Test Project

Module F – Testing and Fault Finding

Duration – 3 Hours

Autonomous Mobile Robotics

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1. Introduction

RoboServe R1 is an autonomous trolley-style robot used in a restaurant to carry food from the kitchen pass to customer tables and return dirty dishes to a bus station. The robot delivered successfully to tables 1–10 but then stalled enroute to table 11. The robot has been returned to the manufacturer where you work in the service workshop after the customer reported this and several operation problems during normal operation. As the assigned service technician, you are required to diagnose the reported symptoms, identify the root cause of each problem, complete the necessary repairs and demonstrate correct operation before returning the robot to the customer.

You will use a structured fault-finding approach to complete a structured diagnostic report.

2. Description of project and tasks

The objective of this module is **not** to test whether competitors can guess hidden faults.

The objective is to assess whether they can:

- interpret customer-reported symptoms,
- follow a structured diagnostic procedure,
- identify the root cause,
- carry out a professional repair,
- verify the repair,
- document the maintenance activity.

READ THE ENTIRE DOCUMENT BEFORE PROCEEDING.

Workplace safety procedures and protocols must be always demonstrated.

If you are advised of a safety infraction during this module, 0.5 of a mark will be deducted for each infraction. On the 3rd infraction, the Competitor will be stopped, and the evaluation will be based on work already completed.

Experts will not intervene unless there is a safety concern.

2.1 Required Components

The list of required components to complete the task.

- Base Robot for Troubleshooting
- Spare parts kit
- Maintenance Manual
- Digital multimeter (voltage, continuity)
- Manufacturer wiring diagram / CAN bus map
- Fault-Finding Checklist
- Fault Record and Repair Sheet
- Basic hand toolkit
- Diagnostic software / laptop with OMS and robot control dashboard access

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2.2 Control Mode

Competitors may use **manual** control to test any relevant features.

2.2 Schedule

Competitors will complete this module in a 45-minute session during a 3-hour time block.

TIME	TASK
00:00 – 00:45	Team 1 Evaluation
00:45 – 01:30	Team 2 Evaluation
01:30 – 02:15	Team 3 Evaluation
02:15 – 03:00	Team 4 Evaluation

The first 40 minutes are allocated for inspection, diagnosis, repair and documentation. The final five minutes are reserved for the Functional Acceptance Test where the competitor demonstrates, in the presence of the experts, that all reported customer complaints have been successfully resolved.

Competitors are not **allowed** to work on their robot (used in other modules) or anything else during the module time.

Competitors should refer to the official competition schedule to determine the start and finish time of their allocated session. Before the end of the time block, competitors must:

- clean and organize their workstation;
- prepare for rotation to the next module;
- leave the repaired base robot on the workbench;
- leave the completed reports and checklists with the robot; and
- wait in the designated briefing area until released by the Chief Expert.

2.3 Task

All competitors are provided with the same **base robot unit** into which up to **4** hardware/electrical faults have been seeded across its subsystems. All faults are repairable using the supplied tools, spare parts and documentation. There is no requirement to disassemble any part of the base robot. Competitors must use the supplied Fault-Finding Checklist to locate and resolve **the faults**, recording each one on the Fault Record and Repair Sheet. Once repaired there is a functional test that must be completed. In the last 5 minutes of the evaluation the functional test will be evaluated by the experts.

No software modifications are required.

2.3.1 Checklist

The checklist acts a verification sheet to show the competitor has verified what the cause of the customer support ticket was.

2.3.2 Instruction Sheet

The instruction sheet acts as a service manual for testing the robot.

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2.3.3 Functional Test

The functional test is completed in the last 5 minutes of the 45-minute evaluation period. The functional test is to show that the customers support issue has been fixed.

2.3.4 Task sequence

Reported Symptom 1: The robot does not drive properly.

Use the Maintenance Manual and Fault-Finding Checklist to determine the root cause and complete the required repair.

Reported Symptom 2: While travelling over bumps the thresholds there is a small rattle.

Use the Maintenance Manual and Fault-Finding Checklist to determine the root cause and complete the required repair.

Reported Symptom 3: The customer has reported that sometime the robot will not turn on or it shuts of during a task.

Use the Maintenance Manual and Fault-Finding Checklist to determine the root cause and complete the required repair.

Reported Symptom 4: The customer has reported that the robot moves in the wrong direction relative to commands.

Use the Maintenance Manual and Fault-Finding Checklist to determine the root cause and complete the required repair

A repair is considered successful only when the robot successfully completes the Functional Acceptance Test

Requirement 1: using the multimeter, measure and record the battery pack voltage at each battery connector before and after your repairs.

Requirement 2: Complete the specified function test and verify the estop safety circuit functions.

3 Instructions to the Competitors

Competitors are expected to apply a logical, systematic and safe fault-finding methodology throughout the diagnostic process.

Use the Fault-Finding Checklist, it guides you through a structured diagnostic procedure and forms part of the evidence demonstrating the troubleshooting process followed.

Find the faults and correct. If replacement parts are required, request the required component from the expert. If the fault does not need a component, you will need to repair the fault.

Once you have found a fault, record the modification/fault on the Post-Repair Testing Sheet (FaultRecordandRepairSheet.docx).

Complete the Functional test to ensure all repairs were successful.

When time is up Experts will collect your work for assessment. NO extra time will be provided to complete the required paperwork.

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3.1 Completion of the Module

Only one group of competitors are allowed into the evaluation room at a time. Competitors who are not in the evaluation room will be inside the briefing room waiting for their turn in the room. Competitors that have finished the module will return to the briefing room.

Competitors should be outside the evaluation room 2 minutes before their starting time. Competitors finishing the module should be expected to leave right at the conclusion of the module.

4 Equipment, machinery, installations, and materials required

4.1 Equipment provided by Competition Organizer

- All equipment, tooling, and materials in the Infrastructure List – see AMR Discussion Forum and Technical Description;
- Testing equipment such as a multimeter;
- Base robot for testing and fault finding.

4.2 Equipment and material not permitted

- Non WorldSkills supplied laptops or portable computers;
- Tablet's e.g. Android, IPAD etc.;
- Memory sticks/ Digital Storage;
- Digital music Player;
- Electronic organizer/diaries;
- Wireless communication devices;
- Non approved SD Cards – approval by Experts or delegate is required for all SD Card images;
- Any additional software not supplied by Competition Organizers unless approved by Experts;
- Purchased items modified in any way prior to the Competition;
- Equipment that is similar or operates in similar manner as supplied equipment. Example – if a metal cut-off saw is provided by Competition Organizers, then no team may provide their own metal cut-off saw;
- All raw materials, components, parts, purchased item, tools and equipment not permitted in the Technical Description and List of Materials Allowed and Not Allowed of the skill.