ASYSTR

User Guide

CONTENTS

1. IN THE BOX

The following are the items that ship in the box when you buy the ASYSTR cobot.

Packing List			
Box-1 of 1 Compartment 1			
S/N	Description	Part No.	Quantity (Nos.)
1	Collaborative robot – ASYSTR 3C		1
Box-1 of 1 Compartment 2			
S/N	Description	Part No.	Quantity (Nos.)
2	Power and Interface panel		1
3	Operator Pendant		1
4	Robot interface Cable – 3m		1
5	16 core Tool interface I/O Cable – 0.5m		1
6	Teaching tab (Lenovo Android TAB)		1

6-axis collaborative robot
with integrated controller
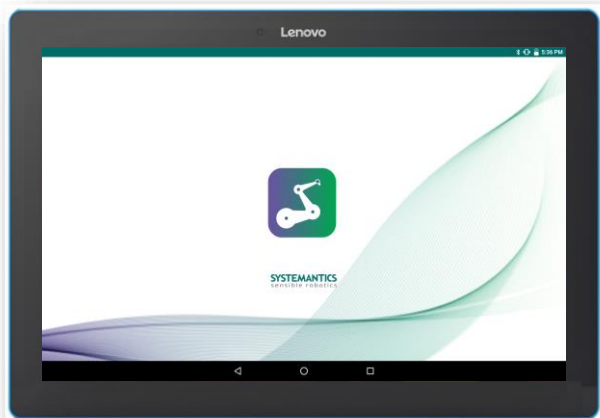
Teaching Tab

The teach pendant is an Android tablet with the **ASYSTR App** installed and the following specifications:

Display	10.1 inch
Operating System	Android 6.0 & later
Processor	1.3GHz quad-core
Resolution	1280 x 800 pixels
RAM	1 GB
Storage	16 GB

DIN rail mountable Power and Interface module
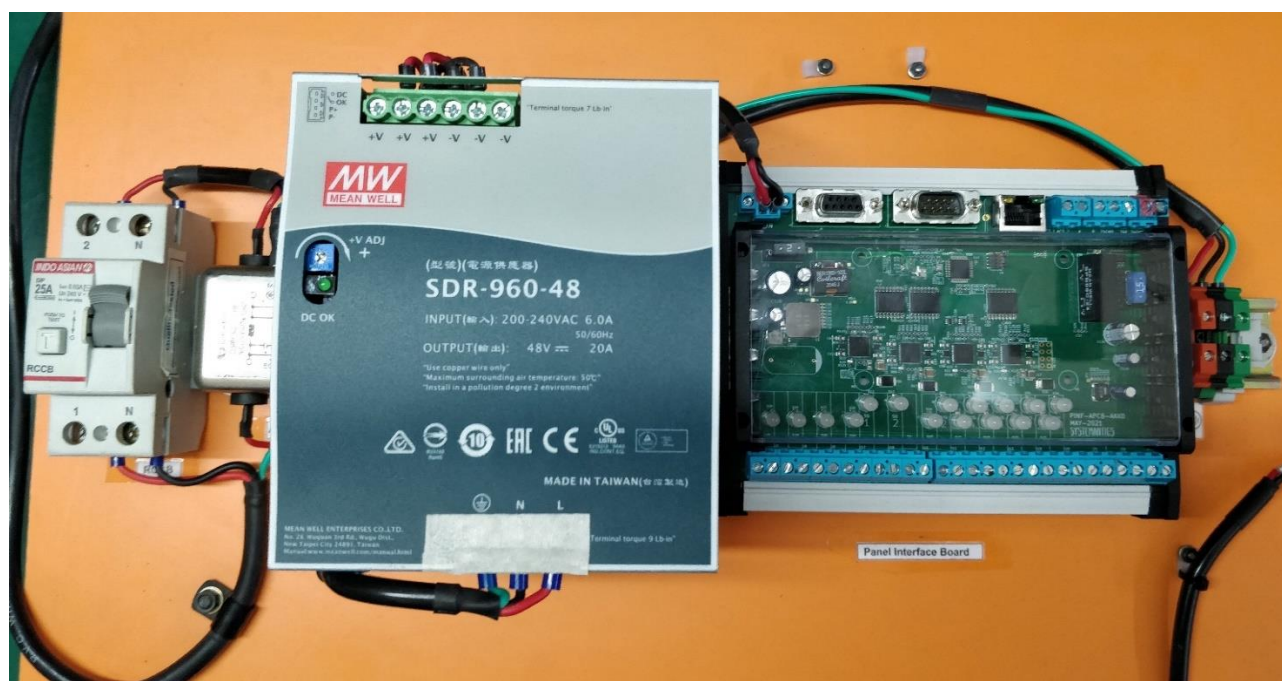
Operator Pendant

**16 core Tool interface
I/O cable – 0.5 m**

**Robot interface cable –
3m**

2.   SAFETY

2.1. PRECAUTIONS

Safety

- Make sure that all personnel (operator and bystanders) keep their heads and faces outside the reach of the ASYSTR.
- Be aware of the ASYSTR's movements (to avoid unintended collision with other apparatus in workspace) when using the teach pendant.
- If the software prompts an error, immediately activate emergency stop.

Precautions

- Ensure that the ASYSTR base is securely bolted in place.
- Make sure the ASYSTR has ample space to operate freely within the operation region (moving links).
- Do not wear loose clothing or jewelry when working with the ASYSTR. Make sure long hair is tied back when working with the ASYSTR.
- Never use the ASYSTR if it is damaged.
- It is recommended that you setup a backup UPS (800VA) which also enables surge protection. This provides approximately 15 minutes of power backup (to perform any vital edit or save tasks) in case of Main power shut down.
- Auto save feature is not available. While teaching the ASYSTR make sure that a taught program is saved as soon as you have marked a point.

3.   GLOSSARY

Hardware	
Term	**Description**
ASYSTR	The 6-Axis collaborative robot described in this manual.
Emergency Stop	Stops all movement of the robot.
End Effector	The tooling (along with the tool holder) integrated with the robot, for user specified application.
Mounting Base	The base plate of the robot.
Operator Pendant	The 3-button device which is used by the operator to start, stop, pause the robot in operation. One of these buttons is an emergency stop button.
Robot Joint	Moving rotational joint. There are 6 joints in ASYSTR.
Tool Flange	The (mating part) feature for assembling the application specific tool holder. Typically, a raised rim or lip.
Power and Interface panel	The DIN rail mountable panel that supplies power to the robot and helps in interfacing the robot with other machines through DIOs and Modbus.

