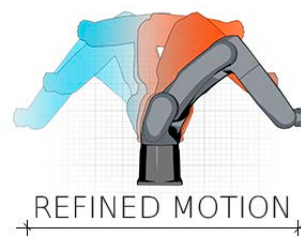


MotionCell^m

User Guide



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Refined Motion “MotionCell M” User Manual • Version 1.0

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This is the original instructions for the operation of the MotionCellm.

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Extensive efforts have been made to ensure the validity and accuracy of this manual, however, if errors are found please contact the Flexible Assembly Systems Inc. so corrections can be made.

To report errors or request more information, please call or send an e-mail to:

Info@FlexibleAssembly.com

www.refinedmotion.com

Ph. (619) 287-7000

Specifications

Production Capacity	N/A
Require Air Pressure	90 PSI
Air Consumption	5 CFM
Power Requirements	208 – 220 VAC 1 Phase / 30 Amps
External Dimensions	33.86" x 131.22" x 41.9"
Environmental Conditions	- Ambient temperature 0-45 °C - Humidity: 75% RH or less; Short term (within a month): 95% or less- Vibration: 0.5G or less
Area of Use	Indoor / Outdoor (Covered overhead, free of corrosive gas, airborne particles, etc.)
Warranty	Reference Service Level Agreement (SLA)
Motion Range	717mm Spherical Reach
Robot Payload	7Kg
Repeatability	0.2mm
Number of Axis	5/6
Speed	4000mm/s
Fieldbus	Ethernet/IP
Vision Compatible	Yes
Database Archiving Compatible	Yes
Dispensing Compatible	Yes
Touchscreen Size	22"

Limitation of Liability

Flexible Assembly Systems Inc. (the producer) has built the referenced equipment in accordance with **(the purchaser)** specification. It is the responsibility of **(the purchaser)** to ensure that the equipment is properly maintained and used in accordance with the producer's maintenance and safety guidelines. **(The purchaser)** should also ensure that proper safety procedures are in place prior to and during the operation of the referenced equipment (Reference: [Safety Requirements](#)).

Flexible Assembly Systems Inc. (Producer) shall not be liable for any damages as a result of but are not limited to the following: if (a) Flexible Assembly Systems Inc. did not put the equipment into use; or (b) that, having regard to the circumstances, it is probable that the defect which caused the damage did not exist at the time when the equipment was put into use by the producer or that this defect came into being afterwards; or (c)

that the equipment was neither manufactured by the producer for sale or any form of distribution for economic purpose nor manufactured or distributed by the producer in the course of his business; or (d) that the defect is due to compliance of the equipment with mandatory regulations issued by the public authorities; or (e) that the state of scientific and technical knowledge at the time when the producer put the equipment into circulation was not such as to enable the existence of the defect to be discovered; or (f) in the case of a manufacturer of a component, that the defect is attributable to the design of the product in which the component has been fitted or to the instructions given by the manufacturer of the equipment.

In accordance with CE directive 85/374/EEC the party shall be required to prove the damage, the defect and the causal relationship between defect and damage. Where, as a result of the provisions of this Directive, two or more persons are liable for the same damage, they shall be liable jointly and severally, without prejudice to the provisions of national law concerning the rights of contribution or recourse. The equipment shall not be considered defective for the sole reason that a better piece of equipment is subsequently put into circulation. Without prejudice to the provisions of national law concerning the right of contribution or recourse, the liability of the producer shall not be reduced when the damage is caused both by a defect in product and by the act or omission of a third party. The liability of the producer may be reduced or disallowed when, having regard to all the circumstances, the damage is caused both by a defect in the equipment and by the fault of the injured person or any person for whom the injured person is responsible.

Warranty

Flexible Assembly Systems Inc. warrants to Purchaser that all goods supplied hereunder, which are manufactured by Flexible Assembly Systems Inc. or individual manufacturer's, will be free from defect in material or workmanship for a period of one (1) year from the delivery date unless a different period is set forth in the body of the proposal in which these terms are incorporated. Should any defect appear during the warranty period, Flexible Assembly Systems Inc. shall, if given prompt notice by Purchaser, correct such nonconformity by, in Flexible Assembly Systems Inc.' sole discretion, either (i) repair at the jobsite, or (ii) repair or replacement of the nonconforming goods F.O.B. Flexible Assembly Systems Inc.' designated repair facility. The foregoing warranties are subject to revocation in Flexible Assembly Systems Inc.' sole discretion in the event that Purchaser (1) modifies the goods in any way without the express written consent of Flexible Assembly Systems Inc.; (2) employs such goods in a manner that is not in accordance with Flexible Assembly Systems Inc.' supplied instructions; or (3) damages the goods in any manner through any means.

The foregoing warranties also are subject to revocation or modification in Flexible Assembly Systems Inc.' sole discretion in the event that

Purchaser uses or transfers the goods outside of the country from which they were sold without notice to and written consent from Flexible Assembly Systems Inc. In such event, Flexible Assembly Systems Inc. may charge Purchaser, at prevailing prices, for all travel, labor, and parts necessary to service such goods.

Repair parts are warranted by Flexible Assembly Systems Inc. for a period of one (1) year from the date of delivery, provided, however, that repairs or replacements to original goods shall not renew or extend the warranty period of such goods. Replaced goods or parts become the property of Flexible Assembly Systems Inc. Goods supplied hereunder, which have been purchased by Flexible Assembly Systems Inc. from other manufacturers, shall have only the warranty offered by the manufacturer thereof, and Flexible Assembly Systems Inc. disclaims any responsibility with respect to the performance of such goods. Service labor provided by Flexible Assembly Systems Inc. is warranted by Flexible Assembly Systems Inc. for a period of ninety (90) days from the date that the Field Service Report is executed.

Safety Requirements

The Occupational Safety and Health Act of 1970 generally places the burden of compliance with the owner/employer, not the manufacturer. Many OSHA requirements are not concerned or connected with the manufactured product but are, rather, associated with the final installation. It is the owner's and user's responsibility to determine the suitability of a product for any particular use. It is recommended that all applicable industry, trade association, federal, state, and local regulations be checked. Read all operating instructions and warnings before operation.

Flexible Assembly Systems, Inc. cannot know of, or provide all the procedures by which equipment operations or repairs may be conducted and the hazards and/or results of each method. If operation or maintenance procedures not specifically recommended by the manufacturer are conducted, it must be ensured that equipment safety is not endangered by the actions taken. If unsure of an operation or maintenance procedure or step, personnel should place the product in a safe condition and contact supervisors and/or the factory for technical assistance.

Flexible Assembly Systems Inc. recognizes that most companies who are using this equipment have a safety program in force at their facility. In the event that some conflict exists between a rule set forth in this publication and a similar rule already set by an individual Company, the more stringent of the two should take precedence.

[Safe Operating Instructions](#) are provided to make an operator aware of dangerous practices to avoid and are not necessarily limited to the following list. Refer to specific sections in the manual for additional safety information.

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbol refers to procedure-specific risk. Refer back to these warnings. Additional, product-specific warnings may be found throughout the body of this manual where applicable.

Safe Operating Instructions

- Only allow personnel trained in safety and operation of this equipment to operate this product.
- Operators should **NEVER** be wearing loose articles of clothing while operating the system.
- **ALWAYS** keep hands clear when moving parts are present.
- **NEVER** perform maintenance on the machine while the system is energized.
- Keep extremities and clothing clear of all moving parts.
- Do not make changes to the system program unless you are authorized to do so.
- Do not touch the robot at **ANYTIME** unless you are an authorized technician.
- Pay attention to the work area at all times when operating the equipment.
- Shut off the electricity and air supply before performing any maintenance.
- Do not operate the equipment when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See Technical Data in all equipment manuals. (reference [Maintenance](#) Section)
- Do not alter or modify equipment.

- Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS forms from distributor or retailer. (reference [Maintenance](#) Section)
- **Check equipment daily.** Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only. (reference [Maintenance](#) Section)
- Use equipment only for its intended purpose. Call manufacturer for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.
- When a "DO NOT OPERATE" sign is placed on the equipment, do not operate the equipment until the sign has been removed by authorized personnel

Warning Tags and Labels



J6405



J5205



J5612



J5606

WARNING EQUIPMENT USE HAZARD

- Read & understand operator's manual before using this machine.
- Failure to follow operating instructions could result in death or serious injury.

WARNING AUTOMATED MACHINERY

- The equipment may start at any time.
- Stay clear.
- Lockout / tag out before servicing.
- Read and understand operator's manual before using this machine.

WARNING MOVING PARTS / PINCH POINT HAZARD

- Moving parts can pinch or amputate fingers and other body parts.
- Keep clear of moving parts.
- Watch your hands and fingers.
- Do not operate equipment with protective guards or covers removed.

WARNING MOVING PARTS / PINCH POINT HAZARD

- Moving parts can pinch or amputate fingers and other body parts.
- Keep clear of moving parts.
- Watch your hands and fingers.
- Do not operate equipment with protective guards or covers removed.



J5301



J6512

DANGER ELECTRIC SHOCK HAZARD

- Improper grounding, setup, or usage of the systems can cause electric shock.
- Turn off and disconnect power cord before servicing equipment.
- Use only grounded electrical outlets.
- Do not expose to rain; store indoors.

STAY CLEAR

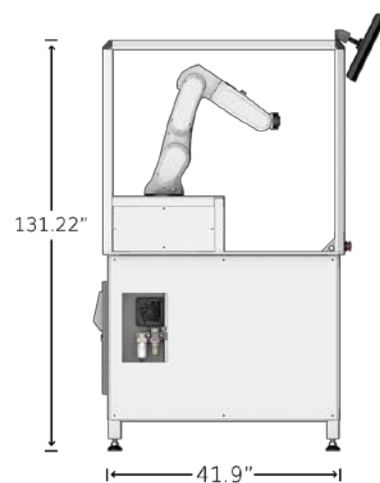
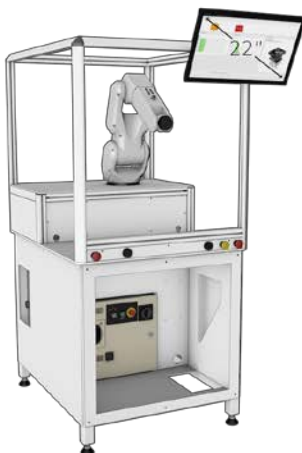
- Moving parts can pinch or amputate fingers and other body parts.
- Keep clear of moving parts.
- Watch your hands and fingers.
- Do not operate equipment with protective guards or covers removed
- Stay Clear of this area when equipment is running

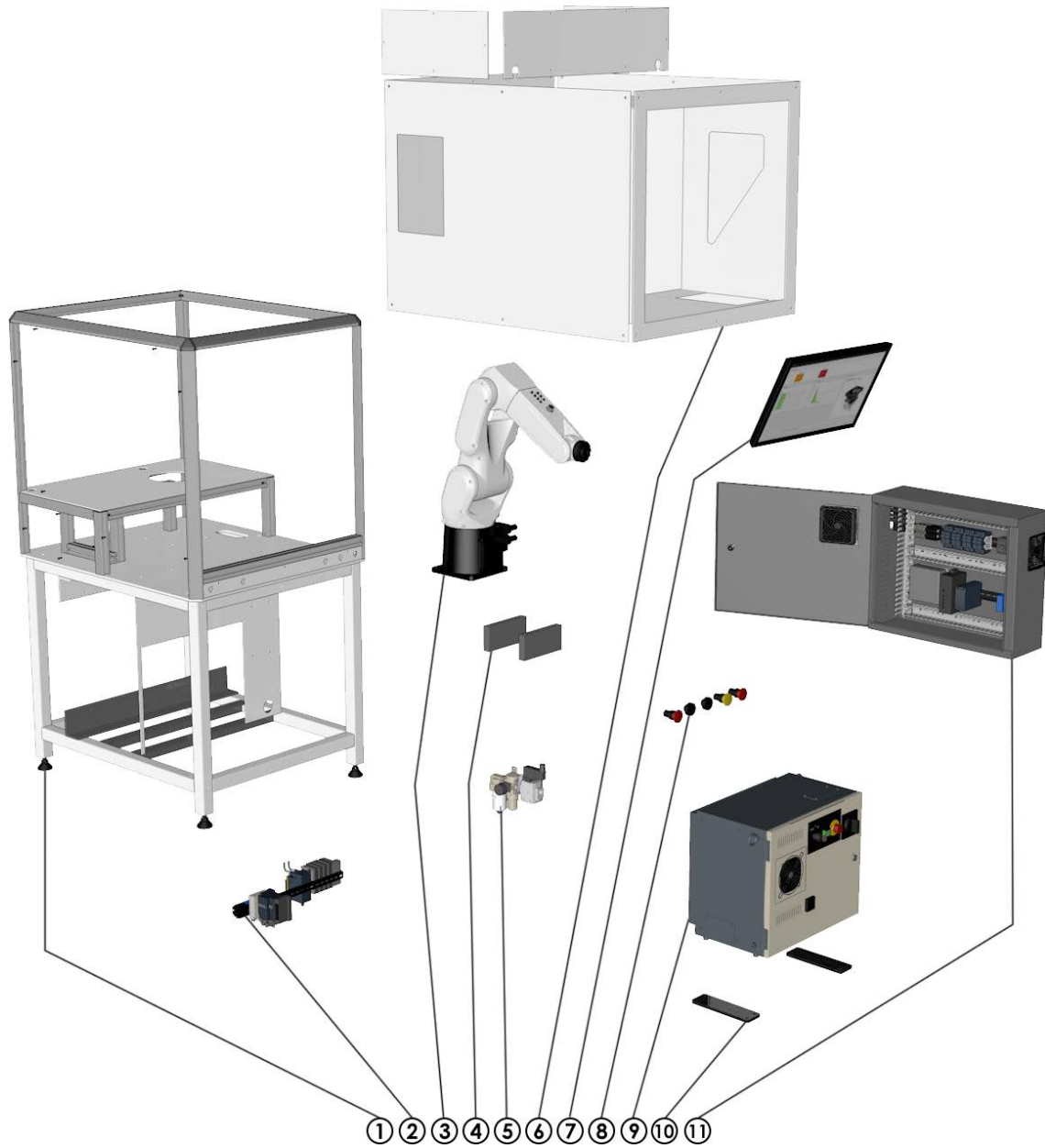
About the MotionCell^m

The MotionCell^m is designed to seamlessly integrate into an existing assembly process or to be partnered with additional MotionCells to create a turnkey assembly line. The MotionCell^m is configurable to meet most desktop hand operations; including, screw fastening, dispensing, and pick/place applications. Product tractability and data collection is now easy to add to your process. A wide variety of custom end fitting tools and modular cell design give the MotionCell^m almost limitless potential.



System Diagrams





Item Number	Part Number	Description
1		Structure Assembly
2		
3		Robot
4		Robot Stand
5		Filter / Pressure Regulator Combo
6		Metal Structure Covers
7		22" Touchscreen HMI
8		Buttons
9		R-30iA Mate Robot Controller
10		Robot Controller Stand
11		Electrical Enclosure

Getting Started

The MotionCellm system includes everything that is required to operate safely and correctly, including the safety circuit features and customized robot end of arm tooling. To order items from the recommended spare parts list or replacement items, contact Flexible Assembly Systems, Inc. by calling (619) 287-7000.

