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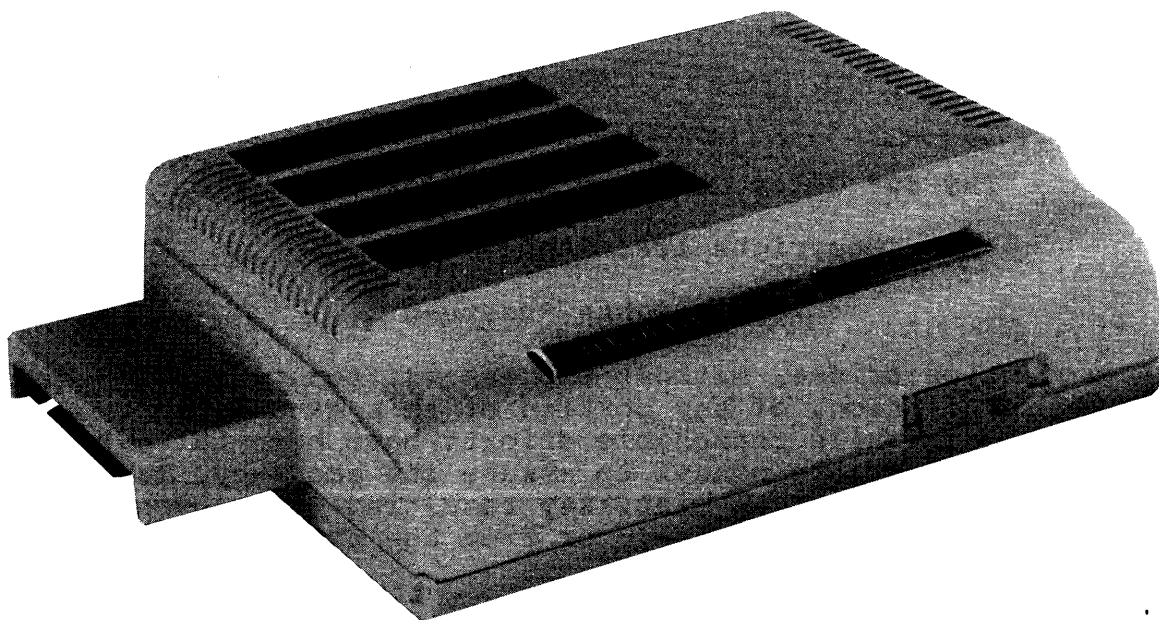
Service Manual

26-3024

TRS-80®

Multi-Pak Interface

Catalog Number 26-3024



CUSTOM MANUFACTURED IN U.S.A. BY RADIO SHACK, A DIVISION OF TANDY CORPORATION

TRS-80® Color Computer Multi-Pak™ Interface

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1/ Introduction

The TRS-80 Color Computer Multi-Pak Interface (CCMI) is designed to enhance the capabilities of the Color Computer by allowing as many as four different plug-in cartridges or peripherals to be inserted into the module simultaneously. The particular cartridge or peripheral in use at any given time is selected either by a front panel slide switch on the Multi-Pak Interface or software in the Color Computer Basic program.

The Multi-Pak Interface plugs into the normal receptacle for individual modules on the right side of the Color Computer. It is designed so that the module plug and the Color Computer receptacle are at the same height and no additional support is required under the Interface module. There are no locking devices to ensure connection of the Multi-Pak Interface with the Color Computer, so care must be exercised if the Color Computer is moved around on the desk top.

Once installed, the CCMI provides four slots into which program modules or peripherals may be installed.

CAUTION

Make sure that power is removed from the Color Computer before plugging in any peripheral. Damage to the cartridge or Color Computer may result if any cartridges are inserted or removed when power is on.

Each module slot is provided with a spring-loaded cover which protects the interior of the CCMI from foreign objects. As the program module is inserted, this cover rotates out of the way into the inside of the Interface. The program modules may be installed in any one of the module slots. The slide switch on the front face of the CCMI selects which one of the four positions provides the program to the Color Computer. The #1 slot is toward the front of the CCMI and #4 slot is toward the rear.

2/ Specifications

2.1 Physical

1. Size: 12" (30.48cm) Wide x 8.25" (20.95 cm) Deep
x 3.5" (8.75 cm) High
2. Weight:
3. Environmental:
 - Ambient Limits
 - Storage: 14 to 122°F (-10 to 50°C)
 - Operating: 41 to 104°F (5 to 40°C)
 - Humidity
 - Storage: 20 to 90%
 - Operating: 40 to 80%

2.2 Electrical

1. Input Voltage: 120V, 50 or 60 Hz
2. Power: 0.15A, 18 Watts

3/ Disassembly/Assembly

Power should be removed from the Multi-Pak Interface as well as the Color Computer any time a Program Cartridge is inserted or removed. If this is not done, damage to the internal circuitry of the CPU or Program Cartridges may result. Therefore, whenever work is to be done on the Interface, make sure that all power to both units is removed.

The Multi-Pak Interface merely plugs into the right side of the Color Computer in place of a regular Program Cartridge. Carefully remove the Interface by pulling on the unit until it is disengaged from the Color Computer. A hinged door on the Color Computer will cover the slot when it is not being used to protect internal circuitry.

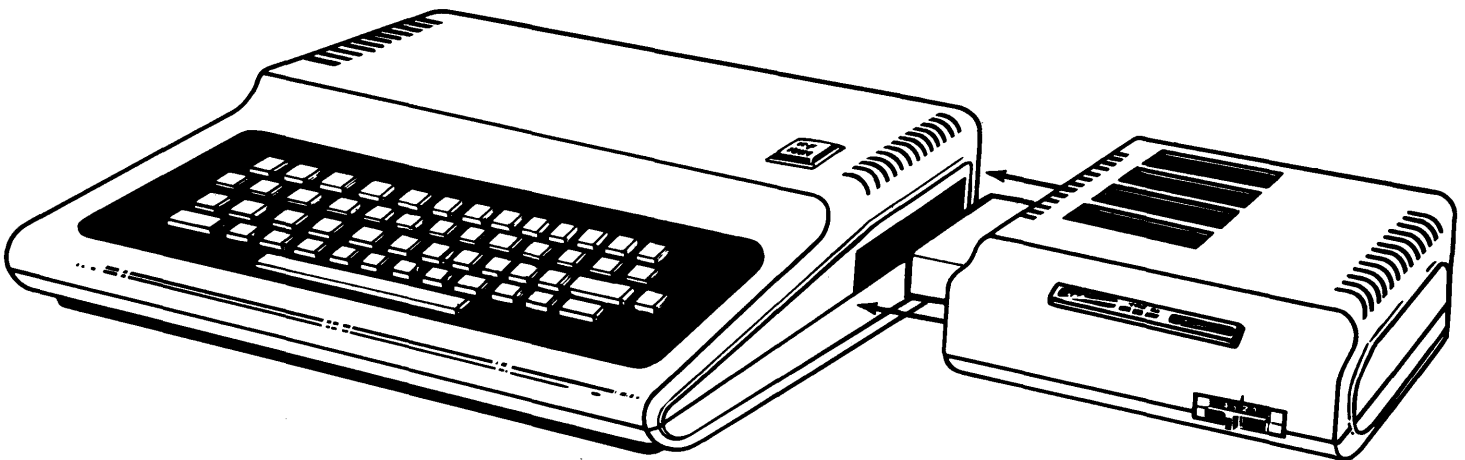


Figure 3-1. Connecting The Multi-Pak Interface

There are four mounting screws which connect the top and bottom covers of the Multi-Pak Interface. Turn the unit over to gain access to these screws. Carefully separate the two sections to allow access to the main circuit board and the transformer board mounted inside the covers.

The main PCB is attached to the bottom cover with five screws located around the edge of the board and one in the middle. It is keyed in the proper position by bosses which extend from the bottom case. To remove the board from the unit, disconnect the wiring attached to the transformer board assembly (five push-on terminal connections, tag them for proper reassembly), remove the six screws mentioned previously and lift the board from the unit.

The transformer board assembly is attached to the bottom of the case with two screws. To remove this assembly from the base, disconnect the five push-on terminal connections (tag them for proper reassembly), remove the two mounting screws, disconnect the three wires from the AC input cord, and lift the board from the assembly.

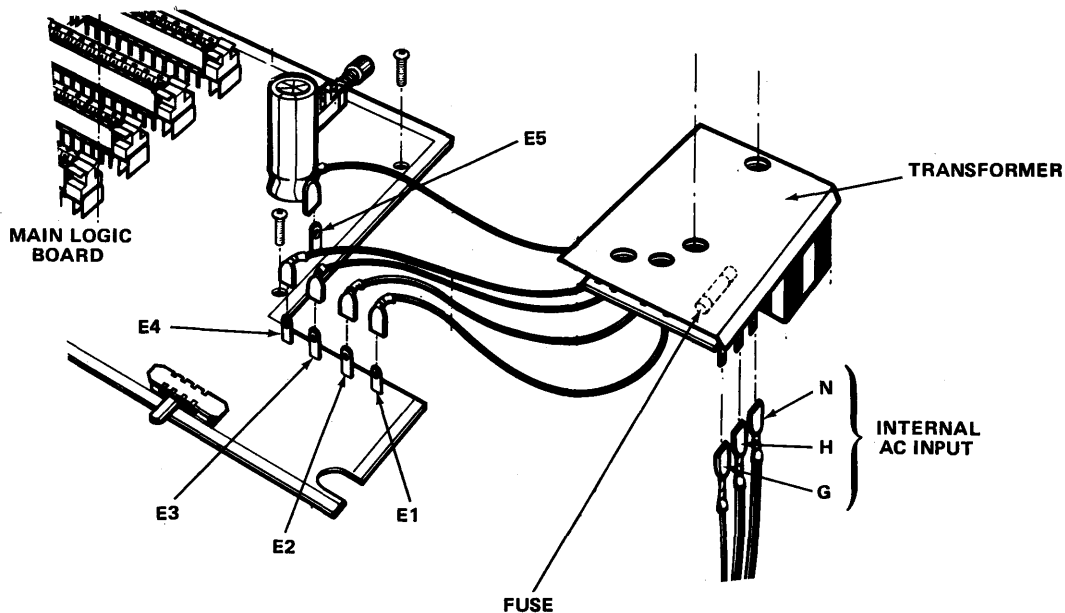


Figure 3-2. Power Supply PCB Removal

Reassemble the Multi-Pak Interface unit in the reverse order of disassembly. Make sure that the wiring from the transformer board assembly is correctly attached to the main board.

4/ Adjustments

There are no internal adjustments on the Multi-Pak Interface module. The only operational adjustment is the positioning of the switch on the front of the unit which selects one of the four slots in the top of the module. When slot selection is controlled by software from the Color Computer, this switch is no longer in the circuit until the reset button on the rear of the CCMI is depressed.

5/ Connector Pin Designations

Main PCB Edge Card Connector, J0

Pin Number	Signal Name	Description
1	-12V	-12 Volts (100MA)
2	+12V	+12 Volts (300MA)
3	HALT	Halt Input to the CPU
4	NMI*	Non-Maskable Interrupt to the CPU*
5	RESET*	Main Reset and Power-Up Clear Signal To System
6	E	Main CPU Clock (0.89 MHz)
7	Q	Quadrature Clock Signal Which Leads E by 90°
8	CART*	Interrupt Input For Cartridge Detection
9	+5V	+5 Volts (300 MA)
10	D0	CPU Data Bit 0
11	D1	CPU Data Bit 1
12	D2	CPU Data Bit 2
13	D3	CPU Data Bit 3
14	D4	CPU Data Bit 4
15	D5	CPU Data Bit 5
16	D6	CPU Data Bit 6
17	D7	CPU Data Bit 7
18	R/W*	CPU Read-Write Signal
19	A0	CPU Address Bit 0
20	A1	CPU Address Bit 1
21	A2	CPU Address Bit 2
22	A3	CPU Address Bit 3
23	A4	CPU Address Bit 4
24	A5	CPU Address Bit 5
25	A6	CPU Address Bit 6
26	A7	CPU Address Bit 7
27	A8	CPU Address Bit 8
28	A9	CPU Address Bit 9
29	A10	CPU Address Bit 10
30	A11	CPU Address Bit 11
31	A12	CPU Address Bit 12

Main PCB Edge Card Connector, J0(con't)

Pin Number	Signal Name	Description
32	CTS*	Cartridge Select Signal
33	GND	Signal Ground
34	GND	Signal Ground
35	SND	Sound Input
36	SCS*	Spare Signal Select
37	A13	CPU Address Bit 13
38	A14	CPU Address Bit 14
39	A15	CPU Address Bit 15
40	SLENB*	Input To Disable Select

6/ Troubleshooting Procedures

The CCMI is basically a simple device which should make troubleshooting it relatively easy if the theory of operation is understood. A hardware diagnostic aid, along with the appropriate software, is available from Radio Shack. However, in the absence of the diagnostic aids, the CCMI can still be effectively troubleshot with the procedures outlined in this section.

