DOBOT

Dobot M1 Blockly Description

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Preface

Purpose

This manual describes how to use the blockly modules of Dobot M1, which will make user use program blockly skillfully.

Intended Audience

This document is intended for:

- Customer Engineer

- Sales Engineer

- Installation and Commissioning Engineer

- Technical Support Engineer

Change History

Date	Change Description
2019/10/30	The first release

Symbol Conventions

The symbols that maybe founded in this document are defined as follows.

Symbol	Description
⚠DANGER	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury
⚠WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robotic arm damage
⚠NOTICE	Indicates a potentially hazardous situation which, if not avoided, can result in robotic arm damage, data loss, or unanticipated result
📖NOTE	Provides additional information to emphasize or supplement important points in the main text

Content

1. **Overview**

Blockly is a programming platform based on Google Blockly. You can program through the puzzle format, which is straightforward and easy to understand.

2. **Dobot Blockly Description**

2.1 **Logic**

<p align="center">Table 2.1   Condition judgement</p>

Blockly	
Description	The block behind **do** will be executed, if the block behind **If** is true
Parameter	None
Return	None

<p align="center">Table 2.2   Logic judgement</p>

Blockly	
Description	Judge the relationship between two values
Parameter	Judgement condition: • = • ≠ • > • ≥ • < • ≤
Return	Return 1: true Return 0: false

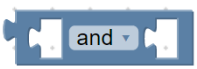<p align="center">Table 2.3   Logical operator AND and OR</p>

Blockly	
Description	Get a value 0 or 1 by calculating two conditions
Parameter	and: When the two conditions are true, the calculated result is true, or else the result is false or: When the two conditions are false, the calculated result is false, or else the result is true
Return	Return 1: true Return 0: false

Table 2.4 Logical operator NOT

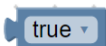| Blockly	not
Description	NOT operator is a Boolean operator that returns TRUE or 1 when the operand is FALSE or 0, and returns FALSE or 0 when the operand is TRUE or 1
Parameter	None
Return	Return 1: true Return 0: false

Table 2.5 True/False module

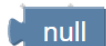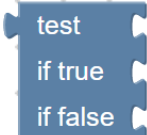| Blockly	true ▾
Description	Return true or false
Parameter	Value type: True or False
Return	Return 1: true Return 0: false

Table 2.6 Empty module

Blockly	null
Description	Return NULL
Parameter	None
Return	Return NULL

Table 2.7 Condition selection

Blockly	test if true if false
Description	If the condition is true, this module will return the result behind **if true**, otherwise return the result behind **if false**

Parameter	None
Return	Return a result according to the condition

2.2 **Loops**

Table 2.8   Repeat for many times
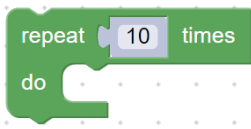
Blockly	repeat 10 times do
Description	Repeat for many times
Parameter	Time: Set time for repetition
Return	None

Table 2.9   While/until loop instruction

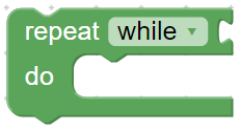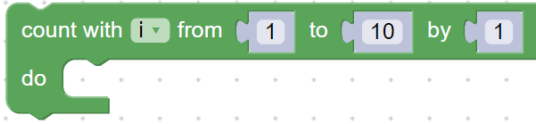| Blockly	repeat while ▾ do
Description	Execute **while** or **until** loop instruction
Parameter	While: In **while** loop, if condition is true, execute loop, otherwise break out of the loop Until: In **until** loop, the loop will be executed one time first, and then judge the condition, if the condition is true, continue loop, otherwise break out of the loop
Return	None

Table 2.10   Traverse a list by interval

Blockly	count with i ▾ from 1 to 10 by 1 do
Description	Traverse a list by interval
Parameter	Variable: Click drop-down list to select a variable or create a variable The starting number: Set a starting number The end number: Set an end number Interval: Set interval to N, traverse list for every N. For example, set a starting number to 1, set an end number to 10 (does not contain 10). When set an interval to 1, the interval values

	are 1, 2, 3, 4...9. When Set an interval to 2, the interval values are 1, 3, 5, 7, 9
Return	None

