

PalletSolver CONTROLLER SETUP AND OPERATION MANUAL FOR MLX200 CONTROLLER

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

CONTROLLER INSTRUCTIONS OPERATOR'S MANUAL MAINTENANCE MANUAL

The operator's manual above corresponds to specific usage. Be sure to use the appropriate manual.

Part Number:170284-1CDRevision:4



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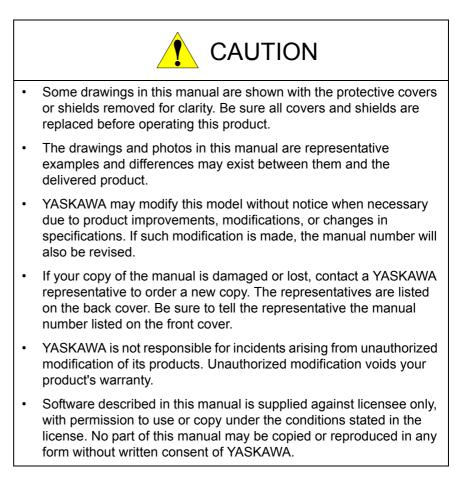
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MANDATORY

- This manual explains the error recovery function. Read this manual carefully and be sure to understand its contents before operation.
- General items related to safety are listed in Section 1: Safety, in the Controller Instructions. To ensure correct and safe operation, carefully read the Controller Instructions before reading this manual.
- For detailed instructions regarding additional equipment including controller, manipulator, or other components, refer to the specific equipment manuals included with your documentation package





We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association 900 Victors Way P.O. Box 3724 Ann Arbor, Michigan 48106 TEL: (734) 994-6088 FAX: (734) 994-3338 www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved YASKAWA training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.



Notes for Safe Operation

Before using this product, read this manual and all the other related documents carefully to ensure knowledge about the product and safety, including all the cautions.

In this manual, the Notes for Safe Operation are classified as "DANGER", "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".



Indicates an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



RY Always be sure to follow explicitly the items listed under this heading.



Must never be performed.

Even items described as "CAUTION" may result in a serious accident in some situations. At any rate, be sure to follow these important items.



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as a "DANGER", "WARNING" or "CAUTION".





• Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the controller and the programming pendant.

When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

Figure 1: Emergency Stop Button



• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Figure 2: Release of Emergency Stop



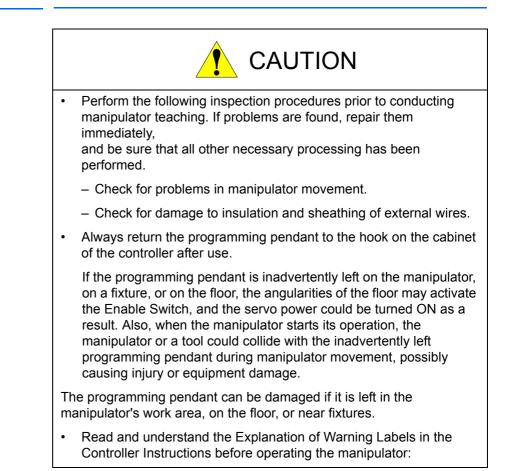
- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
 - Make sure to use a lockout device for safeguarding when going inside.
 - Display a sign that operation is being performed inside the safeguarding and make sure no one removes the safe guards.
 - View the manipulator from the front whenever possible.
 - Always follow the predetermined operating procedure.
 - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning on the power for the controller.
 - Moving the manipulator with the programming pendant.
 - Running the system in the check mode.
 - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem.

The emergency stop buttons are located on the right of front door of the controller and the programming pendant.



Notation of Terms Used In this Manual

Descriptions of the programming pendant, buttons, and displays are shown as follows:

Item	Manual Designation
Menu	The menus displayed on screen are denoted with { }. ex. {TOOL}.
Button	The buttons, check boxes, radio buttons displayed on screen are denoted with []. ex. [Close]; [Sync] check box; [Fast] radio button.

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- 1 Introduction
- 1.1 Overview

1 Introduction

1.1 Overview

The PalletSolver Software Suite provides a turn-key, easy to use system for integrators to develop a palletizing system faster and with ease. This suite also allows the end user to create new palletizing patterns and add new products with ease on a PC and then to quickly transfer the generated pattern to the system controller.

1.1.1 Operation Areas

There are two main operational areas of the PalletSolver Software Suite and they are:

• PC Windows Application (Offline): The PC component consist of a Pattern Generation tool that will run on a Windows base PC. This applications purpose is to generate patterns. A PalletSolver parser is included to convert the pattern generator output.xml file to PLC tags and checked for errors during download



Though this application takes into account physical restrictions of a system (physical interferences, gripper dimensions), it is basically independent of the specifics of the system (robot type, cell layout, I/O configuration.)

• PLC Application (Online): The PLC component utilizes the MLX200 standard product to control the robot with motion AOIs. This palletizing engine will service multiple build, infeed and dispenser stations to process a variety of build patterns in parallel. A standard PalletSolver HMI interface is provided to control all aspects of the cells operation and setup.

1.1.2 Modules

The Pallet Software Suite is composed of the following modules:

- Offline Pattern Generation Application (PC)
- Pallet Pattern Parser (PC)
- Online Palletizing Ladder (RSLogix 5000)
- Control and Monitor HMI Screens (FactoryTalkView)
 - imported into standard MLX200 HMI

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PalletSolver

- 1 Introduction
- 1.2 Features

1.2 Features

1.2.1 PalletSolver- PC Pattern Generation Tool

- · Intuitive user interface with guided pallet recipe generation
- Interference constraints per station to ensure quick change over without halting production
- Import pallet patterns generated by TOPS or CAPE software
- Virtually unlimited SKUs supported
- Support for multiple-cells
- Dynamic gripper zone configuration to change zone sizes for different products at each infeed
- Support for vacuum gripper types

1.2.2 PalletSolver-Controller

• System Configuration - Standard: 4 infeed stations, 4 build stations, 2 pallet dispensing stations, 2 slipsheet dispensing stations



The system configuration can be increased to 8 build stations but requires a PLC with more than 2MB of available memory.

- Dynamic robot path adjustment to ensure optimum production rate
- Simple and quick setup procedure.
 - Only need to teach 2 points (Home and Optional Reject Drop Positions)
 - Simple method for teaching a user frame for each station
 - User friendly setup screen for each station
 - Speed adjustments for each segment of the motion profile
- Ethernet Interface for importing Pattern (recipe) files generated by PalletSolver- PC
- Granular control over Palletizing operations
 - Controlling infeed pick sequence (Round Robin, Priority, Relative Ratio, and Override)
 - · Automatic reject of parts
 - · Build / Infeed / Dispenser lock-out for maintenance or failures
 - End of production handling
 - Adjusting pick-place depth as package changes due to environmental conditions
 - Ability to customize applications for unique gripper handling, error handling or to add extra motion points.



- 1 Introduction
- 1.3 System Requirements

1.3 System Requirements

1.3.1 PalletSolver PC Minimum Requirements

- Compatible with Microsoft Windows XP Service Pack 2.0 and Microsoft Windows 7
- Microsoft .NET Framework 3.5
- 400 megahertz (MHz), Recommended 1 gigahertz (GHz)
- 128 megabytes (MB), Recommended 256 megabytes (MB)
- 30 MB Hard Disk Space
- Monitor Resolution of 1280 x 1024 dots per inch (dpi)
- Hardware Key provided with the PalletSolver Software Suite

1.3.2 PLC Minimum Requirements

- Logix
 - CompactLogix PLC with built-in Ethernet

OR

- ControlLogix/GuardLogix PLC with Ethernet module
- 3 MB of memory
- RSLogix 5000 V20
- FTView ME Station V6.1, with 75 Display Activation

1.4 About this Document

This manual is intended as an introduction and overview for personnel who are familiar with the operation of their YASKAWA Motoman robot model and the standard MLX200 product.

This manual provides an overview of the YASKAWA Motoman PalletSolver system.

This manual contains the following sections:

- Chapter 1 "Introduction"
- Chapter 2 "Palletizing Operation and Control"
- Chapter 3 "PalletSolver System Definitions"
- Chapter 4 "Setup Procedure"
- Chapter 5 "PalletSolver Motion Profile"

Introduction
 Learning PalletSolver

1.5 Learning PalletSolver

YASKAWA has created this product by keeping with our proven track record of delivering industry leading quality, innovation and customer satisfaction. If training is still needed, a variety of options are available to help you learn the MLX200 PalletSolver. For more information on available training classes for the PalletSolver Suite, please contact our training department at: training@motoman.com or visit our web site at: www.motoman.com.

1.6 Reference to Other Documentation

For additional information refer to the following:

- Motoman PalletSolver PC Pattern Generation Tool Manual (169990-1CD)
- Motoman MLX200 Software and Operations Manual (168542-1CD)
- Motoman MLX200 Hardware Installation and Software Upgrade Manual (168283-1CD)
- Motoman MLX200 Data Software Manual (169456-1CD)
- Vendor manuals for system components not manufactured by YASKAWA.



- 1 Introduction
- 1.7 Customer Support Information

1.7 Customer Support Information

If you need assistance with any aspect of your PalletSolver system, please contact YASKAWA Motoman Customer Support at our 24-hour telephone number:

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For **routine** technical inquiries, you can also contact YASKAWA Motoman Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact YASKAWA Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.



Please use e-mail for **routine** inquiries only. If an urgent or emergency need for service, replacement parts, or information, contact YASKAWA Motoman Customer Support at the telephone number shown above.

Please have the following information ready before calling:

System	PalletSolver
Robots	
Software Version	Access this information on the MLX200 by pressing the [Menu] \rightarrow [About MLX] The MLX-D and MLX-R versions should be the same number
Robot Serial Number	Located on the robot data plate
Robot Sales Order Number	Located on the controller data plate



PalletSolver

- 2 Palletizing Operation and Control
- 2.1 Startup

2 Palletizing Operation and Control

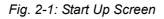
This section will explain all the options the operator will have to control up to four builds during a palletizing operation. The build status will be provided to give a real time display of the progress at each station. The fault recovery section will explain the options to recover from a miss pick or dropped box alarm.

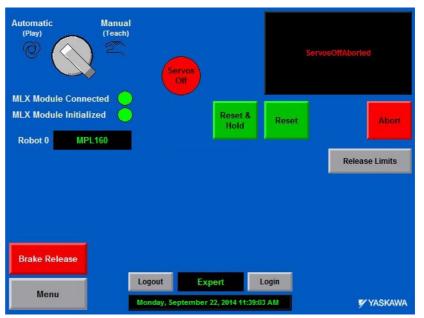


As a prerequisite, the operator should have been trained on the basic MLX200 system. The operation of robot startup, teaching points, user frames and setting up tools will not be covered in this manual. Refer to the "MLX200 Software and Operations" manual.

2.1 Startup

Before any palletizing operations can start, place the MLX200 in Play mode, and press the startup button sequence. ([Abort] > [Reset] > [Enable Servos] > [Start]). The robot will execute a safe homing sequence, where it slowly raises up to a max clearance height, and moves to the home position.





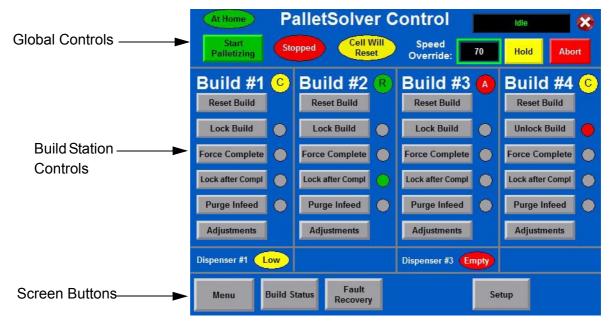


- 2 Palletizing Operation and Control
- 2.2 PalletSolver Main Control

2.2 PalletSolver Main Control

To access the PalletSolver Control screen, press [Menu] > [PalletSolver] on the Main MLX200 screen.

Fig. 2-2: PalletSolver Control Screen Sections



The PalletSolver screens are designed to allow the user to easily distinguish between data inputs and data displays by the following:

- <u>Data Inputs</u> are white on black
- Data Displays are green on gray

On the bottom of each of the PalletSolver screen there is a section where Screen Buttons are located to give the user quick access to other PalletSolver screens.

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PalletSolver

- 2 Palletizing Operation and Control
- 2.2 PalletSolver Main Control

2.2.1 Global Controls

The top section of the PalletSolver Control screen applies to the overall cell.

Fig. 2-3: Global Control Section of PalletSolver Control Screen



- ①<u>At Home</u> This indicator turns on when the robot arrives at the home position.
- ② [Start / Stop Palletizing] This button is used to start and stop the palletizing operation. After the MLX200 finishes the startup sequence and the robot is at the home position, the [Start Palletizing] button can be pressed. When the [Stop Palletizing] button is pressed, the robot will continues its current build cycle and then moves safely to the home position and stops.
- ③ Palletizing / Stopping / Stopped / Alarm Indicator showing the status of the palletizing operation. When "ALARM" is display, the operator would access the Fault Recovery screen for an error message and options on how to recover from this alarm.
- ①Cell will Reset This indicator is a warning that all build stations will be reset to the first layer and the first pick cycle. This feature is turned ON/ OFF on the System Settings screen, and should be used at initial startup.
- Speed Override This value can be used to override the speed of all motions to a percentage of the speeds that were programmed (0-200%). The 100% setting will correspond to the actual programmed speeds.
- ©<u>Current State Phase</u> This displays the current state of the PalletSolver and located on every PalletSolver screen.
- ⑦[Hold / Restart] and [Abort] These buttons function the same as on the MLX200 Main Screen. They are placed on multiple PalletSolver screens to provide quick tools to stop the robot.

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- 2 Palletizing Operation and Control
- 2.2 PalletSolver Main Control

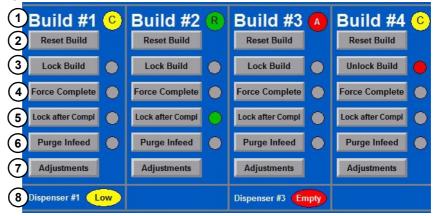
2.2.2 Build Station Controls Section

The middle section of the PalletSolver Control screen is used to control the palletizing operation of all four build stations.



If a build station is not enabled, it will not be shown. If a dispenser is not defined, it will not be shown.

Fig. 2-4: PalletSolver Control Screen Section



① <u>Build Status</u> - Indicator showing state

- R- Running
 L- Locked
 - C- Completed A- Alarm

②[Reset Build] - Button used to reset a completed build to a "Not Completed" state. After resetting an unlocked build, the robot will begin executing it's first layer when boxes are ready for pickup.



To start a new build at a station with a completed status, the operator will need to first remove the completed build, and if there is no pallet dispenser, place an empty pallet at this station. If a pallet sensor is present, it will be used to verify that this removal step has been completed. To begin the new build sequence, the [Reset Build] and possibly the [Unlock Build] buttons need to be pressed.

③[Lock / Unlock Build] - Button is used to manually lock and unlock this build station. When it is locked, no cycles will be executing on it.



When a build station is locked or unlocked from this screen the corresponding infeed station is also locked or unlocked. The offline PalletSolver PC Pattern Generator will assign a single infeed station to each build station.

- ④[Force Complete] Button used to mark this build complete, before it's actually finished. If a cycle is executing on this build, the build will be marked complete after the cycle is finished.
 - Indicator is green when action is queued.

2-4



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PalletSolver

- 2 Palletizing Operation and Control
- 2.2 PalletSolver Main Control
- ⑤[Lock after Compl] Button is used to lock the build after it completes execution.
 - Indicator is green when action is queued.
- (6) [Purge Infeed] Button used when there are not enough boxes on the infeed conveyor for the next pick cycle. This is used when the operator wants to pick what's ever left on the conveyor and finish the build. The robot will ignore the gripper sensors for the next cycle, and then mark the build complete after the cycle.
 - Indicator is green when action is queued.
- ⑦[Adjustments] Button used to access an additional screen for adjustment options. Refer to Section 2.2.3.

