Operation Manual

TrakkaCam®

TC-375

System P/N: 1-0101-0157
TCU P/N: 2-0501-A17D1
HGU P/N: 2-2102-A1
SW: 10.13

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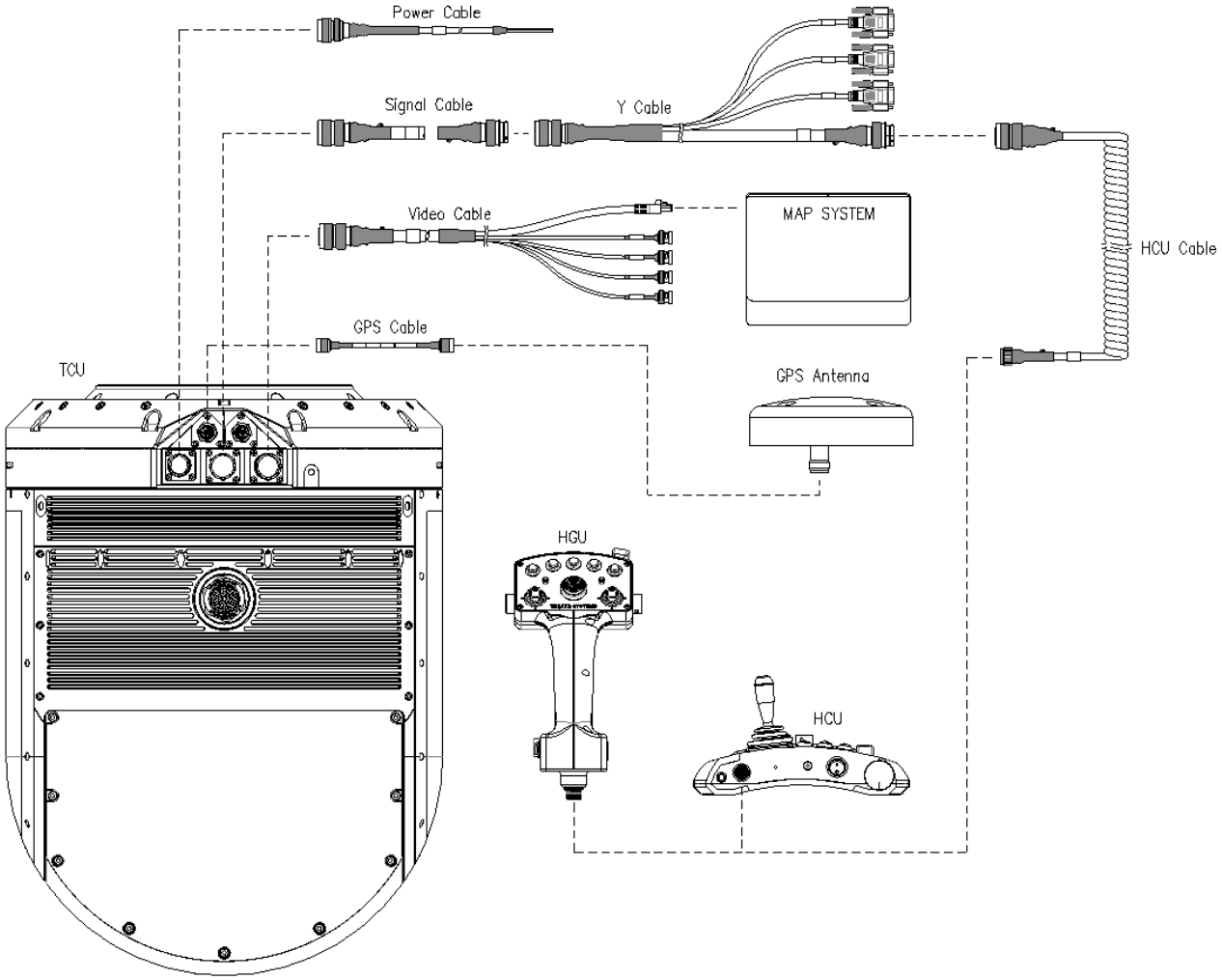
1. System Overview

TC-375 is a multi-sensor surveillance system for airborne vehicles. The system consists of the following major assemblies. The actual delivered configuration may vary from Figure 1.

Figure 1 - Typical TCU system configuration



2. Laser safety information

The Trakka camera unit (TCU) contains one or more laser sources emitting invisible or visible laser radiation. It is the integrator's responsibility to follow the Safety of laser products standard (IEC 60825-1:2014) and any applicable regulations during the installation. Please read this information before powering on the system to avoid possible exposure to hazardous laser radiation.

Note: All lasers are disabled by default until the laser safety zones are defined. Refer to D-2000-0015 for how to configure the laser safety zones. See D-2000-0010 Laser Safety Design Description document for laser safety details.

Cautions:

- Use of controls, adjustments or performance of procedures other than those specified herein and in other referenced documents may result in hazardous radiation exposure, which can cause permanent eye damage.
- The user is responsible to observe local safety regulations.
- The TCU may not be modified in any way that can affect the laser(s).
- Scratched/cracked windows in front of any lasers must be changed by Trakka Systems before use.
- Only trained personnel are allowed to operate the TCU.
- Do not stare into the laser beam paths at any time when the TCU is connected to power.

2.1. Laser apertures

The location of laser apertures, which are not considered eye-safe, are indicated with a Laser aperture label (*Figure 2*) beside its window on the TCU front cover.

Figure 2 – Laser aperture label

2.2. Integrated laser equipment

The integrated laser equipment is classified according to IEC 60825-1:2014. This section describes each laser source which are integrated into the TCU.

2.2.1. Laser range finder (LRF)

The LRF is a class 1M laser product which are safe for all conditions of use except when viewing with magnifying optical instruments such as binoculars and telescopes. Laser radiation from this LRF is invisible for the human eye. The explanatory label (*Figure 3*) is affixed to the TCU base/damper.

Figure 3 – LRF explanatory label

Warnings:

- Viewing the laser output with telescopic optical instruments (for example, telescopes and binoculars) may pose an eye hazard.
- The user should not direct beam into an area where telescopic instruments are likely to be used.

Note: More laser data such as MPE (Max Permissible Exposure), NOHD (Nominal Ocular Hazard Distance) and beam divergence can be found in document D-2000-0065.

2.2.2. Laser pointer (LP)

The laser pointer is a class 3B laser product, which are normally hazardous when direct intrabeam exposure occurs. Viewing diffuse reflections is normally safe. Laser radiation from this laser pointer is visible, in red color, for the human eye. The explanatory label (*Figure 4*) is affixed to the TCU base/damper.

Figure 4 – LP explanatory label

Warnings:

- Invisible laser radiation, avoid exposure to beam.
- Appropriate eye-protection must be used when operating the laser pointer.
- Always aim to the target before firing the laser.
- An external laser safety switch must be installed to prevent unintentional firing of laser radiation.

Note: More laser data such as MPE (Max Permissible Exposure), NOHD (Nominal Ocular Hazard Distance) and beam divergence can be found in document D-2000-0084.

2.2.3. Laser illuminator (LI)

The laser illuminator is a class 3B laser product which are normally hazardous when direct intrabeam exposure occurs. Viewing diffuse reflections is normally safe. Laser radiation from this laser pointer is invisible for the human eye. The explanatory label (*Figure 5*) is affixed to the TCU base/damper.

Figure 5 – LI explanatory label

Warnings:

- Invisible laser radiation, avoid exposure to beam.
- Appropriate eye-protection must be used when operating the laser illuminator.
- Always aim to the target before firing the laser.
- An external laser safety switch must be installed to prevent unintentional firing of laser radiation.

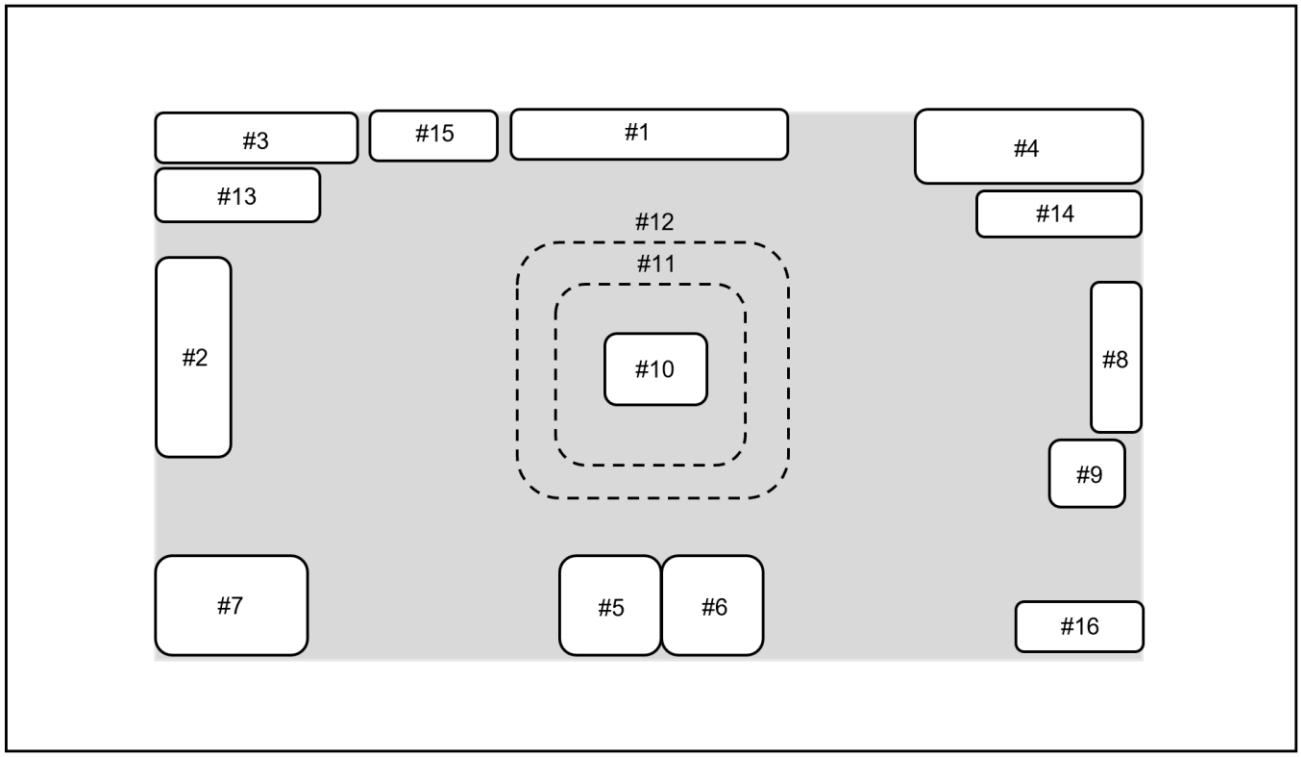
Note: More laser data such as MPE (Max Permissible Exposure), NOHD (Nominal Ocular Hazard Distance) and beam divergence can be found in document D-2000-0018.

3. On-Screen Data

The On-Screen Data (OSD) is an optional video overlay that shows the operator live data from the system.

3.1. Explanation of OSD

Figure 6 - OSD areas



Area	Information	Characteristics
#1	Turret Camera Unit (TCU) Azimuth (AZ) indicator	Shown in angle units as configured in menu system, relative to vehicle.
#2	TCU Elevation (EL) indicator	Shown in angle units as configured in menu system, relative to vehicle.
#3	Vehicle speed	Shown in units as configured in Menu System.
	Vehicle heading	Referenced per true north.
	Vehicle GPS coordinates	Shows vehicle position, latitude, and longitude.
#4	Target speed	Shown in units as configured in Menu System.
	Target heading	Referenced per true north.
	Target GPS coordinates	Shows target position, latitude, and longitude if available.
#5	Compass rose	Rotates with reference to true north of the vehicle.
	Vehicle symbol	Graphic display of vehicle, as configured in Menu System.
	Azimuth indicator	Referenced to the vehicle, as configured in Menu System.
	Simplified Field of View (FOV) indicator	Graphic display.

