apricot Service Manual

apricot

Service Manual

PREFACE

This service manual contains all the information required for the after-sales service that is required to maintain the high quality and reliability of the ACT APRICOT executive micro-computer.

It is assumed throughout this manual that all service personnel involved in the maintenance of the ACT APRICOT already have an in-depth knowledge of digital electronics, with particular emphasis on micro-computer techniques.

This manual contains information relevant to the total APRICOT range. Illustrations and photographs used are of the twin floppy drive version. Please refer to relevant sections for variations.

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QED (Product Design) Ltd.

CONTENTS

Chapter

1 General description
  Specification

2 Installation

3 Safety precautions

4 Recommended tools and equipment

5 Assembly and disassembly

6 Electrical system

7 Electronic system
  Memory map

8 Set-up procedures

9 Trouble-shooting
  Diagnostic programs

10 Expansion Boards

11 Winchester

Appendix

A Monitor

B Disk drive

C Parts list

D PSU

E Circuit diagrams, wiring diagrams

Index

INDEX

Assembly and
  Disassembly 5.1
AC Sub Assembly 6.3
Async Cable
  Connection 6.19

Block Diagram Apricot 7.22

Conversion 240V–115V 6.4
Connectors Pin-Outs 6.6
Circuit Diagrams F.1

Disassembly
  Rear Panel 5.3
  AC Sub Assembly 5.4
  Motherboard 5.5
  Chassis Bridge
  Assembly 5.6
  Disk Drives 5.7
  Front Bezel and Door 5.8
  Main Chassis 5.9
  Power Supply 5.9
  Handle 5.9
  Speaker 5.9
  Monitor 5.10
  Keyboard 5.11
  5.12
  5.13

Diagnostic
  Boot Prom
  Documentation
  Error Codes 9.1
  Programs 9.5
  Disk Drive B.1

Electrical System 6.1
Earthing 6.5
Expansion Information 6.16
Electronic System 7.1

Features 1.2
Fuses 3.2
Floppy Disk Controller 7.13

Installation 2.1
Interconnection
  Diagram 6.2
I/O Section 7.11
I/O Port Address 7.20
I/C Catalogue 7.23

Modem Cable
  Connection 6.19
Memory 7.6
Memory Map 7.38
Monitor A.1
Mnemonics 7.34

Parts Description 1.5
Printer Cable
  Parallel 6.20
  Serial 6.21
Processor Structure 7.7
Parallel Interface 7.14
Parts List C.1
Power Supply E.1

Recommended Tools 4.1
Recommended
  Equipment 4.1

Specification 1.4
Safety Precautions 3.1
System Outline 7.3
Sound Generator 7.11
Serial Interface 7.18
Set-Up Procedure 8.1

Timer 7.16

GENERAL DESCRIPTION

1

I Features

II Specifications

III Individual units

GENERAL DESCRIPTION

I FEATURES

Processor architecture

8086 running at 5mHz
8089 I/O processor
8087 Optional Maths co-processor

Memory

256 Kbytes expandable to 768 Kbytes

Mass storage

One or two 3.5″ Sony mirco-floppy disk drives – 315 Kbytes each
or
One or two 3.5″ Sony double sided micro-floppy disk drives – 360 Kbytes each side

Display

9″ green P39 phosphor with antiglare filter
80 characters × 25 lines
Resolution: 800 × 400 pixels

I/O

1 × RS232 (V-24) serial port
1 × 8-bit Centronics parallel printer port
Optional on-board modem with auto-dial
2 × expansion slots
1 × "Mouse" port

Keyboard

Soft QWERTY keyboard with 8 fixed function keys and 6 touch sensitive keys labelled by LCD Micro-Screen (tm).
Built-in 4 function calculator.
Time/Date display with battery back-up.

Safety/radiation standards

Meets UL
VDE
BS415
CSA
FCC-B

GENERAL DESCRIPTION

II SPECIFICATION

Physical dimensions

Systems box:	16.5″ (43.5cm) wide × 4″ (10.6cm) high × 12.5″ (33cm) deep
Monitor:	10.5″ (27.7cm) wide × 8.5″ (22.5cm) high × 10″ (26.4cm) deep
Keyboard:	16″ (42cm) wide × 2″ (5.3cm) high × 7″ (18.5cm) deep

Weight

Systems box:	14.2 lbs (6.5 kg)
Monitor:	9.1 lbs (4.1 kg)
Keyboard:	3.3 lbs (1.5 kg)

Power requirements

200 to 240 VAC 47 to 63 Hz
or
100 to 125 VAC 47 to 63 Hz

Power consumption

100W at 115V or 230V input

Temperature range

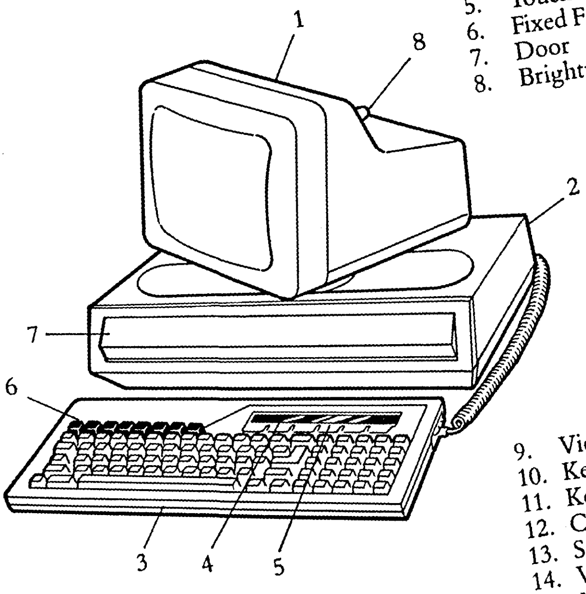
Operating:	5 to 37°C
Storage:	−20 to 60°C

Humidity

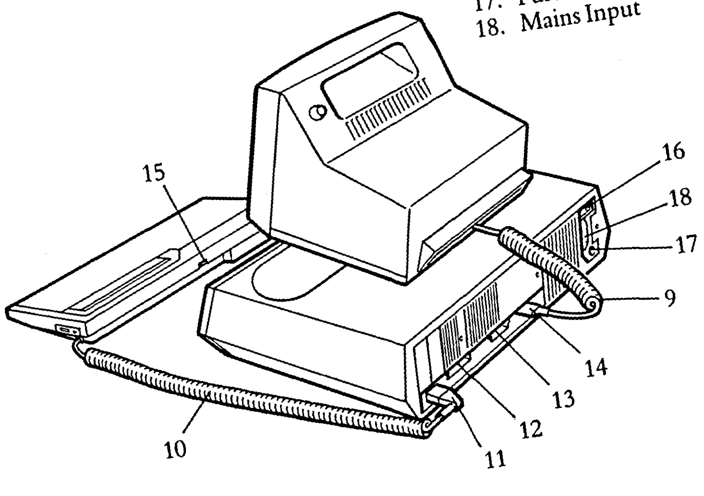
Operating:	20 to 80% RH @ 29°C non-condensing

III INDIVIDUAL UNITS

1. Monitor
2. System Unit
3. Keyboard
4. Microscreen tm
5. Touch Sensitive Keys
6. Fixed Function Keys
7. Door
8. Brightness Control



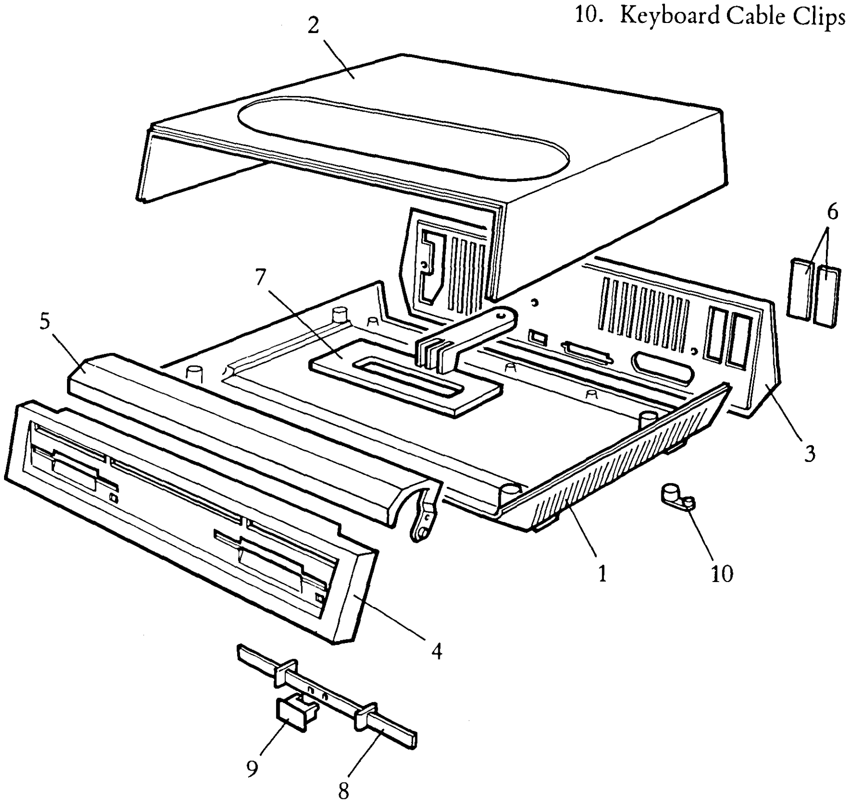
9. Video Cable
10. Keyboard Cable
11. Keyboard Connector
12. Centronics Connector
13. Serial Connector
14. Video Connector
15. Mouse Port
16. Mains Switch
17. Fuse
18. Mains Input



GENERAL DESCRIPTION

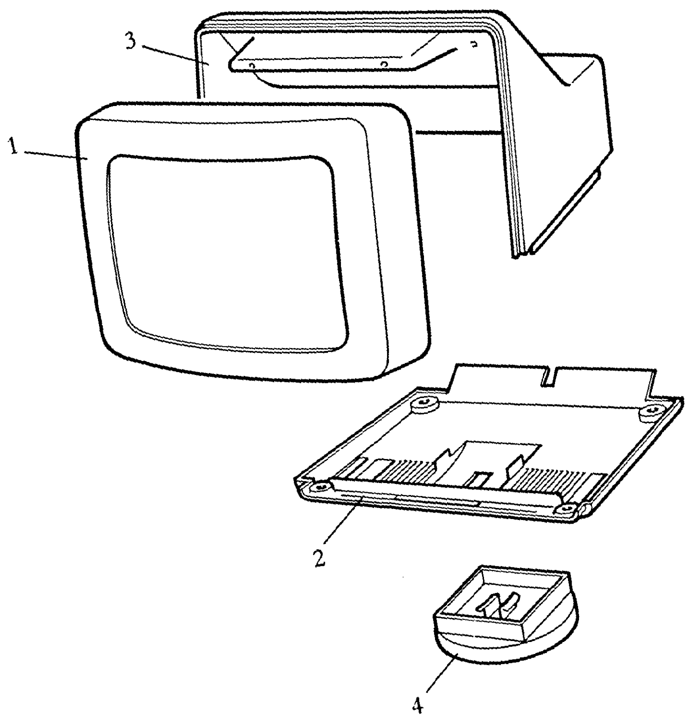
SYSTEMS UNIT External

1. Systems Base
2. Systems Cover
3. Rear Panel
4. Facia Bezel
5. Door
6. Expansion Plates
7. Handle
8. Base Clip
9. Base Button
10. Keyboard Cable Clips



MONITOR External

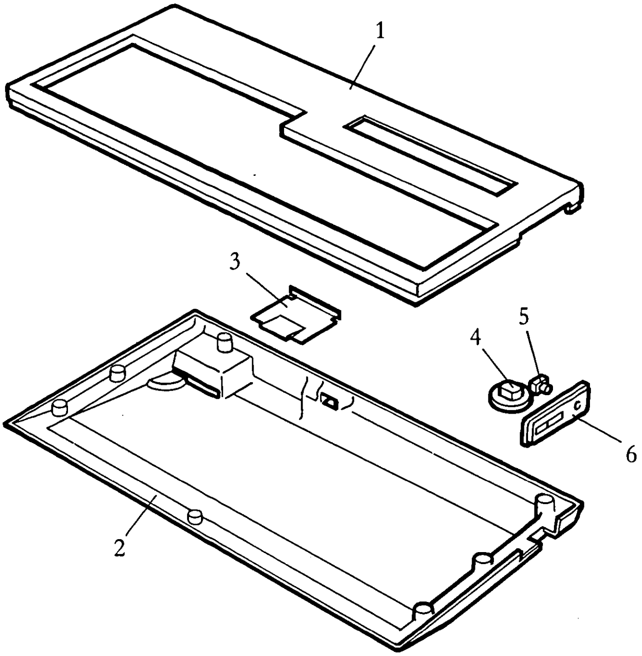
1. Monitor Bezel
2. Monitor Base
3. Monitor Cover
4. Pedestal



GENERAL DESCRIPTION

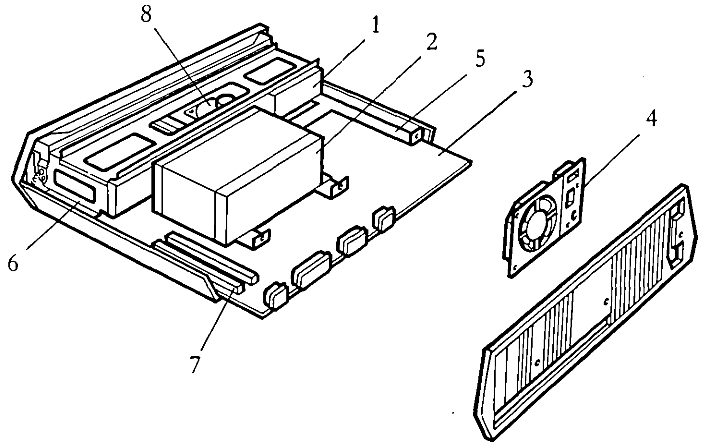
KEYBOARD External

1. Keyboard Bezel
2. Keyboard Base
3. Battery Cover
4. Contrast Wheel
5. Reset Button
6. Reset Plate



SYSTEMS UNIT Internal

1. Disk Drive
2. Power Supply
3. Motherboard
4. AC Sub-Assembly
5. Main Chassis
6. Chassis Bridge
7. Expansion Slots
8. Loudspeaker



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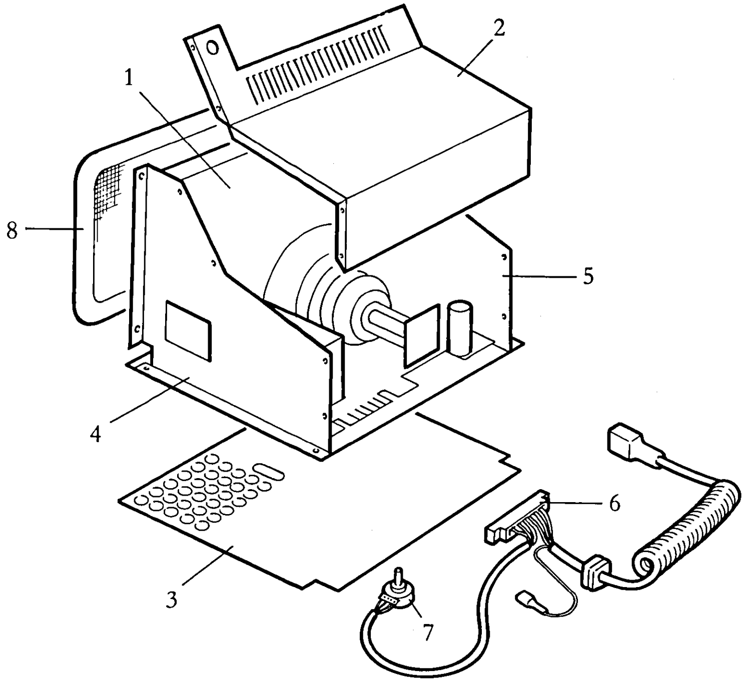
GENERAL DESCRIPTION

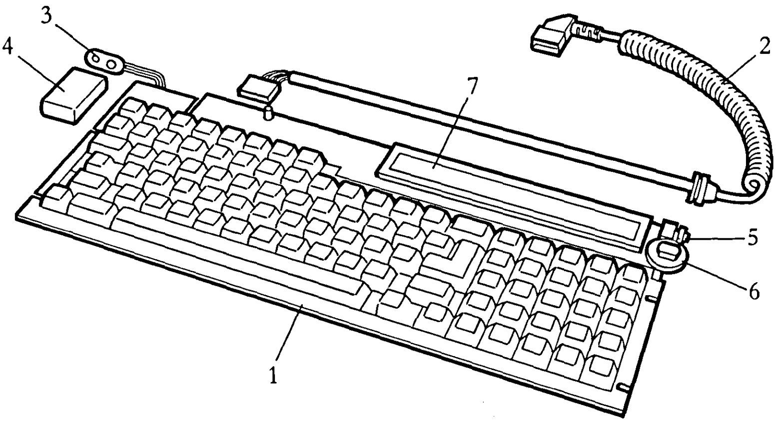
MONITOR UNIT Internal

1. Wire Frame Monitor
2. Top Screen
3. Bottom Screen
4. LH Monitor Bracket
5. RH Monitor Bracket
6. Video Cable
7. Brightness Control
8. Sunflex Screen



KEYBOARD UNIT Internal

1. Keyboard Assembly
2. Keyboard Cable
3. Battery Connector
4. Battery
5. Reset Switch
6. Brightness Control
7. LCD Microscreen



INSTALLATION 2

INSTALLATION

Each computer is carefully adjusted and strictly inspected before it leaves the factory.

Correct installation is extremely important to maintain the high degree of reliability and performance in-built in the machine.

Note the following recommendations:

1. Ensure the line voltage is within the voltage marked on the outside of the systems unit.
2. To maintain data integrity, the computer should be operated in an electrical environment not subject to large voltage transients on the line. A normal office supply is perfectly adequate. Avoid close proximity with heavy industrial machinery such as presses, arc welders, etc.
3. Ensure the operating temperature is not exceeded, and that the temperature of the machine is allowed to stabilise (for approximately 30 mins.) if it is moved from one extreme to another.
4. Do not obstruct any of the ventilation grills.
5. Under no circumstances must any liquid be allowed to enter any of the units.
6. Operating the machine in an abnormally dusty atmosphere will substantially reduce the life of the disk drive and the media.
7. The plastic case of the machine can be cleaned with a damp cloth. Under no circumstances use an abrasive cleanser or solvent.
8. Although the Sony micro floppy disks are extremely robust, a few precautions will ensure a long and trouble-free life:
   - (i) Keep auto shutter closed at all times.
   - (ii) Never touch the oxide surface.
   - (iii) Do not exceed their temperature range (10°C to 60°C).
   - (iv) Do not expose the disks to any magnetic field.
   - (v) Do not attempt to clean the disk surface. This may result in damage to the disk drive heads.

SAFETY PRECAUTIONS 3

I General Safety Precautions

II Fuses

III Power Supply

SAFETY PRECAUTIONS

I GENERAL SAFETY PRECAUTIONS

1. The ACT Apricot has been designed to meet all international safety standards including UL, VDE, BS415, CSA and FCC-B radiation standards.
2. It is recommended that installation of any expansion boards or modifications, be carried out by an authorised dealer – the end user should not dismantle the units.
3. Replacement parts should be of the type and rating specified by the manufacturer, to prevent the risk of shock or fire.

   Refer to appendix A for important safety precautions on the monitor.
4. All earth connections should be maintained to the original specification, refer to Chapter 6.

SAFETY PRECAUTIONS

II FUSES

1. There are three fuses within the whole computer. 2 in the system unit and 1 in the monitor.

   WARNING – REMOVE POWER CABLE BEFORE SERVICING

2. **System Unit:**
   The main system fuse is readily accessible on the rear panel. The carrier is of the screw-in type, and requires a flat bladed screwdriver to remove.

   Type – 20mm slow blow
   240V–T2 Amp – Part Number 11002121
   115V–T3 Amp – Part Number 11002721

3. **Power Supply:**
   The power supply is protected by its own fuse within the power supply casing. Since the power supply will automatically shut down in the case of an external fault, the failure of this fuse indicates a fault within the unit itself. Under no circumstances replace this fuse, but change the unit as an assembly – see overleaf for safety precautions concerning this assembly.

4. **Monitor:**
   The monitor is powered from the +12V rail off the systems unit power supply. This rail is protected by a fuse within the monitor itself. It is located on the P.C.B. under the High Voltage Block component.

   Type – 1¼″ × 2 Amp – Part Number 11040021

III POWER SUPPLY

The ACT Apricot utilizes an ASTEC AC9335 power supply module. Appendix D gives a full specification of the unit.

The unit is of the switch-mode type, and very high voltages are present throughout. If it is envisaged that any kind of testing or servicing be carried out, with the top cover removed, the following precautions should be taken:

1. Use 1:1 isolation transformer in the line.
2. Service only in a "high-voltage" test area.
3. Incorporate an emergency off switch.
4. Disconnect all earths from test equipment.
5. Take every precaution to minimise shock hazard.

It is highly recommended that in the case of failure, this unit should be returned to the distributor for repair.

RECOMMENDED TOOLS AND EQUIPMENT

4

RECOMMENDED TOOLS AND EQUIPMENT

In addition to a standard service engineers tool kit the following equipment is required to maintain the ACT Apricot to component level:

Oscilloscope – double beam – 50 MHz
Frequency counter

To repair the Sony disk drive a tool kit is available either direct from Sony or from ACT, this comprises the following:

Description	Sony Part Number	ACT Part Number
MFD Checker II	J-609-182-0A	
Rotary Knob	J-609-011-0A	11035791
Lead Screw Tool	J-609-136-0A	11035891
Motor Speed Adjuster	7-700-754-01	11035991
Geared Driver	J-609-017-0A	11036091
Level Disk	8-960-009-31	
Alignment Disk	8-960-009-32	
Cleaning Disk	8-960-009-39	
Head Extension Cable	J-609-123-0A	11036491
Std Disk Dummy	J-609-120-0A	11036591
Pad Weight	J-609-124-0A	11036691
Hex Torque Driver	J-609-125-0A	11036791
Power Cable	J-609-130-0A	11036891
Interface Cable	J-609-129-0A	11036991
Tension Gauge	J-604-163-0A	11037091
Tension Gauge	7-732-050-10	11037191

Bench power supply giving –12V @ 1A, +5V @ 1A.

Complete Kit order as 11102711

ASSEMBLY AND DISASSEMBLY

5

I Rear Panel and Top Cover

II AC Sub Assembly

III Motherboard

IV Chassis Bridge

V Disk Drives

VI Front Bezel and Door

VII Main Chassis, Power Supply, Loudspeaker and Handle

VIII Monitor

IX Keyboard

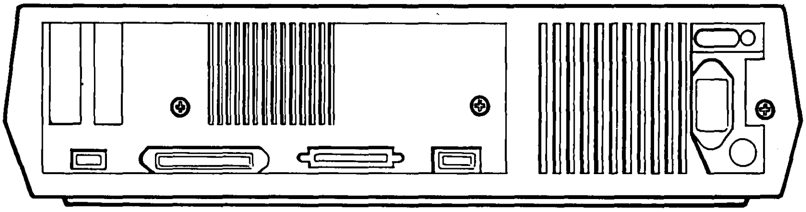
ASSEMBLY AND DISASSEMBLY

GENERAL RECOMMENDATIONS

1. Disconnect from mains supply before disassembling machine.
2. Unless specifically noted, reassembly is the reverse of disassembly and will not be described unless necessary.
3. Do not mix screws (length, diameter).
4. A number in parenthesis thus (4) indicates the number of screws to be slackened or removed to remove that particular part.

ASSEMBLY AND DISASSEMBLY

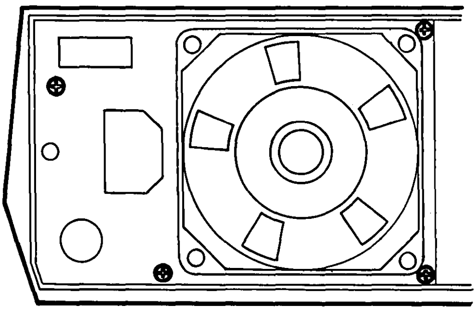
I REAR PANEL



1. Remove M4 × 12mm screws (3).
2. Allow rear panel to tilt backwards and remove top cover by lifting at rear slightly and disengaging lip from front bezel.
3. Remove AC input connector on P.S.U. and all earth leads.

Assembly
Reverse of above procedure.

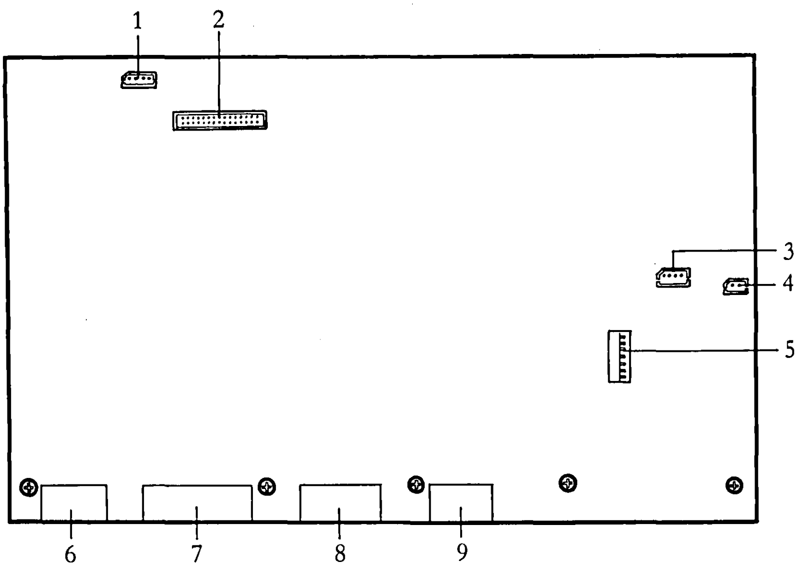
II AC SUB ASSEMBLY



1. Remove back panel as in Section I.
2. Remove M3 × 6mm screws (4).

Assembly
Reverse of above procedure.
For earthing arrangements refer to section 6 page 4.

III MOTHERBOARD



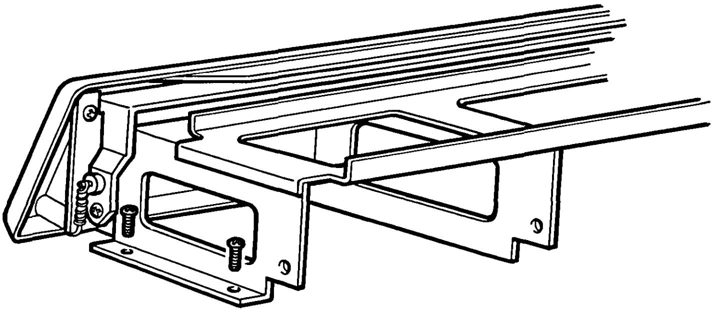
1. Disk Drive 'B' Power
2. Disk Signal
3. Disk Drive 'A' Power
4. Loudspeaker
5. D.C. Power
6. Keyboard
7. Centronics
8. Serial
9. Video

1. Remove back panel and top cover as in Section I.
2. Remove M3 × 6mm screws from rear edge of motherboard (5).
3. Remove power and ribbon cable from both disk drives.
4. Remove DC power cable.
5. Remove loudspeaker cable from motherboard.
6. Slide out motherboard while feeding ribbon cable under chassis.
7. Remove relevant cables as they become exposed.

Assembly
Reverse of above procedure.

ASSEMBLY AND DISASSEMBLY

IV CHASSIS BRIDGE ASSEMBLY



(i) Remove rear panel and top cover as in Section I.

(ii) Disconnect power and ribbon cables from disk drives.

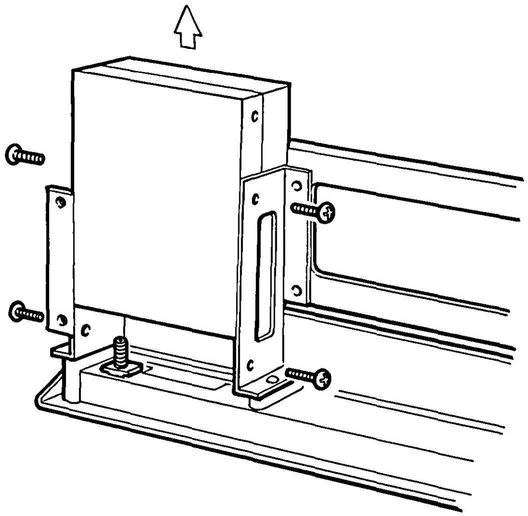
(iii) Slacken M3 × 6mm screws (4).

(iv) Lift chassis bridge assembly away from main chassis.

Assembly

Reverse of above procedure.

V DISK DRIVES



1. Remove chassis bridge assembly as in Section IV.
2. Remove M3 × 6mm screws per drive (4).
3. With assembly tilted vertically as shown in above, slide out disk drive.
4. Eject button and spring will be left in front bezel – note orientation of button. These components are a loose fit – do not lose.

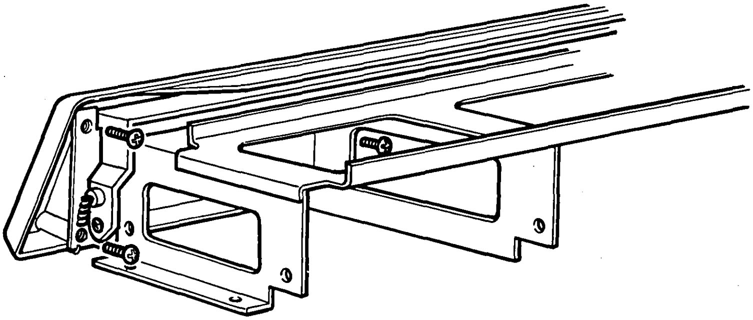
WARNING – Chassis is jigged in factory, do not move inner side cheeks.

Assembly

1. With assembly tilted vertically as shown, install eject button and spring orientating button correctly.
2. Slide disk drive between side cheeks, taking care the LED correctly locates in its aperture.
3. Reverse of above procedure.

ASSEMBLY AND DISASSEMBLY

VI FRONT BEZEL AND DOOR

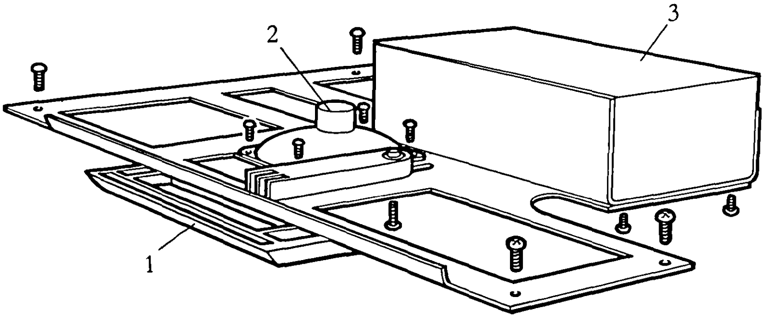


1. Remove disk drives as in Section V.
2. Remove door springs (2) and door pivot screws (2).
3. Remove M3 × 6mm screws securing chassis to front bezel (6).
4. Door can be separated from front bezel by carefully springing open the door slot.

Assembly
Reverse of above procedure.

VII MAIN CHASSIS, POWER SUPPLY, LOUDSPEAKER AND HANDLE

1. Handle
2. Loudspeaker
3. Power Supply

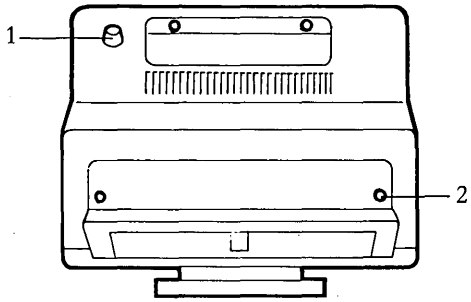


1. Remove rear panel and top cover as in Section I.
2. Remove chassis bridge assembly as in Section IV.
3. Remove M4 × 12mm screws (4) securing main chassis to base moulding.
4. Remove DC power cable and loudspeaker cable.
5. Lift off main chassis taking care not to damage sliding handle.
6. Power supply is secured to the main chassis from beneath by M3 × 6mm screws (4).
7. Loudspeaker is secured by self tapping screws (4).
8. Handle is secured by M4 × 18mm screw (1).

Assembly
Reverse of above procedure.

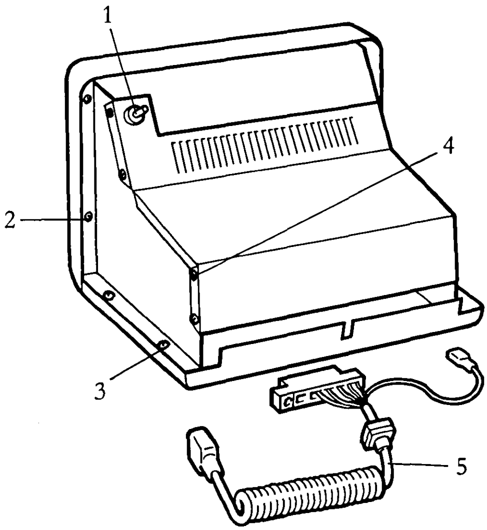
ASSEMBLY AND DISASSEMBLY

VIII MONITOR



Rear

1. Brightness Control
2. 4 M3 x 12mm



1. Brightness Control
2. 4 M3 x 10mm
3. 4 M3 x 6mm
4. 7 Self Tappers
5. Cable Assembly

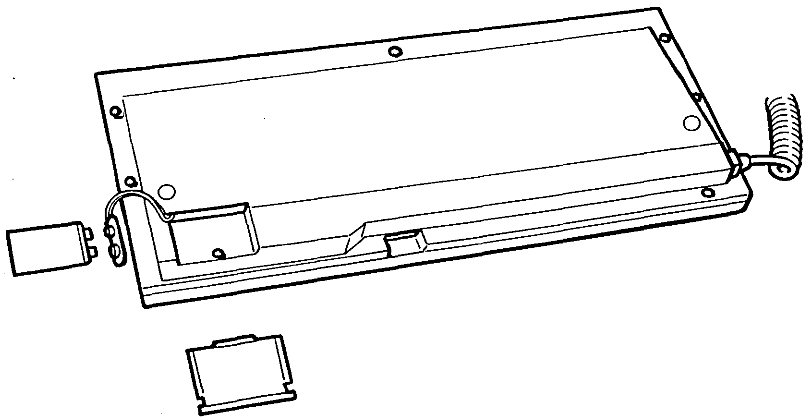
ASSEMBLY AND DISASSEMBLY

1. Remove brightness knob.
2. Remove top cover – M3 × 12mm screws – 2 at rear of monitor, 2 within handle recess (4).
3. Slacken self tapping screws (8) securing top metal screen.
4. Remove brightness control from top screen.
5. Unplug cable assembly, and disengage grommet from base moulding. Detach screen from chassis (1).
6. Remove M3 × 10mm screws securing front bezel to side cheeks (4).
7. Remove M2 × 6mm screws securing base moulding to chassis (4).
8. Lift away front bezel together with Sunflex screen.
9. Lift away side cheeks and monitor assembly from base moulding.
10. Monitor assembly has a bottom screen plate secured by self tapping screws (2).

Assembly
Reverse of above procedure.

ASSEMBLY AND DISASSEMBLY

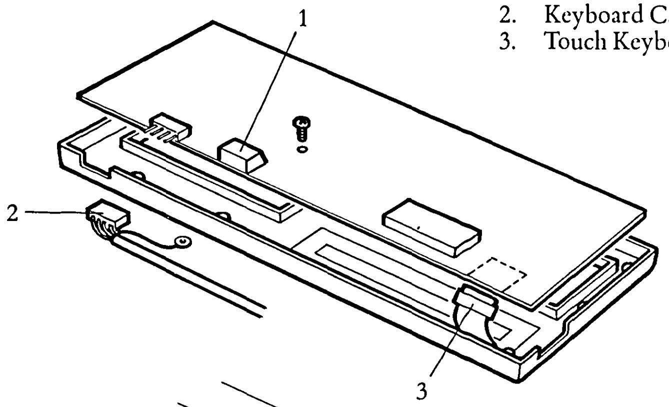
IX KEYBOARD

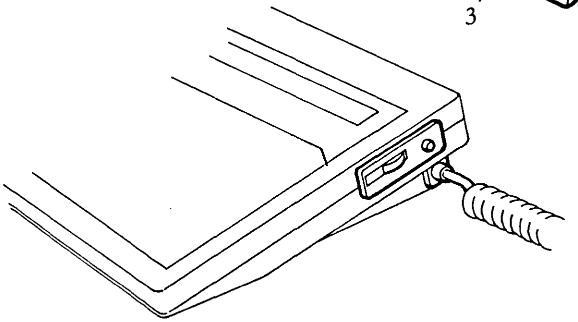


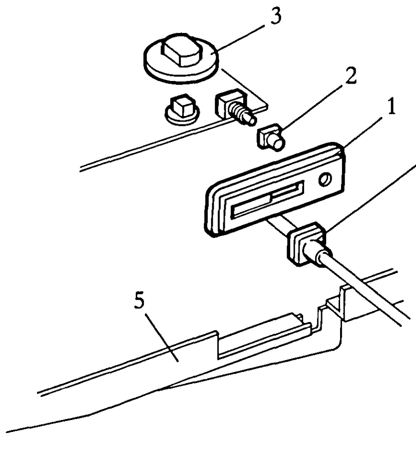
1. Remove battery cover and battery.
2. Remove M3 screws securing base moulding to front bezel (7).
3. Carefully separate the two mouldings, unplug membrane keyboard and lift off front bezel.
4. Withdraw keyboard assembly disengaging brightness control and reset switch from reset plate.
5. Remove reset plate and grommet from base moulding.
6. Unplug cable from keyboard assembly, removing screw (1) securing earth to frame.

Assembly
Reverse of above procedure.

1. Mouse Port
2. Keyboard Cable
3. Touch Keyboard





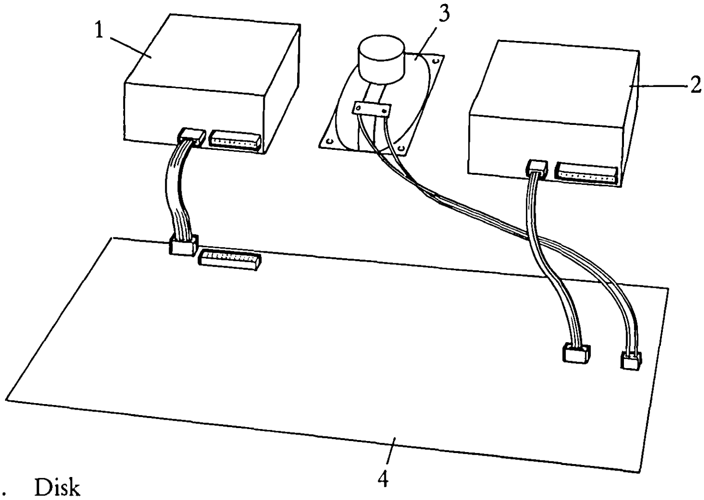


1. Reset Plate
2. Reset Button
3. Contrast Button
4. Keyboard Cable
5. Base

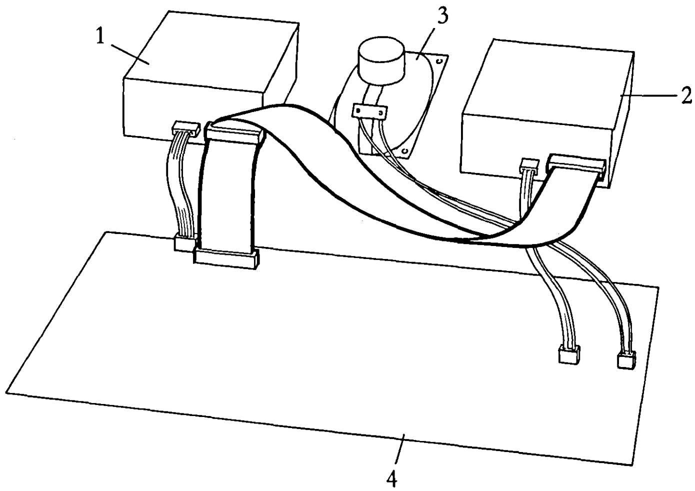
ELECTRICAL SYSTEM 6

I Interconnection Diagram
II AC Sub Assembly
III Conversion from 240V to 115V
IV Earthing
V Cable Connection
VI Expansion Details
VII Async Cable
VIII Printers

I INTERCONNECTION DIAGRAM

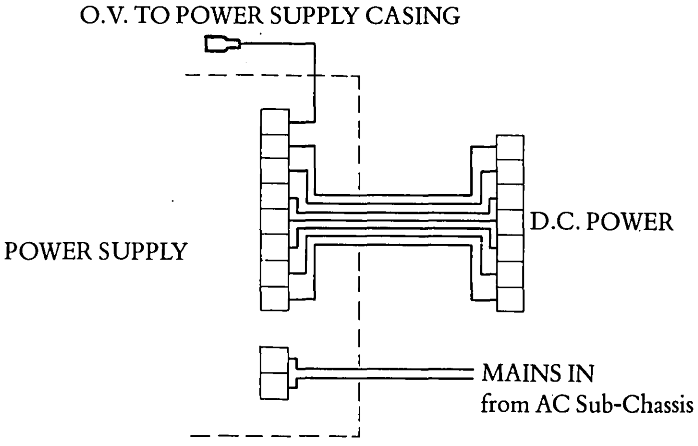


1. Disk
2. Disk
3. Loudspeaker
4. PCB



Interconnection diagrams, cable forms and connector pin details are included to aid the engineer in providing a quick and efficient repair.

ELECTRICAL SYSTEM



II AC SUB ASSEMBLY

This assembly contains four parts which are mounted onto a metal plate. Two of these parts are dependent on the mains input voltage. Refer to section III of this chapter for conversion details.

(a) The fan is a 12W device and designed to extract air from the unit.

(b) The switch will be illuminated when the unit is switched on.

(c) The fuseholder is a 20mm type and made from fire retardant material.

(d) The filter has been designed to both reduce mains transients, and reduce the reflected noise from the power supply back to the mains. It will accept a standard IEC mains connector.

This chapter also contains the correct earthing diagram which should be adhered to at all times.

Refer to appendix E for the AC wiring diagram.

III 240V–115V CONVERSION

WARNING – REMOVE POWER CABLE BEFORE CONVERTING

It is recommended that this conversion should only be carried out by an authorised dealer.

There are only four parts which require either changing or modifying to convert the Apricot from 240V to 115V.

	Modify	Change
Power Supply	Yes	No
Fan	No	Yes
Switch	No	Yes
Input Fuse	No	Yes

	ACT Part Number	
	Voltage	
Part	240V	115V
Fan	11001521	11002521
Switch	11001821	11002621
Input Fuse	11002121	11002721

The Input Fuse rating is: T2 amp – 240V
T3 amp – 115V

1. To modify the power unit remove Apricot covers as indicated in Chapter 5.
2. Remove screw located by the DC power cable (1).
3. This will allow the lid to be removed which is retained by 3 spring clips.
4. The 240V/115V molex link can now be found at the rear edge of the PCB, adjacent to C5-C7.
5. Select required link and re-assemble.

IV EARTHING

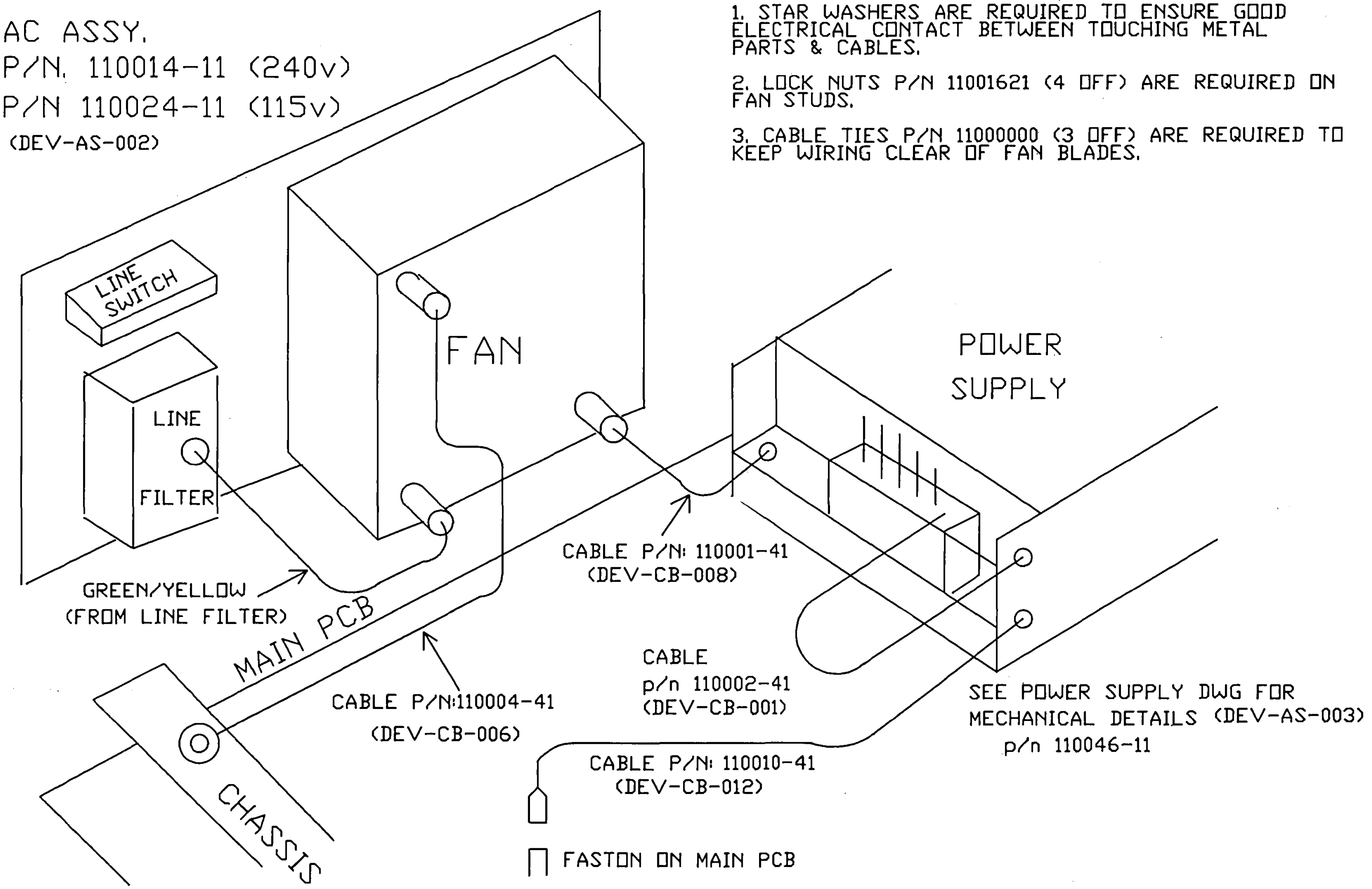
EARTHING ARRANGEMENT

NOTES:

1. STAR WASHERS ARE REQUIRED TO ENSURE GOOD ELECTRICAL CONTACT BETWEEN TOUCHING METAL PARTS & CABLES.

2. LOCK NUTS P/N 11001621 (4 OFF) ARE REQUIRED ON FAN STUDS.

3. CABLE TIES P/N 11000000 (3 OFF) ARE REQUIRED TO KEEP WIRING CLEAR OF FAN BLADES.

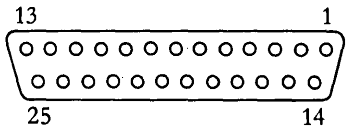


ACT	-
SHEET	1 of 1
ISS.	2
DEV	AS-001
DATE	APPROVED
31/8/83	
17/10/83	

ACT

V CONNECTOR PIN-OUTS

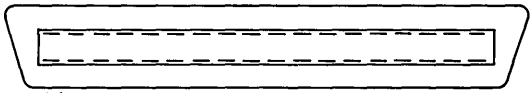
1. Serial Port



Pin	Signal		Direction
1		Frame Ground	
2	TXD	Transmit Data	Out
3	RXD	Receive Data	In
5	CTS	Clear to Send	In
4	RTS	Ready to Send	Out
6	DSR	Data Set Ready	In
7		Signal Ground	
8	DCD	Carrier Detect	In
15	RXC	Receive Clock	In
20	DTR	Data Terminal Ready	Out
24	TXC	Transmit Clock	Out

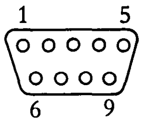
ELECTRICAL SYSTEM

2. Centronics Port



Pin	Signal	Direction	Pin	Signal	Direction
1	Data Strobe	Out	19	OV	
2	DO		20	OV	
3	D1		21	OV	
4	D2		22	OV	
5	D3 8 bit	Bi Dir	23	OV	
6	D4 data bus		24	OV	
7	D5		25	OV	
8	D6		26	OV	
9	D7		27	OV	
10	Ack	In	28	OV	
11	Busy	In	29	OV	
12	Paper Empty	In	30	OV	
13	Select	Out	31	NC	
14	OV		32	Fault	In
15	Unallocated		33	OV	
	Output X	Out	34	Unallocated	
16	OV			Output Y	Out
17	Ground		35	NC	
18	NC		36	NC	

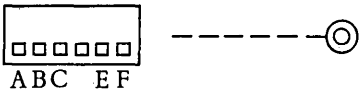
3. Keyboard Cable – Motherboard End



Female

Pin	Signal	Wire Colour
1	+12V	RED
2	OUT	YELLOW
3	IN	WHITE
6	GROUND	SCREEN
7	−12V	BLUE
8	OV	GREEN

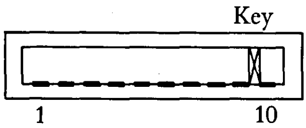
4. Keyboard Cable – Keyboard End



Pin	Signal	Wire Colour
A	OV	GREEN
B	+12V	RED
C	−12V	BLUE
E	OUT	YELLOW
F	IN	WHITE

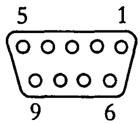
ELECTRICAL SYSTEM

5. Monitor Cable – Monitor End



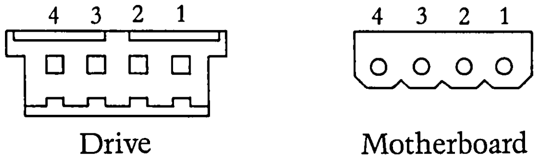
Pin	Signal	Wire Colour
1	OV	GREEN
2	BRIGHTNESS CONTROL	GREEN/YELLOW
3	BRIGHTNESS CONTROL	BLUE
4	BRIGHTNESS CONTROL	BROWN
5	NC	—
6	HORIZONTAL SYNC	YELLOW
7	+12V	RED
8	VIDEO	WHITE
9	VERTICAL SYNC	BLUE
10	VIDEO SCREEN	—

6. Monitor Cable – Motherboard End



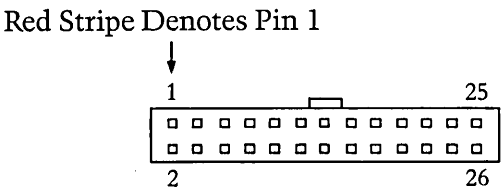
Pin	Signal	Wire Colour
1	–12V	RED
3	OV	GREEN
4	HORIZONTAL SYNC	YELLOW
5	VERTICAL SYNC	BLUE
6	GROUND	OUTER SCREEN
7		VIDEO SCREEN
9	VIDEO	—

7. Disk Drive – Power Cable



Pin	Signal	Wire Colour
1	+5V	RED
2	OV	BLACK
3	OV	BLACK
4	+12V	YELLOW

8. Disk Drive – Signal Ribbon Cable

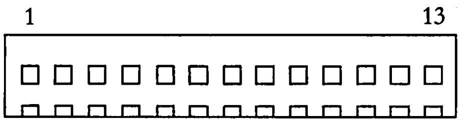


Pin	Signal
2	DRIVE SELECT 0
4	DRIVE SELECT 1
6	DIRECTION
8	STEP
10	WRTDATA
12	WRTGATE
14	HDLOAD
16	SIDESELECT
18	INDEX
20	TRK 00
22	WRTPRT
24	RDDATA
26	READY

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25 – OV

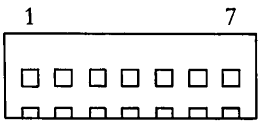
ELECTRICAL SYSTEM

9. DC – Power Cable – Power Supply End



Pin	Signal	Wire Colour
1	NC	—
2	+12V	YELLOW
3	NC	—
4	–12V	VIOLET
5	NC	—
6	+12V	YELLOW
7	NC	—
8	+5V	RED
9	+5V	RED
10	NC	—
11	OV	BLACK
12	OV	BLACK
13	OV	YELLOW/GREEN

10. DC – Power Cable – Motherboard End



Pin	Signal	Wire Colour
1	OV	BLACK
2	OV	BLACK
3	+5V	RED
4	+5V	RED
5	+12V	YELLOW
6	–12V	VIOLET
7	+12V	YELLOW

VI EXPANSION SLOTS

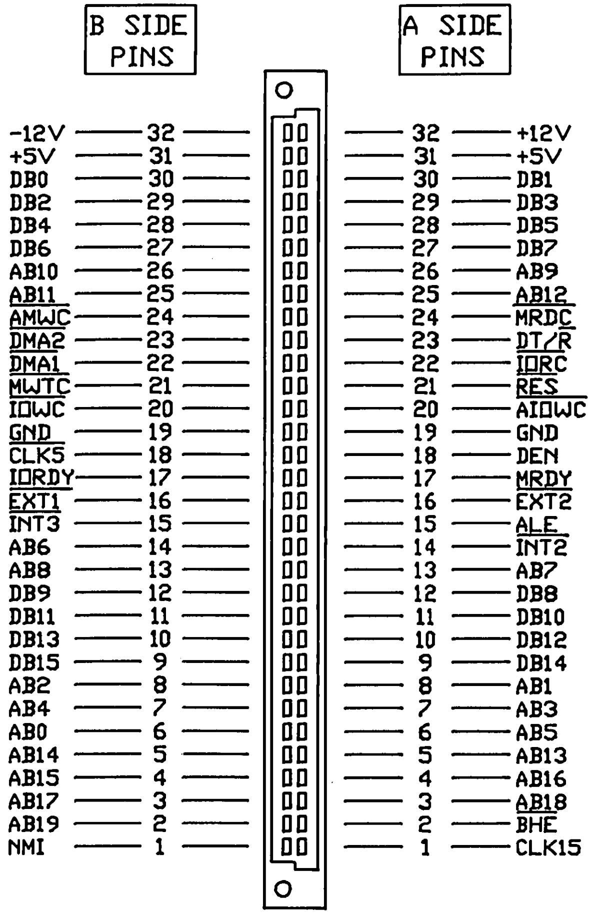


Figure 1. Expansion Connector

ELECTRICAL SYSTEM

Pin Definition

Pin	Description	Input/Output
AB0 to AB19	20-bit system address bus	Output
DB0 to DB15	16-bit system data bus	Bi-directional
$\overline{\text{BHE}}$	Bus high enable	Output
ALE	Address latch enable	Output
DEN	Data enable	Output
DT/$\overline{\text{R}}$	Data transmit/receive	Output
$\overline{\text{AMWC}}$	Advanced memory write command	Output
$\overline{\text{MWTC}}$	Memory write command	Output
$\overline{\text{AIOWC}}$	Advanced input/output write command	Output
$\overline{\text{IOWC}}$	Input/output write command	Output
$\overline{\text{MRDC}}$	Memory read command	Output
$\overline{\text{IORC}}$	Input/output read command	Output
MRDY	Memory ready	Input
IORDY	Input/output ready	Input
$\overline{\text{RES}}$	System reset	Output
CLK15	15 MHz clock signal	Output
$\overline{\text{CLK5}}$	5 MHz clock signal	Output
$\overline{\text{DMA1}}$	DMA request for DMA channel 1	Input
$\overline{\text{EXT1}}$	External terminate for DMA channel 1	Input
$\overline{\text{DMA2}}$	DMA request for DMA channel 2	Input
$\overline{\text{EXT2}}$	External terminate for DMA channel 2	Input
$\overline{\text{INT2}}$	Interrupt request (priority 2)	Input
$\overline{\text{INT3}}$	Interrupt request (priority 3)	Input
$\overline{\text{NMI}}$	Non-maskable interrupt	Input
+12V	System board supply rail	Output
−12V	System board supply rail	Output
+5V	System board supply rail	Output

Introduction

The two Expansion Slots are located on the System Board within the System Unit and provide an extension of the processing system for use by optional boards. The same system connections are wired to both Expansion Slots.

The extension connections wired to the Expansion Slots are:

(a) The 16-bit system data bus.

(b) The 20-bit system address bus.

(c) Various control and timing signals.

(d) Power supply outputs.

Description

Electrical Specification

Current Consumption:

Maximum allowed current consumption of a circuit board fitted into an expansion slot is:

0.5A from the +5V rail.
50mA from the +12V and −12V rails.

Signal Outputs:

All signal outputs (data, address, control and clocks) have the capability to drive a maximum of 2 LS TTL loads, i.e.

Logic high state voltage (Voh);

$2.0 < Voh < 5.25$ with maximum high state output source current of 40uA.

Logic low state voltage (Vol);

$-0.5 < Vol < 0.8V$ with maximum low state output sink current of 0.8mA.

ELECTRICAL SYSTEM

Expansion Slots
Signal Inputs:

The signal inputs to the data bus require a tri-state driver stage meeting the following requirements.

Logic high state voltage (Voh);

$2.4 < Voh < 5.25V$ with maximum high state output source current of 400uA.

Logic low state voltage (Vol);

$-0.5 < Vol < 0.5V$ with maximum low output state sink current of 8mA.

All the remaining inputs are control inputs and require to be driven by an open collector driver stage. The input control lines on the System Board are fitted with pull-up resistors (3.3k).

Pin Detail

Both Expansion Slots are 64-way connectors (DIN 41612, 2 by 32 female, with a type B housing) and are identical with regard to the connections to the system buses, as illustrated on the diagram of an Expansion Connector on page 6-11.

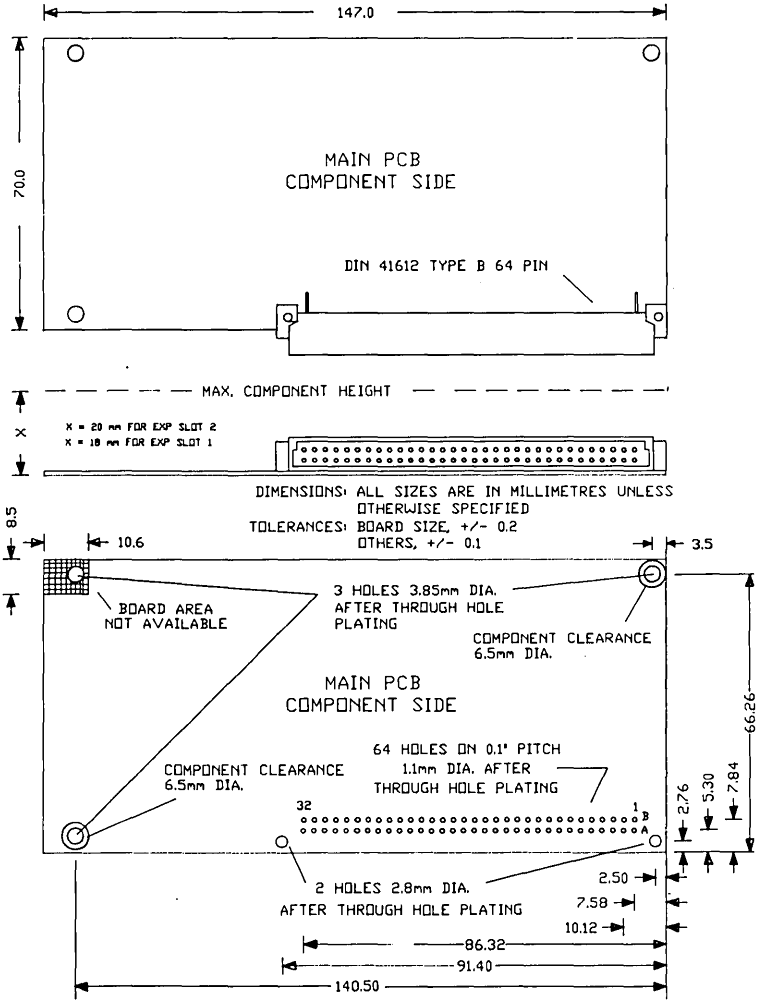


FIG. 2. EXPANSION BOARD DETAIL

ELECTRICAL SYSTEM

VII DIRECT ASYNC CONNECTION CABLE

APRICOT Connector 'A' Male DB-25 Pin	HOST Connector 'B' Male DB-25 Pin		IBM Connector 'B' Female 25 Pin
1	1		1
2	3		3
3	2		2
4	5, 8	Wired together	5, 8
Wired together 5, 8	4		4
6	20		20
7	7		7
20	6		6

Modem Connection Cable

APRICOT Connector 'A' Male DB-25 Pin	HOST Connector 'B' Male DB-25 Pin
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
20	20

VIII PRINTERS

The ACT Apricot will drive most printers currently on the market, with either Centronics compatible or RS232 interfaces.

Parallel

All ACT printers currently marketed, are of the parallel type, and will work with the Apricot, as long as the interface cable supplied with the printer is used.

The Apricot defaults to the parallel port on switch on, and no re-configuring of the operating system is required.

Below is given the wiring of the standard cable:

Pin No.	Signal
1	Strobe
2	Data 0
3	Data 1
4	Data 2
5	Data 3
6	Data 4
7	Data 5
8	Data 6
9	Data 7
11	Busy
16	OV
17	Ground

ELECTRICAL SYSTEM

In order to utilise the additional facilities built into the Apricot BIOS i.e. Fault, Select, Paper Empty, a new cable will be required, as below:

Pin No.	Signal	Pin No.	Signal
1	Strobe	9	Data 7
2	Data 0	11	Busy
3	Data 1	12	Paper Empty
4	Data 2	13	Select
5	Data 3	16	OV
6	Data 4	17	Ground
7	Data 5	32	Fault
8	Data 6	33	Ground

Serial

Serial printers are also supported by the Apricot via the RS232 port, but certain things need to be done for correct operation.

1. Use a cable as specified by the printer manufacturer. Below is given a suggested wiring, but is by no means correct for every printer, and is only given as a possible starting point:

Apricot	Printer	Signal
1	1	Screen
2	3	Data
7	7	Ground
5	20	Busy

2. Re-configure the system to allow printing via the serial port. Use baud rates, number of stop bits, parity etc., as suggested by the printer manufacturer.
3. Change the switch settings, built into all serial printers, to match the parameters of the now changed system.
4. Certain printers use Pin 11 or 19 as 'Busy' or CTS.' Refer to the printers handbook for correct pin.

If any problems are encountered, consult either your dealer or printer manufacturer.

ELECTRONIC SYSTEM 7

I Outline of System
II Integrated Circuit Catalogue
III Mnemonics
IV Memory Map
V Ram Expansion Card Details
VI Modem Card Details

ELECTRONIC SYSTEM

This section of the manual is devoted to a brief outline of the Apricot electrical/electronic system. It is not intended to be an in-depth study, but an overview using block diagrams. For a more detailed insight into the circuitry, refer to the Apricot Technical Reference Manual.

In addition to block diagrams, section II is a catalogue of all the integrated circuits, their truth tables and functions within the machine.

Appendix E contains a complete circuit diagram of the motherboard.

ELECTRONIC SYSTEM

I OUTLINE OF THE SYSTEM

The ACT Apricot can be broken down into 5 sections – the display, memory, multiprocessor structure, I/O section and disk drive.

The monitor and keyboard will also be briefly described.

1. The Display

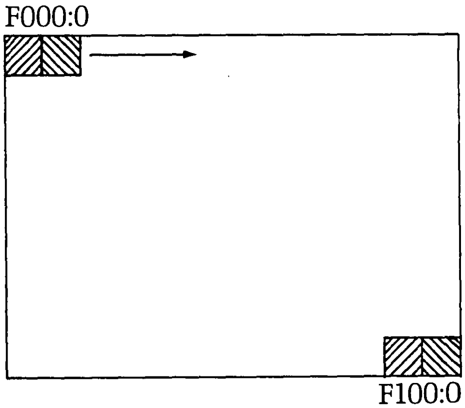
In essence the display consists of 4 parts – the CRT controller, static ram, dynamic ram and finally the video section.

All sections are configured in a "pipeline" structure, in that the output of one section forms the basic input to the next.

The CRT controller generates in addition to vertical and horizontal sync pulses, memory addresses MA0 – MA10.

These addresses are sequentially generated and are the memory address lines for the static screen ram. As the screen consists of 80 characters by 25 lines, the static ram requires 2000 locations (80 × 25). Each character requires 2 bytes and hence the screen memory is a 4K × 8 configuration.

The screen is accessed sequentially line by line, starting at the top left hand character position – this is location F000:0H in the memory map.



Screen Ram

	1st Byte								2nd Byte							
Rows	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
3	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
4	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
5	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
6	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
7	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
8	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
9	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
A	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
B	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0
C	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Font-Cell

Since each character requires 2 bytes, characters can only be written on even address boundaries.

The 16 bits of data contained at each character location is split into 2 parts: D0–D10 is the character and forms the Font Cell Pointer, D11–D15 are the attributes attached to that character.

The Font Cell Pointer forms the basis of a 20 bit address in main memory where the pixel information to be displayed may be found.

ELECTRONIC SYSTEM

				Font-Cell Pointer											Rows					
				Address																
19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	1st Byte – Row 0
0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	1	2nd Byte – Row 0
0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	0		1st Byte – Row 1
0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	1	2nd Byte – Row 1
0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0		1st Byte – Row 2
0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1	0	1	2nd Byte – Row 2

First 6 Addresses of One Character

The CRT controller generates 4 additional signals: RA0 – RA3. These are the row addresses. There are 16 rows of pixels for each character and hence we access 32 contiguous memory locations.

The remaining address bits are made up as follows:

A16, A17, A18, A19 all are 0 since the fonts must be within the lower 64K of the lower 128K.

In character mode the first 10 pixels are displayable, the remaining 6 being 0; except the 2 high order bits which may be programmed for underline or strike through. In graphics mode all 16 are displayable.

The 10 or 16 bits, dependant on mode, are parallel loaded into 2 shift registers (IC69, 87) and are clocked out under the control of CLK15 and LES. The resultant serial stream is the raw video signal to be combined with the attributes previously "stripped off" from the screen ram and formed into the final video signal. Together with the horizontal and vertical sync pulses a direct drive set of signals is passed to the monitor.

2. The Memory

The ACT Apricot has, as standard, 256K of onboard memory implemented with 32 64K × 1 dynamic RAM chips type 3764-20. These are arranged as two banks of 64K × 16, designated MA0–MA15. Data may be accessed 16 bits at a time but high and low order bytes may be written independantly.

The memory is dual-ported and memory access cycles occur on request for CPU cycles and continuously for video and refresh cycles. The state of the CCLK square wave determines the type of cycle performed, continuous RAS and CAS signals are generated by IC36.

