Marconi RB2 TRACKER BALL

USER GUIDE
FOR THE
BBC Micro Model 'B' Version

Marconi

CONTENTS

1. WELCOME TO THE RB2 TRACKER BALL

This booklet and the cassette tape that goes with it will help you to get your Tracker Ball working and show you how versatile and accurate the Tracker Ball is in positioning the cursor on a video display.

For the more advanced user, this booklet contains technical information which explains how the Tracker Ball works and ways in which it can be programmed.

Firstly check that the box contains the following:
● Tracker Ball with inbuilt connecting cable.
● Tape cassette containing the Utilities program.

2. INTRODUCTION

The function of the Tracker Ball is to act as a pointing device to move the cursor on the video display.

Tracker balls evolved from joysticks, and are so accurate that the Tracker Ball is now recognised as the ultimate device for quick and precise control of a cursor.

The Marconi RB2/PC-1 Tracker Ball has been designed for the BBC Micro Model 'B' version and contains three user assignable buttons which can replace existing keyboard key functions or act as additional keys specially assigned by the user.

The tape cassette supplied with your Tracker Ball provides a Utilities program which allows you to run many of your existing programs but using the Tracker Ball instead of cursor keys, joysticks or 'mouse'. The tape also provides a demonstration drawing program Paintball.

To see how versatile and accurate your Tracker Ball is follow the next few pages of the booklet.

3. CONNECTING-UP

As a minimum you will need the following:

● BBC Micro Model 'B'
● Cassette player
● Monitor or television set
● Tracker Ball
● Tape cassette

The booklets supplied with your BBC Micro Model 'B' will tell you all you need to know about connecting up the BBC Micro, cassette player, disc drive unit and monitor (or television set).

Before connecting up the Tracker Ball, make sure that the electrical supply is disconnected or switched off.

Connect the Tracker Ball into the connector marked 'user port' on your BBC Micro Model 'B'. This connector is underneath the keyboard in the centre position.

Switch on the electrical supply. You are now ready to load the software.

4. SOFTWARE DESCRIPTION

Note: This software is suitable for BBC Operating systems 1.0 and above.

Enclosed with the Tracker Ball is a cassette tape, with programs to allow your Tracker Ball to be used with your BBC Model 'B' Microcomputer. The tape is titled SOFTBALL.

Side 1

1. A utilities program which assembles machine code cursor control and joystick simulation programs. It also provides a utility to allow the user to include a Tracker Ball facility in his own program.

2. A demonstration drawing program, called Paintball, which allows the user to create complex graphic displays using the Tracker Ball.

Side 2

1. A version of the utilities program suitable for saving to disc.

2. A slightly modified version of the demonstration drawing program on SIDE 1.

1. Utilities Program

This allows the user to substitute Tracker Ball

a) As cursor control in place of cursor keys. This is particularly good with Wordwise and in general program editing.

b) As replacement for the joystick used in certain compatible games.

c) Finally, a specially written utility is provided for inclusion in user-written programs.

Cursor Control Utility — TRACKER BALL

The cursor control option provides full control over the editing cursor using the Tracker Ball instead of the cursor keys. This is useful for word processing, e.g. in conjunction with Wordwise. The program also assigns the DELETE, RETURN and COPY functions to the three push buttons on the Tracker Ball. Alternatively, the user may assign his own choice of keys to these three push buttons. The only keys not permitted are ESCAPE, CAPS LOCK, SHIFT LOCK, CONTROL, SHIFT and BREAK.

Joystick Simulation Utility — JOYSTICK

This routine is intended for use with those games and other programs which would benefit from the use of Tracker Ball as an alternative to a joystick. The routine also allows a user-written joystick program to have a Tracker Ball alternative by including the BASIC ADVAL() function or using OSBYTE & 80.

User written programs — DIRECT

A programmer who wishes to build the Tracker Ball into his program would normally assemble this utility and save to disc or tape. It is then ready to assemble into his program when convenient.

Which joystick programs will work with RB2 Tracker Balls?

First, since the above utilities use 256 Bytes of memory when loaded, it is necessary that any joystick program to be run does not occupy the whole memory of the BBC.

