## **ARM Programming Environment**





# User Manual

ARM Programming Environment

This manual applies only to Pallas version

\*Supports Pallas firmware 1.7.34 and above

\*Supports ARM version 3.3.39 and above

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QKM Technology (Dongguan) Co., Ltd.

## Preface

Thank you for using our programming software ARM. This manual describes the instructions to properly use the product. Read this manual carefully before use. Keep this manual properly for future reference.

#### General

This manual provides detailed information on the functions, usage and other aspects of ARM so that users can fully understand and properly use the product.

#### **Target reader**

This manual applies to:

Signs and meanings	
Testing Engineer	Technical Support Engineer
R&D Engineer	Software Engineer

The signs in this document clearly indicate any dangers, warnings, attentions and notes that may occur while users perform the operations described in this manual; be sure to pay attention to the following signs when they appear in this document.

The signs in this manual are described in the table below.

Signs	Description	
DANGER	It indicates an imminently hazardous situation, which if not avoided, will result in death or serious injury.	
WARNING	It indicates a potentially hazardous situation would occur, which if not avoided could result in person injury and damage.	
	It indicates a unpredictable situation would occur, which if not avoided could result in software system damage, performance degradation, or data loss.	
	It gives the description on key information and operation tips.	

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## Chapter 1 ARM Overview

ARM is the software programming environment suitable for robots produced by QKM Technology (Dongguan) Co., Ltd. (hereinafter referred to as QKM). Users may develop various functional software based on ARM.

#### 1.1 Prerequisites

- 1) Proficient in QKM Robot Language (QRL).
- 2) Familiar with the mode of motion of the robot.
- **1.2 Product Features**

Main characteristics of ARM

- 1) Quickly write QKM robot programs;
- 2) Set robot motion trajectories and parameters;
- 3) Easily operate QKM robots;
- 4) Modify robot motion parameters on line;
- 5) Directly comment codes;
- 6) Automatically complete codes;
- 7) Quickly look up functional codes;
- 8) Quickly query error messages.

## Chapter 2 ARM Setup

- 2.1 Installation Environment
- 1) NET45 environment;
- 2) Win7, Win8, Win10 systems;
- 3) Memory: 2G or more.

#### 2.2 Software Setup

**Step 1** Download an ARM setup package ARM-3.X.XX-Setup-En from the official website of QKM, as shown in Figure 2-1.

To ARM-3.3.39-Setup-En.exe 2023/11/7 20:27 334,258 KE
---

Figure 2-1 Prepare Setup Package

Step 2 Double-click the left button to install the software, as shown in Figure 2-2.



Figure 2-2 Start Setup

**Step 3** Select the installation folder (recommended on non-C drive) and click on "Next", as shown in Figure 2-3.

邊 ARM Setup	
Select Installation Folder	
This is the folder where ARM will be installed.	
To install in this folder, click "Next". To install to a different folder, enter i "Browse".	t below or click
Follow	
Eolder: C:\Program Files (x86)\QKIM\ARM\	Browse
< Back Next >	Cancel

Figure 2-3 Select Installation Folder

**Step 4** Click on "Install" to complete the installation.



Figure 2-4 Installation Folder is Complete

## Chapter 3 Introduction of ARM Functions

This chapter mainly introduces the interface and functions of ARM for users to use this software quickly and expertly.

#### 3.1 ARM Interface

Automation Resource Man	ager : Pallas					_ = ×
File Edit View Debug Tools	Window Help 🕦			0	0	路 Engineer •
<b></b>		M Thread: MainThrea	d-Initialized 🔹 🕨 🕪			
Pallas Solution Explorer  Remote Location HMIRobot_3_0 HMIRobot_3_1_0 HMIRobot_3_1_0 HMILUSe_HY LINLONCD NewSolution222 ③ TB1607OK1013 Test123 YML_retry_NET C Location NewSolution NewSolution HMIRobot_3_1_0	G			- 1	Robot Control System Manage	0 8 6 1
	6				Power On	Power Off 10% Robot Speed
Pailas Solutio         QRL Comma           Connected         Device: 192.168.12.230	Dutput Threads Error Lis Current File	t Find Results Watch E	Breakpoints Condition B	Breakpoint Ln0	Col0 Ch0	Ins

Figure 3-1 ARM Interface

1 Menu bar, where all functions of the software are displayed.

② Area for switching languages, switching between Macro and QRL, running programs and changing states.

③ Flash remote location, where robot running programs, configuration files, library files, etc. are stored.

④ PC location, indicating computer disks.

⑤ Program running panel area, where programs are viewed, debugged, etc.

(6) Robot control window, where output information of all controllers is displayed.

 $\bigcirc$  Output window, where the contents corresponding to selected outputs, threads, error list, find results, watch, and breakpoints are displayed.

(a) System status window, where robot system status is displayed, and the robot can be manually enabled and disabled.

<sup>(9)</sup> Speed displaying area, where the current robot speed is displayed, and the robot running speed can be adjusted.

10 Login permission, select the permission to operate the software.

#### 3.2 Menu Bar

#### 3.2.1 File

The file operations include New, Open, Close All, Save Current File, Save All, Print, Recent Projects, Exit, etc. In which:

Name	Function
New	Create new QRL projects
Open	Open local existing QRL projects
Close All	Close all opened QRL projects
Save Current File	Save currently opened QRL project
Save All	Save all QRL project files in the software
Recent Projects	Quickly find the recently opened or newly created QRL project in the software
Exit	Exit ARM

Table 3-1 Fil	e Operation	Functions
---------------	-------------	-----------

#### 3.2.2 Edit

The basic edit functions include Undo, Redo, Cut, Copy, Paste, Delete, Select All, Find and Replace, etc.

Name	Function
Undo	Undo the current edit

#### ARM programming environment

Redo	Redo the previously undone content
Cut	Cut the currently selected content
Сору	Copy the currently selected content
Paste	Paste the copied or cut content to the current line
Delete	Delete the line on which caret is located
Select all	Select all current contents
Find and Replace	Quickly find and replace objects

#### Table 3-2 Edit Functions

#### 3.2.3 View

The view functions include Project Manager, Class View, Output, Find Results, Threads, Error, Find, Watch, Breakpoints, etc.

Name	Function
Project Manager	Manage QRL projects in ARM
Class View	Quickly find various classes required for programming to facilitate project development
Output	Output various information that needs to be displayed during program running
Find results	Display information that matches your search
Threads	Display thread status in window
Error	Display information of error list in window
Find	Display information of results found in window
Watch	Display information of monitored variables in window
Breakpoints	Display information of running program breakpoints in window

#### Table 3-3 View Functions

#### 3.2.4 Debug

The debug functions include Compile, Set Breakpoints, Remove Breakpoints from Current File, Remove All Breakpoints from Project, and Remove All Breakpoints from Solution.

Name	Function
Connect or disconnect	Connecting or disconnecting a robot
Scan Robot	Scan the robots in the current LAN
Compile	Compile QRL programs
Set Breakpoints	Set breakpoints in program
Remove Breakpoints from Current File	Remove all breakpoints from current .ql file
Remove All Breakpoints from Project	Remove all breakpoints from current project
Remove All Breakpoints from Solution	Remove all project breakpoints from associated solution

Table 3-4 Debug Functions

#### 3.2.5 Tools

The tool functions include Macro Command Window, Jog Manual, I/O Setting, Tool Frame Calibration, Module Parameter, CM Wizard, Fixed Camera Calibration, Visual Tool Calibration, Modbus TCP Wizard, Data Logger, Battery Wizard, Pallas Firmware Update, Quick Debug, User Control, Latch Manager, Options, etc.

Module	Title	Function
	IDN Configuration	Viewing and Setting IDN Parameters
Donomatan	I/O Setting	Set I/O interface
Settings	Global Variables	Monitor global variables set for modifying programs
	Latch Manager	Set latch signal trigger parameters

#### ARM programming environment

	Modbus TCP	Configure Modbus TCP parameters
Coordinate Settings	Tool Frame	Calibrate and manage tool coordinate system
	User Frame	Calibrate and manage user coordinate system
	Jog Control	Control robot manual interface
Robot Controls	Interference Zone	Set and manage the interference zone of the robot
	Home Calibration	Calibrate the home of the robot
Robot	Conveyor Manager	Configure conveyor parameters, calibrate conveyor, teach at points, etc.
Application	VotF Wizard	Configure VotF parameters
Vision Tool	Vision Tool Calibration	This function is not complete and currently not supported
	Macro Command Debugger	Send and debug macro command
Debugging	Data Logger	Collect robot data and analyze the data
and Analyzing Tool	System Diagnostics	Version detection, device diagnosis, and SD card repair
	Communications Assistant	Debugging robot communication (TCP/UDP/serial port) function
Other	Firmware Upgrade	Upgrade robot firmware and configuration files
	Boot Configuration	Set Dedicated I/O

#### Table 3-5 Tool Functions

#### 3.2.6 Window

The window functions include theme option.

Name	Function
Theme	Users can set theme colors according to their personal habits
Layout	Restore software default layout
Options	Functions such as setting Chinese and English, setting default layout, and opening logs

Table 3-6 Window Functions

#### 3.2.7 Help

The help functions include View Help, About ARM, etc.

Name	Function
View Help	Quickly switch to Precise Documentation Library for facilitating development
Technical support	Provide technical support information
About ARM	View current software version information

#### Table 3-7 Help Functions

### 3.2.8 Shortcut key

Signs	Name	Function	
L.	Open	Open target QRL projects	
	Save Current File	nt File Save currently opened file	
B	Save All	Save all opened files	
0	Navigate Backward	Navigate backward in caret mode	

#### ARM programming environment

Signs	Name	Function
0	Navigate Forward	Navigate forward in caret mode
Q	Quick Connect or Disconnect	Quickly connect to or disconnect from mechanical arm
	Decrease Indent	Decrease indents of selected lines
E	Increase Indent	Increase indents of selected lines
ē	Comment Selected Lines	Comment selected lines
<b>×</b>	Uncomment Selected Lines	Uncomment selected lines
	Switch Tabs on Current Line	Add or cancel tabs to current line
	Move to Previous Tab	Move caret to previous tab
	Move to Next Tab	Move caret to next tab
X	Clear All Tabs	Clear all tabs from current file
a,	Replace and Find	Quickly replace or find objects
Μ	Macro Mode	Currently in macro mode
Q	QRL Mode	Currently in QRL mode
•	Start	Start target Macro/QRL projects
▶	Continue	Continue target Macro/QRL projects
П	Pause	Pause target Macro/QRL projects

Chapter 3 Simple Applications of ARM

Signs	Name	Function
	Stop	Stop target Macro/QRL projects
¥	Step Into	Step into after starting program debug or running to endpoint
\$	Step Over	Step over after starting program debug or running to endpoint
1	Step Out	Continue to run program after step into, step over, or breakpoint.

#### Table 3-8 Introduction of Shortcut Keys

#### 3.2.9 Output Window

#### 1. Output

Display outputs from the program during compilation or execution, as shown in Figure 3-2.



#### Figure 3-2 Output

#### 2. Threads

Display threads being executed and their status, as shown in Figure 3-3.

Threads						<b>→</b> ‡ ×
Thread N	State	Status Info	Solution	Project	File	Line Nun
BGThread	Initialized	0	-	-	-	-
MainThread	Aborted	0	test	project	-	-
Output Th	reads Error	List Find Results W	atch Breakpoi	nts Conditio	on Breakpoin	nt

#### Figure 3-3 Threads

#### 3. Error List

Display all error codes, descriptions and the number of lines where the codes are located in the file during program compilation, as shown in Figure 3-4.

