VIDEO MOD 32

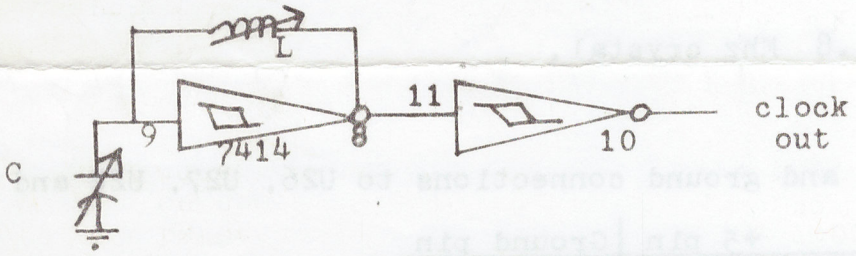
PLEASE NOTE: Any modification to your system will void your factory warranty.

Please read the instructions over and check the diagrams. If you are not sure that you are capable of making the necessary changes please do not attempt to do so. For a few dollars more you can send your board in to the dealer listed in the catalog and be assured of having the changes done correctly.

Use sockets on all chips for ease of repair.

Use insulated jumpers only.

If you do not have a crystal with the correct frequency, a 12.0 Mhz crystal can be used with an adjustable capacitor across it to lower the frequency to 11.8 Mhz or as close to it as possible. Another way of doing it is to replace the 7400 chip 'U58' with a 7414 hex schmitt trigger. You can also use this chip to replace the 7404 'U72' chip. The pin outs are the same for both 7414 and 7404 so you can connect to the same pins. Make sure you cut the foil between pins 12 & 13 and pins 9 & 10 & 11 and between pins 1 & 2 & 8 where the 7400 chip 'U58' used to be. Hook in the connections that used to go to 'U72' 7404 chip. Then add this circuit and adjust C and L to give you 11.8 Mhz.



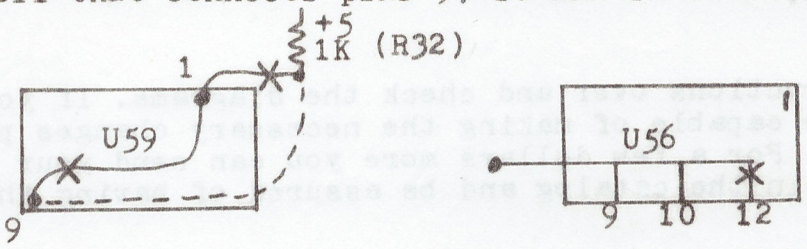
This oscillator circuit should be stable within 2% which should give a stable display.

I reccommend that you make the 32 chr/line Mod. first and then see if you wish to go to 64 chr/line.

NOTE: For 64 chr/line you must add an extra 1K of video memory. The easiest way is to piggy back it to the original 1K. You can solder them pin for pin EXCEPT for the chip select pin. This must be bent out and hooked to CE1 output of U55 pin 12. I do not reccommend 64 chr/line because this will not be compatible with the C1P video format.

PLEASE NOTE: Keep referring to the circuit diagrams. Check to make sure that ALL +5 and ground connections have been made on the added components.

1. It is necessary to remove U59 and U56. On the component side, make a foil cut between pin 1 and pin 9 of U59. Make a foil cut between the foil that connects pins 9, 10 and 12 to isolate pin 12 of U56.



Replace U59 and U56 using sockets. Cut foil on U59 between pin 1 and the 1K resistor. Put a jumper between the 1K resistor and pin 9 on the foil side. Also hook a jumper from the 1K resistor to pin 1 of U60.

2. Solder in the sockets for U26, U27, U28, U29 and U44.

3. CAREFULLY bend out pins 10 through 15 of a 74163 on a right angle. Then solder pins 1 through 9 and pin 16 to U59. In other words pin 1 of U71 to pin 1 of U59 etc. Jumper pin 15 of U59 to pin 10 of U71. MAKE SURE THERE ARE NO SHORTS! This will be U71. See below.*

PIGGY BACK

4. Bend pins 1 through 6, and 8 through 13 of a 7404 at a right angle. Solder pin 7 to pin 7 of U18 and pin 14 to pin 14 of U18. This will be U72.

PIGGY BACK

5. Replace X1 with a 11.8 Mhz crystal.

6. MAKE ALL POWER (+5V) and ground connections to U26, U27, U28 and U44.

	+5 pin	Ground pin
7420 U26	14	7
7474 U27	14	7
74163 U28	16	8
7493 U44	5	10

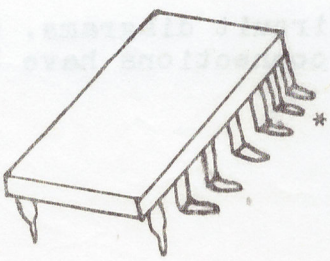
Then make the rest of the ground and +5 VCC connections as shown in the diagrams.
Remember when working on the foil side, pin locations are flipped like so:

Chip side

7	1
8	14

Foil side.

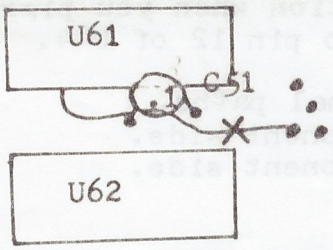
8	14
7	1



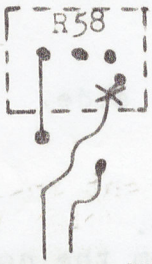
* Bend pin on a right angle.

7. Lets make the rest of the foil cuts. On the component side cut the foil that goes under the 0.1 µf. capacitor between U61 and U62.

This foil goes to pins 7 of U61 and U60 and U59.

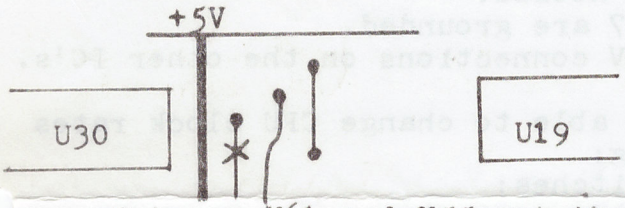


Turn the board over and make the following cuts:

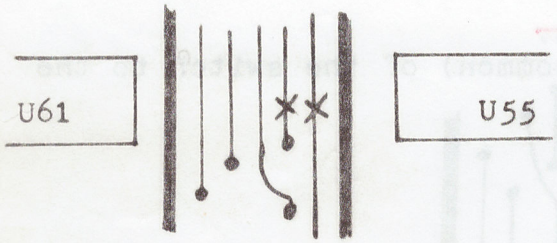


Underneath the R58 5K variable resistor cut where marked. This will isolate pin 9 of U65.

