GROUND DATA TERMINAL

USER MANUAL

Revision: 1

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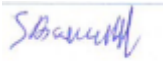
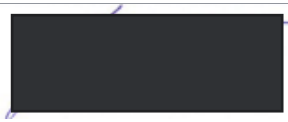
APPROVAL

Name	Signature	Date
COMPILED BY: [redacted] Hardware Engineer		02. October 2022
CHECKED BY: [redacted] Board Member		18. October 2022
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RECORD OF REVISION

Revision No.	Content	Date
1.0	First release	18.10.2022
1.1	Removed reels	02.01.2023

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TABLE OF FIGURES

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1 SAFETY

The information that follows, together with local site regulations, should be studied by all personnel concerned with the operation or maintenance of the equipment, to ensure awareness of potential hazards.

Switch off supplies before removing covers or disconnecting any RF cables, and before inspecting damaged cables or antennas.

Avoid standing in front of high gain antennas (such as a dish) and never look into the open end of a waveguide or cable where strong RF power may be present.

Users are strongly recommended to return any equipment that requires RF servicing to Threod Systems OÜ.

⚠ CAUTION

This system contains MOS devices. Electro-Static Discharge (ESD) precautions should be employed to prevent accidental damage.

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2 WARNINGS, CAUTIONS AND NOTES

UAVs of any kind are dangerous and can cause serious injury. Please read, understand and follow the cautions and instructions.

Throughout the manual warnings and cautions are used to highlight various important procedures. They are defined as:

AN OPERATING PROCEDURE, INSPECTION, REPAIR OR MAINTENANCE PRACTICE, WHICH IF NOT CORRECTLY FOLDOWED, COULD RESULT IN PERSONAL INJURY, OR LOSS OF LIFE.

AN OPERATING PROCEDURE, INSPECTION, REPAIR OR MAINTENANCE PRACTICE, WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE OR DESTRUCTION OF EQUIPMENT.

An operating procedure, inspection, repair or maintenance condition, etc., which is deemed essential to highlight.

3 GROUND DATA TERMINAL (GDT)

3.1 GDT SET

Figure 1. Ground data terminal set.

NR	DESCRIPTION
1	Rugged case (117073)
2	GDT 50P module (117224)
3	Tripod (117031)
4	Battery (103485)
5	Battery header (107661)
6	Battery charger (104528)
7	Ethernet Lemo /RJ45 3m (116568)
8	Power & Comm cable (102847)
9	Extension cable 15m (103472)
10	Contact cleaner (117781)
11	Power and comm extension cable 20m *(optional)*
12	Second battery set (battery, header, charger, 117593) *(optional)*
13	GDT manual
14	GDT packing list
15	GDT assembly diagram

3.2 GDT PARTS

3.2.1 Rugged case

Weight (full set)	26 kg
Dimension (outer)	L: 836 mm W:641 mm H: 304 mm
Temp range	-33°C to 90°C
IP code	IP67

3.2.2 GDT 50P module

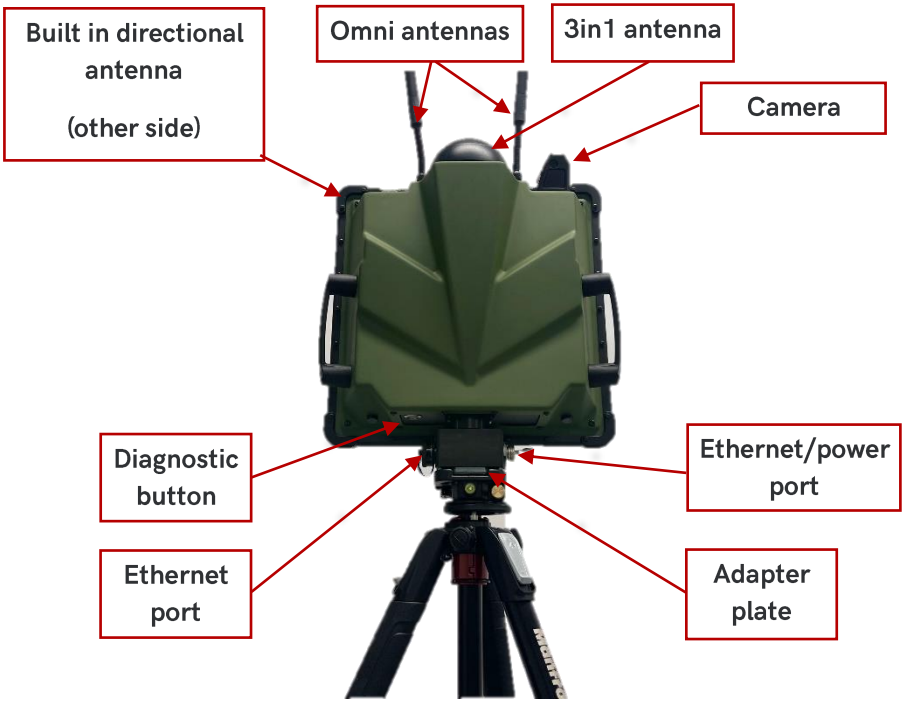

Figure 2. Directional antenna module components.

