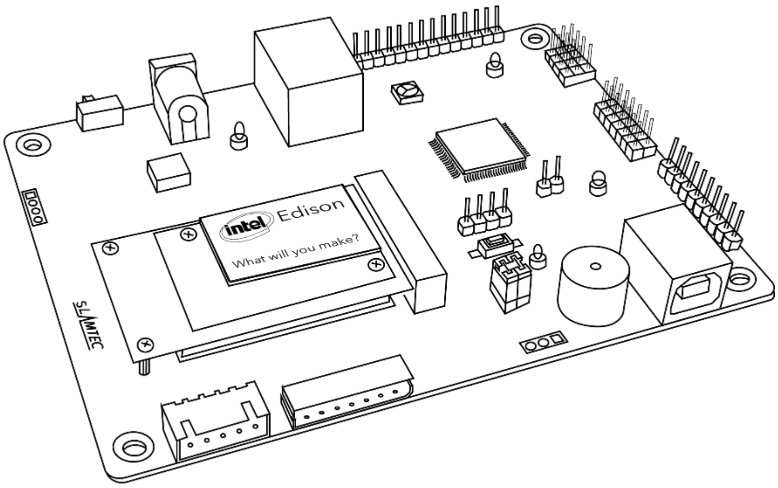
SLAMWARE

Modular Autonomous Robot Localization and Navigation Solution

Breakout User Manual

Model: 3.0



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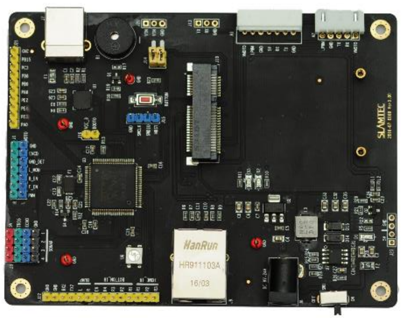
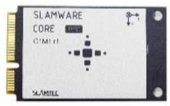
Contents

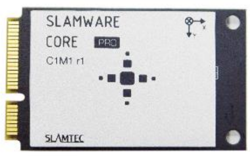
Introduction

SLAMWARE development kit contains all the required devices and tools for evaluating and developing SLAMWARE modular autonomous robot localization and navigation solution. Users can observe the working process from our graphical tool and start developing by just fixing the SLAMWARE core on the SLAMWARE Breakout and connecting the LIDAR, power, and computer to the matched interface of SLAMWARE Breakout.

Components

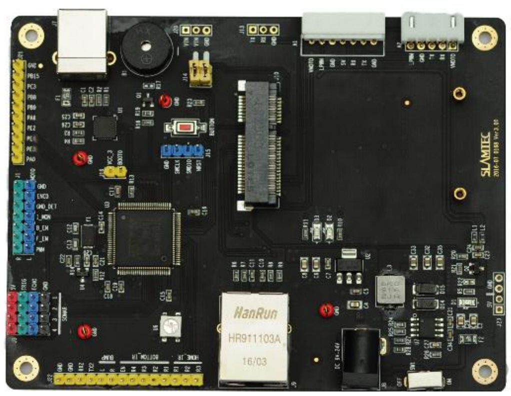



SLAMWARE Modular Autonomous Robot Localization and Navigation Solution (SLAMWARE Core in Short)



Based on RPLIDAR, the SLAMWARE core provides real time localization and autonomous navigation for robot, and supports communication of navigation information between serial port and Ethernet. For detailed specifications, please refer to SLAMWARE core datasheet.

SLAMWARE BREAKOUT



SLAMWARE Breakout is a shield providing SLAMWARE core with communication interfaces connecting directly to A1/A2 RPLIDAR, network, computer, motor and various sensors, which facilitates the hardware or software development based on the core module.

RPLIDAR A1 or RPLIDAR A2

The RPLIDAR can perform 2D 360-degree scanning within a fixed range. The generated 2D point cloud data can be used by SLAMWARE core module for realizing real time localization and autonomous navigation. For detailed specifications and usage, please refer to RPLIDAR related documents.

Module Connection

Interface Diagram

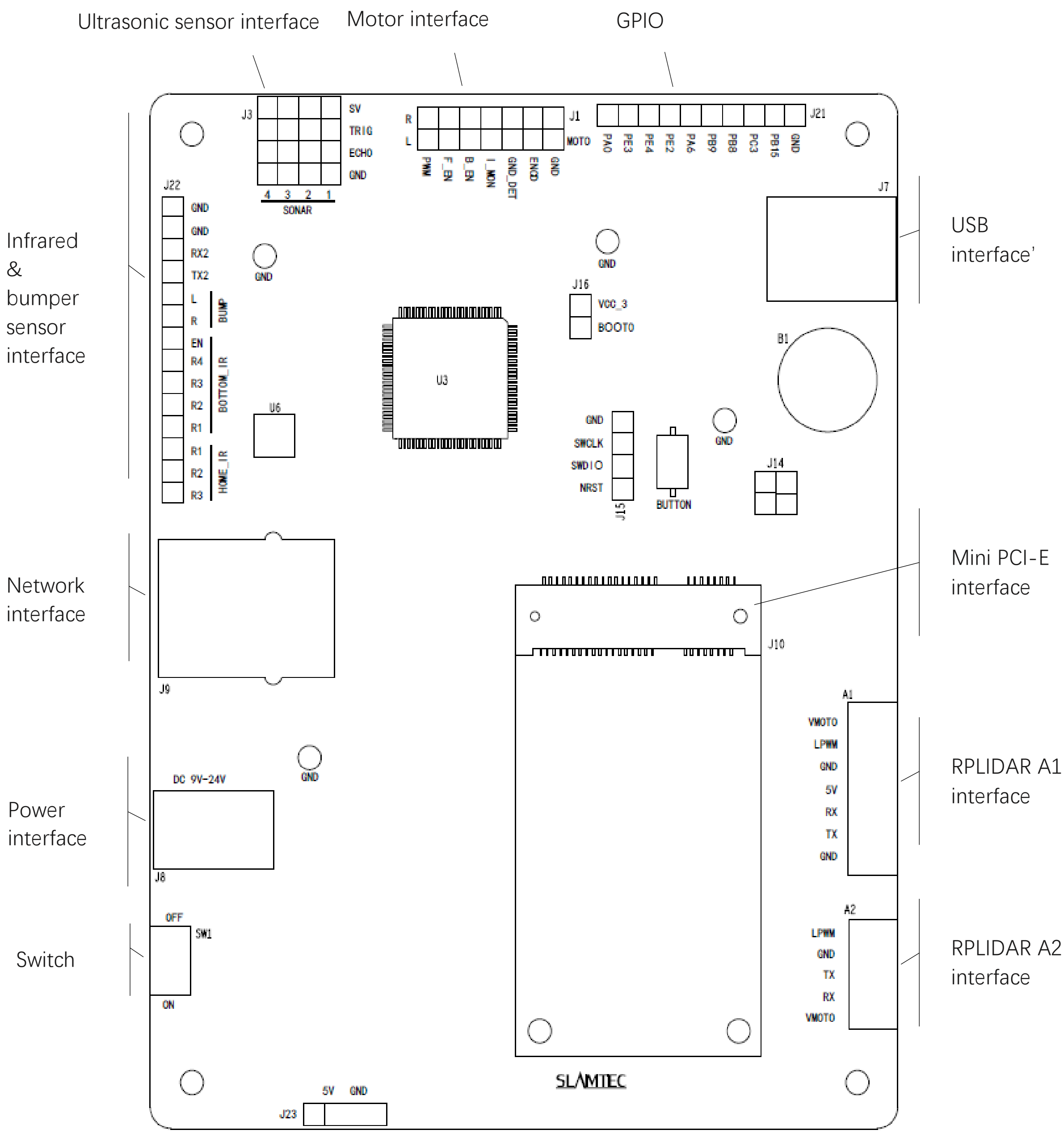


Figure 2-1 The Interface Diagrams of SLAMWARE BREAKOUT

Device Connection

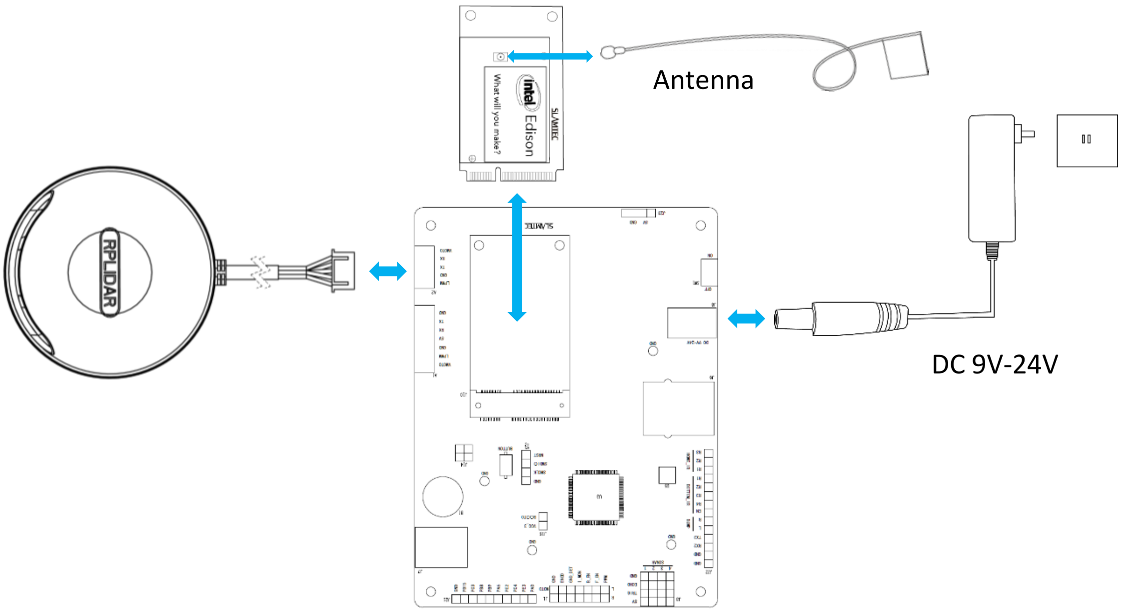


Figure 2-2 The SLAMWARE Kit Components Connection

Connecting to PC

There are two ways for connecting the SLAMWARE kit to a computer. Users can debug their developing project conveniently by connecting the kit to computer via the designed general Ethernet interface on the breakout. At the same time, to meet the need of practical development and application, the kit also supports wireless connection in AP mode and station mode. The following text will introduce the connection steps based on wireless connection.