The first step in troubleshooting any piece of electronic equipment is to determine whether or not a fault really exists. Although this may seem rather obvious, there are instances where incorrect use of the CCMI can result in symptoms which make the unit appear to be defective. Therefore, the following checks should be made prior to proceeding with any other troubleshooting steps.

1. Insure that the CCMI is firmly seated in the cartridge connector on the Color Computer. In order to ensure better contact, the fit of the CCMI is quite snug and may take a little more pressure to insert than the standard ROM cartridge.
2. Ensure that the AC cord is properly connected and that the power switch is ON. The CCMI should be powered up before the Color Computer, particularly if a ROM pack is installed and selected by the switch. This is necessary because the logic for slot selection is powered from the Color Computer. If the active slot of the CCMI contains a ROM pack, it will generate an interrupt to the Color Computer. The CPU tries to read the ROM but can't because the ROM is not powered. This causes the CPU to malfunction.
3. Ensure that the selected ROM pack is a good one. If there is any doubt, remove the CCMI from the Color Computer and insert the ROM pack directly to check it out. (Don't forget to power down both units.)
4. If after selecting a particular ROM pack you are unable to select another ROM pack (even by depressing the RESET button), a fault is not necessarily indicated. It is possible for software to alter the RESET vector to some internal address, usually within itself. If the selector switch is positioned to another slot (even an empty one) and the RESET button is depressed, the vector

still points to the old address which now contains an invalid code, and the CPU again malfunctions.

If, after making the above checks, a problem actually exists, proceed to the preliminary checks and the troubleshooting flowcharts. It is necessary to have a dual trace, triggered-sweep oscilloscope and to be thoroughly familiar with the CCMI operation and general electronic troubleshooting procedures.

6.1. Preliminary/Final Logic Checkout

1. Remove all ROM packs and other devices from the CCMI.
2. Install the CCMI in a known working Color Computer.
3. Power up the CCMI, then the Color Computer. The screen should come up with the BASIC or EXTENDED BASIC signon as appropriate. If it does not, proceed with the buffer checks.
4. Check the switch by entering the following command (from the Command Mode of Basic) for each switch position.

```
PRINT PEEK (65407) <ENTER>
```

The computer should respond with the following values for the associated slots:

```
Slot 0  --  204  
Slot 1  --  221  
Slot 2  --  238  
Slot 3  --  255
```

If the correct results are not obtained, proceed to the select switch check.

5. Check the select latch in a similar manner by first "POKE"ing various values into the same location (65439), and then "PEEK"ing back the location. If the data shown when "PEEK"ed is the same as that which was "POKE"ed, then most of the logic on the main board has been verified. Four good values to try are 0, 255, 85, and 170. These check if all bits can be low or high and if adjacent bits are independent of each other.
6. Install a known good ROM pack (with power OFF to both units) in a slot. Select that slot with the switch and power up the CCMI, then the Color Computer. The screen

should come on with the appropriate signon for the ROM pack. Power down both units (Color Computer first), switch to an unoccupied slot, then power up both units. The screen should come on with the appropriate BASIC signon. The unit should be checked for the ability to select the slot with the ROM in it by both switching to that slot (it may be necessary to RESET the Color Computer) and by software. For software, again power down and select an unused slot. Power up and select the appropriate slot by "POKE"ing the value from the following table:

Slot 0	--	POKE 65407, 0
Slot 1	--	POKE 65407, 17
Slot 2	--	POKE 65407, 34
Slot 3	--	POKE 65407, 51

The above procedures should be repeated for each slot individually, then for slots in combination. Heed the following notes before assuming trouble:

1. The disk cartridge, the deluxe RS232 cartridge, and any other cartridge that does not generate the interrupt CART* signal require an additional step to select, if not in the slot selected on power up: EXEC &HC000.
2. REMEMBER -- once a slot has been selected by software, the switch is no longer effective unless the RESET switch is depressed or the computer powered down.
3. REMEMBER -- some ROM packs alter the RESET vector and cannot be deselected without powering down the computer.
4. REMEMBER -- the internal slot selection logic works from the Color Computer power supply and will function if the CCMI is powered OFF, but the ROM packs draw their power from the CCMI supply. Therefore, the CCMI must be turned ON for them to work.

Following are some simple routines to aid in troubleshooting the CCMI. All (except LISTING ONE) are in 6809 machine code in order to be fast enough to see pulses on the scope. LISTING ONE contains the BASIC loader for each machine code routine with only the DATA statement altered. The routines are used in the Troubleshooting Flowcharts. In LISTINGS TWO through SIX (although the program is shown in assembler mnemonics, hex data, and decimal data), only the portion indicated with a line number (line 50) needs to be keyed in.

LISTING ONE
(Machine Code Loader)

```

10 READ N
20 FOR X= 0 TO N:READ D:POKE 8192 + X, D: NEXT X
30 DEFUSR0 = 8192
40 Q =USR (0)
50 DATA (as required from the following listings)

```

LISTING TWO
(CTS Exercise Loop)

```

LOOP      LDA  $C000      B6 C0 00      182,192,0
          BRA  LOOP      20 FB          32,251

50 DATA 4,182,192,0,32,251

```

LISTING THREE
(SCS Exercise Loop)

```

LOOP      LDA  $FF40      B6 FF 40      182,255,64
          BRA  LOOP      20 FB          32,251

50 DATA 4,182,255,64,32,251

```

LISTING FOUR
(Select Latch Read Loop)

```

LOOP      LDA  $FF7F      B6 FF 7F      182,255,127
          BRA  LOOP      20 FB          32,251

50 DATA 4,182,255,127,32,251

```

LISTING FIVE
(Select Latch High Write Loop)

```

START     LDA  #$FF      86 FF      134,255
LOOP      STA  $FF7F     B7 FF 7F     183,255,127
          BRA  LOOP      20 FB      32,251

50 DATA 6,134,255,183,255,127,32,251

```

LISTING SIX
(Select Latch Low Write Loop)

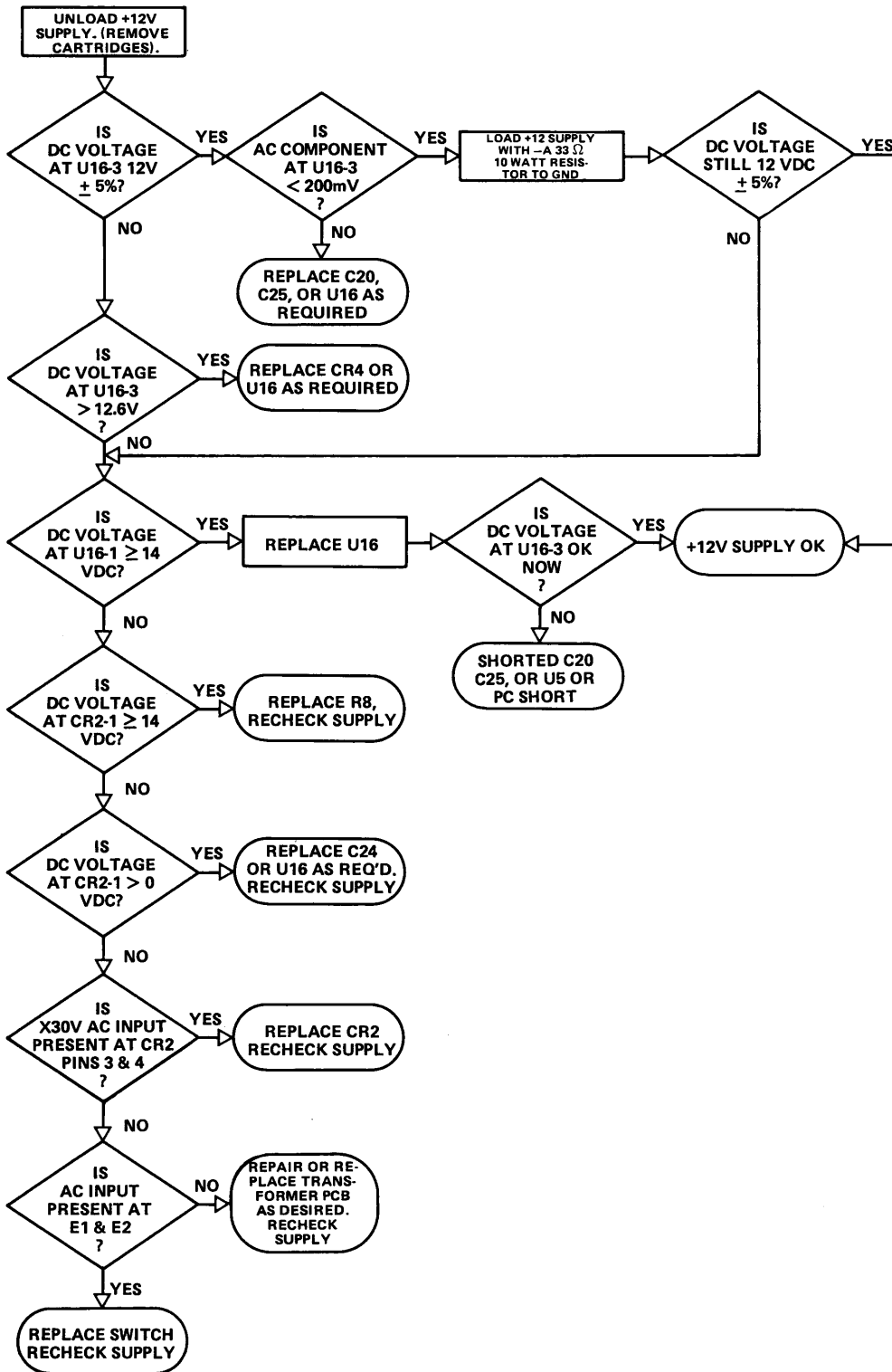
```

START     LDA  #$0       86 00      134,0
LOOP      STA  $FF7F     B7 FF 7F     183,255,127
          BRA  LOOP      20 FB      32,251

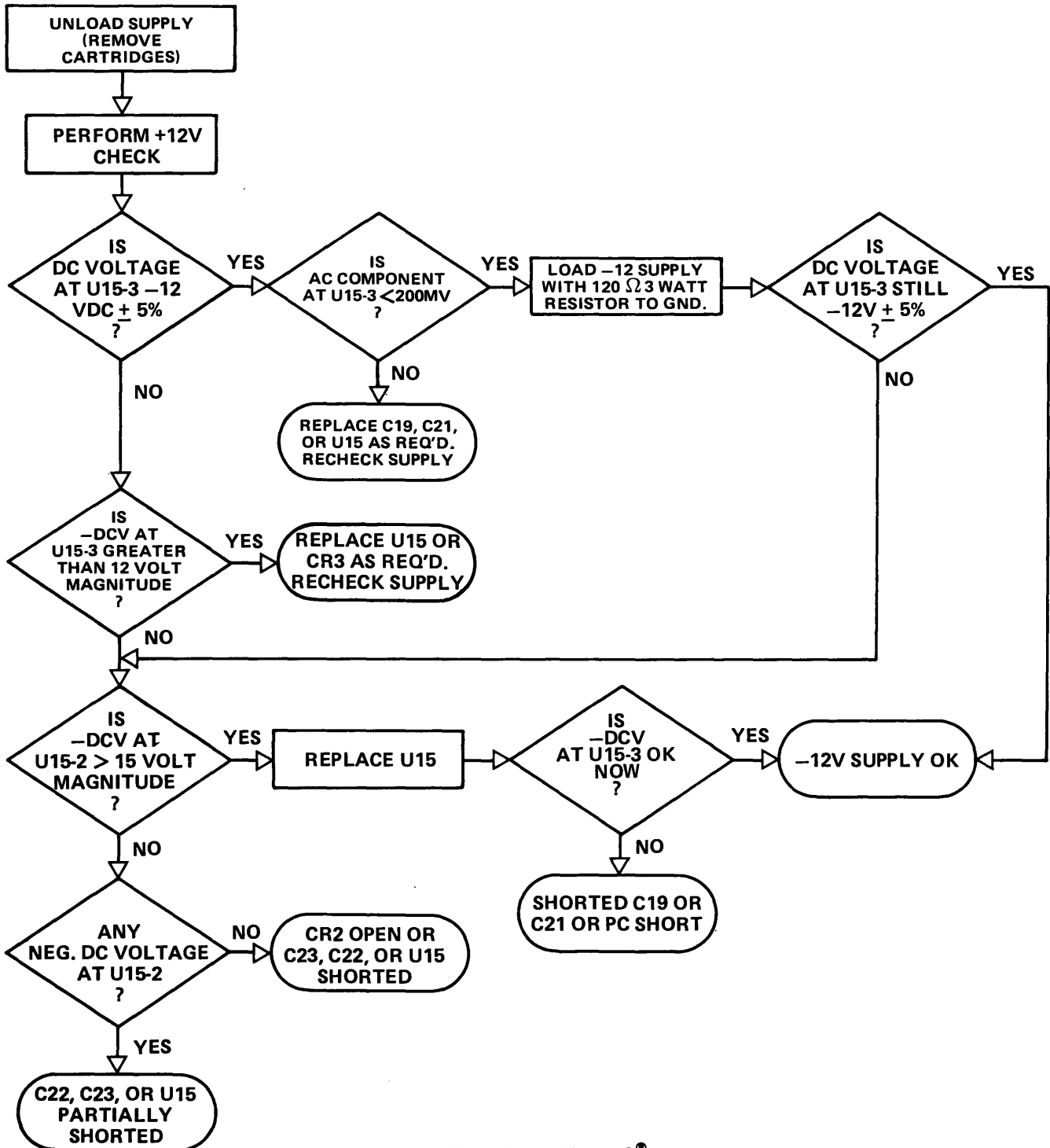
50 DATA 6,134,0,183,255,127,32,251

