sinclair

AMSTRAD

SPECTRUM +3

SERVICE MANUAL

FOR SERVICE MANUALS
CONTACT:
MAURITRON TECHNICAL SERVICES
www.mauritron.co.uk
TEL: 01844 - 351694
FAX: 01844 - 352554

CONTENTS

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TECHNICAL SPECIFICATION

MEMORY:
RAM 128 Kbytes as 8 x 16K pages
ROM 64 Kbytes as 4 x 16K pages

CPU:
Z80A running at 3.54690MHz

SCREEN:
256 x 192 Pixel resolution
24 x 32 Colour resolution
8 colours foreground,
8 colours background,
plus intensity and flash settings
Start of buffer switchable
Independently controllable border

SOUND:
Three voices tone and/or noise with 16 envelope settings
One voice CPU generated
Output via TV, Audio or Monitor socket

KEYBOARD:
58 key full travel QWERTY keyboard

STORAGE:
Integral 3 inch disk drive, single-sided reversible media
40 track, 9 sector, 512 bytes/sector.
CP/M compatible structure
Optional second disk drive
Volatile RAM Drive
Interface for external cassette recorder

FIRMWARE:
48K Spectrum BASIC (compatibility mode)
128K Spectrum ZX+3 BASIC, integrated with +3 DOS
Storage selection by reassignable default with optional override

INTERFACES:
UHF PAL TV port
Serial interface (RS232) port
Parallel Printer port (8 bit)
Auxiliary interface port
RGB Monitor (and PERITEL TV) port
MIDI output port
Two Joystick ports
Audio Out/Cassette port
Second Disk Drive port
Expansion I/O port (full Z80 bus)

SAFETY TESTS (POWER ADAPTOR)

Please note: when any work is completed on this unit, the following safety tests must be completed to ensure continued electrical safety.

1. **Flash test from the mains lead with live and neutral joined together to all accessible external metal points at 4kV.**
2. **Meggertest at 400V DC from the mains lead with live and neutral joined together to all accessible metal points. The reading must not fall below 2 Mohms.**

NB. Ensure the Power Adaptor is switched on when both these tests are carried out.

AMSTRAD PLC
BRENTWOOD HOUSE, 169 KINGS ROAD, BRENTWOOD, ESSEX CM14 4EF.
Telephone: 0277 230222. Telex: 995417 Amsele G.

SELF-TEST ACTIVITATION

To invoke the Spectrum +3 diagnostic routines, first reset the machine while holding the BREAK key down. This will go into the test card display. Now hold down the QAZMLP keys for a few seconds until the diagnostic title is displayed. Now follow the on screen prompts.

RESET

Also contained within the ROM is a small message, to obtain this display, first put the machine into +3 BASIC mode and type:-

copy randomize [ENTER]

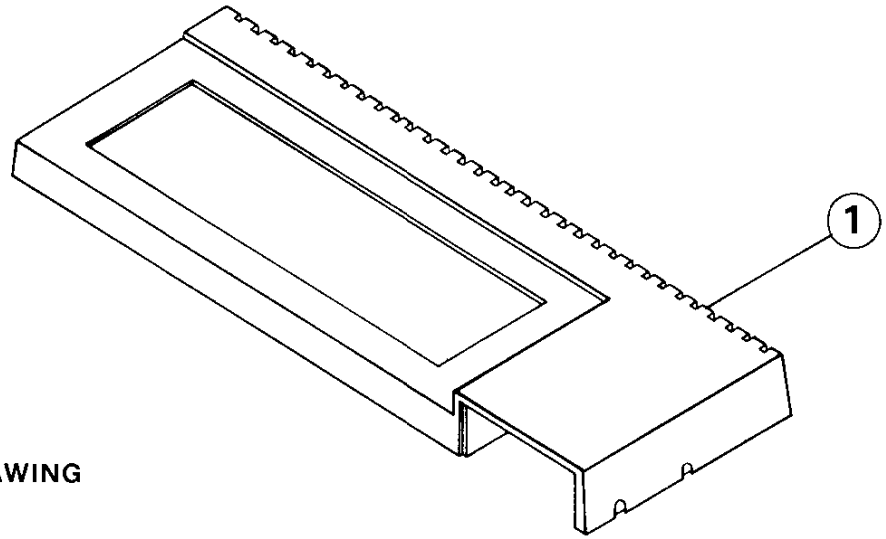
after pressing the ENTER key quickly depress the C, J and L keys together and the message will appear.

