

TASMAN TURTLE MANUAL

written by

Terrapin and Flexible Systems

Terrapin Inc.
380 Green Street
Cambridge MA 02139

Introduction

The Tasman Turtle is an accurate versatile robot that is easy to command from any computer language. Logo routines have been written (and are included) to help you start. With your turtle you can draw complex figures, and "feel" your way around a room.

The Turtle is interesting and educational for youngsters and researchers alike. Hook it up and try it.

Setup

Your Tasman Turtle comes with:

Power Supply (black box)

Interface Board and Cable

Tasman Turtle Control Language Disk

Warranty Card

Please send in the warranty card to get information on changes and enhancements to your turtle. This is an important step to maintain support for your turtle.

To use your turtle:

- 1) Turn off your Apple
- 2) Plug the interface card into **slot 2**
- 3) Plug in the two banana plugs into your Turtle Power Supply box. Red goes in red and black in black.
- 4) Turn off the power supply
- 5) Plug your power supply into the wall.

Now you can turn on your Apple and load in your programs. If you turn on your Turtle Power Supply before running the SETUP procedure (to put the turtle in an initial state) the turtle may have its eyes on or the horn on. This may be annoying, but not harmful.

Two small red lights should be on inside the turtle on the green boards. Further, if you push the touch ring against a sensor switch, the corresponding lamp should light in the group of four lights in the front. If none of these lights work, go back and check to see that the power supply is hooked up correctly.

Logo Interface

The Tasman Turtle can be commanded directly from Terrapin Logo by loading the routines on the accompanying disk in the file "TASTCL". You should feel free to modify the enclosed programs, or add new ones to extend your turtle's capability.

Here is a summary of the command you can use immediately

SETUP should be run after reading "TASTCL"

TFD :dist movement commands

TBK :dist

TRT :angle

TLT :angle

EYESON eyes commands

EYESOFF

TPU turtle pen commands

TPD

HORNHI horn commands

HORNLO

HORNOFF

MOVEUNTIL :direction :distance :condition (see conditional motion section)

LTOUCH? outputs the state of the corresponding touch

sensor- true or false. ex: IF LTOUCH? TLT 30

RTOUCH?

FTOUCH?

BTOUCH?

FTOUCHONLY?

BTOUCHONLY?

LTOUCHONLY?

RTOUCHONLY?

ANYTOUCH?

NOTOUCH?

TOUCH outputs the state of the touch sensors as a number computed as follows:

start with 0 and then

if the front is touched then add :FRONTBIT (4)

if the back is touched then add :BACKBIT (8)

if the left is touched then add :LEFTBIT (1)

if the right is touched then add :RIGHTBIT (2)

Most of these are discussed in the Terrapin Tutorial so I will only discuss the ones that are different.

Motion Commands

The motion commands (eg. TFD) are executed by a piece of assembly code for smooth motion. The source code is F.CODE and in the Logo Assembler format, allowing you to add or modify these routines. (see the Terrapin Technical Manual for Assembler information) The assembled code is in the file TASTCL.BIN and is automatically loaded by setup. IF you have some special code that you keep in the machine language space of Logo then you can use the routines in "TTCL" instead of "TASTCL"; but this will not bother most people).

Conditional Motion

The Tasman Turtle has the ability to move until it hits something. Before each turtle step, whether turning or going straight, the turtle can test its bumpers to see if it should proceed. This allows the user to control what the turtle should do if it hits something along the way.

The easiest way to use this feature is the MOVEUNTIL procedure.

MOVEUNTIL :direction :distance :condition

If you called MOVEUNTIL TFD 100 :FRONTBIT, the turtle will move 100 turtle steps,

unless it hits something in front. In that case it would stop moving and go on to the next command. The turtle can be made sensitive to more than one direction by adding the BITS before the MOVEUNTIL command.

eg. MOVEUNTIL TFD 100 :FRONTBIT + :LEFTBIT

will be sensitive to front and left touches but will ignore back and right touches.

FOR EXPERTS ONLY

Another way to use this feature is the UNTIL command.

UNTIL :condition

Takes a number or word as input and does that test before **all steps in the future.**

So if you said UNTIL :FRONTBIT and then TFD 100 it would do the same as MOVEUNTIL example but the condition would persist in future motion. If you call UNTIL 0 the turtle will not stop for anything, and if you call UNTIL :ANYBIT it will stop for anything.