Table 2.11   Traverse a list

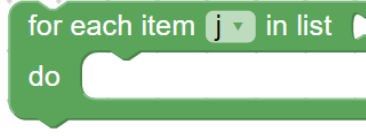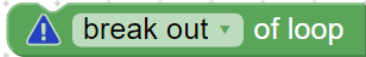| Blockly	for each item j in list do
Description	Traverse a list
Parameter	Variable: Click drop-down list to select a variable or create a variable List: Add a list to this module
Return	None

Table 2.12   Break out/Continue a loop

Blockly	⚠ break out of loop
Description	Break out or continue a loop
Parameter	Break out: Break out of a loop Continue: Continue a loop
Return	None

2.3 **Math**

Table 2.13   Number

Blockly	0
Description	Return a number, which can be a parameter or condition for other modules
Parameter	Number: Set a number
Return	Return a number

Table 2.14   Basic math operation

Blockly	1 + 1

Description	Calculate two numbers to get a result
Parameter	Operators: • + • − • × • ÷ • ∧
Return	Return a result

Table 2.15   Complicated math operator

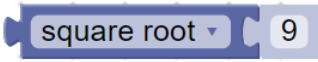| Blockly	square root ▾ 9
Description	Get a calculated number
Parameter	Operator: • square root • absolute • - • In • log10 • e^ • 10^
Return	Return a result

Table 2.16   Trigonometric operator

Blockly	sin ▾ 45
Description	Calculate trigonometric
Parameter	Trigonometric: • sin • cos • tan • asin • acos

	• atan
Return	Return a result number

Table 2.17 Constant

Blockly	TT ▾
Description	Get a constant value
Parameter	Constants: • π • ψ • e • ∞ • sqrt(2) • sqrt(1/2)
Return	Return a constant value

Table 2.18 Judge value type

Blockly	0 is even ▾
Description	Judge a value type
Parameter	Types: • even • odd • prime • whole • positive • negative • divisible by
Return	Return 1: true Return 0: false

Table 2.19   Modify variable value

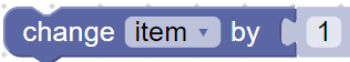| Blockly	change item ▾ by 1
Description	Modify the value of variable
Parameter	Variable: select variable or create a variable Value: Set a value for variable
Return	None

Table 2.20   Round value

Blockly	round ▾ 3.1
Description	Round a value
Parameter	Round types: • round • round down • round up Value: Set a value to round
Return	Return a value

Table 2.21   List calculation

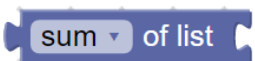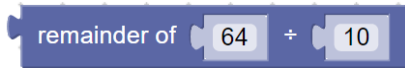| Blockly	sum ▾ of list
Description	Calculate the data which is in a list
Parameter	Calculation types: • sum • min • max • average • median • modes • standard • random item
Return	Return a result

Table 2.22　Get a remainder

Blockly	remainder of (64 ÷ (10
Description	Get a remainder
Parameter	Divisor: Set a divisor Dividend: Set a dividend
Return	Return a remainder

Table 2.23　Limitation number

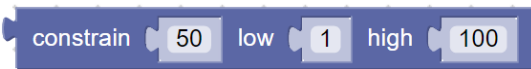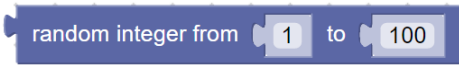| Blockly	constrain (50 low (1 high (100
Description	Limit a number in a range
Parameter	The limited number: Input a value low: Input a minimum value high: Input a maximum value
Return	Return a number

Table 2.24　Get a random integer

Blockly	random integer from (1 to (100
Description	Get a random integer in a range
Parameter	Minimum number: Set a minimum value Maximum number: Set a maximum value
Return	Return a random integer

Table 2.25　Get a random fraction

Blockly	random fraction
Description	Get a random fraction
Parameter	None
Return	Return a random fraction

