

## TF20 disk drive notes

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### Dismantling

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Case : Remove the 4 screws from the sides, lift off the top cover, then turn the unit over and remove the base cover

Rear panel : Unplug the serial cable from the serial PCB. Undo the 2 screws under the rear of the unit. Slide the rear panel out rearwards, unplug the transformer secondary winding connector from the PSU PCB.

Serial PCB : Remove the 4 retaining screws and unplug this PCB from the bus connector on the controller

Controller PCB : Unplug the power harness and the internal disk drive cable from the controller PCB.. Remove the 4 retaining screws and the 4 tapped spacers (used to support the serial PCB). Remove the controller board

PSU : Unplug the power connectors from the drives. Unplug the power LED connector from the PSU PCB. Unplug the controller board power harness from the PSU PCB and remove it. Undo the 2 screws holding the PSU PCB to the bracket, then the 2 screws holding the regulator hybrid module to the transformer cover. Remove the PSU PCB and recover the insulating sheet from under the hybrid module.

Drives : Unplug and remove the disk drive cable. Remove the 8 screws (4 on top, 4 underneath) that retain the drives and slide the drives out from the front.

Remaining chassis parts : Free the power LED cable from the clips on the chassis. Remove the 2 screws under the front of the unit and remove the front panel. Remove the 2 self-tapping screws that retain the power LED PCB to the front panel and remove it. Remove the PSU bracket, the transformer cover and the controller bracket (2 screws each).

Rear panel dismantling : Unplug the transformer primary winding connector from the filter PCB. Undo this PCB's retaining screw, unplug the faston tabs from the power switch and remove the filter PCB. Remove the fishpaper insulator. Undo the 4 nuts retaining the mains transformer, remove the claw washers and the transformer. Unplug the remaining 2 faston connectors from the rear of the power switch, unscrew the earth wire from the chassis (note claw washer under the solder tag), remove the 2 retaining screws and the mains input connector. Unclip and remove the power switch. Undo the 2 retaining screws for each DIN socket and remove the serial cable harness. When reassembling, the 6 pin DIN socket is the upper one, both DIN sockets are fitted with the keyway towards the centre of the panel.

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### Controller PCB links :

- J1 : 1 : RAMVdd = 12V (16K RAM)  
2 : RAMVdd = 5V (64K RAM) \*
- J2 : 1 : Write Precompensation enabled  
2 : Write Precompensation disabled \*
- J3 : 1 : EPROM pin 21 = A11 (2732)  
2 : EPROM pin 21 = +5V (2716) \*  
3 : EPROM pin 18 = A11
- J4 : 1 : EPROM pin 18 = CS/ \*  
2 : EPROM pin 21 = CS/
- J5 : 1 : Ready line always active \*  
2 : Ready line from drive
- J6 : 1 : 16K RAM addressing  
2 : 64K RAM addressing \*

J7 : 1 : RA< A7 toed high (16K RAM)  
2 : RA< A7 lined to address mux (64K RAM) \*

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Serial PCB links :

J1 : Clock / 128 (2400 baud)  
J2 : Clock / 64 (4800 baud)  
J3 : Clock / 32 (9600 baud)  
J4 : Clock / 16 (19200 baud)  
J5 : Clock / 8 (38400 baud) \*  
J6 : Clock / 4 (76800 baud)

Exactly one of J1..J6 must be fitted

J7 : Open : Enable oscillator round CR2 (4.1953 MHz) \*  
Closed : Enable oscillator round CR1 (not fitted)

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Controller PCB testpoints :

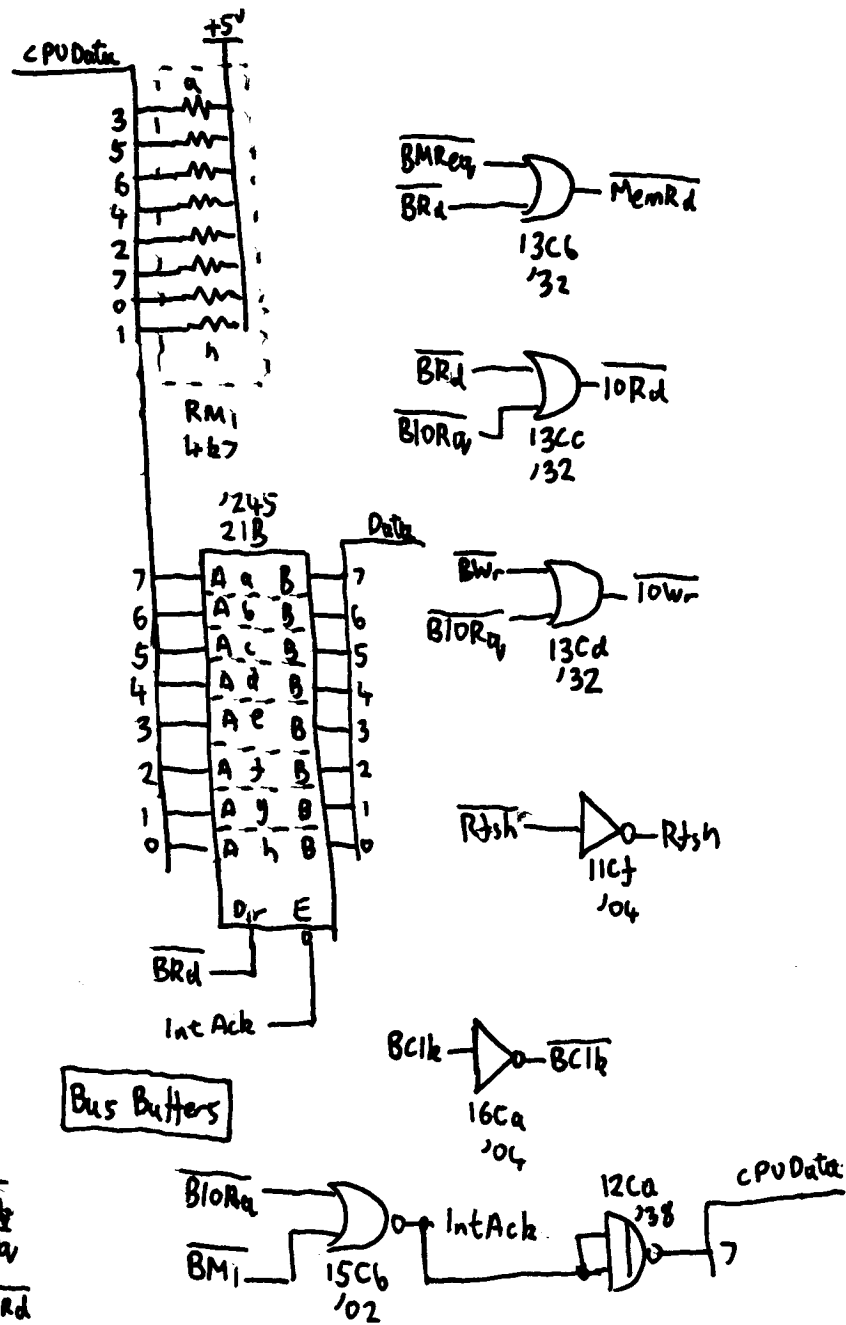
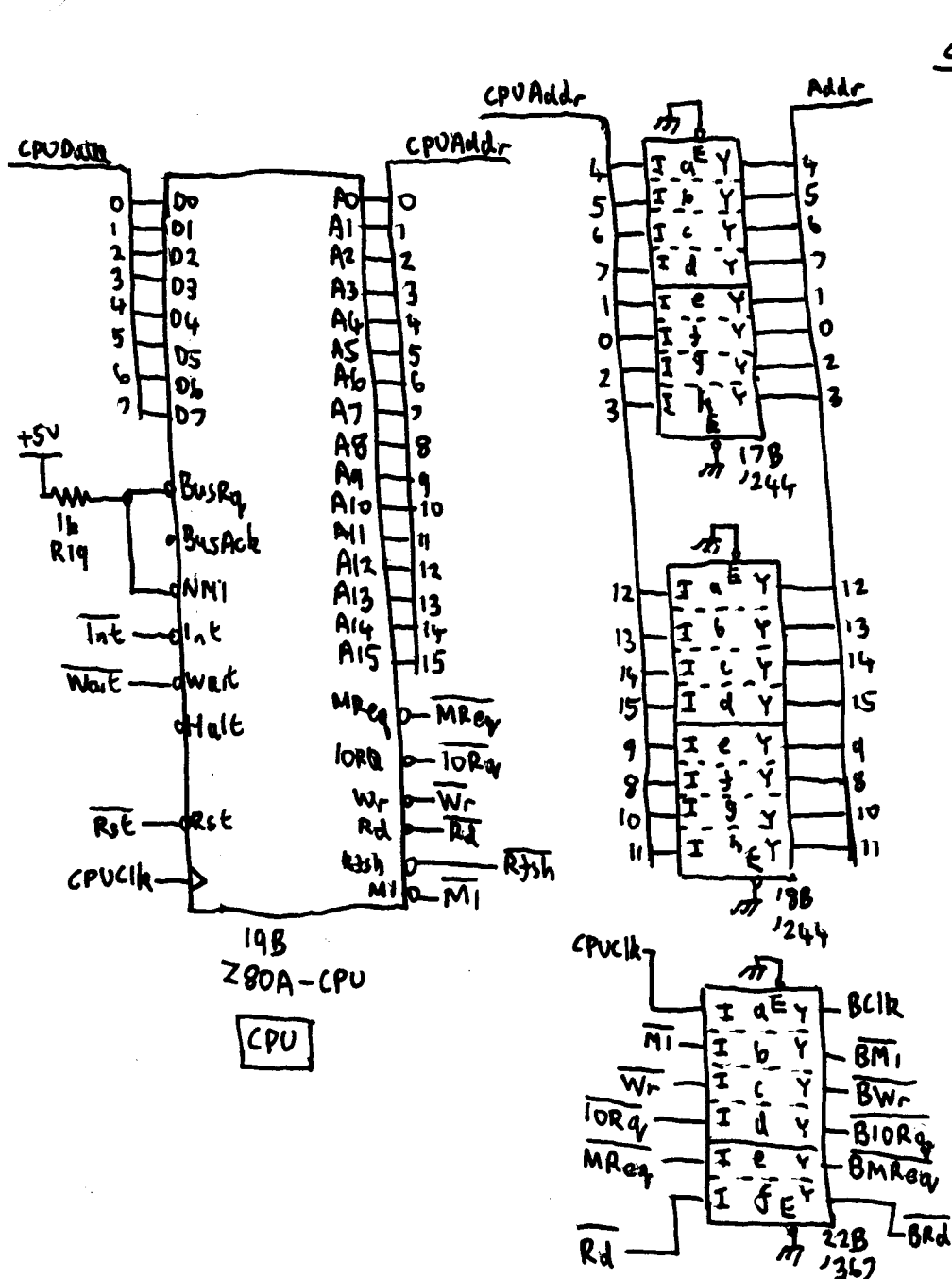
TP1 : RAS/  
TP2 : CAS/  
TP3 : Rd Data  
TP4 : VCO control voltage  
TP5 : VCO output  
TP6 : DW  
TP7 : Ground

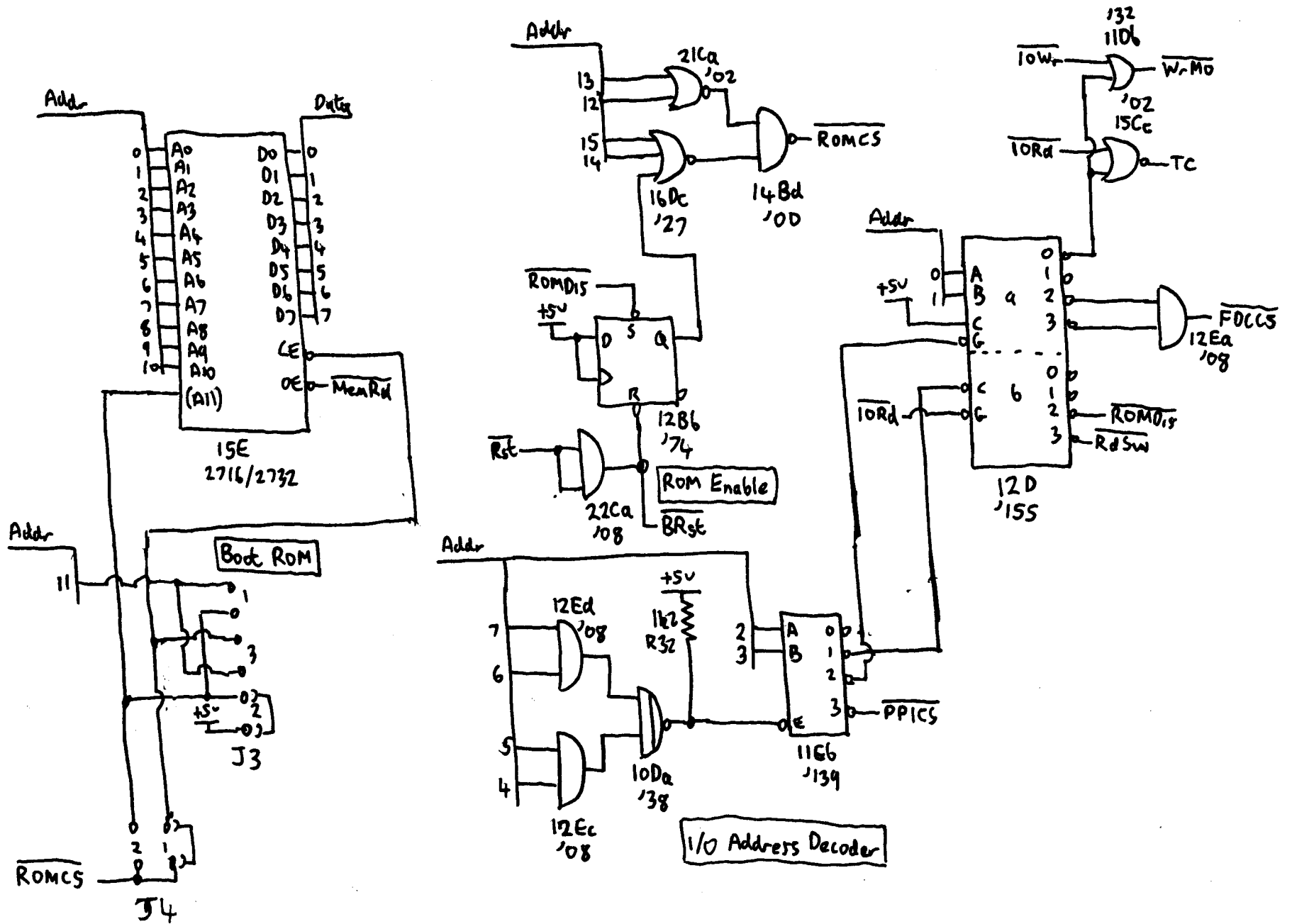
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Serial PCB testpoints :

