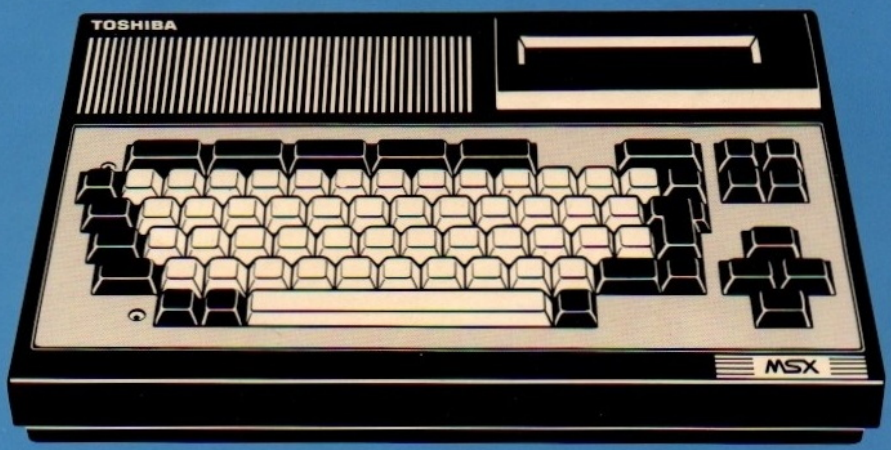
TOSHIBA

MSX

HOME COMPUTER OWNER'S MANUAL

MODEL **HX-10**



CONTENTS

SAFETY PRECAUTIONS 2
INTRODUCTION 3

CHAPTER 1 — SETTING UP 5
1. TOSHIBA HX-10 PACKAGE CONTENTS 6
2. CONTROLS AND CONNECTIONS 6

CHAPTER 2 — GETTING STARTED 9
1. CONNECTING TO A T.V. RECEIVER 10
2. CONNECTING TO A CASSETTE/DATA RECORDER 10
3. TUNING T.V. TO YOUR COMPUTER 11
4. LOADING THE SAMPLE PROGRAM 12
5. CONNECTING TO AN AUDIO SYSTEM 13
6. EXPANDING THE CAPABILITIES OF YOUR HX-10 13
7. PROGRAM LOADING FROM AUDIO CASSETTE TAPE 14
8. PROGRAM LOADING FROM ROM CARTRIDGE 14

CHAPTER 3 — KEYBOARD OPERATIONS 15
1. KEYBOARD LAYOUT 17
2. DATA KEY OPERATIONS 18
3. CONTROL KEY OPERATIONS 21
4. FUNCTION KEY OPERATIONS 23

CHAPTER 4 — MSX BASIC 25
1. BASIC PROGRAMMING 26
2. BASIC PROGRAM DEVELOPMENT PROCEDURE 27
   (1) PROGRAM INPUT 27
   (2) PROGRAM VERIFICATION 27
   (3) PROGRAM DEBUGGING 28
   (4) PROGRAM EXECUTION 30
   (5) ERROR MESSAGE 30
   (6) PROGRAM SAVING 30
3. PROGRAMMING EXAMPLES 31

CHAPTER 5 — IN CASE OF DIFFICULTY 37
BEFORE CALLING FOR SERVICE 39
   (1) CASSETTE PROBLEMS 39
   (2) KEYBOARD FAILURE 40
   (3) ROM CARTRIDGE FAILURE 40
   (4) AUDIO SYSTEM FAILURE 40
   (5) JOYSTICK FAILURE 40
   (6) DISPLAY FAILURE 41

CHAPTER 6 — SPECIFICATIONS 43
SPECIFICATIONS 44

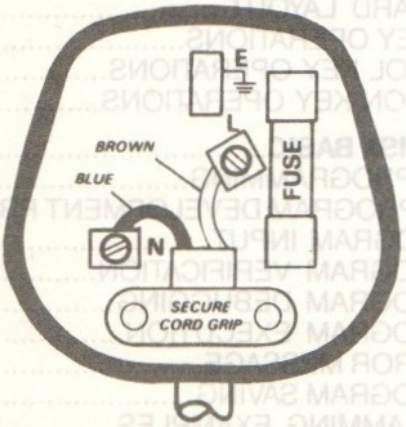
● **APPENDIX**
1. CHARACTER CODE LIST 46
2. ALPHABETICAL ERROR CODE LIST 48

SAFETY PRECAUTIONS

Mains Supply
The mains supply required is 240 volts 50 Hz. A plug is not supplied with the computer because of the wide variety of wall sockets used in domestic dwellings. You will therefore need to have fitted to the mains lead a plug suited to the particular sockets in your home.

We recommend that where possible a 13-amp. plug is used, FITTED WITH A 3-AMP. FUSE. Connect the plug as described in the instructions below.

IMPORTANT
The wires in the mains lead are coloured as follows:
BLUE : NEUTRAL
BROWN : LIVE



Connections to a typical 13-amp. plug

These colours might not be the same as those used to identify the terminals of your plug, so connect the wires as follows:

BLUE — to the terminal marked N, or coloured black
BROWN — to the terminal marked L, or coloured red

ALWAYS SWITCH OFF YOUR COMPUTER BEFORE INSERTING OR REMOVING A ROM CARTRIDGE
See Page 14

INTRODUCTION

The Toshiba HX-10 Owners Manual has been compiled to enable you to properly set up the equipment, to familiarise yourself with the connection and operating procedures, and to begin using the computer as quickly as possible.

The Toshiba HX-10 incorporates many exciting features such as built-in music and sound effects with a connection point for stereo or hi-fi, multi-window graphics for creating 'perspective' in graphic images, and, of course, sufficient connections allowing you to expand the system as your computing requirements grow.

A sample program cassette included with your computer demonstrates the HX-10's versatility and gives an early opportunity for 'hands on' experience.

Before running any program, however, we recommend you follow the procedures outlined in the Chapters on 'Setting Up' and 'Getting Started'.

NOTICE

1. The contents of this manual are subject to change without prior notice.
2. When using a special application program or computation procedure on the HX-10, it is advisable that the execution sequence, intermediate results, and final results be checked out carefully.
3. We are not responsible for any financial loss which might result from the use of the computer.

■ MSX is a registered trademark of MICROSOFT CORPORATION.

© 1984 by TOSHIBA CORPORATION

CHAPTER 1

SETTING UP

1. TOSHIBA HX—10 PACKAGE CONTENTS 6
2. CONTROLS AND CONNECTIONS..... 6

1. TOSHIBA HX-10 PACKAGE CONTENTS

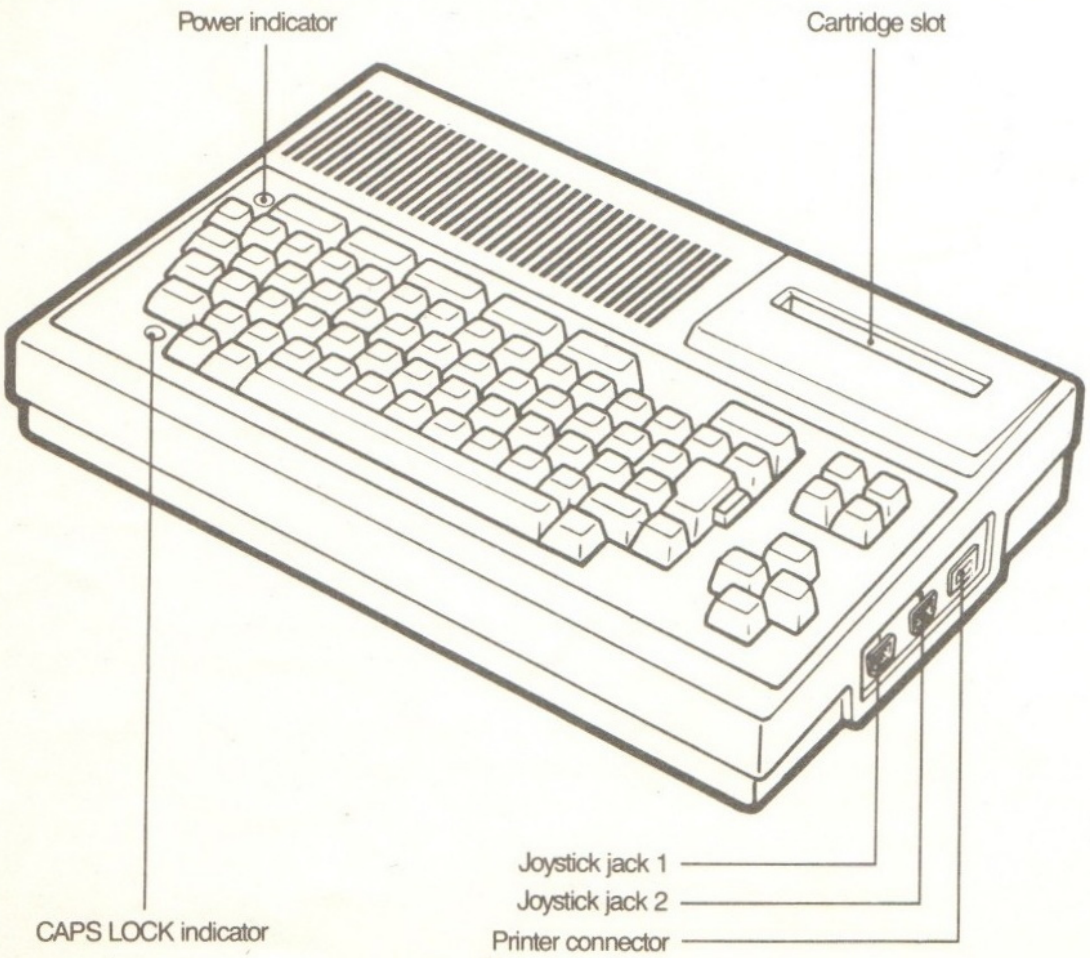
After unpacking your HX–10 and before connecting the computer to your T.V. set please ensure that in addition to this manual the following accessories were supplied with your computer:

- Reference Manual
- Keyboard transfers
- Cassette recorder interface cable
- T.V. connection cable
- Sample program

