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Application Note of DELTA HMC Load-Unload System

*We reserve the right to change the information in this catalogue without prior notice.



Preface

Thank you for purchasing our product. You can find the information related to load-unload system in this application note during inspection, installation, wiring, operation and examination. Please note that different version supports different functions.

The following information describes the purpose and application:

- Control System (Chapter 1)
- System Configuration (Chapter 2)
- Operation (Chapter 3)
- Program Usage and Editing (Chapter 4)
- System Setting (Chapter 5)
- Troubleshooting (Chapter 6)
- Others (Chapter 7)
- Examples (Chapter 8)

Product Features

- Distributed fieldbus control: High precision and high speed motion, quick response and can be easily constructed.
- Smoothing function: Continuously smooth the interpolation.
- Compliance control: Each axis can do adaptive moving with the setting of torque limit.
- Flexibly carry out stacking command
- Template program: 10 program templates for customized setting
- Provides huge amount of command program: With 500 programs and up to 400 commands can be edited in one program.
- Supports dual system

Technical Support

If you have any technical question, please contact local distributers or Delta's service center.

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System Configuration



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1

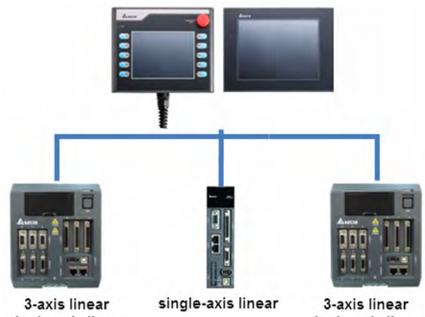
Control System

Please select the servo drives and motors from the list mentioned in this chapter when applying this control system. Pay attention to the safety precautions during installation, wiring, operation and examination. As for the detailed information of each product, please refer to the corresponding user manual.

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1.1 Features

This system adopts Delta's HMC distributed motion control framework for easier and more flexible multi-axis control.



3-axis linear single-axis linear arc helical

3-axis linear single-axis linear arc helical

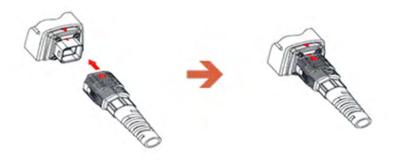
1.2 System Specifications and Configuration

1.2.1 Controller

Model name of HMC07 controller

HMC Model	Applicable System
HMC07-N510H52	3 axes
HMC07-N500H52	3 axes and above
HMC07-N511H52	3 axes and above
HMC08-N500S52	12 axes and below

HMC07 Controller installation and wiring



Definition of HMC07 color thread

Part Number for Wiring

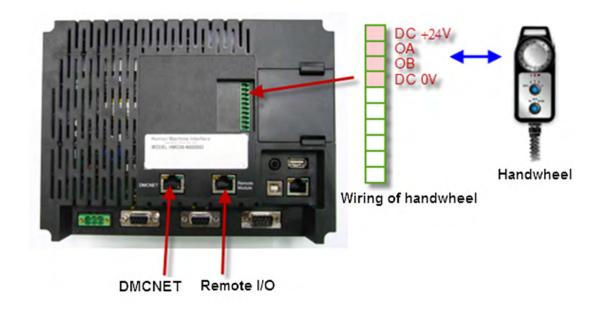
32 pin Type A: HMC-CA3203B0 (3M), HMC-CA3205B0 (5M), HMC-CA3210B0 (10M) 16 pin Type A: HMC-CA1603B0 (3M), HMC-CA1605B0 (5M), HMC-CA1610B0 (10M) 12 pin Type A: HMC-CA1203B0 (3M), HMC-CA1205B0 (5M), HMC-CA1210B0 (10M)

Color	Name	Description
White/Orange	EMG_C	Emergency switch-B contact; users can connect this contact to the safety device.
White/Orange	EMG_C	Emergency switch-B contact; users can connect this contact to the safety device.
White/Green	EMG_O	Emergency switch-A contact; users can connect this contact to the safety device.
White/Green	EMG_O	Emergency switch-A contact; users can connect this contact to the safety device.
Red	Power	System power 24V+
Black	PGND	Ground for system power supply
White	EGND	Grounding
Yellow	422_TX+	RS-422: TX+; RS-232: TX, RS-485: T+/R+
White/Yellow	422_TX-	RS-422: TX- ; RS-485: T-/R-
Black/White	CGND	Grounding for communication
Black/White	CGND	Grounding for communication

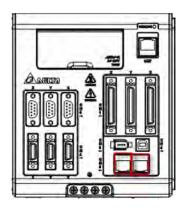
Black/White	CGND	Grounding for communication
White/Blue	ENA_O	Limit switch, A contact
White/Blue	ENA_O	Limit switch, A contact
Purple	422_RX+	RS-422: R+; RS-232:RX
White/Purple	422_RX-	RS-422: R-
Black/Orange	INT1	(Reserved)
Black/Green	INT0	(Reserved)
Red/Black	I_GND	(Reserved)
White/Red	I_PW	(Reserved)
RJ45 Blue	DMC	DMCNET. Connect to DMCNET communication port.
RJ45 Black	ETH	EtherNet. Connection is not a must.
RJ45 Green	RIO	Remote I/O. Connect to I/O module's communication port.

Note: For safety concerns, please connect contact A and B to system loop.

Wiring for HMC08



- Wiring for Peripheral Devices
- (1) Use DMCNET to connect the servo drive or DMCNET modules.



Note:

- 1. Select one port for connection.
- 2. DMCNET wiring is a serial communication loop. Please connect to a terminal resistor at the end of the loop.
- (2) Use Remote I/O to connect I/O module.

	x0-x7	X8-X15	X16-X23	X24-X31	
*	Y0-Y7	Y8-Y15	Y16-Y23	Y24-Y31	521-34 PW 00000 511-1- WI G-+

Note: This RS-422 high-speed communication loop does not require terminal resistor.

1.2.2 Servo System

Please refer to ASDA series user manual for further information:

Website:

http://www.delta.com.tw/ch/product/em/download/download_main.asp?act=3&pid=2&ci d=1&tpid=1

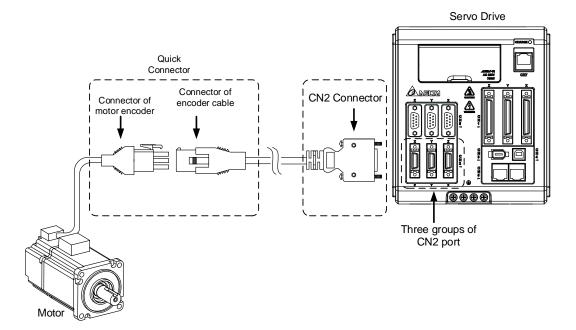
Model Type and Definition

Axial Name	Station Number (P3-00)	Note
X1	1	ASD-M-F/ ASD-A2-F servo drive
Y1	2	ASD-M-F/ ASD-A2-F servo drive
Z1	3	ASD-M-F/ ASD-A2-F servo drive
A	4	ASD-M-F/ ASD-A2-F servo drive
В	5	ASD-M-F/ ASD-A2-F servo drive

Subsystem Model Type and Definition

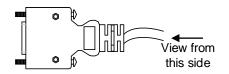
Axial Name	Station Number (P3-00)	Note
X2	6	ASD-M-F/ ASD-A2-F servo drive
Y2	7	ASD-M-F/ ASD-A2-F servo drive
Z2	8	ASD-M-F/ ASD-A2-F servo drive

Encoder Wiring



CN2 connector and 9 pins (3*3) on encoder side shall be connected as the following ways:

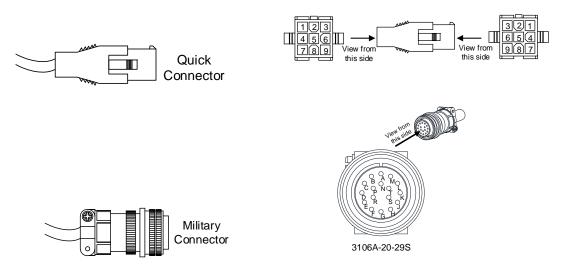
CN2 Connector:



11	9
12	20
100	9
2 🗆	10

CN2 rear view of the terminal block

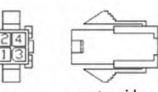
Encoder connector (military connector and quick connector):



The definition of each signal is as follows:

	Drive (Connector	E	ncoder Conne	ector
Pin No	Terminal Symbol	Function and Description	Military connector	Quick connector	Color
5	T+	Serial communication signal input/output (+)	A	1	Blue
4	T-	Serial communication signal input/output (-)	В	4	Blue & Black
-	-	Reserved	-	-	-
-	-	Reserved	-	-	-
14,16	+5V	Power +5V	S	7	Red/Red & white
13,15	GND	Power ground	R	8	Black/Black & white
Shell	Shielding	Shielding	L	9	-

- Wiring for Motor Power Cable:
- (1) Power cable (without brake). See the terminal as below:



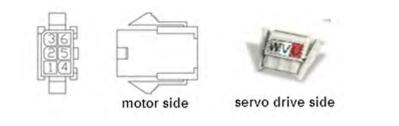


motor side

servo drive side

Motor Side	1	2	3	4
Drive Side	U	V	W	Grounding(GND)

(2) Power cable (with brake). See the terminal as below:



Motor Side	1	2	3	4	5	6
Drive Side	U	V	Brake 1	W	Grounding(GND)	Brake 2

■ Homing sensor/Limit sensor/Brake wiring:

CN1 connector and its definition:



CN1 Connector (female)



Side view

26 DO4- DO5+ DI8- DI6- DI3- SIGN HPulse (MSIGN V_REF GND HSIGN OCZ OZ 50
27 DO5- MPulse DI7- DI5- PULLH_S /SIGN PULLH_P /PULSE PULSE COM- COM- 49
1 DO4+ DO3+ DO2+ DO1+ DI1- COM+ GND MONZ VDD GND OA /OB OB 25
2 DO3- DO2- DO1- DI4- DI2- GND NC MON1 T_REF VCC /OA /OZ 24

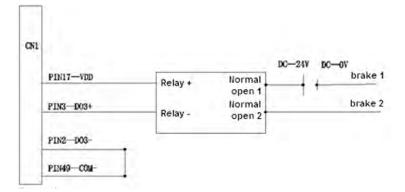
2	DO3-	Digital output	1	NC	Reserved	27	NC	Reserved	26	NC	Reserved	
		9	3	DO3+	Digital output	_		High-speed	28	NC	Reserved	
4	DO2-	Digital output	5	DO2+	Digital output	29	/HPULSE	position command pulse (-)	30	NC	Reserved	
6	DO1-	Digital output				31	NC	Reserved				
8	DI4-	Digital input	7	DO1+	Digital output	33	DI5-	Digital input	32	DI6-	Digital input	
10	DI2-	Digital input	9	DI1-	Digital input	35	PULL HI_S	Pull-high voltage of	34	DI3-	Digital input	
12	GND	Analog input signal ground	11	COM+	Power input (12~24V)	37	(Sign) /SIGN	sign Position command	36	SIGN	Position command signal (+)	
14	NC	No connection	13	GND	Analog input signal ground	39	PULL HI_P (Pulse)	signal (-) Pull-high voltage of pulse	38	HPULSE	High-speed position command pulse (+)	
16	MON1	Analog monitor output 1	15	MON2	Analog monitor output 2	41	/PULSE	Position command pulse (-)	40	/HSIGN	High-speed position command (-)	
18	T_REF	Torque analog command input	17	VDD	+24V power output (for external I/O)	43	PULSE	Position command pulse (+)	42	V_REF	Speed analog command input (+)	
20	VCC	+12 power output (for	19	GND	Analog input signal ground	45	COM-	VDD(24 V) power	44	GND	Analog input signal ground	
	10.4	analog command) Encoder/	21	OA	Encoder/ A pulse output	47		ground VDD (24 V)	46	HSIGN	High-speed position command (+)	
22	/OA	A pulse output				47	COM-	COM- power ground			Encoder	
24	/OZ	Encoder/ Z pulse output	23	/OB	Encoder/ B pulse output	49	COM-	VDD(24V) power	48	OCZ	Z pulse open-collector output	
			25	OB	Encoder/ B pulse output			ground	50	OZ	Encoder Z pulse differential output	

(1) Wiring diagram for homing/limit sensor

Please refer to the followings for wiring methods of homing sensor and limit sensor on each axis. NPN method is applied in this example. Please refer to ASDA series user manual for PNP wiring method.

PIN11-COM+	DC24V
PIN10DI2-	original point
PIN34-DI3-	positive limit
PIN8-DI4-	negative limit
PIN49COM-	DCOV
	PIN10DI2- PIN34DI3- PIN8DI4-

(2) Wiring diagram for servo motor with brake (vertical axis)



Set parameter P2-20 of vertical axis to 2108 or 2008. 2108 is set as normally open (it is usually set as normally open) while 2008 is normally close.

