COLECO VISION™

TECHNICAL MANUAL

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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.

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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 Coleco Vision 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.

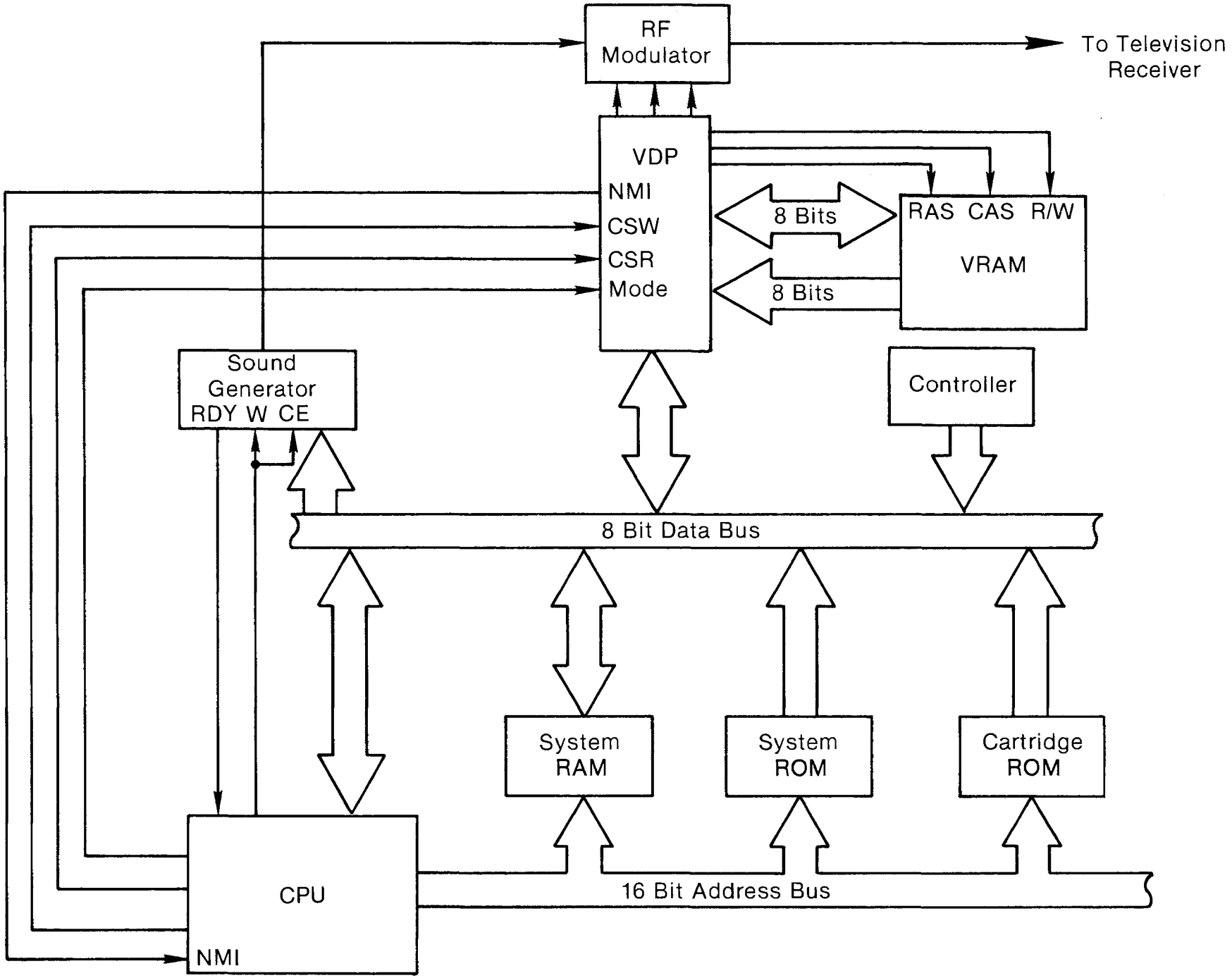
The CPU consists of a Z-80A microprocessor and support circuitry. The Z-80A has an eight bit data bus and a sixteen bit address bus. The support circuitry consists of a clock, reset circuitry and decoders.

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.).


RF
Modulator
To Television
Receiver
VDP
NMI
CSW
CSR
Mode
8 Bits
8 Bits
RAS CAS R/W
VRAM
Sound
Generator
RDY W CE
Controller
8 Bit Data Bus
System
RAM
System
ROM
Cartridge
ROM
CPU
NMI
16 Bit Address Bus

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 handcontrollers.

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 AØ, determines where the VDP will retrieve the data or where it will send the data. If AØ is high, the data will be stored into, or retrieved from an internal register. Which register is used is determined by the data. If AØ 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 R/W determines if data will be written into the VRAM or read onto the VRAM output bus. If R/W 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($\overline{S}$) 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, +12UDC and −5VDC.

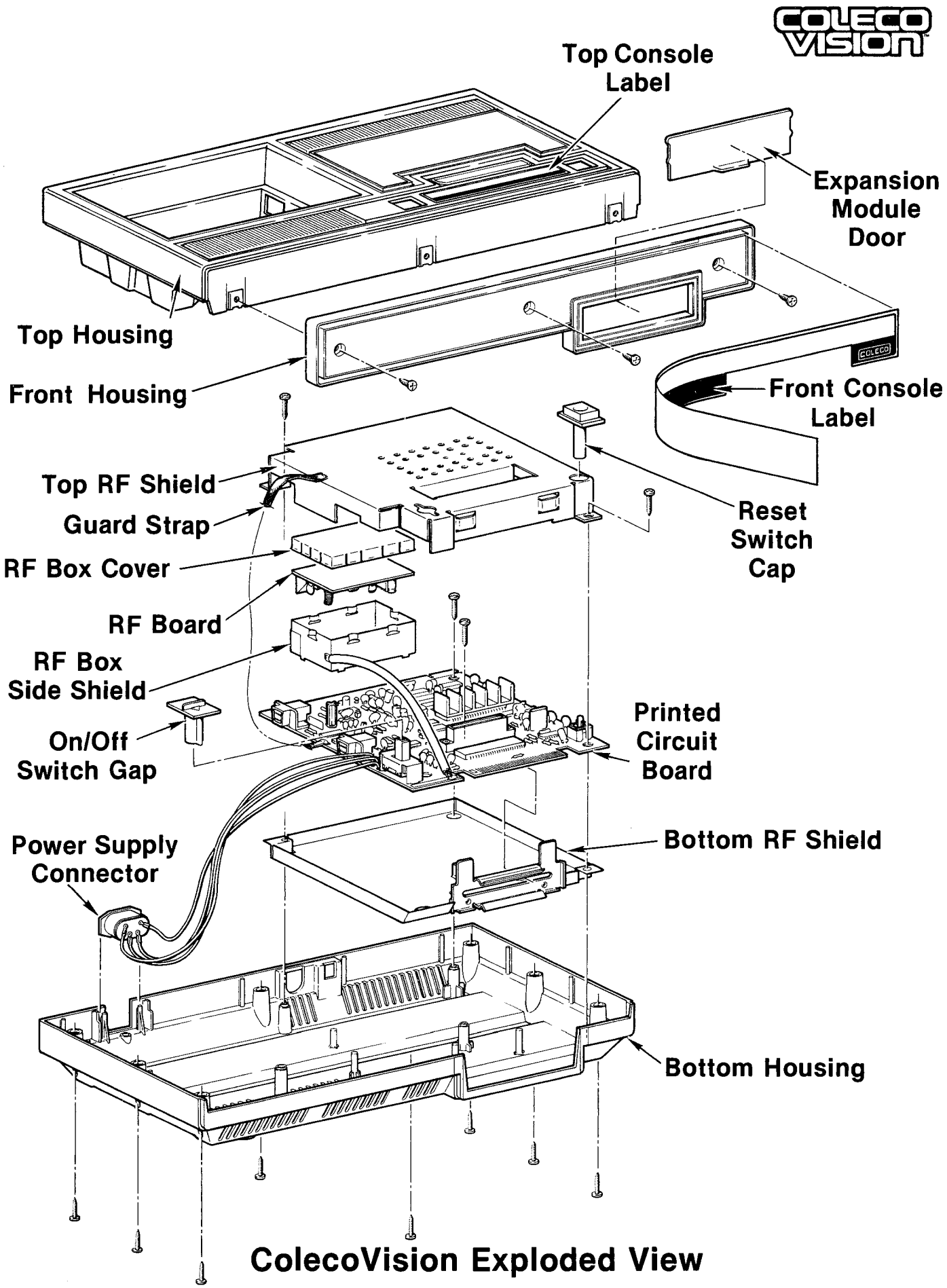
The unit is ultrasonically welded, therefore it is not serviceable. If the power supply is defective or not working properly, the entire unit should be replaced.

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.

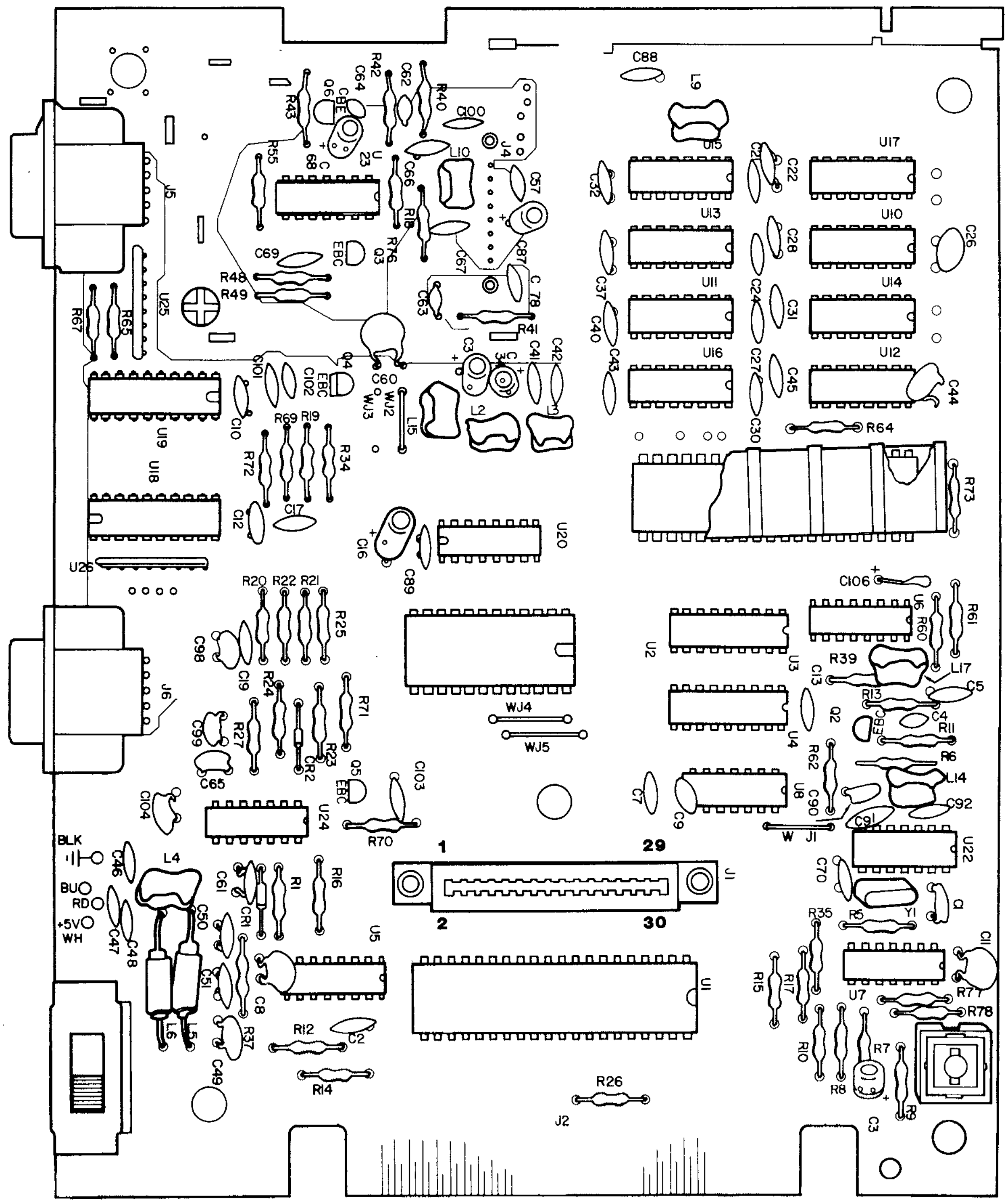
Assembly

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.

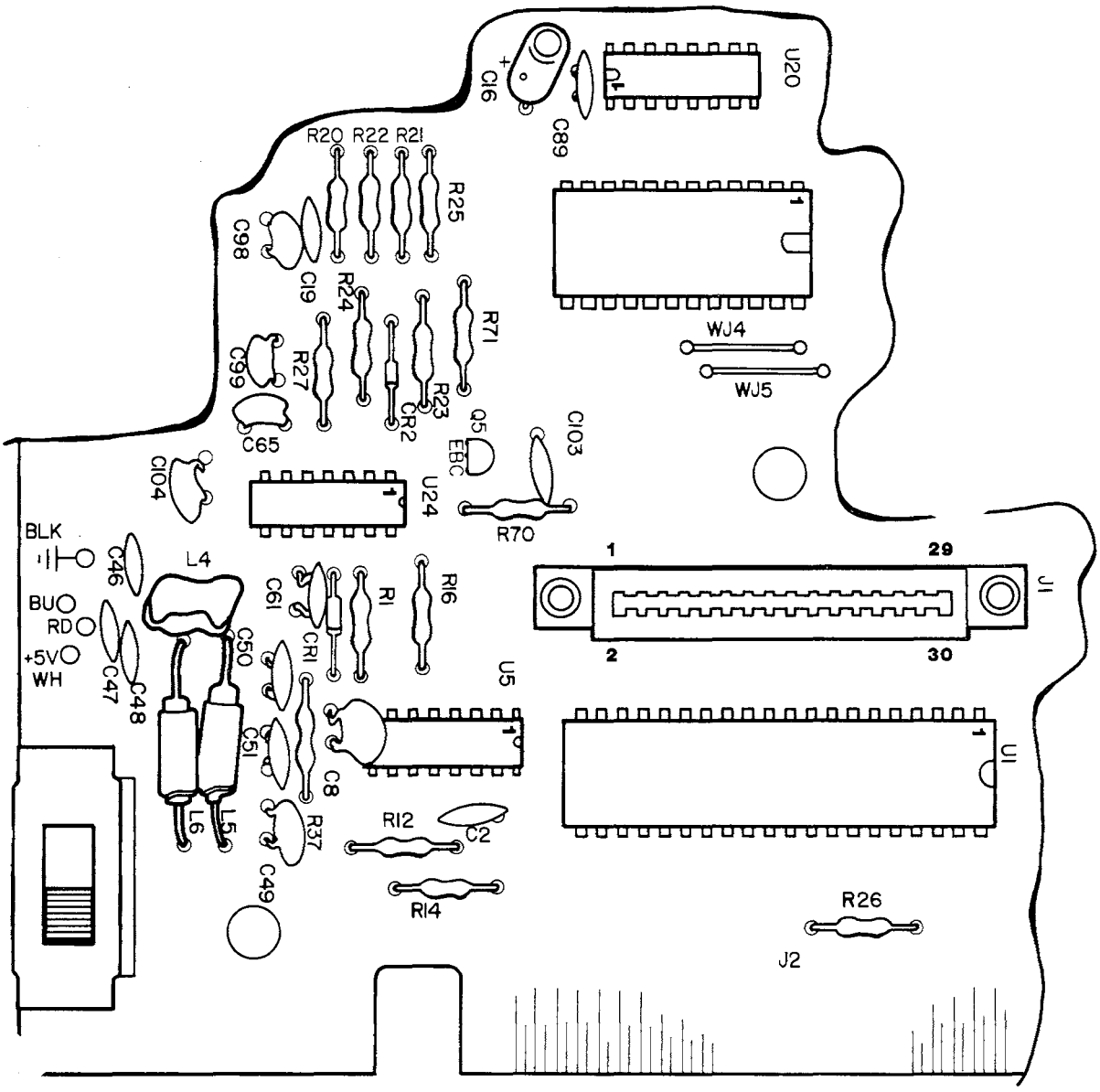


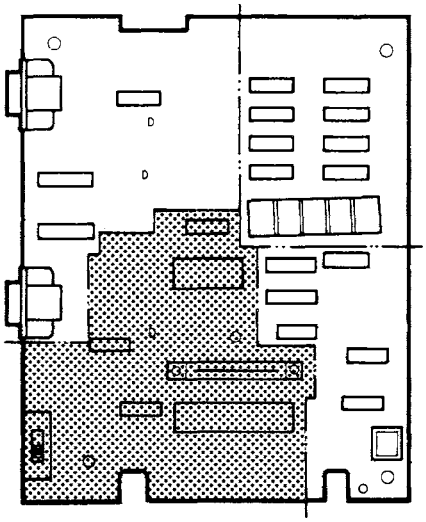
ColecoVision Exploded View

Assembly Drawings

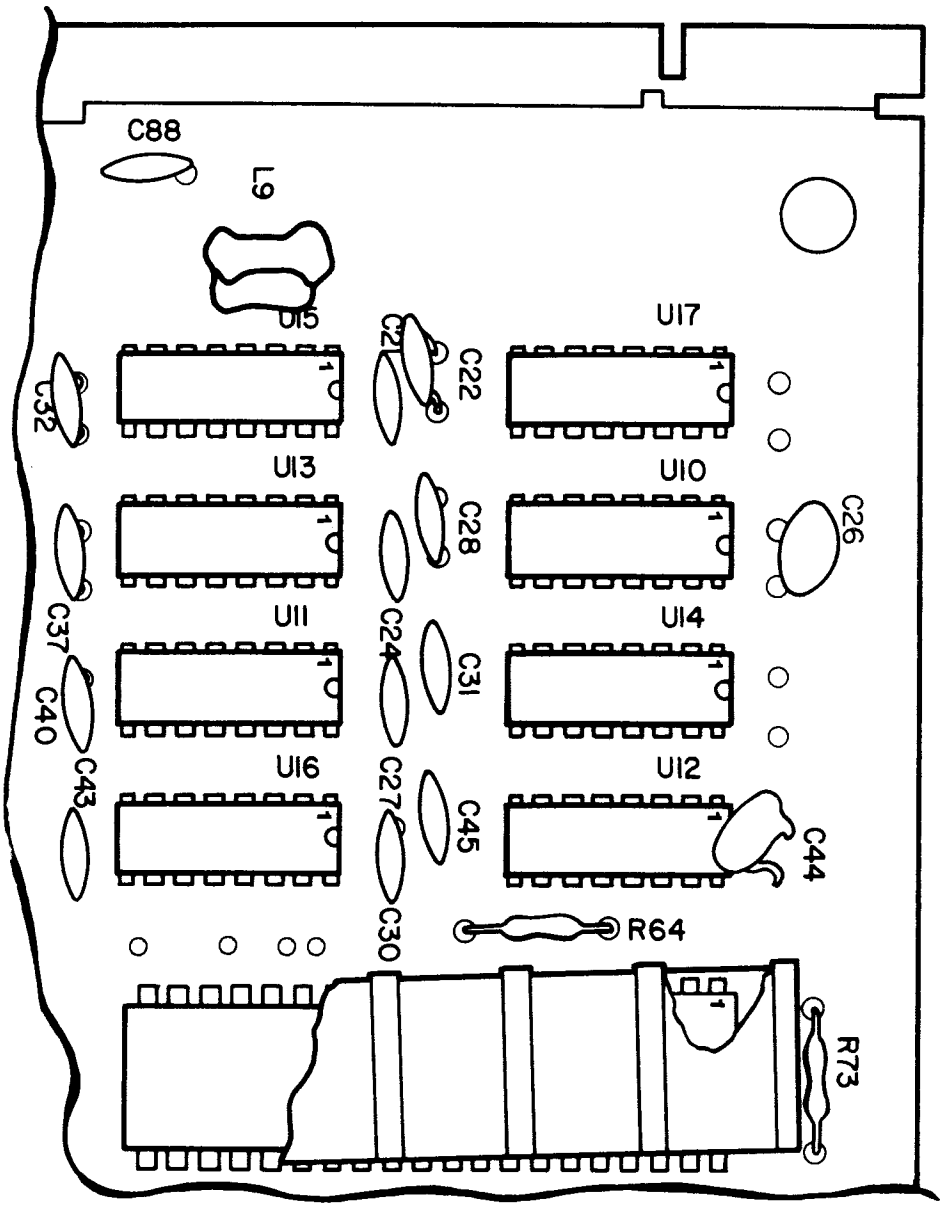

U17
U10
U14
U12
U13
U11
U16
U15
U2
U3
U4
U8
U6
U7
U22
U1
U5
U24
U20
U19
U18
U25
U26
U23
J1
J2
J4
J5
J6
1
2
29
30
L9
L10
L2
L3
L4
L5
L6
L14
L15
L17
Q2
Q3
Q4
Q5
Q6
Y1
WJ2
WJ3
WJ4
WJ5
W J1
CR1
CR2
EBC
R26
R64
R73
R61
R60
R39
R13
R11
R6
R62
R35
R5
R17
R15
R10
R7
R8
R9
R77
R78
R16
R1
R12
R14
R37
R70
R71
R23
R24
R27
R25
R20
R22
R21
R34
R19
R69
R72
R41
R40
R42
R43
R55
R18
R76
R48
R49
R65
R67
C88
C26
C44
C22
C21
C28
C24
C31
C27
C45
C30
C32
C37
C40
C43
C42
C41
C34
C3
C60
C57
C87
C78
C67
C63
C100
C66
C62
C64
C68
C69
C101
C102
C10
C17
C12
C16
C89
C19
C98
C99
C65
C104
C103
C7
C9
C90
C91
C92
C5
C4
C13
C106
C70
C11
C61
C8
C50
C51
C49
C2
C46
C47
C48
BLK
BU
RD
+5V
WH

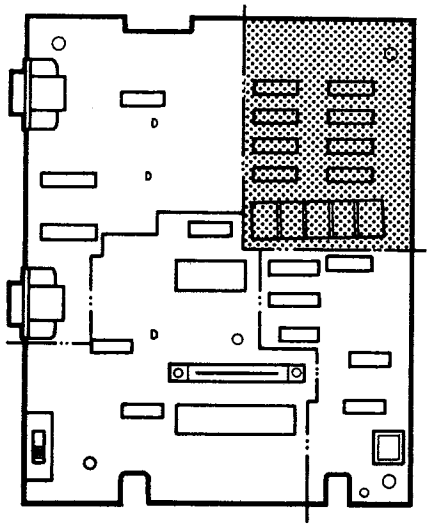
Logic Board



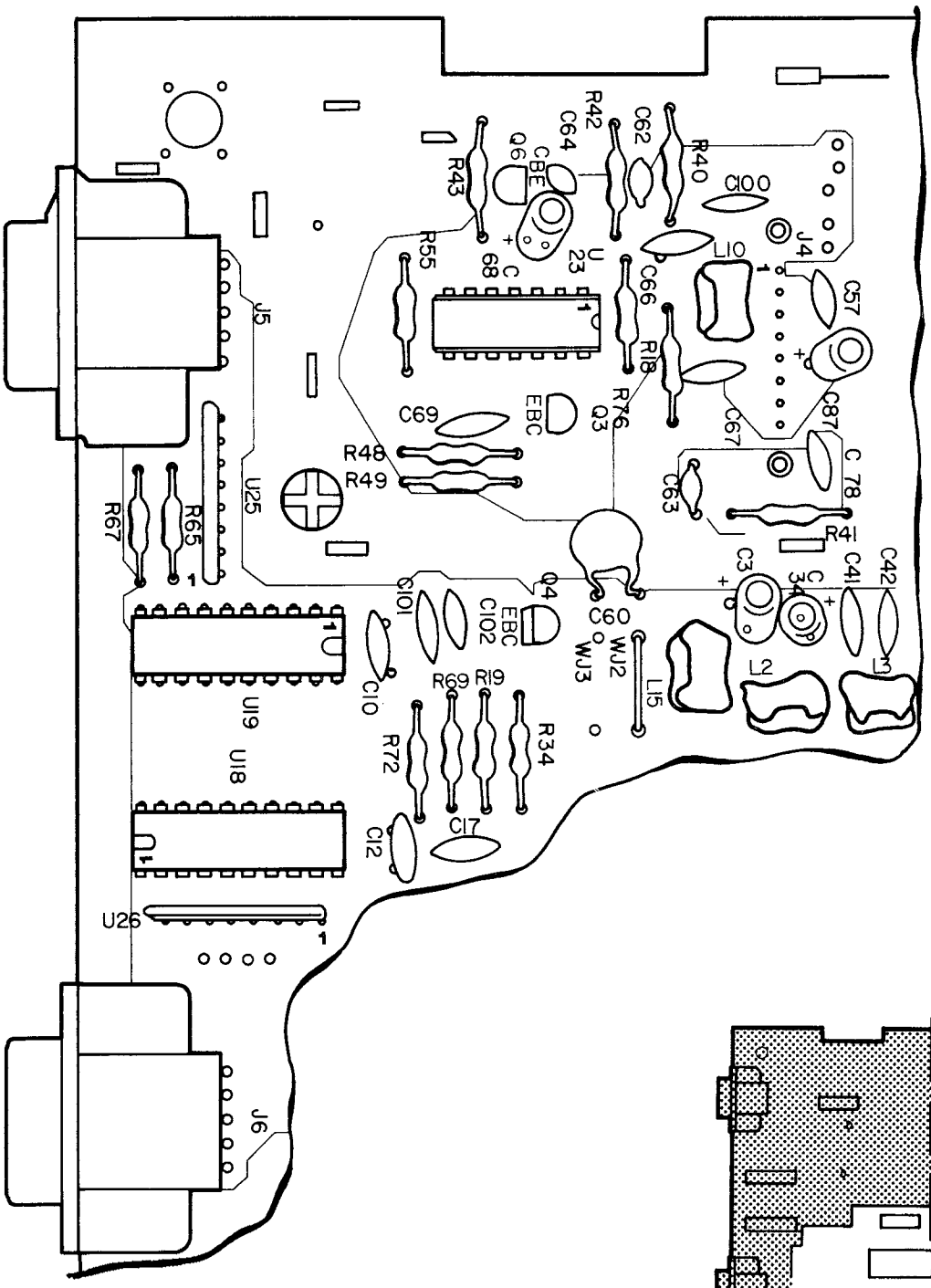


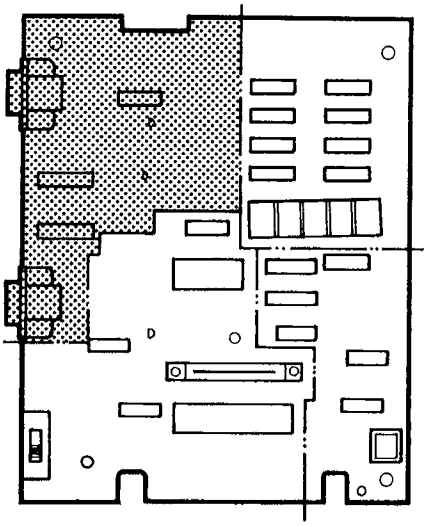
Logic Board
(Expanded View)



