



## SETI League Technical Manual -- Receivers

### Using the ICOM 7000 and 8500 Series Receivers for SETI

Any SETI search of the traditional Water-Hole frequencies requires use of a microwave receiver for the 1440 - 1660 MHz range. This is generally accomplished by down-converting those frequencies to a suitable Intermediate Frequency, and employing an existing VHF receiver as a tunable IF (see, for example, the [Radio Astronomy Supplies Hydrogen Line Radio Telescope](#).) An alternative is to use a microwave receiver which directly tunes the frequencies of interest. Such a receiver is the ICOM 7000 series.



The ICOM model 7000 receiver, which is no longer available to the general public, is an all-mode, synthesized VHF and UHF receiver tuning 25 to 2000 MHz. This is the receiver which was recommended by NASA SETI scientist [Dr. Kent Cullers \(WA6TWX\)](#) a number of years ago as being ideal for ham SETI. It contains AM, NBFM, WBFM, USB and LSB detectors, with an audio output suitable for driving most any baseband Digital Signal Processor which the SETI enthusiast may care to employ. It has been largely replaced by the model 7100, which has similar capabilities except that reception of the 800 - 900 MHz cellular telephone band has been inhibited.

SETI users of either of these two ICOM receivers will wish to precede it with an antenna feedhorn and low-noise preamplifier. Although they are somewhat narrow-band, the [preamplifier](#) and [feedhorn](#) from [Radio Astronomy Supplies](#) should prove suitable for at least Hydrogen-Line SETI. For a wider bandwidth preamp alternative, the SETI League [GaAs MMIC](#) design is offered for your consideration.

Several modifications enhance this receiver greatly for SETI use. SETI League member Denis Jakac has passed along some [ideas](#) regarding scan time and power supply mods. Member Daniel Fox has developed software for scanning and data logging, as well as [documentation](#) for serial data interface to the receivers. We also recommend that you disable the Automatic Gain Control (AGC) of your Icom receiver for SETI use (see below).

The ICOM 7100 receiver was long available from a large number of amateur radio equipment suppliers, priced under \$1500 US. Used ICOM 7000's are occasionally found at hamfests and electronics swapmeets. Because of its unrestricted frequency coverage, the 7000 is in great demand, often selling for a higher price than a new 7100. The SETI League has recently learned that the 7000 series is being discontinued by Icom, to make way for their new Model R-8500 microwave scanning receiver, unveiled at the 1996 Dayton Hamvention. We were recently lent on one of these new receivers for testing, and preliminary analysis indicates it is almost ideal for SETI use.

The IC R-8500 shares one unfortunate, though minor, weakness with its predecessors: the inability to readily disable its Automatic Gain Control (AGC) circuit. This circuit (sometimes called Automatic Volume Control, or AVC) varies the gain of the receiver as a function of the signal strength being received, so as to equalize volume when tuning between strong and weak stations. Most anticipated SETI signals should be incredibly weak, and thus would not trigger the AGC to reduce the receiver's RF or IF gain. However, the same cannot be said for potential adjacent (interfering) signals through which we most likely need to scan. Thus a strong interfering signal can reduce the receiver's sensitivity, to the point we miss altogether the weak signal we're seeking.

It should not be difficult to disable the AGC in the R-8500. In fact, clipping a single wire should suffice. Unfortunately, as we do not own the receiver which Icom America kindly lent us for evaluation, we have no way of testing this necessary mod. We hope some of our active members are in a position to do so, although we must caution them that they would certainly be voiding any receiver warranty. We ask that anyone successfully disabling AGC in this or any other candidate SETI receiver send modification details to us via [email](#), for posting to the Web and inclusion in future editions of the Tech Manual.

For further information about any of these receivers, contact ICOM America at (800) 872-4266, or visit their [Web site](#).



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