

**COLECO
VISION™**

**TECHNICAL
MANUAL**

ZONE

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Introduction

The ColecoVision Repair Manual is designed to assist the repair person in locating problems within the system in a minimum amount of time. The book has been organized into eleven basic headings for ease in selecting sections of pertinence.

- I. Table of Contents
- II. Introduction
- III. Theory of Operation—comprised of two sections; Systems Description giving a general overview of the ColecoVision system and the Theory of Operation with a more detailed description of the ColecoVision parts.
- IV. Disassembly/Assembly Instructions—gives detailed instructions for taking apart the ColecoVision plus a detailed three dimensional drawing of the main console to assist in identifying the console parts.
- V. Schematics and Drawings—includes a parts list and detailed drawings of component locations.
- VI. Testing and Troubleshooting—includes a list of required test equipment, description of the diagnostic cartridge, pictures of the color test as they should be seen on a television screen, the flow charts, along with a description on how to follow the flow charts.
- VII. Pictures of Signals—are representations of readings on the oscilloscope and directions for correctly using the oscilloscope.
- VIII. Technical Tips—acquaint repair person with specific problems, used as a short cut to common repair problems.
- IX. Glossary—describes unfamiliar words and some terms unique to the ColecoVision system.
- X. ColecoVision Updates—will be an area to file modifications, part changes or additional information as it becomes available to repair centers.
- XI. Notes—A place to keep your own notes which you find helpful in servicing ColecoVision in efficient, professional methods. ColecoVision welcomes additions or changes from you, so that we may include them in our ColecoVision Updates.

System Description

ColecoVision contains five basic parts: the Central Processing Unit (CPU), the video section, the audio section, the RF modulator and memory. The game has two handcontroller ports to input data and an expansion port which outputs the entire CPU bus, CPU control lines and selected inputs to the RF modulator, onto a 60 pin edge connector.

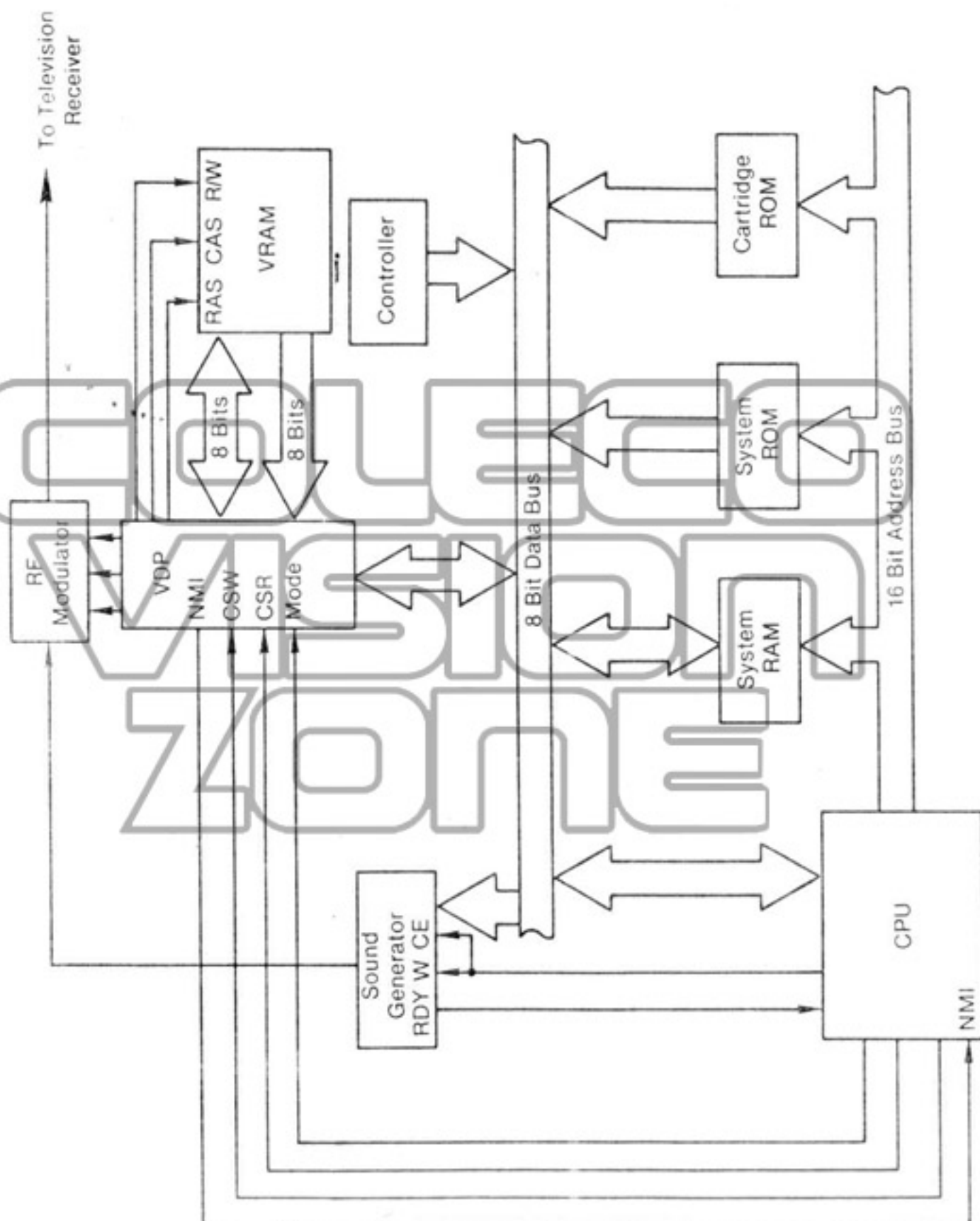
The CPU consists of a Z-80A microprocessor and support circuitry. The Z-80A has an eight bit data bus and a sixteen bit address bus. The support circuitry consists of a clock, reset circuitry and decoders.

The video section is made up of Texas Instrument's 9928 Video Display Processor (VDP) and eight Video RAM (VRAM). The VDP interfaces to the CPU via the eight bit data bus and four control signals, CSW, CSR, Mode (A0), and NMI. VRAM interfaces to the VDP via an eight bit bidirectional address/data bus, a unidirectional eight bit data bus and three control lines, RAS, CAS, and R/W. The video section outputs three signals to the RF modulator.

The audio section is basically the Texas Instrument's 76489 sound generator chip. The integrated circuit is on the eight bit CPU data bus and uses two other inputs to enable the chip along with the system clock for synchronization. The 76489 outputs a ready signal to the CPU when it has inputted the data on the data bus. It outputs audio to the RF modulator.

The RF modulator takes both the audio and video signals and outputs the RF modulated signal. Either channel 3 or 4 carrier frequencies can be selected by the channel selector switch.

ColecoVision uses three types of memory; System Read Only Memory (ROM), cartridge ROM, and Random Access Memory (RAM). The system ROM contains frequently used sub-routines. Cartridge ROM contains patterns and game rules for a particular game. RAM is used to store temporary information (scores, motion variables, etc.).



CPU

The CPU is comprised of the Z-80A microprocessor, a clock circuit for synchronization and two decoders.

The clock circuit is made up of a 7.19 MHz crystal oscillator. This frequency is divided by two using a "D" flip-flop. This new frequency is the 3.58 MHz that is required for color burst.

The decoders are used to translate portions of the address bus to select the VDP, RAM, Cartridge ROM, System ROM and the grounds for the hand controllers.

The Z-80A uses two busses, address and data. The Address Bus (A_0-A_{15}) provides the address for memory (up to 64K bytes unidirectional) data exchanges and for I/O device data exchanges. The A_0-A_{15} constitutes a 16 bit address bus. The Data Bus (D_0-D_7) consists of an 8 bit tri-state bidirectional data bus. It is used for data exchanges with memory and I/O devices.

In addition to the two busses the Z-80A has several control signals.

Machine Cycle One (M_1) indicates the current machine cycle is the OP code fetch cycle of an instruction execution. Output, active low.

Memory Request (MREQ) signal indicates the address bus holds a valid address for a memory read or memory write operation. Tri-state output, active low.

Input/Output Request (IORQ) signal indicates the lower half of the address bus holds a valid I/O address for an I/O read or write operation. An IORQ signal is also generated when an interrupt is being acknowledged to indicate that an interrupt response vector can be placed on the data bus. Tri-state output, active low.

Memory Read (RD) indicates the CPU wants to read data from memory or an I/O device. The addressed I/O device or memory should use this signal to gate data onto the CPU data bus. Tri-state output, active low.

Memory Write (WR) indicates the CPU data bus holds valid data to be stored in the addressed memory or I/O device. Tri-state output, active low.

Refresh (RFSH) indicates the lower seven bits of the address bus contain a refresh address for dynamic memories and the current MREQ signal should be used to do a refresh read to all dynamic memories. Output, active low.

Halt State (HALT) indicates the CPU has executed a HALT software instruction and is awaiting either a non-maskable or a maskable interrupt (with the mask enabled) before operation can resume. While halted, the CPU executes NOP's to maintain memory refresh activity. Output, active low.

Wait (WAIT) indicates to the Z-80A CPU that the addressed memory or I/O devices are not ready for a data transfer. The CPU continues to enter wait states for as long as this signal is active. Input, active low.

Interrupt Request (INT) signal is generated by I/O devices. A request will be honored at the end of the current instruction if the internal software controlled interrupt enable flip-flop (FF) is enabled. Input, active low.

Non Maskable Interrupt (NMI) request line has a higher priority than INT and is always recognized at the end of the current instruction, independent of the status of the interrupt enable flip-flop. NMI automatically forces the Z-80A CPU to restart to location 0066_H. Input, active low.

Reset initializes the CPU as follows: reset interrupt enable flip-flop, clear PC and registers I and R and set interrupt to 808A mode. During reset time, the address and data bus go to a high impedance state and all control output signals go to the inactive state. Input, active low.

Bus Request (BUSRQ) signal has a higher priority than NMI and is always recognized at the end of the current machine cycle. It is used to request the CPU address bus, data bus and tri-state output control signals to go to a high impedance state so that other devices can control these buses. Input, active low.

Bus Acknowledge (BUSAK) is used to indicate to the requesting device that the CPU address bus, data bus and tri-state control bus signals have been set to their high impedance state and the external device can now control these signals. Output, active low.

