FAB-PAK®
ROBOTIC WELDING CELL

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

REFERENCE MANUALS

MAGNUM PRO MANUAL
DRESS-OUT KIT WORK INSTRUCTION
POWER WAVE R450 WORK INSTRUCTIONS
FENCING ASSEMBLY INSTRUCTIONS
POWER REAM II MANUAL
PERFECT POINT MANUAL

This system manual provides an overview of the Lincoln Electric FAB-PAK® systems. It gives general information about the systemS, a description of its major components, and the procedures for installation, system operation, and preventive maintenance. Be sure to read and understand this manual thoroughly before installing and operating the FAB-PAK® system.

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure that all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples, and differences may exist between them and delivered product.
- Lincoln Electric may modify this model without notice when necessary due to product improvement, modifications, or changes in specifications.
- If such a modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a Lincoln Electric representative to order a new copy.

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THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT. And, most importantly, think before you act and be careful.

WARNING

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

CAUTION

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.

KEEP YOUR HEAD OUT OF THE FUMES.

DON'T get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

USE ENOUGH VENTILATION or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

IN A LARGE ROOM OR OUTDOORS, natural ventilation may be adequate if you keep your head out of the fumes (See below).

USE NATURAL DRAFTS or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.

WEAR CORRECT EYE, EAR & BODY PROTECTION

PROTECT your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

PROTECT your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

PROTECT others from splatter, flash, and glare with protective screens or barriers.

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**

SPECIAL SITUATIONS

DO NOT WELD OR CUT containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

DO NOT WELD OR CUT painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

Additional precautionary measures

PROTECT compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

BE SURE cylinders are never grounded or part of an electrical circuit.

REMOVE all potential fire hazards from welding area.

ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.

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SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65 warnings.ca.gov/diesel

WARNING: This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.*)

WARNING: Cancer and Reproductive Harm www.P65warnings.ca.gov

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE POWERED EQUIPMENT.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.

1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.

1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF).
Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

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ELECTRIC SHOCK CAN KILL.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS CAN BURN.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES CAN BE DANGEROUS.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required.**
Additional precautions are also required when welding on galvanized steel.

5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer's safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

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WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

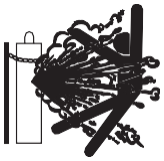
6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER MAY EXPLODE IF DAMAGED.



7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

Refer to http://www.lincolnelectric.com/safety for additional safety information.

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ELECTROMAGNETIC COMPATIBILITY (EMC)

Conformance

Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction

All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Warning: This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electro-magnetic compatibility in those locations, due to conducted as well as radiated disturbances.

Installation and use

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.
Note: The welding circuit may or may not be earthed for safety reasons. Follow your local and national standards for installation and use. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

Assessment of area

Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in surrounding area. The following shall be taken into account:
a) Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;
b) Radio and television transmitters and receivers;
c) Computer and other control equipment;
d) Safety critical equipment, e.g., guarding of industrial equipment;
e) The health of the people around, e.g., the use of pacemakers and hearing aids;
f) Equipment used for calibration or measurement;
g) The immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
h) The time of day that welding or other activities are to be carried out.
The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of reducing emissions

Public supply system

Welding equipment should be connected to the public supply system according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the system. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the welding equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the workpiece

Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g., ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

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Introduction

The FAB-PAK® standard robotic welding cells features a single load and unload area with two independent work zones. The systems are designed to meet ISO 10218 Part 2 (ANSI/RIA 15.06-2012 Part 2) specifications for work cell safety, employing operational zones guarding, or safety light curtains as entry detection, and/or safety rated software pre-reset feature as a presence detection. The cell is configured with push button station completed with operator controls, zone status indicating pilot lights (optional), and a back access door for robot and reamer programming and maintenance. There is a simple PANEL WIZARD screen on the robot teach pendant providing instant real time status overview of major components.

Intended or Proper use of the robotic cells

These cells are intended for use exclusively as a robotic system for metal inert gas shielded (MIG) welding or tungsten inert gas welding (TIG) of steel or aluminum components. These components are held in welding position by specifically designed tooling fixtures.

These cells are intended to be used only in an indoor environment, firmly lagged to a concrete floor. The concrete floor shall be sufficiently stable.

Measures need to be taken to safeguard people who work with these systems. The relevant safety measures that are taken must consider all risks and hazards that may arise when working with these robotic welding systems.

Proper use also includes observing all instructions in the operating manual for the entire system and carrying out the inspection and maintenance work.

Foreseeable misuse of XHS-CM robotic cell

Any procedure, other than what is specified in the “Intended or Proper use of the robotic cells” section that goes beyond the above mentioned “Intended or Proper use of the robotic cells” is considered improper use. This includes, but not limited to, loading the robot and positioner at a higher weight and volume, providing different than what is specified incoming voltage, power feeder protection and capacity, attempts to weld with different materials other than steel or aluminum, or welding using different weld processes other than MIG or TIG.

No changes are permitted to be made to any part of this equipment if they would enable any type of misuse versus what is defined in the “Intended or Proper use of the robotic cells” section.

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Modification of Your Cell

These cells shall not be modified in any way. Modifications could affect their performance, safety or durability, and possibly will violate ISO 10218 Part 2 (ANSI/RIA 15.06-2012 Part 2) safety requirements. In addition, damage or performance problems resulting from modification will not be covered under the Lincoln Electric warranties.

When Reading This Manual

This manual includes information for all options available on this type of equipment. Therefore, you may find some information that does not apply to your system. All information, specifications and illustrations in this manual are those in effect at the time of printing. Lincoln Electric reserves the right to change specifications or design at any time without notice.

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Technical Specifications

System Electrical Power Requirements:

When the system is furnished with a single main power disconnect panel (readily available as a 100 Amperes LOTO-compliant option from Lincoln Automation):

LINCOLN FAB-PAK	INPUT POWER REQUIREMENTS (V/A/Hz)	MAXIMUM INPUT AMPERES	SO CORD SIZE AWG (mm^2)	REQUIRED POWER DROP (A)	TIME DELAY FUSE OR BREAKER (A)
ROBOTIC CELL	460/50/60/3	45(@460)	6 (16)	100	100

Otherwise, this equipment requires two separate power drops (four in the case of two robots):

LINCOLN WELDER	INPUT POWER REQUIREMENTS (V/A/Hz)	MAXIMUM INPUT AMPERES	SO CORD SIZE AWG (mm^2)	REQUIRED POWER DROP (A)	TIME DELAY FUSE OR BREAKER (A)
POWERWAVE R450	3PH (208V – 575V)	37(@460)	8 (10)	60	45

FANUC ROBOT	INPUT POWER REQUIREMENTS (V/A/Hz)	MAXIMUM INPUT AMPERES	SO CORD SIZE AWG (mm^2)	REQUIRED POWER DROP (A)	TIME DELAY FUSE OR BREAKER (A)
R-30iB PLUS	460/50/60/3	5	12 (4)	30	20

Power cords and fuse sizes are based on the National Electric Code (NEC) NFPA 70 2022 edition. The requirements of this code address the fundamental principles of protection for safety which is contained in Section 131 of International Electrotechnical Commission (IEC) Standard 60364-1, Electrical Installations of Buildings.

The end user is responsible for meeting all local electrical codes and certifications. Refer to specific manuals for local codes and regulations.

System Pneumatic Requirements:

PRESSURE: 80 PSI, FLOW 16.5 SCFM

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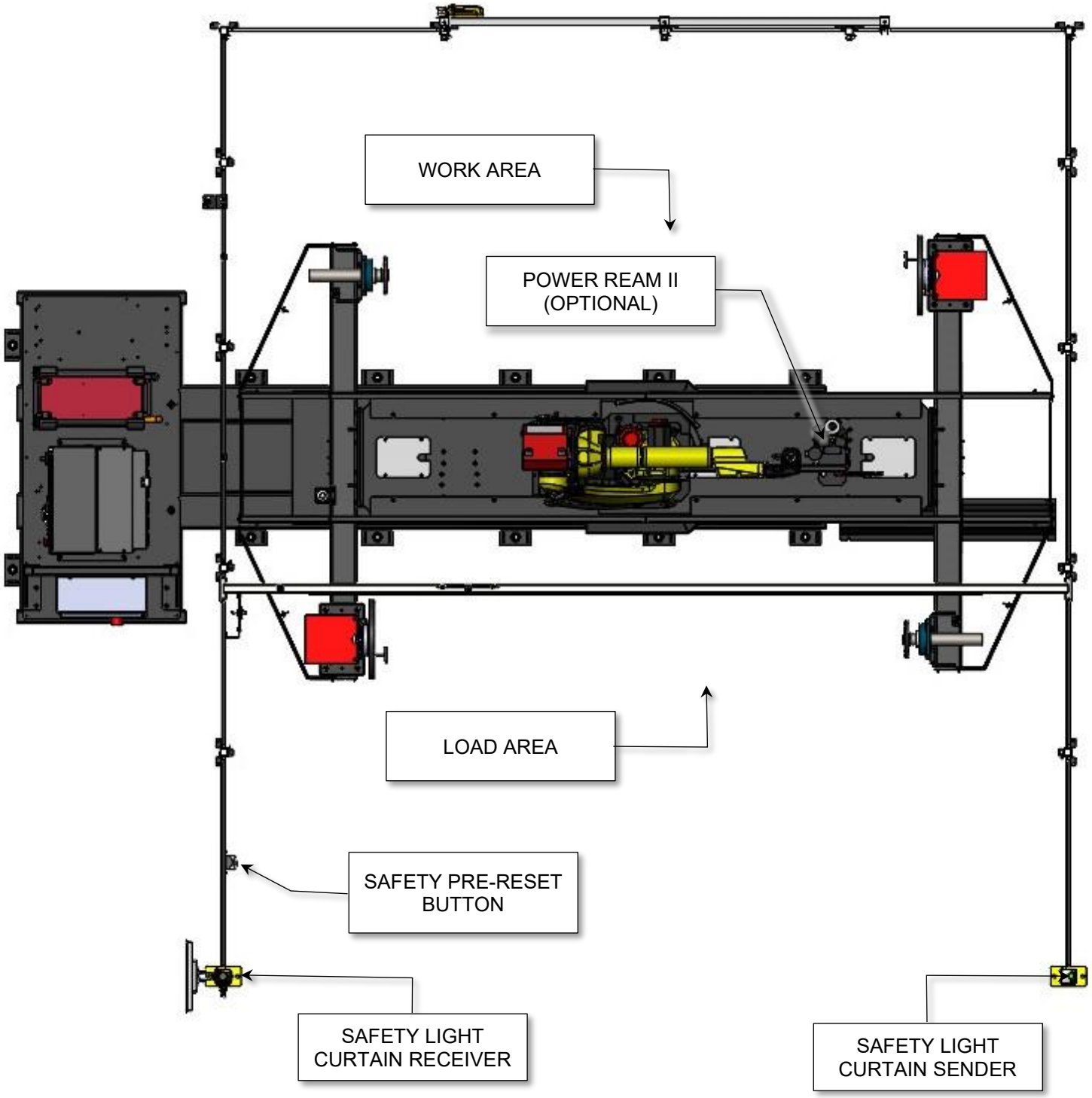
XHS-CM Equipment Layout with Major Components.

View-1, Top:



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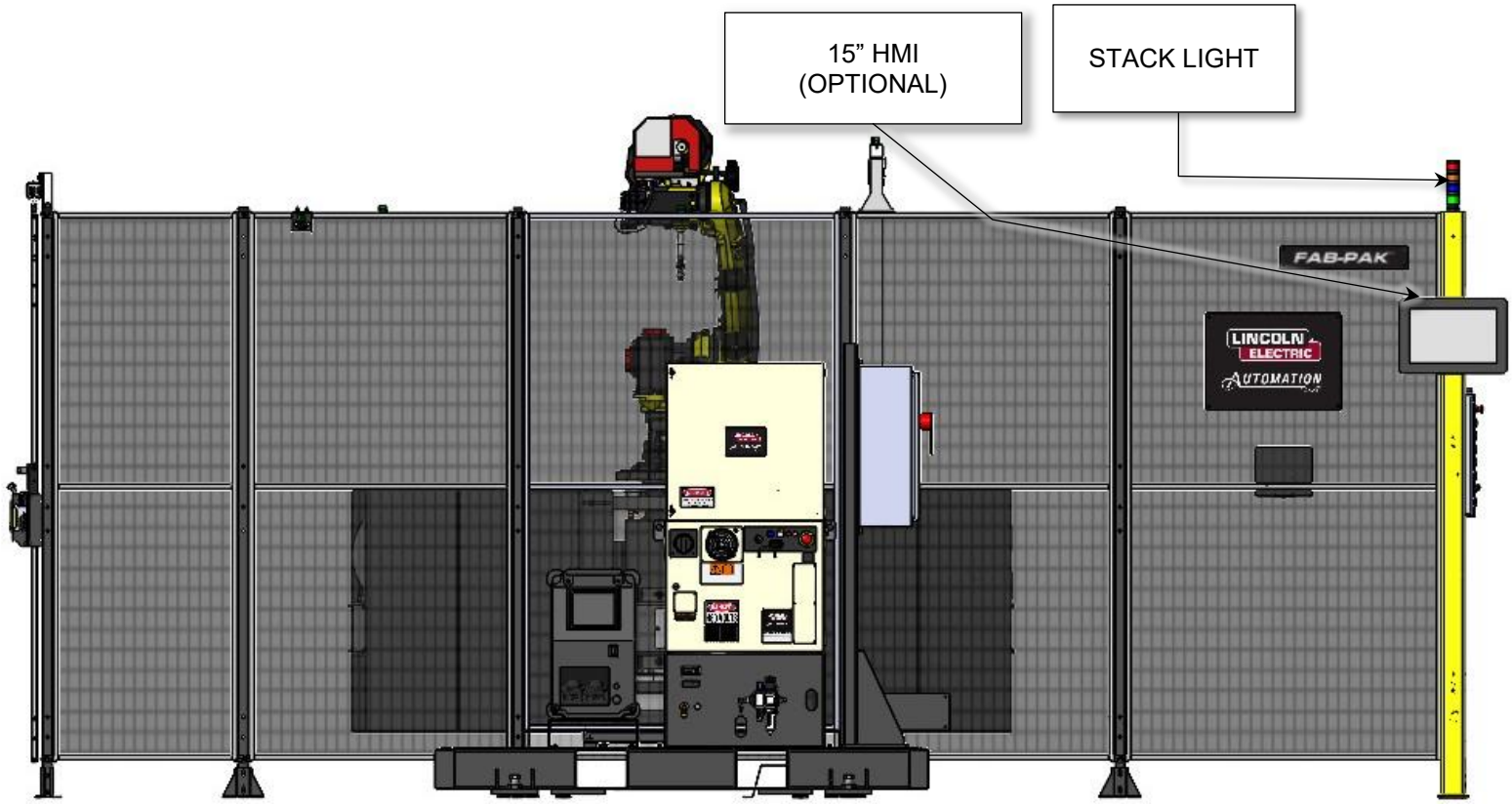
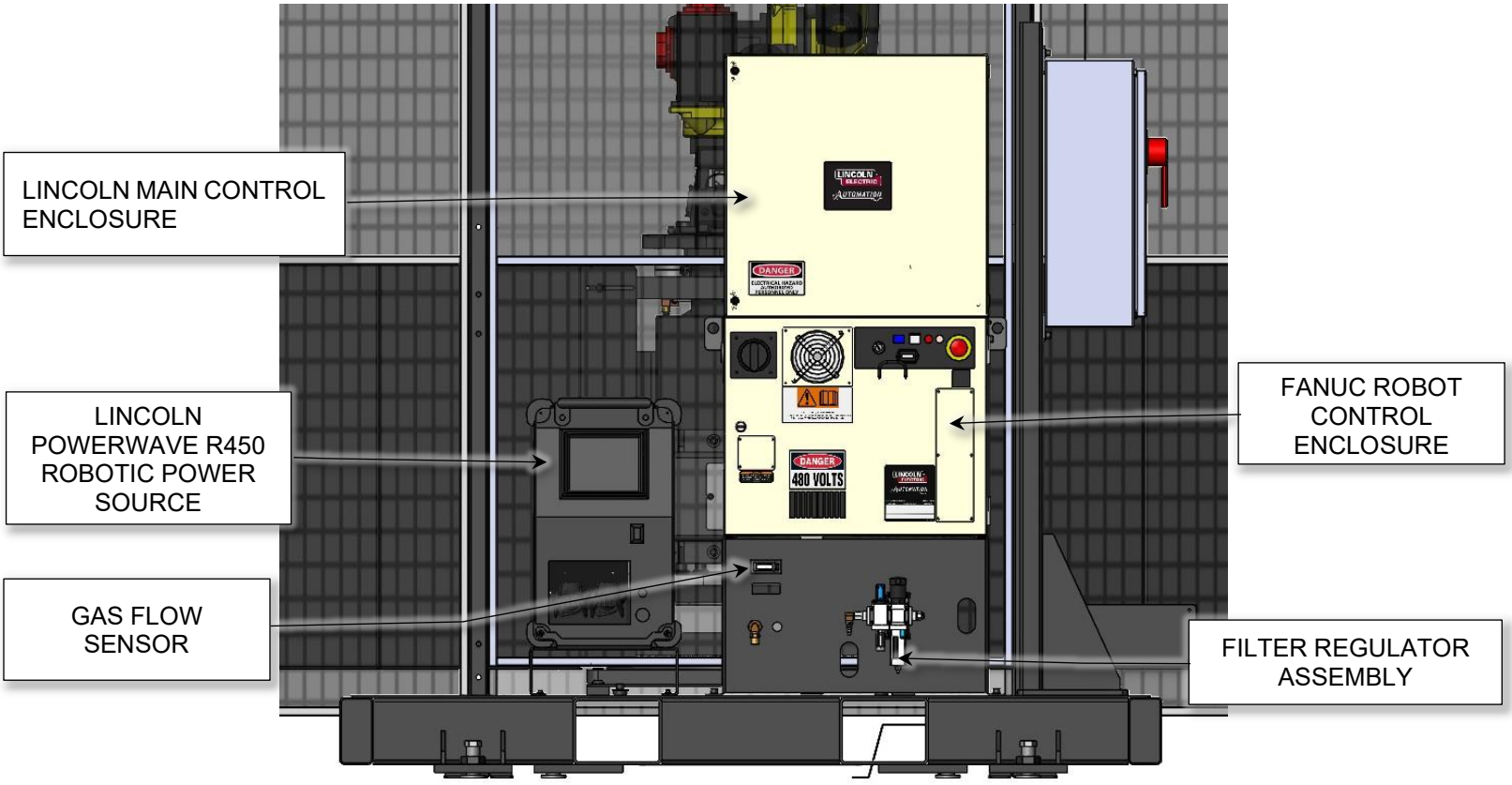
View-2, Right:





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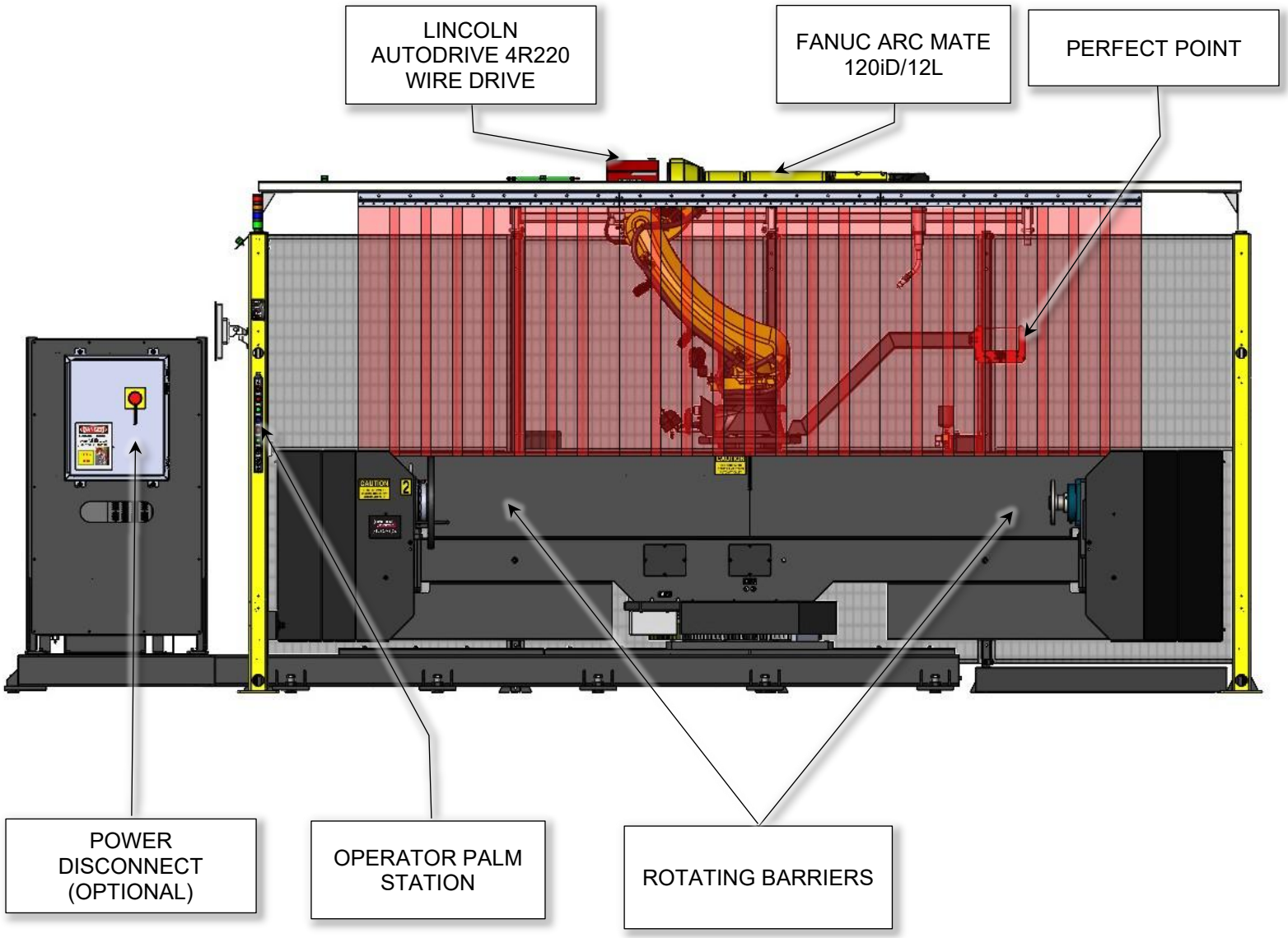
View-3, Front:



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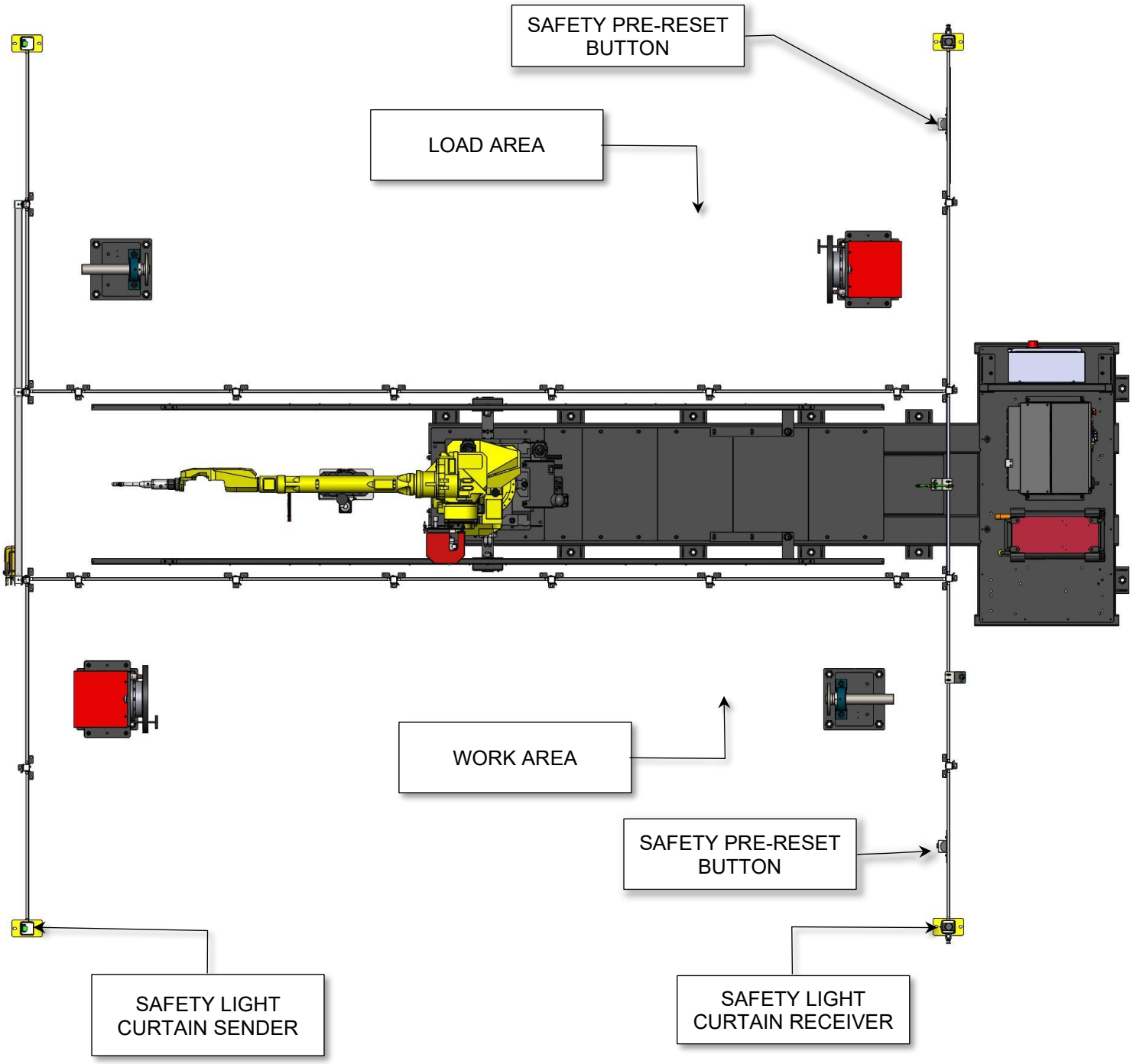
B2B Equipment Layout with Major Components.

View-1, Top:



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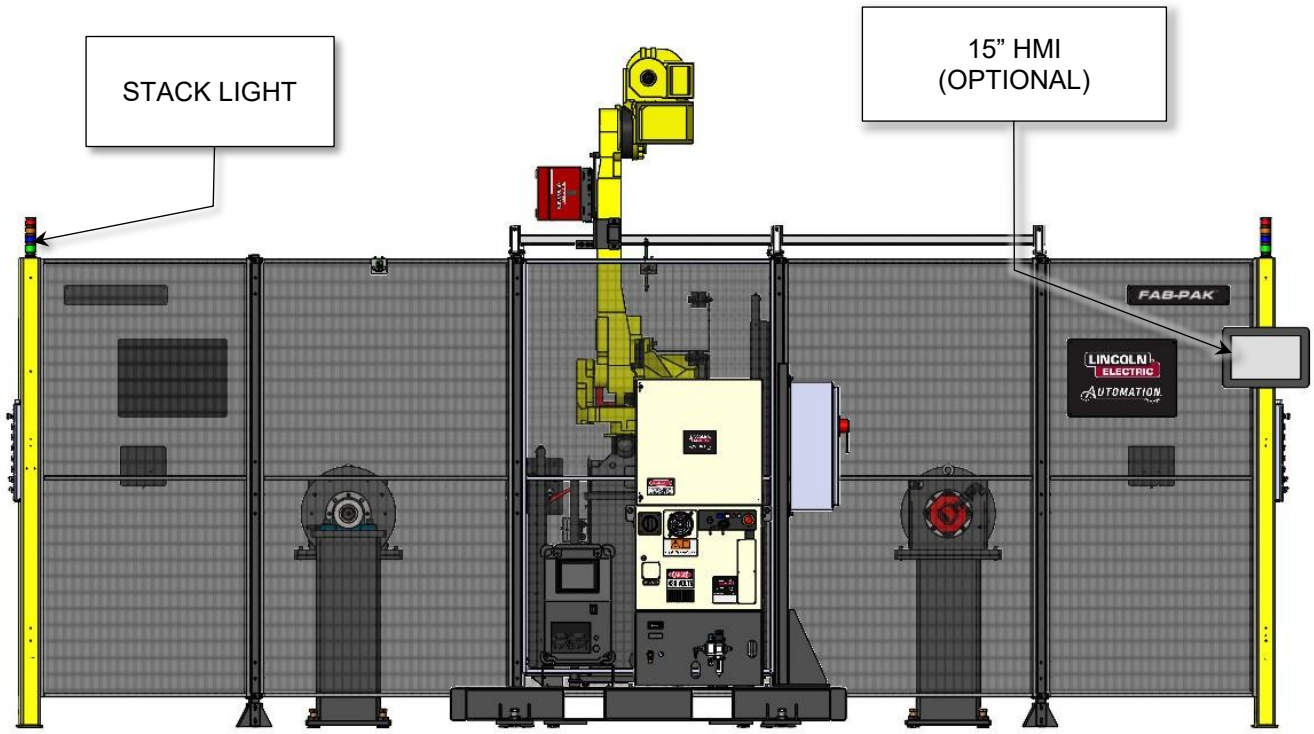
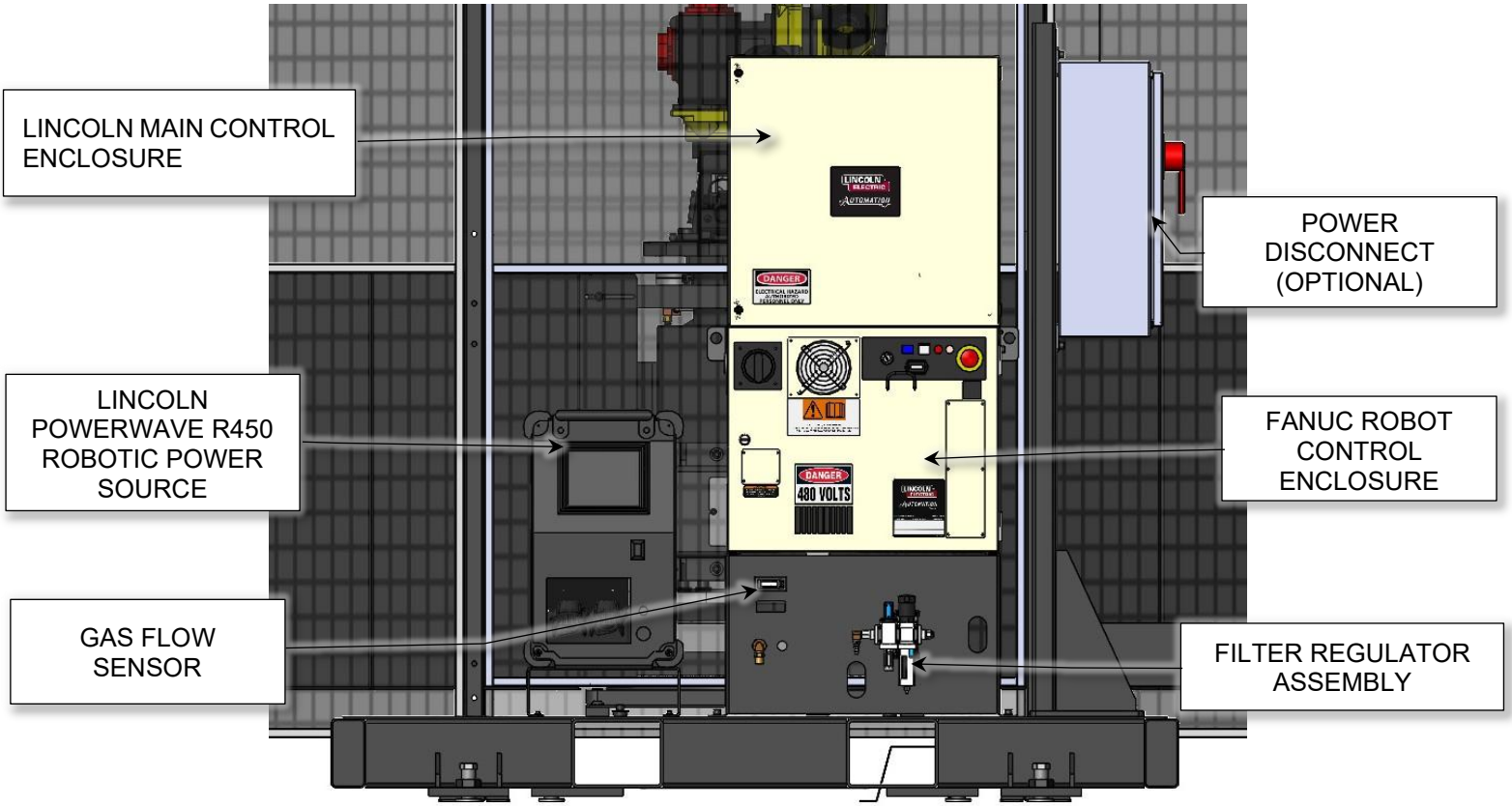
View-2, Right:





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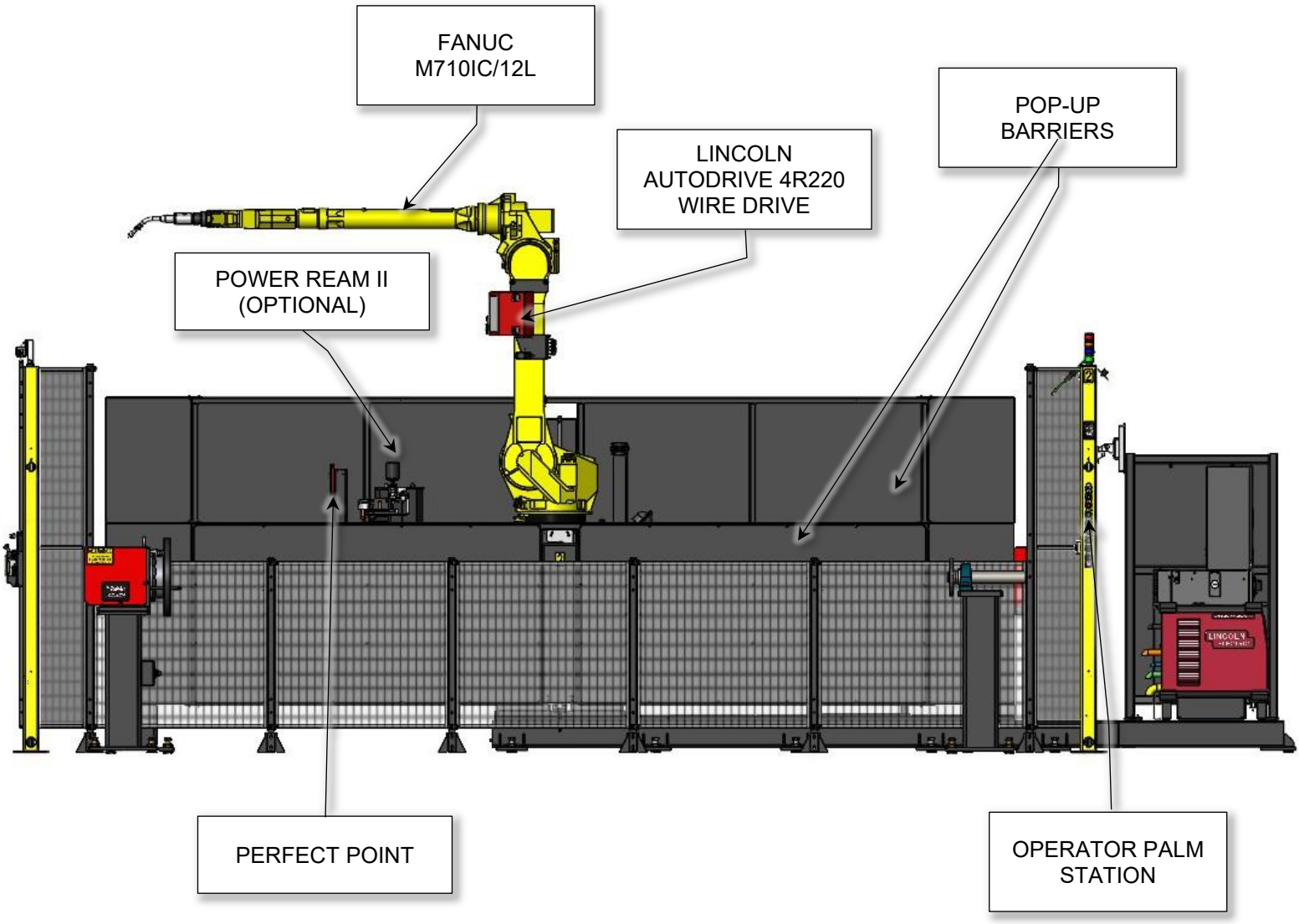
View-3, Front:



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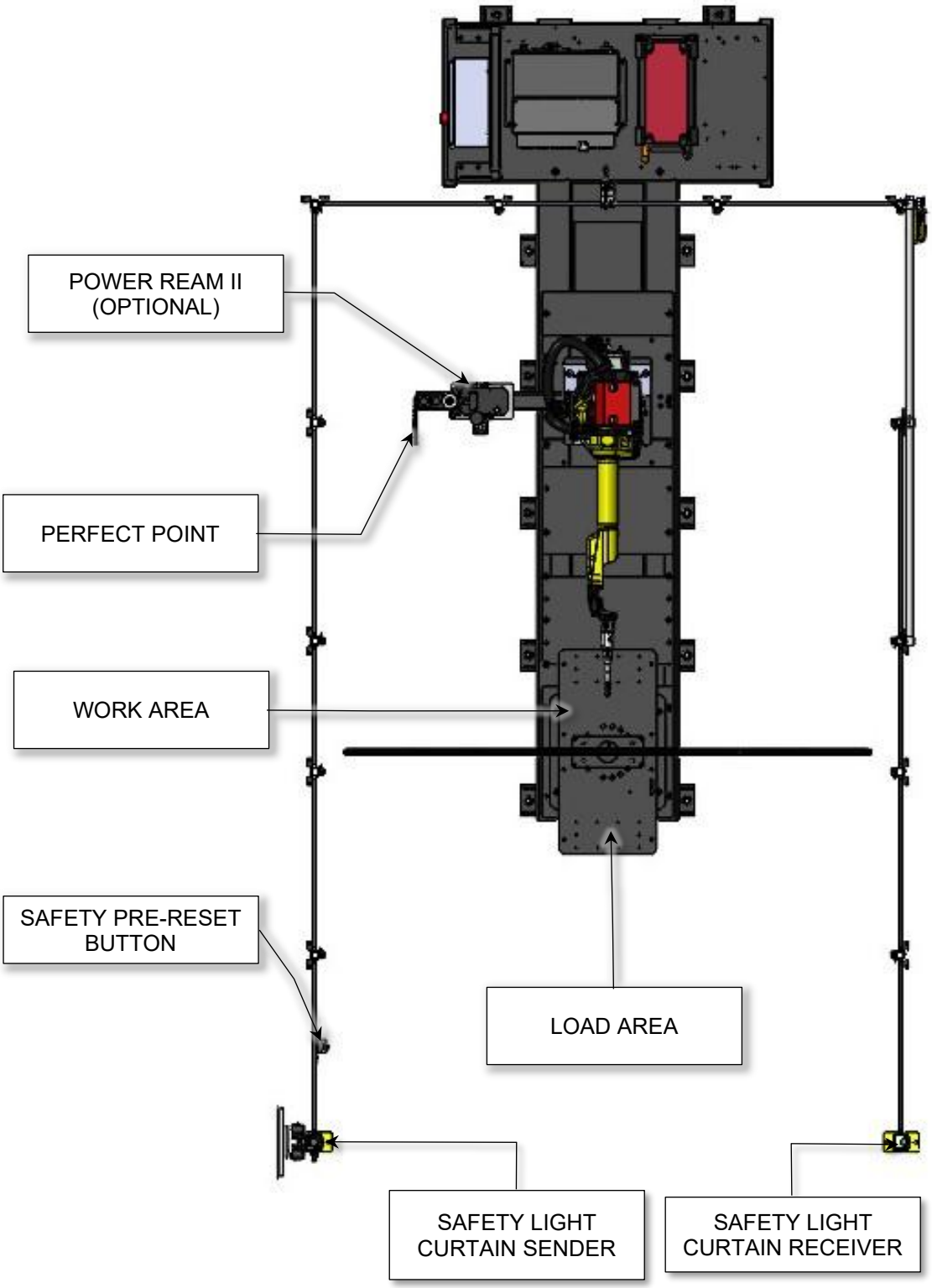
XFT Equipment Layout with Major Components.

View-1, Top:



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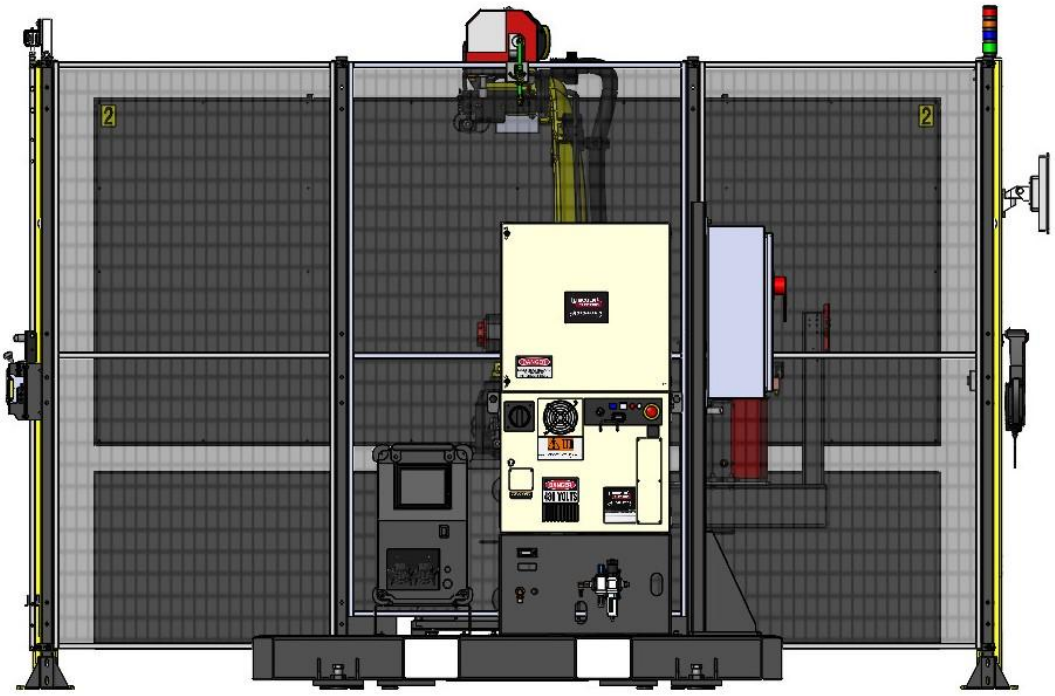
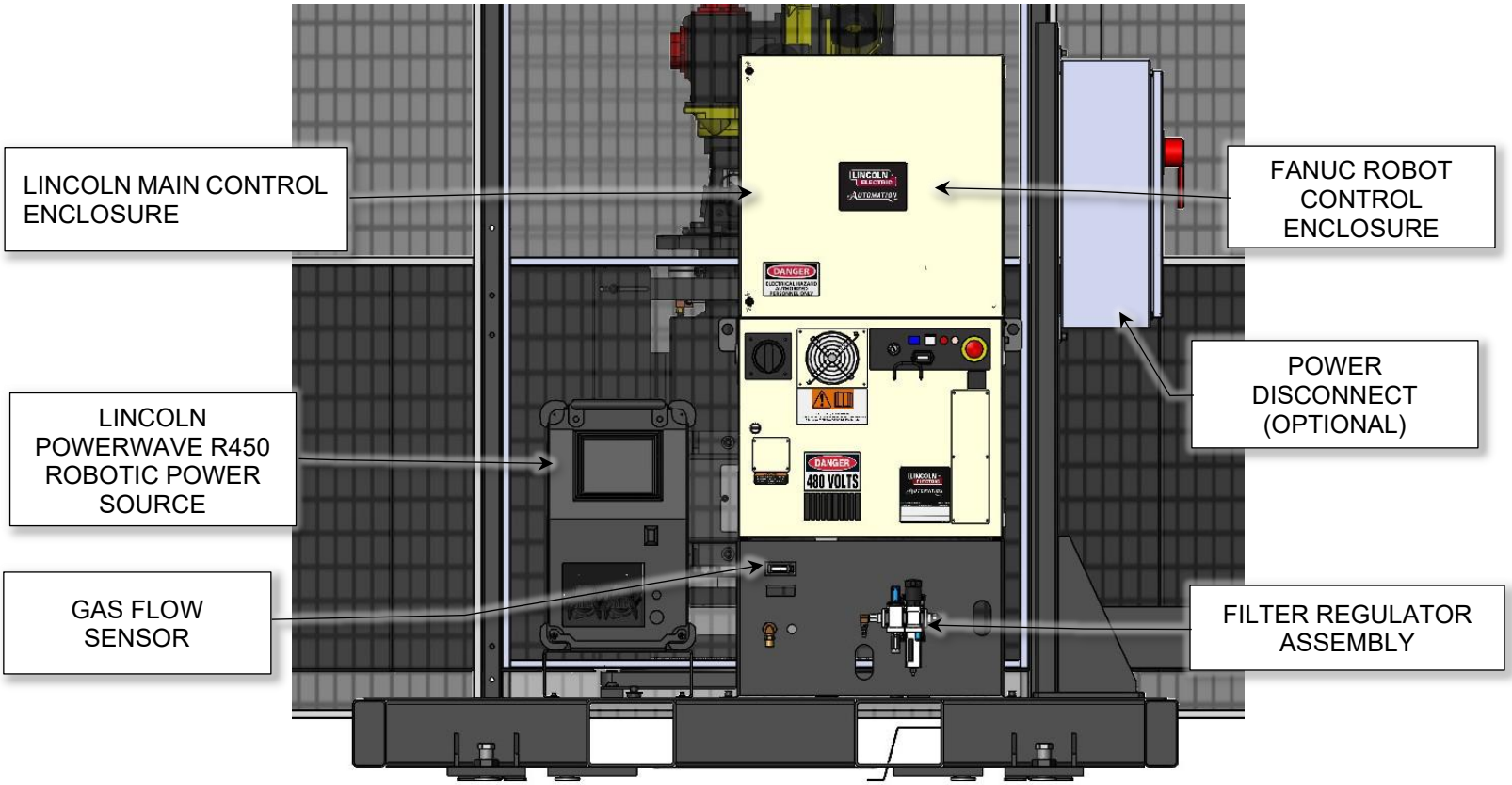
View-2, Back:





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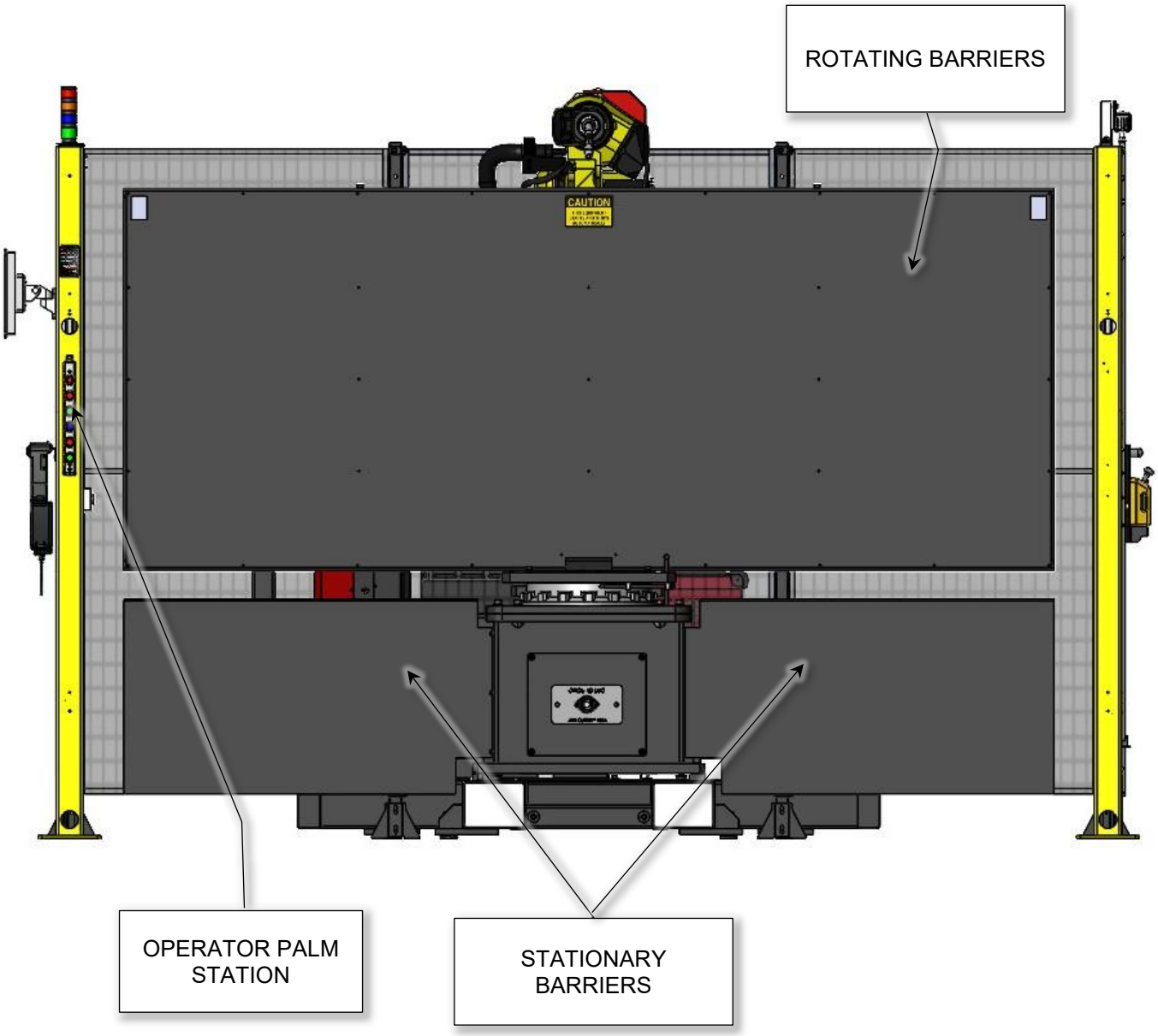
View-3, Front:



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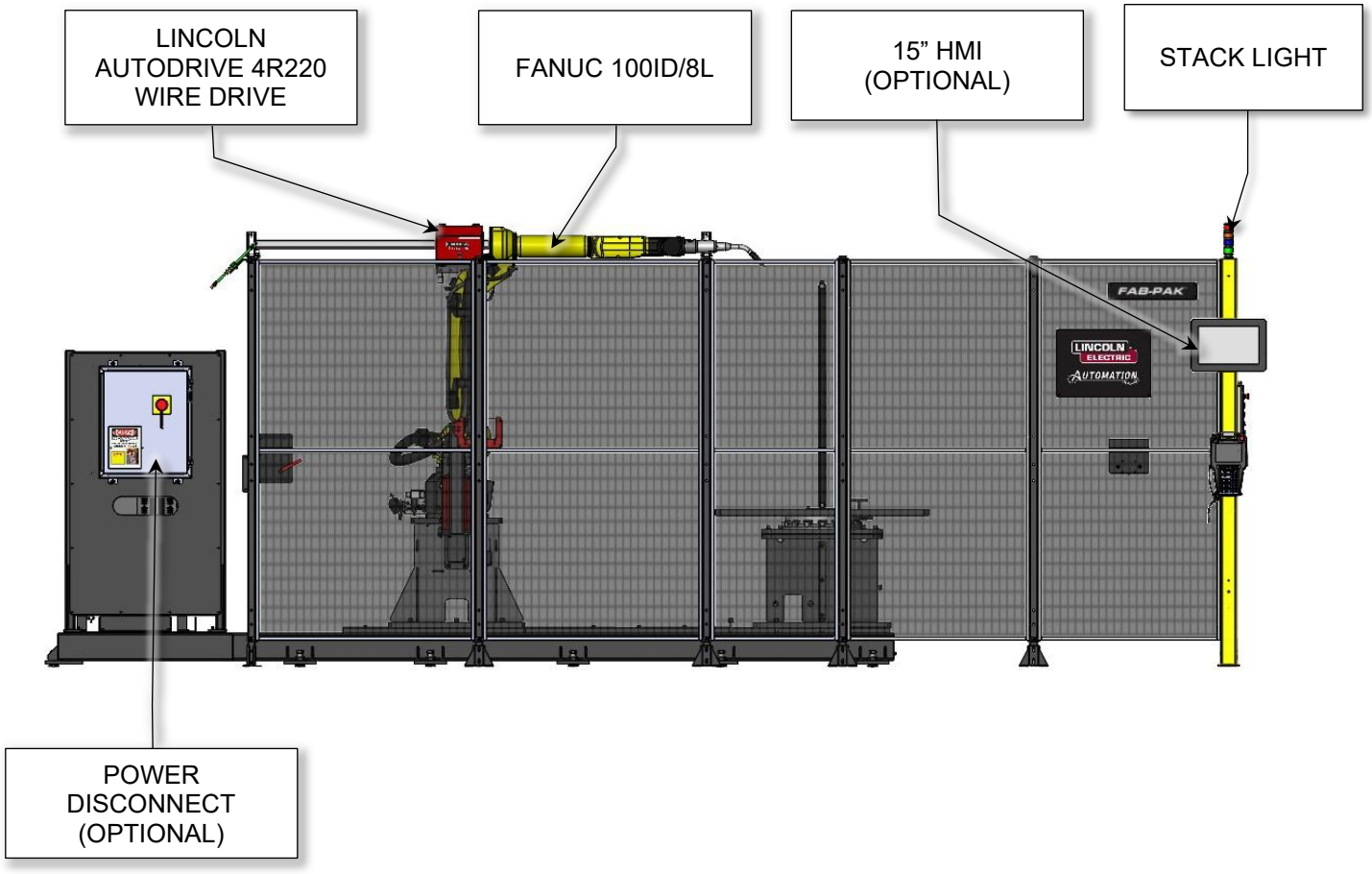
View-4, Left:



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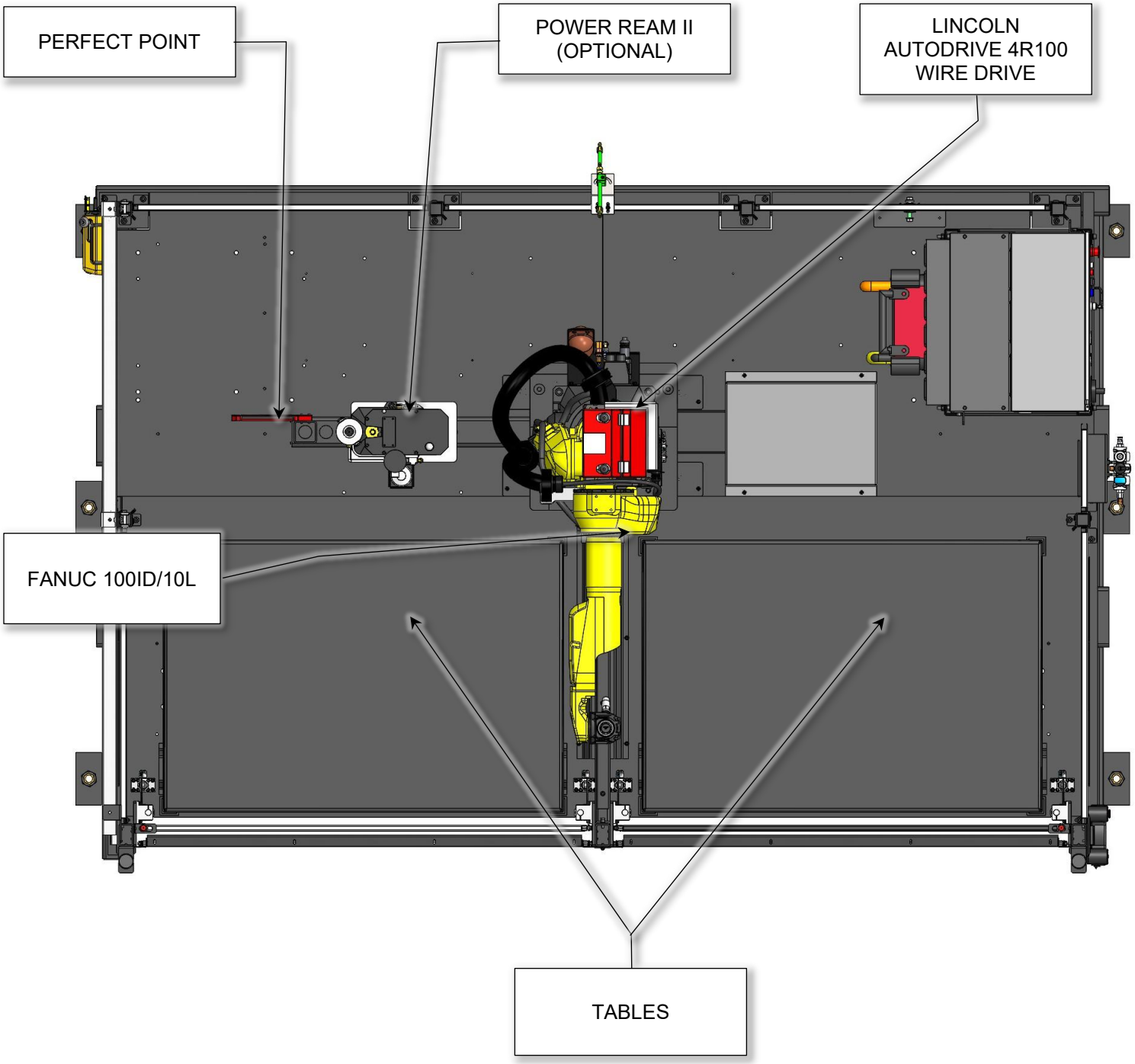
CDZ Equipment Layout with Major Components.

View-1, Top:



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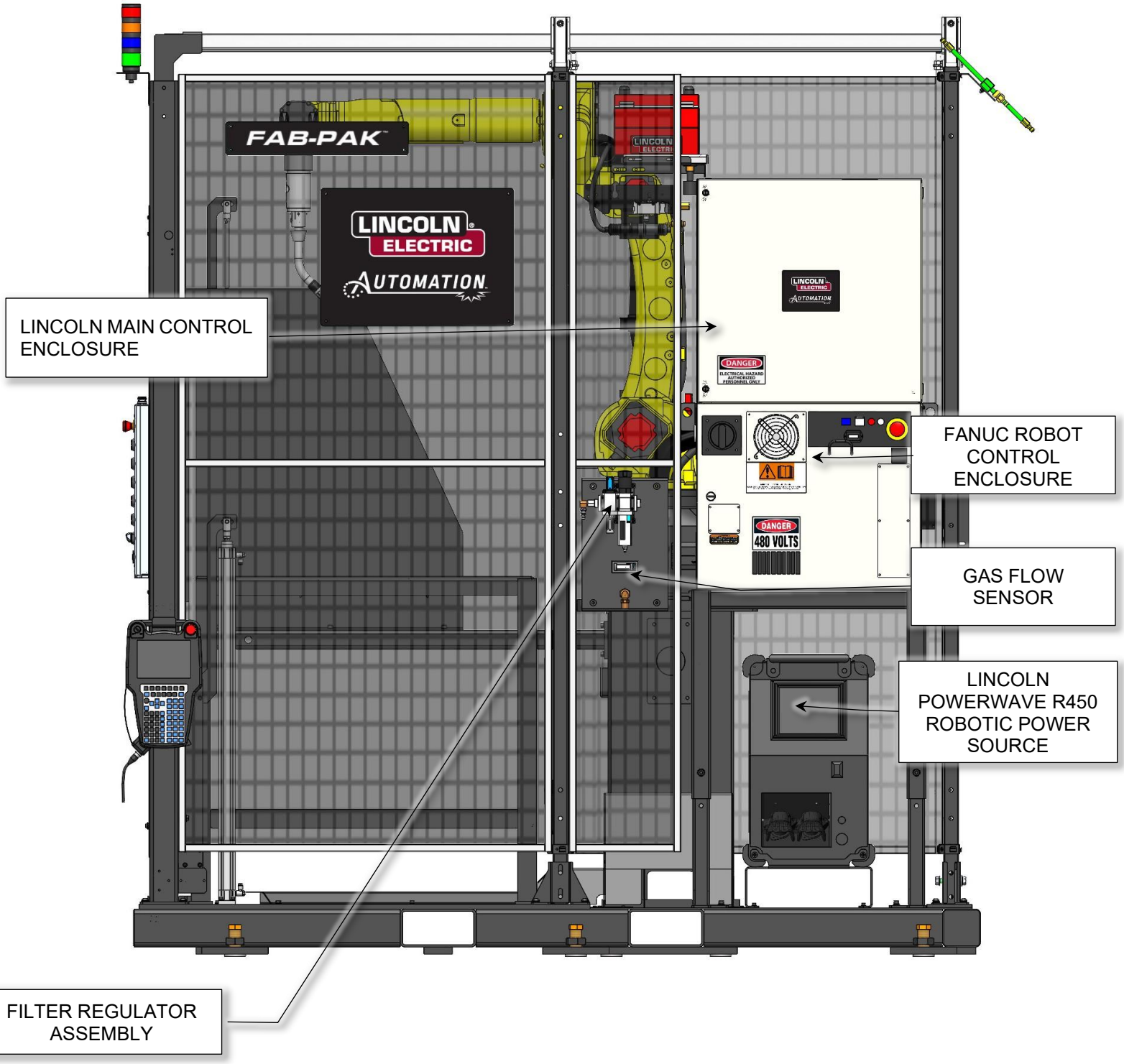
View-2, Right:



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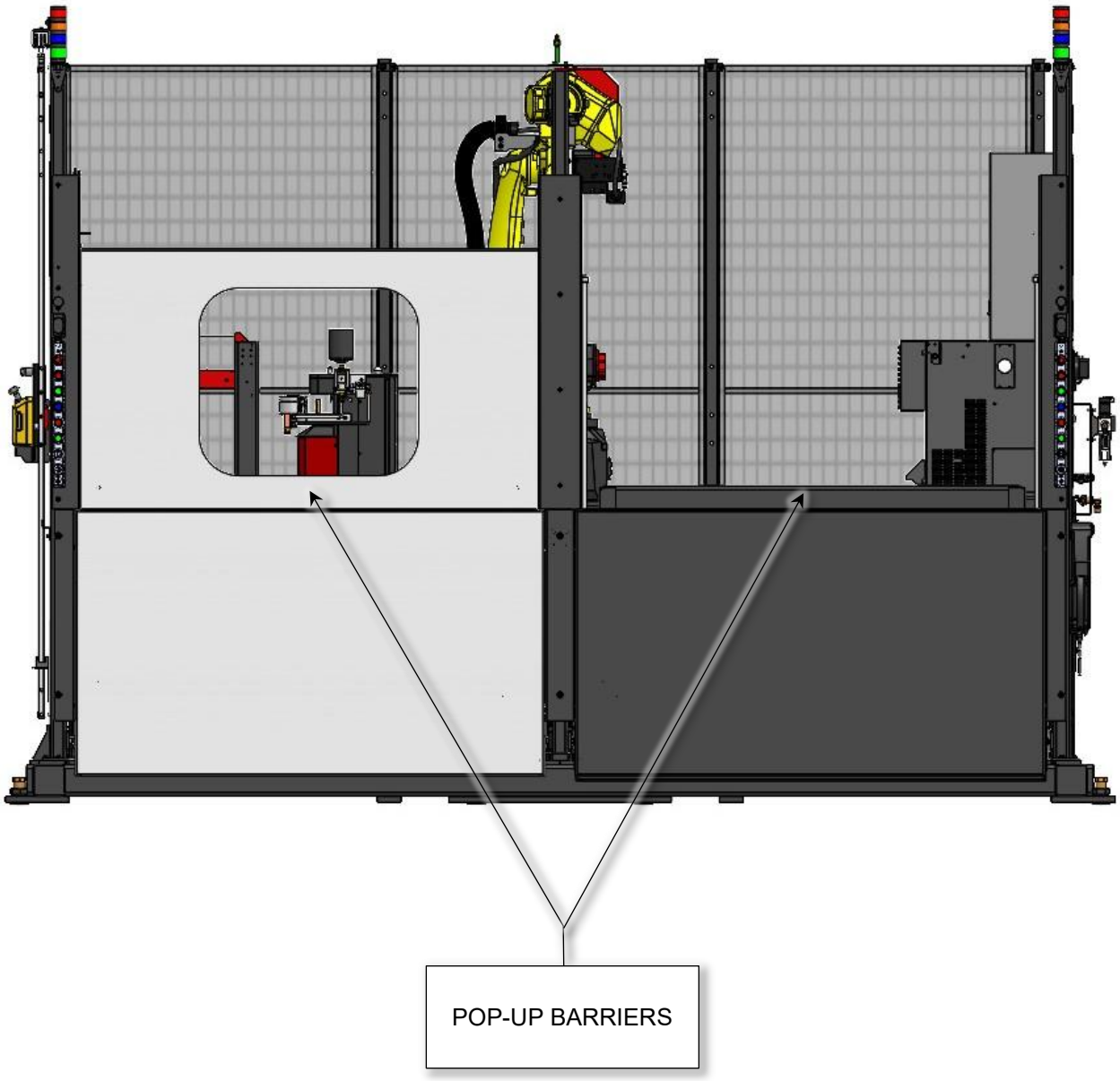
View-3, Front:



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Configuration:

FAB-PAK® Welding Cell can be configured for various lengths and swings, depending on end-user needs.