Second, the above utilities must not be loaded into a memory location used by the joystick program to be run. The utilities program helps here by offering the user a choice of memory locations likely to be available. The correct choice is found by trial. In most instances the &900 location is suitable.

2. Demonstration Drawing Program Paintball

Paintball is a versatile but user-friendly package which allows the user to create four-colour drawings with the aid of the RB2 Tracker Ball. Both text and graphics can be fully mixed and the results can be saved to tape or disc for future use. The package is very easy to use, thanks to the use of a menu and the RB2 Tracker Ball, which vastly speeds up cursor positioning.

Cursor Control

The cursor controlled by the Tracker Ball is central to Paintball. The cursor is used for positioning and drawing points and also for helping to select options from the menu which is on the right hand side of the screen. The Tracker Ball functions as the sole input most of the time.

Buttons

The ball moves the cursor and the left hand and centre buttons are used as 'select' buttons. The right hand button is important. When it is pressed the X and Y co-ordinates of the cursor are displayed. If a shape is being drawn the distance D from the last point to the cursor is displayed. For a circle the radius R is displayed.

Colours

Four colours are allowed on the screen at any time. The colours are accessed via the bottom four buttons of the menu. Each of the colour boxes is split into two. When the left hand portion is selected, that colour becomes the 'current' colour and the 'ON' is displayed.

When the right hand portion is selected, the next colour in a sequence of four replaces the selected colour. A further push on the button selects the next colour and so on.

NOTE: The colour selected cannot be a colour already on screen.

Text

Text can be typed in from the keyboard at any time. If the text is not over the menu then it will be printed on the screen at the cursor position.

The text can be positioned on the screen by moving the Tracker Ball. Pressing a 'select' button freezes the text.

Text can be of the normal type or of a special compressed type which is only available in upper case. The compressed text is accessed by holding down the CTRL key while typing.

Menu functions available

GRID: When selected, a grid of points is superimposed on the screen. This is to help with alignment. Selecting GRID again takes the grid away.

The GRID function should be used with caution since grid points drawn over while the function is on will reappear while the function is switched off. See also section 6.

SOLID: Circles, triangles and oblongs will be drawn in solid if this function is selected, as well as the shape function. Otherwise they will be drawn in outline.

CIRCL: When selected, a circle may be drawn by first defining its centre, then any point on its circumference.

TRNGL: When selected, a triangle may be drawn by defining three cursor points.

OBLNG: When selected, an oblong may be drawn by defining two diagonal corners.

LINE: When selected, a line may be drawn by defining two points. Rubber banding is employed for ease of use.

DRAW: When selected, the user may draw free-hand. This is achieved by moving the ball, while holding down a 'select' button with the other hand.

FILL: After selection, an enclosed shape may be filled by positioning the cursor inside the shape and pressing a 'select' button. To stop filling, press ESCAPE key.

Note: It is only possible to fill over the background colour, that is, the colour shown 'ON' in the bottom colour box.

CLEAR: This resets the menu and clears the screen to the background colour.

LOAD: This will load a named drawing from disc or tape on to the screen for further use. See also section 6.

SAVE: This will save a named drawing, along with its colour palette to a disc or tape for future use.

USER: This function is left blank to allow a programmer to add a function of his own choice, e.g. a screen dump routine. The USER function may be intercepted as a procedure at line 6500 in PBALL 1.

The result of selecting USER on the standard unmodified system is merely to reset the menu.

CAT: This is a catalogue function available for disc systems only. When selected, a catalogue of the disc contents is displayed for three seconds.

5. LOADING AND RUNNING THE UTILITIES SOFTWARE

Programs written specifically to use Tracker Ball, e.g. Paintball, may be loaded directly from tape or disc and run immediately. Where the program to be run needs the Utilities, the following sequence of loading and running should be followed.

First insert side 1 of tape Softball into the cassette player and rewind.

To load, type CH.'' '', followed by RETURN and wait for the tape to load.

NOTE: If your machine is fitted with a disc filing system or Econet, remember to type *T. followed by RETURN.

Once loaded, the screen first displays an explanation of the system.

