QUARTERHILL

intersection

TMB-13X RADAR
USER GUIDE

Vers. 0.4

ICOM S DETECTIONS SA
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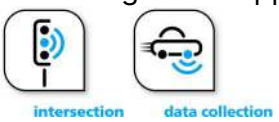
THEORY OF OPERATION

The TMB is a microwave sensor for traffic management available in different configurations according to the applications (intersection management and traffic data collection).



The TMB-13X is a microwave sensor for intersection management. The output of the TMB-13X radar consists of three (3) internal relays representing three (3) virtual loops and an additional RS-485 protocol. The information sent over RS-485 can be converted in dry contacts by using the optional relay board with 9 dry contact outputs.

1. Unpack the unit and check that the following items are in the box, see Fig. 1, p. 4:
    A. Radar with rear side socket
    B. Sticker for front face closure (optional for some configurations)
    C. Cable(s) with connector
    D. Mounting bracket
    E. User's guide and Tune up procedure
2. Assemble the unit with the bracket (see "Tune up procedure").
3. Place the radar on the field according to configuration and to the specific tune-up procedure.
4. Connect the cable(s) according to title WIRING, p. 6.
5. Power the radar.
6. Configure the radar
7. The front face sensor LEDs will switch on when a detection is made according to the application and the chosen settings.

SAFETY PRECAUTIONS

Only skilled and instructed persons should carry out work with the radar product. Experience and safety procedures in the following areas may be relevant:

- Working with mains power
- Working with modern electronic and electric equipment
- Working at height
- Working at the roadside or highways

Please follow these safety precautions:

- Make sure the electricity supply is within the range shown on the label and the manual of the product.
- All connections must be made whilst the power supply is switched off.
- Ensure the wiring is correct as shown in the manual before switching on the power supply.
- Never use a damaged radar.
- Opening the outer casing is deemed dangerous and will void all warranties.
- Ensure the radar is mounted correctly and the screws and bolts of both radar and bracket are firmly tightened. The radar needs to point to the region of interest for proper detection.
- Ensure the radar is configured properly.

WARNING: For the HV version of the radar, a Residual Current Device (RCD), also known as the Residual Current Circuit Breaker (RCCB), with a tripping current not exceeding 30 mA must be installed in the supply circuit.

WIRING

1 STANDARD – LV/MV/HV

To connect the cable(s) to the radar (***except the power connector for the HV version***):

a. Align the markings (•) and push the connector in. You will hear a click when the connector is correctly inserted.

b. !! This is a push/pull connector, do not screw or twist!!

LV (12-60 VDC – 10-30 VAC) & MV (21-75 VDC – 15-54 VAC) & HV		
PIN nr	**Color**	**Function**
1	RED	Power ~ (AC), + (DC) (LV and MV only)
2	BLACK	Power ~(AC), - (DC GND) (LV and MV only)
3	WHITE	COM Relays 1-2-3 *
4	GREEN	NC relay 1 *
5	BROWN	GND RS-485
6	BLUE	NC relay 2 *
7	YELLOW	NO relay 1*
8	ORANGE	B (TX/RX –) - (RS-485)
9	PURPLE	A (TX/RX +) - (RS-485)
10	PINK	NC Relay 3 *
11	TURQUOISE	NO Relay 2 *
12	GREY	NO Relay 3 *

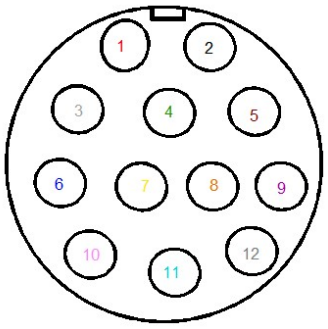


*Figure 7: TMB-13X LV/MV/HV radar connector - Weipu SA2012 (**push/pull** connector)*

*** Do not connect if you use the additional relays board.**

HV (100-240 VAC)		
PIN nr	**Color**	**Function**
1	BLUE	~ Power Supply
2	BROWN	~ Power Supply
3	YELLOW/ GREEN	EARTH
4 to 7	x	Do not connect

See Fig. 5: rear face, HV version, p. 4.

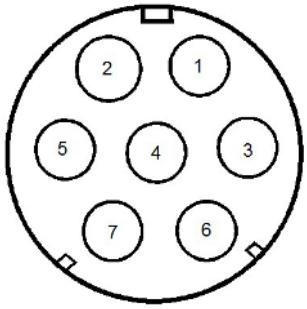


*Figure 8: TMB-13X HV radar connector - Weipu SP2112/P7 (**screw** connector)*

REMARKS

- **LV & MV versions:** **push/pull connector. Do not twist the connector, either to fix it or to remove it! You should hear a "click" when the connector is correctly inserted.**
- **HV version:**
  - COM/Relay(s) connector: **push/pull (see hereabove, do not rotate it)**
  - Power connector: make sure the plug is fully inserted in the socket, and the **cap is firmly tightened on the socket**
- Please disconnect the radar from power before maintenance intervention.

