

# Flipper TS Series / User Manual

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# COMMCRETE



\* All data in this manual refers to all genders equally

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## Introduction

### ***General***

First responders & Military often work in harsh environment, relying on robust portable radios to provide all-informed C4I (Communication for Command, Control, Coordination & Intelligence) of dispersed forces.

However, when operational distances extend beyond line of sight, VHF/UHF radios run out of range, unable to meet the requirements.

Using terrestrial repeaters or relay stations has its own disadvantages when disaster occur. Deployment of mobile repeaters results in insufficient coverage and lots of logistics.

Furthermore, disasters such as Earthquakes, Wildfires and Floods rule out the ability of terrestrial deployment.

### ***Flipper™***

Flipper by Commcrete is a very small form factor satellite communication module. It turns any line of site tactical radio of all bands (Military and Commercial VHF, Military and Commercial UHF, including the 700/800 & 900MHz bands) to a tactical satellite radio.

Small, Rugged, Agile & Multi Band Flexibility make Flipper the right solution for rescuers and first responders.

Whether you're Law Enforcement, Firefighter or Military, adding Flipper to your radio, immediately connects you to the network regardless of geographic boundaries. The size of Flipper combined with a small omni directional antenna, makes it the ultimate Comms-On-The-Move (COTM) product for various scenarios.

### ***Tactical communication over GEO satellites***

**Flipper™** complies with L-Band tactical services by GEO satellite companies, making it invincible in size and performance. Therefore, the integration of Flipper and Customer Radio excels in every parameter, both for Voice & Data.

## Safety Statement

### General

This safety statement is provided for **Flipper™** End Users. These safety notes should be used in conjunction with regional regulations. This equipment is not suitable for use in locations where children are likely to be present. For all mobile versions (VTS-300, VTS-301, MTS-400, ATS-500): if the equipment is intended to be fastened in place, the instructions shall explain how to securely fasten the equipment.

The Flipper consists of RF unit and antenna attached to it.

- The RF unit enables conventional PTT Line-of-Sight commercial or military radios of all bands to operate over commercial L-band frequencies.
- The antenna transmits and receives at L-band in accordance to commercial satellite frequencies.

### DC Power

**Flipper™** can be powered by a variety of power sources. *Handheld version (HTS-100)* is designed to support 6-14V such as 12V battery or other DC power supply (15W max). *Mobile versions (VTS-300, VTS-301, MTS-400, ATS-500)* are designed to support 9-48V in various land, marine and aeronautical platforms (27W max). When using the mobile versions, a 5A fuse (with clear sign on it) must be installed serially to the power source in reach for quick and easy disconnection. Flipper complies with PRC-148 & PRC-152 military grade batteries or similar 7.4 / 10.8 / 12V batteries of other PTT radio models.

### Water resistance

**Flipper™** is designed and tested to comply with IP67 standard. MTS-400 model is designed specifically for extended durability for salty environment. All Flipper models that are being used in salty water require immediate clean-water wash right after use. Prevention of such wash boosts rust and corrosion effects and might harm long the term durability of Flipper modules.

### Standards

**Flipper™** is designed in compliance with the CE & FCC standards:

- EN 55032, EN 55035, EN 301489-1, 301489-3, 301489-17, FCC Part 15B – EMC / EMI
- EN 62209-1528, 47 CFR § 25.253 – Radio
- IEEE STD 1528 IEEE FCC OET 65 – Body SAR
- IEC 62368-1 – Safety
- IEC 60529 – IP Rating (IP 67)

***FCC Interference Statement HTS-100***

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: a) Reorient or relocate the receiving antenna. b) Increase the separation between the equipment and receiver. c) Connect the equipment to an outlet on a circuit different from that to which the receiver is connected. d) Consult the dealer or an experienced radio/TV technician.

This device complies with Part 15 of the FCC Rules. 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.

***FCC Modification Warning Statement HTS-100***

Any changes or modifications not expressly approved by the party, responsible for compliance, could void the user's authority to operate this equipment under FCC Rules.

***FCC RF Exposure Warning - SAR HTS-100***

This device meets the government's requirements for exposure to radio waves. This device is designed and manufactured not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission of the U.S. Government.

The exposure standard employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is **1.6 W/kg**. Tests for SAR are conducted using standard operating positions accepted by the FCC with the EUT transmitting at the specified power level in different channels.

