

**SERVICE MANUAL**  
**MODEL C16 COMPUTER**  
**OCT. 1984      PN-314001-03**

 **commodore**  
COMPUTERS

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**MODEL C16 COMPUTER**  
**OCT. 1984      PN-314001-03**

**Commodore Business Machines, Inc.**  
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## **C16 PRODUCT SPECIFICATION**

### **MEMORY**

16K RAM Standard

### **ROM**

32K ROM Standard (includes operating system and BASIC interpreter).

### **MICROPROCESSOR**

7501/8501 Microprocessor with a two speed clock (.89 or 1.76 MHz).

### **DISPLAY**

40 Columns x 25 lines of text.

### **COLORS**

121 Colors (15 colors; 8 luminance levels and Black).

### **CHARACTERS**

Upper & lower case letters, numerals and symbols. Reverse and flashing characters. All PET graphic characters.

### **DISPLAY MODES**

Text characters. High resolution graphics. Split screen text/high resolution graphics. MultiColor graphics. Split screen/multi-color graphics.

### **RESOLUTION**

320 x 200 Pixels

### **SOUND**

2 Tone generators or 1 Tone and 1 noise generator.

### **VOLUME**

8 Volume levels

### **KEYBOARD**

Full size/full stroke C64 style design.

### **KEYS**

66 Keys total. 4 Cursor control keys. 4 Function keys (up to 8 user defined/programmable functions possible). Color control keys. HELP key. Upper and lower case character set.

### **INPUTS/OUTPUTS**

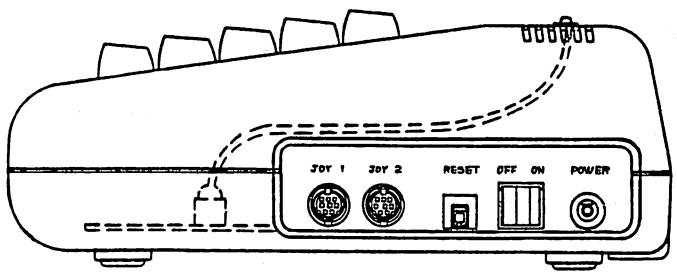
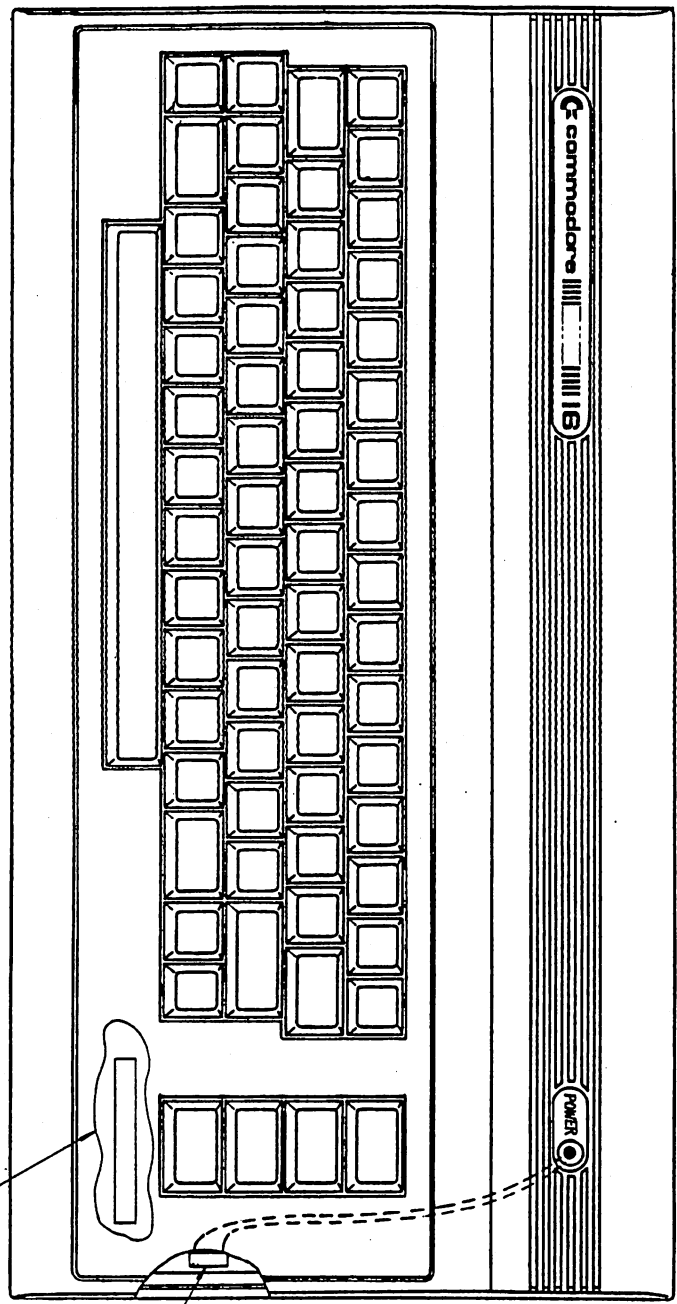
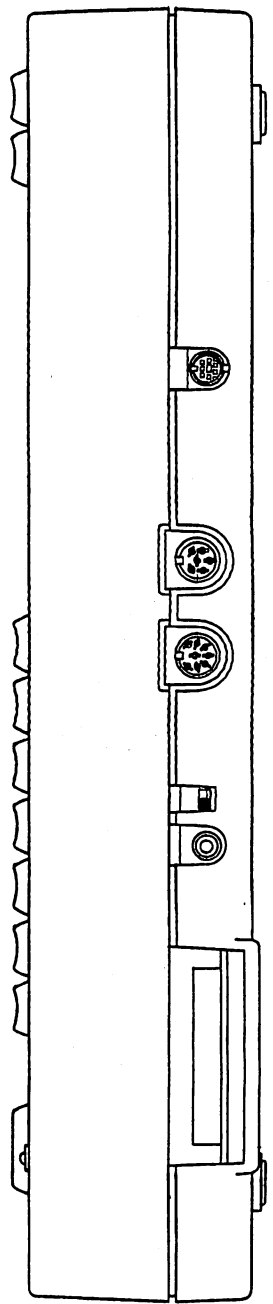
Serial port. ROM cartridge and parallel disk drive port. 2 Joystick ports. C1531 Cassette drive interface port. RF Output — channel 3 or 4. Video output — composite/chrominance/luminance, audio input/output. Power supply input.

