



GO SUB GO!

This short series of articles is designed to help you get the most from the graphics capabilities of the Commodore 64. We will cover many aspects, including screen displays, designing sprites, and keyboard control of movement. During the course, we will construct a Subhunter game, building up the necessary routines as we go along.

One of the Commodore 64's most attractive features is its ability to allow arcade-type games to be written in BASIC. What makes this possible is the machine's ability to handle sprites — high resolution shapes that can be defined by the user and easily manipulated on the screen. There are special registers in the Commodore's memory that control attributes of the sprites, such as their colour, size and position on the screen. By POKEing numbers into these registers, the programmer can easily control the action. The Subhunter game that we will design as the focal project of this series will make use of four of the machine's eight available sprites. These sprites will represent the ship, the submarine, the depth charges fired from the ship, and an explosion.

So that the game can be built up over successive instalments, each section of the program will be written as a short subroutine that is called up for use within the main program loop. This type of structure makes tracing bugs and program extension much easier.

The concept of this game will be familiar to many. The player is in control of a ship that is hunting submarines. These cross the screen at varying depths and speeds, and the ship drops depth charges on them. The player's score is increased every time a sub is hit, the value of each sub being calculated from its depth and speed. Naturally, higher scores are made for hitting deep, fast-moving submarines. However, if the sub escapes, then its value is subtracted from the player's score. The ship is controlled from the keyboard, using the Z and X keys for horizontal movement left and right. Depth charges are fired using the M key. A timer is displayed on the screen, allowing the game to be played for three minutes. At the end of this time the player is asked if another game is required, and a record is kept of the highest score since the program was first run.

The golden rule to observe when designing an action game in BASIC is to keep the main loop of the program as short as possible. The Subhunter program makes use of subroutines to carry out most functions within the game. The only functions controlled directly from within the main

program loop are: updating the timer, accepting an input from the keyboard, moving the ship, and moving the submarine.

This program design is general enough to be applied to any make of computer, but the detailed programming will vary according to the individual characteristics of the computer being used. In this section of the project we shall look at the routine that creates a screen display.

SCREEN DISPLAY

There are two ways to print characters to the screen on the Commodore 64. One is to use the PRINT statement and the other is to POKE numbers to the areas of memory that hold information about the display. We will use both methods in the creation of the backdrop to our game.

The Commodore screen is made up of 25 rows of 40 character spaces. In other words, there are 1,000 places on the screen where a character can be placed. Each position on the screen has two numbers associated with it. The first is a screen code number that tells the computer which character to display in that position. The second is a colour number that tells the computer what colour the character displayed should be. There are two blocks of memory, each consisting of 1,000 locations: one to hold information about the screen code and one to hold information about the colour of every position on the screen. The area that holds the screen codes is called the screen memory and runs from location 1024 to 2023. The colour memory runs from 55296 to 56295.

Each character has its own screen code and these are listed on page 132 of the user guide. There are 16 colours on the Commodore 64. The colour codes are:

0	black	8	orange
1	white	9	brown
2	red	10	light red
3	cyan	11	grey 1
4	purple	12	grey 2
5	green	13	light green
6	blue	14	light blue
7	yellow	15	grey 3

In addition to these areas of memory, two other locations are of special interest. Location 53280 controls the border colour and 53281 controls the screen colour. To design the seascape setting for our game, the top six rows of the screen will be light blue for sky, while the rest of the screen and the border will be dark blue to represent the sea (except for the bottom two rows, which will represent the sea bed).