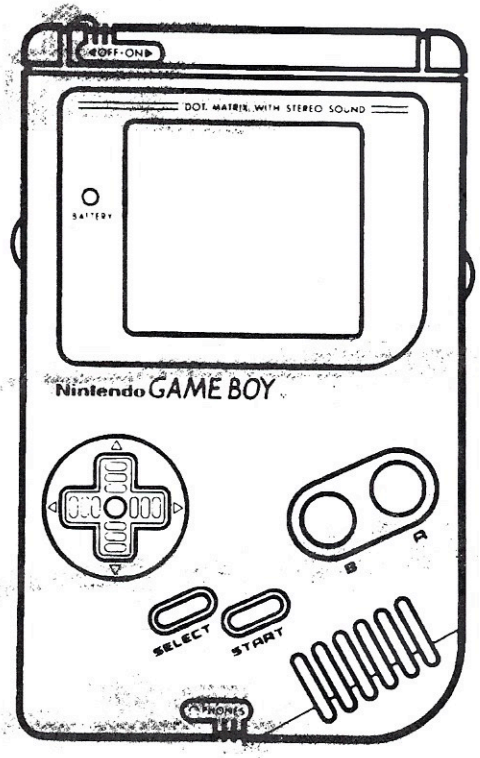
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Nintendo

WORLD CLASS SERVICE℠

GAME BOY™ TECHNICAL MANUAL

GAME BOY®



TECHNICAL MANUAL

CONFIDENTIAL

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CHANGE RECORD

CHG. NO.	CHG. TITLE	CHANGE DATE	ENTERED	COMMENTS

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SYSTEM OVERVIEW

SYSTEM OVERVIEW

Game Boy Hardware

The major features and functions of the Game Boy unit are:

1. Central Processing Unit (CPU)
   - Custom 8 bit processor
   - 127 x 8 bit internal Random Access Memory (RAM)
   - Power up display program contained within internal Read Only Memory (ROM)
   - Produces display signals with four different contrast levels
   - Stereo sound generation

2. Sound Output
   - Audio power amplifier IC to drive outputs
   - Stereo sound provided to external jack for headphones (2mW)
   - Mono sound provided to internal speaker (10mW)

3. Dot Matrix Liquid Crystal Display (LCD)
   - Contains common and segment drivers
   - 160 horizontal by 144 vertical dot resolution
   - LCD buffer amplifier (IR3E02) provides LCD bias voltage and screen contrast control through a variable resistor (VR1)

4. Work RAM (static 8K x 8 bit)
   - Used to keep track of sprite locations, game score, game time, etc.

5. Video RAM (static 8K x 8 bit)
   - Background graphics and text memory map

6. DC/DC Converter
   - Receives V_{CC} (3.5 - 7 volts DC) from either four AA batteries or a Rechargeable Battery Pack
   - Provides 5 volts DC (V_{DD}) for the CPU PCB operation
   - Provides -18 volts DC (V_{EE}) for the LCD operation

7. Expansion Port
   - 6 pin I/O port for multiple player games or peripheral devices

Game Link Cable

The Game Link cable offers the unique opportunity to join two systems in competition. This cable may also be used to connect the Game Boy unit to an external peripheral device (e.g. Four Player Adapter).

Rechargeable Battery Pack

The Rechargeable Battery Pack offers a power source other than AA batteries. Using Nickel-Cadmium batteries, this unit will hold a charge for approximately ten hours of use and may be recharged approximately 300 times. The battery pack may also be used as an AC adapter when connected to a 110 volt AC outlet. A belt clip and the unit's compact size provide portability to the game player.

Four Player Adapter

The Four Player Adapter allows up to four players to play simultaneously when using specially programmed game paks. The Four Player Adapter contains a single microcontroller IC that performs synchronization between each of the connected Game Boy systems, updating each players screen with sprite locations for all players.

