Asyst Falcon™ 300mm Loadport Technical Manual with Installation Instructions

ASYST™

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P/N: 2000-6698-05

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Manual Information

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Asyst Technologies, Inc.
46897 Bayside Parkway
Fremont, California 94538
Telephone: (510) 661-5000
FAX: (510) 661-5166
Technical Support: 1-800-342-SMIF

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Acronym List

AGV	Automated Guided Vehicle
APHD	Active Pod Hold Down
ASCII	American Standard Coding for Information Interchange
CAN	Control Area Network
DSP	Digital Signal Processor
EMI	Electromagnetic Interference
EMO	Emergency (Machine) Off
ESD	Electrostatic Discharge
FIMS	Front-opening Interface Mechanical Standard
FOUP	Front Opening Unified Pod
K-Plate	Kinematic Plate (also referred to as FOUP Advance Plate)
MGV	Manually Guided Vehicle
OEM	Original Equipment Manufacturer
OHS	Overhead Hoist Shuttle
OHT	Overhead Transport or Overhead Hoist Transport
PCB	Printed Circuit Board
PN or P/N	Part Number
RFID	Radio Frequency IDentification
SEMI	Semiconductor Equipment and Materials International
SMIF	Standard Mechanical Interface

Revision History

This section gives an overview of the change history for the document.

Date	Author	Version	Revision Information
11/15/2007	Catherine Day	Ax1	Created using 2000-2414-05 Rev. C as a base.
1/10/2008	Catherine Day	Ax2WIP	WIP - Compiled for Mike F. Reference Only
3/21/2008	Catherine Day	Ax2	Compiled for training class. Huge gaps in Installation, Overview, Interfaces and Comm SW which we will attempt to fill during training week 3/24-28.
3/28/2008	Catherine Day	Ax3WIP	WIP - Compiled for Tou Vang. Reference Only
04/08/2008	Catherine Day	Ax3	Added redlines from Training class. Updated some images with Beta images. Added verifications steps after Service procedures. Added 100-240VAC Option. Added removal of FOUP Advance under cover to affected Service procedures. Fleshed out Overview Chapter.
04/18/2008	Catherine Day	Ax4	Added redlines and new input from Tou Vang, Mike Fahkrabadhi, Selby Sondergaard, Chi Yeh, Gary Durham, Grant Imper, Pranav Desai. Updated more images.
04/24/2008	Catherine Day	Ax5	Added redlines and new input from Tou Vang, Mike Fahkrabadhi, Selby Sondergaard, Matt Hoang. Updated more images.
5/30/2008	Catherine Day	Ax6	Added Content from Tou Vang, Mike Fahkrabadhi and drawings
7/11/2008	Catherine Day	Ax7	Expanded Software upgrade procedure and made it part of the Service Chapter. Added input from John Green and Pranav Desai. Made changes to all chapters and appendices. Incorporated Beta 9 Software release notes, in many case replacing existing content with info from the release notes. Changed multiple illustrations. Updated all Assembly drawings and PCB drawings.

Date	Author	Version	Revision Information
9/3/2008	Catherine Day	Ax8	Added input from John Greene, Duc Le, Bob Carlson, and Pranav Desai. Made changes to all chapters and appendices. Incorporated Beta 10 Software release notes. Updated all Assembly drawings and PCB drawings.
9/22/2008	Catherine Day	Ax9	FINAL DRAFT -Removed information duplicated in the Software Communications Manual and just reference that document. Added Remove and Replace instructions for the E84 and AC Power Options. Edited all service procedures to show new front panel removal. Updated all Assembly drawings and PCB drawings. Added customer cable routing for the E84 and AC Option to the Installation Appendix. Added Details about the Vertical Brake. Added comments/corrections from Chris Lueders, John Greene, Duc Le, Bob Carlson and Tou Vang. Added Specifications from Engineering and Matt Hoang.

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About this Manual

The Falcon Technical Manual is organized as follows:

Chapter 1, Safety Information, describes safety hazards related to operating and maintaining Falcon, as well as safety interlocks and. labeling.

Chapter 2, Product Overview, describes the major subassemblies and components of the Falcon, and includes technical data, specifications and typical operation sequence.

Chapter 3, Interfaces, includes a description of Falcon's indicator lights, FOUP Advance Activator Button, and Falcon Application Software.

Chapter 4, Service, provides detailed procedures to perform Preventive Maintenance, corrective service and software upgrade on the Falcon.

Chapter 5, Troubleshooting, provides an emergency pod removal procedure, a procedure for data collection, lists of error and alarm codes and messages as well as error modes and recommended corrective actions. An illustration showing factory default settings is provided for reference.

Appendix A, Installation Instructions, gives information related to installing Falcon to a Host Tool and initial set-up.

Appendix B, Communications Software, provides detailed information on ASCII communication.

Appendix C, Material Safety Data Sheet Information.

Appendix D, Wiring Diagrams.

Appendix E, PCB Drawings

Appendix F, Assembly Drawings. For Final Assembly and major subassemblies, such as the FIMS Door Drive and the FOUP Advance (Kinematic) Plate.

An Index is also provided in the back of the manual.

Conventions

The following keyboard conventions and terminology are used.

Example	Meaning
Bold	User action on keyboard keys or other objects are **bold**.
Choose	The word choose is used for menu choices. Submenus are separated by a >. For example: Choose File > Import > File...
Click	Refers to mouse actions. For example: Click the hand icon.
`Courier New Font`	Text displayed on the screen uses Courier New. DOS and windows path names are displayed in Courier New. For example: Use the `C:\Folder\SubFolder\SubFolder2` to access this file. Source code or DOS commands use courier new. Hexidecimal streams and examples.
Double quotes	Used when discussing or describing an action, functional word, or definition.
Folder	Used instead of Directory, unless discussing DOS movement commands.
Italic	Italics are used to show computer entry from the users keyboard or Teach Pendant.
Press	Shows action by a user on a key or physical button. For example: Press PF1, then type the file name.
Select	Used if the user is to pick from several choices. For example: Select the lot number from the list supplies.
Type	Shows entry. For example: Type the *Product Name* and *Model Number* at the top of the page. Press **Enter**.

Chapter 1: Safety Information

Introduction

Before attempting any operation or service on the Falcon, it is essential that the information presented in this chapter be read and thoroughly understood. Important information is provided regarding safety hazards that may be encountered while working with these Loadports.

Chapter Summary

This chapter addresses the following:

General Requirements

Warnings and cautions are used throughout this manual to identify potential hazards to personnel.

All warnings and cautions immediately precede the step or operation in which the hazardous condition may be encountered. All personnel operating or performing service on Asyst equipment must fully understand warnings, cautions, and all general safety regulations associated with electromechanical equipment.

Personnel should become thoroughly familiar with all aspects of safety for individuals and equipment prior to operating or performing service on this equipment.

General Safety

- Do not allow unauthorized or inexperienced personnel to operate the Falcon.
- Service personnel should follow standard cleanroom protocols.
- Ensure that another person in the area is aware that work is in progress on the tool, and can provide assistance in the event of injury.
- The Host Tool manufacturer's lockout/tagout procedures must be followed during installation or when service is performed on the Falcon to prevent injury or equipment damage.
- Refer to the appropriate Material Safety Data Sheets; contact information for obtaining MSDSs is located in this manual.
- Remove spilled materials immediately to prevent accidents.

Electrical Safety

- Do not bypass electrical interlocks or safety devices unless specifically required to within a procedure.
- Remove power from Falcon prior to performing any service procedure, unless otherwise specified.
- Remove power from Falcon prior to removing or inserting electrical connectors.
- Remove metal jewelry such as rings, chains, and watches.
- Stand on dry insulating mats when working with energized electrical equipment.
- Ensure that all test equipment and accessory electrical units are grounded to facility ground.

Responsibility

It is the responsibility of the Customer to comply with all local, state, and federal ordinances, regulations, and laws applicable to the installation and operation of this equipment.

Asyst Technologies, Inc. assumes no liability, whatsoever, for any personal injuries or damages resulting from the operation or service of this equipment in any manner inconsistent or contrary to the methods supplied in Asyst Technologies, Inc. literature including, but not limited to, manuals, instructions, bulletins, communications, and recommendations.

For emergencies and for product safety related matters, contact:

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46897 Bayside Parkway

Fremont, California, 94538

(510) 661-5000

Safety Tags

The manual includes the following alert categories. Note that the following are only examples; they do not indicate a specific hazard associated with the Falcon.

DANGER

EXPLOSION HAZARD

DANGERS ALERT PERSONNEL TO POTENTIALLY HAZARDOUS SITUATIONS WHICH, IF NOT AVOIDED, WILL RESULT IN SERIOUS INJURY OR DEATH.

WARNING

MECHANICAL HAZARD

WARNINGS ALERT PERSONNEL TO POTENTIALLY HAZARDOUS SITUATIONS WHICH, IF NOT AVOIDED, MAY RESULT IN SERIOUS INJURY OR DEATH.

CAUTION

LIFT HAZARD

STANDARD CAUTIONS—AS OPPOSED TO EQUIPMENT-DAMAGE CAUTIONS SHOWN BELOW—ALERT PERSONNEL TO POTENTIALLY HAZARDOUS SITUATIONS WHICH, IF NOT AVOIDED, MAY RESULT IN INJURY.

CAUTION

THESE CAUTIONS ALERT PERSONNEL TO SITUATIONS THAT MAY LEAD TO EQUIPMENT DAMAGE. FAILURE TO FOLLOW DIRECTIONS WILL RESULT IN DAMAGE TO THE EQUIPMENT AND/OR DAMAGE TO RELATED PRODUCTS (E.G., WAFERS) AND VOIDING OF WARRANTY.

Safety Requirements

ESD / EMI Precautions

The Falcon with its integrated AdvanTag is a certified Radiated EMI Class A product.

CAUTION

GENERAL HAZARD

FOR ESD AND EMI CONSIDERATIONS AND POWER SUPPLY PROTECTION, THE GROUND CABLE **MUST** BE PROPERLY INSTALLED.

The following instructions must be followed to provide ESD protection and reduced EMI emissions:

- A braided copper ground wire (minimum 12 gauge) with ring-lug connectors (sized for M5 screw) **MUST** be connected between the Falcon ground connection and the Host Tool power supply earth ground point.

NOTE . . .

CHANGES OR MODIFICATIONS TO THE FALCON, NOT EXPRESSLY APPROVED BY ASYST, COULD VOID THE USER'S WARRANTY.

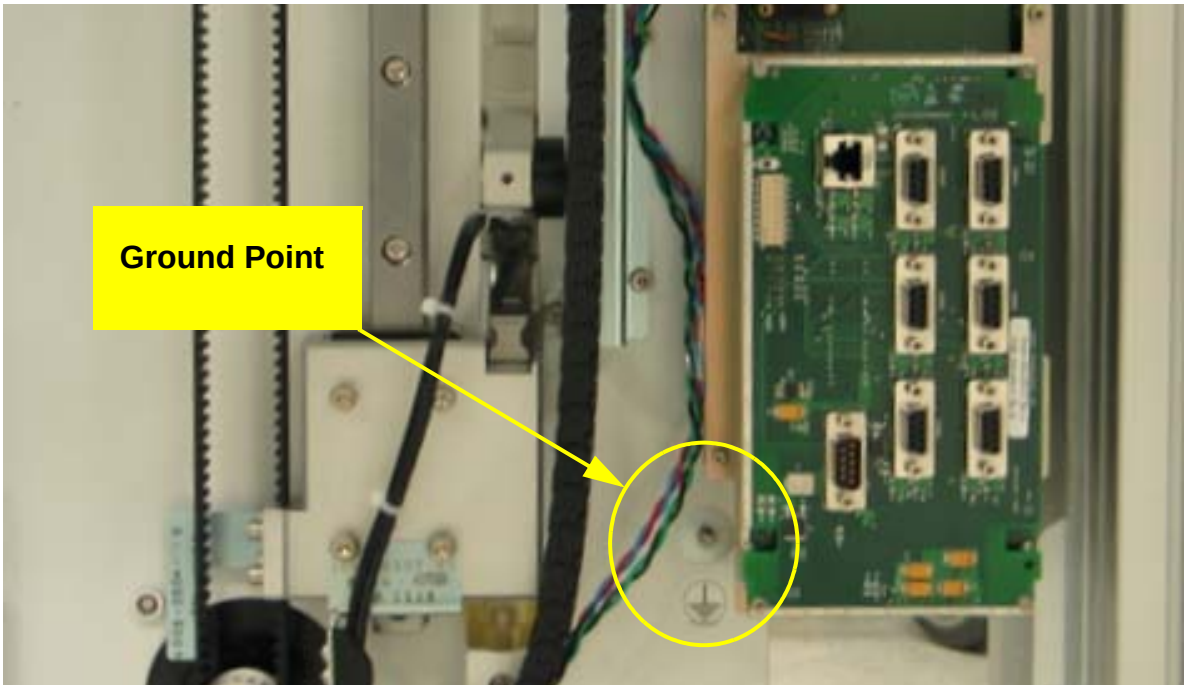


FIGURE 1 *Falcon Ground Point*

EMO & Electrical Power

Electrical power for the Falcon is supplied by the Host Tool. The main electronics are enclosed in the main electronic area, located inside the front cover of the Falcon. Power to the Falcon should be connected through the Host Tool EMO circuitry, and in the event of an emergency all power can be removed from the Falcon by depressing the red mushroom shaped EMO switch mounted on the Host Tool.

