

The LEARN & GO Controller and Activities



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Introduction

LEARN & GO is the first step towards control without a computer. It enables pupils to progress from using a switch in a simple circuit to 'programming' a sequence of on-off switch actions to bring picture to life and movement to models.

LEARN & GO can be thought of as an intelligent switch box with a memory. It is able to remember, or learn, the order in which switches are pressed, how long each switch is held down, and how long between the presses. LEARN & GO can then 'play back', from memory, the sequence of switch actions that a pupil has made.

When introducing LEARN & GO it will help to set the activities in context by making pupils aware of control sequences that they probably take for granted in their everyday lives i.e.

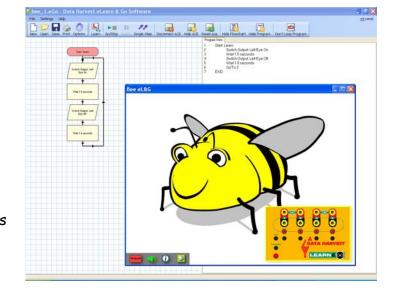
- Flashing advertising signs
- Traffic lights
- Belisha beacons
- Warning lights for school crossing patrols
- Flashing Christmas tree lights

The activities in this booklet progress from using one bulb in a simple circuit to using a selection of electrical components. The activities use bulbs, buzzers and motors.

To ease the progression from LEARN & GO to computer control:

- Ask pupils to describe the steps they have taken to create their sequence and what they need to change if they want to make it work differently.
- Ask pupils to plan the steps of their sequence or program on paper before using LEARN & GO. They can then use the plan to check that their program worked as they expected it to.
- Use the same language that is used in control software e.g. Turn Output x on.
- Use the eLearn & Go software (available from Data Harvest) to provide an on-screen Learn & Go for demonstration or model ACEs that operate as if connected to a Learn & Go controller.
 This software can show a program as it is created in line-by-line commands or as a flowchart thus making

the link with a computer



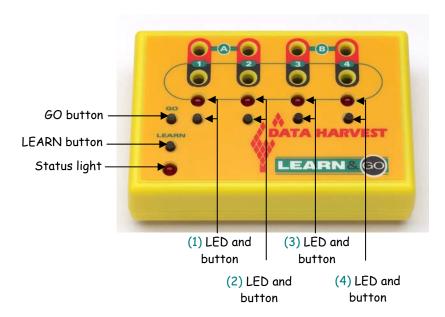
control program.

Using LEARN & GO to create a sequence

- 1. Connect a power supply the status light will flash.
- 2. Connect your components to the outputs e.g. bulbs, buzzers, motors.
- 3. Press the LEARN button (use a definite press) the status light will be lit solidly.
- 4. Press the buttons under the relevant Outputs to create a sequence
- 5. Press the GO button to leave Learn mode the status light will flash
- 6. Press the GO button again to run the stored sequence (the status light will be lit solidly as the sequence runs).
- 7. Press the LEARN button to stop the sequence running the status light will flash.
- To run the stored sequence again press the GO button
- To replace the existing sequence with a new version press the LEARN button.
- To **switch off** LEARN & GO, disconnect the power supply. The sequence is stored even if the power is disconnected.

When the power is re-connected the status light will flash. Press the GO button to run the stored sequence or press the LEARN button to create a new sequence.

It is worth spending a little time getting used to the button presses before starting the activities.

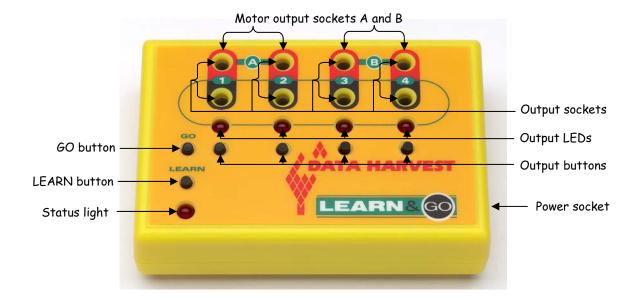


General information

LEARN & GO is able to learn the order in which switches are pressed, how long each switch is held down, and how long between the presses.