Software	
Term	**Description**
Android App	The Android Application which is used to interact with the robot in order to teach and program the robot.
Homing	The process by which the robot (automatically) sets up its joint references.
Joint Space	6-Dimensional space defined by joints (J1, J2, J3, J4, J5, J6).
Jogging	A part of teaching to move robot in Task space or Joint space.
Motion	A linear, circular or spline path consisting of at least two points in case of linear and spline, and at least three points in case of circular.
Program	The sequence of programmed steps which makes the robot perform designated tasks.
Points/Waypoints	Unique positions of the robot in its work area which are stored in the robot memory and called during the program execution.
Robot Frame	Coordinate frame attached to the Robot (also called as ground frame).
Task Space	6-Dimensional space defined by (x, y, z, roll, pitch, yaw).
Tool Frame	Coordinate frame attached to Tool flange.
Pack Pose	Ideal position of the joints for packing the robot

4.   Transportation

Only transport the robot in its original packaging. Save the packaging material in a dry place if you want to move the robot later.

Contact us for videos on how to pack and unpack the cobot

Please visit our website to raise a query – www.systemantics.com

<u>Get in touch with us;</u>
E-mail: sales@systemantics.com
Phone: 080-40939217

Robot Installation and setup

5. INSTALLATION

5.1. INSTALLATION

Pre-Installation Checklist

- Ensure that the surface/frame on which you intend to install the ASYSTR robot can support a minimum mass of 50 kg.
- Ensure that the surface for installation of ASYSTR is planar (horizontal).
- Ensure there is a power outlet within a range of 5m from the location at which you intend to install the ASYSTR robot.
- Ensure there is a minimum space of 115 x 115(mm) and 1000mm in height for mounting and operating of the robot [dimensions provided are not inclusive of application related tooling and related peripherals such as mounting pedestals etc.].
- Ensure there is enough space to accommodate the robot assembly.

Electrical Checklist

- Ensure that there is a dedicated Earthing pit which is as per IS 3043:1987 for the Robot setup.
- The power source should be an Indian Domestic 3 pin 6A socket and should have single phase 230V AC, 50 hertz & should be capable of supplying 6A.
- Ensure that the Earthing connection to the above said power point is taken from the Earthing BUS bar and the Earthing BUS bar is connected to the Earthing Pit dedicated to the Robot setup.
- Ensure that the power and interface panel is mounted inside a dust resistant panel.

⚠️ WARNING	*Ensure Neutral to earth potential does not exceed 2 volts.*

Step 1: Mounting the ASYSTR

Mount the ASYSTR's base onto the pedestal/frame that has been prepared for its installation. There are four mounting points available for the ASYSTR mounting. The four corners' points use M6 Bolts for mounting.

Note: The user should make sure that all the four mounting points should be mounted on a flat and smooth vibration free surface. The minimum space required for mounting the ASYSTR is 115 mm x 115 mm and a clearance height of 1000 mm.
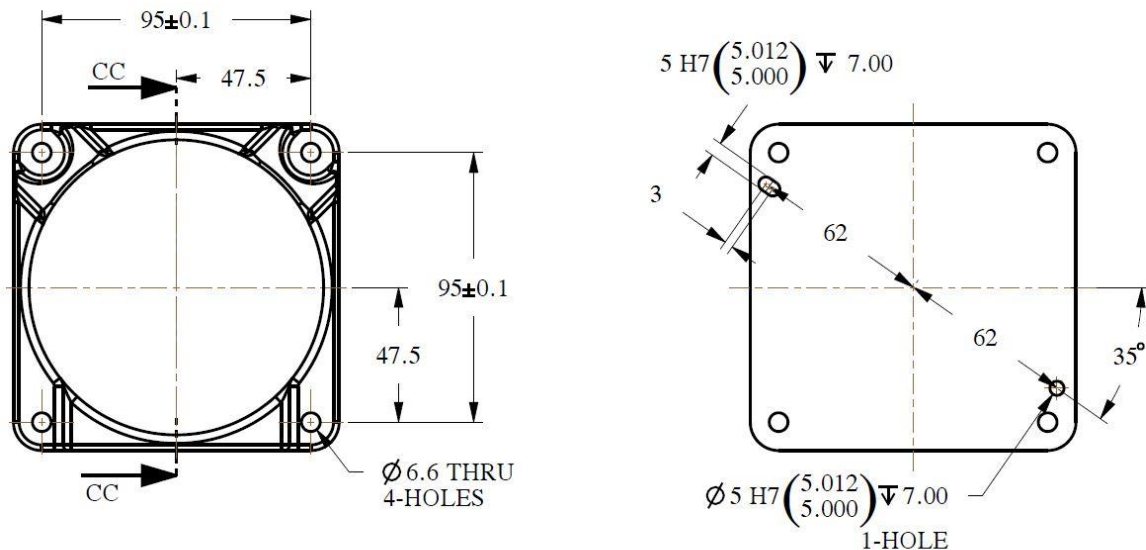

Securing ASYSTR on pedestal

While the ASYSTR is held by support structures for stability, secure the mounting base to the frame with four M6 screws at the corners as indicated in the above diagram.

Tool Flange

The Tool Flange located at the end tip of the ASYSTR is as per ISO_9409-: 2004. The user can make use of the four M6 bolts for mounting the end-of-arm tooling and the locator pin for alignment of the same.
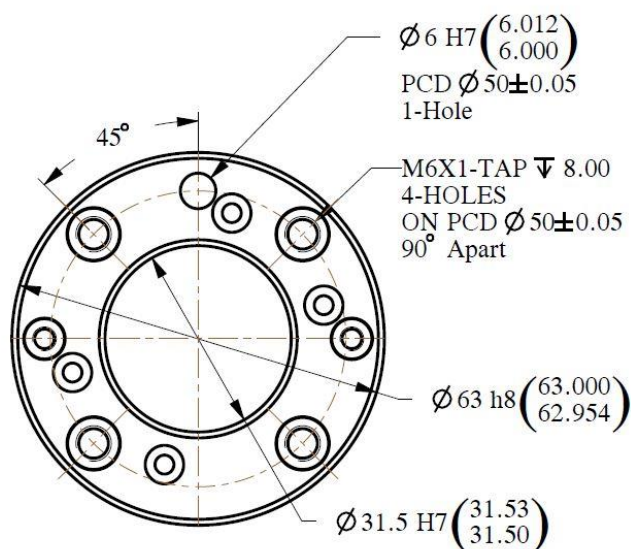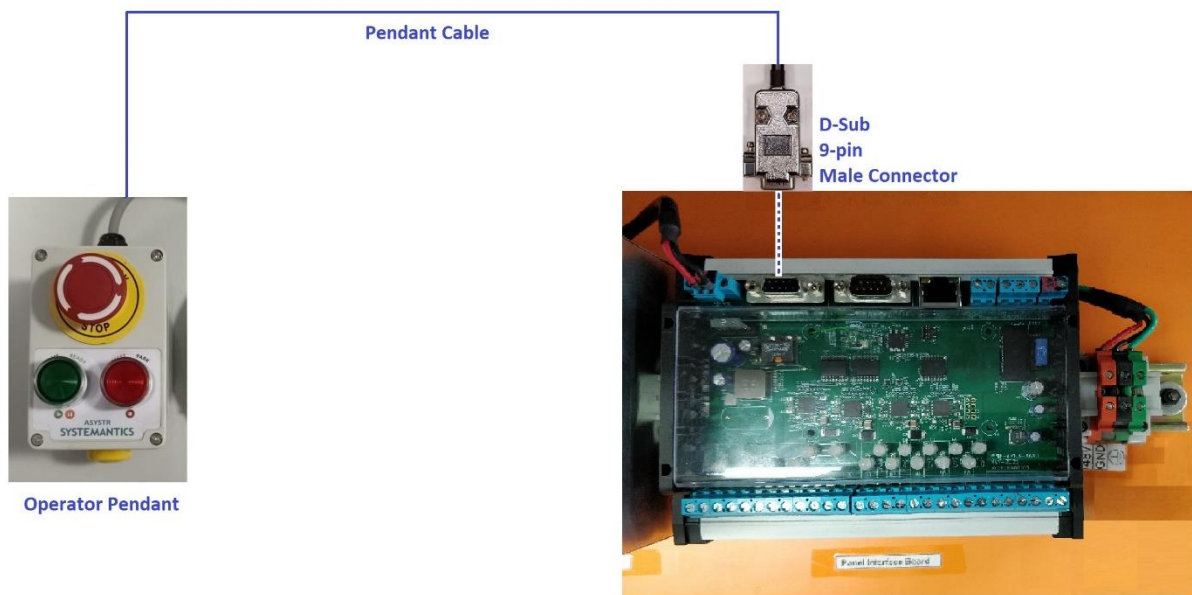