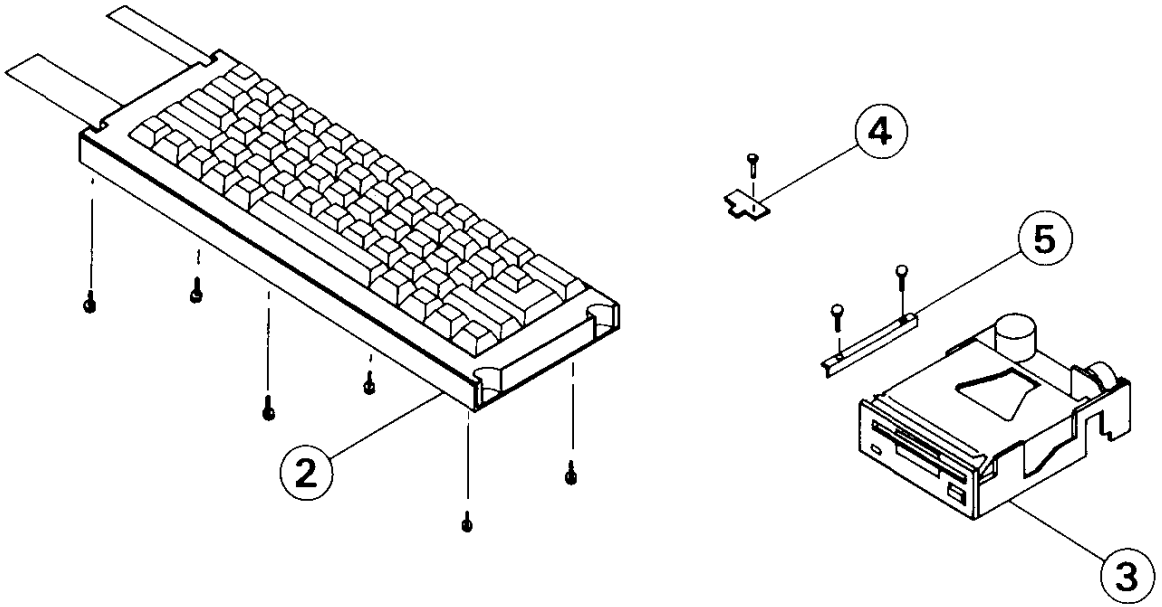
HELLO THERE I'M A +3

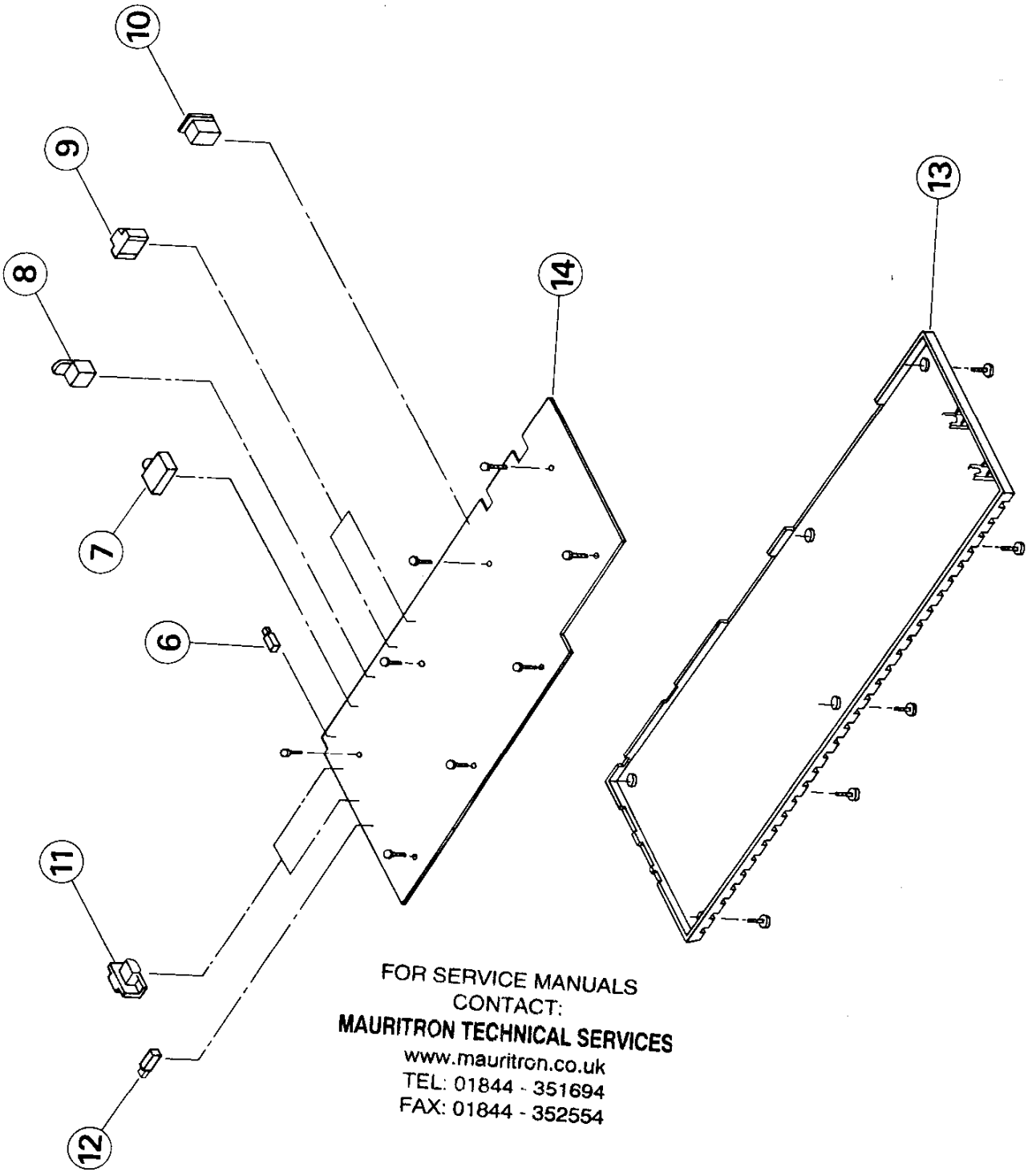
CABINET PARTS LIST

Ref.	Description	Part No.
1	Top Cabinet	173017
2	Switch Keyboard Assembly	173019
3	Disc Drive EME-156	190005
4	LED PCB Assembly	172004
5	Bracket Disc Drive	173021
6	Socket I/O	170022
7	PAL 1 Modulator Block	172020
8	8 Pin DIN Socket	172021
9	BT/Interface Socket	172022
10	6 Pin Power DIN Socket	173026
11	9 Way Joystick Port	170023
12	Reset Switch	172017
13	Bottom Cabinet	173018
14	Main PCB Assembly	173023
	Gun Foot	173021

CABINET DRAWING





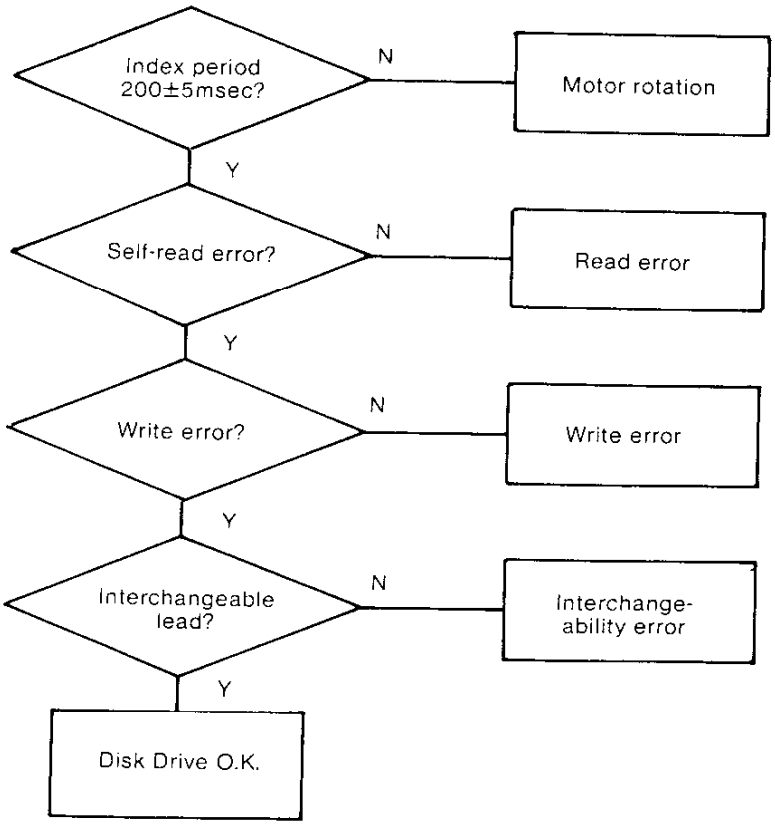


Diagnostic Flow Chart

This chart must be used in conjunction with the Alignment Procedures.

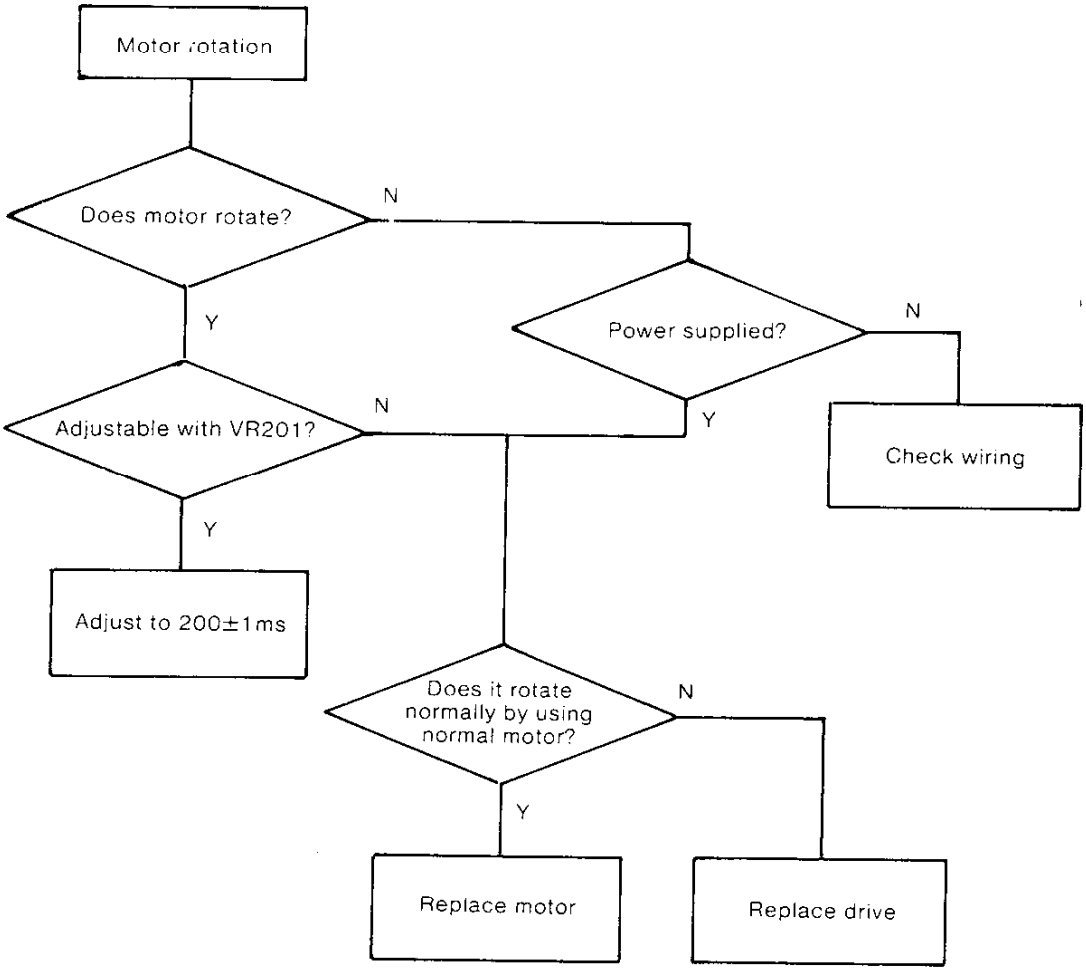
This chart is for information only and does not guarantee an exact diagnosis. For warranty purposes any faulty drive mechanism must be returned to Amstrad for replacement. Service Agents should not attempt any repairs on the mechanism or to its P.C.B. PT. No. Z70312.