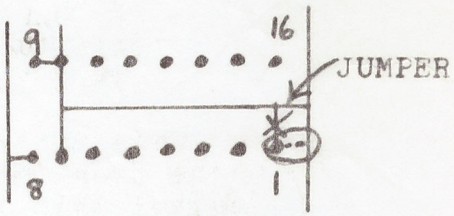
Between U30 and U19 cut where indicated. This isolates Ø0 in (CPU Clock)



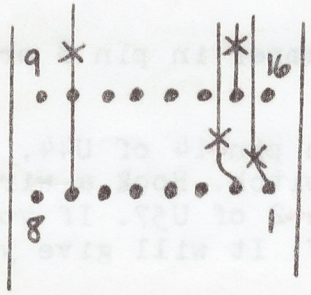
Between U61 and U55 cut two places as shown:
One cuts the lead to pin 2 of U61 and U60.
The other cuts pin 2 of U57 (baud rate).



Under U30 cut as shown to free pin 1 of U30:
NOTE: Some boards may need to be cut where circled. Then JUMPER as marked.



Under U59:

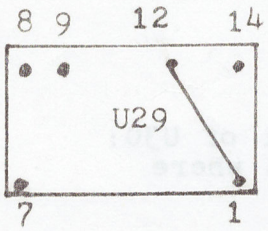


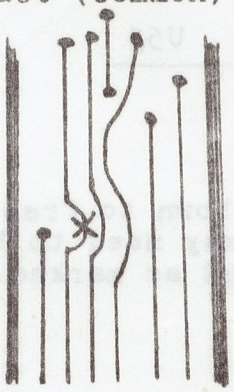
Cut foil to free pin 1
Cut foil to free pin 2
Cut foil to free pin 15
Cut foil to free pin 10 but keep pins 10 and 7 connected.

All foil cutting is now done.

8. Now for the rest of the wiring. FROM THE FOIL SIDE UNLESS INDICATED! Hook up the rest of the connections as shown on the Addition diagrams for the signal paths. -Pin 8 of U29 to pin 14 of U44.
-Pin 9 of U44 to pin 2 of U28 and to pin 2 of U60.
NOTE: Pin 2 of U60 and U61 should still be connected together.
You should have hooked up the column clock addition when you piggy backed U71 on top of U59. -Connect pin 1 of U44 to pin 12 of U44.
-Hook pin 2 of U30 to pin 2 of U59.
For the blanking circuit: Finish wiring the signal paths.
- Pin 11 of U28 to pin 1 of U72--from the component side.
- Pin 12 of U28 to pin 3 of U72--from the component side.
- Pin 13 of U28 to pin 4 of U26.
- Pin 14 of U28 to pin 5 of U26.
- Pin 2 of U72 to pin 1 of U26--from the component side.
- Pin 4 of U72 to pin 2 of U26--from the component side.
- Pin 6 of U26 to pin 4 of U27.
- Pin 5 of U27 to pin 12 of U56.
- Pin 6 of U27 to pin 10 of U27.
- Pin 14 of U71 to pins 9&10 of U26--from the component side.
- Pin 11 of U30 to pin 12&13 of U26.
- Pin 8 of U26 to pin 1 of U27.
- Pin 12 of U65 to pin 13 of U27.
- Pin 8 of U27 to pin 5 of U72--from the component side.
- Pin 6 of U72 to pin 1 of U30 and to pin 1 of U59--from the comp. side.
- Pin 1 of U71 should automatically be hooked.
- Make sure pins 2 & 3 & 11 & 12 of U27 are grounded.
- Make sure of the other ground and +5V connections on the other IC's.

NOW TO FINISH THE JOB:
If you plan to use rotary switches to be able to change CPU clock rates and also baud rates then do the following:
Make sure you use non-shorting rotary switches:
SPDT -Hook pin 8 of U29 to one of the outside contacts.
-Hook pin 9 of U29 to the next contact.
~~Hook pin 11 of U29 to the next contact.~~
-Hook a wire from the center contact (common) of the switch to the foil as marked between U29 and U18.

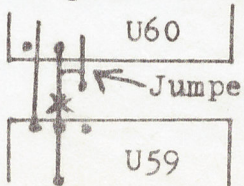




- Jumper pin 1 of U29 to pin 12 of U29.

If you do not want to switch CPU clocks then jumper in pin 8 or pin 9 of U29 to the foil as marked.

For baud rate: If you use a switch then hook in pin 14 of U44, pin 12 of U44, pin 9 of U44 and pin 8 of U44 to the switch. Hook a wire from the common center terminal of the switch to pin 2 of U57. If you don't use a switch, hook pin 8 of U44 to pin 2 of U57. It will give you 300 baud.
SP4T



- Jumper as shown and connect jumper to pin 15 of U28.
- Connect pin 7 of U59 to pin 15 of U30.

Jumper pin 11 of U28 to pin 9 of U65 to give you horizontal sync.

To be safe go back over your wiring. Make sure of your connections and check to make sure you have no shorts between foils anywhere.

Now hook the board to power and connect the J2 connector and turn on the power. You should see random characters on the screen, 32 per line. When you break you will see D/C/W/M? but it will not be on the edge of the screen. Note: You may have to adjust your horizontal hold. If you do not get a stable picture but you do get something on the screen but it seems to be random dots then the column clear circuit is not hooked in properly and/or you have a problem in the horizontal sync circuit. If all you get is a clear screen then the blanking circuit is not working properly.

The CRT driver routine in basic will only allow 24 chr/line so this routine would require changes to allow 32 chr/line. Also the cursor can be lowered 2 lines and its home brought out to the edge of the screen. If you ordered the video mod. kit then you received a cassette with the necessary routines to allow all this plus backspace and rapid screen erase etc. All you have to do is load in the tape, type RUN then type NEW when the cursor moves out to the edge of the screen and 2 lines down. The program is loaded into the first 3 pages of memory so it will not take up any basic memory. The program will work so long as you don't hit the break key. If you do break then the I/O vectors will have to be reloaded to point to this program. If you use poke statements to generate your video screen then no CRT driver is needed.

Enjoy your new video. The new ROM MONITOR which should be ready in late July /80 should allow all the new features of your video as well as have an auto-load routine for saving machine code as well as a disassembler so you can have them without having to load tapes.

PARTS LIST

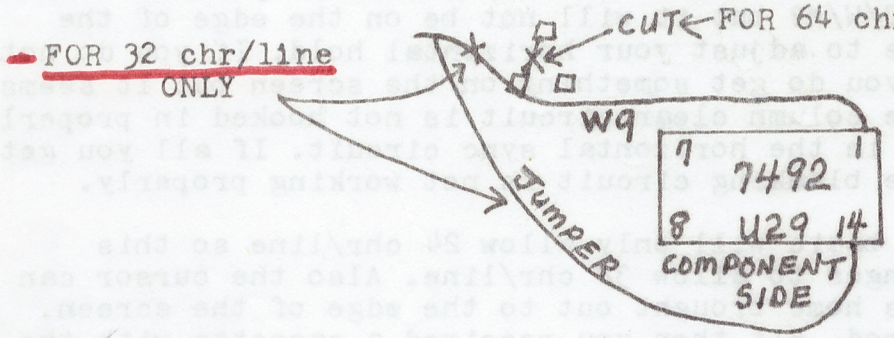
1-7400
1-7404
1-7420
1-7474
1-7492
1-7493
2-74163 or 74161
1-11.8 Mhz crystal
5-14 pin sockets
2-16 pin sockets
Single strand hook up wire (insulated). (not supplied)
For 64 chr/line the memory chips are not supplied.