AP Mode

In this mode, the SLAMWARE core works as a WiFi spot, when the user device connects to the WiFi spot via wired network or WiFi, it will get an IP address from DHCP and supports being visited from 192.168.11.1. This mode is the preset mode for SLAMWARE core delivery.

After connecting the components correctly, please slide the Breakout switch to ON. The RPLIDAR will start rotating in 30 seconds, which indicates the device has launched successfully. There will be a SSID named SLAMWARE-XXXXXXXXXXXX in the computer WLAN list. The users can connect the kit to the computer by connecting to the SSID and the default ip address is 192.168.11. X.

Station Mode

In this mode, SLAMWARE core works as a WiFi device and connects to other WiFi spot. Then the SLAMWARE core will be a wireless bridge and configure ip address for devices on high speed bus and provide services for outer net visit.

It can be configured via the following steps.

Step 1 Connect to the AP of the SLAMWARE core on computer

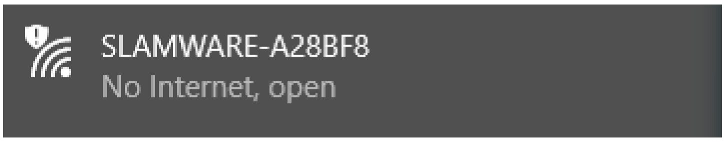


Figure 2-3 The AP of SLAMWARE Core

Step 2 Open the http://192.168.11.1 in browser. (Chrome is recommended)

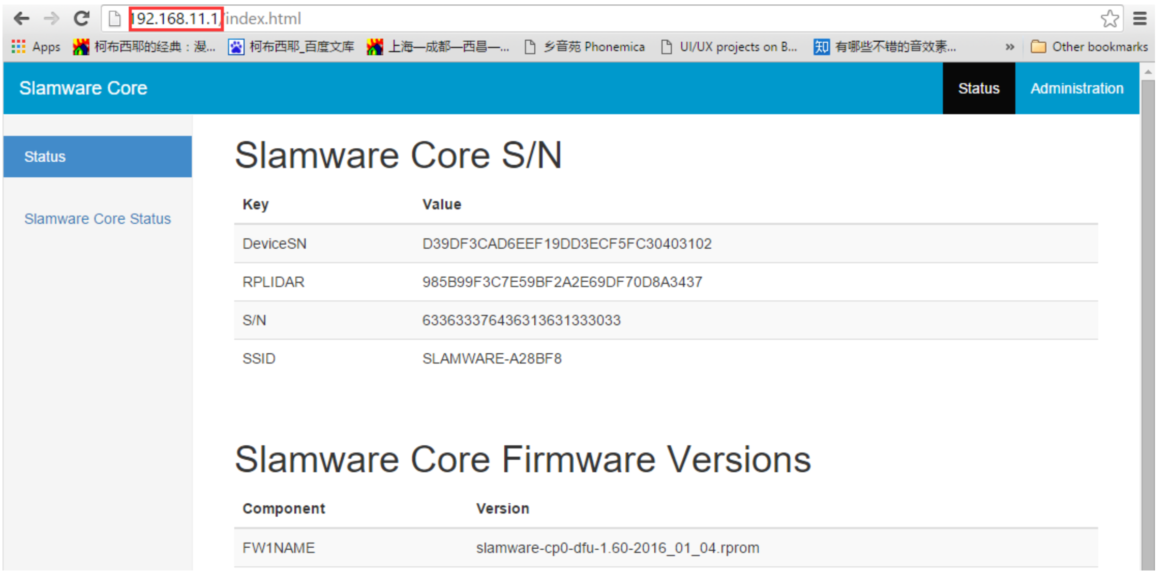


Figure 2-4 Status Page of http://192.168.11.1

Step 3 Click the **Administration** on the upper right corner

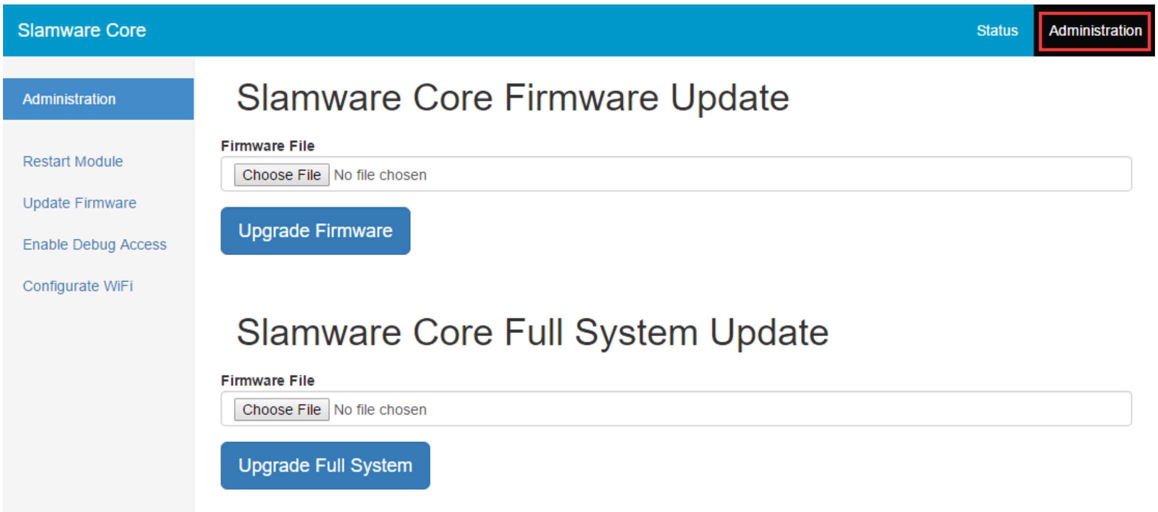


Figure 2-5 Administration Page of http://192.168.11.1

Step 4 Click the **Configurate WiFi** in the left panel

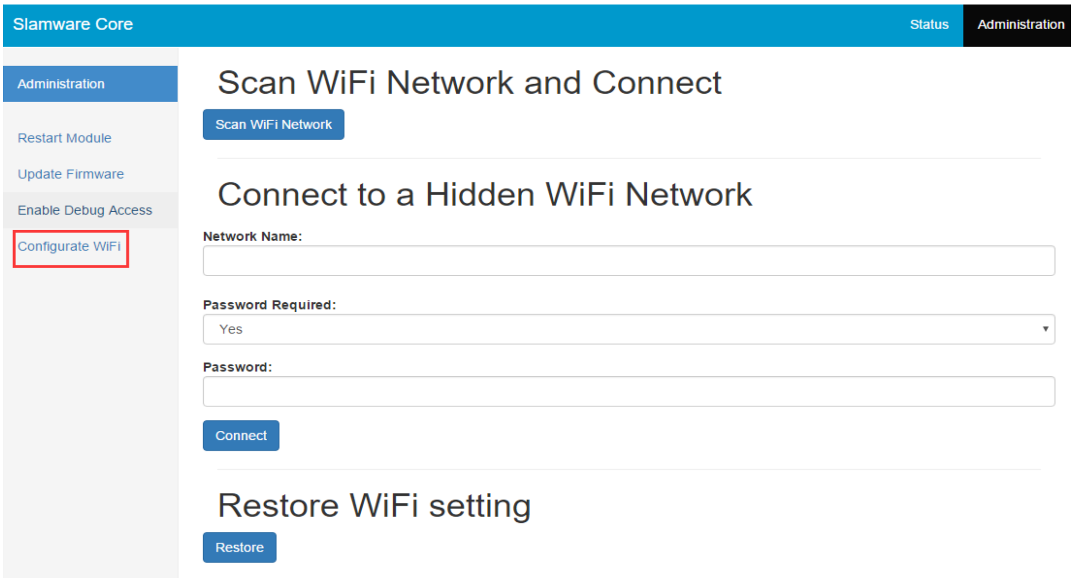


Figure 2-6 SLAMWARE WiFi Configuration Panel

Step 5 Enter the configuration data and click **Connect**

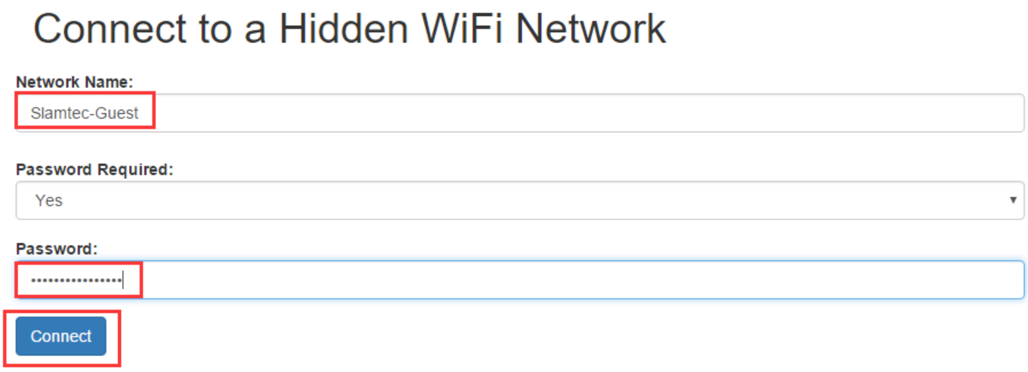


Figure 2-7 SLAMWARE WiFi Configuration and Connection

Step 6 Check the router and there will be the information to show the SLAMWARE core has been connected to the WiFi network successfully.