Table continues on next page…

Area	Information	Characteristics
#6	EL indicator	Referenced per vehicle.
	Simplified FOV indicator	Graphic display.
#7	Active sensor	HD-EO, IR, or alternate.
	TCU mode	Shown as RATE, RATE AID, CAGE, STOW, or V-TRK.
	Date	Shown as configured in Menu System.
	Time	Shown as configured in Menu System.
	Radar	Radar Status ON/OFF
	Selected Tracker mode	Shown as G-TRK SCENE or VEHICLE
	Built in test	Shows built in test messages: MSG: <number> <text>
	MWIR temperature	Shows status MWIR COOLING
	Joystick gain	Shows JSTK %
#8	E-zoom	E-zoom factor.
	CLAHE level	Levels: OFF, 20, 40 or 60.
	Measure distance	Indicator marks on left and right side of crosshair.
	Zoom level indicator	Shows sliding scale graphic of zoom.
#9	Active sensor status	Shows active sensor settings.
#10	Crosshair	References center of image.
#11	Tracker gate	Clamps indicate Object Tracker gate size; area where Object Tracker will acquire target.
#12	FOV Box	Inactive sensor FOV indicator. Can be set using menu System
#13	LRF (Laser Range Finder)	LRF ARMED, ON/OFF + Distance
	Laser pointer or illuminator	Laser ARMED, ON/OFF
#14	Marked Target	Target information when LRF is fired once, needs valid INS. Triangle shaped Icon is visible.
	Temperature reading range	Shown as configured in Menu System.
#15	Digital Video Recorder (DVR) mode	Shows DVR operational status.
#16	Trakka Systems AB logo	---

3.2. OSD Acronyms

The table below shows several On-Screen Data acronyms that can be displayed in OSD areas, along with their definitions. This list does not cover all possible acronyms that can be displayed. Specific text can be configured using the menu system.

OSD Text	Definition
ACFT	Aircraft
AGC	Automatic Gain Control
ALT	Altitude
CAM	Camera
CLAHE	Contrast Limited Adaptive Histogram Equalization
DDE	Digital Detail Enhancement
EXP	Exposure
G-TRK	Geo Track
GPS	Global Positioning System
HD-EO	High-Definition Electro-Optical (day camera)
HDG	Heading
IR	Infrared sensor
KTS	Knots
KMH	Kilometers Per Hour
LI	Laser Illuminator
LL	Low Light Mode
LRF	Laser Range Finder
MSG	Message
NR	Noise Reduction
RNG	Range
TRGT	Target
TRK	Track
JSTK	Joystick

4. Control Unit

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DDE

MENU

Video
Sensor selection
(IR Palettes)

Focus: rotate
One-shot AF: press

Left Multi-Function

Power ON/OFF

SL ON/OFF

SL Slave

SL Zoom

SL Filter

Mode: Cage (Stow)

Hist

NVG Panel: Hist + Focus

Right Multi-Function

Joystick Gain: press + rotate
Blending: press to activate, rotate

Joystick
Gyro Drift: DDE + joystick

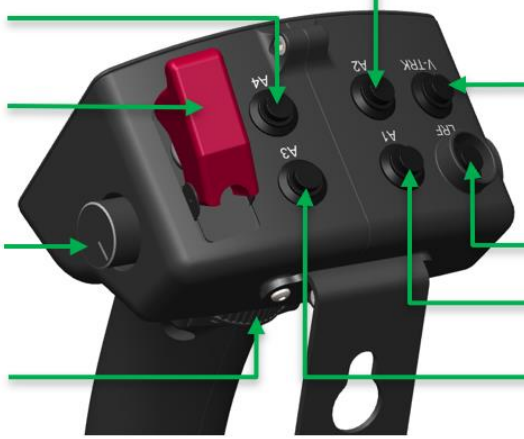
Text within parentheses implies: Long press

A2: MTI
Selected MTI in System menu
Select track
(Auto Track)

A4: REC

Laser

Zoom



V-TRK:
Object Track,
(Scene Track)

LRF

A1: Rate Aid

A3: RBH

Low Light / Polarity

Standard NUC
Alternate NUC: DDE + Press
(Integration Time)
One-shot AWB: Set-up in menu + Press

Defog

Geo Track

Level -
Exposure -

Gain +
Pedestal+: DDE + press

Level +
Exposure +

Auto Gain & Exposure

Gain –
Pedestal-: DDE + press

4.1. HGU Functions

This section describes HGU (Hand Grip Unit) specific functions.

4.1.1. Handedness

The handedness of the HGU can be customized to either right or left. By default, it is set to right-handedness. For more information, please refer to the *Handedness* section under *Menu/Controller*.

4.1.2. NVG panel

The HGU comes with an optional NVG (Night Vision Goggle) compatible panel to light up the main buttons in the front. The brightness can be adjusted to meet the preferences of the operators.

Button	Description
Hist (press and hold) + **Focus** (rotate)	Adjusts the brightness of the backlighting

4.1.3. Programmable buttons

The HGU has four programable buttons which can be programmed to have system and camera functions. For more information, please refer to the *AUX Button #1 to #4* section under *Menu/Controller*.

4.2. Gimbal Functions

This section describes the control unit functions that are available to control the TCU and to configure user preferences.

4.2.1. System Power

- To avoid voltage spikes, power on the system using the ON/OFF switch once vehicle power has stabilized.
- The gimbal will go to the CAGE position and remain there until joystick is moved. The TCU can be controlled using the joystick. It is possible to configure the system to start in STOW position.
- The HDTV image appears in approximately 45 seconds after TCU is powered on.
- The IR sensor will produce an image once the detector has cooled down to its operating temperature. The time may vary depending on the ambient temperature. A status message in OSD area 7 will indicate when IR is cooling down.

Note: At extreme cold temperatures the TCU can go into motor current protection mode. The OSD displays a status message to inform if motor current protection mode is enabled.
Do the following steps if the status message occurs:

- Have the system turned ON and let it heat up for 15 minutes then restart.
- Repeat the steps until the OSD message is completely gone.

Button	Description
Power ON/OFF	Toggles power ON or OFF.

4.2.2. TCU Steering

4.2.2.1. Joystick

The joystick sends steering commands to the TCU, allowing movements in azimuth and elevation. Small joystick deflections cause slower TCU movements, while larger joystick deflections cause faster TCU movements.

4.2.2.2. Joystick Gain

The speed at which the TCU rotates in elevation and azimuth relative to the joystick commands can be adjusted by rotating the **Joystick Gain** knob on the HGU.

Elevation and Azimuth gain settings can be individually set in the **Controller** menu.

Button	Description	OSD area	OSD displays
Joystick Gain (Press + rotate forwards/ clockwise)	Increases joystick sensitivity (TCU moves faster at maximum joystick deflection and when fully zoomed in)	7	JSTK: %
Joystick Gain (Press + rotate backwards /counterclockwise)	Decreases joystick sensitivity (TCU moves slower at maximum joystick deflection and when fully zoomed in)	7	JSTK: %

4.2.2.3. Inverting Elevation

When steering the TCU in elevation axis, standard setting is that joystick deflection forward will cause the TCU to look downwards. This setting can be inverted, making the TCU look upwards when joystick deflection forward. The direction of the elevation command can be inverted in the **Controller** menu, **EL Control** sub-menu.

4.2.3. Rate Aid

Rate Aid is a steering assist function that is useful when following objects travelling at a constant speed and direction. The user can engage Rate Aid and the TCU will move at a constant rate established by the deflection applied to the joystick.

Button	Description	OSD area	OSD displays
Rate Aid (short press)	Toggle Rate Aid ON/OFF	7	MODE: RATE / MODE: RATE AID
Joystick	When in Rate Aid mode, steer and hold for approximate 1 second, then release to move the TCU at a constant rate.	-	-

4.2.4. Cage

Cage is the TCU default position. It gives the operator the ability to automatically steer the TCU to a predetermined position.

4.2.4.1. Cage Position

The MODE button is used to command the line-of-sight to a position of 0° in azimuth and elevation, thus providing the user with a known starting position.

The TCU is not fully stabilized in its CAGE position since the motors are driven by a position command rather than using the gyro inputs.

Button	Description	OSD area	OSD displays
MODE (short press)	Moves the TCU to the Cage position. Move the joystick to release the TCU from the Cage position.	7	MODE: CAGE

4.2.4.2. Set New Cage Position

A new position can be defined in the **System** menu to where the TCU moves every time the MODE button is pressed.

If you want to…	Then…
Set a new azimuth cage position	Increase (up to 180°) or decrease (down to -180°) the angle in **Startup Cage AZ** submenu
Set a new elevation cage position	Increase (up to 90°) or decrease (down to -90°) the angle in **Startup Cage EL** submenu
Save the new positions	Long press the menu button until the menu disappears.

4.2.5. Stow

The Stow command moves the TCU optical windows to a safe position. Stow is used during take-off and landing to protect the optical windows against Foreign Object Damage (FOD) and insect strikes. Stow position is recommended for ferry flight.

Button	Then…	OSD area	OSD displays
MODE (long press)	Toggles the TCU between Stow and Cage position.	7	MODE: STOW / MODE: CAGE

4.2.6. Sensor Selection

Note: Display menu, Video source must be set to Primary or Primary Basic for sensor selection to work.

Button	Description	OSD area	OSD displays
Cam / Video (short press)	Toggles through the available sensors.	7	CAM: (selected sensor)

4.2.7. Gyro Drift

The TCU has been temperature calibrated from -20 ˚C to +55 ˚C. When operating in colder temperatures than -20 ˚C, the user must allow time for the internal heater to warm the TCU to normal operating temperature and to stabilize the output values from internal sensors. The warm-up time depends on the ambient temperature. Once the system has reached normal operating temperatures -20 ˚C to +55 ˚C there should be no need for gyro drift compensation.

This procedure should only be performed when vehicle is parked and power to TCU is supplied by Auxiliary Power Unit (APU).

- Power up the system.
- Select the HD-EO sensor.
- Aim the crosshair at an object approximately 20 to 100 m (60 to 300 ft) distance.
- Fully zoom in on the object.
- Without touching the joystick, determine if gyro drift is present (crosshair moving slightly in any direction).

Compensate for…	Then press and hold DDE and…
Elevation drifts upward	Move the joystick in the **DOWN** direction.
Elevation drifts downward	Move the joystick in the **UP** direction.
Azimuth drifts left	Move the joystick in the **RIGHT** direction.
Azimuth drifts right	Move the joystick in the **LEFT** direction.

4.3. HD-EO Sensor

This section handles the functionality of the High-Definition Electro-Optical sensor also known as the day camera.

4.3.1. Focus

4.3.1.1. Manual Focus

Image focus can be found manually via the **Focus** knob on the controller unit.

Button	Description	OSD area	OSD displays
Focus (rotate CW)	Manually focuses the sensor far away.	9	FOC FAR
Focus (rotate CCW)	Manually focuses the sensor nearby.	9	FOC NEAR

4.3.1.2. Auto Focus After Zoom

The user has the option to set the sensor to perform an auto focus every time that zoom is released. Go to **AF After Zoom** in the **HD-EO Sensor Menu** section to toggle it ON/OFF.

OSD Area 9 momentarily displays **FOCAF.**

4.3.1.3. One-Shot Auto Focus

The sensor will try to find focus under a short period of time. After performing a One-Shot Auto Focus, HD-EO sensor reverts to Manual Focus mode.

Note: Performing One-Shot Auto Focus will focus all active and inactive sensors.

Button	Description	OSD area	OSD displays
Focus (short press)	Performs one-shot auto focus if pressed. Abort auto focus with Focus short press or Focus rotate CW/CCW.	9	FOC AF

4.3.2. Zoom

Zoom will adjust the image field-of-view (FOV). If FOV is narrower the image will appear to be closer. Optical zoom is preferred as the electronic zoom will reduce the resolution of the image.

4.3.2.1. Optical Zoom

Note: Maximum zoom depends on sensor configuration.

Button	Description	OSD area	OSD displays
Zoom (left)	Widens FOV	8	(FOV)
Zoom (right)	Narrows FOV	8	(FOV)

4.3.2.2. Extended Zoom

The extended zoom increases the focal length with a factor of 1.5.

Button	Description	OSD area	OSD displays
Zoom	Release once full optical zoom is reached, zoom in again to activate extended zoom. Zoom out to go back to full optical zoom.	8	1.5 EXT

4.3.2.3. Electronic Zoom

Electronic zoom is a function that digitally enlarges the image once full optical zoom with extended zoom is reached.

Note: Maximum zoom factor depends on sensor configuration and HD-EO sensor menu setting.

Button	Description	OSD area	OSD displays
Zoom	Once extended zoom is activated, zoom in again to activate electronic zoom. Zoom out to go back to extended zoom.	8	(Zoom factor)

4.3.3. Gain & Exposure Control

4.3.3.1. Automatic Gain & Exposure Control

The sensor automatically adjusts gain and exposure to provide an optimal image under changing light conditions thus relieving the operator's workload.

Button	Description	OSD area	OSD displays
Right Multi-Function (center short press)	Activates auto gain and exposure.	9	AGC ON

4.3.3.2. Exposure Offset

An exposure offset can manually be set, which is useful under certain lighting conditions. AGC will still be active.

