

## Introduction

I needed to tie-in a remote repeater site to my Allstar Linked system, but the remote repeater site did not have usable internet, and we were not allowed to do a Ubiquity hop.

When people ask how it was done, I usually just say “bot-radio”, but it is really an ‘Auxiliary-Station’ in full compliance with FCC Part 97 rules. An Aux-Station is set up at a site with usable internet and is linked to the Allstar network. The Aux-Station drives the remote repeater and links it as required. In my case, the Aux-Station and the main repeater are in the same room and are linked via Allstar on my LAN. However, the Aux-Station could be located anywhere with usable internet that is within range of the remote repeater.

Following are instructions on how it was done but first . . .

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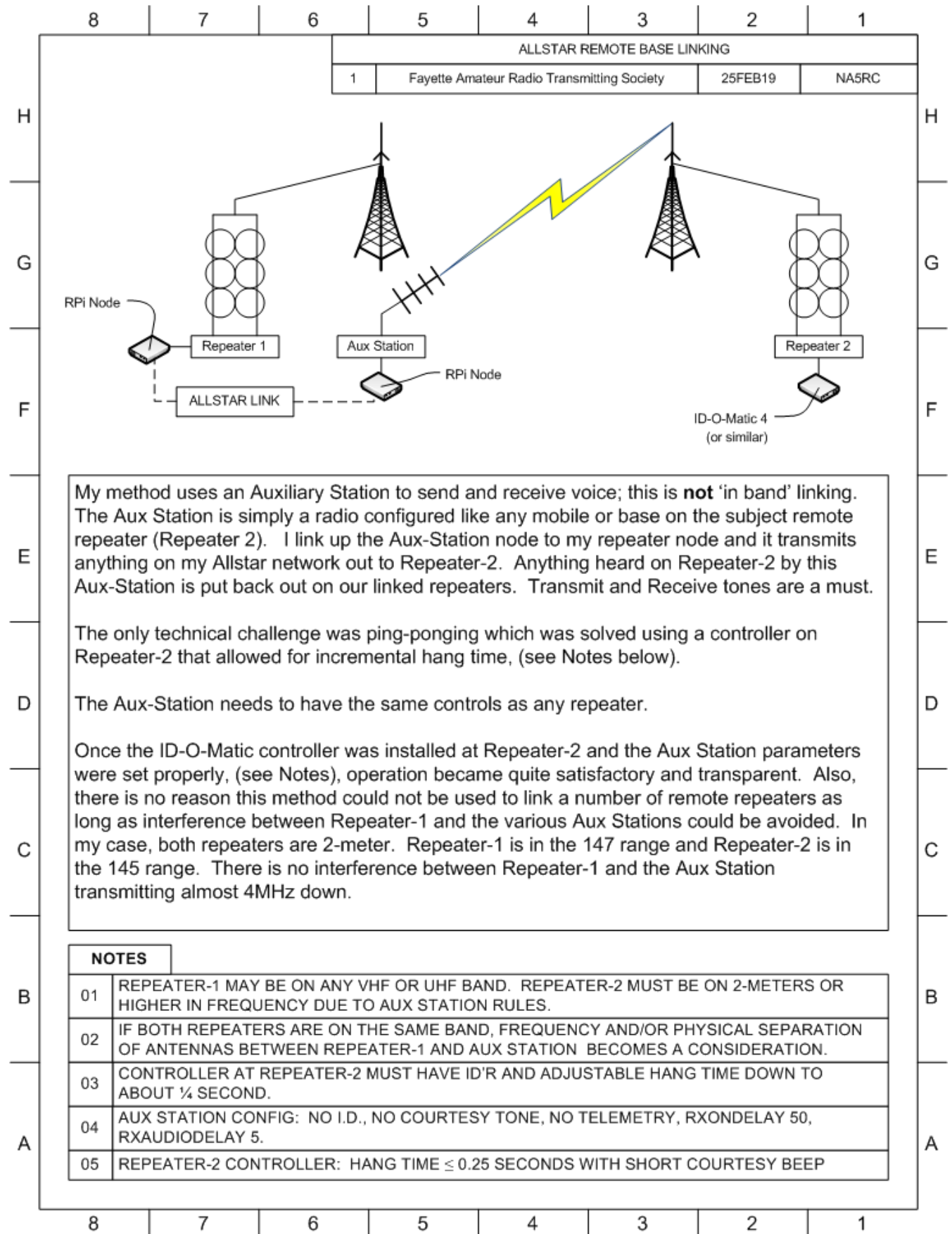
## ARRL explanation of Part 97:

[97.3(a)(7)]." There are a few important rules that apply to auxiliary stations:

- 1) All amateurs, except Novices, may put auxiliary stations on the air [97.201(a)].
- 2) An auxiliary station may transmit only on the 2 m and shorter wavelength bands, except the 144.0-144.5 MHz, 145.8-146.0 MHz, 219-220 MHz, 222.00-222.15 MHz, 431-433 MHz, and 435-438 MHz segments.
- 3) When there is interference, licensees are equally responsible for solving the interference, except where one station is coordinated and the other is not [97.201(c)]. Control links should be coordinated.
- 4) An auxiliary station may be automatically controlled and may send one-way transmissions [97.201(d), (e)].

## Uses:

- 1) Remote control of a station at a different location (such as a repeater on a mountaintop), where a radio link is used to make one-way transmissions of DTMF tones to change its operating parameters
- 2) Voice links between two or more stations within a system of stations, such as:
  - (a) Point-to-point links from a repeater's remote receiver(s) back to the main repeater site.
  - (b) Dedicated point-to-point links between different repeaters in a "system" of either full-time or part-time linked repeaters.
  - (c) A combination of remote control and point-to-point voice links intended to control and carry the voice signals from the control point to the transmitter(s) of a remotely controlled station. (This is the equivalent of replacing the wire between the microphone and the transmitter's mike input with a radio link from the microphone to the remotely located transmitter.) This is commonly referred to as an "uplink."
  - (d) Point-to-point links from the receiver(s) of a remotely located station back to the station's control operator(s) at their control point(s).



My method uses an Auxiliary Station to send and receive voice; this is **not** 'in band' linking. The Aux Station is simply a radio configured like any mobile or base on the subject remote repeater (Repeater 2). I link up the Aux-Station node to my repeater node and it transmits anything on my Allstar network out to Repeater-2. Anything heard on Repeater-2 by this Aux-Station is put back out on our linked repeaters. Transmit and Receive tones are a must.

The only technical challenge was ping-ponging which was solved using a controller on Repeater-2 that allowed for incremental hang time, (see Notes below).

The Aux-Station needs to have the same controls as any repeater.

Once the ID-O-Matic controller was installed at Repeater-2 and the Aux Station parameters were set properly, (see Notes), operation became quite satisfactory and transparent. Also, there is no reason this method could not be used to link a number of remote repeaters as long as interference between Repeater-1 and the various Aux Stations could be avoided. In my case, both repeaters are 2-meter. Repeater-1 is in the 147 range and Repeater-2 is in the 145 range. There is no interference between Repeater-1 and the Aux Station transmitting almost 4MHz down.

NOTES	
01	REPEATER-1 MAY BE ON ANY VHF OR UHF BAND. REPEATER-2 MUST BE ON 2-METERS OR HIGHER IN FREQUENCY DUE TO AUX STATION RULES.
02	IF BOTH REPEATERS ARE ON THE SAME BAND, FREQUENCY AND/OR PHYSICAL SEPARATION OF ANTENNAS BETWEEN REPEATER-1 AND AUX STATION BECOMES A CONSIDERATION.
03	CONTROLLER AT REPEATER-2 MUST HAVE ID'R AND ADJUSTABLE HANG TIME DOWN TO ABOUT ¼ SECOND.
04	AUX STATION CONFIG: NO I.D., NO COURTESY TONE, NO TELEMETRY, RXONDELAY 50, RXAUDIODELAY 5.
05	REPEATER-2 CONTROLLER: HANG TIME ≤ 0.25 SECONDS WITH SHORT COURTESY BEEP