```

Power Supply Flowchart, +12 V Check



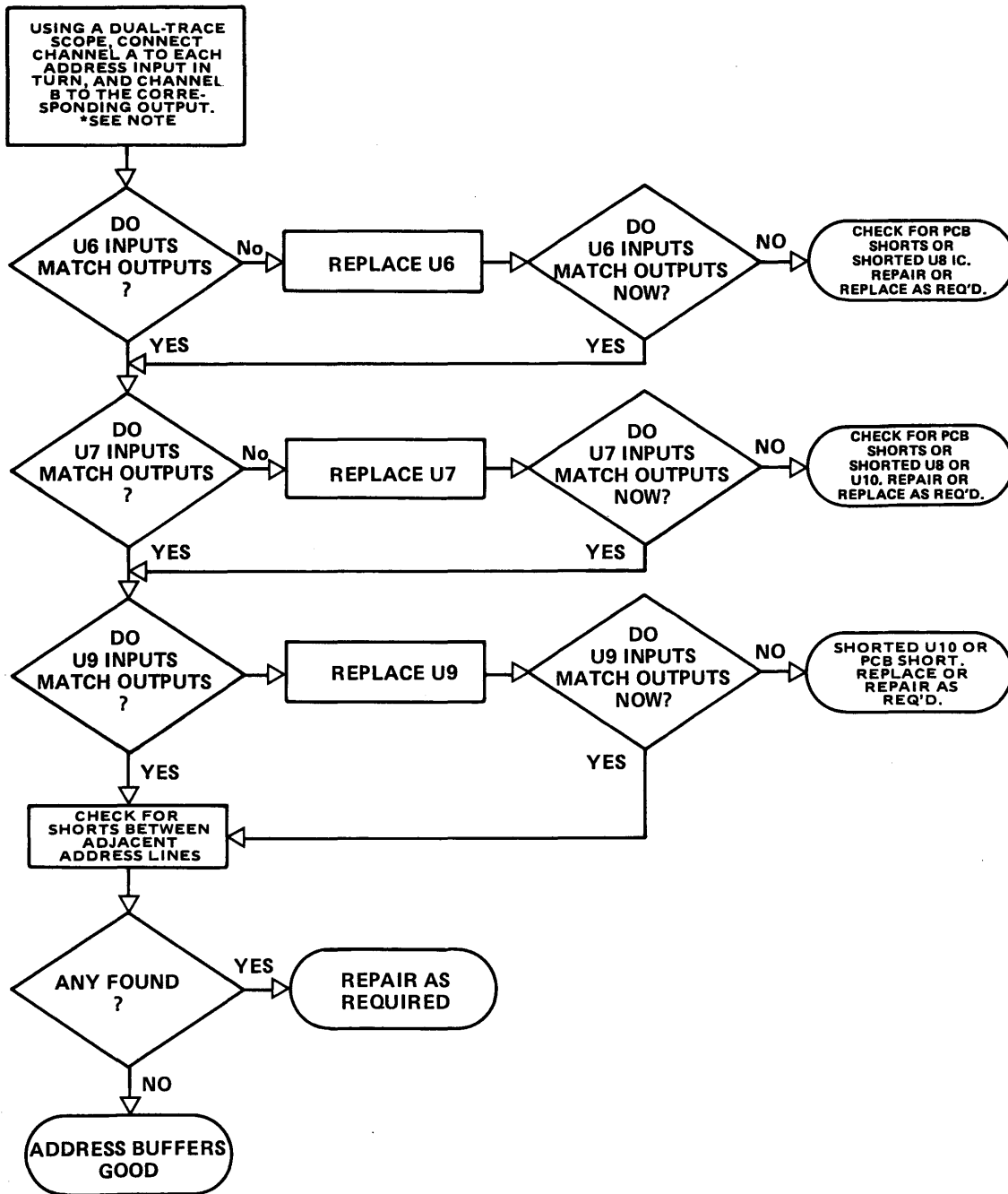
Power Supply Flowchart, -12 V Check



Power Supply Flowchart, +5 V Check

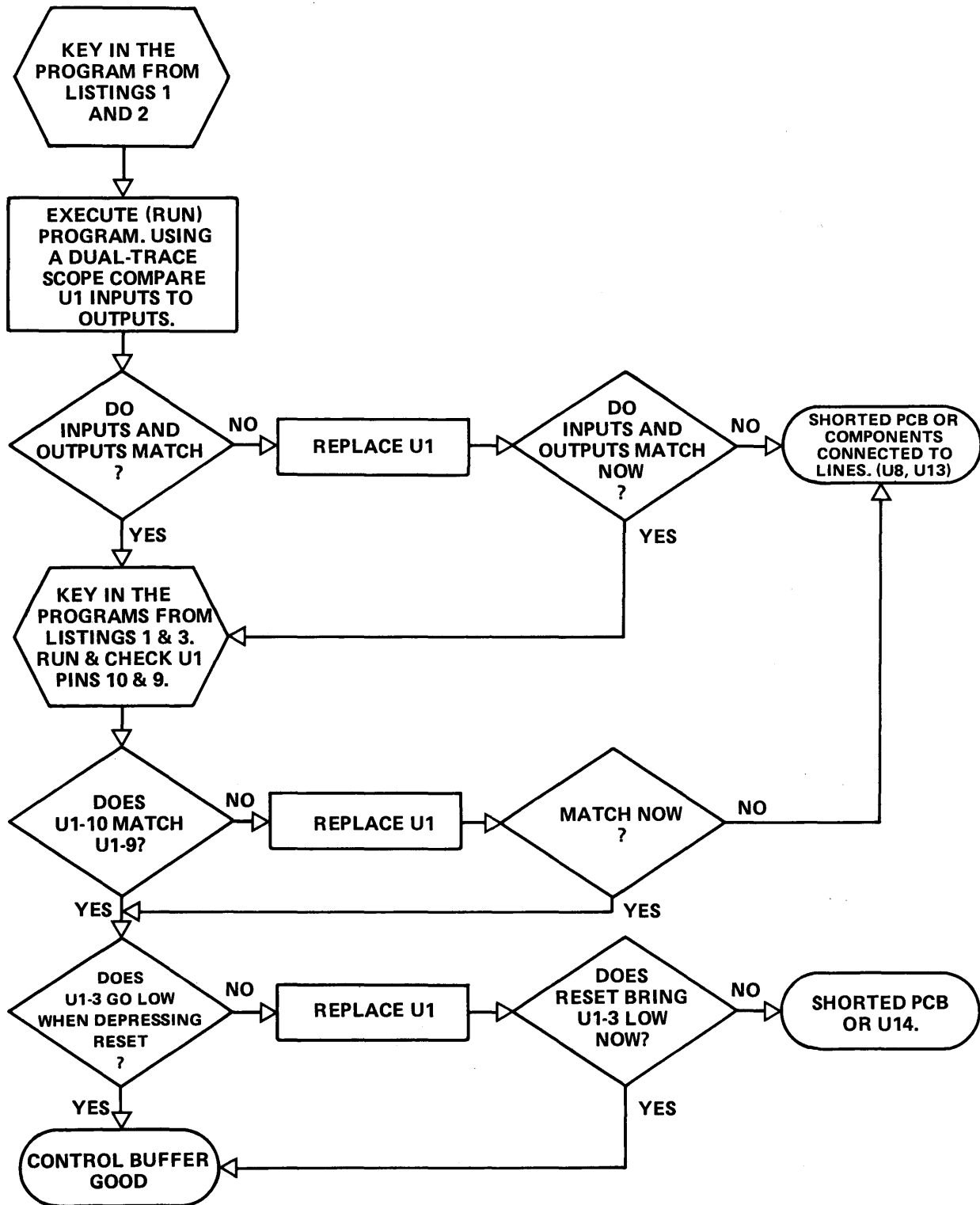


Address Buffer Check Flowchart

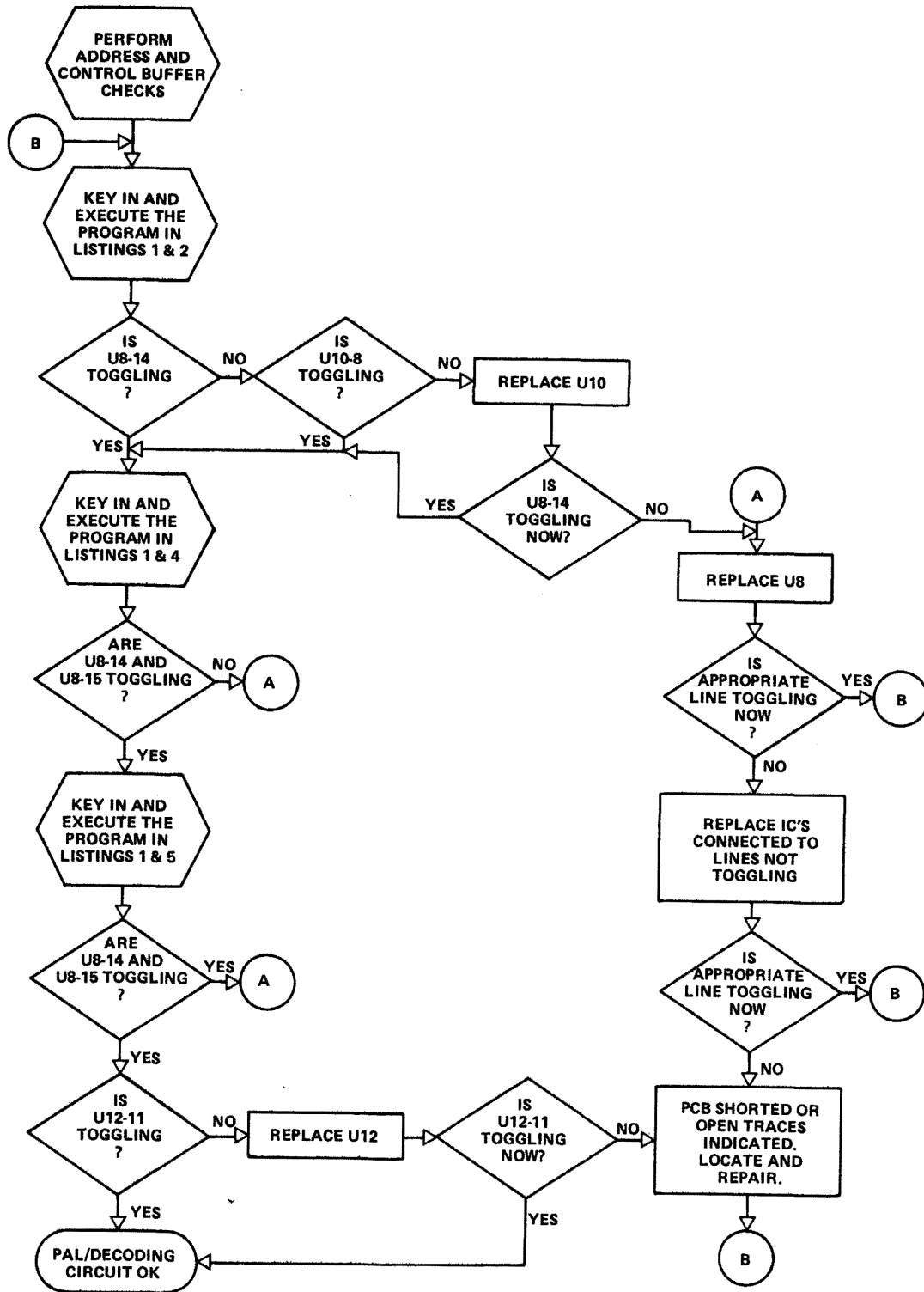


*NOTE – IT IS BEST TO CHECK ADDRESS LINES WITH ACTIVITY ON THEM, NOT JUST HIGHS AND LOWS. FOR A SEEMINGLY INACTIVE ADDRESS LINE, PRESS THE RESET BUTTON.