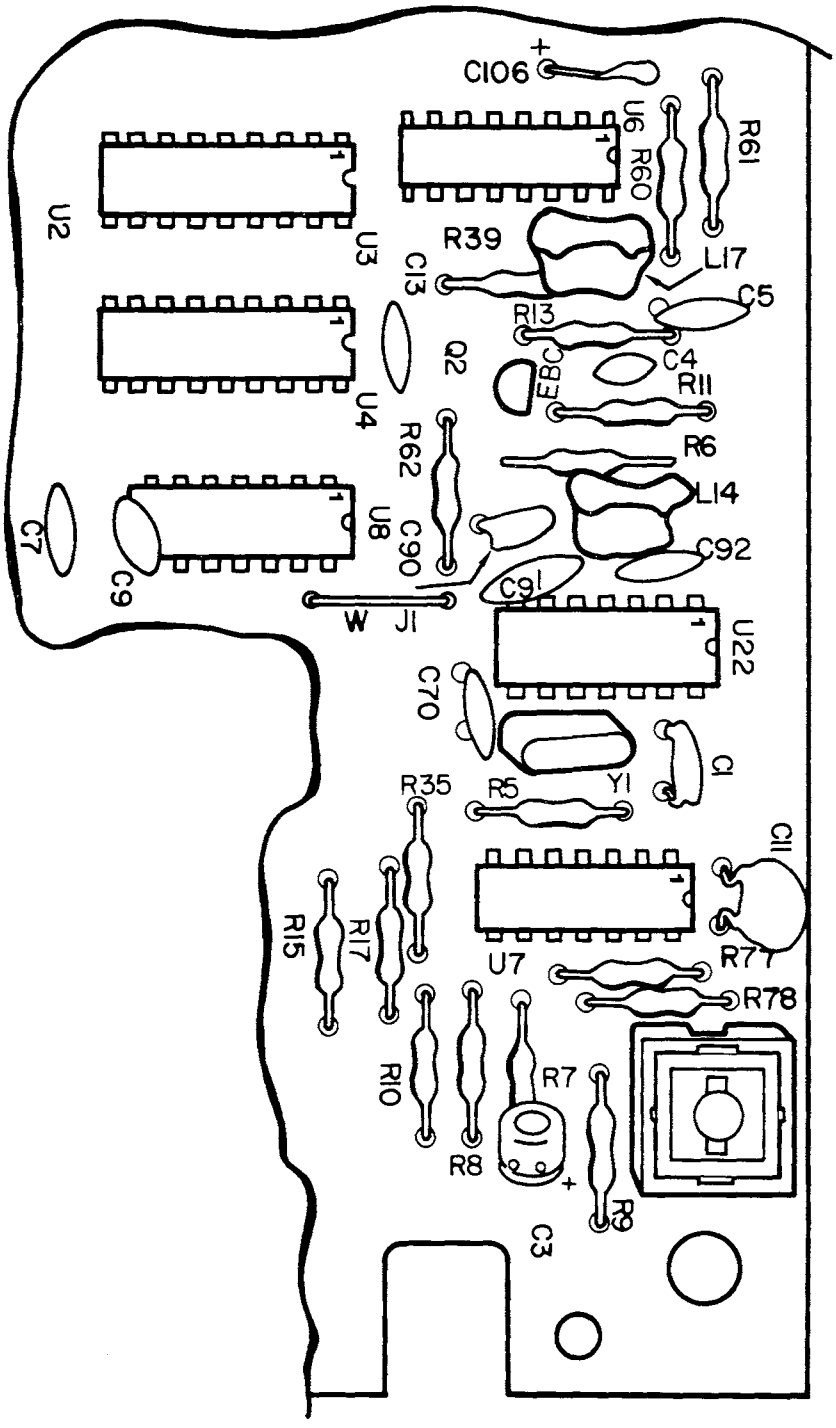


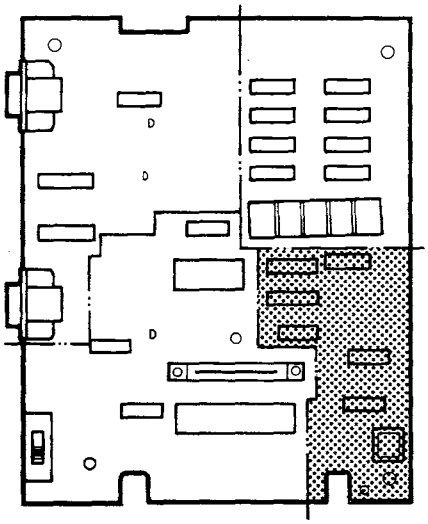
Logic Board
(Expanded View)



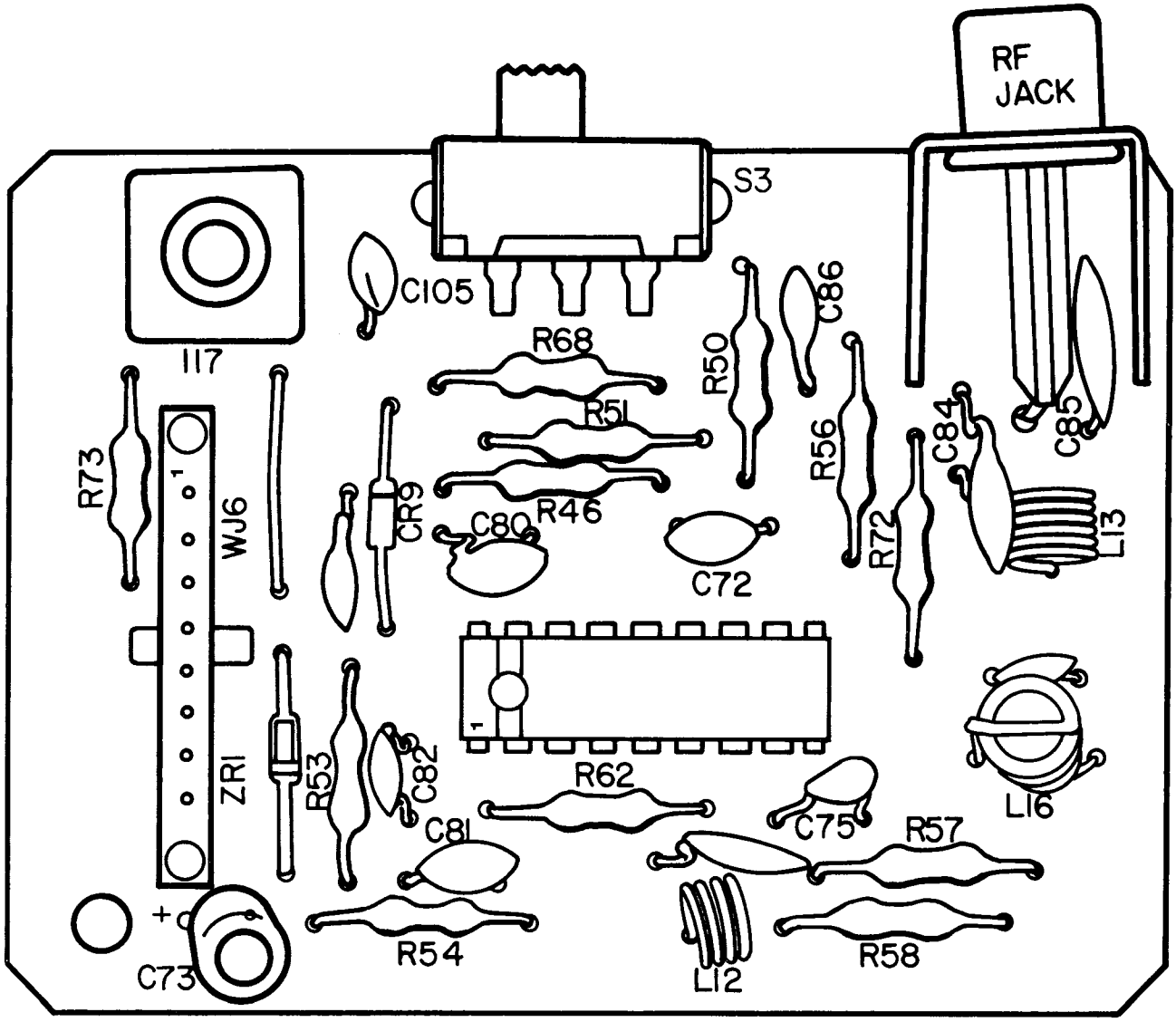


Logic Board
(Expanded View)





Logic Board
(Expanded View)


RF
JACK
S3
C105
117
R68
R50
C86
R51
R56
C84
C85
R73
WJ6
CR9
C80
R46
C72
R72
L13
ZR1
R53
C82
R62
C81
C75
R57
L16
+
C73
R54
L12
R58

RF BOARD

Parts List

Capacitors

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

Capacitors

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

Capacitors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
C73	10 μf 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 μf ceramic disc	R72018
C79	Not used	
C80	47 pf ceramic disc	Order RF board
C81	47 pf ceramic disc	Order RF board
C82	.01 μf 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	.01μf ceramic disc	Order RF board
C87	10 μf electrolytic	R72642
C88	.1 μf ceramic disc	R72284
C89	.1 μf 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 μf ceramic disc	R72018
C99	.01 μf ceramic disc	R72018
C100	.1 μf ceramic disc	R72284
C101	.047 μF ceramic disc	R72296
C102	100 pf ceramic disc	R72012
C103	.047 μf ceramic disc	R72296
C104	100 pf ceramic disc	R72012
C105	.001 μf ceramic disc	Order RF board
C106	10 μf tantalum	R72644

Connectors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
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

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
Y1	7.15909 MHz crystal	R73276

Diodes

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
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

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

Inductors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
L1	Not used	
L2	10 μH postage stamp	R73273
L3	10 μH postage stamp	R73273
L4	10 μH postage stamp	R73273
L5	10 μH ½W	R73274
L6	10 μH ½W	R73274
L7	120 μH postage stamp	R73277
L8	120 μH postage stamp	R73277
L9	43 μH postage stamp	R73278
L10	10 μH 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 μH postage stamp	R73275
L15	43 μH, postage stamp	R73278
L16	.7 μH	Order RF board
L17	43 μH postage stamp	R73278

Integrated Circuits

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
U1	Z-80A microprocessor	R73069
U2	Masked ROM	R73108
U3	1K × 4 RAM	R73071
U4	1K × 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 × 1 video RAM	R73076
U11	16K × 1 video RAM	R73076
U12	16K × 1 video RAM	R73076
U13	16K × 1 video RAM	R73076
U14	16K × 1 video RAM	R73076
U15	16K × 1 video RAM	R73076
U16	16K × 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	22KΩ resistor pack	R73114
U26	22KΩ resistor pack	R73114

Resistors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
R1	1.5KΩ carbon film, ¼W	R58286
R2	Not used	
R3	Not used	
R4	Not used	
R5	330Ω carbon film, ¼W	R57269
R6	620Ω carbon film, ¼W	R74310
R7	91KΩ carbon film, ¼W	R74292
R8	3.3KΩ carbon film, ¼W	R58446
R9	1MΩ carbon film, ¼W	R57570
R10	3.3KΩ carbon film, ¼W	R58446
R11	180Ω carbon film, ¼W	R58049
R12	3.3KΩ carbon film, ¼W	R58446
R13	1.1KΩ carbon film, ¼W	R58441
R14	3.3KΩ carbon film, ¼W	R58446
R15	2.7KΩ carbon film, ¼W	R74004
R16	3.3KΩ carbon film, ¼W	R58446
R17	3.3KΩ carbon film, ¼W	R68446
R18	1.8KΩ carbon film, ¼W	R58007
R19	1.8KΩ carbon film, ¼W	R58007
R20	1.8KΩ carbon film, ¼W	R58007
R21	1.5KΩ carbon film, ¼W	R58286
R22	120Ω carbon film, ¼W	R74060
R23	120Ω carbon film, ¼W	R74060

Resistors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
R24	100K Ω carbon film, ¼W	R57602
R25	1.5K Ω carbon film, ¼W	R58286
R26	470 Ω carbon film, ¼W	R74008
R27	100K carbon film, ¼W	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, ¼W	R58446
R35	3.3K Ω carbon film, ¼W	R58446
R36	Not used	
R37	3.3K Ω carbon film, ¼W	R58446
R38	Not used	
R39	1K Ω carbon film, ¼W	R57268
R40	390 Ω carbon film, ¼W	R74298
R41	390 Ω carbon film, ¼W	R74298
R42	390 Ω carbon film, ¼W	R74298
R43	10K Ω carbon film, ¼W	Order RF board
R44	Not used	
R45	Not used	
R46	22K Ω carbon film, ¼W	Order RF board
R47	Not used	
R48	470K Ω carbon film, ¼W	R74300
R49	10K Ω carbon film, ¼W	R57266
R50	8.2K Ω carbon film, ¼W	Order RF board
R51	4.7K Ω carbon film, ¼W	Order RF board
R52	1K Ω carbon film, ¼W	Order RF board
R53	1K Ω carbon film, ¼W	Order RF board
R54	1K Ω carbon film, ¼W	Order RF board
R55	1.8K Ω carbon film, ¼W	Order RF board
R56	82 Ω carbon film, ¼W	Order RF board
R57	240 Ω carbon film, ¼W	Order RF board
R58	240 Ω carbon film, ¼W	Order RF board
R59	Not used	
R60	47 Ω carbon film, ¼W	R74294
R61	1K Ω carbon film, ¼W	R57268
R62	270 Ω carbon film, ¼W	R74034

Resistors

REFERENCE/ DESIGNATOR	DESCRIPTION	PART NUMBER
R63	Not used	
R64	1K Ω carbon film, ¼W	R57268
R65	270 Ω carbon film, ¼W	R74034
R66	Not used	
R67	270 Ω carbon film, ¼W	R74034
R68	47Ω carbon film, ¼W	Order RF board
R69	22K Ω carbon film, ¼W	R57920
R70	10K Ω carbon film, ¼W	R57266
R71	22K Ω carbon film, ¼W	R57920
R72	10K Ω carbon film, ¼W	R57266
R73	4.7K Ω carbon film, ¼W	R57295
R74	39K Ω carbon film, ¼W	Order RF board
R75	Not used	
R76	1.8K Ω carbon film, ¼W	R58007
R77	22K Ω carbon film, ¼W	R57920
R78	1K Ω carbon film, ¼W	R57268
R79	Optional trim resistor	
R80	39KΩ carbon film, ¼W	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	R57298
Q4	NPN transistor	R74977
Q5	NPN transistor	R74977
Q6	PNP transistor	R57298

Miscellaneous

DESCRIPTION	PART NUMBER
Power supply	S55416
Logic board	S75747
RF board	S75748
Donkey Kong cartridge	S78021
Handcontroller	S78022
Switch box assembly	R74608
Game cable	R75315
RF box sideshield	F74516
RF box cover	F74519
Heat sink (for U9)	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	F74747
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	R79983

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 VI-3. 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.

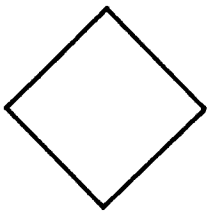
Explanation of Troubleshooting

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).

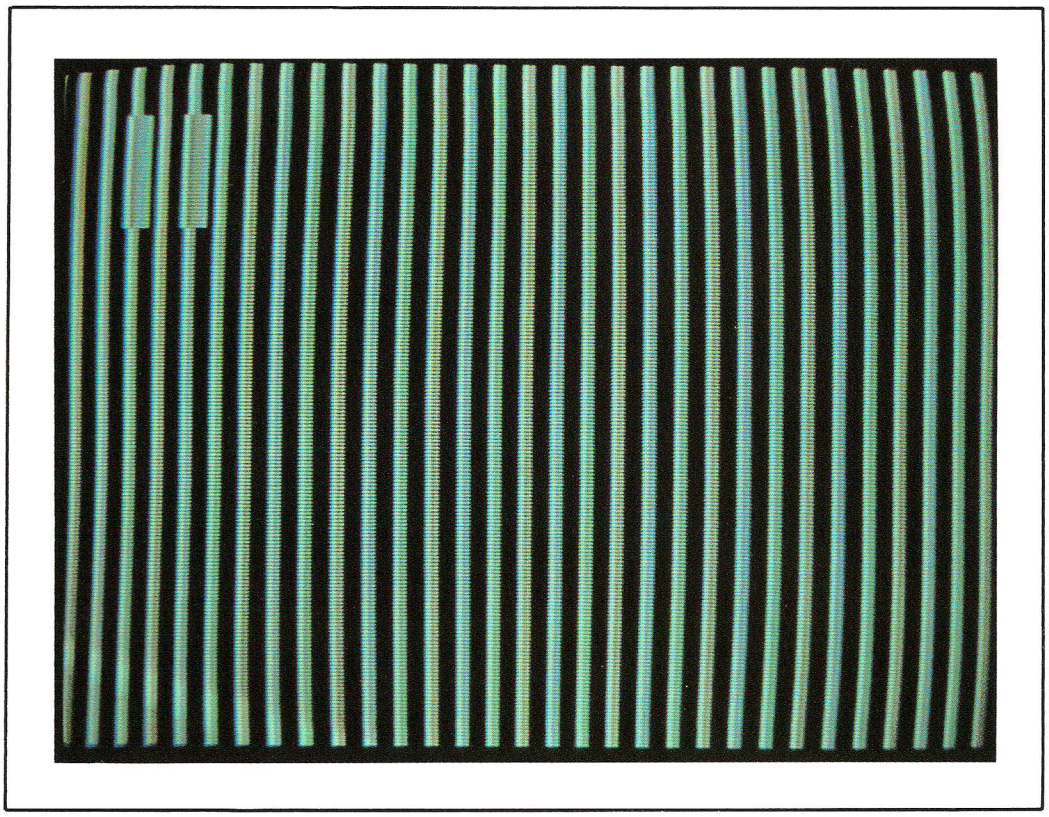
Process Block — Perform the operation stated in the block and proceed to the next step.

Go to Sheet 3

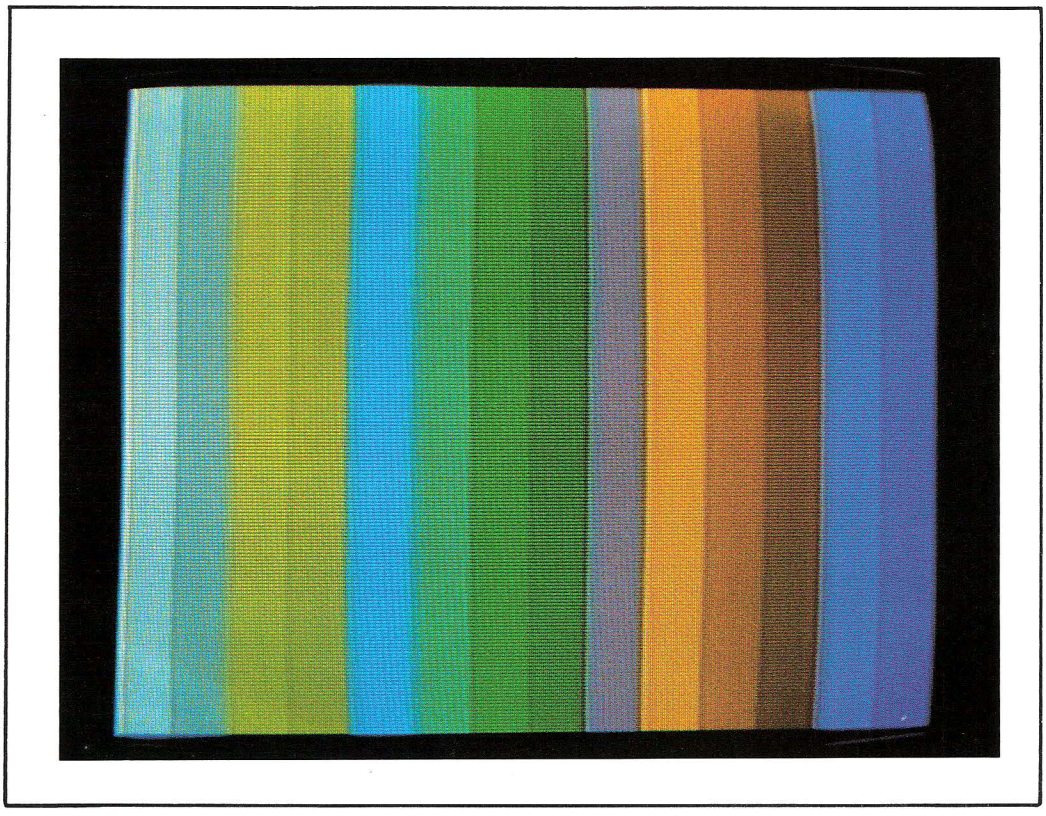
Subroutine Block — Follow specific direction, usually directing repair person to proceed onto an additional page for more detailed instructions.

Return Block — Return to beginning of flow charts.

