

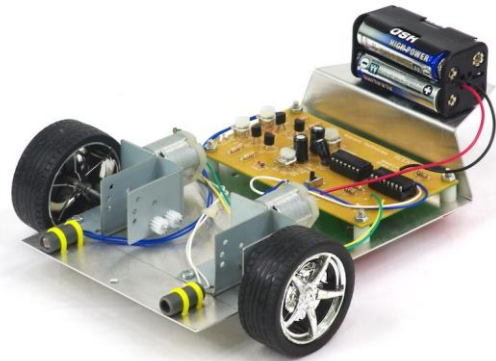


## SEEKER V2 (Code: SEEKERV2)

### DESCRIPTION

The *SEEKER V2* is a three-wheeled vehicle. Each front wheel is driven by a separate gearbox/motor. At the rear is a swivel mounted trailing wheel, allowing the vehicle to change its direction of travel easily.

The direction of travel of the vehicle is controlled by two LDRs (Light Dependent Resistors). When an object is approached, or shade is encountered the *SEEKER V2* will reverse and change its direction of travel. A PCB and a significant number of electronic components control the vehicle.



**LEVEL:**

**HOURS TO CONSTRUCT:**  
*Refer to "What's in the kit"*

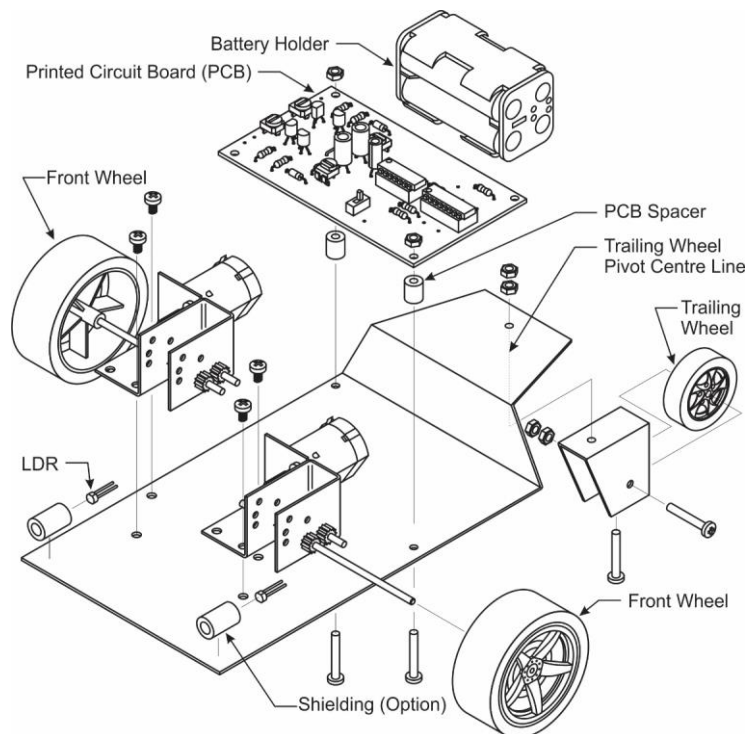
**SKILL DEVELOPMENT:**

Advanced

23 -29 hours – for Unassembled gearbox kits

20 -26 hours - for Assembled gearbox kits

- Planning and Design
- Manufacturing
- Soldering
- Mechanical
- Electrical





## WHAT'S IN THE KIT?

### OPTIONS AVAILABLE – ONE MUST BE SELECTED WHEN ORDERING:

SEEKER V2 – WITH UNASSEMBLED GEARBOXES

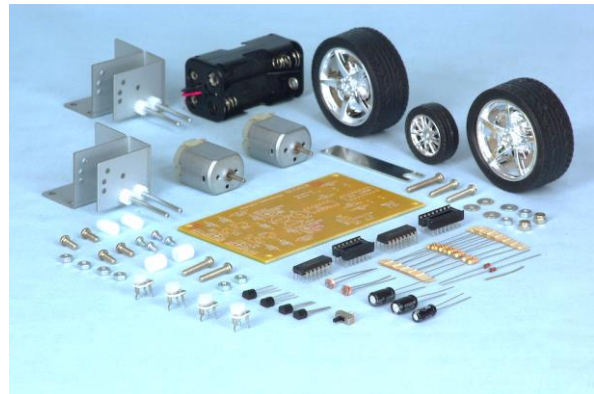
SEEKER V2 ASM - WITH ASSEMBLED GEARBOXES

NOTE: These 2 kits are fundamentally the same, with the only difference being that one provides students less mechanical assembly to carry out (which shortens the time required for the project)

- The teacher needs to be make this choice based on the available time and the individual student's mechanical assembly skill level.

### FOR ALL KITS:

- All the mechanical, electrical and electronic components required to make the *SEEKER V2* work including PCB, motors, gearboxes, shafts, wheels, battery holder and LDRs.
- A detailed teaching unit with a complete parts list, design suggestions, step by step instructions for soldering components onto the PCBs, gearbox assembly, and general construction guidelines.