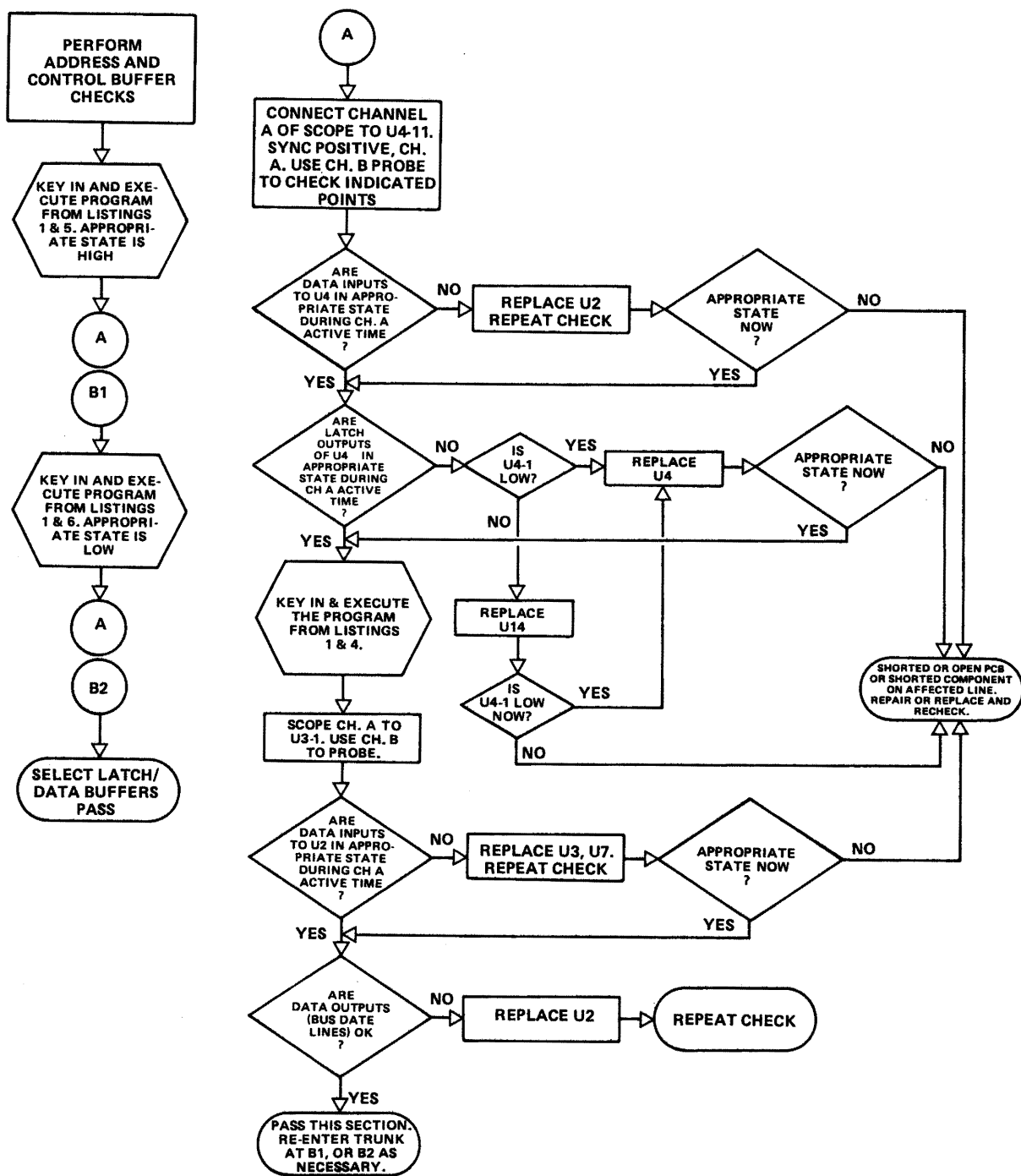
Control Buffer Check Flowchart



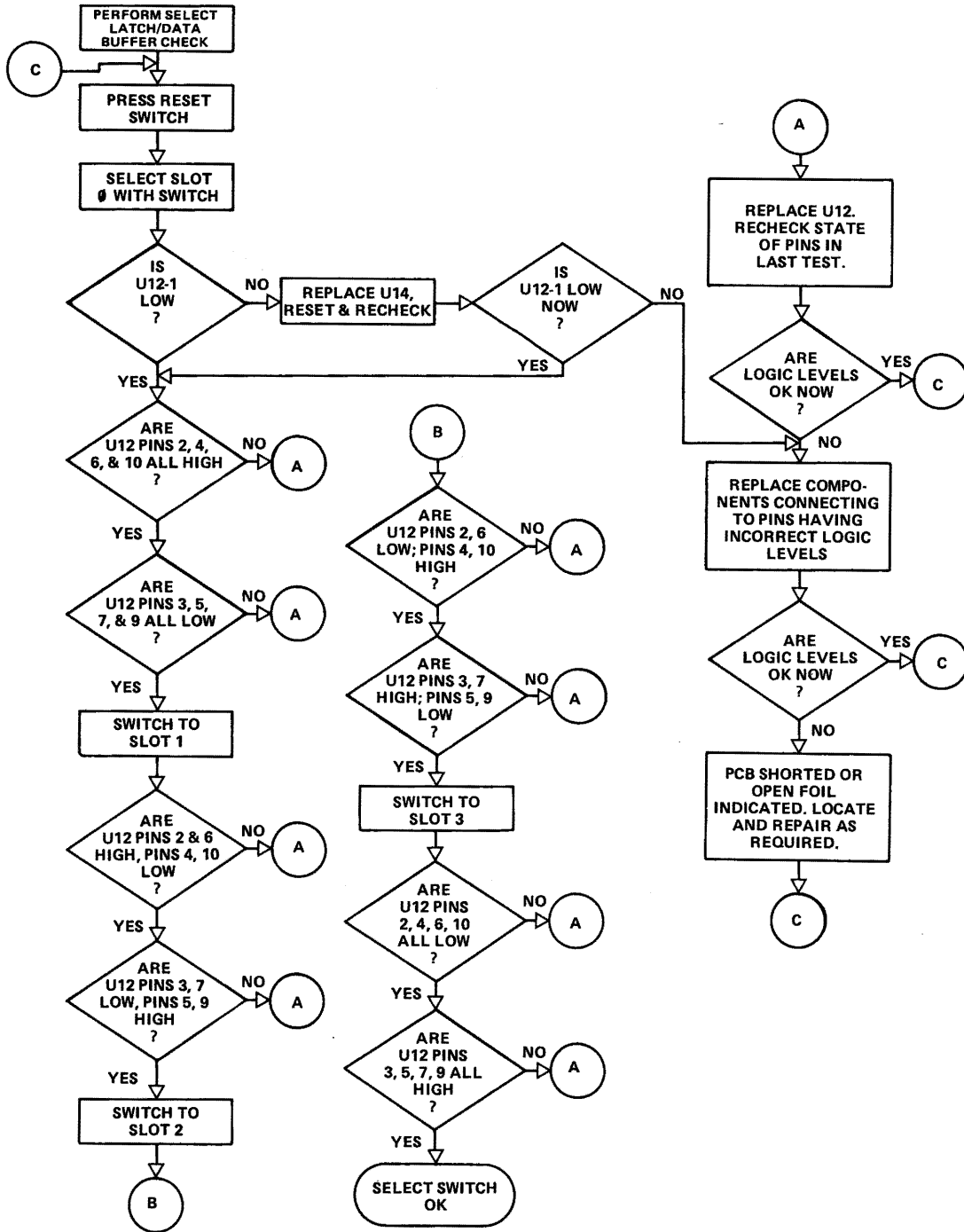
PAL/Decoding Check Flowchart



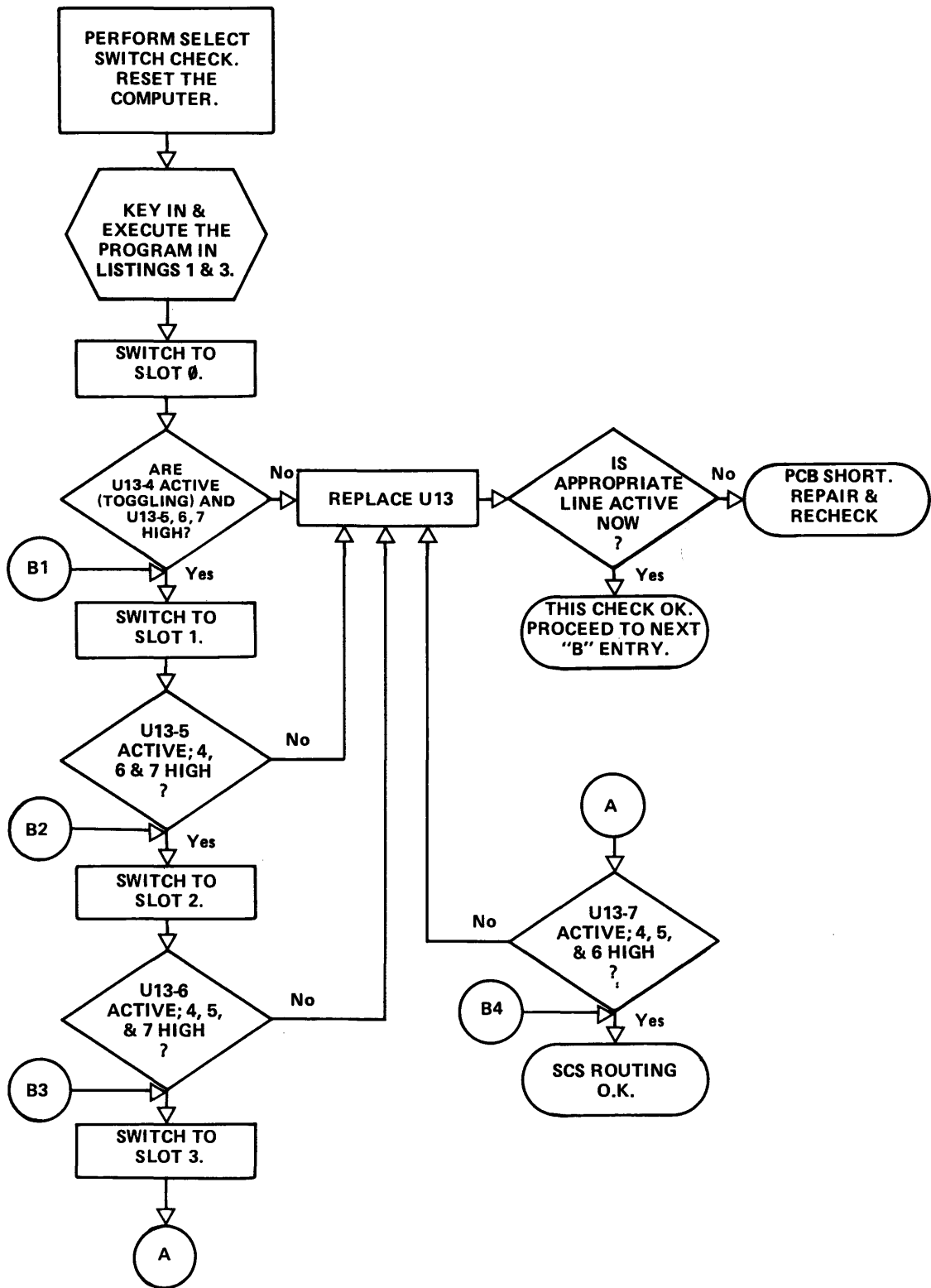
Select Latch/Data Buffer Check Flowchart
(Assumes Preliminary Check #5 Failed)