Step 2: Mounting the Power and Interface panel

Securely mount the power and interface panel in an electrical panel using the DIN rail mountable bracket or keep it upright using the 'L' brackets attached to the board.
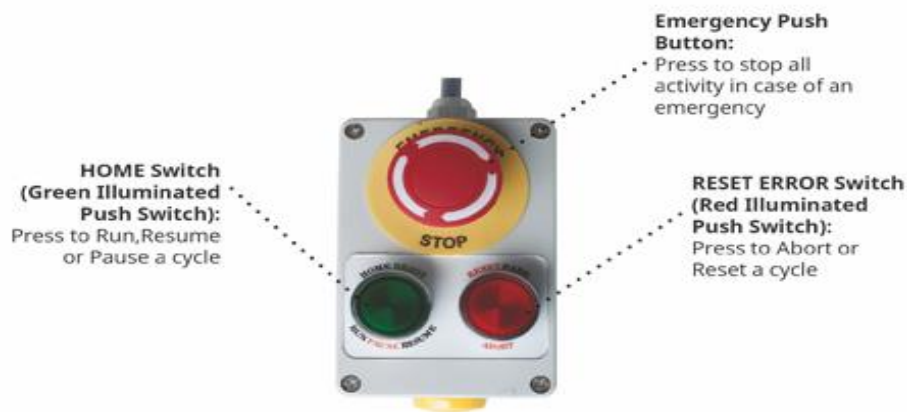
Step 3: Connecting operator pendant

Connect the Operator Pendant to the PENDANT port on the power and interface panel.

Operator Pendant Indicators

The pendant has an EMERGENCY stop switch and two illuminating switches:

● HOME (Green)

● RESET ERROR (Red)

The HOME and RESET ERROR switches act as input devices and status indicators. The switches have the following states:

● ON: Indicates that a user input is needed.

● BLINKING: Indicates that the robot has accepted the previous command and is processing it.

● OFF: Indicates no input is needed from the user.

Note: The RESET ERROR (Red) switch glows when an error occurs. The error can be reset by pressing the RESET ERROR (Red) button.

Step 4: Connection between the power and interface panel and cobot

Connect the power and interface cable between the robot and the interface panel as shown below. Ensure the connection is secure and the cables are routed properly to prevent damage due to external interferences.
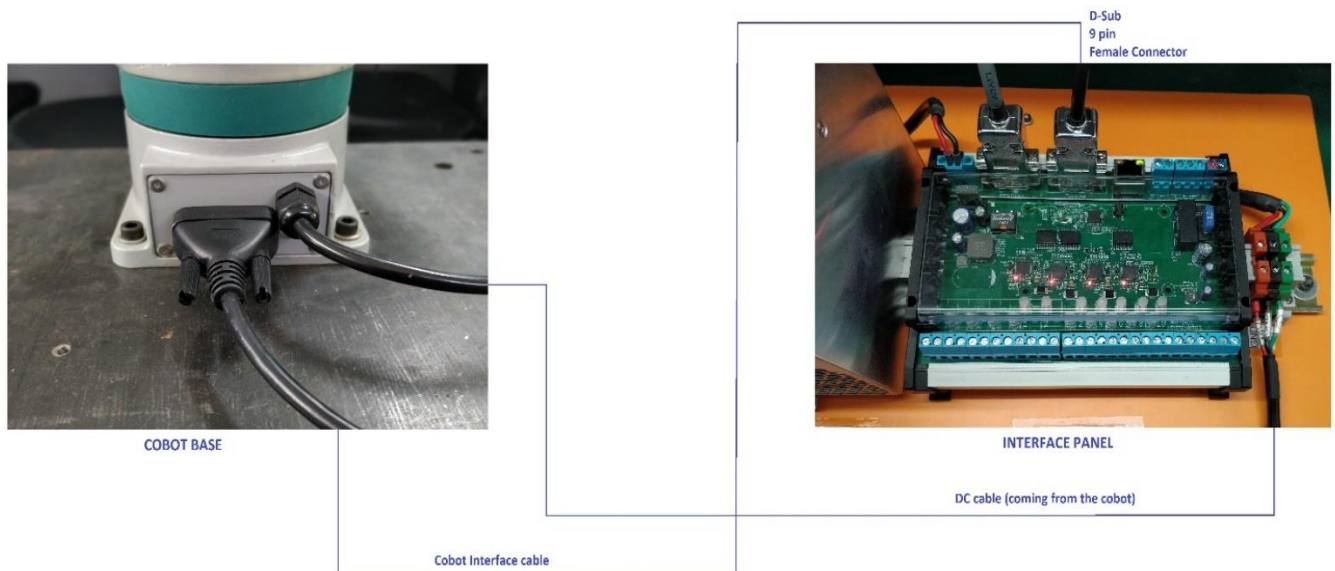
Step 5: Connecting to the power supply

Connect the 3 Pin 5A plug to a 240 VAC Power supply.

Note: It is recommended that you always connect to a power source routed through a UPS.

| ⚠️ WARNING	*Ensure the emergency button on the operator pendant is pressed before powering on the robot.*

Step 6: Running the Default cycle

Follow the below step-by-step process to connect and test the robot condition on arrival.

