

Requirements

Plant-based scientific experiments by scientists/ botanists/ students

- R1.1: User wants water levels to be a controlled variable in the experiment
- R1.2: Continuous measurements/ monitoring of soil moisture levels
- R1.3: Watering levels are controlled by user via potentiometer

Garden irrigation for plant parents away on holiday

- R2.1: User's plants are regularly watered
- R2.2: Needs to be fully automated
- R2.3: Must not be overwatered

Optional: Pond/ pool/ pet water bowl top up for users

- R3.1: User's pool/ pond/ water bowl needs to be regularly watered
- R3.2: Needs to be fully automated
- R3.3: Must not be overwatered
- R3.4: Needs a float switch for triggering

Specifications

Electrical Specifications

Requirement	Specification(s)	Acceptance Test Criteria
R1 An analogue moisture sensor input signal	S1.1 Connected to and constrained to the 0–3.3V range of an Op-Amp comparator circuit	Ensure voltage does not exceed 3.3V or go below 0V by lab-testing comparator's practical range
R2 3 LED's indicating soil moisture levels, related to sensing/comms board	S2.1 Red LED is ON when soil moisture levels are very low and water is required to be released from valves. S2.2 Orange LED is additionally ON when moisture levels are no longer critically low S2.3 Green LED is ON when soil moisture levels are adequate and valves are closed.	LED internal bias tolerances are negligibly small
R3 Switching power supply circuitry for sensing/comms board	S3.1 Switching power regulator: 24V DC from Power Supply regulated to 12V DC for valves	12V DC does not exceed 13V or go below 12 V.

Mechanical Specifications

Requirement	Specification(s)	Acceptance Test Criteria
R1 Two valves release water as required	S1.1 Valves release water when soil moisture levels drops below a user-specified amount – when only Red LED is on. S1.2 Valves close once soil moisture levels are adequate	Valves are waterproof and functional. Amount of water released by valves is within 3 cubic centimetres of the expected amount. Sensors are suitably placed in soil.
R2 User sets soil moisture level for which watering is required	S2.1 Potentiometer and moisture sensor circuit act as voltage divider S2.2 User able to access physically adjust potentiometer to set soil moisture level requirements	Potentiometer voltage divider accuracy is within 3% of the required values.
R3 Float switch/ humidity sensor additional replacement option	S3.1 Float switch triggered when water-level drops below user-specified amount	Water level float switch is triggered by is within 3 cubic centimetres of the designated level.