Video Display Processor

The VDP generates all video, control and synchronization signals and also controls the storage, retrieval and refresh of display data in a dynamic memory, VRAM.

For ColecoVision applications the VDP operates in a Graphics I mode. The Graphics I mode provides a 256 x 192 pixel display for generating pattern graphics in 15 colors plus transparent. A pixel is defined as the smallest point on the TV screen that can be independently controlled.

The video display consists of 35 planes, external VDP, backdrop, pattern plane, and 32 sprite planes. The planes are vertically stacked with the external VDP being the bottom or innermost plane. The backdrop plane is the next plane followed by the pattern plane that contains graphic patterns. The 32 top planes are sprite planes.

The VDP basically has three interfaces: CPU, RF modulator assembly, and a dynamic RAM (VRAM), the contents of which define the TV image. The VDP has eight write-only registers and a read-only status register.

The CPU interface consists of an eight bit bidirectional data bus, control lines and an interrupt.

Data can be transmitted to the CPU or from the CPU over the data bus, depending on the state of the CSW and CSR control lines. When CSW is low, data is transmitted from the CPU to the video display processor. When CSR is in a low state, data is transmitted from the video display processor to the CPU. CSR and CSW should not be simultaneously low.

Another control line, address line A₀, determines where the VDP will retrieve the data or where it will send the data. If A₀ is high, the data will be stored into, or retrieved from an internal register. Which register is used is determined by the data. If A₀ is in a low state the data will be stored into or retrieved from the VRAM.

The Video Display Processor has several internal registers, a general purpose eight bit data register, a 16 bit address register, and 8 eight bit dedicated purpose registers. The general purpose register is used to input

or output data on the CPU data bus. The address register inputs the address of the VRAM. The other eight registers store data for colors, images and image location.

The VDP accesses 16K bytes of dynamic ram called VRAM. The VRAM stores data to be used for image processing.

Three other functions are associated with the VDP; NMI, Reset and the clock. NMI provides a pulse to the CPU approximately every 1/60 second. Reset initializes the internal registers and the synchronization pulses to a known state. The clock input is a 10.7 MHz clock derived from the 3.58 MHz clock by using a third harmonic wave shaping circuit.

The Video Display Processor interfaces with eight 16K x 1 dynamic RAMS. This is accomplished by using two eight bit unidirectional busses and three control lines. Addressing the RAM is a two-step process. First RAS is active while an address is on the data-in/address bus. This is latched into the RAM and is used to select the Row address. The next step is to select the column. This is accomplished by strobing CAS low while an address is on the bus. The other control line RW determines if data will be written into the VRAM or read onto the VRAM output bus. If RW is low the data will be stored into RAM, if high the data will read from RAM to the output bus.

Memory

System ROM is arranged 8K x 8 bits. The CS in the low state reads data onto a data bus which is determined by a selected address. CS in the high state forces Q1-8 into a high impedance state (example: not connected to a bus.). It interfaces to the CPU using the U5 decoder.

Cartridge ROM has a memory capability of up to 32K x 8 bits that is selected in banks of 8K x 8 bits. Each bank is selected by CS1 — CS4 using the U5 decoder. CS 1 — CS4 is the same as chip select in system ROM.

RAM (Random Access Memory) has a memory capacity of 1K x 8 bits. RAM is comprised of two integrated circuits arranged 1K x 4 bits.

Write Enable Low writes DQ1-4 into the memory location selected by the address bus. Write Enable High reads DQ1-4 onto the data bus. DQ1-4 depends on data contained in the location selected by the address bus. Chip Select(S) High deselects the chip, DQ1-4 become a high impedance state, interfacing to the CPU using the U5 decoder and WR from the Z-80A.

RF Modulator

The RF Modulator interfaces video, color, difference, luminance and audio signals to the antenna terminal of the television receiver. It consists of a video modulator integrated circuit and associated discrete circuitry.

The discrete circuitry includes a sound tank circuit, a carrier frequency tank circuit and output impedance matching. An analog switch is used to switch in ColecoVision video or expansion module video. The analog switch is located on the main logic board, rather than on the RF board.

Hand Control Interface

The hand control interface consists of a spinner interface and a joystick/keypad interface.

The joystick/keypad interface uses two ground strobe outputs for each control port and five inputs for each control port. The ground strobe outputs are generated from the CPU address bus using a decoder and a flip-flop. The flip-flop ensures that one strobe is enabled at a time. One strobe is used for the joystick and to fire left. The other strobe is used for the keypad and to fire right. The inputs are buffered by two octal buffers, one for each port. At this point, a low input moves the character on the selected game. The buffers are gated onto the data bus by signals decoded from the address bus.

The spinner interface uses two inputs for each port. Required inputs are two square waves 180° out of phase. Phase relationship determines direction. Pulse time determines speed. One input is used to interrupt the microprocessor. This interrupt enables the microprocessor to halt its action, examine the square waves for direction and speed and then return to its original operation.

Power Supply

The entire power supply is contained in the plug-in wall unit. The supply contains a step-down transformer, rectifiers, filters and regulators. It outputs +5VDC, +12VDC and -5VDC.

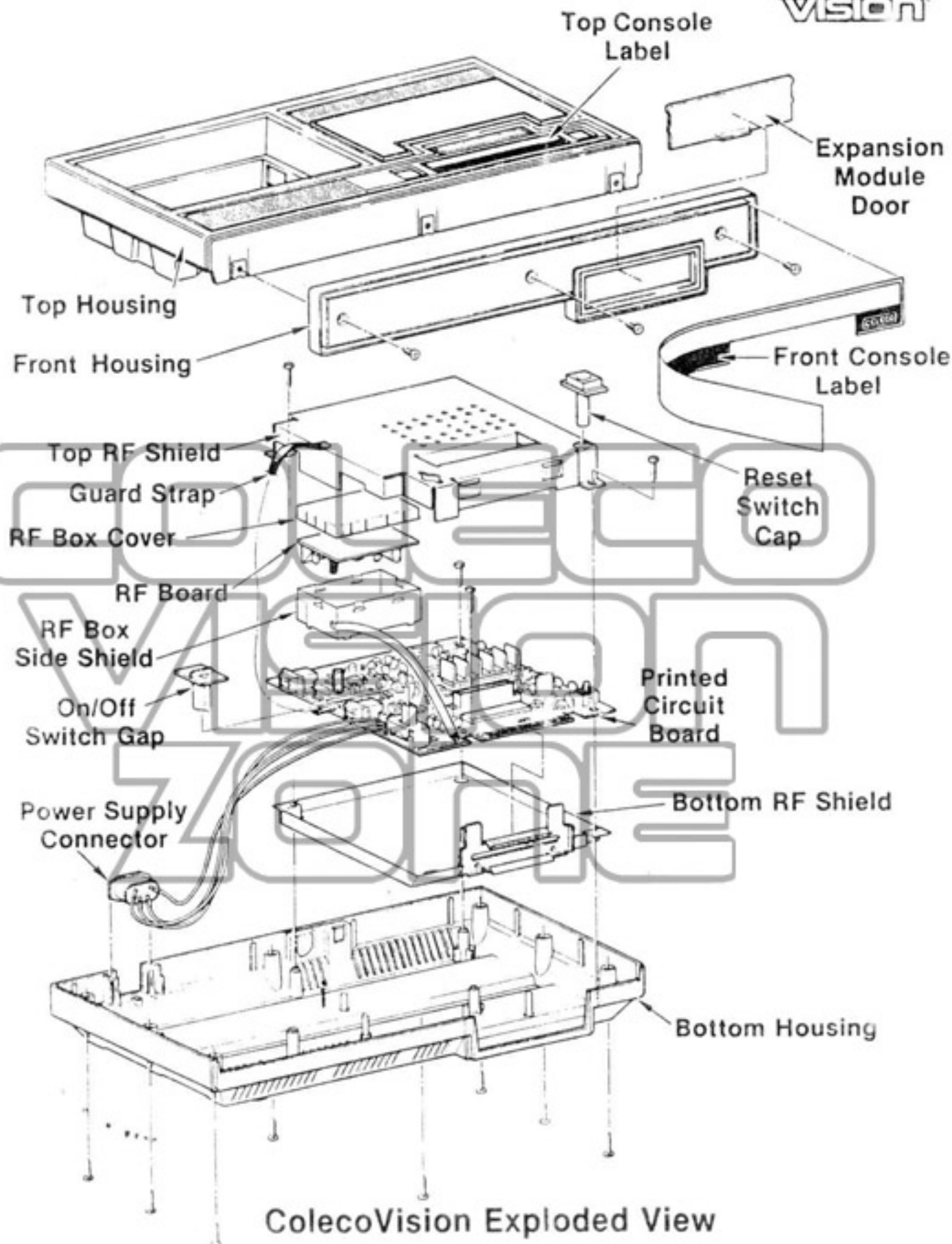
The unit is ultrasonically welded, therefore it is not serviceable. If the power supply is defective or not working properly, the entire unit should be replaced.

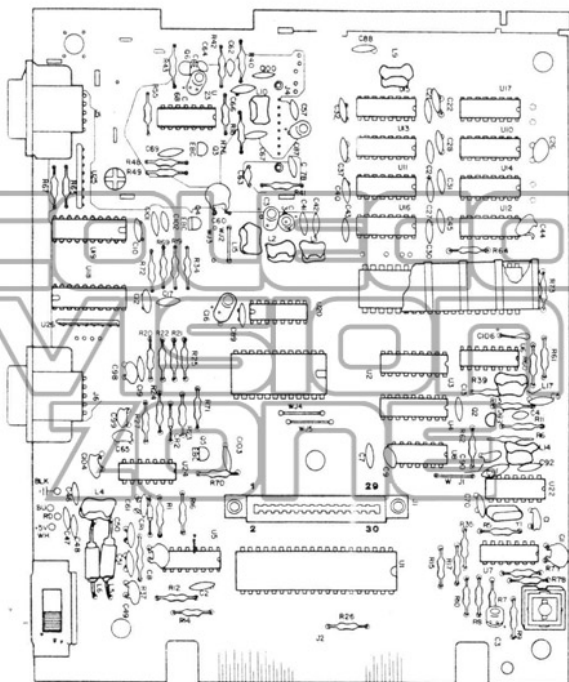
Disassembly

1. Turn unit over so that bottom is in an upright position.
2. Remove eight bottom screws.
3. Turn unit back over so that top is once again in the upright position.
4. To remove top housing, carefully pull out and up in front, then do the same for the back, do this back and forth, firmly, until the top housing pops off. At this point do not tamper with the front housing. There is never a need for it to be removed.
5. Remove reset switch and on/off switch caps.
6. Unsolder and unscrew top RF shield and ground strap and remove.
7. Remove two screws from printed circuit board and repair.

