Cromemco Joystick Console

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Introduction

The Cromemco JS-1 joystick console is a general purpose I/O device designed specifically for use with mini and microcomputers. A Cromemco D+7A analog interface can be used to interface one or two JS-1 consoles to any computer using the S-100 Microcomputer Bus.

Each joystick console includes a two-axis joystick, four push button switches, and an audio amplifier and speaker in an attractive, finished enclosure. A 12-conductor cable is included to connect the console to the top edge connector of the D+7A interface.

When using one JS-1 console with our D+7A interface we recommend the following port assignments:

Joystick X axis - analog input port 19H
Joystick Y axis - analog input port 1AH

SW1 - D0 input port 18H
SW2 - D1 input port 18H
SW3 - D2 input port 18H
SW4 - D3 input port 18H

Speaker - analog output port 19H

When using two JS-1 consoles with our D+7A interface we recommend the following port assignments for the second console:

Joystick X axis - analog input port 1BH
Joystick Y axis - analog input port 1CH

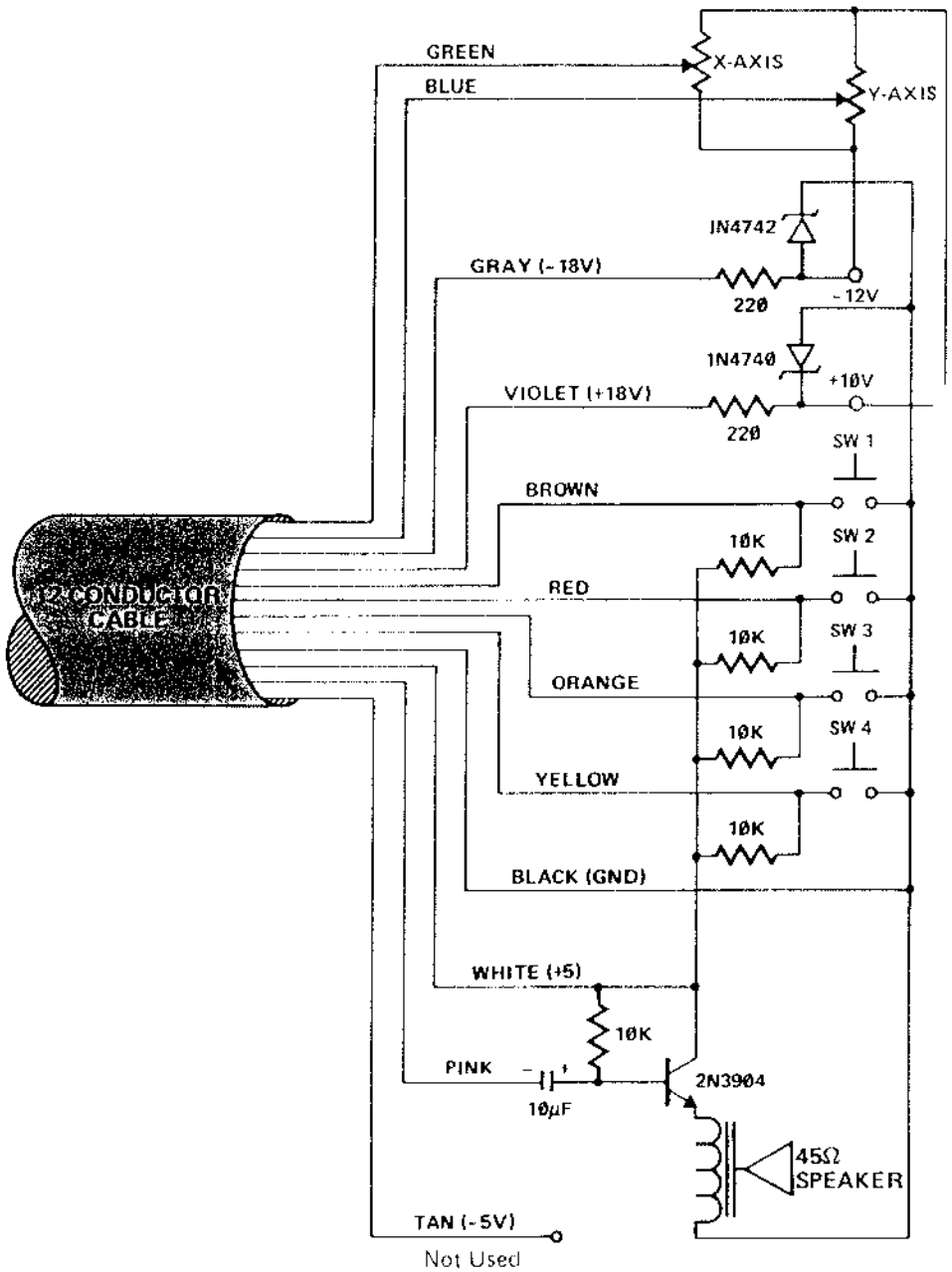
SW1 - D4 input port 18H
SW2 - D5 input port 18H
SW3 - D6 input port 18H
SW4 - D7 input port 18H

