ISM Microhard IP Radio

Data Sheet

Introduction:

The ISM pMDDL IP radio is a feature-rich, high-power, 2x2 MIMO, wireless data link. The radio integrates a swappable microhard pMDDL series radio with ports for usage in UAV applications in a lightweight and robust package.

The pMDDL radio can be configured using microhards built in webUI which does not require any additional tools or software for setup. The unit can operate as a master, slave, or relay (future) to establish a high throughput high-speed data link between GCS and UAV as well as between UAVs. The unit comes stock with the pMDDL 2350.
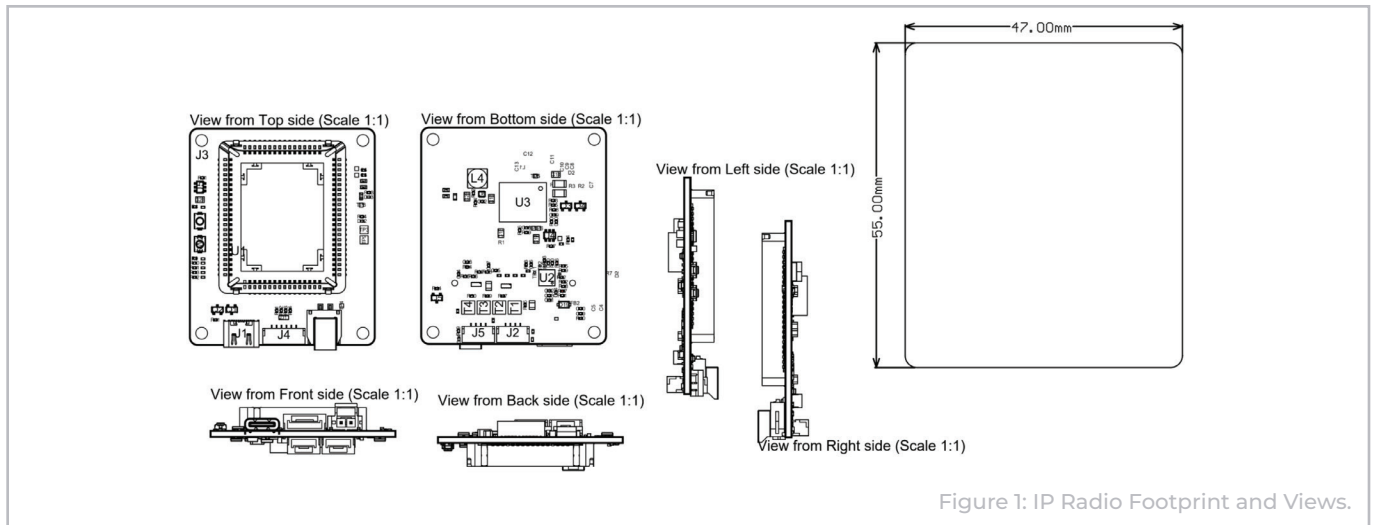


Figure 1: IP Radio Footprint and Views.

Package List:

Air Unit

- 1x ISM MH Carrier Board
- 1x MH pDDL/pMDDL Chipset w/ Heatsink
- 1x 5v Fan
- 2x UFL to SMA extensions
- 2x Antenna (rubber ducky)
- 1x Serial Cable for Pixhawk Cube (15cm)
- 1x LAN Cable for Video/Companion Computer (15cm)
- 1x Molex Power Input Cable (20cm)

Ground Unit

- 1x ISM MH Carrier Board
- 1x MH pDDL/pMDDL Chipset w/ Heatsink
- 1x 5v Fan
- 2x UFL to SMA extensions
- 2x Antenna (rubber ducky)
- 1x LAN to RJ45 Cable (100cm)
- 1x Molex Power Input Cable (20cm)

Performance
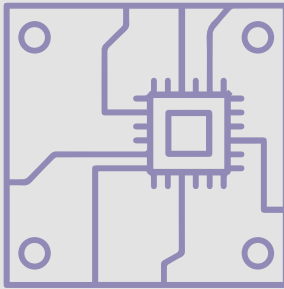
- >50km range with direction and tracking antennas.
- 25+ Mbps data rates.
- 36dBm total power output (4W).
- 2x2 MIMO. Simultaneous IP and serial data.
- 2.304 - 2.390 GHz.
- Maximal ratio combining (MRC), maximal likelihood decoding (ML).
- Low-density parity check (LDPC).
- Small footprint of 47mm x 39mm.
- Low weight of 18g (minus antennas).
- Point-to-point, point-to-multipoint, mesh.
- Dual Ethernet ports - LAN, WAN.
- Port forwarding, ACL, firewall.
- Extended operational temperature range (-45C to 85C).
- 128-bit AES Encryption (256-bit AES Encryption optional).
- Local/remote firmware upgrades.
- Configurable via Telenet, web browser, and local console.