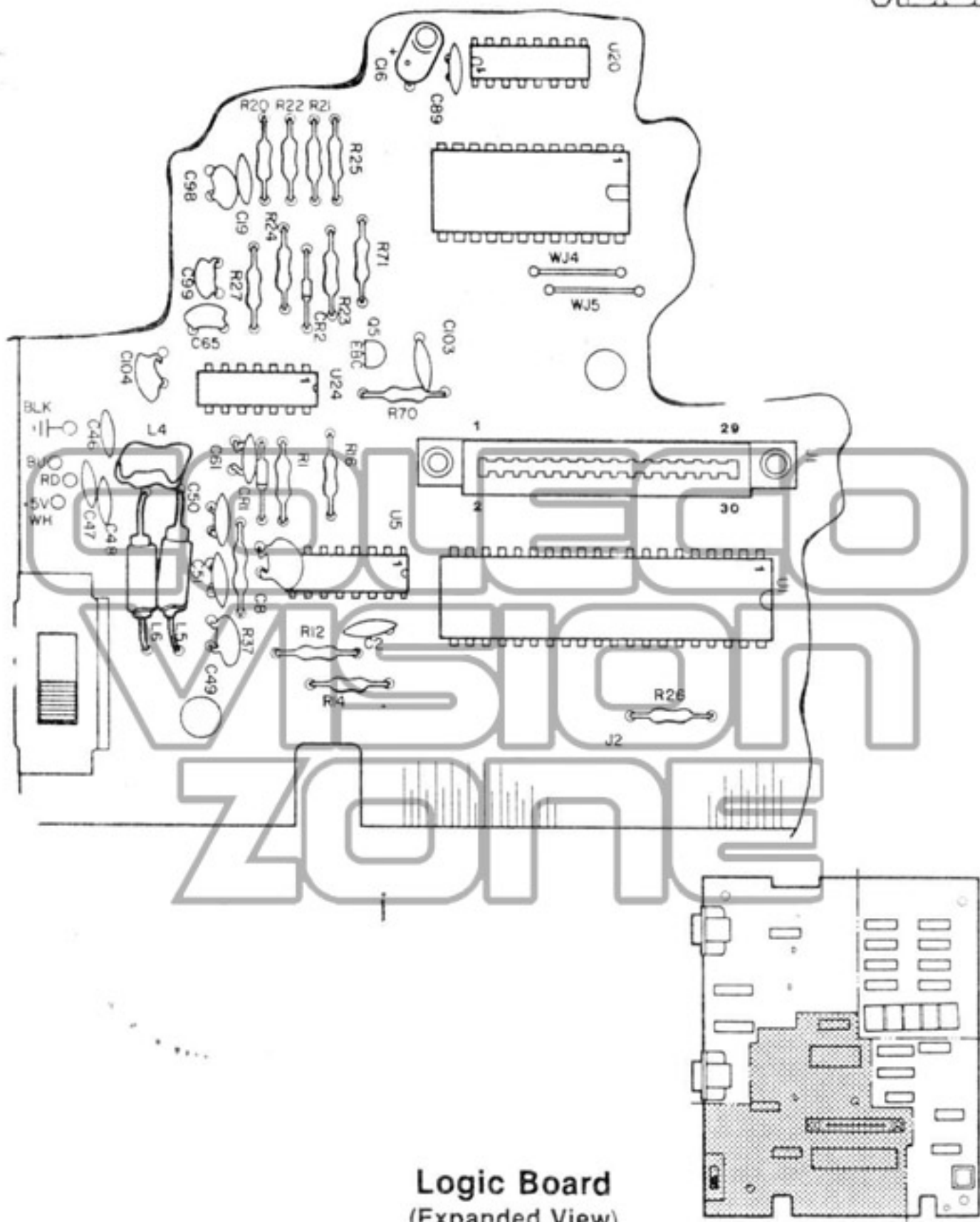
Assembly

1. Replace printed circuit board and replace two screws.
2. Replace ground strap and top RF shield with screws and solder.
3. Replace reset switch and on/off switch caps. Double check, at this point, to make sure the reset switch is in place.
4. Replace top housing.
5. Turn unit over and reset eight bottom screws.
6. Turn back over to the original upright position and test your Coleco-Vision.

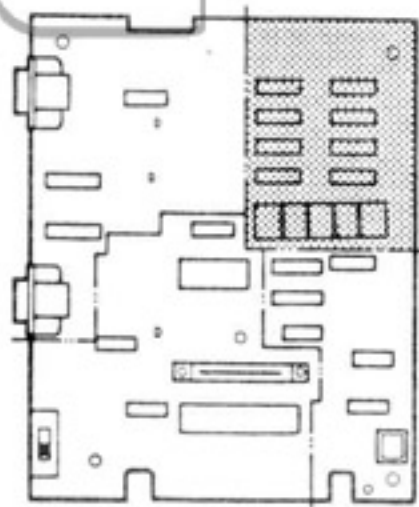
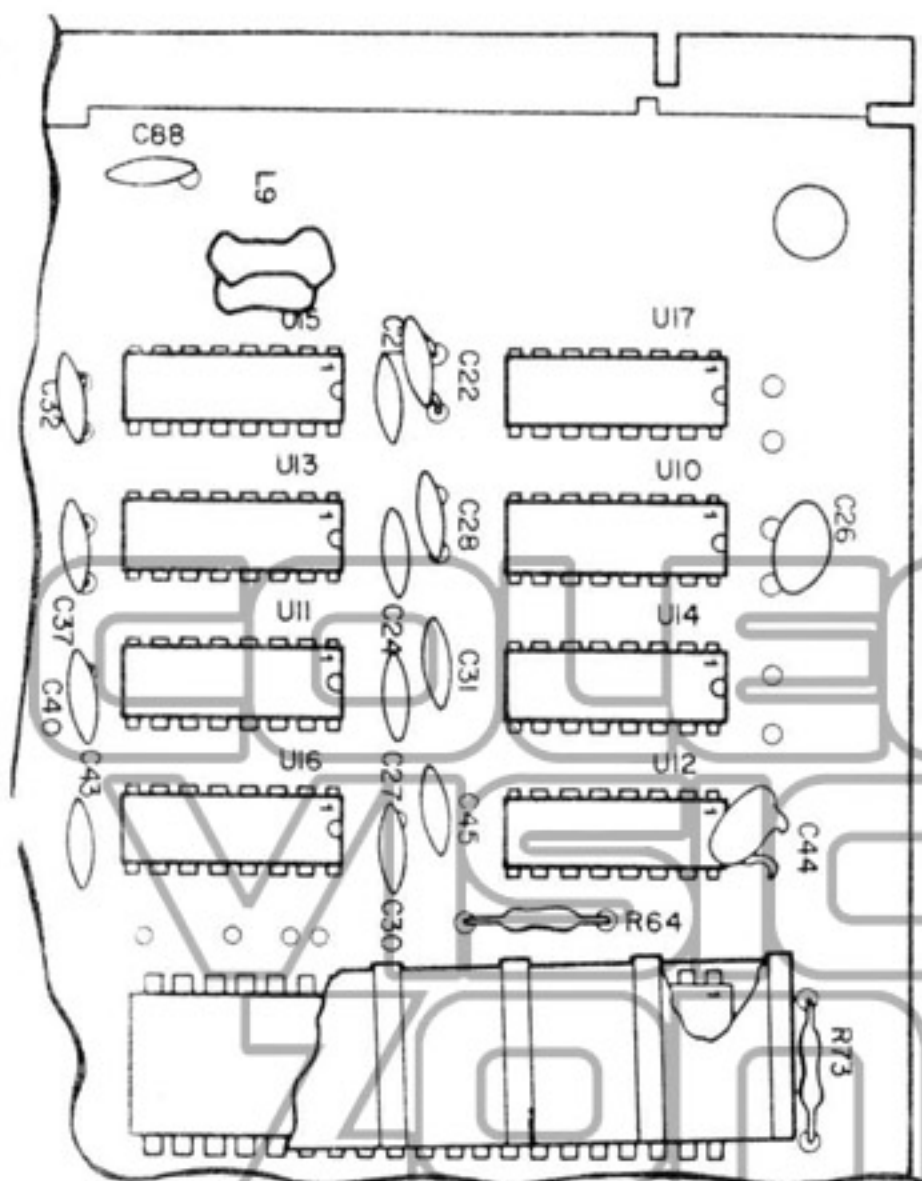