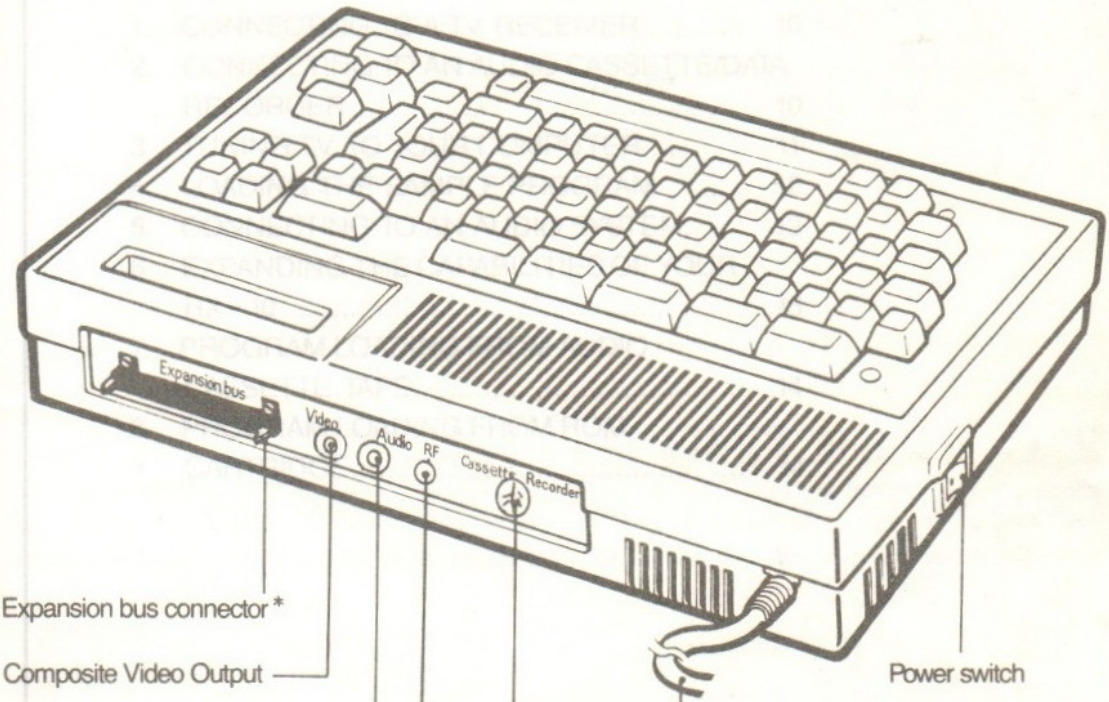
If any of the above items were not supplied, please consult your local dealer.

2. CONTROLS AND CONNECTIONS

Front and Right Side Panels



Rear and Left Side Panels



(1) Expansion bus connector *

(2) Composite Video Output

(3) Audio Output

(4) RF Output (to TV aerial socket)

(5) Cassette recorder

Power switch

Power cord

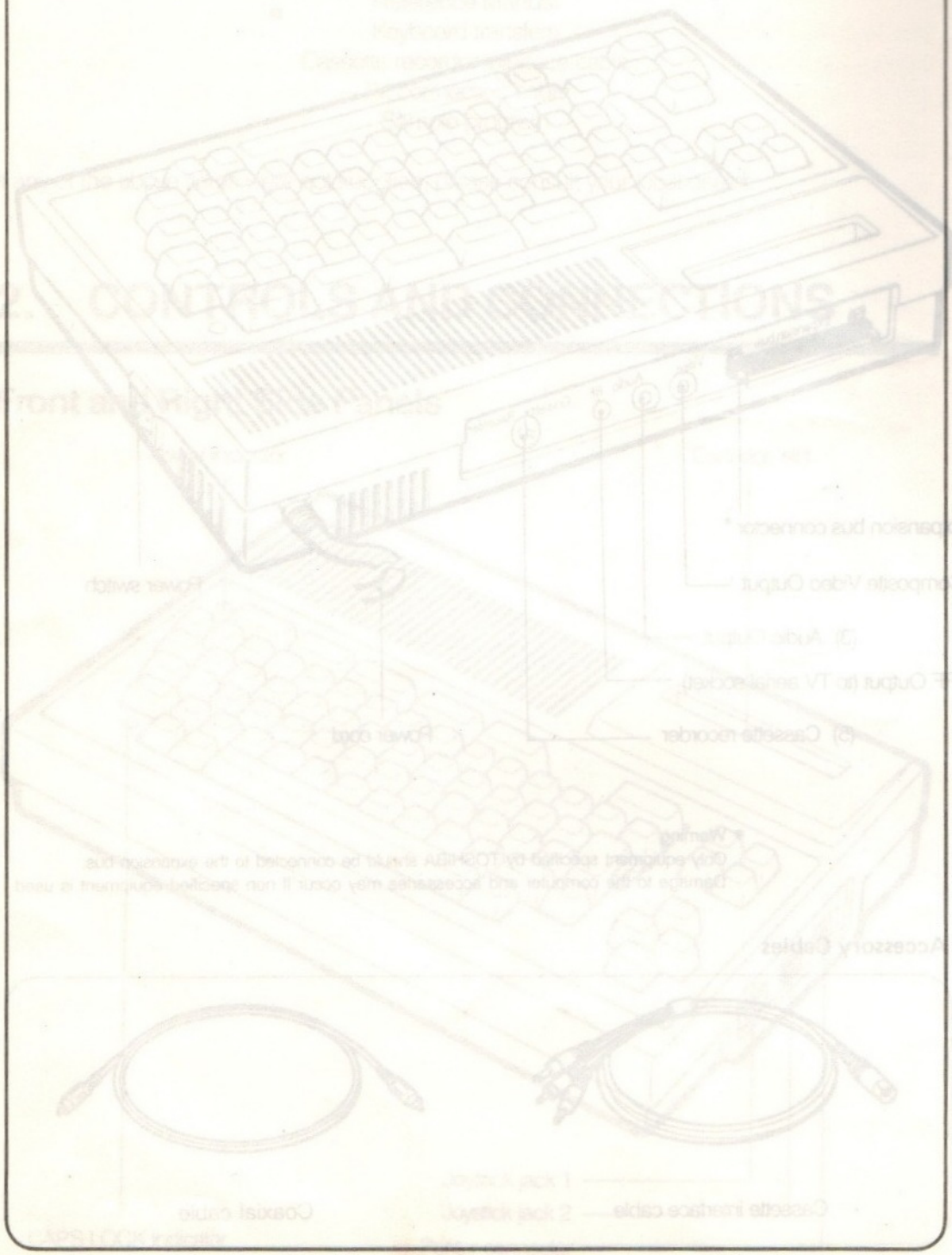
* Warning
Only equipment specified by TOSHIBA should be connected to the expansion bus.
Damage to the computer and accessaries may occur if non specified equipment is used.

Accessory Cables

Cassette interface cable

Coaxial cable

NOTES

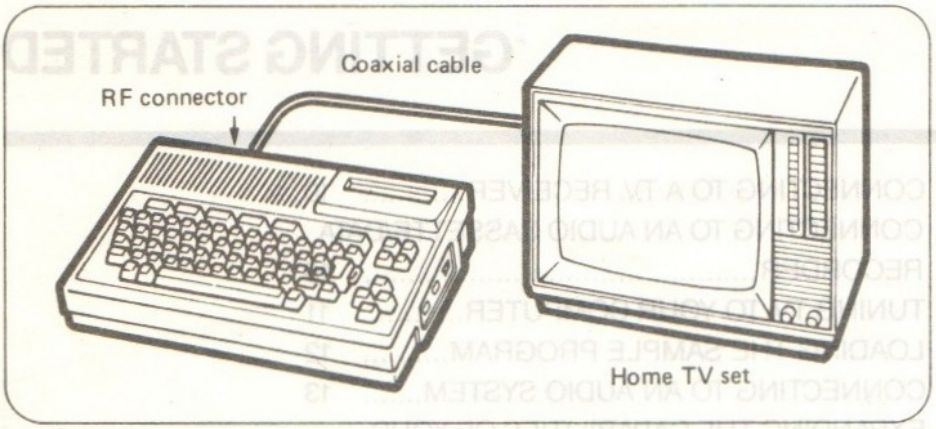


CHAPTER 2

GETTING STARTED

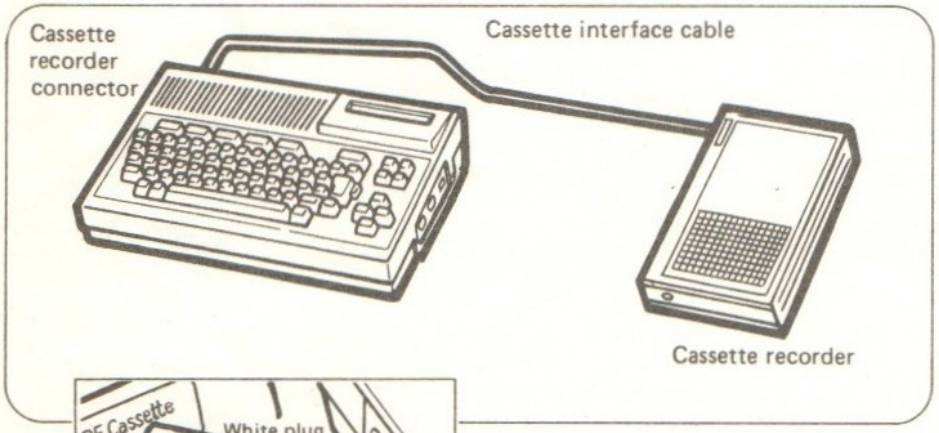
1. CONNECTING TO A T.V. RECEIVER..... 10
2. CONNECTING TO AN AUDIO CASSETTE/DATA RECORDER..... 10
3. TUNING T.V. TO YOUR COMPUTER..... 11
4. LOADING THE SAMPLE PROGRAM..... 12
5. CONNECTING TO AN AUDIO SYSTEM..... 13
6. EXPANDING THE CAPABILITIES OF YOUR HX–10..... 13
7. PROGRAM LOADING FROM AUDIO CASSETTE TAPE..... 14
8. PROGRAM LOADING FROM ROM CARTRIDGE..... 14

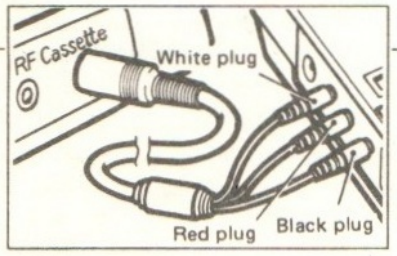
1. CONNECTING TO A T.V. RECEIVER



With the T.V. set and computer switched off, the T.V. connection cable supplied should be plugged into the RF output socket (4) on the rear panel of the computer and to the RF (aerial) socket of the T.V.