The address source for the DRAMs is chosen from the following:

CPU (a) IC61 and 63 allow CPU to address the memory, in conjunction with AB17 which routes the RAS and CAS signals to the A or B 64K memory block.

SCREEN (b) IC55 and 60 allow the screen RAM output data to address the lower 64K bytes of memory bank A.

REFRESH (c) Refresh addresses are supplied instead of screen RAM data during display blanking intervals. These are supplied by the 8 bit binary counter (IC37) and its associated buffer (IC48). Row addresses are enabled onto the DRAM address bus by IC55 or IC61, or IC48 as selected by the cycle type, i.e. screen, CPU or refresh respectively. These are strobed into the DRAMS by the negative going edge of RAS and after a typical 30ns delay generated by the invertors within IC47 the column address is gated onto the address bus before CAS occurs.

The initial boot software, diagnostics and calculator are contained in 2 × 64K eproms (IC53 and 59) enabled by signal NCSP at memory location–FC000H.

3. The Multiprocessor Structure

8086

The ACT Apricot utilizes the 8086 microprocessor running at 5 MHz, making it a true 16 bit microcomputer. In conjunction with the main processor, an 8089 I/O co-processor is included as standard, together with an optional 8087 numeric data processor.

8089

The 8089 takes a substantial software overhead off the 8086 during disk operations and permits concurrent communications processing.

8288

The processors are wired in maximum mode and command and control timing is accomplished by means of a 8288 Bus Controller.

Status lines S0, S1, S2 from the processors are decoded by the 8288 and determine which command is to be issued, i.e. Read, Write etc.

The chart below, gives the meaning of each status "word":

S2	S1	S0	Processor State	Command
0	0	0	Interrupt Acknowledge	INTA
0	0	1	Read I/O Port	IORC
0	1	0	Write I/O Port	IOWC, AIOWC
0	1	1	Halt	None
1	0	0	Code Access	MRDC
1	0	1	Read Memory	MRDC
1	1	0	Write Memory	MWTC
1	1	1	Passive	

The chart below, gives the control outputs:

Control Outputs	Command
DEN – Data enable	Determines when the external data bus is enabled onto the local bus by controlling octal transceivers (IC65, 66).
DT/R – Data Transmit/Receive	Controls the direction of data flow to or from the local bus (IC65, 66).
ALE – Address Latch Enable	Separates data and address by enabling address latches (IC64, 70, 72).
MWC – Memory Write Command	Not used within machine but is available at the expansion port.
AMWC – Advanced Memory Write Command	Write enable signal to memory.
MRDC – Memory Read Command	Enables data from memory to external data bus via LOE signal (IC62, 82).
IOWC – I/O Write Command	Instructs either sound generator or F/D controller to read the data bus.
AIOWC – Advanced I/O Write Command	Write signal to other I/O devices. Enables buffer from data bus to I/O data bus (IC54).
IORC – I/O Read Command	Enables data from any I/O device to I/O data bus. Enables buffer from I/O data bus to external data bus (IC 54).
INTA – Interrupt Acknowledge	Acknowledges a device interrupt and places vectoring information onto the data bus.

ELECTRONIC SYSTEM

8259A

For maximum efficiency, the system is interrupt driven, overall management being undertaken by a 8259A Programmable Interrupt Controller (PIC).

This device accepts interrupts from peripheral equipment and determines which of the incoming requests is of the highest priority and issues an interrupt to the CPU based on its determination. The chart below gives the assignment of the interrupt request lines:

Request Line	Pin No.	Device
IRO	18	8089
IR1	19	8089
IR2	20	Expansion
IR3	21	Expansion
IR4	22	F/D Controller
IR5	23	Z80/S10
IR6	24	Timer
IR7	25	8087

8284A

Clock signals for the system are generated by a 8284A. In addition to clock pulses this chip also provides a System Reset and Ready synchronization. A fundamental frequency of 15 MHz is derived from the crystal and is internally divided by 3 to form the 5 MHz system clock at a 33% duty cycle for maximum efficiency.

2 additional clock signals are generated: OSC on pin 12 is a buffered 15 MHz signal (CLK15) for use by the display circuitry, PCLK on pin 2 is a 2.5 MHz signal at 50% duty cycle used by the Z80/SI0 as its fundamental frequency.

The reset input (RESIN) is synchronized to the falling edge of CLK and generates a system reset (RESET).

Generation of wait states, when necessary, is accomplished by READY signal under the control of RDY1 and RDY2 dependant on whether memory or I/O request it.

Interrupt Controller

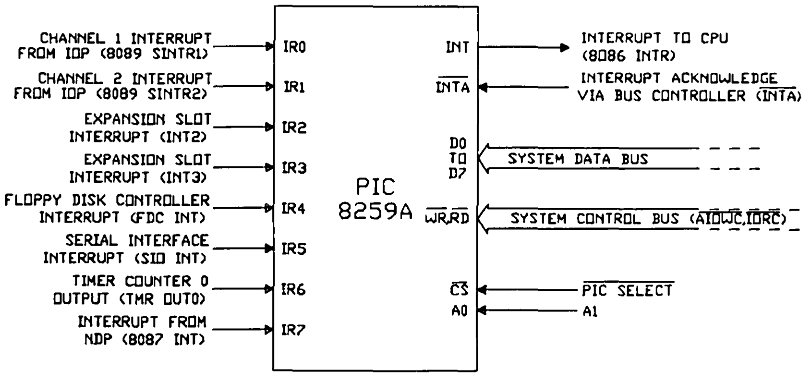


Figure 1. Interrupt Controller block diagram.

PIC Pin Definition

IRO to IR7	Interrupt request inputs
INT	Interrupt output
$\overline{\text{INTA}}$	Interrupt acknowledge
D0 to D7	Data bus connection
$\overline{\text{RD}}$	Read control line
$\overline{\text{WR}}$	Write control line
$\overline{\text{CS}}$	Chip select input
A0	System address bus input

ELECTRONIC SYSTEM

4. The I/O Section

(a) Sound Generator

The sound generator consists of a SN76489 together with an associated octal latch and clock circuitry.

The SN76489 contains 3 programmable tone generators, a noise generator, attenuation registers and an audio output stage. It is memory mapped at location 50H and enabled by signals CSC or IW. Data is latched from the I/O bus via an octal latch (IC18), under the control of the same signals. When data is latched in, it raises WE (Pin 5) to confirm the data is in. The SN76489 uses a fundamental frequency of 2 MHz derived from a 4 MHz crystal oscillator module (IC81) divided by 2 (IC81).

A TBA820 (IC8) is used for the audio output stage. There is also an auxillary input to this amplifier, for reproduction of sound via the internal speaker.

For a detailed description of this interface, refer to the Apricot Technical Reference Manual.

Sound Generation

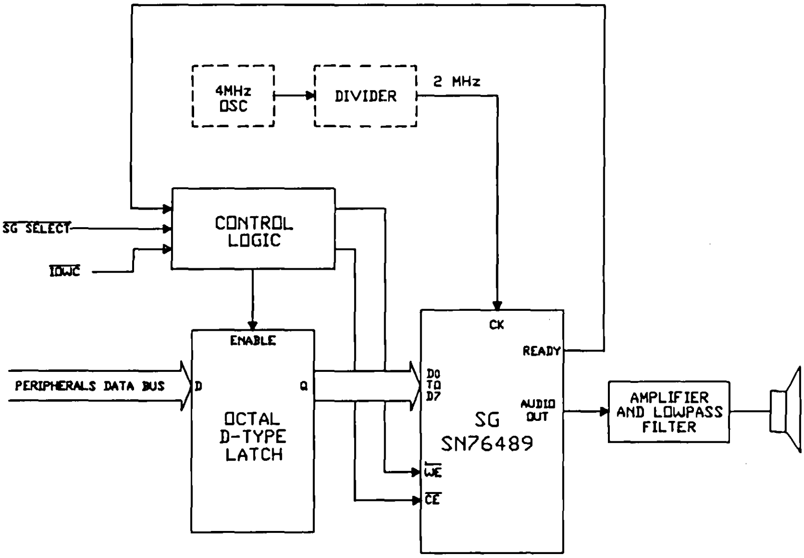


Figure 1. Sound Generator block diagram.

SG Pin Definition

D0 to D7	Data bus connection
CK	2 MHz clock input
$\overline{\text{CE}}$	Chip enable input
$\overline{\text{WE}}$	Write enable input
READY	Ready status output
AUDIO OUT	Audio drive signal

(b) The Floppy Disk Controller

The floppy disk interface consists of a WD2797 controller chip (IC68) and associated buffers (IC79, 73, 80).

The interface provides all the control functions necessary for formatting and transferring data to and from the Microfloppy Disks. Enabling of the FDC is by means of the CSA signal – mapped at position 40H. Internal register locations are detailed below.

Register	Address
Command	40H
Status	40H
Track	42H
Sector	44H
Data	46H

Head load is not derived from the FDC, but is generated separately from the 8255 parallel driver chip (refer to section C).

Signal DRQ indicates to the 8089 that the FDC is ready to accept data in a write operation or transfer data in a read operation.

For a detailed description of this interface refer to the Apricot Technical Reference Manual.

NOTE: Changing the motherboard, the WD2797 or the power supply requires this circuit to be set up as described in Chapter 8.

(c) The Parallel Interface

The parallel port consists of an 8255A-5 Programmable Peripheral Interface (IC17) and two 8 bit buffers (IC5 and 6).

The PPI consists of 3,8 bit input/output ports with an associated control register, the control register determining the direction and mode of operation of each port. System software views the three ports and control register as peripheral devices, located as follows:

Port	Address
A	48H
B	4AH
C	4CH
Control Register	4EH

The interface performs the following functions within the system:

1. Provides a communications interface via the Centronics connector. PA0 – PA7 form the 8 bit data path, PC5 – the Strobe line, and Busy – an interrupt to the Z80 – SIO via DCDB.

   The buffer (IC5), is bi-directional and allows the port to input information from the Centronics connector, the direction of data being controlled in this buffer by PB7.

ELECTRONIC SYSTEM

2. PB0–PB6 generate a series of signals under software control for use throughout the system and comprise:

PB0 – Generates RESCRT to provide a general reset to the CRT controller chip.

PB1 – Unused.

PB2 – A head load signal HLD. This signal allows software to be in total control of the head load for an efficient two drive system.

PB3 – Generates DON to enable the display to be switched on and off.

PB4 – Generates A/G to select either alpha-numeric or graphics mode.

PB5 – Enables drive select gates (IC79).

PB6 – Drive select signal. In conjunction with the above enable signal forms DS0 and DS1.

For a detailed description of this interface, refer to the Apricot Technical Reference Manual.

Section 1.5 illustrates suitable interface cables for printer applications.

Parallel Interface

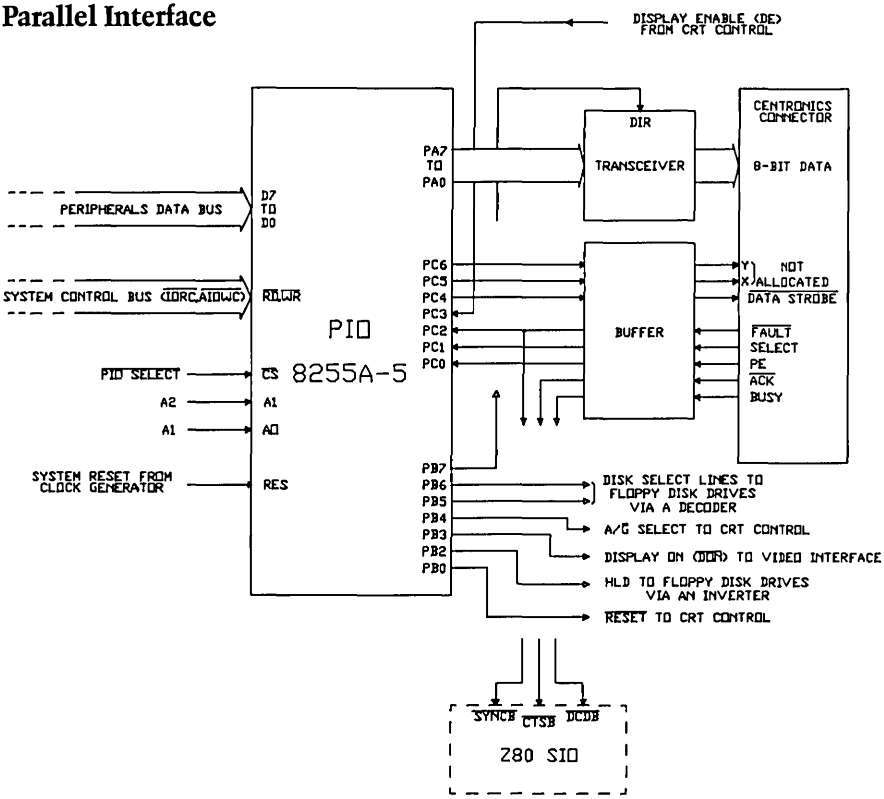


Figure 1. Parallel Interface block diagram.

PIO Pin Definition

PA0 to PA7	Port A
PB0 to PB7	Port B
PC0 to PC7	Port C
D0 to D7	Data bus connection
$\overline{RD}$	Read control line
$\overline{WR}$	Write control line
$\overline{CS}$	Chip select input
A0, A1	System address bus inputs

ELECTRONIC SYSTEM

(d) The Timer

The timer interface comprises of an 8253 Timer (IC16) an oscillator module (IC86) and an associated divider (IC81).

The interface is used to generate the relevant baud rates for the Z80/SIO under software control and is located at 58H via chip select signal CSD.

The timer is organised as three independent, 16 bit counters each with an associated control word register which determines the operating mode of the counters.

The port address locations are detailed below:

Register	Address
Counter 0	58H
Counter 1	5AH
Counter 2	5CH
Control Word	5EH

CLK1 and CLK2 are 2 MHz signals derived from a 4 MHz crystal oscillator divided by 2, and forms the fundamental frequency for 2 of the internal counters. A third counter is used to provide interrupts to the PIC every 20ms and utilizes a basic 0.25 MHz signal, again derived from the oscillator but divided by 16.

For a more detailed description of this interface refer to the Apricot Technical Reference Manual.

Timer

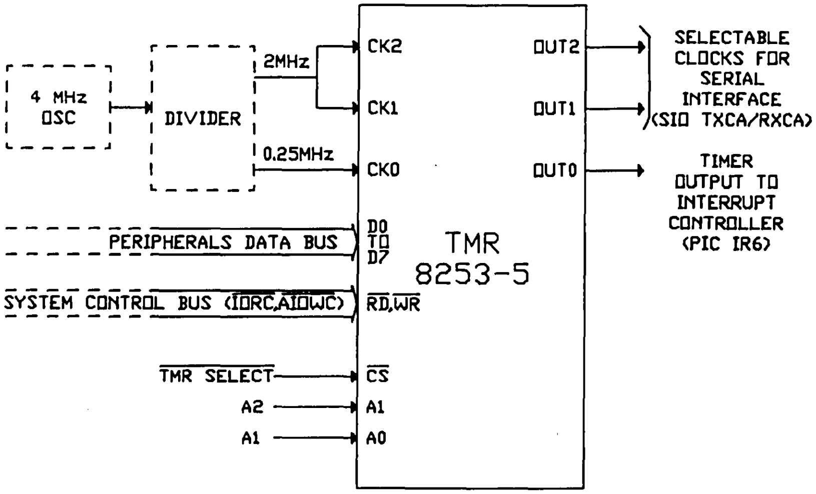


Figure 1. Programmable Interval Timer block diagram.

TMR Pin Definition

CK0	Clock input for Counter 0
CK1	Clock input for Counter 1
CK2	Clock input for Counter 2
OUT 0	Output from Counter 0
OUT 1	Output from Counter 1
OUT 2	Output from Counter 2
D0 to D7	Data bus connection
$\overline{RD}$	Read control line
$\overline{WR}$	Write control line
$\overline{CS}$	Chip select input
A0, A1	System address bus inputs

(e) The Serial Interface

The serial interface consists of a Z80/SIO two channel, multi-protocol serial input/output controller (IC15) together with its associated line driver buffers (IC1, 2, 3).

The Apricot uses this device to:

(i) Interface the equipment to a serial peripheral device i.e. serial printer, modem, other computer equipment etc., via a 25 way 'D' type connector.

(ii) Provide a bi-directional serial link between the systems unit and keyboard, via a 9 way 'D' type connector.

(iii) Generates interrupts to the CPU from the parallel port via ACK, BUSY and FAULT lines.

(iv) Provides a Ready function to the 8089 during DMA operations.

The device is located at position 60H. The port locations are detailed below:

Port	Address
ChA Data	60H
ChA Control	62H
ChB Data	64H
ChB Control	66H

The Z80/SIO requires a clock frequency of 2.5 MHz derived from the 8284A clock generator. Due to the reduction in frequency, compared with the remainder of the system, 5 wait states are required to allow the internal registers to settle before the system is allowed to continue. The wait states are derived from a 74LS174 (IC90) wired as a shift register.

Signal LOCK from the CPU tells the Z80/SIO that there is about to be an interrupt acknowledge bus cycle.

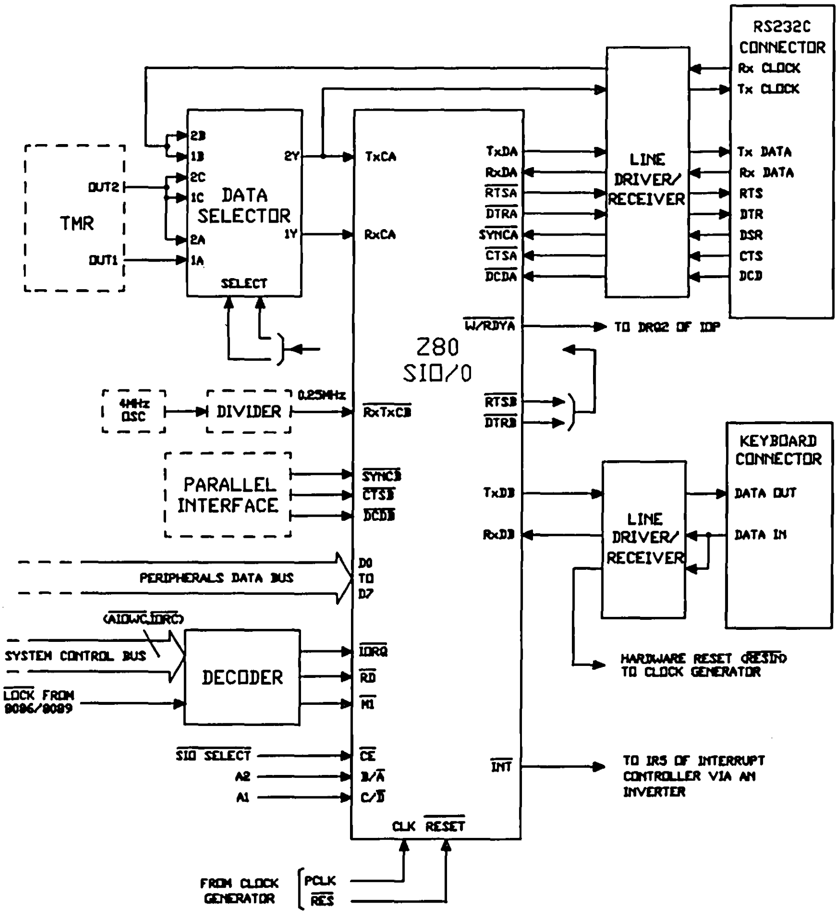


Figure 1. Serial Interface block diagram.

ELECTRONIC SYSTEM

(f) I/O Port Assignments

I/O Address (Hex)	CS	Device	Register
0 2	CSI	PIC	Read: IRR, ISR or Int Level Write: ICW1, OCW2, OCW3 Read: IMR Write: OCW1, ICW2, ICW3, ICW4
40 42 44 46	CSA	FDC	Read: Status Write: Command Track Sector Data
48 4A 4C 4E	CSB	PIO	Port A Port B Port C Write: PIO control register
50 52 54 56	CSC	Sound	Write: Sound generator command
58 5A 5C 5E	CSD	Time	Counter 0 Counter 1 Counter 2 Write: Control
60 62 64 66	CSE	SIO	Channel A: data Channel A: control Channel B: data Channel B: control
68, 6C 6A, 6E	CSF	CRTC	Address Register Control Register
70, 74 72, 76	CA	8089	Channel Attention (Ch-1) Channel Attention (Ch-2)

78, 7A, 7C, 7EH–Not available for use–local peripheral bus.

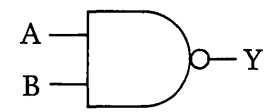
80, 1FFH–Available for use via expansion slots.

II INTEGRATED CIRCUIT CATALOGUE

IC	13,	19,	25,	44,	45,	46,	73,	79,	28,	41

74LS00
74LS10
74S00
7438

NAND

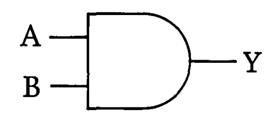


A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

IC	42,	78

74LS08
74LS11

AND

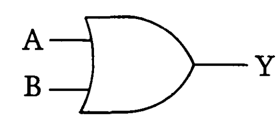


A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

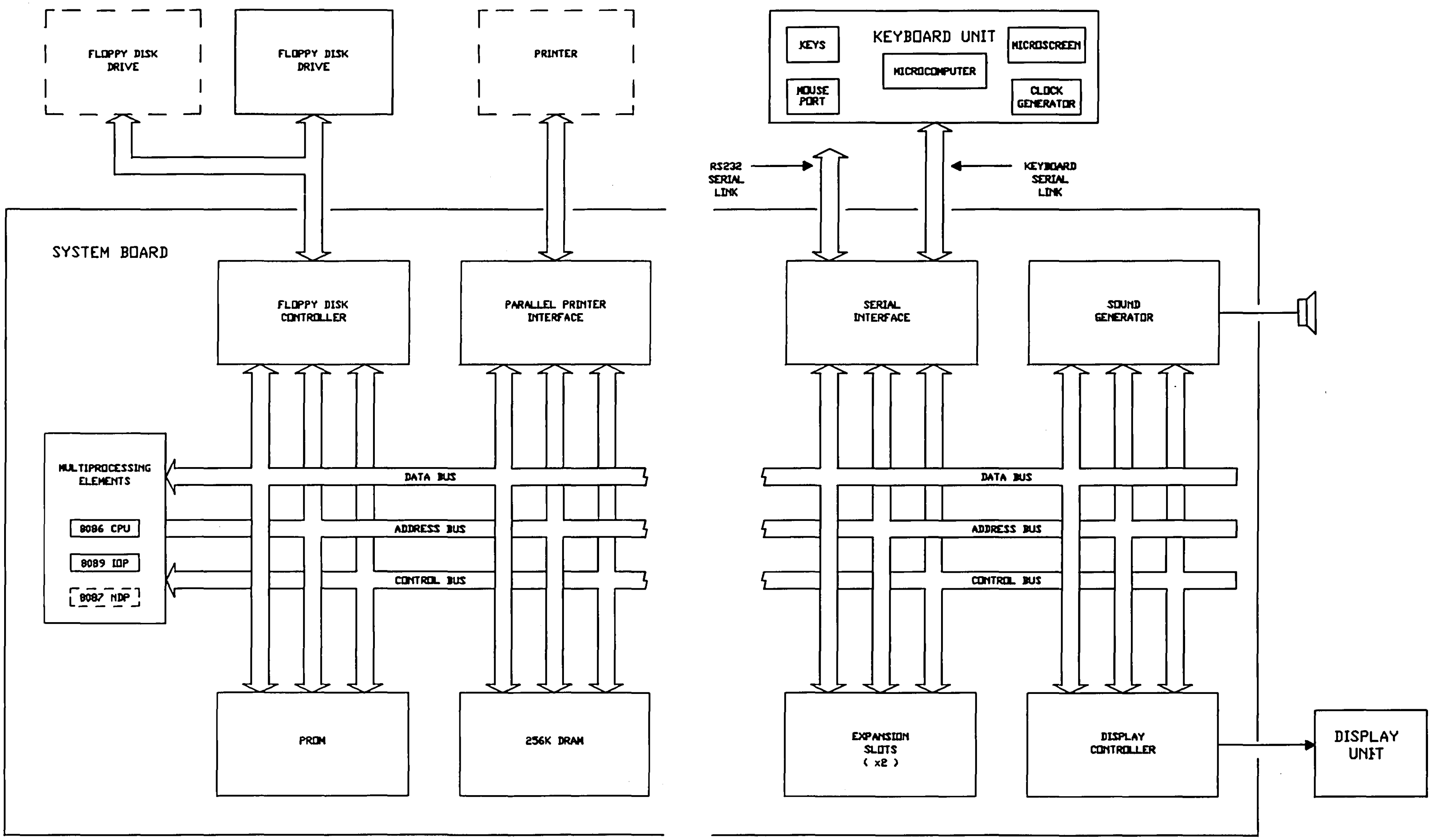
IC	52

74LS32

OR



A	B	Y
0	0	0
1	0	1
0	1	1
1	1	1



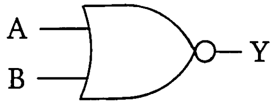
APRICOT COMPUTER BLOCK DIAGRAM

FIG. 1.2

IC	32,	88,	10,	27,	33,	20

NOR

74LS02
74LS27

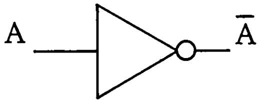


A	B	Y
0	0	1
1	0	0
0	1	0
1	1	0

IC	51,	74,	84,	89,	80,	11,	47

NOT

74LS04
74LS14

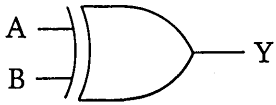


IN	OUT
0	1
1	0

IC	23

EXCLUSIVE OR

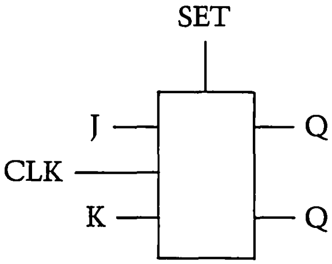
74S86



A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

IC	9,	21,	34,	35,	36

74LS112 J–K FLIP–FLOP
74S112



Function Table						
Inputs					Outputs	
Preset	Clear	Clock	J	K	Q	Q
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H	H
H	H	↓	L	L	Q	Q
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q	Q

IC9

Generates Write Enable to static rams when selected via CSS.

Switches multiplexers (IC 38, 39, 40) to screen.

Provides 1 wait state when static ram is accessed via internal property of J–K flip–flop.

IC36

Generates RAS and CAS.

IC35

Generates CCLK whose mark-space ratio depends on whether alphanumerics or graphics.

Generates signals LES and LEC in antiphase, for enabling either processor or screen to drams.

IC34

Detects if there is enough time to do a processor access to ram. If not, 1 wait state via RDY1 is inserted.

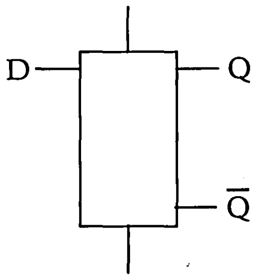
IC21

Generates Display Enable from CRT controller.

IC	12, 90

74S74
74LS174

'D' TYPE FLIP–FLOP



Function Table					
Inputs				Outputs	
Preset	Clear	Clock	D	Q	Q
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	↑	L	H	L
H	H	↑	H	L	H
H	H	L	X	Q	Q

ELECTRONIC SYSTEM

IC12

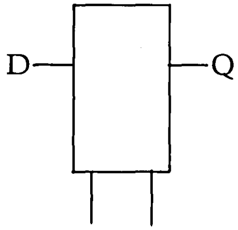
Provides 2 intensity levels under control of attributes.

IC90

Wired as a shift register and provides either 1 or 5 wait states.

IC	18,	64,	70,	72,	62,	82

74LS373 'D' TYPE LATCHES



Function Table			
Output Control	Enable G	D	Outputs
L	H	H	H
L	H	L	L
L	L	X	Q
H	X	X	Z

IC18

Latches data from I/O data bus to sound generator via signals IOWC and CSC.

IC64, 70, 72

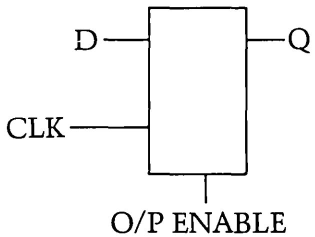
Demultiplexes local address/databus and latches address via signal ALE.

IC62, 82

Enables data from drams to databus via signal LEC and LOC.

IC	55, 60

74LS374 'D' TYPE LATCHES



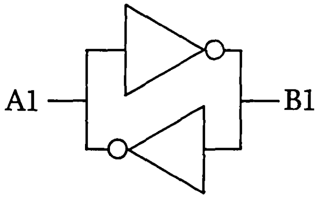
Function Table			
Output Control	CLOCK	D	Outputs
L	↑	H	H
L	↑	L	L
L	L	X	Q
H	X	X	Z

Latches 16 bits of data from srams to be multiplexed onto drams address bus via signals CCLK and RAS.

ELECTRONIC SYSTEM

IC	5,	65,	54,	56,	57

74LS245 OCTAL BUS TRANSCEIVER



Function Table		
Enable G	Direction Control Dir	Operation
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

IC5

Bi-directional data bus from parallel driver circuit (8255) to Centronics connector.

IC65, 66

Bi-directional data bus to processors enabled by DEN and direction controlled by DIR.

IC54

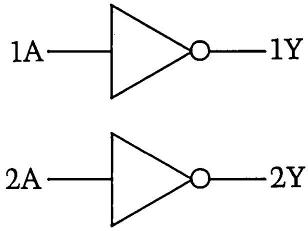
Bi-directional buffer connecting main data bus to I/O data bus enabled by IOC and direction controlled by DIR.

IC56, 57

Bi-directional buffer enabling data to or from the srams and main data bus. Enabled by CSS and direction controlled by DIR.

IC	6, 48

74LS244 BUS DRIVER



Function Table					
Inputs				Outputs	
G1	G2	1A	2A	1Y	2Y
L	L	H	H	H	H
L	H	H	H	H	Z
H	L	H	H	Z	H
H	H	H	H	Z	Z

IC6

Driver chip for control inputs/outputs on Centronics parallel port.

IC48

Driver chip enabling refresh counter to address bus of drams under control of RAS.

ELECTRONIC SYSTEM

IC	38,	39,	40,	43,	61,	63

74LS257 MULTIPLEXERS

Function Table				
Inputs		Output Y		
Output Control	Select	A	B	LS257A
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

IC38, 39, 40

Selects whether the CRT controller or processor has access to srams under control of CSS.

IC43

Selects which bank of 128K dram is selected by means of AB17 and switched by a delayed CCLK. **Note** – screen information can only be in the lower 128K of ram.

IC61, 63

Multiplexes 16 address bits onto 8 bit dram address bus under control of RAS.

IC	14

74LS153 MULTIPLEXER

Function Table							
Select Inputs		Data Inputs				Strobe	Output
B	A	C0	C1	C2	C3	G	Y
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

Allows the switching, by software, between 2 independent baud rates in transmit or receive e.g. Prestel applications.

ELECTRONIC SYSTEM

IC	58, 67

74LS138 3 TO 8 DECODER

Function Table												
Inputs					Outputs							
Enable		Select										
G1	G2	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

74LS139 2 TO 4 DECODER

Function Table						
Inputs			Outputs			
Enable G	Select					
	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

IC58, 67

Provides decoding of address lines to generate chip select signals for I/O devices.

IC 81

74LS393 BINARY COUNTER

Count Sequence				
Count	Output			
	Q_D	Q_C	Q_B	Q_A
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H
10	H	L	H	L
11	H	L	H	H
12	H	H	L	L
13	H	H	L	H
14	H	H	H	L
15	H	H	H	H

Divides 4 MHz clock by 2 or 16 to provide fundamental frequencies to timer.

IC 26

74LS163 SYNCHRONOUS 4-BIT COUNTER

Loaded with either 8 or 11 depending on whether machine is in either alphanumeric or graphics mode by A/G.

Changes the mark to space ratio of CCLK and allows either 10 bits to be displayed in alphanumeric or 16 bits in graphics.

IC	29

74LS377 OCTAL 'D' TYPE FLIP – FLOP

Function Table (Each Flip – Flop)				
Inputs			Outputs	
G	Clock	Data	Q	Q
H	X	X	Q	Q
L	↑	H	H	L
L	↑	L	L	H
X	L	X	Q	Q

Latches attributes before being gated together.

IC	37

74LS393 4 BIT BINARY COUNTER

Refresh counter clocked by CCLK gated by RAS.

IC	69, 87

74LS299 8 BIT SHIFT REGISTER

This pair of shift registers converts 16 bits of video information into a serial stream. Clocked by CLK15 and enabled by LES.

III MNEMONICS

SIGNAL	DESCRIPTION	IC	PIN
LEC	Latch Enable Processor	82	11
LES	Latch Enable Screen	69	1
LOE	Latch Enable Output	82	1
DON	Display Enable	74	8
WE 0-3	Write Enable	44	
RAS 0-3	Row Address Strobe	45	
CAS 0-3	Column Address Strobe	46	
CUR	Cursor	30	19
UNDL	Underline		
REV	Reverse		
BOLD	Bold		
STK	Strike through		
INVERT	Invert		
MRC	Memory Read Command	19	1
AMWC	Advanced Memory Write Command	19	9
MWC	Memory Write Command	TP3	
MC	Memory Access Command	9	15
$\overline{\text{DE}}$	Display Enable	21	5
DE	Display Enable	21	6
HS	Horizontal Sync	11	4
VS	Vertical Sync	11	6
DIR	Buffer Direction Control	66	1
RDY 2	Ready 2	9	9
CSS	Static Ram Chip Select	9	3
DB 0-15	Data Bus	66/65	
PB 0-7	I/O Bus	30	
E	Enable Strobe R/W	30	23
AØ	Register Address Line Ø	72	15
A1	Register Address Line 1	72	16
A2	Register Address Line 2	72	19
RESCRT	Reset CRT	30	2

SIGNAL	DESCRIPTION	IC	PIN
BHE	Bus High Enable	33	9
AB 0-19	20 Bit System Address Bus		
RDY 1	Ready 1	20	3
A/G	Alphanumeric/Graphics	26	3
CLK15	15 MHz Clock	25	1
CLK5	5 MHz Clock	84	2
CCLK	Character Clock	35	11
CLK15	15 MHz Clock After Nand	25	4
PU2	Logic High – from pull up resister	25	2
2MHZ	2 MHz Clock	7	14
4MHZ	4 MHz Clock	81	1
$\overline{\text{CCLK}}$	Inverse of Character Clock	35	6
PCLK	Peripheral Clock Z80 SI/0	92	2
FGND	Frame Ground		
VIDEO	Serial Video	TP5	
0VM	Zero Volts Monitor		
+12VM	+12 Volts Monitor		
GND	Ground		
HORSYNC	Horizontal Syn		
VERTSYNC	Vertical Syn		
DS 0-1	Disk Drive Select	79	3
WG	Write Gate	79	11
WD	Write Data	79	8
STEP	Step	73	3
DIRD	Direction Disk	73	6
SS	Side Select	73	11
HLD	Head Load	73	8
TRKØØ	Track Zero	74	4
WRPR	Write Protect	74	2
RDY	Ready Disk	80	12
INDEX	Index Pulse	80	10
RD	Raw Read Data	TP4	

SIGNAL	DESCRIPTION	IC	PIN
IORC	Input Output Read Command	68	4
IOWC	Input Output Write Command	68	2
AIOWC	Advance Input Output Write Command	17	36
CSA	Disk Controller Chip Select	58	15
CSB	Centronics Port Chip Select	58	14
CSC	Sound Generator Chip Select	58	13
CSD	Interval Timer Chip Select	58	12
CSE	Z80 SI/0 Chip Select	58	11
CSF	Video Controller Chip Select	58	10
CSI	Interrupt Controller Chip Select	67	12
CSP	Boot Prom Chip Select	67	7
CSW	I/O Port Address	58	5
CA	Channel Attention (8089)	32	13
DBUS	Data Bus		
INT2	Interrupt Request 2 Ext	51	4
INT3	Interrupt Request 3 Ext	51	2
INT4	Interrupt Request 4 Floppy Disk	85	13
WPN	Write Precompensation Width	68	33
RPW	Read Pulse Width	68	18
VCO	Voltage Controlled Oscillator	68	26
RES	Master Reset	68	19
IOC	Input Output Command	42	8
RESET	Reset	77	21
RQGTO	Request Grant	91	31
PE	Paper Empty	6	8
FAULT	Printer Fault	6	6
ACK	Printer Ready to Receive	6	2
BUSY	Printer is Unable to Receive	6	4
DAT 1-8	Parallel Data	5	
SYNB	Sync Port B	17	16
CTS B	Clear to Send Port B	6	18
DCD B	Data Carrier Detect B	6	16

ELECTRONIC SYSTEM

SIGNAL	DESCRIPTION	IC	PIN
SPK	Speaker		
ALE	Address Latch Enable	89	5
DEN	Data Enable		
DMAI	DMA Request 1	84	10
DMA2	DMA Request 2	42	3
NMI	Non Maskable Interrupt	89	10
Ext 1	External Terminate CH1	51	10
Ext 2	External Terminate CH2	51	12
IORDY	Input Output Ready	78	9
RESIN	Master Reset from Keyboard	92	11
LOCK	Indicates to Bus Controller that more than one contiguous cycle is required	15	8
MRDY	Memory Ready	78	13
R/W	Read/Write Control	30	22

IV MEMORY MAP

SOFTWARE OVERVIEW

Table 1 – Apricot Memory Map of the Lower 128K.

HEX	DECIMAL	SIZE IN BYTES	DESCRIPTION
		UP TO 896K	
20000H	131072		USER RAM
		17K	MS-DOS 2.0
1B000H	113664		
		1K	KEYBOARD TABLE
1b800H	112640		
		2K	SPARE FOR BIOS EXPANSION
B000H	110952		
		4K	BIOS HEAP/STACK
1A000H	106496		
		10K	GLOBAL VARIABLES
17000H	94208		
		6K	BIOS CONSTANTS
16000H	90112		
		32K	BIOS CODE
E000H	57344		
		2K	SYSINIT>THROWAWAY (40K GRAPHICS)
D800H	55296		
		4K	PRIMARY CACHE 6K (40K GRAPHICS)
C800H	51200		
		24K	SECONDARY CACHE LOGO (40K GRAPHICS)
6800H	26624		
		8K	CHARACTER FONT #3 (40K GRAPHICS)
4800H	18432		
		8K	CHARACTER FONT #2 (40K GRAPHICS)
2800H	10240		
		8K	CHARACTER FONT #1
0800H	2048		
		1K	POINTERS
0400H	1024		
		1K	VECTORS
0000H	0		

SET-UP PROCEDURES

8

I Keyboard Clock Set-Up Procedure
II Floppy Disk Controller Set-Up Procedure

SET-UP PROCEDURES

I KEYBOARD CLOCK OSCILLATOR SET-UP

1. Apply power to keyboard (no data).
2. Frequency counter/scope to pin 37 of 6301.
3. Adjust variable cap (C2) to give 976.562 uS ± .01 uS
   i.e. 976.55–976.57 uS.

SET-UP PROCEDURES

II FLOPPY DISK – CONTROLLER SET-UP REV E

1. Switch on.
2. Short out pins 1 and 2.
3. Scope/frequency counter to pin 3.
4. Adjust variable capacitor (VCI) to give 2 uS period (500 KHz) ± 100 nS.
5. Scope to pin 4.
6. Adjust WPW (Write Precompensation – VR2) to give 125 nS ± 10 nS.
7. Scope to pin 5.
8. Adjust RPW (Read Pulse – VR1) to give 250 nS ± 10 nS.

FLOPPY DISK – CONTROLLER SET-UP REV G

1. Switch on.
2. Short out pins 1 and 2.
3. Scope/frequency counter to pin 4.
4. Adjust variable capacitor (VCI) to give 2 uS period (500 KHz) ± 100 nS.
5. Scope to pin 5.
6. Adjust WPW (Write Precompensation – VR2) to give 125 nS ± 10 nS.
7. Scope to pin 3.
8. Adjust RPW (Read Pulse – VR1) to give 250 nS ± 10 nS.

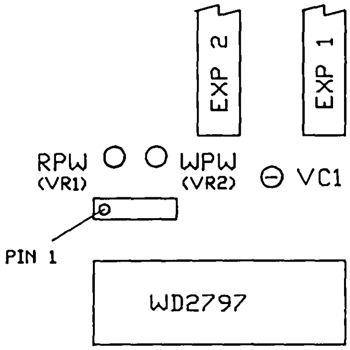


Figure 1. Position of Molex and Adjustable Pots.

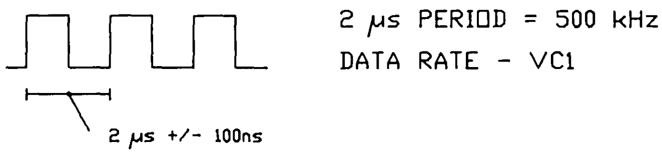


Figure 2. Date Rate.

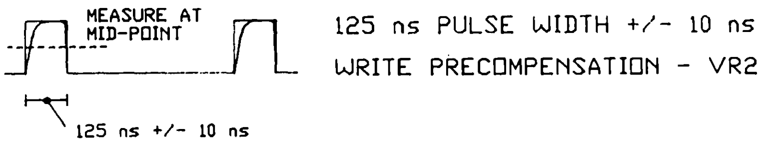


Figure 3. Write Precompensation Pulse.

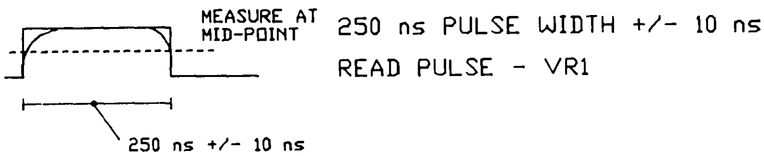


Figure 4. Read Pulse.

DIAGNOSTIC

9

I Diagnostic Boot Prom Documentation and Error Codes

II Diagnostic Programs

I DIAGNOSTIC BOOT PROM DOCUMENTATION AND ERROR CODES

1. Display Layout

```
                                                      Apricot



 Testing (a)                  ↑ (b)
 RAM 256K (c)                [   ] (d) A (e) Error XX (f)
```

2. Operation

After a power-on reset, or a keyboard reset when no system has been booted, the boot PROM performs a series of diagnostic tests. (Total time approx 11 seconds.)

After the first 8 of these tests (approx 5 seconds), the screen is initialised, and the Apricot logo appears in the top right-hand corner of the screen, with the word 'Testing' in field (a).

If all tests pass, the field (a) is replaced with 'System OK,' if there has been a diagnostic failure the (a) field is cleared, and the error number is displayed in the error field (f).

The RAM size field (c) is displayed, along with the disk logo (d), and flashing load prompt arrow (b).

A valid system disk can then be booted, the booting drive is indicated by the drive letter field (e), and the arrow symbol (b) is replaced by a clock icon to indicate 'please wait' whilst loading the system.

If there is a disk error this is displayed in the error field (f).

DIAGNOSTIC

If calc mode is entered before boot then fields (b) – (f) are cleared, – fields (b) – (e) are restored on leaving calc mode.

On a reset after a system boot, none of the diagnostic tests are executed, and the program jumps straight to the 'load disk' prompt – field (a) is not used.

3. Error Numbers

02 – Drive Not Ready
(disk removed during boot)

04 – CRC Error
(corrupt disk data)

06 – Seek Error
(possible unformatted or corrupt disk)

07 – Bad Media
(corrupt disk media block)

08 – Sector Not Found
(unformatted or corrupt disk)

11 – Bad Read
(corrupt data field on disk)

12 – Disk Failure
(disk hardware or media fault)

20 – Diagnostic PROM Checksum Error
(corrupt boot PROM)

21 – Diagnostic Sound Generator Failure
(suspect sound generator chip)

22 – Diagnostic Serial I/O Failure
(Z80 SIO fails read/write test)

23 – Diagnostic Video Chip Failure
(CRTC fails read/write test)

24 – Diagnostic Video Pointer RAM Failure
(video pointer RAM test failed)

25 – Diagnostic System RAM Failure
(system RAM test failed)

26 – Diagnostic Parallel Port Failure
(parallel printer port test failed)

27 – Diagnostic Interrupt Controller Failure
(8259A PIC failed read/write test)

28 – Diagnostic Floppy Disk Controller Failure
(FDC failed read/write/seek test)

29 – Diagnostic Counter Timer Failure
(CTC failed read/write test)

30 – Diagnostic Serial Channel Failure
(channel A of Z80 SIO failed test)

31 – Diagnostic Keyboard Failure
(keyboard initialisation test failed)

32 – Diagnostic Timer Accuracy Failure
(CTC accuracy check against timing loop failed)

33 – Diagnostic Timer/PIC Interaction Failure
(CTC/PIC timing interaction test failed)

34 – Diagnostic IO Processor Failure
(8089 IOP failed init/memory move test)

99 – Non-System Disk
(disk is not a valid system disk)

Note: Tests 21, 26, 30 and 33 are not fully implemented and should never fail at present.

EXPANSION BOARDS

10

Apricot Expansion Boards

Contents

1. General Installation Instructions
2. Expansion Board Power Requirements
3. 256K RAM
4. 128K/512K RAM
5. Modem
6. Lan Board

1 General Installation Instructions.

1. General Recommendations
2. Apricot PC - Apricot Xi
3. Apricot F1 - Apricot F1e
4. Apricot Portable

1. General Recommendations

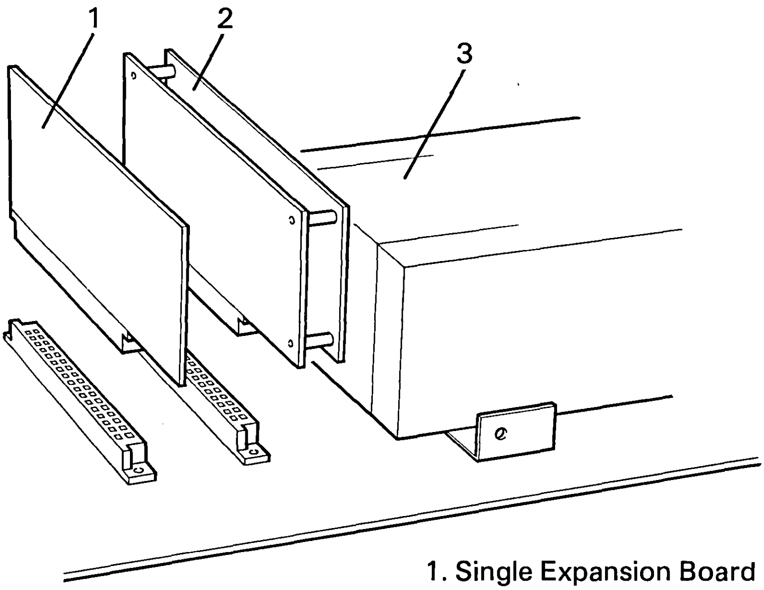
1. It is recommended that installation of any expansion board be carried out by an authorised dealer.

   Warning - Remove Power Cable Before Attempting To Gain Access To The Expansion Slots.
2. Unless specifically noted, assembly is the reverse of disassembly.
3. Do not mix screws (length, diameter).
4. A number in parenthesis, thus (4) indicates the number of screws to be slackened or removed to remove that particular part.
5. The expansion slot is polarised to prevent incorrect insertion.
6. A single or double board may be installed into any Apricot.
7. Check all expansion board pins are straight before fitting into expansion slot.
8. Plug in all cables as per relevant instructions and jumper pins where necessary.

2. Apricot PC - Apricot Xi

Removal of top cover.

1. Remove M4 x 12mm screws (3) on rear panel.
2. Allow rear panel to tilt backwards and remove top cover by lifting at rear slightly and disengaging lip from front bezel.
3. Expansion slots are adjacent to power supply.



1. Single Expansion Board
2. Double Expansion Board
3. Power Supply

When installing a single layer board, i.e., a ram expansion, the board may be plugged into any of the expansion slots.

When installing an option with a daughter board attached, i.e., a colour or modem card, then it must be plugged into the slot adjacent to the power supply as shown above.

Plug in all cables as per relevant instructions and jumper pins where necessary.

The expansion plates on the rear panel may be pushed out if applicable.

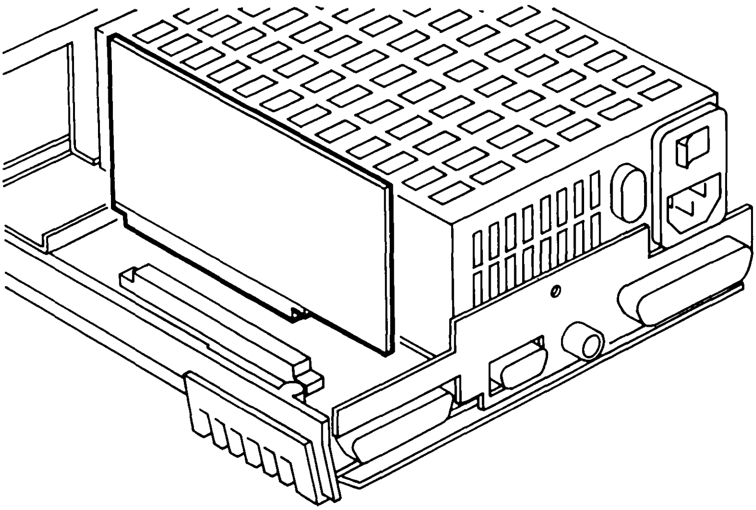
Assemble machine as per previous instructions.

Refer to relevant section in this chapter regarding specific installation instructions.

3. Apricot F1 - Apricot F1e

Removal of top cover

1. Remove M3 x 10mm screws (2) on rear panel.
2. Allow rear panel to tilt backwards and remove top cover by lifting at rear slightly and disengaging lip from front bezel.
3. Expansion slot is adjacent to the power supply.



Plug in all cables as per relevant instructions and jumper pins where necessary.

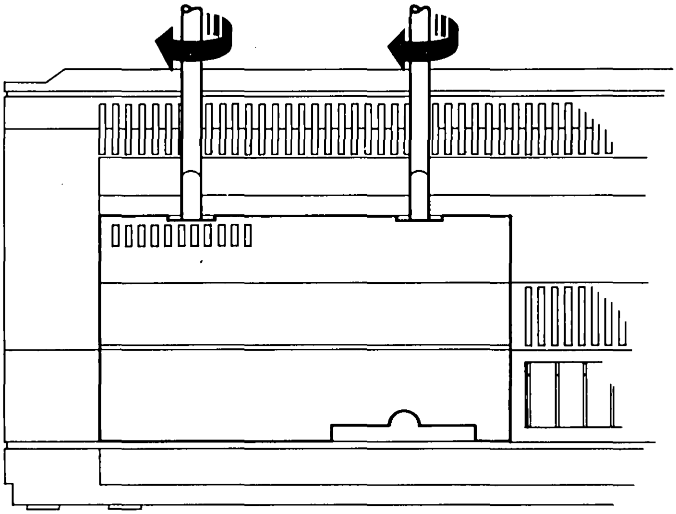
The expansion plate on the rear panel may be pushed out if applicable.

Assemble the machine as per previous instructions.

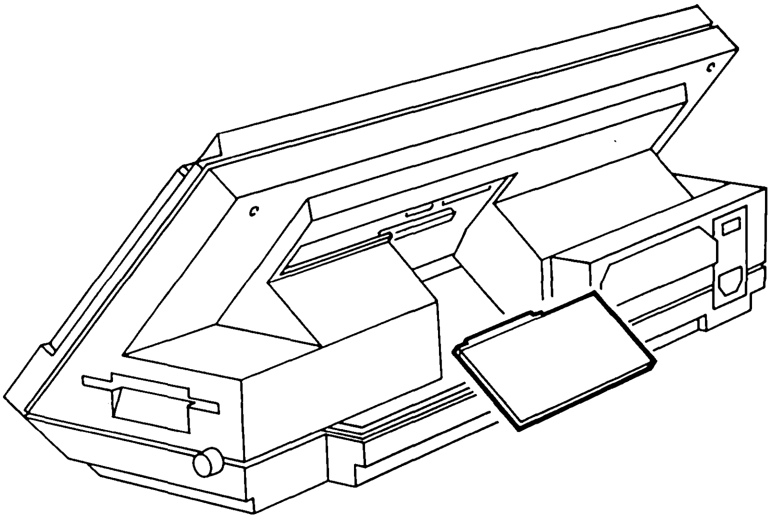
Refer to relevant sections in this chapter regarding specific installation instructions.

4. Apricot Portable

Removal of Apricot Portable cable manager



Installation of expansion board into Portable



When installation is complete clip the cable manager in place.

2 Power Requirements

Expansion Board	+5u	Construction
128K RAM	0.5A	Single
256k RAM	0.5A	Single
512K RAM	0.49A	Single
Lan	0.35A	Single
Winchester	0.6A	Single
Modem	0.37A	Double
Colour	1.3A	Double

256K RAM Expansion Board

1. Installation
2. Theory of operation.
3. Integrated circiut catalogue.
4. Mnemonics
5. Parts list.

1. Installation

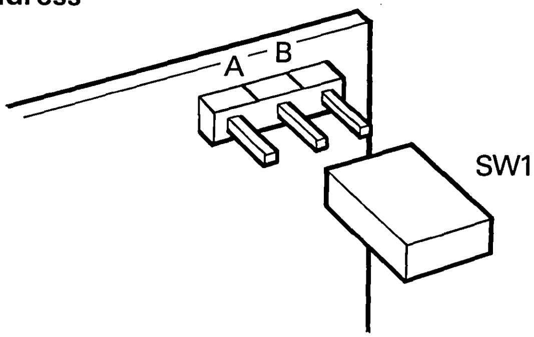
256K RAM expansion boards may be installed into the Apricot range. The Apricot PC/Xi range may have 1 or 2 boards fitted making a total capacity of either 512k or 768k.

NOTE This board can not be fitted to an F1e.

Any expansion slot may be used for individual boards.

A general description of installation procedure is contained at the beginning of this section.

Base Address



A jumper SW1 is provided, as detailed above, to set a base address for the board, of either 40000H or 80000H. Jumper 'B' when one board is installed and 'A' on the second, when two boards are fitted.

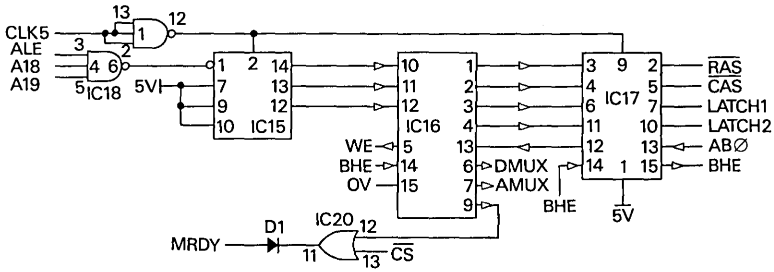
2. Theory of Operation

The design utilizes 8 256K x 1 dynamic ram chips (ICI-IC8) with on chip refresh. This allows most of the logic associated with the DRAM refresh function to be eliminated from the design.

The 16 bits of data is multiplexed onto an internal 8 bit wide data bus via IC11 and IC12 under the control of DMUX. Data from the ram chips is latched in as upper and lower bytes into IC9 and IC10. Latching is accomplished at the correct time by LATCH1 and LATCH2. Similarly, the address bus AB1-AB16 is multiplexed onto an internal 8 bit wide address bus via IC13 and IC14 under the control of AMUX.

IC19 with inputs DMUX and AB17 controls the selection of high or low memory pages. Board selection via SW1 is generated by the IC18 and IC19 combination, resulting in CS.

Timing for the circuit is accomplished using a counter, PROM and latch (IC15, IC16, IC17) in a novel form as shown below.



A valid CPU memory cycle synchronizes a 3 bit counter (IC15) by clearing it to zero during an ALE pulse, clocking of the counter is by CLK5. During each CPU memory cycle, IC15 counts from 0 to 7 and drives a PROM (IC16) - this chip is programmed with all the control signals necessary to access the memory and maintain DRAM refresh, even during repetative memory accesses.

3. Integrated Circuit Catalogue

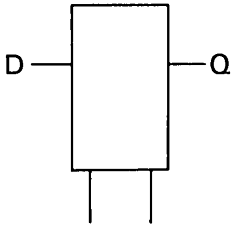
IC	1,2,3,4,5,6,7,8.

HM50256-20 256K x 1 Dynamic Random Access Memory.

Forms 256K x 8 memory

IC	9,10

74LS373 'D' Type Latches



Enable O/P Enable

Function Table			
Output Control	Enable G	D	Outputs
L	H	H	H
L	H	L	L
L	L	X	Q
H	X	X	Z

Latches high and low order bytes to main data bus during a memory read, under control of LATCH1, LATCH2, C5 and MRDC.

IC	11,12,13,14.

74LS257 Multiplexers

Function Table				
Inputs		Outputs Y		
Output Control	Select	A	B	LS257A
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

IC	11,12.

Multiplexes 16 data bits onto 8 bit DRAM data bus during a memory write, under control of DMUX.

IC	13,14.

Multiplexes 16 address bits onto 8 bit DRAM address bus under control of AMUX.

IC	15.

74LS163 Synchronous 4 Bit Counter

Counts from 0 to 7 under control of ALE, A18, A19 and clocked by CLK5. Generates input signals for PROM (IC16).

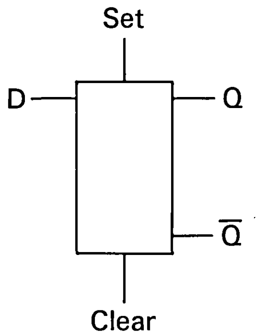
IC	16.

74S288 256 Bit Programmable Read-Only Memory

Programmed with control signal and timing information.

IC	17.

74LS174 'D' Type Flip-Flop

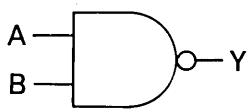


Function Table					
Inputs				Outputs	
Preset	Clear	Clock	D	Q	Q
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	↑	L	H	L
H	H	↑	H	L	H
H	H	L	X	Q	Q

Latches timing and control signals RAS, CAS, LATCH1, LATCH2, ABO AND BHE, clocked by CLK5.

IC	18

74LS10 NAND

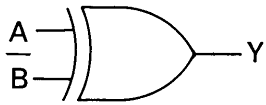


A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

IC	19

74S86

XOR

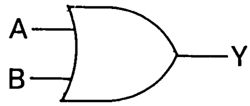


A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

IC	20

74LS32

OR



A	B	Y
0	0	0
1	0	1
0	1	1
1	1	1

4. Mnemonics

Signal	Description	IC	Pin
CLK5	5MHz Clock	18	1
ALE	Address Latch Enable	18	3
CS	Chip Select	20	2
MRDC	Memory Read Control	20	1
WE	Write Enable	16	5
BHE	Bus High Enable	16	14
RAS	Row Address Strobe	17	2
CAS	Column Address Strobe	17	5
LATCH1	Latch1	17	7
LATCH2	Latch2	17	10
DMUX	Data Multiplexer	16	6
AMUX	Address Multiplexer	16	7

5. Parts List

Ref.	Description
IC1 - IC8	HM50256-20
IC9 - IC10	74LS373
IC11 - IC14	74LS257
IC15	74LS163
IC16	74S288
IC17	74LS174
IC18	74LS10
IC19	74LS86
IC20	74LS32
C1 - C6	Cap 0.01 mfd
C7,C14	Cap 100 mfd 6.3V.
D1	Diode OA47
R1	Resistor 3K3 1/4W
	3 way SIL
	Jumper Link
RN1	330/390 Resistor Network
	Din 4162 64 Pin Plug
	P.C.B.

4 128K/512K RAM Expansion Board

1. Installation
2. Theory of operation
3. Intergrated circuit catalogue
4. Mnemonics
5. Parts list

1. Installation

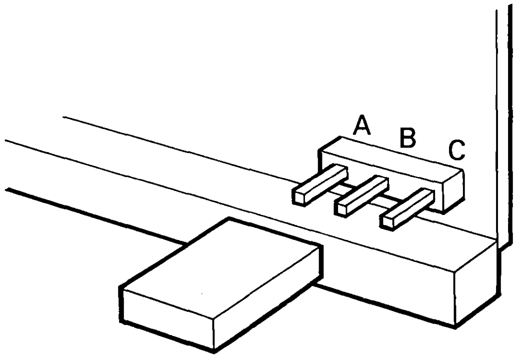
128k Ram or 512K Ram expansion boards may be installed into the Apricot range.

The Apricot PC/Xi range may have 1 or 2 boards fitted making a total capacity of either 384k ,512k or 768k.

Note The F1e ram upgrade is a special 128k ram board with a base address of 128k. The 512K and 256K ram board cannot be fitted at present.

Any expansion slot may be used for individual boards.

A general description of installation procedure is contained at the beginning of this section.



A Jumper P2/P3 is provided to select the base address of the memory board.

P2	256K - 384K	A-B
P3	384K - 512K	B-C
No strap	512K	

2. Theory of operation

The single P.C.B. is designed to use either 64K or 256K drams. This will allow two configurations 128K or 512K.

Data is written directly into the memory with the RAS/CAS addresses being supplied by a single memory controller IC1.

When data is read, it is first latched into IC8 and 9. These latches are gated by IC7 and enabled by MRDC from IC5.

IC3 is a memory controller interface and uses the Apricot control signals to provide RAS/CAS enable. A0 and BHE are decoded to provide CAS enable for the upper and lower memory banks. After data transfer is completed the memory ready signal is returned to the Apricot. A wait state can be introduced by strapping D and E. This will allow slow dram to be used.

The address lines A17-19 are latched into IC4 by ALE and are decoded by IC7 as the base address for IC1's chip select.

Electronic System

Test Points

TP1	on board 5Mhz clock
TP2	ready output
TP3	ALE
TP4	refresh clock.

Straps

A-B	256K - 384K	128K Board
B-C	384K - 512K	128K Board
Not fitted	512K	512k Board
D-E	1 wait state for slow drams	

3. Intergrated circuit catalogue

IC No.	Component	Description
1	DP8409	Memory controller
2	DP84300	Memory programmable refresh timer
3	DP84332	Memory controller interface
4	74LS375	4-bit bistable latch
5	74LS244	Octal buffer line driver/receiver
6	74LS74	Dual D-type edge triggered
7A	74LS86	Qual 2-input exclusive -or
8	74LS373	Octal D-type latch
9	74LS373	Octal D-type latch
7B	74S10	Triple 3 input pos nand gate
11-26	4164 - 20	64K/256K drams.

IC	4

74LS375 4 Bit Bistable Latch

Function Table			
Inputs		Outputs	
D	G	Q	Q
L	H	L	H
H	H	H	L
X	L	Qo	Qo

IC4 latches Apricot address lines A17-19 to decode chip select for memory controller address latched by ALE.

IC	5

74LS244 Octal Buffer Line Drive/Receiver

IC5. Tri state buffers used to buffer control signals from expansion bus.

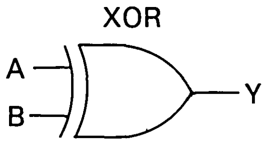
IC	6

74LS74 Dual D-Type Edge Triggered

IC6. Memory ready from IC3 syncronized and clock by Clk5 (5 Mhz). The signal is buffered by IC5 and enabled by Clk5.

IC	7

74LS86 Quadruple 2-Input Exclusive-OR

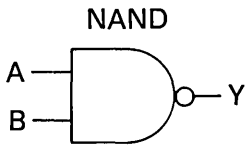


A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

IC7 A/1 fitted on 512K memory boards to decode address lines A18-19 to give chip select for memory controller.

A/2 latches data into octal D-type from drams.

74LS10 3 Input Positive NAND Gate



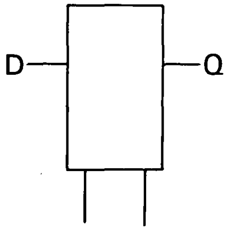
A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

IC7B/1 fitted on 128K memory boards to decode address lines A17-19 to give chip select for the memory controller.

B/2 latches data from drams into octal buffer.

IC	8,9

74LS373 Octal D-Type Latch



Function Table			
Output Control	Enable G	D	Outputs
L	H	H	H
L	H	H	L
L	L	X	Q
H	X	X	Z

IC 8,9 latches data from drams, gated by NCAS and output enabled by memory read (MRDC).

4. Mnemonics

Signal	Description	IC	Pin No.
A1-19	Address lines		
ALE	Address latch enable	IC5	14
AMWRTC	Advanced memory write command	IC5	16
CLK5	5MHZ clock	IC5	18
A0	Address 0	IC3	2
BHE	Bus high enable	IC3	3
MRDY	Memory ready	IC5	17
MRDC	Memory read command	IC5	9
DO-7	Data bus low	IC9	
D8-15	Data bus high	IC8	
CAS	Column address strobe	IC1	15
RAS	Row address strobe	IC11	4
WE	Write enable	IC11	3

Signal	Description	IC	Pin No.
OE	Output enable	IC9	1
G	Gate enable	IC9	11
R0-8	Row address byte	IC1	
C0-8	Column address byte	IC1	
CS	Chip select	IC1	47
WIN	Write enable input	IC1	45
RGCK	RAS generator clock	IC1	2
RFCK	Refresh clock	IC1	1
RFSH	Refresh	IC1	5
M0	Mode control	IC1	3
RASIN	Row address strobe in	IC1	48
MA0-8	Memory address	IC1	
RFRQ	Refresh request	IC3	8
CASL	Column address strobe lower	IC3	13
CASU	Column address strobe upper	IC3	14
RDY	Ready	IC3	15
WAIT	Wait state	IC3	7

5. Parts list

128K Expansion Board   Part No. 11130511

Comp.Ref.	Item	Part No.	Description	Qty
PC02/02	1	11130411	Printed circuit board	1
IC1	2	11130621	SN74S409 (8409)	1
IC2	3	11130721	IC 20x10 (84300)	1
IC3	4	11130821	IC 16RA8 (84332)	1
IC4	5	11130921	SN74LS375	1
IC5	6	11015121	SN74LS244	1
IC6	7	11131021	SN74LS74	1
IC7	8	11013521	SN74LS10	1
			Fitted in Right Hand Position	
IC8,9	9	11015521	SN74LS373	2
IC11-26	10	11012521	4164-20 Dram	16
RP1, 2, 3	11	11131221	Res Pak 47R x 4 SIL	3
R1, 5	12	11131321	Res 10ohm 1/4W 10% Carbon	2
R2,3,4,6	13	11017021	Res 3K3 1/4W 10% Carbon	4
C1, 2	14	11131421	Cap 100uF 10V Elec.Axial	2
C3	15	11131521	Cap 1uF 50V 20% Cer.Radial	1
C4-23	16	11131621	Cap 0.1uF 50V 20% Cer.Rad	20
PL abc	17	11131721	3 Way Wafer (22-10-2031)	1
PL de	18	11131821	2 Way Wafer (22-03-2021)	1
Plug	19	11126521	64 Way Conn.DIN 41612	1
TP1-4	20	11131921	4 Way Wafer (22-10-2041)	1
Link	21	11132081	Jumper	1

Modem Board

1. Installation
2. Technical Details

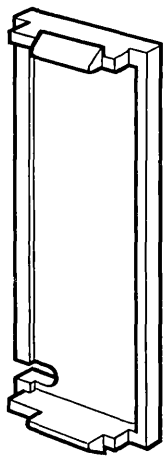
1. Installation

Modem boards may be installed into the Apricot range. If the board is fitted into an Apricot PC or Xi, slot 2 (that nearest to the power supply) must be used.

