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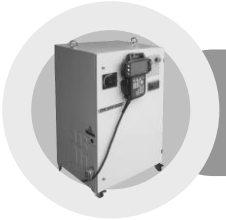
HEAVY INDUSTRIES CO.,LTD.

WARNING

INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED INSTALLATION PERSONNEL AND MUST CONFORM TO ALL NATIONAL AND LOCAL CODES

Hyundai Robot

Hi5ER100601FMEN1



Hi5 Controller Function Manual

Endless rotation axis function

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1 Introduction

This function enables Robot's R1 axis, or additional axis (JIG axis) to have rotation that exceeds the soft limit. This function can be used for the following three purposes.

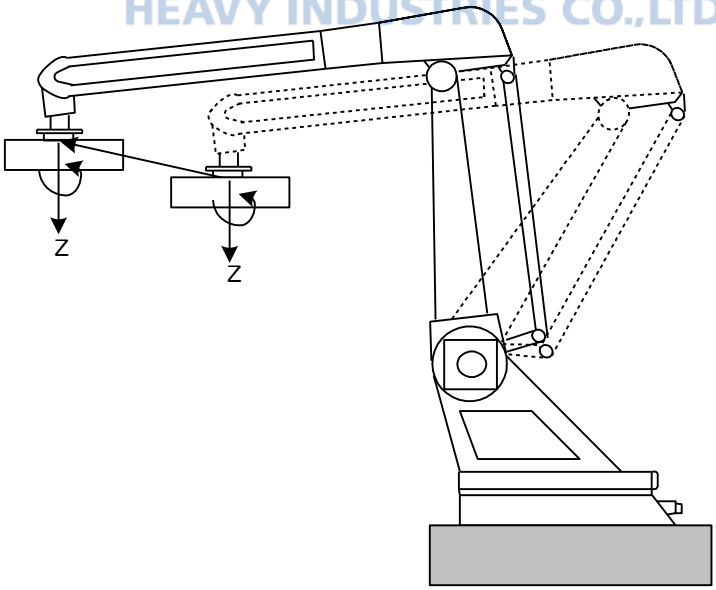
Firstly, a method that designates the number of ration based on the position of designated step from Robot's JOB program. By setting the number of rotation at the top of JOB program, and operate it. A JOB program that will rotate the axis for the setting will be completed

Secondly, a function that convert the ENDLESS axis of rotation that exceeded ± 180deg to angle of rotation within ± 180deg. For example, an axis that rotated 360deg is physically identical as 0deg. By using this ENDLESS RESET function, the axis can conveniently move back to 0deg without having reserve rotation.

Last function sets the axis of ENDLESS rotation to 0deg. This ENDLESS ZERO function is useful when the current position needs to be set to 0deg regardless of the absolute position of the axis of ENDLESS. It is similar to ENDLESS RESET, but it does not maintain the physical axis's absolute position and change the current position to 0.

Function features

(1) Conveniently assign the number of ENDLESS rotation(support exclusive function)
(2) Supports straight line interpolation when R1 axis does ENDLESS rotation(Tool's X,Y direction will be internally set to 0)
(3) Enables a rotation that exceeds the range of soft limit
(4) Automatic reset function when step reaches, or stops
(5) Provides exclusive ENDLESS reset function that converts the degree within 1 rotation



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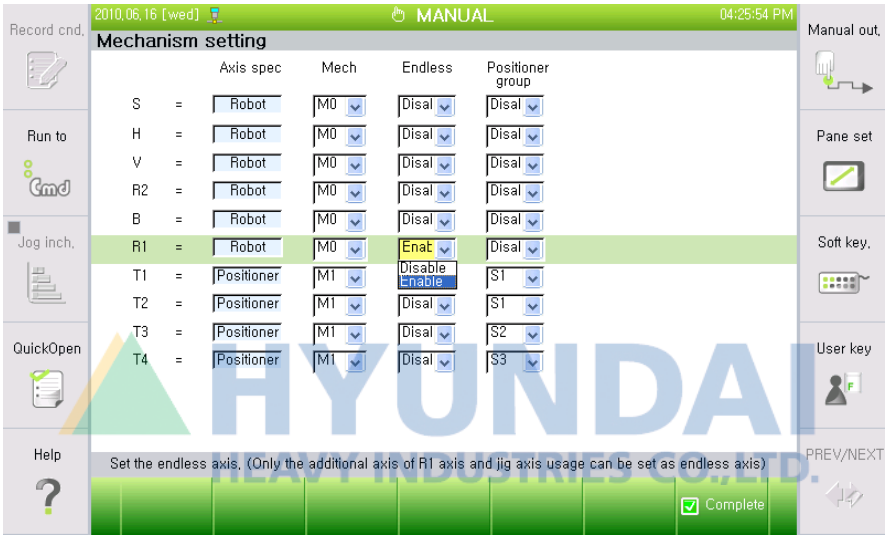
System Setting

2.1. System Setting

(1) Set endless axis from『[F2]: System』 → 『5: Initialize』 → 『6: Mechanism Setting』menu. Set 'Enable' for the axis that you wish to use as ENDLESS axis. Some axis may not be selected as ENDLESS axis according to their specifications.