⚠️ **CAUTION**	<u>**Observations upon powering ON the cobot**</u> • The LED indicators on the power panel is 'Green" • The LED indicators on the interface panel is ON • The RED light on the operator pendant is ON

Step 1:

Switch ON the Teaching Tab and open the ASYSTR app
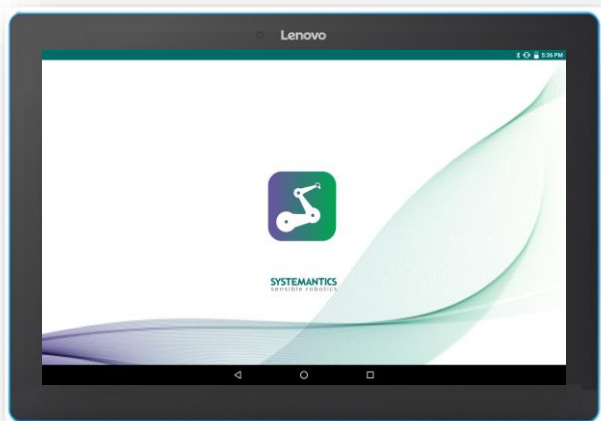
Step 2:

Click on 'Add Robot' to search for the cobot

⚠️	*Ensure that you are within less than 1m distance from the robot*

Once you discover the cobot ; Select the robot and enter the details for easy connection in the future.

Step 3:

Select the 'Live on Arrival Test cycle' and select 'Open'
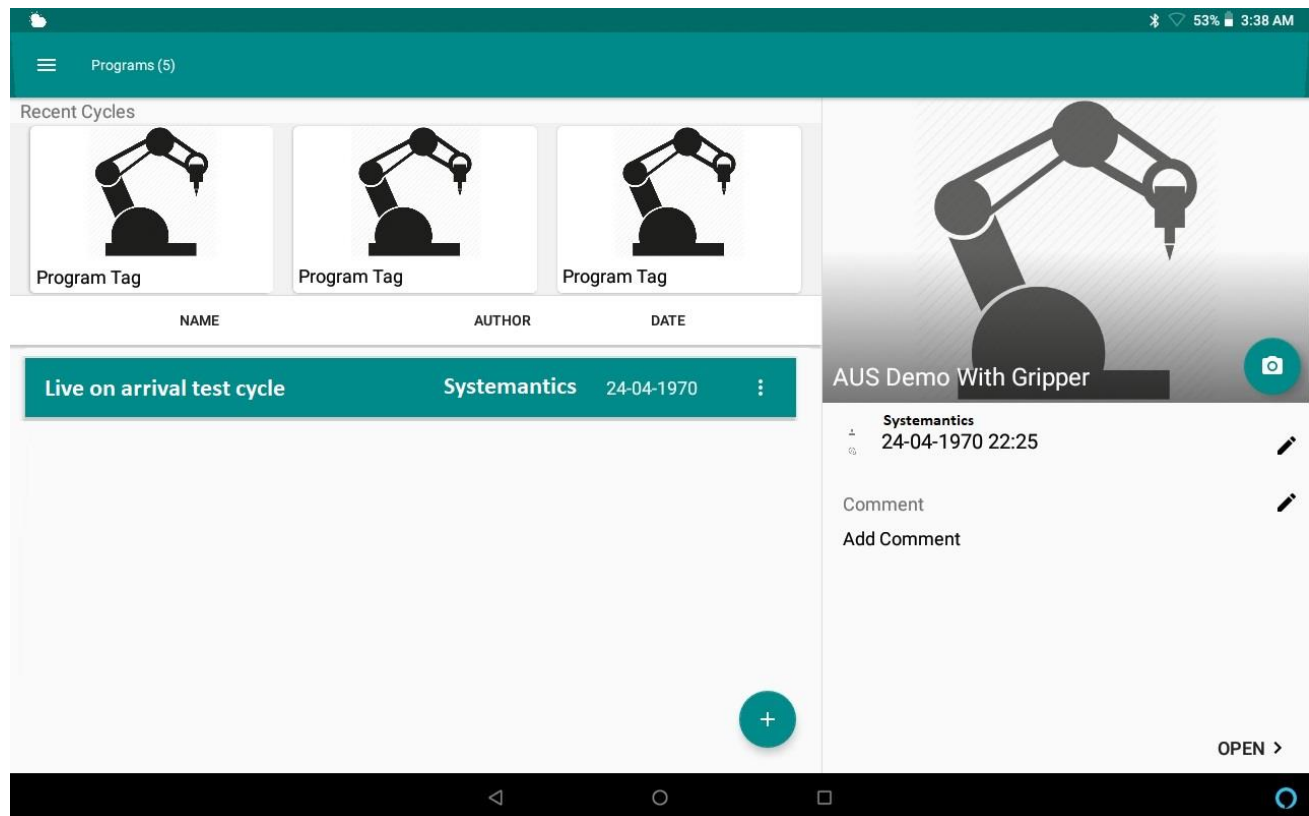
Step 4:

Once the cycle is successfully loaded; RUN the cycle using the operator pendant. Follow the below sequence to RUN the cycle.

Press the emergency button	Rotate the emergency button clockwise	Press the green button

Once the cycle is complete the robot will stop at its Home position.

Routing cables/pipes over the robot body

Use the channels, as shown below, to secure the ties in case cables / pneumatic pipes are required to be routed over the body of the cobot.
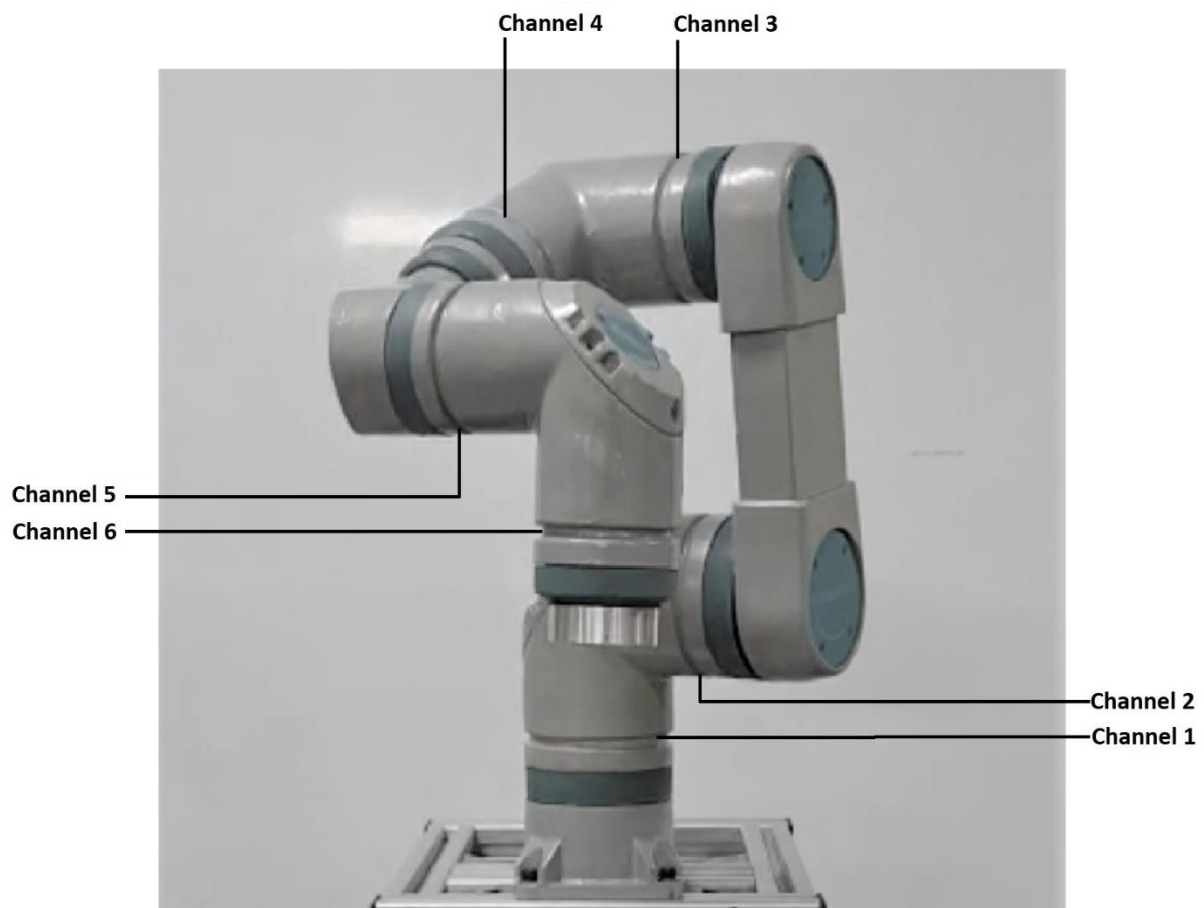
5.3. COMMUNICATION INTERFACE

