MICROMONITOR TECH NOTES

Volume V introduced a new product, the Micromonitor, to be used to expand a variety of CB Radios to the 10 Meter band. The Micromonitor System represents a new concept in adaptations and is not yet well understood in the industry. Figure 1 illustrates the basic block diagram of the common phase locked loop type circuits which are found in CB radios today.

The circuit shown in figure 1 shows several distinct areas used in these PLL circuits. The essence of the circuit is the PLL IC. This device contains two counters and a digital phase detector. The first counter simply divides the reference oscillator by 2048 to yield 5KHz as the reference frequency input to the phase comparator. The second counter is programmable from external pins and can be programmed to divide by any number between zero and 256. When the outputs of each of these counters occur simultaneously, the PLL is considered to be locked. How-

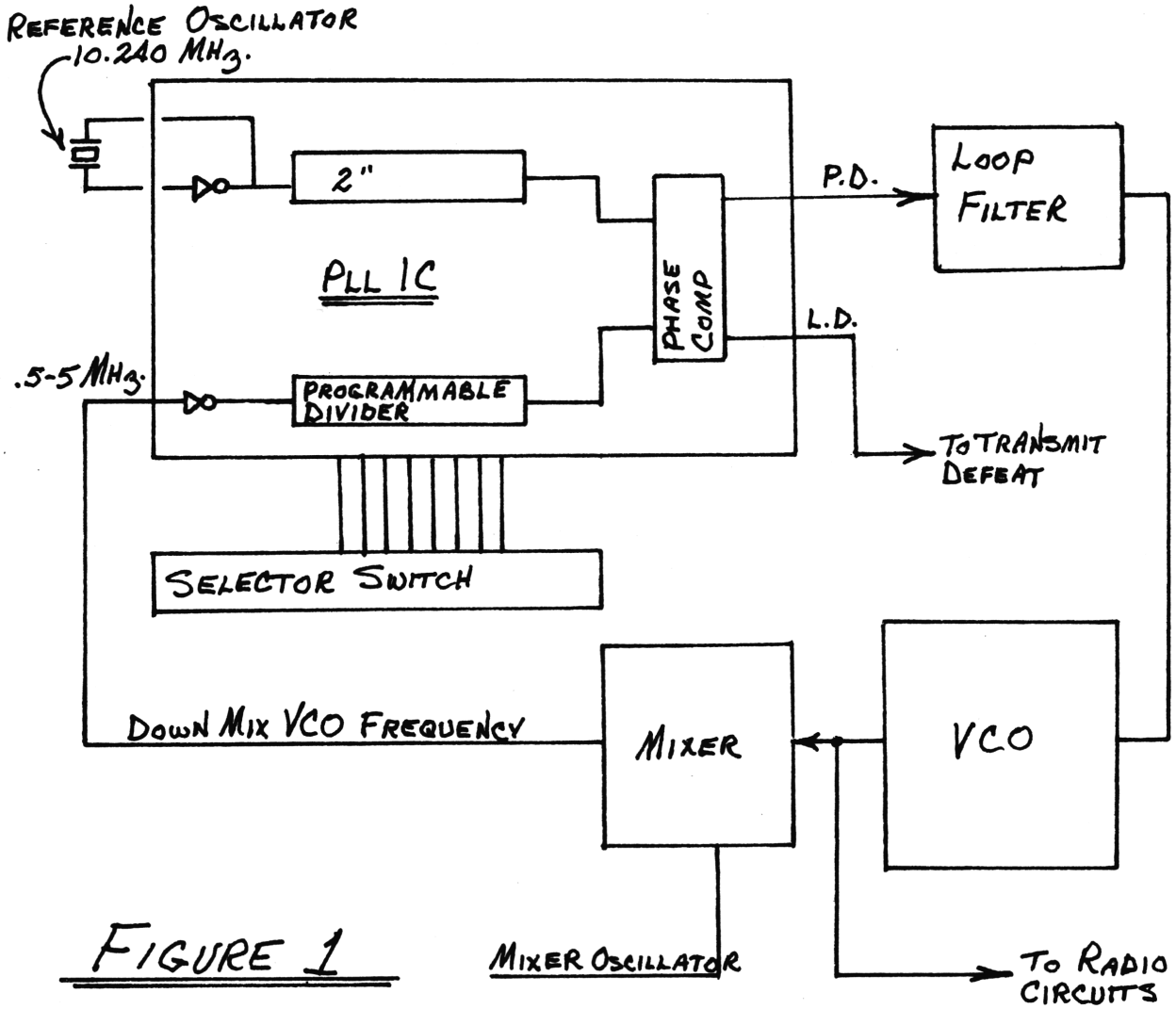

FIGURE 1

ever, when the reference counter output lags or leads the output of the programmable divider, the PLL is unlocked. The phase comparator detects the difference in phase and outputs a pulse of the proper polarity and duration so as to cause the VCO to adjust its frequency to again achieve a locked condition. The majority of PLL chips used today output a positive going pulse to increase VCO frequency and a negative pulse to decrease VCO frequency. Note, however, that a few chips reverse the polarity of the output pulse.