2 FOR UK – VERSION UK-LV

Supply range: 12-38V DC / 10-29V AC 50-60Hz

UK: cable gland & Bulgin 9 contacts	
PIN nr	**Function**
1	Power ~ (AC), + (DC)
2	Power ~(AC), - (DC GND)
3	NC relay 1
4	COM relays 1-2-3
5	NO relay 1
6	NO relay 2
7	NO relay 3
8	NC relay 2
9	NC relay 3

Figure 10 : cable gland & Bulgin plug

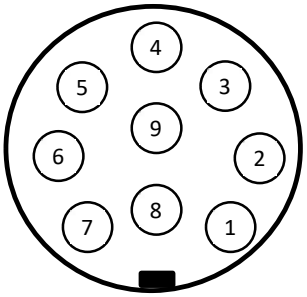


Figure 9: Bulgin connector PX0728/P

UK : cable gland & flying leads	
RED	Power ~ (AC), + (DC)
BLACK	Power ~(AC), - (DC GND)
WHITE	COM relays 1-2-3 *
GREEN	NC relay 1 *
BROWN	GND RS-485
BLUE	NC relay 2 *
YELLOW	NO relay 1*
ORANGE	B (TX/RX –) (RS-485)
PURPLE	A (TX/RX +) (RS-485)
PINK	NC Relay 3 *
TURQUOISE	NO Relay 2 *
GREY	NO Relay 3 *

*** Do not connect if you use the additional relays board.**

3 RELAYS

USER'S OUTPUTS: resistive load: 30 V AC 0.3 A - 60 V DC 0.3 A

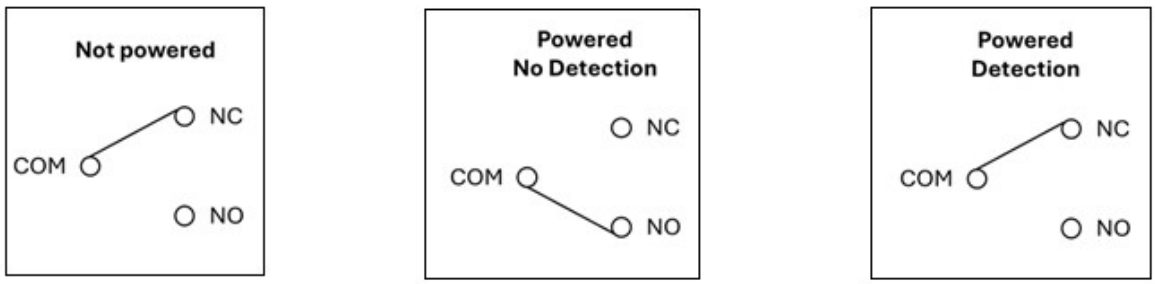


Figure 11: TMB-13X - relays behaviour

TMB-13X
CONFIGURATION – TUNE UP

The TMB-13X is a microwave sensor for intersection management. The output consists of three (3) internal relays representing three (3) virtual loops and an additional RS-485 protocol. The information sent over RS-485 can be converted in dry contacts by using the optional relay board with 9 dry contact outputs.

1 PARAMETERS DESCRIPTION

1.1 REGION OF INTEREST AND AZIMUTH

The Region of Interest (ROI) allows to define the detection zone and disregard anything detected outside the zone. Not only does this make the configuration easier, but it also allows the radar to avoid using internal resources (track allocation, memory and computing capacity) for moving objects outside the Region of Interest.

The azimuth is the angle at which the radar is installed in relation to the direction of the vehicles. Setting the azimuth allows to have vertical tracks on the graphical interface, and to position loops longitudinally in relation to vehicle tracks.

1.2 VIRTUAL LOOP SIZE AND POSITION

The TMB-13X radar emulates one or more virtual loops.

Each virtual loop can be set in the software using a mouse or by editing the coordinates x_min, x_max, y_min and y_max representing the x and y values compared to the (0,0) point which represents the radar.

When a movement is detected in any configured virtual loop, the radar will update the value of the corresponding register. When polled, the radar will respond with the register value which is then communicated through the RS-485 channel. When there is no vehicle, the register value for the virtual loop is set to 0. The communication protocol is detailed in a separate document.

1.3 FUNCTION OF THE VIRTUAL LOOP

The virtual loop can be set to apply different types of functions:

a. Movement detection: up to 110 meters from the radar installation point
b. Movement and presence detection: up to 50 meters of the radar installation point.

1.4 MAXIMUM RELAY HOLD TIME

This setting defines the maximum hold time for the relay register for “movement and presence” virtual loops. After this maximum time, the radar will reset the relay, regardless of the presence of a vehicle. If there is no relay (radar with serial output only), the virtual contacts hold time can be defined as well.

1.5 RF CHANNEL

This parameter allows to shift the radar’s frequency. If two units face each other, they must be put on different channels as to not interfere with each other.

2 LED INDICATOR

2.1 STARTUP

The red and green LEDs are flashing signaling the boot sequence.

2.2 OPERATION

- The red LED lights up if any “movement” virtual loop is activated
- The green LED lights up if any “movement and presence” virtual loop is activated.

3 INSTALLATION GUIDE

3.1 GENERAL

- Installation height: min. 3 m - max. 5 m. The installation height must be chosen to avoid masking effect of the transverse traffic.
- Use cases
  - Stop-line detection (see Figure 12 and title 3.2, p. 9)
    - Distance between pole and the stop-line (D): minimum 4 m
    - Horizontal angle: 30°
    - Vertical angle: 20°
    - Presence detection up to 50m
  - Far detection (up to 110m, see Figure 13 and title 3.2, p. 9)
    - Aim the radar to centre of the of the zone to be monitored.

