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High Power 222 MHz. Transverter
DEM Part Number 222-28HP

Operational Overview

The New DEM 222-28HP is a 222 MHz. to 28 MHz high power transverter. It l has the same list of receive performance as the standard level transverter, but with new heat sink and enclosure, it is capable of producing >60 watts of output power. The transverter can be configured with any transceiver with or with out a transverter port that does not exceed 10 watts. The 222-28HPoutput power can be limited with an internal adjustable attenuator to preset the maximum output power if you require lower power when using an additional power amplifier. The 222-28HP has a built in transmit / receive relay but provisions have been made to allow separating the transmit and receive ports to simplify adding a high power amplifier or to interface the transverter with additional receive filtering and external or mast-mounted preamplifiers. Additional options have been included to custom tune your receive gain requirements to obtain the best performance (sensitivity and IMD) possible.

Keying options for +1 to + 15VDC (PTT-H) or a closure to ground (PTT-L) have been provided. Auxiliary relay contacts to control external transmit and receive functions are available. All IF connections are BNC connectors. The control and auxiliary connections are RCA jacks, the DC power connector is a AMP circular style with mating cord and the 222Hz. connectors are Type “N” (2 supplied if required). The 222-28HP is housed in an enclosure and heat sink, which measures approximately 3.5 “ high by 7 “ wide by 9.75 deep and is painted in our standard rugged gray.

DEM 222-28HP Operating Specifications

Operating Voltage:	11.0 - 16.5 VDC, 13.8 nominal
Current Drain:	12 amps maximum on Transmit, 600 milliamps on Receive
Output Power:	Nominal 60 W linear Output with 25 dB of adjustable range with any drive level specified.
Receive Noise Figure and gain:	<0.8 dB NF @ 17 dB conversion gain for best receive intermod performance. Other gain options are available that will affect system noise figures, and IMD performance.

Assembly Options

Common IF input/output option:	1 - 10 Watt IF drive option
External TR switching control:	-20 dBm IF drive option
Separate Transmit and Receive ports:	External preamplifier option
+1 to 15 V TTL or PTT ground keying:	Frequency monitor

DOWN EAST MICROWAVE 222-28HP TRANSVERTER FUNCTIONS

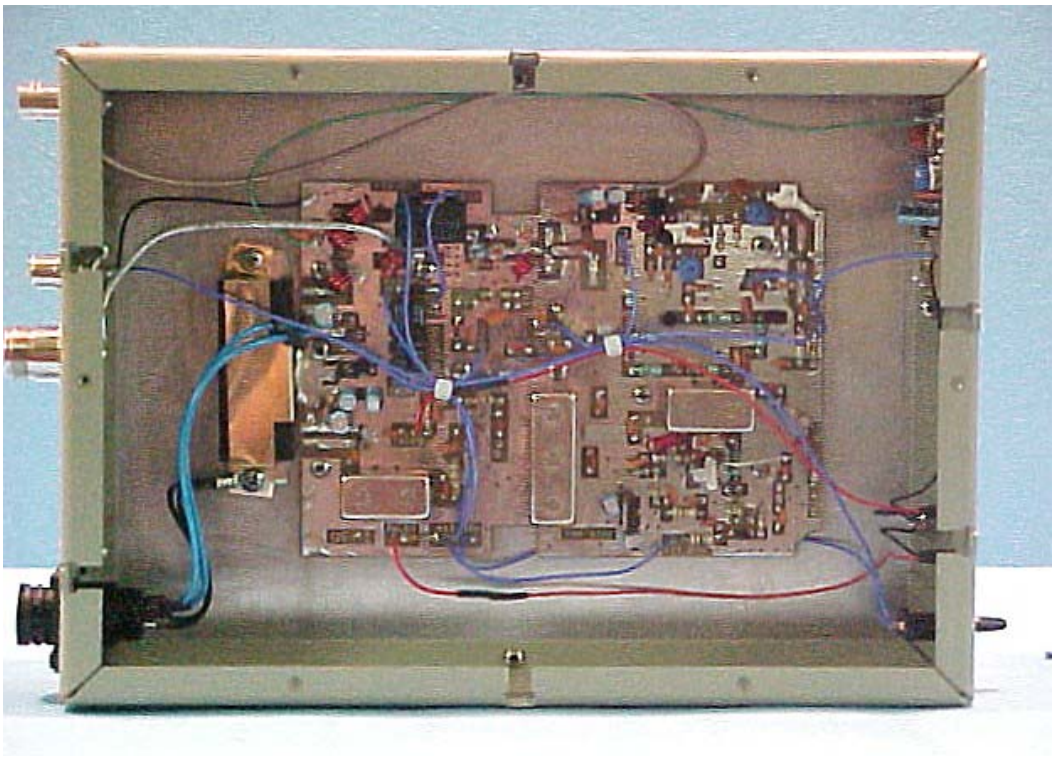
Receive signals enter through a type "N" connector and depending on your configuration, pass through the TR switch (K2) or by-pass the switch and enter the RX gain stage directly through C64. The RX gain stage is designed with Q4, an ATF10736 GaAs-FET, and IC1, a broad band MAV-11A MMIC. The circuit is designed for approximately 28 dB of combined gain. Q4, having a P1dB of +17 dBm, is biased to optimize its output IP3 (3rd order intercept point) performance of +27 dBm. Since the FET is intended for microwave frequency use, it has inherent low noise figure when optimized at the frequency used in this transverter. IC1 has an output IP3 of ≅ +35 dBm and a P1dB of +18 dBm. The amplified receive signal then passes through a three pole helical filter (F2) to eliminate out of band signals that would cause most intermodulation products in the mixer. The now filtered signal enters M1, a TUF-1H mixer, that has a 1 dB compression point of +14 dBm, but more important, an IP3 of approximately +29 dBm. This high level mixer requires a +17 dBm input that is supplied by the local oscillator after passing through a two-pole helical band pass filter (F1) to eliminate harmonics and spurious signals. The mixers IF output is then terminated into a diplexer band pass filter combination to reduce reflections back into the mixer. The IF signal produced (222 MHz. – 194 MHz = 28 MHz.) then enters an adjustable attenuator. No additional gain is designed into this system.