Lockout/Tagout

As determined by the Host tool owner, Lockout/tagout may be required on the Host tool when service is performed on the Falcon or when the Falcon is removed /replaced to prevent injury or equipment damage.

> ***NOTE . . .***
>
> LOCKOUT/TAGOUT OF THE HOST TOOL MUST BE PERFORMED BY THE HOST TOOL OWNER. ASYST SERVICE PERSONNEL ARE NOT PERMITTED TO PERFORM LOCKOUT/TAGOUT OF THE HOST TOOL.

Where no company procedures exist, follow the guidelines below:

_____1. Notify all affected employees and users that service is to be performed and that the Host tool needs to be shut down and locked out.

_____2. The circuit that provides power to the Host tool must be switched off. (This may require the Host Tool to be powered down.)

Requirements for circuit breaker provided by the customer: The overcurrent device and disconnect device provided for the Falcon should be rated for at least 10,000 RMS symmetrical amperes interrupting capacity.

_____3. Lock out the circuit with an assigned lock.

_____4. Test to make sure the Host tool cannot be turned on accidentally.

_____5. Tag the locked circuit with a statement indicating:

_____• Unauthorized operation of the equipment or removal of tag is prohibited

_____• Date of service performed

_____• Name(s) and contact information of the person(s) performing the service

Pinch Hazards

Normal Operation

There are no pinch hazards during Normal Operation of the Falcon.

During Service

WARNING

MECHANICAL HAZARD

MAINTENANCE PERSONNEL MUST KEEP HANDS AND FINGERS AWAY FROM ALL MOVING PARTS DURING MOTION OF THE FOUP ADVANCE PLATE OR THE PORT DOOR. FAILURE TO COMPLY MAY RESULT IN INJURY.

A pinch hazard exists during the opening/closing of the Port Door.

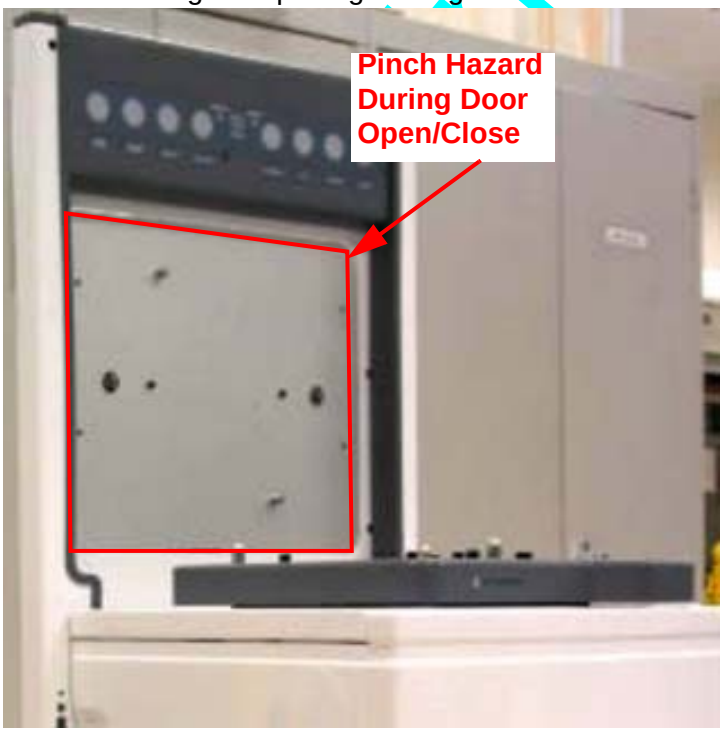


FIGURE 2 *Pinch Hazards During Service*

See " Safety Features" on page 15 for Safety Features designed to prevent Pinch Hazards.

WARNING

MECHANICAL HAZARD

FIMS DOOR MUST BE SECURED WITH THE SHIPPING BRACKET EVERY TIME A COMPONENT OF THE VERTICAL/HORIZONTAL DRIVE IS SERVICED. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY.

Install shipping bracket (Asyst P/N 4003-0842-01) to the FIMS Loadport Door and secure with 8 screws to both the FIMS door and the BOLTS Frame. See Figure 3.

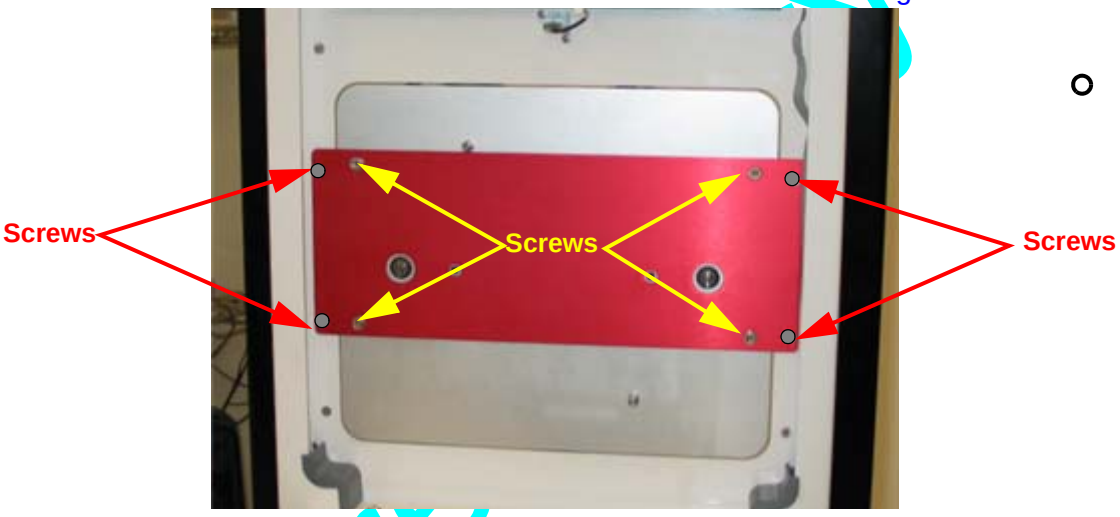


FIGURE 3 *Shipping Bracket Securing FIMS Door*

If Vertical Drive Belt is disengaged or broken the Vertical Drive may free fall creating pinch/crush hazards. All service procedures affecting the belt must use the FIMS door shipping bracket (Asyst P/N 4003-0842-01) to assure the Vertical Drive is immobilized. See Figure 4 on page 11 for affected areas.

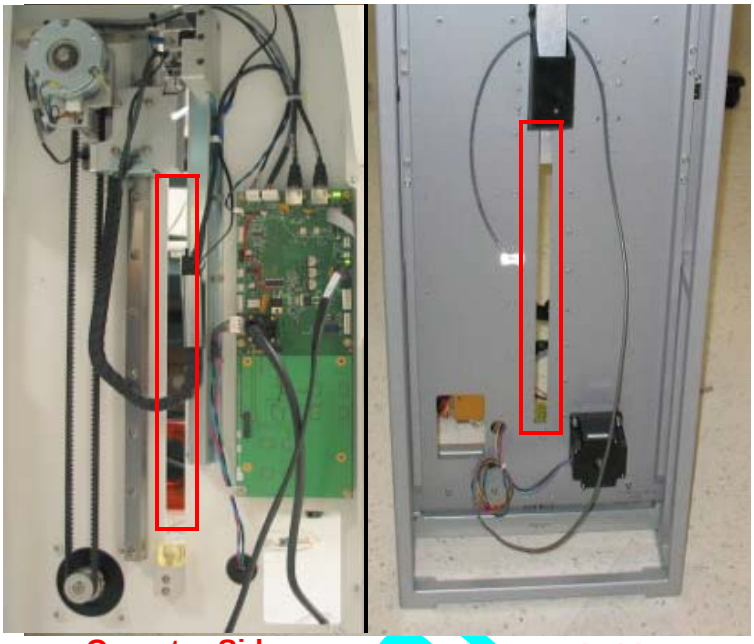


FIGURE 4 *Areas of Pinch/Crush Hazard*

During Installation

During installation, power to the Falcon must be off and the Host Tool in Lockout/Tagout so there are no electrical (current) or mechanical hazards.

Seismic

The position of the center of gravity (CG) will be shown in the forthcoming Outline Drawing. Figure 5 shows seismic attachment points for the Falcon. Follow all installation procedures to ensure compliance with SEMI S2: Safety Guidelines For Semiconductor Manufacturing Equipment, Seismic Requirements.

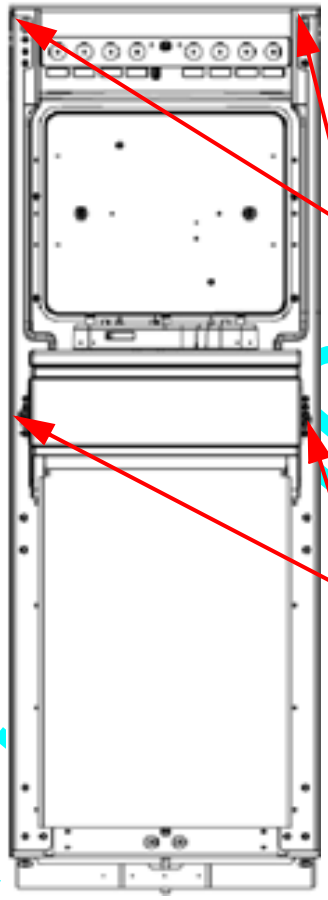


FIGURE 5 *Seismic Attachment Points*

Ergonomic

A fully loaded FOUP exceeds recommended limits for handling by one operator. To conform with SEMI S8, use of AGV, MGV, or OHS is recommended.

Options

Wafer Mapper Option

See “ Wafer Mapper Assembly Option” on page 40 for details.

100-240VAC Option

See “ 100-240VAC Power Option” on page 41 for details

E84/PIO/ Interlock Option

See “ E84/PIO/Interlock Option” on page 43 for details.

Tilt and Go Wheels Option

See “ Tilt & Go Wheels Option” on page 44 for details.

Agency Compliance

FCC

Definition

Class A digital device

A digital device that is marketed for use in a commercial, industrial or business environment, exclusive of a device which is marketed for use by the general public or is intended to be used in the home.

Compliance

The Falcon with its integrated AdvanTag 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

CAUTION

ANY CHANGES OR MODIFICATIONS TO THE FALCON INTEGRATED RFID WITHOUT SPECIFIC WRITTEN APPROVAL FROM ASYST TECHNOLOGIES WILL VOID FCC COMPLIANCE.

CE Mark

The Falcon with its integrated AdvanTag complies with the following directives:

- 2006/95/EC Low Voltage Directive
- 2004/108/EC EMC Directive
- 99/5/EC Radio & Telecommunication Terminal Equipment
- 98/37/EC Machinery Directive

Safety Features

DC Voltage

The Falcon operating voltage is +24 VDC. This voltage is considered non-hazardous and requires no mechanical power interlocks.

AC Option

If equipped with the 100-240VAC Option, the front cover has an electrical warning label which alerts the user to an electrical hazard located behind the Front Cover. Shutdown and lockout/tagout must be performed before opening the Front Cover. Also the front cover is secured with a screw.

Pinch Hazard

During normal operation there is no pinch hazard.

During Service, a number of design points ensure that Service personnel in manual mode are not exposed to hazards as described below:

Port Door

- Pinch hazards due to opening and closing of the Port Door.

  The combination of the FOUP placement detection, and the FOUP-at-Port switch provide an interlock to prevent a Port Door pinch hazard.

  The FOUP must be in place on the FOUP advance and then must fully advance to the port, sealing the port opening, before the Port Door will open during normal operation in Auto Mode.

  During Home Calibration, the Port Door, can move without a FOUP, but the motion speed is slow and easily avoidable.

FOUP Advance

- Although there is no pinch hazard due to FOUP Advance motion, the following safety feature is present:

  Current Limiting Circuit limits the amount of force that can be exerted by the FOUP Advance motion to a safe level. When FOUP comes in contact with an object the FOUP Advance motion will stop.