The FCC has granted an Equipment Authorization for this device with all reported SAR levels evaluated as in compliance with the FCC RF exposure

guidelines. SAR information on this device is on file with the FCC and can be found under the Display Grant section of [www.fcc.gov/eot/ea/fccid](http://www.fcc.gov/eot/ea/fccid) after searching on FCC ID: 2BBUK-FLIPPERHTS100

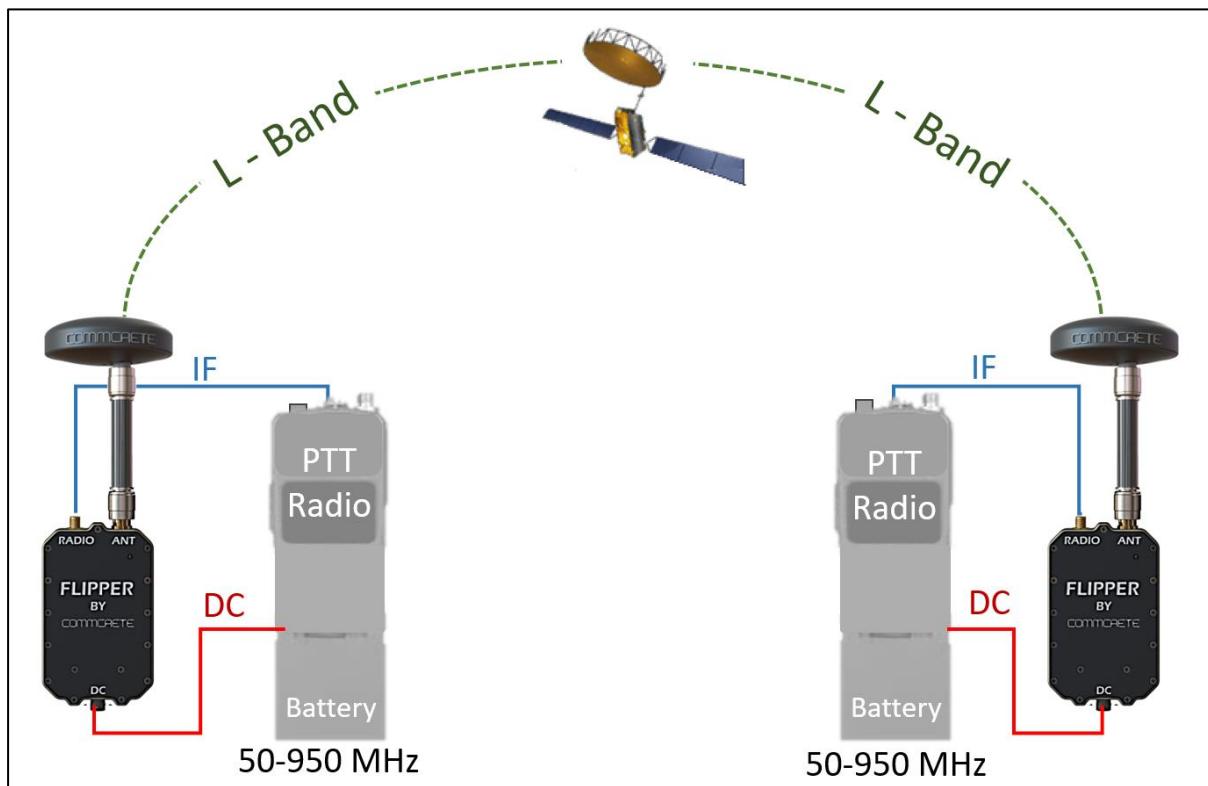
This device has been evaluated for and shown compliant with the FCC Specific Absorption Rate (“SAR”) limits when operated in portable exposure conditions. To ensure that RF exposure levels remain at or below the tested levels, use only recommended accessories defined by OEM or similar, designated for this product, or when used with an accessory that Contains no metal that maintains a minimum separation distance of 25mm between your body and the device.

The maximum SAR value is 1.083W/kg when the device used 25mm close to user.

The radiated output power of the Wireless Device is below the FCC radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