2. CONNECTING TO AN AUDIO CASSETTE/DATA RECORDER





To connect a cassette recorder, the recorder interface cable supplied should be plugged into the cassette recorder socket (5) of the computer and to the input, output, and remote connectors of the cassette recorder in the following order:

*White plug	Plug into the EARPHONE or MONITOR jack of the cassette recorder. The line out jack cannot be used.
*Red plug	Plug into the MIC or EX MIC jack on the cassette recorder. The line in jack cannot be used.
*Black plug	Plug into the REMOTE jack on the cassette recorder.

Remember that the Cassette/Data recorder needs to be individually powered by either batteries or mains connection.

3. TUNING T.V. TO YOUR COMPUTER

Switch on both the computer and the T.V. set. The power indicator on the computer keyboard will then be illuminated. If not, switch off at the mains and check the wiring and the fuse in the plug. If the indicator remains unlit then consult your Toshiba Dealer.

With the T.V. set and the computer connected, select a spare channel on the T.V.

... and adjust the tuning control to obtain the following message in the top left hand corner of the screen:

This will be followed a few seconds later by the message:

Your system is now ready for operation

4. LOADING THE SAMPLE PROGRAM

The sample program can now be inserted into the Cassette Recorder. Now press the play button on the Cassette Recorder, type CLOAD and press the RETURN Key on the Computer.

The Cassette will automatically begin. Within 30 seconds, FOUND SAMPLE will appear on your T.V. Screen.

Within a few minutes Ok will appear on your screen. Now, type RUN and press the RETURN Key.

The sample program will then begin. All you need do now, is follow the instructions as they appear on your T.V. Screen.

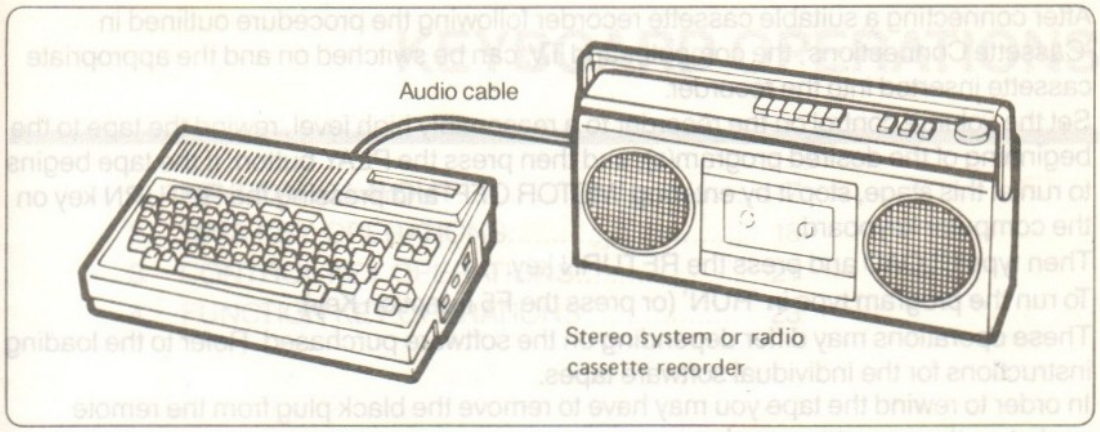
(For full details of loading from audio cassette see Page 14 of this manual)

Note

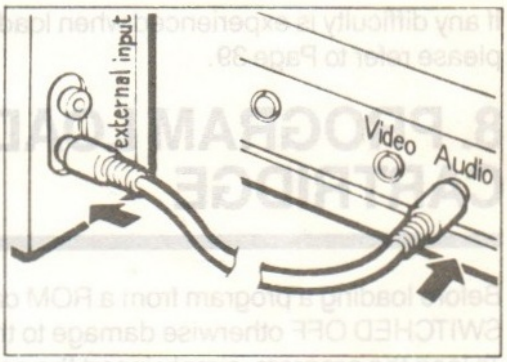
It should be noted that where a T.V. set with video and audio inputs is to be used, suitable connecting coaxial cables* should be plugged into the composite video output socket (2) and audio output socket (3) on the rear panel of the computer and to the video and audio input sockets of the T.V.

*Contact your local Authorised Toshiba Agent.

5. CONNECTING TO AN AUDIO SYSTEM

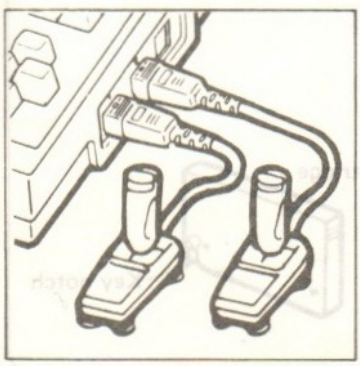


For connecting an audio system (e.g. stereo or hi-fi) a suitable cable should be connected to the EXTERNAL IN socket of the audio system and to the audio output socket (3) of the computer.
To obtain sound, type BEEP on the computer keyboard and press the RETURN key. It should be noted that if the audio system has a mode selector, this should be set to the MONO position. Where there is no mode selector, the sound will be reproduced through only one loudspeaker.

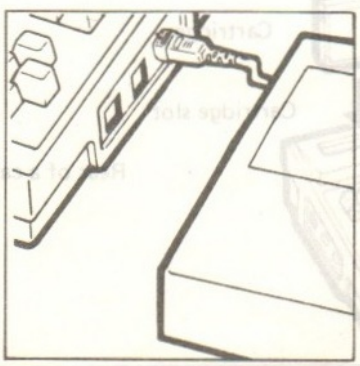


6. EXPANDING THE CAPABILITIES OF YOUR HX-10

The Toshiba HX–10 is totally expandable, enabling you to add for example disk drives for data storage, a printer for letter writing or program printouts and two joysticks for an added dimension to family entertainment. For further details of these peripherals contact your local authorised Toshiba Agent.



JOYSTICKS



PRINTER

DISK DRIVE

7. PROGRAM LOADING FROM AUDIO CASSETTE TAPE

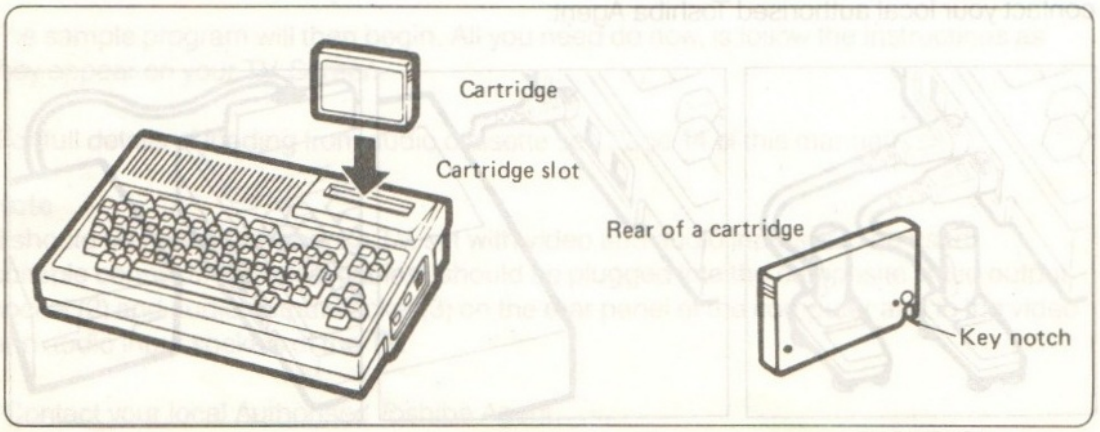
After connecting a suitable cassette recorder following the procedure outlined in 'Cassette Connections', the computer and T.V. can be switched on and the appropriate cassette inserted into the recorder.
Set the volume control on the recorder to a reasonably high level, rewind the tape to the beginning of the desired program(s), and then press the PLAY button. If the tape begins to run at this stage, stop it by entering 'MOTOR OFF' and pressing the RETURN key on the computer keyboard.
Then type CLOAD and press the RETURN key.
To run the program type in 'RUN' (or press the F5 Function Key).
These operations may differ depending on the software purchased. Refer to the loading instructions for the individual software tapes.
In order to rewind the tape you may have to remove the black plug from the remote socket on the cassette recorder.

Note:
If any difficulty is experienced when loading a program from audio cassette tapes, please refer to Page 39.

8. PROGRAM LOADING FROM ROM CARTRIDGE

Before loading a program from a ROM cartridge, MAKE SURE THE COMPUTER IS SWITCHED OFF otherwise damage to the program on the cartridge may result.
To load the program, simply insert the cartridge into the slot in the top of the computer ensuring that the KEY NOTCH AT THE BACK OF THE CARTRIDGE IS FACING THE REAR OF THE COMPUTER.
When the computer is switched on, the message appearing on the screen will differ depending on the type of cartridge installed.

IMPORTANT
If a program or data is already in the memory of your computer, it will be cleared from the memory when a ROM cartridge is installed. Programs or data should, if required, be saved on a cassette tape or diskette before installing a cartridge.

