



Technical Bulletin

## **Band Pass Filters: Use and Selection**

A band pass filter is designed to “pass” (meaning to transmit or receive through) only the listed frequency segments (or band) for which they are tuned, blocking all frequencies above and below this passband. Band pass filters are necessary anywhere that critical single band performance is required, or where nearby transmitting stations on an adjacent band can cause interference to communications. For example, in a field day style environment with multiple stations on multiple bands transmitting simultaneously, and where all stations have antennas in close proximity, is it common for a 40m station to interfere with the 20m station, or vice versa. In this example, if the 40m station is operating CW, the interference heard in the 20m station sounds like static bursts or humming as each dit and dah is transmitted. It can be a minor irritant, or it could be loud enough to prevent hearing a sideband signal, completely wiping out use of that band. Also keep in mind that band pass filters work in both receive and in transmit: They can reduce interference received, and reduce transmitted interference for other stations.

Morgan Systems manufactures two styles of band pass filters. The first are our line of legacy filters, first designed more than two decades ago. They are a simple three pole design and reduce out of band RF signals by approximately 20dB with a slight  $\frac{1}{2}$  dB loss (model dependent). This is 100 fold reduction in signal strength from the interfering station, and will help that station from clobbering the band you are actively operating on. The legacy lineup, Models M-403 through M-411cb, are inexpensive and easy to use, and cover all bands including WARC bands and even a model for citizen band radio.

The second style of filter is our high performance lineup offering a whopping 40dB (model dependent) of signal attenuation, which amounts to 10,000 fold reduction in nearby signals. The high performance models are a 5 pole design and are carefully tuned during manufacture to provide 40dB of rejection of the next closest non-WARC band, with attenuation rising to over 65dB several bands away from the passband. High performance models M-423 through M-431cb cover the main non-WARC bands only. Of special note, The M-423 160m filter is actually a 6 pole design with an additional sharp cutoff to remove the top end of the AM broadcast band, so if 160m work is your thing, this filter will help prevent AM broadcast signals from covering up weak signals.

Which filter should be used? The legacy model or the high performance? This depends on the requirements of the radio operation and the severity of the interference. Back to our field day example: If directional antennas are used (such as yagis) and all antennas are pointing the same direction, this directionality is helpful in reducing interference because the antenna's nulls are facing each other. In this case the legacy filters may reduce the remaining interference just fine. However if a field day set up is using mixed antennas of directional and omni-directional, the interference could be so severe that only the high performance filters will solve it. We recommend looking at the web page of each filter model and looking carefully at the VNA sweeps, making note of the dB reductions in the bands you are interested in, and choosing a model that fits your situation.

One warning: Do NOT transmit through a band pass filter on any band that it is not designated to be used on! I.E., if you have an M-407 10m filter and you transmit through it on 40m. This will damage the filter, usually resulting in a blown capacitor, and requiring a trip to the factory for repair. (We do repair all Morgan filters if the need arises, and it is generally fast and not expensive).

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