



MTGR

Micro Tactical Ground Robot User Manual



Table of Contents

Warranty and Liability	4
Introduction	5
MTGR System Case Content.....	7
Supplied Cables	8
Batteries	10
MTGR Technical Specifications.....	11
ROCU-7 Technical Specifications.....	12
Wave Relay MPU3 Communication Unit - Technical Specifications	13
MTGR Overview – Upper View	14
MTGR Overview –Front View	15
MTGR Overview –Rear view.....	16
ROCU-7 Overview –Front View	17
MPU3 - Communication Unit Overview	19
Getting Started	20
Getting Started – switching on the MTGR.....	20
Getting Started – Switching on the ROCU-7.....	25
Connecting the Comm. Unit to the ROCU-7 and Battery.....	27
Rough Terrain Wheel Kit	28
Operation Interface	41
Operating – Basic Navigation.....	42
Operating – ROCU-7 Button Method	44
System States.....	45
Operating – Views.....	46
Operating – Status View Mode	47
Operating – Status View Mode	49
<i>Camera Selection.</i>	49
<i>Illumination Selection.</i>	50
<i>Digital Zoom.....</i>	50
<i>Arms Presets</i>	52
<i>Virtual Joystick.</i>	53
<i>Log</i>	54
<i>Manipulator</i>	55
<i>Laser.</i>	56
Menu - Settings	57
Settings: Recording	58

Settings: Platform.....	60
Settings: Platform: Illumination.....	62
Settings: ROCU-7	63
Settings: General.....	64
ICD	65
Mechanical Formation	65
<i>MTGR Top View with Picatinny:</i>	66
<i>MTGR Rear View with Picatinny:</i>	67
Electronic Formation – Glenair Mighty-Mouse	68
<i>Connector Line Out.</i>	69
MTGR Tactical Manipulator.....	70
Manipulator Technical Specifications:.....	71
Manipulator Overview –Front View	73
Manipulator Overview – Camera Module	74
Getting Started – Installing the MANP on the MTGR	75
Getting Started – Switching on the MANP.....	78
Operating – Using the ROCU-7 in MANP Mode	80
Operating – Status View	81
Operating – Menu Mode.....	82
Operating – Manipulator Presets	83
Operating – Changing Manipulator View.....	84
Troubleshooting.....	85
Single Camera Malfunction	85
Communication Malfunction	86
MTGR is Drifting in One Direction	87
IMU Malfunction / Arms Are Not Calibrated	88
GPS is Not Responding/Accurate	88
Arms Are Not Responding	89
Log Folder is Empty.....	90
Storage Maintenance.....	91
Operational Maintenance	92
Tightening the Systems' Tracks	94
<i>Main Tracks</i>	94
<i>Arms' Tracks</i>	96
Appendix A: Contact	97

Warranty and Liability

Please carefully read the following before operating any part of the MTGR System

- Use of any part of the system (MTGR, ROCU-7, MANP) is exclusively the responsibility of the operator
- All operators must attend the MTGR training course provided by Roboteam and or its affiliates and be qualified before operating the system
- Be careful of moving parts to avoid injury – to fingers or other body parts
- Roboteam and its affiliates are not responsible in any way for injuries resulting from misuse of the system
- Do not perform any maintenance procedures before verifying that the battery has been removed from the MTGR and/or the Manipulator Arm
- Do not try and operate the system with batteries other than those specified. This can result in irreversible damage to the system, hurt the operator, and damage the surroundings
- Do not look into the lasers and/or into the LED illumination module (both IR and visible) Lasers are eye-safe in accordance with Class IIIa classification



Introduction

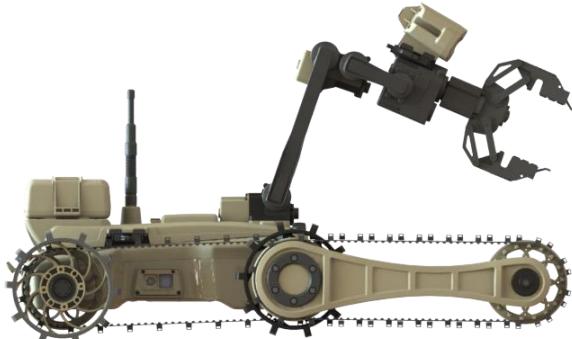
MTGR SYSTEM

The MTGR System consists of a Micro Tactical Ground Robot (MTGR); Manipulator arm (MANP); Ruggedized Operator Control Unit (ROCU) and Accessories set.

The MTGR is a unique and robust lightweight, tactical unmanned vehicle with high maneuverability in a variety of terrains both indoors and outdoors while maintaining a simple and intuitive control interface.

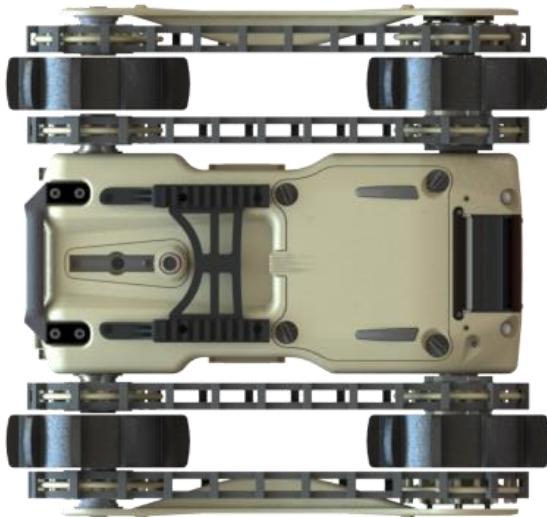
The MTGR was specially designed to aid ground forces in various combat situations. The system includes the ROCU-7, a generic, hand-held, 7" screen, high resolution, and resistive touch-screen operator console with gamepad controllers.

Moreover, the MTGR's unique communication system allows a single operator to control several unmanned systems land, air and maritime.



MTGR - Main Features

- Maneuverability in any terrain
- Ability to climb stairs and overcome other vertical obstacles both indoors and outdoors
- 360° video coverage day & night vision for uninterrupted mission control
- Intuitive control unit
- Includes inertial sensors
- Enables mounting of various add-ons (manipulator arm, thermal camera, and more) through standardized connections



MTGR System Case Content



MTGR



ROCU-7+ x2 Protective Film



X2



Lite Adapter X2



Manipulator



MPU3



X2



X6



Documentation



Battery Charger for BB-2557/U



Tracks Gauge



ROCU7-MPU3 Data Cable
(ROCU-M-2030-00)



ROCU7-MPU3-Battery Cable
(ROCU-M-4000-28)



ROCU-7 Technician Cable
(ROCU-M-2020-00)



Field Tool Kit

Rachet wrench handle- drive 1/4"
Socket wrench adapter 1/4"-3/8"
Socket wrench extention 3"-drive 1/4"
Hex socket wrench 1.5mm (108 deg. ribs) short
Hex socket - 3mm T-Handle
Hex Socket wrench 7mm-drive 1/4"
Microfiber cleaning cloth
Wheel cleaning brush
Hex L-N Key-2.5mm T-Handle
Hex socket 5.5mm D1/4
Hex Socket wrench 13mm-drive 1/4"



Drive & Idler Wheels Set

Arm flange insert x2
Arm flange (inner) x2
Drive wheel middle insert x2
Screw DIN 912 M4X55 st-st x6
Nylon Nut DIN 985 M4 st-st x8
Spring lock washer DIN 7980 M4 st-st x6



Recovery Rope



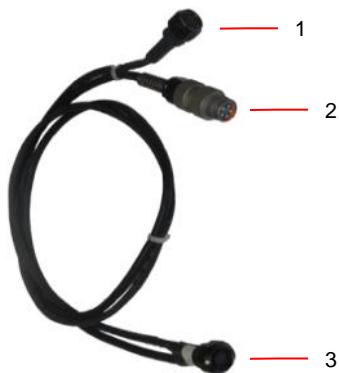
Stylus Pen

Supplied Cables



Energy Cable (ROCU-M-4000-28)

- Connects the battery to the ROCU and the MPU Comm. Unit
1. Battery
 2. Power connector to MPU
 3. Energy connector to ROCU



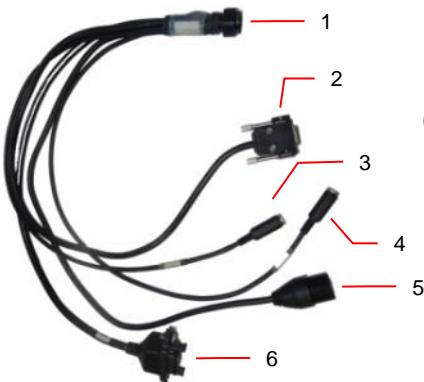
Communication Cable (ROCU-M-2030-00)

- Connects the MPU to the ROCU
1. Communication to MPU
 2. Communication to microphone
 3. Communication to ROCU



ROCU Technician Cable (ROCU-M-2020-00)

- Enables DATA updates to the ROCU
1. USB
 2. RJ45 (Ethernet)
 3. Connects to ROCU



ROCU-7 Debug Cable- (*for FSR's only*) (ROCU-M-1030-00)

- Maintenance and updates to the ROCU
1. Glenair
 2. VGA
 3. Line IN (Audio)
 4. Line OUT (Audio)
 5. USB
 6. RJ45 (Ethernet)

Batteries

BB-2557 US military battery

All system parts: MTGR, MANP, ROCU & MPU can operate with the BB-2557 battery. This battery provides 4 hours of operation time.

Quantity per system - 6 batteries.



BB-2557 Battery

MTGR Technical Specifications

Parameter	Description
Width	14.5 inches , with wheel kit 18.5 inches
Length Arms Closed	17.9 inches, with wheel kit 18.6 inches
Height	5.7 inches, with wheel kit 6.5 inches
Weight	15.0 Lbs. with wheel kit 18.5 Lbs.
Max Payload Weight	20.0 Lbs.
Speed	3.5 Kmh.
Environmental	Ingress Protection 65, Operating Temperature -4°F + 140°F
Vertical Obstacle	13.8 inches
Stair Climbing Ability	8 inches 45°
Operating Range	1600 feet . LOS
Operating Time	2 hours (operation mode dependent)
Payload Ports	Power (12-28V) Ethernet RJ45 (IP65) RS232 Video/Audio port
Mechanical Interfaces	Standard Picatinny Rails
GPS	Google Earth and Falcon View compatible
Video & Cameras	Real time day & night audio and 360° video + zoom
Sensor Tilt Module	-20° - +90°
Illumination Module	360 ° IR illumination + front white LED

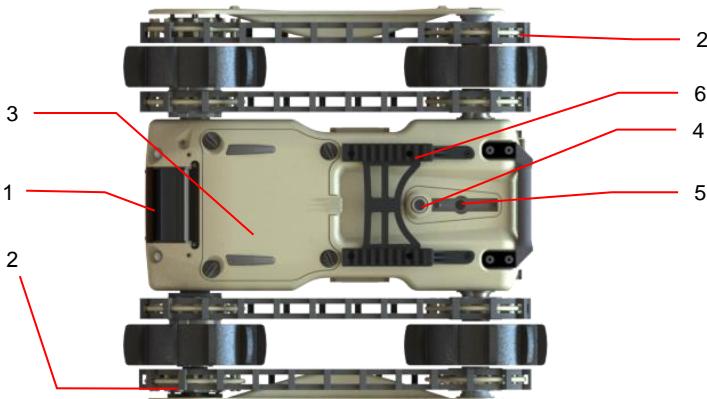
ROCU-7 Technical Specifications

Parameter	Description
Width	11.8 inches
Length	6.7 inches
Screen Size	7 inches
Weight	<ul style="list-style-type: none">○ Without battery 3.9 lbs.○ Including battery 5.0 lbs.
Ingress Protection	IP65
Operating Temperature	-4°F – +140°F
Operational Time	4 hours
Power Supply	BB-2557 US Military Standard Battery

