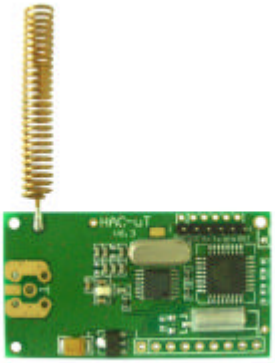
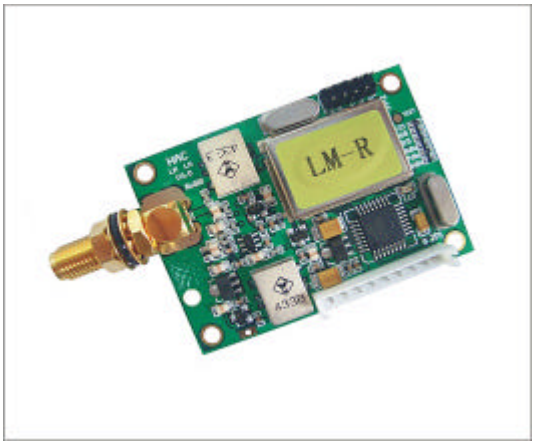
HAC-UT V6.3 Wireless Single Meter/Double pipe Metering type Wireless Transmitter

HAC-LMR Wireless Data Receiver/ Repeater Module





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Ⅰ. HAC-UT Wireless Single Meter/Double pipe Metering Type Wireless

1. Features:

· The single module support single meter/double reed switch, low cost.

· Accurate impulse filtering, collecting circuit and metering algorithm, higher precision.

· Reliable, stable and long distance data transmission.

· The communication distance is much further owning to the automatic intermediate function.

· Ultra low power consumption, the average consumption is less than 20μA.

· The detection function of power voltage will give out a alarm signal when the power of battery is almost run out.

· If the circuit is broken naturally or from spite, the break line fault detection will sound the alarm.

2. Power Supply:

Under metering and transmitting state, the working voltage is +3.1~3.6VDC

Sleeping current is equal to or less than 15μA;

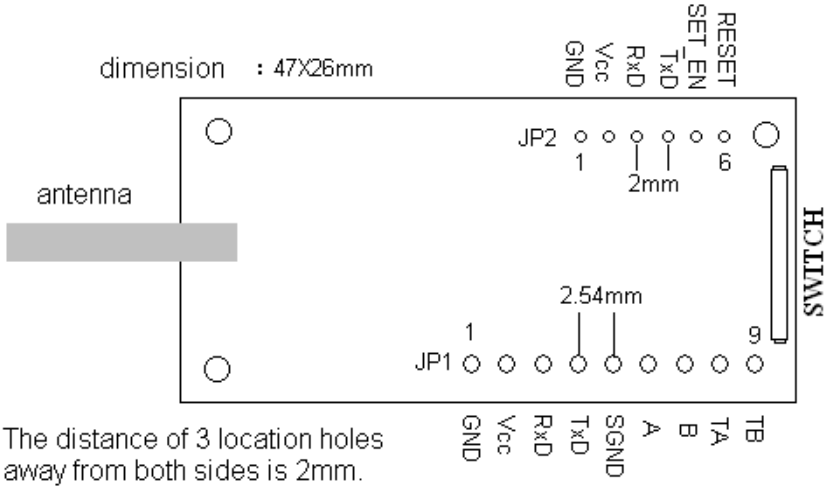
Transmitting current is no more than 40mA, duration for transmitting one group data is no more than 230ms;

Average interval time of transmitting is no less than 3 hours;

Average working current is no more than 20μA;

The voltage for initialization is +2.5~5.5VDC;

3. Configuration sketch map:



4. Interface Definition and Instructions:

JP1: Pin1: GND

Pin2: Vcc

Pin3: RxD the input of setting initial information

Pin4: TxD power on or finishing setting, the output of initial

information

Pin5: SGND Signal Ground, it can be used for the common grounding of reed switch

Pin6: A the incoming end of reed switch A

Pin7: B the incoming end of reed switch A

Pin8: TA the break line fault detection, connected to the ground when stalling

Pin9: TB no definition

JP2: Pin1: GND

Pin2: Vcc

Pin3: RxD the input of setting initial information, the same as JP1;

Pin4: TxD power on or finishing setting, the output of initial information; the same as JP1

Pin5: SET_EN initial setting enable, this pin keeps low level. When RxD/TxD is effective, we can set the initial information.

