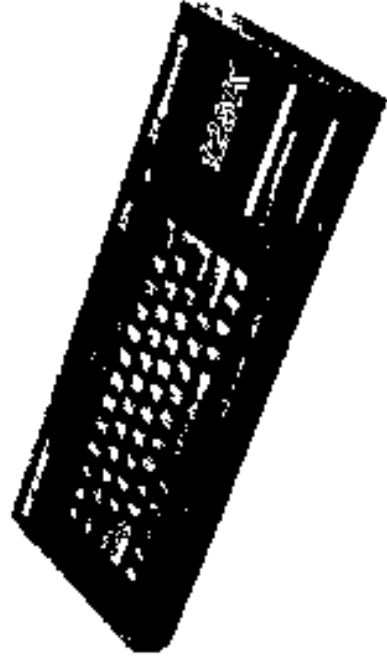


Sinclair

Amstrad



Spectrum +3

Service Manual

Thanks to Andy Dansby <adansby@atlantic.net> for converting to text and scanning in the images, his homepage <http://www.atlantic.net/~adansby> is well worth a visit.

Comments to Pete Robinson <pete@madhippy> demon.co.uk

Please note that I have not optimised scanned images of circuit diagrams etc.

Document is © Amstrad.

The PDF version is made by Alvaro Alea <ALEAsoft@yahoo.com>

AMSTRAD PLC

**BRENTWOOD HOUSE, 169 KINGS ROAD, BRENTWOOD, ESSEX
CM14 4EF.**

Telephone: 0277 230222. Telex: 99541 7 Amaele G.

CONTENTS

CONTENTS	3
TECHNICAL SPECIFICATION	4
SELF-TEST ACTIVITATION	6
DEMO MODE	6
CABINET PARTS	7
FLOW CHARTS	9
PRINTED CIRCUIT BOARD LAYOUT	13
DISK DRIVE DIAGRAM	14
SOFTWARE ERRORS	16
DIAGNOSTIC FLOW CHART	18
SELF DIAGNOSTIC TESTS	19
CIRCUIT DIAGRAM	20
ELECTRICAL PART LIST	22

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 Color resolution

8 colors foreground,

8 colors 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.

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

SELF-TEST ACTIVATION

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.

DEMO MODE

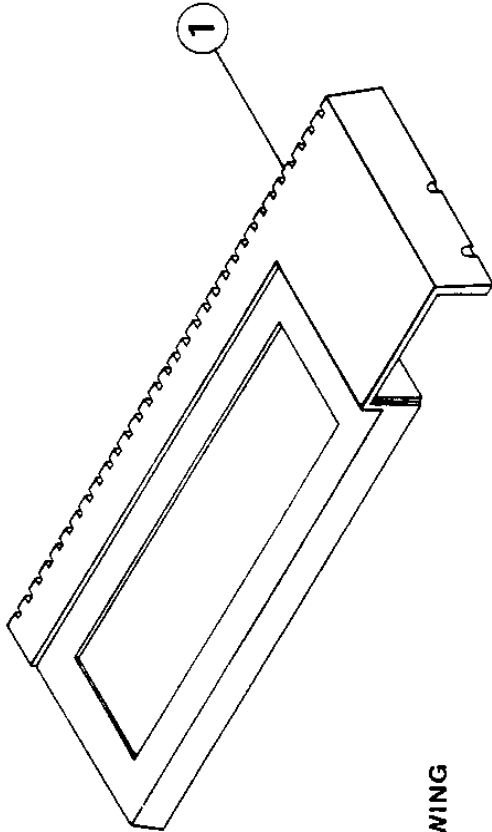
Also contained within the ROM is a small message, to obtain this display, first put the machine into +3 BASIC mode and type:-

```
copy randomize (ENTER)
```

