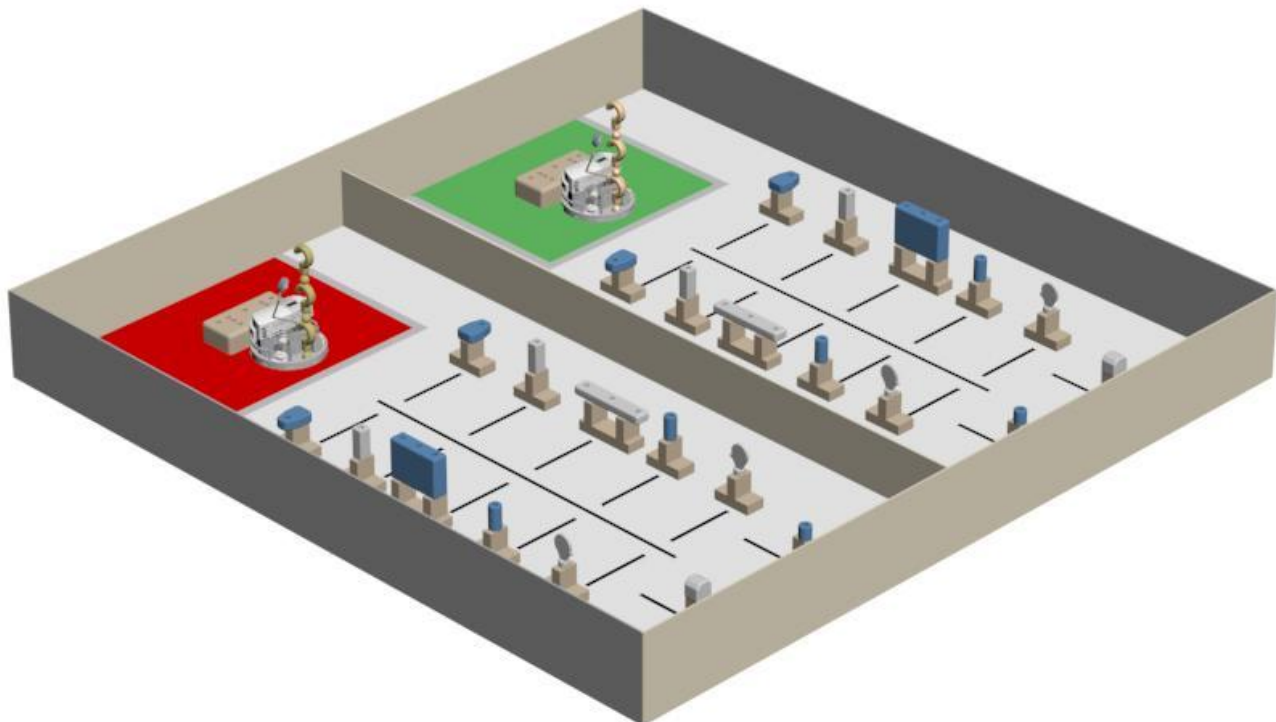


DRAFT

Test Project Proposal: Made in Germany

Final Text Version offered for consideration in the Approval Vote

WSC2013_TP23_AA_EN



Submitted by:

Name: Bob Tone, 2013 Mobile Robotics Expert

Member Country: Canada

INTRODUCTION

The '**Made in Germany**' task requires competitors to:

- Manage the mobility of an Autonomous Robot in a Simulated Manufacturing Facility
- Design / Fabricate / Utilize a Competitor Built Radio Controlled Object Management System to retrieve Robot Components from the Warehouse Area and Assemble Prescribed Robot Models in the Assembly Area

CONTENTS

This Test Project Proposal consists of the following documentation / files:

1. Description of Project and Tasks
2. The 'Simulated Manufacturing Facility' Court Elements
3. Prescribed Robot Solution Models
4. Marking
5. Robot Component Placement in the Warehouse
6. The Robot Component Collection
7. Instructions to the Competitor
8. Equipment, Machinery, Installations and Materials required
9. Marking Scheme
10. Court Layout, Robot Component / Fabrication, Prescribed Solution Robot Model Details

DESCRIPTION OF PROJECT AND TASKS

The Two Competitor Built / Radio Controlled Object Management System Courts each provide:

- Two Side by Side **Independent Simulated Manufacturing Facilities**
- The Robot Components in BOTH Independent Simulated Manufacturing Facilities are the same colour pattern
- 5 to 6 Teams of Competitors are expected to share the pair of Independent Simulated Manufacturing Facilities in each court during the 'Daily AM Shared Court Access Open Work Periods'
- All Teams of Competitors can expect to have 'Evaluation Task Runs' on BOTH of the Independent Simulated Manufacturing Facilities present in their Assigned Court
- There are NO Restrictions on how many Robot Components a Competition Robot may possess at one time. It is a Competitor Decision how often they will travel into the Warehouse (Pick One Robot Component each time they enter the Warehouse or enter the Warehouse less often and Pick Multiple Robot Components each time.)