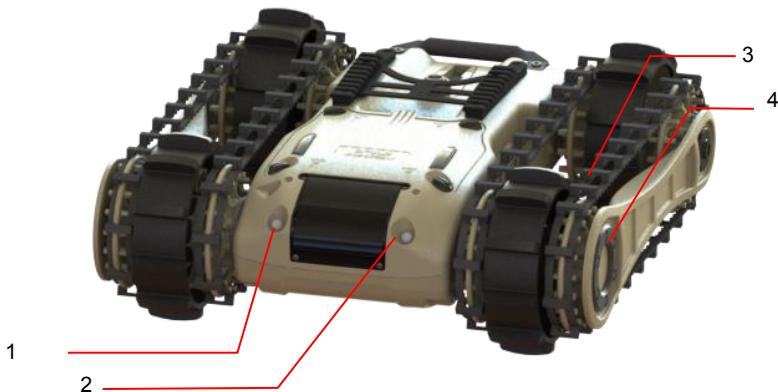
Wave Relay MPU3 Communication Unit - Technical Specifications

Parameter	Description
Width	4.7 inches
Length	5.0 inches
Weight	0.88 lbs.
Peak Transmission Power	2W
Ingress Protection	IP67
Operating Temperature	-4°F – +140°F
Encryption	256-bit AES Encryption with SHA-512 MAC on Backbone
Power Supply	BB-2557 US Military Standard Battery

MTGR Overview – Upper View



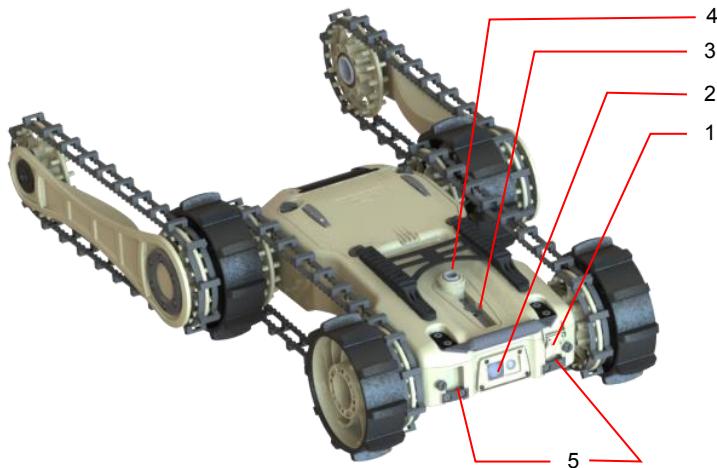
No.	Component	Description
1	Front Camera Module	Front module includes 2 cameras (wide angle and zoom camera), two laser pointers (Visible laser and Near IR laser)
2	Arms	Enables stair climbing and overcoming vertical obstacles
3	Battery Compartment	Compatible with BB-2557 US Military certified batteries
4	Auxiliary Port	Allows quick and easy connection for various add-ons (Glenair connector)
5	Communication Antenna	Enables secured MANET communication
6	Picatinny Rails	Standard mounting of sensors & devices



MTGR Overview –Front View

No.	Component	Description
1	Front White LED Light	White light LED
2	Front IR LED Light	NIR (808 nm) LED
3	Tracks	All terrain tracks enables high maneuverability in all terrain
4	Arms	Enables stair climbing and overcoming challenging obstacles

MTGR Overview –Rear view

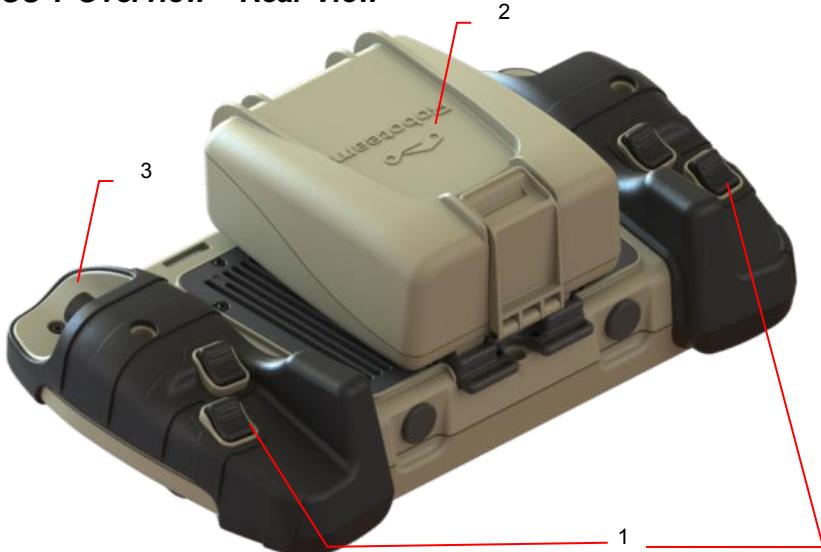


No.	Component	Description
1	ON/OFF Switch	Used for activating the robot. (Blue LED indication)
2	Rear View Camera	With IR LED illumination
3	Communication Antenna	For secured MANET communication (DATA, Video and location)
4	Glenair Connector	Enables connection of various add-ons
5	Towing Hooks	Enables manual dragging, or deploying the robot by rope

ROCU-7 Overview –Front View



No.	Component	Description
1	Drive Joystick	Uses to drive the robot in all directions
2	Buttons	Uses to activate various functions (fully configurable by user)
3	Right Joystick	Controls the front tilt camera or the manipulator Arm (when installed)
4	Touchscreen	Operate the MTGR and display video from platform's cameras
5	Battery Pack	
6	ON/OFF Button	Turns ON/OFF the ROCU-7

ROCU-7 Overview – Rear View

No.	Component	Description
1	Arms Controllers	Controls both Arms. Arms can be operated in synchronization or separately
2	Battery Pack	Enables quick and easy battery replacement
3	Communication Connector	For connecting the communication cable

MPU3 - Communication Unit Overview



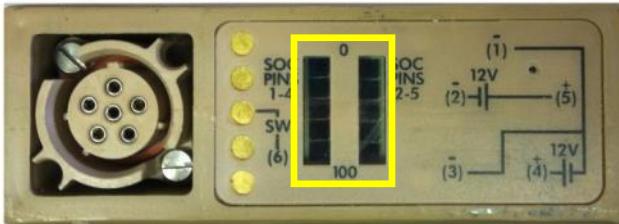
No.	Component	Description
1	Power Connector	Connect to certified battery only
2	Communication Connector	Connect to the ROCU-7 (cable type: ROCU-M-2030-00)
3	ON/OFF Button*	Warning: Do Not press this button 3 consecutive times it will erase the MPU's settings. In order to turn the MPU3 on hold this button for 3 seconds and release
4	Antenna Connector	Use only certified communication antennas

* Turn on the communication unit by connecting a BB 2557 battery or Roboteam's 24V battery ONLY

Getting Started

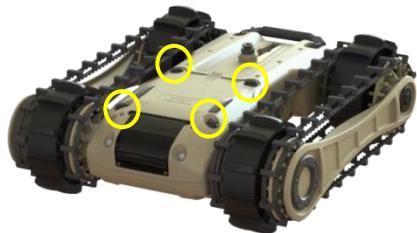
Getting Started – switching on the MTGR

1. Verify MTGR battery is fully charged



- Use only certified batteries: BB-2557 US Military standard battery (3.3Ah)

2. Unlock the 4 battery compartment latches



2

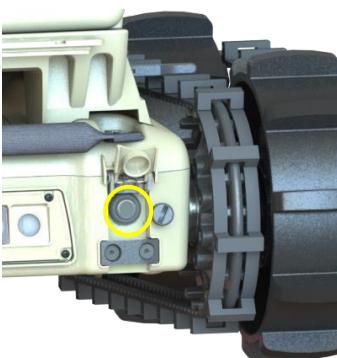
- 3.

4. Insert battery into the battery compartment, and close the battery compartment tightly
 - Battery should not be forced in



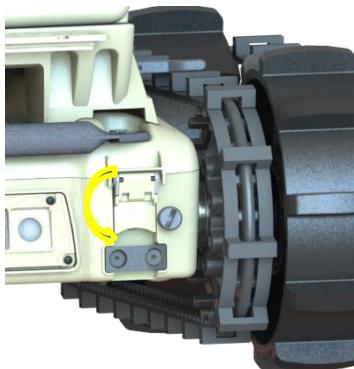
3

5. Turn on the MTGR by pressing the ON/OFF button, in the rear part of the platform



4

6. Close the protective cover over the ON/OFF button



5

7. Verify an antenna is connected



6

Warning:

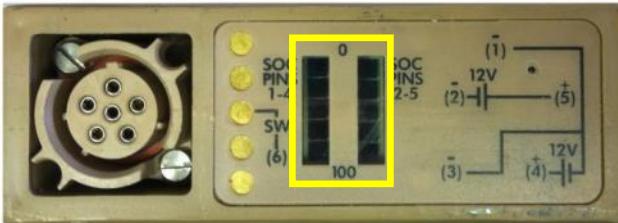
1. Use **ONLY** certified BB-2557 US Military batteries. The use of a different battery can result in irreversible damage to the platform and its components.
2. Verify that the battery is inserted in the correct alignment.
3. Do not use force when inserting the battery into the battery compartment.
4. Before operational use, batteries should be fully charged, in order to achieve maximum performance.
5. MTGR reboot time is approximately 45 seconds



Getting Started – Switching on Communication Unit

(Wave Relay – MPU3)

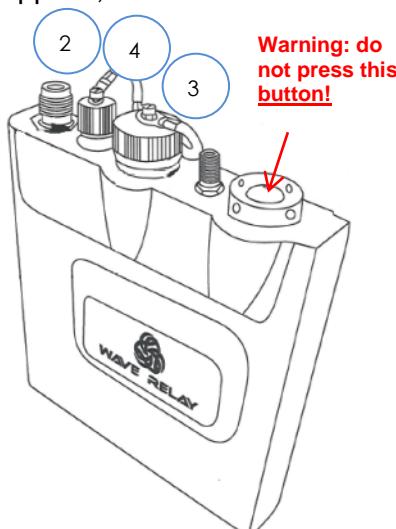
1. Verify Comm. Unit battery is fully charged.



2. Verify the antenna is connected secured to the Comm. Unit.
3. Connect Comm. unit to the ROCU-7 using the communication cable (labeled **ROCU-M-2030-00**)
4. Connect the Comm. unit to the battery; this will turn on the communication (use the cable supplied, labeled **ROCU-M-4000-28** or **ROCU-M-1020-00**).