Ispenser Indicators - Displays the current state.

- OK
 Empty
- Low
 Locked



- 2 Palletizing Operation and Control
- 2.2 PalletSolver Main Control

2.2.3 Build Station Adjustments

The Adjustments screen can be accessed from the PalletSolver Control screen, by pressing the [Adjustments] button below the Build #.

	Build #1 Adjustment	S ServosOffAborted 🔀
	Product: Box - Sim Pattern:	5 Box -B1
2	Build Station #1 Pallet #1 with Infeed #2	BuildHeight: 1020.0 3
	Layer 1 of 3 Package Layer 0 of 2 Pick 1 of 5Size: 1 Place 1 of 1Size: 1 Package Placed 0 of 5 Priority 4 Ratio Pick # 1 of 4 Next Pick Size: 1	ADJUSTMENTS:Pick Height:2.04Place Height:-3.05Max Layers:06
	PalletSolver Control	

^①At the top, the product name and pattern name are displayed.

- ⁽²⁾ The left side of the screen is the same information that is shown on the Build Status screen, which will be explained in *Section 2.3 "Build Status"*.
- ③ <u>Build Height</u> This indicator displays the current height of this build, including the pallet, box layers and slip sheets.
- ④ <u>Adjustment: Pick Height</u> Value to adjust the pick height of the infeed (+/- 25 mm).
- SAdjustment: Place Height Value to adjust the placement height of this build (+/- 25 mm).
- ⑥ Adjustment: Max Layers Value to adjust the max layers of this current build. When this number of layers has been finished, the build will be marked complete and locked. If zero, there will be no adjustment.



The layer count includes the pallet and slip sheets.

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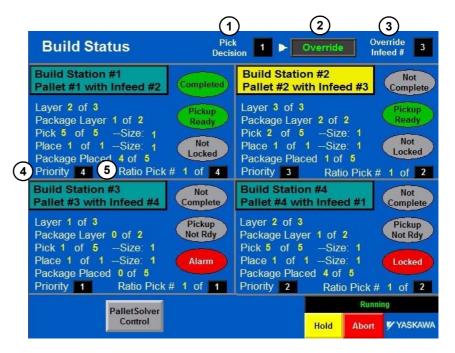
PalletSolver

- 2 Palletizing Operation and Control
- 2.3 Build Status

2.3 Build Status

From the PalletSolver Control screen, press [Build Status]. This screen can be used to monitor the status of each build station.

Fig. 2-6: Build Status Screen



2.3.1 Pick Decision

The pick decision can be set to one of four options to define the criteria of which infeed station with boxes ready for pickup will be serviced next.

- 1. Override 2. Round Robin
- 3. Priority 4. Ratio
- ① <u>Pick Decision</u> is set to one of four options to define the criteria of which infeed station with boxes ready for pickup will be serviced next.

②An indicator displays the name of the active pick decision. This corresponds to the number selected.

- (1) <u>Override</u> Used to force all picks to be performed on one infeed station.
 - ③<u>Override Infeed #</u> Enter the infeed station number to force execution on when its next pick is ready. This data field will appear when the Override option is chosen.
- (2) <u>Round Robin</u> The PLC will check each infeed in a round robin fashion. If a station has boxes ready for pickup, one pick cycle will be performed, otherwise the next infeed will be checked.



If boxes are ready, but a slip sheet is required first, both operations will be executed.



- 2.3 Build Status
 - (3) ④ Priority The infeed station with the highest priority will be checked first. If boxes are ready to be picked up, one pick cycle will be performed. When two infeed stations have the same priority and boxes are ready for pickup, the execution will alternate between the two stations. If boxes are not ready for pickup at the higher priority stations, the next lower priority stations will be checked.



The infeed priority setting is set at the bottom of each build stations status area.

(4) ⁽⁵⁾<u>Ratio</u> - This option will function like the Round Robin, with one addition. If the ratio value is more than 1, the robot will continue to perform pick cycles from this infeed until the count of cycles is equal to the ratio number. During the process, if boxes are not ready for pickup, the count will be reset back to 1, and the next infeed station will be checked.



• The Ratio is set at the bottom of each build stations status area.

• The yellow number shows the current count

PalletSolver

- 2 Palletizing Operation and Control
- 2.3 Build Status

2.3.2 Status of Each Build

The status of each build assembly is shown in one of the four quadrants of the Build Status screen. If a build station is not enabled, this quadrant will not be shown. The build number, pallet number, and infeed number are shown in a box.



The build number and the pallet number are always the same. This title box will turn yellow when this build is executing a cycle.

2.3.2.1 Status Information Examples:

- *Layer 3 of 6* shows the current layer and the total layers. Note that "Layer" includes pallet, box and slip sheet layers.
- Package Layer 2 of 4 shows the only the box layer count and total
- *Pick 3 of 10* shows the pick that will be executed next or is currently executing and the total picks for this layer.
- *Pick Size: 3* shows the number of boxes that will be picked up during the next cycle.
- *Place 2 of 3* shows the current placement count and the total placements of this pick cycle. This is used for a multi-zone gripper that will have a couple of placements per pick.
- Place Size: 2 shows the number of boxes that will be placed at the next drop off.
- *Package Placed 4 of 12* shows the number of boxes that have been placed and the total number of packages to complete this layer.
- Completed / Not Completed indicator showing whether or not this build has been completed.
- *Pickup Ready / Pickup Not Rdy* indicator showing whether boxes are ready for pickup
- Locked / Not Locked indicator showing whether or not this build and infeed are locked.



2.4 Fault Recovery

2.4 Fault Recovery

From the PalletSolver Control screen, press [Fault Recovery]. This screen can be used to check alarm messages and provide options for resuming after a miss pick or dropped box alarm.

The PalletSolver can be placed in one of two modes for recovering from a drop/pick alarm. (1) If the Reject Drop Station is defined and unlocked, an alarm recovery will be automatic by dropping off unwanted boxes in the gripper. (2) If the Reject Drop Station is locked, one of five manual recovery options can be chosen.



A Reject Drop Station is not required. If one is not defined, a manual recovery will be used for all alarms.

2.4.1 Reject Drop Station

The Reject Drop Station is used for automatic recovery of miss picks and dropped boxes. After an alarm, this build station will be locked until an operator investigates the alarm. The advantage of this option is to allow the palletizing operation to continue on other build stations without taking the entire cell down due to an alarm condition on one build stations. The operator can investigate the problem at a later time.

PalletSc 1 Lock R Drop St			idie Ho	
	Dropped Box Alarm eset Build 1 eject Alarm			
Reset Build 1	R			Turn Off Gripper
Error Message				
Build 3 Reject Drop	p. Clear current layer, p	ress [Reset Reject A	larm], and unlock.	Reset Alarms
Menu	PalletSolver Control	Mask Grip Zone	Helpful Guides	

Fig. 2-7: PalletSolver Fault Recovery - Auto Reject Drop Enabled

- ①[Lock / Unlock Reject Drop Station] This button is located at the top of the Fault Recovery screen and locks and unlocks the Reject Drop Station.
- ②<u>Auto Reject Drop Enabled / Use Manual Recovery</u> Status indicator shows either:
 - Auto Reject Drop Enabled when unlocked
 - Use Manual Recovery when locked

PalletSolver

- 2 Palletizing Operation and Control
- 2.4 Fault Recovery
- 1. <u>Unlocked Reject Drop Station</u> All miss pick and drop box alarms will automatically initiate a recovery sequence. This build station will be locked. After the recovery sequence, the robot will continue to execute other build stations.
 - Recovery Sequence:
 - If the robot does not have any boxes in its gripper, the robot will move to a safe clearance height and to the Home position.
 - If the robot still has boxes in its gripper, the robot will move up to a safe clearance height and move to the Reject Drop Station. The robot will release the remaining boxes and return to the Home position.
 - ③Reseting a Reject Drop Alarm
 - [Reset Build x Reject Alarm] When a reject drop recovery executes, a [Reset Build x Reject Alarm] button will appear. Before pressing this button, make sure to clear the current box layer. The execution will reset to the first pick of this layer. This build station will also need to be unlocked to resume execution.
- Locked Reject Drop Station After a miss pick or dropped box. The robot will be placed in the HOLD state and an ALARM indicator on the PalletSolver Control screen will notify the operator to access the Fault Recovery screen for manual options on how to resume. Refer to Section 2.4.2 "Manual Recovery Options".

- 2 Palletizing Operation and Control
- 2.4 Fault Recovery

2.4.2 Manual Recovery Options

When the Reject Drop Station is Locked, five options will appear during a miss pick or dropped box alarm condition. The operator will be permitted to open the safety gate, which will kill servo power, to investigate the problem. The operator must exit the cell and close the safety gate before choosing one of the recovery options.

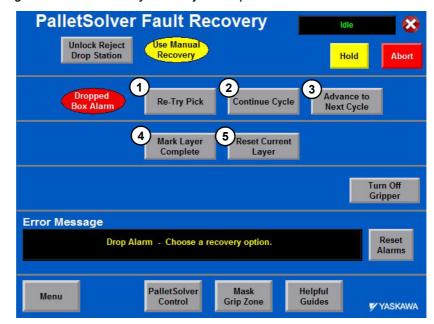


Fig. 2-8: Fault Recovery with Reject Drop Station Locked

- ①[Re-Try Pick] If a new set of boxes are ready to be picked up at this infeed station, it will retry the pick sequence. Otherwise the robot will move home, and the PLC will check other build stations for a ready condition.
- ②[Continue Cycle] The robot will continue moving the boxes to the build station. This option is used after the operator places the dropped box back onto the gripper.
- ③ [Advance to Next Cycle] The robot will abort this cycle. It will move above the location where the boxes should have been placed, and then move safely Home. The pick count, box count, and possibly layer counts will be incremented appropriately. This option is used after the operator places the dropped box on the build station in the correct location. If the operator is unsure of the exact location, he can override the speed on the PalletSolver Control screen to a slow setting before pressing this button. When selected the robot will slowly move to location above the placement position. At this spot, the operator can press the [HOLD] button to verify his assumption was correct.
- ④[Mark Layer Complete] Button is used to mark the current layer complete, by incrementing the layer count, and setting the pick count to 1. The build total box count will also be adjusted. This button is typically used when an operator manually places the last few boxes on a build to complete that layer.



PalletSolver

- 2 Palletizing Operation and Control
- 2.4 Fault Recovery
- ⑤[Reset Current Layer] Button is used to reset the current layer, by setting the pick count to 1. The box count will be set to 0, and the build total box count will be adjusted. This button is typically used when the robot had a placement alarm during a multi-placement sequence. Sometimes the operator will not know where to place the dropped box to complete that cycle, so in order to recover, all the boxes on that layer would be manually cleared.
- 2.4.2.1 Other Controls and Indicators on the Fault Recovery Screen

[Turn Off Gripper] - Button to turn off all gripper outputs.

<u>Error Message</u> - Whenever other screens show a alarm indicator, this display will provide alarm details.

[Reset Alarms] - Button to clear alarm message.



- 2 Palletizing Operation and Control
- 2.4 Fault Recovery

2.4.3 [Broken Gripper Sensor

When a gripper sensor becomes inoperable, it can be masked, or ignored to continue palletizing. The sensor can be repaired later during a maintenance period. To access this screen, press [Mask Grip Zone] on the Fault Recovery screen.

Fig. 2-9: Gripper Zone Mask

Gripper Zone Mask	Abort	ldle 😵
1 Mark Zone 1 Sensor Broken Sensor Broken	Mark Zone 3 Sensor Broken	Zone 4 Sensor is Ignored
Mark Zone 5 Sensor Broken	Mark Zone 7 Sensor Broken	Mark Zone 8 Sensor Broken
	Fault Recovery	

- ①[Mark Zone x Sensor Broken] If a gripper sensor becomes inoperable, it can be ignored by pressing this button.
- ②[Zone x Sensor is Ignored] If a gripper sensor becomes ignored and the [Mark Zone x Sensor Broken] button was pressed, this button is displayed. Once the sensor is repaired press this button so the gripper sensor is no longer ignored.

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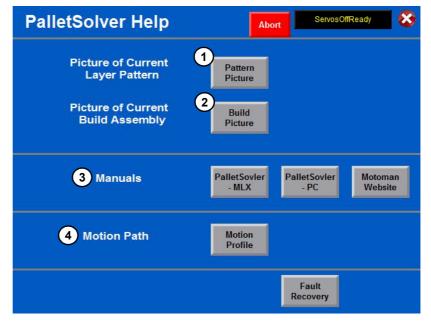
PalletSolver

- 2 Palletizing Operation and Control
- 2.4 Fault Recovery

2.4.4 Helpful Guides

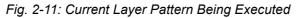
For additional help, press the [Helpful Guides] button on the Fault Recovery screen.

Fig.	2-10:	PalletSolver	Help
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- ① Pattern Picture This button displays a 2D picture of the layer pattern that is currently being executed. These pictures will be generated by the PalletSolver PC pattern generator software. During an alarm, the operator will be able to view the picture of the current layer. From the pick and place counts, the operator will know exactly where to place a dropped box.
- ⁽²⁾ <u>Build Picture</u> This button will display a 3D picture of the build that is currently being executed.
- ③<u>Manuals</u> The PalletSolver-MLX and PalletSolver-PC manuals can be viewed on the HMI. The Motoman website can also be accessed if there is a connection to the Internet
- ④ <u>Motion Profile</u> A picture of the robot motion profile can be viewed for a particular gripper type. These positions will be executed for each pick place cycle. More details on the motion profile is explained in *Section 5.1 "Palletizing Motion Profile Explanation" on page 5-1.*

- 2 Palletizing Operation and Control
- 2.4 Fault Recovery



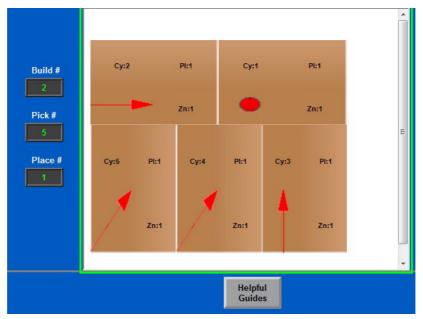
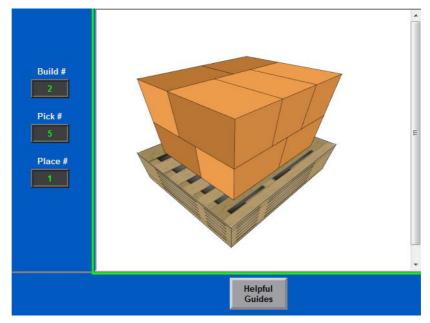


Fig. 2-12: Current Build Being Executed



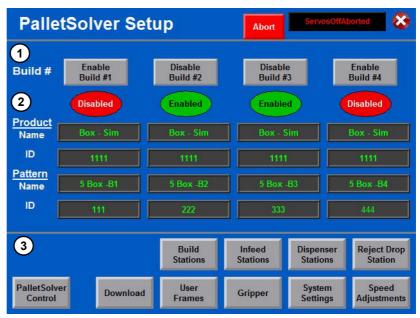
PalletSolver

- 2 Palletizing Operation and Control2.5 Setup
- 2.5 Setup

2.5 Setup

From the PalletSolver Control screen, press [Setup]. This screen displays which build stations are currently enabled. From the bottom of this screen all of the system component setup screens can be accessed.

Fig. 2-13: PalletSolver Setup Screen



- ①[Enable/Disable Build #] Each of the build stations can be enabled or disabled by pressing the appropriate button. A status indicator is displayed below each button. To execute a pallet build, the station must be enabled and unlocked.
- ② Product/Pattern Name and ID Information that is currently downloaded for this build station.
- ③<u>Buttons on lower part of screen</u> These buttons will access setup screens for each component of the system.

Initially, each of the build stations will be disabled. It is not possible to enable a build station until all the stations (build, infeed, and dispenser) used with this build and setup are marked complete. This will be part of the *Chapter 4 "Setup Procedure"*.



