

# Cromemco Joystick Console

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**Cromemco**

i n c o r p o r a t e d

Specialists in computers and peripherals

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## Introduction

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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*

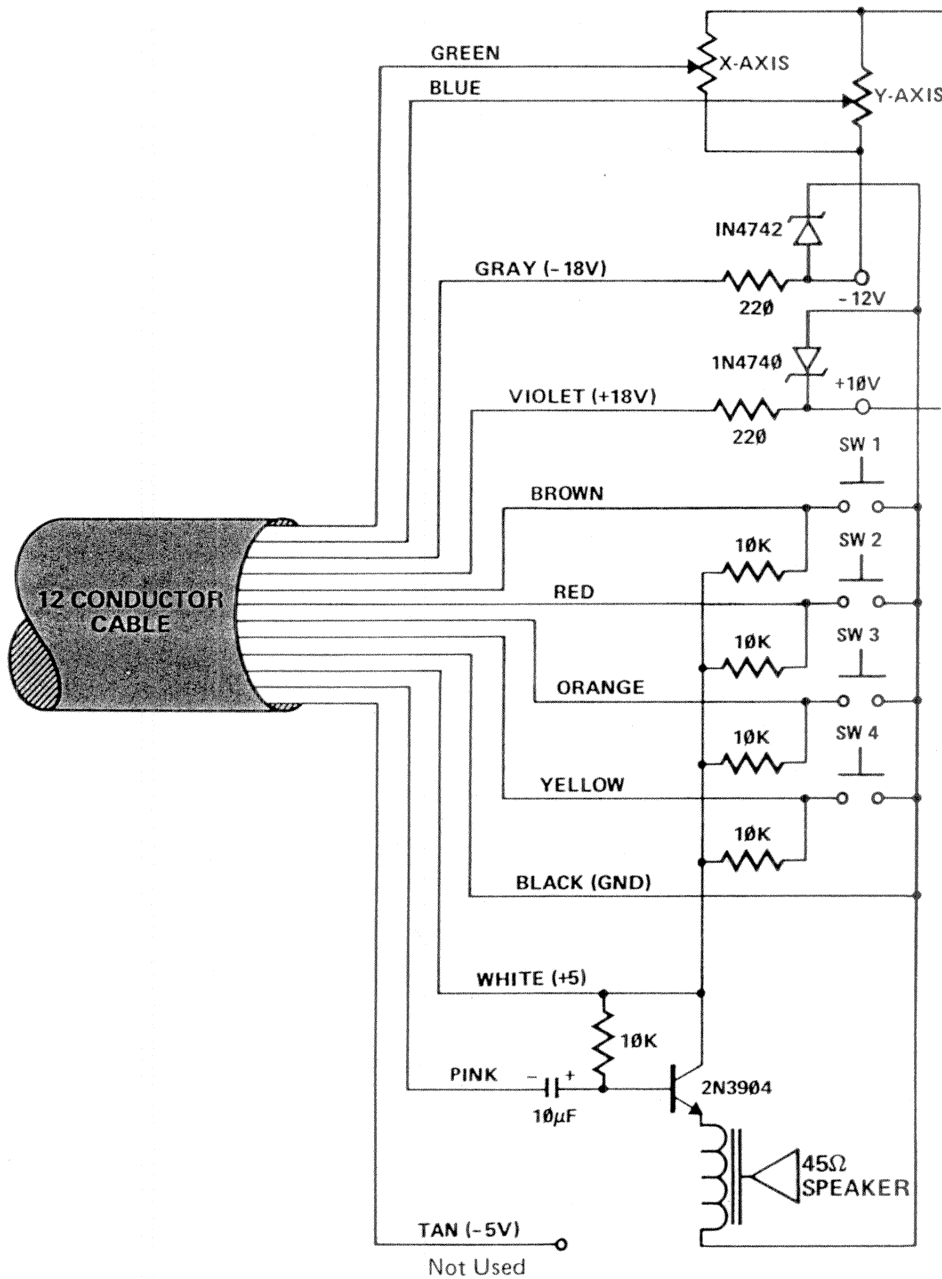
*SW1 - D4 input port 18H  
SW2 - D5 input port 18H  
SW3 - D6 input port 18H  
SW4 - D7 input port 18H*