Warning:

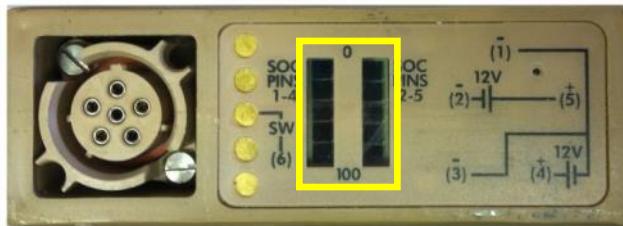
1. Use ONLY BB-2557 US Military standard batteries or Roboteam's 24V batteries
2. Pressing the ON/OFF button three (3) consecutive times will cause the system to disconnect from the MTGR and might cause irreversible damage
3. For more details please contact Roboteam Ltd.
support@robo-team.com



Warning: do not press this button!

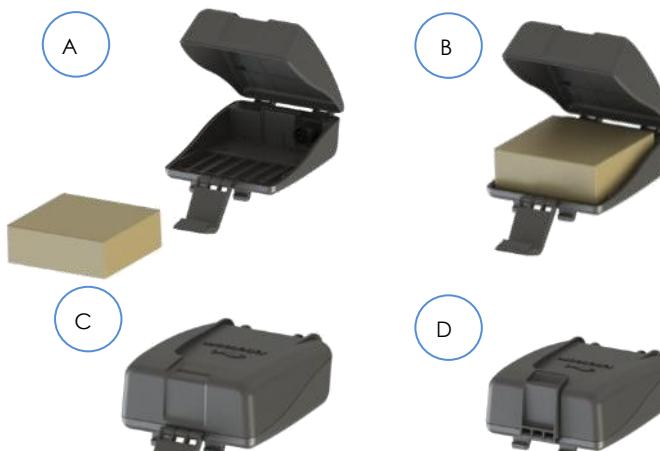
Getting Started – Switching on the ROCU-7

1. Verify battery is fully charged



1

2. Insert battery into the ROCU-7 Battery pack



2

Warning: When not in use, always remove battery from battery pack

3. Insert battery pack into ROCU-7 (Verify battery is secured)



3

4. Press the ON/OFF button located at the bottom-right side of the ROCU-7. MTGR application will load automatically



4

Connecting the Comm. Unit to the ROCU-7 and Battery

- The ROCU-7 is connected directly to the battery using the battery pack.
- The ROCU-7 is connected to the MPU3 Comm. unit via the communication cable (labeled ROCU-M-2030-00)
- The MPU3 is powered by a separate battery which connected via cable labeled ROCU-M-4000-28
- 4000-28 cable can power the ROCU-7 externally, without the use of the Battery Pack



- To verify connection is established:
 - Communication icon is OK
 - LED on MTGR is blue
 - Video is streaming



Rough Terrain Wheel Kit

The rough terrain wheel kit was developed and designed according to end-user requirements and recommendations. It was created to handle rough and harsh field conditions.

The large wheels provide higher clearance from the ground, greater mobility and higher velocity. The wheel kit is assembled in addition to the systems' tracks and creates a unique combination of superior mobility. The system is supplied with the wheel kit assembled but it can be operated without it; based on the tracks only. This configuration is more suitable for urban scenarios; enabling the system to maneuver inside a building including full operation on stairways.



Dis-assembly Instructions:

Tools Needed:

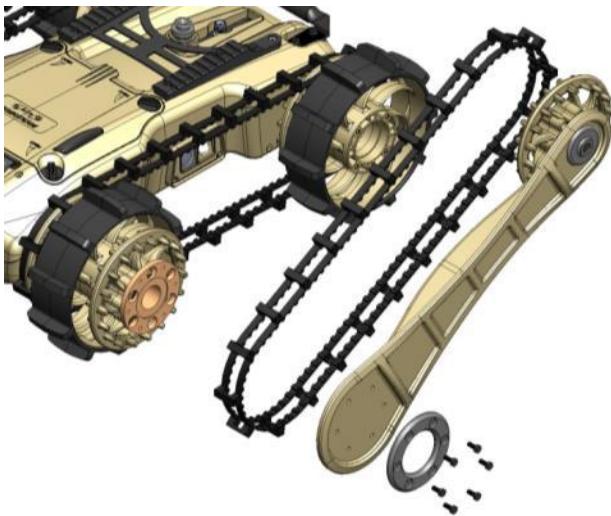
No.	Tool Name	Picture
1.	Ratchet Wrench Handle (drive 1/4" – Short Handle)	
2.	Wrench Extension Adaptor (3" –long)	
3.	Wrench Drive Adaptor (1/4" → 3/8")	
4.	7 mm Hexagonal Socket Wrench (drive 1/4")	
5.	13 mm Hexagonal Socket Wrench (drive 1/4")	
6.	19 mm Hexagonal Socket Wrench (drive 3/8")	
7.	3 mm Allen Key (T-Handle).	
8.	2.5 mm Allen Key (T-Handle).	
9.	2 mm Allen bit	

Thread Lock Glue (Loctite) – not supplied with system



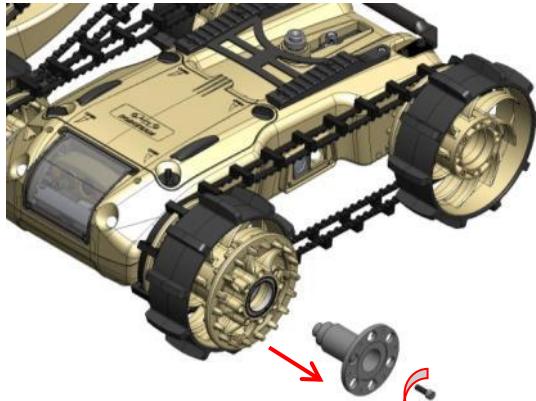
1. Front wheels:

- a. Remove Arms – Use the 7mm hexagonal socket with the Ratchet wrench and release the Arms' screws (6 screws). Detach the Arm and remove the track.

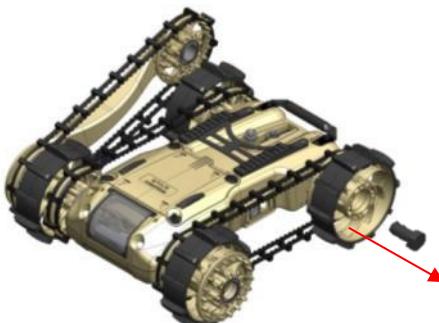


b. Remove the Main Shaft Extender –

Release security screw- use the 13 mm hex. socket wrench. Release the shaft extender by pulling it out of the main shaft.

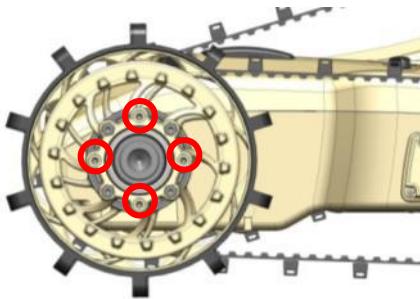


Release rear wheel, use the 19mm hexagonal socket with the ratchet handle. Unfasten the main screw (M12X25).

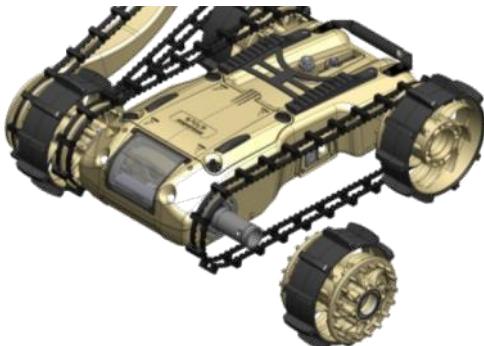


- c. Untighten track tension by releasing the tension screw using the 3 mm Allen key (remove screw cap using a flat screwdriver)

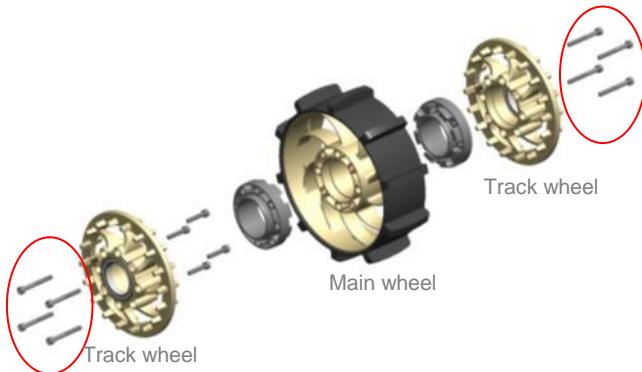
- d. Detach the front wheel assembly from the platform by unfastening four (4) fixation screws to the drive disk. Notice: fixation screws are located **deep inside the rounded** holes (screws will not fall out as they are secured inside the wheel assembly)



- e. Manually detach the wheels from the main body (two track wheels and main wheel)



- f. Release the connecting screws of the track wheels from the main wheel (four from each side). Use 3mm Allen key.



- g. Attach two track wheels; verify the middle insert is located in between. Fasten four (4) M4X55 screws through the wheels to the nuts (insert the screws through the hexagonal sockets)



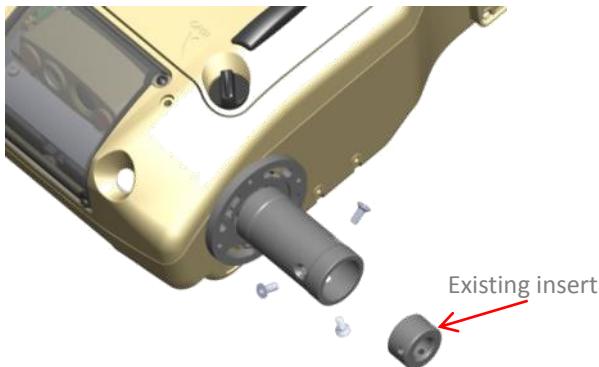
Note:

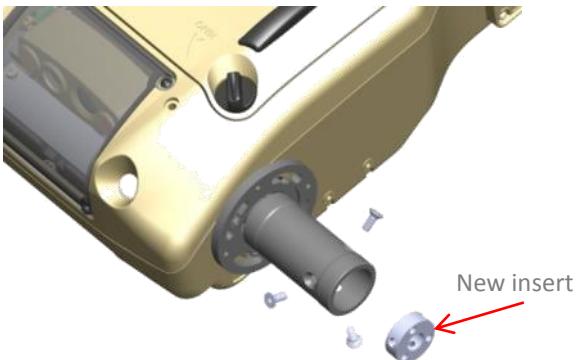
- Wheels inner ribs are facing the same rotation direction
- Verify track teeth are aligned
- Verify to attach the wheels in the correct rotation direction (shown below)

h. Front Wheel Assembly



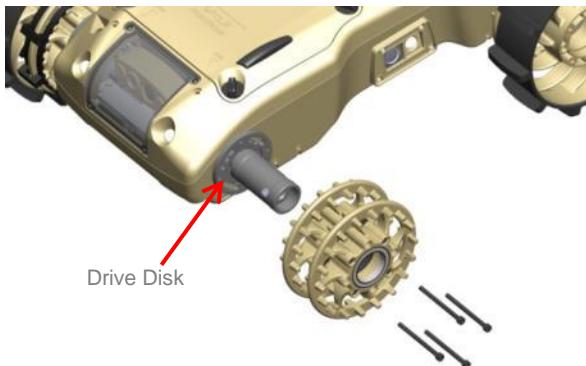
- i. Use the 2.5 mm Allen key to release the M4X6 screws (3 screws). Pull off the insert and replace it with the new insert (see next section).