2.4　**Text**

Table 2.26   Set text

Blockly	
Description	Set text
Parameter	None
Return	Return text

Table 2.27   Create a string
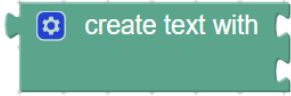
Blockly	
Description	Create a string
Parameter	None
Return	Return a string

Table 2.28   Append a string
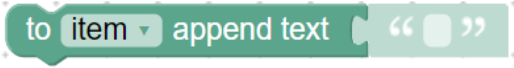
Blockly	
Description	Append a string to another string
Parameter	Appended String: Select a appended string String: Input a string to append
Return	None

Table 2.29   Get the length of string

Blockly	
Description	Get the length of string
Parameter	String: Input a string
Return	Return length

Table 2.30   Judge a string whether is empty or not

Blockly	

Description	Judge whether a string is empty or not
Parameter	String: Input a string
Return	Return 1: Empty Return 0: Not empty

Table 2.31 Find the index of string

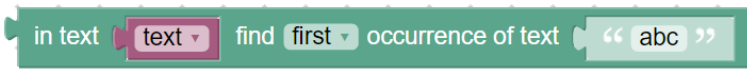| Blockly	in text `text ▾` find `first ▾` occurrence of text `" abc "`
Description	Find the indexes of the first and last position of substring
Parameter	String: Drag a string into this module Index: Select the index where substring appears Substring: Input a substring that you want to find
Return	If string is found, return the index, otherwise return 0

Table 2.32 Get a character from other string

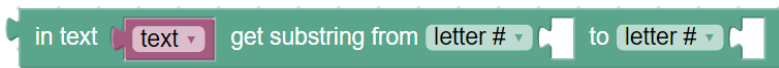| Blockly	in text `text ▾` get `letter # ▾`
Description	Get a character at a specified position from a string
Parameter	String: Drag a string to this module Select the index of character: • Letter #: Set the index of letter that you want to get, for example, set to 3, means you will get the third letter • Letter # from end: Set the index of letter that you want to get, for example, set to 2, means you will get the second letter from end • First letter: Get the first letter • Last letter: Get the last letter • Random letter: Get a random letter
Return	Return a letter

Table 2.33 Get a substring from a string

Blockly	in text `text ▾` get substring from `letter # ▾` to `letter # ▾`
Description	Get a substring from a string
Parameter	• String: Set a string

	• Select the starting index
	• Select the end index
Return	Return a substring

Table 2.34   Convert string to uppercase or lowercase

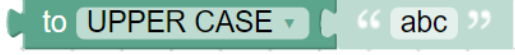|	
Blockly	to UPPER CASE ▼ " abc "
Description	Convert string to uppercase or lowercase
Parameter	Convert styles: • UPPER CASE • lower case • Title Case
Return	Return a converted string

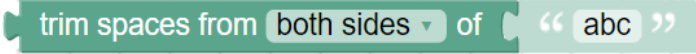Table 2.35   Remove space in a string

Blockly	trim spaces from both sides ▼ of " abc "
Description	Remove space in a string
Parameter	Space position: • Both sides • Right side • Left side
Return	Return the converted string

Table 2.36   Print a string

Blockly	print " abc "
Description	Print a string
Parameter	None
Return	None

Table 2.37   Set prompt

Blockly	prompt for text ▼ with message " abc "

Description	Set a prompt
Parameter	Input a prompt
Return	Return a prompt

2.5 **Lists**

Table 2.38   Create an empty list

Blockly	
Description	Create an empty list
Parameter	Add item: Click , and drag **item** to **list**.
Return	Return an empty list

Table 2.39   Create a list with item
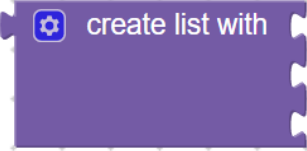
Blockly	
Description	Create a list with item
Parameter	Add item: Click , and drag **item** to **list** based on site requirements
Return	Return a list

Table 2.40   Create a list with one element repeated

Blockly	
Description	Create a list with one element repeated
Parameter	Item: Set one element Repeat times: Set repeating times
Return	Return a list