A general description of installation procedure is contained at the beginning of this section. **Warning - Do Not Connect the Telephone Cord To British Telecom Socket Until The Modem Has Been Correctly Installed In The Apricot Computer**

Warning - This Modem Is Not Suitable For Use With Some Call Connect Systems With Digital Setup And Cleardown Commands.

If the Modem is fitted into the Apricot PC, Xi, F1 or F1e the expansion plate on the rear panel must be removed and the modems telephone cord fed through the resultant hole. The expansion plate must then be replaced by a plate as shown in the diagram below - with a hole to allow the telephone cord to pass through it.



Expansion Plate

If the Modem is fitted into the Apricot Portable the telephone cord may be fed through the cable manager.

When the Modem has been correctly inserted into the machine the approval sticker must be fixed onto the rear panel.

Finally the telephone and Modem must be connected into the telephone socket.

Installation is now complete.

2. Technical Details

Electrical Details:

1. Modulation: Frequency Shifted Keyed (FSK) with the following frequency parameters:

Mode	Baud Rate	Transmit Space	Frequency* Mark	Receive Space	Frequency* Mark	Answer Tone*
CCITT V21						
Originate	300	1180	980	1850	1650	---
Answer	300	1850	1650	1180	980	2225
CCITT V23						
Originate	75/1200	450	390	2100	1300	---
Answer	1200/75	2100	1300	450	390	2100
CCITT V23 Half duplex	1200	2100	1300	2100	1300	2100

* Hz.

2. Data Format: Serial Asynchronous.

3. Minimm Recieve Level: -43dBm.

4. Maximum Transit Level: -13dBm.

Mechanical Details:

1. The Apricot Modem consists of two printed circuit boards linked together.
2. The physical dimensions of the Modem are as follows:

Length;	5.9 inches	(147 mm.)
Max. Height;	3.0 inches	(78 mm.)
Width;	1.1 inches	(27 mm.)
Weight;	7 ounces.	(200 grams)

Connect Details

Series 600 plug for connecting the Modem to the telehone network.

Modem Module

The modem is a communications facility to allow an Apricot computer to transmit and recieve data via the Public Switched Telephone Network (PSTN).

Inspect the modem module to make sure no damage has occured in transit. If damage has occured, return the complete package.

B.A.B.T. Approval No. S/1397/3/E/500039 Model No. ADM/4.

B.T. Circuit

The modem is only to be used with 2 wire PSTN circuits. The modem generates CCITT V25 answer sequences when set in auto answer mode and may be used on lines listed in British Telecom telephone directories. It must not be used with payphones, partylines or certain types of call connect systems that do not use two wire signalling systems.

Bell Tinkle

When the modem is used with telephones that use a mechanical bell 'bell tinkle' will be caused when dialling.

Ringer Equivalence

Equipment for attachment to the public telephone network is assesed to determin its 'ringer equivalence' number (REN). The REN indicates, in effect, the load that the telephone exchange sees when ringing the equipment. It is not permitted to put more than a total of 4 REN onto the exchange line. The modem has a REN of 3 and care must be taken not to use it with other telephone equipment that would result in the maximum figure of 4 REN being exceeded.

Important

The approval of this modem for connection to the British Telecom public switched telephone network is INVALIDATED if the apparatus is subject to any modifications in any way not authorised by BABT or it is used with or connected to:-

1. Internal software that has not been formally accepted by BABT.
2. External control software or external control apparatus which causes the operation of the modem or associated call set-up equipment to contravene the requirements of the standard set out in BABT/SITS/82/005s/B

Local Area Network

1. Installation
2. Theory of Operation
3. Connector Pinouts
4. Integrated Circuit Catalogue
5. Mnemonics
6. Parts List
7. Network Diagram.

1. Installation

One local area network board (Lan) can be installed into the Apricot to create a structure so that files/programs can be shared with other people in a local area network.

Any expansion slot may be used for individual boards.

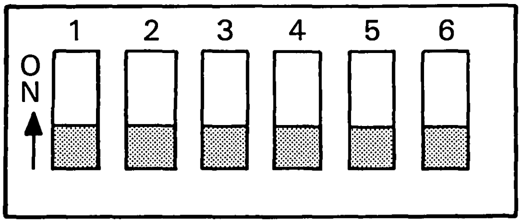
After checking the network device address follow the general installation instructions at the beginning of this section.

When the board has been correctly installed;

1. Connect the lan tap cable to the rear of the lan board.
2. Insert the tap cable into the lan tap box.

Network Device Addresses

The device address is set on a dip switch (SW1) shown as address 63.



Network Device Addresses (SW1)

Address	Switch Setting						Address	Switch Setting					
	1	2	3	4	5	6		1	2	3	4	5	6
0	↑	↑	↑	↑	↑	↑	32	↑	↑	↑	↑	↑	—
1	—	↑	↑	↑	↑	↑	33	—	↑	↑	↑	↑	—
2	↑	—	↑	↑	↑	↑	34	↑	—	↑	↑	↑	—
3	—	—	↑	↑	↑	↑	35	—	—	↑	↑	↑	—
4	↑	↑	—	↑	↑	↑	36	↑	↑	—	↑	↑	—
5	—	↑	—	↑	↑	↑	37	—	↑	—	↑	↑	—
6	↑	—	—	↑	↑	↑	38	↑	—	—	↑	↑	—
7	—	—	—	↑	↑	↑	39	—	—	—	↑	↑	—
8	↑	↑	↑	—	↑	↑	40	↑	↑	↑	—	↑	—
9	—	↑	↑	—	↑	↑	41	—	↑	↑	—	↑	—
10	↑	—	↑	—	↑	↑	42	↑	—	↑	—	↑	—
11	—	—	↑	—	↑	↑	43	—	—	↑	—	↑	—
12	↑	↑	—	—	↑	↑	44	↑	↑	—	—	↑	—
13	—	↑	—	—	↑	↑	45	—	↑	—	—	↑	—
14	↑	—	—	—	↑	↑	46	↑	—	—	—	↑	—
15	—	—	—	—	↑	↑	47	—	—	—	—	↑	—
16	↑	↑	↑	↑	—	↑	48	↑	↑	↑	↑	—	—
17	—	↑	↑	↑	—	↑	49	—	↑	↑	↑	—	—
18	↑	—	↑	↑	—	↑	50	↑	—	↑	↑	—	—
19	—	—	↑	↑	—	↑	51	—	—	↑	↑	—	—
20	↑	↑	—	↑	—	↑	52	↑	↑	—	↑	—	—
21	—	↑	—	↑	—	↑	53	—	↑	—	↑	—	—
22	↑	—	—	↑	—	↑	54	↑	—	—	↑	—	—
23	—	—	—	↑	—	↑	55	—	—	—	↑	—	—
24	↑	↑	↑	—	—	↑	56	↑	↑	↑	—	—	—
25	—	↑	↑	—	—	↑	57	—	↑	↑	—	—	—
26	↑	—	↑	—	—	↑	58	↑	—	↑	—	—	—
27	—	—	↑	—	—	↑	59	—	—	↑	—	—	—
28	↑	↑	—	—	—	↑	60	↑	↑	—	—	—	—
29	—	↑	—	—	—	↑	61	—	↑	—	—	—	—
30	↑	—	—	—	—	↑	62	↑	—	—	—	—	—
31	—	—	—	—	—	↑	63	—	—	—	—	—	—
	1	2	3	4	5	6		1	2	3	4	5	6
Address	Switch Setting						Address	Switch Setting					

Switch on=Logic zero

↑ = on
— = off

The above table displays the switch settings for all devices. The address range is split into three areas:

Address	Device
0-9	File Server
10-63	Network Station
63	Network Bank

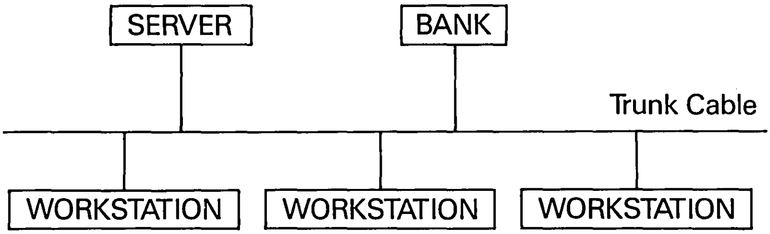
Each network device must have a unique device address.

Maximum bit transfer rate 1M bit/sec.

2. Theory Of Operation

Omninet

The network is based on RS 422, this protocol is used to achieve a high signaling rate over long distances. The trunk cable is a twisted pair and provides a balanced circuit.



Trunk Cable

Data is transferred along the trunk cable from one transporter to another by NRZI (non return to zero inverted).

All data information which travels over the network is in the form of a packet.

Leading Flags	Message Header	User Control	User Data	CRC	Trailing Flags

Network Controller

The design utilizes the corvus chipset which consists of an MC 6801 microprocessor, the MC 68A54 communications controller and a corvus gate array.

6801 Microprocessor
The 6801 is an eight bit microprocessor containing 2048 bytes of rom which stores the transporter operating program and 128 bytes of ram which are utilized for temporary storage by the program.

68A54 advance data link controller (ADLC)
The ADLC provides the interface between the RS422 tranceivers and the transporter. The main functions of the ADLC are bit serialization, zero insertion, packet framing, CRC generation and data byte buffering.

Corvus gate array
The gate array provides the timing and control for all data transfers occuring outside the 6801.

The connection to the trunk cable is via IC7, a RS422 transceiver which provides a balanced circuit for transmitting and receiving data. The driver accepts data bits from the ADLC and converts them into voltage differentials on the lines.

The led is used to indicate when the transporter is transmitting.

An open collector driver IC8 and SW1 (6/8 position dip switch) is used to set the node address and is read once at power on. Each address should be unique.

The 8 bits of data are latched to and from the computer data bus by IC9. The direction and enable is controlled by PAL2.

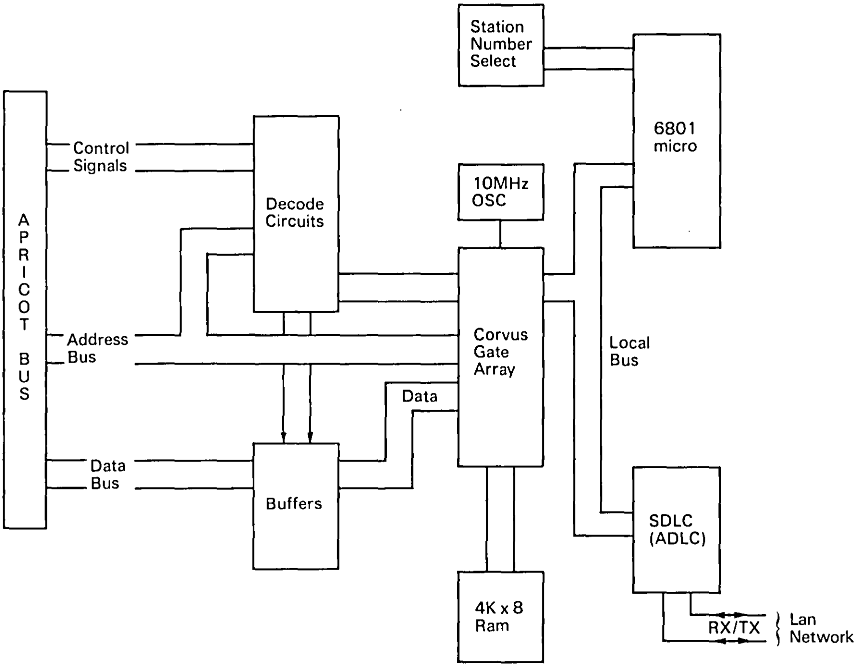
PAL2 decodes the address lines AB5 and AB8 to provide the base address 120H, these addresses are latched by ALE and the read/write status is controlled by IORC/AIOWC.

A 4K byte ram IC4/IC5 is used to store information from the host until required for transmission by the LAN controller. The opposite applies for data from the network to the host.

Network I/O Address

Function	**I/O Address**	**Read/Write Status**
Read high nibble of counter and status bit	120H	Read
Read ram location pointed to by counter	122H	Read
Read low byte of counter	124H	Read
Read ram and then increment counter	126H	Read
Write high nibble of counter	120H	Write
Write to command address register	122H	Write
Write to low byte of counter	124H	Write
Write to ram and then increment the counter	120H	Write

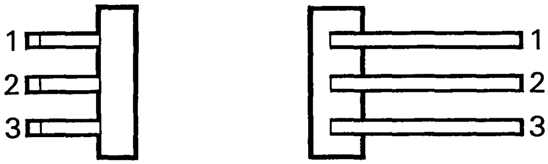
Block Diagram LAN Board



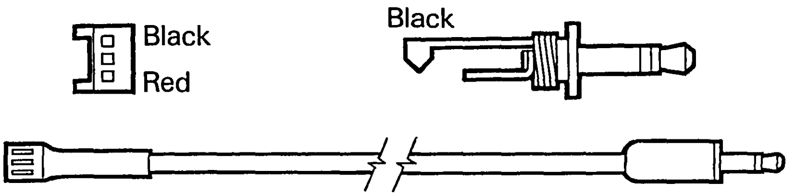
Board Block Diagram

3. Connector Pinouts

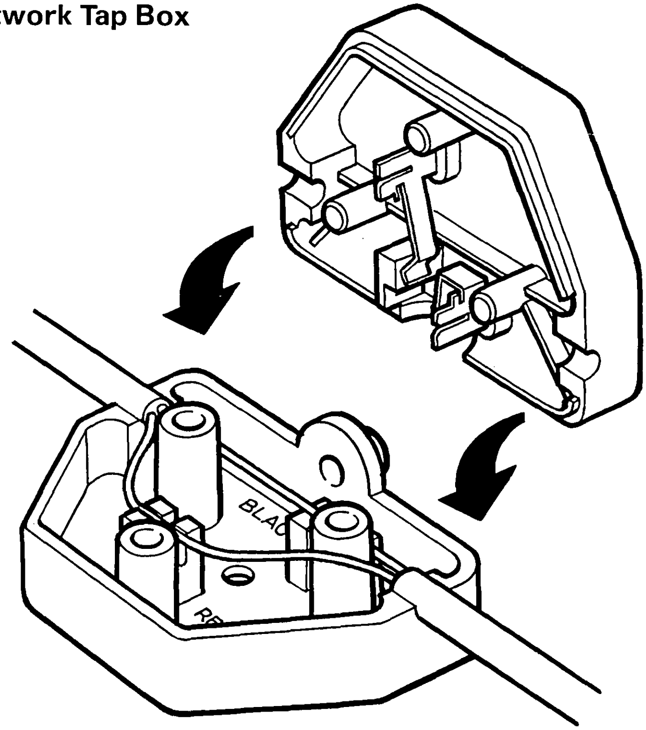
Lan Board



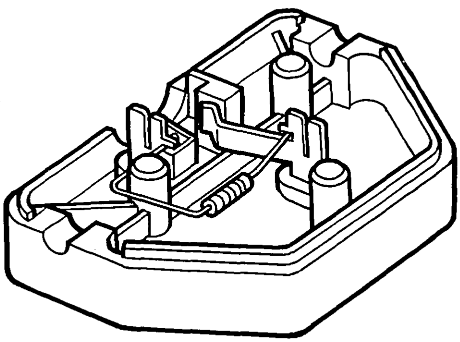
Network Station Cable



Network Tap Box



1. Standard station node box
   Trunk cable should be a continious length where possible.
2. Termination box at each end. The termination box can be used as a standard node.



Network Cable

Cable Lengths

Cable	Network	Between Nodes	Beldon Cable Type Number
Unscreened	2000ft/620m	2m	8205

Tap Cables

Part Number	Length	Function
11114841	3m	Apricot to Apricot

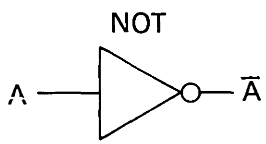
4. Integrated Circuit Catalogue

IC No.	Component	Description
IC1		Corvus gate array
IC2	6801	Corvus processor
IC3	68A54	Corvus ADLC
IC4	6116	Skinny dip ram
IC5	6116	Skinny dip ram
IC6	TBP24510	Prom
IC7	SN75176	RS422 line driver
IC8	SN74LS05	Hex inverter
IC9	SN74LS00	Quad pos-nand
IC10	SN74LS04	Hex inverter
IC11	SN74LS245	Octal bus transceiver.

IC	8, 9

74LS04
74LS05

Hex Inverters

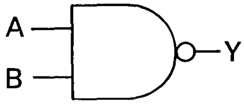


In	Out
0	1
1	0

IC	10

74LS00 Quad Positive NAND

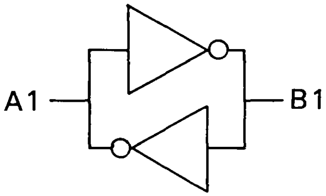
NAND



A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

IC	11

Octal Bus Transceiver



Function Table		
Enable G	Direction Control DIR	Operation
L	L	B Data to A Bus
L	H	A Data to B Bus
H	X	Isolation

IC11 bi-directional data bus from Apricot expansion bus to corvus gate array.

IC	7

SN75176 RS422 Balanced Line Driver

IC7 connects the twin twisted pair LAN network to the LAN board balanced non polorized signal.

IC	4, 5

6116 Skinny Dip Ram

5. Nmemonics

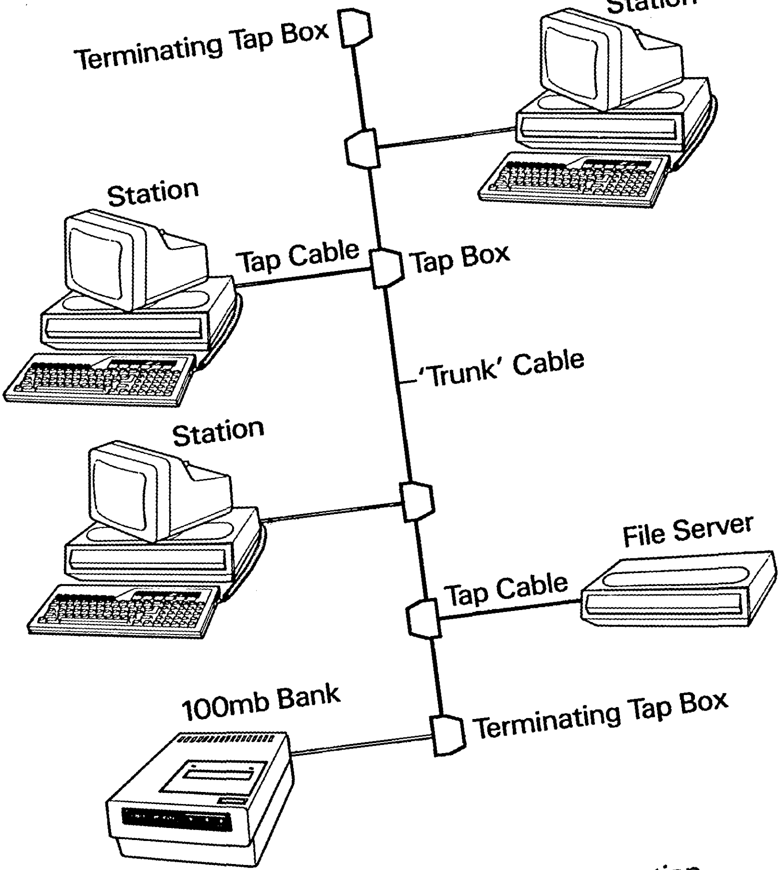
Signal	Description	IC	Pin
AB0-8	Address bus 0-8	IC6	
AIOWC	Advanced I/O write command	IC6	9
IORC	I/O read command	IC6	8
DB0-7	Data bus 0-7	IC9	
INT3	Interupt 3	IC6	20
RESET	Reset	IC2	6
WE	Write enable	IC1	2
CS	Chip select	IC11	20
BRD	Buffer Read	IC6	14
ALE	Address latch enable	IC6	7
RA0-1	Ram Address	IC1	
RD0-7	Ram Address	IC1	
OE	Output enable	IC1	3
WR	Write request	IC1	4
HD0-7	Host Data	IC1	
TXENA	Transmit enable	IC1	61
RXD	Receive data	IC1	62
BITCK	1 MHz clock output	IC1	63
DSR	Data service request	IC1	55
RTS	Request to send	IC1	59
IN/OUT	Transfer IN or OUT of memory	IC1	64
EOUT	1.25 MHz clock output	IC1	57
IRQ	Interrupt request	IC1	60
XTAL2	5 MHz clock	IC1	58
EIN	1.25 MHz clock IN	IC1	56
R/W	Read/Write	IC1	50
AUTO	Decodes which DMA mode is to begin	IC1	65
READY	Ready	IC2	17
A8-15	Address lines	IC2	
HDINT	Interrupt signal to host	IC2	18
XTAL1	Crystal Oscillator 10Meg	IC2	2
RDSR	Receive data service request	IC3	23
TDSR	Transmit data service request	IC3	24
TXC	Transmit data clock	IC3	5
RXC	Receive data clock	IC3	4
DCD	Data carrier detect	IC3	27
CTS	Clear to send	IC3	28
TXD	Transmit data	IC3	6

6 Parts List

Local Area Network Board Assembly Part No. 11156011

Comp.Ref.	Item	Part No.	Description	Qt
PC08	1	11138611	Printed Circuit Board	1
IC1	2	11156121	Corvus Gate Array	1
IC2	3	11156221	6801 Microprocessor	1
IC3	4	11156321	68A54 ADLC	1
IC4, 5	5	11133221	HM6116ALSP	2
IC6	6	11138921	TBP24S10N	1
			AM27521A (alternative)	
			N825129N (alternative)	
			DM745287 (alternative)	
IC7	7	11139021	SN75176 or DS3695	1
IC8	8	11138721	SN74LS05	1
IC9	9	11013121	SN74LS00	1
IC10	10	11013321	SN74LS04	1
IC11	11	11015221	SN74LS245	1
XTAL	12	11156421	10MHz Oscillator	1
C1	13	11125521	Cap 47uF 10V Electrolytic	1
C2-C11	14	11019021	Cap 0.1uF Decoupler	10
C12	15	11139421	Cap 220pF Ceramic	1
R1-4, R7-8	16	11017321	Res 1K 1/4W Carbon	6
R5, 6	17	11156521	Res 4K 1/4W 10% Carbon	2
T1	18	11156621	Transformer PTABT	1
Q1	19	11140021	Transistor BC184	1
D1	20	11139521	Miniature LED	1
SW1	21	11139221	DIP Switch	1
J1	22	11126521	64 Way DIN 41612 Conn	1
J2	23	11139921	3 Way Conn (22-05-2031)	1
SK1	24	11138821	68 Way Socket	1
SK2	25	11139321	40 Way Socket	1
	26	11139681	Washer M2.5	2
	27	11139781	Nut M2.5	2
	28	11139881	Screw M2.5	2

7. Network Diagrams



Basic (Unbranched) Network Configuration

Printed in England by Studio Press SP/0485/2.5M/AT

WINCHESTER

11

Winchester

Winchester

Contents

1. Assembly And Disassembly
2. Electrical System
3. Electronic System
4. Parts List
5. Circuit Diagrams

1 Assembly and Disassembly

1 General Recommendations
2 Rear Panel And Top Cover
3 Chassis Bridge
4 Winchester Disk Drive

1 Assembly And Disassembly

1. General Recommendation

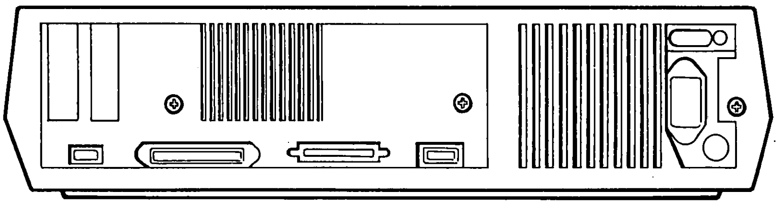
1. Disconnect from mains supply before disassembling machine.
2. Unless specifically noted, assembly is the reverse of Disassembly and will not be described unless necessary.
3. Do not mix screws (length, diameter)
4. A number in parenthesis thus (4) indicates the number of screws to be slakened or removed to remove that particular part.

   Warning -

   When bench testing or working on a drive, a foam mat should be placed underneath the unit to reduce the risk of accidental damage if the drive is dropped or topples over. It is recommended that a PVC skinned foam sheet approximately one inch thick is used.

   Engineers are reminded that the Winchester module is a sealed unit. Removal of the module cover will render any returns void.

2 Rear panel and top cover

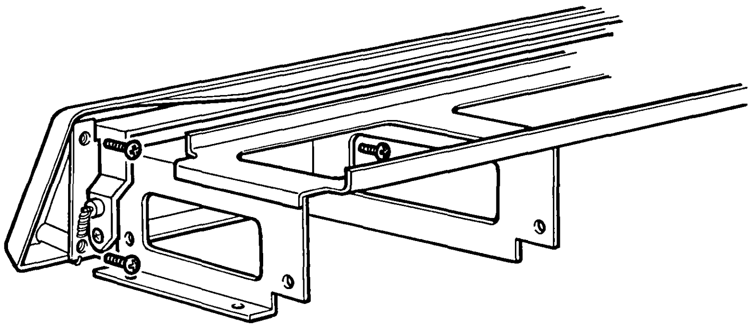


1. Remove M4 X 12mm screws (3).
2. Allow rear panel to tilt backwards and remove top cover by lifting at rear slightly and disengaging lip from front bezel.
3. Remove A.C input connector on P.S.U and all earth leads.

Assembly

Reverse of above procedure.

3. Chasis Bridge Assembly

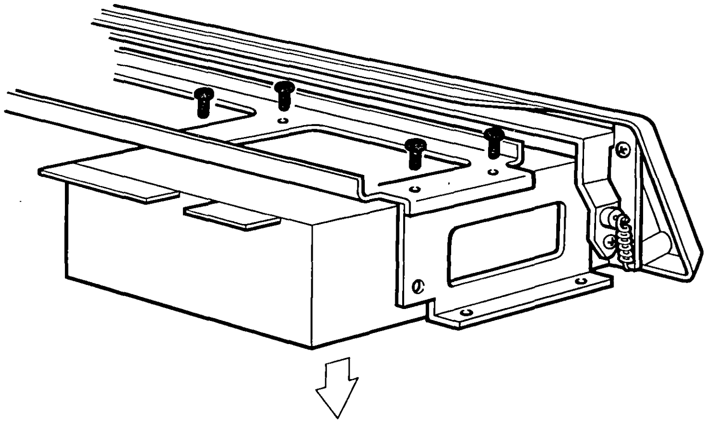


1. Remove rear panel and top cover as in Section 1.
2. Disconnect power and ribbon cables from disk drives.
3. Slaken M3 x 6mm screws (4)
4. Lift chassis bridge assembly away from the main chasis.

Assembly

Reverse of above procedure.

4. Winchester Disk Drive



1. Remove chassis bridge assembly as in Section II
2. Remove 9 x 36 unc screws (4)
3. Slide Winchester drive out.

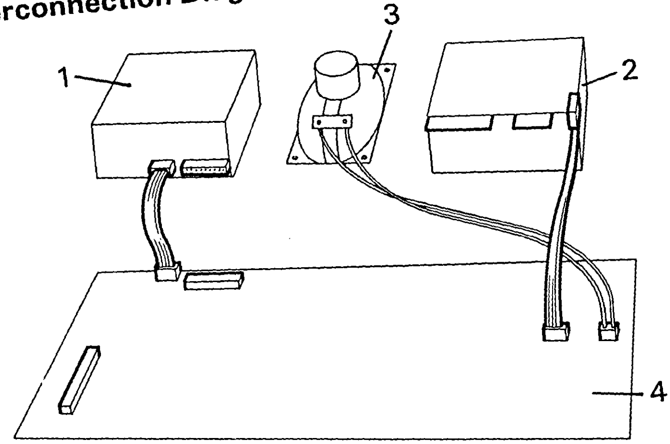
Assembly

Reverse of above procedure.

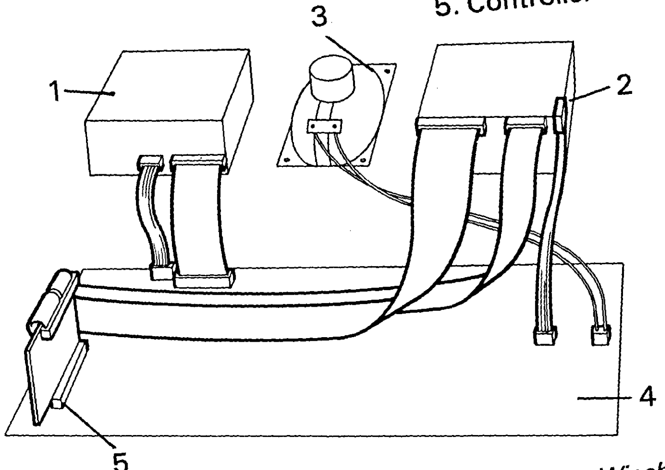
Electrical System

1. Interconnection Diagram
2. Connector Pin-Outs

1. Interconnection Diagram



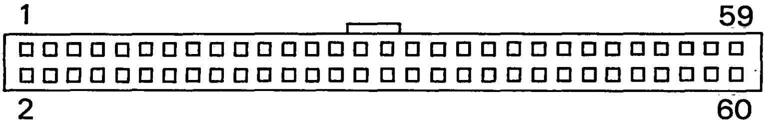
1. Floppy Drive
2. Winchester Drive
3. Loud Speaker
4. PCB
5. Controller



2. Connector Pin-Outs.

Winchester Cable Controller End

↓ Red strip denotes pin 1.



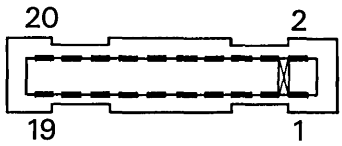
2	RWC	28	Drive Select 2
4	Head Select 2	30	Drive Select 3
6	Write Gate	32	Drive Select 4
8	Seek Complete	34	Dir
10	Track 00	36	
12	Write Fault	38	
14	Head Select 0	40	
16		42	
18	Head Select 1	44	
20	Index	47	+MWD
22	Ready	48	—MWD
24	Step	51	+MRD
26	Drive Select 1	52	—MRD
		54	

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 36, 38, 40, 42, 45, 46, 49, 50, 53, 54 Ground returns.

55-60 not used

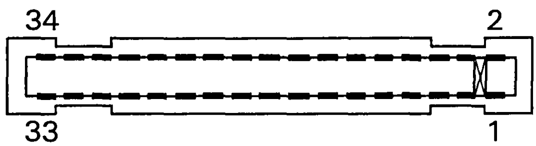
Winchester Cable Drive End

Data Interface



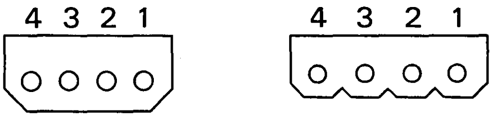
GND	Signal Pin	Signal Name
2	1	Drive Selected
4	3	Reserved
6	5	Spare
8	7	Reserved
10	9	Spare
	11	GND
	13	+MFM write data
	14	—MFM write data
16	15	GND
	17	+MFM read data
	18	—MFM read data
20	19	GND

Winchester Cable Drive End Control Interface



GND Pin	Signal Pin	Signal Name
1	2	Reserved
3	4	Reserved
5	6	Write gate
7	8	Seek complete
9	10	Track 0
11	12	Write fault
13	14	Head select 0
15	16	Reserved
17	18	Head select 1
19	20	Index
21	22	Ready
23	24	Step
25	26	Drive Select 1
27	28	Drive Select 2
29	30	Drive Select 3
31	32	Drive Select 4
33	34	Direction IN

Winchester Drive Power Cable



	Drive		Motherboard	
Pin	Signal	Wire Colour	Signal	Wire Colour
1	+12V	Yellow	+5V	Red
2	0V	Black/White	0V	Black
3	0V	Black	0V	Black/White
4	+5V	Red	+12V	Yellow

Electronic System 3

1. Outline Of Controller.
2. Integrated Circuit Catalogue
3. Mnemonics

1. Outline of Controller

Introduction

The Winchester disk drive controller is a single board expansion card which fits into either one of the system expansion slots and connected to the disk drive by a ribbon cable.

The board acts as the interface between the processing system and the Winchester disk drive.

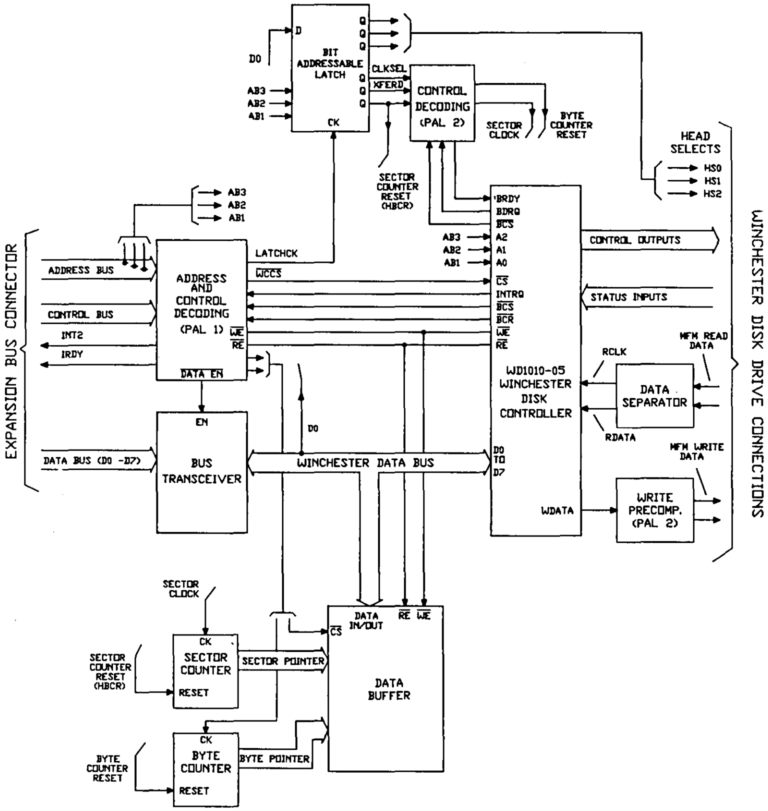
Description

The controller is broken into seven parts; the WD1010-05, Data seperator, write precompesation, addressing, RAM buffer control port and finally a data bus.

Winchester Disk Controller (WD1010-05)

The Winchester disk interface consists of a WD1010-05 and associated buffers.

The interface provides all the control functions necessary for formatting and transferring data to and from the winchester disk.



Winchester Controller Board Block Diagram

The WD1010-05 is selected by WCCS from PAL1.

Head select is controlled by the control port (IC8).

The controllers registers are selected by AB1 – 3 from the Apricot.

Data Separator.

The DP8460 (IC2) data separator receives digital pulses from a differential line receiver which converts the data from balanced to TTL format. The data separators lock to the frequency of these input pulses and separates them into synchronized data and clock signals.

Write Precompensation

The Rodime RO350 does not require write precompensation although the controller is capable of producing early, normal and late data. Write data (WDATA) from the WD1010-05 can be used to drive a delay line, (Not normally fitted). This generates two extra write data signals delayed by 10ns and 20ns. These data signals are then selected by PAL2 which is controlled by RWC/EARLY and LATE from the WD1010-05.

The write data output of PAL2 is converted to balanced format by the differential line drive.

Addressing.

The PAL1 is used to interface the address bus from the Apricot to the Winchester controller. It receives address lines AB4-AB8 which allows the controller to detect accesses to the WD1010-05.

The control port and the data port AB0 qualifies the device selects and ALE is used to prevent glitches as the addresses change.

When the WD1010-05 isolates the local bus to perform a data transfer the PAL1 would produce NRAMCS from the appropriate address. PAL1 is also enabled by BCS from the WD1010-05.

The WD1010-05 interrupt request output (INTRQ) is bufferd by PAL1 and output as NINT2 to the Apricot.

To meet the address setup times of the WD 10 10-05, the read enable signal is delayed by qualifying it with the data enable signal whenever the controller is addressed by the Apricot IC8 also adds additional wait states by holding IRDY low until its Qc output goes high. This counter is clocked by the 5MHz clock (CLK5).

The expansion bus is buffered by tri-state drivers to avoid contention with other expansion cards.

Control Port

The control port (IC6) is an 8 bit addressable latch enabled by the signal latch-CK from PAL 1.

The signals HSO-HS2 are used to select the winchester head.

CLKSEL defines if the system processor or the WD1010-05 causes the sector pointer to be incremented.

XFERD is a handshaking protocol informing the WD1010-05 that data is available.

HBCR is used to reset both the sector pointer and the byte pointer to zero. It is controlled by the system processor.

Data Bus

The local data bus is isolated from the expansion bus by IC5 an octal bus transceiver. Its direction is controlled by NIORC from the Apricot and enabled by NDATAEN from PAL 1.

Static Ram.

This 8K x 8 or 2K x 8 bit buffer acts as a temporary store for all data transfers. Data is written into the buffer from the Apricot and then access is passed to the WD1010-05 which transferes the data to the winchester disk.

RAM chip select, read enable and write enable are controlled by PAL 1.

The RAM addresses are generated by counters which form the byte pointer(IC7 +IC10) and sector pointer(IC8).

The byte counter is incremented by the byte clock from PAL 1 and goes high whenever RE or WE is active from either the CPU or WD10105.

The sector counter is clocked by sector CLK from PAL2. This is derived from either the Byte counter reaching its maximum count or from the buffer data request of the WD1010-05.

The byte counter is reset by the signal BCR from IC4. This is generated by either the system (HBCR) or the WD1010-05 (NWBCR).

The sector counter is only reset by the system (HBCR), this is to allow for a WD1010-05 option to be implemented.

Individual Bytes within the buffer cannot be specified by the system or WD1010-05.

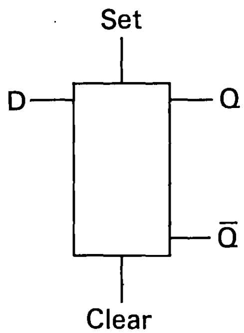
Byte counter specify a particular byte within a 512 byte section. The sector counter specifies a particular 512 bytes.

2. Integrated Circuit Catalogue

IC No.	Component	Description
1	WD1010-05	Winchester disk controller
2	DP8460-4	Data separator
3	PAL 20210	Program array logic
4	PAL 14H4	Program array logic
5	74LS245	Octal bus tranceiver
6	74LS259	8-bit addressable latch
7	74LS393	Dual 4 bit binary counter
8	74LS393	Dual 4 bit binary counter
9	26S02	Dual retriggerable monostable
10	74LS74	D-type edge triggered
11	74LS374	Octal D-type latch
12	74LS240	Octal buffered line driver/receiver
13	74LS240	Octal buffered line driver/receiver
14	HM6264P-15	8K x 8 static RAM
15	NOT FITTED	Delay line
16	SN75116	Differential line driver/receiver

IC	10

74S74 D-Type Flip-Flop

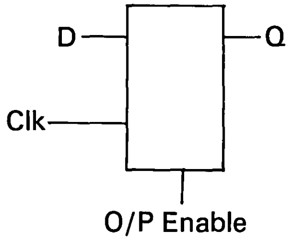


a) Produces the most significant bit of a 9 bit counter for the byte count.

b) Divides VCO by two to generate the read clock for the WD1010-05.

IC	11

74LS374 Octal D-Type Flip Flop.



Latches write data and precompensation outputs from the Write data and precompensation outputs from the Winchester controller. It also latches write clock and buffer data request.

IC	12, 13

74LS240 Octal Buffer Line Driver/Receiver

IC 12 Seven buffers are used to buffer controller signals to the Winchester disk drive. The remaining buffer is used as an input to a 4 bit binary counter for the sector clock.

IC 13. Buffers used to buffer Winchester controller signals from the Winchester disk drive.

IC	7, 8

74LS393 4 Bit Binary Counter

IC 7 dual 4 bit counter used to produce 8 bits of a 9 bit byte counter.

IC8 One counter used for the sector counter and the second allows for the addition of extra wait states.

IC	6

74LS259 8 Bit Addressable Latch

Select Inputs			Latch
C	B	A	Addressed
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3
H	L	L	4
H	L	H	5
H	H	L	6
H	H	H	7

IC 6 Apricot address lines AB1-3 are decoded by this control port to give head select, HBCR, XFERD and CLKSEL.

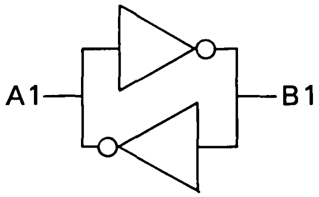
IC	9

AM26502 Dual Retriggerable Mono Stable.

Monostable triggered by read data will detect all 0's or 1's and produces DRUN. DRUN is used by the WD1010-05 to indicate pre-amble (all 0's)

IC	5

74 LS 245 Octal Bus Transeiver



Function Table		
Enable G	DIR	Operation
L	L	B Data To A Bus
L	H	A Data To B Bus
H	X	Isolation

IC 5 Bi-directional buffer connecting expansion bus to Winchester controller bus enabled by DATEN.

IC	3, 4

Pal Programable Array Logic

Description of PAL.

The programmable array logic is used to reduce the number of discrete TTL components to allow the complex circuitry to fit onto a smaller area.

IC 3 PAL 1. The main function is address decoding from the Apricot.

IC 4 PAL 2. This PAL operates as a data selector to choose early data (EDATA), normal data (NDATA) and late data(LDATA) from the delay line. This is controlled by RWC/EARLY/LATE.

3. Mnemonics

Signal	Description	IC	Pin
Clk5	5MHz clock	PAL1	B18
AB0	System address bus	PAL1	
Ale	Address latch enable	PAL1	5
IORC	Input output read command	PAL1	2
DEN	Data enable	PAL1	3
IOWC	Input write command	PAL1	4
DB0-7	Data bus	IC5	2 3 4 5 6 7 8 9
DATAEN	Data enable	PAL1	15
INTRQ	Interrupt request	PAL1	1
WCCS	Winchester controller chip select	PAL1	23
BSC	Buffered chip select	PAL1	19
RAMCS	Ram chip select	PAL1	18
Q2	Delayed read	PAL1	13
RDY	Ready	PAL1	17
IRDY	Input output ready	PAL1	
WE	Write enable	PAL1	21
INT2	Interrupt request 2 ext.	PAL1	22
RE	Read enable	PAL1	20
BYTECLK	Byte clock	PAL1	16
LATCHCK	Latch clock	PAL1	14
MR	Memory read	IC1	5
CLKSEL	Clock select	PAL2	13
XFERD	Data transferred	PAL2	8
SECTOR CK (SCLK)	Sector clock	PAL2	14
BYTE CTR (BCR)	Byte counter	PAL2	15

Signal	Description	IC	Pin
RAMA8	Ram address 8	PAL2	12
RES	Master reset	IC1	5
WBCR	Winchester buffer count reset	PAL2	9
BRDY	Buffer ready	ICI	35
BDRQ	Buffer data request	IC1	36
STEP	Step	IC1	27
DIR	Buffer direction control	IC1	26
WG	Write gate	IC1	24
RWC	Reduced write current	IC1	33
INDEX	Index pulse	IC1	29
TK00	Track zero	IC1	31
READY	Ready disk	IC1	28
WF	Write fault	IC1	30
WC	Write clock	IC1	25
RCLK	Read clock	IC1	39
RDATA	Raw data	IC1	37
READ GATE	Read gate	IC1	38
DRUN	Data run	IC1	34
WDATA	Write data	IC1	21
LATE	Late (write precompensation)	IC1	22
EARLY	Early (write precompensation)	IC1	23
DS1	Drive select	PL2	
DS2-4	Drive select	PL2	28 30 32
HS0-2	Horizontal sync	PL2	14 18 4
WCLK	Write clock	PP3	4
MFMRD	Modified frequency modulated read data	IC2	20
MWD+/—	Modified frequency modulated write data	IC16	4+ 2—
VCO	Variable crystal oscillator	IC2	8
EDATA	Early data	PAL2	1
NDATA	Normal data	PAL2	2
LDATA	Late data	PAL2	3

4 Parts List

PCB Bill Of Materials For Apricot Winchester Controller
Options: Multiple sector transfers, 8Kx8 sector buffer, no write pre-compe

Part	Qty	Component
IC1	1	WD1010-05
IC2	1	DP8460-4
IC3	1	PAL20L10
IC4	1	PAL14H4
IC5	1	74LS245
IC6	1	74LS259
IC7	1	74LS393
IC8	1	74LS393
IC9	1	26S02
IC10	1	74274
IC11	1	74LS374
IC12	1	74LS240
IC13	1	74LS240
IC14	1	HM6264P-15 8Kx8 RAM 200nS or less
IC15	0	Not fitted on this version
IC16	1	SN75116 (Texas)
X01	1	10MHz crystal oscillator
RP1	1	8-pin SIL Res Pak 220/330R
RP2	1	8-pin SIL Res Pak 10K
RP3	1	8-pin SIL Res Pak 1K
R1	1	4K99 0.5% 0.125W H8
R2	1	100K 1% 0.25W MFR4
R3	1	1K5 1% 0.25W MFR4
R4	1	1K5 1% 0.25W MFR4
R5	1	4K7 1% 0.25W MFR4
R6	1	200R 1% 0.25W MFR4
R7	1	1K00 0.5% 0.125W
R8	1	47K 1% 0.25W MFR4
R9	1	1R 5%
R10	1	Not fitted to this version
RV1	0	Not fitted to this version
C1	1	47uF 10V electrolytic (axial)
C2	1	1uF 5% 63V MKS4
C3	1	0.1uF 5% 100V MKS4
C4	1	1.0nF 10% FKC2
C5	1	1.0nF 10% FKC2

Part	Qty	Component
C6	1	6.8nF 5% FKP2
C7	1	150pF 1% 630v Polystyrene
C8	1	100pF 1% 630V Polystyrene
C9	1	100pF 1% 630V Polystyrene
C10	0	Not fitted to this version
C11-C20	10	0.01uF Ceramic
J1	1	64-way DIN 41612 right-angle plug
A1	1	Apricot Winchester Disk Interface Part no. 111115-41
A2	1	Apricot Winchester Disk Power Cable Part no. 111118-41
A3	1	Paxolin cable protector Part no. 111119-61
	2	M2.5x14mm screws
	1	M2.5x6mm screw
	3	M2.5 nuts
	3	M2.5 shakeproof washers
	1	Disk Drive or Chassis Bad Sector

5 Circuit Diagrams

1. Winchester Controller CCT
2. Component Layout

Printed in England by Studio Press SP/0485/1M/AT

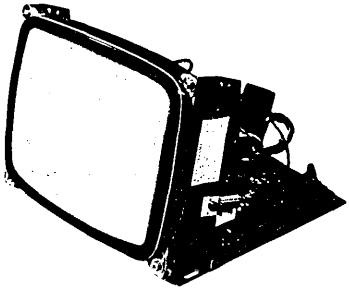
MONITOR

A

CODE No. FTD83105021C2

Service Manual

CRT Data Display
MODEL K-907A9
Chassis No. Y08A



CONTENTS

SAFETY PRECAUTIONS 1
GENERAL INFORMATIONS 1
CRT DATA DISPLAY SPECIFICATIONS 2
CONNECTOR WIRING 4
TIMING CHART 4
BLOCK DIAGRAM 5
MONITOR CIRCUIT BOARD DETAIL COMPONENT LOCATION 6
CONTROL DESCRIPTION 7
ALIGNMENT PROCEDURE 8
PREASSEMBLY INSPECTION AND HANDLING INSTRUCTIONS 10
CAUTION FOR SERVICING 10
MONITOR CIRCUIT BOARD-SOLDER VIEW 11
SCHEMATIC DIAGRAM FOR K-907A9 12
TROUBLE SHOOTING HINTS 13
REPLACEMENT PARTS LIST 18

Panasonic®

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

SAFETY PRECAUTIONS

1-1 CAUTION:

No modification of any circuit should be attempted. Service work should only be performed after you are thoroughly familiar with all of the following safety checks and servicing guide lines.

1-2 SAFETY CHECK

Care should be taken while servicing this CRT display because of the high voltage used in the deflection circuits. These voltages are exposed in such areas as the associated flyback and yoke circuits.

1-3 FIRE & SHOCK HAZARD

1-3-1 Insert an isolation transformer between the CRT display and AC power line before servicing chassis.

1-3-2 In servicing pay attention to original lead dress especially in the high voltage circuit. If a short circuit is found, replace all parts which have been overheated as a result of the short circuit.

1-3-3 All the protective devices must be reinstalled per original design.

1-3-4 Soldering must be inspected possible for cold solder joints, frayed leads, damaged insulation, solder splashes or sharp solder points. Be certain to remove all foreign material.

1-4 IMPLOSION PROTECTION

All Panasonic picture tubes are equipped with an integral implosion protection system, but care should be taken to avoid damage and scratching during installation. Use only Panasonic replacement picture tubes.

1-5 X-RADIATION

WARNING: The only potential source of X-Radiation is the picture tube. However when the high voltage circuitry is operating properly there is no possibility of X-Radiation problem. The basic precaution which must be exercised is to keep the high voltage at the following factory-recommended level.

Note: It is important to use an accurate periodically calibrated high voltage meter.

1-5-1 To measure the high voltage, use a high impedance high voltage meter.
Connect (-) to chassis and (+) to the CRT anode button.

1-5-2 Turn the Brightness control fully counterclockwise.

1-5-3 Measure the high voltage. The high voltage meter should indicate at the following factory-recommended level.

1-5-4 If the upper meter indication exceeds the maximum level, immediate service is required to prevent the possiblity of premature component failure.

1-5-5 To prevent X-Radiation possibility, it is essential to use the specified picture tube.

1-5-6 The nominal high voltage is 11KV and must not exceed 14.5KV at zero beam current at rated voltage.

INPORTANT SAFETY NOTICE

There are special components used in Panasonic CRT displays which are important for safety. These parts are identified by the international symbol ⚠ on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacture's specified parts to prevent X-RADIATION, shock, fire or other hazards. Do not modify the original design without written permission of the Panasonic company or this will void the original parts and labor guarantee.

GENERAL INFORMATIONS

Here is an outline of Model K-907A9.
These a model are CRT DATA DISPLAY of metal frame type.
K-907A9 uses P39 (Green) phosphor and Polish Cathode Ray Tube.
For improke the interlace, add High Voltage block and make stabilization of High Voltage.
Input signal is separate type and each input signal is put through 10 pin-cardedge connector on the P.C. Board.

When connecting to equipment, directly connect it to printed circuit board input terminal through 10-pin card edge connector.

Input signal is for TTL level.

In additon, +B is supplied from the outside through 10-pin card edge connector, operating the monitor on +11.8 DC.

Features:
CRT is exceptionally superb in quality and reliability and is of Polish type (direct etched CRT). Phospher P39.

The deflection coil is a yoke equipped with 4-P magnet and is of PANASONIC's own design that permits adjustment of geometric distortion on the raster.

In order to meet users' requirements, frame mechanism is employed for easy adjustment of CRT setting angle.

Angle can be changed by stages such as 0°, 2.5°, 5°, 7.5° and 10°

Chassis is fully equipped with ICs:
Vertical deflection
H.AFC/OSC

F.B.T is sealed up for assuring high quality and reliability.

All connections are equipped with connectors to make servicing easier.

CRT DATA DISPLAY SPECIFICATIONS

1. PHYSICAL CHARACTERISTICS

Dimension:	
Height:	174mm max.
Width:	241 ±1.5 mm
Depth:	226 ±5.0 mm
Weight:	6.2 lbs (2.8 kg)
Picture Tube:	240AMB39 polish Visual 9" 90° def. 20 mm dia.
Tilt:	10° ± 1°

2. ELECTRICAL CHARACTERISTICS OF CRT DISPLAY MONITOR

Power Requirements:	DC 11.8V 1.0A
Signal Input (cf. page 4)	
Video Input Signal Requirements	
	Black level = 0 + 0.4 -0.0V
	White level = 4 ± 1.5V
Input Impedance:	300 ohms min 40pF max.

VERTICAL INPUT SYNC SIGNAL REQUIREMENTS

Active Polarity:	Positive
Pulse Rate:	71.9 Hz
Pulse Width:	158μs
Amplitude:	Low = 0 + 0.4 - 0.0V High = 4 ± 1.5V
Input Impedance:	1 Kohm min. 40pF max.

HORIZONTAL INPUT SYNC SIGNAL REQUIREMENTS

Active Polarity:	Positive
Pulse Rate:	15.79 kHz
Pulse Width:	8.0μs
Amplitude:	Low = 0 + 0.4 - 0.0V High = 4 ± 1.5V
Input Impedance:	2 Kohms min. 40pF max.
Video Amplifier Band Width:	25 MHz typ
Resolution:	≧ 800 TV Lines at center ≧ 650 TV Lines at corner
Character Area	
Vertical:	120 ±5mm
Horizontal:	150 ±5mm
	*According to the attached timing chart
	* +B = 11.8 ± 0.05V

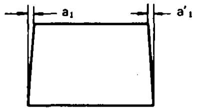
BLANKING TIME REQUIREMENTS

Vertical:	1200 μs min.
Horizontal:	10 μs min.
Deflection Linearity	
Vertical:	10 %
Horizontal:	10%
Raster Distortion:	See Fig. 1
Centering:	See Fig. 2
H. Tilt:	See Fig. 3
Storage Temperature	- 40 ~ + 65°C
Humidity:	5 ~ 90% (Non-Condensing)
Altitude:	0 ~ 40,000 Feet
Operating Ambient Temperature:	0 ~ 55°C
Humidity:	5 ~ 90% (Non-Condensing)
Altitude:	0 ~ 10,000 Feet

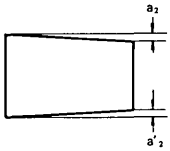
Deflection linearity: $\left(\frac{\text{max} - \text{min}}{\text{max} + \text{min}} \times 100\right)$

NOTE:
- Be sure not to power-off within 10 seconds after power-on to avoid spot-burn.
- SG and FG (Franme ground) are separated by 100 K ohm resister.

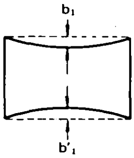
1. Trapezoid



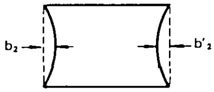
$a_1, a'_1 \leqq 2.4$ mm
$a_2, a'_2 \leqq 1.7$ mm



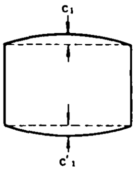
2. Pincushion



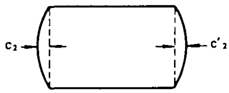
$b_1, b'_1 \leqq 0.9$ mm
$b_2, b'_2 \leqq 1.2$ mm



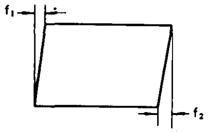
3. Barrelling



$c_1, c'_1 \leqq 0.9$ mm
$c_2, c'_2 \leqq 1.2$ mm



4. Parallelogram



$f_1, f_2 \leqq 2.0$ mm

Fig. 1 GEOMETRIC DISTORSION

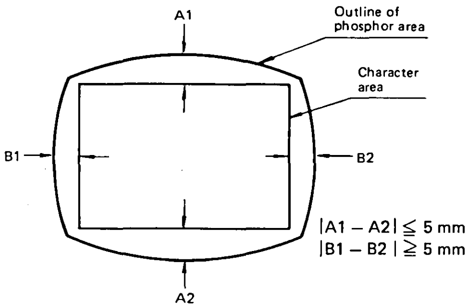


Fig. 2 CENTERING

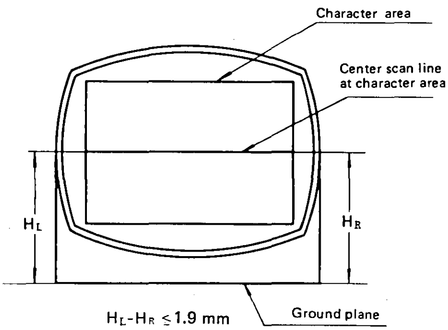
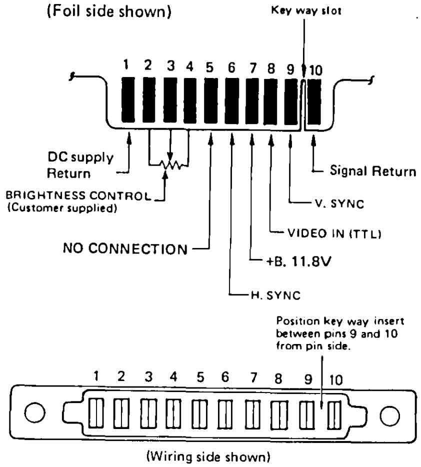


Fig. 3 HORIZONTAL TILT

CONNECTOR WIRING

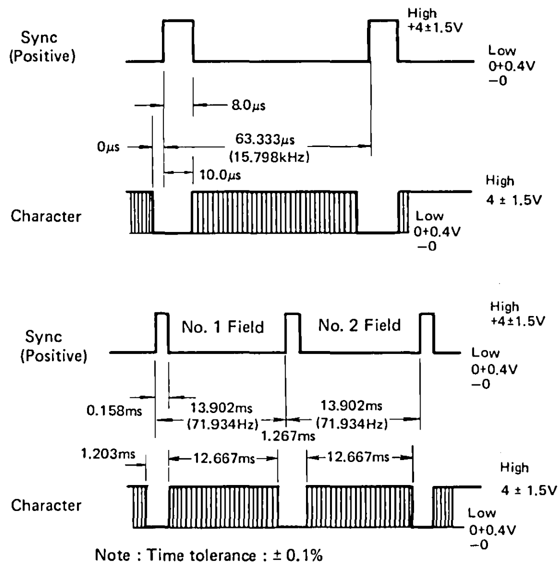
P.C.B. CARD EDGE CONNECTION



TIMING CHART

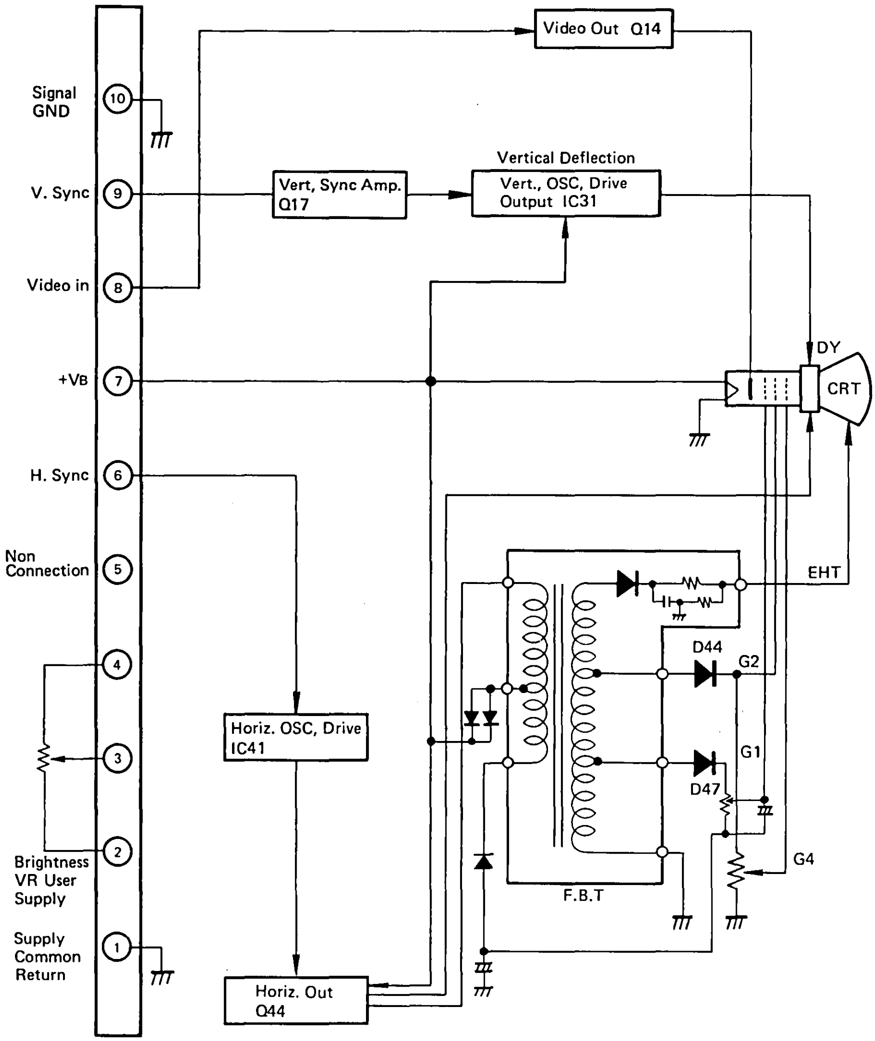
Horizontal Sync. Timing

Vertical Sync. Timing

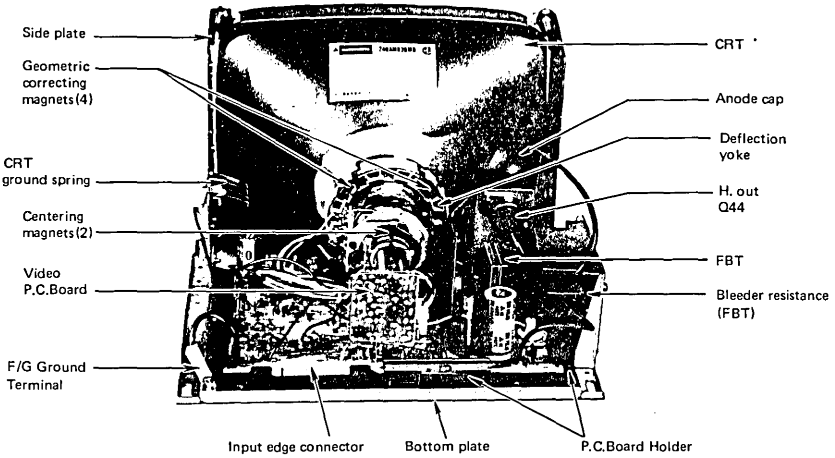


Note : Time tolerance : ± 0.1%
Unit is adjusted according to this timing and frequency.
Example:
Dot freq. : 15.000 MHz
Character block : 10 x 16
Total characters : 80 x 25

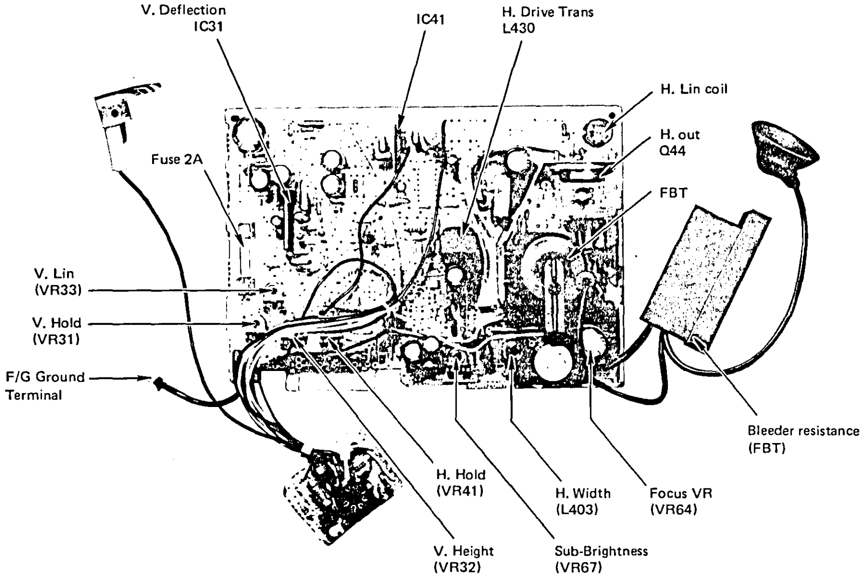
BLOCK DIAGRAM



MONITOR CIRCUIT BOARD DETAIL COMPONENT LOCATION

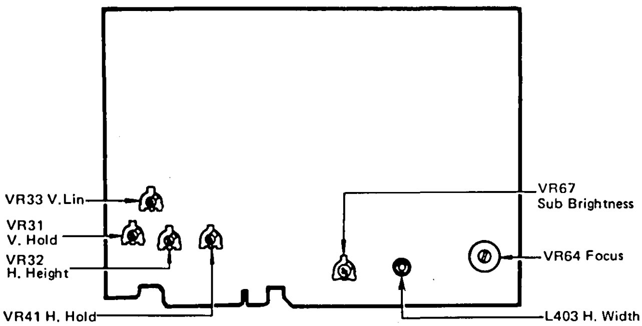


Rear Chassis View

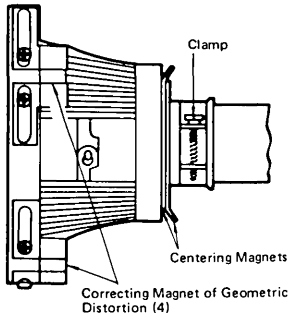


Monitor Circuit Board Detail-Component Location

CONTROL DESCRIPTION



Main P. C. Board-Top View



Deflection Yoke Side View

Vertical Hold (VR31):
Stabilizes the raster vertically.

Vertical Height (VR32):
Adjusts the height of the active display area.

Vertical Linearity (VR33):
Adjusts the height of the characters within the active display area.

Horizontal Hold (VR41):
VR41 can be considered a fine adjustment for the horizontal stability and position of the display area
Adjust VR41 to center the display area.

Horizontal Width (L403):
Adjusts the width of the active display area.

Sub Brightness (VR67): (Internal)
Adjusts the brightness of the raster.

Brightness: (User Supply)
Adjust the brightness of the raster.

Focus (VR64):
Adjusts the focus in the center of the active display area. Keep the whole picture uniform and then adjust it to the best point.

Tilt Adjustment (1):
The tilt adjustment entails the use yoke clamp.
Loosening the yoke clamp and rotating the yoke either clockwise or counter-clockwise corrects the tilt of the raster.

Centering Magnets (2):
(Located on the yoke between the yoke electrical termination and the yoke clamp.) These controls are used to center the raster vertically.

Geometric Positioning Magnets (4):
(Located around the yoke periphery) adjusts the geometric shape of the active display area.

ALIGNMENT PROCEDURE

PREPARATION

1. Connect the 10-Pin connector from the proper logic to the defined input signal.
2. Apply power to the CRT data display and allow the monitor to stabilize.
3. Adjust coils by means of a hexagonal tuning tool (non-metalic).
   Variable resister by – screw driver and deflection yoke (deflection distortion) by square tuning tool (non-metalic).
4. All controls are set at optimum position prior to shipment.

Checking of height, width and bright should be performed more than 30 minutes after power is applied.
Measure the luminous intensity near the center of CRT and set at 50 Lx ±20% (40 to 60 Lx). These adjustment are performed on the basis of the input signal of timing chart (page 4).

ADJUSTMENT PROCEDURE

• Image Tilt Adjustment

Loosen the deflection yoke clamp and turn in the arrow directions to adjust tilt. (See Fig. 4).