(2) If axis specification is 'Robot', 'R1' axis can be set as ENDLESS axis, and when it is 'JIG', ENDLESS can be set as enabled.

(3) Once completed, press『[F7]: Complete』key.



(4) Restart and the ENDLESS axis setting will be effective.

< Caution >

① This function automatically convert -180~180deg of ENDLESS axis and change the position when restarts.

② When attempt to recover the controller with back up files (Integer files such as ROBOT.CON, ROBOT.MCH), please reset the encoder off-set and axis integer position as physical position of ENDLESS axis cannot be recovered.

3 Writing Programs

3.1. Entering number of ENDLESS rotation

When axis needs to be moved by ENDLESS rotation, please use ENDLESS command. ENDLESS command must be positioned above the MOVE command and if you with to perform ENDLESS rotation on many axis, please list them to write the program.

```
S1  MOVE    L,S=60%,A=1,T=0
S2  MOVE    L,S=100mm/s,A=1,T=0
    ENDLESS R1=10                 → Assign 10 rotation for R1 axis
S3  MOVE    L,S=100mm/s,A=1,T=0   → R1 axis moves while rotates(S3 as reference)
S4  MOVE    L,S=100mm/s,A=1,T=0
    ENDLESS T1=100                → Assign 100 rotation for T1 axis
    ENDLESS T2=100                → Assign 100 rotation for T2 axis
S5  MOVE    P,S=10%,A=1,T=0       → T1,T2 axis moves while rotates 100 times around S5
S6  MOVE    L,S=200mm/s,A=1,T=0
    END
```

3.2. ENDLESS

ENDLESS {axis name} = {number of rotation}

(1) Select the name of axis that set as the ENDLESS rotation axis as axis name. R1, T1~T16

(2) Number of rotation is set as the number of rotation for 1 rotation of corresponding axis (-10000~10000 rotation)
Number of rotation's set range changes according to the deceleration ratio of axis. Generally, for R1 axis, 1000 rotation settings are fine. However if above it has set, an 'E0173 ENDLESS Rotation number overflow' error may occur from ENDLESS command, when the program is executed. In this case, number should be reduced as it exceeded the range of rotation number for one rotation.

(3) If RESET, or ZERO is set without axis name setting, number of rotation will not be set.

(4) ENDLESS RESET is a command that maintains the physical position, and convert it within -180~180deg.

Example of program)

```
S1    MOVE   L,S=60%,A=1,T=0
S2    MOVE   P,S=50%,A=1,T=0
      ENDLESS RESET   → Move all ENDLESS axis to S2, and RESET
                      → If the step position of ENDLESS R1 axis of S2 is 750deg
                      → Convert it to 30deg
```

(5) ENDLESS ZERO sets the current position to 0deg with disregarding the previously set physical position.

Example of program)

```
S1    MOVE   L,S=60%,A=1,T=0
S2    MOVE   P,S=50%,A=1,T=0
      ENDLESS ZERO    → Move all ENDLESS axis to S2, and ZEROING
                      → Regardless of the step position of ENDLESS R1 axis of S2
                      → Set it to 0deg.
```

(6) Command input can be done from manual mode, and select 『[F6』: Cmd input』 → 『[F1]: Motion, I/O』 → 『PREV/NEXT』Key → 『[F1]: ENDLESS』while window is focused to Robot program

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R CODE

4.1. Manual RESET by R350 code

Manual RESET function by R350 code is used when a user wants to reset from manual or automatic mode (instead of program command ENDLESS RESET) while Robot is immobilized.

R CODE	Parameter	Description
R350	0	RESET on all axis
	6-12	RESET on corresponding axis number

4.2. Manual ZERO by R354 code

Manual ZERO function by R354 code is used when a user wants to ZERO from manual or automatic more (instead of program command ENDLESS ZERO) while Robot is immobilized.

R CODE	Parameter	Description
R354	0	ZERO on all axis
	6-12	ZERO on corresponding axis number

5 Error Code

5.1. Error Code

E0108 (0 axis) Encoder error: Encoder reset required
Encoder is at the unusable range. Please adjust the Encoder off-set and try again.

E0172 (0 axis) Endless rotation location error
This error occurs during initialization. It occurs when the back up position of current Encoder and absolute position of Encoder after the power are different more than 0x20000
If this error occurs, Encoder off-set adjustment for corresponding axis is required.

E0173 Endless rotation overflow
Rotation number that exceeds the valid range that can be handled by software has been designated. Even lesser than 1000 rotation number may become invalid if the deceleration ratio is large. Please reduce the rotation number that designated for ENDLESS command and try again.

E0193 (0 axis) Endless unsupported encoder type
For 1 rotation of motor, only Encoders with 1024, 2048, 4096, 8192 pulse supports the ENDLESS function. Other Encoders are programmed not to support it

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