Moving and Handling

WARNING

TIP-OVER HAZARD

MOVING THE FALCON WITH A FOUP MOUNTED MAY CAUSE THE FALCON TO TIP AND FALL OR OTHERWISE BECOME UNSTABLE. INJURY AND/OR TOOL DAMAGE WILL OCCUR IF FALCON FALLS.

NEVER move the Falcon with a FOUP mounted. Always remove the FOUP before removing the Falcon from the Host tool, moving or installing the unit.

WARNING

TIP-OVER HAZARD

MOVING THE FALCON ON UNEVEN OR NON-LEVEL SURFACES MAY CAUSE THE FALCON TO TIP AND FALL OR OTHERWISE BECOME UNSTABLE. INJURY AND/OR TOOL DAMAGE WILL OCCUR IF FALCON FALLS.

The Falcon may have wheels; therefore, once it is removed from the shipping container it should be placed on a level surface. The extended portion of the shipping container base enables the Falcon to be removed from the shipping container in its vertical position.

Store and Move the Falcon only in Vertical Position

CAUTION

HANDLING OR BUMPING CERTAIN AREAS OF THE FALCON MAY RESULT IN DAMAGE TO THE FOUP ADVANCE, DOOR DRIVE, AND PORT DOOR ASSEMBLIES, AS WELL AS THE FRONT COVER.

When moving the Falcon Do NOT place hands on the top section of the FOUP advance assembly, the door drive assembly, or by the wafer mapper assembly.

When moving the Falcon, PUSH from the Tool Side ONLY, placing hands on the corners on the Tool SIde of the Falcon. See Figure 6.

FIGURE 6 *Tool Side Corners*

The Falcon is designed to be pushed from the Tool Side only. Do not pull from the Operator Side; do not push from the Operator Side except when mounting.

When moving the Falcon, use both hands to push at all times and push evenly. Keep all four wheels on the ground at ALL times. Do not tilt or rock the Falcon while moving and turning. Doing so may cause the Falcon to tip and fall.

Labeling

See Table 1 for a description of labels used on the Falcon. See Figure 7 on page 20, Figure 8 on page 21 and Figure 9 on page 22 for typical label locations.

TABLE 1 *List of Falcon Labels*

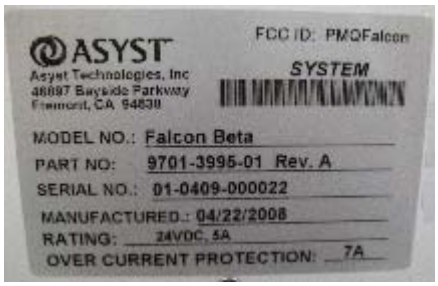
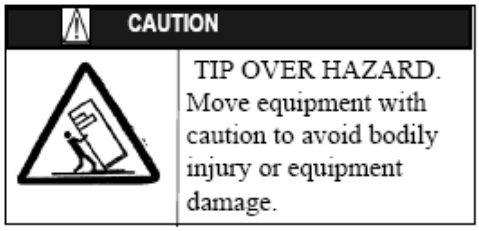
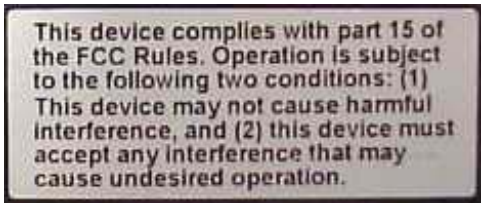
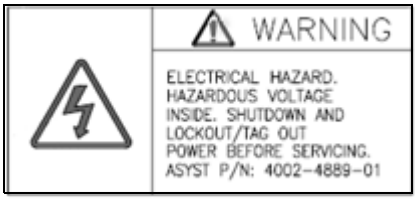
Label	Description/Location
Model/Serial Number Label 	The model and serial number label for the Falcon provides FCC ID and unit specific information required when contacting Asyst Technologies for any matter concerning the equipment.
Tip Over Hazard 	The Tip Over Hazard label is an alert to move the Falcon with caution. It is located above the port door on the Host Tool side.
Mechanical Hazard 	The Mechanical Hazard label is an alert to moving parts located behind the Cover with the label. Shutdown and lockout/tagout must be performed before opening the Cover. Both Vertical and Horizontal styles are used.
CE Label 	This label identifies equipment that conforms to testing and certification requirements of the European Community.

TABLE 1 *List of Falcon Labels*

Label	Description/Location
FCC Label 	The presence of the FCC label indicates compliance with FCC Rules and Regulations as specified on the Label.
Handle Corners Label 	This label identifies where to handle equipment.
Electrical Hazard Label 	The Electrical Hazard label is an alert to electrical hazard located behind the Front Cover when the Falcon is configured with the AC Power Option. Shutdown and lockout/tagout must be performed before opening the Front Cover. **FOR AC OPTION ONLY**
Pinch Hazard Label 	The Pinch Hazard label is an alert to moving parts located behind the Cover with the label.Shutdown and lockout/tagout must be performed before opening the Cover.
Ground Point Label 	The Ground Point Label indicates the Falcon grounding point use to connect earth ground wires from the Host tool.