- LAN port - 4-pin JST GH
- WAN port - 4-pin JST GH
- Pixhawk standard serial port - 6 pin JST GH - 3.3v UART
- USB C port - USB 2.0 data, USB power delivery sink, Ethernet, and Serial over USB.
- Battery Connector - 2-pin Molex Nano Fit - 4.5 to 55V input.
- 5v and GND pads for fan.
- Configuration and Reset buttons.
- LED indicators for power, wireless TX RX, RSSI, and LAN link status.
- Reverse polarity protection.

Interfaces
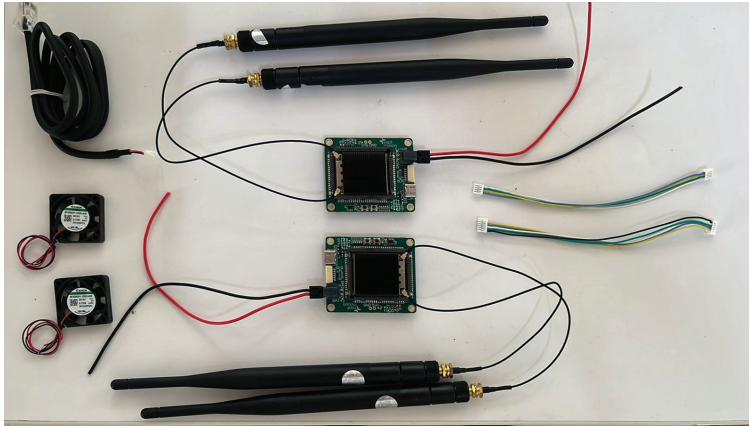
Quick Start Guide Steps:

To set up the Microhard pMDDL series module, follow these detailed steps:

1. **Insert the Module:**
   - Place the Microhard pMDDL series module into the holder.
   - Apply thermal paste to the bottom of the module.
   - Ensure the antennas face the rear of the module, away from the connectors.

2. **Attach Antenna Extensions:**
   - Connect the Ipex-SMA extensions to the ant1 and ant2 ports on the MH chipset of the radio module.

3. **Secure Antennas:**
   - Screw the antennas onto the extensions.
   - Warning: Never power on the module without the antennas connected to avoid damage.

4. **Connect to Computer:**
   - Use an Ethernet cable to connect your computer to the LAN port on the radio module.

5. **Connect Autopilot Telemetry:**
   - Use a 6-pin cable to connect the autopilot's telemetry/serial port to the Serial port on the radio module.

6. **Power the Module:**
   - Connect an appropriate power supply (ranging from 4.5V to 55V) to the power port on the radio module or connect power via the USB C port.

7. **Initialization:**
   - Power on the module.
   - Wait for the module to initialize. The green status LED should become solid, indicating successful initialization.

8. **Configure Network Settings:**
   - Ensure your PC's network settings are configured as follows:
   - DHCP: The modem will assign an IP address automatically.
   - Static IP (alternative option): Set the IP address to 192.168.168.10 and the subnet mask to 255.255.255.0.

9. **Access the Module via Browser:**
   - Open a web browser and enter 192.168.168.1 in the address bar.

10. **Login:**
    - Use the factory default credentials:
    - ID: admin
    - Password: ilpl123

11. **Configuration:**
    - Follow the setup guide provided by Microhard to configure the radio module with settings tailored to your application.
    - Use the suggested parameters for standard Point-to-Point (P2P) operation as supplied.