Parameters setting list of each axis:

Main Arm	X1-axis (M/A2)	Y1-axis (M/A2)	Z1-axis (M/A2)
Original Point	P2-11 = 1124 or 1024	P2-11 = 2124 or 2024	P2-11 = 3124 or 3024
Positive limit	P2-12 = 1123 or	P2-12 = 2123 or 2023	P2-12 = 3123 or 3023
Negative limit	1023 P2-13 = 1122 or	P2-13 = 2122 or 2022	P2-13 = 3122 or 3022
Servo operating direction	1022 P1-01 = B or 10B	P1-01 = B or 10B	P1-01 = B or 10B
Parameter for station number	P3-00 = 1	P3-00 = 2	P3-00 = 3
Communication Rate	P3-01 = 203	P3-01 = 203	P3-01 = 203
Brake setting in non-volatile area	P3-10 = 11	P3-10 = 11	P3-10 = 11
E-gear ratio setting in non-volatile area	P3-12 = 100	P3-12 = 100	P3-12 = 100
Software limit stop	P4-25 = 11	P4-25 = 11	P4-25 = 11
No parameter is applied	P2-10 = 1100	P2-10 = 2100	P2-10 = 3100
No parameter is applied	P2-14 = 1100	P2-14 = 2100	P2-14 = 3100
No parameter is applied	P2-15 = 1100	P2-15 = 2100	P2-15 = 3100
Assistant Arm	A-axis (A2)	B-axis (A2)	
Original Daint	P2-11 = 1124 or	P2-11 = 2124 or 2024	
Original Point	1024		
Positive limit	P2-12 = 1123 or	P2-12 = 2123 or 2023	
	1023		
Nogotivo limit	P2-13 = 1122 or	P2-13 = 2122 or 2022	
Negative limit	1022		
Servo operating	P1-01 = B or 10B	P1-01 = B or 10B	

direction		
Parameter for station number	P3-00 = 4	P3-00 = 5
Communication Rate	P3-01 = 203	P3-01 = 203
Brake setting in non-volatile area	P3-10 = 11	P3-10 = 11
E-gear ratio setting in non-volatile area	P3-12 = 100	P3-12 = 100
Software limit stop	P4-25 = 11	P4-25 = 11
No parameter is applied	P2-10 = 1100	P2-10 = 2100
No parameter is applied	P2-14 = 1100	P2-14 = 2100
No parameter is applied	P2-15 = 1100	P2-15 = 2100

Note:

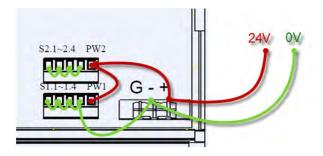
- 1. The above setting is for reference only. Please setup parameters according to the servo drive you applied.
- 2. P2-11 (for setting the original signal) is set to 1124. It means this sensor is a normal open signal and 1024 represents normally close.

1.2.3 I/O Module

Applied Model

Model	Communication Interface
HM-RIO3232T12	RS-422

- Power Supply and Wiring
- (1) Power supply for I/O Module



For protecting the circuit, please short-circuit the Pin 0 V and Pin 24 V of each set.

1

(2) Input Point Wiring

DC Signal IN	Wiring Circuit	Note
	24VDC +24V[24G]	(1) Two sets of PW shall connect to external +24V power.
SINK Mode		 (2) X0 ~ X15's input common point of HM-RIO3232T12 has already connected to PW1; X16 ~ X31's input common point has already connected to PW2. (3) Use SINK mode to connect external output / contact to X intput point.

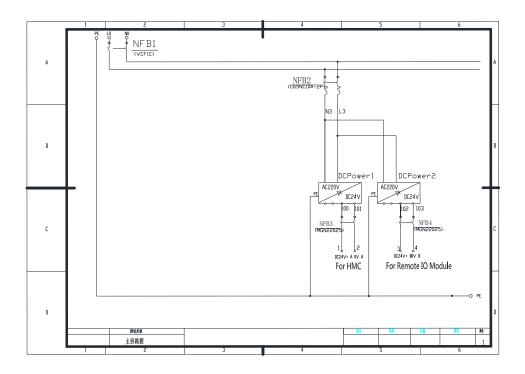
(3) Output Point Wiring

DC Signal IN	Wiring Circuit	Note
NPN Mode	24VDC +24V124G Load VO Y31 CTL CTL Transistor	 Two sets of PW shall connect to external +24 V power. Y0 ~ Y15's output common point of HM-RIO3232T12 has already connected to S1; Y16 ~ Y31's output common point has already connected to S2. S1 includes S1.1 ~ S1.4; while S2.1 ~ S2.4 are included in S2. If current of the output point is less than 8 A, connect to S1.1 and S2.1 ~ 24 G will do. No need to connect S1.2 ~ S1.4 and S2.2 ~ S2.4. If current of the output point is more than 8 A, please connect S1.1 ~ S1.4 and S2.1 ~ S2.4 to 24 G in parallel so as to distribute load current.

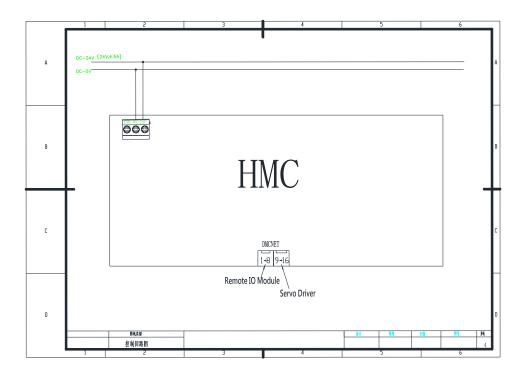
1.3 Wiring Description

[Wiring diagram] in this section is for reference only. The connected peripheral devices might be different in actual situation.

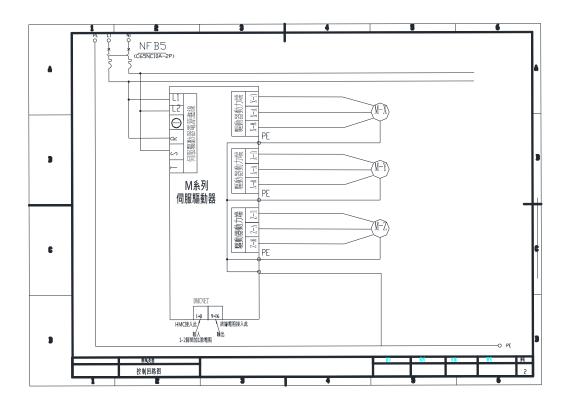
Main Power



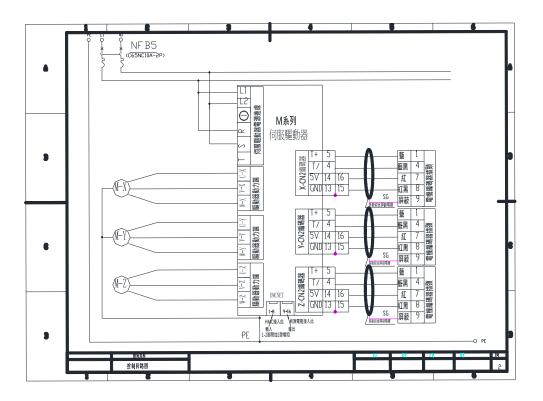
Controller Power



Power of Servo Drive



Encoder



- NF B5 (C65NC10A-2P) . L1 COM+11
 M系列
 DI2-10

 局服驅動器
 DI3-34

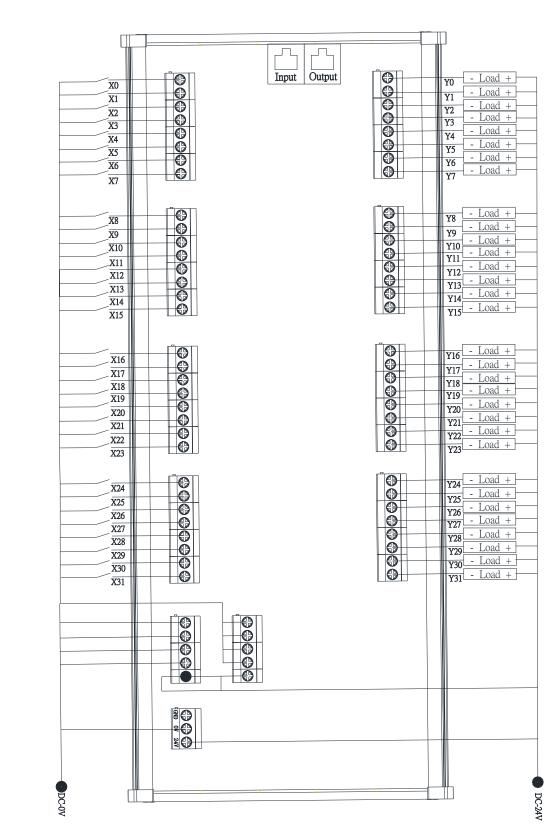
 OLU-10
 DI4-8

 COM-41
 DI4-8

 COM-49
 原點 X轅光電 正極限 負極限 屏蔽 SG 多股股合開發電纜 1 -
 X-N
 X-N

 和力端
 10-10
 COM+11 COM+11 -超版 DI2- 10 -大 DI3- 34 -DI3- 8 -COM-49 -原點 Y軸光電 正極限 負極限 SG 多股校合屏藏電纜 屏蔽 繼電器輸入+ 繼電器輸入- 繼電器 VDD 17 DO3+ 3 COM+11 DI2- 10 DI3- 34 DI3- 34 DI4- 8 COM 49 C DC-24V 負極限 COM- 49 DO3-2 SG 屏蔽 8 -O PE 困境类型 控制回路图
- CN1 Homing Sensor / Limit Sensor / Brake

I/O Board



2

System Configuration

The load-unload system usually requires different mechanism for different demands. This control system provides users a great flexibility so as to satisfy each demand of different applications by merely modifying the parameters settings.

System Configuration	2-	2
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Users can firstly configure the system according to the applied mechanism. It enables users to easily change the settings. After the system is applied to the power, go to [System] > [System Setting] > [Mechanism]. See the followings for detailed information.

System Setting		27 N	EW	Admin	2015/08/18 09:34:35
Mechanism	HMC System	Operation Info	Debug Tool	1	
System Setup	Dual system ²⁾	Without limit switch	3) Incremental Motor		
Use Remote IO	module ⁴⁾ 🛃 No	Yes			
The servo axis n applied by main		2-axis (#1, #2)	-		
The servo axis n applied by subsy		1-axis (#6)	-		
X1 unit ⁷⁾ mr	n - Y1 unit	mm -			
X2 unit mr	n -				Save
X1 axis: 0.000	Y1 axis: 0.000				
Operate M	anual	ch I/O	System	Alarm	Main

- (1) **Single system/Dual system:** Users can determine if single system or dual system will be applied. Settings and functions related to subsystem can be used only when it is set to dual system.
- (2) With/Without limit switch: Determine if your control system shall work with limit switch. HMC hand-hold model equips with the function of limit switch. When it is in jog operation of manual mode, this function will be enabled for protection. HMC standard model (HMC08) does not equip with this function, thus, users have to select "Without limit switch" for normal operation.
- (3) **Incremental/Absolute Motor:** Select to apply incremental motor or absolute motor. When applying absolute motor, then there is no need to do homing after the power is off. This is because its coordinate will remain even when the power is off.
- (4) **Use remote IO module:** Determine if the Remote I/O module shall be applied. The system will monitor the communication between HMC and the remote I/O module. An alarm will occur when the communication is broken. Please select [No] when you are not going to use remote I/O module.
- (5) The servo axis number applied by main system: It can set up the servo axis number that will be applied by the main system, range from 1 to 5. The corresponding station number shall be set in order. See the sequence below: X1-axis (station no. 1), Y1-axis (station no. 2), Z1-axis (station no. 3), A-axis (station no. 4) and B-axis (station no. 5).

- (6) The servo axis number applied by subsystem: It can set up the servo axis number that will be applied by subsystem, range from 1 to 3. The corresponding station number shall be set in order. See the sequence below: X2-axis (station no. 6), Y2-axis (station no. 7) and Z2-axis (station no. 8).
- (7) **Unit for each axis:** The axis can be set as linear or rotated motion. Unit for linear motion is [mm]; while the unit for rotated motion is [°].