The 'Simulated Manufacturing Facility' Court Elements

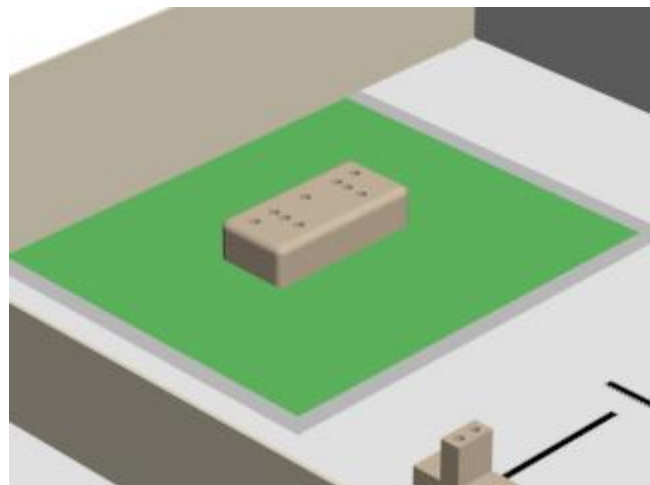
The Assembly Area

The Assembly Area is an 1100 by 950 mm space.

This area includes the Fixed In Position Assembly Base Block.

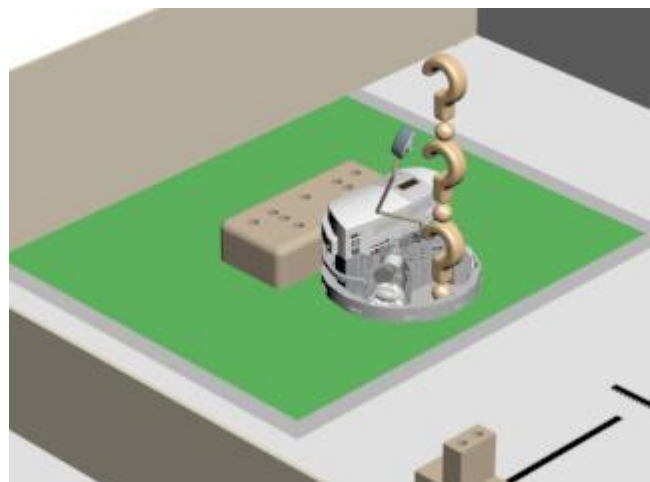
The top of the Assembly Base Block has multiple holes to enable it to support a variety of Designated Robot Solution Designs.

The Assembly Base Block has overall dimensions of: 420 by 200 by 100 mms.



The Robot Start Position

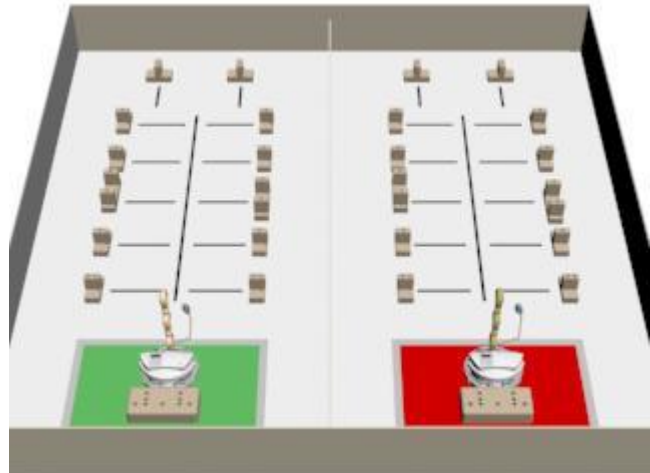
Robots start in the Assembly Area directly in front of the Assembly Base Block.



The Warehouse

Each Warehouse has 12 Robot Component Stands.

Each Warehouse Floor has a Pattern of Tape Lines available for use by Competitors when managing Robot Mobility.