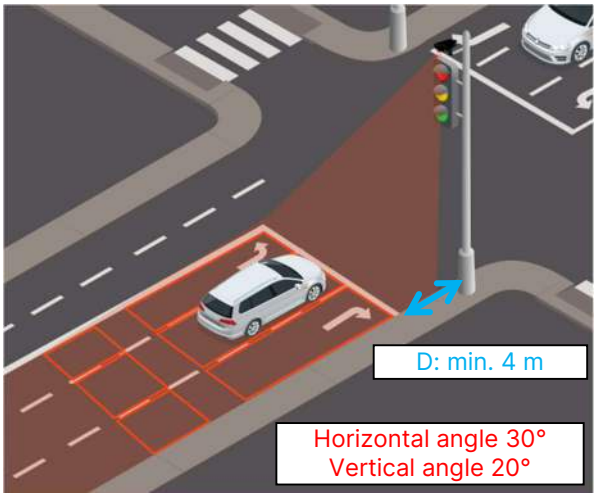


Figure 12: Stop-line + far detection, 3 lanes- Side installation

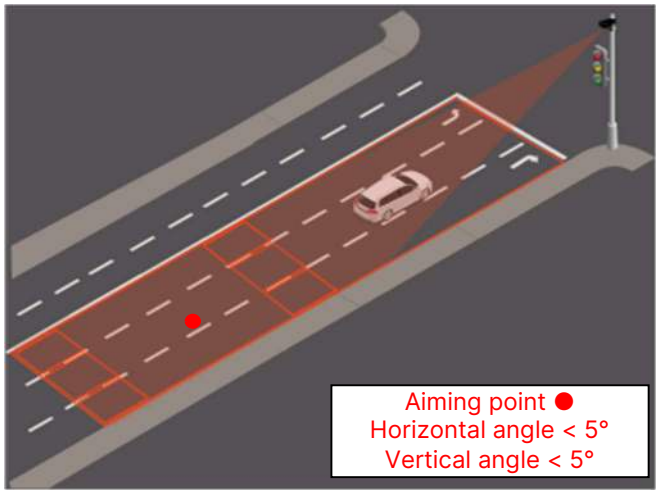


Figure 13: Far detection (up to 110 m) Side installation

- If improperly installed, radars can interfere with each other. Installation of multiple radars sharing the same frequency band requires channel configuration. Please refer to chapter 5.4, p. 16.

3.2 GRADUATED BRACKET

The TMB-13X comes with a graduated bracket for easy installation of the radar. The long part of the ‘pole’ element must always be parallel to the road/vehicle travel axis (→). The three holes allow you to choose the horizontal angle of the radar:

- Stop-line detection (max. range 40 to 50 m): -30° or +30°, depending on whether the radar is installed on the right or left side of the road

- Distant detection (up to 110 m): 0°

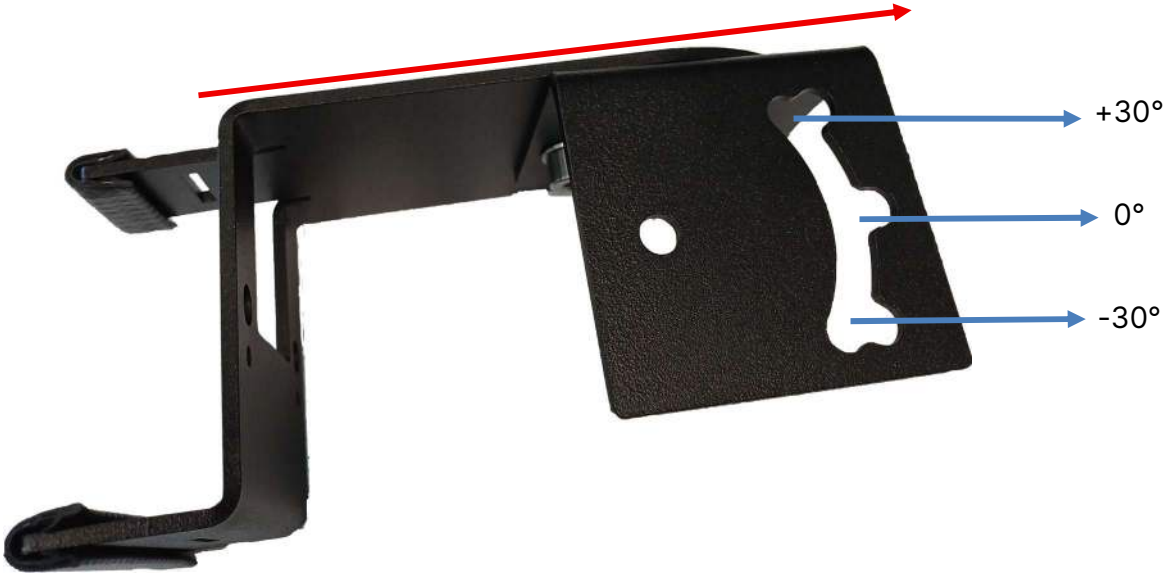


Figure 14 : bracket, top view, choice of horizontal angle

The groove on the 'radar' bracket allows you to select a vertical angle of 5° (long-range detection) or 20° (stop-line detection). Insert the third screw to lock the bracket in the desired position.