Button	Description	OSD area	OSD displays
Right Multi-Function (right short press)	Increases exposure.	9	AGC ON EXP+
Right Multi-Function (left short press)	Decreases exposure.	9	AGC ON EXP-

4.3.3.3. Manual Gain Control

The manual gain adjusts the high and low grey scale range that the sensor sees when viewing a scene.

Button	Description	OSD area	OSD displays
Right Multi-Function (upward short press)	Increases gain.	9	AGC OFF GAIN+
Right Multi-Function (downward short press)	Decreases gain.	9	AGC OFF GAIN-

4.3.4. Digital Detail Enhancement

Digital Detail Enhancement or DDE is an algorithm that sharpens edges of objects.

DDE levels: OFF, LOW, MED, HI.

Button	Description	OSD area	OSD displays
DDE (short press)	Toggles DDE levels.	9	DDE OFF / DDE LOW / DDE MED / DDE HI

4.3.5. Low-Light Mode

Low light mode is useful when lighting conditions start to fall, for example when flying during dawn or dusk or at night with an artificially lit scene. When enabled the sensor's IR-cut filter is removed from the optical path and thereby increasing the detector's light sensitivity.

NOTE: In low-light mode, the HD-EO sensor image is monochrome.

Button	Description	OSD area	OSD displays
Left Multi-Function (upward short press)	Toggles Low-light mode ON/OFF.	9	LL ON / LL OFF *

* Shows momentarily.

4.3.6. Defog

Defog improves the HD-EO image in hazy conditions.

NOTE: In Defog mode, the HD-EO sensor image is monochrome.

Button	Description	OSD area	OSD displays
Left Multi-Function (downward short press)	Toggles Defog modes.	9	DEFOG ON / DEFOG OFF

4.3.7. Pedestal

Pedestal or Black Level adjusts the level of brightness at the darkest part of the image.

Button	Description	OSD area	OSD displays
DDE + Right Multi-Function (upward short press)	Press and hold DDE button, then press Right Multi-Function Up button to increase pedestal	9	Pedestal +
DDE + Right Multi-Function (downward short press)	Press and hold DDE button, then press Right Multi-Function Down button to decrease pedestal	9	Pedestal -

4.3.8. Saturation

By selecting **Saturation** in the **HD-EO menu,** the color saturation can be changed. Color saturation refers to the intensity of color in an image. As the saturation increases, the colors appear to be purer. As the saturation decreases, the colors appear to be more washed-out or pale.

A positive value increases the color saturation up to a maximum of 100.

A negative value decreases the color saturation down to a minimum of -100.

4.3.9. Automatic White Balance

White balance is a feature that the sensor uses to accurately balance color. It defines what the color white looks like in specific lighting conditions. The sensor is set to adjust the white balance automatically by default. The operator can perform a one-shot white balance for the current lighting conditions.

Go to **WB Type** in the **HD-EO sensor** Menu section to select **Auto (1-Shot).**

Button	Description	OSD area	OSD displays
Left Multi-Function (center short press)	To perform One-Shot AWB, point and zoom the sensor at a white target then press Left Multi-Function Center button.	9	WB TRIG

4.3.10. Slave Fields of View

The sensors can be set to slave to each other's field-of-view when zooming.

Go to the **System** menu and toggle **Slave FOVs** ON/OFF.

4.4. Mid-Wave Infrared (MWIR) Sensor

4.4.1. Focus

4.4.1.1. Manual Focus

Image focus can be found manually via the **Focus** knob on the controller unit.

Button	Description	OSD area	OSD displays
Focus (rotate CW)	Manually focuses the sensor far away.	9	FOC FAR
Focus (rotate CCW)	Manually focuses the sensor nearby.	9	FOC NEAR

4.4.1.2. One-Shot Auto Focus

After performing a One-Shot Auto Focus, MWIR sensor reverts to Manual Focus mode.

Note: Performing One-Shot Auto Focus will focus all active and inactive sensors.

Button	Description	OSD area	OSD displays
Focus (short press)	Performs one-shot auto focus.	9	FOC AF

4.4.1.3. Auto Focus After Zoom

The user has the option to set the sensor to perform an auto focus every time that zoom is released.
Go to **AF After Zoom** in the **MWIR Sensor** menu section to toggle it ON/OFF.

OSD Area 9 momentarily displays **FOC AF.**

4.4.2. Zoom

Zoom will adjust the image field-of-view (FOV). If FOV is narrower the image will appear to be closer. Optical zoom is preferred as the electronic zoom will reduce the resolution of the image.

4.4.2.1. Optical Zoom

Note: Maximum zoom depends on sensor configuration.

Button	Description	OSD area	OSD displays
Zoom (left)	Widens FOV	8	(FOV)
Zoom (right)	Narrows FOV	8	(FOV)

4.4.2.2. Electronic Zoom

Electronic zoom is a function that digitally enlarges the image once optical zoom at the narrow field-of-view is reached.

Note: Maximum zoom factor depends on sensor configuration and MWIR sensor menu setting.

Button	Description	OSD area	OSD displays
Zoom	Release once full optical zoom is reached, zoom right again to activate electronic zoom. Immediately disable by pressing Zoom left.	8	(Zoom factor)

4.4.3. Gain and Level Control

4.4.3.1. Automatic Gain and Level Control

AGC continuously adjusts gain and level to produce the best image for the current scene conditions.

Button	Description	OSD area	OSD displays
Right Multi-Function (center short press)	Activates auto gain and level.	9	AGC ON

4.4.3.2. Manual Gain Control

The manual gain adjusts the high and low grey scale range that the sensor sees when viewing a scene.

Button	Description	OSD area	OSD displays
Right Multi-Function (upward press)	Increases gain.	9	AGC OFF GAIN+
Right Multi-Function (downward press)	Decreases gain.	9	AGC OFF GAIN-

4.4.3.3. Manual Level Control

A Manual Level adjustment moves the grey scale range upwards or downwards.

Button	Description	OSD area	OSD displays
Right Multi-Function (right press)	Increases level.	9	AGC OFF LEVEL+
Right Multi-Function (left press)	Decreases level.	9	AGC OFF LEVEL-

4.4.4. Digital Detail Enhancement

DDE increases the sharpness of edges in objects in the scene.

DDE levels: OFF, LOW, MED, HI.

Button	Description	OSD area	OSD displays
DDE (short press)	Toggle DDE levels.	9	DDE OFF / DDE LOW / DDE MED / DDE HI

4.4.5. Non-Uniformity Correction – NUC

Non-Uniformity Correction or NUC is required when the image displays noise due to detector drift when the scene and operating environment change. This process adjusts each pixel's gain and offset.

Make sure the system is facing a clear sky before performing the NUC. Otherwise, hot objects may become superimposed on the image after the NUC process finishes.

4.4.5.1. Standard NUC

While the NUC process is being performed, the image freezes until the NUC process is completed.

Button	Description	OSD area	OSD displays
Left Multi-Function (center short press)	Activates Standard NUC.	9	IR NUC

4.4.5.2. Alternate NUC

While the NUC process is being performed, the image freezes until the NUC process is completed.

Button	Description	OSD area	OSD displays
DDE + Left Multi-Function (center short press)	Activates Alternate NUC	9	IR NUC

4.4.6. Histogram

Histogram adjusts the amount of contrast between hot objects and the background scene. Start-up setting can be selected in MWIR sensor menu.

Available settings: HIST OFF, HIST LOW (default), HIST MED and HIST HI.

Button	Description	OSD area	OSD displays
Hist (short press)	Toggle through histogram levels.	9	HIST OFF / HIST LOW / HIST MED / HIST HI /

4.4.7. Integration Time

Integration time sets how long the thermal imager's detectors are exposed to a scene. A longer integration time is used in cold weather and on cold targets. Shorter integration times are used in warm weather and on warm targets. Start-up setting can be selected in MWIR sensor menu.

Select the integration time setting that is most appropriate for your current target temperature.

Button	Description	OSD area	OSD displays
Left Multi-Function (center long press)	Toggle through integration time.	9	ITG FIRE / ITG HOT / ITG MED / ITG COLD

4.4.8. Polarity

The selected palette's color can be inverted.

Button	Description	OSD area	OSD displays
Left Multi-Function (upward short press)	Toggle through palette polarities.	9	POL BH / POL WH

4.4.9. Palette

Palettes are false color visualizations of a scene and are useful for certain mission profiles.

Default palette is **OFF**

Button	Description	OSD area	OSD displays
Video/Cam (long press)	Toggle through palettes.	9	PAL OFF / PAL IBO / PAL RBO / PAL STE / PAL LOCK / PAL HOTM / PAL SAT

4.4.10. Slave Fields of View

The sensors can be set to slave to each other's field-of-view.

Go to the **System menu** to set **Slave FOVs** ON or OFF.

4.5. Short-Wave Infrared (SWIR) Sensor

4.5.1. Focus

4.5.1.1. Manual Focus

Image focus can be found manually via the **Focus** knob on the controller unit.

Button	Description	OSD area	OSD displays
Focus (rotate CW)	Manually focuses the sensor far away.	9	FOC FAR
Focus (rotate CCW)	Manually focuses the sensor nearby.	9	FOC NEAR

4.5.1.2. Infinity Focus

The SWIR sensor has the possibility to be set to infinity focus.

Button	Description	OSD area	OSD displays
Focus (short press)	Sets the SWIR sensor to infinity focus.	9	FOC INF

4.5.2. Zoom

Zoom will adjust the image field-of-view (FOV). If FOV is narrower the image will appear to be closer. Optical zoom is preferred as the electronic zoom will reduce the resolution of the image.

4.5.2.1. Optical Zoom

Note: Maximum zoom depends on sensor configuration.

Button	Description	OSD area	OSD displays
Zoom (left)	Widens FOV	8	(FOV)
Zoom (right)	Narrows FOV	8	(FOV)

4.5.2.2. Electronic Zoom

Electronic zoom is a function that digitally enlarges the image once full optical zoom is reached.

Note: Maximum zoom factor depends on sensor configuration and SWIR sensor menu setting.

Button	Description	OSD area	OSD displays
Zoom	Release once full optical zoom is reached, zoom in again to activate electronic zoom. Immediately disable by zooming out.	8	(Zoom factor)

4.5.3. Gain and Level Control

4.5.3.1. Automatic Gain and Level Control

AGC continuously adjusts gain and level to produce the best image for the current scene conditions.

Button	Description	OSD area	OSD displays
Right Multi-Function (center press)	Activates auto gain and level.	9	AGC ON

4.5.3.2. Manual Gain Control

The manual gain adjusts the high and low grey scale range that the sensor sees when viewing a scene.

Button	Description	OSD area	OSD displays
Right Multi-Function (upward press)	Increases gain.	9	AGC OFF GAIN+
Right Multi-Function (downward press)	Decreases gain.	9	AGC OFF GAIN-

4.5.3.3. Manual Level Control

A Manual Level adjustment moves the grey scale range upwards or downwards.

Button	Description	OSD area	OSD displays
Right Multi-Function (right press)	Increases level.	9	AGC OFF LEVEL+
Right Multi-Function (left press)	Decreases level.	9	AGC OFF LEVEL-

4.5.4. Low-Light Mode

Low light mode is useful when lighting conditions start to fall, for example when flying during dawn or dusk or at night with an artificially lit scene. When enabled the sensor's IR-cut filter is removed from the optical path and thereby increases the detector's light sensitivity.

Button	Description	OSD area	OSD displays
Left Multi-Function, (upward press)	Upward press toggles Low Light mode.	9	LL ON / LL OFF *

* Shows momentarily.

4.5.5. Slave Fields-of-View

The sensors can be set to slave to each other's field-of-view when zooming.
Go to **Slave FOVs** in the **System Menu** section to toggle ON/OFF

4.6. Laser Range Finder (LRF)

The laser range finder measures the distance to objects. The measurements from the LRF are also used by the Inertial Navigation System (INS) computer to calculate geographical coordinates.

Warning!
Before operating the LRF, please read and understand the Laser safety information in the beginning of this operating manual.

The LRF needs to be fired towards the ground so that the INS can calculate the ground elevation distance needed to determine the exact target position (crosshair position).

If the INS is enabled and valid, a triangle shaped icon appears and stays on the measured location and OSD area 14 will display target location.

If the field-of-view moves away from the triangle shaped icon, an arrow along the image border indicates the direction that the user needs to steer to reacquire the icon.

The LRF crosshair is shown on OSD area 10. The range to target and position is displayed on OSD area 13, if there is a valid measurement; otherwise, **N/A** is displayed.

Button	Description	OSD area	OSD displays
LRF (short press)	Fires the LRF one time.	13	LRF ARMED + (distance)
LRF (long press)	Fires the LRF continuously. **LRF** short press will exit the continuous mode.	13	LRF ON + (distance)

4.7. Laser Illuminator (LI)

The laser illuminator provides a wide laser beam, visible to NVG devices.