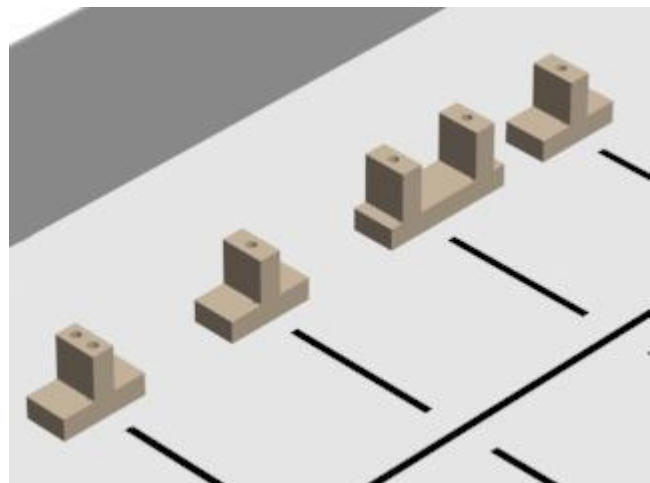
The Robot Component Stands

All Robot Component Stands are the same height.

Two Robot Component Stands have 2 Holes in their Top.

Eight Robot Component Stands have 1 Hole in their Top.

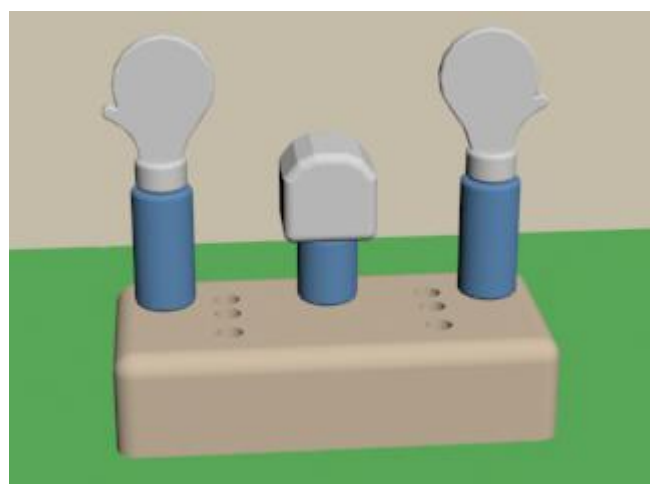
Two Robot Component Stands have 2 Vertical Ribs with 1 Hole in the Top of each Rib.



Prescribed Robot Solution Models

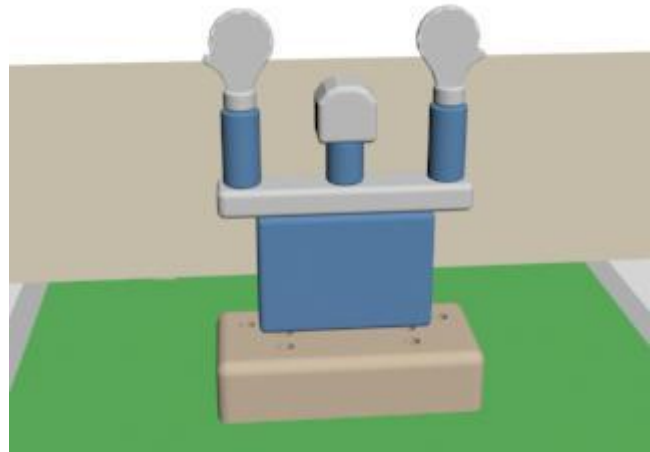
The 6 Component Robot Solution Model

- 1 Neck Component
- 2 Arm Components
- 2 Hand Components
- 1 Head Component



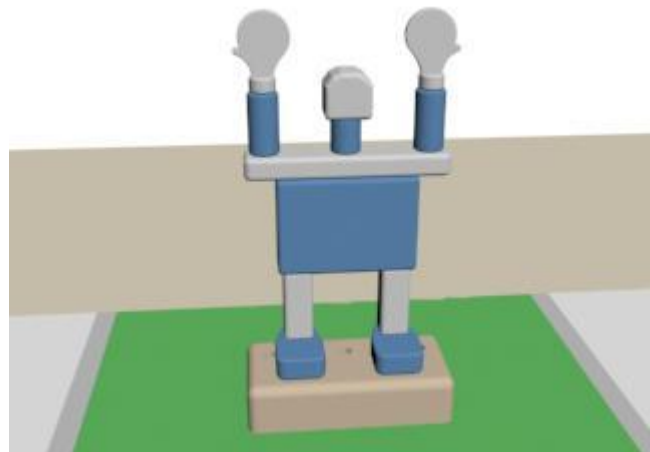
The 8 Component Robot Solution Model

- 1 Torso Component
- 1 Shoulder Component
- 1 Neck Component
- 2 Arm Components
- 2 Hand Components
- 1 Head Component



