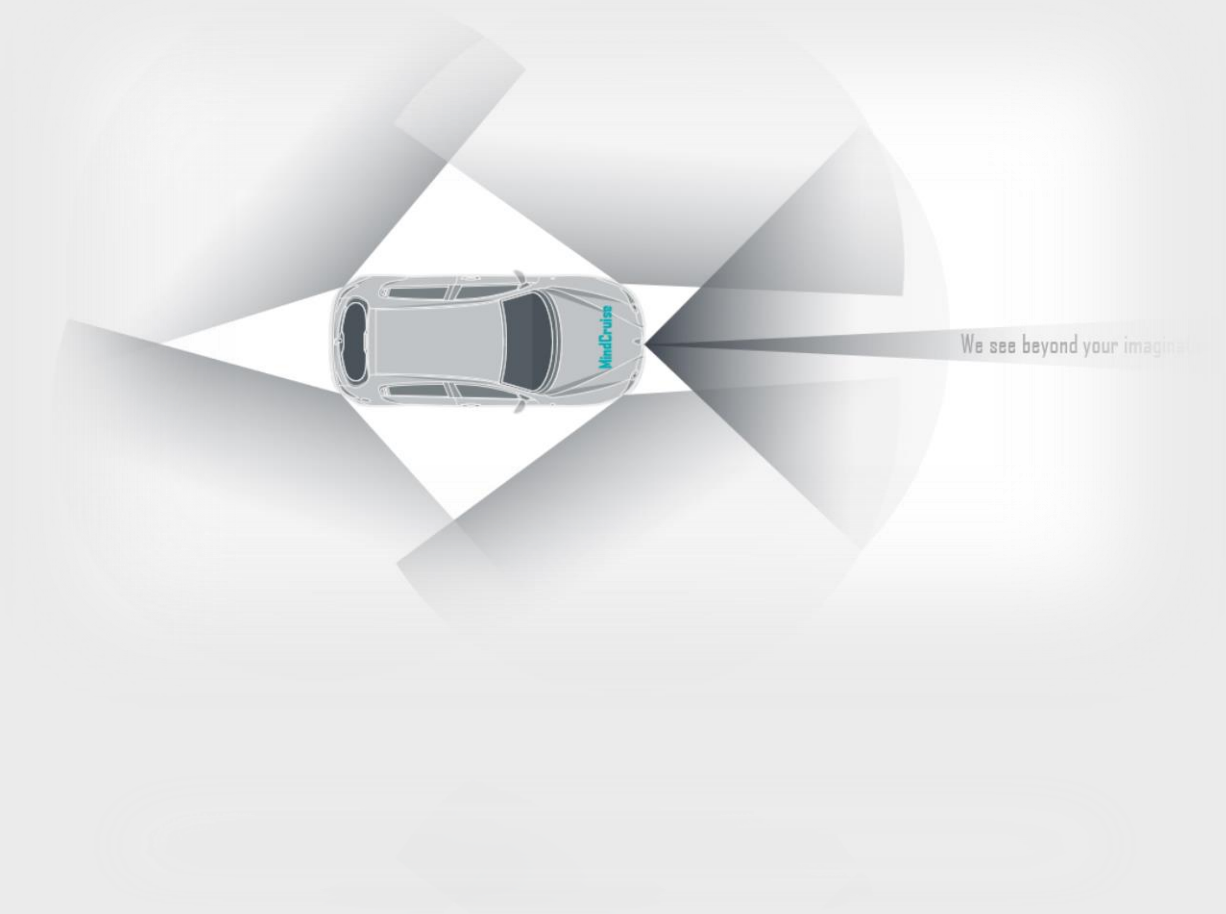


MindCruise

P0 后向雷达用户手册 P0 Rear Radar User Manual

Version 5





<i>Project:</i> CFMOTO F050	<i>Status:</i>
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Note: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and operated with minimum distance 20cm between the radiator & your body.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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1 前言/General Description

Product: P0

Spec Type: SYS

Security Level: Partners

General Description:

This spec is used as guideline to MindCruise customers to understand how to start work with MC Radar.





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2 术语/Terms

缩写/Term	全称/Full Description
PC	Personal Computer
MC	MindCruise
IPC	Industrial Personal Computer
GW	Gateway
FOV	Field Of View 可视角度
BSD	Blind Spot Detection 盲区预警
LCA	Lane Change Assist 变道辅助
RCW	Rear collision Warning 后碰预警



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3 雷达基本信息/Radar Basic Information

3.1 P0 雷达简介/P0 Brief

P0 雷达是一轮 MindCruise 公司 77GHz 后向雷达产品，可提供 BSD, LCA, RCW 功能，可支持 L0 级别的自动驾驶。

P0 is type of rear radar of MindCruise which provides integrated BSD, LCA, RCW features and can support up to L0 ADAS features.