CELL	GUARDING	COMMON BASE	NUMBER OF ROBOTS	WELDING STATIONS	POSITIONER TYPE	PAYLOAD TYPE (KG)	MAX PART SIZE (M)
FAB PAK XHS-CM	ROTATING FLASH BARRIER, VERTICAL LIGHT CURTAINS, AND PRE-RESET PUSH BUTTON	CELL EQUIPMENT	1	1	HS MODULE	UP TO 1,000	2M X 1.30M
			1 OR 2				3M X 1.30M

CELL	GUARDING	COMMON BASE	NUMBER OF ROBOTS	WELDING STATIONS	POSITIONER TYPE	PAYLOAD TYPE (KG)	MAX PART SIZE (M)
FAB PAK B2B	POP-UP BARRIERS, VERTICAL LIGHT CURTAINS, AND PRE-RESET PUSH BUTTON	CELL EQUIPMENT	1	1	HS MODULE	UP TO 1,000	2.5M X 1.25M
			1 OR 2				3.15M X 1.25M
						UP TO 2,000	4.5M X 1.50M

CELL	GUARDING	COMMON BASE	NUMBER OF ROBOTS	WELDING STATIONS	POSITIONER TYPE	PAYLOAD TYPE (KG)	MAX PART SIZE (M)
FAB PAK XFT	ROTATING FLASH BARRIER, VERTICAL LIGHT CURTAINS, AND PRE-RESET PUSH BUTTON	CELL EQUIPMENT	1	1	HS MODULE	UP TO 350	1.7M
						UP TO 500	2.25M
						UP TO 1,000	3M

CELL	GUARDING	COMMON BASE	NUMBER OF ROBOTS	WELDING STATIONS	POSITIONER TYPE	PAYLOAD TYPE (KG)	MAX PART SIZE (M)
CDZ	POP-UP BARRIERS	CELL EQUIPMENT	1	1	FIXED TABLE	UP TO 500	TABLE

CELL	GUARDING	COMMON BASE	NUMBER OF ROBOTS	WELDING STATIONS	POSITIONER TYPE	PAYLOAD TYPE (KG)	MAX PART SIZE (M)
CDZ W/ HS	POP-UP BARRIERS	CELL EQUIPMENT	1	1	HS MODULE	UP TO 500	1.0M X 0.75M

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Unloading/Handling:

System will be shipped on several skids. Care should be taken when unloading the equipment from the truck. Components such as light towers and control buttons may be mounted on the outside of the structures and therefore may be exposed and unprotected.

Inspection:

Before setting up the system, be sure to unpack and identify all the items. Ensure all items on the order have been received. Inspect the system and all components for damage.

Contact Lincoln Electric Sales Representative or Automation Project Manager with any questions. Have Lincoln Electric project AU-R00xxxx number and FANUC robot F-number.

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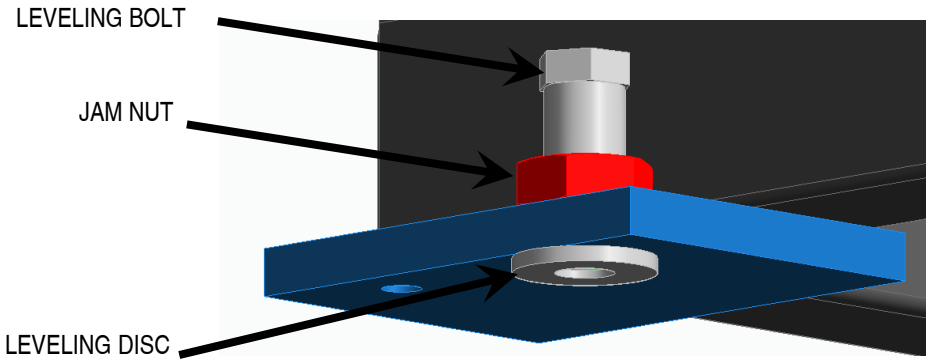
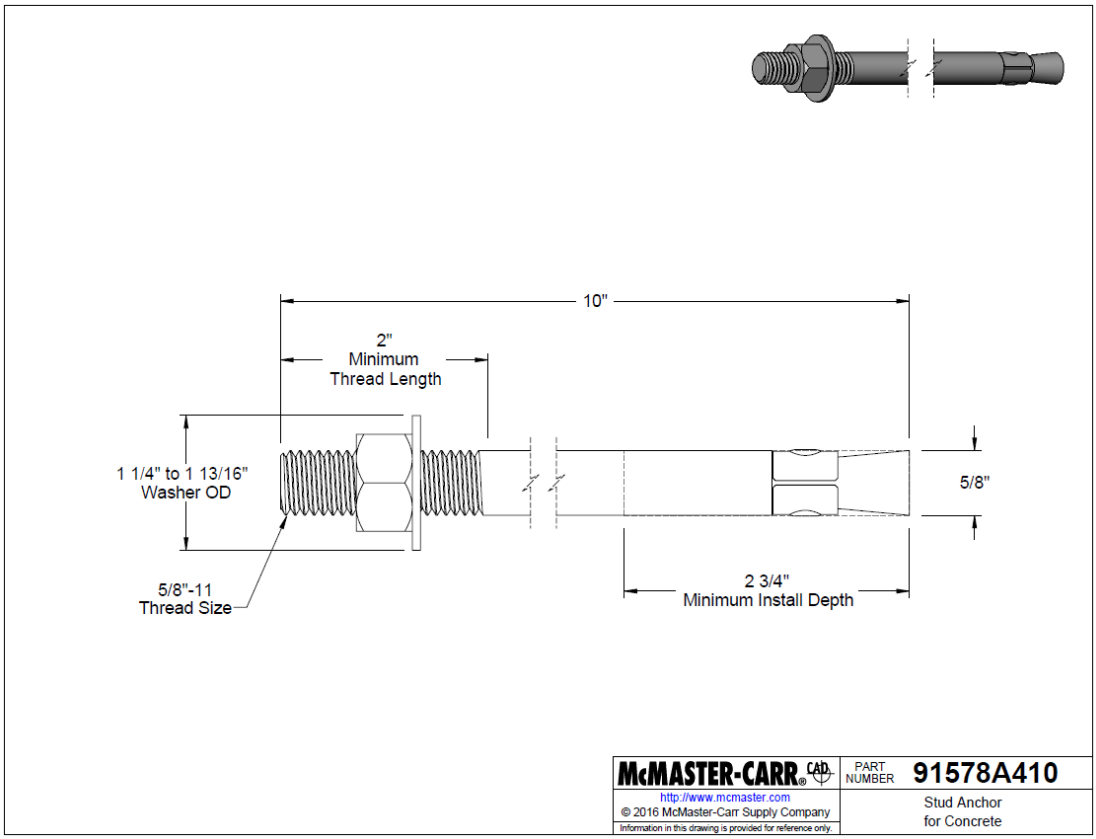
Equipment Porch and Tooling Headstock / Tailstock Lagging and Leveling

The equipment base (T-Pallet Or Palletized Frame) should be leveled and securely lagged to the floor before any robot programming is performed. Programmed points may need to be re-taught if the system is lagged after programming. Lag pads with thru holes are welded to the frame in several positions. Lag bolts are not included and should be chosen based on the floor type and conditions. See below for lag pad locations. Additional information is available at www.hilti.com.

A jam nut and disc are used to level the plate. The disc sits under the plate for the threaded bolt to sit on.



A lag bolt, similar to the one below, shall be installed through the above fixture. The anchor needs to be at least 7” tall and should be chosen based on floor thickness and conditions.



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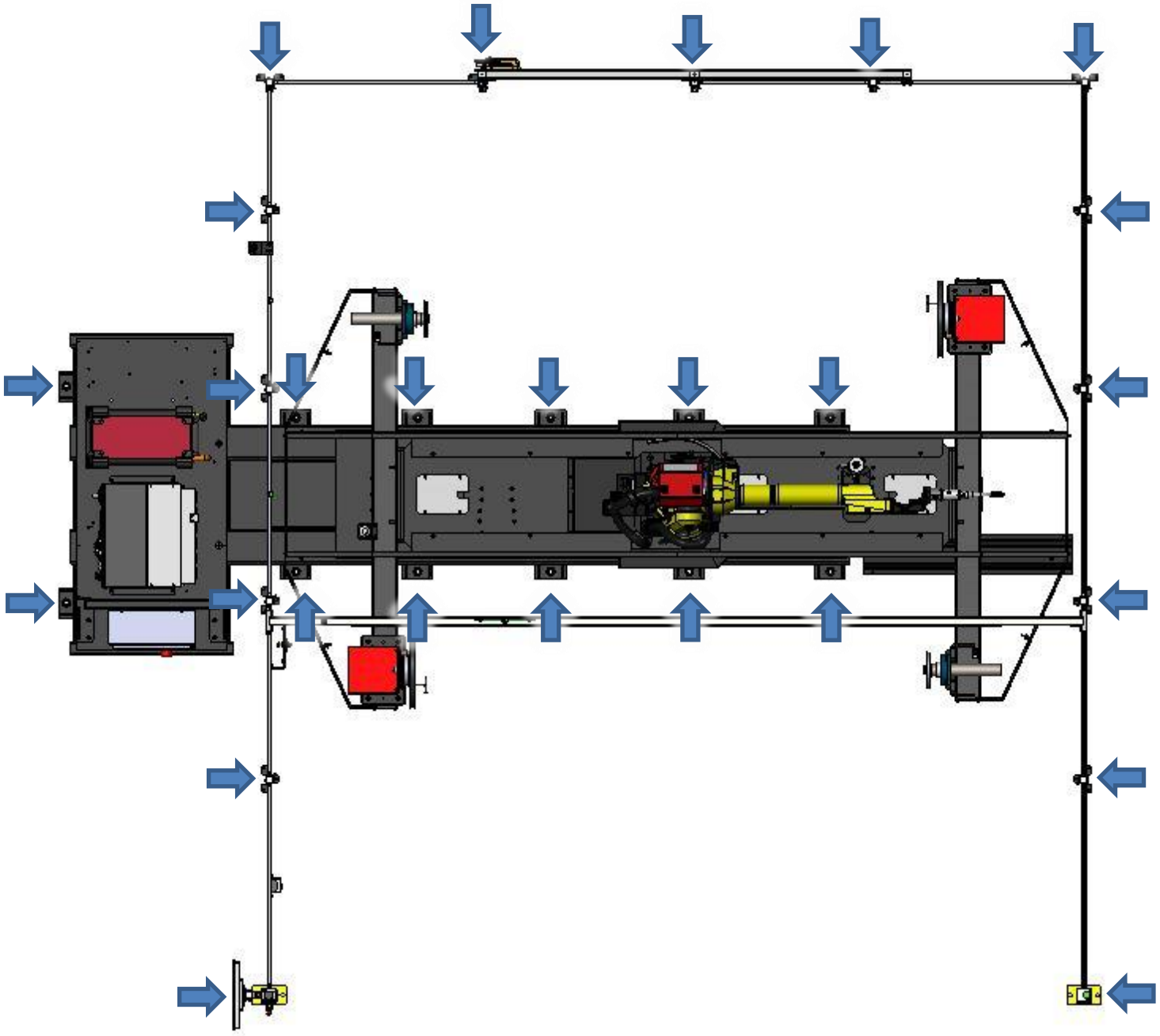
Equipment Porch and Tooling Headstock / Tailstock Lagging Locations:

XHS-CM



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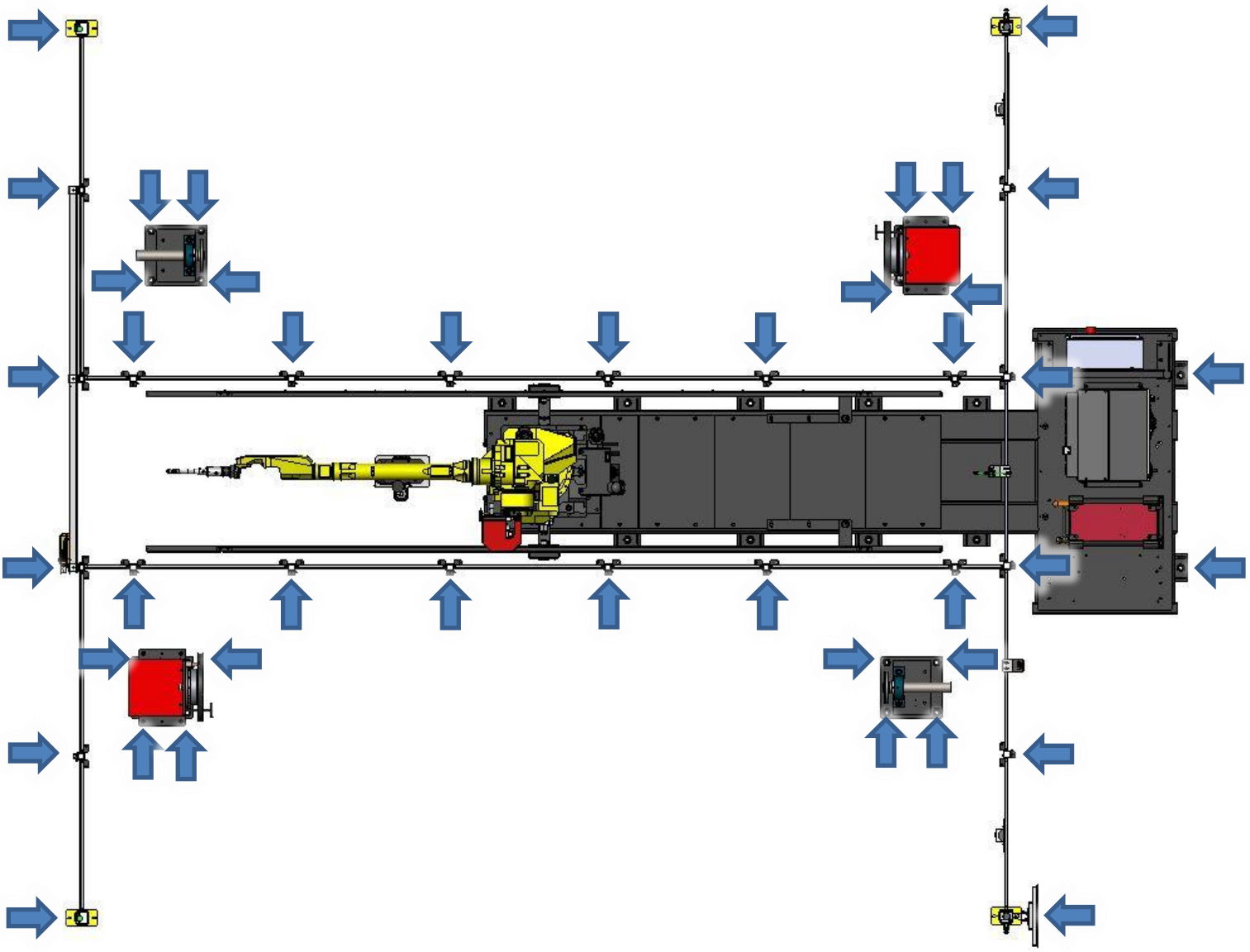
B2B



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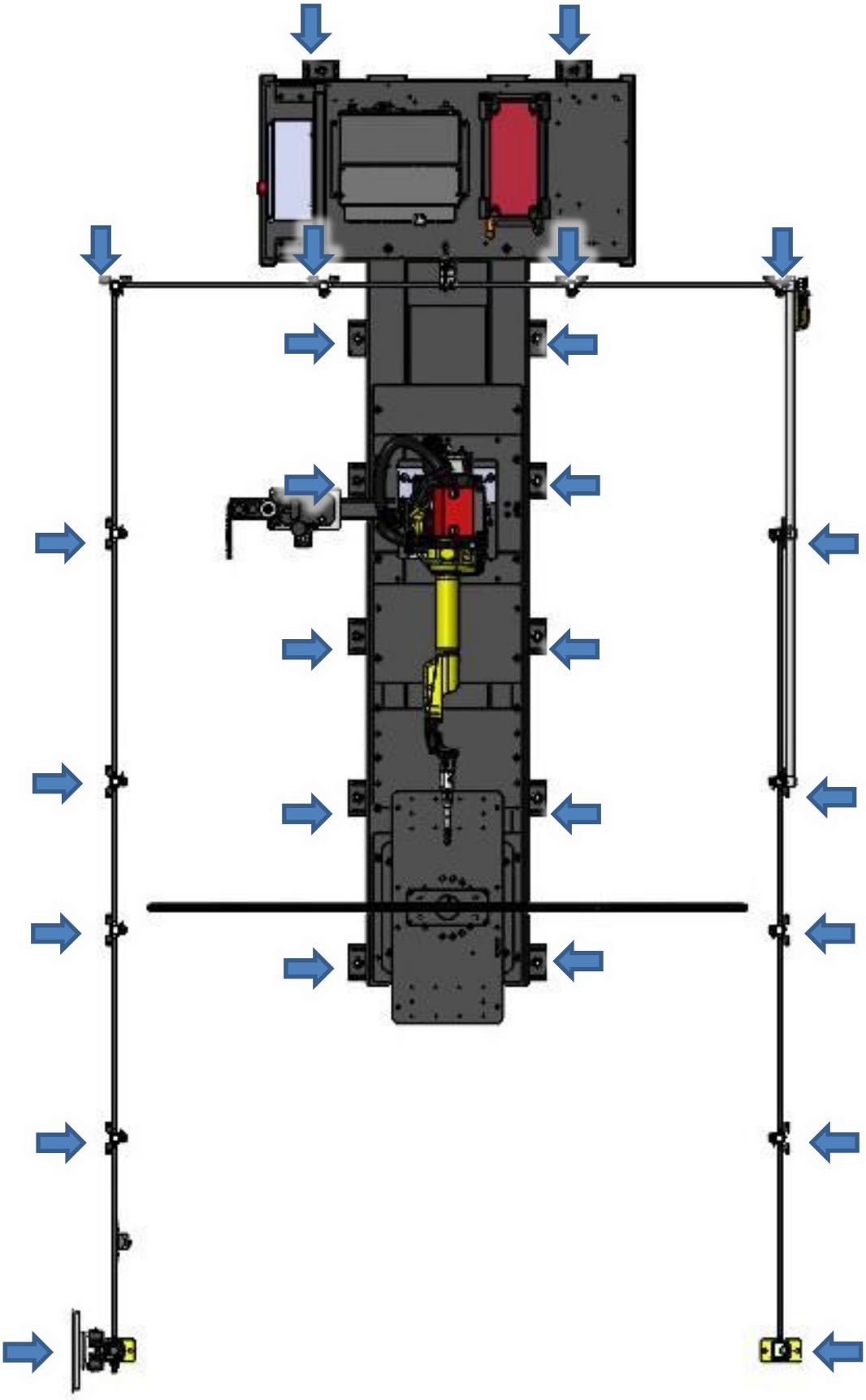
XFT



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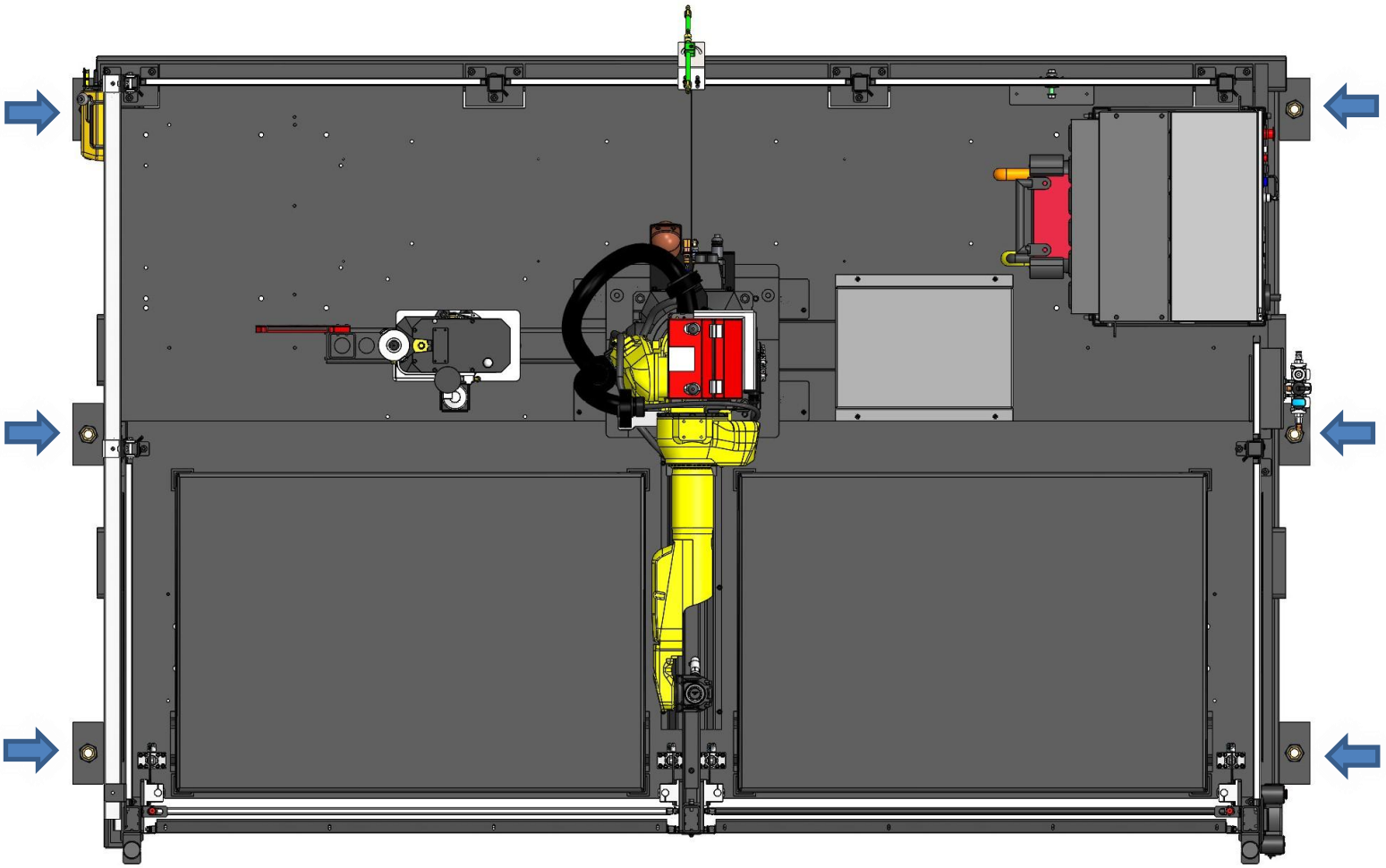
CDZ