NOTE: IT IS PREFERABLE THAT YOU USE 74LS series chips to reduce power consumption.
Also if 74LS163 are not available 74LS161 can be used. Your Radio Shack store should have these. If you don't use a crystal then replace 74LS04 with a 74LS14 hex schmitt trigger IC and refer to the instructions for hooking up.

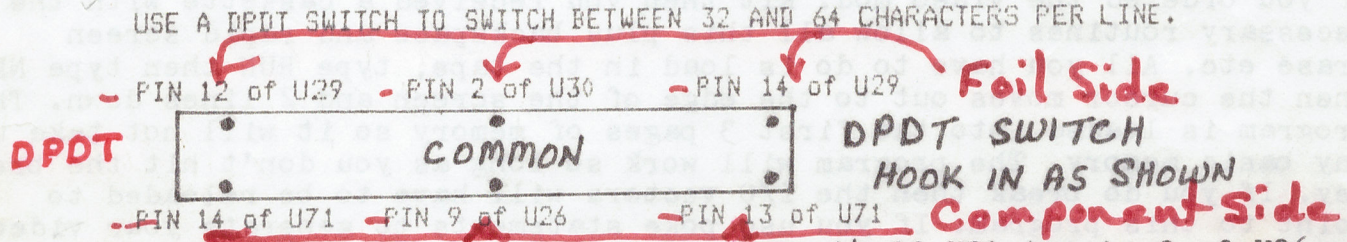
64 CHARACTER MODIFICATION ADDITION TO VIDEO MOD.

IF YOU ARE GOING TO USE THE SWITCHABLE 32 AND 64 CHR/LINE THEN MAKE THE FOIL CUTS AND JUMPER CONNECTION SHOWN BELOW.

- Make sure pin 1 of U29 is hooked to pin 12 of U29.

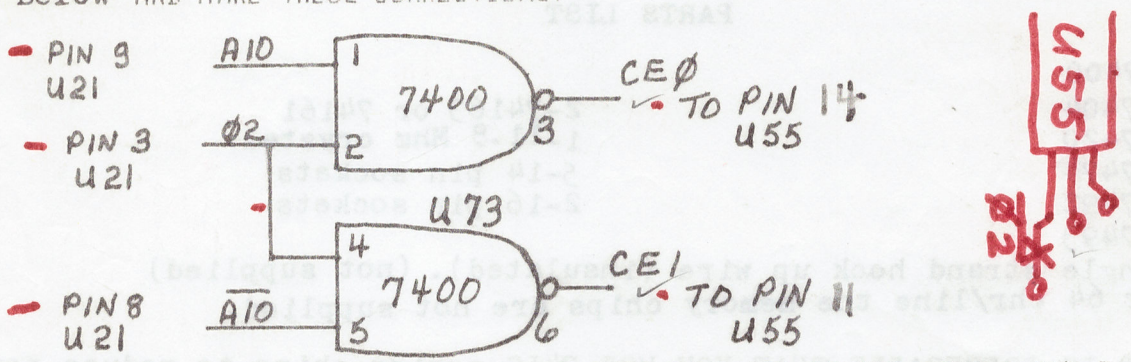


USE A DPDT SWITCH TO SWITCH BETWEEN 32 AND 64 CHARACTERS PER LINE.

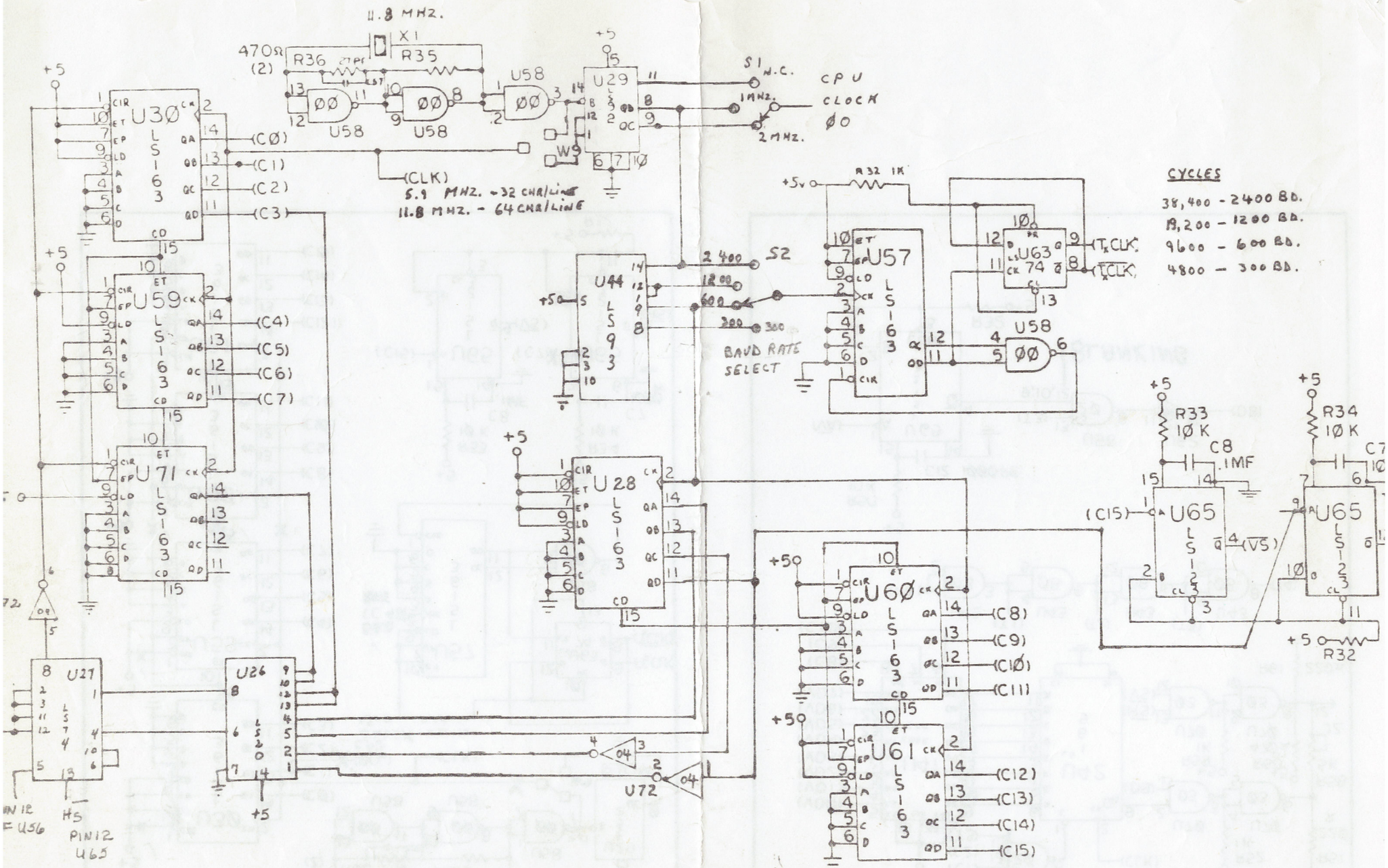


- Remove the jumper that goes from pin 14 Of U71 to pin 9 of U26.