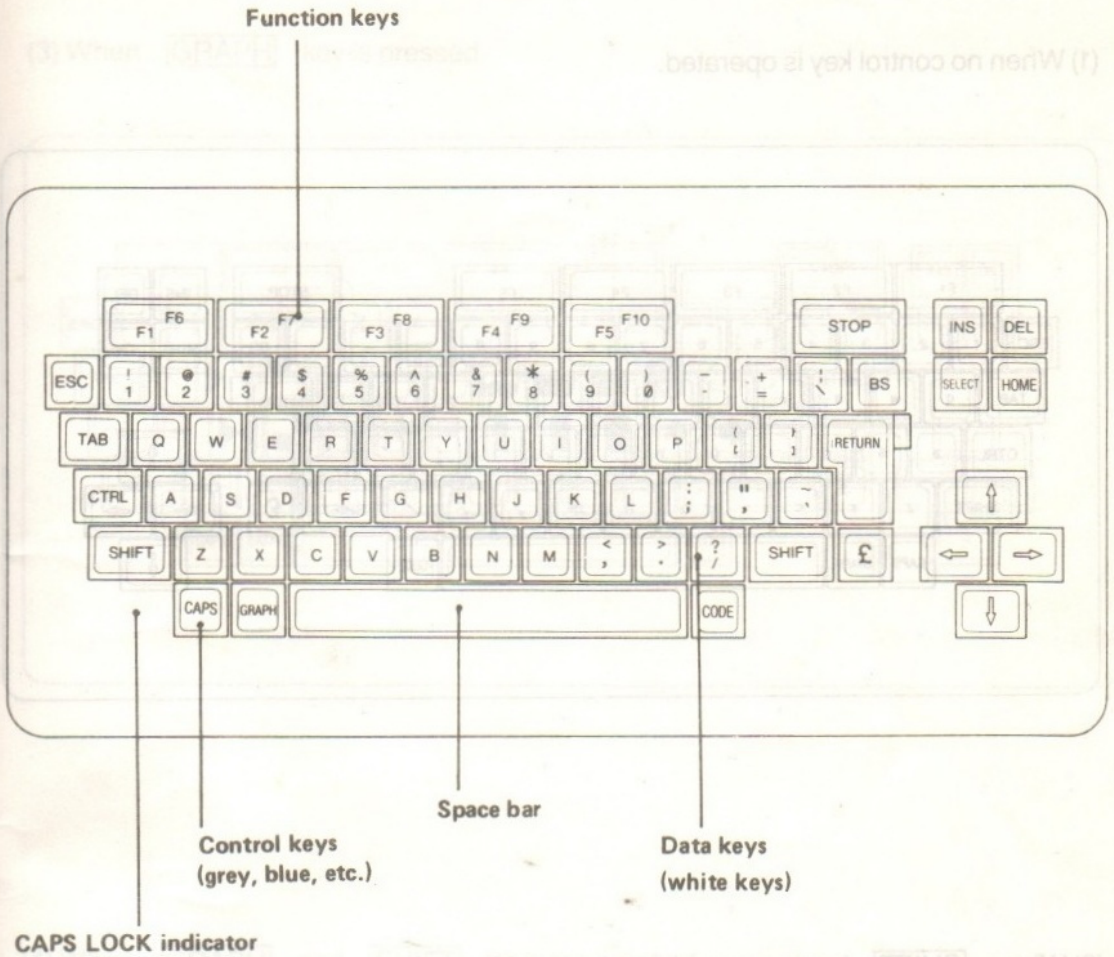


CHAPTER 3

KEYBOARD OPERATIONS

1. KEYBOARD LAYOUT..... 17
2. DATA KEY OPERATIONS..... 18
3. CONTROL KEY OPERATIONS..... 21
4. FUNCTION KEY OPERATIONS..... 23

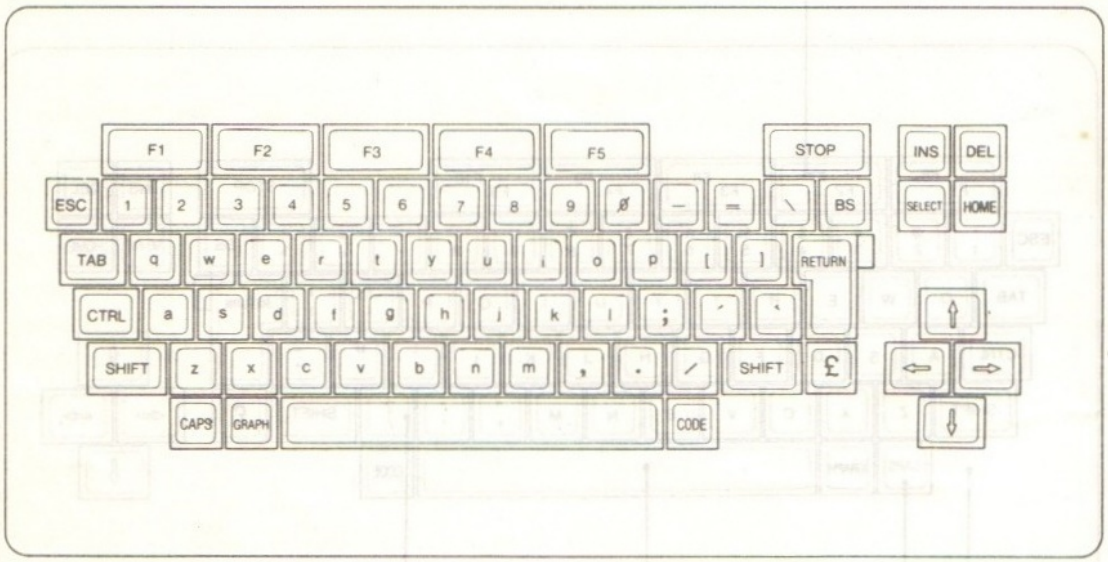
1. KEYBOARD LAYOUT



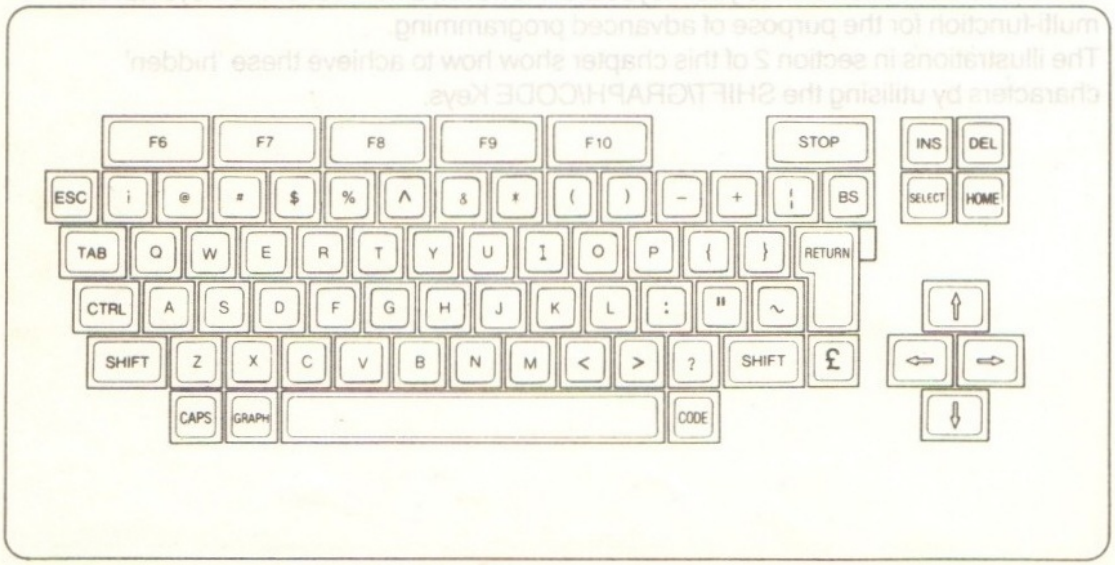
The above illustration shows your keyboard. However, a number of the Keys have a multi-function for the purpose of advanced programming.
The illustrations in section 2 of this chapter show how to achieve these 'hidden' characters by utilising the SHIFT/GRAPH/CODE Keys.

2. DATA KEY OPERATIONS

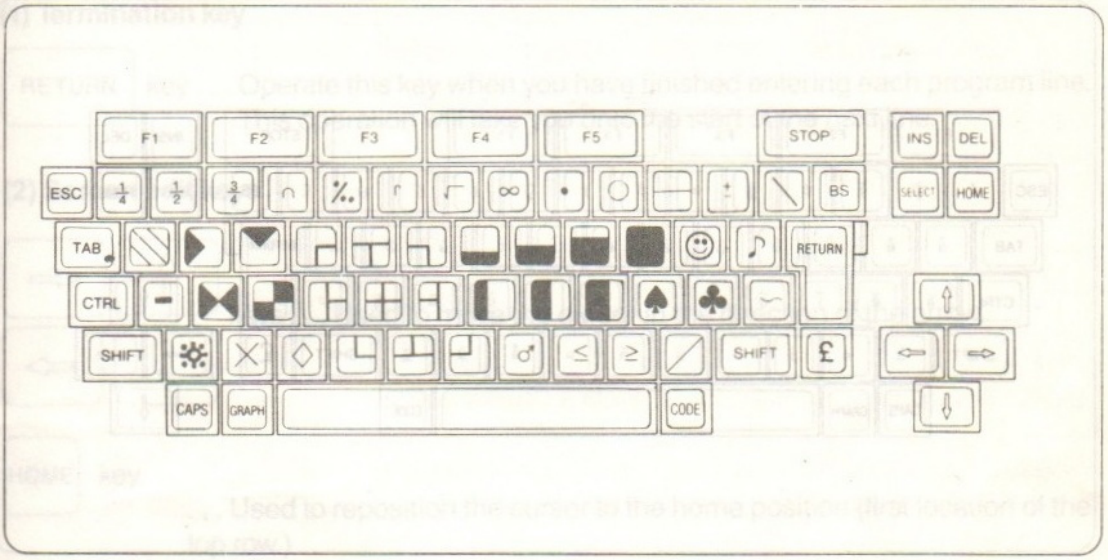
(1) When no control key is operated.



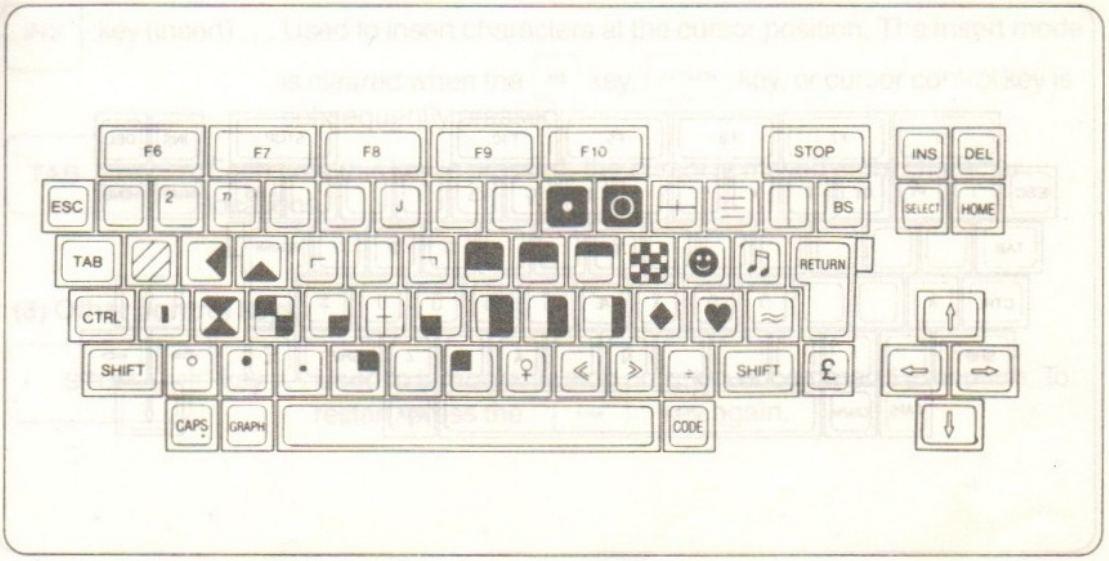
(2) When [SHIFT] key is pressed.