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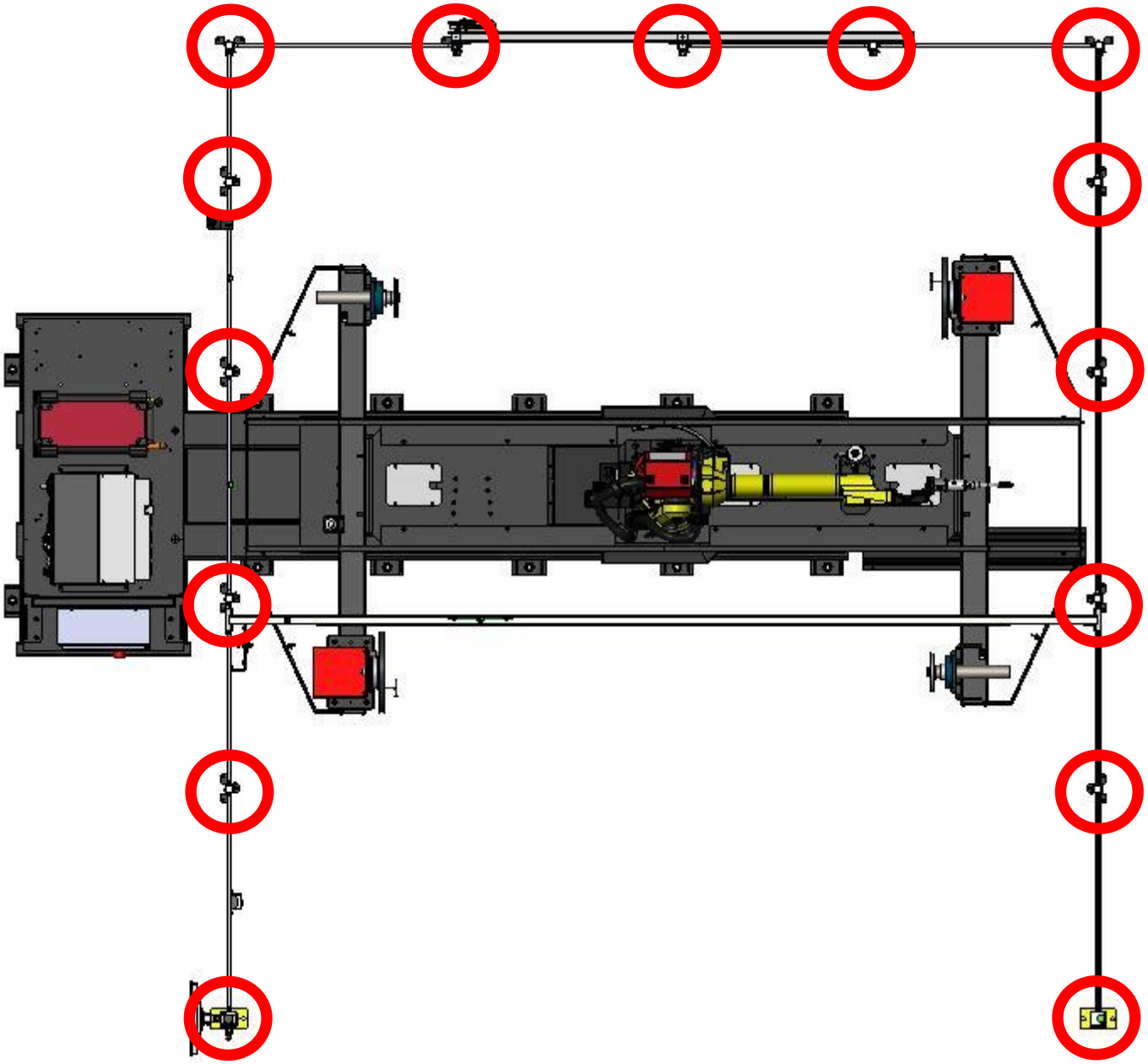
Assembling and Power up

Lincoln Automation uses fencing from different sources. Therefore, please refer to the fencing instruction manual as well as layout print for numbering scheme on the panels when assembling the fencing. Both are provided with your system.

After the equipment porch or frame is lagged to the floor, and the fencing perimeter is in place and secured to the floor, connect the peripheral electrical control and safety devices such as light curtains, push button station, pre-reset push button, indicating multi-color light tower and back door safety switch – follow markings on interconnecting cables.

XHS-CM



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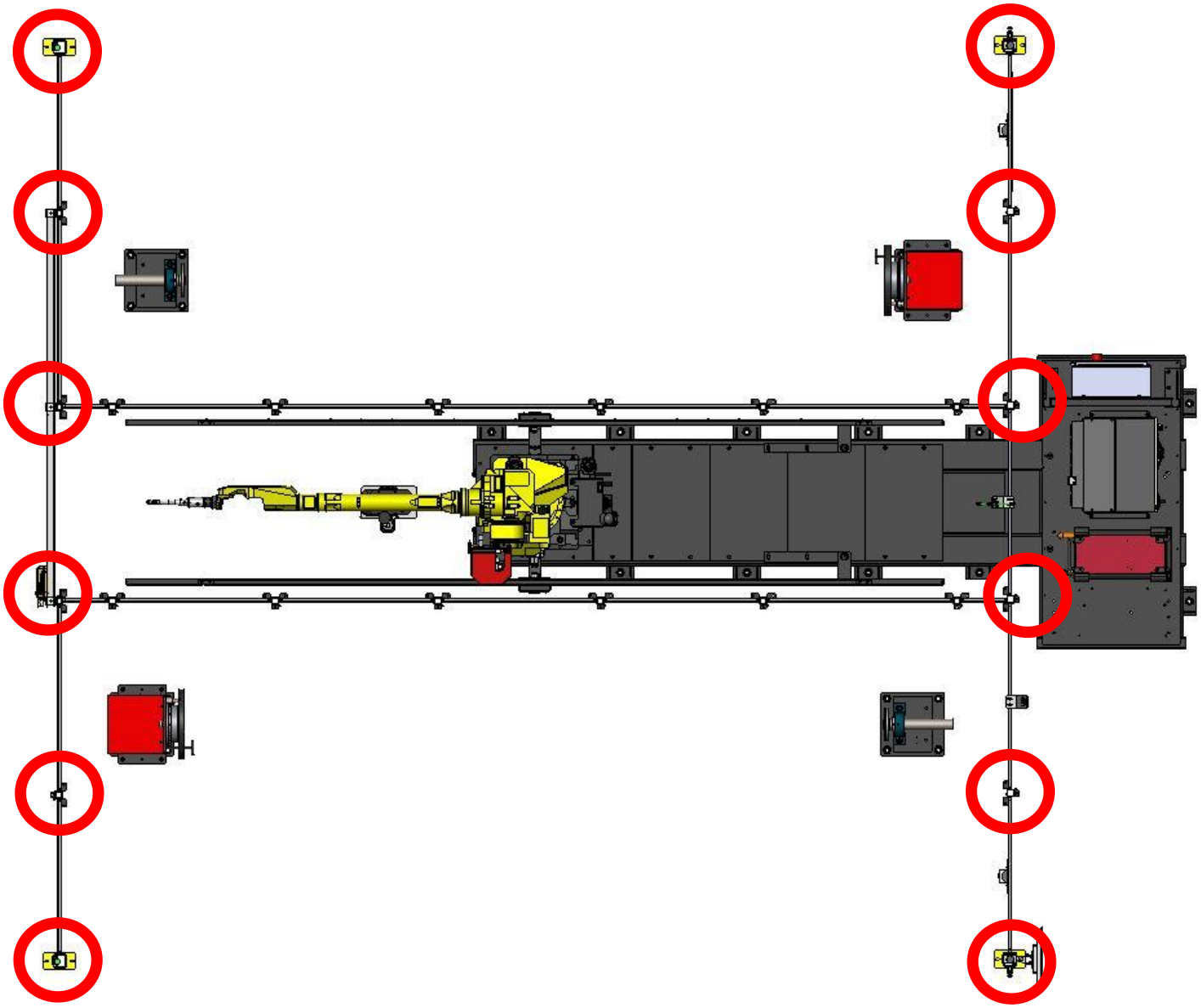
B2B



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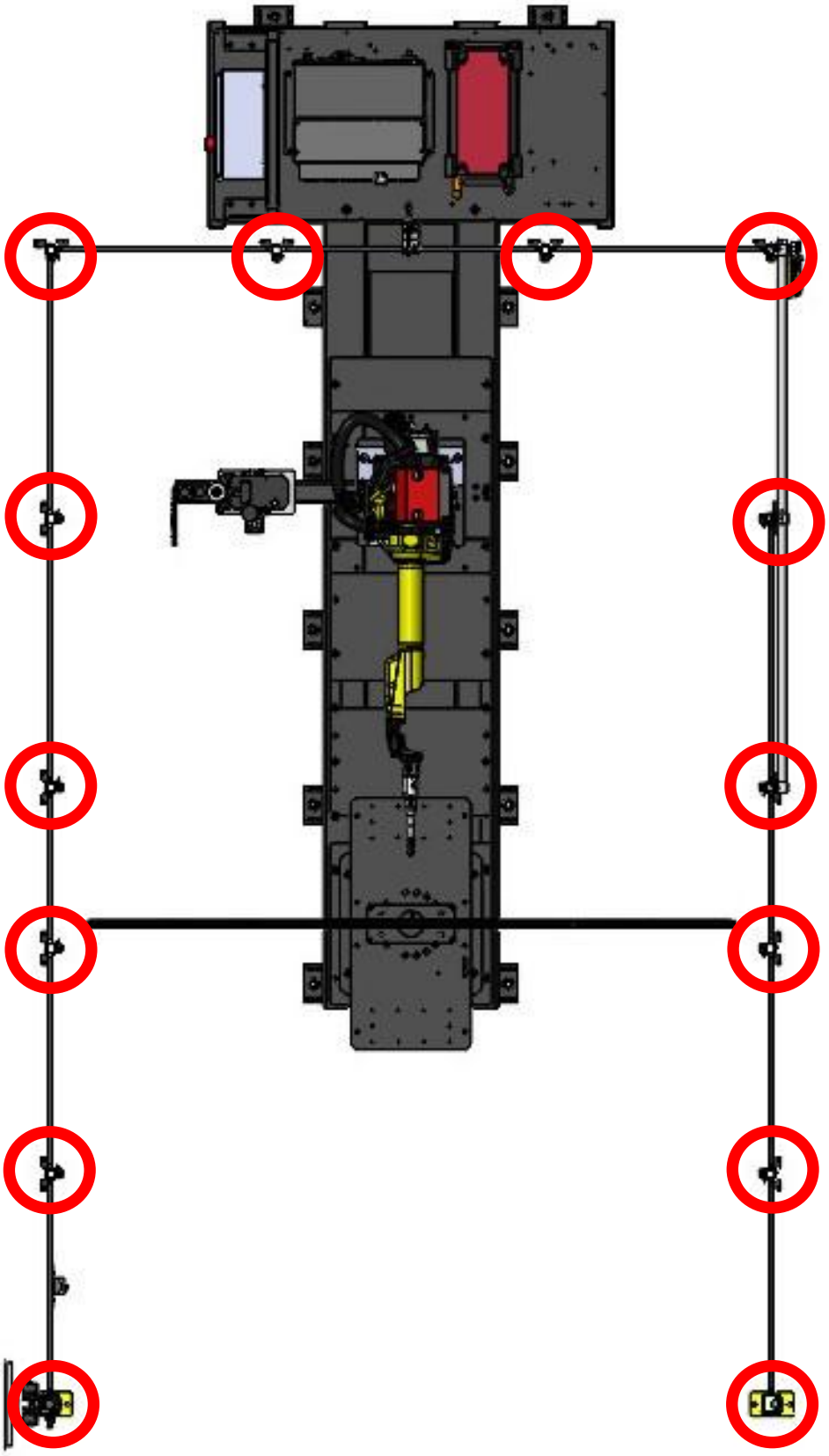
XFT



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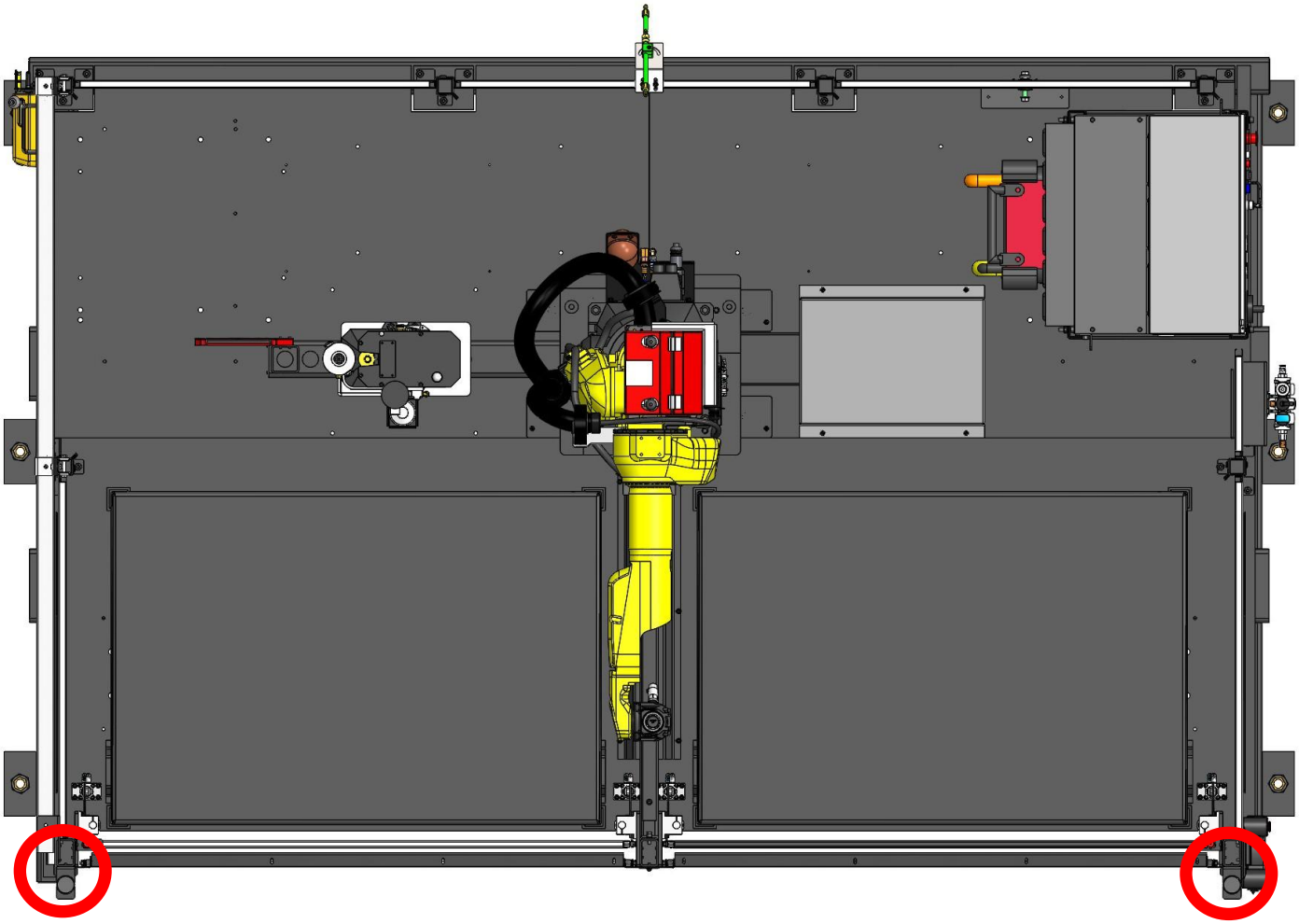
CDZ



The next step of the installation procedure is to provide main power drop(s) to Fanuc robot controller and Lincoln welding power source. Run a ¼" compressed air line and connect it to the air filter/regulator located on lower right side of robot control cabinet. See Technical Specifications chapter of this manual, and if necessary, corresponding manuals for wiring instructions and details.

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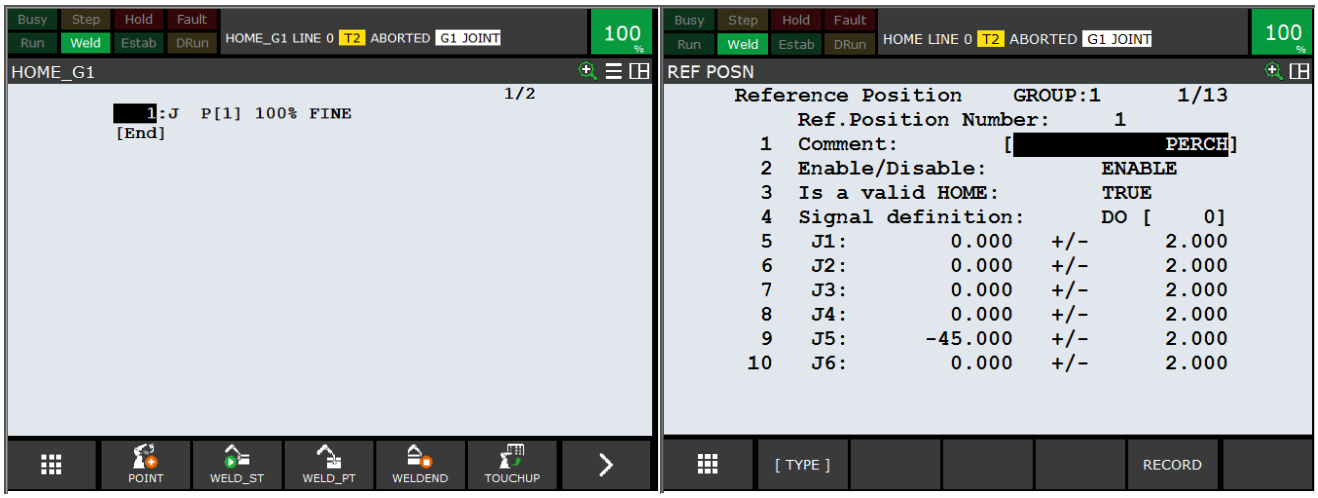
Basic System Programming

During assembly of the robotic cell, several basic programs are written for use during testing and startup. The programs are as follows:

For XHS-CM and XFT:

1. HOME_G1 — Starting and ending point for working zone
2. INDEX_1_TO_ROB — Index Side 1 to robot
3. INDEX_2_TO_ROB — Index Side 2 to robot
4. RSR0001 — Robot Service Request Program (calls for STN_1A production)
5. RSR0002 — Robot Service Request Program (calls for STN_2A production)
6. STN_1A — Production Welding Program
7. STN_2A — Production Welding Program

HOME_G1 is a one-line program that creates a main reference position (PERCH) for all six axes of the robotic arm. This point will position the robot clear of the working zone and any obstruction within the cell. Only when the robot is at HOME_G1 (PERCH) position can the production sequence in AUTO mode be initiated.



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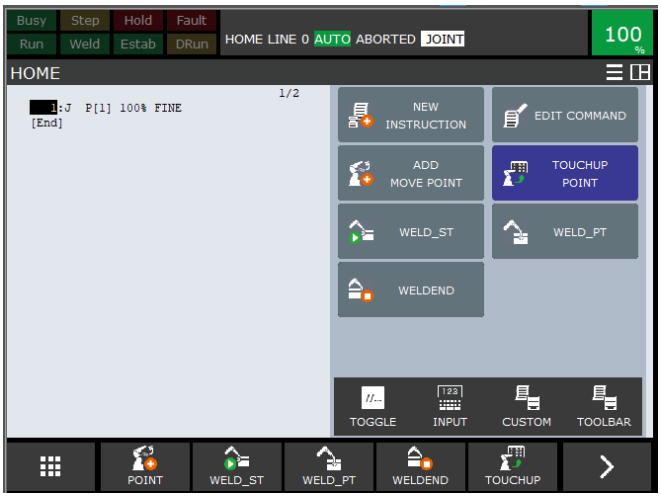
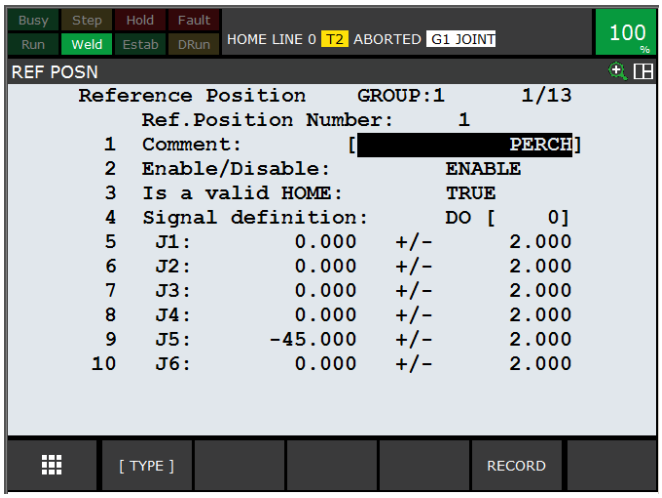
For B2B and CDZ:

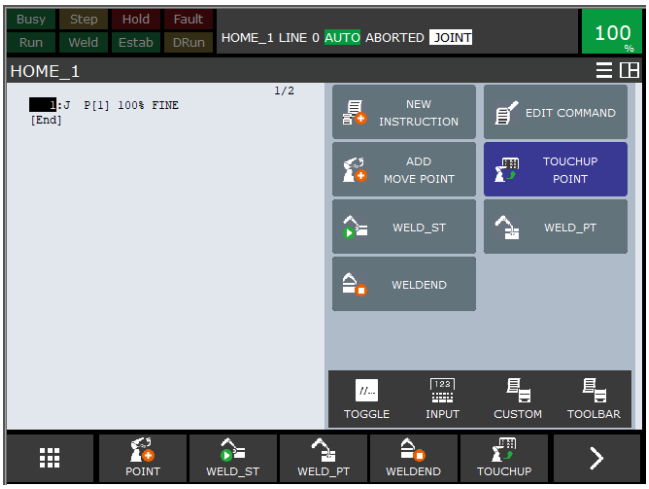
1. HOME Safe point away from working zone
2. HOME_1 Starting and ending point for working zone in STAT_1
3. HOME_2 Starting and ending point for working zone in STAT_2
4. RSR0001 Robot Service Request Program (calls for STAT_1 production)
5. RSR0002 Robot Service Request Program (calls for STAT_2 production)
6. STAT_1 Production Welding Program
7. STAT_2 Production Welding Program

HOME program is a one-line sequencer that creates main reference position (PERCH) for all six axes of the robotic arm. This point will position the robot clear of the working zone and any other obstruction within the cell. Only when the robot is at HOME (PERCH) position the production sequence in AUTO mode can be initiated.





