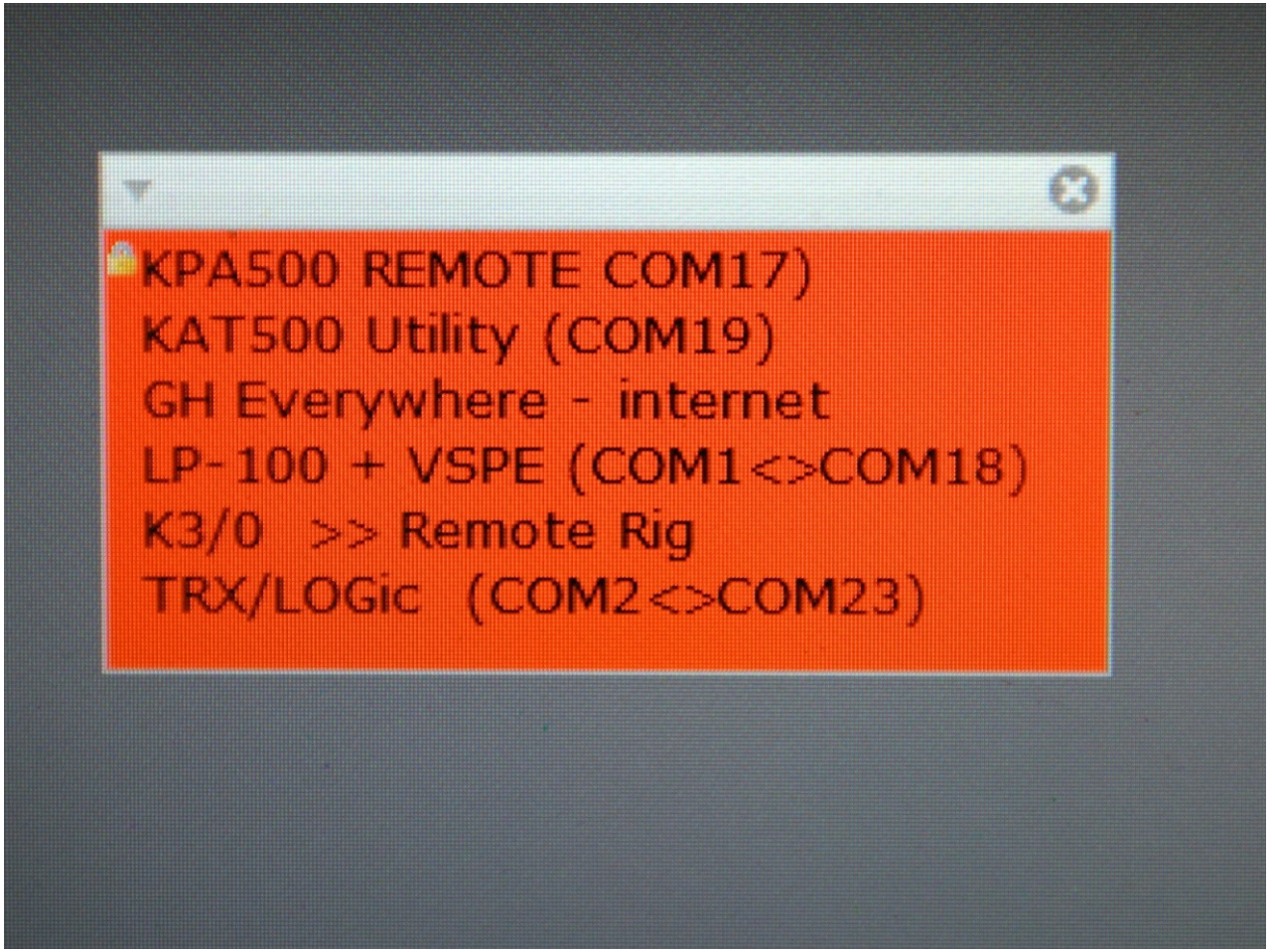
While this web interface is nice and comprehensive, it is tedious when it comes routine operation. Fortunately, having a customizable TELNET client simplifies these tasks.



