Atari Joystick Adapter

Get that arcade game response on your Color Computer.

The Adapted Joystick

by Robert Lee Hawkins

MANY ARCADE GAMES modified for the Color Computer were originally designed for Atari-style joysticks. The games aren't quite the same without them. Fortunately, the flexibility of the Color Computer's joystick ports makes it easy to adapt Atari joysticks to the Color Computer. Here's a method that uses a $1.00 integrated circuit (IC) and eight resistors, requires no modifications to the computer or the joysticks, and even lets you rotate the sticks for left-handed operation.

How They Work

Atari joysticks contain five switches: the fire button and four switches that sense the direction the "stick" is pushed. All are connected on one side to ground (line G in Figure 1), and are normally open. A joystick switch is closed when the stick is moved. Thus, pushing the fire button closes the F switch; the computer senses that the F line has been connected to ground, and launches a doomsday missile. The other four lines indicate left (line A), right (B), up (D), and down (C). Pushing the stick left and up causes switches A and D to close. The stick is self-centering — take your hands away and all switches open.

A Color Computer joystick port is actually two analog-to-digital converters, one for the X (horizontal) direction and one for the Y (vertical) direction. The fire button works just like Atari's. The X and Y converters accept a voltage from zero to five volts, and convert it to a number from zero to 63. The ports supply five volts to the joysticks, which divide it down to some intermediate voltage depending on the position of the stick. For example, if the right joystick is centered in the horizontal direction, the five volts would be divided in half, and 2.5 volts would be returned to the X input. The Basic function JOYSTK(0) would return a value of 31.

An arcade-style game reduces the Color Computer's subtlety to the Atari-like crudity it requires, by interpreting any joystick value less than 12 as left, any value above 50 as right, and everything in-between as centered. This leaves a large dead space in the middle, making it tough to change directions in a hurry. Also, the Color Computer joysticks aren't self-centering, so you might find yourself traveling in a direction you never intended. All this makes a game even more frustrating than it was intended to be.

The solution is to use Atari joysticks, and translate the Atari's crude switch closures into the civilized voltages of the Color Computer. The X voltage should be zero when joystick switch A is closed, about 2.5 volts when neither A nor B is closed, and five volts when B is closed.

The Circuit

My translator is diagrammed in Figure 2. Connections to the Atari joysticks are drawn as circles, and connections to the Color Computer port are drawn as triangles. The IC is a 4066-quad bilateral switch. The 4066 contains four solid-state switches, each of which can be connected to any voltage you desire, not just ground. An IC switch is open when its control line is at ground, closed when its control line is at five volts.

To see how the circuit works, consider just the A and B switches and horizontal motion. Control lines A and B are connected to five volts through resistors, so IC switches A and B are normally closed. The X output is then connected, through equal resistors, to five volts by IC switch A, and to zero volts by IC switch B. The voltage at X is the average, 2.5 volts.

The A control line is connected to the A switch on the joystick. When the stick is pushed left, the A joystick switch closes, shorting the A control line to ground, and opening IC switch A. Now the X output is connected only to zero volts, just what you want for left movement. Similarly, if the stick is pushed right, the B line is grounded, and X is connected only to five volts — right. The Y output works the same way, except that zero volts means up and five volts means down.

♦ more

Build It

The circuit can be constructed using any technique. Use a 14-pin socket to hold the 4066, and take reasonable precautions against static electricity when handling it. You may want to build two circuits on one circuit board, for the left and right joystick ports. The pre-etched circuit boards in the parts list have enough room for this.

I used 100k-ohm resistors in the prototype because they were cluttering up my junkbox, but any value from 10k to 100k will work fine. It's only important that the two resistors attached to IC switches A and B be the same, and that the two attached to C and D be the same. In fact, I only had seven 100K resistors, so I used an 82K part on the D control line.

The circuit isn't much use until you can plug an Atari joystick in one end and a Color Computer in the other. For the Atari end, you need a standard DB-9 plug. Figure 1 gives a solderer's-eye view of the solder pins on the back of the plug. If you're left-handed, you may want to rotate the joystick so the fire button is in the upper right corner, rather than the upper left. In that case, change the wiring to the DB-9 as follows: A becomes D, D becomes B, B becomes C, and C becomes A.