When the latest style CB radios were introduced, the PLL IC's used deviate from that shown in figure 1. The latest chips employ a ROM (read only memory) between the selector switch inputs and the programmable divider as shown in Figure 2.

When these new chips are used in CB radios and conversion is attempted, a third output, the illegal code detector will be activated and in turn, shut down the entire PLL chip. In some cases, external crystals can be used to alter the output frequency to the desired operating range. However, this technique can lead to other problem areas.

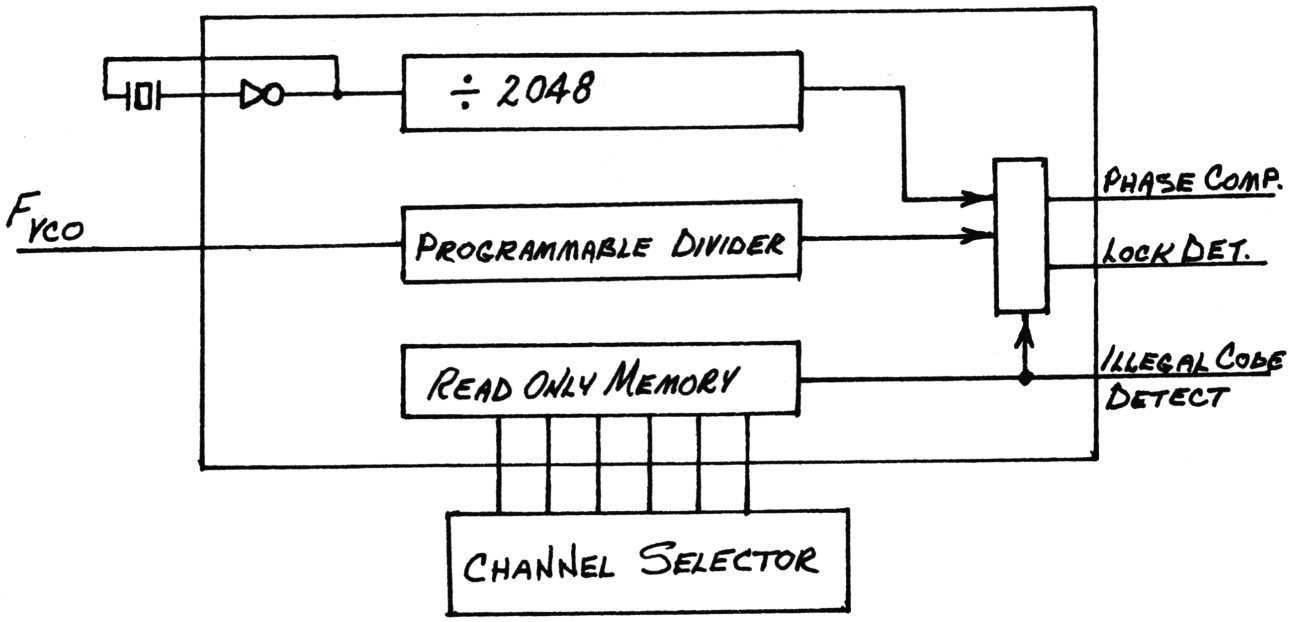

FIGURE 2

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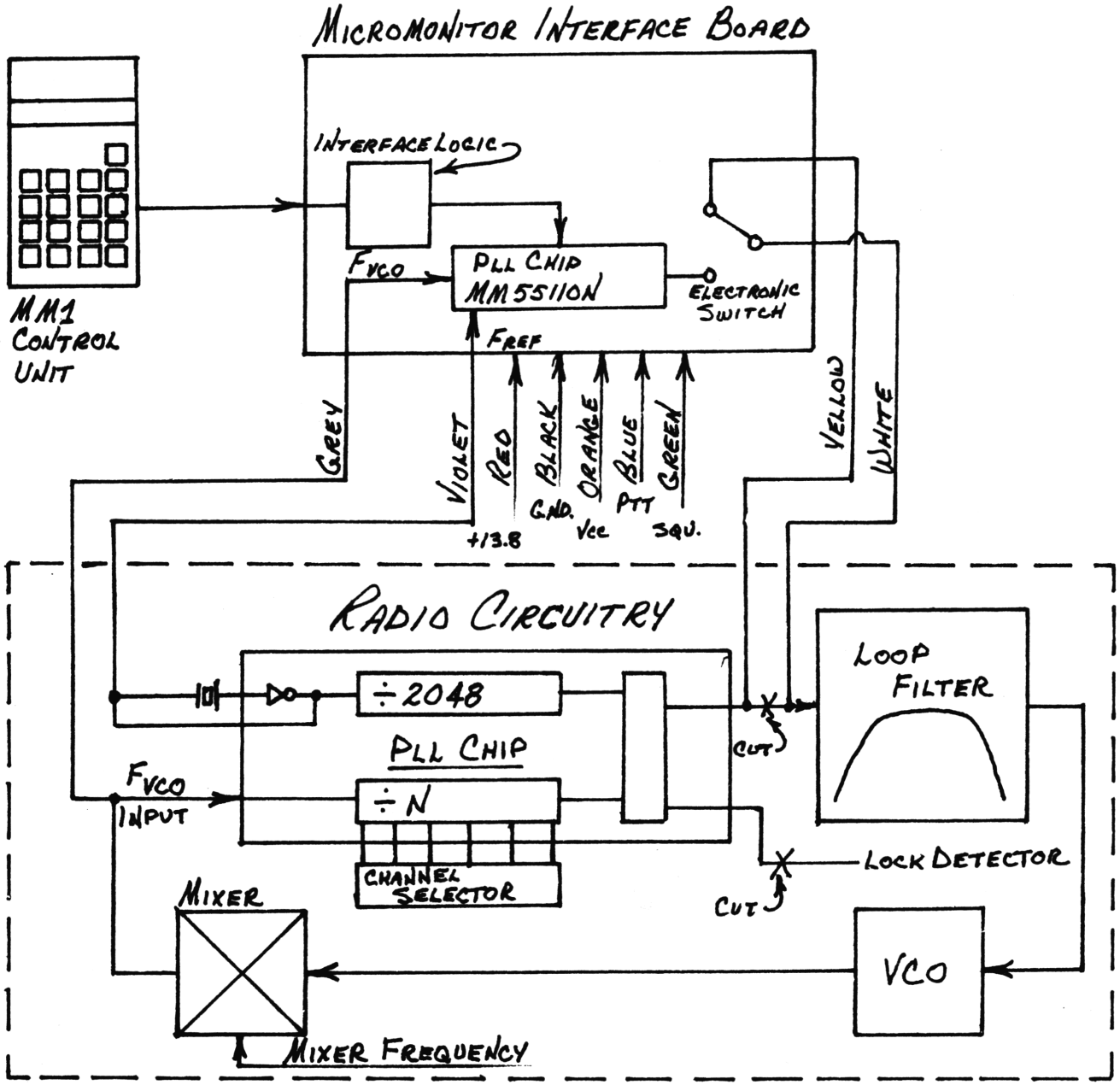
The Micromonitor System was designed to allow NORMAL radio operation using whatever type of PLL IC the radio designers have chosen to use and, when the 10 Meter use is desired, to electronically switch the Micromonitor circuitry into operation. Figure 3 depicts the block diagram with the Micromonitor installed.

