TWIN CITY FM CLUB

PO BOX 26201
ST. LOUIS PARK, MN 55426-0201

REPEATERS:
146.760 ALLSTAR NODE 429820
444.100 WIRES-X ROOM 65857
444.125 *TONE 114.8 ON ALL REPEATERS

NORTH STAR RADIO CONVENTION

Interfacing to AllStarLink

Presenters

Tim Arimond – N0BYH

Roy Wood – W0REW

Interfacing Repeaters to AllStarLink

Are you considering connecting your repeater to the AllStarLink Network?

- AllStarLink (ASL)
  - The original repeater linking implementation based on Asterisk, an open-source implementation of a telephone PBX. Asterisk PBX is used by net control for the MS150 for the rider help line
  - Originally coded by Jim WB6NIL (SK) who developed drivers for USB sound cards along with code to manage a node. AllStarLink maintains servers to facilitate connections between nodes by maintaining a list of active nodes.
  - Nodes are assigned numbers used as addresses that are translated into IP address/port at a connection request. By creating an account on allstarlink.org you can create up to 10 of these nodes.

Interfacing to AllStarLink

Interfacing to AllStarLink

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- AllStarLink V3 is the first new client in 15 years for AllStarLink.
  - ASL 3 has been redesigned to run on Asterisk 22 LTS with the latest version of Debian 12 Linux and modern hardware. This is a significant update from the previous clients running Asterisk Version 1.4
  - The new version incorporates over 15 years of Asterisk bug fixes, major security improvements, and enhancements. The update required “app_rpt”, the Asterisk application that is Allstar, to be heavily modified. This adds up to improved stability and uptime
  - Over 3,700 nodes have already upgraded and are currently using ASL 3

Interfacing to AllStarLink

- AllStarLink Software Updates Have Been Improved
  - Asterisk uses a custom kernel module named DAHDI that must be updated when the Linux kernel version changes
    - ASL versions 1 & 2 required the kernel module to be re-compiled manually after kernel updates
    - ASL3 uses the KMS kernel module updating capability to do this “automagically”
    - This allows kernel security updates without breaking ASL3
  - ASL3 now can be installed from Debian based OS software repositories like other software

Interfacing to AllStarLink

- Obtaining AllStarLink ASL3 software
  - Download source from https://github.com/allstarlink and build
    - Build process downloads and compiles asterisk with AllStarLink modules. Can be built on Raspberry Pi or Debian Arm/x64 systems
  - Download image from https://allstarlink.github.io/install/pi-appliance
    - Wiki - https://allstarlink.github.io/install/pi-appliance/pi-detailed/
    - Web based or SSH based administration, Minimal OS install
    - Raspberry Pi Imager must be used to image the SD card. Due to a bug in version 1.9.4 that breaks WIFI setup. Use version 1.8.5 until the issue is fixed
  - Install from the Linux software repository on an already running system

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- Presentation Assumptions
  - A functioning coordinated repeater or a personal Raspberry Pi node, documentation, interface documentation
  - An Internet connection, 10 Mbps minimum
  - A familiarity with Linux
    - While AllStarLink has progressed to the point that you can install it from the OS repository and configure it from a menu, you will do yourself a favor to learn how use Linux before you start the addition of AllStarLink and become comfortable with it. Some functionality or troubleshooting requires the ability to edit configuration files
  - You know how to Google or “phone a friend”

Interfacing to AllStarLink

- Presentation Assumptions (Continued)
  - HDMI Monitor, keyboard, mouse (at least for system setup)
  - A running Raspberry Pi with the latest PIOS installed. 32 GB SD card recommended. **SD cards Must be at least Class 10, preferably UHS 3**
  - A RA-42 from Masters Communications or equivalent
  - A USB SD card adapter for backups. Can also be done via network by backing up configuration files.
    - *Asl-config allows you to backup ASL files locally as you work on the configuration*
  - *Murphy was an optimist*

