



## Using the Roamer

### If you have never used a Roamer before:

- You control where the Roamer is going using the buttons on the top.
- The arrows obviously give the direction of travel or turn.
- The numbers allow you to control distance travelled, degrees turned etc.
- The unit of travel is **one** Roamer forward or backward.
- The unit of turn is 1 degree through.
- The only other important buttons at this stage are the **CM** button, which clears the Roamer's memory so that you can start from scratch, and the **GO** button, which you press when you want the Roamer to execute the instruction you give...



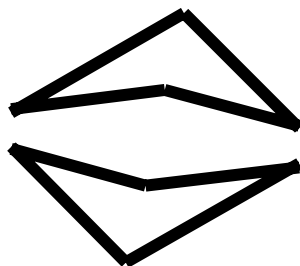
### Basic Roamer Commands:

Pressing this button when the Roamer is first switched on will run through a demonstration program.

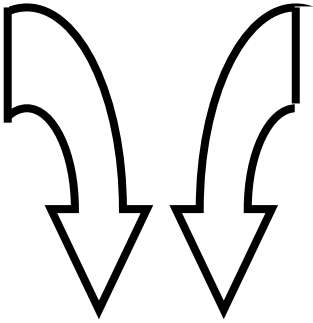


Pressing this button twice will clear the demonstration program from the Roamer's memory and allow you to add your own program.

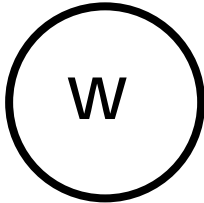
### (Always press this button twice before starting your Roamer work)



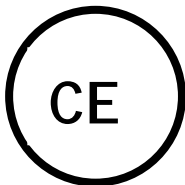
These buttons will move the Roamer forwards and backwards. Pressing one of these buttons then a number (from 1 to 99) followed by GO will move the Roamer. Roamers move in steps.



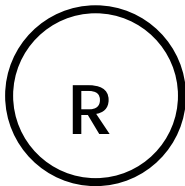
These buttons turn the Roamer left or right. Pressing one of these buttons then a number (up to 999) followed by GO will turn the Roamer. Roamers turn in degrees e.g. if you ask the Roamer to turn 90 it will turn a right angle.



This button tells the Roamer to wait. Pressing this button then a number followed by GO will make the Roamer wait. Roamers wait in seconds.



This button will cancel the last instruction or part instruction from the GO program.



This is a repeat button, it must be used with a number and brackets, for example when drawing a square.



This button is a sound button. The Roamer has a programmable sound facility. You need to specify how long each note will last (duration) and how high or low the note will be (pitch).

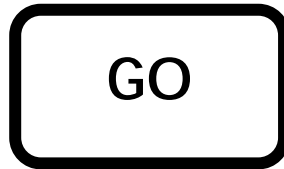
To play a note press this key followed by a number from 1 to 8 for its duration, and another number from 1 to 13 for its pitch.

If you want to rest enter 14 for the pitch.

## Roamer Programs

There are two types of program, the Go Program and Procedures.

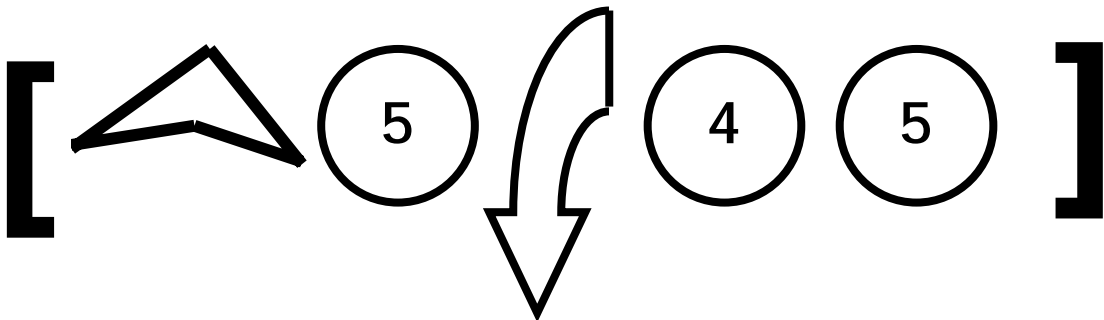
The GO Program is a list of instructions carried out when you press:

