Thuraya T2M-DUAL

User Guide

Thuraya t2m

TRACKING & MONITORING DUAL

THURAYA

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Terms and Abbreviations

Terms and Abbreviations	
3G	Third Generation
ADC	Analog to Digital Converters
BAT	Battery
CAN	Controller Area Network
DIP	Dual In-line Package
FOTA	Firmware Over The Air
GmPRS	Geo Mobile Packet Radio Service
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
GPS	Global Positioning System
I/O	Input Output
IGN	Ignition
LED	Light Emitting Diode
PWR	Power
RPM	Revolutions Per Minute
SAT	Satellite
SIG	Signal
SIM	Subscriber Identification Module
SMA	A type of coaxial radio frequency connector (Subminiature version A)
SMS	Short Message Service
UART	Universal Asynchronous Receiver and Transmitter

1 Introduction

1.1 OVERVIEW

The Thuraya Tracking and Monitoring terminal enables remote management of fixed and mobile industrial assets anywhere under Thuraya network coverage and where terrestrial 3G networks are available. The Thuraya tracking and monitoring terminal is a robust and ruggedized solution that is adequate for operation on vehicles, trucks, heavy equipment and in harsh environments such as oil fields, open mines, solar and wind farms and remote utilities installations.

The terminal supports SAE J1939 CAN protocol and integrates GNSS location communications, Thuraya satellite communication network and 3G terrestrial networks (Other CAN protocols can be supported based on case by case basis). Asset status, telematics and location information can be sent to an application server to be accessed by end users to monitor their assets present status, location and other sensor data via an application WEB interface or a mobile App. The Thuraya T2M-DUAL terminal gives users the ability to monitor and manage their mobile and fixed assets in real time to increase efficiency and reduce operational costs.

1.2 T2M-DUAL SYSTEM DIAGRAM

Ther following figure shows the system overview of the T2M-DUAL terminal

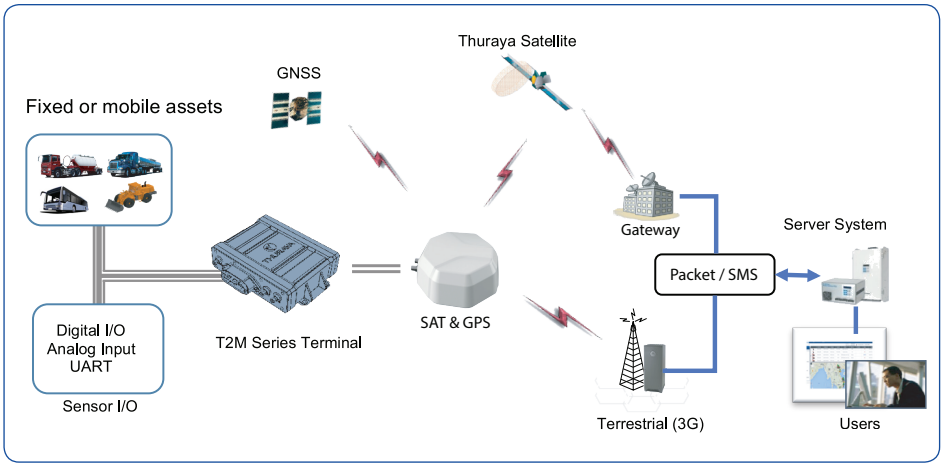

Figure 1 T2M-DUAL System Diagram

2 Getting Started

2.1 IN THE BOX

	
T2M-DUAL Terminal	SAT & GPS Antenna
	
I/O Cable Ass'y	5M RF Cables (SAT & GPS)
	 
Back-up Battery	3G External Antenna Fixing screws

Figure 2 Box Contents

2.2 CONNECTION DIAGRAM

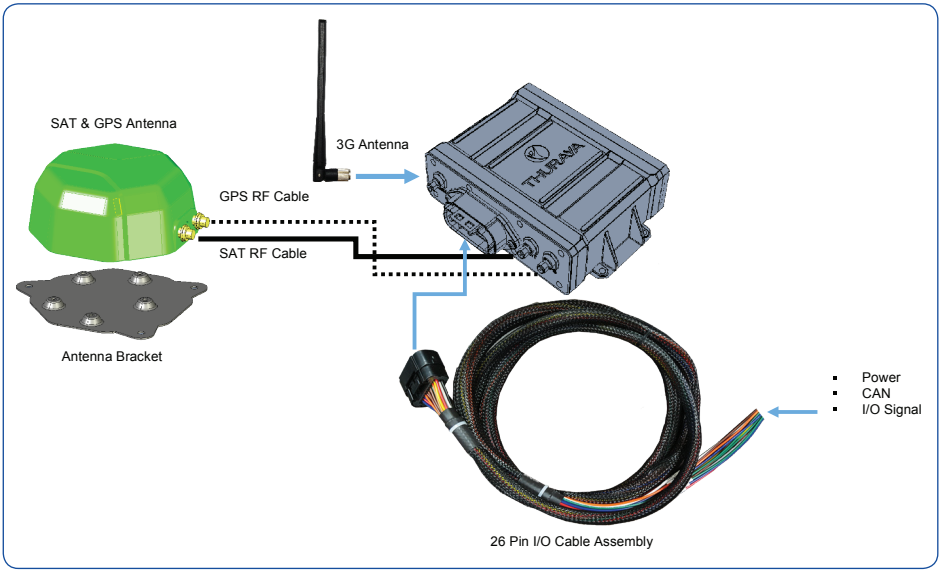

Figure 3 T2M-DUAL Connection Diagram

2.3 FEATURES

- Satellite & 3G dual mode communication
- 5 communication mode:
  (a) SAT messaging Only Mode
  (b) SAT Packet Preferred Mode
  (c) GSM Only Mode
  (d) SAT Preferred Mode
  (e) GSM Preferred Mode
- Periodic Data Gathering and Transmitting
- Event Data Transmitting
- 26 Selectable Data points
- Supports J1939 CAN protocol
- 4 Digital Input / Output
- 2 Digital I/O and Analog ADC Data Input
- 2 UART Port
- 1-Wire Communication for Driver Authentication
- Driving Reports from IGN On to IGN Off
- Upgrade by remotely using Firmware Over the Air function.

3 Hardware

3.1 T2M-DUAL (THURAYA TRACKING AND MONITORING)

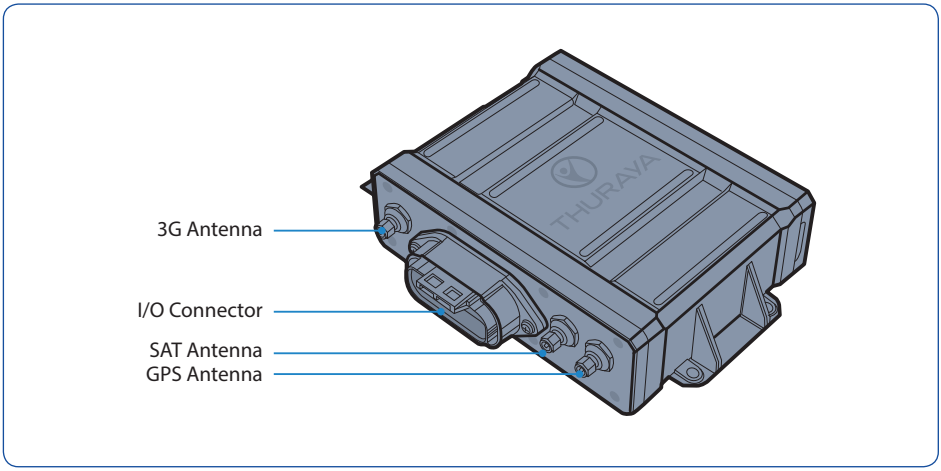

Figure 4 T2M-DUAL Terminal Front Side

TABLE 1 TERMINAL ANTENNA INTERFACES

Port Name	Specifications	Comments
SAT Antenna Port	SMA-Female	Gold color
GPS Antenna Port	SMA-Female	Silver Color
I/O Connector	26 pin waterproof I/O connector	2meters
3G Antenna Port		• An internal antenna is built in the terminal but when needed, a booster 3G external antenna can be connected to improve 3G signal quality. • When an external 3Gantenna is installed, signal path will be changed to external path automatically.