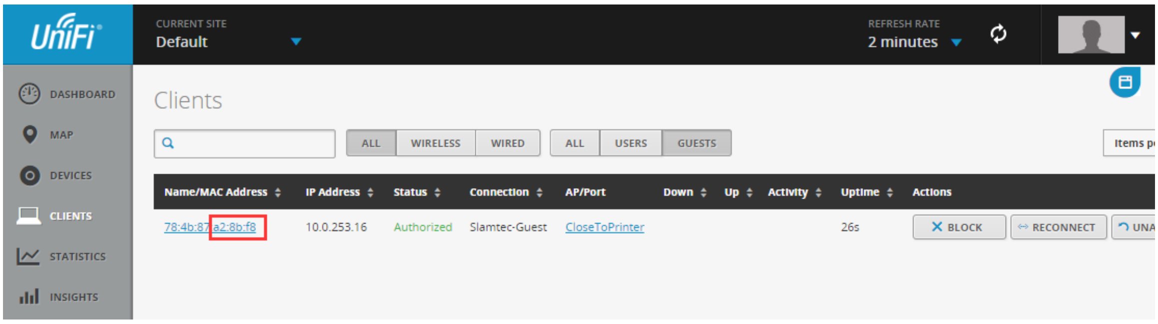


Figure 2-8 SLAMWARE WiFi Configuration Success

Note: The AP mode is still active in this situation.

Breakout Property

Maximum Rating

Item	Range
Power supply voltage	9V ~24V
Pin voltage	-0.3V ~3.6V
Operating temperature range	-20°C ~+60°C

Figure 3-1 SLAMWARE Breakout Maximum Rating

Electrical Characteristics

Symbol	Parameter	Minimum Value	Typical Value	Maximum Value	Unit
V_{DD}	Rated system working voltage	4.75	5	5.25	V
I_{DD}	System current consumption	-	-	1000	mA
V_{DD_IO}	Digital interface voltage range	2.6	3.3	3.6	V
I_{DD_IO}	Digital interface current consumption	-	-	TBD	mA
V_{DIL}	Low-level digital input	-	-	0.2*V_{DD_IO}	V
V_{DIH}	High-level digital input	0.8*V_{DD_IO}	-	-	V
V_{DOL}	Low-level digital output	-	-	0.2*V_{DD_IO}	V
V_{DOH}	High-level digital output	0.8*V_{DD_IO}	-	-	V
$I_{STANDBY}$	Current consumption @ off mode	-	-	TBD	mA

Figure 3-2 SLAMWARE Breakout Electrical Characteristics

Breakout Interface and Pin Definition

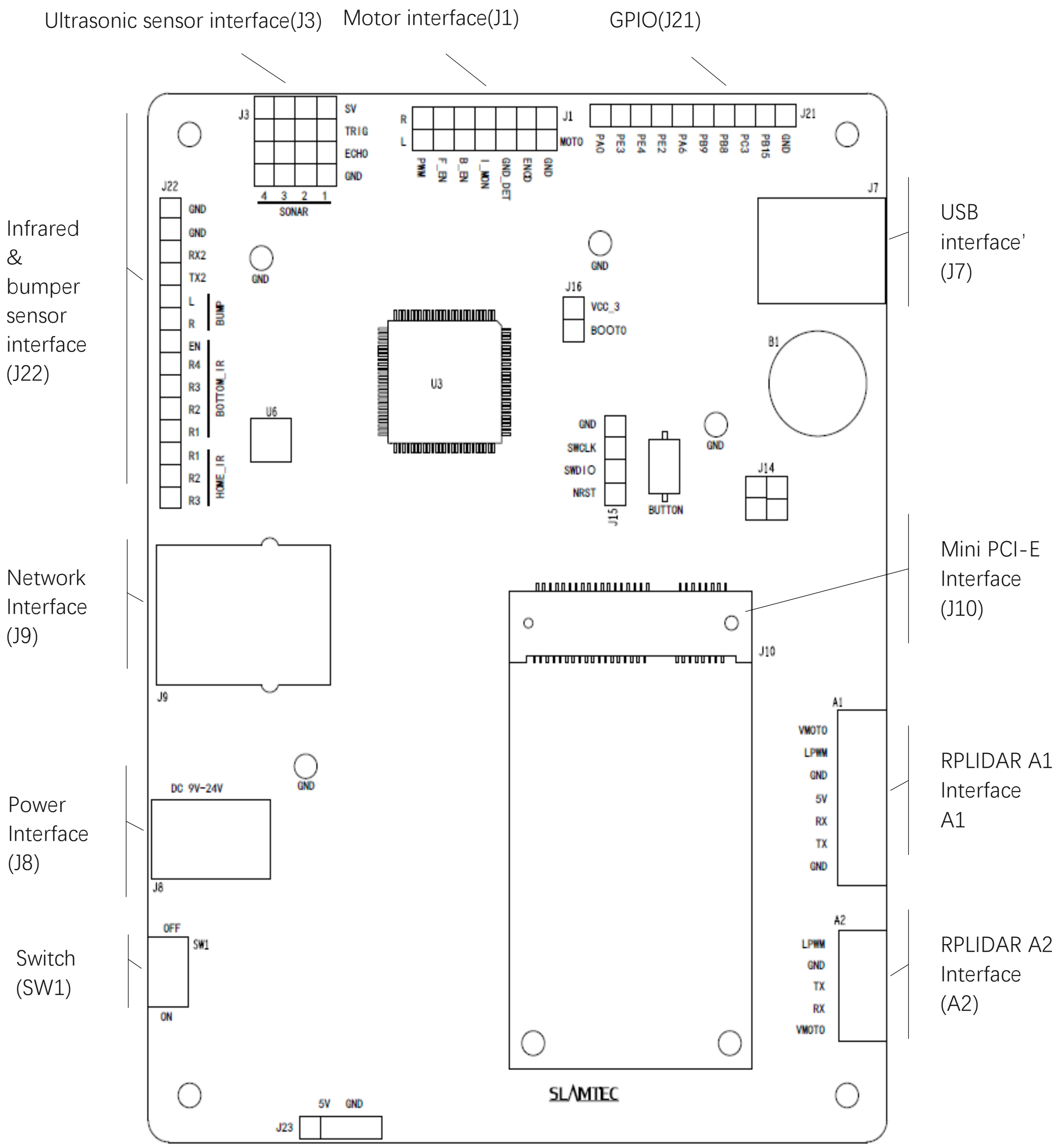


Figure 3-3 SLAMWARE Breakout Interface and Pin Definition

Interface Overview

Interface No.	Interface Name	Description
J8	Power interface	GND —●— VCC Input voltage: 9-24V, current: 1A
SW1	Switch	ON for power on, OFF for power off
J9	Network interface	RJ45 standard modular interface
A1	RPLIDAR A1 interface	Please refer to the RPLIDAR A1 pin definition table for details
A2	RPLIDAR A2 interface	Please refer to the RPLIDAR A2 pin definition table for details
J10	Mini PCI-E interface	Connect to SLAMWARE core
J7	USB interface	Connect to the TX3 and RX3 of MCU via CP2102
J1（MOTO）	Motor interface	Please refer to the motor pin definition table for details
J3（SONAR）	Ultrasonic sensor interface	Please refer to the ultrasonic sensor interface definition table for details
J22	Infrared and bumper sensor interface	Please refer to the Infrared and bumper sensor interface definition table for details
J21	GPIO interface	-
J15	SWD interface	Please refer to the SWD interface definition table for details

Figure 3-4 SLAMWARE Breakout Interface Overview

RPLIDAR A1 Interface Pin Definition

No.	Name	Description
1	VMOTO	Power for RPLIDAR A1 motor, 5V
2	LPWM	PWM signal for RPLIDAR A1 motor, active high
3	GND	GND for RPLIDAR A1 range scanner core motor
4	5V	Power for RPLIDAR A1 range scanner core
5	RX	Serial input for RPLIDAR A1 range scanner core
6	TX	Serial output for RPLIDAR A1 range scanner core
7	GND	RPLIDAR A1 range scanner core GND

Figure 3-5 SLAMWARE RPLIDAR A1 Interface Pin Definition

RPLIDAR A2 Interface Pin Definition

No.	Name	Description
1	LPWM	PWM signal for RPLIDAR A2 motor, active high
2	GND	RPLIDAR A2 range scanner core GND
3	TX	Serial output for RPLIDAR A2 range scanner core
4	RX	Serial input for RPLIDAR A2 range scanner core
5	VMOTO	Power for RPLIDAR A2 motor, 5V