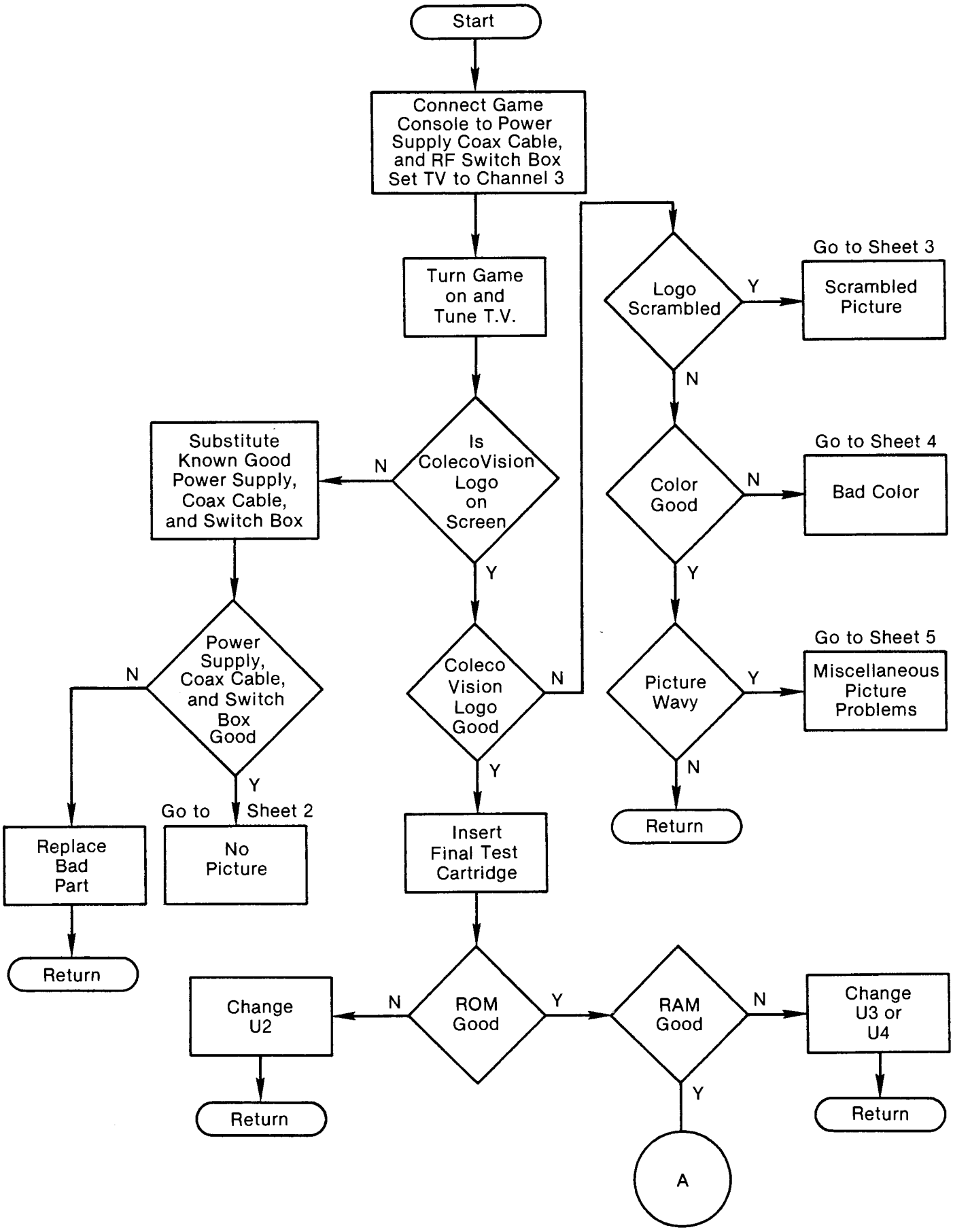
Video Test

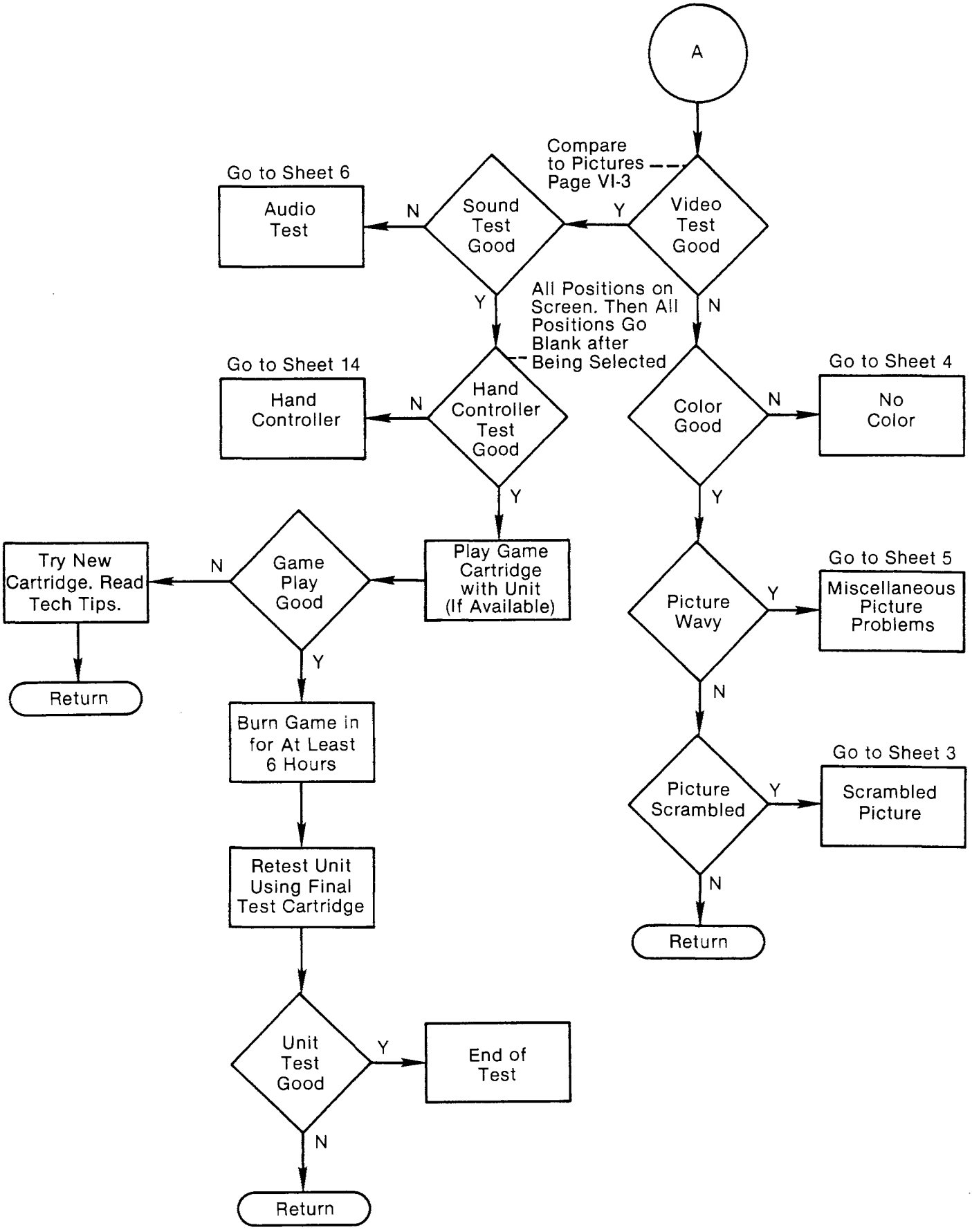


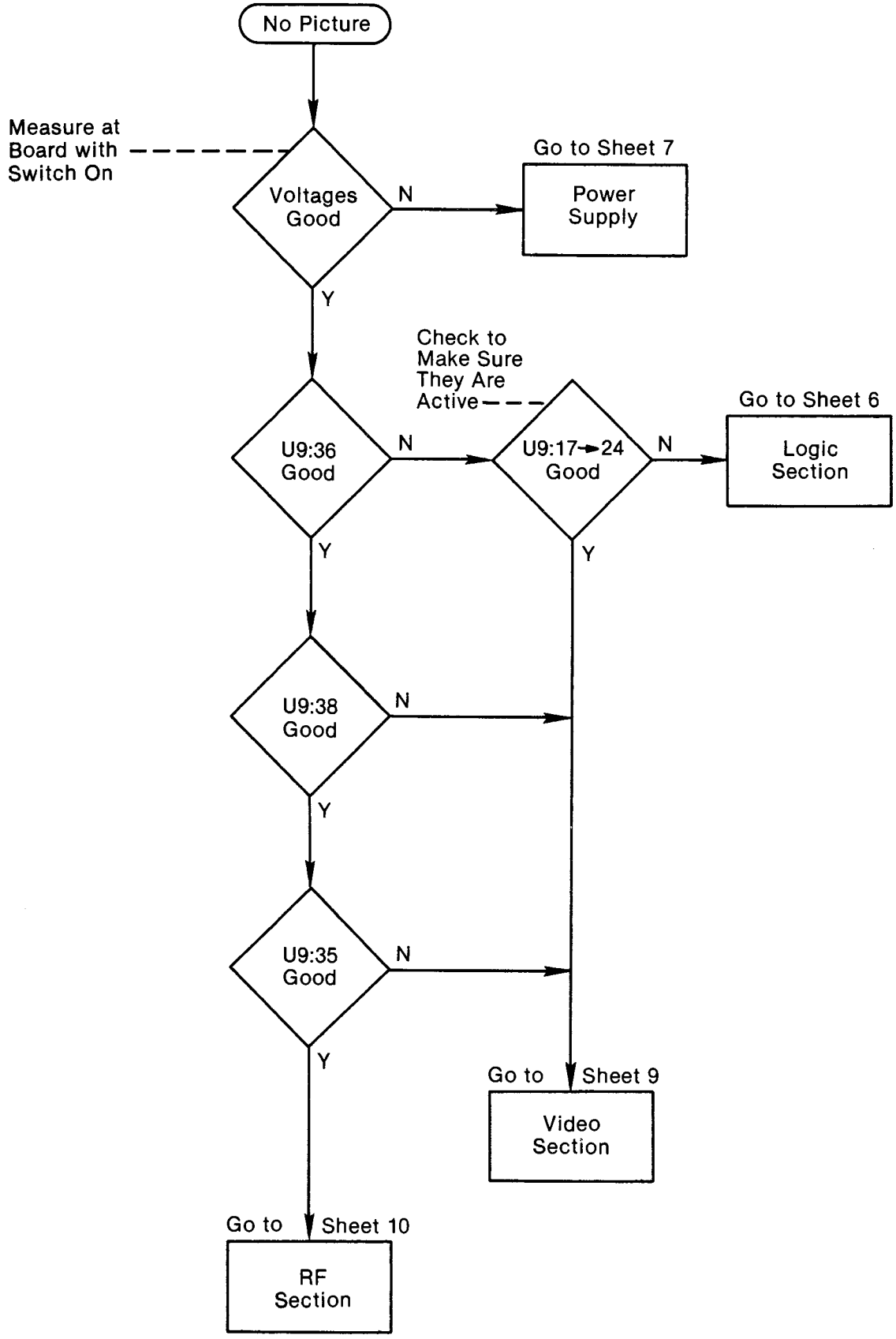
Color Test

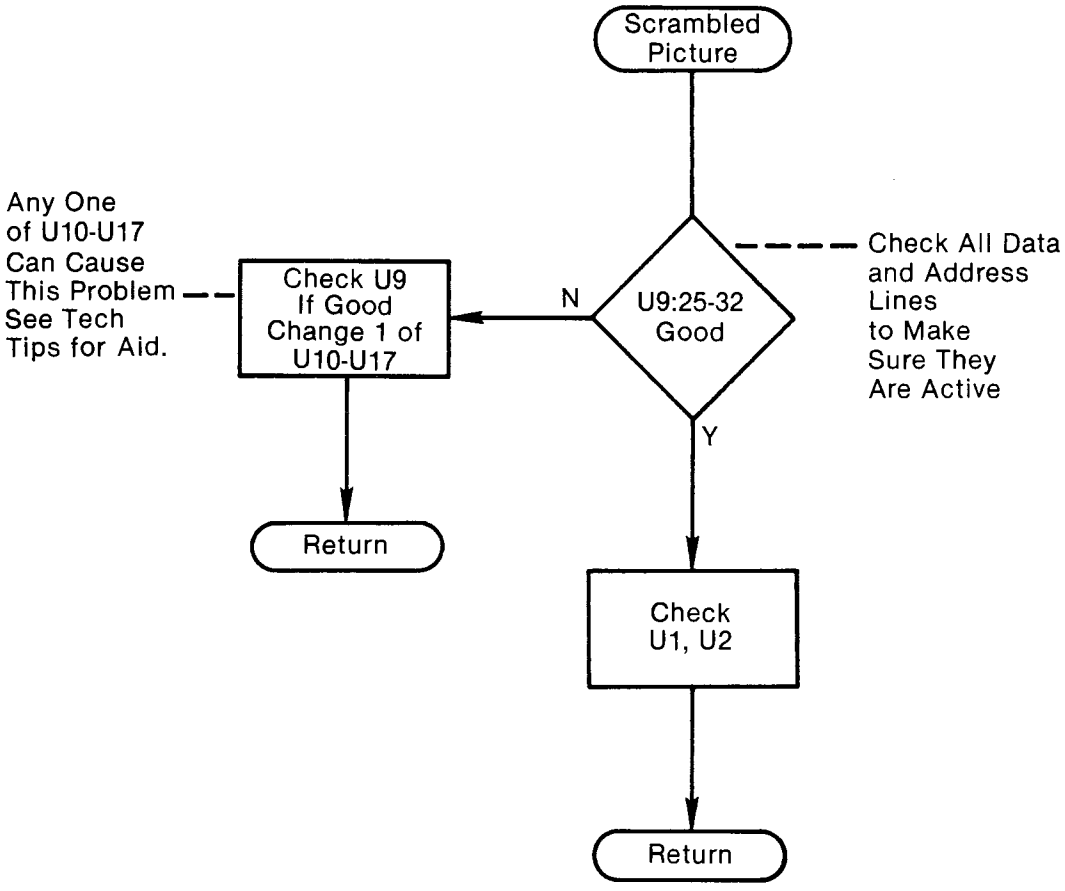


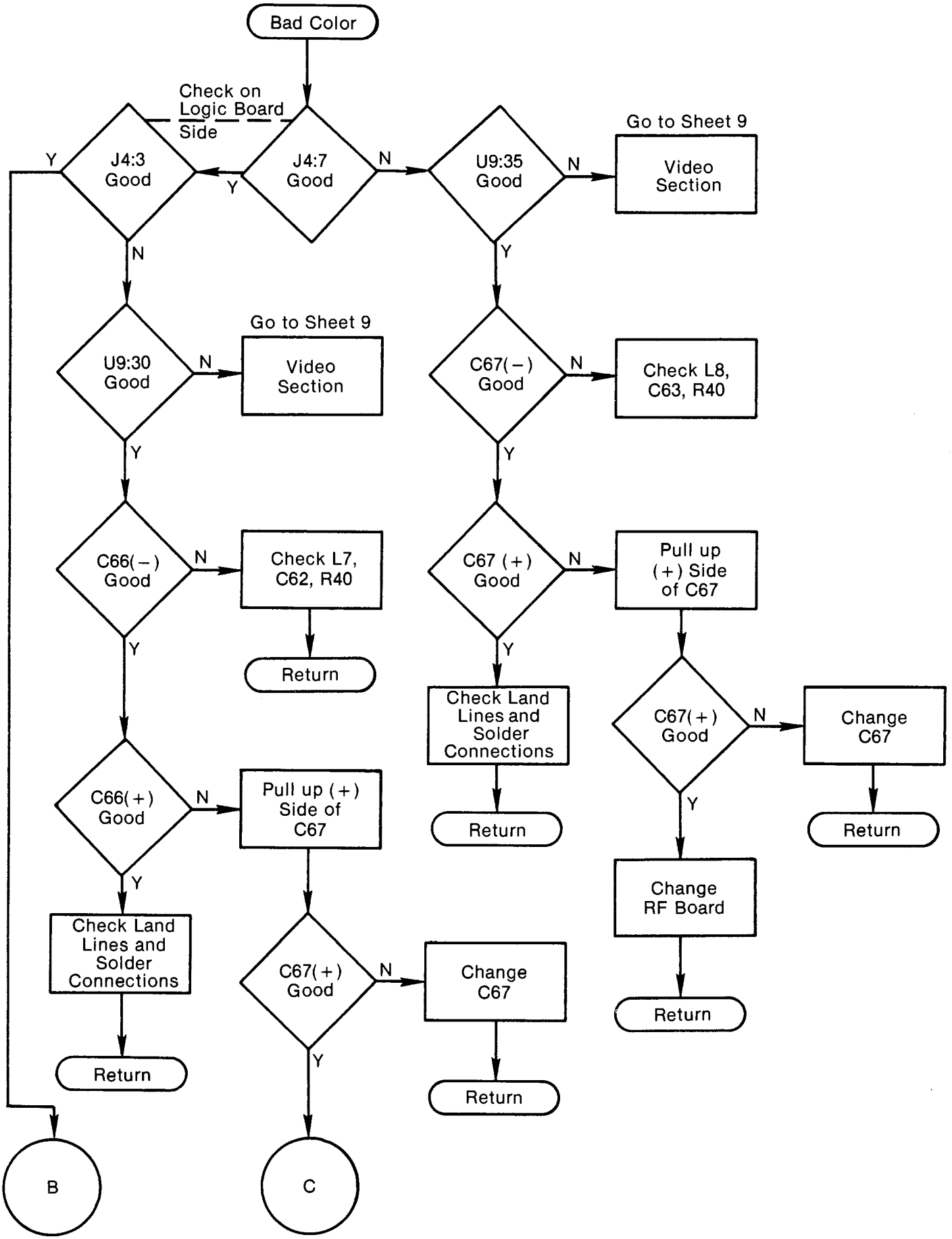
Troubleshooting Flow Charts

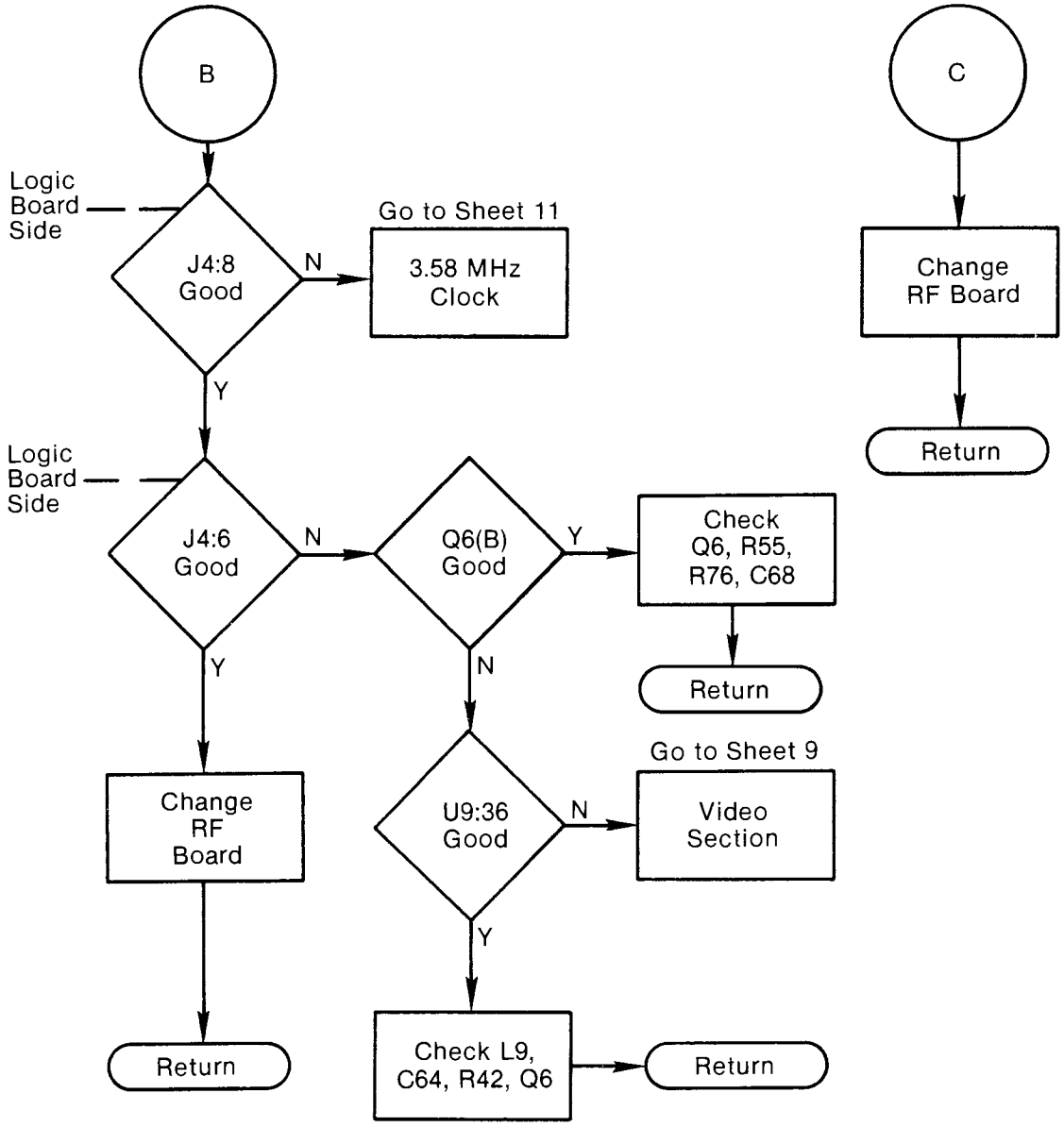

Start
Connect Game Console to Power Supply Coax Cable, and RF Switch Box Set TV to Channel 3
Turn Game on and Tune T.V.
Is ColecoVision Logo on Screen
N
Substitute Known Good Power Supply, Coax Cable, and Switch Box
Y
Coleco Vision Logo Good
N
Y
Insert Final Test Cartridge
Logo Scrambled
Y
Go to Sheet 3
Scrambled Picture
N
Color Good
N
Go to Sheet 4
Bad Color
Y
Picture Wavy
Y
Go to Sheet 5
Miscellaneous Picture Problems
N
Return
Power Supply, Coax Cable, and Switch Box Good
N
Y
Replace Bad Part
Return
Go to Sheet 2
No Picture
ROM Good
N
Change U2
Return
Y
RAM Good
N
Change U3 or U4
Return
Y
A

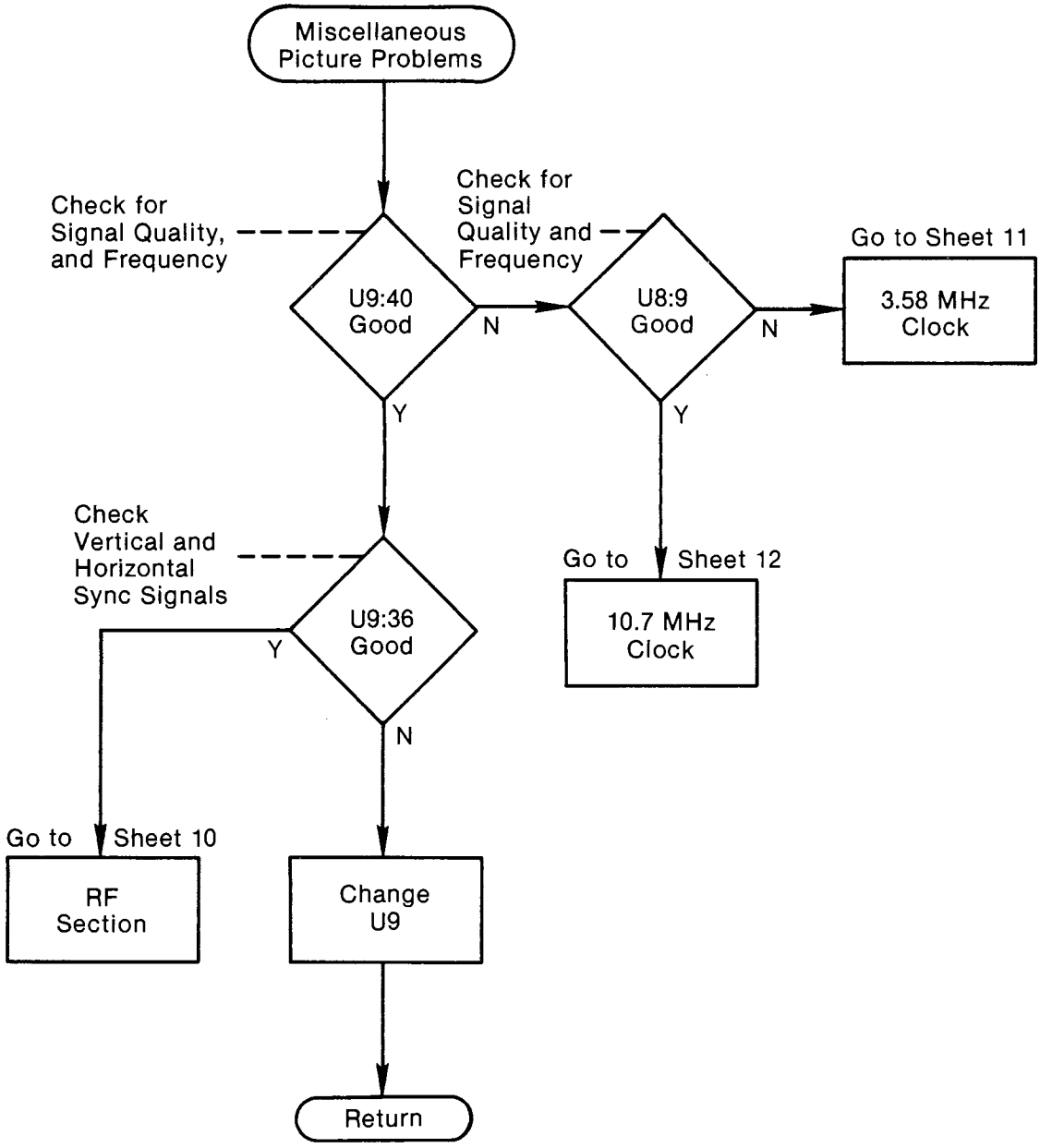

A
Compare to Pictures Page VI-3
Video Test Good
Y
Sound Test Good
N
Go to Sheet 6
Audio Test
Y
All Positions on Screen. Then All Positions Go Blank after Being Selected
N
Hand Controller Test Good
N
Go to Sheet 14
Hand Controller
Color Good
N
Go to Sheet 4
No Color
Y
Play Game Cartridge with Unit (If Available)
Game Play Good
N
Try New Cartridge. Read Tech Tips.
Return
Y
Burn Game in for At Least 6 Hours
Retest Unit Using Final Test Cartridge
Unit Test Good
Y
End of Test
N
Return
Picture Wavy
Y
Go to Sheet 5
Miscellaneous Picture Problems
N
Picture Scrambled
Y
Go to Sheet 3
Scrambled Picture
N
Return

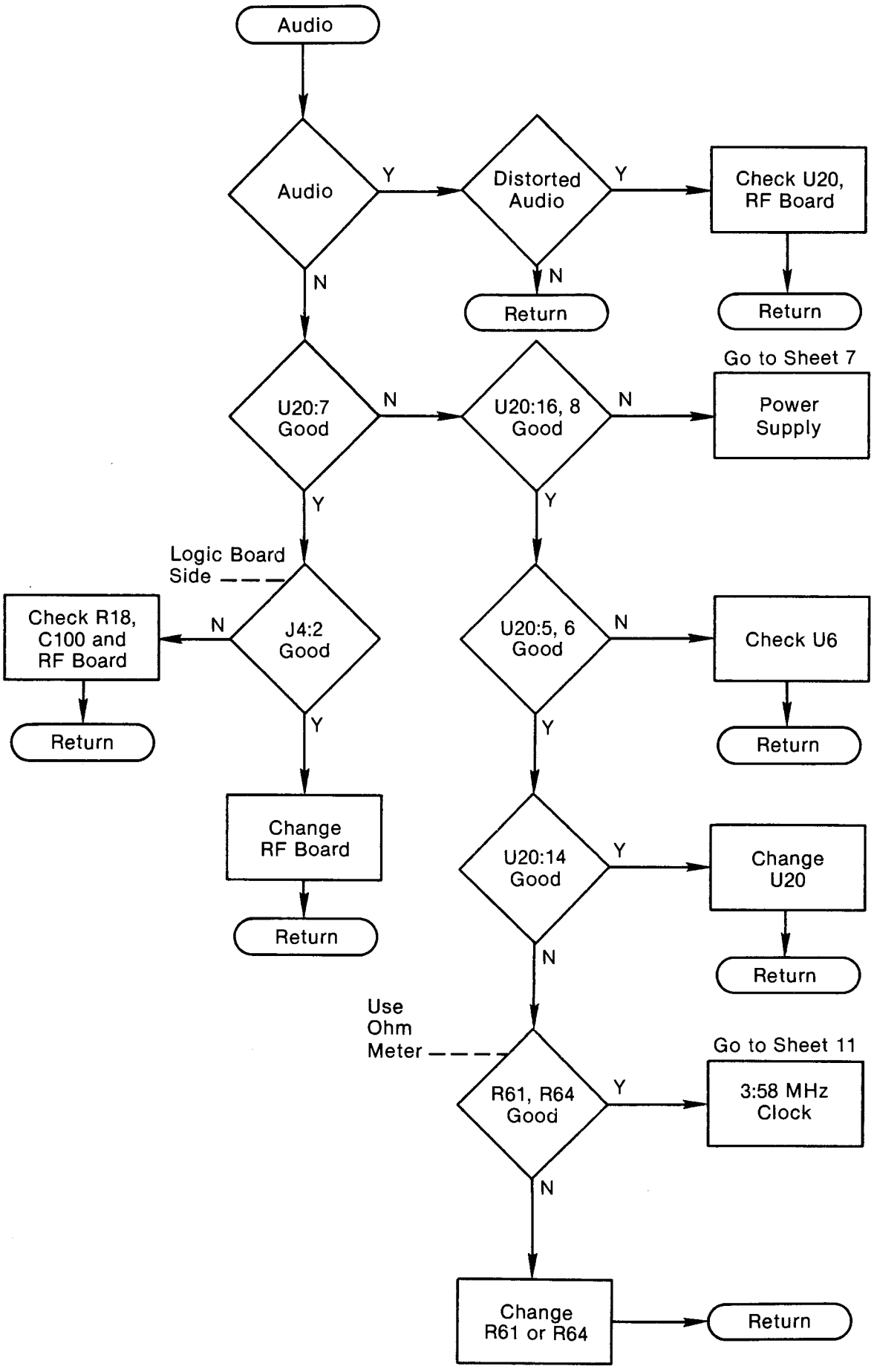

No Picture
Measure at Board with Switch On
Voltages Good
N
Go to Sheet 7
Power Supply
Y
Check to Make Sure They Are Active
U9:36 Good
N
U9:17→24 Good
N
Go to Sheet 6
Logic Section
Y
Y
U9:38 Good
N
Y
U9:35 Good
N
Y
Go to Sheet 9
Video Section
Go to Sheet 10
RF Section

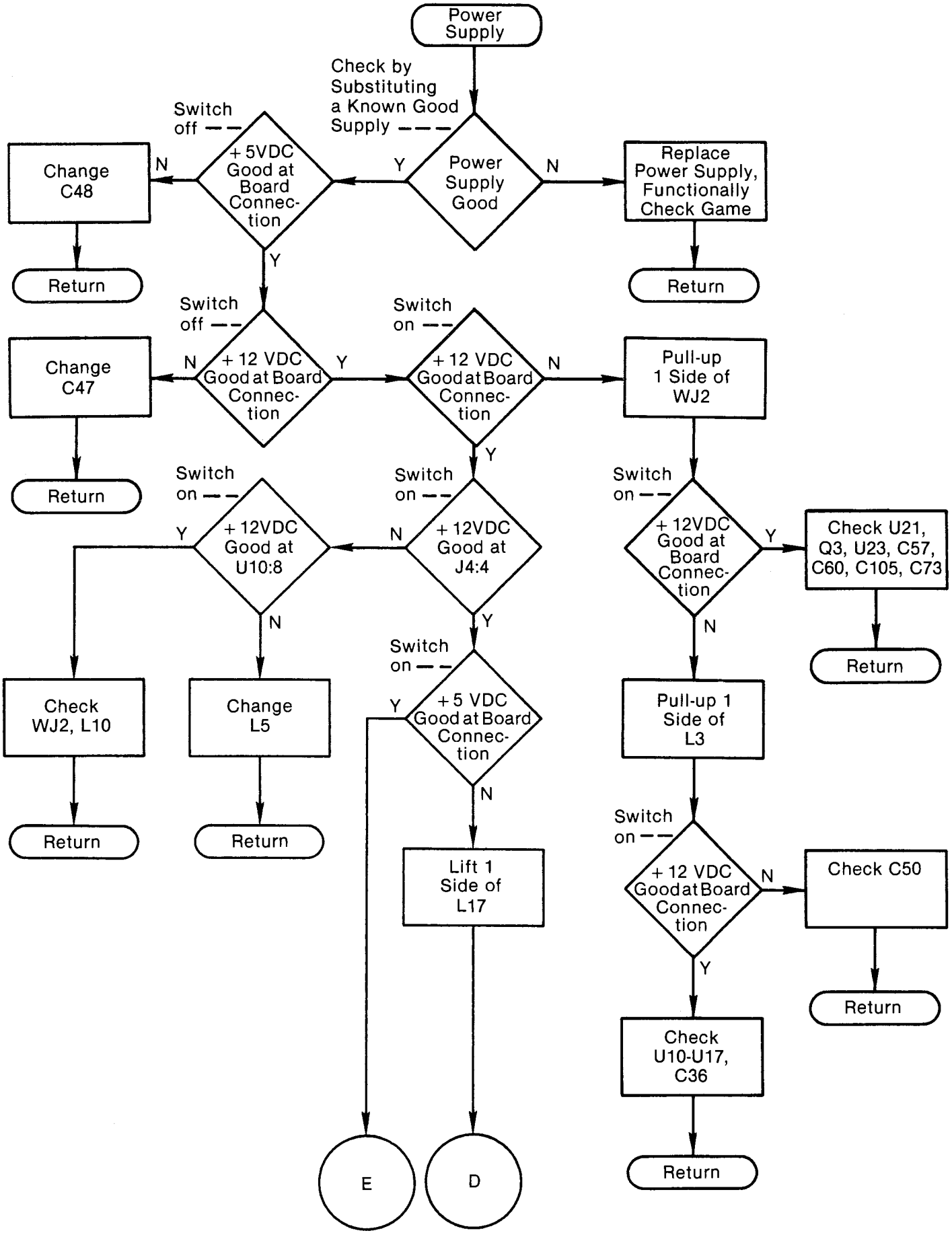

Scrambled Picture
U9:25-32 Good
N
Y
Check All Data and Address Lines to Make Sure They Are Active
Check U9 If Good Change 1 of U10-U17
Any One of U10-U17 Can Cause This Problem See Tech Tips for Aid.
Return
Check U1, U2
Return

