APPLICATION NOTE JULY 4, 1996

1200/9600 BPS AND POCSAG MODEMS USING THE RITRON RPM SERIES TRANSCEIVERS

The Ritron RPM-150 VHF-FM 30 Watt Programable Synthesized Radio Transceiver is a great radio for use with a 9600 bps packet modem. It is even more suited for use with a dual mode 1200/9600 bps modem with POCSAG encode/decode capabilities.

This is because the RPM-150 has about a 60 millisecond TX/RX synthesizer settling time from application or release of the PTT signal. There aren't any synthesized amateur radios that are any faster and you can't use a TNC TXDELAY setting that is faster than the slowest user you want to support on the system. If you want really fast TX/RX transitions Ritron makes the RM series crystal controlled telemetry modules that do a full TX/RX transition in less than 1.5 milliseconds. But then with who would you be able to connect?

Also the connection for the 1200/9600 bps and POCSAG modulation can be made to an internal op amp summing node. This means that the signals from the internal microphone speech processor, internal sub-audible tones, 1200 bps and 9600 bps modems do not interact or load each other and change modulation levels.

Finally the RPM-150 uses a two point modulation technique. This provides essentially flat frequency response from a few Hertz to 5000 Hz. This really helps provide good 9600 bps and POCSAG modulation response.

And of course, the RPM-150 is proudly designed and manufactured in the United States of America.

Here is a description of what is required for a typical installation.

Using the RPM's PC programming software, disable the PTT Debounce function for minimum TX/RX delay. This feature is available in RPM's with the "04" microcontroller or later. Earlier units with an "02" or "03" microcontroller cannot eliminate the 16 to 32 millisecond debounce time and will therefore run slower.

Short R608 to ground on the volume control / display board. It enables the receive audio to be set all the way to zero.

The microphone gain is set for commercial applications. Change C237 from 1000pF to 100pF and R248 from 56K to 120K for more microphone gain. This is optional since the modem signals do not go through this path.

Install the optional Ritron 9 pin accessory connector on the RPM-150 rear panel wired per Figure 1.

The popular Kantronics KPC-9612 has been successfully used with the RPM-150 as follows:

1) Remove R5. It overloads RXA discriminator output.
2) Set the 9600 bps TXDELAY for 9 or 10.
3) No special TX or RX equalization is required.
4) Remove J6 to decouple the 9600 bps modulation.
5) Set J16 and J17 to position 2. This allows the RPM-150 to power the
   KPC-9612 via DB-9 pin 7.
6) Install J7 for proper output level.
7) Install J1 in for proper 1200 bps RX equalization.
8) Remove J2 for proper 1200 bps modulation.
9) Adjust for proper 1200 & 9600 bps deviation per the manual.

For connection between the KPC-9612 and the Ritron RPM-150, make a cable with
a mating 9 pin connector for the radio to a DB-15M and DB-9M connector wired
as follows:

```
RPM-150    DB-9M    DB-15M    DESCRIPTION
-------    -----    ------    -------------------------------
1          7                  +12VDC switched from radio to modem.
2          6                  Ground  Wired.
3
4          3        1         Pull to ground to activate TX.
5
6
7          1                  Transmit Audio 1 Wideband DC Coupled Flat
8                   3         Transmit Audio 2 Wideband DC Coupled Flat
9          5        2         Receiver Audio Wideband DC Coupled Flat
```

Run the cable into the DB-9 shell and run just the 3 lines required for 9600
bps over to the DB-15.

FIGURE 1. RITRON RPM HIGH SPEED MODEM INTERFACE CONNECTOR. An optional 9 pin
connector block can be installed on the RPM-150 rear panel and wired as
follows:

```
                    AS VIEWED FROM BACK PANEL
                             TOP

              3 GND      6 ____       9 RXA
                SHLD       ____          GRN

Polarizing >  2 GND      5 COR        8 TXA1
   Detents >    BLK        BLU          BRN

              1 B+       4 PTT        7 TXA2
                RED        WHT          YEL
```

```
Acc          Wire    PCB
Pin   ID     Color   Pin   Description
---   ----   -----   ---   ----------------------------------
1     B+     RED      3    Output  +12VDC switched from radio to modem.
2     GND    BLK      2    Ground  Wired.
3     GND    SHLD    16    Ground  Shield wire.
4     PTT    WHT      4    Input   Pull to ground to activate TX.
5     COR    BLU     19    Output  +5 VDC on signal detect.
6                          Spare
7     TXA2   YEL      -    Input   Transmit Audio Wideband DC Coupled Flat
                                   Through a 100K resistor to IC204 pin 13
8     TXA1   BRN      -    Input   Transmit Audio Wideband DC Coupled Flat
                                   Through a 100K resistor to IC204 pin 13

9     RXA    GRN      1    Output  Receiver Audio Wideband DC Coupled Flat
                                   Unsquelched and not de-emphasized.
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Current RPM-150's have push on pins on the printed circuit board for most of
the connections. Some earlier radios had the pin connections shown on the
schematic but the pins themselves where not on the board.

Thanks to K9DC and K9JRI for allowing themselves to be test subjects. Good
Luck and Happy 1200/9600 BPS Packet and POCSAG Operation!

Steve Henke, W9SH

RITRON RPM MOBILE TRANSCEIVER TO TNC/MODEM INTERFACE

ACCESSORY CONNECTOR KIT PARTS LIST

RITRON #	DESCRIPTION / FUNCTION	QTY
06001098	Cable, Shielded, 9 cond, (inches) Connect from radio PCB points to rear panel and connect from rear panel to TNC/Modem	24
02100214	Connector, Shell, Recpt, 9 pos, w/ears Mates with 02100205 Mounts on rear panel of radio	1
02100045	Contact, female, for 02100214	9
02100205	Connector, Shell, Plug, 9 pos Mates with 02100214 For cable from radio to modem.	1
02100044	Contact, male, for 02100205	9
02100325	Connector, Shell, Plug, 2 pos Mates w/Radio DC Power Connector on radio	1
02100324	Contact, female, for 02100325	2
21122001	Contact, Push On Connect to radio interface points on PCB and via cable 06001098 to rear panel connector 02100214.	9
04700157	Resistor, CF, 1/4W, 5%, 100K Ohm	2

```
Set the Kantronics KPC-9612 internal jumpers as follows:

Jumper  Position  Description
------  --------  -------------------------------------------------------
J1      IN        1200 bps Equalization
J2      OPEN      No Key/Attenuation
J6      OUT       AC Coupled
J7      IN        High Level
J16     2         Allows +12VDC from RPM-150 to power the KPC-9612
J17     2         Allows +12VDC from RPM-150 to power the KPC-9612


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