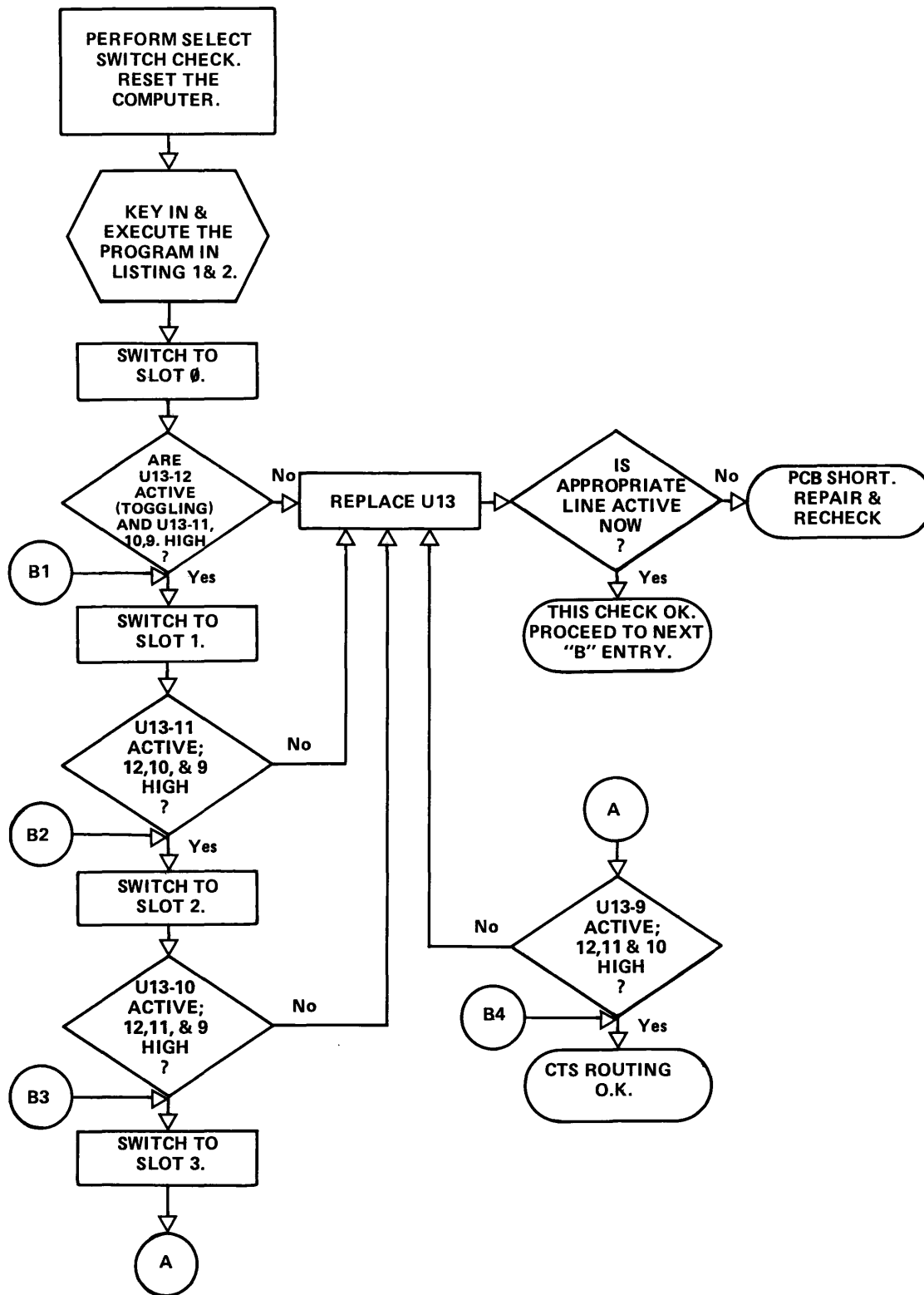
Select Switch Check Flowchart
(Assumes Preliminary Check #4 Failed)



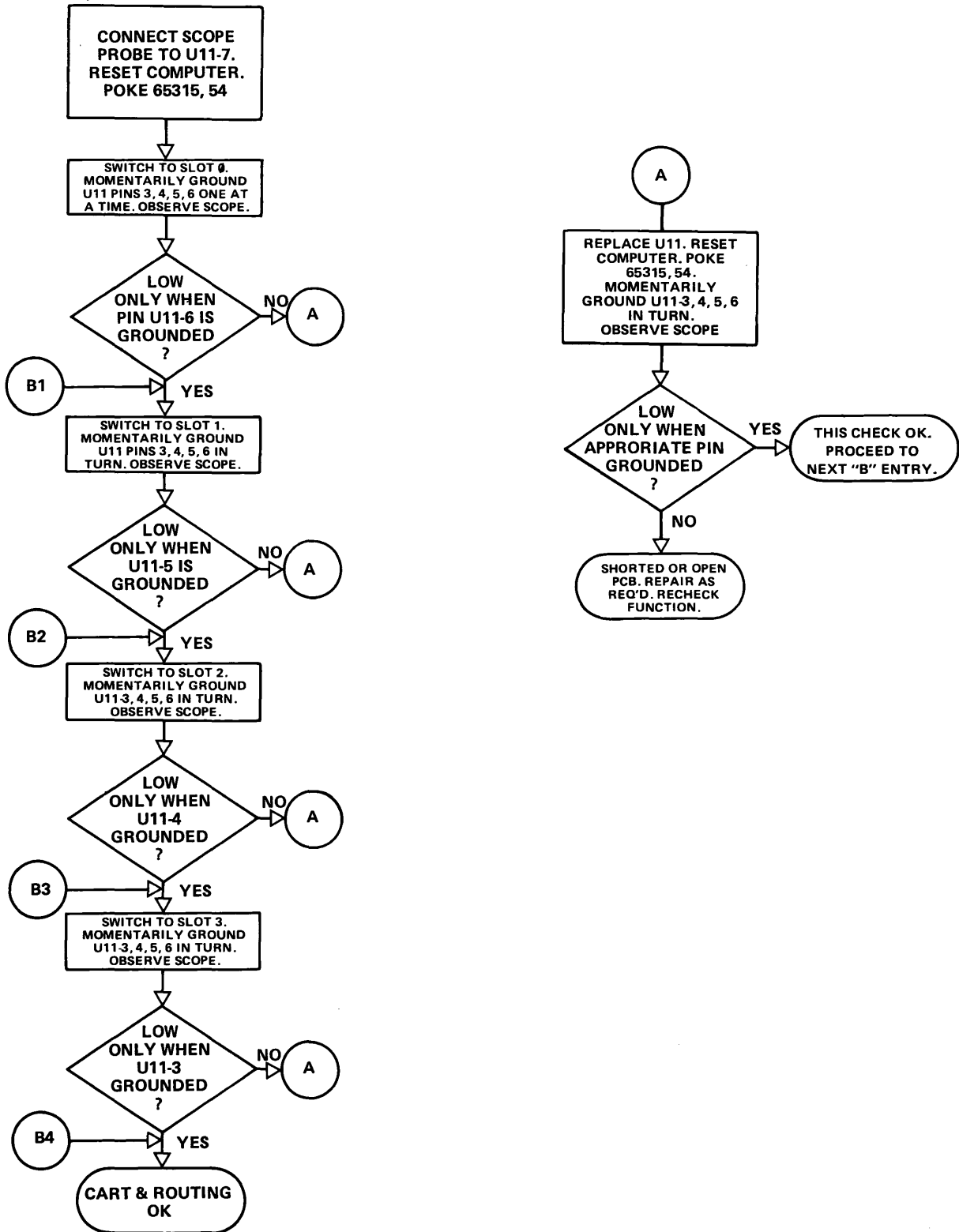
SCS Routing Check Flowchart



CTS Routing Check Flowchart



CART* Routing Check Flowchart



7/ Theory of Operation

POWER SUPPLY

The power supply for the Multi-Pak Interface is essentially the same as the power supply contained in the Color Computer. Note that the power supply in the Interface Unit is used only for the slots. All on-board TTL draws its power from the Color Computer.

The power supply provides three voltages: +12 volts, -12 volts, and +5 volts. The +5 volt supply is designed to provide up to 1.35 amps, the +12 volt supply provides up to 400 milliamps, and the -12 volts supply is designed to provide 100 milliamps.

The power supply is shown on page 2 of the schematic. On the primary side of the transformer, the power supply incorporates a 0.7 amp fuse and three high voltage capacitors. These capacitors (C1, C2, and C3) isolate computer noise from the AC line. The two active lines of the power cord are connected across the primary side of the power transformer. The third line (ground) is connected to the computer ground (terminals 4, 5, and 8).

The transformer has two center-tapped secondary windings. One secondary is rated at 16.3 volts AC at 1 amp, and is used solely for the +5 volt supply. The other secondary is rated at 33.5 volts AC at 0.35 amps. Both center taps are connected to ground. Each side of the 16.3 volt AC secondary is connected to a rectifier diode (CR1 and CR2). This produces a full-wave rectified signal when the two negative sides of the diodes are tied together.

All of the above circuitry is located on a secondary board inside the Multi-Pak Interface case. This isolates the high voltage signals away from the main circuit board. The transformer board is indicated on the schematic by a dashed line.

At the output of the transformer assembly, four signals are connected to the main power supply board: ground, the input to the +5 volt regulator circuit, and the two sides of the 33.5 volt secondary. The two lines from the 33.5 volt secondary are connected to the bridge rectifier CR2.

At the output of the bridge CR2 are two nearly identical regulator circuits. Each one uses a three terminal regulator chip to generate the DC supply voltages. C24 is the filter capacitor for the +12 volt supply. One side is connected to U16 (a 78M12 regulator)/the + side of the bridge and the other side is connected to ground. CR4 provides protection for the regulator chip. C20 and C25 are the output capacitors for the +12 volt regulator. The negative side of the bridge is connected to filter capacitors C22 and C23. From the input to U15, the -12 volt circuit is identical to the +12 volt circuit. Note that CR3 on the -12 volt regulator U15 is connected differently.

Compared to the other regulator circuits, the +5 volt supply is a complex assortment of resistors, capacitors, and transistors. However, this circuit will provide a reliable 1.35 amps maximum current. The circuit begins with filter capacitor C12. Connected to C12 is the pass transistor Q1 and its bias resistor R7. Q1 controls the flow of current into the +5 volt line, but the actual job of regulation is performed by U13 (a 723C voltage regulator). The regulator output (pin 10) is buffered by Q2. Then Q2 is used to drive the base of pass transistor Q1.

Figure 7-1 shows a block diagram of the 723 regulator chip. The regulator is powered from the +12 volt supply. In operation, a 7.15 volt zener reference is available at pin 6. Resistors R1 and R3 then divide this reference voltage down to 5 volts, which is connected to pin 5 of the regulator. Pin 5 is the non-inverting input to internal Op-amp Zb (as shown in Figure 7-1). The inverting input is connected through a feed-back resistor (R2) to the +5 volt output. Op-amp Zb is then turned on or off in response to changes on the 5 volt line. C2 is a frequency compensation capacitor for Zb.

The output from Op-amp Ab controls transistor Qa, which drives the regulator output. Qa is also powered from the +12 volt supply. A second control source on Qa is transistor Qb. This transistor allows a current limit to be set by resistors R4 and R5. If the current limit is exceeded, Qb will turn on and turn off Qa.

R6 is a current limiting resistor for the output voltage. Overvoltage protection is provided by CR1, a 6.2V zener diode. C1 is the output filter capacitor for the +5 volt supply.

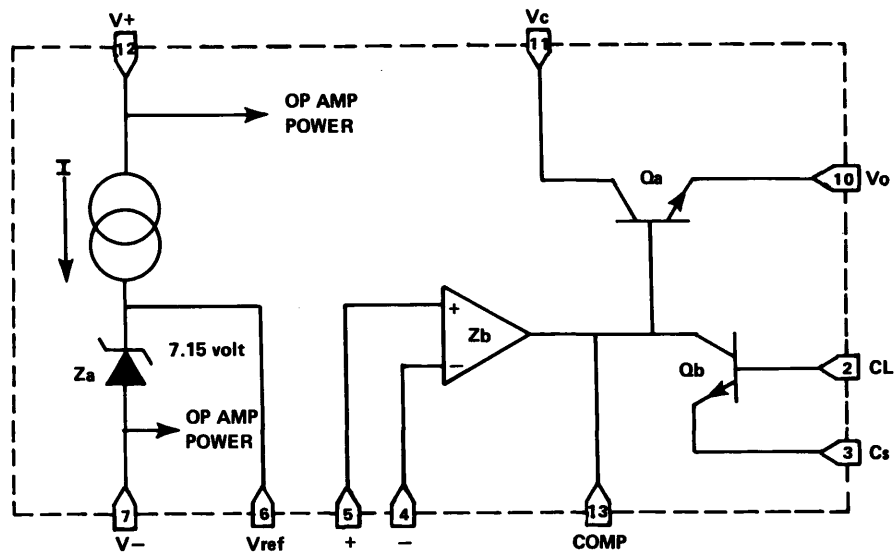


Figure 7-1. 723 Regulator Block Diagram

ADDRESS DECODING

There are two components in the address decoding circuitry of the Multi-Pak Interface. The first is U10, a 74LS30, 8 input NAND gate. The inputs to this NAND gate are the high order address lines. The output will be active (low) whenever any address in the range \$FF00 through \$FFFF is activated. The signal will be referred to as \$FFXX*. The other device in the address decoding section is a Programmable Array Logic (PAL) device, U8. A PAL device is a semi-custom IC which may be programmed for specific functions which would ordinarily take many more TTL packages.

The inputs to the PAL U8 are as follows: \$FFXX*, the low order address lines, CTS*, SLENB*, E, Q, and the R/W* line from the 6809E. CTS* is a device select signal produced by the SAM (when in map type 0), and is active for READ ONLY from any address in the range of \$C000 through \$FEFF. This is the signal used to select the ROM chips in the cartridges. The SLENB* signal is an input to the Color Computer, and is used whenever any external device needs to deselect the mapping signals produced by SAM. E and Q are system clock (synchronization) signals.