Threads						<b>~</b> ↓ ×
Thread N	State	Status Info	Solution	Project	File	Line Nun
BGThread	Initialized	0	-	-	-	-
MainThread	Aborted	0	test	project	-	-
Output Th	reads Error	List Find Results Wate	h Breakpoir	nts Conditio	n Breakpoint	t

Figure 3-4 Error List

#### 4. Find Results

Display the line and total number of project files where the finding is located, as shown in Figure 3-5.

Find Results	<b>→</b> ‡ ×
<b>ð</b>	
/media/flash/PallasSolutions/test/project/main.ql(3): print("Hello world1!") /media/flash/PallasSolutions/test/project/main.ql(5): print("Hello world2!") /media/flash/PallasSolutions/test/project/main.ql(7): print("Hello world3!") /media/flash/PallasSolutions/test/project/main.ql(9): print("Hello world4!") /media/flash/PallasSolutions/test/project/main.ql(10): print("Hello world5!") Total found: 5	
▲	•
Output Threads Error List Find Results Watch Breakpoints Condition Breakpoint	

Figure 3-5 Find Results

#### 5. Watch

Monitor the execution of specified thread variables in the program, as shown in Figure 3-6.

Watch							★ 0 ×
Name			Value			Associated Thread	
tCount			6		م	MainThread	
tIndex			10		Q	MainThread	
Output	Threads	Error List	Find Results	Watch	Breakpoints	Condition Breakpoint	,

Figure 3-6 Run a Specified Program

#### 6. Breakpoints

Display the file location of each breakpoint (including tabs and breakpoints) in the project. as shown in Figure 3-7.

Breakpoints	Breakpoints 👻 🗸 🛪					
Number	Solution Name	Project Name	File Name	File Line		
1	Test123	project	/media/flash/PallasSolutions/Test123/project/main.ql	3		
2	Test123	Test123	/media/flash/PallasSolutions/Test123/Test123/main.ql	2		
3 Test123 Test123		Test123	/media/flash/PallasSolutions/Test123/Test123/main.ql	4		
4 test project /media/flash/PallasSolutions/test/project/main.ql 9		9 -				
Output Th	Dutput Threads Error List Find Results Watch Breakpoints Condition Breakpoint					

Figure 3-7 Breakpoints

#### 7. Condition Breakpoints

Suspend programs being executed by adding thread interruption judgment conditions. When a running program meets the conditions, it will automatically be suspended.

12	在*			
13	⊖funct	Conditional Breakpoint Setting	×	
14				
15	-	Thread:		
16	R	BGThread 🔹		
17				
18	-	The selected thread will break when the following condition is met:		
19	t	4 m day 10		
20	$\ominus$ $\frac{1}{2}$	undex == 10		
21				
22			Add	~
Condition Brea	kpoint			<b>~</b> ₫ ×
Number	Thread	Conditional expression		
1	MainThread	{tindex==10}		
1				

Figure 3-8 Conditional Breakpoint

#### 3.3 Connecting Robots

Before connecting the robot, you need to set the IP address of the PC and the robot to the same network segment (the default IP address of the robot factory is: 192.168.10.120).

#### 3.3.1 IP Modify the Computer IP

The steps to modify the IP address of the PC are as follows: Step 1: Open the Network and Sharing Center and click Local Area Connection.

🕞 💬 🗢 🔛 🕨 Control Panel 🕨	All Control Panel Items   Network and Sharing Center	er 👻 🍫 Search Con 🔎
Control Panel Home	View your basic network information a	nd set up connections
Change adapter settings	📃 🔍 —— 🚑	See full map
Change advanced sharing settings	WIN-JU7Q1D9J4NO Netwo (This computer)	rk Internet
	View your active networks	Connect or disconnect
	Network Public network	Access type: Internet Connections: U Local Area Connection
	Change your networking settings Set up a new connection or network Set up a wireless, broadband, dial-up, ad	hoc, or VPN connection; or set up a router or access point.
	Connect to a network Connect or reconnect to a wireless, wired	d, dial-up, or VPN network connection.
	Choose homegroup and sharing options Access files and printers located on other	; r network computers, or change sharing settings.
See also	Troubleshoot problems	
HomeGroup	Diagnose and repair network problems, o	or get troubleshooting information.
Internet Options		
Windows Firewall		

Figure 3-9 Network and Sharing Center

Step 2: In the pop-up local connection status window, click the Properties button.

📱 Local Area Connection Statu	is 💌
General	
Connection	
IPv4 Connectivity:	Internet
IPv6 Connectivity:	No network access
Media State:	Enabled
Duration:	02:49:44
Speed:	100.0 Mbps
Details	
Activity	
Sent —	— 💵 — Received
Bytes: 4,692,7	20,735,879
Properties Disabl	e Diagnose
	Close

Figure 3-10 Local Area Connection Status

Step 3: In the pop-up local connection properties window, double-click Internet Protocol version 4 (TCP/IPv4).

Local Area Connection Properties
Networking
Connect using:
Intel(R) PRO/1000 MT Network Connection
Configure This connection uses the form terms:  Client for Microsoft Kas  Client for Microsoft Kas  Client for Microsoft Vacion of (TCP/IPv4)  File and Printer Protocol Version 4 (TCP/IPv4)  File and Printer Topology Discovery wapper I/V Driver  A Link-Layer Topology Discovery Responder
Install Uninstall Properties
Description
Transmission Control Protocol/Internet Protocol the default wide area network protocol that provid across diverse interconnected network
OK Cancel

Figure 3-11 Local Area Connection Properties

Step 4: In the pop-up Internet Protocol version 4 (TCP/IPv4) property window, modify the IP address. The IP address of the PC should be in the same network segment as the IP address of the QKM robot, that is, The first three digits of the IP address are consistent, but the last digit is not. After the modification is complete, click the OK button. Complete the modification of the IP address of the PC.

Internet Protocol Version 4 (TCP/IPv4)	Properties 2 X	
General		
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.		
Obtain an IP address automatica	llv	
Ose the following IP address:		
IP address:	192 - 168 - 10 - 2	
Subnet mask:	255 · 255 · 255 · 0	
Default gateway:	· · ·	
Obtain DNS server address auto	matically	
Ose the following DNS server add	dresses:	
Preferred DNS server:		
Alternate DNS server:	• • •	
Validate settings upon exit	Advanced	
	OK Cancel	

Figure 3-12 Internet Protocol Version 4 (TCP/IPv4) Properties

#### 3.3.2 Robot Scan

Before connecting to the robot, if you do not know the robot's IP address, click the Connect icon, and click the Scan button in the pop-up Connect to Pallas dialog box. Use the IP scan function to obtain a list of currently available devices, and view the IP address of the robot you want to connect to in the list.

🔉 Automation Resource Manager : Pallas _ 🗉 ×			
File Edit View Debug Tools Window Help	😤 Engineer 🔻		
■ 🖻 🛛 🗣 💀 📮 🔛 🗶 🔍 🔍			
Pallas Solution Explorer	Robot Control 🔷 🗸		
PC Location C	System Manage 🛃 🧧		
Image: Solution     I			
Connect to Pallas	×		
Robot IP Ad	dress		
192.168.12	230 ×		
Scan	Cancel		
Condition Prosknoint			
Number Thread Conditional expression			
	Power On Power State		
	10% Robot Speed		
Pallas Soluti QRL Comm Output Threads Error List Find Results Watch Breakpoin	s Condition Breakpoint		

Figure 3-13 Robot Scan

In the pop-up device list interface, view the list of devices that can be connected to the current local area network. Select the robot to connect and click Select. The IP address of the robot to be connected is automatically filled in the IP address field of the Connect to Pallas dialog box.

D	evices List					×
	Robot Serial Number (• IP Address Conflict )	Robot Information	Node ID ( • master )	Node Hardtype	Ethernet Information(● Unseperate ) ( Show All Information )	
		Name: 1 Type:	0	Comm	• 192.168.12.100	
	unknown	Name: MotorBox230 Type: unknown		Comm	• 192.168.10.120	
	Scan				Select	

Figure 3-14 Select Robot

#### 3.3.3 Modify the Robot IP

If you want to modify the robot IP, you can double-click the device in the device list, enter the modified IP in the IP setting column on the right, and click the Settings button to modify the selected robot's IP.

Devices List				×
ot Information	Node ID ( • master )	Node Hardtype	Ethernet Information( • Unseperate ) ( Show All Information )	IP Config
ne: unknown -0400-0204-1700TS	0	Comm	• 192.168.12.230	Robot Config
Name: 1 Type:	0	Comm	• 192.168.16.199	Serial Numb
Name:/0 be: unknown	0	Comm-E	• 192.168.12.249	Type: AH3-0400-0204-1700TS
4				IP Address: 192.168.12.230 Gateway: 192.168.12.2
Scan			Select	Config

Figure 3-15 Change IP



Figure 3-16 Set IP

Set the IP network segment of the submodule according to the prompt in the pop-up prompt box

Yes: The submodule IP and the robot IP are in the same network segment.

No: Enter the IP network segment of the submodule in the pop-up box.

Cancel: Cancel IP settings

Note: A robot has multiple child node devices (Comm or Cell), and each child node device occupies 2 IP addresses.

Input IP Segment	×
IP Segment:*	
Sure Cance	

Figure 3-17 Set Network Segment

#### 3.3.4 Connecting

After modifying the IP address of the PC, open the ARM programming software. Click the Connect icon, and in the pop-up connection window, select or manually enter the IP address of the robot to be connected, and click the Connect button.



Figure 3-18 Connect to Robot

After failing to connect to the robot, a prompt window will pop up indicating a connection failure. If the connection fails, check whether the network cable connecting the PC and the robot is loose and whether the robot is powered on.



Figure 3-19 Connection Failure

After successfully connecting the robot, users can operate the corresponding application functions on the robot.

Automation Resource Mar	nager : Pallas	_ = ×
File Edit View Debug Tools	Window Help	路 Manager 🔹
🖬 🖻 💿 💿 💁 🛅 📔	🗦 📮 🖸 🖸 🙎 🥰 🛛 MinThread: MainThread-Initialized 🔹 🕨 📗 📕	
Pallas Solution Explorer	× Robot Control	<b>→</b> >
Remote Location	System Manage	0 🖻 🖥 🗎
<ul> <li>HMIRobot 3 0</li> <li>HMIRobot 3 1 0</li> <li>HMIRobot 3 1 0</li> <li>HMI_Use HY</li> <li>LNLONCD</li> <li>NewSolution222</li> <li>TB16070K1013</li> <li>Test123</li> <li>YML_retry_NET</li> <li>PC Location</li> <li>NewSolution</li> <li>HMIRobot 3 1 0</li> </ul>		
	Output	Power Off
		10% Robot Speed
Pallas Solution QRL Comman	Output Threads Error List Find Re Watch Breakpo Conditi	
Devices 102 169 12 220		les.

Figure 3-20 Successful Connection

#### 3.4 Introduction to Language Mode Switching

Two modes are available: Macro and QRL.

Macro: QKM robot macro language. In Macro mode, Users can send Macro language to the robot through the upper computer program to achieve corresponding logical functions.

QRL: QKM robot programming language. In QRL mode, the robot can directly run the QRL programs stored in it to implement corresponding logic functions.

Click the language mode switching button to switch between Macro and QRL.