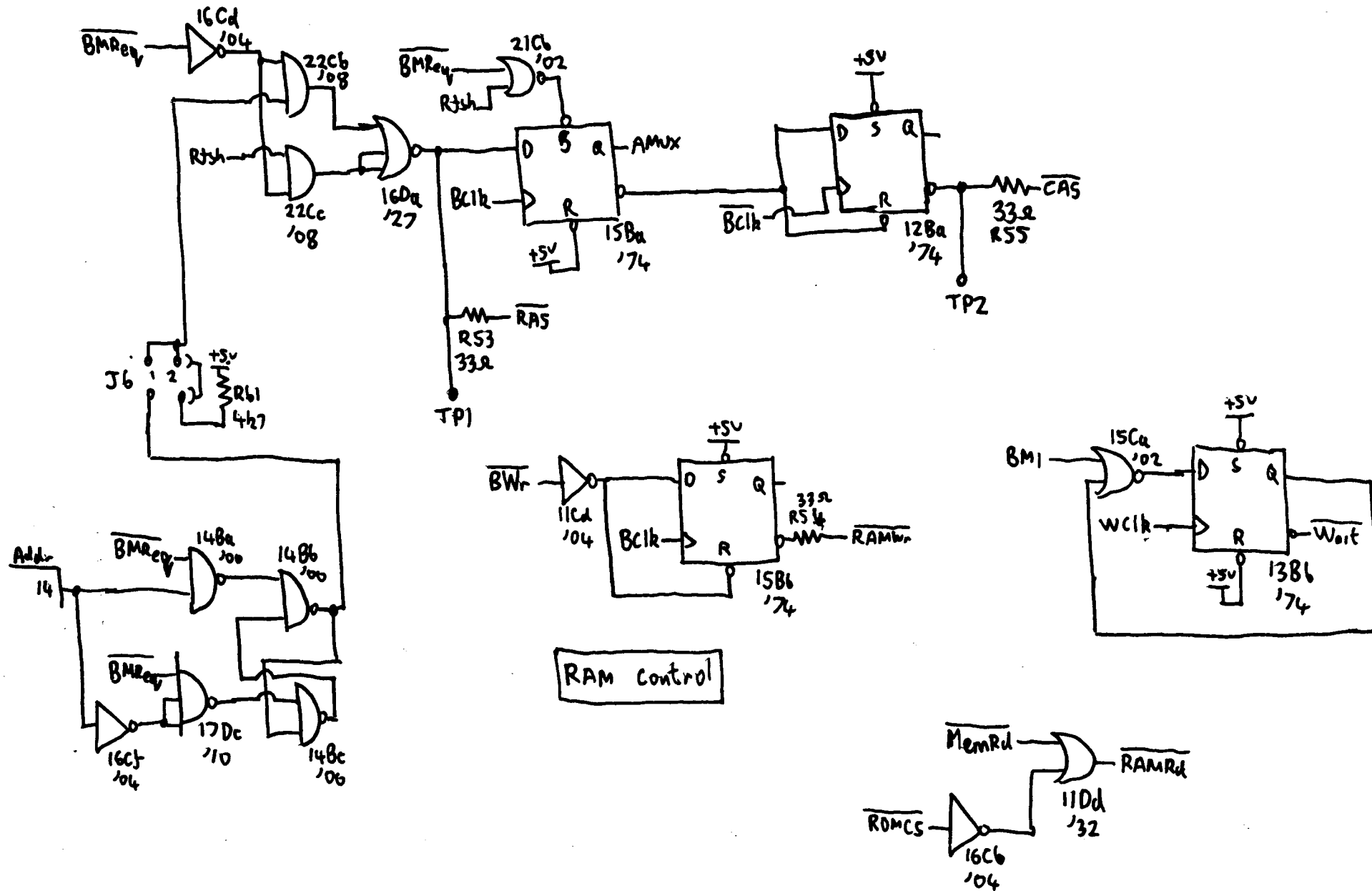
TXCA : Baud Clock (\*16) to serial chip  
TXDA : Serial data output to host  
RXDA : Serial data input from host  
TXDB : Channel B serial data output (not used)  
RXDB : Channel B serial data input (not used, pulled high via 10k resistor)



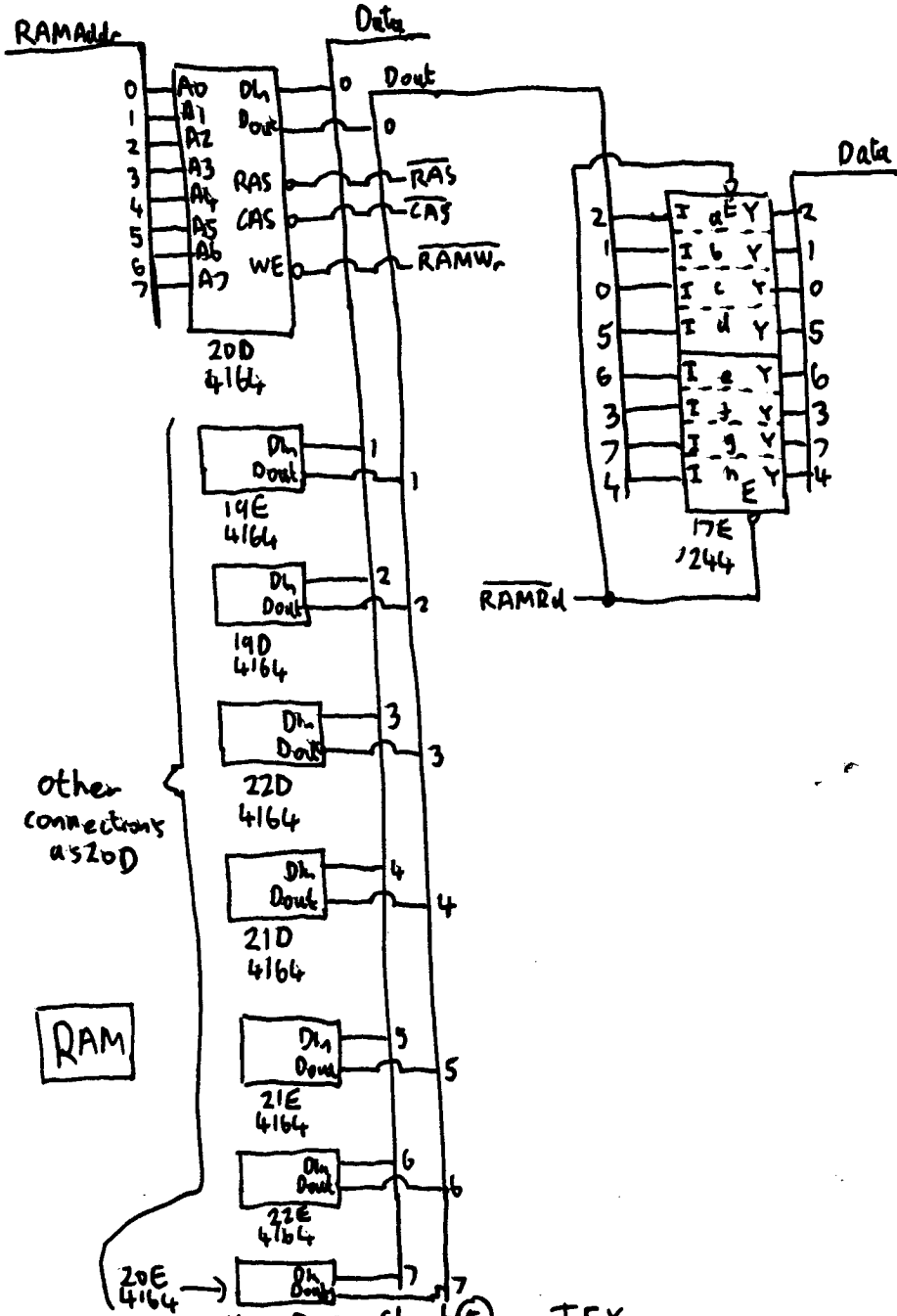
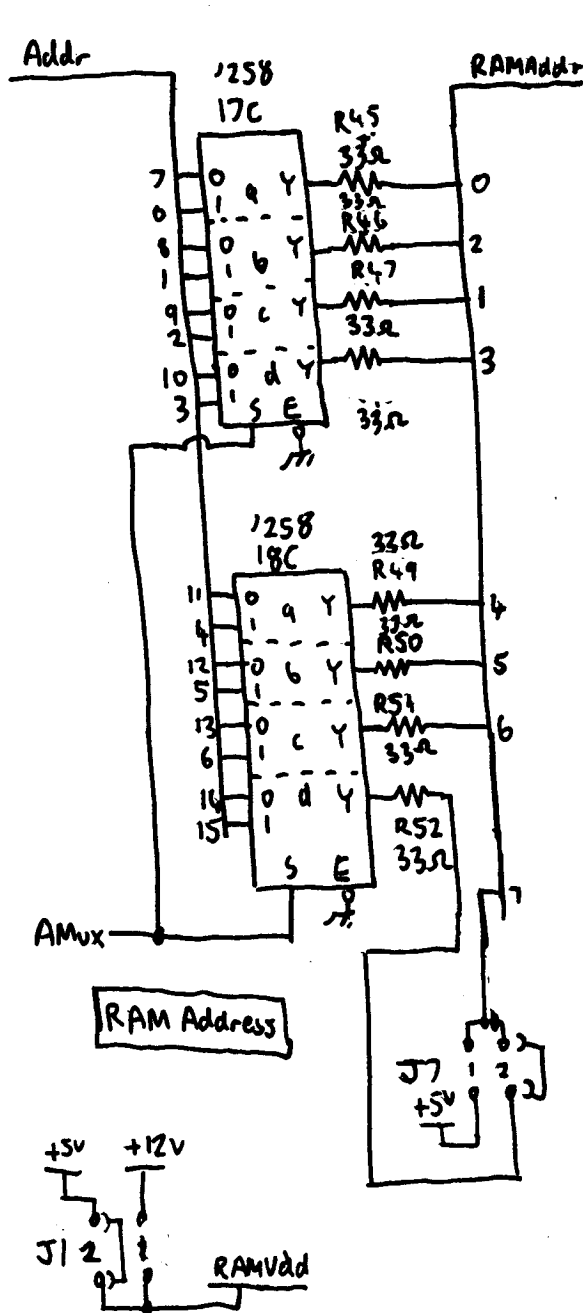