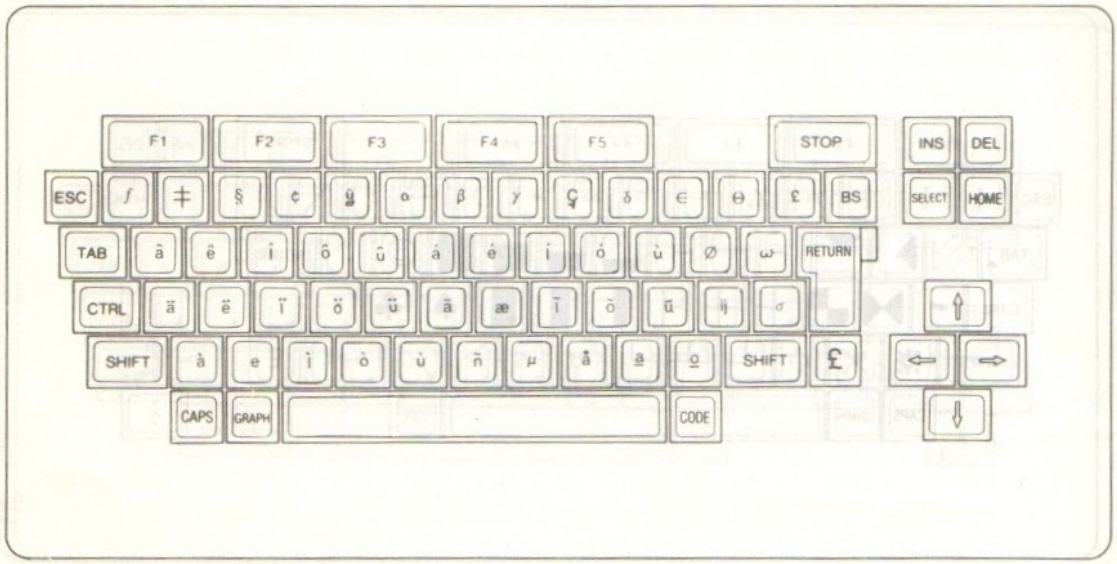
(3) When GRAPH key is pressed.



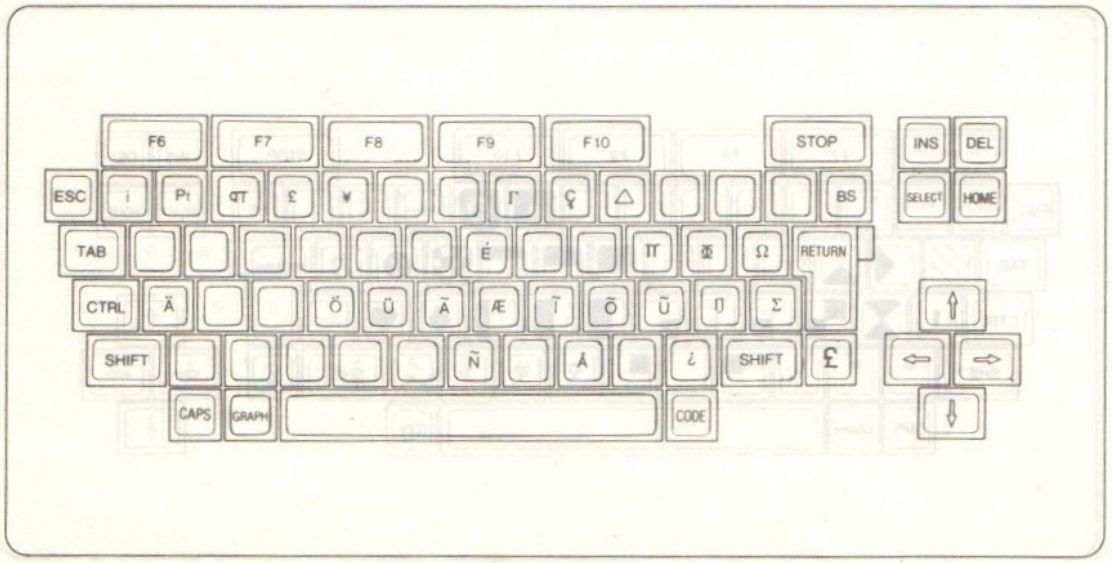
(4) When GRAPH and SHIFT keys are pressed.



(5) When [CODE] key is pressed.



(6) When [CODE] and [SHIFT] keys are pressed.



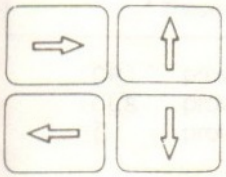
3. CONTROL KEY OPERATIONS

Control keys are used to control the cursor on the screen, key function shift or perform screen editing. The cursor is a square mark ■ on the screen indicating the location into which a character or symbol is to be entered next.

(1) Termination key

RETURN key . . . Operate this key when you have finished entering each program line. This operation will take you onto the start of the next line.

(2) Screen edit keys



keys . . . Used to move the cursor in the direction of the arrow.

HOME key . . . Used to reposition the cursor to the home position (first location of the top row.)

HOME key with SHIFT key . . . Used to clear the entire screen.

BS key (backspace) . . . Backspaces the cursor one character position and deletes that character.

DEL key (delete) . . . Used to delete the character from location at which the cursor is positioned.

INS key (insert) . . . Used to insert characters at the cursor position. The Insert mode is cleared when the INS key, RETURN key, or cursor control key is subsequently pressed.

TAB key . . . Each time this key is pressed, the cursor is moved eight character locations.

(3) Other control keys

STOP key . . . Used to temporarily stop program or command execution. To restart, press the STOP key again.

CTRL key (control) with STOP key

. . . If the STOP key and CTRL key are pressed simultaneously the computer stops the current command execution and waits for the next command entry.

ESC key (escape) . . . Used to generate an Escape code.

SELECT key . . . Used to generate a Select code.

CTRL key (control) . . . Used to generate a Control code.

(The Escape and Select codes are used to control peripheral devices. You are allowed to specify their function in your own program.)

4. FUNCTION KEY OPERATIONS

When the computer is switched on, each function key is assigned the following functions:

F1	F2	F3	F4	F5
F1 : Color F6 : Color 15, 4, 4 CR *	F2 : auto F7 : cload"	F3 : goto F8 : cont CR *	F4 : list F9 : list CR * ↑ ↑ *	F5 : run F10 : CLS * run CR *

** These symbols do not appear on the screen when the computer is switched on.*

CR provides the same function as the RETURN key.
CLS provides the same function as the HOME key, to clear the screen.
↑ provides the same function as the ↑ key, to move the cursor upward.

How to use function keys.
E.g. **To run a program**
Instead of typing RUN and pressing the RETURN key, simply operate the function key F5 F10

To list the program you simply operate the function key F4 F9 instead of typing LIST and pressing the RETURN key.

Assigning different functions to function keys.
You may wish to alter the functions originally assigned to these keys. This can easily be achieved by using the KEY statement in the following format:

Example:
To assign SCREEN1 CR to the F1 F6 key, type the following statement:

KEY1, "SCREEN 1" + CHR$ (13) RETURN

The colour function has now been replaced by SCREEN 1 CR function to the F1 section of F1 F6 key. However, when the computer is switched off this function will be cancelled from the memory and the original function reinstated.

NOTES

CHAPTER 4

MSX BASIC

1. BASIC PROGRAMMING..... 26
2. BASIC PROGRAM DEVELOPMENT PROCEDURE.... 27
3. PROGRAMMING EXAMPLES..... 31

1. BASIC PROGRAMMING

Your Toshiba computer performs a list of instructions which are called a program.

(1) BASIC language

The BASIC language includes commands, statement, and functions.

Commands — Used to create, execute, edit or control BASIC programs.

Statements — A BASIC program consists of a set of statements each, in principle, assigned its own line number.

Functions — Always used in statements to allow you special numeric operations or special manipulation of numerals or characters. Functions can not be used alone.

(2) What is a program?

A program is a set of statements or commands which are arranged in order. The computer executes statements in order — from the smallest line number to the largest line number.

Line — Consists of a line number and one or more statements. A line is the most basic descriptive element in a BASIC program. The specifiable range of line numbers is between 0 and 65529.

	line number	statement
E.g.	10	PRINT "TOSHIBA"
	20	PRINT "COMPUTER"

Multi-statement — While each line normally consists of only one statement, more than one statement separated by colons(:) may be used in a single line to save line numbers.

Line number statement : statement : statement : statement : statement :
E.g. 15 PRINT "TOSHIBA" : BEEP : PRINT "MICRO" : BEEP : GOTO 15

Note It should be noted, however, that no statement is allowed to follow the following statements:
REM, END, RETURN, GOTO, and ON ~ GOTO

(3) Execution during command wait state

In the command wait state, the computer is ready to execute a command or statement entered from the keyboard or to generate program codes.

- Immediately after the computer is switched on or program execution is completed or stopped, the computer enters the command wait state, with "Ok" appearing on the screen.
- If the CTRL and STOP keys are simultaneously pressed during program or command execution, the computer stops the execution and enters the command wait state.

1) Program entry — If a command or statement is preceded by a line number when it is entered from the keyboard, the computer regards it as a line of a program.

2) Direct execution — If a command or statement is entered with no line number attached to it, the computer immediately executes it. To stop direct execution, simultaneously press the CTRL and STOP keys; the computer will enter the command wait state.

2. BASIC PROGRAM DEVELOPMENT PROCEDURE

Programming sequence

(1) Program input
Enter the desired program from the keyboard or cassette tape into the computer.

(2) Verifying the program
List the program lines on the display or printer to verify its contents.

(3) Debug the program.

(4) Execute the program by pressing [f5 F10] key.

(5) If an error occurred during execution or the result is not correct, determine the error by using the error message as a guideline. After correcting the error, repeat from the above step (2).

(6) Save the program on a cassette tape or diskette.

(1) Program input

1) Enter the program lines (each preceded by its own line number) from the keyboard when the computer is in the command wait state.
2) Press the [RETURN] key at each end of a line (if the [RETURN] key operation is missing, the line will not be entered into the computer).

- If data transfer to or from a peripheral device is programmed, specify the number of files to be used by using the MAXFILES = statement.
- For more efficient program entry, use the following BASIC commands:

AUTO: Lets the computer automatically generate line numbers in a sequential order. To clear the AUTO mode, simultaneously press the [CTRL] and [STOP] keys.
KEY: Allows you to assign functions to function keys.
KEY LIST: Lists the functions assigned to function keys.