Calling UNTIL with a number is a versatile way to control the conditions.

Combination of conditions is made by adding them as in MOVEUNTIL

The only procedures that change the UNTIL set condition, is SETUP and MOVEUNTIL.

I recommend that you play with it to see what it does. You might want to change the UNTIL procedure.

Screenturtle Option

You can have the turtle's movements reflected by the screen turtle by typing:

```
MAKE "SCREENTURTLE "TRUE
```

Many people like this option. If you want to happen all of the time you can change the SETUP routine to make "screenturtle "true rather than "false as the routine is now written.

Example

After hooking up your turtle and loading Terrapin Logo type:

```
READ "TASTCL
```

SETUP now you are ready to go.

Maybe you want to make a square, so type

```
REPEAT 4 [TFD 20 TRT 90] and away it should go.
```


Fine Adjustments

Certain parameters can be changed to suit your preference.

:CALIBR and :CALIBL are calibration variables to make your turtle work exactly in degrees. This may range from 1.0 to 1.1 (default is 1.05). You may want to change this if your turtle does not turn exactly 180 degrees. :CALIBR is for right adjustments and :CALIBL is for left adjustments.

TSTEP is the size of each turtle step in the Forward and Backward routines. This can be changed by

.DEPOSIT :TSTEP <number> (default is 10).

TSTALL controls the speed of the turtle. This can be changed a bit but not much.

Change by

.DEPOSIT :STALL <number> (default 12).



FLEXIBLE SYSTEMS

**INC.
TASMAN TURTLE CO.**

219 LIVERPOOL STREET
HOBART, TASMANIA 7000 AUST
Tel. (002) 34 3064

RUNNING YOUR TASMAN TURTLE IN BASIC

The Tasman Turtle is a general purpose personal robot designed to have all the flexibility needed to encourage hobby, educational or professional use. The Turtle is easiest to use when used in conjunction with the higher level language LOGO, however, any other language including machine code can be used to run the Turtle.

The following is a brief guide to allow the Tasman Turtle to be used with Basic. You will discover new possibilities and greater versatility using the turtle robot this way.

Housed inside the Tasman TurtleTM is a General Purpose Interface board which allows up to 64 bits of input/output data to be utilised.

This is arranged as four 8 bit input ports and four 8 bit output ports:

	IN	OUT
PORT 1	(W)	(W)
PORT 2	(W + 1)	(W + 1)
PORT 3	(W + 2)	(W + 2) = R
PORT 4	(W + 3)	(W + 3)

The 8 bits of Port 1 input are dedicated to the 8 Turtle functions described below.

The first four bits of Port 3 output are dedicated to the four Turtle sense switches. All other bits are free for custom use, or for use by Turtle options such as the Turtle Talk TM.

If port 2 of the Apple II is used then $W = -16224$ and $R = -16222$ where W stands for Write (for the Turtle) and R stands for Read (from the Turtle)

To operate the turtle functions

POKE W, X

- where X = 16 - lamps on
- 32 - pen down
- 64 - toot low
- 192 - toot high

More than one function can operate simultaneously. e.g. to put the pen down and the lamps on

POKE W, 48 (48 = 16 + 32)

To turn everything off

POKE W, 0

To move the Turtle

```

100 POKE W, A
110 GOSUB 1000
120 POKE W, B
130 GOSUB 1000
140 GOTO 100

```

```

1000 FOR T = 1 TO TT
1010 NEXT T
1020 RETURN

```

Where

MOTION	A	B
FORWARD	8	13
BACK	2	7
LEFT	10	15
RIGHT	0	5
RIGHT WHEEL	0	1
or	0	4
LEFT WHEEL	2	3
or	8	12

The value of TT is best between $\phi - 5$; the larger the value the slower the turtle will move.

To sense the touch switches

```

100 A = PEEK (R)
110 IF A = X THEN GOSUB
120 GOTO 100

```

or

```

100 A = PEEK (R)
110 IF A = 255 THEN 100
120 IF X = 254 THEN
130 IF X = 253 THEN
etc.