## WHAT ELSE IS NEEDED?

The following items are required and are available from Scorpio Technology, but need to be ordered separately:

- 4 x Battery – AA Alkaline (BATTALK or BATTALK40 for a pack of 40)
- Multi strand hook-up wire – in a variety of colours (WIREHU10)

The following material is to be supplied by the student / teacher:

- Material for the base plate, bumper bar and trailing wheel carrier (PVC or acrylic sheet, aluminium, plywood, etc.)
- Block of wood to support gear case at the assembly stage. At least 25mm thick, that holes can be drilled into
- A 12mm thick piece of timber (to folding the aluminium trailing wheel carrier)

## TOOLS REQUIRED

The following tools are required:

REQUIRED TOOLS	ORDERING CODE
Assorted hand tools (depending on materials chosen)	-
Small Phillips screwdriver #1 point	SCREWDRPH1/80
Ruler and pen	-
Craft knife	CRKNF
Small hammer	HAMMERC
A small spanner	MULTITOOL
Soldering Iron and Soldering iron stand: – a good quality soldering iron, with a fine tip	SOLDIRN SOLDIRNSTD
<b>Or</b>	



Soldering station	SOLDSTN
Solder: – 0.71mm 60/40 solder is recommended	SOLD250/SOLD500
Wire strippers	WIRESTR
Side cutters	SIDECUT or SIDECUTM
Mini Bolt Cutters	BOLTCUTM
Drill Bit – 3.5mm	DB3.5

In addition, the following tools are useful to have and are available from Scorpio Technology, but need to be ordered separately if required:

- Component lead forming tool (for resistors, diodes etc.) (COMPLFT)
- IC Inserter (ICINSERT) / IC remover (ICEXTRACT) / IC straightener (ICSTRAIT)
- PCB Holder (PCBHOLD)

## ABOUT THE PROJECT

The major features of this project are the planning, design, construction and assembly stages of an advanced vehicle.

### PLANNING PHASE

Advanced projects such as the *SEEKER V2* require good time management from the student because of the number of components involved as well as the complexity of the project. Before commencing work the student should spend some time planning their project, drawing up a plan describing:

- The sequence of work that will be necessary to complete the *SEEKER V2*.
- A timeline showing the anticipated completion dates of each section of work.
- How the *SEEKER V2* operates.

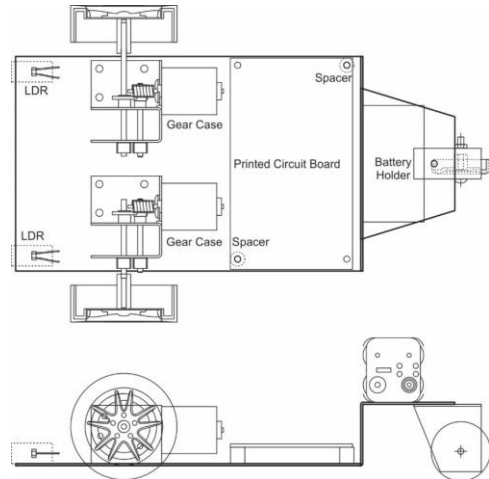
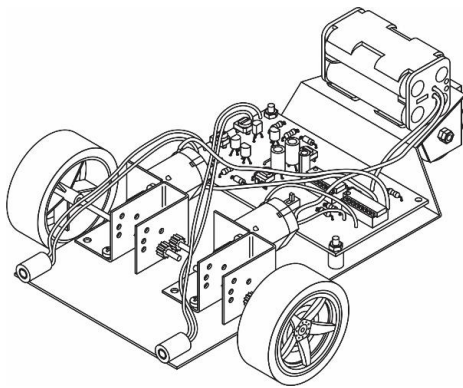
These plans should also take into account what items should be recorded throughout the life of the project. This may include maintaining a logbook, recording daily or weekly progress, problems encountered, measurements taken and observations made.

### DESIGN PHASE

Create your own unique *SEEKER V2* design based on our drawings which focus on component relationships, rather than dimensions. This provides scope for students to individualise their *SEEKER V2* design and increase their engagement in the project.

During the **Design phase**, students will need to:

- Evaluate the suitability of various materials, such as PVC, acrylic, aluminium plate, plywood or balsa wood
- Look at the vehicle's length, balance, turning circle, component layout, space efficiency
- Investigate how the vehicle's manoeuvrability is affected by the length of the chassis (i.e. by the distance between the front wheels and the trailing wheel)
- Select a gear ratio – two ratios are available for the student to trade off speed versus torque and manoeuvrability
- Understand how the vehicle's manoeuvrability is affected by the time the motors stay in reverse (using the adjustable time delay)
- Understand why a 4 wheel design is not suitable (or for the more advanced, what is needed to make a 4 wheel design possible)



- Consider aesthetic questions, for example: Can the appearance be improved?
- Determine the best location of the LDRs, and investigate a suitable form of shielding to reduce the amount of ambient light falling on the LDRs

The above design considerations could also be part of a class challenge, for example, to design a vehicle that can navigate an obstacle course.

## MAKING / CONSTRUCTION

Once the Design process has been completed, the students will be able to start **building their design**. They will:

- Make and assemble the *SEEKER V2* base plate/platform, trailing wheel carrier and bumper bar that they have designed
- Assemble and solder the main PCB and its components (resistors, diodes, capacitors, trimpots and ICs)
- Assemble and solder the bump switch PCB, and mount it in place
- Assemble and mount the two gearboxes
- Mount the PCB and all the other components to the baseplate
- Wire up the PCBs, microswitches and motors
- Test and adjust the *SEEKER V2* including setting the time delay for how long the motors will reverse
- Troubleshoot any problems!

## **DOES THE TEACHING UNIT INCLUDE ANY THEORY?**

The Teaching unit has a THEORY section, which covers:

- How the *SEEKER V2* operates -
- How the *SEEKER V2*'s circuits work including:
  - The circuit and its sub-systems
  - The reverse delay circuit (RC circuit)
  - The Schmitt Trigger Inverter
  - The motor control circuit