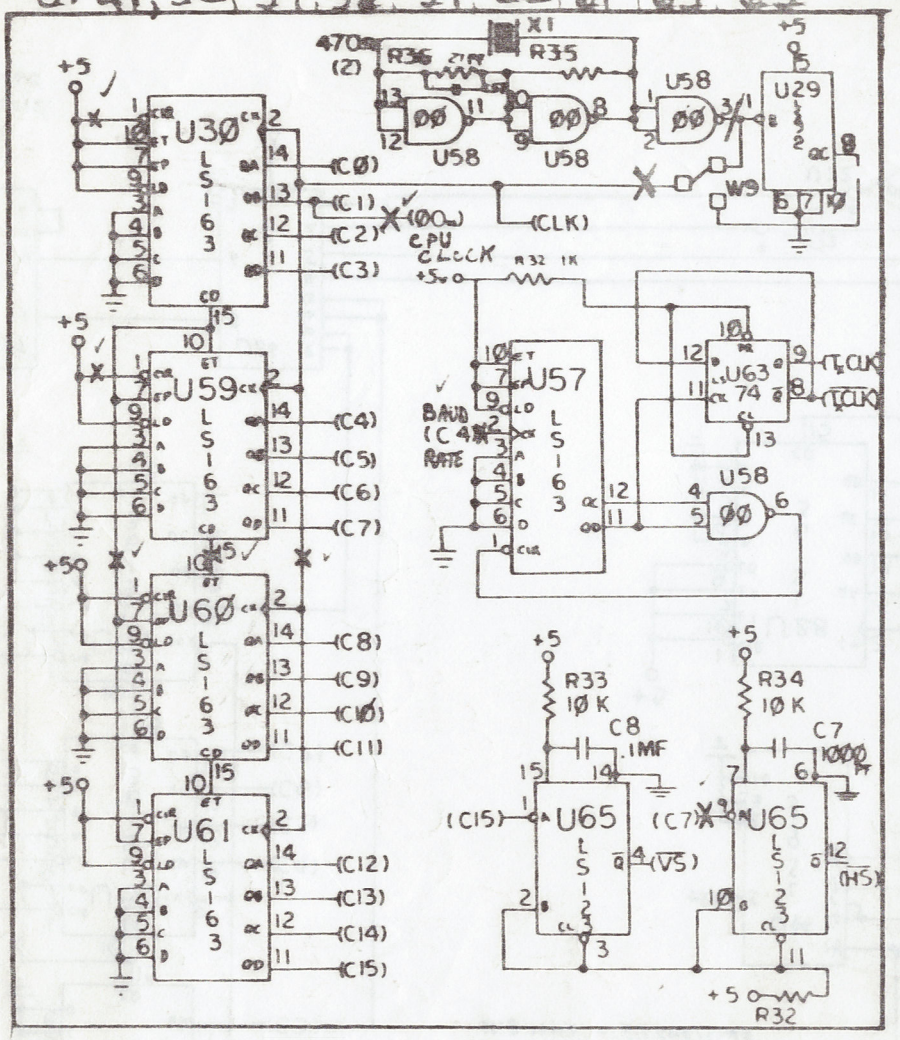
- YOU MUST ADD ONE MORE CHIP A 7400 CALL IT U73 THIS CHIP CAN BE ADDED BY PIGGY BACKING IT TO U58 START BY BENDING ALL PINS AT A RIGHT ANGLE EXCEPT PINS SEVEN AND FOURTEEN (7 & 14) THESE YOU CAN SOLDER TO PINS SEVEN AND FOURTEEN OF U58.REFER TO AN EARLIER DIAGRAM IN THE INSTRUCTIONS ON THE 32 CHARACTER VIDEO MOD. IF YOU ARE NOT SURE OF HOW TO BEND THESE PINS. CUT THE FOIL GOING TO PIN 11 of U55.THIS IS THE NOT Ø2 LINE. WHEN YOU HAVE THIS CHIP MOUNTED REFER TO THE DIAGRAM Below AND MAKE THESE CONNECTIONS:



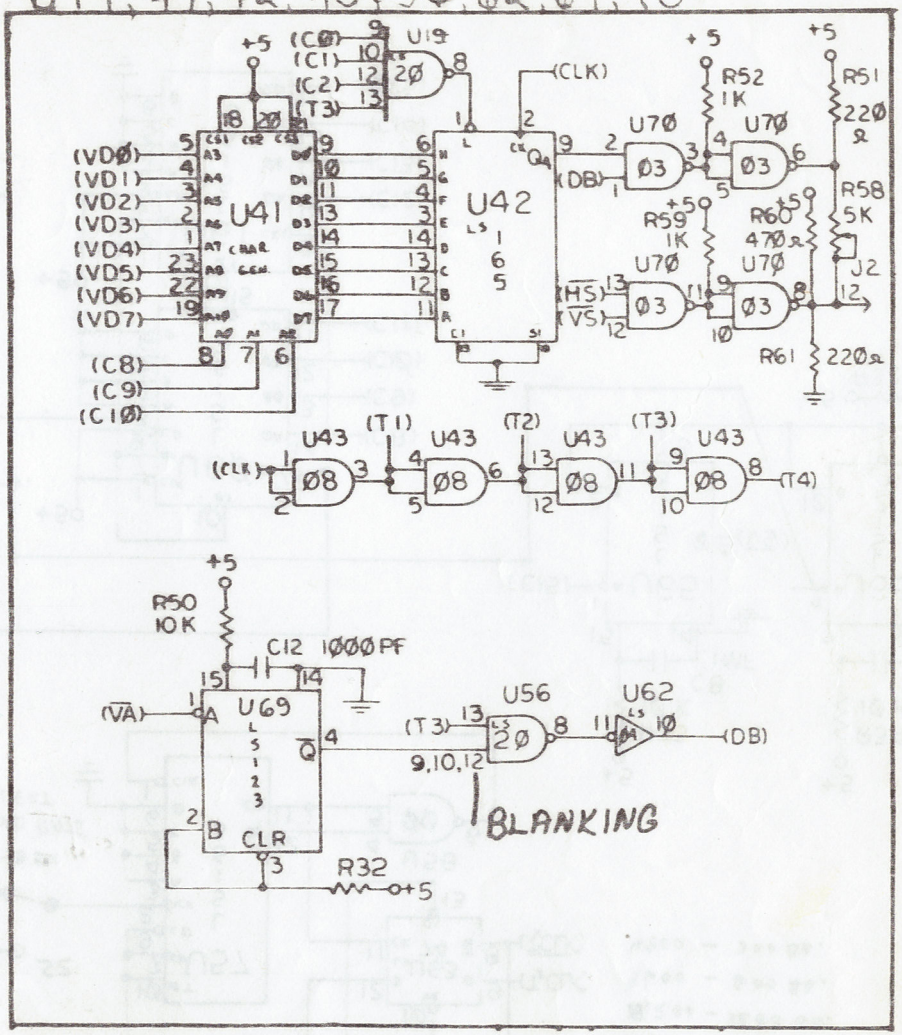
- ON U20 CUT ADDRESS LINE NOT A10 GOING TO PIN1 AND SOLDER PINS 1 AND 2 TOGETHER.
- ON U56 CUT ADDRESS LINE NOT A10 GOING TO PIN 2 AND SOLDER PIN 1 AND 2 TOGETHER.
- CUT FOILS GOING TO PINS 6,10 AND 13 OF U54.
- CUT FOILS GOING TO PINS 3,6 and 10 of U55.
- HOOK PIN 14 OF U71 TO PIN 6 OF U54
- HOOK PIN 11 OF U60 TO PIN 10 OF U54
- HOOK PIN 14 OF U61 TO PIN 13 OF U54
- HOOK PIN 13 OF U61 TO PIN 3 OF U55
- HOOK PIN 12 OF U61 TO PIN 6 OF U55
- HOOK PIN 11 OF U61 TO PIN 10 OF U55
- ALSO HOOK IT TO PIN 9 OF U72
- HOOK PIN 8 OF U72 TO PIN 13 OF U55
- Hook pin 12 of U55 to pin 8 of the 2nd K of the Video RAM. This is the chip enable for it.


11.8 MHz.
X1
470Ω (2)
R36
R35
U58
U29
S1 N.C.
CPU CLOCK
1 MHz.
2 MHz.
ØØ
W9
(CLK)
5.9 MHz. - 32 CHR/LINE
11.8 MHz. - 64 CHR/LINE
U30
U59
U71
(C0)
(C1)
(C2)
(C3)
(C4)
(C5)
(C6)
(C7)
U44
2400
1200
600
300
S2
BAUD RATE SELECT
R32 1K
U57
U63
74
T_xCLK
$\overline{T_xCLK}$
CYCLES
38,400 - 2400 BD.
19,200 - 1200 BD.
9600 - 600 BD.
4800 - 300 BD.
U28
U60
U61
(C8)
(C9)
(C10)
(C11)
(C12)
(C13)
(C14)
(C15)
R33 10K
C8 .1MF
R34 10K
U65
(VS)
R32
U27
U26
U72
PIN 12 = U56
HS
PIN 12 U65