HOME_1 is also a one-line program that creates a safe position of the robotic arm inside the working zone in order to ensure its unobstructed movements from and into the HOME position.



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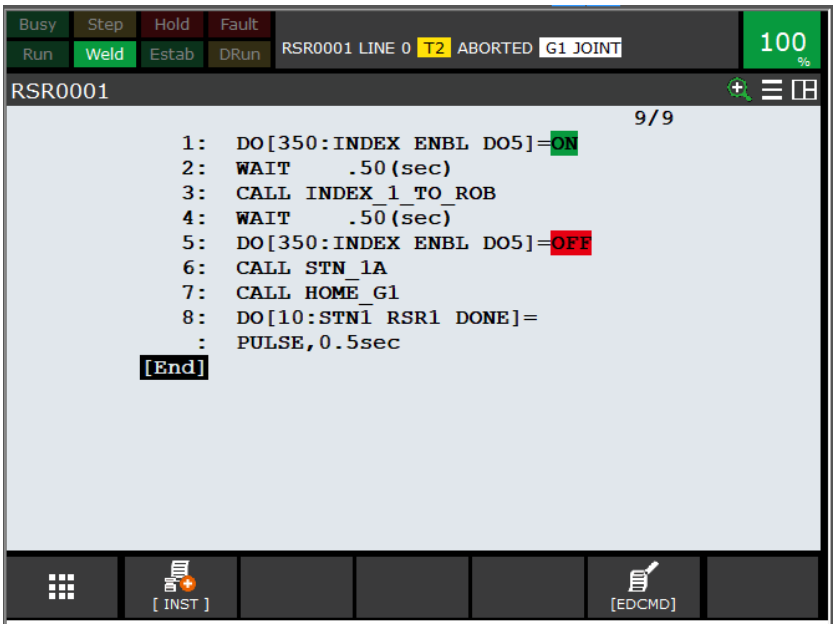
RSR0001 (Robot Service Request) is a request for service from a palm station START push button. This request is a dedicated input to the robot. It operates only while the system is in AUTO mode, the teach pendant selector switch is in OFF (left) position, robotic arm is in HOME (PERCH) position, fence door is closed and locked, operating zone is clear and the PRE-RESET feature is engaged.

XHS-CM & XFT



B2B & CDZ

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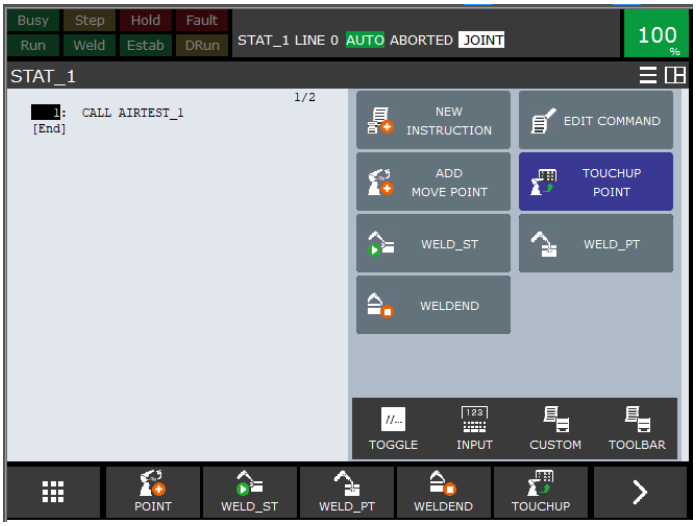
Upon pressing START push button the following sequence occurs:

1. Robot calls INDEX_1 to turn to robot
    a. For B2B and CDZ robot calls HOME_1
2. Robot calls STN_1A program containing production sequence;
    a. For B2B and CDZ robot calls STAT_1
3. After finishing production program, robot returns to HOME_G1 position;
    a. For B2B and CDZ robot returns to HOME position

For XHS-CM and XFT, RSR0001 calls a custom program STN_1A. After a production program is developed, it shall be inserted in the STN_1A program. Originally the system will have just a movement test program AIRTEST_1A.

For B2B and CDZ, RSR0001 calls a custom program STAT_1. After a production program is developed, it shall be inserted in the STAT_1 program. Originally the system will have just a movement test program AIRTEST_1.



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For XHS-CM and XFT, after creation of a production program (PART_1 for example), open STN_1A program and CALL the name of that program instead of a sample AIRTEST_1A.

For B2B and XFT, after creation of a production program (PART_1 for example), open STAT_1 program and CALL the name of that program instead of a sample AIRTEST_1.

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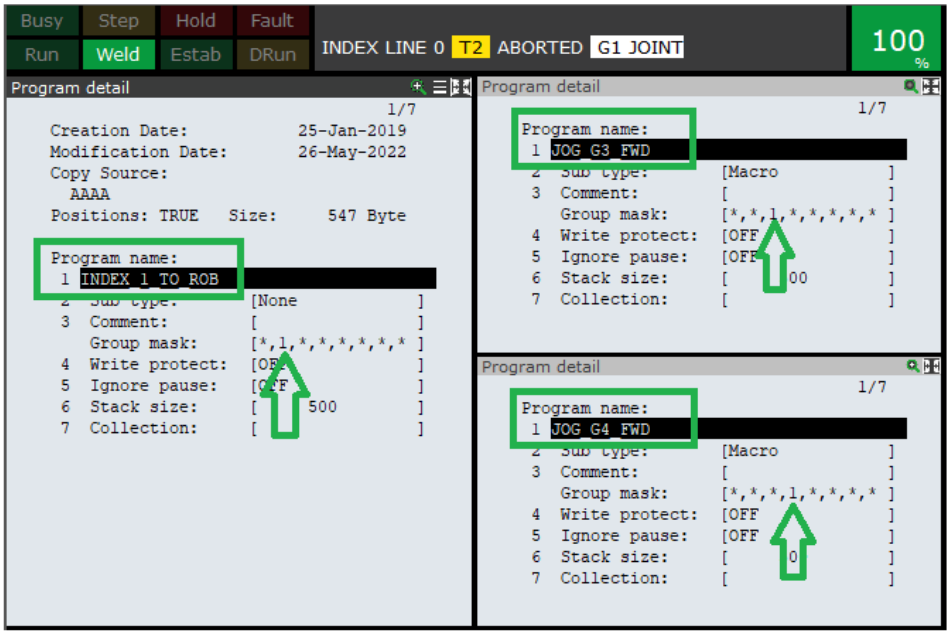
For XHS-CM and XFT, programs created to control the movements of the turn-table positioner (Group 2) and headstocks (Group 3 for Side-1 and Group 4 for Side-2) shall contain the proper details. Program details establish what physical equipment can be controlled by masking groups. Group 1 will always be the robot arm. To access a program detail screen, use the following procedure:

1. Press SELECT.
2. Move the cursor to a program using the arrow keys.
3. Press NEXT.
4. Press F2 DETAIL and ensure proper groups are enabled (Group Mask = 1).
5. Press F1 END when complete.



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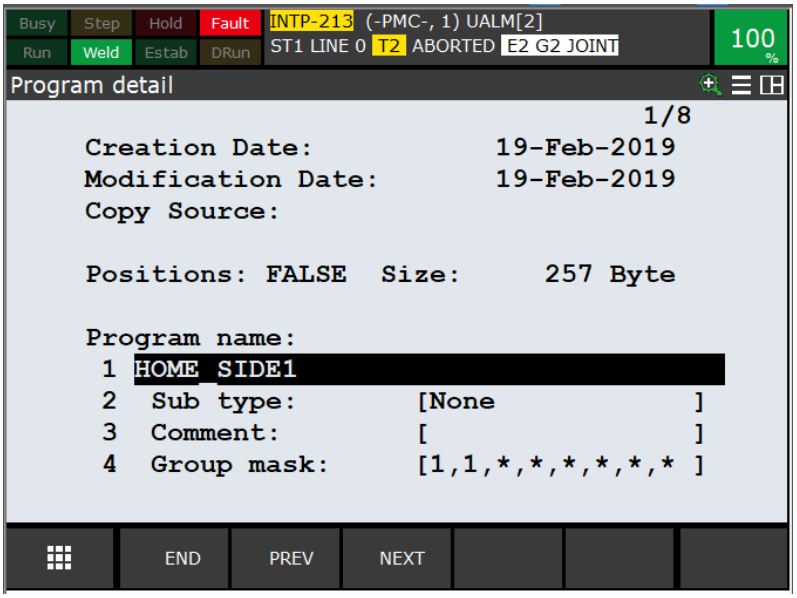
For a B2B and CDZ, programs created to control the movements of the headstock shall contain the proper details. Program details establish what physical equipment can be controlled by masking groups. Group 1 will always be the robot arm. Group 2 will be a positioner. To access a program detail screen, use the following procedure:

1. Press SELECT.
2. Move the cursor to a program using the arrow keys.
3. Press NEXT.
4. Press F2 DETAIL and ensure proper groups are enabled (Group Mask = 1).
5. Press F1 END when complete.



NOTE: These details show Group 1 (Robot) and Group 2 (Positioner).

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System Operation and Status Indicators

Power up sequence for a B2B and CDZ system:

To avoid unwanted errors, upon powering up the system manually raise the screens using the selector switches. If the screens are up when the cell is powered up, turn the selector switch to the up position.

Two modes of operation are used to interface with the robot - Program mode and Auto (Production) mode. Refer to the table below to verify each condition that must be set in order to achieve a certain mode of operation.

Mode	TP Mode Select	Pre-reset Feature	Access Door	Teach Pendant	E-Stop Buttons	Robot Position
Program	T1	Any	Any	On	Reset	Any
Auto	Auto	Engaged	Locked	Off	Reset	Perch

NOTE: The Pre-Reset feature does not apply to a CDZ system

Warning: ***Prior to operation in auto mode, verify that robot and positioner are clear of obstructions, all foreign objects are removed, all personnel are outside of fencing, and back access door is closed and its safety switch properly engaged.***

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Program Mode (T1)

This mode is used to program all parts, peripheral devices, and “touch-up” existing programs. This mode is also used for various maintenance procedures. T1 is operating the robot at safe speed (<250 mm/s) per ISO 10218 Part 2 (ANSI/RIA R15.06-2012 Part 2) Article 5.6.3. Review sample programs for programming examples and proper sequence of operations. Prior to programming, also verify that all tooling and parts are properly mounted and secured.

Sequence of Program Cycle

1. Turn the Teach Pendant switch to ON (right) position.
2. Mode selection will pop up on the screen – choose T1 mode.
3. Enter “CODE NUMBER” 2222
4. Make sure robot is away from part loading pass.
5. Load the part.
6. Create a new program.
7. Record positions and welding points.
8. Open a program named STN_1A.
    a. For B2B and CDZ open a program named STAT_1
9. Replace the test program AIRTEST_1 with the newly created production program.
10. Run the program at T1 speed to verify that it works as intended.
11. Run “HOME” program to move the arm to its HOME (PERCH) position.

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Auto Mode (Production)

This mode used for production and automatic operation of the system. Auto mode is the normal operating means of the system. After all parts have been programmed and welds examined to meet specifications, this welding cell can be setup for continuous operation.

Sequence of Auto Cycle For XHS-CM, XFT, & B2B

1. Make sure robot is at HOME (PERCH) position.
2. Turn Teach Pendant switch to OFF (left) position.
3. Mode selection will pop up on the screen – choose AUTO mode.
4. Enter “CODE NUMBER” 2222
5. Press FAULT RESET (RED) button.
6. If SAFE TO ENTER (GREEN) light is not illuminated, clear any fault condition.
7. Operator may enter and load a part. BLUE light indicates that an operator entered the area.
8. After part has been loaded and secured, press PRE-RESET (WHITE) button (the button starts blinking along with SAFETY RESET (BLUE) button) and exit the loading area.*
9. Press blinking SAFETY RESET (BLUE) button within 10 seconds and then press FAULT RESET (RED) button. CYCLE START (GREEN) button turns on indicating that the system is ready for production cycle.
10. Press CYCLE START (GREEN) button to start Auto Cycle (production).
11. Robot starts RSR program. SAFE TO ENTER (GREEN) light and CYCLE START (GREEN) button both turn off.
12. At the end of a production program, the robot goes back to its HOME (PERCH) position. SAFE TO ENTER (GREEN) light and CYCLE START (GREEN) button both turn on.

    NOTE: If the program is interrupted for any reason, clear the fault condition, and repeat steps 5 through 9 in order to restart.

** see the PRE-RESET section for further explanations of this safety feature.*

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Sequence of Auto Cycle For A CDZ

1. Make sure robot is at HOME (PERCH) position.
2. Turn the Teach Pendant switch to OFF (left) position.
3. Mode selection will pop up on the screen - choose AUTO mode.
4. Press FAULT RESET (RED) button.
5. If the GREEN Stack Light is not illuminated, check the cell and clear any fault condition.
6. Operator may load a part in the working zone
7. Press FAULT RESET (RED) button. All lights should be OFF except for the GREEN light.
8. With the GREEN light ON, press the Cycle Start button to start the Auto Cycle.
9. Robot will start RSR program. YELLOW (warning) light turns ON.
10. At the end of a production program, the robot goes back to its HOME (PERCH) position. YELLOW light turns OFF and GREEN light turns back ON.

NOTE: If the program is interrupted for any reason, clear the fault condition, and repeat steps 5 through 7 in order to restart.

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Indicator Stack Lights Tower status definitions

One of the features is a light tower to communicate the status of the system. The lights are an external interface to the operator.

Color	On	Off	Flashing
RED	System Fault	No Fault	None
AMBER	System in Motion or Teach Pendant ON	Robot at HOME and Teach Pendant OFF	None
BLUE	Access door opened or light curtain crossed	Access door shut and locked; pre-reset feature engaged (Pre-reset feature does not apply to a CDZ system)	None
GREEN	System ready	System not ready or during operation	PAUSED, ready to restart

Push Button Operator Station status definitions

Robotic Cells uses an illuminated push button station to control the cell and to communicate states of the system to the operator.

For XHS-CM, XFT, and B2B:

Color	On	Off	Flashing
RED	System Fault	No Fault	None
GREEN	Safe to enter	Entry will fail the system	None
BLUE	Access door opened or light curtain crossed	Access door shut and locked; pre-reset feature engaged	10 sec. pre-reset sequence initiated
GREEN	System ready / cycle START/RESTART	System not ready	Active program paused or next program queued

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For CDZ:

Color	On	Off	Flashing
RED	E-STOP engaged	E-STOP clear	Non-illuminated E-STOP button
RED	System Fault	No Fault	None
GREEN	Safe to enter	Entry will fail the system	None
BLUE	Light curtain crossed	Working zone clear, pre-reset engaged	10 sec. pre-reset sequence initiated
RED	Program HOLD	Non-illuminated push button	Non-illuminated push button
GREEN	System ready / cycle START/RESTART	System not ready	PAUSED, ready to restart
NONE*	Left – screen down*	Right – screen up*	Non-illuminated selector switch*
NONE*	Left – jog forward*	Right – jog reverse*	Non-illuminated selector switch*

*For cells with flash screens and headstocks

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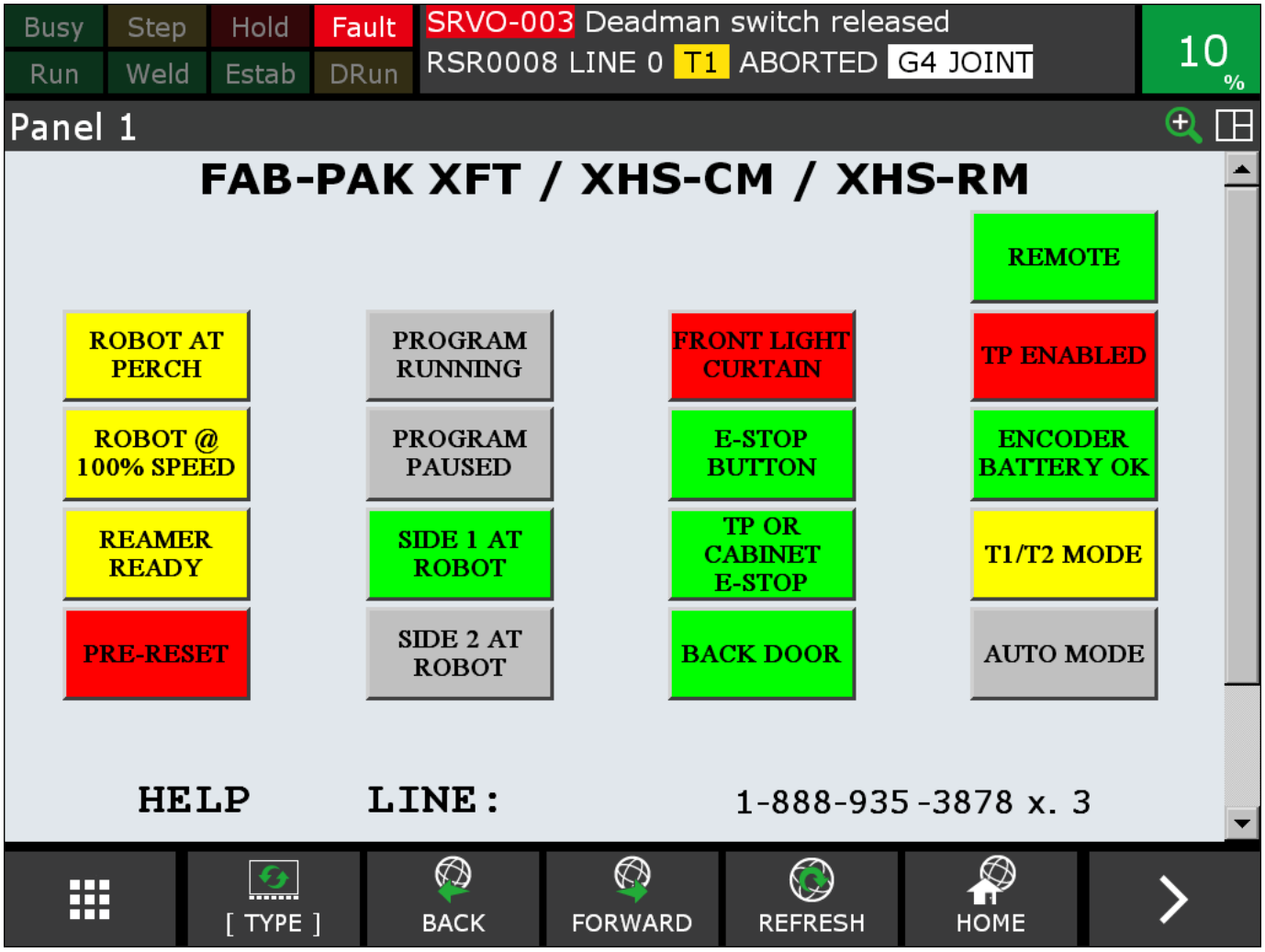
Production Ready Teach Pendant PANEL WIZARD

This robotic system has a built-in **PANEL WIZARD** as one of a Teach Pendant screens. This convenient visual feature is provided in order to streamline the production process and greatly reduce equipment downtime due to non-critical errors and easily fixable conditions of individual parts and assemblies. This TP screen can also be helpful to Lincoln Electric field technicians during troubleshooting and assisting the customer. The states of the most critical parts of the robotic cell are displayed "live" and colored accordingly to their significance to the production process in "**AUTO**" mode, i.e. **GREEN** color indicates a "**GO**" condition, **RED** color indicates a "**NO GO**" condition, **YELLOW** color indicates a "**WARNING**" condition and **GRAY** color is a "**STATUS**" only and will not affect the process. For the robotic cell to be ready for operation in "**AUTO"** mode there must be no indicators in **RED** color on this screen. "**PRODUCTION READY**" screen automatically appears on teach pendant every time the robot powers up.