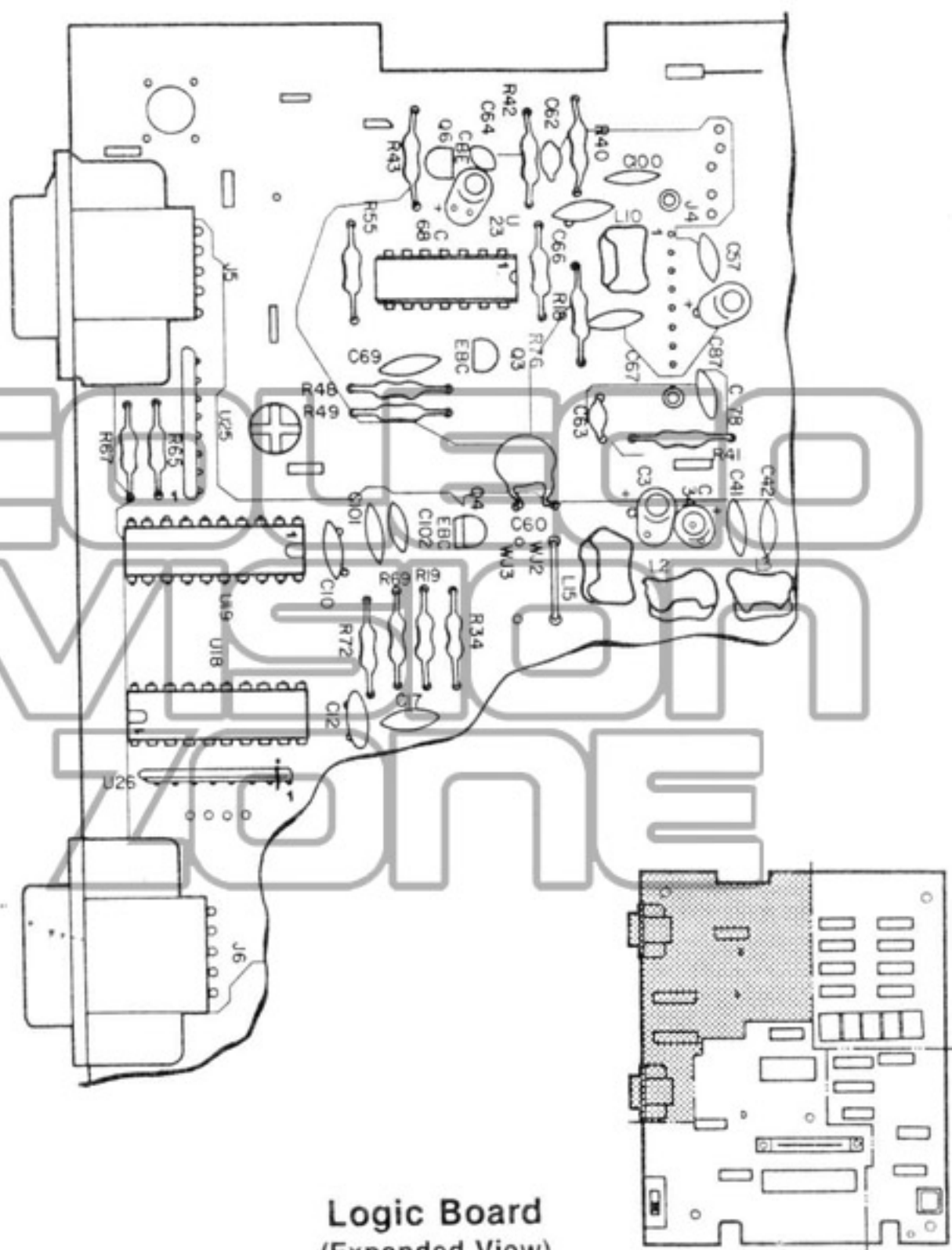
Logic Board



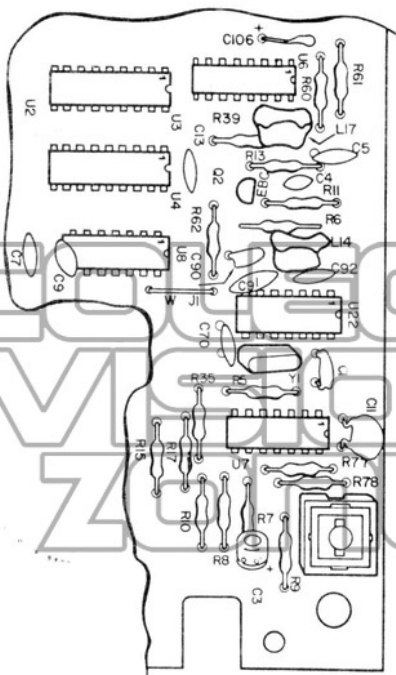
Logic Board
(Expanded View)



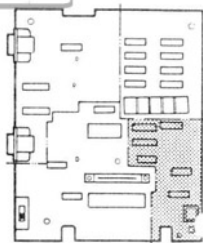
Logic Board
(Expanded View)

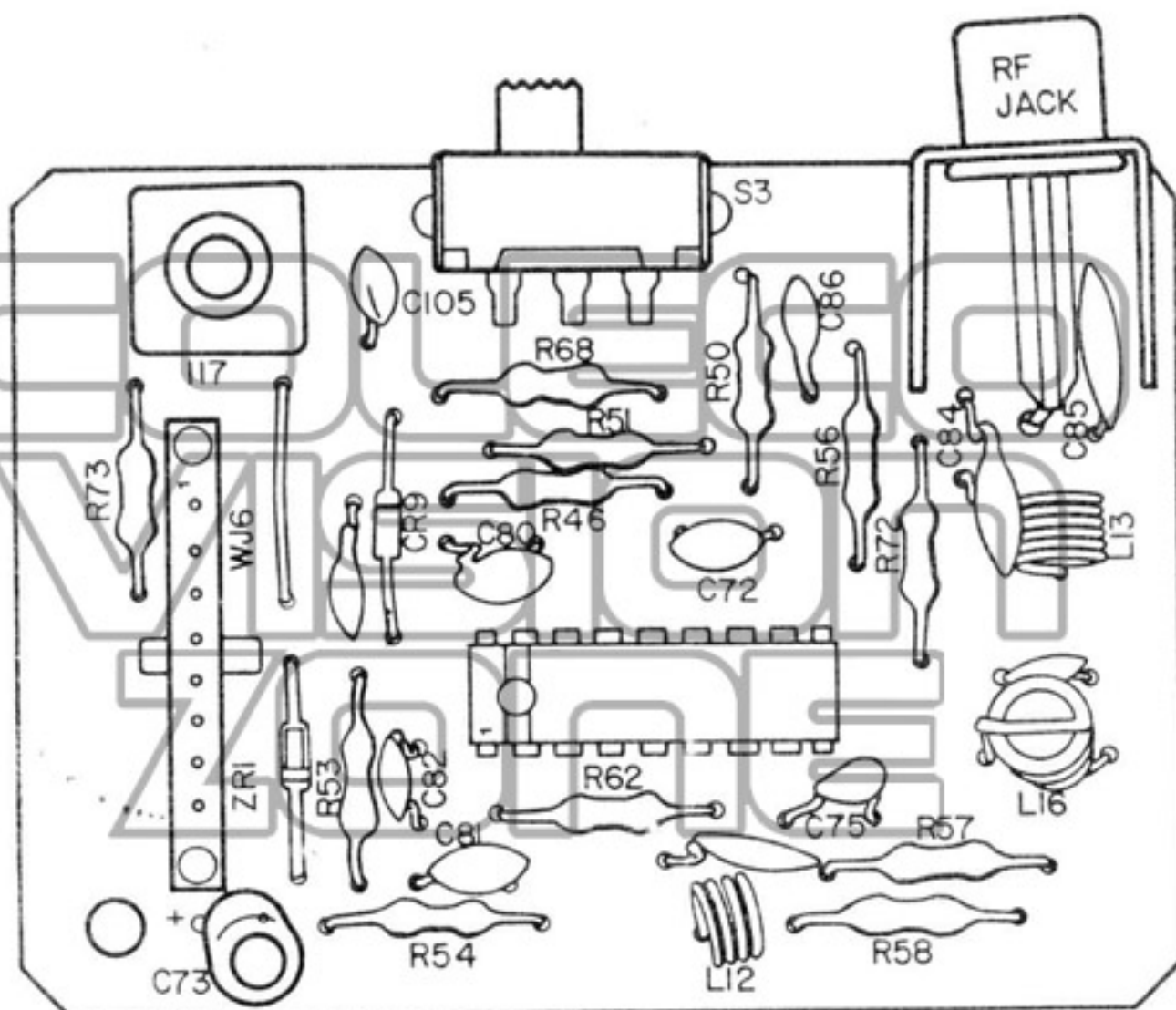


Logic Board
(Expanded View)



Logic Board
(Expanded View)





Capacitors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
C1	.002 μ f ceramic disc	R72311
C2	.1 μ f ceramic disc	R72284
C3	1 μ f electrolytic	R72617
C4	68pf ceramic disc	R72255
C5	.1 μ f ceramic disc	R72284
C6	Not used	
C7	.1 μ f ceramic disc	R72284
C8	.1 μ f ceramic disc	R72284
C9	.1 μ f ceramic disc	R72284
C10	.1 μ f ceramic disc	R72284
C11	.1 μ f ceramic disc	R72284
C12	.1 μ f ceramic disc	R72284
C13	.1 μ f ceramic disc	R72284
C14	Not used	
C15	Not used	
C16	10 μ f electrolytic	R72642
C17	.1 μ f ceramic disc	R72284
C18	Not used	
C19	.1 μ f ceramic disc	R72284
C20	Not used	
C21	.1 μ f ceramic disc	R72284
C22	.1 μ f ceramic disc	R72284
C23	Not used	
C24	.1 μ f ceramic disc	R72284
C25	Not used	
C26	.1 μ f ceramic disc	R72284
C27	.1 μ f ceramic disc	R72284
C28	.1 μ f ceramic disc	R72284
C29	Not used	
C30	.1 μ f ceramic disc	R72284
C31	.1 μ f ceramic disc	R72284
C32	.1 μ f ceramic disc	R72284
C33	Not used	
C34	10 μ f electrolytic	R72642
C35	Not used	
C36	10 μ f electrolytic	R72642

Capacitors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
C37	.1 μ f ceramic disc	R72284
C38	Not used	
C39	Not used	
C40	.1 μ f ceramic disc	R72284
C41	.1 μ f ceramic disc	R72284
C42	.1 μ f ceramic disc	R72284
C43	.1 μ f ceramic disc	R72284
C44	.1 μ f ceramic disc	R72284
C45	.1 μ f ceramic disc	R72284
C46	.1 μ f ceramic disc	R72284
C47	.1 μ f ceramic disc	R72284
C48	.1 μ f ceramic disc	R72284
C49	.1 μ f ceramic disc	R72284
C50	.1 μ f ceramic disc	R72284
C51	.1 μ f ceramic disc	R72284
C52	Not used	
C53	Not used	
C54	Not used	
C55	Not used	
C56	Not used	
C57	.01 μ f ceramic disc	R72018
C58	Not used	
C59	.01 μ f ceramic disc	R72018
C60	.047 μ f ceramic disc	R72296
C61	.01 μ f ceramic disc	R72018
C62	470 pf ceramic disc	R72015
C63	470 pf ceramic disc	R72015
C64	120 pf ceramic disc	R72289
C65	.01 μ f ceramic disc	R72018
C66	.1 μ f ceramic disc	R72284
C67	.1 μ f ceramic disc	R72284
C68	10 μ f electrolytic	R72642
C69	.047 μ f ceramic disc	R72296
C70	100 pf ceramic disc	R72012
C71	Not used	
C72	47 pf ceramic disc	Order RF board