Automation Resource	ce Manager : Pallas
File Edit View Debug	Tools Window Help
🖬 🖬 🖸 💿 💿 🦉	፲ ፲ 📮 🖾 😫 🖸 🖸 🖉 🔍 🕅 Thread: MainThread-Initialized 🔹 ► 🕨 🔲 🔳
Pallas Solution Explorer	**
Remote Location	C
<ul> <li>HMIRobot_3_0</li> <li>HMIRobot_3_1_0</li> <li>HMI_Use_HY</li> <li>LNLONCD</li> <li>NewSolution222</li> <li>TB1607OK1013</li> <li>Test123</li> <li>YML_retry_NET</li> <li>Concation</li> </ul>	
NewSolution HMIRobot_3_1_0	

Figure 3-21 Macro Mode

In Macro mode, the robot system will pause or stop according to the error level after an error is reported. At this time, the robot cannot execute some Macro commands.

Users can change the system status according to the actual situation.

Automation Resource	e Manager : Pallas
文件(F) 编辑(E) 视图(V) 调	斌(D) 工具(T) 窗口(W) 帮助(H)
🖻 🖻 🖸 📀 😒 🖻	🤨 🗟 🔯 🖸 🖸 🖉 🖉 🥰 🛛 M 线程: MainThread-Aborted 🔹 🕨 📔 🔳
Pallas工程管理器	
远程位置	C
▷ 📰 BB	
D E LNLONCD	
D m TB1607OK1013	
D TestProgram	

Figure 3-22 Robot System Status in Macro Mode

In most cases, QRL mode is used to write QRL programs to meet relevant application requirements.

🙊 Automation Resource Manager : Pallas	_ = ×
File Edit View Debug Tools Window Help	
Pallas Solution Explorer         Remote Location         HMIRobot 3_0         HMIRobot 3_1_0         HMIRobot 3_1_0         HMIRObot 3_1_0         HMIRObot 3_1_0         NewSolution222         TB16070K1013         Test123         YML_retry_NET         PC Location         NewSolution         HMIRobot 3_1_0	Robot Control 🛛 🕹
	Power On Power Off
Pallas Solution         QRL Comman         Output         Threads         Error List         Find Results         Watch         Breakpoints         Condition Breakpoint	10% Robot Speed
Connected Device: 192.168.12.230 Current File: Ln0	Col0 Ch0 Ins

Figure 3-23 QRL Mode

MainThread: Select the corresponding project and select MainThread under Threads to start the program.

BGThread: Background thread is a special thread that is not affected by the status of the robot device and will always run. Right click on the QRL project to run as a background thread, select Set as Background Thread from the pop-up menu, and select BGThread from the Thread menu to start the program.

Automation Re	esource Manager : Pallas
File Edit View De	bug Tools Window Help
<b>- 1 - 0 0</b>	o 🤨 🔄 🛱 🛱 🚺 🖸 😫 🕰 🛛 💽 Thread: MainThread-Ab
Pallas Solution Explor Remote Location	er ××
<ul> <li>HMIRobot_3_0</li> <li>HMIRobot_3_1</li> <li>HMIRobot_3_X</li> </ul>	_0
▷	
D E LNLONCD	New Solution
<ul> <li>MewSolution2</li> <li>TB1607OK101</li> <li>Test123</li> <li>YML_retry_NE</li> </ul>	New Project Add Project Expand
D 🚞 test	Rename
_	Delete
	Set as Background Project
	Attribute




Figure 3-25 Start QRL Project

## 3.5 Login Permissions

In the upper right corner of the software interface, you can select the permissions to operate the software.

		_ =	×
	ŝ	Manager 🔹	
▶ <b>I</b> ► <b>II</b> ■   ↓	<i>⊊</i> ¥	QKM	
ot Control		Manager	<del>-</del> ×
stem Manage		Engineer	Î.
		Operator	
		Visitor	

Figure 3-26 Select Permissions

Click on the corresponding permission and enter the password corresponding to the permission in the pop-up box to log in and operate the robot with this permission. After checking "Auto Login", the next time the software starts, it will automatically log in to the previous login permission.

QKM: Has all permissions for the software and can view and modify passwords for other permissions.

Manager: Has all permissions except for modifying passwords.

Engineer: Has the authority to operate and control robots, but cannot perform firmware upgrades or other operations on devices.

Operator: Only has operation permissions and can start and stop the robot, but cannot modify operating parameters.

Visitor: Only allowed to view the status of the robot, unable to operate the robot.

Roles Manager					
Roles:	Manager •	]			
Password:		]			
Auto Lo	gin				
	ОК				

Figure 3-27 Login

Note: The password for administrators and those with lower permissions than administrators are 12345678 by default. It can be modified through the manufacturer's permissions. If you need manufacturer's permissions or to modify the password, please contact QKM's after-sales personnel.

# 3.6 Robot Control Panel

Automation Resource Mana	ager : Pallas	_ = ×
File Edit View Debug Tools W	Window Help	路 Manager 🔹
🖕 R 🛛 🗢 💿 🐨 🧮 🛱	🛿 📮 💽 🖸 📮 🕰 🔢 💽 Thread: MainThread-Initialized 🔹 Solution test 🔹 🕨 🕨	I ■   ↓ ☆ ↑
Pallas Solution Explorer	Robot Control	<b>→</b> ×
Remote Location C	System Manag	e 🚯 📋 🚺 📋
D HMIRobot_3_0		
▶ ■ HMIRobot_3_1_0		
NewSolution222		
D TB1607OK1013		
D 💼 Test123		
D T YML_retry_NET		
PC Location		
NewSolution		
Image: HMIRobot 3 1 0		
	Output	
	Pov	ver On Power Off
		10% Robot Speed
Pallas Solution QRL Comman	Output Threads Error List Find Results Watch Breakpoints Condition Breakpoint	
Connected Device: 192.168.12.230	Current File: Ln0 Col0	Ch0 Ins

Figure 3-28 Robot Control Panel

In Robot Control panel, users can perform the following operations:

(1) View firmware version of robot system;

nread: Main	Thread-Initialized • Solut	ion test		28 Manager → ↓ ~ ↑
	Robot Information			×
	Robot Model Robot Serial Number Robot IP Login State Auto/Manual Macro/QRL Axis Number System Status Version	AH3-0400-0204-170 192.168.12.230 Operator(1) Auto QRL 4 Initialized COMM V1.7.40; QO	DOTS S V1.3.211;	
		Interpreter_V1.7.30 ModbusTCP_V1.1.2 QRTOS_V1.7.47; FP COMM_CFG_V1.2.3 CELL1_FPGA_V1.7.1 CELL2_QRTOS_V1.7. CELL2_CFG_V1.2.2.0	MCLink_V1.2.22; 8; QKMMath_V1.0.1; 6A, V1.7.44; .0; CELL1_QRTOS_V1.7.19; 7; CELL1_CFG_V1.2.20; .19; CELL2_FPGA_V1.7.17; ;	; DK Power Off

Figure 3-29 Robot Information

(2) View robot system logs;

rer	C X				Robot Control System Manage 1
System Lo	og				_ = ×
Log File	pallas.00	0101-000013.qrtos	.0.loį ▼	Module A	ALL 🔹 Level All 🔹 🖸 🗋
Time		Timestamp (ns)	Module	Level	Message
2000/01/01	-00:08:42	043862056	CFG	info	CONS: Robot serial number read success = ^Q^R^S^T^U^V^W^X^Y^Z^[^\^]^^^_ !*#\$%&'0 *+,-,/0^O
2000/01/01	-00:08:42	043901872	MacroSYS	err	CONS: Get robot type = , robot serial = ^Q^R^S^T^U^V^W^X^Y^Z^[^\^]^^^_ !*#\$%&'()* +/0^O
2000/01/01	-00:08:42	044592216	MacroSYS	err	CONS: RTEMSethernet_net_common_cmd
2000/01/01	-00:08:42	044621168	MacroSYS	err	CONS: mclink module = 6
2000/01/01	-00:08:42	044640456	MacroSYS	err	CONS: mclink cmd= 0
2000/01/01	-00:08:42	044658920	MacroSYS	err	CONS: net command = 0
2000/01/01	-00:08:42	050159752	CP-IP	info	CONS: This is Comm-E
2000/01/01	-00:08:42	050186512	CP-IP	info	CONS: This is Comm-E
2000/01/01	-00:08:42	050206456	CP-IP	info	CONS: This is Comm-E
2000/01/01	-00:08:42	050233048	CP-IP	info	CONS: Get local node0 Ethernet info with gateway=192.168.10.254
2000/01/01	-00:08:42	070298376	CP-IP	info	CONS: Get Linux IP success = 192.168.12.249
2000/01/01	-00:08:42	070339696	CP-IP	info	CONS: Get local node0 Ethernet info with mac0=B4:A2:EB:00:03:A7, IP0=192.168.12.249
2000/01/01	-00:08:42	070372136	CP-IP	info	CONS: Get local node0 Ethernet info with mac1=B4:A2:EB:00:04:6C, IP1=192.168.10.101
2000/01/01	-00:08:42	070395328	CP-IP	info	CONS: Get ethernet info success
2000/01/01	-00:08:42	070415200	CP-IP	info	CONS: node = 0
2000/01/01	-00:08:42	070433952	CP-IP	info	CONS: Controller master:1, switch:1, hwtype:2, node:0
2000/01/01	-00:08:42	070453848	CP-IP	info	CONS: MAC0:B4:A2:EB:00:03:A7, MAC1:B4:A2:EB:00:04:6C, IP0:192.168.12.249, IP1:192.168.10.101, gate:192.168.10.254
2000/01/01	-00:08:42	070476200	MacroSYS	err	CONS: RTEMS0
2000/01/01	-00:09:25	413844712	CFG	info	CONS: Robot serial number read success = ^Q^R^S^T^U^VW^X^Y^Z^[^\^]^^^_ !*#\$%&'0 *+,-,0^O
2000/01/01	-00:09:25	413884248	MacroSYS	err	CONS: Get robot type = , robot serial = ^Q^R^S^T^U^V^W^X^Y^Z^[^\]^^^_ !*\$%&'()* +,-,/0^O
File Name:	pallas.000	101-000013.qrtos.0.lo	g Creat Da	te: 2000/01/	/01-00:00:13 Creat Module: QRTOS File Size: 10810 Ln (1001.09KB)

Figure 3-30 System Log

(3) View robot system error messages;

Robot Control					<b>-</b> ×
System Manage		0	Ê	2	Î
09-27 16:47:39.842: -5029 Recovered:20000101-0112 occurred"(Robot:1)	31:889	Erro	or "ES	тор	
09-27 16:47:39.146: -5029 Occurred:20000101-01123 occurred"(Robot:1)	1:205 E	rror	"EST	ΌΡ	
Power On			Pow	er Of	ff
-1	10%	R	obot	Spe	ed

Figure 3-31 System Information

(4) Monitor power-on state and robot speed, and perform operations of power-on/off, adjusting robot speed.



Figure 3-32 Simple Operations

# 3.7 Introduction of Common Tools

## 3.7.1 IDN Configuration

Users can modify some system parameters of the robot through the IDN parameter configuration interface. Select IDN parameter configuration under the menu bar tool options.

