ROBOTEAM

MTGR V2

GTA

Graphical Training Aid

WWW.ROBO-TEAM.COM

Roboteam Ltd. Proprietary Information – Commercially Classified

P/N: DOC00002-B REV.B00

Warranty and Liability

Read the following carefully 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 be qualified before operating the system
- Be careful of moving parts to avoid injuries to your fingers or other body parts
- Roboteam Ltd. is 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, can hurt the operator, and can 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

System Components

MTGR

ROCU-7+ x2 Protective Film

Battery Pack

Lite Adapter

Manipulator

MPU3

Spring Antenna

Battery US BB-2557/U

Documentation+SW

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)

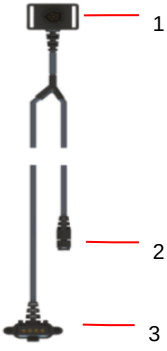
Field Tool Kit

Drive & Idler Wheels Set

Recovery Rope

Stylus Pen

Supplied Cables



Energy Cable
(ROCU-M-4000-28)
Connects the battery to the ROCU-7 and the MPU3 Comm. Unit

1. Battery
2. Power connector to MPU
3. Energy connector to ROCU

Communication Cable
(ROCU-M-2030-00)
Connects the MPU3 and the ROCU-7

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

MTGR Specification

SPEC

Parameter	Description
Size (length arms closed)	17.9 x 14.5 x 5.7 (L x W x H) inch
With Wheel Kit	18.6 x 18.5 x 6.5 (L x W x H) inch
Weight	16 (19 with wheel kit) lb
Max Payload Weight	20 lb
Speed	2 Mph
Vertical Obstacle	14 inch
Stair Climbing Ability	45˚, 8 inches
Communication	Secured IP MESH data link
Operating Range	1600 feet LOS
Power Supply	14V Mil Std
Working Time	2-4 hours (operation mode dependent)
Payload Ports	Power (12-28V),Ethernet RJ45, RS232, Video/Audio
Mechanical interfaces	Standard Picatinny rails
GPS	Internal
Video & Cameras	360° Real time day & night video + zoom x 10 and audio
Sensor Tilt module	-20°- +90°
Illumination module	360˚ NIR illumination + front white LED

MANP Specification

Parameter	Description
Actuator DOF	4 DOF, (2 Joints, 1 gripper and wrist capability)
Max Gripper Opening	4.3”
System Weight (lb)	2.7
Max Lift Capacity (lb)	10 (fully extended)
Reach Length	14.17”
Camera	Auto Focus Camera, Optical Zoom X10 and close up gripper camera
Illumination	White / NIR LED
Mechanical Interface	Quick release screws and Picatinny rails
Operational Temperature	-4°F to +140°F
Military Standards	IP65

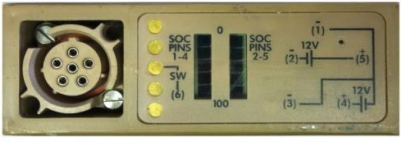
ROCU Specification

SPEC

Parameter	Description
Dimensions (inch)	11.8 x 6.7 (L x W)
Height (inch)	With battery pack - 4.5 Without battery pack - 2.8
Weight (lb)	Without battery - 3.9 Including battery - 5.0
Military Standard	Ruggedized, IP65
Operating System	Windows 7, internal memory 64GB
CPU	1.6 Ghz Dual Core
Screen	7", 1024x600, resistive touch screen, sunlight readable, NVIS compatible, Gorilla glass
Power Supply	14V Mil Std. or 24V Roboteam's battery
Working time	3-6 hours (operation mode dependent)
Interfaces	USB (powered), Ethernet, audio in/out, 2 Joysticks, 8 hard buttons, 4 rockers
Operational Temperature (Mil Std.)	-4°F – +140°F

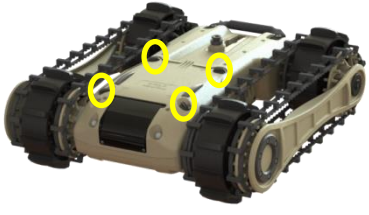
Switching on the MTGR

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



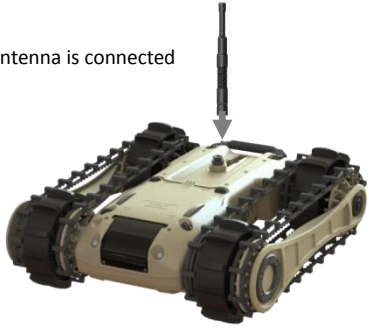
3. Insert battery into the battery compartment, and close the battery compartment tightly