3—A



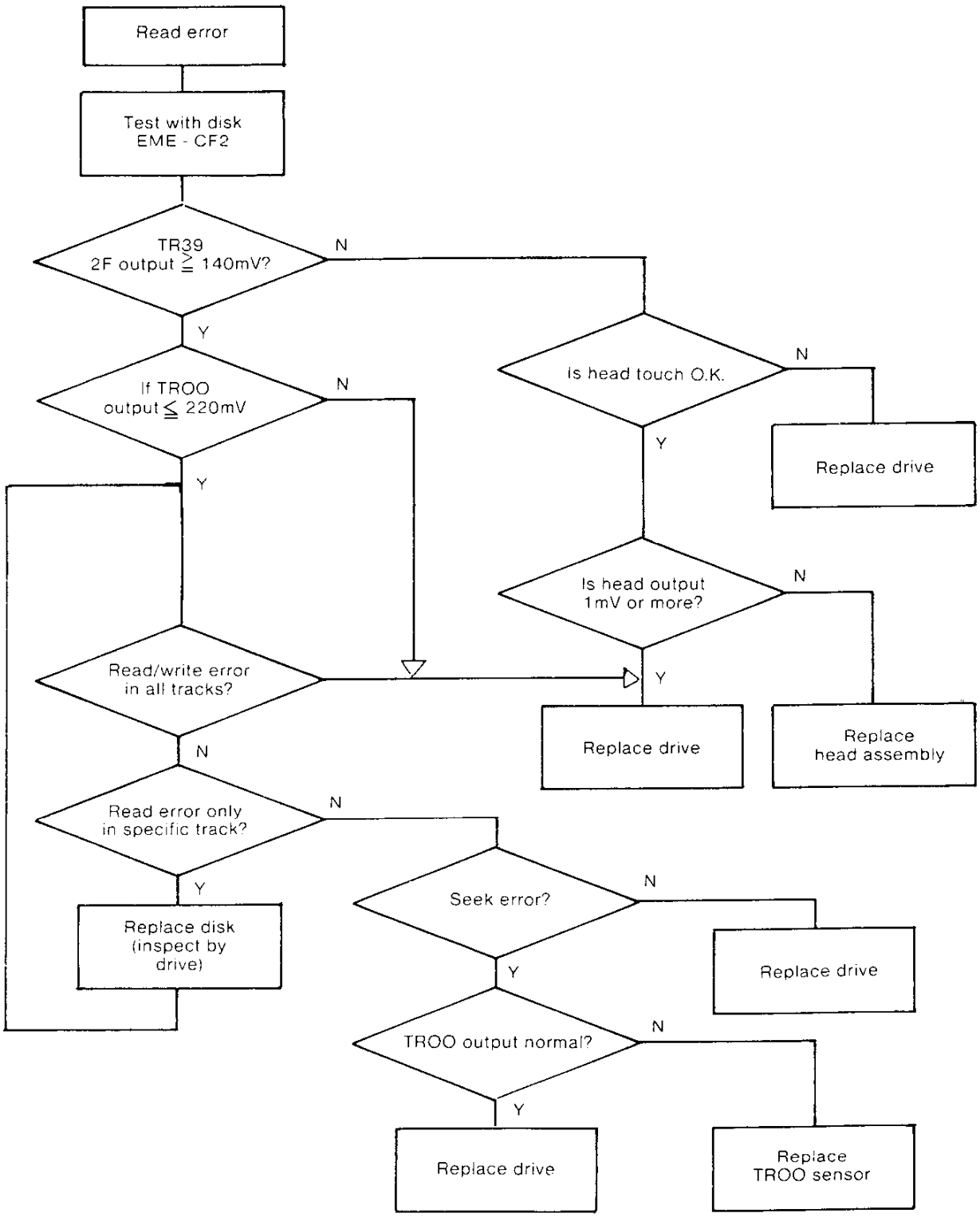
FLOW CHART (cont)

3—B



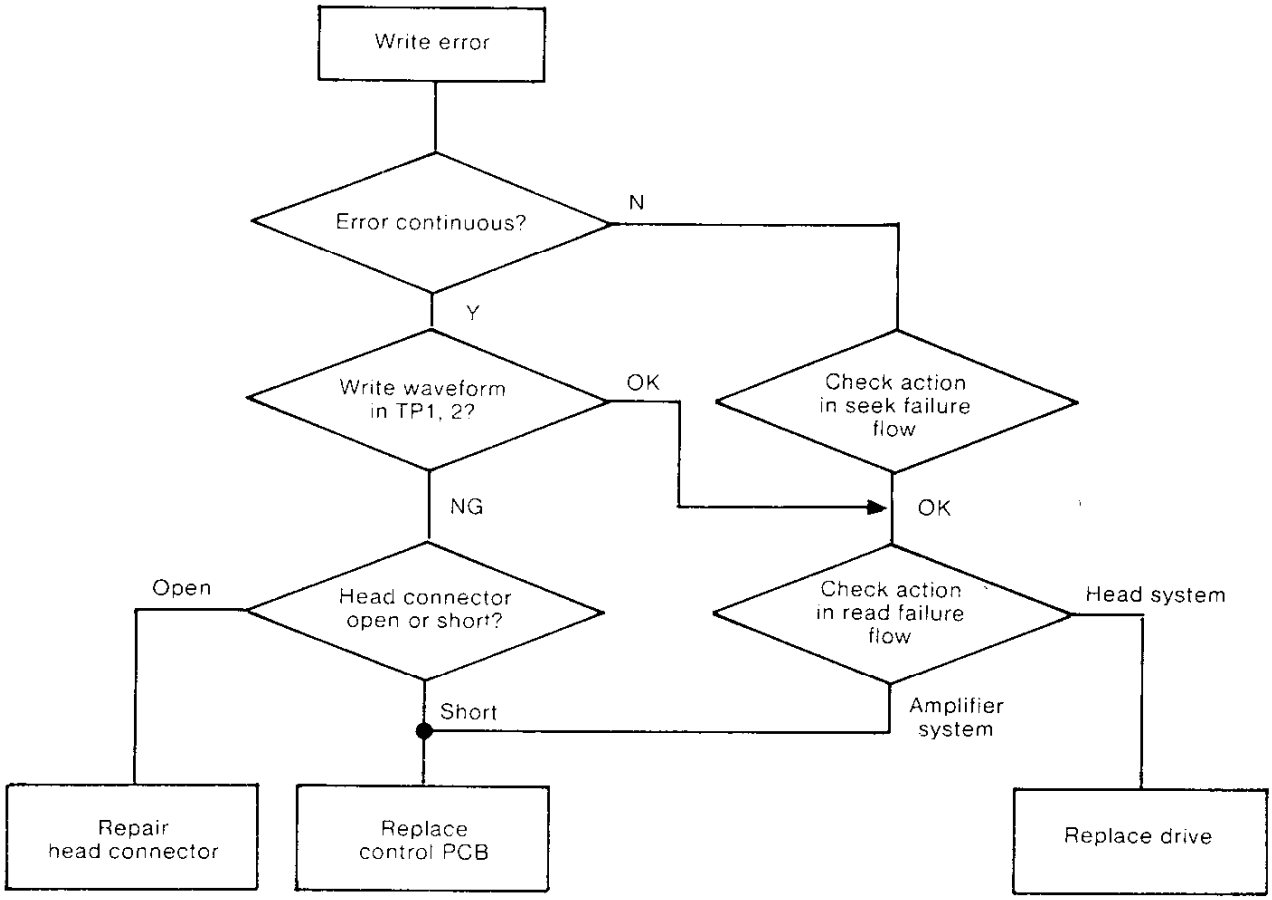
FLOW CHART (cont)