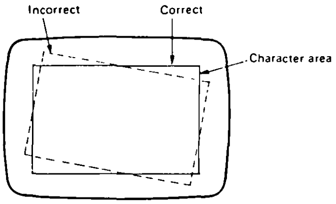


Fig. 4

• Horizontal Hold Adjustment

Adjust the VR41 to get stable character (syncroning condition) as shown in below (See Fig. 6).
Under the condition of free running i. e. horizontal sync signal is disconnected.

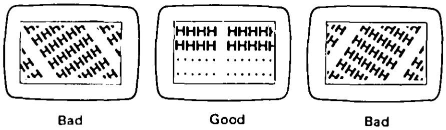


Fig. 6

• Vertical Hold Adjustment

Adjust (VR31) until the image becomes stable vertically as shown in Fig. 5.

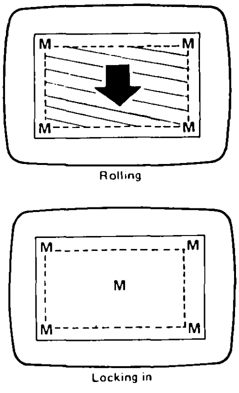


Fig. 5

• Vertical Height Adjustment

Adjust the vertical height (VR32) to set the vertical height of the active character area as shown in Fig. 8.

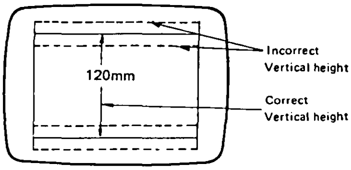


Fig. 8

• Horizontal width Adjustment
Adjust the horizontal width coil (L403) to set the proper width of the active character area as shown in Fig. 9.

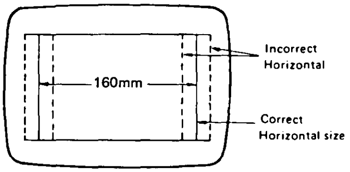


Fig. 9

• Vertical Linearity Adjustment
Adjust (VR33) for uniform character height within the active character area as shown in Fig. 10.

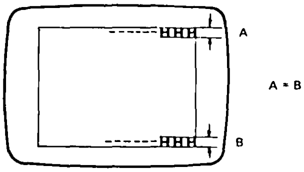


Fig. 10

• Centering Magnet Adjustments
Rotate the centering magnet tabs away from each other until the character area is centered on the screen as shown in Fig. 11.
Before this adjustment, be sure to ascertain H. hold.

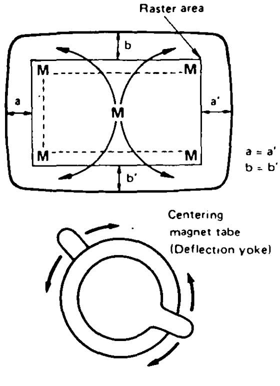


Fig. 11

• Focus Control Adjustment
Adjust (VR64) until optimum focus is seen on the characters displayed within the active character area.

• Sub Brightness Adjustment
Look at a place 30cm distant from the CRT surface and set at a point where the raster slightly comes out, with the contrasts VR set at min.

• Correcting Magnet of Geometric Distortion (4)
Adjust each "Distortion Correcting Magnet" until the active character area is adjusted to the proper shape as shown in Fig. 12.

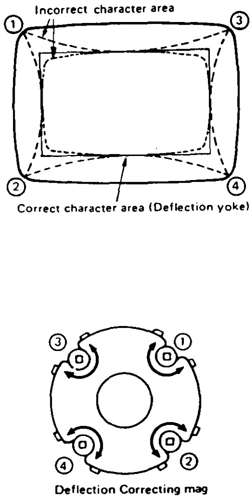


Fig. 12

PREASSEMBLY INSPECTION AND HANDLING INSTRUCTIONS

Caution:
Be sure all handling of the CRT Display is done by the CRT mounting brackets. At no time should the wires be used as a means of moving or carrying a given CRT Display. The CRT neck is the most fragile part of the CRT Display Module and extreme care should be taken not to bump, tap, or otherwise excert force on this neck.
Before applying power to the CRT Display an inspection should be preformed to insure that any foreign material has not been dropped in any part of the CRT Display.

1. Insure that the proper signal and power connections are made in accordance.
2. Apply power to CRT display under test and allow CRT display to stabilize for a minimum of 5 minutes.
   Note: All adjustments have made at the factory. This procedure is to insure that these adjustments have been made correctly.
3. When turn External Brightness Control to maximum and raster should be slightly visible.
4. Check CRT display for proper centering.
5. Check CRT display for the specified active character area per Page 2 of this Manual.
6. Check Geometric Distortion.
7. Check focus.
8. Check Power Supply Voltages in accordance per Page 2 of this Manual.

CAUTION FOR SERVICING

Be sure to provide power supply sequence of more than 100 ms.

Power ON-OFF
Do not turn OFF power supply when the CRT heater is not sufficiently heated. Otherwise, CRT may be burned in spot.

In case of servicing or replacing CRT, high voltage sometimes remains in the anode of CRT. So, completely discharge high voltage before servicing or replacing CRT so as to prevent a shock to the serviceman.
In this case, discharge to thr external conductive coating (aquadag) of CRT.

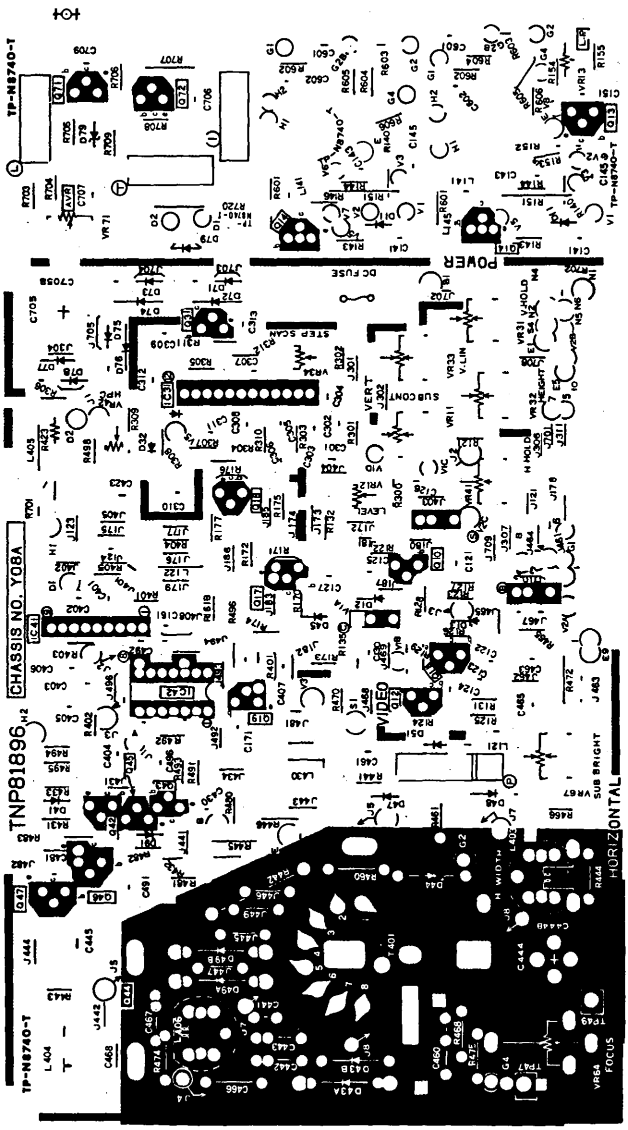
Discharging to other places will cause troubles. The heat sink of horizontal output transistor is applied with +B. So, do not earth it in case of servicing.

In case of storaging or transporting it, be sure to take some countermeasures for static electricity. When using a soldering iron, be sure to connect it to the earth.

The unused terminal should be soldered without fail.

MONITOR CIRCUIT BOARD-SOLDER VIEW

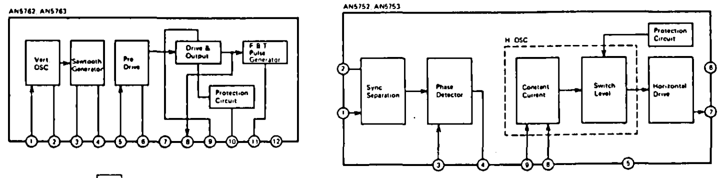
TNP81869



SCHEMATIC DIAGRAM FOR K-907A9

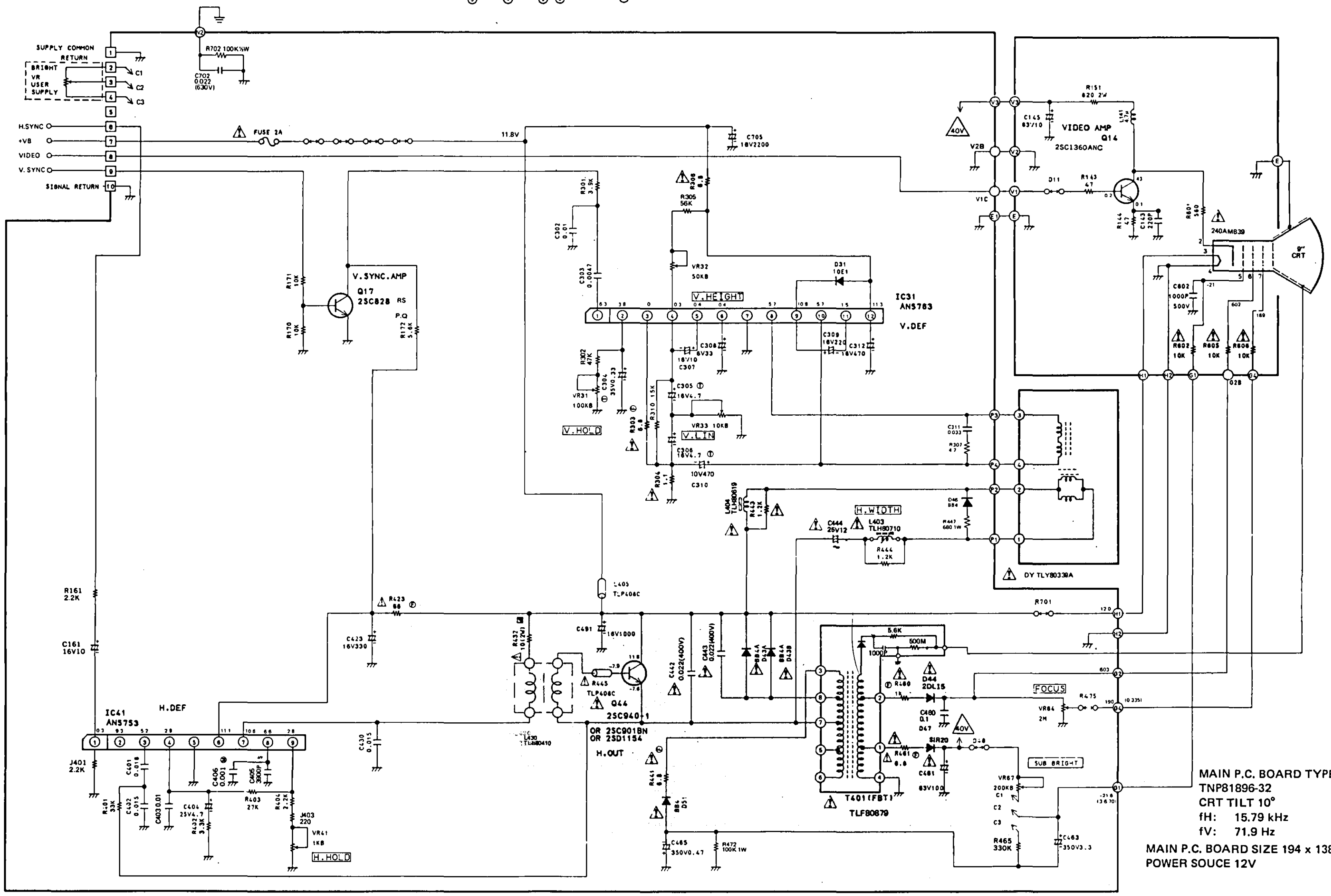
NOTE

1. RESISTOR
   All resistors are carbon 1/4W resistor, unless otherwise noted the following marks.
   Unit of resistance is OHM (Ω). (K=1,000, M=1,000,000)
   ▲ : Solid resistor
   Ⓕ : Non Flame
2. CAPACITOR
   All capacitors are ceramic 50V capacitor, unless otherwise noted the following marks.
   Unit of capacitance is μF, unless otherwise noted.
   Ⓜ : Polyester — Ⓢ : Polystylene capacitor
   Electrolytic capacitor — Ⓣ : Tantalum
3. COIL
   Unit of inductance is μH.
4. VOLTAGE MEASUREMENT
   a. Voltage is measured by a digital meter with DC 10MΩ OHM/V receiving normal signal.
   b. Use each measurement voltage for reference.



IMPORTANT SAFETY NOTICE

The component identified by shading or the international symbol ⚠ on this schematic diagram incorporates special features important for protection from X-Radiation, fire and electrical shock hazards. When servicing it is essential that only manufacturer's specified parts be used for those critical components.



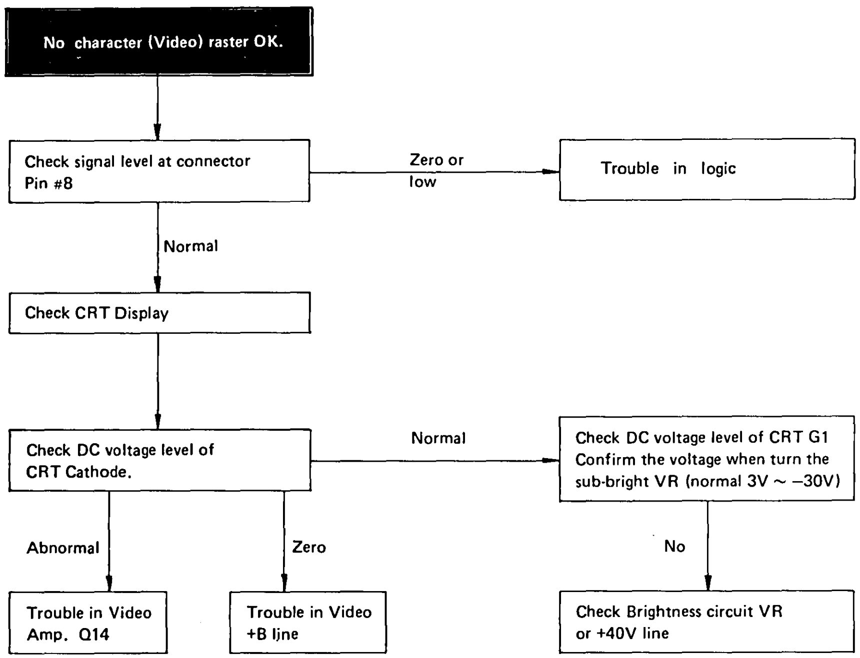
TRANSISTOR BASE INFORMATION

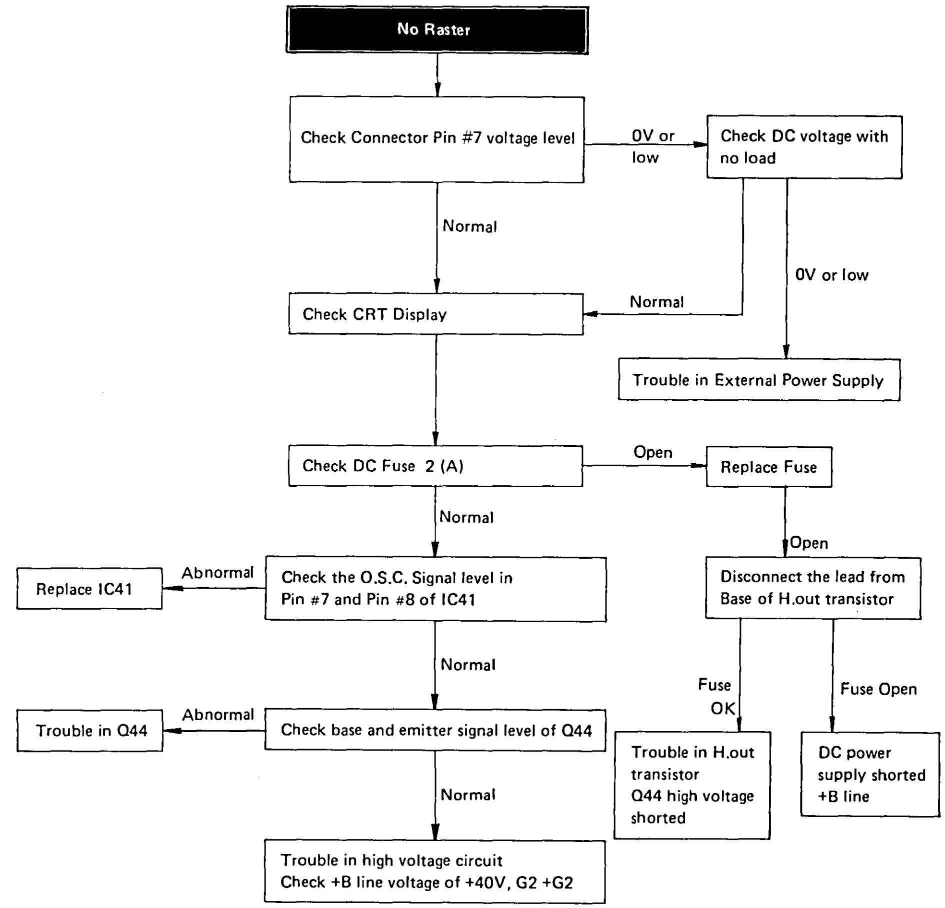
LOCATION	PARTS NAME
	2SC828 2SC829C 2SC945 2SC1318
	2SC1825 2SC1360ANC 2SC2632
	2SC940 2SC901BN 2SC1154
	AN5753 AN5752
	AN5762 AN5763 AN5763(N)
	MPD4011C TC4011BP MN4011B

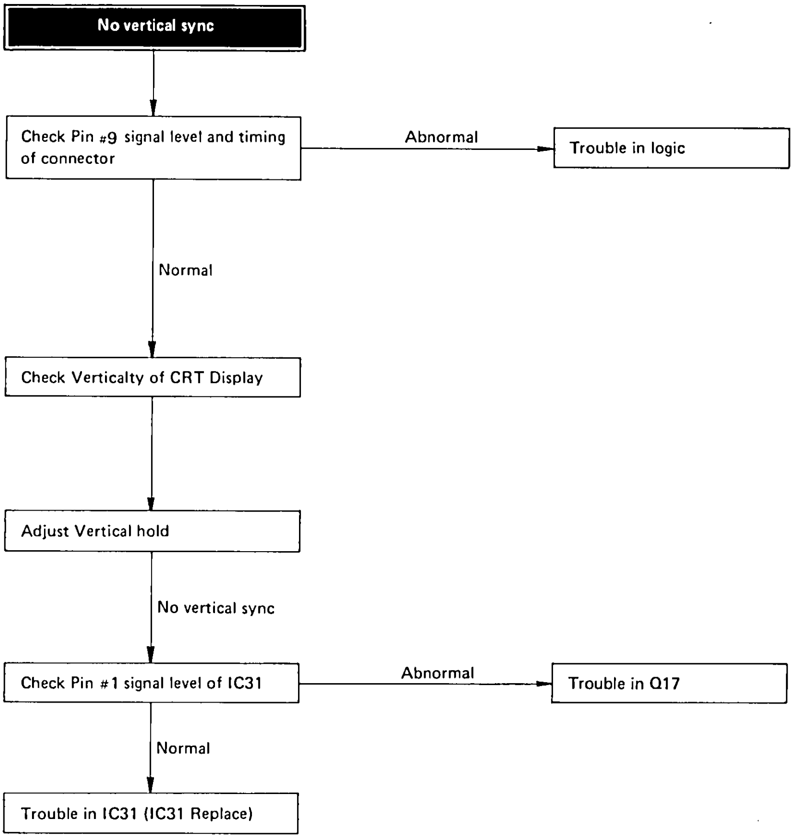
MAIN P.C. BOARD TYPE
TNP81896-32
CRT TILT 10°
fH: 15.79 kHz
fV: 71.9 Hz
MAIN P.C. BOARD SIZE 194 x 138
POWER SOUCE 12V

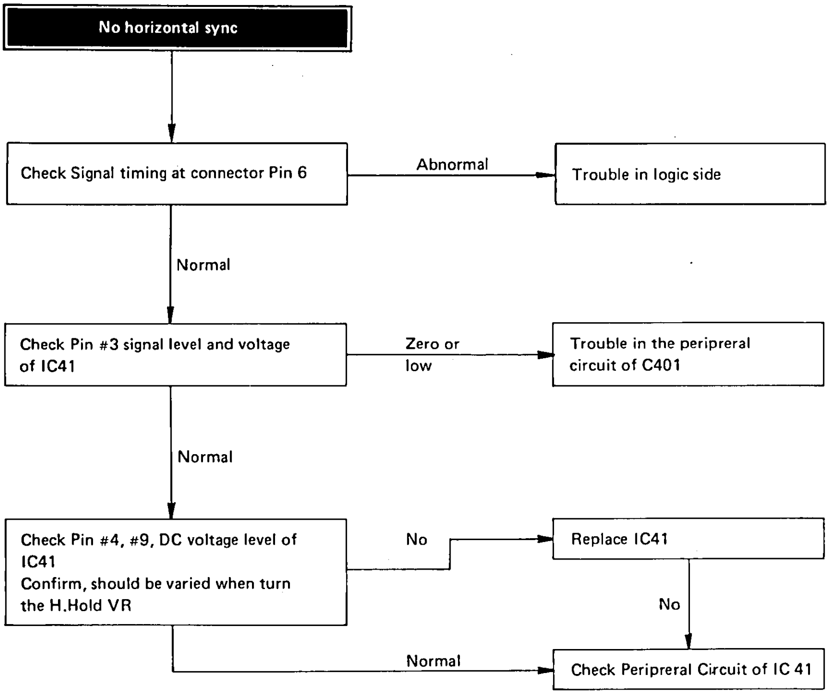
 K-907A9

TROUBLE SHOOTING HINTS






No vertical sync
Check Pin #9 signal level and timing of connector
Abnormal
Trouble in logic
Normal
Check Verticalty of CRT Display
Adjust Vertical hold
No vertical sync
Check Pin #1 signal level of IC31
Abnormal
Trouble in Q17
Normal
Trouble in IC31 (IC31 Replace)


No horizontal sync
Check Signal timing at connector Pin 6
Abnormal
Trouble in logic side
Normal
Check Pin #3 signal level and voltage of IC41
Zero or low
Trouble in the peripreral circuit of C401
Normal
Check Pin #4, #9, DC voltage level of IC41
Confirm, should be varied when turn the H.Hold VR
No
Replace IC41
No
Normal
Check Peripreral Circuit of IC 41

No vertical Sweep

IC31 are cosists V.osc V.amp and V output therefore, may be IC internal problem

Check Pin 2, 4, 5, 8 signal level of IC31 and Pin 12, DC voltage of +12V line

Abnormal → Trouble in IC31 (Replace 31)

No → Check peripreral circuit of IC31

Normal → Check deflection coil deflection coil connector

A vertical line in CRT Center

Check contact P1, P2 of deflection yoke

Bad. → Replace or Change

Normal → Check deflection coil open, H.Lin, Width (Replace parts)

REPLACEMENT PARTS LIST

Important Safety Notice

Components identified by the international symbol ⚠ have special characteristics important for safety.
When replacing any of these components use only manufacturer's specified parts.

Ref. No.		PART NO.	DESCRIPTION
CABINET AND MAIN CHASSIS PARTS			
		TUW81967-1	Side Plate (R)
		TUW81968-1	Side Plate (L)
		TUX80847-5	Bottom Plate
		TUX80721	(High Voltage) Bracket
		TBM81104	Model (Plate) K907A9
		TES8189-1	CRT Grounded Spring
		TKX822001	PCB Holder (Big)
		TKX822101	PCB Holder (Small)
		TMM1455	Beads Band
		TJC341	1P Terminal
		TMK81526	Insulator Sheet
		TMM81457	Nut
	⚠	240AMB39MD	Picture Tube
	⚠	TLY80339A	Deflection Yoke
		TNP81896-32	Main PCB Assy.
		TXAJTV4P179A	4P Connector Assy. (DY)
		TPC826071	(Outer) Carton K907A9
		TXAPD2M900Z	Filler Complete
		TPE814056	Set Cover
		TQF80525	Fuse Label
		TQF80759	Warning Label
		TQF80802	Service Warning Label
		TQF83825	Serial No. Label
		XSN4+8S	Screw (High Voltage Block)
		XTV3+15BFN	Screw (PCB Holder)
		XTV3+8BFN	Screw (1P Terminal Side Plate)
		XTB4+10AFN	Screw (CRT Spring)
		XTB4+20BFN	Screw (CRT)
		XWA4B	Washer (Side Plate)
		XWA3B	Washer (Side Plate)
		XWG5H14	Washer (CRT)
		XWC3BFN	Washer (1P Terminal)
TNP81896-32			
I. C			
IC31		AN5763	I.C
IC41		AN5753	I.C
TRANSISTORS			
Q14		2SC1360ANC	Transistor
Q17		2SC828AR	Transistor (Q, R)
Q44		2SC901BN	Transistor

Ref. No.		PART NO.	DESCRIPTION			
DIODES						
D31		TVS10E1	Diode			
D43A	⚠	TVSBB4A	Diode			
D43B	⚠	TVSBB4A	Diode			
D44	⚠	TVS2DL15	Diode			
D46	⚠	TVSBB4	Diode			
D47		TVSS1R20	Diode			
D51		TVSBB4	Diode			
COILS & TRANSFORMERS						
L141		TLT047-999	Peaking Coil	4.7μH		
L403	⚠	TLH80710	Horiz. Width Coil			
L404	⚠	TLH80619	Horiz. LIN. Coil			
L405		TLP408	Choke Coil			
L430	⚠	TLH80410	Horiz. Drive Trans.			
T401	⚠	TLF80879	Flyback Trans.			
CAPACITORS						
C143		ECCD1H221J	Ceramic	220pF	J	50V
C145		ECEA1JS100	Electrolytic	10μF	–	63V
C161		ECEA1CS100	Electrolytic	10μF	–	16V
C302		ECQM1H103JZ	Polyester	0.01μF	J	50V
C303		ECQM1H472JZ	Polyester	4700pF	J	50V
C304		ECSF35ER33V	Tantalum	0.33μF	–	35V
C305		ECSF16E4R7Y	Tantalum	4.7μF	–	16V
C306		ECSF16E4R7Y	Tantalum	4.7μF	–	16V
C307		ECEA1CS100	Electrolytic	10μF	–	16V
C308		ECEA0JS330	Electrolytic	33μF	–	6.3V
C309		ECEA1CS221	Electrolytic	220μF	–	16V
C310		ECEA1AS471	Electrolytic	470μF	–	10V
C311		ECQM1H333JZ	Polyester	0.033μF	J	50V
C312		ECEA1CS471	Electrolytic	470μF	–	16V
C401		ECQM1H183JZ	Polyester	0.018μF	J	50V
C402		ECQM1H153JZ	Polyester	0.015μF	J	50V
C403		ECQM1H103JZ	Polyester	0.01μF	J	50V
C404		ECEA1ES4R7	Electrolytic	4.7μF	–	25V
C405		ECQS1392JWT	Styrol	3900pF	J	100V
C406		ECQM1H102JZ	Polyester	1000pF	J	50V
C423		ECEA1CS331	Electrolytic	330μF	–	16V
C430		ECQM1H153JZ	Polyester	0.015μF	J	50V
C441		ECKD2H102KB2	Ceramic	1000pF	K	500V
C442	⚠	ECQM4223KZ	Polyester	0.022μF	K	400V
C443	⚠	ECQM4223KZ	Polyester	0.022μF	K	400V

Ref. No.		PART NO.	DESCRIPTION			
C444	⚠	ECEA25W12ZE	Electrolytic	12μF	–	25V
C460		ECQE6104KZ	Polyester	0.1μF	K	600V
C461	⚠	ECEA1JS101	Electrolytic	100μF	–	63V
C463		ECEA2VS3R3Y	Electrolytic	3.3μF	–	350V
C465		ECEA2VSR47Y	Electrolytic	0.47μF	–	350V
C491		ECEA1CS102	Electrolytic	1000μF	–	16V
C602		ECKD2H102KB2	Ceramic	1000pF	K	500V
C702		ECQE6223KZ	Polyester	0.022μF	K	600V
C705		ECEA1CS222	Electrolytic	2200μF	–	16V
		RESISTORS				
R143		ERD25FJ470K	Carbon	47Ω	J	¼W
R144		ERD25FJ470K	Carbon	47Ω	J	¼W
R146		ERD25FJ820K	Carbon	82Ω	J	¼W
R151		ERG2ANJ821	Metal	820Ω	J	2W
R161B		ERD25FJ222K	Carbon	2.2KΩ	J	¼W
R170		ERD25FJ103K	Carbon	10KΩ	J	¼W
R171		ERD25FJ103K	Carbon	10KΩ	J	¼W
R172		ERD25FJ562K	Carbon	5.6KΩ	J	¼W
R301		ERD25FJ392K	Carbon	3.9KΩ	J	¼W
R302		ERD25FJ473K	Carbon	47KΩ	J	¼W
R303	⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R304	⚠	ERD25FJ1R1K	Carbon	1.1Ω	J	¼W
R305		ERD25FJ563K	Carbon	56KΩ	J	¼W
R306	⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R307		ERD25FJ4R7K	Carbon	4.7Ω	J	¼W
R310		ERD25FJ153K	Carbon	15KΩ	J	¼W
R401		ERD25FJ333K	Carbon	33KΩ	J	¼W
R402		ERD25FJ332K	Carbon	3.3KΩ	J	¼W
R403		ERD25FJ273K	Carbon	27KΩ	J	¼W
R404		ER025CKG2201	Metal	2.2KΩ	G	¼W
R423	⚠	ERD25FJ680K	Carbon	68Ω	J	¼W
R432	⚠	ERF2AJ100	Non. Flame	10Ω	J	2W
R441	⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R443	⚠	ERD25FJ122K	Carbon	1.2KΩ	J	¼W
R444		ERD25FJ122K	Carbon	1.2KΩ	J	¼W
R445		TLP408	Choke Coil			
R447		ERG1ANJ271	Metal	270Ω	J	1W
R460	⚠	ERD25FJ102K	Carbon	1KΩ	J	¼W
R461	⚠	ERD25FJ6R8K	Carbon	6.8Ω	J	¼W
R465		ERD25FJ334K	Carbon	330KΩ	J	¼W
R472		ERG1ANJ104	Metal	100KΩ	J	1W
R601		ERC12GJ561	Solid	560Ω	J	½W
R602	⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
R605	⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
R606	⚠	ERD25FJ103K	Carbon	10KΩ	J	¼W
R702		ERC12GJ104	Solid	100KΩ	J	½W
J401		ERD25FJ222K	Carbon	2.2KΩ	J	¼W
J404		ERD25FJ221K	Carbon	220Ω	J	¼W
VR31		EVTS3AA00B15	Control (Vert. Hold)			
VR32		EVTS3MA00B54	Control (Vert. Height)			

Ref. No.		PART NO.	DESCRIPTION
VR33		EVTS3AA00B14	Control (Vert. LIN)
VR41		EVTS3AA00B13	Control (H. Hold)
VR64		EVT81US10B26	Control (Focus)
VR67		EVLS3JA00B25	Control (Sub. Bright)
SF1, SF3		TJC305-1	Fuse Holder
		TJS25640V	CRT Socket
		TMK81516	CRT PCB Cover
		TMM81434	Revet
	⚠	XBA1F20NU14	Fuse (2A)
		TMM81416	Cord Band

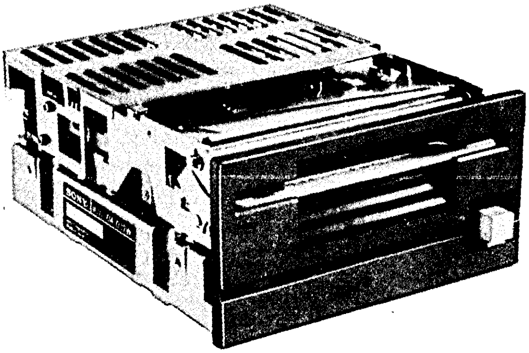
DISK DRIVE

B

MICRO FLOPPYDISK DRIVE

OA-D32W
OA-D32V

OA-D32W-90



SONY®
SERVICE MANUAL

Specifications

	OA-D32W		OA-D32V	
	SINGLE DENSITY	DOUBLE DENSITY	SINGLE DENSITY	DOUBLE DENSITY
Capacity				
Unformatted Per Disk	500 Kbytes	1.0 Mbytes	250 Kbytes	500 Kbytes
Unformatted Per Track	3.125 Kbytes	6.25 Kbytes	3.125 Kbytes	6.25 Kbytes
Burst TRANSFER RATE	250 Kbits/sec	500 Kbits/sec	250 Kbits/sec	500 Kbits/sec
Access Time				
Track to Track	12 msec.		12 msec.	
Average*	350 msec.		350 msec.	
Settling Time	30 msec.		30 msec.	
Head Load Time	60 msec.		60 msec.	
Average Latency	50 msec.		50 msec.	
Functional				
Rotational Speed	600 RPM		600 RPM	
Recording Density (inside track)	4359 bpi	8717 bpi	4094 bpi	8187 bpi
Track density	approx. 135 TPI		approx. 135 TPI	
Cylinders	80		80	
Tracks	160		80	
R/W Heads	2		1	
Encoding Method	FM, MFM		FM, MFM	
Heat Dissipation				
Operating Mode (Head Load)	6.0 W		6.0 W	
Standby mode (Head Unload)	3.9 W		3.9 W	
Media Requirements 3.5" x 3.7" (90 mm x 94 mm)	SONY OM-D4440		SONY OM-D3440	

*Average access time = 1/3 x (Track Nos.) x (Track to track time) + (Settling Time)

Environmental Considerations

Reliability and Maintainability

Preventive Maintenance (PM)	Not required
Meantime Between Failures (MTBF)	8000 POH (Power On Hourtime)
Meantime to Repair (MTTR)	30 min.
Component Life	5 years or 15,000 POH
Media Life	3.0×10^6 passes/track
Disk Interchange	20,000 times
Soft Read Error	1 per 10^9 bits read
Hard Read Error	1 per 10^{12} bits read
Seek Error	1 per 10^6 seeks

Environmental Limits

Temperature (Operating)	40°F to 115°F (5°C to 45°C)
Humidity (Operating)	20 % to 80 % relative humidity, with a wet bulb temperature of 85°F (29°C) and no condensation.
Vibration (Operating)	The unit shall perform all read/write operations (no seek) according to specifications, with continuous vibration of less than 0.5 G (±10 %) from 5 Hz to 100 Hz (along the x, y, z plane).

Dimensional Data

Height	2.0 in.	(51 mm)
Width	4.0 in.	(102 mm)
Depth	5.1 in.	(130 mm)
Weight	1.5 lbs	(650 g)

DC Power Requirements

Reading	+12.0 V	±5 %	0.30 A (typical)
(Operating)	+5.0 V	±5 %	0.48 A (typical)

RECORD OF REVISIONS	
REVISION	NOTES
1	ORIGINAL ISSUE November, 1983

TABLE OF CONTENTS

Description *Page*

SECTION 1. INTRODUCTION 7

SECTION 2. TOOLS AND MEASURING INSTRUMENTS 8

2-1. GENERAL AND SPECIAL TOOL LIST 8
a. General Tools 8
b. Special Tools 8
c. Measuring Equipment 8
d. Disks 8
e. Expendable and Chemical Supplies 8
2-2. SPECIAL TOOLS 9
2-2-1. MFD Checker II 9
2-2-2. Configuration of SMC-70 Drive Test System 13
2-2-3. Disks 14

SECTION 3. TROUBLESHOOTING 15

3-1. BEFORE TROUBLESHOOTING 15
3-2. TYPES OF ERROR ON A SYSTEM LEVEL 15
3-2-1. Soft Error 15
3-2-2. Write Error 15
3-2-3. Seek Error 15
3-2-4. Interchange Error 15
3-3. FAULT DIAGNOSIS BY MFD CHECKER II 15
3-3-1. Normal Operation 15
3-3-2. Check Points to Abnormal Operation 20
3-4. FINAL CHECK 23
3-4-1. Setting of SMC-70 23
3-4-2. Set the Check Area 23
3-4-3. Check the Drive Unit 25
3-4-4. Error Message 27

SECTION 4. PART REPLACEMENT 29

4-1. FC-9/FC-14 MOUNTED BOARD REPLACEMENT 29
4-1-1. Removal 29
4-1-2. Installation and Adjustment 29
4-2. FRONT PANEL ASS'Y REPLACEMENT 29
4-2-1. Removal 29
4-2-2. Installation 29
4-3. BLIND PANEL REPLACEMENT 30
4-3-1. Removal 30
4-3-2. Installation 30

Description *Page*

4-4. LED MOUNTED BOARD ASS'Y REPLACEMENT 30
4-4-1. Removal 30
4-4-2. Installation 30
4-5. MAIN COVER REPLACEMENT 31
3-5-1. Removal 31
3-5-2. Installation 31
32V 4-6. PAD ASS'Y REPLACEMENT 31
4-6-1. Removal 31
4-6-2. Installation and Adjustment 31
32W 4-7. DAMPER REPLACEMENT 31
4-7-1. Removal 31
4-7-2. Installation 32
4-8. HEAD LOAD ASS'Y REPLACEMENT 32
4-8-1. Removal 32
4-8-2. Installation and Adjustment 32
4-9. CASSETTE-UP ASS'Y REPLACEMENT 33
4-9-1. Removal 33
4-9-2. Installation and Adjustment 33
4-10. WP ARM / D-DETECTION ARM / COMPRESSION SPRING (3-659-609-00) REPLACEMENT 34
4-10-1. Removal 34
4-10-2. Installation and Adjustment 34
4-11. DC DISK DRIVE MOTOR (BHC-2101A) REPLACEMENT 34
4-11-1. Removal 34
4-11-2. Installation and Adjustment 35
4-12. SENSOR MOUNTED BOARD REPLACEMENT 35
4-12-1. Removal 35
4-12-2. Installation and Adjustment 35
4-13. LEAD SCREW ASS'Y (STEPPING MOTOR / LEAD SCREW / COUPLING ASS'Y / COMPRESSION SPRING (4-601-083-00)) REPLACEMENT 36
4-13-1. Removal 36
4-13-2. Installation and Adjustment 36
4-14. (32V) HEAD ARM ASS'Y REPLACEMENT, (32W) HEAD CARRIAGE ASS'Y REPLACEMENT 37
4-14-1. Removal 37
4-14-2. Installation and Adjustment 38

Description *Page*

SECTION 5. CHECK AND ADJUSTMENT 39

5-1. LEAD SCREW ECCENTRICITY 39
5-1-1. Tools and Measuring Equipment 39
5-1-2. Measurement 39
5-1-3. Adjustment 39

32V 5-2. PAD PRESSURE 39
5-2-1. Tools and Measuring Equipment 39
5-2-2. Measurement 39
5-2-3. Adjustment 40

5-3. HEAD COMPLIANCE 40
5-3-1. Tools and Measuring Equipment 40
5-3-2. Measurement 40
5-3-3. Adjustment 41

5-4. RADIAL ALIGNMENT AND TRK 00 SENSOR 42
5-4-1. Tools and Measuring Equipment 42
5-4-2. Measurement 42
5-4-3. Adjustment 42
5-4-4. Set Up Command 42
5-4-5. Measurement Command 43
5-4-6. Adjustment Command 44
5-4-7. Error Message 46

32V 5-5. STEPPING MOTOR LOAD TORQUE 46
5-5-1. Tools and Measurement Equipment 46
5-5-2. Measurement 46
5-5-3. Adjustment 46

5-6. INDEX PHASE 47
5-6-1. Tools and Measuring Equipment 47
5-6-2. Measurement 47
5-6-3. Adjustment 47

5-7. READ AMPLIFIER GAIN AND READ AMPLIFIER OFF SET 47
5-7-1. Tools and Measuring Equipment 47
5-7-2. Measurement 47
5-7-3. Adjustment 48

5-8. DISK DRIVE DC MOTOR SPEED 48
5-8-1. Tools and Measuring Equipment 48
5-8-2. Measurement 48
5-8-3. Adjustment 49

Description		Page
32V 5-9.	HL ARM HEIGHT	53
5-9-1.	Tools and Measuring Equipment	53
5-9-2.	Measurement	53
5-9-3.	Adjustment	53
5-10.	HEAD CLEARANCE	53
5-10-1.	Tools and Measuring Equipment	53
5-10-2.	Measurement	53
5-10-3.	Adjustment	53
5-11.	HEAD CLEANING	54
5-11-1.	Tools and Measuring Equipment	54
32V 5-11-2.	Cleaning with Applicator	54
5-11-3.	Cleaning with Cleaning Disk	54
SECTION 6.	**PARTS LOCATION AND LIST (OA-D32W)**	55
6-1.	PARTS ASS'Y LOCATION	55
6-2.	MECHANICAL PARTS LIST	57
6-3.	OVER ALL DIAGRAM	59
6-3-1.	Interconnection Diagram	59
6-4.	CIRCUIT DIAGRAM	61
6-4-1.	Circuit Diagram on FC-9 Mounted Board	61
6-4-2.	Parts Layout on FC-9 Mounted Board	65
6-4-3.	Disk Motor Circuit Diagram	67
6-4-4.	Parts Layout on Disk Motor Circuit Board	69
6-5.	ELECTRIC PARTS	70
6-5-1.	Chip Parts Replacement Procedure	70
6-5-2.	Electric Parts List	71
SECTION 7.	**PARTS LOCATION AND LIST (OA-D32V)**	75
7-1.	PARTS ASS'Y LOCATION	75
7-2.	MECHANICAL PARTS LIST	77
7-3.	OVER ALL DIAGRAM	79
7-3-1.	Interconnection Diagram	79
7-4.	CIRCUIT DIAGRAM	81
7-4-1.	Circuit Diagram on FC-14 Mounted Board	81
7-4-2.	Parts Layout on FC-14 Mounted Board	85
7-4-3.	Disk Motor Circuit Diagram	87
7-4-4.	Parts Layout on Disk Motor Circuit Board	89
7-5.	ELECTRIC PARTS	90
7-5-1.	Chip Parts Replacement Procedure	90
7-5-2.	Electric Parts List	91
SECTION 8.	**TRANSISTORS / DIODES / ICS PIN ARRANGEMENT**	94

SECTION 1
INTRODUCTION

This manual is a maintenance guide for OA-D32W (Double sided) and OA-D32V (Single sided).

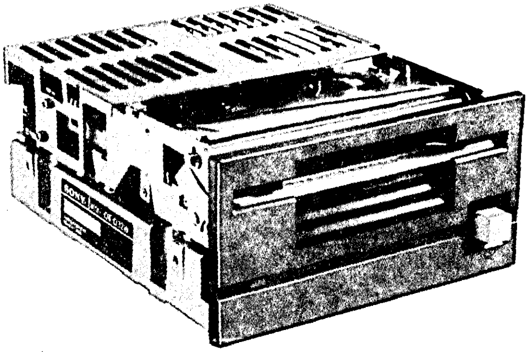
SECTION 2 describes disks and tools necessary for maintenance.

SECTION 3 provides fault diagnostic procedures that may require spare parts or some adjustments.

The overall check after removals and adjustments will be included in this section.

SECTION 4 and 5 cover parts replacements and adjustments, respectively.

SECTION 6 and 7 consist of circuit diagrams, ass'y drawings, and parts lists.



> The cassette dummy (4-603-929-00) should be inserted in the OA-D32W when it is transported. Otherwise, its heads may be damaged.

Perform maintenance in accordance with the procedure specified in this manual as follows:

(Example)

e. Fasten the guide shaft with the two screws (PSW2.6 x 6).

32V f. Fasten the head board to the chassis on the bottom surface, and apply nut lock paint to the screw.

32V g. Connect the head board to the head harness (by four points) with a soldering iron. (Refer to Fig. 4-14 (c))

32W h. Connect the head board to the head harness (by six points) with a soldering iron. (Refer to Fig. 4-14 (d))

32W i. Fasten head board and terminal shield plate with a screw (PSW2.6 x 8) on the chassis bottm, and then apply nut lock paint onto it.

32V j. Perform the stepping motor load torque adjustment. (Refer to 5-5)

k. Install the cassette-up ass'y in place. (Refer to 4-9)

Steps e, h, i, and k should be carried out in sequence for the OA-D32W.
Steps e, f, g, j and k should be carried out in sequence for the OA-D32V.

SECTION 2
TOOLS AND MEASURING INSTRUMENTS

2-1. GENERAL AND SPECIAL TOOL LIST

The tools, and measuring instruments for performing maintenance on the OA-D32W/OA-D32V are listed below.

a. General Tools

	SONY Parts No.
TOTSU Screw Driver (M2.6)	(7-721-050-62)
⊕ Driver 2 mm	(7-700-749-01)
⊖ Driver 2 mm	(7-700-750-01)
⊖ Driver 4 mm	(7-700-750-04)
Tweezers	(7-700-753-02)
Round Nose Plier	(7-700-757-01)
Adj Rod	(7-700-733-01)
Cutter	(7-700-758-02)
Soldering Iron (20W)	
Desoldering Metal Braid	
DC Power Supplier (+5 V DC ±5 %, 0.8 A max., +12 V DC ±5 %, 1.5 A max.)	
Tester	

b. Special Tools

MFD Checker II	(J-609-182-0A)
SMC-70 System	
SMI-7011 / SMI-7011A / SMI-7012 / SMI-7012A	
SMC-70	
KX-13G1	
A/D Converter	(J-623-002-0A)
25P/26P Conversion Cable	(J-623-001-0A)
Radial Alignment System Disk (OR-D86VA)	(8-960-009-74)
Error Check System Disk (OR-D87VA)	(8-960-009-75)
Rotatory Knob (for Stepping Motor)	(J-609-011-0A)
Lead Screw Eccentricity Inspection Tool	(J-609-136-0A)
Standard Disk Dummy (for Cassette-Up Ass'y Installation)	(J-609-120-0A)
Geared Driver	(J-609-017-0A)
Pad Weight	(J-609-124-0A)
Hexagon Wrench Torque Driver	(J-609-125-0A)
Power Cable	(J-609-130-0A)
Interface Cable	(J-609-200-0A)

c. Measuring Equipment

Oscilloscope Dual Trace 20 MHz		
Universal Counter Resolution 0.1 msec.		
Tension Gauge	(Max. 200 g)	(J-604-163-0A)
Tension Gauge	(Max. 20 g)	(7-732-050-10)

d. Disks

Level Disk	
32V OR-D46VA	(8-960-009-31)
32W OR-D46WA	(8-960-009-40)
Alignment Disk	
32V OR-D47VA	(8-960-009-32)
32W OR-D47WA	(8-960-009-41)
Dynamic Inspection Disk +30	
32V OR-D51VA	(8-960-009-35)
32W OR-D51WA	(8-960-009-44)
Dynamic Inspection Disk −30	
32V OR-D52VA	(8-960-009-36)
32W OR-D52WA	(8-960-009-45)
Cleaning Disk	
32V OR-D29VA	(8-960-009-15)
32W OR-D29WA	(8-960-009-39)

e. Expendable and Chemical Supplies

Nut Lock Paint	
Alcohol	
Sony Oil	(7-611-018-01)
Sony Grease	(7-622-001-52)
Bamboo Stick	
Applicator	

2-2. SPECIAL TOOLS

2-2-1. MFD Checker II

(1) MFD Checker II configuration
Main Checker Board
I/F Cable (26pin and 34pin)
Power Cable (2 pieces)
Conversion Board (26pins-to-34pins)

NOTE: The Conversion Board and 34pin I/F Cable are required for the OA-D33W/OA-D33V.

(2) Micro Floppydisk Drive Connection (Refer to Fig. 2-1)

(3) MFD Checker II function switches

STEP IN .... Steps the head inwards.

STEP OUT .... Steps the head outwards. The head continously moves if the switch is kept pressed.

SIDE SELECT .... Selects one of two heads (side 0 or side 1) for a double sided. (This switch is invalid for single sided versions.)

WRITE .... Records, data specified by the OSC SEL switch, onto one track.

OSC SEL .... Selects such write data as "2F", "1F", "WCP" (worst case pattern), or EXT.

WCP W/M .... Selects upper and lower patterns when the OSC SEL switch is set to WCP. (Refer to Fig. 3-3 (c), (d))

HD LOAD .... This is used to set the plunger solenoid active.

MOTOR ON ...... This is used to operate the Disk Motor.

DRIVE SELECT ... Selects the disk drive. The DRIVE SELECT switch on the disk drive relates to the DRIVE SELECT switch on the checker as follows:

Drive (S101)	Checker 1	Checker 2
1	OFF	OFF
2	ON	OFF
3	OFF	ON
4	ON	ON

CHGRST .... Resets the DSKCHG signal.

600/300 SELECT (Located in the middle of the board) .... Set the 600/300 SELECT switch at "600" for the OA-D32W/OA-D32V.

80/70 SELECT (Located in the middle of the board) .... Set the 80/70 SELECT switch to "80" for the OA-D32W/OA-D32V.

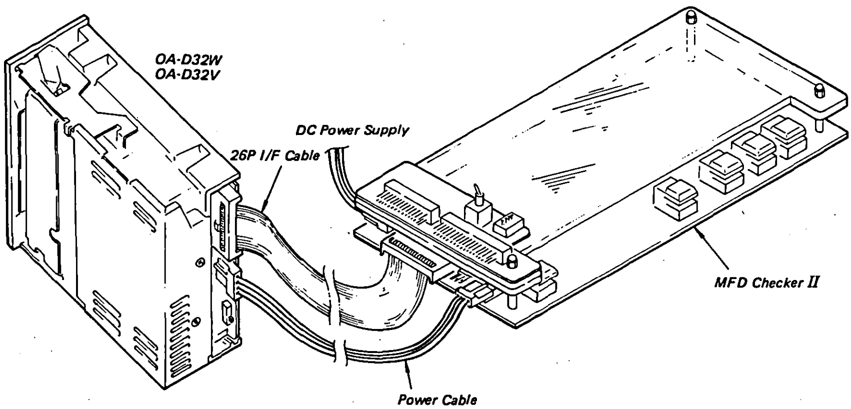


Fig. 2-1 Drawing of Connection Between Disk Drive and MFD Checker II

(4) INDICATOR

OSC SEL (Four LEDs in the left of the board) .... They indicate the selected position on the OSC SEL switch.

I/F signals (Five LEDs in the middle of the board) .... They indicate at the states of TRK 00, WRTPRT, RDY, DSKCHG, and INDEX, respectively.

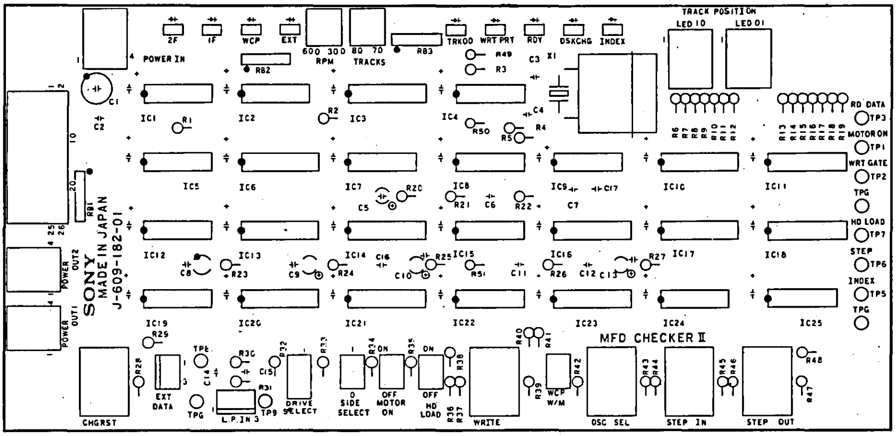
The TRK 00, WRTPRT, RDY, and DSKCHG indicators are lit when the respective I/F signals are low (true). The INDEX indicator blinks when the INDEX signal is applied to the board.

TRACK POSITION (Seven segment LED indicator in the right of the board) .... Indicates the current track position.

(5) Test Points

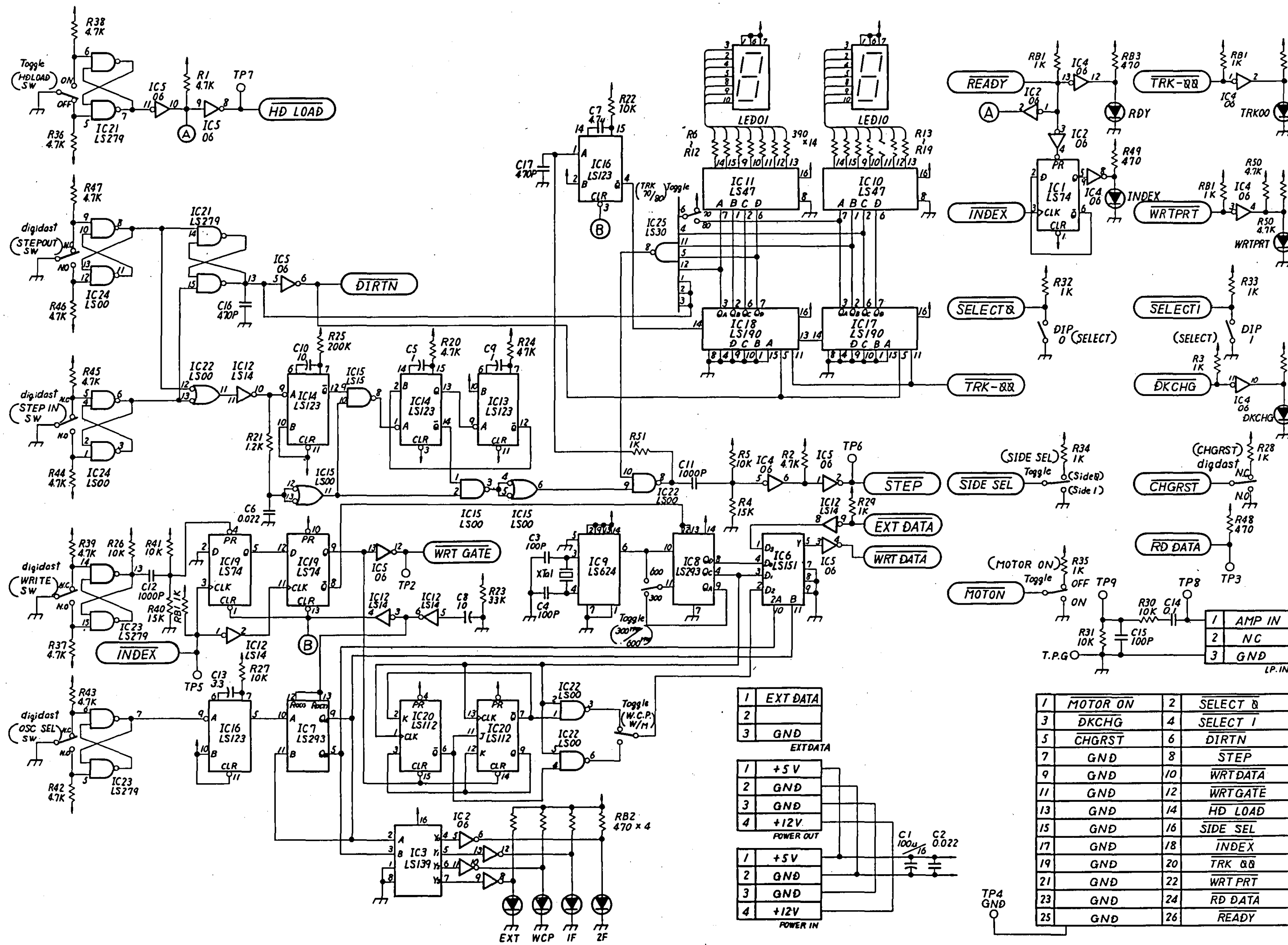
TP-1; $\overline{\text{MOTOR ON}}$
TP-2; $\overline{\text{WRT GATE}}$
TP-3; $\overline{\text{RD DATA}}$
TP-5; $\overline{\text{INDEX}}$
TP-6; $\overline{\text{STEP}}$
TP-7; $\overline{\text{HD LOAD}}$

The GND terminal is marked by "GND".



MFD Checker II Block Diagram

 MFD Checker II Circuit Diagram



MFD Checker II Circuit Diagram

2-2-2. Configuration of SMC-70 Drive Test System

System configuration for Radial Alignment and TRK 00 Sencer measurement, adjustment, and error check with SMC-70 System is shown in Fig. 2-2 (a), (b).

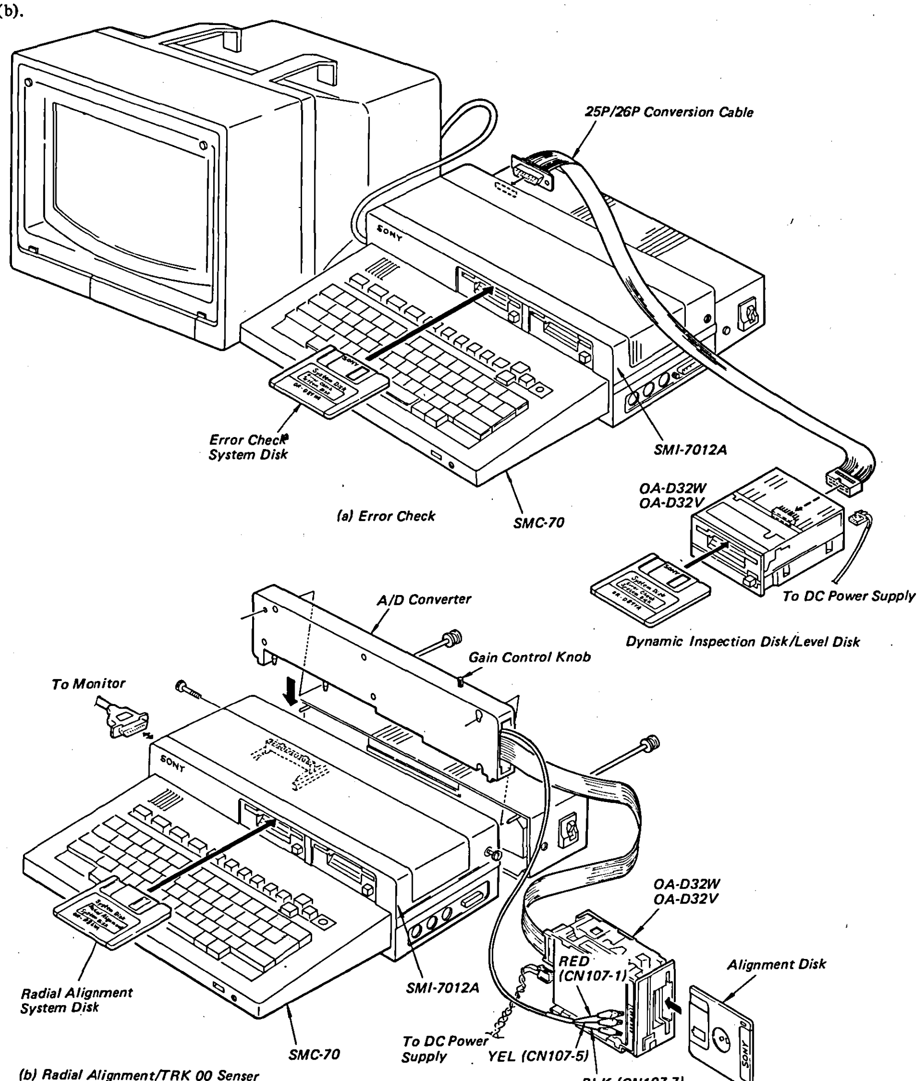


Fig. 2-2

2-2-3. Disks

(a) Level disk 32V OR-D46VA
32W OR-D46WA

These disks are used to check and adjust the read amplifier gain and off set. The self-read/write operation can be checked with both of these disks and the SMC-70 System.

(b) Alignment disk 32V OR-D47VA
32W OR-D47WA

These disks have prerecorded data such as Cat's eye pattern and INDEX signal to check and adjust the off-tracking and index position.

	OR-D47VA		OR-D47WA	
	SIGNAL	TRACK	SIGNAL	TRACK
SIDE 0	CAT'S EYE PATTERN	00, 20, 25, 30, 35, 40, 45, 50, 55, 79	CAT'S EYE PATTERN	00, 20, 25, 30, 35, 40, 45, 50, 55, 79
	INDEX	40	INDEX	40
SIDE 1	not applicable		CAT'S EYE PATTERN	40
			INDEX	40

(c) DYNAMIC INSPECTION DISK +30
32V OR-D51VA
32W OR-D51WA
DYNAMIC INSPECTION DISK –30
32V OR-D52VA
32W OR-D52WA

These disks can be used in the final check for a drive with the SMC-70 System.

NOTE: (+) indicates that data has been recorded in the inner side of tracks.
(–) indicates that data has been recorded in the outer side of tracks.

(d) CLEANING DISK
32V OR-D29VA
32W OR-D29WA

This type of disk can be used for cleaning the head.

Contents

	OR-D51VA	OR-D52VA	OR-D51WA	OR-D52WA
SIDE 0	Offset of +30 μm for all formatted tracks	Offset of –30 μm for all formatted tracks	Offset of +30 μm for all formatted tracks	Offset of –30 μm for all formatted tracks
SIDE 1	not applicable	not applicable	Offset of +30 μm for all formatted tracks	Offset of –30 μm for all formatted tracks

SECTION 3
TROUBLESHOOTING

SECTION 3 describes the methods of trouble-shooting. 3-2 refers to several errors specfied in a system level. 3-3 describes normal operations and the check points for abnormal operations. These descriptions define the Error Spot under operating conditions.

3-1. BEFORE TROUBLE SHOOTING

The following procedures are recommended to see if the drive is really faulty or not:

1) Incorrect operational procedure
2) program error of host system
3) Poor connection with host system (esp. GND-related connection, frame GND, etc.)
4) Defective disk. Check that same trouble occurs with other disks.
5) Environmental conditions (where electrical noise easily jumps into signal)
6) Influence of strong magnetic field
7) Wrong supply voltage

3-2. TYPES OF ERROR ON A SYSTEM LEVEL

3-2-1. Soft Error

Soft error are caused by;

1) Dirty head
2) Electrical noise
3) Tracking error
4) Poor connection with system (GND-related connection)
5) Incorrect motor speed
6) Incorrect head compliance

Clean the head first. Check for index pulse interval and head compliance and then read error spot more than several times. If not readable, move the head to the adjacent track in the same direction as before, then return to the desired track, and read. If readable this time, check radial alignment. (Refer to 5-4) If not readable yet, the error is not recoverable.

3-2-2. Write Error

To determine whether the disk or the drive is failing, the disk should be replaced by other disks and check that there still exists write error. If write error does not exist any more, remove the old one. If write error exists with use of any disk, drive might cause write error.

3-2-3. Seek Error

Seek error comes from:

1) Head movement is incorrect because ellectrical noise jumps into signal.
2) Head driving system might be at fault. If it is not re-readable after re-calibration, drive might be at fault.

3-2-4. Interchange Error

If data written on one drive is readable correctly on another drive, but not by other drives, interchange error exists.

Interchange errors are caused by;

1) Head is not properly positioned.
2) Motor speed is not correct.
3) Optimum head output level and offset and head compliance are not obtained.
4) Chucking mechanism does not work.

3-3. FAULT DIAGNOSIS BY MFD CHECKER II

3-3-1 describes check method for normal operations in accordance with the predetermined procedures.

3-3-2 describes check points for abnormal operations which come out in accordance with the above procedures.

3-3-1. Normal Operation

Pre-setting:

1) Refering to Fig. 2-1 (Micro Floppydisk Drive Connection), connect the drive to MFD Checker II.
2) Set the slide switch (S101) on the disk drive to "1".
3) Set all switches in the MFD Checker II to "OFF".

Normal Operation

<table>
<tr><th>Procedure</th><th>Step</th><th>Operation</th></tr>
<tr><td>1</td><td>Power On</td><td>1. The head automatically returns to TRK 00 and stops there.
2. The disk motor remains stopped.</td></tr>
<tr><td>2</td><td>Drive Select Check after checked, the disk drive is to be kept selected.</td><td>1. The TRK 00, WP, and DSKCHG indicators light only when the DRIVE SELECT switch on the MFD Checker II and the slide switch (S101) on the disk drive are set as follows:
<table><tr><th colspan="2">MFD Checker II</th><th>Disk drive</th></tr><tr><th>1</th><th>2</th><th>(S101)</th></tr><tr><td>OFF</td><td>OFF</td><td>1</td></tr><tr><td>ON</td><td>OFF</td><td>2</td></tr><tr><td>OFF</td><td>ON</td><td>3</td></tr><tr><td>ON</td><td>ON</td><td>4</td></tr></table>
Otherwise, these indicators go out.</td></tr>
<tr><td>3</td><td>Operation during CASSETTE IN (Alignment disk is to be inserted.)</td><td>1. When the cassette is inserted, the motor is rotating and the plunger is pulled out. The head is loaded and unloaded in sequence. The motor then stops operation.</td></tr>
<tr><td>4</td><td>MOTOR ON switch on</td><td>1. The motor rotates. (The INDEX indicator on the MFD Checker II blinks.)
2. The TRK 00, WRTPRT, RDY, and DSKCHG indicators light. (The RDY indicator, however, lights in about 1.5 seconds after the disk is inserted.)</td></tr>
<tr><td>5</td><td>CHGRST switch on</td><td>1. The DSKCHG indicator goes out at the moment when the CHGRST switch is pressed.</td></tr>
<tr><td>6</td><td>HD LOAD switch on</td><td>32V 1. The plunger Solenoid is set on, and the pad lifts down.
32W 2. The plunger Solenoid is set active and the head lifts down.
3. The clearance between the HL arm and pad arm is set as shown in Fig. 5-9.</td></tr>
<tr><td>7</td><td>Stepping</td><td>1. When the STEP IN switch is pressed, the head is continuously stepped in until it arrives at TRK 79.
When the STEP OUT switch is pressed, the head is continuously stepped out until it arrives at TRK 00.
2. When the head is set to any track other than TRK 00, the TRK 00 indicator does not light.</td></tr>
<tr><td>8</td><td>Track positioning</td><td>1. Such a Cat's eye pattern signal as shown in Fig. 3-1 (a) can be obtained at CN107-1 on the disk drive when the head accesses TRK 20, TRK 30 or TRK 50. The oscilloscope is triggered by the signal at TP-5 of the MFD Checker II.
Note: Such a signal as shown in Fig. 3-1 (b) can be obtained when the head accesses TRK 40.
32W 2. SIDE SELECT switch to side 1. such a Cat's eye pattern signal as shown Fig. 3-1 (b) can be obtained at CN107-1 on the disk drive. When the head accesses TRK 40.
3. Set amplitude L in Fig. 3-1 (a) to 5 divisions, and then read amplitude R in Fig. 3-1 (a).
Calculate the OFF TRACK value, refering to Table 3-1</td></tr>
</table>

Procedure	Step	Operation

(c) and (d), in accordance with R in Fig. 3-1 (a).
Then, obtain the humidity-compensated OFF TRACK value from the following expression:

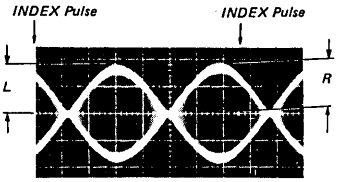
The compensated OFF TRACK value = OFF TRACK value + 0.2 (50 − H) (39.5 − 0.1875N − 1.5S)/33.5 ...(1)

Where;

H: Relative humidity (%)
N: Track number
S: Side ID number
Side 0: 0 Side 1 : 1

The compensated OFF TRACK value should meet the following formula.
−20 ≦ Compensated OFF TRACK value ≦ +20 ... (2)

[EX] For R = 4.5 in the OA-D32V, the apparent OFF TRACK value is as shown in table 3-1 (d).
Assuming = 4.5,
H = 60 %, N = 40, and S = 1, we can obtain the compensated OFF TRACK value as 2.6 from expression (1).
This satisfy the formula.