3.2 P0 雷达性能/P0 Parameters

参数 Parameters	内容 Content
天线布置 Antenna	2 发 3 收 2Tx/3Rx
中心频率 Center Frequency	76.5GHz
探测距离 Max. Detection Range	50m
最小距离 Min. Detection Range	0.5m
距离精度 Distance Accuracy	0.4m
距离分辨率 Distance Resolution	0.5m
水平可视角度 FoV	-75~75°
水平角度精度 Angle Accuracy	0.5°
水平角度分辨率 Angle Resolution	10°
速度范围 Velocity Detection Range	-35 ~ +35m/h
速度探测精度 Velocity Detection Accuracy	0.1m/s
速度分辨率 Velocity Detection Resolution	0.4m/s
最大探测点数 Max. Detection Output	100/cycle
支持功能 Self-integrated Features	BSD, LCA, RCW

3.3 Communication Protol 通讯协议

P0 雷达使用 RS485 通讯协议。



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RS-485 is used as communication protocol of P0.

3.4 P0 Data Matrix P0 数据矩阵

P0 雷达 Data Matrix 如附件。

[F050_Matrix_485_V0.3_23231128\(jade modified\).xlsx](#)

P0 radar data matrix could be found in Appendix.

3.5 P0 雷达输出信息 P0 radar Output Information

3.5.1 雷达状态信息/Radar Status Information

在当前 P0 Matrix 中，P0 雷达将会收到轮询信号后输出雷达的状态。最小输出周期为 100ms。

In currently defined data matrix, P0 outputs radar status once receiving request information. Minimum cycle time is 100ms.

信号名称/Signal Name	信号说明/Signal Description
RS_Status	雷达当前状态信号 / Indicate radar status

3.5.2 功能报警信息/Radar Feature Warning Information

在当前 Data Matrix 中，P0 雷达将会收到轮询信号后输出雷达功能报警信息，包括功能 BSD, LCA 和 RCW。最小输出周期为 100ms。

In currently defined Data matrix, P0 outputs radar warning information including BSD, LCA and RCW once receiving request information. Minimum cycle time is 100ms.

信号名称/Signal Name	信号说明/Signal Description
BSD warning information	BSD 功能报警状态 / BSD warning information
LCA warning information	LCA 功能报警状态 / LCA warning information
RCW warning information	RCW 功能报警状态 / RCW warning information



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3.5.3 目标信息/Object

在当前 data Matrix 中，P0 雷达将会以 50ms 的周期输出最多 30 个目标的追踪信息。若被追踪的目标不足 7 个，则 485 信号将会是默认值状态输出，需要使用方法进行判定。

In currently defined data matrix, P0 outputs up to 7 objects every 100ms. If existing objects in environment are less than 7 485 signals still output 7 objects with dummy objects whose attributes are set to default.

目标信息说明如下表/Object Description Table:

信号名称/Signal Name	信号说明/Signal Description
RS_Obj[xx]_XPos RS_Obj[xx]_YPos	信号坐标系/Signal Coordinates: 如果雷达刷入了静态参数，则该值将会在整车坐标系下输出。 If radar static parameters are flashed in, these values will be output per vehicle coordinates 信号基本功能/Signal basic function: 目标 X、Y 坐标位置 Object X, Y Position
RS_Obj[xx]_XVelAbsolute	信号坐标系: 如果雷达刷入了静态参数，则该值将会在整车坐标系下输出。 Signal Coordinates: if radar static parameters are flahsed in, these values will be output per vehicle coordinates. 信号基本功能/Signal basic function: 目标的绝对 X 速度 Object absolute X velocity

3.6 P0 雷达电气信息/P0 Electrical Information

3.6.1 Pin 脚定义/Pin Definition

PIN	Pin 脚描述/Name	Pin 脚类型/Type	详细描述/Description
1	VA/RXD+	Communication I/O	整车 RS485+
2	L_LED B+	Communication I/O	左 LED 驱动 I/O
3	BAT+	Power Input	DC12V+ 接入整车 KL15 或 KL30



