

READ THIS FIRST

DRAGON by TANO

OWNER'S MANUAL



AN INTRODUCTION TO THE DRAGON by TANO

Welcome to the world of DRAGON computing! Your new DRAGON by TANO 64K computer is one of the most powerful and versatile personal computers available today. It has been designed to reliably deliver years of service to you, your family and business as an educator, an entertainer and a business tool.

As you become more familiar with your DRAGON and its capabilities, you will appreciate its features and performance, and when the time comes it is ready and waiting to expand and grow with you.

This manual explains how to unpack, connect and operate your new DRAGON computer. Please read it completely before proceeding with "An Introduction to BASIC Programming Using the DRAGON."

UNPACKING

Having opened the box and found this manual you should also have found:

1. Your Dragon computer
2. A power supply unit
3. A TV connection cable
4. A TV transfer switch
5. "An Introduction to BASIC Programming Using the DRAGON" manual
6. A cassette recorder cable

In addition to these items you will need an ordinary home television set. Your Dragon Computer will work with either a color or black and white TV. However, to obtain the full color graphic ability of your Dragon, you will have to connect it to a color TV. This is all that is required to get your Dragon working.

You can, however, extend the capabilities of your machine by adding the following options:

1. A cassette recorder to store programs and data
2. A printer
3. Joysticks for game playing
4. Disk drives for mass storage of programs and data

None of these options is necessary, but a cassette recorder or disk drive will allow you to load commercially available software and save your own programs for later use.

KEY

1. TV SOCKET

Connection to VHF television set.

2. RESET button

Used to reset computer to initial state. Stops running program, or input/output operations, immediately. Any program currently in memory is still present after pressing reset.

3. LEFT JOYSTICK SOCKET

4. RIGHT JOYSTICK SOCKET

For both 3. and 4 above. 5 pin DIN sockets used for connecting joysticks, available as optional accessories.

5. CASSETTE INPUT/OUTPUT SOCKET

5 pin DIN socket for connection of cassette recorder.

6. SERIAL INPUT/OUTPUT SOCKET

7 pin DIN connector for connection to a telephone modem, a serial printer or another computer.

7. PARALLEL PRINTER PORT

Connection for a centronics type printer.

8. PROGRAM CARTRIDGE SLOT

Used for program/game cartridges. Cartridge must be inserted with the computer switched off.

9. POWER PACK SOCKET

For connection of supplied power pack unit.

10. MONITOR SOCKET

For connection of color monitor.

11. CHANNEL 3/4 SELECT SWITCH

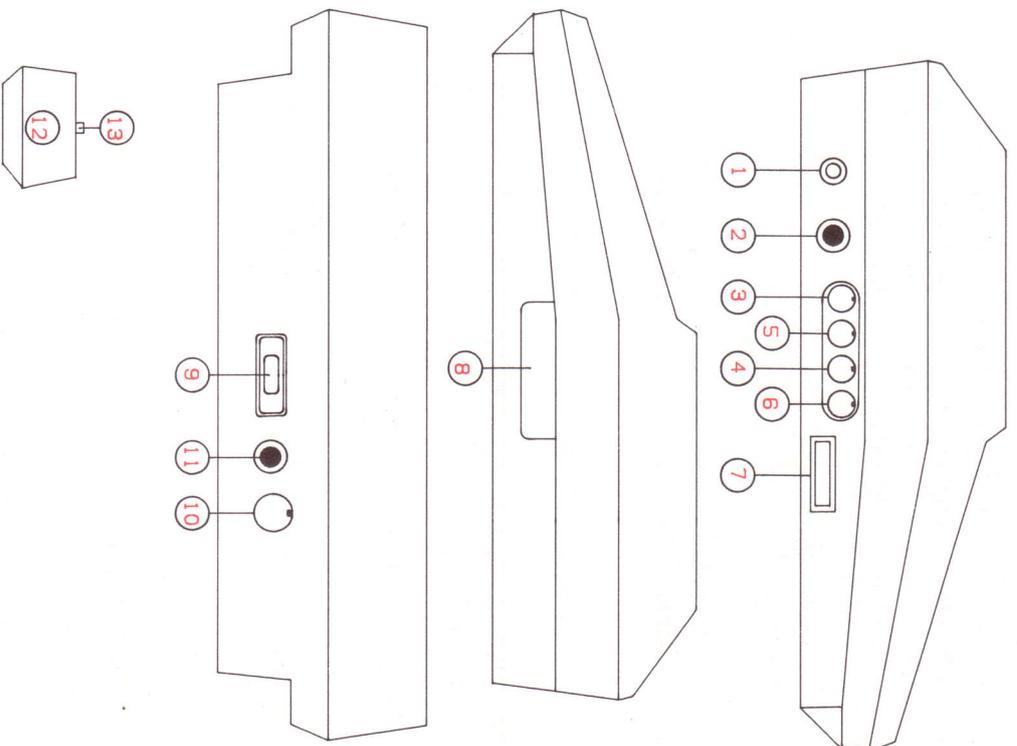
Used to select an unused channel in your location.