Battery should <u>not</u> be forced in

Switching on the MTGR

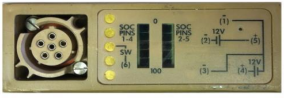
4. Turn on the MTGR by pressing the ON/OFF button, in the rear part of the platform

5. Verify an antenna is connected

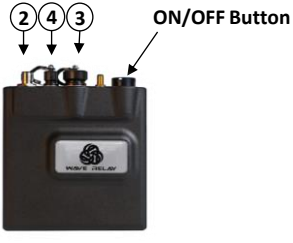


Switching on the Communication Unit

1. Verify Communication unit battery is fully charged.



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



NOTE:
After connecting the MPU3 to the battery, verify the GREEN LED is on. If not, HOLD the ON/OFF Button for 3 seconds and release, to turn the MPU3 on.

Switching on the Control Unit

5. Connect the ROCU to the power cable (labeled ROCU-M-4000-28) or insert a battery into the ROCU-7 Battery pack

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

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

7. The ROCU-7 is connected to the MPU3 communication unit via the communication cable (labeled ROCU-M-2030-00)
8. Press the ON/OFF button located at the bottom-right side of the ROCU-7. MTGR application will load automatically

9. Verify connection is established by:
- Communication icon is OK
- Video is streaming

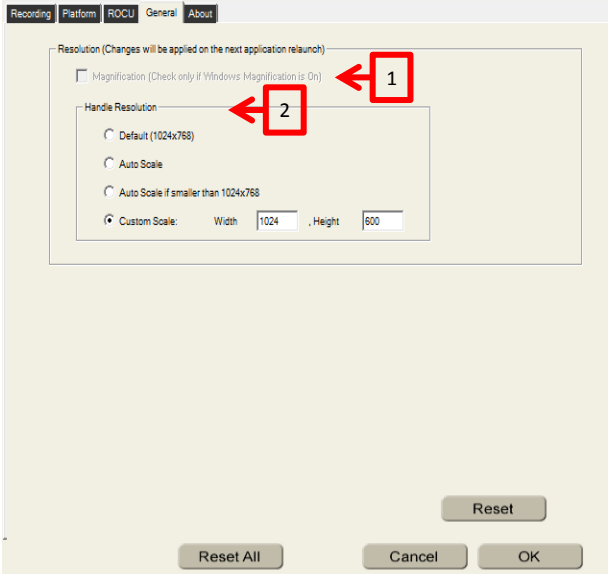
Settings

Warning

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

Settings – General

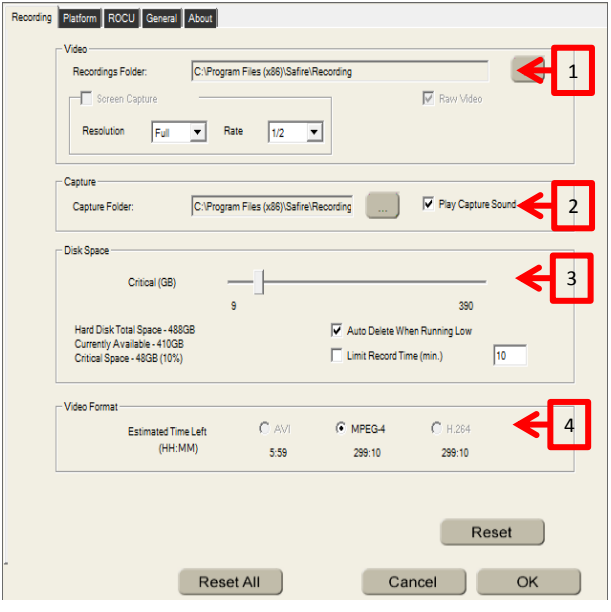
No.	Name	Description
1	Magnification	Available only when Tablet is supplied
2	Handle Resolution	Operator can change the screen resolution according to the size of the screen



Settings – Recording

No.	Name	Description
1	Recordings Folder	This is the target folder in which recorded videos are saved on the computer. Videos can be saved in screen capture (regular video) or raw video (4 camera capture). Changing resolution and rate is possible by checking their boxes.
2	Capture Folder	This is the target folder in which recorded images are saved on the computer. Playing sounds when capture is optional by checking the box.
3	Disk Space: For Recording Purposes	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. Auto delete - checking this box will enable auto delete when reaching the critical level, according to video date. Limit record time - allows the operator to set a limit on recording time.
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 – Recording



