HACCOM UM96 DataSheet / UserManual

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Disclaimer: This document was made during a senior engineering project. Its contents contain information from the original datasheet, as well as input from myself. This document is intended to assist any future users of this radio modem module. While creating this document, time was limited and certain ambiguities regarding the modem still may exist even after having read this document. Please thoroughly test the device before implementing it.

I. Features of HAC-UM96ultra Low Power Data Radio Module

1. Ultra low power transmission with the transmission power of 10mW

2. ISM frequency band, requiring on application of frequency point.
   Carrier frequencyof433MHz, also capable of providing 450MHz carrier frequency.

3. High anti-interference and low BER(Bit error Rate):
   Based on the GFSK modulation mode, the high-efficiency forward error correction channel encoding technology is used to enhance data.s resistance to both burst interference and random interference and the actual bit errorrate of 10-5 ~ 10-6 can be achieved when channel bit error rate is 10-2.

4. Long transmission distance:
   Within the range of visibility, the reliable transmission distance is >300m when the height is greater than 2m (BER=10-3/9600bps).
   Within the range of visibility, the reliable transmission distance is >500m when the height is greater than 5m (BER=10-3/9600bps).

5. Transparent data transmission:
   Transparent data interface is offered to suit any standard or nonstandard user protocol. Any false data generated in the air can be filtrated automatically (What has been received is exactly what has been transmitted). THIS DEVICE IS A UART DEVICE. IT OFFERS TRANSPARENT **UART** PERFORMANCE. You must frame your data according to the UART standard (at 9600bps for this particular unit) to get proper operation from these units.

6. Multi-channel
   The standard HAC-UM96 configuration provides 8 channels. If the user needs, it can be extended to 16/32 channels, meeting the multiple communication combination mode of the user.

7. Dual serial port, 3 interface modes:
HAC-UM96 provides 2 serial ports and 3 interfaces, with COM1 as the TTL level UART interface and COM2 as user defined standard RS-232/RS-485 interface (user only needs to plug/pull 1 bit short circuiter and energize it to make the definition).

8. Large data buffer zone:
Interface baud rate which is set before ex-factory is 1200/4800/9600/19200/38400bps with format of 8N1/8E1 and user self-definition, allowing the transmission of long data frames at one time for more flexible programming by users. (If the user needs, it can also transmit the data in unlimited length at one time).

9. Intelligent data control and the user doesn't need to prepare excessive programs:
Even for semi duplex communication, the user doesn't need to prepare excessive programs, only receiving/transmitting the data from the interface. HAC-UM96 will automatically complete the other operations, such as transmission/receiving conversion in the air, control, etc.

10. Low power consumption and sleeping function:
For receiving, current is <30mA, transmitting current is <40mA, and sleep current is 20uA.

11. High reliability, small and light:
Single chip radio- frequency integrated circuit and single chip MCU are used for lessened peripheral circuits, high reliability, and low failure rate.

II. Using the UM96 RF Modems

1. Power Supply:
HAC-UM96 uses DC power supply with voltage of +3.3~5.5V. The working voltage can be reduced down to 3V based on the user's needs. It can also share power supply with other equipment, however, the high quality power supply with desirable ripple factor should be selected. If possible, 7805 chip or other voltage-stabilizing chip should be used for separate power supply. In addition, the reliable grounding must be used if there is other device in the system equipment. In case of failure to connect with the earth, it can form its own grounding but it must be absolutely separated from the municipal electric supply. Under working condition, transmission current is ≤40mA, receiving current is ≤ 30mA and sleeping current is ≤20uA.