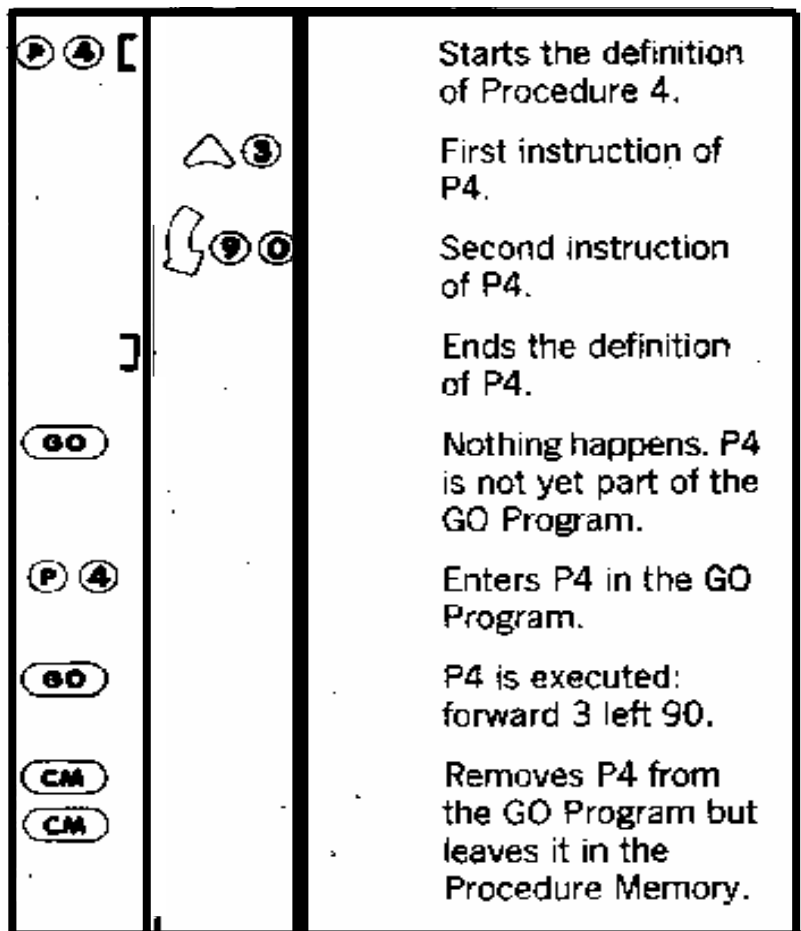


A Procedure is a list of instructions with a name. Once you have chosen the list of instructions you give it a name (e.g.P1) and then use that like any other instruction.

When you enter its name in the GO Program, the Roamer will carry out the whole procedure list.

(So if you write a procedure for moving as a square and name it P1 or P2 etc. each time you want to do a square you enter P1 rather than the whole procedure).





### Procedures

A Procedure is a list of instructions named P, plus a number from 1 to 99. The list is enclosed in brackets: [ ].

When keying in instructions in a procedure definition, sound cues for valid and invalid instructions are still made.

However a different pitch is used to inform the programmer that the instructions are part of a procedure, not part of a GO program.

## Roamer - Training notes.

Points to remember.

Before planning to use the Roamer in the classroom make sure it is sufficiently charged for your needs.

If the Roamer is not in use for more than a week remove the batteries.

If you switch off the Roamer, pause for at least three seconds before switching it back on to allow the microprocessor to reset.

If the Roamer does not beep when you switch it on, switch it off again and wait three seconds.

Before using the Roamer in a 'hands on' session for children I would suggest some preliminary activities for work in the classroom, for example (see attached sheet)

Go through Teacher Guides.

Go through the command keys.

Get the teachers to move the Roamer.

Introduce the activity cards and booklet and follow some of the tasks in them.

Play Skittles or pathways or into a box.

Explain about Procedures and leave the relevant sheet.

Ideas for activities prior to using the Roamer.

- Discuss with the children the meaning of the right angle 90 and amount of turn. Play a game whereby they are asked to turn 1 right turn clockwise or anticlockwise. Turn more than one...etc...where are they facing. Link this to maths work on Logo or Positions on a compass ( N,S,E,W)
- Introduce the  $\frac{1}{2}$  right angle 45o extending it to NE, NW, SE, and SW.
- Play Musical Roamer...using instruments and children (as the Roamer). A different instrument is used to represent fd., bk., rt., lt.
- In PE play Roamer where the children move around obstacles using Roamer commands.
- Use a floor map to travel around.
- Move around the desks in the classroom (Pathways)
- Get children to play skittles where they direct each other to knock over Skittles.
- Direct a partner into a cupboard, box, to a certain pre-set destination.