- When power is first connected, the status light will flash to signify that LEARN &
 GO is ready to either learn a new sequence or run the stored sequence:
 - 1. To **learn** a new sequence press the LEARN button and then press the output buttons to create a sequence.
 - 2. To **run** the stored sequence press the GO button and LEARN & GO will play back the last stored sequence continuously until stopped.
- An output's LED will light up while its button is pressed to signify that LEARN & GO is storing the action.
- More than one output button can be pressed at the same time.
- LEARN & GO will remember the length of time:
 - 1. The button is held down so keep it pressed down for as long as you want the output to be on
 - 2. Between button presses so wait the required time before selecting the next output.
 - 3. Between the last output button press and stopping Learn mode.
- LEARN & GO (V3) can hold up to 64 actions in its memory a press is one action, releasing the button is another.
- When LEARN & GO's memory is full, it will automatically leave Learn mode and the status light will flash.
- LEARN & GO remembers the last stored sequence, even if the power is disconnected.
- If the status light is lit solidly, LEARN & GO is either:
 - 1. Playing a stored sequence (Go mode) output LEDs will light on and off as selected in the sequence being run.
 - 2. Creating a sequence (Learn mode) output LEDs switch on when an output button is pressed.
- If the status light is flashing LEARN & GO is not in either the Learn or Go mode.
- Press the GO button to leave Learn mode, press the LEARN button to leave Go mode.

The LEARN & GO controller



Power

LEARN & GO (V3) can be powered using a 6 V mains power supply (see page 8) or 6 V batteries connected via the battery snap supplied.

A suitable power source needs an output that does not exceed 6 V=== (DC), 2000 mA. See page 9.

How to connect components to LEARN & GO

The output voltage from LEARN & GO is slightly less than the input voltage so when used with the 6 V mains power supply will be 5.5 to 6V.

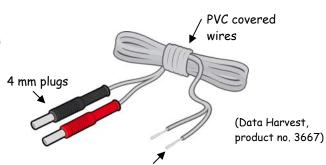
When connecting electrical components to LEARN & GO, please check their voltage rating is suitable e.g. when LEARN & GO is powered by a 6 V battery or power supply use 6 V MES bulbs, buzzers or 4.5 to 6V motors.

LEARN & GO unit has 4 pairs of output sockets, which are 4 mm in diameter.

The methods of connecting electrical components to these sockets include:

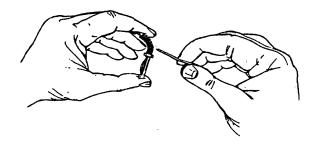
 Using a pair of 4 mm plugs fixed to PVC covered wire cable, which is then attached to the electrical component.

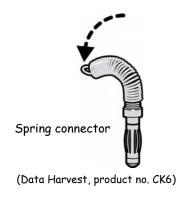
Note: 4 mm plugs are often referred to as Banana or Stackable plugs and can have either a solder or screw connection.



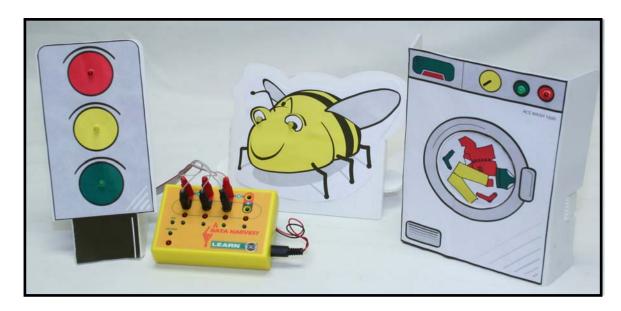
Bare wires to connect to an electrical component

2. Spring Connectors - the base of a spring connector is a 4 mm plug, the top part is a spring that is pushed back to trap the bare wires connected to the electrical component.