2

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Operation



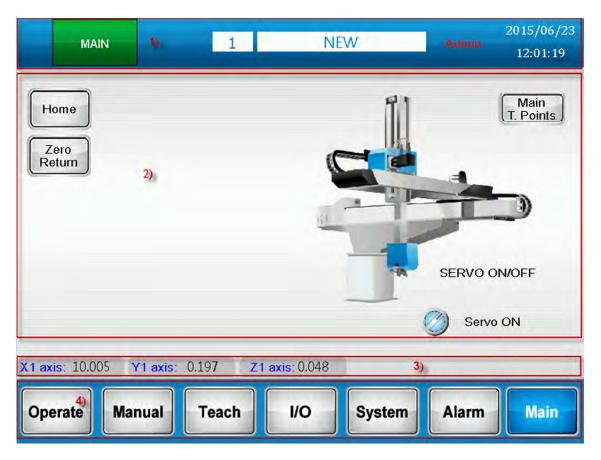
This chapter provides the information about screen configuration, operating functions and operations of each mode.

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3.1 Screen configuration

3.1.1 Main Screen

When the system is started up, the main screen will pop up which is showed as below:



- (1) **Status bar:** It shows the title of the current screen, program number, program name, current user, date and time.
- (2) **Operation in main screen:** Users can servo on/servo off the drive, do homing and status display.
- (3) **Servo position:** Display the servo's current position of each axis. Users can press this button to switch between the main system and subsystem.
- (4) **Function key:** Click the button to enter the corresponding page.

3.1.2. Status Bar



- (1) Screen title: It displays the screen title that you currently use.
- (2) **Current program name:** It displays current program number and program name. 1000 programs are provided to store different commands and for users to apply. Click this button to enter the screen of [Program manager].
- (3) **User level:** It displays four different user levels, operator, operator leader, engineer and administrator. Click this button to log off. Click on it again to use different user name to log on.
- (4) **Date & Time:** It displays the current date and time.

3.1.3. Function Keys

Operate

Operation Screen

It includes the function of auto operation, single cycle and step run.



Manual Screen

Window of jog in manual mode will pop up. Users also can control the cylinder in this window.



Teach Screen

Edit the program that you currently choose.



Terminal Screen

Monitor and control the signal of cylinder, arm-in-position signal, handshake signal with load-unload system and the signal from servo drive.



System Screen

Users can set up motion, moving distance, protection and servo related functions in this screen.



Alarm

It shows the information of current alarms and alarm history so that users can identify the alarm causes.

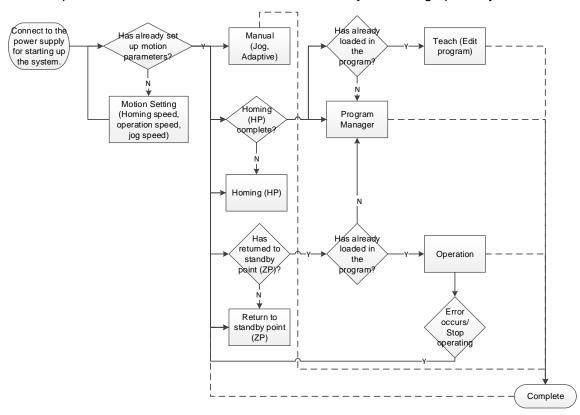


Main Screen

Return to the main screen.

3.2. Start-up Procedure

See the procedure below for each main function after you starting up the system:



After starting up the system, please complete [Homing] first to obtain the correct position of each axis. When executing [Homing], each servo drive will be servo on simultaneously. If any alarm occurs at the moment, please clear the alarm first.

See the following for descriptions of main and subfunctions:

Item	Subfunctions
	Program manager
	Log on/Log off
Main screen	Work with load-unload system
	Homing
	Return to standby point
Aleree	Current alarm: Alarm Confirm (F10)
Alarm	Alarm history
	Motion setting: homing offset, homing mode, motion speed and torque protection.
	Safety setting: setting of max. moving distance of each axis, homing/return to standby point setting.
System	Operation setting: motion setting and motion confirm setting
Cystom	System setting: applied mechanism, system auxiliary setting and information for operation
	Servo setting: gear ratio, acceleration/deceleration smoothing setting,
	max. speed limit, motor operating direction.

4

	Version information
	Cylinder input and output signal
	Arm's input and output signal
Terminal	Output signal of load-unload system
	Input signal of load-unload system
	Signal from servo drive
Taaab	Teaching of program command
Teach	Motion setting
	Jog with unlimited range
	Jog with limited range
Manual	Jog with the set target
	Compliance control
	Handwheel
	Return to standby point
Oneration	Operation
Operation	Trial operation (step run)
	Production setting

3.3. Description of User Permission

3.3.1. User Level

It has four user levels. Before logging on, users can only view the alarm information and the information on main screen. Following describes the authorization for each user level:

- Operator: Operators can only use basic functions, such as homing and auto operation.
- **Operator leader:** Apart from the basic functions, operator leaders can apply the function in manual mode and select the load-in programs.
- Engineer: Except for the functions that are for administrators only, engineers have the authority to access all functions.
- Administrator [Manufacturer]: Administrators have the authority to access all functions, including setting up the mechanism and password. This authorization is usually given to system manufacturers.

See the following table for the authorization of each function:

Functions	Operator (level 1 ~ 3)	Operator Leader (level 4, 5)	Engineer (level 6)	Administrator [Manufacturer] (level 7)
Servo on	\checkmark	\checkmark	\checkmark	\checkmark
Return to standby point/ homing point	\checkmark	\checkmark	\checkmark	\checkmark
Program operation	×	\checkmark	\checkmark	\checkmark
Program load-in selection	×	\checkmark	\checkmark	\checkmark
Manual operation	×	\checkmark	\checkmark	\checkmark
Program manager	×	×	\checkmark	\checkmark
Teach program	×	×	\checkmark	\checkmark
Edit the template program	×	×	×	\checkmark
Semi-auto operation	×	×	\checkmark	\checkmark
Production setting	×	×	\checkmark	\checkmark
Motion setting	Motion setting ×		×	\checkmark
Homing/standby point sequence setting	×	×	\checkmark	
Servo setting	×	×	×	\checkmark
Safety setting	×	×	×	
Operation setting	×	×	×	
System setting	×	×	×	

 $\sqrt{1}$ means user can use the function / \times means users cannot use the function

3.3.2. Logon / Logoff

Click "User Level" on status bar. A window for logon / logoff will pop up. When successfully logging on, click on this button again to log off.

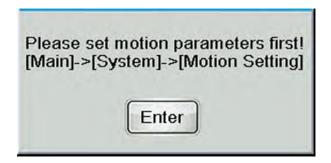


- (1) **Logon:** Enter the password to log on.
- (2) **Logoff:** After logging off, it will be in [Not logged on] status.
- (3) **Automatically log off:** Users can set the function of [Time for automatically log off]. If there is no operation within the set up time, the system will be automatically logged off. When the value is set to 0, then it means the system is always logged on.
- (4) **No authority to access:** When you have no authority to access the function, a pop-up window will appear or a red lock icon will show as the reminder.



3.4. System Setting before Motion being Executed

Before the motion being executed, please make sure settings of the servo drive and mechanism are correct. Wrong setting might result in danger. In addition, the system needs to complete the specified speed setting first. Otherwise, the following window will pop up when executing the motion command.



Following is the window of motion parameters setting. You can start the operation after the speed setting is complete.

	Homing Offset	Homing	Homing High-speed	Homing Low-speed	AutoRun speed	Jog speed	Torque protection
	(mm)	Mode		(mn	n/s)		(%)
X1 Axis	0.000	35	200.000	50.000	800.000	200.000	10.0
Y1 Axis	0.000	35	80.000	50.000	500.000	200.000	0.0
Z1 Axis	0.000	35	80.000	50.000	500.000	250.000	0.0
A Axis	-100.000	1	50.000	50.000	500.000	200.000	0.0
B Axis	-100.000	1	50.000	50.000	500.000	200.000	0.0
							*

3.5. Homing / Return to Standby Point

Please complete homing after the system is started up. This is for ensuring the accuracy of servo's position. Also, before starting auto-operation or trial run, the arm shall return to the starting point, which is the standby point for safety concerns. This is why the system needs to complete [Return to standby point] beforehand.

When carrying out homing or returning to standby point, for a safer operation, users can use the [Enabling switch] to immediately stop the operation when any safety worries arise. (See the figure below.)

To use [Enabling switch], please go to [System] > [Safety setting] > [Homing/Return to standby point] and enable the function of [Enabling switch protection]. When the [Enabling switch] is enabled, homing/ returning to standby point can be carried out. When [Enabling switch] is disabled, it will immediately stop the action and a pop-up window will appear. When the function of [Enabling switch protection] is disabled, the operation will not be controlled by [Enabling switch].

_	Contradiction and Contradiction of the
Please	press the enabling switch
	while Homing!
	OK

[Enabling Switch] is a 3-position operation switch. See the definitions below:

- **Not pressed:** Disabled status; Inhibit to operate in manual mode.
- **Pressed:** Enabled status; Allow users to operate in manual mode.
- **Firmly pressed:** Disabled status; Inhibit to operate in manual mode.



3.5.1. Homing

Click [Homing] (Homing of main system) on main screen. A window of motion sequence and posture will pop-up. Click on [Homing] again, the system will start homing.

	*[Homing] sequence :		
		Hor.	
	X1 axis The 2nd		
MAIN	Y1 axis The 1st		
	Z1 axis The 3rd		
Home Zero Return	Homing Can	cel	

When executing the command, the button will be flashing and a text of [Homing...] in red color will appear on top-left corner. After the motion is complete, the button will become blue and shows command completed.



This sequence and posture can be set in [System] > [Safety setting] > [Homing / Zero (Standby point)].

	Homing sequence Ho	r. Return Zero sequence
X1 axis	The 2nd 🝷 🗸	The 2nd 👻
Y1 axis	The 1st 👻 🗸	The 1st 👻
Z1 axis	The 3rd 🝷 🗸	The 3rd -

3.5.2. Return to Standby Point

Click on [Zero Return] (Return to standby point of main system) on main screen.



Or, users can click on [Zero Return] (Return to standby point) on operation screen.



When executing the command, the button will be flashing and a text of [Homing...] in red color will appear on top-left corner. After the motion is complete, the button will become blue and shows command completed.



This sequence and posture can be set in [System] > [Safety setting] > [Homing / Zero (Standby point)].

	Homing sequence Hor	Return Zero sequence
X1 axis	The 2nd 🚽 🗸	The 2nd 🔻
Y1 axis	The 1st 🚽 🗸	The 1st
Z1 axis	The 3rd 🚽 🗸	The 3rd 🔽

3.5.3. Homing of Subsystem

Click on [Sub Sys Home] (Homing of subsystem) on main screen, the command of homing will appear. Click on [Homing], it will start to carry out homing command for subsystem.

The content of homing for subsystem command is recorded by the program. Thus, each program has its own homing procedure and homing position. This setting can be done in [Teach].

	* Sub Sys. [Homing] Program:	
	No (Sub Sys.) Homing instruct	ions 😞
	1 Homing[X2_Y2] ,speed50%	
Sub Sys		
Home		
Sub Sys		
Zero	Homing Cancel	2
Return		

When executing the command, the button will be flashing. After the motion is complete, the button will become blue and shows command completed.



3.5.4. Return to Standby Point of Subsystem

Click on [Sub Sys Zero Return] (Return to standby point of Subsystem) on main screen. Commands about subsystem returns to standby point will show on the screen. Click on [Zero Return] (Return to standby point) again, it will start to execute the command.

The content of subsystem returns to standby point command is recorded by the program. Thus, each program has its own standby procedure and standby position. This setting can be done in [Teach].

	No (Sub Sys.) Zero return instructions 😞
	1 Single-Axis Move[X2]100.000mm ,speed
	2 Single-Axis Move[Y2]100.000mm ,speed
	3 Interp. Move[X2_Y2]0.0000.000mm ,spe
b Sys	
b Sys ero Im eturn	Zero Return Cancel

Or, users can click on [Zero Return] (Return to standby point) on operation screen.



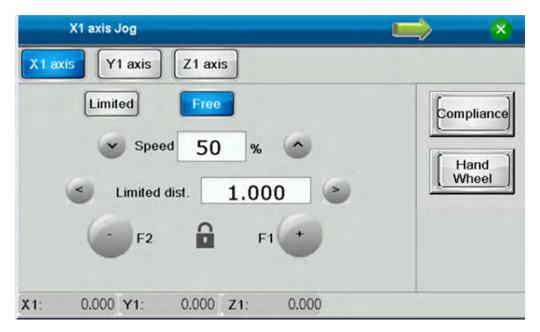
When executing the command, the button will be flashing. After the motion is complete, the button will become blue and shows command completed.



3.6. Operate in Manual Mode

The manual mode cannot be enabled when the system is in auto operation. Other than that, manual mode can be applied in all screens. When it switches to manual mode, the window of operating function in manual mode will pop up, including jog, compliance and

handwheel. In dual system, click on this button (**Less**) on top right corner of the screen can switch between the main system and subsystem when it is in jog operation.