## Flipper Overview

### System architecture

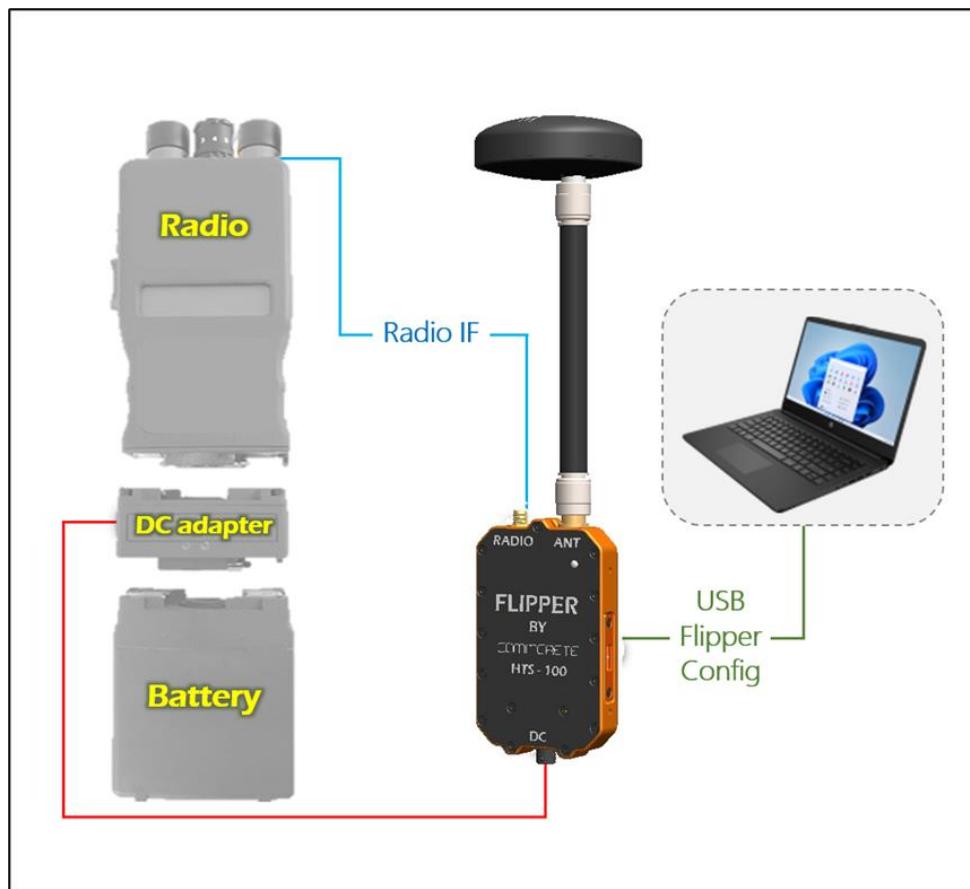


### Main Features

- Turning any LOS PTT Radio, no matter the frequency band, to PTT satellite radio.
- Turning all analog & digital PTT Radio waveforms such as FM, CVSD 16K & 12K, P25, TETRA, DMR, NXDN.
- Omni directional antenna – no need to point the antenna to the satellite.
- The system is tolerant to environmental obstacles, yet it is recommended to avoid physical disturbances such as trees and buildings.
- System end to end latency: ~250ms-500ms (depends on the specific GEO satellite used).

