

## **Technical Description:**

### **TRMS-400-11011**

The main function of this device is receiving data and dispose it so that radio the data to TRMS-ANT(connect to PC), the receiving signals are:

1. Data from serial port of RS232.
2. Wireless signals from TRMS-RFS-FS06(315MHZ).
3. Wireless signals from three TRMS-RFS-DS002 (315MHZ).
4. Receiving the time flag and inquiry signals(433.92MHZ) from TRMS-ANT(connect to PC).

It would communicate with TRMS-ANT (433.92MHZ) immediately or delay a certain cycle after it's receiving.

#### **RS232 SECTION:**

TTL level of RS232 connect to the 2th(RX) and 3th(TX) pin of U8(main MCU), Which read the data and dispose it.

#### **315MHZ RX SECTION:**

Band-pass filter of CF1 filters the unnecessary signals from antenna, and the LNA which including Q7,R61,L10 , amplifies and sends the just signals to U11, in which contains oscillator, mixing and demodulation circuit, quartz X3 and the included oscillator circuit in U11 provide the 316.8MHz local frequency, demodulation is implemented in U11, finally, the baseband signal is transformed(3v to 5v) by Q4 and Q5 then sent to U9(MCU1) through 13th pin of U11. U9 decodes the baseband signals and send it to U8(MCU2). Voltage regulator of U2 provide power supply of 3v for UHF circuit.

#### **433.92MHZ RX AND TX SECTION:**

LC filter of L18,C1 filters the unnecessary signals from antenna, and the LNA which including Q3,Q4,L3,C14,L4, amplifies and sends the just signals to U4, in which contains oscillator, mixing, demodulation and decoding circuit, quartz X1 and the included oscillator circuit in U4 provide the local frequency, the decoded data is sent to U8(main MCU) via SPI.

Data that to be radio out is loaded to U4 via SPI port, and U4 change the data into RF signals and output it via 10th pin, the RF signals route a filter of CF3 then to PA, which including Q1,Q2, output of PA connect to the impedance matching network of antenna. Regulator of U1(7808) convert 12v power supply to 8v through a diode of D18 connect to E-polar of Q6, U8 controls PA's power via it's 9th pin and Q5,Q6.

This system, TRMS-400-11011 Communication is modulated by FSK, in the information processing in two ways:

1: Automatic transmission: it will cease transmission with 300ms after activation.

A: TRMS-400-11011 test GPS latitude and longitude when the car into / out of car park gates ,and sent an information to TRMS-ANT host connecting to PC interface.

B: TRMS-400-11011 detected the door on / off status and reefer fuel tank informaion,When door change status,fuel tank Variation is more than 5%, reefer operating mode changes and the

temperature is higher than the previous temperature value collected  $\pm 8^{\circ}\text{F}$ , RMS-400 -11011 will automatically transmit a current information. The transmission data in each time, contain all the information described above, only update the data on the latest changes, the data no change of information will remain the last transmission data.

C: TRMS-400-11011 can receive TRMS-ANT instruction which contain read a variety of data(for example,door no/off status, fuel tank information, etc.), can also change the temperatur and operation mode of reefer.

2: periodic transmission:In the car park, TRMS-400-11011 will receive TRMS-ANT order which send the information (for example,the door on/off status ,fuel tank information and so on)every 6 minutes, TRMS-400-11011 answer the request after receiving the order(no contain GPS latitude and longitude data). The transmission time is 180ms.It will no transmit any information when not within the car park.

#### TRISTATE I/O INPUT:

Voltage compare circuit including U6(LM324),U7(LM324), output of LM324 connect to 35th ~ 42th pin of U8(main MCU) so that outer tristate level could be read.

#### BIDIRECTION I/O:

Pins of 44th ~ 46th of U8 are Bidirectional I/O, it can both used for input or output, and it used for reading temperature data and I/O level in this device.

#### TRIGGER INPUT:

The three of outer trigger line connect to U3(MC14069) via D13,D16,D17(IN4148) then send to MCU's 49th ~ 51th pin , respectively.

#### MCU CIRCUIT:

The device including two of MCU, U8 as master and U9 slave, both of it are powered by U10(78L05). Main clock provided by X2.

#### LED INDICATOR:

LED1 color is alterable, it driven by 31th and 32th pin of U8(main MCU) to indicate current working status.

#### DRIVE SECTION:

MCU output high level or low level as soon as it's receiving from SID55, to control peripherals correctly and reliably, drivers of Q9,Q10,Q11 are employed, and each of these drivers corresponding to a TRMS-RFS-DS002.

Once fuel volume information sent by TRMS-RFS-FS006 is received, MCU would converted it to voltage and through LM2904 provide to peripherals.

U8(main MCU) will output high level at 33th pin, while fuel volume slide to 1/4 of it's maximum value, Q16 switch on to drive low fuel volume alarm device.

The antenna installation description:

To TRMS-400-11011, it is undetachable between antenna and connector, and we ensure that the antenna will be fixed by a screw the dimension is 1.3\*2.5mm before entering into market, the installation method is following:

Step 1: the connector will be drilled on a available position;

Step 2: To fix the antenna by a nail the dimension is 1.3\*2.5mm;

Step 3: To rub out the screw thread on the top, let user not to modify or replace the antenna.

Details please refer to following plots.