Automation Resour	ce Manager : Pallas			
File Edit View Debug	Tools Window Help			
	Parameter Settings	×.	IDN Configuration	orted
			I/O Setting	
Pallas Solution Explorer	Coordinate Settings	•	Global Variables	
Remote Location	Robot Controls	•	Latch Manager	
NewSolution222	Robot Application			
TB16070K1013			Modbus ICP	
Test123	Vision Tool	•	ad.Sleep(1)	
	Debugging and Analyzing	Tool 🕨		
	Other	•		

Figure 3-33 Select IDN Configuration

Users can modify the robot's motion parameters, control parameters, workspace, system settings, fan detection and other parameters in the IDN parameter configuration interface, and support modifying unlisted IDN parameters through the custom settings interface.

Note:	This	function	requires	Manager	and a	bove	permissions.
1.000						~~~	

IDN Configuration					_ ×
lotion Parameters	Jog Parameters			Refresh	Clear Save
Jog Parameters					
Operating parameter settin	Name	Value	New Value	IDN Number	Note
PPB parameter settings	<ul> <li>Jog basic parameters</li> </ul>				
Axis parameter settings	JogLocation prf vel	51		P-0-518.0.40	JogLocation prf vel
ontrol parameters	JogLocation prf acc	71		P-0-518.0.42	JogLocation prf acc
/orkspace	JogLocation prf acc ramp	0.1		P-0-518.0.43	JogLocation prf acc ramp
ystem settings	JogLocation prf dec	50		P-0-518.0.44	JogLocation prf dec
an detection	JogLocation prf dec ramp	0.2		P-0-518.0.45	JogLocation prf dec ramp
ustom Settings	<ul> <li>Jog Cartesian space ref</li> </ul>	erence velocity	·		
	cart trans base prf vel of J	250		P-0-518.0.62	cart trans base prf vel of JogLocat
	cart rot base prf vel of Jog	150		P-0-518.0.63	cart rot base prf vel of JogLocation
		eleration			
	cart trans base prf acc of J	2500		P-0-518.0.96	cart trans base prf acc of JogLocat
	cart rot base prf acc of Jog	1500		P-0-518.0.97	cart rot base prf acc of JogLocatio
	<ul> <li>Jog Descartes space de</li> </ul>	celeration			
	cart trans base prf dec of .	2500		P-0-518.0.106	cart trans base prf dec of JogLoca
	cart rot base prf dec of Jc	1500		P-0-518.0.107	cart rot base prf dec of JogLocati
		nce speed			
	1 Axis	72		P-0-518.0.50	joint 0 base prf vel of JogLocation

Figure 3-34 IDN Parameter Configuration

## 3.7.2 I/O Setting

Users can monitor I/O status and perform I/O setting operations in I/O Setting interface. Select I/O Setting under Tools in the menu bar.

#### ARM programming environment

🛕 Automation Resour	ce Manager : Pallas				
File Edit View Debug	Tools Window Help				
	Parameter Settings	×	IDN Configuration	nning <b>T</b>	
			I/O Setting	g	
Pallas Solution Explorer	Coordinate Settings	1	Global Variables		
Remote Location	Robot Controls	1	Latch Manager		
MIRobot_3_0	Robot Application	. •	Modbus TCP		
	Misley Teel	_		]	
	VISION LOOI	1			
MawSolution222	Debugging and Analyzing Too				
	Other				
	Other	<u> </u>			
P m Test 123					

Figure 3-35 Select I/O Setting Interface

Users can monitor and perform all digital inputs, digital outputs and high-speed inputs on System Group page, and perform custom grouping in I/O Setting interface.

Note: If I/O is configured as dedicated I/O, I/O status cannot be set through this interface (Refer 3.7.17 for configuration method)

I/O Setting				_ ×
System Group Custom G	roup			
V DIN				<b>î</b>
010101	010102	010103	010104	
010105	010106	010107	010108	
010109	010110	010111	010112	
010113	010114	010115	010116	
010117	010118	010119	10120	
V DOUT				
20101	20102	20103	20104	
20105	20106	20107	20108	
20109	20110	20111	20112	
20113	20114	20115	20116	
20117	20118			$\overline{\mathbf{v}}$
			Save	Exit

Figure 3-36 I/O Setting Interface

Users can make some remarks on I/O in the I/O remark box for easy identification of I/O. Upon completion, click the Save button to save the remarks.

I/O Setting				_ ×
System Group Custom Group				
V DIN				
10101 Power state	010102	010103	10104	
010105	010106	010107	10108	
010109	010110	010111	010112	
010113	010114	010115	010116	
010117	010118	010119	10120	
V DOUT				
20101 PowerOn	20102	20103	20104	
20105	20106	20107	20108	
20109	20110	20111	20112	
20113	20114	20115	20116	
20117	20118	-		-
			Save	Exit

Figure 3-37 Remark Name of I/O

Users can monitor and operate I/O signals.

Right-click the corresponding signal to enable the signal to enter a forced state (on which a lock sign is marked), and then click the corresponding signal to turn it on or off. Right click a signal in forced state to take the signal out of the forced state.

The input signal 10101 is normally on; the input signal 10102 is normally off; the input signal 10105 is forcibly off; and the input signal 10106 is forcibly on.

The output signal 20101 is normally on; the output signal 20102 is normally off; the output signal 20105 is forcibly off; and the output signal 20106 is forcibly on.

Note: Before starting a robot program, handle signals in forced states. If the robot program does not have functions called for clearing signals in forced states, the signals will be forcibly on or off.

#### ARM programming environment

✓ DIN				
10101 I/O On	010102 I/O Off	010103	010104	
10105 I/O Force On	10106 I/O Force Off	010107	010108	
10109	010110	010111	010112	
10113	010114	010115	010116	
10117	010118	010119	010120	
/ DOUT				
• 20101 I/O On	20102 I/O Off	20103	20104	
• 🔂 20105 I/O Force On	20106 I/O Force Off	20107	20108	
20109	20110	20111	20112	
20113	20114	20115	20116	
20117	20118			

Figure 3-38 Monitor and Operate I/O

Users can create corresponding I/O custom groups according to I/O used by project in Custom Group of I/O Setting interface for monitoring and operating I/O used by project.

I/O Setting				_ ×
System Group Custom Group				
✓ IOGroup				<u></u>
• 20101 I/O Off	10102 I/O Off	20102 I/O Off	=+	
∨ test				
010101 I/O On	20101 I/O Off	010203	≡+	
			Save	Exit

Figure 3-39 Create Custom Groups

## 3.7.3 Global Variables

Users can monitor, modify, and annotate global variables in the global variable interface. Select Global Variables under the menu bar tool options to open the Global Variables window.

(a Automation Resour	rce Manager : Pallas	
File Edit View Debug	Tools Window Help	
	Parameter Settings	IDN Configuration
		I/O Setting
Pallas Solution Explorer	Coordinate Settings	Global Variables
	Robot Controls	Latch Manager
MIRobot_3_0	Robot Application	Modbus TCP
D HMIROBOL_3_1_0	Vision Tool	
D in LNLONCD	Debugging and Analyzing Tool	
NewSolution222		
TB1607OK1013	Other •	
b 💼 Test123		

Figure 3-40 Select Global Variables

After opening the global variable interface, you can view the values of GBool, GInt, GDouble, and GString global variables in the interface, set corresponding notes, and add commonly used global variables to favorites for easy use.

Note: After modifying the shared variable, click the save button. After the robot is powered off and restarted, the modified content will be retained.

GBool						
GBool[1-32]	VarNumb	oer Value	Comment	VarNumber	Value	Comment
GBool[33-64]	GBool[1]	1	G1	GBool[17]	0	
GBool[65-96]	GBool[2]	0	aaa	GBool[18]	0	
GBool[97-128]	GBool[3]	0		GBool[19]	0	
GBool[129-160]	GBool[4]	0	1	GBool[20]	0	
GBool[161-192]	GBool[5]	0		GBool[21]	0	
GBool[193-224]	GBool[6]	0		GBool[22]	0	
GBool[225-256]	GBool[7]	0		GBool[23]	0	
GInt	GBool[8]	0		GBool[24]	0	
GDouble	GBool[9]	0		GBool[25]	0	
GString	GBool[10]	0		GBool[26]	0	
Favorite	GBool[11]	0		GBool[27]	0	
	GBool[12]	0		GBool[28]	0	
	GBool[13]	0		GBool[29]	0	
	GBool[14]	0		GBool[30]	0	
	GBool[15]	0		GBool[31]	0	
	GBool[16]	0		GBool[32]	0	

Figure 3-41 Global Variables Interface

#### ARM programming environment

GBool	<b>▲</b> +			1	L Di	splay Delete Butto
GBool[1-32]	VarNum	oer Value	Comment	VarNumber V	alue	Comment
GBool[33-64]	GBool[1]	1	G1			
GBool[65-96]	GBool[2]	0	aaa			
GBool[97-128]						
GBool[129-160]						
GBool[161-192]						
GBool[193-224]						
GBool[225-256]						
GInt						
GDouble						
GString						
Favorite						
AAC						
AA0						
Favorite0						
Favorite1						
Favorite2						

Figure 3-42 Global Variables Favorite

# 3.7.4 Latch Manager

Users can add and manage Latches in the Latch management interface. Select Latch Management under the menu bar tool options to open the Latch Management window.

Automation Resour	🚵 Automation Resource Manager : Pallas										
File Edit View Debug	Tools Window Help	_		_							
	Parameter Settings	•	IDN Configuration	orte							
			I/O Setting								
Pallas Solution Explorer	Coordinate Settings		Global Variables								
	Robot Controls	1	Latch Manager								
HMIRobot 3 1 0	Robot Application		Modbus TCP	1							
MI Use HY	Vision Tool	•									
	Debugging and Analyzing Tool										
NewSolution222											
TB1607OK1013	Other	$\mathbf{F}$									
Dest123											

Figure 3-43 Latch Manager

After opening the Latch management interface, you can create Latch signals in the interface and manage the created Latches to view their triggering status.

Latch M	Manager														-	×
Lat	tch List	Cour	nt D	roportvi	Туре	Station	ID	Trigger(I/0	) Method	Dela	ıy(s)	ResultTy	pe		Clear	Π
	•	0		operty.								Encoder	•		Refresh	
Times	Stamp		Hit	Pos1	Pos2	Pos3	Pos4	4 Pos5	Pos6	Pos7	Pos8	Pos9	Pos	10 Pos11	Pos12	_
																-
TYPE		CTAT		ID		тысстри				c)						
TYPE		STATI	UN					METHOD		5)						
Robo	ot 🔹	01	•	01	•	50101		KISING	•						reation	

Figure 3-44 Latch Manager Interface

#### 3.7.5 Modbus TCP

Users can configure the parameters of the robot Modbus TCP Master Station in Modbus TCP Wizard interface, and perform I/O mapping interaction with the remote I/O module as Modbus TCP Slave Station. Select Modbus TCP Wizard under Tools in the menu bar.



Figure 3-45 Select Modbus TCP Wizard Interface

In the Modbus TCP Wizard interface, users can modify parameters as needed Common parameters, which will take effect on all Modbus TCP nodes after modification:

Scan time: The time interval for scanning Modbus device data.

Scan timeout: If the Robot is not communicated with the Modbus device for more than this time, it is considered that the connection is disconnected. Note that this time needs to exceed the scan time.

I/O partition quantity: The maximum I/O quantity displayed for each I/O grouping. If

the quantity mapped by a node exceeds this setting, it will be divided into multiple I/O groupings.

I/O Continuity: After setting I/O continuity, the signals mapped by multiple nodes will be displayed in one I/O grouping until the grouping exceeds the limit of I/O segmentation before being displayed in the next grouping.

Modbus node: One node corresponds to one remote I/O module, and users need to add or delete nodes according to the actual situation.