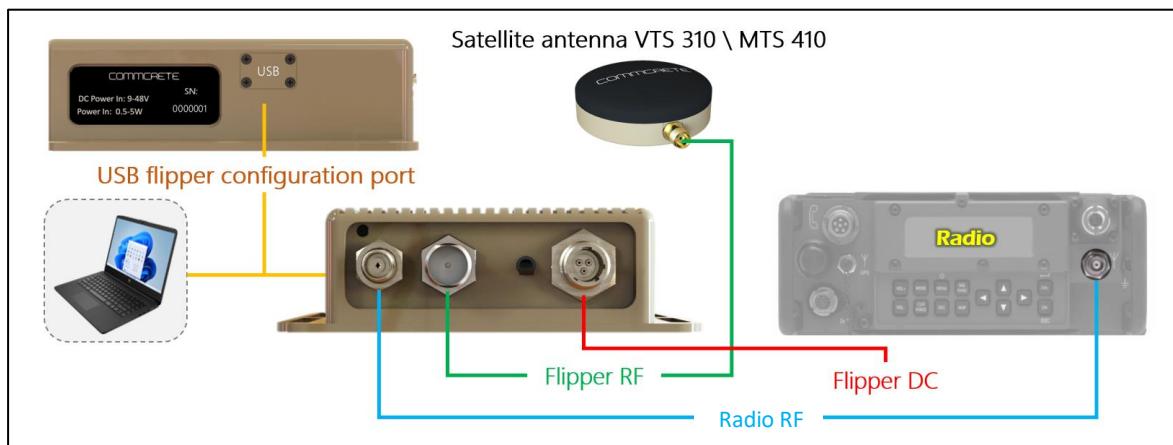
## Flipper Formations

### HTS-100 (Handheld)

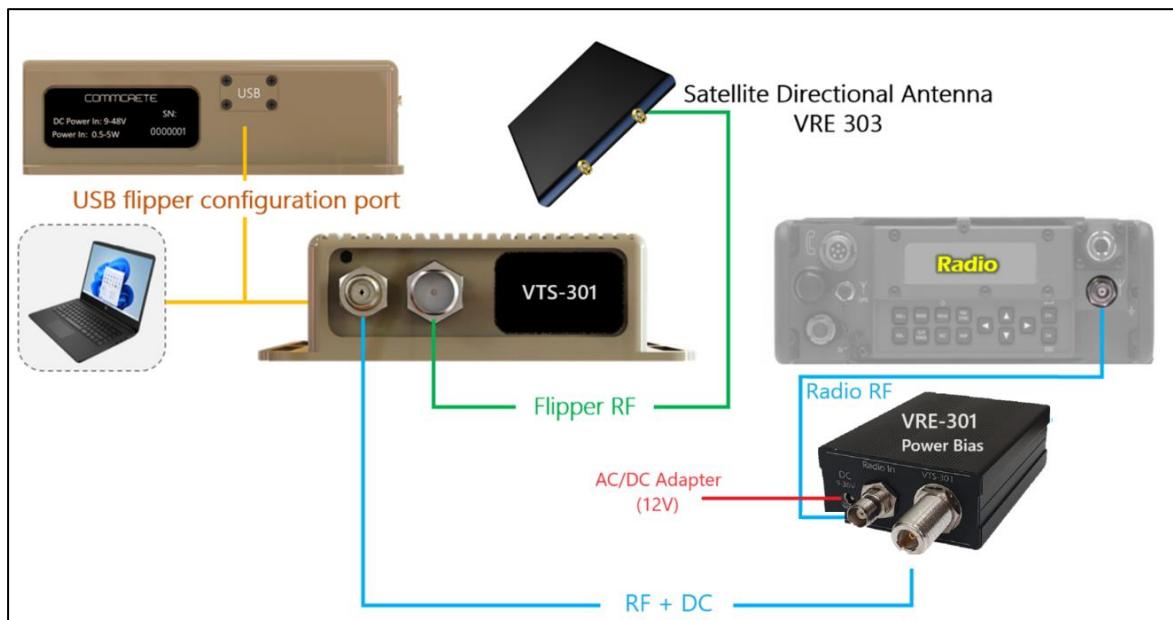


- HTS-100 is designed for COMMS-On-The-Walk for any soldier or first responder using it on body during a mission.
- Rugged device yet small, lightweight and needs no pointing to satellite.
- Great antenna performance compromising directivity and gain to their optimal point for men on tactical mission.

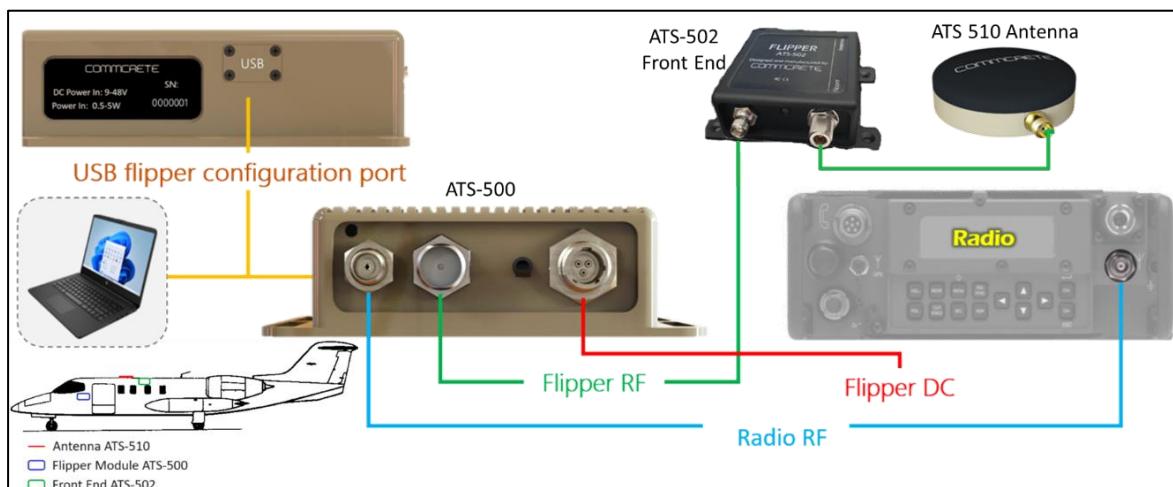
## VTS-300 – Vehicle / MTS-400 – Maritime



## VTS-301 – Headquarters (Long distances)



## ATS-500 - Aeronautical





- **VTS-300** is designed for COMMS-On-The-Move for any vehicle on mission using tactical radios for communication.
- Rugged device designed for platform mountable Flipper and antenna.
- Compensation of RF loss is considered so the distance between the Flipper and the antenna is flexible.

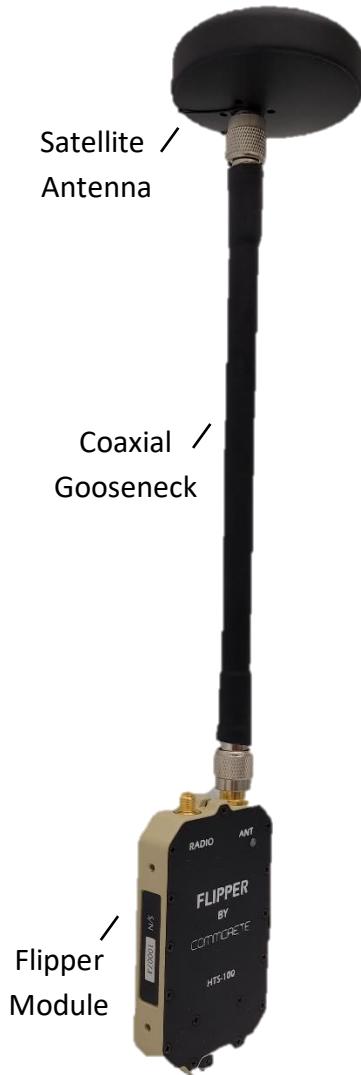
Limitation for distance:

- Up to 9m@RG-58 coaxial cable
- Up to 14m@LMR-400 coaxial cable
- **VTS-301** is designed for headquarters allowing to keep the radio inside the command zone and take the Flipper and the antenna to distant areas. **VTS-301** kit is supplied with 35m LMR-195 cable (equivalent to RG-58 and better), keeping user in an optimal working point in terms of allowed distances and satellite link margin.
- **MTS-400** is similar version of the VTS-300 modified to maritime standards.
- **ATS-500** is similar version of the VTS-300 modified to aeronautical needs. The antenna is passive allowing it to work in extremely low temperatures (-60°C). For optimization of aero formation to customer needs it is recommended to consult Commcrete Ltd.
- **MTS-400 & ATS-500** kits are supplied with 15m LMR-195 cable (equivalent to RG-58 and better), keeping user in an optimal working point in terms of allowed distances and satellite link margin.
- In case of customer using his own infrastructure, this is the distance limitation for these models:
  - Up to 29m@RG-213 coaxial cable
  - Up to 51m@LMR-400 coaxial cable

## Operation

### HTS-100

HTS-100 Assembled



HTS-100 Interfaces



USB Connector (covered)  
/ Flipper Configuration



1. Note: It is highly recommended to position the Flipper in its pouch in order to protect it and allow the accessibility to Flipper interfaces.
2. Connect the RF cable between the radio device and the Flipper (SMA RADIO port).  
Note: Maximum RF power from the radio is 5W.
3. Connect the Gooseneck to the Flipper (TNC ANT port).
4. Connect the satellite antenna right to the gooseneck top connector.
5. Connect the DC adapter between the radio device and its battery. Once connected, plug in the Fischer Push-Pull connector to the Flipper (DC Port). Now Flipper is on.
6. Below LED indications for Flipper (relates to all Flipper models):

LED Indication	Meaning
Green	In power, on process
Green Blink	Working regular (Reception mode)
Orange (Constant or Blink)	Low Voltage
Red	Transmission mode
Red Blink	Configuration error – Needs reprogramming by Flipper CMD
Blue	Software failure – Needs reset or firmware update

## VTS-300

### VTS-300 Interfaces (also relevant to MTS-400, ATS-500)



1. Note: It is highly recommended to mount the Flipper on stable surface prior to installation. It is also recommended to mount the antenna using the mounting plate supplied or by magnets if surface allows.
2. Connect the RF cable between the radio device and the Flipper (TNC Radio In port).  
Note: Maximum RF power from the radio is 5W (VTS-300 is protected to 80W, yet not recommended to work at these conditions).
3. Connect the RF cable between the Flipper and the antenna on the Flipper side (N-Type Antenna Out port). Connect this cable on the antenna side (TNC Antenna port).
4. Connect the DC cable to the Flipper (DC Power port).
5. Power on the Flipper with the toggle switch (green LED will blink).

## **VTS-301 Headquarters Flipper**

- Working in HQ formation, provisional or permanent, often puts a barrier to customers regarding maximum distance of deployment.
- While standard VTS-300 Flipper allows 5 meters distance between the Flipper module and the active antenna (RG-58 cable), VTS-301 setup allows the extension of this distance to a minimum of 35 meters (LMR-195 cable).
- This extension is achieved by using 2 other elements:
  1. Power bias module (VRE-301)
  2. Directional antenna (VRE-303)
- The power bias provides DC power over RF cable to the extended Flipper module (no additional power cable is needed).
- The passive directional antenna allows the best link performance without using more active elements (active antenna and power for it). The directivity of the antenna compensates the significant RF loss over large distances so original performance remains the same.
- A specific configuration file for the VTS-301 Flipper combined with the directional antenna will regain the maximum allowed link performance both in reception while keeping the maximum allowed EIRP.
- If customer already has RF infrastructure ready to be plug the VTS-301 Flipper to the antenna, here are the maximum distances achievable using standard RF cables:

<b>Cable Loss for 0.5dB Sensitivity Degradation</b>				
Frequency Band	Cable Loss [dB]	LMR-400 [Meters]	RG-58 [Meters]	RG-213 [Meters]
L-VHF	8.7	232	65	160
VHF	8.1	162	49	105
M-UHF	6.4	96	24	56
UHF	9.4	107	27	60
H-UHF	11.2	91	21	49

<b>Cable Loss for 1dB Sensitivity Degradation</b>				
Frequency Band	Cable Loss [dB]	LMR-400 [Meters]	RG-58 [Meters]	RG-213 [Meters]
L-VHF	11.5	307	86	211
VHF	10.9	218	66	141
M-UHF	9.2	138	35	81
UHF	12.3	140	35	79
H-UHF	13.5	110	25	59

