

flex Robotic Cell – fRC-S

User Manual



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Revision and Signoff Sheet

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2.4	18/09/2016	Alexander Krylovskyi	Draft - Reviewed
2.5	10/09/2016	Hassan Aluraibi	Draft - Reviewed
2.6	10/25/16	Hassan Aluraibi	Draft – Reviewed

 INFO	Prior to using this manual, it is advised that all users complete frc-s training with a flex certified trainer
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For more information on how to get trained please contact: [REDACTED]

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The specifications given in this document may be modified without advance notice.

If difficulties arise during the operation or the maintenance of the machine which are not dealt with in this document or if additional information is required, please contact [REDACTED]

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1. General Cell Description

1.1 What is the fRC-S?

The flex Robotic Cell-SCARA (fRC-S) is a multifunctional, modular automation building block designed for generic applications within flex production sites worldwide. These applications include

- fastening
- pick and place
- dispensing
- visual inspection

Its intuitive GUI (graphical user interface), offers a user friendly programming environment to easily teach the robot and put together a step by step application (recipe) with minimal programming experience required.



Operator interfacing with fRC

1.2 How to read this manual

This manual is designed to guide users/owners of the fRC-S to:

- Un-crate the system and install it on a production floor
- Provide users with a high-level overview of the core system and its various accessories
- Provide safety and cautionary information
- Outline operation of the system and basic configuration
- Troubleshooting and best practices

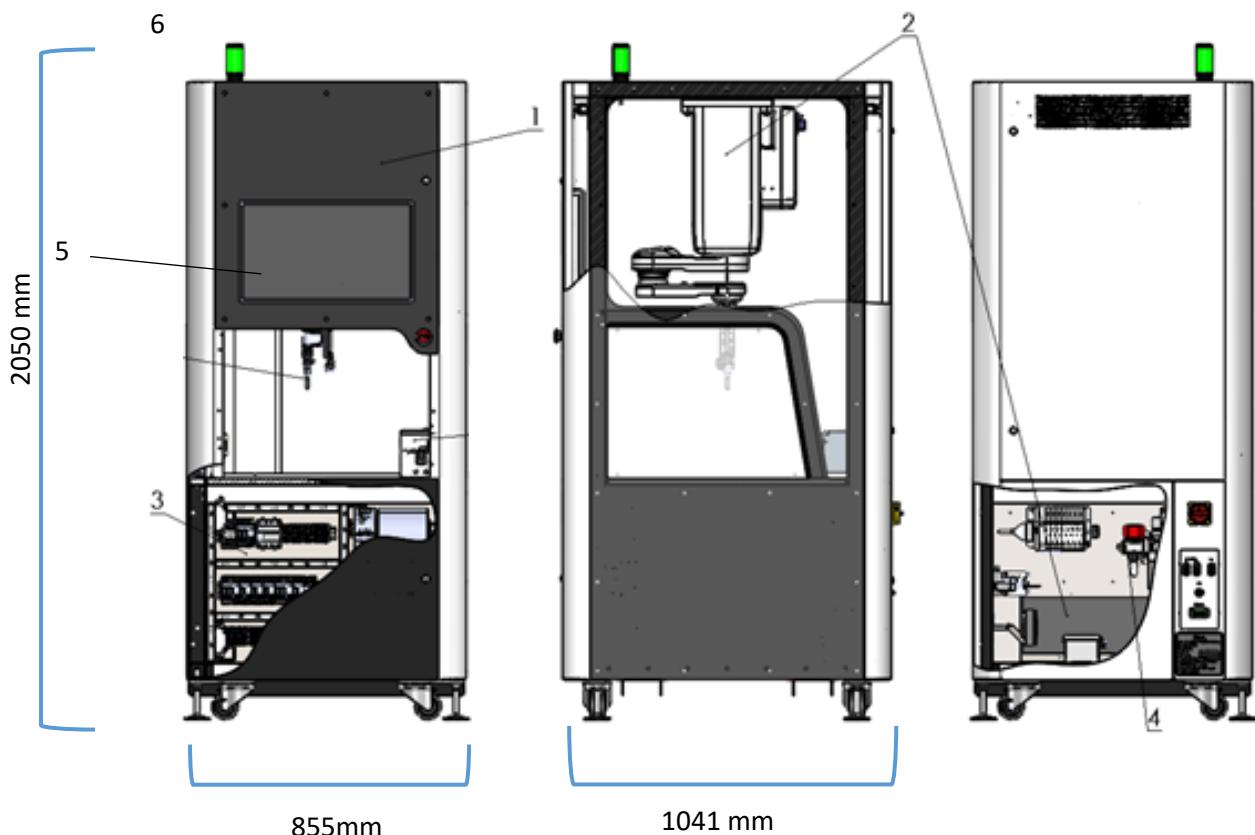
As such, this manual should only be reviewed by a user after they have completed fRC-S training by a certified flex trainer

For more information on getting trained please contact [REDACTED]

1.3 What's included in an fRC-S?

The base configuration of the fRC-S includes the following:

- 1 – Cell Enclosure
- 2 – Nachi EZ03-V02 Robot + Controller
- 3 – Electrical Controls Panel
- 4 – Pneumatic Controls Panel
- 5 – Touchscreen monitor
- 6 – Stack light



Include isometric dimensions



Side view

Front view



Rear View

Cell Enclosure

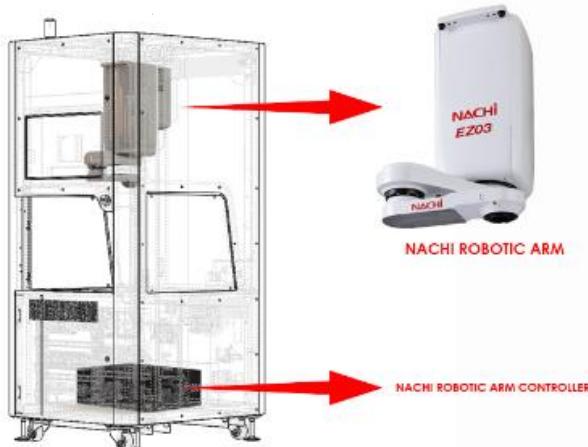
The following hardware is all housed inside of the cell.

Please use a **XXX mm allen wrench** to open the pneumatic and controls panels.

Remember to close the panels afterwards.

1.4 Nachi EZ03-V2 Robot

Motion paths and all manipulation revolve around the use of the Nachi EZ03-V2 Ceiling Mounted SCARA Industrial Robot Arm. This arm is mounted inside of the cell.



NACHI EZ03-V2 KEY SPECS

NUMBER OF AXES	4
PAYLOAD (MAXIMUM WEIGHT)	2.5KG *
STROKE (J1 FULL EXTENSION)	250mm
REPEATABILITY	+/- .014mm
REACH	450mm
MASS	42KG

*: Listed max is 2.5KG, see drawing for max condition

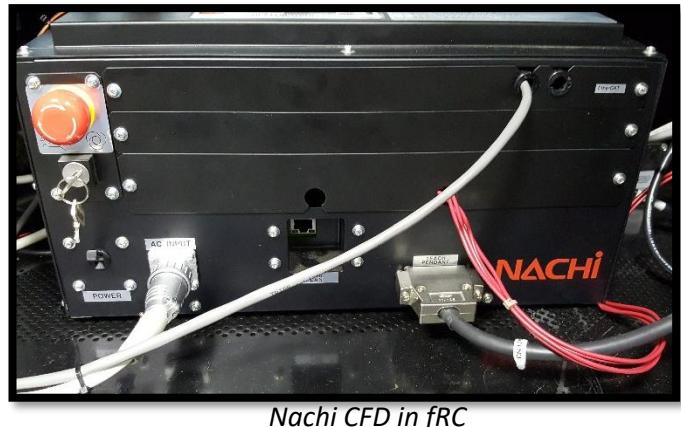
	Rated condition	Max.condition *1
【EZ03V4-02-4525】		
【EZ03V4-02-4515】		
【EZ03F4-02-5525】		
【EZ03F4-02-5515】		

Center of Gravity Condition. Keep these dimensions limits in mind to attain max effectiveness of the robot

 DANGER	The rated conditions above are <u>explicitly</u> defined by Nachi Robotics. Caution should be taken when running EZ03V4-02 with an end of arm tool that exceeds the listed conditions above.
-------------------	--

 CAUTION	<p>There is a case that the wrist vibration occurs when operating with low speed, even setting the wrist load correctly, depending on the motion and the tool shape of robot. This occurs because of the arm drive system vibration and natural frequency of the arm come close to each other.</p> <p>It is possible to make the vibration small by shifting resonance point followed by the method below in that case.</p> <ul style="list-style-type: none">• Change recorded speed of the robot program• Change tool weight and inertia moment• Change robot posture
 CAUTION	<p>There is a case that vibration, overload and execution error can occur depending on the motion and/ or loading condition when start-up under low temperature.</p> <p>In that case, conduct break-in about 10 min w/ 30% override, and speed up gradually.</p>
 CAUTION	<p>In case of transporting the arm without fixing, there's a possibility to damage the robot by vibration or impact during transportation.</p> <p>Please make sure to equip the arm fixing bracket, which was installed at shipping when transporting the robot.</p>
 CAUTION	<p>Overhaul period of robot itself is either 4 years or 20,000 Hr. (Choose shortest one.) This overhaul period is calculated by the motion pattern of NACHI standard, therefore durability may decline depends on operating condition of the customer.</p> <p>It is recommended to operate 50% of cycle time duty as a operation guide to meet the overhaul period above.</p> <p>*Cycle time duty: The ratio of operation time during 1 cycle. Stop time of the robot includes arm halt during hand operation and waiting till next cycle.</p>

All robot functionality is driven through its central controller, called the CFD. Cabling is routed through the cell from the backside of the robot to its central controller located beneath the pneumatic panel.

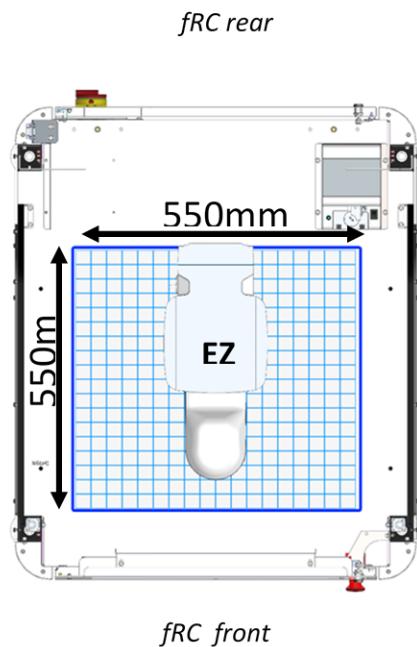


Orientation of keyswitch and power switch on CFD for standard operation



CFD User Panel Main Features	
1	E-Stop Button (robot interlock only)
2	Auto/Manual Switch (should always be set to Auto)
3	Main Power Switch (should always be on, latched upwards)
4	Connector for AC Power (single/3 phase, 220V, .5KW)
5	USB/Ethernet port
6	Filter (do not block)
7	Teach pendant Port (needs blanking plug)

Range of movement for the EZ03 is limited based on “virtual zones”.
These are pre-defined system configurations that limit the fRC joints, to prevent them from colliding with the physical cell.



1.5 Electrical Panel

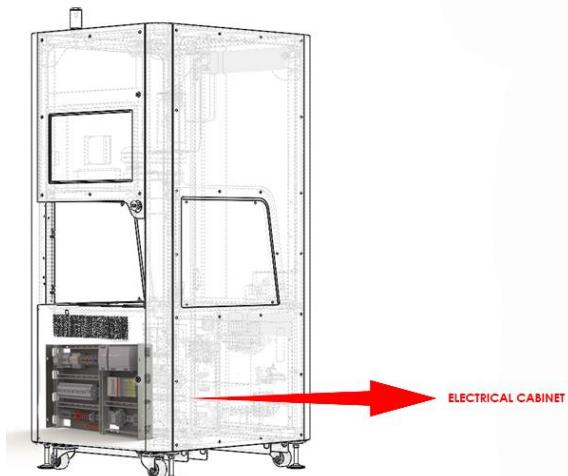
Supplying power to all hardware, safety interlock systems, and driving power to both the robot and main controls system is the electrical controls cabinet. The main electrical feed is routed through the back side of the cell, requiring either single or three phase, 220V AC, rated for up to 15A.



DANGER

The contents in this section deal with electrical requirements, safety and compliance with CE standards.

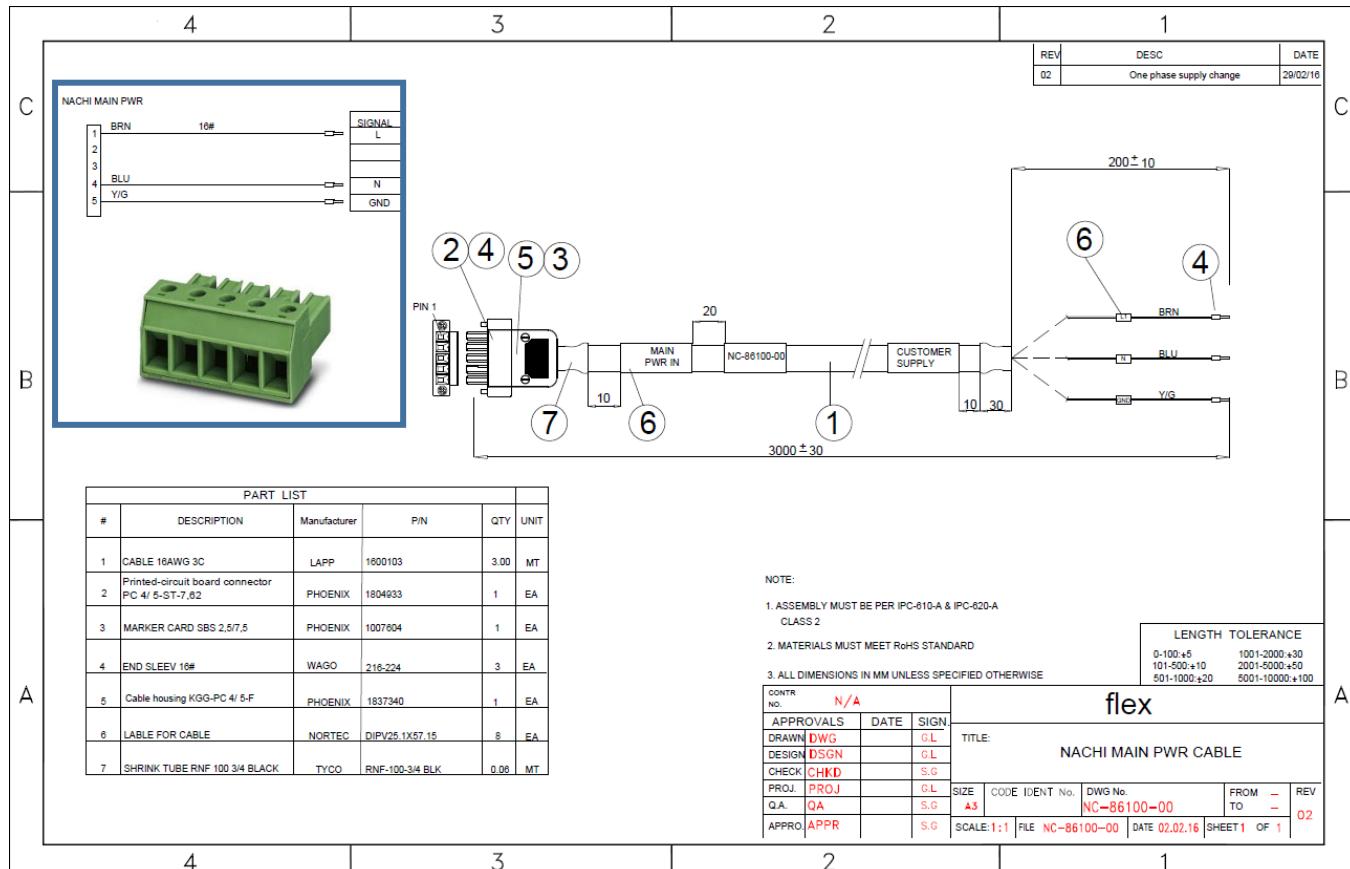
Content in this section should be reviewed **very** carefully along with a **trained engineer or electrician**.



