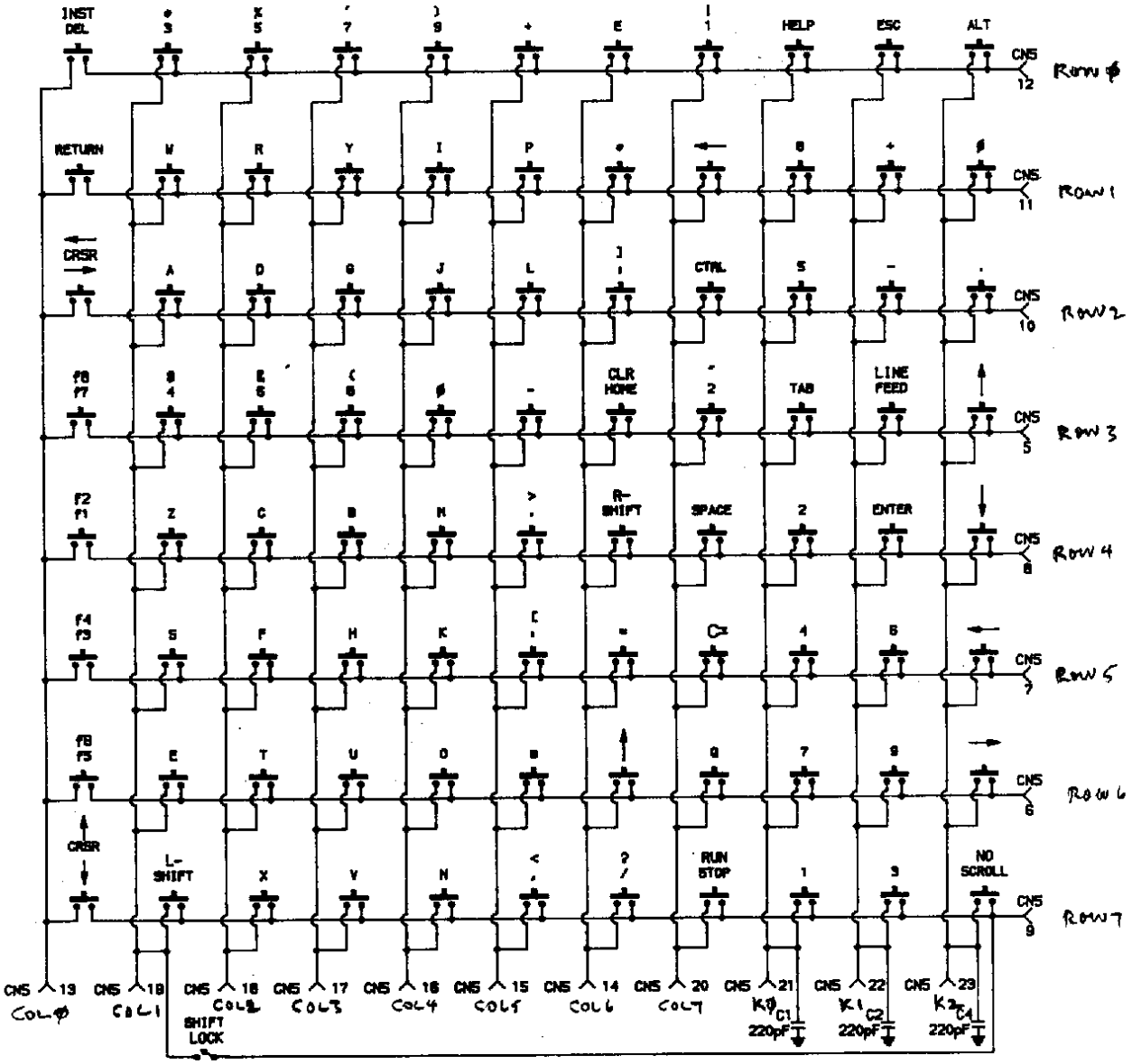
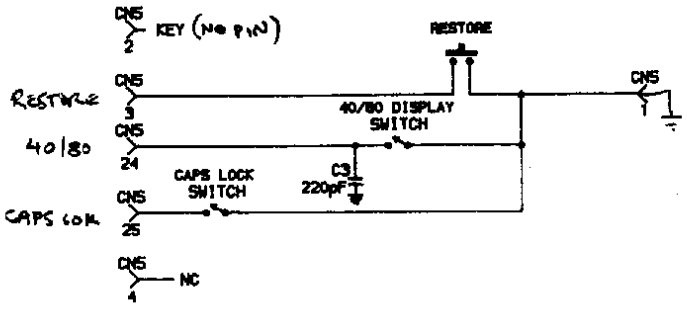
CBM C 128 (D)