The GDT 50P module consists of a built-in high gain panel antenna, two omni antennas, a camera, GPS and Wifi 3 in 1 antenna, a diagnostic button, adapter plate, Ethernet port and Ethernet/power port. The directional antenna main operating distance is from 20 km to 50 km. The directional elevation operating area is 11° up and 6° down with a pan axis azimuth range of 360°. The omni-directional antennas cover up to 20 km operational range around the GDT 50P.

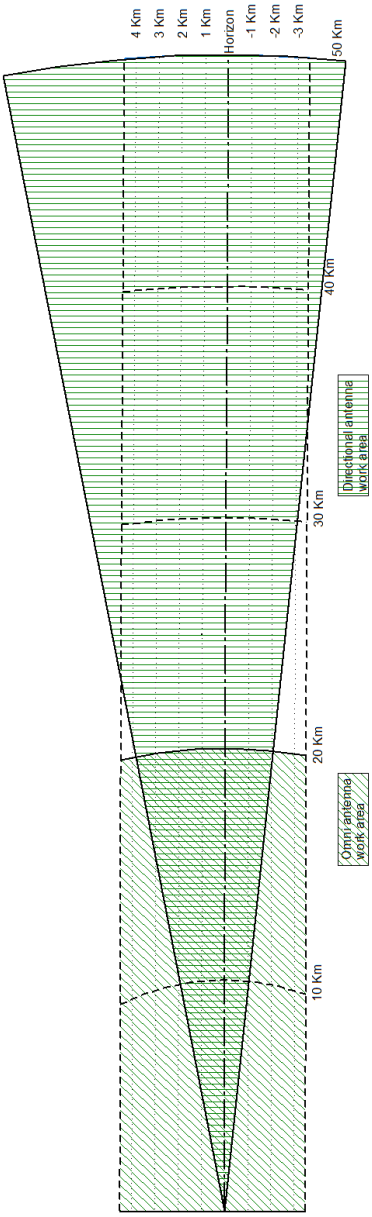

Figure 3. GDT 50P radiation pattern.

The built-in camera is used mainly for directional calibration prior to take-off but can also be used for monitoring the take-off and landing of the aircraft. The viewing angle is 74° up and 32° relative to the horizon. Directional antenna calibration is described in the GCS operating manual.

The GPS is used for GDT 50P position information.

The diagnostic button has a built-in red light. When the button is depressed, the light will indicate the status of the GDT 50P. If operations in the dark is required (no visible lights), the light can be turned off, by pressing and releasing the diagnostic button. The light indicates the operational status of the GDT 50P: If the light is on, the unit is operational. The light will come on approximately 1 minute after power has been applied to the GDT 50P.

The grounding bolt can be used to earth the GDT 50P. It should be used if the unit is installed on a mast for extended periods.

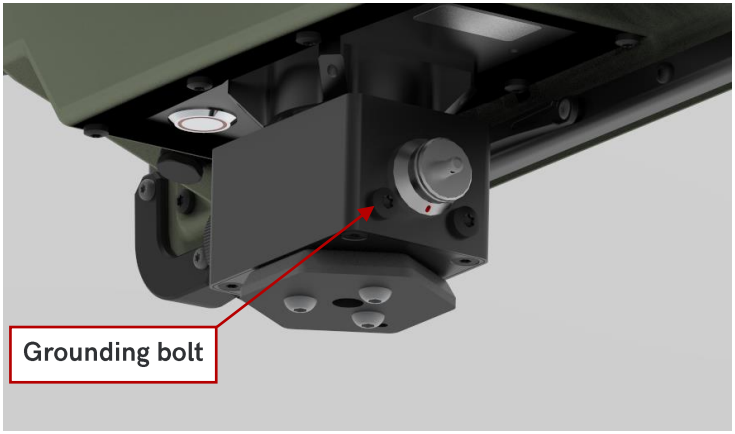

Figure 4. Grounding bolt location.

The adapter plate is for the quick release system between the GDT 50P module and the tripod/mast.