By following these steps, you will successfully set up and configure your Microhard pMDDL series module for operation.
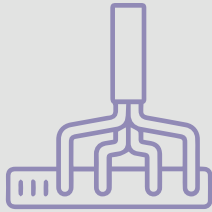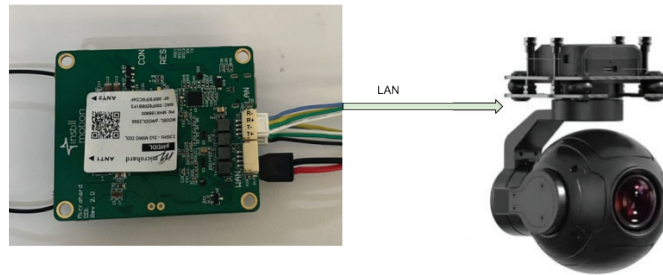
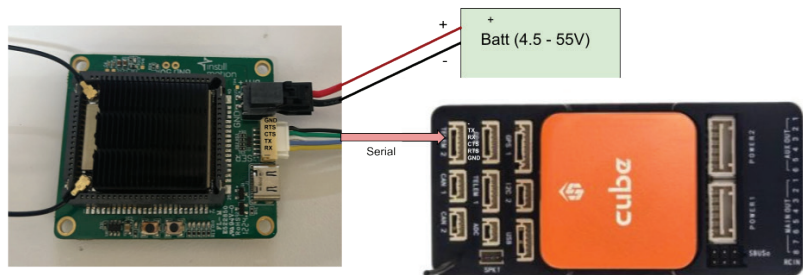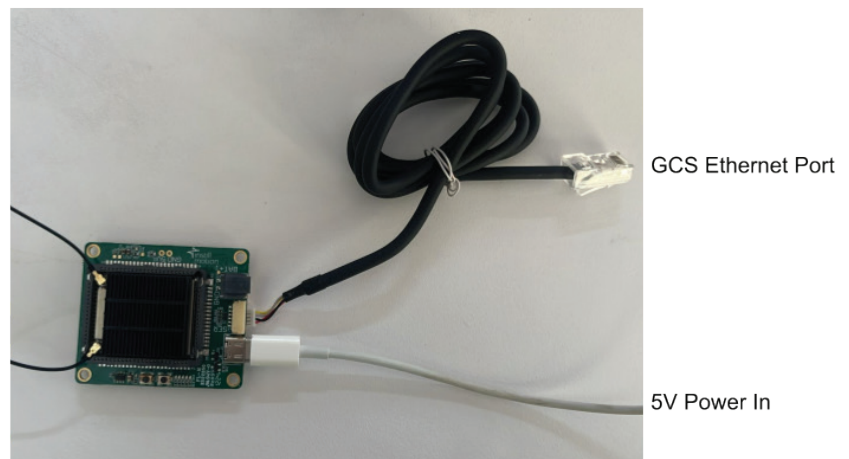## Suggested Wiring Setup for UAVs

The following setup will allow you to use the ISM IP Radio as a conduit for HD video and telemetry P2P communication.

The standard set out of the box at maximum power output will allow up to 20 km of range. Ensure the setup has adequate cooling.

Air Unit (Master)

+
Batt (4.5 - 55V)

Serial

cuba

LAN

Ground Unit (Slave)

GCS Ethernet Port

5V Power In

Configuration details for the air unit and ISM IP radios:

Master Configuration:
- The air unit is set as the master.
- Default IP for the master: 192.168.168.101.

Default Settings:
- The ISM IP radios come pre-configured and are already bound out of the box.
- The master unit is set to the lowest power setting initially to avoid damage during bench testing.

Power Settings:
- If you need to use higher power settings, ensure the unit has adequate cooling.
- Utilize the heatsink and fan if necessary to prevent overheating.

Make sure to adjust the power settings appropriately and monitor the temperature to maintain the equipment's safety and performance. If you have any specific questions or need further details on configuring or operating the units, feel free to ask or refer to the Microhards Operational Manual!

System Information

System >> General Settings

System Information

Host Name	UserDevice	Description	mypMDDL2350
Product Name	pMDDL2350	System Date	1969-12-31 17:06:32
Hardware Version	Rev A	System Uptime	5 min
Software Version	v1.4.0	Build Date	2020-03-16
Software Build	1022	Build Time	17:01:17

LAN Status

MAC Address	00:0F:92:08:EB:11		
IP Address	192.168.168.101	Connection Type	static
Subnet Mask	255.255.255.0	Gateway	192.168.168.102

RF Status

General Status

MAC Address	Operation Mode	Network ID	Bandwidth	Frequency	Tx Power	Encryption Type
00:0F:92:FB:EC:DF	Master	pMDDL	8 MHz	2377 MHz	20 dBm	AES-128