8 ROWS X 11 COLUMNS MATRIX

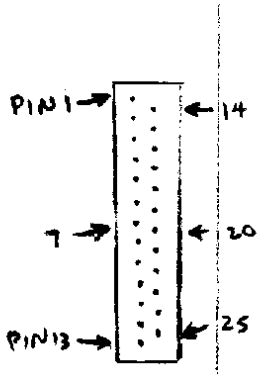


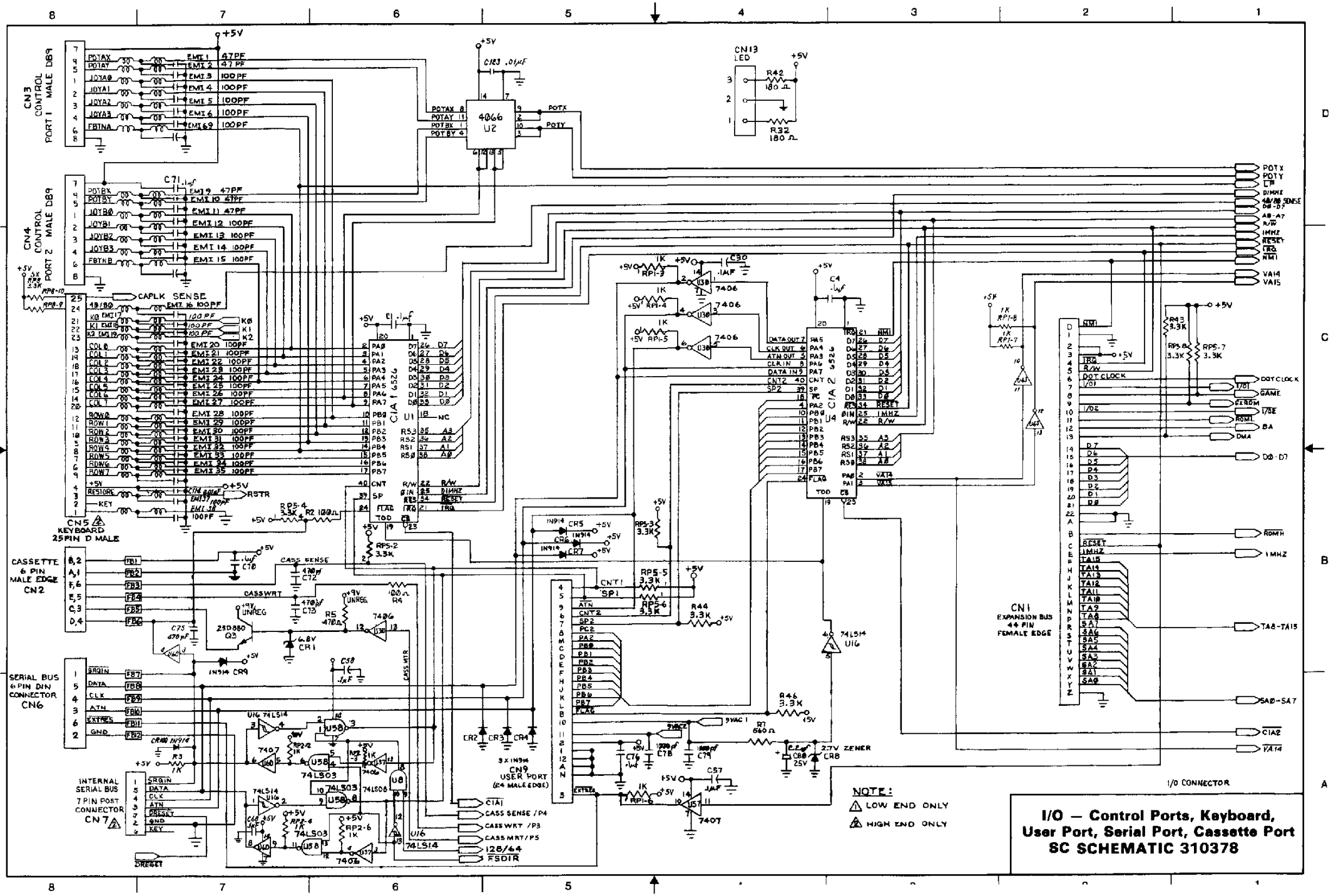


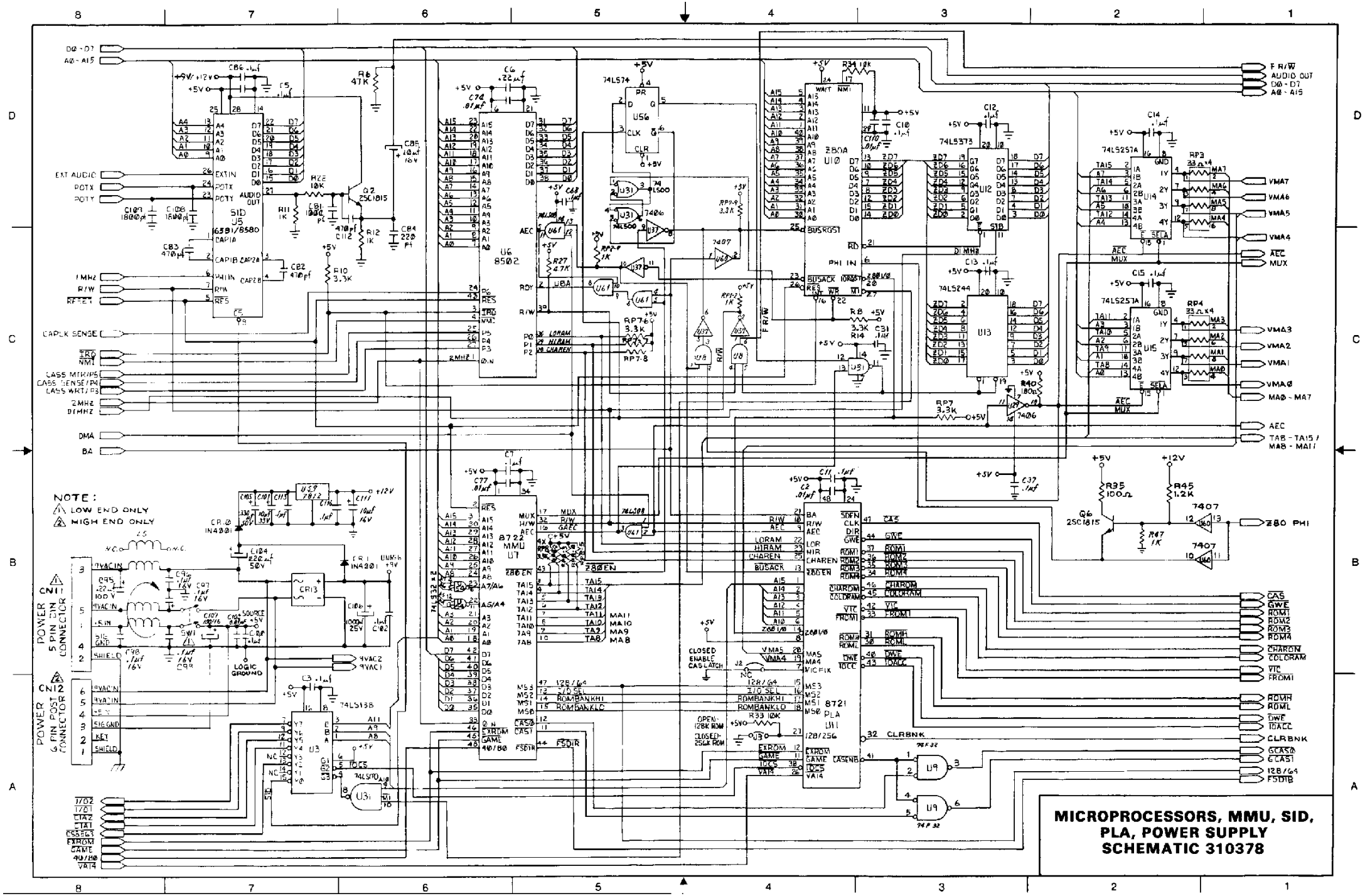
C2 KEY: CN5-7 TO CN5-20

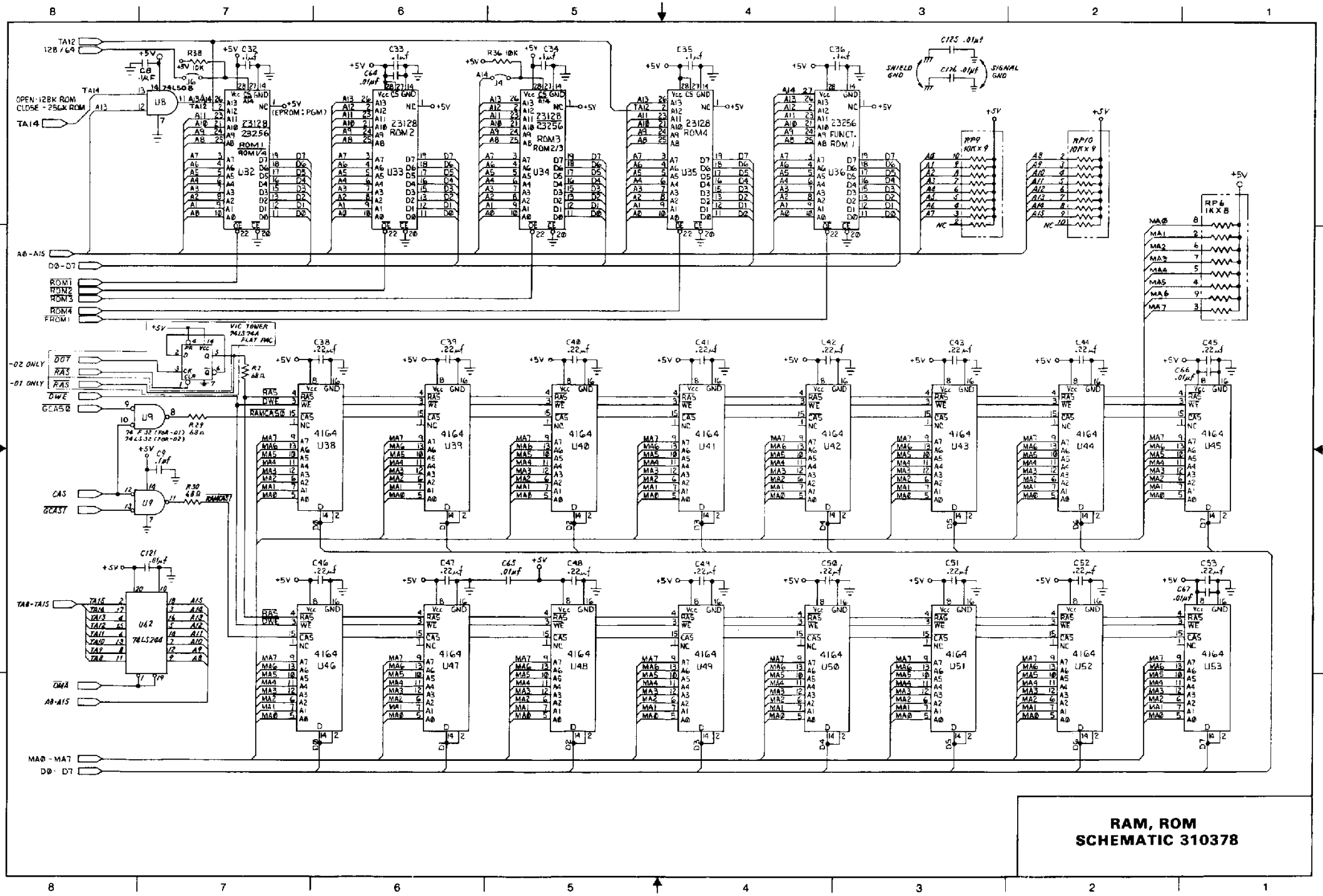
40/80 SW: CN5-1 TO CN5-24

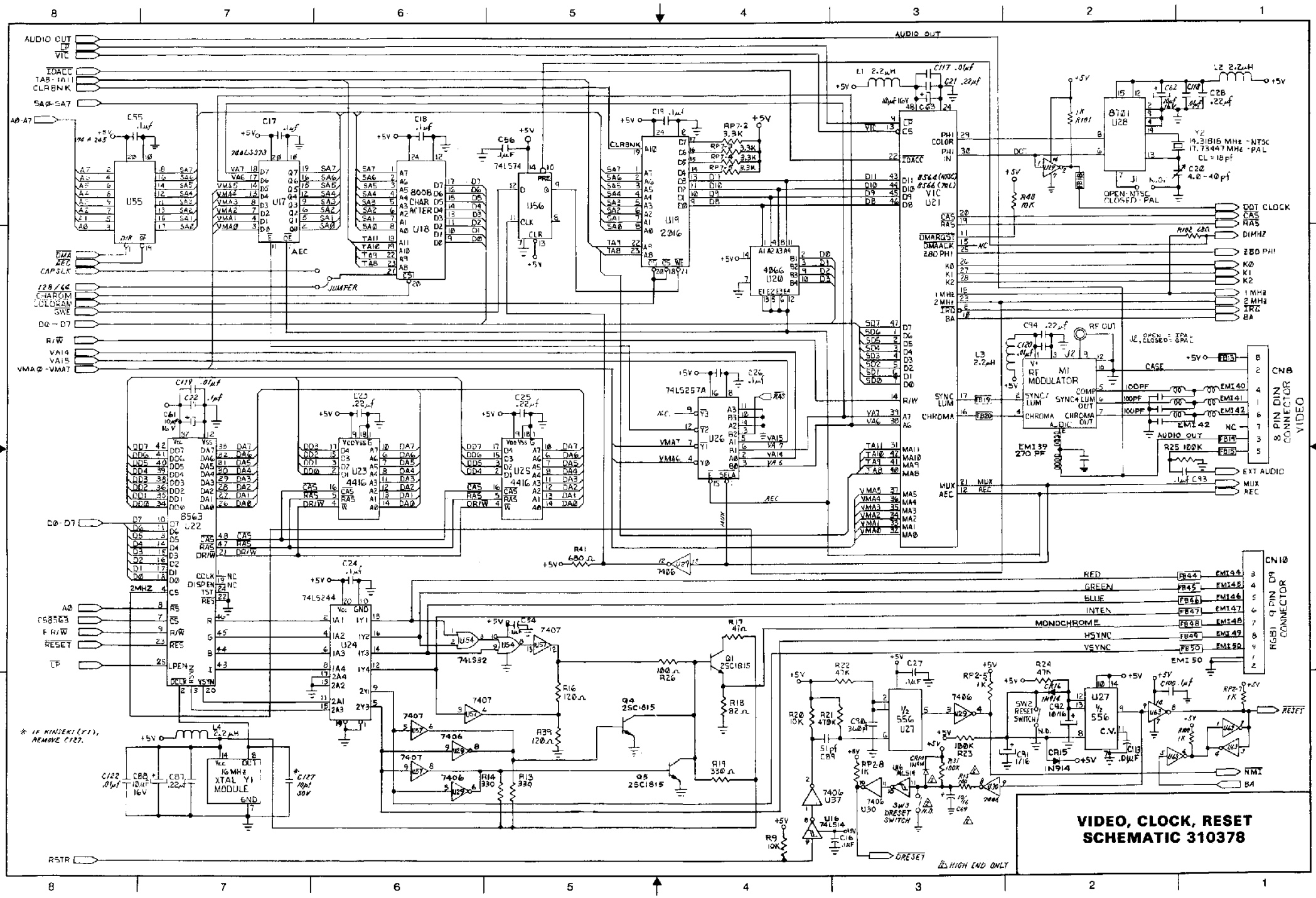
GND

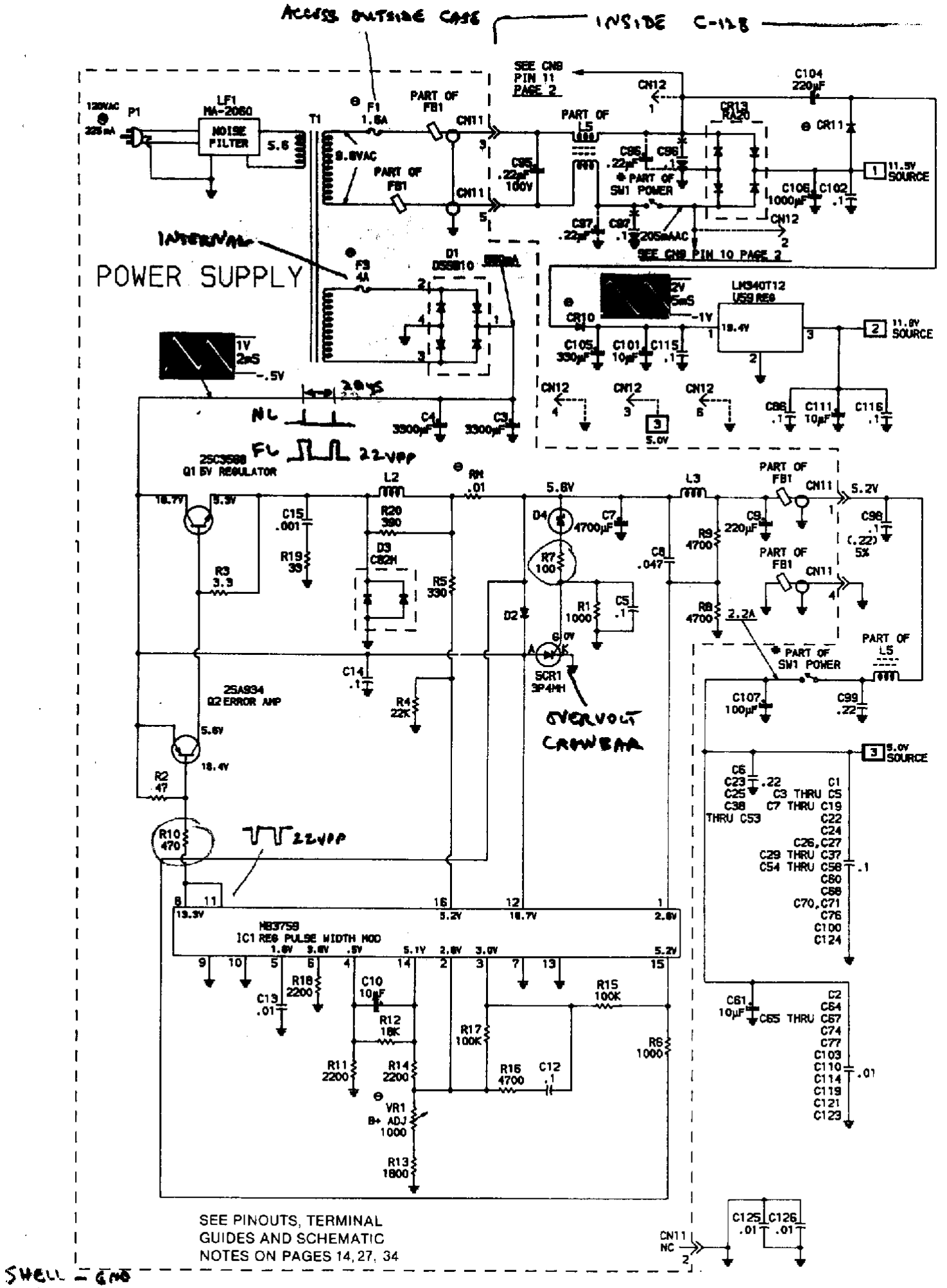



CN3 CONTROL PORT 1 MALE DB9
CN4 CONTROL PORT 2 MALE DB9
CN5 KEYBOARD 25PIN D MALE
CN2 CASSETTE 6 PIN MALE EDGE
CN6 SERIAL BUS 6 PIN DIN CONNECTOR
CN7 INTERNAL SERIAL BUS 7 PIN POST CONNECTOR