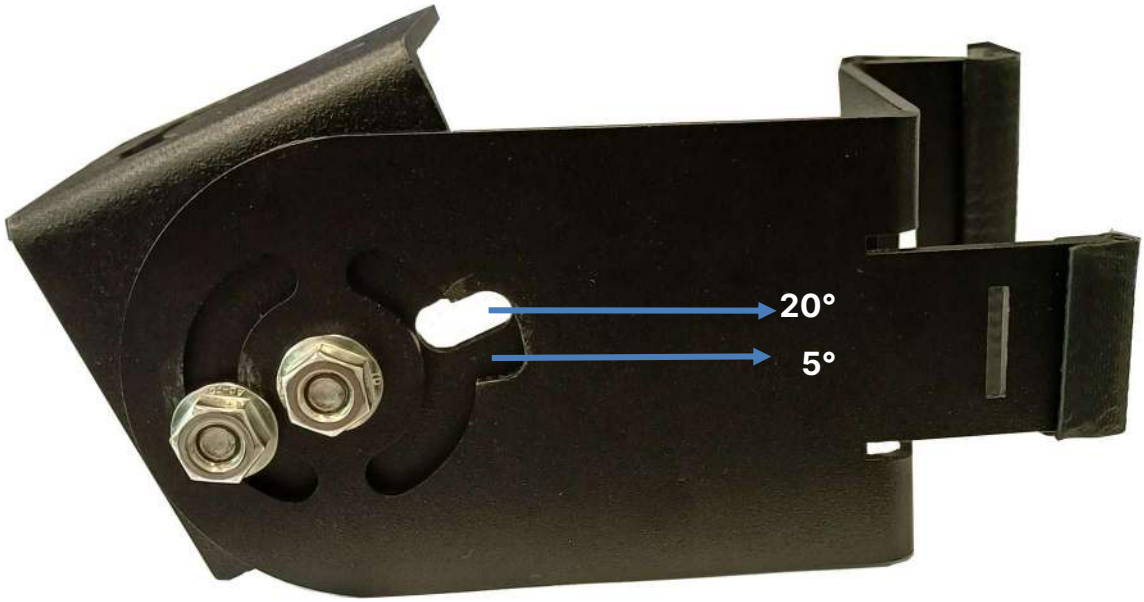


Figure 15: bracket, side view, choice of vertical angle

Figure 16 : distant detection installation < 5° vertical/0° horizontal

Figure 17 : installation for stop-line detection, radar on the right in the direction of travel 20° vertical/-30° horizontal

3.3 KEY POINTS

- Lanes: up to 4 lanes
- Direction: approaching
- Virtual loops: up to 9 loops (with the additional relays board)
- Max. number of objects tracked simultaneously: 40 vehicles or bicycles
- Detection mode: movement and presence
- Total detection range: 110m
- Maximum detection speed: 120 km/h
- Minimum detection speed: 3.4 km/h
- Minimum vehicle tracking speed: 3.4 km/h
- Range resolution: 0.25m

4 CONNECT THROUGH WIFI

While standing close to the powered device, search for the Wi-Fi network named "TMB-13X-xyz" with xyz being the serial number of the device. This allows to differentiate between devices if more than one device is present nearby.

The default Wi-Fi password to connect is "icomsgateway".

4.1 LOGIN PAGE

- Browse to the URL ***http://192.168.0.1*** to access the login page. ***Do not use HTTPS***.
- Choose the language and use the default password "***icoms***"
- When logging for the first time, the device will ask to change the password to secure the login.

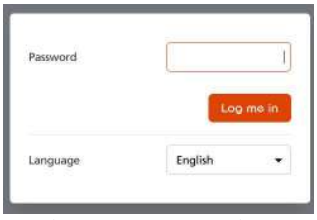


Figure 18: Log in page

Please ensure you save the new password to avoid being locked out of the user interface.

4.2 PASSWORD RESET

- Contact your reseller and share the serial number of the device to receive the recovery password
- Navigate to ***http://192.168.0.1/reset-password*** and key in the recovery password as well as the new password.

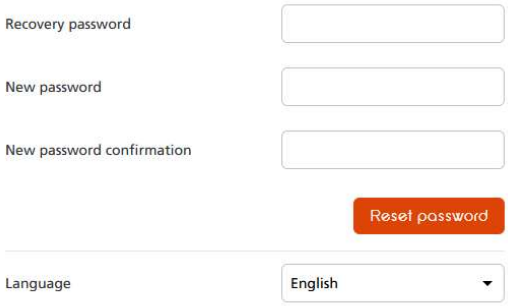


Figure 19: password reset page

5 DETECTION AREA SETTINGS

The Home button  shows the detection configuration page as shown in Figure 14.

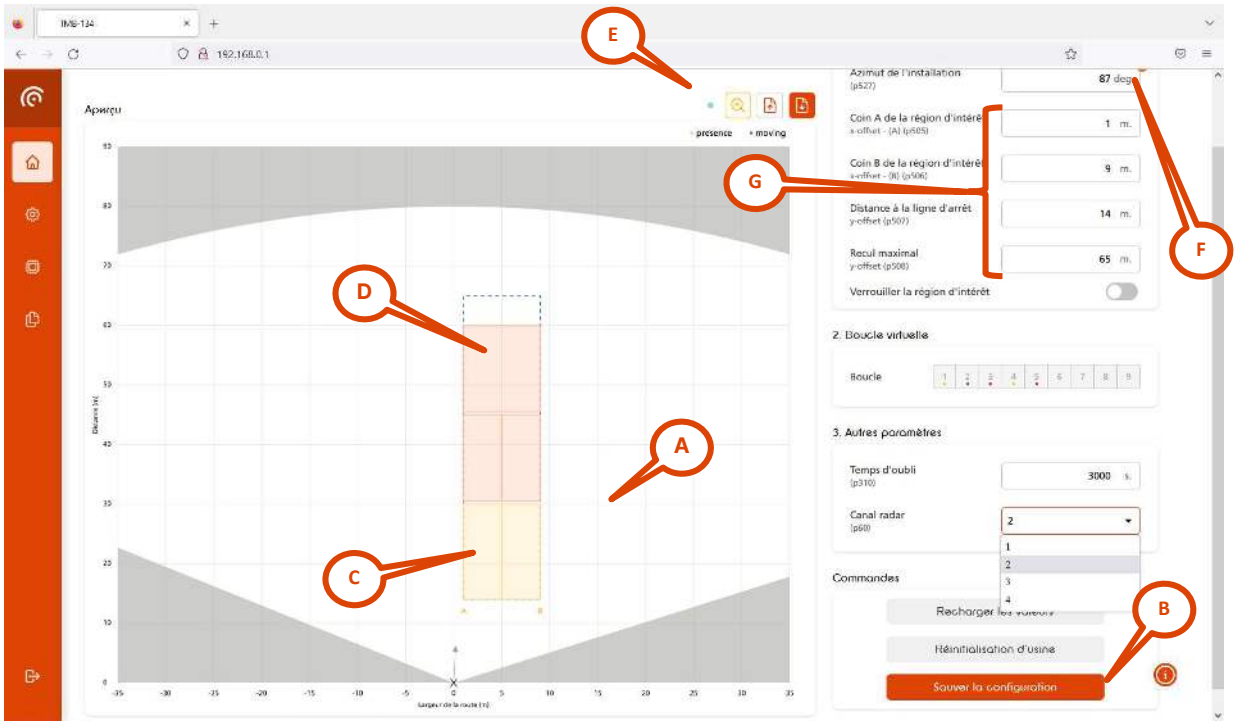


Figure 20: defining the region of interest

5.1 SET THE AZIMUTH ANGLE

The azimuth angle of installation is defined according to the radar's boresight and the perpendicular to the road to the right of it.