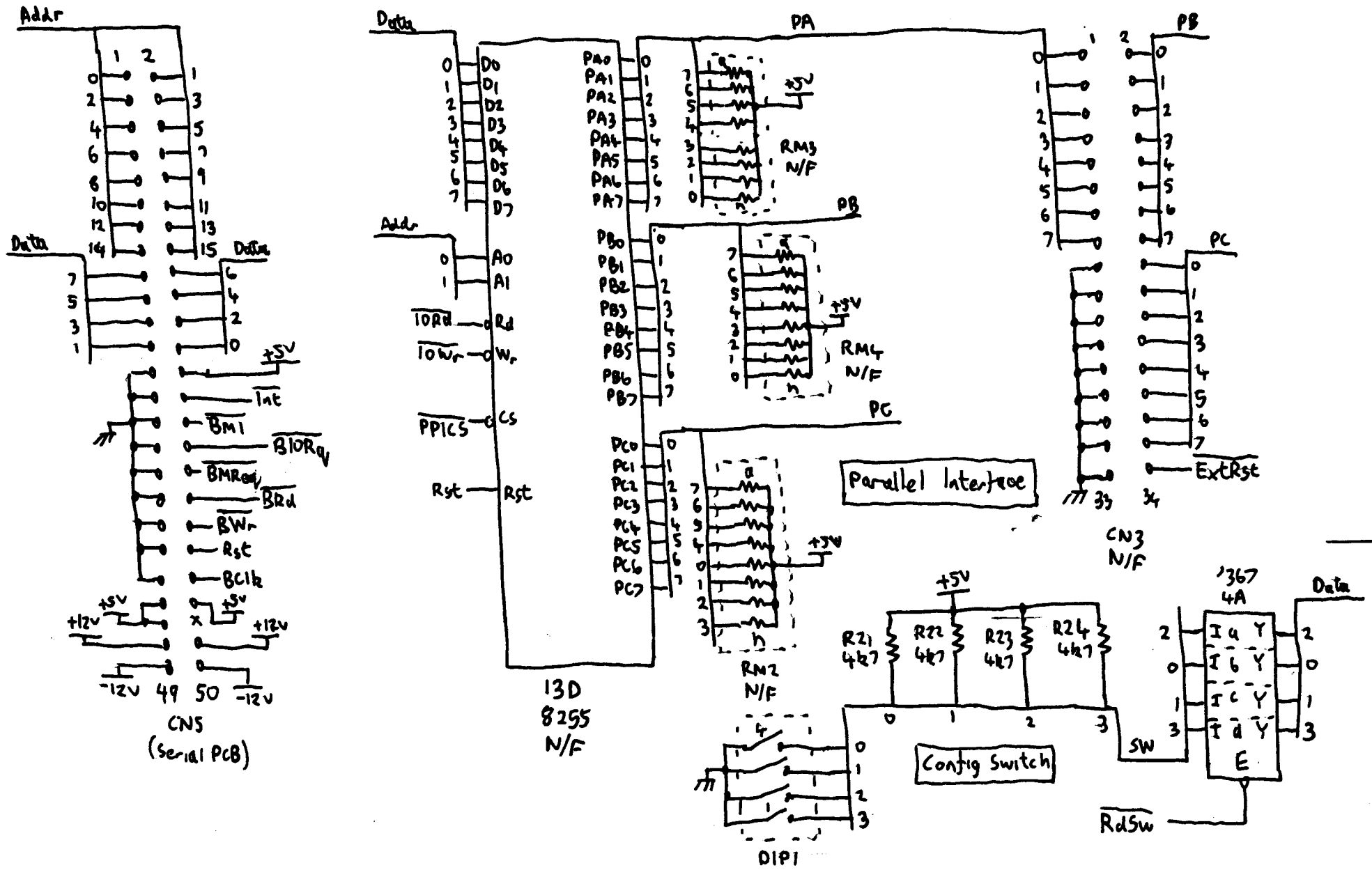
Epson TF20 Controller PCB Sheet(3) TFX



RAM control

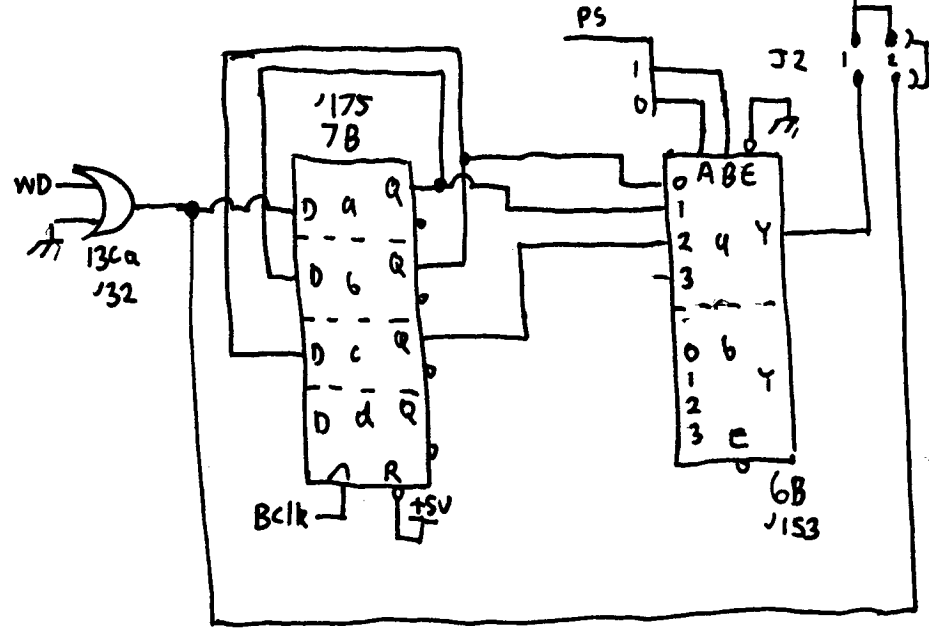
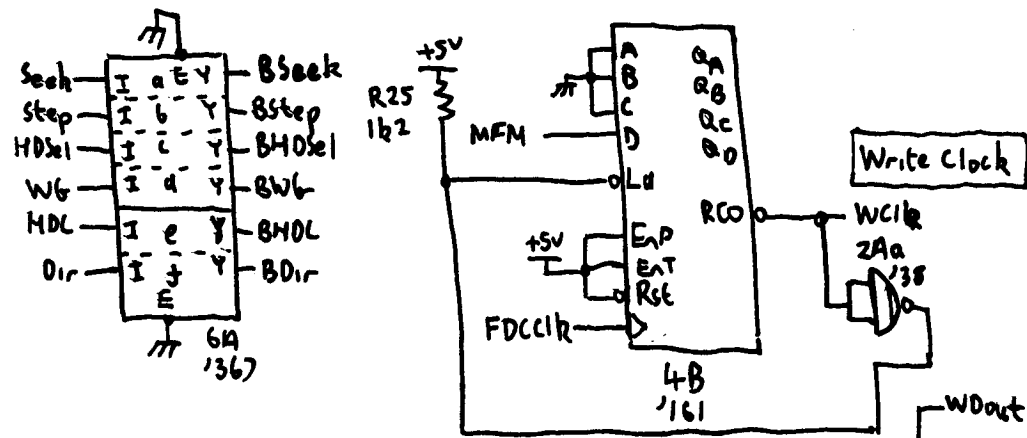
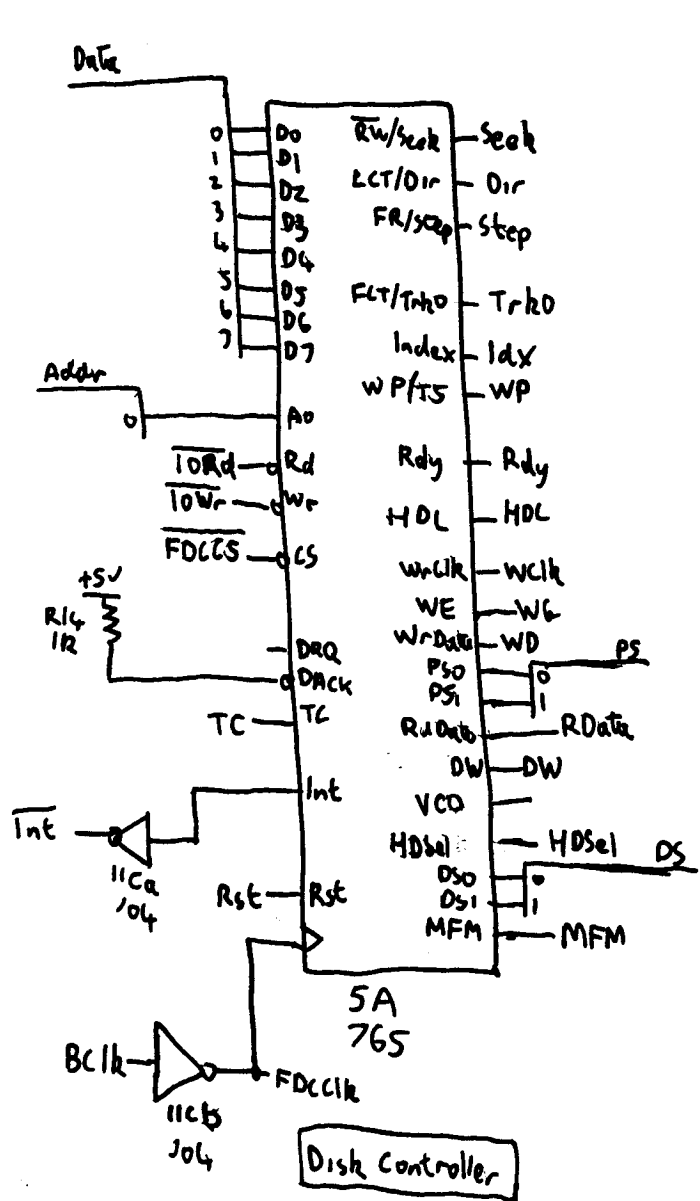


Epson TF20 Controller PCB Sheet ⑤ TFX

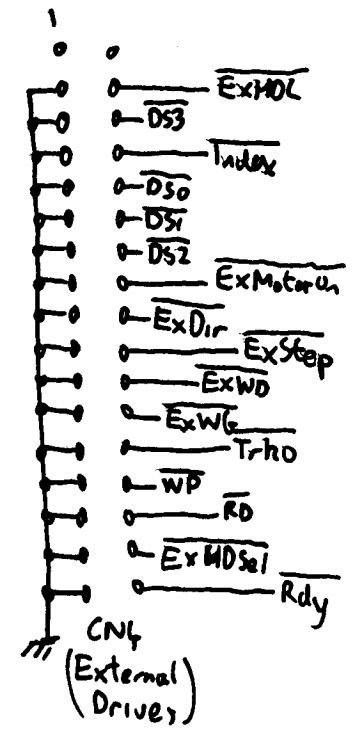
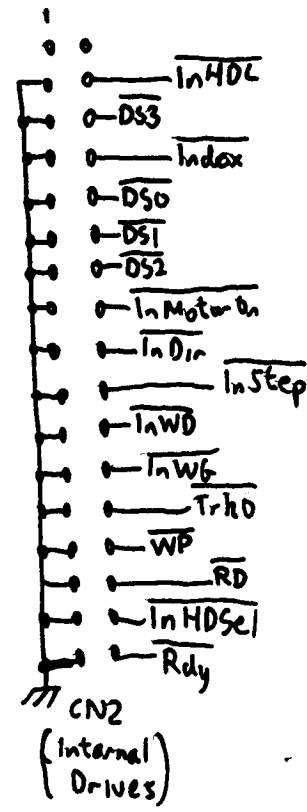
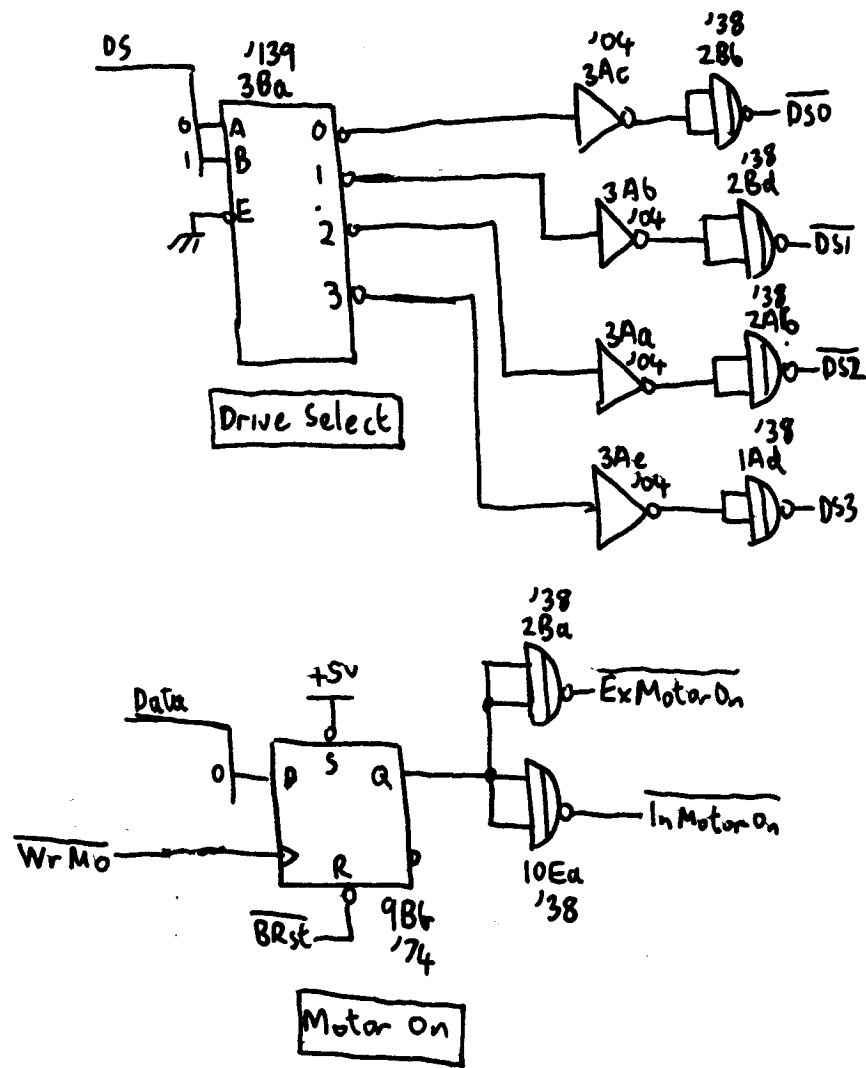


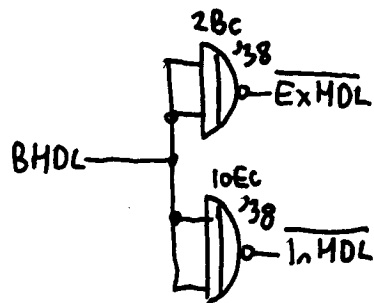
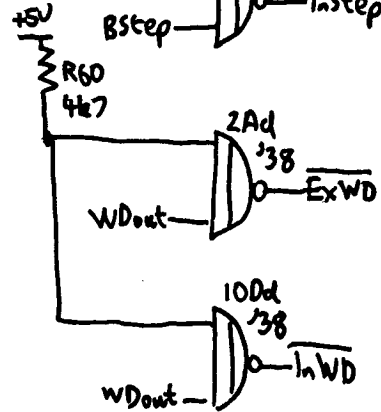
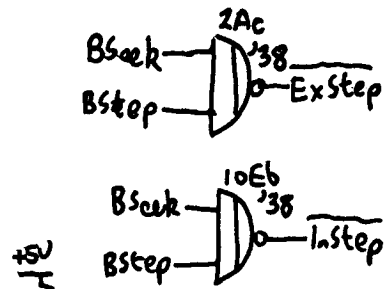
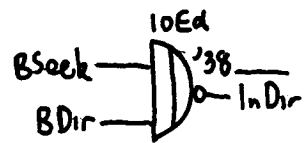
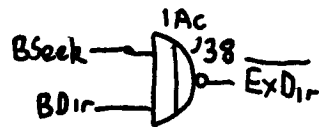
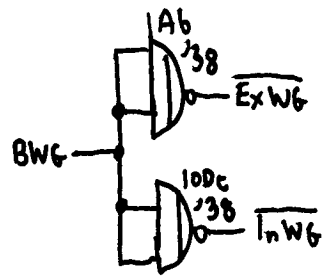
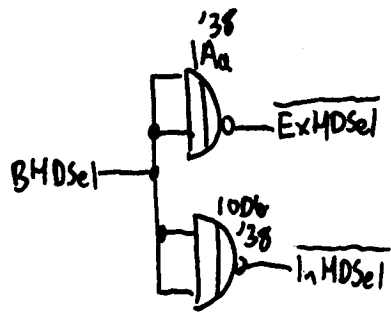
Epson TF20 Controller PCB Sheet (6) TFX



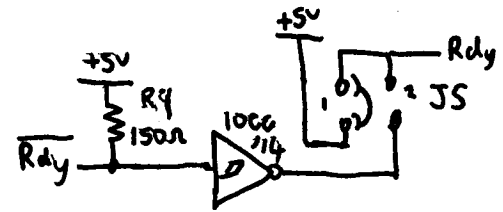
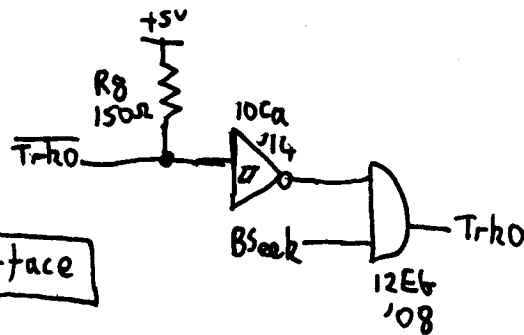
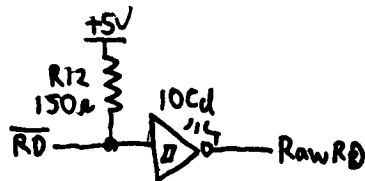
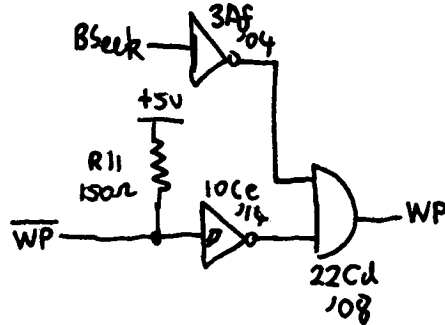
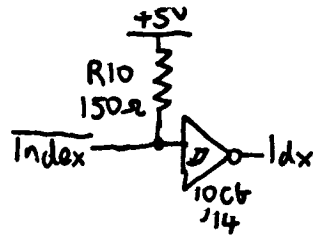