The 12 Component Robot Solution Model

- 2 Foot Components
- 2 Leg Components
- 1 Torso Component
- 1 Shoulder Component
- 1 Neck Component
- 2 Arm Components
- 2 Hand Components
- 1 Head Component



Marking

Marking will take place in two stages.

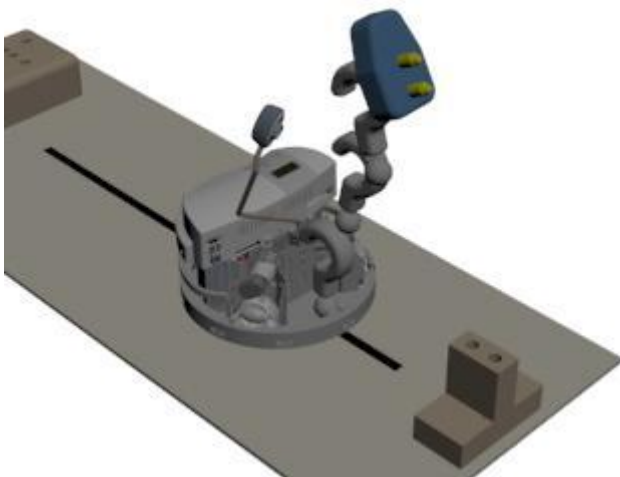
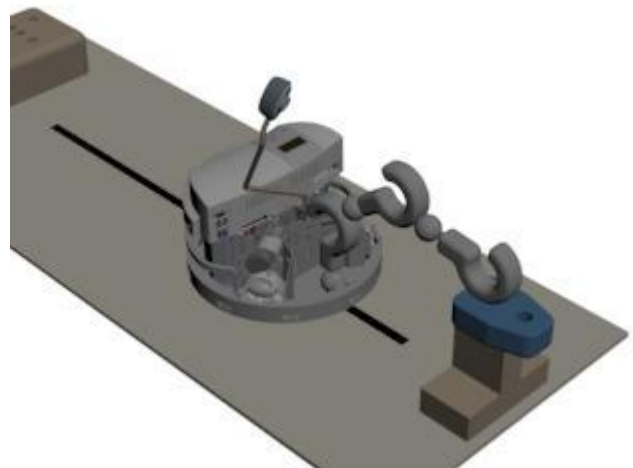
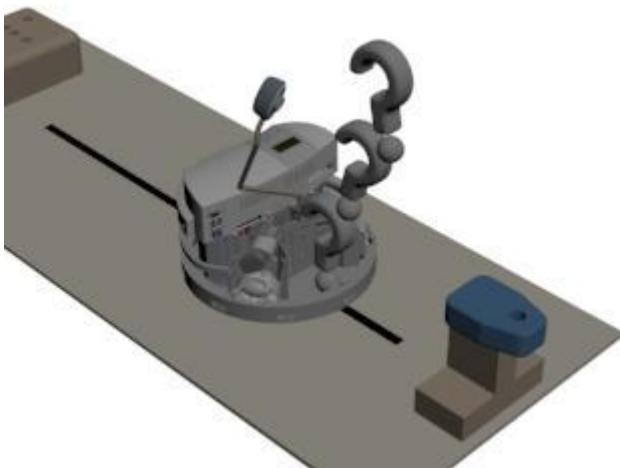
Stage One: **CBRCOMS Performance Specific Marking** involving CBRCOMS only and with the Tele-operator having Direct Line of Sight access to their CBRCOMS. Value 40% of the Overall Mark

- Teams will have a Robot Performance Testing / Practice Space in their Assigned Workspace.
- It is expected that Teams will fabricate a minimum of One of each of the Three Robot Component Stands, and One Robot Assembly Base as well as One of each Robot Component for use during their Competition Preparation Activities and that they will bring these items to Leipzig for use in their Workspace.
- CBRCOMS Marking will take place during the AM Competition Sessions.
- CBRCOMS Marking will take place on the Robot Testing / Practice Space in each Team's own Assigned Workspace.
- CBRCOMS Marking will involve NO Robot Mobility Elements. Competitors will position their Robot in Front of the Component Stands and the Assembly Base prior to the Marking of each CBRCOMS Marking Element.
- CBRCOMS Marking will require each of the Eight Robot Components to be Lifted Clear of the Stand and held for 10 seconds.
- The Stationary Robotino positioned in front of the Assembly Base will be handed the Robot Components one at a time in the order they are required to build the Solution Robot Model.