Capacitors

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
C73	10 μ f electrolytic	Order RF board
C74	Not used	
C75	20 pf ceramic disc	Order RF board
C76	82 pf ceramic disc	Order RF board
C77	Not used	
C78	.01 μ f ceramic disc	R72018
C79	Not used	
C80	47 pf ceramic disc	Order RF board
C81	47 pf ceramic disc	Order RF board
C82	.01 μ f ceramic disc	Order RF board
C83	10 pf ceramic disc	Order RF board
C84	82 pf ceramic disc	Order RF board
C85	270 pf ceramic disc	Order RF board
C86	.01 μ f ceramic disc	Order RF board
C87	10 μ f electrolytic	R72642
C88	.1 μ f ceramic disc	R72284
C89	.1 μ f ceramic disc	R72284
C90	120 pf ceramic disc	R72283
C91	150 pf ceramic disc	R72014
C92	82 pf ceramic disc	R72288
C93	Not used	
C94	Not used	
C95	Not used	
C96	Not used	
C97	Not used	
C98	.01 μ f ceramic disc	R72018
C99	.01 μ f ceramic disc	R72018
C100	.1 μ f ceramic disc	R72284
C101	.047 μ F ceramic disc	R72296
C102	100 pf ceramic disc	R72012
C103	.047 μ f ceramic disc	R72296
C104	100 pf ceramic disc	R72012
C105	.001 μ f ceramic disc	Order RF board
C106	10 μ f tantalum	R72644

Connectors

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
J1	30 pin, cartridge connector	R75451
J2	60 pin, expansion port connector	Part of Logic Board
J3	4 pin, power connector	R75458
J4	8 pin riser	Order RF board
J5	9 pin "D", handcontrol connector	R75450
J6	9 pin "D", handcontrol connector	R75450

Crystals

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
Y1	7.15909 MHz crystal	R73276

Diodes

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
CR1	Signal diode	R57188
CR2	Signal diode	R57188
CR3	Not used	
CR4	Not used	
CR5	Not used	
CR6	Not used	
CR7	Not used	
CR8	Not used	
CR9	Tuner diode	Order RF board

Zener Diodes

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
ZR1	6.2V zener	Order RF board

Inductors

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
L1	Not used	
L2	10 μ H postage stamp	R73273
L3	10 μ H postage stamp	R73273
L4	10 μ H postage stamp	R73273
L5	10 μ H $\frac{1}{2}$ W	R73274
L6	10 μ H $\frac{1}{2}$ W	R73274
L7	120 μ H postage stamp	R73277
L8	120 μ H postage stamp	R73277
L9	43 μ H postage stamp	R73278
L10	10 μ H postage stamp	R73273
L11	Adjustable sound tank coil	Order RF board
L12	2½ turn	Order RF board
L13	6 turn	Order RF board
L14	2.7 μ H postage stamp	R73275
L15	43 μ H, postage stamp	R73278
L16	.7 μ H	Order RF board
L17	43 μ H postage stamp	R73278

**Integrated
Circuits**

<u>REFERENCE/ DESIGNATOR</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
U1	Z-8CA microprocessor	R73069
U2	Masked ROM	R73108
U3	1K \times 4 RAM	R73071
U4	1K \times 4 RAM	R73071
U5	3 to 8 decoder	R73072
U6	3 to 8 decoder	R73072
U7	Hex inverter, open collector	R73073
U8	Dual "D" flip-flop	R73074
U9	Video display processor	R73075
U10	16K \times 1 video RAM	R73076
U11	16K \times 1 video RAM	R73076
U12	16K \times 1 video RAM	R73076
U13	16K \times 1 video RAM	R73076
U14	16K \times 1 video RAM	R73076
U15	16K \times 1 video RAM	R73076
U16	16K \times 1 video RAM	R73076

Integrated Circuits

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
U17	16K x 1 video RAM	R73076
U18	Octal buffer	R73077
U19	Octal buffer	R73077
U20	Sound generator	R73078
U21	RF modulator	Order RF board
U22	Hex inverter	R73079
U23	CMOS quad bilateral switch	R73030
U24	Quad nand gate	R73113
U25	22K Ω resistor pack	R73114
U26	22K Ω resistor pack	R73114

Resistors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
R1	1.5K Ω carbon film, 1/4W	R58286
R2	Not used	
R3	Not used	
R4	Not used	
R5	330 Ω carbon film, 1/4W	R57269
R6	620 Ω carbon film, 1/4W	R74310
R7	91K Ω carbon film, 1/4W	R74292
R8	3.3K Ω carbon film, 1/4W	R58446
R9	1M Ω carbon film, 1/4W	R57570
R10	3.3K Ω carbon film, 1/4W	R58446
R11	180 Ω carbon film, 1/4W	R58049
R12	3.3K Ω carbon film, 1/4W	R58446
R13	1.1K Ω carbon film, 1/4W	R58441
R14	3.3K Ω carbon film, 1/4W	R58446
R15	2.7K Ω carbon film, 1/4W	R74004
R16	3.3K Ω carbon film, 1/4W	R58446
R17	3.3K Ω carbon film, 1/4W	R68446
R18	1.8K Ω carbon film, 1/4W	R58007
R19	1.8K Ω carbon film, 1/4W	R58007
R20	1.8K Ω carbon film, 1/4W	R58007
R21	1.5K Ω carbon film, 1/4W	R58286
R22	120 Ω carbon film, 1/4W	R74060
R23	120 Ω carbon film, 1/4W	R74060

Resistors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
R24	100K Ω carbon film, 1/4W	R57602
R25	1.5K Ω carbon film, 1/4W	R58286
R26	470 Ω carbon film, 1/4W	R74008
R27	100K carbon film, 1/4W	R57602
R28	Not used	
R29	Not used	
R30	Not used	
R31	Not used	
R32	Not used	
R33	Not used	
R34	3.3K Ω carbon film, 1/4W	R58446
R35	3.3K Ω carbon film, 1/4W	R58446
R36	Not used	
R37	3.3K Ω carbon film, 1/4W	R58446
R38	Not used	
R39	1K Ω carbon film, 1/4W	R57268
R40	390 Ω carbon film, 1/4W	R74298
R41	390 Ω carbon film, 1/4W	R74298
R42	390 Ω carbon film, 1/4W	R74298
R43	10K Ω carbon film, 1/4W	Order RF board
R44	Not used	
R45	Not used	
R46	22K Ω carbon film, 1/4W	Order RF board
R47	Not used	
R48	470K Ω carbon film, 1/4W	R74300
R49	10K Ω carbon film, 1/4W	R57266
R50	8.2K Ω carbon film, 1/4W	Order RF board
R51	4.7K Ω carbon film, 1/4W	Order RF board
R52	1K Ω carbon film, 1/4W	Order RF board
R53	1K Ω carbon film, 1/4W	Order RF board
R54	1K Ω carbon film, 1/4W	Order RF board
R55	1.8K Ω carbon film, 1/4W	Order RF board
R56	82 Ω carbon film, 1/4W	Order RF board
R57	240 Ω carbon film, 1/4W	Order RF board
R58	240 Ω carbon film, 1/4W	Order RF board
R59	Not used	
R60	47 Ω carbon film, 1/4W	R74294
R61	1K Ω carbon film, 1/4W	R57268
R62	270 Ω carbon film, 1/4W	R74034

Resistors

REFERENCE/ DESIGNATOR

DESCRIPTION

PART NUMBER

R63	Not used	
R64	1K Ω carbon film, 1/4W	R57268
R65	270 Ω carbon film, 1/4W	R74034
R66	Not used	
R67	270 Ω carbon film, 1/4W	R74034
R68	47 Ω carbon film, 1/4W	Order RF board
R69	22K Ω carbon film, 1/4W	R57920
R70	10K Ω carbon film, 1/4W	R57266
R71	22K Ω carbon film, 1/4W	R57920
R72	10K Ω carbon film, 1/4W	R57266
R73	47K Ω carbon film, 1/4W	R57266
R74	39K Ω carbon film, 1/4W	Order RF board
R75	Not used	
R76	1.8K Ω carbon film, 1/4W	R58007
R77	22K Ω carbon film, 1/4W	R57920
R78	1K Ω carbon film, 1/4W	R57268
R79	Optional trim resistor	
R80	39K Ω carbon film, 1/4W	Order RF board

Switches

REFERENCE/ DESIGNATOR

DESCRIPTION

PART NUMBER

S1	Reset switch	R74933
S2	On/off switch	R74932
S3	Channel selector switch	Order RF board

Transistors

REFERENCE/ DESIGNATOR

DESCRIPTION

PART NUMBER

Q1	Not used	
Q2	PNP transistor	R74983
Q3	PNP transistor	R57296
Q4	NPN transistor	R74977
Q5	NPN transistor	R74977
Q6	PNP transistor	R57296

Miscellaneous

<u>DESCRIPTION</u>	<u>PART NUMBER</u>
Power supply	S55416
Logic board	S75747
RF board	S75748
Donkey Kong cartridge	S78021
Handcontroller	S78022
Switch box assembly	R74606
Game cable	R75315
RF box sideshield	F74516
RF box cover	F74519
Heat sink (for UG)	F74937
Loctite 420 adhesive	R75982
Bottom shield assembly	S57048
Top housing assembly	S92049
Cartridge door assembly	S78016
Expansion port door	F74751
Front console label	R77390
Top console label	R77391
Top shield	F74514
Bottom housing	R74747
On/off switch cap	F74749
Reset switch cap	F74750
Phillips pan head screws	M65319
Rubber foot	R75973
Instructions for fine tuning	R74888
Warranty card, console	R78074B
Owner's manual	R78200A
Donkey Kong instruction manual	R78214
Retail carton	R78080
Top styrofoam insert	R79962
Bottom styrofoam insert	R79963

Troubleshooting Equipment Requirements

In addition to having good ColecoVision peripherals (power supply, handcontroller, RF switch box, and coax game cable), the following test equipment is required for ColecoVision repair —

- A 35 MHz oscilloscope
- An 80 MHz frequency counter
- An RF preamp capable of amplifying RF signals up to 80 MHz. This unit will be in series with the game and the frequency counter. This combination tests carrier frequency.
- A properly adjusted color television.
- A diagnostic cartridge.
- A ColecoVision Repair Manual.
- A spinner interface tester.