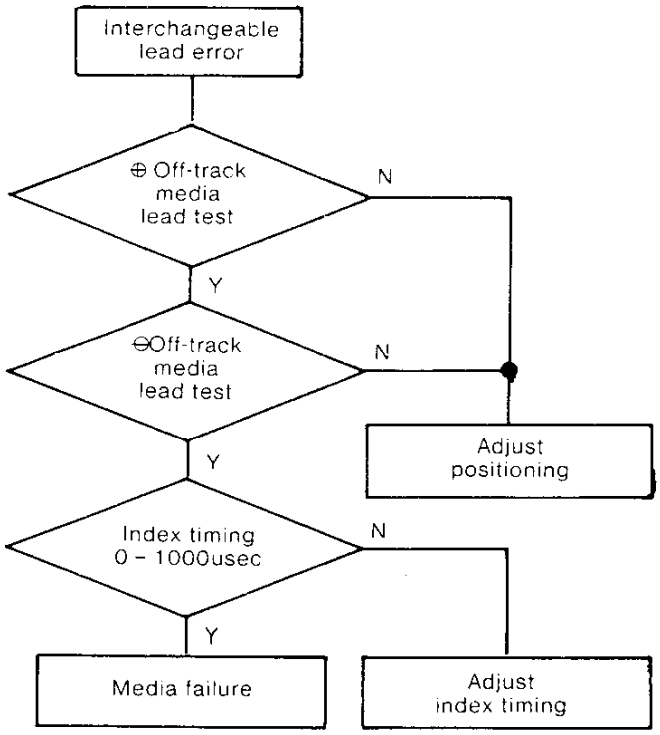
3—C



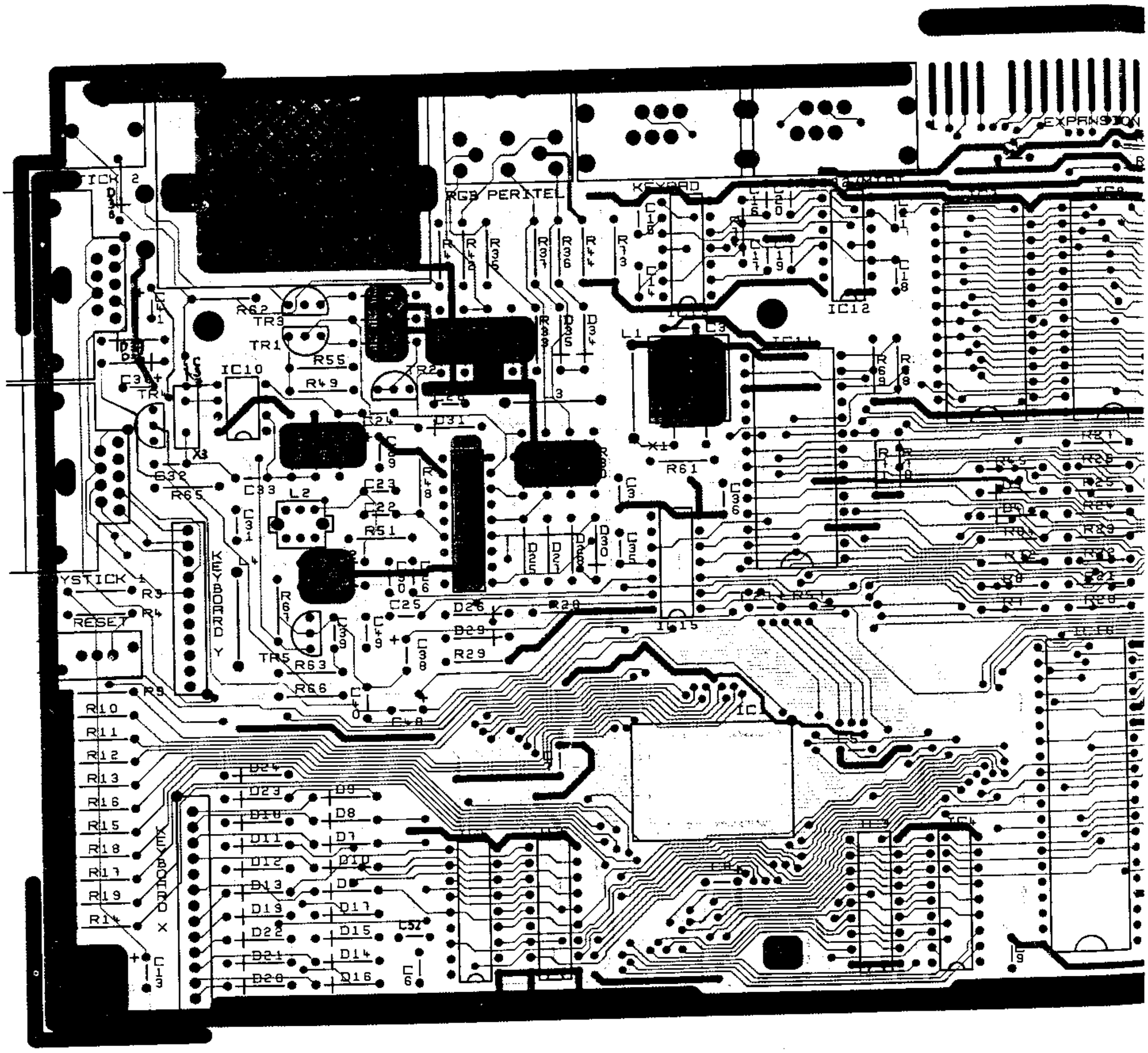
FLOW CHART (CONT)

