

APPLICATION NOTE: USING HAMTRONICS® 9600 BAUD RADIOS WITHOUT THE MO-96 MODEM

GENERAL.

This application note describes general procedures for using the Hamtronics® high-speed exciter and receiver modules with equipment and modems other than the MO-96, which these radio modules were designed to be used with normally.

DIFFERENCE BETWEEN "HS" VERSIONS OF RADIOS AND REGULAR VOICE TYPE.

Hamtronics makes special versions of some of its fm exciters and receivers which have been modified to operate on narrow-band fm channels with 9600 baud data. These models have an "HS" suffix on the model number to indicate that they are optimized for high speed data operation. These radios normally are used with our MO-96 Modem, which is designed expressly to interface with packet radio TNC's (terminal node controllers) which have a TTL signal interface for data lines and a ground ptt output as a transmitter keyline.

The normal exciters (TA51, TA451, TA901) use a phase modulator in order to obtain the best frequency stability, since any component used in the oscillator circuit affects the frequency stability with voltage and temperature changes. The models optimized for 9600 baud data, which have an "HS" suffix on the model number, use a varactor diode in the oscillator circuit to directly modulate the crystal frequency.

The "HS" versions of our receivers use special if filters which have a pass-band style optimized for high-speed data reception to provide low group delay distortion. In addition, they include special connections for the AFC (automatic frequency control) circuit to be used with a special digital afc circuit in the MO-96 Modem.

EXCITER.

The exciter normally gets two signals from the MO-96 Modem: a data signal for the modulator and a keyline in the form of switch + 13.6Vdc to power the exciter. Any equipment which is used in place of the MO-96 must provide suit-

able substitutes.

The schematic below shows a circuit which can be used to inject the data into the varactor modulator in the exciter. The varactor diode, of course, alters the frequency of the channel crystal by changing the load capacitance the crystal sees. In order to function properly, the equipment driving the varactor circuit must set the exact channel frequency you intend to operate on by setting the bias voltage applied to the varactor diode. This may be done with a precision pot connected to a very stable voltage source. The normal center voltage the varactor wants to see is about + 4.5Vdc.

In addition, the external equipment must also have a method of adjusting the deviation of the fm signal by adjusting the level of the data signal swing. In the MO-96 Modem, this is done with a series of op-amps having a gain control. The op-amps also provide a very carefully controlled low-pass filtering to prevent splatter by shaping the data signals. Square-wave signals would cause the fm signal to occupy much more than a normal narrow-band fm channel.

It is not easy to duplicate this filtering function. Therefore, if you are interested in an easy way to interface data equipment with the exciter and receiver, we recommend you consider using the low-cost MO-96 Modem to provide the interface.

KEYING CIRCUIT.

The MO-96 Modem provides an electronic switch to apply power to the exciter whenever the computer equipment sends a keyline signal. Your interface circuits should include a similar circuit which would respond to the command to key up the transmitter. You can use a power transistor with accompanying driver transistor or a relay to perform this function.

RECEIVER.

The receiver has two special facilities for connection to the MO-96 Modem. Data output to the modem is taken from the DISCRIMINATOR terminal on the receiver. It has a dc voltage centered at about +4 Vdc, which varies up and down in voltage with the data signal. The MO-96 Modem normally does some filtering on this raw discriminator signal and has a digital slicer to construct the logic signal for the computer equipment.

The receiver also has a special provision to connect the digital afc circuit of the MO-96 Modem to be used in place of the simple afc circuit in the basic voice-style receiver. When the MO-96 is not used with an "HS" type receiver, the original afc circuit in the receiver must be restored in order to have the channel oscillator be tuned on-frequency properly.