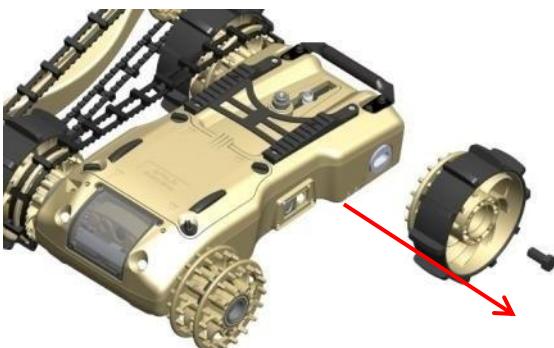
Important: Use Thread Lock glue to ensure the screws stay in place.

- j. Connect the wheels to the Drive Disk using M4X55 screws, use the 3 mm Allen key. *Notice:* fixation screws through rounded holes.

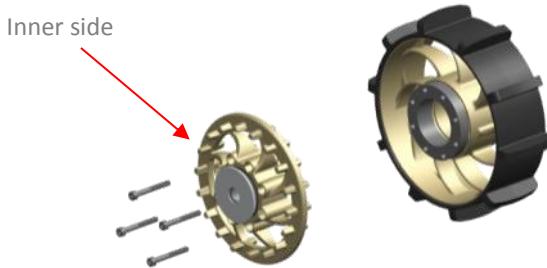


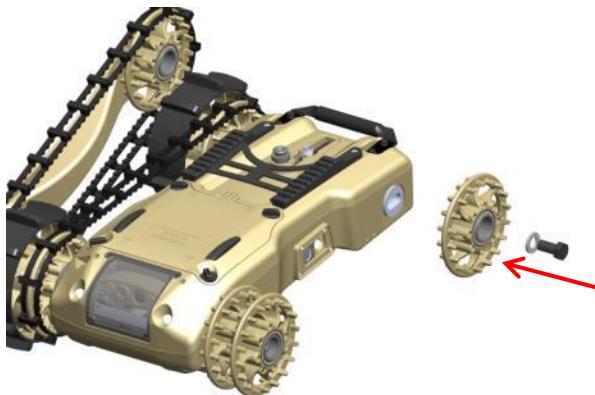
k. Rear Wheel Dis-assembly:

Unfasten the main screw (M12X25) using the 19mm hexagon socket and the Ratchet wrench + 3" extender. Remove wheel assembly from platform.

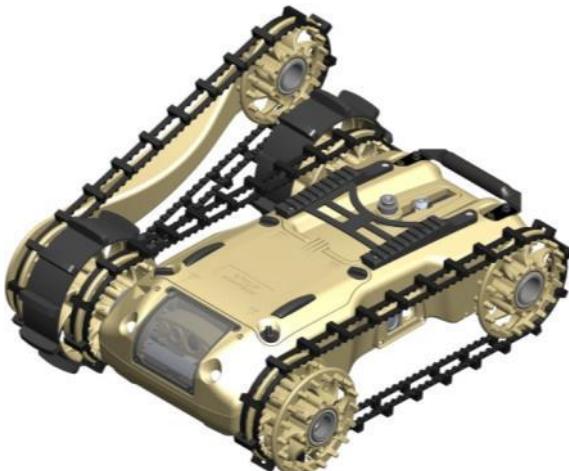


l. Unfasten four M4X35 screws using the 3mm Allen key from the internal side of the wheel.
Detach the wheels.

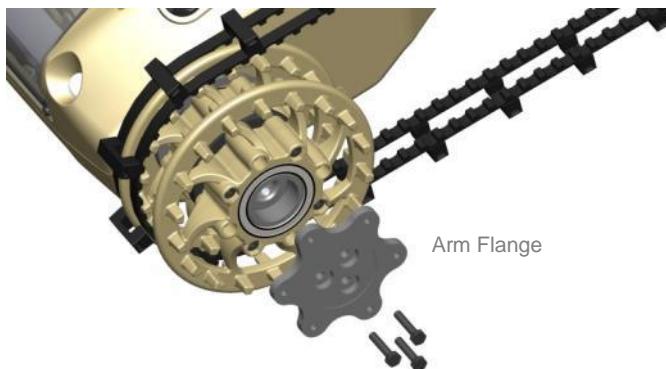




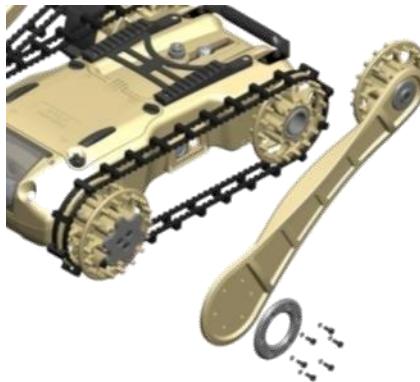
- m. Attach the rear wheel to the platform. Fasten M12X25 screw using the 19mm hexagonal socket and the ratchet wrench + 3" extender
- o. Install the drive track on the inner wheels



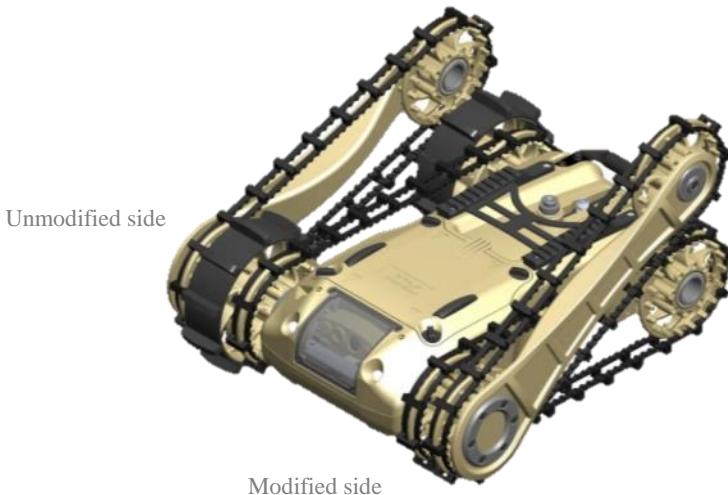
- p. Attach the Arm flange to the main shaft. Fasten three (3) M4X20 screws using the 7mm hexagonal socket and Ratchet handle.



- q. Attach the Arm to the Arm flange. Fasten six (6) M4X20 screws using the 7mm hexagonal socket and Ratchet handle. *Notice:* Verify spring washers are in place.



r. Place the track on the Arm



Repeat the sections above to wheel assemblies on the other side.

*** After replacing wheel formation verify the tracks are sufficiently tight – use the tension gauge according to page 95.

Warning

1. The MTGR consists of numerous moving parts – do not touch the MTGR while it is being operated.
2. Do not try to disassemble the MTGR – this can cause irreversible damage to the system, and will void the warranty.
3. Do not touch any exposed wires.
4. Use ONLY certified batteries! The use of different batteries from those specified in this manual is extremely dangerous!
5. Follow the safety instructions in this manual, as well as in the Maintenance manual.
6. Do not submerge the MTGR.
7. Do not toss the MTGR.
8. The MTGR should be operated by a qualified operator only.
9. The operator should always monitor the MTGR either by direct sight or by the user interface.

Operation Interface

1. The MTGR is controlled via the ROCU-7 system, which was specially designed to enable an intuitive and easy use of the MTGR on the battlefield.
2. The ROCU-7 includes multiple rugged joysticks and buttons, as well as a touch-screen which was specifically designed for use in austere conditions.
3. The MTGR has three main operation screens, which can be toggled by tapping anywhere on the touch-screen:
 - Drive view mode – This is the main driving mode with the maximum field of view with no icons
 - Status mode – this screen allows the operator to receive data concerning the main statuses of the robot: alignment, compass bearing, battery status, illumination, camera status, signal and more (this is the default view mode)
 - Menu mode – This mode allows the operator to activate all of the advanced functions available with the MTGR

Operating – Basic Navigation

1. In order to navigate the MTGR, the operator uses the left hand joystick. The MTGR can navigate in all directions and turn while in motion.



2. The tilt camera is controlled by the right hand joystick, which can also control the manipulator Arm (when installed).



3. The Arms are controlled by the rear Rockers on each side of the ROCU-7.
 - a. Before starting to climb stairs/vertical obstacles, it is important to adjust the Arms to the correct angle, either manually (by using the Arms buttons) or by using the Arms presets (see page 37).
 - b. When climbing stairs, it is recommended to SYNC the Arms, by positioning the Arms in the climbing angle (30°) and pressing the “SYNC Arm” button (see page 32).



Operating – ROCU-7 Button Method

The following button configuration is installed on the ROCU-7:



Note: These settings can be configured via MENU/ROCU-7 (see page 50)

Button	Pressing Method
ON/OFF	Single press <ul style="list-style-type: none"> • ROCU-7 is OFF: ROCU-7 turns ON • ROCU-7 is ON: Lock mode
ON/OFF	Long press: OFF
Brightness	Click + and – simultaneously: toggle day \ night mode

System States

- **OFF** – System is shut down - Initial state \ Final state.
- **ON** – MTGR application is running.
- **Lock** – MTGR application running – Joysticks, Buttons, Touch Screen – disabled.
- **Sleep** – Windows enter sleep mode (when switching to Lock mode, choose "sleep").
- **MTGR application off Windows On** – MTGR application is not running, ROCU-7 is operating as a ruggedized tablet.