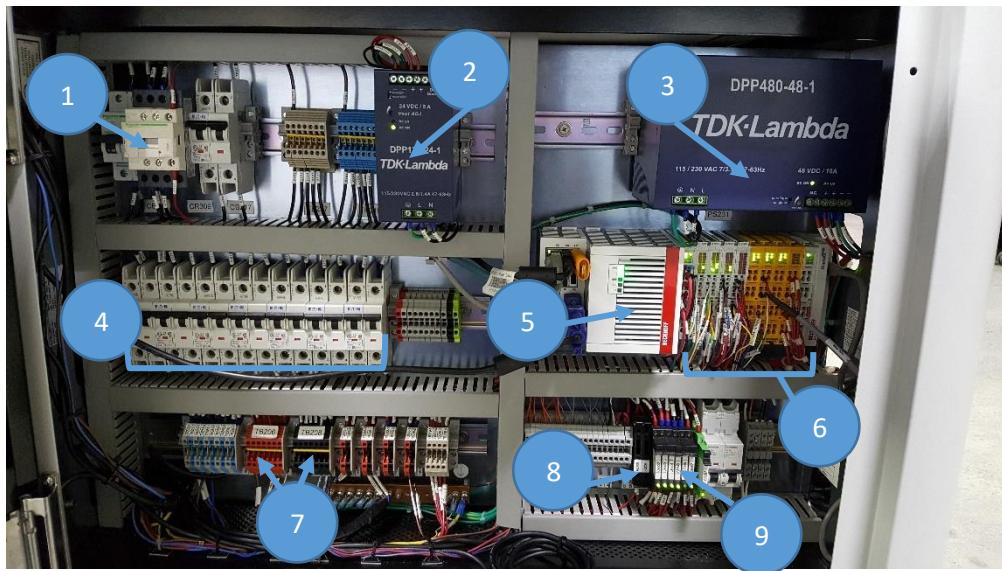
*Main power is fed through the backside of the fRC, connecting to the electrical panel at the front side of the cell.
Your setup may differ from that in the image*

The fRC needs to be connected to main power before it can be energized.

This must be done through the PC 4/ 5-ST-7, 62 plug (figure2.3.4) at the bottom of the control cabinet through a corresponding IEC C19 cord, see illustration below.



Please carefully review the below image and ensure that your fRC includes all elements as seen below. ****Your setup may differ than the below****



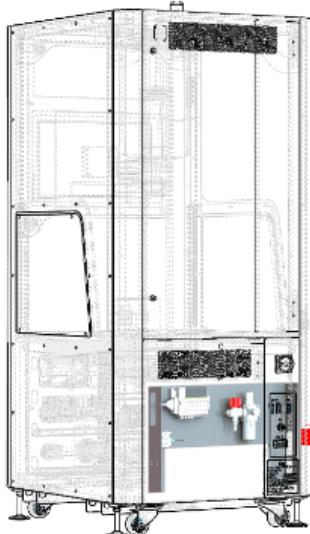
Control Panel Main Features

1	Main disconnect
2	24V Power Supply
3	48V Power Supply
4	Fuse blocks (resettable)
5	Beckhoff CX5140 (4 core, PC Based controller)
6	Beckhoff Ethercat I/O Block (yellow are safety I/O)
7	24V +/- terminal blocks
8	Fuse blocks (single use)
9	Relays (drive main power for peripheral hardware, e.g. screw feeder)

1.6 Pneumatics Panel

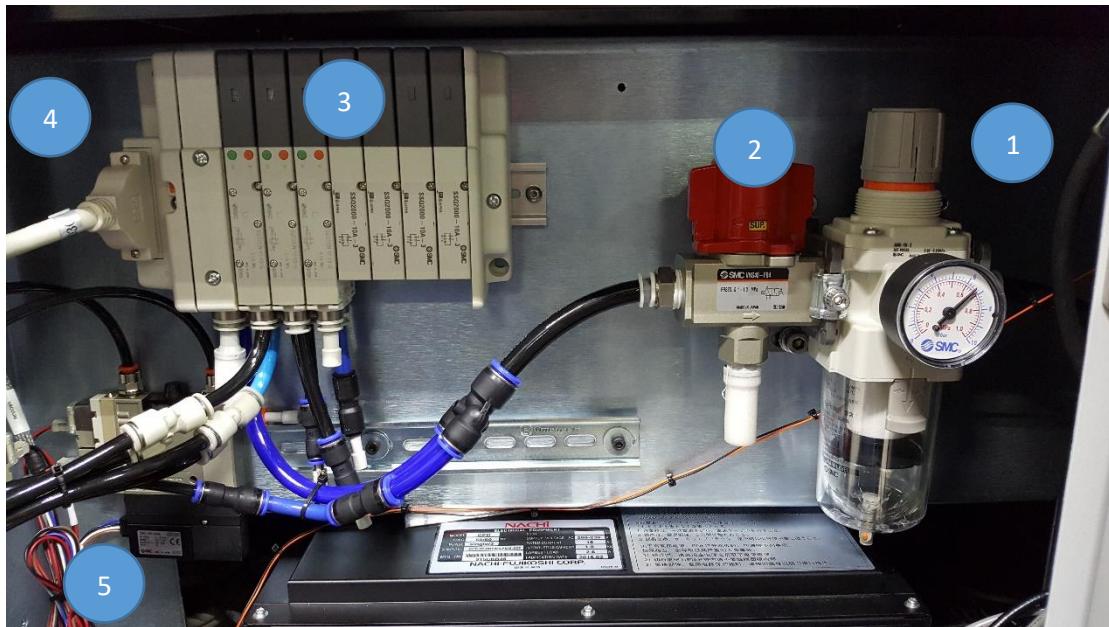
Pressurized air is used to drive actuators, generate vacuum, and index parts through the use of solenoid driven drawers. Air is supplied through the backside of the cell with a recommended 4-8 PSI (6 on average).

 DANGER	Pressurized air is dangerous, and tubing/fittings and all pneumatic components must be properly secured, fastened and inserted. Ensure that your air supply is dry and void of any contamination/dirt
--	--



*Air supply is fed through the backside of the fRC, connecting to the pneumatic panel at the backside side of the cell.
Your setup may differ from that in the image*

Please familiarize yourself with all of the below hardware located in your pneumatic panel.



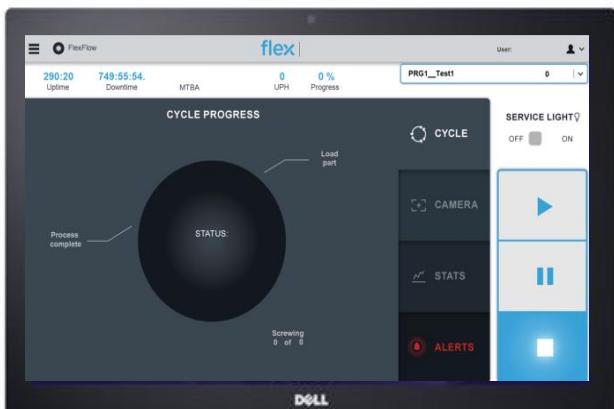
Pneumatic Panel Main Features	
1	SMC Air Regulator: Main air supply should feed into regulator first Recommended: 6-8 PSI
2	Shut off valve
3	Valves
4	Manifold
5	Vacuum Generator

1.7 Touchscreen Monitor

Engineers/Technicians/Operators will use the touchscreen monitor to interface with the system. The touchscreen monitor displays the fRC Graphical User Interface using a DVI adapter to the Beckhoff 5140



The Dell Monitor provides high quality images as well as multi touch features. However, care must be taken to clean it of smudge and dirt (see section on *maintenance*, and avoid any collision to prevent damage.



23" Dell Touchscreen displaying fRC GUI



23" Dell Touchscreen displaying fRC GUI

1.8 Stack Light

Providing a visual indicator of system status, the stack light is mounted on top of the fRC cell. It will illuminate in red/yellow/green depending on current operating status of the fRC. Special



Normal operating
Green



Warning
Orange



Critical error
Red

1.9 Controls Architecture

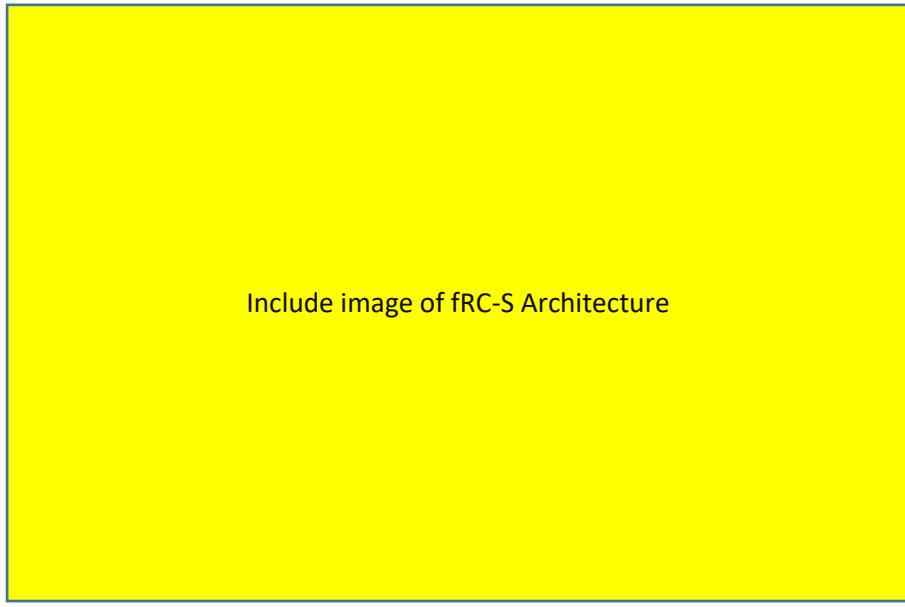
The fRC-S Controls architecture is based around a Beckhoff 5140 PC based controller. Using a customized Windows Embedded OS, the Beckhoff controller offers the flexibility to manage separate processes, including dedicated processes for controls related tasks, and a windows embedded environment to integrate and communicate with many peripheral devices and software.



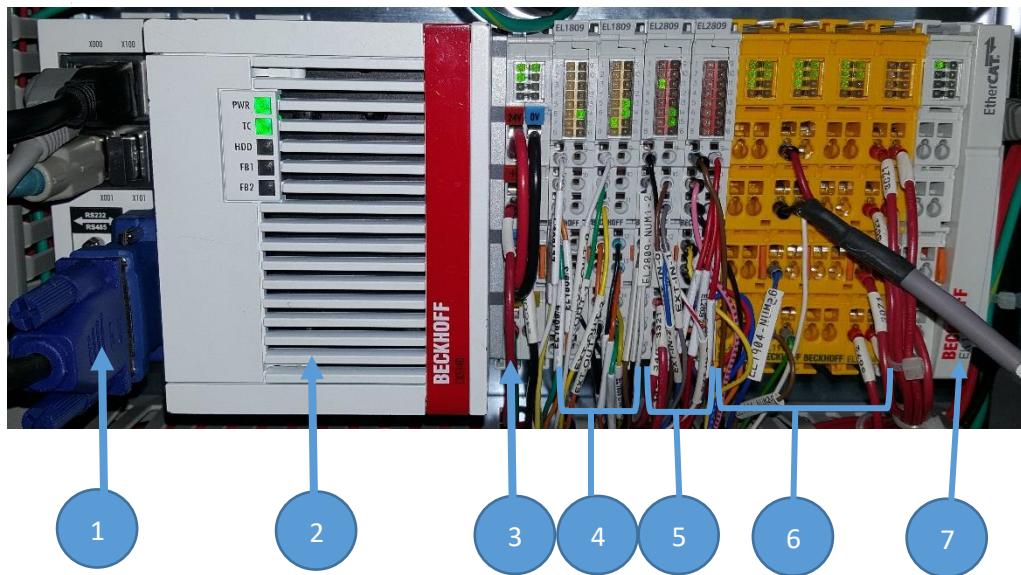
DANGER

Although the Beckhoff 5140 offers a standard windows environment, care should be taken not to overload with the controller with non-essential applications, software and tasks, else risk poor performance/latency of the fRC GUI

Include image of fRC-S Architecture

A large, solid yellow rectangular box with a thin black border, occupying the central area of the page below the warning section.

As a result of this architecture, all devices and hardware on the fRC-S are managed by the beckhoff controller. Please take time to familiarize yourself with the hardware below, all of which are located in your controls cabinet.