- Radiation Safety:

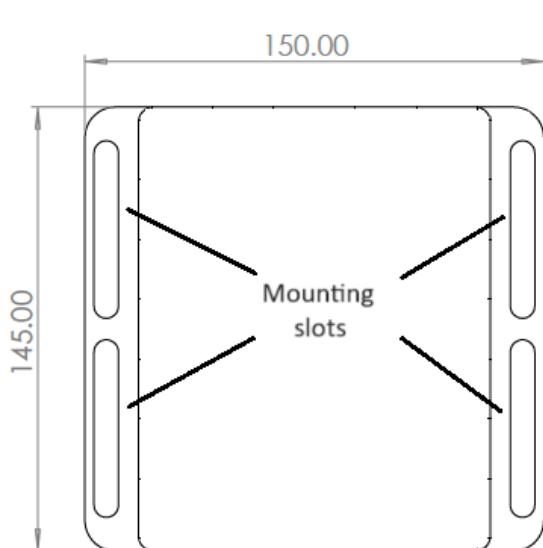
VTS-301 Flipper module and its directional antenna do not exceed the allowed EIRP to satellite (same as VTS-300 with omni-directional active antenna).

VTS-301 antenna is not dangerous as far as RF exposure, yet it is recommended to keep 10cm distance from the front panel of the antenna.

- Installation:

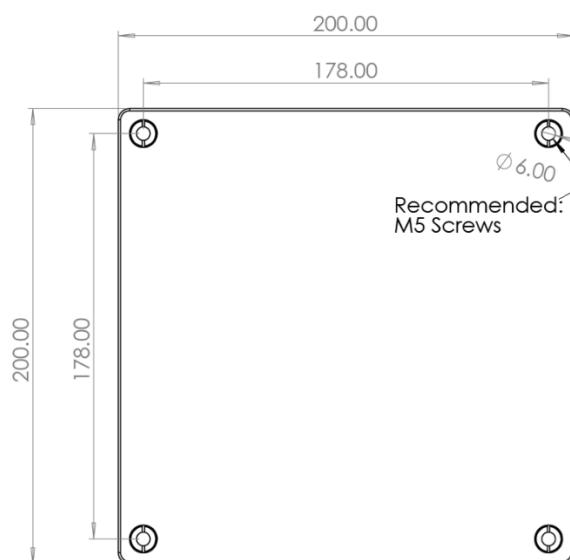
VTS-301 Flipper Kit should be installed according to the system formation suggested by Commcrete:

1. VRE-301 module will be placed near the radio device in the HQ. Its power is supplied with the power supply that is attached to the kit.
2. Long RF cable should be used to connect the VRE-301 to the VTS-301 Flipper module (RF & DC power combined together).
3. The VTS-301 module is to be stabilized and mounted to a surface anywhere near the directional antenna (VTS-301 has an integral mounting plate).
4. The directional antenna will be mounted on an angular surface that is inclined in the elevation angle of the satellite over the narrow-beam coverage zone.



VTS-301 Mount Plate

Same mounting method  
to all mobile versions:  
**VTS-300 / MTS-400 / ATS-500**



Directional Antenna Mount Holes

## Power Bias Module

- Power bias module (VRE-301) controls the power supply to the VTS-301 Flipper Module (toggle switch).
- In addition, an indication light helps to know if the channel is busy (Tx) or free in reception mode (Rx).
- Power bias module will be supplied to the customer with a 12V/5A power supply as part of the whole kit.



## Technical Specification

### Model Info Table

Handheld Flipper HTS-100	Passive Antenna	Mobile Flipper / HQ Flipper VTS-300, MTS-400 ATS-500, VTS-301	Active Antenna
Radio Frequencies 50-950 MHz (Each band is user defined)	Frequency (L-Band) Uplink Tx: 1626.5-1660.5 MHz Downlink Rx: 1525-1559 MHz	Radio Frequencies 50-950 MHz (Each band is user defined)	Frequency (L-Band) Uplink Tx: 1626.5-1660.5 MHz Downlink Rx: 1525-1559 MHz
DC Power 6-14 Volts		DC Power 9-48 Volts	
RF Input 0.5-5 Watts	Power Passive (none)	RF Input 0.5-5 Watts (Protected up to 80W)	Power Active – Powered by Flipper over coax cable
EIRP 33dBm (max)	Mounting Side Mount Gooseneck	EIRP 33dBm (max)	Mounting Bottom Mount Screws / Magnet
Environmental -30°C - +60°C Operation IP67	Environmental -30°C - +60°C Operation (-60°C - +60°C for ATS-510) IP67	Environmental -30°C - +60°C Operation IP67	Environmental -30°C - +60°C Operation IP67
Physical 60mm X 90mm X 14mm 130 grams	Physical Ø65mm 100 grams	Physical 150mm X 145mm X 40mm 700 grams	Physical Ø100mm 260 grams
Interfaces Radio port: SMA Antenna port: TNC DC port: Fischer Push-Pull	Interfaces Antenna port: TNC	Radio port: TNC Antenna port: N-Type DC port: Amphenol	Interfaces Antenna port: TNC
Compliance: CE, FCC		Compliance: CE, FCC	