Interfacing to AllStarLink

- Optional (But can make things easier when dealing with problems)
  - Service monitor - Some tuning built into the software already
  - Multimeter
  - Oscilloscope
  - USB Power Meter to measure current draw of USB devices and the Raspberry Pi
  - Patience

Interfacing to AllStarLink

AllStarLink Interfacing Requirements

- Only specific USB sound chips are supported
  - CM108
  - CM108AH
  - CM109A
  - CM109B
  - C-Media Electronics, Inc. Audio Adapter (Unitek Y-247A)
    - Special Case – The Manufacturer code:Device ID must be added to a file
- USB sound cards can be hacked to interface to the repeater
  - Recommend purchasing an interface designed for AllStarLink

Interfacing to AllStarLink

Contents of res_usbradio.conf or res_simpleusb.conf to allow additional Cmedia compatable chips

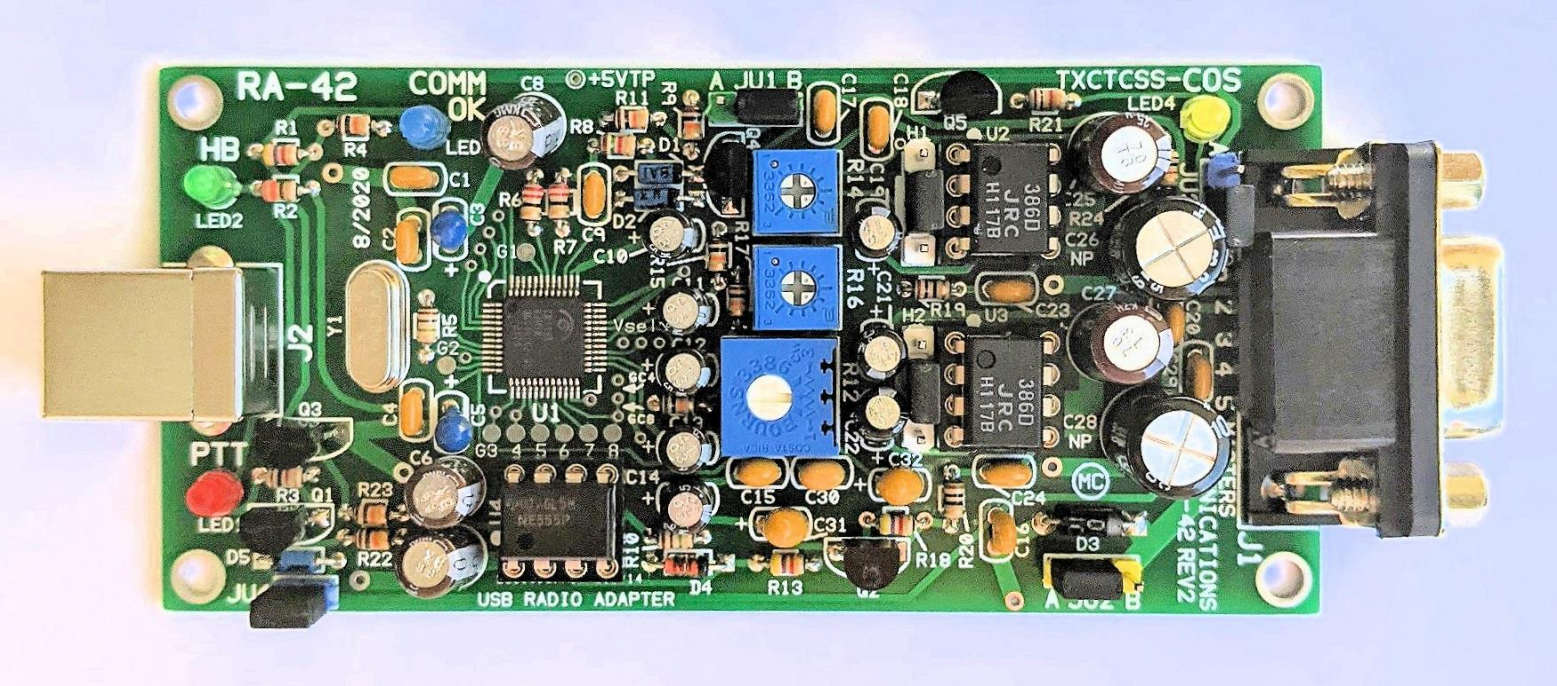
```
[general]

;usb_devices = 1209:7388    ;comma delimited list of usb
                            ;descriptors to allow.
                            ;format vvvv:pppp in hexadecimal
                            ;vvvv=vendor id, pppp=product id
                            ;
                            ;1209:7388 = AIOC (all in one cable)

; Mpow Headset
usb_devices = 0d8c:0014  ;  C-Media Electronics, Inc. Audio Adapter (Unitek Y-247A)
```

