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CQ Reviews:

The Regency HR-2 Transceiver

BY GLEN E. ZOOK,* K9STH

The number of amateurs operating on v.h.f. f.m. in the United States and Canada has increased rapidly in the past few years. During most of this time operation has been with obsolete commercial units released from police, taxi, and other services. Within the past two years a number of solid-state v.h.f. f.m. units designed for use by the amateur radio operator have been introduced by manufacturers both foreign and domestic. The Regency HR-2 is a good example of the equipment being manufactured within the United States for the f.m. minded amateur. It is compact, versatile, and has sufficient power for most serious and all casual f.m. work.

General

The Regency HR-2 transceiver is designed for operation on the 2 meter (144-148 mc) amateur band. Both receive and transmit frequencies are crystal controlled on each channel. The receiver is a dual conversion superheterodyne with a ceramic filter for adjacent channel rejection. The transmitter utilizes phase modulation (as do most units for commercial use) with an output of 10 watts or more. The unit comes equipped with a mounting bracket for under-the-dash use and a length of cable for power application (12 volt negative ground). Accessories include a cigarette lighter plug (Regency MA-10, not supplied) for easy attachment to the automobile electrical system, and a good quality high-impedance

ceramic microphone and connector (supplied).

Technical Details

The HR-2 employs complete solid state circuitry, including the following:

Integrated Circuits	2
Silicon Transistors	21
Silicon Balanced Emitter Trans	2
Zener Diodes	2
Varicap Diodes	2
Small Signal Diodes	3
Field Effect Transistor	1
Total devices	<u>33</u>

Of these devices 13 transistors, 2 integrated circuits, and one zener diode are utilized in the receiver section. All remaining devices are used in the transmitting section.

Receiver

The receiver is a 6 channel crystal controlled superheterodyne dual conversion unit. Basic sensitivity for 20 db quieting is a claimed 0.35 microvolts nominal. Audio output at 4 ohms and 10% distortion is 3 watts, with a maximum output of 5 watts. All transistors and integrated circuits appear to be manufactured by Motorola, but some devices are marked only with a color-code. The color coding on these devices are similar to those on devices manufactured by Motorola and used in their own communications equipment.

The r.f. amplifier stage of the HR-2 receiver section is a bi-polar silicon transistor. This transistor has no JEDEC number stamped on it, only color coding. The 50 ohm input is matched through a tapped, slug-tuned coil. The signal is applied to the base of the r.f. amplifier through a second tuned stage. The output of the amplifier is then fed through 2 tuned circuits to the base of the mixer transistor, (apparently identical to the r.f. amplifier transistor, thus indicating a good, low noise, high frequency silicon transistor).

The oscillator section utilizes a 2N5130 as an overtone oscillator-multiplier. The crystals are 45 mc overtone types which are switched for channel selection. No provisions are made for warping or "rubbering" the receive crystals to

*FM Editor, CQ.



The Regency HR-2 2-meter f.m. transceiver.

frequency, so quality crystals matched to the receiver must be used to ensure on-channel operation. The output of the oscillator-multiplier stage is 10.7 mc lower in frequency than the desired received frequency. When this signal is applied to the 1st mixer the result is a 10.7 mc high i.f.

The output of the 1st mixer is applied through two transformers to the high i.f. amplifier, an MC1550G integrated circuit. This integrated circuit has the potential gain of at least 30 db power and a noise figure of less than 5 db¹ at 60 mc. The IC also contains the 2nd mixer stage. A 10.245 mc signal is applied from a transistorized, crystal controlled 2nd oscillator. The result is a 455 kc low i.f., which is passed through a Japanese Murata ceramic filter to the second IC.

This second IC functions as a low i.f. amplifier, limiter, and detector. The IC is a 14 pin DIP type with no visible markings. Audio output is applied simultaneously to the audio amplifier and squelch stages, which operate on noise impulses. The audio output consists of three stages with capacitor coupling to an integrated 3.2 ohm 4 inch speaker. Provision is made for use of an external speaker if so desired.