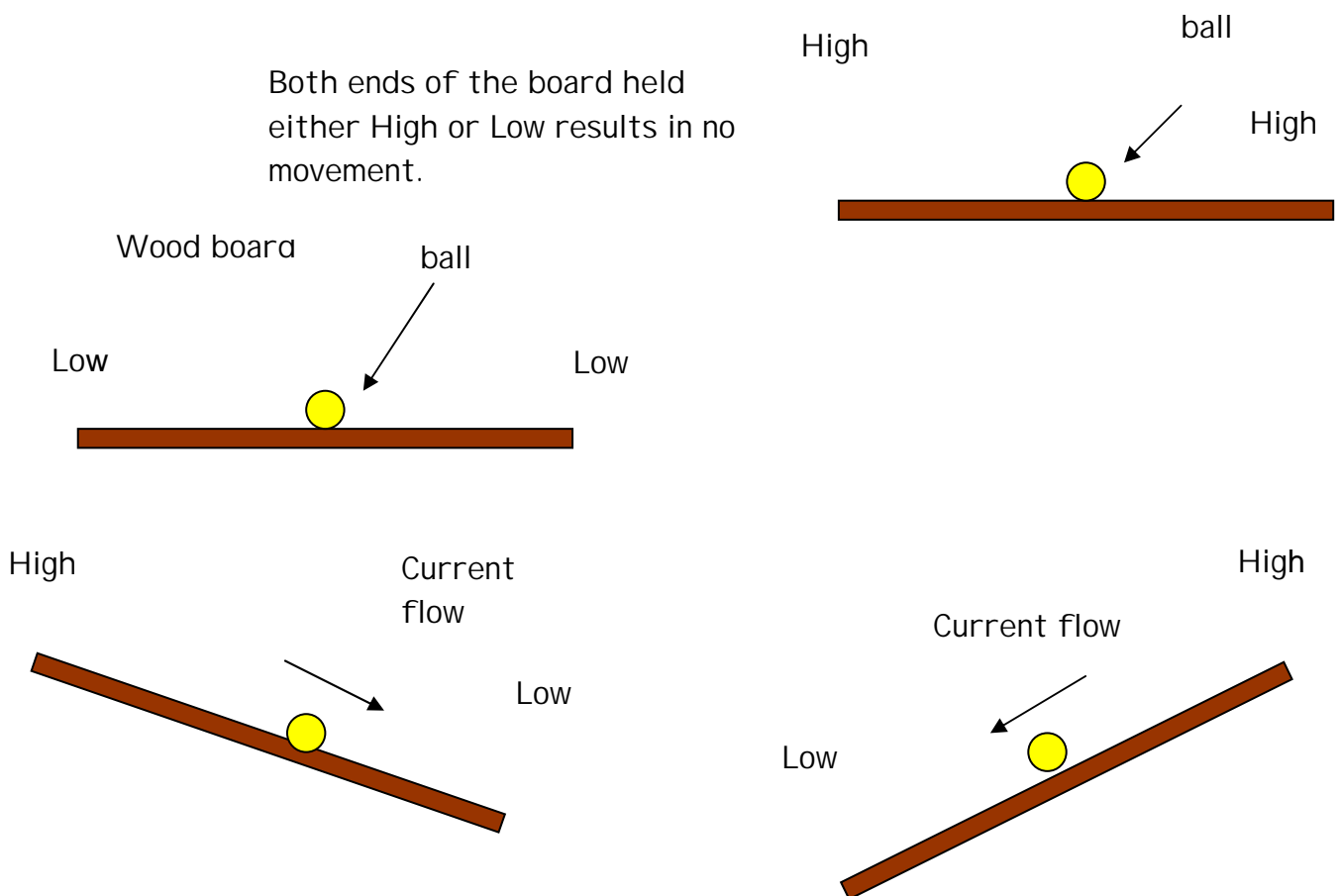
## Using Roamer with the Control Box

### Before Starting Control Work

You should know how to program the basic Roamer and be familiar with Roamer procedures. The Roamer is an electrical control system, so it is useful to understand a little about electricity:

1. Lights illuminate and motors turn because of the flow of an electric current.
2. An electric current flows between two points because there is a difference in voltage (energy level). For example - the positive terminal on a battery is at a High voltage level and the negative terminal is at a Low voltage. Current flows from High to Low voltage.