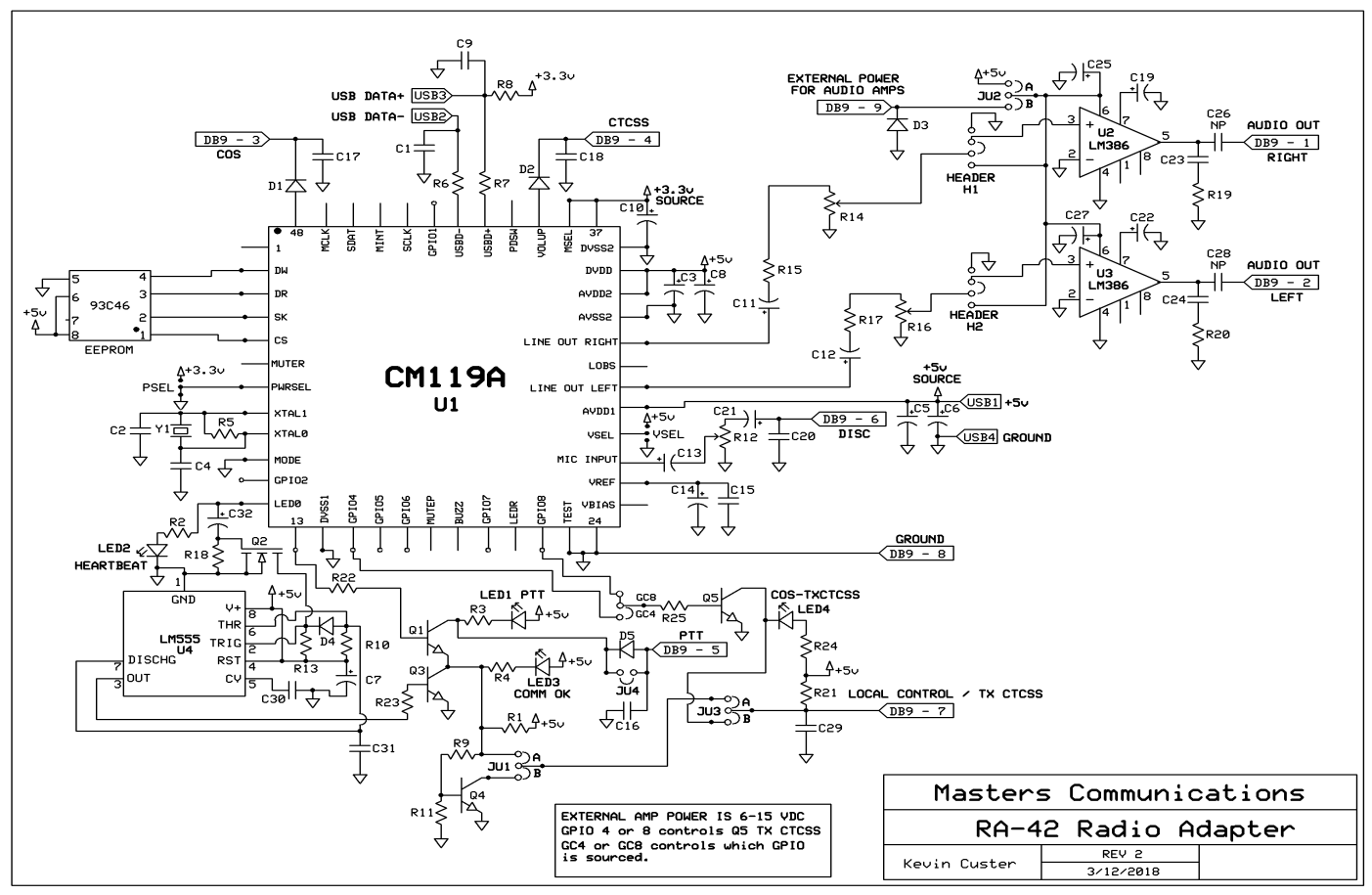
Interfacing to AllStarLink

Masters Communications RA-42 – Based on a CM109A



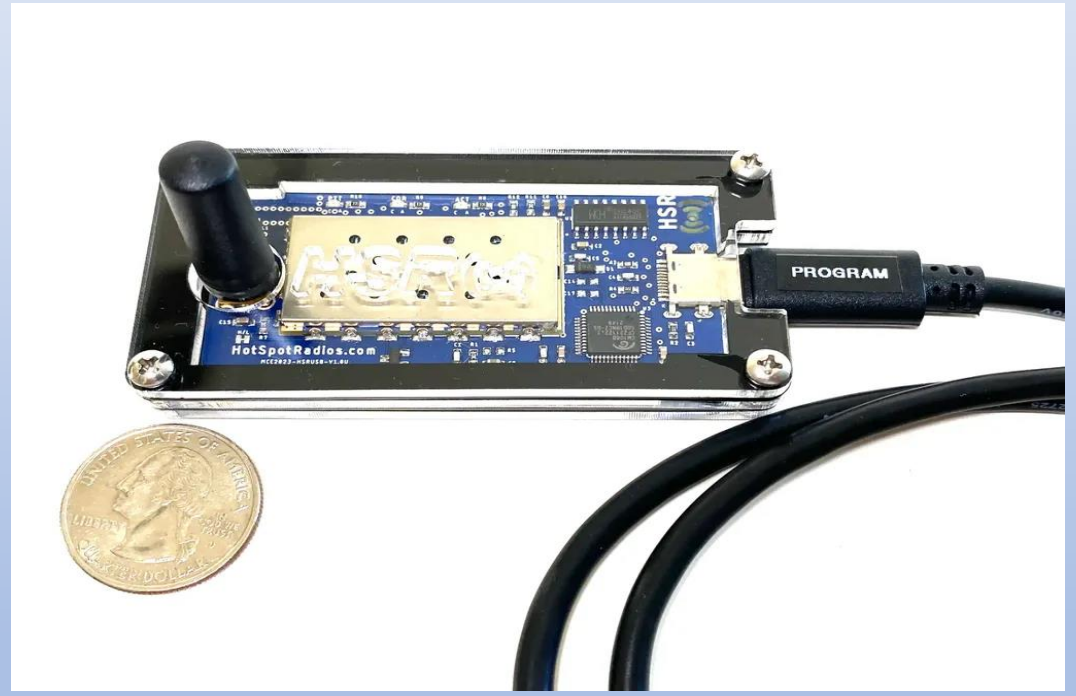
Interfacing to AllStarLink

Masters Communications RA-42 – Based on a CM109A



Interfacing to AllStarLink

HotSpotRadio - USB



An all in one HotSpotRadio ready to plug into any computer or raspberry Pi that can run Allstarlink software.

Status LEDs for Power, PTT, COR, and Heartbeat
Uses the Cmedia CM 119B USB audio IC

Uses a NiceRF SA818S UHF embedded radio module 100 to 400 milliwatts RF output power

Small, portable with self-contained radio and antenna. No external power needed.

