

AMSD-2

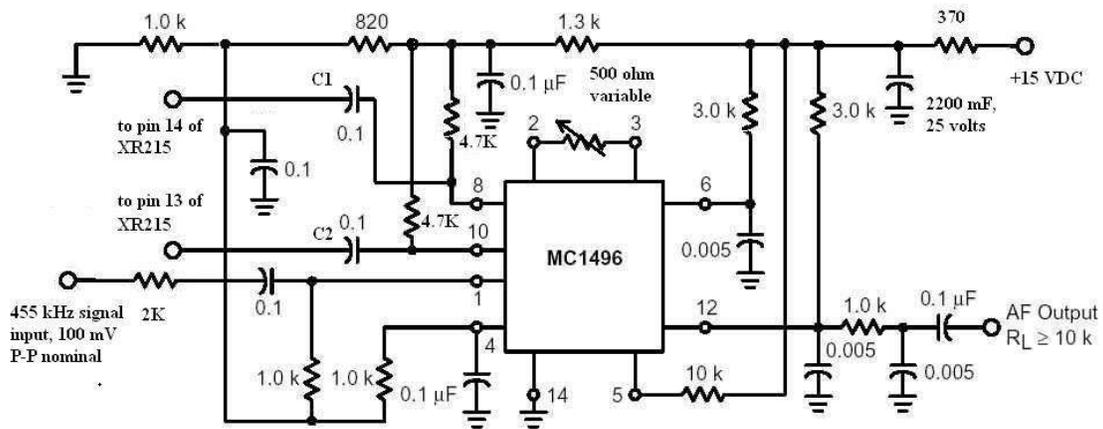
Dallas Lankford, 7/8/04
rev. 12/15/04

The AMSD-2 is an updated and improved version of the AMSD-1 AM synchronous detector which was described in the 1989 issue of Fine Tuning's *Proceedings* edited by John Bryant. The AMSD-1 used two Exar IC's, an XR-215 and an XR-2228. While a few XR-215's can still be found by the diligent scrounger, XR-2228's appear to be unavailable. The 2228 is basically a product detector, so I decided to see if an MC1496P could be used instead. After a few adjustments to my initial design, it seems to be working fine. However, additional use and testing may reveal other adjustments which should be made. Nevertheless, I believe it is close enough to the final version should anyone wish to build it.

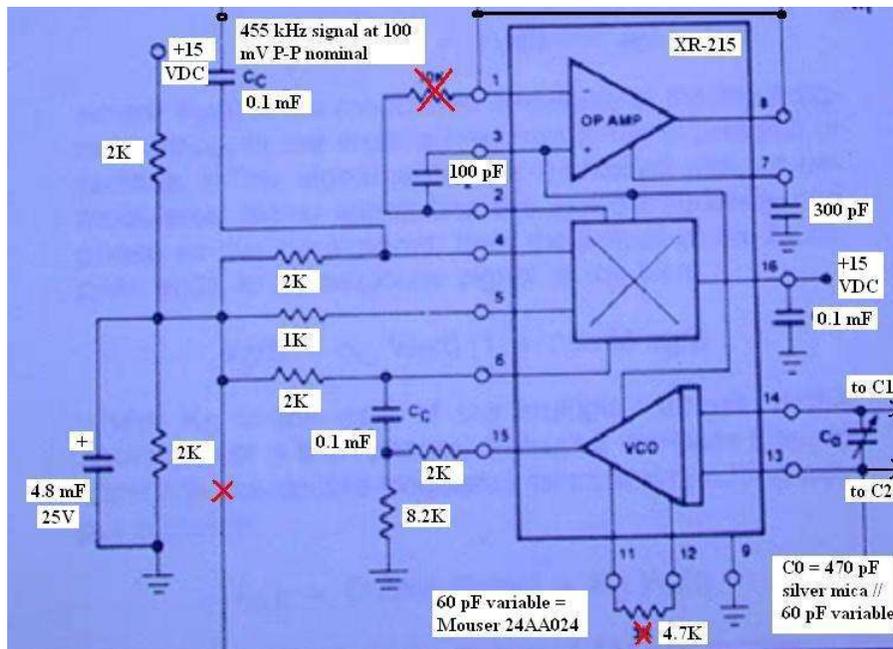
Like the AMSD-1, the AMSD-2 has an extremely wide capture and lock range, in excess of +/- 100 kHz at most signal levels. You never hear it lock or unlock unless you feed it with a signal generator (and no BW filter). When connected to a receiver 455 kHz IF output with appropriate signal levels the AMSD-2 is completely transparent to the user. There are no hets, whistles, growls, or any other indication that you are using an AM synchronous detector as you tune your receiver. Weak signals, strong signals, it makes no difference. You want USB AMS? Just off tune your receiver to the appropriate side. Again, no hets, whistles, or growls. The AMSD-1, and now the AMSD-2, used to be in a class by themselves (oops, and some of the Racals). However, ICOM figured out how to implement a 32 bit DSP AM synchronous detector in their IC-746Pro that is in the same class. I understand they also use an AMSD in their new IC-7800.

In addition to the XR-215 and MC1496P, the AMSD-2 uses a Velleman M4001 audio amplifier. With a 12 volt supply, it puts out 1.56 watts of undistorted audio into an 8 ohm speaker. The frequency response is 20 – 20,000 Hz at 3 dB down, 86 dB S/N ratio, 40 mV sensitivity with an input impedance of 150 K ohms, and 0.05% THD. It is an excellent audio amp. With an 18 volt supply, it will put out about 3.5 watts into 8 ohms.

This is not intended to be a construction article, but enough information will be given below for an experienced builder to reproduce my new design.



The 370 ohm resistor (150 + 220) and 2200 mF electrolytic capacitor in the +15 VDC line of the MC1496P are for 60 cycle hum elimination. If you want to use a +12 VDC supply and don't mind a slight amount of 60 Hz hum, you can use a 33 ohm in place of the 370. According to an Exar data sheet, the XR-215 will operate with signal levels up to about 1 volt rms. However, according to a MC1496P data sheet, it is good only up to about 100 mV rms. So I inserted a 2K ohm dropping resistor in the MC1496P signal line to provide about 10 dB attenuation. The MC1496P requires only 9 microvolts for a 20 dB S+N/N ratio, so the attenuation is insignificant in this application. The 500 ohm pot between pins 2 and 3 is a gain control pot. Using a scope, it can be set so that the maximum audio output of the Velleman amp does not clip for some signal level input, such as -10 dBm from a signal generator. It is not critical because you can always turn down the volume control if you have it set so high that the audio output is distorted. To adjust the 215 oscillator, tune an accurate sig gen set to about -30 dBm back and forth around 455 kHz. You should hear the AMSD-2 lock and unlock. Reduce the signal level. At about -70 dBm the 215 will no longer lock, and you will hear only the rough (and it does sound rough) beat of the 215 oscillator. If you haven't heard the beat, set the ceramic trimmer to min capacitance and tune the sig gen considerably above 455 kHz until you find the 215 oscillator. Then "bring" the 215 oscillator to 455 kHz using the sig gen. The 60 pF ceramic trimmer can vary the oscillator probably 50 kHz or more, so a little change in the trimmer value corresponds to a big change in the oscillator frequency.



The XR-215 circuit is the same one I used 15 years ago. And it works just as well.

I have been testing the AMSD-2 with my R-390A and WJ-8711A. It works very well with both of them. However, despite what some people say, an AMSD won't let you hear any signals you couldn't hear almost as well without it.