Speaker - analog output port 1BH

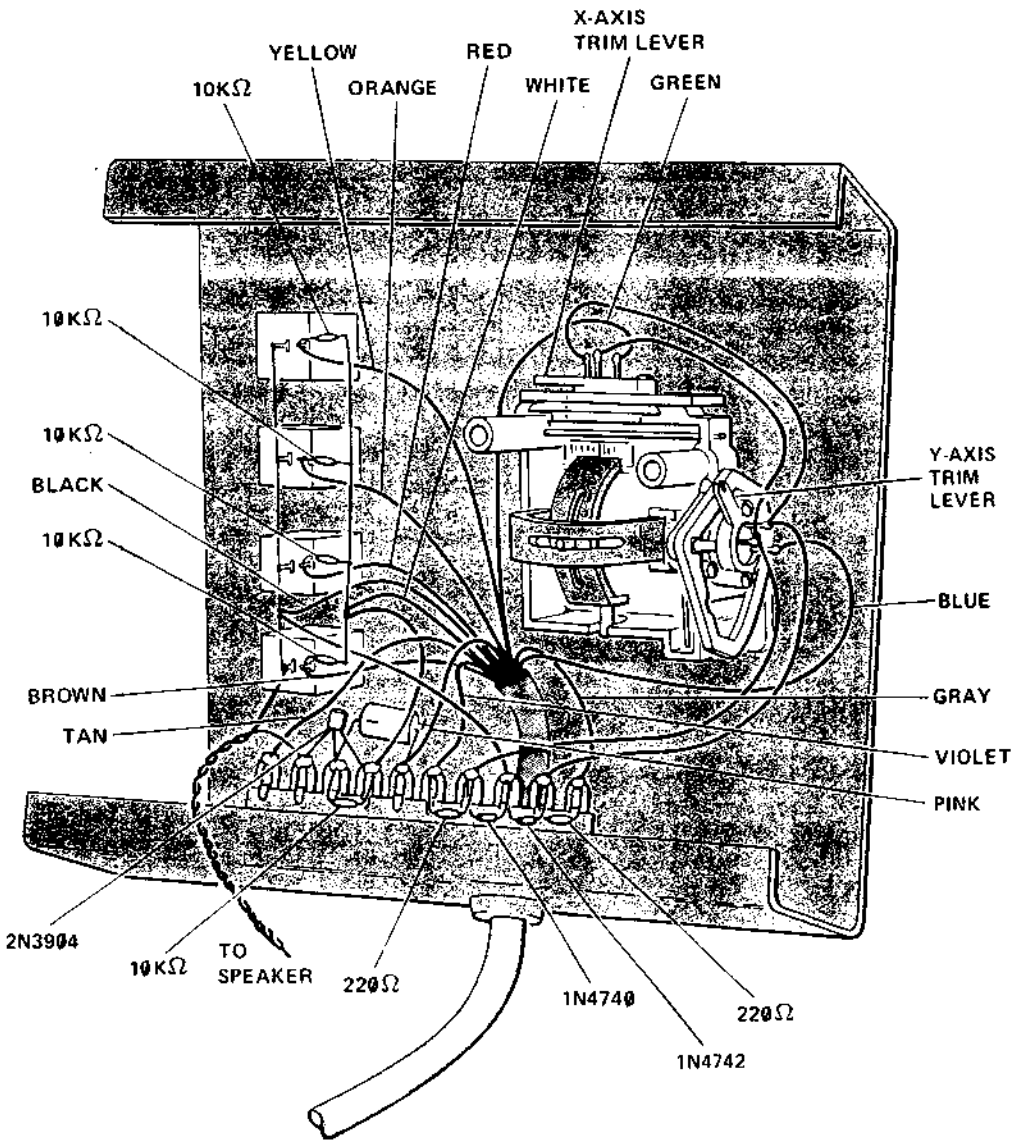
Cromemco also provides software support for the joystick console including the games of DAZZLE-DOODLE, TRACK, CHASE!, SPACE-WAR, DOGFIGHT, GOTCHA!, TANKWAR, SOLO and AMBUSH, complete with documentation. All of these games are available on either a 5" or an 8" diskette (model FDG-S and FDG-L, respectively), with documentation, for $95.

