

Control It

Jack socket version

User guide

DELTRONICS

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Introduction

This document explains what the Control It Buffer Box is, what it does, and how to use it for computer control. For further information refer to your software manual. On the subject of computer control refer to one of the many books now available on the subject.

The Control It Buffer Box is a general purpose interface that gives you easy and protected access to the computer's user port. It has:

- eight input lines
 - eight output lines
 - four motor control pairs
- All via jack sockets.
- a dual voltage power supply,

The Control It Buffer Box can, with the correct interface leads, be connected to any of the following computers:

- BBC Model B, Master 128
- Archimedes
- RM 380Z, 480Z, and Nimbus
- Sinclair Spectrum
- IBM compatibles

Control It can be used with any computer that has an 'user' port giving access to eight input lines, eight output lines, 5 V and 0 V.

Software for control is available from many sources. Control It works with most of them.

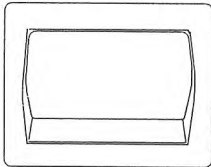
Setting up

1. Power

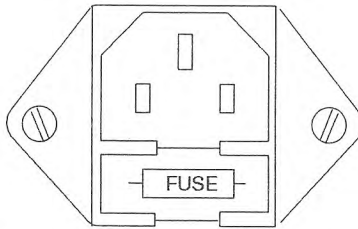
Caution: The Deltronics Control It is earthed. Please check that your mains' power supply is earthed correctly. Consult a qualified electrician if you are unsure.



Connect the Control It to the mains' supply by means of the mains' lead provided.



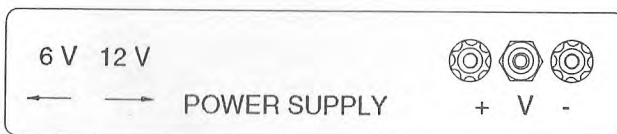
Mains' ON/OFF switch



Mains' inlet socket

Select the output voltage you require using the voltage range key switch on the front of the buffer box. The two voltages that can be supplied by the power supply are 12 V and 6 V

Control It can also be used to supply low voltage DC from the 3.5 mm jack socket, for other purposes. Or from the two 4mm sockets on the top which are marked with + and -. The voltage is the 6 V or 12 V selected.



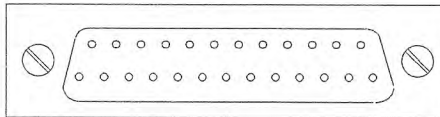
When you are ready, switch on the mains' power using the illuminated rocker switch on the rear right-hand side of Control It

Note:

If you accidentally overload Control It, it will automatically cut-out. This is because the power supply is stabilised and protected internally against overloads and short circuits. Normal operation resumes when the cause of the overload is removed.

2. Computer connection

Control It has a 25 way D-type socket at the rear, for the cable connecting it to a computer.



The appropriate cable for your computer will have been specified on your order and supplied with the Control It.

BBC Computers

Plug the 25 way D plug into Control It.

Plug the 20-way IDC connector fitted on one of the other two ribbon cable ends into the computer's User Port, and plug the 26-way IDC connector fitted on the remaining ribbon cable end into the Printer Port. Control It is now ready to use.

If you are using a BBC Master Compact you will require a Master Compact Companion and a Control It cable for the Master Compact, which has a 24-way Centronics plug on the Printer Port lead.

RM 380Z and 480Z

The cable for the RM 380Z and 480Z has a 25-way D-Type connector at each end. The end of the cable marked yellow/green connects to Control It, the other end plugs into the User Port of the computer.

RM Nimbus

For the Nimbus you require either an RM Piconet Parallel Module and a Control It RM cable (connect as for RM 480Z); or, an RM Parallel I/O Port and a Control It BBC cable (connect as for BBC computers).

Sinclair Spectrum

For the Spectrum you require a Spectrum Interface Module, which is available from Deltronics, and a Control IT RM cable (connect as for RM 480Z).

Archimedes

The standard Archimedes requires a BBC I/O expansion board and, in some cases, a backplane, for normal connection. The lead supplied is then plugged into the User and Printer ports.

IBM compatible computers

Check whether your computer has a parallel I/O board fitted. The lead supplied, plugs into the 25 way socket on the board and into Control It.

Note that Deltronics produce a BBC I/O expansion board for the Archimedes and a parallel I/O board suitable for most IBM compatibles.

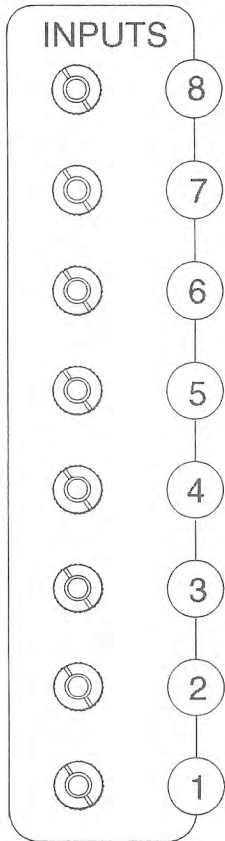
Input Circuits

The eight 2.5 mm jack sockets on the left of the top surface of the buffer box provide access to the computer's input lines. The input circuits are designed so that the computer is protected from damage that could be caused by accidental application of over-voltage or reverse voltage.