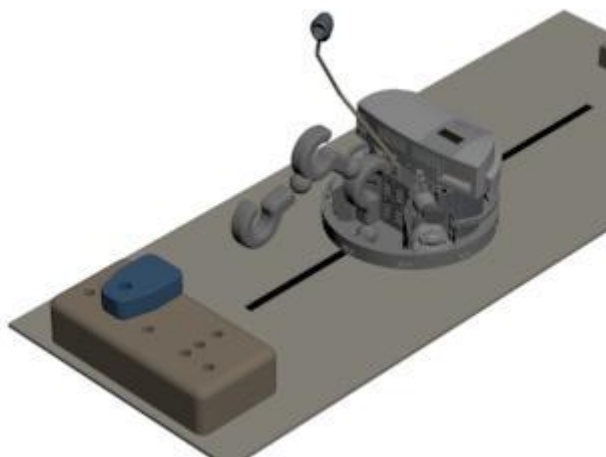
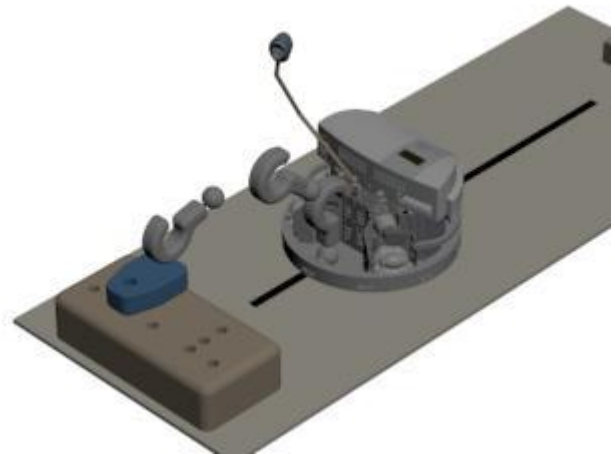
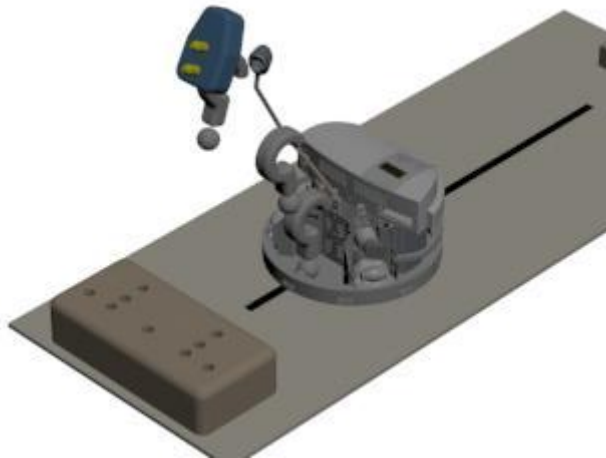
- CBRCOMS Marking will require the assembly of a Complete Robot Solution Model. Marks assigned per Robot Component will depend on the number of Components in the Robot Solution Model.
- Competitor provided Stands, Assembly Base and Robot Components will be examined and IF they are in compliance with the Competition Standard they will be used during the CBRCOMS Performance Specific Marking Process.

Note: If the Competitor provided items are deemed to not be in compliance with the Competition Standard then an alternate set of Testing Elements will be provided and used for the CBRCOMS Performance Specific Marking Process.

Workspace CBRCOMS Marking Sample



- Criterion One: Reach Out and contact the Robot Component on the Stand
- Criterion Two: Lift the Robot Component clear of the Stand
- Criterion Three: Hold the Robot Component for a Minimum of 10 Seconds



- Criterion One: Take Possession in your CBRCOMS of the Robot Component handed to it
- Criterion Two: Place the Robot Component in the Correct Location within the Assigned Robot Model
- Criterion Three: Move the CBRCOMS clear of the Assigned Robot Model

Stage Two: **On the Court in the Simulated Manufacturing Facility Complete Task**

Performance Marking involving Robot Mobility and CBRCOMS Performance with all of the following options available and the Final Decisions being made in Leipzig. Value 60% of the Overall Mark

Marking

- All Marking will take place **AFTER an On the Court Evaluation Task Run Attempt has been COMPLETED.**

Note: Two Teams will be making On the Court Task Run Attempts at the same time in side by side Independent Simulated Manufacturing Facilities.

