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# TRM101 Wireless Data Transceiver Module

## User Manual

(Version: V1.3)

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**approved:** \_\_\_\_\_ **Date:** \_\_\_\_\_



# Goelectron

**Guangzhou Goelectron Science & Technology Company Limited**

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### Revision history

Revision	Date	Description	Person	Position
V1.0	20200707	First version	Fengting Han	
V1.1	20200903	Added 7 and 9 pin description	Fengting Han	
V1.2	20210304	Modify dimensioning instructions	Fengting Han	
V1.3	20220318	Update photos and dimension due to PCB update for MCU change to China local MCU-HDSC.	Fengting Han	

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# 1、 Technical specifications

**Feature:**

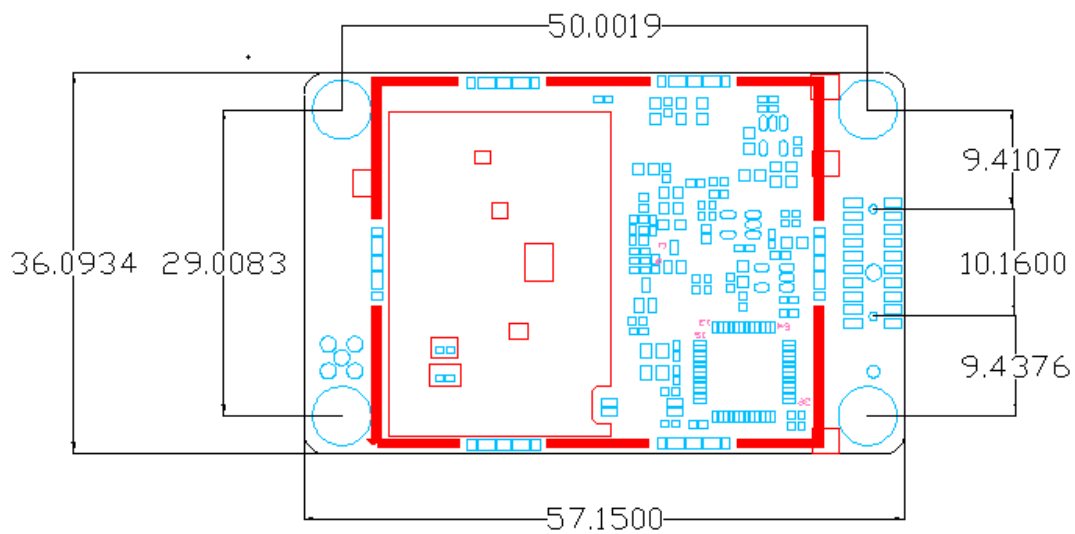
- ① Transmit and receive, support 410~470MHz.
- ② High reliability, RF port contact discharge 8KV 200 times continuous discharge point is not damaged, can be used in different complex environment.
- ③ Optimized design of RF transmission chain PA, 46.5% efficiency.
- ④ Supported protocols include TRIMTALK, TRIMMK3, SOUTH, TRANSEOT, GEOTALK, GEOMK3, SATEL, HITARGET, PCCEOT, PCCFST, SATEL\_ADL, PCCFST\_ADL and support interoperability protocols of mainstream manufacturers.
- ⑤ Harmonic control meets CE requirements; minimizes the impact of the third harmonic on GNSS receivers.
- ⑥ Module has passed the certification standard of FCC, CE, KC.

Technical specifications		
Specification name	specification requirements	
Frequency rage	410~470MHz	
Working type	half-duplex	
Channel spacing	6.25KHz / 12.5KHz / 25KHz	
Modulation type	4FSK/GMSK	
Operating voltage	3.3V ±10%( TX state, not more than 4V)	
Power consumption	Transmitted power	3.3W
	Receive power	0.48W
Frequency stability	≤±1.0ppm	
Size	57×36×7mm	
Weight	16g	
Operating temperature	-40~+60°C	
Storage temperature	-45~+90°C	
Antenna interface	IPX or MMCX	
Antenna impedance	50ohm	
Data interface	20pin	
Transmitter specification		
Specification name	specification requirements	
RF output power	High power ( 1.0W )	30±0.3dBm@DC 3.3V
RF power stability	±0.3dB	
Adjacent channel inhibition	>50dB	
Receiver specification		

Specification name	specification requirements
Sensitivity	Better than -115dBm@BER $10^{-5}$ · 9600bps
Co-channel inhibition	>-12dB
Block	>70dB
Adjacent channel selectivity	>52dB@25KHz
perturbation resistance stray	>55dB
Modulator	
Specification name	Specification requirements
Air rate	4800bps,9600bps,19200 bps
Modulation method	4FSK/GMSK