Next, an initial menu option is offered:

1. Proceed to UTILITIES

2. Pass straight to demonstration drawing Paintball.

3. Look at an EDIT DEMO. (Disc version only)

If UTILITIES is selected, the next menu offers UTILITIES

1. DIRECT
2. JOYSTICK
3. TBALL
4. HELP

as previously described.

Select your choice by moving the Tracker Ball and pressing the Tracker Ball centre button. HELP provides assistance. A brief explanation of the chosen utility is then displayed.

If JOYSTICK is selected — follow the sequence of screen menu selections summarised below:—

Menu 1 Asks if the joystick program to run uses Joystick 1, Joystick 2 or both. After a response:—

Menu 2 Asks which joystick connection is required — Acorn standard, reversed X and Y axes etc. After a response:—

Menu 3   Asks the user to select the memory location required for the location of the Utility. After a response:—

Menu 4   Tells the user that the Utility is now ready and offers the choice:—

1. RUN CODE if required to run immediately

2. SAVE CODE to disc or tape

3. RESTART if required

A frequently used utility should be given a file number and saved separately on disc or tape.

To RUN CODE simply press BREAK. A tell-tale MEDL-J symbol will then appear on the top of the screen next to 'BBC Computer'. The presence of this MEDL-J sign whenever BREAK is pressed is always an indication that the Utility is present.

You are now ready to load the main joystick program in the normal way.

If TBALL is selected:

Menu options are offered in a similar way to the joystick utility.

Menu 1   Asks the user to select the designation of the three Tracker Ball Buttons.

    1. DEFAULT KEYS (i.e. standard DELETE, RETURN, COPY)

    2. USER KEYS

If USER KEYS is selected press the choice of keys you require to be simulated by the given ball movements. Note, while this screen selection is present, DO NOT move the Tracker Ball.

Menu 2   Offers choice of memory location, as for JOYSTICK

Once the memory location has been selected, proceed as for JOYSTICK.

A MEDL-T symbol indicates the presence of the utility.

If DIRECT is selected:—

Choice of memory location is offered. Once this has been done proceed as for JOYSTICK.

A MEDL-D symbol indicates the presence of the utility.

Loading the main program

Load and run all main programs as normal, but use Tracker Ball instead of Joystick or cursor keys.

Hints

1. The main program may be run normally without upsetting the utility. Pressing BREAK or SHIFT/BREAK on most programs will not usually affect it. Only CTRL/BREAK will remove the utility.

2. If the memory location chosen for the utility won't allow the main program to be run, start again, and try another location.

3. Never try to load a utility into memory when one is already there. Always clear memory by pressing CTRL/BREAK.

4. In the final selection menu, if SAVE CODE is selected in error press BREAK and start again.

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6. LOADING AND RUNNING DRAWING PROGRAM PAINTBALL

CAUTION: Before attempting to load this program, always clear the memory by pressing CTRL/BREAK.

Insert Side 1 of cassette tape Softball.

Type CH 'PBALL' (RETURN) and wait for the tape to load.

NOTE: If your machine is fitted with a disc filing system or Econet, don't forget to first type *T. (RETURN).

When loaded the screen displays the prompt 'Do You require instructions (Y/N)'.

If you press Yes, the cassette commences to load the main program of instructions. This is several screens of text explaining how to use the program with Tracker Ball.

If you press No, the cassette loads the screen menu and you are ready to draw using the Tracker Ball.

Hints
1. When FILLING if a colour 'leaks' then press ESCAPE to stop filling.

2. Erasing. If a mistake is made it can be erased by drawing solid oblongs or triangles in the background colour over the troubled area.

Unwanted grid dots left superimposed on a coloured area may be removed, as follows:—

Select as background colour, colour of affected area. Select DRAW for individual dots or LINE for row of dots.

3. LOAD or SAVE selected by mistake.

If this happens, an 'Enter filename' appears at the top of the screen. Enter a dummy filename, e.g. QQQ(RETURN). The screen then displays LOAD Y/N or SAVE Y/N. If you type N screen returns to normal menu. If you type Y by mistake, a load onto tape or disc is attempted. Press ESCAPE, to return to normal menu.