For avoiding danger resulting from wrong operation, jog function shall be used with [Enabling switch] and can work only when [Enabling switch] is enabled. If you select the controller that has no built-in [Enabling switch], please select [No enabling switch] in System setting for jog function.



[Enabling Switch] is a 3-position operation switch. See the definitions below:

- **Not pressed:** Disabled status; Inhibit to operate in manual mode.
- **Pressed:** Enabled status; Allow users to operate in manual mode.
- Firmly pressed: Disabled status; Inhibit to operate in manual mode.

3.6.1. Troubleshoot in Jog Mode

Users can use jog function to clear alarms. Please note that the position protection for each axis will be invalid when applying jog function.

X1 axis Jog	>
X1 axis Y1 axis Z1 axis 1)	
Limited Free 2) 3) Speed 10 % Limited dist. 1.000 5) F2 4) F1 +	8) Compliance 7) Hand Wheel
X1: 0.000 Y1: 0.000 Z1: 0.000	

- (1) Axis selection: Users can select the axis which is going to execute commands.
- (2) **Mode:** This function can work with the function of jog with unlimited range, compliance control and handwhweel.
- (3) **Speed:** This is for setting the speed (%) in jog mode. It can only operate at 10% of the speed or below in this situation.
- (4) **Jog function enabled:** It should work with enabling switch. (Disable) / Enable
- (5) **Jog in reverse direction:** Jog in reverse direction. Release the button to stop the operation
- (6) **Jog in forward direction:** Jog in forward direction. Release the button to stop the operation +.
- (7) **Handwheel:** Click on this button and it will switch to external handwheel operation. Users can enter the handwheel scale here.



(8) Compliance: Click on this function and the screen which shown as below will pop up. Please select the axis first. Then, set the torque output (Bigger setting value needs larger external force to move the servo axis). After the setting is complete,

((Main system) Compliance motion						×	
	🖌 X1 a		5. Uni	0 %		Current status:	Disable	
	🔲 Z1 a	axis	0	<u>)</u>			0	
X1:	0.003	Y1:	0.001	Z1:	0.000			

click on 🦉 to enable compliance control function.

3.6.2. Jog with Unlimited Range

Jog function can be used within the set distance.

X1 axis Jog	
X1 axis Y1 axis Z1 axis 1)	
Limited Free 2) 3) Speed 10 % \frown Limited dist. 1.000 \ge 5) F2 4) \bigcirc 6) F1 +	Compliance Hand Wheel
X1: 0.000 Y1: 0.000 Z1: 0.000	

- (1) Axis selection: Users can select the axis which is going to execute commands
- (2) Mode: Unlimited mode
- (3) **Speed:** This is for setting the speed (%) in jog mode, range from 1 to 100%.
- (4) **Jog function enabled:** It should work with enabling switch. (Disable 1/2) / Enable
- (5) **Jog in reverse direction:** Jog in reverse direction. Release the button to stop the operation

(6) **Jog in forward direction:** Jog in forward direction. Release the button to stop the operation +.

3.6.3. Jog with Limited Range

Jog function can be used within the set distance. Users can specify the max. moving distance for one operation with jog function. It can be applied for teaching the position.

	X1 axis Jog		N
X1 a	Y1 axis	Z1 axis 1)	
	2) Limited 3)	Free	Compliance
	Speed	10 % 🔿	Hand
	Limited of	list. 1.000	> Wheel
	5) - F2	4) 2 6) +	
X1:	0.000 Y1:	0.000 Z1: 0.000	

- (1) Axis selection: Users can select the axis which is going to execute commands
- (2) Mode: Limited mode
- (3) **Speed:** This is for setting the speed (%) in jog mode, range from 1 to 100%.
- (4) Set the moving distance: Set the max. moving distance in jog mode. Use and to change the setting. The moving distance can be set as 100, 10, 1 and 0.1 (mm).
- (5) **Jog function enabled:** It should work with enabling switch. (Disable 1 / Enable
- (6) Jog in reverse direction: Jog in reverse direction. Release the button to stop the operation
- Jog in forward direction: Jog in forward direction. Release the button to stop the operation

3.6.4. Jog with the Set Target

When applying this function, each axis can be moved to the target position that users set before. This function can be applied in [Teach] only. And only when the modified command is [Move to], [Move to ... by single axis], [interpolation] or [position], can the user use this function to move the arm to the absolute position. This function limits the system to jog with the set direction and distance. For example, if the current position is 100, when the target position is 200, the system only can move in forward direction. Also, when its position is at 200, it cannot move further. Users can apply this function to quickly move the arm to the target position and do fine tuning afterwards.

X1 axis Jog	
X1 axis Y1 axis Z1 axis 1)	
Limited Free Target 2) 3) $5)$ 50 50 50 $ F2$ $F2$ $F1$ $+$	Compliance Hand Wheel
X1: 0.000 Y1: 0.000 Z1: 0.000	

- (1) **Axis selection:** Users can select the axis which is going to execute commands.
- (2) Mode: Target mode
- (3) **Speed:** This is for setting the speed (%) in jog mode, range from 1 to 100%.
- (4) **Jog function enabled:** It should work with enabling switch. (Disable 1/2) / Enable
- (5) **Jog in reverse direction:** Jog in reverse direction. Release the button to stop the operation
- (6) Jog in forward direction: Jog in forward direction. Release the button to stop the operation

3.6.5. Compliance Control

With the function of compliance control, users can complete position teach by hand movement. When this function is enabled, the servo motor will limit the arm's action by the limited torque output. The arm will move by the external force. It will be easier to move the arm when the torque setting is smaller. Please note that when the axis that moves vertically applies this function, the arm might slip if the torque is set to small. Only one axis can apply the function of compliance control at a time. Leave the page of compliance control teach to disable this function. Click on [Compliance] in the screen of manual mode to enter compliance screen.



(Main syst	em) Co	mpliance n	otion			- ×
1)	X1 a	ixis	²⁾ 5.0) % 111 %		Current status: Disable 3)	
X1:	0.003	Y1:	0.001	Z1:	0.000		

Go to compliance screen.

- (1) Axis selection: Users can select the axis that is going to do compliance control.
- (2) **Torque output:** Output setting to limit the torque. Range for the axis that moves vertically is from 50 to 100% and 1 to 100% for other axes.
- (3) **Switch:** Click on the button to enable or disable compliance control function.

(Enable	/ Disable	V)
---------	-----------	----

3.6.6. Handwheel

Users can directly control the moving direction of the servo axis via handwheel. When this function is enabled, the system will control the servo axis by pulse signal which generated by the handwheel. For dealing with different speed, users can adjust the moving speed via the setting of handwheel scale.

Only one servo axis can apply the handwheel function at a time. Leave the page of handwheel to disable this function. Click on [Handwheel] to control the system by handwheel in Jog mode.

X1 axis Jog		8
X1 axis Y1 axis Z	1 axis 1)	
Limited Speed	Free 10 %	compliance)
Limited dist.	1.000	2) Hand Wheel
- F2	F1	3) H.W Mag.
X1: 0.002 Y1: 0.	001 Z1: 0.000	

- (1) Axis selection: Users can select the axis that is going to do compliance control.
- (2) **Handwheel switch:** Use this button to enable or disable the function of handwheel. When this function is enabled, users can switch to different servo for controlling.
- (3) **Handwheel scale:** Users have to enable the handwheel function first to display the setting. The range is from 1 to 10000. Bigger setting value brings faster speed.

3.7 Trial Run Operation

When loading in a new program or editing the command, trial run operation can be used to ensure the accuracy of the action. Through this function, users also can adjust the target position.

Go to [ATUO] screen and return to start point which is the standby point of the arm before proceeding trial run. Then, click on [Step run].



See the screen of [Trail run operation] below. Users can select [single cycle] or [Step run]. Click on [Stop] to stop the trail run operation.

AUTO Running 4 T4	2015/07/08 Admin 15:21:56
2) No T. Points (Main Sys.) Instructions 0 1 Goto T.P. ,speed50% , P1	Speed ¹⁾ 40 % Running Information
2 Goto T.P. ,speed50% , P2 3 Goto T.P. ,speed50% , P3	Planned cycles4Remainder0Cycle time0.00Sec
6) 7) 8) 9) Zero Single BackStep NextStep Stop	
X1 axis: 0.001 Y1 axis: 0.000 Z1 axis: 0.000 Operate Manual Teach I/O	em Alarm Main

(1) **Speed:** Users can adjust the percentage to change the speed of trial run.

(2) **Teaching Point:** When the function of compliance control is disabled, click on this button to view the coordinate of each axis. In trial run mode, users can select a specific teaching point to change its coordinate and click [Write to point] to update the coordinate.

Pos. 1 1 100.000 0.000 0.000 Pos. 2 2 0.000 100.000 0.000 Pos. 3 3 0.000 0.000 10.000 Pos. 4 4 0.000 0.000 0.000 Pos. 5 5 0.000 0.000 0.000 Pos. 6 6 0.000 0.000 0.000	
Pos. 3 3 0.000 0.000 10.000 Pos. 4 4 0.000 0.000 0.000 Pos. 5 5 0.000 0.000 0.000	
Pos. 4 4 0.000 0.000 0.000 Pos. 5 5 0.000 0.000 0.000	
Pos. 4 4 0.000 0.000 0.000 Pos. 5 5 0.000 0.000 0.000	
Pos. 6 6 0.000 0.000 0.000	
	_
Pos. 7 7 0.000 0.000 0.000	
Pos. 8 8 0.000 0.000 0.000	

- (3) **Program command:** It displays the command of current program. Target command will be highlighted here. When this function is disabled, you can directly click on the command that you wish to see or modify. The command editing window will pop up.
- (4) **Command tracking:** When this function is enabled, the target command is the current command. When it is disabled, users can select the target command and set up the parameters of the command.
- (5) **Command display:** When tracking function is disabled, clicking on this button can check the content of previous, next command, and command content on previous or next page.
- (6) Single cycle: Click on this button to start trial run in single cycle. If the enabling switch is enabled, it will start to execute the command in sequence. If not, the trial run will stop after all commands are complete. Then, a pop-up window will appear. Please note that it is necessary to return to standby point before you start to do trial run. If the controller has no built-in enabling switch, the trial run operation ends after a cycle is complete.



- (7) **Previous step:** The system will set the previous command as the target command. Thus, when clicking on this button, the system will go to the end position from previous command.
- (8) **Next step:** Clicking on this button, the cursor will move to the next command after completing the current command. The next command will be set as the target command. When the command is complete, a pop-up message will appear.



- (9) **Stop:** Click on this button to cancel the trial run of single cycle.
- (10) **Handwheel:** When enabling this function, the current motion will be controlled by handwheel.
- (11) **Scale:** When enabling the function handwheel, users can change its scale to control the motion speed. The setting range is between 1 and 50000.

Note:

If it is in dual system, please click on the screen title you wish to use to go to the command list. Then, start to do trial run. If conducting trial run when both system are adapted, it will firstly be carried out by the main system.

No	Ma	in System	lin 0	No	\$	Sub System	Im !
1	Goto T.P. ,s	speed50%,	N	1		,speed50%	,94
2	Goto T.P. ,s	speed50%,	P2	2	Goto T.P.	,speed50%	, P2
3	Goto T.P. ,s	speed50%,	P3	3	Goto T.P.	,speed50%	, P3

3.8 Auto Operation

With this function, the current selected program will be in auto operation. Go to [Operation] screen. Before starting auto operation, the arm has to be returned to the start position, which is the standby point. Then, click [Run].

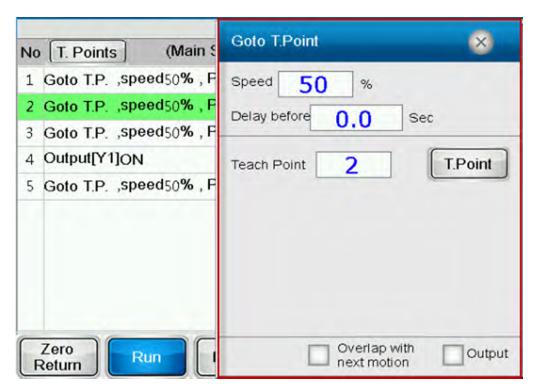


See the screen of [Auto operation] below:

	AUTO	Running Setting	4	T4		Admin	2015/07/08 17:44:51
1	3) T. Points	(Main Sys.)	Instructions		3 5)	Speed ¹⁾ 40	%
1 G	Soto T.P. ,speed	50%, P1		2)		Running Informa	tion
2 G	oto T.P. ,speed	50%, P2			~	Planned 9)	3
3 G	oto T.P. ,speed	150 % , P3				cycles	
4 0	utput[Y1]ON				~	Remainder 10)	0
5 G	oto T.P. ,speed	150% , P1 ,del	lay1.0 Sec			Cycle time 115.	80 Sec
					4) ~		
Re	ero turn Run xis: 100.000	6) Pause Y1 axis: 0.00		8) CycleSt xis: 0.000	op I	13) Magni. <u>1</u>	12) Hand Wheel
Op	oerate Ma	nual T	each	1/0	Syste	m Alarm	Main

(1) **Speed:** Users can adjust the percentage to change the speed of trial run.