Unpacking the System

- 1) Remove clear shrink wrap and tarp from the system. Save any bubble wrap for you popping pleasure.
- 2) Toes clips are installed to secure the systems feet onto the pallet during transport. Removing the tow clips and banding.
 - a. **Remove and store toe clips in a safe location.** Toe clips will be used for installation.
- 3) Utilizing a forklift, lift the system from beneath the lower cross bars and remove from the pallet. Then lower to ground level. The systems base is designed to be the lift point.
- 4) If room permits, a forklift can be used to move the system into position. A pallet jack can also be utilized to move the system into position.

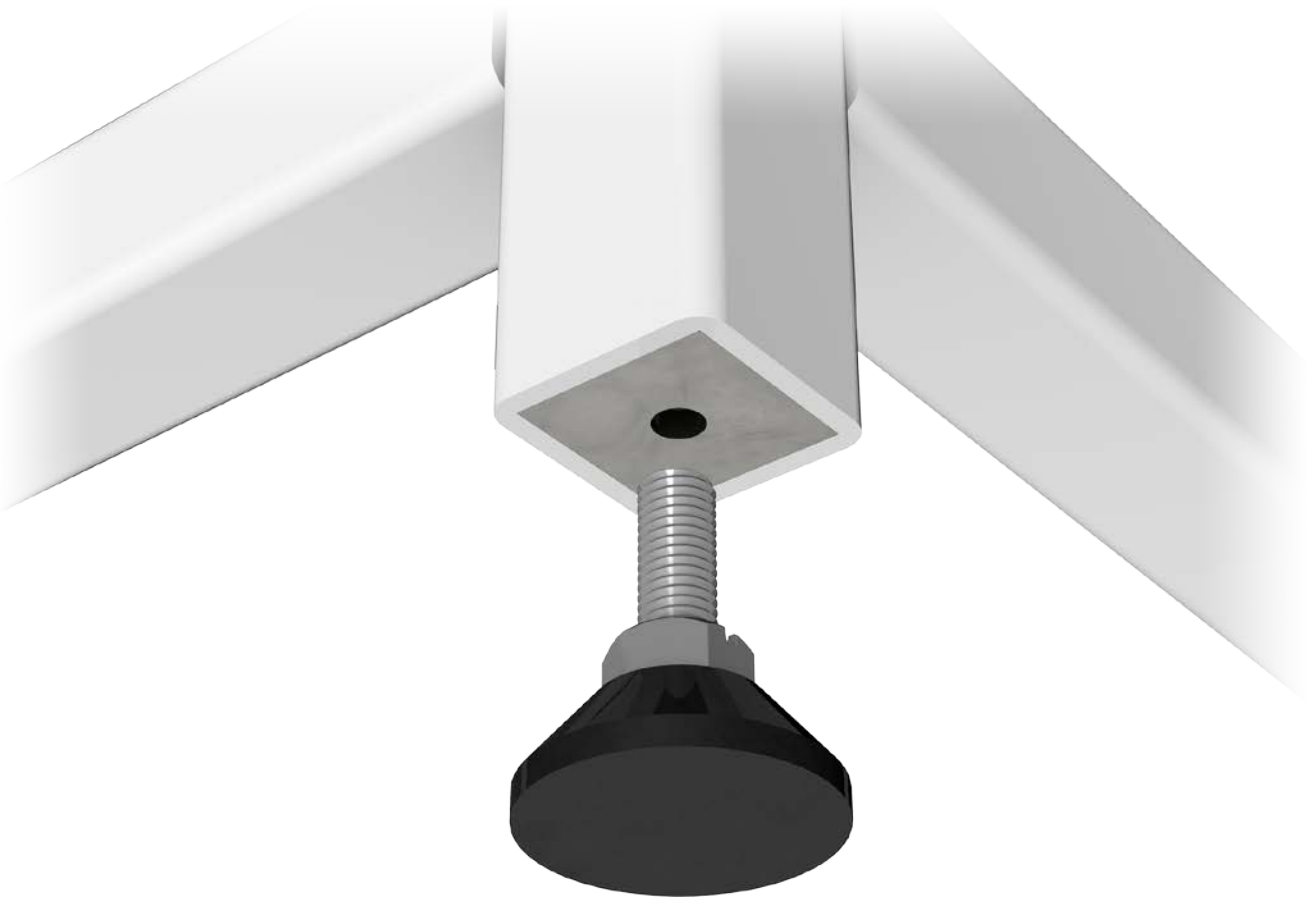


Setup

Required Tools: Level / 13mm Wrench / 24mm Wrench

Site Preparation

- 1) The concrete surface under the feet must be clean and flat. There should not be any holes, cracks, lumps, or ancient sacred burial grounds directly under the leveling feet. Patch all holes and broken concrete.
- 2) Clean and inspect the system feet. Clean any debris from the threaded feet posts.



Leveling

- 1) Leveling is accomplished by turning the leveling screws into and out of the machine base.
- 2) Using a precision machinists' level, electronic level, or laser, determine the machine's low side in the left-to-right direction. Raise the low side of the machine, by turning all of the leveling screws on the low side an equal amount, until the machine is level in that direction. Using a hydraulic jack will make the process easier on heavy machines.
- 3) Repeat procedure in the front-to-back direction.
- 4) Repeat Steps 2 and 3 until the machine is level.

CAUTION: Do not over adjust the screws. Make sure that leveling screw threads are fully engaged in the machine base.