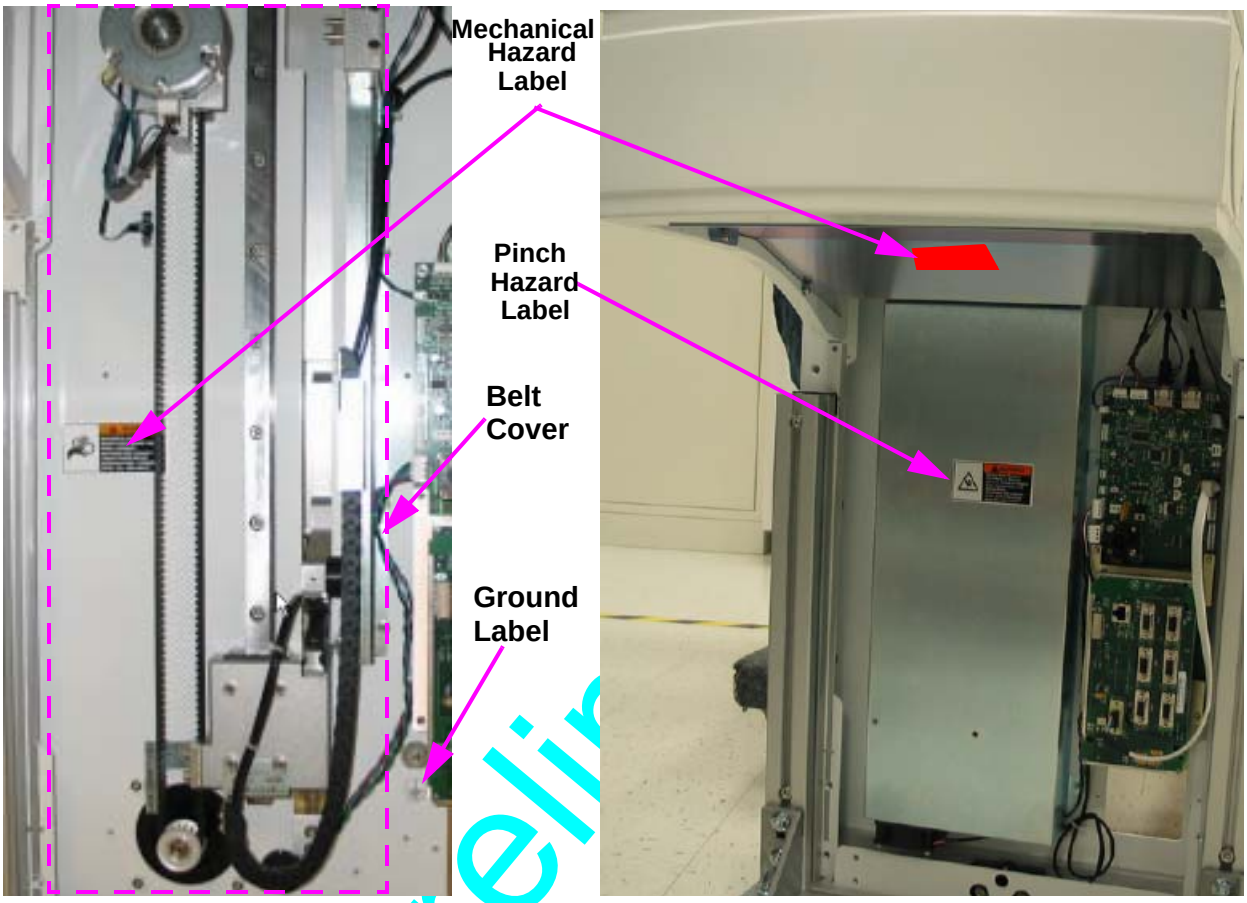


FIGURE 7 *Falcon Label Placement (Operator Side)*

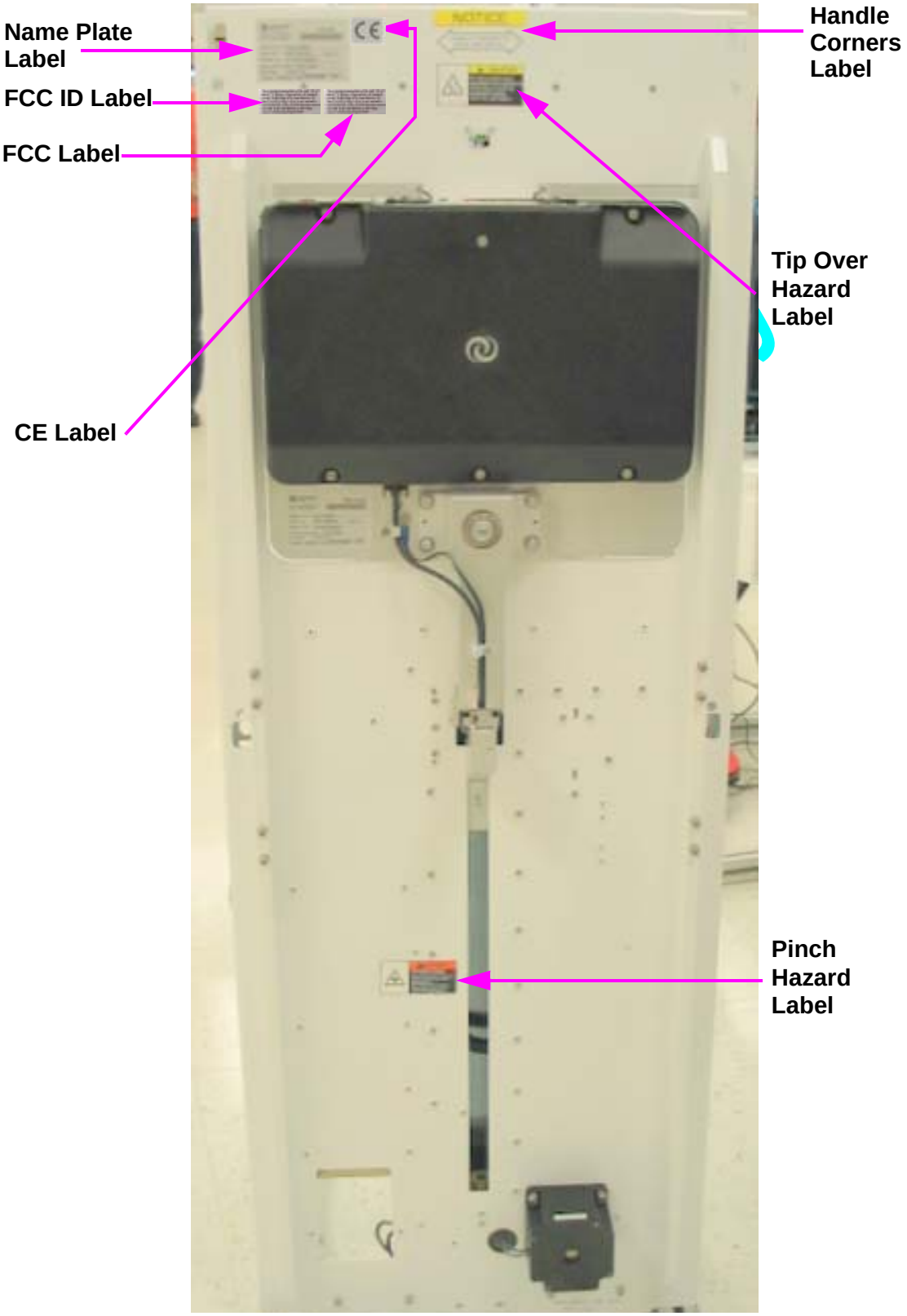


FIGURE 8 *Falcon Label Placement (Host Tool Side)*

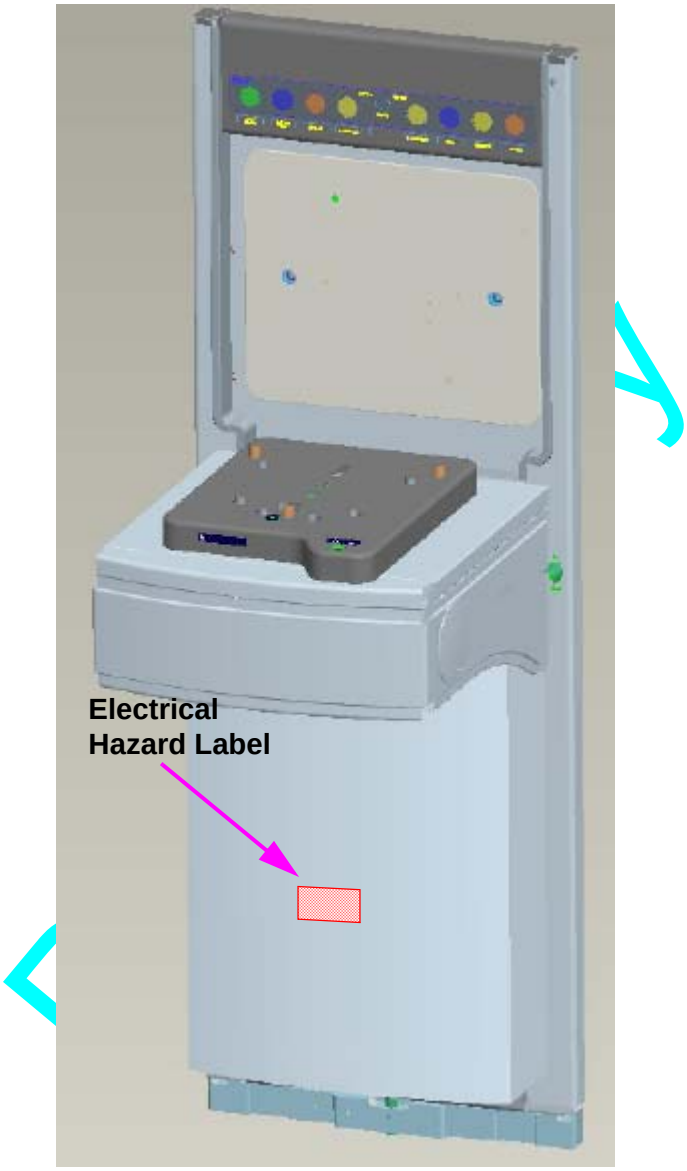


FIGURE 9 *Falcon with AC Option Only*

Chapter 2: Product Overview

This chapter describes the operation of Falcon and the interrelation of all of its mechanical, electromechanical, and electronic subsystems.

The product overview is divided into the following sections:

“ Product Description” on page 24— an overall description of Falcon product.

“ Specifications” on page 27— Technical Data for Falcon.

Major Subassemblies with features, Options and Operational Descriptions:

- “ FIMS Door” on page 29
- “ Vertical-Horizontal Door Drive” on page 32
- “ FOUP Advance Subassembly” on page 34
- “ BOLTS Frame” on page 38
- “ Options” on page 40
- “ Operation Sequence”— describes Falcon’s typical operation sequence.

FIGURE 10 *Falcon Loadport*

Product Description

The Falcon is an all-new loadport design based on Asyst's many years of experience with loadports, incorporating input from a wide range of fabs & OEMs. This elegantly simple design anticipates the customer demand for synergy between AMHS and EFEM requiring seamless integration, faster hand-offs, more efficient buffering and improved productivity.

Asyst is the only loadport supplier with both EFEM and AMHS capability. Falcon has the Best In Class performance for Speed and Cleanliness. Asyst's patented Latch key Twist & Pull Technology to securely hold the FOUP Door during access, means no vacuum is required.

The Falcon design improves reliability and speed of wafer handling, provides more robust alignment stability, and reduces Preventive Maintenance requirements; All reducing the overall cost of ownership. The modular design of the components shortens service times, while eliminating most service alignments.

Falcon is a 300mm Loadport that maintains better than Class 1 environment for loading and unloading (opening and closing) SEMI standard 300mm FOUPs. The Front-Opening Unified Pod (FOUP), designed for 25 wafer capacity, is a sealed carrier pod that provides a sub-class 1 environment. Falcon is compatible with most SEMI standard compliant FOUPs.

The Falcon interface to the Host tool complies with the SEMI 300mm Tool Loadport Specification (E15.1). It is designed to directly mount onto a Host Tool through a SEMI E63 (BOLTS) interface and can be quickly disconnected for ease of servicing.

A system of sensors and use of stepper motors ensure safe operation of Falcon, preventing wafer breakage or errors in mechanical operation. Software provides for integrated self-tests and diagnostics.

Major Components

This section describes the major components of the Falcon loadport, with operational descriptions, subassemblies, and features.

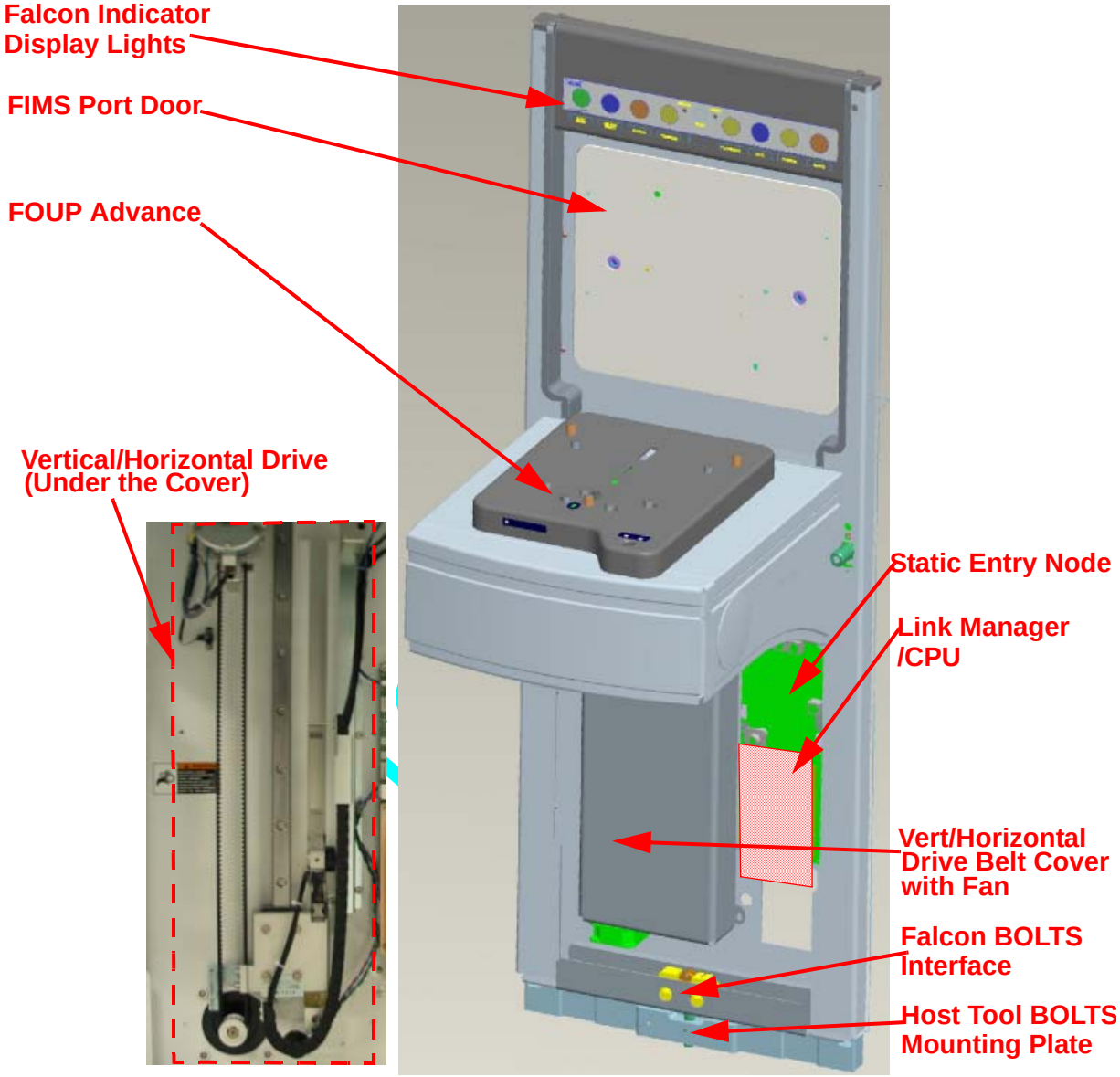


FIGURE 11 *Falcon Loadport*

- " FIMS Door" on page 29
- " Vertical-Horizontal Door Drive" on page 32
- " FOUP Advance Subassembly" on page 34
- " BOLTS Frame" on page 38

Features

The following features contribute to Falcon's easy adoption, ease of use and overall product robustness.

- Protocol converters to emulate previous & competing loadports
- Browser configurable
- SW configurable indicator lights (no lenses)
- No internal alignment once installed
- Tilt-N-Go installation
- Integrated Features:

  Manual Load/Unload Push Button Switch

  AdvanTag RFID
- Integrated Options:

  ABCD Mechanical Lockout Pin

  ABCD Sensor

  Wafer Mapping

Power

Falcon is powered by +24VDC (+10, -2%). The input power is applied through a CPC4 connector "+24VDC IN" (see Figure 12).

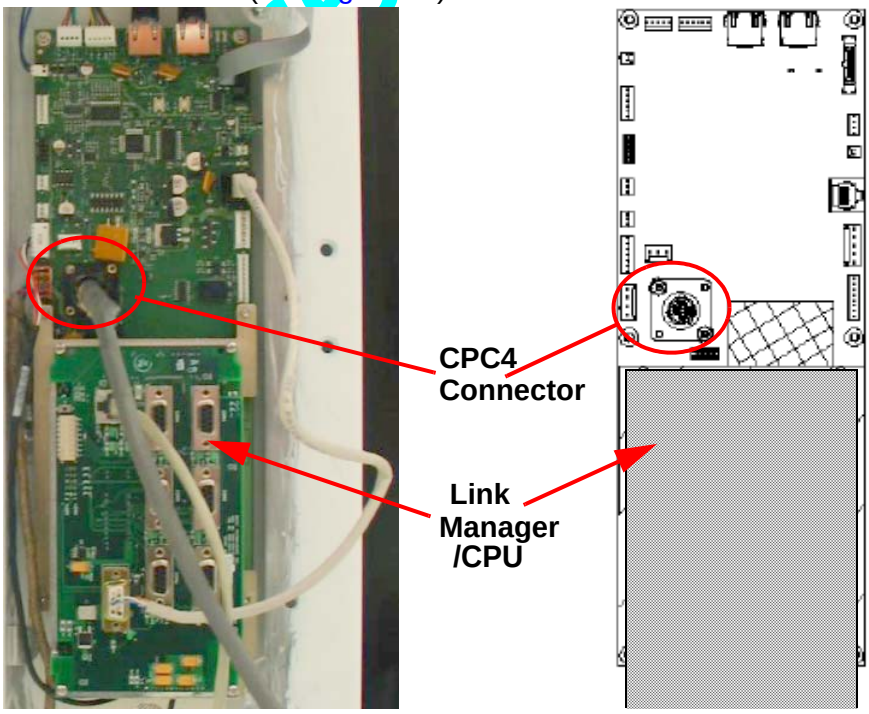


FIGURE 12 *Static Entry Node PCB Assembly with Link Manager/CPU*

Specifications

TABLE 2 *Falcon Product Specifications**

Wafer Size:	300mm	
Height:	1351.1mm (53.19 in.)	
Width:	470mm (18.5in.)	
Depth:	485mm (19.1 in.) Note: from BOLTS Plane	
Weight:	68Kg (150 lbs) with Tilt & Go Wheels installed	
Mounting:	Falcon is designed to directly mount onto a Host Tool having a SEMI E63 (BOLTS) interface.	
FOUP Load Height:	Per SEMI Standards E15.1 and E63 ±10mm Height Adjustability on Host tool	
Contamination Control	Wafer Environment Airborne Particle Cleanliness	Class 1 per ISO 14644-1
	Fab Environment Airborne Particle Cleanliness	Class 5 per ISO 14644-1
	Defect Density	< 0.01 PWP @ 0.15 Particle Size
FOUP Compatibility	The Falcon is designed to operate with SEMI E47 compliant wafer carriers.	
Wafer Mapping	Emitter Sensor - ± 1º beam angle Collimated IR LED Receiver Sensor - Light-to-voltage photodiode with	
Door Speed (OPEN/CLOSE)	8 Seconds Open with Wafer Mapping 8 Seconds Close with Wafer Mapping	
Power:	<u>Requirement from Host tool:</u> 24 VDC (+10, -2%) @ 7 amps peak	<u>Falcon Power Consumption:</u> 2 Amp standby (max) 5 Amp operating (max) 7 Amp peak (max)
	100-240VAC Option, the customer provides 100-240VAC, 50/60Hz.,3.5A AC Power module converts the power to the +24VDC (+10, -2%), 7A required for Falcon operation.	
Communications:	Serial RS-232C (ASCII or SECS 2), Ethernet (ASCII), Parallel is optional	
Carrier Types	300mm 25-Wafer FOUP (Front Opening Unified Pods)	
Vacuum	None	
Compressed Air	None	

TABLE 2 *Falcon Product Specifications**

Noise	70-80dB RMS: Compliant to SEMI S8	
Environmental:	Operating Temperature	10 to 40° C.
	Operating Humidity	10 to 75% non-condensing
	Storage Temperature	-10 to +55°C.
	Storage Humidity	5 to 90% non-condensing

Falcon complies with content of SEMI S2, SEMI S8, and CE Marking.