Game Paks

Each Game Boy Game Pak contains a program ROM IC that contains instructions which are read by the Game Boy CPU. It also contains all character information for the graphic display. Some game paks contain an additional IC for memory management. This enables the Game Boy hardware to access additional amounts of memory.

GAME BOY

GAME BOY

Purpose

Game Boy is a hand held, compact video game system. The Game Boy unit contains the hardware; Central Processing Unit (CPU), Liquid Crystal Display (LCD), input controls and related circuitry. The Game Boy system is occasionally referred to as Dot Matrix Game (DMG), which refers to the structure of the LCD.

Theory of Operation

The Game Boy unit cannot function alone. It requires the programmed information stored within a game pak and user input, from the built-in controller, in order for game play to take place. The main functions of the Game Boy hardware are to execute the instructions contained in a game pak, produce sound, and graphics display.

The Game Boy unit can be broken down into seven functional blocks:

1. Power Supply Section
2. Controller Input Section
3. System Timing Section
4. Program Section
5. Display Section
6. Sound Section
7. Game Pak Interface

The following will give a brief overview of each functional block.

1. ***Power Supply Section*** - The Game Boy unit is capable of receiving power from one of two sources, either four AA batteries or a Rechargeable Battery Pack. The power supply section, within the Game Boy unit, consists of a DC/DC converter PCB to provide +5 volts DC (V_{DD}) to the CPU PCB and -18 volts DC (V_{EE}) to the LCD for its operating voltage. The Game Boy system operates on an input voltage between 3.5 and 7 volts DC. When a connection is made to the power jack, a normally closed switch is opened to disable power from the AA batteries.

2. ***Controller Input Section*** - A controller is built into the front assembly of the Game Boy unit. It is configured similar to a matrix key pad with rows and columns. All control signals are sent and all controller functions are received by the CPU.

3. ***System Timing Section*** - System timing includes an oscillator and discrete components to supply a 4.194 MHz master clock signal to the CPU. The CPU uses the master clock to derive the control signals for the rest of the unit.