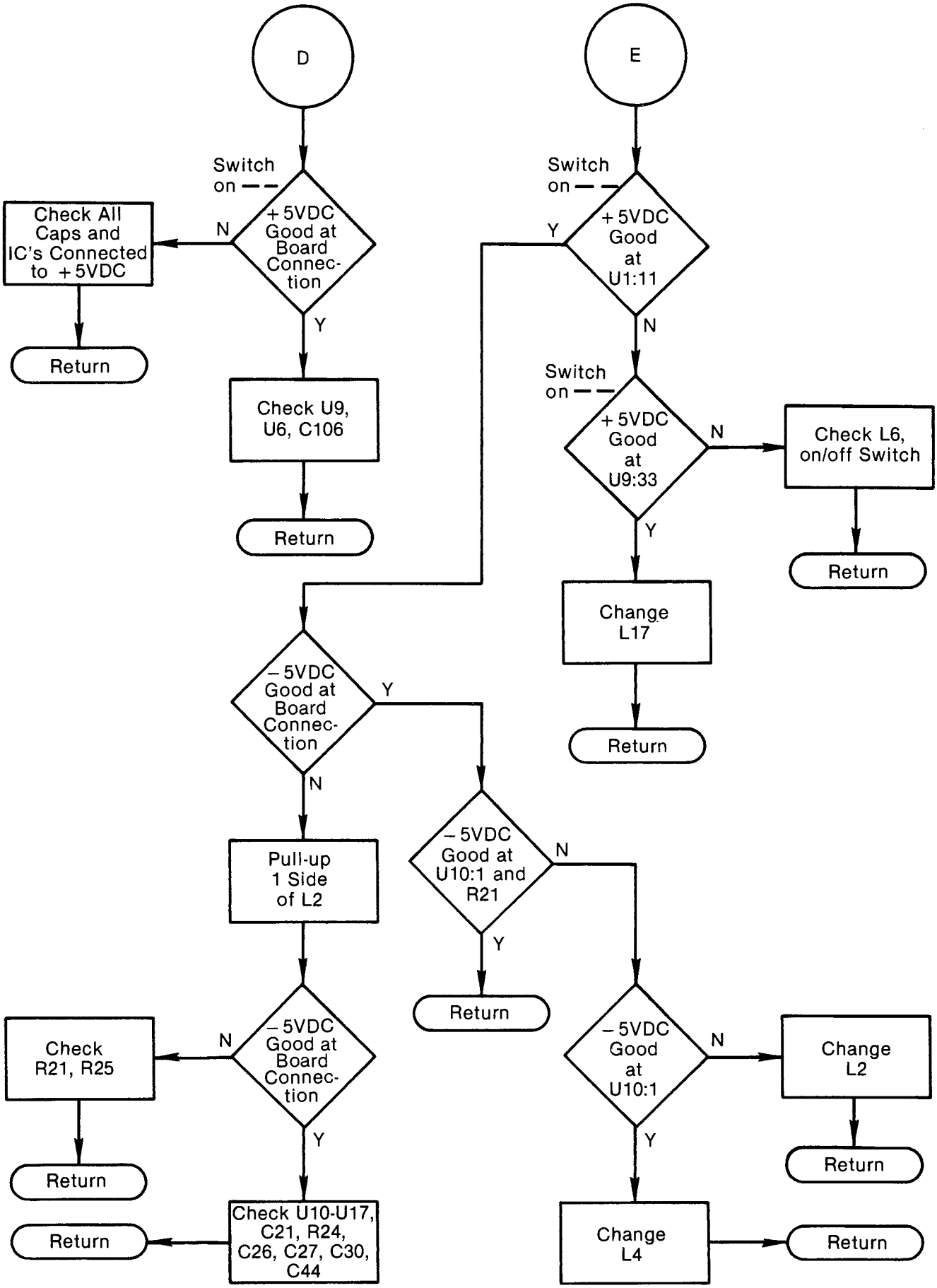

Bad Color
Check on Logic Board Side
J4:7 Good
J4:3 Good
U9:35 Good
Go to Sheet 9
Video Section
U9:30 Good
Go to Sheet 9
Video Section
C67(−) Good
Check L8, C63, R40
C66(−) Good
Check L7, C62, R40
Return
C67 (+) Good
Pull up (+) Side of C67
Check Land Lines and Solder Connections
Return
C66(+) Good
Pull up (+) Side of C67
C67(+) Good
Change C67
Return
Change RF Board
Return
Check Land Lines and Solder Connections
Return
C67(+) Good
Change C67
Return
B
C
Y
N

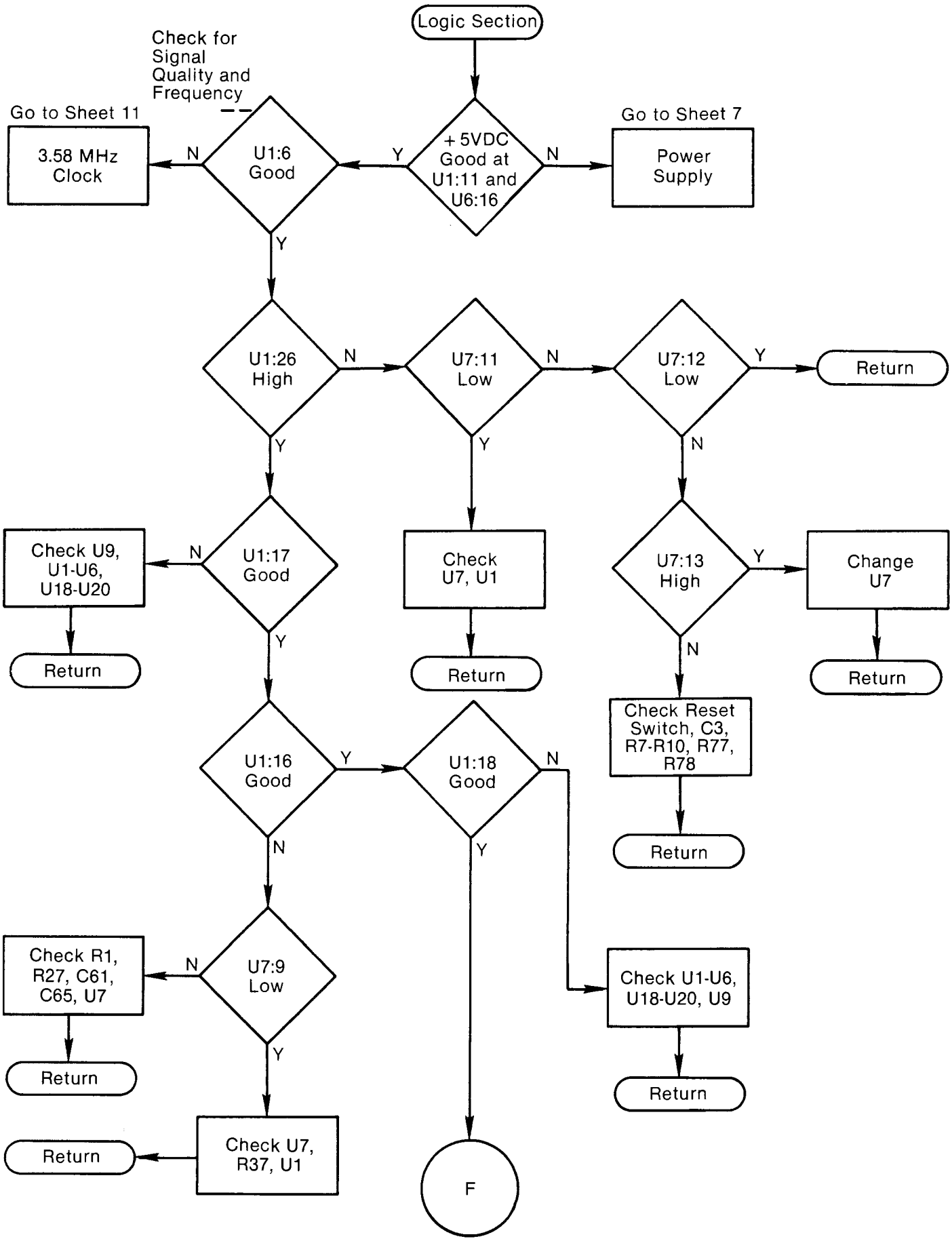

B
C
Logic Board Side
J4:8 Good
N
Go to Sheet 11
3.58 MHz Clock
Y
Change RF Board
Return
Logic Board Side
J4:6 Good
N
Q6(B) Good
Y
Check Q6, R55, R76, C68
Return
Y
N
Go to Sheet 9
Change RF Board
U9:36 Good
N
Video Section
Y
Return
Check L9, C64, R42, Q6
Return

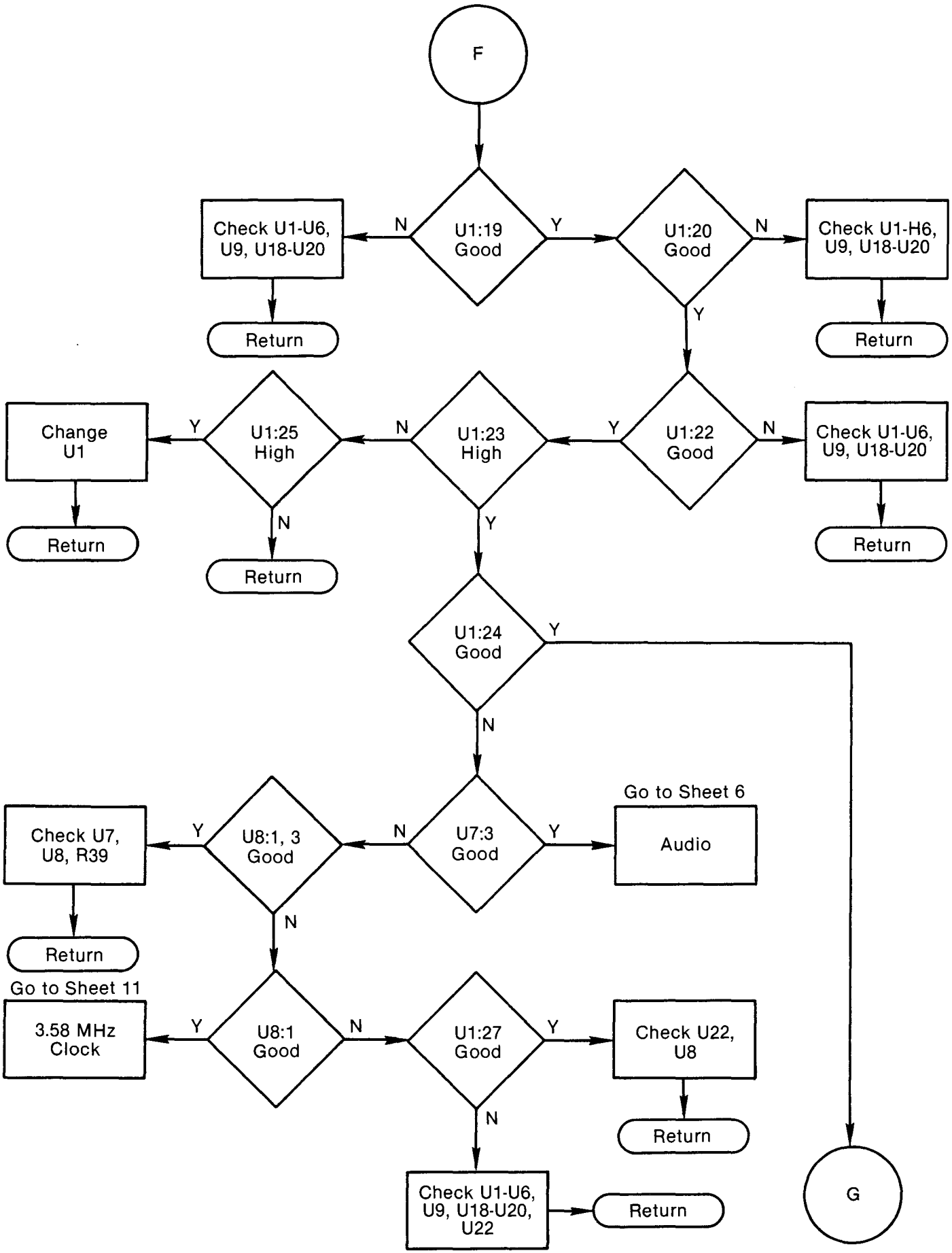

Miscellaneous Picture Problems
Check for Signal Quality, and Frequency
U9:40 Good
N
Check for Signal Quality and Frequency
U8:9 Good
N
Go to Sheet 11
3.58 MHz Clock
Y
Y
Check Vertical and Horizontal Sync Signals
U9:36 Good
Y
N
Go to Sheet 12
10.7 MHz Clock
Go to Sheet 10
RF Section
Change U9
Return

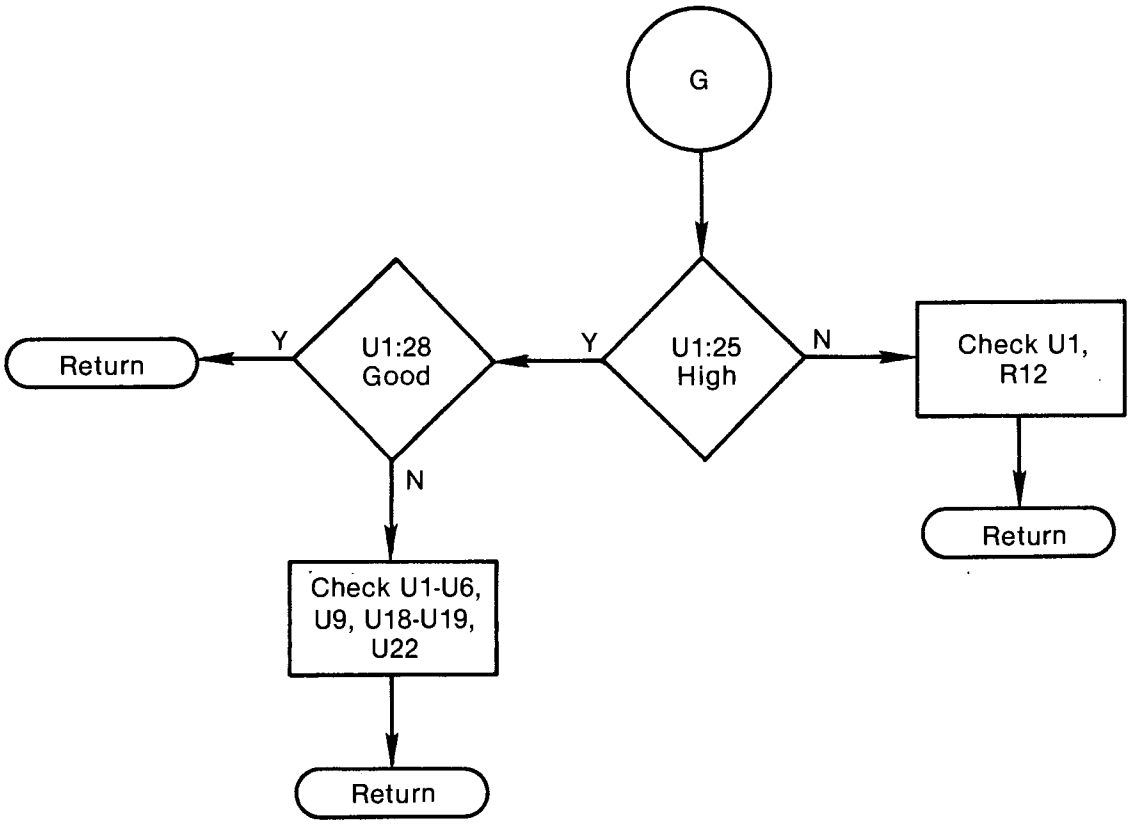

Audio
Audio
Y
Distorted Audio
Y
Check U20, RF Board
N
N
Return
Return
Go to Sheet 7
U20:7 Good
N
U20:16, 8 Good
N
Power Supply
Y
Y
Logic Board Side
Check R18, C100 and RF Board
N
J4:2 Good
U20:5, 6 Good
N
Check U6
Return
Y
Y
Return
Change RF Board
U20:14 Good
Y
Change U20
Return
N
Use Ohm Meter
Go to Sheet 11
R61, R64 Good
Y
3:58 MHz Clock
N
Change R61 or R64
Return

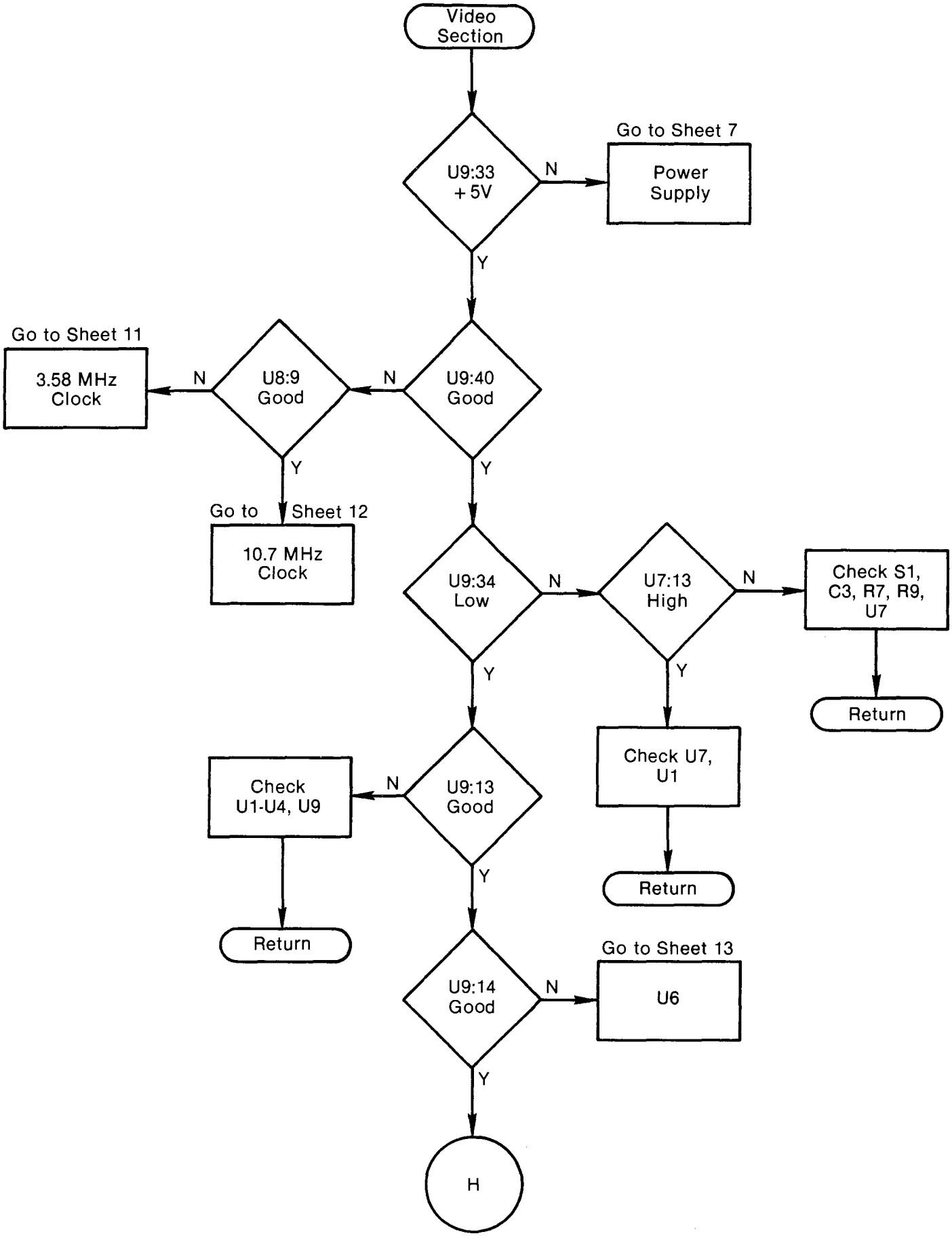

Power Supply
Check by Substituting a Known Good Supply
Power Supply Good
Y
N
Replace Power Supply, Functionally Check Game
Return
Switch off
+5VDC Good at Board Connection
N
Change C48
Return
Y
Switch off
+12 VDC Good at Board Connection
N
Change C47
Return
Y
Switch on
+12 VDC Good at Board Connection
N
Pull-up 1 Side of WJ2
Y
Switch on
+12VDC Good at U10:8
Y
Check WJ2, L10
Return
N
Change L5
Return
Switch on
+12VDC Good at J4:4
N
Y
Switch on
+5 VDC Good at Board Connection
Y
N
Lift 1 Side of L17
E
D
Switch on
+12VDC Good at Board Connection
Y
Check U21, Q3, U23, C57, C60, C105, C73
Return
N
Pull-up 1 Side of L3
Switch on
+12 VDC Good at Board Connection
N
Check C50
Return
Y
Check U10-U17, C36
Return

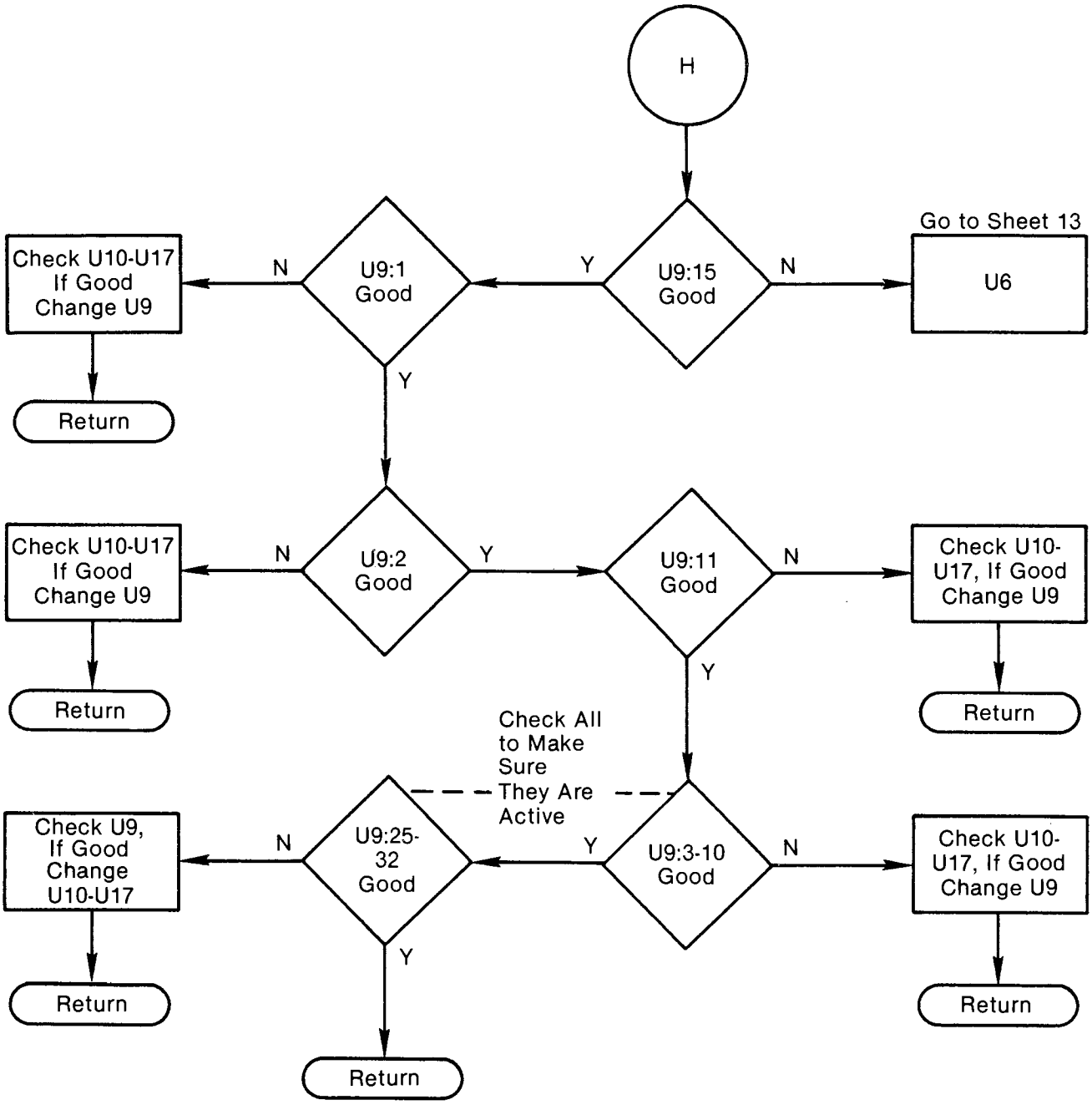

D
E
Switch on
+5VDC Good at Board Connection
N
Y
Check All Caps and IC's Connected to +5VDC
Return
Check U9, U6, C106
Return
Switch on
+5VDC Good at U1:11
Y
N
Switch on
+5VDC Good at U9:33
N
Check L6, on/off Switch
Return
Y
Change L17
Return
-5VDC Good at Board Connection
Y
N
Pull-up 1 Side of L2
-5VDC Good at U10:1 and R21
N
Y
Return
Check R21, R25
N
-5VDC Good at Board Connection
Y
Return
Return
Check U10-U17, C21, R24, C26, C27, C30, C44
-5VDC Good at U10:1
N
Y
Change L2
Return
Change L4
Return