Figure 3-6 SLAMWARE RPLIDAR A2 Interface Pin Definition

Motor Interface Pin Definition

No.	Silk Screen（full name）	GPIO(AFIO)	Description
1	PWM (MOTO_L_PWM)	PE14	PWM signal
2	PWM (MOTO_R_PWM)	PE13	PWM signal
3	F_EN (MOTO_LF_EN)	PD4	Motor running forward enabled
4	F_EN (MOTO_RF_EN)	PD6	Motor running forward enabled
5	B_EN (MOTO_LB_EN)	PD9	Motor running backward enabled
6	B_EN (MOTO_RB_EN)	PD7	Motor running backward enabled
7	I_MON (MOTO_LI_MONITOR)	PD5	Motor floating detect
8	I_MON (MOTO_RI_MONITOR)	PC5	Motor floating detect
9	GND_DET (GND_L_DETECT)	PD1	Motor floating detect
10	GND_DET (GND_R_DETECT)	PD10	Motor floating detect
11	ENCD (ENCODER_L_SENSOR)	PD3	Motor encoder input
12	ENCD (ENCODER_R_SEN SOR)	PD2	Motor encoder input
13	GND	GND	Motor GND
14	GND	GND	Motor GND

Figure 3-7 SLAMWARE Motor Interface Pin Definition

Ultrasonic Sensor Interface(J3) Pin Definition

No.	Silk Screen（full name）	GPIO(AFIO)	Description
1	5V	5V	Power for ultrasonic sensor
2	TRIG (SONAR_TRIG1）	PE10	Control end
3	ECHO (SONAR_ECHO1)	PE5	Receiving end
4	GND	GND	GND
5	5V	5V	Power for ultrasonic sensor
6	TRIG (SONAR_TRIG2)	PE11	Control end
7	ECHO (SONAR_ECHO2)	PE7	Receiving end
8	GND	GND	GND
9	5V	5V	Power for ultrasonic sensor
10	TRIG (SONAR_TRIG3)	PE12	Control end
11	ECHO (SONAR_ECHO3)	PE8	Receiving end
12	GND	GND	GND
13	5V	5V	Power for ultrasonic sensor
14	TRIG（SONAR_TRIG）	PE15	Control end
15	ECHO (SONAR_ECHO4)	PE9	Receiving end
16	GND	GND	GND

Figure 3-8 SLAMWARE Ultrasonic Sensor Interface Pin Definition

Infrared & Bumper Sensor Interface(J22) Pin Definition

No.	Silk Screen（full name）	GPIO(AFIO)	Description
1	HOME_IR_R3	PD14	Recharge dock IR receiving end 3
2	HOME_IR_R2	PD13	Recharge dock IR receiving end 2
3	HOME_IR_R1	PD12	Recharge dock IR receiving end 1
4	BOTTOM_IR_R1	PC2	IR receiving end 1

5	BOTTOM_IR_R2	PC1	IR receiving end 2
6	BOTTOM_IR_R3	PC4	IR receiving end 3
7	BOTTOM_IR_R4	PA4	IR receiving end 4
8	BOTTOM_IR_EN	PC7	Cliff sensor IR enabled
9	BUMP_R (BUMP_DETECT_R)	PB13	Right bumper interface
10	BUMP_L (BUMP_DETECT_L)	PB5	Right bumper interface
11	TX2 (UART2_TX)	PA2	-
12	RX2 (UART2_RX)	PA3	-
13	GND	GND	GND
14	GND	GND	GND

Figure 3-9 SLAMWARE Infrared & Bumper Sensor Interface Pin Definition

SWD Interface(J15) Pin Definition

No.	Name	Description
1	GND	GND
2	SWCLK	Serial clock input
3	SWDIO	Serial data input & output
4	NRST	reset

Figure 3-10 SLAMWARE SWD Interface Pin Definition

GPIO Interface(J21) Pin Definition

No.	Silk Screen（full name）	GPIO(AFIO)	Description
1	PA0	PA0	IO/ADC/PWM
2	PE4	PE4	IO
3	PE3	PE3	IO
4	PE2	PE2	IO
5	PA6	PA6	IO/ADC/PWM
6	PB9	PB9	IO/PWM
7	PB8	PB8	IO/PWM
8	PC3	PC3	IO/ADC
9	PB15	PB15	IO
10	GND	GND	GND

Figure 3-11 SLAMWARE GPIO Interface Pin Definition

J23

No.	Name	Description
1	5V	5V
2	5V	5V
3	GND	GND
4	GND	GND

Figure 3-12 SLAMWARE J23 Interface Pin Definition

J16

No.	Name	Description

1	VCC_3	3.3V power supply
2	BOOTO	Microcontroller boot0

Figure 3-13 SLAMWARE J16 Interface Pin Definition

MISC

BUTTON: microcontroller Reset

Indicator light D1: indicator light for power

U6: user indicator light

For the detailed specification of SLAMWARE core, please refer to SLAMWARE core datasheet.

For the detailed specification of SLAMWARE RPLIDAR, please refer to its related documents.

SDK

SLAMTEC provides SDKs for Windows, Linux and Android respectively to facilitate the SLAMWARE SDK based application developing on those operating systems. Please refer to the related SDK documents for details.

Firmware Compiling

SLAMTEC provides an open source reference design for users. Please download the latest open source firmware from http://www.slamtec.com/.

The above firmware is developed based on the IAR 7.60 platform. An IAR 7.60 or a higher version and related license are required for developing the project. The following is a recommendation:

https://www.iar.com/iar-embedded-workbench/#!?architecture=ARM&device=STM32F103VB

After setting up the IAR developing environment, users can open the **base ref.eww** file under **firmware\ref_public\base_ref** folder of the open source firmware.

Users can start programming by directly clicking **Project > Make** in the menu bar in the IAR application. The firmware file will be created under folder **firmware\ref_public\base_ref\output\debug\Exe**. For detailed process in programming, please refer to IAR and STM32 related documents.

Referential documents:

http://www.stmcu.org/document/list/index/category-147

Firmware Writing In

To update the above compiled firmware in the Breakout, please use TTL-to-USB serial port line to connect to the TX and RX pin of J14, and connect GND to the GND pin of J15, then short out the J16. Reset the Breakout and launch the Flash Loader of STM32 to write the new firmware in the STM chip of the Breakout.

Related Tools

The following are tools used in the developing and debugging process.

GUI Demo Tool uicommander.exe

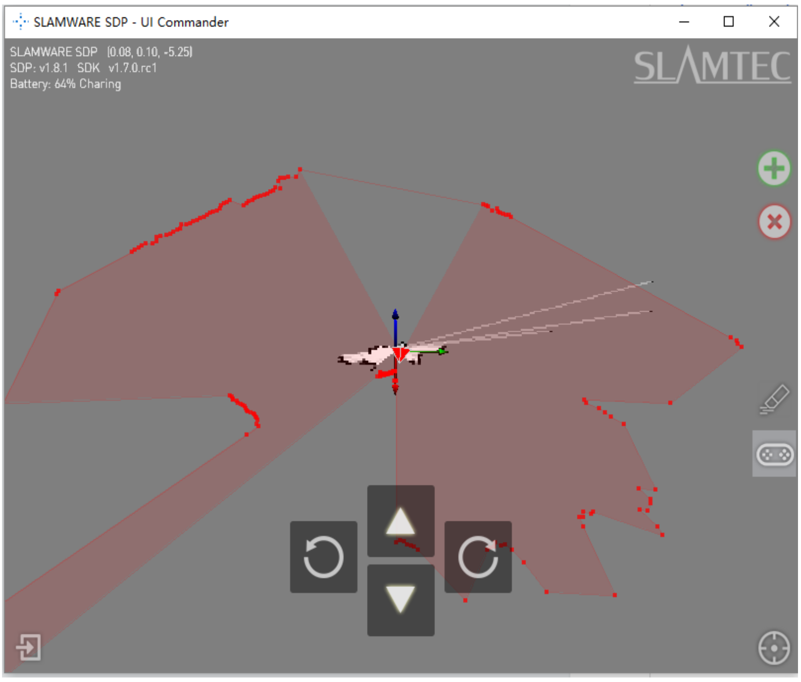


Figure 4-1 uicommander.exe interface

Icon	Operation
	Add operations
	Cancel operations
	Clear map
	Forward
	Back
	Turn right
	Turn left
	Locate the robot
	Exit

Figure 4-2 Cheat Sheet for Uicommander.exe

Administration Portal Introduction

SLAMWARE core related products supports managing from the portal, a backend administration tool. After connecting to the device ip address, users can check the health status of the device and take some actions.

Please log in the portal according to the steps in Connecting to PC . In the **status** page, users can check the information including SSID, LIDAR model, device SN, firmware version, etc.

In **Administration** page, users can reset the module, update firmware, start Debug mode, configure WiFi and enable SLAMWARE core diagnosis.