The user can choose from three channels, **Ethernet, Modbus RTU or Digital Inputs/Outputs**, available, separately or on combination, to interface ASYSTR with other machines, sensors and PLCs. These interfaces are provided both at the tool tip and at the interface panel.
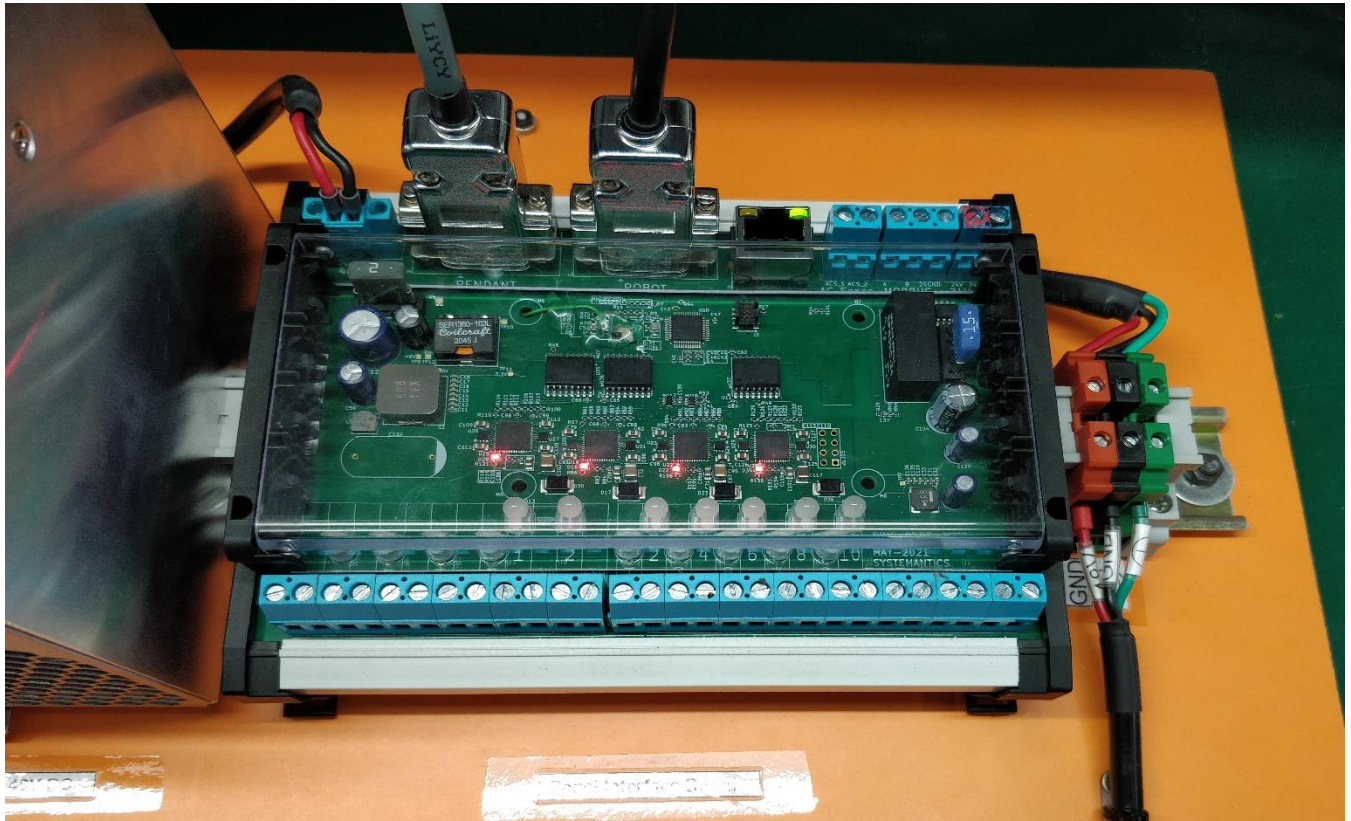
Interface panel

Interface panel Input/Output

The interface panel is DIN rail mountable; it houses;