- 3 PalletSolver System Definitions
- 3.1 Standard PalletSolver Software Capacities

3 PalletSolver System Definitions

The system definition establishes conventions to identify and define components in both the controller and Offline pattern generator software. These conventions must be followed on both sides in order for the system to operate properly. This definition only needs to be done once during the initial setup of a new cell.

3.1 Standard PalletSolver Software Capacities

The standard Pallet Solver software supports the following cell component capacities;

• Gripper 1

- Gripper Type
 - · Vacuum with 8 Zones with 32 grip areas Supported
 - · Clamp Not Supported in this release
 - · Bag Not Supported in this release
- Infeed Stations 1 to 4
- Build Stations 1 to 4
- Slipsheet Dispensers 0 to 2
- Pallet Dispensers 0 to 2
- Reject Station 0 to 1



If required, any of these capacities can be increased by contacting Yaskawa Motoman Customer Support. Refer to *Section 1.7 "Customer Support Information" on page 1-5* for contact information.



PalletSolver

- 3 PalletSolver System Definitions
- 3.2 Cell Identification

3.2 Cell Identification

Each cell is identified by a unique user-defined number, the cell ID. This number is entered in both the PalletSolver PC Pattern Generation Tool application and MLX200 PalletSolver Download Screen. (*Section 4.6 "Download Build Patterns"*). During a download operation, the PalletSolver Parser software will verify the cell ID matches the one in the XML pattern file. This will provide Offline validation (gripper, interference zone...) that the pattern was done with the data corresponding to the actual physical cell.

3.2.1 Station Definition Identification

During the initial cell definition, it is important that the stations identified in PalletSolver PC application match the identification of the actual cell hardware. Each station within a cell should be identified by a type: infeed station, build station (outfeed conveyor), pallet dispenser, slipsheet dispenser; and an ID number starting at 1 to the number of stations of that type.



There is only one infeed station assigned to each build station. Two build stations cannot use the same infeed station.

In the MLX PalletSovler PLC code, the following rules for identification numbering are used:

- box # = infeed station #
- sheet # = dispenser station #
- virtual gripper# = infeed station #
- pallet # = build station #



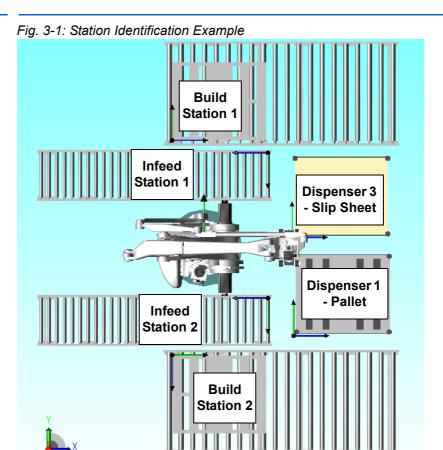
The slip sheet dispensers are re-numbered in the PLC software (Online). Pallet and slip sheet dispensers are executed the same, so all their information is stored in the same UDT tag array. The slip sheet station numbering always starts at dispenser 3. Refer to *Table 3.1*

Table 3-1: Dispenser PalletSolver PC vs PalletSolver PLC Identification

Dispenser PC Numbering (Offline)		Dispenser PLC Numberi (Online)	ng
Pallet Dispenser	1	Dispenser (Pallet)	1
Pallet Dispenser	2	Dispenser (Pallet)	2
Slip Sheet Dispenser	1	Dispenser (Slip Sheet)	3
Slip Sheet Dispenser	2	Dispenser (Slip Sheet)	4



- 3 PalletSolver System Definitions
- 3.2 Cell Identification



3.2.2 Station Frame

All frames (coordinate systems) follow the Right-Hand-Thumb rule.



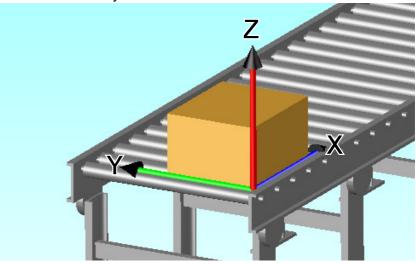
If it is difficult to teach the user frame as shown, the programmer can teach a user frame somewhere on the station, and enter an XYZ offset to define the vector distance to the desired frame.

• Infeed Conveyor Frame: The origin of conveyor frame is at the right front corner of the conveyor such that X-axis of the frame is pointing against the flow of the conveyor. The X-axis is aligned with the right side of the box and the Y-axis is aligned with the front the first box. Refer to Section 4.4 "Teach User Frames" for details on the three different offset types, which define the box location.



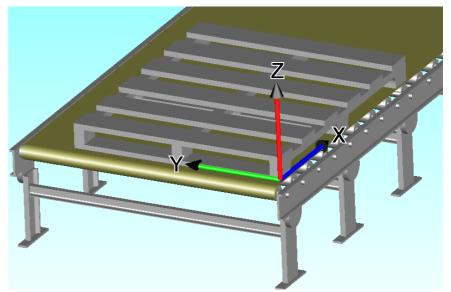
PalletSolver

- 3 PalletSolver System Definitions
- 3.2 Cell Identification
- Fig. 3-2: Infeed Conveyor Frame



• Build Station Frame (Pallet/Outfeed Frame): The origin of the pallet frame is at the right front bottom corner of the pallet such that the entire pallet lies in the positive quadrant of X- and Y-axis.

Fig. 3-3: Build Station Frame



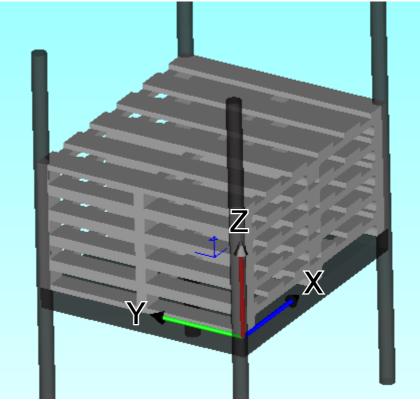


- 3 PalletSolver System Definitions
- 3.2 Cell Identification
 - *Dispenser Frame:* The origin of the dispenser frame is at the right front bottom corner of the pallet/slipsheet stack such that the entire pallet/slipsheet stack lies in the positive quadrant of X and Y axis.



If the dispenser has a mechanism to automatically lift or place the next pallet in the same place for pickup, the frame should be taught at the top corner of the pallet when it is ready for pickup.

Fig. 3-4: Pallet Dispenser Frame



- 3 PalletSolver System Definitions
- 3.2 Cell Identification

3.2.3 User Frame Offsets

Sometimes the robot cannot reach the required user frame location on all stations. (See Fig. 3-5) In this figure the robot reach is shown in yellow. Location (1) is the desired user frame location. However the robot cannot reach this point.

In these cases, the user can set the station user frame to a known location such as the front left edge of the outfeed conveyor or position (2). A measurable offset such as the width of the outfeed conveyor (3) can be added to position (2).

Position (2) becomes the user frame. Position (3) is the offset from Position (2).

When possible, the user frame should be set directly on the station, position (1) and the offset (xyz) should be set to 0.0

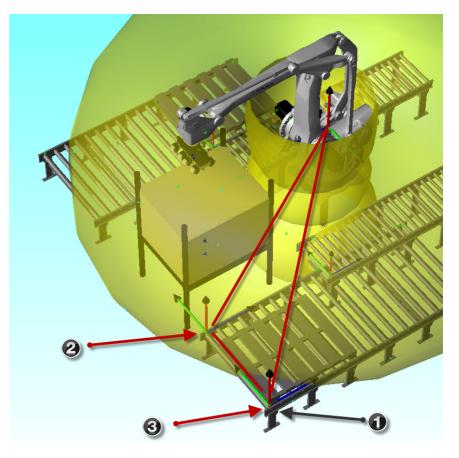


Fig. 3-5: Offset Reach

3.2.4 Station Interference Boundary

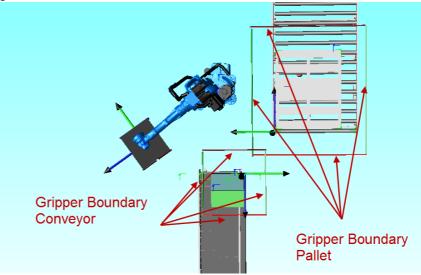
Station interference boundaries are defined around the build station and infeed station. These constraints define the area where the robot can pick and place the product safely without the gripper interfering with other structures in the cell, or the protective fence.



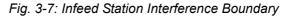
3-6

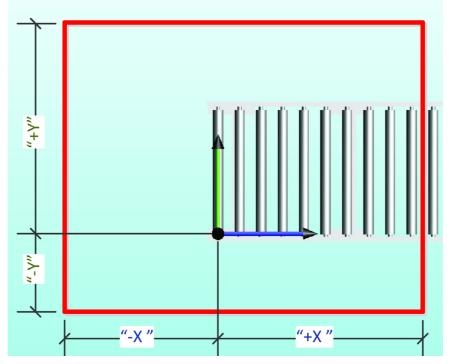
- 3 PalletSolver System Definitions
- 3.2 Cell Identification

Fig. 3-6: Station Interference



The interference constraints are defined with respect to the origin of the infeed or build station. Distances are entered in the positive and negative direction of the frame axes. This information will be entered in the Offline pattern generator software.

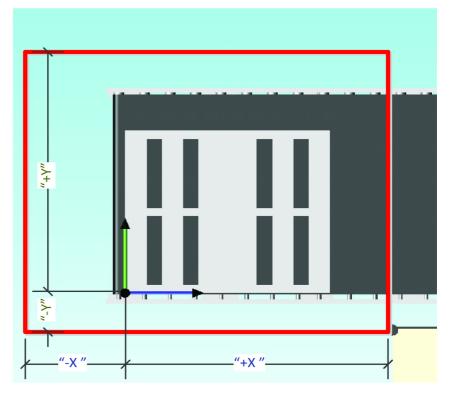




PalletSolver

- 3 PalletSolver System Definitions
- 3.2 Cell Identification

Fig. 3-8: Build Station Interference Boundary

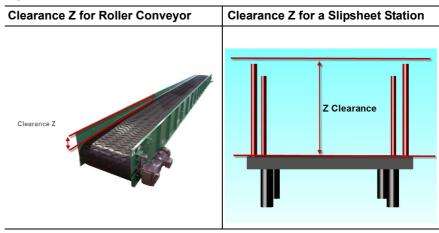


3.2.5 Clearance Z

Each Station has a clearance height called Clearance Z. Clearance Z is the height about the station user frame that will allow the robot to safely transition over it. Clearance Z does not take into consideration product on the station.

Some stations, such as Slipsheet stations, have a clearance height that is larger than the station plus it's associated product stack height. Other stations such as some infeed conveyors have a clearance height that is lower than the conveyor with typical product on it.

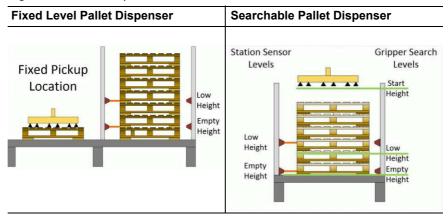
Fig. 3-9: Clearance Z





3.2.6 Dispenser Types

Dispensers hold a stack of Pallets or Slip-sheets. They can be Fixed Level (the bottom product is pushed to a set pickup location) or Searchable (varying stack height whose top of stack is determined by robot gripper). Optional Station Level sensors can also be set to determine when the stacks are low or empty.



PalletSolver

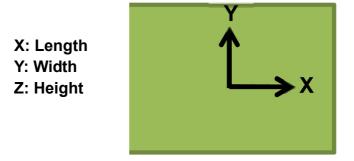
- 3 PalletSolver System Definitions
- 3.3 Package Definition

3.3 Package Definition

3.3.1 Package Frame and Dimensions

The package frame is in the middle of the top surface of the package

Fig. 3-11: Package Frame



3.3.2 Label Position

Labels can be defined on one or more sides of a box package relative to the package frame.

3.3.3 Package Coordinates

The package X and Y coordinates define the position and orientation of the center in relation to conveyor/pallet frame and are defined in the pattern files.

The orientation is the Z rotation angle of the box X-axis relative to the conveyor/pallet frame.



The package coordinates do not directly corresponds to the robot coordinates. The robot coordinates are based on the gripper coordinates.



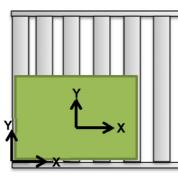
- 3 PalletSolver System Definitions
- 3.3 Package Definition

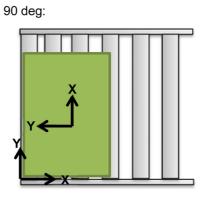
3.3.3.1 Package Orientation on the Infeed

The package orientation is defined relative to the infeed conveyor frame.

Fig. 3-12: Package Orientation on Infeed

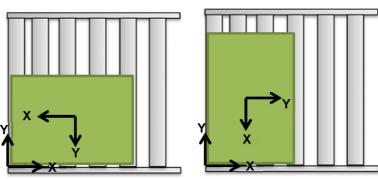
0 deg:





180 deg:

270 deg:



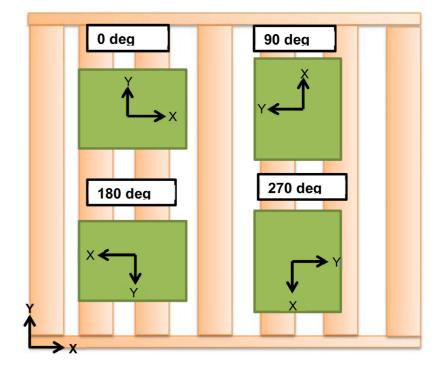


PalletSolver

- 3 PalletSolver System Definitions
- 3.3 Package Definition
- 3.3.3.2 Package Orientation on the Build Station

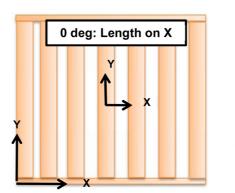
The package orientation is defined relative to the build station (outfeed conveyor) frame.

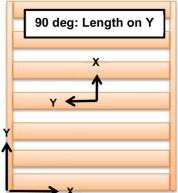
Fig. 3-13: Package Orientation on Build Station



The pallet itself also has an orientation defined relative to the build station frame. The pallet can be defined as "Length on X" or "Length on Y".

Fig. 3-14: Pallet Orientation







3.4 Gripper Definition

3.4 Gripper Definition

The box gripper tool control point (TCP) defined on the MLX controller must match the gripper TCP location defined in the PalletSolver PC Pattern Generation software.



The X and Y dimensions of the TCP can be defined anywhere on the gripper, as long as the Offline TCP matches the Online TCP. For each gripper type, Motoman recommends a preferred location of the TCP with pictorial examples.

3.4.1 Vacuum Gripper

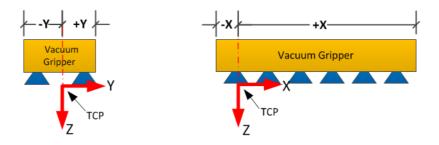
The vacuum gripper TCP is defined at the center of the first row of suction cups at the bottom of the suction cups. The Z position, MUST be at the bottom of the cups where a box would be before applying vacuum to grip it. The X-axis points toward the other cups along the length of the gripper and the Z-axis towards the bottom of the gripper. The Y-axis is perpendicular to the other two axes following the right-hand rule.

The gripper body (interference dimensions) is defined by the -X, +X, -Y, +Y lengths measured from the TCP, as shown in *Fig. 3-15*.



The grippers defined body geometry should be large enough to include any overhanging component (connectors hoses, brackets...) that may cause a collision in an interference zone.