(2) **Program command:** It displays the command of current program. Target command will be highlighted. When this function is disabled, you can directly click on the command that you wish to see or modify. And the command editing window will pop up.



(3) **Teaching Points:** When the function of compliance control is disabled, click on this button to view the coordinate of each axis. In trial run mode, users can select a specific teaching point to change its coordinate and click [Write to point] to update the coordinate.

Comment	Р	#X1 axis	#Y1 axis	#Z1 axis	
Pos. 1	1	100.000	0.000	0.000	
Pos. 2	2	0.000	100.000	0.000	
Pos. 3	3	0.000	0.000	10.000	
Pos. 4	4	0.000	0.000	0.000	
Pos. 5	5	0.000	0.000	0.000	
Pos. 6	6	0.000	0.000	0.000	-
Pos. 7	7	0.000	0.000	0.000	
Pos. 8	8	0.000	0.000	0.000	

- (4) **Command tracking:** When this function is enabled, the target command is the current command. When it is disabled, users can select the target command and set up the parameters of the command.
- (5) **Command display:** When tracking function is disabled, clicking on this button can check the content of previous, next command, and command content on previous or next page.
- (6) **Pause:** Click on [Pause], the system will temporarily stop. Button of [Operating] will flash. Double click the [Pause] button to resume the operation.
- (7) **Stop:** Click on [Stop], the system will stop operating after completing the current command. If the current command has not been completed, click on [Stop] again to resume the operation.
- (8) **Cycle stop:** Click on [Cycle stop], the system will stop operating when the current cycle ends. Then, a window will pop up. Click on [Cycle stop] again to resume the operation.

This	cycle has been comp	leted,
	Auto Run finished!	
	OK	

To immediately stop the operation, please click on [Pause] when the cycle stops. A pop-up window will appear then. Users also can directly click [EMS] button.

Cyc	le is stopped Run is canceled!
Auto F	Run is canceled!
	OK

- (9) Number of the complete cycle: The complete cycle number in one auto operation.
- (10) **Residual number**: Users can set up the total number of the product in [Production setting]. The residual number is the result that deducts [Number of the complete cycle] from [Total number of production]. If there is no need to set up the number of production, then set this value to 0.
- (11) **Duration for a cycle:** It shows the time it takes for the last cycle.
- (12) **Handwheel:** When enabling this function, the current motion will be controlled by handwheel.
- (13) **Scale:** When enabling the function handwheel, users can change its scale to control the motion speed. The setting range is between 1 and 50000.

(14) **Production setting:** This window shows production setting and the related information.

Running Setting	×
# 0 for useless	current cycle time
Planed cycles	19) ¹⁸⁾ 10.38 Sec
15) 0	19:19:11 6.80 △
Planed reminder cycles to warn	19:19:18
16) 0	19:19:32 6.80
	19:19:38 <mark>6.80</mark>
Planed defective cycles to warn	19:19:45 <mark>6.80</mark> 19:19:52 <mark>6.80</mark>
17) 0	19:19:59 6.80
	19:20:05 6.80
	19:20:12 6.80
Save	∇

(15) **Total number of the product:** When the number of completed product reaches this setting value, a window will pop-up as the reminder and stop auto operation. Set it to 0 means to disable this function.



(16) **Reminder for the number of product:** When the number of completed product reaches this setting value, a window will pop-up. Set it to 0 means to disable this function.



- (17) **Number of defective goods:** When the number of defective goods exceeds the setting value, an alarm will occur as a reminder. Set it to 0 means to disable this function.
- (18) **Duration for the current cycle:** It shows the duration time for the current cycle.
- (19) **Record for the cycle time:** Records for the time of the last ten cycle.

Note:

In the window of dual system, click the title bar to go to the command list of each system. It also shows the number of operation cycle.

No	Main System 🦮	0	No	Sub System
1	Goto T.P. ,speed50% ,		1	Goto T.P. ,speed50% , -1
2	Goto T.P. ,speed50% , P2	2	2	Goto T.P. ,speed50% , P2
3	Goto T.P. ,speed50% , Pa	3	3	Goto T.P. ,speed50% , P3

Click on the button to enter the screen that shows below. Click on the title again to return to the screen of dual system.

No	T. Points (Main Sys.) Instructions	**	10
1	Goto T.P. ,speed50% , P1	5	^
2	Goto T.P., speed50%, P2		~
3	Goto T.P. ,speed50% , P3		
4	Output[Y1]ON		~
5	Goto T.P. ,speed50% , P1 ,delay1.0 Sec		

3.9 Signal Monitoring

Click on [I/O] on main screen to go to terminal monitoring screen, you can monitor input/output signals of load-unload system, signals of servo drive and control the external signal.

				19:44:36
Input Signal	Output Signal	Reserve 1	Reserve 2	Driver Signal
• x0	0 X8	O X16	• X24	
• X1	O X9	• X17	• X25	
• X2	O X10	O X18	• X26	
• X3	O X11	O X19	• X27	
O X4	O X12	O X20	O X28	
O X5	O X13	O X21	• X29	
X 6	O X14	O X22	• X30	
• x7	X 15	• X23	• X31	
1 axis: 100.014	Y1 axis: 0.000	Z1 axis:-0.001	1	
Operate		h //O		Alarm Main

Click on the button of [On/Off] to enable or disable the function of the corresponding terminal.



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3

Program Usage and Editing 4

This chapter describes the method to manage and edit the program and the related functions.

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The load-unload system needs different motions to handle different types of production line. The combination of different motions is called [Program]. This system provides 500 programs for users. Each program contains 400 motion commands and 300 teaching points for the main system and subsystem.

Another 10 program templates are provided for administrators to pre-edit the commonly used motions and stores these motions in different program templates. When loading the program template, users can quickly download each created motion that they had defined beforehand.

In addition, to import and export the program via USB disk or SD card is also supported so that the program can be shared among different load-unload systems.

4.1 Program Manager

Click on the program name on status bar to enter the screen of [Program manage].



See the following figure for the screen of [Program manage]:

		OGRAM NAGE		1) 1	1	DEN	10			2015/07/09 11:51:33
	No.		Progra	n name			Modified	time		
-)	1		DE	MO			201	5/7/9	11:48:9	
	2		Т	2			2015	/6/24	17:9:25	
	3									*
	4		Т	4			201	5/7/8	17:44:4	
	5									
	6									
Î	7									
	8									
	9									
	10									
ax	Sele Prog	ram	1 1 axis: (.000	4) Z1 axis:-0	prog	elected gram	5) Sh	ow All	6) Edit Template

- (1) **Currently used program:** It displays the program number and program name that currently used.
- (2) **Program list:** It displays all program names and the modified time. Directly click on it to select the program.
- (3) **Select the program:** Users can select the program number that wish to operate.

(4) Edit the selected program: Edit the selected program. Click on this button, the following screen will show up. Users can edit or load the program.

Program Opera	ation	×
Select program :	2	
Program name :	7) TEST	
8) 9) Export Impo	10) 11) ort Delete Copy	12)
	Delete Copy	Luau

- (5) **Display all/Only display the selected ones:** Users can switch the displayed list. [Display all] means to display the list of 500 programs; [Only display the selected ones] means it only displays the program which has file name.
- (6) **Edit the template:** Select the program template for editing. This function only can be used by administrators. The following screen will show up after clicking on the icon:

Edit template	×
Template 1	Template 2
Template 3	Template 4
Template 5	Template 6
Template 7	Template 8
Template 9	Template 10

Select the template to enter [Teach] screen. 10 templates are provided, 1001 ~ 1010.

Temp late Unload	TEACH	Motion Setting	1008	TEMPL	.ET_8	Admin	2015/07/09 11:54:34
No	(Mair	n Sys.) Instr	ructions		Instructi	on List	Instruction List

- (7) **Program name:** Edit the program name that you selected.
- (8) **Export:** Export the selected program to external device.
- (9) **Import:** Import the selected program from external device.

(10) **Delete:** Delete the content from the selected program. A window will pop up.

2
Confirm

(11) **Copy:** Copy the selected program to other programs. A window of the selected program will pop up after clicking on it.

сору	
Copy to program	3
Cancel	Confirm

(12) Load: Load the selected program and enter teach editing screen.

4.2 Loading and Editing a Program

After loading a program, it will enter [Teach] screen for command editing. Users also can directly click on [Teach] to edit the current program when you have already downloaded the program.

4.3 Description of Edit Function in Teach Mode

Apart from commands editing, parameters from the program can also be edited in teach mode. See the figure below for [Teach] screen:

Temp Tate TEACH Unload	14Setting 1	DE	МО		2015/07/09 11:58:02
No (Ma 1 Goto T.P. ,speed	in Sys.) Instructions	2)	Goto T.Point		Instruction 11) List
2 Goto T.P. ,speed 3 Output[Y1]ON		×	Speed 80 Delay before Teach Point	% 0.0 2	12) Sec
(3) (5) C (4) (6) Pa (3) (7) (7) Pa (3) (7) (7) (7) (7) (4) (7) (7) (7) (7) (7) (4) (7)	aste 8) Add 10	Save		Overlap with next motion	¹ Output
Operate Ma	anual Teach	I/O	System	Alarm	Main

- (1) **Content of the command:** It is the command content of the current program. Click on it, a window of parameters will pop up so that users can modify the setting.
- (2) **Operate the command displaying area:** Users can scroll the displayed page of command content and change the target command. The related parameters will not be displayed here.
- (3) **Cut/delete:** Cut the target command.
- (4) Clear: Long press the button for three seconds to clear all commands.
- (5) **Copy:** Copy the target command.
- (6) **Paste:** Long press the button for three seconds to paste the [Cut] or [Copy] command on the target command.
- (7) Insert: Insert the current editing command to the target command.

- (8) **New:** Add the current editing command to the position placed after the target command.
- (9) **Change:** Change the current editing command to the target command.
- (10) **Store:** Store the current editing program. If the program is not stored after being edited or modified, a prompt message will pop up and ask for confirmation.
- (11) **Command list**: Call the command list and to select the command that you wish to join.
- (12) Edit the command: It displays the related parameters of current command.
- (13) **Template**: Select the template to download to the current program.

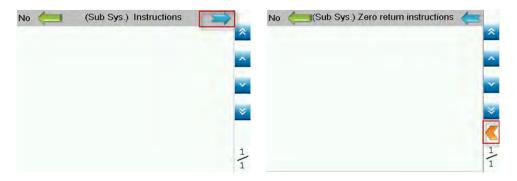
Select the loaded template					
Template 1	Template 2				
Template 3	Template 4				
Template 5	Template 6				
Template 7	Template 8				
Template 9	Template 10				
Original program	will be placed !				

- (14) **Motion setting:** It includes the setting of current program, such as postures of homing and standby mode. When you click on it, its setting window will pop up.
- (15) **System switching:** It can switch the editing window among main system, subsystem, homing of subsystem and return to standby point of subsystem.
- (16) See the switching steps as below:

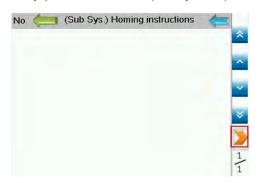
Go to the screen of (subsystem) command for editing.

No (Main Sys.) Instructions		No	(Sub Sys	.) Homing	instruction	s 🧲	2
1 Goto T.P. ,speed50% , P1	*					-	*
2 Goto T.P. ,speed80% , P2							-
3 Output[Y1]ON	^						^
4 Goto T.P. ,speed50% , P1 ,delay1.0 Sec	~						~
	*						*
	4						>
	$\frac{1}{1}$						1/1

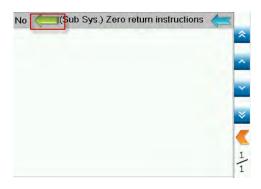
Go to the screen of homing command (subsystem) for editing.



Go to the screen of standby point command (subsystem) for editing.



Go to the screen of (main system) command for editing.



4.4 Description of Program Setting

Each program can save its own settings, such as standby position, posture or standby mode, including parameters setting. Click on [Motion setting], a window for program setting will pop up.

Motion Setting)	5
1) Zero return		
X1 axis	Hori.	
	0.000	
Y1 axis	0.000	
Z1 axis	0.000	

(1) **Position and posture when returning to zero position:** It can set up the position and posture of each axis when standby.