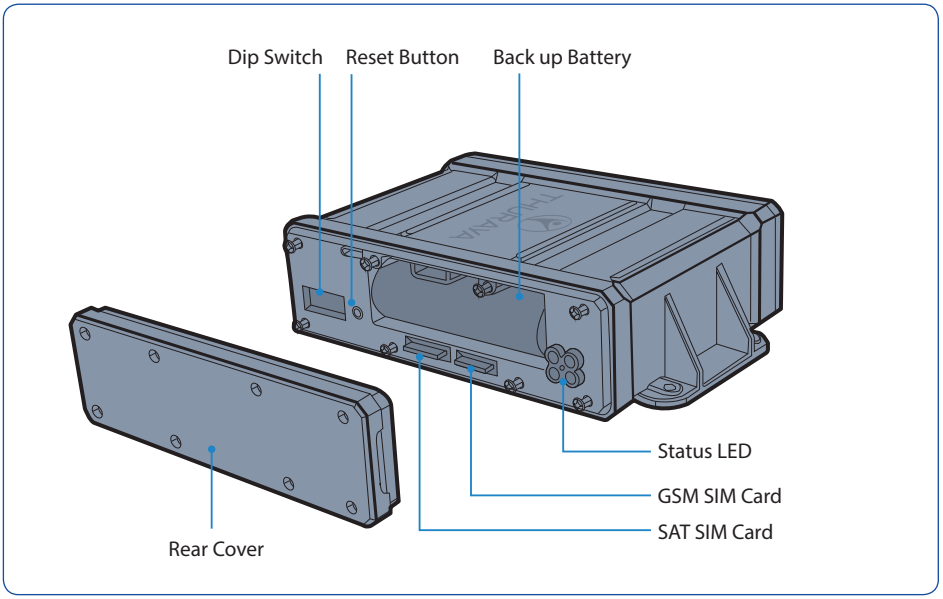

Figure 5 T2M-DUAL 1 Terminal Rear Side

TABLE 2 TERMINAL REAR SIDE INTERFACE

Port Name	Specification	Comment
Back up Battery	◦ Li-Ion, 3000mAh ◦ 18mm (D) x 65mm (L)	Up to 24 hours back-up
GSM SIM Card Slot	Size: Micro SIM	
SAT SIM Card Slot	Size: Mini SIM	
Reset Button	Restarts the terminal	
DIP Switch	Used for the low voltage cut off to prevent vehicle battery discharge. When the external battery voltage is low, terminal will disconnect the external power.	• Pin # 6 Up: 12V vehicle Down: 24V vehicle • Other pins are reserved
Status LED	Terminal status indicator	

- **LED Terminal Status indicators**

  The terminal status indicator LEDs show the terminal status.
  There are 4 LEDs on T2M-DUAL.
  Below table shows the LED status descriptions.

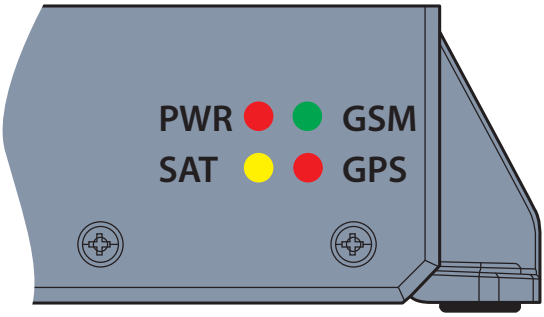

Figure 6 LEDs

TABLE 3 LED FUNCTIONS

LED	Color	Status	Status	Comments
POWER	RED	Power Status	OFF	Power off
			ON	Power on
			Blinking	When an Event occurs, LED is blinking
SAT	YELLOW	SAT Status	OFF	Power off, Satellite disconnected
			ON	Satellite connected
			Blinking	Data Transmitting
GSM	GREEN	3G Status	OFF	Power off, 3G modem disconnected
			ON	3G modem connected
			Blinking	Data Transmitting
GPS	RED	GPS Status	OFF	Power off, GPS disconnect
			ON	GPS connected

- **DIP Switch**

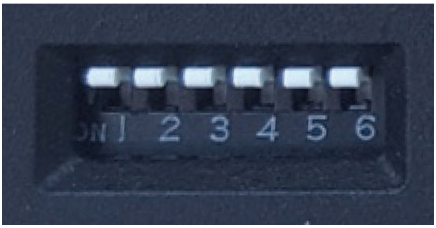

Figure 7 DIP Switch

TABLE 4 DIP SWITCH FUNCTIONS

No.	Function	Setting	Description
1	Reserved	-	-
2	Reserved	-	-
3	Reserved	-	-
4	Reserved	-	-
5	Reserved	-	-
6	Vehicle Voltage Select	• Switch up: 12V vehicle • Switch down: 24V vehicle	Ensure low voltage cut off to prevent vehicle battery discharge

3.2 SAT & GPS ANTENNA

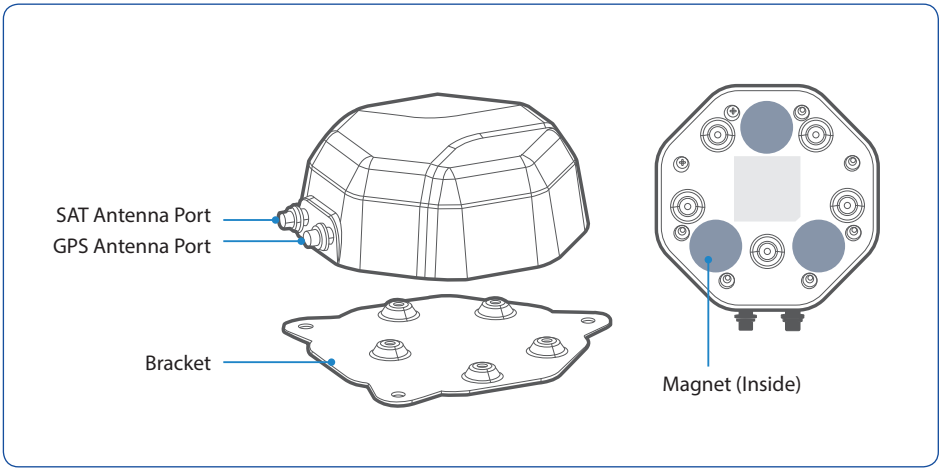

Figure 8 SAT & GPS Antenna

TABLE 5 SAT&GPS ANTENNA

Specification		Comment
SAT Antenna Port	SMA-Female	Gold Color
GPS Antenna Port	SMA-Female	• Silver Color • Supports GPS, Galileo, Glonass, Beidou.
Bracket	Optional bracket for screw mounting.	You can simply fix the antenna with the powerful magnet mounts built in the antenna or use the screw mount for a more permanent installation

3.3 I/O CABLE ASSEMBLY

The I/O cable assembly connects the terminal with the asset (vehicle, RTU, etc.) or sensor. It consists of a 26-pin waterproof connector.