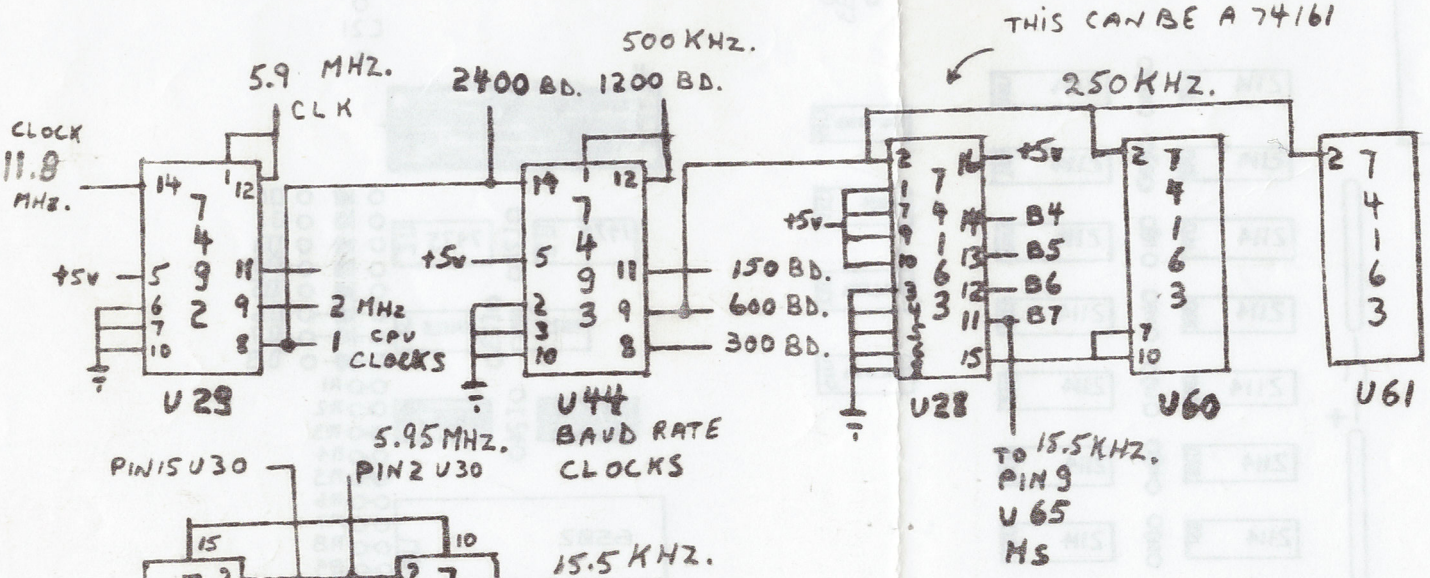
U: 29, 30, 57, 58, 59, 60, 61, 63, 65



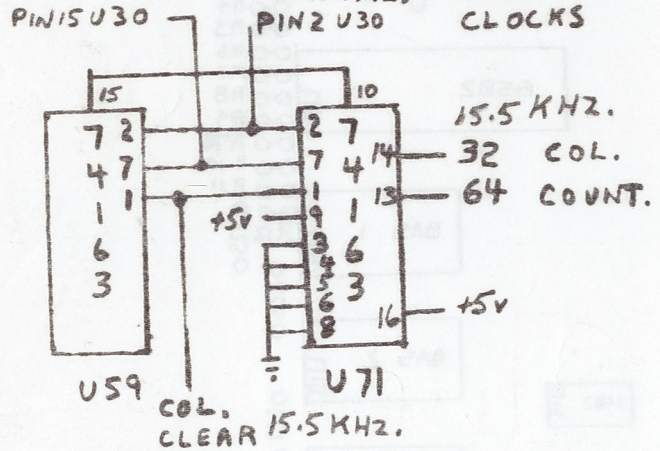
U19, 41, 42, 43, 56, 62, 69, 70



ADD TO ROW CLOCKS

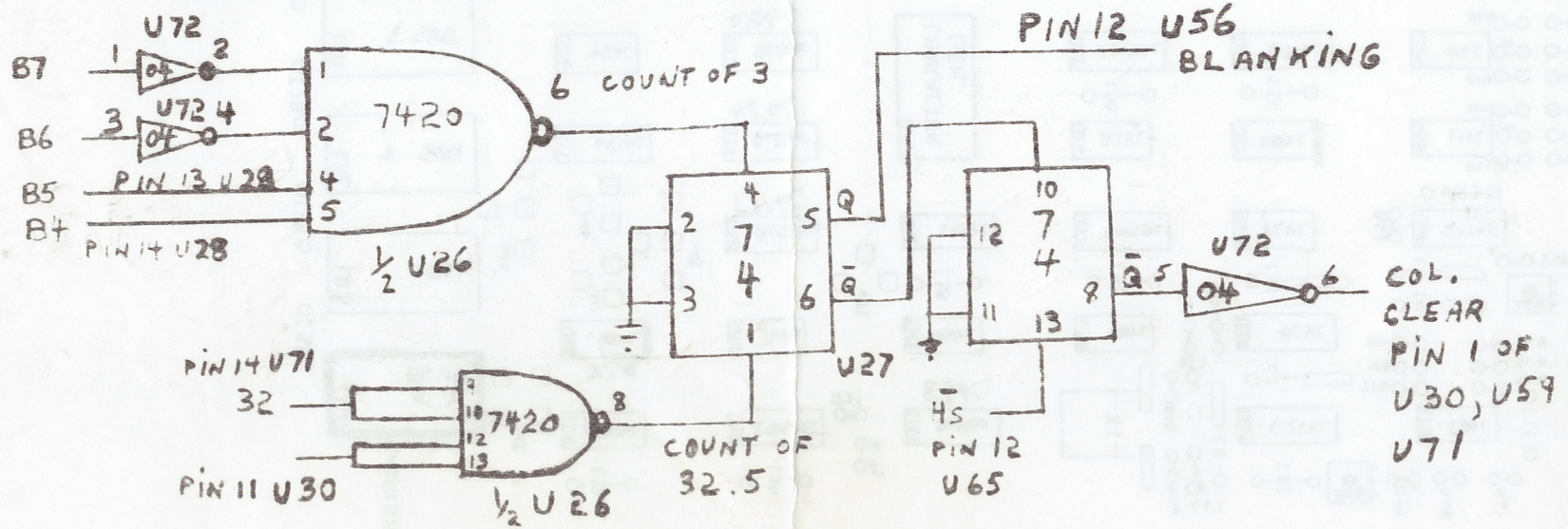


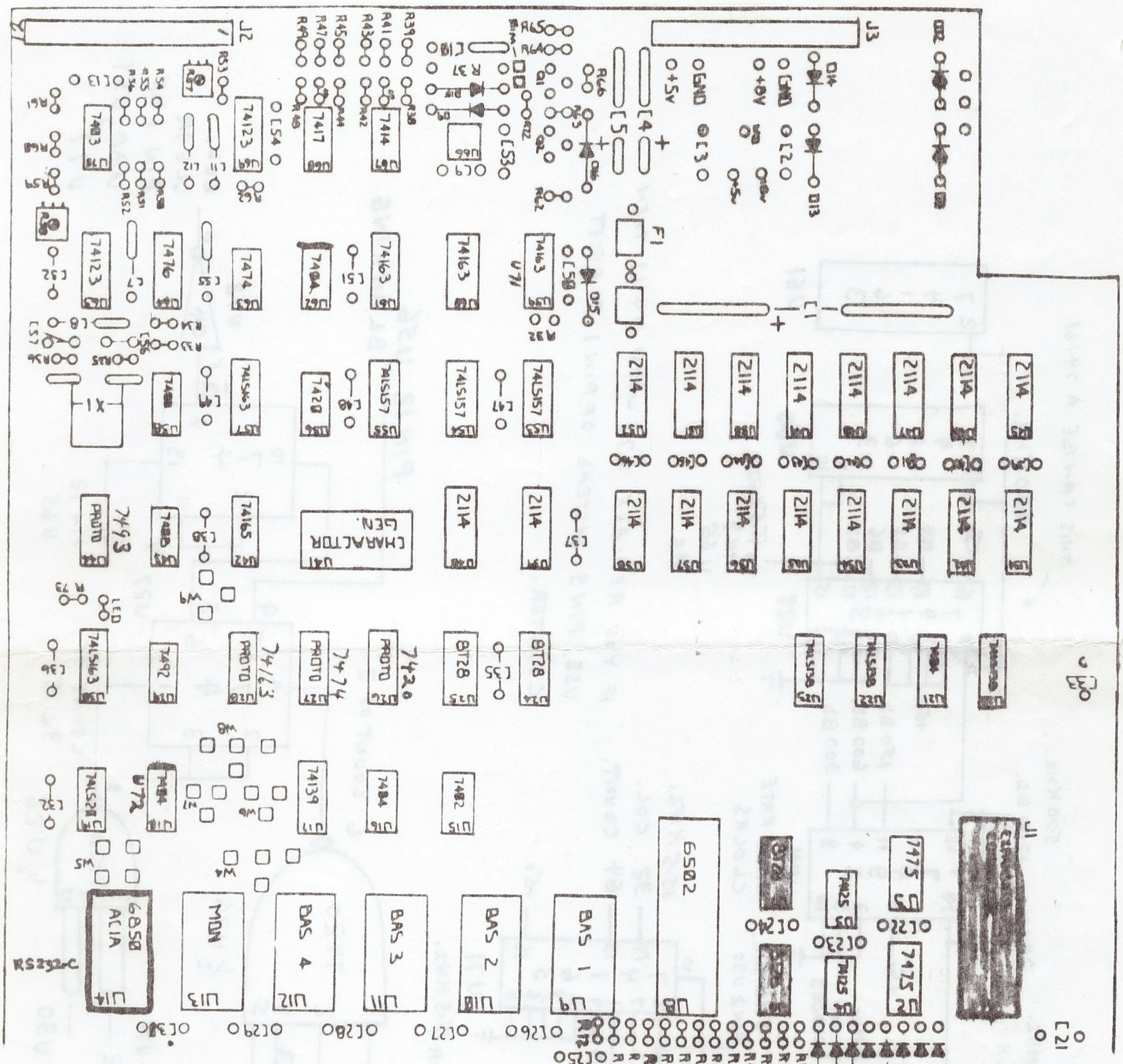
ADD TO COL. CLOCKS



IF YOU REPLACE U71 WITH 74161 THEN USE PIN 9 INSTEAD OF PIN 1 TO RESET COUNTER.