Pin6: RESET negative impulse resets the singlechip

SWITCH: Reed switch, you can use a magnet suction to get a negative pulse. If the Reed switch has a negative impulse of more than 100ms, the module will transmit data once every 4 seconds. It transmits 16 times continuously in order to installing or producing/testing. MCU can save all the current data of RAM to EEROM before transmitting. So this pin can be considered as a saving data signal before power off. When the module is powered up, MCU will recover the program from EEROM automatically.

5. The Method of Initialization and Instruction:

Keep the SET_EN stay low level and transmits information with 1200 N81 format to RxD which are shown as follow:

The quantity of initialization transmitting byte: 13Bytes

0FFH,$,T,ID5,ID4,ID3,ID2,ID1,PN,S,DH,DL,E

Here: 0FFH, $ denote code and they are necessary.

T is the number of the concentration that the module belonged to.

ID5, ID4, ID3, ID2, ID1 are 10 bits meter number, BCD code, the high bit is ahead.

PN is impulse constant, Hex, the value is 1~255, it indicates how many impulses represent 1 ton water.

S is the state byte of meter, specific definition will be explained later.

DH, DL are the reading of meter, Hex, the unit is ton, the value is 0~65535.

E is the pulse number of decimal fraction in the reading, Hex, the value is 0~PN-1.

Note: E is expressed by the number of impulse in the RAM. When initializing E, we need to convert the decimal fraction of initialization reading to the pulse number, then write it to EEPROM and RAM.

6. The Data Format Transmitted In The Air:

when the impulse constant is no more than 10, the transmission in the air proceeds once as the module meters one impulse, or else it transmits once every 10 impulses. If we didn't meter impulse for a long time, the module transmits data every 4 hours timely.

The data format transmitted in the air is shown as below (14 bytes):

$	T	ID5	ID4	ID3	ID2	ID1	PN	S	DH	DL	E	CRCH	CRCL

Here: $: symbol code, it doesn't contain in CRC checking

T: the number of concentrator

ID5, ID4, DI3, ID2, ID1: the number of meter

PN: the impulse constant, Hex, the value is 1~255, it indicates how many impulses represent 1 ton water.

S is the state word of meter, the definition is shown in the table:

S7	S6	S5	S4	S3	S2	S1	S0
Overflow	Break line	reservation	Testing	EEPROM	Power state	Sign of A/B	Type of meter

Here: S7: the sign of overflow, S7=1, it means the reading is equal to or more than 65536;

S6: the sign of break line, 0: normal condition, 1: break line;

S5: reservation, it has no definition at present;

S4: testing sign, 0: normal data, 1: testing signal;

S3: writing the EEPROM state, 0: successfully writing, 1: failure;

S2: power state, 0: the power is in regular state, 1: the voltage is not enough;

S1: reservation, it has no definition at present;

S0: the type of the meter, 0: water meter;

DH: the high bit of reading

DL: the low bit of reading, the maximum value of DH_DL can indicate 655356 tons of water.

E: the decimal fraction of reading, e.g.: E=19H, it means 0.25 ton.

CRCH: the high bit of CRC checking, the checking doesn't contain $ symbol code

CRCL: the low bit of CRC checking

This CRC checking verifies 11 words that mentioned before. The multinomial of CRC is $1021.

7. The Preserve Method for Current Data in EEPROM:

After initialization, the permanent data kept in EEPROM contain: the number of concentrator, the number of meter, the impulse constant and so on. The program can't be changed in the process of using once the permanent data has been initialized. Unless we initialize the data newly, it can be changed.