## 2、Hardware structure

### 2.1 Dimensions (bottom perspective)



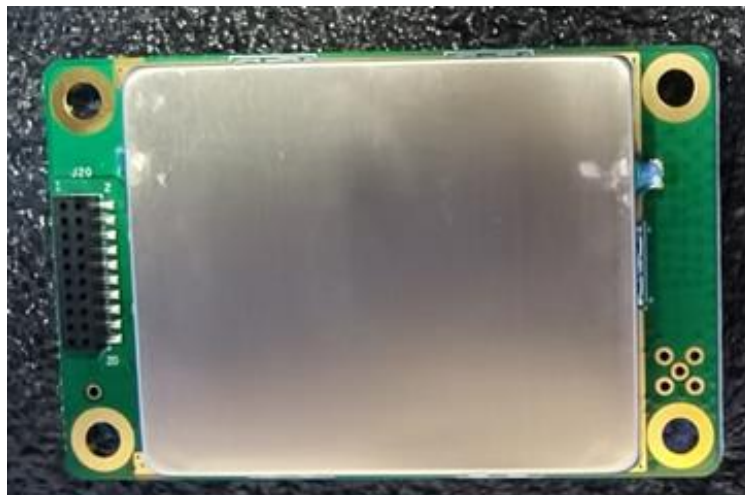
## 2.2 Photos of Product

Front view:



Note: IPX port connect antenna, radio frequency signals are received and transmitted

Back view:



Note: 20PIN-connect to host, input and output data

### 2.3 Definition of interface connector pin

Pin No.	Input/output	definition
1	Input	VCC
2	Input	VCC
3	Input/output	GND
4	Input/output	GND
5	NC	No use
6	Input	Enable
7	Output	TXD (UHF data output)
8	NC	No use
9	Input	RXD (UHF data input)
10	NC	No use
11	NC	No use
12	NC	No use
13	NC	No use
14	NC	No use
15	NC	No use
16	NC	No use
17	Input	Config (default as high radio data mode, need to pull low configuration to enter command mode)
18	NC	No use
19	NC	No use
20	NC	No use

## 2.4 Antenna information

### UHF Antenna specification

Technical parameters	
Frequency range (MHz)	410~470
Bandwidth (MHz)	20
Polarization mode	Vertical
Gain (dBi)	4
Input impedance ( $\Omega$ )	50
Voltage standing wave ratio	$\leq 2.0$
Maximum power (W)	20
Joint type	TNC
Antenna length (mm)	293
Antenna weight (g)	50
Extreme wind speed (km/h)	90

Remark: Antenna structure for elastic whip, and resistance to bending.





### 3、 Transceiver command instructions

#### 3.1 Serial port configuration in the factory state

serial port baud rate setting	38400
Data bits	8
Stop bit	1
Check bit	none

#### 3.2 Basic command

##### 3.2.1 TX 【parameter】

Function: set the transmission frequency (MHz)

Parameter choice: 410.000 – 470.000

Example: TX 466.125 show: “PROGRAMMED OK”

##### 3.2.2 TX

Function: Check the transmission frequency

Example: TX show: “TX 466.12500 MHz”

##### 3.2.3 RX 【parameter】

Function : set receive frequency (MHz)

Parameter choice: 410.000 – 470.000

Example: RX 466.125 show: “PROGRAMMED OK”

##### 3.2.4 RX

Function: Check the receive frequency

Example: RX show: “RX 466.12500 MHz”

##### 3.2.5 BAUD 【parameter】

Function : set air baud rate (bps)

Parameter choice: 4800、9600、19200

Example : BAUD 9600 show: “PROGRAMMED OK”

##### 3.2.6 BAUD

Function : check the air baud rate (bps)

Example : BAUD show: “BAUD 9600”

##### 3.2.7 PWR 【parameter】

Function: set the transmission power

Parameter choice: H、L

Example: PWR L show “PROGRAMMED OK”

##### 3.2.8 PWR

Function: check the transmission power

Example: PWR show “PWR L”

##### 3.2.9 CHANNEL 【parameter】

Function: Set the current channel

Parameter choice: 0~16

Example: CHANNEL 1 show “PROGRAMMED OK”

Note: Note: After setting CHANNEL, the frequency of transmission and reception will be modified to the frequency of the corresponding channel. After setting CHANNEL and then setting the TX frequency, the transmit frequency will be changed to the frequency set by TX, After setting CHANNEL and then setting the RX frequency, the receiving frequency will be changed to the frequency set by RX. The opposite setting order also works.