Table 2.41   Get the length of list

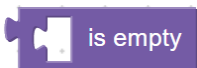| Blockly	length of
Description	Get the length of list
Parameter	List: drag a list to this module to get the length
Return	Return a length

Table 2.42   Judge a list whether is empty or not

Blockly	is empty
Description	Judge a list whether is empty
Parameter	List: Drag a list to this module
Return	Return 1: Empty Return 0: Not empty

Table 2.43   Search the index of list

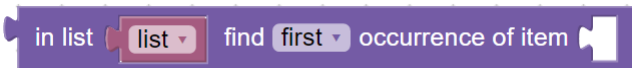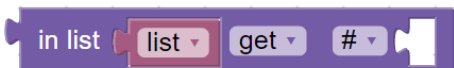| Blockly	in list list find first occurrence of item
Description	Get the indexes of the first and last item in list
Parameter	List: Drag the searched list to this module Searched positions: • The first occurrence • The last occurrence The searched item: Drag the searched item to this module
Return	If searched item is found, return the index, otherwise return 0

Table 2.44   Operate the items in list

Blockly	in list list get #
Description	Operate the items in list
Parameter	List: Drag a list to this module Operations: • Get • Get and remove

	• Remove Index: • # • # from end • First • Last • Random Index: Set index
Return	When the operation is **get** or **get and remove**, return the obtained valuet There is no return, when the operation is **remove**

Table 2.45　Modify item in list

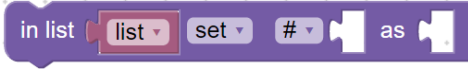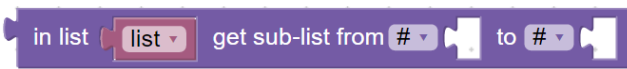| Blockly	
Description	Modify item in list
Parameter	List: Drag a list to this module Modifications: • Set • Insert at Index: • # • # from end • first • last • random Index: Set index Value: Set value
Return	Return a modified list

Table 2.46　Get a sub-list from list

Blockly	
Description	Get a sub-list from list
Parameter	List: Drag a list to this module The starting positions:

	• get a sub-list from # • get a sub-list from # from end • get a sub-list from first The end positions: • to # • to # from end • to end Index: Set index
Return	Return a sub-list

Table 2.47   Convert text and list

Blockly	
Description	Convert list and text with delimiter
Parameter	Convert methods: • Make list from text • Make text from list Delimiter: Input a delimiter
Return	Return a list or text

Table 2.48   Sort and copy list

Blockly	
Description	Sort and copy list
Parameter	Sort regulations: • numeric • alphabetic • alphabetic, ignore case sort: • ascending • descending
Return	Return a sorted list

2.6 **Colour**

Table 2.49   Get color

Blockly	
Description	Select a color from color plate
Parameter	None
Return	Return a color

Table 2.50   Get a random color

Blockly	random colour
Description	Get a random color
Parameter	None
Return	Return a random color

Table 2.51   Custom color

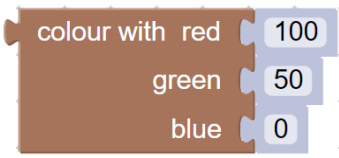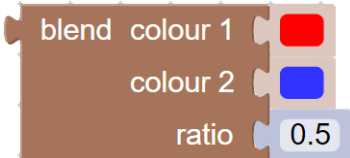| Blockly	colour with red 100 green 50 blue 0
Description	Create a color with three colors: red, green, blue
Parameter	Red: The range is 0~100 Green: The range is 0~100 Blue: The range is 0~100
Return	Return a custom color

Table 2.52   Mix two colors

Blockly	blend colour 1 ▮ colour 2 ▮ ratio 0.5
Description	Create a color by mixing two colors
Parameter	Color 1: Click color plate to select a color Color 2: Click color plate to select a color Ratio: Set the ratio of two colors, the range is 0~1