3 foot USB to USB-C cable included

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Software Setup

Interfacing to AllStarLink

- Preparing the Host System
  - Choice of hardware depends on how Raspberry Pi is to be used. Options include using Raspberry Pi's 3, 4's or 5's, or even x86_64/AMD PCs
    - Running an appliance with no graphics and controlled via web interface (Supermon or Allmon) and terminal access to the Pi, a Pi-3 should suffix
    - Running full featured Linux, graphics, program development, remote access via a VNC, and other background programs, a Pi-4 with larger memory or a desktop or laptop might be a better option

  - Raspberry Pi's should be in a case with heat sinks or fans
  - Prepare SD card with OS, boot and update software
  - Verify Linux is functional
  - Add some developer stuff
    - Sudo apt-get update
    - Sudo apt-get install build-essentials

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- Installing AllStarLink on an existing Linux installation
  - The easiest way is to install using the system software maintenance program, apt-get for Debian based systems
    - sudo apt-get update
    - Sudo apt-get install asl3
    - Sudo apt-get install asl3-update-nodelist

  - For those with Linux experience (and are masochistic) the source can be downloaded and the application compiled. Updating the kernel will break asterisk kernel modules. Unless the install process included setting up the KMS build of DAHDI. the DAHDI kernel module will have to be recompiled every time the apt-get full-upgrade command is run.

Interfacing to AllStarLink

Basic Setup AllStarLink Setup

- The radio interface will determine which driver use
  - USBradio
    - Discriminator audio must be available to use the USBradio driver. The driver can derive the COR (squelch) and CTCSS signals from discriminator audio if required using DSP techniques
  - SimpleUSB
    - The driver requires the repeater to supply the COR and CTCSS signals

Interfacing to AllStarLink

Basic Setup AllStarLink Setup

- Configuring AllStarLink you will need to have node number and password from node registration on allstarlink.org and the driver type to use determined for your situation

- The assisted way:
  - Login to the Node and using a terminal run asl-menu to configure

- By editing the configuration files:
  - Log into the Node and edit 6 othe following files:

Interfacing to AllStarLink

Edit the files in /etc/asterisk

- extensions.conf:8: NODE = node# ; change this to your node number
- iax.conf:8:;register => node#/passwd@register.allstarlink.org
- rpt.conf:31:node# = radio@127.0.0.1:node#/passwd,NONE
- rpt.conf:202:[node#](node-main)
- rpt.conf:205:rxchannel = SimpleUSB/node# ; SimpleUSB
- rpt_http_registrations.conf:5:register =>node#/passwd@register.allstarlink.org
- savenode.conf:2:NODE=node#
- simpleusb.conf:132:[node#](node-main)
- usbradio.conf:186:[node#](node-main)
- voter.conf:16:[node#]

Interfacing to AllStarLink

- Gotcha Alert
  - Previous versions of ASL would find your USB device on initial startup and set devstr = to the current USB port location in the driver config file. Subsequent startups expected to find the device in the same location and would fail if moved
  - If this field has no device name configured ASL3 will scan for it.
  - Writing the driver configuration will sometimes fill in this field. Use an editor to set the location to blank again if it is not found on startup, or move the USB device to the original port
  - The program asl-find-sound will list the location of the device
    1-1.4:1.0 --> 0d8c:0014 C-Media Electronics Inc.

Interfacing to AllStarLink

Initial Setup AllStarLink Setup

- Connect the RA-42 to the Node (or your equivalent device)
- Enable and start the asterisk daemon
  - May have been enabled and started already depending on the installation process used
- Check the status lights on device for proper indication
- Check /var/log/asterisk/messages using an editor for error messages

Interfacing to AllStarLink

- Initial Software Checkout
  - Ensure asterisk is running by entering
    - Ps –ef|grep asterisk
      - asterisk 1265 1 10 Aug18 ? 04:39:52 /usr/sbin/asterisk -g -f -p -U asterisk
    - Check for logged errors
      - Sudo vi (nano) /var/log/asterisk/messages
      - Find where the last program startup is listed, make sure the are no errors
    - Go to http://www.allstarlink.org/ and sign in. Go to Portal->Nodes and see if registered node shows green (assuming you have enabled it in rpt.conf). This shows that the node is updating it's online/offline status

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Backup Your Chip!