The outputs from U8 are LOADREG*, ENREAD*, and ENBUS*. LOADREG* is produced by a write to address \$FF9F, appropriately synchronized with E and Q, and is used to write data into the cartridge select latch (U4). In addition, the first time this signal is active, it will cause the flip-flop U14 to toggle, disabling the slot selection by the switch and enabling slot selection by the select latch. The signal ENREAD* is active whenever the processor reads from address \$FF9F. This signal enables the buffers U3 and part of U7 to allow the software to determine which slot is selected. Prior to writing to \$FF9F, it is possible to read the setting of switch S2. The signal ENBUS* is used to enable the data buffer U2, and is active with CTS*, SLENB*, or during any access in the address range of \$FF40 through \$FF9F.

BUFFERING

The address lines are buffered by U6, U9, and part of U7. These 74LS367s are hex buffers with tri-state outputs. However, the outputs are permanently enabled. All 16 address lines are buffered.

Control signals R/W*, RESET*, CTS*, SCS*, E, and Q are buffered by U1. This is also a 74LS367 with the outputs permanently enabled.

The data bus is buffered by U2, a 74LS245, eight bit bidirectional buffer with three-state outputs. The buffer is enabled by the signal ENBUS* from the address decoding circuitry. The direction is controlled by BR/W* (buffered read/write not). In addition, the outputs of U3 and part of U7 are gated onto the data bus during ENREAD* in order to read the status of the select latch.

SLOT SELECTION

All signals are in parallel to all four of the cartridge slots with the exception of SCS*, CTS*, and CART*. Therefore, these three will be the only ones necessary to route to or from the desired slot. This is done by the position of switch S2 on power up or reset, or by writing to the select latch at address \$FF9F.

SCS* from the Color Computer is used to enable one half of U13, a 74LS139 two-line to four-line decoder. The binary combination of the two select inputs (from the switch or select latch, as appropriate) determines which output of the 74LS139 is active, and therefore which slot gets the SCS*

signal. Note that no output is active unless the original SCS* signal (from the Color Computer) is active.

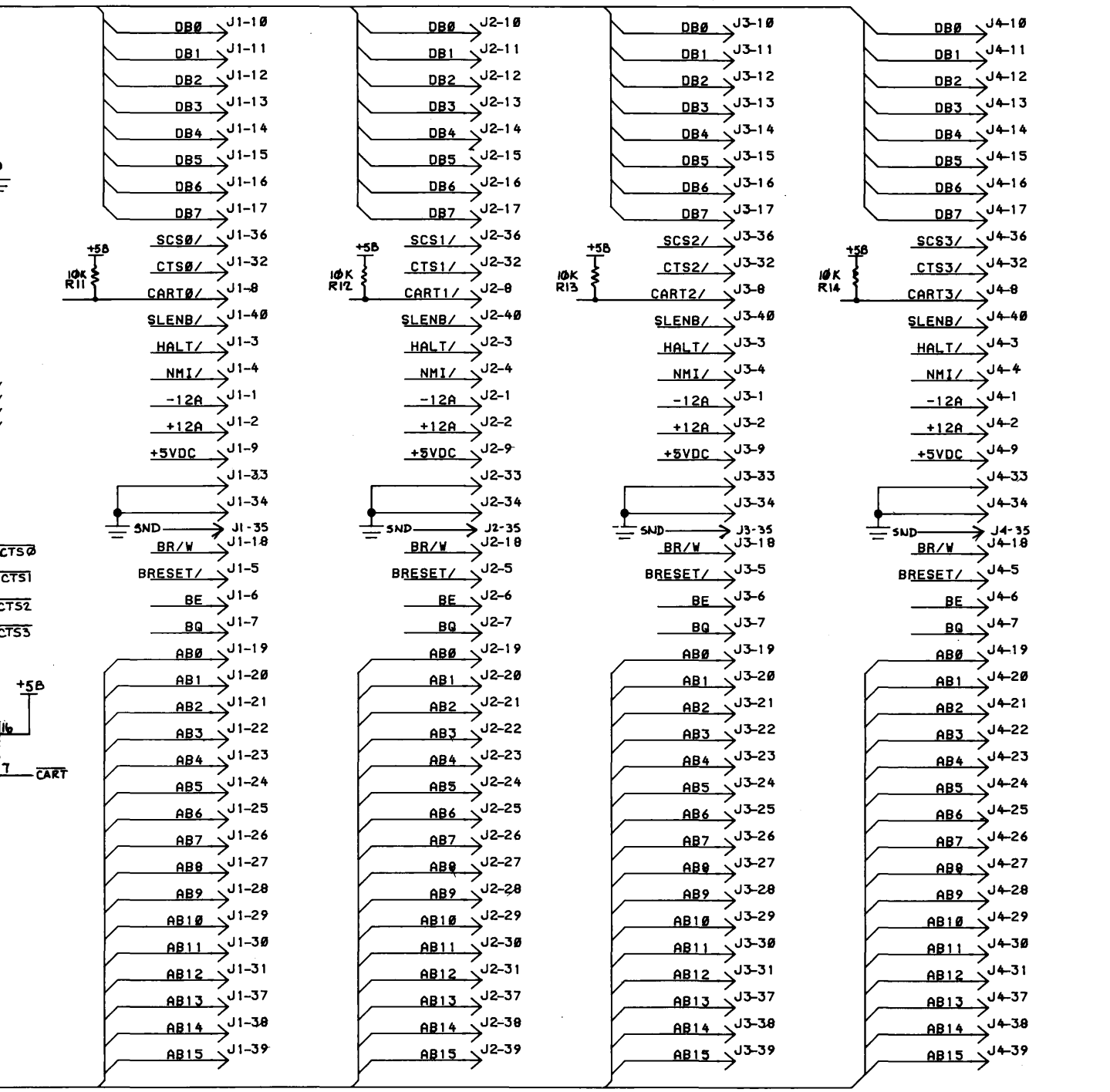
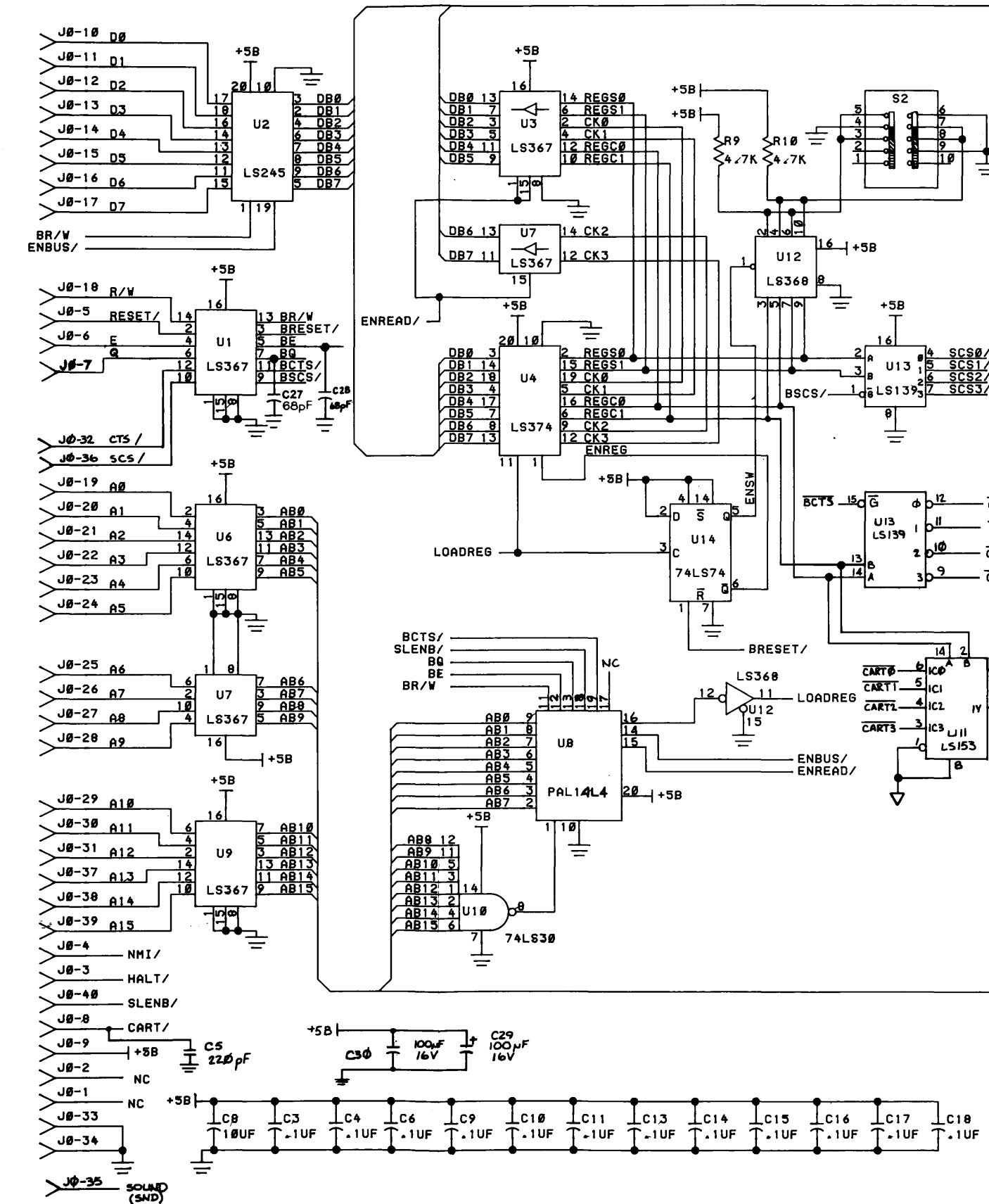
CTS* from the Color Computer is handled similarly by enabling the other half of U13. Again, the inputs come from the switch or select latch as appropriate, and no slot will get a CTS* unless the original CTS* from the Color Computer is active.

U11, a 74LS153, is used to determine which cartridge slot can activate the signal CART* which is an input to the Color Computer. This IC is a four-to-one multiplexer. Only the active slot (selected by the same inputs which determine CTS*) will be allowed to activate CART*.

The select latch, U4, is a 74LS374 eight bit latch with three-state outputs. When \$FF9F is written to, the data is clocked into the latch by the signal LOADREG. This signal also causes flip-flop U14 to toggle, enabling the three-state output of U4 and disabling the three-state outputs of U12, a 74LS368 inverting buffer. The inputs to U12 come from the front panel switch. Thus, the first write into the select latch will disable the front panel switch and enable the select latch. Data bits 0 and 1 are used to determine which slot receives the SCS* signal when active. Data bits 4 and 5 are used to determine which slot receives the CTS* signal when active and also which slot has the ability to toggle CART*. Data bits 2, 3, 6, and 7 perform no hardware function, but may be written into and read back to check the operation of the select latch.