Note: The Two Teams will have a Single Shared Evaluation Task Run Start Time.

Note: Competitors must remain OFF the court until Marking has been Completed for Both Teams.

Note: IF any time remains in the Assigned Evaluation Time Block after the Marking has been completed then Both Teams may use this time for On the Court Task Preparation.

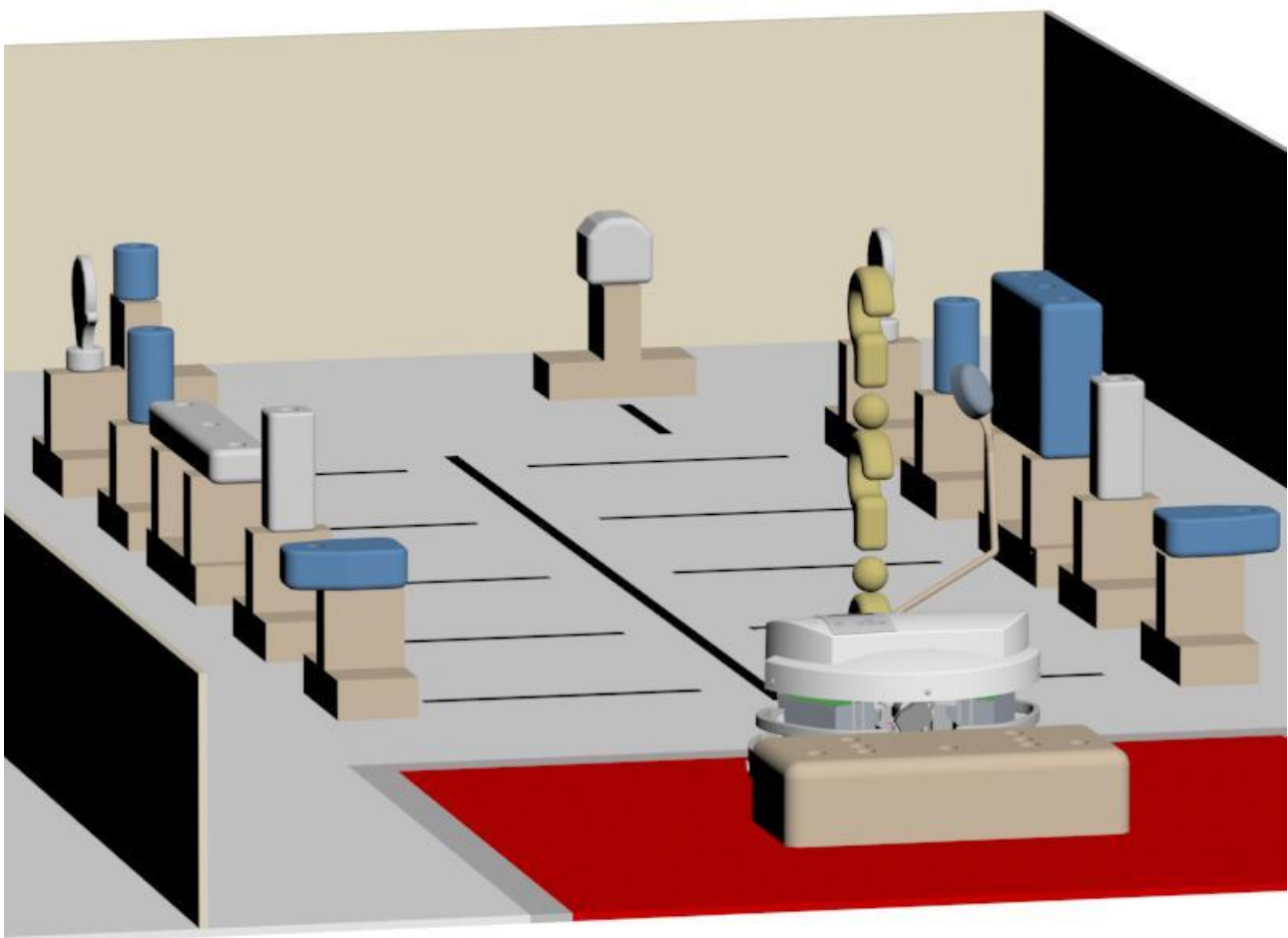
- The Mark Value on a Per Component Basis will depend on the Number of Components in the Assigned Robot Solution Model and the Overall Number of Evaluation Task Runs available per Task.
- 70 % of each Evaluation Task Run's Marks will be awarded based on the Number of Robot Components delivered into the Assembly Area