Warning!
Before operating the laser illuminator, please read and understand the Laser safety information in the beginning of this operating manual.

4.7.1. Enable Laser Illuminator

1. Select **Illuminator** under **Selected Laser** in the **Lasers** menu.
2. OSD area will display **LI: OFF**
3. Arm the laser safety switch.
4. OSD area 13 will display **LI: ARMED**

Button	Description	OSD area	OSD displays
Laser (forward)	Pushing switch forward turns the selected laser on.	13	LI: ON
Laser (center position)	Center position turns selected laser off.	13	LI: ARMED
Laser (backwards)	Pulling switch backwards turns selected laser on, as long as the switched is pulled.	13	LI: ON

4.8. Geo Functions

Prerequisites:

A valid INS signal is required for the Geo functions to function. Typically, this is achieved by having a valid GPS signal and vehicle motion.

Ground altitude is also required, otherwise the tracked position will appear to drift across the ground. Ground altitude data can be provided by:

- A valid LRF return in an area near the target.
- Data from an external source such as Trakka.
- Input manually in the Base Altitude setting in the **Geo** menu.

4.8.1. Geo Track

Button	Description	OSD area	OSD displays
Left Multi-Function (short right press)	Right press toggles the Geo Track function ON/OFF. Geo Track is only available in **INS Mode** (OSD area 3)	7	MODE: G-TRACK

If a valid INS Solution is not available, OSD Area 7 briefly displays **G-TRK REQUIRES VALID INS** and Geo Track is not engaged.

If the system is unable to compute a ground altitude, OSD Area 7 briefly displays **G-TRK REQUIRES TGT POS** and Geo Track is not available.

4.8.2. Geo Steering

Geo Steering can be enabled and disabled in the **Geo** menu, under **Geo-Steering** sub-menu.

With Geo Track active, the system can be manually steered using the joystick similar to when operating in RATE mode. Unlike operation in Rate mode, however, the system will continue to stare at the updated position when the joystick is released. There are three Geo-Steering options available in the Menu system.

- **Disabled:** Steering the Geo Track position is not allowed.
- **Fixed Altitude:** The user may steer the Geo-Track position, but the altitude is not adjusted for the terrain.
- **Follow Terrain:** The user may steer the Geo-Track position, and the altitude of the tracked position will follow terrain updates from an external source (e.g. TrakkaMaps).

4.8.3. G-Aid

When in G-TRACK mode (see Geo Track section under Geo Functions), G-Aid is a steering assist function (same as Rate Aid mode) that is useful when following objects travelling at a constant speed and direction. The user can engage G-Aid and the TCU will move at a constant rate established by the deflection applied to the joystick.

Button	Description	OSD area	OSD displays
Rate Aid (short press)	Toggle G-Aid mode ON/OFF	7	MODE: G-TRACK / MODE: G-AID
Joystick	When in G-Aid mode, steer and hold for approximate 1 second, then release to move the TCU at a constant rate.	-	-

4.8.4. Geo Point

It is possible to command the TCU to a coordinate. This requires an external source such as the TrakkaMaps to provide the coordinate. Upon receiving new coordinates, the TCU will automatically slew and hold the position.

4.8.5. Virtual Laser Range Finder

Note: This is only applicable when TrakkaMaps is connected to the TCU.

The Virtual LRF is used in conditions where the Laser range finder is unavailable, or the maximum range has been reached. The range measurements are now calculated by the INS system using the digital terrain elevation data (DTED) installed in TrakkaMaps.

The measurements are displayed in OSD area 4 as RNG. No user input is required to activate the virtual LRF. It activates as soon as the TCU enters INS mode.

4.9. Video Functions

4.9.1. Digital Video Recorder

The TCU has the ability to capture images and record videos from all installed video sensors as it displays on the monitor. All the captured images and video recordings are saved on the TCU's internal memory card. To access the files, Trakka Media Download Tool (P/N: 8-0111-0001) needs to be installed on a PC connected to same ethernet network as the TCU. See Trakka Media Download Tool's supplied operation manual.

4.9.1.1. Snapshot

This option provides the ability to capture still images internal to the TCU.

Various configurable settings are found in the **Recorder** menu.

Button	Description	OSD area	OSD displays
REC (short press)	Snaps a still image.	15	CAPTURED

4.9.1.2. Video Recording

This option provides the ability to record video internal to the TCU.

Various configurable settings are found in the **Recorder** menu.

Button	Description	OSD area	OSD displays
REC (long press)	Toggles video recording start/stop. While recording it is possible to snap still images with REC short press without stopping the recording.	15	REC: ---- HRS

4.9.2. Image Blending

The HD-EO and IR images can be blended together to obtain additional visual information under certain mission conditions.

Image Blending can be activated by selecting **Display** in the sub-menu under **Special Displays**, and then scrolling through and selecting **Blend**. To deactivate Image Blending, return to the **Display** sub-menu and scroll through to select **Primary Only**.

Under **Display** there is also the possibility to select **Blend Mode**, **Blend Area (%)** and **Blend Amount**.

For Image Blending to work, **Blend Mode** cannot be set to **Disabled**.

Button	Description
Blending (short press)	Toggle image blend on/off.
Blending (rotate)	Rotate the Blending knob to adjust blend level of active sensor.

Note: Blending misalignment may occur depending on zoom and focus level. For optimal blending accuracy, it is crucial that both cameras are focusing on the same target. If auto focusing is unsuccessful, manually adjust focus on each camera individually.

4.9.3. Video Auto Tracker

The video auto tracker is a user assist used to automatically track scenes or moving objects.

4.9.3.1. Scene Tracker

The user can lock and hold the line-of-sight onto a scene, such as a building. The joystick can be used to move the line-of-sight to a different scene. Track lock may be broken if an obstruction, like a landing skid, enters the line-of-sight.

If object tracker is active, reset object tracker. Otherwise, enter Scene Tracker.

Button	Description	OSD area	OSD Displays
V-TRK (long press)	Turns on the Scene Tracker	7	MODE: SCENE
V-TRK (short press)	Turns off the Scene Tracker	7	MODE: RATE

4.9.3.2. Object Tracker

The user can lock and hold the line-of-sight on a moving object. The joystick can be used to move the line-of-sight around the tracked object. Track lock may be broken if an obstruction, like a landing skid, enters the line-of-sight.

Additional tracker settings, like setting the tracker gate size, can be found in the **Tracking** menu.

Button	Description	OSD area	OSD displays
V-TRK (short press)	Toggle Object Tracker ON/OFF	7	MODE: OBJECT / MODE: RATE

The active sensor can be switched while tracking, without breaking tracker lock.

- The Tracker gate will flash slowly in OSD area 11.
- OSD area 7 will flash **MODE: OBJECT** and **MODE: SECONDARY**

4.9.4. Moving Target Indication (MTI)

The moving target indication or MTI is an algorithm that highlights moving objects in a scene and a selected object can be handed over to the object tracking.

Enter the **Tracking** menu system to:

1) Select the MTI mode.
2) Set the threshold (sensitivity).
3) Set the object minimum detection size.

OSD Area 7 displays the selected MTI mode and the target number**.**

Button	Then…
MTI	Scrolls through highlighted targets. White line points to the target.
MTI (Press and Hold)	Activates tracking of the selected target. OSD Area 7 displays **MODE: OBJECT.**
V-TRK	Disables tracking of the selected target

4.9.5. Radar Slaving

This option slaves the TCU to commands received from a radar. The radar slaving must be enabled in the **Radar menu** for the RBH button to function. Make sure the selected COM-Port is set to **NMEA Vehicle,** otherwise radar will not function.

For **additional settings,** see **Radar** menu below.

Button	Description
RBH	Short press toggles between available radar targets. Long press (2 seconds) exits radar slaving. If **Manual** mode is selected, you have to toggle manually through the available tracks. If **Automatic** mode is selected the available tracks are toggled through automatically, by every scan interval (scan interval has to be set to automatic).

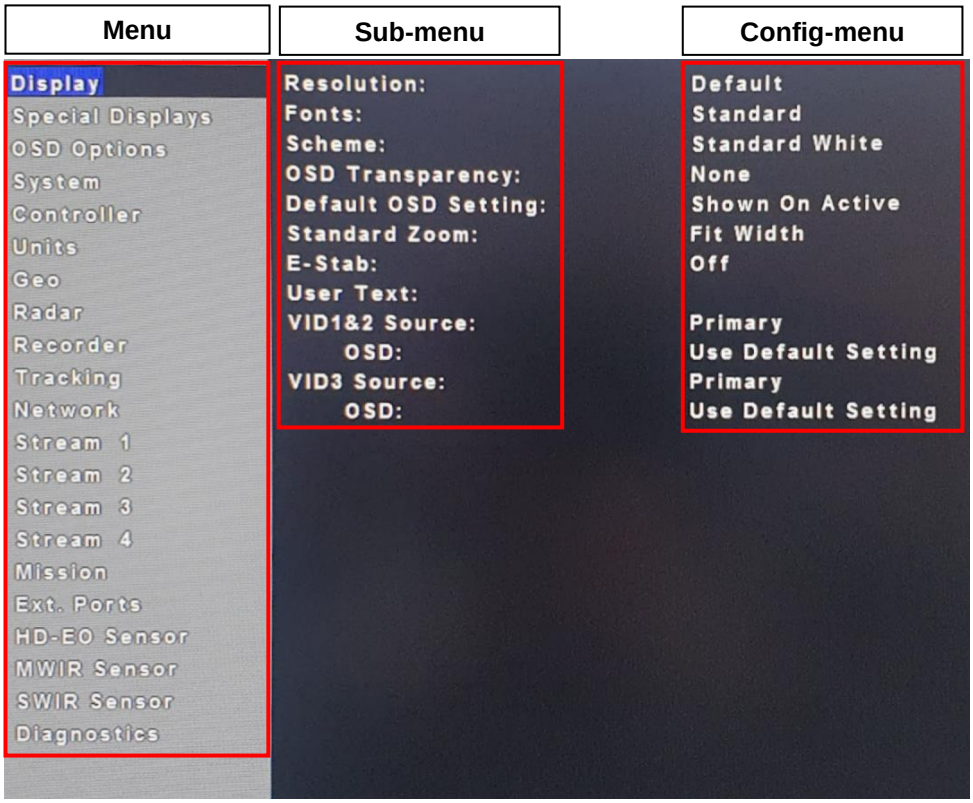
5. Menu

This section describes the functions found within the Menu system. Depending on the installed sensors, sensors and options, the Menu system may not include all the fields and settings described in this section.

5.1. Menu Explanation

The following figure illustrates the menu structure. Note that, depending on TCU sensor setup, your menu may differ from figure below.

Figure 7 - Menu structure



5.2. Navigating the Menu

The **MENU** button on the control unit is used to enter and exit the menu system.

To scroll vertically within the menus and to change the values within the config-menu,

- For the HCU (Hand Control Unit): Use the **UP/DOWN arrows**.
- For the HGU (Hand Grip Unit): Use the **Joystick UP/DOWN**.

To scroll horizontally within the menus,

- For the HCU: Use the **LEFT/RIGHT arrows**.
- For the HGU: Use the **Joystick LEFT/RIGHT**.

Changed values are not automatically saved and will revert to the previous setting upon a power cycle, unless saved by a long press of the menu button, until the menu disappears.

5.3. Display

The video resolution, display options, electronic stabilization and OSD symbology size and color can be changed within the Display menu which are described in this chapter.

5.3.1. Resolution

By selecting **Resolution** in the sub-menu under **Display**, you can toggle through available resolution options in the Config-menu.

Note: Ensure that the display supports the selected video format.

Note: Once the resolution is selected and saved, restart the system.

If you want to configure…	Then select…
To default value (1080p30 resolution)	Default
720p resolution	720p50
	720p60
1080p resolution	1080p25
	1080p30
	1080p50
	1080p60
1080i resolution	1080i50
	1080i59.94
	1080i60

5.3.2. Fonts

The font size of the OSD can be changed by selecting **Fonts** in the sub-menu under **Display.**

If you want to configure…	Then select…
Small OSD font	Small
Medium OSD font	Standard
Large OSD font	Large

5.3.3. Scheme

The color of the OSD Fonts can be changed by selecting **Scheme** in the sub-menu under **Display**.

If you want to configure…	Then select…
White colored OSD	Standard White
Green colored OSD	Standard Green
Cyan colored OSD	Standard Cyan
Green colored OSD with important graphics highlighted	High Vis Green
White colored OSD with important graphics highlighted	High Vis White
Cyan colored OSD with important graphics highlighted	High Vis Cyan

5.3.4. OSD Transparency

By selecting **OSD Transparency** in the sub-menu under **Display**, the transparency of the OSD can be set.