(a)

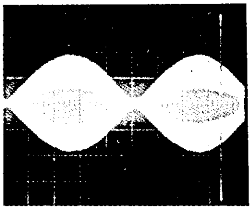

(b)

Fig. 3-1 Cat's Eye Pattern Signal

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2:	34.5	32.9	31.3	29.8	28.3	26.8	25.4	24.0	22.7	21.4
3:	20.1	18.9	17.7	16.5	15.3	14.2	13.1	12.0	11.0	9.9
4:	8.9	8.0	7.0	6.1	5.1	4.2	3.4	2.5	1.6	0.8
5:	0.0	−0.8	−1.6	−2.3	−3.1	−3.8	−4.6	−5.3	−6.0	−6.6
6:	−7.3	−8.0	−8.6	−9.3	−9.9	−10.5	−11.1	−11.7	−12.3	−12.9
7:	−13.4	−14.0	−14.5	−15.1	−15.6	−16.1	−16.6	−17.1	−17.6	−18.1
8:	−18.6	−19.0	−19.5	−20.0	−20.4	−20.9	−21.3	−21.7	−22.2	−22.6
9:	−23.0	−23.4	−23.8	−24.2	−24.6	−25.0	−25.4	−25.7	−26.1	−26.5

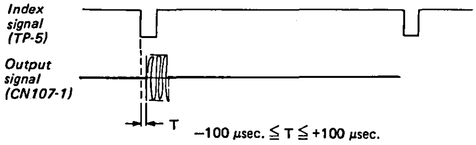
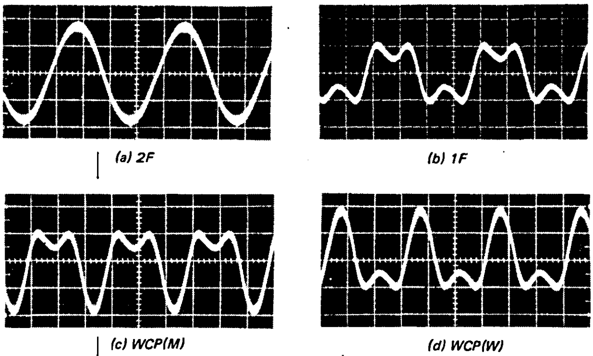
(c) OA-D32W

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2:	36.9	35.1	33.4	31.8	30.2	28.7	27.2	25.7	24.3	22.9
3:	21.5	20.2	18.9	17.6	16.4	15.2	14.0	12.9	11.7	10.6
4:	9.6	8.5	7.5	6.5	5.5	$\boxed{4.5}$	3.6	2.7	1.8	0.9
5:	0.0	−0.9	−1.7	−2.5	−3.3	−4.1	−4.9	−5.6	−6.4	−7.1
6:	−7.8	−8.5	−9.2	−9.9	−10.6	−11.2	−11.9	−12.5	−13.1	−13.7
7:	−14.3	−14.9	−15.5	−16.1	−16.6	−17.2	−17.7	−18.3	−18.8	−19.3
8:	−19.8	−20.4	−20.8	−21.3	−21.8	−22.3	−22.8	−23.2	−23.7	−24.1
9:	−24.6	−25.0	−25.4	−25.9	−26.3	−26.7	−27.1	−27.5	−27.9	−28.3

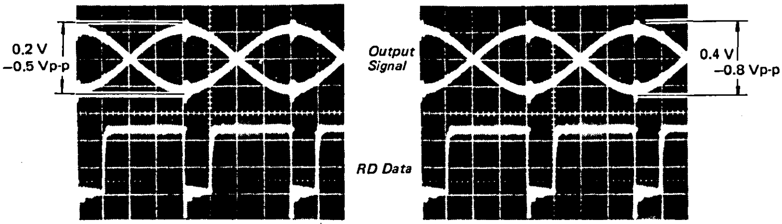
(d) OA-D32V

Table 3-1. Apparent off Track

Procedure	Step	Operation
9	Motor speed	1. The Motor speed can be measured at TRK35, in TP-5 on MFD Checker II with an universal counter. It should be 100 msec ±1.5 msec.

Procedure	Step	Operation
10	Index position	1. The following waveform can be obtained on TRK 40.  *Fig. 3-2 Index Phase Specification*
11	TRK 00 sensor level	1. Move the head until it arrives at TRK 01. (Do not move the head passing TRK 01. If the head arrives at TRK 00, through the Cat's eye pattern signal is to be rechecked and then the head is to be set on the TRK 01.) The output signal level of CN107-5 is 3 V or more. 2. Move the head until it arrives at TRK 00. The output signal level of CN107-5 is 0.7 V or less.
12	Cassette out (When the alignment disk is ejected.)	1. The DSKCHG indicator lights.
13	Write (When the level disk is inserted)	1. When the WRITE switch is pressed and "2F", "1F", or "WCP (M/W)" are written, the corresponding waveform can be obtained at CN107-1. (Refer to Fig. 3-3)  *Fig. 3-3 2F, 1F and WCP Waveforms* 32W 2. Set the SIDE SELECT switch to side 1, and "2F", "1F", or "WCP (M/W)" are written, the corresponding waveform can be obtained at CN107-1. (Refer to Fig. 3-3)

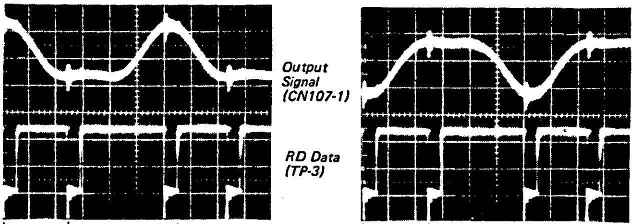
Procedure	Step	Operation
14	Output level	1. Move the head until it arrives at TRK 79, and then write "2F". The output signal level of CN107-1 is 0.4 to 0.8 Vp-p (32W 0.2 to 0.5 Vp-p). The following read data can be obtained at TP-3 on the checker. (Refer to Fig. 3-4 (a) (b)) 32W 2. Set the SIDE SELECT switch to side 1. Move the head until it arrives at TRK 79, and then write "2F". The output signal level of CN107-1 is 0.2 to 0.5 Vp-p. The following read data can be obtained at TP-3 on the checker. (Refer to Fig. 3-4 (a))



(a) 32W (b) 32V

Fig. 3-4 Output Signal and RD Data Waveforms

Procedure	Step	Operation
15	Peak Shift	1. Write "WCP (W/M)" onto TRK 79. Such waveforms as shown in Fig. 3-5 (a) (b) can be obtained at CN107-1 and TP-3, respectively. The waveform in Fig. 3-5 (a) (b) shows the read data at TP-3.



(a)
Less than 2.43 µsec. (with OA-D46VA)
Less than 2.43 µsec. (with OA-D46WA)

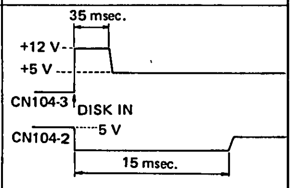
(b)
Less than 2.43 µsec. (with OA-D46VA)
Less than 2.43 µsec. (with OA-D46WA)

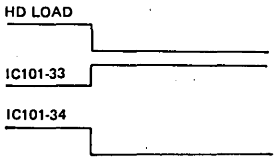
Fig. 3-5 Waveforms of Output Signal and RD Data at TRK 79

Procedure	Step	Operation
		32W 2. Set the SIDE SELECT switch to side 1. Write "WCP (W/M)" onto TRK 79. Such waveforms as shown in Fig. 3-5 (a) (b) can be obtained at CN107-1 and TP-3, respectively. The waveform in Fig. 3-5 (a) (b) shows the read data at TP-3.

Check Points to Abnormal Operation

3-3-2. Check Points to Abnormal Operation

Step	Abnormal Operation for Each Step	Check Point (defective place)	Remarks
Power On	1. The head moves toward the center of the Drive.	1. TRK 00 sensing circuit.	The signal of CN103-2 is Low level.
	2. The head is stepped out, but it is idling around the outmost track.	1. TRK 00 sensing circuit. 2. Check if the TRK 00 Sensor Mounted Board is installed a little bit outside.	The signal of CN103-2 is High level.
	3. The head moves uncertainly. (The head movement is not constant.)	1. Stepping motor drive system. **NOTE:** If no TRK 00 is detected in several seconds after power is turned on, the CPU automatically stops the stepping motor and thereafter accepts no instruction.	A voltage of +12 V appears at CN105-2 during normal operation. Voltages at 3 pin through 6 pin of of CN105 are switched in 10 ± 0.1 msec intervals.
	4. The disk motor rotates.	1. Disk motor drive system.	The signal CN101-5 and CN101-7 are Low level.
Drive Select Check after checked, the disk drive is to be kept selected.	1. The I/F indicators are put out for the selected combination, or they are lit for the unselected combination.	1. Drive select circuit system.	The signal of IC108-3 for the selected combination is High level during normal operation. The signal of IC108-3 is Low level for unselected combination.
Operation during CASSETTE IN (Alignment disk is to be inserted.)	1. After the cassette is inserted, the head is not loaded and the motor does not rotate.	1. The CSTIN signal does not appear at CN101-5, and it is not sent from the motor. 2. The cassette is not properly placed.	Refer to 5-8.
	2. The head is loaded, but the motor does not rotate.	1. The disk motor.	Refer to 5-8.
	3. The disk motor rotates, but the head is not loaded.	1. Plunger solenoid or its drive system. 2. Plunger stroke. 3. Head Clearance. 4. HL arm height.	The signal waveforms shown below appear of CN104-2, 3. During normal operation. (Refer to Fig. 3-6) Refer to 5-10. Refer to 5-9.
MOTOR ON switch on	1. The disk motor does not rotate.	1. Disk motor drive system.	The signal of CN101-7 is High level, or the disk motor is defective.
	2. The I/F indicators do not light.	1. If no I/F indicators is lit, the drive select is not conducted. 2. If some I/F indicators are lit, the I/F signal circuit is defective.	 *Fig. 3-6*

Step	Abnormal Operation for Each Step	Check Point (defective place)	Remarks
CHGRST switch on	1. The DSKCHG indicator does not go out.	1. The CHGRST signal (CN109-3) is not sent to the CPU (IC101-9).	
HD LOAD switch on	1. The plunger solenoid is not energized.	1. The HD LOAD signal (at CN109-14) is not sent to the CPU (IC101-6). 2. IC 111 3. IC 101	Waveforms of normal operation are;  *Fig. 3-7*
Stepping	1. The step operation does not function at all, or it is not smoothly functioned.	1. Stepping motor drive system or stepping motor itself.	In normal condition, the signal of IC101-40 is High level for about 1 msec after the STEP signal enters. During this time, a DC voltage of +12 V is applied to the stepping motor.

TRACK	P0(IC106-5)	P1(IC106-9)	P2(IC106-11)	P3(IC106-13)
0, 4, 8, . . . 72, 76.	H	H	L	L
1, 5, 9, . . . 73, 77.	L	H	H	L
2, 6, 10, . . . 74, 78.	L	L	H	H
3, 7, 11, . . . 75, 79.	H	L	L	H

Step	Abnormal Operation for Each Step	Check Point (defective place)	Remarks
		2. The harness (i, e, the TRK 00 sensor) is internally attached to other mounting parts. 3. Obstacles are attached to the slide guide shaft.	
Track positioning	1. The ratio of the left to right signals does not meet the specification.	1. A voltage of +5 V is not applied to the stepping motor. (CN105-1, 2) 2. Radial alignment is incomplete.	Refer to 5-4.
	2. No signal appears.	1. Read amplifier circuit. 2. A seek error has occurred.	Signal appeance must be confirmed with the sequence of CN107-1, IC103-16, IC103-17, IC103-1, IC103-2, IC104-7, IC104-8. Refer to 3-2-3.

Check Points to Abnormal Operation

Step	Abnormal Operation for Each Step	Check Point (defective place)	Remarks
Motor speed	1. The motor speed does not meet the specification.	1. The disk motor 2. The pad pressure	Refer to 5-8. Refer to 5-2.
Index position	1. When the cassette is inserted twice or more, positions on each track is varied ±40 μsec or more.	1. The chucking mechanism of the disk moter is defective.	Refer to 4-11.
	2. When the cassette is set twice or more, positions on each track is varied ±40 μsec or less. The shifted positions, however, do not meet the specification.	1. The INDEX phase is mis-adjusted.	Refer to 5-6.
TRK 00 sensor level	1. The head returned from inside track does not stop at TRK 01 and it goes to TRK 00 where re-calibration is to be carried out.	1. The TRK 00 sensor positioning is improper.	The signal level of CN107-5 is 3 V or more at TRK 01 during normal operation. (Refer to 5-4.)
Cassette out (When the alignment disk is ejected.)	1. When the casette is ejected, the DSKCHG indicator does not light.	1. Signal has not been detected cassette ejection. Check if the D-detected arm moves properly. 2. Check if the disk motor circuit board operates properly. 3. Signal appearance must be confirmed with the sequence of IC101-3, IC112-1, IC112-3, CN109-3.	The signal of CN101-5 remains Low level.
Write (When the level disk is inserted.)	1. The waveform signal cannot be re-written.	1. Write circuit 2. Check whether write data is applied or not.	32W Change the SIDE SELECT SWITCH to side 1 and then conduct the operation specified in item 13-1 of NORMAL OPERATION. In normal condition of write gate circuit, terminal voltage of CN109-12 is Low level, terminal voltage of IC101-46 is High level, terminal voltage of IC115-4 is High level and 32V Collector voltage of Q106 is approx. +12 V. 32W When SIDE SELECT switch is set to side 0, collector voltage of Q107 is approx. +12 V. When it is set to side 1, collector voltage of Q106 is approx. +12 V.

Step	Abnormal Operation for Each Step	Check Point (defective place)	Remarks
Output level	1. The output signal level does not meet the specification.	1. Read amplifier gain adjustment is incomplete.	Refer to 5-7.
	2. Read data does not appear.	1. IC103 (MC3470AP)	
Peak Shift	1. The shifted peak value does not meet the specification.	1. When the value in both "WCP W" and "WCP M" do not meet the specification, the head is defective.	Refer to 4-14.
		2. When difference in value between "WCP W" and "WCP M" is remarkably Big, off set adjustment is incomplete.	Refer to 5-7.

3-4. FINAL CHECK

3-4-1. Setting of SMC-70

a. Place auto start switch located on the left side panel to "DISK".

b. A conversion cable for I/F (25 pin to 26 pin) is connected to rear panel of SMI-7012A (Drive Unit).

c. Connect the drive under test to the conversion cable and set the DRIVE SELECT switch (S101) of the unit to "2".

d. Error check system disk is inserted into drive A of SMI-7012A and power is turned on.

e. After word "A>" appears on CRT display, drive check program will start.

3-4-2. Set The Check Area

Description	Keying	Display
To display original test condition of the disk.	[W] [N] [E] [W] [1] [C] [RETURN]	***** Floppy Disk Analysis v3.0 ***** ***** Copyright (C) 1981. Sep. ***** [Test condition] — drive C Minimum track — 0 Maximum track — 79 Minimum Sector — 1 Maximum sector — 16 Sector size — 256 Single or Double side? — S Read & Write retry — 1 Seek & Home retry — 0 #Do you want to change these test conditions? (Y, N) =
To change any of test conditions. Type the minimum track to be tested.	[Y] [RETURN]	+Minimum track 0 [track]==>
[EX] In case it is TRK 00.	[0] [RETURN]	+Maximum track 79 [track]==>

Description	Keying	Display
Type the maximum track to be tested. [EX] In case it is TRK 79.	[7][9] [RETURN]	+Minimum sector 1 [sector]=⇒
Type the minimum sector to be tested. [EX] In case it is 1 sector.	[1] [RETURN]	+Maximum sector 16 [sector]=⇒
Type the maximum sector to be tested. [EX] In case it is 16 sector.	[1][6] [RETURN]	+Sector size 256 [bytes]=⇒
Type the number of byte size per a sector, to be tested. [EX] In case it is 256 bytes.	[2][5][6] [RETURN]	+Single side or Double side? <S, D>=⇒
Type the initial name letter (S-single sided, D-double sided) of disk surface to be tested. [EX] In case it is double side.	[D] [RETURN]	+Read & Write retry 1 [times]=⇒
Type the number of how many retry must be conducted when read error or write error occurs. [EX] In case it is once.	[1] [RETURN]	+Seek + Home retry 0 [times]=⇒
Type the number of how many seek retry must be conducted when the error occurs. [EX] In case no retry is desired.	[0] [RETURN]	*** Command table *** r := read test w := write test l := show disk condition s := set test condition h := help e := finish & exit to CP/M

3-4-3. Check the Drive Unit

The test item from command table must be chosen.

Description	Keying	Display
1. To read dynamic inspection disk or pre-recorded data disk.	[R] [RETURN]	*** Read Test *** #Enter pass-count = 1
Type the number of pass-count for reading tracks and sectors pre-set in item 3-4-2. [EX] In case it is once.	[1] [RETURN]	#Test disk ready? yes --→ hit [Return]
Insert the disk to be tested.	[RETURN]	<<Pass-count = 1>> In-ward (trkmin--→ trkmax) +Track = Out-ward (trkmax--→trkmin) +Track =
Read test starts under the test condition pre-set in item 3-4-2.		
The test ends.		*** Read Test End *** [1] Total of Seek error: 0 times during 00160 times seek. +Seek CRC error: 0 times +Seek error: 0 times [2] Total of Read error: 0 times during 02560 times read. +ID, DATA ADM missing: 0 times +ID CRC error: 0 times +DATA CRC error: 0 times +Lost data error: 0 times +Byte data verify Err: 0 times [3] Total of Write error: 0 times during 00000 times write. +ID, ADM missing: 0 times +ID CRC error: 0 times +Lost data error: 0 times +Write Protect error: 0 times +Write Fault error: 0 times
2. To write the data on a level disk. **NOTE:** Before writing data pattern on a level disk, formatting (initialization) can be mode automaticaly. If the some error occurs during the processing, the error will be displayed under title of "Initialize Test End".	[W] [RETURN]	*** Write Test *** *** Write data pattern *** Pattern No. 1 . . . Random data (all data random) Pattern No. 2 . . . Random data (1st byte–0AAh) Pattern No. 3 . . . Worst pattern (DBh, 6Dh, B6h) Pattern No. 4 . . . User definable #Select pattern number: [1, 2, 3, 4] =
To select the data pattern. [EX] In case it is worst pattern.	[3] [RETURN]	#Now, You select pattern No: 3 #Test disk ready? yes --→ hit [Return]
	[RETURN]	*** Write Test Start *** +Track = End
The test ends.		*** Write Test End ***

Description	Keying	Display
[EX] In case it is random data. (all data random.)	[1] [RETURN]	#Now, You select pattern No: 1 #Hit any key after few seconds ==⇒
Type any key.	[A] [RETURN]	#Test disk ready? yes --→ hit [Return] *** Write Test Start *** + Track = End
The test ends.		*** Write Test End ***
[EX] In case it is random data. (1st byte = 0AAh)	[2] [RETURN]	#Now, You select pattern No: 2 #Hit any key after few seconds ==⇒
Type any key.	[A] [RETURN]	#Test disk ready? yes --→ hit [Return] *** Write Test Start *** +Track = End
The test ends.		*** Write Test End ***
[EX] In case it is user definable.	[4] [RETURN]	#Now, You select pattern NO: 4 +Enter hex data [1st Bytes] ==⇒
Type the data to be written it. [EX] In case it is "DA".	[D] [A]	
NOTE: Only 2 characters can be assigned for each byte; the character of more than two is disregarded. The Key [RETURN] must be depressed at the end of each byte. Maximum twenty (20) characters (ten kind of byte -10th bytes) can be assigned.	[RETURN] [RETURN] [RETURN]	+Enter hex data [2nd Bytes] ==⇒ #Test disk ready?--→hit [Return] *** Write Test Start *** +Track = End
The test ends.		*** Write Test End ***
3. To display the test condition.	[L] [RETURN]	[Test condition] — drive C Minimum track — 0 Maximum track — 79 Minimum sector — 1 Maximum sector — 16 Sector size — 256 Single or Double side? — S Read & Write retry — 1 Seek & Home retry — 0
4. To change any of test condition. (Refer to item 3-4-2)	[S] [RETURN]	+Minimum track 0 [track] ==⇒
5. To display the command table.	[H] [RETURN]	*** Command table *** r := read test w := write test l := show disk condition s := set test condition h := help e := finish & exit to CP/M
6. To end the test or retest from the first step.	[E] [RETURN]	A>

3-4-4. Error Message

Kind of Error	Error Message	Considerable Cause	Countermeasure (Confirmation / Adjustment)
SEEK ERROR	Seek CRC error Seek error	Stepping motor load torque is too high. Stepping motor circuit is out of order.	Confirm stepping motor load torque. (Refer to 5-5.) Confirm the function of stepping motor circuit.
READ ERROR	ID, data, ADM missing.	Read circuit is out of order.	Confirm the read circuit. (at first check RF out put)
	ID, data CRC error	Off track, chucking trouble, wrong head compliance.	Confirm head compliance, (Refer to 5-3.) chucking mechanism or radial alignment and TRK 00 sensor (Refer to 5-4).
WRITE ERROR	ID ADM missing	No write function. (write circuit is out of order, no formatting)	Confirm the waveform of RF output. (CN107-1)
	ID CRC error	Off track wrong head compliance, chucking trouble, or disk.	Confirm the radial alignment and TRK 00 sensor (Refer to 5-4.), head compliance (Refer to 5-3.), or chucking mechanism.
	Write protect error	Condition is set to write protect.	Confirm Media, write protect circuit or write protect mechanism.

MEMO

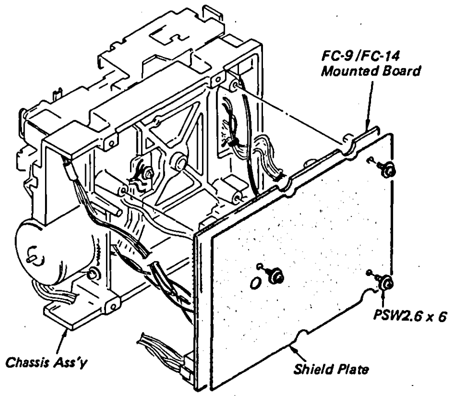
SECTION 4
PART REPLACEMENT

4-1. FC-9/FC-14 MOUNTED BOARD REPLACEMENT

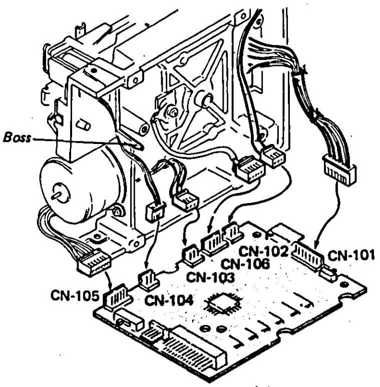
4-1-1. Removal

a. Remove the three screws (PSW2.6 x 6) which fasten both the FC-9/FC-14 Mounted Board and shield plate to the chassis ass'y. (Refer to Fig. 4-1 (a))

b. Remove all the connectors. Do not apply any excessive force to the head harness (CN106). (Refer to Fig. 4-1 (b))



(a)



(b)

Fig. 4-1 FC-9/FC-14 Mounted Board

4-1-2. Installation and Adjustment

a. Set the respective connectors to the FC-9/FC-14 Mounted Board.

Harness	FC-9/FC-14 Mounted Board
7p (To the disk motor)	CN101
6p (To the stepping motor)	CN105
(V) 5p (To the head)	CN106
(W) 6p (To the head)	CN106
3p (To the plunger)	CN104
3p (To LED)	CN102
3p (To the TRK 00 sensor)	CN103

b. Insert the harness between the chassis ass'y and FC-9/FC-14 Mounted Board and fasten the FC-9/FC-14 Mounted Board and shield plate with the three screws (PSW2.6 x 6). (Refer to Fig. 4-1)

c. Read amplifier gain and offset adjustment. (Refer to 5-7)

d. Index phase adjustment. (Refer to 5-6)

4-2. FRONT PANEL ASS'Y REPLACEMENT

4-2-1. Removal

a. Remove the two screws (PS2.6 x 10) from the bottom of the chassis ass'y and then remove the front panel ass'y. (Refer to Fig. 4-2)

4-2-2. Installation

a. Install the eject button and compression spring onto the front panel ass'y.

b. Install the LED into the square opening within the front panel ass'y, and then press the front panel ass'y to the chassis ass'y.

c. Fasten the chassis ass'y to the front panel ass'y on the bottom surface with the two screws (PS2.6 x 10). (Refer to Fig. 4-2)

NOTE 1: Install both the chassis ass'y and front panel ass'y in place so that these assemblies closely contact.

NOTE 2: Do not pintch the harness, (especially head harness), during the installation i.e, the head harness gap between these assemblies.

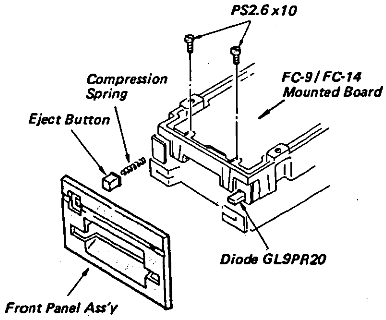


Fig. 4-2 Front Panel Ass'y Replacement

4-3. BLIND PANEL REPLACEMENT

4-3-1. Removal

a. Remove the front panel ass'y. (Refer to 4-2)

b. Remove the blind panel by twisting it into the arrow while pressing its both edges. (Refer to Fig. 4-3)

4-3-2. Installation

a. Press the blind panel toward the cassette-up ass'y and latch the two tabs onto the disk holder. (Refer to Fig. 4-3)

b. Install the front panel ass'y. (Refer to 4-2)

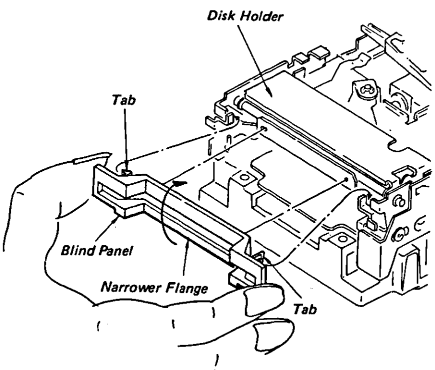


Fig. 4-3 Blind Panel Replacement

4-4. LED MOUNTED BOARD ASS'Y REPLACEMENT

4-4-1. Removal

a. Remove both the FC-9/FC-14 Mounted Board and shield plate. Disconnect CN 102 connector. (Refer to Fig. 4-4 (a))

b. Remove the front panel ass'y. (Refer to 4-2)

c. Remove the LED Mounted Board ass'y from the chassis ass'y.

4-4-2. Installation

a. Peel off remover from the cushion and set the LED Mounted Board as shown in Fig. 4-4 (b).

b. Install both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

c. Install the front panel ass'y. (Refer to 4-2)

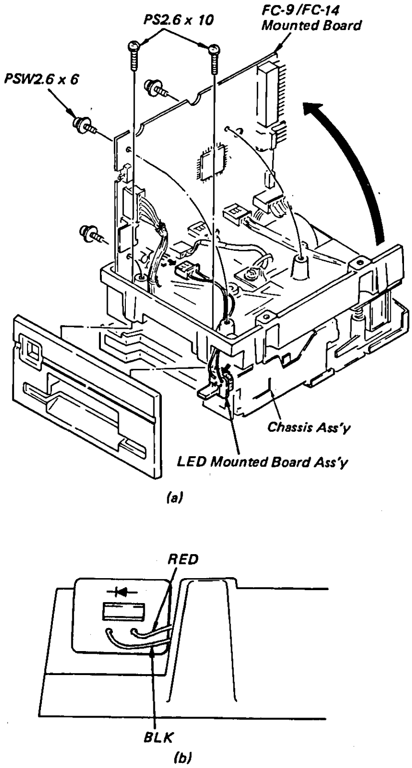


Fig. 4-4 LED Mounted Board Ass'y Replacement

4-5. MAIN COVER REPLACEMENT

4-5-1. Removal

a. Remove the screw (B2.6 x 5) which fastens the main cover from the chassis ass'y, and then remove the main cover. (Refer to Fig. 4-5)

4-5-2. Installation

a. Install the main cover so that the position marked is set in accordance with the arrow, and then install the main cover with the screw (B2.6 x 5). (Refer to Fig. 4-5)

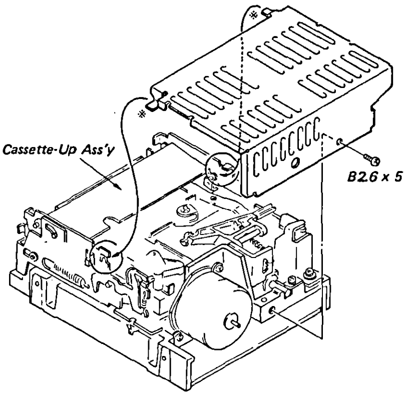


Fig. 4-5 Main Cover Replacement

32V 4-6. PAD ASS'Y REPLACEMENT

4-6-1. Removal

a. Remove the main cover. (Refer to 4-5)

b. Lifting the pad arm tip so that any excessive force may not be applied to the pad arm ass'y, remove the pad ass'y by pressing its rear part. (Refer to Fig. 4-6 (a))

4-6-2. Installation and Adjustment

a. Pick up pad holder (not pad itself) of pad ass'y lightly and insert pad ass'y into the location on pad arm ass'y. (Refer to Fig. 4-6 (a))

b. Pull down the pad arm ass'y, and check if the pad is arranged in parallel with the head as shown in Fig. 4-6 (b).

c. Perform the pad pressure adjustment. (Refer to 5-2)

d. Perform the head clearance adjustment. (Refer to 5-10)

e. Perform the HL arm height adjustment. (Refer to 5-9)

f. Make the head clean. (Refer to 5-11)

g. Perform the head compliance adjustment. (Refer to 5-3)

h. Install the main cover. (Refer to 4-5)

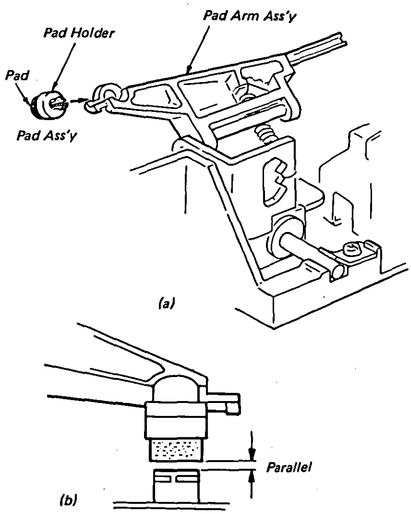


Fig. 4-6 Pad Ass'y Replacement

32W 4-7. DAMPER REPLACEMENT

4-7-1. Removal

a. Remove the main cover. (Refer to 4-5)

b. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

c. Remove the screw (PS2.6 x 6) which fastens the damper to the head load ass'y, and then remove the damper. (Refer to Fig. 4-7)

4-7-2. Installation

a. Insert the damper arm tip into between the cassette holder and HL arm, and set the damper to the head load ass'y. (Refer to Fig. 4-7)

b. Install the main cover. (Refer to 4-5)

c. Make the head clean. (Refer to 5-11)

32W

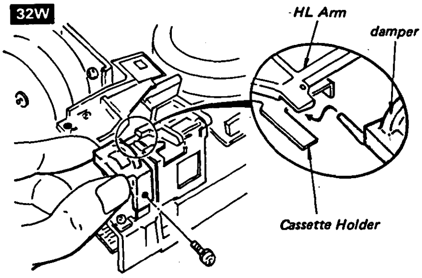


Fig. 4-7 Damper Replacement

4-8. HEAD LOAD ASS'Y REPLACEMENT

4-8-1. Removal

a. Remove both the FC-9/FC-14 Mounted Baord and shield plate. (Refer to 4-1)

b. Remove the main cover. (Refer to 4-5)

c. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W d. Remove the damper. (Refer to 4-7)

e. Remove the two screws (PS2.6 x 6) which fasten the head load ass'y to the chassis so that an excessive force is not applied to the head arm, and then remove the head load ass'y, (Refer to Fig. 4-8 (a) (b))

4-8-2. Installation and Adjustment

a. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

b. Pass the harness of the head load ass'y through the opening of the chassis. (Refer to Fig. 4-8 (a) (b))

c. Fasten both the head load ass'y and lug terminal to the chassis with the two screws (PS2.6 x 6). (Refer to Fig. 4-8 (a) (b))

d. Bend one tip of the lug terminal by 90° ±10°. (Refer to Fig. 4-8 (c))

32W e. Install the damper in place. (Refer to 4-7)

f. Install both the FC-9/FC-14 Mounted Board and shield plate in place. (Refer to 4-1)

g. Perform the head clearance adjustment. (Refer to 5-10)

h. Perform the HL arm height adjustment. (Refer to 5-9)

i. Install the main cover in place. (Refer to 4-5)

j. Make the head clean. (Refer to 5-11)

32V

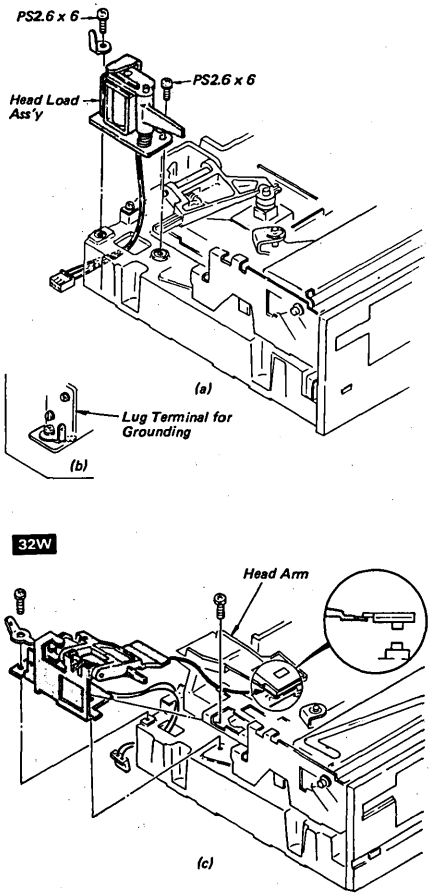


Fig. 4-8 Head Load Ass'y Replacement

4-9. CASSETTE-UP ASS'Y REPLACEMENT

4-9-1. Removal

32W a. Remove both the FC-9 Mounted Board and shield plate. (Refer to 4-1)

b. Remove the front panel ass'y. (Refer to 4-2)

c. Remove the blind panel. (Refer to 4-3)

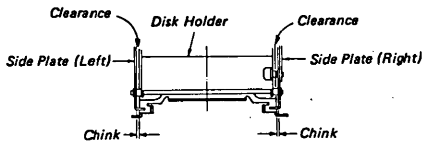
d. Remove the main cover. (Refer to 4-5)

e. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

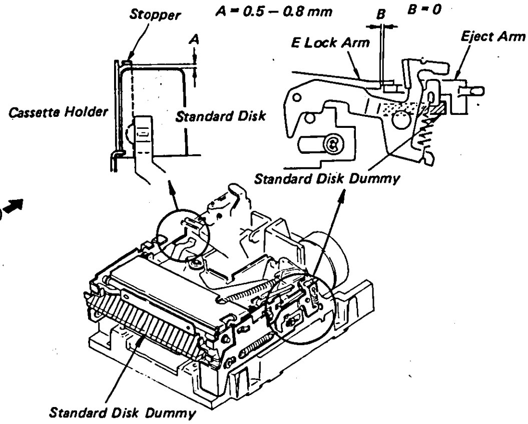
32W f. Remove the damper. (Refer to 4-7)

32W g. Remove the head load ass'y. (Refer to 4-8)

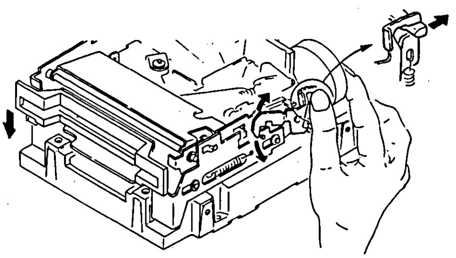
h. Remove the four screws (PSW2.6 x 8) from the bottom of the chassis, and then remove the cassette-up ass'y. (Refer to Fig. 4-9 (b))



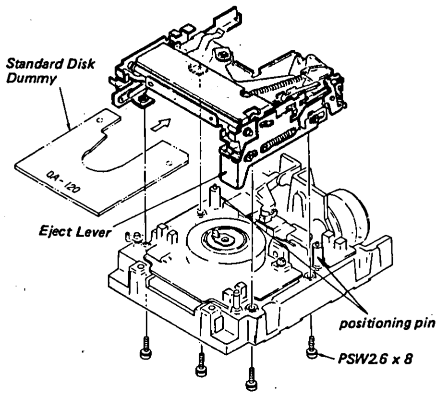
(c)



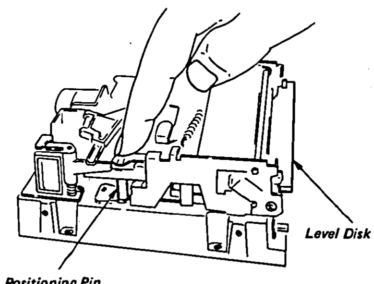
(d) TOP VIEW of Cassette-Up Ass'y



(a) Steeling to Disk-In Mode



(b)



(e)

Fig. 4-9 Cassette-Up Ass'y Replacement

4-9-2. Installation and Adjustment

a. Place the cassette-up ass'y onto the chassis ass'y and fasten the bottom of the chassis ass'y lightly with the four screws (PSW2.6 x 8). (Refer to Fig. 4-9 (b))

b. Insert the standard disk dummy (OA-120) into the cassette-up ass'y. Check if the standard disk dummy positioning hole aligns with the positioning pin on the chassis, and if the clearance shown in Fig. 4-9 (c) (d) are kept assured, and then fasten the four screws firmly.

32W c. Install the head load ass'y. (Refer to 4-8)

32W d. Install the damper in place. (Refer to 4-7)

e. Insert the level disk into the cassette-up ass'y. Check if disk positioning is properly located while touching the forefinger at the positioning holes in the left and right of the disk. (Refer to Fig. 4-9 (e)) Check if disk positioning is properly located even while placing each side of the disk drive downwards.

f. If any displacement is found during positioning test in item (e), repeat the operations defined in 4-9-2.

g. Press the eject lever and check if the level disk can smoothly be shifted up and down.

32W h. Install the both FC-9 Mounted Board and shield plate in place. (Refer to 4-1)

i. Make the head clean. (Refer to 5-11)

j. Install the main cover in place. (Refer to 4-5)

k. Install blind panel in place. (Refer to 4-3)

l. Install the front panel ass'y in place. (Refer to 4-2)

4-10. WP ARM/D-DETECTION ARM/COMPRESSION SPRING (3-659-609-00) REPLACEMENT

4-10-1. Removal

32W a. Remove both the FC-9 Mounted Board and shield plate. (Refer to 4-1)

b. Remove the front panel ass'y. (Refer to 4-2)

c. Remove the main cover. (Refer to 4-5)

d. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W e. Remove the damper. (Refer to 4-7)

32W f. Remove the head load ass'y. (Refer to 4-8)

g. Remove the cassette-up ass'y. (Refer to 4-9)

h. Remove the E ring (E2.3), pull out both the WP and D-Detection arms, and remove the compression spring (3-659-609-00) from the chassis ass'y. (Refer to Fig. 4-10)

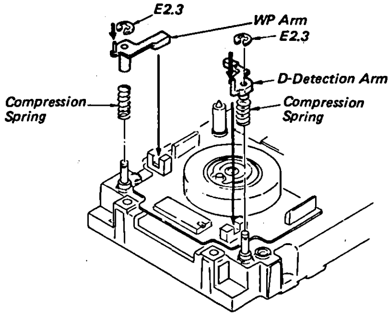


Fig. 4-10 WP Arm/D-Detection Arm/Compression Spring Replacement

4-10-2. Installation and Adjustment

a. Pass the compression spring (3-659-609-00) and WP arm or the compression spring (3-659-609-00) and D-Detection arm through the shaft in sequence. Then, clamp them with the E ring (E2.3). (Refer to Fig. 4-10)

b. Pressing with the fingers the portion indicated by arrow on the WP or D-Detection arm, check if the WP or D-Detection arm smoothly returns to home position by spring force.

32W c. Install both the FC-9 Mounted Board and shield plate in place. (Refer to 4-1)

d. Install the cassette-up ass'y in place. (Refer to 4-9)

32W e. Install the head load ass'y in place. (Refer to 4-8)

32W f. Install the damper in place. (Refer to 4-7)

g. Make the head clean. (Refer to 5-11)

h. Install the main cover in place. (Refer to 4-5)

i. Install the front panel ass'y in place. (Refer to 4-2)

4-11. DC DISK DRIVE MOTOR (BHC-2101A) REPLACEMENT

4-11-1. Removal

a. Connect the MFD Checker II, and then turn off the power switch. (Refer to Fig. 2-1)

b. Remove both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

c. Remove the front panel ass'y. (Refer to 4-2)

d. Remove the main cover. (Refer to 4-5)

e. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W e. Remove the damper. (Refer to 4-7)

32W f. Remove the head load ass'y. (Refer to 4-8)

g. Remove the cassette-up ass'y. (Refer to 4-9)

h. Remove the WP arm, D-Detection arm and these compression springs. (Refer to 4-10)

i. Remove the two screws (PS2.6 x 8) which fasten the disk motor, and then remove the disk motor. (Refer to Fig. 4-11)

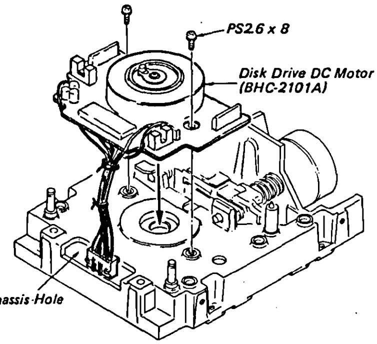


Fig. 4-11 Disk Drive DC Motor (BHC-2101A) Replacement

4-11-2. Installation and Adjustment

a. Pass the DC Disk motor harness through the opening in front of the chassis ass'y, and then fasten the DC Disk motor with the two screws (PS2.6 x 8). (Refer to Fig. 4-11)

b. Install the WP arm, D-Detection arm, and these compression springs in place. (Refer to 4-10)

c. Install the cassette-up ass'y in place. (Refer to 4-9)

32W d. Install the head load ass'y in place. (Refer to 4-8)

32W e. Install the damper in place. (Refer to 4-7)

f. Install both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

g. Make the head clean. (Refer to 5-11)

h. Perform the radial alignment and TRK 00 sensor adjustment. (Refer to 5-4)

i. Perform the index phase adjustment. (Refer to 5-6)

j. Install the main cover in place. (Refer to 4-5)

k. Install the front panel ass'y in place. (Refer to 4-2)

4-12. SENSOR MOUNTED BOARD REPLACEMENT

4-12-1. Removal

a. Connect the MFD Checker II, move the head until it arrives at TRK 79, and then turn off the power switch. (Refer to Fig. 2-1)

b. Remove both the FC-9/FC14 Mounted Board and shield plate. (Refer to 4-1)

c. Remove the front panel ass'y. (Refer to 4-2)

d. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W e. Remove the damper (Refer to 4-7)

32W f. Remove the head load ass'y. (Refer to 4-8)

g. Remove the cassette-up ass'y. (Refer to 4-9)

h. Remove the screw (PSW2.6 x 6) which fastens the Sensor Mounted Board and remove the Sensor Mounted Board. (Refer to Fig. 4-12)

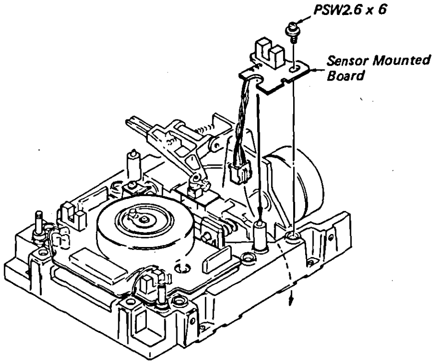


Fig. 4-12 Sensor Mounted Board Replacement

4-12-2. Installation and Adjustment

a. Feed the harness of Sensor Mounted Board as shown by the arrow, set the Sensor Mounted Board onto the chassis along the positioning pin, and fasten lightly it with the screw (PSW2.6 x 6). (Refer to Fig. 4-12)

NOTE: The sensor board should be placed near the disk motor as far as possible.

b. Install the cassette-up ass'y in place. (Refer to 4-9)

Lead Screw Ass'y Replacement

32W c. Install the head load ass'y in place. (Refer to 4-8)

32W d. Install the damper in place. (Refer to 4-7)

e. Install both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

f. Make the head clean. (Refer to 5-11)

g. Perform the radial alignment and TRK 00 sensor adjustment. (Refer to 5-4)

h. Install the front panel ass'y in place. (Refer to 4-2)

i. Install the main cover in place. (Refer to 4-5)

4-13. LEAD SCREW ASS'Y (STEPPING MOTOR/ LEAD SCREW/COUPLING ASS'Y/COMPRESSION SPRING (4-601-083-00)) REPLACEMENT

4-13.1. Removal

a. Remove both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

b. Remove the front panel ass'y. (Refer to 4-2)

c. Remove the main cover. (Refer to 4-5)

d. Attach the rotary knob to the rear shaft of the stepping motor with hexagon wrench torque driver. (Refer to Fig. 4-13 (a))
Check if the gap between the motor bearing metal and rotary knob is approximately 0.5 mm.

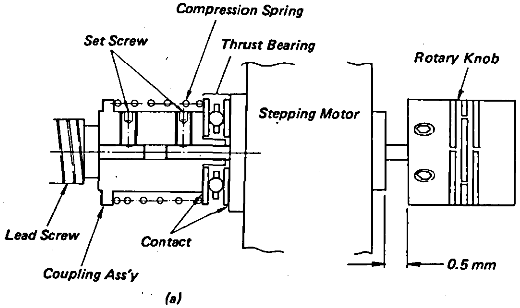
e. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W f. Remove the damper. (Refer to 4-7)

32W g. Remove the head load ass'y. (Refer to 4-8)

h. Remove the cassette-up ass'y. (Refer to 4-9)

i. Remove the two screws (PSW2.6 x 6) which fasten the stepping motor. (Refer to Fig. 4-13 (b))



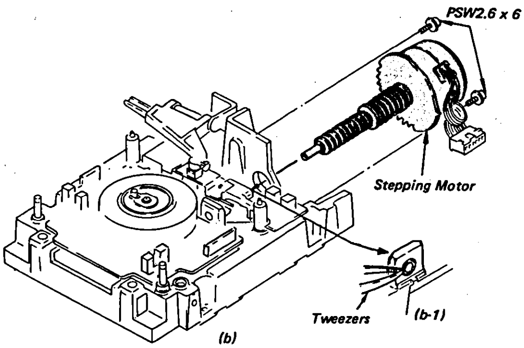


Fig. 4-13 Stepping Motor (SNS-1100A), Coupling Ass'y and Compression Spring Replacement

j. Turning the rotary knob, remove the lead screw ass'y. During removal, hold with the tweezers the ball bearing which hold the lead screw, as shown in Fig. 4-13 (b)-1.

4-13-2. Installation and Adjustment

NOTE: If the replacement can be made with lead screw ass'y, steps a up to g should be skipped.

NOTE: Apply Sony grease (same quantity of watch tip) on whole area of lead screw before replacing it.

a. Stepping motor, lead screw, coupling ass'y and thrust bearing must be roughly assembled.

b. Pressing the coupling ass'y to the lead screw, fasten the setscrew near the lead screw with a hexagon wrench torque driver. (Refer to Fig. 4-13 (a))

c. Pressing the coupling ass'y to the stepping motor, fasten the setscrew near the stepping motor with a hexagon wrench torque dirver. (Refer to Fig. 4-13 (a))

d. Turning the rotary knob, pass the lead screw through the opening of the ball bearing along the path indicated by arrow. (Refer to Fig. 4-13 (b))

e. Fasten loosely the stepping motor with the two screws (PSW2.6 x 6).

f. Loosen the setscrew near the stepping motor so that the lead screw touches the ball bearing by the force of the compression spring.

g. Pulling the rotary knob lightly, fasten the setscrew near the stepping motor with a hexagon wrench torque driver.

h. Perform the lead screw eccentricity adjustment. (Refer to 5-1)

32V i. Perform the stepping motor load torque adjustment. (Refer to 5-5)

j. Install the cassette-up ass'y in place. (Refer to 4-9)

32W k. Install the head load ass'y in place. (Refer to 4-8)

32W l. Install the damper in place. (Refer to 4-7)

m. Install both the FC-9/FC14 Mounted Board and shield plate. (Refer to 4-1)

n. Make the head clean. (Refer to 5-11)

o. Remove the rotary knob from the stepping motor shaft.

p. Perform the radial alignment and TRK 00 sensor adjustment. (Refer to 5-4)

q. Install the main cover in place. (Refer to 4-5)

r. Install the front panel ass'y in place. (Refer to 4-2)

4-14. (32V) HEAD ARM ASS'Y REPLACEMENT (32W) HEAD CARRIAGE ASS'Y REPLACEMENT

NOTE: Do not disassemble or adjust the head arm ass'y or head carriage ass'y because these ass'y have precisely been adjusted in factory.

4-14-1. Removal

a. Remove both the FC-9/FC14 Mounted Board and shield plate. (Refer to 4-1)

b. Remove the front panel ass'y. (Refer to 4-2)

c. Remove the main cover. (Refer to 4-5)

d. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32W e. Remove the damper. (Refer to 4-7)

32W f. Remove the head load ass'y. (Refer to 4-8)

g. Remove the cassette-up ass'y. (Refer to 4-9)

32V h. Remove the screw (PSW2.6 x 6) which fastens the head harness to the chassis on the bottom surface. (Refer to Fig. 4-14 (a))

32W i. Remove the screw (PSW2.6 x 8) which fastens the head harness to the shield plate on the bottom surface of the chassis, and remove the head harness that is adhesive to the chassis. (Refer to Fig. 4-14 (b))

NOTE: The head harness is contacted to the chassis via the adhesive tape with its both surface coated with adhesive agent.

j. Remove the two screws (PSW2.6 x 6) which fasten the guide shaft. (Refer to Fig. 4-14 (a) (b))

32V k. Smoothly pull out the head arm ass'y together with the guide shaft. (Refer to Fig. 4-14 (a))

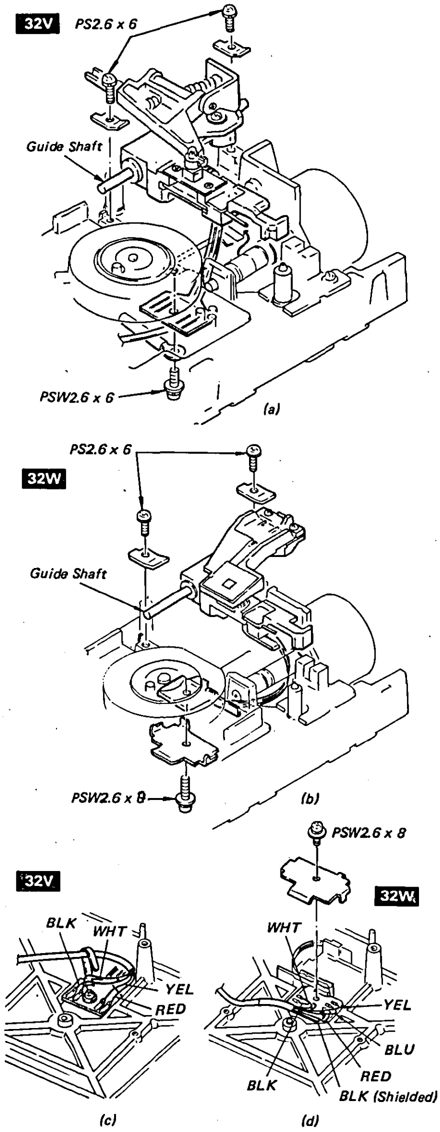


Fig. 4-14 Head Arm Ass'y Replacement
Head Carriage Ass'y Replacement

32W l. Smoothly pull out the head carriage ass'y together with the guide shaft. (Refer to Fig. 4-14 (b))

32V m. Disconnect the head board from the head harness (by four points) with a soldering iron. (Refer to Fig. 4-14 (c))

32W n. Disconnect the head board from the head harness (by six points) with a soldering iron. (Refer to Fig. 4-14 (d))

4-14-2. Installation and Adjustment

NOTE: Apply Sony oil to the guide shaft before installing. Apply Sony oil to the openings of both the head arm ass'y and head carriage ass'y using the bamboo stick.

32V a. Pass the guide shaft through the opening of the head arm ass'y.

32W b. Pass the guide shaft through the opening of the head carriage ass'y.

32V c. Carefully install the head arm ass'y in place. (Refer to Fig. 4-14 (a))

32W d. Carefully install the head carriage ass'y in place. (Refer to Fig. 4-14 (b))

e. Fasten the guide shaft with the two screws (PSW2.6 x 6).

32V f. Fasten the head board to the chassis on the bottom surface, and apply nut lock paint to the screw.

32V g. Connect the head board to the head harness (by four points) with a soldering iron. (Refer to Fig. 4-14 (c))

32W h. Connect the head board to the head harness (by six points) with a soldering iron. (Refer to Fig. 4-14 (d))

32W i. Fasten head board and terminal shield plate with a screw (PSW2.6 x 8) on the chassis bottom, and then apply nut lock paint onto it.

NOTE: The screw must not be tighten too hard. It may produce electrical short or crack of head board.

32V j. Perform the stepping motor load torque adjustment. (Refer to 5-5)

k. Install the cassette-up ass'y in place. (Refer to 4-9)

32W l. Install the head load ass'y in place. (Refer to 4-8)

32W m. Install the damper in place. (Refer to 4-7)

n. Install both the FC-9/FC-14 Mounted Board and shield plate. (Refer to 4-1)

o. Perform the HL arm height adjustment. (Refer to 5-9)

p. Perform the head clearance adjustment. (Refer to 5-10)

q. Make the head clean. (Refer to 5-11)

r. Perform the radial alignment and TRK 00 sensor adjustment. (Refer to 5-4)

s. Perform the read amplifier gain and offset adjustment. (Refer to 5-7)

t. Perform the index phase adjustment. (Refer to 5-6)

u. Install the main cover in place. (Refer to 4-5)

v. Install the front panel ass'y in place. (Refer to 4-1)

SECTION 5
CHECK AND ADJUSTMENT

After measurement and adjustment in accordance with SECTION 5, please surely clean the head.

5-1. LEAD SCREW ECCENTRICITY

Disassemble the following parts and then perform the measurement and adjustment.

a. Main Cover (Refer to 4-5)

b. Front Panel Ass'y (Refer to 4-2)

32W c. Damper (Refer to 4-7)

32W d. Head Load Ass'y (Refer to 4-8)

e. Cassette-up Ass'y (Refer to 4-9)

5-1-1. Tools and Measuring Equipment

a. Lead Screw Eccentricity Inspection Tool

b. Hexagon Wrench Torque Driver

c. Rotary Knob

d. MFD Checker II

5-1-2. Measurement

a. Connect the MFD Checker II to the disk drive. (Refer to Fig. 2-1) and step in the head until it arrives at TRK 79.

b. Turn off the power.

c. Attach the rotary knob onto the rear shaft of the stepping motor shaft with hexagon wrench torque driver. (Refer to Fig. 4-13 (a)) Check if the gap between the motor bearing metal and rotary knob is approximately 0.5 mm.

d. Revolve the rotary knob 3 to 4 turns counterclockwise by hand.

e. Aligning the positioning hole of the lead screw eccentricity tool to the positioning pin on the chassis ass'y, set the lead screw eccentricity inspection tool in place. (Refer to Fig. 5-1)

f. Turn the rotary knob clockwise or counterclockwise by hand. Check if the gap measures 50 μm (5 scales on the meter of the lead screw eccentricity inspection tool) or less.

5-1-3. Adjustment

a. Attach the rotary knob onto the stepping motor shaft. (Refer to Fig. 4-13 (a))

b. Loosen with a hexagon wrench torque driver the two screws which fasten the coupling ass'y.

c. Pressing the coupling ass'y to the lead screw, fasten the setscrew for the lead screw with a hexagon wrench torque driver. (with a torque of 0.7 kg-cm)

d. Pulling the stepping motor shaft, fasten the setscrew for the stepping motor. (With a torque of 0.7 kg-cm)

e. Measure the lead screw eccentricity in accordance with 5-1-2.
Unless the result meets the specification, measurement should be carried out again starting with item "a".

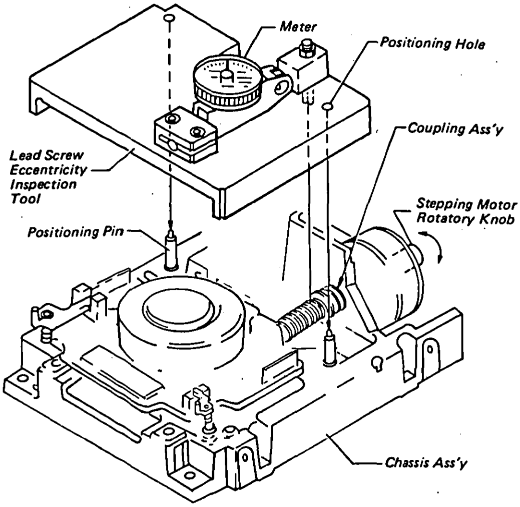


Fig. 5-1 Lead Screw Eccentricity Adjustment

32V 5-2. PAD PRESSURE

Disassemble the following parts and then perform the measurment and adjustment.

a. Main Cover (Refer to 4-5)

5-2-1. Tools and Measuring Equipment

a. Tension Gauge

5-2-2. Measurement

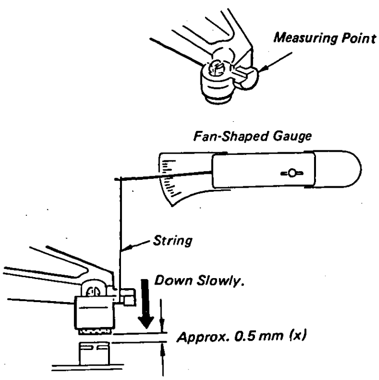
a. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

b. Install a string to the tension gauge at one end and tie the other end to the measuring point. (Refer to Fig. 5-2 (a))

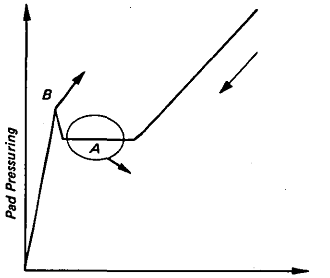
c. Manually put down the HL arm, and then set the machine into the Head Load mode.

d. Lift the pad arm with the tension gauge, and then slowly put down the pad arm until the gauge reading becomes unchanged.

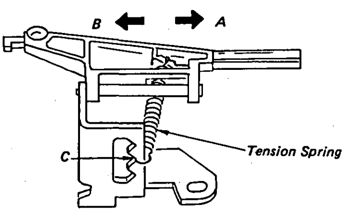
Identify as "A" the position where the stable reading can be obtained. (Refer to Fig. 5-2 (b))



(a) Pad Pressure Measuring Method



(b)



(c)

Fig. 5-2 Pad Pressure Adjustment

e. Put down the pad arm below point "A" until the point just before the pad arm touches the head, and then read the rising peak value at point "B". (Refer to Fig. 5-2 (b))

f. Check if the reading is within 11 ±1.5 g specified for adjustment.

5-2-3. Adjustment

a. Unless the reading is out of 11 ± 1.5 g, change the spring set-position.

b. If the reading is in excess of 12.5 g, move the position toward "A". If the reading is less than 9.5 g, move the position toward "B". Do not change position "C" where the string is set. (Refer to Fig. 5-2 (c))

5-3. HEAD COMPLIANCE

Disassemble the following parts and then perform the measurment and adjustment.

a. Main Cover (Refer to 4-5)

5-3-1. Tools and Measuring Equipment

a. Oscilloscope

b. MFD Checker II

32V c. Level Disk (OR-D46VA)

32W d. Level Disk (OR-D46WA)

e. Pad weight

32V f. ⊖2 mm Driver

g. Rotary Knob

h. Hexagon Wrench Torque Driver

5-3-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 2-1)

b. Insert the level disk in place, and move the head onto TRK 79.

c. Set the HD LOAD switch on the MFD Checker II to "ON".

d. Attach the rotary knob onto the stepping motor shaft and fix it with a hexagon wrench torque driver. (Refer to Fig. 4-13 (a))

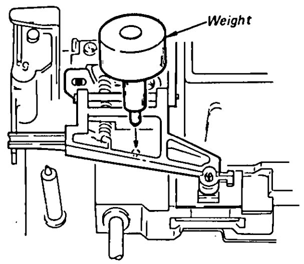
e. Write "2F" into the disk and check if the amplifier output waveform at CN107-1 is satisfactory.

f. When a pad weight is loaded as shown in Fig. 5-3 (a), (b);

1) The output signal level at that time should not be greater than that obtained when no pad weight is loaded.

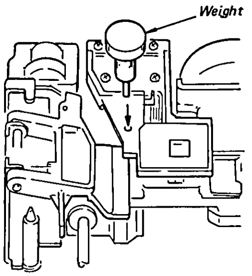
2) The output signal level at that time should not be 95 % or less of that obtained when no pad weight is loaded.

32V



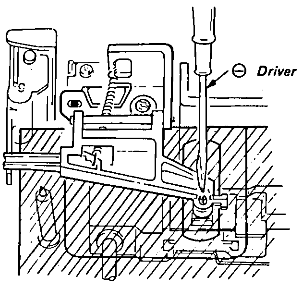
(a) Weight Positioning

32W



(b) Weight Positioning

32V



(c) Pad Ass'y Rotation

Fig. 5-3 Head Complience

g. Take the pad weight, and move the head to TRK 03.

h. Write "1F" into the disk.

i. Turn the rotary knob clockwise until it arrives at the clicking point, move the head to TRK 04, and write "EXT" in to the disk.

32V j. Fully turn the rotary knob counterclockwise, move the head back to TRK 03, and check if the output signal level at that time is 5 % or less of that obtained by item "h".

32W k. Fully turn the rotary knob counterclockwise, move the head back to TRK 03, and check if the output signal level at that time is 10 % or less of that obtained by item "e".

l. Write "1F" into the disk.

m. Turn the rotary knob counterclockwise until it arrives at the clicking point, move the head to TRK 02, and write "EXT" into the disk.

32V n. Turn the rotary knob clockwise until it arrives at the clicking point, move the head back to TRK 03, and check if the output signal level at that time is 5 % or less of that obtained by item "l".

32W o. Turn the rotary knob clockwise until it arrives at the clicking point, move the head back to TRK 03, and check if the output signal level at that time is 10 % or less of that obtained by item "l".

5-3-3. Adjustment

32V a. If the output signal level does not meet item 5-3-2 "f", perform adjustment by turning the pad ass'y as shown in Fig. 5-3 (c).

32W b. If the output signal level does not meet item 5-3-2 "f", replace the head carriage ass'y. (Refer to 4-14)

32V c. If the output signal level doesnot meet item 5-3-2 "n", perform adjustment by turning the pad ass'y as shown in Fig. 5-3 (c).

NOTE: Check if the head compliance is satisfactory after this adjustment.

32W d. If the output signal level doesnot meet item 5-3-2 "o", replace the head carriage ass'y. (Refer to 4-14)

5-4. RADIAL ALIGNMENT AND TRK 00 SENSOR

Dissassemble the following parts and then perform the measurement and adjustment.

a. Main Cover (Refer to 4-5)

5-4-1. Tools and Measuring Equipment

a. SMC-70 System
b. Radial Alignment System Disk
32V c. Alignment Disk (OR-D47VA)
32W d. Alignment Disk (OR-D47WA)
e. Rotary Knob
f. Geared Driver
g. TOTSU Screw Driver (M2.6)
h. ⊖4 mm Driver
i. Hexagon Wrench Torque Driver

5-4-2. Measurement

a. Insert the Radial Alignment system disk into the SMI-7012A drive A.
b. Turn on the power switch. After approximately 15 seconds, "off set measurement/ adjustment ver 1.0" is displayed.
c. Connect the disk drive (under test) to the cable which leads to the A/D converter, insert the alignment disk, and set the DRIVE SELECT switch (S101) to 4. (Refer to Fig. 2-2)
d. Execute the Set Up command. (Refer to 5-4-4)
e. Execute the Measurement command. (Refer to 5-4-5)
f. If adjustment is necessary, the Adjustment command is to be executed. (Refer to 5-4-6)

5-4-3. Adjustment

a. Perform adjustment in accordance with 5-4-2 (a) up to (d).
b. Attach the rotary knob to the stepping motor shaft and fix it with a hexagon wrench torque driver. (Refer to Fig. 4-13 (a))
c. Execute the Adjustment command. (Refer to 5-4-6)

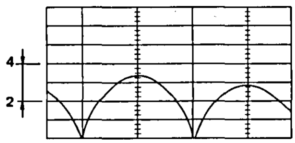
NOTE: For resuming the state of SMC-70 System to the initial state (that apprears immediately after power goes on), press the reset button.

5-4-4. Set Up Command

Function	Keying	Display
1. Select the Set Up command.	[1]	COMMAND NUMBER? 1. HUMIDITY 20 – 80 % : 50.0 [%] 2. SPECIFICATION : 26.0 [micrometer] 3. TIME/4DIVISIONS : 100 [ns] 4. R/W CORE WIDTH : 120 [micrometer] 5. QUIT
2. Asks for the command number at display center.		COMMAND NUMBER?
3. The initial value for the relative humidity is to be set at 50 %.	[1]	HUMIDITY [%]?
[EX] In case a relative humidity of 60 % is keyed in,	[6][0][RETURN]	COMMAND NUMBER?
4. The initial value for the specified off track is to be set at 26 μm.	[2]	SPECIFICATION?
[EX] In case an off track of 30 μm is keyed in,	[3][0][RETURN]	COMMAND NUMBER?