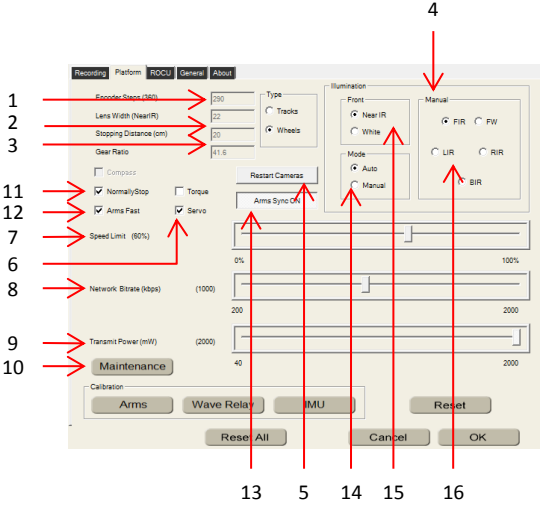
Settings – Platform

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)

Settings – Platform

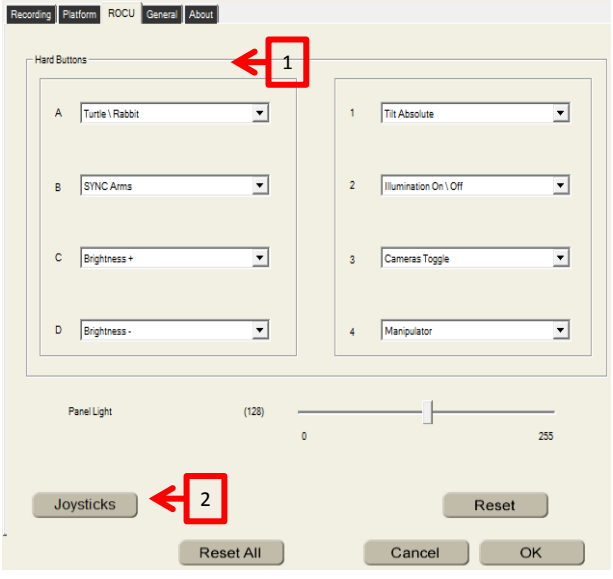
No.	Name	Description
9	Transmit Power	Increase/decrease the Comm. Unit transmit power, and change the communication range
10	Maintenance	Calibration settings (refer to Maintenance Manual for more details).
11	Normally Stop	Lock the system's wheel when not in motion
12	Arms Fast	Controls the speed of the arms
13	Arms Sync	Synchronized the movement of the arms
14	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
15	Front (Only in Auto Mode)	Near IR – illumination will activate Near IR illumination White – Illumination will activate White light
16	Auto White Balance	FIR – Front IR illumination FW – Front White LIR – Left IR RIR – Right IR BIR – Back IR