## **FEATURES**

Built-in BASIC 3.5 — over 100 commands, statements and functions. Built-in Machine Language Monitor — over 12 commands. Built-in graphics and sound commands. Screen window capability. Extended screen editor.

## **PERIPHERALS**

C1541 Disk drive, C1551 Fast Disk Drive, C1531 Datasette, MPS 802 Dot matrix printer, MPS 803 Dot matrix printer, DPS 1101 Daisy wheel printer, C1520 Plotter/Printer, C1802/1803 Color monitor, C1702 Color monitor.



20-PIN CONNECTOR  
FROM KEYBOARD  
CN2 REF.

3 PIN CONNECTOR  
FROM LED LAMP  
CN9 REF.

C-16 Casework Identification

**PARTS LIST**  
**C-16**

**TOP CASE ASSY**

Top Case	C 251813-01
Keyboard, 66 Key	C 251798-01
LED Plate	C 326160-02
Nameplate	C 251794-01
Lamp Holder Set	C 903820-03
LED Assembly	C 1001039-01

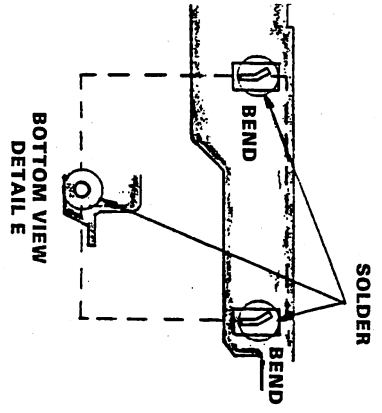
**BOTTOM CASE ASSY**

Bottom Case	C 251790-01
Foot, Self-Adhesive	C 950157-04
PCB Shield Plate, top	C 251795-01
PCB Shield Plate, bottom	C 251796-01
PCB Insulation Sheet	C 251797-01