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PIN	Pin 脚描述/Name	Pin 脚类型/Type	详细描述/Description
			Connect to KL15 or KL30 power
4	B/RXD-	Communication I/O	整车 RS485-
5	GND	Communication I/O	DC12V- 接地 Connect to ground
6	R_LED B+	Driver IO	右 LED 驱动 I/O

3.6.2 供电方式说明/Power Supply

P0 雷达是基于车辆应用设计，支持 9V~16V 供电电压下正常工作，额定工作电压为 12V，功率为 0.25W。

P0 is normally applied to vehicle with 9V - 16V supported, classic working voltage is 12V with 0.25W power consumption



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4 雷达安装与连接/Radar Installation & Connection

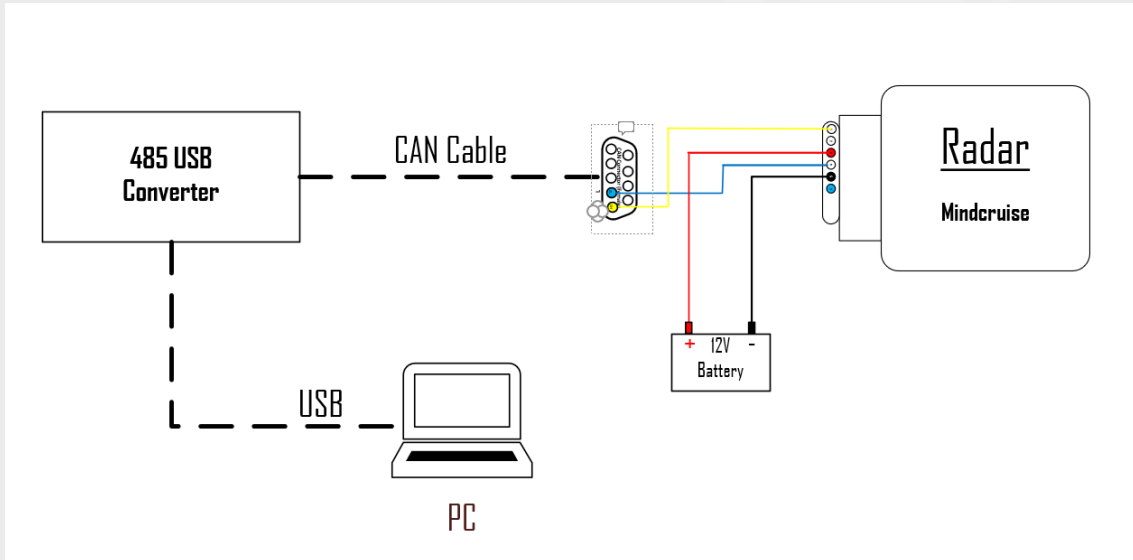
4.1 静态测试/Static Test

4.1.1 电气连接/Electrical Connection

所需物品：雷达、线束、12V 电源、485-USB 转换头、PC 或 IPC

Needed equipment: Radar, harness, 12v power supply, 485-USB converter, PC or IPC.

Electrical connection refer to below:



4.1.2 基础测试场景/Basic Test Scene

按照上述描述连接好系统后，可于室外空旷地带，在雷达正前方 5m 处放置一 10dBsm 的角反（角反与雷达高度需一致），观察上位机软件上雷达是否探测到目标，以确保雷达正常工作。

After connecting radar system per Electrical Connection section, to have a quick check whether radar is up and running, below basic test is recommended to be conducted:

find a plain & open square, place a 10dBsm reflector at 5m in front of radar(reflector height shall be the same with radar), look into radar visualizer software - Farseer(can be provided by MindCruise) to see whether there is detection.

If there is a stand still detection at around 5m in front of radar, then radar is now up and running.



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4.1.3 雷达输入信号需求列表/Radar Needed Input Signal List

毫米波雷达需要从整车获取以下信号，以便能够进行准确的补偿和计算，以便得出准确的环境信息。

Radar needs signals from vehicle so that it can compensate vehicle dynamic status to output accurate object and detection.

请提供包含以下整车输入信息的 dbc，以便于 MC 将整车信息整合到雷达系统。

Please provide vehicle dbc which at least contains below signals to MindCruise:

雷达需求的整车输入信号/Requested input signal	描述信息/Description	需求等级/Requirement Level
ESC_VehicleSpeed_Valid_indicator (车速有效位)	Host raw velocity valid indicator 主车速度有效位	Mandatory
ESC_VehicleSpeed (车速)	Host raw velocity 主车速度	Mandatory