3. Using ready-made, ready-wired models with 4 mm plugs:



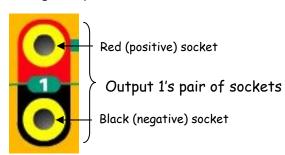
Model pack one - product no. 3604

Connecting Outputs

- Each output has a pair of 4 mm sockets.
- The outputs are labelled 1, 2, 3 and 4.
- Plug a 6 V output device e.g. bulb, into one of the pairs of output sockets.

TIP! A buzzer or LED will only operate if connected the right way round.

The state of an output is shown by the LED below the socket. When an output is switched **On** the LED will be **lit**. When the output is **Off** the LED will be **off**.



Examples of output devices include:







6V Buzzers (Square and Piezo): - connect the red lead from the buzzer to the red socket and the black lead to the black socket.

Light Emitting Diodes (LEDs) - any type can be used. For a standard LED connect a 470 ohm resistor in series with the LED to protect it from the excess current - alternatively a LED with in-built resistor can be used. Connect the long leg of the diode to the red socket and the shorter leg to the black socket.

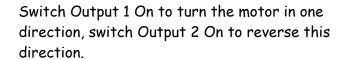


Small D.C. Motors

 If a motor is connected to Outputs 1, 2, 3 or 4 it will rotate in one direction only.



 If a motor is connected to the red sockets of a pair of output sockets (labelled A or B) it can be controlled both forwards and backwards (clockwise and anticlockwise).





Plug the motor into a motor output socket

Technical specifications

Mains power supply:

The 6 V mains power supply (Data Harvest, product no. 3611-2), is rated with an output of 6 V = == (0 - 2 A max) with a positive centre and a negative outer pin.

LEARN & GO has thermal over current protection and will not be damaged by a short circuit if powered using this power supply.

Safety Notice

A suitable power source needs an output that does not exceed 6 V === (DC), 2000 mA.

Any mains powered supply used to power LEARN & GO must include a low voltage transformer to fully isolate this unit from the mains supply. The mains power supply should have a regulated or switched output.

The warranty for LEARN & GO applies only if it has been used with either the power supply provided or with batteries that supply a maximum of 6 V, 2A.

Maximum current:

The maximum current supplied to each output is 600 mA with a total output (over all 4 outputs) of 1.3 A (1300 mA).

The supply for the outputs is via a 'resettable' fuse. Should the load exceed 1.3 A, unplug all the outputs and the fuse will automatically reset.

For example:

- The current required by $4 \times 6 \text{ V}$ (150 mA) ordinary MES bulbs is 600 mA, which is within the 1300 mA limit.
- The current required by $4 \times 6.5 \text{ V}$ (500 mA) High Intensity MES bulbs is 2000 mA, which exceeds the 1300 mA limit.

Outputs: 4 x digital outputs or 2 x motor drive outputs.

Memory: 128 byte programmable memory.

External dimensions: Approximately H 72 mm, W 108 mm, D 28 mm.

Weight: Approximately 120 g.

Please note:

- LEARN & GO contains no user serviceable parts.
- Using LEARN & GO in a way that is outside its normal operation (as described in this manual) may impair the unit's protection and ability to function correctly.

LEARN & GO Activites



Teacher's notes

Activity 1: Wink and Blink

You will need:

LEARN & GO and power supply
2 pairs of spring connectors
2 bulbs
2 bulb holders
4 lengths of wire
5tiff card
Pencils or crayons
5mall lump of plasticine and a pencil - see TIPs

For the additional activity: 1 buzzer and 1 pair of spring connectors

Objective:

Bring a favourite storybook character to life by drawing a face on card, and then use bulbs to make the eyes light up. The pupils will first create a program that makes the character wink with one eye, then with the other, and then blink with both eyes.

When the story is read out, the pupils can run the stored program to make the character wink and blink a couple of times whenever its name is mentioned. If you have a number of LEARN & GO units, several characters from the story could be selected.

TIPs

- 1. To create a hole for the bulb neck, push a pencil through the card into the lump of plasticine. The bulb can be screwed into the bulb holder from the front of the card so that the hole does not become too big.
- 2. A buzzer will only operate if the red wire is connected to the upper red socket, and the black wire to the lower black socket.