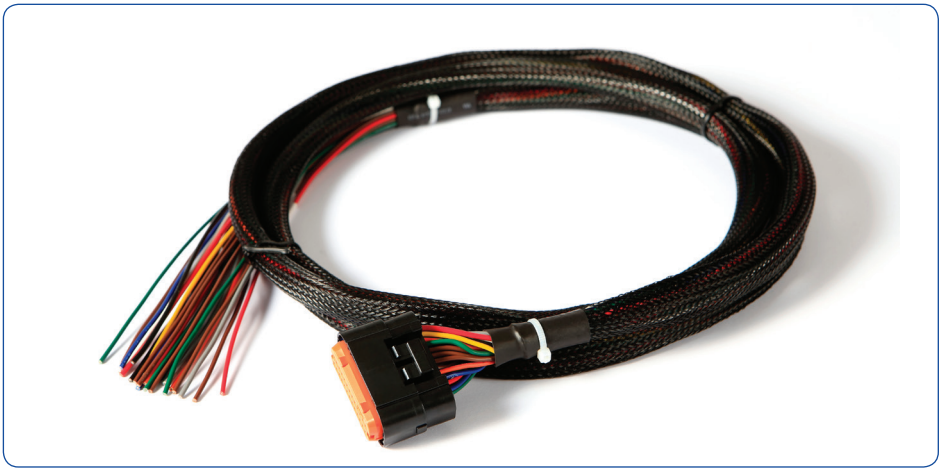

Figure 9 26 Pin I/O Cables Assembly

The length of the cable assembly is 2 meters. Below is the cable assembly configuration

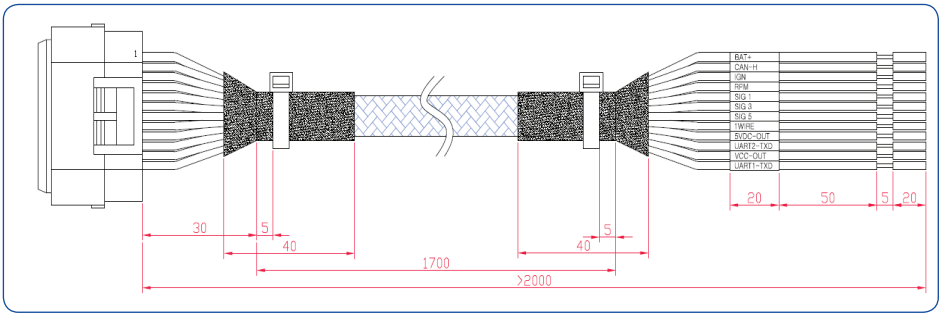

Figure 10 Cable Assembly Drawing

Below figure and table show the pin allocation of the connector

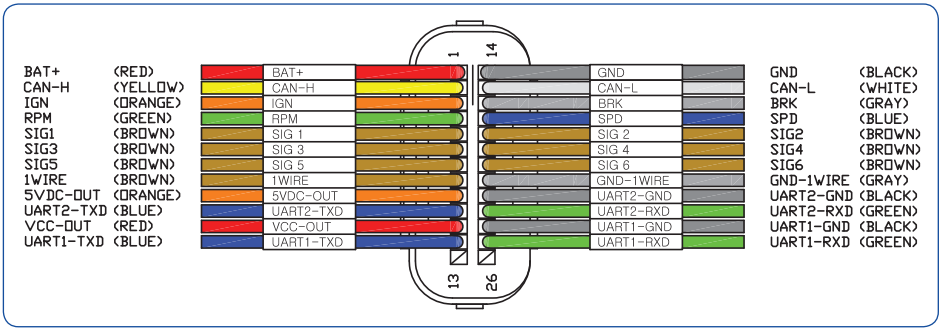

Figure 11 Connector Pin Allocation

TABLE 6 CONNECTOR PIN DESCRIPTION

No.	Name	Type	Description	No.	Name	Type	Description
1	BAT+	Power	Car Battery Input	14	GND	Power	Ground
2	CAN-H	IO	CAN High Signal	15	CAN-L	IO	CAN Low Signal
3	IGN	Input	IGN Signal Input	16	BRK	Input	Brake Signal Input
4	RPM	Input	RPM Signal Input	17	SPD	Input	Speed Signal Input
5	SIG 1	IO	I/O 1	18	SIG 2	IO	I/O 2
6	SIG 3	IO	I/O 3	19	SIG 4	IO	I/O 4
7	SIG 5	IO	I/O 5	20	SIG 6	IO	I/O 6
8	1WIRE	IO	1Wire Bus	21	GND-1WIRE	Power	1Wire GND
9	5VDD OUT	Power	5V Output	22	UART2-GND	Power	UART2 Ground
10	UART2-TXD	Output	RS232 Level TXD Signal	23	UART2-RXD	Input	RS232 Level RXD Signal
11	VCC-OUT	Power	Car Battery + output	24	UART1-GND	Power	UART1 Ground
12	UART1-TXD	Output	RS232 Level TXD Signal	25	URT1-RXD	Input	RS232 Level RXD Signal
13	-	-	-	26	-	-	-

3.4 3G ANTENNA

The T2M-DUAL has a built in internal 3G antenna which is the default antenna. An additional external antenna is optional and can be connected to the T2M-DUAL to improve signal quality in weak signal areas or inside heavy equipment. When the external 3G antenna is installed, signal path will be automatically to the external antenna.

Figure 12 3G Exteranl Antenna

3.5 BACK-UP BATTERY

The back-up battery is used when the external power supply is disconnected or not available.

Back-up battery Specifications:

- Li-Ion, 3000mAh
- 18mm (D) x 65mm (L)
- Discharging Temperature: -20°C +70°C

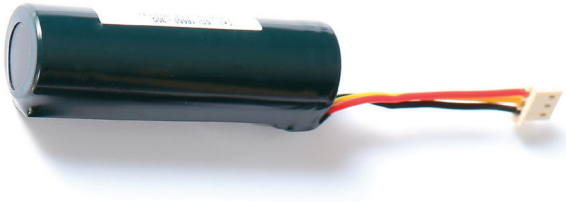

Figure 13 Back-up Battery

CAUTION

- ✓ **Risk of explosion if battery is replaced by an incorrect type.**
- ✓ **May explode if damaged or disposed of in fire.**
- ✓ **Do not short circuit.**
- ✓ **Dispose of used batteries according to the instruction.**

3.6 ANTENNA CABLES

The T2M-DUAL package contains two antenna cables. A satellite (SAT) antenna cable and another is GPS antenna cable. The cable specifications are as follows.

TABLE 7 ANTENNA CABLES

Cable	Length	Connector	Connector Color	Cable Specification
SAT Antenna Cable	5M	SMA(M)-SMA(M)	Gold Color	LMR-200 or Equivalent
GPS Antenna Cable	5M	SMA(M)-SMA(M)	Silver Color	

4 Functional Description

In order to integrate third party solutions with the T2M-DUAL terminal, please refer to the "T2M-DUAL Protocol Document".