*Specifications subject to change without notice

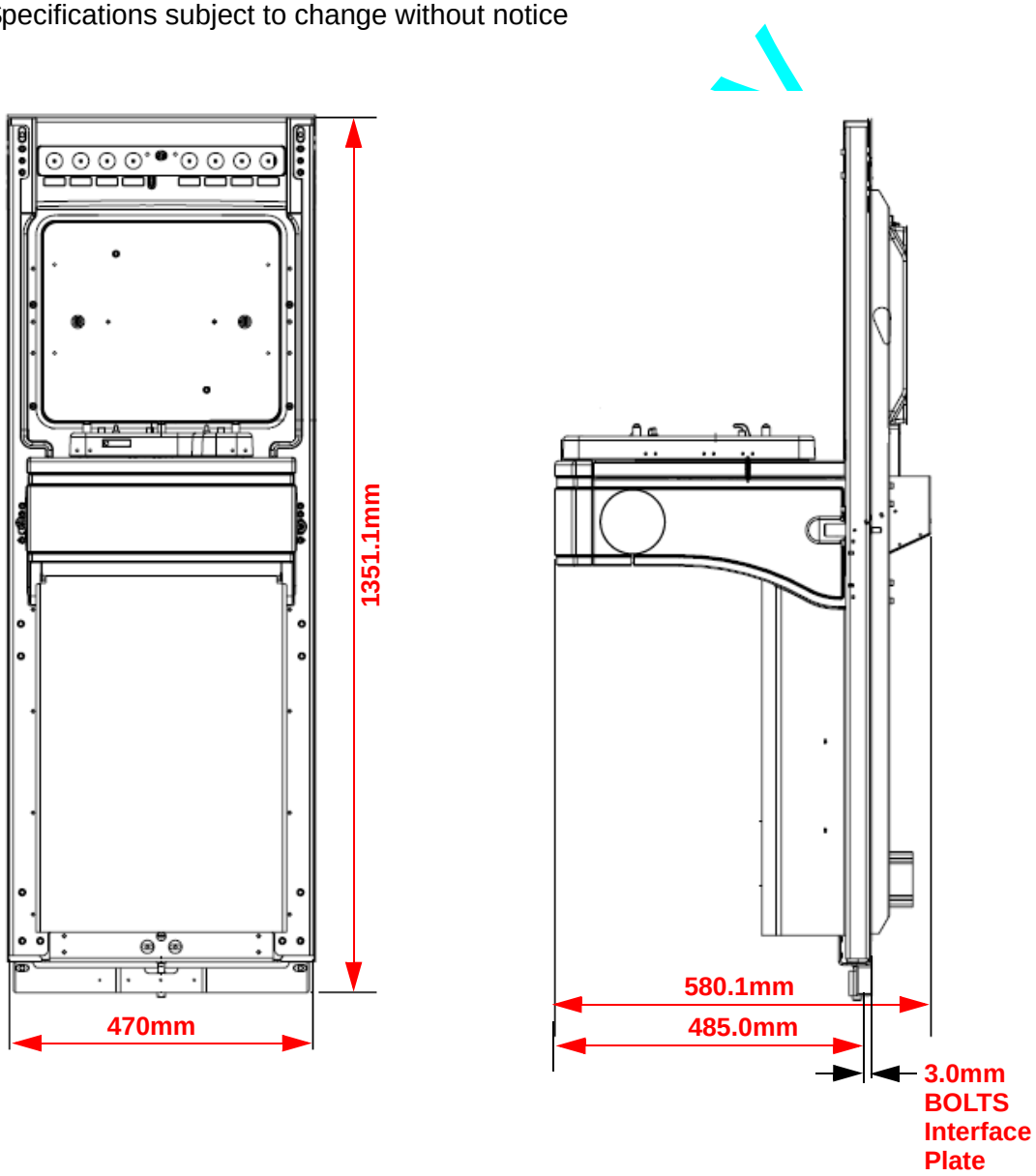


FIGURE 13 *Falcon Basic Outline*

For additional dimensions, interface points and datums see “ 2000-6803-01 Falcon Outline Drawing” on page 284.

FIMS Door

The Falcon Front-Opening Interface Mechanical Standard (FIMS) door is used to open a 25-wafer FOUP. Two latch keys located on the FIMS door rotate to horizontal to unlock the FOUP door. Using Asyst's patented Twist & Pull technology, both latch keys retract at the horizontal (unlocked) position to secure the FOUP door.

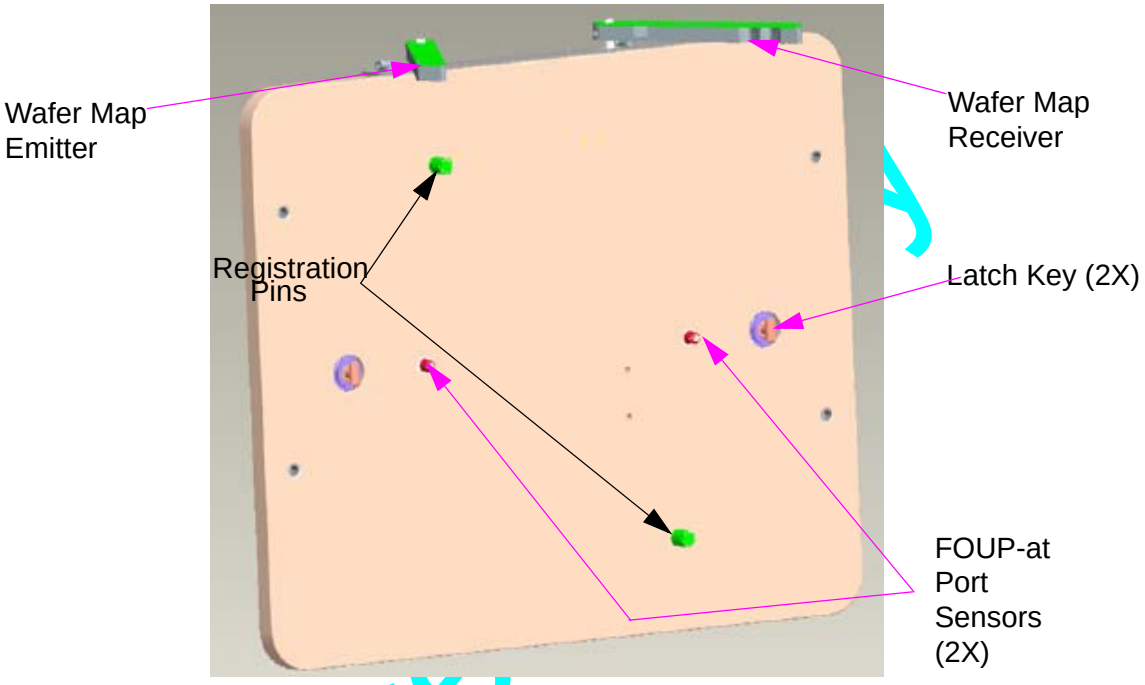


FIGURE 14 *FIMS Door, Front View*

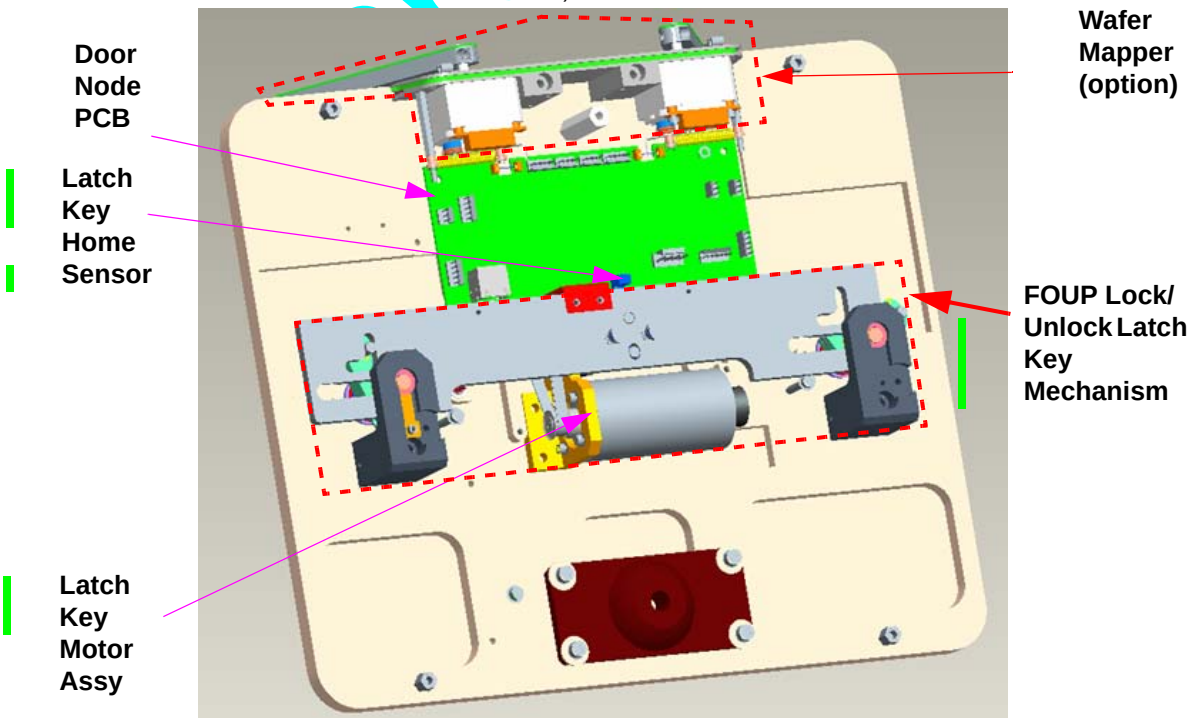


FIGURE 15 *FIMS Door, Rear View (without Cover)*

After the port door latch keys secure the FOUP door, it backs away from the FOUP, then lowers until the FOUP opening is cleared. Once the port door is lowered, the wafers are accessible for processing. For details on how the Port Door works in conjunction with the FOUP Advance plate, see “ Operation Sequence” on page 45.

Features

Ball Joint with Clamping for Port Door Alignment

This feature enables roll, pitch and theta alignment of the port door with one fastener for all three adjustments. This permits setup and alignment to be done with 1 fixture and one tool. The reduced part count reduces the potential for error. See Figure 16.

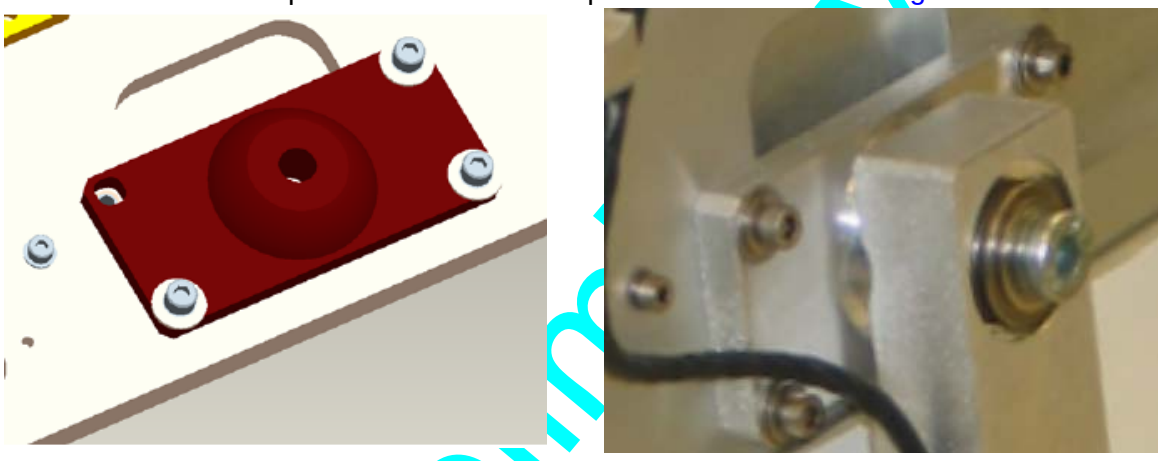


FIGURE 16 *Ball Joint Design*

Simplified Twist and Pull Latch Key Drive

The Falcon design preserves Asyst’s proven and patented twist & pull latch key drive and door retention with no vacuum system needed to secure a FOUP door to a FIMS door. Each latch key provides 3-4 lbs of pulling force. This design uses a one piece cam drive plate, guided by a latch key shaft to move the 2 individual latch key mechanisms. The pull-in FOUP clamping feature is comprised on a spherical bushing and socket detent in the cam drive plate. A compression spring provide the clamping force. The Falcon latchkey are lubricated for the rate life of the unit and requires no preventive maintenance. See Figure 17.