The input circuitry of your buffer box will be either *standard input* logic or *primary* logic.

With **standard input logic** the input sockets are normally 'high'. This means that when there is no connection between the wires to the input sockets, one of the wires has a potential of +5 V. If a switch connected between the input wires is closed, the corresponding computer input line becomes 'low'.

With **primary input logic**, the input sockets 'float low'. This means that when there is no connection between the wires attached to the input sockets, the computer's input lines, are 'low' and have a potential of 0 V.



If a switch, connected between the two wires attached to an input socket is closed, the corresponding computer input becomes 'high', i.e. the concept of operating a switch to turn something on.

The type of input logic you require will depend on the software you use. Some software has a 'software switch' and can cope with either type of input logic.

A buffer box can be converted from one type to another by changing two I.C.s (chips) fitted in sockets in the box. For further details contact Deltronics.

Output Circuits

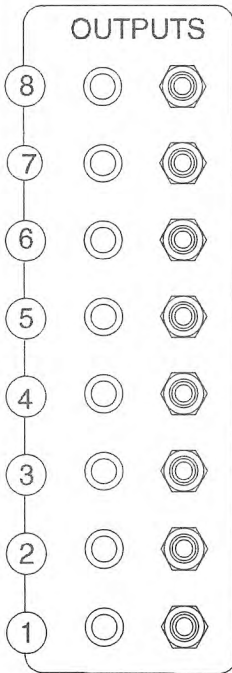
The eight 3.5 mm output sockets on the buffer box reflect the state of the computer's output lines. If the output line is 'high', then the corresponding output socket will be at a voltage of either 5.25 V or 11.25 V. The value depends upon the voltage you selected with the key switch.

The states of the output sockets are indicated by the LEDs alongside the sockets, a line is 'high' when the LED is on, and 'low' when the LED is off.

Lamps, buzzers, etc. can be operated by connecting them to an output socket.

Small DC. motors can also be operated in this manner, but with one direction of rotation only.

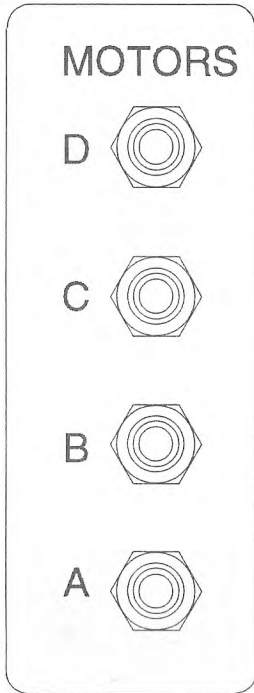
Two ID31 Stepper motors can be driven from the eight output lines.



The maximum current that can be supplied by these output circuits is limited by the power supply to a total of 1.5 A.

This total current can be drawn from one socket if required. No damage will result if an output socket is 'shorted'.

Motor Control Circuits



Using the motor control section of the buffer box, up to four small DC motors, can be controlled simultaneously.

The four sockets are four pairs, i.e. pairs 'A', 'B', 'C' and 'D' and should always be used as such.

If a motor is connected to pair 'A', then the state of the computer output line 0 determines whether the motor is 'on' or 'off'. The state of the output line 1 determines the direction of the rotation as the following table shows.

Computer output		State of motor
Line 0	Line 1	
Low	Low	Off
High	Low	On (forward)
High	High	On (reverse)
Low	High	Off

I.e. for the motor to turn, line 0 must be 'high'.

The motor control function of each of the computer output lines is as follows:

Output line	Function
0	Motor 'A' stop/start
1	Motor 'A' forward/reverse
2	Motor 'B' stop/start
3	Motor 'B' forward/reverse
4	Motor 'C' stop/start
5	Motor 'C' forward/reverse
6	Motor 'D' stop/start
7	Motor 'D' forward/reverse

Some degree of motor speed control can be achieved by pulsing the stop/start bit, thus switching the motor on and off repeatedly. The inertia of the motor's rotating components will maintain the movement. This feature may be available as a simple command in the software you are using.

In effect, the average voltage applied to the motor is reduced, thus reducing the speed of rotation. Controlling the mark-space ratio (on/off ratio) of the pulse, controls the speed of the motor. Note that with some motors the motion may not be smooth when operating in this mode.

Speed control is possible because the Control It Buffer box uses solid state circuitry for motor control, and not relays.