CN9 USER PORT (24 MALE EDGE)
CN1 EXPANSION BUS 44 PIN FEMALE EDGE
CN13 LED
4066 U2
CIA 6526 U1
CIA 2 6526 U4
74LS14 U16
7406
7407
74LS03
74LS08
9VAC
2.7V ZENER
I/O CONNECTOR
NOTE:
LOW END ONLY
HIGH END ONLY
I/O — Control Ports, Keyboard, User Port, Serial Port, Cassette Port
SC SCHEMATIC 310378


MICROPROCESSORS, MMU, SID, PLA, POWER SUPPLY SCHEMATIC 310378
NOTE:
LOW END ONLY
HIGH END ONLY
POWER 5 PIN DIN CONNECTOR
POWER 6 PIN POST CONNECTOR
SID U5 6581/8580
U6 8502
8722 MMU U7
Z80A U10
8721 PLA U11
74LS257A
74LS373
74LS244
74LS138
74LS00
7406
7407
74LS74
74LS08
74LS32
2SC1815
1N4001
LOGIC GROUND
SOURCE
CLOSED ENABLE CAS LATCH
OPEN-128K ROM
CLOSED-256K ROM
D0 - D7
A0 - A15
R/W
AUDIO OUT
EXT AUDIO
POTX
POTY
1MHZ
RESET
CAPLK SENSE
IRQ
NMI
CASS MTR/P5
CASS SENSE/P4
CASS WRT/P3
2MHZ
DIMHZ
DMA
BA
AEC
MUX
VMA7
VMA6
VMA5
VMA4
VMA3
VMA2
VMA1
VMA0
MA0 - MA7
TAB - TA15 / MAB - MA11
Z80 PHI
CAS
GWE
ROM1
ROM2
ROM3
ROM4
CHARON
COLORAM
VIC
FROM1
ROMH
ROML
DWE
IOACC
CLRBNK
GCASA
GCAS1
128/64
FSDIB