Operating – Views

Drive View Mode



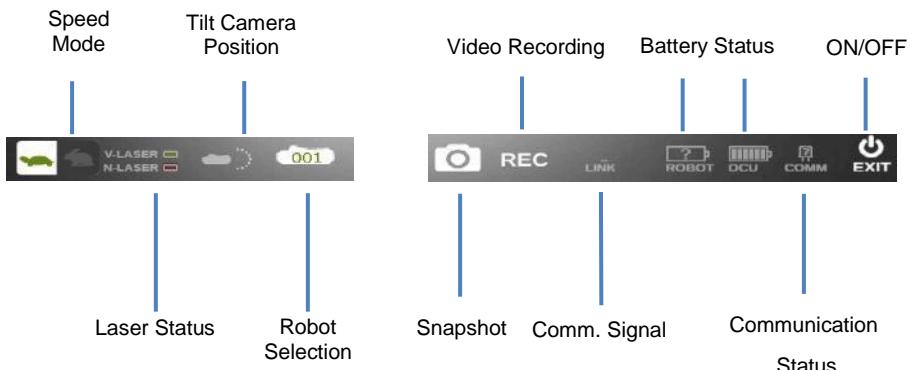
Status View Mode



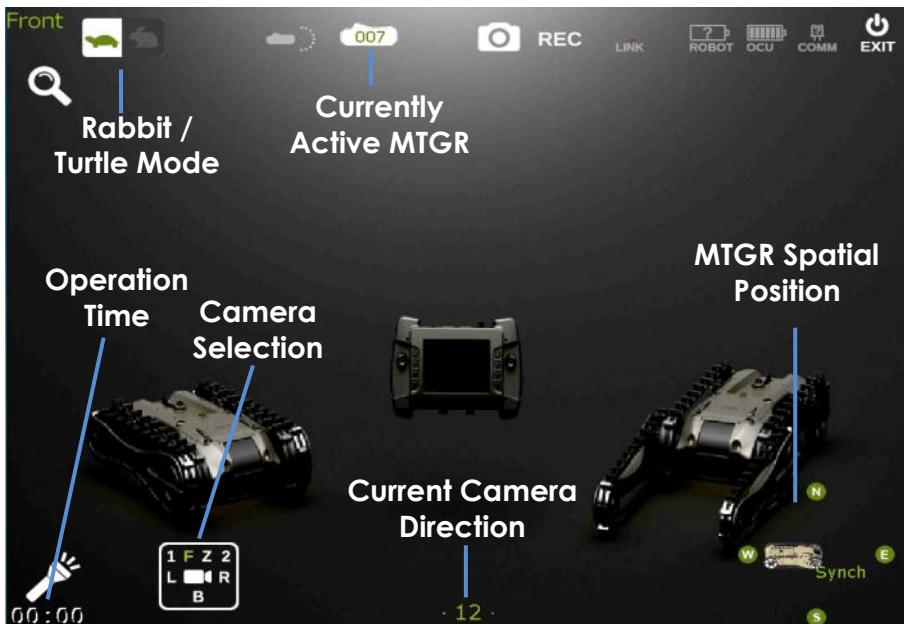
Menu View Mode



Operating – Status View Mode



Operating – Status View Mode



- Arms position is indicated by the 3D model
- Switching to Rabbit mode disables speed limit (for further details, refer to settings)
- Operation time is calculated in hours : minutes and resets on each activation of the ROCU-7

Operating – Status View Mode

Camera Selection



- The selected camera will be marked in green
- For selecting multiple custom cameras click the '?' and press the preferred cameras one after the other

Illumination Selection



- Activates \ Deactivates LED illumination module
- Operator can increase or decrease illumination strength by using the slider, or the +/- hard buttons on the ROCU-7
- White illumination is available only in the front camera
- Refer to the Settings chapter for further details regarding illumination



Digital Zoom



- This option enables the operator to zoom in on targets located in the surrounding area for more data
- Digital zoom is available on all cameras and will be performed on the currently selected cameras

Arms Presets



Enables quick access to common arms presets

- **Home** – Arms are folded on each side of the MTGR
- **Climb** – Arms are positioned 45° upwards (for climbing stairs)
- **Down** – Arms are positioned 45° downwards
- **Forward** – Arms are positioned 180° forward

Virtual Joystick



- The Virtual Joystick is extremely useful tool in case the ROCU-7 buttons are damaged. The MTGR can be fully operated by using the Virtual Joystick:
- D - Drive mode; T - Tilt module; A - Arms operation
- It is recommended to switch to Drive View Mode while working with the virtual joystick



Log



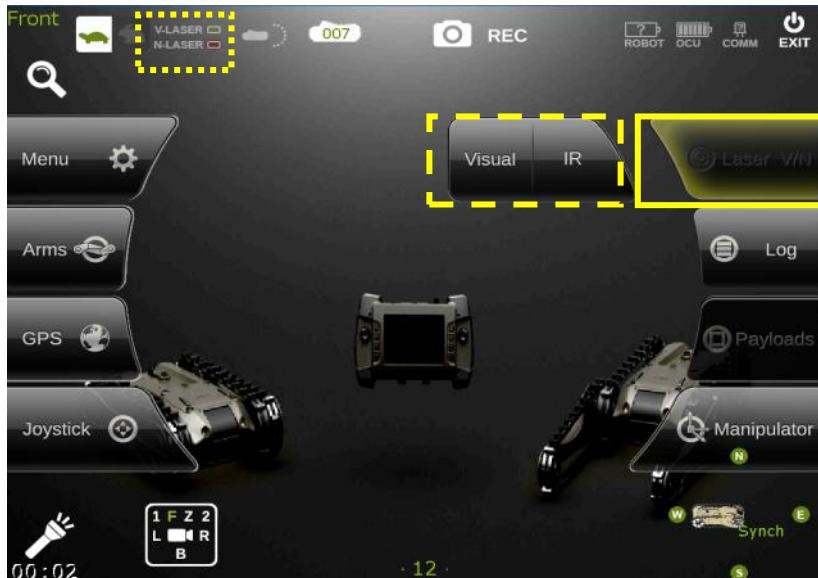
- Pressing the Log button opens the file directory in which all the captured photos and recorded videos are stored.
- The files are arranged according to date and time.

Manipulator



- Activates the Tactical Manipulator application (Please refer to page 77 for Manipulator overview and page 86 for operation instructions)

Laser



- Activates/Deactivates IR/Visible laser pointer
- Indication is presented on top of the screen
 - V-laser– Visible red laser beam
 - N-laser– Near IR laser beam



Menu - Settings

Warning

- Do not make any changes in settings unless you are a certified operator.
- Changing settings improperly can cause system malfunctions.



Settings: Recording

Recording Platform ROCU General About

Video

Recordings Folder: C:\Program Files (x86)\Safire\Recording

Screen Capture Raw Video

Resolution: Full Rate: 1/2

Capture

Capture Folder: C:\Program Files (x86)\Safire\Recording

Play Capture Sound

Disk Space

Critical (GB): 9 390 Auto Delete When Running Low Limit Record Time (min.) 10

Hard Disk Total Space - 488GB
Currently Available - 410GB
Critical Space - 48GB (10%)

Video Format

Estimated Time Left (HH:MM) 5:59 AVI MPEG-4 H.264

This screen enables the user to change settings specific to the record function of the ROCU-7. In this setting, the operator can change the target directories for recorded files, change the limits of hard drive usage or choose the format of the video files.

#	Name	Description
1	Recordings Folder	This is the target folder to which recorded videos are saved on the computer. Videos can be saved in screen capture (regular video) and/or raw video (4 camera capture). Changing resolution and rate is possible by checking their boxes.
2	Capture Folder	This is the target folder to which recorded images are saved on the computer. Playing sounds when capture is optional by checking the box.
3	Disk Space: For Recording Purposes	<p>Critical Disk Space - defines the critical level for low disk space. Beyond this level, if auto delete is checked, auto deleting will commence. If not, recording will stop automatically.</p> <p>Auto delete - checking this box will enable auto delete when reaching the critical level, according to video date.</p> <p>Limit record time - allows the operator to set a limit on recording time.</p>
4	Video Format	Allows the user to change between three formats: AVI, MPEG-4, and H.264. The values underneath each format displays an estimation of how much space (in terms of footage time) is available

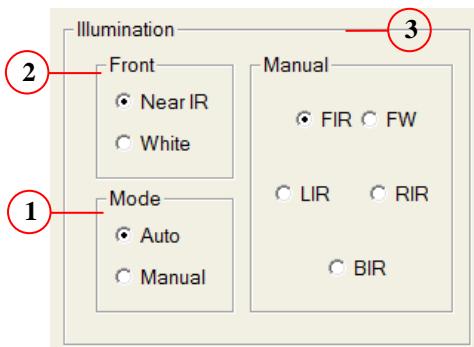
Settings: Platform

Recording Platform **ROCU** General About

Encoder Steps (360)	<input type="text" value="290"/> Type 1	Front	<input checked="" type="radio"/> Near IR	Manual	<input checked="" type="radio"/> FIR
Lens Width (NearIR)	<input type="text" value="22"/> Tracks	<input type="radio"/> White	<input type="radio"/> FW		
Stopping Distance (cm)	<input type="text" value="20"/> Wheels	Mode	<input checked="" type="radio"/> Auto	<input type="radio"/> RIR	
Gear Ratio	<input type="text" value="41.6"/>	<input type="radio"/> Manual	<input type="radio"/> BIR		
<input type="checkbox"/> Compass	<input type="button" value="Restart Cameras"/>				
<input checked="" type="checkbox"/> NormallyStop	<input type="checkbox"/> Torque	0%	100%		
<input checked="" type="checkbox"/> Arms Fast	<input checked="" type="checkbox"/> Servo	Speed Limit (60%)			
Network Bitrate (kbps)	<input type="text" value="8 (1000)"/> 7	0% 100%			
Transmit Power (mW)	<input type="text" value="9 (2000)"/> 8	200 2000			
Maintenance	<input type="text" value="10"/> 9	40 2000			
Calibration		<input type="button" value="Arms"/>		<input type="button" value="Wave Relay"/>	<input type="button" value="IMU"/>
		<input type="button" value="Reset All"/>		<input type="button" value="Cancel"/>	<input type="button" value="OK"/>

No.	Name	Description
1	Encoder Steps	Allows semi-autonomous navigation (To enable this feature please contact Roboteam (Appendix B))
2	Lens Width (Near IR)	Determines the Zoom lens angle (should not be changed after company settings, unless a lens has been changed)
3	Stopping Distance (cm)	Determines the autonomous stopping distance before objects. To enable this feature please contact Roboteam (Appendix B)
4	Illumination	Controls the Illumination preferences (for more details, refer to the next page)
5	Restart Cameras	Restarts the system's cameras in case of malfunction in the video stream
6	Servo/Torque	Divert power for more torque
7	Speed Limit	Defines speed when in "Turtle" mode. Switching to "Rabbit" will disable speed limit 
8	Network Bitrate	Controls the video compression (increasing compression will result in lower resolution, but higher communication range)
9	Transmit Power	Increase/decrease the Comm. Unit transmit power, and change the communication range
10	Maintenance	Calibration settings (refer to Maintenance Manual for more details).
11	Normally Stop	Lock the system's wheel when not in motion
12	Arms Fast	Controls the speed of the arms
13	Arms Sync	Synchronized the movement of the arms

Settings: Platform: Illumination



No.	Name	Description
1	Mode	Auto – When activating illumination, LED will be activated according to currently activated camera; front LED will be activated according to settings Manual – Illumination will be activated according to settings
2	Front (Only in Auto Mode)	Near IR – illumination will activate Near IR illumination White – Illumination will activate White light
3	Auto White Balance	FIR – Front IR illumination FW – Front White LIR – Left IR RIR – Right IR BIR – Back IR