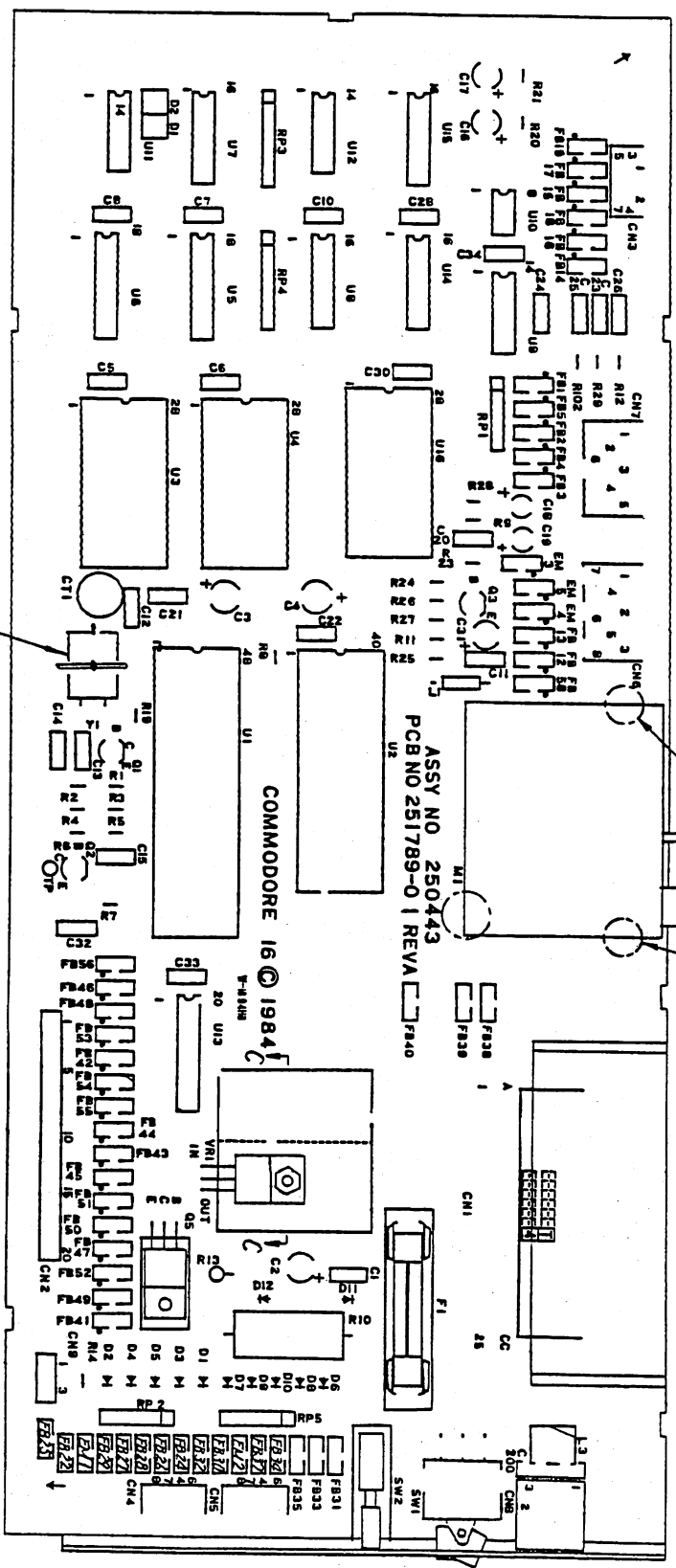
**ACCESSORIES**

Users Manual	C 251799-01
Power Supply	C 251539
RF Cable	C 326189-02
Switch Box	C 904778-01

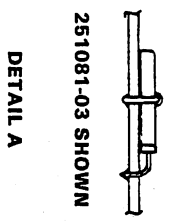
C — Indicates Commodore Stock Part



SEE DETAIL E  
FOR -01 TO -03



SEE DETAIL A



C-16 PCB Assembly



## PARTS LIST — C-16 PCB ASSEMBLY #250443-01

**PLEASE NOTE:** Commodore part numbers are provided for reference only and do not indicate the availability of parts from Commodore. Industry standard parts (Resistors, Capacitors, Connectors) should be secured locally. Approved cross-reference for TTL chips, Transistors, etc., will be available in manual form through the Service Department in November of 1984. Unique or non-standard parts will be stocked by Commodore and are indicated on the parts list by a "C".