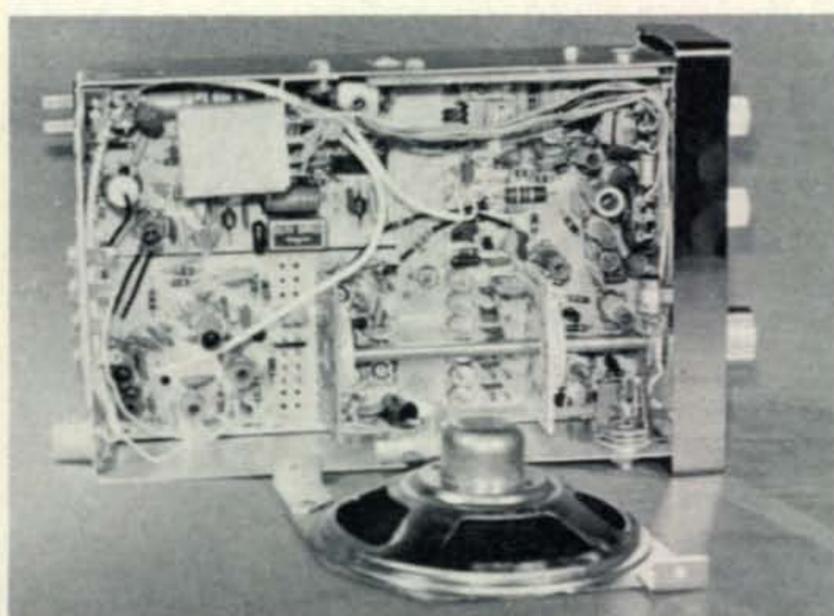
Transmitter

The transmitter section of the HR-2 is a crystal controlled solid-state unit with an output of at least 10 watts. The crystals used have a tolerance of 0.0015% and may be set to frequency for on-frequency operation. Frequency multiplication is 24 times, which is achieved in the first five stages. The final transistor, a 2N5590 balanced emitter v.h.f. NPN silicon operates straight through. A high-s.w.r. protection circuit which senses reflected power is provided to prevent damage to the transmitter when operated with improper load. Circuitry is straight-forward.

The audio section of the transmitter uses a JFET as microphone pre-amplifier. Output from the preamp is fed through an audio gain control to the 2nd audio amplifier transistor whose output is clipped by a pair of small-signal diodes and fed to the audio output stage. The output of the final transmitter audio amplifier stage is fed through a 2nd gain control (labeled DEVIATION) to a Varicap modulator. This final gain control, as well as the microphone gain control, can be varied to produce the deviation desired.

Performance

The unit functioned well from start. Modulation quality and receiver audio were excellent. The controls are functional and easy to operate. When compared to the published speci-



Top view of the Regency HR-2 showing the frequency switch, receiver crystal sockets (at left of rear switch deck) and transmit crystal sockets (at left of front deck).

fications the following results were obtained:

	<i>Claimed</i>	<i>Measured</i>
RECEIVER SENS.		
20DB:	0.35 nom. μ v	0.45 μ v
SELECTIVITY:	6db \pm 16 kc	exceeded
	50db \pm 32 kc	exceeded
MODULATION		
ACCEPTANCE:	\pm 15 kc	\pm 22 kc
POWER OUTPUT,		
TRANSMIT:	10 watts	12 watts
DEVIATION:	Preset \pm 10 kc	\pm 18 kc
FREQUENCIES:		
TRANSMIT:	146.940 mc	146.9387 mc
RECEIVE:	146.940 mc	146.9415 mc

The receiver sensitivity did not meet the nominal specifications published. However, giving a nominal specification for 20 db of quieting is somewhat unusual. Normal practice is to list a minimum acceptable standard and then try to beat that standard. In the case of both commercial high band and amateur 2 meter f.m. equipment the normal specification for 20 db quieting is 0.5 microvolts. Often the actual sensitivity is about 0.35 microvolts. Thus, the 0.45 microvolts for 20 db quieting is not an indication of a bad receiver. The only indication is the need for a minimum standard rather than a nominal standard. In both cases of frequency measurement the tolerances were within the 0.001% receive and 0.0015% transmit tolerances. Deviation was excessive for areas in which wide-band operation is still in use. However, both the deviation and microphone gain controls had to be adjusted to achieve \pm 5 kc for narrowband work. This required a little juggling of the controls. The result was a good sounding \pm 5 kc deviation transmitted signal. The physical size of these transmitter audio is such that they require a small screwdriver and a light hand, but they can be adjusted for narrowband.