4. BREAK is pressed by mistake.

To restore the menu type RUN followed by RETURN.

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7. TRANSFERRING TO DISC

Side 2 of the Softball tape contains a version of the Utilities and Paintball suitable for transferring to disc.

To help you do this, a disc-making program is included at the beginning of the tape.

To load type *T. (RETURN)
Then CH." "

Once the new disc is made it can be called up by CH." " INTRO" " (RETURN)

The Marconi RB2 Tracker Ball is designed for desk top mounting and is housed in an attractive plastic moulding styled to match the modern office environment.

The Tracker Ball is operated either by the fingers or by the palm of the hand and is free to rotate in any direction without limiting stops. The ball sits on two freely rotating steel shafts at right angles to each other and a roller bearing forms a third support point. The two shafts drive optical encoders which produce trains of electrical pulses in X and Y directions, the number of pulses produced being proportional to the vector quantities derived from the ball's movement. The pulses are shaped internally such that the final output of the Tracker Ball is 2 trains of square wave pulses for each of the X and Y directions. The phase relationship between these pulses determines the direction. This is clear from the output waveforms.

In addition, the Marconi RB2 Tracker Ball has three buttons which can have any function assigned by the user.

The RB2 Tracker Ball does not contain its own electrical supply. It requires only a 5 volt dc supply for operation and it derives this supply from the user port of the BBC Micro Model 'B'.

Output Waveforms

X1 (Y1) Leading means RIGHT (DOWN)

X2 (Y2) Leading means LEFT (UP)
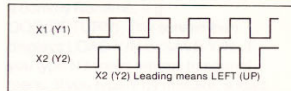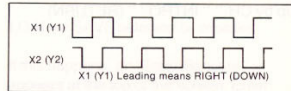
Physical Characteristics

Length	:	200mm (7.87 in)
Width	:	115mm (4.53 in)
Height	:	70mm (2.76 in)
Weight	:	600gm (21.12 oz)
Ball diameter	:	57mm (2.25 in)
Ball colour	:	Brown
Body colour	:	Ivory
Tracking force	:	30gm (1.06 oz) Tangential force on ball periphery
Drive ratio	:	200 pulses $\pm$5% for 1 full ball revolution in X or Y direction.
Buttons	:	Three, each user assignable. Guaranteed life 10^7 operations per button.
Operating temperature	:	5° C to 45° C
Storage temperature	:	-10° C to 60° C

Electrical Characteristics

Cable Length	:	1 metre (39.37 in)
Connector Type	:	20-Way connector compatible with BBC Micro User Port.
Input Power Requirements	:	5Vdc 5% 60mA max from user port of BBC Micro Model 'B'.
Square Wave Outputs	:	Standard 5V TTL levels. Encoded square wave outputs are quadrature coded to provide directional information.
Button Outputs	:	Normally 5V TTL level. Output falls to OV when button is pressed. The switch outputs are normally logic '1' and logic '0' when pressed.

The Tracker Ball outputs are fed directly into the user port with the port defined as an input. The CB1 and CB2 lines are used in conjunction with PB3 and PB4 for sensing pulses and determining the direction of rotation of the ball.

The connections are:—

CB1		X1
CB2		Y2
PB0		Left switch button
PB1		Middle switch button
PB2		Right switch button
PB3		X2
PB4		Y1
PB5, PB6, PB7, not used		
5V		Power Connection
0V		Power Connection.

An occasional clean and polish of the ball is normally sufficient to keep the RB2 running smoothly.

In the event of liquid spillage past the ball, the inside of the RB2 should be dried out. First remove the 4 screws holding the top cover of the RB2. Next, remove the top cover and then the ball. Carefully dry all parts with a non-fluffy cloth and reassemble.

(handwritten annotations:)

Next to connections list: 2) CB1, 4) CB2, 2) PB0, 3) PB1, 10) PB2, 12) PB3, 4) PB4, PB5,PB6,PB7 not used (16-20), 1) 5V, 0V (5-19)

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mouse
CB1    X1
CB2    Y2
PB0
PB2
PB1,3,4 - not used
PB5  — LH Button
PB6  — Middle Buttons
PB7  — RH Button
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