Traffic Status

Receive Bytes	Receive Packets	Transmit Bytes	Transmit Packets
446.575KB	6414	1018.371KB	5875

Connection Info

MAC Address	Tx Mod (MIMO)	Rx Mod (MIMO)	SNR (dB)	RSSI (dBm)
00:0F:92:FB:CD:4F	BPSK FEC 1/2(On)	64-QAM FEC 5/6(On)	64	-30

Stop Refreshing Interval: 20(in seconds)

Network Status

LAN Port Status

General Status

IP Address	Connection Type	Subnet Mask	MAC Address
192.168.168.101	static	255.255.255.0	00:0F:92:08:EB:11

Traffic Status

Receive bytes	Receive packets	Transmit bytes	Transmit packets
474.706KB	8656	1.181MB	8000

Default Gateway

Gateway	192.168.168.102

DNS

DNS Server(s)	None

IPv4 Routing Table

Destination	Gateway	Subnet Mask	Flags	Metric	Ref	Use	Interface
0.0.0.0	192.168.168.102	0.0.0.0	UG	0	0	0	(br-lan)
192.168.168.0	0.0.0.0	255.255.255.0	U	0	0	0	(br-lan)

Network >> Status Page

System	Network	Wireless	Firewall	Serial	Diag	Admin

Status	LAN	WAN	USB	DHCP	Routes	Ports	Device List

Network LAN Configuration

LAN Configuration

Spanning Tree (STP)	Off
IGMP Snooping	On
Connection Type	Static IP
IP Address	192.168.168.101
Netmask	255.255.255.0
Default Gateway	192.168.168.102
Default Route	Yes
DNS Mode	Manual
Primary DNS	
Secondary DNS	

LAN DHCP

DHCP Server	Enable
Start IP Address ⓘ	192.168.168.101
Number of Address ⓘ	150
Lease Time (in minutes) ⓘ	720
Alternate Gateway	
Preferred DNS server	
Alternate DNS server	
WINS/NBNS Servers	
WINS/NBT Node Type	none

Network >> LAN Settings

Network >> WAN Settings

| System | **Network** | Wireless | Firewall | Serial | Diag | Admin |

| Status | LAN | **WAN** | USB | DHCP | Routes | Ports | Device List |

WAN Port Configuration

Configuration

Working Mode ⓘ   [Bridge with LAN Port ⌄]

Network >> USB Settings

| System | **Network** | Wireless | Firewall | Serial | Diag | Admin |

| Status | LAN | WAN | **USB** | DHCP | Routes | Ports | Device List |

USB Port Configuration

Configuration

Working Mode ⓘ   [Bridge with LAN Port ⌄]

Wireless >> RF Settings

| System | Network | **Wireless** | Firewall | Serial | Diag | Admin |

| Status | **RF** |

Wireless Configuration

RF Configuration

Radio	◉ On ○ Off
Channel Bandwidth	[8MHz ⌄]
Channel-Frequency	[68 - 2377 MHz ⌄]
Tx Power	[20 dbm ⌄]
Wireless Distance	[3000] (m)
TX Antenna Chains	[1+2 ⌄]
RX Antenna Chains	[1+2 ⌄]
Operation Mode	[Master ⌄]
TX Rate	[Auto (recommended) ⌄]
Ceiling Rate	☐
Extended Addressing	[ON ⌄]
Network ID	[pMDDL]
Encryption Type	[AES-128 ⌄]
Encryption Key	[•••••••••]
Show password	☐

RF Serial Port Configuration

Serial Port TX Rate	[Normal Rate ⌄]

Suggested Configuration for UAVs P2P Communication ———— GROUND UNIT

configuration details and important points for using the ISM IP radio pairs:

Configuration and Binding:
- The ground unit is set up as the slave device.
- All ISM IP radio pairs are pre-configured and come bound out of the box.

Default IP Address:
- The default IP address for the slave (ground unit) is 192.168.168.100.

Power Settings:
- The radios are set to the lowest power setting by default to prevent damage during bench testing.
- If higher power settings are required, ensure the following:
- Adequate cooling is in place.
- Use the heatsink and fan as necessary to avoid overheating.