The JS-1 console provides an easy and low-cost way to communicate with your computer. This manual includes the schematic diagram of the console, wiring diagram, assembly instructions and parts list. A listing of our Dazzle-Doodle software is also included to provide a software example using the JS-1 joystick console.

Schematic Diagram



Wiring Diagram



Assembly Instructions

1. Mount the connector strip and speaker on the inside rear panel of the cabinet using six #6 screws and nuts.

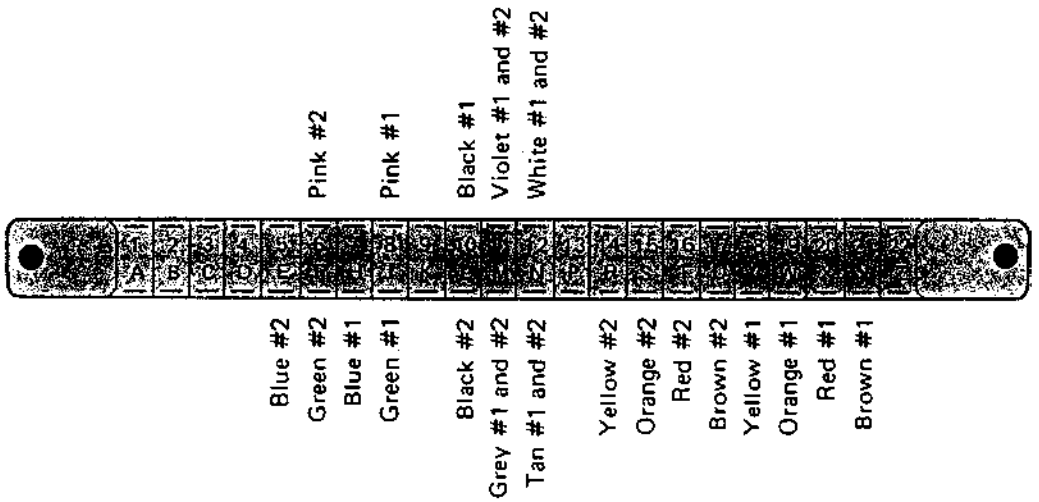
2. Press the four pushbutton switches into position using firm pressure. Press the four numbered key tops into position on top of each of the switches.

3 Mount the joystick assembly using the four screws provided.

4. Strip off approximately 6" of the outer sheath at one end of the 12-conductor cable. Clamp this end of the cable in the strain relief insert and press into position on the rear panel. You may need to use a pair of pliers to squeeze the strain relief insert closed while pressing it into position.

5 Following the schematic diagram and the wiring diagram in this manual, complete the electrical wiring of the console.

6. Secure the two pieces of the console cabinet together using the four rubber feet and four mounting screws provided. Assembly is now complete.



Wiring Diagram For D +7 A Interface

Either one or two JS-1 consoles may be interfaced to a computer using the Cromemco D+7A interface. The diagram above shows how to connect two joystick consoles (#1 and #2) to the top edge connector of the D+7A interface card. The colors correspond to the color of the wires in the 12-conductor cable from each joystick.