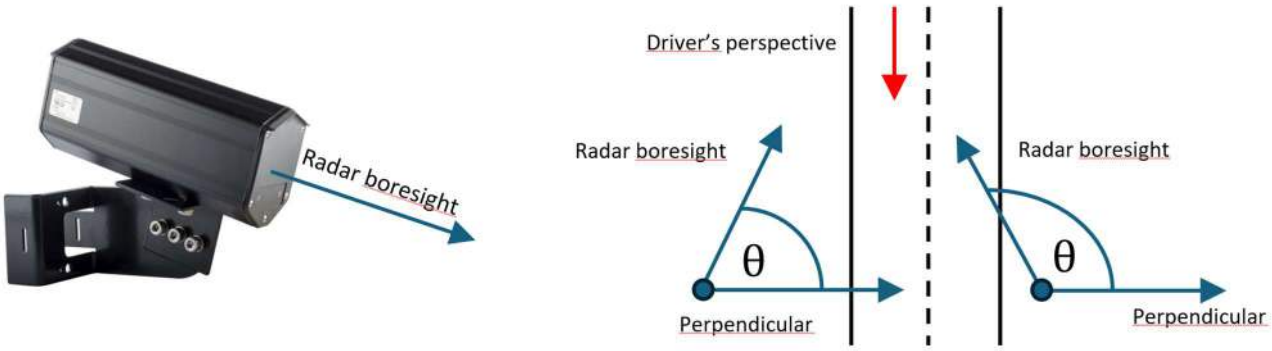


Figure 21: radar boresight and azimuth

An installation where the radar is placed, from the driver's perspective, to the right of the road, will therefore have an azimuth between 0 and 90°. If it is placed to the left of the road, it will have an azimuth between 90 and 180°, from the same perspective (see Figure 21).

This configuration step consists of entering the estimated azimuth angle of the installation, which is necessary for the radar to function properly. You can ensure the accuracy of the value sent by checking, after saving the azimuth or configuration, that the vehicle tracks are aligned with the Y-axis. This makes it easier to position the virtual loops on the tracks.

Alignment can be achieved by modifying the “azimuth” angle, displayed in degrees, as shown in Figure 20, reference F. Figure 22 shows the vehicle tracks that must be aligned vertically by changing the azimuth.

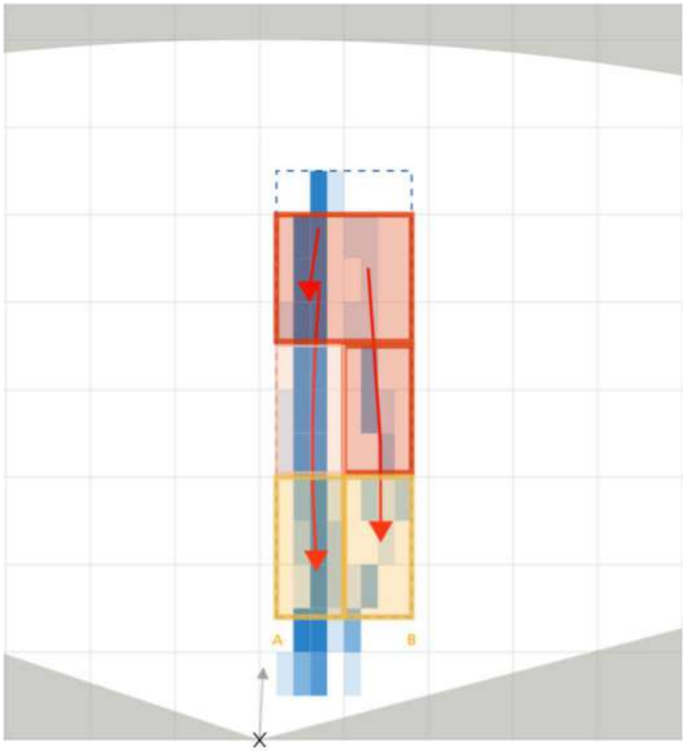


Figure 22: detected vehicles are shown and passed vehicles tracks are shown in blue

If the configured azimuth angle is incorrect, the vehicle tracks will be oblique as shown in Figure 23 on the left.