To configure the T2M-DUAL terminal please refer to the "T2M-DUAL Management Tool" document.

4.1 COMMUNICATION MODE

T2M-DUAL supports satellite and 3G dual mode communication. For satellite mode, data can be transmitted using SMS and packet.

Below table show the communication mode description of the T2M-DUAL.

TABLE 8 COMMUNICATION MODES

Mode No.	Mode Name	Description
1	SAT Only SMS	• Satellite network only • SMS only.
2	SAT Packet Preferred	• Satellite network only • GMPRS preferred, switches to SMS if needed
3	GSM Only	• 3G network only.
4	SAT Preferred	• Satellite network preferred, switches to 3G network if not available. • The mode sequence is GMPRS >SAT SMS> 3G Packet. • The mode is automatically switched.
5	GSM Preferred	• 3G network preferred, switches to satellite network if not available.

4.2 TRACK MODE AND GPIO MODE

The Track is used to gather necessary data from mobile assets such as location in addition to selectable data through GPIO ports.

The GPIO mode is used to collect and transmit selected GPIO data only (e.g. fixed installations).

TABLE 9 TRACK & GPIO MODES

Mode	Description
Track Mode	• Basic data and all selectable data will be transmitted periodically based on the transmission period setting (minimum 2 minutes) • If GPIO data is selected, it will be transmitted as well
GPIO Mode	• If you set the "sampling period" and "transmission period" at track mode to "0", GPIO mode is enabled. • In GPIO mode the T2M-DUAL will collect and transmit GPIO data only.

4.3 DATA LOGGER

The T2M-DUAL can store more than 50,000 data points (basic data) to the internal memory.

The logged data can be dumped from the terminal using "T2M-DUAL management tool"

4.4 NECESSARY AND SELECTABLE DATA

The terminal collects and transmits two types of data.

1. Necessary data: Basic data that is always collected and sent.
2. Selectable data: Optional data which the terminal can be configured to collect and transmit.

The user can configure the terminal locally by using the "T2M-DUAL Management tool" or remotely.

On how to configure the T2M-DUAL, please refer to the "T2M-DUAL Management Tool user's guide" and "T2M-DUAL Protocol document".

The table below details the necessary data and all selectable data.

TABLE 10 NECESSARY & SELECTABLE DATA

No	Collection Data	Collection Method	Necessary	Selective	Comment
1	Time	GPS	V		• Default Data
2	Longitude	GPS	V		
3	Latitude	GPS	V		
4	Angle	GPS	V		
5	IGN	GPS	V		
6	Wheel Based Speed	CAN / Sensor	V		
7	RPM (Engine Speed)	CAN / Sensor	V		
8	Altitude (B1)	GPS		V	
9	GPS Speed (B2)	GPS		V	
10	Moving Distance (B3)	Terminal		V	
11	Vehicle Battery Voltage (B4)	Sensor		V	
12	G-Sensor (Shock) (B5)	Sensor		V	
13	Internal Battery Voltage (A1)	Sensor		V	
14	Terminal Temperature (A2)	Sensor		V	
15	1-Wire (A3)	Sensor		V	• Driver Authentication
16	Fuel Level (C1)	CAN		V	• These data from CAN are depends on the vehicle manufacturer and year. • Support J-1939 protocol
17	Engine Hours (C2)	CAN		V	
18	High Resolution total vehicle distance (C3)	CAN		V	
19	Engine Coolant temparature (C4)	CAN		V	
20	Ambient Temperature (C5)	CAN		V	
21	Instantaneous Fuel Economy (C6)	CAN		V	
22	Fuel Rate (C7)	CAN		V	
23	Accelarator Pedal Position (C8)	CAN		V	
24	Current Gear (C9)	CAN		V	
26	IO 1	Digital		V	
27	IO 2	Digital		V	
28	IO 3	Digital		V	
29	IO 4	Digital		V	
30	IO 5 (ADC)	Analog/Digital		V	
31	IO 6 (ADC)	Analog/Digital		V	
32	UART 1	Data		V	
33	UART 2	Data		V	Ex) Thermometer

4.5 DATA SAMPLING INTERVAL (FOR PERIODIC DATA)

The interval of data collection and transmission can be set to different periods (e.g. collect every minute transmit every 10 minutes).

The interval period can be set using the "T2M-DUAL management tool" or on the server remotely. It is recommended that the transmission period be an integer multiple of the collection period.

TABLE 11 PERIODIC DATA

Tracking Sampling Period	Transmit	• > 2 minutes • 0 : if GPIO mode
	Collect	• > 1 minute • 0 : if GPIO mode
GPIO Sampling Period	Transmit	• > 2 minutes
	Collect	• > 1 minute

4.6 EVENT DATA (NON-PERIODIC DATA)

When the vehicle encounters an event which triggers an alert, the terminal will transmit the event data immediately to the server.

The table below describes the event data.

TABLE 12 EVENT DATA

No	Event Name	Event Status
1	Vehicle Battery Disconnection	• In case the vehicle battery is disconnected (e.g. tampering). • This alert is invoked also when the terminal self-disconnects to protect the vehicle battery from draining (low voltage)
2	IGN On / Off	• Vehicle IGN On and Off status
3	Low Battery Warning	• In case of internal battery voltage indicates that it will be exhausted soon.
4	Shock	• When external shocks occurs
5	SIM Error	• When a SAT SIM Error is occurs, it is reported over 3G and vice-versa
6	Geo-Fence Deviation	• When the vehicle is out of the set geofence.
7	Over Speed	• When the vehicle is over the set speed limit.
8	Overturn	• When the vehicle is overturned.

4.7 GPIO PORT

The T2M-DUAL has 8 I/O ports that can connect with external sensors.

I/O Ports 1 to 4 are digital ports that can be set to input or output using the T2M-DUAL management tool.

I/O ports 5 and 6 can be used as digital ports or analog ports. When used as digital ports they can be set to input or output using the T2M-DUAL management tool. In case they are used as analog ports they are can only be set to input using the T2M-DUAL management tool.

The T2M-DUAL contains two serial (UART) ports. In case the UART ports are used, the necessary UART protocol should be implemented.

The table below shows the I/O port summary.

TABLE 13 I/O PORT

No	I/O	Specification	Description
1	IO 1	Digital	
2	IO 2	Digital	
3	IO 3	Digital	
4	IO 4	Digital	
5	IO 5 (ADC)	Analog/Digital	• Digital: Input/output • Analog: ADC Input
6	IO 6 (ADC)	Analog/Digital	
7	UART 1	Data	
8	UART 2	Data	

4.8 OVER SPEED ALARM SETTING

Over speed alarm setting invokes the terminal to ring the buzzer continuously when the vehicle exceeds the set speed limit.

4.9 SHOCK LIMIT SETTING

The impact value of the built-in impact sensor can be configured differently for each user.

IGN On and IGN Off time shock limit value can be set differently.

4.10 SPEED, RPM AND BRAKE COEFFICIENT SETTING

For vehicles that do not support CANbus, it is possible to measure the speed, rpm and braking data of the vehicle using analog speed sensor and rpm sensor signals. This signals are different for each vehicle manufacturer; the installer needs to adjust the appropriate parameter coefficient.