“NetTerm” is the best client

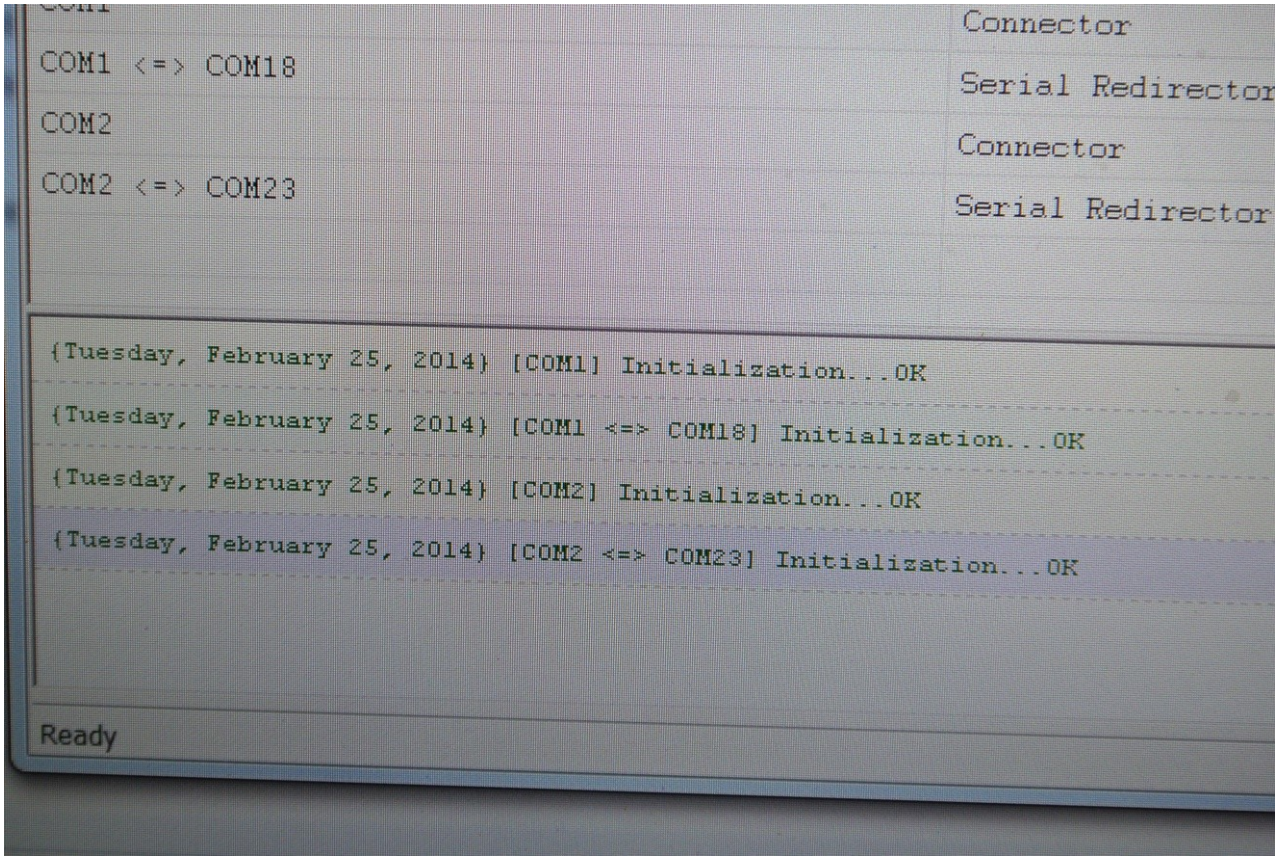
Easy to program standard buttons. Allows telnet connections to other services such as the DX cluster at W3LPL.

Normal functions – ALL ON, ALL OFF, and REBOOT. (ALL is really MOST)



Miscellaneous weird problems to overcome

Port redirection becomes necessary when some older software applications have limited port numbers. VSPE to the rescue. See next slide.



VSPE Virtual Port creator and redirection

Recommended by those who did this before me. It is not free – but worth every penny if you need it. A must if using the DIGI PortServer.