4.5 Description of Program Command

Click on [Instruction list] (Command list) on [Teach] screen, a window of command list will pop up for selection. Select the command that you are going to use. And the selected commands will be displayed in command area. See further information below:

Temp late TEACH	Motion Setting 1	DE	МО	Admin	2015/07/09 12:07:29
	Sys.) Instructions		Goto T.Point		Instruction List
1 Goto T.P. ,speed	50%, P1	^		_	
2 Goto T.P. ,speeda	30%, P2		Speed 80	%	9
3 Output[Y1]ON	A REPORT OF A REPORT	^	Delay before	0.0	Sec
A Coto TD speeds	Di delant o Con			0.0	000

4

4.5.1 Motion

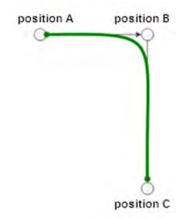
Goto	T.Point	Go	oto Zero	
Single Goto	e-Axis T.Point	Plane	e Stackir	ng
Interp	. Move		ain Arm tacking	
	e-Axis			

Move to target position [Goto T.Point]: All axes linearly move to the target position.

Goto T.Point	Instruction List
Speed a) 80 %	
Delay before b) 0.0	Sec
Teach Point C 2	e) T.Point
d) Overlap next mo	

- (a) The is the setting for motion speed
- (b) It is for setting up the time interval before carrying out the motion command.
- (c) Select the target position, from P1 to P300.

(d) Check [Overlap with next motion], it means the current command will smoothly connect to the next command. Please bear in mind that the motion type and axis of the current and next command shall be the same but the target position shall be different. See the following figure as the example. If the current position is A and current command is [Move to the position, ..., P[B]], the next command shall be [Move to the position, ..., P[C]]. And the sequence to complete the command will be (A > B > C).



(e) Go to the screen which can change the teaching point.

Comment	Ρ	#X1 axis	#Y1 axis	#Z1 axis	
Pos. 1	1	າ 0,000	0.000	0.000	
Pos. 2	2	50.000	0.000	0.000	
Pos. 3	3	100.000	0.000	0.000	
Pos. 4	4	0.000	0.000	0.000	
Pos. 5	5	0.000	0.000	0.000	
Pos. 6	6	0.000	0.000	0.000	
Pos. 7	7	0.000	0.000	0.000	
Pos. 8	8	0.000	0.000	0.000	

- (f) This part displays the coordinate of each axis. Users can directly change the position by clicking on the item.
- (g) Users can enter the position number to access or set up its coordinates.
- (h) Write the currently editing coordinate into the target position.
- (i) Read the selected position's coordinates.
- (j) It displays the data that is being edited. Users can change the value here or click on [Update] to change the value.
- (k) The [Update] key can update the current coordinates of each axis to the editing area.

Single axis moves to the target position [Single-Axis Goto T.Point]: Specify one single axis to linearly move to the target position.

Single-Axis Goto T.Point	Instruction List
Speed 50 9	6
Delay before 0.	0 Sec
Teach Point	T.Point
Z1 Axis	Y1 Axis

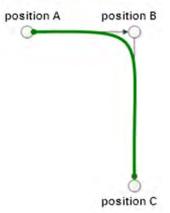
Please refer to [Move to teaching point] command for motion parameters.

Interpolation [Interp. Move]: Linear motion of multi-axis (interpolation). Users can select single axis or multi-axis to do linear interpolation.

Interp. Move	,	Instru Lis	
Speed a) 5 Delay before		Sec	•
c) X1 Axis	d)	0.000	1
Y1 Axis	1	00.000	
Z1 Axis		0.000	
g) Without suspend		ap with 🕕	Output

- (a) This is the setting for motion speed.
- (b) It is for setting up the time interval before carrying out the motion command.
- (c) Select the motion command for axis.
- (d) Execute the command according to the setting value. When executing relative motion command, it moves to the relative position. When executing absolute command, it moves to the absolute position.
- (e) Update the position for multiple axes. Regard the current position of each axis as the teaching point.
- (f) Update the position for single axis. Regard the current position of corresponded axis as the teaching point.
- (g) Check [Without suspend], it means after current motion command is complete, it will execute the next command right away. Thus, multiple axes can work individually and simultaneously.
- (h) Check [Overlap with next motion], it means the current command will smoothly connect to the next command. Please bear in mind that the motion type and axis of

the current and next command shall be the same but the target position shall be different. See the following figure as the example. If the current position is A and current command is [interpolation[XYZ]..B], the next command shall be [interpolation [XYZ]..C]. And the sequence to complete the command will be (A > B > C).



Single-Axis Move: Single axis moves along the straight line. Only one axis can be used at a time.

Single-Axis Move	Instruction List
Speed 50 %	
Delay before 0.0	Sec
X1 Axis	0.000 5
Y1 Axis	0.000
Z1 Axis	0.000
	ap with Output

Please refer to command of [Interpolation] for motion parameters.

Go to standby position [Goto Zero]: It is the moving command to ask the system to move to the standby position.

Goto Ze	ro	Ins	struction List
Speed	50	%	
			Hor.
×1 axis		0.000	
Y1 axis		0.000	
Z1 axis		0.000	
Read on	lγ		

This screen is for displaying the information only. If you wish to change its setting value, please go to [Teach] > [Motion setting].

Plane stacking: This function is for stacking stuff in a flat surface and can be controlled by the main system and subsystem. Users only need to set up the plane and the first position for stacking. The system will automatically calculate the next position according to the stacking moving distance and stacking number.

Instruction List
Sec
etting
n times

- (a) This is the setting for motion speed.
- (b) It is for setting the time interval before carrying out the motion command.
- (c) Click on this function to enter window of [Stack setting].
- (d) **Execute period (Interval for executing commands)**. It indicates the interval among each command. If the interval number is 2, it means the command will be executed once every three cycles.

Plane stacking setting	× × × × × × × × × × × × × × × × × × ×
Stack plane & sequence 1st sequence 1 axis 1 1 axis	d * # 10 11 12 2 7 8 9 4 5 6
1st Axis position 100.000	1 2 3 7 d2
2nd Axis position 100.000	
Matrix setting	
d1 h) 20.000 Number	3
d2 20.000 Number	5

- (e) Select the axis for the first stacking. The system will start from the first axis that you've just selected. Then, it will proceed to the second axis after reaching the stacking number of the first axis. See the above figure.
- (f) Select the axis for the second stacking. The system will start from the second axis that you've just selected. Then, it will proceed to the second axis after reaching the stacking number of the first axis. See the above figure.
- (g) This is for setting the position of the first plane stacking.
- (h) This is for setting the moving distance of each axis.
- (i) This is for setting the stacking number of each axis.
- Array positioning of the main arm [Main Arm Stack]: It is also called stacking. Users only need to set up the start point for stacking. The system will automatically calculate the position of each point in accordance with the offset value, number and sequence. This command contains a series motion of stacking; It determines whether the machine shall move in transverse direction and then place the object right above the target position and if it shall pass the entry point then move downwards to the placing point.

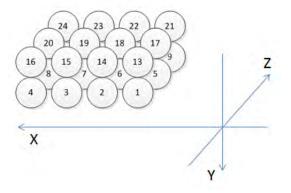
Main Arm Stack	Instruction List
a) Speed 50 % Delay after b) (c) Stack S	0.0 Sec
Contact distance of low-speed use	^{d)} 0.000
Low-speed 9 10	%
Cylinder hor. while stacking	Cylinder Vertical

- (a) It is the speed of motion.
- (b) It is for setting the time interval before you execute the next motion command.

- (c) **Array positioning [Stack Setting]**: Click on this button to enter the setting window of array positioning.
- (d) Starts to move at low speed with the set distance when it is above the target point.
- (e) Set up low-speed motion
- (f) It can change the setting of main arm's posture before it starts to carry out the command of array positioning.

Stack setting	×
Stack sequence Stack 9) sequence ×1-axis => Y1-axis => Z1-ax	kis
Entry point h) Through the entry point ×1 Axis position 1 100.000	dx dz
Y1 Axis position 100.000 Z1 Axis position 0.000	
First position	Matrix setting
X1 Axis position 100.000 X1 Axis position 50.000	
Z1 Axis position 0.000	

(g) The sequence setting of array positioning: If the sequence is X1-axis > Z1-axis > Y1-axis and the stacking number of X1-axis, Z1-axis and Y1-axis shall be 4, 3, and 2 respectively, the arrangement is showed as below:



- (h) Check [Through the entry point]. The arm will move to the entry point first. Then, it moves toward the stacking position.
- (i) It is the coordinate of the entry point
- (j) Check [Parallel entry] (Horizontally move). Before the arm goes to stacking position, it moves horizontally right above the placing point first. Then, move downward to the stacking point.
- (k) It is the coordinates of the first stacking point
- (I) It is the offset setting of the distance between two stacking positions.
- (m) It is the setting of stacking number.

4.5.2 Action

Motion	Action	Flow Control	Othe
	Dutput	Monitor	
	Wait	Suspend Interlock	
	Delay	Interlock sub system	n

Signal output [Output]: It is the signal to control the clamp/vacuum valve and output command from peripheral device.

Output	Ins	struction List
Action time a)).0 Sec	
c) ON d) OFF e) Pulse (valid c	b) Y V	1
Execute period	f) ()	Times
* For ON / OFF ad means "delay be * For PULSE action means "holding	efore action". on, "action time"	

- (a) It is the setting time for signal output.
- (b) Users can select the target device for signal output, Y0 ~ Y63 or UM0 ~ UM63.
- (c) Set the target device as On
- (d) Set the target device as Off.
- (e) Control the signal by pulse. Set the device as On and the device will be Off after the setting time is complete. When it issues the pulse command, the command can be executed before the previous command is complete (Off > On > Off). That is to say, when the signal is On, the system will automatically proceed to the next command. This will not influence the cycle time, thus, it can be used to control the conveyor.
- (f) **Interval for executing commands [Execute period]**. It indicates the interval among each command. If the value is set to 2, it means the command will be executed once every three cycles.

Wait for signal input [Wait]: Wait for the input command from clamp/vacuum valve or peripheral device.

Wait	Instruction List
ON OFF	a) X • 1
Execute period	c) O Times
Detect time	1.0 Sec
Valid time	0.5 Sec
∗If detect time = system will wai	0, t until the condition satisfaction

- (a) Users can select the output device which will send the signal, X0 ~ X63 or UM0 ~ UM63, as the waiting target.
- (b) This is for setting the status (On or Off) of the device that you have just selected.
- (c) **Interval for executing commands [Execute period]**: It indicates the interval among each command. If the value is set to 2, it means the command will be executed once every three cycles.
- (d) **Detection time [Detect time]**: When the system does not receive the signal within the setting time, an alarm will occur. When the detection time is not set to 0, a window of time delay will pop up and an alarm will occur.

Detecting time	out while Wait!
Stop	Continue

Press [Continue] to resume the operation; press [Stop] to stop the operation.



Monitor: Users shall select the device that is going to be monitored. If the monitoring condition is not satisfied during operation, it will stop the operation or pause until the monitoring condition is fulfilled. This can be regarded as the protection mechanism.

Monitor	Instruction List
	a) M <u>· 1</u>
Mode Start	
Execute period d	0 times

- (a) Users can select X0 ~ X63 or UM0 ~ UM63 as the monitoring target.
- (b) This is for setting the status (On or Off) of the device that you've just selected.
- (c) Users can select to Start to monitor or cancel the monitoring function.
- (d) **Interval for executing commands [Execute period]**: It indicates the interval among each command. If the interval number is 2, it means the command will be executed once every three cycles.

Wait for the permission from the system: It is the interlock signals transmitted between the main and subsystem. The main system shall obtain the permission from the subsystem to continue executing the command. Please bear in mind that when this function is enabled, the system will keep waiting until the condition of [Main system is allowed] is fulfilled.



Enable subsystem [Interlock sub system]: It is the interlock signal between the main and subsystem.



4.5.3 Flow Control

Instruction List	8
Motion Action	Flow Control Other
Start	END
Cycle Start	Cycle END
IF	FOR
ELSEIF	BREAK
ELSE	NEXT
ENDIF	

- Program starts [Start]: Apart from the first cycle, each cycle starts from this command when it is in auto operation. <u>Commands before [Program starts] will be regarded as the initial commands for auto operation.</u>
- **Program ends [END]:** When executing this command, the cycle is over.
- Interval program starts [Cycle Start]\ Interval program ends [Cycle END]: Commands between [Cycle Start] and [Cycle END] will not be executed every cycle. They will be carried out according to the interval setting. For example, if the interval is set to 1, commands within the range will be executed every two cycles.