These steps are crucial for safe and efficient use of the ISM IP radio pairs, particularly during initial testing and setup. If you have any specific questions or need further details on setup or troubleshooting, feel free to ask or look up Microhards Operational Manual!

Summary	Settings	Services	Maintenance	Reboot

System Information

System Information

Host Name	UserDevice2	Description	mypMDDL2350
Product Name	pMDDL2350	System Date	2020-03-16 17:18:31
Hardware Version	Rev A	System Uptime	13 min
Software Version	v1.4.0	Build Date	2020-03-16
Software Build	1022	Build Time	17:01:17

LAN Status

MAC Address	00:0F:92:08:B1:F3		
IP Address	192.168.168.100	Connection Type	static
Subnet Mask	255.255.255.0	Gateway	192.168.168.101

WAN Status

MAC Address	00:0F:92:09:B1:F3		
IP Address	N/A	Connection Type	dhcp
Subnet Mask	N/A	Gateway	N/A
Primary DNS	N/A	Secondary DNS	N/A

RF Status

General Status

MAC Address	Operation Mode	Network ID	Bandwidth	Frequency	Tx Power	Encryption Type
00:0F:92:FB:CD:4F	Slave	pMDDL	8 MHz	2377 MHz	20 dBm	AES-128

Traffic Status

Receive Bytes	Receive Packets	Transmit Bytes	Transmit Packets
2.325MB	15895	1.525MB	16738

Connection Info

MAC Address	Tx Mod (MIMO)	Rx Mod (MIMO)	SNR (dB)	RSSI (dBm)
00:0F:92:FB:EC:DF	64-QAM FEC 5/6(On)	BPSK FEC 1/2(On)	64	-31

Stop Refreshing Interval: 20(in seconds)

System >> General Settings

Instillmotion Labs Pvt. Ltd.
Opposite GAR Tower 8&9,
Gandipet Mandal, Kokapet (V),
Hyderabad, Telangana 500075

labs@instillmotion.net

Network >> Status Page

| System | Network | Wireless | Firewall | Serial | Diag | Admin |

| Status | LAN | WAN | USB | DHCP | Routes | Ports | Device List |

Network Status

LAN Port Status

General Status

IP Address	Connection Type	Subnet Mask	MAC Address
192.168.168.100	static	255.255.255.0	00:0F:92:08:B1:F3

Traffic Status

Receive bytes	Receive packets	Transmit bytes	Transmit packets
239.492KB	2050	427.321KB	1779

WAN Port Status

General Status

IP Address	Connection Type	Subnet Mask	MAC Address
N/A	dhcp	N/A	00:0F:92:09:B1:F3

Traffic Status

Receive bytes	Receive packets	Transmit bytes	Transmit packets
72.560KB	603	7.348KB	22

Default Gateway

Gateway	192.168.168.101

DNS

DNS Server(s)	None

IPv4 Routing Table

Destination	Gateway	Subnet Mask	Flags	Metric	Ref	Use	Interface
0.0.0.0	192.168.168.101	0.0.0.0	UG	0	0	0	(br-lan)
192.168.168.0	0.0.0.0	255.255.255.0	U	0	0	0	(br-lan)

Stop Refreshing Interval: 20 (in seconds)

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Network >> LAN Settings

System	Network	Wireless	Firewall	Serial	Diag	Admin
Status	LAN	WAN	USB	DHCP	Routes	Ports	Device List

Network LAN Configuration

LAN Configuration

Spanning Tree (STP)	Off
IGMP Snooping	On
Connection Type	Static IP
IP Address	192.168.168.100
Netmask	255.255.255.0
Default Gateway	192.168.168.101
Default Route	Yes
DNS Mode	Manual
Primary DNS	
Secondary DNS	

LAN DHCP

DHCP Server	Enable
Start IP Address ⓘ	192.168.168.100
Number of Address ⓘ	150
Lease Time (in minutes) ⓘ	720
Alternate Gateway	
Preferred DNS server	
Alternate DNS server	
WINS/NBNS Servers	
WINS/NBT Node Type	none

Network >> WAN

System	Network	Wireless	Firewall	Serial	Diag	Admin
Status	LAN	WAN	USB	DHCP	Routes	Ports	Device List

WAN Port Configuration

Configuration

Working Mode ⓘ	Independent WAN

WAN Configuration

Connection Type	DHCP
Default Route	No
DNS Mode	Auto

Network >> USB

| System | Network | Wireless | Firewall | Serial | Diag | Admin |
| Status | LAN | WAN | **USB** | DHCP | Routes | Ports | Device List |