Initial Check-Out

After completing assembly of your joystick console kit, carefully check your work. To check out the operation of the console, connect the twelve color-coded wires of the cable to the top edge connector of the model D+7A interface card as shown in the diagram on page 4. When using one joystick, make the connections as shown for joystick console # 1. With the D+7A plugged into an S-100 bus computer and the computer power turned on, operation of the console switches, speaker/amplifier, and joystick can be tested as described below.

Switch Operation

A voltmeter can be used to test for proper operation of the pushbutton switches by measuring voltages at the top edge connector of the D+7A interface. Normally voltages at the brown, red, orange, and yellow wires (contacts Y, X, W, and V of the connector) should be +5 volts relative to GND (the black wire). When switch # 1 is depressed, the voltage at the brown wire should fall to zero. Switch #2 should similarly affect the voltage of the red wire, switch # 3 the orange wire, and switch # 4 the yellow wire.

If your computer has output port ØFFH displayed as a programmed output port on the front panel (such as the Cromemco Z-1 computer) a simple program can be used to display the output of the console switches. These four switches are connected to the low-order four bits of input port 18H by the D+7A interface. The following program inputs from port 18H and outputs to port ØFFH (the front panel lights). The program begins at location zero in memory.

```
0000  DB16    IN    A,18H
0002  D3FF    OUT   ØFFH,A
0004  C30000  JP    Ø
```

Speaker/Amplifier Operation

The following program can be used to generate a tone to check the operation of your joystick console amplifier and speaker. The program begins at location zero in memory.

```
0000  C601    ADD   A,1
0002  D319    OUT   19H,A
0004  C30000  JP    Ø
```

This program functions by adding the number one to the contents of the accumulator and outputting the result to the D+7A interface. Port number 19H of the D+7A interface is an analog output port that is connected to the console speaker amplifier. The jump instruction in the program causes the program to loop continuously thus outputting a staircase waveform to the output port. After loading the above program, examine location zero and run. You should hear a medium-pitched tone from the joystick console speaker.

Joystick Operation

A voltmeter can be used to check the operation of the joystick. First measure the voltage at the green wire (contact J of the D+7A connector) relative to GND. With the joystick straight up and centered this voltage should be approximately zero volts. If it is not approximately zero, the joystick trim tabs should be adjusted. Coarse adjustment can be made by adjusting the internal X-axis trim lever (see diagram on page 3). Fine adjustments can be made with the horizontally oriented trim tab on the console front panel.

Now move the joystick to the extreme right. The voltage on the green wire should increase to approximately 2 volts. Next move the joystick to the extreme left. The voltage on the green wire should decrease to approximately -2 volts.

Operation of the joystick Y axis can similarly be tested by measuring the voltage on the blue wire (contact H on the D+7A connector) relative to GND. When the joy stick is pushed all the way forward, the voltage should measure approximately 2 volts. When the joystick is pulled all the way back, the voltage should measure approximately -2 volts.

Parts List

Qty.	Part	Part No.
2	220 OHM 1/4 WATT RESISTORS	
5	10K OHM 1/4 WATT RESISTORS	001-0030
1	10 μF @ 50V POLARIZED CAPACITOR	004-0031
	1N4740 10 VOLT ZENER DIODE	008-0001
	1N4742 12 VOLT ZENER DIODE	008-0008
1	2N3904 NPN TRANSISTOR	009-0001
1	45 OHM QUAM SPEAKER	007-0002
4	N/O PUSHBUTTON SWITCHES	013-0004
1	PUSHBUTTON CAP LABELED "1"	021-0008
1	PUSHBUTTON CAP LABELED "2"	021-0009
	PUSHBUTTON CAP LABELED "3"	021-0012
1	PUSHBUTTON CAP LABELED "4"	021-0011
	CHROMED PLASTIC BEZEL JOYSTICK	016-0000
	STRAIN RELIEF INSERT	015-0025
1	10 TERMINAL STRIP	021-0002
	JS-1 CHASSIS ASSEMBLY	016-0001
4	SMALL BLACK RUBBER FEET	021-0045
6	SCREWS, 6-32 x 38 PAN HEAD	015-0000
6	HEX NUTS, 6-32	015-0013
4	SCREWS, 2-56 x 1/4 PAN HEAD	015-0079