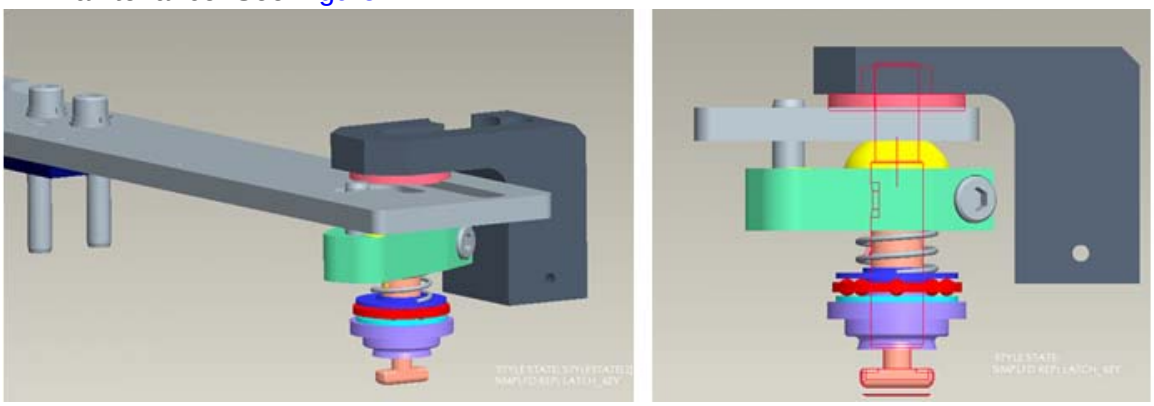


FIGURE 17 *Simplified Twist and Pull Latch Key Drive*

Sensors

There are two FOUP-at-Port (FAP) Sensors that will detect the presence of a FOUP door when up against the FIMS door. Both FAP sensors detect the presence of a FOUP door at the docked position.

Ground Path to FOUP Door

The Falcon provides a path to ground from the FOUP door through the port door latch keys, when the FOUP door is removed from the FOUP.

Configurable Latch Key Over-Rotation

The Falcon rotates the latch key from the locked position at 90 degrees (FOUP Door locked position) to the unlocked position of 0 degrees. Falcon can be configured for over-rotation at the 90 degree position to 1,2, or 3 degrees over-rotate through the GUI Interface. The factory default setting for over-rotate is 2 degrees.

Vertical-Horizontal Door Drive

The vertical and horizontal drive (V/H Drive) has two functions: To open and close the FOUP door. During opening of the FOUP door, the V/H Drive will move backward in horizontal movement to clear to the BOLTS plate and downward to give to host tool access to the wafers. See Figure 18.

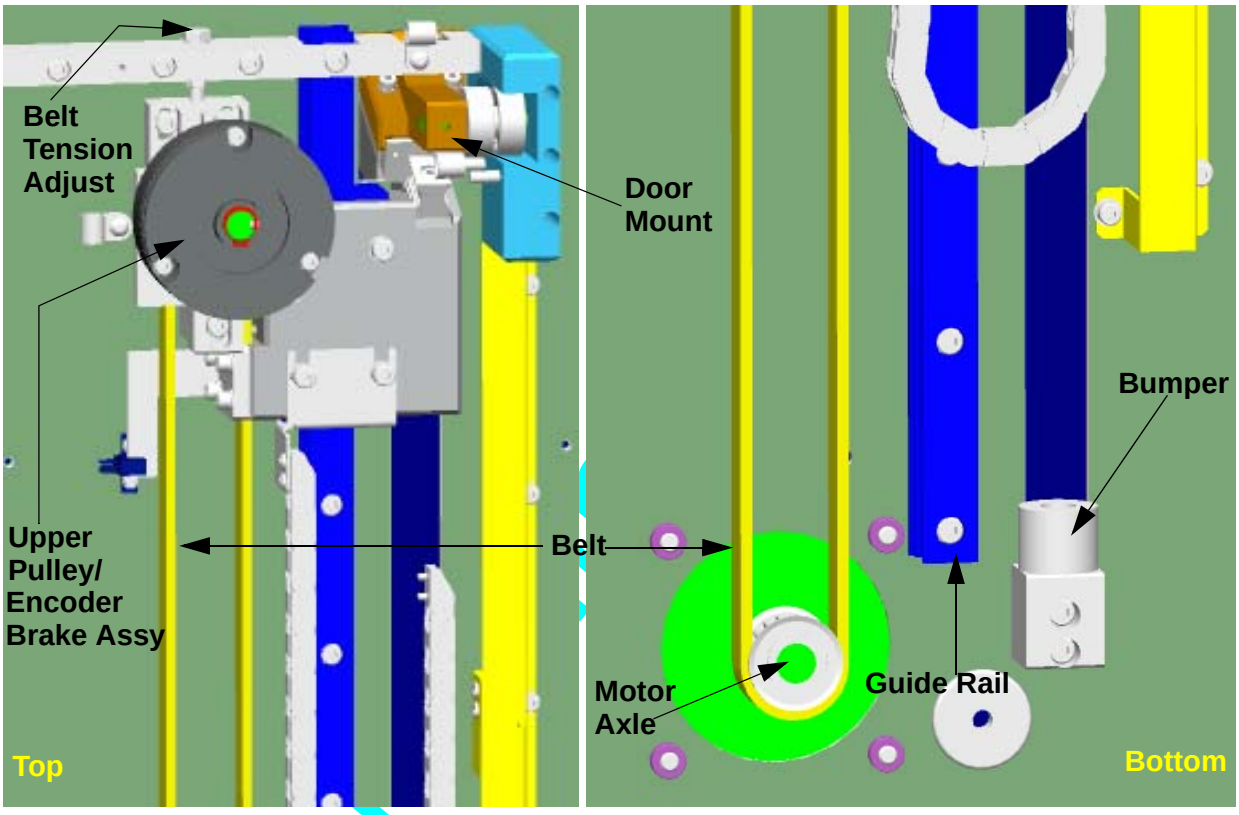


FIGURE 18 *Vertical/Horizontal Door Drive Components*

During closing, the V/H Drive will move upward and in to close the FOUP.

When configured with the optional wafer mapper, mounted on the door module, the V/H Drive makes 2 stops to allow for wafer mapping during open and/or close cycle.

The V/H Drive is designed to be maintenance free. There are no user serviceable components and no alignments are necessary. Major modules (Motor, Upper Pulley/Brake/Encoder Assembly, Belt) are designed for quick replacement if needed, with no changes to alignment.

Features

Single Motor for Two Axes

The design of the Vertical/Horizontal Drive Assembly incorporates a single stepper motor and Belt Drive to perform both Vertical & Horizontal Door Motions. The Motor mounts directly to the BOLTS plate frame so no machined brackets are required. The use of

Direct stepper drive eliminates the need for a speed reduction system. The integrated design means that fewer sensors, adjustments, and moving cables are required.

Upper Pulley/Brake/Encoder Assembly

The Upper Pulley/Brake/Encoder Assembly includes a 24V Brake used in the event of power loss to stop Z Movement of the FIMS Door. The fail-safe Brake keeps the vertical drive held in place when inactive or during loss of power.

The Encoder, part of the Upper Pulley Assembly, is used to give position feedback and also to work with wafer mapper to detect wafer presence and slot positions in a FOUP.

There is no hard stop for homing the Vertical/Horizontal Drive, the encoder with home sensor is used to determine home position. Home position of the Vertical/Horizontal Drive is at the top of the drive.

The Brake, part of the Upper Pulley Assembly, stops all movement of the Vertical-Horizontal Door Drive:

- anytime power is cut
- at the end of motion (excluding Upper and Lower Mapping positions)
- whenever a following error is larger than its limit (Important during upward movement to prevent the door from dropping)

Vertical/Horizontal Drive components (Motor, Upper Pulley/Brake with encoder, and home sensors) all connect directly to the static entry node on the BOLTS frame.

Fan Assembly

The Fan Assembly is located on the bottom of the removable belt/drive cover. It provides a continuous air flow for airborne particle control for the vertical/horizontal drive mechanisms. This is done to insure no contamination to the Host Tool mini environment by this mechanism.

FOUP Advance Subassembly

The FOUP Advance Module is a component of the Falcon loadport which is required to position the FOUP on the loadport for processing by the Host Tool and AMHS system.

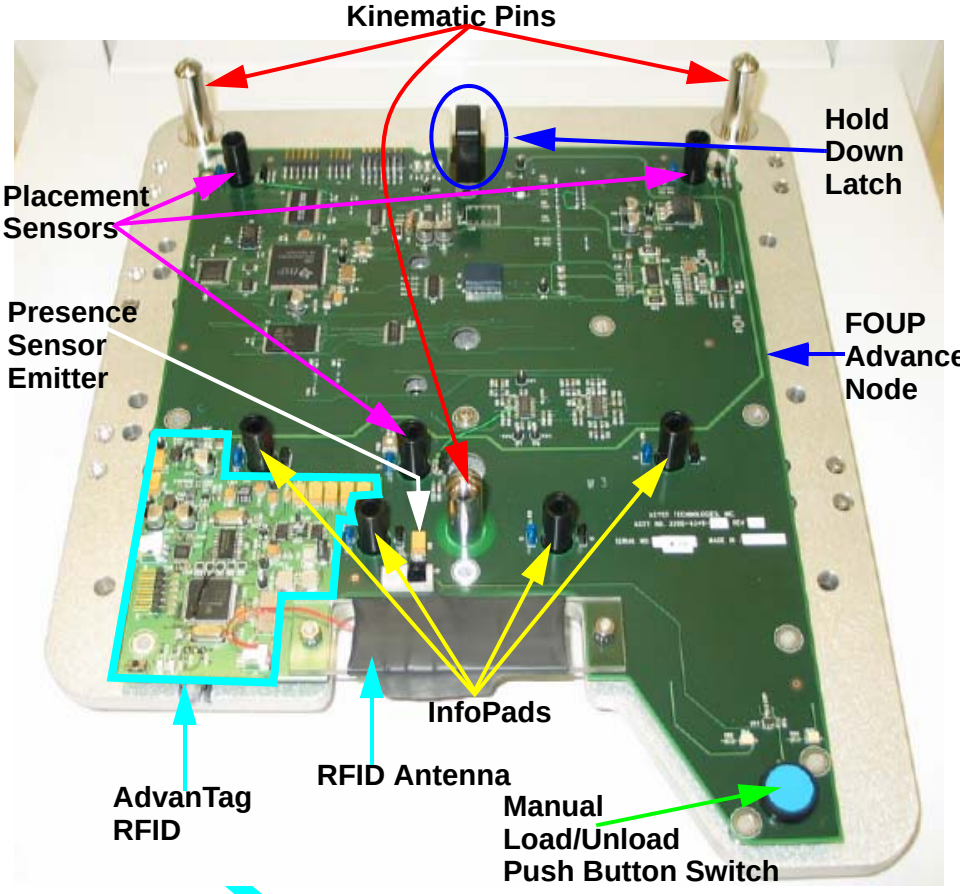


FIGURE 19 *FOUP Advance Plate without Cover*

The FOUP Advance Module positions the carrier using kinematic pins in an orientation for AMHS transfers, positions the FOUP in an orientation for opening the FOUP door and positions the kinematic pins in an orientation using for wafer handling by a front end robot.

The FOUP Advance Module also provides a means of latching the carrier to prevent removal of the carrier by operators with adequate holding force to allow door opening, resisting operator applied forces, and a means of reading and/or writing to the carrier RFID tag.

The K-Plate is supported by 2 linear rails that are attached to the FOUP Advance Base.