Cycle Start	Instruction List
Cycle : Execute period	Start

IF\ELSEIF\ELSE\ENDIF: As long as the condition of IF is established, can the procedure of IF...ELSEIF of IF...ENDIF be executed. The applying method is similar to program language. <u>Please note that nested loop is not supported. It only supports one layer of IF.</u>

IF	Instruction List		
Condition variable	U1		×
	=<	User variable (U) 1 ✓ User flag (UM) 0 X1-axis current position Y1-axis current position Y1-axis current position X1-axis current position	 Planed running cycles Accumulative defective cycles
Judgment is variable		Z1-axis current position	Current accumulative cycles
Judgment is constant	0	Automatic signal	Defective signal

■ FOR\BREAK\NEXT: The executing time of commands in FOR....NEXT can be set in accordance with the set constant or variables. <u>Please note that nested loop is</u> <u>not supported.</u>

FOR	Instruction List		
Variable			
Constant	5		
			×
		User variable (U) 1	
		Accumulative defective cycles	
		Current accumulative cycles	
		Accumulative cycles	

4.5.4 Others

Instructio	n List		8
Motion	Action	Flow Control	Other
A	ddition	Division	
Sut	otraction	Remainde	er
Mult	iplication	Assign	
	Jump	Label	

Addition\Subtraction\Multiplication\Division\Remainder\Assign: It is the operation command for system variables. 32 system variables for commands are in total, U1 ~ U32, which can be used by procedure commands.

Addition +	Instruction List
Augend is variable	<u>u 1</u>
Augend is constant	
Addend is variable	
Addend is constant	1
Result	<u>u 2</u>

Label: It works with [GOTO].



■ **GOTO [Jump]**: It looks for the specified label and directly goes to the command. If the specified label cannot be found, the cycle is over.

Jump	Instruction List
Jump to label	0

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System Setting

This chapter illustrates the operation about system setting and the related information for safety setting.

5.1	Mot	ion Setting5-3
5.2	Ser	vo Setting 5-4
5.3	Мо	ving Distance5-5
5.4	Set	ting for System Operation5-6
5.	4.1	Motion Setup
5.	4.2	Motion Confirmation
5.5	Sys	tem Parameters Setting5-8
5.	5.1	Information about Operation
5.	5.2	HMC Controller Setting5-9
5.	5.3	Debugging Tool for the System 5-10



Click [System] on main screen to enter the system setting page.

When entering the system page, users of different levels can access different contents.

Screen	Limit of Authority	Description
Motion setting	Administrator	LEVEL 7
Safety setting	Engineer	LEVEL 6
Operation setting	Engineer	LEVEL 6
System setting	Administrator	LEVEL 7
Servo setting	Administrator	LEVEL 7
Version	Engineer	LEVEL 6

5.1 Motion Setting

Settings of servo axis (speed, torque and others):

	Homing Offset	Homing	Homing High-speed	Homing Low-speed	5) AutoRun speed	6) Jog speed	Torque
	(mm)	Mode		(mn			(%)
(1 axis	0.000	35	50.000	50.000	300.000	150.000	1.0
1 axis	0.000	35	50.000	50.000	200.000	100.000	10.0
Z1 axis	0.000	35	50.000	50.000	100.000	50.000	20.0

- (1) **Homing offset value:** When not regarding the sensor as the zero point, this function allows users to set any position as zero point.
- (2) **Homing mode:** Various homing modes are provided. Please refer to HMC Controller User Manual for further information.
- (3) **Homing at high speed:** It is the speed before the servo axis is detected by the homing sensor during homing.
- (4) **Homing at lower speed:** It is the speed after the servo axis is detected by the homing sensor, which is the speed to look for Z phase during homing.
- (5) **Operation speed:** The max. speed during auto-operation.
- (6) Jog speed: The max. jog speed when it is manually controlled.

5.2 Servo Setting

This system needs to work with Delta's ASDA-A2-F and ASDA-M-F series servo drive. This screen is for setting up motion parameters of servo axis and servo performance.

-		D	2) S-curve	3) Acc.	4) Dec.	5) Homing	6) Max. sp		7)
0	Gear ratio (Mol.)	Gear ratio (Den.)	S-Cuive	time	time ns)	acc./dec.	mm/s	RPM	Dire.
X1 axis	1280000	28880	0	10	10	200	962.666	2000	C.C.W
Y1 axis	1280000	17940	0	10	10	200	597.999	2000	C.C.W
Z1 axis	1280000	9000	0	10	10	200	299,999	2000	C.C.W

(1) **E-gear ratio:** Electronic gear ratio plays a vital role when converting the unit of controlling system with the unit of real machine.

N represents numerator and M represents denominator; 1:a is the gear ratio from motor side to final output terminal.

N = 1280000

M = gear number*tooth spacing/a Note: the unit of pitch is millimeter (mm). Example: a gear reducer with 1:5 of gear ratio, the gear number of belt pulley is 20 and the pitch is 5 mm. Then, N = 1280000, M = 20000 (20000 is acquired when the unit converts from mm to um) N/M = 1280000/20000 = 64/1

- (2) **S-curve:** It is for setting the acceleration curve when motion starts and deceleration curve when motion stops. Bigger value brings smoother motion. However, it brings longer response time.
- (3) Acceleration time: The required time when the motor runs from 0 rpm to 3000 rpm. Increase the value can smoother the operation. But the excessive value might bring a longer response time.
- (4) **Deceleration time:** The required time when the motor runs from 3000 rpm to 0 rpm. Increase the value can smoother the operation. But the excessive value might bring a longer response time.
- (5) **Acceleration/deceleration time of homing**: Acceleration and deceleration time when homing.
- (6) **Max. speed limit:** RPM = (rotation/minute); mm/s = (millimeter/second). When setting the E-gear ratio, rpm and mm/s is in linear relation. RPM is equal to mm/s.

(7) Forward direction: It can be defined as motor rotating in clockwise or counterclockwise direction. When it is in forward direction, it means the coordinate value is increasing while backward direction means the value is decreasing. This setting can be done via this button. Please repower on the servo after the setting is complete for activating this function.

5.3 Moving Distance

It is the motion setting range for each axis. When it is in jog operation or position teaching, the setting value will be limited within the setting range for safety concerns.

Safety Setting	2	2 USE-T	FEMPLET	Admin	2015/08/17 17:29:38
Safety Area	Moving Distance	Homing/Zero	Moving Distance for Sub_Sys	6	
		Start position	End position		
Moving dis of X1 Axis	stance mm	-100.000	250.000		
Moving dis of Y1 Axis	tance mm	-100.000	100.000		
Moving dis of Z1 Axis	stance mm	-100.000	100.000		
					Save
X1 axis: 0.000	Y1 axis: 0.000	Z1 axis: 0.000			
Operate	Manual Teac	h //O	System	Alarm	Main

5.4 Setting for System Operation

5.4.1 Motion Setup

	perating Setting		22	USE-TEMPLET		2015/08/17 17:43:12
Motion S	etup1	Action Confirm	1	_		
in auto o	Construction of the second	1)	10.000	mm		
Distance target po	e that prior osition	to the 2)	0.000	mm		
3) X1 Axis	10.000	s applied during	l linear motio	on		
Y1 Axis	10.000					
Z1 Axis	10.000					Save
X1 axis: (0.000	Y1 axis: -0.001	Z1 axis	s: 0.000		
Operate	Ma	nual Tea	ich	I/O System	Alarm	Main

- (1) Adjust the distance in auto operation: When the system is in auto operation, click on [Not tracking] to select the command for slightly adjusting the moving distance. Users can setup the maximum distance that can be adjusted via this function.
- (2) **Distance that prior to the target position:** The axis has not reached the target position yet (still moving). When the residual distance is smaller than this setting value, the system will prepare to execute the next command. For example, When X1-axis almost completes its task, Y1-axis will start to execute the command in advance.
- (3) **Overlap function is applied during linear motion:** its setting value is the radius of the round angle for smoothing the path.

5.4.2 Motion Confirmation

Operating Setting		22	USE-TE	MPLET	Admin	2015/08/17 17:43:46
Motion Setup1	Action Confirm					
Monitor abnorma	I action 🛃 Stop	Pa	use			
						Save
(1 axis: 0.000	Yt axis: -0.003	1 Z1a	xis:0.000			
Operate M	anual Te	ach	1/0	System	Alarm	Main

(1) **Abnormality when monitoring:** When applying the monitoring command, if the condition is not fulfilled, the system can be set as Pause and resume the operation when the condition is satisfied or Stop and cancel auto operation.

5.5 System Parameters Setting

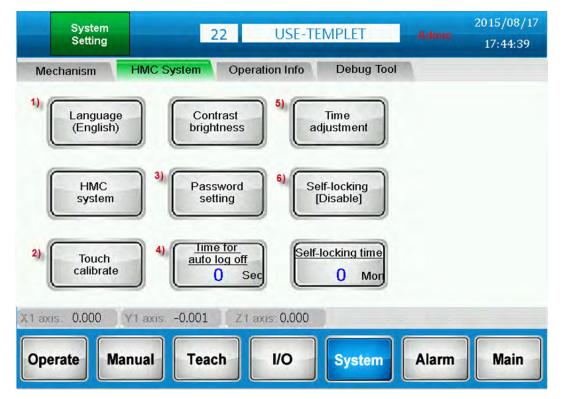
5.5.1 Information about Operation

It records the system's total operation time. Administrator can long press this button to clear the accumulative value.

System Setting		1 D	EMO	Admin	2015/07/28 12:12:01
Mechanism	HMC System	Operation Info	Debug Tool	1	
Total accumula	lion cycles	149	Clear		
X1 axis: -0.001	Y1 axis -0.002	Z1 axis:-0.001	1		
Operate M	anual Tea	ch I/O	System	Alarm	Main

5.5.2 HMC Controller Setting

HMC controller setting includes [Touch to calibrate], [Password setting] and [Time for auto log off].



- (1) **Language:** Users can change system language via this function. Traditional Chinese, Simplified Chinese and English are available now.
- (2) Touch to calibrate: Press this button to calibrate the system.
- (3) **Password setting:** Users can change the password.
- (4) **Time for auto log off:** If there is no operation within the setting time, the system will log out automatically. [Log on] will show on the screen.
- (5) **System time:** Users can modify the system time via this function.
- (6) **Lock for protection:** When this function is enabled, if the using time exceeds the setting time of [Auto lock time], users will be unable to use the system.

5.5.3 Debugging Tool for the System

5

	stem ting		1	DEN	МО	Admin	2015/07/28 12:16:10
Mechanis	m HN	AC System	Operat	ion Info	Debug Tool		
1)	#1	#2	#3				
Servo ON							
QS OFF							
CMD Start							
CMD OK							
CMD Cmp.							
CMD Err							
Err Code	0	0	0				
(2) Ladder X1 axis: -0.0		axis -0.002	71 av	is:-0.001	3)	[Lo	g Save
Operate	Manua		ach	I/O	System	Alarm	Main

- (1) **Display the servo status:** Users can view the flag about servo status and motion command.
- (2) Ladder: With this function, users can open the ladder and monitor it online.
- (3) **LOG (Log Save):** When any abnormality occurs, press this button can save the command history to non-validate area so that technicians can use this record to do troubleshooting. Once this function is enabled, please remember to re-power on the controller to resume the operation.

Troubleshooting

Users can find the related information about alarm screens, causes and corrective actions in this chapter.

6.1 Screen of Alarm
6.2 Servo Alarms and Troubleshooting
6.3 System Alarm and Troubleshooting

6.1 Screen of Alarm

Apart from the scrolling text shown in the bottom of the screen, the screen also display the information about current alarms and alarm history. Click on [Alarm Confirm] or F10 to clear the alarm.

ALARM	1	. DE	МО	Admin	2015/07/28 12:21:45
Current Alarm	Alarm History				
X 003 10:53:18 O 008 12:21:38	07/28 DMCNet or 07/28 DMCNet or 07/28 EMS butto 07/28 EMS butto	ommunication em n start			Alarm Reset
\triangleleft					(F10)
X1 axis: -0.001	Y1 axis: -0.002	Z1 axis:-0.001			
Operate M	anual Teacl	h I/O	System	Alarm	Main

6.2 Servo Alarms and Troubleshooting

When alarm occurs, the system will display the alarm content and related information. Please refer to the following for alarms:

Alarm Code	Corrective Actions	Note
ALE002 Overvoltage	Connect to external regenerative resistor	
ALE003 Under voltage	Check if the wiring of RST is correct	
AL006 Overload	 Value of the servo gain is incorrect Overload 	
ALE009 Excessive position error	 The setting of the gain value is too small. UVW connector is not properly connected. Motor's loading is too heavy. 	
ALE011 Encoder error	Check if CN2 connector is correct.	
ALE013 Emergency stop	Check if the emergency stop button is enabled.	
ALE014/015 Sensor limit warning	Check if the limit switch is enabled.	
ALE283 / 285 Software limit warning	Software limit warning. Please check if the motor's current position is within the setting range.	

6.3 System Alarm and Troubleshooting

Alarms	Corrective Actions	Note
I/O communication error	 Check if the I/O communication cable is securely connected or broken. If it is broken, please replace a new one. Make sure the cable is connected to the INPUT terminal on I/O board. If users do not apply the remote I/O module, please disable this function in the setting of mechanism. 	
Servo communication [DMCNET] error	 Make sure DMCNET cable is securely connected or broken. If it is broken, please replace a new one. Make sure the servo drive is connected to terminal resistor. 	
EMS button is activated	EMS button is activated.	