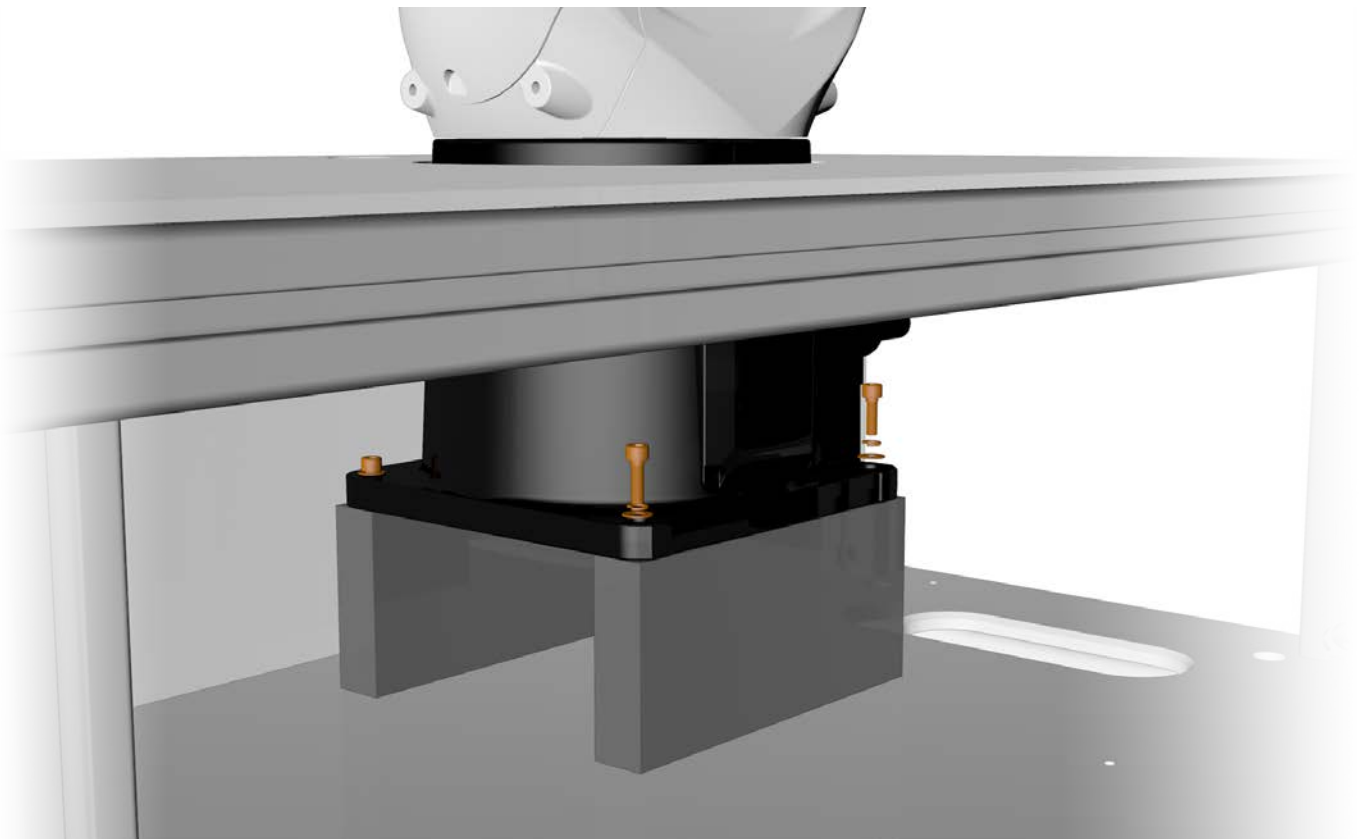


Notice:

Toe clips from packaging can be reused to anchor the systems feet to the floor. Leveling feet do not bolt to the floor and should not be used to mount machines that depend on anchor bolts to keep them from tipping or collapsing.

Verifying Robot Mounting Bolts

It is important for the installer to verify the mounting bolts holding the robot onto the base. As the bolts have been tightened down during the build and testing, vibration during transportation may have inadvertently caused the bolts to loosen. They are highlighted in the image below.

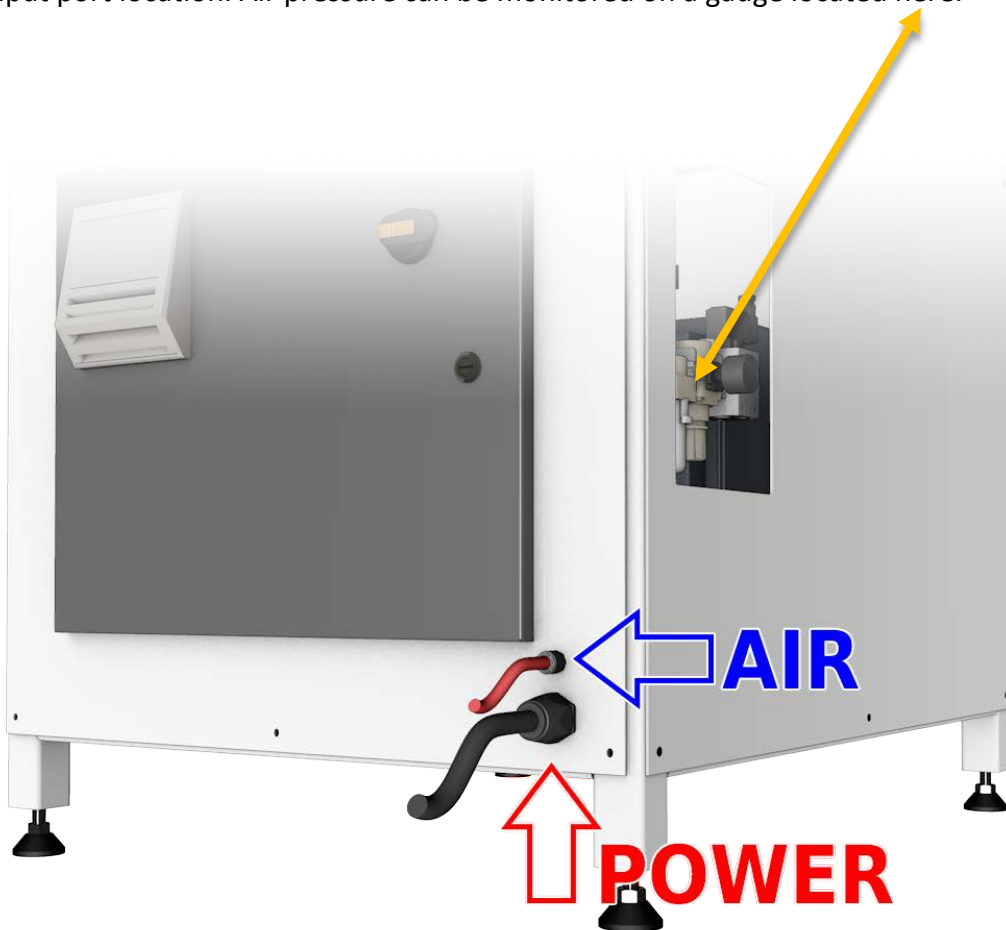


Supplying Air and Power to the System

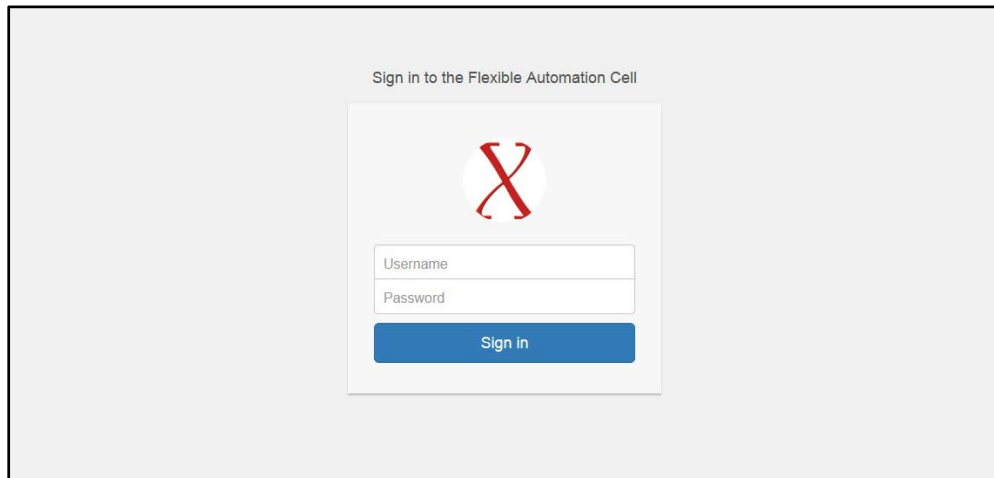
Prior to shipment, Flexible Assembly Systems, Inc. verified the facilities have the proper power and air supplies routed to the work area. It is the customer's responsibility to ensure that all power requirements are completed prior to the shipment of the system.

The system is supplied with a custom length power cable with NEMA plug (p/n: L6-30) that will require a 208-220 VAC 30 AMP power outlet. The power cable is routed from the control cabinet out the bottom of the system.


Air supply must provide a system min: **90 - 120 PSI** and **5 CFM**. Reference the image below for the air input port location. Air pressure can be monitored on a gauge located here.