3—D

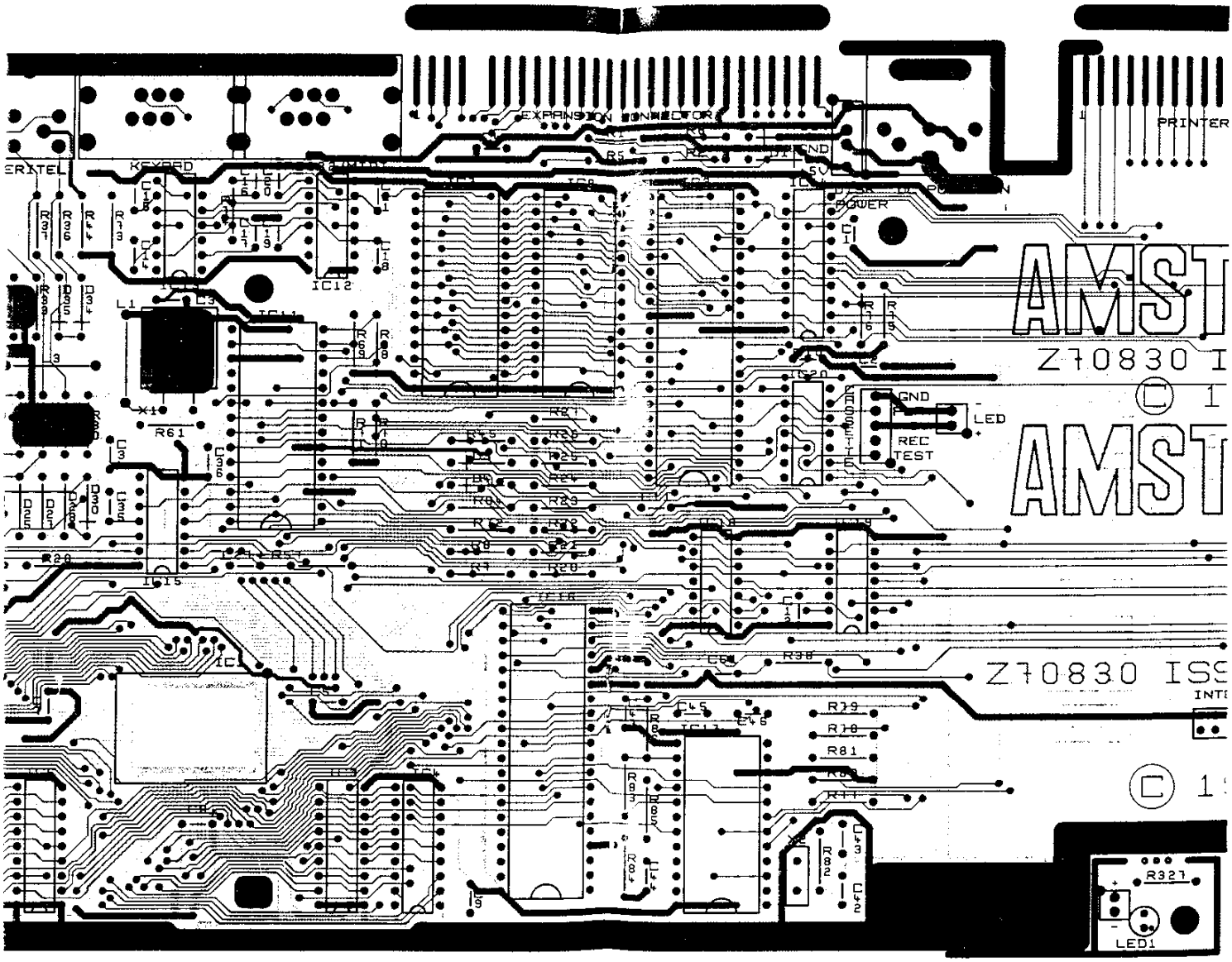




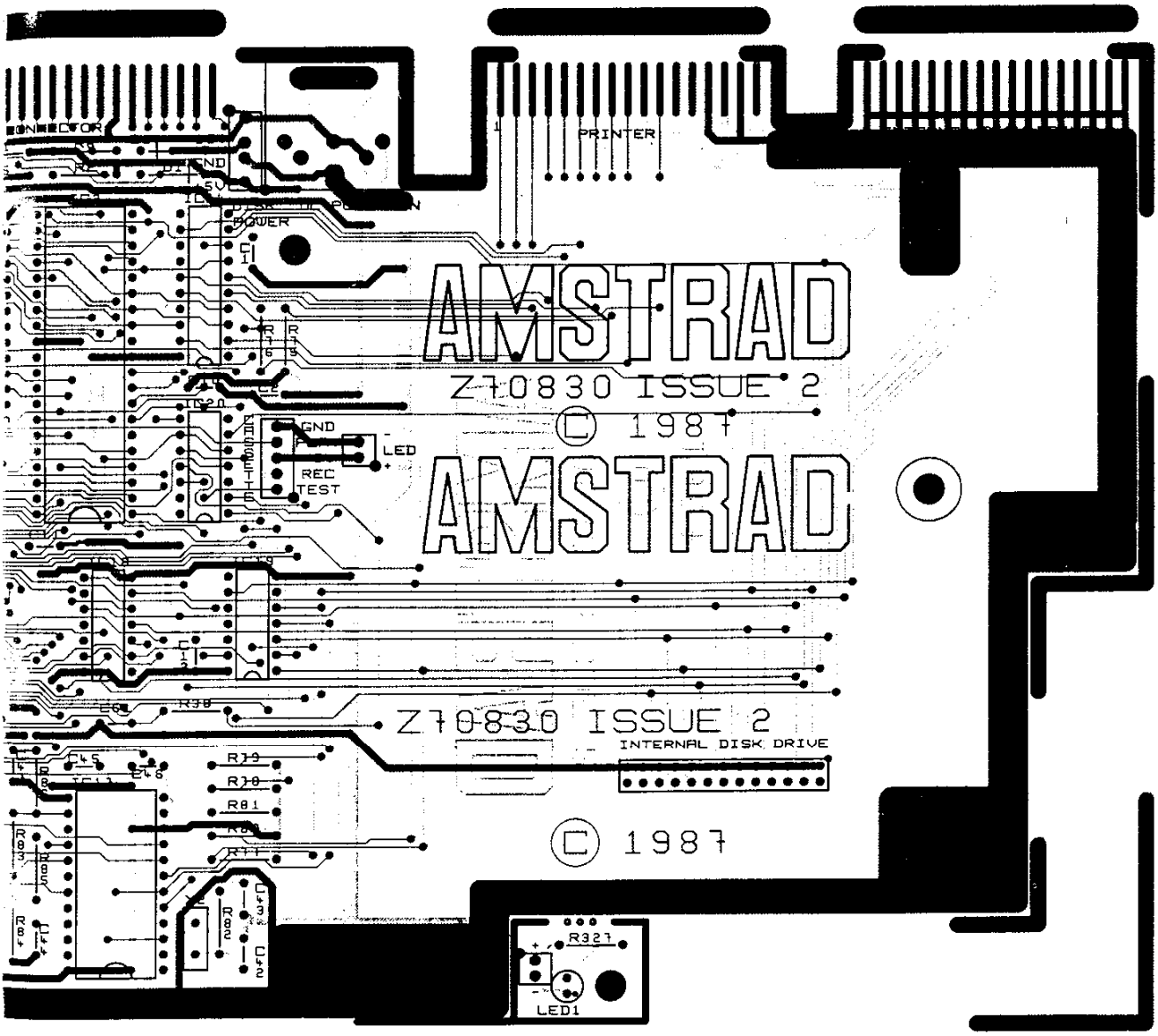
PRINTED CI
COMPONE



PRINTED CIRCUIT BOARD
COMPONENT LAYOUT



IRCUIT BOARD
ENT LAYOUT



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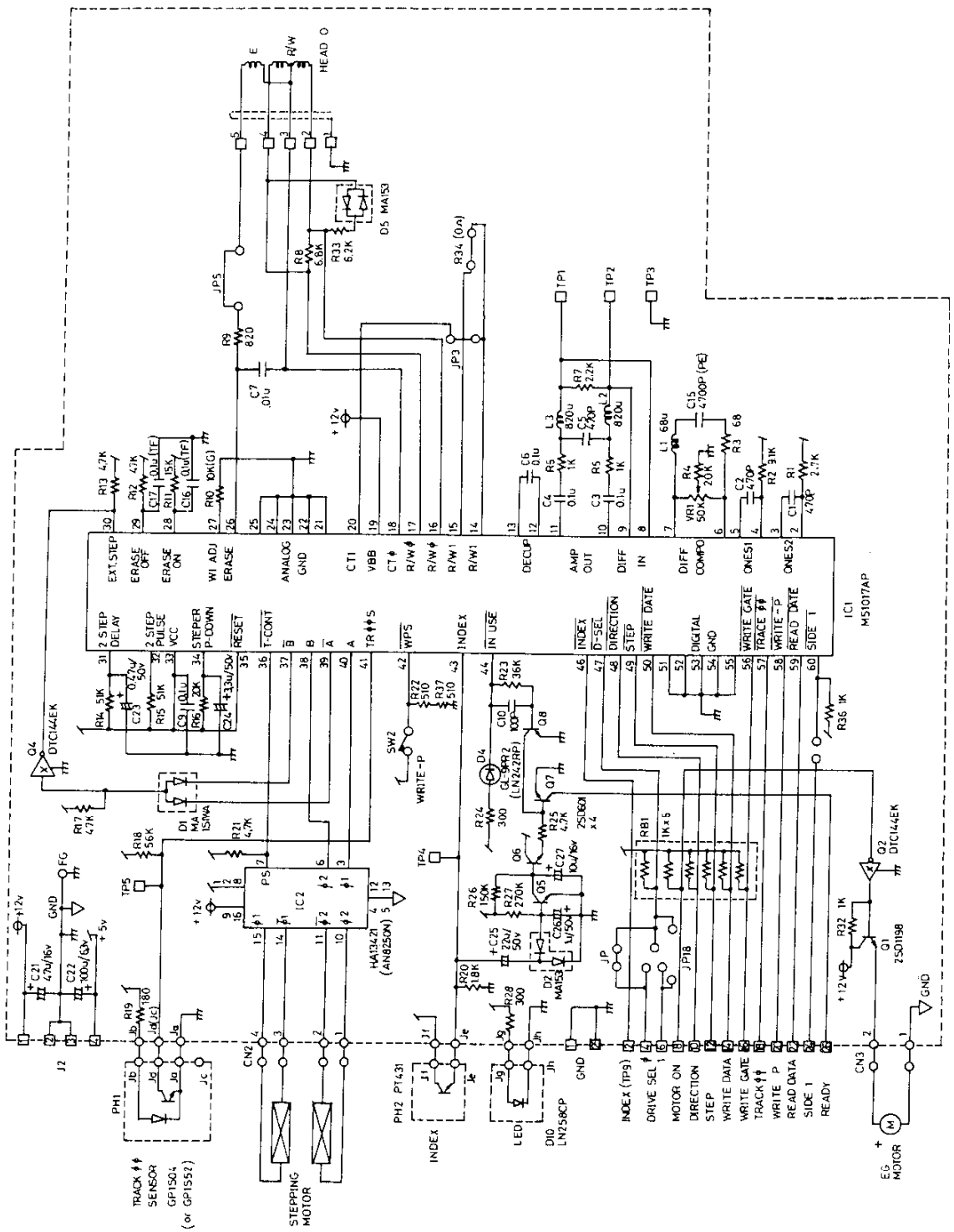
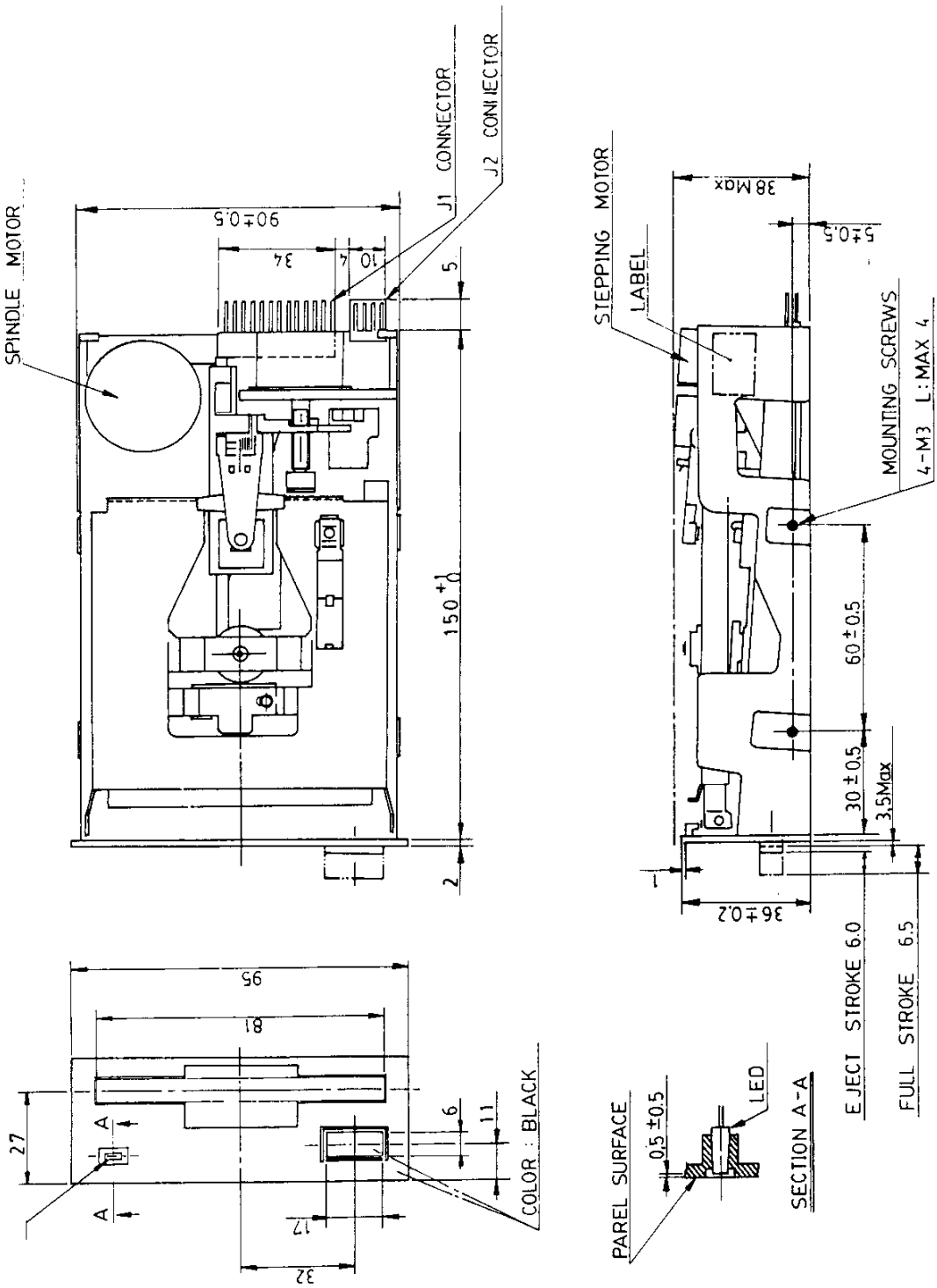
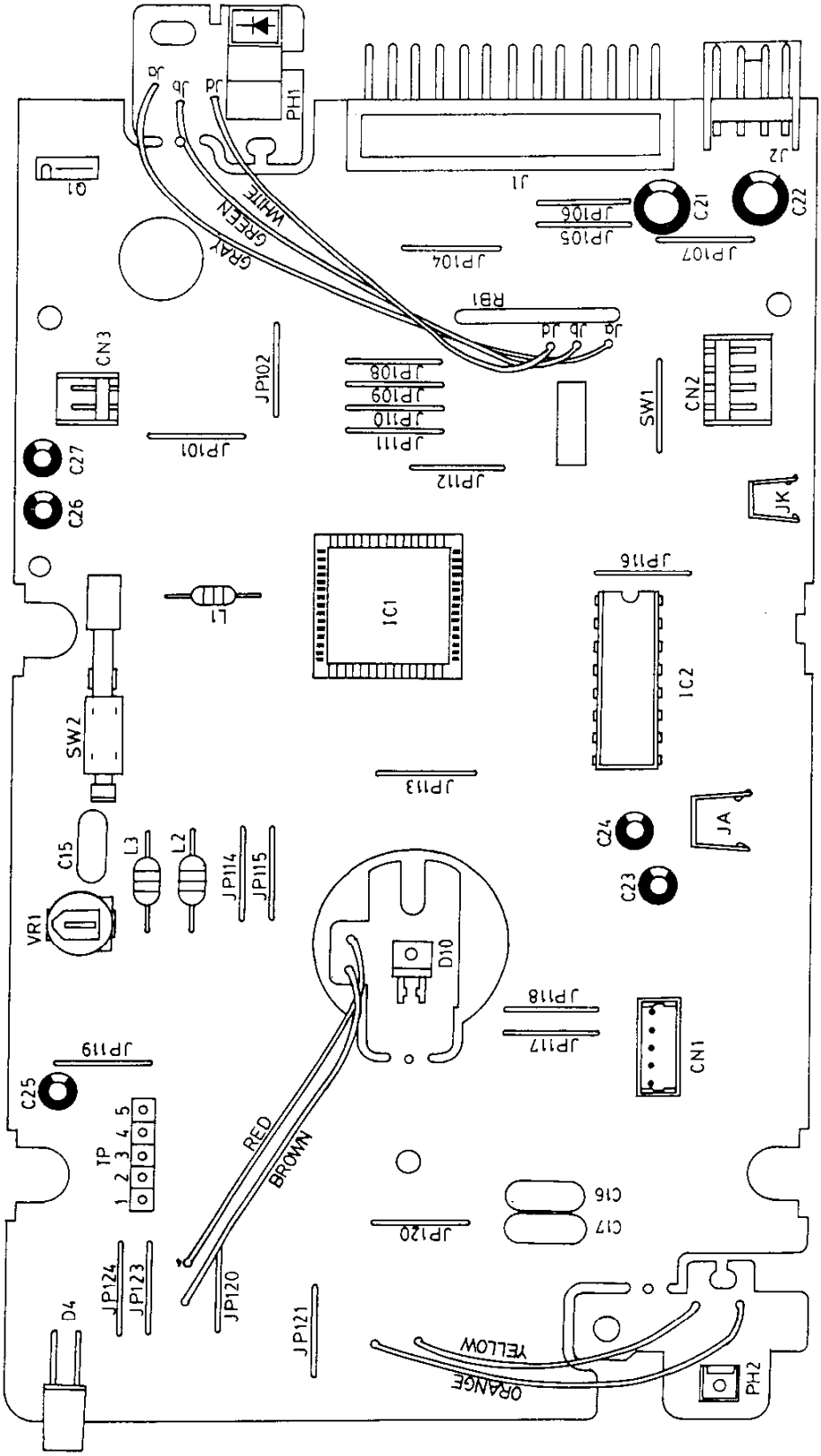
FD-1 EME-156 DISK DRIVE CIRCUIT DIAGRAM