The temporary data are: the state word, the reading, the decimal fraction of reading, etc. These data will be changed in company with the reading. The specific regulations are shown below:

The state word and the reading in the EEPROM are refreshed once after we has counted 1 ton of water, the decimal fraction will keep 0 all the time. We adopt this way according to the service life of EEPROM (the service life of EEPROM in ATMEGE48V is 100,000 times). If the module is start again after power off, the state word and the reading can be recovered accurately but the decimal fraction will be lost, it causes some errors.

In order to reduce metering error and not to loss the decimal fraction, customer can connect RxD/T_EN with ground before factitious power off, announce the module to save all the data to EEPROM, then shut off the power.
Additionally, for the sake of preventing damaging EEPROM after too many times writing, the program will read and compare it after writing to EEPROM. If there are any mistakes in writing, it can be shown in the state words when transmitting data.

Ⅱ. HAC-LMR Wireless Receiver/Repeater Module

The data transmitted from HAC-UT are transmitted to the concentrator through UART port in the format of 1200 N81. If we use the repeater, it will send the data out from serial port, at the same time, it will send the data to the air. The coverage of concentrator can be extended by relaying function.

Note: The receiver doesn't have the function of check out the mistake if the received data has mistake. The data are still transmitted from serial port or repeater. (If customer wants to filter the error data, our company will also support). The multinomial of CRC checking is $1021.

1. Power Supply:

Power Supply: +5.0VDC;
Receiving current: =50mA;
The maximum transmitting current: =400mA.

2. Interface definition and instruction:

JP1：Pin1：GND

Pin2：Vcc

Pin3：RxD no definition.

Pin4：TxD the data sent by data collection or repeater will be output to concentrator by this pin.

Pin5：SGND signal ground.

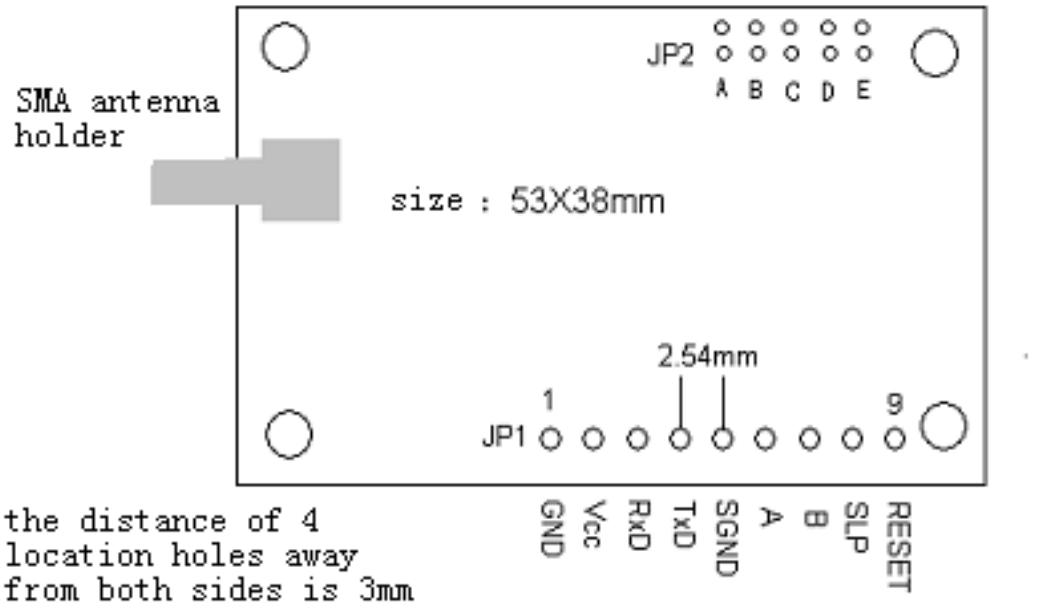
Pin6：A no definition.

Pin7：B no definition.

Pin8：SLP　if receiving the correct data from the air, and the pin will output 120ms high level. As the correct indicator, it can be in series with a resistance with 470ohm to drive the LED directly.