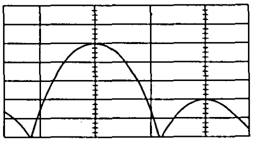
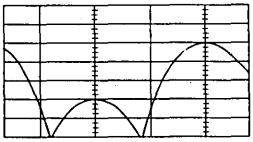
Function	Keying	Display
5. The initial value for the INDEX signal period is to be set at 100 msec.	[3]	TIME/4 DIVISIONS?
[EX] In case an INDEX signal period of 100 msec is keyed in,	[1][0][0] [RETURN]	COMMAND NUMBER?
6. The initial value for the R/W core width is to be set at 120 μm.	[4]	R/W CORE WIDTH?
[EX] In case a R/W core width of 131 μm for the OA-32V is keyed in. (Specify a R/W core width of 120 μm for the OA-32W.)	[1][3][1] [RETURN] [1][2][0] [RETURN]	COMMAND NUMBER?
7. When the Set Up command execution ends, (control to the main menu.)	[5]	MAIN MENU [1] SET UP [2] MEASUREMENT [3] ADJUSTMENT

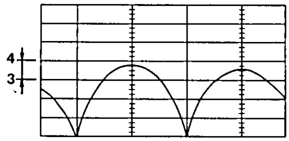
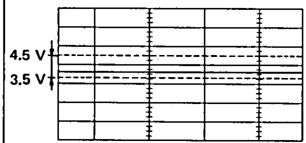
5-4-5. Measurement Command

Function	Keying	Display
1. Select the Measurement command.	[2]	SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
Insert the Alignment disk.	[RETURN]	ADJUST CAT'S EYE SIGNAL LEVEL [MIN (L, R) > 2 div] AND [MAX(L, R) < 4 div] AND [MAX(L/R, R/L) < 1.5] HIT [RETURN] KEY
2. Set the A/D converter gain by adjustment so that the peak values at both edges of the Cat's eye pattern signal may range from 2 to 4 divisions. (Refer to Fig. 5-4 (a)) **NOTE:** If gain adjustment cannot be done, key in [0] to execute step 9. Thereafter, perform the radial alignment adjustment. (Refer to 5-4-6.)	[RETURN]	 (a)
3. Measure the off track.		MEASURING
4. Calculate the off track. **NOTE:** When "NO GOOD" is indicated on the CRT, key [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-6.		CALCULATING ADJUST 00 SENSOR HIT [RETURN] KEY

Function	Keying	Display
5. Check if the TRK 00 sensor output is set at a value between broken lines 3.5 V and 4.5 V. (Refer to Fig. 5-4 (e)) **NOTE:** If not, key in [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-6.	[RETURN]	TRACK 3 : XXX VOLT TRACK 00>01 (Spec : 3.5–4.5) : XXX VOLT OK TRACK 02>01 (Spec : 3.5–4.5) : XXX VOLT OK TRACK 01>00 (Spec : MAX 0.5): XXX VOLT
6. Check if the TRK 00 sensor output is satisfactory. (When "NO GOOD" is displayed on the CRT, repeat step 5.)		
7. Measure the off track		MEASURING
8. Calculate and check the off track. **NOTE:** When "NO GOOD" is displayed on the CRT, key in [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-6.	[RETURN]	CALCULATING GOOD ! HIT [RETURN] KEY SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
9. End the execution in the Measurement mode.	[E][N][D] [RETURN]	

5-4-6. Adjustment Command

Function	Keying	Display
1. Select the Adjustment command.	[3]	COMMAND NUMBER ? SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
Insert the Alignment disk.	[RETURN]	ADJUST CAT'S EYE [MIN(L, R) > 3 div] AND [MAX(L, R < 4 div] AND [MAX(L/R, R/L) < 1.2] HIT [RETURN] KEY
2. Turn the rotary knob clockwise until the head arrives at the outmost position. Thereafter, turn the rotary knob counter clockwise while stopping and starting at each clicking point until the Cat's eye pattern signal appears. Turning the stepping motor with the geared driver within the range that the screw fastening the stepping motor is not dropped from the stepping moter flange, set the amplitude ratio of the peak signals on the Cat's eye pattern signal at 1 : 1.2 or less. **NOTE:** A ratio of 1 : 1.2 is defined by identifying the smaller one as unity. **NOTE:** If adjustment of the stepping motor cannot be conducted by using the geared driver, first find the appropriate position in accordance with the		 (b)  (c) *Fig. 5-4*

Function	Keying	Display
following procedure, and perform adjustment again. (1) When the waveform is as shown in Fig. 5-4 (b), turn the rotary knob clockwise. (2) When the waveform is as shown in Fig. 5-4 (c), turn the rotary knob counterclockwise.		
3. Set the A/D converter gain by adjustment so that the peak values of the Cat's eye pattern signal may range from 3 to 4 divisions. (Refer Fig. 5-4 (d)) **NOTE:** If the amplitude ratio is set at any value other than utmost 1 : 1.2 during initializing, control does not advance the step to the next even if the [RETURN] key is pressed.	[RETURN]	
4. Measure the off track.		MEASURING
5. Calculate the off track.		CALCULATING ADJUST RADIAL ALIGNMENT [MAX (L/R, R/L) < 1.05] TIGHT FIRMLY HIT [RETURN] KEY
6. Turning the stepping motor with the geared driver, set the amplitude ratio of the peak signals on the Cat's eye pattern signal utmost at 1 : 1.05, fasten the setscrew and then apply nut lock paint to it. **NOTE:** A ratio of 1 : 1.05 is defined by identifying the smaller one as unity. **NOTE:** Unless the amplitude ratio is utmost 1 : 1.05, control does not advance the next step.	[RETURN]	MOVE 00 SENSOR BOARD TO OUT SIDE HIT [RETURN] KEY  (d) Fig. 5-4
7. Move the TRK 00 sensor board outside (toward the stepping motor).	[RETURN]	ADJUST 00 SENSOR HIT [RETURN] KEY
8. Check if the TRK 00 sensor output level is within the range of broken lines 3.5 V to 4.5 V. If not, set the level nearlest to the center between these broken lines by adjustment, and fasten the setscrew with nut lock paint. (Refer to Fig. 5-4 (e)) **NOTE:** When "NO GOOD" is displayed on the CRT, repeat step 8.	[RETURN]	TRACK 3 : XXX VOLT TRACK 00>01 (Spec : 3.5–4.5) : XXX VOLT OK TRACK 02>01 (Spec : 3.5–4.5) : XXX VOLT OK TRACK 01>00 (Spec : MAX 0.5): XXX VOLT  (e) *Fig. 5-4 Radial Alignment, TRK 00 Adjustment*

Function	Keying	Display
9. Measure the off track.		MEASURING
10. Calculate and check the off track.		CALCURATING GOOD ! HIT [RETURN] KEY
	RETURN	SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
	E N D RETURN	

5-4-7. Error Message

One of the following errors can occur during measurement, adjustment, or setting of the machine for radial alignment:

a) Not Ready ... Indicates that READY signal is not issued. Check for disk drive connection or check for the DRIVE SELECT switch position.

b) Not Index Pulse ... Indicates that INDEX signal is not issued. Check for diskdrive connection.

c) Cat's Eye Error ... Indicates that the Cat's eye pattérn signal is abnormal. Check for the alignment disk.

In addition to these messages in above, one of the following statements is also displayed.

Statement 1:

[0] CONTINUE / [1] RETRY

Statement 2:

[RETURN] FIRST STEP / [1] RETRY

Key in [0] when statement [1] is displayed, and then control advances the step to the next, disregarding the error which has occurred.

Thereafter, key in [1] and then the same measurement item is executed again.

Key in [RETURN] when statement 2 is displayed, and then control performs the radial alignment measurement and returns to the initial step in the Adjustment mode. Thereafter, key in [1] and then the same measurement item is executed again.

NOTE: Check for the disk drive in accordance with confirmation items to the message displayed before retrying the key-in [1] operation.

32V 5-5. STEPPING MOTOR LOAD TORQUE

Disassemble the following parts and then perform the measurement and adjustment.

a. FC-9/FC-14 Mounted Board. (Refer to 4-1)

5-5-1. Tools and Measurement Equipment

a. Oscilloscope

b. MFD Checker II

32V c. Alignment Disk (OR-D47VA)

d. Tention Gauge

e. ⊕Driver 2 mm

5-5-2. Measurement

a. Push up the steel plate near the lead screw with a spring balance. (Refer to Fig. 5-5)

b. Check if the spring balance indicates a value in the range of 50 g to 80 g at the point where the head arm is just separated from the lead screw.

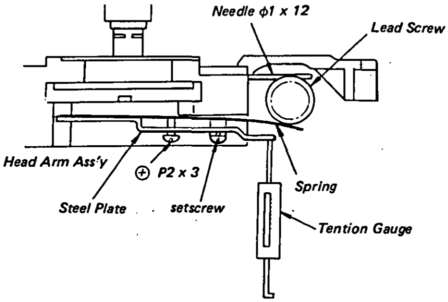


Fig. 5-5 Stepping Motor Load Torque

5-5-3. Adjustment

a. If the spring balance indicates a force of 50 g or less, fasten the setscrew (+P2x3). If it indicates 80 g or more, loosen the setscrew. (Refer to Fig. 5-5)

b. Fix the setscrew (+P2x3) for the steel plate with nut lock paint.

c. Perform the radial alignment and TRK 00 sensor adjustment. (Refer to 5-4)

5-6. INDEX PHASE

5-6-1. Tools and Measurement Equipment

a. Oscilloscope

b. MFD Checker II

32V c. Alignment Disk (OR-D47VA)

32W d. Alignment Disk (OR-D47WA)

e. Adj rod.

5-6-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 2-1)

b. Insert the alignment disk in place.

c. Connect the oscilloscope probe tip to CN107-1 and trigger the oscilloscope at TP-5 of the MFD Checker II.

d. Move the head to TRK 40.

e. Check if the phase relation between the INDEX signal and output signal meets the specification shown in Fig. 5-6 (a).

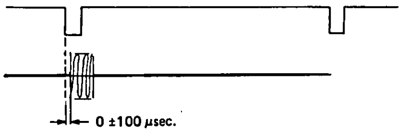


Fig. 5-6 (a) Index Phase Specification

5-6-3. Adjustment

a. If the phase relation described above does not meet the specification, adjust RV101 on the FC-9/FC-14 Mounted Board with an adj rod tool.

NOTE: If adjustment of RV101 does not satisfy the specification, the disk drive motor may be damaged. For the replacement, please refer to 5-8.

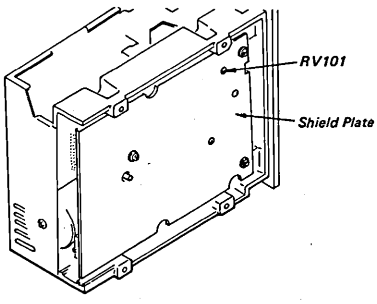


Fig. 5-6 (b) Index Phase Adjustment

5-7. READ AMPLIFIER GAIN AND READ AMPLIFIER OFF SET

5-7-1. Tools and Measuring Equipment

a. Oscilloscope

b. MFD Checker II

32V c. Level Disk (OR-D46VA)

32W d. Level Disk (OR-D46WA)

e. Adj rod

5-7-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 2-1)

b. Connect the oscilloscope probe tip (CH-1) to CN107-1 built in the disk drive and other tip (CH-2) to TP-5 of the MFD Checker II.

NOTE: The vertical sensitivities are set at 0.2 V/div on CH-1 and at 2 V/div on CH-2 with a timing range of 10 ms/div. The oscilloscope is triggered by the signal on CH-2.

c. Select display only for CH-1.

d. Insert the level disk in place and move the head to TRK 79.

32W e. Set the SIDE SELECT switch on the MFD Checker II to side 0.

f. Press the WRITE switch, and then "2F" is written into the disk.

g. Check if the peak-to-peak value of the output waveform for "2F" is 0.6 ± 0.2 V (32W 0.35 ± 0.15 V). (Refer to Fig. 5-7 (a))

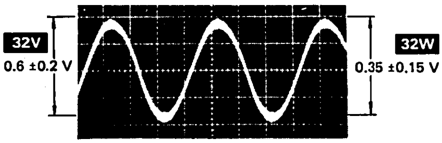
32W h. Set the SIDE SELECT switch on the MFD Checker II to side 1.

32W i. Press the WRITE switch, and then "2F" is written into the disk.

32W j. Check if the peak-to-peak value of the output waveform for "2F" is | 0.35±0.15V (Refer to Fig. 5-7 (a))

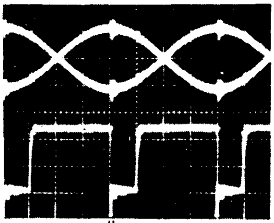
k. Connect the oscilloscope probe tip (CH-2) to TP-3 on the MFD Checker II.

l. Operate the oscilloscope in the chop mode with a timing range of 0.5 μsec/div.



(a)

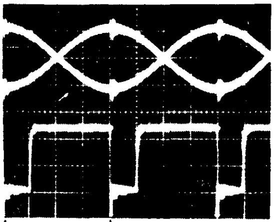
32V



No Jitter

(b)

32W



2.0 ± 0.2 μsec.

(c)

Fig.5-7

m. Select "Uncal" on the timing axis of the oscilloscope and then such a waveform as shown in Fig. 5-7 (b) can be obtaind.

32V n. Check if no jittery pulse follows the triggered one. (Refer to Fig. 5-7 (b))

32W o. Check if the pulses are issued from side 0 or 1 every 2.0 ± 0.2 μsec. (Refer to Fig. 5-7 (c))

5-7-3. Adjustment

Read amplifier gain adjustment

a. If the peak-to-peak value of the "2F" Read signal output is other than 0.6 ± 0.2 V (32W 0.35 ± 0.15 V), set the output signal at 0.6 ± 0.05 V (32W 0.35 ± 0.15 V) by adjusting RV102 on the FC-9/FC-14 Mounted Board with an adj rod tool.

32W b. If the peak-to-peak value of output waveform for "2F" in item j of the above is not 0.35±0.15V, replace the head carriage ass'y. (Refer to 4-14)

c. Perform the Head compliance adjustment. (Refer to 5-3)

Read amplifier off set adjustment

32V a. If any jittery pulses follow the triggered one, stop jittering at the pulse edge as far as possible by adjusting RV103 on the FC-14 Mounted Board with an adj rod tool.

32W b. If the pulses are issued from side 0 or 1 at any interval other than 2.0 ± 0.2 μsec, set the pulse interval on both sides 0 and 1 at 2.0 ± 0.2 μsec by adjusting RV103 on the FC-9 Mounted Board with an adj rod tool.

c. If adjstment of a and b above does not satisfy the spec, FC-9/FC-14 Mounted Baord must be replaced. (Refer to 4-1)

NOTE: After completion of the read amplifier gain adjustment, perform the read amplifier offset adjustment.

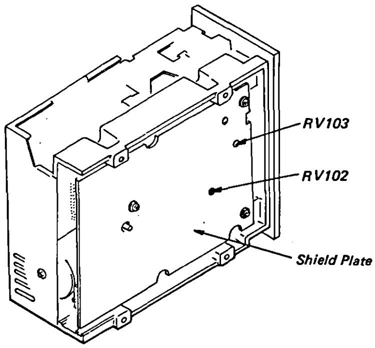


Fig. 5-7 (d) Read Amplifier Gain and Off set Adjustment

5-8. DISK DRIVE DC MOTOR SPEED

5-8-1. Tools and Measuring Equipment

a. MFD Checker II

32V b. Level Disk (OR-D46VA)

32W c. Level Disk (OR-D46WA)

d. Universal Counter

5-8-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 5-8 (a))

b. Insert the level disk in place.

c. Move the head until it arrives at TRK 35.

d. Connect the universal counter probe tip to TP-5 on the MFD Checker II.

e. Check if the pulses are generated every 100 ± 1.5 msec.

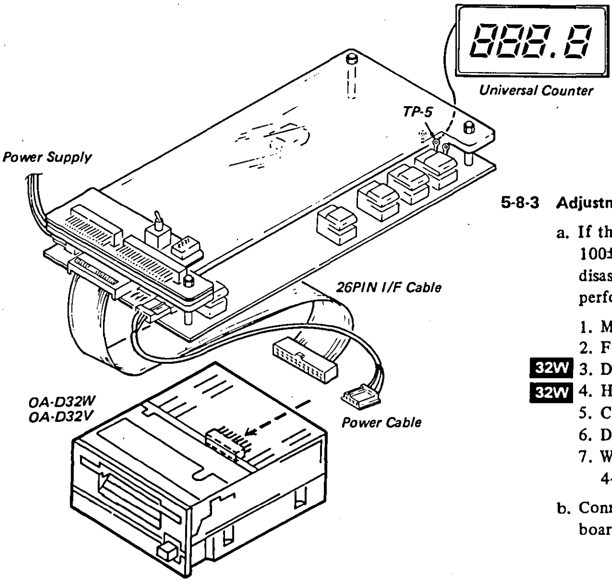


Fig. 5-8 (a) Motor Speed Measurement

5-8-3 Adjustment

a. If the pulses are generated other than every 100±1.5 msec in the measurement (5-8-2), disassemble the following parts and then perform the adjustment.

1. Main cover (Refer to 4-5)
2. Front panel ass'y (Refer to 4-2)
3. 32W Damper (Refer to 4-7)
4. 32W Head load ass'y (Refer to 4-8)
5. Cassette-up ass'y (Refer to 4-9)
6. Disk motor (Refer to 4-11)
7. WP arm, D-Detection arm (Refer to 4-10)

b. Connect the disassembled disk motor board as shown in Fig. 5-8 (b).

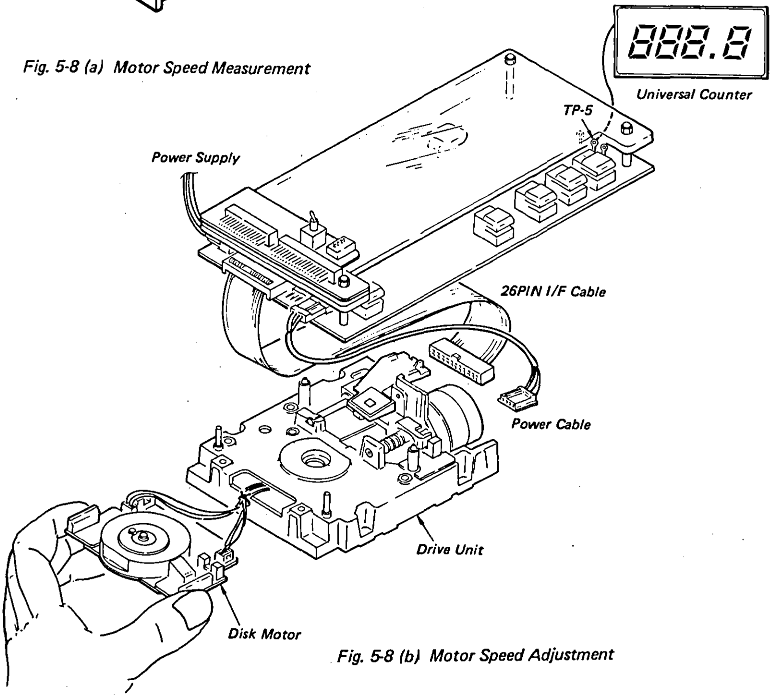


Fig. 5-8 (b) Motor Speed Adjustment

c. Set disk motor control switch (S102) located on FC-9/FC-14 Mounted Board, to side "A".

d. Turn on the unit. Read the value of the universal counter.

e. The value may be falled in one of the followings.

1. 0 (Not rotate)
2. 100±10 msec
3. 90 msec or less

Replace the parts in accordance with the flowchart or expression below:

i) When the disk motor does not rotate: (Refer to flowchart 5-8 (a))

ii) When the pulses are generated every 100 ±10 msec:

Change the value of R9 and R8 in the following manner:

- PULSE INTERVAL – 100 < 0
  R9 (kΩ) = 1.5 x [100 – PULSEINTERVAL (msec)]
  R8 = 150 kΩ
- PULSE INTERVAL – 100 > 0
  R8 (kΩ) = 150 – 1.5 x [PULSEINTERVAL (msec) – 100]
  R9 = 0Ω

NOTE: Figures marked with # are for a disk motor having the lot number of XXXX2. For detail, refer to the circuit diagram and electrical parts list.

- PULSE INTERVAL –100 < 0
  R9 (kΩ) = 1.5 x [100 – PULSEINTERVAL (msec)]
  #R8 = 160 kΩ
- PULSE INTERVAL – 100 > 0
  #R8 (kΩ) = 160 –1.5 [PULSEINTERVAL (msec) – 100]
  R9 = 0Ω

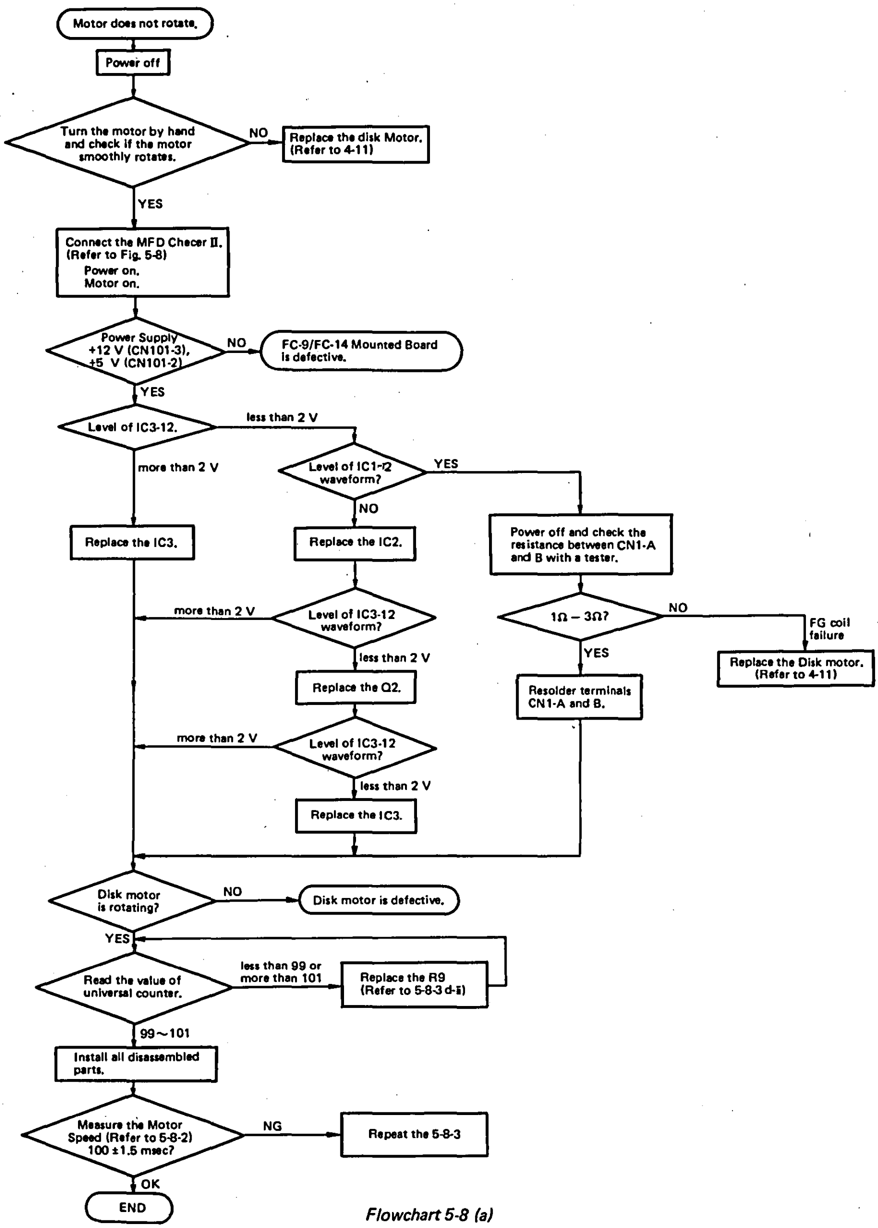
iii) When the motor speed is abnormally high: (Refer to flowchart 5-8 (b))

f. Install all the assembled parts.

g. Remeasure the motor speed interval and confirm that it is 100±1.5 msec.

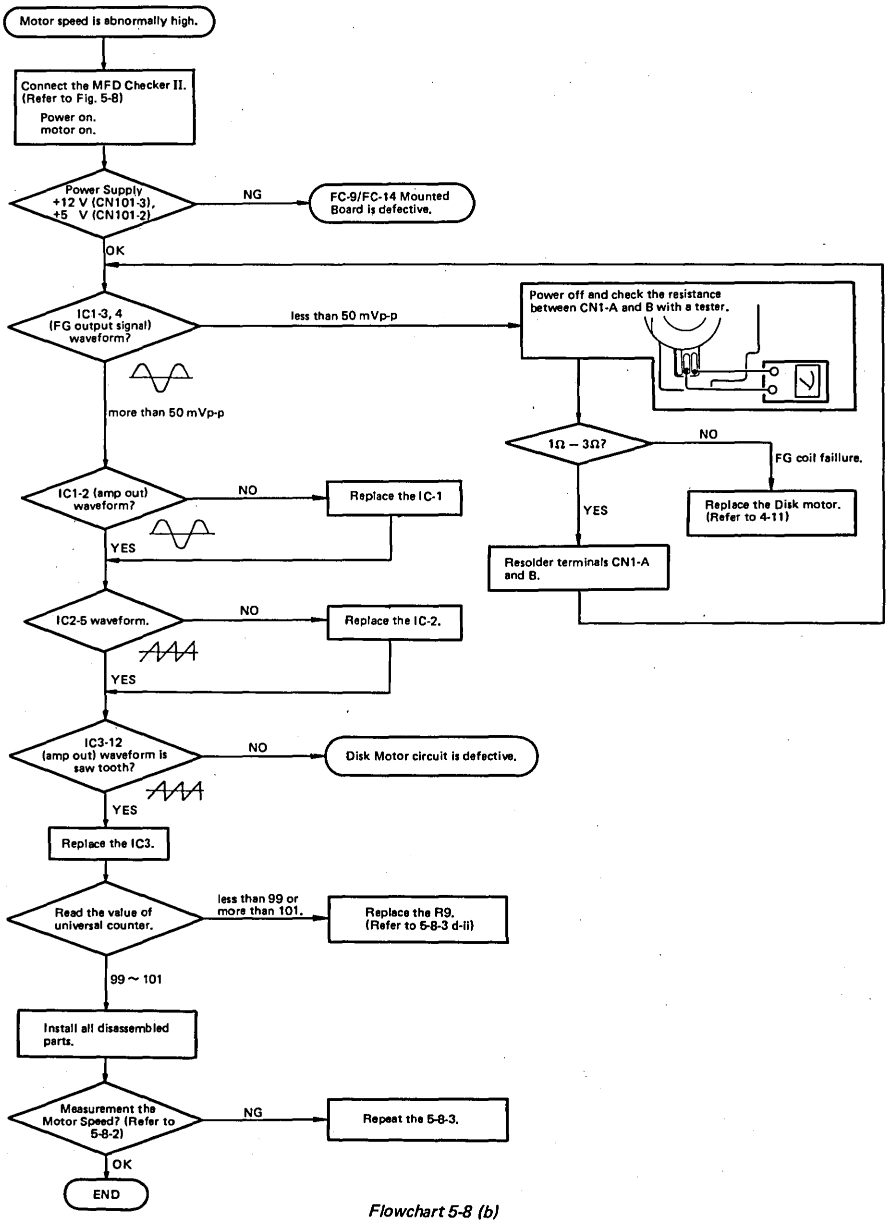
h. If it is not 100±1.5 msec, repeat the steps from the beginning of 5-8-3. Adjustment.

NOTE: Don't forget to put disk motor control switch (S102) located on FC-9/FC-14 Mounted Board, back to original position.



Flowchart 5-8 (a)

Troubleshooting Flowchart



Flowchart 5-8 (b)

32V 5-9. HL ARM HEIGHT

Disassemble the following parts and then perform the adjustment.

a. Main Cover (Refer to 4-5)

5-9-1. Tools and Measuring Equipment

a. MFD Checker II

b. ⊕2 mm Driver

c. ⊖2 mm Driver

5-9-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 2-1)

b. Move the head until it arrives at TRK 79.

c. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

d. Push down the plunger core of the head load ass'y at point A. (Refer to Fig. 5-9)

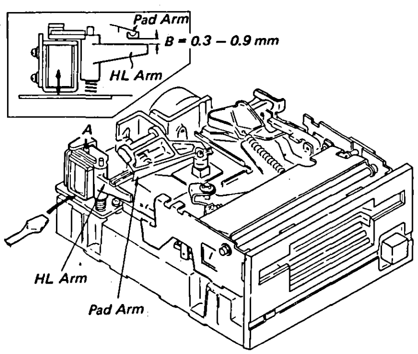


Fig. 5-9 HL Arm Height Adjustment

e. Check if clearance B between the HL Arm and pad arm is set at a value within the range of 0.3 to 0.9 mm. (Refer to Fig. 5-9)

5-9-3. Adjustment

a. If the gap is not within 0.3 to 0.9 mm, loosen the screw which fastens the plunger solenoid and once push down the plunger solenoid.

b. Insert a ⊖ driver beneath the plunger solenoid and slowly push up the plunger solenoid until clearance B becomes the specified value. (Refer to Fig. 5-9)

c. Fasten the screw and check again if clearance B meets the specification.

5-10. HEAD CLEARANCE

Disassemble the following parts and then perform the adjustment.

a. Main Cover (Refer to 4-5)

5-10-1. Tools and Measuring Equipment

a. MFD Checker II

b. Round Nose Plier

c. Hexagon Wrench Torque Driver

5-10-2. Measurement

a. Connect the disk drive to the MFD Checker II. (Refer to Fig. 2-1)

b. Move the head until it arrives at TRK 79.

c. Manually set the machine into the Disk-In mode. (Refer to Fig. 4-9 (a))

32V d. After pressing the HL Arm twice or more, visually check if the clearance between the head and pad is within 0.1 to 0.4 mm. (Refer to Fig. 5-10 (a))

32W e. After pressing the HL Arm twice or more, visually check if the clearance between both heads is within 0.1 to 0.4 mm. (Refer to Fig. 5-10 (b))

5-10-3. Adjustment

32V a. If the clearance is greater than 0.4 mm, bend the HL Arm mounting plate downwards. (Refer to 5-10 (a))

32V b. If the clearance is less than 0.1 mm, bend the HL Arm mounting plate upwards. (Refer to Fig. 5-10 (a))

32W c. If the clearance is out of the specified range, turn the HL Arm adjusting screw until the clearance is in the specification. (Refer to Fig. 5-10 (b))

32W d. After completion of the adjustment, fix the adjusting screw with nut lock paint. (Refer to Fig. 5-10 (b))

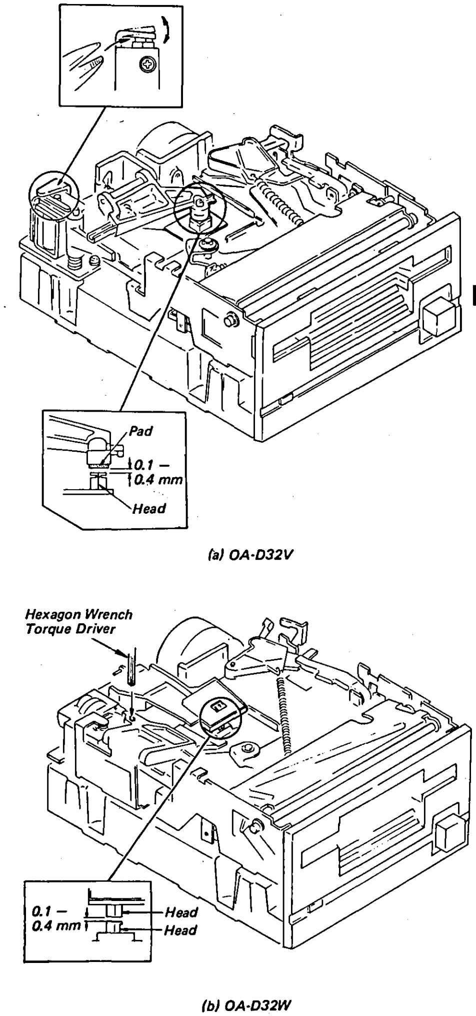


Fig. 5-10 HL Arm Height Adjustment

5-11. HEAD CLEANING

Disassemble the following parts and then make the head clean.

a. Main Cover (Refer to 4-5)

5-11-1. Tools and Measuring Equipment

32V a. Applicator

32V b. Alcohol

32V c. Cleaning Disk (OR-D29VA)

32W d. Cleaning Disk (OR-D29WA)

e. MFD Checker II

32V 5-11-2. Cleaning with Applicator

a. Manually lifting the pad arm, scrub the head surface lightly with an applicator containing alcohol.

b. Scrub the head surface with a dry applicator. Do not leave fine cotton fibers on the head surface.

5-11-3. Cleaning with Cleaning Disk

a. Connect the disk drive to MFD Checker II. (Refer to Fig. 2-1)

b. Move the head until it arrives at an unused track of the cleaning disk.

c. Set the cleaning disk in place, and hold it for about 10 seconds. Thereafter, eject the cleaning disk.

NOTE: Do not use any scratched cleaning disk. Do not reuse any used track because reuse of the track weakens the cleaning effect on the head.

NOTE: Cross out numbers of the used tracks on a cleaning disk label, shown in the example, for avoiding reusage.

Cleaning Disk

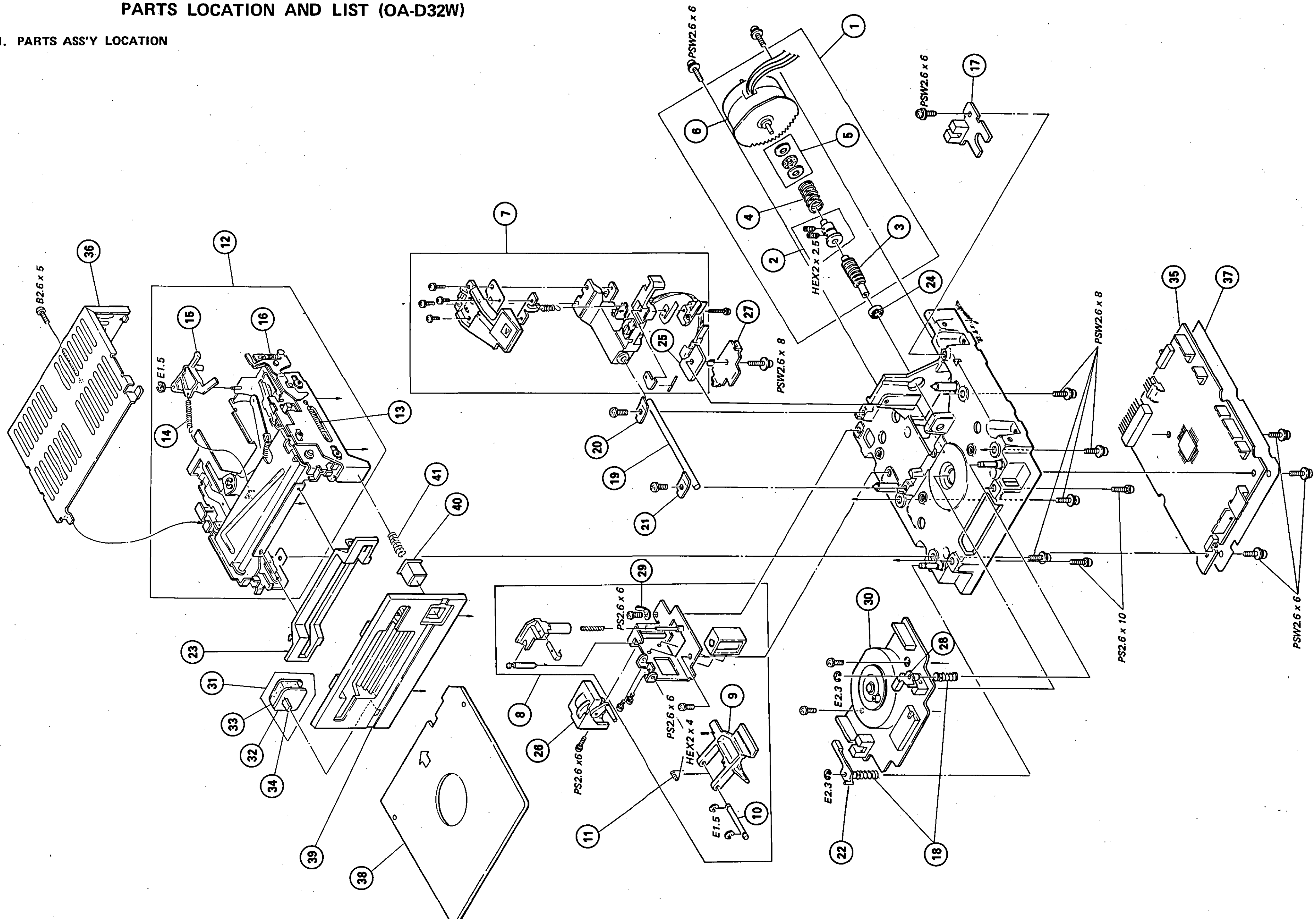
Check Column

~~00~~	~~01~~	~~02~~	03	04	05	06	07	08	09
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

OR-D29VA

SECTION 6
PARTS LOCATION AND LIST (OA-D32W)

6-1. PARTS ASS'Y LOCATION



6-2. MECHANICAL PARTS LIST

NOTE: 1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this list are not normally required for routine service work. Orders for parts not shown in **Bold-Face type** will be processed, but allow for additional delivery time.

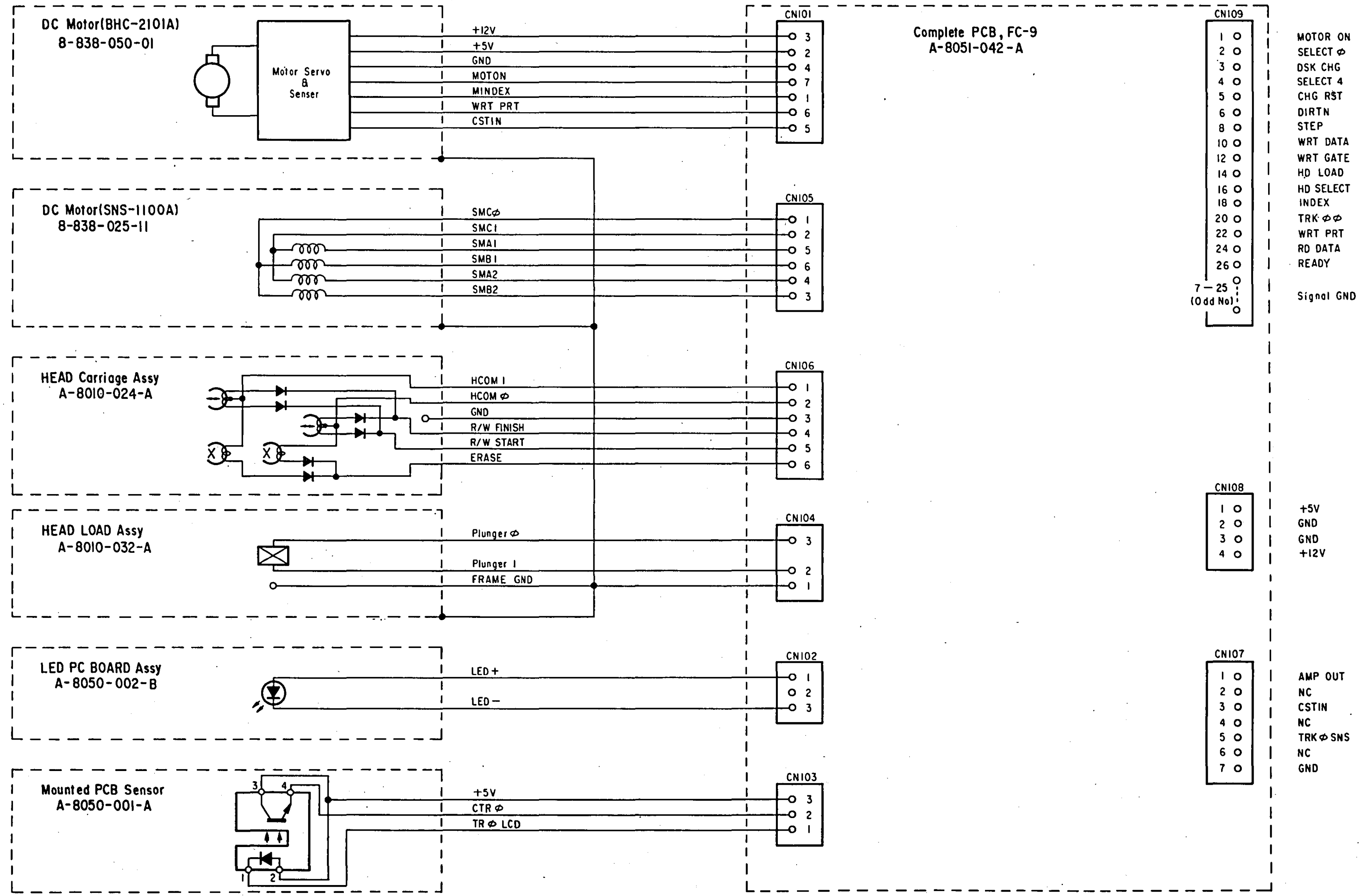
No.	*Parts No.*	*Description*
1	**A-8010-049-A**	**Lead Screw Ass'y**
2	**A-8010-014-B**	**Coupling Ass'y**
3	4-601-076-00	Lead Screw
4	4-601-083-00	Compression Spring
5	4-601-097-00	Thrust Bearing
6	**8-838-025-11**	**Stepping Motor (SNS-1100A)**
	8-838-061-01	**Stepping Motor (SNS-1500A)**
7	**A-8010-024-A**	**Head Carriage Ass'y**
8	**A-8010-025-A**	**Head Load Ass'y**
9	**4-603-921-00**	**HL Arm**
10	**4-603-922-00**	**HL Arm Shaft**
11	**4-603-923-00**	**Torsion Spring**
12	**A-8010-026-A**	**Cassette-up Ass'y**
13	4-601-096-00	Tention Spring
14	**4-603-901-00**	**Tension Spring**
15	**4-604-062-00**	**Eject Arm**
16	**4-847-057-00**	**Tension Spring**
17	A-8050-001-A	Sensor Mounted Board
18	**3-659-609-00**	**Compression Spring**
19	4-601-003-00	Slide Guide Shaft
20	4-601-008-03	Guide Retainer (A)
21	4-603-926-00	Guide Retainer (C)
22	4-601-009-03	WP Arm
23	4-601-050-04	Blind Panel
24	**4-601-098-00**	**Ball Bearing (No Flange)**
25	4-603-916-00	HC-Harness Holder
26	4-603-924-00	Damper
27	4-603-925-02	Terminal Shield Plate
28	4-603-927-00	D-Detection Arm
29	**7-623-520-01**	**Lug, 3**
30	**8-838-050-01**	**Disk Drive Motor (BHC-2101A)**
31	A-8050-002-B	LED Mountcd Board Ass'y
32	1-605-400-00	LED Mounted Board
33	4-601-027-00	Cushion
34	**8-719-900-92**	**GL-9PR20**
35	A-8051-042-A	FC-9 Complete PCB
36	4-601-026-11	Main Cover
37	4-603-928-00	Shield Plate
38	4-603-929-00	Transport Cassette Dummy
39	X-4601-029-1	Front Panel Ass'y (OA-D32W)
	X-4601-043-1	Front Panel Ass'y (OA-D32W-10)
40	**4-601-052-12**	**Eject Button**
41	**4-601-060-00**	**Compression Spring**

Parts No.	*Description*
7-621-972-25	SCREW, TOTSU PS2.6 x 6
7-621-972-45	SCREW, TOTSU PS2.6 x 10
7-621-981-15	SCREW, TOTSU PSW2.6 x 6
7-621-981-25	SCREW, TOTSU PSW2.6 x 8
7-621-912-20	SCREW, TOTSU B2.6 x 5
7-621-731-08	SET-SCT, HEX. 2 x 2.5, FLAT POINT
7-621-733-08	SET-SCT, HEX. 2 x 4 FLAT POINT
7-624-102-04	STOP RING 1.5, TYPE -E
7-624-105-04	STOP RING 2.3, TYPE -E

MEMO

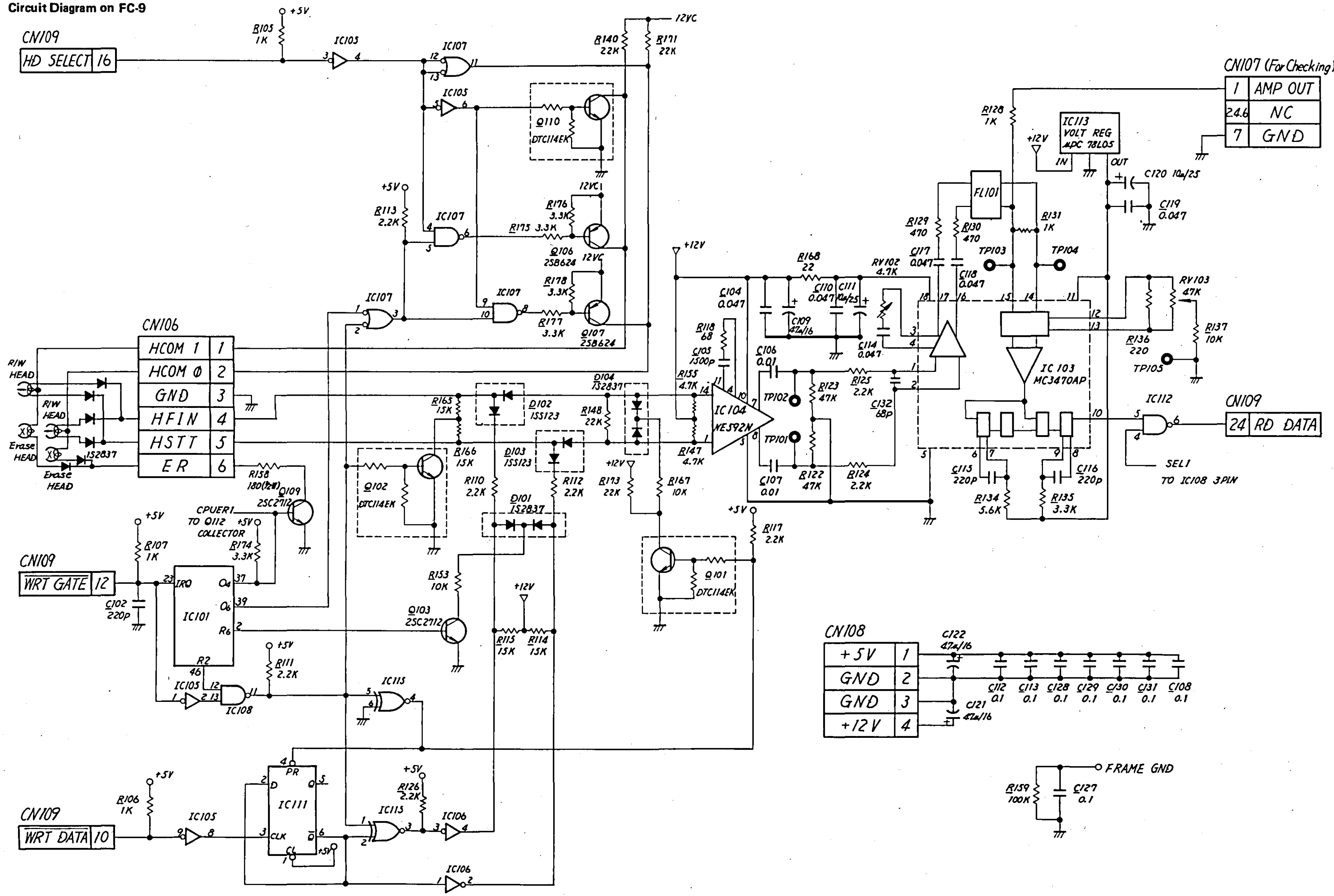
6-3. OVER ALL DIAGRAM

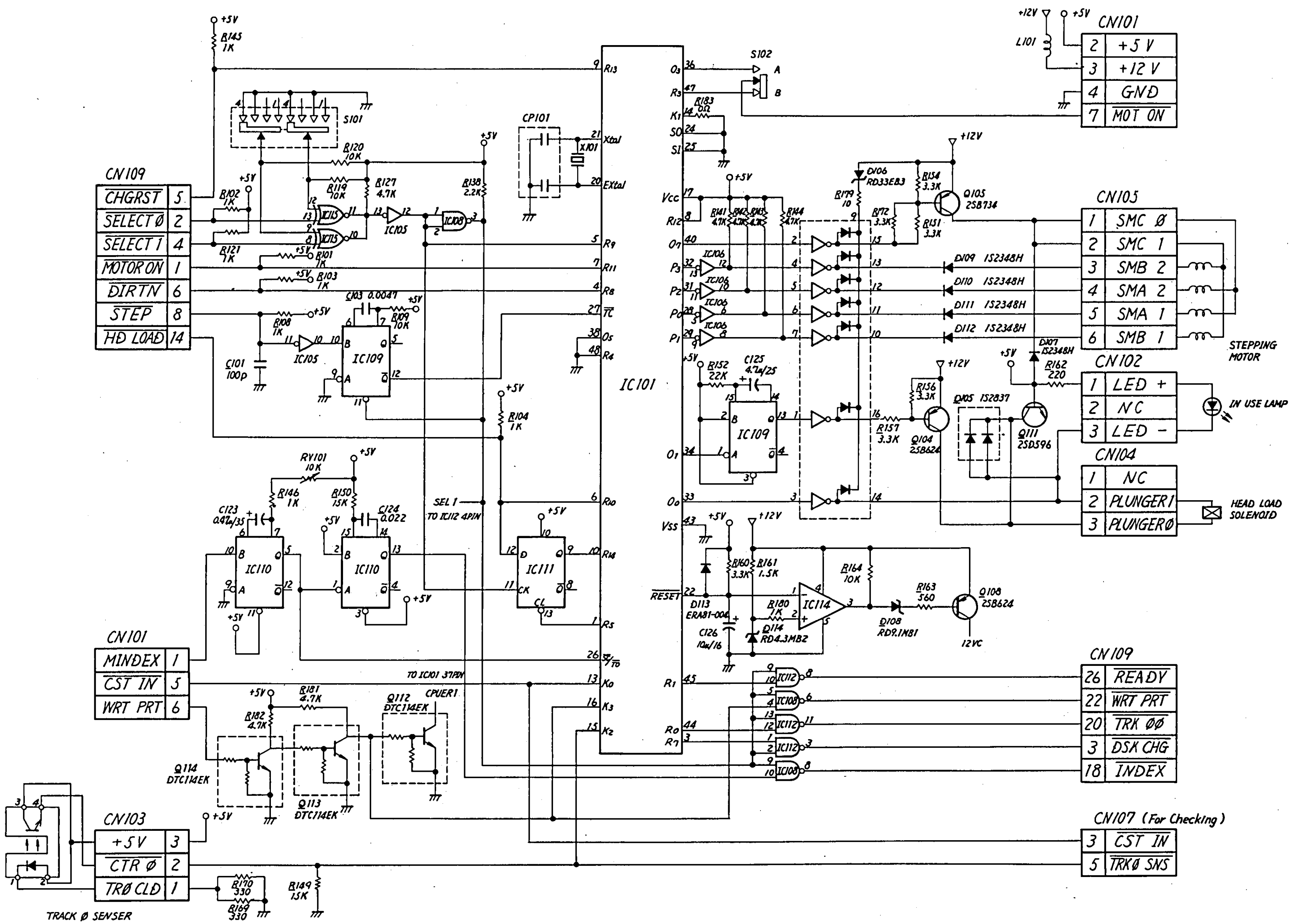
6-3-1. Interconnection Diagram



6-4. CIRCUIT DIAGRAM

6-4-1. Circuit Diagram on FC-9

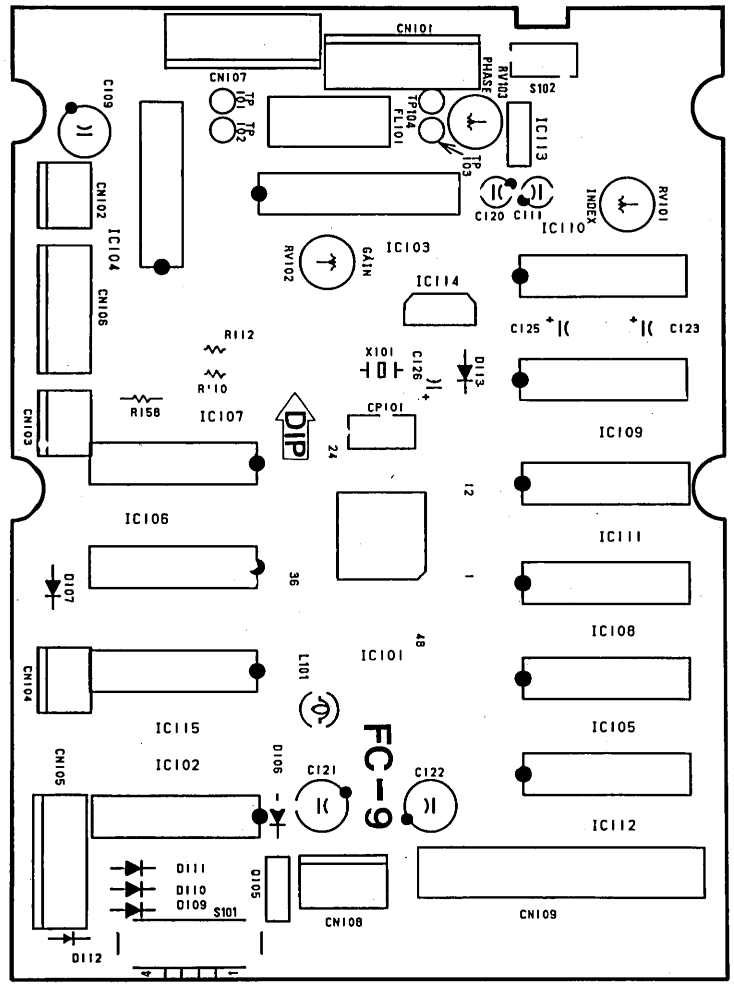



CN109
CHGRST 5
SELECT Ø 2
SELECT 1 4
MOTOR ON 1
DIRTN 6
STEP 8
HD LOAD 14
IC101
CN101
2 +5V
3 +12V
4 GND
7 MOT ON
CN105
1 SMC Ø
2 SMC 1
3 SMB 2
4 SMA 2
5 SMA 1
6 SMB 1
STEPPING MOTOR
CN102
1 LED +
2 NC
3 LED −
IN USE LAMP
CN104
1 NC
2 PLUNGER1
3 PLUNGERØ
HEAD LOAD SOLENOID
CN101
MINDEX 1
CST IN 5
WRT PRT 6
CN109
26 READY
22 WRT PRT
20 TRK ØØ
3 DSK CHG
18 INDEX
CN103
+5V 3
CTR Ø 2
TRØ CLD 1
TRACK Ø SENSER
CN107 (For Checking)
3 CST IN
5 TRKØ SNS

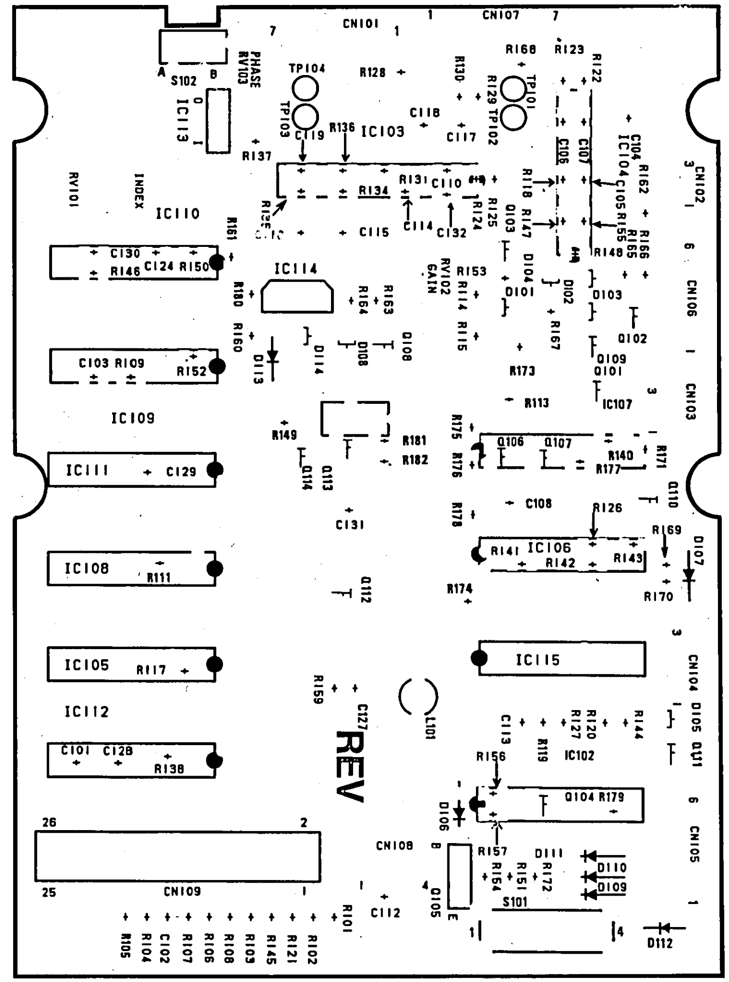
Parts Layout on FC-9

6-4-2. Parts Layout on FC-9

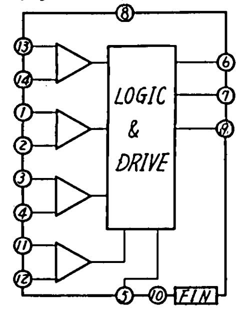
— Component Side —



— Pattern Side —



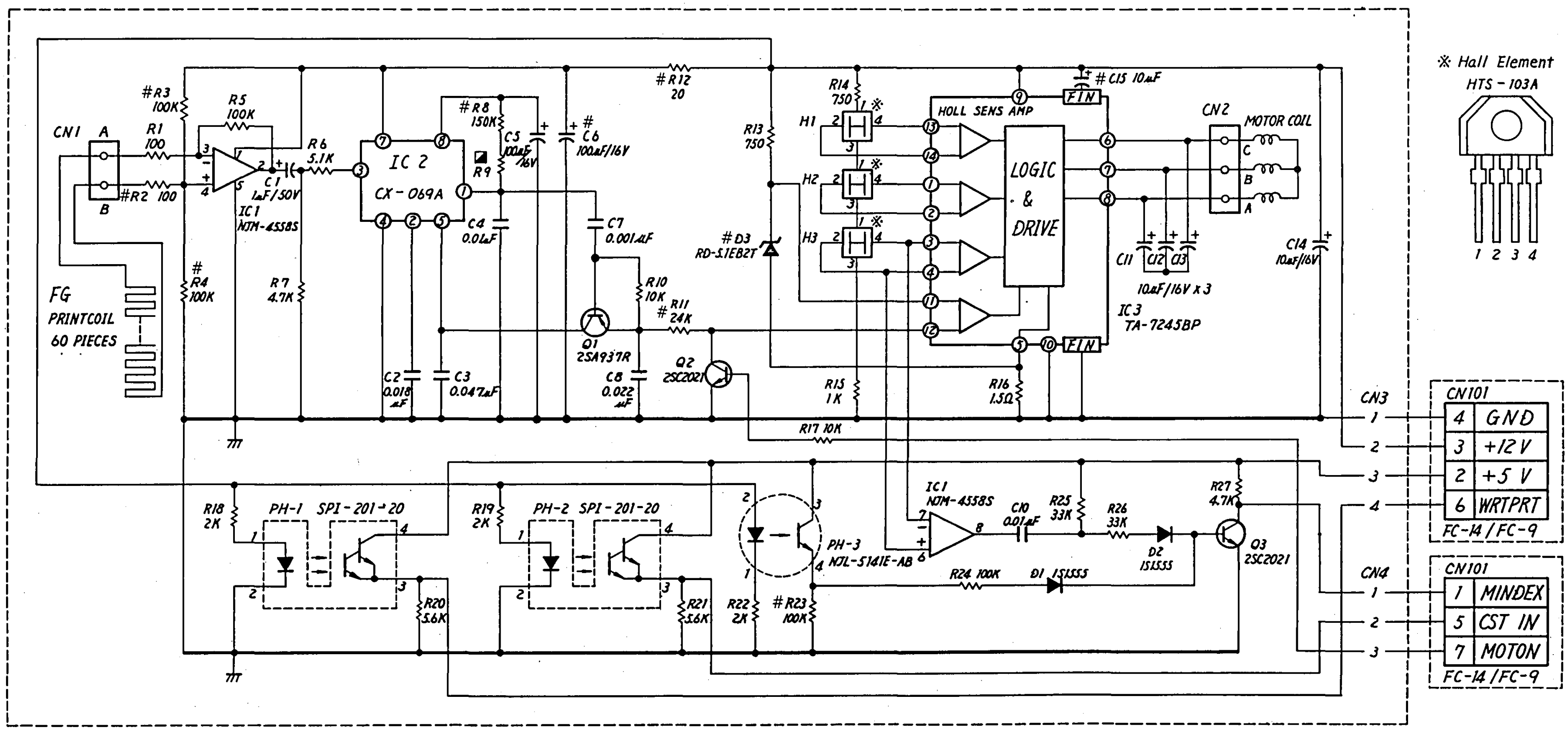
 Disk Motor Circuit Diagram



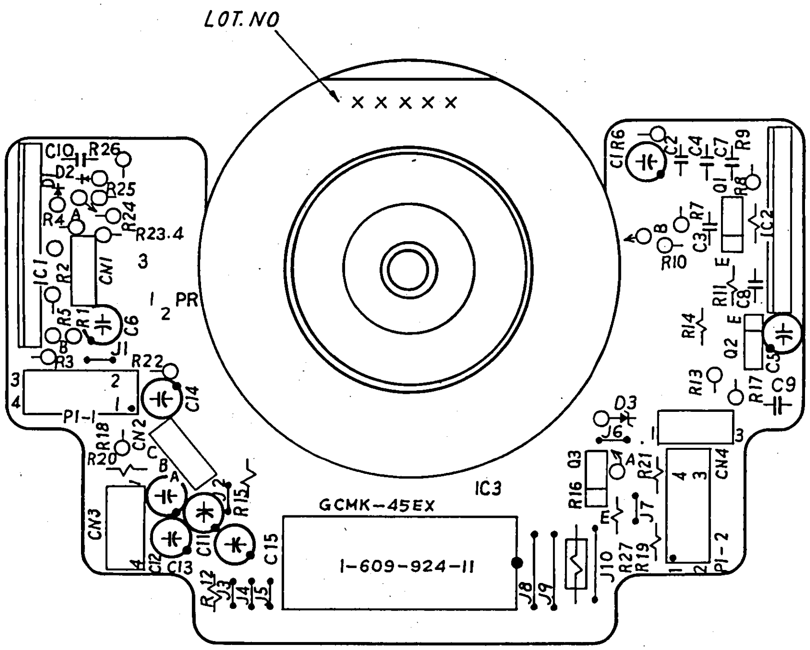
6-4-3. Disk Motor Circuit Diagram

Remark:

1. Numbers between FC-14/FC-9 and Disk Motor Circuit Board indicate the color of the cable.
2. A part marked with ◪ in the diagram is factory selected. For the replacement, please refer to 5-8.
3. Part name or part's value of part reference no marked with # may be differed from this diagram for a disk motor having the lot number of XXXX2, that is rubber-stampped on the metal cover. As to the actual part name and part's value for these parts, please refer to electrical parts list.



6-4-4. Parts Layout on Disk Motor Circuit Board



6-5. ELECTRIC PARTS

6-5-1. Chip Parts Replacement Procedure

This unit uses chip components such as carbon resistor, ceramic capacitor, transistor and diode in some circuits. It also uses IC's of flat-pack type.

As the appearance of carbon resistor and ceramic capacitor are identical, destinguishment of each can be possible by visual check of reference address of silk-screen print on the printed circuit board.

As the shape of transistor and diode are same, they also are distinguished by the reference address of silk-screen print.

Tools:

- Soldering iron; 20 W
  (If possible, use soldering tip with heat-controller of 270 ± 10°C)
- Desoldering metal braid ("SOLDER TAUL" or equivalent)
- Solder (of 0.6 mm dia. is recommended.)
- Tweezers

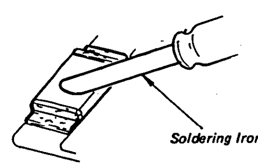
Soldering Conditions:

Tip temperature; 270±10°C
Solder within 2sec. per an electrode
Higher temperature or longer tip application than specified may be damaged to the chip component.

(1) Resistor and Capacitor

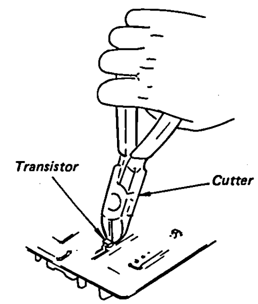
1) Add heat onto the chip-part by the top of soldering iron tip and slide the chip-part aside when the solder is melted.
2) Confirm visually with care that there is no pattern peeling, damage, and/or bridge where the part was removed or its surrounding.
3) Presolder the pattern into thin where the part was removed.
4) Place a new chip-part onto the pattern and solder both sides.

CAUTION: Do not use the chip-part again once used.



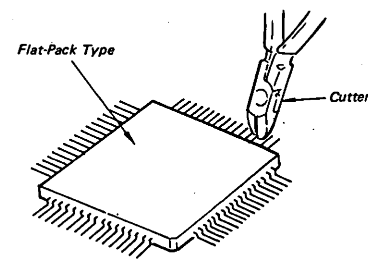
(2) Transistor and Diode

1) Cut the leads of the semiconductor part to be removed with a cutter.
2) Remove the leads cut as the above, and confirm visually that there is no pattern peeling, any damage and/or bridge where the part was removed or its surrounding.
3) Presolder the pattern into thin where the part was removed.
4) Place a new chip-part onto the pattern and solder the leads.



(3) IC (Flat-pack type)

1) Cut the leads of the IC to be removed with a cutter.
2) Remove the each pin of IC from the pattern by tweezers while heating the pin by soldering iron.
3) Confirm visually with care that there is no pattern peeling, damage, and/or bridge where the part was removed or its surrounding.
4) Place a new IC onto the pattern and solder it.
5) Confirm by tester that each conduction between IC's terminal and upper port is surely made.
6) If not, resolder the portion.



6-5-2. Electric Parts List

NOTE:
1. All capacitors are in micro farads unless otherwise specified.
2. All inductors are in micro henries unless otherwise specified.
3. All resistors are in ohms.
4. "CHIP" stands for chip component.