DISK DRIVE
MECHANICAL DRAWING WITH DIMENSIONS



DISK DRIVE CONTROLLER PCB
COMPONENT LAYOUT



Software Errors

If a drive fault is reported the fault may be a software problem. Before investigating the drive please carry out the following checks to ensure it is not a software problem.

Detection and Correction of "Soft Errors"

Soft errors are usually caused by the following reasons.

1) Random external noise of several usec or less.

2) Minute off-tracking and shifting of write timing that are not detected during the write operation which can cause the soft error during the read.

To remedy such soft errors, take the following procedures at the controller side.

1) Repetitive reading on the track by 10 times or more until the data is restored.

2) When the data is not restored by step 1, access the head to the adjacent track in the same direction as move previously, and thereafter return the head to the original track.

3) Repeat the step 1.

4) If the data is not restored by the above steps, the error cannot be remedied

Write Error

When an error is caused during the write operation, the error is usually detected during the next rotation through the read operation called "Write check".

To correct the error, repeat the write operation again and carry out the Write check.

If the result is still incorrect even after the write operation is repeated more than 10 times, either the disc or the drive are working incorrectly. To find out the trouble source, carry out the read operations with another track. Should the error still be found, change the disk and repeat the above procedures. Should error still be found, the drive should be considered defective. If the error is removed, the original disk must be defective. Discard it.

Seek Error

1) Step motor or step motor drive circuit is defective.

2) The torque of the carriage is not correct.

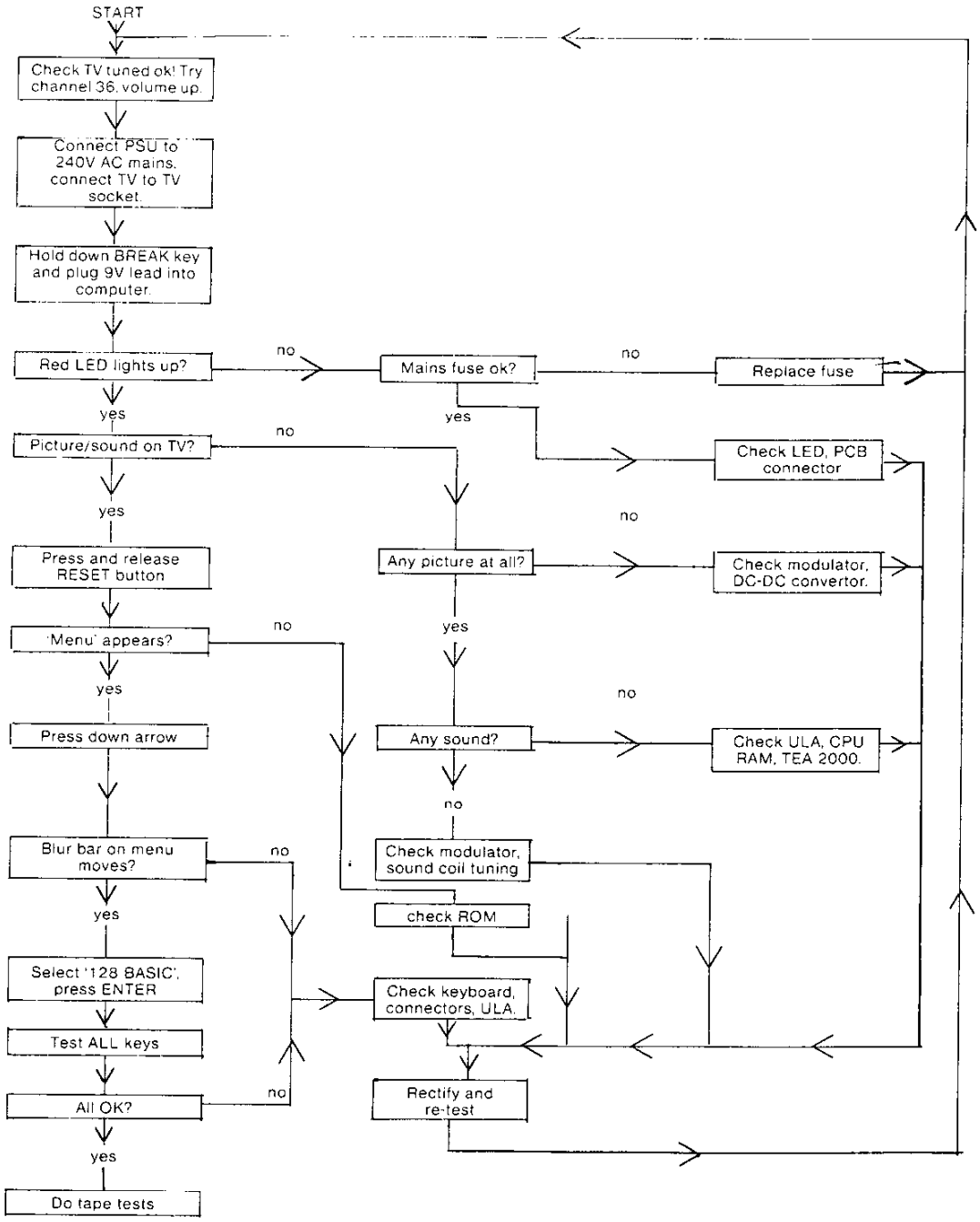
Restoration procedures from the seek error.
Make the re-calibration to the track OO. Then, carry out the re-seek to the original track.