Fall 2005
Link-Belt

QTH Photos (2014)

120’ Tower Base

When the YAGI falls down

The snow never melts

Shack is above the garage

The Shack

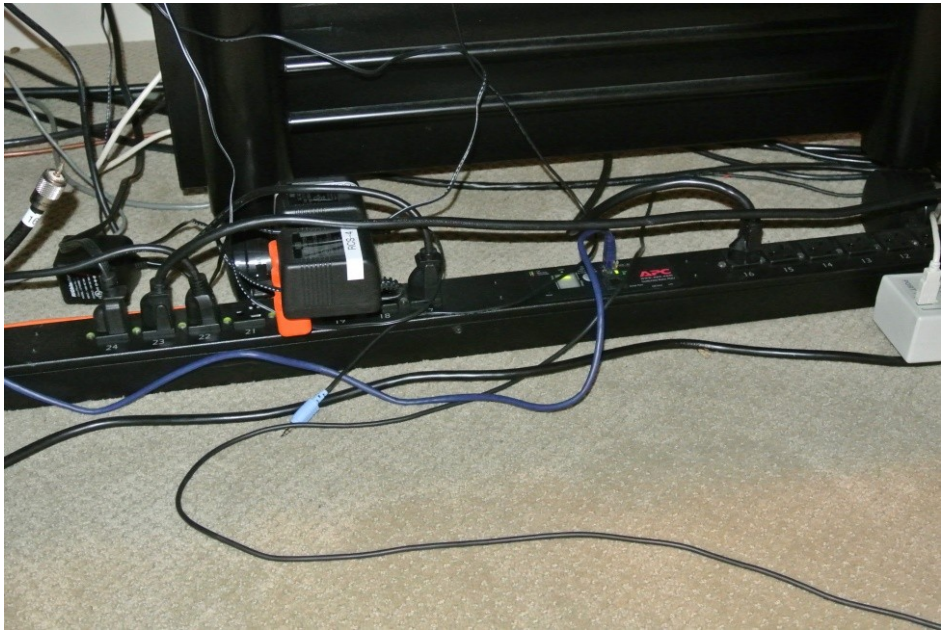
Working HF Antennas

The short (60’) tower

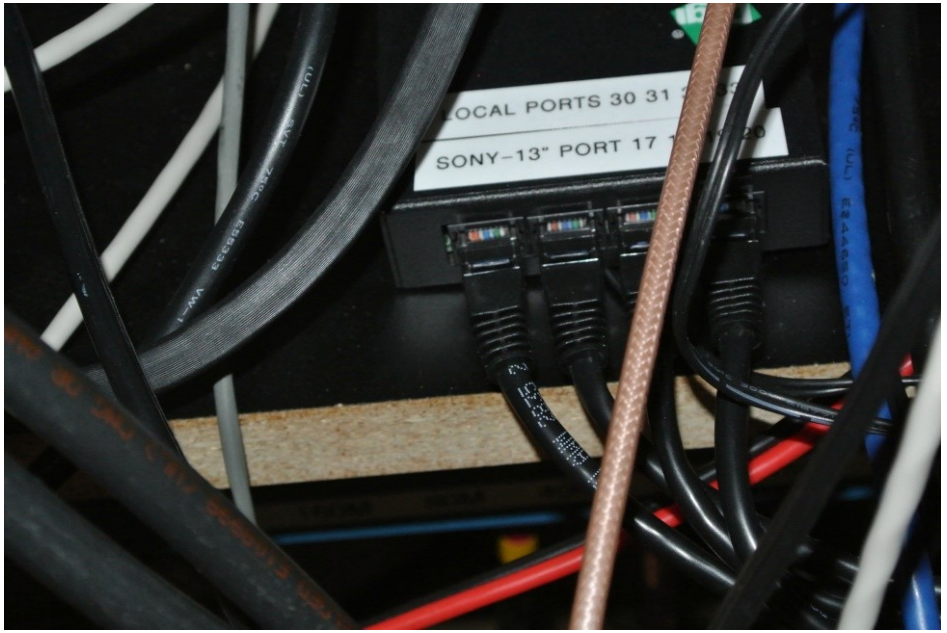
Front Yard – Four Square

Nice to have items

Internet Controlled AC power



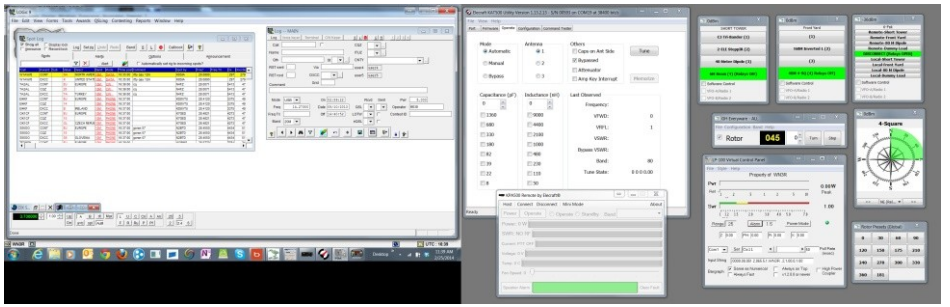