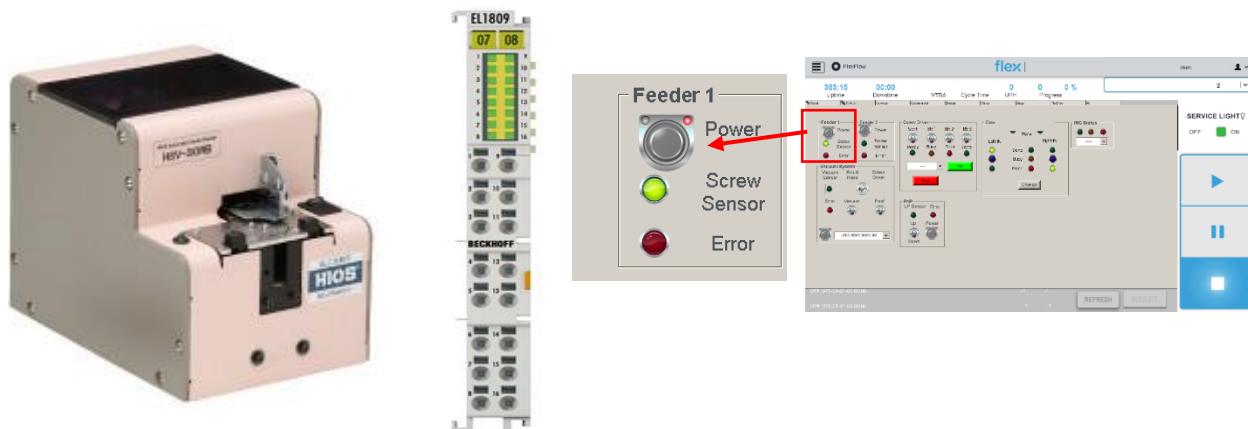
fRC Beckhoff 5140 Controller Layout

1	Non-ethercat communication terminals (USB, TCP/IP devices)
2	Beckhoff 5140 controller
3	Power supply for ethercat bus
4	Beckhoff Input, 24V (see model # for more information)
5	Beckhoff Output, 24V (see model # for more information)
6	Beckhoff TwinSAFE I/O (safety over ethercat)
7	Beckhoff ethercat coupler

The Beckhoff 5140 communicates with all other machines/systems by use of one of the below communication method.

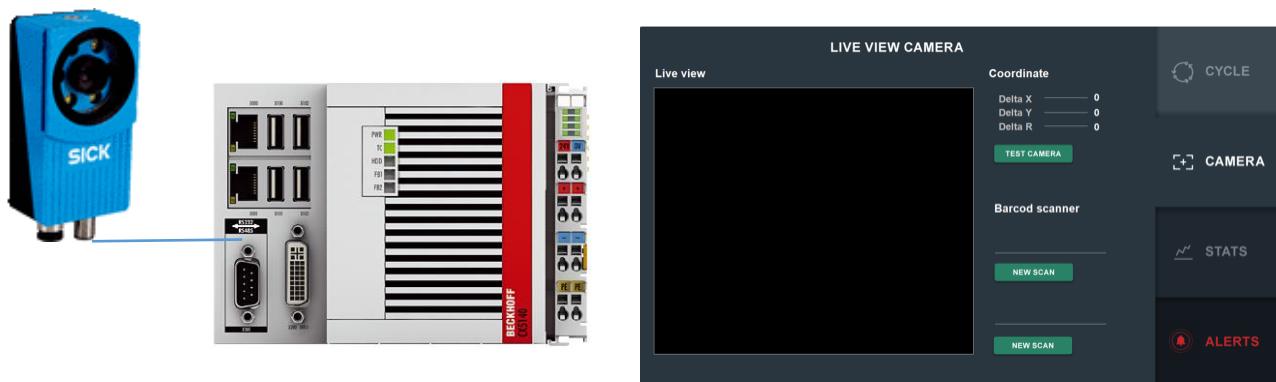
Physical Input/Output – 24V signals used as either an input or output, to toggle an actuator, or receive feedback that a process is ready for the next step

E.g. Screw presenter – 24V signal to indicate that a screw is present to be picked



Feeder (left) screw present output signal is physically connected to Beckhoff 16 channel input card (right)

TCP/IP – Higher level communication protocol, very commonly used for large data transfer and management of networks. Based on a server/client topology



Sick Vision Camera (left) transmits machine vision data to the Beckhoff 5140 (right) through its Ethernet port

Ethercat – Ethernet based fieldbus protocol, master/slave configuration (beckhoff is master).
 Offers the fastest data transmission rates (<100 µs) for rapid transfer of small packets of data.
 All devices communicating through ethercat need to have a compatible card or driver



*Nachi CFD (left) sends/receives commands
 Over ethercat, connecting to the Beckhoff controller through an EK1100 coupler card*

1.10 fRC Accessories

The fRC also offers optional tooling and accessories that can be integrated into the system into the cell.

The accessories listed below can be purchased at any time.

- Fastening Applications

The standard fastening tool for fRC applications, is the Atlas Copco QMC-41 tool. This series offers torque ranges from 1.2cNm – 250cNm

Its components are listed below

QMC Screwdriver w/Controller		
Component	Function	Picture
QMC-41	Fasten screws, current controlled, with Led indicator	
MTFocus 400A	Screwdriver controller, pre-sets programs and fastening sequences (separate software)	
4mm Half-moon bit	Bit insert for screwdriver	 Bits with 4 mm halfmoon drive
DB15 connector for I/O	Toggling I/O triggers screwdriver through beckhoff controller	
Vacuum Kit	Standard part from Atlas Copco, used for vacuum pickup of screw	
Toolstalk configurator software (available upon request from Atlas Copco)	Used to program torque sequences, plot data, configure I/O etc.	

- Glue Dispensing Applications – To be added

2. SAFETY

This section includes:

- Procedures
- Interlock locations
- Warnings/hazards

All users must review this section prior to first time use of the fRC.

 DANGER	At no point At NO time should any of the below safety guidelines be ignored, or interlocks systems disabled. Safe operation of the system should never be compromised. Failure to do so may result in severe injury or death.
 DANGER	The fRC is made up of high voltage systems, fast moving parts and highly pressurized components. Failure to maintain basic guidelines prior can result in injury.

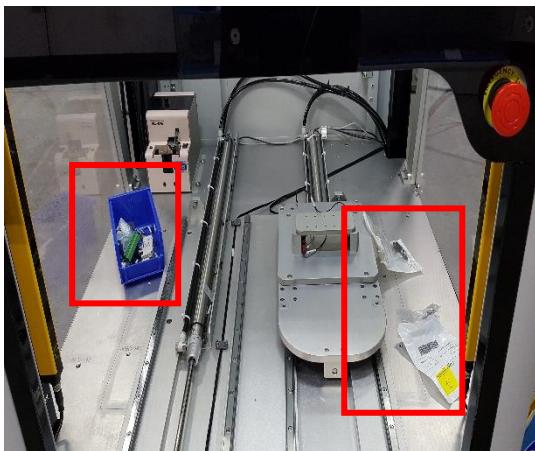
2.1 Procedures

Before operating the system, all users must review and comply with the below:

- Never protrude any body part into the cell, or insert any object
- All front and rear panels must be shut and locked
- All cabling and wiring can must be routed inside of the cell with no loose parts in or around the cell
- levelers must be firmly seated on the floor prior to operation
- All panels must be installed prior to running the system
- NOT wearing loose clothing that can get caught on any part of the fRC



4 levelers are installed on the underside of the fRC



Do not leave any loose equipment or items in the cell



Do not attempt to enter the cell during operation.
Refrain from wearing loose clothing

Safety procedures on the fRC are assigned to two user levels –

Operator - skilled in basic cell operations.

Technician –skilled in advanced operations:

- Robot teaching and changing the recipe.
- Step by step operation.
- Debug mode.
- Basic maintenance
- Trained by a flex fRC trainer

- Referenced documents:
 - Directive 2006/42/EC
 - Nachi Robotics EZ-03 Manual

2.2 WARNINGS

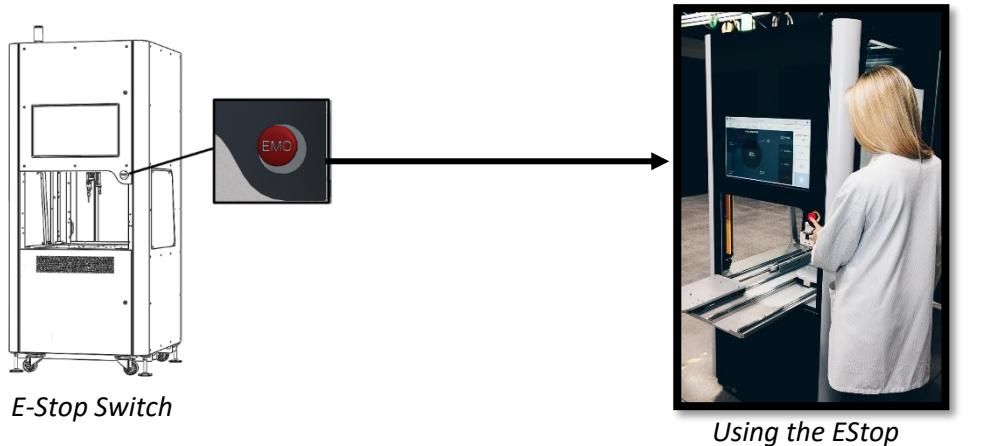
 DANGER	This indicates an imminently hazardous electrical situation which, if not avoided, could result in death, serious injury, and/or damage to equipment
 DANGER	This indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
 IMPORTANT	This indicates the other special notes.

2.3 ROBOTIC CELL SAFETY DEVICES

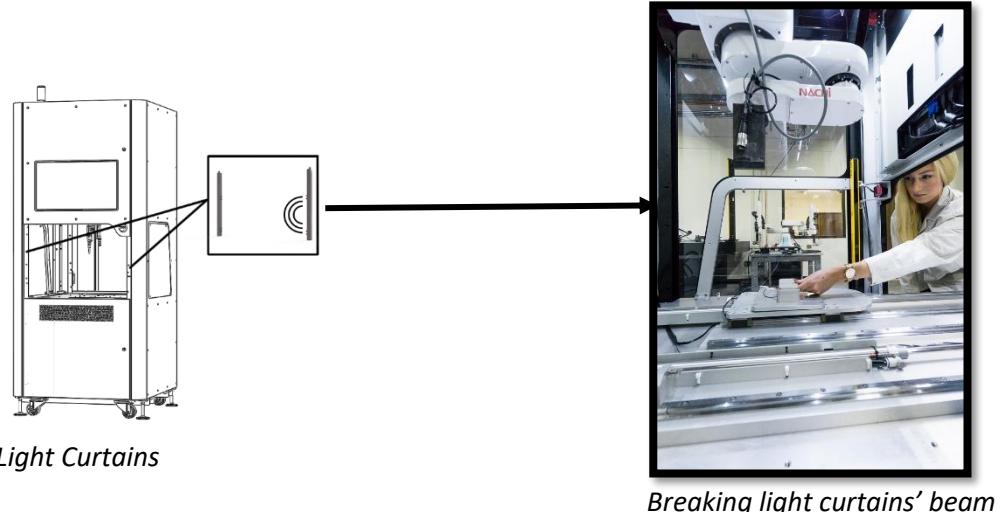
Safety devices are an integral part of the design and the installation of the robotic cell.

Prior to running the fRC, familiarize yourself with the location of each of the below safety interlock systems. Tampering, modifying or removing interlocks on the fRC is strictly prohibited.

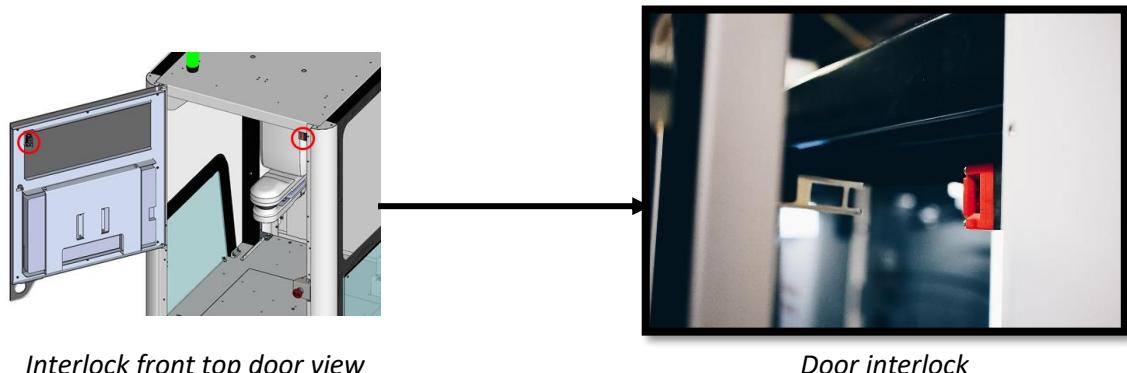
The below interlockers are all controlled by the Beckhoff TwinSAFE Terminals.



Using the EStop

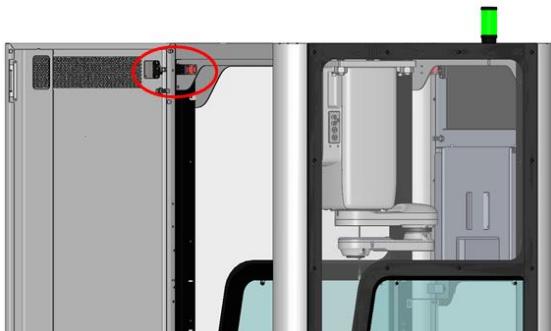


Breaking light curtains' beam



Interlock front top door view

Door interlock



Interlock rear top door view



Interlock rear top door view

3. Operation – Starting the fRC

This section details a step by step process on installing and turning on your fRC for the first time.

This includes

- Uncrating and physical installation
- Mechanical inspection
- Electrical inspection
- Supplying power and air
- First time boot up

3.1 Uncrating and physical installation

The fRC is shipped in a wooden crate.

Care must be taken to constantly maintain a vertical orientation of the crate at all times.

Include picture of fRC during transport

Total size of crate image, and include weight

When receiving your fRC, please ensure it is correctly handled and transported from receiving dock to the area of deployment

Depending on workspace available during uncrating, it may be advised to uncrate the cell as soon as possible (prior to moving it onto the production floor), and then loosening the levelers and rolling it onto the floor for use.



It is advised to store all parts of the crate for reuse or transport of the system

Use an MXXX bit to remove all screws on the fRC and carefully remove each panel of the crate.

After uncrating, make sure the below items are found, and please familiarize yourself with them.

- fRC Cell (with robot, control cabinet, pneumatic cabinet, stack light)
- fitting, tubing and connectors package
- No scratches, dents, damages, broken or missing parts.