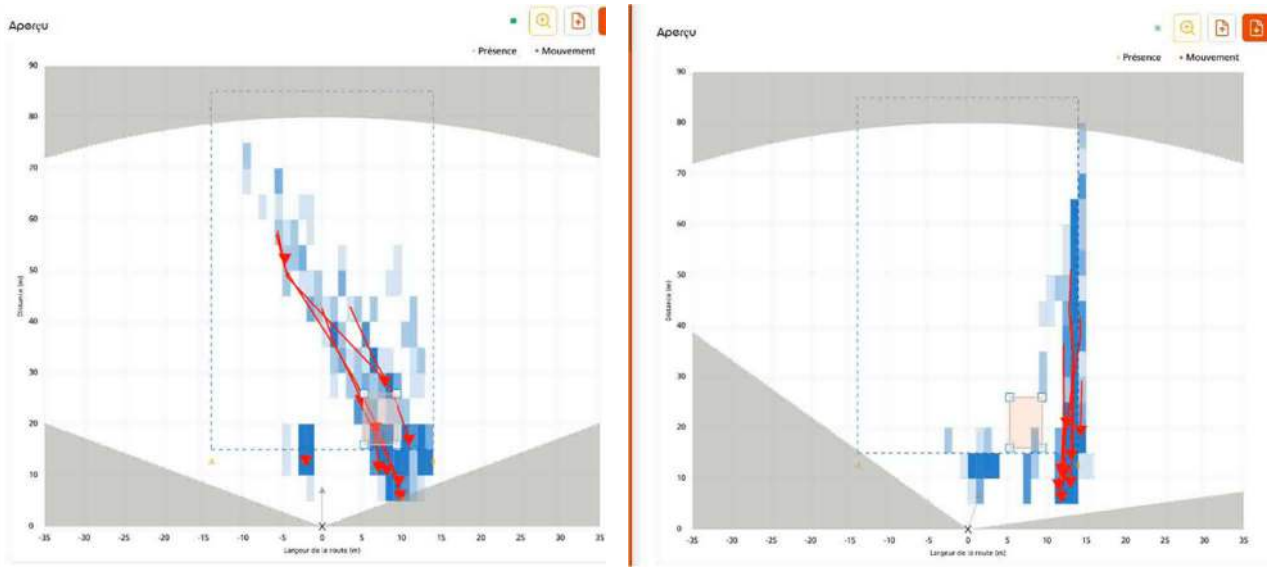


Figure 23: azimuth incorrectly set to 90° (left figure) and correctly set to 72° (right figure) – radar located to the right of the road, from the driver's perspective

A significantly wrong azimuth value will reduce the actual target representation area and complicate the setup process, make sure to encode values that are close enough to reality. Also make sure that the ROI (Figure 20, mark **A**) is large enough at this stage to allow a sufficiently large portion of the representation space to be displayed and to facilitate the adjustment of the azimuth. If necessary, refer to title 5.2, p. 14, to enlarge the ROI.

- If the tracks of the vehicles go to the right (as in Figure 23 on the left), the azimuth in the configuration must be decreased.
- If the tracks go to the left, it must be increased.

It is important to converge on tracks parallel to the Y-axis to ensure full radar performance.

5.1.1 Far detection

If the road is curved, it is recommended that you align the targets as much as possible at their spawn area with the Y axis.

5.1.2 Stop-line detection

To detect at the stop-line, the horizontal angle of installation is +30° or -30°, depending on the position of the radar (see section 3.2, p. 9).

- For a position at -30° (radar placed on the right of the road, from the point of view of the motorist), the azimuth will be 60°.
- For a position of +30° (radar placed on the left of the road, from the point of view of the motorist), the azimuth will be 120°.

These values will need to be refined so that the tracks are parallel to the Y-axis.

If the stop-line is curved, it is a question of finding a compromise between aligning the targets with the Y axis at their spawn area and being able to draw stop-line loops that properly separate the bands.

5.2 DEFINE THE REGION OF INTEREST

The "Region Of Interest (ROI)" must then be defined depicted in blue dotted lines on Figure 20, mark **A** and to size this area as close as possible to the lanes to be monitored. The purpose of this

step is to avoid unwanted detections, from counterflow traffic, reflections, pedestrians on the footpath, etc.

In the example hereabove (Figure 20), the parameters for ROI configuration are set as follows (**G**):
- Road rightmost corner offset compared to the radar installation point: 1 meter
- Road width: 9 meters
- Stop line distance from radar: 14 meters

Once the ROI is defined, save the setting by clicking the "Save the ROI" button on the right of the screen.

Figure 24: save the region of interest

5.3 DEFINE THE LOOPS

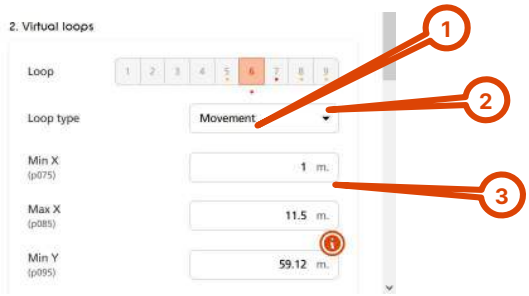


Figure 25: Loop definition

1. select the loop you want to set (you can define up to 3 virtual loops without relay board, and up o 9 virtual loops with the optional relay board)
2. choose the function:
    a. movement + presence (yellow-Figure 20 mark (**A**)) - Max. distance from the radar: 50 m.
    b. movement only (red - Figure 20 mark (**B**))
    c. disabled
3. define the size and position with the x/y coordinates. **Loops must be at least 4 m long.**
4. **Save the configuration.** ***The Wi-Fi interface does not show the activation of modified/moved and unsaved loops.***

Please ensure that the vehicle tracks are aligned with the centre of the virtual loops to maximize the detection precision. Set the azimuth angle if needed.

TIPS – BEST PRACTICES
- Define the "Min Y" coordinate of the stop-line loops on the stop-line (same Y value).
- The virtual loops must be centered on the blue heatmap tracks.
- **ROI :**
    - Laterally: define the ROI as close as possible to the lane(s) to be detected, using the blue tracks that appear as vehicles pass.
    - Longitudinally: at the longest. Unless there are specific cases, set the ROI length to the maximum allowed.

5.4 SET THE RF CHANNEL IN CASE MULTIPLE TMB-134 RADARS ARE PRESENT IN THE SAME AREA

If two units are facing each other or are interfering with each other, set the units on RF channels 1 and **3** respectively, using the parameter shown in Figure 19.