Default Login Information



Sign in to the Flexible Automation Cell



Username
Password

Sign in

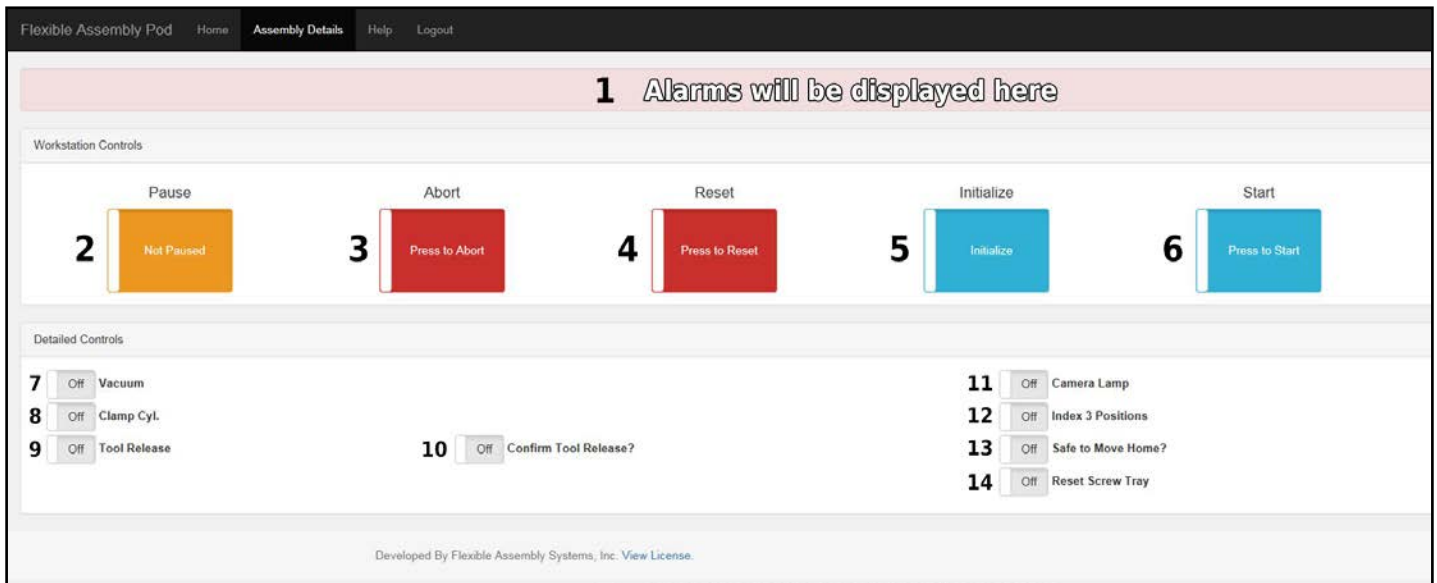
Username	Password
administrator	admin
operator	operator

The login information may be edited after delivery by an authorized supervisor utilizing the following txt file path:

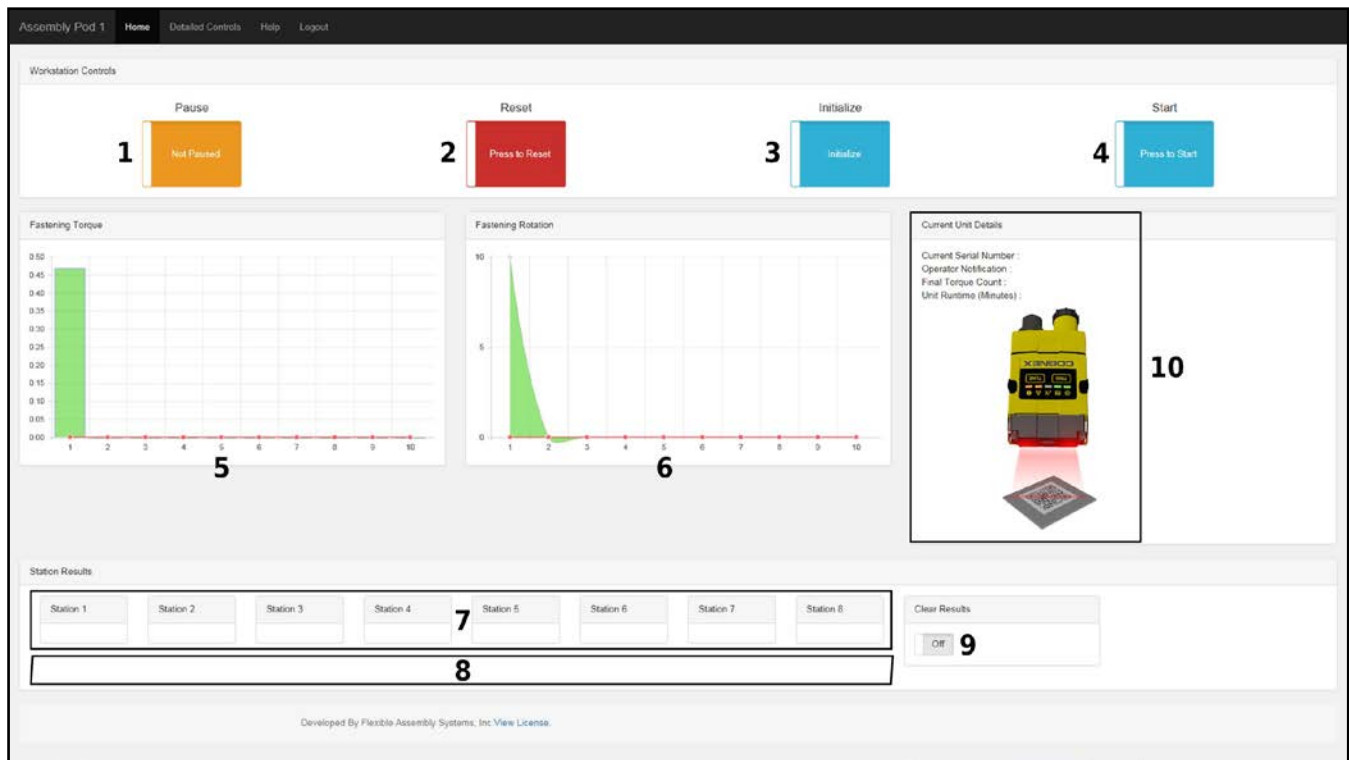
C:\flex-flow\passwd.txt

HMI Screenshots and Information

Below are some examples of Administrator HMI Screens. Since each MotionCell is custom your layout may differ slightly from those below.



#	Labeled As	Description
1	Alarm Display	FAS and Fanuc alarms will be displayed here
2	Pause	Pause the systems operation
3	Abort	Abort all functions
4	Reset	Reset alarms or faults
5	Initialize	Initialize routine in preparation for start
6	Start	Start system operation
7	Vacuum	Vacuum generator will turn on/off
8	Clamp Cyl.	Jig clamp generator will actuate
9	Tool Release	Tool holder will release the tool
10	Confirm Tool Release?	Prompts the operator to confirm the command to release the tool
11	Camera Lamp	Camera light will turn on
12	Index 3 Positions	Index table will move 3 positions to load
13	Safe to Move Home?	Prompts the operator to confirm the robots path home is clear of obstructions
14	Reset Screw Tray	Reset screw tray to start at the first position