Construction

The construction of the Regency HR-2 is

¹The Integrated Circuit Data Book, Motorola Semiconductor Products, Inc., Phoenix, Ariz., 1968, pages 9-67 - 9-70.

excellent. Good quality printed circuit boards with immersion tin plating are used throughout. All solder connections were excellent with no resin residue. The only criticisms which can be justified are, first, the "Mickey-Mouse" mounting of the pilot lamp. This lamp is held in place by a spring clip which makes the ground connection. The center connection (hot side) is soldered to the bulb making easy replacement impossible. The second criticism is the placement of the microphone jack on the left side of the chassis. When the unit is installed in an automobile there is a distinct chance of the protrusion of the microphone plug interfering with the right leg of the driver. This plug, along with the beginning of the coiled cord project over three inches beyond the side of the unit. This, however, can be overcome by replacing the plug with a Switchcraft 230 (or equivalent) "Flat Plug." This type of plug protrudes less than 1/2" from the side of the unit, and the microphone cord comes out at 90° from the shank of the plug. Thus, the

interference with the driver can be avoided.

Conclusion

Basically the Regency HR-2 is a high-quality transceiver for use by the amateur f.m.'er. The power output is sufficient for normal direct contacts as well as those contacts made through repeaters. The six channel capabilities along with the built-in strapping options to allow pairing of various crystals gives the amateur f.m.'er the versatility needed while travelling through areas with repeaters on frequencies other than 146.34/146.94 or 146.34/146.76 mc. The HR-2 was not designed to compete with the high-priced commercial equipment, but in many cases it can do the same job as those units in its power class. The expenditure of \$229.00 including crystals for simplex operation on 146.94 mc is well worth considering. The manufacturer is Regency Electronics, Inc., 7900 Pendleton Pike, Indianapolis, Ind. 46226.

—K9STH

CQ Reviews:

The Standard SR-C806MA Transceiver

BY GLEN E. ZOOK,* K9STH

ONE of the important contributions to the amateur f.m. market is the SR-C806MA transceiver imported by Standard Communications Corporation, Wilmington, California. This unit is designed for operation in the 2 meter (144-148 mc) amateur band. The transceiver has provisions for up to twelve channel operation with a minimum power output of 10 watts. Accessories include a base station a.c. supply (SR-C12/120-1) and a 25 watt output final amplifier (SR-

CL25L). The unit is equipped from the factory for operation on four channel-combinations: 146.94 mc transmit/ 146.94 receive; 146.34 mc transmit/ 146.76 mc receive; 146.20 mc transmit /146.80 mc receive; and 146.34 mc transmit/ 146.94 mc receive. These frequencies cover the most used repeater frequencies as well as the national calling frequency of 146.940 mc. The receiver is a solid-state dual-conversion superheterodyne design. A ceramic filter is incorporated into the low i.f. stages for adjacent channel rejection. The transmitter is also completely solid-state. A low power switch is located on the front to reduce the 10 watt output to 0.8 watts for short range QSO's. Modulation is phase type (as used in most commercial equipment) and frequency stability is 0.001%. The unit is equipped with a sturdy mounting bracket, built-in 2¼ inch speaker, dynamic push-to-talk microphone, and crystals for operation on four channel-combinations. Additional accessories include filters for alternator hash, and a 25 watt power amplifier.



The Standard Communications Corp. model SR-C806MA 2-meter f.m. transceiver.

Technical Details

The SR-C806MA employs completely solid-