FIGURE 3-

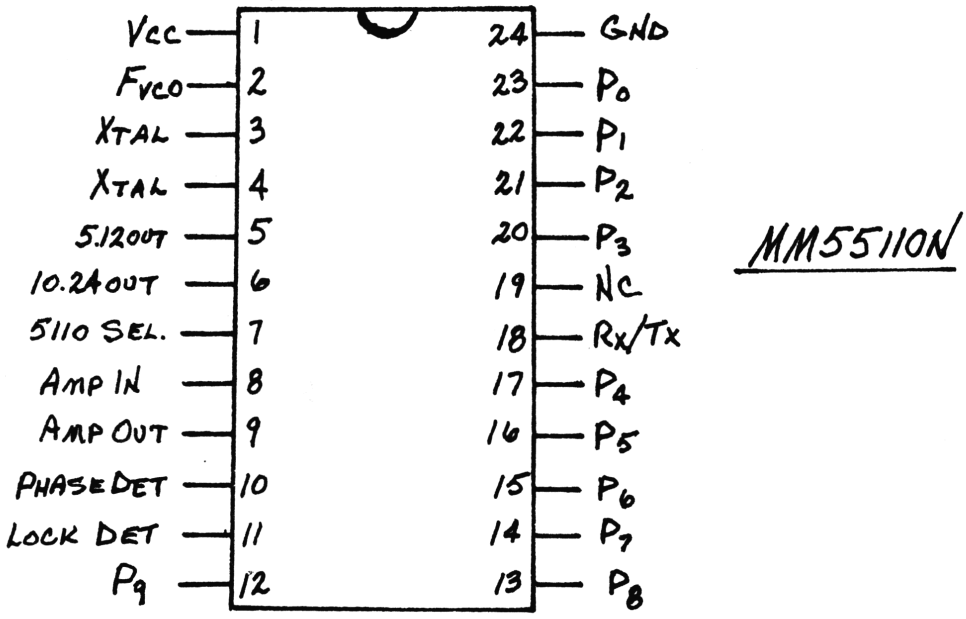


When the Micromonitor system is installed, only two radio circuit changes are normally required; the lock detector circuit must be defeated and the phase detector output of the radio's PLL chip is interrupted. When the MM1 is installed, a variety of connections are required. The interface board contains low current CMOS circuits and uses about 20 ma of radio power. The connections should always start with the black wire (ground) and proceed following the instructions included with each unit. When the radio's phase comparator output is cut, attach the yellow wire to the PLL chip and the white wire to the trace that used to be connected to the PLL chip. During normal radio operation, the output signal from the radio is routed to the yellow wire on the interface board and is electronically switched to the white wire which delivers the signal right back to where it used to be connected. As a result of this signal flow, the radio can be used in exactly the same way as it was before the modification was installed. However, when the MM1 is plugged in and turned on, the electronic switch changes state and now outputs a signal from the MM1 IC chip to control the VCO. As the reader can see, the best of both worlds can now be realized. The addition of the parallel PLL chip and the electronic switch allows the user the greatest flexibility possible in radio control.

The foregoing describes the principles of operation of the radio and Micromonitor designs, and, in practice generally works quite well. There are however, several anomalous modes that have turned up as operating history has been gained on the system. The remainder of this article will attempt to focus on these technical areas and to describe the techniques developed to assure reliable operation.

The first anomalous feature has to do with the MM55110 PLL chip found on the interface board. Figure 4 illustrates the pinout configuration of this IC.

FIG. 4



NOTICE that the Fvco input frequency connects to pin 2 of this device and also that the 10.240MHz reference oscillator appears on pin 3. These adjacent pins exhibit roughly 3-5pf of capacitance between them and as a result, some signal coupling exists between them. The effect of this coupling has been signal instability once installed in the radio.

The solution to this phenomenon is relatively simple: a 10k resistor and a small capacitor of about 39-50pf. Figure 5 illustrates the hookup of the filter.

This filter has been incorporated into the design and is now installed on all new units leaving the factory.