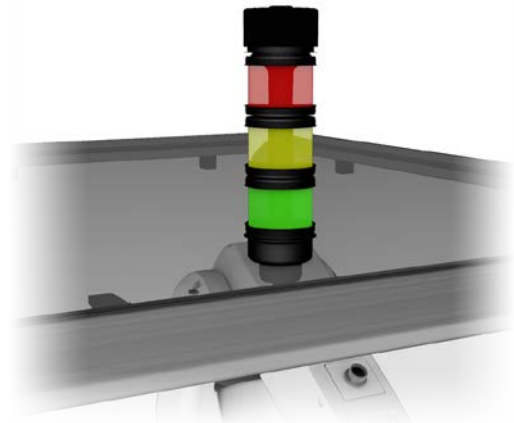
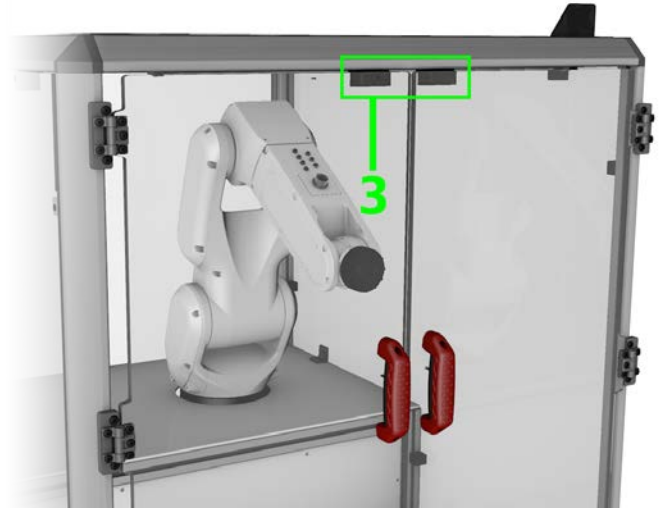
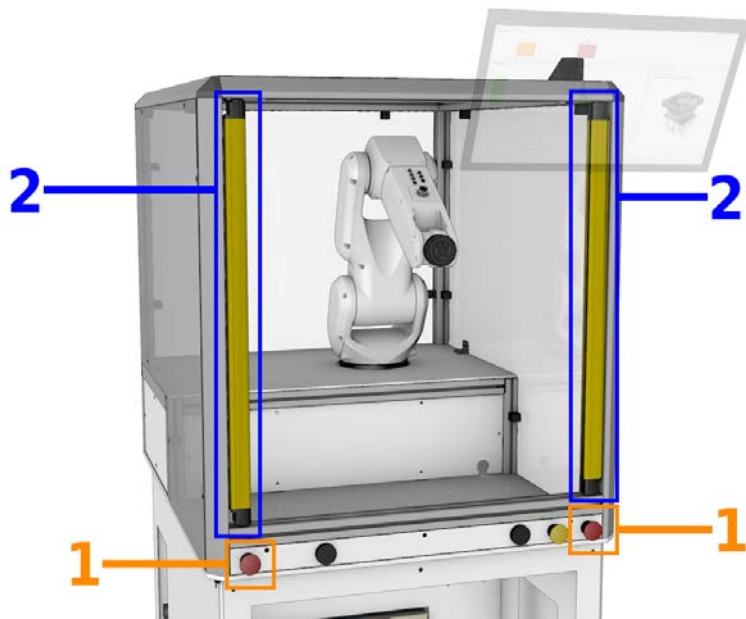
#	Labeled As	Description
1	Pause	Pause the system operations
2	Reset	Reset alarms or faults
3	Initialize	Initialize routine in preparation for start
4	Start	Start system operation
5	Fastening Torque	Final torque of screw
6	Fastening Rotation	Final angle of screw rotation
7	Station Results	Check marks will appear when specific station is complete
8	Not Labeled	Serial numbers will be displayed here
9	Clear Results	Clear results of previous run
10	Current Unit Details	Current sequence of operation

User Alarms

The system is loaded with these alarm codes, along with OEM Fanuc error codes that will display on the red bar of the HMI when flagged.

User Alarm	Comment	Severity
User Alarm [1]	System Aborted	43
User Alarm [2]	Vision Error	6
User Alarm [3]	Tool Error	6

Safety Circuit



1	Dual E-Stops	
2	Light Curtains (Optional)	
3	Magnetic Interlock Sensor (Optional)	
4	Main Disconnect Switch	

Color	Light Tower Indication
GREEN	OK / System in Operation
AMBER	High Speed Chirp: Fault Single Chirp: Fault
RED	Medium Chirp: Database Upload Complete Fault (Will display on-screen information)

Operation

The following is a basic walkthrough of system operations.

Cycle Start

1. Verify that all e-stops are released, access door is securely closed satisfying the interlock check and that light curtains are clear. Also make sure that the Fanuc Teach Pendant is switched OFF and the controller's key switch is turned to "Auto".

2. Press the RESET button.



3. Verify the stack light lamps are off and faults have been cleared (see [safety circuit](#))

4. Press cycle start. System will begin program sequence.



Pausing the System

1. At any time you can press the PAUSE button on the HMI screen. By pressing the robot will decelerate to a controlled stop.



WARNING: THIS IS NOT AN E-STOP FUNCTION AND SHOULD NOT BE USED AS ONE

2. Perform the intended task that initiated the PAUSE.
3. Verify that all e-stops are released, access door is securely closed satisfying the interlock check and that light curtains are clear.

4. Press the RESET button.



5. Verify the stack light lamps are clear.

6. Press cycle START. System will begin program sequence. The system will resume operation from where it has left off before the PAUSE.



Aborting the Current Program

In some cases it may become necessary to end the current program and start over from the beginning. By pressing the ABORT button on the administrator screen the machine will end all running programs and will require manually jogging the robot to a safe home position, after removing all path obstructions and parts.

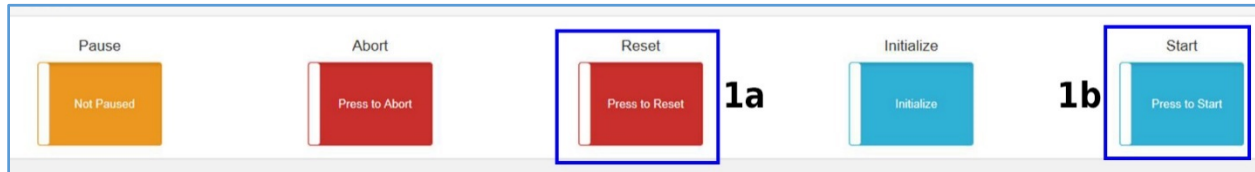


Following the [Cycle Start](#) procedure above will begin a new program.

Troubleshooting

If the machine becomes jammed during operation the system will try to recover itself before it faults out. If the machine is unable to recover please follow the steps below.

1. Pressing Reset (1a) and then pressing Start (1b) will resume the current process.



2. Follow the following steps if the machine is unable to automatically recover from an error.
3. Press an Emergency Stop button immediately if the error has not been resolved. ([Reference](#))
4. Inspect the problem with caution.
5. Attempt to resolve the issue. If the issue cannot safely be resolved, please contact an authorized technician immediately.
6. Once the issue has been resolved release the E-Stop by turning the button counter-clockwise.
7. To restart the system reference section [Aborting the Current Program](#) for the procedures.
8. Depending on the severity of the issue a re-initialization may be required.

Problem	Possible Cause	Solution
No Power	Main disconnect in off position	Turn to on position
	Tripped circuit breaker in equipment control panel	Open control cabinet and reset the tripped breaker (flip the breaker switch completely off and back to its on position)
	Tripped circuit breaker at main facility panel	Contact facility personnel for assistance
Enable Signal Fault	Low air pressure	Check air pressure is set to recommended setting
System Will Not Start	Light curtains blocked	Remove obstruction
	Controller in T1 mode or Teach Pendant ON	Turn the key to the correct position
	Interlock door open	Securely close interlock door
	Low air pressure	Verify air pressure coming into the system
	Fault not cleared	Clear fault on HMI screen
Poor Screw Detection	Low Air Pressure	Check air pressure is set to recommended setting
	Clogged filter, regulator or air line	Remove clog and replace filter
	Broken fitting or airline	Remove worn or defective part
High Reject Quantity	Bit is worn	Replace bit
	Bolt variability	Confirm tolerance specs of components being placed into the machine

Fanuc Controller Backup and Restore

If you are updating controller software you should first backup all program, system and application files you want saved to disks in case these files are lost during the update. If these files are lost during the update, you can load these files back into the controller from the disks.