Include picture of fRC Cell after being unpacked

Include picture of fitting/accessories package

Include picture of anything else...

3.1 Electrical checks

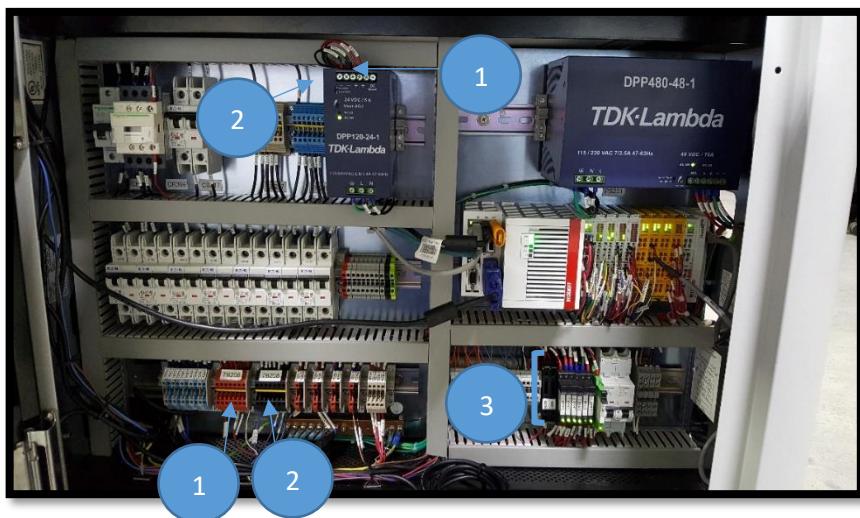
Prior to booting up the fRC, a local technician, certified and trained on using the fRC must perform the following checks and inspections

Tools Required: Multimeter

Continuity Test

Ensure that the fRC is not energized and not powered on prior to performing continuity tests.

Step 1



Continuity test results		
Pair #	Expected	Actual
1 (+ voltage on power supply, to + voltage terminal block)	Beep	
2 (- voltage on power supply, to - voltage terminal block)	Beep	
3 (across fuse blocks)	Beep	

If actual continuity does not match expected result, please proceed to section **XXX**, troubleshooting

After the continuity test is complete, it is time to check & measure main/peripheral voltage supplies.

Preparing for voltage check

Please consult the section on schematics in this manual for the electrical connections, and control wiring

These tests must be performed while the system is “live” and energized, only an experienced technician, or engineer should perform the following inspections. Never measure voltage without supervision.

Prior to performing the following steps, please ensure all fuses in fRC control cabinet are reset



Left: Circuit open (Green)
Right: Circuit closed (Red)



Single use fuse

Step 2

Connect fRC power cable to Single Phase/3 Phase 200-230V main power line, then switch its main disconnect on



Connect main power



Main switch should be switched ON
(clockwise)

Step 3

Measure the following AC Voltages (remember to switch Multimeter to “AC”)

Check your measured voltages against the expected (table on the right)

If actual voltage does not fall in the range of expected voltage, please disconnect your fRC from main power immediately and proceed to section XXX, “Troubleshooting”



Voltage Readings		
Measured	Expected	Actual
1 (Across line neutral on 48V power supply)	240V (+/- 2%)	
2 (Across line neutral on 24V power supply)	240V (+/- 5%)	

Step 4

Measure the following DC Voltages (remember to switch Multimeter to “DC”)

Check your measured voltages against the expected (table on the right)

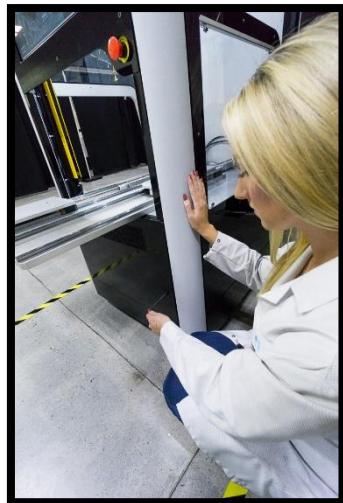
If actual voltage does not fall in the range of expected voltage, please disconnect your fRC from main power immediately and proceed to section XXX, “Troubleshooting”



Voltage Readings		
Measured	Expected	Actual
1 (Across +/- on 24V power supply)	24V	
2 (Across +/- on 24V power supply)	24V	

Step 5

If all voltages readings fall within the expected range, then please pack up your multimeter and disconnect the system from the main power line



*Remember to close the cabinet
after the checks are complete*

For more information on the electrical cabinet, including wiring diagrams, please consult the section on schematics in this manual for connections to power supplies and fuses

3.2 Pneumatic test and configuration

Main air supply must be installed and piped correctly to actuate all pneumatically driven components (vacuum, drawers, grippers). A local technician, certified and trained on using the FRC must perform the following checks and inspections

Please proceed through the following steps to setup your air supply correctly

Step 1:

Open your pneumatic cabinet (M6 allen wrench) and make sure all of your tubing/fittings have been inserted and connected correctly.

All pneumatic hardware should be located in the **ABC hardware kit**.

Step 2:

After completing step 1, and ensuring all pneumatic hardware has been connected, locate your shut off valve. Be sure it is set to supply (SUP), rotate it if it's not.



Shut off valve (Off state)



Shut off valve (On state)

Step 3:

Connect your main air supply to the frc fitting connected to the regulator

**Step 4:**

Lift up the regulator cap, and rotate it to set your air supply between 6-8 PSI. Press and lock the regulator cap back in afterwards



Step 5

Listen for any leaks. Choose to either tighten a fitting, or add Teflon tape to seal between threads

3.3 First time fRC Boot

Once the above checks have been completed, it is time to perform the first boot of the fRC.

Ensure that all switches/system have been toggled to an “OFF STATE” before starting the initial boot below

Step 1:

Connect the fRC to main power and air supply.

Ensure that the Nachi CFD main power switch is set to “ON”.



*Ensure E-Stop is released
Key switch turned to right
Power switch up*

Turn Main power switch, located at the rear side of the cell



Step 2:

Wait for the application interface to load on the Dell touchscreen HMI.

This may take a couple of minutes

Proceed to the front side of the cell and you should see an interface similar to the one in fig. 4

 IMPORTANT	<p>The fRC will continue to be upgraded, and include new features.</p> <p>Please be advised that the overall look of the HMI may be slightly different, but all functional commands should be accessible by using the following steps</p>
---	---



Bootup



Windows 7



TwinCAT Boot

Highlights of screens you may see prior to the HMI booting below

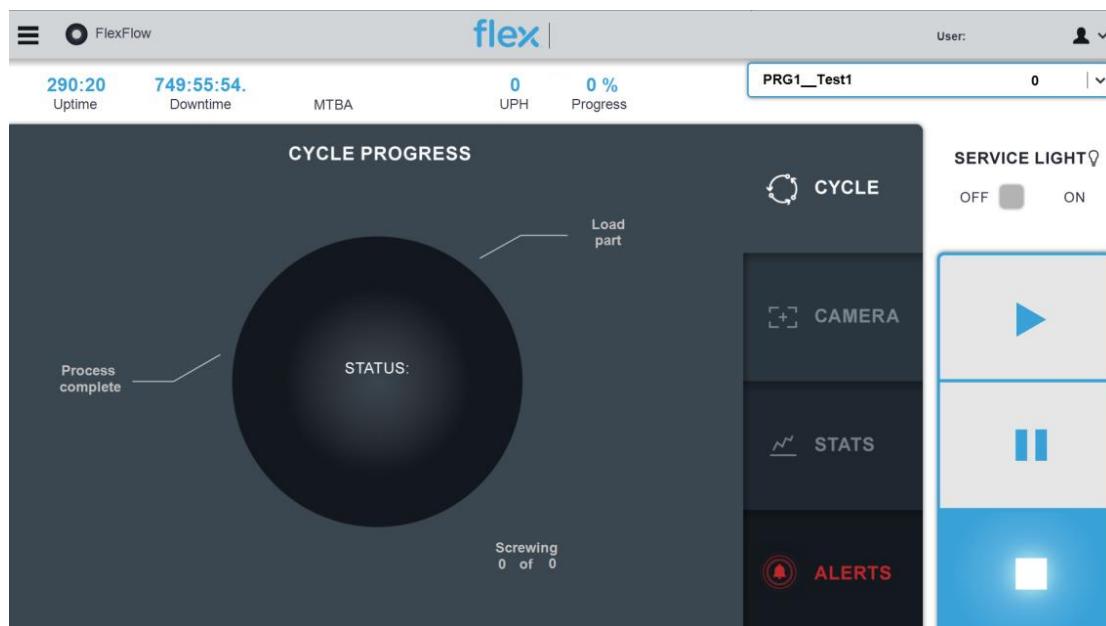
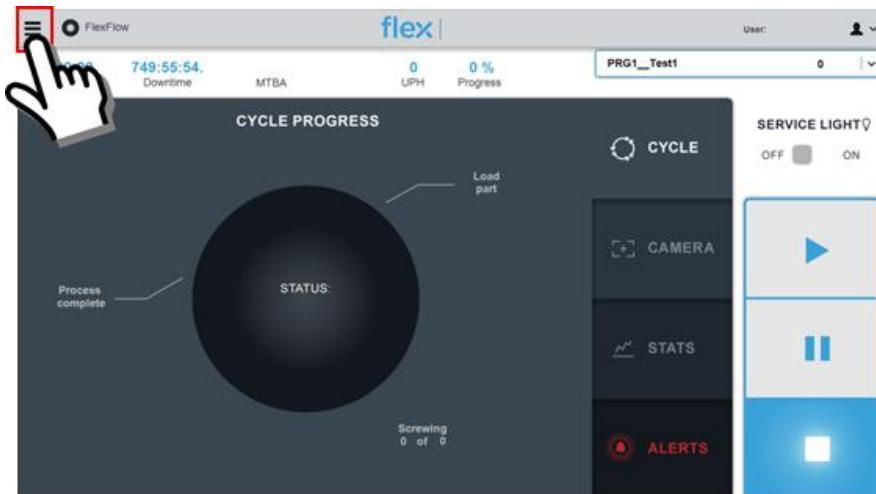


Fig. 4: This should be the first screen you see once the Beckhoff 5140 has completed its boot sequence

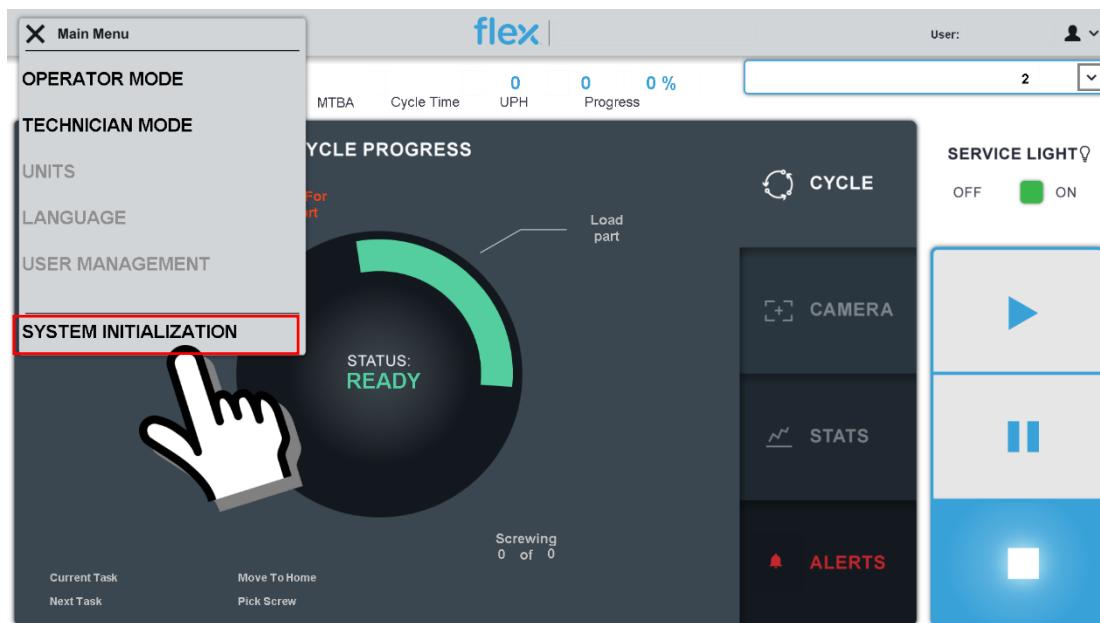
Step 3

Click on the “more options icon” located in the top left of the main screen.



Step 4

A dropdown menu should appear. Please click system initialization.



Step 5

System initialization (Operator login)



- Click the “refresh button” on the bottom right of the screen
- Wait about 2 minutes while the system is starting up.
- When the "Robot Power On" indicator is green press "INIT" button.
- If all safety I/O and installed system devices indicators are green, then congratulations, you have successfully booted your fRC!

3.4 Using the fRC HMI

The fRC interface is designed on TwinCAT's HMI development software. It uses a series of I/O indicators, pull down tabs, field boxes and other GUI elements to create an immersive interface that allows users to:

- Switch between two user classes (operator/technician)
- Create and modify recipes
- Programming robot path and motion (entirely through interface, no need to program the robot)
- Indexing parts in/out using conveyors and/or drawers
- Program linear program steps
- Save current recipe, load previous ones.
- Configure all system devices
- Toggle/test I/O (pneumatic, electric etc.)
- View real time process data

- Program a vision system to perform visual inspections/checks on products, and offset positioning for robot

The HMI has many additional tools and features that lend itself to an intuitive and functional workspace. Care must be taken to carefully understand all commands and functions prior to their use.