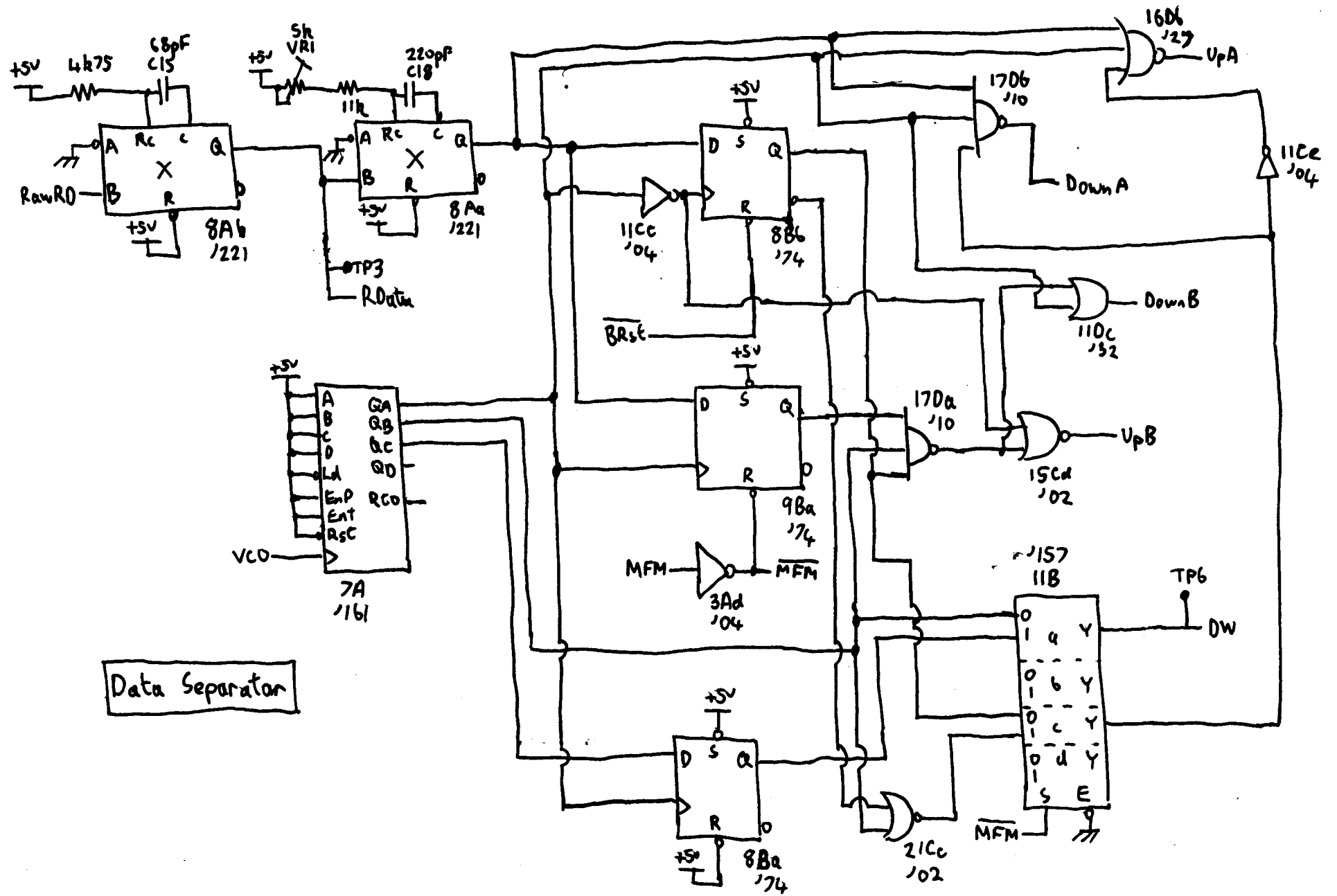
Write Precompensation



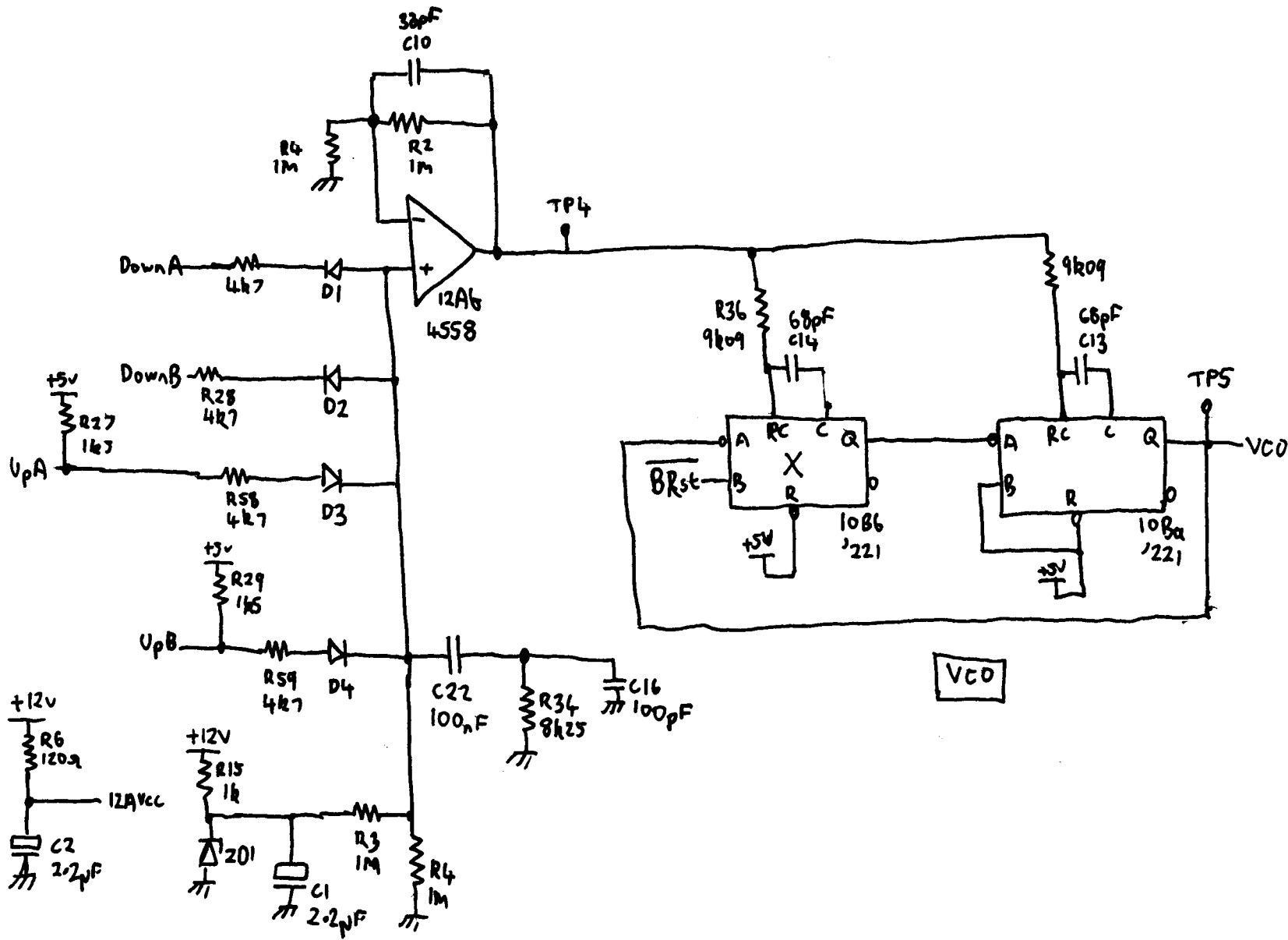


Drive Interface

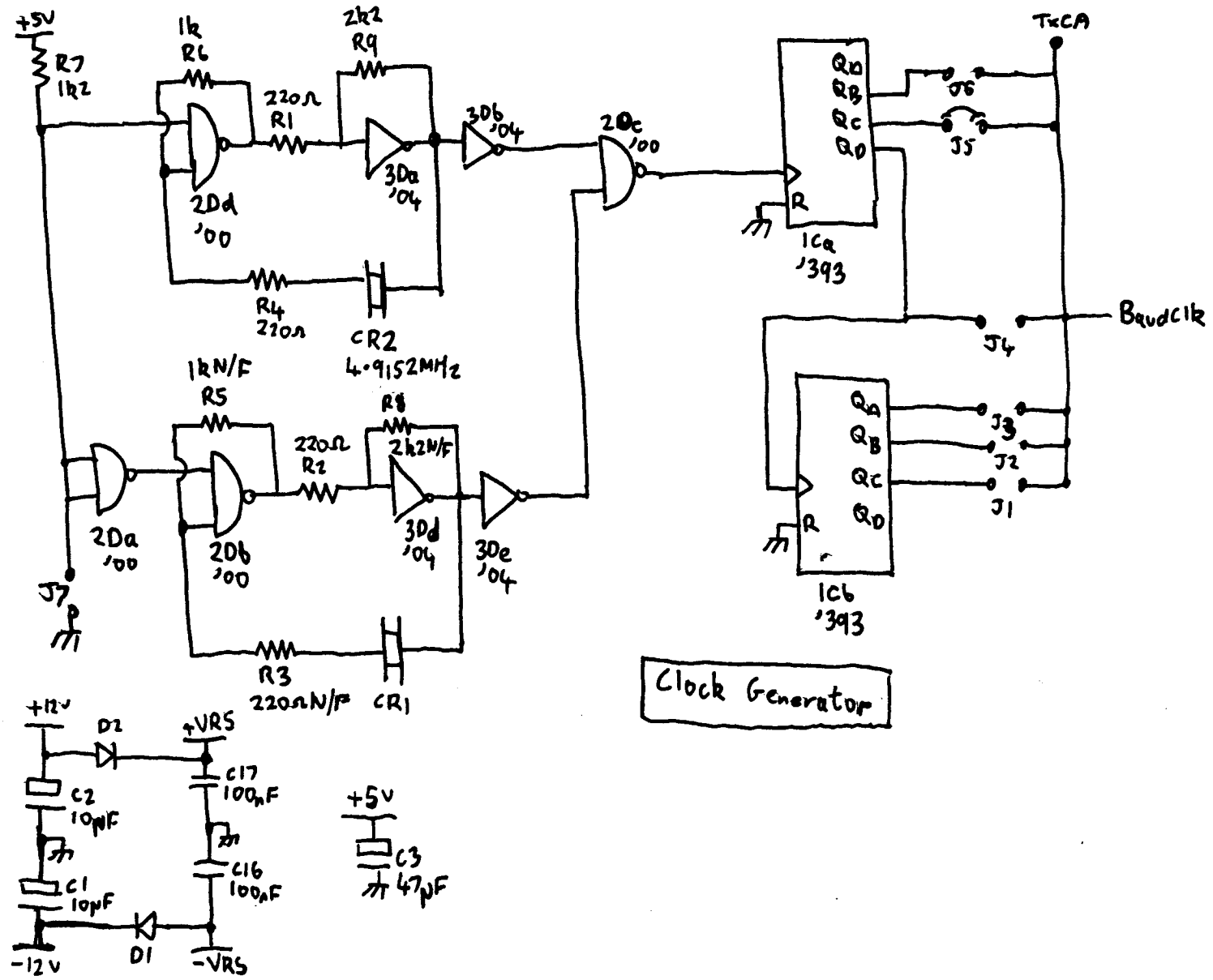
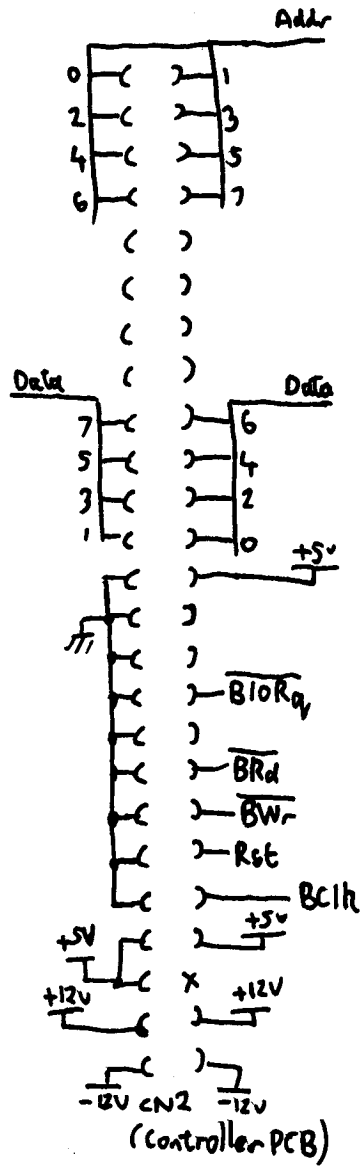




Data Separator

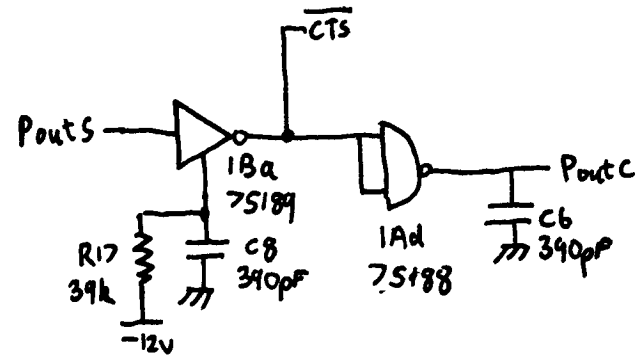
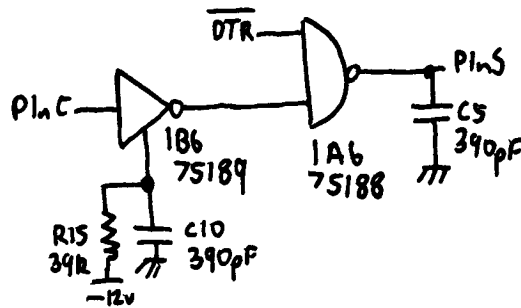
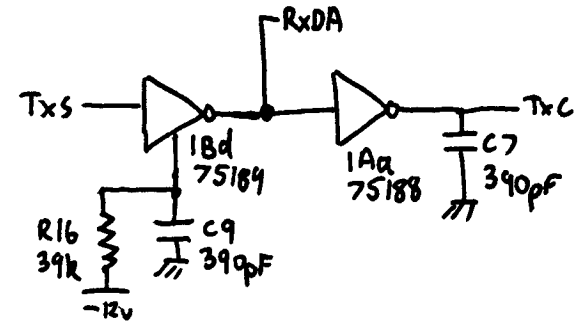
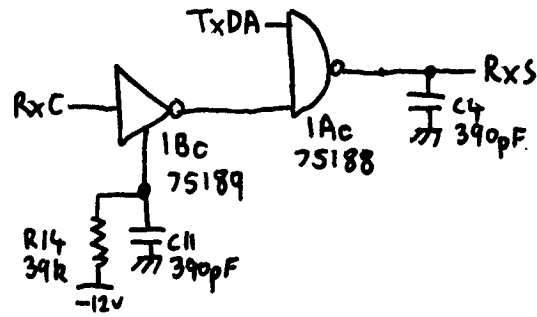


Epson TF20 Controller PCB Sheet (II) TFX



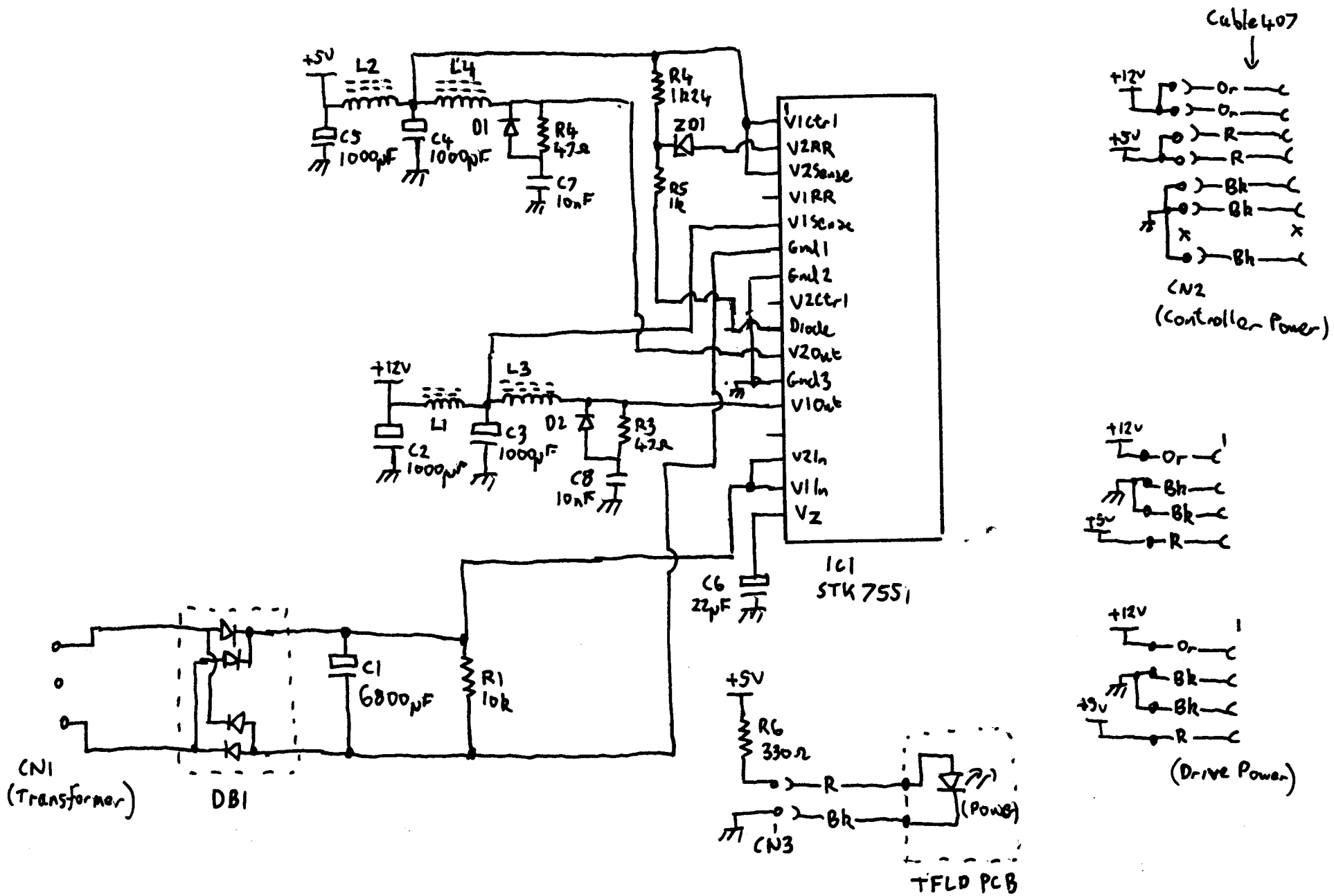


- 1
  - RxS
  - X
  - PlnS
  - TxS
  - PoutS
  - ⏏
  - PoutC
  - TxC
  - PlnC
  - RxL
- CN1  
(Serial Ports)