It is easy to see from these illustrations that a ball (energy flow) flows from high to low. This analogy is easy for children to understand.

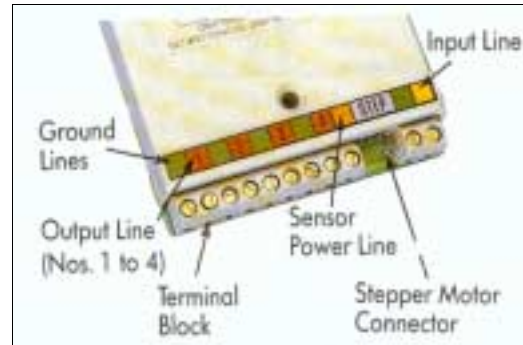


Tilting the boards results in movement (current flow) from High to Low.

## The Control Box

The Roamer Control box has:

- Four Two-state Outputs for DC motors, lamps, LED's, etc.
- A Stepper Motor drive
- An Input (for sensors)
- A Power Line for sensors
- Five Ground Terminals



More than one 'low' power device (e.g. LED) may be connected into a single Output. But only one 'power hungry' device (e.g. a DC motor) should be connected to each Output. For example, you can connect a DC motor and a LED to the same Output, but not two DC motors.

### Connecting a Stepper Motor

If a Stepper Motor connector is plugged into the Control Box the wrong way round, the motor will not turn. The connector of the Valiant Stepper Motor is marked with a lilac dot. Turn the Roamer upside down and push the connector in with the dot facing upwards towards you. If you use a different Stepper Motor, find the correct way to plug it in and mark it in the same way.

### Colour Coded Wires

The Control Box terminals and the wires on Valiant lamps, LED's motors and sensors are colour-coded to make connecting easier.

Red - Output

Green - Ground

Yellow - Input

Orange - Sensor Power

Lamps, DC Motors and Sensors are fitted with black wires. They can be fitted either way round.

**DO NOT** connect an external power supply (mains or battery) to any Roamer terminals.

**DO NOT** connect a Red Output directly to a green Ground Terminal.

**DO NOT** connect a Red Output directly to another Red Output.

## Programming Guide

### Outputs

The Roamer has four Two-state Outputs. These can be programmed to be in one of two states, either High or Low. The Outputs are numbered 1 to 4. When the Roamer is switched on, the Outputs are in a Low State. The Ground Lines are always Low.

### Programming an Output

To program a Two-state Output:

- Press **T** followed by a number from 1 to 4 to specify which output you are connected to.
- Then press 1 to set the Output to a Low state or 2 to set it to a High state.
- Once the Output is set to High, it remains High until the Roamer completes the GO Program (unless, of course, it is reset during the GO Program). At the end of a GO Program all Outputs return to their original Low states.



### Attaching Lamps to Roamer

- Roamer lamps are supplied with suckers so they can easily be attached to the Roamer case.

### Activity 1

- Connect a light to Output 1 and Ground on the Control Box (Black to Red and Black to Green)

GO Program

<b>T</b>	<b>1</b>	<b>2</b>	This sets the Output 1 High. (Turns light on)
	<b>9</b>	<b>0</b>	Roamer turns right with the light on
<b>T</b>	<b>1</b>	<b>1</b>	Set Output 1 Low (Turns light off).
	<b>1</b>		Roamer moves forward with the light off

## Activity 2: Roamer Car Headlights

Fit Roamer with headlights as outlined below. Make a tunnel. Program the Roamer to drive through the tunnel. It should switch its lights on when it enters the tunnel and switch them off when it leaves.

Attach a pair of lamps to Roamer's case.


- Connect one wire to **Terminal 1 (T1)** and the other to the **Ground Terminal** next door.
- Connect the second lamp in the same way but this time connect to **Terminal 2 (T2)** and the **Ground Terminal** next to that.

### GO Program

 3 Drive up to tunnel


T 1 2 Set Output 1 High (Headlight 1 lights up).

T 2 2 Set Output 2 High. (Headlight 2 lights up).