If you want…	Then select…
Less OSD transparency	Higher percentage
More OSD transparency	Lower percentage
No OSD transparency	None

5.3.5. Default OSD Setting

By selecting **Default OSD Setting** in the sub-menu under **Display**, the default OSD setting is set.

If you want…	Then select…
OSD to always be shown	Always Shown
OSD to be shown on active sensor	Shown on active
OSD to never be shown	Never Shown
OSD to be shown on only CH1	Shown on CH1 only

5.3.6. Standard Zoom

The standard zoom viewing options can be configured in the Config-menu **Standard Zoom** in the sub-menu under **Display**.

Note: Standard Zoom applies when not in Side-by-Side mode.

If you want to configure…	Then select…
Full image width, will result in no bars for any of the input sources.	Fit Width
Full image height, will result in bars on the side if the input is 5:4 or 4:3	Fit Height
Raw sensor image, resulting in the imaging being displayed in its native resolution.	Fit None

5.3.7. E-Stab

By selecting **E-Stab** (Electronic Stabilization) in the sub-menu under **Display**, the amount of electronic stabilization can be adjusted in the config-menu**.**

If you want to configure…	Then select…
Small degree of image-based stabilization, at narrow zoom setting	Low
Medium degree of image-based stabilization	Medium
High degree of image-based stabilization	High
No image-based stabilization	Off

5.3.8. Boresight

By selecting **Boresight** in the sub-menu under **Display**, the electronic boresight correction can be deactivated. When active, this correction applies to all cameras and the image will be slightly cropped.

Note: This feature requires software version from 10.13.31 to be available in sub-menu.

If you want to…	Then select…
Use no correction of boresight	Mechanical Only
Use electronically tuned boresight (default)	Electronically Tuned

5.3.9. User Text

Custom text can be input by the user in the Config-menu **User Text** in the sub-menu under **Display**. User Text will appear on OSD area 7.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.3.10. Video Source

By selecting **VID Source** in the sub-menu under **Display**, you can set a specific sensor as a video source.

Note: Depending on sensor configuration, all options may not be available.

If you want to…	Then select…
Set the active sensor as video source	Primary
Set the SWIR sensor as the video source	SWIR
Set the MWIR sensor as the video source	MWIR
Set the HD-EO sensor as the video source	HD-EO
Set the active sensor as video source without add-on´s such as blending, PiP or Side-by-Side.	Primary (Basic)
Set the 3rd as video source	Tertiary
Set the 2nd as video source	Alternate

5.3.10.1. OSD for Video Source

By selecting **OSD** in the sub-menu under **Display** below **VID Source**, the OSD can be set to an option other than default.

If you want to…	Then select…
Use the default setting	Use default setting
Show OSD on active sensor	Shown When Active
Always show OSD	Always Shown
Never show OSD	Never Shown

5.4. Special Displays

This section handles special display settings like Picture in Picture.

5.4.1. Display Mode

How the sensors videos are displayed on monitor can be selected by selecting **Display Mode** in the sub-Menu **Special Displays**.

If you want to display…	Then select…
The Active sensor only	Single
Side by Side video **Note:** Displays video from two sensors side by side	Side-by-Side
Picture-in-Picture video **Note:** Displays video from two sensors, one full screen and the other in a small area within the full screen in the upper-right corner (see PiP Corner, PiP Size PiP Camera sections for more settings).	PiP
Blending mode **Note:** Displays videos from two sensors, one in full screen and the other in a smaller area centered within the full screen, blended together (see Blend Amount and Blend Area sections for more settings). The blending option needs to be installed for this option to be available.	Blend

5.4.2. PiP Corner

By selecting **PiP Corner** in the sub-menu under **Special Displays**, the position on the display of the picture-in-picture image can be selected.

If you want the appearance of picture-in-picture is shown in the…	Then select…
Lower right corner	Lower-Right
Lower left corner	Lower-Left
Upper right corner	Upper-Right
Upper left corner	Upper-Left

5.4.3. PiP Size

The size of Picture-in-Picture image can be adjusted in the Config-menu **PiP Size** in the sub-menu under **Special Displays**.

If you want to configure a…	Then select…
1/4 screen sized Picture-in-Picture	Small
3/8 screen sized Picture-in-Picture	Medium
1/2 screen sized Picture-in-Picture	Large

5.4.4. PiP Camera

The sensor that is used for the Picture-in-Picture and Side-by-Side image can be selected in the Config-menu **PiP Camera** in the sub-menu under **Special Displays.**

If you want to configure the…	Then select…
Alternate sensor selection as the Picture-in-Picture image	Alternate
Color sensor as the Picture-in-Picture image	HD-EO
Mid-Wave Infrared sensor as the Picture-in-Picture image	MWIR
Short-Wave Infrared sensor as the Picture-in-Picture image	SWIR

5.4.5. Split Zoom

The split zoom viewing options can be configured in the Config-menu **Split Zoom** in the sub-menu under **Special Displays.**

Note: Split Zoom only applies when in Side-by-Side mode.

If you want to configure the split screen image to show…	Then select…
Full image width, the image fills half the display width.	Fit Width
Full image height, the image fills the display height. Results in grey bars on sides due to the aspect ratio.	Fit Height
Raw sensor image, resulting in the imaging being displayed in its native resolution.	Fit None

5.4.6. Blend Mode

The image blending options can be configured in the Config-menu **Blend Mode** in the sub-menu under **Special Displays**.

If you want to…	Then select…
Disable blend mode	Disabled
Show grayscale between two sensors	B&W Fade
Highlight hot spots in an EO Image	IR Highlight
Highlight bright spots in an IR Image	EO Highlight
Configure a color blend between two sensors	Color Fade
Toggle between EO Highlight and IR Highlight, depending on which sensor is active. - If **IR** sensor is active then it automatically toggles **EO Highlight** - If **HD-EO** sensor is active then it automatically toggles **IR Highlight**	Automatic

5.4.7. Blend Amount

The amount of image blending in the Config-menu **Blend Amount** in the sub-menu under **Special Displays**.

Note: Values range between 1 and 255.

If you want to…	Then…
Increase the image blending	Press Up and increase the value
Decrease the image blending	Press down and decrease the value

5.4.8. Blend Area

The area of image blending on the display can be adjusted in the Config-menu **Blend Area(%)** in the sub-menu under **Special Display**.

Note: Values range between 40% and 100%.

If you want to…	Then…
Increase the area of blending	Press Up and increase the percentage
Decrease the area of blending	Press down and decrease the percentage

5.5. OSD Options

This chapter describes the available options to configure how the on-screen data is displayed on the screen.

5.5.1. Vehicle Position

The vehicle position, data which shows OSD area 3, can be turned on or off in **VHCL Pos** in the sub-menu under **OSD Options.**

If you want to…	Then select…
Display vehicle position data on the display	On
Disable vehicle position data on the display	Off

5.5.2. Target Position

The target position, which shows in OSD area 4, can be turned on or off in **TRGT Pos** in the sub-menu under **OSD Options**.

If you want to…	Then select…
Display target position data on the display	On
Disable target position data on the display	Off

5.5.3. LRF Target Position

The laser range finder target position, which shows in OSD area 4, can be turned on or off in **LRF TRGT Pos** in the sub-menu under **OSD Options**.

If you want to…	Then select…
Display the latest LRF target position taken on the OSD	On, Single Marker
Display the three latest LRF target positions taken on the OSD	On, Three Markers
Display the two latest LRF target positions taken on the OSD	On, Two Markers
Display a LRF target position, but it disappears after 3 seconds	On, No marker
Display no LRF target positions	Off

5.5.4. Azimuth HUD

By selecting **Azimuth HUD** in the sub-menu under **OSD options**, the format of the azimuth geographical data can be configured. The azimuth head-up display (HUD) is visible in OSD area 1.

If you want to have the format…	Then select…
In degrees (“0”, “30”, “60, “90”…), relative to gimbal.	Degrees
In degrees (“0”, “30”, “60, “90”…), relative to true north.	Geo Degrees
In cardinal direction (“N”, “NE”, “E”, “SE”…) relative to gimbal.	Geo Compass
In MILS (NATO), relative to true north.	Geo MILS (NATO)
In MILS Warsaw Pact (WP), relative to true north.	Geo MILS (WP)
Hidden	Off
In MILS (NATO) relative to gimbal.	MILS (NATO)
In MILS Warsaw Pact (WP) relative to gimbal.	MILS (WP)

5.5.5. Elevation HUD

By selecting **Elevation HUD** in the sub-menu under **OSD options**, the format of the elevation geographical data can be configured. The azimuth head-up display (HUD) is visible in OSD area 2.

If you want to have it…	Then select…
In degrees	Degrees
Hidden	Off
In MILS (NATO)	MILS (NATO)
In MILS Warsaw Pact (WP)	MILS (WP)

5.5.6. Crosshairs

By selecting **Crosshairs** in the sub-menu under **OSD Options**, the crosshair can be configured in the Config-menu. Crosshairs is displayed on OSD area 10.

If you want to have…	Then select…
A crosshair serves as both a crosshair and a north indicator. To function, it requires a valid INS, otherwise it behaves as ***Simple***.	Compass
A standard crosshair, always visible at the center of the screen.	Simple
Hidden	Off
A crosshair serves as both a crosshair and a north indicator. To function, it requires a valid INS, otherwise it behaves as ***Simple***. **Note:** The crosshair is hidden while the video tracker is active.	Compass w/Hide
A standard crosshair, always visible at the center of the screen. **Note:** The crosshair is hidden while the video tracker is active.	Simple w/Hide

5.5.7. System Status

By selecting **System Status** in the sub-menu under **OSD Options**, the system status can be turned ON or OFF on OSD area 7.

If you want to…	Then select…
Display system status	On
Disable system status.	Off

5.5.8. Sensor Status

By selecting **Sensor Status** in the sub-menu under **OSD Options**, the sensor status can be turned on or off in the Config-menu. Sensor Status is displayed on OSD area 9.

If you want to…	Then select…
Display sensor status	On
Not display sensor status.	Off

5.5.9. Vehicle Icon

By selecting **Vehicle Icon** in the sub-menu under **OSD Options**, the vehicle icon can be changes in OSD area 5.

If you want the vehicle icon to display as…	Then select…
A generic symbol	Generic
A ship	Ship
An airplane	Airplane
A van	Van
A helicopter	Helicopter
Hidden	Hidden

5.5.10. Icon Size

By selecting **Icon Size** in the sub-menu under **OSD Options**, the size of the vehicle icon can be changed.

If you want to change the vehicle icon size to…	Then select…
The standard size	Standard
A small size	Small
A large size	Large

5.5.11. Logo

By selecting **Logo** in the sub-menu under **OSD Options**, the Trakka logo can be hidden/shown or changed to a customized logo. The logo is located in OSD area 16.

If you want to…	Then select…
Show the Trakka logo in grayscale color	Monochrome
Hide logo	Off
Show the Trakka logo in Trakka blue	Color
Show a customized logo[1]	User

[1] Please contact Trakka Systems for more information.

5.5.12. FOV Box

By selecting **FOV Box** in the sub-menu under **OSD Options**, the field-of-view box (markers) of other sensors can be selected. The FOV box will show In OSD area 12.

If you want the…	Then select…
FOV box turned off	Off
Previous sensor (toggle order) FOV box selected	Prev Cam
Next sensor (toggle order) FOV box selected	Next Cam
Narrow FOV box selected	Narrow
HD-EO sensor FOV box selected	HD-EO
MWIR sensor FOV box selected	MWIR
SWIR sensor FOV box selected	SWIR

5.5.13. Zoom HUD

By selecting **Zoom HUD** in the sub-menu under **OSD Options,** the zoom data can be configured in OSD area 8.

If you want to…	Then select…
Display the active sensor´s zoom level. **Note:** Displays only a small arrow to indicate the zoom level, no numerical value.	Simple
Have the gauge hidden.	Off
Display the active sensor´s zoom level along one edge of the gauge, and the SWIR sensor along the other edge. **Note:** Displays the numerical value (in degrees, FOV). **Note:** The TCU must have the SWIR sensor installed for this option to be available.	Dual - SWIR
Displays the active sensor´s zoom level along one edge of the gauge, and the MWIR sensor along the other edge. **Note:** Also displays the numerical indicator (in degrees, FOV).	Dual – MWIR
Display the active sensor´s zoom level along one edge of the gauge, and the HD-EO sensor along the other edge. **Note:** Displays the numerical value (in degrees, FOV).	Dual – HD-EO
Display the active sensor´s zoom level along one edge of the gauge, and the alternate sensor along the other edge. **Note:** Displays the numerical indicator (in degrees, FOV).	Dual – Alt
Only the active sensor´s zoom level. **Note:** Displays the numerical value (in degrees, FOV).	Show FOV

5.6. System

This section describes the procedures to configure gimbal positioning, and field-of-view (FOV) default settings.