Please review the section on “HMI Screens” for more information

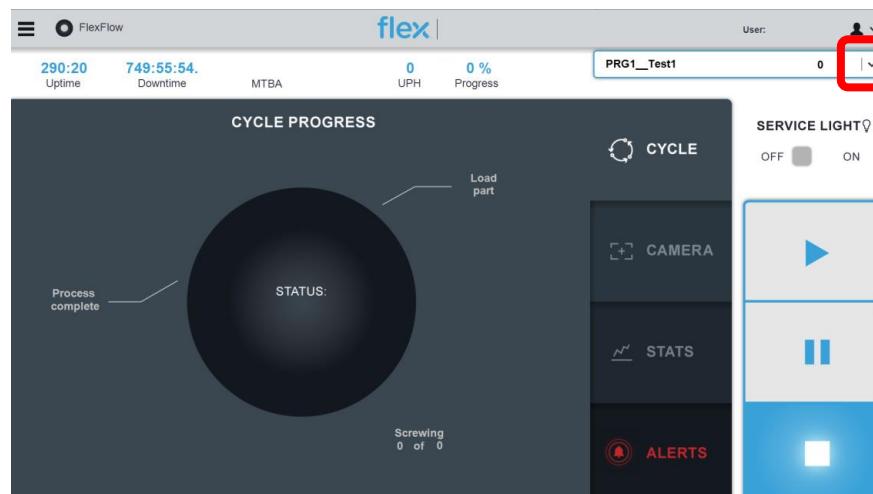
3.5 Step-by-Step functions in fRC (Operator Mode)

This section will offer a step by step guide on using the fRC interface through the “Operator” menu. These functions include

- Selecting a recipe/running your recipe
- Resetting interlock faults/monitoring faults
- Clearing alerts
- configuring your camera

3.5.1 Selecting a Recipe/Running your Recipe

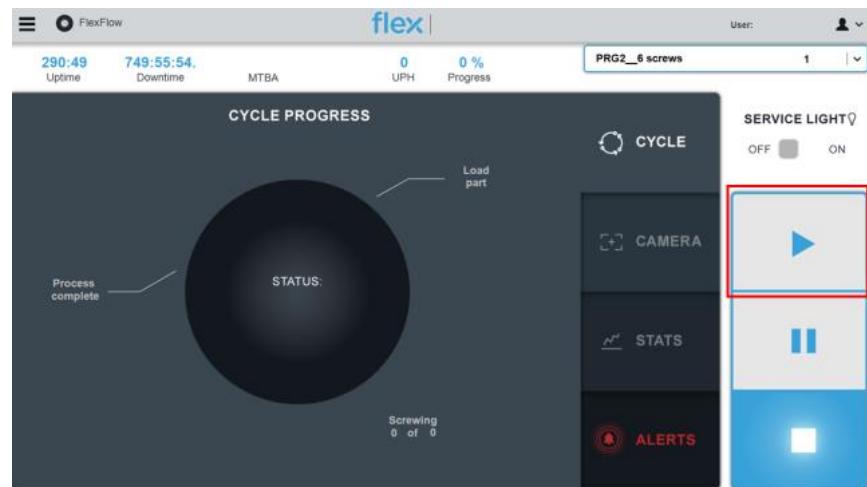
- Touch the down arrow icon to open the "Recipe" menu.



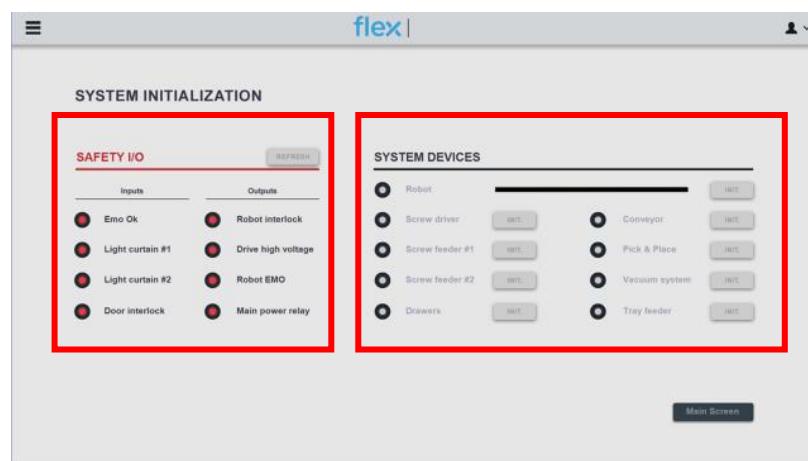
- Choose the appropriate recipe type for the required operation.
- Use the numpad to select the # of cycles required (0 –#??)
- Touch the "INITIALIZE" button to complete the selection. Your recipe is now loaded and ready to run



- Touch the play/start button to run your recipe.



- Monitoring Faults/System Status

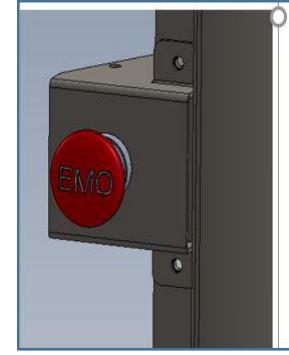


Safety I/O indicators
(all should be green, unless
interlock is activated)

Indicators for all subsystems
if subsystem is active, the
indicator will be green

3.7 Power up Preparations

- Verify all circuit breakers in electric panel at the front of the cell are down
- Verify EMO button in the front of the cell is not pressed
- Verify all circuit breakers screws are properly closed, using a screw driver
- Please check with DVM the continuously of the GND connections
- Connect power cable to the cell and into the wall power supply (220 VAC)
- Power on the cell from the rear
- Move to up position, main circuit breaker and then 48V 24V ROBOT and screwdriver



Turn on the HMI by pressing the on\off button on the right side of it from inside of the cell
 Change input source to "HDMI1" by pressing upper button and approving 1 button bellow



Installation Folder\beckhoff\TC31-Full-Setup.3.1.4018.26



TC31-Full-Setup.3.1.4018.26.exe
TwinCAT3.1 XAE Setup
Beckhoff Automation



TcPlcLibHydraulics.chm
Compiled HTML Help file
976 KB

CELL Software installations consists of the following installations

- Beckhoff – For Controller
- Atals copco – For Screw driver
- Sick-Sopas-For Camera
- Default FRC Folder creation
- ROBOT Software
- Cell application upload

All installations need to be installed by choosing complete (Not Custom)

if any installation is asking for company\Organization Name, please fill "FLEX"

Beckhoff software installation



TC31-XAR-Setup.3.1.4018.26.exe
TwinCAT3.1 XAR Setup
Beckhoff Automation



TC3-InfoSys.exe
TwinCAT 3 Information System
Beckhoff Automation



TF6310-TCP-IP.exe
Contact: Your local Beckhoff Sup...
Beckhoff Automation



TF6421-XML-Server.exe
Contact: Your local Beckhoff Sup...
Beckhoff Automation

Long Press and choose "run as administrator" to install the following software

flex



NDP452-KB2901907-x86-x64-AllO
S-ENU.exe
Microsoft .NET Framework 4.5.2 S...

[Installation software of Atlas copco – For Screw driver](#)



ToolsTalk MT 6.0.1.2 Setup.exe
08/11/2016 16:41
8.06 MB

[Installation software for Sick-Sopas-For Vision Camera](#)



SopasET.3.2.3.1057R-windows.exe
SOPAS Engineering Tool Starter
SICK AG

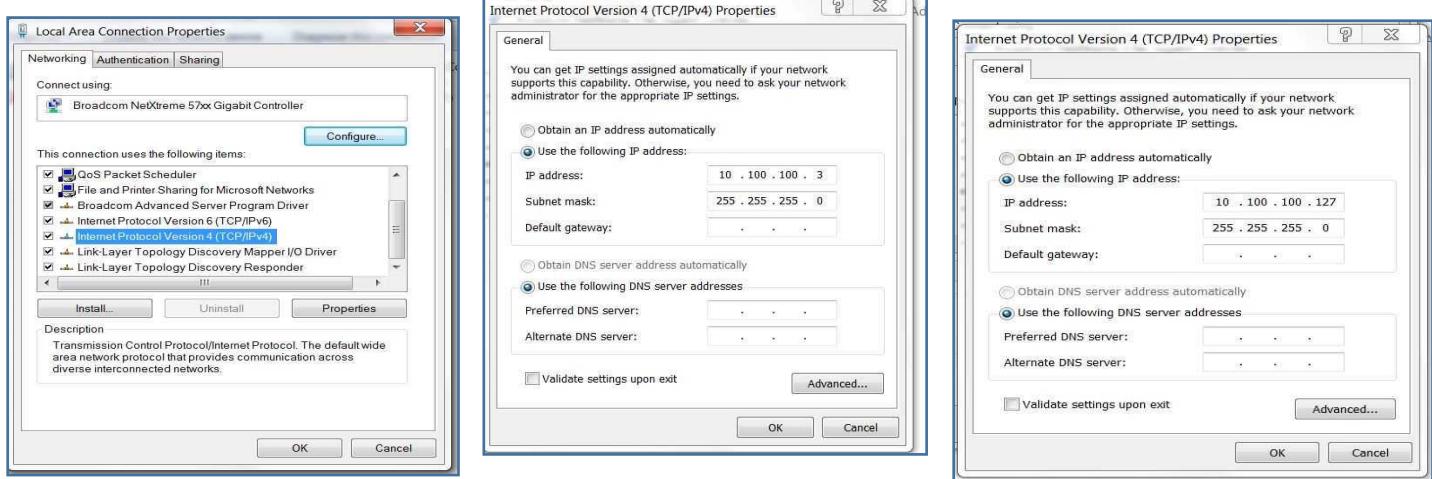
Copy "FRC " Folder to from installation folder C:\ (Root folder)

Establishing connection between the JIG computer and the Cell

Connect Lan cable between the cell and the JIG computer

Change the IP address of the cell network card to 10.100.100.3 and the Gateway to 255.255.255.0

Change the IP address of the cell network card to 10.100.100.127 and the Gateway to 255.255.255.0

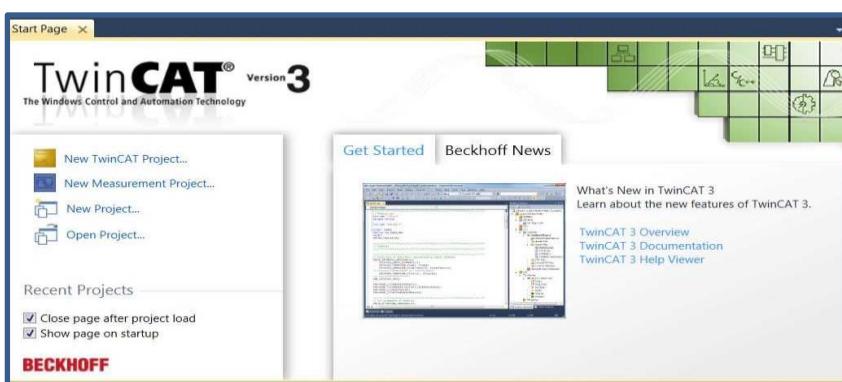


Loading the software project file by using TwinCAT XAE Installed on the JIG computer

Active the software from the taskbar

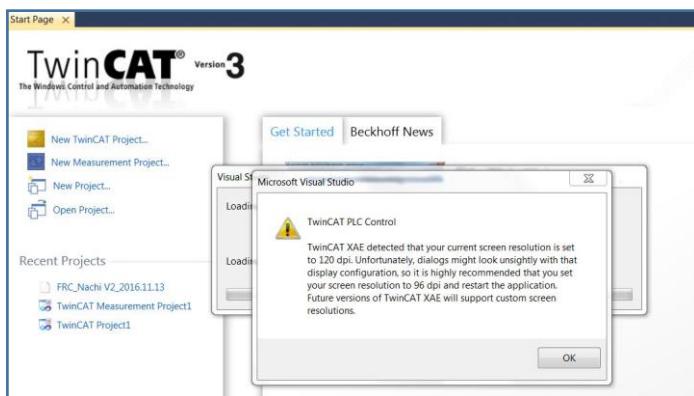
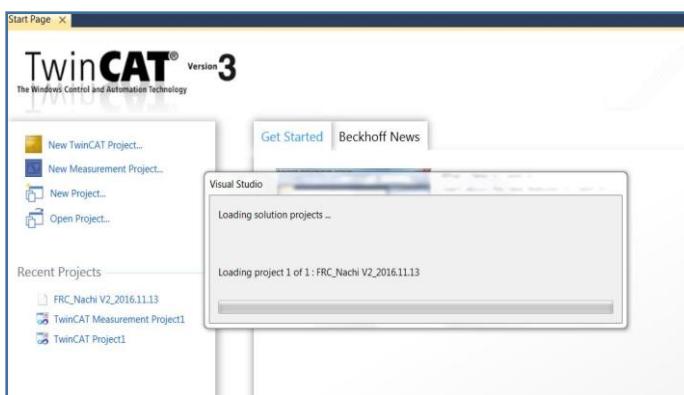
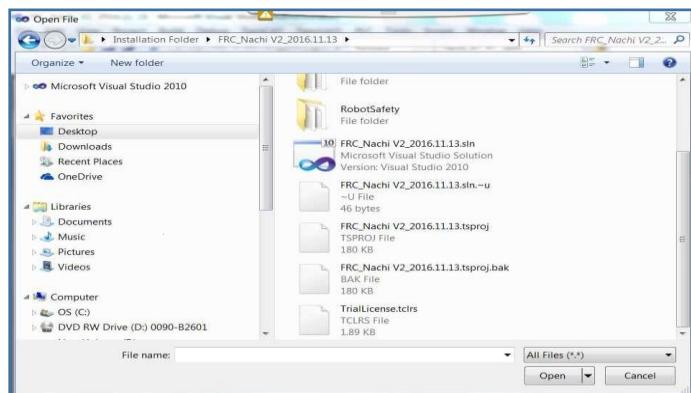