Fig. 3-15: Vacuum Gripper TCP Definition



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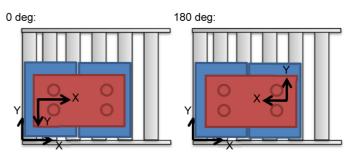
PalletSolver

- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

3.4.2 Gripper Orientation on Infeed Conveyor

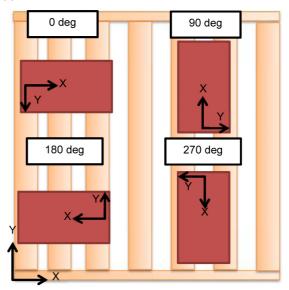
The gripper orientation is defined relative to the infeed conveyor frame. Only two orientations are supported:

Fig. 3-16: Gripper Orientation on Infeed Conveyor



3.4.3 Gripper Orientation on Build Station

The gripper orientation is defined relative to the build station frame. *Fig. 3-17: Gripper Orientation on Build Station*

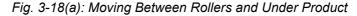




- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

3.4.4 Forkable Conveyors

Fork and bag grippers have to move between the conveyor roller and beneath the product during the pickup sequence. The PalletSolver - PC Pattern Generation Tool is responsible for ensuring the conveyor is forkable with each associated Fork Gripper.



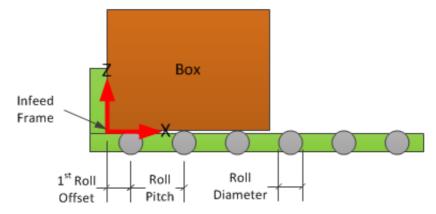
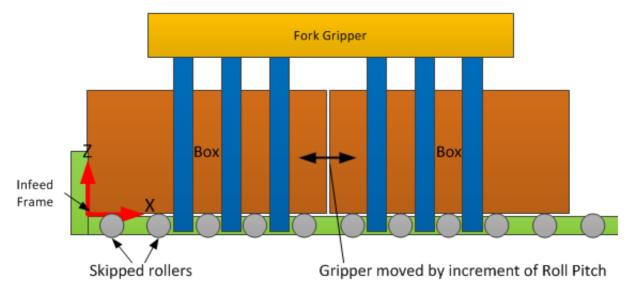


Fig. 3-18(b): Balancing Loads on Grippers

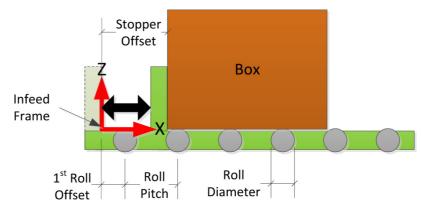


- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

3.4.5 Conveyor End Stops

Infeed Conveyors can be equipped with optional End stops. These stops are mainly used with Fork style grippers. They are typically used to help center the products on the fork gripper. Each time the product size changes this stop might need adjusting. This information is set in PalletSolver - PC Pattern Generation Tool.

Fig. 3-19: Conveyor End Stops





3.4 Gripper Definition

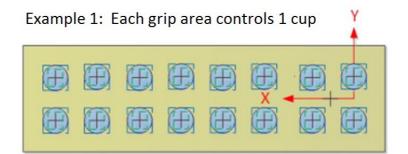
3.4.6 Physical Gripping and Sensing Areas

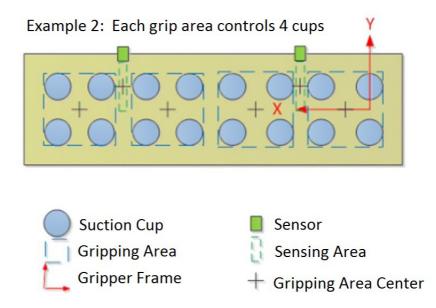
A GripAreaID identifies one or more suction cups or actuators that will always be activated together. For example, if a single vacuum generator is connected to 4 suction cups, it would be a single GripAreaID, and the effective area would cover all 4 suction cups.

Each GripAreaID or SensorID needs to have its own set of I/O signals on the Online side. There is a maximum of 32 GripAreaIDs and 32 Sensor IDs.

Two example grip area configurations are shown in *Fig. 3-20*. In the first, each suction cup is independently controller and has its own sensor (vacuum confirmation). In the second, the vacuum gripper has four gripping areas (composed of 4 suction cups physically connected together) and two sensor areas.

Fig. 3-20: Gripping and Sensing Area Examples





A SensorID identifies the sensing area of a single sensor. The effective area is defined as the area where the sensor will turn on if a package is partially in the area.

In the case of vacuum sensing, the effective area should be the minimum area that needs to be completely covered by the packages in order for the vacuum to be made.

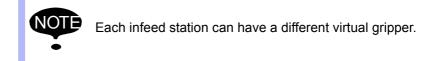
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- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

3.4.7 Virtual Gripper

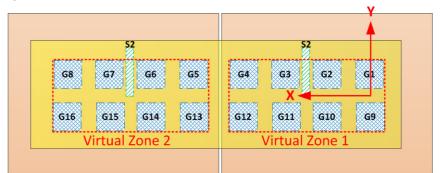
A physical gripper may have multiple virtual grippers defined as needed based on the package size. The purpose is to combine gripping areas and sensor areas together into a logical zone that matches the package size.

The maximum configuration of a virtual gripper will consist of 32 grip areas and 32 sensors, which can be configured into a maximum of 8 zones.



The example in *Fig. 3-21*, shows a virtual gripper with two zones to pickup large boxes. Zone 1 is composed of grip areas 1 - 4 and 9 - 12, plus sensor 1. and Zone 2 is composed of grip areas 5 - 8 and 13 - 16, plus sensor 2.

Fig. 3-21: Virtual Zone Definitions



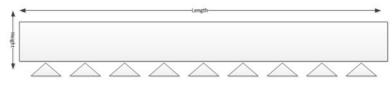


- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

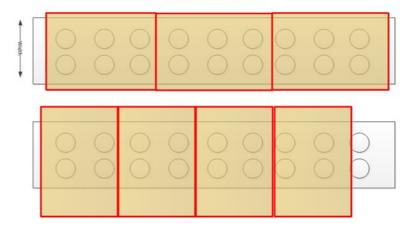
The example in *Fig.* 3-22 shows a gripper that can pickup three or four boxes on a conveyor, depending on the box orientation.

Fig. 3-22: Different Virtual Gripper for Box Orientations





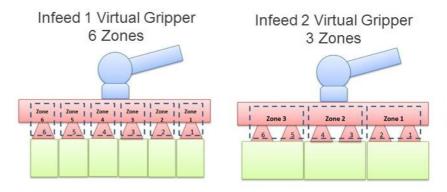
Bottom Views

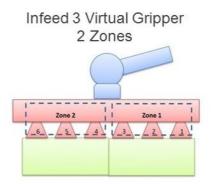


- 3 PalletSolver System Definitions
- 3.4 Gripper Definition

The example in *Fig.* 3-23 illustrates the huge benefit of having a gripper that can dynamically change it's zone configuration before each pick cycle. Every infeed can have a different size box. In the example, infeed 1 uses a virtual gripper to pick up six small boxes, infeed 2 uses a virtual gripper to pick up three medium boxes, and infeed 3 uses a virtual gripper to pick up two large boxes. Each of the boxes picked up can be individually placed on a build station, one at a time.

Fig. 3-23: Different Virtual Gripper for Each Infeed Station







4 Setup Procedure



As a prerequisite, the person performing the setup procedure should have been trained on the basic MLX200 system. The operation of teaching points, user frames and setting up tools will not be covered in this manual. Refer to the "MLX200 Software and Operations" manual.

Summary of the Required Steps:



For any MLX robot, it is very important that Collision Detection is setup before executing robot cycles. Refer to chapter 5 of the "MLX200 Software and Operation Users Manual." PalletSolver uses Collision Detection File #0 for all motion.

Schedule the "Bare_Arm_Test_Routine" and teach it's four positions forcing motion on all axes (Job 2, teach points 1, 2, 3, 4). Follow the procedure in chapter 5 mentioned above to setup initial Collision Detection settings for File #0 while this job executes. At a later time, these settings can be fined tuned when the final PalletSolver jobs are executing.

- 1. Setup the Gripper TCP tool, parameters and define PLC inputs.
- 2. Add a few PalletSolver IO interface tags to a customers PLC job.
- 3. Teach points for the Home, optional Maintenance, and optional Reject Drop positions.
- 4. Teach User Frames for each Infeed, Build, and Dispenser station.
- 5. On the HMI screen for each station, enter data for all fields, and press the [Mark Setup Complete] button.
- 6. Download Build Patterns.
- 7. Enter Speed Adjustments.
- 8. Enter System Settings.

- 4 Setup Procedure
- 4.1 Setup Gripper

4.1 Setup Gripper

4.1.1 Gripper TCP Tool Data

Define three gripper TCPs on the MLX200 Tool Properties Setup screen. The tool numbers shown below can be changed to another available tool number.

- Box Gripper Tool 0 TCP for picking up boxes
- · Sheet Gripper Tool 1 TCP for slip sheets and pallets
- Teach Tool Tool 2 TCP for teaching user frames



There is also a Tool 3, which is reserved for the robot flange. This tool is used for internal calculation and should not be changed.

Fig. 4-1: Setting TCP



The Box Gripper TCP location needs to be the same as the gripper definition in the Offline pattern generator (PalletSolver -PC). Refer to *Fig.4-2 "Gripper TCP Examples"*.



The example gripper TCP locations shown in *Fig.4-2* "*Gripper TCP Examples*" are only recommendations. The TCP can be located anywhere on the gripper as long as the Offline and Online TCP matches. However, the Z value of the TCP can not be changed.

The Sheet Gripper can have a TCP in the middle of the gripper using the Z distance down to the gripping surface.

For the Teach Tool, a pointer should be installed somewhere on the gripper. One option is to install a pointer in one of the vacuum cup screw holes on the gripper. The teach tool is used for teaching user frames.





- 4 Setup Procedure
- 4.1 Setup Gripper

For each of the required tools, perform the following steps:

 Enter the XYZ distances from the middle of the robot flange to the TCP (Tool Center Point) of the tool.



It is a good idea to first jog the robot in the Tool Coordinates when no tool is enabled (-1). Jog in the X, Y and Z directions to determine the correct directions for the measurements.

 Adjust the Rz angle so that the robot jogs in the correct X direction when the Tool Coordinates is active. Refer to the gripper tool +X direction shown in the examples of *Fig.4-2 "Gripper TCP Examples"*.



The Teach Tool needs to have the same tool angles as the Box Gripper (Rx, Ry, Rz)

3. Enter the tools weight, center of gravity and inertia data. This data should be entered for the heaviest payload with the products in the gripper.

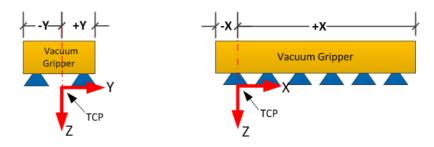


To obtain the best performance and speed optimization, all fields (weight, center of gravity, and inertia) in the tool mass section should be entered.

4. Verify the tool was setup correctly by pressing the [Rz] button in the tool coordinates. The tool should rotate about the TCP defined. If not, check the measurements in step one.

Fig. 4-2: Gripper TCP Examples

Fig. 4-2(a): Vacuum Gripper Help



- PalletSolver
- 4 Setup Procedure
- 4.1 Setup Gripper

Fig. 4-2(b): Clamped Fixed Edge Gripper Help

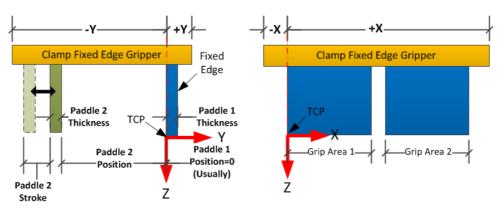


Fig. 4-2(c): Clamp Moving Edges Gripper Help

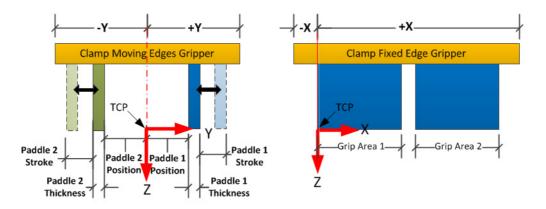
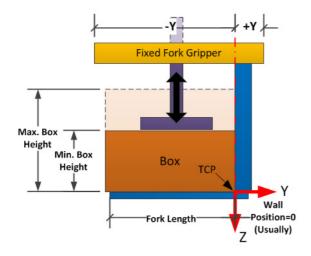
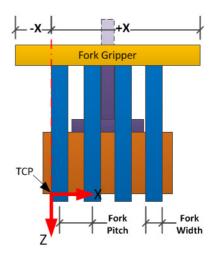


Fig. 4-2(d): Fixed Fork Gripper Help

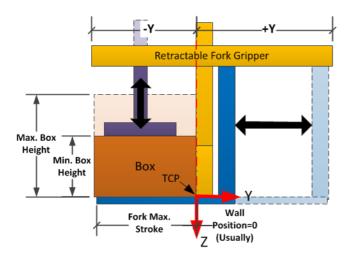






- 4 Setup Procedure
- 4.1 Setup Gripper

Fig. 4-2(e): Retractable Fork Gripper Help



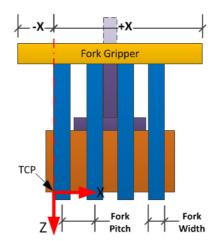
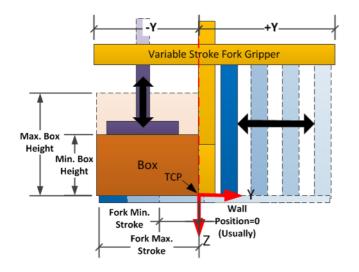


Fig. 4-2(f): Variable Stroke Fork Gripper Help



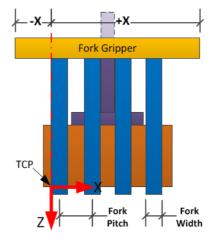
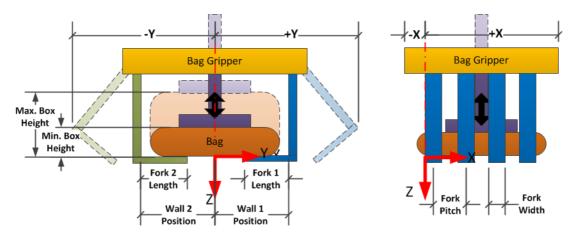


Fig. 4-2(g): Bag Gripper Help



PalletSolver

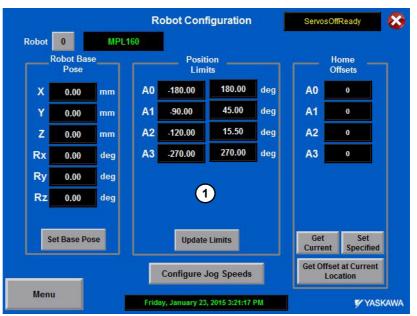
- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.2 Tool Rotation Limits

Reduce the T-axis rotation limits (last robot axis) to prevent damage to the gripper harness.

1. Enter the new limits on the MLX200 Robot Configuration screen, and press the [Update Limits] button to save the settings.

Fig. 4-3: Changing T-Axis Rotation Limits



4.1.3 Set Alias to PLC I/O Boards for Gripper Control

Setup the Alias for the input and output boards which will interface to the gripper. Select the correct local IO board (data type) and slot number, as shown *Table 4-1*.

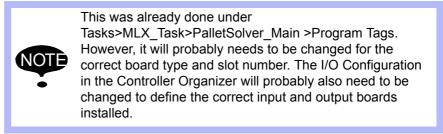


Table 4-1: Setup Alias	for Input and Output Boards
------------------------	-----------------------------

Name	Alias For 📃 🛛	Base Tag	Data Type
⊞-Gripper_OutputCard	Local:2:0.Data(C)	Local:2:0.Data(C)	INT
⊞-Gripper_InputCard	Local:1:I.Data(C)	Local:1:I.Data(C)	INT

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- 4 Setup Procedure
- 4.1 Setup Gripper

These boards will be used for all the gripper inputs and outputs.



The standard PalletSolver software provides a setup for one input and one output PLC card to control all I/O of the gripper. Each card can have 32 I/O points. If more outputs are required for a very large gripper, the

G20_AreaID_Outputs and G28_Gripper_Output_Execute routines in the PalletSolver_Main task can be modified to provide access to additional PLC output cards. One option is to assign a certain range of Grip Area IDs to each card.