```

Where X =

	L	R	F	B
L	254			
R	252	253		
F	250	249	251	
B	246	245	243	247

- LFB - 242
- RFB - 241
- LFR - 248
- LBR - 244
- LBFR - 240

If no switch is operated then X = 255

To operate the turtle functions

POKE W, X

- where X = 16 - lamps on
- 32 - pen down
- 64 - toot low
- 192 - toot high

More than one function can operate simultaneously. e.g. to put the pen down and the lamps on

POKE W, 48 (48 = 16 + 32)

To turn everything off

POKE W, 0

To move the Turtle

```

100 POKE W, A
110 GOSUB 1000
120 POKE W, B
130 GOSUB 1000
140 GOTO 100

```

```

1000 FOR T = 1 TO TT
1010 NEXT T
1020 RETURN

```

Where

MOTION	A	B
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or	8	12

TASMAN TURTLE

MINIMUM CONFIGURATION (Minimum Turtle)

Functions:

- Left Motor Set Direction
- Left Motor Toggle
- Right Motor Set Direction
- Right Motor Toggle
- Horn
- Horn Tone
- Lights
- Pen Solenoid
- Auxiliary Input
- Left Sense Switch
- Right Sense Switch
- Front Sense Switch
- Back Sense Switch

Address	Function	Notes
0000	CRASH	
0001	STOP	
0002	START	
0003	STOP	
0004	STOP	
0005	STOP	
0006	STOP	
0007	STOP	
0008	STOP	
0009	STOP	
000A	STOP	
000B	STOP	
000C	STOP	
000D	STOP	
000E	STOP	
000F	STOP	

Specifications:

Power Requirements

12VDC (Nominal)

1.5 Amp (Max.)

Stepping Motors

Step Angle - 7.5°

Voltage - 12VDC

Max. Frequency - 100Hz

Control Inputs

High - On

Low - Off

Sense Switches

Normally - High

Active - Low

Auxiliary Input

12VDC, 1 Amp Drive Current (Max)

High - On

Low - Off

Dimensions

Diameter - 385mm

Height - 180mm

Ground Clearance - 20mm

Drive Mechanism

Direct Drive

- Wheel diameter - 60mm
- Pulses per revolution - 168
- Gear ratio - 3.5 : 1

Drive Logic

- LMS Left Motor Set direction
- LMT Left Motor Toggle

- RMS Right Motor Set direction
- RMT Right Motor Toggle

Set Direction High - clockwise
 Low - anticlockwise

MOTION	LEFT MOTOR	RIGHT MOTOR
FORWARD	LOW	HIGH
REVERSE	HIGH	LOW
RIGHT TURN	LOW	LOW
LEFT TURN	HIGH	HIGH
RIGHT WHEEL (F)	LOW	OFF
LEFT WHEEL (F)	OFF	HIGH
RIGHT WHEEL (B)	HIGH	OFF
LEFT WHEEL (B)	OFF	LOW

Connecting Plug

25 Pin RS 232 Plug

(Grey) +12 VDC	1	0	14 - LMT	(Red)
(Grey) +12 VDC	2	00	15 - LMS	(White)
		00	16 - RMT	(Cream)
		00	17 - RMS	(Grey)
		00	18 - Lamp	(Light Blue)
		00	19 - Pen Sol.	(Violet)
		00	20 - Horn	(Blue)
		00	21 - Tone (Aux)	(Green)
		00	22 - B SW	(Yellow)
		00	23 - F SW	(Orange)
(Grey/Black) GND	12	00	24 - R SW	(Brown)
(Grey/Black) GND	13	00	25 - L SW	(Black)

Maintenance

It is anticipated that the Tasman Turtle will be relatively free of maintenance, however, as with all mechanical devices, certain adjustments may have to be made from time to time and dependent on the frequency and nature of use.

Adjustments are simple to make.

Sensor Switches

See Fig. 1

1. The Peripheral Sensor Band is held in a central position by the micro switch actuators.
2. To adjust the band loosen each of the four micro switch setting screws (a1, a2, a3, a4) and the four micro switch holding screws (b1, b2, b3, b4).
3. Adjust the band until the gap $A1 = A2 = B1 = B2 =$ approx. 3mm.
4. Tighten the screws.
5. Check that each switch is actuated by the Peripheral Sensor Band.
6. Check that the band returns to its central position after each switch is actuated.

Note: The micro switch should not be adjusted out so far that it is always actuated, nor in so far that the Peripheral Sensor Band cannot actuate it.