Choose the "Open Project" option

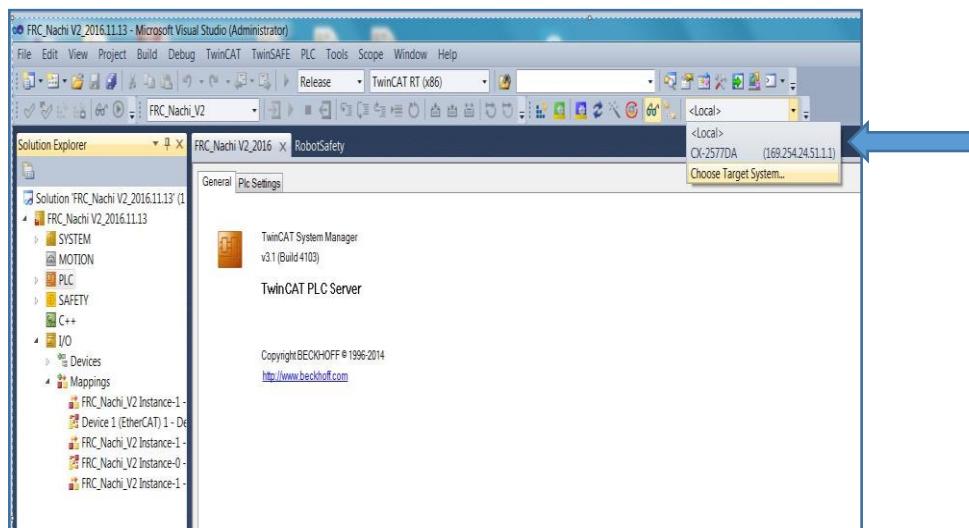


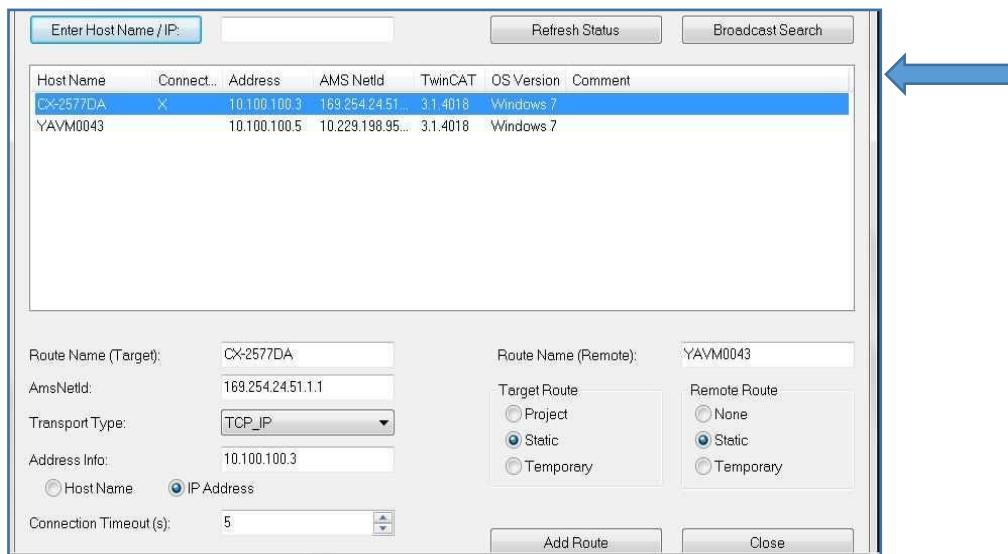
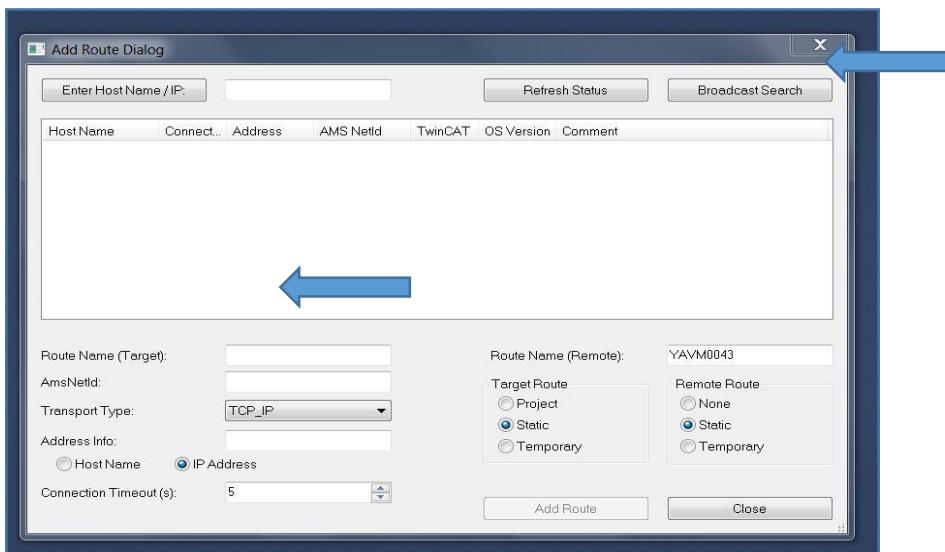
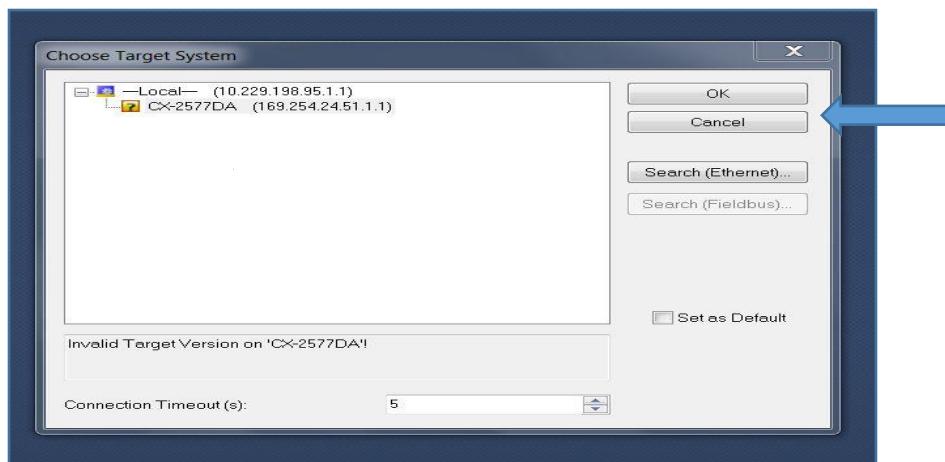
Browse for the last updated file within the installation folder (filename.tsproj)

flex



Choosing Target cell to upload the software





Enter Password: "1" and press O.K. when finished press close

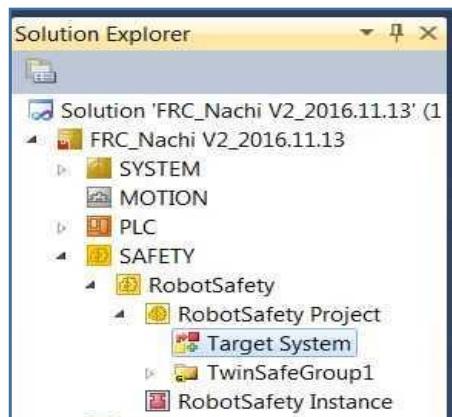


Press on the active configuration icon

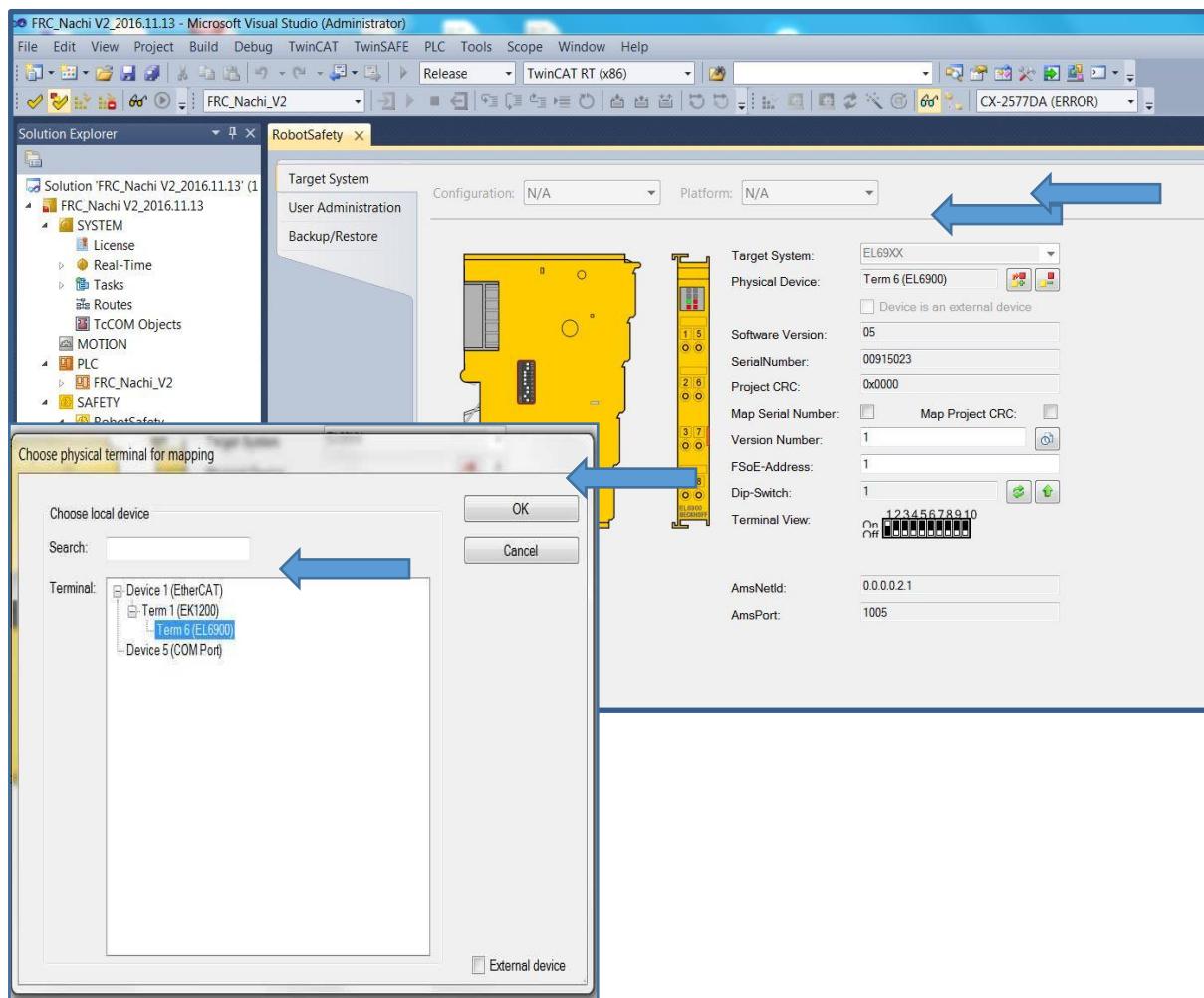


Robot Safety project installation

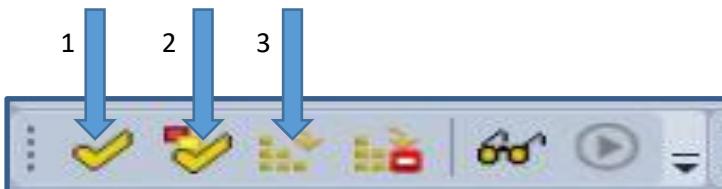
Choose target system



Record serial number marked and then press on the color button



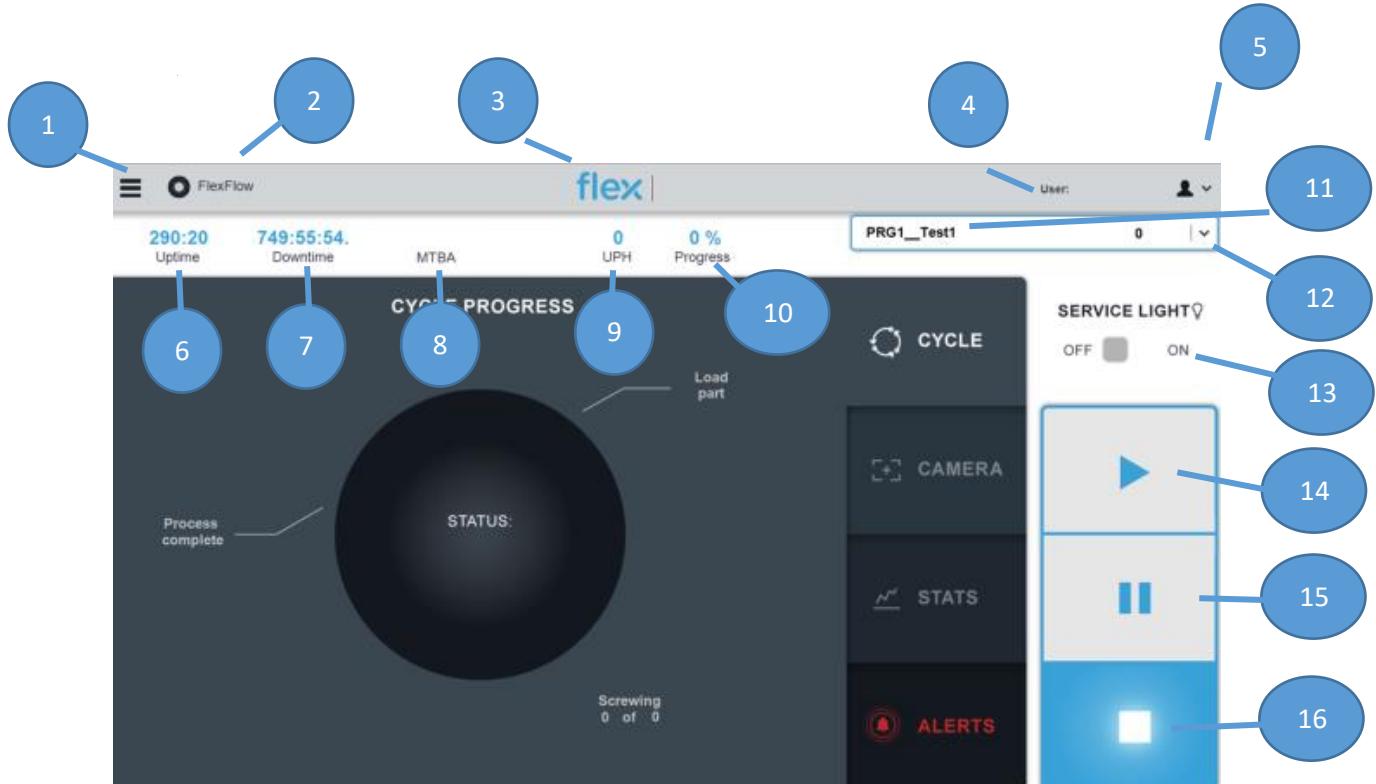
User: "Administrator"
Password : "TwinSAFE"



Create shortcut to the software on desktop and in startup folder
Turn off the cell and wait about 1 minute to the UPS to be shut off
Turn on the cell again

3.6 SCREENS DESCRIPTIONS

3.6.1 Operator's Screen



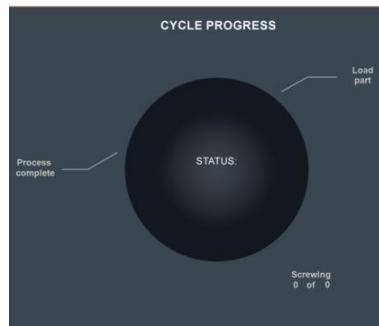
Operator's screen

No.	Icon	Type	Functionality
1		Button/dropdown	Calls drop down Main menu.
2		Indicator	Displays connection to the Flextronics Data Base.
3		Picture	Flex logo, serial number of the cell.
4	User	Dropdown	Current User Indicator. Displays the name of current operator.
5		Button/dropdown	User Menu. Displays user name.
6		Indicator	Displays uptime from putting into operation.
7		Indicator/timer	Displays downtime from putting into operation.
8		Indicator/timer	Displays mean time between assists.
9		Indicator/timer	Displays amount of units were produced per hour.
10		Indicator/timer	Displays % units which were produced from currently selected recipe
11		Button/dropdown	Recipe Selection and Initialization. When pressed displays currently selected recipe, and available recipes. Touch button INITIALIZE for approve & initialize recipe. Touch button to call NumPad.
12			
13		Slider/Indicator	Slide to ON/OFF cell lights. Will be green in ON.
14		Button/Indicator	Starts new cycle. When cycle is started indicator is illuminated (blue). Touch to start new cycle.
15		Button/Indicator	Temporary breaks current operation of the cycle. When cycle is paused indicator is illuminated (blue). Touch to brake current operation of the cycle.