Return	Return a color

2.7 **Variables**
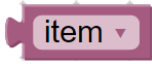
Table 2.53   Set variable
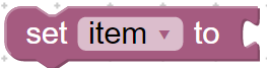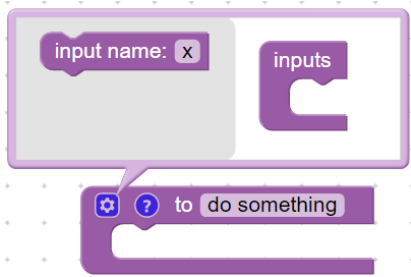
Blockly	
Description	Create variable
Parameter	Create variable: Click drop list to create variable Select variable: Click drop list to select variable Rename variable: Click drop list to rename variable
Return	Return a variable

Table 2.54   Assigning values to variables

Blockly	
Description	Assign values to variables
Parameter	Create variable: Click drop-down list to create variable Select variable: Click drop-down list to select variable Rename variable: Click drop-down list to rename variable Value: set variable value
Return	None

2.8 **Function**

Table 2.55   Define a function without return value

Blockly	
Description	Define a function without return value
Parameter	Function name: Click edit box to input function name Parameters: Click , and drag parameter module to the right module and name it.

	Tip: Click , and add tip for function.
Return	None

Table 2.56　Define a function with a return value

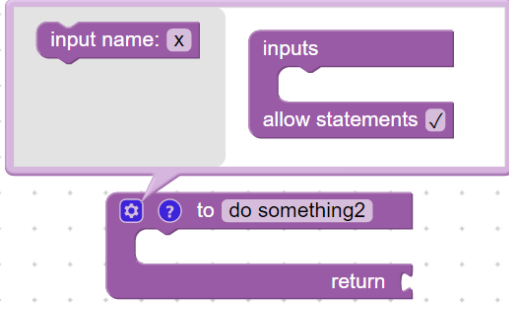|	
Blockly	
Description	Define a function with a return value
Parameter	Function name: Click edit box to input function name Parameters: Click to drag parameter module to the right module and name it. Tip: Click to add tip for function. Return: return a value
Return	None

Table 2.57　Logic judgement in function

Blockly	
Description	If condition is true, return a value
Parameter	Condition: Drag a condition into this module Return: Drag a return module into this module
Return	None

2.9　**Dobot API**

⚠ NOTICE

- If you use the motion command when writing a program in Cartesian coordinate system, please add the orientation command before this motion command, which indicates the arm orientation of Dobot M1.

- When creating TCP/IP, the IP address of the client and server must be in the same network segment.

2.9.1   Basic

Table 2.58   Get system time

Blockly	GetTime
Description	Get the current system time
Parameter	None
Return	System time, unit: second

Table 2.59   Create server IP and port

Blockly	Create Server Ip " " Port 0
Description	Create Server IP address and port
Parameter	Server Ip: Server IP address. That is, IP address of Dobot M1 or M1Studio as the server Port: Server Port
Return	None

Table 2.60   Receive data from client

Blockly	Recive data from the Client
Description	Server (Dobot M1 or M1Studio) receives data from the client (external equipment)
Parameter	None
Return	Client data

Table 2.61   Send data to client

Blockly	Send data to the Client Data " "
Description	Server (Dobot M1 or M1Studio) sends data to the client (external equipment)
Parameter	Data: Data sent to the client
Return	None

Table 2.62　Close the server

Blockly	Close the Server
Description	Close the server
Parameter	None
Return	None
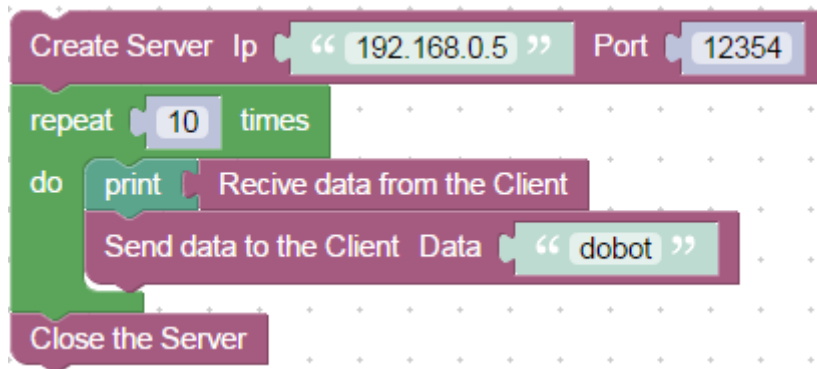
Figure 2.1　Server demo