USB Port Configuration

Configuration

Working Mode ⓘ   Bridge with LAN Port ▾

Wireless >> RF

| System | Network | **Wireless** | Firewall | Serial | Diag | Admin |
| Status | **RF** |

Wireless Configuration

RF Configuration

Radio   ● On ○ Off
Channel Bandwidth   8MHz ▾
Channel-Frequency   68 - 2377 MHz ▾
Tx Power   20 dbm ▾
Wireless Distance   3000   (m)
TX Antenna Chains   1+2 ▾
RX Antenna Chains   1+2 ▾

Operation Mode   Slave ▾
TX Rate   Auto (recommended) ▾
Ceiling Rate   ☐
Extended Addressing   ON ▾
Network ID   pMDDL
Encryption Type   AES-128 ▾
Encryption Key   ••••••••••
Show password   ☐

RF Serial Port Configuration

Serial Port TX Rate   Normal Rate ▾

Serial >> Console

System	Network	Wireless	Firewall	Serial	Diag	Admin

Status	Console	Gadget

Serial Port Configuration

Port Configuration

Port status	Data
Escape Sequence	Disabled
Data Baud Rate	57600
Data Format	8N1
Data Mode ⓘ	⦿ Seamless ○ Transparent
Character Timeout	24
Maximum Packet Size	256
No-Connection Data ⓘ	○ Disable ⦿ Enable
MODBUS TCP Status	⦿ Disable ○ Enable
IP Protocol Config	TCP Client

TCP Configuration

Remote Server IP Address	192.168.168.101
Remote Server port	20002
Outgoing Connection Timeout(seconds)	60
Fast Recovery ⓘ	⦿ Disable ○ Enable

The standard setup for configuring a master-slave point-to-point communication involves using a TCP connection. The standard configuration out of the box uses the following settings.

Mission Planner >> TCP Connection
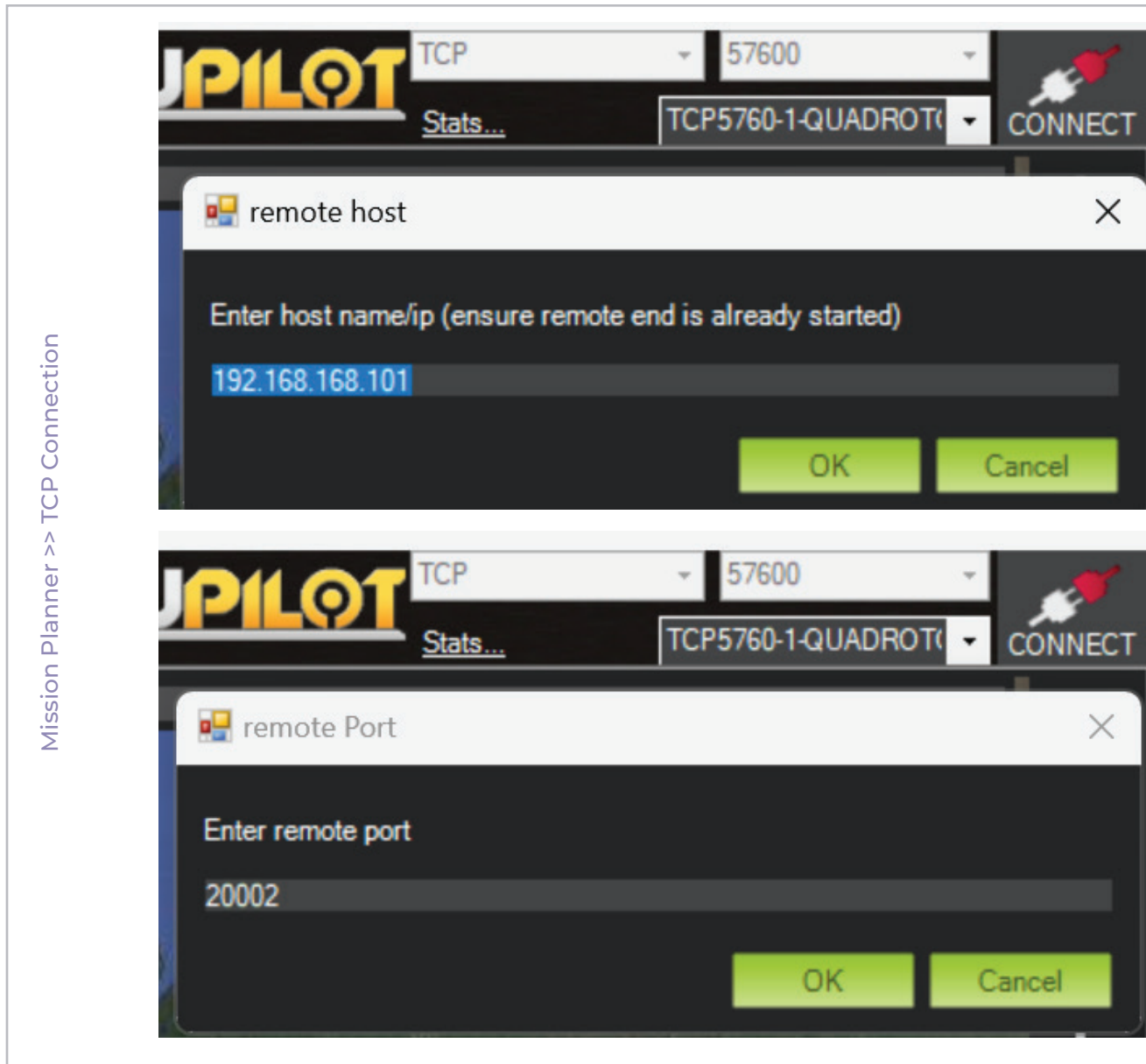
Autopilot >> Serial Port Configuration (Telem 2)