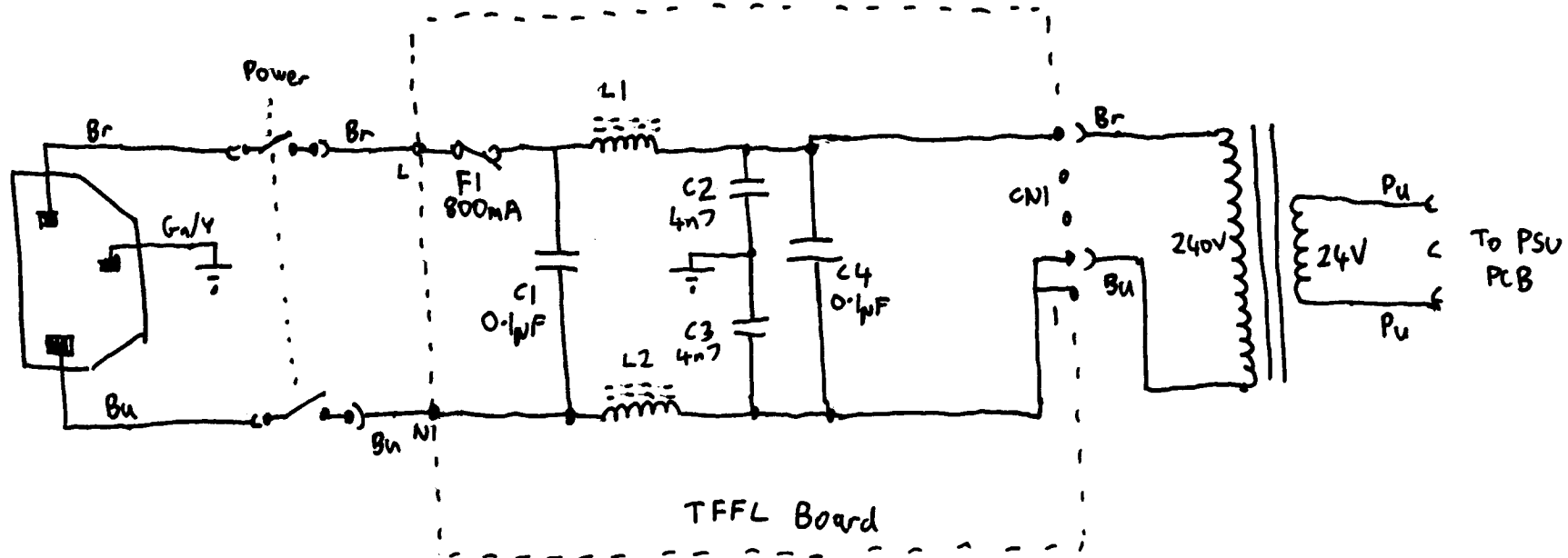


RS232 Buffers





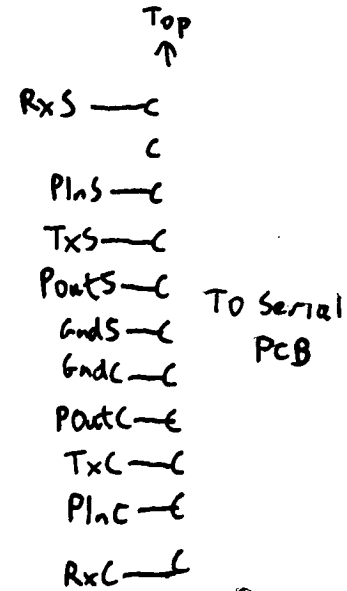
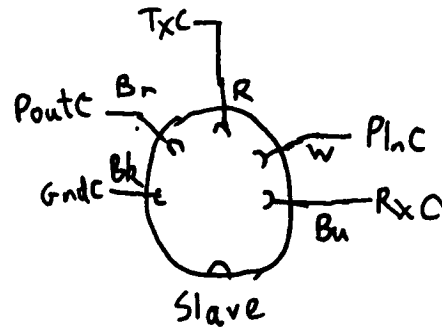
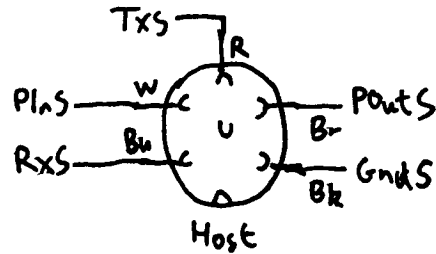
Epson TF20 PSU PCB TFPS



Epson TF20 Mains Wiring

Note: Signal Direction

RxS out  
 PlnS out  
 TxS in  
 PoutS in  
 RxC in  
 PlnC in  
 TxC out  
 PoutC out



Epson TF20 Serial Connector Wiring

## SD320, SD321 drive dismantling

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### Remove the logic board :

Undo the 4 screws fixing the logic board. The rear left is a long machine screw, rear right a short machine screw, centre right and front centre are (short) self-tapping screws. Lift the logic board to disconnect the 3 pin connector at front left (index/write protect sensors), 10 pin (positioner) and 3 pin (spindle motor) connectors at rear. Turn logic board over towards right side of the drive. Free the head cables from the clamps on the logic PCB, unplug the head connector. Set the logic board aside.

On SD320 (with head load solenoid), dismantle the head load mechanism :  
Remove the screw and washer on top of the head load solenoid. Loosen the screw from the rear bearing of the head load flap (this screw is on the left side of the drive chassis) until the bearing can be turned away from the pivot pin. Free the hard load flap from its front bearing, remove it, note how the compression spring fits over a peg on the base of the linear positioner. Remove the conical spring from the top of the head load solenoid, remove the solenoid armature. Remove the screw and bearing (loosened earlier). Remove the screw holding the head load solenoid to the chassis, lift out the solenoid and 'stick' it to the linear positioner magnet. When reassembling this section, note that the screw on top of the solenoid should not be fully tightened. Adjust it so that the heads load correctly when the drive is tested on an exerciser.

### Remove the linear positioner (voice coil assembly) :

Undo the 2 screws + springs and the single countersunk screw fixing the linear positioner to the main chassis. Free the head cables from the clips on the right-hand disk guide. Place a piece of paper between the heads, lift the positioner from the rear and slide it out

### Remove the disk clamp :

Unhook and remove the tension spring for the frontpanel button linkage. Mark the position of the index sensor on the disk clamp bridge to aid reassembly. Remove the 3 screws holding the bridge in place, lift it up and turn it over towards the left side of the drive (take care not to damage the index phototransistor wiring. Remove the 3 spacers from the slots in the disk guides. Free the index phototransistor wiring from the hooks on the bridge, remove the screw holding the phototransistor mount in place and remove the bridge completely.

### Remove the spindle motor and spindle :

Remove the 2 screws holding the spindle motor in place. Remove the motor, slipping the belt off the pulley. Remove the belt from the idler and spindle. Remove the idler (one central screw, washer on top of bearing). Remove the central screw from the spindle hub, lift off the spindle hub and remove the bearings (crinkle washer under top bearing). If possible remove the washer from the fixed spindle in the chassis

### Remove the front panel :

Remove the 2 screws and slide the panel out, taking care not to damage the index LED wiring.

### Remove the disk guides :

Remove the right hand disk guide (2 screws). Remove the index LED mounting (1 screw), then remove the screw holding the left hand disk guide. Remove the guide. Undo the screw holding the sensor PCB to the guide and remove it.

### Dismantle the interlock lever :

Unhook the tension spring from the eject linkage. Remove the E-circlip from one end of the interlock lever pivot, slide out the pivot rod and remove the lever. Recover the compression spring.

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### Dismantling the spindle motor

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Do NOT dismantle the spindle motor unless absolutely necessary. Most

electronic repairs can be performed without dismantling the mechanical section. However, should it be necessary to dismantle it, proceed as follows.

Clean off the silicone rubber over the FG (frequency generator) coil wires. Try to avoid damaging the wires. Desolder them from the PCB pads.

Bend up the 4 tabs on the bottom of the motor and pull off the housing complete with the FG coil.

Support the motor on a bench vice with the pulley between the jaws. Using a hammer and pin punch, tap the spindle downwards until it is free from the rotor. Remove the rotor from the top of the motor. Remove the spindle, washer, and lower bearing. Push out the upper bearing.

If the FG wires were damaged when the cover was removed, carefully scrape away the tops of the 3 heat stakes retaining the coil former inside the housing. Pull out the former (and lower pole piece), and either unwind one turn to give a longer end of wire for reassembly, or re-wind the coil. Put the former back in place, if you have been careful in removing it, it will snap in place without further fixing.

#### Motor Protection Circuit :

The circuit round Q33 removes the drive from the motor if the control voltage from IC10 rises too high (either because the motor is overloaded, or because the FG signal is missing). If this triggers too easily (the motor stops after a few seconds), decrease R76 to 56k

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#### Dismantling the positioner

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On an SD-320, desolder the head load solenoid leads from the positioner connector PCB and set the solenoid aside

Undo the PCB retaining screw and allow the PCB to move away from the rear of the positioner.

Undo the screw holding the graticule to the carriage. Remove the clamp plate under the screw, then with the heads fully 'out', free the graticule from the carriage and slide it out of the optical block.

Straighten the end 2 tabs on the underside of the unit (these retain the cover on the velocity transducer). Remove the cover.

Remove the rear section of the voice coil core, which is retained by a single screw under the rear of the positioner.

Remove the 2 screws holding the voice coil and velocity transducer coil to the carriage. With the heads 'out', remove the pole piece from the middle of the velocity transducer coil (this is retained by magnetism only).

Retract the heads, then lift the coils off the carriage. Leave them hanging on the flexible PCB

Remove the clamps from the rear end of each head rail (1 screw each). Slide out the front clamp, then lift out the head carriage and remove the rails

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#### Dismantling the disk-inserted levers

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(These are the linkages on the left-hand disk guide.)

Unhook the torsion spring and slide out the eject interlock flap. Remove the spring

Unhook the torsion spring on the latch lever (top rear of the guide). Remove the E-circlip, the torsion spring and the latch lever

Unhook the torsion spring on the disk-present lever (under the front of the guide. Remove the E-circlip, the torsion spring and the disk-present lever.

Remove the E-circlips on the mounting posts for the frontpanel button slide. Remove the 2 washers, lift off the slide and recover the following parts : 2 spacers and 2 washers from the mounting posts ; 2 rollers from the slide ; 1 reaction plate from the guide

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#### Dismantling the disk clamp assembly

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Pull the disk clamp lever away from the bridge by hand until the disk clamp cone is free of the spindle. Slide the clamp cone out of the end of the lever.

Unhook the torsion spring. Remove the E-circlip from the end of the pivot spindle, slide out the spindle and remove the torsion spring. Separate the clamp lever from the bridge.

Unclip the 2 halves of the disk clamp cone and remove the compression spring. Press out the bearing. Remove the circlip and slide the bush out of the centre of the bearing.

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#### Bearings

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##### Clamp Bearing

ID : 4.6mm

OD : 9.5mm

Thickness 3.17mm (1/8")

##### Motor Bearings and Belt Idler

ID : 3mm

OD : 8mm

Thickness : 4mm

##### Spindle Bearings

ID : 4.75mm

OD : 9.5mm

Flange OD : 10.8mm

Total Thickness : 3.15mm

Flange Thickness : 0.75mm

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#### SD320 links :

##### SS1 (6 position DIP switch)

1 : Drive select 0

2 : Drive select 1

3 : Drive select 2

4 : Drive select 3

5 : Head load from pin 4 of interface connector \*

6 : Head load from drive select

##### SS2 :

HS : Load controlled by head-load signal \*

MS : load controlled by motor enable

##### SS3 :

DS : In-use LED controlled by drive select

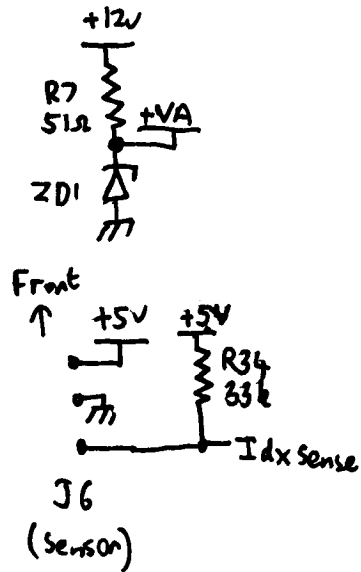
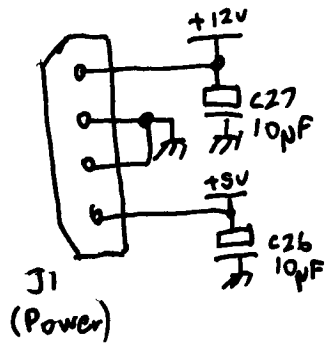
HL : In-use LED controlled by head load drive \*