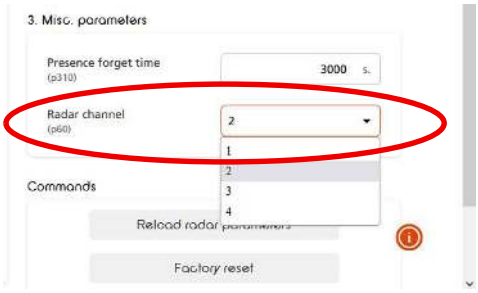


Figure 26: Configuration of the RF channel

5.5 SEND THE CONFIG TO THE RADAR

To complete the configuration, click the "Save configuration" button on the right of the screen. The button (**E**) will then appear green to indicate that the radar settings are up to date. An orange dot indicates that the settings on the screen are not the same as the settings stored in the radar. Click on 'Save configuration' to update the radar settings.

Figure 27: Save the configuration to the radar

6 DISABLING AUTOMATICALLY WIFI COMMUNICATION

Click on the Wi-Fi symbol  on the left navigation pane to access the Wi-Fi settings. Use the selection button to disable automatically the Wi-Fi signal after 60 minutes of inactivity. After changing the setting, **click on the "Update" button to save the setting to the radar.**

Figure 28: disable the Wi-Fi automatically after 60 minutes of inactivity

To reactivate Wi-Fi, disconnect the radar from its power supply, wait min. 30 seconds and then switch it back on.

7 WHAT IF...

7.1 VIRTUAL LOOP(S) DO NOT ACTIVATE

- Check the azimuth setting: the blue tracks should be parallel to the Y axis.
- Check the definition of ROI:
  - It must be drawn as close as possible to the tracks in width,
  - Increase the maximum distance of detection to 110 m,
  - Virtual loops must be inside the ROI.

- Check the loops
  - They must be well centered on the blue tracks,
  - Their minimum length must be 4 m.
- Save the loops ("save configuration" button).
- Slightly increase or decrease the vertical angle of the radar by tilting or raising the radar portion of the mount.
- Reload the web page using the "Refresh Page" button on your browser.

7.2 THE VIRTUAL LOOP(S) ARE ACTIVATED UNEXPECTEDLY

- Check the azimuth setting: the blue tracks should be parallel to the Y axis.
- Check the definition of the ROI: it must be drawn as close as possible to the lanes in width.
- Check that the loops are centered on the blue marks. Slightly shrink the loop(s) that are activating unnecessarily.
- Slightly increase or decrease the vertical angle of the radar by tilting or raising the radar portion of the mount.

7.3 THE RADAR RANGE IS INSUFFICIENT, I CAN'T PLACE A REMOTE LOOP

- Check the azimuth setting: the blue tracks should be parallel to the Y axis.
- Check the definition of ROI: increase the maximum distance of detection to 110 m,
- Slightly decrease the vertical angle of the radar by raising the "radar" part of the bracket.

TMB-13X – Relays board option

A DIN rail mountable board with 9 relay outputs is available as an option. It converts the information received from the TMB-13X radar over RS-485 in dry contacts, for each configured detection area.