Settings: ROCU-7

Recording Platform ROCU General About

Hard Buttons

1

A	Turtle \ Rabbit
B	SYNC Arms
C	Brightness +
D	Brightness -

1	Tilt Absolute
2	Illumination On \ Off
3	Cameras Toggle
4	Manipulator

Panel Light (128) 0 255

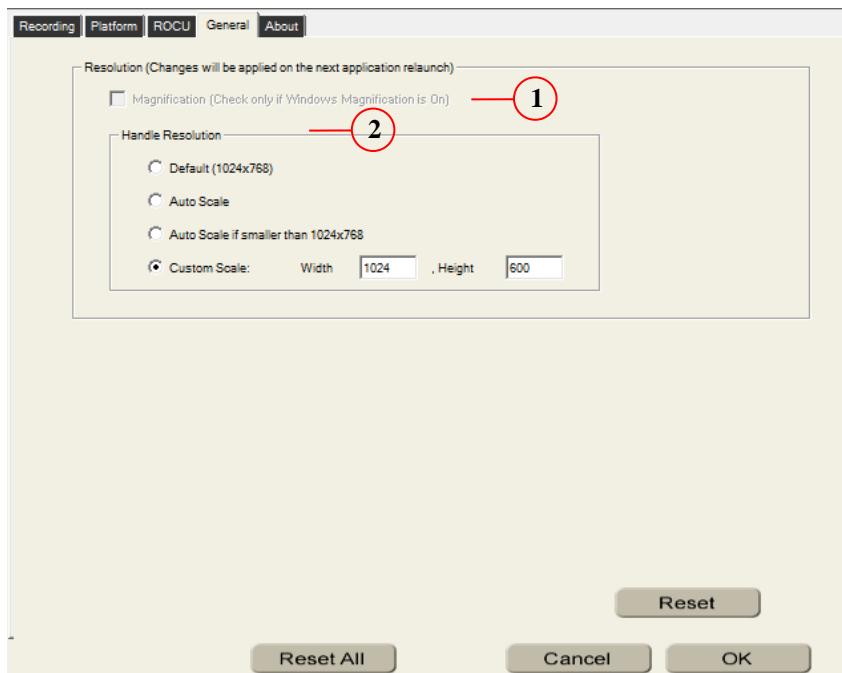
Joysticks 2

Reset

Reset All Cancel OK

No.	Name	Description
1	Buttons	Assign operations to hard buttons
2	Joysticks	Calibrate the Joysticks

Setings: General



No.	Name	Description
1	Magnification	Available only when Tablet is supplied
2	Handle Resolution	Operator can change the screen resolution according to the size of the screen

ICD

The MTGR was designed to be compatible with various standard add-ons, such as:

- Thermal camera
- Tactical manipulator
- Beacons

Note: Maximum payload weight is 10 lbs.

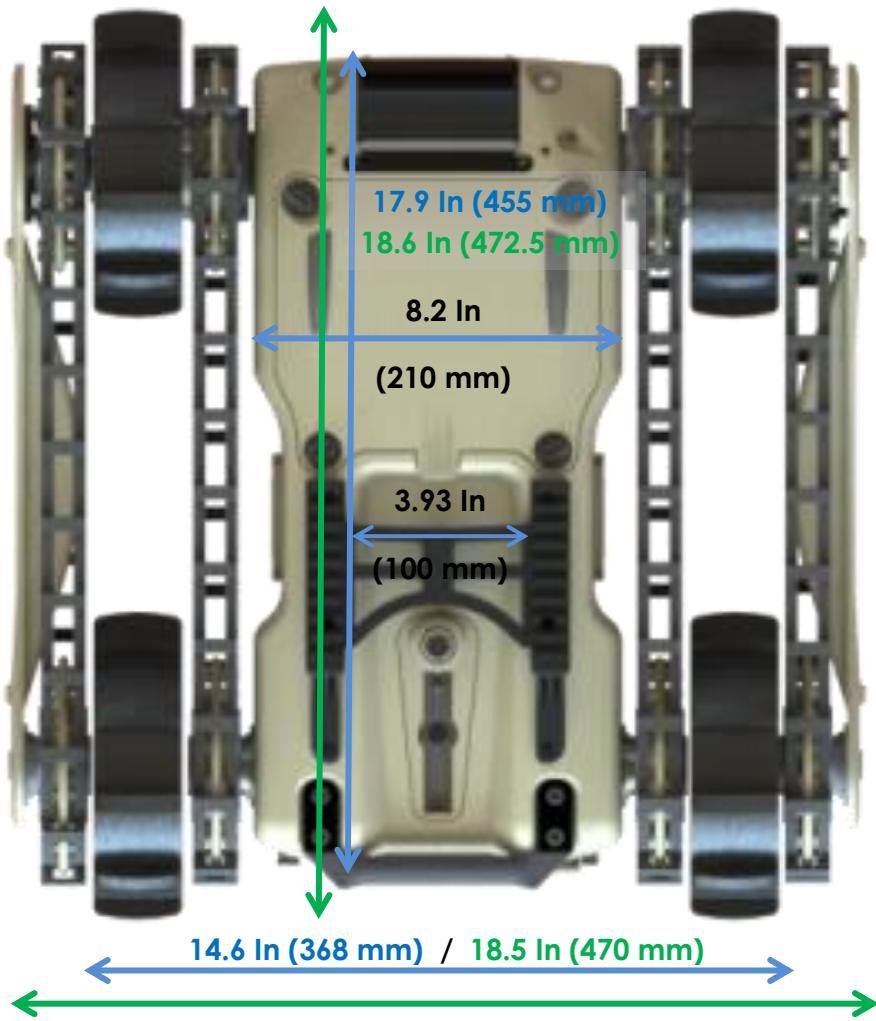
The following chapter will describe the details regarding the connection options on the MTGR.

Mechanical Formation

The MTGR is equipped with two (2) standard Picatinny rails, which are located at the end of the robot.



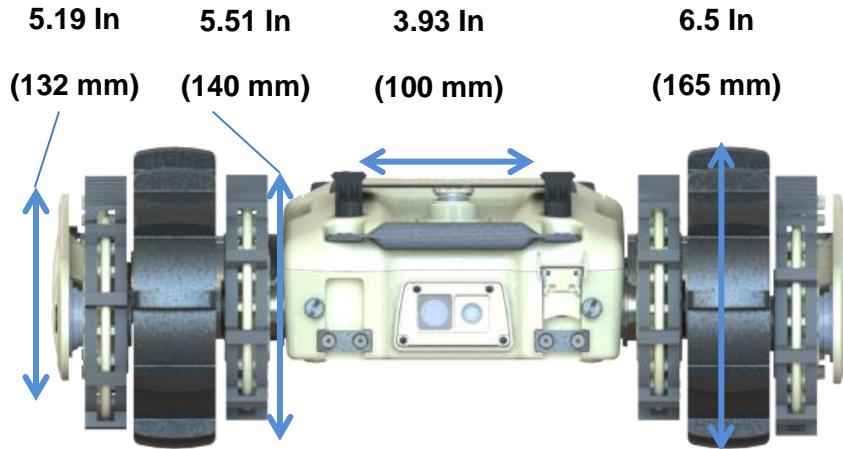
MTGR Top View with Picatinny:



MTGR Rear View with Picatinny:

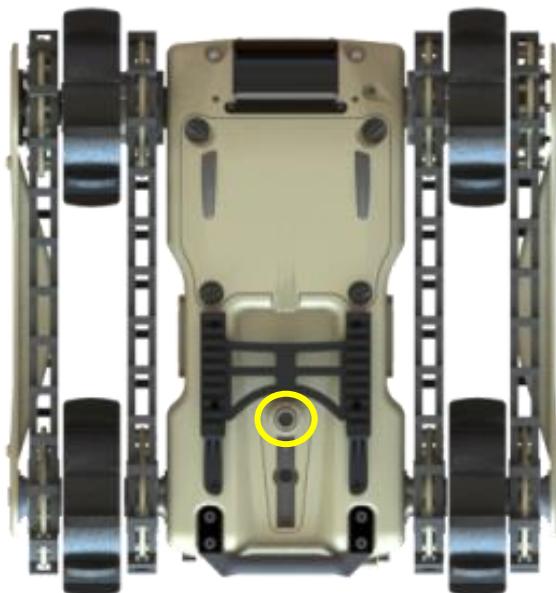
Note: height difference between the Picatinny rail and the inner tracks is approximately 0.32 in (8 mm).

Note: the MTGR will not be able to flip itself over while a payload is attached to it



Electronic Formation – Glenair Mighty-Mouse

The MTGR is equipped with a Glenair Mighty-Mouse connector. The connector is located in the rear part of the MTGR, between the Picatinny rails, as shown in the following image:



Connector Line Out

- 19 pins
- Pin configuration:

Audio WR	LAN
Audio Com	Video
USB	General

PIN	Description	Comments
1	In Battery - GND	
2	In Battery - GND	
3	In Battery + 14.4V	
4	In Battery + 14.4V	
5	14.4V out (0.5A)	
6	5V out (2A)	
7	GND out	
8	Video 1 IN	
9	Video 2 IN	
10	Video Audio GND	
11	Video 1 5V (0.15A)	
12	Video 2 5V (0.15A)	
13	CANL	
14	CANH	
15	TX+	* To enable these pins (16 – 19) please contact Roboteam at support@robo-team.com
16	TX-	
17	RX+	
18	RX-	
19	Audio Out	

MTGR Tactical Manipulator

The MTGR Tactical Manipulator is fully intuitive robotic Arm extending the range of operation of the MTGR, and allows it to handle and manipulate various objects in the environment.

The manipulator was designed primarily in order to enable the MTGR to dismantle IED's (by placing counter explosive), remove small debris and obstacles, place sensitive sensors and more.



Manipulator Technical Specifications:

Name	Description
Actuator DOF (Degree Of Freedom)	
Shoulder	180° Pitch
Elbow	+/- 110° Pitch
Wrist	360° continues Pitch
Gripper	0-100°
Operating Time	4 hours
Installation Time	under 30 Sec.
Environmental	IP65 MIL-STD-810F
Max Gripper Opening	110 mm
System Weight	7.2 lbs.
Max Lift Capacity	5 lbs. (fully extended)
Reach Length	390 mm MAX; 50 mm MIN

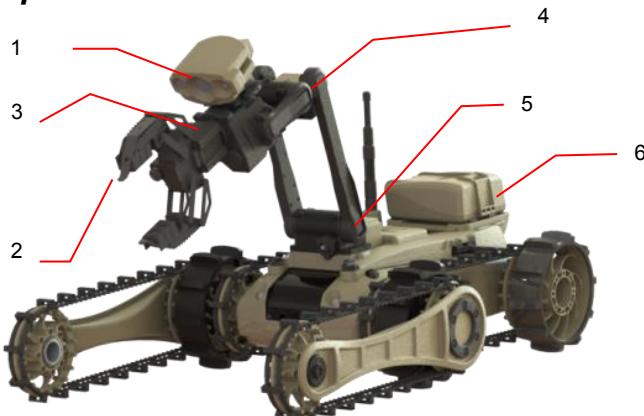


Stowed Dimensions	450X100X70 mm
Cameras	Gripper Mintron camera
Mintron Camera	10X Optical ZOOM LENS MTV-54G10H-R
Gripper Camera	
Resolution	480 TVL
Robot Connection	Glenair Connector Mighty Mouse 801-007
Operating Voltage	10V – 32V



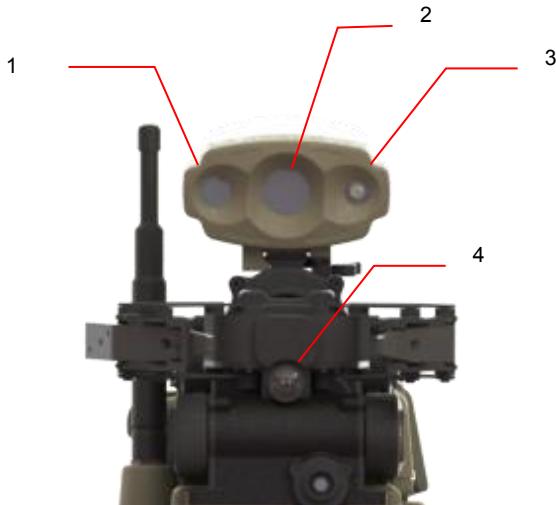
Operated by Additional External Battery

Manipulator Overview –Front View



No.	Component	Description
1	Camera Module	Includes 2 Illumination modules and a camera
2	Gripper	Enables the MANP to pick up and handle objects
3	Wrist	Enables the gripper to rotate 360°
4	Elbow	Enables the movement of the MANP on the vertical plane
5	Shoulder	Enables the movement of the MANP forward and backward
6	Battery Compartment - Detachable	Houses the battery of the MANP (optional)