TABLE 14 ANALOG COEFFICIENT

Item	Set Value	Example
Speed	1~ 99999	4-pulse: 2548 8-pulse: 5096 16-puse : 10192
RPM	1~ 99999	30
Brake	High / Low	

4.11 J1939 CAN DATA

T2M-DUAL supports J1939 CAN specifications.

Below table shows the CAN support data based on J1939 specifications. (It can vary by vehicle manufacturer and manufacturing year)

TABLE 15 J1939 CAN DATA

No	Item	Description	Unit
1	Fuel Level	Ratio of volume of fuel to the total volume of fuel storage container.	%
2	Engine Speed (RPM)	Actual engine speed which is calculated over a minimum crankshaft angle of 720 degrees divided by the number of cylinders.	RPM
3	Engine Hours	Engine total hours of Operation: Accumulated time of operation of engine.	Hour
4	High Resolution total vehicle distance	Accumulated distance travelled by the vehicle during its operation.	Meter
5	Engine Coolant temperature	Temperature of liquid found in engine cooling system.	°C
6	Ambient Temperature	Ambient Air Temperature: Temperature of air surrounding vehicle.	°C
7	Fuel Rate	Amount of fuel consumed by engine per unit of time	L/h
8	Instantaneous Fuel Economy	Current fuel economy at current vehicle velocity	Km/L
9	Wheel based speed	Speed of the vehicle as calculated from wheel or tail shaft speed	Km/h
10	Brake Switch	Switch signal which indicates that the driver operated brake foot pedal which is being pressed. This brake foot pedal is controlling the vehicles' service brake (total vehicle braking application, not parking brakes).	on/off
11	Accelerator Pedal Position	The ratio of actual position of the analogue engine speed/ torque request input device (such as an accelerator pedal or throttle lever) to the maximum position of the input device.	%
12	Current Gear	The gear currently engaged in the transmission or the last gear engaged while the transmission is in the process of shifting to the new or selected gear.	-

4.12 DRIVING REPORT

If you turn off the vehicle key, a driving report will be generated and sent to the back-end application server. The driving report is part of the selectable data.

The followings data points are included in the driving report:

- **IGN On time**
- **IGN Off time**
- **Driver's name**
- **Driving distance (in meters)**
- **Number of brakes**
- **Number of harsh brakes**
- **Number of harsh accelerations**
- **Maximum speed during the driving**
- **Maximum RPM during the driving**

4.13 GEO-FENCE

Geo-fences can be generated on the server and transferred to the terminal. If terminal receives the geo-fence data from the server, the terminal will store the data in the internal memory. If the vehicle is outside the geo-fence, the terminal beeps and sends an alert/ event to the back-end application server. Geo-fences can be set by packet mode only.

The T2M-DUAL terminal supports up to 128 geo-fencing polygons of geo-fence.
A polygon can be defined by up to 64 points.

5 I/O ports Description

5.1 GPIO PORT

The terminal's 6 configurable GPIO lines are each independently operable in one of following modes:

- **Digital Input**
- **Digital Output**
- **Analog Input (I/O# 5, 6)**
- **Disabled.**

5.1.1 DIGITAL INPUT

The figure below shows a schematic of the I/O when configured as a digital input.

Please note the input voltage conditions.

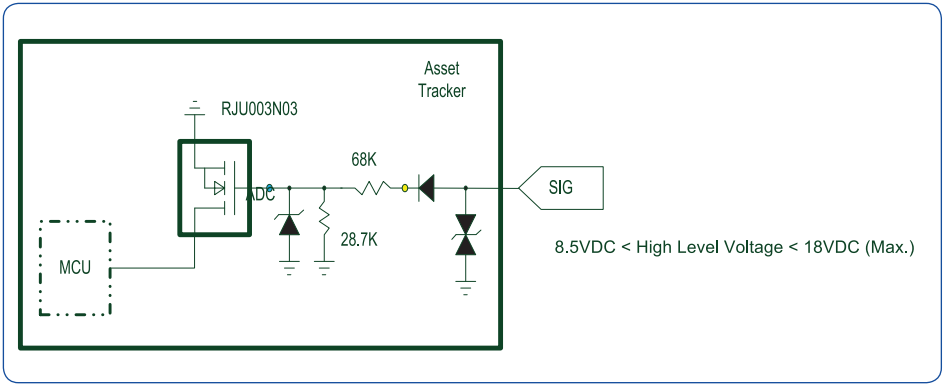

Figure 14 Digital Input

5.1.2 DIGITAL OUTPUT

The figure below shows a schematic of the I/O when configured as digital output.

Please note the voltage and current curves.

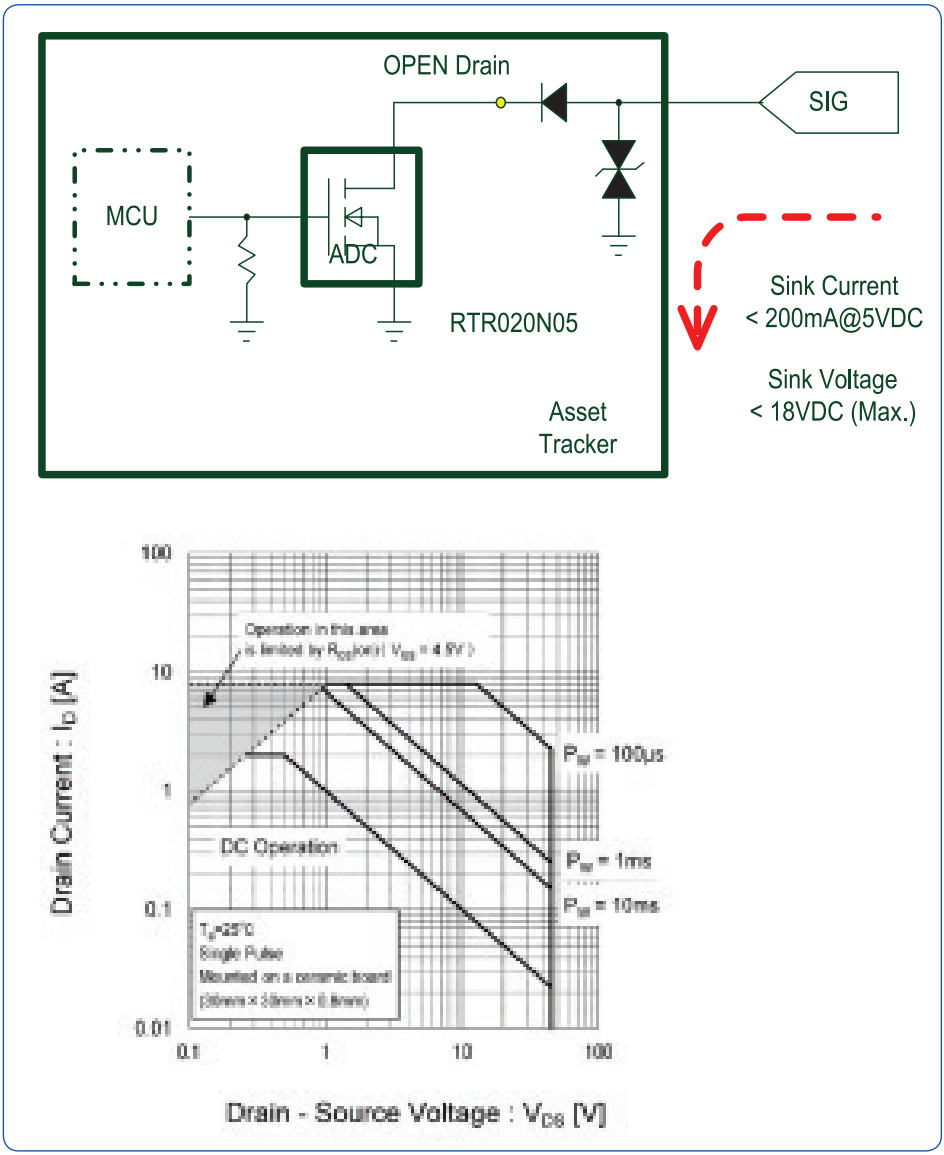

Figure 15 Digital Output

5.1.3 ANALOG INPUT

The figure below contains a schematic of the I/O when configured as an analog input.