Pin9：RESET

3. Configuration sketch map:



JP2: There are 5 short circuits called ABCDE, they are shown as follow:

A is used to control the transmitting power of repeater, its definition is shown as follow:

A=1, transmitting power: +27dBm

A=0, transmitting power: +20dBm

DCB are used to control the send/receive delay time for repeater transmitting, their definition are shown as follow:

DCB=111，repeater transmits data after delay waiting for seven time slices

DCB=110，repeater transmits data after delay waiting for six time slices

DCB=101，repeater transmits data after delay waiting for five time slices

DCB=100，repeater transmits data after delay waiting for four time slices

DCB=011，repeater transmits data after delay waiting for three time slices

DCB=010，repeater transmits data after delay waiting for two time slices

DCB=001，repeater transmits data after delay waiting for one time slice

DCB=000，repeater transmits data after delay waiting for no time slices

0 indicates plug the short circuits, 1 indicates hang in the air. One time slice is equal to 300ms.

If the E of JP2 is plugged by short circuit, and the module will be defined as repeater, or it will only receive and not send.

If the Pin6 (A) of JP1 is plugged by short circuit, the module will enter into the production testing state after be electrified.

Note: The repeater can't transfer the data which has been sent by the other repeaters.

III. Power consumption of HAC-UT Wireless Data Transmit Module

1. Working voltage

The working voltage for HAC-UT module is from 3.1V to 5.0VDC.

2. Sleeping Current:

The definition of the idle state for the module is: the power supply of RF is shut off and the MCU works in the mode of saving power (The main block stop vibrating, but the 32.768KHZ clock is vibrating from beginning to end). Each I/O port keeps their proper conditions.

Sleeping current is 15 μA.

3. Soft Clock Count State:

MCU is waked up by the time clock every 62.5ms and it counts the soft clock. The awaken time lasts 31.25μs. MCU works while the power supply of RF is still shut off during the awaken time.

The working current of MCU is equal to or less than 5mA.

The average consumptive current during the soft clock's count state is:

5000μA×31.25μs/62500μs=2.5μA

4. RF Transmitting State:

The RF circuit transmits one time every 4 hours or when it has measured 0.1 ton of water. Each transmission lasts 230ms and we calculate the transmitting current according to 40mA (actually it is about 35mA). Suppose the circuit transmits once in 3 hours on average, the current in transmitting state is shown below:

40000μA×0.23s/(3×3600s)=0.85μA

5. The Total Power Consumption:

15+2.5+0.85=18.35μA

The manual gives out the total power consumption of this type is equal to or less than 20μA

HAC-UT Collecting and Transmitting module	
Transmitting power	15~20mW
The visible distance	≥800m
Air baud rate	1200bps
Topology Network	Multi-point to point
Voltage	3.1V~5V
Transmitting current	<40mA
Sleeping current	<15μA
Average working current	<20μA
Carrier frequency	430.375MHz
Channel	Single channel
Communication mode	Single transmitter
Bandwidth	10kHz
Dimension	47mm×26mm×8mm
Antenna	spring antenna called HAC-TH433-B
Antenna impedance	50Ω,
Weight	22g
Working temperature	-20℃~+60℃
Frequency stabilization	±5PPM

IV. Performance Parameter

HAC-LMR Wireless receiver/repeater module	
Transmitting distance	500mW (default), 100mW (optional)
The visible distance	≥800m
Receiving sensitivity	-124dBm
Air baud rate	1200bps
Frequency stabilization	Industrial grade:±2.5ppm Commercial grade:±5ppm
Topology Network	Multi-point to point
Voltage	4.75~5.5V DC
Transmitting current	<400mA
Receiving current	<50mA
Communication mode	Half-duplex
Frequency	430.375MHz
Default interface mode	TTL 1200bps 8N1 (only output the data)
Dimension	53mm×38mm×10mm
Weight	34g
Antenna impedance	50Ω, including SMA
Antenna	10cm helical antenna, magnetic antenna (optional)
Working temperature	Industrial grade: -40℃~+80℃(TCXO) Commercial grade: -20℃~+60℃