12. POWER PACK UNIT

Plug this unit into a 110V AC 60 Hz socket only.

13. POWER SWITCH

Use this switch to turn your DRAGON ON and OFF.



CONNECTING YOUR DRAGON by TANO

1. Disconnect the existing antenna leads on the VHF terminals of your television set.
2. Connect the TV Transfer Switch leads marked "TO TV" to the antenna connections marked VHF on your television set. The TV Transfer Switch is a small box with a switch on it marked COMPUTER/TV.
3. Connect your VHF TV antenna to the terminals marked "ANTENNA" on the TV Transfer Switch.
4. Connect the supplied video cable to the socket marked "COMPUTER" on the TV Transfer Switch.
5. Connect the free end of the video cable to the TV socket on the left side of the Dragon.
6. Slide the switch on the TV Transfer Switch to COMPUTER.
7. Plug the Power Pack into a 110V 60Hz wall socket.
8. With the Power Pack power switch OFF, plug the free cable into the Power Pack socket (marked TRANS SUPPLY) on the back of the Dragon.
9. Switch on the TV and the Dragon Power Pack.
10. Tune your TV to channel 3 or channel 4, whichever is unused in your area.
11. Set the Channel 3/4 switch on the back of the Dragon IN for channel 3 or OUT for channel 4.
12. You should see a green square with a black border (or a light grey square with a black border if the TV is a black and white set.) Adjust the fine tuning for the clearest picture.

In the green square will be the following message:

(C) 1982 DRAGON DATA LTD
16K BASIC INTERPRETER 1.0
(C) 1982 BY MICROSOFT

OK

Your computer is now ready to use. The accompanying manual "An Introduction to BASIC Programming Using the DRAGON" includes tutorials and examples of BASIC programming, so you are now ready to explore the fascinating world of DRAGON computing.

Finish reading this manual first, though. It contains instructions for connecting devices such as cassette recorders, hints on taking care of your computer, and an explanation of the workings of the DRAGON by TANO.

THE FEDERAL COMMUNICATIONS COMMISSION (FCC) WANTS YOU TO KNOW:

Like any computer, the Dragon generates and uses radio frequency energy. If it is not installed and used properly, that is, in strict accordance with these instructions, it may cause interference to radio and television reception.

It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.
- Disconnect one or more of the peripherals until the interference stops.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

“How to Identify and Resolve Radio-TV Interference Problems.”

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

Warning: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception.

Use of cables other than the TANO cables (or equivalent) specified in this manual to connect peripheral equipment such as printers, modems, or video monitors will invalidate the Federal Communication Commission's certification of your DRAGON computer and may cause interference levels exceeding the limits established by the FCC for this equipment.

USING PROGRAM CARTRIDGES

Turn off the DRAGON, and insert the cartridge, with the label facing up, into the cartridge slot (8 in the diagram). When you turn on the computer, the program will automatically run. If it fails to do so, press RESET.

NOTE: Always turn off the computer before inserting or removing a cartridge. Failure to do so could result in damage to both the cartridge and the computer.

USING GAME JOYSTICKS

DRAGON joysticks are available as optional accessories. To connect the joysticks, just plug them into the joystick sockets (3 and 4 in the diagram).

CONNECTING A CASSETTE RECORDER

Any reasonable quality cassette recorder can be used to store programs and data from your DRAGON. The cassette recorder must have sockets for remote control (REM), earphone (EAR), and auxiliary or microphone input (AUX or MIC). The connection to the computer is at socket 5 in the diagram.

The cable that came with your DRAGON has a DIN connection on one end. This connects to the computer. The other end has three jack plugs — two with equal length prongs and one with a shorter, narrower prong. The cable will have one of two color codes — either red, white and blue, or grey and black. With the first type, the white plug goes into the socket marked EAR; the red goes into the AUX or MIC socket; and the smaller blue plug goes into the REM socket. With the second type, the small, gray plug goes into REM; the large gray plug goes into AUX or MIC; and the large black plug goes into EAR.

See chapter 4 of the Programming Manual for instructions on how to use the recorder.

CONNECTING A PRINTER

To connect a parallel printer to your DRAGON, use a TANO Parallel Printer Cable for the DRAGON by TANO, part number 952000. This cable allows your DRAGON to work with a centronics type parallel printer. Set the printer's automatic line feed "ON."

CONNECTING A VIDEO MONITOR

If you choose, you can use an NTSC video monitor instead of a television. Use a TANO Video Monitor Cable for the DRAGON by TANO, part number 952015. This cable has connections for audio and video.