IP address: IP address of remote I/O modules.

Server DI start address: Start address of input signals that need to be mapped.

DI number: Number of input signals that need to be mapped.

Server DO start address: Start address of output signals that need to be mapped.

DO number: Number of output signals that need to be mapped.

Scanner enable: Check to enable the interaction function of the robot ModbusTCP Master Station; uncheck to disable the interaction function of the robot ModbusTCP Master Station. Upon checking, related I/O correspondence will be generated for users to view.

Upon parameter setting, click the Apply button. Parameter settings will take effect after restart.

Modbus TCP				×
	Controller a This permit *Parameter	allows to configured s 3rd party remote I, setting takes effect	Modbus TCP nodes. /O to be used with the Controller. after restart.	
I/O Correspondence	Input	Output	Common parameters	
Robot:	10201~10296	20201~20296	Scan Time(ms):	16
Remote Device:	20~125	20~125	Scan Timeout(ms):	100
Remote Device.	50~125	50~125	I/O Split Number:	96 •
			I/O Continue Flag:	✓
			Private parameters	
			Modbus Node:	1 • + -
			IP address:	192.168.10.110
			Server digital input start address:	30
			Digital Input Number:	96
			Server digital output start address:	30
			Digital output number:	96
			Scanner Enable:	
I/O Check			Apply	Cancel

Figure 3-46 Modbus TCP Wizard Interface

Modbus TCP					×
	Controller a This permit *Parameter	allows to configure s 3rd party remote setting takes effect	d Modbus TCP I/O to be used t after restart.	nodes. with the Controller.	
I/O Correspondence	Input	Output	Common p	parameters	
Robot:	10201~10296	20201~20296		Scan Time(ms):	16
Remete Devices	20, 125	20 125		Scan Timeout(ms):	100
Remote Device:	30~125	30~125		I/O Split Number:	96 •
				I/O Continue Flag:	
			Private par	ameters	
				Modbus Node:	1 • + -
				IP address:	192.168.10.110
			Server d	igital input start address:	30
				Digital Input Number:	96
			Server dig	ital output start address:	30
				Digital output number:	96
				Scanner Enable:	✓
I/O Check				Apply	Cancel

Figure 3-47 I/O Correspondence in Modbus TCP Wizard Interface

#### 3.7.6 Tool Frame

Users can calibrate the TCP (Tool Center Point) tool coordinate system of the robot in Tool Frame Calibration interface. Select Tool Frame Calibration under Tools in the menu bar.

🛕 Automation Resour	🙊 Automation Resource Manager : Pallas									
File Edit View Debug	Tools Window Help		_							
<b>- 1 - - -</b>	Parameter Settings	•	হ	Thread:	MainThread-Abor	ted				
Pallas Solution Explorer	Coordinate Settings	÷	C	Tool Fram	e Calibration					
Remote Location	Robot Controls	•		User Fram	e Calibration					
D I HMIRobot_3_0	Robot Application	•	Γ							
b HMI_Use_HY	Vision Tool	•								
Enclosed     Enclosed	Debugging and Analyzing Too									
D 🔤 TB1607OK1013	Other	•								
Test123										

Figure 3-48 Select Tool Frame Calibration Interface

In Tool Frame Calibration interface, users can calibrate the TCP tool coordinate system of four-axis robot and six-axis robot respectively.

Users can perform calibration in Teach or Calculate mode.

Teach mode: After entering the Teach mode, users move the robot according to the steps in the wizard on Tool frame calibration interface and record the location

information to complete the calculation on the TCP tool coordinate system.

Calculate mode: After entering the Calculate mode, users only need to input the required location information to complete the calculation on the TCP tool coordinate system.

Set Tool: Set the currently selected tool coordinate to the robot's tool coordinate.

Save: Save the tool coordinates of the current interface so that they still exist after power outage and restart.

Calibrate: Open the tool coordinate calibration interface and recalibrate the selected tool coordinates.

Index	Explain	x	v	7	Vaw	Pitch	Roll
IIIGEA	Explain	~		4	raw	Fiten	KVII
1	Test1	1	3	0	0	0	0
2	Tool2	6	5	0	0	0	0
3	Tool3	35	0	0	0	0	0
4	Tool4	4	0	0	0	0	0
5	Tool5	5	0	0	0	0	0
6		6	0	0	0	0	0
7		7	0	0	0	0	0
			1	-			
Curre	nt Tool	0	0	0	0	0	0

Figure 3-49 List of Tool Coordinates

Step 1 Select <Teach Mode>, and select <TCP Two-Point Method> or <TCP Four-Point Method> by robot type. Four-axis robot is used as an example herein, so select <TCP Two-Point Method>, and click <Sure> button.



Figure 3-50 Tool Frame Calibration Interface

Step 2 Fix the calibration fixture at any position within the working range of the robot. Move the robot to enable the center of its end fixture (or sucker) to contact the center

Tool Calibrate			_ ×
Ā	1. Fix the calibrat the robot action 2. Move robot m calibration fixture 3. Record the cur	ion fixture at the p range. akes the tool tip to e tip. rrent location A bef	osition within uch the ore entering
	Teach Position:		Record
	X (mm)	Y (mm)	Z (mm)
	400.000	0.000	0.000
	Yaw (deg)	Pitch (deg)	Roll (deg)
	0.000	180.000	180.000
	Previous		Next

of the calibration fixture. Click <Record> and <Next> buttons.

Figure 3-51 Record Location A

Step 3 Lift the Z-axis and rotate it. Ensure that the difference between the Roll value of the robot and that of Location A recorded for the first time is more than 30 °. Move the robot again to enable the center of its end fixture (or sucker) to contact the center of the calibration fixture. Click <Record> and <Next> buttons.



Figure 3-52 Record Location B

Step 4 Click the <Calculate> button to calculate the tool coordinates of the robot end fixture (or sucker). Click the <Sure> button to end calibrate.

Tool Calibrate		-	×
Location A:	( 200.000, 0.000, 0.000, 180.000, 90.000 )		
		_	
Location B:	( 400.000, 0.000, 0.000, 180.000, 180.000 )		
Tool:	( -100.000, 100.000, 0.000, 0.000, 0.000, 0.000 )		
	Previous Calculate Sure		

Figure 3-53 Calculate Tool Coordinates

## 3.7.7 User Frame

Users can calibrate the robot user coordinate system in the User Frame Calibration interface. Select User Frame Calibration under the menu bar.

Automation Resour	ce Manager : Pallas		
File Edit View Debug	Tools Window Help		
🛏 🖬 🖻 📀 📀 🗧	Parameter Settings	•	Thread: MainThread-Aborted 🔹
Pallas Solution Explorer	Coordinate Settings	•	Tool Frame Calibration
Remote Location	Robot Controls	•	User Frame Calibration
Image:	Robot Application	•	
D 🔤 HMI_Use_HY	Vision Tool		
INLONCD NewSolution222	Debugging and Analyzing To	ol 🕨	
TB1607OK1013	Other	•	

Figure 3-54 User Frame

Open the User Frame Calibration interface, select the user coordinate to be calibrated in the left user coordinate series table, and manually write the points on the three user coordinate systems shown in the figure through teaching or manual writing. Click Calculate to calculate the current user coordinate system.

Settings: Use the current user coordinates.

Save: Save the current user coordinates to the robot, but do not use them.

Set and Save: Use the current user coordinates and saving to the robot

User Frame Cal	ibration	-							_ ×
1 user1			Х	Y	Z	Yaw	Pitch	Roll	
2		ORG:	10	20	0	0	0	0	Acquire
3	Zw Hand	X-P:	20	50	0	0	0	0	Acquire
4 	A A A A A A A A A A A A A A A A A A A		20						Toquire
с с	Xw	Y-P:	30	60	0	0	0	0	Acquire
7	Х-Р Ү-Р	User Frame	10	11	12	13	14	15	Calculate
8		Comment :	user1						
9									
10	Tips Hand - Hand of robot	ORG - User Fra	me Origin	X-P - Point or	Yavis V-P -	Point on X-V	nlane		
11	Step 1:As shown in the figur	e above, get th	ie coordinat	e values of O	RG X-P Y-P.	I OILL OILX I	plane.		
12	Step 2:Click calibration to ol	otain the currer	nt user fram	e system valu	e.				
13	Step 3:Click Set to activate t	he current user	frame syste	em.					
14	Step 4:Click Save to save the	e current user fi	rame system	n value to a fil	e.				
15	Note:SCARA and Delta robo	ts need to ensu	ure the same	e Z value, oth	erwise the est	tablished use	r frame will h	ave posture.	
16									
						Set	Save	Se	et And Sav

Figure 3-55 User Frame Coordinate

# 3.7.8 Jog Control

Users can move the robot in Jog Control interface. Select Jog Control under Tools in the menu bar.



Figure 3-56 Select Jog Manual Interface

In Jog Control interface, you can monitor and control the following robot parameters in real time:

(1) Current Cartesian coordinates and axis coordinates;

(The Yaw and Pitch from Cartesian coordinates of a four-axis robot is 0 and 180 respectively, and remain unchanged; the J5 and J6 from joint coordinates of a four-axis robot are both 0, and remain unchanged.)

(2) Current TCP coordinates;

(3) Current Config information.

Jog Control						×
Cartesian 🔻				Сог	nfig: Intreval(-	180,180] Right(257)
X (mm)	Y (mm)	Z (mm)	Yaw (deg)	Pit	ch (deg)	Roll (deg)
400.000	0.000	0.000	0.000	1	80.000	180.000
Joint 🔻						
Jt1 (deg)	Jt2 (deg)	Jt3 (deg)	Jt4 (deg)	Jt	5 (deg)	Jt6 (deg)
0.000	0.000	0.000	0.000		0.000	0.000
Current Tool 🔻						
X (mm)	Y (mm)	Z (mm)	Yaw (deg)	Pit	ch (deg)	Roll (deg)
0.000	0.000	0.000	0.000		0.000	0.000
Current UserFrame	•					
X (mm)	Y (mm)	Z (mm)	Yaw (deg)	Pit	ch (deg)	Roll (deg)
0.000	0.000	0.000	0.000		0.000	0.000
Jog Mode			х	-	400.000	+
Jog	Step	<ul> <li>Disable</li> </ul>	Y	-	0.000	+
Frame Type			Z	-	0.000	+
🔵 Joint 💿	World O Tool	O UserFrame	Yaw	-	0.000	+
Selected Frame			Pitch	-	180.000	+
User Fram Null	<ul> <li>Tool Fra</li> </ul>	im Null 🔻	Roll	-	180.000	+

Figure 3-57 Coordinate Display in Jog Control Interface

The Config contains two parts, one is the real robot config, and the other is the region limit for joints with a motion range exceeding  $360^{\circ}$ .

The robot supports 4 regions, defined as follows:

192: All joints with a motion range of more than  $360^{\circ}$  for robots are between (-540°,-180°];

256: All joints of the robot with a range of motion exceeding  $360^{\circ}$  are between (-180°,180°];

320: All joints of the robot with a range of motion exceeding  $360^{\circ}$  are between (180 °,540 °];

0: All joints of the robot with a range of motion exceeding 360 ° are in different ranges. The four-axis robot supports two configurations, defined as follows:

Right-hand: RIGHTY (0x0001)

Left-hand side: LEFTY (0x0002)

Six-axis robot supports 8 configurations

config	wrist	elbow	shoulder
21	flip	up	right
22	flip	up	left
25	flip	down	right

26	flip	down	left	
37	nonflip	up	right	
38	nonflip	up	left	
41	nonflip	down	right	
42	nonflip	down	left	
15	wrist singularity			
51	elbow singularity			
60	hand singularity			

#### Table 3-9 Six-axis Robot Config

Status value	hexadecimal	decimalism
right shoulder	0x01	1
left shoulder	0x02	2
up elbow	0x04	4
down elbow	0x08	8
flip	0x10	16
nonflip	0x20	32
status value	hexadecimal	decimal

Table 3-10 Six-axis Robot Status Value

The final Config value of the robot is obtained by adding the region value to the config value.