Technical Information

The nominal supply voltages are either 12 V or 6 V. There is a voltage drop across the buffer box internal circuitry so that the voltages available at the output and motor sockets are lower than the above supply voltages. With the outputs high, the voltages are:

	6 V range	12 V range
Output sockets	5.25 V	11.25 V
Motor sockets	4.5 V	10.5 V

The values of voltage drop given above are approximate only, and are for moderate values of load current (up to 500 mA). If you place a higher load on the buffer box, then the internal volt drop increases. This increase will not usually affect the normal operation of the buffer box.

The maximum current that the power supply can deliver is approximately 1.5 A.

The mains' transformer is of the toroidal type, and the mains' fuses are 5 A in the plug top, and 500 mA in the buffer box. The buffer box fuse is located in the mains' inlet socket, and for reasons of safety, cannot be removed when the mains' cable is connected to the buffer box.

In addition to the mains' fuses, a 3 A fuse is mounted on the printed circuit board of the buffer box.

In case of difficulty

If you experience any difficulty getting your Control It to operate, then try the following:-

- Check that the connections are correct and secure.
- Check that your software or your program is operating correctly.
- Try Control It without your software by typing in one of the sets of lines of Basic given below, that are appropriate to your computer.
- If the Control It is still not operating, please contact Deltronics.

Simple applications

The Control It pack contains some simple input and output devices. The action of each input sensor is detected and the action of each output device is controlled by simple commands in Basic.

If you are using one of the many good control programs available, the manual will show which commands are appropriate.

1. Input

Each of the input sensors has a 2.5 mm plug on the end of its lead. Push the plug into the first socket (marked 1).

The following few lines of Basic show how the input may be detected.

BBC

```
10 CLS
20 VDU 23 1 0
30 FOR I = 1 to 100
40 X = ?&FE60
50 PRINT X; " "
60 VDU 11
70 NEXT I
```

RM 480Z

```
10 PRINT CHR$(12), CHR$(22)
20 PUT 21
30 FOR I = 1 TO 100
40 X = INP(29)
50 PRINT CHR$(22):
60 PRINT X; " "
70 NEXT I
```

The loop is needed to give time to operate the switch.

The **Archimedes**

requires operating system calls, viz. OSBYTE 150 and OSBYTE 151. To achieve the same purpose as the above, write

```
10 osbyte% = 6
20 readbyte% = 150
30 offset% = &60
40 result% = 0
50 CLS
60 VDU 23 1 0
70 FOR I = 1 TO 100
80 SYS osbyte%, readbyte%, offset%,
result%TO,, result%
90 PRINT result%; " "
100 VDU 11
110 NEXT I
```

2. Output

A lamp or buzzer as supplied with Control It has a 3.5mm plug at the end of its lead because they are output devices. Push the plug into the first socket (marked 1).

For the **BBC** computer, the Basic is

```
10 ?&FE61 = 32
```

For the **RM 480Z**, it is

```
10 OUT 29, 32
```

For the **Archimedes**, it is

```
10 VDU 2
20 VDU 1,32
30 VDU 3
```

3. Motor control

Each of the grey leads supplied with Control It has a 3.5mm plug on one end and the other end is tinned ready for connecting to a motor. When the tinned ends are connected to the motor push the plug on the other end into the 'motor' socket marked A.

For the **BBC**, the Basic to turn the motor on is
10 ?&FE61 = 1
and reverse is
10 ?&FE61 = 3

For the **480Z**, forward is
10 OUT 29,32
and reverse is
10 OUT 29,3

For the **Archimedes**, forward is
10 VDU 2
20 VDU 1,1
30 VDU 3
and reverse is
10 VDU 2
20 VDU 1,3
30 VDU 3

4. Combinations

Light a lamp connected to output 3 using a switch connected to input 2.

BBC

```
10 ?&FE61 = 0
20 X = ?&FE60
30 Y = X AND 4
40 IF Y = 0 THEN ?&FE61 = 8: GOTO 20
50 ?&FE61 = 0
60 GOTO 20
```

480Z

```
10 OUT 29,0
20 X = INP(29)
30 Y = X AND 4
40 IF Y = 0 THEN OUT 29,8: GOTO 20
50 OUT 29,0
60 GOTO 20
```

Archimedes

```
10 osbyte& = 6
20 readbyte% = 150
30 offset% = &60
40 result% = 0
50 SYS osbyte%, readbyte%, offset%,
result%YO,,result%
60 Y = result% AND 4
70 VDU 2
80 IF Y = 0 then VDU 1,8: GOTO 100
90 VDU 1,0
100 VDU 3: GOTO 50
```

Specifications

Dimensions:	Length	240 mm
	Width	170 mm
	Depth	55 mm

Weight: 2.0 kg

Power Supply: 240 V in
6 V or 12 V out

Power for the LEDs and internal logic is drawn from the computer. The LEDs showing the state of the output lines can be used without the power supply being switched on.