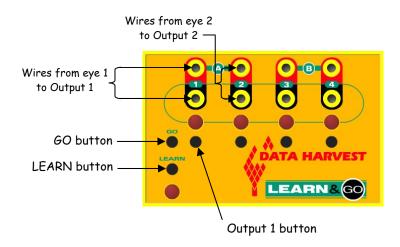
More ideas:

- Design a flashing lighthouse
- Design a warning light for a police car, ambulance or fire engine
- Add a buzzer and build a new program to make a noisy character

Activity 1: Wink and Blink

- 1. Who is your favourite character in the story?
- 2. Draw a picture of their face on a piece of stiff card and colour it in.
- 3. Ask your teacher to show you how to make a hole in the card for each eye.
- 4. Connect wire to each bulb holder.
- 5. Hold each bulb holder in position behind the eye hole and screw the bulb into the holder from the front of the card.
- 6. Connect the wires from one eye to Output 1 of LEARN & GO.
- 7. Connect the wires from the other eye to Output 2 of LEARN & GO
- 8. Connect LEARN & GO to its power supply the red status light will start to flash.





To make one eye wink twice:

- 1. Press the LEARN button (status light will be lit solidly).
- 2. Press the Output 1 button, hold down, and then let go, wait a short time, press the Output 1 button again, hold down, then let go.
- 3. Press the GO button to finish (status light will flash).
- 4. Press the GO button to play back the sequence (status light will be lit solidly).
- 5. Press LEARN to stop it running (status light will flash).
- 6. To make it wink again, press the GO button (press LEARN to stop it running).

Now try making a new sequence to make:

- The second eye wink.
- The left eye wink once, then the right eye wink once.
- The left eye wink once, the right eye once, then hold down both Output buttons at the same time to make both eyes blink together.

Teacher's notes

Activity 2: Twinkle, twinkle little star

You will need:

LEARN & GO and power supply

4 pairs of spring connectors

4 bulbs

4 bulb holders

8 lengths of wire

Stiff card

Pencils or crayons

Small lump of plasticine and a pencil - see TIPs

Objective:

Bring a display to life by adding flashing bulbs.

The pupils are to build a program that makes 4 bulbs switch on and off, one after the other to create a twinkling star.

This allows pupils to explore both switching a bulb on and off quickly, and switching a bulb on for a longer time to create different patterns of flashing lights.

TIPs

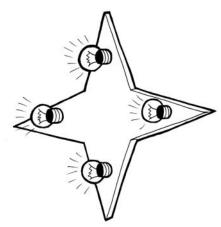
- 1. Push a pencil through the card into a plasticine lump to create a hole for the bulb neck. Push the bulb through from the front and connect the bulb holder from the back of the card so that the hole does not become too big.
- 2. If 2 or more bulbs are connected to an output they should be connected in parallel so that the light level from each bulb is the same.

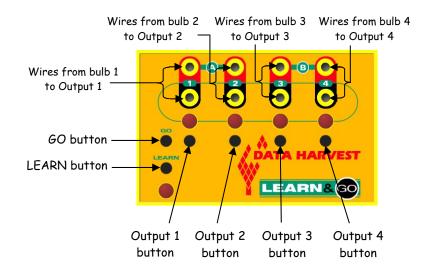
More ideas:

- Design a volcano display
- Design a seaside illumination
- Design an advertising display
- Design flashing Christmas tree lights
- Design a flashing fireworks display

Activity 2: Twinkle, twinkle little star

- 1. Draw a star on a piece of card, and mark the points you want to light up with a bulb.
- 2. Ask your teacher to show you how to make a hole at these points.
- 3. Connect wires to each of the 4 bulb holders.
- Hold each bulb holder in position behind a hole, and screw the bulb into the holder from the front of the card.
- 5. Connect the wires from each bulb holder to an Output on LEARN & GO.
- 6. Connect LEARN & GO to its power supply -the red status light will start to flash.