##### 3.2.10 CHANNEL

Function: Check the current channel

- Example: CHANNEL show "CHANNEL 1"
- 3.2.11 CHANNELTABLE 【parameter 1】 【parameter 2】  
Function: Set frequency of channel  
Parameter: parameter 1 (channel): 1~16, parameter 2 (frequency): 410.0 – 470.0 902.4 – 9285  
Example: CHANNELTABLE 1 414.015 show "PROGRAMMED OK"
- 3.2.12 CHANNELTABLE 【parameter】  
Function: Check frequency of channel  
Parameter: 1~16  
Example: CHANNELTABLE 1 show "CHANNELTABLE 1 414.015000"
- 3.2.13 PRT 【parameter】  
Function: Set current protocol type  
Parameter choice: TRIMTALK、TRIMMK3、SOUTH、TRANSEOT、GEOTALK、GEOMK3、SATEL、HITARGET、PCCEOT、PCCFST、SATEL\_ADL、PCCFST\_ADL  
Example: PRT TRIMTALK show "PROGRAMMED OK"
- 3.2.14 PRT  
Function: Check current protocol type  
Example: PRT show "PRT TRIMTALK"
- 3.2.15 SREV  
Function: Check current software version  
Example: SREV show the current software version "G001.02.07"
- 3.2.16 SER  
Function: Check the serial number  
Example: SER show "SN:TRM218030242"  
note: If UHF has never set the SN with no.14 command, so only show the "SN:"
- 3.2.17 CTIME  
Function: Set the serial number  
Parameter choice: Less than 16 numbers of ASCII  
Example: SER TRU201-006 show "PROGRAMMED OK"  
note: Serial number is the only remark for the UHF, so it's forbidden to change the serial number by software.
- 3.2.18 FLOW  
Function: Check the lower limit of UHF frequency.  
Example: FLOW show "FLOW 410"
- 3.2.19 FUPP  
Function: Check the upper limit of UHF frequency.  
Example: FUPP show "FUPP 470"
- 3.2.20 SBAUD 【parameter】  
Function: Set baud rate of Communication interface.  
Parameter choice: 9600、19200、38400、57600、115200  
Example: SBAUD 38400 show "PROGRAMMED OK"
- 3.2.21 SBAUD  
Function: Check baud rate of Communication interface (unit:bps)  
Example: SBAUD show "SBAUD 38400"
- 3.2.22 BOOTVER  
Function: Check current BOOT version  
Example: BOOTVER show "15.09.23"
- 3.2.23 HWVER  
Function: Check hardware version  
Example: HWVER show "V1.0"
- 3.2.24 MODEL  
Function: Check model.  
Example: MODEL show "TRM101"
- 3.2.25 PWRL

- Function: Check L-grade power indicator  
Example: PWRL show "0.500"  
3.2.26 PWRH
- Function: Check H-grade power indicator  
Example: PWRH show "1.000"  
3.2.27 SPRT
- Function: Check the supported protocols  
Example: SPRT show  
"TRIMTALK;TRIMMK3;SOUTH;TRANSEOT;GEOTALK;GEOMK3;SATEL; HITARGET; PCCEOT; PCCFST;  
SATEL\_ADL; PCCFST\_ADL"  
3.2.28 SBAUDRATE
- Function: Check air baud rate(unit: bps)  
Example: SBAUDRATE show "4800; 9600; 19200"  
3.2.29 TEMP
- Function: Check current temperature(°C)  
Example: TEMP show "36.808"  
3.2.30 U
- Function: Check present supply voltage.  
Example: U show "3.288"  
3.2.31 RPT **【parameter】**
- Function: Set relay mode  
Parameter: ON/OFF  
Example: Enable relay function "RPT ON", show "PROGRAMMED OK"  
3.2.32 RPT
- Function: Check relay mode  
Example: RPT show "RPT OFF"  
3.2.33 FEC **【parameter】**
- Function: Set FEC function switch  
Parameter: ON/OFF  
Example: Enable FEC function "FEC ON" show "PROGRAMMED OK"  
3.2.34 FEC
- Function: Check FEC function state  
Example: FEC show "FEC ON"  
3.2.35 RIP **【parameter】**
- Function: Set protocol correction on output (only for TRANSEOT、TRIMTALK、TRIMMK3)  
Parameter: ON/OFF  
Example: Enable RIP function "RIP ON" show "PROGRAMMED OK"  
3.2.36 RIP
- Function: Check RIP function state  
Example: RIP show "RIP ON"  
3.2.37 CSMA **【parameter】**
- Function: Set carrier to sense multiple access  
Parameter: ON/OFF  
Example: Enable CSMA function "CSMA ON" show "PROGRAMMED OK"  
3.2.38 CSMA
- Function: Check CSMA function state  
Example: CSMA show "CSMA ON"  
3.2.39 ID **【parameter】**
- Function: Set ID number for call sign  
Parameter: 16-digit ID number (if less than 16 digits, 0 to16 digits will be added automatically  
in front of ID)  
Example: ID 123 show "PROGRAMMED OK"  
3.2.40 ID