# **※**Be sure to perform control in Macro mode, otherwise an error will be reported.

In Jog Manual interface, you can continuously move the robot or jog the robot in Cartesian coordinate system, axis coordinate system, tool coordinate system, or user coordinate system.

#### Note: Make sure that the robot is powered on and homed before controlling the

robot to move. Otherwise, an error message will appear and the robot cannot be moved. To ensure safety, reduce the system speed before controlling the robot to move.



Figure 3-58 Simple Operations

# Continuous movement operation in Cartesian coordinate system (tool coordinate system):

Select Step under Jog Mode and Tool (tool coordinate system) under Frame Type. Long press the "+" button beside the X, Y, Z, Yaw, Pitch and Roll, the robot will move in the positive direction of the Cartesian coordinate system (tool coordinate system). Long press the "-" button, the robot will move in the negative direction of the Cartesian coordinate system (tool coordinate system). Release the button, the robot will stop moving.

## Continuous movement operation in axis coordinate system

Select Step under Jog Mode and Axis Coordinate System under Frame Type. Long press the "+" button beside J1, J2, J3, J4, J5 and J6, the robot will move in the positive direction of the corresponding axis. Long press the "-" button, the robot will move in the negative direction of the corresponding axis. Release the button, the robot will stop moving.

## Jog in Cartesian coordinate system (tool coordinate system):

Select Jog under Jog Mode and Tool (tool coordinate system) under Frame Type. Write the jog value in Distance (with a unit of mm in Cartesian coordinate system) to jog the robot. Click the "+" button beside the X, Y, Z, Yaw, Pitch and Roll, the robot will jog the corresponding distance in the positive direction of the Cartesian coordinate system (tool coordinate system). Click the "-" button, the robot will jog the corresponding distance in the negative direction of the Cartesian coordinate system (tool coordinate system). After jogging the corresponding distance, the robot will stop moving.

#### Jog in axis coordinate system:

Select Jog under Jog Mode and Axis Coordinate System under Frame Type. Write the jog value in Distance (with a unit of degree in axis coordinate system) to jog the robot.

Click the "+" button beside the X, Y, Z, Yaw, Pitch and Roll, the robot will jog the distance in the positive direction of the corresponding axis. Click the "-" button, the robot will jog the distance in the negative direction of the corresponding axis. After jogging the corresponding distance, the robot will stop moving.

## 3.7.9 Interference Zone

1. Application scenario:

1). During the process of space movement, robots may encounter some areas that need to be avoided, and the areas to be avoided need to be set as the interference zone of the robot.

2). When the robot cooperates with external equipment for operation, when specific conditions are required for the machine to be allowed to enter the operation area, it is necessary to set the operation area as the interference zone of the robot.

3). When multiple robots work together, a certain area is the working position of multiple robots, and it needs to be set as the interference area of multiple robots to reasonably plan the sequence of multiple robots' operations.

2. Function Introduction:

1). The robot will automatically pause when it reaches the interference zone position.

2). When the robot is in the interference zone, it will output a DOUT signal.

3. Function usage:

1). Open the tool and select the Interference Zone under the tool options in the menu bar.



Figure 3-59 Interference Zone

2). Open the interference zone setting interface, select the interference zone to be set in the left interference zone list, set the shape attributes of the interference zone, and set the attributes such as whether the interference zone is enabled, effective range, and activation method on the right. Select settings to avoid the robot in the interference zone and prevent collisions between the robots.



Figure 3-60 Interference Zone Interface

4. Explanation of interference zone parameters:

Currently, Pallas robots offer up to 16 sets of custom configurations for interference zones.

1). Enable

Interference zone switch, selection Yes: the interference zone is valid and can be configured with interference zone parameters; Select No: The interference zone is invalid.

2). Comment

Explain the interference zone for easy user differentiation.

3). Setting Mode

Diagonal

rea Parameter	Parameter Setting		
	Enable :	Yes	÷
X(mm): 0 Y(mm): 0 Z(mm): 0 Acqu (X,Y,Z)	Comment :	Area1	
	Setting Mode:	Diagonal	·
	Effective Range :	IN	Ŧ
	Activate Way :	Macro	•
-X(mm): 0 -Y(mm): 0 -Z(mm): 0 Acqu	Activate :	No	•
¥	Output Mode :	Macro	•
	Use Userframe:	No	·

Figure 3-61 Diagonal Method of Interference Zone

a) Determine a rectangle area by setting two points.

b) Move the robot to a specific position, click the get button, and the robot will automatically record the current position.

d) The two point data for determining the cuboid area is based on the user coordinate system.

When no is selected in the setting user coordinate system in the settings attribute, the default user coordinate system of (0,0,0,0,0,0) is used by default.

When selecting Yes in the Set User Coordinate System section of the Settings Properties section, the corresponding user coordinate system needs to be filled in the 'User Coordinate System Settings page. When the filled data is (0,0,0,0,0,0,0), the same effect as selecting No in the User Coordinate System section is achieved

Center

a Parameter			Parameter Setting		Γ.
			Enable :	Yes	
(mm): 0	Y(mm): 0 Z(mm): 0	Acqu	Comment :	Area1	_
			Setting Mode:	Center	
		Le to	Effective Range :	IN	
	Area X length: 0	N Let	Activate Way :	Macro	
	Area Y length: 0	Y Length X Length	Activate :	No	
	Area Z length: 0		Output Mode :	Macro	_
			Use Userframe:	No	_

Figure 3-62 Center Method of Interference Zone

a) Determine a cuboid area by setting a point and the length in the X, Y, and Z directions.

b) Move the robot to a specific position, which is the center of the cuboid area. Click the get button, and the robot will automatically record the current position.

c) The determination of a point data in the cuboid area is based on the user coordinate system.

When no is selected in the setting user coordinate system in the settings attribute, the default user coordinate system of (0,0,0,0,0,0) is used by default.

When selecting Yes in the Set User Coordinate System section of the Settings Properties section, the corresponding user coordinate system needs to be filled in the User Coordinate System page. When the data filled in is (0,0,0,0,0,0,0), the effect is the same as selecting No in the User Coordinate System section.

4). Effective Range

ĪΝ

The set cuboid area is the interference area, and the cuboid area has the function of interference area.

#### OUT

The outside of the set cuboid area is the interference area, and the outside of the cuboid area has the function of interference area.

5). Activation Way

After setting the interference zone parameters, it is necessary to activate the interference zone in order for the interference zone to function as interference zone function 1: when the robot enters the interference zone, stop the robot's action

There are four activation methods: Macro, I/O, Macro+AutoRetry, I/O+AutoRetry.

Macro

Select the macro command activation method, and in the Activate option below, select "Yes" to activate the interference zone.

Activate Way :	Macro	•
Activate :	Yes	•

Figure 3-63 Macro Activation Way

Ι/Ο

Activate Way :	I/O •
DI Activate Code	10101

Figure 3-64 I/O Activation Way

Select the I/O activation method and fill in the correct digital input signal in the DI activation number option below, such as 10101. When there is a signal in 10101, the interference zone can be activated.

It should be noted that using I/O to activate the interference zone cannot use the forced I/O function. The I/O signal must be a digital input signal, and high-speed input signals can also be used, but soft I/O cannot activate the interference zone.

Macro+AutoRetry

Activate Way :	Macro + AutoRetry	•
Activate :	Yes	•

Figure 3-65 Macro+AutoRetry Activation Way

Select the Macro+AutoRetry activation method, and in the Activate option below, select "Yes" to activate the interference zone.

Configure Macro+AutoRetry retry, when the interference zone is not activated, the

robot in the interference zone can automatically restore its previous motion.

I/O+AutoRetry

Activate Way :	I/O + AutoRetry	•
DI Activate Code	10101	

Figure 3-66 I/O+AutoRetry Activation Way

Select the I/O+AutoRetry activation method, and fill in the correct digital input signal in the DI activation number option below, such as 10101. When there is a signal in 10101, the interference area can be activated

It should be noted that using I/O to activate the interference zone cannot use the forced I/O function. The I/O signal must be a digital input signal, and soft I/O cannot activate the interference zone

Configure I/O+AutoRetry, so that when the interference zone is not activated, the robot in the interference zone can automatically restore its previous motion.

6). Output Mode

Macro

When the interference zone is activated, you can use Zone.Get 1 to obtain the activation status of the interference zone and check whether the interference zone is activated. The 1 in the Zone.Get 1 command represents the interference zone with a sequence number of 1

Ι/Ο

Output Mode :	DO •
DO Code :	20101

Figure 3-67 I/O Output Mode

When the interference zone is activated, the system will automatically output a digital output signal, which can be determined based on the status of the digital output number set below (whether it is open) to determine whether the interference zone is activated.

It should be noted that the DO output number can only be set for digital output signals, and soft I/O cannot be set.

When the interference zone is enabled, as long as the robot is within the interference zone, regardless of whether the interference zone is activated or not, the DO output signal will be output as 1.

#### 7). Use UserFrame

User Frame Calibration	Use Userframe: Yes 🔹
X(mm): 0 Y(mm): 0 Z(mm): 0	
RX(deg): 0 RY(deg): 0 RZ(deg): 0	
	Set Set And Save

Figure 3-68 Use User Frame

Note: Choosing the user coordinate system will affect the position of the interference area cuboid area set. The position data within the cuboid area is based on the user coordinate system. When the user coordinate system data is all 0, the effect is the same as selecting No.

#### 3.7.10 Home Calibration

Users can select the home calibration function under the menu bar tool options to recalibrate and calibrate the robot's zero point.

🖄 Automation Resour	ce Manager : Pallas				
File Edit View Debug	Tools Window Help				
🖕 🖬 🖻 📀 📀 📀	Parameter Settings	1	м	Thread: MainThread	Runr
Pallas Solution Explorer	Coordinate Settings	•			
Remote Location	Robot Controls	÷		Jog Control	
Image: Milliphi Mi	Robot Application	•		Interference Zone	
<ul> <li>HMIRobot_3_1_0</li> <li>HMIRobot_3_X</li> <li>HMI_Use_HY</li> <li>LNLONCD</li> </ul>	Vision Tool Debugging and Analyzing Tool	•		Home Calibration	
NewSolution222	Other	•			

Figure 3-69 Select Home Calibration

Open the home calibration interface, select the robot model and calibration method to be calibrated, obtain the values of each axis encoder of the current robot through the Get Encoder Value button, and click the Calculate button to calculate the home position of the current robot.

Select the axis to recalibrate the home, and use the write button to write the calculated

home into the robot.

The calibration method currently supports both rough and accurate calibration.

Accurate: Use the calibration fixture provided by QKM to calibrate and obtain the encoder values according to the precise calibration method of the model, and then click the Calculate and Write buttons in sequence.

Rough: Turn each joint of the robot to the zero position, obtain the encoder value, and then click the calculate and write buttons in sequence.