### Flipper Kits

Part Number	Description	Part Number	Description
<b>KIT-HTS-100</b>	<b>Handheld Flipper Kit</b>	<b>KIT-MTS-400</b>	<b>Maritime Flipper Kit</b>
HTS-100	Flipper Handheld Module	MTS-400	Flipper Maritime Module
HTS-102	Flipper Handheld 24cm Coaxial Gooseneck	MTS-410	Flipper Maritime Antenna (active)
HTS-111	Flipper Handheld Antenna for Gooseneck	MTS-444	Flipper Maritime Antenna Mount Plate
HTS-120	Flipper Handheld - Power Cable Pass Through for PRC-148 / PRC-152 12V Battery	VTS-322	Flipper Mobile - 12V Power Cable Pigtail, 2m
VRF-ST010	Flipper Handheld - RG-58 RF Cable, SMA to TNC, 1m	VRF-TT010	Flipper Mobile - RG-58 RF Cable, TNC to TNC, 1m
HTS-103	Mole pouch for vest	VRF-NT150	Flipper Mobile - LMR-195 RF Cable, N-Type to TNC, 15m
<b>KIT-VTS-300</b>	<b>Vehicle Flipper Kit</b>	<b>KIT-ATS-500</b>	<b>Aeronautical Flipper Kit</b>
VTS-300	Flipper Vehicle Module	ATS-500	Flipper Aeronautical Module
VTS-310	Flipper Vehicle Antenna (active)	ATS-502	Flipper Aeronautical Front End
VTS-333	Flipper Vehicle Antenna Mount Plate	ATS-510	Flipper Aeronautical Antenna (passive)
VTS-322	Flipper Mobile - 12V Power Cable Pigtail, 2m	ATS-555	Flipper Aeronautical Antenna Mount Plate
VRF-TT010	Flipper Mobile - RG-58 RF Cable, TNC to TNC, 1m	VTS-322	Flipper Mobile - 12V Power Cable Pigtail, 2m
VRF-NT050	Flipper Mobile - RG-58 RF Cable, N-Type to TNC, 5m	VRF-TT010	Flipper Mobile - RG-58 RF Cable, TNC to TNC, 1m
<b>KIT-VTS-301</b>	<b>Headquarters Flipper Kit</b>	VRF-NT150	Flipper Mobile - LMR-195 RF Cable, N-Type to TNC, 15m
VTS-301	Flipper Headquarters Module	VRF-NT010	Flipper Mobile - RG-58 RF Cable, N-Type to TNC, 1m
VRE-301	Flipper Headquarters Bias Tee		
VRE-302	Flipper Headquarters - AC/DC 12V Power Adapter		
VRF-TT010	Flipper Mobile - RG-58 RF Cable, TNC to TNC, 1m		
VRF-NT350	Flipper Mobile - LMR-195 RF Cable, N-Type to TNC, 35m		
VRF-NS020	Flipper Mobile - RG-58 RF Cable, N-Type to SMA, 2m		
VRE-303	Flipper Headquarters RHCP Directional Antenna		

## **Flipper Band Support**

**Flipper** supports all PTT radios frequencies and waveforms by hardware capabilities. Nevertheless, it is necessary to configure it for each band by client demand and authorization.

**Flipper** supports all frequencies in the range of 50-950MHz including:

- Low VHF: 50-88MHz
- Commercial VHF: 136-174MHz
- Military UHF: 225-400MHz
- Commercial UHF: 400-512MHz
- High UHF: 700-930MHz

Each of the frequency bands of the **Flipper** is enabled by the manufacturer who first gather the specific client needs and his regional license for the frequency bands requested.

**Flipper** configuration is done by a proprietary PC Programming Software (**Flipper CMD**) supplied by Commcrete only by clients' request with specific bands enable keys.

**Flipper** configuration is not needed for most customers since the Flipper is configured by customer demands before supply. Nevertheless, firmware update, Flipper band support extension or any other flexible options for the user might require the PC Programming Software.