 4 Drive through the tunnel with lights on

T 1 1 Set Output 1 Low. (Headlight 1 turned off).

T 2 1 Set Output 2 Low. (Headlight 2 turned off).

 3 Roamer drives away from the tunnel



The Roamer drives towards the tunnel, turns its headlights on, drives through the tunnel, turns the lights off and drives away.

## Roamer Control : Inputs

### Sensors

A sensor on a robot has much in common with our own senses. When our senses are stimulated, they send signals to our brains along nerves. The Roamer's sensors send signals along the Roamer's Input Line to its microprocessor brain.

### Signals

We have seen how the Roamer controls its Output Line to be in one of Two-States, High or Low. Sensors do the same thing to the Roamer's Input Line. For example a Light Sensor makes the Input Line Low when the surroundings are light. The same sensor makes the Input Line High if the surroundings are dark. If the surroundings change from light to dark the sensor changes the Input Line from Low to High and vice versa. These changes are called "Signals".

### Recognising Signals

The Roamer can be programmed to recognise:

- 1 A High to Low change (e.g. light to dark).
- 2 A Low to High change (e.g. dark to light).
- 3 Low to High or High to Low (e.g. either a light to dark or a dark to light change).
- 4 The Roamer will recognise if the Input Line is already Low when the Sense Instruction is executed or if a High to Low Signal occurs. E.g. if the car starts its journey in the dark it will not recognise any change (Signal).
- 5 The Roamer will recognise if the Input Line is already High when the Sense Instruction is executed or if a Low to High Signal occurs

## Responding to Signals

When the Roamer recognises a specified Input Signal, it responds by executing a **Sense Procedure**. A Sense Procedure is like any other Roamer procedure, except it is referred to in a **Sense Instruction** and should not be used as part of the **GO** Program.

### The Sense Instruction

A Sense Instruction tells the Roamer which Input Signal to recognise and which Sense Procedure to execute.

- To enter a Sense Instruction, press **S** followed by a number for the Input Signal,
- Then another number for the Sense Procedure. (1,2, 3, 4 or 5 from above).

### Activity 3: Roamer Car Headlights (2) - Light Sensor

This is a development of the car and tunnel activity on page 4. Fit the car with a light sensor (following the colour-coded wires) and program it to turn on its headlights if its surroundings become dark.

#### GO Program

**S 1 1**

Respond to High low Signal by executing the Sense Procedure 1



**3 6**

Drives forward 36 units (or number of your choice).

#### Sense Procedure.

**P 1 [ T 1 2**

Set Output 1 High (turn on headlight 1)

**T 2 2 ]**

Set Output 2 High (turn on headlight 2)



## Using more than one Sense Instruction in a GO Program.



In a **GO** Program, every instruction entered after the Sense Instruction is subject to its influence. If a second Sense Instruction is entered, it replaces the previous Sense Instruction. The Roamer always responds to the most recent Sense Instruction.

### Roamer Control using the Touch Sensor



- Fit a Touch Sensor to Roamer by connecting the black wires to the **Yellow** Input Line and the **Green** Ground Line on the Control Box. The following activity programs Roamer to move away from an obstacle.

#### Activity 4:

##### GO Program

S	1	1	Respond to a High to Low Signal by executing <b>Sense Procedure 1</b>
	1	0	Move forward 10 Units (or a number of your choice). If a High to Low signal occurs (Roamer meets an obstacle), execute <b>Procedure 1</b> .
S	1	2	Change the Sense instruction. Respond to a High to Low Signal by executing <b>Sense Procedure 2</b>
	1	0	Moves forward 10 units. If a High to Low Signal occurs, execute <b>Sense Procedure 2</b>

## Sense Procedure

P	1	[		9	0	]	Start definition of Sense Procedure 1. Turn left. End definition of Procedure 1.
P	2	[		9	0	]	Start definition of Sense Procedure 2. Turn right. End definition of



The Roamer will move forward 20 Units. If a High to Low signal occurs during the first half of the journey the Roamer will turn left. During the second half it will cause a right turn.

## Ignoring Signals

Our brain can always choose to ignore signals sent to it from our sensors. Robots can also ignore Signals from their sensors. In fact a Roamer ignores all signals until a **Sense Instruction** is executed. To program the Roamer to ignore signals, press **S** without any numbers.

# Roamer Symbols

