



The Galaxy V Mark 2

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A quick glance at the new Galaxy V, Mark 2, five-band SSB transceiver leads you to wonder what changes were made from the previous model. The front panel certainly doesn't look very much different. The only changes evident here are the new vernier logging scale and removal of the "zeroing" knob. However, a look inside and a quick check of the schematic show that this new transceiver from Galaxy has actually been modified a great deal.

The most obvious difference is the large number of semiconductors that have taken the place of tubes. In the Mark 2, semiconductors are used in the VFO, high-frequency crystal oscillator, speech amplifiers, AVC rectifier and amplifier, CW sidetone generator, and receiver audio stages. In addition, the optional plug-in VOX accessory is completely transistorized.

The solid-state VFO is really exceptional—no less than four transistors are used: the oscillator, a two-transistor buffer stage and an output stage. The people at Galaxy are so proud of the stability of this new VFO

that they run a frequency-stability check on each transceiver and include the curve with the unit. The frequency drift on my Galaxy V, Mark 2, is less than 100 Hz in any fifteen minute period, and most of that takes place in the first thirty minutes after it's turned on. After forty-five minutes or so it's difficult to detect *any* drift at all. This was borne out when I had the opportunity to see the Mark 2 VFO run into a digital frequency counter—once you set it on frequency there were occasional 1 Hz drifts to one side or the other, but that's all.

In addition to its excellent stability qualities, frequency readout is extremely linear. When you zero in on the nearest 100 kHz point and set the vernier logging scale, you can read the frequency directly in kilohertz. With a little practice you can interpolate to within about 100 Hz. If a DX station says that he's listening on 14206 kHz, you can hit it right on the money with no effort at all.

Other new, more subtle features of the Mark 2 are 400 watts on SSB, sidetone audio for CW, optional CW break-in and an

optional CW filter. Many of the transceivers on the market leave a lot to be desired for the CW operator; not so with the Mark 2. With the break-in and filter options, and the built-in sidetone feature, it's a dream to use on CW.

If you have ever tried to work the CW section of a DX contest, or tried to snag a rare one in a pileup on twenty meters, you know exactly what I mean. The *if* filters designed for sideband just don't do the job on CW. However, the optional new Galaxy F-3 filter provides the extreme selectivity required in CW work. The selectivity is nominally 300 Hz wide at the -6 dB points, with some broadening as the signal level increases. In fact, the selectivity is adequate to split the mark and space signals from an RTTY signal shifting only 170 Hz! To compensate for insertion losses, a one-stage transistor amplifier is built in. With this little nicety it is possible to switch the F-3 filter in with no change in the audio output.

Transmitter circuit

In the Mark 2 the microphone signal is amplified by two transistor audio amplifiers and then applied to a 12AT7 balanced modulator. A carrier signal from a 6GX6 crystal-controlled carrier oscillator is also coupled into the balanced modulator—the frequency depending upon which sideband is selected, upper or lower. The output from the 12AT7 is a double sideband, suppressed carrier signal.

This D.S.S.C. signal is coupled into the six-crystal lattice filter. This filter is only 2.1 kHz wide at 6 dB down and its excellent shape factor results in a very clean SSB signal with unwanted sideband suppression of at least 55 dB. The SSB signal from the output of the filter is amplified by a 6EW6 *if* stage and then coupled into a 6EJ7 transmitting mixer.

The 5.0 to 5.5 MHz signal from the VFO is coupled directly into the transmitting mixer stage for operation on 20 and 80 meters. On 40, 15, and 10, a signal from the high-frequency crystal oscillator is mixed with the VFO output in a 6EA8 mixer and then applied to the 6EJ7 transmitting mixer. This signal is coupled into the 6GK6 driver—then to the parallel 6HF5 output stage.

For CW operation the carrier oscillator is shifted so that the carrier is centered in the bandpass of the crystal filter. This is helpful because you are transmitting on exactly

the same frequency where you're listening, and not hopping across the band with every "over." In the CW mode, the 6EJ7 transmitting mixer is grid-block keyed.

The internal ALC system consists of two semiconductor diodes in the final grid circuit. Whenever grid current flows in the power amplifier, it is rectified and coupled as a negative ALC voltage to the 6EW6 *if* amplifier, reducing the gain to maintain linearity.

Receiver circuit

In the receiver the incoming signal is amplified by a 12BZ6 rf amplifier and then coupled into a 6HG8 receiving mixer. The mixing signal is supplied by the same VFO and 6EA8 mixer used in the transmitter. The output of the mixer is fed into the crystal filter and then to a 6EW6 *if* stage. It is further amplified in the second *if* amplifier, a 12BA6, and coupled into the 6GX6 product detector. The low-level audio output from the product detector drives the solid-state AVC rectifier and audio amplifier stages. The negative AVC voltage is applied to the rf stage and the first and second *if* stages.