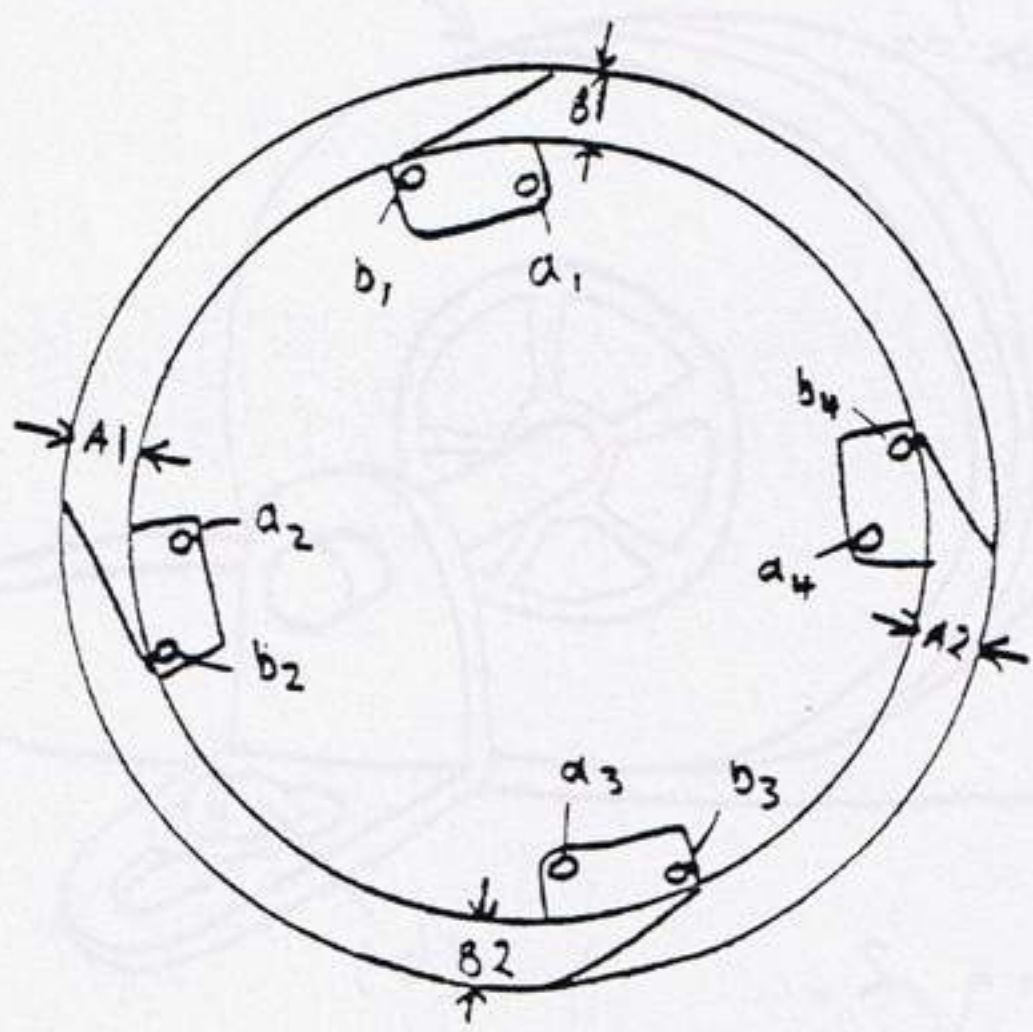


Fig. 1

Motor Drive

See Fig. 2

1. Adjust for good mesh (a) between G1 and G2 by loosening the angle bracket screw (b) and adjusting wheel (c) sideways.
2. Further adjustment is possible by loosening the motor front mounting screws and pushing G1 down on G2 gently.
3. Good mesh is obtained when any visible gap between G1 and G2 just disappears.

Note: Do not adjust the angle bracket so far that the wheel rubs on the base plate.

The motor drive mechanism will vibrate if held in the air while adjusting. Test all adjustments by running on a flat surface.

Too much pressure between G1 and G2 will cause the motor to miss steps.