- ➢ 2 Emergency Digital Input points
- ➢ 2 Safety Digital Input points
- ➢ 2 Safety Digital Output points
- ➢ Modbus RTU connection port
- ➢ 24 VDC input power port – power supply to be provided by user from an external source
- ➢ 10 configurable Digital Input/Output points
- ➢ Ethernet connection port
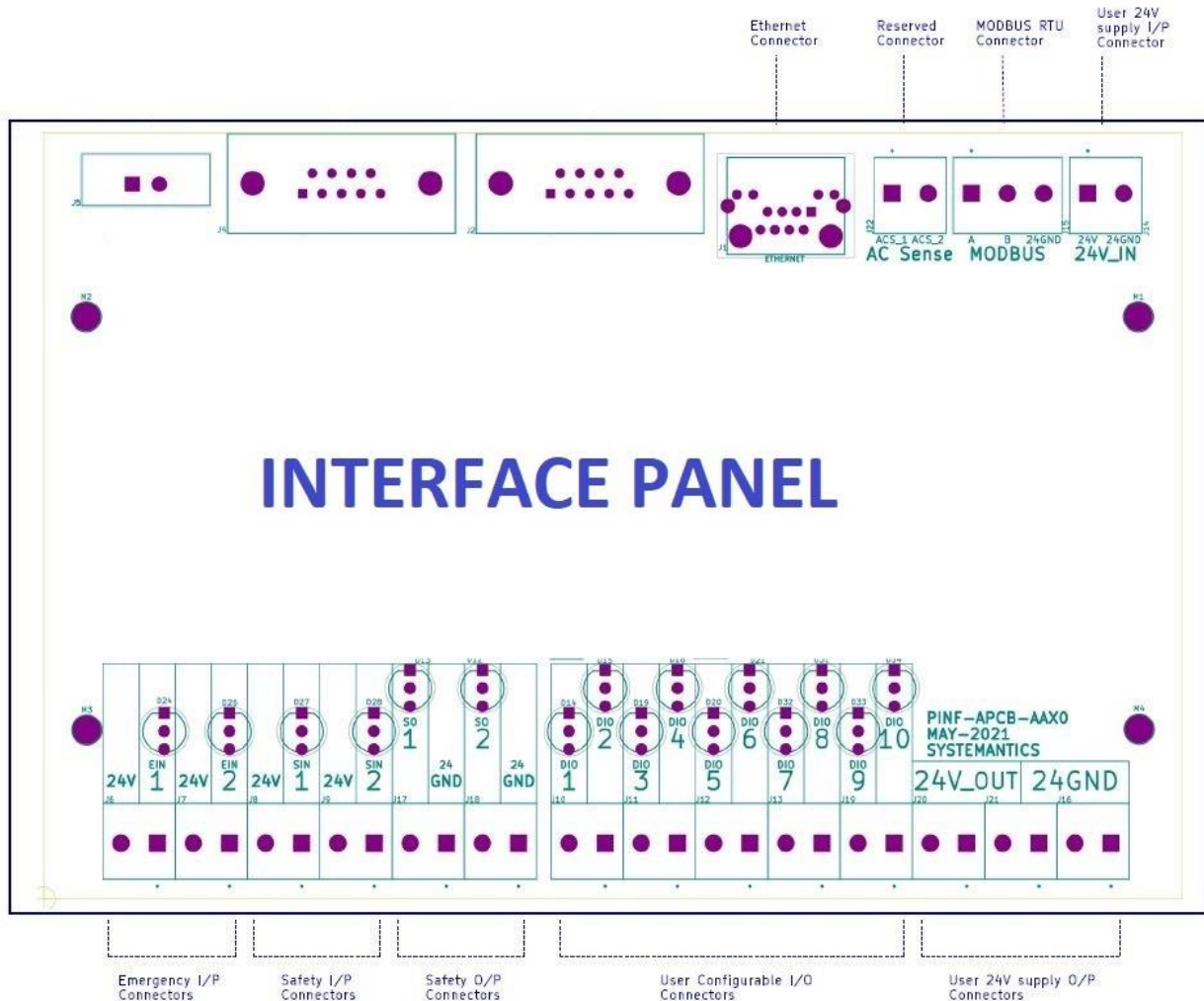
⚠️ **WARNING**	The interface panel does not have in-built 24VDC power source; hence a power supply of 24VDC is to be connected.

Safety I/Os

Safety devices are an integral part of any solution, we have dedicated points to connect the emergency/safety systems with the robot. Prior to operation customer should ensure that the safety systems are installed and well-integrated as per the safety standards. We have 2 Emergency Digital Inputs, 2 Safety Digital Input, and 2 Safety Digital Output points provided in the interface panel as shown below.

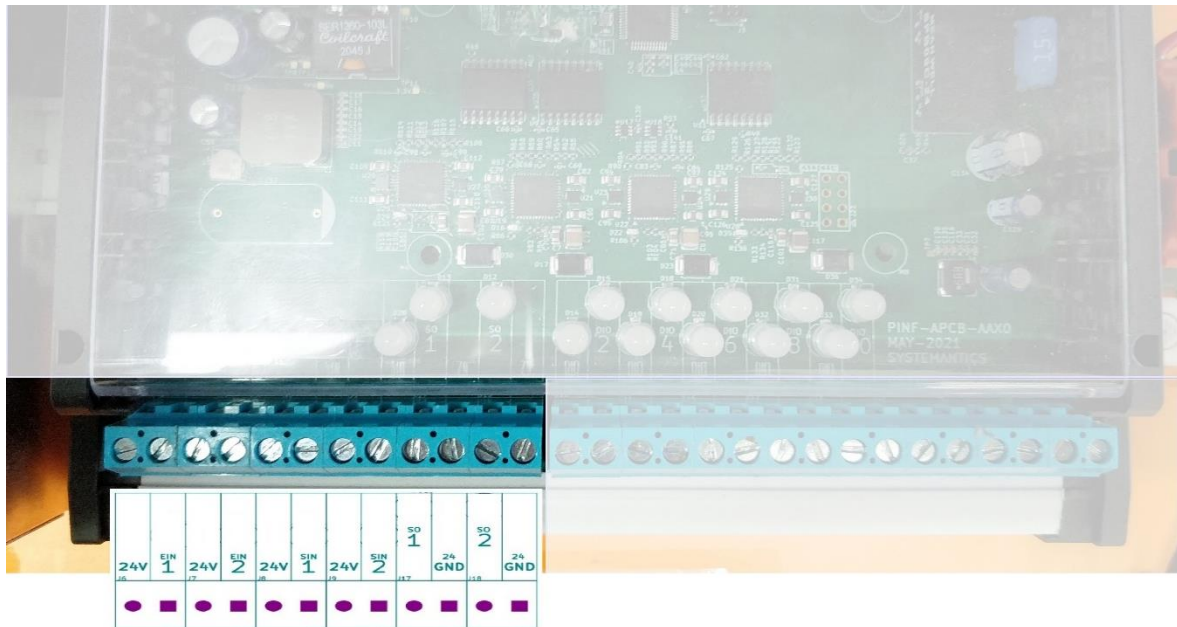| Pins from left to right (as shown in the above figure)											
24VDC +	EIN 1	24VDC +	EIN 1	24VDC +	SIN 1	24VDC +	SIN 2	SO1	24 GND	SO2	24 GND
J6		J7		J8		J9		J17		J18	
Emergency Signal Inputs				Safety Signal Inputs				Safety Signal Output			

Configurable Digital Input/Output

In addition to the safety I/Os there are 10 user configurable digital I/O points provided for the user. Interface panel doesn't have an inbuild 24VDC power supply to power the digital I/O, user have to provide 24VDC 0.5A(max.) from an external source.
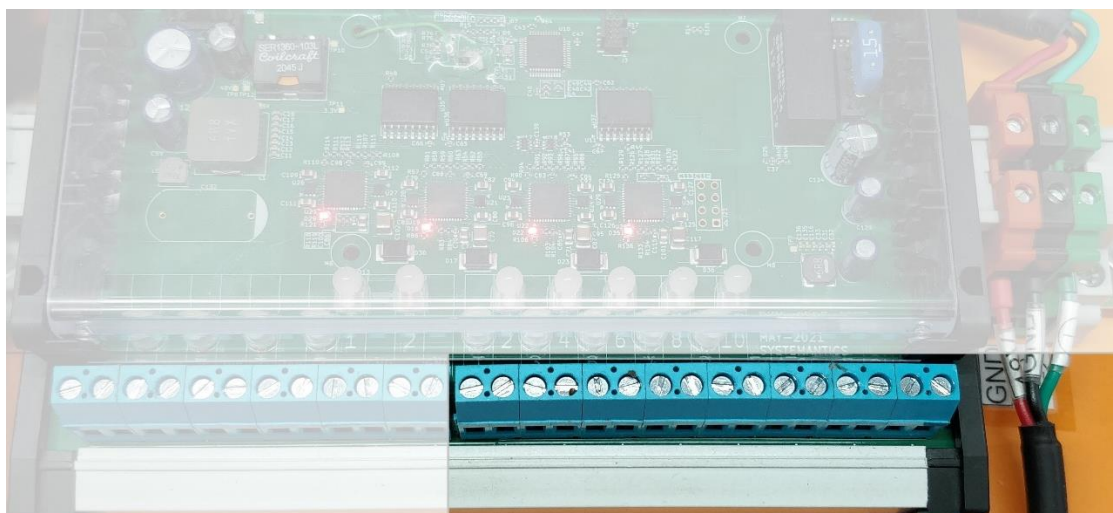
Below are the DIO pin layout details considered from left to right, refer to the above figure;