DIGI PortServer



In Rockville

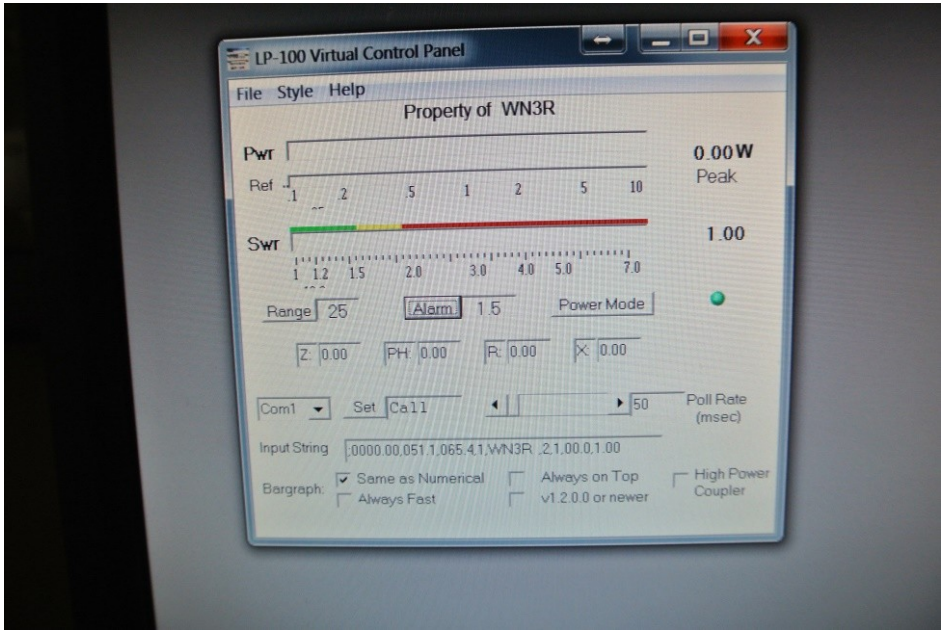
Rockville Home Office/Shack

Logging and Control Screens

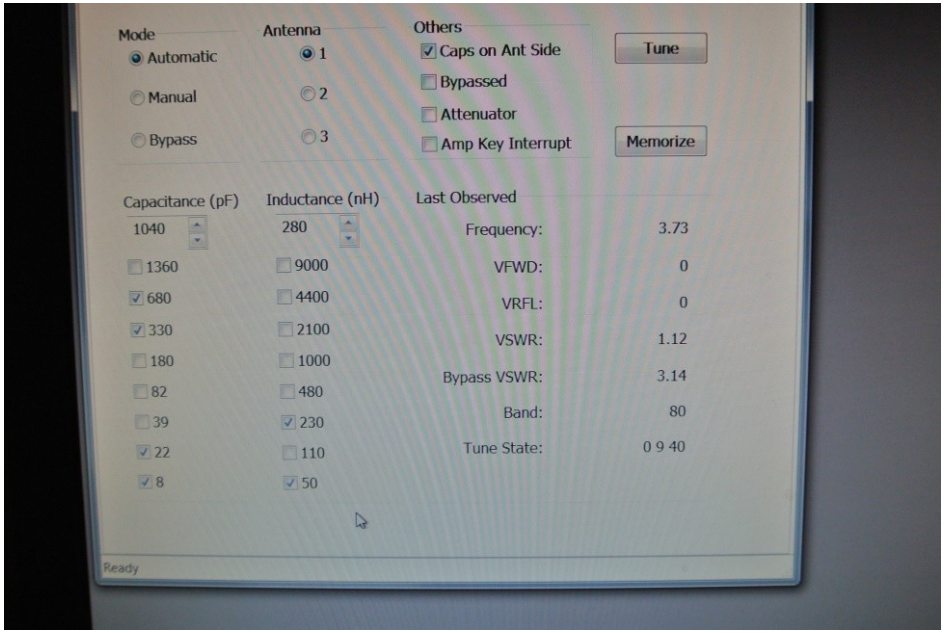


Screen Close Ups

LP-100 SWR Display

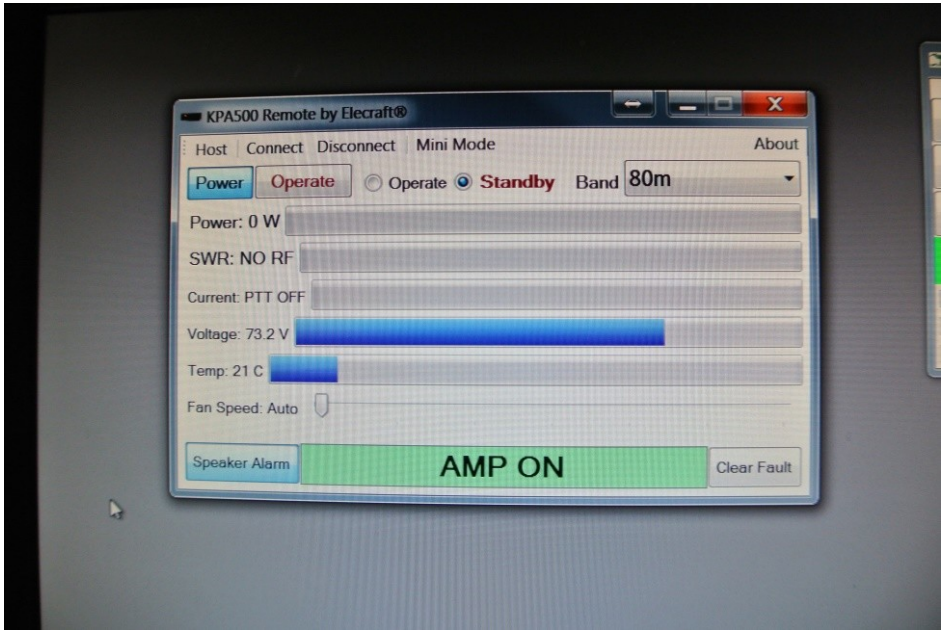


Automatic Antenna Tuner



Control Screens

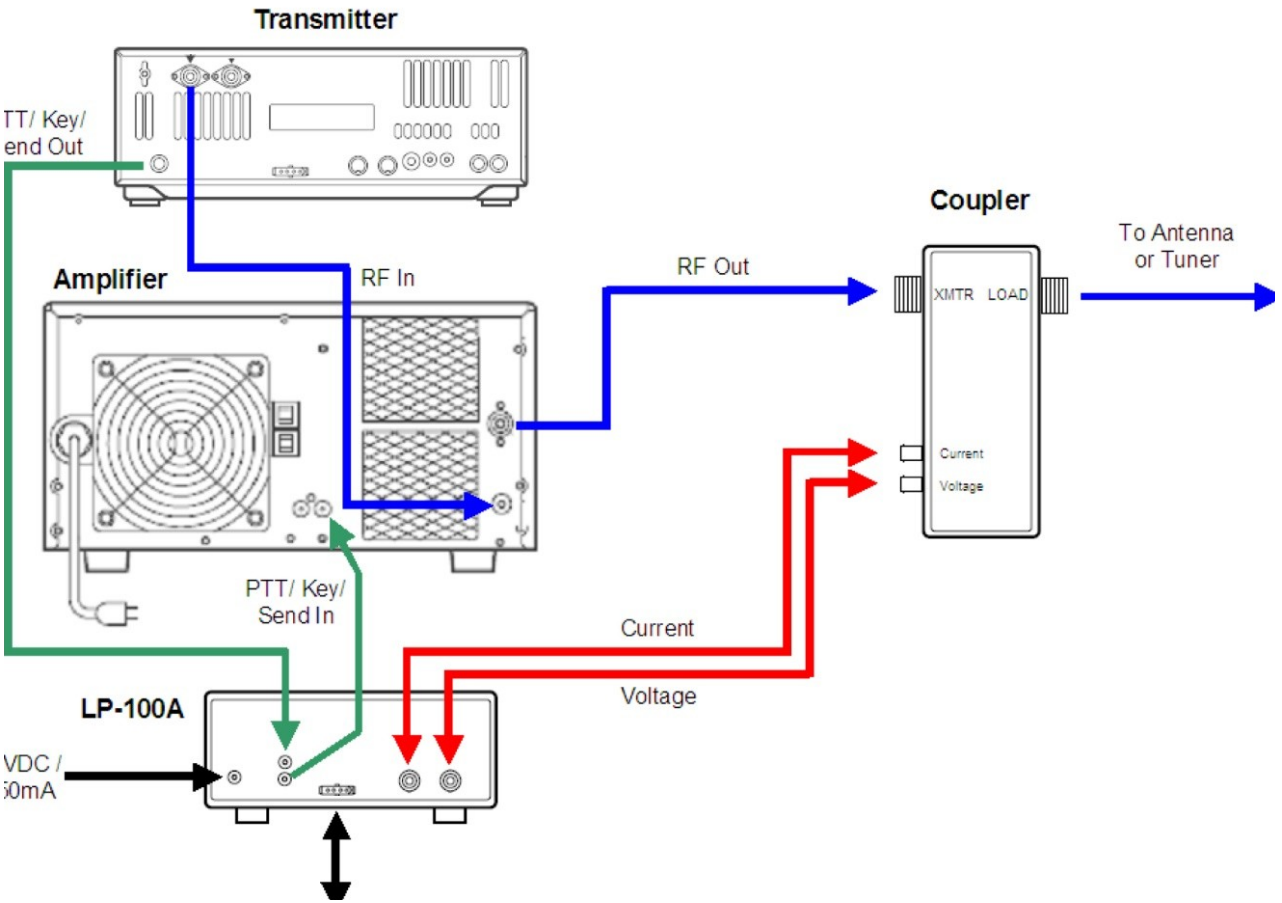
KPA500 Amplifier Control



GH Everywhere for Antennas

PIECES TO THE PUZZLE

- Elecraft K3, K3/0, KAT500, KPA500
- LARRY PHIPPS – LP-100 SWR BRIDGE
- ARRAY SOLUTIONS 6-PAK ANTENNA SWITCH
- AMERITRON – REMOTE COAX SWITCHES
- GREEN HERON ROTOR CONTROLLER
- GREEN HERON EVERYWHERE
- DIGI PORT SERVER
- REMOTERIG.COM
- NETGEAR ROUTER
- APC REMOTE CONTROLLED POWER STRIP
- VSPE SERIAL PORT EMULATOR
- LOGIC 9 LOGGING SOFTWARE
- AN OLD BULLET PROOF PC WITH XP (LOCKED DOWN)



Station Saver

This is how I protect myself from selecting the wrong antennas. The GREEN line circuit cuts off the amp when the SWR exceeds a pre-set limit. Automatic Reset is a must.

THE END

A good question to ask is,
“Why a QTH in Frederick?”

The Future is Here. The new K3/0