FC-9 BOARD

Ref. No.	*Parts No.*	*Description*			
		CAPACITORS			
C101	1-163-251-00	CERAMIC (CHIP) 100PF		5%	50V
C102	1-163-259-00	CERAMIC (CHIP) 220PF		5%	50V
C103	1-163-017-00	CERAMIC (CHIP) 0.0047		10%	50V
C104	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C105	1-163-011-00	CERAMIC (CHIP) 0.0015		10%	50V
C106	1-163-021-00	CERAMIC (CHIP) 0.01		10%	50V
C107	1-163-021-00	CERAMIC (CHIP) 0.01		10%	50V
C108	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C109	1-123-821-00	ELECT 47		20%	16V
C110	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C111	1-123-621-41	ELECT 10		20%	25V
C112	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C113	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C114	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C115	1-163-259-00	CERAMIC (CHIP) 220PF		5%	50V
C116	1-163-259-00	CERAMIC (CHIP) 220PF		5%	50V
C117	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C118	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C119	1-163-035-00	CERAMIC (CHIP) 0.047			50V
C120	1-123-621-41	ELECT 10		20%	25V
C121	1-123-821-00	ELECT 47		20%	16V
C122	1-123-821-00	ELECT 47		20%	16V
C123	1-131-345-00	TANTALUM 0.47		10%	35V
C124	1-163-037-00	CERAMIC (CHIP) 0.022		10%	25V
C125	1-131-357-00	TANTALUM 4.7		10%	25V
C126	1-131-371-00	TANTALUM 10		10%	16V
C127	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C128	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C129	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C130	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C131	1-163-038-00	CERAMIC (CHIP) 0.1			25V
C132	1-163-247-00	CERAMIC (CHIP) 68PF		5%	50V

Ref. No.	*Parts No.*	*Description*
		CONNECTORS
CN101	1-560-618-00	CONNECTOR POST HEADER, ILG 7P
CN102	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN103	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN104	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN105	1-560-360-00	CONNECTOR POST HEADER, ILG (6P)
CN106	1-560-360-00	CONNECTOR POST HEADER, ILG (6P)
CN107	1-560-619-00	CONNECTOR POST HEADER, ILG 7P
CN108	1-560-542-00	POST HEADER, EI CONNECTOR 4P
CN109	1-564-244-00	CONNECTOR (M) 26P
		DIODES
D101	8-719-100-05	1S2837 (CHIP)
D102	8-719-101-23	1SS123 (CHIP)
D103	8-719-101-23	1SS123 (CHIP)
D104	8-719-100-05	1S2837 (CHIP)
D105	8-719-100-05	1S2837 (CHIP)
D106	8-719-101-07	RD33EB3
D107	8-719-912-25	1S2348HTD
D108	8-719-106-43	RD9.1M-B1 (CHIP)
D109	8-719-912-25	1S2348HTD
D110	8-719-912-25	1S2348HTD
D111	8-719-912-25	1S2348HTD
D112	8-719-912-25	1S2348HTD
D113	8-719-981-01	ERA81-004
D114	8-719-105-64	RD4.3M-B2 (CHIP)
		ICS
IC101	8-759-908-30	IC MB8847-1199M
IC102	8-759-120-03	IC μPA2003C
IC103	8-759-000-07	IC MC3470AP
IC104	8-759-005-92	IC NE592N
IC105	8-759-900-14	IC SN74LS14N
IC106	8-759-974-06	IC SN7406N
IC107	8-759-900-26	IC SN74LS26N
IC108	8-759-974-38	IC SN7438N
IC109	8-759-902-74	IC SN74LS423N
IC110	8-759-902-21	IC SN74LS221N
IC111	8-759-900-74	IC SN74LS74AN
IC112	8-759-974-38	IC SN7438N
IC113	8-759-178-05	IC μPC78L05
IC114	8-759-612-04	IC M51204L
IC115	8-759-902-66	IC SN74LS266N

Electric Parts List

Ref. No.	Parts No.	Description			
		COILS			
L101	1-408-442-21	MICRO INDUCTOR 10μH			
		TRANSISTORS			
Q101	8-729-900-53	DTC114EK (CHIP)			
Q102	8-729-900-53	DTC114EK (CHIP)			
Q103	8-729-271-23	2SC2712G (CHIP)			
Q104	8-729-162-45	2SB624-BV5 (CHIP)			
Q105	8-729-103-43	2SB734-2			
Q106	8-729-162-45	2SB624-BV5 (CHIP)			
Q107	8-729-162-45	2SB624-BV5 (CHIP)			
Q108	8-729-162-45	2SB624-BV5 (CHIP)			
Q109	8-729-271-23	2SC2712G (CHIP)			
Q110	8-729-900-53	DTC114EK (CHIP)			
Q111	8-729-159-64	2SD596-DV5 (CHIP)			
Q112	8-729-900-53	DTC114EK (CHIP)			
Q113	8-729-900-53	DTC114EK (CHIP)			
Q114	8-729-900-53	DTC114EK (CHIP)			
		RESITORS			
R101	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R102	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R103	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R104	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R105	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R106	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R107	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R108	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R109	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R110	1-214-140-00	METAL	2.2K	1%	1/4W
R111	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R112	1-214-140-00	METAL	2.2K	1%	1/4W
R113	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R114	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R115	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R117	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R118	1-216-021-00	METAL (CHIP)	68	5%	1/10W
R119	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R120	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R121	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R122	1-216-089-00	METAL (CHIP)	47K	5%	1/10W
R123	1-216-089-00	METAL (CHIP)	47K	5%	1/10W
R124	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R125	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R126	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R127	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R128	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R129	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R130	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R131	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R134	1-216-067-00	METAL (CHIP)	5.6K	5%	1/10W
R135	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R136	1-216-033-00	METAL (CHIP)	220	5%	1/10W
R137	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R138	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R140	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R141	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R142	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R143	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R144	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R145	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R146	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R147	1-216-083-00	METAL (CHIP)	27K	5%	1/10W
R148	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R149	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R150	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R151	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R152	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R153	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R154	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R155	1-216-083-00	METAL (CHIP)	27K	5%	1/10W
R156	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R157	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R158	1-212-515-00	METAL	180	1%	1/2W
R159	1-216-097-00	METAL (CHIP)	100K	5%	1/10W
R160	1-216-085-00	METAL (CHIP)	33K	5%	1/10W
R161	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R162	1-216-033-00	METAL (CHIP)	220	5%	1/10W
R163	1-216-043-00	METAL (CHIP)	560	5%	1/10W
R164	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R165	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R166	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R167	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R168	1-216-009-00	METAL (CHIP)	22	5%	1/10W
R169	1-216-037-00	METAL (CHIP)	330	5%	1/10W
R170	1-216-037-00	METAL (CHIP)	330	5%	1/10W
R171	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R172	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R173	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R174	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W

Ref. No.	Parts No.	Description			
R175	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R176	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R177	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R178	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R179	1-216-001-00	METAL (CHIP)	10	5%	1/10W
R180	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R181	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R182	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W

VARIABLE RESISTORS

RV101	1-226-703-00	RES, ADJ, METAL GLAZE 10K
RV102	1-226-772-00	RES, ADJ, METAL GLAZE 4.7K
RV103	1-226-774-00	RES, ADJ, METAL GLAZE 47K

SWITCHES

S101	1-554-644-00	SWITCH, SLIDE
S102	1-553-510-00	SWITCH, SLIDE

OSCILLATOR

X101	1-527-838-00	OSCILLATOR, CERAMIC (WITH CAP)

FILTER

FL101	1-235-269-00	FILTER, LOW PASS

DISK DRIVE DC MOTOR BOARD (BHC-2101A)

The reference no. marked with # is used only for a disk motor having the lot number of XXXX2, that is rubber-stampped on the metal cover.

CAPACITORS

C1	1-123-611-00	ELECT	1	20%	50V
C2	1-161-054-00	CERAMIC	0.018	10%	50V
C3	1-130-491-00	MYLAR	0.047	5%	50V
C4	1-136-213-00	FILM	0.01	5%	100V
C5	1-123-617-00	ELECT	10	20%	16V
C6	1-123-617-00	ELECT	10	20%	16V
#C6	———	———	—	———	
C7	1-161-039-00	CERAMIC	0.001	10%	50V
C8	1-130-487-00	MYLAR	0.022	5%	50V
C10	1-161-051-00	CERAMIC	0.01	10%	50V
C11	1-123-617-00	ELECT	10	20%	16V
C12	1-123-617-00	ELECT	10	20%	16V
C13	1-123-617-00	ELECT	10	20%	16V
C14	1-123-617-00	ELECT	10	20%	16V
C15	1-131-371-00	TANTALUM	10	10%	16V
#C15	———	———	—	———	

Ref. No.	Parts No.	Description

DIODES

D1	8-719-815-55	1S1555TP
D2	8-719-815-55	1S1555TP
D3	8-719-150-23	RD5.1EB2T
#D3	8-719-150-21	RD4.7EB3T
PH1	8-719-902-90	PHOTO INTERRUPTOR SPI201-20
PH2	8-719-902-90	PHOTO INTERRUPTOR SPI201-20

ICS

IC1	8-759-700-08	IC NJM4558S
IC2	8-750-690-00	IC CX-069
IC3	8-759-201-54	IC TA7245BP
#IC3	8-759-202-02	IC TA7259P

TRANSISTORS

Q1	8-729-993-72	2SA937-R
Q2	8-729-902-11	2SC2021-R
Q3	8-729-902-11	2SC2021-R

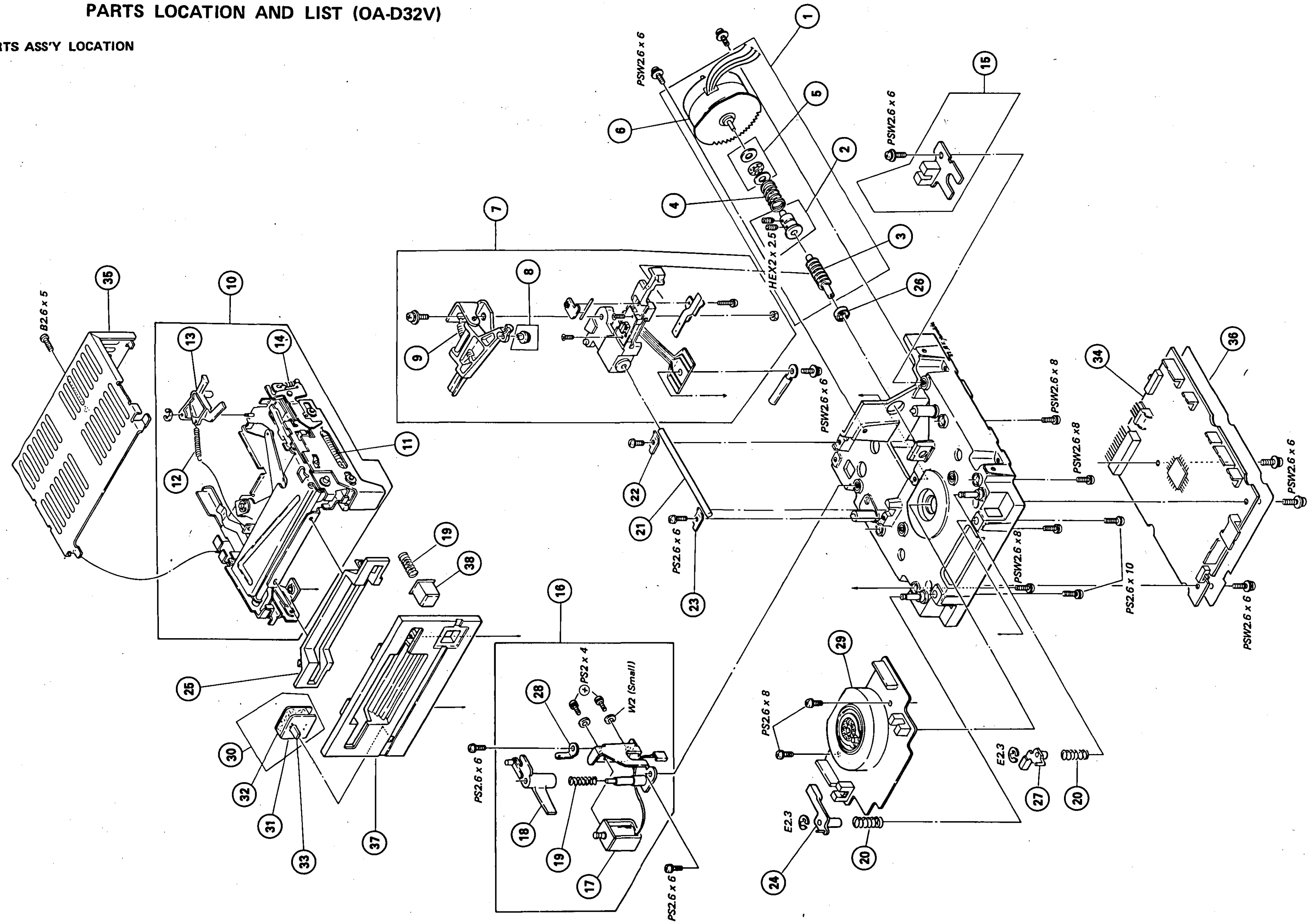
RESISTORS

R1	1-247-807-00	CARBON	100	5%	1/6W
R2	1-247-807-00	CARBON	100	5%	1/6W
#R2	1-247-890-00	CARBON	300K	5%	1/6W
R3	1-247-879-00	CARBON	100K	5%	1/6W
#R3	1-247-849-00	CARBON	5.6K	5%	1/6W
R4	1-247-879-00	CARBON	100K	5%	1/6W
#R4	1-247-849-00	CARBON	5.6K	5%	1/6W
R5	1-247-879-00	CARBON	100K	5%	1/6W
R6	1-247-848-00	CARBON	5.1K	5%	1/6W
R7	1-247-847-00	CARBON	4.7K	5%	1/6W
R8	1-247-883-00	CARBON	150K	5%	1/6W
#R8	1-247-884-00	CARBON	160K	5%	1/6W
R10	1-247-855-00	CARBON	10K	5%	1/6W
R11	1-247-864-00	CARBON	24K	5%	1/6W
#R11	1-247-879-00	CARBON	100K	5%	1/6W
R12	1-247-790-00	CARBON	20	5%	1/6W
#R12	———	———	—	———	
R13	1-247-828-00	CARBON	750	5%	1/6W
R14	1-247-828-00	CARBON	750	5%	1/6W
R15	1-247-831-00	CARBON	1K	5%	1/6W
R16	1-246-405-00	CARBON	1.5	5%	1/4W
R17	1-247-855-00	CARBON	10K	5%	1/6W
R18	1-247-838-00	CARBON	2K	5%	1/6W
R19	1-247-838-00	CARBON	2K	5%	1/6W
R20	1-247-849-00	CARBON	5.6K	5%	1/6W
R21	1-247-849-00	CARBON	5.6K	5%	1/6W
R22	1-247-838-00	CARBON	2K	5%	1/6W
R23	1-247-879-00	CARBON	100K	5%	1/6W
#R23	1-247-873-00	CARBON	56K	5%	1/6W
R24	1-247-879-00	CARBON	100K	5%	1/6W
R25	1-247-867-00	CARBON	33K	5%	1/6W
R26	1-247-867-00	CARBON	33K	5%	1/6W
R27	1-247-847-00	CARBON	4.7K	5%	1/6W

MEMO

SECTION 7
PARTS LOCATION AND LIST (OA-D32V)

7-1. PARTS ASS'Y LOCATION



7-2. MECHANICAL PARTS LIST

NOTE: 1. Parts printed in **Bold-Face type** are normally stocked for replacement purposes. The remaining parts shown in this list are not normally required for routine service work. Orders for parts not shown in **Bold-Face type** will be processed, but allow for additional delivery time.

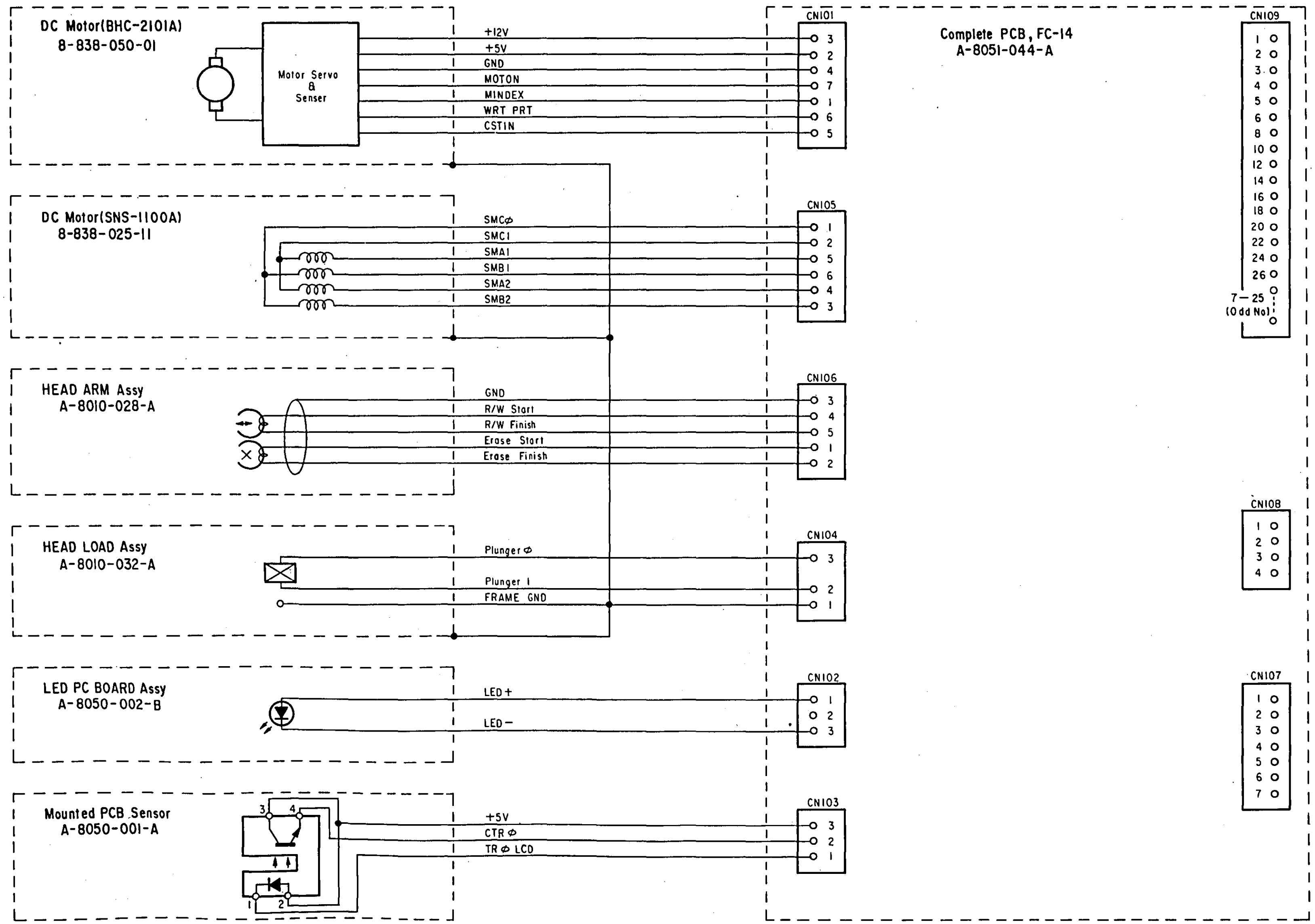
No.	*Parts No.*	*Description*
1	**A-8010-049-A**	**Lead Screw Ass'y**
2	**A-8010-014-B**	**Coupling Ass'y**
3	4-601-076-00	Lead Screw
4	4-601-083-00	Compression Spring
5	4-601-097-00	Thrust Bearing
6	**8-838-025-11**	**Stepping Motor (SNS-1100A)**
	8-838-061-01	**Stepping Motor (SNS-1500A)**
7	**A-8010-028-A**	**Head Arm Ass'y**
8	**A-8010-020-A**	**Pad Ass'y**
9	**4-603-936-00**	**Tension Spring**
10	**A-8010-030-A**	**Cassette-up Ass'y**
11	4-601-096-00	Tension Spring
12	**4-603-901-00**	**Tension Spring**
13	**4-604-062-00**	**Eject Arm**
14	**4-847-057-00**	**Tension Spring**
15	A-8050-001-A	Sensor Mounted Board
16	**A-8010-032-A**	**Head Load Ass'y**
17	1-454-289-21	Plunger Solenoid
18	4-601-017-00	HL Arm
19	**4-601-060-00**	**Compression Spring**
20	**3-659-609-00**	**Compression Spring**
21	4-601-003-00	Slide Guide Shaft
22	4-6-1-008-03	Guide Retainer (A)
23	4-603-926-00	Guide Retainer (C)
24	4-601-009-03	WP Arm
25	4-601-050-04	Blind Panel
26	**4-601-098-00**	**Ball Bearing (No Flange)**
27	4-603-927-00	D-Detection Arm
28	**7-623-507-01**	**Lug, 2.6**
29	**8-838-050-01**	**Disk Drive Motor, (BHC-2101A)**
30	A-8050-002-B	LED Mounted Board Ass'y
31	1-605-400-00	LED Mounted Board
32	4-601-027-00	Cushion
33	**8-719-900-92**	**GL-9PR20**
34	A-8051-044-A	FC-14 Complete PCB
35	4-601-026-11	Main Cover
36	4-603-928-00	Shield Plate
37	X-4601-029-0	Front Panel Ass'y
38	**4-601-052-12**	**Eject Button**

Parts No.	*Description*	
7-621-972-25	SCREW, TOTSU	PS2.6 x 6
7-621-972-45	SCREW, TOTSU	PS2.6 x 10
7-621-981-15	SCREW, TOTSU	PSW2.6 x 6
7-621-981-25	SCREW, TOTSU	PSW2.6 x 8
7-621-912-20	SCREW, TOTSU	B2.6 x 5
7-628-253-05	SCREW +PS2 x 4	
7-621-731-08	SET-SCT. HEX. 2 x 2.5, FLAT POINT	
7-624-105-04	STOP RING 2.3, TYPE -E	
7-688-001-01	W2, SMALL	

MEMO

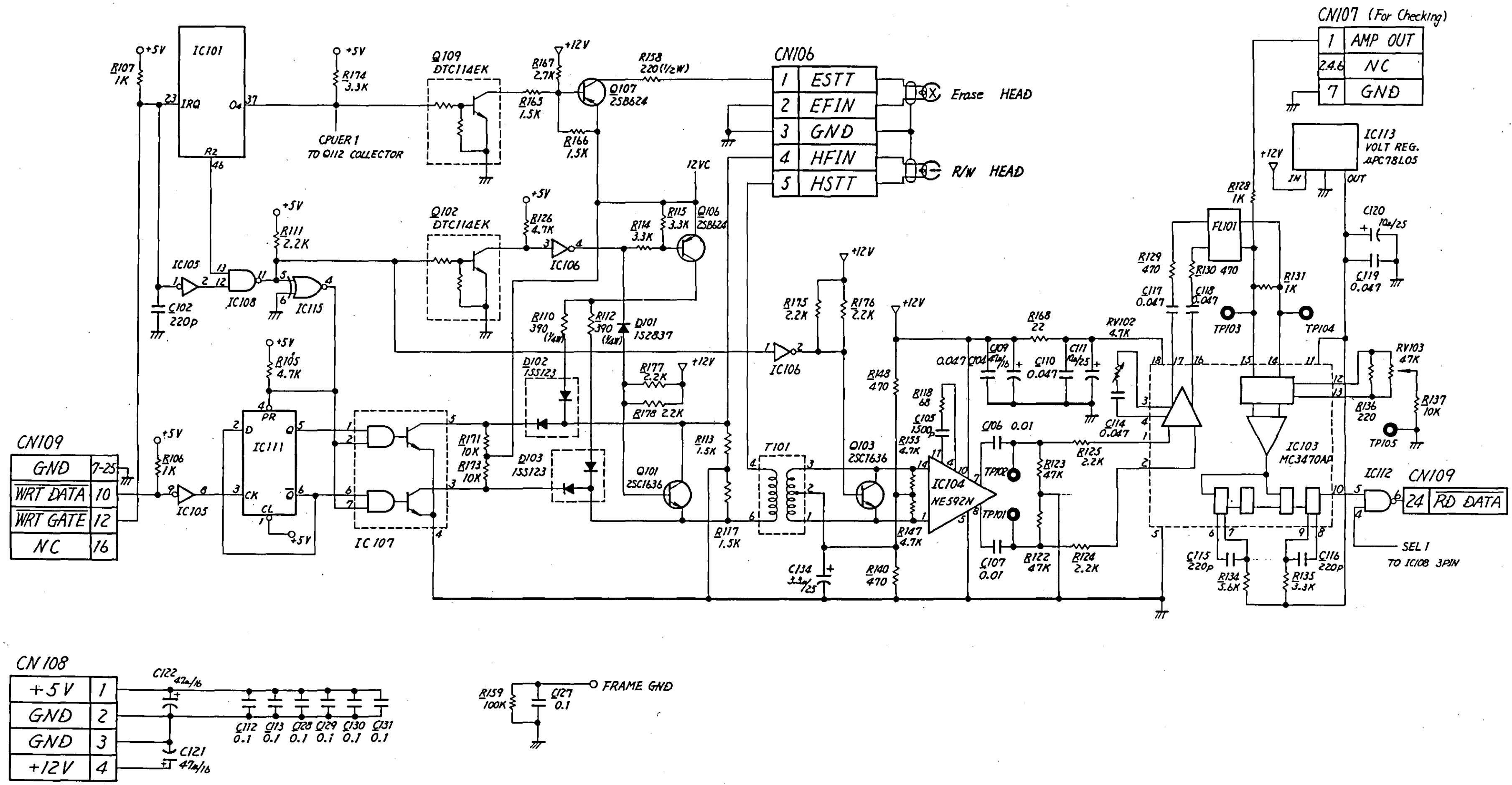
7-3. OVER ALL DIAGRAM

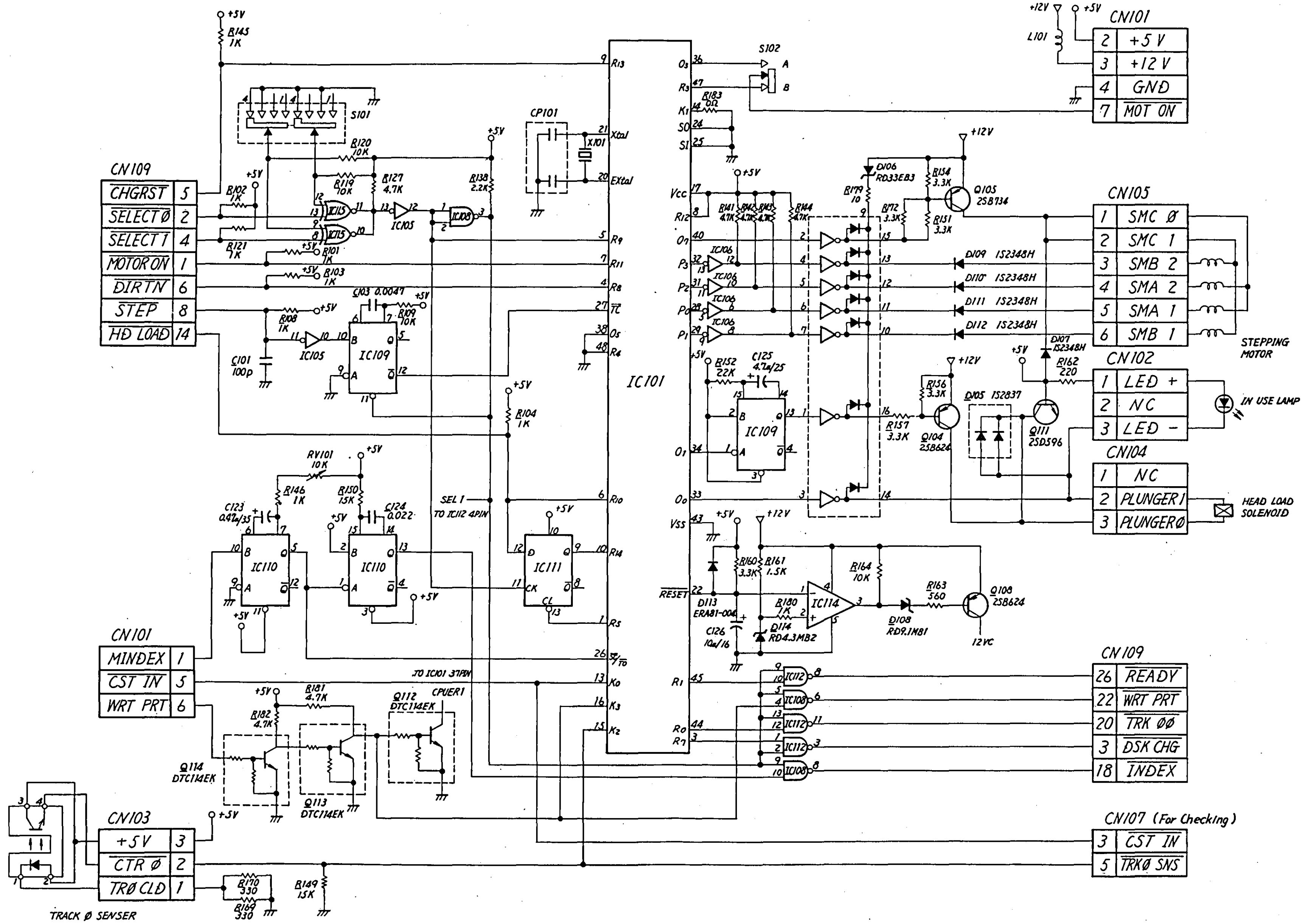
7-3-1. Interconnection Diagram



7-4. CIRCUIT DIAGRAM

7-4-1. Circuit Diagram on FC-14

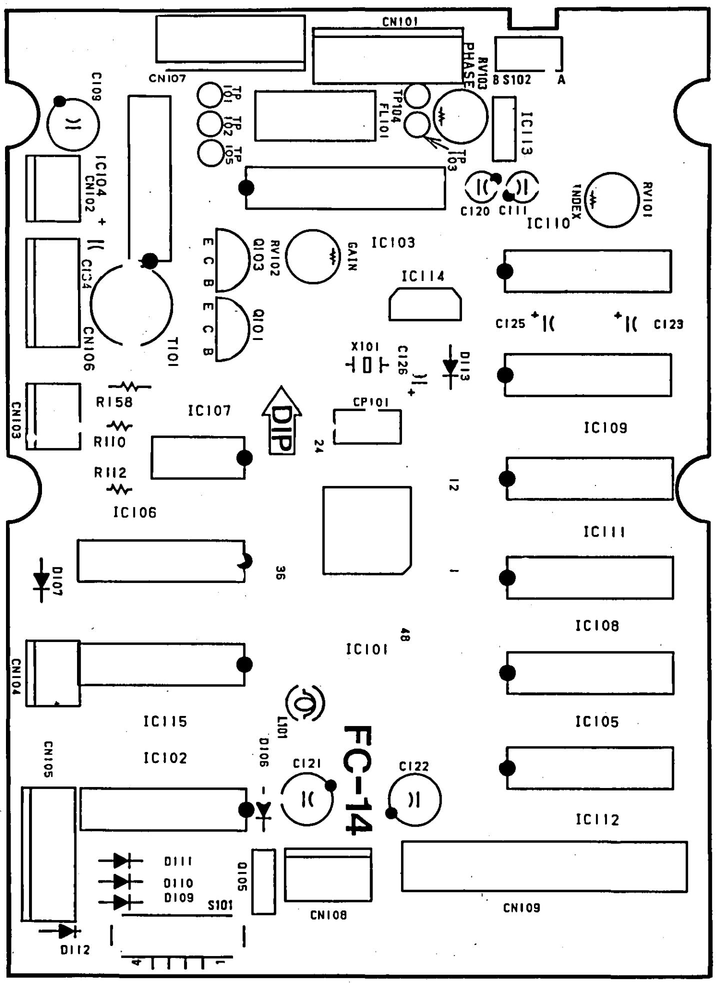



CN109
CHGRST
SELECT Ø
SELECT 1
MOTOR ON
DIRTN
STEP
HD LOAD
IC101
CN101
+5 V
+12 V
GND
MOT ON
CN105
SMC Ø
SMC 1
SMB 2
SMA 2
SMA 1
SMB 1
STEPPING MOTOR
CN102
LED +
NC
LED −
IN USE LAMP
CN104
NC
PLUNGER 1
PLUNGER Ø
HEAD LOAD SOLENOID
CN101
MINDEX
CST IN
WRT PRT
CN109
READY
WRT PRT
TRK ØØ
DSK CHG
INDEX
CN103
+5V
CTR Ø
TRØ CLD
TRACK Ø SENSER
CN107 (For Checking)
CST IN
TRKØ SNS

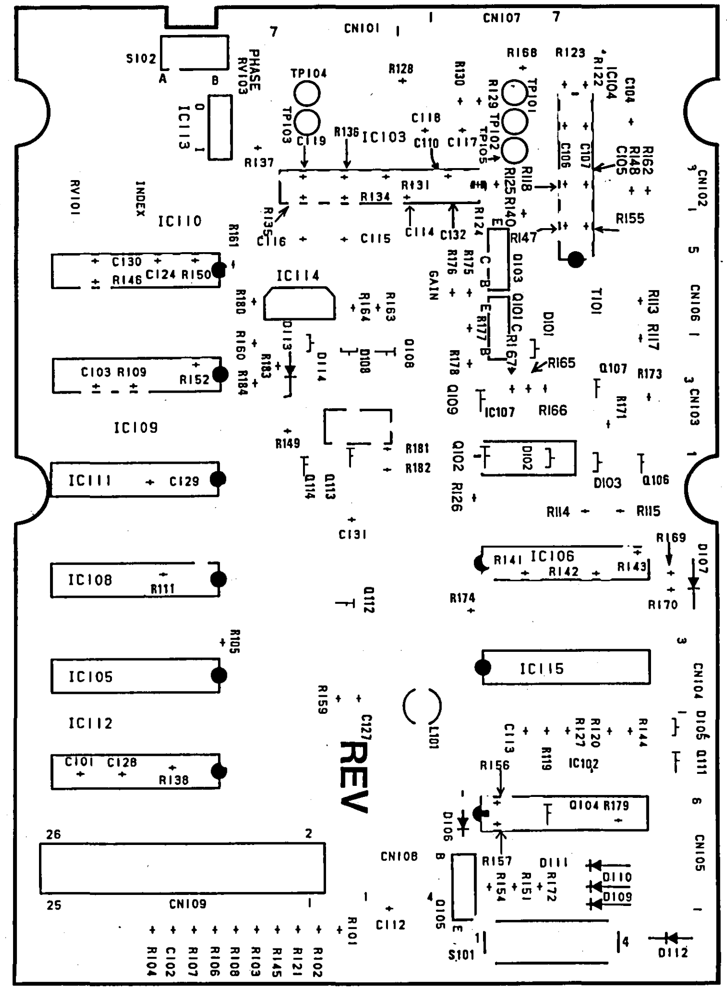
 Parts Layout on FC-14

7-4-2. Parts Layout on FC-14

— Components Side —



— Pattern Side —

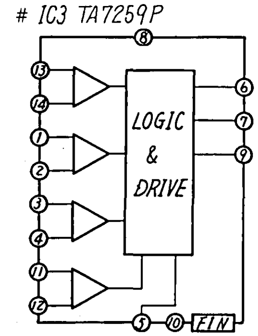


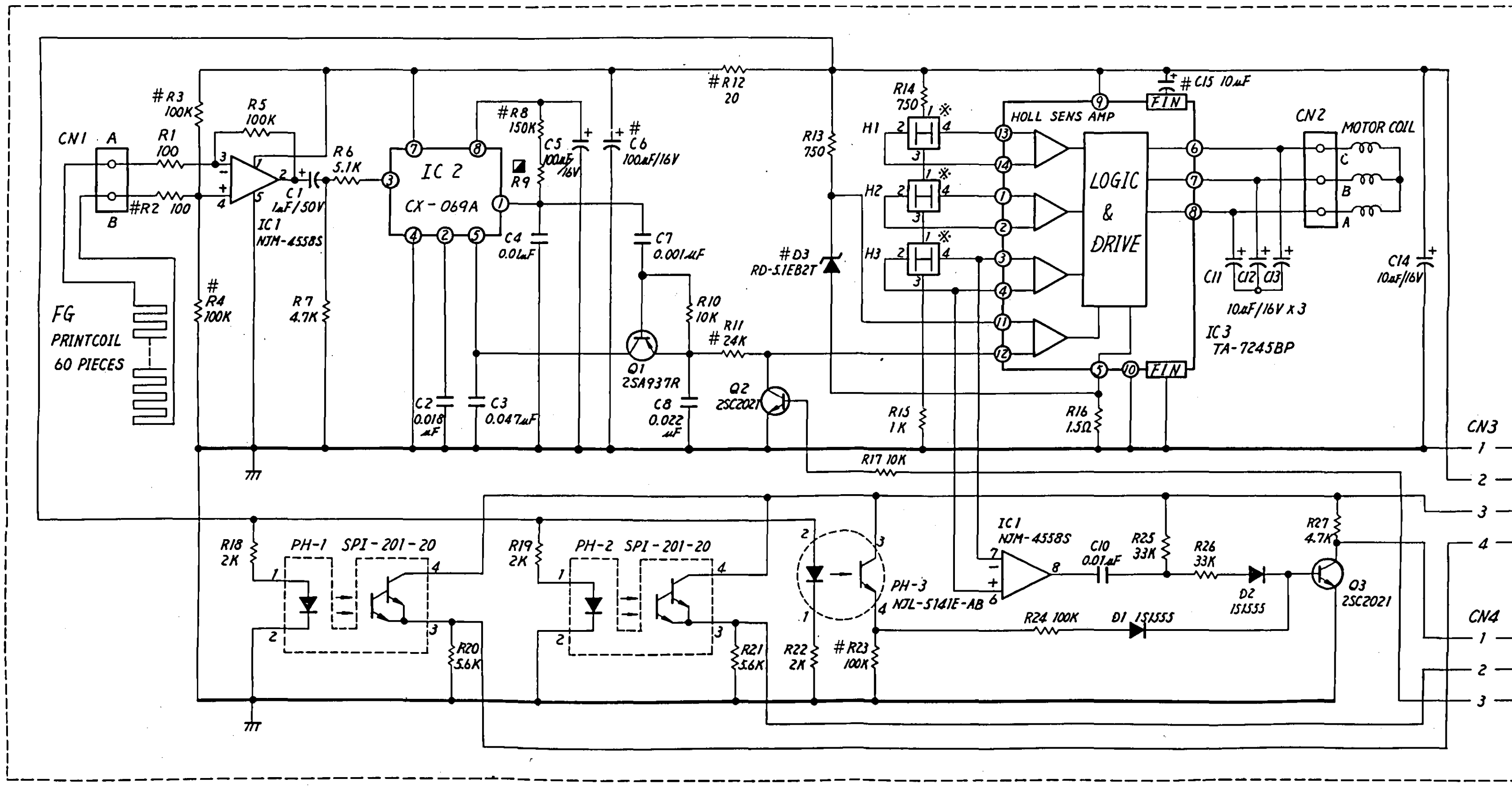
 Disk Motor Circuit Diagram

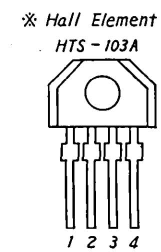
7-4-3. Disk Motor Circuit Diagram

Remark:

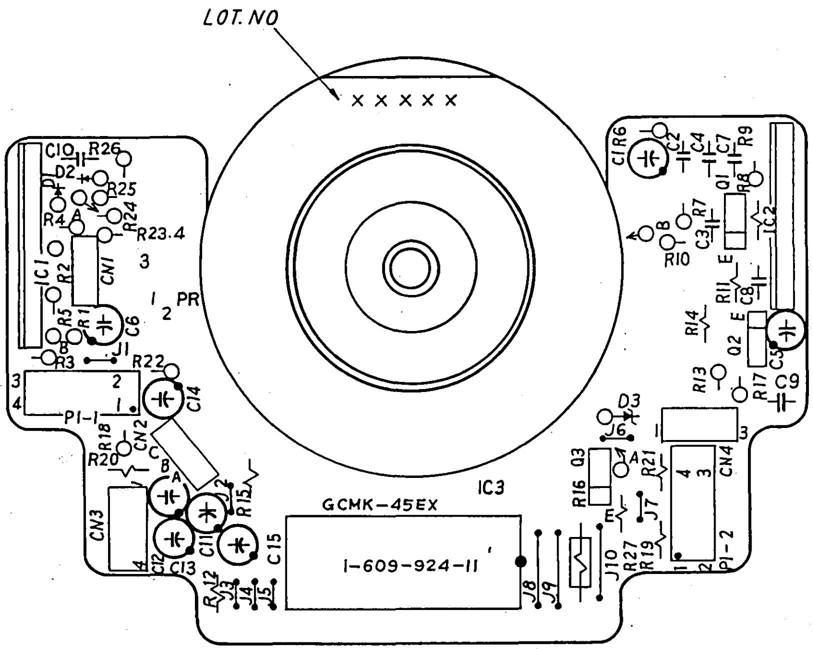
1. Numbers between FC-14/FC-9 and Disk Motor Circuit Board indicate the color of the cable.
2. A part marked with ◪ in the diagram is factory selected. For the replacement, please refer to 5-8.
3. Part name or part's value of part reference no marked with # may be differed from this diagram for a disk motor having the lot number of XXXX2, that is rubber-stampped on the metal cover. As to the actual part name and part's value for these parts, please refer to electrical parts list.







7-4-4. Parts Layout on Disk Motor Circuit Board



7-5. ELECTRIC PARTS

7-5-1. Chip Parts Replacement Procedure

This unit uses chip components such as carbon resistor, ceramic capacitor, transistor and diode in some circuits. It also uses IC's of flat-pack type.

As the appearance of carbon resistor and ceramic capacitor are identical, destinguishment of each can be possible by visual check of reference address of silk-screen print on the printed circuit board.

As the shape of transistor and diode are same, they also are distinguished by the reference address of silk-screen print.

Tools:

- Soldering iron; 20 W
  (If possible, use soldering tip with heat-controller of 270 ± 10°C)
- Desoldering metal braid ("SOLDER TAUL" or equivalent)
- Solder (of 0.6 mm dia. is recommended.)
- Tweezers

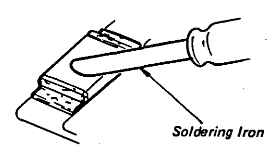
Soldering Conditions:

Tip temperature; 270±10°C
Solder within 2sec. per an electrode
Higher temperature or longer tip application than specified may be damaged to the chip component.

(1) Resistor and Capacitor

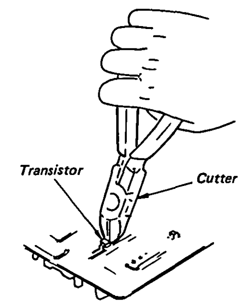
1) Add heat onto the chip-part by the top of soldering iron tip and slide the chip-part aside when the solder is melted.
2) Confirm visually with care that there is no pattern peeling, damage, and/or bridge where the part was removed or its surrounding.
3) Presolder the pattern into thin where the part was removed.
4) Place a new chip-part onto the pattern and solder both sides.

CAUTION: Do not use the chip-part again once used.



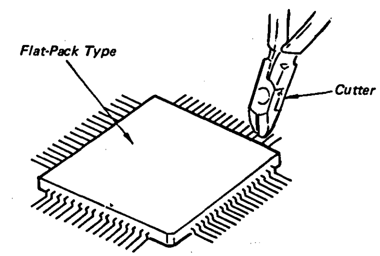
(2) Transistor and Diode

1) Cut the leads of the semiconductor part to be removed with a cutter.
2) Remove the leads cut as the above, and confirm visually that there is no pattern peeling, any damage and/or bridge where the part was removed or its surrounding.
3) Presolder the pattern into thin where the part was removed.
4) Place a new chip-part onto the pattern and solder the leads.



(3) IC (Flat-pack type)

1) Cut the leads of the IC to be removed with a cutter.
2) Remove the each pin of IC from the pattern by tweezers while heating the pin by soldering iron.
3) Confirm visually with care that there is no pattern peeling, damage, and/or bridge where the part was removed or its surrounding.
4) Place a new IC onto the pattern and solder it.
5) Confirm by tester that each conduction between IC's terminal and upper port is surely made.
6) If not, resolder the portion.



7-5-2. Electric Parts List

NOTE: 1. All capacitors are in micro farads unless otherwise specified.
2. All inductors are in micro henries unless otherwise specified.
3. All resistors are in ohms.
4. "CHIP" stands for chip component.

FC-14 BOARD

Ref. No.	Parts No.	Description			
		CAPACITORS			
C101	1-163-251-00	CERAMIC (CHIP)	100PF	5%	50V
C102	1-163-259-00	CERAMIC (CHIP)	220PF	5%	50V
C103	1-163-017-00	CERAMIC (CHIP)	0.0047	10%	50V
C104	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C105	1-163-011-00	CERAMIC (CHIP)	0.0015	10%	50V
C106	1-163-021-00	CERAMIC (CHIP)	0.01	10%	50V
C107	1-163-021-00	CERAMIC (CHIP)	0.01	10%	50V
C109	1-123-821-00	ELECT	47	20%	16V
C110	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C111	1-123-621-41	ELECT	10	20%	25V
C112	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C113	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C114	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C115	1-163-259-00	CERAMIC (CHIP)	220PF	5%	50V
C116	1-163-259-00	CERAMIC (CHIP)	220PF	5%	50V
C117	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C118	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C119	1-163-035-00	CERAMIC (CHIP)	0.047		50V
C120	1-123-621-41	ELECT	10	20%	25V
C121	1-123-821-00	ELECT	47	20%	16V
C122	1-123-821-00	ELECT	47	20%	16V
C123	1-131-345-00	TANTALUM	0.47	10%	35V
C124	1-163-037-00	CERAMIC (CHIP)	0.022	10%	25V
C125	1-131-357-00	TANTALUM	4.7	10%	25V
C126	1-131-371-00	TANTALUM	10	10%	16V
C127	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C128	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C129	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C130	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C131	1-163-038-00	CERAMIC (CHIP)	0.1		25V
C134	1-131-356-00	TANTALUM	3.3	10%	25V

Ref. No.	Parts No.	Description
		CONNECTORS
CN101	1-560-618-00	CONNECTOR POST HEADER, ILG 7P
CN102	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN103	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN104	1-560-357-00	CONNECTOR POST HEADER, ILG (3P)
CN105	1-560-360-00	CONNECTOR POST HEADER, ILG (6P)
CN106	1-560-359-00	CONNECTOR POST HEADER, ILG (5P)
CN107	1-560-619-00	CONNECTOR POST HEADER, ILG 7P
CN108	1-560-542-00	POST HEADER, EI CONNECTOR 4P
CN109	1-564-244-00	CONNECTOR (M) 26P
		DIODES
D101	8-719-100-05	1S2837 (CHIP)
D102	8-719-101-23	1SS123 (CHIP)
D103	8-719-101-23	1SS123 (CHIP)
D105	8-719-100-05	1S2837 (CHIP)
D106	8-719-101-07	RD33EB3
D107	8-719-912-25	1S2348HTD
D108	8-719-106-43	RD9.1M-B1 (CHIP)
D109	8-719-912-25	1S2348HTD
D110	8-719-912-25	1S2348HTD
D111	8-719-912-25	1S2348HTD
D112	8-719-912-25	1S2348HTD
D113	8-719-981-01	ERA81-004
D114	8-719-105-64	RD4.3M-B2 (CHIP)
		FILTER
FL101	1-235-269-00	FILTER, LOW PASS
		ICS
IC101	8-759-908-30	IC MB8847-1199M
IC102	8-759-120-03	IC μPA2003C
IC103	8-759-000-07	IC MC3470AP
IC104	8-759-005-92	IC NE592N
IC105	8-759-900-14	IC SN74LS14N
IC106	8-759-974-06	IC SN7406N
IC107	8-759-954-52	IC SN75452BP
IC108	8-759-974-38	IC SN7438N
IC109	8-759-902-74	IC SN74LS423N
IC110	8-759-902-21	IC SN74LS221N
IC111	8-759-900-74	IC SN74LS74AN
IC112	8-759-974-38	IC SN7438N
IC113	8-759-178-05	IC μPC78L05
IC114	8-759-612-04	IC M51204L
IC115	8-759-902-66	IC SN74LS266N

Electric Parts List

Ref. No.	Parts No.	Description
		COIL
L101	1-408-442-21	MICRO INDUCTOR 10μH
		TRANSISTORS
Q101	8-761-621-00	2SC1636-21
Q102	8-729-900-53	DTC114EK (CHIP)
Q103	8-761-621-00	2SC1636-21
Q104	8-729-162-45	2SB624-BV5 (CHIP)
Q105	8-729-103-43	2SB734-2
Q106	8-729-162-45	2SB624-BV5 (CHIP)
Q107	8-729-162-45	2SB624-BV5 (CHIP)
Q108	8-729-162-45	2SB624-BV5 (CHIP)
Q109	8-729-900-53	DTC114EK (CHIP)
Q111	8-729-159-64	2SD596-DV5 (CHIP)
Q112	8-729-900-53	DTC114EK (CHIP)
Q113	8-729-900-53	DTC114EK (CHIP)
Q114	8-729-900-53	DTC114EK (CHIP)

RESISTORS

Ref. No.	Parts No.	Description			
R101	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R102	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R103	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R104	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R105	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R106	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R107	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R108	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R109	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R110	1-214-122-00	METAL (CHIP)	390	1%	1/4W
R111	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R112	1-214-122-00	METAL (CHIP)	390	1%	1/4W
R113	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R114	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R115	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R117	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R118	1-216-021-00	METAL (CHIP)	68	5%	1/10W
R119	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R120	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R121	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R122	1-216-089-00	METAL (CHIP)	47K	5%	1/10W
R123	1-216-089-00	METAL (CHIP)	47K	5%	1/10W
R124	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R125	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R126	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W

Ref. No.	Parts No.	Description			
R127	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R128	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R129	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R130	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R131	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R134	1-216-067-00	METAL (CHIP)	5.6K	5%	1/10W
R135	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R136	1-216-033-00	METAL (CHIP)	220	5%	1/10W
R137	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R138	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R140	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R141	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R142	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R143	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R144	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R145	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R146	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R147	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R148	1-216-041-00	METAL (CHIP)	470	5%	1/10W
R149	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R150	1-216-077-00	METAL (CHIP)	15K	5%	1/10W
R151	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R152	1-216-081-00	METAL (CHIP)	22K	5%	1/10W
R154	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R155	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R156	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R157	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R158	1-212-517-00	METAL (CHIP)	220	10%	1/2W
R159	1-216-097-00	METAL (CHIP)	100K	5%	1/10W
R160	1-216-085-00	METAL (CHIP)	33K	5%	1/10W
R161	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R162	1-216-033-00	METAL (CHIP)	220	5%	1/10W
R163	1-216-043-00	METAL (CHIP)	560	5%	1/10W
R164	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R165	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R166	1-216-053-00	METAL (CHIP)	1.5K	5%	1/10W
R167	1-216-059-00	METAL (CHIP)	2.7K	5%	1/10W
R168	1-216-009-00	METAL (CHIP)	22	5%	1/10W
R169	1-216-037-00	METAL (CHIP)	330	5%	1/10W
R170	1-216-037-00	METAL (CHIP)	330	5%	1/10W
R171	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R172	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R173	1-216-073-00	METAL (CHIP)	10K	5%	1/10W
R174	1-216-061-00	METAL (CHIP)	3.3K	5%	1/10W
R175	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R176	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W

Ref. No.	Parts No.	Description			
R177	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R178	1-216-057-00	METAL (CHIP)	2.2K	5%	1/10W
R179	1-216-001-00	METAL (CHIP)	10	5%	1/10W
R180	1-216-049-00	METAL (CHIP)	1K	5%	1/10W
R181	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R182	1-216-065-00	METAL (CHIP)	4.7K	5%	1/10W
R183	1-216-295-00	METAL (CHIP)	0	5%	1/10W

VARIABLE RESITORS

RV101	1-226-703-00	RES, ADJ, METAL GLAZE 10K
RV102	1-226-772-00	RES, ADJ, METAL GLAZE 4.7K
RV103	1-226-774-00	RES, ADJ, METAL GLAZE 47K

SWITCHES

S101	1-554-644-00	SWITCH, SLIDE
S102	1-553-510-00	SWITCH, SLIDE

TRANSFORMER

T101	1-426-073-00	TRANSFORMER, RF

OSCILLATOR

X101	1-527-838-00	OSCILLATOR, CERAMIC (WITH CAP)

DISK DRIVE DC MOTOR BOARD (BHC-2101A)

The reference no. marked with # is used only for a disk motor having the lot number of XXXX2, that is rubber-stampped on the metal cover.

CAPACITORS

C1	1-123-611-00	ELECT	1	20%	50V
C2	1-161-054-00	CERAMIC	0.018	10%	50V
C3	1-130-491-00	MYLAR	0.047	5%	50V
C4	1-136-213-00	FILM	0.01	5%	100V
C5	1-123-617-00	ELECT	10	20%	16V
C6	1-123-617-00	ELECT	10	20%	16V
#C6	———	———	—	———	
C7	1-161-039-00	CERAMIC	0.001	10%	50V
C8	1-130-487-00	MYLAR	0.022	5%	50V
C10	1-161-051-00	CERAMIC	0.01	10%	50V
C11	1-123-617-00	ELECT	10	20%	16V
C12	1-123-617-00	ELECT	10	20%	16V
C13	1-123-617-00	ELECT	10	20%	16V
C14	1-123-617-00	ELECT	10	20%	16V
C15	1-131-371-00	TANTALUM	10	10%	16V
#C15	———	———	—	———	

Ref. No.	Parts No.	Description

DIODES

D1	8-719-815-55	1S1555TP
D2	8-719-815-55	1S1555TP
D3	8-719-150-23	RD5.1EB2T
#D3	8-719-150-21	RD4.7EB3T
PH1	8-719-902-90	PHOTO INTERRUPTOR SPI201-20
PH2	8-719-902-90	PHOTO INTERRUPTOR SPI201-20

ICS

IC1	8-759-700-08	IC NJM4558S
IC2	8-750-690-00	IC CX-069
IC3	8-759-201-54	IC TA7245BP
#IC3	8-759-202-02	IC TA7259P

TRANSISTORS

Q1	8-729-993-72	2SA937-R
Q2	8-729-902-11	2SC2021-R
Q3	8-729-902-11	2SC2021-R

RESISTORS

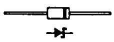
R1	1-247-807-00	CARBON	100	5%	1/6W
R2	1-247-807-00	CARBON	100	5%	1/6W
#R2	1-247-890-00	CARBON	300K	5%	1/6W
R3	1-247-879-00	CARBON	100K	5%	1/6W
#R3	1-247-849-00	CARBON	5.6K	5%	1/6W
R4	1-247-879-00	CARBON	100K	5%	1/6W
#R4	1-247-879-00	CARBON	100K	5%	1/6W
R5	1-247-879-00	CARBON	100K	5%	1/6W
R6	1-247-848-00	CARBON	5.1K	5%	1/6W
R7	1-247-847-00	CARBON	4.7K	5%	1/6W
R8	1-247-883-00	CARBON	150K	5%	1/6W
#R8	1-247-884-00	CARBON	160K	5%	1/6W
R10	1-247-855-00	CARBON	10K	5%	1/6W
R11	1-247-864-00	CARBON	24K	5%	1/6W
#R11	1-247-879-00	CARBON	100K	5%	1/6W
R12	1-247-790-00	CARBON	20	5%	1/6W
#R12	———	———	—	———	
R13	1-247-828-00	CARBON	750	5%	1/6W
R14	1-247-828-00	CARBON	750	5%	1/6W
R15	1-247-831-00	CARBON	1K	5%	1/6W
R16	1-246-405-00	CARBON	1.5	5%	1/4W
R17	1-247-855-00	CARBON	10K	5%	1/6W
R18	1-247-838-00	CARBON	2K	5%	1/6W
R19	1-247-838-00	CARBON	2K	5%	1/6W
R20	1-247-849-00	CARBON	5.6K	5%	1/6W
R21	1-247-849-00	CARBON	5.6K	5%	1/6W
R22	1-247-838-00	CARBON	2K	5%	1/6W
R23	1-247-879-00	CARBON	100K	5%	1/6W
#R23	1-247-873-00	CARBON	56K	5%	1/6W
R24	1-247-879-00	CARBON	100K	5%	1/6W
R25	1-247-867-00	CARBON	33K	5%	1/6W
R26	1-247-867-00	CARBON	33K	5%	1/6W
R27	1-247-847-00	CARBON	4.7K	5%	1/6W

SECTION 8

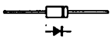
TRANSISTORS / DIODES / ICS PIN ARRANGEMENT

RD5.1EB2T
RD33EB3

ERA81-004

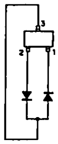


1S1555TP
1S2348HTD

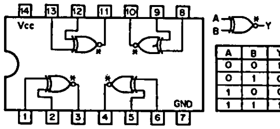


1SS123

TOP VIEW (SCALE 4/1)

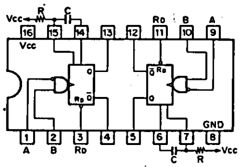


SN74LS266N (TI)
TTL 2-INPUT EXCLUSIVE – NOR GATE
WITH OPEN – COLLECTOR OUTPUT
– TOP VIEW –



A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

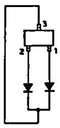
SN74LS423N (TI)
TTL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH DIRECT RESET
– TOP VIEW –



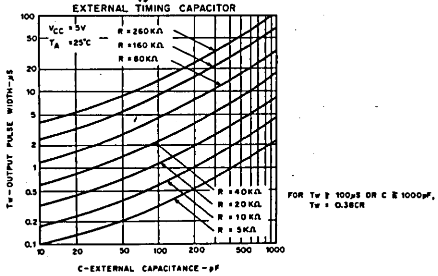
INPUTS			OUTPUTS	
RD	A	B	Q	$\bar{Q}$
0	X	X	0	1
X	1	X	0	1
X	X	0	0	1
1	0	↑	⎍	⊔
1	↓	1	⎍	⊔

0:LOW LEVEL
1:HIGH LEVEL
X:DON'T CARE

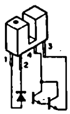
1S2837
TOP VIEW (SCALE 4/1)



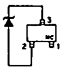
OUTPUT PULSE WIDTH vs EXTERNAL TIMING CAPACITOR



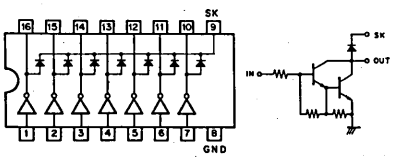
SPI201-20



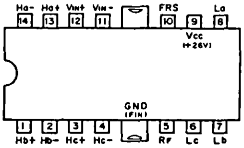
RD??M
TOP VIEW (SCALE 4/1)



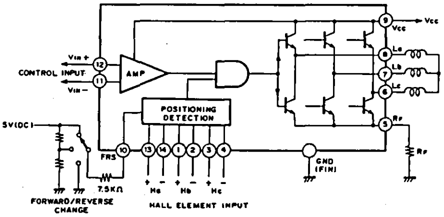
µPA2003C (NEC)
HIGH GAIN AMPLIFIER
– TOP VIEW –



TA7245BP
****
TA7245BP (TOSHIBA)
MOTOR DRIVER
—TOP VIEW—

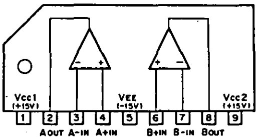


La,Lb,Lc ; COIL TERMINAL
Ha,Hb,Hc ; HALL ELEMENT INPUT
FRS ; FORWARD REVERSE SELECT

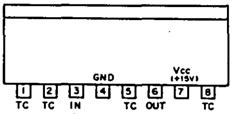


FRS ; FORWARD REVERSE SELECT

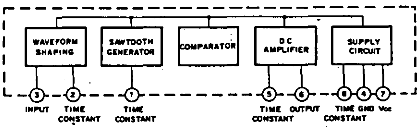
NJM4558S
****
NJM4558S (JRC)
HIGH PERFORMANCE DUAL OPERATIONAL AMPLIFIER
— SIDE VIEW—



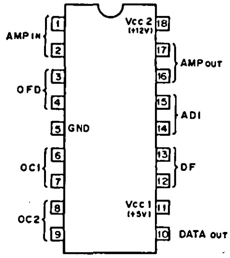
CX069
******
CX069 (SONY)
—SIDE VIEW—



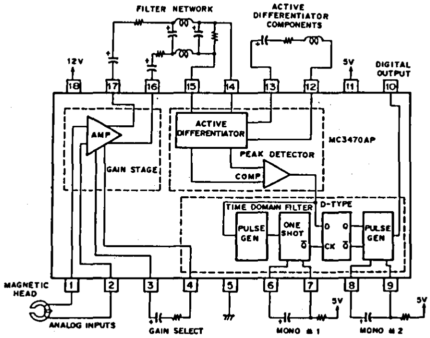
TC ; TIME CONSTANT



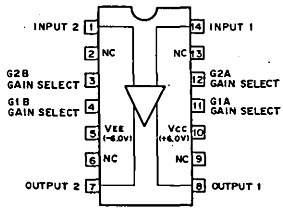
MC3470AP (MOTOROLA)
— TOP VIEW—



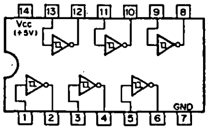
AMP IN ;AMPLIFIER INPUTS
OFD ;OFFSET DECOUPLING
OC ;ONE-SHOT COMPONENTS
AMP OUT ;AMPLIFIER OUTPUTS
ADI ;ACTIVE DIFFERENTIATOR INPUTS
DF ;DIFFERENTIATOR COMPONENTS

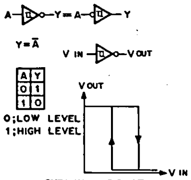


NE592N (MOTOROLA)
— TOP VIEW—



SN74LS14N (TI)
– TOP VIEW –



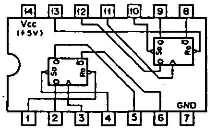


A	Y
0	1
1	0

0;LOW LEVEL
1;HIGH LEVEL

SN7414N-----0.9 1.7V
SN74LS14N---0.8 1.6V

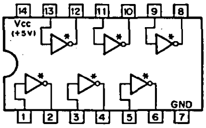
SN74LS74AN (TI)
– TOP VIEW –

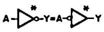


INPUTS				OUTPUTS	
So	Ro	CK	D	Qn+1	$\bar{Q}$n+1
0	1	X	X	1	0
1	0	X	X	0	1
0	0	X	X	1*	1*
1	1	↑	1	1	0
1	1	↑	0	0	1
1	1	0	X	Qn	$\bar{Q}$n

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE
1*;NONSTABLE

SN7406N (TI)
– TOP VIEW –



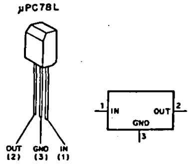


Y = $\bar{A}$

A	Y
0	1
1	0

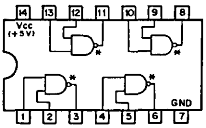
0;LOW LEVEL
1;HIGH LEVEL
*;OPEN COLLECTOR

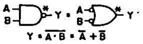
µPC78L05A (NEC)
POSITIVE VOLTAGE REGULATOR (100 mA)



5 V µPC78L05 (A)

SN74LS26N (TI)
– TOP VIEW –



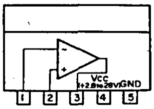


Y = $\overline{A \cdot B}$ = $\bar{A} + \bar{B}$

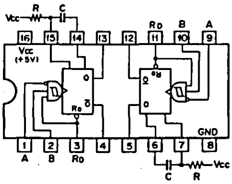
A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

0: LOW LEVEL
1: HIGH LEVEL

M51204L (MITSUBISHI)
VOLTAGE COMPARATOR
– SIDE VIEW –



SN74LS221N (TI)
– TOP VIEW –

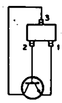


INPUTS			OUTPUTS	
RD	A	B	Q	$\bar{Q}$
0	X	X	0	1
X	1	X	0	1
X	X	0	0	1
1	0	↑	⊓	⊔
1	↓	1	⊓	⊔
↑	0	1	⊓	⊔

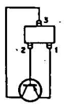
0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE

OUTPUT PULSE WIDTH ≈ 0.7CR

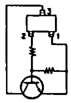
2SC2712
2SD596
TOP VIEW (SCALE 4/1)



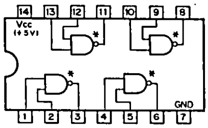
2SB624
TOP VIEW (SCALE 4/1)

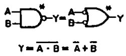


DTC114EK
TOP VIEW (SCALE 4/1)



SN7438N (TI)
– TOP VIEW –



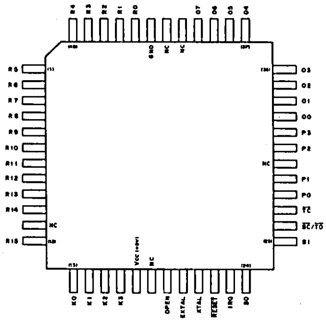


A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

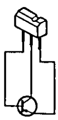
0 ; LOW LEVEL
1 ; HIGH LEVEL
* ; OPEN COLLECTOR

2SB734

MB8847 (FUJITSU) (FLAT PACKAGE)
4-BIT ONE-CHIP MICROCOMPUTER
– TOP VIEW –



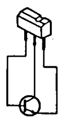
2SA937-R

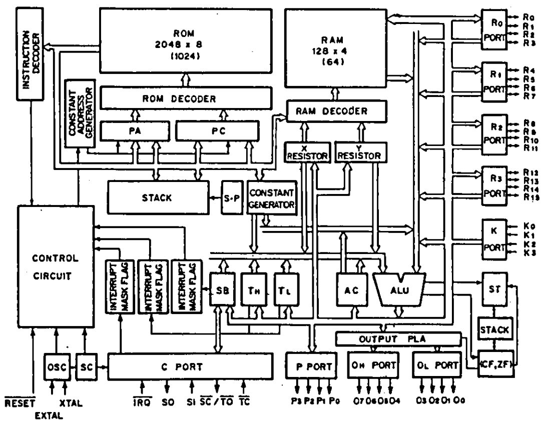


R0 ~ R3 : R0 PORT
R4 ~ R7 : R1 PORT
R8 ~ R11 : R2 PORT
R12 ~ R15 : R3 PORT
K0 ~ K3 : K PORT
O0 ~ O3 : OL PORT
O4 ~ O7 : OH PORT
P0 ~ P3 : P PORT

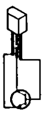
$\overline{TC}$: TIMER COUNTER
$\overline{SC}/\overline{TO}$: SERIAL SHIFT CLOCK/TIMING OUTPUT
SI : SERIAL BUFF
SO : SERIAL BUFFER OUTPUT
$\overline{IRQ}$: INTERRUPT
EXTAL/XTAL : FOR X'TAL OR CLOCK INPUT
$\overline{RESET}$: RESET INPUT

2SC2021-R





2SC1636-21



MEMO

9-975-131-01

Sony Corporation

83K0510-1

MICRO FLOPPYDISK DRIVE

OA-D32W
OA-D32V

SUPPLEMENT 1

This supplement covers some change of reference disks for servicing of models OA-D32W/OA-D32V.

We have changed signal composit method and phase relationship for alignment disk, in order to increase the accuracy of the adjustments to be required in the field service.

In addition to the above, system disks to be employed for both radial alignment adjustment/ measurement and final error check are modified in each content, to utilize the field available soft-wares CP/M (SONY model name SMW-7002) and SONY BASIC (SONY model name SMW-7011). The new system disk, we prepare, is named as R/E systm disk (OR-D114VA, P/N 8-960-010-18).