5.6.1. Start Mode

By selecting **Start Mode** in the sub-menu under **System**, you can configure how the TCU will be positioned at start-up.

If you want the system to start in…	Then select…
Cage position (0° in elevation 0° in azimuth, if not altered).	Cage
Stow position.	Stow

5.6.2. Orientation

By selecting **Orientation** in the sub-menu under **System**¸ you can configure the systems orientation so the video output will rotate correctly.

If you want the system to…	Then select…
Detect the orientation by itself	Auto Detect
Be set as ball down	Ball Down
Be set as ball up	Ball Up

5.6.3. Slave Field-of-Views

By selecting **Slave FOVs** in the sub-menu under **System**¸ the sensors field-of-views can be slaved to follow one another.

If you want…	Then…
All sensors to simultaneously zoom and show the same Field-of-View.	On
No sensors to simultaneously zoom and show the same Field-of-View.	Off

5.6.4. Azimuth Offset

By selecting **AZ Offset** in the sub-menu under **System**, the azimuth offset indicator and value can be offset from the default factory setting.

If you want to configure…	Then…
Azimuth position from its zero position, in degrees. (±180°).	Press Up or Down

5.6.5. Toggle Sensors

By selecting **Toggle Sensors** in the sub-menu under **System**, the user has the option to select one sensor pair to toggle between with the **Video/CAM** button instead of toggling all three sensors. Depending on sensor configuration, it may deviate how the sensor pairs are presented in the menu.

Note: When toggling between selected sensor pair, **Video/CAM** button long press will select third sensor and reset this setting, hence the **Video/CAM** button short press will then toggle between all three sensors.

If you want…	**Then select…**
Toggle between the MWIR and SWIR sensors	MWIR <> SWIR
Toggle between the HD-EO and SWIR sensors	HD-EO <> SWIR
Toggle between the HD-EO and MWIR sensors	HD-EO <> MWIR
Toggle between all the three available sensors	All

5.6.6. Startup Cage AZ

By adjusting **Startup Cage AZ** in the sub-menu under **System**, the factory default 0° cage position can be changed.

If you want to…	**Then…**
Change the azimuth position in degrees (± 180°)	Increase or decrease the value.

5.6.7. Startup Cage EL

By adjusting **Startup Cage EL** in the sub-menu under **System**, the factory default 0° cage position can be changed.

If you want to…	**Then…**
Adjust the elevation position in degrees (± 90°)	Increase or decrease the value.

5.7. Lasers

This section describes how to configure the installed lasers.

5.7.1. LRF Arming

By selecting **LRF Arming** in the sub-menu under **Lasers**, the way of arming the LRF can be selected.

If you want to configure the LRF to…	Then select…
Always be armed	Always armed
Be armed by an external laser safety switch	Use Arm SW

5.7.2. LRF Range Mode

By selecting **LRF Range Mode** in the sub-menu under **Lasers**, the response of the LRF single-shot readings can be configured.

If you want to configure the LRF to read…	Then select…
(Same as Balanced)	Default
short distances with fast response	Fast Response
medium length distances with reasonably fast response	Balanced
long distances with slower response	Max Distance

5.7.3. Selected Laser

If the TCU is equipped with both laser pointer and laser illuminator, only one of them can be activated at the time. By selecting **Selected Laser** in the sub-menu under **Lasers**, the preferred laser can be selected.

If you want…	Then select…
No laser to be active	None
Only the laser pointer to be active	Pointer [1]
Only the laser illuminator to be active	Illuminator [1]

[1] Only available when hardware is installed.

5.7.4. Pointer Mode

By selecting **Pointer Mode** in the sub-menu under **Lasers**, the preferred pointer mode can be set for the laser pointer when firing continuously.

If you want the laser pointer to fire…	Then select…
Continuously	Continuous
Once per second	1Hz
2,5 times per second	2,5Hz
5 times per second	5Hz

5.8. Controller

This section describes how to configure the control unit. Depending on if the TCU is equipped with a hand control unit (HCU) or hand grip unit (HGU) some options may not be available in the menu.

5.8.1. Elevation Control

By selecting **EL Control** in the sub-menu under **Controller**, the direction that the TCU responds in the elevation to the joystick deflection can be reversed.

If you want to configure…	Then select…
Gimbal elevation to move downward when Joystick is moved forward	Standard
Gimbal elevation to move upward when Joystick is moved forward	Inverted

5.8.2. Elevation Sensitivity

By selecting **AZ Sensitivity (%)** in the sub-menu under **Controller**, the sensitivity of the joystick in azimuth can be adjusted.

If you want to configure…	Then…
Joystick sensitivity in elevation, between 10% and 800%.	Press Up or down to select value

5.8.3. Azimuth Sensitivity

By selecting **AZ Sensitivity (%)** in the sub-menu under **Controller**, the sensitivity of the joystick in azimuth can be adjusted.

If you want to configure…	Then…
Joystick sensitivity in azimuth, between 10% and 800%.	Press Up or down to select value

5.8.4. Joystick

By selecting **Joystick** in the sub-menu under **Controller**, the algorithm for the joystick response can be selected.

If you want…	Then select…
The joystick command rate to increase linearly	Linear
The joystick command rate to increase more slowly, allowing finer-control at low-speed movements	Square

5.8.5. NVG Panel Lights

By selecting **NVG Panel Lights** in the sub-menu under **Controller**, the intensity of the NVG panel lights can be adjusted.

If you want to…	Then…
Change the intensity of the NVG panel lights between 0 and 100.	Press Up or down to select value

The intensity of the NVG panel lights can also be changed by press and hold **HIST** button while rotating the **Focus** button. Rotate counterclockwise for increasing intensity and clockwise for decreasing intensity.

5.8.6. Handedness

By selecting **Handedness** in the sub menu under **Controller**, the HGU can be set for right or left handedness.

Right handedness is set by default. When selecting left handedness following will change:

- Zoom switch will invert.
- Focus and blending function will swap place.

If you want to configure the HGU for…	Then select…
Right handedness	Right Hand
Left handedness	Left Hand

5.8.7. AUX Button #1 to #4

By selecting **AUX Button #1** to **#4** in the sub-menu under **Controller**, the four buttons labelled “A1”, “A2”, “A3” and “A4” on the HGU can be programmed to various system and map functions. For more information of individual functions, please refer to *Gimbal functions* and *Sensor* section in this document. For map functions please refer to TM-100 operation manual.

Figure 8 – Location of programmable buttons.

The programmable buttons are set default to:

A1 = Rate Aid
A2 = Moving Target Indication (MTI)
A3 = Radar Tracking (RBH)
A4 = Snapshot/recording

Note: Depending on installed functions, not all options may appear in the menu.

If you want to program the AUX button for…	Then select…
No function	None
Default function	Default
Geo tracking	G-TRK
Recording	REC
Rate Aid	Rate Aid
Radar tracking	RBH
Moving Target Indication	MTI
Integration	ITG
Contrast Limited Adaptive Histogram Equalization	CLAHE
TM-100 Augmented Reality	Map AR
TM-100 Draw Mode	Map Draw Mode
TM-100 Draw Menu	Map Draw Menu
TM-100 Draw Add Point	Map Draw Add Pt
TM-100 Drop Pin	Map Drop Pin
TM-100 Change layout	Map Layout
TM-100 View still image	Map View Still
TM-100 Take still image	Map Take Still
TM-100 Toggle Recording	Map Toggle Rec [1]

[1] Requires Video version from 10.13.19 and HCU version from 10.13.6.

5.9. Units

This section describes how to change values like time, date, distance, speed, coordinates and altitude.

5.9.1. Time Zone

By selecting **Time Zone** in the sub-menu under **Units**, the time zone can be adjusted. Time Zone is displayed on OSD area 7.

If you want to configure…	Then select…
Universal Time Coordinate, with no offset	UTC
Universal Time Coordinate + X hours, where X is a user selected number	UTC+X, until required offset is reached
Universal Time Coordinate - X hours, where X is a user selected number	UTC-X, until required offset is reached

5.9.2. Date Format

By selecting **Date Format** in the sub-menu under **Units**, the format of how the date is presented can be changed. Date Format is displayed in OSD area 7.

If you want to display date format as…	Then select…
Year-Month-Day	YYYY-MMM-DD
Day-Month-Year	DD-MMM-YYYY
Month-Day-Year	MMM-DD-YYYY

5.9.3. Time Format

By selecting **Time Format** in the sub-menu under **Units**, the format of the time can be selected. Time Format is displayed in OSD area 7.

If you want to display time format as…	Then select…
Hours:Minutes:Seconds.	HH:MM:SS
Hours:Minutes:Seconds.Miliseconds	HH:MM:SS.zzz

5.9.4. Range

By selecting **Range** in the sub-menu under **Units**, the units of measure for distance can be changed. Range is displayed in OSD areas 3 and 4.

If you want to display range as…	Then select…
Meters	Meters
Yards	Yards
Nautical Miles	NM
Miles	Miles
Kilometers	Km
Feet	Feet

5.9.5. Ownship Speed

By selecting **Ownship Speed** in the sub-menu under **Units**, the unit of measurement for speed can be changed. Ownship is displayed in OSD area 3.

Note: Ownship speed is the vehicle speed.

If you want to display…	Then select…
Knots	Knots
Meters per second	m/s
Kilometers per hour	km/h
Miles per hour	MPH

5.9.6. Target Speed

By selecting **Target Speed** in the sub-menu under **Units**, the unit of measurement for speed can be changed. Target Speed is displayed in OSD area 4.

Note: Target speed is the speed of the object you are viewing.

If you want to display…	Then select…
Knots	Knots
Meters per second	m/s
Kilometers per hour	km/h
Miles per hour	MPH

5.9.7. Coordinates

By selecting **Coordinates** in the sub-menu under **Units**, the units of coordinates can be changed. Coordinates are displayed in OSD areas 3 and 4.

If you want to display…	Then select…
Decimal Degrees	DD
Degrees Decimal Minutes	DDM
British National Grid	BNG
Universal Transverse Mercator	UTM
Military Grid Reference System	MGRS
Degrees Minutes Seconds	DMS

5.9.8. Altitudes

By selecting **Altitudes** in the sub-menu under **Units**, the units for altitude can be changed. Altitude is displayed in OSD area 3.

If you want to display…	Then select…
Mean Sea Level in feet	MSL (ft)
Mean Sea Level in meter	MSL (m)

5.9.9. Measure Dist

By selecting **Measure Dist** in the sub-menu under **Units**, a distance measurement tool (indicator marks on either side of the crosshair as displayed on OSD area 10) can be activated in the Config-menu. Measured distance is displayed on OSD area 8.

Note (only applies when not in Auto mode): The indicator marks will move farther apart or together so that they show you the fixed distance on the ground. For instance, if you set it to 5 meters, then as you zoom in, the tick marks will spread apart to show you how big 5 meters looks in the video.

If you want to display…	**Then select…**
An automatic fixed pixel distance	Auto
No distance	Off
A set distance between 0.5 – 100m	0.5m → 100m

5.9.10. Temperatures

By selecting **Temperatures** in the sub-menu under **Units**, the displayed temperature units can be configured.

If you want to display temperatures…	**Then select…**
In Celsius	°C
In Fahrenheit	°F
In Kelvin	K

5.10. Geo

This section describes how geo steering can be turned on and off and how to manually input altitude.

5.10.1. Position Mode

By selecting **Position Mode** in the sub-menu under **Geo**, three different position modes can be set. The default mode is GPS/INS. INS information is displayed in OSD area 3.

Note: This feature is available from video version 10.13.12. The video version can be found under the **Diagnostics** menu, and config-menu set to **Versions**.

If you want to use position mode…	Then select…
GPS/INS, When GPS/INS is selected then the position and attitude are calculated in the INS solution. This require that the vehicle is in motion.	GPS/INS
Fixed, When fixed mode is selected then the position and attitude are manually configured via external tools. For static installations. [1]	Fixed
Manual heading, When manual heading is selected then the position and attitude are calculated from the GPS and the manual entered heading in the menu. For static installations.	Manual Heading

[1] Please contact Trakka Systems for more information.

5.10.2. Manual Heading

Note: This setting is only active when **Position Mode** is set to **Manual Heading**.

If you want to…	Then press…
Configure the manual heading (from 0° to 360°, where 0° is north).	Up or Down

5.10.3. Geo-Steering

By selecting **Geo-Steering** in the sub-menu under **Geo**, the geo steering options can be selected.