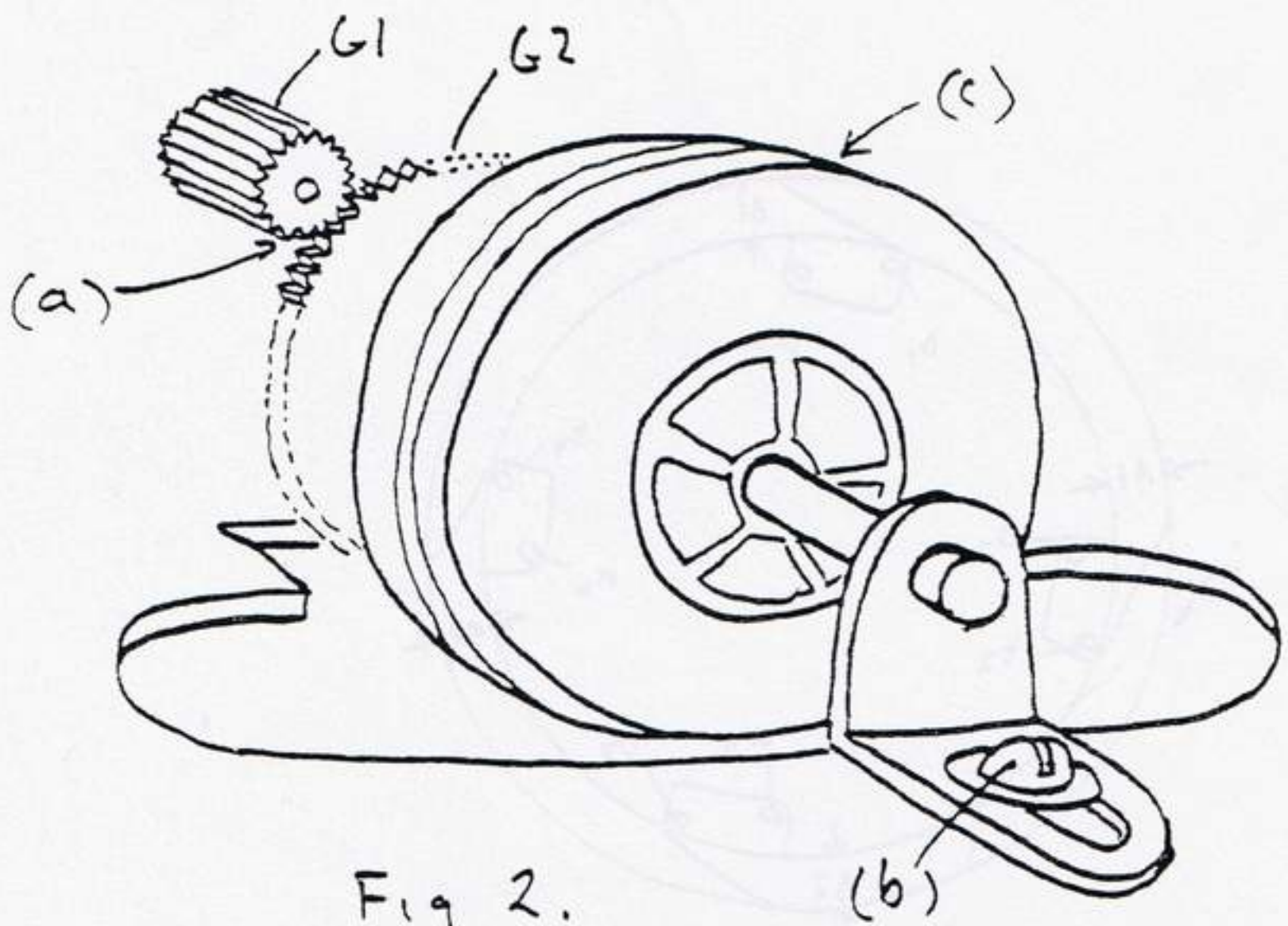
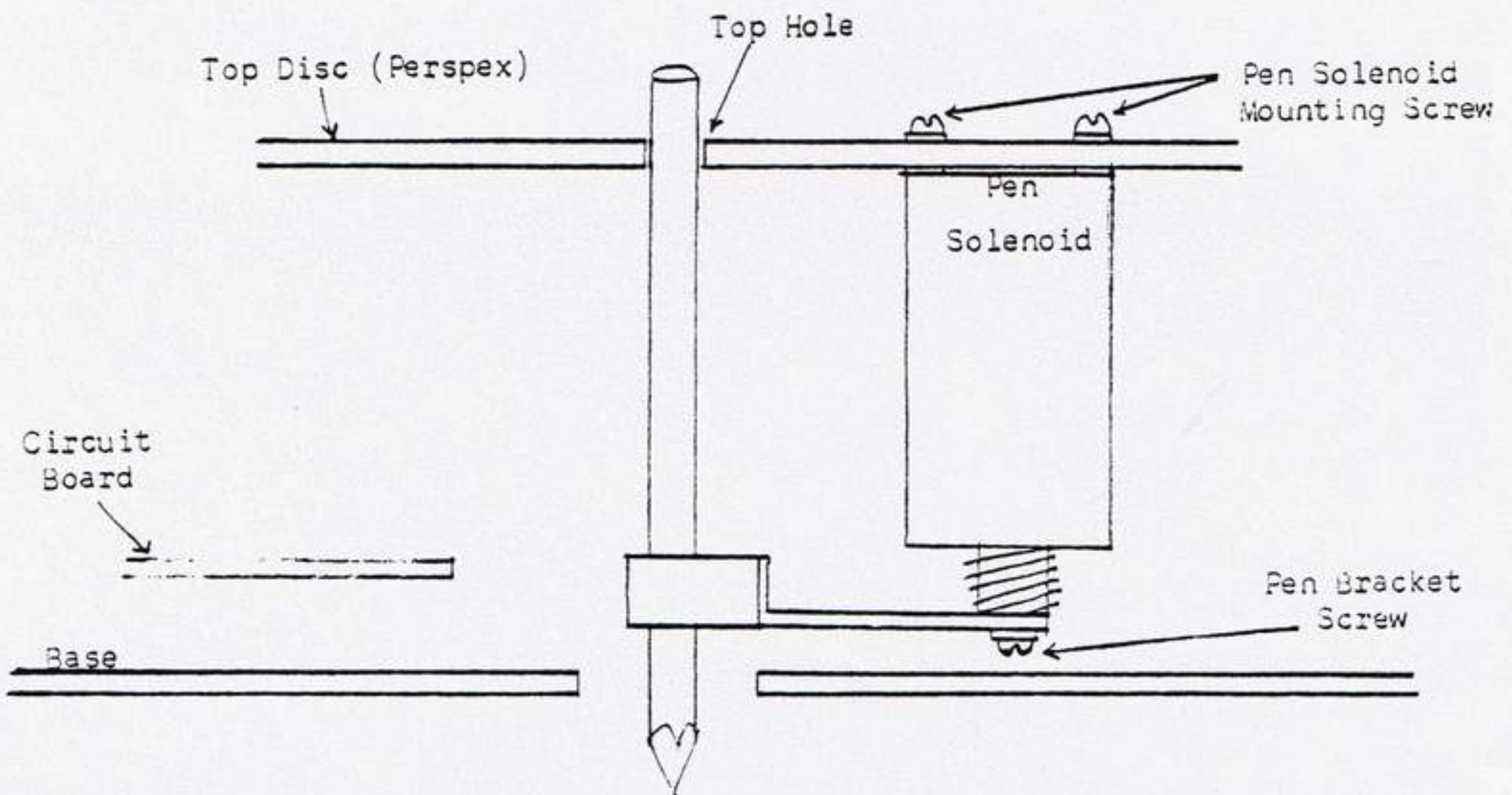


Fig 2.

See Fig. 3

1. Centering of the pen is done by adjusting the pen solenoid mounting screws.
2. Remove dome by removing the four flange nuts on the long micro switch screws
3. The dome will move off to the side, do not pull on the cable or plugs.
4. Adjust pen solenoid by trial and error till the best centering is obtained.
5. The best centering is obtained when the pen leaves a small dot or the smallest circle when the Turtle rotates 360° .
6. The turtle can be operated with the dome disconnected by simply placing the dome over the base, but not putting the four flange screws on.
7. If centering cannot be obtained satisfactorily then the Pen bracket Screw may need to be adjusted. This should be done rarely.
8. Replace dome and flange nuts ensuring that the cable and plugs inside the turtle are satisfactory.
9. The pen must not rub against the top hole in the perspex disc.



Auxiliary Input

If a specific function is required but not provided, provision has been made for owner modifications.

1. Connect the horn-pitch input to the auxiliary input.
2. Connect the function device (solenoid, oscillator, light, Dc motor, etc.,) to the auxiliary output.
3. Test by applying 12VDC to the Horn/Auxiliary input.

Note: That the two tone horn function is sacrificed to allow this modification, but the single pitch function (low pitch) is retained.