The Ethernet port can be used only for the link between the GDT 50P and the Ground Control Station (GCS). It supports an ordinary RJ45 connector or for IP67 rating an Amphenol RJF series plug (code A key position) can be used.

The Ethernet/Power port is used for powering the GDT 50P and supports the signal link between the GDT 50P and the GCS. It uses a IP68 rated connector.

Parameter	Value
Weight	7.2 kg
Dimensions	L:375 mm W:166 mm H: 608 mm
Antenna gain	±19 dBi
Range of movement	Azimuth: 360° continuously
Signal coverage	Elevation: 360° @ up to 20 km +11°/-6° 20 to 50 km
Polarization	Dual, slant-polarized
Input connector	Lemo K series (EGG.2K.310)

3.2.3 Tripod

The tripod is a standard Manfrotto MT055XPRO3 tripod for the GDT 50P mounting. The mount uses a click-on mechanism and can be opened with two levers. There is a net placed on the tripod for placing the battery and cabling. Other mast systems are possible upon request for extended operation.

Parameter	Value
Weight	2.5 kg
Max. topload	9 kg
Max. height	1.7 m
Folded length	0.61 m

3.2.4 Battery

The battery is a standard BB-2590 battery which powers the entire system.

Parameter	Value
Weight	1,4 kg
Dimension	L:112 mm W:61 mm H: 127 mm
Nominal Voltage	28,8 V, 2 x 14,4 V
Maximum Voltage	33.0 V, 2 x 16,5 V
Capacity	9,9 Ah in 24 V Mode; 19,8 Ah in 12 V mode
Discharge	10 A Max continuous/ Section
Pulse Discharge	18 A (5 sec ON/25 sec OFF)/ Section
Operating Temperature	-20°C to +60°C
Recommended Storage Temperature	-40°C to +40°C

3.2.5 Battery header

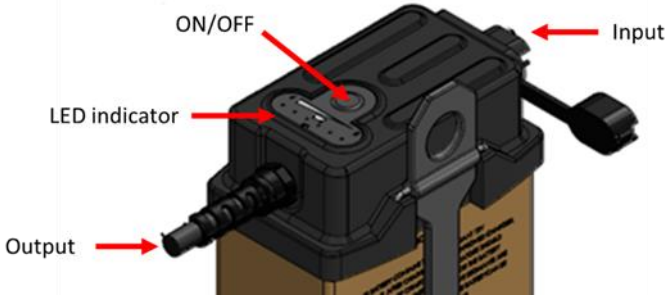

Figure 5. Battery header.

The battery header for the BB-2590 battery acts as an UPS module. When no external power source is connected, the power is supplied from the battery. When an external power source is connected, the battery header will automatically switch from output to input from the external power source and starts charging the battery. The charger also has a LED indicator, an ON/OFF switch and a 5V(regulated) Micro USB power output port.

Parameter	Value
Weight	0.34 kg
Dimensions	L:130 mm W:81 mm H: 185 mm
Output voltage	20 to 33 V (unregulated)
Input connector	SAE 2 Pin
ON/OFF switch	Press and hold 5 sec. for power down; press for state of charger indication
Cable length	300 mm
Cable connector	Lemo K Series (FGG.2K.310)
Operating temperature	-40°C to +60°C

The GDT 50P comes with one battery as standard. A second battery is an optional extra.

3.2.6 Battery charger

One battery charger for the BB-2590 battery comes with the set.

Parameter	Value
Weight	0.9 kg
Dimensions	L:173 mm W:70 mm H: 35 mm
Input	AC 100 to 240 V
Output	DC 24 V 6.67 A

3.2.7 Ethernet Lemo/RJ45 3m

The GDT 50P set consist of one 3m ethernet Lemo/RJ45 cable. The cable is used to connect the GCS to the ethernet on the Y-cable, or the ethernet extension cable.

3.2.8 Power & Comm cable

Figure 6. Power & comm cable.

This cable is used for powering the GDT as well as providing the data interface to the GCS. The cable connects the GDT50P module (2C) to the battery (2A) and the extension or ethernet cable (2B) to the GCS. The cable has markings on its ends which indicate where it should be connected. The GCS and GDT connectors are inter-changeable and can be plugged in on either side.

Parameter	Value
Length	1.5 m
Weight	465 g
Power connector (2A)	PHG.2K.310.CLLC85Z
GDT connector (2C)	FGG.2K.310.CLAC85Z
GCS connector (2B)	FGG.2K.310.CLAC85Z

Figure 7. Connectors alignment

CAUTION

CAUTION: Align the red dots on the plugs and sockets or damage may occur to the connector or pins.