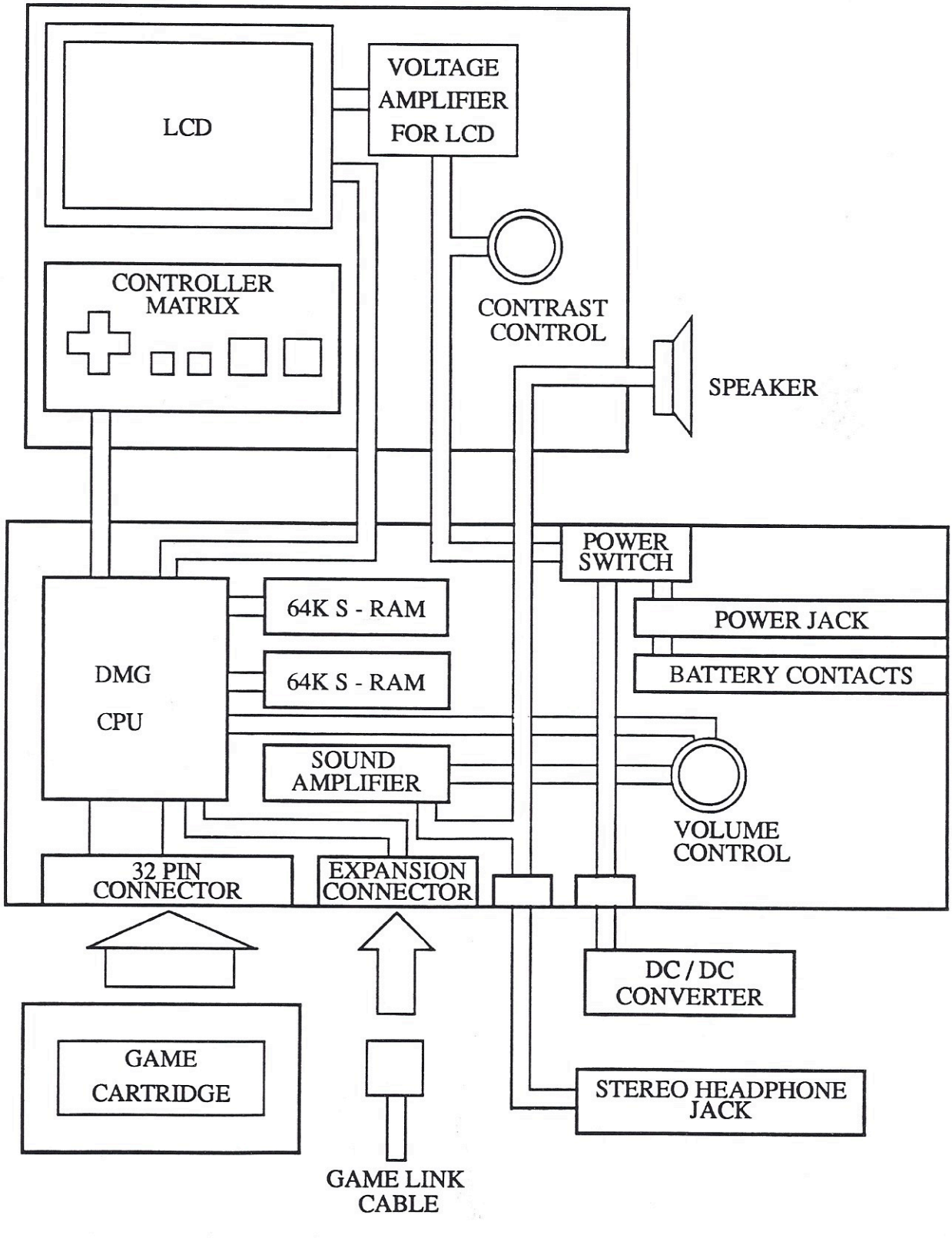
4. ***Program Section*** - The program section includes the CPU and work RAM. The CPU is the master controller for Game Boy operation. The functions of the program section include fetching and decoding instructions from ROM, generating sound, controlling graphics, and reading controller data.

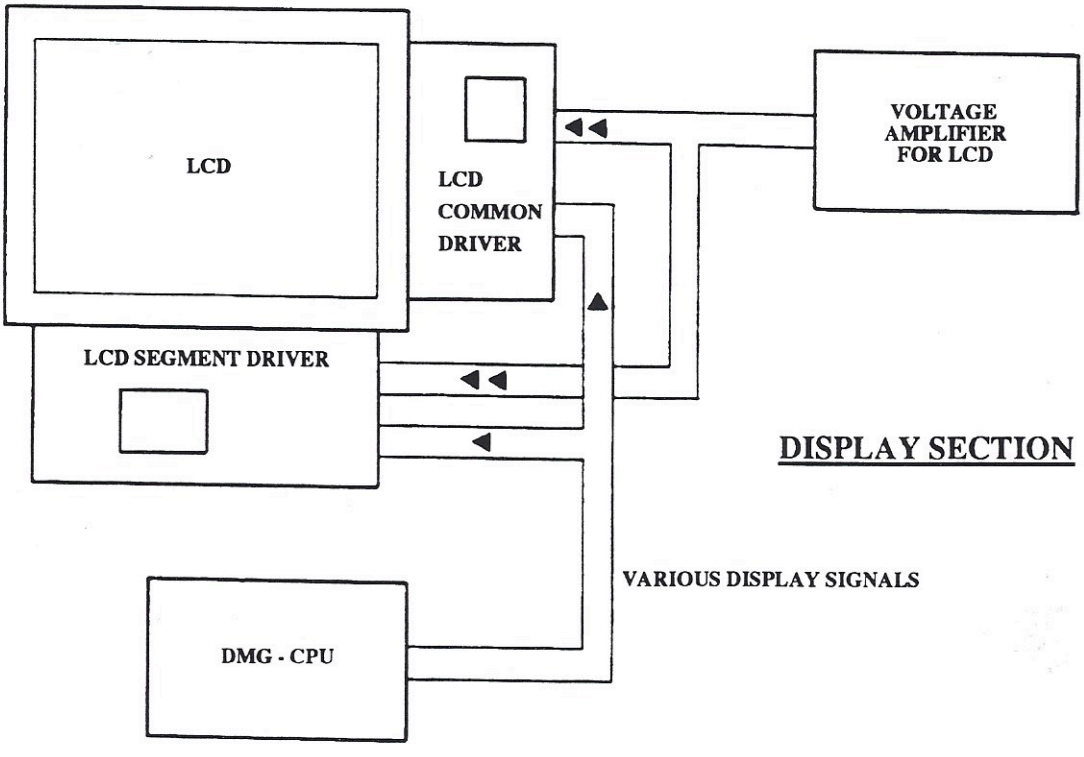
5. ***Display Section*** - The display section consists of the LCD which has a built in segment driver and a common driver. This works in conjunction with a voltage amplifier to produce the graphic images received from the CPU.