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

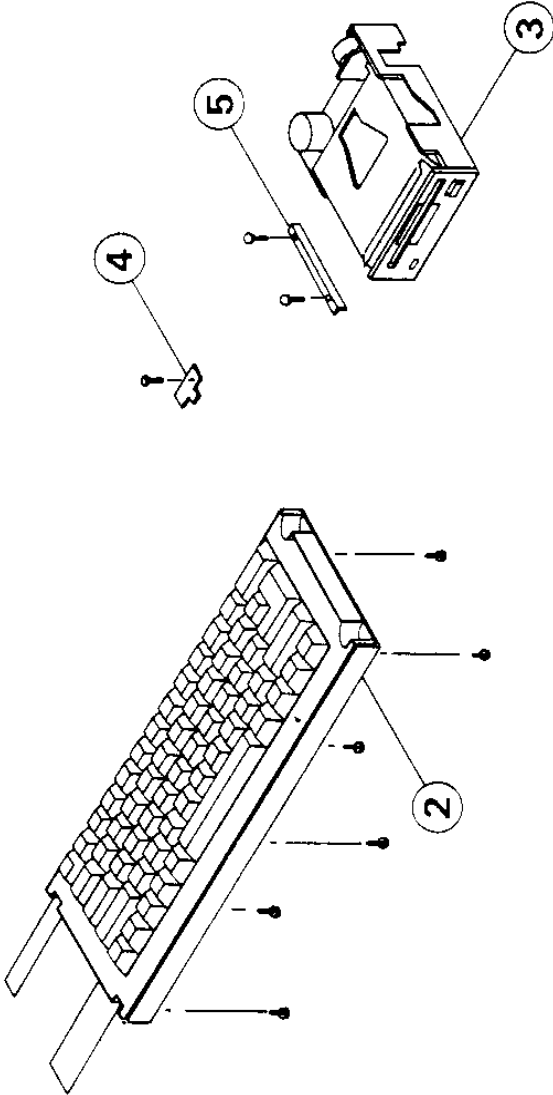
```
HELLO THERE I 'M A +3
```

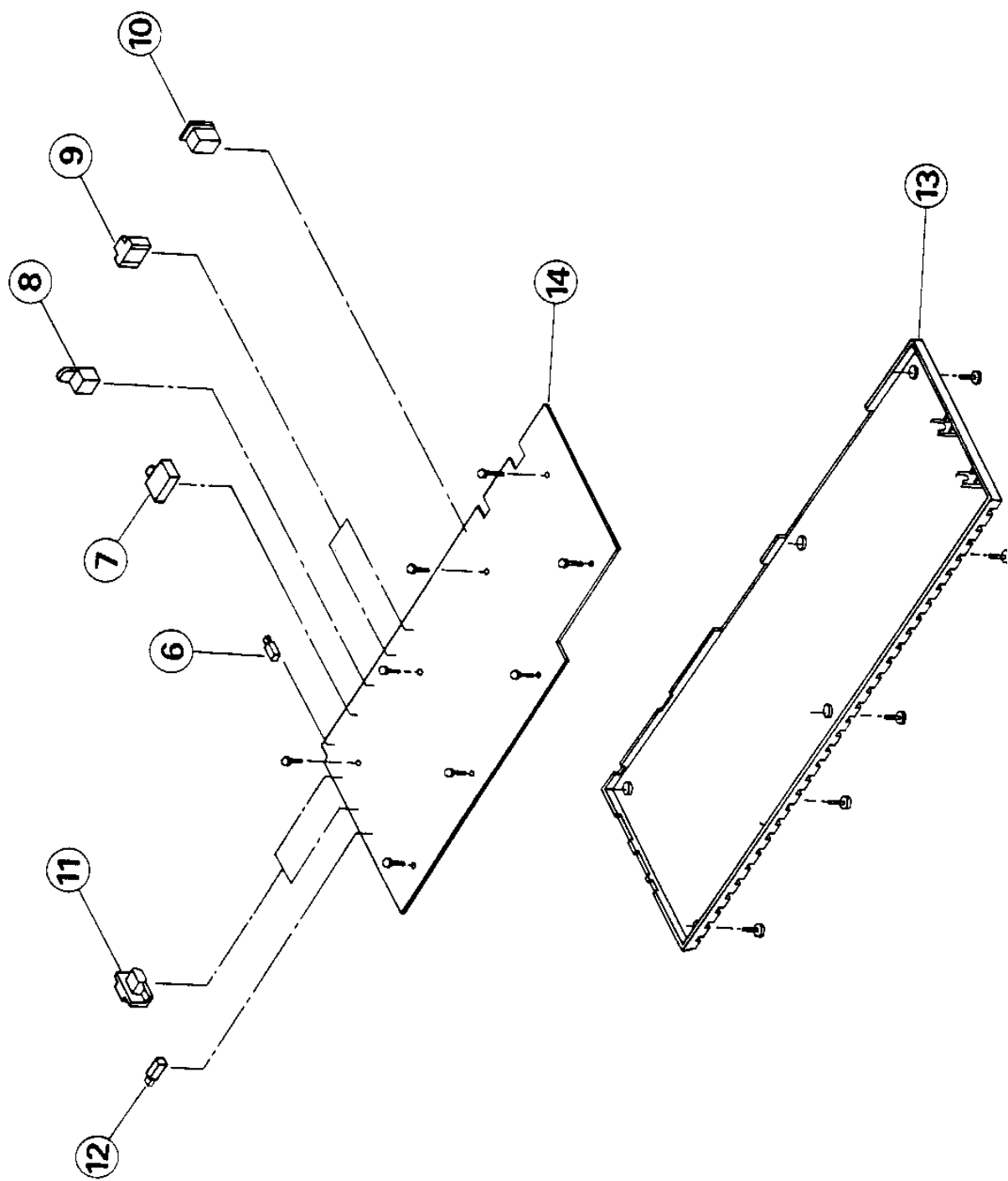
CABINET PARTS



CABINET DRAWING

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





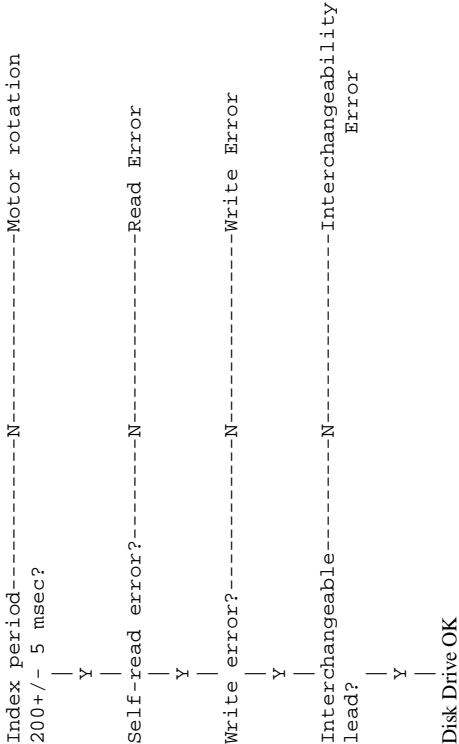
Flow Charts

This chart must be used in conjunction with the alignment procedures