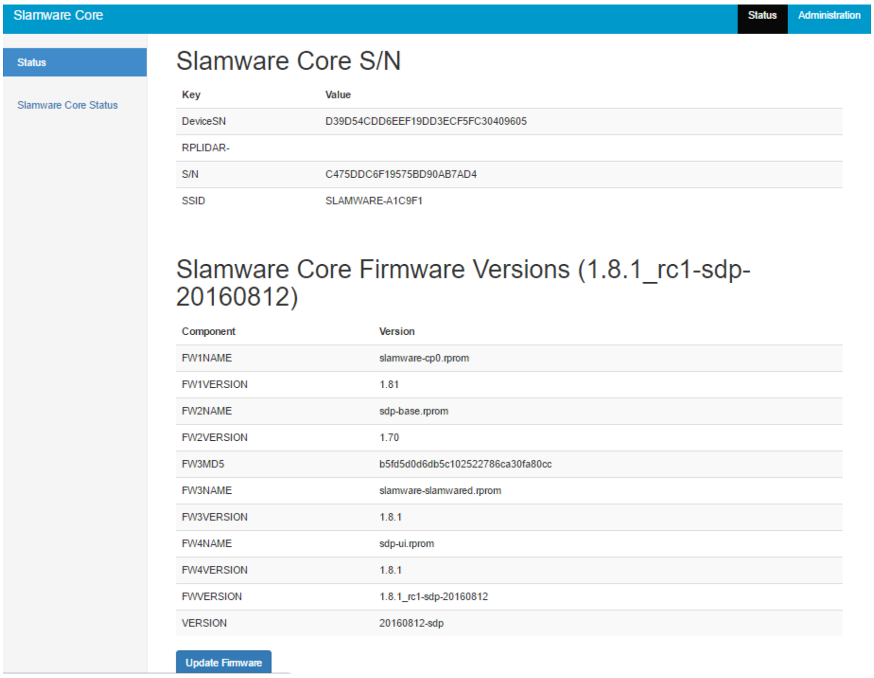


Figure 4-3 Status Page of Administration Portal

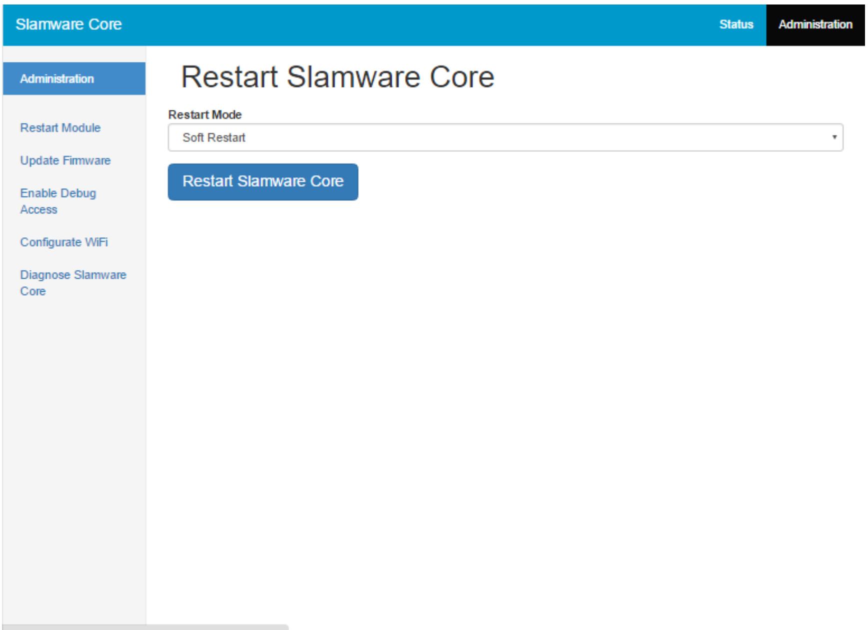


Figure 4-4 Administration Page of Administration Portal

Hardware Platform

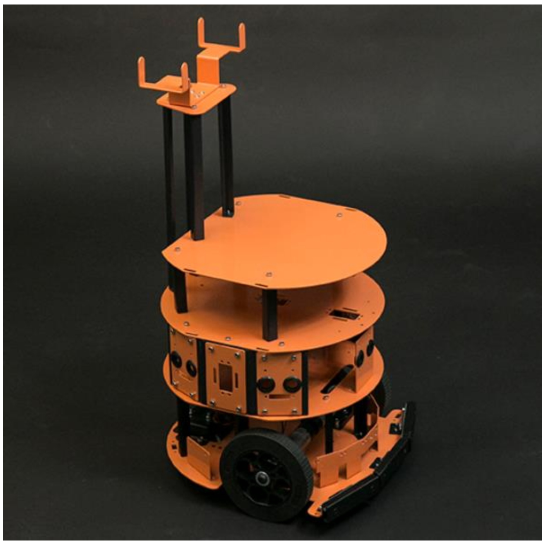
System components

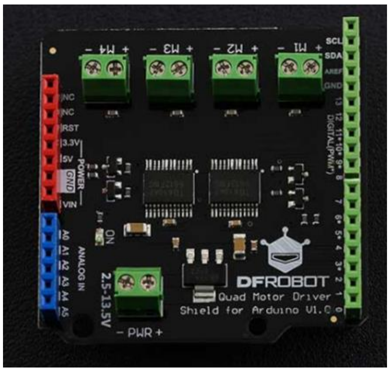
SLAMWARE core, Breakout 3.0, RPLIDAR A2, HCR (Home Care Robot), quad motor driven shield for Arduino, heavy current Li-polymer battery, Dupont lines, VCC/GND expansion board.

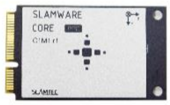
For the installation and usage of HCR (Home Care Robot) and the quad motor driven shield for Arduino, please refer to the following links for details.

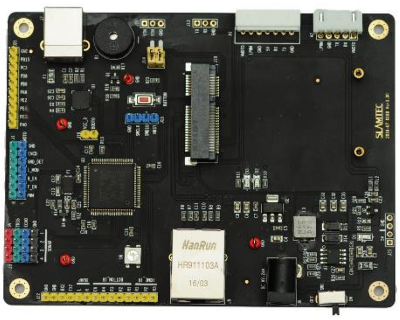
For HCR, please refer to this link;

For quad motor driven shield for Arduino, please refer to this link. (Currently Chinese only)





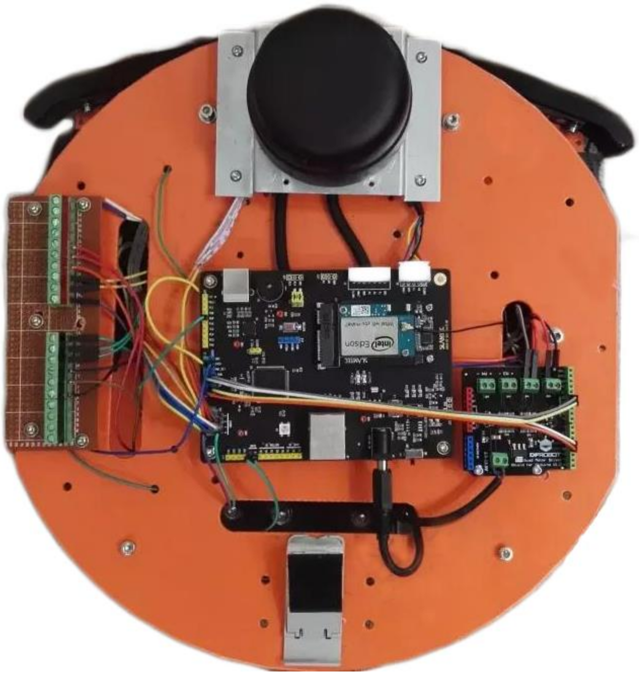




Set up the platform

Please install the lower two layers of HCR according to the installation instruction (including the right and left motor, omni-directional wheel, bumper sensors and ultrasonic sensors), then fix Breakout 3.0, motor driven board, RPLIDAR A2, Li-polymer battery and VCC/GND expansion board on the HCR as below.

Note: When installing the RPLIDAR, please don't block the vision of it, or the scanning results will be affected.



Connection

Connection between Breakout 3.0 interfaces and other components is shown as below:

Breakout Interface	Other Components	Note	
J10	SLAMWARE core	Please connect the antenna to the SLAMWARE core	
A2	RPLIDAR A2	*	
J3	Ultrasonic sensor	Connect the GND, Trig, ECHO and VCC pin of every ultrasonic sensor to the corresponded pins of J3 interface on Breakout 3.0 via Dupont lines. **Note:** J3 interface supports 4 ultrasonic sensors at the most. If more ultrasonic sensors are required to support, please extend them from the GPIO pins of J21 interface. The firmware supports 8 ultrasonic sensors at the most.	
J22	Bumper sensor, VCC/GND expansion board	Connect the data pin of every bumper sensor to the L and R pin of J22 interface on Breakout 3.0; connect GND pin and VCC pin of every bumper sensor to the corresponding pins of the VCC/GND expansion board. **Note:** J22 interface supports 2 bumper sensors at the most. If more bumper sensors are required to support, please extend them from the GPIO pins of J21 interface. The firmware supports 8 bumper sensors at the most. In this reference design, the data pin is connected to the PB8 pin of J21 GPIO interface.	
J1	Motor Driven	PWM pin on L row	Motor driven board pin 3

Board	B_EN pin on left row	Motor driven board pin 12
	PWM pin on R row	Motor driven board pin 4
	B_EN pin on R row	Motor driven board pin 11

Figure 5-1 HCR Case: Components Connection Table 1

The connection between the HCR motors and motor driven board, VCC/GND expansion board and the J1 interface is shown as below.

HCR Motor Pins	Motor Driven Board/Expansion Board/J1 Interface
HCR L motor pin moto-(Black)	M2- pin of L Motor Driven Board
HCR L motor pin moto+(Red)	M2+ pin of L Motor Driven Board
HCR L motor pin VCC(Yellow)	VCC pin of VCC/GND expansion board
HCR L motor pin GND(Green)	GND pin of VCC/GND expansion board
HCR L motor pin A(Blue)	Reserved
HCR L motor pin B(Orange)	Left ENCD pin of J1 interface
HCR R motor pin moto-(Black)	M2- pin of R Motor Driven Board
HCR R motor pin moto+(Red)	M2+ pin of R Motor Driven Board
HCR R motor pin VCC(Yellow)	VCC pin of VCC/GND expansion board
HCR R motor pin GND(Green)	GND pin of VCC/GND expansion board
HCR R motor pin A(Blue)	Reserved
HCR R motor pin B(Orange)	Right ENCD pin of J1 interface

Figure 5-2 HCR Case: Components Connection Table 2

Firmware Configuration and Writing In

STM32 Firmware Configuration

The code in the base firmware needs to be modified to adapt to the actual base dimensions. Please use slamware_config_tool.exe to generate the configuration file. The major parameters required to be modified are as below.