RAM, ROM
SCHEMATIC 310378

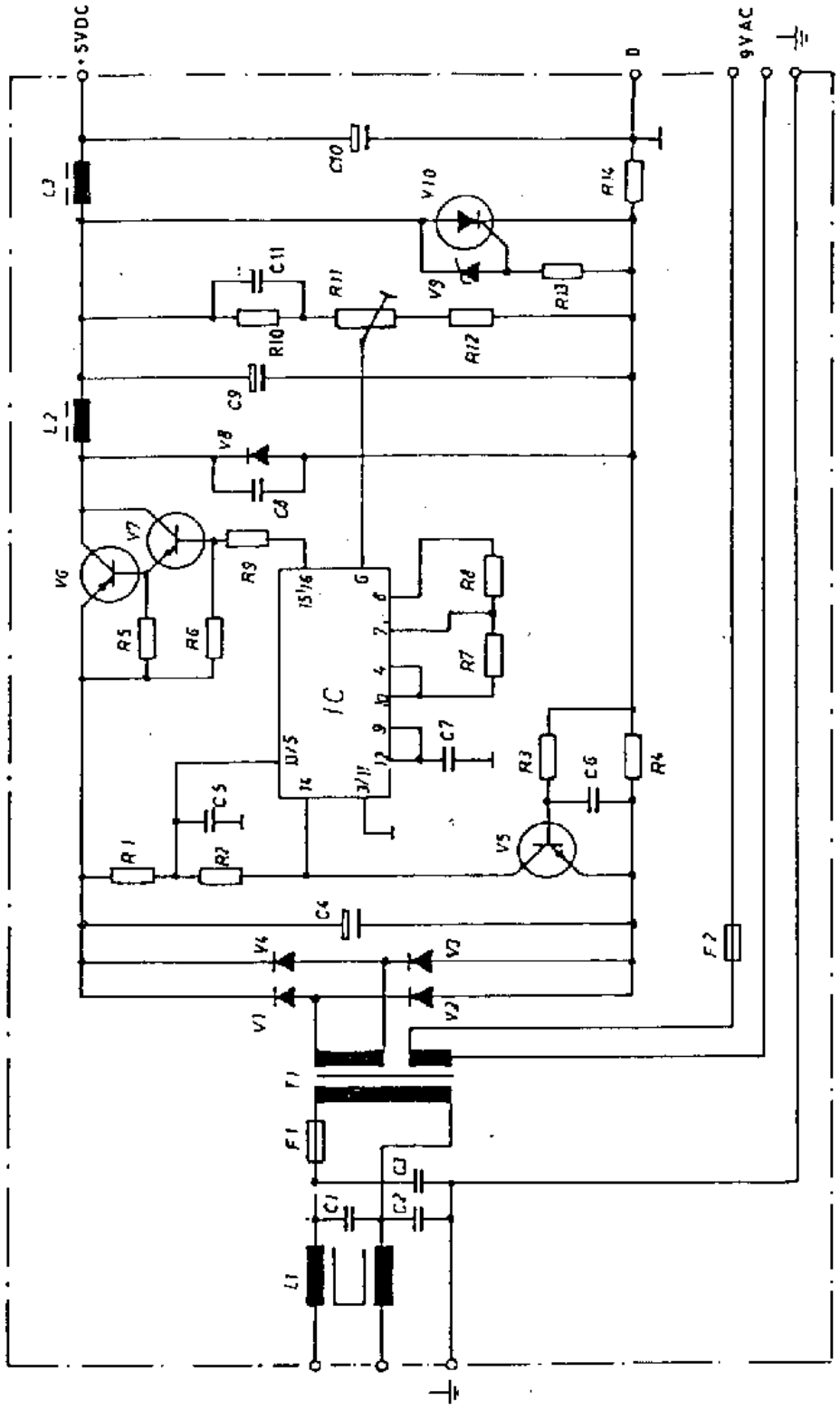

VIDEO, CLOCK, RESET
SCHEMATIC 310378
AUDIO OUT
VIC
U21
8564 (NTSC)
8566 (PAL)
U26
74LS257A
U25
U23
4416
U22
8563
U24
74LS244
U19
2016
U18
8008 CHAR ROM
U17
74LS373
U55
U56
74LS74
4066
U20
RF MODULATOR
U28
8701
CN8
8 PIN DIN CONNECTOR VIDEO
CN10
RGBI 9 PIN D9 CONNECTOR
16 MHz XTAL Y1 MODULE
SW2 RESET SWITCH
SW3 DRESET SWITCH
HIGH END ONLY
* IF KINSEKI (Y1), REMOVE C127.



SHELL = GND
1 — RED — +5VDC @ 4.3A
2 NC
3 — BRN — GND
4 — BLK — 9VAC @ 1A
5 — WHT — 1.6A SLO

POWER SUPPLY

9VAC @ 1 AMP
5VDC @ 3 AMPS



				Fremdbezeichnung		Part 31 04 16 - 01, - 02, - 03
					Tag	Name
				85		
				Bearb	8.5.	
				Gepr		
				Norm		
Aus-gabe	Änderung	Tag	Name	ISMET-WERKE Joh. Schlenker-Maier Schwenningen a. N		00.400.001.110

TITLE: POWER SUPPLY, EXTERNAL
C 128

Maßstab

39

16K to 64K VRAM UPGRADE "PIGGYBACK" BOARD

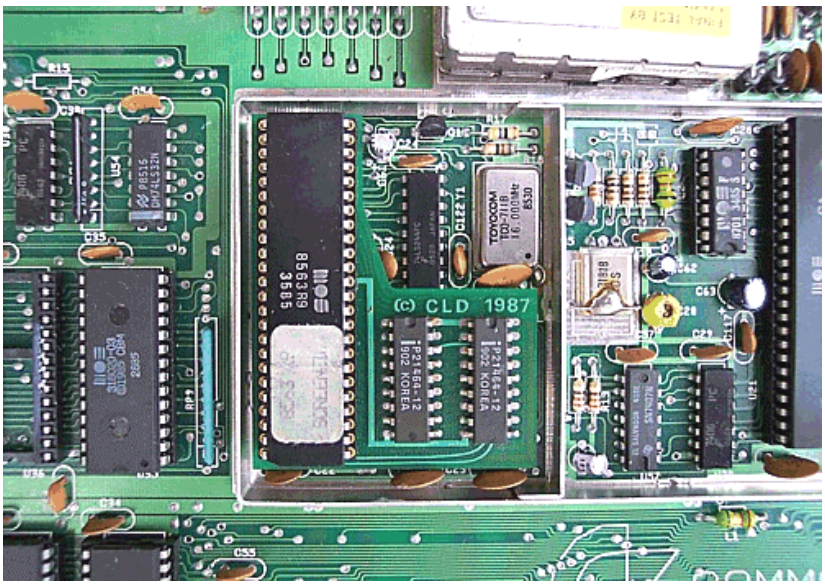
latest information 8-10-05

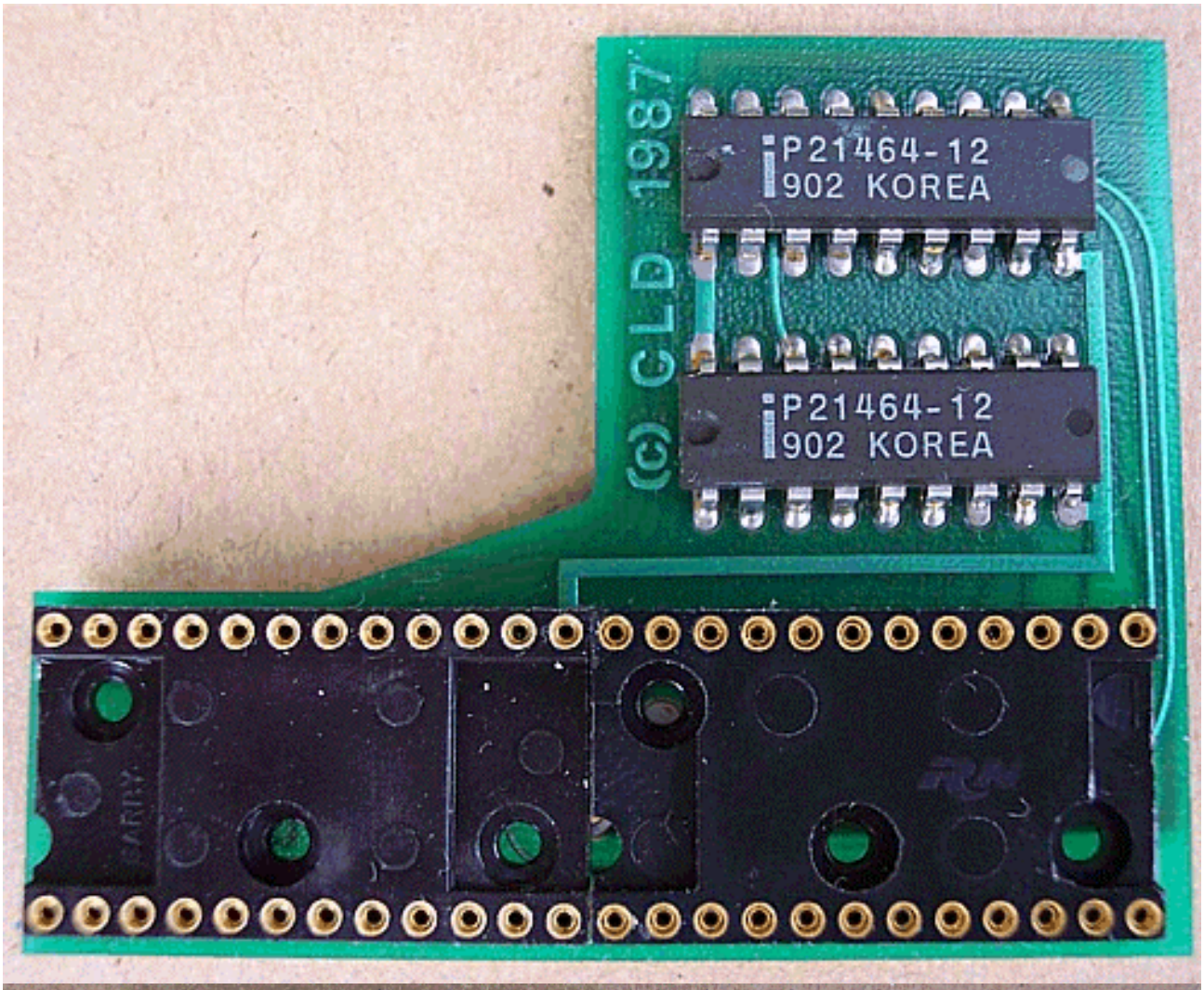
This board was built by Chip Level Designs back in the late 1980s and is no longer available. To install this upgrade board, the original RGB chip was removed, the piggyback board inserted into the RGB socket, and the RGB chip installed in the piggyback board. The original RAM chips in the computer are bypassed and do not need to be removed.