Backing Up Files

CAUTION: Before you connect an external device to the controller, turn on the controller, then connect and turn on the device; otherwise, equipment could be damaged.

Conditions

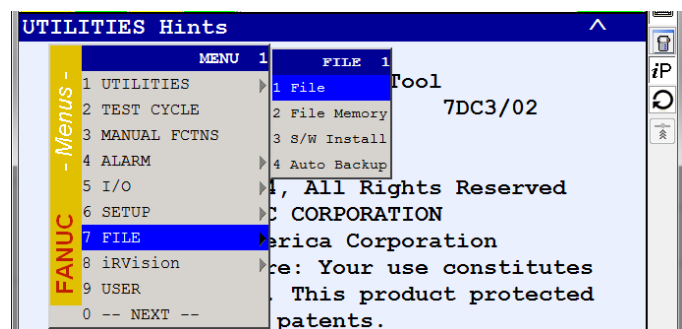
- If you are backing up files to a memory card or USB memory stick, the memory card or memory stick is installed properly. Most commonly a USB memory stick is installed on the Teach Pendant.
 - **Note: The memory card interface is not available on the R-30iB Mate Controller.**

Steps

1. Press **MENU**

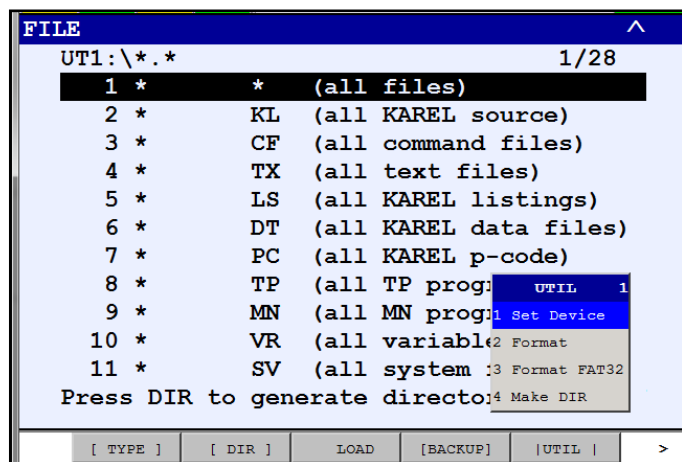
2. Press **7** for **FILE**

3. Press **1** for **File**

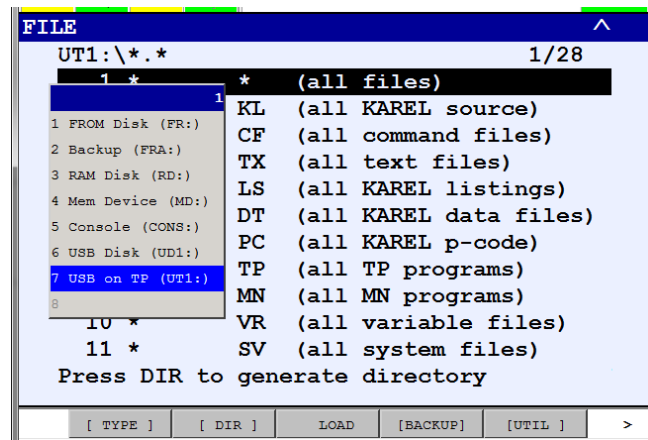


4. Press **F5** for **Utility**

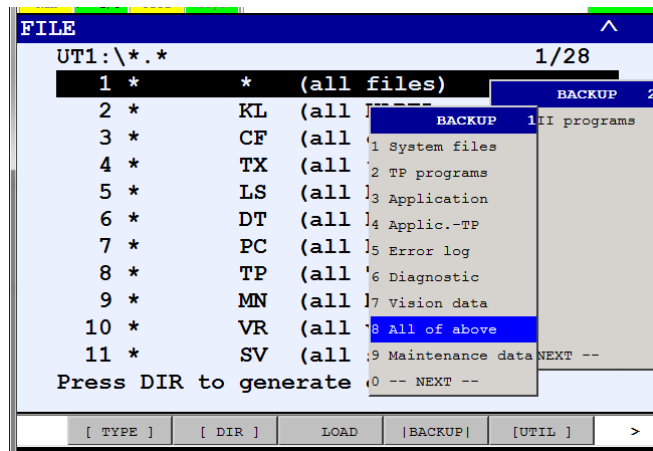
5. Press **1** for **Set Device**



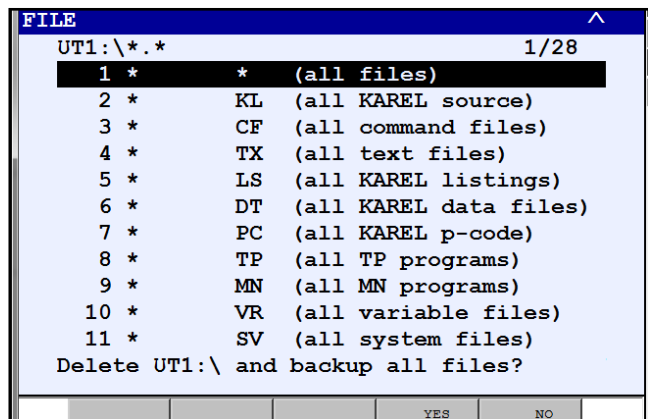
6. Press (#) that corresponds to your drive (most likely **7** for **USB on TP**)



7. Press **F4** for **Backup**
8. Press **8** for **All of above**



9. You will be prompted to delete all files. Press **F4** for **Yes**

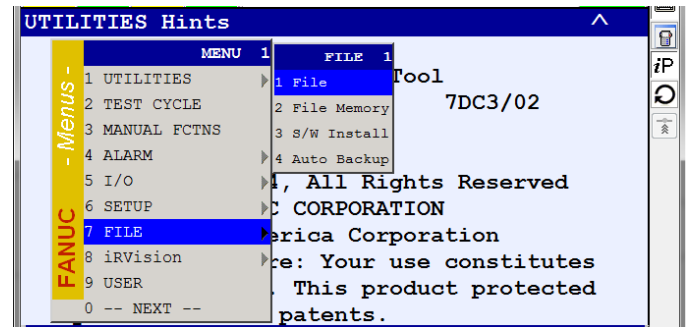


10. A progress bar will show the total number of files backed up.

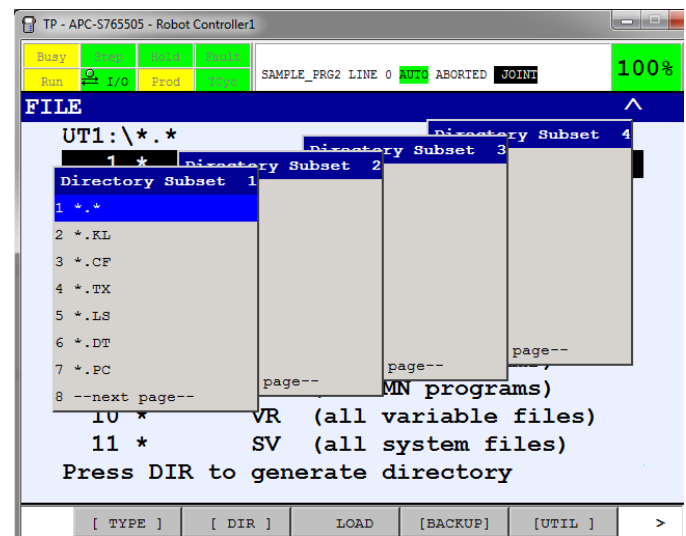
11. You have now backed up all your files.