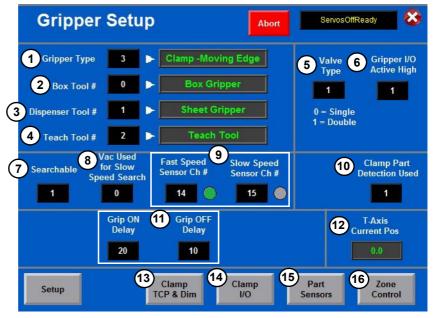


- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.4 Setup Gripper Parameters

From the PalletSolver Setup screen, press [Gripper]. For each of the black data entry fields, enter the correct information about the gripper installed. These items are explained below.

Fig. 4-4: Gripper Setup Screen



① <u>Gripper Type</u> - Choose the gripper type number that correspond to the gripper defined for this cell in the Offline pattern generator software. The type name will be displayed to the left.

- 1.Vacuum
- 2.Clamp -Fixed Edge
- 3.Clamp -Moving Edge
- 4.Fork -Fixed
- 5.Fork -Retractable
- 6.Fork -Variable
- 7.Bag Gripper
- ② Box Tool Number Set the tool number that will be used for the box gripper TCP. The tool name will be displayed to the left.
- ③<u>Dispenser Tool Number</u> Set the tool number that will be used for the sheet gripper.
- ① Teach Tool Number Set the tool number that will be used for teaching user frames.
- S <u>Valve Type</u> Set the solenoid valve type. (0=Single, 1=Double) A double valve type will require an output channel to turn on and an output channel to turn off the valve.
- (6) <u>Gripper I/O Active High</u> This setting can be used to invert the output logic. (0=Vac ON with low signal, 1= Vac ON with high signal)
- \bigcirc <u>Searchable</u> Indicates whether the gripper has a fast speed and a slow speed sensor to search for the top sheet of a dispenser. If this is set to 1, items 8 and 9 will be visible.



- Setup Procedure
- 4.1 Setup Gripper

4

- In this is the second secon
- ③ Fast/Slow Speed Channel #s Input channel numbers for the grippers sensors that will be used during a search. The indicators to the right will show the status of the sensors.
- Clamp Part Detection Used (Clamp Grippers) Set this to a "1" if the grippers side clamp or top clamp will be used to detect whether a part is present. After turning on the clamp, if it travels the full motion to the position where the clamp closed sensor turns on, the part is not present. For a part to be present, both the clamp on and off sensors need to be off. The clamp part detection option can be used with or without the addition of optical part sensors.
- *Item not shown:* If a different gripper is selected for item ①, an additional option will appear:
- ⊗<u>Bypass Used</u> This is an option for large vacuum pump system that will over heat if there is no product on the gripper. The Bypass valve will be turned ON whenever there is no product on the gripper.
 - <u>Bypass On and Off Ch #</u> If the Bypass option is used, enter the output channels to turn on and off the valve.
- Fig. 4-5: Bypass On and Off Ch #



- ⊗ <u>Top Clamp Used (Fork Grippers)</u> Set this to a "1" if there is a top clamp installed on the gripper. Some bag grippers do not have this top clamp.
- Fig. 4-6: Top Clamp



- ① <u>Gripper Delays</u> Depending on the gripper type selected for item (1), a set of delays will appear. The list below shows the various delays (ms) that will be displayed:
 - Vacuum, Clamp and Fork Grippers
 - <u>GripON Delay</u> starts when the robot arrives at the Pick position.
 After the delay, the robot will begin its depart motion.
 - <u>GripOFF Delay</u> starts when the robot arrives at the Place position. After the delay, the robot will begin its depart motion.

- 4 Setup Procedure
- 4.1 Setup Gripper
 - Bag Grippers
 - <u>Moving Grip ON Delay</u> starts when the robot leaves the Approach Pick position. After the delay, the gripper will be turned on.
 - Moving Clamp ON Delay starts when the robot leaves the Pick position. After the delay, the top clamp will be turned on. For most grippers, this will be set to 0.
 - Moving Grip OFF Delay starts when the robot leaves the Approach Place position. After the delay, the gripper will be turned off.
 - Moving Clamp OFF Delay starts when the robot leaves the Approach Place position. After the delay, the top clamp will be turned off.
- ⁽²⁾ <u>T-Axis Current Pos</u> Displays the current axis angle of the T-axis.
- [] [Gripper TCP & Dim] Button to access the TCP and Dimensions setup screen for the particular gripper type chosen.
- Image: Gripper I/O] Button to access the I/O setup screen for the particular gripper type chosen.
- (B[Part Sensors] Button to access the Part Sensor screen to define input channels (used for all gripper types)
- [6] [Zone Control] Button to access the Zone Control screen to test each virtual gripper (used for vacuum and clamp grippers)



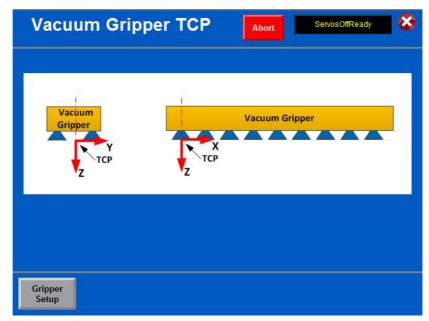
4.1 Setup Gripper

4.1.5 Gripper TCP and Dimensions Setup

The majority of the gripper dimensions were defined in the Offline pattern generator software. For the Online side, only a few additional dimensions need to be entered, depending on the gripper type. The TCP pictures on the HMI should be used as a reference. These TCP locations were only recommended, and the location on the gripper could be changed. The important note is that the Online TPC location needs to match the Offline TCP location, defined in the pattern generator software.

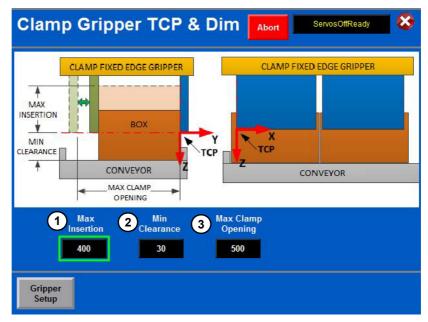
4.1.5.1 Vacuum Gripper TCP

Fig. 4-7: Vacuum Gripper TCP



4.1.5.2 Clamp Gripper TCP & Dimensions

Fig. 4-8: Clamp Gripper TCP & Dimensions

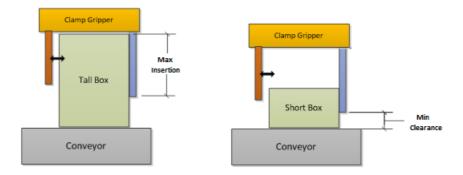


- 4 Setup Procedure
- 4.1 Setup Gripper
- ① <u>Max Insertion</u> Enter the max contact length of the paddle that can be used to grip the box. If the paddles are different lengths, take a measurement on the paddle that hangs the lowest.
- ②<u>Min Clearance</u> Enter the minimum distance above the conveyor that the bottom of the paddle can be lowered to before picking up the box.
- ③<u>Max Clamp Opening</u> Enter the distance between the clamps when they are open.



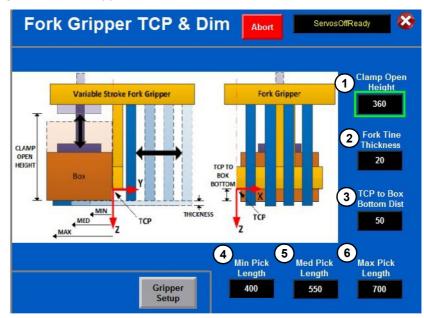
Fig. 4-8 shows the unique case where the box height happens to be exactly equal to the sum of the Max Insertion and the Min Clearance lengths. See *Fig. 4-9* for cases where this is not true.

Fig. 4-9: Clamp Gripper Examples for Tall and Short Boxes.



4.1.5.3 Fork Gripper TCP & Dimensions

Fig. 4-10: Fork Gripper TCP & Dimensions



4.1 Setup Gripper

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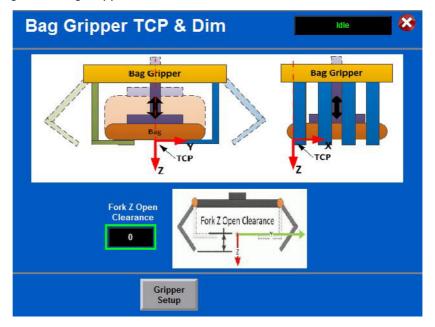
- ② Fork Tine Thickness Enter the height of the fork blades. This will be used while placing the box on the build to prevent contact with other boxes below the placement.
- ③<u>TCP to Box Bottom Distance</u> Enter the Z distance from the defined TCP to the bottom of the box.
- ④ <u>Min Pick Length</u> Enter the length of the fork blade under the box when the gripper is activated to the min pick position. (used for variable forks)
- S<u>Med Pick Length</u> Enter the length of the fork blade under the box when the gripper is activated to the med pick position. (used for variable forks)
- (6) <u>Max Pick Length</u> Enter the length of the fork blade under the box when the gripper is activated to the max pick position. (used for all fork grippers.)



Depending on gripper type, some of the pick lengths will not be shown. If one of the fork positions is shown, but not used, set the length to zero to disable it.

4.1.5.4 Bag Gripper TCP

Fig. 4-11: Bag Gripper TCP



① Fork Z Open Clearance - Defines the extra clearance distance needed when the fork is open.

- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.6 Gripper I/O (Grip Areas)

For each grip area ID, the input and output channels will be defined to control the functionality of the gripper. These channel numbers will be used to interface the PLC I/O boards that were aliased in *Section 4.1.3 "Set Alias to PLC I/O Boards for Gripper Control"*.

4.1.6.1 Vacuum Gripper I/O

Fig. 4-12: Vacuum Gripper I/O



- ① <u>Total Grip Area IDs</u> Enter the total number of grip areas that were setup for this gripper (32 max).
- ②<u>Vac On Output Ch #</u> Enter the channel number that will turn on the vacuum at this grip area ID.
- ③<u>Vac Off Output Ch #</u> Enter the channel number that will turn off the vacuum (displayed when gripper valve type = 1, or double).
- ④[Vac On / Vac Off] Buttons to manually turn on and off this grip area. These buttons are only available in the Manual mode.



When the vacuum is turned off, the blowoff output will be pulsed for the amount of time defined.

- S <u>Blowoff Output Ch #</u> Enter the channel number that will turn the on the blowoff.
- ⑥Blowoff Used This will enable and disable the blowoff function. (1=enabled)
- ⑦<u>Blowoff Time (ms)</u> Enter the amount of time that the blowoff will pulse when vacuum is turned off.



- 4 Setup Procedure
- 4.1 Setup Gripper

Grip Area ID	Vac On Output Ch #	[Activate]	
1	0	Vac ON	Blowoff Used
2	3	Vac ON	0
3	6	Vac OFF	
4	9	Vac ON	
5	12	Vac OFF	
6	15	Vac ON	

Fig. 4-13: Vac Gripper I/O with Single Valve Type and Blowoff Disabled

The example screen in Fig. 4-13 shows the case where the gripper valve type is set to single on the Gripper Setup screen, and the blowoff is disabled. These settings will remove some columns from the display.

NOTE

The active buttons will only be displayed when the MLX state is in HOLD, ABORT, or in the TEACH mode.

Fig. 4-14: Vac Gripper I/O with Max 32 Grip Areas

Vac	I/O	Total Grip Area IDs	32	Abort	tializing 🦉
Grip Area ID	Vac On Output Ch #	Vac Off Output Ch #	[Activate]	Blowoff Output Ch #	
1	0	1	Vac ON	2	Blowoff Used
2	3	4	Vac ON	5	1
3	6	7	Vac OFF	8	
4	9	10	Vac ON	11	Blowoff Time (ms)
5	12	13	Vac OFF	14	35
6	15	16	Vac ON	17	
7	18	19	Vac ON	20	
8	21	22	Vac ON	23	
Gripper Setup				p Area Grip Are 9-16 ID 10-2	

The example screen in Fig. 4-14 shows the case where there are 32 grip areas. At the bottom of the screen, there are buttons to access different sets of eight grip areas.



PalletSolver

- 4 Setup Procedure
- 4.1 Setup Gripper
- 4.1.6.2 Clamp Gripper I/O

Fig. 4-15: Clamp Gripper I/O

1	8	- Contraction of the local division of the l		Input Ch #	Input Ch #
		9	CLOSE	8	9
2	10	11	CLOSE	10	11
3	12	13	OPEN	12	13
4	14	15	CLOSE	14	15 🔵

- ① <u>Total Grip Area IDs</u> Enter the total number of grip areas that were setup for this gripper (8 max).
- ② <u>Close and Open Output Ch #s</u> Enter the channel numbers that will close and open the clamps.
- ③[CLOSE / OPEN] Button to manually close and open the clamps in this grip area.
- ④ <u>Closed and Opened Input Ch #s</u> Enter the channel numbers of the sensors that detect whether the clamp is closed or opened.







- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.6.3 Fork Gripper I/O

Fig. 4-16: Fork Gripper I/O

Grip Area ID 1	Fork -Min	Fork -Med	Fork -Max	Fork-Back	Clamp Down	Clamp
Output Ch	2 0	1	2	4	5 5	6
[Activate]	3 MIN	MED	MAX	ВАСК	6 CL	DSE
Input Ch #	0	1	2	4	5	6
	4	0	•	0		0
Grip Area ID 2	Fork -Min	Fork -Med	Fork -Max	Fork-Back	Clamp Down	Clamp
Output Ch #	7	8	9	10	11	12
[Activate]	MIN	MED	MAX	BACK	OP	EN
Input Ch #	7	8	9	10	11	12

- ① <u>Total Grip Area IDs</u> Enter the total number of grip areas that were setup for this gripper (2 max).
- ② Fork Position Output Ch #s Enter the channel numbers which will activate the gripper fork to the corresponding position (Min, Med, Max or Back).



Depending on the fork gripper type selected, some of the columns might not be shown.

- ③[MIN], [MED], [MAX] and [BACK] Buttons to manually activate the fork to one of the positions.
- ④ Fork Position Input Ch #s Enter the channel number of the sensor that will detect the forks actual position (Min, Med, Max or Back).
- ⑤ <u>Clamp Down and Up Output Ch #s</u> Enter the channel numbers that will close and open the top clamp.
- ⁶[CLOSE / OPEN] Button to manually close and open the top clamp.
- ⑦ <u>Clamp Down and Up Input Ch #s</u> Enter the channel numbers of the sensors that will detect the top clamps down and up position.

PalletSolver

- 4 Setup Procedure
- 4.1 Setup Gripper
- 4.1.6.4 Bag Gripper I/O

Fig. 4-17: Bag Gripper I/O



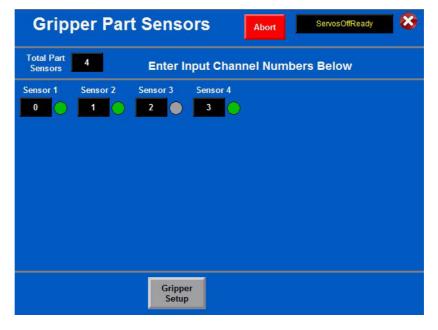
- ① <u>Close and Open Output Ch #s</u> Enter the channel numbers that will close and open the clamps.
- ②[CLOSE / OPEN] Button to manually close and open the clamps.
- ③<u>Closed and Opened Input Ch #s</u> Enter the channel numbers of the sensors that detect the clamp is closed or opened.
- ④ <u>Clamp Down and Up Output Ch #s</u> Enter the channel numbers that will close and open the top clamp.
- S[CLOSE / OPEN] Button to manually close and open the top clamp.
- ⑥ <u>Clamp Down and Up Input Ch #s</u> Enter the channel numbers of the sensors that will detect the top clamps down and up position.