Note: When operating over **hilly terrain**, it is very important to use the **Follow Terrain** mode to prevent coordinates from being calculated under or above the ground. This will make Geo pointing to appear to “drift” relative to the ground.

If you want the Geo Steering to…	Then select…
Be disabled	Disabled
Follow the terrain, When Follow Terrain is selected, the altitude of the point on the ground will be adjusted based on the terrain coming from an external source, such as the TM-100.	Follow Terrain
Follow a fixed altitude, The point on the ground will be kept at the same altitude as when the point was started.	Fixed Altitude

5.10.4. Base Altitude (m)

By selecting **Base Alt (m)** you can manually configure the base altitude.

Note: This value will be used as the ground altitude until one of the following occurs:

- A valid LRF range is returned.
- An altitude message is received by an external device (e.g., from TrakkaMaps)

If you want to…	Then press…
Configure and change the base altitude (from -100 to 10000 m).	Up or Down

5.10.5. Lever Arm Mode

By selecting **Lever Arm Mode** in the sub-menu under **Geo**, the distance between the TCU and the primary GPS Antenna (connected to GPS 1 on TCU) can be set in the Config-menu.

Note: The system is equipped with an automatic lever arm calibration that requires vehicle motion. Lever Arm is the distance between the center of the TCU and the primary GPS Antenna.

If you want to…	Then select…
Have the lever arm computed automatically from vehicle motion. The system calculates the antenna location relative to the TCU.	Dynamic
Provide the lever arm statically. This is not changed dynamically by the internal INS. Values must be input in **Lever Arm X Y Z (m)**.	Static
Calibrate XYZ values without requiring manual measurement. The TCU must be in calibration mode and the vehicle moving. Once the vehicle stops, the lever arm values are stored so that upon the next power cycle, the values are restored as the starting point. The calibrated value can then be used as part of the Dynamic or Static lever arm.	Calibrate

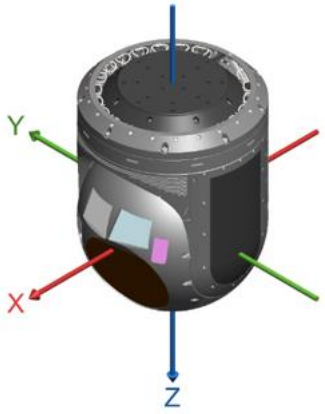
Note: If the TCU is moved relative to the primary GPS Antenna position, that a non-zero lever arm value will need to be recalibrated or re-entered manually.

5.10.6. Lever Arm XYZ (m)

By selecting **Lever Arm X, Y or Z (m)** in the sub-menu under **Geo**, the distance between the center of the TCU and the primary GPS Antenna can be input in meters in the Config-menu.

The coordinate system directions are the same for standing and hanging gimbal installation.

Figure 9 - The systems coordinate system.



Note: Ensure that Lever Arm Mode is set to the **Static**.

If you want to…	Then press…
Change the distance between the TCU and the primary GPS Antenna.	Up or Down
Move the cursor to the previous or the next character.	Left or Right

5.11. Radar

This section describes functions available for radar slaving.

5.11.1. Follow Mode

By selecting **Follow Mode** in the sub-menu under **Radar**, the radar slaving can be set to switch between targets by the radar or the user.

Note: The radar only works if NMEA Vehicle protocol is in use.

If you want to…	Then select…
Have this mode disabled	Disabled
Switch between any external radar targets automatically at every scan interval. **Note:** Ensure that radar status in the lower left corner of the OSD indicates **RADAR: OFF [RDY]**	Automatic
Switch between the radar targets when the user presses the RBH button. **Note:** Ensure that radar status in the lower left corner of the OSD indicates **RADAR: OFF [RDY]**	Manual

5.11.2. Scan Interval

By selecting **Scan Interval (s)** in the sub-menu under **Radar**, the scan interval can be set.

Scan Interval controls how many seconds elapse before the automatic scanning moves to the next target in the list.

Note: The scan interval only works when **Follow Mode** is set to **Automatic**.

5.11.3. AZ Offset

By selecting **AZ Offset** in the sub-menu under **Radar,** a correction can be input between the externally supplied target angle and the sensor angle.

5.11.4. EL Offset

By selecting **EL Offset** in the sub-menu under **Radar,** the angle at which the TCU will point in elevation can be configured.

Note: Radar does not supply the elevation angle.

5.12. Recorder

This section describes the available digital video recorder (DVR) settings.

5.12.1. Snapshot Style

By selecting **Snapshot Style** in the sub-menu under **Recorder,** the snapshot mode can be configured in the Config-menu.

If you want to capture images…	**Then select…**
From the sensor without OSD	Clean
From the sensor with OSD	As Displayed

5.12.2. Snapshot Format

By selecting **Snapshot Style** in the sub-menu under **Recorder,** the image format can be set in the in the Config-menu.

If you want to save images…	**Then select…**
In Portable Network Graphics format	PNG
As JPEG files, with embedded metadata (position)	JPEG + EXIF

5.12.3. Start Recorder

By selecting **Start Recorder** in the sub-menu under **Recorder,** the recorder can be turned on or off in the Config-menu.

If you want to have the digital video recorder (DVR)…	**Then select…**
Off at system power up	Stopped
On at system power up	Recording

5.12.4. Status Display

By selecting **Status Display** in the sub-menu under **Recorder,** the option to display **REC** on the OSD when recording can be set in the Config-menu. REC Status is displayed in OSD area 15.

If you want to…	**Then select…**
Display REC in the OSD	On
Not display REC in the OSD	Off

5.13. Tracking

This section describes the available image tracking settings and parameters.

5.13.1. BG Registration

By selecting **BG Registration** in the sub-menu under **Tracking,** the background motion compensation can be turned on or off.

If you want to…	Then select…
Allow the tracker to subtract background motion when prediction target locations	On
Have the tracker ignore the background registration	Off

5.13.2. Acquisition Assist

By selecting **Acquisition Assist** in the sub-menu under **Tracking,** the target acquisition assistance can be turned on or off.

If you want to…	Then select…
Automatically select a target near the crosshairs – when user starts tracking	On
Begin tracking exactly at the crosshair position	Off

5.13.3. Auto Rotate

By selecting **Auto Rotate** in the sub-menu under **Tracking,** the tracking algorithm can be set to track on a target that changes its shape.

If you want to…	Then select…
Allow tracking to automatically evolve, based on changing shape	On
Limit tracking to the object's shape - when tracking begins	Off

5.13.4. On Video Switch

By selecting **On Video Switch** in the sub-menu under **Tracking,** how the Track functions can be configured in the Config-menu.

If you want to…	Then select…
Continue tracking using the inactive sensor	Keep Track
Stop tracking completely	Drop Track
Attempt to restart the same track using a different sensor	Migrate Track

5.13.5. Coast Time

By selecting **Coast Time** in the sub-menu under **Tracking**, you can configure the predict duration of the coast time.

Note: In case of lost visibility of an object Coast Time comes handy. It determines for how long the tracker search for the tracked object before dropping out of tracking.

If you want to…	Then select…
Set Coast Time between 1-2 seconds and led the video board automatically determine what suits better.	Default
Lock Coast Time for a specific duration.	1 to 5 seconds

5.13.6. Tracker Size

By selecting **Tracker Size** in the sub-menu under **Tracking**, the size (10 - 250) of the tracker box can be adjusted in the Config-menu. Tracker gate is displayed on OSD area 11.

If you want to…	Then select…
Decrease tracker box size	A lower value
Increase tracker box size	A higher value

5.13.7. MTI Mode

By selecting **MTI Mode** in the sub-menu under **Tracking,** the available moving target indication modes can be selected in the Config-menu. MTI Mode is displayed in OSD Area 7.

If you want to…	Then select…
Disable Moving Target Indicators	Off
Detect unique objects based on color and intensity. Detects up to 100 objects	Anomaly
Detects objects that are light or dark compared to their surroundings. Detects up to 100 objects.	Blob
Detect hottest objects in the scene. Detects up to 100 objects	Radiometric
Detects objects that are small and move slow, move fast at varying rates, or that temporarily stops. Detects up to 100 objects.	Staring
Detect vehicles that are typically 10 to 100 pixels long in the scene. Detects up to 5 objects	Large Objects
Detect drones and attempt to filter out false positives using an Artificial Intelligence Classifier	Drone + AI
Detect drones that are typically 10 to 100 pixels long in the scene. Detects up to 5 objects	Drone
Detect small, slow-moving objects. Detects up to 100 objects	Small Objects
Detect objects at sea. Detects up to 100 objects.	Maritime

5.13.8. MTI Threshold

By selecting **MTI Threshold** in the sub-menu under **Tracking,** the threshold sensitivity can be set in the Config-menu.

If you want to…	Then select…
Increase the threshold sensitivity	A lower value
Decrease the threshold sensitivity	A higher value

5.13.9. Min Detect Size

By selecting **Min Detect Size** in the sub-menu under **Tracking,** the minimum detection size in pixels can be set.

If you want to…	Then select…
Set the system default value	Default
Decrease the object detect size, between 5-100 Pixels	A lower value
Increase the object detect size, between 5-100 Pixels	A higher value

5.14. Network

This section describes the procedures to configure system IP and communications.

5.14.1. Address Type

By selecting **Address Type** in the sub-menu under **Network**, the internet protocol (IP) address can be set.

If you want to…	Then select…
Allow the board to automatically receive its IP address via DHCP.	DHCP
Enter a static IP address. **Note:** Board IP address must be configured for this setting. Refer to **Board IP.** **Note:** Saving this setting and rebooting Menu system are required.	Fixed

5.14.2. Board IP

By selecting **Board IP** in the sub-menu under **Network**, the board static protocol (IP) address can be set.

If you want to configure…	Then…
The board's static IP address, as follows: **XXX.XXX.XXX.XXX** Where **X** is a single digit, between 0 and 9	**1.** Disable DHCP. Refer to **DHCP**. **2.** Enter static IP address. **3.** Save changes. **4.** Reboot the system.

5.14.3. Subnet Mask

By selecting **Subnet Mask** in the sub-menu under **Network**, the subnet mask can be set.

If you want to configure…	Then…
The subnet mask, as follows: **XXX.XXX.XXX.XXX** Where **X** is a single digit, between 0 and 9	**1.** Disable DHCP. Refer to **DHCP**. **2.** Enter the subnet mask. **3.** Save changes. **4.** Reboot the system.

5.14.4. Gateway

By selecting **Gateway** in the sub-menu under **Network**, the gateway can be set.

If you want to configure…	Then…
The gateway, as follows: **XXX.XXX.XXX.XXX** Where **X** is a single digit, between 0 and 9	**1.** Disable DHCP. Refer to **DHCP**. **2.** Enter the gateway. **3.** Save changes. **4.** Reboot the system.

5.15. Stream 1 to 4

This section describes how to setup **Stream 1** to **4** over the Ethernet connection.

5.15.1. Source

By selecting **Source** in the sub-menu under **Stream,** the video source on the stream can be configured.

If you want to…	Then select…
Disable the stream	Off
Set the stream source to SWIR	SWIR
Set the stream source to MWIR	MWIR
Set the stream source to HD-EO	HD-EO
Set the stream source to active sensor, without add-on´s such as blending, PiP or Side-by-Side.	Primary (Basic)
Set the stream source to the inactive sensor	Alternate
Set the stream source to the active sensor	Primary

5.15.2. OSD

By selecting **OSD** in the sub-menu under **Stream,** the OSD on the stream can be configured.

If you want to…	Then select…
Use the default setting set in 5.3.5	Use default setting
Show OSD when active	Shown When Active
Always display OSD	Always Shown
Never show OSD	Never Shown

5.15.3. Bit Rate

By selecting **Bit Rate** in the sub-menu under **Stream,** communication speed used on each stream can be set.

If you want to have a…	Then select…
Slower communication rate	A lower **Kbps** – **Mbps** value
Higher communication rate	A higher **Kbps** – **Mbps** value

5.15.4. Dest IP

By selecting **Dest IP** in the sub-menu under **Stream,** the destination IP address for multicast or unicast can be assigned in the Config-menu.

Options listed in the table below:

If you want to configure…	Then select…
A multicast stream, with a valid multicast IP address	Press Left or Right - Up or Down to change this setting
A broadcast stream, with a valid broadcast address	

5.15.5. Dest Port

By selecting **Dest Port** in the sub-menu under **Stream,** the destination port can be assigned in the Config-menu.

If you want to configure…	Then select…
The port to where the data is delivered	Press Left or Right - Up or Down to change this setting

5.15.6. Protocol

By selecting **Protocol** in the sub-menu under **Stream,** RTP or UDP protocol can be selected in the Config-menu.

