For the converter to be effective, you must use an outside antenna. Beam antennas are nice if you wish to point them at the geostationery ATS satellites over the equator. However, a good ground plane is ideal for picking up 135 MHz signals that are then amplified and down-converted to 35 MHz.

Converters take just a moment to install. Simply remove your antenna cable from your scanner and connect it to the converter. Connect the converter antenna cable back to the scanner antenna connector. Plug in to the proper low voltage, and presto, you are on the air!

Not only will converters give you the satellites, but there are many different models that may also tune into other radio services. You can down-convert that elusive 220 MHz band, 300 MHz, and even 900 MHz to present scanner freqency limits. You can even get an up-converter that will take short wave frequencies and bring them into the VHF receiving range of your scanner set.

If you're real adventurous, you may want to build a converter for your scanner. Directions for an easy-to-build converter appear in this issue.

Regardless of how you tune satellite frequencies, you'll soon discover that these transmissions open a new world of scanning. Those satellite signals are just waiting for you to tune them in!

SCAN

Build a Simple Scanner Converter

by Gordon West

If you enjoy building projects, here is a fun one for adding new frequencies to your scanner.

A popular, low-noise crystal controlled converter for your scanner set can be constructed in about 15 hours. It will down-convert any signal between 130 MHz to 150 MHz, and bring it out on 30 to 50 MHz for your scanner receiver. It will provide excellent weak-signal amplification, as well as low noise with few 'birdies.'

EXPERT'S CORNER

The converter circuit is shown in the accompanying figure. Complete details on the project were found in the *VHF Handbook for Radio Amateurs,* Radio Publications, Incorporated, Box 149, Wilton, Connecticut 06897, $5.95 plus $2 postage.

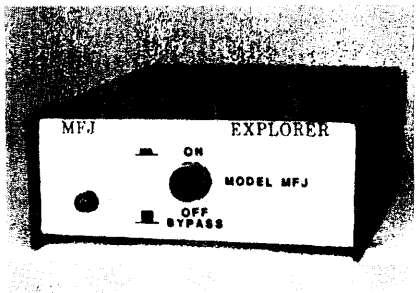
This 100 MHz down-converter uses an RF amplifier with a 2N4416 JFET, or equivalent, in a common gate circuit. The input (L1, C1) and output (L2, C2) circuits employ compact toroid coils tuned by miniature ceramic trimmer capacitors. The high Q coils were chosen to allow tight packaging of the converter, as the RF fields are well confined to the toroid, which aids in reducing any tendency towards instability.

The JFET is source biased and a blocking capacitor in the antenna circuit prevents shorting the bias supply if a grounded antenna system is used for your scanner antenna.

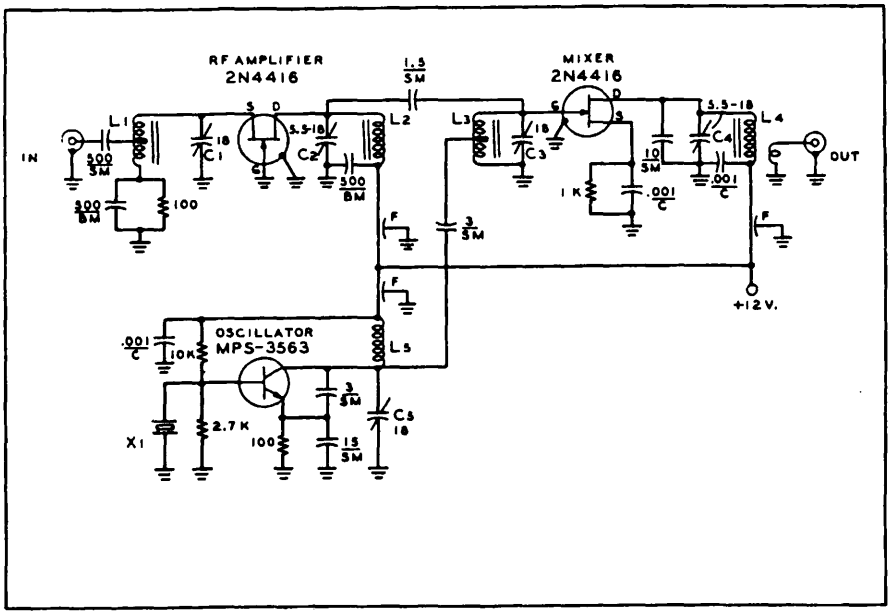
The mixer uses a second 2N44116 transistor with gate injection. The output circuit (L4, C4) is proportioned to provide a band width of 2 MHz for the intermediate frequency range of 30 to 50 MHz.

Also utilized by the crystal oscillator is an inexpensive MPS-3563 epoxy package transistor op-

erating directly at 100 MHz. Using this high mixing frequency eliminates many mixer 'birdies' and provides clear spurious-free reception on your scanner set. The converter is built on single-sided glass-epoxy circuit boards.



VHF converters can be obtained from various manufacturers for about $100.



Schematic for the 100 MHz down-converter from the VHF Handbook for Radio Amateurs. (Used with permission of Radio Publications, Inc.)

After the wiring is completed and checked, the source resistor of the mixer stage is adjusted. The zero bias drain current is measured at the feed-through capacitor when the source is temporarily grounded. The current is usually 11.2 mA.

The mixing crystal is now plugged into the socket and the oscillator capacitor C5 tuned for steady crystal operation. The injection level to the mixer stage is now adjusted by the placement of the tap on coil L3. The tap is moved a turn at a time until the drain current of the mixer rises to about 40 percent of the zero bias value which, in this case, is 4.4 mA. You then align the trimmer capacitors for maximum response to weak signals on the satellite band. You can also adjust for maximum response on any other frequency between 130 MHz and 150 MHz. Good coaxial cable should be used to reject unwanted signals when connecting the converter to your scanner receiver.

Every scanner receiver will receive frequencies out-of-the-band on their 'image' frequency. The image is produced in the mixer stage of a scanner, and is a normal part of the receiver using superheterodyne conversion. On Regency and Radio Shack scanners, the image frequency is 21.4 MHz below the operating or indicated frequency. On Bearcat receivers, the image frequency is 21.6 MHz below the indicated frequency.

With a Bearcat 300 scanner, for instance, to receive the 136.6 MHz satellite channel, try programming 158.200 MHz. You will hear both channels, 136.6 MHz and 158.2 MHz at the same time. Although sensitivity on the image frequency will be somewhat less than on regular frequencies, you may be able to hear stronger satellite signals with a conventional un-modified scanner receiver.

It's fun and educational to build simple scanner projects. Always wear safety glasses to protect your eyes, and always work in well-ventilated areas.

For more detailed instructions, we suggest referring to the *VHF Handbook for Radio Amateurs.* And, when building the project, please remember to wear safety glasses to protect your eyes.

Good luck!

SCAN