Object	Parameters	Unit	Note
Robot	Robot Diameter	m	Please set the parameters according to the actual dimensions of the device.
Bumper/ Sonar	x	m	-
	y	m	
	z	m	
	Yaw	degree	
LIDAR Installation Pose	x	m	Please refer to the details in the following sketch map.
	y	m	
	Yaw	degree	
Motion Planning	Side Margin	m	Please set the parameters according to the actual situation.
	Bump Handle Strategy	-	Options are Default and Stop
Feature	Has IR Tower	-	Whether the device is equipped with IR tower.

Automatically charging	-	Whether enable automatically recharging feature.
Battery Level to Go Home	-	The value is between 0% and 100%. After setting, when the base battery percentage is lower than the value, the device will automatically go back to the charge station for recharging.
Battery Level to Resume	-	The value is between 0% and 100%. After setting, when the base battery percentage is higher than the value, the device will resume the unfinished task.

Figure 5-3 HCR Case: Firmware Parameters Configuration

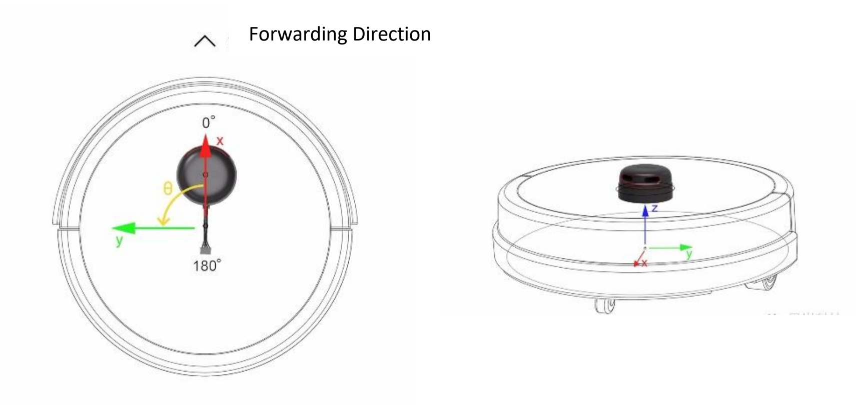


Figure 5-4 HCR Case: Firmware Coordinate System Definition

After the configuration, please click **Export** on the upper right corner to save the file as binary_config.c.

Code Modification

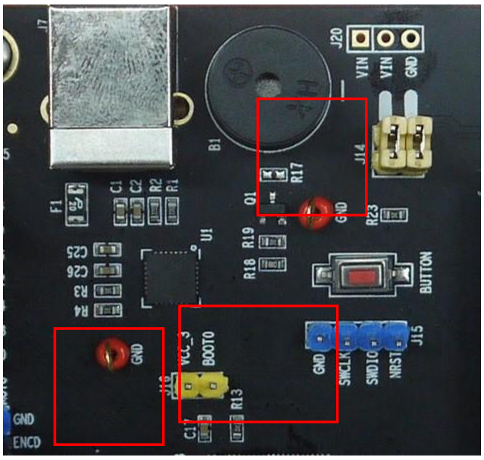
Replace the binary_config.c file in the project source with the above modified file and configure the motor PID parameters and pulse-count-per-meter according to the following method.

a. PID configuration: increase the P and I value gradually until the HCR will respond quickly and not start shaking. The reference value in this case is P=1, I=0.2, D=0. Users can also set the PID parameters in motor.c to get an ideal result.

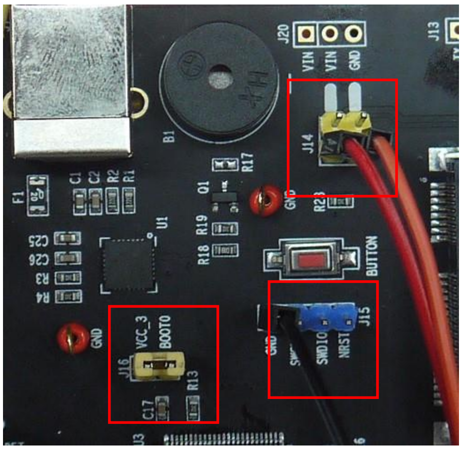
b. Pulse-count-per-meter calculation: the motor outputs 663 pulse feedback signals per revolution and the wheel diameter is 13cm, that is 2.45 revolution per meter, therefore the pulse-count-per-meter is 663 * 2.45 = 1624(set in motor.h).

Writing Firmware in Breakout'

Please remove one jumper cap of J14 to J16 to short it out, then connect GND of USB-to-TTL serial port line to the GND of J15 and connect TX and RX to the RX and TX of J14 respectively.)



Connection in normal status



Connection when writing in firmware

Figure 5-5 HCR Case: Breakout Jumper Connection in Writing in Firmware

Then use flash tools to write the modified firmware in MCU. Please recover the connection after writing firmware in the Breakout.

Debugging and Developing

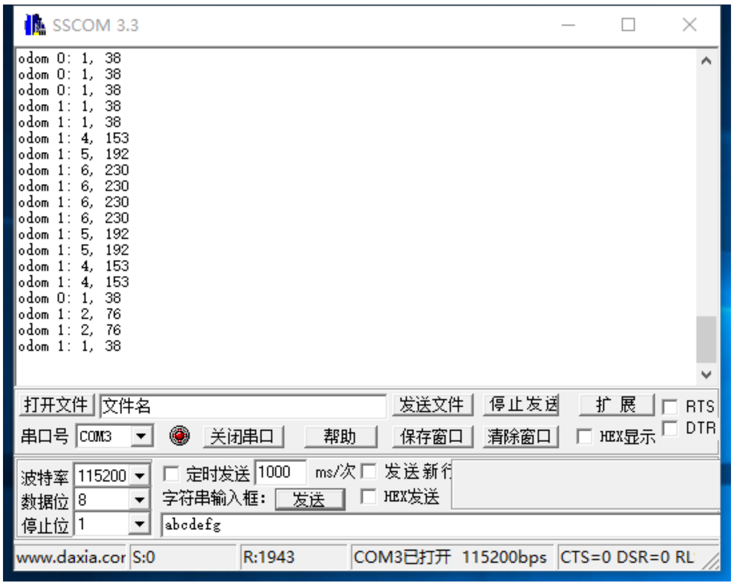
Output Base Debugging Information

To output the debugging information, users can connect J7 debug output interface to the computer via USB cable, then check the debugging information via serial port output tools (The introduction in this document is based on SSCOM tool).

Add `DBG_OUT()` in the base code, with the same format as `printf()`.

```
DBG_OUT("odom %d: %d, %d\r\n", cnt, (int)_lastEncoderTicksDelta[cnt], (int)_lastOdometerSpeedAbs[cnt]);
```

Connect J7 interface with the computer COM port, use SSCOM tool to check the debugging information.



Check Base Status

Use TTL-to-USB serial port line to connect the control bus serial port(J14) of base to computer com port. (Please remove the jumper cap of J16, then connect GND of serial port line to the GND of J15 and connect TX and RX to the RX and TX of J14 respectively.)

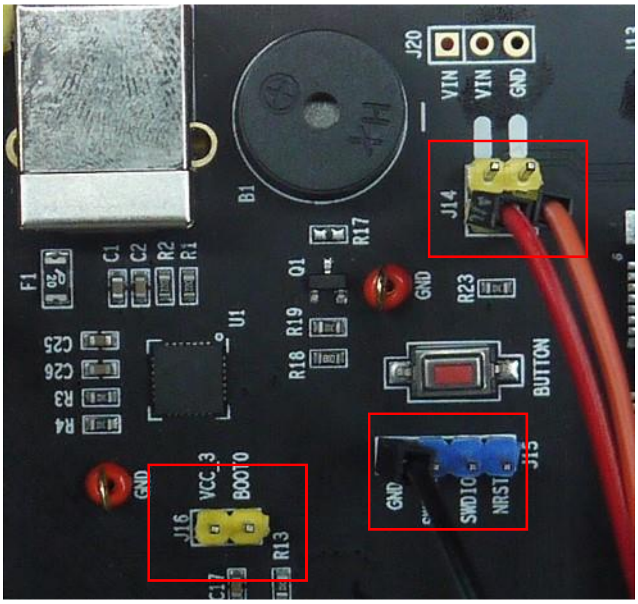
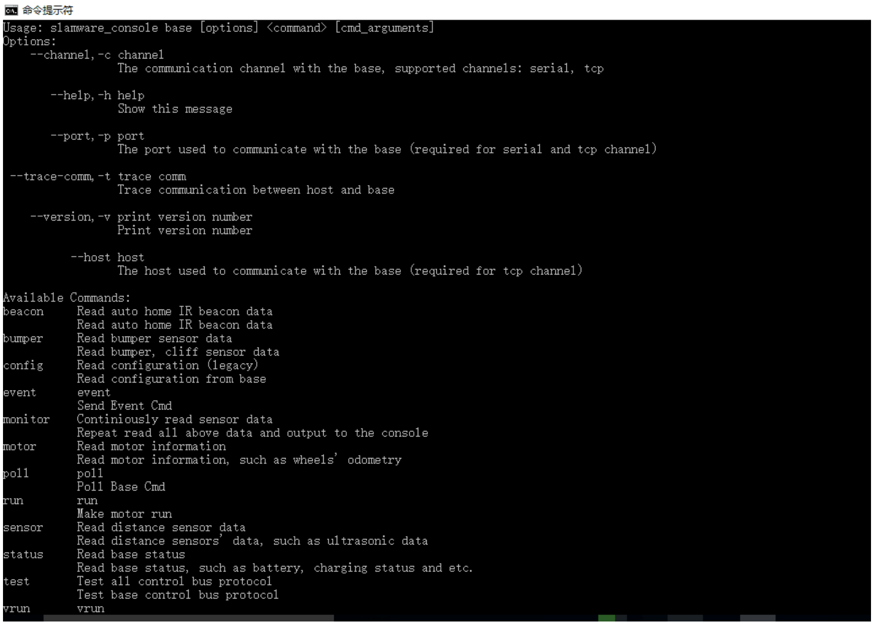