INTEGRATED CIRCUITS				RESISTORS (Continued)			
U1	IC 7360 VSLI, Text Display (TED)	C 251535-01		R5	18K	R20	47K
	Sub: IC8360	C 251535-02		R6	1.5K	R21	100K
U2	IC 7501 Custom Microprocessor	C 251536-01		R7	470K	R23	10K
				R8	1K	R24	1K
U3	IC 23128 ROM TED Basic	C 318006-01		R9	12K	R25	100K
				R10	Wound 20K 5W, 10%	R26	240K
U4	IC 23128 ROM TED Kernal	C 318005-05		R11	10K	R27	240K
	Sub: IC23128	C 318005-04		R12	3.3K	R28	1K
U5,U6	IC D-RAM 16 x 4	251538-02		R13	470K	R29	100K
U7,U8	IC 74LS257	901521-57		R14	470K	R102	330K
U9	IC 7406	901522-06		<b>RESISTOR PACK</b>			
U10	IC 555	901523-01		RP1	1K 6 PIN 0.19W 2%	902441-22	
U11	IC 74LS125	901521-20		RP2	3.3K 6 PIN 0.19W 2%	902441-29	
U12	IC 74LS02	901521-21		RP3	68K 8 PIN	326149-06	
U13	IC 6529B Single Port Interface	C 251640-03		RP4	68K 8 PIN	326149-06	
				RP5	3.3K 6 PIN 0.19W 2%	902441-29	
U14	IC 74LS139	901521-18		<b>CAPACITORS</b>			
U15	IC 74LS175	901521-34		C1	Elect 1 $\mu$ F 25V	900100-32	
U16	IC 7700-010 PLA	C 251641-02		C2	Elect 47 $\mu$ F 25V	900100-33	
<b>TRANSISTORS</b>				C3	Elect 10 $\mu$ F 25V	900100-01	
Q1	2SC 1815	902693-01		C4	Elect 10 $\mu$ F 25V	900100-01	
Q2	2SC 1815			C5	Ceramic 0.1 $\mu$ F 25V	251075-06	
Q3	2SC 1815			C6	Ceramic 0.1 $\mu$ F 25V	251075-06	
Q5	2SD 880	902694-01		C7	Ceramic 0.22 $\mu$ F 25V	251075-07	
<b>DIODES</b>				C8	Ceramic 0.22 $\mu$ F 25V	251075-07	
D1—D10	IN914B FORMING	251819-16		C10	Ceramic 0.1 $\mu$ F 25V	251075-06	
	Sub:			C11	Ceramic 0.1 $\mu$ F 25V	251075-06	
	15953(3) FORMING	251819-07		C12	Ceramic 22 pF 50V	251070-14	
D11	IN4001	900750-01		C13	Ceramic 220 pF 50V	251071-26	
D12	ZENER RD 6.8EB	900927-01		C14	Ceramic 150 pF 50V	251071-24	
	Sub: ZENER IN754A	900927-02		C15	Ceramic 0.01 pF 25V	251075-01	
<b>RESISTORS</b> — All values are in ohms-1/4 W 5%, Carbon Comp - Forming Typ, unless noted otherwise.				C16	Elect 10 $\mu$ F 25V	900100-01	
R1	10K	R3	470K	C17	Elect 1 $\mu$ F 16V	900100-16	
R2	4.7K	R4	220K	C18	Elect 10 $\mu$ F 25V	900100-01	
				C19	Elect 10 $\mu$ F 25V	900100-01	
				C20	Ceramic 0.01 $\mu$ F 25V	251075-01	
				C21	Ceramic 0.1 $\mu$ F 25V	251075-06	
				C22	Ceramic 0.1 $\mu$ F 25V	251075-06	

C — Commodore Stock Item

**PART LIST — C16 PCB ASSEMBLY # 250443-01 (Continued)**

<b>CAPACITORS (Continued)</b>		<b>MISCELLANEOUS (Continued)</b>	
C23	Ceramic 470 pF 50V 251071-30		
C24	Ceramic 470 pF 50V 251071-30		
C25	Ceramic 470 pF 50V 250171-30		
C26	Ceramic 0.1 $\mu$ F 25V 251075-06		
C28	Ceramic 0.1 $\mu$ F 25V 251075-06		
C30	Ceramic 0.1 $\mu$ F 25V 251075-06		
C31	Elect 10 $\mu$ F 25V 900100-01		
C32	Ceramic 0.1 $\mu$ F 25V 251075-06		
C33	Ceramic 0.1 $\mu$ F 25V 251075-06		
C34	Ceramic 0.1 $\mu$ F 25V 251075-06		
C200	Ceramic .22 $\mu$ F 25V 251075-07		
CT1	Capacitor, Trimmer 251029-02		
<b>MISCELLANEOUS</b>		<b>CONNECTORS</b>	
Y1	Crystal 14.31818 MHZ — CL = 32 pF 251081-03 Sub: Crystal 14.31818 MHZ 251081-01	M1	Cartridge Guide C 310171-01 Connector Panel 251791-01 RF Modulator C 251844-01
L1	Coil Inductor 1.2 $\mu$ H 325570-01	FB1-5, FB12-19 FB22, FB24-35 FB37-56, FB58	Ferrite Bead 325563-01
L3	Line Filter 251701-01	EM1-5	EMI Filter 251842-01
SW1	Switch, Rocker (PC Mount) C 251587-01		
SW2	Switch, Push Button C 251260-01		
VR1	Voltage Regulator 7805 901527-02		
F1	Fuse, Normal BLOW 250V 1.5A 903556-18		
F1	Fuse, Clip 906102-01		
		CN1	Connector, 50 PIN Female Edge, Expan. Gold Plated 251630-02
		CN2	Header Pin, 20 PIN, Keyboard 903364-01
		CN3	Connector, 7 PIN MINI DIN, Cassette C 251616-01
		CN4	Connector, 8 PIN MINI DIN, Joy 0 Joy 1 C 251259-01
		CN5	Connector, 8 PIN MINI DIN, Joy 0 Joy 1 C 251259-01
		CN6	Connector, 8 PIN DIN, Audio/Video C 325573-01
		CN7	Connector, 6 PIN DIN, Serial Bus C 903361-01
		CN8	Connector Jack, DC Power, Power C 251263-01
		CN9	Header Assembly, 3 PIN, LED 903332-03