2. Connecting Terminals:

Pin #	Pin Name	Description	Remarks
1	GND	This is the system ground. It is the ground of the on-board electronics (transmitter, buffer, etc)	Ground Line
2	Vcc	Vcc of the system. It is supposed to be from 3.3-5.0 Volts (DC). 3.3 volt operation works fine, but may not give the range that 5.0V does.	3.3 – 5.0 Volts (DC)
3	Transmit Out (TTL)	TTL level (3.3V) Transmit. This is the line that data is sent to, to be sent out via the modem over the airwaves. When not transmitting anything, this line should be kept logical high (3.3V).	3.3 Volts COM1
4	Receive In (TTL)	TTL level (3.3V) Receive. This is the line that is monitored for incoming data. This line stays high (3.3 V, logical 1) when no data is received.	3.3 Volts COM1
5	Signal Ground	Ground of signal. If signal and Vcc come from the same source (an FPGA or PIC chip), this pin can be connected to the system GND (pin1).	Signal Ground
6	Receive In (RS-232/485)	Serial Receive. This channel simultaneously shows what is on pin 4. See section **II**-3 for more information.	COM2
7	Transmit Out (RS-232/485)	Transmit Out, Serial RS-232/485. This is a transmit pin. See section **II**-3 for more information.	COM2
8	Sleep	This is the pin that allows for low power, sleep mode. This pin should be a logical 0 (0.0 V) to stay in “awake” mode. Transmit/Receive will not work if this pin is logical 1 (3.3 / 5.0 V).	Power Saving
9	Reset	This pin resets the system. To keep normal operation, leave this pin at logical 1 (3.3 / 5.0 V). Transmit/Receive will not work if this pin is logical 0 (0.0 V)	Negative Impulse Reset

2. Jumper Pins:

There are 5 jumper pins for the UM96 RF modem unit. Herein, these pins will be referred to as pins A,B,C,D,E respectively.

PINS A-B-C:

These pins are used to designate which carrier frequency is to be used.

Channel Number	Frequency
CBA=000 (0)	430.2000 MHz
CBA=001 (1)	431.4288 MHz
CBA=010 (2)	431.7360 MHz
CBA=011 (3)	430.5072 MHz
CBA=100 (4)	434.6940 MHz
CBA=101 (5)	434.2332 MHz
CBA=110 (6)	433.1580 MHz
CBA=111 (7)	433.9260 MHz

It is believed that a "0" means that there is a jumper on the respective pin, and a "1" means that the jumper pin is open. I used no jumpers on pins ABC and the modem units worked fine.

PIN D:

Pin D is the pin that selects whether RS-232 or RS-485 will be used (if you are using I/O pins 6 and 7 –COM2—for your I/O). If the jumper is placed on Pin D, then the system will be configured to RS-232 standard. If there is no jumper on Pin D, the system will be configured to RS-485 standard. I have not tested this, I used pins 3 and 4 and used TTL levels.

PIN E:

Pin E is the parity pin. If the jumper IS PLACED on Pin E, then NO PARITY BIT is used. If the jumper IS NOT PLACED, then a PARITY BIT is sent. This makes the received frame 11 bits (instead of the standard UART 10 bit frame). I believe this to be an "odd transmission" parity check. If there is an odd number of 1's and 0's in your 8 bit word (within the transmitted 10 bit frame), a parity bit is send out before the stop bit. You should test this out if you would like to use the parity bit.

III Additional Notes

In conclusion, the UM96 RF modem unit is very simple to use, if one knows how to use it properly. Remember that this IS A UART DEVICE and that all data must be properly framed. Also, remember to always

keep the transmit pin (pin 3 if you are using COM1-TTL level operation) to logical 1 (TTL level 3.3 Volts) if you are not transmitting out data.

A very odd problem I ran into was the need to send out a “1” before any data was ever sent. This does not make sense because logical “1” is always being sent out when no official data is being sent. For some odd reason, I had to transmit out a “1” before all of my UART’ed data. This preceding “1” was only sent out before the whole data transmission, not before each 10-bit frame.

Additionally, one must let 6 clock cycles (6 / 9600 seconds) pass between sending bytes.

This is a diagram of the pin and jumper layout