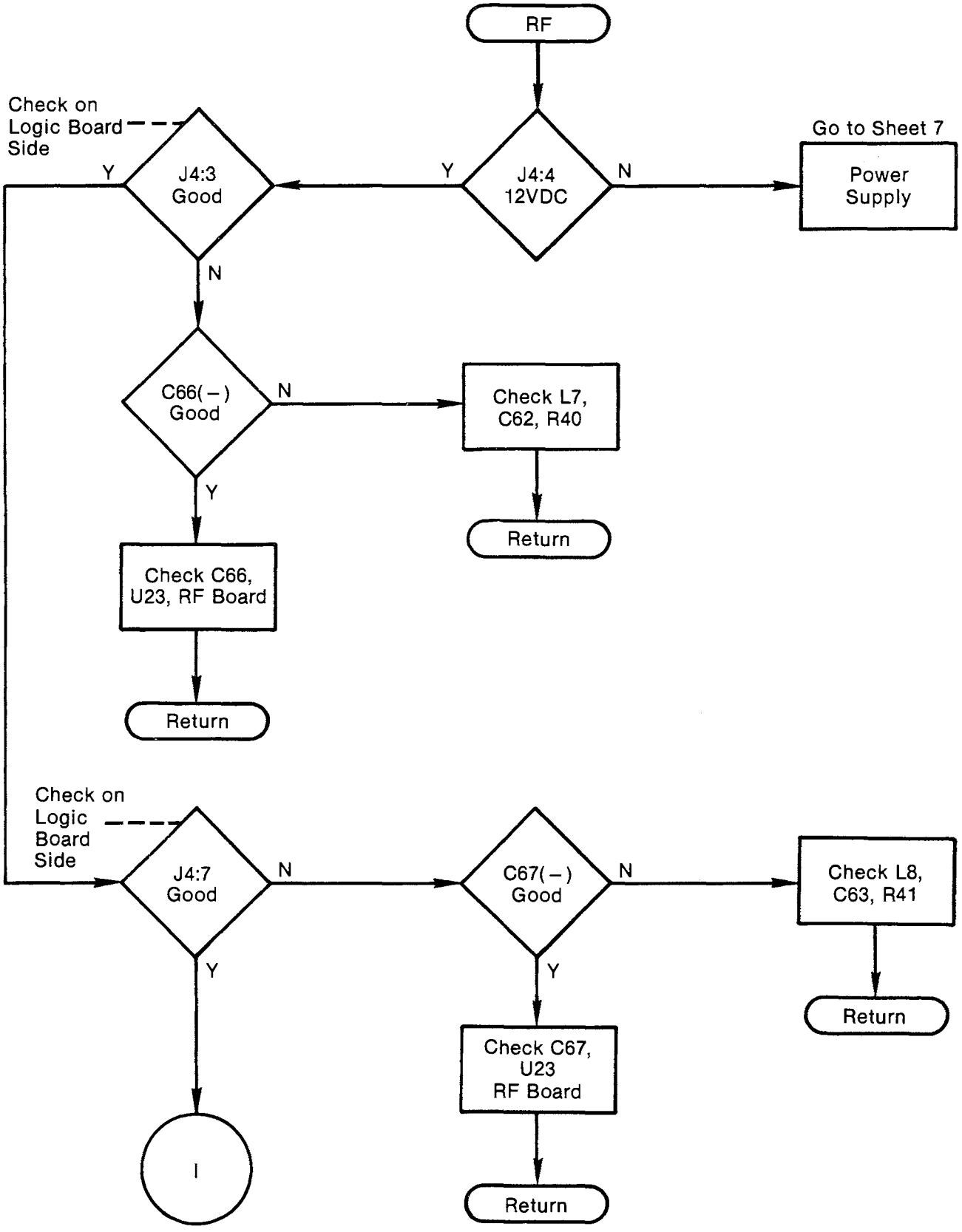

Logic Section
+5VDC Good at U1:11 and U6:16
N
Go to Sheet 7
Power Supply
Y
Check for Signal Quality and Frequency
U1:6 Good
N
Go to Sheet 11
3.58 MHz Clock
Y
U1:26 High
N
U7:11 Low
N
U7:12 Low
Y
Return
Y
Y
N
Check U9, U1-U6, U18-U20
N
U1:17 Good
Check U7, U1
U7:13 High
Y
Change U7
Return
Y
Return
Return
N
Check Reset Switch, C3, R7-R10, R77, R78
U1:16 Good
Y
U1:18 Good
N
Return
N
Y
Check R1, R27, C61, C65, U7
N
U7:9 Low
Check U1-U6, U18-U20, U9
Return
Y
Return
Return
Check U7, R37, U1
F

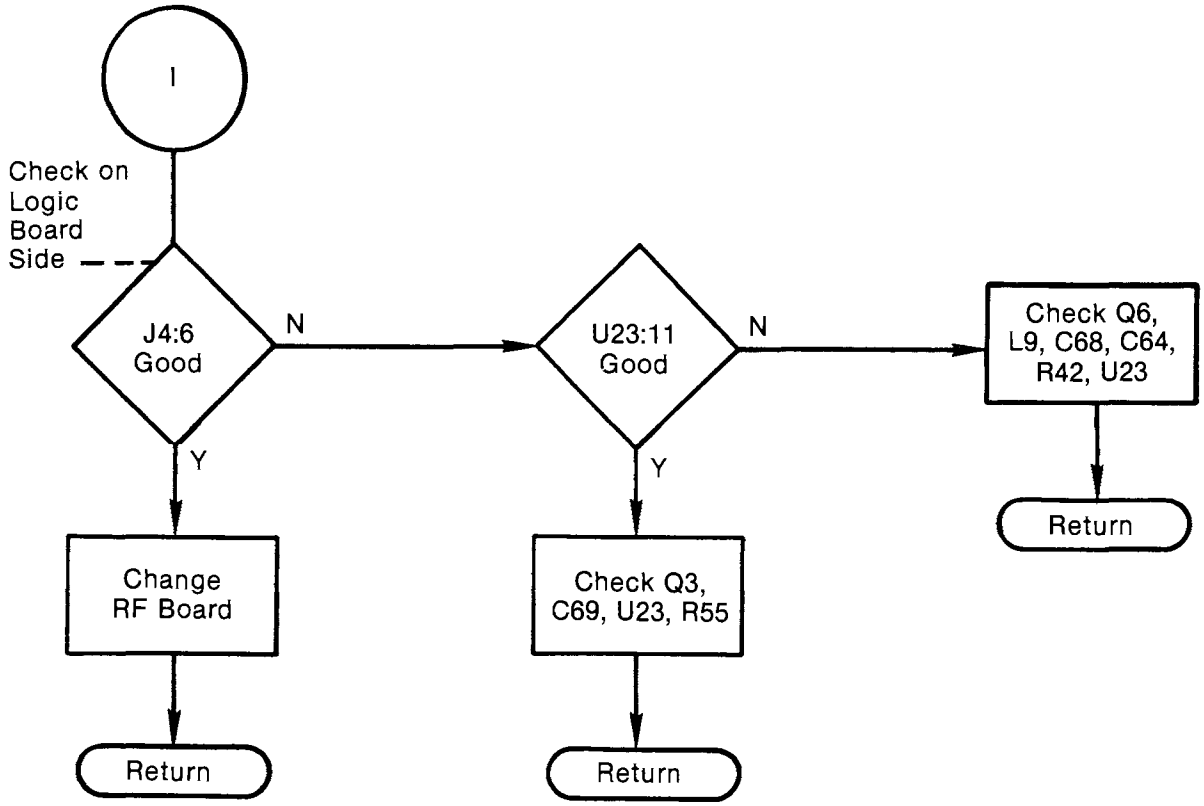

F
U1:19 Good
N
Y
Check U1-U6, U9, U18-U20
Return
U1:20 Good
N
Y
Check U1-H6, U9, U18-U20
Return
U1:22 Good
Y
N
Check U1-U6, U9, U18-U20
Return
U1:23 High
Y
N
U1:25 High
Y
N
Change U1
Return
Return
U1:24 Good
Y
N
G
U7:3 Good
N
Y
Go to Sheet 6
Audio
U8:1, 3 Good
Y
N
Check U7, U8, R39
Return
U8:1 Good
Y
N
Go to Sheet 11
3.58 MHz Clock
U1:27 Good
Y
N
Check U22, U8
Return
Check U1-U6, U9, U18-U20, U22
Return

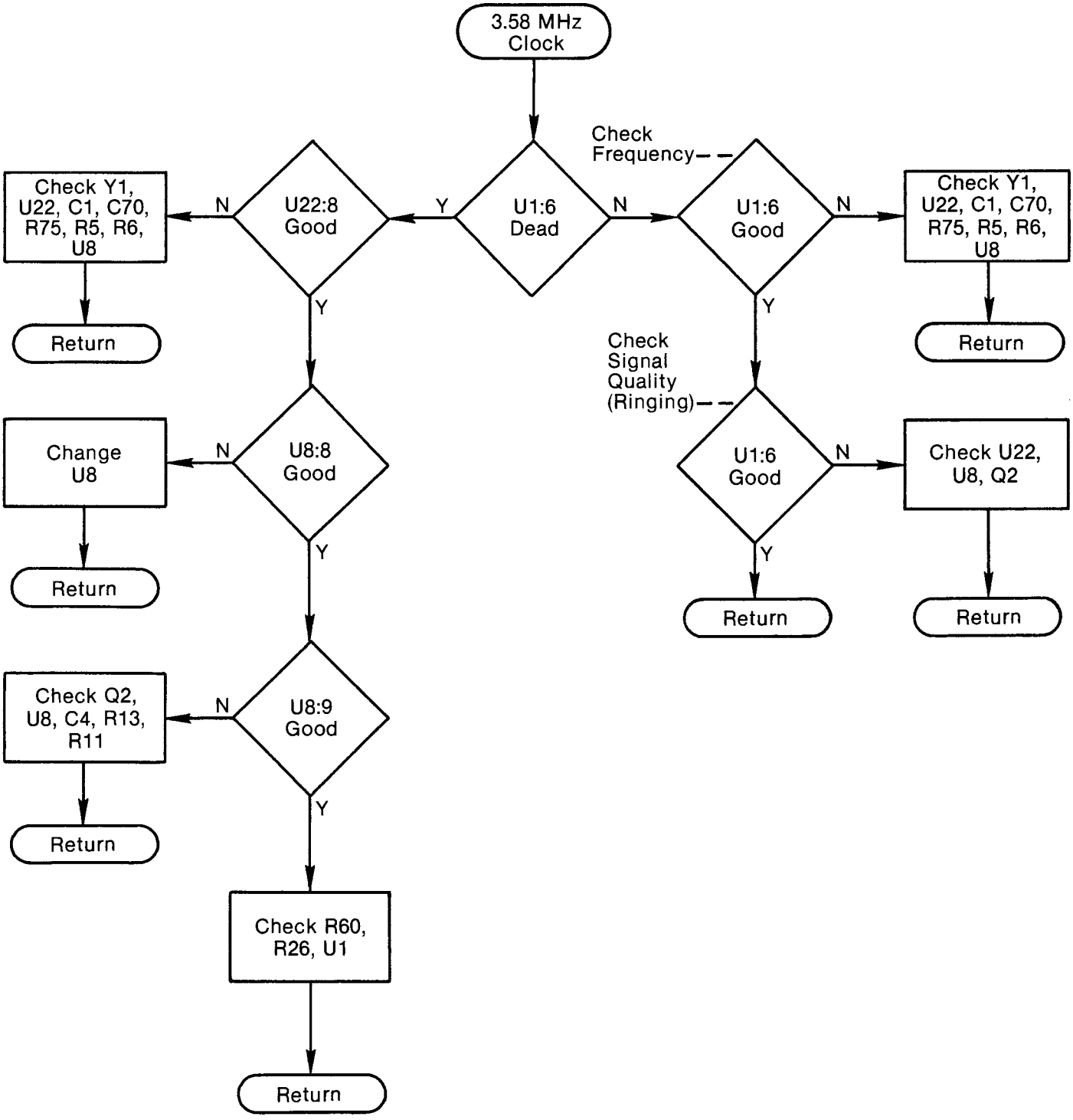

G
U1:25
High
Y
U1:28
Good
Y
Return
N
Check U1,
R12
Return
N
Check U1-U6,
U9, U18-U19,
U22
Return

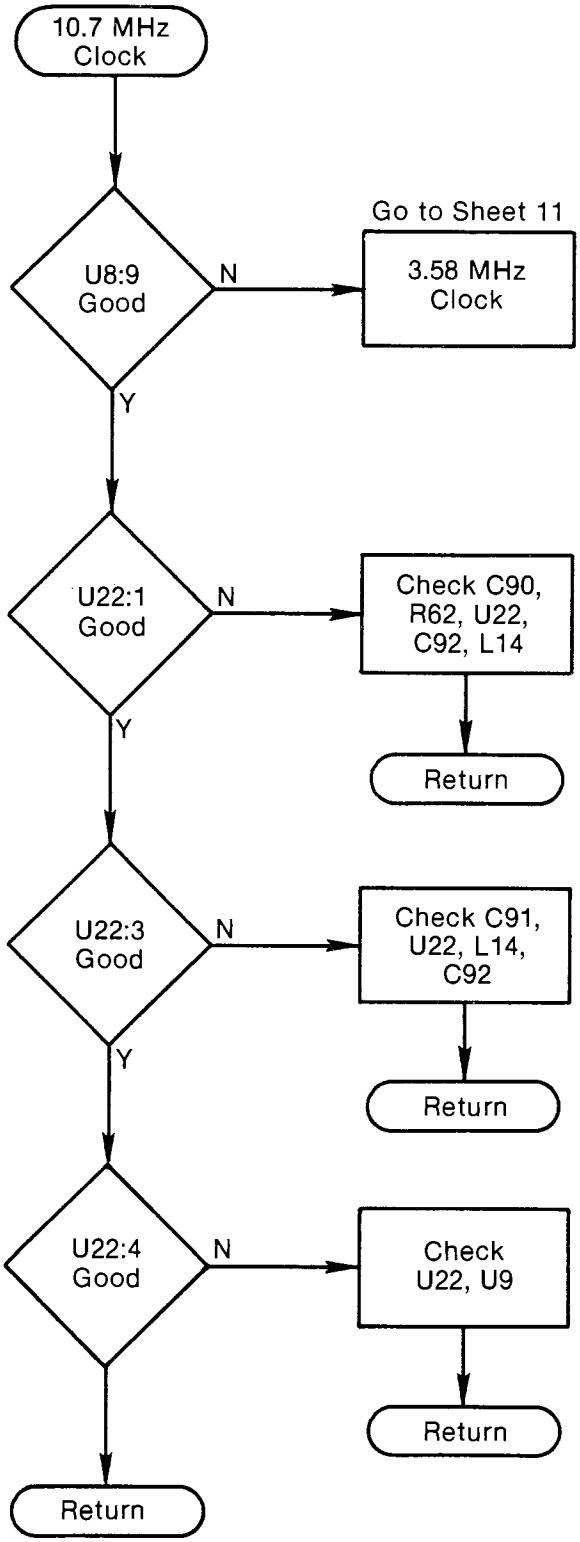

Video Section
U9:33 +5V
N
Go to Sheet 7
Power Supply
Y
Go to Sheet 11
3.58 MHz Clock
N
U8:9 Good
N
U9:40 Good
Y
Y
Go to Sheet 12
10.7 MHz Clock
U9:34 Low
N
U7:13 High
N
Check S1, C3, R7, R9, U7
Return
Y
Y
Check U7, U1
Return
Check U1-U4, U9
N
U9:13 Good
Return
Y
U9:14 Good
N
Go to Sheet 13
U6
Y
H

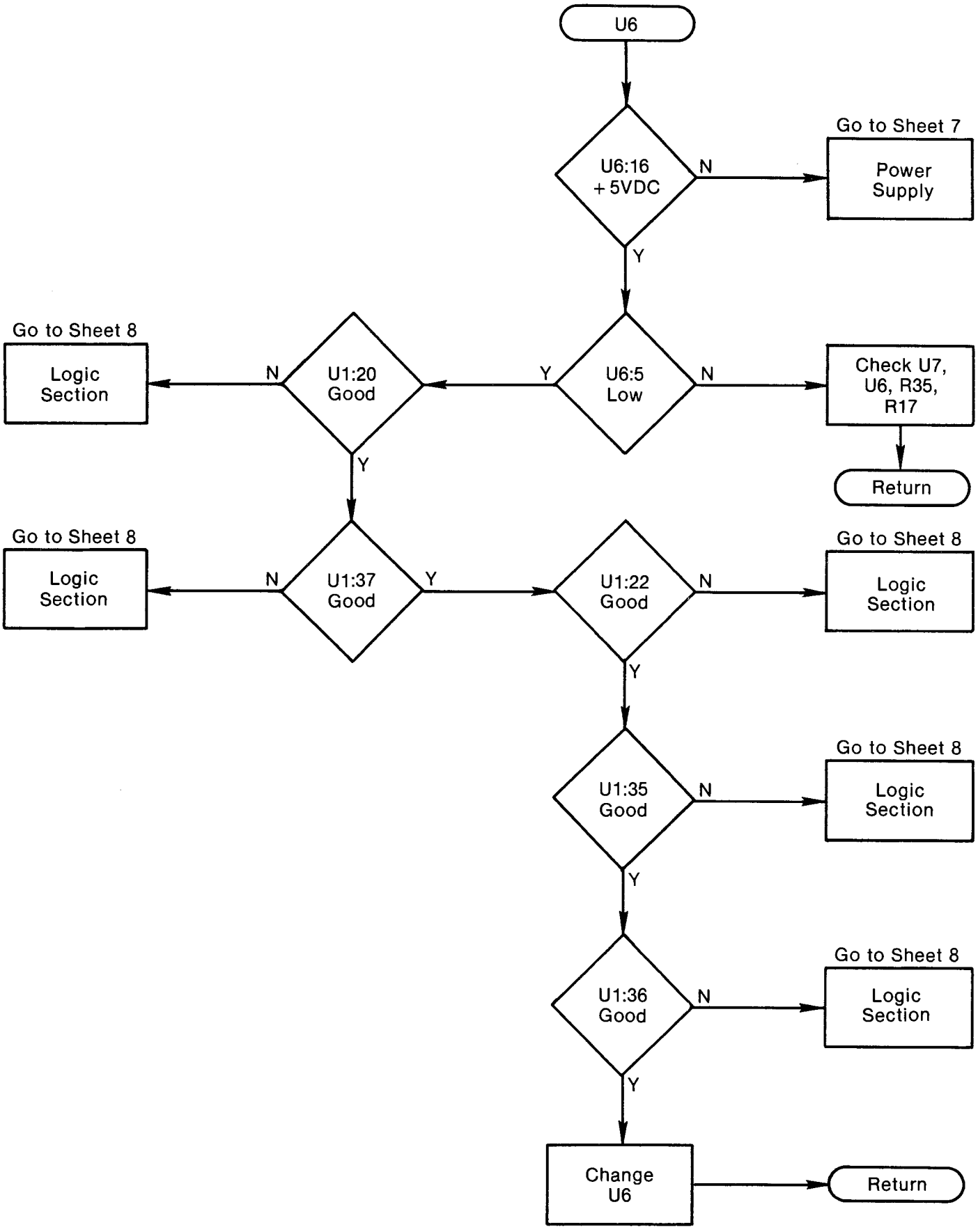

H
U9:15 Good
Y
N
Go to Sheet 13
U6
U9:1 Good
N
Check U10-U17 If Good Change U9
Return
Y
U9:2 Good
N
Check U10-U17 If Good Change U9
Return
Y
U9:11 Good
N
Check U10-U17, If Good Change U9
Return
Y
Check All to Make Sure They Are Active
U9:3-10 Good
N
Check U10-U17, If Good Change U9
Return
Y
U9:25-32 Good
N
Check U9, If Good Change U10-U17
Return
Y
Return

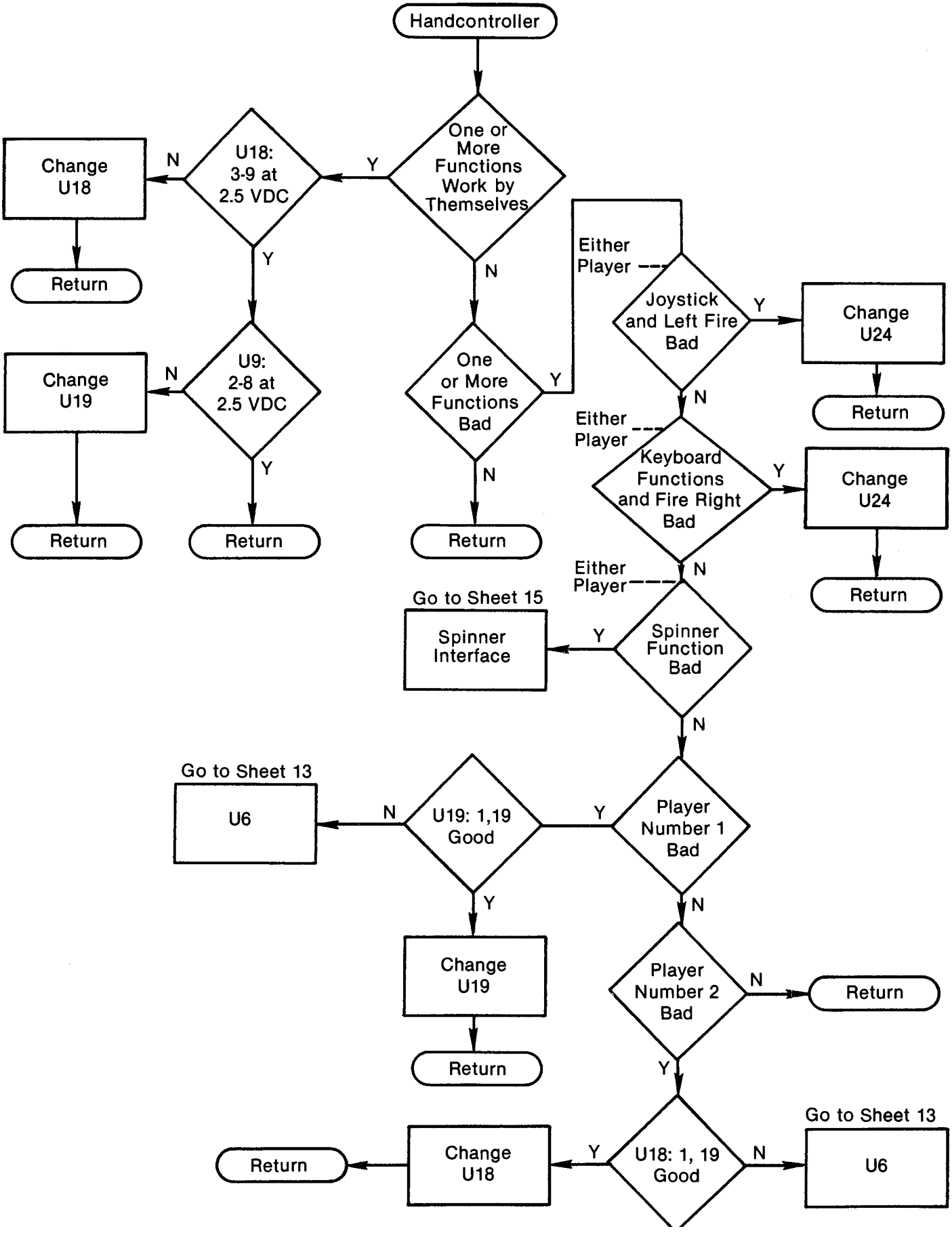

RF
Check on Logic Board Side
J4:3 Good
Y
J4:4 12VDC
Y
N
Go to Sheet 7
Power Supply
N
C66(–) Good
N
Check L7, C62, R40
Return
Y
Check C66, U23, RF Board
Return
Check on Logic Board Side
J4:7 Good
N
C67(–) Good
N
Check L8, C63, R41
Return
Y
Y
Check C67, U23 RF Board
Return
I

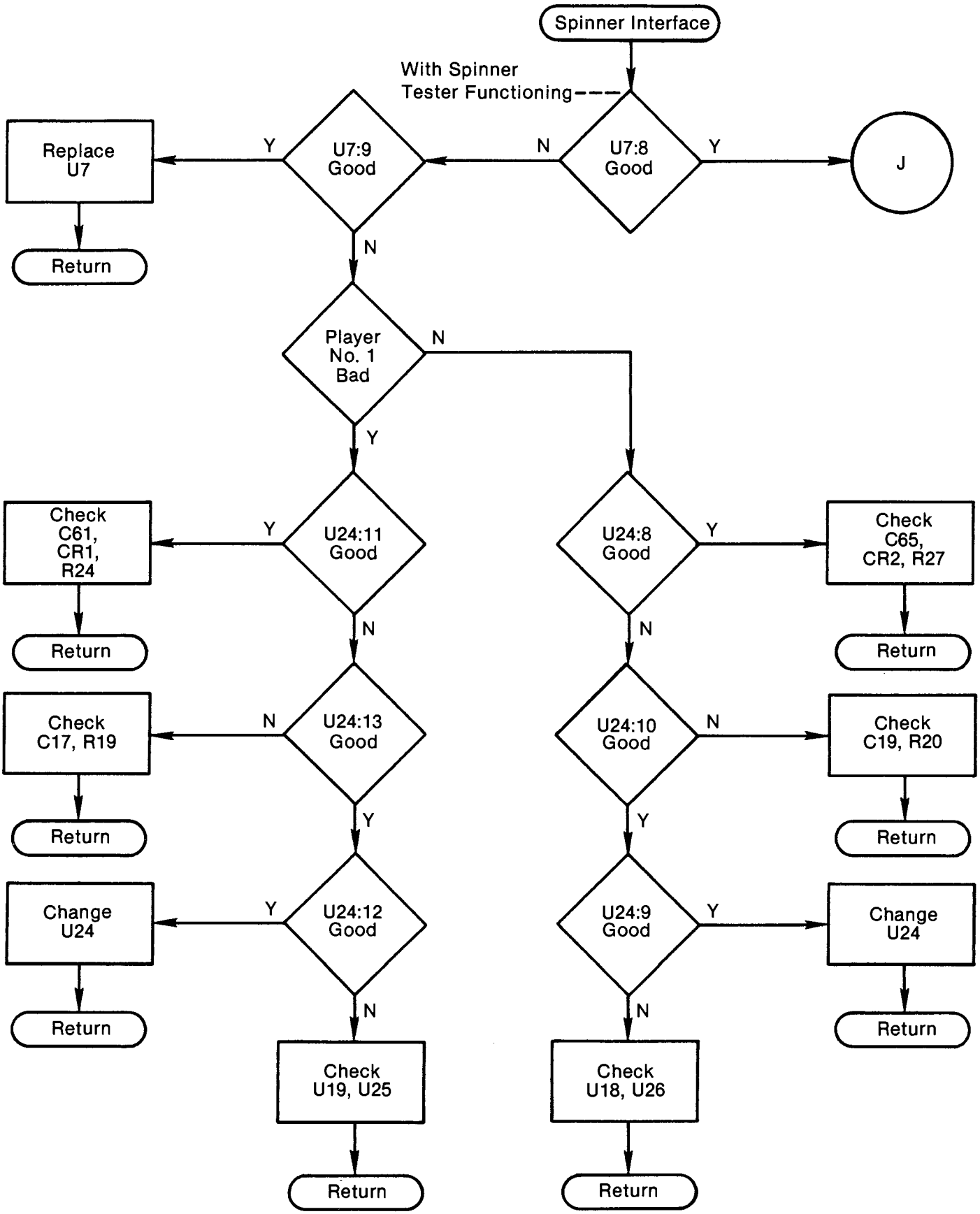

I
Check on Logic Board Side
J4:6 Good
N
U23:11 Good
N
Check Q6, L9, C68, C64, R42, U23
Y
Y
Return
Change RF Board
Check Q3, C69, U23, R55
Return
Return