C — Commodore Stock Item

**PIN  
ASSIGNMENT**

A2	1	48	-A3
A1	2	47	-A4
A0	3	46	-A5
VDD	4	45	-A6
CS0	5	44	-A7
CS1	6	43	-A8
R/W	7	42	-A9
IRQ	8	41	-A10
MUX	9	40	-A11
RAS	10	39	-A12
CAS	11	38	-A13
$\phi$	12	37	-A14
COLOR	13	36	-A15
CLK IN	14	35	-AEC
K0	15	34	-BA
K1	16	33	-SND
K2	17	32	-D7
K3	18	31	-D6
K4	19	30	-D5
K5	20	29	-D4
K6	21	28	-D3
K7	22	27	-D2
SYNC	23	26	-D1
VSS	24	25	-D0

**U1-251535-01  
VLSI, TEXT DISPLAY  
(TED)**

**PIN  
ASSIGNMENT**

$\phi$ OIN	1	40	-RES
RDY	2	39	-R/W
IRQ	3	38	-D0
AEC	4	37	-D1
VCC	5	36	-D2
A0	6	35	-D3
A1	7	34	-D4
A2	8	33	-D5
A3	9	32	-D6
A4	10	31	-D7
A5	11	30	-P0
A6	12	29	-P1
A7	13	28	-P2
A8	14	27	-P3
A9	15	26	-P4
A10	16	25	-P5
A11	17	24	-P6
A12	18	23	-GATE IN
A13	19	22	-A15
GND	20	21	-A14

**U2-251536-01  
CUSTOM MICROPROCESSOR**

**PIN  
ASSIGNMENT**

ENABLE	1	18	-VSS
D0	2	17	-D3
D1	3	16	-CAS
WE	4	15	-D2
RAS	5	14	-A0
A6	6	13	-A1
A5	7	12	-A2
A4	8	11	-A3
VDD	9	10	-A7

**U5-U6 16 X 4 D-RAM**

**PIN  
CONFIGURATION**

NC	1	28	-VCC
A12	2	27	-CS <sub>3</sub>
A7	3	26	-A13
A6	4	25	-A8
A5	5	24	-A9
A4	6	23	-A11
A3	7	22	-CS <sub>1</sub>
A2	8	21	-A10
A1	9	20	-CS <sub>2</sub>
A0	10	19	-D8
D1	11	18	-D7
D2	12	17	-D6
D3	13	16	-D5
GND	14	15	-D4