This should be done frequently during your setup process

- Insert USB SD Reader/Writer in RPI USB port
  - GUI
    - RPi symbol → Accessories → SD Copy
      - Source device /dev/mmcblk0
      - Destination device /dev/sdx ??
  - Command Line
    - Use the Linux dd command to write a disk image to a file
    - Run pishrink.sh to shrink image
  - Copy SD Chip to your laptop using an imaging tool
    - If copying the image to another Linux system, pishrink.sh can be used to compact the image after the copy (copy pishrink.sh from your ASL3 system to your system with the image on it).

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Backups (Continued)

- On the RPi use the asl-menu program to backup the /etc/asterisk directory to the computer file system and/or allstarlink.org
  - This method only saves the configuration files. The backed up files should be copied off to another system
  - Restoration involves doing a complete install and configuration of Linux, installation of ASL software, and, any other programs and customizations. Then the backed up configuration files may be copied over the newly installed configuration files in /etc/asterisk

Interfacing to AllStarLink

Wiring it together

- Depends on driver used and whether the repeater or AllStarLink software will provide COR and CTCSS
  - SimpleUSB – repeater provides COR and CTCSS signals. Radio must provide transmit CTCSS tone if required
  - USBRadio – More flexible but audio from discriminator is required if decoding CTCSS or squelch from audio. Signals are derived using DSP techniques on the Raspberry Pi and can generate transmit tone
  - Fusion repeaters need connections for digital/FM jumpered to Auto/Auto to allow FM and Digital
  - Options are available in each configuration file to use CTCSS, add timing adjustments, etc

- Connect AllStarLink interface device and radio

Interfacing to AllStarLink

Audio Setup

Setting audio levels is important since you will be interfacing with other repeaters/nodes.

- Audio sources to consider:
  - Input from repeater receiver
  - Audio files supplied with asterisk
  - Newsline or other custom audio files
  - Input from other nodes
  - Your audio going to repeater transmitter
  - Your audio going to the internet

- Minnesota Repeater Council sets a max 4.5 kHz deviation limit including PL tone. Tone should be in the range of 400 - 600 Hz deviation

- The best way of assuring good audio quality is using a service monitor if you are setting up a repeater.

- There is a document at https://allstarlink.github.io/adv-topics/audio-level/ that goes through setup using a service monitor

Interfacing to AllStarLink

Connecting Node to Radios

For devices connected to radios start out on low power with radio connected to a dummy load until basic operation is confirmed

Have another radio to test proper control line operation and relative receive and transmit volumes. Adjust using asl-menu to get them in the ballpark

Interfacing to AllStarLink

Initial Testing : USBRadio

- Make sure asterisk is running and communicating with your USB interface. Fix any errors
- Run radio-tune-menu
  - With antenna connected and repeater/radio to lowest power level
    - Run option 2) Auto-Detect Rx Noise Level Value (with no carrier)
    - Run option 5) Set Rx Squelch Level
    - Next steps best done with a service monitor (or on-air with a finely tuned ear)
    - 6) Set Transmit Voice Level
    - 8) Set Transmit CTCSS Level
    - 4) Auto-Detect Rx CTCSS Level Value (with carrier + CTCSS)
    - 9) Auto-Detect Rx Voice Level Value (with carrier + 1KHz @ 3KHz Dev)