3.2.9 Extension cable 15m

A 15 m extension cable is used for extending the connection between the GDT and the GCS. The cable connects directly to the power & comm cable. The cable extends only ethernet, and the GDT battery will not power the GCS when this cable is connected to the GDT 50P.

Parameter	Value
Length	15 m
Weight	1,72 kg
Power & comm connector	PHG.2K.310.CLLC85Z
GCS connector	FGG.2K.310.CLAC85Z

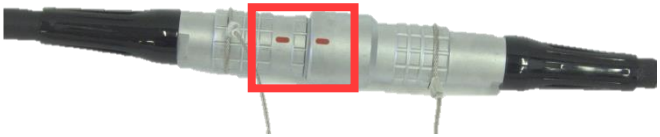

Figure 8. Connectors alignment

CAUTION

CAUTION: Align the red dots on the plugs and sockets or damage may occur to the connector or pins.

3.2.10 Air Duster 200ml

The compressed air canister is for cleaning the radio and the cable connectors. Mechanical cleaning is not recommended. If the can runs out, it can be replaced with any other commonly available compressed air can.

3.2.11 Power and comm extension cable 20m (Optional)

This cable supports power and signal in one cable. It can be used if the GDT 50P is installed on a mast and the battery is kept on the ground. It can also be used to increase the distance between the GDT and the GCS.

3.2.12 Second battery set (battery, header, charger) (Optional)

For longer duration flights and operation, it is possible to have a second battery set.

4 GDT ASSEMBLY

4.1 ASSEMBLY

It is recommended to place the tripod with GDT 50P onto a stable surface, with few obstacles (trees, buildings etc.) in the area to provide clear line-of-sight communication between the aircraft and GCS.

1. Setup the tripod on a stable surface.

Figure 9. Assembled tripod.

2. Adjust the level of the tripod using the spirit level indicators.

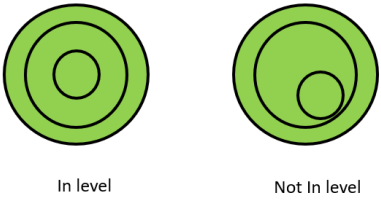

Figure 10. Spirit level indicator.

NOTICE

When the tripod is not in level, the signal integrity at longer ranges may be adversely affected.

3. Attached the GDT 50P module to the tripod.

Figure 11. GDT 50P mounting to tripod.

CAUTION

Ensure the tripod quick release locks have locked into place before letting go of the GDT 50P.

4. Connect the power & comm cable (Y-cable) to the tracker module (2C). Ensure to align the red dots on the connectors and mate the dust caps with each other to prevent any contamination getting inside the caps during operations.

Figure 12. Power & comm cable connected to GDT 50P module.

CAUTION

Ensure to insert the cable correctly or damage to the connector or pins may occur.

5. Check that the battery is powered off, by pressing power the button for 1 second on top of the battery header and check that the LED lights do not turn on. Connect the battery to the Y-cable (1A to 2A). Ensure the red dots on the connectors are aligned and mate the dust caps with each other to prevent any contamination getting inside during operations.

Figure 13. Power & comm cable connected to battery.

CAUTION

Ensure that the cables are connected correctly or damage may occur.

CAUTION

To prevent damage to the connectors and electronics, ensure the battery is powered off prior to connecting the battery to the GDT.

6. Connect ethernet extension cable (2B to 3B). Ensure the red dots on the connectors are aligned and the dust caps have been mated with each other to prevent any contamination getting inside during operations.

Figure 14. Power & comm cable connected to the ethernet extension cable.

CAUTION

Ensure that the cables are connected correctly or damage may occur.

7. Connect the ethernet extension cable to the GCS/RVT (3A). Ensure to align the red dots on the connectors and mate the dust caps with each other to prevent any contamination getting inside during operations.

Figure 15. Ethernet extension cable connected to GCS.

CAUTION

Ensure that the cables are connected correctly or damage may occur.

8. Power on the battery by pressing down the ON/OFF button for five seconds. The charge indicators will illuminate after the battery has been switched on.

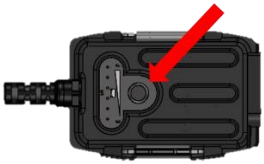

Figure 16. Powering on the battery.

4.1.1 Assembly Checklist

#	GDT ASSEMBLY	Check
1	Set up tripod	☐
2	Lock GDT 50P module on a tripod	☐
3	Connect power & comm cable to tracker module	☐
4	Connect battery with power & comm cable	☐
5	Connect ethernet extension cable with power & comm cable	☐
6	Connect Ethernet Lemo /RJ45 3m cable to extension cable	☐
7	Connect Ethernet Lemo /RJ45 3m cable to GCS	☐
8	Power on battery	☐

4.2 DISASSEMBLY

⚠ CAUTION

Prior to disassembling, power off battery else damage may occur

Disassembly the system in the reverse order. Before packing, check that the cables are without any damage and the connectors are clean.