*Speaker - analog output port 1BH*

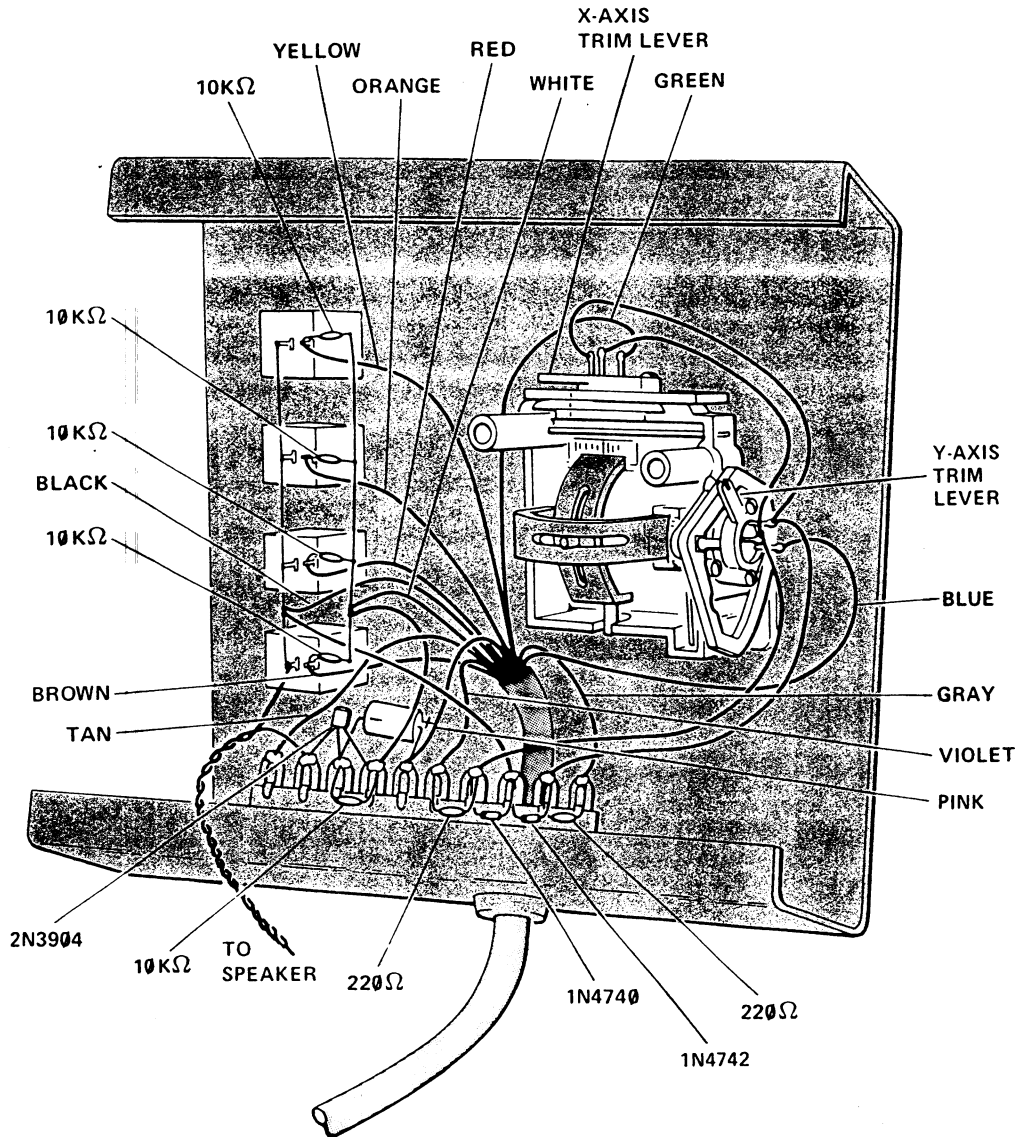
Cromemco also provides software support for the joystick console including the games of DAZZLE-DOODLE, TRACK, CHASE!, SPACEWAR, DOGFIGHT, GOTCHA!, TANKWAR, SOLO and AMBUSH, complete with documentation. All of these games are available on either a 5" or an 8" diskette (model FDG-S and FDG-L, respectively),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

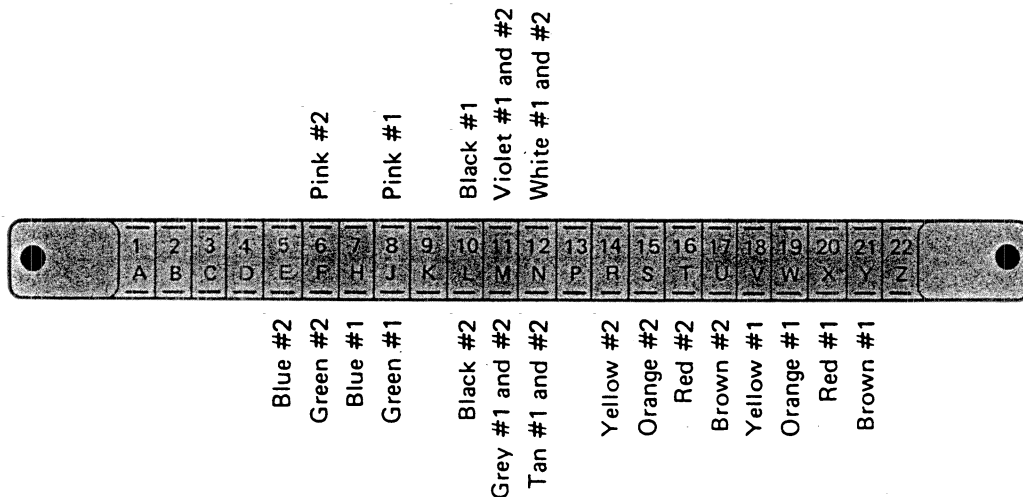


## Wiring Diagram



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



**Wiring Diagram For D+7A 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 0FFH 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 0FFH (the front panel lights). The program begins at location zero in memory.

```
0000 DB16 IN A,18H
0002 D3FF OUT 0FFH,A
0004 C30000 JP 0
```

### Speaker / Amplifier Operation

The following program can be used to generate a tone to check the operation of your joystick con-

sole amplifier and speaker. The program begins at location zero in memory.

```
0000 C601 ADD A,1
0002 D319 OUT 19H,A
0004 C30000 JP 0
```

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 joystick 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 $\mu$ F @ 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 con-

sole 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
                                        ;
                                        ;Main program begins here
                                        ;
                                ORG      100H

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)
                                        ;Input Joystick X-axis
0112 DB19      IN       A,JOY1X
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
					;in upper nybble of data byte
014B	DA5601		JP	C,UPPERN	
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	C3040		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	C30401		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.