- When loading a program from a peripheral device, use the following BASIC commands:

CLOAD: Loads a program from the cassette tape into the computer.
LOAD: Loads a program from the specified device.
MERGE: Loads a program from the specified device and merges it with another program already in main memory.

(2) Program verification

To list the program lines on the display or printer, execute the following commands:
LIST n-m: Lists the lines with line numbers between n and m on the display.
LLIST n-m: Lists the lines with line numbers between n and m on the printer.

(3) Program debugging

Screen editor

The screen editor allows you to position the cursor to any location on the screen and to delete, insert, correct, or renumber program lines.

1) Using the LIST command, list the portion of the program in which the line to be edited is contained on the display.

2) Position the cursor to the location to be corrected.

3) Perform the necessary editing operation.

4) With the cursor left on the row on which editing has just been performed, press the [RETURN] key.

Note 1: If a [RETURN] key operation is missing, editing will not be carried out.

Note 2: If the program lines are renumbered and the [RETURN] key is operated, the statements will remain as they are.

Edit function	Edit operation	Example
Modifying the contents of a listed program line. e.g. Correcting "PRIMT" into "PRINT".	(1) Position the cursor to the character to be corrected, by using the cursor control keys ([⇨] [⇦] [⇩] [⇧]). (2) Overtype the correct character (3) Press [RETURN] key.	PRIMT ■ "M" should be replaced by "N". (■ indicates the cursor.) PRI M T Use [⇦] to position the cursor to "M". PRIN T Overtype the correct character (N). The cursor will move to the next location.
Deleting a character from a line. e.g. Correcting "PRIXNT" into "PRINT".	(1) Using the cursor control keys, position the cursor to the character to be deleted. (2) Press [DEL] key. (3) Press [RETURN] key.	PRIXNT ■ "X" must be deleted. PRI X NT Position the cursor to "X". PRI N T Press [DEL] key.

Edit function	Edit operation	Example
Inserting a character into a listed line. e.g. Correcting "PRNT" into "PRINT".	(1) Using the cursor control keys, position the cursor to the character location where the missed character is to be inserted. (2) Press [INS] key (3) Type in the character to be inserted. (4) Press [INS] key again. (5) Press [RETURN] key.	PRNT■ "I" is missing. PR N T Use [←] to position the cursor to "N". PRNT Press [INS] key to select the Insert Mode. PRINT Type in the character "I". PRI N T Press [INS] key again to clear the Insert mode.
Correcting an entire program line.	(1) Type in the replacement program line with the same line number as that of the line to be replaced. (2) Press [RETURN] key. The entire contents of the old line will be replaced with the new line.	Type in the correct line press [RETURN] key. *When you list or run the program the new line will replace the old.*
Deleting an entire program line.	(1) Type in the number of the line to be deleted. (2) Press [RETURN] key.	Type 10 press [RETURN] key. This will delete the entire line numbered "10".
Deleting more than one program line.	(1) Execute the DELETE command.	Type DELETE 20-60 [RETURN] key. This will delete the lines numbered from 20 to 60 when you list or run the program.
Inserting a line in between two lines (numbered "n" and "m").	(1) Type in the line to be inserted, with a line number k ($n < k < m$) assigned to it, then press RETURN key.	
Renumbering the lines.	(1) Execute the RENUM command.	Type RENUM 100,10 Press [RETURN] key. This will renumber the lines in increments of 10, beginning with "100".

(4) Program execution

1) To start the execution of an entered program, type in the RUN command (press the [F5 F10] key).

2) To break program execution, simultaneously press [CTRL] key and [STOP] key.

- To restart execution from a break point, enter the CONT command (press [F3 F8] while holding down [SHIFT]).

Note, however, that you cannot restart program execution from a break point if you have made any correction to the aborted program.

3) To temporarily stop program execution, press [STOP] key. (While program execution is paused, any key other than the [STOP] key is inoperative.)

- To restart the program execution, press [STOP] key a second time.

(5) Error

If an error occurred during program execution, an error message will appear on the screen in the following format:
error message IN line number where error occurred (e.g. Syntax error in 10)

1) If an error occurred, determine the cause of the error by using the error message for guidance.

2) Once you have determined the cause of the error, correct it by following the edit procedure described on page 28.

(6) Program saving

To save the entered program onto a cassette tape or other peripheral device, use the following commands:
CSAVE . . . . Saves the program onto a cassette tape.
SAVE . . . . . Saves the program onto a specified device.

e.g. For this example the filename "SOCCER", has been given to the program to be saved, to save your program onto tape for future recall **press record and play on your recorder** and enter:

CSAVE "SOCCER". and press [RETURN] key.

The recorder will automatically start recording the program. When the recorder stops, the program is saved.

To verify that the program has been saved . . .

Rewind the tape and press play on the cassette recorder, then type, CLOAD?
"SOCCER" and press [RETURN] key.

When the computer finds the program on the tape it will display — found: "SOCCER".

If it has been incorrectly saved 'verify error' will be displayed. After checking the recorder (see page 39) you should repeat the CSAVE sequence.

If no error is displayed, you can be sure that the program has been saved correctly.

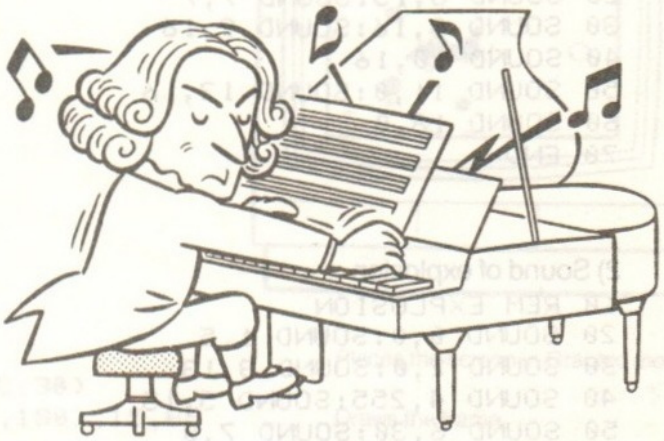
It is advisable to always use this checking process after using the CSAVE sequence.

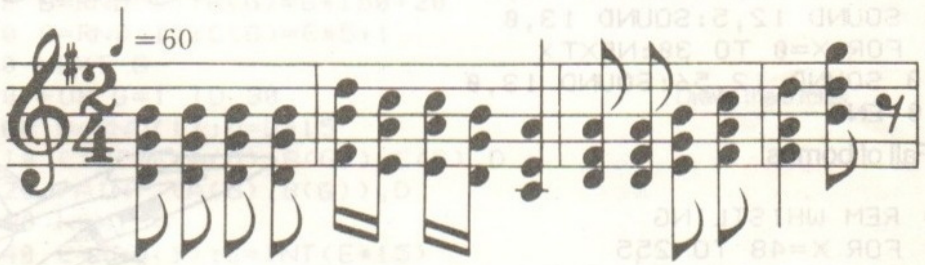
Note: The filename can be up to six characters in length between the " " marks.

3. PROGRAMMING EXAMPLES

(1) Music play

The following program example lets your computer play the first four bars of Schubert's The Wild Rose.





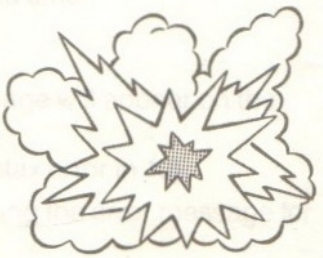

```
10 PLAY"O4T60S0M10000","O4T60S0","O4T60S0"
20 PLAY"L8BBBB","L8GGGG","L8DDDD"
30 PLAY"L16O5DCCO4BA4","L16BAAGE4","L16F+EEDC4"
40 PLAY"L8AABO5C","L8F+F+GA","L8DDEF+"
50 PLAY"O5D4GR8","A4O5DR8","F+4BR8"
60 END
```

Specifies the tempo and tone.
1st bar
2nd bar
3rd bar
4th bar

(2) Sound effects for video games

1) Sound of gunfire

```
10 REM GUNSHOT
20 SOUND 6,15:SOUND 7,7
30 SOUND 8,16:SOUND 9,16
40 SOUND 10,16
50 SOUND 11,0:SOUND 12,16
60 SOUND 13,0
70 END
```



2) Sound of explosion

```
10 REM EXPLOSION
20 SOUND 0,0:SOUND 1,5
30 SOUND 2,0:SOUND 3,13
40 SOUND 4,255:SOUND 5,15
50 SOUND 6,30:SOUND 7,0
60 SOUND 8,16:SOUND 9,16
70 SOUND 10,16:SOUND 11,0
80 SOUND 12,5:SOUND 13,0
90 FOR X=0 TO 30:NEXT X
100 SOUND 12,56:SOUND 13,0
110 END
```

3) Fall of bombs

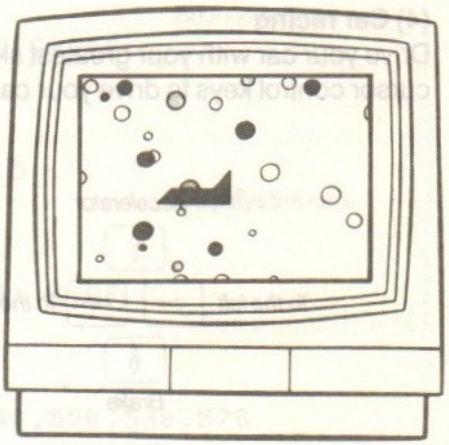
```
10 REM WHISTLING
20 FOR X=48 TO 255
30 SOUND 7,254:SOUND 8,15
40 SOUND 0,X:SOUND 1,0
50 NEXT X
60 SOUND 8,0
70 END
```

4) Exhaust note

```
10 REM CAR SOUND
20 SOUND 0,0:SOUND 1,2
30 SOUND 2,0:SOUND 3,3
40 SOUND 4,0:SOUND 5,5
50 SOUND 6,15:SOUND 7,56
60 SOUND 8,15:SOUND 9,15
70 SOUND 10,15
80 FOR X=0 TO 2000:NEXT X
90 SOUND 7,255
100 END
```

(3) Colouring

The following program example paints an aeroplane on the screen with different colours. To stop program execution, simultaneously press CTRL and STOP keys.



```
10 SCREEN 2
20 DIM A(30),B(30),C(30)
30 LINE(20,10)-(245,180),15,BF
40 FOR G=1 TO 30
50 A=RND(1):A(G)=A*215+20
60 B=RND(1):B(G)=B*150+20
70 C=RND(1):C(G)=C*5+1
80 NEXT G
90 FOR G=1 TO 30
100 D=RND(1):D=D*15
110 CIRCLE(A(G),B(G)),C(G),D
120 PAINT (A(G),B(G)),D
130 NEXT G
140 E=RND(1):E=INT(E*15)
150 LINE(100,100)-(130,110),E,BF
160 LINE(130,100)-(130,90),E
170 LINE(130,90)-(120,100),E
180 LINE(100,100)-(90,110),E
190 LINE(100,110)-(90,110),E
200 LINE(107,110)-(107,113),E
210 PAINT(99,105),E
220 PAINT(125,98),E
230 CIRCLE(107,115),2,E
240 CIRCLE(110,100),5,E,0,3.14
250 LINE(105,100)-(115,100),E
260 PAINT(110,98),E
270 FOR G=1 TO 500:NEXT G
280 GOTO 90
```

Places the screen in Graphic mode.