4.1 Setup Gripper

4.1.7 Part Sensors

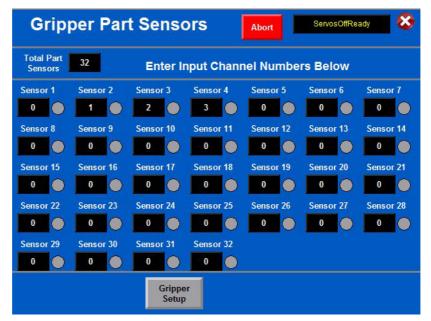
The input channel for each part sensor needs to be entered. A single part sensor could be used with a combination of grip areas. These channel numbers will be used to interface the PLC Input board that was aliased in *Section 4.1.3 "Set Alias to PLC I/O Boards for Gripper Control".*

Fig. 4-18: Gripper Part Sensors



- ①<u>Total Part Sensors</u> Enter the total number of part sensors that installed on this gripper (32 max).
- ② Sensor x Ch # Enter the channel number of the sensor that will detect a box present.

Fig. 4	-19:	Gripper	with	32	Part	Sensors
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The example screen in *Fig. 4-19* shows the case where there are 32 part sensors.



- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.8 Gripper Zone Control

A physical gripper can be configured into a multiple virtual grippers. Each virtual gripper can have a different number of zones (eight max). The virtual gripper configuration information is included in the pattern file, which is generated Offline. Therefore, number of virtual grippers is determined Offline. On the Gripper Zone Control screen, a virtual gripper number can be selected for testing purposes, and all of its corresponding zones will be shown.



All downloaded pattern files need to have the same gripper information for a particular cell.

Fig. 4-20: Gripper Zone Control



- ① <u>Total Number of Virtual Grippers</u> Indicator to show how many virtual grippers were defined Offline with the pattern generator software.
- ②<u>Virtual Gripper Test Number</u> Enter the virtual gripper number to test. The number of zones configured for this virtual gripper will be shown.
- ③[Turn ON/Turn OFF] Button to turn on and off this zone.
- ④ Parts Picked Indicator that shows that all part sensors are on for this zone and all gripper clamps are in the correct position for a gripped part.
- S <u>Drop Alarm</u> Indicator that shows a box was dropped during transit to a build station.



The Drop Alarm indicator will only be turned on in the Play mode during execution. This indicator will stay on until the zone is turned off and the alarm is reset.





- 4 Setup Procedure
- 4.1 Setup Gripper

4.1.9 Setup Dispenser I/O

The standard software is programmed to turn on all gripper grip area IDs when picking up a slip sheet or pallet from a dispenser. After lifting the sheet, all of the gripper sensors will be checked to determine a successful pickup. If this is desired, remove the [AFI] from the first rung in each of the followings routines.

- D01_Pallet_Gripper_Outputs
- D02_Check_Pallet_Gripper_Sensors
- D03_Slip_Sheet_Gripper_Outputs
- D04_Check_Slip_Sheet_Gripper_Sensors

If it is not desired to turn on all gripper grip area IDs and check all sensors when executing a dispenser cycle, modify the appropriate routines above for the desired I/O control.

4 Setup Procedure

4.2 Add PalletSolver IO Interface Tags to Customers PLC Job

4.2 Add PalletSolver IO Interface Tags to Customers PLC Job

The PalletSolver IO tags are located under the Controller Tags in the controller organizer. These tags can be controlled and monitored by a customer's PLC program. Almost all of the PalletSolver IO tags are being used by the standard HMI. However, there are a few tags that are required to be interfaced with a customer's PLC program to complete the setup process.



An example Customer_Job can be found in the Unscheduled Programs directory of the controller organizer.

4.2.1 Required PLC Interface Tags

Table 4-2: Required PLC Interface Required Tags

Тад	Descriptions
PalletSolverIO.NextPickSize[I] ^{a)}	Input (to customer PLC job) - Indicates the number of boxes that are required for the next pickup. The customer PLC job will use this number to queue up the correct number of boxes.
PalletSolverIO.PickupReady[I] ^{a)}	Output - When the correct number of boxes are ready for pickup at this station, the customer PLC job needs to turn on this tag. Note that for a single zone gripper, this tag could be tied directly to the sensor input.
PalletSolverIO.PickComplete[I] ^{a)}	Input - Indicates the pick was completed. This notifies the customer PLC job to setup the next queue of boxes. The PalletSolverIO.Pickup Ready[x] signal should be turn off, until it's valid again.

a [I]-Refers to the infeed station number



4.2 Add PalletSolver IO Interface Tags to Customers PLC Job

4.2.2 Required PLC Interface Tags When Sensors Are Used

Only the gripper IO is controlled and monitored by the standard PalletSolver software. All other system IO needs to be controlled and monitored by the Customers PLC job. This job needs to turn on PalletSolver IO tags when input conditions are satisfied, for item such as Pickup Ready, Dispenser Low/Empty, and Pallet Ready.

Table 4-3: Required PLC Interface Tags When Sensors Are Used

Тад	Description
PalletSolverIO.Dispr_LowSensorStatus[D] ^{a)}	Output - Indicates this dispenser low sensor is on.
PalletSolverIO.Dispr_EmptySensorStatus[D] ^{a)}	Output - Indicates this dispenser empty sensor is on.
PalletSolverIO.PalletReady[B] ^{b)}	Output - Indicates a pallet is in place and ready. Requirements for this condition could be a sensor on and a pusher operation complete.

a [D] - Refers to the dispenser station number

b [B] - Refers to the build station number

4.2.3 Optional PLC Interface Tags

There are many other PalletSolver IO tags that can be utilized in the customer PLC job for monitoring and cell control. The *Table 4-4* "Optional *PLC Interface Tags*" list a few examples of the more common options.

Table 4-4: Optional PLC Interface Tags	Table 4-4: C	ptional PL	_C Interface	Tags
--	--------------	------------	--------------	------

Тад	Descriptions
PalletSolverIO.PickDecision[I] ^{a)}	DINT Output - The customer PLC job can change the pick decision. (1-Override, 2-Round Robin, 3-Priority, 4-Ratio)
PalletSolverIO.PLC_PickOverride[I] ^{a)}	DINT Output - If the customer PLC job sets the pick decision to override, it needs to set this tag to the infeed station number that will be used for all box pickups.
PalletSolverIO.BuildComplete[B] ^{b)}	Input - Indicates the build station is complete. When there is an outfeed conveyor, this is a signal for the customer PLC job to start the pallet exit sequence.
PalletSolverIO.ResetBuildReq[B] ^{b)}	Output - If a new pallet is automatically brought into the cell by a conveyor, the customer PLC job can toggle this tag to reset the build complete status.

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4 Setup Procedure

4.2 Add PalletSolver IO Interface Tags to Customers PLC Job

Тад	Descriptions
PalletSolverIO.LockUnlockBuildReq[B] ^{b)}	Output - A build can be locked after it has been completed. If a new pallet is automatically brought into the cell, the customer PLC can use toggle this tag to unlock this build station when it's ready to start the next build.
PalletSolverIO.Dispr_SeachReq[D] ^{c)}	Output - Will force a search sequence. If a safety gate is opened, all dispensers will already be forced to perform a search.

a [I] - Refers to the infeed station number.

b [B] - Refers to the build station number.

c [D] - Refers to the dispenser station number.





4.3 Teach Positions

Teach Positions

4.3

Place the MLX200 in teach mode, activate the box gripper tool, and teach the two positions below in World Coordinates:

- Home Position Job 1 Teach Point 0
- Reject Drop Position (optional) Job 1 Teach Point 1
 - Approach Maintenance Position (optional) Job 1 Teach Point 2
 - Maintenance Position (optional) Job 1 Teach Point 3



- These positions must be taught in the World Coordinates with the Box Tool active.
- The Reject Drop and Maintenance positions are optional and not required for cell setup.

4.3.1 Home Position

The robot will move to the Home position at startup and return there during the palletizing when there are no boxes ready for pickup or during certain alarms. It's a good idea to teach the home position above the most important infeed, so it's ready for the next pick.

At startup, the safe homing sequence will move the robot slowly move up to a max global height to clear all cell objects and builds. Then it will move the gripper back towards the robot to the same radius around the robot that the home position was taught. At this point, the gripper will rotate the T-axis if it was wound up during the last cycle. Next the robot will move to the home position.

It is important to teach the home position at a radius from the robot where is it safe to to rotate the gripper in all directions. This gripper rotation should be clear of all obstacles at this radius for any angle around the robot.

4.3.2 Reject Drop Position

When the Reject Drop is defined and unlocked, the robot will automatically drop off unwanted boxes still in its gripper at the Reject Drop position after a miss pick or drop box alarm.

- 4 Setup Procedure
- 4.3 Teach Positions

4.3.3 Maintenance Position

If the Maintenance position is defined, the robot will move there when the [Stop Palletizing] button is pressed on the PalletSolver Control screen. Otherwise, the robot will move to the Home position.

Fig. 4-21: Setting Teach Positions



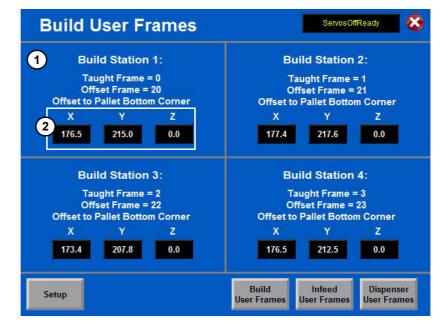


- 4 Setup Procedure
- 4.4 Teach User Frames

4.4 Teach User Frames

From the PalletSolver Setup screen, press [User Frames]. On this screen, the Build User Frames, Infeed User Frames, and Dispenser User Frames details can be accessed, by pressing the appropriate screen button at the bottom.

Fig. 4-22: Build User Frame



The "Offset Frames" needs to be the located as defined in Section 3.2.3 "User Frame Offsets" on page 3-6. For the infeeds, always define the offset frame at the box when it's located at the right side of the conveyor. If the box is actually enters the pickup on the left side or the center, the offline pattern generator will calculate the actual pickup position based on the conveyor width.

These screens can be a road map on which user frame number to teach for each station. Also refer to *Table 4-5*.



For each station, there is a taught user frame and a calculated offset user frame. Many times it is hard to teach the desired user frame on the cell hardware due to access and collisions. Therefore, it is possible to teach a user frame somewhere else on the station structure and define an XYZ offset distance to a desired location. If this offset is not required, it can be set to zero.

- 4 Setup Procedure
- 4.4 Teach User Frames

	USER FRAMES			
UF #	TAUGHT		UF #	OFFSET TO
0	Build 1 - Taught		20	Pallet 1 Bottom Corner
1	Build 2 -Taught		21	Pallet 2 Bottom Corner
2	Build 3 - Taught		22	Pallet 3 Bottom Corner
3	Build 4 -Taught		23	Pallet 4 Bottom Corner
4			24	
5	Infeed 1 - Taught		25	Infeed 1 Box Bottom Corner
6	Infeed 2 -Taught		26	Infeed 2 Box Bottom Corner
7	Infeed 3 -Taught	\Box	27	Infeed 3 Box Bottom Corner
8	Infeed 4 -Taught		28	Infeed 4 Box Bottom Corner
9			29	
10	Dispr 1 -Taught		30	Dispr 1 Stack Bottom Corner
11	Dispr 2 -Taught		31	Dispr 2 Stack Bottom Corner
12	Dispr 3 -Taught		32	Dispr 3 Stack Bottom Corner
13	Dispr 4 -Taught		33	Dispr 4 Stack Bottom Corner
14			34	

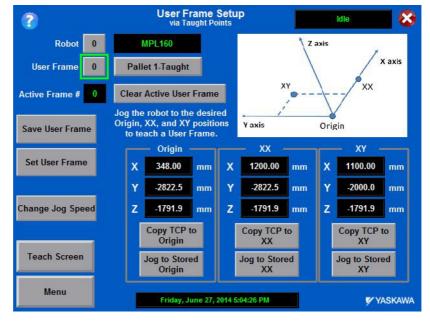
- 1. ①For each of the cells build, infeed, and dispenser stations, determine the frame to teach, which is shown on the User Frame setup screen (Fig. 4-23).
 - As shown in the Dispenser User Frames screen, the ٠ pallet dispensers are always dispensers 1 and 2. The slip sheet dispensers are dispensers 3 and 4, which correspond to the PalletSolver PC slip sheet dispensers 1 and 2. For dispensers, if there is a mechanism to lift or place the next pallet/slip so that it's at the same pick height, the frame should be taught at the top corner of the pallet/slip sheet, otherwise it should be taught at the bottom of the stack, as explained in Section 3.2.2 "Station Frame" on page 3-3.





- 4 Setup Procedure
- 4.4 Teach User Frames
- 2. Teach the required user frame number for each station.
 - Utilize the MLX200 User Frame Setup screen to teach the three positions for defining each user frame (Origin, XX and XY).

Fig. 4-23: User Frame Setup Screen



On the PalletSovler User Frame screens, complete the process by defining the following parameters

O<u>X</u>, <u>Y</u> and <u>Z</u> Offsets (see Fig. 4-22) - Defines the vector distance between the taught user frame origin and the desired user frame origin for that station type. Both user frames need to be orthogonal to each other.

4 Setup Procedure

4.5 Setup Parameters for Each Station

4.5 Setup Parameters for Each Station

For each station that is present in the cell, setup all parameters shown on that stations setup screen. This includes all build stations, infeed stations and pallet/slip sheet dispenser stations. The following sections will explain the data of each station type.

4.5.1 Build Station Parameters

From the PalletSolver Setup screen, press [Build Stations]. In each black data entry field, enter the correct data required for this cells configuration.

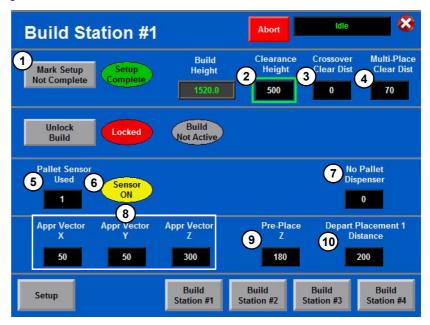


Fig. 4-24: PalletSolver Build Station Screen



- ①[Mark Setup Complete/Mark Setup Not Complete] After all parameters have been entered, press this button to indicate station is ready for execution. This button can be pressed again to indicate it's not complete.
- ②<u>Clearance Height</u> Enter the distance from the origin of the build user frame (bottom pallet corner) to the top of any obstacle near the build that needs to be traveled over to service this station.
- ③<u>Crossover Clearance Dist</u> Enter the distance between the top of the build to the bottom of the box being carried when the robot needs to crossover this build station to access another station in the cell.
- ④<u>Multi-Place Clear Dist</u> Enter the distance between the top of the build to the bottom of the box being carried when crossing over the build to make a second placement during that cycle.



- 4 Setup Procedure
- 4.5 Setup Parameters for Each Station
- S Pallet Sensor Used Enter a "1" to designate that a sensor is used to detect the pallet is in place.



If a sensor is used, the customers PLC job needs to detect the input, and set the PalletSolverIO.PalletRready[x].

- ⁽⁶⁾ Sensor OFF/ON If a sensor is used, this indicator will show the state of the PalletSolverIO.PalletReady[x] tag. This indicator disappears if a sensor is not being used.
- ⑦ <u>No Pallet Dispenser -</u> Enter a "1" if a pallet dispenser is not used for this build. For this case, the pallet will be manually set in place or with a device other than the robot.
- Appr Vector XYZ Enter the approach vector XYZ distances, which will be used before each drop off position. The PalletSolver PC Pattern Generator will define whether the X and Y elements will be used for this drop off. Sometimes neither will be used for a straight down approach.



Refer to *Chapter 5 "PalletSolver Motion Profile"* for a detailed description of the motion profile.

 Pre-Place Z - Enter the distance directly above the placement. The position will be traveled to after the approach position. At this point, the carried box will be right next to the stationary boxes, before it is placed downward.
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 downward.
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The Pre-Place Z distance needs to be less than height of the box. If a larger number is entered it will be changed to 90% of the box height during execution.