Home Calib	oration		×
Robot	Type AH6-500-06	54-1600 🔹	Calibration Type Accurate 🔻
	Calibration One	Calibration Two	AllResult 🗸
Axis 1:	0	0	0
Axis 2:	0	0	0
Axis 3:	0	0	0
Axis 4:	0	0	0
Axis 5:	0	0	0
Axis 6:	0	0	0
	Get Value	Get Value	
		Cal	culat Save Clear

Figure 3-70 Home Calibration Interface

# 3.7.11 Conveyor Manager

Refer to the Conveyor Management Manual.

🖄 Automation Resour	rce Manager : Pallas	
File Edit View Debug	Tools Window Help	
🖻 🖻 🖸 💿 📀	Parameter Settings	]
Pallas Solution Explorer	Coordinate Settings	
Remote Location	Robot Controls	
Image: Milliphi Mi	Robot Application   Conveyor Manager	
▷ I HMIRobot_3_1_0	VotF Wizard	
D B HMIRobot_3_X	Vision Tool	
▷ 💼 HMI_Use_HY	Debugging and Analyzing Tool 🕨	
D 🔤 LNLONCD		
NewSolution222	Other +	
TD16070K1013		

Figure 3-71 Select Conveyor Manager

# 3.7.12 VotF Wizard

Refer to the VotF Management Manual

Automation Resource	ce Manager : Pallas	
File Edit View Debug	Tools Window Help	
e 🖯 🖬 🖬 🐨	Parameter Settings	M Thread: MainThread-Running
Pallas Solution Explorer	Coordinate Settings	•
Remote Location	Robot Controls	•
▷ Image: Description of the provided HMIRobot_3_0	Robot Application	Conveyor Manager
<ul> <li>HMIRobot_3_1_0</li> <li>HMIRobot_3_X</li> <li>HMI_Use_HY</li> <li>INI_ONCD</li> </ul>	Vision Tool Debugging and Analyzing	Tool >
NewSolution222	Other	•

Figure 3-72 Select VotF Wizard

## 3.7.13 Macro Command Debugger

Users can send macros from Macro Command Window to the robot to enable its corresponding functions. Select Macro Command Window under Tools in the menu bar.

Automation Resource	ce Manager : Pallas			
File Edit View Debug	Tools Window Help			
e 🖸 🗐 🗐 🖷	Parameter Settings	М	Thread: MainThread-Running	• • 1
Pallas Solution Explorer	Coordinate Settings	•		
Remote Location	Robot Controls			
▷ Image: Description of the provided HMIRobot_3_0	Robot Application			
Image: Milliphi Mi				
▷ 🚞 HMIRobot_3_X	Vision Tool			
▷ Image: Description: Descr	Debugging and Analyzing Tool	F .	Macro Command Debugger	
D 🚞 LNLONCD			Data Logger	
NewSolution222	Other			
TB1607OK1013		_	System Diagnostics	
D in Test123			Communications Assistant	
D I YML retry NET				

Figure 3-73 Select Macro Command Window

Open Macro Command Window, enter a corresponding macro command in the command input area, and click the Run button, then the robot can execute the input macro command.

Users can query the sending and receiving status of macro commands in the output area. Users can also query the description of macro commands in the Macro Command Manual, and double-click the corresponding macro command to automatically input it into the command input window.

For details, please refer to the "QKM Robot Command Manual".

Note: Some macro commands can only be executed in Macro mode, and some can be executed in both QRL mode and Macro mode. Refer to Section 3.5 Robot



system status in macro mode during operation.

Figure 3-74 Macro Command Window

## 3.7.14 Data Logger

Users can select a data collection analyzer under the menu bar tool options. Through the data collection analyzer, robot data can be collected for statistical analysis, facilitating the debugging of robots.

🛕 Automation Resour	ce Manager : Pallas	
File Edit View Debug	Tools Window Help	
e 2 0 0 0	Parameter Settings	M Thread: MainThread-Running •
Pallas Solution Explorer	Coordinate Settings	•
Remote Location	Robot Controls	•
▷ I HMIRobot_3_0	Robot Application	•
Image: Milling Mill		-
Image: Milling Mill	Vision Tool	•
▷ Image: Description of the provided HTML Description of the p	Debugging and Analyzing Tool	Macro Command Debugger
D in LNLONCD		Data Logger
NewSolution222	Other	System Diagnostics
D III TB1607OK1013		Communications Assistant
D m Test123	-	Communications Assistant
N maximum KITT	*	

Figure 3-75 Select Data Logger

Open the data logger, select the data to be collected, trigger method and content, collection location, collection time, and other information in the data collection interface, and click Start Collection to collect the data of the current robot.

1) Location: Choose to collect data for Comm or Cell.

2) Set trigger type and trigger value.

Start Now: Immediately start collecting after clicking on 'start'.

Trigger Start: Start collection when triggering conditions are met.

Trigger Segment Acquisition: Stop collection when the triggering conditions are met first and then not met.

Trigger End: Endcollection when triggering conditions are met.

3) Set Trigger Value

Start Now: Offset time not supported.

Trigger Start: Forward bias, collect a section of data before triggering.

Trigger Segment Acquisition: Backward bias, collecting a section of data after triggering ends.

Trigger End: Backward bias, collecting a section of data after triggering ends.

Data Collecting							_ = ×
Location         Trigger Typ           Comm             Start collection when the trigger	e Acquisition gr • 1 er condition is true a	Interval Acquisition 10 and end collection w	Time (s)Offset Time 0 /hen it is false	(ms) Trigger Val Cartesian	ue positio • == •		✓ Get
Script Selection		• Ope	n after acquisition i	s complete Open	Script File Ope	en Data File	Save as Script
Add Custom IDN			IDN Description				Add
Cartesian position command	✓ x	<b>✓</b> y	✓ z	🗸 rx	✓ ry	🗹 rz	✔ 全选
Cartesian position feedback	x	у	🗌 z	🗌 rx	П гу	🗌 rz	全选
Cartesian speed command	✓ x	🖌 у	✓ Z	🗹 rx	✓ ry	🖌 rz	✔ 全选
Cartesian speed feedback	x	🗌 у	🗌 z	🗌 rx	🗌 гу	🗌 rz	全选
Joint position command	🔲 Jt1	Jt2	Jt3	Jt4	Jt5	🗌 Jt6	全选
Joint position feedback	🔲 Jt1	Jt2	Jt3	Jt4	Jt5	Jt6	全选
Joint velocity command	🔲 Jt1	Jt2	Jt3	Jt4	Jt5	Jt6	全选
Joint velocity feedback	🔲 Jt1	Jt2	Jt3	Jt4	Jt5	Jt6	全选
Data Stavan							
Data Storage			Select	Open Folde		Start	Stop

Figure 3-76 Data Logger Interface

4) Script Selection: The data collector is equipped with multiple commonly used collection scripts. You can select existing scripts from the Common Script selection drop-down box, or you can save the current collected content to the Common Script by clicking the Save as Common Script button, which is convenient for next use.

After the collection is completed, select "Open" or click the "Open Data File" button to open the collected data in the data collection analyzer, display a list and waveform of the data, and use the mouse and buttons to zoom in and out on local data.



Figure 3-77 Data Interface

Click the spectrum analysis button to perform Fourier transform on the currently selected data and display the spectrum after Fourier transform.



Figure 3-78 Freq Interface

## 3.7.15 System Diagnostics

Users can select system diagnosis under the menu bar tool options. Through the system diagnosis function, they can view the current firmware version of the robot and diagnose the robot.

Automation Resource Man	ager : Pallas
File Edit View Debug Tools	Window Help
Parameter Settings	<sup>*</sup> 3 8 0 0 8 <del>2</del>
Coordinate Settings	→
Robot Controls	→
Robot Application	<b>•</b>
Vision Tool	•
Debugging and Analyzing Tool	Macro Command Debugger
Other	Data Logger
Uther	System Diagnostics
	Communications Assistant

Figure 3-79 System Diagnosis

On the version detection page, click the start detection button to perform version detection on the current ARM, robot's Comm, Cell, and configuration files. If there is any version mismatch, a prompt will be give.

			Co	nfig File		
Model	version	Name	Туре	Release Date	Version	Robot Model
ARM	3.3.35					
		configuration.xml	Network file in master	2023-5-26	V1.2.3.0	AH3-0400-0204-1700
_		conveyor.xml	Conveyor file in master	2023-5-26	V1.2.3.0	AH3-0400-0204-1700
Comm	1.7.40	robot1.xml	Robot1 file in master	2023-5-26	V1.2.3.0	AH3-0400-0204-1700
		syscfg.xml	Syscfg file in master	2023-5-26	V1.2.3.0	AH3-0400-0204-1700
Cell 1 1.7.19		configuration.xml	Network file in slave1	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
		motor1.xml	Motor1 file in slave1	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
	1.7.19	motor2.xml	Motor2 file in slave1	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
		syscfg.xml	Syscfg file in slave1	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
		configuration.xml				
		motor1.xml	Motor1 file in slave1	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
Cell 2	1.7.19	motor2.xml	Motor2 file in slave	2023-3-14	V1.2.2.0	AH3-0400-0204-1700
		syscfg.xml	Syscfg file in master/slave	2023-3-14	V1.2.2.0	AH3-0400-0204-1700



On the system diagnosis page, you can view the current servo alarm and encoder

alarm of the robot, and clear the encoder alarm. You can view the values of each axis and encoder, and repair and format the SD card.

System Diagnost	tics				×
Version Check Rol	bot Diagnostics				
Axis	Servo Error		Encoder Error	Clear Errc	Encoder Value
Axis 1	0X00000	0X00000			229933
Axis 2	0X00000	0X00000			-10834003
Axis 3	0X00000	0X00000			246175
Axis 4	0X00000	0X00000		135113	
Auxiliary Encode	0	Auxiliary Encode		0	
Auxiliary Encode	0	Auxiliary Encode		0	
		SD Card Repair SD Card Format			d Format

Figure 3-81 Robot Diagnosis

# 3.7.16 Communications Assistant

Users can select Communication Assistant under the menu bar tool options to open the network serial port debugging tool, establish TCM, UDP, or serial port communication with the robot, and facilitate debugging of communication functions.

Automation Resource Mana	ager : Pallas
File Edit View Debug Tools	Window Help
Parameter Settings	<sup>*</sup> 3 🛛 🖸 🕄 🕰
Coordinate Settings	•
Robot Controls	<b>&gt;</b>
Robot Application	•
Vision Tool	
Debugging and Analyzing Tool	Macro Command Debugger
Other	Data Logger
Other	System Diagnostics
	Communications Assistant

Figure 3-82 Select Communication Assistant

Open the Network/Serial Debugging Assistant, where you can select protocol types such as TCP client, TCP server, UDP, and serial port. After selecting a communication protocol and establishing a connection, the robot can be controlled to send data in the data sending window, and the data received by the robot can be viewed in the data log

window.

Network/Serial Commun	ication Assista	nt				×
Network Settings	Data Log					
Protocol Type						
TCP Client •						
Server IP						
-						
Server Port						
Connect						
Receive Settings						
● ASCII ● HEX						
Log mode display						
Receive auto wrap						
Receive save to file						v
Send Settings	Data Send			<b>∠</b> Clea	r <mark>K</mark> Clea	ar
ASCII HEX						
Opening file source						
Send in a loop					Send	
Cycle Time 1000						
		0/0	Send: 0	Recv: 0	Reset C	lou

Figure 3-83 Communication Assistant

## 3.7.17 Firmware Upgrade

Users can select Firmware Upgrade under the menu bar tool options, open the Firmware Upgrade window, and upgrade the firmware and configuration files of the robot.