Galaxy V Mk 2 Specifications

Frequency coverage:	3.5-4.0 MHz, 7.0-7.5 MHz, 14.0-14.5 MHz, 21.0-21.5 MHz, 28.0-28.5 MHz, 28.5-29.0 MHz.
Types of emission:	Selectable upper or lower sideband, CW.
Power input:	400 watts PEP SSB, 300 watts CW.
SSB generation:	Crystal lattice filter, bandwidth 2.1 kHz at 6 dB points. Unwanted sideband suppression -55 dB. Carrier suppression -45 dB.
Receiver sensitivity:	0.5 μ V for 10 dB signal to noise ratio.
Features:	Push-to-talk or optional VOX, ALC, automatic carrier insertion for CW, break-in CW operation with VOX accessory, grid-block keying on CW, tuning dial with vernier logging scale provides 1 kHz frequency readout—interpolation to within 100 Hz, optional 300 Hz CW filter.
Tubes and semiconductors:	12 tubes, 16 transistors and 9 diodes. Parallel 6HF5's in the power amplifier.
Accessories:	AC35 117 Vac power supply, G35A 12 Vdc mobile power supply, remote VFO, crystal calibrator, F-3 CW filter, VOX.
Size and weight:	6" x 10 $\frac{1}{4}$ " x 11 $\frac{1}{4}$ ". 13 pounds.
Price:	\$420.00.

VOX

In the optional VOX unit, an audio signal is picked up at the second speech amplifier and fed into a two-stage VOX amplifier. The output of the VOX amplifier is used to drive a Schmitt trigger. The base to emitter junction of a transistor is used as a level reference zener diode in the trigger circuit. When the input reaches the level preset by this diode, the trigger quickly conducts and drives a relay amplifier. The trigger circuit is much more positive than the usual VOX

circuitry and minimizes undesirable relay chattering. In the CW mode the keying circuit operates the sidetone oscillator which injects a strong audio signal to operate the VOX for break-in operation.

When you combine all of these features with a 0.5 μ V sensitivity for 10 dB signal to noise ratio, selectable sideband, 400 watts PEP and complete five-band coverage, including a full megahertz on 10 meters, you have an all-around transceiver that is hard to beat.

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The Transistor: A Primer

It is inevitable that successful new devices such as the transistor are the subject of controversy, the victim of misconception, and the target of sour-grapes-type tube guys who are poor losers. Now we've got to go back to year 1 and clear the air so that both the neophyte and the hoped-for converts will understand the transistor's history, its uses, and its limitations.

1. It is not true that transistors were invented by a fashion plate and thief because the tubes he stole made his pockets bulge and ruined his crease.

2. The question, "Where are transistors found"? is somewhat a contradiction in terms. Once a transistor is lost it stays lost.

3. The practice of plating transistors with precious metal and using them as shirt studs and cuff links was a natural outcome after the discovery that they cannot be found if they roll under the bed or the bureau.

4. It is not true that the Japanese make transistors because they don't know how to make tubes. They simply don't have room to make tubes.

5. It is not true that Japanese transistor rigs are packaged by their fishing industry and the parts are not packed like sardines. Soy bean oil, cottonseed oil, mustard sauce, and catsup are all corrosive to transistors. At least the transistors have not appeared with every other one inverted on the board.

6. It is not necessary for the casual experimenter to stock a multitude of transistors for his home projects. You usually find only two types on his bench; the ruptured junction PNP and the open collector NPN.

7. Transistors are definitely interchangeable. The problem is to get them exchangeable at the store where we got them.

8. No, we don't have a sample transistor to show you. We did have but lost it on the way here.

9. No, dropping a transistor is not harmful. It always finds a soft spot in your cuff where it is lost.

10. Yes, we can define the words, "epitaxial planar passivated". They are discouraging words.

11. No, do not use RG-8U to interconnect monolithic chips containing 60 transistors and diodes. Use 5U4's (in the darlington connection for transistors) instead to benefit from the large signal handling capability.

12. Yes, if you repair a transistor rig and have to leave the vtvm connected to sustain oscillation, you can charge the customer for the vtvm.

13. Yes, the boxes that transistors come in were designed to contain transistors—why do you ask?

14. No, there is no shock hazard involved in servicing transistor rigs other than the initial one upon removal of the cover and having peered inside.

15. Yes, transistors last a lifetime. They usually survive the serviceman who works on them since he usually shoots himself by-and-by.

16. No, this isn't a biased opinion. That depends upon what you mean by bias. I used to know but I don't any more.

17. Watch it! Don't anyone move. No, this isn't a stickup. I just dropped my last 2N697.

. . . Raymond Stellhorn WAØNEA