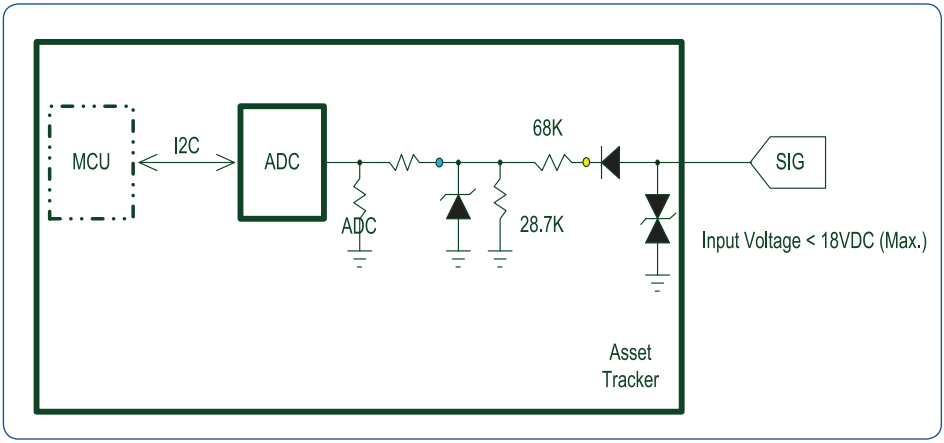

Figure 16 Analog Input

5.2 SERIAL INTERFACES

There are 2 RS-232 (UART) ports in the T2M-DUAL terminal.

The RS-232 interface defaults to the following settings:

- **Baud Rate: 115,200**
- **Stop Bit: 1**
- **Data Bit: 8**
- **Parity Bit: None**

6 Installation

This section outlines the standard installation guidelines for the installers. During the installation, the installer should take all the necessary safety precautions. The installer should take every precaution in order not to damage the vehicle during the installation procedure. The general installation procedure is as follows.

1. **Prepare for the installation.**
2. **Select proper locations for antenna and terminal.**
3. **Mount the antenna.**
4. **Mount the terminal**
5. **Rout the SAT & GPS antenna cable**
6. **Connect the 26pin I/O cable**
7. **Key on and operating.**

CAUTION

- ✓ **The installation must be done by a skilled installation professional.**
- ✓ **The installer must comply with all safety precautions and not to damage the vehicle.**

6.1 PREPARE FOR THE INSTALLATION

Before installation, the installer should prepare the following:

1. Prepare the necessary tools and auxiliary materials for required for mounting the hardware
2. Set the terminal using "T2M-DUAL Management Tool" for communication mode, selectable data, server IP, short code and any other necessary configurations.
3. Insert the SIM cards and back up battery into the terminal and set the vehicle voltage DIP switch.

CAUTION

- ✓ **Before the start of the installation of the terminal, Set the terminal parameters using the "T2M-DUAL Management Tool".**

4. Affix the back cover and fasten the screws.

6.2 SELECT THE PROPER MOUNTING LOCATIONS

It is very important for the installer to select an unobstructed location for the antenna and a suitable location to install the terminal.

6.2.1 ANTENNA LOCATION

The antenna is designed for optimal performance when installed on the roof of the vehicle. If it is mounted on the trunk or a lower obstructed surface optimal performance may not be achieved.

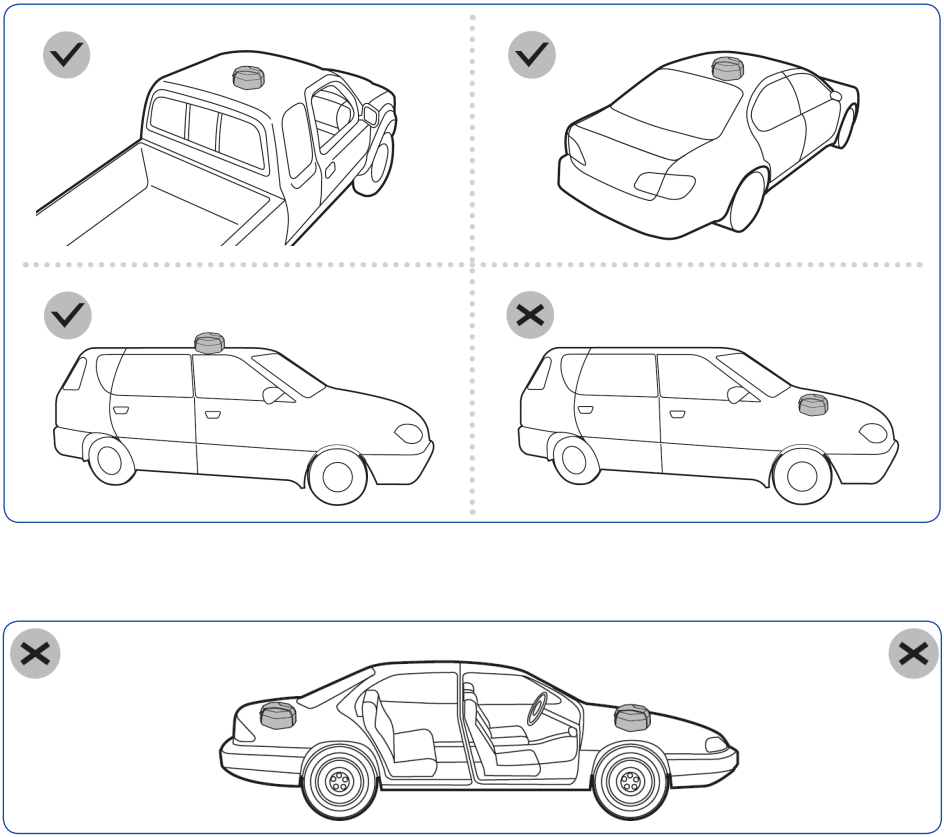

Figure 17 Antenna Mounting Location

6.2.2 TERMINAL LOCATION

Some suggested locations to install the T2M-DUAL terminal are under the passenger seat or under the dashboard. When mounting the T2M-DUAL, it is important to keep the terminal as horizontal as possible.

6.3 MOUNTING THE ANTENNA

The antenna should be fixed after selecting the proper mounting position. There are two methods to fix the antenna. Either by simply fixing it on the top of the vehicle using the magnet mounts or the screw mounting bracket for a more permanent installation.

6.3.1 MAGNET MOUNTING

There are 4 magnets in the inside of the antenna bottom. Therefore, it can be mounted on conductive (metal) surface on the roof of the vehicle. It will withstand very high velocity of the vehicle. Before mounting, remove and clean the dust on the surface to be installed. And put the antenna there.