**U3-318006-01  
ROM TED - BASIC**

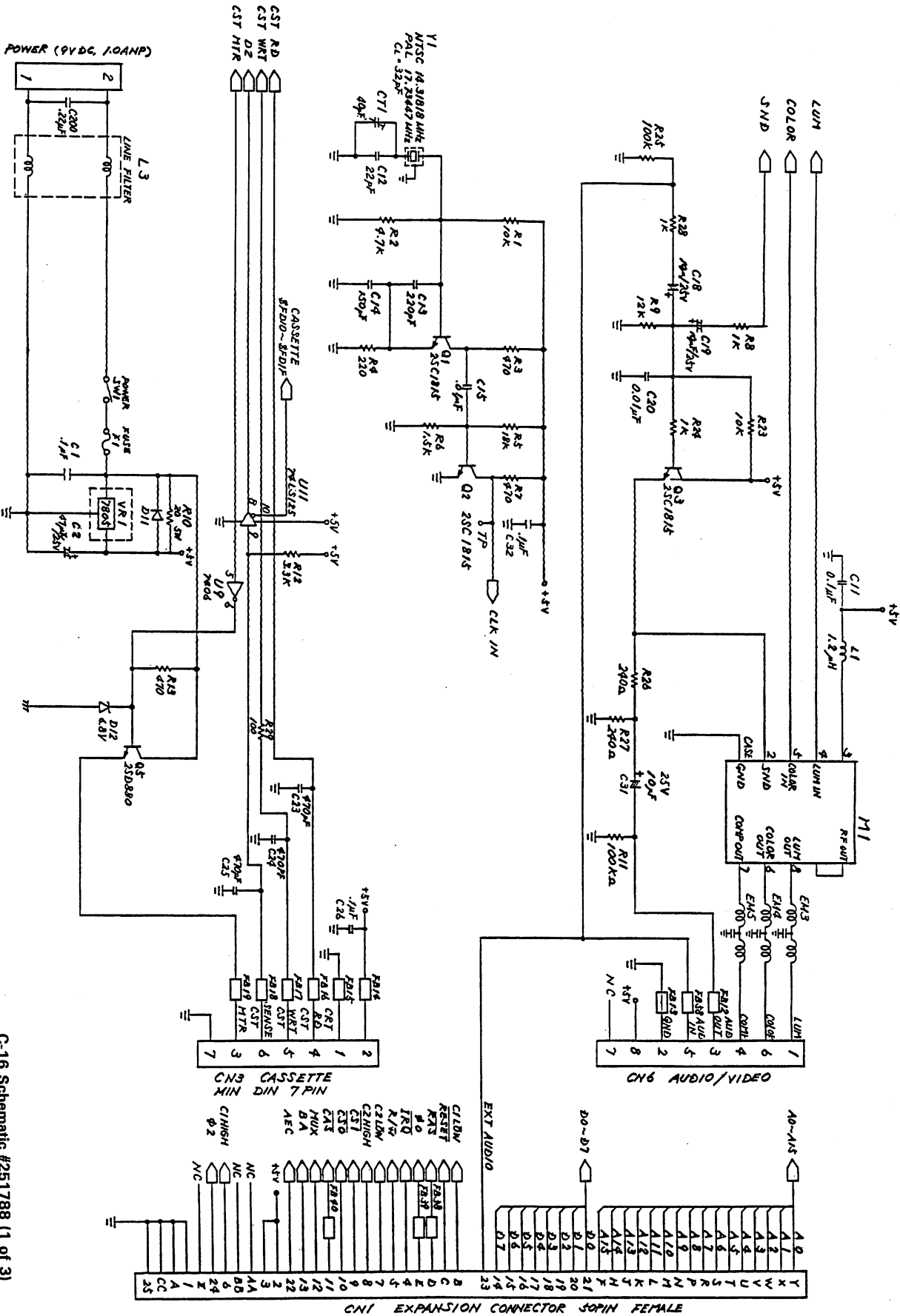
**PIN  
CONFIGURATION**

NC	1	28	-VCC
A12	2	27	-CS <sub>3</sub>
A7	3	26	-A13
A6	4	25	-A8
A5	5	24	-A9
A4	6	23	-A11
A3	7	22	-CS <sub>1</sub>
A2	8	21	-A10
A1	9	20	-CS <sub>2</sub>
A0	10	19	-D8
D1	11	18	-D7
D2	12	17	-D6
D3	13	16	-D5
GND	14	15	-D4

**U4-318005-04  
ROM TED - KERNAL**

PART NO.	SUGGESTED SOURCE OF SUPPLY	VENDOR PART NO.	ACCESS TIME FROM RAS TRAC (ns)	RANDOM READ/ WRITE CYCLE TIME TRACT (ns)
251538-02	TEXAS INSTRUMENT	TMS4416-15	150	260
-02	FUJITSU	MB81416-15	150	260
-02	MITSUBISHI	M5M4416P-15	150	260
-02	HITACHI	HM48416AP-15	150	260

CN8 POWER (9VDC, 10AMP)



C-16 Schematic #251788 (1 of 3)