USING THE SERIAL INTERFACE

The serial interface can be connected to other serial devices by using a TANO Serial Interface Cable for the DRAGON by TANO, part number 952023. This cable can be used to connect your DRAGON to serial printers, modems, other computers and more.

ADDITIONAL FEATURES OF THE DRAGON by TANO

USING 64K RANDOM ACCESS MEMORY

Your DRAGON by TANO has been designed to provide you with the best of two worlds: one, the power and flexibility of 64K bytes of random access memory (48K bytes available when using BASIC) and two, complete compatibility with all software written for the 32K byte DRAGON 32 computer.

So that the DRAGON by TANO can use software already written for the DRAGON 32, your new computer can operate as either a 32K or 64K machine. Programs written in BASIC will run equally well on either configuration, but, due to the change in the memory map, some programs in machine language for the 32K version will not run in the 64K mode. If you find that a program won't run in 64K mode, just turn off the computer for about 10 seconds. When you turn it on again, it will run the program as usual.

GETTING INTO 64K MODE

When you turn on the DRAGON, it is automatically configured in the 32K mode, and any DRAGON 32 software will run with no trouble. To get into 64K mode, simply type:

EXEC [ENTER]

If you have already given another EXEC command during your programming, type:

EXEC 48000 [ENTER]

When the computer is "booted" into 64K mode using the EXEC or EXEC 48000 command, the system will display the DRAGON DATA LTD. copyright notice with a 1983 date, and the cursor will flash blue instead of black. You now have 48K instead of 32K bytes of memory space for BASIC programs and graphics.

Booting into 64K mode **will not** wipe out an existing program. It acts like a CLEAR command so that your BASIC program in memory will run as it usually does after a CLEAR.

Compare the memory map at the back of this introduction with the memory map of the DRAGON 32 at the back of "An Introduction to BASIC Programming Using the DRAGON." Notice that there is no longer a memory area for cartridges. For this reason, cartridges will not run on the 64K mode configuration. However, since the DRAGON should be turned off before inserting a cartridge, and it starts out in 32K mode, your cartridges will work quite well. This is also true for the disk controller cartridge.

Note also that the BASIC Interpreter takes up 16K at the top of RAM so that you have 48K left for programming. If you use the optional OS9 operating system, the computer no longer needs this memory area for BASIC, and the full 64K RAM is available.

KEYBOARD AUTO-REPEAT

In 64K mode the keys repeat when you hold them down for about 1 second. This feature is not provided in the 32K mode because of incompatibility with certain existing software.

RS232 SERIAL INTERFACE

First a word about Serial and Parallel transmissions. When the DRAGON sends a parallel transmission, it sends the 8 pieces (bits) of a byte of information at once, since a parallel connection has enough wires to send one bit per wire. A serial transmission is sent one bit at a time over one wire. The main use for serial transmission is for communicating with other computers over telephone lines using a MODEM (for MODulate DEModulate) device which translates the sounds from the telephone into electrical impulses recognizable to the computer.

BASIC and machine language programs can be serially transmitted from one DRAGON directly to another by using the new commands **DLOAD** and **DLOADM**.

DLOAD allows a BASIC program in ASCII format to be downloaded from the host computer. DLOADM is used to the same effect with machine code programs.

SERIAL PRINTERS

The Serial Interface can also be used as a printer output port. The PRINT #-2 and LIST commands (shown on page 132 of the Introduction to BASIC Programming book) can be directed to the serial port by the command:

POKE &H3FF,1

All output to the parallel port will be redirected to the serial port after this command is given. To go back to the parallel I/O port, type

POKE &H3FF,0

When the DRAGON is first turned on, it is set to use the parallel I/O port.

TAKING CARE OF YOUR DRAGON COMPUTER

1. Keep all liquids well away from your computer. Your DRAGON does not work as well on coffee and Cokes as you do.
2. Make sure all loose wires are kept out of harm's way. An accidental trip could be expensive.
3. Make sure all plugs are firmly in their sockets before turning on the DRAGON.
4. Switch off everything and disconnect the machine when it's not in use.
5. To clean the case and keyboard, first disconnect the unit completely from the power supply. Using a slightly damp cloth, wipe the case and keyboard. **Do not** use any spirit based cleaners.

64K MODE MEMORY MAP

A map of the 32K mode is printed in the back of the programming manual.

