

Washington Mailbox

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VHF/UHF and Repeaters The Basics

The most popular amateur band is 2 meters, and the fastest-growing license class is Technician. It isn't surprising that frequency coordinators, ARRL officials and ARRL Headquarter staff members, receive many questions concerning Part 97 rules and regulations as they govern repeaters, including auxiliary stations, crossband linking, autopatch operation and the recently implemented RF exposure rules.

Everything amateurs need to know about applicable FCC rules can be found in Part 97, but the relevant "pieces" are scattered throughout Part 97. It's up to individual amateurs to apply the correct rules for particular systems.

Of course, it's difficult to understand the rules if you don't have them in front of you! *The FCC Rule Book*, published by the ARRL, includes almost 200 pages of interpretation material as well as a complete updated copy of Part 97. The most recent edition of *The FCC Rule Book* is the Tenth edition, third printing. It is available for \$12. ARRL publications are available from your local ARRL dealer or directly from the ARRL. Mail orders to Publication Sales Department, ARRL, 225 Main St, Newington, CT 06111-1494. You can order toll-free at 888-277-5289; fax your order to 860-594-0303; or send e-mail to pubsales@arrl.org. Check out the full ARRL publications line on the World Wide Web at <http://www.arrl.org/catalog>.

Q: How does the FCC define a "repeater"?

A: A repeater is "An amateur station which simultaneously retransmits the transmission of another amateur station on a different channel or channels [97.3(a)(37)]." Part 97 does state that "Limiting the use of a repeater to only certain users is permissible [97.205(e)]." The frequencies used by repeaters belong to the public, but the actual repeater is private property. Sometimes, a repeater is closed to eliminate intermod problems from nearby amateur and/or nonamateur stations.

Q: Where may repeaters operate?

A: All frequencies used by repeaters, including secondary inputs, "may receive and retransmit only on the 10 m and shorter wavelength frequency bands except 28.0-29.5 MHz, 50.0-51.0 MHz, 144.0- 144.5 MHz, 145.5-146.0 MHz, 222.0-222.15 MHz, 431.0-433.0 MHz and 435.0-438.0 MHz segments [97.205(b)]." That's why you never hear repeaters (including secondary inputs) on the HF bands (with the exception of the 29.5-29.7 MHz segment). The VHF and UHF exceptions protect weak signal and satellite segments that are highly susceptible to interference.

Q: Why do repeaters have different transmit and receive frequencies? Why can't they operate on one frequency?

A: Actually, they can. The FCC's amateur repeater rules were written with older analog voice systems in mind. These systems require separate frequency channels for transmit and receive, for technical reasons: the repeater's transmitted signal prevents it from hearing other signals on the same frequency, and in fact it takes careful engineering for a repeater to hear signals on a different frequency in the same band. A newer digital technique known as TDMA permits the use of the same frequency for both transmit and receive more than 100 times per *second*. How the FCC's rules might apply to amateur TDMA systems has not really been tested, but the FCC generally encourages amateurs to try new techniques.

Q: My dual-band H-T is capable of acting as a crossband repeater. Is this legal?

A: Yes, but even though it is a low-power device, it must conform to all repeater rules. You must "plug in" the necessary Part 97 rule sections including sections on auxiliary operation [97.3(a) and 97.201], control [97.3(a), 97.103, 97.105, 97.109] and telecommand [97.213]. Identification requirements also apply and you must be sure not to cause harmful interference to coordinated repeaters. Any time a permanent repeater is planned, the area frequency coordinator should be consulted to make sure that it won't cause interference to existing repeaters. Your frequency coordinator's name and address can be found in *The ARRL Repeater Directory*, or by contacting ARRL HQ.

Q: What's an auxiliary station?

A: An auxiliary station is "An amateur station, other than in a message forwarding system, that is transmitting communications point-to-point within a system of coordinating amateur stations [97.3(a)(7)]." It is essentially a closed system. Auxiliary stations, which usually control repeaters, may only transmit above 222.15 MHz except in the 431-433 MHz and 435-438 MHz segments

[97.201(b)]. All operators of the system must be authorized control operators who can implement all control commands. An average user wouldn't have access to these commands. For a detailed look at the many uses of auxiliary stations in linked systems, see QST Apr 1996, page 108.

Q: What's "telecommand"?

A: FCC defines telecommand as "A one-way transmission to initiate, modify, or terminate functions of a device at a distance [97.3(a)(39)]." A repeater must have a radio or wireline link between the control point and the station so that the control operator can perform his or her duties. If radio is used, the control link must use an auxiliary station [97.213(a)]. Radio and telephone links can fail, so the FCC requires that transmissions be limited to three minutes in the event of a malfunction of the control link [97.213(b)]. That's why time-out timers are used on repeaters.

Q: Can I use my H-T to remotely control my 2-meter home station, thereby extending the range of my H-T?

A: Sure, but an auxiliary station must be used. Don't forget to identify all links.

Q: Why can't I access the autopatch of my local repeater at night?

A: Repeaters can be controlled automatically, however, FCC rules state that "No station may be automatically controlled while transmitting third-party communications. [97.109(e)]." An autopatch *must* be remotely (or locally) controlled and there *must* be a designated control operator present. Many repeater controllers have a "day mode" and a "night mode." When the "day mode" is activated, a designated repeater control operator is present. When the "night mode" is "up," a control operator is not always available. Remember that each amateur is the control operator of his or her own station, but not necessarily of the repeater station.