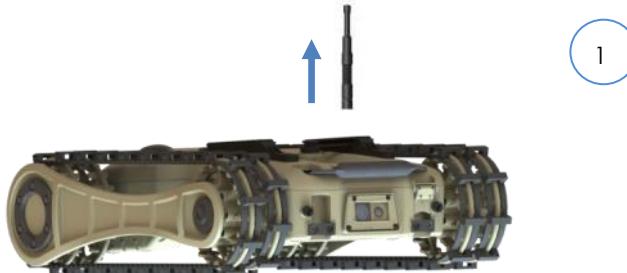
Manipulator Overview – Camera Module



No.	Component	Description
1	Front Illumination	White illumination – for close range
2	Camera	Optical Zoom (X10) camera
3	Narrow Illumination	White illumination – for longer range
4	Gripper Camera	Gives better perception when handling the gripper

Getting Started – Installing the MANP on the MTGR

1. If using a Spring Antenna, remove the antenna from the MTGR.



2. Attach the MANP to the MTGR lock it down using the two bayonet screws



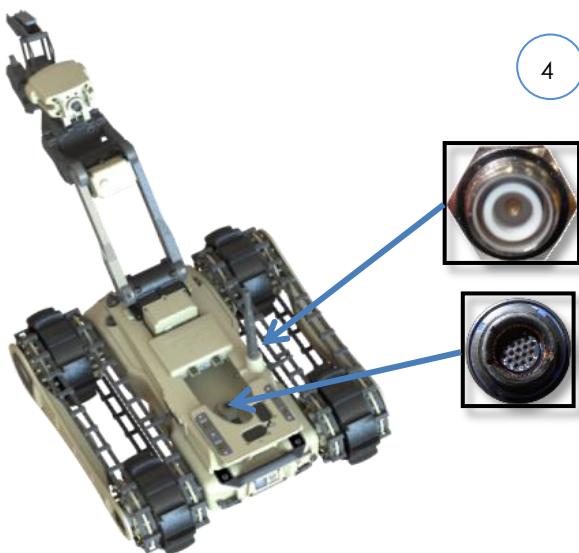
-
3. Fasten the Picatinny latch and verify that the MANP is secured.

3



4. Connect 19-pin cable and antenna cable

4



5. Verify that a charged battery is installed in the battery pack, and connect the battery pack (same process as the ROCU-7 battery pack).



* When not connecting an external battery the manipulator will run on the MTGR's battery



Getting Started – Switching on the MANP

1. In order to switch to Manipulator mode, press the Manipulator button in the MENU, or press hard button no.4 on the ROCU-7.



2. The MANP controls will appear on top of the regular display



Operating – Using the ROCU-7 in MANP Mode



Left Rocker: MTGR
Arms control

Right Rocker:
Shoulder control



Operating – Status View



- Selecting the MTGR model (lower right corner) will enable the control over the robot and all navigation buttons will revert to MTGR functions
- When on Zoom mode, optical zoom can be controlled by moving the left joystick horizontally (focus will be adjusted automatically). When switching to Focus mode, the focus can manually adjusted by moving the left joystick horizontally

Operating – Menu Mode



- Pressing the settings allows to edit various advance options of the MANP
- Press the calibration button in order to calibrate the Manipulator in case it is not calibrated (see Maintenance Manual for further instructions)

Operating – Manipulator Presets



- This allows the user to choose between 4 commonly used presets that were specifically designed in order to assist in common Manipulator tasks
- Up to 4 custom presets can be saved by using the "Custom" button

Operating – Changing Manipulator View

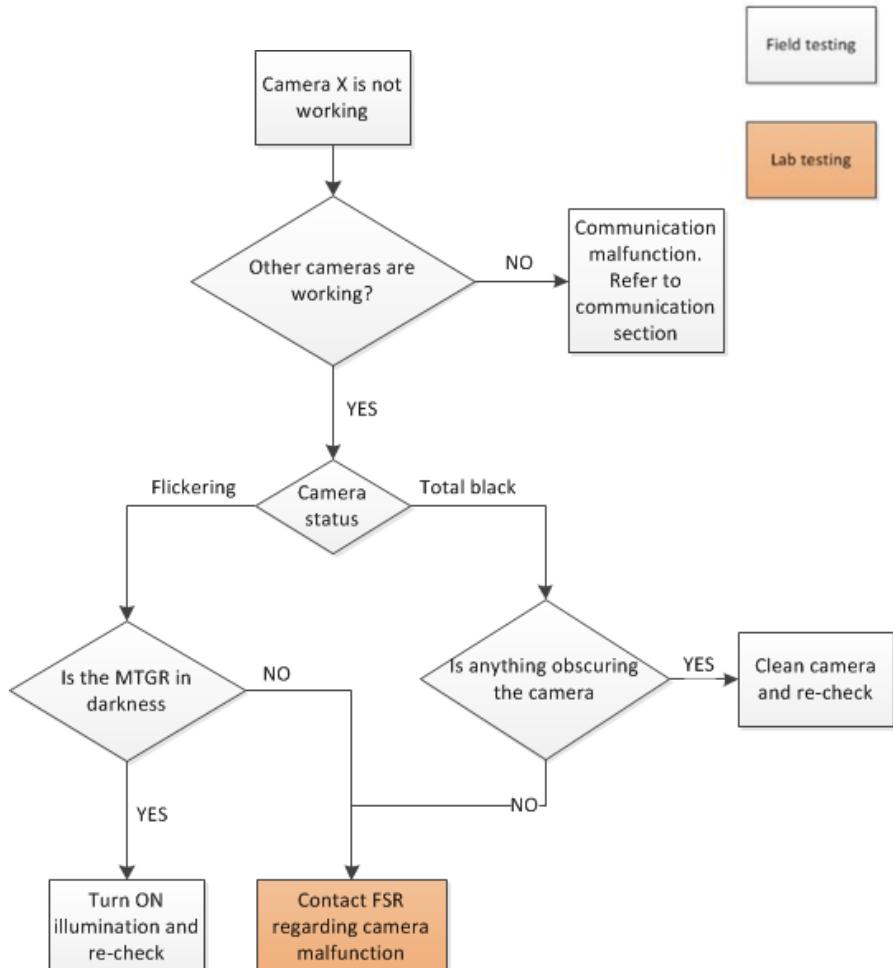


- Allows the Operator to change view of the 3D model of the Manipulator
- Custom views can be set by using the "?" key and moving the model through the touchscreen

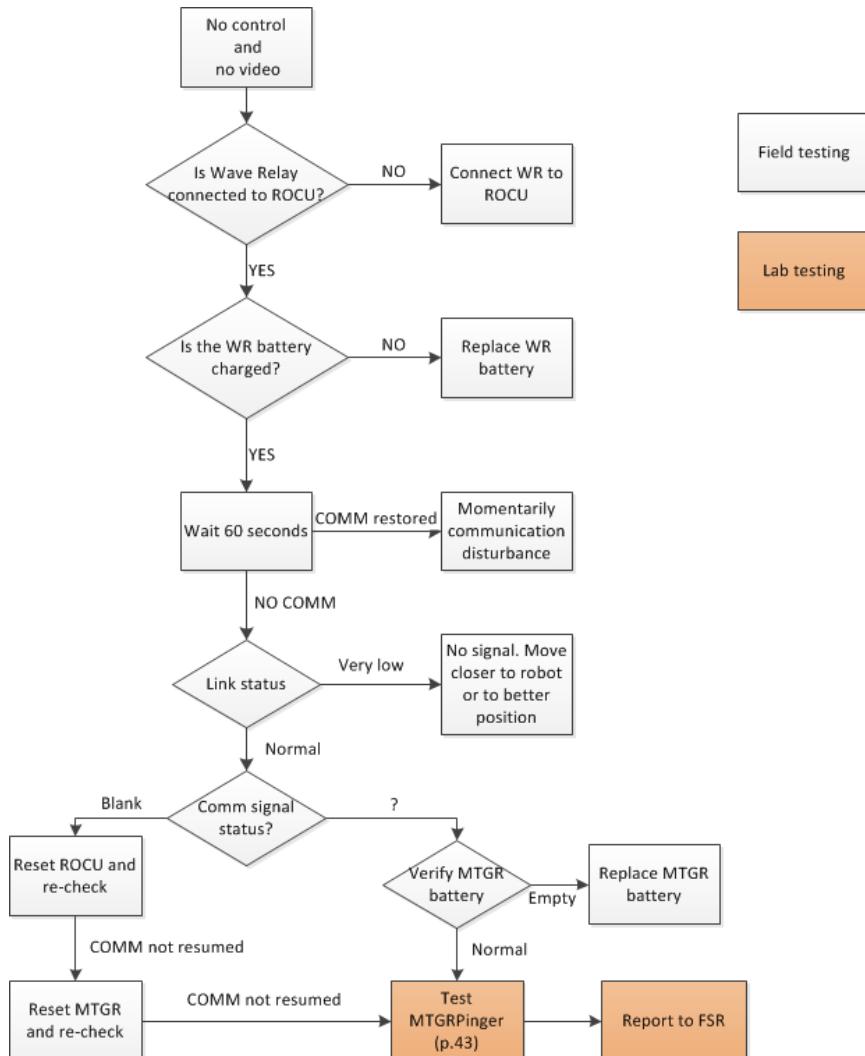
Troubleshooting

- Note: All pages referenced in the following charts refer to the Maintenance Manual.