Demonstration Software: Dazzle-Doodle

The Cromemco Dazzle-Doodle software is designed to allow the user to draw full-color pictures on the screen of an ordinary color TV under joystick control. The hardware required is a Cromemco JS-1 joystick console, a Cromemco D+7A interface for the joystick console, and a Cromemco TV Dazzler for the TV display interface. These units must be used with a compatible computer with 2K of static RAM for picture storage and approximately an additional 128 bytes of memory for program storage. Cromemco 4KZ or 16KZ RAM memory boards both provide more than enough memory capacity for both program and picture storage.

To use the DAZZLE-DOODLE program, simply depress either button 2, 3, or 4 on the joystick console and begin "drawing" with the joystick. Button 2 is for red, 3 gives green, and button 4 is for blue. More than one of these buttons may be depressed for a combination of colors. Button 1 is used to erase the picture. The screen may also be filled with color by depressing button 1 while at the same time depressing one or more of buttons 2, 3, or 4.

The Dazzle-Doodle program, listed below, must be loaded into your computer beginning at location 0100H. If you wish to begin execution at location zero in memory, you must insert a jump instruction to location 0200H in memory.

DAZZLE-DOODLE DEMONSTRATION PROGRAM

```
        (000E) DAZZADDR: EQU     0EH             ;DAZZLER address port
        (000F) DAZZSTAT: EQU     0FH             ;DAZZLER status port
        (000F)  HISTRIP: EQU     0FH             ;Mask to strip high nybble
        (00F0)  LOSTRIP: EQU     0F0H            ;Mask to strip low nybble
        (0000)   NOCOLR: EQU     0               ;DAZZLER no color control byte
        (0018)  BUTTONS: EQU     18H             ;Joystick pushbuttons port
        (0019)    JOY1X: EQU     19H             ;Joystick #1 X-axis port
        (001A)    JOY1Y: EQU     1AH             ;Joystick #1 Y-axis port
        (0008)   HIADDR: EQU     8               ;High byte of DAZZLER picture:
                                                 ;modify to change pix location
                                                 ;
                         ORG     100H            ;Main program begins here
                                                 ;
0100  3E84     DOODLE:   LD      A,[HIADDR SHR 1] OR 80H
0102  D30E               OUT     DAZZADDR,A      ;Output to DAZZLER to turn
0104  3E30     SETSTAT:  LD      A,30H           ;on (2K to 4K)
0106  D30F               OUT     DAZZSTAT,A      ;Select 64x64 mode full color
0108  DB18               IN      A,BUTTONS       ;Input from Joystick console
010A  2F                 CPL                     ;pushbuttons
010B  F610               OR      A,10H           ;Set for only high-intensity
010D  1F                 RRA                     ;colors
010E  47                 LD      B,A             ;Save state of buttons
010F  DA6201             JP      C,FILL          ;Jump if Button #1 is pressed
                                                 ;(Block Fill)
0112  DB19               IN      A,JOY1X         ;Input Joystick X-axis
0114  C640               ADD     A,40H
0116  F21B01             JP      P,DOOD10        ;Jump if voltage within range
0119  0600               LD      B,NOCOLR        ;Otherwise, put 0 in B to
                                                 ;inhibit screen write
011B  1F       DOOD10:   RRA
011C  5F                 LD      E,A             ;Save X displacement in E
011D  DB1A               IN      A,JOY1Y         ;Input Joystick Y-axis
```

```
011F  C640            ADD     A,40H
0121  F22601          JP      P,DOOD20        ;Jump if voltage within range
0124  0600            LD      B,NOCOLR        ;Otherwise, put 0 in B to
                                              ;inhibit screen write
0126  1F      DOOD20  RRA
0127  2F              CPL                     ;Y displacement is in A
0128  E63F            AND     3FH             ;The following instructions
012A  67              LD      H,A             ;generate a 64x64
012B  E620            AND     20H             ;DAZZLER address in HL given
012D  84              ADD     A,H             ;the (X,Y) coordinates in DE
012E  67              LD      H,A
012F  7B              LD      A,E
0130  E620            AND     20H
0132  B4              OR      A,H
0133  0F              RRCA
0134  0F              RRCA
0135  0F              RRCA
0136  0F              RRCA
0137  67              LD      H,A