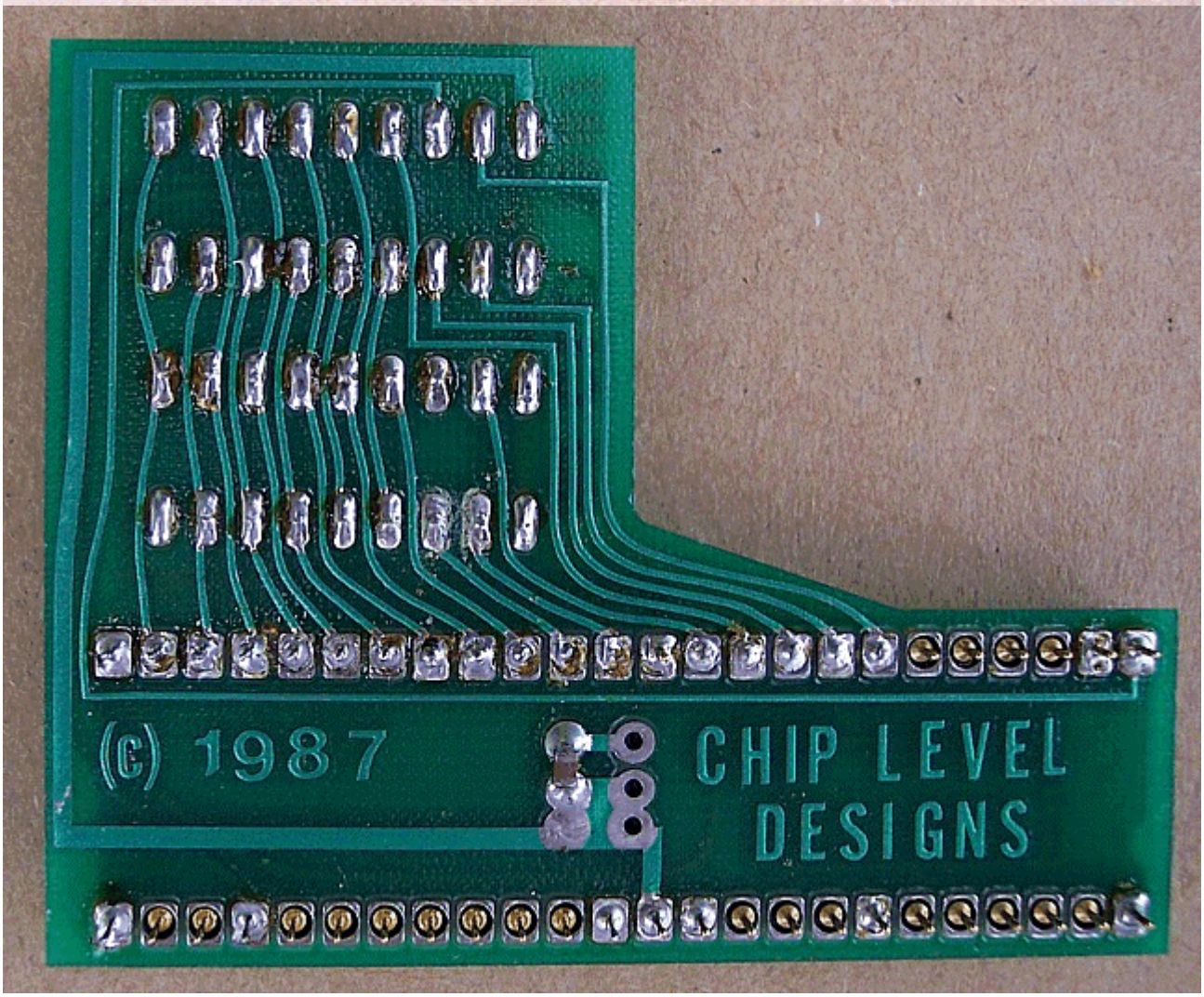
When this board is installed in a C128, the 4" X 6" metal cover that clamps over the RGB and VIC area will not fit back down all the way. The RGB chip sticks up higher because of the modification. As long as the metal "fingers" that touch the chips still do, the cover will work as intended as both a shield and a heat sink for those two chips. The metal shield that covers the motherboard will of course stick up a bit higher too. Just bend the fingers down a bit before installing it so all will be contacting their respective chips when the cover is reinstalled.

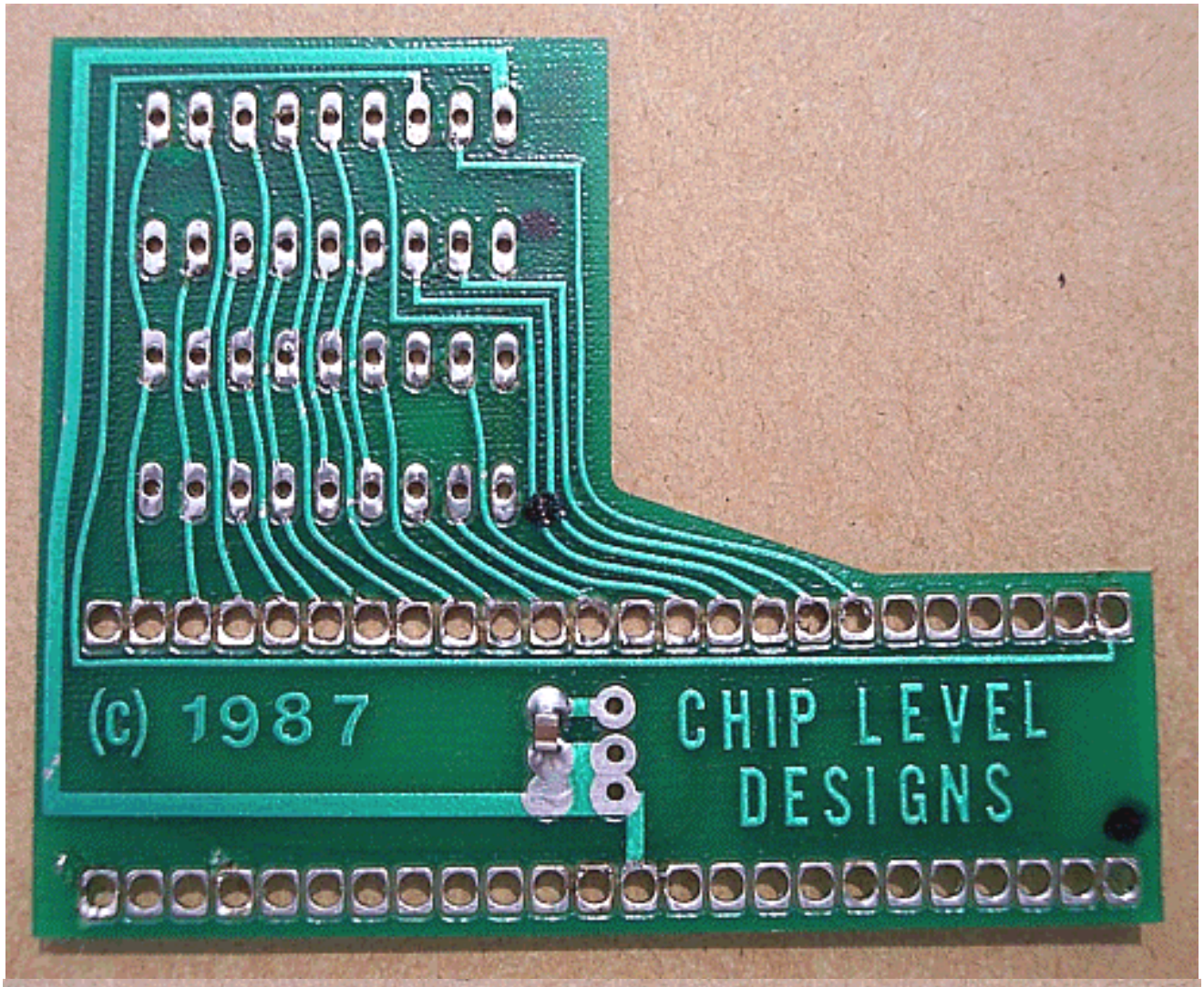
To those who might want to duplicate this board, I took some digital photos before and after I removed the components to show the board layout underneath them. There were two 4464 RAM chips and two 24 pin sockets (the 8563 RGB chip is a 48 pin IC). The low profile socket pins stick through the 1/32" thick piggyback board far enough for the pins to be used as a header plug. Note the size of the holes in the bare board. The sockets used have a large round metal surface that protrudes out of the bottom about 1/32". Those stubs are what is soldered to the PC board. The pins that protrude from those stubs are what is plugged into the computer socket, and they are fragile! If any pins are bent, they will break off, and the socket must be replaced. Note that some of them are cut off because the RAM chips on the piggyback board bypass the ones on the computer motherboard. Pins 1 through 33, 37, and 43 through 48 are left intact. The ones removed are pins 34 through 36 and 38 through 42. The board holes are plated-through ensuring a connection from board top to bottom. The tiny surface-mount component on the back side of the board is a capacitor, a 0.022uF bypass filter across the supply line. Note the black dots I put on the bare board. Those indicate IC pin 1 for each of the chips.