6.3.2 SCREW MOUNTING USING BRACKET

The antenna can be fixed by screw using bracket.

1. Fix the bracket to antenna using the 5 screws provided with the screw mount.
2. Select the antenna location.

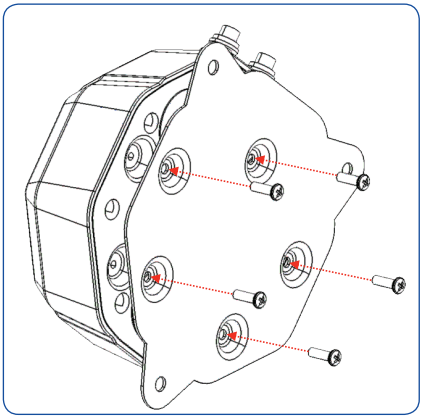

Figure 18 Antenna Bracket Fixing

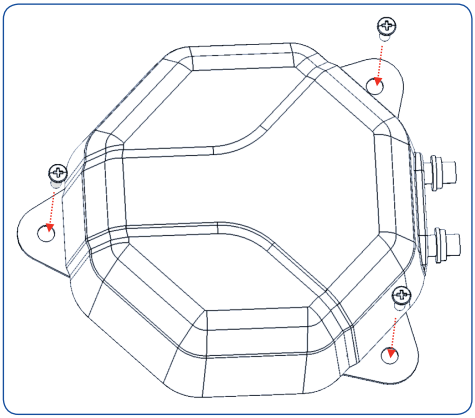

Figure 19 Antenna Fixing

3. Fix the antenna using the 3 mounting screws.

6.4 MOUNTING THE TERMINAL

The T2M-DUAL terminal can be installed under the passenger seat or on or under the dashboard. When mounting the terminal, it is important to keep it as horizontal as possible.

Below are the steps for installing the T2M-DUAL terminal.

1. Set the terminal parameters using the "T2M-DUAL Management Tool"
2. Insert the SIM cards.
3. Insert the backup battery if needed. The backup battery is not necessary for terminal operation provided the terminal is connected to an external battery.

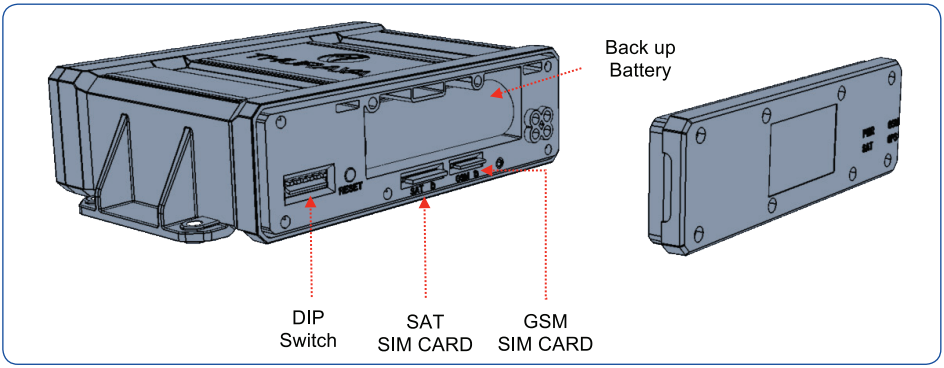

Figure 20 SIM, Battery, DIP siwtch

4. Set the DIP switch #6 to the off state (upper position) for vehicles with 12V battery. If the vehicle is powered with a 24V battery, #6 switch should be set to the on state (lower position)

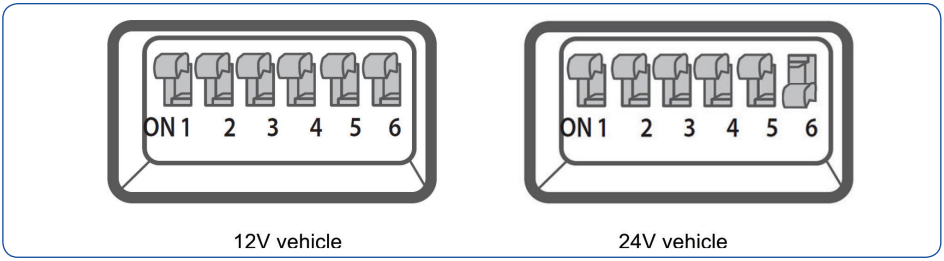

Figure 21 DIP Switch Position

CAUTION

✓ **Be sure to set the DIP switch according to the operating voltage of the vehicle battery.**

5. Close the rear cover of the terminal and fixing the 8 screws.

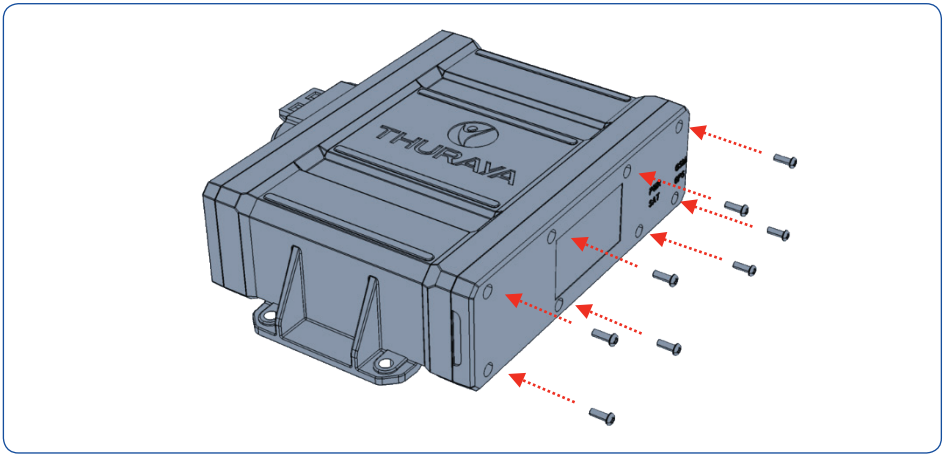

Figure 22 Installing the rear Cover

CAUTION

✓ **If the rear cover is not closed or all screws are not tightened, waterproof is not guaranteed.**

6. Mount the T2M-DUAL terminal and fix the 4 screws

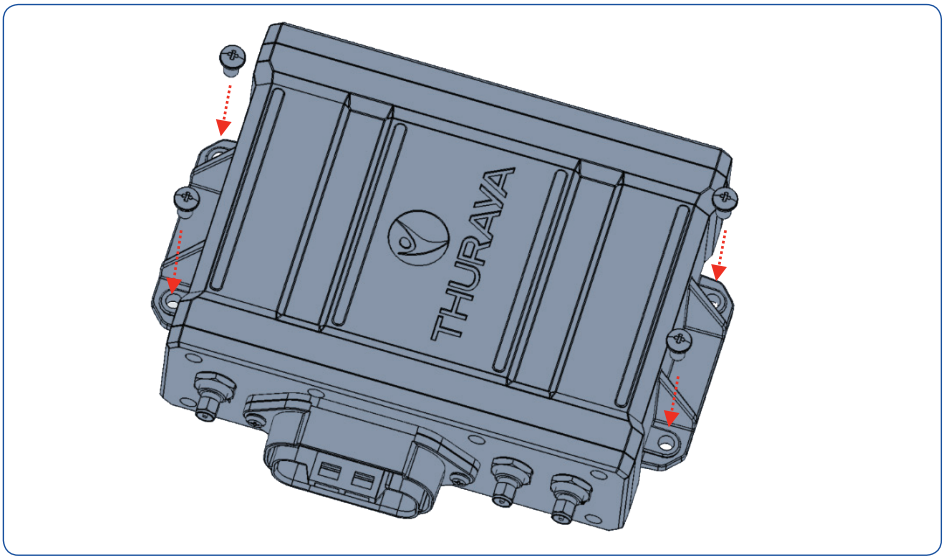

Figure 23 Terminal mounting

6.5 ROUTING THE SAT & GPS ANTENNA CABLES

Connect the 5M RF cables from the antenna to the terminal.