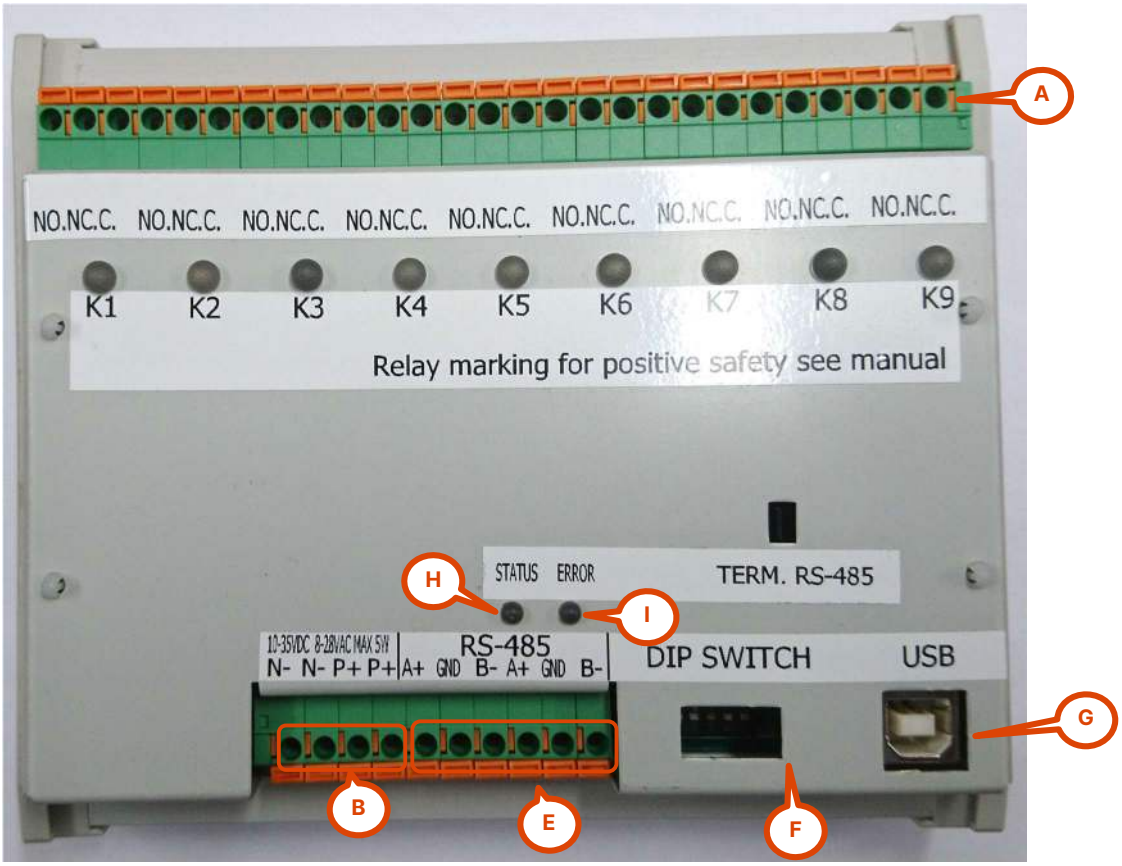


Figure 29: 9 relay outputs board

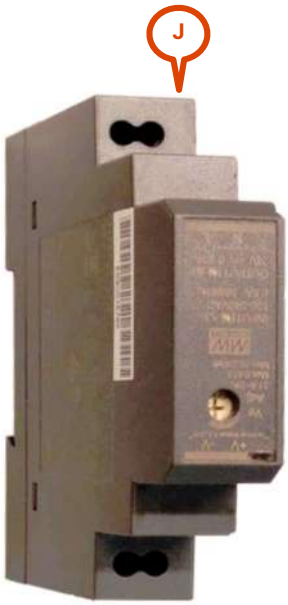


Figure 30: optional transformer for the relay board

1 CABLING

A: relays (NC, NO, COM, for each of the 9 relays). “
B: power (10-35 V DC/8-25 V AC, 50-60Hz). For power supply above these values, please use the optional rail mount module (**J**) 100-240V AC, 50-60Hz.

E: RS-485 from radar

2 RELAYS

The “no detection” state correspond to an energized relay.

3 LED INDICATORS

At power-up, the 3 digits of the Relays Board firmware version flash on the LEDs (the first digit on the status LED (H), the second digit on the error LED (I) and the third digit on the status LED again). Then, in operation, when a relay is activated, its corresponding LED indicator lights up.
H: the Status LED lights up when the radar communicates, either with the PC or the relays board.
I: Error LED (lights up in case of communication error)

4 SWITCHES

Given for information purposes only. Do not change the position of the switches.

- DIP 1 = TMB Baud rate. Off = 115 200 bps (default value, **must be “off”**) - on = 19 200 bps
- DIP 2 = error correction (ECC) **(ON by default**). Dip switch “on” disables the ECC. If you encounter errors on the communication channel, contact the manufacturer to switch on the error correction code on the radar.
- DIP 3 = Unused, **leave OFF**
- DIP 4 & 5 = Relays polling period – Both must be OFF (OFF-OFF : 50 ms/OFF-ON : 300 ms/ON-OFF : 500 ms/ON-ON : 800 ms)

5 COMMUNICATION DETAILS BETWEEN TMB RADAR AND THE RELAY BOARD

- The latency between the poll request from the relay board and the answer from the radar received by the relay board needs to be within the timeout of the relay board (equal to the maximum between 200 ms and the selected polling period). No reliable communication can be established if this is not ensured.
- The length of the messages sent via the Relay Board USB port should be shorter or equal to 128 bytes.
- Messages from the TMB and the Relay Board must not be split into separate messages by optional additional equipment between the radar and the relay board. The relay board assumes that the message from the TMB is terminated when there is a gap of more than 1 ms on the communication line. Once the request-response cycle is considered complete, the relay board reasserts the control on the RS-485 bus. Any parts of message arriving from the TMB at this time will be lost.

If there is a problem of communication between the TMB and the relays board, the error LED will light up and all relays will be set in their “detection“ state. The relay board internally bias the RS-485 bus. Additional equipment should thus not add an additional bias to it.

TECHNICAL FEATURES

	TMB-LV	TMB-MV	TMB-HV
Protection level	IP 65		
Power supply	8–30 V AC, 50-60 Hz 10–60 V DC	15–54 V AC, 50-60 Hz 21–75 V DC	100–240 V AC, 50-60 Hz
Power consumption	@12 V DC: < 6 W		@220 V AC: < 6 W
User output	See “Tune up procedure”		
Temperature range	-40° C to +60° C		
Dimensions	68 mm x 99 mm x 163 mm	68 mm x 99 mm x 208 mm	
Weight	446 g	605 g	631 g
Wiring & connectors	Weipu connector: SA2010/S12 for cable & SA2012/P12B for radar		
Operating frequency	76-77GHz		
Max. transmit power	< 20 dBm EIRP		

WARRANTY

Icoms Detections warrants its hardware products to be free from defects in workmanship and materials, under normal use and service, for a period of two (2) years from the date of dispatch from Icoms Detections premises, except for the batteries for which a warranty period of six (6) months applies.
If a product does not operate as warranted during the applicable warranty period, Icoms Detections shall, at its option, either repair the defective unit, or deliver an equivalent product or part to replace the defective item. All products that are replaced become property of Icoms Detections.

The defective product must be returned to Icoms Detections within the applicable warranty period. The defective product must be shipped DDP (delivered duty paid) back to Icoms Detections, wrapped in the original or similar shipping package to ensure that it will not be damaged during transportation. It must be accompanied by appropriate paperwork (ask first for a **R**eturn **M**aterial **A**uthorisation number) detailing the nature of the defect experienced.

Icoms Detections shall be under no liability in respect of any defect arising from normal wear and tear, wilful damage, negligence, damage due to inappropriate packaging, abnormal working conditions, failure to follow Icoms Detections instructions (whether oral or in writing), misuse, improper installation, alteration or repair without the approval from Icoms Detections.

DECOMMISSIONING

We encourage customers to send back decommissioned equipment to the manufacturer for recycling. To differentiate between equipment to be recycled and equipment to be repaired, please inform your reseller or the manufacturer about the decommissioned equipment. Icoms Detections will take care of the recycling for a sustainable end-of-life of the product.

FURTHER INFORMATION

1 LEGAL NOTIFICATION

Hereby, Icoms Detections declares that this TMB range of products is in compliance with the requirements and other relevant provisions of

- Directive 2014/53/EC – all configurations
- UKCA

2 VERSION

Issue n°	Date	Comment
V0.1	April 7, 2025	TMB-13X V2 – Draft release
V0.2/0.3	June 12, 2025	Add-on graduated bracket – Relay behaviour
V0.4	Dec. 8, 2025	NO/NC relays

3 THE MANUFACTURER

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