|		
J10	1	DIO 2
	2	DIO 1
J11	1	DIO 4
	2	DIO 3
J12	1	DIO 6
	2	DIO 5
J13	1	DIO 8
	2	DIO 7
J19	1	DIO 10
	2	DIO 9
J20	1	24V_OUT
	2	24V_OUT
J21	1	24GND
	2	24V_OUT
J16	1	24GND
	2	24GND

Tool Tip Input/Output

There are 8 user configurable digital I/O points and Modbus RTU provided for the users. Tool tip have an inbuild 24VDC 0.5A power supply which the user can use to power the digital I/Os. The pin details are as given below;

Pin No.	Wire Colour	Signal Name
1	Blue w/ BLK rings	DIO_5
2	White w/ BLK rings	DIO_4
3	Orange w/ BLK rings	DIO_3
4	White w/ BRN rings	DIO_6
5	Black w/ BLU rings	GND
6	Red w/ BLK rings	+24V_PWR
7	Green w/ BRN rings	DIO_2
8	Blue w/ BRN rings	DIO_1
9	Green w/ BLK rings	DIO_8
10	Black w/ GRN rings	DIO_7
11	Black w/ ORG rings	GND
12	Yellow w/ BLK rings	+24V_PWR
13	Red w/ WHT rings	+24V_PWR
14	Brown w/ BLK rings	MBUS_A+
15	Black w/ BRN rings	MBUS_B-
16	Black w/ WHT rings	GND
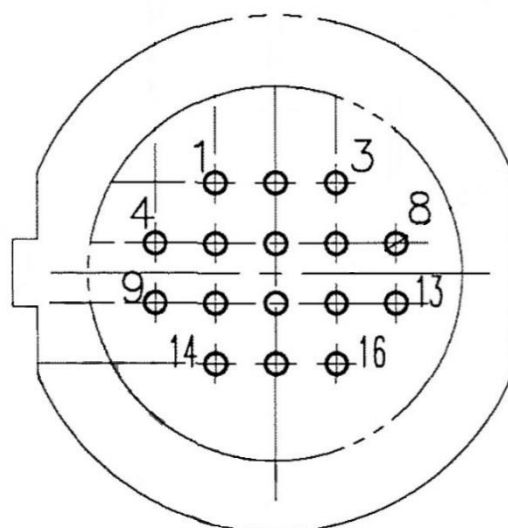
5.4. SAFETY AND PRECAUTIONS BEFORE OPERATION

- Check all connections and cables as mentioned above.
- Check if the ASYSTR is mounted properly.
- Check if the stand is bolted firmly to the mounting surface and ensure it is vibration free.
- Ensure earthing of the system is properly done.
- Ensure that there are no objects or personnel in the workspace of the ASYSTR that can obstruct the movement of the ASYSTR.
- Ensure the gripper/holder is properly tightened to the tool flange.
- Ensure the cables are secure and doesn't obstruct the motion of the cobot.

6. ASYSTR OPERATION

6.1. MOVING TO READY POSITION

1. Press the RESET ERROR (Red) switch that is currently ON.

    Now the HOME (Green) switch on the pendant glows steady.

2. Press the HOME (Green) switch.
    The ASYSTR executes the homing sequence and then moves to the READY position.
    The HOME (Green) switch flashes till the ASYSTR reaches the ready position and then it glows steady.

Note: At the end of homing activity the ASYSTR reaches a predetermined position which is the first point in the loaded program or (default) origin of the workspace if there is no residing (loaded) program.

6.2. RUNNING A CYCLE USING OPERATOR PENDANT

1. To run a Program from the READY position, press the HOME (Green) switch that is currently ON.

2. The robot starts executing the previously loaded program.

3. The HOME (Green) switch flashes while a program is being executed.

6.3. PAUSING A PROGRAM

1. To Pause a Program, press the blinking HOME (green) switch.

2. The ASYSTR pauses after the end of motion.

3. Both the HOME (Green) and RESET ERROR (Red) switches are ON and glow steady.

6.4. RESUMING A PROGRAM

1. To resume a Program, press the HOME (Green) switch that currently glows steady.

2. The program resumes operation.

3. The HOME (Green) switch starts blinking.

4. The RESET ERROR (Red) switch turns OFF.

6.5. ABORTING A PROGRAM

1. Pause the Program (see Pause a Program).

2. Press the RESET ERROR (Red) switch.

    The ASYSTR stops abruptly.
    The HOME (Green) switch glows steady.

To Abort all operations on the ASYSTR in an emergency, see Emergency Stop section.

6.6. RESTARTING A PROGRAM AFTER AN ABORT

1. Press the HOME (Green) switch that is already glowing steady.

2. The ASYSTR executes the homing sequence and enters the READY position.

3. The HOME (Green) switch flashes till the ASYSTR reaches the READY position.

6.7. ERROR

When the ASYSTR is powered ON and an error occurs:
1. The ASYSTR stops functioning.