This chart is for information only and does not guarantee an exact diagnosis.

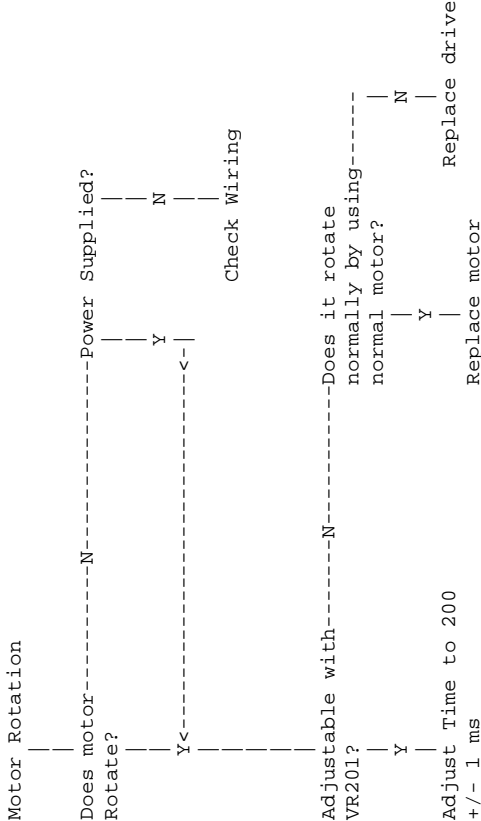
For warranty purposes and faulty drive mechanism must be returned to Amstrad for replacement. Service agents should not attempt any repairs on the mechanism or to it's P.C.B. PT. No. 270312

3-A



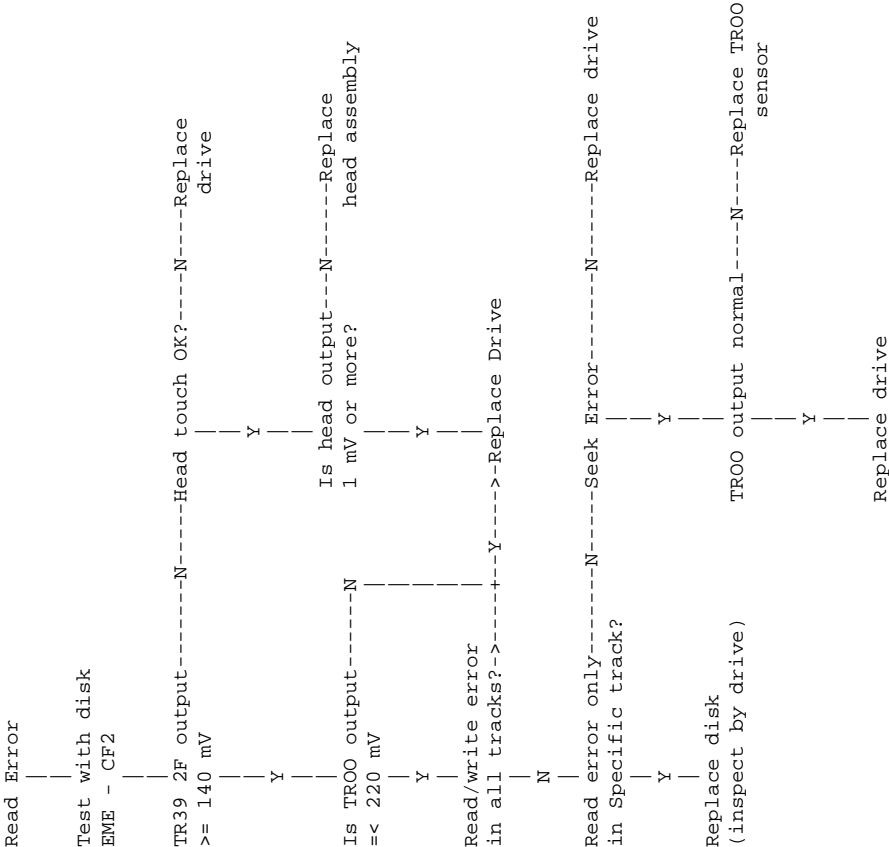
Diagnostic Flow Chart (continued)