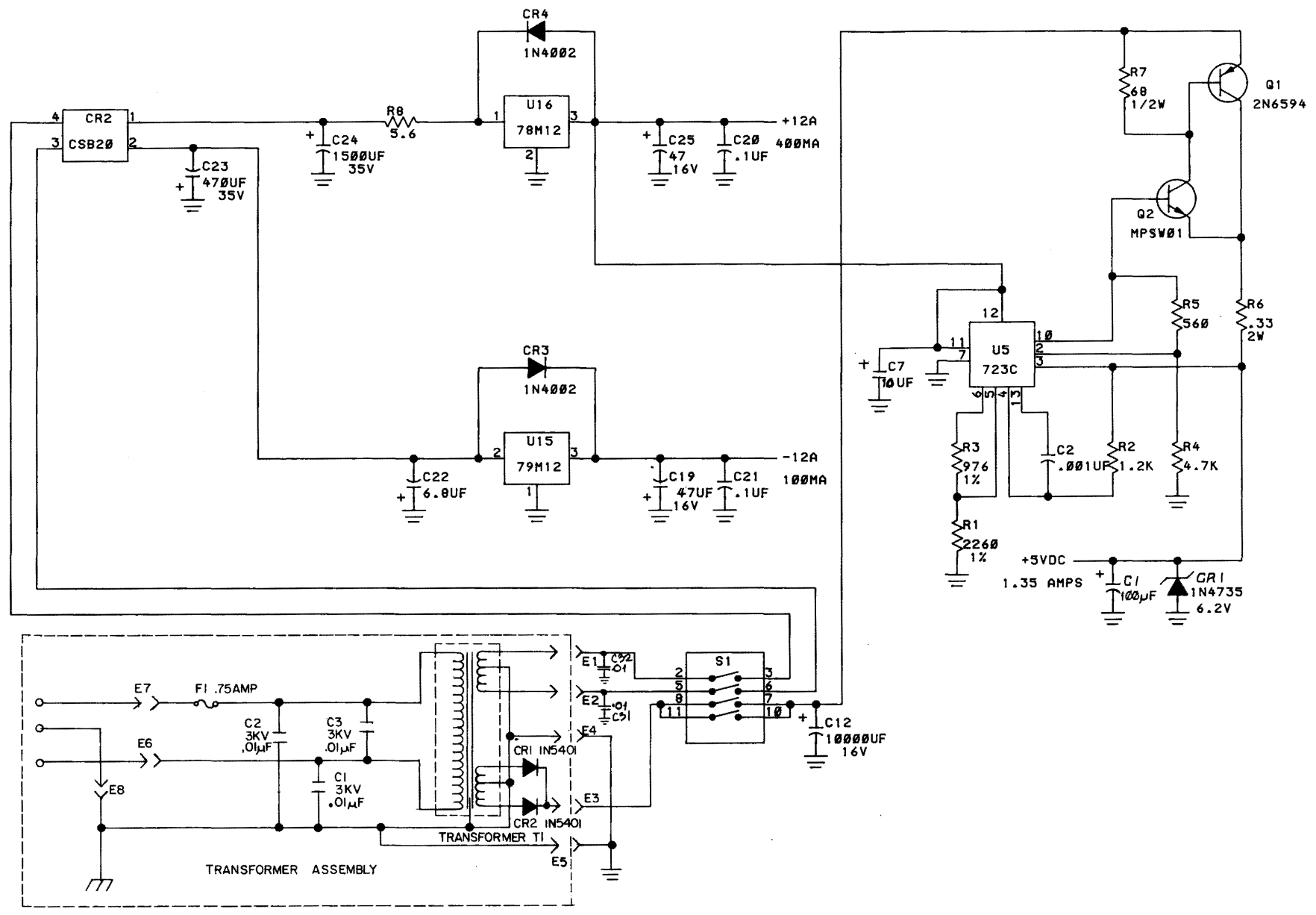
Upon power up or reset, the switch S2 determines which slot will be active. When any portion of this switch is closed, the appropriate node is grounded. When that portion of the switch is open, the same node is pulled up by resistors R9 and R10. The switch is wired to impress a binary code on the input of U12, which is enabled by the ENSW output of flip-flop U14. Once this flip-flop is toggled (by the first write to \$FF9F), the switch is no longer effective until the next power up or reset.

ZONE	LTR.	REVISION DESCRIPTION	DATE	APPROVED
SHEET 2	A	TRANSFORMER ASSEMBLY ADDED	12-18-82	[Signature]
SHEET 2	B	C1 100uF WAS C147uF	12-14-82	[Signature]
RELEASED FOR PRODUCTION			12-14-82	[Signature]



MATERIAL	UNLESS OTHERWISE SPECIFIED	DRAFT	DATE	TITLE
FINISH	TOLERANCES .XX = ±.010 .XXX = ±.005 ANGLES = 21° HOLE DIA TOLERANCES .014 - .250 = +.005 -.001 .251 - .750 = +.008 -.001 .751 - UP = +.015 -.001	CHECK [Signature] DESIGN [Signature] APPD [Signature] APPD [Signature]	DATE 12/18/82 DATE 12/14/82 DATE 12/14/82 DATE 12/14/82	COLOR COMPUTER EXPANSION BOARD
	DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING			
	DO NOT SCALE THIS DRAWING	NEXT ASSY.	USED ON	
				DWG NO. 8000170 SCALE NONE SHEET 1 OF 2 SIZE D

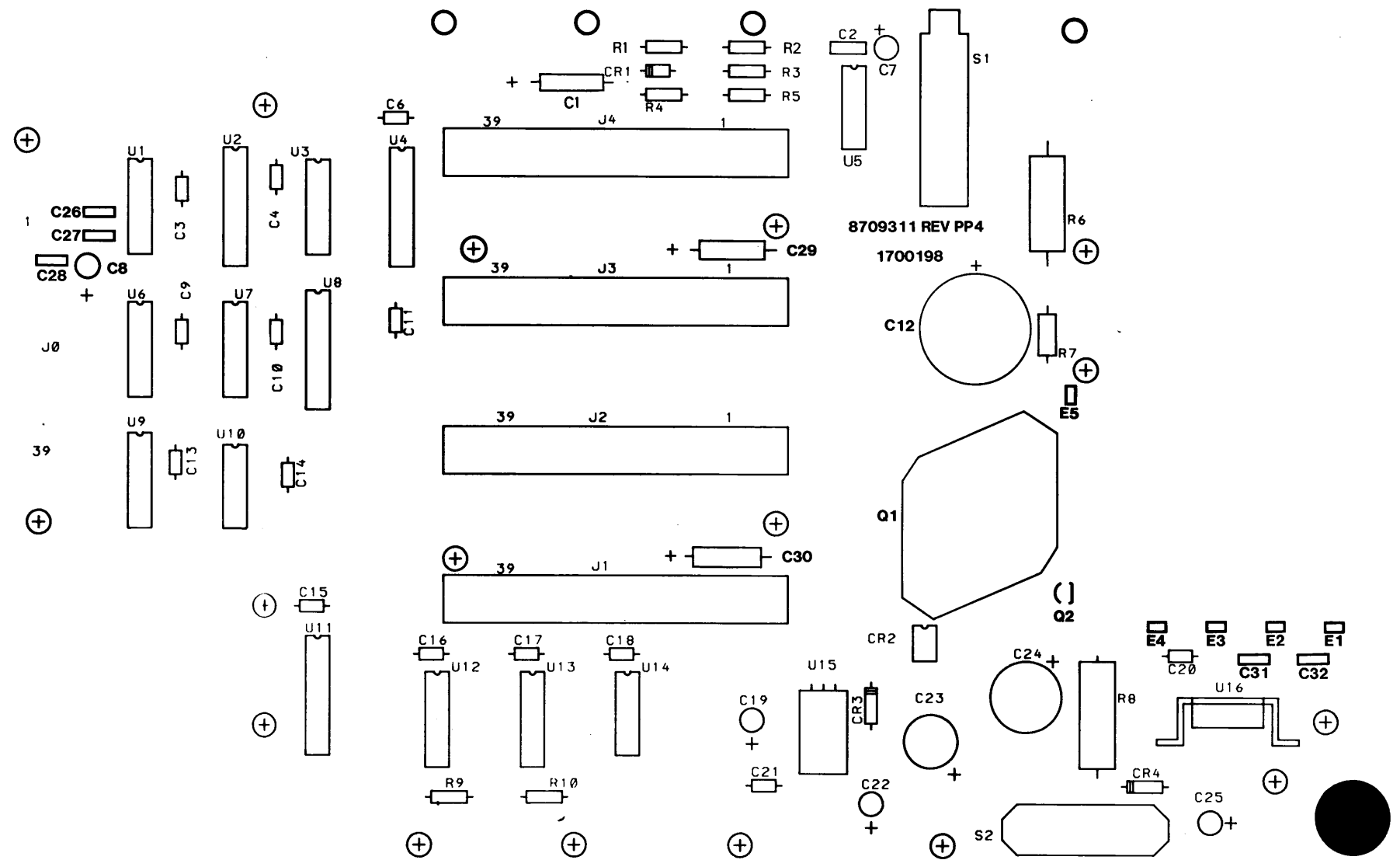




MATERIAL	UNLESS OTHERWISE SPECIFIED			DRAFT	DATE	TITLE	
FINISH	TOLERANCES XX = ± .010 XXX = ± .005 ANGLES = 30°			CHECK	DATE		
	HOLE DIA TOLERANCES .014 - .250 = +.005 - .001			DESIGN	DATE		
	.251 - .750 = +.008 - .001			APPD	DATE		
	.751 - UP = +.015 - .001			APPD	DATE		
	DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING						
	DO NOT SCALE THIS DRAWING		NEXT ASSY.	USED ON			