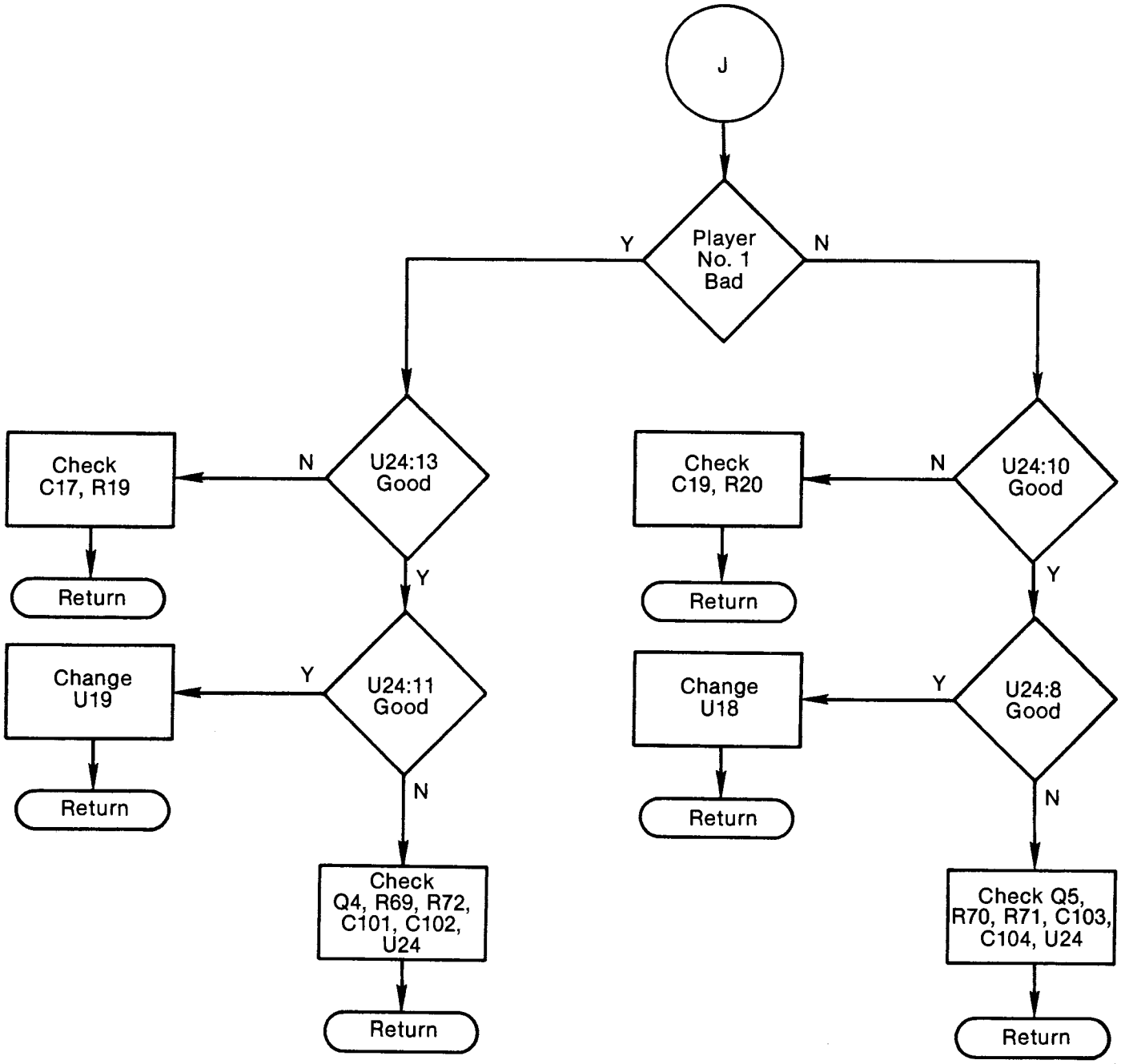

3.58 MHz Clock
U1:6 Dead
Y
N
U22:8 Good
N
Check Y1, U22, C1, C70, R75, R5, R6, U8
Return
Y
U8:8 Good
N
Change U8
Return
Y
U8:9 Good
N
Check Q2, U8, C4, R13, R11
Return
Y
Check R60, R26, U1
Return
Check Frequency
U1:6 Good
N
Check Y1, U22, C1, C70, R75, R5, R6, U8
Return
Y
Check Signal Quality (Ringing)
U1:6 Good
N
Check U22, U8, Q2
Return
Y
Return


10.7 MHz Clock
U8:9 Good
N
Go to Sheet 11
3.58 MHz Clock
Y
U22:1 Good
N
Check C90, R62, U22, C92, L14
Return
Y
U22:3 Good
N
Check C91, U22, L14, C92
Return
Y
U22:4 Good
N
Check U22, U9
Return
Return


U6
U6:16
+5VDC
N
Go to Sheet 7
Power
Supply
Y
U6:5
Low
Y
N
Check U7,
U6, R35,
R17
Return
U1:20
Good
N
Go to Sheet 8
Logic
Section
Y
U1:37
Good
N
Go to Sheet 8
Logic
Section
Y
U1:22
Good
N
Go to Sheet 8
Logic
Section
Y
U1:35
Good
N
Go to Sheet 8
Logic
Section
Y
U1:36
Good
N
Go to Sheet 8
Logic
Section
Y
Change
U6
Return

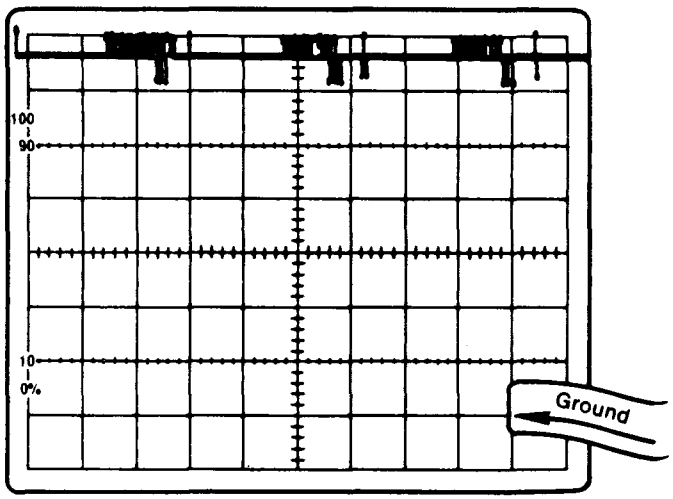

Handcontroller
One or More Functions Work by Themselves
Y
U18: 3-9 at 2.5 VDC
N
Change U18
Return
Y
U9: 2-8 at 2.5 VDC
N
Change U19
Return
Y
Return
N
One or More Functions Bad
Y
N
Return
Either Player
Joystick and Left Fire Bad
Y
Change U24
Return
N
Either Player
Keyboard Functions and Fire Right Bad
Y
Change U24
Return
N
Either Player
Spinner Function Bad
Y
Go to Sheet 15
Spinner Interface
N
Player Number 1 Bad
Y
U19: 1,19 Good
N
Go to Sheet 13
U6
Y
Change U19
Return
N
Player Number 2 Bad
N
Return
Y
U18: 1, 19 Good
Y
Change U18
Return
N
Go to Sheet 13
U6


Spinner Interface
With Spinner Tester Functioning
U7:8 Good
Y
J
N
U7:9 Good
Y
Replace U7
Return
N
Player No. 1 Bad
N
Y
U24:11 Good
Y
Check C61, CR1, R24
Return
N
U24:13 Good
N
Check C17, R19
Return
Y
U24:12 Good
Y
Change U24
Return
N
Check U19, U25
Return
U24:8 Good
Y
Check C65, CR2, R27
Return
N
U24:10 Good
N
Check C19, R20
Return
Y
U24:9 Good
Y
Change U24
Return
N
Check U18, U26
Return


J
Player No. 1 Bad
Y
N
U24:13 Good
N
Check C17, R19
Return
Y
U24:11 Good
Y
Change U19
Return
N
Check Q4, R69, R72, C101, C102, U24
Return
U24:10 Good
N
Check C19, R20
Return
Y
U24:8 Good
Y
Change U18
Return
N
Check Q5, R70, R71, C103, C104, U24
Return

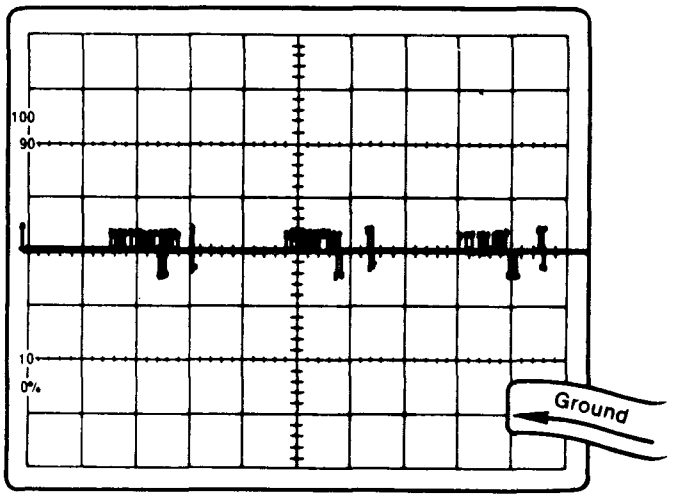
Pictures of Signals

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.



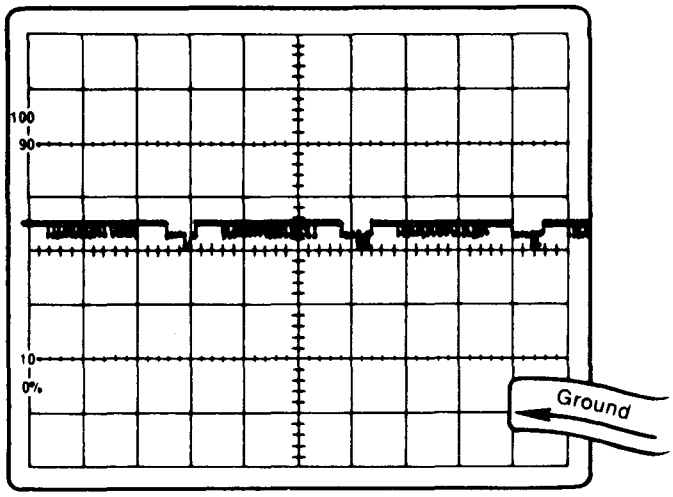
C66 (+) R-Y VIDEO
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



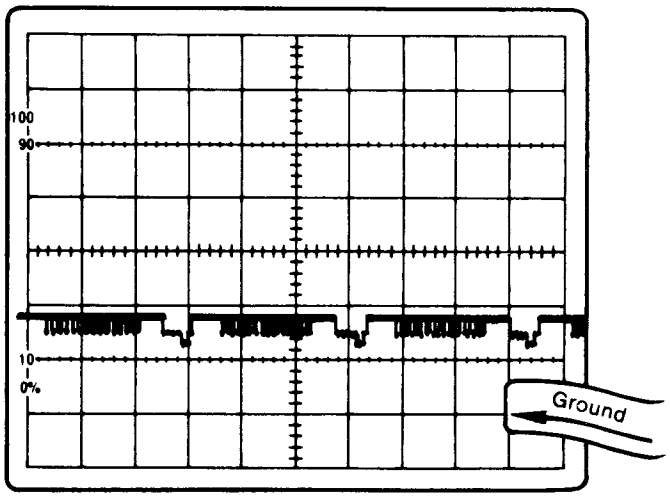
C66 (−) R-Y VIDEO
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



C67 (+) B-Y VIDEO
Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

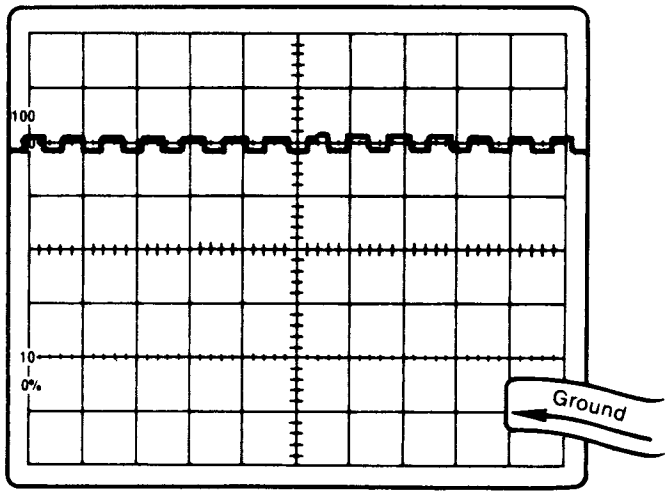
Signal Shown Is During Blue Menu Screen of Game Cartridge.



C67 (–) B-Y VIDEO

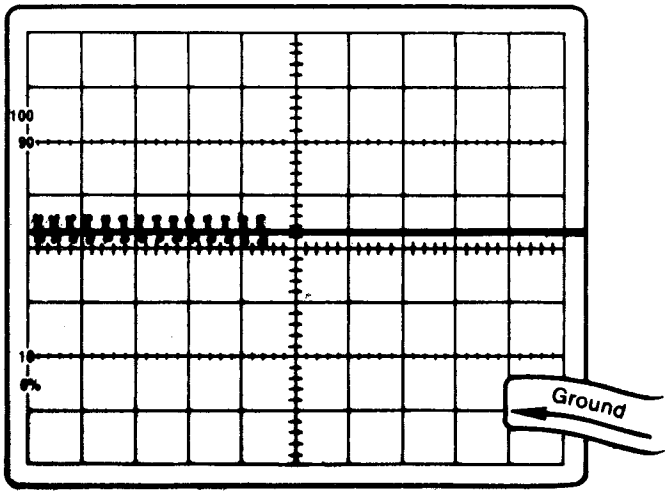
Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



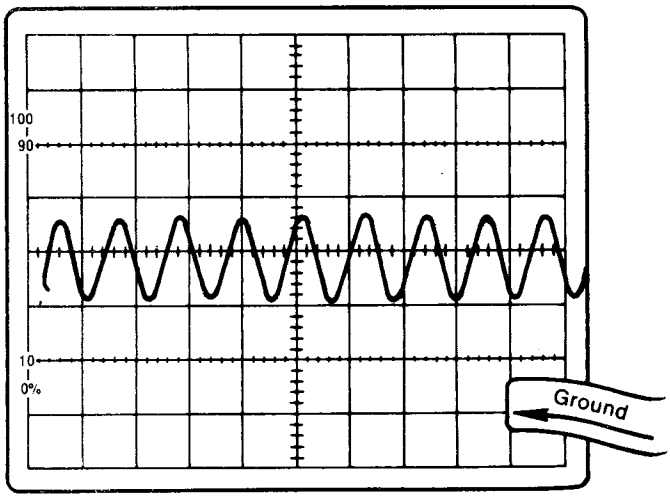
J4:2 — AUDIO

Vertical Sensitivity 2V/Div
Horizontal Sensitivity 5mSec/Div



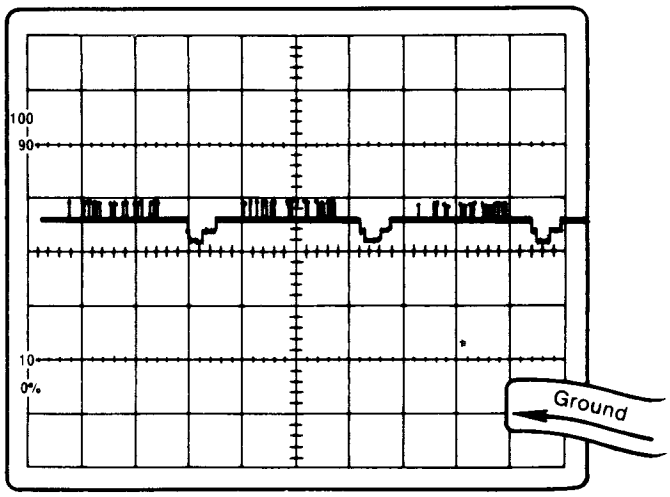
J4:3 — R-Y VIDEO

Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.5mSec/Div



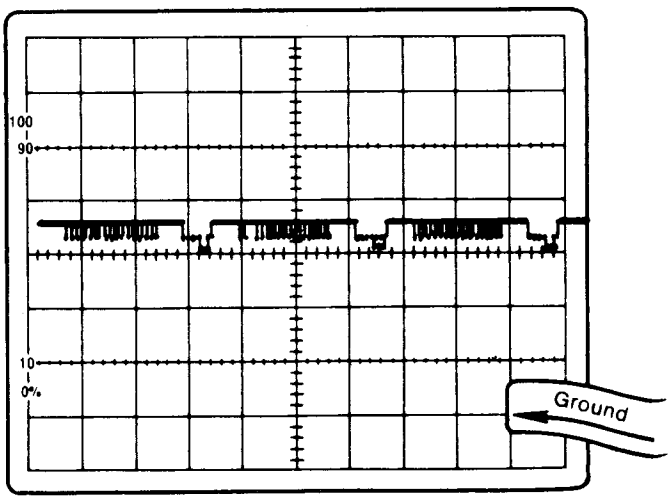
J4:4
Vertical Sensitivity 5mV/Div
Horizontal Sensitivity 2μSec/Div
AC Coupled.

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



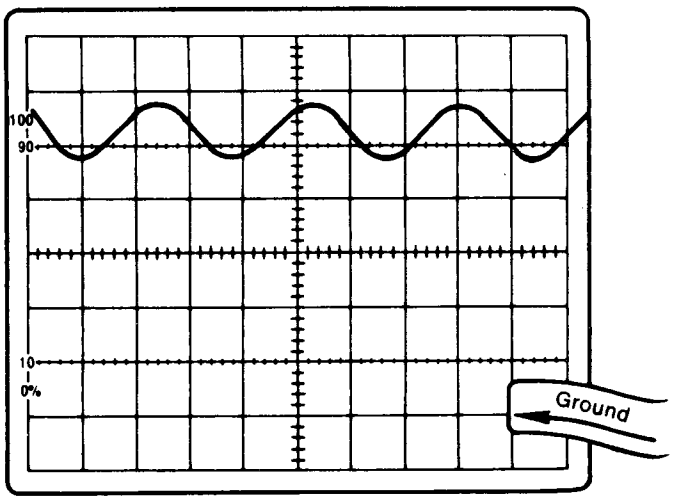
J4:6 — COMPOSITE VIDEO
Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



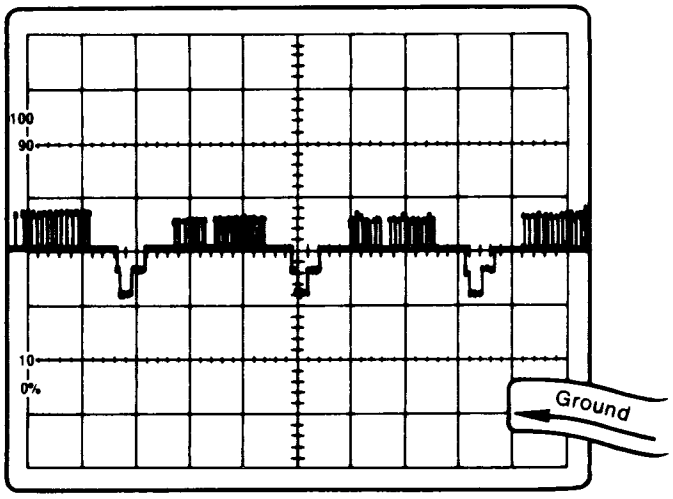
J4:7 — B-Y VIDEO
Vertical Sensitivity 2V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



J4:8 — RF CLOCK

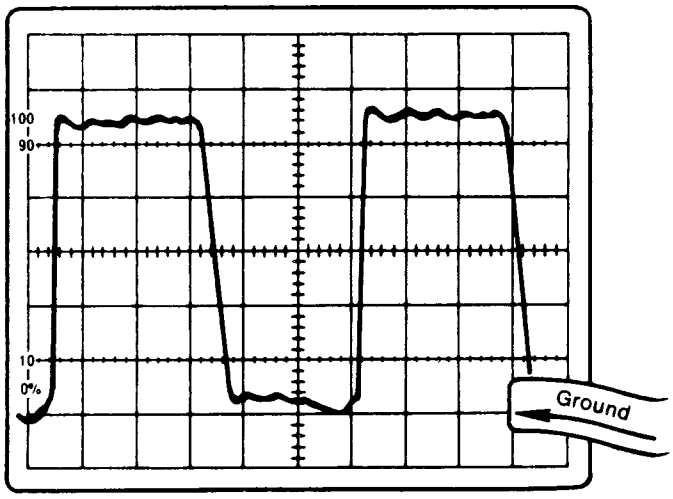
Vertical Sensitivity 2V/Div
Horizontal Sensitivity 1μSec/Div
Frequency 3.579545 MHz ± 100Hz



Q6 BASE Y VIDEO

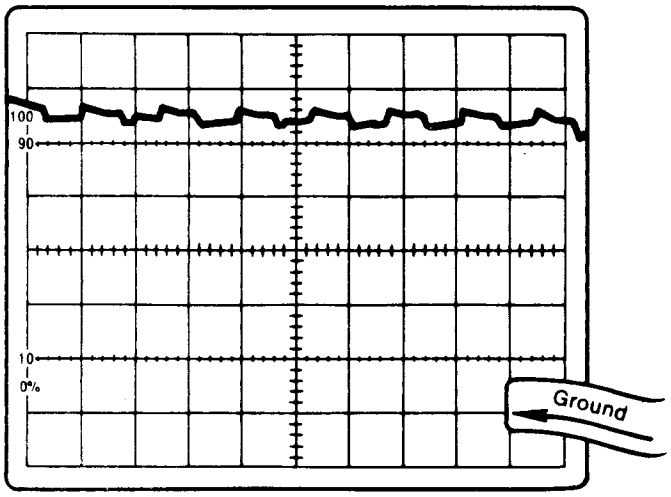
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.2mSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



U1:6 — MAIN CLOCK

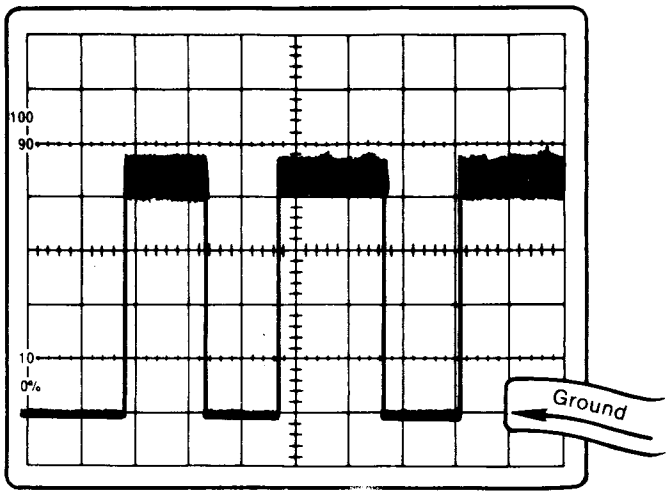
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 50nSec/Div
Frequency — 3.579545 MHz ± 100 Hz



U1:16 — INTERRUPT

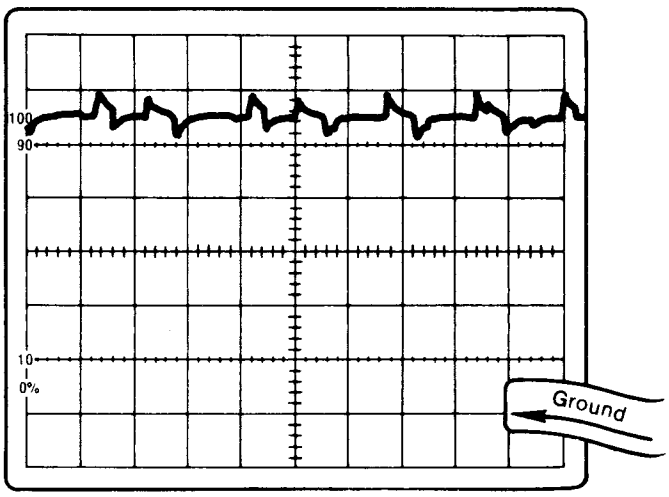
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.2μSec/Div

Signal Should Basically Be a 5VDC Level



U1:17 — NMI

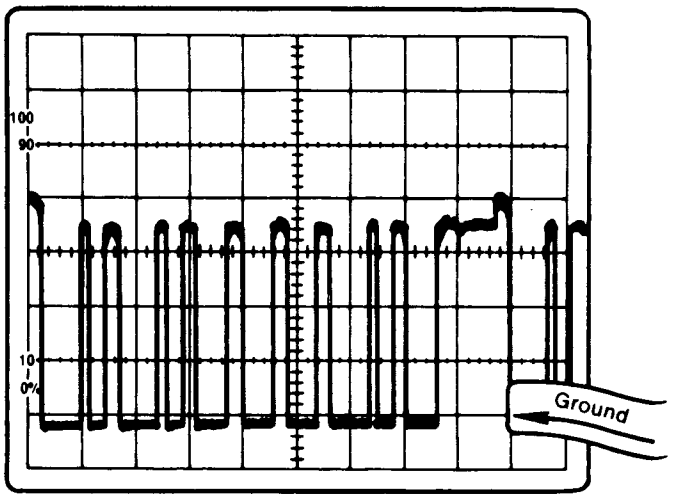
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5mSec/Div



U1:18 — HALT

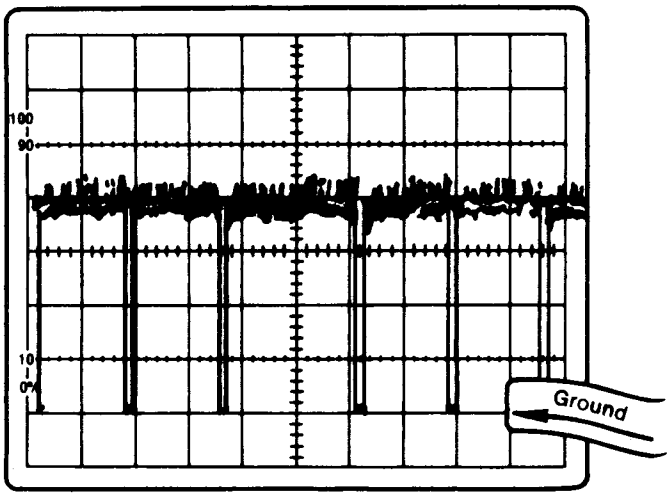
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5mSec/Div

Signal Should Basically Be a 5VDC Level

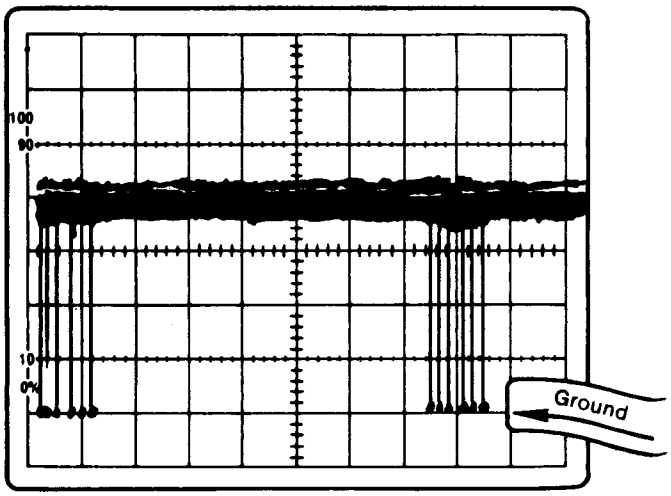


U1:19 M REQ
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.1μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.