16		Button/Indicator	Stops the cycle. When cycle is stopped indicator is illuminated (blue). Touch to stop cycle.
----	--	------------------	--

Operator's screen

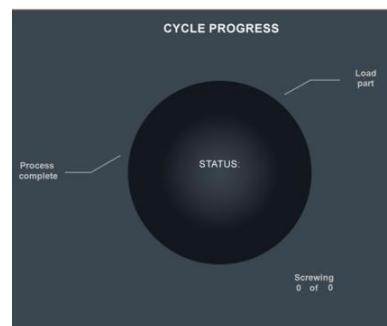
Tab 1 (default tab) Cycle Progress



Process State



Warning State

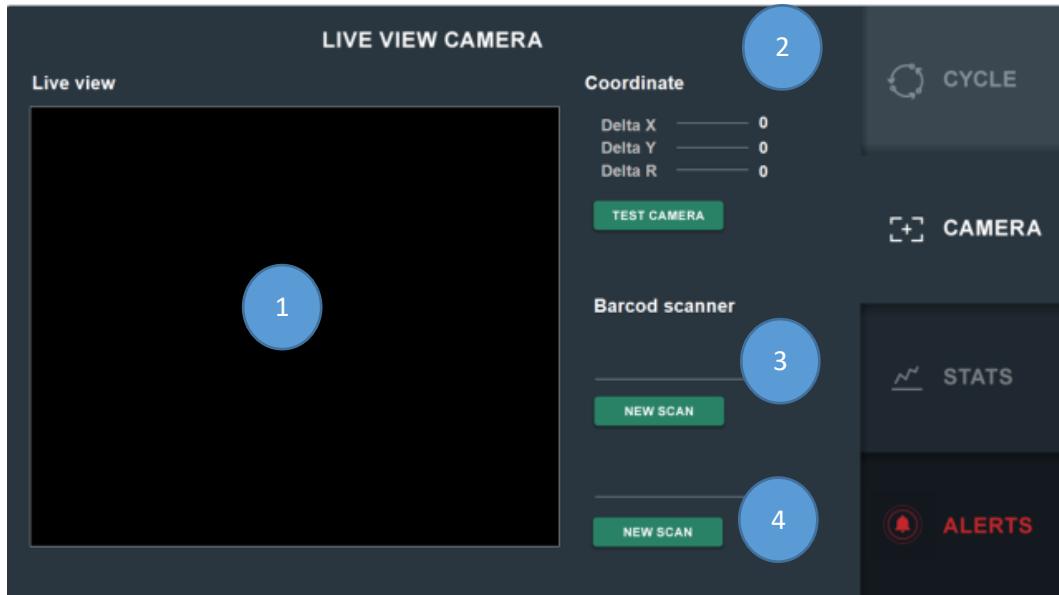


Error State

Name	Icon	Type	Functionality
1: Cycle Progress (default tab)		Indicator	Shows current status: In process/warning/error. This tab displays current cycle. Circle will be filled in and lights will go on as the cycle progresses. If stuck on a certain stage, the relevant light will go Orange for warning and Red for Error, indication will show on the alerts tab.
2: Cycle Tab		Button/new screen	Jump to "Cycle" page
3: Camera Tab		Button/new screen	Jump to "Camera" page
4: Stats Tab		Button/new screen	Jump to "Stats" page
5: Alerts Tab		Button/new screen	Jump to "Alerts" page

Operator's screen

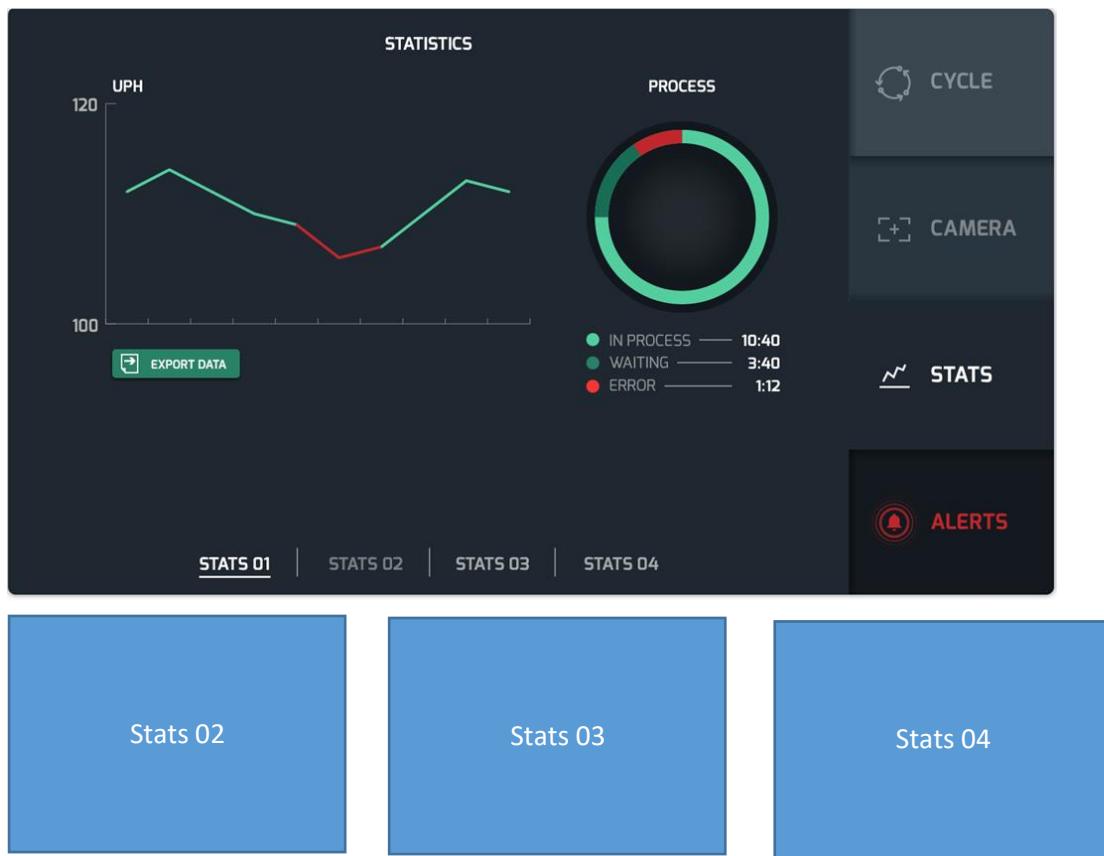
Camera Page



Number	Type	Functionality
1		Will display working area.
2		In process displays presence of part to be checked (1 or 0), or coordinates.
3		In process displays bar code.
4		New Scan

Operator's screen

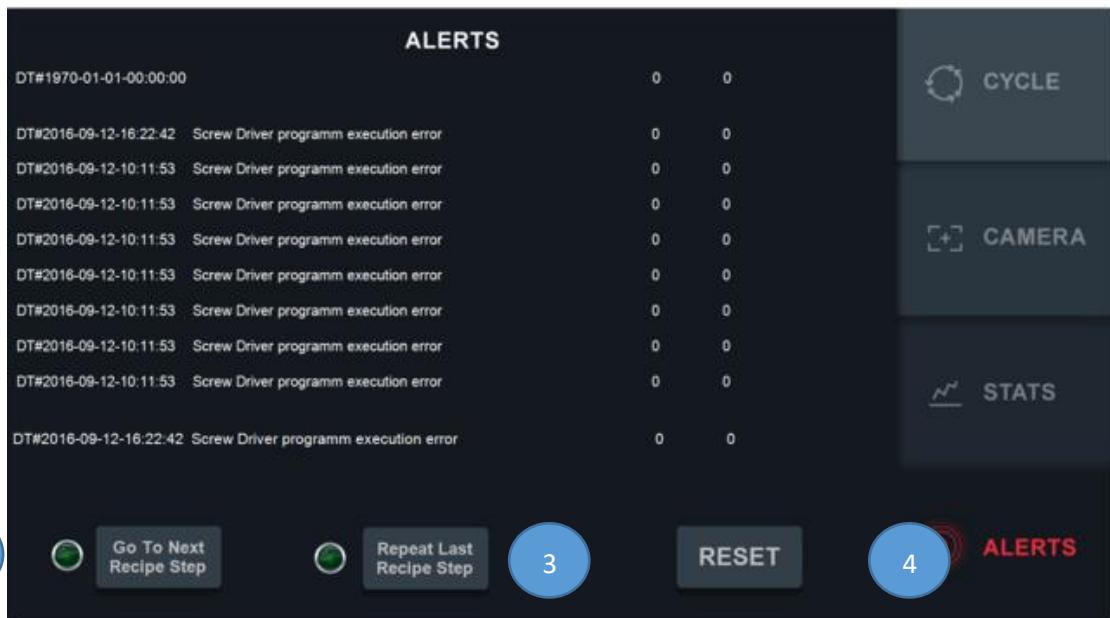
Tab 3 Statistics



Operator's screen

*Stats 02**Stats 03**Stats 04*

Alerts



No.	Name	Icon	Type	Functionality
1	Alert List		Indicator	Shows different error alerts in tabular form. To go Touch on.
2	Go To Next Recipe Step		Button/Indicator	Press to go to next recipe step. Indicator will be ON.
3	Repeat Last Recipe Step		Button/Indicator	Press to repeat last recipe step. Indicator will be ON.
4	Reset		Button/Indicator	Press to reset error alerts.

Alerts and faults recovery

Module	Range	Code	Alert	To recovery
Robot	1000-1999	1010	Communication Error	Contact to authorized personnel
		1005	Initialization Failed	Contact to authorized personnel
		1950	Execution Error	Contact to authorized personnel
		1900	Time Out Error	Contact to authorized personnel
		1004	Emergency Stop Pressed	Contact to authorized personnel
			Robot in Teach Mode	Contact to authorized personnel
Conveyors	3000-3999	3010	Initialization Failed	
			Communication Error	
		3200	Load requested while machine not ready to receive	
		3280	Locking mechanism piston not at upper sensor	
		3300	Unload requested while machine not ready to send	
		3900	Program Execution Failed	
		3950	Time Out	
			Loading Error	
			Unloading Error	
			Locking piston Error	
Screw Driver	2000-2999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
Feeders	4000-4999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
			Screw not ready	
Vacuum system	5000-5999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
			Vacuum sensor Error	

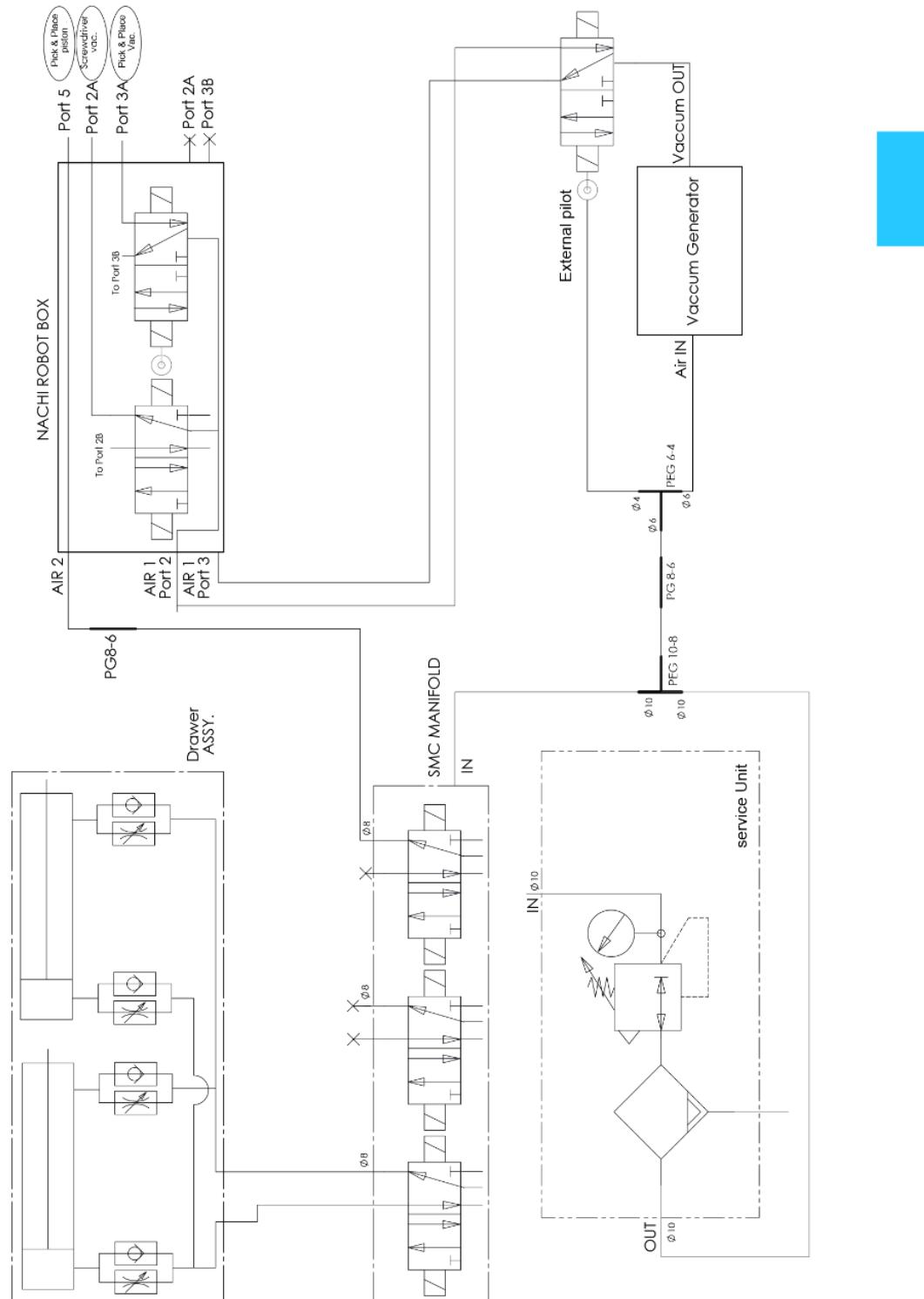
Pick & Place	6000-6999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
			PnP state Error	
Camera	7000-7999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
			Data Error	
Bar Code Reader	8000-8999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
			Data Error	
Drawers	9000-9999		Communication Error	
			Initialization Failed	
			Execution Error	
			Time Out Error	
Main Sequence	30000- 31999	30001 30002	LC1 interrupted LC2 interrupted	1. Remove an object from cell. 2. Touch button "Clear all" on Tab "Alerts", lamp on the roof of the cell will be green. 3. Call dropdown Main menu and select "System Initialization", display "SYSTEM INITIALIZATION" will be opened. 4. If indicator "LightCurtain 1 field: presence of an object" and/or indicator "LightCurtain 2 field: presence of an object" is green, and indicator lamp "Robot" in SYSTEM DEVICE section is yellow, touch button