Settings – Platform

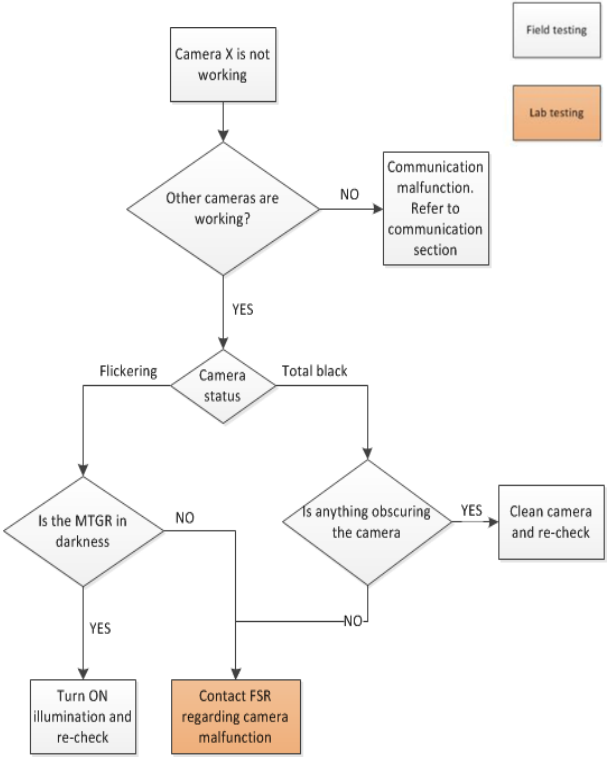


Settings – ROCU-7

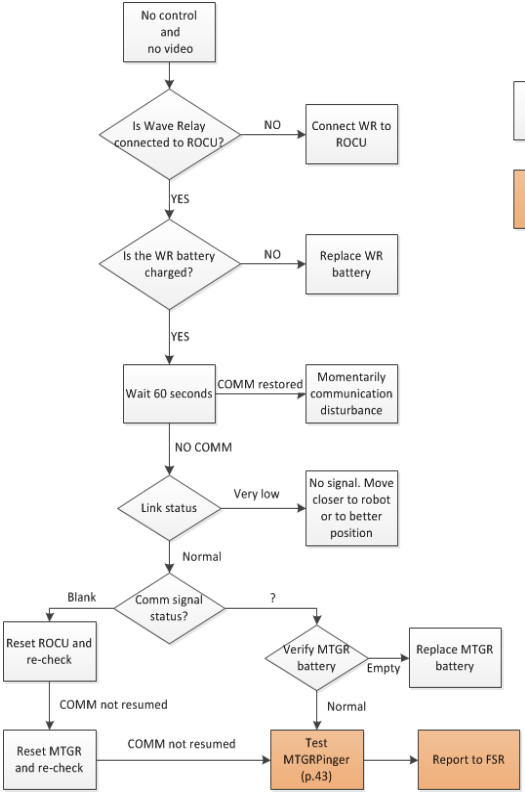
No.	Name	Description
1	Buttons	Assign operations to hard buttons
2	Joysticks	Calibrate the Joysticks