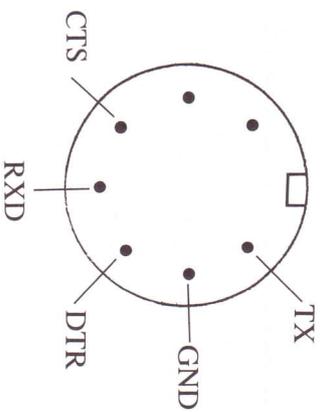
Decimal Address	Contents	Hex Address
00-1023	System use	0-3FF
255	Direct page RAM	OFF
1023	Extended Page RAM	3FF
1024-1535	Text Screen Memory Graphics Screen Memory	400-5FF
1536-3071	Page 1	600-BFF
3072-4607	Page 2	C00-11FF
4608-6143	Page 3	1200-17FF
6144-7679	Page 4	1800-1DFF
7680-9215	Page 5	1E00-23FF
9216-10751	Page 6	2400-29FF
10752-12287	Page 7	2A00-2FFF
12288-13823	Page 8	3000-35FF
13824-49151	Program and Variable Storage	3600-BFFF
49152-65279	Basic Interpreter	C000-FE9F
65280-65375	Input/Output	FF00-FF5F
65376-65503	SAM Control Bits	FF60-FFDF
65504-65535	MPU Vectors	FFE0-FFFF

PIN CONNECTIONS

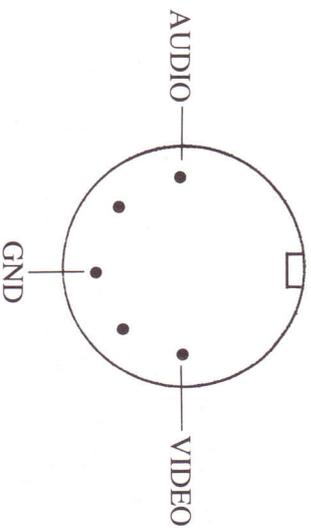
PARALLEL PORT

PIN	FUNCTION	PIN	VOLTS
PIN 1	PRINT STROBE	PIN 2	+5 VOLTS
PIN 3	DATA BIT 0	PIN 4	+5 VOLTS
PIN 5	DATA BIT 1	PIN 6	0 VOLTS
PIN 7	DATA BIT 2	PIN 8	0 VOLTS
PIN 9	DATA BIT 3	PIN 10	0 VOLTS
PIN 11	DATA BIT 4	PIN 12	0 VOLTS
PIN 13	DATA BIT 5	PIN 14	0 VOLTS
PIN 15	DATA BIT 6	PIN 16	0 VOLTS
PIN 17	DATA BIT 7	PIN 18	0 VOLTS
PIN 19	ACR	PIN 20	BUSY

RS232 SERIAL PORT



MONITOR PORT



IMPORTANT

Please make these changes to "An Introduction to BASIC Programming Using the DRAGON" before studying it.

- P.13 Command Summaries.
Pages with green borders give details of commands as they are introduced. Text may be interrupted by these command pages, so keep this in mind, and find the continuation of the text on the next non-bordered page.
- P.23 Line 100 in the program is missing. It should be:
100 PRINT:PRINT P\$: INPUT A\$: CLS
- P.35 Item "d" under cassette recorder description. "Mains" power means a three-pronged, 110 volt, household power socket.
- P.35 See cassette recorder hookup discussion in the "DRAGON Owner's Manual" for correct information.
- P.36 At bottom of page. The sentence "To check it is there, type . . ." should be followed by the command:
RUN
- P.43 "The command will remember . . ." should read:
"The command will renumber . . ."
- P.44 The first line should read:
"The RENUM command will renumber all, or some of, . . ."
- P.56 Note the STEP command discussion. To count backwards, you must show a negative step — i.e.:
FOR I = 10 TO 1 STEP -1
In the value chart, therefore, the first line "50 1 1" will only print "50" and then stop. If you change the step to "-1", the program will count backwards from 50 to 1.
- P.66 Last line. Read "parentheses" instead of "brackets."
- P.89 Program line 120 should read:
120 CLS0: FOR Y = 0 TO 1: PRINT@
0,Z(1)::PRINT@ 26,Z(0);
Lines 150 and 160 should read:
150 IF P = 126 OR P = 254 THEN
F = 0:T = 1:GOSUB 200
160 IF P = 125 OR P = 253 THEN
F = 1:T = 0:GOSUB 200
- P.96 Under "DRAW THE LINE, SOMEWHERE", line 30 should read:
30 PCLS:LINE(10,180)-(245,10),PSET
The "BF" is added and explained later in the discussion.
- P.113 The line "A sharp flat note can be indicated . . ." should read "A sharp or flat note . . ."
- P.117 The three-line program at the bottom of the page. Remove "C8;" from line 20. It should read:
20 DRAW "BM120,96;U26;R13;D26;L13"
- P.124 The line "Relative movement can be specified by the 8 parameter . . ." should read:
"Relative movement can be specified by the M parameter . . ."
- P.131 In "Field specifiers" chart, the comma display example should be "###,###,###".
Last page. Dragon Memory Map. The decimal address range of page 6 of graphic screen memory should read "9216-10751". Page 7 should read "10752-12287".