What does this all mean? If the math is done with the specifications given, it says that the weakest point in the converter system would be either the IC1 or the mixer M1 depending on the exact loss of the three pole filter (nominal 3-5 dB). When a -10 dBm (71 mV) signal is applied to the input of the transverter, it would just start to compress (either IC1 or M1) resulting a system with a IP3 output of ≅ +21 dBm. This input level, amplified by the nominal amount of RX conversion gain (minimum of +17 dB) of the transverter, could produce a ≅ +7 dBm output signal at the input of a 28 MHz. receiver. This is a large signal for anything but some of the newest and/or best receivers on the market. This transverter IF output level could be as much as 35 –40 dB above the compression level for most later day transceivers. The RXIF adjustable attenuator (R9, R10, and R12) can be used to reduce the gain of the transverter with little effect on the system noise figure. It has about 25 dB of range. Increasing the attenuation will decrease the dynamic range of the transverter (dB for dB) but will increase the dynamic range of your IF transceiver. It is most useful strong signal environments.

On transmit, with the proper options, any 28 MHz IF drive level from –20 dBm to 10 watts, will produce +60 watts of output power. This TX IF signal proceeds through an adjustable attenuator (25 dB range), then through the same filter diplexer combination as the receive signal. This is done with a pin diode switch which is biased in the transmit position only. Although the mixer can handle up to +14 dBm before compressing, that level is never needed or approached. The transmit signal also shares the mixer, 3 pole helical filter, and pin diode switch with the receive side. It then proceeds to IC 2 and IC 8. These stages have approximately 22 dB gain. The transmit signal is then filtered with a 2-pole helical band pass filter with about 3 dB insertion loss to eliminate LO signals and any other spurious. With +0 dBm entering

the standard version transverter, there should be ≅ 5 - 10 mW driving the Hybrid module. The hybrid, IC5, is a MOSFET with >40 dB gain. The output of the hybrid then enters a low pass filter to eliminate the 2nd harmonic and above spurious. The signal then enters the TR switch or exits the transverter using its own TX port.

All switching functions are controlled by either a Signal to Ground or a +1.5-15 VDC that is provided by a transceiver on transmit. The transverter is in RX mode during standby. Isolated auxiliary contacts are provided for switching external equipment such as mast mounted pre-amps, power-amps, or T/R switches and controlled by K1.



Block Diagram