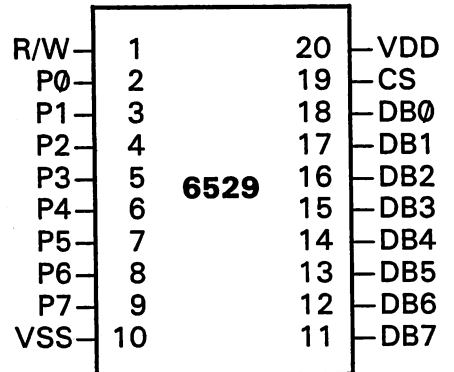




CS	R/W	D0-D7
L	L	DATA BUS TO PORT
L	H	PORT TO DATA BUS
H	X	ISOLATION

L = LOW LEVEL  
H = HIGH LEVEL  
X = IRREVELANT

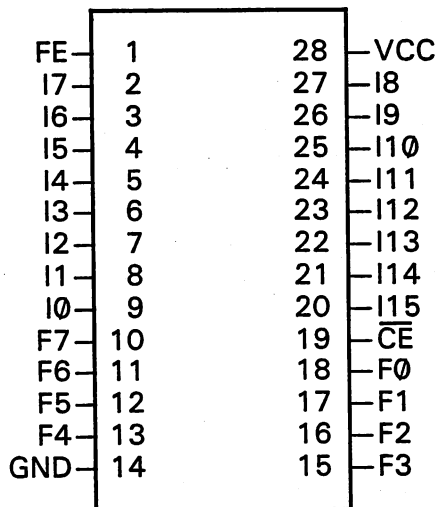
### PIN CONFIGURATION



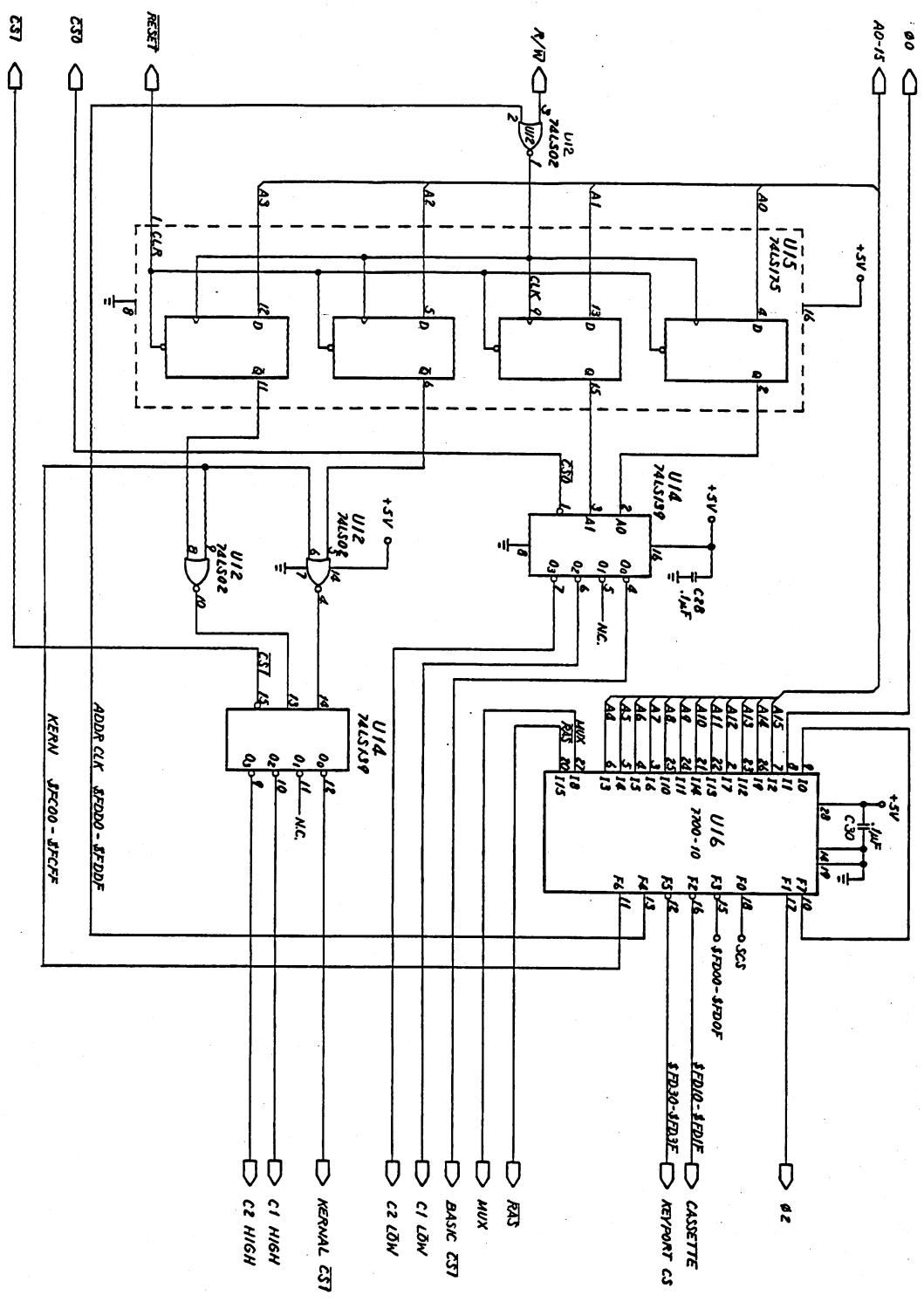
**U13-251640-03  
SINGLE-PORT INTERFACE**

MOS	6529B	3 MHZ
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### PIN CONFIGURATION