Diagnostic Cartridge

~~The cartridge was developed to aid in the testing of ColecoVision. Game cartridges should not be substituted to test the ColecoVision games, as they do not test as much circuitry as the diagnostic software.~~

~~This test is to be used in conjunction with the flow charts located at the end of this section. If a malfunction occurs while operating the diagnostic cartridge, refer to flow charts for troubleshooting procedures.~~

~~The first portion of the test is to check the internal ROM and RAM. The screen will indicate whether one or both of these tests have passed. If ROM is bad, change U2. If RAM is defective, change U3 or U4.~~

~~The video test follows. Simply compare the screen to the color pictures provided on page V43. If the screen does not compare with the pictures, follow the directions in the flow charts.~~

~~The sound test is the next step. All three of the sound generators are tested first, then the noise generator is tested. The test uses audio tones. Game cartridges do not consistently use all the generators so it is essential that the diagnostic cartridge is used, ensuring a thorough check of the audio portion of the game. If only one sound is missing replace U20.~~

~~The final test is the handcontroller test. It indicates each handcontrol function on the screen. Each function will blank out after that function has been selected and is performing correctly. It also provides a method of checking the spinner interface. This is accomplished by plugging the spinner interface tester into player number one, then player number two. After turning the tester on, an arrow should flash. Changing the direction switch will cause the arrow to flash in the opposite direction.~~

Explanation of Troubleshooting

This manual is written as a guideline to aid in troubleshooting. It will lead the repair person to a level where individual isolation techniques can take over and diagnose the failure.

At this point, two assumptions have been made: the peripherals (power supply, controllers, RF switch box, RF cord) are good, and the landlines and solder connections are good. The peripherals can be tested by substitution. Faulty landlines and solder connections can be found by a careful visual inspection.

The troubleshooting guide uses flow charts, signal pictures and a list of technical tips. The signal pictures demonstrate how the signals should look in a perfect situation with an explanation and methods of examining each signal.

Following is a description of each symbol used in the flow charts.



Decision Block — Carefully read the question inside the block. Answer it by a simple yes or no. Follow the appropriate answer to the next block. Signals to be examined are designated by an IC number, a colon followed by a pin number (U9:38 means U9 Pin 38).



Process Block — Perform the operation stated in the block and proceed to the next step.

Go to Sheet 3

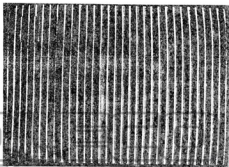


Subroutine Block — Follow specific direction, usually directing repair person to proceed onto an additional page for more detailed instructions.

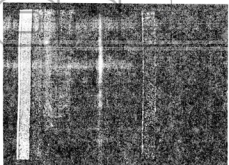


Return Block — Return to beginning of flow charts.

Video Test



Color Test

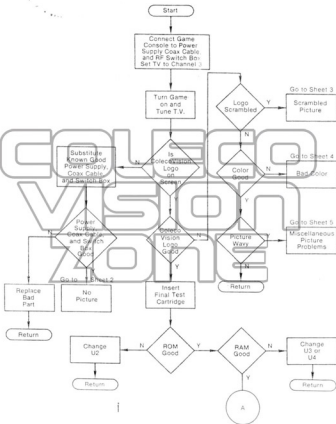


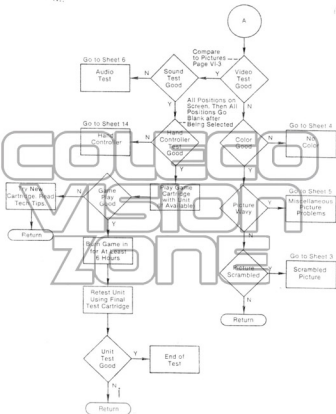
Troubleshooting Flow Charts

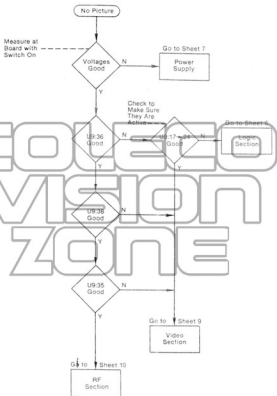
Sheet 1	Overview Test
Sheet 2	No Picture
Sheet 3	Scrambled Picture
Sheet 4	Bad Color
Sheet 5	Miscellaneous Picture Problem
Sheet 6	Audio
Sheet 7	Power Supply
Sheet 8	Logic Section
Sheet 9	Video Section
Sheet 10	RF
Sheet 11	3.58 MHz Clock
Sheet 12	10.7 MHz Clock
Sheet 13	U6
Sheet 14	Handcontroller
Sheet 15	Spinner Interface