Single Camera Malfunction



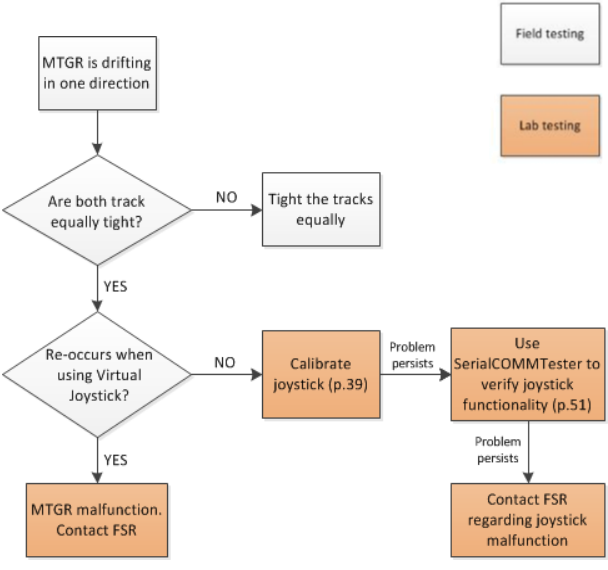
Communication Malfunction



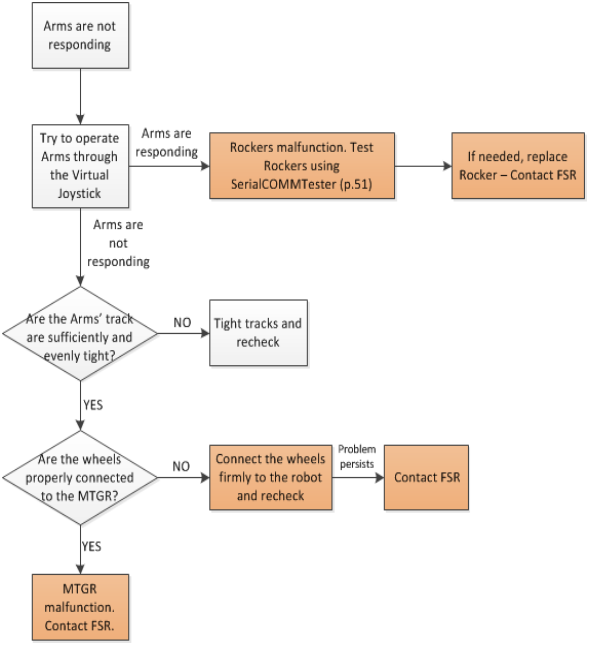
Field testing

Lab testing

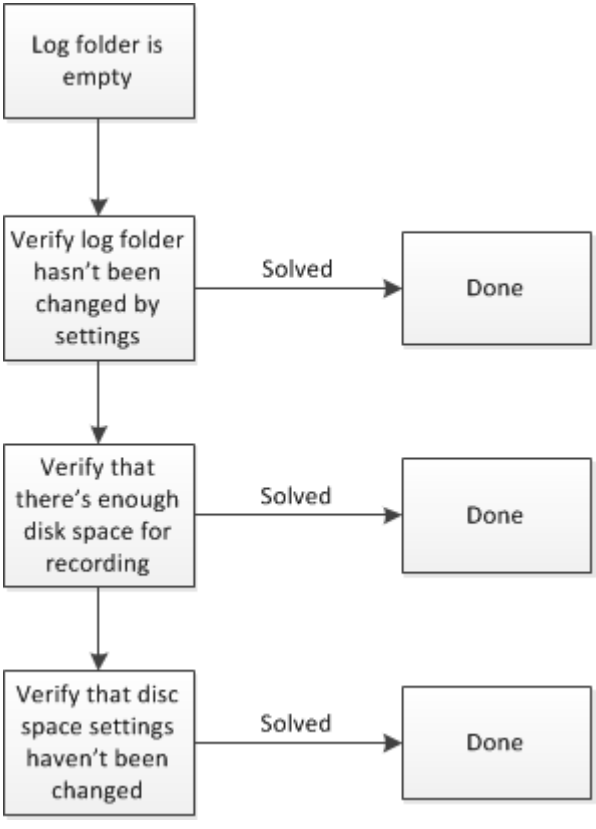
MTGR is Drifting in One Direction



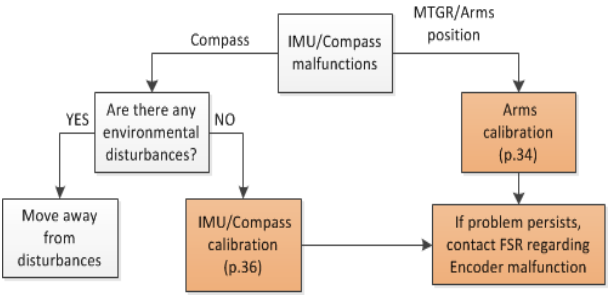
Arms Are Not Responding



Log Folder is Empty

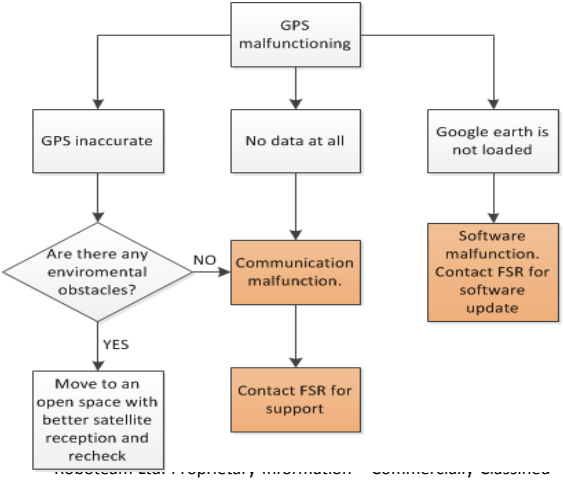


IMU Malfunction / Arms Are Not Calibrated



TROUBLE-SHOOTING

GPS is Not Responding/Accurate



Roboteam Ltd. Proprietary Information - Commercially Classified

Storage

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.
- 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' lenses are clean.
- ROCU-7 screen is intact and clean.
- Verify 2 cables are connected and secured
    - MPU3 Battery cable
    - Communication cable

Operational Maintenance

These procedures should be done after every mission to ensure the continuous high performance of the robot.

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

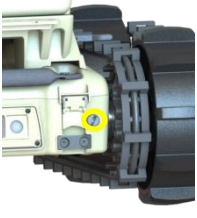
Tightening the Systems' Tracks

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

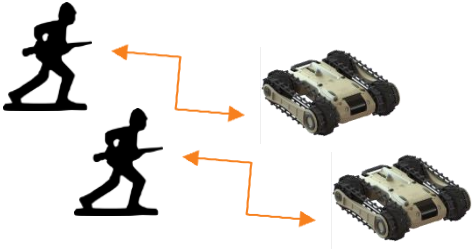


3. Fasten the main screw (using the 19mm socket)

Tightening the Systems' Tracks

4. Pinch the tracks and make sure they are approximately 3inch (75 mm) apart (use the gauge supplied) - For extra tightening or releasing open the screw and pull backward or forward correspondingly. For the arms' tracks use the 19mm Hexagonal Socket Wrench and set the Arms track tension with the screw located in the long edge.