ADD FOR BLANKING




J2
J3
6502
6850 ACIA
RS232-C
MON
BAS 1
BAS 2
BAS 3
BAS 4
CHARACTER GEN.
2114
7475
74LS157
74163
74123
74LS163
PROTO
8T28
74139
F1
+5V
GND
X1
LED

```
 1400 REM" VIDEO MOD.32
 1450 REM
 1480 REM"COPYRIGHT 1979 PROGRESSIVE COMPUTING.
 1490 REM
 1500 REM"TO USE LOAD PROGRAM THEN RUN
 1510 REM"TYPE NEW TO ERASE PROGRAM AFTER CURSOR HAS MOVED
 1520 REM"OUT TO THE EDGE OF THE SCREEN.IT SHOULD ALSO
 1530 REM"BE 2 LINES FURTHER DOWN ON THE SCREEN.
 2002 FOR IN = 546 TO 767
 2004 READ OP :POKE IN,OP
 2006 NEXT IN
 2008 POKE538,34:POKE539,2
 2010 DATA 141 , 2 , 2 , 72 , 138 , 72 , 152
 2020 DATA 72 , 173 , 2 , 2 , 240 , 66 , 172
 2030 DATA 6 , 2 , 240 , 8 , 162 , 32 , 202
 2040 DATA 208 , 253 , 136 , 208 , 248 , 201 , 10
 2050 DATA 240 , 61 , 201 , 13 , 208 , 6 , 32
 2060 DATA 204 , 2 , 76 , 113 , 2 , 141 , 1
 2070 DATA 2 , 201 , 95 , 208 , 13 , 169 , 32
 2080 DATA 141 , 1 , 2 , 32 , 194 , 2 , 206
 2090 DATA 0 , 2 , 208 , 6 , 32 , 194 , 2
 2100 DATA 238 , 0 , 2 , 169 , 31 , 24 , 105
 2110 DATA 160 , 205 , 0 , 2 , 48 , 12 , 32
 2120 DATA 212 , 2 , 104 , 168 , 104 , 170 , 104
 2130 DATA 32 , 108 , 255 , 96 , 32 , 207 , 2
 2140 DATA 32 , 194 , 2 , 169 , 160 , 41 , 224
 2150 DATA 141 , 2 , 2 , 162 , 7 , 189 , 225
 2160 DATA 2 , 157 , 7 , 2 , 202 , 16 , 247
 2170 DATA 190 , 233 , 2 , 169 , 32 , 160 , 31
 2180 DATA 141 , 8 , 2 , 160 , 0 , 32 , 7
 2190 DATA 2 , 208 , 251 , 238 , 9 , 2 , 238
 2200 DATA 12 , 2 , 236 , 9 , 2 , 208 , 240
 2210 DATA 32 , 7 , 2 , 204 , 2 , 2 , 208
 2220 DATA 248 , 169 , 32 , 32 , 10 , 2 , 206
 2230 DATA 8 , 2 , 208 , 248 , 240 , 172 , 174
 2240 DATA 0 , 2 , 173 , 1 , 2 , 157 , 0
 2250 DATA 211 , 96 , 32 , 194 , 2 , 169 , 160
 2260 DATA 141 , 0 , 2 , 174 , 0 , 2 , 189
 2270 DATA 0 , 211 , 141 , 1 , 2 , 169 , 95
 2280 DATA 208 , 231 , 185 , 0 , 208 , 153 , 0
 2290 DATA 208 , 200 , 96 , 211 , 72 , 169 , 32
 2300 DATA 162 , 0 , 157 , 0 , 208 , 157 , 0
 2310 DATA 209 , 157 , 0 , 210 , 157 , 0 , 211
 2320 DATA 232 , 208 , 241 , 104 , 96
 2350 FORIN=224TO234:READOP:POKEIN,OP:NEXT
 2360 DATA32,186,255,201,127,208,3,76,234,2,96
 2370 POKE536,224:POKE537,0

OK
```

Note: Backspace = Shift '0'
Screen Clear = Rubout

```
2000 REM THIS SUB POKES CRT64CHR INTO MACHINE LANGUAGE
2002 FOR IN= 546 TO 765
2004 READ OP :POKE IN,OP
2006 NEXT IN
2010 DATA 32, 186, 255, 201, 127, 208, 3, 76, 220, 2, 96, 240
2020 DATA 72, 141, 2, 2, 72, 138, 72, 152, 72, 173, 2, 2
2030 DATA 201, 10, 240, 61, 201, 13, 208, 6, 32, 199, 2, 76
2040 DATA 111, 2, 141, 1, 2, 201, 95, 208, 13, 169, 32, 141
2050 DATA 1, 2, 32, 189, 2, 206, 0, 2, 208, 6, 32, 189
2060 DATA 2, 238, 0, 2, 169, 63, 24, 105, 64, 205, 0, 2
2070 DATA240, 12, 32, 207, 2, 104, 168, 104, 170, 104, 32, 108
2080 DATA 255, 96, 32, 202, 2, 32, 189, 2, 169, 64, 141, 2
2090 DATA 2, 162, 7, 189, 243, 191, 157, 7, 2, 202, 16, 247
2100 DATA 162, 215, 169, 64, 141, 8, 2, 160, 0, 32, 7, 2
2110 DATA 208, 251, 238, 9, 2, 238, 12, 2, 236, 9, 2, 208
2120 DATA 240, 32, 7, 2, 204, 2, 2, 208, 248, 169, 32, 32
2130 DATA 10, 2, 206, 8, 2, 208, 248, 240, 177, 208, 178, 174
2140 DATA 0, 2, 173, 1, 2, 157, 0, 215, 96, 32, 189, 2
2150 DATA 169, 64, 141, 0, 2, 174, 0, 2, 189, 0, 215, 141
2160 DATA 1, 2, 169, 171, 208, 231, 72, 169, 32, 162, 0, 157
2170 DATA 0, 208, 157, 0, 209, 157, 0, 210, 157, 0, 211, 157
2180 DATA 0, 212, 157, 0, 213, 157, 0, 214, 157, 0, 215, 232
2190 DATA 208, 229, 104, 96
2200 POKE536,34:POKE537,2:POKE538,45:POKE539,2

OK
```