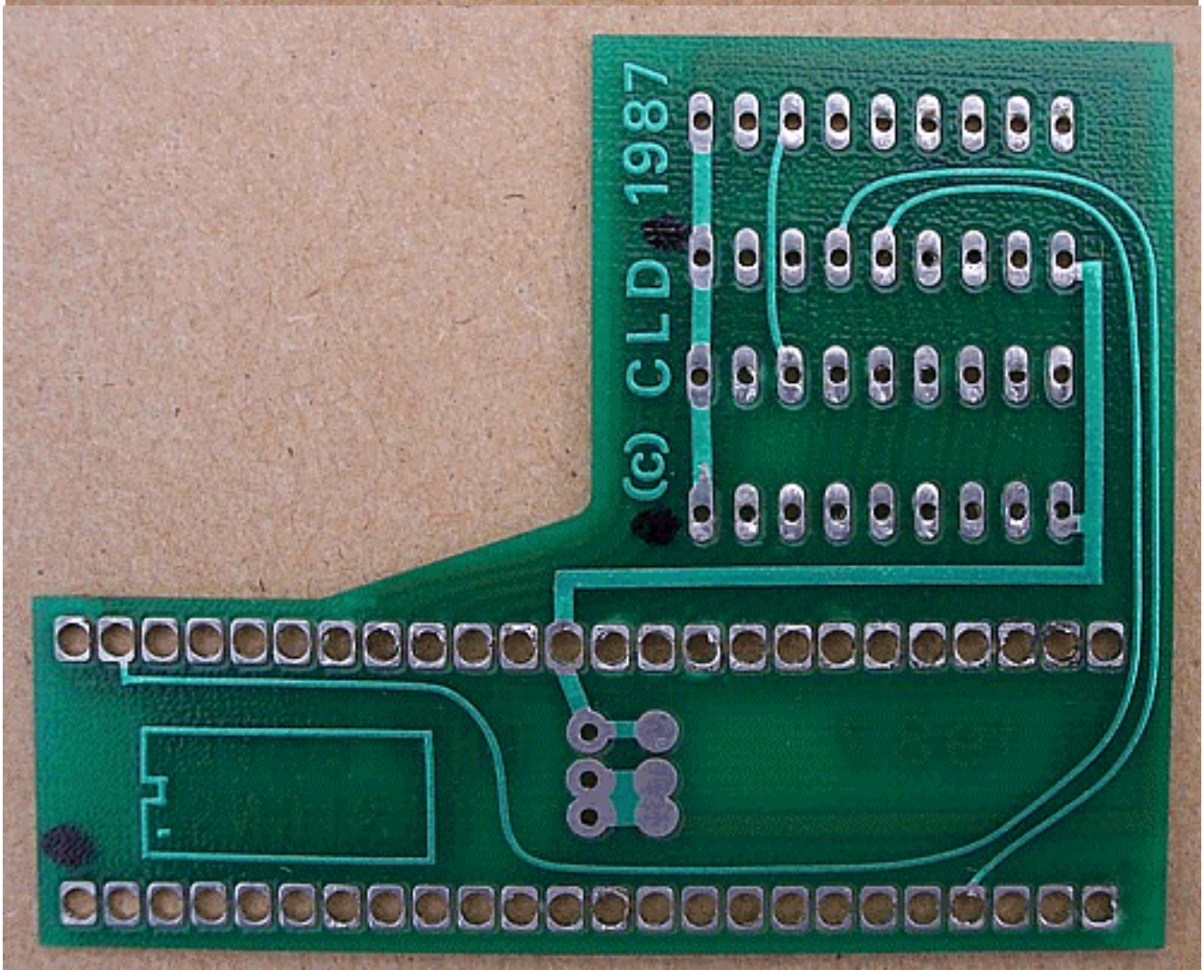
If I were going to build a board like this, I would change a few things to make fabricating the PC board easier. I would have the header pins offset from the IC socket so any low profile socket could be used. A single-sided board would require reconfiguring the layout and using jumpers, but it would eliminate the need to use plated-through holes. Header pins could be just bits of solid hookup wire soldered into the holes. Such wires would be flexible, and if accidently bent, could be straightened without breaking. If one or more did break off, they could be replaced easily.




(c) CLD 1987
P21464-12
902 KOREA
P21464-12
902 KOREA


(c) 1987
CHIP LEVEL
DESIGNS


(C) 1987
CHIP LEVEL
DESIGNS


(C) CLD 1987

UPGRADING THE C128 FROM 16K TO 64K OF VIDEO RAM 08-19-04

There used to be an easy-to-install piggyback board. You would pull the VDC chip, install the board and plug your chip into it. It had the upgraded video RAM chips on it. Unfortunately, that board has not been available for years.

Upgrading the VRAM on your own involves unsoldering the two original 4416 (16K X 4) RAM chips (probably marked something like: MB81416-12) inside the tin can in the middle of the motherboard. The two chips are at board locations U23 and U25 and are very likely soldered in. It's tight in there and desoldering chips is a pain anyway, not to mention risky if you accidently break a foil trace and don't repair it before installing the new chips. You end up covering up your mistake rather well. As a tech, I always desolder the original and put in a socket. That way, I have the option of putting the old ones back if the upgrade doesn't work for some reason. You never want to solder on the board more than once if you can help it. Sockets are cheap. An alternative to desoldering the whole chip is to cut off all the pins close to the body of the IC, then desolder each one and clean out the holes with wick or a solder sucker so the new chip (or socket) will fit. That's much easier on the board, but obviously destroys the chips. Not a big deal... they usually end up in the garbage anyway.