3-B

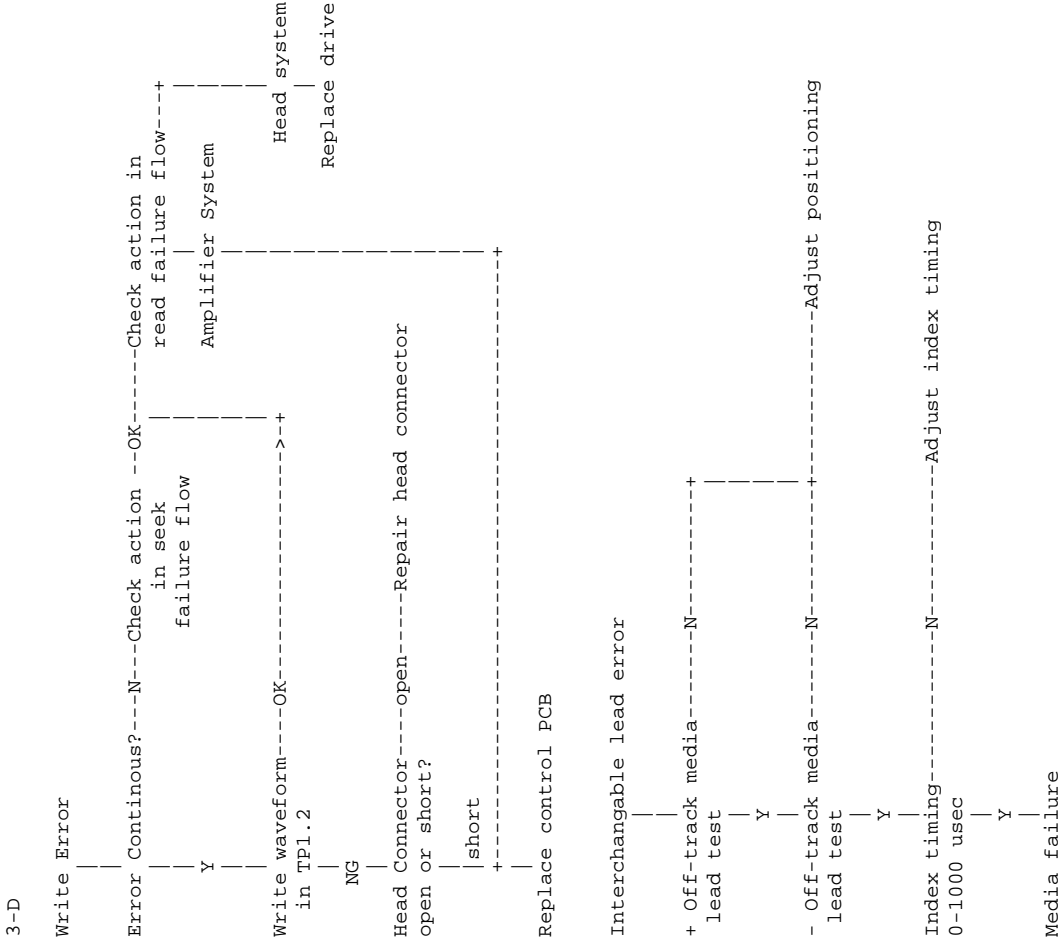


Diagnostic Flow Chart (continued)