Close-up of the Circuit.

It has been widely and incorrectly reported that the Color Computer joystick ports take a "standard five-pin DIN plug." In fact, the five-pin DIN plugs that Radio Shack sells won't fit. What you really need is a six-pin DIN plug; the sixth center pin is wasted. Some manufacturers leave the center pin off and call the result a "270 degree five-pin DIN plug." Be sure to get thinline plugs that will fit into the narrow hole in the Color Computer's case. Even so, you may have to cut the plastic shell short to get a reliable connection. If you're really cheap, you can make your own plug using 16-gauge solid wire for pins.

Now the circuit's assembled and ready to be tested. You can't use an inexpensive multimeter, because the multimeter's resistance will be less than the resistances used in the circuit. A vacuum-tube or FET multimeter will give accurate voltages. Better yet, just plug the circuit into your right joystick port. It can't damage your computer, because the computer is its only source of power.

To test the fire button, enter the following line: `FOR I=1 TO 2 STEP 0 : PRINT PEEK(65280) : NEXT I`. A column of numbers will flow up your screen. As long as the numbers change when you press the fire button, it's working. To test the joystick itself, enter: `FOR I=1 TO 2 STEP 0 : PRINT`

JOYSTK(0), JOYSTK(1) : NEXT I. Two columns of numbers will flow up your screen, the first being the X joystick value, the second the Y value. When the stick is centered, both should be about 31 (resistor variations might cause a variation of a few counts). Push the stick left and the first number only should change (to zero); push right and it should change to 63. The second number should be zero when the stick is pushed up, 63 when it's pushed down. The 4066 can handle about ten million changes of direction per second, which should be adequate even for championship play.

The final step is to load in one of those arcade games and start playing it the way it was meant to be played! ■ ■ ■

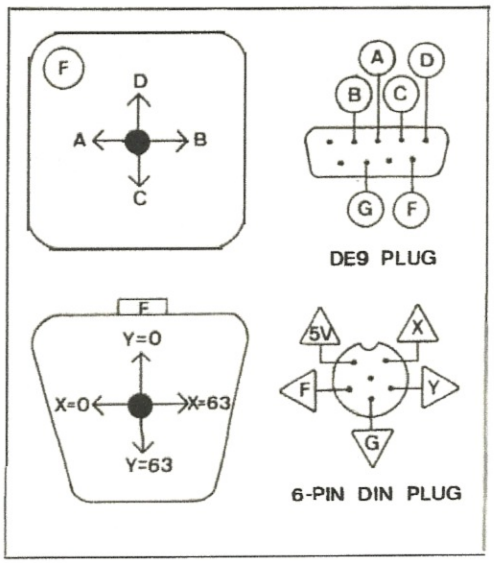

Figure 1. Atari (top) and Color Computer (bottom) joystick connections.

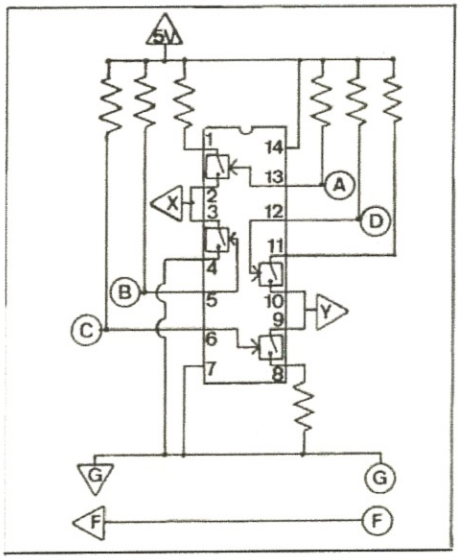

Figure 2. Atari-to-Color Computer converter circuit.

Parts List

4066 quad bilateral switch (Radio Shack 276-2466)

Eight 100k-ohm, ¼ watt resistors

DB-9 plug (Radio Shack 276-1537)

Six-pin thinline DIN plug

Misc: pre-etched circuit board (Radio Shack 276-159, 276-153, or 276-170), five-conductor cable, plastic case, 14-pin IC socket, wire, solder, etc.

Note — Six-pin DIN plugs are available from Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071; part no. 17PP048. The plastic shell will have to be cut down to fit into the Color Computer.