SERIAL_PASS1	0	-1:Disabled 0:Serial0 1:Serial1	This sets one side of pass-through between two serial ports. Once both sides are set then all data received on either port will be passed to the other port	☐
SERIAL_PASS2	-1	-1:Disabled 0:Serial0 1:Serial1	This sets one side of pass-through between two serial ports. Once both sides are set then all data received on either port will be passed to the other port	☐
SERIAL2_BAUD	57	1:1200 2:2400 4:4800	The baud rate of the Telem2 port. Most stm32-based boards can support rates of up to 1500. If you setup a rate you cannot support and then can't connect to your board you should load a firmware from a different vehicle type. That reset all your parameters to defaults.	☐
SERIAL2_OPTIONS	0		Control over UART options. The InvertRX option controls invert of the receive pin. The InvertTX option controls invert of the transmit pin. The HalfDuplex option controls half-duplex (onewire) mode, where both transmit and receive is done on the transmit wire. The Swap option allows the RX and TX pins to be swapped on STM32F7 based boards.	☐
SERIAL2_PROTOCOL	2	-1:None 1:MAVLink1 2:MAVLink2	Control what protocol to use on the Telem2 port. Note that the Frsky options require external converter hardware. See the wiki for details.	☐
BRD_SER1_RTSCTS	2	0:Disabled 1:Enabled 2:Auto	Enable flow control on serial 1 (telemetry 1). You must have the RTS and CTS pins connected to your radio. The standard DF13 6 pin connector for a 3DR radio does have those pins connected. If this is set to 2 then flow control will be auto-detected by checking for the output buffer filling on startup. Note that the PX4v1 does not have hardware flow control pins on this port, so you should leave this disabled	☐
BRD_SER2_RTSCTS	2	0:Disabled 1:Enabled 2:Auto	Enable flow control on serial 2 (telemetry 2). You must have the RTS and CTS pins connected to your radio. The standard DF13 6 pin connector for a 3DR radio does have those pins connected. If this is set to 2 then flow control will be auto-detected by checking for the output buffer filling on startup.	☐

VLC/QGC/MP >> Video Stream >> RTSP Settings

Note - the RTSP address used will be the one assigned to your IP camera. If you plan on using a non-IP camera, you will need an IP encoder or companion computer to use it directly with the module.

Open Media

File | Disc | Network | Capture Device

Network Protocol

Please enter a network URL:

rtsp://192.168.168.3:8554/main.264

http://www.example.com/stream.avi
rtp://@:1234
mms://mms.examples.com/stream.asx
rtsp://server.example.org:8080/test.sdp
http://www.yourtube.com/watch?v=gg64x

☐ Show more options

Play ▾ | Cancel