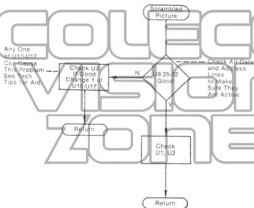
COLECO
VISION
ZONE

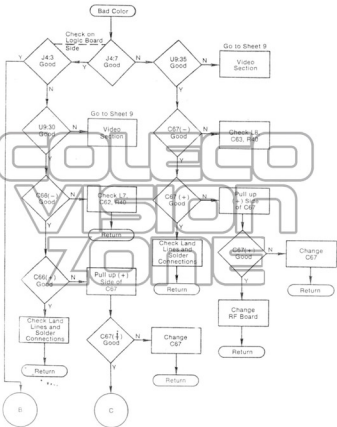
SHEET 1

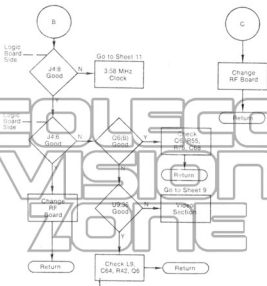


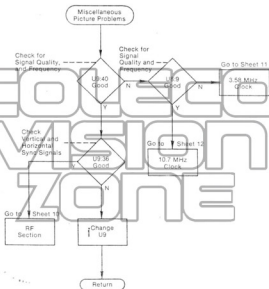


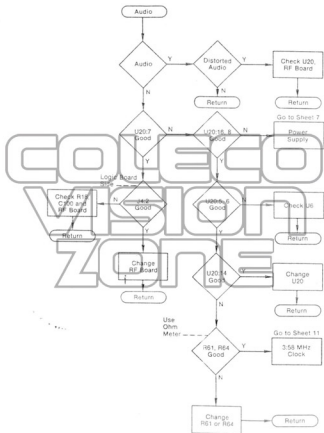


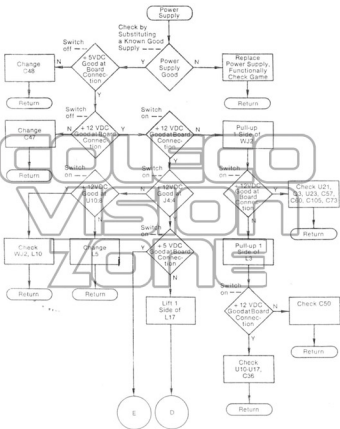


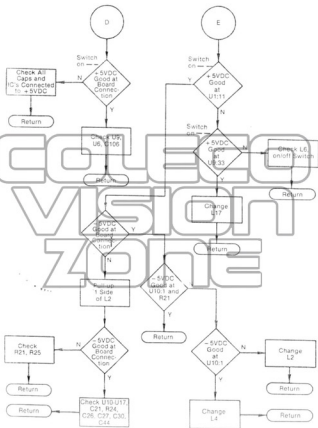


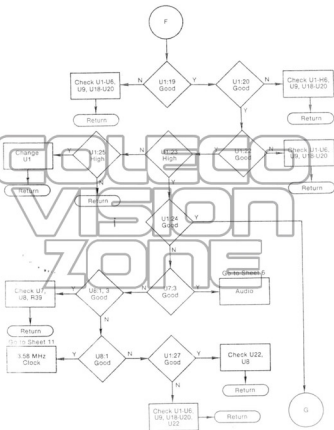


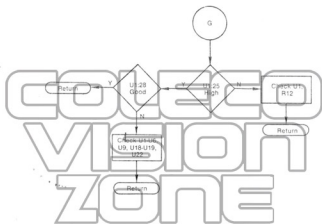


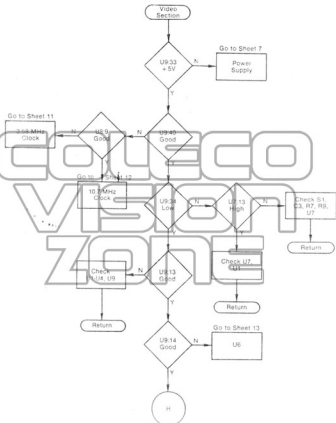


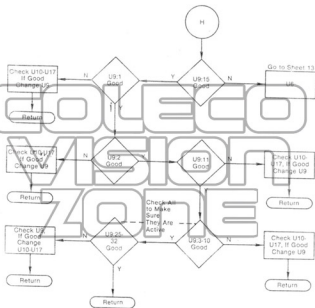


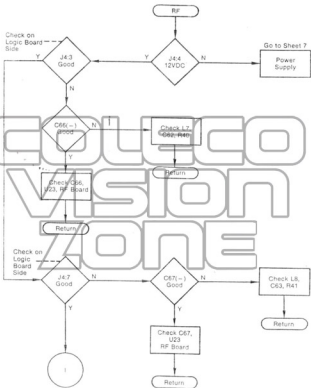


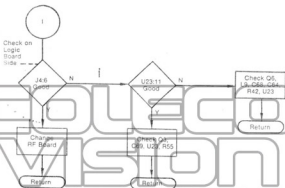


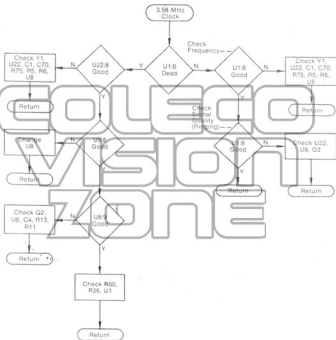


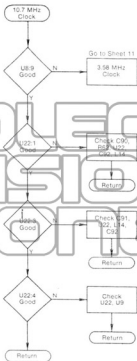


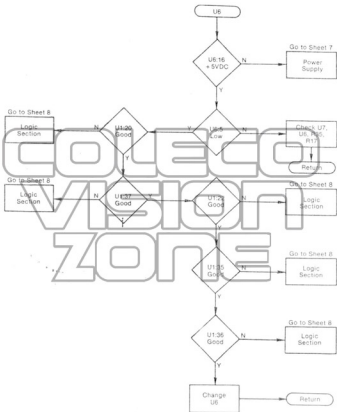


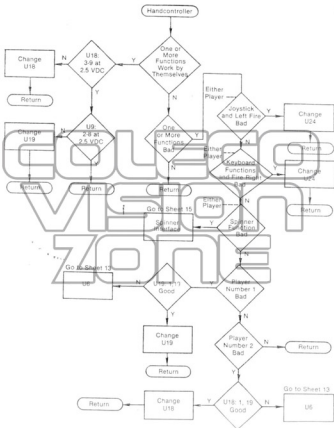


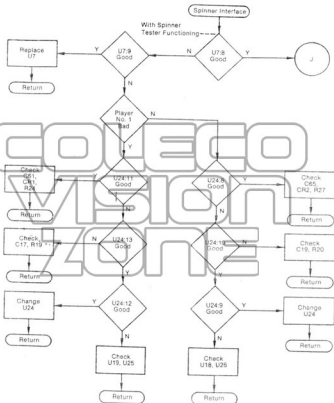


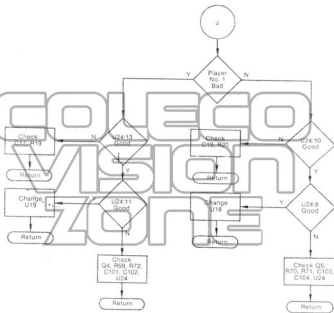








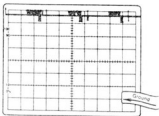




Pictures of Signals

The following pages have illustrated representations of oscilloscope readings. An oscilloscope with a bandwidth of at least 35 MHz is recommended for accurate readings. Adjacent to each diagram are directions of where to probe the circuit board, a signal description, where applicable, vertical and horizontal sensitivity adjustment information and directions to obtain correct signal representations.

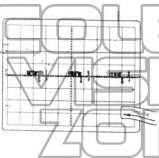
COLECO VISION ZONE



C66 (+) R-Y VIDEO

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu
Screen of Game Cartridge.



C66 (-) R-Y VIDEO

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.2mSec/Div

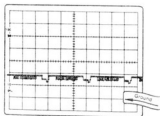
Signal Shown Is During Blue Menu
Screen of Game Cartridge.



C67 (+) B-Y VIDEO

Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu
Screen of Game Cartridge.

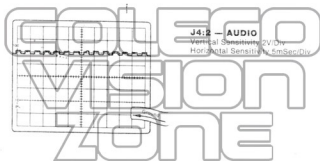


C67 (-) B-Y VIDEO

Vertical Sensitivity 2V/Div

Horizontal Sensitivity 0.2mSec/Div

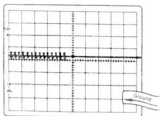
Signal Shown Is During Blue Menu
Screen of Game Cartridge.



J4:2 - AUDIO

Vertical Sensitivity 2V/Div

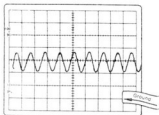
Horizontal Sensitivity 5mSec/Div



J4:3 - R-Y VIDEO

Vertical Sensitivity 2V/Div

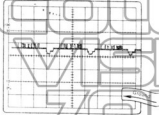
Horizontal Sensitivity 0.5mSec/Div



J4:4

Vertical Sensitivity 5mV/Div
Horizontal Sensitivity 2 μ Sec/Div
AC Coupled.

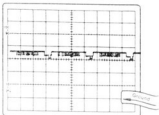
Signal Shown is Ripple on 12VDC Line.
DC Level Should Be 12VDC.



J4:6 — COMPOSITE VIDEO

Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

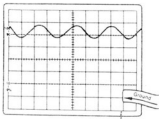
Signal Shown is During Blue Menu
Screen of Game Cartridge.



J4:7 — B-Y VIDEO

Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown is During Blue Menu
Screen of Game Cartridge.

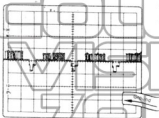


J4:B — RF CLOCK

Vertical Sensitivity 2V/Div

Horizontal Sensitivity 1 μ Sec/Div

Frequency 3.579545 MHz \pm 100Hz

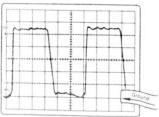


Q8 BASE Y VIDEO

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 0.2mSec/Div

Signal Shows Is During Blue Menu
Screen of Game Cartridge.

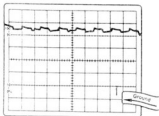


U1:B — MAIN CLOCK

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 50nSec/Div

Frequency — 3.579545 MHz \pm 100 Hz



U1:16 — INTERRUPT

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 0.2 μ Sec/Div

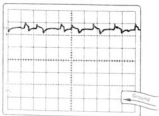
Signal Should Basically Be a 5VDC Level



U1:17 — NMI

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 0.5mSec/Div

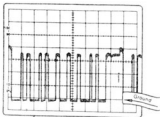


U1:18 — HALT

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 0.5mSec/Div

Signal Should Basically Be a 5VDC Level

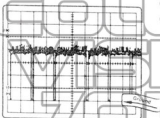


U1:19 M REQ

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 0.1 μ Sec/Div

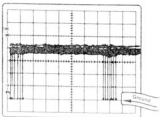
Signal Shown Is During Blue Menu
Screen of Game Cartridge.



U1:20—IORQ

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 5 μ Sec/Div

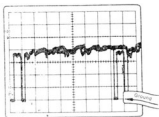


U1:20—IORQ

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 50 μ Sec/Div

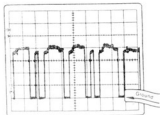
Signal Shown Is During Blue Menu
Screen of Game Cartridge.

**U1:22 — WR**

Vertical Sensitivity — 1V/Div

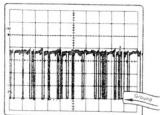
Horizontal Sensitivity — 1 μ Sec/DivSignal Shown Is During Blue Menu
Screen of Game Cartridge.**U1:24 — WAIT**

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 1 μ Sec/DivSignal Shown Is During Blue Menu
Screen of Game Cartridge.**U1:27 — M1**

Vertical Sensitivity — 1V/Div

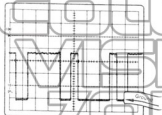
Horizontal Sensitivity — 2 μ Sec/DivSignal Shown Is During Blue Menu
Screen of Game Cartridge.



U1:28 — RSFH

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 5 μ Sec/Div

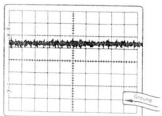


U1:35 — ADDRESS LINE A5

Vertical Sensitivity — 1V/Div

Horizontal Sensitivity — 4 μ Sec/Div

All Address Lines Should Have a Similar Signal (Pulses). If No Pulses Are Seen the Address Line is Dead. The Signal Shown is During Blue Menu Screen of Game Cartridge.

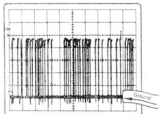


U6:5 GATE 2B

Vertical Sensitivity — 50mV/Div

Horizontal Sensitivity — 0.2 μ Sec/Div

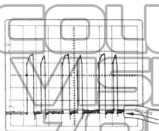
Signal Should Be a DC Level Less Than 250mV.



U7:3

Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 2 μ Sec/Div

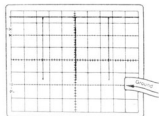
Signal Shown is During Blue Menu
Screen of Game Cartridge.



U7:3

Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5 μ Sec/Div

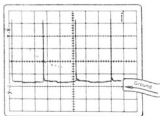
Signal Shown is During Blue Menu
Screen of Game Cartridge.



U7:8 INTERRUPT

Vertical Sensitivity — 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

Signal Shown is with Spinner Interface
Tester in Operation.



U7:9

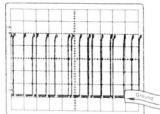
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

Signal Shown is with Spinner Interface Tester in Operation



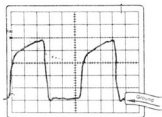
UB:1 M1

Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5 μ Sec/Div



UB:1 M1

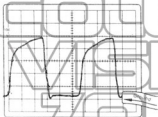
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 5 μ Sec/Div



U8:3 3.58 MHz CLOCK

Vertical Sensitivity 1V/Div

Horizontal Sensitivity — 50nSec/Div



U8:8 3.58 MHz CLOCK

Vertical Sensitivity 1V/Div

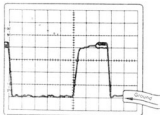
Horizontal Sensitivity 50nSec/Div



U8:9 3.58 MHz CLOCK

Vertical Sensitivity 1V/Div

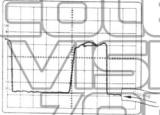
Horizontal Sensitivity 50nSec/Div



U9:1 — RAS

Vertical Sensitivity 1V/Div

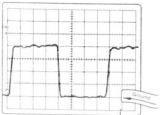
Horizontal Sensitivity 50nSec/Div



U9:2 — CAS

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 50nSec/Div

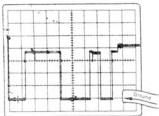


U9:3 — VDP ADDRESS LINE A7

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 50nSec/Div

All VDP Address Lines Should Have Similar Waveforms (Pulses). If No Pulses Are Seen the Address Line Is Dead.



U9:13 — MODE A ϕ

Vertical Sensitivity 1V/Div

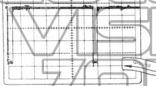
Horizontal Sensitivity 0.1 μ Sec/Div

U9:14 — VDP CSW

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 2 μ Sec/Div

Signal Shown Is Right After the Reset Switch Was Released

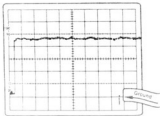


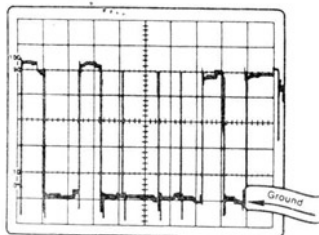
U9:15 — VDP CSR

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 2 μ Sec/Div

Signal Shown Is During Game Play of a Game Cartridge. The Negative Pulse May or May Not Be Present. Negative Pulses Are Always Present Although Sometimes They Are Too Fast for the Oscilloscope.