To make the bulbs light up one by one:

- 1. Press the LEARN button (status light will be lit solidly).
- 2. Press the Output 1 button, hold down for a short time, let go.
- 3. Press the Output 2 button, hold down for a short time, let go.
- 4. Press the Output 3 button, hold down for a short time, let go.
- 5. Press the Output 4 button, hold down for a short time, let go.
- 6. Press the GO button to finish (status light will flash).
- 7. Press the GO button to play back the sequence (status light will be lit solidly).
- 8. Press LEARN to stop the sequence running (status light will flash).
- 9. To make it 'twinkle' again, press the GO button (press LEARN to stop).

Extra Activity:

- Try making the bulbs flash on and off more quickly or more slowly.
- What did you do to make the bulbs flash more slowly?
- Try holding down more than one Output button at the same time and create a different 'twinkling' effect.

Teacher's notes

Activity 3: Round and Round!

You will need:

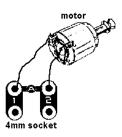
LEARN & GO and its power supply
1 pair spring connectors
1 motor with a removable pulley - see TIPs
2 lengths of wire
Stiff card
Pencils or crayons
Scissors
Small lump of plasticine and a pencil - see TIPs
Blu-Tack

For extra activity: 2 bulbs, bulb holders and 4 lengths of wire

Objective:

Learn how to use a motor with LEARN & GO to introduce dynamic movement to a picture or display.

The activity uses a bow tie attached to the motor shaft. Pupils can explore the effects of stopping, starting and reversing the motor.



TIPs

- As the hole needed for the motor shaft is only 2 mm wide, just use the pencil point to create a hole in the card.
- 2. Remove the pulley when pushing the motor axle through card. Place the bow-tie on the narrow part of the pulley before replacing the pulley on to the motor shaft. (This help to secure the bow-tie.)
- To support the motor at the back of the card use a ring Blu-Tack placed around the drive shaft end of the motor help it adhere to the card.

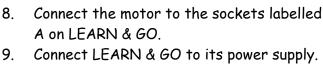
More ideas:

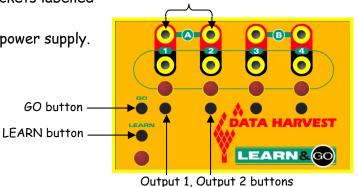
- Design a dynamic bus display.
- Design a fairground display which involves movement.
- Design an insect with moving wings.

Activity 3: Round and Round!

- 1. Draw a face on the card of a storybook character.
- 2. On a separate piece of card draw a bow tie, and cut it out.
- 3. Secure the wires tightly to the solder tags of the motor.
- 4. Mark and make a small hole on the neck where the centre of the bow tie will be.
- 5. Make a hole in the centre of the bow tie just large enough for a tight fit on to the narrow stem of the pulley.
- 6. Remove the pulley from the motor shaft, and then secure the motor to the back of the card.
- Push the narrow stem of the pulley through the hole on the bow tie. Then push the pulley onto the motor shaft.







Motor wires to Output A

To make the bow tie move:

- 1. Press the LEARN button (status light will be lit solidly).
- 2. Press Output 1 button and hold down for a short time, then let go.
- Wait for the motor to stop turning.
- 4. Press the Output 2 button and hold down for a short time, then let go.
- 5. Press the GO button to finish (status light will flash).
- 6. Press the GO button to play back the sequence (status light will be lit solidly). To stop the sequence running press LEARN (status light will flash).
- What happened to the bow tie when Output 1 is on?
- What happened to the bow tie when Output 2 is on?
- Decide what you want to happen and 'teach' LEARN & GO the new sequence.

Extra Activity:

Add bulbs as eyes, and connect to Outputs 3 and 4. Try making the eyes blink before the bow tie revolves one way and then the other.

Teacher's notes

Activity 4: Movement

You will need:

LEARN & GO and its power supply
1 pair spring connectors
2 long lengths of wire
Model vehicle built with a motor to drive an axle

For the extra activity: 2 bulbs, bulb holders and 4 lengths of wire

Objective:

Use LEARN & GO to control the movement of a buggy backwards and forwards.

Extra activity:

Add lights to the buggy to warn pedestrians when it is reversing.