5 CONNECTION

The connection with the aircraft is created in the Ground Control Station (GCS). This is described in detail in the GCS software manual Annex 1.

For access to the radio, locate the IP address from the GDT 50P module. The GDT 50P must be set up as described below:

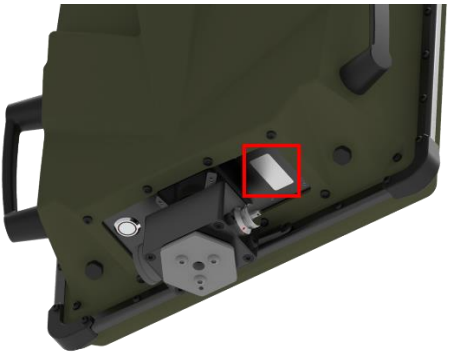

Figure 17. Label with radio IP address

Type the IP address found on the GDT 50P unit into the web browser in the GCS to access the radio configuration page.

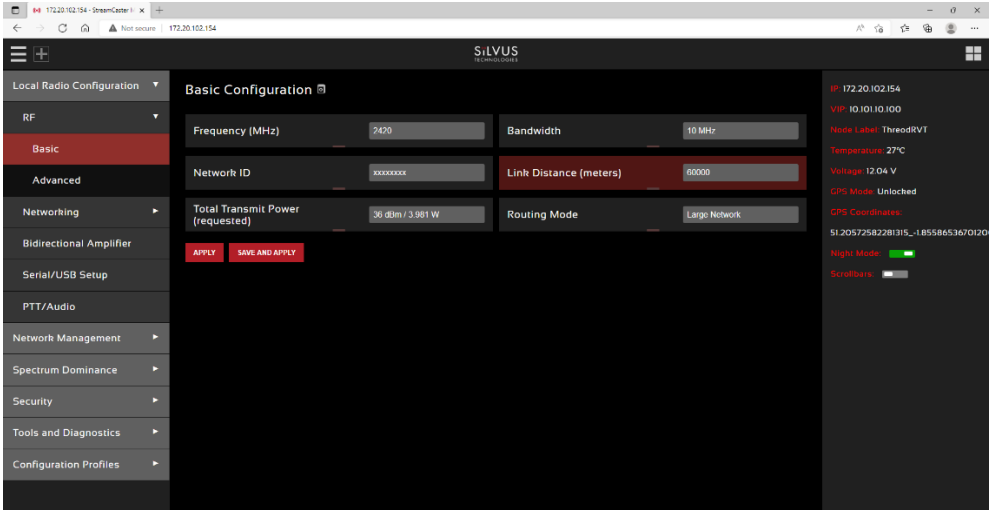

Figure 18. Radio configuration page

6 MAINTENANCE

The maintenance schedule is provided below:

	Each use	Monthly	Yearly
Charge battery	x	x	x
Check contacts	x	x	x
Clean contacts with contact cleaner		x	x
Update radio and GDT firmware			x

6.1 CHARGE THE BATTERY

The BB-2590 battery can be charged using the provided battery charger which connects directly to the battery header of the BB-2590 battery and takes in 220VAC. While charging, the system can also be operating as the battery header acts as an UPS module providing external power to the system while also charging the battery.

The batteries are Lithium-Ion batteries with a protective circuitry that prevents them from excessive discharge. When the battery output voltage per cell drops below a certain threshold value, the battery will switch off and will require servicing by Threod Systems. For this reason, the batteries have to be periodically charged even if not used. The batteries have a charge indicator (per each cell in the battery) and the user should not leave batteries with a minimum charge (below two LED bars) for more than two weeks without re-charging them.

6.2 CHECK AND CLEAN CONTACTS

Before and after use of the equipment, the user should ensure that all the cable contacts are clean and that there is no moisture or particles inside them. In case there is any contamination inside the connectors, the user should clean the connectors thoroughly with the supplied air duster.

The user should also clean all the contacts and equipment generally before storing it for longer periods and also periodically during normal operations (once a month).

It is recommended to use contact cleaner after every rainy operation, when storage for longer periods and based on the maintenance schedule.

Recommended contact cleaner: CRC Kontakt Super 10 (MFG: 33382-AA)

6.3 UPDATE RADIO FIRMWARE

The GDT firmware on the radio requires updating periodically. This cannot be performed by the user, but only by a Threod Systems technician.

NOTES