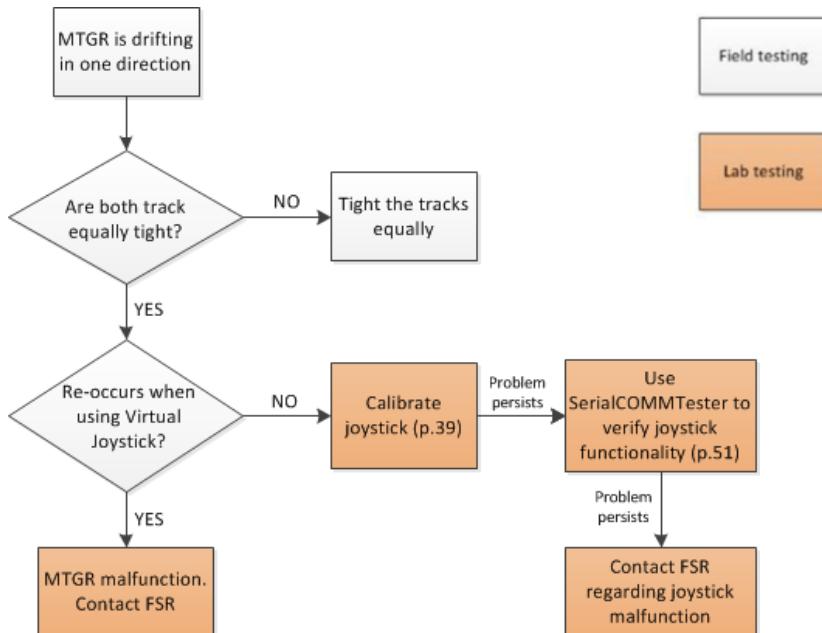
Single Camera Malfunction



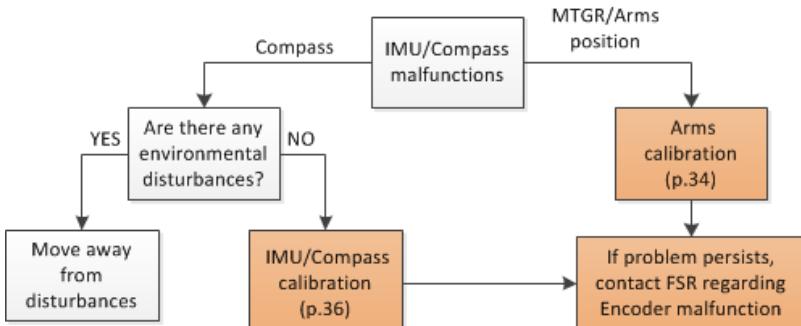
Communication Malfunction



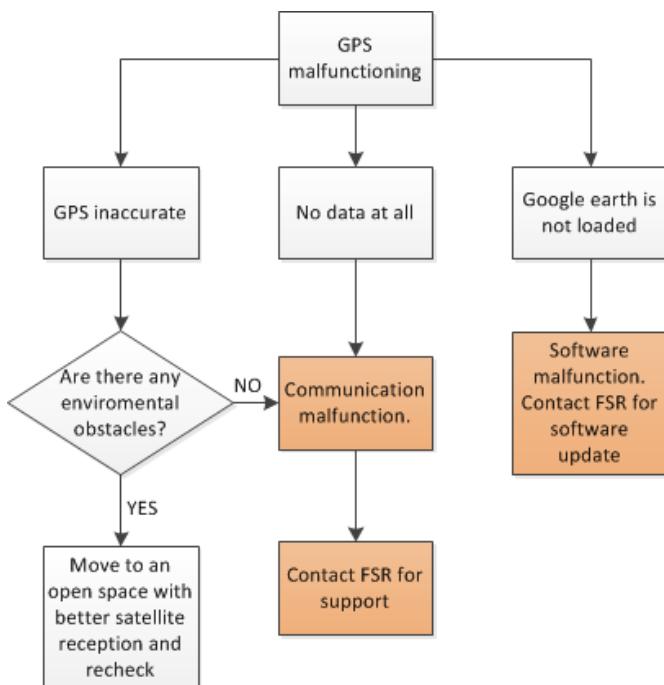
MTGR is Drifting in One Direction



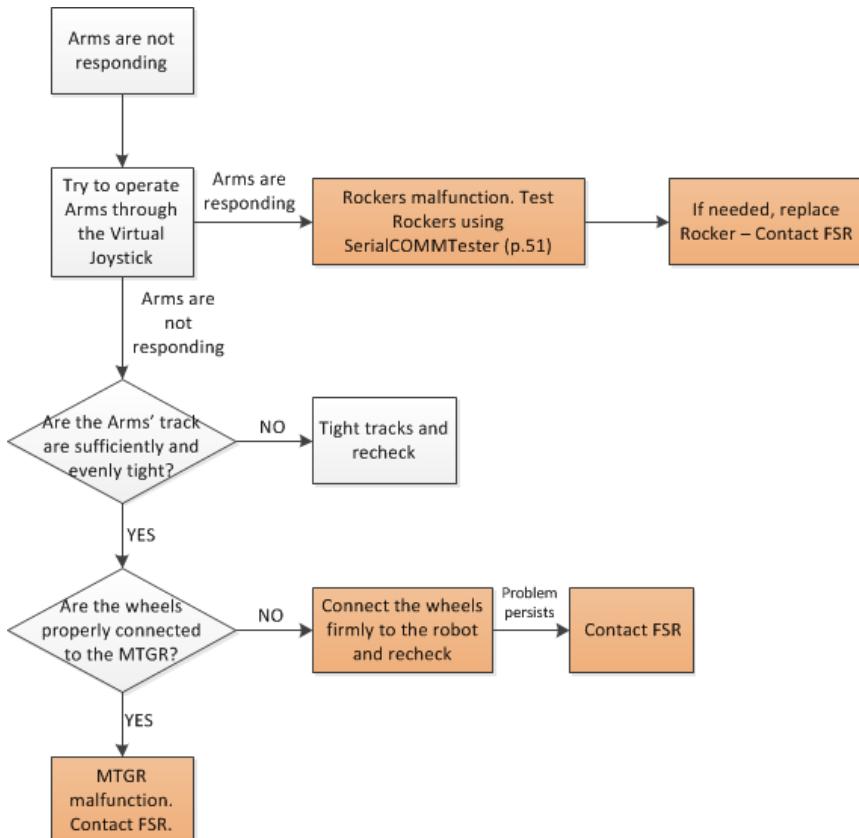
IMU Malfunction / Arms Are Not Calibrated



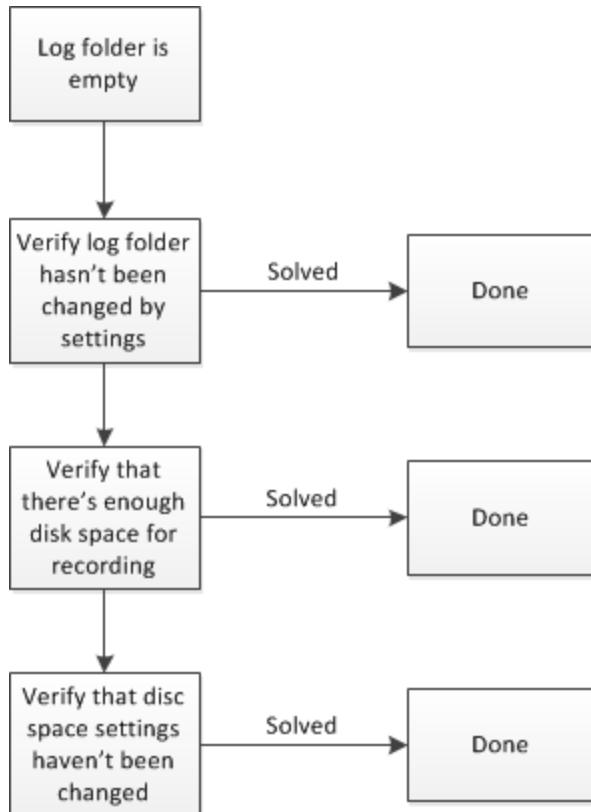
GPS is Not Responding/Accurate



Arms Are Not Responding



Log Folder is Empty



Storage Maintenance

While not operational, MTGR should be stored according to the following maintenance rules:

- Always store the MTGR together with its ROCU-7 and MPU3 inside the supplied case.
- Batteries should be fully charged once a week.
- MTGR should be stored in a dry and cool place.

Remember Basic preparations before every mission!

- Verify batteries are fully charged.
- Tracks are sufficiently tight and secure.
- Cameras' covers are clean.
- Wheels are secured.
- ROCU-7 screen is intact and clean.
- Verify 2 cables are connected and secured
 - MPU3 Battery cable
 - Communication cable
- Remember to update the attached operation log for tracking the amount of operational hours.

Operational Maintenance

The following procedures should be performed only by qualified MTGR Operators. These procedures should be done after every mission to ensure the continuous high performance of the robot. Remember to update the attached operation log.

Operation	Description	Tools Used
Whole Body Cleanup	Remove dust, sand gravel, etc.	Air pump
Cameras	Wipe off dust, mud, etc.	Moist cloth (use specialized lens cleaner cloth)
Main Tracks	Tighten tracks to proper tension	Ratchet wrench handle (drive 1/4" – short handle), 19mm socket Allen 3mm
Arms Tracks	Tighten tracks to proper tension	13mm socket + Ratchet wrench
Battery Compartment	Clean battery compartment and battery connector	Air pump Moist cloth
Batteries	Verify batteries are fully charged	Certified BB-2557 or Roboteam's charger

No.	Tool Name	Picture
1.	Ratchet Wrench Handle (drive 1/4" – Short Handle)	
2.	Wrench Extension Adaptor (3" –long)	
3.	Wrench Drive Adaptor (1/4" → 3/8")	
4.	7 mm Hexagonal Socket Wrench (drive 1/4")	
6.	13 mm Hexagonal Socket Wrench (drive 1/4")	
7.	19 mm Hexagonal Socket Wrench (drive 3/8")	
8.	3 mm Allen Key (T-Handle).	
9.	2.5 mm Allen Key (T-Handle).	
10.	2 mm Allen bit	

Thread Lock Glue (Loctite) – Not supplied with system



Tightening the Systems' Tracks

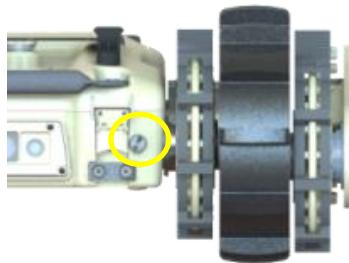
Proper maintenance of the tracks is the key to obtaining the maximum maneuverability from your system. As a basic rule, when driving the MTGR in an urban/indoor environment tracks should be relatively loose, while driving in open field, tracks should be tight.

Main Tracks

1. Open the rear wheel screw with the ratchet wrench with the 3" extension and 19mm Hexagonal Socket Wrench.



2. Remove the cap (using a regular flat screwdriver or a coin) and use 3mm Allen Key in order to turn the tension screw to set the tense level



3. Fasten the main screw M12X25 (using the 19mm socket)



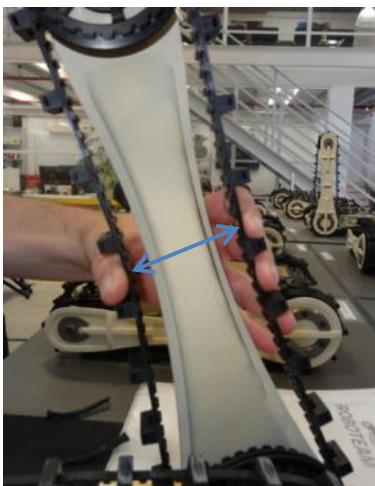
4. Pinch the tracks and make sure they are approximately 3.24 inch (82.5mm) apart (use the gauge supplied) - For extra tightening open the screw and pull backwards and to release move forward.



Arms' Tracks

1. Use the 19mm Hexagonal Socket Wrench and set the Arms track tension with the screw located in the long edge.
2. Measure the tension. It should be taken at the middle of the track; behind the central arch. Make sure the tracks are approximately 3.24 inch (82.5mm) apart (use the gauge supplied – with the DRIVE side).

View from the inside:



Appendix A: Contact

The Roboteam Support Team is always available to assist with any matter or question.

7979 Old Georgetown Rd, Suite 900

Bethesda, MD 20814

Email: support@robo-team.com

Website: www.robo-team.com





ROBOTEAM

DOMINATE THE UNKNOWN