Automation Resource Man	ager : Pallas
File Edit View Debug Tools	Window Help
Parameter Settings	<sup>*</sup> 9 8 0 8 8 4
Coordinate Settings	<b>•</b>
Robot Controls	▶
Robot Application	•
Vision Tool	•
Debugging and Analyzing Tool	•
Other	Firmware Upgrade
	Boot Configuration

Figure 3-84 Select Firmware Upgrade

After selecting the upgrade firmware, click the button to select the folder where Comm firmware and Cell firmware are located, select the Cell that need to be upgrade, and click the upgrade button to perform a one click upgrade of the firmware.

#### ARM programming environment

Firmware Upgrade		×
Upgrade Type	Upgrade Firmware Oupgrade Configuration	
Comm Firmware	Choose Fold	
Cell Firmware	Choose Fold	
Cell Choose	Cell 1 Cell 2	
Upgrade Informa		
	Upgrade Exit	

Figure 3-85 Upgrade Configuration

After selecting the upgrade configuration file, select the configuration files for Comm and each cell respectively to upgrade the configuration file. When upgrading, check the option to Tick "Reserved ADC" can reserve the zero point and other information of the original configuration file.

Firmware Upgrad	e		×
Upgrade Type	O Upgrade Firmware	Upgrade Configuration	
Comm		Choose Fold 🔽 Reserved ADC	
Cell 1		Choose Fold  Reserved ADC	
Cell 2		Choose Fold V Reserved ADC	
Upgrade Informa			
		Upgrade Exit	

Figure 3-86 Upgrade Configuration

Note: When upgrading Cell firmware or configuration files, it is necessary that the Cell's IP and the robot are in the same network segment, otherwise the upgrade will fail.

## 3.7.18 Boot Configuration

Users can select boot configuration under the menu bar tool options, set the dedicated I/O of the robot, and start the self start program after startup.
Automation Resource Man	ager : Pallas
File Edit View Debug Tools	Window Help
Parameter Settings	' 9 <b>9 0 0</b> 8 <del>2</del>
Coordinate Settings	•
Robot Controls	•
Robot Application	•
Vision Tool	•
Debugging and Analyzing Tool	•
Other	Firmware Upgrade
	Boot Configuration

Figure 3-87 Select Boot Configuration

Control I/O supports digital input, high-speed input, and virtual I/O (Modbus TCP/DIO, etc.), and can be triggered by force. Control I/O includes the following:

- Start I/O: When the rising edge occurs, control the start of the thread with the "selected" attribute.
- Stop I/O: When the rising edge occurs, control the termination of threads with the "selected" attribute.
- Pause I/O: When the rising edge occurs, control the thread with the "selected" attribute to pause.
- Continued I/O: When the rising edge occurs, the thread with the "selected" attribute is controlled to continue.
- Servo control I/O: control the servo to power on at the rising edge and power off at the falling edge.

Note: In QRL mode, the main thread has the "selected" attribute by default, and other threads need to add this attribute before they can be controlled by I/O. In Macro mode, the main thread has the "selected" attribute.

The status display I/O supports digital output and virtual I/O. The status display I/O includes the following:

- Servo status I/O: After the servo is powered on, there is a signal, and after the servo is powered off, there is no signal.
- Start output I/O: When the main thread is in a non-terminating state, there is a signal, the main thread terminates, and there is no signal.

- Pause output I/O: The main thread is in a paused state with a signal, and the main thread is in a non- paused state without a signal.
- Abnormal state I/O: After triggering an exception, there is a signal, and after the exception is resolved, there is no signal.
- Program self-starting configuration, configuring the self-starting content of the robot after it is turned on.

Main program self-starting: configure whether to automatically start the last running QRL program after booting.

- Background thread self-starting: configure whether to start the background thread after booting.
- Mode switching: configure whether to switch to Macro or QRL mode after booting.

Note: After enabling the program self-starting, the mode switching can only use the QRL mode.

Boot Configuration	on				×
External I/O config	juration				
Start I/O	Unused 🔹	Abort I/O	Unused 🔹	Output Start I/O	20101 •
Pause I/O	Unused •	Retry I/O	Unused •	Output Pause I/O	20102 •
PowerEnable I/O	Unused •	Motor State I/O	20104 •	Errors I/O	20103 •
Project auto start o	configuration				
Main auto start	Close •	Thread auto start	Close •	Mode Toggle	Macro •
					Save

Figure 3-88 Boot Configuration

# Chapter 4 ARM Programming

# 4.1 Create QRL Projects

Step 1 Select New - >Pallas Project under File in the menu bar.



Figure 4-1 Select New - Pallas Project

Step 2 In the new solution window, select the solution template to create, fill in the name of the QRL solution, and select the location where the QRL program will be saved.

The names must not start with numbers or programs cannot be named with pure numbers. Use them in text format, otherwise ARM will prompt that projects cannot be created.

Users can save QRL programs in PC or robot Flash. To save in PC, users need to select a save path. To save in robot Flash, users need to save them in the path specified in robot Flash.

#### ARM programming environment

Solution Template		_ ×	
Ordinary Project		Ordinary blank	
HMI Project	Blank Project	most familiar 'Hello World' for	
Conveyor Project Templa	Pick and Place	programmers'	
Vott Project Template			
woodduster Project tern			
4 <b>• • •</b>			
Select Path D:/Work		✓ Select	
Solution Name NewSolution	PC Location	<ul> <li>Create</li> </ul>	

Figure 4-2 New Solution

## 4.2 Load QRL Programs

Step 1 Select Open - >Pallas Project under File in the menu bar.



Figure 4-3 Select Open - Pallas Project

Step 2 Select the QRL program folder to be opened, select the solution.qsln file, and click Open. At this point, the QRL program file will be loaded on the local interface. Users can double-click to open the program file to edit and modify it.

C→ V→ Test →		▼ 49 搜索
Organize 🗸 🛛 new	folder	
<ul> <li>★ Favorites</li> <li>▲ Downloads</li> <li>■ Desktop</li> <li>≅ Recent places =</li> </ul>	project solution.qsln	2021/3/19 1 2021/3/19 1

Figure 4-4 Select a QRL program



Figure 4-5 Local location

In addition, you can directly drag a QRL program folder from PC to local location, and the QRL program file will be loaded on the local interface.

Step 3 If you need to run a QRL program in robot Flash, then Drag the QRL program file directly from a local location to a remote location, or directly from the PC folder to a remote location.



Figure 4-6 Load to Remote Location

If the user needs to save the QRL program in the robot Flash to the PC, they can directly drag the QRL program file from the remote location to the local location. After dragging, select the saved PC path in the pop-up dialog box.

In the pop-up dialog box, you can select the location to save it by clicking the 'Select' button, or you can select a history path in the download history path as the save location.



Figure 4-7 Download Solution

The selected path will be automatically added to the history path. You can also modify the history path by clicking the Add and Delete buttons at the top for easy selection and use.

# 4.3 QRL Program File

QRL program files include those with extensions .ql and .qlv.

- .ql file: QRL codes are saved.
- .qlv file: Robot location and speed information is saved.



Figure 4-8 QRL Program Files

In some cases, users may create multiple .ql and .qlv files in QRL programs to save QRL codes. Right-click the project folder and select New Item. Create corresponding files according to the actual situation.

🔕 Autom	ation Resource Manager : Pallas
File Edit V	/iew Debug Tools Window Help
🛏 🖻 🖻 🌘	0 0 0 III III III III II III III III II
Pallas Solutio	on Explorer 🚽 👻
Remote Loca	ation C
<b>→</b> 🚰 HMIRo	bbot_3_0
>         >         pr           >         >         >         HMI           >         >         HMI         HMI	New Project Expand
D C HM	New Item
New TB1 Test	Delete Rename
D S YML	Attribute

Figure 4-9 New Item

New Item		×
al		
.qlv		
.qm		
NUMBER		
INEWFILE	Add	Cancel

Figure 4-10 Create File

ql file:

Double-click a ql file to open it. Users can modify QRL codes in the ql file.

### ARM programming environment

Automation Resource M	anager : Pallas			_ = ×
File Edit View Debug Tools	Window Help			路 Engineer •
<b>- 2</b> 0 0 0 <b>- -</b>	🗐 🔯 👤 🔍 🔍 🔍 💽 Thread: MainThread-Aborted 🔹 Solut	tion test	•  •  •	II ■   ½ ?? ↑
Pallas Solution Explorer	⊬ x <mark>Qmain.ql ×</mark>	-	Robot Control	<b>→</b> ×
Remote Location	C 0main · 1 0 owhile true do 3 print("Hello world!") 4 Thread.Sleep(1) 6		System Manage	0 🖻 🖻 🗎
	Output	<u>≁</u> û ×		
			Power On	Power Off
Pallas Solution QRL Comman	Output Threads Error List Find Re Watch Breakpo Conditi			- 10% Robot Speed
Connected Device: 192 168 12 23	0 Current File: /media/fla	In1	Col0	Ch0 Inc

Figure 4-11 Open a ql file

qlv file:

Double-click a qlv file to open it. Users can create, save and modify location and speed information in the qlv file. Users can move the robot to the corresponding location by checking linear motion or joint motion in the qlv file.

The information of location and speed in qlv file can be directly called in ql file.

## 4.4 Run QRL Program

Before using the main thread to run the QRL program, enable the robot to be in QRL mode, and QRL programmes that need to be run are saved in the robot Flash.

Select the program in Solution dialog and click the Start button, the QRL program will run. When the QRL program is running, click the Stop button to stop running it.

_			I [					
Q Thread	: MainThread-Aborted	•	Solution	test	-	▶	Ш	

Figure 4-12 Select and Run QRL Program

Thread status description

Running: Running now

	1			1			
হ	Thread	MainThread-Running	•	Solution	test	•	I.
				1			

Figure 4-13 Thread Running Status

Aborted: Aborted status, indicating that the thread is not running or has completely stopped running.



Figure 4-14 Thread Aborted Status

Stopped: In the paused state, the thread will stop running. You can control the thread to continue running by clicking the Continue button.



Figure 4-15 Thread Stopped Status

## 4.5 Run Background Thread

The background thread is a special thread, and the QRL program launched through the background thread is not affected by the status of the robot device and will always run.

Automation	Resource Manager : Pallas				
File Edit View	Debug Tools Window Help				
🛏 🖻 🖻 🔾	∞ ፸፸ ₽₽₽ 200	🛛 🔍 🛛 💽 Thr	ead: BGThread-Aborted	Solution HMI_Use_HY	▼ ► ► II ■
Pallas Solution Exp	plorer				
Remote Location	C				
▷ I HMIRobot_	3_0				
▷ I HMIRobot	3_1_0				
▷ Image: Description of the provided HMIRobot of the provided HMIRO	3_X				
▷ ■ HMI_Use_H	v New Solution				
D E LNLONCD	New Solution				
NewSolutio	New Project				
D TB1607OK1	Add Project				
Dest123	Expand				
VML_retry_1					
D 🔤 test	Rename				
	Delete				
	Set as Background Project				
	Attribute				

Figure 4-16 Set Background Thread

Right click on the QRL project that you want to run as a background thread, select Set as Background Thread from the pop-up menu, and select BGThread in the thread to

start the program.



Figure 4-17 Run Background Thread

Note: Thread and motion related instructions cannot be executed in the background thread.



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