			<p>"INIT" in SYSTEM DEVICE section next to the name "Robot". Indicator lamp "Robot" in SYSTEM DEVICE section will green. System will be recovered.</p> <p>5. Otherwise, contact to authorized personnel.</p>
	30003	Front/Rear door open	<ol style="list-style-type: none">1. Close the door.2. Touch button "Clear all" on Tab "Alerts", lamp on the roof of the cell will be green.3. Call dropdown Main menu and select "System Initialization", display "SYSTEM INITIALIZATION" will be opened.4. If indicator "Door Interlock" is green, and indicator lamp "Robot" in SYSTEM DEVICE section is yellow, touch button "INIT" in SYSTEM DEVICE section next to the name "Robot". Indicator lamp "Robot" in SYSTEM DEVICE section will green. System will be recovered.5. Otherwise, contact to authorized personnel.
	30004	EMO button pushed	<ol style="list-style-type: none">1. Release the button.2. Touch button "Clear all" on Tab "Alerts", lamp on the roof of the cell will be green.3. Call dropdown Main menu and select "System Initialization", display "SYSTEM INITIALIZATION" will be opened.

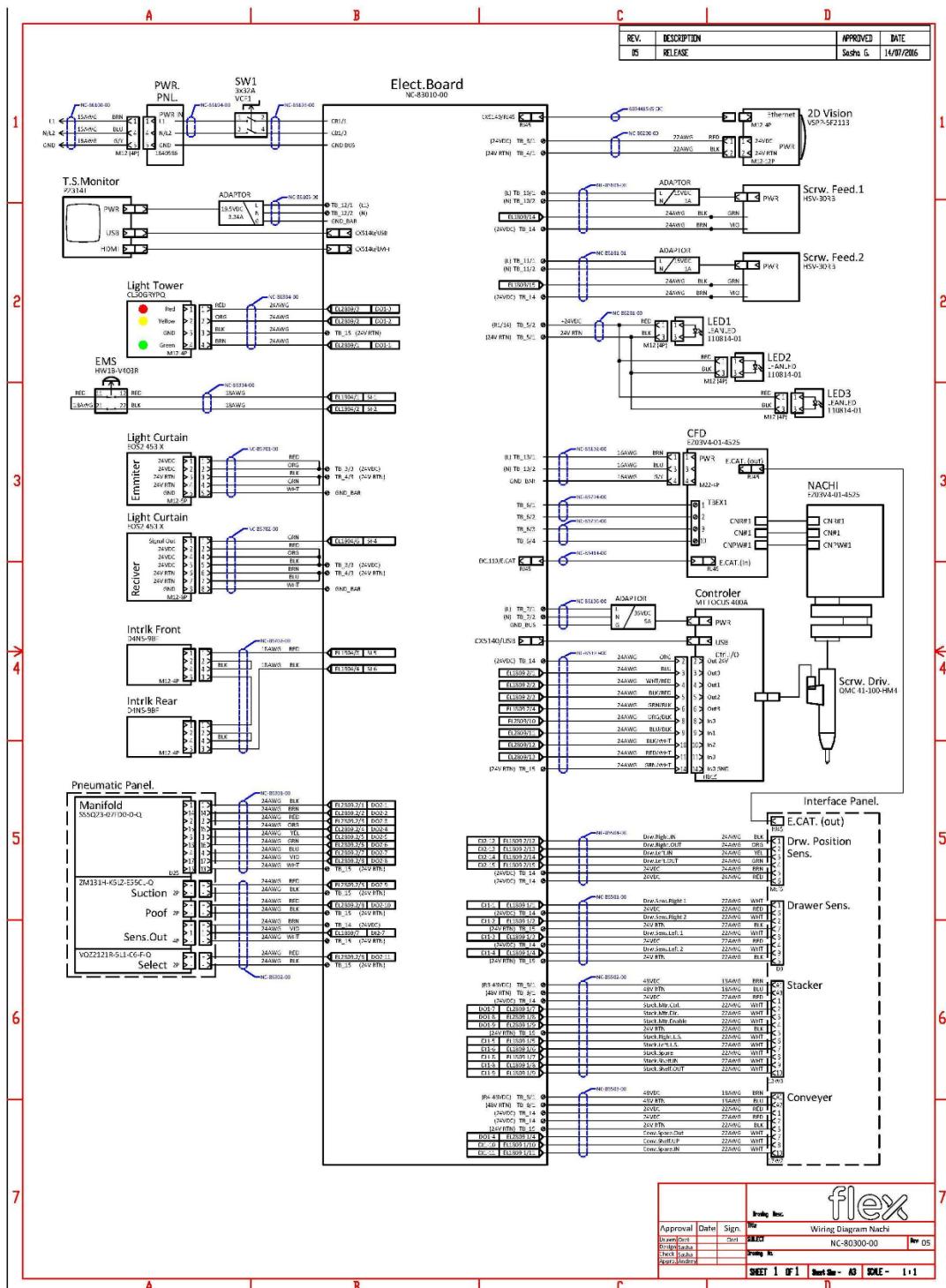
				4. If indicator "Emo OK" is green, and button "REFRESH" in SAFETY I/O section is red, touch it. Wait for progress indicator "Robot" in SYSTEM DEVICE section will green, and indicator lamp "Robot" will yellow. Then touch button "INIT" next to the name "Robot". Indicator lamp "Robot" will green. System will be recovered. 5. Otherwise, contact to authorized personnel.
	30030		Robot Init Failed	
	30050		Y-Conveyor SDO Write Failed	
	30070		TR-Conveyor SDO Write Failed	
	30095		System Init Failed,	
	30900		Execution Failure	
	31000		Repeat / Next Action not selected	
	31120		Case Error	
	30950		Time Out	
	30007		Job is Finished	
Flex Flow	32000-		Communication Error	
	32999			
			Initialization Failed	
			Execution Error	
			Time Out Error	

4. SYSTEM Schematics

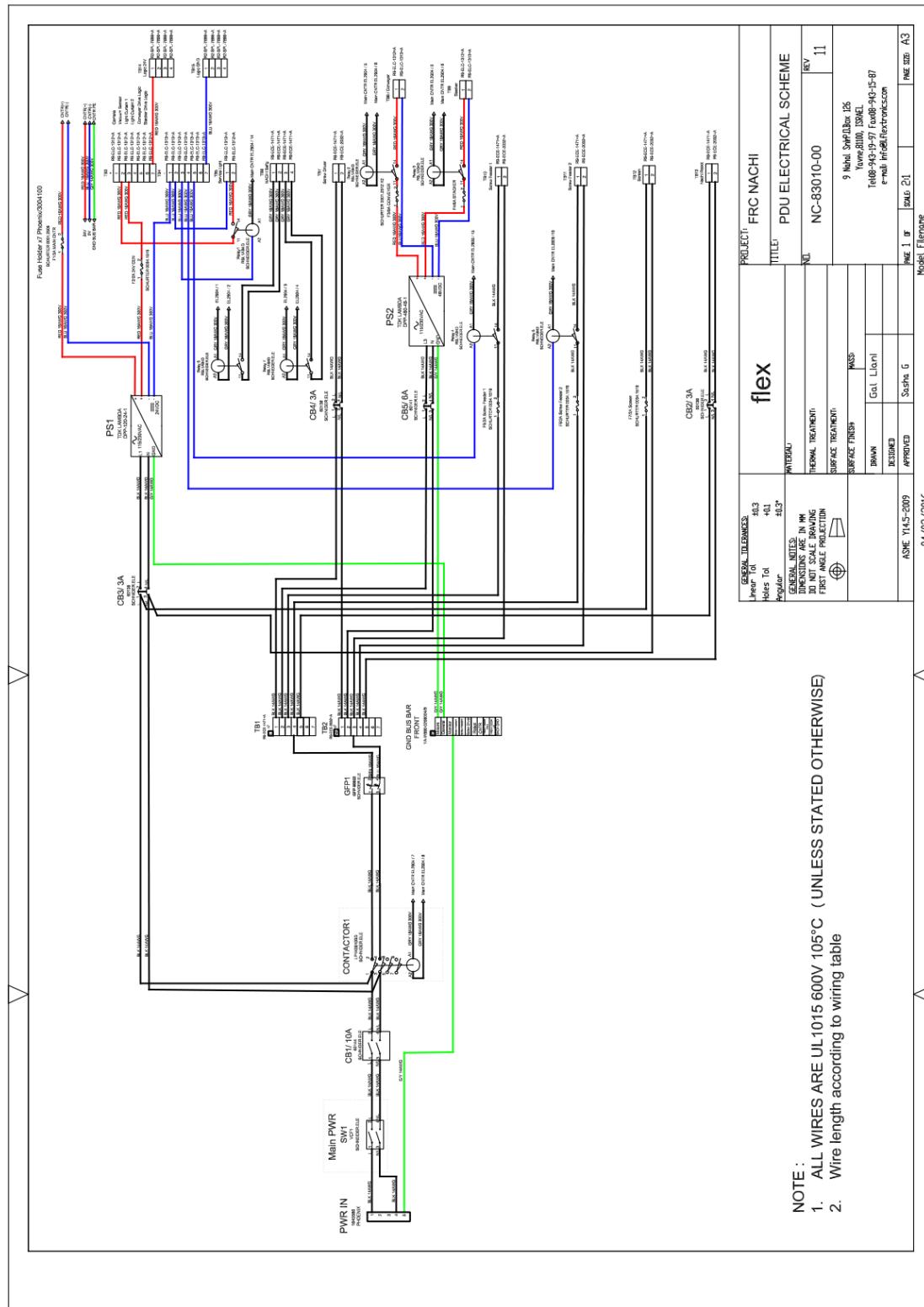
4.1 Pneumatics:



Electrical Wiring

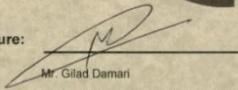
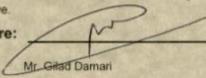


4.2 PDU – Power Distribution Unit





4.3 CE Certification and machine name plate test

<p>flex</p> <p>EC DECLARATION of CONFORMITY</p> <p>(Directive 2006/42/EC – Annex II)</p> <p>We, FLEXTRONICS (ISRAEL) Ltd, 3 NACHAL SNIR, NORTHERN INDUSTRIAL PARK, YAVNE, ISRAEL, 8122440</p> <p>Herewith declare that the following product conforms to the relevant EC provisions.</p> <p>The person authorized to compile the technical file is Mr. Attila David, Zalaegerszeg Posta 63, H8900, HUNGARY.</p> <p>Product: MULTIFUNCTION MODULAR SYSTEM FOR AUTOMATIC SOLUTIONS</p> <p>System Name: fRC – flex ROBOTIC CELL</p> <p>Type designations: fRC-S (basic, drawers, conveyer, tray feeder, drawers + tray feeder, conveyer + tray feeder)</p> <p>To which this declaration relates is in conformity with the following standards</p> <p>EN ISO 12100:2010 EN 60204-1:2006+A1:2009 EN ISO 4414:2010 EN 614-1:2006+A1:2009</p> <p>EMC: EN 61000-6-1:2007 EN 55011:2009/A1:2010</p> <p>Following the provisions of Machinery Directive 2006/42/EC EMC Directive 2004/108/EC</p> <p>Signature:  Mr. Gilad Damari General Manager, FLEXTRONICS (ISRAEL) Ltd. flex YAVNE SITE</p> <p>Date: 5 June 2016</p> 	<p>flex</p> <p>EC DECLARATION OF INCOMPORTATION</p> <p>(According to Annex II B of the Machinery Directive, for machinery which cannot function independently or machinery parts)</p> <p>We, FLEXTRONICS (ISRAEL) Ltd, 3 NACHAL SNIR, NORTHERN INDUSTRIAL PARK, YAVNE, ISRAEL, 8122440</p> <p>Herewith declare that the following product conforms to the relevant EC provisions.</p> <p>The person authorized to compile the technical file is Mr. Attila David, Zalaegerszeg Posta 63, H8900, HUNGARY.</p> <p>Product: MULTIFUNCTION MODULAR SYSTEM FOR AUTOMATIC SOLUTIONS</p> <p>System Name: fRC – flex ROBOTIC CELL</p> <p>Type designations: fRC-S (basic, drawers, conveyer, tray feeder, drawers + tray feeder, conveyer + tray feeder)</p> <p>To which this declaration relates is in conformity with the following standards</p> <p>EN ISO 12100:2010 EN 60204-1:2006+A1:2009 EN ISO 4414:2010 EN 614-1:2006+A1:2009</p> <p>EMC: EN 61000-6-1:2007 EN 55011:2009/A1:2010</p> <p>Following the provisions of Machinery Directive 2006/42/EC EMC Directive 2004/108/EC</p> <p>The product covered by this declaration is intended to be installed or assembled with the other machinery to constitute machinery covered by the Machinery Directive (2006/42/EC), and shall not be put into service until the machinery into which it is to be installed or assembled has been declared in conformity with the provision of the applicable Directive.</p> <p>Signature:  Mr. Gilad Damari General Manager, FLEXTRONICS (ISRAEL) Ltd. flex YAVNE SITE</p> <p>Date: 5 June 2016</p> 
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