Falcon software uses two sensing systems, FOUP Placement and FOUP Presence, to ensure that the FOUP advance will not operate unless the FOUP is properly positioned. When the FOUP is placed on the Kinematic Pins of the FOUP Advance, the Presence sensor detects the presence of the FOUP and the Placement sensors detect that the FOUP has been properly placed.

The FOUP Advance controls horizontal movement of the FOUP and support plate. After both the FOUP placement and presence sensors are triggered, the Active Pod Hold Down (APHD) latches to hold the FOUP to the Kinematic Pins. This ensures the FOUP can not be removed from the Kinematic Pins. The plate then moves towards the port door to the configured FOUP docked position. The FIMS door moves to meet the FOUP door at the Docked position. FAP sensors are actuated by the FOUP door, confirming a FOUP Door is present. The latchkeys then unlock the FOUP door and hold the FOUP door in position on the port (FIMS) door.

Features

Torque Tube with Cantilevered Supports

- Provides major improvement in torsional rigidity/stability in the as-installed condition
- Provides stable reference platform for the FOUP advance /K plate assembly
- Enables one time factory setup/alignment for critical K plate dimensions. No field adjustment required.

Manual Load/Unload Push Button Switch

The FOUP Advance Plate features one push button switch that is end-user configured. It is a Programmable Function Manual Push button with Indicator LEDs. See Figure 20.

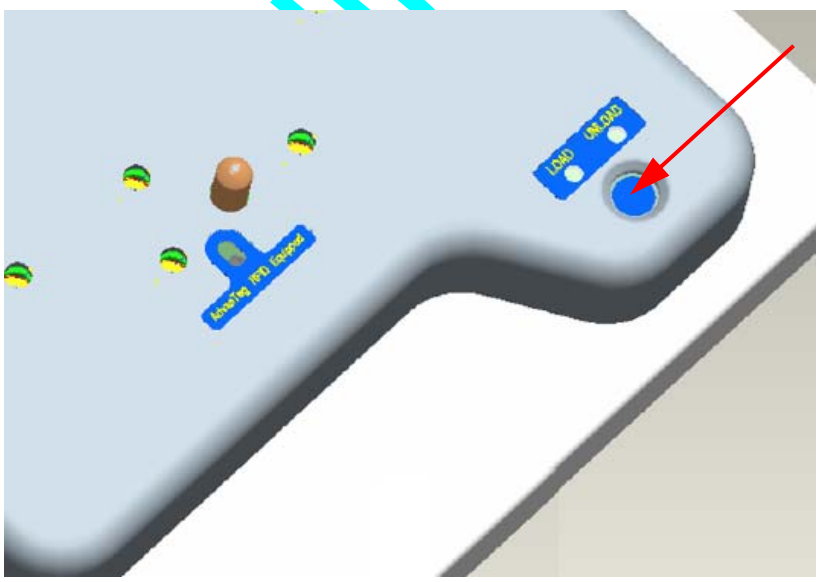


FIGURE 20 *FOUP Advance Load/ Unload Push Button Switch*

NOTE . . .

THE BUTTON MUST BE PROGRAMMED BY THE USER BEFORE SUBSEQUENT ACTION IS PERFORMED BY THE FALCON AS A RESULT OF THE BUTTON EVENTS.

K-Plate Node PCB

The K-Plate Node PCB, located on the top of K-Plate, has two controllers, both which communicate via CAN to the System Link Manager/CPU module.

Ti-DSP:

- Controls FOUP advance function using close loop Step motor and encoder.
- Controls FOUP Hold Down function using an open loop DC motor, and position sensor.
- Provides approximately 30 general purposes I/Os.
- Monitor FOUP status through 7 on board sensors
- Communicates with system CPU via CAN

PIC-Controller:

- Controls RFID communication and RF power; and communicate with System CPU via CAN.

Integrated AdvanTag Circuitry. The main component of the integrated AdvanTag circuitry is a transmitter that generates radio waves through an antenna. This TIRIS compatible low-frequency (134.2kHz), low-power RF energy is used to read from or write to a transporter near the antenna. The 134.2kHz carrier from the RFID-ASIC is amplified to the proper levels to drive the dual MOSFET power amplifier. This provides a 12Vp-p low impedance drive to the antenna circuit. The antenna is a series resonant LC circuit resonated at 134.2kHz to achieve maximum voltage on the antenna.

Cam Activated Pod Hold Down

The FOUP is held down and cannot be manually removed from the Falcon unless the APHD is released.

– Very fast acting (0.40 seconds)

– No adjustments necessary

Sensors

FOUP Presence Sensors. One Emitter/Receiver pair located in the Status Display board (emitter) and FOUP Advance Plate (receiver) to detect whether a FOUP is present on the Advance plate (the load/unload area).

FOUP Placement Sensors. There are 3 FOUP placement sensors, incorporated into the FOUP Advance Plate; each sensor is located near a kinematic pin. The placement sensors work in parallel to provide accurate detection of a FOUP that is correctly placed on the FOUP Advance Plate/kinematic pins.

InfoPad Sensors. The Falcon provides for InfoPad sensors and/or a mechanical interlock pin to be installed at four location on the FOUP Advance Plate. InfoPads Sensors are used to distinguish between FOUP identities based on info plugs installed on the underside of a FOUP. A mechanical lockout pin can be placed in any InfoPad position. If the pin is placed in the "A" location, then a FOUP with the "A" location blocked cannot be placed properly onto the loadport. This is to prevent wafers in certain FOUPs from entering a process tool.

BOLTS Frame

The BOLTS frame is the structure to which main subassemblies are mounted. It also provides the interface/mounting point for the Host Tool. In addition, the frame includes several key electronic circuits as well as the status indicators.

Main Components

Light Display Node PCB

The Light Display Node PCB controls the indicator lights at the top of the Frame. The Display PCB can only be accessed from the Operator side of Falcon. Figure 21 shows the PCB (with the indicator light panel removed from the top of the Frame).

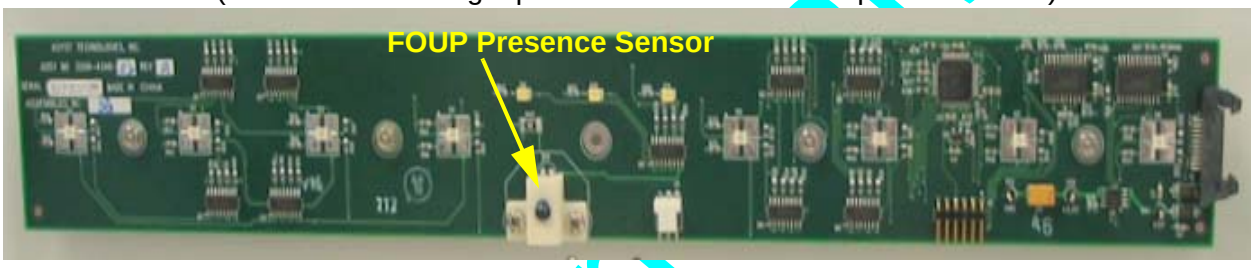


FIGURE 21 *Light Display Node PCB*

The emitter of the FOUP Presence Sensor is located on the Display Node PCB. It works in conjuction with the receiver located on the FOUP Advance assembly to detect whether there is a FOUP on the FOUP Advance plate.

> ***NOTE . . .***
>
> THE FOUP PRESENCE SWITCH DOES NOT INDICATE WHETHER THE FOUP IS PLACED CORRECTLY ON THE PLATE, ONLY THAT THERE IS A OBJECT PRESENT ON THE PLATE.

Excessive Wafer Protrusion Sensor

The Excessive Wafer Protrusion Sensor is located on the BOLTS frame assembly, this interlock sensor detects whether a wafer is positioned too far out of the FOUP. If sensed, all movement is halted to prevent damage to wafers and allow manual re-seating into the FOUP.

The Excessive Wafer Protrusion sensor used on the Falcon is break-the-beam type optical sensor It provides an off/on signal via the digital I/O and an interrupt to the processor when actuated, V/H Door motion is stopped and a fatal error message is sent to the Host (Tool).

Static Entry Node PCB

Located on the Operator side of the BOLTS Frame Assembly, the Static Entry Node controls movement of the Horizontal/ Vertical Drive and FOUP Advance assemblies, and is able to communicate via CAN to the Link Manager/CPU, the Door Node, and the FOUP Advance Node.

The Static Entry Node contains circuitry that monitors voltage and current. If the applied voltage becomes too low or too high the electronics will be shutdown until the correct voltage level is restored. Over current (over load) protection device rating is 9 amp. To recover the operation, power will have to be cycled off and then on again.

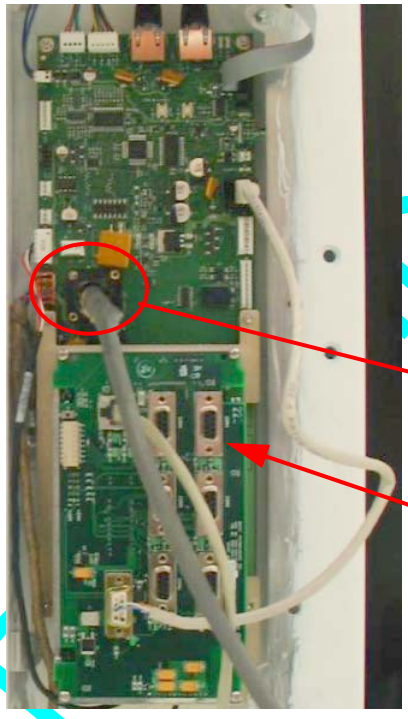


FIGURE 22 *Static Entry Node PCB*

TABLE 3 *Static Entry Node Connections*

SEN Connector	Goes To	Link Manager/CPU	
J1	V/H Motor Encoder	J1	Ethernet
J3	V/H Drive Brake	Comm1	RS232 Serial
J9	RJ45 cable goes to ------->	J10	DB9
J22	Main Power In		
J23	V/H Motor		
J25	Fan		
J27	V/H Home Sensor		
J36	Excessive Protrusion Sensor		

Options

Current options available for the Falcon are the Wafer Mapper, the 100-240VAC Power Option, the E84/PIO/Interlock Option and the Tilt & Go Wheel option.

Wafer Mapper Assembly Option

An optional wafer map system can be attached to the FIMS door, that consists of two arms, with sensors, operating during the vertical movement of the port door to determine the position of wafers and detect cross-slotting or double-slotting of wafers within a FOUP. See Figure 23.

FIGURE 23 *Wafer Mapper Uninstalled*

The wafer mapper assembly with protrusion module is comprised of a light source and a receiver. The light source/receiver pair is for detecting wafer presence, empty slots, cross-slotted and double-slotted wafers within the FOUP. This wafer map data is transmitted to the host tool. Two stepper motors are used to deploy and retract the arms.

The Falcon wafer mapper is designed to be maintenance free. There are no user serviceable components and no alignments are necessary.

100-240VAC Power Option

Typically the Falcon is powered by +24VDC (+10, -2%) provided by the Customer, via the Host Tool. Falcon loadports configured with the 100-240VAC 50/60 Hz, 3.5A Option, permit the customer to provide AC power to an AC Power Supply, within the Falcon, that converts the power to the +24VDC (+10, -2%), 7A required for Falcon operation. See Figure 24 for main view of components, see Figure 25 for tool side view and see Figure 26 on page 42 for wiring diagram.