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6

Others

7

Users can learn how to use external device (e.g. USB) to update the system and share the program from this chapter.

7.1	Procedures of using USB disk to [Export]/[Import]7-2
7.2	Update the System Screen via USB Disk

7.1 Procedures of using USB disk to [Export]/[Import]

Step 1: Go to the screen of [Program Manager]. Then, select the program that you wish to store in USB disk.

No.	Program name	Modified time	
1	TEST	2015/8/3 16:21:24	^
2			_
3			*
4			
5			
6			
7			
8			
9			
10			
Select Program	1	Edit selected program Show All	Edit Templa
dis: 0.000	Y1 axis: -0.001	I axis:-0.001	

Step 2: Click [Edit the selected program] and the screen will show as below:

No.	Program name	Modified tim	ie	
1	TEST	2015/8/	3 16:21:24	-
2	Program Operation			
3				~
4	Select program : 1			
5	Program name :	TECT		
6	Program name .	TEST		
7				
8	Export Import De	lete Copy L	oad	
9				
9				
10				
	1	Edit selected program	Show All	Edit Templ

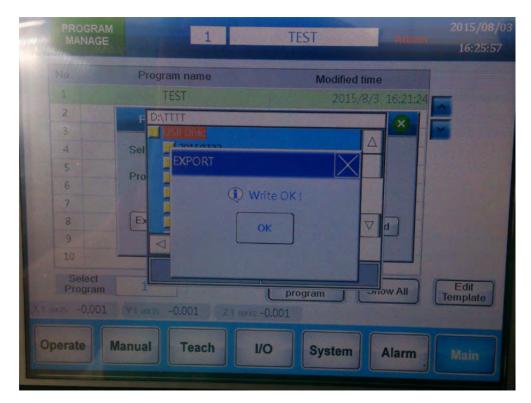
Step 3: Click [Export]. Then, click USB disk. If the file is from external device, please select [import].

	PROGRAM MANAGE	1	TEST	Admin	2015/08/03 16:24:57
12.20		Program name	Modified time		
12-14	1	TEST	2015/8/3	16:21:24	-
	2	F D:\			-
	3	USB Disk	Δ		
100	4	Sel SD:			
100	5	Pro			
100	6				
20	7	_			
Contract of	8	Ex	V	d	
100	9				
	10	OK	CANCEL		
	Select		CANCEL	TOW AII	Edit
	Program		program		Template
		Y 1 axis, -0.001 Z1 axis	-0.001		
0	perate Ma	anual Teach	I/O System	Alarm	Main

Step 4: Name the file that you wish to store in USB Disk in the blank of D:\. If the file is from external device, please select the file name from USB disk.

		OGR/				1			TE	ST			Adn	110	2015/08/03 16:25:14
	No. 1 2			Prog	ram r TEST	ame				Mo	dified 2015,		16:21:	24	
	3 4 5	ASCII D:∖	KEY												
	6	1	2	3	4	5	6	7	8	9	0	-	=	ALT	
	8	Q	W	E	R	Т	Y	U	I	0	Р	1	1	CLR	1
	10 S	A	S	D	F	G	Н	L	ĸ	L	:	•		DEL	
XII	Pr	Z	x	С	V	В	N	м	•	•	1	1		ENT	Edit mplate
F	perat	e (Man	ual	Te	each		1/0		Sys	tem		larm		Main

Step 5: Click [OK] after you name the file. Then, the following window will pop up to inform you that the file is successfully saved.



7.2 Update the System Screen via USB Disk

The HMC controller editing software also supports USB disk. Users can update system screen with a USB disk without computer.

Step 1: Edit screen file

Click [document] > [Edit the screen so as to automatically update the system]

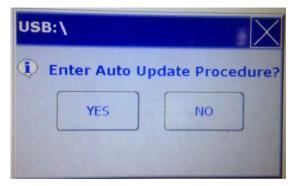
,	D:\00_HMC\專機_泛用\HMC_Load-Unload\台達HMC_上下料泛用.dps - D	DPSoft			
File	Edit View Element Screen Tools Options Window Help				
6	<u>N</u> ew <u>O</u> pen <u>C</u> lose <u>S</u> ave Ctrl+S Save <u>A</u> s				
	Make Ext. Memory Data	yy/mm/dd			
	Make Auto Update Data	234 BCDEFGHUKLMNOPQRS 未登入 HH:MM:S			
	Open Ext. Memory Data Ctrl+I Password Protect				
1	Print Ctrl+P Print Preyjew Exit				

Step 2: Store the screen to USB disk without changing the file name. Its default file name is [HMI_AutoUp] and can only be stored in root directory. The format of USB disk must be FAT32.



Step 3: Insert the USB Disk to HMC and restart the HMC.

Step 4: See below for the start-up screen of HMC:



Click [YES] and the system will start upgrading. Then, restart the system and unplug the USB Disk after the procedure is completed.

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This chapter introduces the way to create a new program and to use program template to start the production.

Examples

8.1	Applying New Program8-2
8.2	Applying Program Template

8.1 Applying New Program

Here introduces the procedure of starting up the system, creating new program and auto-operating the system.

Step 1: When the system is started up, please execute homing first to identify a correct coordinate system.

Step 2: Log on and enter the screen of [Program Manager].



Step 3: Select program No.21 and open to edit it.

Step 4: Enter [NEW] as [Program Name] and load in this program for teaching and editing.

No.	Program name	Modified time		
21	NEW	2015/8/3	16:32:33	-
22	Program Operation			
23				~
24	Select program : 21		-	
25	Program name :	NIENA		
26	Program name .	NEW		
27				
28	Export Import De	elete Copy	bad	
29		4 0		
30				
Select	21	Edit selected		Edit
Program	21 3		show All	Templa
	CONTRACTOR OF THE OWNER	and the second se		

Step 5: When creating a new program, the essential commands list will be automatically generated on the screen. Click the command list to select the command that you wish to edit. Then, complete the program editing by following the procedures.

Temp late TEACH Unload	Action Setting 21	NEW	Adn	2015/08/03 10 16:36:07
	Sys.) Instructions		o T.Point	Instruction
1 Goto Zero ,speed	50 %	*		5
2 Goto T.P. ,speeds	50%, P1	Spe	ed 50 %	
3 Goto T.P. ,speeds	50 % , P2	Dela	y before 0.0	Sec
4 Output[Y1]ON			0.0	
5 Goto T.P. ,speeds	50 % , P1	Teac	ch Point 2	T.Point
Cut / Delete Co		1 Change	Overla	p with
Clear All Pas	ste Add	Save	next m	
X1 axis: 0.000 Y	1 axis: -0.001 Z1	axis: 0.000		
Operate Mar	nual Teach	I/O Sy	/stem Ala	rm Main

Step 6: After editing the motion commands, please store its teaching content.

Temp late TEACH Action Jnload 21	NEW	Admin 2015/08/03 16:36:07
No (Main Sys.) Instructions	Goto T.Point	Instruction List
	*	
2 Goto T.P. ,speed50% , P1	Speed 50	%
3 Goto T.P. ,speed50% , P2	Delay before	0.0 Sec
4 Output[Y1]ON		0.0
5 Goto T.P. ,speed50% , P1	Teach Point	2 T.Point
Cut / Delete Copy Insert Change		
Clear All Paste Add Save		Overlap with Output
X1 axis: 0.000 Y1 axis: -0.001 Z1 axis: 0.00	Ó	
Operate Manual Teach I/O	System	Alarm Main

Step 7: Then, switch the screen to Operation for auto-operating the system.

Step 8: For safety operation, please return to the standby point of the main system before carrying out auto-operation.

Step 9: Click [Run] to start auto-operating.

	AUTO	Running Setting 21	1	NEW	Admin	2015/08/03 16:37:00
No	T. Points	(Main Sys.) Instru	ctions	0	Speed 20) %
1	Goto Zero ,speed	1 50 %			Running Inform	nation
2	Goto T.P. ,speed	50 % , P1		~	Planned cycles	0
3	Goto T.P. ,speed	50%, P2				
4	Output[Y1]ON			~	Remainder	10
5	Goto T.P. ,speed	50%, P1			Cycle time).00 Sec
	8 9			tack		
	Zero Return a	StepRun Y1 axis: 0.000	Z1 axis : 0.0		Magni. <u>1</u>	Hand Wheel
•	Operate Ma	nual Teach	1/0	Syste	em Alarm	Main

Step 10: Auto-operating.

8.2 Applying Program Template

This section introduces the process from starting up the system, and how to save the editing time by applying program template to auto-operate the system.

Step 1: When the system is started up, please execute homing first to create a correct coordinate system.



Step 2: Log on and enter the screen of [Program Manager].

Step 3: Select program No.22 and open to edit it.

Step 4: Enter [USE-TEMPLET] as [Program Name] and load in this program for teaching and editing.

C	
C	

	PROGRAM MANAGE	21	NEW	Admin	2015/08/03 16:38:17
	No.	Program name	Modified time		
	21	NEW	2015/8/3	16:36:33	-
	22	Program Operation			
	23				~
	24	Select program : 22			
	25	Program name :	TEMPLET		
	26		SE-TEMPLET		
	27				
	28	Export Import	Delete Copy Loa	ding	
	29			24	
	30				
X1 a	Select Program	And and an other statements of the statement of the state	Edit selected program S s: 0.000	how All	Edit Template
O	perate Ma	anual Teach	I/O System	Alarm	Main

Step 5: Click [Template] to select the template screen.

lathr TEACH	Action Setting 22	USE-TEI	MPLET		2015/08/03 17:09:42
No ⁵ 📥 (Mair	n Sys.) Instructions	×.	Instruction I	List	Instruction List
		▲ × × 1/1		elect comm struction Li	
Cut / Delete Co	py Insert	Change			
Clear All Pa	ste Add	Save			
X1 axis: 0.000	Y1 axis: 0.000	Z1 axis: 0.000			
Operate Ma	nual Teach	1/0	System	Alarm	Main

Temp late 2015/08/03 Action Setting **USE-TEMPLET** TEACH 22 16:45:18 Inload (Main Sys.) Ins Instruction No L Select the loaded template × tion List List Template 1 Template 2 **Template 3** Template 4 e select command from Template 5 Template 6 [Instruction List] Template 7 **Template 8** Cut / Delete Template 9 Copy Template 10 **Clear All** Paste Original program will be placed ! X1 axis: 0.000 Y1 axis: -0.001 Z1 axis: 0.000 Manual Teach 1/0 Alarm Main Operate System

Step 6: Click on the program template.

Step 7: After loading in the program template, all commands and motions from target template will be loaded into the current program. Users only need to modify or adjust part of the commands. Then, store the setting and switch the screen to run for auto-operating.

Temp late TEACH	Action Setting 22	USE-TEM	1PLET		2015/08/03 16:46:01
No 🛑 (Main	Sys.) Instructions		Blank page		Instruction List
1 Output[Y1]OFF		*			LISI
2 START					
3 Goto T.P. ,speeds	50 % , P1	^			
4 Goto T.P. ,speeds	50 % , P2				
5 Output[Y1]ON		× 1			
6 Delay1.0 Sec		-			
7 Goto T.P. ,speeds	50 % , P1	×			
8 Output[Y1]OFF					
9 Goto T.P. [X1] ,sp	eed50%, P3	1			
		1			
Cut / Delete Co	py Insert C	hange			
Clear All Pas	ste Add	Save			
X1 axis: 0.000 Y	A REAL PROPERTY AND ADDRESS OF AD	7 cis: 0.000			
Operate Mar	nual Teach	1/0	System	Alarm	Main

Step 8: Please return to the standby point of the main system before carrying out auto-operation. Click [Run] to auto-operate the system.

AUTO	Running Setting 22	USE-T	EMPLET	Admin	2015/08/03 16:46:52
No T. Points	(Main Sys.) Instruction	ons	3 😞	Speed 2	0 %
1 Output[Y1]OFF				Running Inform	nation
2 START			~	Planned	3
3 Goto T.P. ,spe	ed50%, P1			cycles	
4 Goto T.P. ,speed50% , P2			~	Remainder	7
5 Output[Y1]ON				Cycle time	L.10 Sec
6 Delay1.0 Sec			*		
7 Goto T.P. ,spe	ed50%, P1				
8 Output[Y1]OFF			~		
9 Goto T.P. [X1]	,speed50% , P3		tack	¢	
Zero Return Rt X1 axis: 0.000		top Cycle 1 axis: 0.000	⇒Stop	Magni. <u>1</u>	Hand Wheel
Operate N	lanual Teach	1/0	Syste	em Alarm	Main