Note: Backspace = Shift '0'
Screen Clear = Rubout

65D CIP
64 CHR./LINE

```
4599 98     TYA
459A 48     PHA
459B AC5B26 LDY $265B
459E AD6323 LDA $2363
45A1 297F   AND #$7F
45A3 A240   LDX #$40
45A5 C90D   CMP #$0D
45A7 F078   BEQ $4621
45A9 C908   CMP #$08
45AB F066   BEQ $4613
45AD C910   CMP #$10
45AF F069   BEQ $461A
45B1 C90C   CMP #$0C
45B3 F065   BEQ $461A
45B5 C90A   CMP #$0A
45B7 F074   BEQ $462D
45B9 C920   CMP #$20
45BB 301C   BMI $45D9
45BD C97B   CMP #$7B
45BF 1018   BPL $45D9
45C1 9D00D7 STA $D700,X
45C4 E8     INX
45C5 E080   CPX #$80

45C7 F060   BEQ $4629
45C9 EA     NOP
45CA EA     NOP
45CB BC00D7 LDY $D700,X
45CE 8C5B26 STY $265B
45D1 A9AB   LDA #$AB
45D3 9D00D7 STA $D700,X
45D6 8EA425 STX $25A4
45D9 68     PLA
45DA A8     TAY
45DB AD6323 LDA $2363
45DE 48     PHA
45DF A901   LDA #$01
45E1 209F24 JSR $249F
45E4 500E   BVC $45F4
45E6 A908   LDA #$08
45E8 209F24 JSR $249F
45EB 1007   BPL $45F4
45ED 202B25 JSR $252B
45F0 C911   CMP #$11
45F2 D0F9   BNE $45ED
45F4 4CF124 JMP $24F1
45F7 00     BRK

45F8 00     BRK
45F9 00     BRK
45FA 00     BRK
45FB 00     BRK
45FC 00     BRK
45FD 00     BRK
45FE 00     BRK
45FF 00     BRK
4600 00     BRK
4601 00     BRK
4602 00     BRK
4603 00     BRK
4604 00     BRK
4605 00     BRK
4606 00     BRK
4607 00     BRK
4608 00     BRK
4609 00     BRK
460A 00     BRK
460B 00     BRK
460C 00     BRK
460D 00     BRK
460E 00     BRK

460F 00     BRK
4610 00     BRK
4611 00     BRK
4612 00     BRK
4613 98     TYA
4614 9D00D7 STA $D700,X
4617 CA     DEX
4618 B0B1   BCS $45CB
461A 98     TYA
461B 9D00D7 STA $D700,X
461E E8     INX
461F B0AA   BCS $45CB
4621 98     TYA
4622 9D00D7 STA $D700,X
4625 A240   LDX #$40
4627 D0A2   BNE $45CB
4629 A240   LDX #$40
462B D004   BNE $4631
462D 98     TYA
462E 9D00D7 STA $D700,X
4631 8E5726 STX $2657
4634 A920   LDA #$20
4636 A280   LDX #$80

4638 9D00D7 STA $D700,X
463B E8     INX
463C D0FA   BNE $4638
463E A0CF   LDY #$CF
4640 C8     INY
4641 8C4926 STY $2649
4644 8C4C26 STY $264C
4647 BD40D0 LDA $D040,X
464A 9D00D0 STA $D000,X
464D E8     INX
464E F0F0   BEQ $4640
4650 10F5   BPL $4647
4652 C0D7   CPY #$D7
4654 90F1   BCC $4647
4656 A240   LDX #$40
4658 4CCB25 JMP $25CB
465B 200100 JSR $0001
465E 00     BRK
465F 00     BRK
4660 00     BRK
4661 00     BRK
```

OFF SET TO
:Q4599

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4599 98      TYA
459A 48      PHA
459B AC5B26  LDY $265B
459E AD6323  LDA $2363
45A1 297F    AND #$7F
45A3 A265    LDX #$65
45A5 C90D    CMP #$0D
45A7 F078    BEQ $4621
45A9 C908    CMP #$08
45AB F066    BEQ $4613
45AD C910    CMP #$10
45AF F069    BEQ $461A
45B1 C90C    CMP #$0C
45B3 F065    BEQ $461A
45B5 C90A    CMP #$0A
45B7 F074    BEQ $462D
45B9 C920    CMP #$20
45BB 301C    BMI $45D9
45BD C97B    CMP #$7B
45BF 1018    BPL $45D9
45C1 9D00D3  STA $D300,X
45C4 E8      INX
45C5 E080    CPX #$80

45C7 F060    BEQ $4629
45C9 EA      NOP
45CA EA      NOP
45CB BC00D3  LDY $D300,X
45CE 8C5B26  STY $265B
45D1 A95F    LDA #$5F
45D3 9D00D3  STA $D300,X
45D6 8EA425  STX $25A4
45D9 68      PLA
45DA A8      TAY
45DB AD6323  LDA $2363
45DE 48      PHA
45DF A901    LDA #$01
45E1 209F24  JSR $249F
45E4 500E    BVC $45F4
45E6 A908    LDA #$08
45E8 209F24  JSR $249F
45EB 1007    BPL $45F4
45ED 202B25  JSR $252B
45F0 C911    CMP #$11
45F2 D0F9    BNE $45ED
45F4 4CF124  JMP $24F1
45F7 00      BRK

45F8 00      BRK
45F9 00      BRK
45FA 00      BRK
45FB 00      BRK
45FC 00      BRK
45FD 00      BRK
45FE 00      BRK
45FF 00      BRK

4600 00      BRK
4601 00      BRK
4602 00      BRK
4603 00      BRK
4604 00      BRK
4605 00      BRK
4606 00      BRK
4607 00      BRK
4608 00      BRK
4609 00      BRK
460A 00      BRK
460B 00      BRK
460C 00      BRK
460D 00      BRK
460E 00      BRK

460F 00      BRK
4610 00      BRK
4611 00      BRK
4612 00      BRK
4613 98      TYA
4614 9D00D3  STA $D300,X
4617 CA      DEX
4618 B0B1    BCS $45CB
461A 98      TYA
461B 9D00D3  STA $D300,X
461E E8      INX
461F B0AA    BCS $45CB
4621 98      TYA
4622 9D00D3  STA $D300,X
4625 A260    LDX #$60
4627 D0A2    BNE $45CB
4629 A260    LDX #$60
462B D004    BNE $4631
462D 98      TYA
462E 9D00D3  STA $D300,X
4631 8E5726  STX $2657
4634 A920    LDA #$20
4636 A280    LDX #$80

4638 9D00D3  STA $D300,X
463B E8      INX
463C D0FA    BNE $4638
463E A0CF    LDY #$CF
4640 C8      INY
4641 8C4926  STY $2649
4644 8C4C26  STY $264C
4647 BD20D0  LDA $D020,X
464A 9D00D0  STA $D000,X
464D E8      INX
464E F0F0    BEQ $4640
4650 10F5    BPL $4647
4652 C0D3    CPY #$D3
4654 90F1    BCC $4647
4656 A260    LDX #$60
4658 4CCB25  JMP $25CB
465B 200100  JSR $0001
465E 00      BRK
465F 00      BRK
4660 00      BRK
```