- 20 % of each Evaluation Task Run's Marks will be awarded based on the Number of Robot Components correctly placed in the Assigned Robot Solution Model
- 10 % of each Evaluation Task Run's Marks will be awarded based on the Time Taken to build a Complete Assigned Robot Solution Model.

Note: Time Marks will be calculated in the CIS based on the following formula: Overall Best Qualified Team Task Run Time / Individual Team's Qualified Time X Total Individual Task Run Time Marks available

Note: The Number of Time Marks available per Task Run will depend on how many Evaluation Task Runs can be scheduled per Team.

Robot Component Placement in the Warehouse



Competitors MUST Understand that the Component Placement in the Warehouse Pattern displayed in this document is ONLY an Example of ONE Possible Component Placement in the Warehouse Pattern.

The Competition Leipzig Component Placement in the Warehouse Patterns will be determined during the Mobile Robotics Expert Jury Panel's Leipzig pre-competition meetings.

Competitors can expect that the Tape Line Pattern on the Warehouse Floor in Leipzig will be Exactly as shown.

The Robot Components will be the Same Colour Pattern in ALL Four of the Simulated Manufacturing Facilities.

Competitors will have both of their CBRCOMS Competition Day Task Experiences in the same court.

Competitors will have some Evaluation Task Runs in the Green Simulated Manufacturing Facility and some Evaluation Task Runs in the Red Simulated Manufacturing Facility.

The Robot Component Collection

Note: Individual Robot Components will be a Maximum Weight of 500 Grams.

Note: All Robot Component Surfaces will be Smooth, Painted and Non-porous.

The Robot Component Connection System

Uses Pegs placed in Holes to connect Robot Components.

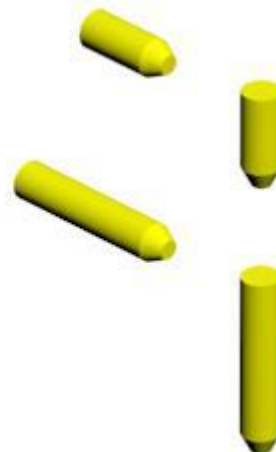
The Peg Diameter will be 2 mm less than the Hole Diameter.

One End of each Peg will have a 10 by 5 mm Chamfer.

The 2 mm Peg / Hole Diameter Difference will secure components in place.

The 5 mm Peg Chamfer will enable reliable positioning of Pegs in Holes.

The Neck Peg is longer than the other Pegs given it must pass through the Shoulder Component and into the Torso Component.

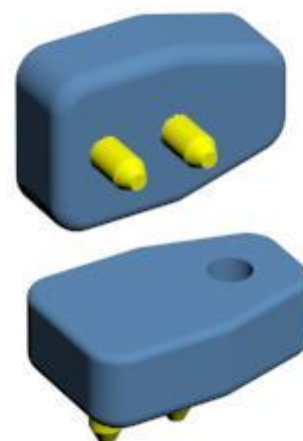


The Foot Component

The Foot Component has overall dimensions of: 150 by 100 by 50 mms.

The Foot Component has 2 Pegs for placement on the Component Stands and the Assembly Block.

The Foot Component has 1 Hole in the Top of the Foot to enable the Leg Component to be put in place.



The Leg Component

The Leg Component has overall dimensions of: 150 by 60 by 60 mms.

The Leg Component has a Peg for placement on the Component Stands and the Foot Component.

The Leg Component has 1 Hole in the Top of the Leg to enable the Torso Component to be put in place.

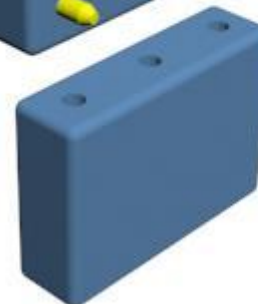
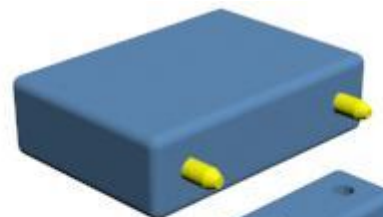


The Torso Component

The Torso Component has overall dimensions of: 280 by 200 by 40 mms.