3-C

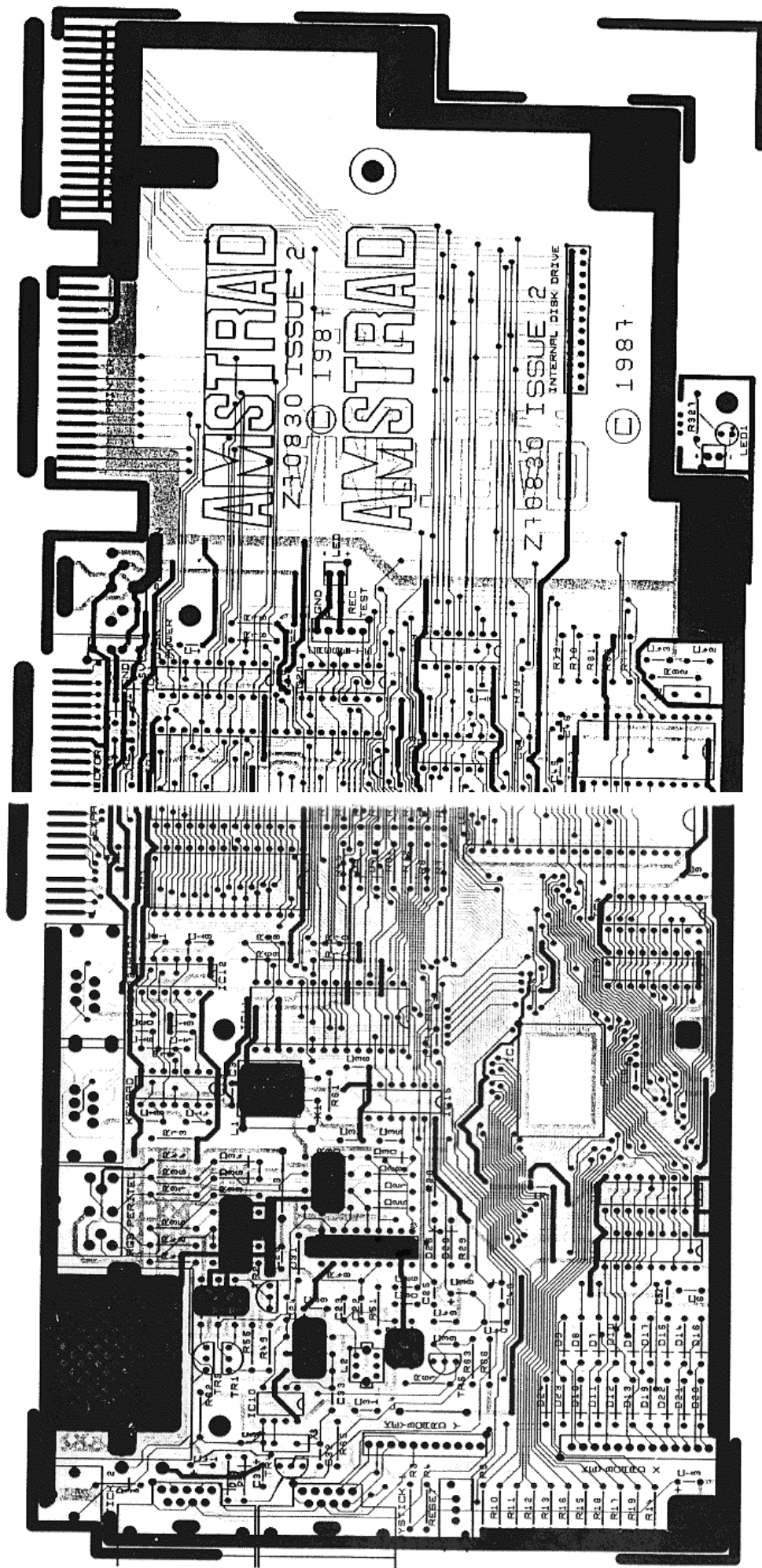


Diagnostic Flow Chart (continued)