In the actual procedure, the following disks must be prepared for necessary adjustment and final check.

1. As for radial alignment adjustment/measurement, a SONY BASIC and our new system disk OR-D114VA are required.
2. As for final check, a CP/M disk, a CP/M disk and our new system disk OR-D114VA are required.

The change of P/N for applicable disks are as follows.

Item	P/N of original disk	P/N of new disk
a) Alignment disk	OR-D47VA 8-960-009-32	OR-D123VA 8-960-010-26
b) Radial alignment system disk	OR-D86VA 8-960-009-74	none
c) Error check system disk	OR-D87VA 8-960-009-75	none
d) CP/M disk	none	SMW-7002
e) SONY BASIC	none	SMW-7011
f) R/E system disk	none	OR-D114VA 8-960-010-18

The following sections (pages on original service manual) should be replaced with attached revised pages.

Section 2-1 General and special tool (page 8)
Section 3-3-1 Procudure Ttack positioning (pages 16 - 17)
Section 3-4 Final check (pages 23 - 27)
Section 5-4 Radial alignment (pages 42 - 46)

SONY®
SERVICE MANUAL

2-1 GENERAL AND SPECIAL TOOL LIST

The tools and measuring instruments for perform maintenance on the OA-D32W/OA-D32V are listed below.

a. General Tools

	SONY parts No.
TOTSU screw driver(M2.6)	(7-721-050-62)
+ driver 2mm	(7-700-749-01)
- driver 2mm	(7-700-750-01)
- driver 4mm	(7-700-750-04)
Tweezers	(7-700-753-02)
Round nose plier	(7-700-757-01)
Adj. rod	(7-700-733-01)
Cutter	(7-700-758-02)
CP/M (SMW-7002)	
SONY DISK BASIC (SMW-7011)	
Soldering iron (20W)	
Desoldering Metal Braid	
DC power supplier	
+5VDC±5%, 0.8A min.,	
+12VDC±5%, 1.5A min.	
Tester	

b. Special Tools

MFD Checker II	(J-609-182-0A)
SMC-70 System	
SMI-7011/SMI-7011A/SMI7012/SMI7012A	
SMC-70	
KX-13HG1	
A/D Converter	(J-623-002-0A)
25P/26P Conversion Cable	(J-623-001-0A)
R/E System Disk (OR-D114VA)	(8-960-010-18)
Rotatory Knob (for stepping motor)	(J-609-011-0A)
Lead Screw Eccentricity Inspection Tool	(J-609-136-0A)
Standard Disk Dummy (for Cassette-Up Ass'y Installation)	(J-609-120-0A)
Geared Driver	(J-609-017-0A)
Pad Weight	(J-609-124-0A)
Hexagon Wrench Torque Driver	(J-609-125-0A)
Power Cable	(J-609-130-0A)
Interface Cable	(J-609-200-0A)

c. Measuring Equipment

Oscilloscope Dual Trace 20MHz	
Universal Counter Resolution 0.1msec.	
Tension Gauge (Max. 200g)	(J-604-163-0A)
Tension Gauge (Max. 20g)	(7-732-050-10)

d. Disks

Level Disk	
32V OR-D46VA	(8-960-009-31)
32W OR-D46WA	(8-960-009-40)
Alignment Disk	
32V OR-D123VA	(8-960-010-26)
32W OR-D47WA	(8-960-009-41)
Dynamic Inspection Disk +30	
32V OR-D51VA	(8-960-009-35)
32W OR-D51WA	(8-960-009-44)
Dynamic Inspection Disk -30	
32V OR-D52VA	(8-960-009-36)
32W OR-D52WA	(8-960-009-45)
Cleaning Disk	
32V OR-D29VA	(8-960-009-15)
32W OR-D29WA	(8-960-009-39)

e. Expendable and Chemical Supplies

Nut Lock	
Alcohol	
Sony Oil	(7-611-018-01)
Sony Grease	(7-622-001-52)
Bamboo Stick	
Applicator	

Procedure	Step	Operation
8	Track positioning	1. Such a Cat's eye pattern signal as shown in Fig. 3-1 (a) can be obtained at CN107-1 on the disk drive when the head accesses TRK 20, TRK 30, TRK 40 or TRK 50. The oscilloscope is triggered by the signal at TP-5 of the MFD checker II. **Note:** Such a signal as shown in Fig. 3-1 (b) can be obtained when the head accesses TRK 40. 32W 2. SIDE SELECT switch to side 1. such a Cat's eye pattern signal as shown Fig. 3-1 (b) can be obtained at CN107-1 on the disk drive. When the head accesses TRK 40. 3. Move the head onto TRK 40. 4. Set amplitude L in Fig. 3-1 (b) to 4 divisions, and then read amplitude R in Fig. 3-1 (b). Calculate the OFF TRACK value, refering to Table 3-1 (c) and (d), in accordance with R in Fig. 3-1 (b). Then, obtain the humidity-compensated OFF TRACK value from the following expression: The compensated OFF TRACK value = OFF TRACK value + 0.2(50-H)(32-1.5S)/33.5.....(1) Where; H: Relative humidity (%) S: Side ID number Side 0 : 0 Side 1 : 1 The compensated OFF TRACK value should meet the following formula. $-26 \leq$ Compensated OFF TRACK value $\leq +26$.........(2) [EX] For R = 3.6 in the OA-D32V, the apparent OFF TRACK value is as shown in table 3-1 (c). Assuming the apparent OFF TRACK = 4.5, H = 60%, and S = 0, we can obtain the compensated OFF TRACK value as 2.589 from expression (1). This satisfy the formula.

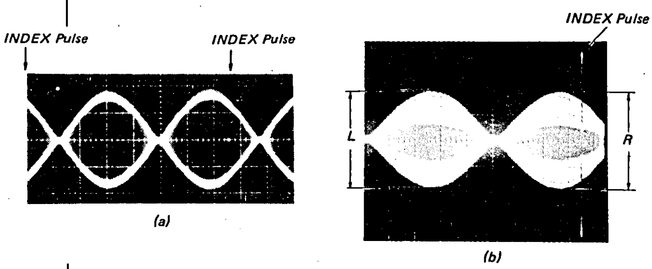


Fig. 3-1 Cat's Eye Pattern Signal

Procedure	Step	Operation

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2:	28.7	26.8	25.0	23.2	21.5	19.8	18.2	16.7	15.2	13.7
3:	12.3	10.9	9.6	8.2	7.0	5.7	$\boxed{4.5}$	3.4	2.2	1.1
4:	0.0	-1.1	-2.1	-3.1	-4.1	-5.1	-6.0	-6.9	-7.8	-8.7
5:	-9.6	-10.4	-11.2	-12.0	-12.8	-13.6	-14.3	-15.1	-15.8	-16.5
6:	-17.2	-17.9	-18.5	-19.2	-19.8	-20.5	-21.1	-21.7	-22.3	-22.9
7:	-23.5	-24.0	-24.6	-25.1	-25.6	-26.2	-26.7	-27.2	-27.7	-28.2
8:	-28.7	-29.1	-29.6	-30.1	-30.5	-31.0	-31.4	-31.8	-32.2	-32.7
9:	-33.1	-33.5	-33.9	-34.3	-34.7	-35.0	-35.4	-35.8	-36.1	-36.5

(c) OA-D32V

	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
2:	26.8	25.1	23.4	21.7	20.1	18.6	17.1	15.6	14.2	12.8
3:	11.5	10.2	8.9	7.7	6.5	5.4	4.2	3.1	2.1	1.0
4:	0.0	-1.0	-2.0	-2.9	-3.8	-4.7	-5.6	-6.5	-7.3	-8.1
5:	-8.9	-9.7	-10.5	-11.3	-12.0	-12.7	-13.4	-14.1	-14.8	-15.4
6:	-16.1	-16.7	-17.4	-18.0	-18.6	-19.2	-19.7	-20.3	-20.9	-21.4
7:	-22.0	-22.5	-23.0	-23.5	-24.0	-24.5	-25.0	-25.5	-25.9	-26.4
8:	-26.8	-27.3	-27.7	-28.1	-28.6	-29.0	-29.4	-29.8	-30.2	-30.6
9:	-31.0	-31.3	-31.7	-32.1	-32.4	-32.8	-33.1	-33.5	-33.8	-34.2

(d) OA-D32W

3-4 FINAL CHECK

3-4-1 Setting of SMC-70

a. Refering to Fig. 2-2 (a), connect the drive to SMC-70 system.

b. Place auto start switch located on the left side panel to "DISK".

c. Set the DRIVE SELECT switch (S101) of the unit to "2".

d. Insert the CP/M Disk into drive A of SMI-7012A.

e. Turn on the power switch. "A" is displayed on screen.

f. Eject the CP/M Disk and then insert the R/E system disk.

g. Perform keying [W],[N],[E],[W],[I],[C] and [RETURN].

3-4-2 Set the Check Area

Description	Keying	Display
To display original test condition of the disk.	[W][N][E][W][I][C] [RETURN]	***** Floppy Disk Analysis v3.0 ***** ***** Copyright (C) 1981.Sep. ***** [Test condition] drive C Minimum track 0 Maximum track 79 Minimum sector 1 Maximum sector 16 Sector size 256 Single or Double side? S Read & Write retry 1 Seek & Home retry 0 #Do you want to change these test conditions? (Y,N) =
To change any of test conditions	[Y] [RETURN]	+Minimum track 0 [track] =>
Type the minimum track to be tested. [EX] In case it is TRK 00.	[0] [RETURN]	+Maximum track 79 [track] =>
Type the maximum track to be tested. [EX] In case it is TRK 79.	[7][9] [RETURN]	+Minimum sector 1 [sector] =>
Type the minimum sector to be tested. [EX] In case it is 1 sector.	[1] [RETURN]	+Maximum sector 16 [sector] =>
Type the maximum sector to be tested. [EX] In case it is 16 sector.	[1][6] [RETURN]	+Sector size 256 [bytes] =>

Description	Keying	Display
Type the number of byte size per a sector, to be tested. [EX] In case it is 256 bytes.	$\boxed{2}\boxed{5}\boxed{6}$ $\boxed{\text{RETURN}}$	+Single side or Double side? (S,D) ==>
Type the initial name letter (S-single sided, D-double sided) of disk surface to be tested. [EX] In case it is double side.	$\boxed{D}$ $\boxed{\text{RETURN}}$	+Read & Write retry 1 [times] ==>
Type the number of how many retry must be conducted when read error or write error occurs. [EX] In case it is once.	$\boxed{1}$ $\boxed{\text{RETURN}}$	+Seek + Home retry 0 [times] ==>
Type the number of how many seek retry must be conducted when the error occurs. [EX] In case no retry is desired.	$\boxed{0}$ $\boxed{\text{RETURN}}$	*** Command table *** r := read test w := write test l := show disk condition s := set test condition h := help e := finish & exit to CP/M

3-4-3 Check the Drive Unit

The test item from command table must be chosen.

Description	Keying	Display
1. To read dynamic inspection disk or	R RETURN	*** Read Test ***
pre-recorded data disk.		# Enter pass-count =
Type the number of pass count for		
reading tracks and sectors pre-set		
in item 3-4-2.		
[EX]		
In case it is once.	1 RETURN	# Test disk ready ? yes --> hit [Return]
Insert the disk to be tested.	RETURN	Pass-count = 1
		In-ward (trkmin --> trkmax)
		+Track=
Read test starts under the test		Out-ward (trkmax--> trkmin)
condition pre-set in item 3-4-2.		+Track=
The test ends.		*** Read Test End ***
		[1] Total of Seek error :
		0 times during 00160 times seek.
		+ Seek CRC error : 0 times
		+ Seek error : 0 times
		[2] Total of Read error :
		0 times during 02560 times read.
		+ ID,DATA ADM missing : 0 times
		+ ID CRC error : 0 times
		+ DATA CRC error : 0 times
		+ Lost data error : 0 times
		+ Byte data verify Err: 0 times
		[3] Total of Write error:
		0 times during 00000 times write.
		+ ID, ADM missing : 0 times
		+ ID CRC error : 0 times
		+ Lost data error : 0 times
		+ Write Protect error : 0 times
		+ Write Fault error : 0 times
2. To write the data on a level disk	W RETURN	*** Write Test ***
Note: Before writing data pattern on		*** Write data pattern ***
a level disk, formatting (initi-		Pattern No.1 --- Random data (all data random)
alization) can be mode automatical-		Pattern No.2 --- Random data (1st byte-0AAh)
ly. If the some error occurs during		Pattern No.3 --- Worst pattern (DBh, 6Dh, B6h)
the processing, the error will be		Pattern No.4 --- User definable
displayed under title of "Initialize		# Select pattern number : [1,2,3,4]=
Test End".		

Description	Keying	Display
To select the data pattern.		
[EX]		
In case it is worst pattern.	[3][RETURN]	# Now, You select pattern No: 3
		# Test disk ready? yes--> hit [Return]
	[RETURN]	*** Write Test Start ***
		+Track=End
The test ends.		*** Write Test End ***
[EX]		
In case it is random data.	[1][RETURN]	# Now, You select pattern No: 1
(all data random.)		# Hit any key after few seconds =>
Type any key.	[A]	# Test disk ready? yes--> hit [Return]
	[RETURN]	*** Write Test Start ***
		+Track=End
The test ends.		*** Write Test End ***
[EX]		
In case it is random data.	[2][RETURN]	# Now, You select pattern No: 2
(1st byte = 0AAh)		# Hit any key after few seconds =>
Type any key.	[A]	# Test disk ready? yes--> hit [Return]
	[RETURN]	*** Write Test Start ***
		+Track=End
The test ends.		*** Write Test End ***
[EX]		
In case it is user definable.	[4][RETURN]	# Now, You select pattern No: 4
		+Enter hex data [1st Bytes]=>
Type the data of written it.		
[EX]		
In case it is "DA".	[D][A]	
Note: Only 2 characters can be assigned for each byte; the character of more than two is disregarded.	[RETURN]	+Enter hex data [2nd Bytes]=>
The key [RETURN] must be depressed at the end of each byte. Maximum	[RETURN]	# Test disk ready? --> hit [Return]
twenty(20) characters (ten kind of byte-10th bytes) can be assigned.	[RETURN]	*** Write Test Start ***
		+Track=End
The test ends.		*** Write Test End ***
3. To display the test condition.	[L] [RETURN]	[Test condition] drive C
		Minimum track 0
		Maximum track 79
		Minimum sector 1
		Maximum sector 16
		Sector size 256
		Single or Double side? S
		Read & Write retry 1
		Seek & Home retry 0

Description	Keying	Display
4. To change any of test condition. (Refer to item 3-4-2)	S RETURN	# Do you want to change these test conditions? (Y,N) =
5. To display the command table.	H RETURN	*** Command table *** r := read test w := write test l := show disk condition s := set test condition h := help e := finish & exit to CP/M
6. To end the test or retest from the first step.	E RETURN	A>

3-4-4 Error Message

KIND OF ERROR	ERROR MESSAGE	CONSIDERABLE CAUSE	COUNTERMEASURE (CONFIRMATION/ADJUSTMETNT)
SEEK ERROR	Seek CRC error Seek error	Stepping motor load torque is too high. Stepping motor circuit is out of order.	Confirm stepping motor load torque. (Refer to 5-5) Confirm the function of stepping motor circuit.
READ ERROR	ID, data, ADM missing	Read circuit is out of order.	Confirm the read circuit. (at first check RF output)
	ID, data CRC error	Off track, chucking trouble, wrong head compliance.	Confirm head compliance, (Refer to 5-3) chucking mechanism or radial alignment and TRK 00 sensor (Refer to 5-4).
WRITE ERROR	ID ADM missing	No write function. (write circuit is out of order, no formatting)	Confirm the waveform of RF output. (CN107-1)
	ID CRC error	Off track wrong head compliance, chucking trouble, or disk.	Confirm the radial alignment and TRK 00 sensor (Refer to 5-4), head compliance (Refer to 5-3), or chucking mechanism.
	Write protect error	Condition is set to write protect.	Confirm Media, write protect circuit or write protect mechanism.
CONNECTION ERROR	Disk not ready	Disk is not inserted, or the insertion is not detected.	Confirm disk detect circuit.
	Drive not connected	DC power is not supplied, or a drive is not selected.	Confirm DC power supplier, drive select switch position and drive select circuit.

5-4 RADIAL ALIGNMENT AND TRK 00 SENSOR

Disassemble the following parts and then perform the measurement and adjustment.

a. Main Cover (Refer to 4-5)

5-4-1 Tools and Measuring Equipment

a. SMC-70 System
b. R/E System Disk (OR-D114VA)
32V c. Alignment Disk (OR-D123VA)
32W d. Alignment Disk (OR-D47WA)
e. CP/M Disk
f. SONY Disk Basic
g. Rotary Knob
h. Geared Driver
i. TOTSU Screw Driver (M2.6)
j. - Driver 4mm
k. Hexagon Wrench Torque Driver
l. A/D Converter

5-4-2 Measurement and adjustment

a. Insert the CP/M Disk into the drive "A" of SMI-7012A.
b. Turn on the power switch. "A" is displayed on screen.
c. Eject the CP/M Disk and then insert the SONY Disk Basic.
d. Perform keying B, A, S, I, C and RETURN.
e. Eject the SONY Disk Basic and then insert TSE R/E system disk.
f. Perform keying R, U, N, ", 1, ", and RETURN.
g. Connect the disk drive (under test) to the cable which leads to the A/D converter, insert the alignment disk, and set the DRIVE SELECT switch (S101) to 4. (Refer to Fig. 2-2)
h. Execute the Set Up command. (Refer to 5-4-3)
i. Execute the Measurement command. (Refer to 5-4-4)
j. Execute the Adjustment command. (Refer to 5-4-5)

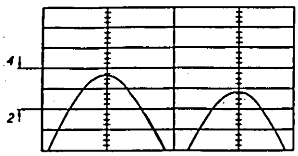
Note: For resuming the state of SMC-70 system to the initial state (that appears immediately after power goes on) press the reset button.

5-4-3 Set Up Command

Function	Keying	Display
		Main Menu [1] Set Up [2] Measurement [3] Adjustment COMMAND NUMBER?
1. Select the Set Up command.	1	1. HUMIDITY 20 - 80%: 50.0[%] 2. SPECIFICATION : 26.0[micrometer] 3. TIME/4DIVISIONS : 100[ms] 4. R/W CORE WIDTH : 120[micrometer] 5. QUIT
Asks for the command number at display center.		COMMAND NUMBER?
2. The initial value for the relative humidity is to be set at 50%.	1	HUMIDITY[%]?
[EX] In case a relative humidity of 60% is keyed in,	6 0 RETURN	COMMAND NUMBER?

Function	Keying	Display
3. The initial value for the specified off track is to be set at 26um. [EX] In case an off track of 30um is keyed in,	2 3 0 RETURN	SPECIFICATION? COMMAND NUMBER?
4. The initial value for the INDEX signal period is to be set at 100msec. [EX] In case an INDEX signal period of 100msec is keyed in,	3 1 0 0 RETURN	TIME/4 DIVISIONS? COMMAND NUMBER?
5. The initial value for the R/W core width is to be set at 120um. [EX] In case a R/W core width of 131um for the OA-D32V is keyed in. (Specify a R/W core width of 120um for the OA-D32W.)	4 1 3 1 RETURN 1 2 0 RETURN	R/W CORE WIDTH? COMMAND NUMBER?
6. When the Set Up command execution ends. (This control returns to the main menu.)	5	MAIN MENU [1] SET UP [2] MEASUREMENT [3] ADJUSTMENT

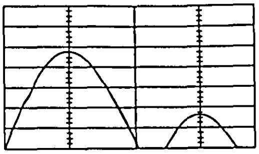
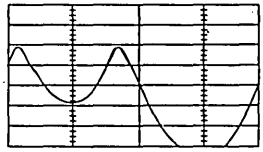
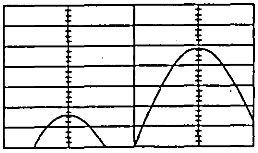
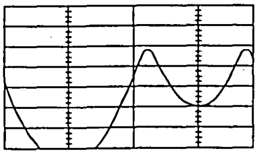
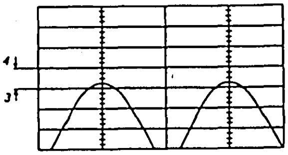
5-4-4 Measurement Command

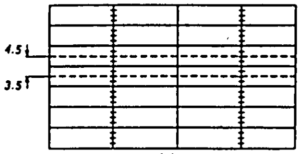
Function	Keying	Display
1. Select the Measurement command. Insert the Alignment disk.	2 RETURN	SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY ADJUST CAT'S EYE SIGNAL LEVEL [MIN (L,R) 2div] AND [MAX (L,R) 4div] AND [MAX (L/R, R/L) 1.5] HIT [RETURN] KEY
2. Set the A/D converter gain by adjustment so that the peak values at both edges of the Cat's eye pattern signal may range from 2 to 4 divisions. (Refer to Fig. 5-4 (a)) Note: If gain adjustment cannot be done, key in 0 to execute step 9. Thereafter, perform the radial alignment adjustment. (Refer to 5-4-5)	RETURN	 (a)

Function	Keying	Display
3. Measure the off track.		MEASURING
4. Calculate the off track.		CALCULATING
Note: When "NO GOOD" is indicated on the CRT,key [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-5.		ADJUST 00 SENSOR HIT [RETURN] KEY
5. Check if the TRK 00 sensor output is set at a value between broken lines 3.5V and 4.5V. (Refer to (Refer to Fig. 5-4 (e))	[RETURN]	TRACK 3 : XXX VOLT TRACK 00>01 (Spec:3.5-4.5) : XXX VOLT OK TRACK 02>01 (Spec:3.5-4.5) : XXX VOLT OK TRACK 01>00 (Spec:MAX 0.5) : XXX VOLT
Note: If not, key in [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-5.		
6. Check if the TRK 00 sensor output is satisfactory. When "NO GOOD" is displayed on the CRT, repeat step 5.		
7. Measure the off track.		MEASURING
8. Calculate and check the off track.		CALCULATING GOOD! HIT [RETURN] KEY
Note: When "NO GOOD" is displayed on the CRT, key in [0] to execute step 9. Thereafter, perform adjustment in accordance with 5-4-5.	[RETURN]	SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
9. End the execution in the Measurement mode.	[E] [N] [D] [RETURN]	

5-4-5 Adjustment Command

Function	Keying	Display
1. Select the Adjustment command.	[3]	COMMAND NUMBER? SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
Insert the Alignment disk.	[RETURN]	ADJUST CAT'S EYE SIGNAL LEVEL [MIN (L,R) 3div] AND [MAX (L,R) 4div] AND [MAX (L/R, R/L) 1.2] HIT [RETURN] KEY

Function	Keying	Display
2. Turn the rotary knob clockwise until the head arrives at the outmost position. Thereafter, turn the rotary knob counterclockwise while stopping and starting at each clicking point until the Cat's eye pattern signal appears. Turning the stepping motor with the geared driver within the range that the screw fastening the stepping motor is not dropped from the stepping motor flange, set the amplitude ratio of the peak signals on the Cat's eye pattern signal at 1:1.2 or less. **Note:** A ratio of 1:1.2 is defined by identifying the smaller one as unity. **Note:** If adjustment of the stepping motor cannot be conducted by using the geared driver, first find the appropriate position in accordance with the following procedure, and perform adjustment again. (1) When the waveform is as shown in Fig. 5-4 (b)-1 and (b)-2, turn the geared driver clockwise. (2) When the waveform is as shown in Fig. 5-4 (c)-1 and (c)-2, turn the geared driver counterclockwise. 3. Set the A/D converter gain by adjustment so that the peak values of the Cat's eye pattern signal may range from 3 to 4 divisions. (Refer to Fig. 5-4 (d)) **Note:** If the amplitude ratio is set at any value other than utmost 1:1.2 during initializing, control does not advance the step to the next even if the [RETURN] key is pressed.	[RETURN]	 (b)-1  (b)-2  (c)-1  (c)-2  (d) *Fig. 5-4*

Function	Keying	Display
4. Measure the off track.		MEASURING
5. Calculate the off track.		CALCULATING ADJUST RADIAL ALIGNMENT [MAX (L/R,R/L)<1.05] TIGHT FIRMLY HIT [RETURN] KEY
6. Turning the stepping motor with the geared driver, set the amplitude ratio of the peak signals on the Cat's eye pattern signal utmost at 1:1.05, fasten the setscrew and then apply nut lock paint to it. **Note:** A ratio of 1:1.05 is defined by identifying the smaller one as unity. **Note:** Unless the amplitude ratio is utmost 1:1.05, control does not advance the next step.	RETURN	MOVE 00 SENSOR BOARD TO OUTSIDE HIT [RETURN] KEY
7. Move the TRK 00 sensor board outside (toward the stepping motor).	RETURN	ADJUST 00 SENSOR HIT [RETURN] KEY
8. Check if the TRK 00 sensor output level is within the range of broken lines 3.5V to 4.5V. If not, set the level nearlest to the center between these broken lines by adjustment, and fasten the setscrew with nut lock paint. (Refer to Fig. 5-4 (e)) **Note:** When "NO GOOD" is displayed on the CRT, repeat step 8.	RETURN	TRACK 3 : XXX VOLT TRACK 00>01 (Spec:3.5-4.5) : XXX VOLT OK TRACK 02>01 (Spec:3.5-4.5) : XXX VOLT OK TRACK 01>00 (Spec:MAX 0.5) : XXX VOLT  (e) *Fig. 5-4 Radial Alignment, TRK 00 Adjustment*
9. Measure the off track.		MEASURING
10. Calculate and check the off track.		CALCULATING GOOD! HIT [RETURN] KEY
	RETURN	SET DRIVE SELECT 4 INSERT ALIGNMENT DISK HIT [RETURN] KEY
11. End the execution in the adjustment mode. (This control returns to the main menu.)	E N D RETURN	

5-4-6 Error Message

One of the following errors can occur during measurement, adjustment, or setting of the machine for radial alignment:

a) Not Ready...Indicates that READY signal is not issued. Check for disk drive connection or check for the DRIVE SELECT switch position.

b) No Index Pulse.....Indicates that INDEX signal is not issued. Check for disk drive connection.

c) Cat's Eye Error.....Indicates that the Cat's eye pattern signal is abnormal. Check for the alignment disk.

In addition to these messages in above, one of the following statements is also displayed.

Statement 1: [0] CONTINUE/[1] RETRY

Statement 2: [RETURN] FIRST STEP/[1] RETRY

Key in $\boxed{0}$ when statement $\boxed{1}$ is displayed, and then control advances the step to the next, disregarding the error which has occurred.

Thereafter, key in $\boxed{1}$ and then the same measurement item is executed again.

Key in $\boxed{\text{RETURN}}$ when statement 2 is displayed, and then control performs the radial alignment measurement and returns to the initial step in the Adjustment mode. Thereafter, key in $\boxed{1}$ and then the same measurement item is executed again.

Note: Check for the disk drive in accordance with confirmation items to the message displayed before retrying the key-in $\boxed{1}$ operation.

Sony Corporation

9-975-131-51
84F0510-1

PARTS LIST

C

ACT PART NUMBERING SYSTEM

Comprises eight numeric digits.

ACT numbers will provide a restricted identification by major category only and no further attempt will be made to try and produce a comprehensive descriptive part number.

Material Control will maintain a register of part numbers and will be the sole authority for issuing new numbers.

The numbering system is as follows:

```
XX XXXX X    X
|    |   |    └─'Finish identification (see note).
|    |   └─ Major category identification (see reference).
|    └─Straight sequential number from 0001 to 9999.
└─These two will always be '11' (this identifies the
   number as ACT).
```

Note

Finish identification. This is used to define a part which may have several types of finishes.

Essentially the number '1' will be used as standard. However, options such as plating, painting . . . will be defined by '2' or '3' etc.

References	**Finish**
Major Category Reference	
1 Sub Assemblies	1 Standard
2 Components	2 Plating
3 (Spare)	3 Paint
4 Cabling	4
5 Metalworking	5
6 Plastics	6 Spare
7 Packaging	7
8 Fasteners/Connectors	8
9 Drawings/Miscellaneous	9 Drawing

PARTS LIST

Sample Part Number

Assume the part to be numbered is the plastic bevel for the monitor, and that this was the first part to have a number assigned. The part number would be: 110001-61.

STOCK NUMBER	DESCRIPTION	UOM	PROD GROUP
11000141	Fan Earth Cable	EA	4
11000241	Cable (DC Power)	EA	4
11000341	D/Disk Signal Cable	EA	4
11000441	Chassis Earth	EA	4
11000541	Sw/Fuse Wire	EA	4
11000641	Cable (Speaker)	EA	4
11000741	Cable (Disk DC)	EA	4
11000841	Cable (PSU AC)	EA	4
1100091	8089 MICRO	EA	9
11000941	S/Disk Signal Cable	EA	4
11001041	Wire (PSU Ch To PCB)	EA	4
11001141	Keyboard Cable	EA	4
11001241	Video Cable	EA	4
11001411	AC Sub Chassis 240V	EA	1
11001521	Fan 240V	EA	2
11001621	Nut M3	EA	8
11001753	Chassis AC	EA	5
11001821	Switch 240V	EA	2
11001921	RFI Filter	EA	2
11002021	Fuse Holder	EA	2
11002121	Fuse 2A 240V	EA	2
11002221	Mains Lead 240V	EA	4
11002321	Screw M3×12	EA	8
11002411	AC Sub Chassis 115V	EA	1
11002521	Fan 115V	EA	2
11002621	Switch 115V	EA	2
11002721	Fuse 3A 115V	EA	2
11002811	Disk Assembly	EA	1
11002911	Monitor	EA	1
11003511	CRT	EA	1
11003621	Glare Filter	EA	2
11003752	Base Screen	EA	5
11003852	LHS Screen	EA	5
11003952	RHS Screen	EA	5
11004052	Top Screen	EA	5

STOCK NUMBER	DESCRIPTION	UOM	PROD GROUP
11004121	Screw M3×6	EA	8
11004221	Screw No 4×6.4 Self Tap	EA	8
11004321	Screw M3×10	EA	8
11004411	Processor 240V Dual Disk	EA	1
11004511	Motherboard Assy	EA	1
11004611	Power Supply 240V	EA	1
11004791	Label (Warn) Monitor	EA	9
11004891	Label (Serl) CPU	EA	9
11005091	Label (Hi Volt) Monitor	EA	9
11005191	Label (Warn) CPU 250V	EA	9
11005291	Label (Ser No) K-Board	EA	9
11006052	Chassis (Main)	EA	5
11006152	Bridge	EA	5
11006221	Loudspeaker	EA	2
11006321	Spring (Disk)	EA	2
11006421	Spring (Door)	EA	2
11006521	Rubber Feet	EA	2
11006791	Label (Ser No) Monitor	EA	9
11006891	Label (Warn) Pow Sup	EA	9
11006991	Label (Earth Pow Sup	EA	9
11007021	Screw M4×8	EA	8
11007121	Screw No 10×6.4 Self Tap	EA	8
11007221	Screw M4×12	EA	8
11007421	Screw (Shoulder)	EA	8
11007521	Screw M4×18	EA	8
11007621	Nut M4	EA	8
11007721	Washer M4	EA	8
11007821	Grooved Pins	EA	2
11007921	Star Washer M3	EA	8
11008091	Label (ACT) Proc/Mon	EA	9
11008121	Ring Tag	EA	2
11008211	Bridge (Dual Disk)	EA	1
11008311	Chassis PSU/Speaker 240V	EA	1
11008411	Keyboard Assembly	EA	1
11008521	Screw M3×16mm	EA	8
11008611	Keyboard	EA	1
11008991	Membrane Switch	EA	2
11009421	2764 Eprom (Non Blown)	EA	2
11009721	PP3 Battery	EA	2
11009821	2764 Eprom (Low)	EA	2
11010251	Retaining Ring	EA	8

PARTS LIST

STOCK NUMBER	DESCRIPTION	UOM	PROD GROUP
11010311	Processor 240V S/Disk	EA	1
11010411	Processor 115V Dual Disk	EA	1
11010511	Processor 115V S/Disk	EA	1
11010611	Chassis PSU/Speaker 115V	EA	1
11010811	Bridge (Single Disk)	EA	1
11010911	Power Supply 115V	EA	1
11011011	Power Unit 115V	EA	1
11011111	Power Unit 240V	EA	1
11011291	Label (Warn) CPU·115V	EA	9
11020821	Bale Lock	EA	2
11020921	Bale Lock Screw	EA	2
11021021	Tappex Grooved Pin M3×13	EA	8
11037211	Motherboard	EA	1
11038921	Fan Stud Sleeve	EA	2
11050071	Monitor Box (Cardboard)	EA	7
11050171	System Box (Cardboard)	EA	7
11050271	Monitor End (Polyst)	EA	7
11050471	Keyboard Top (Polyst)	EA	7
11050671	Systems Box Fr (Polyst)	EA	7
11050771	Systems Box Rear (Polyst)	EA	7
11050871	Accessory Tray (Polyst)	EA	7
11050971	Poly Bag (Sys)	EA	7
11051071	Unpacking Inst (Sys)	EA	7
11051171	Poly Bag (Monitor)	EA	7
11051271	Poly Bag (Keyboard)	EA	7
11100021	6301 Micro	EA	2
11100071	Owners Handbook	EA	7
11100081	Special Washer	EA	8
11100091	8089 Micro Surcharge	EA	2
11100121	LMO18 LCD	EA	2
11100171	MS DOS Users Guide	EA	7
11100181	Star Washer M4	EA	8
11100191	Labels Apricot	EA	9
11100221	8087 Micro (M Opt)	EA	2
11100271	Configurator Guide	EA	7
11100281	Tie Rap (RS 543-428)	EA	8
11100291	Unpacking Inst (Mon)	EA	9
11100321	PCB	EA	2
11100371	Supercalc Manual	EA	7
11100391	Mon Carton Ser No Label	EA	9
11100431	3¼″ Microfloppy Disk	EA	3

STOCK NUMBER	DESCRIPTION	UOM	PROD GROUP
11100471	MS DOS Quick Ref Card	EA	7
11100571	BASIC Quick Ref Card	EA	7
11100671	BOS Voucher	EA	7
11100771	TDI p-System Voucher	EA	7
11100871	Apricot Disk Wallet	EA	7
11101091	Sys Carton Ser No Label	EA	9
11101191	Apricot Insp Label	EA	9
11101271	Pulsar Voucher	EA	7
11443061	Monitor Top (PI)	EA	6
11443161	Swivel/Ped (PI)	EA	6
11443261	Mon Base (PI)	EA	6
11443361	Mon Bezel (PI)	EA	6
11443461	Key Top (PI)	EA	6
11443561	Key Base (PI)	EA	6
11443661	Sys Top (PI)	EA	6
11443761	Sys Base (PI)	EA	6
11443861	Sys Rear Panel (PI)	EA	6
11443961	Sys Front Panel (PI)	EA	6
11444561	Door (PI)	EA	6
11444661	Handle (PI)	EA	6
11445621	Keyboard Cable Cover (PI)	EA	6
11445761	Expansion Cover (PI)	EA	6
11445861	Button Disk (PI)	EA	6
11445961	Battery Cover (PI)	EA	6
11446061	Switch Housing (PI)	EA	6
11446161	Reset Button (PI)	EA	6
11446162	Brightness Wheel (PI)	EA	6
11446261	Keyboard Button (PI)	EA	6
11446262	Keyboard Clip (PI)	EA	6
11447061	Knob (PI)	EA	6
11447161	Sys Cable Clip (PI)	EA	6

POWER SUPPLY

D

Electrical Specifications

PARAMETER	MIN	TYP	MAX	UNIT	NOTES
Input Voltage	90	115	135	VAC	
	180	230	270	VAC	
Input Frequency	47	50/60		Hz	
Outputs: VO_1	4.9	5.0	5.1	V	+5V Output
IO_1	1.35		6.0	A	
IO_1	2.50*		5.0*	A	
VO_2	11.4	12.0	12.6	V	
IO_2	0.60		1.50	A	
VO_3	11.4	12.0	12.6	V	
IO_3	0.40		2.10	A	
IO_3	0.75*		3.50*	A	
VO_4	−11.40	−12	−12.60	V	−12V Output
IO_4	0		0.25	A	

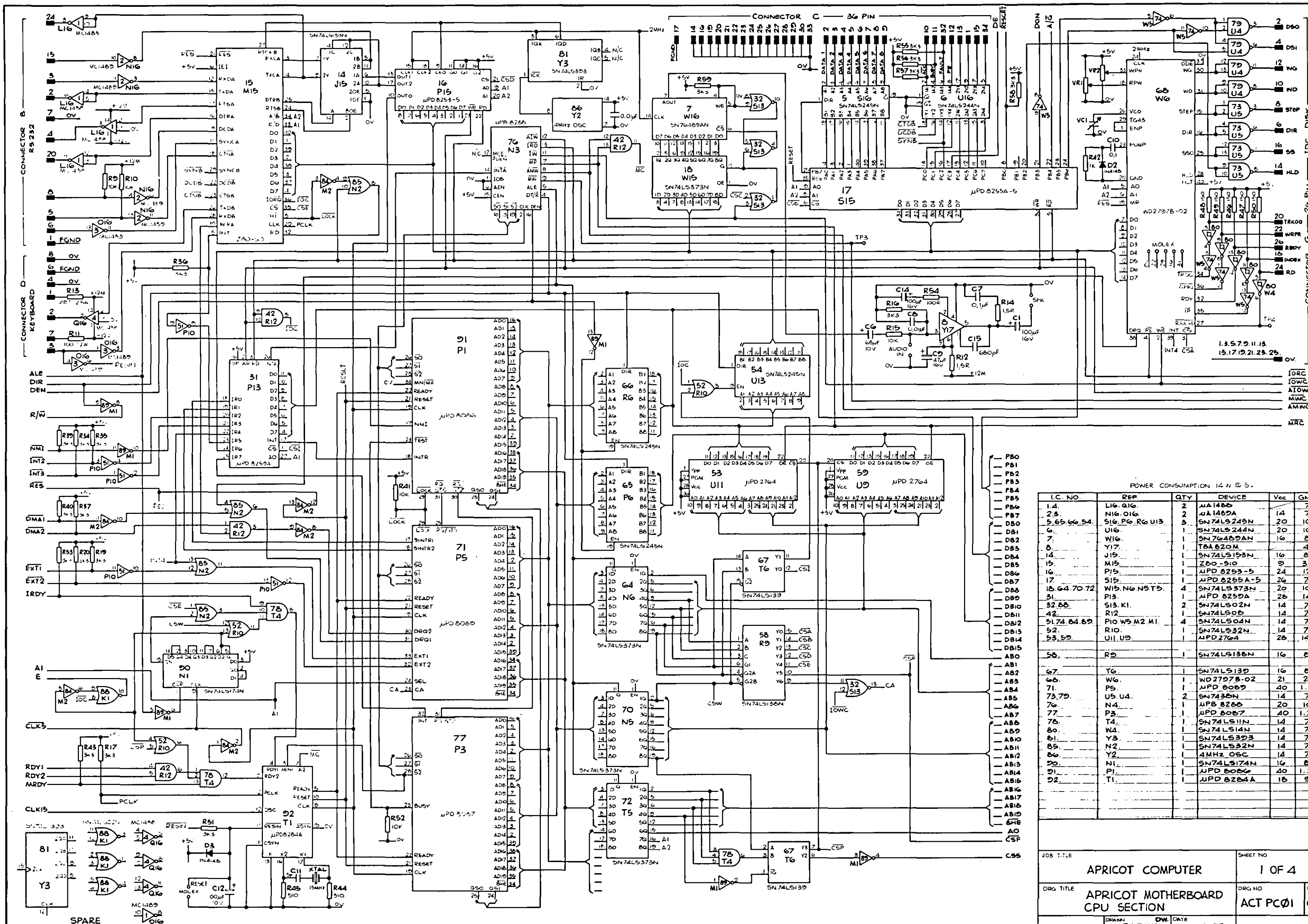
*Loading condition if VO_2 and VO_3 are paralleled.

PARAMETER	MIN	TYP	MAX	UNIT	NOTES
Efficiency	65			%	At full load 115/230 VAC in
Operating Temperature	0		50	°C	Ambient Temp
Output Power			50	W	Max Continuous
Output Ripple			1	%	1 Hz to 10 MHz
Line Regulation		0.1	0.2	%	
Load Regulation					
VO_1		0.2	2.0	%	
VO_2, VO_3, VO_4			5.0	%	
Over Voltage Protection	5.9		6.9	V	+5V Supply
Hold-up Time	16	24		mS	Full load at 115/230V

Short Circuit Loads	Indefinite period on all outputs
Open Circuit Loads	Indefinite period on all outputs
EMI Requirements	Meets the conduction limits of VDE 0871 'B' rules for 230 VAC and FCC 'B' rules for 115 VAC in
Safety Requirements	Meets UL 1012 safety standard for power supplies

CIRCUIT DIAGRAM

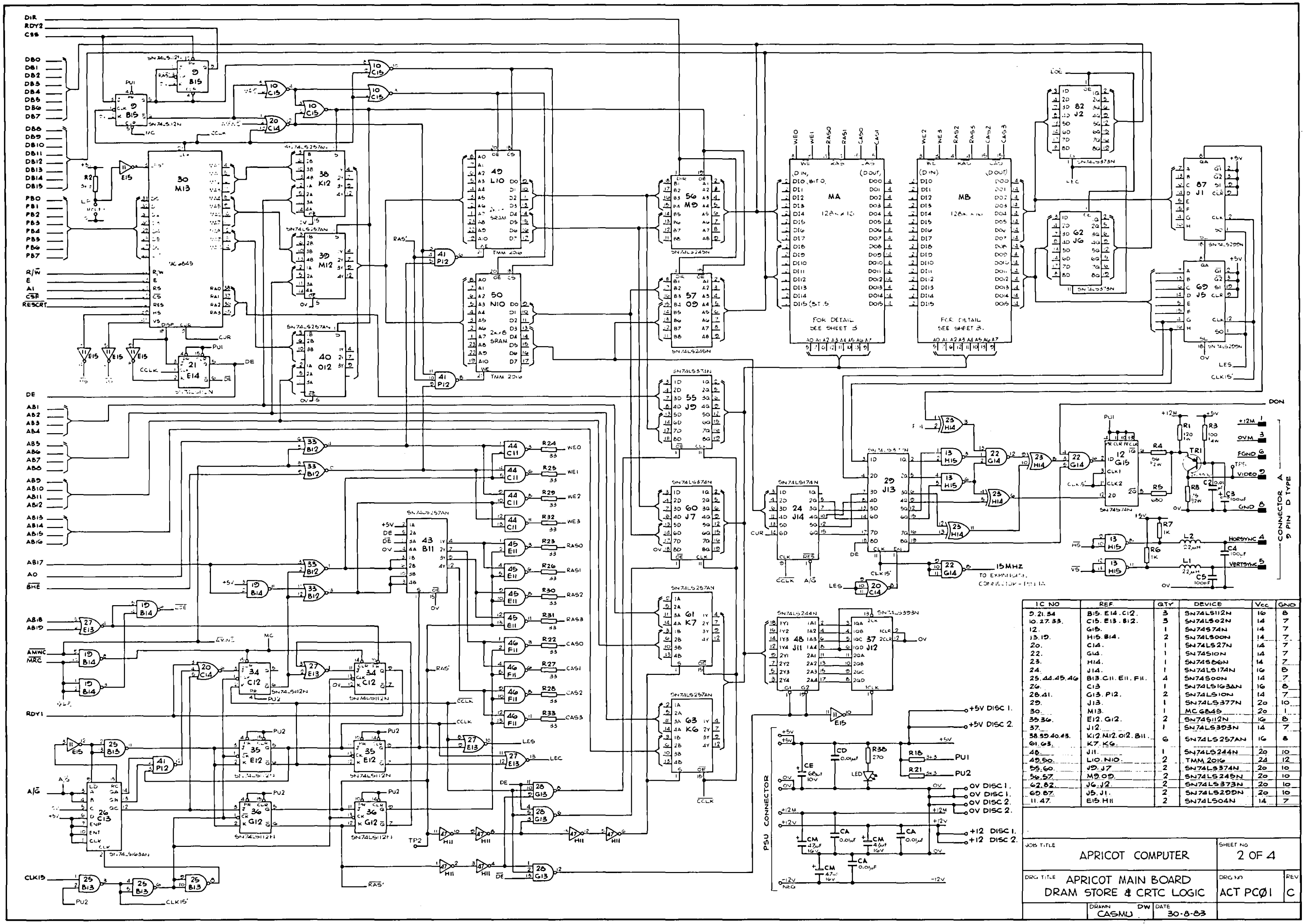
CIRCUIT DIAGRAM



POWER CONSUMPTION 14 N @ 5.

I.C. NO.	REF.	QTY	DEVICE	Vcc	GND
1.4.	L16. Q16.	2	µA1488		7
2.3.	N16. O16.	2	µA1489A	14	7
5.65.66.54.	S16. P6. R6. U13	3	SN74LS245N	20	10
6.	U16.	1	SN74LS244N	20	10
7.	W16.	1	SN76489AN	16	8
8.	Y17.	1	TBA820M		4
14.	J15.	1	SN74LS153N	16	8
15.	M15.	1	Z80-SIO	9	31
16.	P15.	1	µPD 8253-5	24	12
17.	S15.	1	µPD 8255A-5	26	7
18.64.70.72.	W15. N6. N5. T5.	4	SN74LS373N	20	10
31.	P13.	1	µPD 8259A	28	14
32.88.	S13. K1.	2	SN74LS02N	14	7
42.	R12.	1	SN74LS08	14	7
51.74.84.89.	P10. W5. M2. M1.	4	SN74LS04N	14	7
52.	R10.	1	SN74LS32N	14	7
53.59.	U11. U9.	1	µPD2764	28	14
58.	R9.	1	SN74LS138N	16	8
67.	T6.	1	SN74LS139	16	8
68.	W6.	1	WD2797B-02	21	20
71.	P5.	1	µPD 8089	40	1.20
73.79.	U5. U4.	2	SN7438N	14	7
76.	N4.	1	µPB 8288	20	10
77.	P3.	1	µPD 8087	40	1.20
78.	T4.	1	SN74LS11N	14	7
80.	W4.	1	SN74LS14N	14	7
81.	Y3.	1	SN74LS393	14	7
85.	N2.	1	SN74LS32N	14	7
86.	Y2.	1	4MHz OSC	14	7
90.	N1.	1	SN74LS174N	16	8
91.	P1.	1	µPD 8086	40	1.20
92.	T1.	1	µPD 8284A	18	9

JOB TITLE: APRICOT COMPUTER		SHEET NO: 1 OF 4	
DRG TITLE: APRICOT MOTHERBOARD CPU SECTION		DRG NO: ACT PCØ1	REV: C
DRAWN: CASMU	DW. DATE: 30-8-83		



I.C NO	REF.	QTY	DEVICE	Vcc	GND
9.21.34	B15. E14. C12.	3	SN74LS112N	16	8
10.27.33.	C15. E13. B12.	3	SN74LS02N	14	7
12.	G15.	1	SN74S74N	14	7
13.19.	H15. B14.	2	SN74LS00N	14	7
20.	C14.	1	SN74LS27N	14	7
22.	G14.	1	SN74S10N	14	7
23.	H14.	1	SN74S86N	14	7
24.	J14.	1	SN74LS174N	16	8
25.44.45.46	B13. C11. E11. F11.	4	SN74S00N	14	7
26.	C13	1	SN74LS163AN	16	8
28.41.	G13. P12.	2	SN74LS10N	14	7
29.	J13.	1	SN74LS377N	20	10
30.	M13.	1	MC6845	20	1
35.36.	E12. G12.	2	SN74S112N	16	8
37.	J12.	1	SN74LS393N	14	7
38.39.40.43. 61.63.	K12. M12. O12. B11. K7. K6.	6	SN74LS257AN	16	8
48.	J11.	1	SN74LS244N	20	10
49.50.	L10. N10.	2	TMM 2016	24	12
55.60.	J9. J7	2	SN74LS374N	20	10
56.57.	M9. O9.	2	SN74LS245N	20	10
62.82.	J6. J2.	2	SN74LS373N	20	10
69.87.	J5. J1.	2	SN74LS299N	20	10
11.47.	E15. H11	2	SN74LS04N	14	7

JOB TITLE: APRICOT COMPUTER

SHEET NO: 2 OF 4

DRG TITLE: APRICOT MAIN BOARD DRAM STORE & CRTC LOGIC

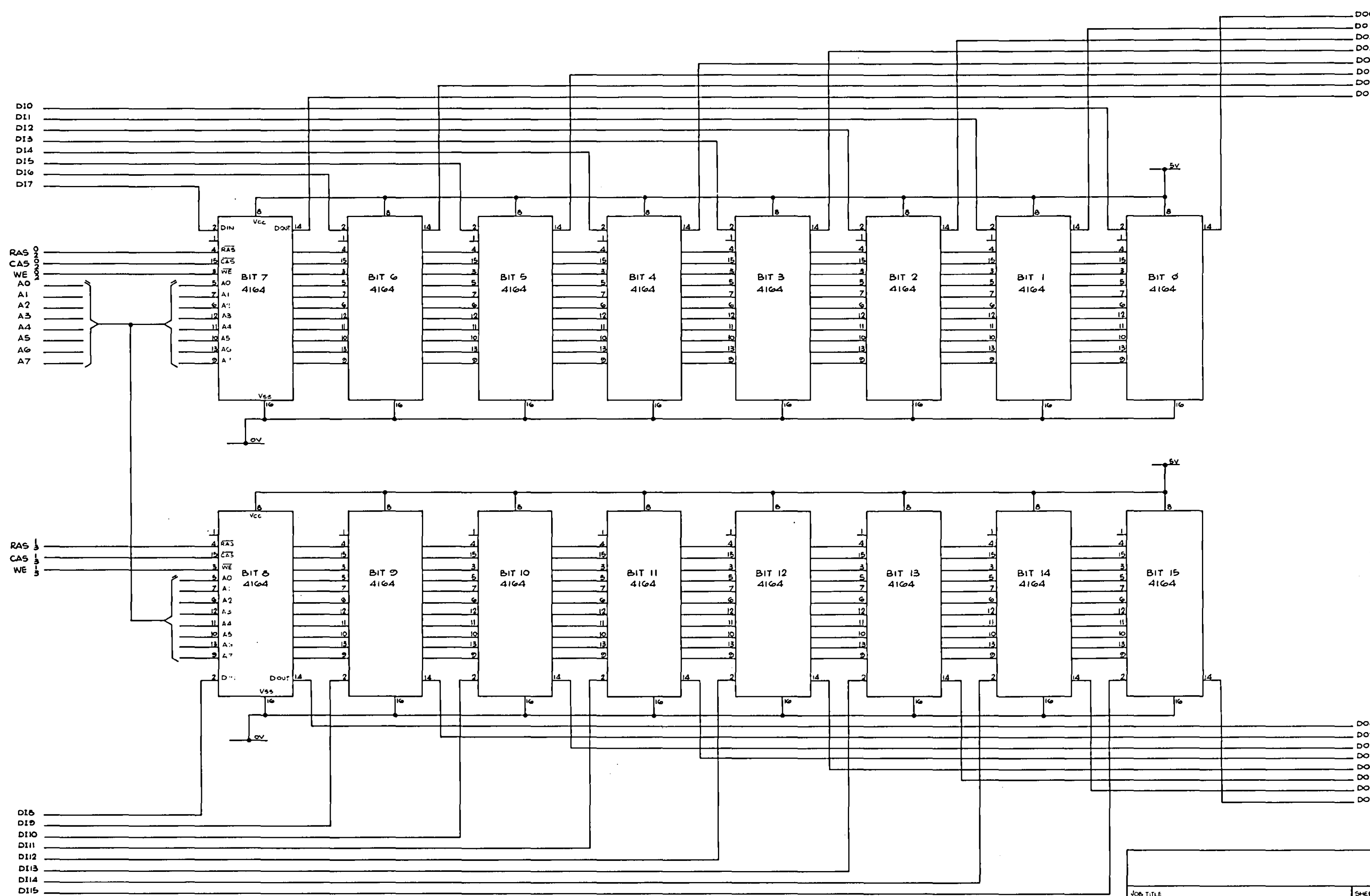
DRG NO: ACT PCØ1

REV: C

DRAWN: CASMU DW

DATE: 30-8-83

CIRCUIT DIAGRAM

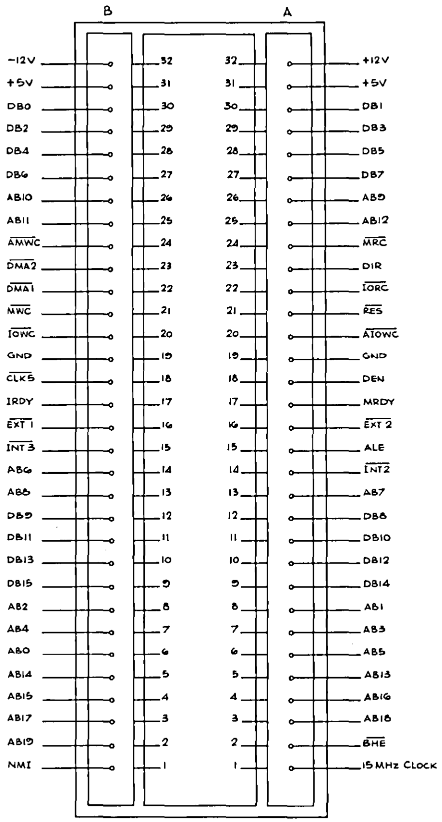


NOTE:- 2 BANKS OF 128K RAM SHOWN PER BOARD.

JOB TITLE: APRICOT COMPUTER		SHEET NO: 3 OF 4	
DRG TITLE: APRICOT 128K RAM SECTION		DRG NO: ACT PCØ1	REV: C
DRAWN: CASMU DW	DATE: 30-8-83		

CIRCUIT DIAGRAM

E
4



EXPANSION 1.

NOTE :- MAXIMUM SIGNAL LOADING IS
2 LS TTL GATES PER SLOT.
2 EXPANSION SLOTS PER BOARD.

JOB TITLE: APRICOT COMPUTER		SHEET NO: 4 OF 4	
DRG TITLE: APRICOT EXPANSION SLOT		DRG NO: ACT PCØ1	REV: C
DRAWN: CASMU DW	DATE: 30-8-83		

CIRCUIT DIAGRAM

EARTHING ARRANGEMENT (UK VERSION)

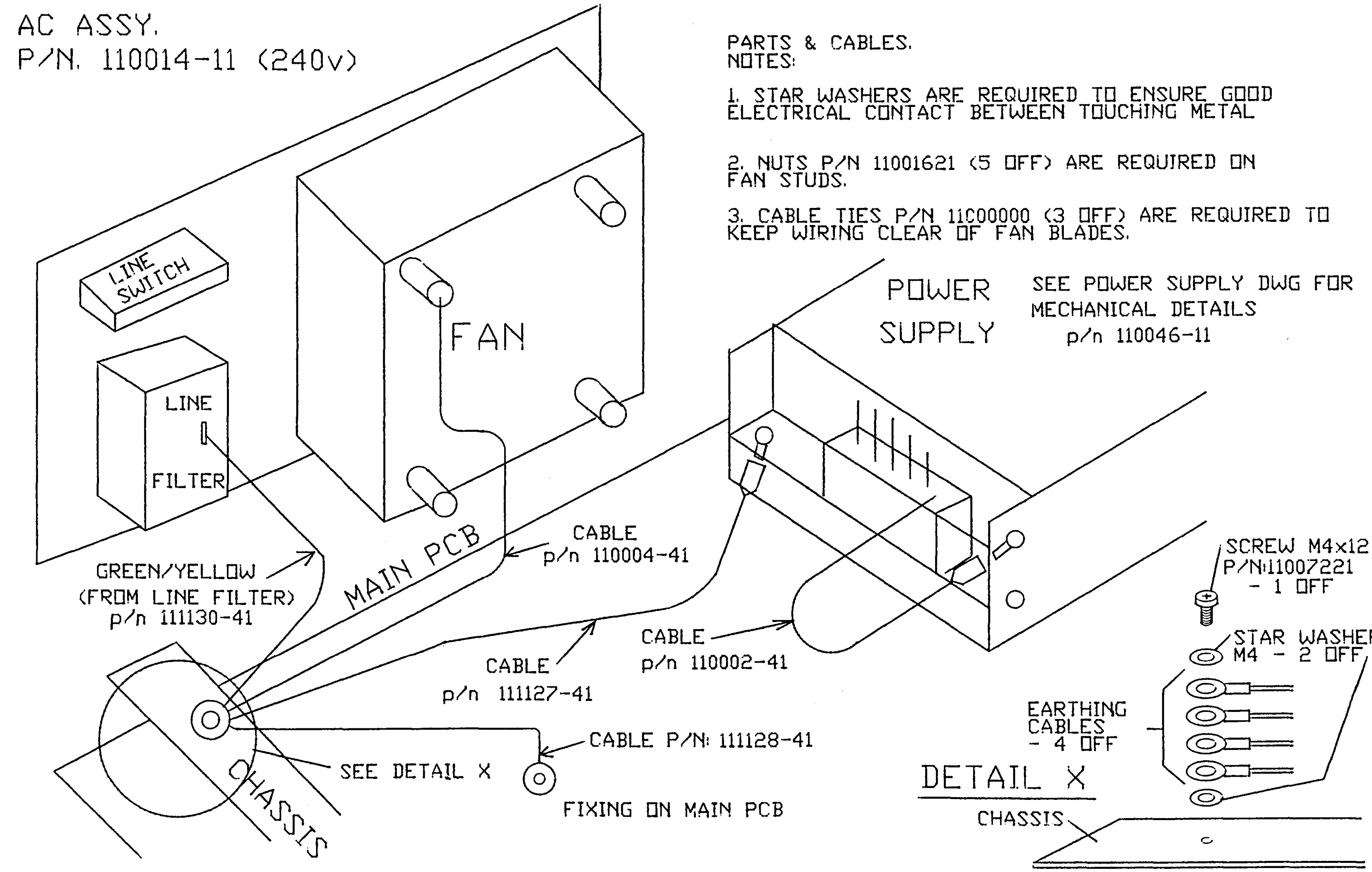
AC ASSY.
P/N. 110014-11 (240v)

PARTS & CABLES.
NOTES:

1. STAR WASHERS ARE REQUIRED TO ENSURE GOOD ELECTRICAL CONTACT BETWEEN TOUCHING METAL

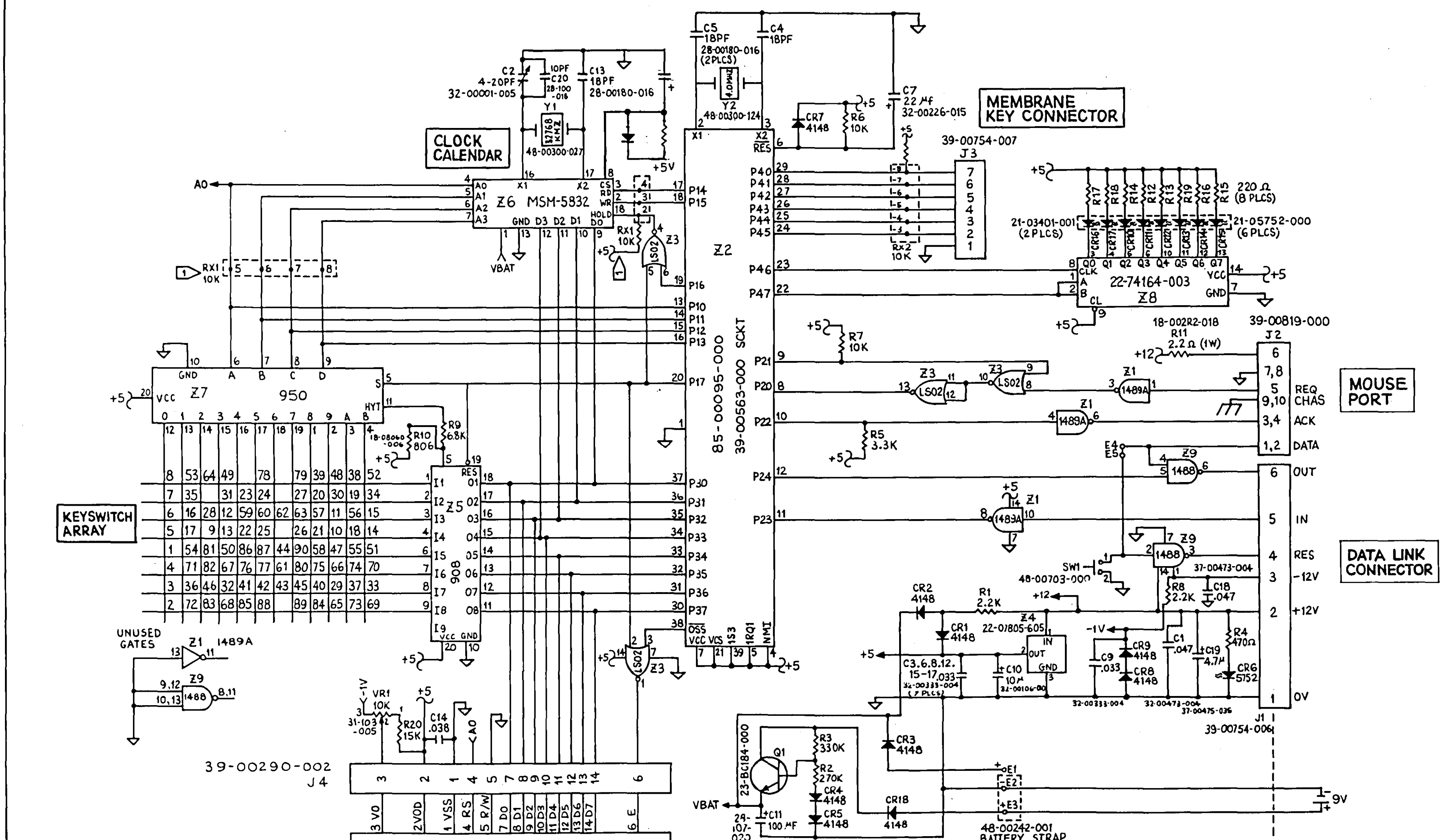
2. NUTS P/N 11001621 (5 OFF) ARE REQUIRED ON FAN STUDS.

3. CABLE TIES P/N 11C00000 (3 OFF) ARE REQUIRED TO KEEP WIRING CLEAR OF FAN BLADES.



ACT	111125-99
SHEET	1 of 1
ISS.	3
DEV	AS-006
DATE	ECO. NO. APPROVED
5-3-84	
24-10-84	

ACT



JOB TITLE	SHEET NO.	
APRICOT COMPUTER	1 OF 1	
DRG TITLE	DRG No.	REV.
APRICOT KEYBOARD	ACT KBØ1	B
DRAWN	DATE	

CIRCUIT DIAGRAM

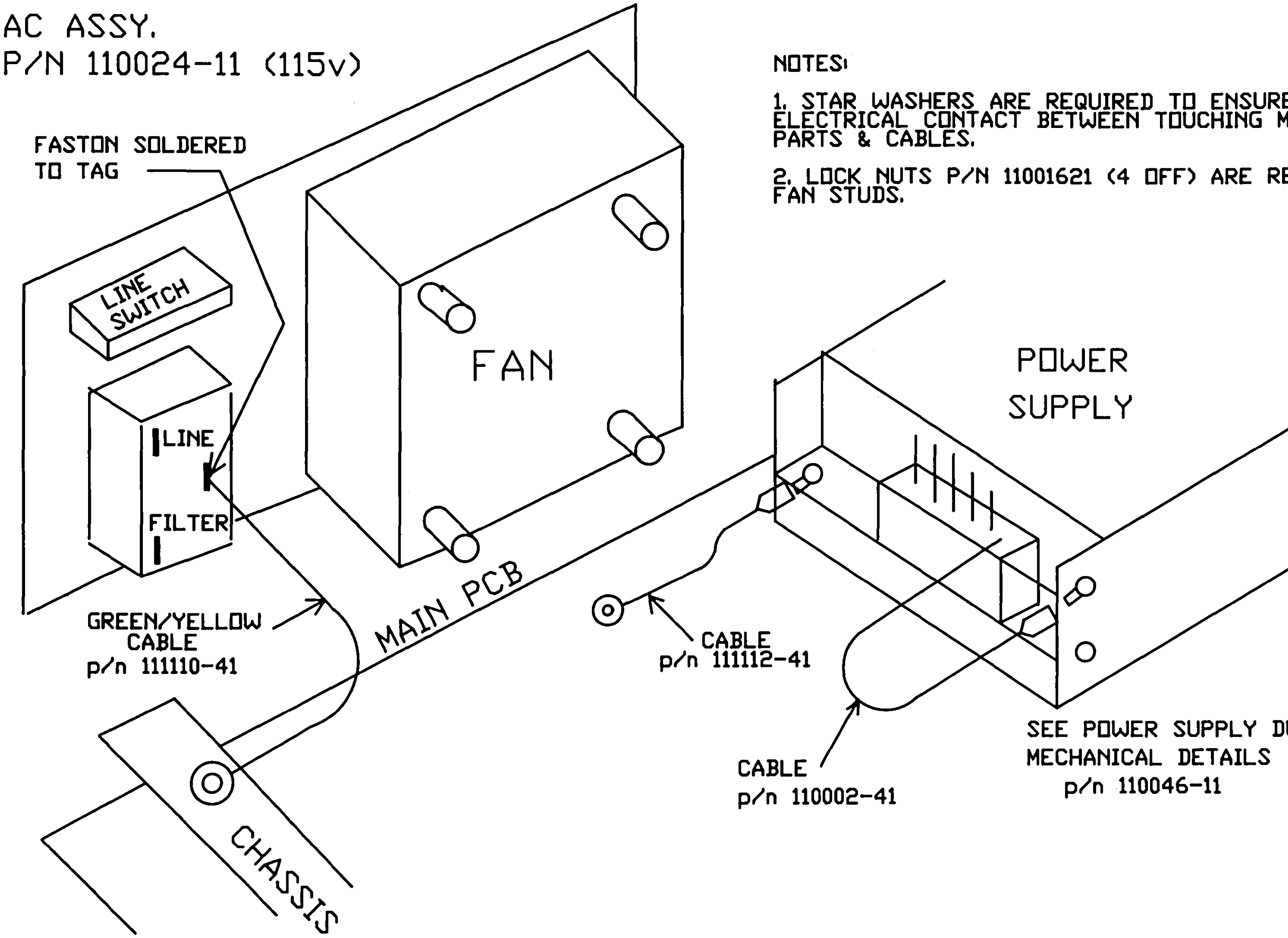
EARTHING ARRANGEMENT (N. AMERICAN VERSION)

AC ASSY.
P/N 110024-11 (115v)

NOTES:

1. STAR WASHERS ARE REQUIRED TO ENSURE GOOD ELECTRICAL CONTACT BETWEEN TOUCHING METAL PARTS & CABLES.

2. LOCK NUTS P/N 11001621 (4 OFF) ARE REQUIRED ON FAN STUDS.



ACT	111126-99
SHEET	1 of 1
ISS.	1
DATE	APPROVED
7-3-84	

ACT