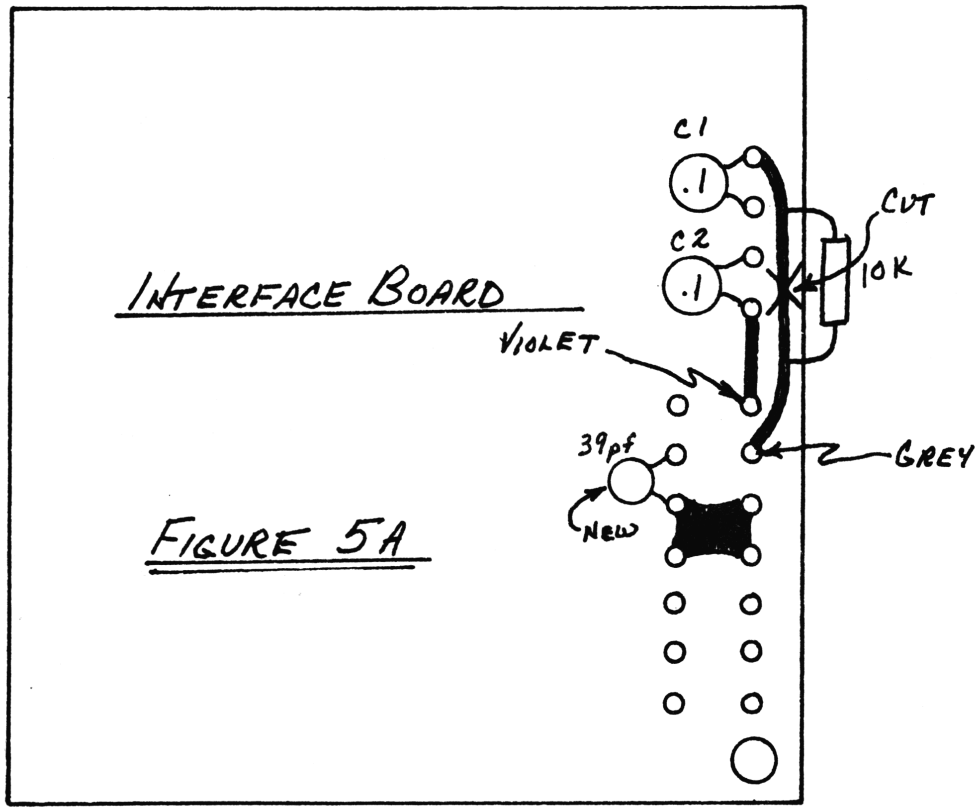


FIGURE 5A

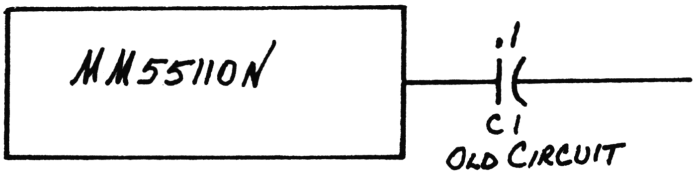


FIGURE 5B

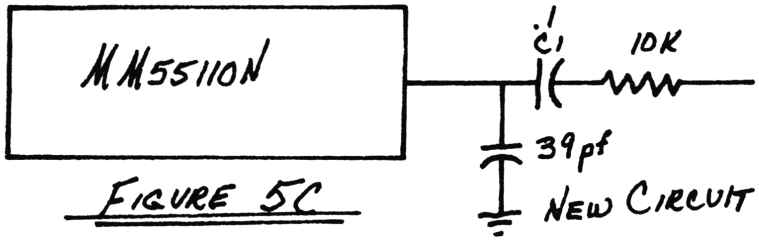


FIGURE 5C

The second potential source of difficulty has to do with the Fvco input signal characteristics. The circuit requires a minimum of 1.5 volts peak to peak at all operating frequencies and, in addition, requires that each pulse be identical with each other. This translates to peaking up the VCO downmix signal at the mixer (see figure 3.).

In general, the higher the signal amplitude of this signal, the better the performance and, in turn, the corresponding operating range is increased. When the MM1 has been connected to CPI radios, experience has shown that some signal degradation exists when the radio is operated at the high end. Q615 is the Fvco mixer/amplifier for this stage. Simply rebiasing this stage will cure any instability problem. R626 is a 4.7k resistor in this radio. Substituting this resistor with a 2.2k (supplied) assures that the downmix VCO signal will perform adequately under all operating conditions. Similarly, the new UNIDEN chassis use two different down mix circuits, a one transistor design and a two transistor design. In the single transistor design, the collector-base feedback resistor (100K) may be increased to 470k to peak the signal. The two transistor design requires reducing the first transistor's base-to-ground resistor to 1k.

Of course each radio is slightly different, and, should instability be present, it is best to contact the factory for consultation. Note however, that these problems are not normally present. When they do occur, the technique is usually a very simple modification or adjustment that will allow full performance.

Lastly, some of the Micromonitor units exhibited a problem that showed up when RF amplifiers were used. The extremely high RF field caused by the linear amplifier was causing the Microcomputor to become unstable and the MM1 would exhibit a wierd display to signal this condition.

The solution to this problem is to remove the four screws holding the case back on to the control device. Once the board has been exposed, remove the bare ground wire and the red wire from the board. Install a ferrite bead onto each of these wires and reinstall into the board. This has proven especially helpful in eliminating the effects of high RF radiation. Alternately, some method of shielding the interconnecting cable should be helpful in reducing effects of this type.

In conclusion, the Micromonitor system can offer unique advantages to the user, however, as with any add-on device, troublesome areas can occur. These problems, once identified, can be cured and turned to the user's advantage in terms of increased performance. The areas identified thus far are the few problems that have appeared.

As these areas and their solutions have been identified, checkout and adjustments to the user installation instructions have been incorporated to minimize installation time.