- Function: Check ID of call sign  
 Example: ID show "123"
- 3.2.41 TIMEID **【parameter】**  
 Function: Set the sending interval of call sign (unit: min)  
 Parameter: 0~255  
 Example: TIMEID 2 show "PROGRAMMED OK"
- 3.2.42 TIMEID  
 Function: Check sending interval of call sign  
 Example: TIMEID show "2"

### 3.3 Special commands (special commands work only with antenna, so antenna must be connected before testing)

- 3.3.1 CCA **【parameter】**  
 Function: Check the received signal strength value (dBm) of the specified channel (MHz).  
 Parameter choice: 410.000 – 470.000  
 Example: CCA 466.125 show (two options):
- 1) CCA **【parameter 1】**: **【parameter 2】**, Example "CCA 466.125:-106.125", indicate the received signal strength value is -106.125 dBm in the current 466.125MHz channel.
  - 2) "CCA 466.125:ERROR", indicate the test is failed, but it is not indicated that all the channels to be tested aren't applicable. It indicates only the failure for the test operation without connecting the antenna, or too close to the emission source, etc. may lead to the test failure.
- 3.3.2 RSSI  
 Function: Check the received signal strength value.  
 Example: RSSI show (two options):
- 1) RSSI indicates it doesn't receive any data in the protocol, so it can't show the received signal strength value.
  - 2) RSSI -52.478 -48.063, -52.478 (dBm) Refers to the average value of the signal strength received in the last 20 times or less than 20 times in the protocol (because from power-on to the execution of the RSSI command, no more than 20 data packets are received in the protocol); -48.063 (unit: dBm) refers to the received signal strength of the last intra-protocol packet reception of RSSI command execution.

## 3、 Main Power Supply

TRM101 can operate with any 3.3V power supply, which comes from data interface connector with good filtered. The power must supply 1A current at least and featured with current-limiting, even if you make radio modem operating on low power mode (0.5W).

## 4、 Warning & Statement

This module meets the requirements of FCC CFR Title 47 Part 90, FCC CFR Title 47 Part 2.

Integration is strictly limited to fixed categorized end-products where a separation distance of at least 40 cm between the radiating part and any human body can be assured during normal operating conditions.

This module only allows connection antenna in the instruction manual. If other antennas are used, re-evaluation is required.

This module is test stand-alone, if more another modules work together with this module, please evaluation the multiple RF exposure.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2ABAN-TRM101A or Contains FCC ID: 2ABAN-TRM101A".

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment must be installed and operated with minimum distance 40cm between radiator & your body

**IMPORTANT NOTE:**

Integration is strictly limited to mobile/fixed categorized end-products where a separation distance of at least 40 cm between the radiating part and any human body can be assured during normal operating conditions.

**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter).then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

**IMPORTANT NOTE:**

This module is intended for OEM integrator only and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following “ Contains FCC ID: 2ABNA-

TRM101A” .If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

The end user manual shall include all required regulatory information/warning as shown in this manual, include: This product must be installed and operated with a minimum distance of 40 cm between the radiator and user body.

#### Warnings:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence exempt RSS(s).

Operation is subject to the following two conditions:

(1) This device may not cause interference and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient un ou des émetteurs/récepteurs exempts de licence conformes aux RSS exempts de licence d'Innovation, Sciences et Développement économique Canada.

Le fonctionnement est soumis aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

This equipment should be installed and operated with minimum distance 40cm between radiator & your body.

Cet équipement doit être installé et utilisé avec une distance minimale de 40 cm entre le radiateur et votre corps.

**IMPORTANT NOTE:**

Integration is strictly limited to mobile/fixed categorized end-products where a separation distance of at least 40 cm between the radiating part and any human body can be assured during normal operating conditions.

**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the IC authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate IC authorization.

**IMPORTANT NOTE:**

This module is intended for OEM integrator only and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.

**LABEL OF THE END PRODUCT:**

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC :11648A-TRM101" If the size of the end product is smaller than 8x10cm, then additional IC statement is required to be available in the users manual: Cet appareil contient un ou des émetteurs/récepteurs exempts de licence conformes aux RSS exempts de licence d'Innovation, Sciences et Développement économique Canada.

Le fonctionnement est soumis aux deux conditions suivantes :

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement doit être installé et utilisé avec une distance minimale de 40 cm entre le radiateur et votre corps.