

Design Note



To: Owners of all preamp models 50MHz. through 1900 MHz.
From: DEMI R&D Dept.
DN#: 002 - Parts kit # DN002LK or DN002HK
Date: August 15, 2002
Re: IP3 improvements for 50MHz through 1900 MHz preamplifiers

Performance Improvement

When originally designed, the 50 through 1900 MHz. preamplifiers and preamplifier kits had their bias points adjusted at HP/Avantek's recommendation for best noise figure. After recent engineering by our R&D department, it has been discovered that the -1dB compression point can be improved by 3 dB or more which will result in a IP3 improvement of over 6 dB with little or no degradation to the preamplifier's noise figure.

Circuit Change Description

All GaAs FET preamplifiers, assembled or kits, have been biased for approximately 20 - 25 mA current with 2.0 to 2.5 Volts on the drain. This is derived from a 5 volt regulated supply and a 150 ohms of voltage dropping resistor. The source resistors were then adjusted up or down from 50 ohms to produce the desired current drain. To improve the IP3, the FET should be biased at 55-65 mA., maintaining approximately 3.0 volts on the drain. To simply replace the 150 ohm drain resistor with a lower value would load the circuit down and attenuate more gain than desired. Placing a RF choke in the drain supply, similar to the one used in some of the preamps 33 cm and up is possible but could cause a potential instability with the required lower value drain resistor. The higher drain resistance value in the original circuit provides out of band stability, particularly the low frequencies. The elimination of the RF choke is required on the 33cm and higher frequency preamplifiers for stability reasons. The changes required for all preamps start with a 9 volt regulator replacing the standard 5 volt unit. Next is to use a combination of resistors to have a total of 100 ohms in the drain supply. Because of the higher current biasing, the wattage of a standard 1206 chip resistor and ¼ watt leaded resistor will be over dissipated. On most kit preamplifiers, a combination of (3) 300 ohm resistors in series connected from the supply line to the drain on the RF line will do the trick. Bypass the resistors with a good quality chip capacitor. If your preamplifier has a string of axial leaded resistors for the drain supply, adjust the values for 100 ohms total. If resistor values are kept below 50 ohms, ¼ watt dissipation may be used. The total source resistance for all preamplifiers should be between 8 and 15 ohms depending on the FET. A good starting point should be 12 ohms. (a 24 ohm chip on each source lead) Adjust the bias and retune. Lower frequency preamplifiers with L-C circuits may need their L values increased. Series Inductor input circuits may need a decrease in inductance. Parts kits are available for 70 cm and lower frequency under part # DN002LK. Order DN002HK for 33 cm and higher frequency. These parts kits will contain full assembly instructions.

Caution!

Be sure that the source resistors are in place before applying any voltage that exceeds 5 volts to the Drain of any FET. In this design, the Gate is at DC ground potential and the delta of greater than 5 volts (Gate to Drain) will cause permanent damage to the FET. Measure source to ground resistance with a ohm meter before applying any voltage.

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