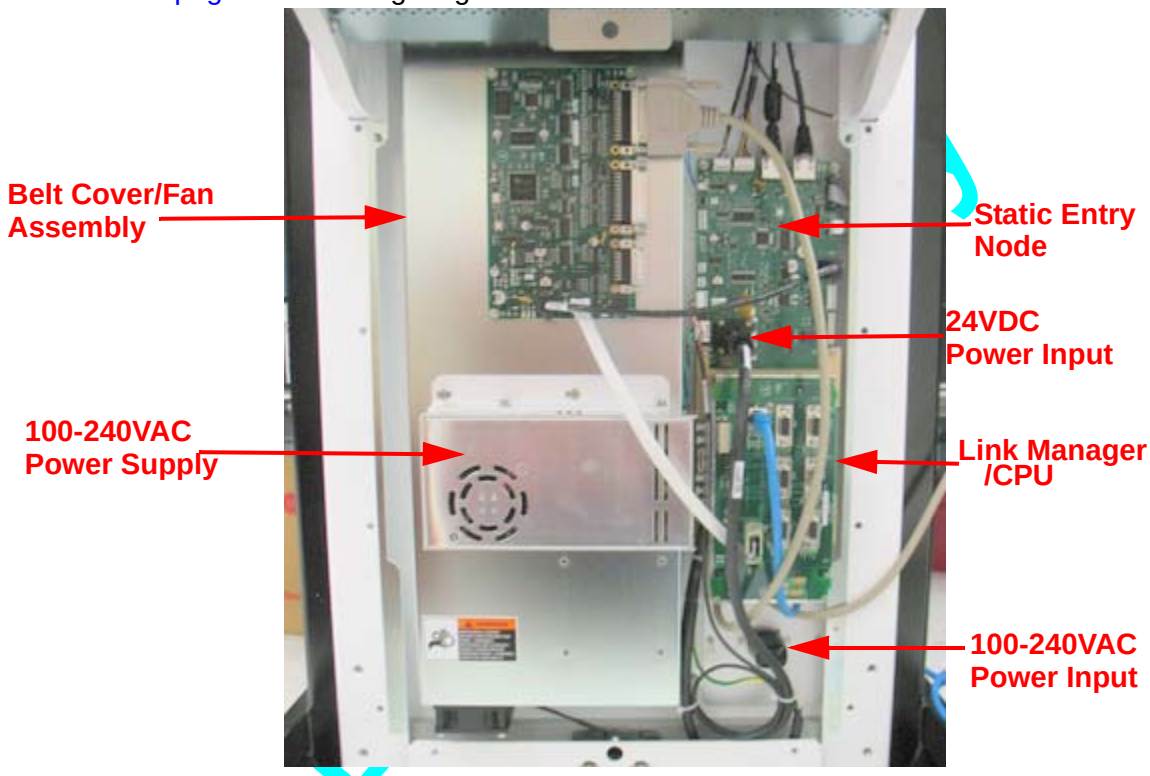


FIGURE 24 *Components of the 100-240VAC Option*

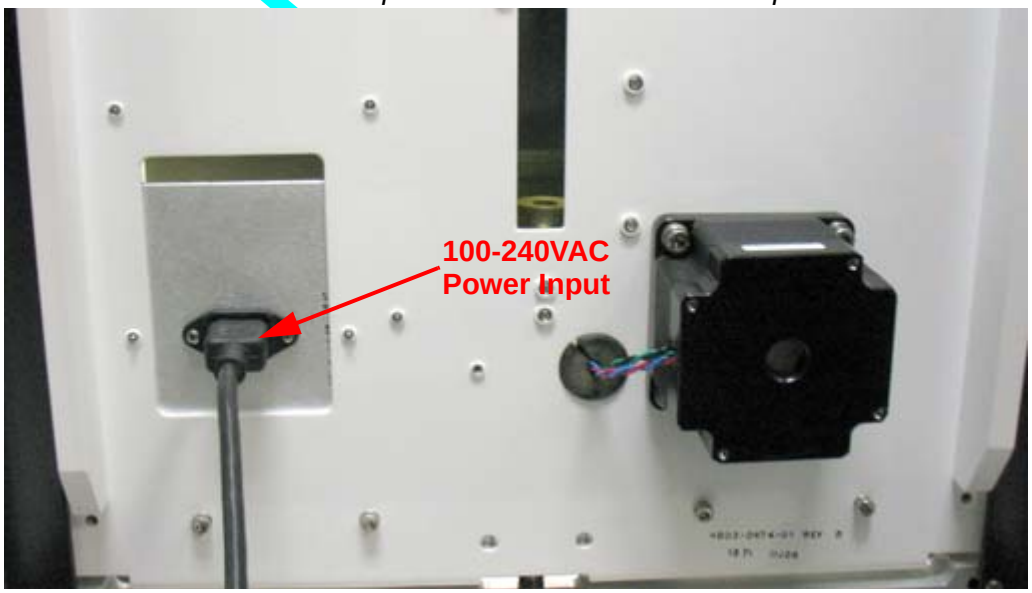


FIGURE 25 *Tool Side View*

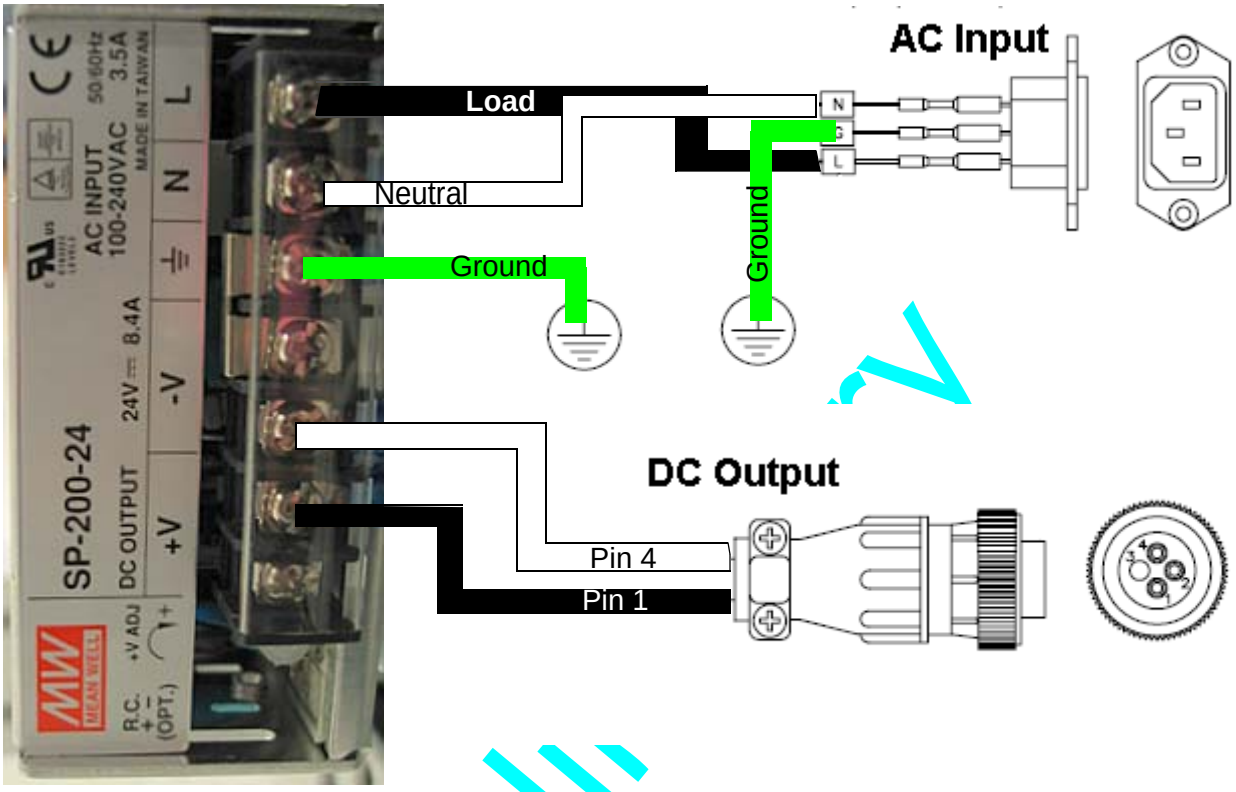


FIGURE 26 *Wiring for the AC Option*

E84/PIO/Interlock Option

The E84/PIO/Interlock Option provides communications interface with a variety of FOUP delivery systems including AGV, AMHS, or process tools.

The E84/PIO/Interlock Option provides several functions for the Falcon loadport:

- Provides E84 interface for communication with AMHS/AGV systems for FOUP delivery.
- Provides PIO interface for communication with process tools for door close/open operation.
- Provides an interlock to disable loadport operation.

Components

The E84/PIO/Interlock Option consist of the E84 Node PCB and connecting cables.

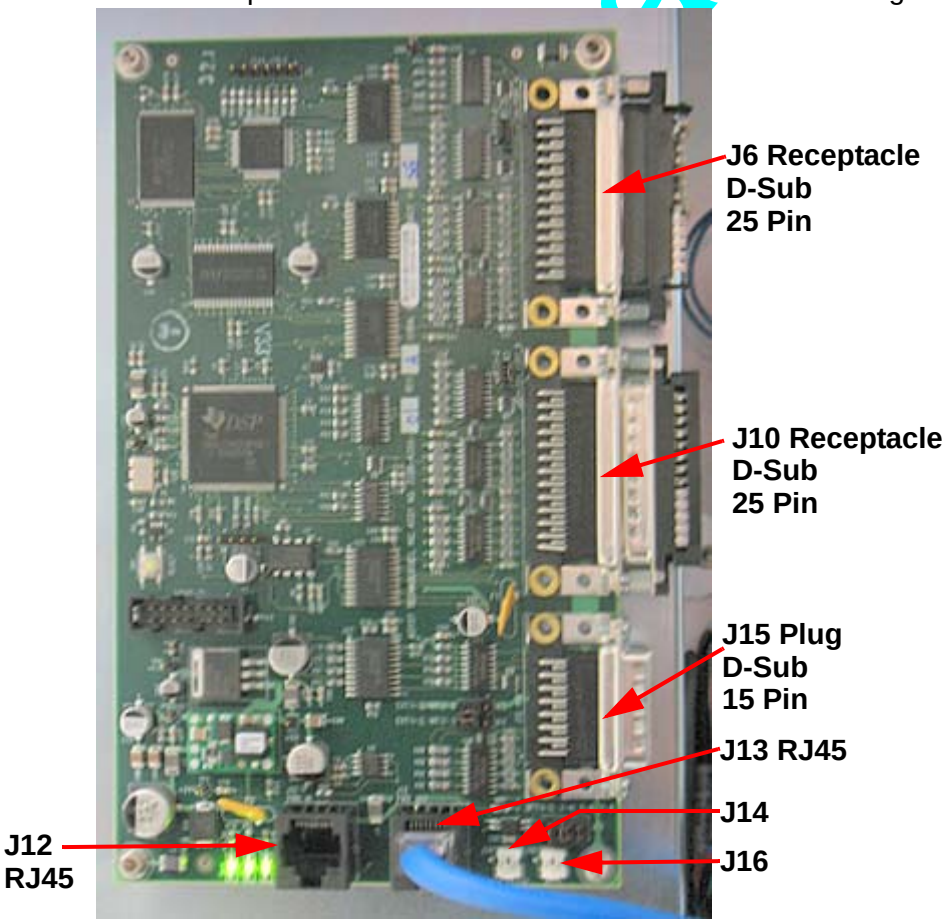


FIGURE 27 *E84 Board*

Tilt & Go Wheels Option

The Tilt & Go wheels option allows a single operator to assemble and align the Falcon to the Host tool, as well as remove the Falcon from the Host tool. Also, one operator can move the Falcon to various parts of a fab (e.g., from tool to tool, to a repair area). See Figure 28 on page 44.

CAUTION

GENERAL HAZARD

FOR ONE PERSON REMOVAL FALCON MUST HAVE A BASE WHEEL ASSEMBLY ATTACHED BEFORE REMOVING THE FALCON FROM THE HOST TOOL. THE WHEEL ASSEMBLY MAY HAVE BEEN REMOVED AFTER INSTALLATION.

FIGURE 28 *Falcon Tilt & Go Wheels*

NOTE . . .

WITHOUT THE TILT AND GO WHEEL OPTION THE FALCON MUST BE MOVED USING A TWO PERSON LIFT, TAKING CARE TO OBSERVE THE MOVING AND HANDLING REQUIREMENTS SPELLED OUT IN THIS CHAPTER. SEE " Moving and Handling" on page 16.

Operation Sequence

Step 1 Undocked (Home) Position

The operating sequence for Falcon always begins from the undocked (Home) position:

- Vertical Drive is at Home position; Door is at Closed position
- FOUP Advance Drive is at Undocked position
- Latch Keys are in Vertical position
- Wafer Map Arms are retracted
- Active Pod Hold Down is in Open position

Step 2 Place FOUP on FOUP Advance Plate

1. FOUP is properly placed onto the kinematic pins located on the FOUP advance plate. FOUP Presence sensors and FOUP Placement sensors are activated.
2. Falcon reports to Host that the FOUP has arrived.

Step 3 Advance FOUP to Port Door

1. Host sends an Open command to open the FOUP.
2. The FOUP Advance Module latches the carrier to prevent removal of the carrier while the door is open.
3. Integrated AdvanTag reads and/or writes to the carrier RFID tag as initiated by the Host.
4. The FOUP Advance moves the FOUP towards the FIMS door to the configured FOUP docked position.
5. The FIMS door moves to meet the FOUP door at the Docked position.
6. FAP sensors are actuated by the FOUP door confirming a FOUP Door is present.

Step 4 Open and Lower the Port and FOUP Doors

1. Latch Keys unlock the FOUP door and hold the FOUP door in position on the port (FIMS) door.
2. FIMS door with FOUP door are moved horizontally and vertically away from the port to clear the opening.
3. With Wafer Map Option present, vertical drive moves to Mapper Upper position.
4. With Wafer Map Option present, Wafer Map Light Source (IR LED) activates.
5. With Wafer Map Option present, Wafer Mapper arms extend, and the Wafer Map system activates.