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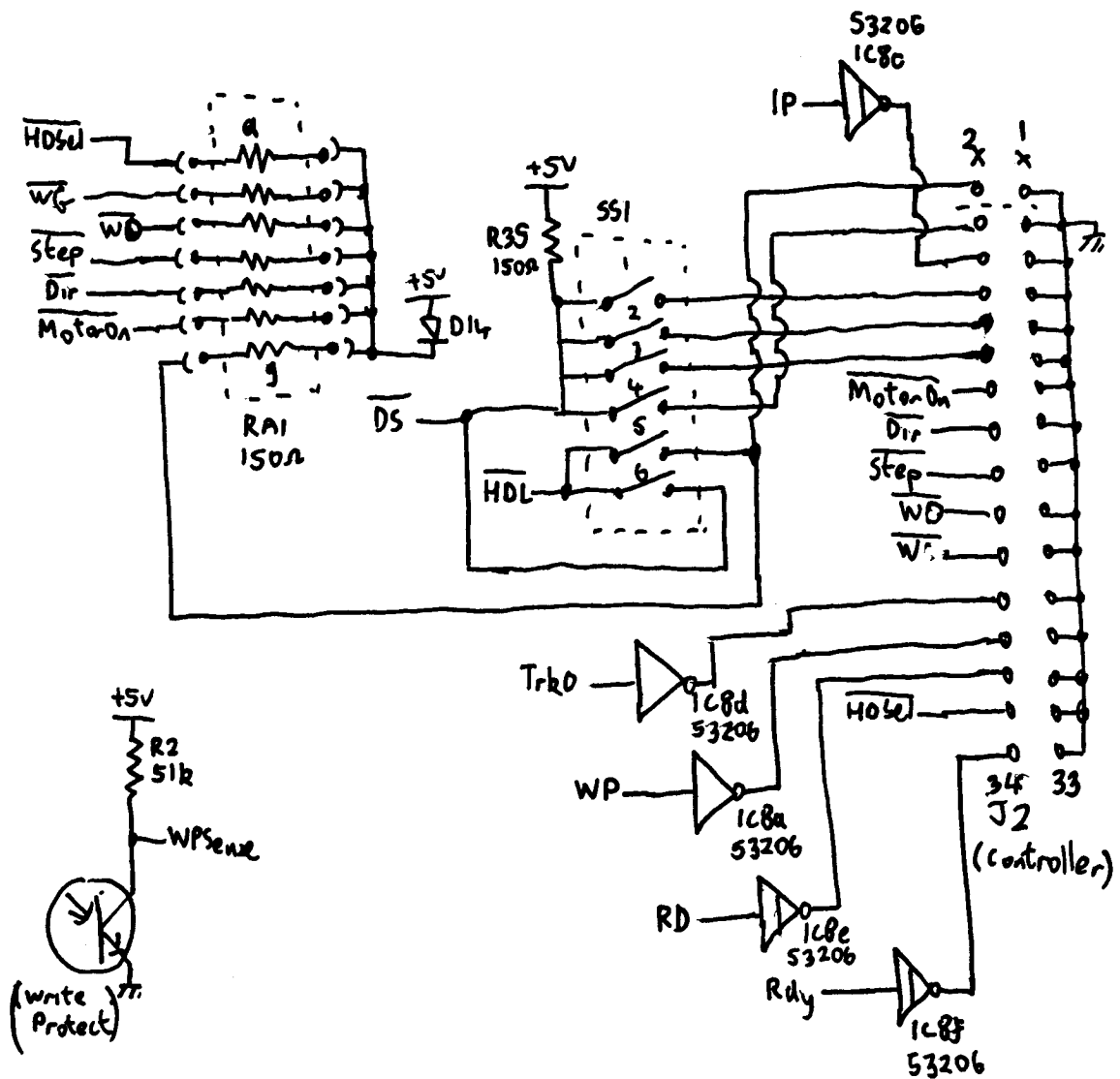
#### Testpoints :

1 : Ground

- 2 ) Differential outputs of read amplifier
- 3 )
- 4 ) Differential inputs to comparator
- 5 )
- 6 Index sensor
- 7 Index pulse
- 8 Drive Select/

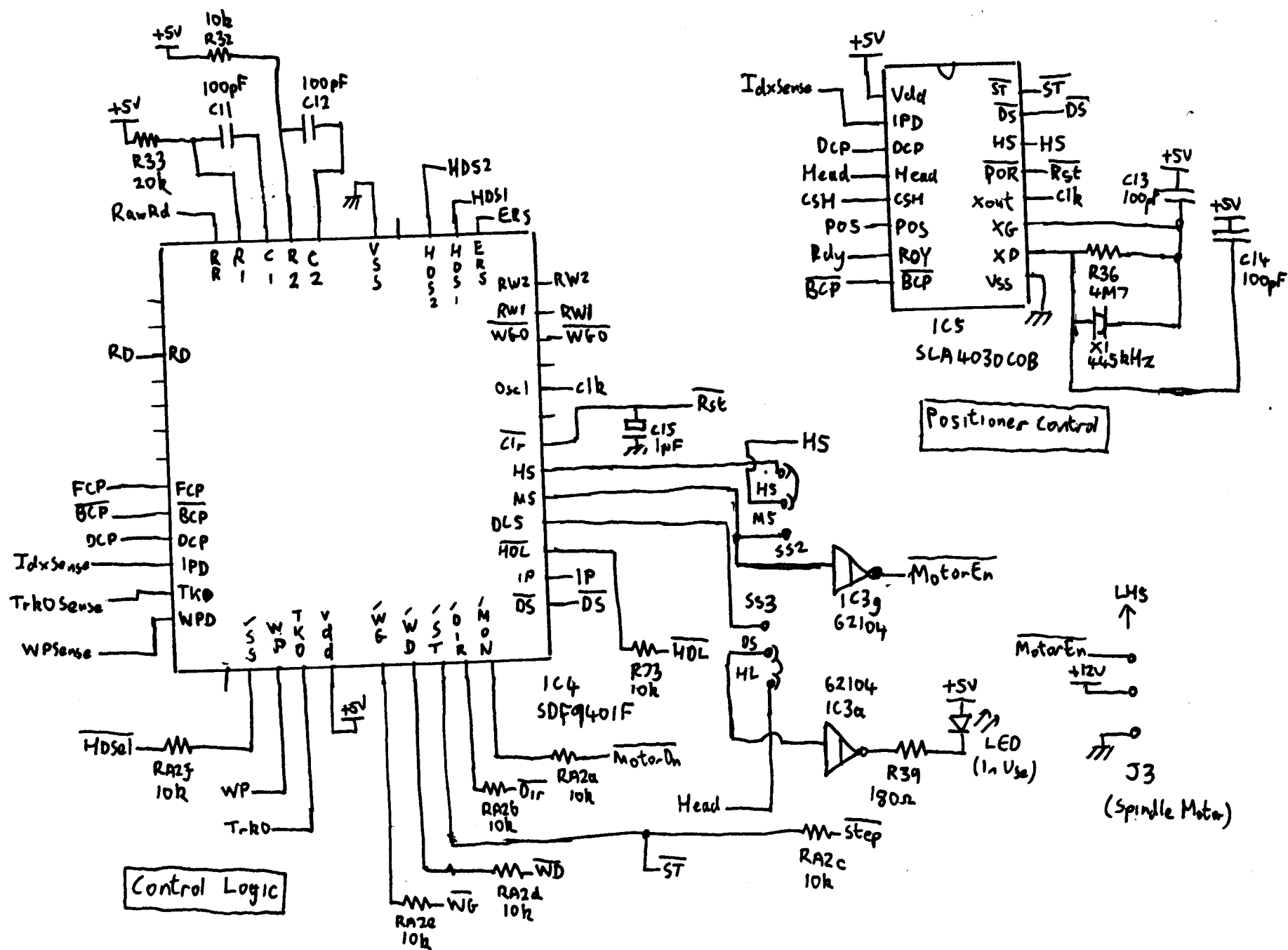


Sensors

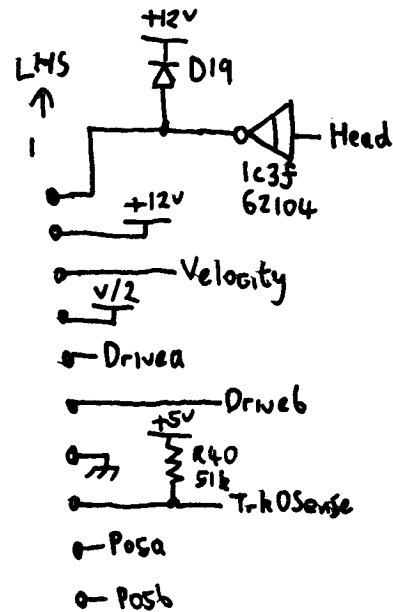


Controller Interface

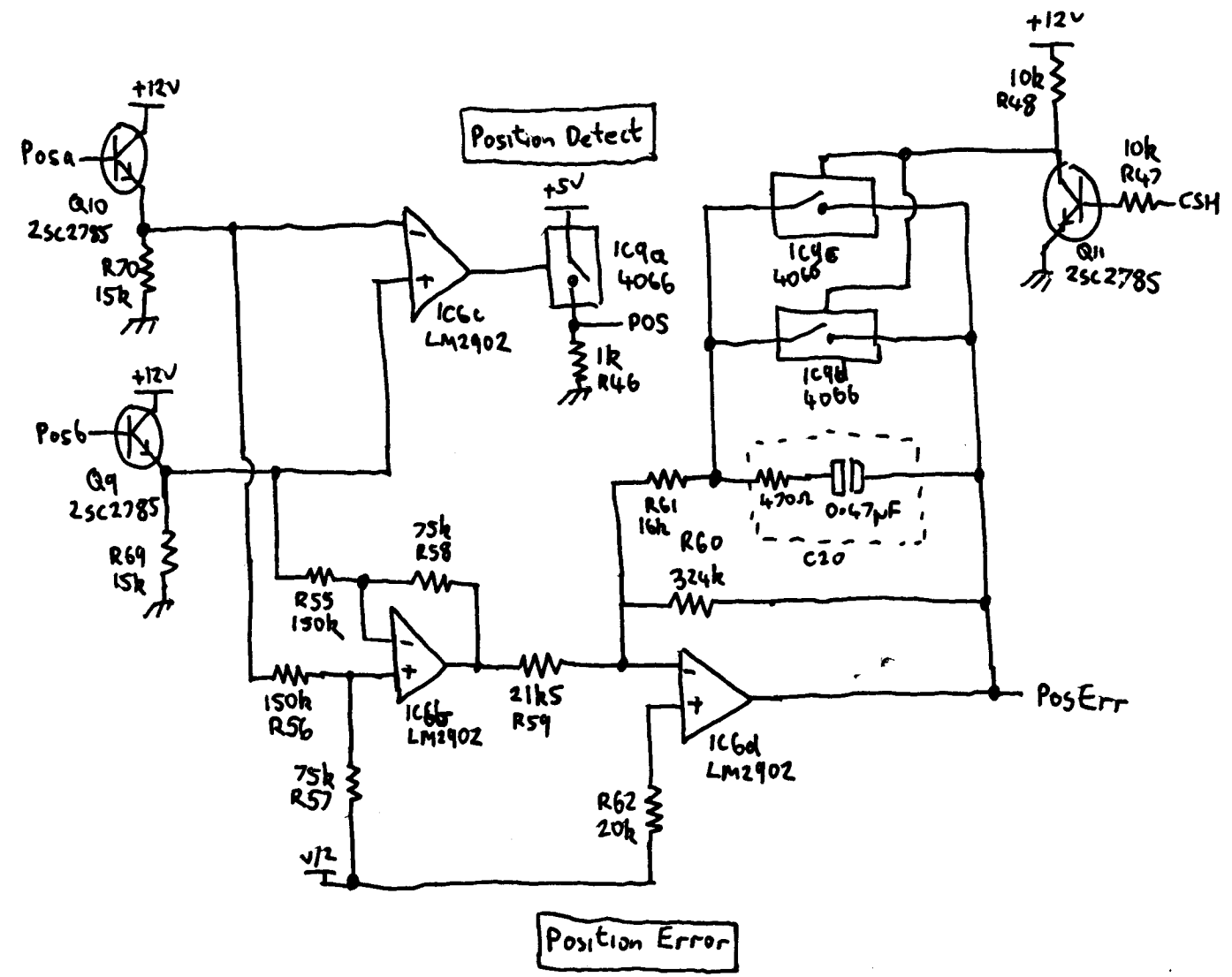
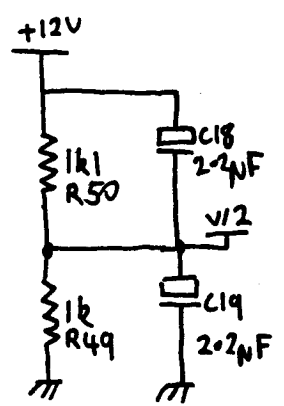