Interfacing to AllStarLink

Radio-tune-menu

Active USB Radio device is [429820].
1) Select active USB device
2) Auto-Detect Rx Noise Level Value (with no carrier)
3) Set Rx Voice Level (using display)
4) Auto-Detect Rx CTCSS Level Value (with carrier + CTCSS)
5) Set Rx Squelch Level
6) Set Transmit Voice Level
7) Set Transmit Aux Voice Level
8) Set Transmit CTCSS Level
9) Auto-Detect Rx Voice Level Value (with carrier + 1KHz @ 3KHz Dev)
E) Toggle Echo Mode (currently 'disabled')
F) Flash (Toggle PTT and Tone output several times)
G) Change Carrier From (currently 'usbinvert')
H) Change CTCSS From (currently 'usbinvert')
P) Print Current Parameter Values
O) Options Menu
S) Swap Current USB device with another USB device
T) Toggle Transmit Test Tone/Keying (currently 'disabled')
V) View COS, CTCSS and PTT Status
W) Write (Save) Current Parameter Values
0) Exit Menu

Please enter your selection now:

Interfacing to AllStarLink

Initial Testing : SimpleUSB

- Run simpleusb-tune-menu
  - Use the menus to set levels to low values
  - Use asl-menu to generate a tone to set transmit audio
  - Using a another radio to monitor audio levels by comparing receive/transmit audio to other stations

Interfacing to AllStarLink

Active Simple USB Radio device is [547791].

1) Select active USB device
2) Set Rx Voice Level (using display)
3) Set Transmit A Level (currently '950')
4) Set Transmit B Level (currently '950')
B) Toggle RX Boost (currently 'enabled')
C) Toggle Pre-emphasis (currently 'disabled')
D) Toggle De-emphasis (currently 'disabled')
E) Toggle Echo Mode (currently 'disabled')
F) Flash (Toggle PTT and Tone output several times)
G) Toggle PL Filter (currently 'enabled')
H) Toggle PTT mode (currently 'ground')
I) Change Carrier From (currently 'usbinvert')
J) Change CTCSS From (currently 'no')
K) Change RX On Delay (currently '0')
L) Change TX Off Delay (currently '0')
P) Print Current Parameter Values
S) Swap Current USB device with another USB device
T) Toggle Transmit Test Tone/Keying (currently 'disabled')
V) View COS, CTCSS and PTT Status
W) Write (Save) Current Parameter Values
0) Exit Menu

Please enter your selection now:

Interfacing to AllStarLink

Audio Testing – Either Driver

- Connect with another radio and verify transmit and receive volumes
- Have other hams converse on the repeater and get audio quality reports or notification of other issues (no transmit tones, squelch tails, noise, hum, etc)
- Resolve any issues

Interfacing to AllStarLink

First Online Testing

- Connect to node 55553, transmit your call sign and a 10 count. The node will respond by echoing your message along with a volume report. Adjust transmit audio using the appropriate radio-tune menu until you get a good report. Microphone placement and voice volume will affect results
- Contact other hams on other repeaters and get audio quality reports and notification of other issues (Squelch tail, noise or hum, etc)
- Have a properly adjusted node connect and send a short 1 kHz audio tone from it's tuning menu or Supermon. Use a service monitor or calibrated ears to adjust receive audio
    - You may need to adjust the volume of audio coming in from the internet if all properly configured stations are to loud or to low by editing rpt.conf

Interfacing to AllStarLink

Install Supermon or use the default Allmon for remote control of asterisk using a browser. A command line interface is available through Asterisk but is more complex to use

- Supermon is the more robust option but must be configured
- See
  - http://www.hamradiolife.org/documents/Supermon%20for%20ASL%203.pdf