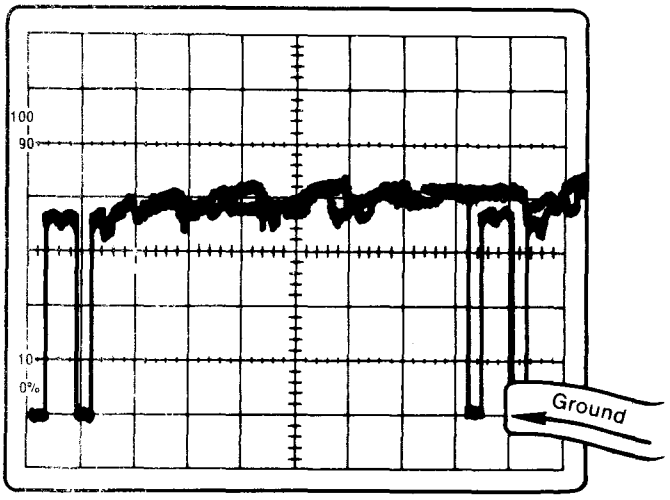


U1:20—IORQ
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 5μSec/Div



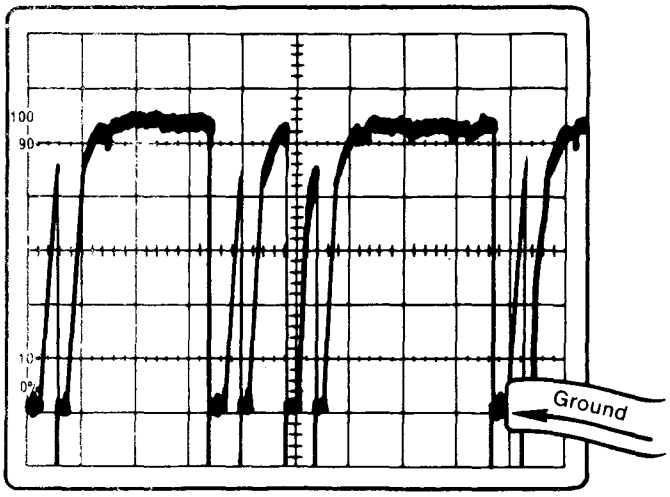
U1:20—IORQ
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 50μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



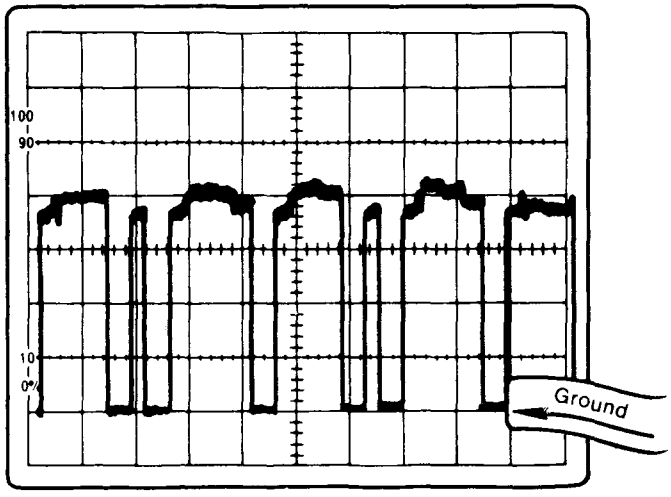
U1:22 — WR
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 1μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



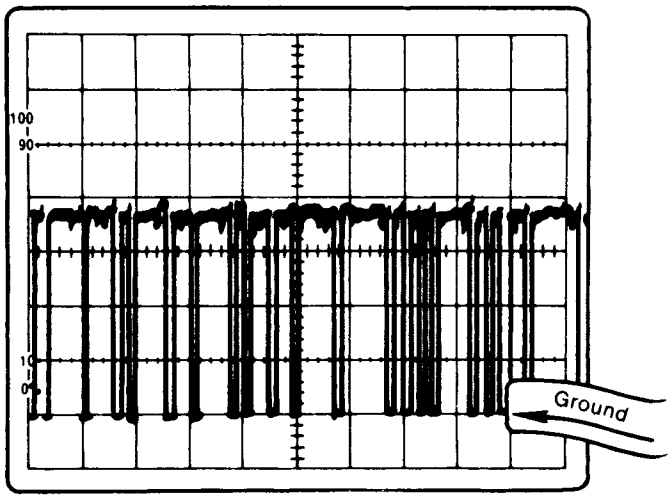
U1:24 — WAIT
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 1μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



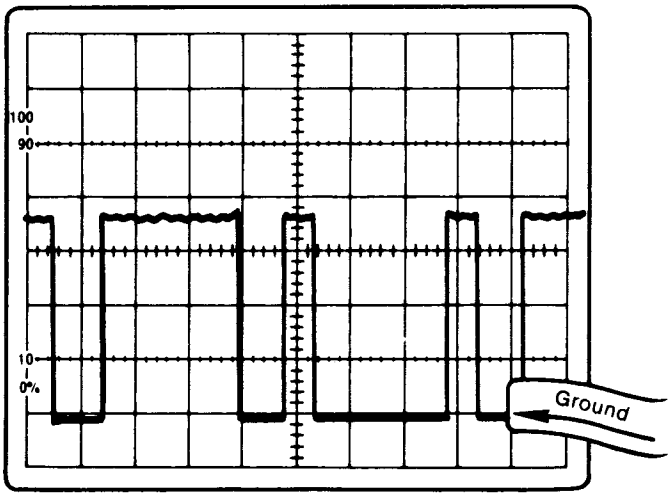
U1:27 — M1
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 2μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



U1:28 — RSFH

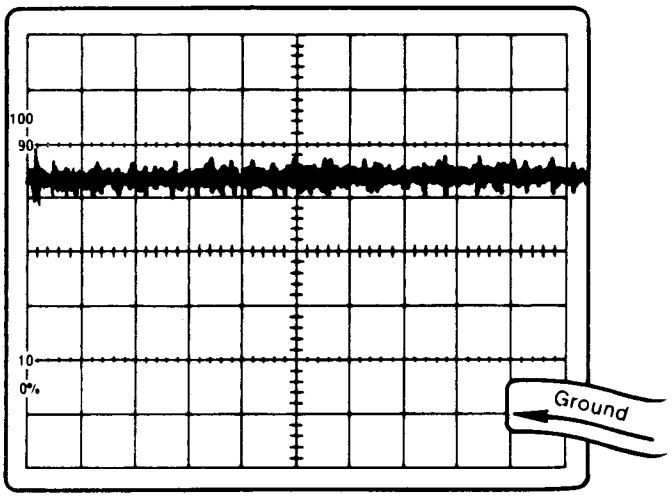
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 5μSec/Div



U1:35 — ADDRESS LINE A5

Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 1μSec/Div

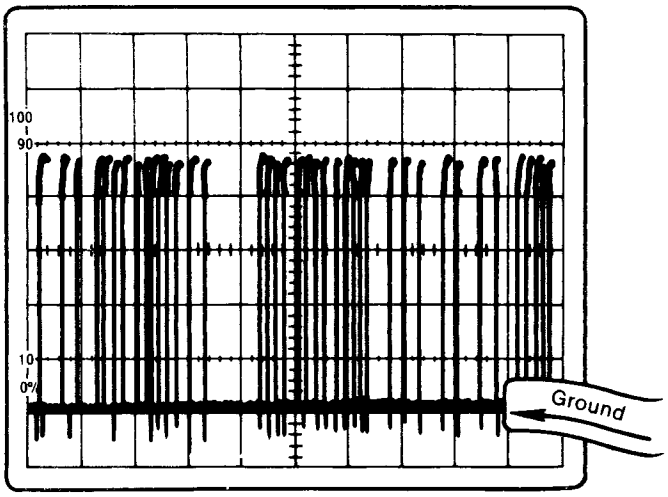
All Address Lines Should Have a Similar Signal (Pulses), If No Pulses Are Seen the Address Line Is Dead. The Signal Shown Is During Blue Menu Screen of Game Cartridge.



U6:5 GATE 2B

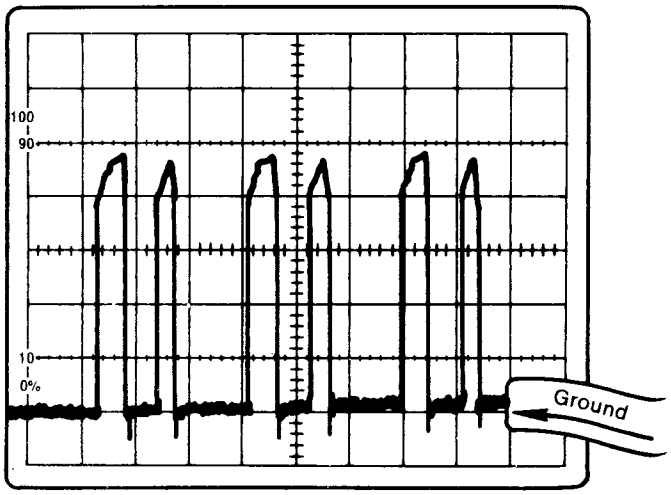
Vertical Sensitivity — 50mV/Div
Horizontal Sensitivity — 0.2μSec/Div

Signal Should Be a DC Level Less Than 250mV.



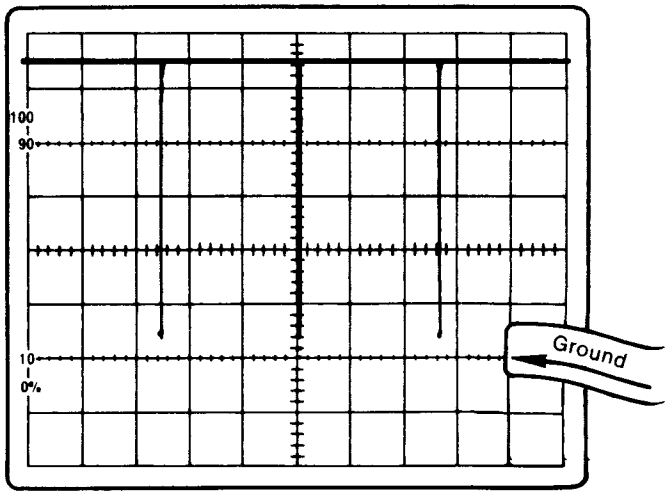
U7:3
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 2μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



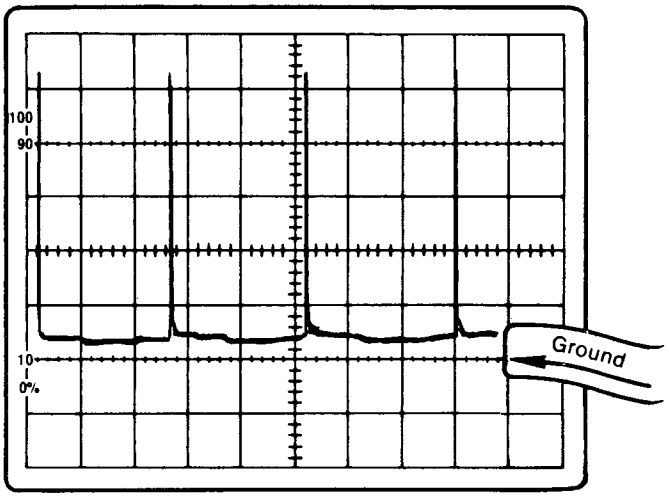
U7:3
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5μSec/Div

Signal Shown Is During Blue Menu Screen of Game Cartridge.



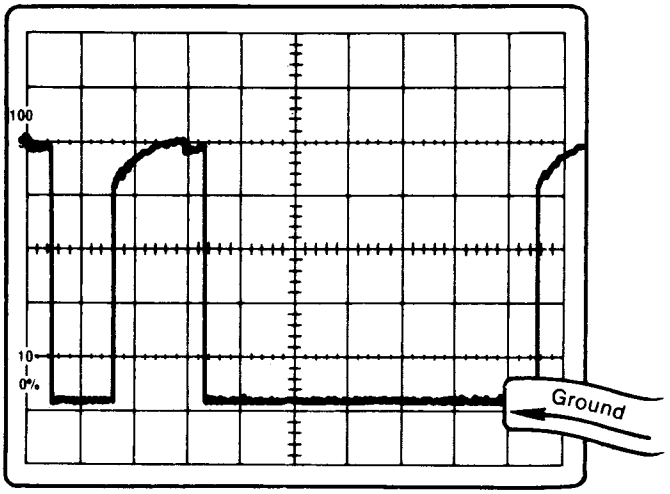
U7:8 INTERRUPT
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation.

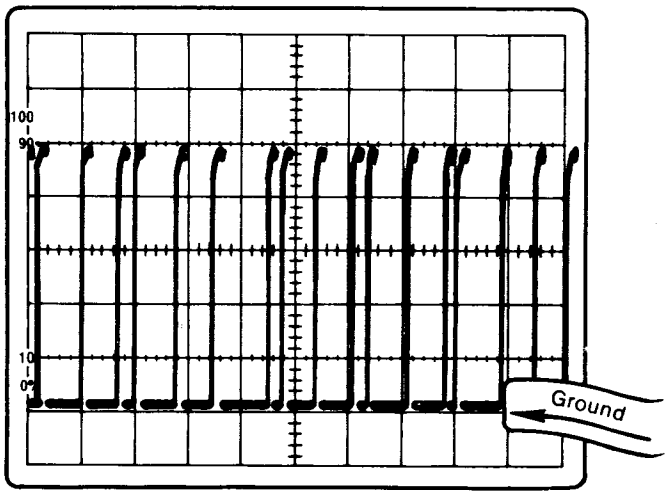


U7:9
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

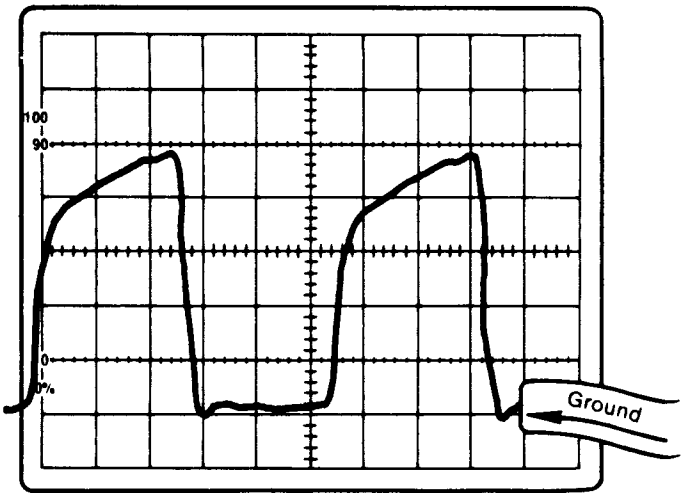
Signal Shown Is with Spinner Interface Tester in Operation



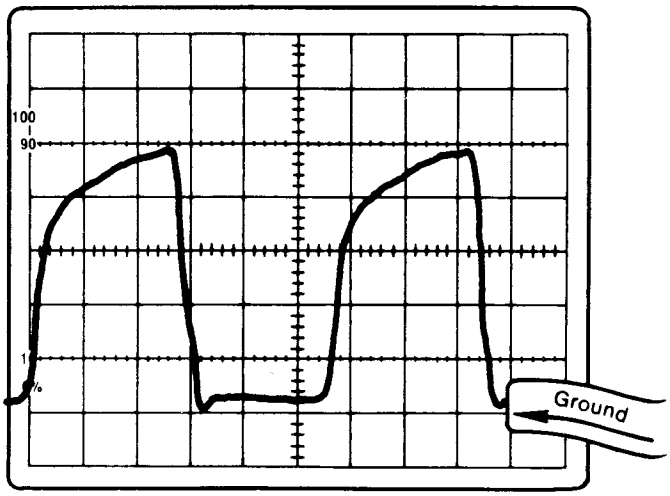
U8:1 M1
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 0.5μSec/Div



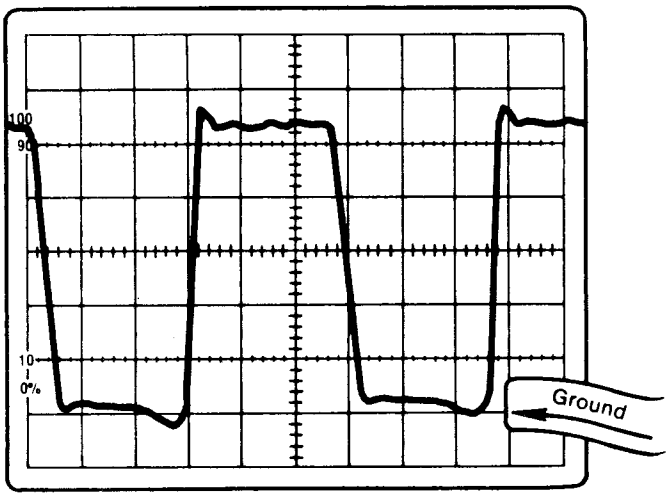
U8:1 M1
Vertical Sensitivity — 1V/Div
Horizontal Sensitivity — 5μSec/Div



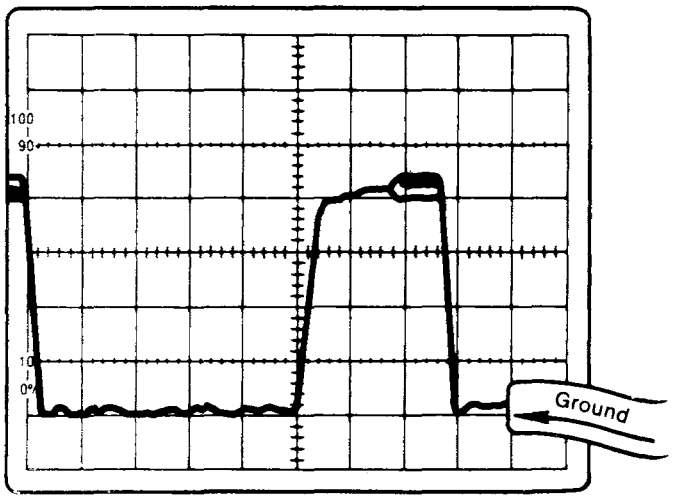
U8:3 3.58 MHz CLOCK
Vertical Sensitivity 1V/Div
Horizontal Sensitivity — 50nSec/Div



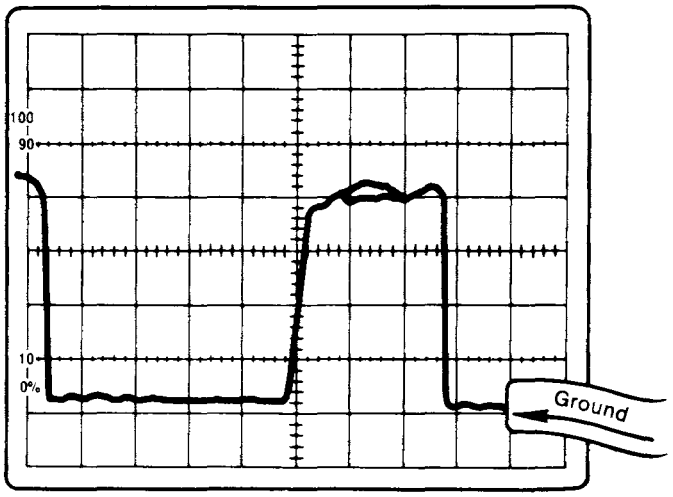
U8:8 3.58 MHz CLOCK
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div



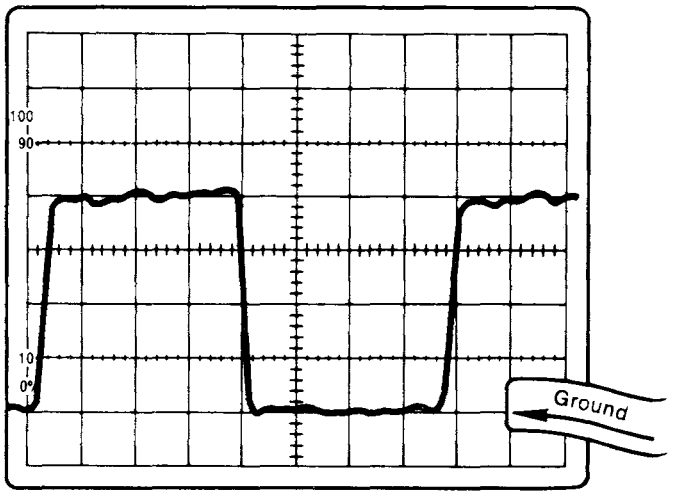
U8:9 3.58 MHz CLOCK
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div



U9:1 — RAS
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div

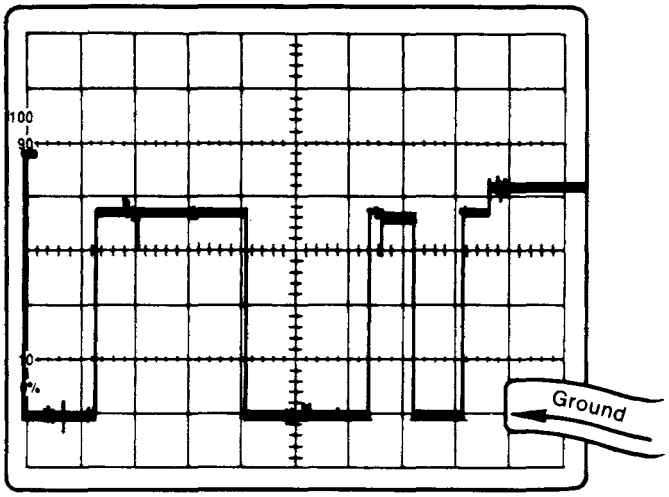


U9:2 — CAS
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div



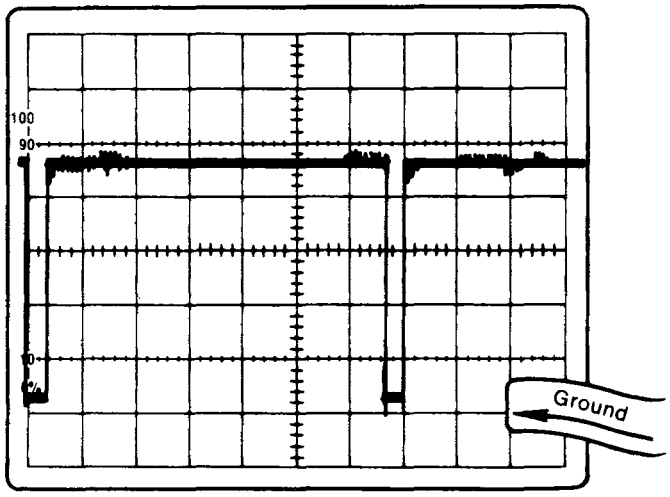
U9:3 — VDP ADDRESS LINE A
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div

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



U9:13 — MODE Aϕ

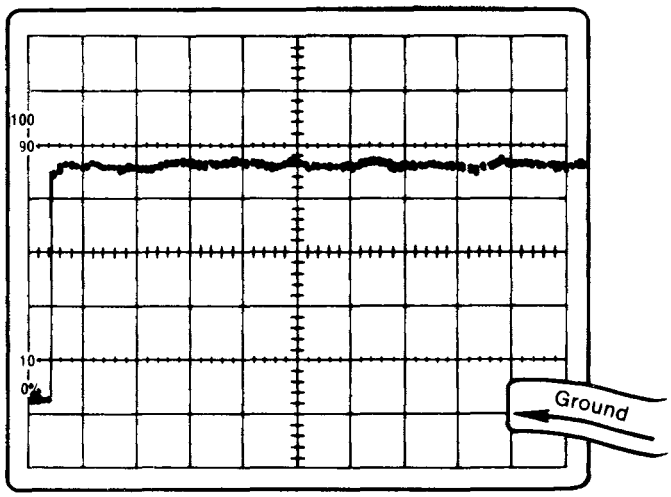
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.1μSec/Div



U9:14 — VDP CSW

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 2μSec/Div

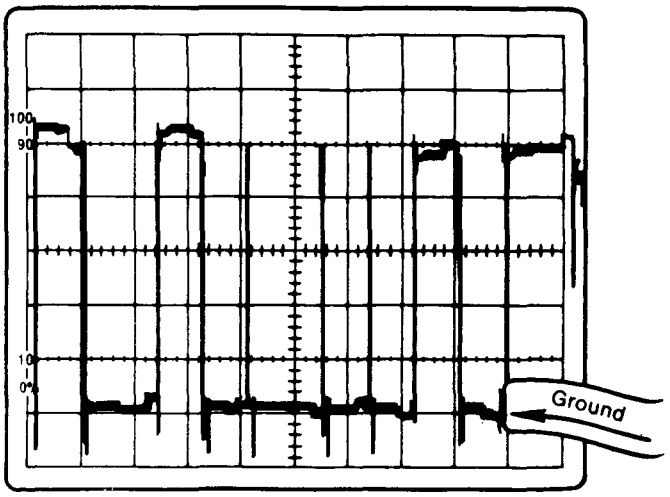
Signal Shown Is Right After the Reset Switch Was Released.



U9:15 — VDP CSR

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 2μSec/Div

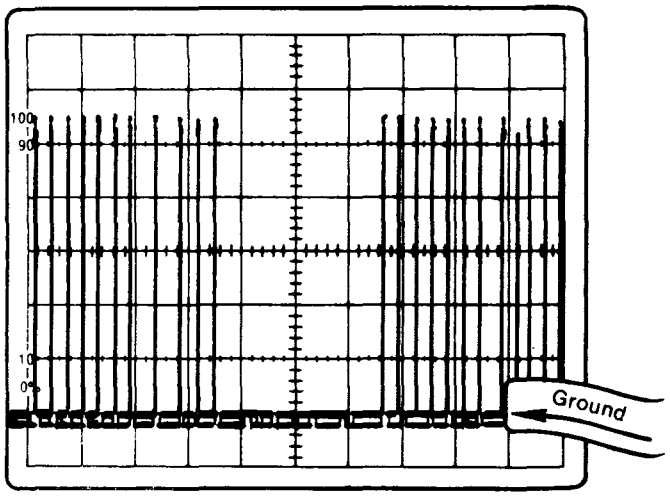
Signal Shown Is During Game Play of a Game Cartridge. The Negative Pulse May or May Not Be Present. Negative Pulses Are Always Present Although Sometimes They Are Too Fast for the Oscilloscope.



U9:17 — DATA LINE D7

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 1μSec/Div

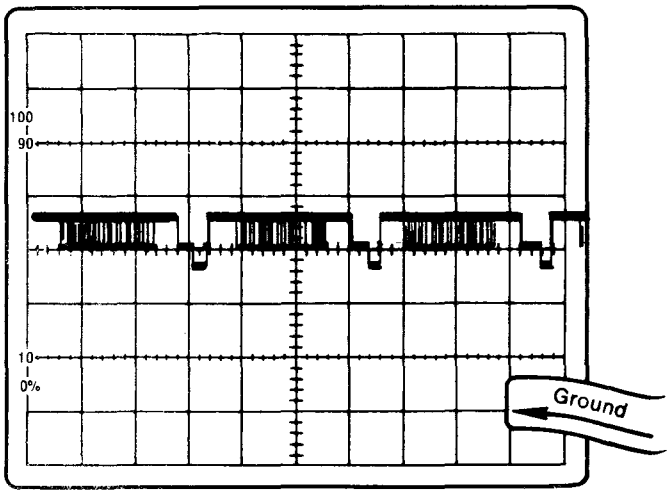
Signal Shown Is During Blue Menu Screen of Game Cartridge. All the Data Lines Should Have a Similar Waveform, If Not, the Data Line Is Dead.