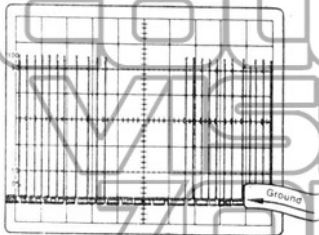


**U9:17 — DATA LINE D7**

Vertical Sensitivity 1V/Div

Horizontal Sensitivity $1\mu\text{Sec}/\text{Div}$

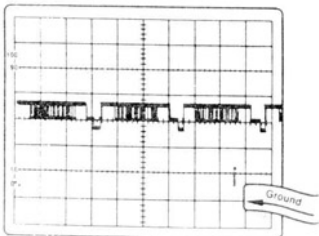
Signal Shown Is During Blue Menu Screen of Game Cartridge. All the Data Lines Should Have a Similar Waveform, If Not, the Data Line Is Dead.

**U9:25 — VDP DATA LINE RD7**

Vertical Sensitivity 1V/Div

Horizontal Sensitivity $0.1\text{mSec}/\text{Div}$

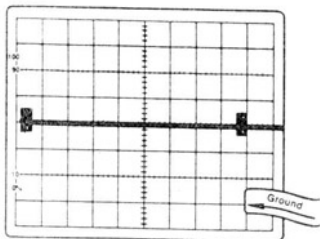
Signal Shown Is During Blue Menu Screen of Game Cartridge. All Data Lines Should Have a Similar Waveform, If Not the Data Line Is Dead.

**U9:35 — B-Y VIDEO OUTPUT**

Vertical Sensitivity 1V/Div

Horizontal Sensitivity $20\mu\text{Sec}/\text{Div}$

Signal Shown Is During Blue Menu Screen of Game Cartridge.


U9:38 — R-Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 2mSec/Div

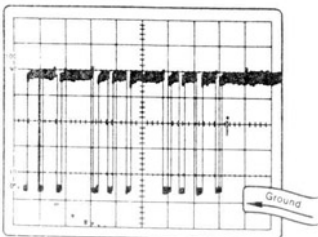
 Signal Shown Is During Blue Menu
Screen of Game Cartridge.

U9:40 — VDP CLOCK

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 50nSec/Div

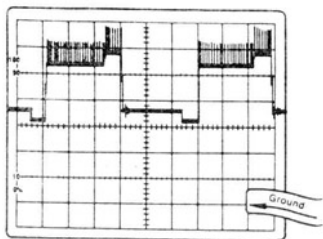
Frequency 10.7MHz


U20:5, 6

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 0.5mSec/Div

 Signal Shown Is During Game Play of a
Game Cartridge.

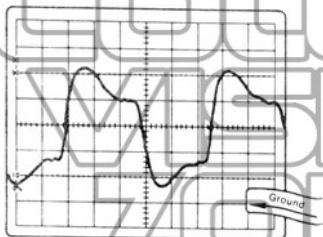


U20:7 — AUDIO OUTPUT

Vertical Sensitivity 0.5V/Div

Horizontal Sensitivity 10mSec/Div

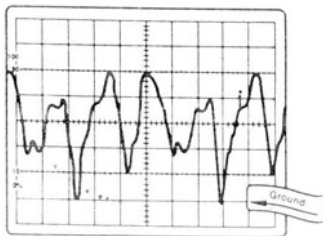
Signal Shown Is During Game Play of a Game Cartridge. This Signal Will Vary Depending on the Sound.



U20:14 — SOUND GENERATOR CLOCK

Vertical Sensitivity 0.5V/Div

Horizontal Sensitivity 0.5μSec/Div

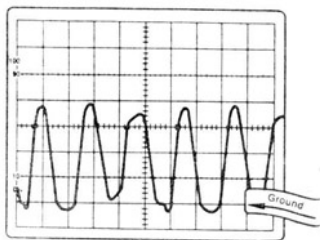


U22:1 INPUT TO THIRD HARMONIC WAVE SHAPER

Vertical Sensitivity 0.5V/Div

Horizontal Sensitivity 5μSec/Div

Signal Shown Is with C91 Installed. C91 Is Not in All Revisions. The Waveform Will Vary Slightly with C91 Removed.



U22:3

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5 μ Sec/Div

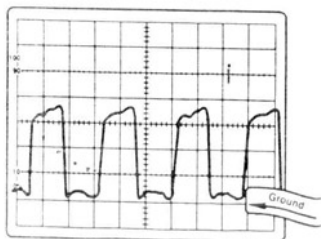
Signal Shown Is with C91 Installed.
C91 Is Not in All Revisions. The
Waveform Will Vary Slightly with C91
Removed.



U22:4

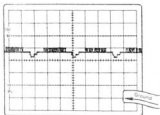
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5 μ Sec/Div

Signal Shown Is with C91 Installed.
C91 Is Not in All Revisions. The
Waveform Will Vary Slightly with C91
Removed.



U22:8 7.159 MHz CLOCK

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5 μ Sec/Div

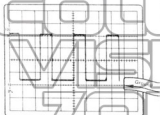


U23:11 — Y VIDEO

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu
Screen of Game Cartridge.

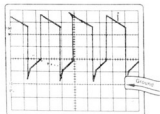


U24:8

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 500 μ Sec/Div

Signal Shown Is with Spinner Interface
Tester in Operation.

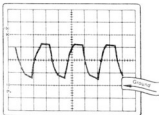


U24:9

Vertical Sensitivity 1V/Div

Horizontal Sensitivity 500 μ Sec/Div

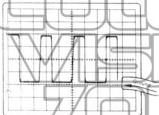
Signal Shown Is with Spinner Interface
Tester in Operation



U24:10

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

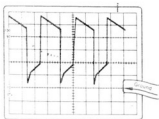
Signal Shown Is with Spinner Interface
Tester in Operation



U24:11

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

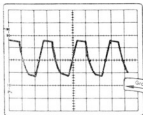
Signal Shown Is with Spinner Interface
Tester in Operation



U24:12

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

Signal Shown Is with Spinner Interface
Tester in Operation



U24:13

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500 μ Sec/Div

Signal Shown Is with Spinner Interface
Tester in Operation.

COLECO VISION ZONE

Technical Tips

Black Out on Screen

If the screen blacks out after the game has been played for a short interval check C106 for proper polarity. If polarity is wrong replace C106.

Purple Monkey

In Donkey Kong, if the monkey, Mario and the barrels are purple, rather than their normal colors, replace U9.

Joystick Game Selection

If the keypad does not control the game selection, only the joystick can be used to select games, replace U6.

Channel 3 But Not Channel 4

Channel 3 operates normally but channel 4 works only if the game is turned off and then turned back on again, (or vice versa) replace RF board.

Not All Cartridges Function

Game does not accept all and/or any cartridges. Examine C70 for mechanical obstructions. Is it flopped over flat on board? Replace U5.

Vertical Lines

Vertical lines on background rather than solid blue background with no lines. Replace C106. If not, try U5. V. L. C. 110.

Skips Menu

Menu is skipped. This is the blue screen with skill levels. Check pins 3-9 of U18 with DVM. If any pin is below 2.2VDC change U18. Check pins 2-8 of U19 with DVM. If any pin is below 2.2VDC, change U19.

No Explosion

If there is no explosion, a sound testing the noise generator, on the final test, replace U20.

12 VDC Is Shorted to -5VDC

Examine WJ2 to see if it has shorted to adjacent test points.

No RF Voltage

If there is no voltage to RF board, check WJ2.

No Color

If color has disappeared, check frequency at J4 Pin 8. Correct frequency is 3.57954 MHz \pm 100 Hz. If the frequency is incorrect, check the clock circuit.

Double Image

Replace U9 for double images.

Wavy Picture

If the picture is wavy, ensure that R62 is 270 Ω and C90 is 120pF. If they are incorrect, replace them. Check Q2, if it is an ITT transistor, replace it.

Incorrect Scoring

If scoring is not working properly, replace U3 and/or U4.

Wrong Frequency

3.579 MHz clock is the wrong frequency. If U22 is a Texas Instrument I.C., replace it.

Bad Spinner Interface

Spinner interface is not working. If U24 is a Texas Instrument I.C., replace it.

Slow Game

If game is running abnormally slow, replace U20.

crambled Picture

If the following images appear on your screen (at this point no cartridge or expansion module is being used) rather than "ColecoVision Presents" make adjustments as directed below each example.



Replace U10



Replace U11

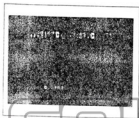


Replace U12

every one of
our owners™



Replace U13



Replace U14



Replace U15



Replace U16



Replace U17

Glossary

Active High—A signal is considered active high when the true state of the signal is high.

Active Low—A signal is considered active low when the true state of the signal is low.

CAS—Column Address Strobe—Used to inform VRAM that the address on the bus is the column of the matrix.

CPU—Central Processing Unit

CSR—Chip Select Read—The VDP sends data onto the data bus when CSR is active (low).

CSW—Chip Select Write—The VDP writes data from the data bus into internal registers when CSW is active (low).

CS1-CS4—Chip Select 1-4—Used to select separate IC's inside the cartridge.

Data Address Bus—a wire or group of wires used to carry data to or from a number of different locations.

IC—Integrated Circuit— a combination of interconnected circuit elements inseparably associated on or within a continuous substrate.

Memory Bus—the CPU register in a computer, which holds the address of the memory location being accessed.

Mode A0—A control signal used by the VDP to select data entry or exit point. If high, the data will be stored or retrieved from internal registers. If low, data will be stored into or retrieved from VRAM.

NMI—Non Maskable Interrupt—The VDP sends an NMI signal to the CPU every 1/60 second (refresh rate of TV).

NOP—No Operation—An instruction for a computer to do nothing but process the next instruction in sequence.

Pixel—The smallest point on the television screen that can be independently controlled.

Planes—Same as geometric planes, provide background, borders, etc.

RAM—Random Access Memory — A memory that can be written into or read by locating any data address.

RAS—Row Address Strobe—Used to inform VRAM that the address on the bus is the row of the matrix.

RF Modulator—Combines video and audio information into a carrier wave to transport it to television receiver.

Sprite—An object whose pattern is relative to a specified X, Y coordinate and whose position can therefore be controlled by that coordinate with a positional resolution of one pixel.

Tri-State—Logic systems utilizing three conditions on one line: a definitely applied high voltage (logic 1); a definite low voltage (logic 0); and an open circuit of undefined state, permitting another part of the circuit to determine whether the line will be high or low.

VRAM—Video RAM—refers to the dynamic RAMs that connect to the VDP and whose contents define the TV image.

Updates

Subject: First Update
Date: March 1, 1983

An example of the ColecoVision updates that will be provided to you as they occur. They should be placed in this section for quick referral.

COLECO
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