Notes:
1) Always ensure the head is clean.

2) Index/Sector Factor (Ready Defect)

As the unit has Optional Read Output
It is normally not ready until 2 revolutions are made after the disk insertion.

DIAGNOSTIC FLOW CHART



SPECTRUM +3 SELF DIAGNOSTIC TESTS

The Spectrum +3 test software comes on a rom board. This should be plugged into the Expansion I/O slot of the +3. The +3 should also have a loopback cable plugged into the KEYPAD and RS232 sockets, two joysticks plugged in, and monitor, TV and audio amp connected.

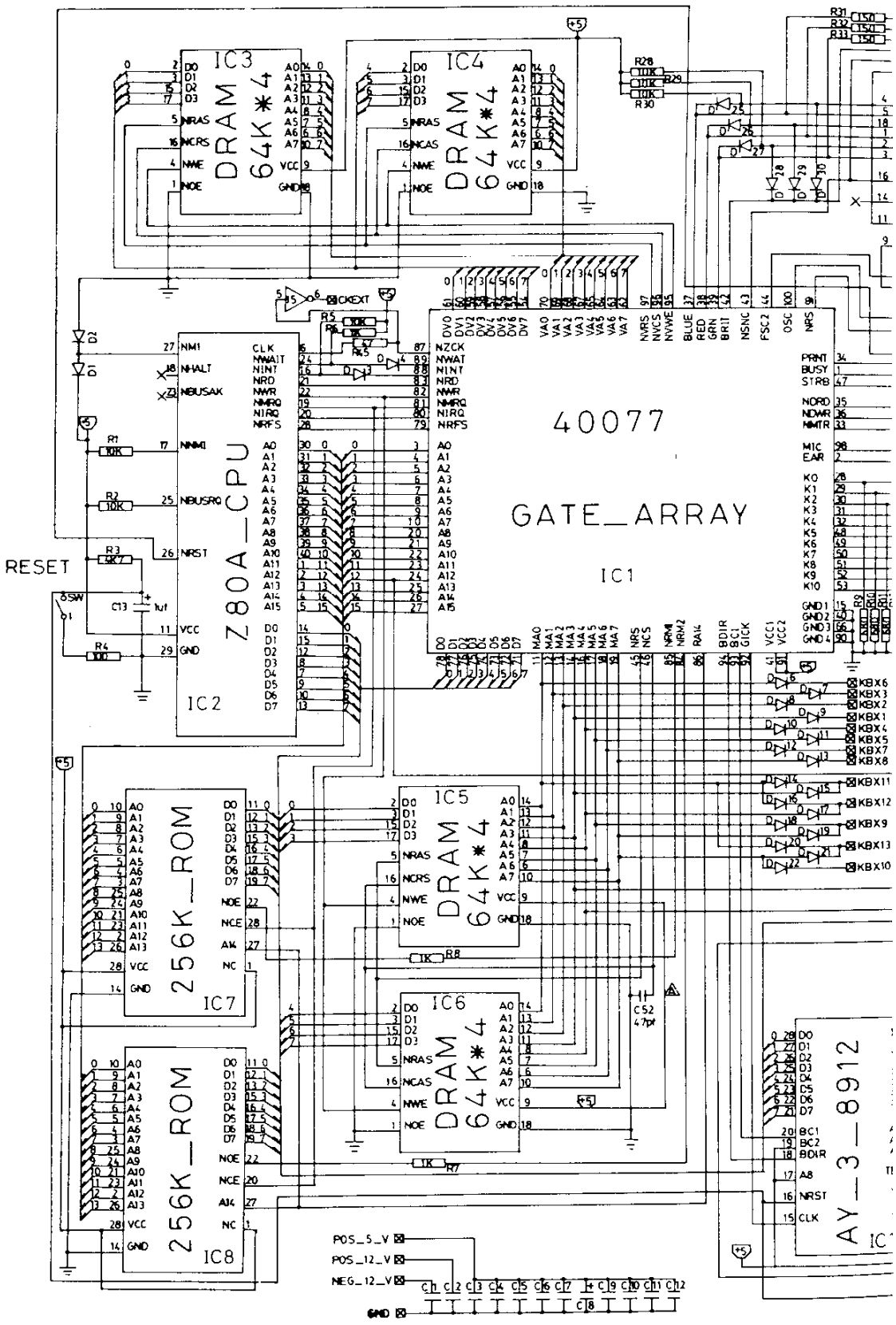
Turn the machine on. One of two things will happen.

1) A test card with some text will appear. Follow the instructions on the screen.
2) No text or testcard. In this case, note the colour of the edge of the screen. It will either be a steady colour or flashing regularly with a predominant colour. Consult the table below to find out which RAM chip has (probably) failed.

Colour	STEADY	FLASHING
BLACK	IC 17	IC 32
BLUE	IC 18	IC 31
RED	IC 19	IC 30
MAGENTA	IC 20	IC 29
GREEN	IC 21	IC 28
CYAN	IC 22	IC 27
YELLOW	IC 23	IC 26
WHITE	IC 24	IC 25

If you follow the instructions on screen from the first occurence, then everything should be self-explanatory. The RAM test, if it finds a fault, will give two numbers. The first is the address at which the fault was found, and the second is the bank of memory which contained the address. If the address is zero, then it is probably not a RAM fault, but a paging hardware problem. Note that there is no way to fail the keyboard test – if a key won't respond then you can progress no further.

The cassette test comes in two parts. The first cassette test is similar to the ULA sound test, and is the last test in the ROM program. The tone it asks you to hear is much quieter than the other noises. The second cassette test comes on a tape and is used when the BASIC is running. Turn on the Spectrum, wait for the menu to appear and then press ENTER. Then start the test cassette. After a short while, the words PROGRAM: Loading... should appear, and shortly afterwards some instructions will appear on the screen. Follow these to test the cassette unit.



NOTE:

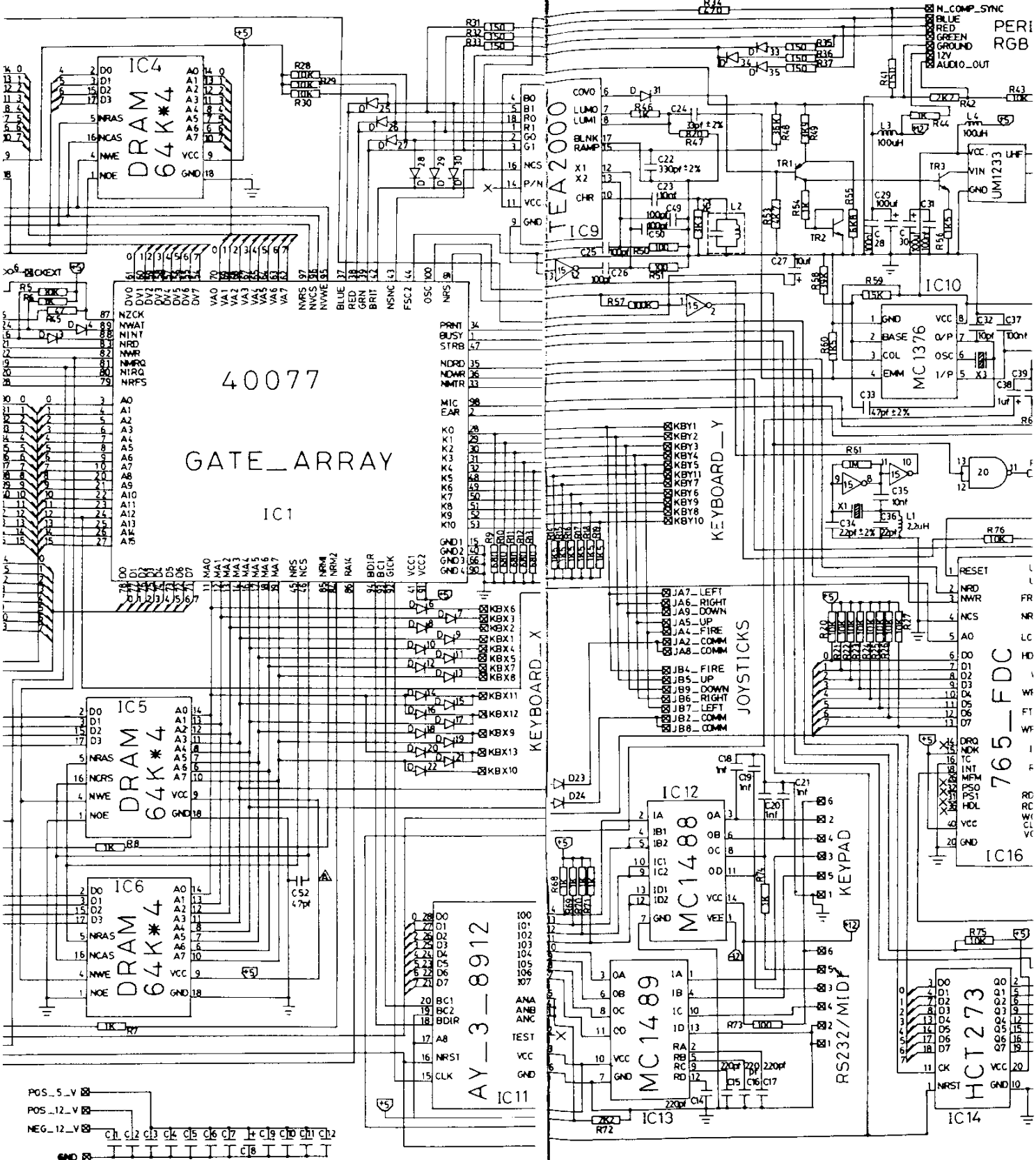
(1)+3A USE ONLY
IC16-IC20
R77-R86
CA1-CA7
X2