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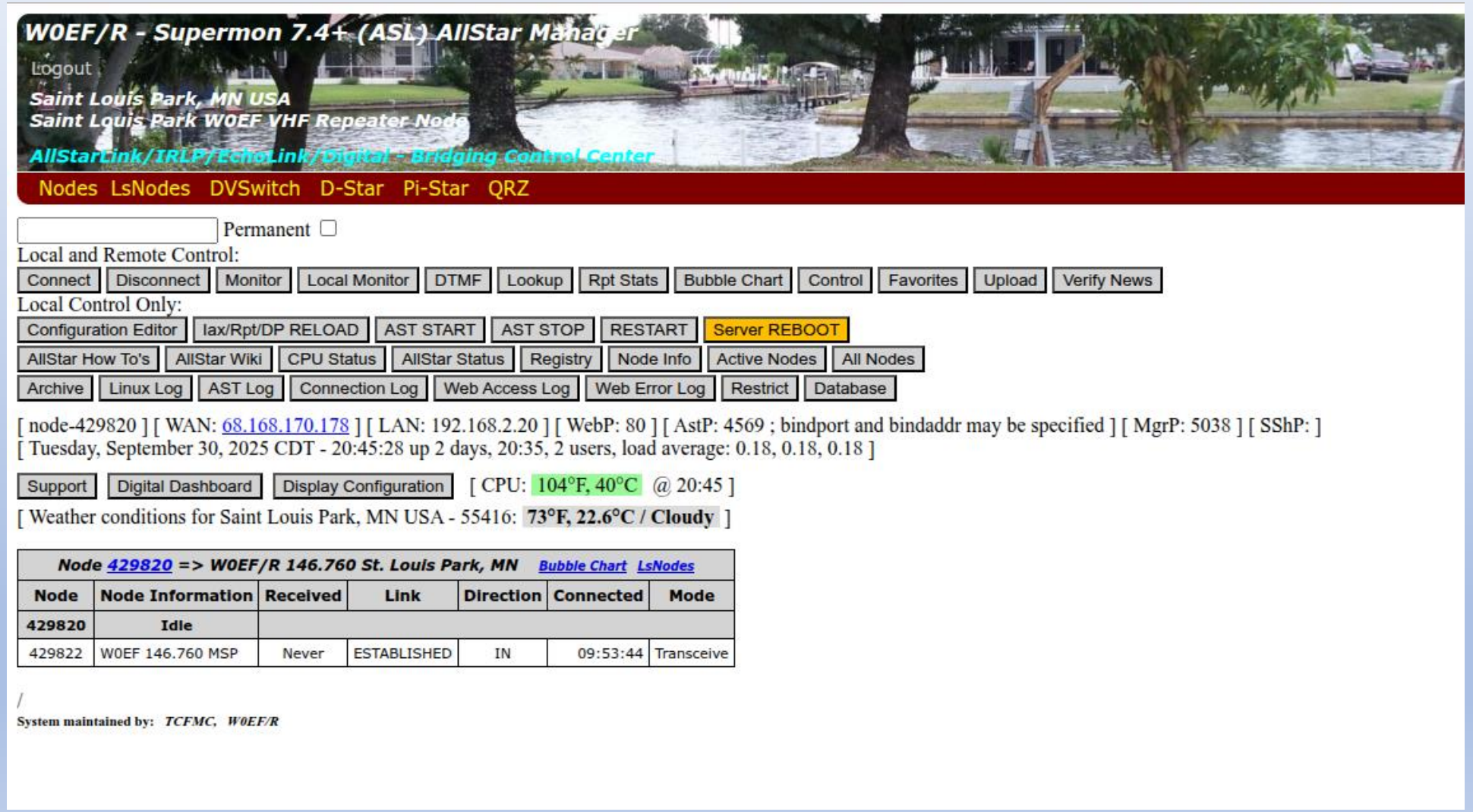

Interfacing Repeaters to AllStarLink

Some things that can be controlled via configuration files

- Node connect/disconnect announcements (Telemetry)
- ID Volume
- Transmit Timeouts
- Link Timeouts
- Different Courtesy Beep for Local and Remote Systems
- Audio Recording
- Internet Volume
- Startup Macros
- Macro Commands
- Control States
- And More...

Interfacing to AllStarLink

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A Brief Demo

Interfacing to AllStarLink

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Questions?

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Helpful Links:

- https://allstarlink.github.io/
- https://wiki.allstarlink.org/wiki/Main_Page
- http://www.hamradiolife.org/documents/Supermon%20for%20ASL%203.pdf
- https://www.billmongan.com/posts/2025/01/asl3/