Route the RF cables so that the door or window closes properly and does not damage the cable. Be careful not to twist or break the cable and tighten the RF cable using cable tie.

CAUTION

- ✓ **Be careful not to twist or break the antenna RF cables.**

6.6 CONNECTING THE 26 PIN I/O CABLE

Prior to working on any cabling, ensure that the terminal is powered off while work is in progress.

Connect the I/O connector to the terminal and also connect the opposite side of the cable to the vehicle and appropriate monitoring sensors and peripherals (Digital/ analog sensors, serial devices, I wire cable etc.).

The pins #1(BAT+), #14(GND), and #3(IGN) associated with the power supply must be connected. The remaining cables are connected to the various sensors as needed. Please refer to Table 6 for a detailed cable pin description.

CAUTION

- ✓ **The pins #1(BAT+), #14(GND), and #3(IGN) associated with the power supply must be connected**
- ✓ **Prior to working on any cabling, ensure that the terminal is powered off and unable to start while work is in progress.**

6.7 TERMINAL POWER UP AND OPERATION.

After connecting the cable, plug the 26-pin connector into the terminal.

The terminal will be turned on automatically.

Data transmission will start and should be received at the server.

7 Specifications

7.1 GENERAL SPECIFICATIONS

TABLE 16 GENERAL SPECIFICATIONS

Item	Specification	Descriptions
Size	133(W) x 103(L) x 39.8(H)	Unit : mm
Weight	395 g	T2M-DUAL terminal
	1.35 kg	Include Accessories
Operating Temperature	-30°C ~ +70°C	Exclude back up battery
	-20°C ~ +60°C	Include back up battery
Storage Temperature	-40°C ~ +85°C	
Battery Capacity	3000 mAh	Li-Ion
Vibration	Random 5~20Hz 0.05g2/Hz, 20~150Hz: -3dB/oct. (1.7g rms), 3-axis, 30minutes for each axis.	
Thermal Shock	-40°C (1H)/+85°C (1H), 1cycle- Total24 cycle, 48H, non-operating	
Humidity	+70°C/95%/48 Hours, Operating	

7.2 TERMINAL SPECIFICATIONS

TABLE 17 TERMINAL SPECIFICATIONS

Item		Specification	Descriptions
Communication Modem	SAT	Thuraya SM-2700	Support Thuraya Satellite Network
	3G	3G Data Modem	Support Band I, Band V, Band VIII.
GNSS	Chipset	UBLOX-M8030	Supports multi GNSS (GPS, GLONASS, Beidou, Galileo)
	TTFF	• Cold Start: 26sec • Hot Start : 1sec	
Ingress Protection		> IP66	
Operating Voltage		+10Vdc ~ +34Vdc	
I/O Connector		26 Pin	Waterproof connector
Antenna Port		• SAT: SMA(F), Gold • GPS: SMA(F), Silver • 3G: SMA(F), Gold	
SIM Slot		• SAT: Mini SIM • GSM: Micro SIM	
LED		4 LEDs	Power, SAT, GSM, GPS
ETC		DIP Switch	Set vehicle voltage
		Reset Button	Reset terminal

7.3 ANTENNA SPECIFICATIONS

TABLE 18 ANTENNA SPECIFICATIONS

Items		Specification
SAT & GPS Antenna	Frequency	1525Mhz ~ 1660.5 Mhz (SAT)
	Impedance	50Ω
	Polarization	LHCP (SAT) / RHCP(GPS)
	Axial Ratio	< 4dB
	Gain	>5dBic@peak
	Size	110 (D) x 42(H) [unit: mm]
	Connector	SAT: SMA (F), Gold color GPS: SMA (F), Silver color
	Ingress Protection	IP67
	Mounting	Magnet Mounting bracket Mounting
3G Antenna	Type	Basic: Internal Multi-Band Antenna Optional: External Multi-Band Antenna
	Beam Pattern	Omni-Directional
	Impedance	50Ω

7.4 ACCESSORIES

TABLE 19 ACCESSORY SPECIFICAITONS

Items	Specification
RF Cable SAT & GPS	LMR-200 or Equivalent, 5meter
Multi-pin interface cable (I/O Cable)	2 meter, 26pin I/O waterproof connector
Mounting Screws	
Back-up battery	Li-Ion, 3000mAh / 18mm(D) x 65mm(L)
Back cover panel	
Sat and GPS antenna	
GSM external antenna	

8 Limited Warranty.....

LIMITED WARRANTY

This Limited Warranty is provided to the original end-user purchaser (the 'Buyer') of any new Thuraya T2M-DUAL terminal. This Limited Warranty is non-transferable.

Warranty Coverage and Service

Thuraya warrants all new Thuraya T2M-DUAL terminals (the 'Product') under normal use and wear to be free from defects in material and workmanship for a period of one (1) year from the date of purchase by the original Buyer (the 'Warranty Period'). If, under normal use and wear, the Product becomes defective in materials or workmanship and is returned at Buyer's expense to a Thuraya Authorized Service Center during the Warranty Period, the Product will be repaired or replaced, at Thuraya' sole and exclusive option, and at no charge to Buyer. Buyer will be required to provide reasonable proof of date of purchase.

Reconditioned replacement components, parts, units or materials may be used if the Product is repaired or replaced. Costs incurred in the removal, de-installation or reinstallation of the Product are not covered.

THIS LIMITED WARRANTY DOES NOT COVER AND THURAYA WILL NOT BE RESPONSIBLE FOR THE FOLLOWING:

This Limited Warranty will be void in its entirety if the Product is serviced by anyone other than Thuraya or a Thuraya Authorized Service Centre. Buyer's sole and exclusive remedy shall be the repair or replacement of the defective product, as specifically described above. Thuraya neither assumes nor authorizes any Authorized Service Centre or any other person or entity to assume any other obligation or liability beyond that which is provided for in this Limited Warranty.

This Limited Warranty is conditioned upon proper use of the Product and does not cover the following:

- products or accessory equipment not manufactured or provided by Thuraya
- failures or defects caused by misuse, abuse, accident, alteration, dampness, sand, unusual physical, electrical or electromechanical stress or neglect
- unauthorized installation, removal or repair
- failure to follow instructions
- fire, flood or other nature caused accidents
- spills of food or liquids; moisture

- normal wear and tear
- scratches, dents and cosmetic damage
- improper installation, maintenance or improper storage
- operation or repair; performance of the Product when used in combination with other products or equipment not manufactured or provided by Thuraya
- payments for labor or service to representatives or service centers not authorized by Thuraya

This limited Warranty of the Product does not cover the operation, availability, coverage, range or grade of service provided by the satellite systems.

Thuraya m2m