Procedure Objective:



In this section you will find the guidelines for how to configure single or multiple MTGRs simultaneously at the same location. Following the procedures below will ensure the highest efficiency and mission control the MTGR can provide.

BRD2 & MPU3 Configuration Items Required:

MTGR
MTGR-V2-0000

ROCU-7
ROC7-V2-0000

Spring Antenna *2

MPU3

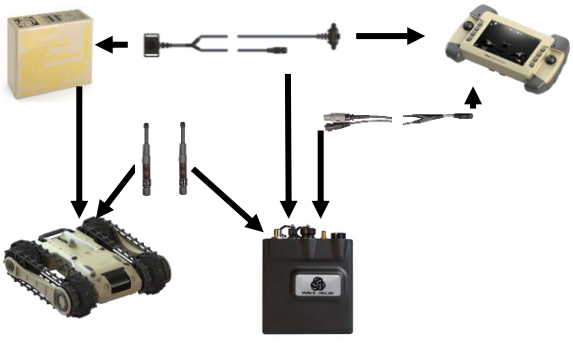
ROCU-M-2030-00

ROCU-4000-28 Power Cable

BB-2557(X2)

COMM-CONF.

Procedure Objective:



NOTE:

- After connecting the MPU3 to the battery, verify the GREEN LED is on. If not, HOLD the ON/OFF Button for 3 seconds and release, to turn the MPU3 on.

COMM-CONF.

PAY ATTENTION! FOR CORRECT SET UP:

- **Ensure** all cables and connections are properly secured (Red O-Ring on Glenair connectors can not be seen)
- Both antennas must be securely fastened and in a vertical position on the MPU3 and MTGR
- MPU should be located as high from the ground as possible (chest level and up)

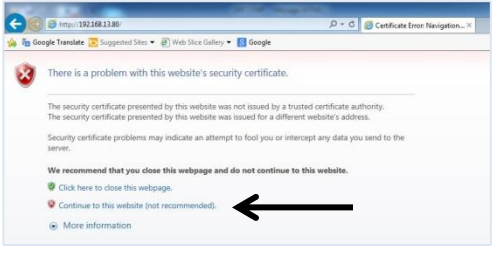
Log Into Your WR (BRD\MPU) Unit

1. Power ON the unit you wish to manage

2. If you are connecting to the MPU via ROCU, close the application and open the browser

3. In the address bar, type the IP address of the node

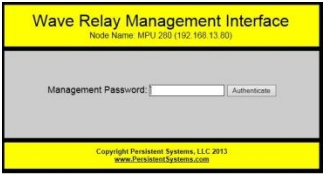
4. The browser will send you to a security page, click on: "Continue to this web site (not recommended)"



COMM-CONF.

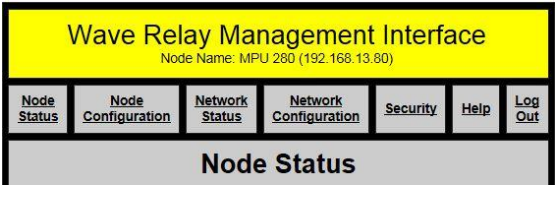
Log Into Your WR (BRD\MPU) Unit

5. On the password page type: “password”



6. After entering the password you will enter the BRD\MPU configuration page

7. Int. The head of the page you will find the main tool bar



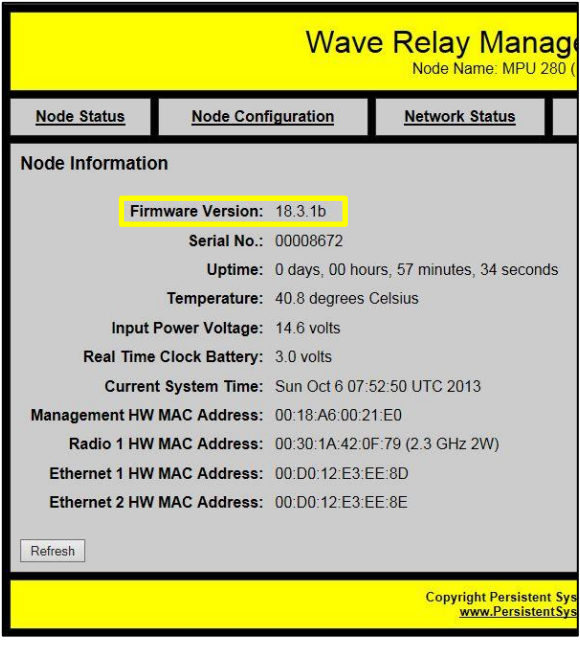
COMM-CONF.