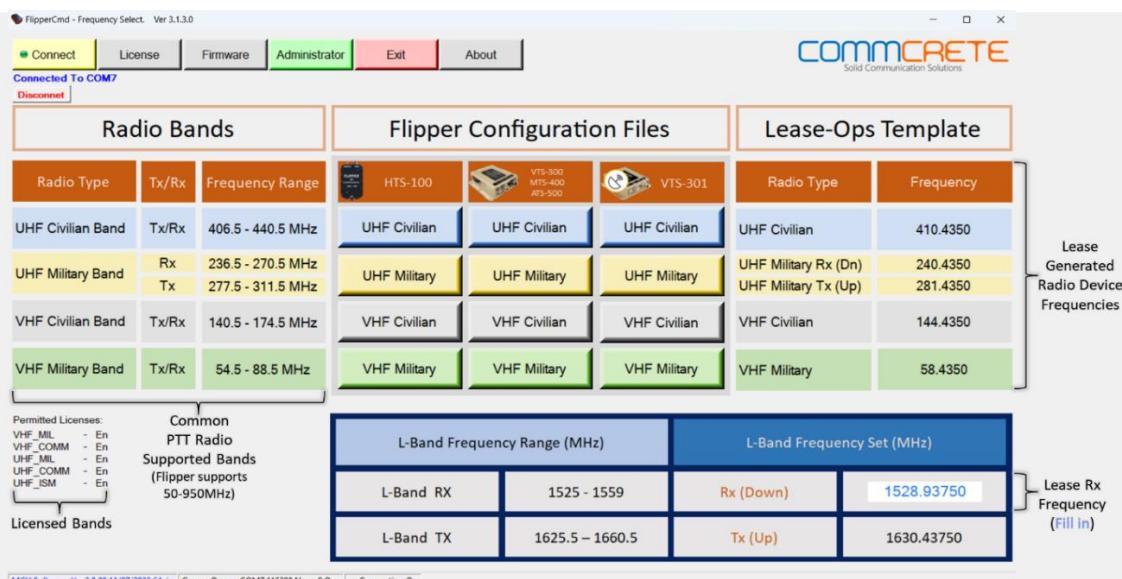
All Flippers are supplied to customers with single Disk-On-Key drive with the software already on it. In addition, a single special USB-C communication cable for configuration of the Flipper module is supplied as well.

A remote instruction session will be given to the customer for the whole installation and configuration process of **Flipper CMD**.

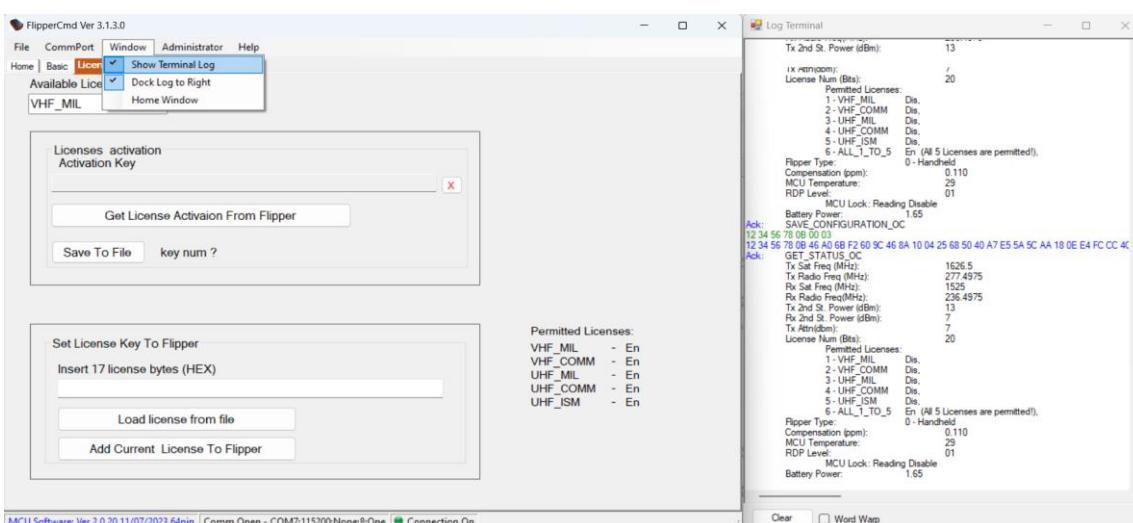
## Flipper CMD

1. Flipper CMD software allows configuration of Flipper modules.
2. Situations in which using Flipper CMD is necessary:
  - a. Switching the frequency band that Flipper supports (according to the purchased license and Lease-Ops generated Rx frequency)
  - b. License update (for customers who expand their license)
  - c. Firmware update by Commcrete Ltd
  - d. Factory default settings
3. For customers who need further flexibility using Flipper CMD Software, Commcrete will conduct a specific remote guidance of how to use the Flipper CMD properly and supply config files if necessary.

### Home Tab (Configuration & Basic Info)



### License Tab (Log Files Extended Info)



## Customer service & support

- Flipper TS Series Kit contents, accessories & spare parts are detailed in the Flipper TS Series datasheet.
- Commcrete Ltd constantly develops and updates its portfolio of products. This user manual is updated accurately to the date noted on it.
- For any further information it is recommended to contact Commcrete Ltd directly through any channel preferred:
  - Office Tel: +972-8-6686244
  - Office E-mail: [info@commcrete.co.il](mailto:info@commcrete.co.il)
  - Website: <https://commcrete.com>
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