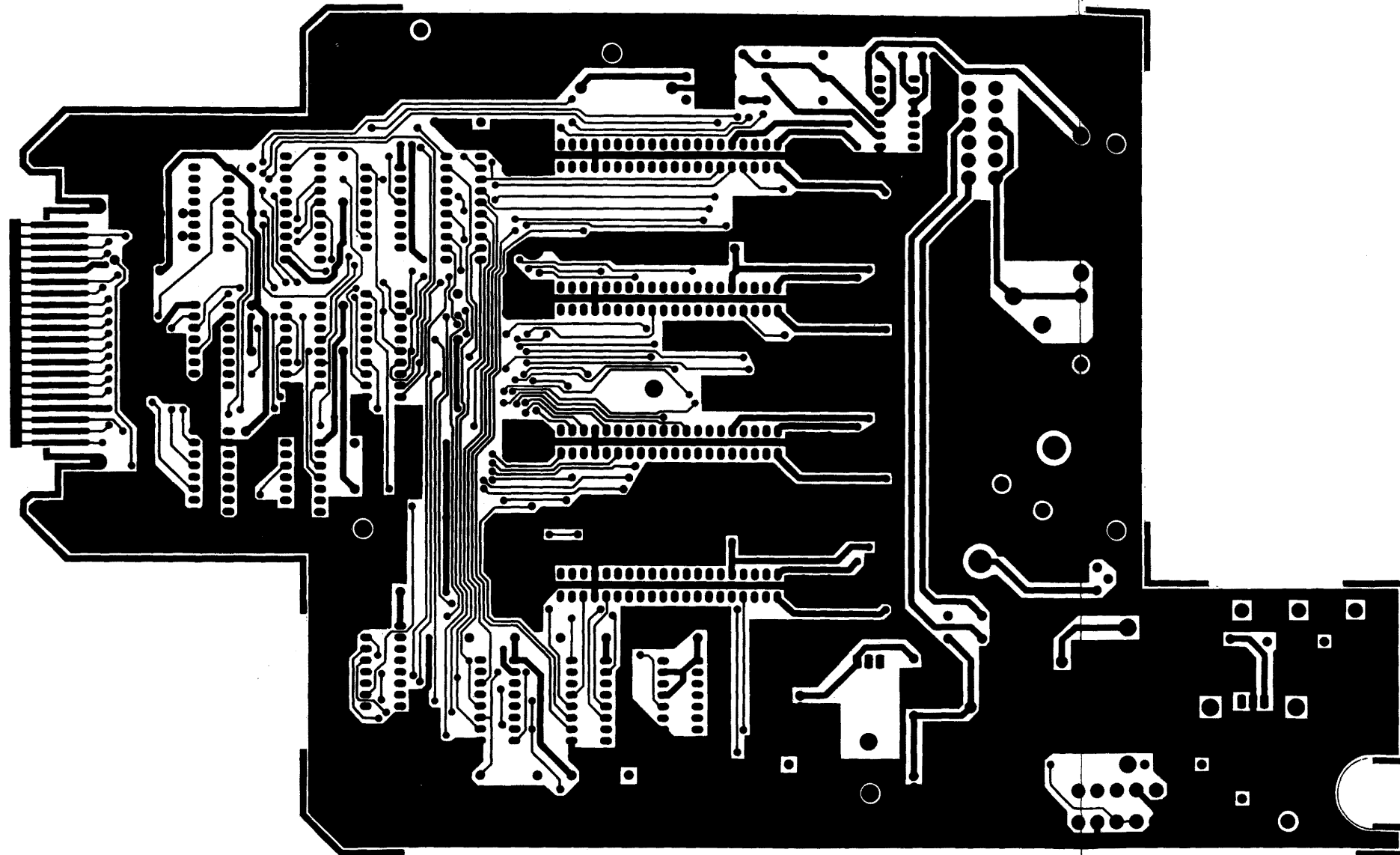


DWG. NO.	B000170	SIZE	
SCALE	SHEET	2	OF
		2	2

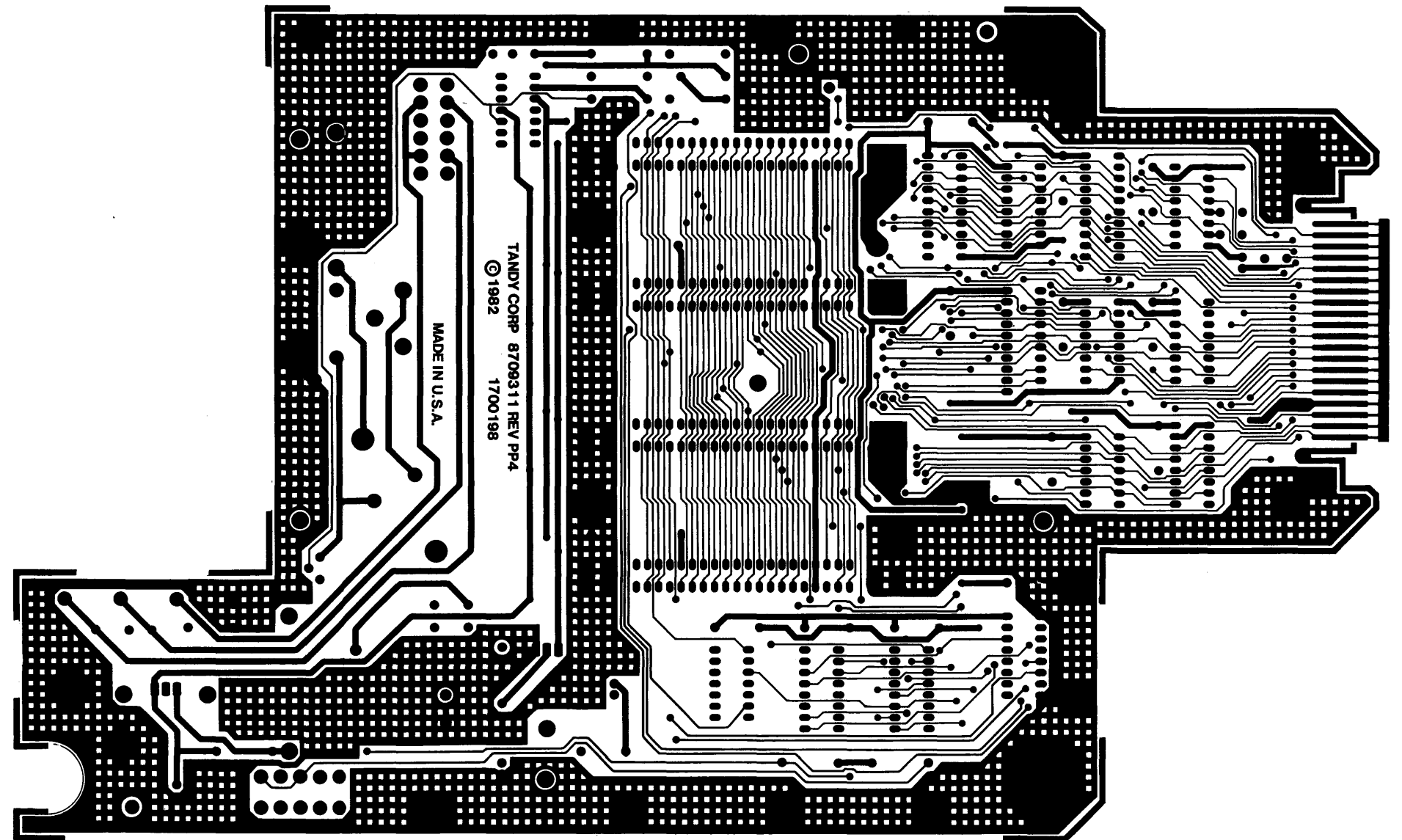


8709311 REV PP4

Component Layout, Main Logic PCB 8857570



Circuit Trace, Main Logic PCB 8857570, Component Side



Circuit Trace, Main Logic PCB 8857570, Solder Side

Main Logic PCB Assembly 8857570, Multi-Pak Interface

Item	Qty	Description	Part No.
1	1	PC Board, Main Logic	8709311
2	1	Socket, 20-Pin (U8)	8509009
3	4	Connector, 40 Pos. Edge Card (J1-J4)	8519165
4	5	Lug, Faston (E1-E5)	8529016
5	1	Switch, DP4T, Select (S2)	8489055
6	1	Switch, 4PDT, Power (S1)	8489002
7	1	Resistor, 68 Ohm, 1/2 Watt 5% (R7)	8217068
8	1	Resistor, 0.33 Ohm, 2 Watt 5% (R6)	8247833
9	1	Resistor, 5.6 Ohm, 3 Watt 5% (R8)	8247756
10	1	Resistor, 560 Ohm, 1/4 Watt 5% (R5)	8207156
11	1	Resistor, 1.2K Ohm, 1/4 Watt 5% (R2)	8207212
12	3	Resistor, 4.7K Ohm, 1/4 Watt 5% (R4,9,10)	8207247
13	4	Resistor, 10K Ohm, 1/4 Watt 5% (R11-14)	8207310
14	1	Resistor, 976 Ohm, 1/4 Watt 1% (R3)	8200198
15	1	Resistor, 2.26K Ohm, 1/4 Watt 1% (R1)	8200222
16	14	Capacitor, 0.1 ufd, 50V (C3,4,6,9,10,11, 13-18,20,21)	8374104
17	2	Capacitor, 0.01 ufd, Cer. Disk (C30,31)	8303104
18	1	Capacitor, 0.001 ufd, 50V Cer. Disk (C2)	8302104
19	2	Capacitor, 10 ufd, 25V Elec. (C7,8)	8326102
20	1	Capacitor, 6.8 ufd, 16V Low Lkg. (C22)	8395661
21	2	Capacitor, 47 ufd, 16V Elec. (C19,25)	8326471
22	3	Capacitor, 100 ufd, 10V Elec. (C1,28,29)	8317100
23	1	Capacitor, 470 ufd, 35V Elec. (C23)	8327473
24	1	Capacitor, 1500 ufd, 35V Elec. (C24)	8328153
25	1	Capacitor, 10K ufd, 16V Elec. (C12)	8328101
26	2	Capacitor, 68 pfd, 50V Cer. Disk (C26,27)	8300684
27	1	Capacitor, 220 pfd, 50V Cer. Disk (C5)	8301223
28	2	Diode, IN4002RL (CR3,4)	8150002
29	1	Diode, Zener, IN4735 6.2V (CR1)	8150735
30	1	Diode, VM-28 Bridge Rectifier (CR2) 4-Pin	8160028
31	1	Transistor, MPSW01 NPN (Q2)	8110001
32	1	Transistor, 2N6594 PNP (Q1)	8100594
33	1	Heat Sink (Ref 2N6594, Q1)	8549016
34	1	Heat Sink (Ref. 78M12, U16)	8549017
35	1	IC, 74LS30, Positive NAND (U10) 14-Pin	8020030
36	1	IC, 74LS74, Dual Flip-Flop (U14) 14-Pin	8020074
37	1	IC, 74LS139, Dual Decoder (U13) 16-Pin	8020139
38	1	IC, 74LS153, Multiplexer (U11) 16-Pin	8020153
39	1	IC, 74LS245, Octal Bus (U2) 20-Pin	8020245
40	5	IC, 74LS367, Hex Bus Driver (U1,3,6,7,9)	8020367
41	1	IC, 74LS368, Hex Bus Driver (U12) 16-Pin	8020368
42	1	IC, 74LS374, Octal Flip-Flop (U4) 20-Pin	8020374

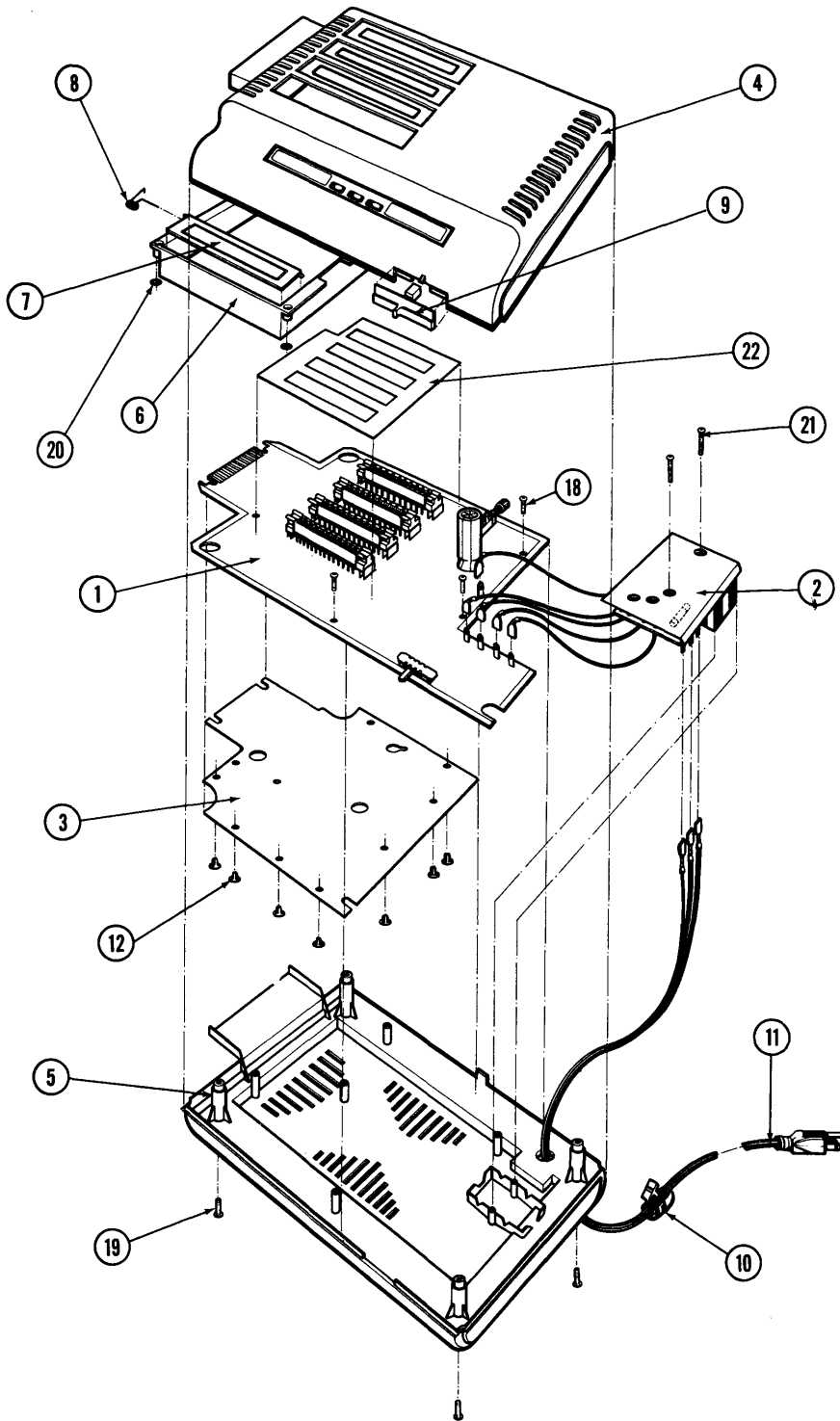
Main Logic PCB Assembly 8857570, Multi-Pak Interface
(con't)

Item	Qty	Description	Part No.
43	1	IC, MC1723, +5V Reg. Adj. 1% (U5) 14-Pin	8051723
44	1	IC, 78M12, +12V Reg. 500 ma (U16)	8050812
45	1	IC, 79M12, -12V Reg. 500 ma (U15)	8050912
46	1	IC, PAL14L4, Logic Array (U8)	8075144
47	2	Screw, #4-40 x 3/8" (for U15,16)	8569082
48	2	Nut, #4 KEPS (for U15,16)	8579003
49	2	Nut, #6 KEPS (for Q1)	8579004

Note: This PCB composed of 8857569 PCB Subassembly & PAL14L4 (Item 46)

Power Supply PCB 8857252

Item	Qty	Description	Part No.
1	2	Diode, 1N5401 (CR1,2)	8160401
2	3	Capacitor, 0.01 ufd, 3KV Cer. (C1,2,3)	8303108
3	1	Fuse, .75 A @ 250 V (F1)	8479012
4	3	Lug, Fast-On	8529016
5	3	Tubing, Air Shrink	8539017
6	5	Cable, Transformer Jumper	8709158
7	1	PCB, Power Supply	8709284
8	1	Transformer, Power Supply	8790020
9	1	Insulator	8539021
10	1	Label, Power Supply	8789745



Exploded View, Multi-Pak Interface Module 2603024

8/ Exploded View/Parts List

Multi-Pak Interface Module 2603024, Color Computer

Item	Qty	Description	Part No.
1	1	PCB Assembly, Main Logic	8857570
2	1	PCB Assembly, Power Supply	8857252
3	1	Shield, RFI Mylar	8729173
4	1	Case, Top	8719273
5	1	Case, Bottom	8719272
6	1	Guide, Cartridge	8719269
7	4	Door	8719271
8	4	Spring, Door	8739011
9	1	Switch Cap	8719270
10	1	Strain Relief	8559025
11	1	Cord, Power	8709150
12	19	Tri Mount	8559023
13	4	Feet, Rubber	8719123
14	1	Label, Serial/UL	8789826
15	1	Label, PCB Serial	8789827
16	1	Logo	8789828
17	8	Clip, RFI	8729172
18	4	Screw, #6-19 x 1/4" (PCB Mounting)	8569077
19	4	Screw, #6-19 x 1" (Case Top to Bottom)	8569156
20	4	Retainer, Shaft (Cartridge Guide)	8559043
21	2	Screw, #6 x 1-1/2" (Power Supply Tie Dn)	8569086
22	1	Overlay, PCB	8539033

RADIO SHACK, A DIVISION OF TANDY CORPORATION

**U.S.A.: FORT WORTH, TEXAS 76102
CANADA: BARRIE, ONTARIO L4M 4W5**

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