The Torso Component has 2 Pegs for placement on the Component Stands and the Pair of Leg Components.

The Torso Component has 3 Holes in the Top of the Torso to enable the Shoulder and Neck Components to be put in place.

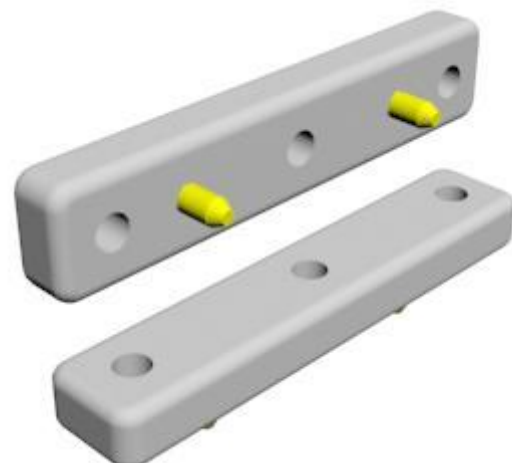


The Shoulder Component

The Shoulder Component has overall dimensions of: 400 by 80 by 15 mms.

The Shoulder Component has 2 Pegs for placement on the Component Stands and the Torso Component.

The Shoulder Component has 3 Holes Passing Through from the Top to the Bottom of the Shoulder to enable the 2 Arms and the Neck Components to be put in place.



The Neck Component

The Neck Component has overall dimensions of: 70 mm Long and a Dia. Of 60 mm.

The Neck Component has a Peg for placement on the Component Stands and the Shoulder Component.

The Neck Component Peg is longer to enable it to pass through the Shoulder and into the Torso to secure the Shoulder Component in place.

The Neck Component has 1 Hole in the Top of the Neck to enable the Head Component to be put in place.



The Head Component

The Head Component has overall dimensions of: 90 by 90 by 80 mms.

The Head Component has a Peg for placement on the Component Stands and the Neck Component.



The Arm Component

The Arm Component has overall dimensions of: 120 mm Long and a Dia. Of 60 mm.

The Arm Component has a Peg for placement on the Component Stands and the Shoulder Component.

The Arm Component has 1 Hole in the Top of the Arm to enable the Hand Component to be put in place.



The Hand Component

The Head Component has overall dimensions of:
126 by 107 by 15 mms.

The Head Component has a Peg for placement on
the Component Stands and the Neck Component



INSTRUCTIONS TO THE COMPETITOR

Competitors are expected to demonstrate True Fair Play and Co-operation at all times but most particularly when they are sharing the court spaces during the AM Work Periods.

Given All of the Robot Components in the Side by Side Simulated Manufacturing Facilities are the Same Colour Pattern Competitors cannot use Camera Based Colour Analysis to locate Robot Components in the Warehouse.

EQUIPMENT, MACHINERY, INSTALLATIONS AND MATERIALS REQUIRED

Competitors are responsible to bring to the competition site and to use exclusively during the competition the Robot provided to them 6 months prior to the competition for use during their competition preparation activities.

Competitors are expected to bring ALL of their Competition Equipment in a container no larger than One Cubic Meter.

ON THE COURT MARKING SCHEME

Marking is based on **Three Criterion**:

Criterion One: Delivery of Robot Components to the Designated Robot Assembly Area. Value 70% of the Marks available per Evaluation Task Run.

Criterion Two: Assembly of the Robot Components into a Robot. Value 20% of the Marks available per Evaluation Task Run.

Criterion Three: Time taken, Note: A Time Mark is only awarded when a Complete Robot has been assembled. Value 10% of the Marks available per Evaluation Task Run.

COURT LAYOUT, ROBOT COMPONENT / FABRICATION, PRESCRIBED SOLUTION ROBOT MODEL DETAILS

- 6 Component Robot Solution Model Details
- 8 Component Robot Solution Model Details
- 12 Component Robot Solution Model Details
- Assembly Base Details
- Component Stand One Details
- Component Stand Two Details
- Component Stand Three Details
- Peg and Neck Details
- Foot Details
- Arm and Leg Details
- Hand Details
- Torso Details
- Shoulder Details
- Head Details
- Court Dimension Details