Depart Placement 1 Distance - Enter the distance the robot will raise up after placement



The Depart Placement 1 will be a short distance for a slow depart, and then it will travel faster to Depart Placement 2, which will be at a global clearance height for the next cycle.

- 4.5.1.1 Other Controls and Indicators on the Build Station Screen
 - <u>Build Height</u> Indicator showing the current build height, including the pallet, box layers and slip sheets.
 - <u>[Lock / Unlock Pallet]</u> Button to Lock or Unlock this build station to disable or enable execution at this build.
 - <u>Build Not Active / Active</u> Indicator showing when a cycle is executing on this build station.





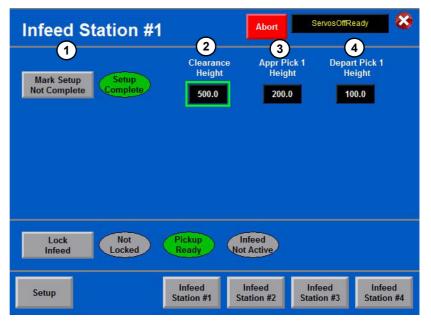
- 4 Setup Procedure
- 4.5 Setup Parameters for Each Station

4.5.2 Infeed Station Parameters

From the PalletSolver Setup screen, press [Infeed Stations]. For each black data entry field, enter the data required for this cell configuration.

4.5.2.1 Vacuum and Clamp Gripper Infeed Stations

Fig. 4-25: Infeed Station Screen - Vacuum and Clamp Grippers





Ensure the clearance height is slightly higher than any structure near this station to prevent a collision.

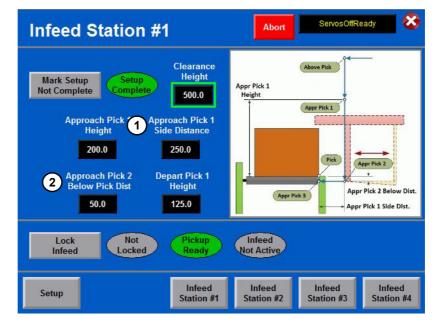
- ① <u>[Mark Setup Complete/Mark Setup Not Complete]</u> After all parameters have been entered, press this button to indicate that this station is ready for execution.
- ②<u>Clearance Height</u> Enter the distance from the origin of the infeed user frame to the top of any obstacle that needs to be traveled over to service this station.
- ③<u>Approach Pick 1 Height</u> Enter the distance above the pick position on the infeed for the approach position.
- Depart Pick 1 Height Enter the distance above the pick for departing. Refer to Chapter 5 "PalletSolver Motion Profile".





4.5 Setup Parameters for Each Station

- Other Controls and Indicators on the Infeed Stations Screen
 - <u>[Lock / Unlock Infeed]</u> Button to lock or unlock this infeed station to disable or enable execution at this infeed.
 - <u>Pickup Not Ready / Pickup Ready</u> Indicator showing status of the PLC tag, PalletSolverIO.PickupReady[x].
 - <u>Infeed Not Active / Active / Pick Complete</u> The Active indicator shows when a cycle is executing at this infeed station. After the robot leaves the station, the Pick Complete indicator will turn on, along with the PLC tag, PalletSolverIO.PickComplete[x]. When the cycle is complete, the indicator displays Not Active.
- 4.5.2.2 Fork Gripper Infeed Station
 - Fig. 4-26: Infeed Station Fork Grippers



The Fork Gripper Infeed screen has the same parameters as the clamp gripper with the addition of two more.

- ① <u>Approach Pick 1 Side Distance</u> Enter the Y distance from the infeeds user frame origin to the side of the roller conveyor for the Approach Pick 1 and Approach Pick 2 positions. This will prevent a collision with the side of the roller conveyor.
- ② <u>Approach Pick 2 Below Pick Dist.</u> Enter the Z distance below the infeeds user frame origin that the top of the gripper tine will lower to before moving underneath the roller conveyor. This will be used for the Approach Pick 2 and Approach Pick 3 positions. The Approach Pick 3 will be this distance directly below the Pick Position.

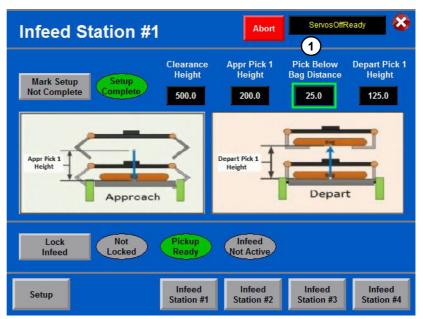


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PalletSolver

- 4 Setup Procedure
- 4.5 Setup Parameters for Each Station
- 4.5.2.3 Bag Gripper Infeed Station

Fig. 4-27: Infeed Station - Bag Grippers



The Bag Gripper will use the same parameters as the clamp gripper, with the addition of one more.

① <u>Pick Below Bag Distance</u> - Enter the Z distance below the bag on the roller conveyor. This will be use for the Pick position to allow the gripper jaws to completely close before lifting the bag off of the conveyor.



4.5 Setup Parameters for Each Station

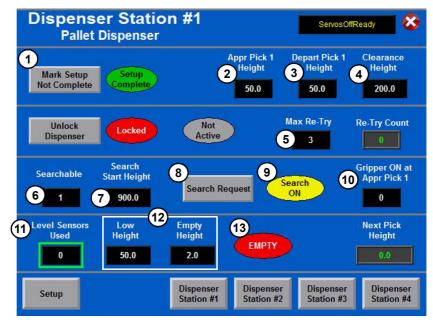
4.5.3 Dispenser Station Parameters

From the PalletSolver Setup screen, press [Dispenser Stations]. For each black data entry field, enter the correct data required for this cells configuration.



At the top of the screen, it will define whether this is a pallet dispenser or a slip sheet dispenser.

Fig. 4-28: Dispenser Station Screen



- ①[Mark Setup Complete/Mark Setup Not Complete] After all parameters have been entered, press this button to indicate that this station is ready for execution. Once this button is pressed the Setup Complete indicator lights.
- ② <u>Approach Pick Distance</u> Enter the distance above the pick for an approach position.
- ③ <u>Depart Pick 1 Distance</u> Enter the distance above the pick for the depart position. Refer to *Chapter 5 "PalletSolver Motion Profile"*



Ensure the clearance height is slightly higher than the structure to prevent a collision.

① <u>Clearance Height</u> - Enter the distance from the origin of the dispenser user frame (stack bottom corner) to the top of any obstacle that needs to be traveled over to service this station.

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- 4 Setup Procedure
- 4.5 Setup Parameters for Each Station
- SMax Re-Try Enter the number of times the robot should try an attempt to pick up a slip sheet or pallet. Every attempt will decrease the pick height slightly.
 - If Searchable = "0", and the max re-try is reached, a miss pick alarm is activated
 - If Searchable = "1", and max re-try is reached, a search sequence will be initiated.
- ⑤ Searchable Enter "1" to designate that there are high and low speed search sensors on the gripper. The search will be used to detect the top sheet after the dispenser has been refilled. After the pick, the next pick height will be decremented by the sheet thickness. The following picks will not require a search.
 - Enter "0" to designate that there are no sensors. For this case, all pallets or slip sheets will be picked at the same height. A mechanism will raise the next sheet after it receives the signal from the PalletSolverIO.DisprPickComplete[x] tag. (Customer PLC job)



- \bigcirc <u>Search Start Height</u> Enter the height from the dispenser frame origin, where the search motion will start.
- (8) [Search Request] If Searchable, this button will manually request a search for the next dispenser cycle. If any safety gate is opened, all dispensers will be requested to search. This operation can also be commanded by the customer PLC job with the PalletSolverIO.DisprSearchReq[x] tag
- ③ Search ON / OFF If Searchable, this indicator will display whether or not a search will be executed the next dispenser cycle.
- Image: Construction of the second second
- ① Level Sensors Used Enter "1" to designate that there are low and empty sensors to detect warning and alarm levels.
 - Enter "0" to designate that the next pick height will be compared to low and empty height levels that are entered



- Dow and Empty Heights If Level Sensors are Not Used, enter the low height for a warning and an empty height for an alarm condition.
- ⁽³⁾ Level OK / Low / Empty Indicates the status of the dispenser sheet level. If sensors are not used, the next pick level is compared to heights entered. If sensors are used, the customer PLC job will read the sensors and turn on PalletSolverIO.Dispenser_Low[x] and PalletSolverIO.Dispenser_Empty[x] tags.

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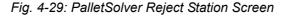


4.5 Setup Parameters for Each Station

- 4.5.3.1 Other Controls and Indicators on the Dispenser Station Screen:
 - [Lock / Unlock Dispenser] Button to Lock or Unlock this dispenser station to disable or enable execution at this dispenser.
 - <u>Not Active / Active / Pick Complete</u> Indicator showing when a cycle is executing at this dispenser station. After the robot leaves the station, the Pick Complete indicator will turn on, along with the PalletSolverIO.DisprPickComplete[x] tag.
 - <u>*Re-Try Count*</u> Indicator showing the re-try count if previous pickup attempts were unsuccessful. When the station is inactive, the count gets reset back to 0.
 - <u>Next Pick Height</u> Indicator showing the height the robot will pick from during the next dispenser cycle. If Searchable, this gets decremented a sheet height after each pick.

4.5.4 Reject Drop Station (Optional)

From the PalletSolver Setup screen, press [Reject Drop Station].



Reject Station	Abort ServosOffAborted ጰ
1 Mark Setup Not Complete	
2 Lock Reject Drop Station	
	Setup

- ①[Mark Setup Complete] If the optional reject drop position was taught in Section 4.3 "Teach Positions", press this button to confirm it was done.
- ② [Lock / Unlock Reject Drop Station] Button to Lock or Unlock the reject drop station. This will determine how to recover from miss picks and dropped box alarm, as discussed in Section 2.4 "Fault Recovery" on page 2-10

- 4 Setup Procedure
- 4.6 Download Build Patterns

4.6 **Download Build Patterns**

Setup Pattern File Directory 4.6.1

In order to download the pattern files (.xml) created by the PalletSolver PC Pattern Generator, a directory structure needs to copied to the HMI computer, which could be either a PC or a PanelView. A MobileView pendant is actually a PC that operates on Windows. Note that the PanelView requires a different parser.exe, because it operates on Windows CE. The corresponding directory structure was provided with the software package in a zip file.

4.6.1.1 PC or MobileView HMI Directories

- 1. Unzip "PC or MobileView Parser and Directories.zip".
- 2. Copy the "PalletSolver" directory to the C: drive of the computer.
- 3. Copy all the pattern files (.xml) that were created by the pattern generator into the directory below:

C:PalletSolver / Pattern XML Files /

- 4. Copy all the picture files (.png) that were created by the PalletSolver PC software into the directory below.
 - This includes each layer 2D picture and a final build 3D picture.
 - These pictures can be displayed on the HMI to help recover from a drop box alarm.

C:PalletSolver / Pattern Pictures /

5. Modify the IP address for the PLC Ethernet card in the file below:

C:PalletSolver / Pattern XML Files / IPAddress.ini

4.6.1.2 PanelView HMI Directories

For the PanelView option, the parser and drivers will be located in a "PalletSolver" directory on the root drive of the PanelView. All of the pattern files and picture files will be stored and accessed from a second "PalletSolver" directory, located on an USB drive connected to the PanelView.

- 1. Unzip "PanelView Parser and Directories.zip".
- 2. Create a "PalletSolver" directory on the root drive of the PanelView.
- 3. Copy the following files from the unzipped file to the PanelView directory on the root drive of PanelView:
 - / PalletSolver / PalletSolverParser.exe
 - / PalletSolver / IPAddress.ini
 - / PalletSolver / NLGX50CFRT.LIC
 - / PalletSolver / INGEAR.NET.InterfacesCF.dll
 - / PalletSolver / INGEAR.NET.LOGIXCF.dll
- 4. Copy the "PalletSolver" directory that was included in the unzip file to the USB drive that will be inserted to the PanelView.





5. Copy all the pattern files (.xml) that were created by the pattern generator into the directory on the USB drive shown below:

/ USB Storage / PalletSolver / Pattern XML Files /

6. Copy all the picture files (.png) that were created by the PalletSolver PC software into the directory below.

/ USB Storage / PalletSolver / Pattern Pictures /

7. Modify the IP address for the PLC Ethernet card in the file below, located on the PanelView drive:

/ PalletSolver / IPAddress.ini

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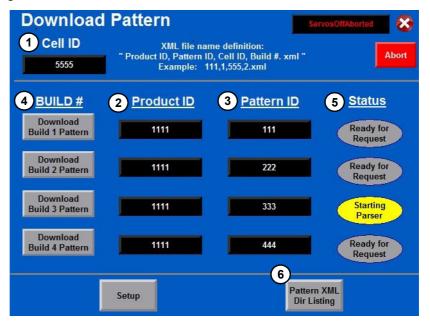
PalletSolver

- 4 Setup Procedure
- 4.6 Download Build Patterns

4.6.2 Execute Download to Build Stations

From the PalletSolver Setup screen, press [Download]

Fig. 4-30: PalletSolver Download Screen



The following steps need to be executed to download pallet pattern files. To view the pattern files that are available for downloading, press the ⑥ [Pattern XML Dir Listing] button.

- 1. Before a new pattern file can be downloaded to a build station, every station (infeed, build, dispenser) used for this build # needs to have its Setup screen "Marked Complete".
- 2. The build station needs to be disabled on the Setup screen by pressing the [Disable Build #] button. When disabled, it's download button will appear.
- 3. The ①Cell ID needs to be entered one time during the initial setup. This Cell ID must match the one used with the PalletSolver PC Pattern Generator.
- 4. Enter the ⁽²⁾Product ID for this build station.
- 5. Enter the ③Pattern ID for this build station.
- 6. Press the ④[Download Build x Pattern] button.



4.6 Download Build Patterns

- 7. After the download, the information will be checked for invalid data and alarms. If everything is ok, the build will automatically be enabled, which will make the download button disappear. If there is an alarm, it will be displayed under the Status column. Refer to the download status codes in *Section 4.6.3 "Download Status Codes*".
- 8. Press the [Unlock] button for this build station on the PalletSolver Control screen to begin execution.

4.6.3 Download Status Codes

During the download process, the Status indicator can show the following states:

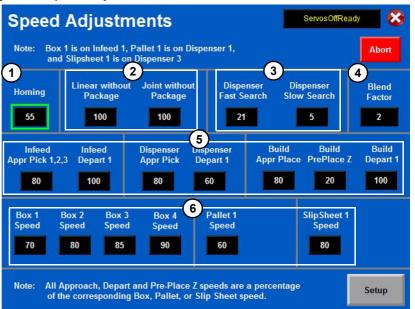
- Ready for Request indicates a new download can be requested.
- *Starting Parser* indicates it's trying to communicate with the parser. If for some reason the parser is not running, it will use an Active X and start the parser.
- Downloading indicates the download process has started.
- File Not Found alarm that the requested file could not be found.
- Failed to Load alarm that the data file was invalid.
- Same Infeed on 2 Builds alarm that another enabled build station is already using this infeed station. Note that each infeed station can only be assigned to one build station.
- *Build Station Not Defined* alarm that the build station is not setup yet.
- Infeed Station Not Defined alarm that the infeed station is not setup yet.
- *Dispenser Not Defined* alarm that the dispenser used for this build is not setup yet.
- *Build Set for No Pallet Dispr* the build setup indicated no pallet dispenser, but the download data included one.
- Capacities Exceed Max the station number from the PalletSolver PC is higher than max station number in the PLC.
- *Need License* the parser will not work unless the PalletSolver license was purchased for this MLX computer.