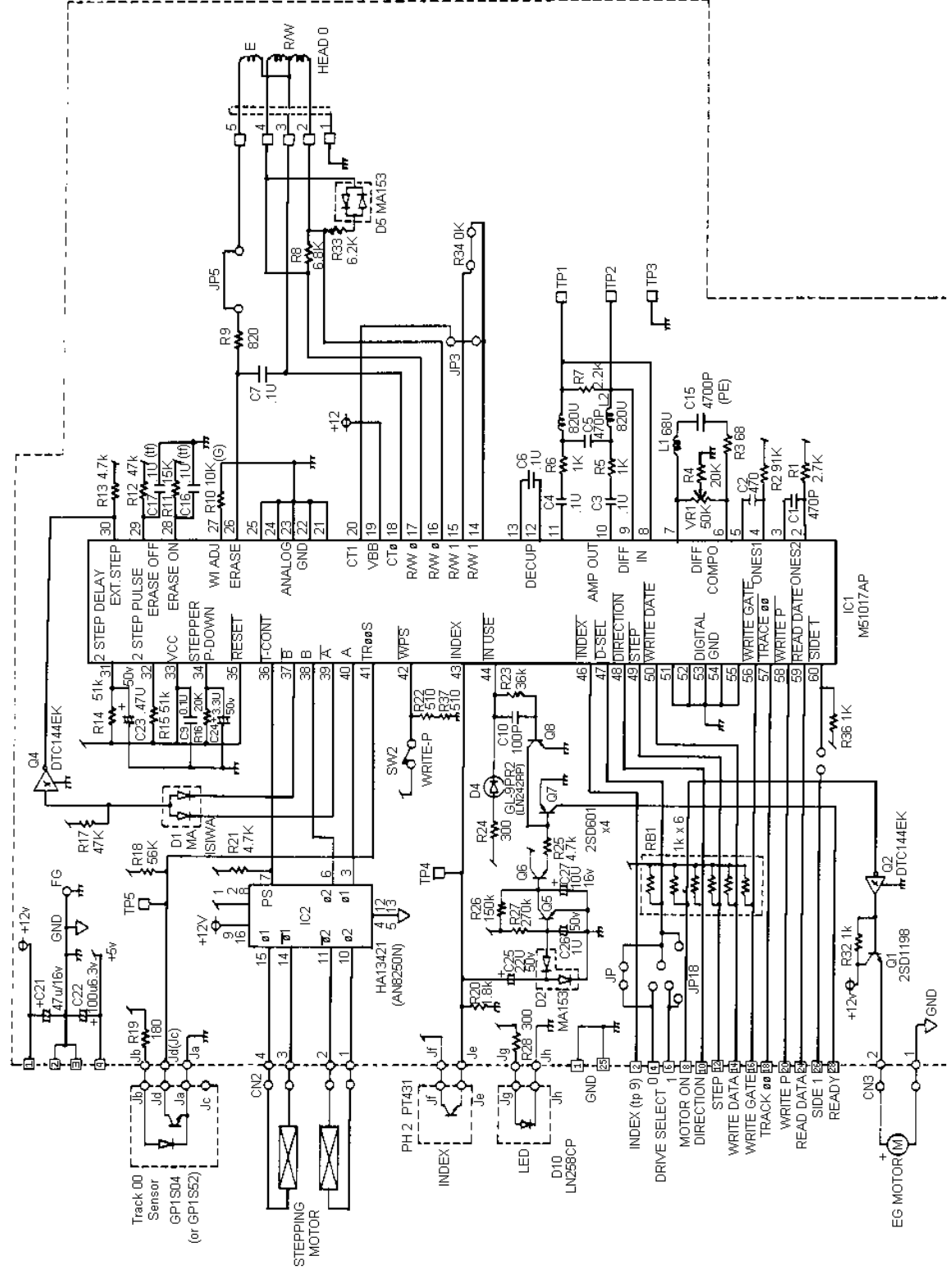


AMSTRAD
Z10830 ISSUE 2
© 1981

AMSTRAD
Z10830 ISSUE 2
INTERNAL DISK DRIVE
© 1981



FD-1 EME-156 DISK DRIVE CIRCUIT DIAGRAM



SPINDEL MOTOR

STEPPING MOTOR

90 ± 0.5

36

3

5

150 ± 0.1

J1 CONNECTOR

J2 CONNECTOR

36 MAX

3.6

60 ± 0.5

30 ± 0.5

3.6 MAX

150 MAX

36 ± 0.2

26 ± 0.2

55

18

5

11

17

27

4

12

COLOR - BLACK

PANEL SURFACE

0.2-0.5

LED

SECTION A-A

EJECT STROKE 6.0

FUEL STROKE 6.5

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

101

102

103

104

105

106

107

108

109

110

111

112

113

114

115

116

117

118

119

120

121

122

123

124

125

126

127

128

129

130

131

132

133

134

135

136

137

138

139

140

141

142

143

144

145

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

169

170

171

172

173

174

175

176

177

178

179

180

181

182

183

184

185

186

187

188

189

190

191

192

193

194

195

196

197

198

199

200

201

202

203

204

205

206

207

208

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

226

227

228

229

230

231

232

233

234

235

236

237

238

239

240

241

242

243

244

245

246

247

248

249

250

251

252

253

254

255

256

257

258

259

260

261

262

263

264

265

266

267

268

269

270

271

272

273

274

275

276

277

278

279

280

281

282

283

284

285

286

287

288

289

290

291

292

293

294

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

312

313

314

315

316

317

318

319

320

321

322

323

324

325

326

327

328

329

330

331

332

333

334

335

336

337

338

339

340

341

342

343

344

345

346

347

348

349

350

351

352

353

354

355

356

357

358

359

360

361

362

363

364

365

366

367

368

369

370

371

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389

390

391

392

393

394

395

396

397

398

399

400

401

402

403

404

405

406

407

408

409

410

411

412

413

414

415

416

417

4

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.