Table 2.63　Create Client IP and port
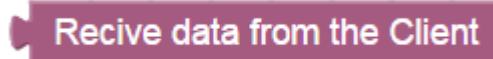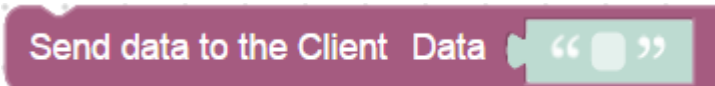
Blockly	Create client Ip Port 0
Description	Create Client IP address and port
Parameter	client Ip: Client IP address. That is, IP address of Dobot M1 or M1Studio as the client Port: Client port
Return	None

Table 2.64　Receive data from server

Blockly	Recive data from the Server
Description	Client (Dobot M1 or M1Studio) receives data from the server (external equipment)
Parameter	None
Return	Server data

Table 2.65   Send data to server

Blockly	Send data to the Server Data (" ▢ "
Description	Client (Dobot M1 or M1Studio) sends data to the server (external equipment)
Parameter	Data: Data sent to the server
Return	None

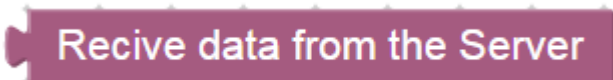Table 2.66   Close the client

Blockly	Close the Client
Description	Close the client
Parameter	None
Return	None
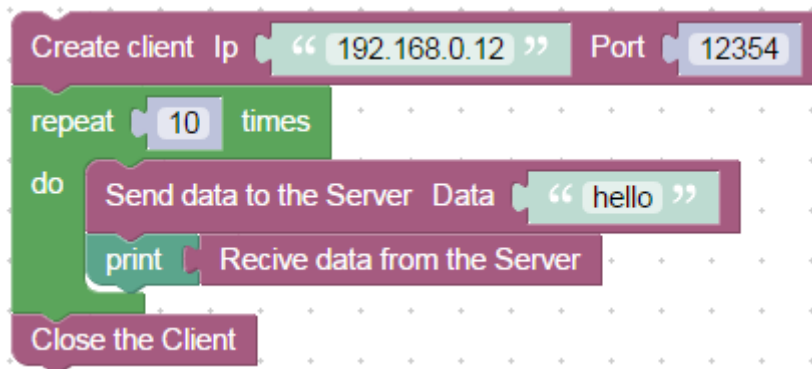
Figure 2.2   Client demo

2.9.2   Config

Table 2.67   Set the velocity ratio and acceleration ratio in PTP mode

Blockly	Set Coordinate Speed VelocityRatio (20 JerkRatio (50
Description	Set the velocity ratio and acceleration ratio in PTP mode
Parameter	VelocityRatio: Velocity ratio in PTP mode. The actual velocity = the maximum velocity * VelocityRatio JerkRatio: Acceleration ratio in PTP mode. The actual velocity = the maximum acceleration *

	JerkRatio
Return	None

Table 2.68   Set the lifting height and maximum lifting height in JUMP mode

Blockly	Set Jump Params JumpHeight 20 ZLimit 200
Description	Set the lifting height and maximum lifting height in JUMP mode
Parameter	JumpHeight: Lifting height ZLimit: Maximum lifting height
Return	None

2.9.3   Motion

Table 2.69   Set arm orientation
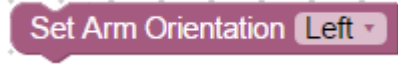
Blockly	Set Arm Orientation Left ▾
Description	Set the arm orientation
Parameter	Arm Orientation: Left, Lefty-hand; Right: Righty-hand
Return	None