- 4 Setup Procedure
- 4.7 Speed Adjustment

4.7 Speed Adjustment

From the PalletSolver Setup screen, press [Speed Adjustments]. The speed of every segment of the robots motion can be individually adjusted. This can be tuned so that the motion for each build station can be performed at different speeds. It might be desirable to move heavy or fragile products slower than light products

Fig. 4-31: Speed Adjustment Screen



- 1 <u>Homing</u> The homing speed is normally a slower speed at startup and during fault recoveries.
- ②Linear and Joint without Package These speeds are performed when no product is in the gripper.
- ③ <u>Dispenser Fast/Slow Search</u> These speeds are used when the robot searches for the top pallet or slip sheet in a dispenser. The robot will move down at the fast speed until the fast search sensor turns on, and then moves at the slow speed until the slow search sensor turns on, where it will stop to pick the sheet.
- ③Blend Factor This blend factor will used or all motion cornering.
- S Approach / Depart / PrePlace Z These speed settings are used at the designated stations (Infeed, Dispenser and Build). Refer to Chapter 5 "PalletSolver Motion Profile" for a detailed description of each motion segment.



The Approach / Depart / PrePlace Z speed settings are a percentage of the corresponding box, pallet, and slip sheet speed that is downloaded from the PalletSolver PC pattern files. For example when the Speed Override is set to 80% on the PalletSolver Control screen, the Infeed Appr Pick Speed = 85% and the Box 1 Speed = 75%, the resultant speed for infeed #1 approach pick motion will be:

Actual Speed = 0.8 x 0.85 x 0.75 x 100 = 51% of max speed.



- 4 Setup Procedure
- 4.7 Speed Adjustment

⁽⁶⁾Box / Pallet / Slip Sheet Speeds - These speed settings were initially defined Offline with the PalletSolver PC software and downloaded with the pattern files. They can be changed after the download.



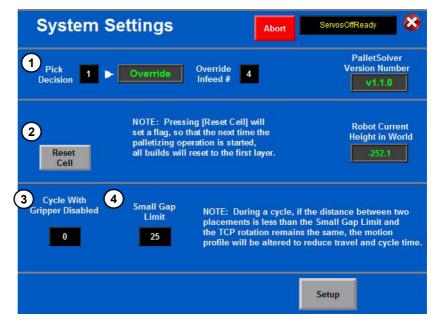
The Box, Pallet, and Slip Sheets speeds will only be shown if that corresponding station is defined (setup marked complete). In *Fig.4-31 "Speed Adjustment Screen"*, the second pallet dispenser and second slip sheet dispenser are not defined.

- 4 Setup Procedure
- 4.8 System Settings

4.8 System Settings

From the PalletSolver Setup screen, press [System Settings]. On this screen, a few global settings can be entered.

Fig. 4-32: System Settings



- ① <u>Pick Decision</u> This control is for determining which infeed to service next and is discussed in Section 2.3.1 "Pick Decision" on page 2-7
- ② [Reset Cell / Cancel Cell Reset] Pressing the [Reset Cell] button will set a flag to reset all builds to the first layer the next time the palletizing operation is started. This feature should be used at cell startup. The [Cancel Cell Reset] button can be pressed to deactivate the setting. When the flag is set, an indicator, "Cell Will Reset", will be displayed above the button, and on the PalletSolver Control screen, to provide a warning.
- ③<u>Cycle With Gripper Disabled</u> If this is set to "1", the gripper control and zone sensing will be disabled. This can be used to run a build pattern without actually picking up boxes.
- ④ Small Gap Limit (Vacuum grippers only) This limit is used to speed up multiple placements during a pick cycle. If the distance between two placements is less than the Small Gap Limit and the TCP rotation remains the same, the motion profile will be altered to reduce the travel and cycle time. The modified path will skip the Above Placement and the Approach Placement position.

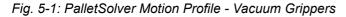
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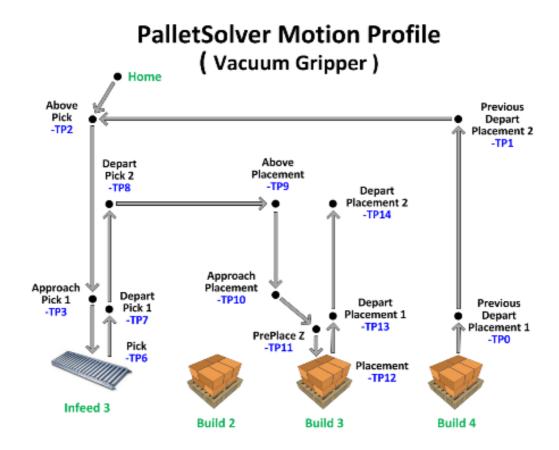
- 5 PalletSolver Motion Profile
- 5.1 Palletizing Motion Profile Explanation

5 PalletSolver Motion Profile

5.1 Palletizing Motion Profile Explanation

The MLX PalletSolver motion profile is a very simple concept. There are a total of only 15 teach points that are calculated to generate the motion for all pick cycles. For each cycle, there is a single pick and one or more placements. The pick could be at an infeed conveyor or at a dispensing station. For the case of multiple placements, some of the points are re-calculated for each drop sub-cycle.





Refer to the *Fig. 5-1* as the sequence is explained in detail. For a starting point, assume the robot just dropped off a box at Pallet 4. If no infeeds have boxes ready to be picked up, the robot will rise up to the PrevDepartPlacement 1 (TP0), and verify all boxes have been dropped off. If the gripper is empty, it will continue to the PrevDepartPlacement 2 (TP1) position, and wait. There is an option for the robot to move to a home position.

After a short time, the infeed conveyor 1 has boxes ready to be picked up. The PLC will check the global height of all stations between Pallet 4 and Infeed 1. If required, it robot will move up to a safe clearance height. The robot will move to the AbovePick (TP2) position, and move down to the ApprPick 1 (TP3) and then to the Pick (TP6) position.

Depending on the gripper type, the Approach Pick could be one to three positions (TP3-TP5). For a Clamp-Fixed and Fork gripper, the approach will be off to the side. The Fork grippers final approach position will be below the box. Refer to *Fig. 5-5*, Fig. 5-3, and Fig. 5-4 for the motion profile of the other gripper types.



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5 PalletSolver Motion Profile

5.1 Palletizing Motion Profile Explanation

After the box is gripped, the robot will lift the box to the DepartPick 1 (TP7) position, and verify all the required boxes are gripped. If the pick was successful, it will continue to raising to the DepartPick 2 (TP8) position, which is higher than all the station global clearance heights between Infeed 1 and Pallet 3. The robot will move the box to the AbovePlacement (TP9), lower it to the ApproachPlacement (TP10), move it a vector distance to Pre-Place Z (TP11), and then straight down to the Placement (TP12) position.

For a single placement, after it releases the boxes, the PLC will check all infeed stations for boxes ready to be picked up. If boxes are ready, the PLC will calculate the 15 positions for the next cycle, while still at the Placement position. If boxes aren't ready for pickup, the robot will raise up the DepartPlacement 1 (TP13), verify all boxes were removed and continue to the DepartPlacement 2 (TP14) position.

The next cycle will repeat the sequence in the same manner. Note that before the calculations, the DepartPlacement 1 (TP13), and the DepartPlacement 2 (TP14) positions get copied to the PrevDepartPlacement 1 (TP0) and PrevDepartPlacement 2 (TP1) positions.

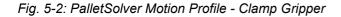
The complete cycle consists of two blended motion paths, each on a single rung. For an example, assume another infeed has boxes ready for pickup when the robot is at the placement position. The first blended motion moves to the Pick position (TP0-TP1-TP2-TP3-TP6). The second blended motion moves to the Place position. (TP7-TP8-TP9-TP10-TP11-TP12).

In the case of a multiple placement cycle, the sub-cycles after the first placement position will use fewer calculated teach points (TP0-TP1-TP9-TP10-TP11-TP12).

At startup, the Home position is copied to the PrevDepartPlacement 1 and PrevDepartPlacement 2 positions and the first cycle executes the same as other cycles. (green path)



- 5 PalletSolver Motion Profile
- 5.1 Palletizing Motion Profile Explanation



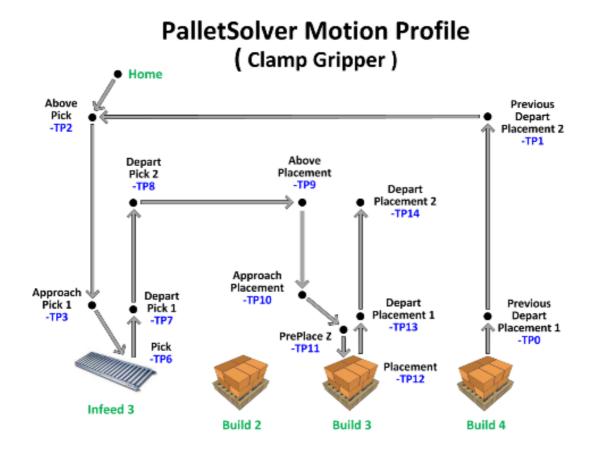
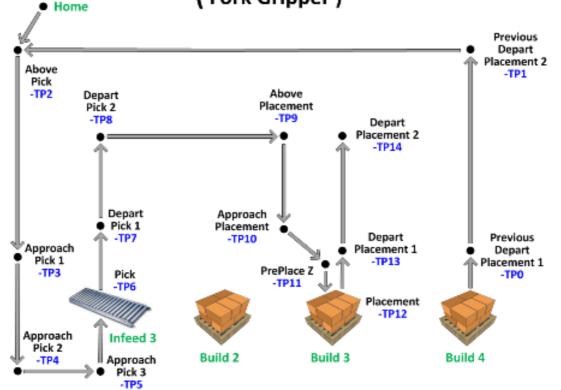


Fig. 5-3: PalletSolver Motion Profile - Fork Gripper



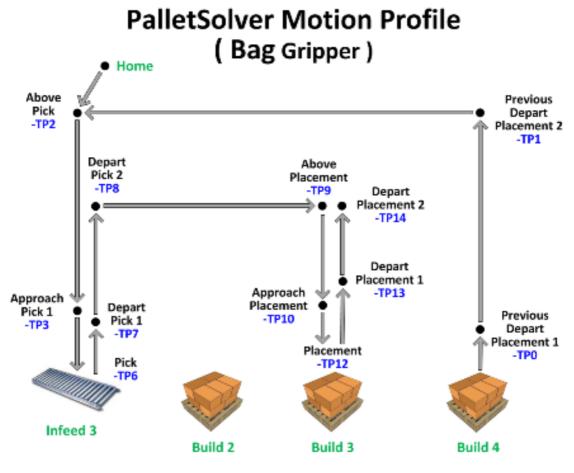


5-3



- PalletSolver
- 5 PalletSolver Motion Profile
- 5.1 Palletizing Motion Profile Explanation

Fig. 5-4: PalletSolver Motion Profile - Bag Gripper





5 PalletSolver Motion Profile

5.2 Single Stepping the Build Sequence in Play Mode

5.2 Single Stepping the Build Sequence in Play Mode

It is possible to single step the entire build cycle, by pressing [Step Pause] and [Step Continue] on the Main MLX200 screen. Typically, it's desirable to single step one build at a time, so set the Pick Decision to "Override". Start the palletizing motion in the play mode. To single step, press the [Step Pause] button, and the motion will execute all positions on the current blended rung. Therefore, the motion will stop at either a pick or the placement position. This includes all placement positions of a multi-placement cycle. To execute the next blended motion rung, press the [Step Pause] button to get motion started again and then the [Step Pause] button.

The [Hold] and [Restart] buttons are another option, but the motion will stop immediately. The [Step Pause] button permits the robot to finish the blended motion and stop at the pickup or placement position for verification of accuracy.

The [Abort] button can't be used to single step a build sequence, because the palletizing engine will stop. It is possible to continue the current motion path by using the startup steps: [Reset & Hold] > [Enable Servos] > [Restart]. This will maintain the motion queue and the robot will continue the execution of its current motion path. However, since the palletizing engine was not restarted on the PalletSolver control screen, the pick and place counters didn't get adjusted. Therefore, when the palletizing engine is re-started later, it will execute this pick cycle again and place new boxes on top of the existing boxes, causing a crash.



For the PalletSolver application, the [Reset & Hold] button should not be used to restart motion.



5 PalletSolver Motion Profile

5.3 Stepping Through Cycle Points in Teach Mode

5.3 Stepping Through Cycle Points in Teach Mode

With a good understanding of the motion profile, it is easy to stop the robots execution and step through all calculated teach points of the current cycle to verify positions. It is not recommended to use the single step buttons, because when the robot reaches the placement position, all the positions will be calculated for the next cycle. It is better to use the [Hold] and [Abort] buttons to save confusion on what cycle your are stepping through. After the robot is stopped, switch to the Teach mode, and use the Teach menu to step through the cycles positions. Press the arrow buttons to quickly access the next teach point.

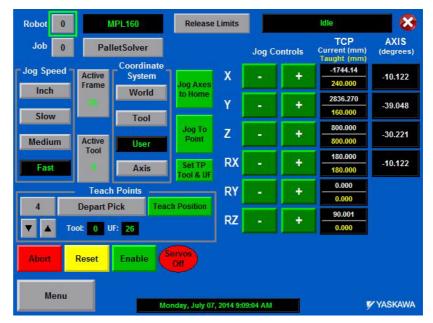


Fig. 5-5: Teach Point Screen

The calculated 15 teach points for each pick/place cycle are stored under Job 0, Teach Point 0 through Teach Point 14. Set the Coordinate System to [User]. Before jogging to each teach point, verify the Active User Frame and Active Tool are the same numbers as the ones shown under the teach points name. If they are not the same, press the [Set TP Tool & UF] button. This function will make the teach points user frame and tool the active ones. Whenever the robot moves between stations, the user frame will change. However, the first position (Above Pick or Above Placement) will be an axis move, which could make long sweeps to the opposite side of the cell possible. All the remaining motion commands are linear moves in a user frame.



The teach point user frame and tool number, displayed under the teach point name, are only used for reference on the conditions of how it was taught or calculated. Changing these numbers in the PLC tags has no effect on the positional data.

With the Coordinate System set to [User], press the [Jog to Point] button to move the robot to the teach point shown. If the robot goes in an undesired direction, it is probably because the correct user frame is not active. To correct this, press the [Set TP Tool & UF] button.



Appendix A

A.1 Alarms

Alarm Message	Remedy
Starting build and previous pallet is still present	Remove pallet, and re-start.
Starting build and no pallet present	If cell has no pallet dispenser, a pallet needs to be brought into the cell.
During execution, pallet was moved	Verify the pallet is in place and the sensor is working
Dispenser is Empty	Refill the dispenser
System Alarm while executing a transfer. Press [Repeat Cycle] or [Skip Cycle].	To recover from an system alarm, such as Abort, choose one of the recovery options. This will update the correct layer number and pick count.
Build #x Reject Drop. Clear current layer, press [Reset Reject Alarm], and unlock.	An automatic Reject Drop happened on this build station. Follow the steps in the alarm message to continue palletizing on this build.
Miss Pick Alarm - Choose a recovery option.	The pick was not successful. Choose one of the five recovery options.
Drop Alarm - Choose a recovery option.	A box was dropped while moving to a build. Choose one of the five recovery options.
Remove Boxes from Gripper, and Re-Start.	At startup, the gripper still has unwanted boxes in the gripper. Remove the boxes and restart.
Download Error - Build Station Not Defined	On the build station setup screen, enter all data, and press [Mark Setup Complete].
Download Error - Infeed Station Not Defined	On the infeed station setup screen, enter all data, and press [Mark Setup Complete].
Download Error - Dispenser Station Not Defined	On the dispenser station setup screen, enter all data, and press [Mark Setup Complete].
Download Error - Same Infeed Assigned to 2 Builds	The downloaded pattern file for a build station is using the same infeed that another build station is using. Disable the other build station, and then Enable the downloaded build station.
Download Error - Build has No Pallet Dispenser	The downloaded pattern file includes a pallet dispenser cycle, but on that build station setup screen, the "No Pallet Dispenser" setting is on.

CONTROLLER SETUP AND OPERATION MANUAL

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Specifications are subject to change without notice for ongoing product modifications and improvements.



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