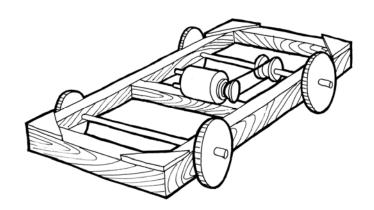
More ideas:

- Using a similar model without wheels, make use of the forwards and reverse movement to wind string around the axle.
- Design a motorised well.
- Design a scene from a poem with movement e.g. spider on a thread.
- Design a moving Christmas scene e.g. Father Christmas down the chimney.
- Design a ski-lift.

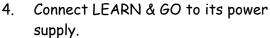


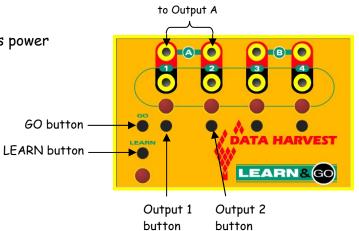
Activity 4: Movement

- Build a buggy and ensure the motor is mounted securely.
- 2. Position the pulley on the front axle in line with the motor pulley and attach a rubber band.



 Connect the two wires from the motor to the sockets labelled A on LEARN & GO.





Motor wires

To make the car go forwards and then backwards:

- 1. Press the LEARN button (status light will be lit solidly).
- 2. Press the Output 1 button and hold down for a short time, then let go. Wait for the motor to stop turning.
- 3. Press the Output 2 button and hold down for a short time, then let go.
- 4. Wait for the motor to stop turning and press the GO button to finish (status light will flash).
- 5. Press the GO button to play back the sequence (status light will be lit solidly). To stop the sequence running press LEARN (status light will flash).
- What happened to the car when Output 1 was pressed?
- What happened to the car when Output 2 was pressed?
- If pressing Output 1 made the car go in the wrong direction, what do you need to do?

Extra Activity:

- Try adding bulbs to your car and flashing them on and off whilst the car is moving backwards.
- Try using your buggy as a crane.

Teacher's notes

Activity 5: Fairground Ride

You will need:

LEARN & GO and its power supply
3 pairs of spring connectors
2 bulbs and bulb holders
6 lengths of wire
Model Ferris wheel with a motor attached

Objective:

The motor on the Ferris wheel can be used with LEARN & GO to control the movement of the model.

Lights can be added and made to flash at the same time as the model is moving.

TIP

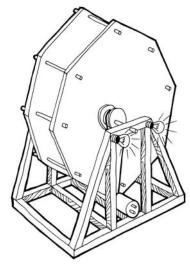
It is easier to control the switching on and off of the motor with one hand, whilst the other hand controls the lights flashing on and off. This requires good co-ordination, as you are being asked to do two things at once.

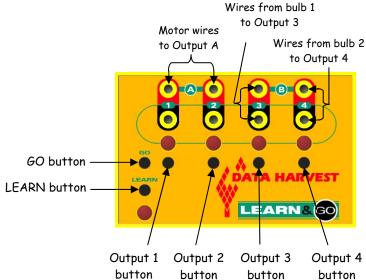
More ideas:

- Design a roundabout that moves one way and then the other.
- Design a barrier with warning lights.
- Design a washing machine program.

Activity 5: Fairground Ride

- Use a model of a Ferris wheel that has a motor attached and 2 bulbs fixed to the supports.
- 2. Connect the two wires from the motor to the sockets labelled A on LEARN & GO.
- 3. Connect the wires from the bulbs to Output 3 and Output 4.
- 4. Connect LEARN & GO to its power supply.

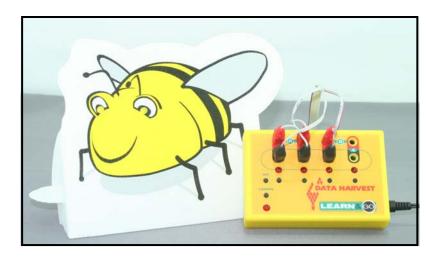




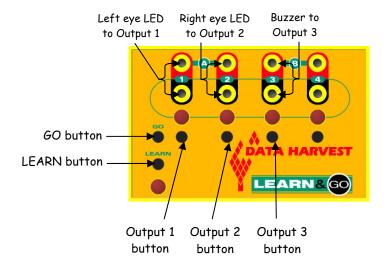
To operate the Ferris wheel:

- Press the LEARN button (status light will be lit solidly).
- 2. Press the Output 1 button, hold down for a count of 3, then let go, wait a count of 1 then press the Output 2 button, hold down for a count of 3, then let go, and repeat this sequence once more.
- 3. Press the GO button to finish (status light will flash).
- 4. Press the GO button to play back the sequence (status light will be lit solidly).
- 5. Watch what happens to the Ferris wheel. Decide how long you would like the Ferris wheel to turn in each direction. Press LEARN to stop the sequence from running (status light will flash).
- 6. Press the LEARN button, press Output 1 and 2 in the sequence you have decided for the Ferris wheel with one hand and with your other hand, press and let go of the Output 3 and Output 4 buttons for the light display.
- 7. Press the GO button to finish.
- 8. Press the GO button to play back the sequence (to stop the sequence running press LEARN).
- Does the Ferris wheel go backwards and forwards at the same time as the lights are flashing?

Activity 6: Using the Bee model



- Connect the Bee model to LEARN & GO e.g. left eye LED to Output 1, right eye LED to Output 2 and buzzer to Output 3.
- 2. Connect LEARN & GO to its power supply.



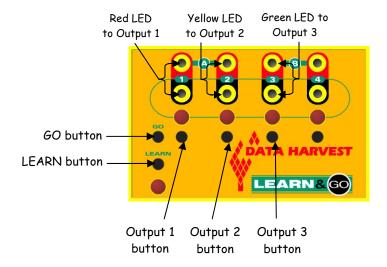
Program the Bee:

- 1. Press the LEARN button (status light will be lit solidly).
- 2. Press and release the Output 1 button, then the Output 2 button, then Output 3, and repeat this sequence once more.
- 3. Press the GO button to finish (status light will flash).
- 4. Press the GO button to play back the sequence (status light will be lit solidly). To stop the sequence running press LEARN (status light will flash).
- Decide exactly what you would like to happen and 'teach' LEARN & GO a new sequence.

Activity 7: Using the Traffic light model



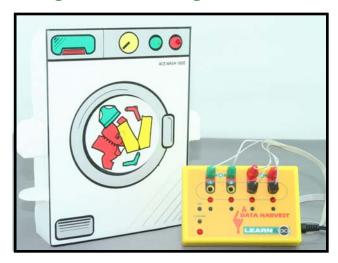
- Connect the Traffic light model to LEARN & GO e.g. red LED to Output 1, yellow LED to Output 2 and green LED to Output 3.
- 2. Connect LEARN & GO to its power supply.



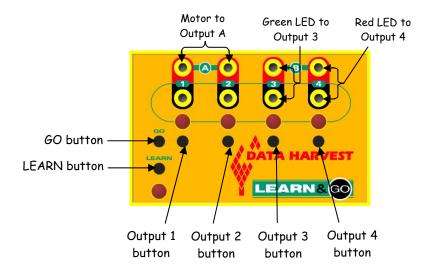
Program the Lights:

- Press the LEARN button (status light will be lit solidly).
 - Press the Output 1 button, hold down for a count of 3
 - Press Output 2 as well and hold down both buttons for a count of 2, let go
 - Press the Output 3 button, hold down for a count of 3, let go
 - Press the Output 2 button and hold down for a count of 2
- 2. Press the GO button to finish (status light will flash)
- 3. Press the GO button to play back the sequence (status light will be lit solidly). To stop the sequence running press LEARN (status light will flash)
- Is this sequence correct? Decide what you want to change and 'teach' LEARN & GO a new sequence.

Activity 8: Using the Washing machine model



- Connect the Washing machine model to LEARN & GO e.g. motor to Output A, green LED to Output 3, red LED to Output 4.
- 2. Connect LEARN & GO to its power supply.