Node Status

1. On the main menu click the “Node Status” tab

2. Click the “Unit Info” button

3. Make sure the unit’s firmware version is: 18.3.1b or above

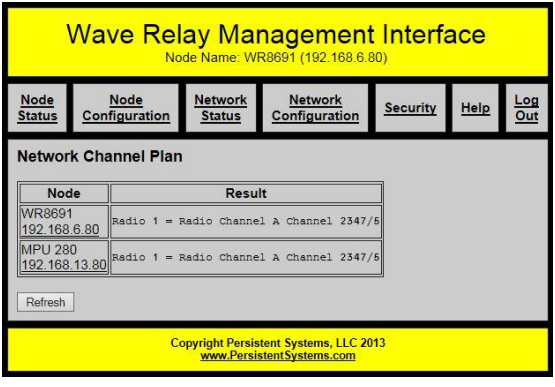


Chanel Plan

1. On the main menu click the “Network Status” tab

2. Click the “Channel Plan” button

3. On the screen you will see all the nodes that are currently in your operating channel.



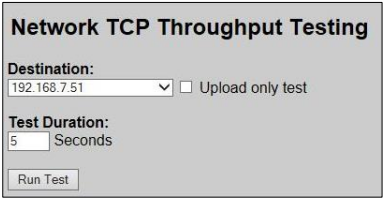
Bandwidth Test

1. On the main tool bar click the “Node Status” tab

2. Click the “Bandwidth Test” button

3. Make sure **only** two nodes are switched on, and both are in the radios of no more than 6 feet.

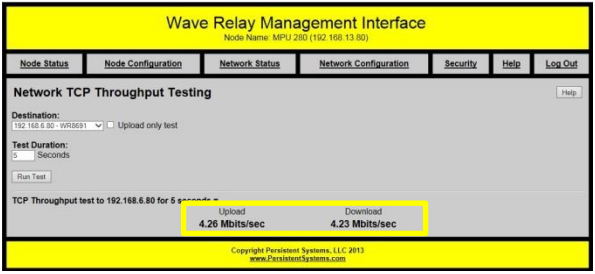
4. On the drop-down list choose the node with which you will check the bandwisth (You can’t choose the node you are using) and press: “Run Test”



BW TEST

Bandwidth Test

5. The test results will be written at the bottom of the page



6. Check that all of the results are in the range as described in the table below:

MHz cheeked	Min result (both for upload & download)	Max difference between upload & download
5 MHz	4 Mbits/sec	1 Mbits/sec
10 MHz	8 Mbits/sec	1 Mbits/sec
20 MHz	16 Mbits/sec	1.5 Mbits/sec

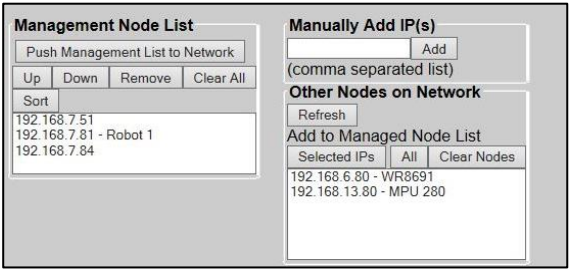
7. If the test fails, change the frequency and run test again

Clean List

1. On the main tool bar click the “Network Configuration” tab

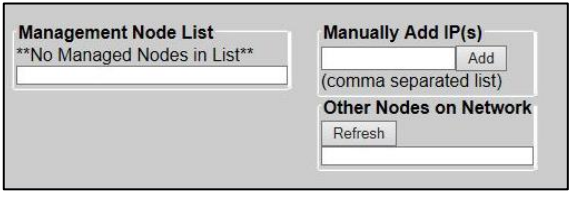
2. Click the “Network Node List” button

3. You will see 2 lists: “Management Node List” & “Other nodes on Network”



4. In order to clear the lists, click the “Clear All” & “Clear Nodes” button

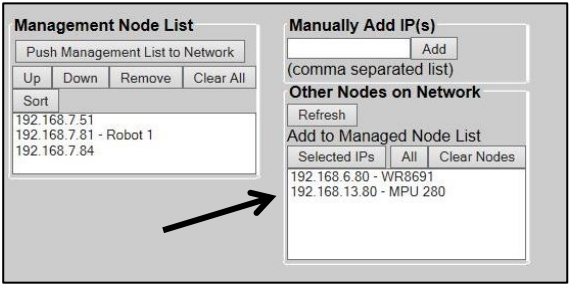
5. Clicking the: “Refresh” button will find all detected nodes