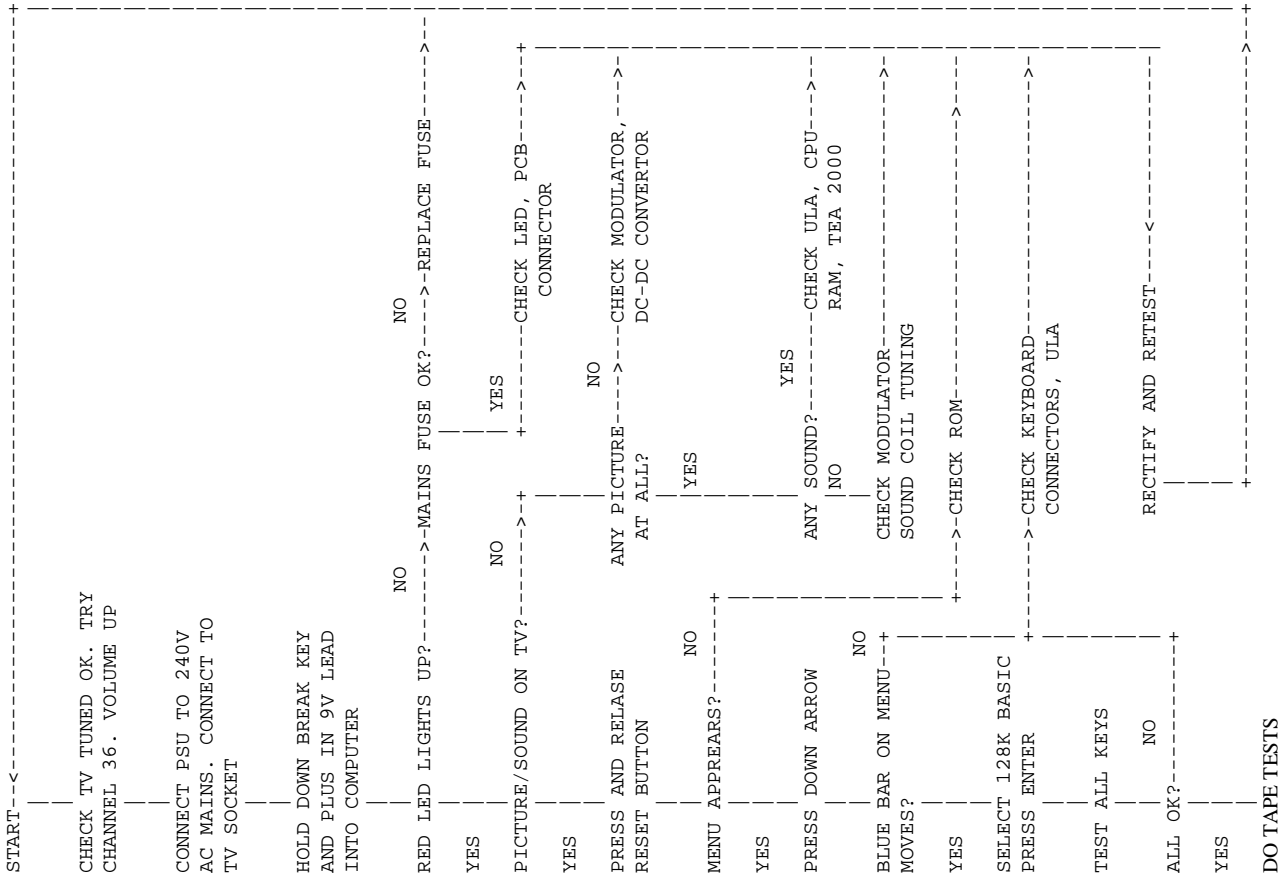
Seek Error

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 00. 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



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.

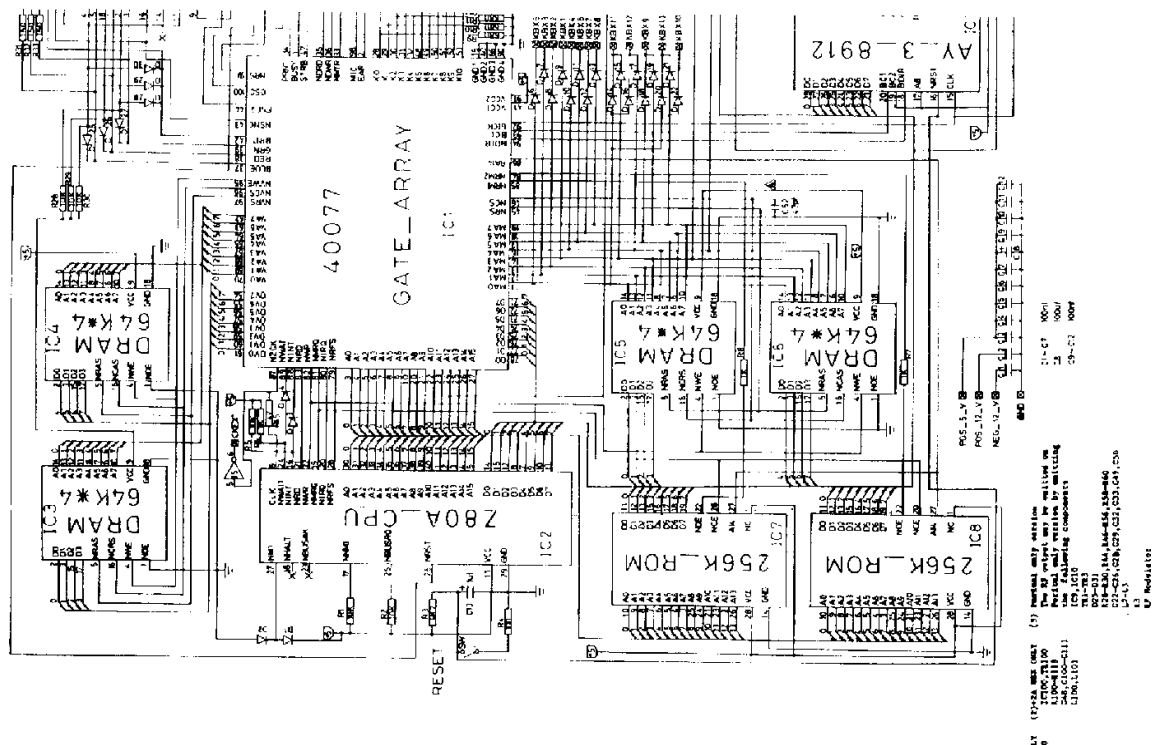
1. A test card with some text will appear. Follow the instructions on the screen.
2. No text or testcard. In this case, note the color of the edge of the screen. It will either be a steady color or flashing regularly with a predominant color. Consult the table below to find out which RAM chip has (probably)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