2. The HOME (Green) switch turns OFF.

3. The RESET ERROR (Red) switch turns ON.

6.8. RESETTING AN ERROR

1. To reset an error, press the RESET ERROR (Red) switch.

   The RESET ERROR (Red) switch turns OFF, if the error is reset - or continues to flash if the Error has not been resolved.
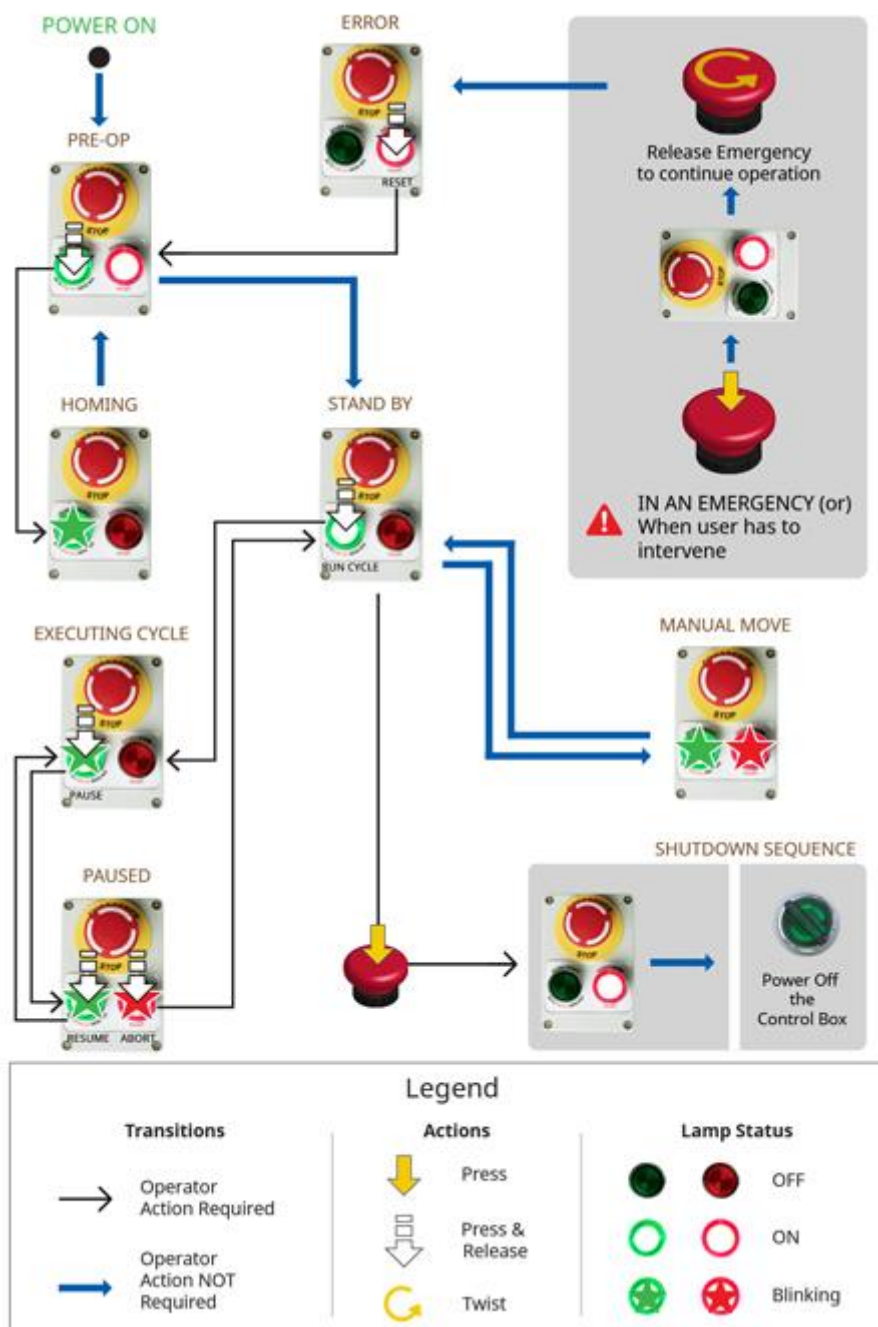
6.9. EMERGENCY STOP

The EMERGENCY PUSH button on the pendant is used to stop the ASYSTR in an Emergency.

1. Press the EMERGENCY PUSH button.

    The ASYSTR stops functioning.
    The RESET ERROR (Red) switch starts blinking.

6.10.   RECOVERING FROM EMERGENCY STOP

1. Turn the EMERGENCY PUSH button clockwise.

   The RESET ERROR (Red) switch stops blinking and the HOME (Green) switch is glows steady, to indicate that you can perform the homing sequence and move the robot to the READY position.

⚠	Use the EMERGENCY PUSH button only in an emergency situation; Otherwise, you should only abort the program/operation. See the section Aborting the robot program/operation.

6.11.   Q & A

i.   **The operator pendant is not working.**
Ensure the connection between pendant and control box is secure.
If the connection is proper and the pendant still doesn't work, contact the support team.

ii.   **What if the ASYSTR is not moving?**
Make sure that there are no physical objects interfering with the working of the ASYSTR.
Ensure there is no voltage fluctuation.
Make sure the Emergency button is not engaged.
Please contact the support team if the problem persists.

iii.   **The ASYSTR is not detected by the android tab.**
Restart the ASYSTR and try re-connecting.
If the problem persists, contact the support team

iv.   **The Android tab does not connect to the ASYSTR?**
Ensure that the battery level of the Android tab is higher than 20% (recommended).
Restart the android application and try re-connecting to the ASYSTR.
If the problem persists, restart (first shutdown and then turn on) the tab and connect to the ASYSTR.

v.   **If the ASYSTR does not respond to any user action on the android tab.**
Restart the android app and try re-connecting to the ASYSTR.
If the problem persists, restart the ASYSTR wait for 30 seconds and try reconnecting.

vi.   **What should I do if the status indicators on the control cabinet do not glow?**
Contact the support team.

vii.   **What should I do if the ASYSTR doesn't home?**
Power off the ASYSTR, ensure that the cable (from control cabinet to the ASYSTR) is secured and intact. Restart the ASYSTR and home the ASYSTR.
If the problem persists, contact the support team.

6.12.   USER DEBUG GUIDE

● Make sure that all harnesses are intact and secured, if not report to our service personnel.
● Power the system, and switch on the ASYSTR 400 - which would (if successful) then glow green.
● Also, notice the state (the buttons lit) on the operator pendant. ROBOT RESET (RED LED ON). Button press leads to HOME(GREEN) LED ON.
● In case of a power failure, the ASYSTR 400 has been designed to recover from sudden Power cut off and it would re-start the program (last loaded) immediately after homing. But a power surge (independently or accompanying a power failure) - could permanently damage the ASYSTR 400.

7. DISCLAIMER

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All rights reserved. Systemantics India Pvt. Ltd. reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation. Contact your Systemantics Representative for the most current information. ASYSTR is a trademark owned by Systemantics India Pvt. Ltd. Systemantics Logo is a trademark of Systemantics India Pvt. Ltd. All other companies and product names mentioned may be trademarks of the companies with which they are associated.

Warranty

The robot and its supporting systems are shipped to our customers only after being subjected to quality checks, tests, and inspections to certify its compliance with our performance standards. Even so, any product malfunctions resulting due to manufacturing defects will be repaired (resolved) free of charge during the normal warranty period. However, customers will be charged for repairs in the following cases (even if they occur during the warranty period):

- Damage or malfunction caused by improper use which is not described in the manual, or careless use.
- Malfunctions caused by customer's' unauthorized disassembly of the system.
- Damage due to improper adjustments or unauthorized repair attempts.
- Lack of maintenance of the system.
- If the robot or associated systems are used outside of the usage conditions and product specifications described in the manual.
- If you do not follow the WARNINGS and CAUTIONS indicated in this manual, we cannot be responsible for any malfunction or accident, even if it results in injury.
- We cannot foresee all possible dangers and consequences. Therefore, this manual cannot warn the user of all possible hazards.
- Damage caused by natural disasters such as earthquake, flood, etc.

8. CONTACT US

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