Figure 5-6 HCR Case: Breakout Jumper Connection in Checking Base Status

Use slamware_console.exe to test the status of base



```
命令提示符
Usage: slamware_console base [options] <command> [cmd_arguments]
Options:
    --channel,-c channel
                 The communication channel with the base, supported channels: serial, tcp

       --help,-h help
                 Show this message

       --port,-p port
                 The port used to communicate with the base (required for serial and tcp channel)

 --trace-comm,-t trace comm
                 Trace communication between host and base

    --version,-v print version number
                 Print version number

          --host host
                 The host used to communicate with the base (required for tcp channel)

Available Commands:
beacon     Read auto home IR beacon data
           Read auto home IR beacon data
bumper     Read bumper sensor data
           Read bumper, cliff sensor data
config     Read configuration (legacy)
           Read configuration from base
event      event
           Send Event Cmd
monitor    Continiously read sensor data
           Repeat read all above data and output to the console
motor      Read motor information
           Read motor information, such as wheels' odometry
poll       poll
           Poll Base Cmd
run        run
           Make motor run
sensor     Read distance sensor data
           Read distance sensors' data, such as ultrasonic data
status     Read base status
           Read base status, such as battery, charging status and etc.
test       Test all control bus protocol
           Test base control bus protocol
vrun       vrun
```

Figure 5-7 HCR Case: Slamware_console Tool Interface

As shown in the above screenshot, slamware_console tool can be used to test the base configuration information and all the sensor status. And the `run` command (This command is used for two-wheel differential motor only, and as for three-wheel omni-directional wheel, the `vrun` command is required. For details, please refer to slamware_console application note) can test the work status of motor.

To test whether the motor works properly, please follow the following steps:

a) run 50 50 5, when the speed is set as 50, the motor will respond properly;

b) run 100 100 5, when the speed is set as 100, the motor will run steadily.

c) Test whether the odometer works correctly.

   1) run 300 300 5

Return value pose (displacement on X axis, displacement on Y axis, angular displacement)

Unit (mm, mm, degree)

The positive direction of X axis is the forwarding direction of the robot, the positive direction of Y axis is the left of the robot. Angle is the anti-clockwise angular displacement with X axis direction set as 0.

Compare the difference between the actual measurement and the return value from original position (pose (0, 0)) to ending position.

The ending position in the following code is pose (1302.15056, 190.48846, 6.8deg)

```
[rp.slamware.test.SlamwareBaseConsoleApplication]  [INFO]  dl=  5.00000 dr=5.00000 pose:(1297.28958, 189.31762,  6.8deg) ->(1302.15056, 190.48846, 6.8deg)
```

2) run 300 0 5 make the left wheel run only (the angular displacement when the robot run clockwise) and test the difference.

3) run 0 300 5 make the right wheel run only (the angular displacement when the robot run anti-clockwise) and test the difference.

Note: the difference should be lower than 5%, or the robot will behave abnormally and there will be error in robot navigation.

Check System Status

1. Connect to the SLAMWARE core;

Figure 5-8 HCR Case: Connect to AP

2. Open Chrome browser and enter the above ip address to log in the administration portal;

Figure 5-9 HCR Case: Log in Portal Administration Tool

3. Click the **Administration** in the upper right corner, then click the **Diagnose Slamware Core** in the left panel to enable diagnosis.

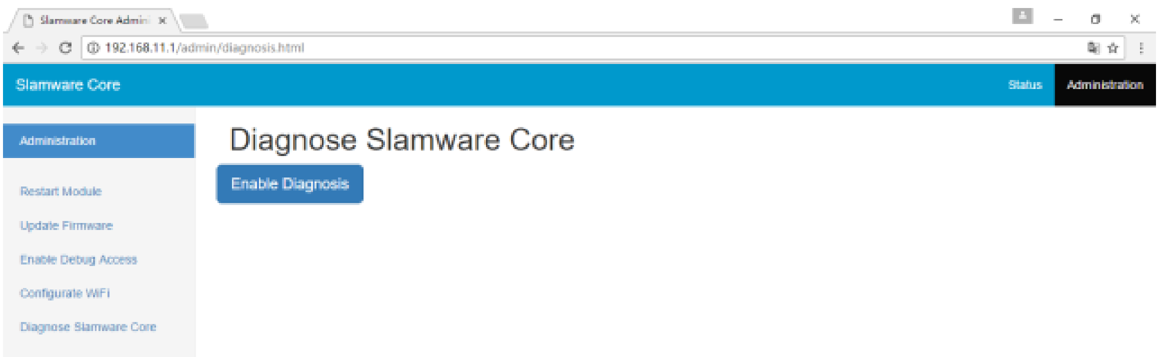


Figure 5-10 HCR Case: Enable Diagnose Funtion

4. Check whether there is noise when the RPLIDAR rotating and whether the status of bumper sensor and ultrasonic sensors in the portal are the same as in the actual situation.

5. In the below screenshot, the blue arrow mark is the center of HCR platform; the arrows direction is the robot's forwarding direction; the red lines made of red dots are the outlines of detected obstacles; the black blocks around the arrow are the cliff sensors, ultrasonic sensors and bumpers. Please check whether the sensors are installed correctly and whether their status are correct when triggered.

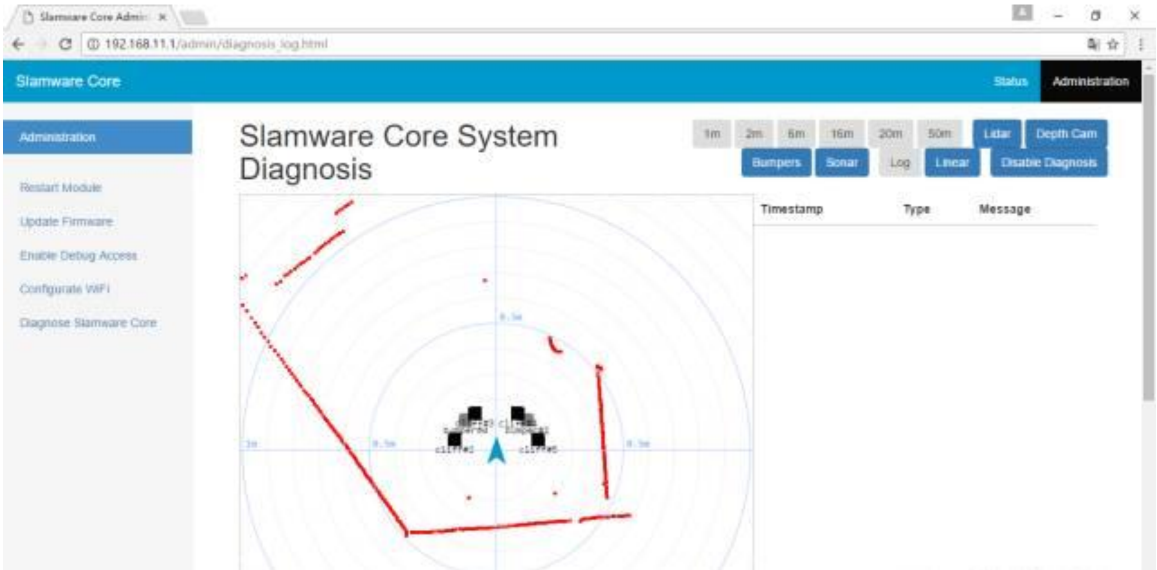


Figure 5-11 HCR Case: Diagnose Enabled Interface

Control with uicommander

1. Open the uicommander.exe under folder `bin` of SLAMWARE windows SDK to connect to the HCR platform.

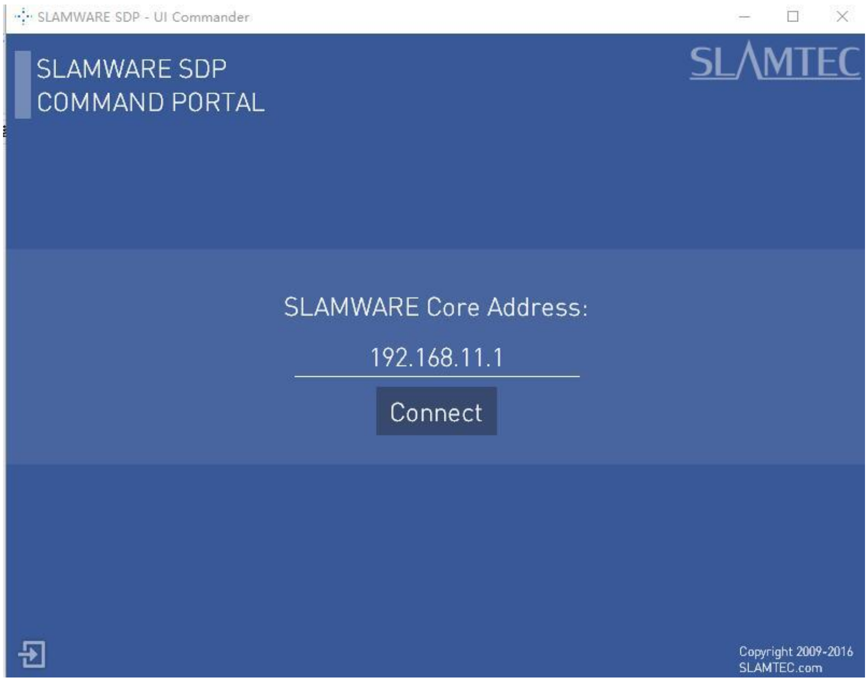


Figure 5-12 HCR Case: connect to HCR via uicommander

2. Check whether the HCR can map successfully.

Figure 5-13 HCR Case: HCR is Mapping

3. Motion control: Click the gamepad icon to open the motion control panel and click the arrow icon to check whether HCR can move as expected. (Users can also use the arrow direction on the key board to control the HCR.)