So, you'll need two 4464 (64K X 4) RAM chips. Jameco Electronics @ 1-800-831-4242 has them, but you'll need to add $5 for orders under $25, then shipping on top of that. They have a WEBsite: www.jameco.com. The Jameco part number for the chip is 41582 or 41574 or 41611. Those three numbers represent the same chip, but at different speeds, 120ns, 100ns, and 80ns respectively. All will work and cost less than $3 each. Jameco has the sockets too. Order # 38113 or 112230 socket (18 pin DIP single or double contact) for less than $0.25 each.

For desoldering, you'll want an iron of about 25 watts. Don't be tempted to use your 30 year old soldering gun... it will eat that board. Make sure you mount the new chips exactly the way the old ones came out. There is a notch at one end so you shouldn't get them in backwards. Use a marking pen to indicate where the notch goes if necessary. After the new sockets/chips are installed, carefully inspect your work for solder splashes or bridges between traces, etc. If all is well, put it all back together.

Power up the computer and observe the opening screen. You might notice that just -before- it comes up, the screen looks different than it used to. When the opening screen appears, it should look the same as before. One way to tell if you have the upgraded VRAM is with a little BASIC program typed in 80 column mode:

```
POKE DEC("D600"),28:POKE DEC("D601"),63:SYS DEC("FF62"):SCNCLR <RETURN>
```

If the screen says: READY and looks normal, you have 64K of VRAM.
If you have only 16K, the screen will fill up with zeros.

Ray Carlsen CET
Carlsen Electronics

C128 CHIPS AND COMMON SYMPTOMS

latest updates or corrections 1-31-06

U1 906108-02 (6526) VIA (interchanges with 8521)
unknown (8521) VIA later version C128
C64 startup screen normal, but no cursor. May not start up in 128 mode. No keyboard, joyport, or cassette access. Partial failure: some keys or joystick positions don't work. Cartridge works. Swap U1 with U4 to check. See KEYBOARD.

U4 901108-02 (6526) VIA
Startup screens normal (64 & 128), but no serial or user port access. Drive resets on power up but "File not found" error when drive accessed. Cartridge works. Swap U4 with U1 to check. Check also buffer IC U30.

U5 906112-02 (6581) early 128 SID: 12 volt VDD
318013-01 (8580) late 128 SID: 9 volt VDD
No sound (check also transistor Q2), weak or bad sound of one or more voices. Proportional mouse or graphics tablet doesn't work, or mouse pointer frozen or jitters. If chip is shorted, will produce blank screen. Remove chip to check.

U6 315020-01 (8502) MPU (Microprocessor)
No bootup in any mode. Blank screen with no border. Cartridge don't work. If intermittant, screen freezes after warmup or running programs lock up.

U7 310389-01 (8722) MMU (Memory Management Unit)
No bootup in any mode. Blank screen with no border. Partial failure: CP/M inoperative.

U10 906150-02 (Z80B) CPU (Microprocessor)
No bootup in any mode. Blank screen with no border. Partial failure: CP/M inoperative.

U11 315012-01 (8721) PLA (Programable Logic Array)
No bootup in any mode. In 40 columns: blank screen, white screen, light blue screen (no border), random checkerboard pattern or flashing "garbage" characters.

U14 & U15 74LS257 logic, RAM interface
Can cause blank screen. Partial failure can cause abnormal bytes free at startup.

U18 390059-01 CHARACTER ROM
No characters. Startup has border, but "garbage" where characters belong. Entire area inside border just lines or blocks.

U19 generic SRAM (6116 - LC3517A) COLOR RAM 2K X 8
128 startup screen and colors normal. C64 screen characters & colors flash rapidly.

U21 315009-03 (8564) VIC (40 column screen)
Dead chip: Blank white screen in 40 columns and black screen in 80 columns. Partial failure: 80 column OK but weak or garbled 40 column video, no video or no color. Check also U28 and crystal Y2.

U22 315014-09 (8563) VDC for C128 80 column screen.
315092-01 (8568) VDC for C128D 80 column screen.
40 column screen OK. 80 column screen: Blank screen. Entire screen shifts horizontally. May not switch from 128 to 64 mode with reset switch. Check also crystal oscillator Y1. If one or more colors missing, check U24.

U23 & U25 generic 4416 Video RAM (16K)
generic 4464 Video RAM (64K VRAM upgrade)
In 80 column mode only: blank screen or some characters garbled. Shorted chips may get hot.

U24 generic 74LS244 Buffer
One color (such as red) missing from 80 column screen. Check also U22.

U28 251527-09 (8701) Clock gen. (Master oscillator)
Dead chip: no bootup in any mode. Partial failure: diagonal lines on monitor or TV (horizontal sync bad), no color in 40 column mode, or "barber pole" colors. Check also crystal Y2.

U32 251913-01 C64 Kernal/Basic ROM.
Blank screen at startup in C64 mode only. Cartridge works.

U33 318018-02 C128 BASIC LO ROM
No BASIC startup screen in 128 mode only. Computer goes into "monitor" mode.

U34 318019-02 C128 BASIC HI ROM
Blank screen with border at 128 mode startup. Lines or "garbage" inside border.

U35 318020-03 C128 Kernal ROM
Comes up in C64 mode, but cartridge doesn't work. Partial failure: blank screen in 128 mode only.

U36 socket empty from factory... for "upgrades".

U38 THRU U53 16 RAM chips (4164)
4 RAM chips (4464) in later versions.
Blank screen, no border. Shorted chips may get hot. Will sometimes produce "garbage" screen, abnormal number of bytes free (check also U14 and U15) or "out of memory" error on startup screen, and program crashes when loading (depends on what part of memory is bad).

Y1 16 MHz Crystal Oscillator
Blank screen in 80 column only.

Y2 14.31818 MHz crystal (Master osc. reference)
See U21 VIC.

M1 251917-02 RF Modulator (tin can "module").
TV output only: no picture, no sound, snowy picture, no color, weak video or sound, interference, etc. Note: direct A/V outputs still work normally.

KEYBOARD:
Stuck (shorted) keys will show up when another key is pressed... it either will not work, or both appear on screen. Character may repeat, depending on which key is bad. If keyboard is suspected, unplug it... the computer will start up normally without it. Check also U1 CIA chip.

POWER SUPPLY:
Most common problem is "dead" computer, but can produce many symptoms like blank screen (power LED on or off), screen freeze-up, "garbage screen", hum bars moving up screen, intermittant operation, etc.

For intermittant operation or "glitches" on screen, random characters, etc. check solder of power supply connector and power switch on motherboard. Also, reseat socketed chips: lift up slightly at each end (but do not remove) and press back down. Reseat suspected chips first for any problem, especially intermittants.

For in-depth troubleshooting, Sams Photofact (schematic and parts list) has flow charts and step by step diagnostics. It requires an oscilloscope and the necessary skills to interpret the readings. The Sams book for the C128 is CC18 and CSCS25 for the 128DCR. They are available at electronic parts distributors. Copies may be viewed at the main branch of the Public Library.

Ray Carlsen CET
CARLSEN ELECTRONICS

Your questions or comments are always welcome, especially if you spot any errors here. Thanks!