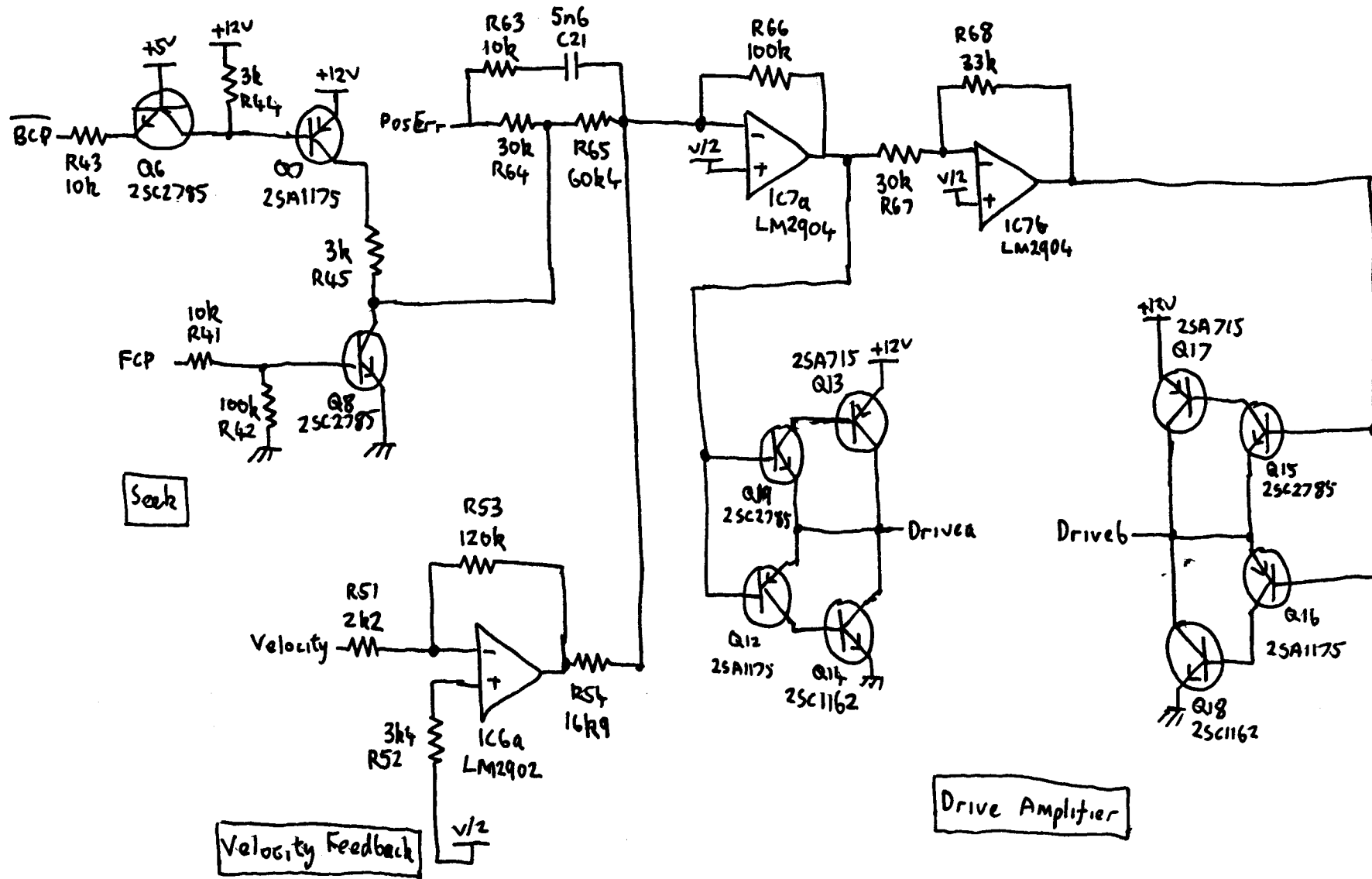


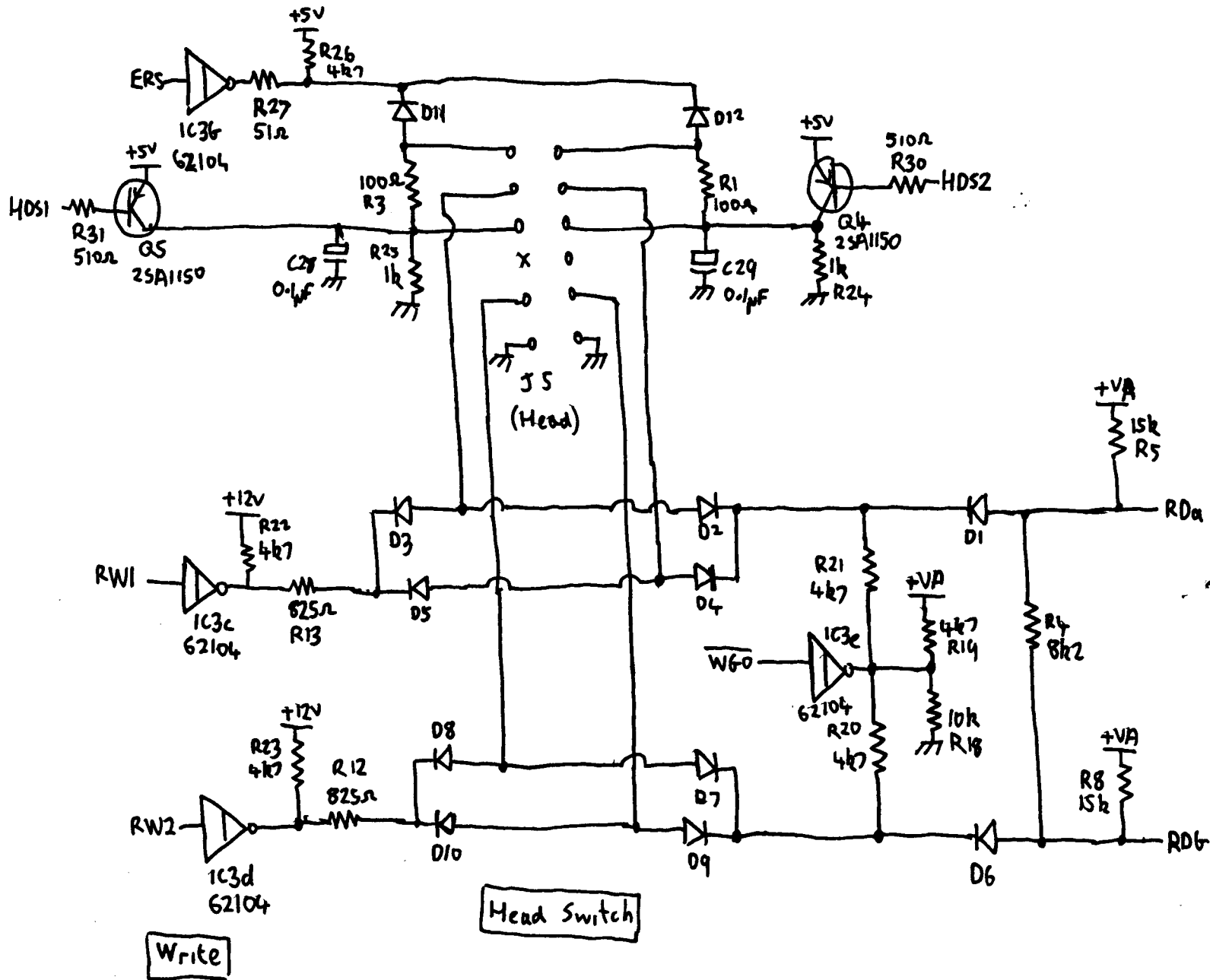
Epson SD320 Logic PCB sheet (2) SD320-MAIN1



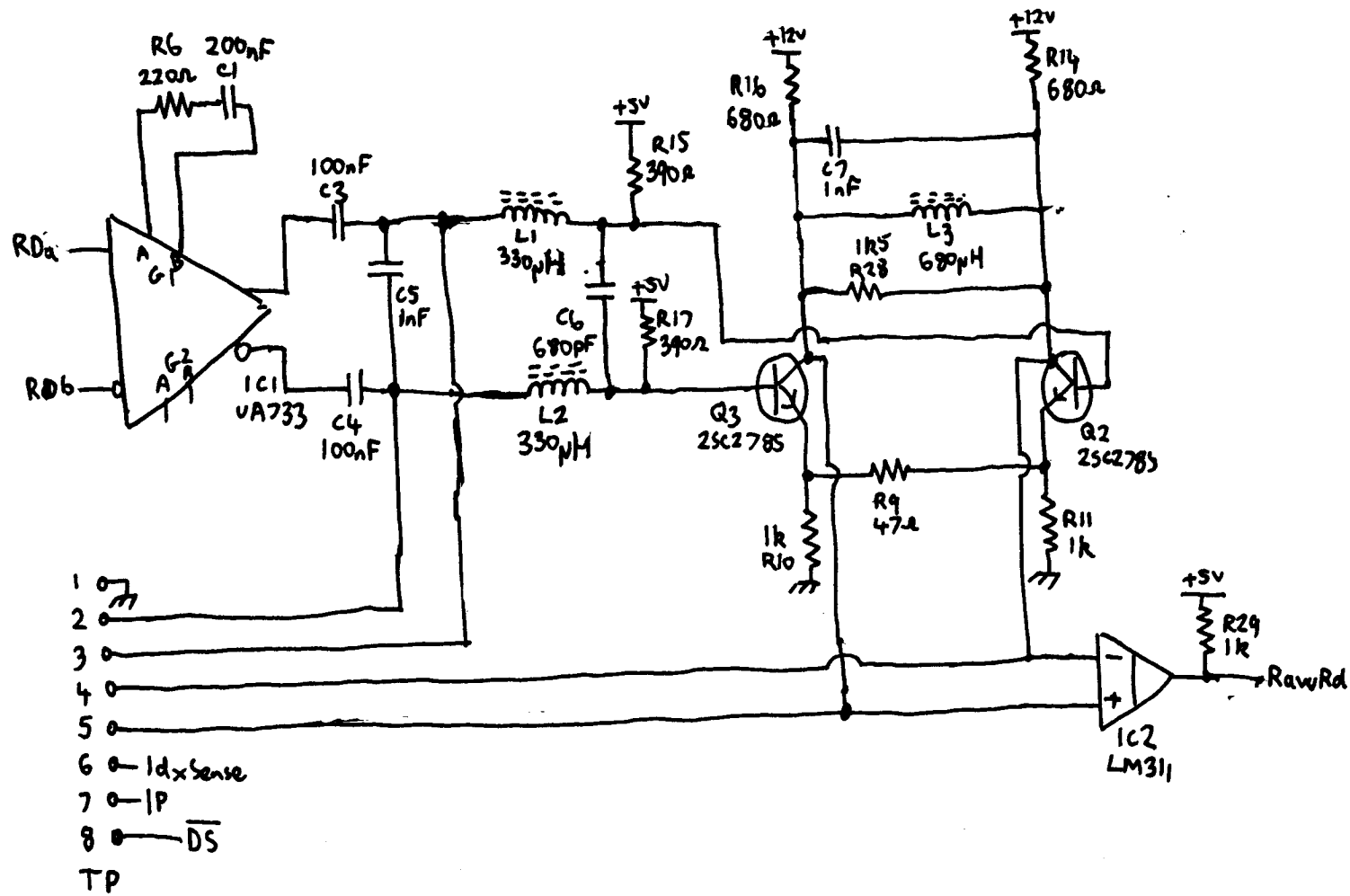
J4  
(Positioner)





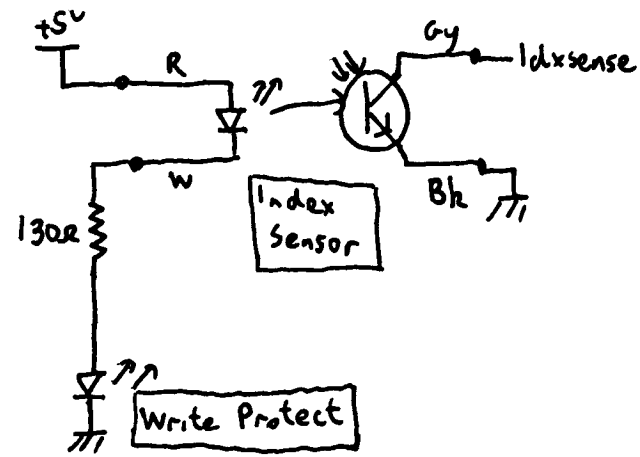


Epson SD320 Logic PCB Sheet (5) SD320-MAIN1

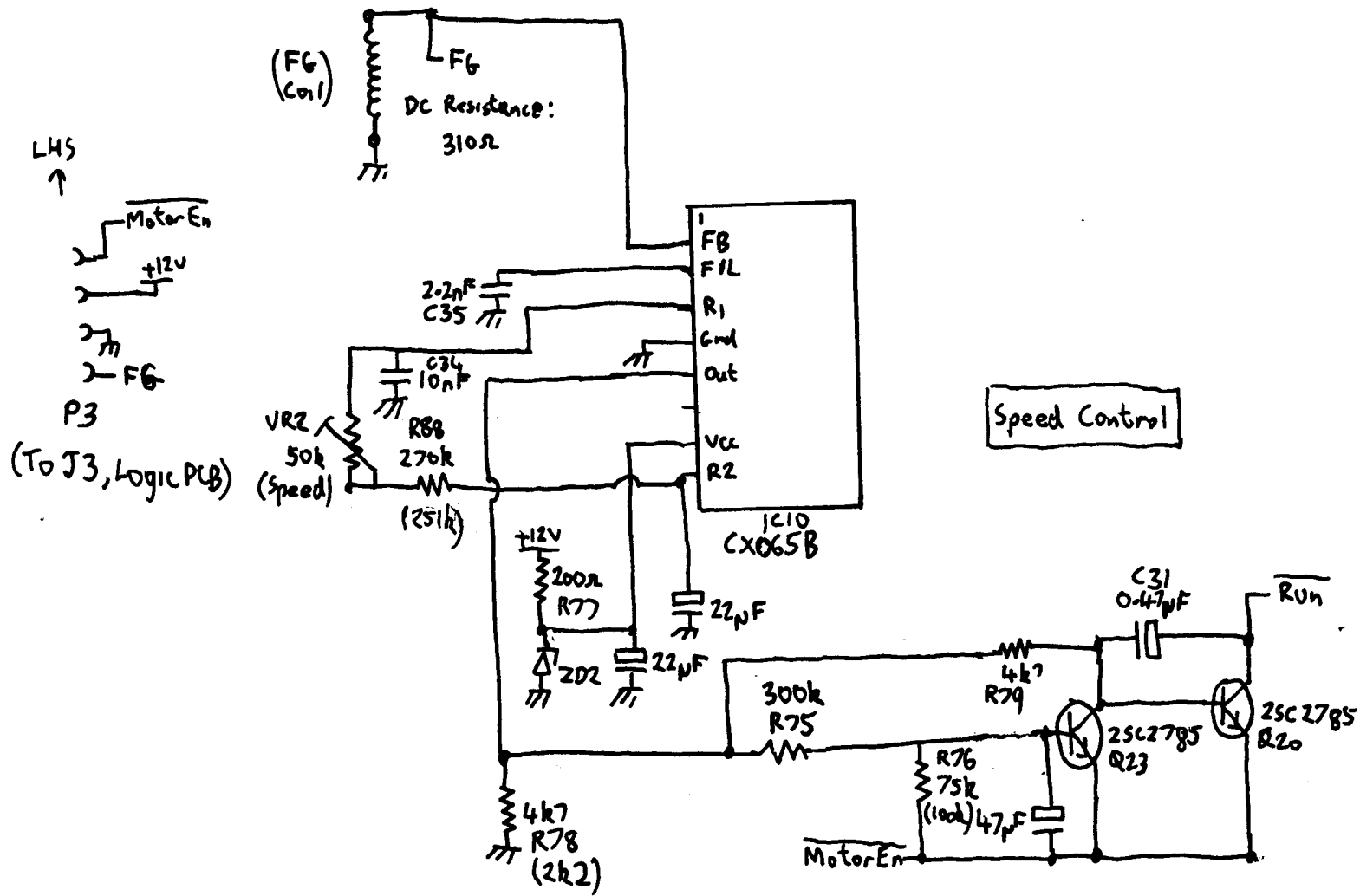


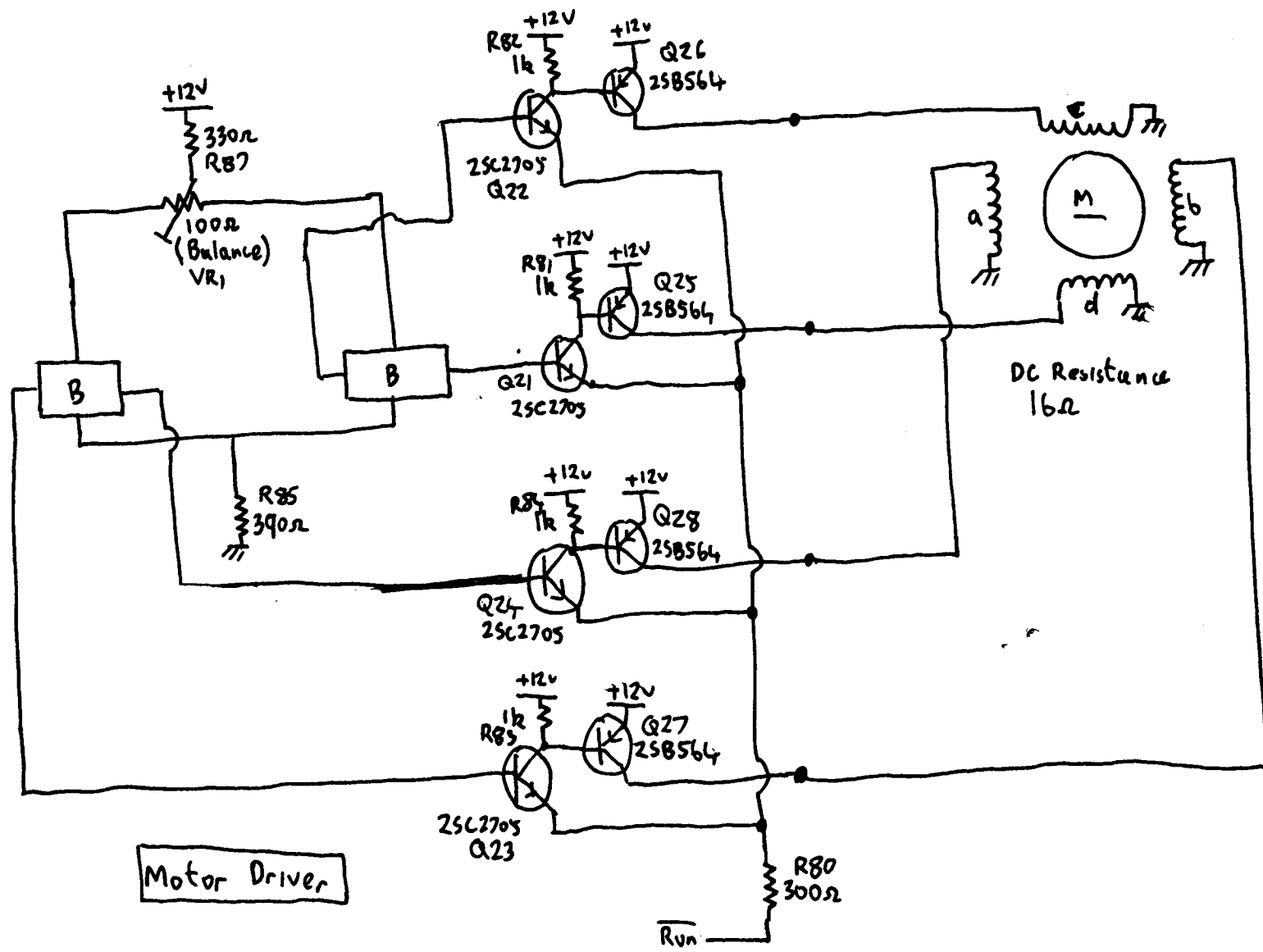
Read Amplifier

Front  
↑  
+5v  
↓  
↓  
↓  
Idx sense  
(to J6, Logic PCB)