Table 2.70   Get arm orientation
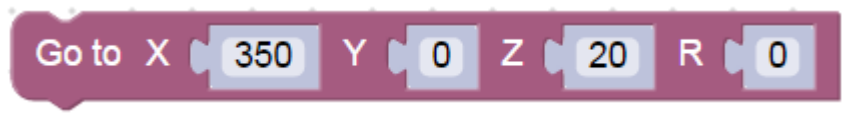
Blockly	Get Arm Orientation
Description	Get the arm orientation
Parameter	None
Return	Arm Orientation: Left, Lefty-hand; Right: Righty-hand

Table 2.71   Move Dobot M1 to a target position in MOVL mode

Blockly	Go to X 350 Y 0 Z 20 R 0
Description	Move Dobot M1 to a target position in MOVL mode

Parameter	X: Set X-axis coordinate in Cartesian coordinate system
	Y: Set Y-axis coordinate in Cartesian coordinate system
	Z: Set Z-axis coordinate in Cartesian coordinate system
	R: Set R-axis coordinate in Cartesian coordinate system
Return	None

Table 2.72   Move Dobot M1 to a target position in JUMP mode

Blockly	Jump To X 350 Y 0 Z 20 R 0
Description	Move Dobot M1 to a target position in JUMP mode
Parameter	X: Set X-axis coordinate in Cartesian coordinate system
	Y: Set Y-axis coordinate in Cartesian coordinate system
	Z: Set Z-axis coordinate in Cartesian coordinate system
	R: Set R-axis coordinate in Cartesian coordinate system
Return	None

Table 2.73   Move Dobot M1 to a target position in MOVJ mode

Blockly	Nonlinear movement to(Descartes) X 350 Y 0 Z 20 R 0
Description	Move Dobot M1 to a target position in MOVJ mode
Parameter	X: Set X-axis coordinate in Cartesian coordinate system
	Y: Set Y-axis coordinate in Cartesian coordinate system
	Z: Set Z-axis coordinate in Cartesian coordinate system
	R: Set R-axis coordinate in Cartesian coordinate system
Return	None

Table 2.74   Move Dobot M1 to a target position in MOVJ mode

Blockly	Nonlinear movement(MOVJ) to(joint) ΔX 350 ΔY 0 ΔZ 20 ΔR 0
Description	Move Dobot M1 to a target position in MOVJ mode

Parameter	△X: Set X-axis coordinate increment in Cartesian coordinate system
	△Y: Set Y-axis coordinate increment in Cartesian coordinate system
	△Z: Set Z-axis coordinate increment in Cartesian coordinate system
	△R: Set R-axis coordinate increment in Cartesian coordinate system
Return	None

Table 2.75　Move Dobot M1 to a target position in MOVL mode

Blockly	Linear movement(MOVL) to(joint) J1 350 J2 0 J3 20 J4 0
Description	Move Dobot M1 to a target position in MOVL mode
Parameter	J1: Set J1-axis coordinate in Joint coordinate system
	J2: Set J2-axis coordinate in Joint coordinate system
	J3: Set J3-axis coordinate in Joint coordinate system
	J4: Set J4-axis coordinate in Joint coordinate system
Return	None

Table 2.76　Move Dobot M1 to a target position in JUMP mode

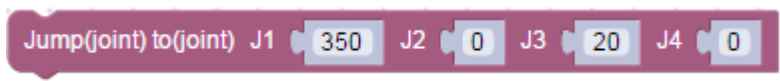| Blockly	Jump(joint) to(joint) J1 350 J2 0 J3 20 J4 0
Description	Move Dobot M1 to a target position in MOVJ mode
Parameter	J1: Set J1-axis coordinate in Joint coordinate system
	J2: Set J2-axis coordinate in Joint coordinate system
	J3: Set J3-axis coordinate in Joint coordinate system
	J4: Set J4-axis coordinate in Joint coordinate system
Return	None

Table 2.77　Move Dobot M1 to a target position in MOVJ mode

Blockly	Nonlinear movement(MOVJ) to(joint) J1 350 J2 0 J3 20 J4 0
Description	Move Dobot M1 to a target position in MOVJ mode

Parameter	J1: Set J1-axis coordinate in Joint coordinate system
	J2: Set J2-axis coordinate in Joint coordinate system
	J3: Set J3-axis coordinate in Joint coordinate system
	J4: Set J4-axis coordinate in Joint coordinate system
Return	None