U9:25 — VDP DATA LINE RD7

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.1mSec/Div

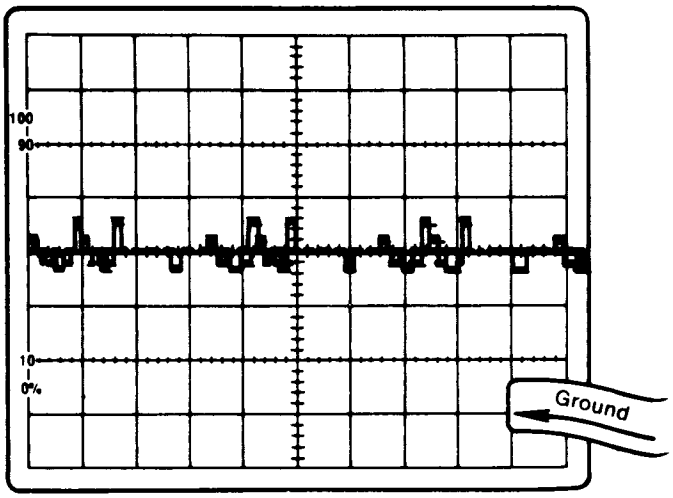
Signal Shown Is During Blue Menu Screen of Game Cartridge. All Data Lines Should Have a Similar Waveform, If Not the Data Line Is Dead.



U9:35 — B-Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 20μSec/Div

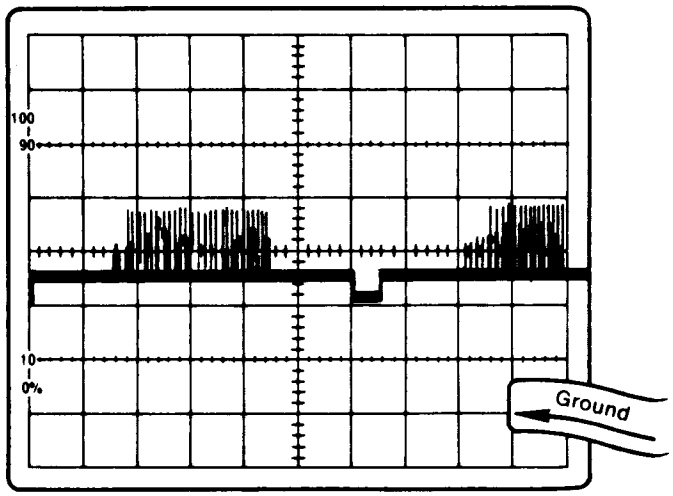
Signal Shown Is During Blue Menu Screen of Game Cartridge.



U9:35 — B-Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 20μSec/Div

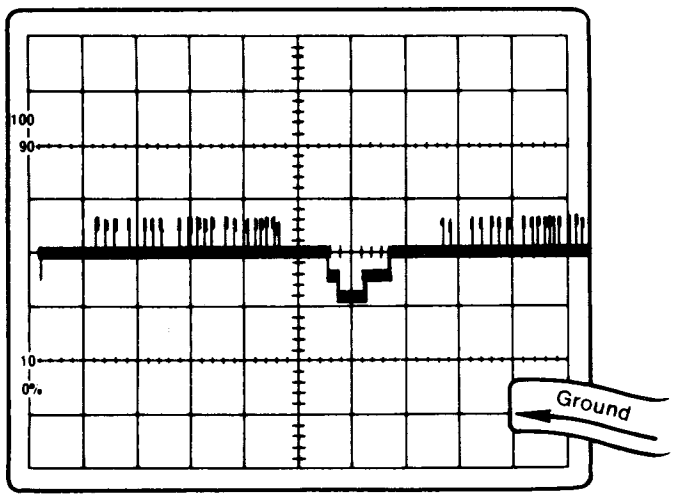
Signal Shown is During "ColecoVision Presents" Screen.



U9:36 — Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 10μSec/Div

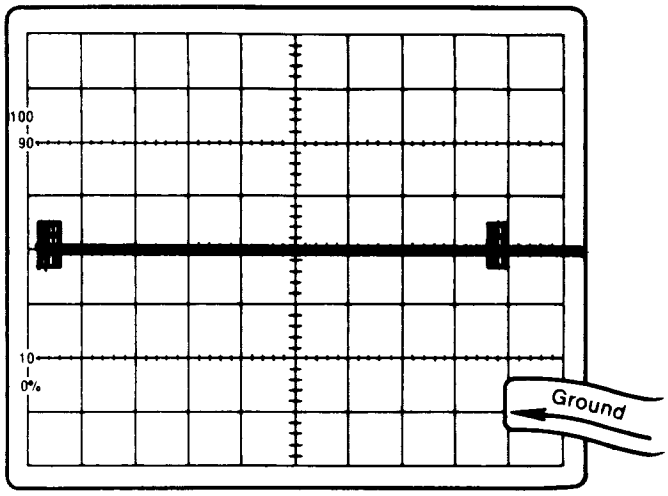
Signal Shown Is During "ColecoVision Presents" Screen.



U9:36 — Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 10μSec/Div

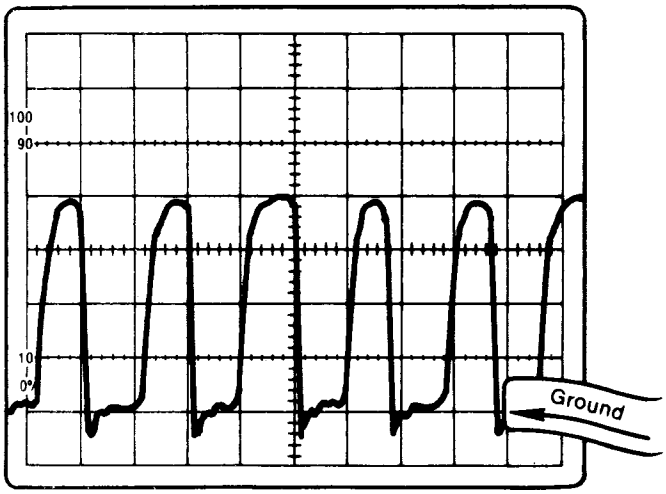
Signal Shown Is During Blue Menu Screen of Game Cartridge.



U9:38 — R-Y VIDEO OUTPUT

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 2mSec/Div

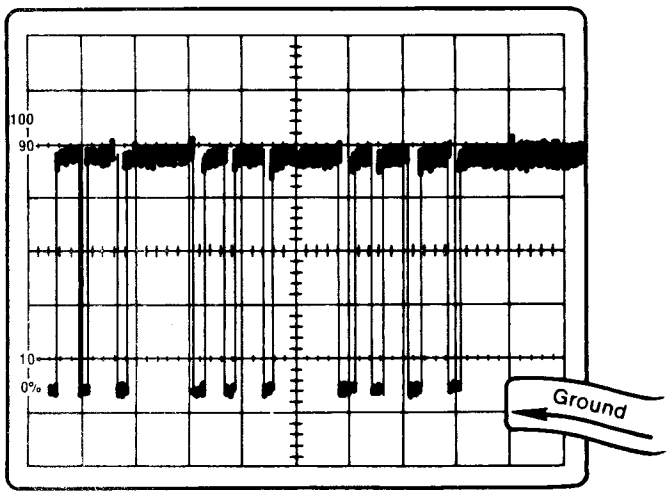
Signal Shown Is During Blue Menu Screen of Game Cartridge.



U9:40—VDP CLOCK

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 50nSec/Div

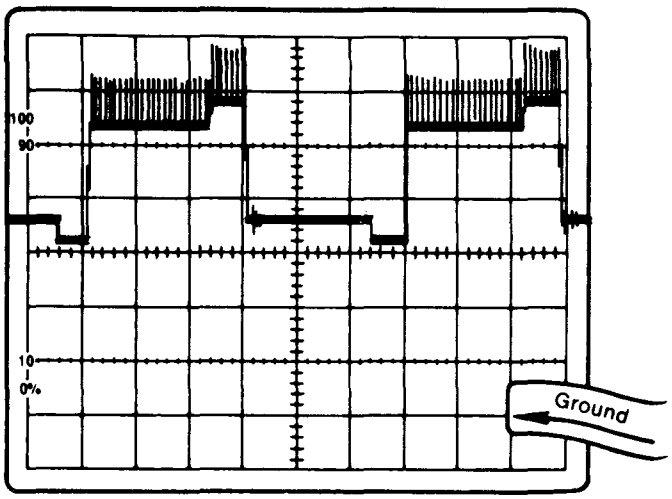
Frequency 10.7MHz



U20:5, 6

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 0.5mSec/Div

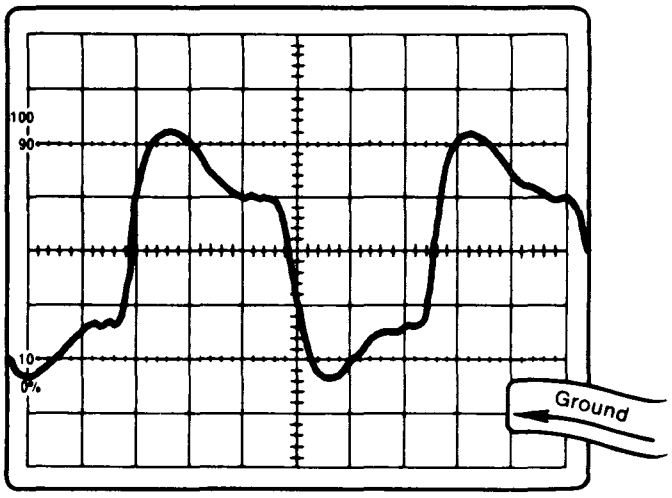
Signal Shown Is During Game Play of a Game Cartridge.



U20:7 — AUDIO OUTPUT

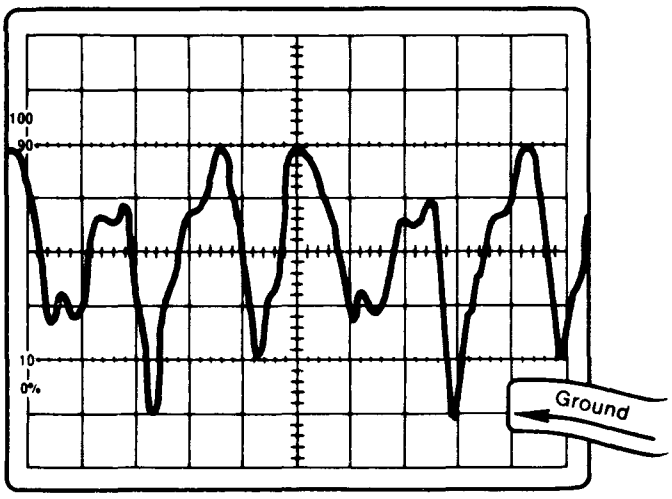
Vertical Sensitivity 0.5V/Div
Horizontal Sensitivity 10mSec/Div

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



U20:14 — SOUND GENERATOR CLOCK

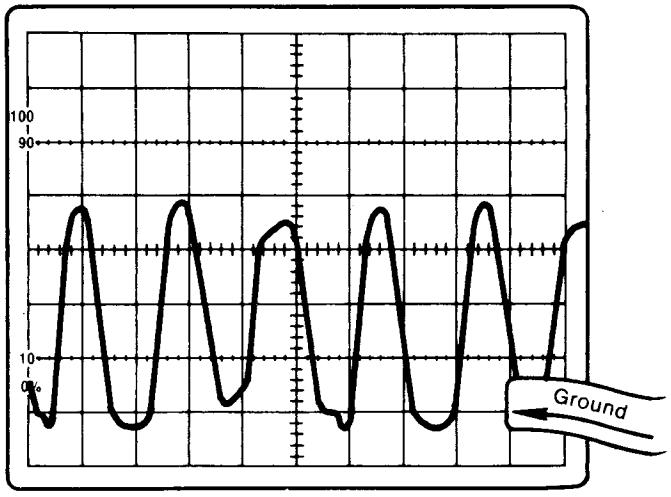
Vertical Sensitivity 0.5V/Div
Horizontal Sensitivity 0.5μSec/Div



U22:1 INPUT TO THIRD HARMONIC WAVE SHAPER

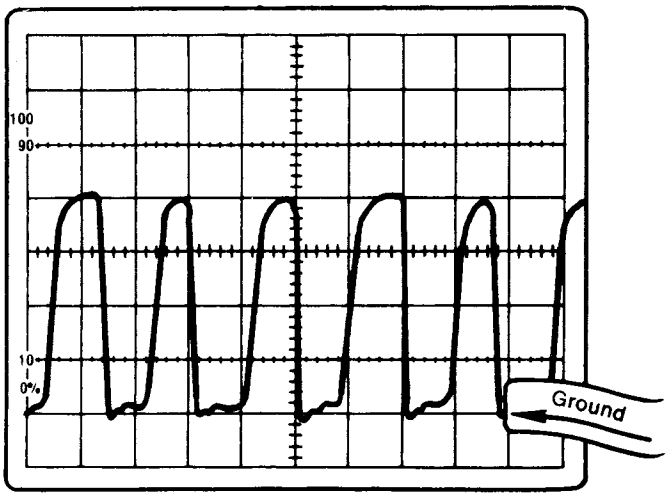
Vertical Sensitivity 0.5V/Div
Horizontal Sensitivity 5μSec/Div

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



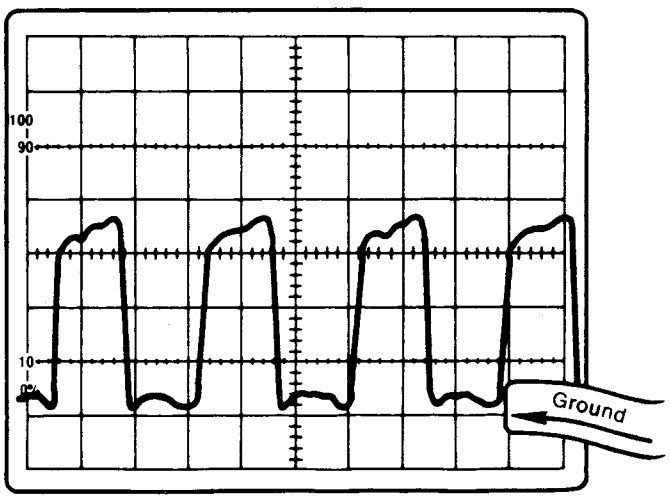
U22:3
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5μSec/Div

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

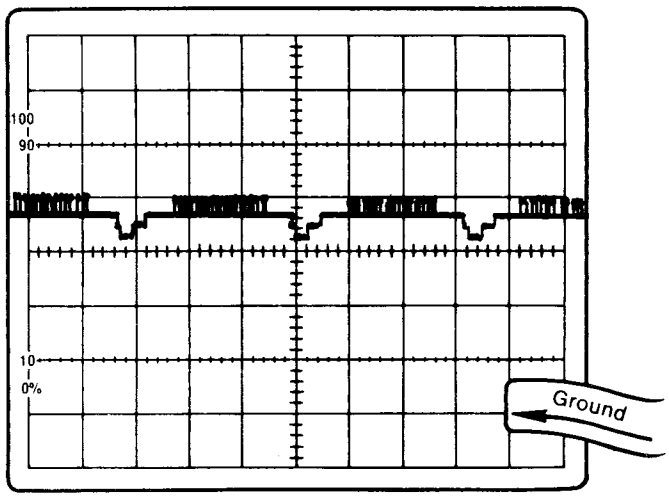


U22:4
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5μSec/Div

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



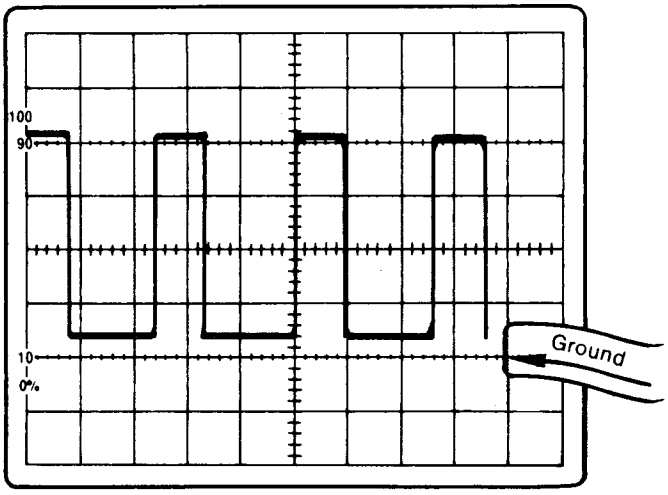
U22:8 7.159 MHz CLOCK
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 5μSec/Div



U23:11 — Y VIDEO

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

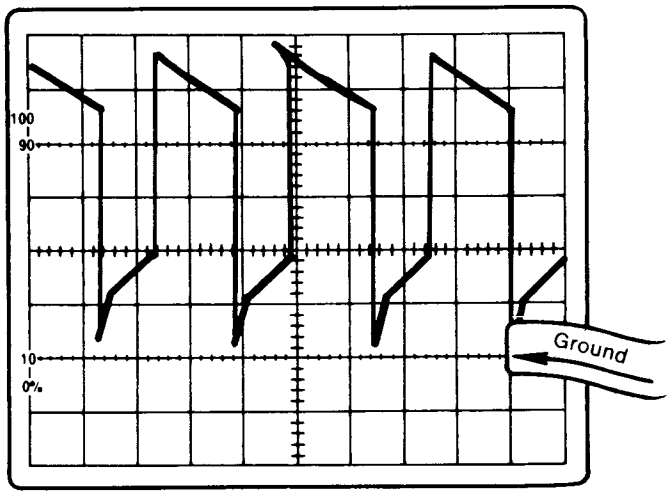
Signal Shown Is During Blue Menu Screen of Game Cartridge.



U24:8

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

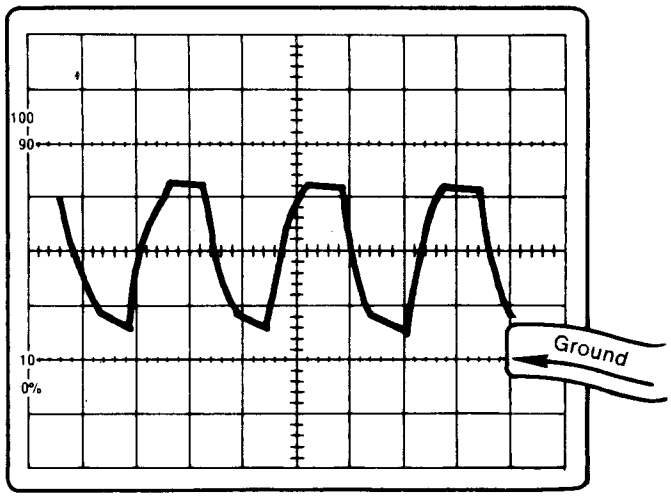
Signal Shown Is with Spinner Interface Tester in Operation.



U24:9

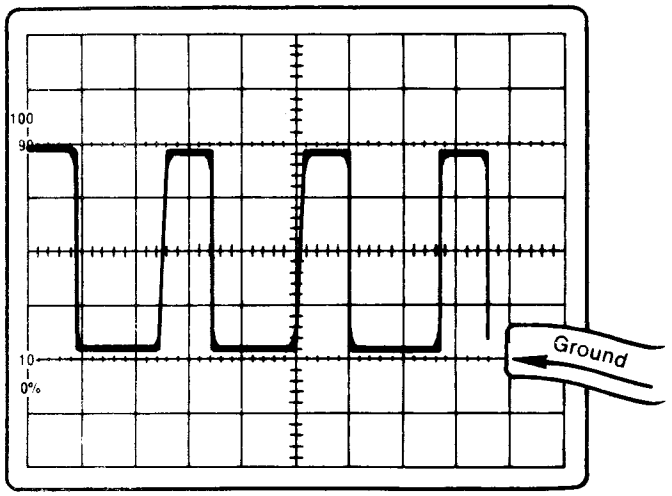
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation



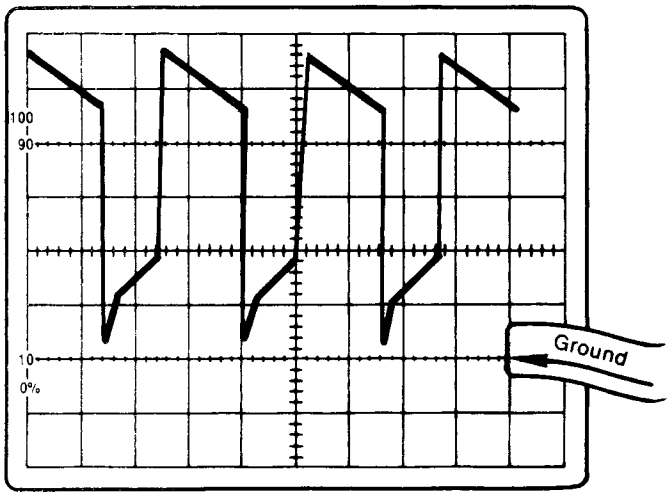
U24:10
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation



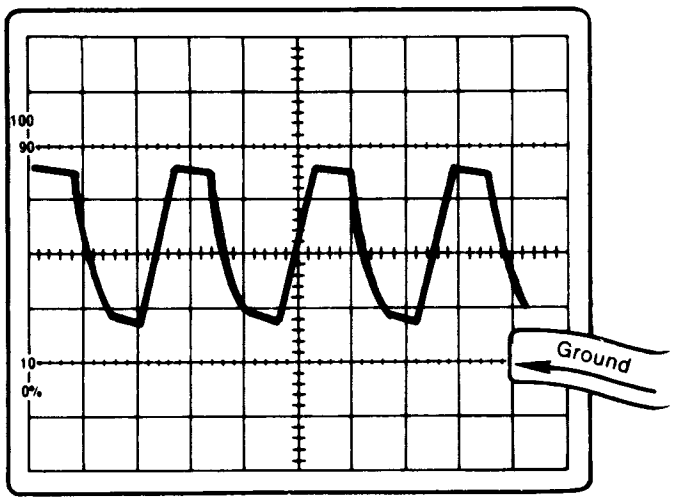
U24:11
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation



U24:12
Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation



U24:13

Vertical Sensitivity 1V/Div
Horizontal Sensitivity 500μSec/Div

Signal Shown Is with Spinner Interface Tester in Operation.

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.

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 U18 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 ± 100 Hz. If the frequency is incorrect, check the clock circuit.

Double Image
Replace U9 for double images.

Wavey Picture
If the picture is wavey, ensure that R62 is 270Ω 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.

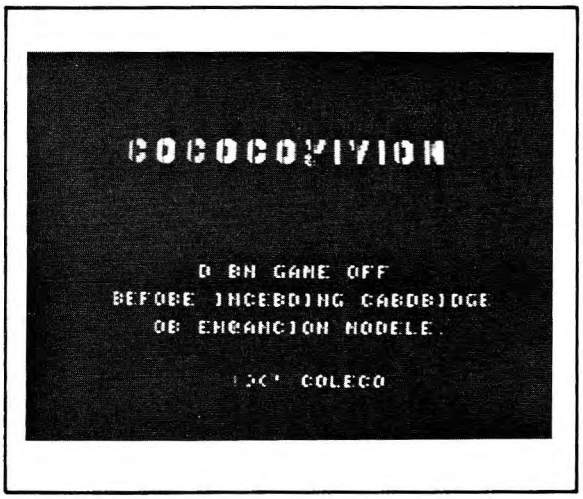
Wrong Frequency
3.579 MHz clock is the wrong frequency. If U22 is a Texas Instrument I.C., replace it.

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.

Scrambled Picture

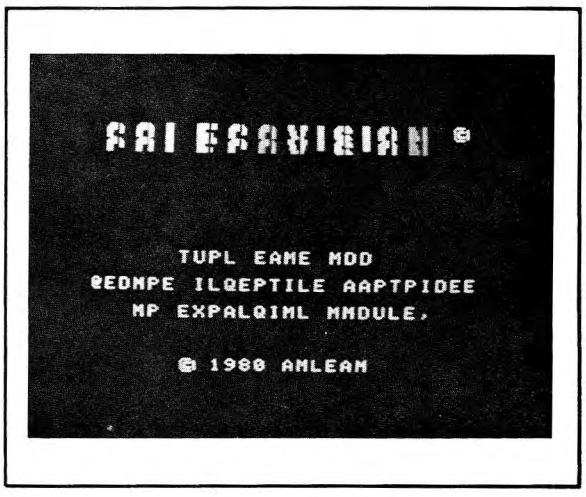
If the following images appear on your screen (at this point no cartridge or expansion module is being used) rather than "ColecoVision Presents" make adjustments as directed below each example.



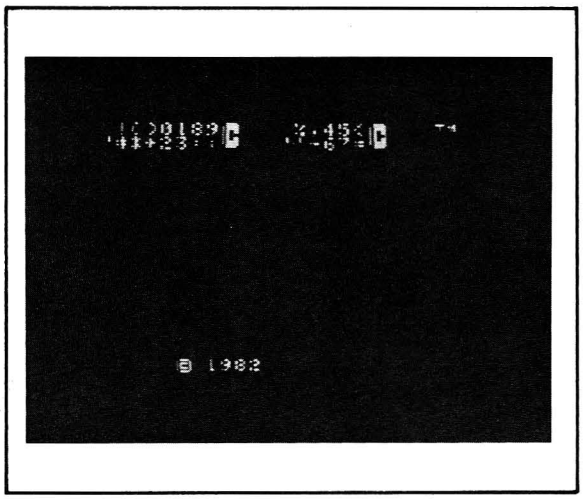
Replace U10

Replace U11

Replace U12

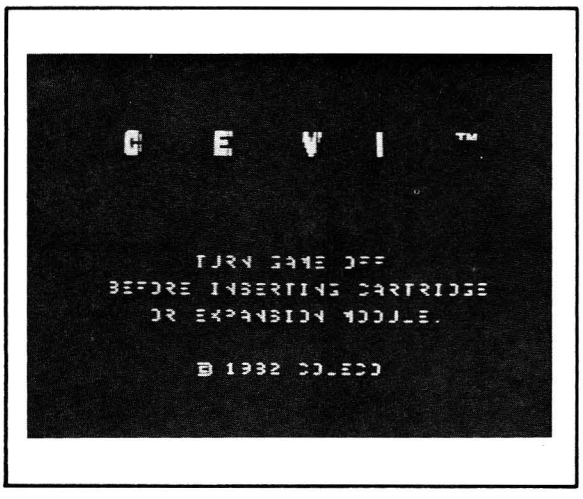


Replace U13

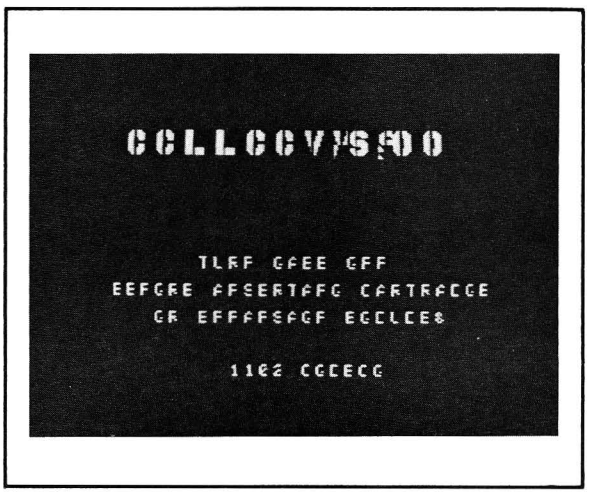


Replace U14

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.

I.C.—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 AØ—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 Ø); 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.

Notes

The enclosed notepaper is provided for the repair person's personal ColecoVision notes to enhance the manual for each individual.