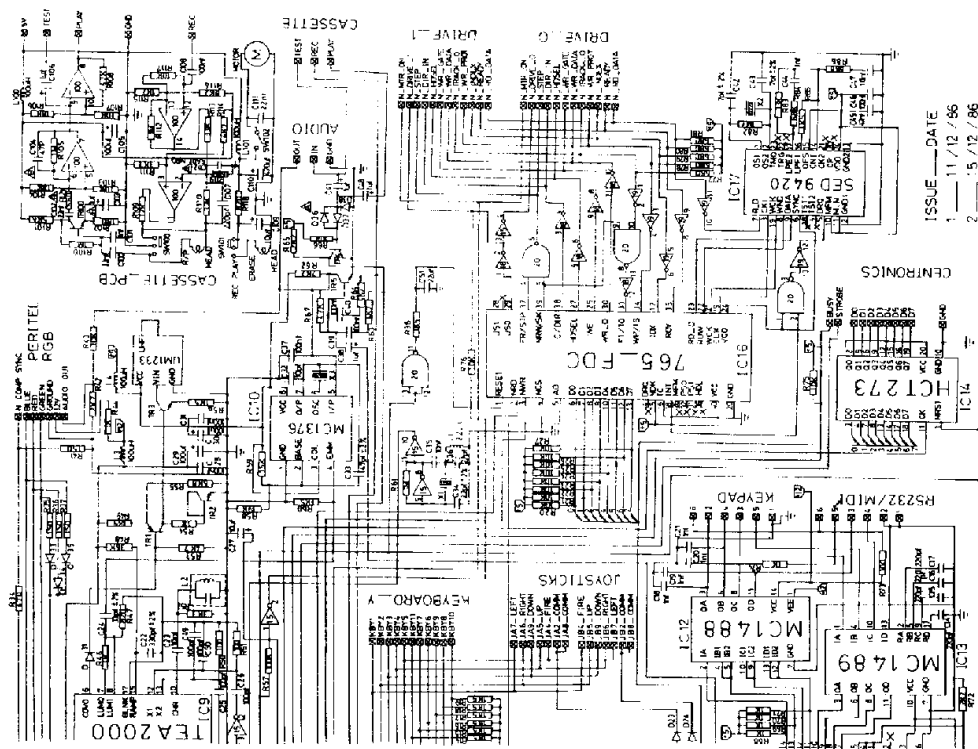
Color	BLACK	BLUE	RED	MAGENTA	GREEN	CYAN	YELLOW	WHITE
Steady	IC 17	IC18	IC19	IC 20	IC 21	IC22	IC 23	IC 24
Flashing	IC32	IC31	IC30	IC29	IC 28	IC27	IC 26	IC 25

If you follow the instructions on screen from the first occurrence, 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.

CIRCUIT DIAGRAM





ISSUE DATE

1 11/12/86

2 15/12/86

3 26/1/87

ELECTRICAL PART LIST

Ref.N°	Description	Part #
INTEGRATED CIRCUITS		
IC1	Gate Array 40077	40077
IC2	Z80A CPU	40080
IC3-6	64K x 4 D.RAM	173001
IC7	256K ROM VERSION	173002
IC8	256K ROM VERSION 2	173003
IC9	TEA2000	172048
IC10	MC1376	172049
IC11	AY-3-8912A	40001
IC12	MC 1488 QUAD RS232 DRIVER	172039
IC13	MC 1489 QUAD RS232 REC	172038
IC14	74HCT273	173004
IC15	74HCU04	40005/A
IC16	765 Floppy Disk Controller	40018
IC17	SED 9420	171034
IC18	74HC704	173008
IC19	74HC14	171033
IC20	74HCT00	40008
	IC40 Pin Socket	170121
	IC28 Pin Socket	170120
Transistors		
TR1	TRBC3083/BC558B	172032
TR2-5	TRBC239B/BC549B	50008
Diodes		
D1-4,6-31	D1N4148	190715
D33-35	D1N4148	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

R45	47ohm	10020
R4, 50, 51, 73	100ohm	10032
R31-33.35-37, 41	150ohm	10036
R34	470ohm	10048
R77-81	680ohm	10052
R9-13, 47	820ohm	10054
R6-8, 44, 46	1kohm	10061
R54, 68-71, 74	1kohm	10061
R14-19, 56, 60, 85	1k5ohm	10065
R42, 62, 65, 72	2k2ohm	10069
R52	3k3ohm	10073
R49	3k9ohm	10075
R53, 63, 64	4k7ohm	10077
R55, 86	6k8ohm	10081
R1-3, 5, 20-30	10kohm	10085
R43, 57, 66, 75, 76	10kohm	10085
R59	15kohm	10089
R83	33kohm	10097
R48	36kohm	172077
R58	39kohm	10099
R67	47kohm	10101
R84	68kohm	10105
R61, 82	1Mohm	10147

Capacitors

C42, 43	7 pF NPO	173027
C32	10 pF NPO	173028
C34	22 pF NPO	173029
C36	22 pF	150511
C22	33 pF NPO	173030
C33	47 pF NPQ	173031
C25.26, 49, 50	100 pF	1422144
C14-17	220 pF	400107
C24	330 pF NPO	173032
C18-21, 44	0.001 uF	24027
C23, 35, 47	0.01 uF	24011
C45	0.047pF	24015
C1-7, 9-12, 28	0.1uF	171058
C31, 37, 39, 40, 46	0.1uF	171058
C13, 27, 38, 41	1uF/50V	20062
C8, 29.30	100uF/16V	20028