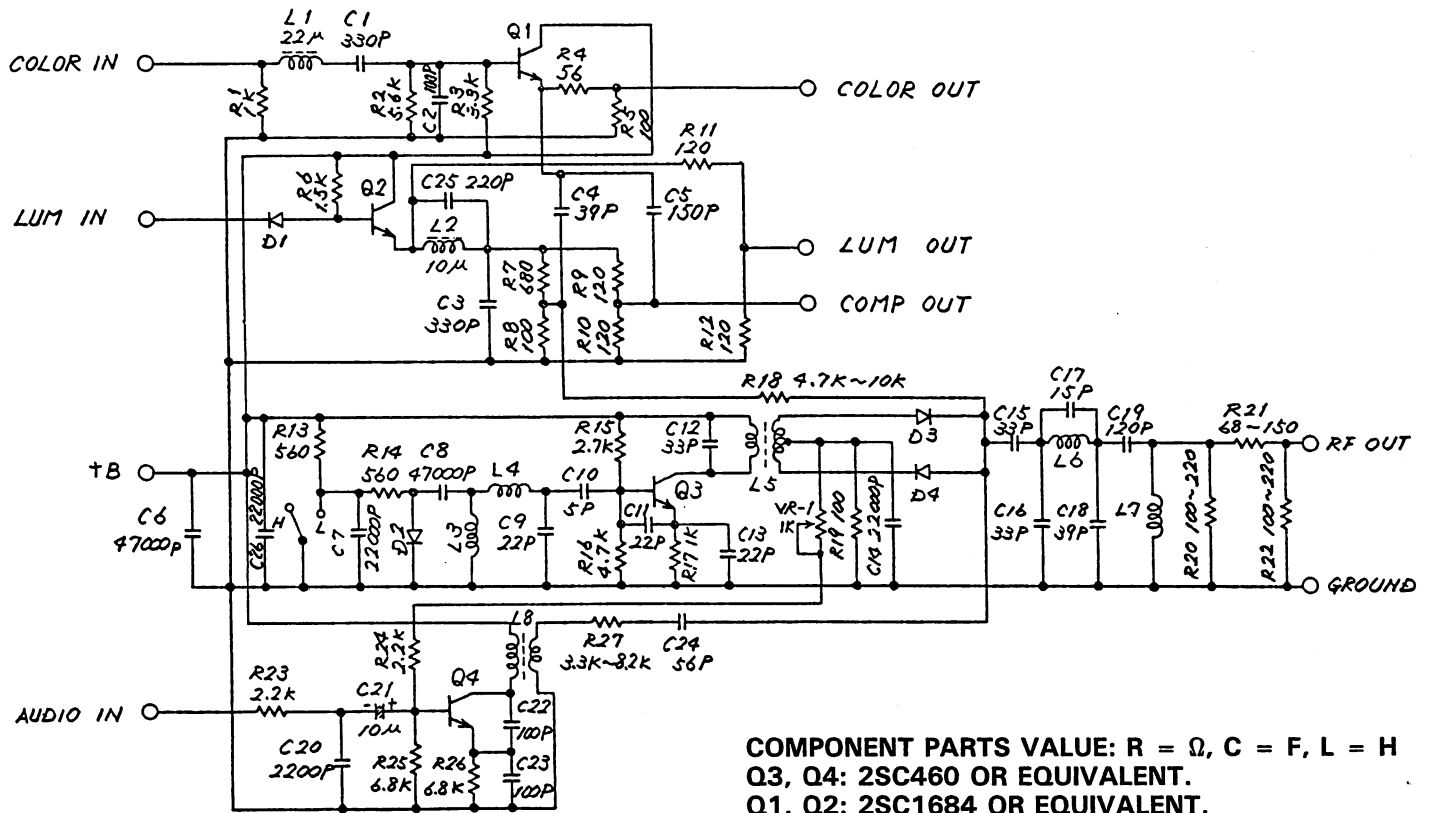
**U16-251641-02  
PLA**



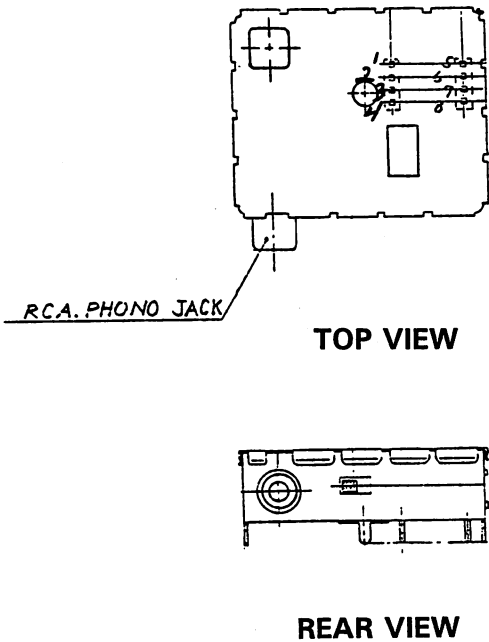
1. ALL RESISTANCE VALUES IN OHMS, 1/4W ± 5%.  
 NOTES: UNLESS OTHERWISE SPECIFIED —

C-16 Schematic #251788 (3 of 3)





COMPONENT PARTS VALUE: R =  $\Omega$ , C = F, L = H  
 Q3, Q4: 2SC460 OR EQUIVALENT.  
 Q1, Q2: 2SC1684 OR EQUIVALENT.  
 D3, D4: 1SS198 OR EQUIVALENT.  
 D2 : 1SS110 OR EQUIVALENT.  
 D1 : 1SS119 OR EQUIVALENT.



NO.	TERMINALS
1	N.C.
2	AUDIO SIG. INPUT
3	+B (+5V)
4	SYNC + LUM. SIG. INPUT
5	COLOR SIG. INPUT
6	COLOR SIG. OUTPUT
7	COMPO. SIG. OUTPUT
8	SYNC + LUM. SIG. OUTPUT
9	RF OUTPUT
10	CHANNEL SELECT SW.

RF Modulator Layout and Schematic #251844

Date: \_\_\_\_\_

Manual Name: \_\_\_\_\_

Part Number: \_\_\_\_\_

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**Service Documentation**

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