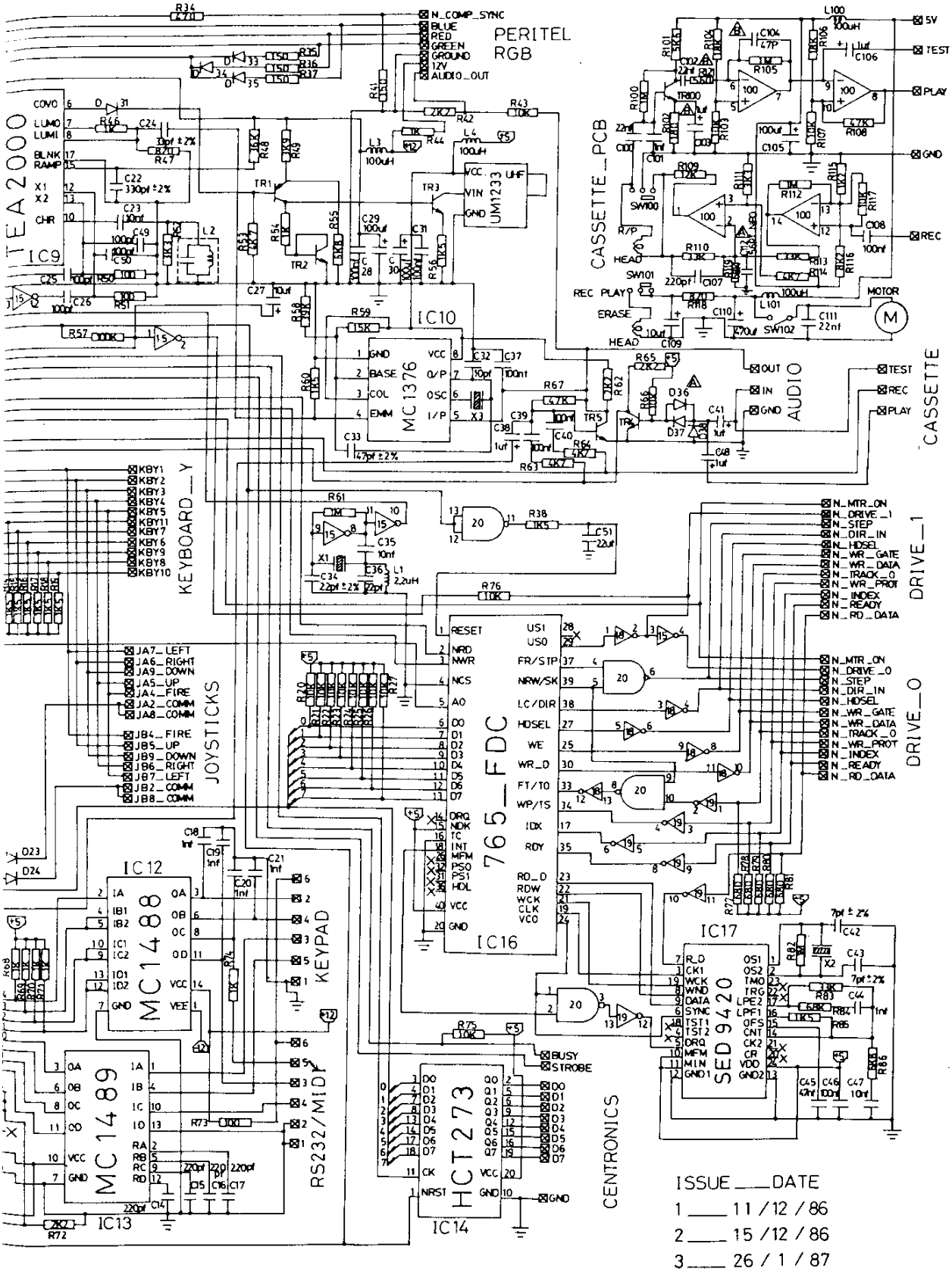
(2)+2A USE ONLY
IC100,TR100
R100-R118
C48,C100-C111
L100,L101

(3) Peritel only version
The RF output may be omitted on Peritel only version by omitting the following components.
IC9,IC10
TR1-TR3
D25-D31
R28-R30,R44,R46-R56,R58-R60
C22-C26,C28,C29,C32,C33,C49,C50
L2-L3
X3
RF Modulator

C1~C7 : 100nf
C8 : 100uf
C9~C12 : 100nf

CIRCUIT DIAGRAM




PERITEL RGB
N_COMP_SYNC
BLUE
RED
GREEN
GROUND
12V
AUDIO_OUT
TEA2000
IC9
IC10
MC 1376
UM1233 UHF
CASSETTE_PCB
5V
TEST
PLAY
GND
REC
MOTOR
CASSETTE
AUDIO
KEYBOARD_Y
JOYSTICKS
765_FDC
IC16
DRIVE_1
DRIVE_0
IC12
MC1488
KEYPAD
MC1489
RS232/MIDI
IC13
HCT273
IC14
CENTRONICS
BUSY
STROBE
SED9420
IC17
ISSUE ___ DATE
1 ___ 11 / 12 / 86
2 ___ 15 / 12 / 86
3 ___ 26 / 1 / 87

ELECTRICAL PARTS LIST

Reference No.	Description	Part No.
IC's		
IC1	IC Gate Array 40077	40077
IC2	IC Z80A CPU	40080
IC3-6	IC 64K x 4 D.RAM	173001
IC7	IC 256K ROM VERSION 1	173002
IC8	IC 256K ROM VERSION 2	173003
IC9	IC TEA2000	172048
IC10	IC MC1376	172049
IC11	IC AY-3-8912A	40001
IC12	IC MC1488 QUAD RS232 DRIVER	172039
IC13	IC MC1489 QUAD RS232 REC	172038
IC14	IC 74HCT273	173004
IC15	IC 74HCU04	40008/A
IC16	IC 765 Floppy Disk Controller	40018
IC17	IC SED 9420	171034
IC18	IC 74HCT04	173008
IC19	IC 74HC14	171033
IC20	IC 74HCT00	40008
	IC 40 Pin Socket	170121
	IC 28 Pin Socket	170120
Transistors		
TR1	TR BC308B/BC558B	172032
TR2-5	TR BC239B/BC549B	50008
Diodes		
D1-4, 6-31, 33-35	D IN4148	190715
	LED Red LTL 3211A	172004
Miscellaneous		
X1	Crystal 35.4690MHz	172067
X3	6MHz Ceramic Resonator	173011
X2	16.000MHz Ceramic Resonator	173013
	Modulator UHF	172020
	Aerial Lead	172065
	9 Way D Plug	173015
	Power Supply Unit	173034
Coils		
L1	Inductance 2.2uH	172058
L3, 4	Inductance 100uH	172060
L2	RF Choke 4.43MHz 4097	173016
Carbon Film Resistors		
47ohm	R45	10020
100ohm	R4, 50, 51, 73	10032
150ohm	R31-33, 35-37, 41	10036
470ohm	R34	10048
680ohm	R77-81	10052
820ohm	R9-13, 47	10054
1kohm	R6-8, 44, 46, 54, 68-71, 74	10061
1k5ohm	R14-19, 56, 60, 85	10065
2k2ohm	R42, 62, 65, 72	10069
3k3ohm	R52	10073
3k9ohm	R49	10075
4k7ohm	R53, 63, 64	10077
6k8ohm	R55, 86	10081
10kohm	R1-3, 5, 20-30, 43, 57, 66, 75, 76	10085
15kohm	R59	10089
33kohm	R83	10097
36kohm	R48	172077
39kohm	R58	10099
47kohm	R67	10101
68kohm	R84	10105
1Mohm	R61, 82	10147
Ceramic Capacitors		
7pF NPO	C42, 43	173027
10pF NPO	C32	173028
22pF NPO	C34	173029
22pF	C36	150511
33pF NPO	C22	173030
47pF NPO	C33	173031
100pF	C25, 26, 49, 50	1422144
220pF	C14-17	400107
330pF NPO	C24	173032
0.001uF	C18-21, 44	24027
0.01uF	C23, 35, 47	24011
0.047pF	C45	24015
0.1uF	C1-7, 9-12, 28, 31, 37, 39, 40, 46	171058
Electrolytic Capacitors		
1uF/50V	C13, 27, 38, 41	20062
100uF/16V	C8, 29, 30	20028