Draws the frame

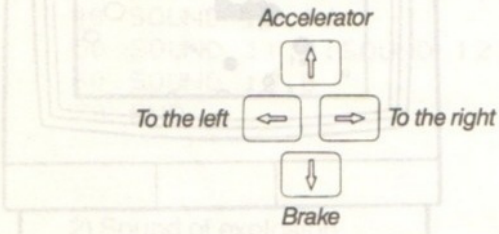
Specifies the location and size of the circles.

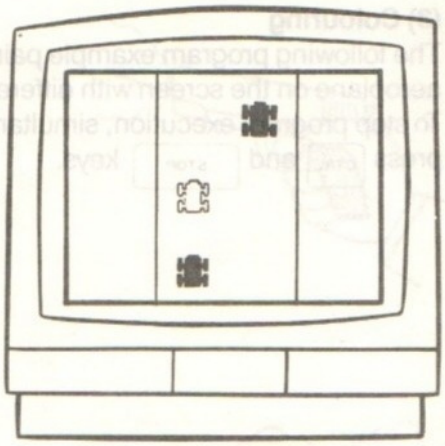
Draws the circles.

Draws the aeroplane.

(4) Car racing

Drive your car with your greatest skill. Use the cursor control keys to drive your car.





```
10 REM CAR DRIVE
20 SCREEN 2,1,0:CLS:L=5:SPRITE ON
30 ON SPRITE GOSUB 680
40 LINE(0,0)-(80,190),12,BF
50 LINE(160,0)-(255,190),12,BF
60 REM CAR PATTERN
70 A1$=CHR$(&B00011000)
80 A2$=CHR$(&B10011001)
90 A3$=CHR$(&B11111111)
100 A4$=CHR$(&B10111101)
110 A5$=CHR$(&B00111100)
120 A6$=CHR$(&B10111101)
130 A7$=CHR$(&B11111111)
140 A8$=CHR$(&B10111101)
150 A$=A1$+A2$+A3$+A4$+A5$+A6$+A7$+A8$
160 SPRITE$(0)=A$
170 REM EXPLOSION PATTERN
180 B1$=CHR$(&B00000000)
190 B2$=CHR$(&B00011000)
200 B3$=CHR$(&B00111100)
210 B4$=CHR$(&B01111110)
220 B5$=CHR$(&B11111111)
230 B6$=CHR$(&B01111110)
240 B7$=CHR$(&B00111100)
250 B8$=CHR$(&B00011000)
260 B$=B1$+B2$+B3$+B4$+B5$+B6$+B7$+B8$
270 SPRITE$(1)=B$
280 REM
290 OPEN "GRP:" AS #1
300 PSET(217,10),12
310 PRINT#1,"km/h"
320 COLOR 15,4
330 X=95:Y=100:V=50
340 X1=98:Y1=150:V1=55
350 X2=130:Y2=50:V2=57
```

Places the screen in Graphic mode.

Draws the road.

Draws the cars.

Specifies the exploded car figure.

Specifies the initial car position and speed.

```
360 REM CAR NOISE                                    Sounds exhaust note.
370 S=INT(12000/(V+1)):IF S>255 THEN S=255
380 SOUND 0,S:SOUND 1,1:SOUND 2,S
390 SOUND 3,2:SOUND 4,0:SOUND 5,5
400 SOUND 6,15:SOUND 7,56
410 SOUND 8,15:SOUND 9,15:SOUND 10,15
420 PUT SPRITE 1,(X,Y),8,0                           Displays the cars.
430 PUT SPRITE 2,(X1,Y1),1,0
440 PUT SPRITE 3,(X2,Y2),1,0
450 D=INT(V/5)*5:LINE(185,5)-(215,20),4,BF
460 PSET(184,10),12
470 PRINT#1,USING"####";D;
480 B=STICK(0):B=B+1
490 ON B GOTO 580,500,510,520,530,540,550,560,570
500 V=V+2:GOTO 580                                   Controls the car according to the cursor
510 X=X+3:V=V+2:GOTO 580                             control keys.
520 X=X+3:GOTO 580
530 X=X+3:V=V-5:GOTO 580
540 V=V-5:GOTO 580
550 X=X-3:V=V-5:GOTO 580
560 X=X-3:GOTO 580
570 X=X-3:V=V+2:GOTO 580
580 Y1=Y1-(V1-V)/L:Y2=Y2-(V2-V)/L
590 SPRITE ON
600 IF Y1>190 THEN Y1=5                              Specifies the off-road condition.
610 IF Y2>190 THEN Y2=5
620 IF Y1<0 THEN Y1=180
630 IF Y2<0 THEN Y2=180
640 IF X<81 THEN GOSUB 680
650 IF X>145 THEN GOSUB 680
660 IF V>0 THEN 360
670 V=0:GOTO 360
680 REM EXPLOSION ROUTINE                            Displays the explosion image and sound.
690 SPRITE OFF:LINE(185,5)-(215,20),4,BF
700 PSET(184,10),12:PRINT#1,USING"####";D;
710 PUT SPRITE 0,(X,Y),10,1
720 SOUND 0,0:SOUND 1,5:SOUND 2,0
730 SOUND 3,13:SOUND 4,255:SOUND 5,15
740 SOUND 6,30:SOUND 7,0
750 SOUND 8,16:SOUND 9,16:SOUND 10,16
760 SOUND 11,0:SOUND 12,5:SOUND 13,0
770 FOR T=1 TO 30:NEXT T
780 SOUND 12,56:SOUND 13,0
790 FOR K=1 TO 10
800 PUT SPRITE 1,(X,Y),8,0:PUT SPRITE 0,(X,Y),10,1
810 PUT SPRITE 0,(X,209):PUT SPRITE 1,(X,209)
820 NEXT K
830 FOR X=1 TO 800:NEXT X:RETURN 320
```

NOTES

CHAPTER 5

IN CASE OF DIFFICULTY

BEFORE CALLING FOR SERVICE..... 39

BEFORE CALLING FOR SERVICE

(1) Cassette Problems

If a save or load operation still results in failure after you have checked the following then obtain our recommended data recorder.

Item	Check
Volume control	Set the volume control of your recorder to a relatively high position. ● A proper load operation will not be done if the volume control is set too high or too low.
Tone control	If your cassette recorder has a tone control, set it to the "clear (or treble boost)" position.
Battery check	Check that the batteries in your cassette recorder are not flat. ● If so, replace with new. ● If your recorder has an accessory AC adapter, use it to power your recorder from an AC outlet.
Operation	Check your cassette recorder operation again: ● Record and play operation: After recording your program or data, disconnect the cassette interface cable from your recorder and play back the portion you have just recorded. If the program or data was properly recorded, a peep sound should be heard from the speaker. ● If your recorder has the VLSS feature or high-speed playback switch ensure its switched off. If the VLSS feature is active, recording will fail. If the high-speed playback switch is on, playback will fail.
Head-cleaning	Check if the record/play head in your cassette recorder requires cleaning. ● Clean it with a head-cleaning kit if necessary.
Tape	Check your tape: ● Use cassette tapes designed for computer application. If you have only audio cassette tapes, select the normal or low-noise type with a length of 30 or 45 minutes. ● Make sure that your tape has no fold, spliced portion or creases, as these will cause failure. ● Use a new, blank tape to save your program or data. ● Do not use the first few inches of the tape.
Transfer rate	If a save operation at the high transfer rate fails, reduce it to the lower rate. ● In general, a lower transfer rate assures a safer save operation.

(2) Keyboard failure

Symptom	Action
Keyboard locked up.	1. Press [CTRL] key and [STOP] key simultaneously. 2. Temporarily turn off the system, then turn it on again a few seconds later.

(3) ROM cartridge failure

Symptom	Action
Inoperative	• Turn off the system, and re-install the cartridge properly into its slot. • The system operation differs depending on the installed cartridge type. Carefully check by referring to the pertinent cartridge leaflet. • Try an alternative cartridge.

(4) Audio system failure

Symptom	Action
No sound	1. Your audio system is unplugged from its outlet. 2. Your audio system is off. 3. Check fuse in mains plug. 4. Check for the correct system connections. • Check for cross or erroneous connections. • Connect cables firmly into their sockets. 5. If your TV set has a video input, the input selector is placed in a wrong position.
Noise interference	Check that the cable connectors are firmly plugged into their sockets.

(5) Joystick failure

Symptom	Action
Joystick is inoperative or does not trigger.	1. Joystick is connected to a wrong socket. 2. Loose connection. 3. The joystick used has specifications incompatible with the HX-10.

(6) Display failure

Symptom	Action
Nothing shows on the display screen.	1. The computer or display is off. Turn it on. 2. Check the system connections. ● Check fuse in mains plug. ● Check for cross or wrong connections. ● Connect the cables firmly into their sockets. 3. If your home TV set has a video input, check if the input selector is set in the wrong position. 4. Check if the same colour is specified for the text and background with the COLOR statement. First press [CTRL] key and [STOP] key then [SHIFT] key and [F1 F6] simultaneously.
Improper display images.	Check for proper cable connections.
Noise interference	1. Check for a connection to the TV's aerial terminal. 2. Never use an aerial mixer. When using the computer, the cable for the off-air aerial should be removed.
Display image overflows the screen or an edge of the display image is missing.	1. Adjust the width control on your display. 2. If the number of characters per row specified exceeds the initial default value (29 or 37 characters per row), the rows may overflow from the screen. Correct the specification.
Poor picture quality or synchronization goes out.	1. Adjust the Bright, Contrast, and/or Channel controls on your display (TV). 2. Adjust the H. SYNC or V. SYNC. control.
Severe colour disalignment	1. Adjust colour controls on your display. 2. Specify the following colours: COLOR 15, 5 COLOR 15, 4 COLOR 14, 4

Note

If after carrying out all the above checks your computer does not operate properly, contact your nearest Authorised Toshiba Agent.