Restoring Files

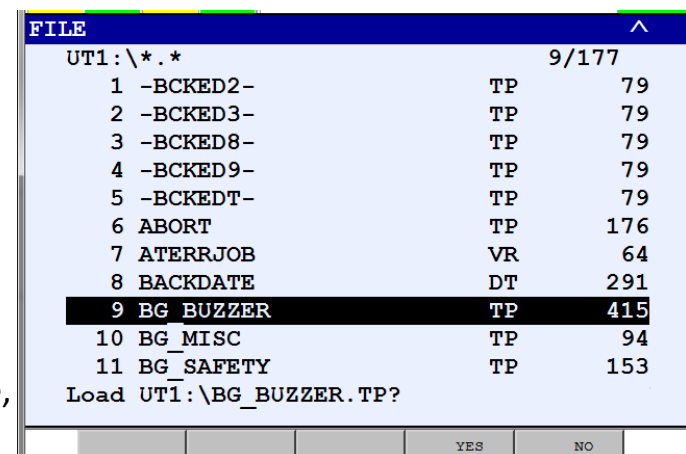
1. Press **MENU**
2. Press **7** for **FILE**, then **1** for **File**.



3. Press **F1** for **TYPE**
4. Press **F2** for **DIR**
5. Press **1** for ***.*** to list all files



6. Select the file you want to load and press **F3** to **Load**
7. When prompted to load press **F4** for **Yes**
8. If the program already exists press **F3** to **Overwrite**, **F4** to **Skip**, or **F5** to **Cancel**



Maintenance

Preventative Maintenance Checks and Service

Preventive maintenance recommendations are designed to prevent unexpected breakdowns and problems through periodic inspection and maintenance. Maintenance intervals should be based on frequency of usage and operating environment. Frequent usage, or dirty operating conditions require more frequent servicing. A clean, dry air supply will help keep the equipment functioning properly. Using this report will aid in tracking component failures or faults. We recommend the use of this report as a preventive maintenance tool.

This maintenance section is meant to be an overview and will provide basic maintenance info for servicing and maintaining the equipment. Please follow the recommended maintenance guidelines from each of the individual component manufacturers. This information can be found in the operation and maintenance sections of each manufactured component's operator manual which was provided with this equipment.

Daily Checks

Check the following items when necessary before daily system operation.

Check Items	Check Points and Management
Oil seepage	Check there is oil on the sealed part of each joint. If there is oil seepage, clean them.
Vibration and/or Abnormal noises	Check whether vibration or abnormal noises occur.
Repeatability	Check whether the taught positions of the robot have not deviated from the previous taught positions.
Peripheral devices for proper operation	Check whether the peripheral devices operate properly according to commands from the robot and the peripheral devices.
Brakes for each axis	Check that the droppage of the end effector is within 2 mm when the servo power turned off.
Warnings	Check whether unexpected warnings occur in the alarm screen on the teach pendant.
Cleaning & checking each part	Clean each part and check components for cracks or flaws.
Air Pressure / leakage	Check air pressure using pressure gauge.
Cleaning	See list below

- Clean sediments periodically. In particular, clean in the vicinity of the wrist axis and oil seal. If chippings or spatters are attached to the oil seal, an oil leak may be caused.
- Check if the vicinity of the necessary inspection points, wrist part, and J3 arm significantly wears due to rubbing against the welding cable or hand cable.
- Check if there is a trace of a collision around the hand.
- Check the reducer or grease bath for an oil leak.
 - o If oil can be found a day after wiping oil, an oil leak may be present.

Robot Maintenance

NOTE The following Fanuc periodic maintenance procedures described below assume that the Fanuc robot is used for up to 3,850 hours a year. In cases where robot use exceeds 3,840 hrs/year, adjust the given maintenance frequencies accordingly.

First One Month (320 Hours)

Check Items	Check Points
Control unit cable and robot connecting cable	Check whether the cable connected to the teach pendant and robot is unevenly twisted.
Cleaning the controller ventilation system	If the controller ventilation system is dusty, turn the power off, and clean the unit.

Every 3 Months (960 Hours)

Check Items	Check Points
Control unit cable and robot connecting cable	Check whether the cable connected to the teach pendant and robot is unevenly twisted.
Ventilation portion of control unit	If the ventilation portion of the control unit is dusty, turn off the power and clean the unit.
Cleaning and checking each part	See " Cleaning " in Daily Checks

Check the following items at the first quarterly inspection, then every year thereafter.

First Quarterly Inspection

Check Items	Check Points
Connector used in mechanical unit.	Check that the connectors of the connector panel are securely engaged. See below.
Further tightening external main bolts.	Tighten the end-effector mounting bolts and external main bolts. See below.

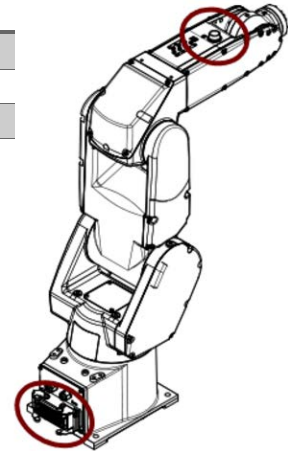
Check Items	Check Points
Circular Connector	Check the connector for looseness by turning it manually.
Square Connector	Check the connector for disengagement of its lever.
Earth Connector	Check the terminal for looseness by turning.

Points To Be Retightened

The end effector mounting bolts, robot installation bolts, and bolts to be removed for inspection need to be retightened.

The bolts exposed to the outside of the robot need to be retightened.

For tightening torque, please see the recommended bolt tightening torque shown in the appendix of the Fanuc LR Mate 200iC maintenance manual.



Every 1 year (3,840 Hours)

Check Items	Check Points
Tightness of major bolts	See " Points To Be Retightened " above.
Battery (built-in type)	Replace the battery. See Next page.

Every 2 years (7,680 hours)

Check Items	Check Points
Greasing of reducers of each axis	Specified grease Harmonic grease 4BNo.2 Spec: A98L-0040-0230#2KG Greasing kit (tube of grease plus injector) Spec: A05B-1139-K021 Tube of grease (80 g) Spec: A05B-1139-K022 Do not use Harmonic grease SK-3 or unspecified grease.

Every 4 years (15,360 Hours)

Check Items	Check Points
Replacing the mechanical unit cable	Replace the mechanical unit cable.
Replacing the controller batteries	Replace the controller batteries.

Replacing the Robot Batteries (Built-in type)

The position data of each axis is preserved by the backup batteries. The batteries need to be replaced every 1 year. Also, use the following procedure to replace when the backup battery voltage drop alarm occurs.

- 1) **Keep the power on.** Press the EMERGENCY STOP button to prohibit the robot motion.

CAUTION: Replacing batteries with the power supply turned off causes all current position data to be lost. Therefore, mastering will be required again.

- 2) When severe dust/liquid protection or 5LC, 5WP, 5C is selected, remove the battery case cap.
- 3) Loosen the plate screw, take the lid out of the battery box, and replace the batteries (4x C battery).
The battery can be taken out by pulling the stick.
- 4) Assembly them by the opposite procedure, pay attention to the orientation of the batteries.