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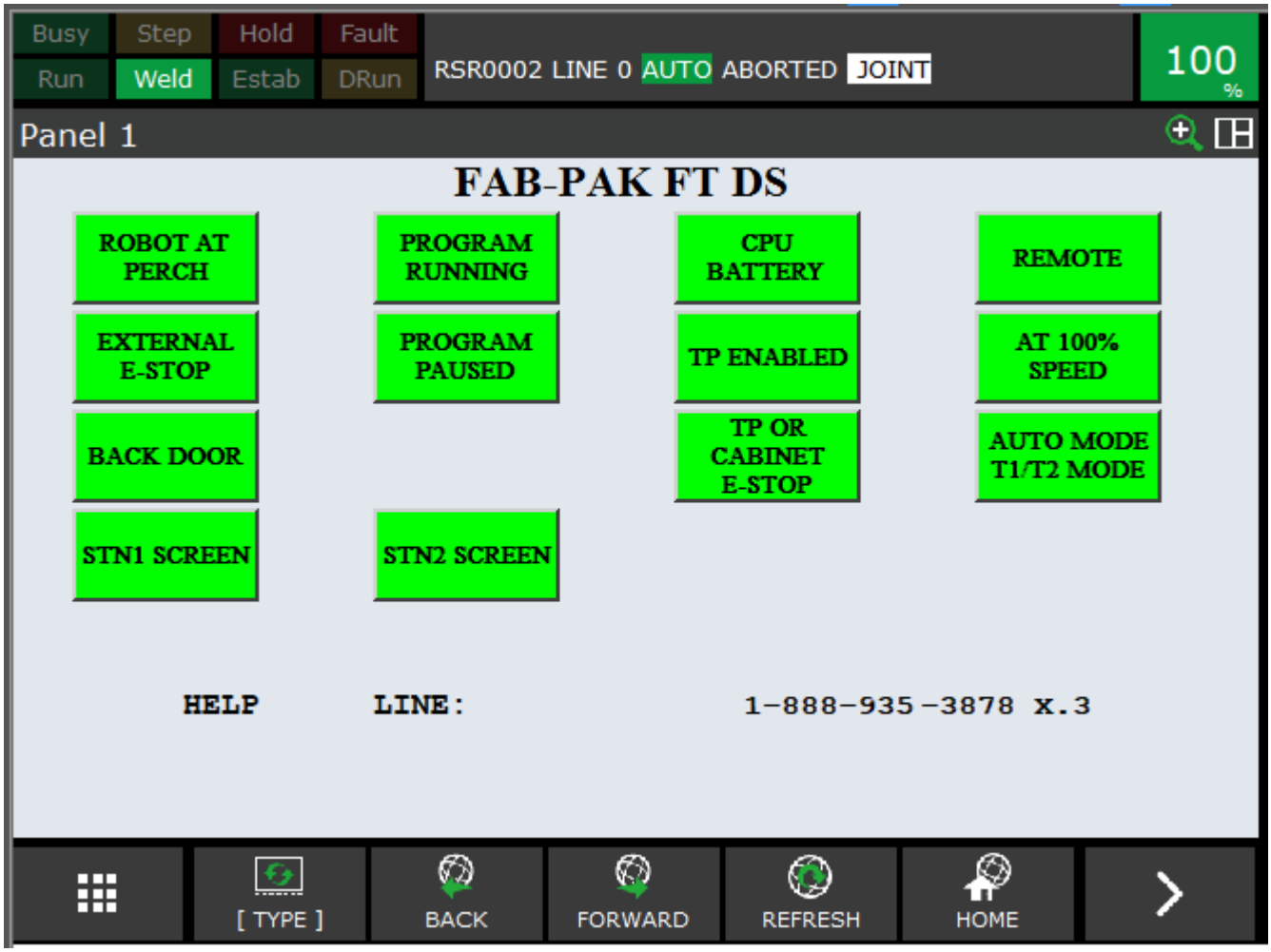

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In order to open the PANEL WIZARD screen at any time, **(1)** press **"MENU"** button on Teach Pendant and **(2)** then press "NEXT" button:

Next page of Teach Pendant menus appears, **(3)** press "F1" button and TP PANEL WIZARD screen reappears:

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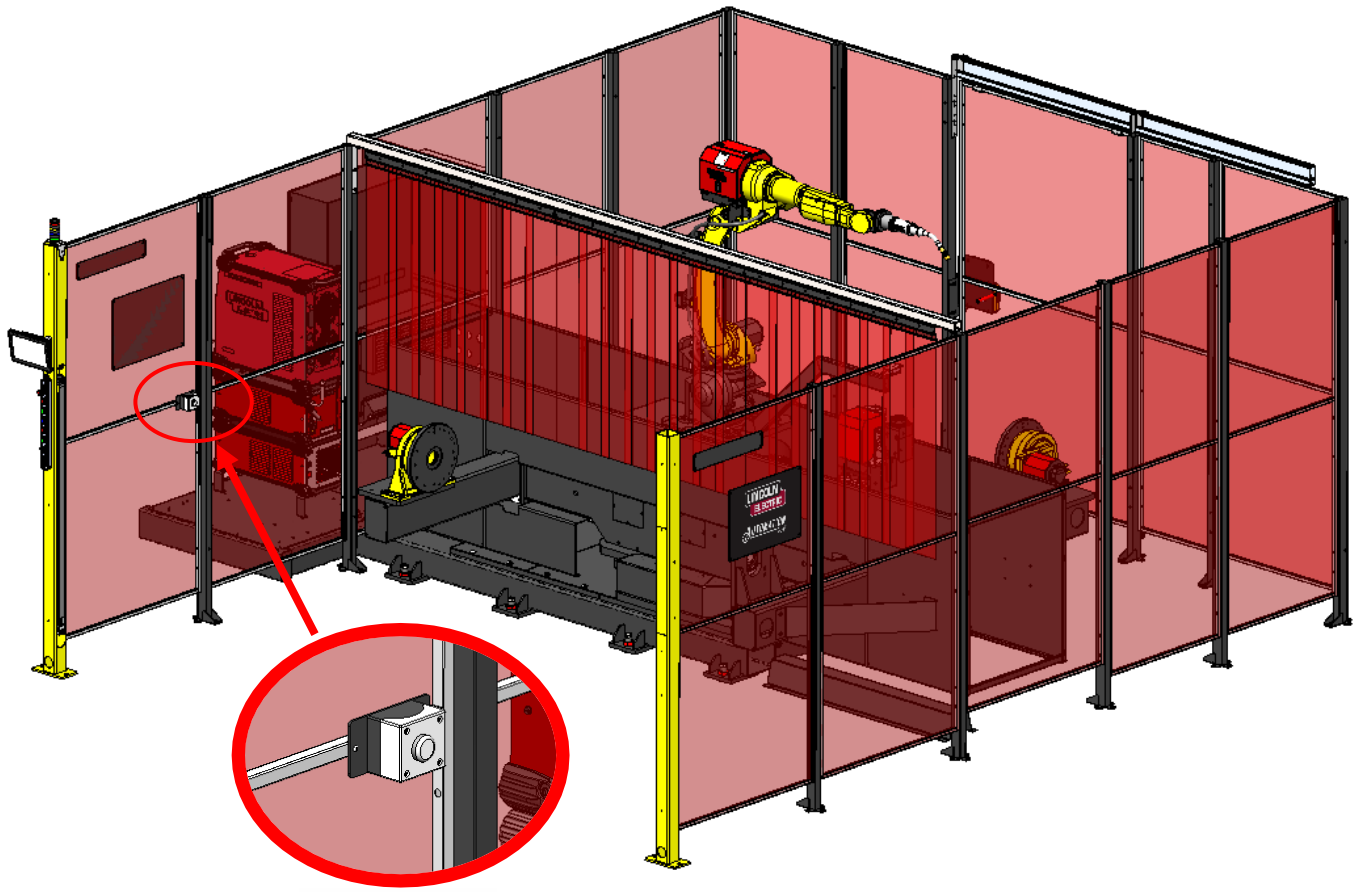
Pre-Reset Feature Sequence of Operations For XHS-CM, XFT, & B2B

This safety feature is a “time-limited reset device” replacing front barriers, floor area scanners and horizontal light curtains with dual-channel safety-rated push buttons combination. It allows, in combination with FANUC Dual Check Safety (DCS) and Safety PMC logic, to monitor the protected zones through a time limited acknowledgement action of a person operating the robotic cell per ISO 10218 Part 2 (ANSI/RIA R15.06-2012 Part 2 Clause 5.6.3.4.3).



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Step 1 - Operator enters a cell crossing vertical Safety Light Curtain.

This action, through Safety PMC logic, signals to the system that someone is in the zone and:

- Deactivates the green START button so cycle cannot be initiated in that zone.
- If the robot is currently operating in the zone, it immediately stops all movements and places the equipment in an “Open Fence” fault mode.
- Both blue SAFETY RESET button on the main operator push button station and white PRE-RESET button mounted on an inner wall illuminate.

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Step 2 - After loading part or fixing any issues, operator presses PRE-RESET button.

This action, through Safety PMC logic, signals to system that a person is leaving the zone and:

- Starts safety rated 10 seconds timer setting the duration of the PRE-RESET / SAFETY RESET action.
- Both blue SAFETY RESET button and white PRE-RESET button lights begin blinking.

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Step 3 – A person exits the cell, crossing vertical Safety Light Curtain once again.

This action, through Safety PMC logic, signals to system that a person has left the zone and:

- Pressing blinking blue SAFETY RESET button will set Safety PMC bits, allowing the equipment to operate.
- If no faults present, green START button illuminates enabling production CYCLE START action.
- If other faults or alarms present, red RESET button illuminates allowing resetting the system and illuminating green START button if no faults left present.
- If blinking blue SAFETY RESET button is not pressed, and the 10 second safety rated timer expires, both blue SAFETY RESET button and white PRE-RESET button lights will stop blinking and an operator must enter the zone and repeat Step-2.

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Safety Features

Robotic Cell is equipped with numerous safety features to protect the operator from injury caused by the robot and / or positioner motion. The following components are used in the safety scheme of this system:

For XHS-CM, XFT, and B2B:

- Loading Area Safety Light Curtains
- Working Area Access Door Safety Switch
- Teach Pendant E-STOP button
- Robot Control Panel E-STOP Button
- Operator Palm Station E-STOP Button
- AUTO/T1 software mode select for secured safe speed way of operation
- Loading Area Pre Reset entry / exit feature
- DCS Safety PMC ladder logic controller / sequencer
- DCS Joint Position Check robot positions limiting safety rated software
- DCS Joint Speed Check robot and positioner speed limiting safety rated software
- DCS Cartesian Position Check robot reach points limiting safety rated software
- Optional safety floor area scanner as a replacement for the Pre Reset software feature

For CDZ:

- Pop-up fences for work zones
- Side Door Safety Switch
- Teach Pendant E-STOP button
- Operator Palm Station E-STOP Button
- AUTO/T1 software mode select for secured safe speed way of operation
- DCS Safety PMC ladder logic controller / sequencer
- DCS Joint Position Check robot positions limiting safety rated software
- DCS Joint Speed Check robot and positioner speeds limiting safety rated software
- DCS Cartesian Position Check robot reach points limiting safety rated software

For XHS-CM, XFT, and B2B, to operate the system in automatic mode, the Light Curtain must not be obstructed, access door must be closed and locked, Palm Station E-STOP button must be released and PRE-RESET safety feature engaged.

For CDZ, to operate the system in automatic mode, the pop up fence must initially be up, side door must be closed and locked, and the Palm Station E-STOP button must be released.

To operate the system in Teach mode, the E-STOP Buttons must be released. The Light Curtains and Door Switch are not active in Teach mode.

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Fault Recovery

If a fault occurs during automatic operation, the system will stop and red “Fault” light will illuminate. To recover from the fault, first determine and correct the fault condition(s). The Teach Pendant or the PANEL WIZARD display an error message which can be useful in determining the cause of the fault. Press the Reset button and, if all faults have been cleared, the system will be ready to resume operation. Press Cycle Start button to resume operation.

Note: If Safety Light Curtain was crossed during AUTO operation, the PRE-RESET feature shall be exercised prior to resetting robot fault. This does not apply to a CDZ system.

Example: a fault occurs during a welding routine and the operator identifies the fault on the Teach Pendant as an ARC START FAILURE.

1. Press Fault Reset button
2. Wait for the fault to clear and the illumination of the green “Robot Ready” flashing light
3. Press and release the Cycle Start button
4. Observe the recovery of the robot and the restarting of the welding routine

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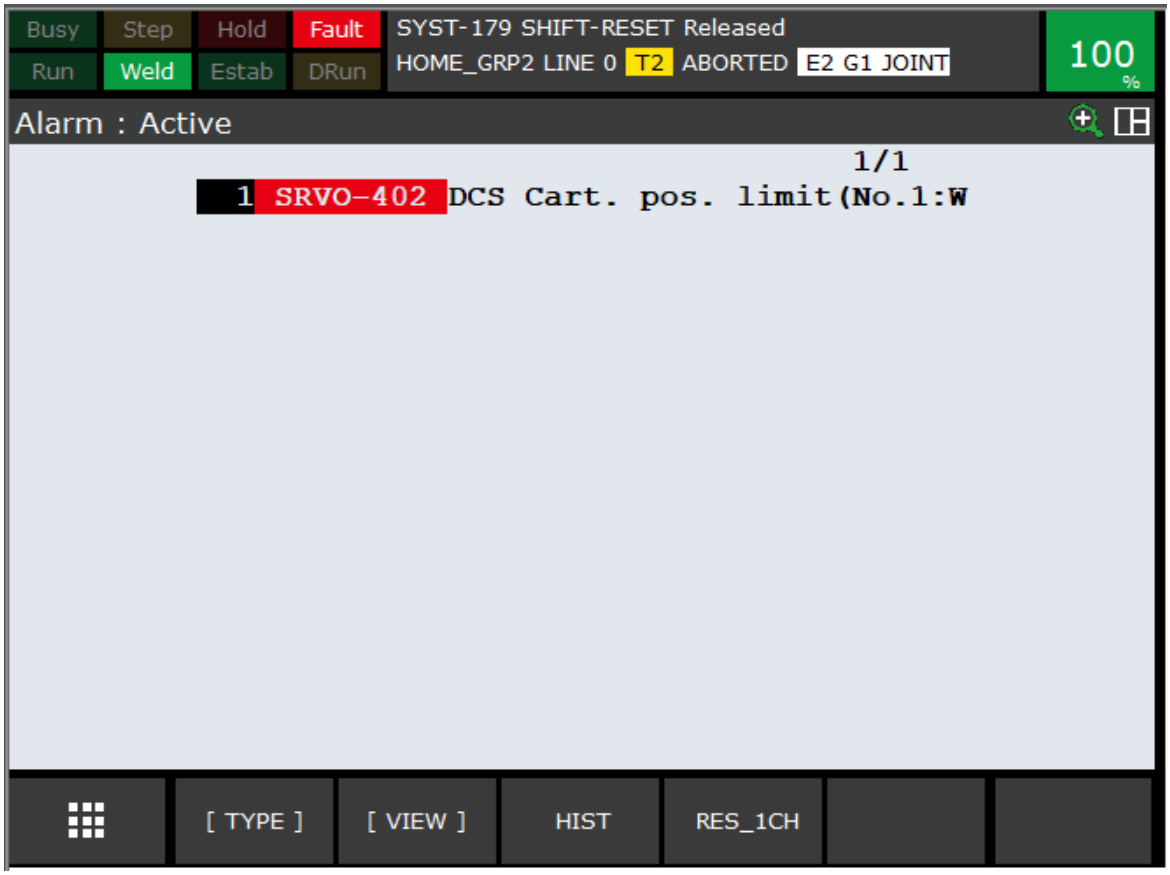
Troubleshooting

The Active Alarm screen shows any active alarms in the system. To access Active Alarm screen press **Menu>Alarm>Alarm Log**



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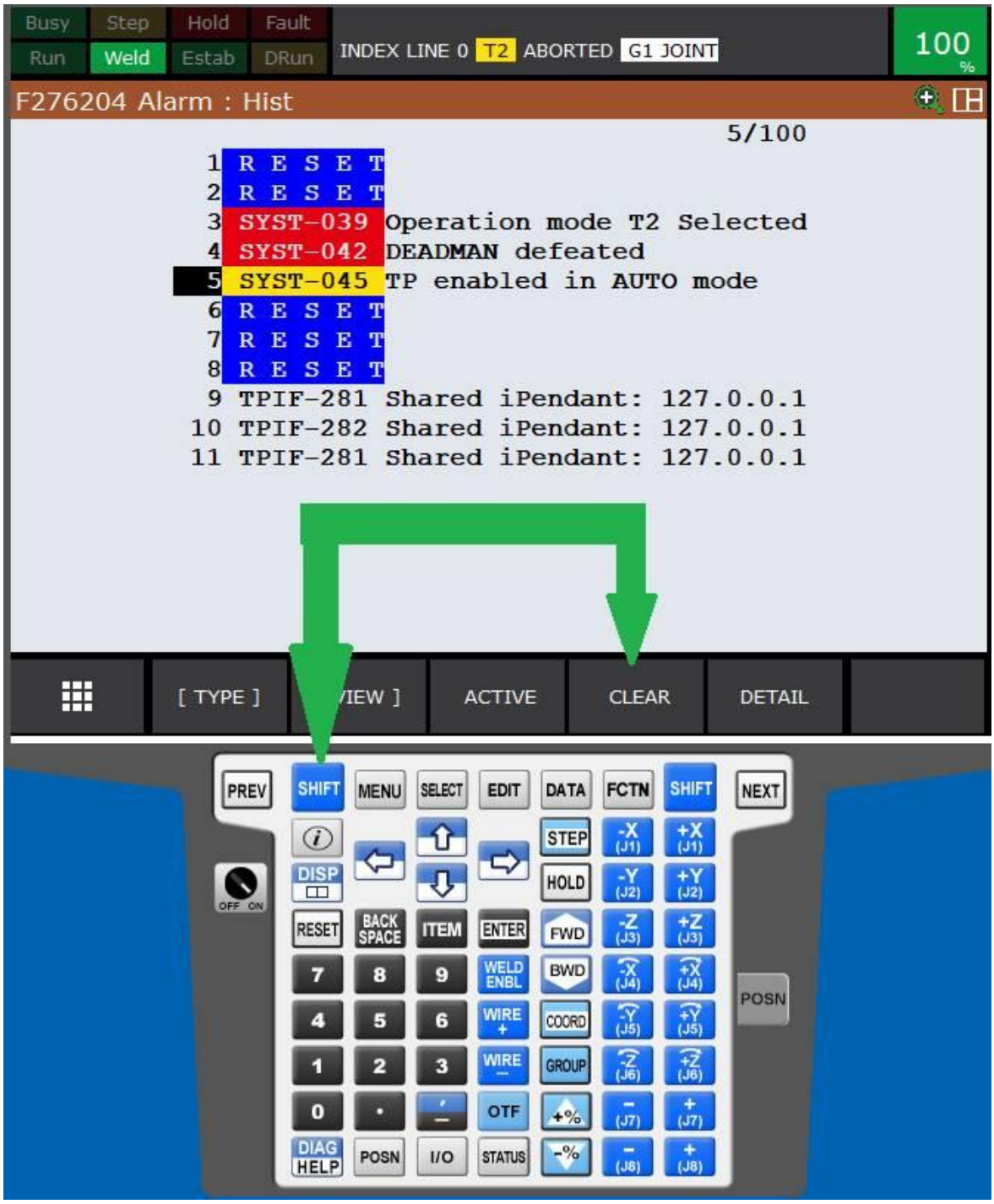
To access Alarm History screen press **F3 Hist**
Alarm History can be cleared by simultaneously pressing Shift-Clear



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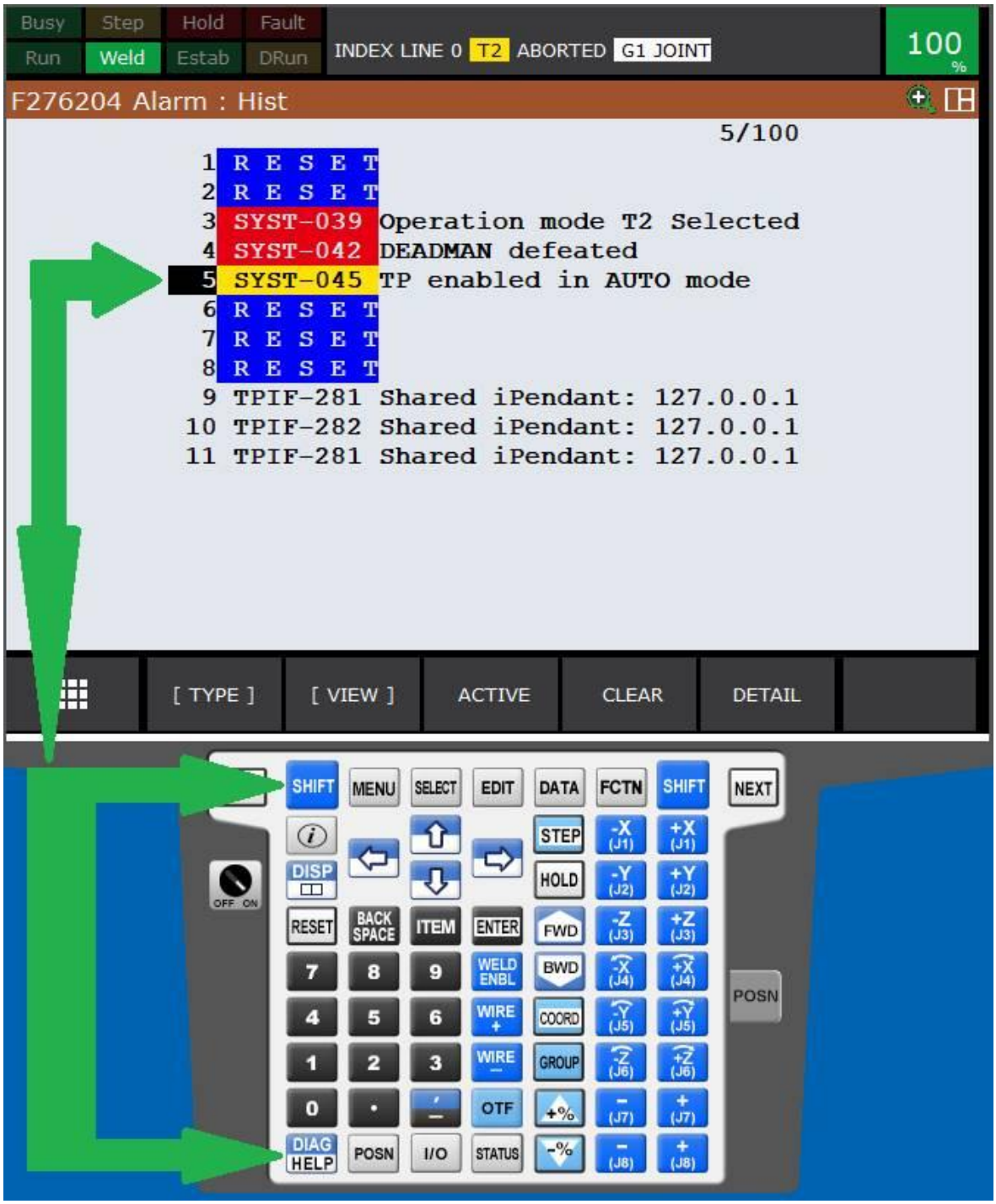
To view a detailed diagnostic of any alarm, highlight the alarm and press simultaneously SHIFT-DIAG buttons:



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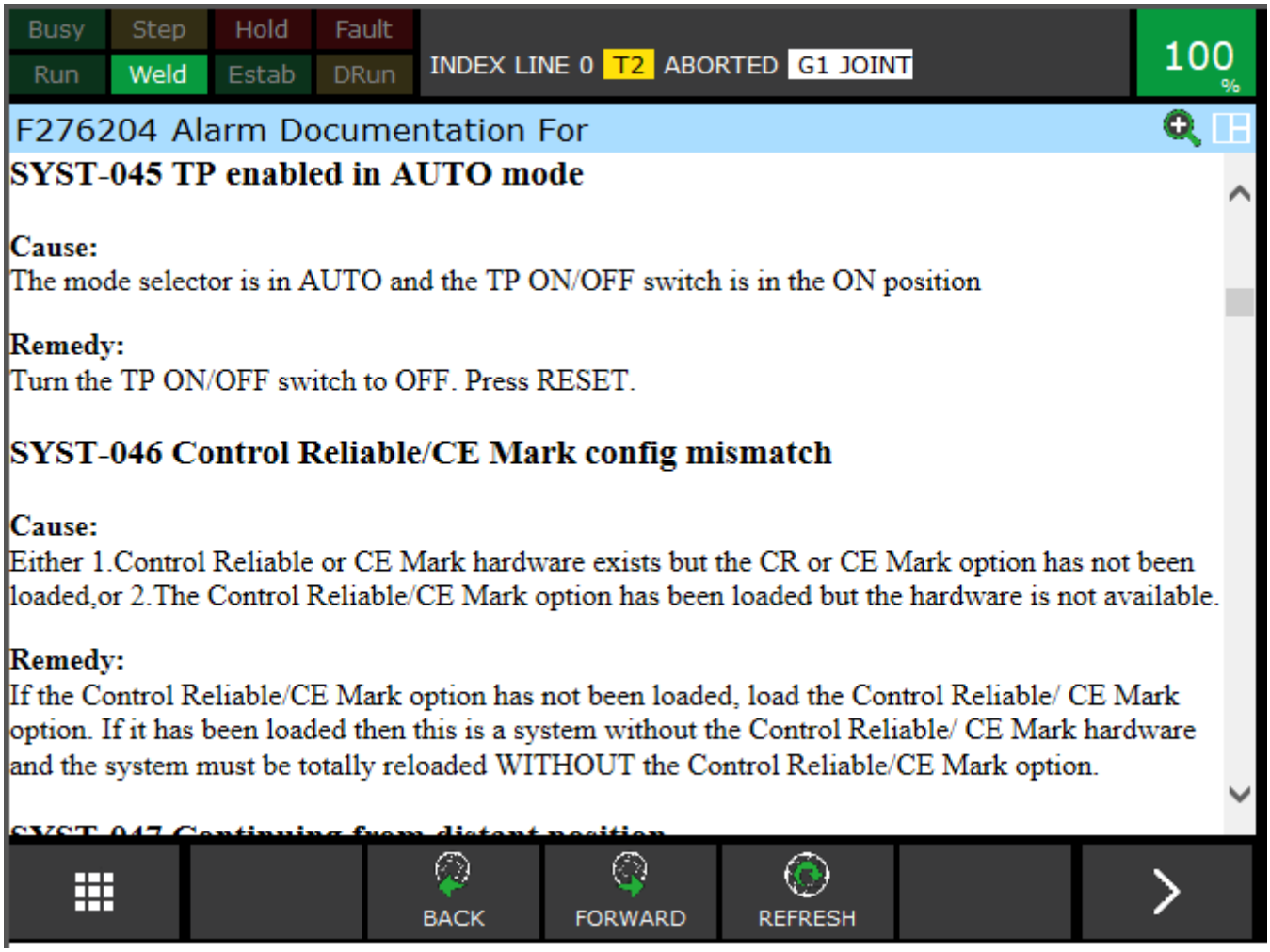
The cause of the alarm and the remedy is displayed on the screen:



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TROUBLESHOOTING GUIDE:

Problem	Possible Reasons	What to look for	Possible Solution
System does not start	System not ready	1. Check Panel Wizard to see if **ROBOT AT PERCH** icon is green	1. Robot(s) not at home [**PERCH**], Run home program (Put system in T1 mode, press select on Teach Pendant, find and run home program.)
		2. For CDZ check Panel Wizard to see if **STATION-1/2 SCREEN UP** icons are green	2. Safety screens are not up (use operator panel to raise screens)
Light tower Red Light On	System faulted	1. Light curtain may have been crossed or misaligned	1. Check light curtain alignment, look for green lights on the Safety Light curtain unit
		2. E-Stops may have been pushed	2. Check E-Stop buttons on robot controller, teach pendant, and operator push button station
		3. Back maintenance door opened and/or safety latched not engaged	3. Shut the maintenance door and engage safety latch

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Maintenance

This section provides general maintenance guidelines for the system. It does not provide maintenance guidelines for the system's individual components. Be sure to follow the appropriate maintenance procedures for the different components of the system (robot, power source, reaming station, etc.)

Recommended Maintenance Schedule:

Daily:

- Check cell and remove any object not required for operation.
- Check any exposed cables for defect.
- Check for loose connections or improper operation of cell functions.
- Check welding torch for tip, nozzle, or cable wear.
- Inspect compressed air lines.

Weekly:

- Verify the proper operation of all safety components.
- Test peripheral devices for proper operation.
- Clean robot, power source, operating cell, and all peripheral devices.

Monthly:

- Inspect welding torch body and components.
- Inspect teach pendant cable.
- Clean wire feeder assembly.
- For XHS-CM, grease slewing ring, pinion and bearing

Yearly:

- Change C-cell encoder batteries (with robot power on).

Every 3 Years:

- Grease robot mechanical unit

Every 4 Years:

- Change CPU Lithium battery (with robot power on).

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XHS-CM SLEWING RING BEARING

Bearing should be lubricated every 100 hours of operation for slow speed or intermittent use. In applications where the bearing is rotating continuously, the bearing should be lubricated after 20 hours of continuous use. Bearings that are in storage or mounted on equipment that is idle should be lubricated every 6 months. Below are the recommended types of lubricant:

Brand	***Raceway***	***Gear***
Exxon	Ronex MP	Surret Fluid
Castrol	Molub-Alloy 220 ES	Optimol Viscogen 0
Mobil	Mobilux EP2	Mobiltac 375NC
Texaco	Multifak EP2	Crater 2x Fluid
Sunoco	Ultra Prestige 2 EP	
Shell	Alvania EP2	Cardium Fluid M or H
Kluber	Centoplex 2 EP	Grafloscon C-SG 0 Plus
76 Lubricants	Unoba EP2	Gearite HDCF 4800

LTU POSITIONER

The RV-drive requires lubrication every 20,000 hours of operation. See chart below for grease specification and volume of grease. The copper grounding pin may be lubricated by applying, as needed, a thin conductive grease to the faceplate where contact is made. Conductive grease can be purchased from Lincoln Automation M18091-15.

Grease		
Manufacturer	*Brand Name*	*Operating Range*
Teijin Seiki	Molywhite RE00	-10C - 40C
Showa Shell Oil	Albania EPR0	-10C - 40C
Nippon Oil	Epinoc AP0	-10C - 40C

Horizontal installation	
Series	Grease Qty. (CC/grams)
A4023878-F / A4023878-A	383 / 333
A4023880-F / A4023880-A	630 / 548
A4023921-F / A4023921-A	1600 / 1400

Vertical Installation	
Series	Grease Qty. (CC/grams)
A4023878-F / A4023878-A	461 / 401
A4023880-F / A4023880-A	759 / 660
A4023921-F / A4023921-A	1900 / 1650

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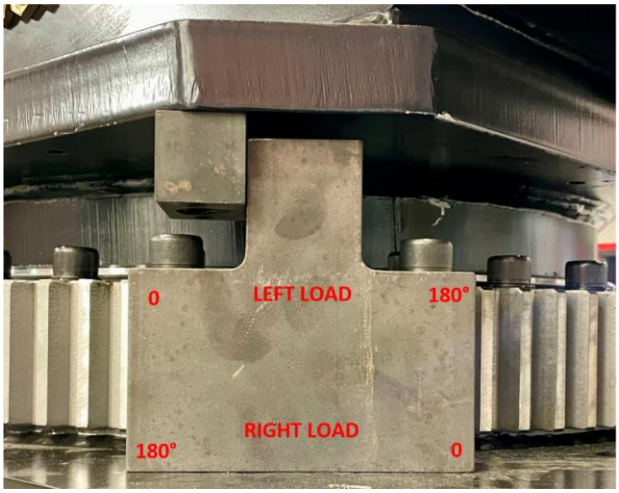
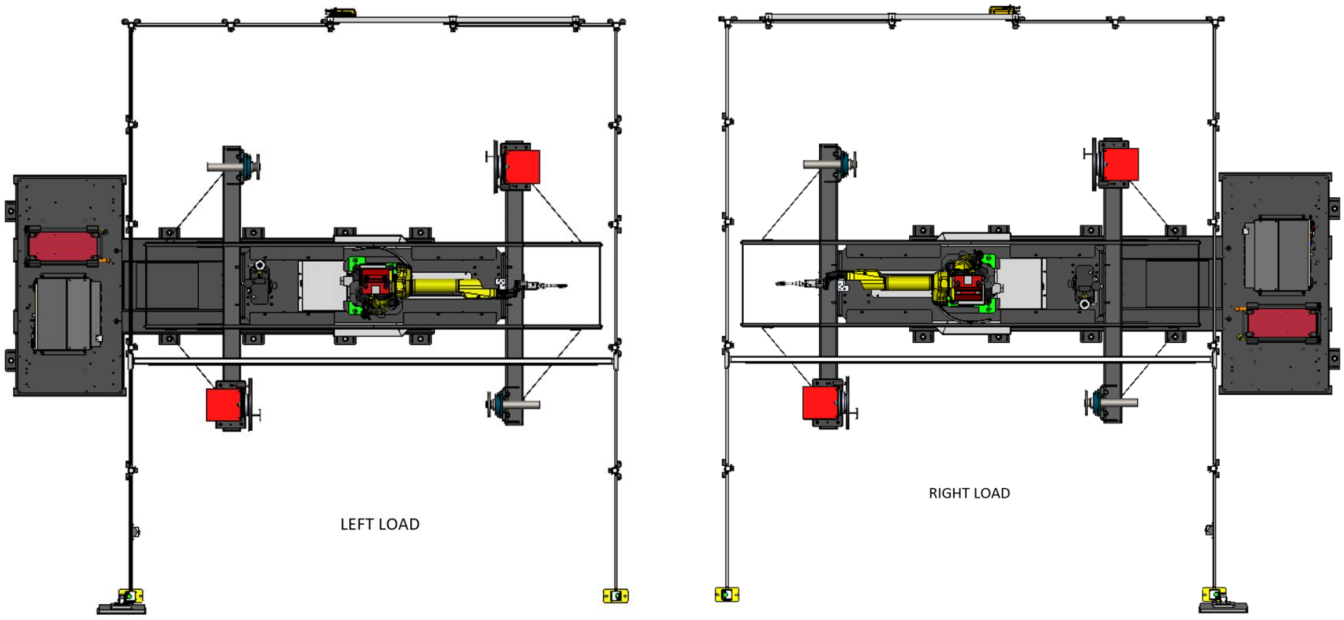
Mastering Servo CM/RM

1. Disable PMC, turn on DO5
2. Move G2 (G3 for dual arm) about 1 degree off of hard stop on ZERO=SIDE1 G3 at robot (G4 for dual arm).





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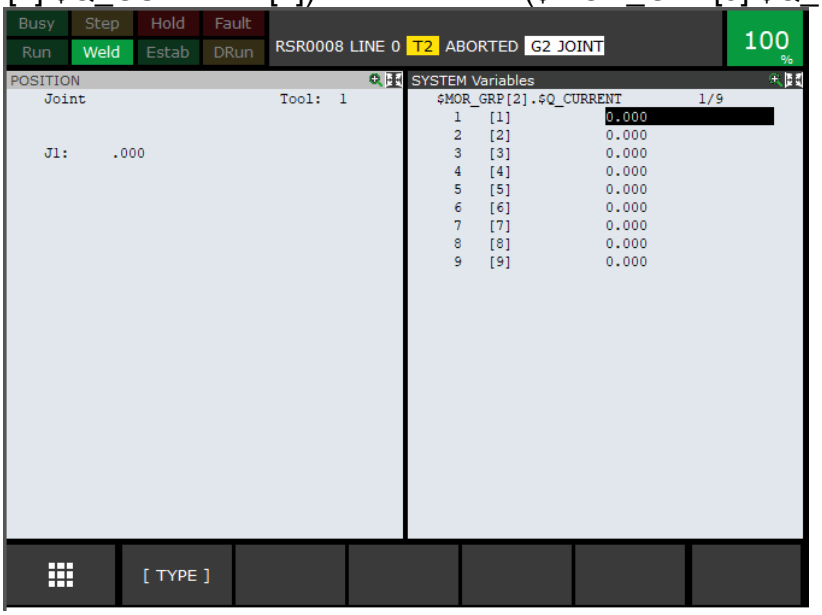
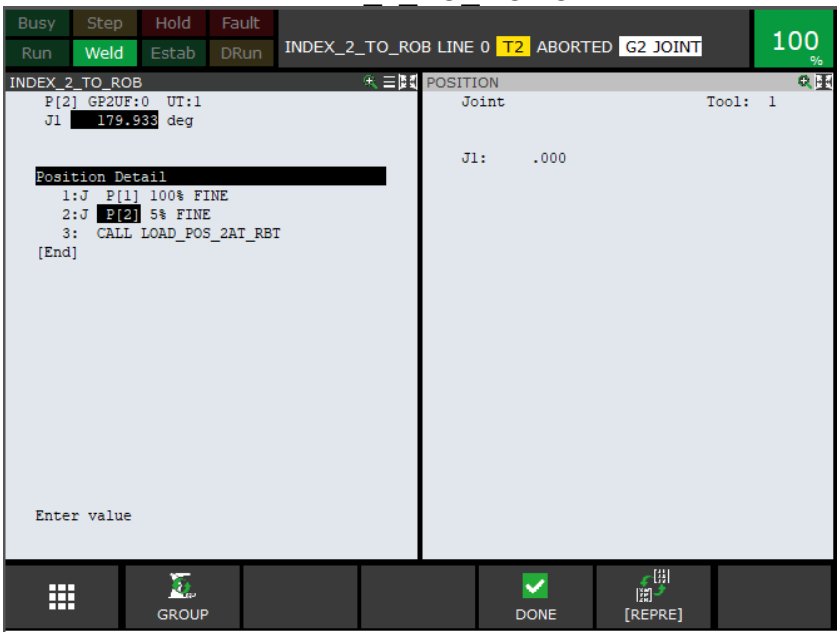
3. JOG at 1% into block watching for contact, monitor position and motor current ($MOR_GRP[2] $Q_CURRENT[1]). For dual arm ($MOR_GRP[3] $Q_CURRENT[1]).



4. When current starts to rise above nominal this is an indication that all backlash is removed.
5. Zero position master for G2. G3 for dual arm.
6. Run program INDEX_1_TO_ROBOT, monitor G2 position and make sure G2 stays at 0 when brake is applied. (For Dual arm G2 becomes G3).
7. Push and pull on H Frame for any noticeable backlash.
8. Index 179 degrees perform Step 1 and 2 (G2 speed is limited to 50% in teach mode). (G3 for dual arm). Motion sign to be set for positive direction.
9. JOG at 1% into block watching for contact, monitor position and motor current ($MOR_GRP[2] $Q_CURRENT[1]). For dual arm ($MOR_GRP[3] $Q_CURRENT[1]).
10. Inset this position in line 2 of INDEX_2_TO_ROBOT.



11. Run program INDEX_2_TO_ROBOT, monitor G2 position make sure G2 stays at 180 when brakes are applied. (For Dual arm G2 becomes G3).
12. Push and pull on the H frame for any noticeable backlash.

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Parts List

RECOMMENDED QTY	PART #	DESCRIPTION
1	A2000074	6 BUTTON 6 BAY UNIT
1	A2009229	HDPE PLASTIC BOTTLE
1	A2019546	DOOR LATCH MAGNETIC REED SWITCH
1	A2020789	CPL SERVO GUN CHANGE UNIT
1	A2033604-1500R	LIGHT CURTAIN, 1500MM L x 30MM W, REC
1	A2033604-1500T	LIGHT CURTAIN, 1500MM L x 30MM W, TRAN
1	A2038453	LINCOLN COOLARC - FLOW SENSOR, SPK
1	A2042877	POWER SUPPLY, 3-PH, 320-600VAC
1	A2044886	TOWER LIGHT
1	A4022224-01	FILTER ASBLY, SIZE 4, 1 PORT
1	K2391-2	POWER REAM® II
1	K2829-1	115V AUXILIARY POWER KIT,SPK
1	K3451-1	POWER WAVE® R450
1	K3560-1	AUTODRIVE 4R100 WIRE FEEDER
1	KP1505-035S	DRIVE ROLL KIT (.035, 4 ROLL), SPK
1	KP1505-045S	DRIVE ROLL KIT (.045, 4 ROLL), SPK
1	KP2457-1	POWER REAM® II - ANTI-SPATTER (RED), 1 GAL.
1	KP2435-3	POWER REAM® II - REAMING BIT 5/8", SPK
10	KP2745-035	CONTACT TIP 550, .035
10	KP2745-045	CONTACT TIP 550, .045
2	KP2747-1	DIFFUSER, THREAD-ON, 550A
2	KP2773-1	INSULATOR 550
1	KP3066-100ID	CABLE MAGNUM PRO FANUC 100ID
1	KP3355-45	MAGNUM PRO 45D AC GOOSENECK
1	KP2920-9	BREAKAWAY DISC, THRU THE ARM, ID ROBOT
2	KP44-3545-15	LINER, 035-045,10/12/15' GUN(44-3545-15)
2	KP3364-1	JUMPLINER, ROBOTIC WIREBRAKE (.035/.045)
1	K4307-2	NOSE CONE W/WIRE BRAKE
1	K4308-4	TORCH HOUSING W/WIRE BRAKE (SHORT)
1	K5445-100ID-B	DRESS OUT KIT, 100ID

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This instruction page applies only to equipment in Europe that displays this symbol:

English:
Do not dispose of electrical equipment together with normal waste!
In observance of European Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) and its implementation in accordance with national law, electrical equipment that has reached the end of its life must be collected separately and returned to an environmentally compatible recycling facility. As the owner of the equipment, you should get information on approved collection systems from our local representative.
By applying this European Directive you will protect the environment and human health!

Italiano:
Non gettare le apparecchiature elettriche tra i rifiuti domestici!
In ottemperanza alla Direttiva Europea 2002/96/CE sui Rifiuti di Apparechiature Elettriche ed Elettroniche (RAEE) e la sua attuazione in conformità alle norme nazionali, le apparecchiature elettriche esauste devono essere raccolte separatamente e restituite ad una organizzazione di riciclaggio ecocompatibile. Come proprietario dell'apparecchiatura, Lei potrà ricevere informazioni circa il sistema approvato di raccolta, dal nostro rappresentante locale.
Applicando questa Direttiva Europea Lei contribuirà a migliorare l'ambiente e la salute!

Deutsch:
Werfen Sie Elektrowerkzeuge nicht in den Hausmüll!
Gemäss Europäischer Richtlinie 2002/96/EG über Elektro- und Elektronik- Altgeräte (Waste Electrical and Electronic Equipment, WEEE) und Umsetzung in nationales Recht müssen verbrauchte Elektrowerkzeuge getrennt gesammelt und einer umweltgerechten Wiederverwertung zugeführt werden. Als Eigentümer diese Werkzeuges sollten sie sich Informationen über ein lokales autorisiertes Sammel- bzw. Entsorgungssystem einholen.
Mit der Anwendung dieser EU Direktive tragen sie wesentlich zur Schonung der Umwelt und ihrer Gesundheit bei!

Español:
No tirar nunca los aparatos eléctricos junto con los residuos en general!.
De conformidad a la Directiva Europea 2002/96/EC relativa a los Residuos de Equipos Eléctricos o Electrónicos (CRAEE) y al acuerdo de la legislación nacional, los equipos eléctricos deberán ser recogidos y reciclados respetando el medioambiente. Como propietario del equipo, deberá informar de los sistemas y lugares apropiados para la recogida de los mismos.
Aplicar esta Directiva Europea protegerá el medioambiente y su salud!

Français:
Ne pas jeter les appareils électriques avec les déchets ordinaires!
Conformément à la Directive Européenne 2002/96/EC relative aux Déchets d' Équipements Électriques ou Électroniques (DEEE), et à sa transposition dans la législation nationale, les appareils électriques doivent être collectés à part et être soumis à un recyclage respectueux de l'environnement. En tant que propriétaire de l'équipement, vous devriez vous informer sur les systèmes de collecte approuvés auprès nos représentants locaux.
Appliquer cette Directive Européenne améliorera l'environnement et la santé!

Norsk:
Kast ikke elektriske artikler sammen med vanlig søppel.
I følge det europeiske direktivet for Elektronisk Søppel og Elektriske Artikler 2002/96/EC (Waste Electrical and Electronic Equipment, WEEE) skal alt avfall kildesorteres og leveres på godkjente plasser i følge loven. Godkjente retur plasser gis av lokale myndigheter.
Ved å følge det europeiske direktivet bidrar du til å bevare naturen og den menskelige helse.

Nederlandse:
Gooi elektrische apparatuur nooit bij gewoon afval!
Met inachtneming van de Europese Richtlijn 2002/96/EC met betrekking tot Afval van Elektrische en Elektronische Apparatuur (Waste Electrical and Electronic Equipment, WEEE) en de uitvoering daarvan in overeenstemming met nationaal recht, moet elektrische apparatuur, waarvan de levensduur ten einde loopt, apart worden verzameld en worden ingeleverd bij een recycling bedrijf, dat overeenkomstig de milieuwetgeving opereert. Als eigenaar van de apparatuur moet u informatie inwinnen over goedgekeurde verzamelsystemen van onze vertegenwoordiger ter plaatse.
Door het toepassen van deze Europese Richtlijn beschermt u het milieu en ieders gezondheid!

Svenska:
Släng inte uttjänt elektrisk utrustning tillsammans med annat avfall!
Enligt Europadirektiv 2002/96/EC ang. Uttjänt Elektrisk och Elektronisk Utrustning (Waste Electrical and Electronic Equipment, WEEE) och dess implementering enligt nationella lagar, ska elektrisk utrustning som tjänat ut sorteras separat och lämnas till en miljögodkänd återvinningsstation. Som ägare till utrustningen, bör du skaffa information om godkända återvinningssystem från dina lokala myndigheter.
Genom att följa detta Europadirektiv bidrar du till att skydda miljö och hälsa!

Polski:
Nie wyrzucac osprzetu elektrycznego razem z normalnymi odpadami!
Zgodnie z Dyrektywa Europejska 2002/96/EC dotyczaca Pozbywania sie zuzytego Sprzetu Elektrycznego i Elektronicznego (Waste Electrical and Electronic Equipment, WEEE) i jej wprowadzeniem w zycie zgodnie z miedzynarodowym prawem, zuzyty sprzet elektryczny musi byc skladowany oddzielnie i specjalnie utylizowany. Jako wlasciciel urzadzen powinienes otrzymac informacje o zatwierdzonym systemie skladowania od naszego lokalnego przedstawiciela.Stosujac te wytyczne bedziesz chronil srodowisko i zdrowie czlowieka!

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Customer Assistance Policy

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

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