If you want to…	Then select…
Encapsulate the data using RTP packets	RTP/H.264 TS
	RTP/H.265 TS
Send raw UDP packets as configured above	UDP/H.264 TS
	UDP/H.265 TS

5.16. Mission

This section describes the mission-specific tags, data, and security settings that can be embedded in the KLV streams.

5.16.1. Mission ID

By selecting **Mission ID** in the sub-menu under **Mission,** a customized mission name or identifier can be set in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or to the next space	Left or Right

5.16.2. Platform

By selecting **Platform** in the sub-menu under **Mission,** a customized platform name can be set in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.3. Classification

By selecting **Classification** in the sub-menu under **Mission,** the security designation can be selected in the Config-menu.

If the mission will have…	Then select…
No security classification	Unclassified
Highest security classification	Top Secret
Second highest security classification	Secret
Third highest security classification	Confidential
Minimum security classification	Restricted

5.16.4. Country Code

By selecting **Country Code** in the sub-menu under **Mission,** the country code can be entered in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.5. Encoding

By selecting **Encoding** in the sub-menu under **Mission,** the security encoding can be configured in the Config-menu.

If you want to configure this type of encoding…	Then select, as required…
International Standards Organization 3166	ISO 3166 (mix)
	ISO 3166 (#)
	ISO 3166 (3)
	ISO 3166 (2)
Geopolitical Entities, Names, and Codes	GENC (mix)
	GENC (#)
	GENC (3)
	GENC (2)
1059	1059 (mix)
	1059 (3)
	1059 (2)
Federal Information Processing Standards	FIPS10-4 (mix)
	FIPS10-4 (4)
	FIPS10-4 (2)

5.16.6. SCI/SHI

By selecting **SCI/SHI** in the sub-menu under **Mission,** the security instructions can be entered in the Config-menu.

Note: If the classification of any file is Top Secret, Secret or Confidential and requires special handling, then SCI/SHI digraphs, trigraphs, or compartment names must be added identifying a single or a combination of special handling instructions.
Options listed in the table below:

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.7. Caveats

By selecting **Caveats** in the sub-menu under **Mission,** custom notes and advisories can be entered in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.8. Releasing Inst

By selecting **Releasing Inst** in the sub-menu under **Mission,** the releasing organization can be entered in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.9. Object Country

By selecting **Object Country** in the sub-menu under **Mission,** the country of origin can be entered in the Config-menu.

Note: Up to 17 characters of custom text are available.

If you want to…	Then press…
Select letters or numbers	Up or Down
Move the cursor to the previous or the next space.	Left or Right

5.16.10. Encoding

By selecting **Encoding** in the sub-menu under **Mission,** the required country of origin encoding can be set in the Config-menu.

If you want to configure this type of encoding…	Then select, as required…
International Standards Organization 3166	ISO 3166 (#)
	ISO 3166 (3)
	ISO 3166 (2)
Geopolitical Entities, Names, and Codes	GENC (Ad Sub)
	GENC (#)
	GENC (3)
	GENC (2)
1059	1059 (3)
	1059 (2)
Federal Information Processing Standards	FIPS10-4 (4)
	FIPS10-4 (2)

5.17. Ext. Ports

This section provides instructions to set up the external RS-232 (COM1 to COM4) and RS-422 (COM5 and COM6) communications ports.

Note: The configuration procedure is the same for each protocol. Saving the settings and rebooting the system will be required after any changes made to Ext Ports, otherwise they will not take effect.
Details on saving menu settings are found under **Save Settings**.

5.17.1. COM Protocol

By selecting **COM Protocol** in the sub-menu under **External Ports,** the communication protocol for each port can be selected in the Config-menu.

On the right side of all COM protocols, you will find two communication indicator arrows. The upper arrow pointing to the right will indicate yellow color when the TCU is sending data. The lower arrow pointing to the left will indicate green color when the TCU is receiving data.

If you want to configure…	Then select…
Advanced protocol for Trakka Searchlight slaving and full remote control. **Note:** Trakka SL+ shall only be used at one COM-Port at a time.	Trakka SL+
Protocol for Trakka Searchlight slaving only.	Trakka SL
Standard TC Protocol for command & control.	TC Protocol
No communication on the com port.	None
Direct connection to the secondary GPS for debugging. **Note:** This will prevent the GPS from working.	UBX (SEC GPS)
Direct connection to the primary GPS for debugging. **Note:** This will prevent the GPS from working.	UBX (PRI GPS)
Output for redirecting debug messages to the given port for debugging the system.	Debug Output
GPS correction data.	RTCM
Radar interface.	NMEA Radar
Output the target position in NMEA format.	NMEA Target
Output the current position and accept a heading from the vehicle in NMEA format.	NMEA Vehicle
Searchlight slaving.	SLASS

5.17.2. Baud Rate

By selecting **Baud Rate** in the sub-menu under **External Ports,** the rate at which data is transferred can be set in the Config-menu.

If you want to configure…	Then select…
A customized baud rate	Baud rate from 4800 to 115200, or 921600 for Ports 5 and 6

5.18. HD-EO Sensor

This section describes available settings for the HD-EO sensor.

Note: The options below may vary depending on sensor configuration.

5.18.1. WB Type

By selecting **WB Type** in the sub-menu under **HD-EO Sensor,** the white balance algorithm can be selected in the Config-menu.

If you want to…	**Then select…**
Have the sensor to detect significant shifts in ambient lighting shifts and dynamically changes the white balance.	Auto
Use a preset white balance for daylight with clear sky conditions.	Outdoor
Use a preset white balance for sunrise/sunset with clear sky conditions.	Indoor
Lock white balance based on a reference white source.	Auto (1-shot)

5.18.2. Saturation

By selecting **Saturation** in the **HD-EO Sensor** menu**,** the color saturation can be changed. Color saturation refers to the intensity of color in an image. As the saturation increases, the colors appear to be purer. As the saturation decreases, the colors appear to be more washed-out or pale.

A positive value increases the color saturation up to a maximum of 100.

A negative value decreases the color saturation down to a minimum of -100.

Note: A value of 0 is the default color level.

If you want…	**Then select…**
The image color to increase	Increase the value by pressing upwards
The image color to decrease	Decrease the value by pressing downwards

5.18.3. AF After Zoom

Note: The following option will only be available in the HD-EO sub-menu for sensors without built-in Continuous Auto Focus.

By selecting **AF After Zoom** in the sub-menu under **HD-EO Sensor,** the command to the sensor to auto focus after completing zoom can be set in the Config-menu.

If you want…	**Then select…**
Auto Focus After Zoom activated.	On
Auto Focus After Zoom deactivated	Off

5.18.4. Digital Zoom Limit

By selecting **Digital Zoom Limit** in the sub-menu under **HD-EO Sensor**, the digital zoom can be limited.

Note: Maximum digital zoom limit depends on sensor configuration.

If you want to…	**Then select…**
Increase the digital zoom limit	A higher value
Decrease the digital zoom limit	A lower value

5.19. MWIR Sensor

This section describes available settings for the MWIR sensor.

Note: The options below may vary depending on sensor configuration.

5.19.1. AF After Zoom

By selecting **AF After Zoom** in the sub-menu under **MWIR Sensor,** the command to the sensor to auto focus after completing zoom can be set in the Config-menu.

If you want…	Then select…
Auto Focus After Zoom activated	On
Auto Focus After Zoom deactivated	Off

5.19.2. Digital Zoom Limit

By selecting **Digital Zoom Limit** in the sub-menu under **MWIR Sensor**, the digital zoom can be limited.

Note: Maximum digital zoom limit depends on sensor configuration.

If you want to…	Then select…
Increase the digital zoom limit	A higher value
Decrease the digital zoom limit	A lower value

5.19.3. Histogram

By selecting **Histogram** in the sub-menu under **MWIR Sensor,** different types of histogram settings can be chosen.

If you want…	Then select…
Histogram turned off	Off
Histogram on a low-level setting (darker)	Low
Histogram on a medium-level setting	Medium
Histogram on a high-level setting (lighter)	High

5.19.4. Integration

By selecting **Integration** in the sub-menu under **MWIR Sensor,** different types of pre-set environments can be chosen. Depending on the surrounding temperature, the image might be better if a matching pre-set environment is set.

Note: The list of options may vary depending on IR sensor. Refer to section *2. Control unit*, and *Mid-wave infrared (MWIR) sensor*.

If the surrounding temperature…	Then select…
Is very hot	Hottest
Is hot	Hot
Is warm	Warm
Is mild	Mild
Is Cold	Cold
Is very cold	Coldest

5.19.5. Cooler Mode

The cooler mode allows you to extend the life of the MWIR sensor cooler by disabling it when the camera is not in use. By selecting **Cooler Mode** in the sub-menu under **MWIR Sensor**, the Cooler Mode can be changed according to the table presented below.

Note: The Cooler Mode is only available in the menu when supported by the MWIR sensor.

If you want to have the …	Then select…
IR sensor cooler active and produce video at all time	On
IR sensor cooler disabled with no video. It may take several minutes to produce video when IR sensor is selected.	Off
IR sensor cooler active, but at reduced level. IR sensor produces no video but can be restored more quickly when selected.	Standby [1]

[1] The standby configuration is not supported by all MWIR sensors.

5.19.6. Lens Mode

By selecting **Lens Mode** in the sub-menu under **MWIR Sensor**, two lens modes can be chosen: Normal or ultra-wide. The ultra-wide mode offers an expanded field of view.

Note: Using the ultra-wide mode may result in slight image distortion.

If you want to use the…	Then select…	OSD area	OSD displays
Normal mode (standard)	Normal	9	W
Ultra-wide mode	UltraWide	9	UW

5.20. SWIR Sensor

This section describes available settings for the SWIR sensor.

5.20.1. Digital Zoom Limit

By selecting **Digital Zoom Limit** in the sub-menu under **SWIR Sensor**, the digital zoom can be limited.

Note: Maximum digital zoom limit depends on sensor configuration.

If you want to…	Then select…
Increase the digital zoom limit	A higher value
Decrease the digital zoom limit	A lower value

5.21. Diagnostics

The diagnostic section displays the software versions and system information linked to the system.

If you want to display…	Then select category…
Internal log messages. See Appendix A.	BIT History
The software versions in the TCU.	Versions
GPS information	GPS
The following system information: - Serial Number - IP Address - Hours (Running time) - Temperature (Inside of the TCU) - Relative Humidity (Inside of the TCU) - Voltage (if available) - Current (if available)	System

5.22. Save Settings

When any settings have been changed, it can be saved in two ways.

If you want to…	Then…
Save the changed settings for now (will not last after system restart)	Press Menu
Save the changed settings permanently (will last after system restart)	Long press Menu

6. This document

6.1. Revision history

Revision	Date	By	Reference	Comment / Change description
A	18 JUN 2024	JP	ABSO-00407	Initial release

6.2. Full change description

Revision	Section / Page	Details

Appendix A – BIT (Built in test) codes

BIT codes		
Id	**Code**	**Description**
1	HUB COMMS	Indicates no communication between HUB and Main Board
2	SIB COMMS	Indicates no communication between SIB and Main Board
3	MTR JUMPER	Indicates the motors are disabled by jumper
4	AZ ENC FAULT	Indicates an error with the azimuth encoder
5	EL ENC FAULT	Indicates an error with the elevation encoder
6	EEPROM CSUM	Indicates the internal EEPROM is invalid
7	MTR PROT OAZ	Motor protection overcurrent - outer azimuth
8	MTR PROT OEL	Motor protection overcurrent - outer elevation
9	MTR PROT IAZ	Motor protection overcurrent - inner azimuth
10	MTR PROT IEL	Motor protection overcurrent - inner elevation
11	NO SD CARD	Main board has no SD Card for error reporting
12	DB VERSION	Database version doesn't match firmware
13	SW VERSION	Software versions don't match
14	IMU ID	IMU ID not recognized
15	ANT BASELINE	Configured distance between GPS antennas doesn't match detected
16	NO S/N	Indicate that the systems serial number has not been set in the EEPROM
17	GPS FW	Unsupported GNSS chip firmware
18	IMU ALARM	IMU alarm
19	EEPROM BACKUP	EEPROM backup checksum error
20	TEMP SENSOR	SIB temperature sensor failure
21	PRI ANT SHORT	Primary GNSS antenna shortage
22	SEC ANT SHORT	Secondary GNSS antenna shortage
23	AZ AXLE ALARM	Azimuth axle alarm caused by motor encoder, angle encoder or mechanical stop failure
24	EL AXLE ALARM	Elevation axle alarm caused by motor encoder, angle encoder or mechanical stop failure