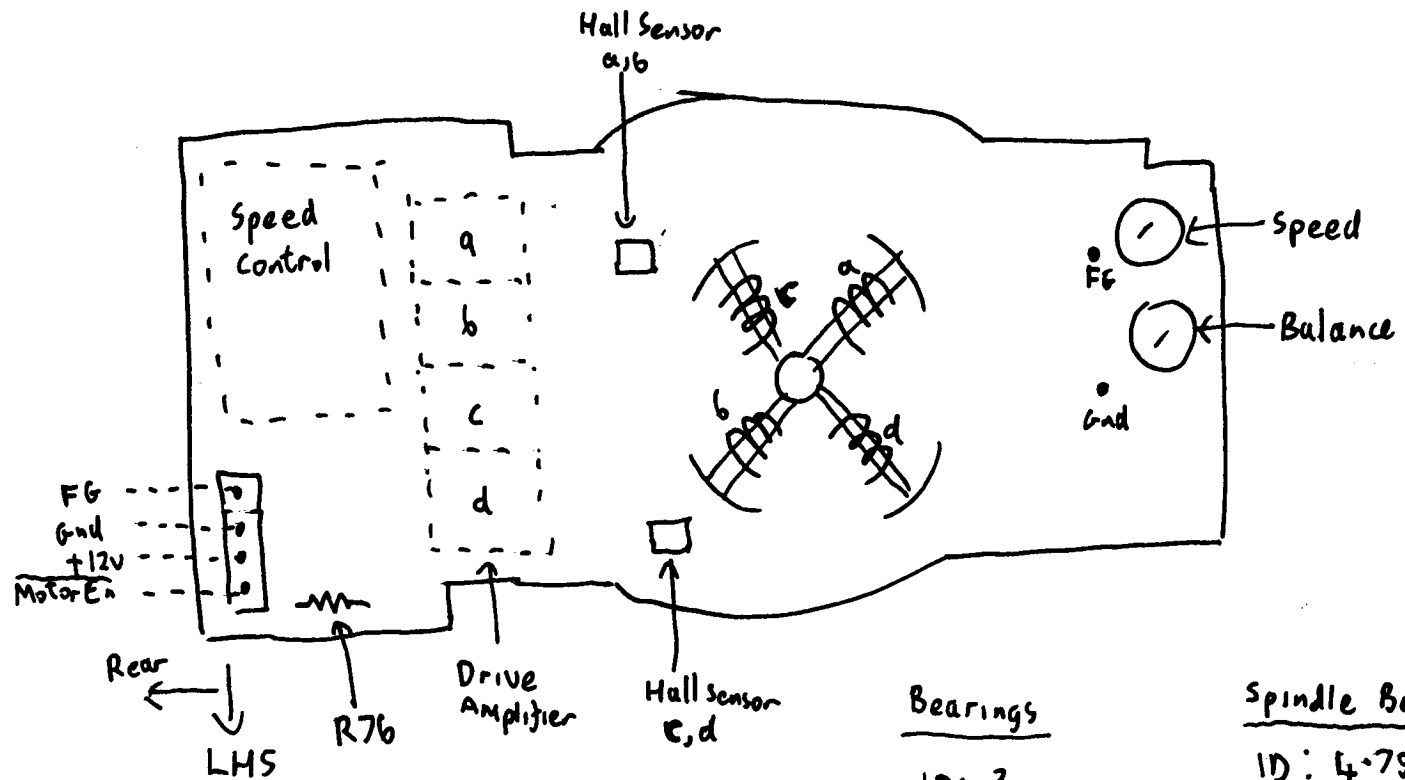
Epson SD320 Sensor PCB



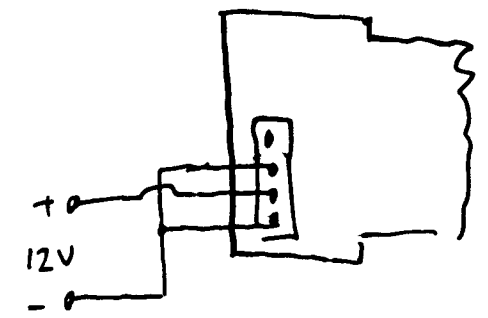


Motor Driver





Test connections



Note

Q23 forms a protection circuit, which disables motor if the control voltage from IC10 rises too high (motor overspeed or too heavily loaded). If this triggers too easily, (motor stops after a few seconds),

reduce R76 to 56kΩ

Bearings

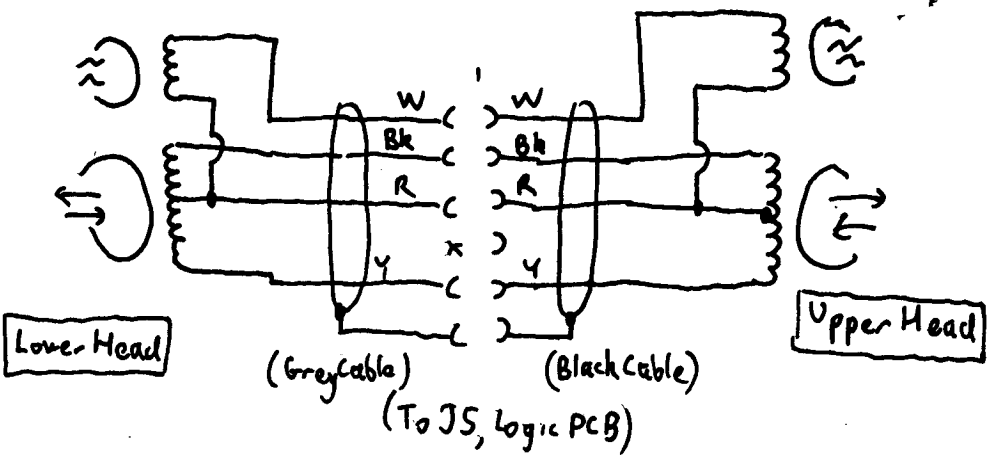
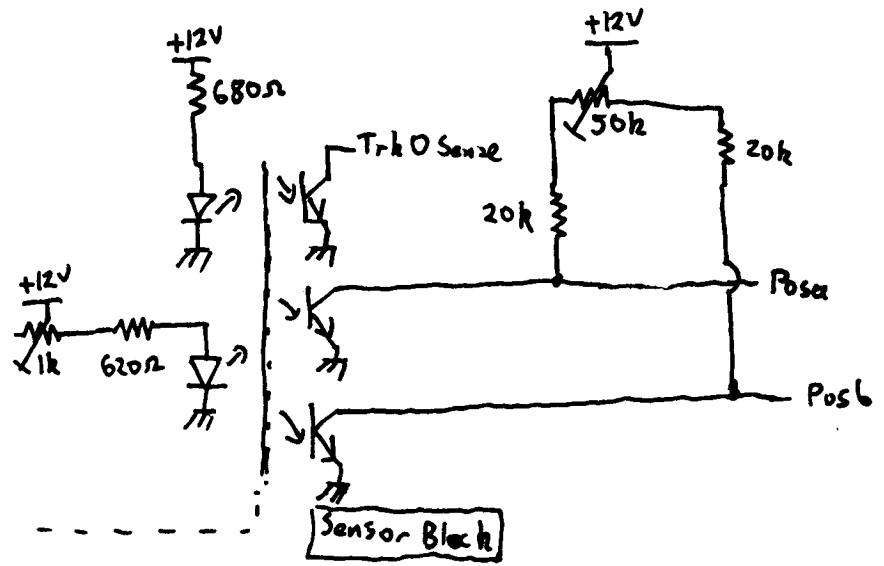
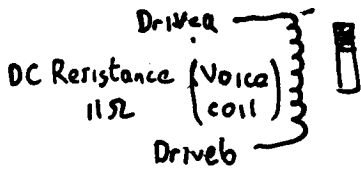
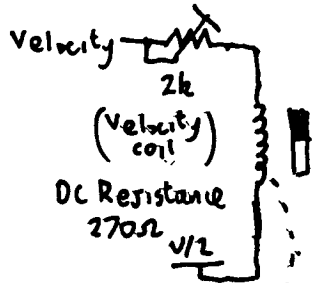
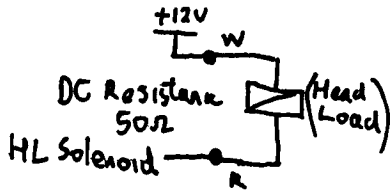
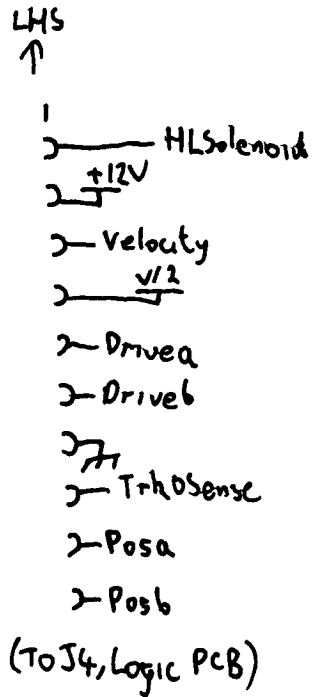
ID: 3mm  
 OD: 8mm  
 Thickness: 4mm

Spindle Bearings

ID: 4.75mm  
 OD: 9.5mm  
 Flange OD: 10.8mm  
 Total Thickness: 3.15mm  
 Flange Thickness: 0.75mm

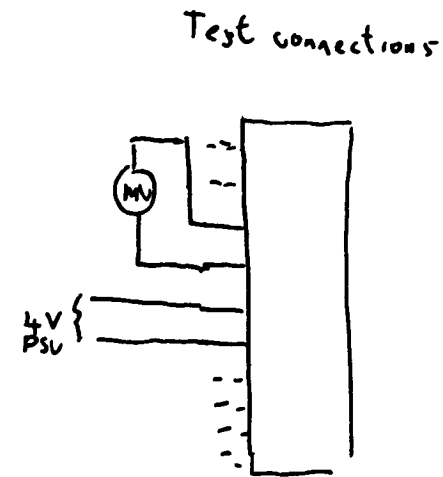
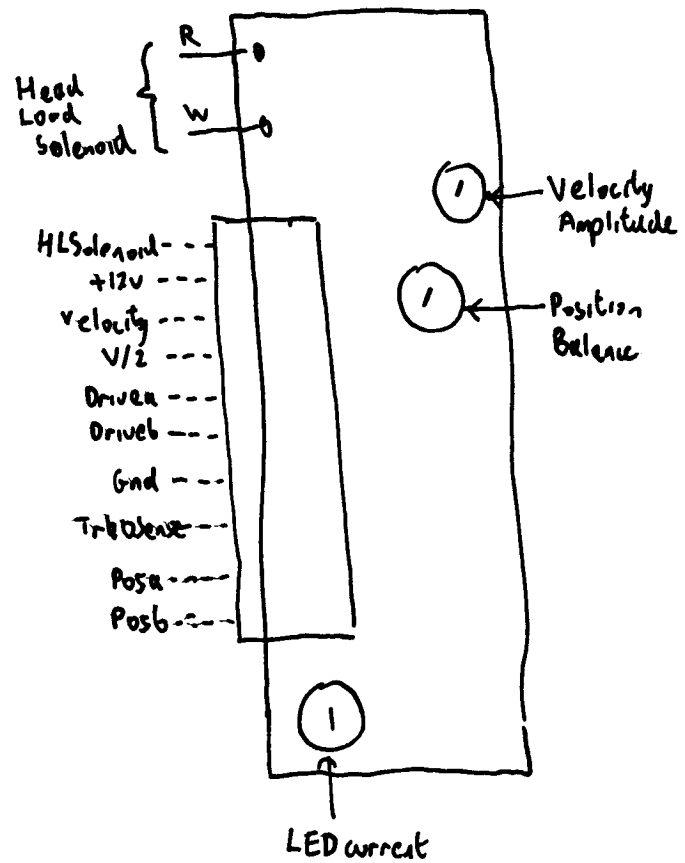
Epson S0320 Spindle Motor layout

DM4801



Epson S0320 Positioner

VCM 1



Drivea	Drive B	velocity (wrt V/2)	Direction
+ve	-ve	-ve	towards spindle
-ve	+ve	+ve	towards track 0

Epson SD320 Positioner layout

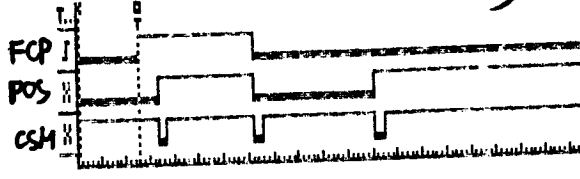
Trigger: 06/02/21 15:10:24

1 ms/div  
10 us/sa

X-0: -2.57 ms  
X-T: -2.57 ms

TTL

### Forward Seek



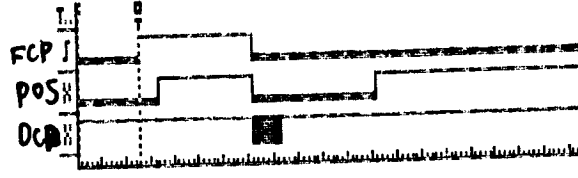
Trigger: 06/02/21 15:18:52

1 ms/div  
10 us/sa

X-0: -2.56 ms  
X-T: -2.56 ms

TTL

### Forward Seek



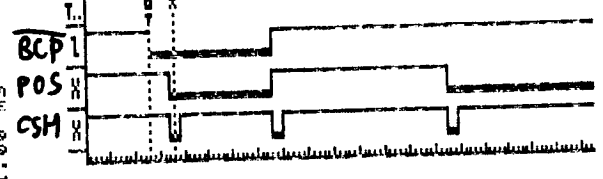
Trigger: 06/02/21 15:22:14

1 ms/div  
10 us/sa

X-0: 1.00 ms  
X-T: 1.00 ms

TTL

### Reverse Seek



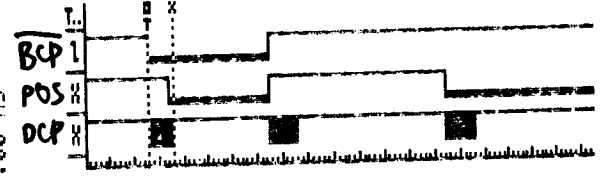
Trigger: 06/02/21 15:25:07

1 ms/div  
10 us/sa

X-0: 1.00 ms  
X-T: 1.00 ms

TTL

### Reverse Seek



Epson SD320 Positioner Signals