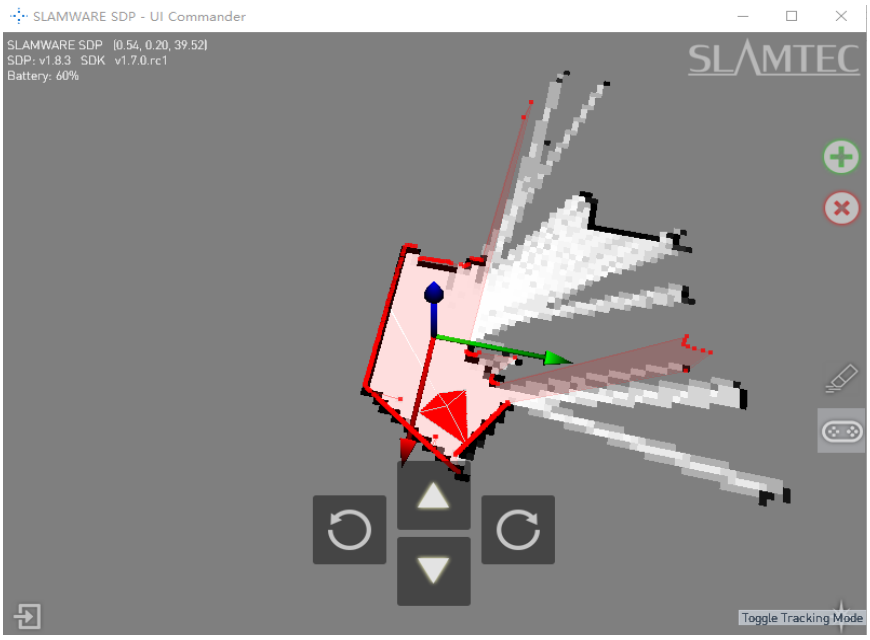


Figure 5-14 HCR Case: Control HCR Moving

4. Set a target (the violet diamond) by clicking the green icon with a plus sign to check whether the HCR (the red diamond) can move to the target along the green planed path.

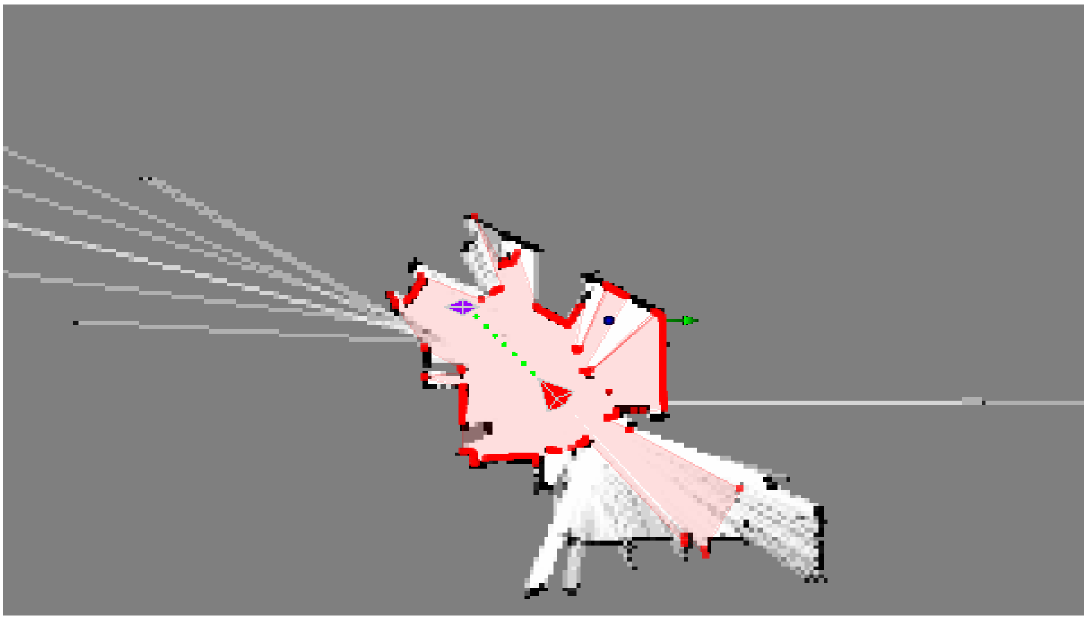


Figure 5-15 HCR Case: Control HCR Moving to Specified Target

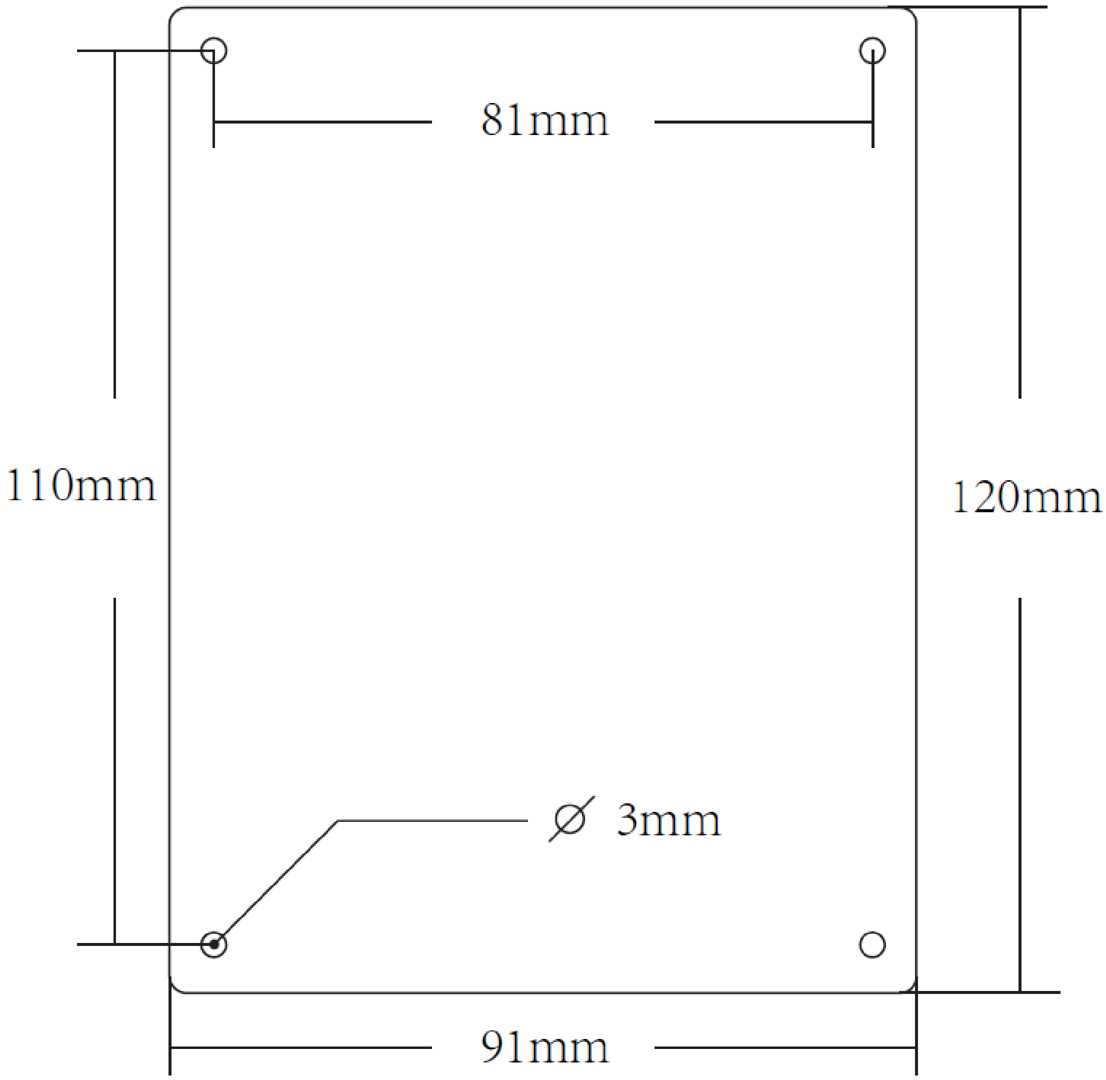


Figure 6-1 The Mechanical Dimensions of SLAMWARE BREAKOUT

Revision History

Date	Version	Remark
2016-10-25	1.8	Initial version

Image and Table Index