NOTES

CHAPTER 6

SPECIFICATIONS

SPECIFICATIONS 44

SPECIFICATIONS

SPECIFICATIONS HX-10

Item	Specifications
Microprocessor Clock speed	Z80A 3.58MHz
Main Memory System Memory Video Memory	64K RAM 32K ROM 16K RAM
Programming language	Microsoft Extended BASIC
Display output VDP Screen Mode Text mode Hight resolution mode Multi-colour mode Sprites Colour	RF/Composite video terminals TMS 9929A 3 Modes 40 characters×24 lines/ 32 characters×24 lines 256×192 dot matrix 64×48 blocks (4×4 dot matrix per block) 32 definable shapes 16 colours
Keyboard	73 Keys. Alphanumeric and graphic symbols
Sound output PSG	Audio terminal AY-3-8910 8 Octaves Triple Chord
Audio cassette interface	FSK 1200/2400 baud
Printer interface	CENTRONICS parallel
System bus	Cartridge bus, expansion bus
Joystick connections	Twin joystick ports
Power consumption	AC240V, 50Hz, 17W
Dimensions (WxHxD)	370×60×245 mm
Weight	2.8 Kg

APPENDIX

1. CHARACTER CODE LIST..... 46
2. ALPHABETICAL ERROR CODE LIST.. 48

1. CHARACTER CODE LIST

Available character codes range between hex 00 and FF (0 and 255 in decimal). Each character code consists of one byte which is composed of the high and low order, four bits each representing a numeric value.

Capital letter A . . . .hex 41 (41H)
Hexadecimal numbers are suffixed with an "H" in this manual.

Decimal vs. hexadecimal

Hexadecimal	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Decimal	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

A two digit hex number may be converted into a decimal number by the following formula:

(decimal expression of MSD) * 16 + (decimal expression of LSD)
FFH — 15 * 16 + 15 = 255 (hex FF is 255 in decimal.)
3 BH — 3 * 16 + 11 = 59 (hex 3B is 59 in decimal.)

(1) Display character code list

Most significant 4 bits →

Least significant 4 bits ↓

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			Blank (Space)	Ø	@	P	`	p	Ç	É	á	Ã			α	≡
1			!	1	A	Q	a	q	ü	æ	í	ã			β	±
2		INS	"	2	B	R	b	r	é	Æ	ó	Ĩ			Γ	≥
3			#	3	C	S	c	s	â	ô	ú	ĩ			Π	≤
4			$	4	D	T	d	t	ä	ö	ñ	Õ			Σ	∫
5			%	5	E	U	e	u	à	ò	Ñ	õ			σ	∫
6			&	6	F	V	f	v	ȧ	û	a̲	Ũ			μ	÷
7	BL		´	7	G	W	g	w	ç	ù	o̲	ũ			ϒ	≈
8	BS		(	8	H	X	h	x	ê	ÿ	¿	∏		△	Φ	°
9	TAB		)	9	I	Y	i	y	ë	Ö	⌐	ij		‡	Θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	¾		ω	Ω	•
B	HOME	ESC	+	;	K	[	k	{	Ï	¢	½	∼			δ	√
C	CLS	→	,	<	L	\	l	¦	Î	£	¼	◊			∞	ⁿ
D	CR	←	−	=	M	]	m	}	Ì	¥	¡	‰			φ	²
E		↑	.	>	N	^	n	~	Ä	Pt	≪	¶			∈	▮
F		↓	/	?	O	_	o	Blank (DEL)	Å	ƒ	≫	§			∩	Blank (FF)

← Hex numbers

↑ Hex numbers

When preceded by the grahpic character header

	4	5
0	Blank (NULL)	
1	☺	
2	☻	
3	♥	
4	♦	
5	♣	
6	♠	
7	•	
8	◘	
9	○	
A	◙	
B	♂	
C	♀	
D	♪	
E	♫	
F	☼	

(2) Key entry code list

Most significant 4 bits →

Least significant 4 bits →

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			Blank (Space)	Ø	@	P	`	p	C	É	á	Ã			α	≡
1			!	1	A	Q	a	q	ü	æ	Í	ã			β	±
2		INS	"	2	B	R	b	r	é	Æ	ó	Ĩ			Γ	≥
3			#	3	C	S	c	s	â	ô	ú	Ĩ			Π	≤
4			$	4	D	T	d	t	ä	ö	ñ	Õ			Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	õ			σ	⌡
6			&	6	F	V	f	v	å	û	a	Ũ			μ	÷
7	BL		´	7	G	W	g	w	ç	ù	o	ũ			τ	≈
8	BS	SELECT	(	8	H	X	h	x	ê	ÿ	¿	Ī			Φ	°
9	TAB		)	9	I	Y	i	y	ë	Ö	⌐	ij			Θ	•
A	LF		*	:	J	Z	j	z	è	Ü	¬	¾			Ω	•
B	HOME	ESC	+	;	K	[	k	{	ï	¢	½	~			δ	√
C	CLS	→	,	<	L	\	l	¦	î	£	¼	◇			∞	ⁿ
D	CR	←	−	=	M	]	m	}	ì	¥	¡	‰			φ	²
E		↑	.	>	N	^	n	~	Ä	Pt	≪	¶T			∈	▮
F		↓	/	?	O	_	o	Blank (DEL)	Å	ƒ	≫	§			∩	Blank (FF)

↑ Hex numbers

Hex numbers →

With the graphic character header

	4	5
0	Blank (NULL)	
1	☺	
2	☻	
3	♥	
4	♦	
5	♣	
6	♠	
7	•	
8	◘	
9	○	
A	◙	
B	♂	
C	♀	
D	♪	
E	♫	
F	☼	

Control codes

Character codes with the most significant 4 bits representing 0 or 1 are generated when the CTRL key and a pertinent data key are simultaneously operated, and are used for various control purposes.
E.g. 9C is the character code for the £ symbol.

2. ALPHABETICAL ERROR CODE LIST

Error message	Error code	Description
Can't continue	17	Program execution cannot be continued ● After execution was aborted by an error generation. ● After the program was edited after its execution was aborted.
Device I/O error	19	An I/O error occurred during communication with an I/O device. ● Load error from the cassette recorder ● Communication was forcibly suspended by operating CTRL key and STOP key simultaneously.
Direct statement in file	57	An ASCII file being loaded contained a direct statement.
Division by zero	11	Divided by zero. ● Divider was zero. ● Divided by an undefined variable.
File already open	54	File is already open.
File not found	53	File was not found.
File not open	59	File is not opened.
Illegal direct	12	Execution of a not-direct statement was attempted.
Illegal file name	56	Illegal file name ● Mode specification in the OPEN statement has an error or is missing.
Illegal file number	52	Illegal file number ● A number greater than the one specified in the MAXFILE statement was specified. ● A file number not specified in the OPEN statement was specified.
Illegal function call	5	Statement or function call is illegal. ● Argument in the statement or function exceeds the specified range. ● Negative values are used for subscripts in arrays, or subscripts are too large.
Internal error	51	An error occurred within the BASIC program. ● Normally this type of error will not occur. Should it occur, temporarily switch the system off, then switch it on again.
Input past end	55	Date loading was attempted using the INPUT # statement after all data from the file had been loaded. ● The number of INPUT # statements exceeds that of data. ● Data read from a vacant file was attempted. (This error message can be disabled by using the EOF function.)

Error message	Error code	Description
Missing operand	24	A necessary operand is missing. ● Operand value has an error. ● Separators between operands are periods (.), instead of commas(,).
NEXT without FOR	1	The number of NEXT clauses exceeds that of FOR clauses. ● One FOR...NEXT loop has been mixed with another FOR...NEXT loop.
No RESUME	21	NO RESUME statement is in an error service routine. ● Control was returned from an error service routine by using the GOTO statement.
Out of DATA	4	There is no data to be read by the READ statement. ● Insufficient amount of data. ● Erroneous line number for the RESTORE statement. ● Erroneous separators used in the DATA statement.
Out of memory	7	Insufficient memory capacity. ● The program is too long. ● Too many variables. ● Too large arrays. ● Too many FOR...NEXT loops, or control exits from a FOR...NEXT loop without clearing the stack.
Out of string space	14	String space is not sufficient. ● String space specified by the CLEAR statement is too small.
Overflow	6	Numeric value exceeds the allowable range. ● The result of computation is too small or too large.
Re-dimensioned array	10	An array was re-dimensioned. ● An already dimensioned array was re-dimensioned by the DIM statement. ● A subscripted array (no more than ten) was used before it was dimensioned with the DIM statement.
RESUME without error	22	A RESUME statement was executed outside an error service routine.
RETURN without error		A RETURN statement was executed before a GOSUB statement was executed. ● Branching to a subroutine was attempted by using a GOTO statement. ● An END statement is missing from the main routine, and the subroutine just following the main routine was executed.
String formula too complex	16	String formula is too complex ● Character string written on a line is too complex (too many parantheses).

Error message	Error code	Description
String too long	15	Character string is too long. ● Transfer in excess of 256 characters was attempted into a character variable.
Subscript out of range	9	Subscript for an array exceeds the allowable range. ● Subscript value is too large. ● Undefined array has a subscript of 10 or more.
Syntax error	2	Syntax illegal to MSX BASIC. ● Typing error. ● Illegal separator (commas, periods, colons, semi-colons, etc.) ● Illegal use of parentheses. ● Variable name does not begin with an alphanumeric character.
Type mismatch	13	Variable type does not match. ● Transfer of characters to a numeric variable was attempted. ● Arguments in functions do not match.
Undefined line number	8	Line number not defined. ● A line number specified in a GOTO, GOSUB, RESTORE, or RESUME statement does not exist.
Undefined user function	18	User function is not defined. ● Function name in the DEFFN statement has an error. ● DEFFN statement was not executed.
Verify error	20	Verify error ● Error was found during the execution of the CLOAD? command. ● Verify operation using the CLOAD? statement was attempted for a program created on another type of machine (an error will result even if the contents of the program are correct).

NOTES

NOTES

TOSHIBA CORPORATION
TOKYO JAPAN
PRINTED IN JAPAN
A 0379–1