0138  7B              LD      A,E
0139  0F              RRCA
013A  E60F            AND     HISTRIP
013C  6F              LD      L,A
013D  7C              LD      A,H
013E  E6F0            AND     LOSTRIP
0140  B5              OR      A,L
0141  6F              LD      L,A
0142  7C              LD      A,H
0143  E607            AND     7
0145  F608            OR      A,[HIADDR AND 0FEH]
                                              ;Sets the picture address
                                              ;in memory, must be an even
                                              ;2K boundry
0147  67              LD      H,A             ;(HL) now = DAZZLER address
0148  4E              LD      C,(HL)          ;Fetch data byte from memory
0149  7B              LD      A,E             ;Retrieve X displacement to
                                              ;check LSB
014A  0F              RRCA                    ;Put LSB of X into carry flag.
                                              ;If LSB = 1, jump to write
014B  DA5601          JP      C,UPPERN        ;in upper nybble of data byte
014E  3E0F    LOWERN  LD      A,HSTRIP
0150  A0              AND     B               ;Strip color information from B
0151  B1              OR      A,C             ;and combine with present
                                              ;memory data
0152  77              LD      (HL),A          ;Replace with new memory data
0153  C33040          JP      SETSTAT         ;Jump back to beginning to
                                              ;check input again
0156  3E0F    UPPERN: LD      A,HSTRP
0158  07              AND     B               ;Strip color info from B
0159  07              RLCA                    ;and shift into byte upper half
015A  07              RLCA
015B  07              RLCA
015C  07              RLCA
015D  B1              OR      A,C             ;Combine with present
                                              ;memory data
015E  77              LD      (HL),A          ;Replace with new memory data
015F  C33401          JP      SETSTAT         ;Jump back to beginning to
                                              ;check input again
                                              ;
                                              ;Start of memory clear routine
                                              ;First pix byte addr in HL
```

```
0162  210008      FILL: LD      HL,[HIADDR SHL 8]
0165  3E0F            LD      A,HISTRIP
0167  A0              AND     B               ;Strip color information from B
0168  4F              LD      C,A
0169  07              RLCA                    ;Copy in upper half of byte
016A  07              RLCA
016B  07              RLCA
016C  07              RLCA
016D  B1              OR      A,C             ;High/low nybbles of color in A
016E  77              LD      (HL),A          ;Store new data in memory
016F  54              LD      D,H
0170  5D              LD      E,L             ;Duplicate HL in DE & increment
0171  13              INC     DE              ;to point to following location
0172  010008          LD      BC,800H         ;Fill 2K memory swath for pix
0175  EDB0            LDIR                    ;Do the block fill
0177  C30401          JP      SETSTAT         ;and jump back to the beginning
017A  (0100)          END     DOODLE
```

Warranty

Your factory-built Joystick Console is warranted against defects in materials and workmanship for a period of 90 days from the date of delivery. We will repair or replace products that prove to be defective during the warranty period provided that they are returned to Cromemco. No other warranty is expressed or implied. We are not liable for consequential damages.

Should your factory-built Joystick Console fail after the warranty period, it will be repaired for a fixed service fee, provided that it is returned to Cromemco. We reserve the right to refuse to repair any product that in our opinion has been subject to abnormal electrical or mechanical abuse. The service fee is currently $70 and is subject to change without notice.

Your assembled Joystick Console kit will be repaired for a fixed service fee, provided that it is returned to Cromemco. We reserve the right to refuse repair of any kit that in our opinion has not been assembled in a workmanlike manner or has been subject to abnormal electrical or mechanical abuse. Payment of the service fee must accompany the returned merchandise. The service fee is currently $70 and is subject to change without notice.