Table 2.78　Move Dobot M1 to a target position in MOVJ mode

Blockly	Nonlinear movement to(joint) △J1 [350] △J2 [0] △J3 [20] △J4 [0]
Description	Move Dobot M1 to a target position in MOVJ mode
Parameter	△J1: Set J1-axis coordinate increment in Joint coordinate system
	△J2: Set J2-axis coordinate increment in Joint coordinate system
	△J3: Set J3-axis coordinate increment in Joint coordinate system
	△J4: Set J4-axis coordinate increment in Joint coordinate system
Return	None

Table 2.79　Move Dobot M1 to a target position in ARC mode

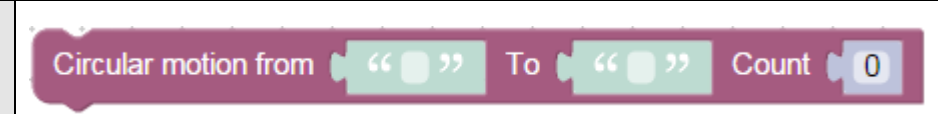| Blockly	Arc motion from [" [ ] "] To [" [ ] "]
Description	Move Dobot M1 to a target position in ARC mode
	It is necessary to confirm the three points with other motion blocks.
Parameter	First parameter: Middle point, which can be set to Cartesian coordinate
	Second parameter: End point, which can be set to Cartesian coordinate
Return	None

Table 2.80　Move Dobot M1 to a target position in CIRCLE mode

Blockly	Circular motion from [" [ ] "] To [" [ ] "] Count [0]
Description	Move Dobot M1 to a target position in CIRCLE mode
	It is necessary to confirm the three points with other motion blocks.

Parameter	First parameter: Middle point, which can be set to Cartesian coordinate
	Second parameter: End point, which can be set to Cartesian coordinate
	Count: Circle number
Return	None

Table 2.81　Get the real-time Cartesian coordinates of Dobot M1

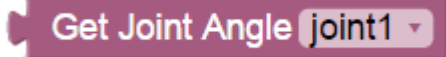| Blockly	GetCurrentCoordinate X ▾
Description	Get the real-time Cartesian coordinates of Dobot Magician
Parameter	Coordinates:
	• x: X-axis coordinate
	• y: Y-axis coordinate
	• z:: Z-axis coordinate
	• r: R-axis coordinate
Return	Return Cartesian coordinate

Table 2.82　Get the real-time joint angle of Dobot M1

Blockly	Get Joint Angle joint1 ▾
Description	Get the real-time joint angle
Parameter	Joints:
	• joint1: J1-axis coordinate
	• joint 2: J2-axis coordinate
	• joint 3: J3-axis coordinate
	• joint 4: J4-axis coordinate
Return	Return Joint coordinate

Table 2.83　Set wait time

Blockly	Delaytime 1 s
Description	Set the wait time
	If you need to set the pause time between the two modules, please call this module
Parameter	Delaytime, Unit: s

Return	None

2.9.4   I/O

Table 2.84   Get digital input
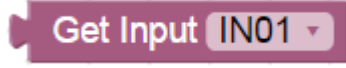
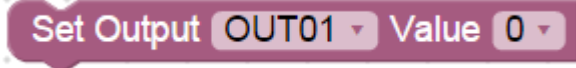| Blockly	Get Input IN01 ▾
Description	Get digital input
Parameter	Input: Digital input address. Value range: IN01-IN24
Return	Level value of the right digital input address. 0: Low level; 1: High level

Table 2.85   Get analog input

Blockly	Get AD AD01 ▾
Description	Get analog input
Parameter	AD: Analog input address. Value range: AD01-AD06
Return	Value of the right analog input address. Value range: 0-4095

Table 2.86   Set digital output

Blockly	Set Output OUT01 ▾ Value 0 ▾
Description	Set EIO output
Parameter	Output: Digital output address. Value range: OUT01-OUT02 Value: 0: Low level; 1: High level
Return	None