Program the Washing machine

- Press the LEARN button (status light will be lit solidly).
 - Press the Output 3 button, and keep it held down
 - Press Output 1 and hold down for a count of 4, let go (keep Output 3 held down).
 - Press the Output 2 button and hold down for a count of 4, let go (keep Output 3 held down).
 - Release Output 3 and hold down Output 4 for a count of 2
- 2. Press the GO button to finish (status light will flash).
- 3. Press the GO button to play back the sequence (status light will be lit solidly). To stop the sequence running press LEARN (status light will flash).
- Is this sequence correct? Decide what you want to change and 'teach' LEARN & GO a new sequence.

Moving on to computer control

The difference between using LEARN & GO and using a computer to run a sequence of actions is that LEARN & GO needs button presses to teach it what to do, whilst a computer needs commands or instructions typed in.

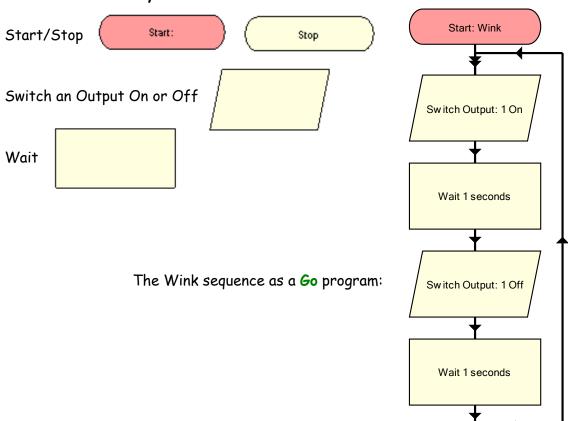
On the next page are **eLearn & Go** or **Go** symbols which could be cut out as cue cards to describe a sequence of actions as a flowchart. Pupils can write in the appropriate instructions so that the symbols and instructions are familiar before using a computer program. Pupils using LEARN & GO should be able to write down their sequence as a list of actions. They can then be introduced to the instructions that a computer would need to do the same task. Here is an example:

Example 1: Making one eye wink

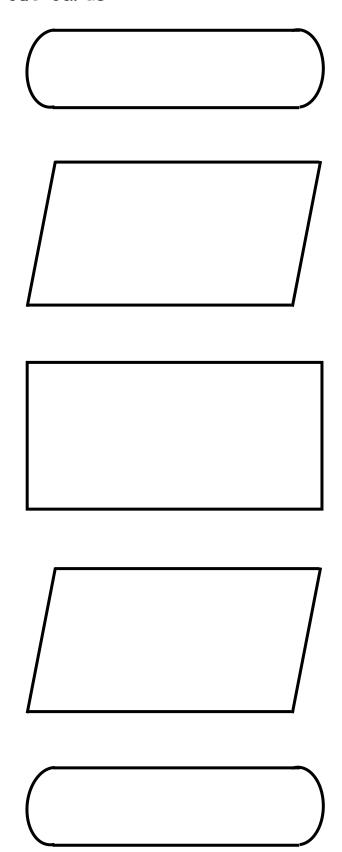
Pupil's Actions	Computer instruction
I pressed the LEARN button	Start
I pressed the Output 1 button	Switch Output 1 On
I held it down and counted 1	Wait 1
I let go of the Output 1 button	Switch Output 1 Off
I pressed the LEARN button	Stop

If you are going on to use the **eLearn & Go** or **Go** control software, then flowchart symbols could be introduced.

eLearn & Go or Go symbols



Flowchart cue cards



Warranty

LEARN & GO is warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase provided it has been used in accordance with any instructions, under normal conditions. This warranty does not apply if LEARN & GO has been damaged by accident or misuse.

In the event of a fault developing within the 12 month period, LEARN & GO must be returned to Data Harvest for repair or replacement at no expense to the user other than postal charges.

Note: Data Harvest products are designed for **educational** use and are not intended for use in industrial, medical or commercial applications.



WEEE (Waste Electrical and Electronic Equipment) Legislation
Data Harvest Group Ltd is fully compliant with WEEE legislation and is
pleased to provide a disposal service for any of our products when their
life expires. Simply return them to us clearly identified as 'life expired'
and we will dispose of them for you.

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