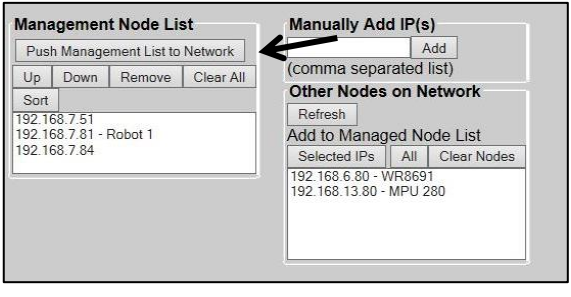
CLEAN CREATE LIST

Create List

1. Choose the IPs you want to add to the “Management Node List” and click the “Selected IPs” button, Or click the “All” button in order to select all nodes on the list



2. Clicking the “Push Management List to Network” will copy the list to all nodes.
Make sure to include the node you are working from



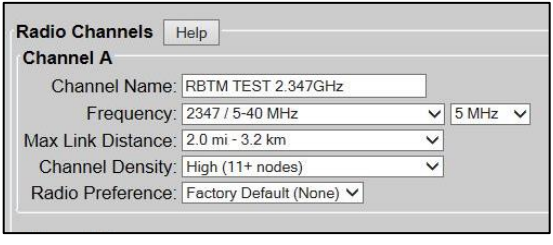
CLEAN CREATE LIST

Change Frequency

1. On the main menu click the “Network Configuration” tab

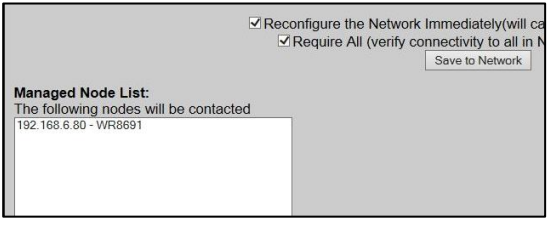
2. Click the “Network Default” button

3. Choose in the drop-down list the requested frequency. It is recommended to change the channel’s name so it will include the new frequency.



4. Choose the: BW, Max Link Distance, Channel Density & Radio Preference according to “BW Table” “Rule of Thumb” tables

5. Make sure the “Managed Node List” contains all of the nodes. If not go to Clean\Create List



CHANGE FREQ.

Change Frequency

6. Click the “Save to Network” button

7. In order to see all the nodes on your profile, go to “Channel Plan”

BW Table		
№ of Systems	**LOS**	**Non LOS**
1 system –P2P	5 MHz	10 MHz
2 systems	10 MHz	20 MHz
More than 2 systems	20 MHz	

Rule of Thumb Table	
The Max Link Distance (longest hop)	The Max distance between two different nodes * 1.5
Channel Density	№ Nodes * 2 (make sure to count all nodes ROCUs & MTGRs)
Radio Preference	Factory Default

Default BW is 10 MHz

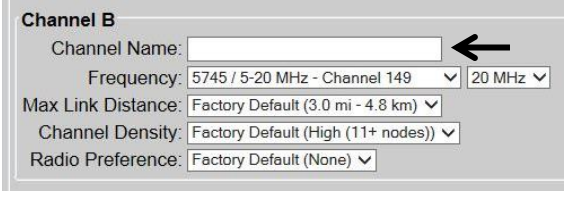
CHANGE FREQ.

New Profile

1. On the main menu click the “Network Configuration” tab

2. Click the “Network Default” button

3. Choose a channel and name it

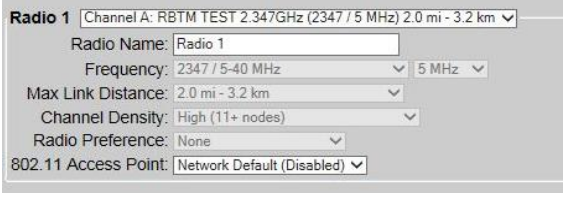


CHANGE FREQ.

New Profile

1. Do not change anything else before you change all the requested nodes to the new profile (3 following steps)

a.	On the main menu click the “Node Configuration” tab
b.	Click the “Node Configuration” button
c.	Choose the new profile from the drop-down list



2. Perform “Change Freq.” on the new profile

CHANGE FREQ.

CONTACT

Contact

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DOMINATE THE UNKNOWN

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