6. ***Sound Section*** - The sound section includes a two channel variable resistor, amplifier IC, speaker, and an audio jack PCB. The CPU provides stereo output through a variable resistor (for volume control), then to an amplifier IC. The amplifier passes the sound to the audio jack PCB and combines the stereo signals to provide a mono output to the internal speaker. When a connection is made to the stereo jack, a normally closed switch is opened to disable the internal speaker.

7. ***Game Pak Interface*** - The 32 pin connector is used for interfacing to the Game Pak.

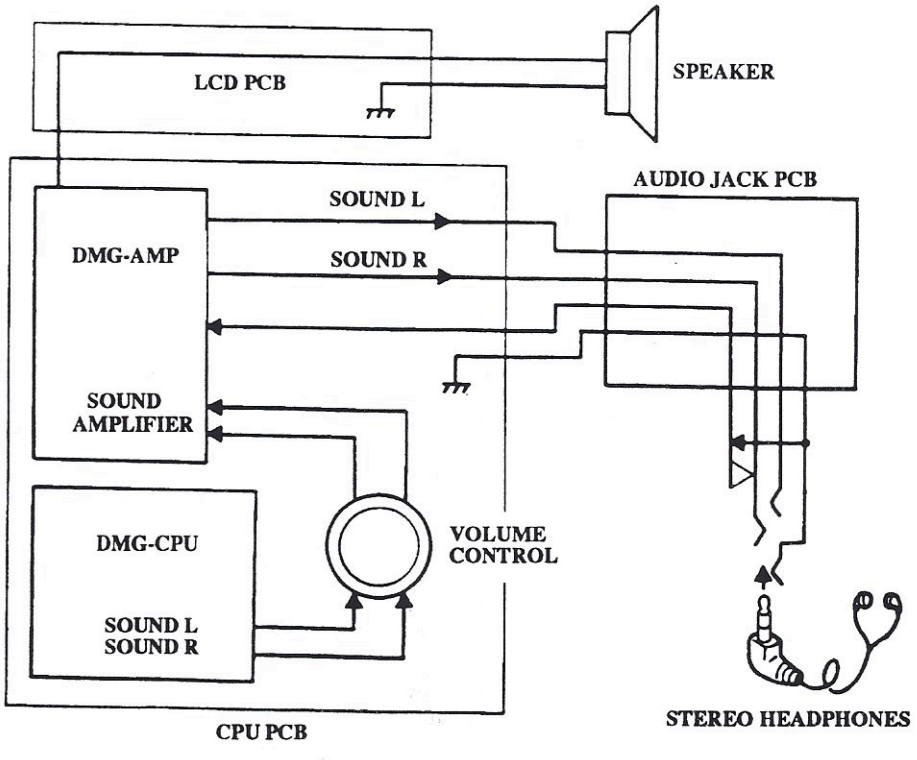
BLOCK DIAGRAM



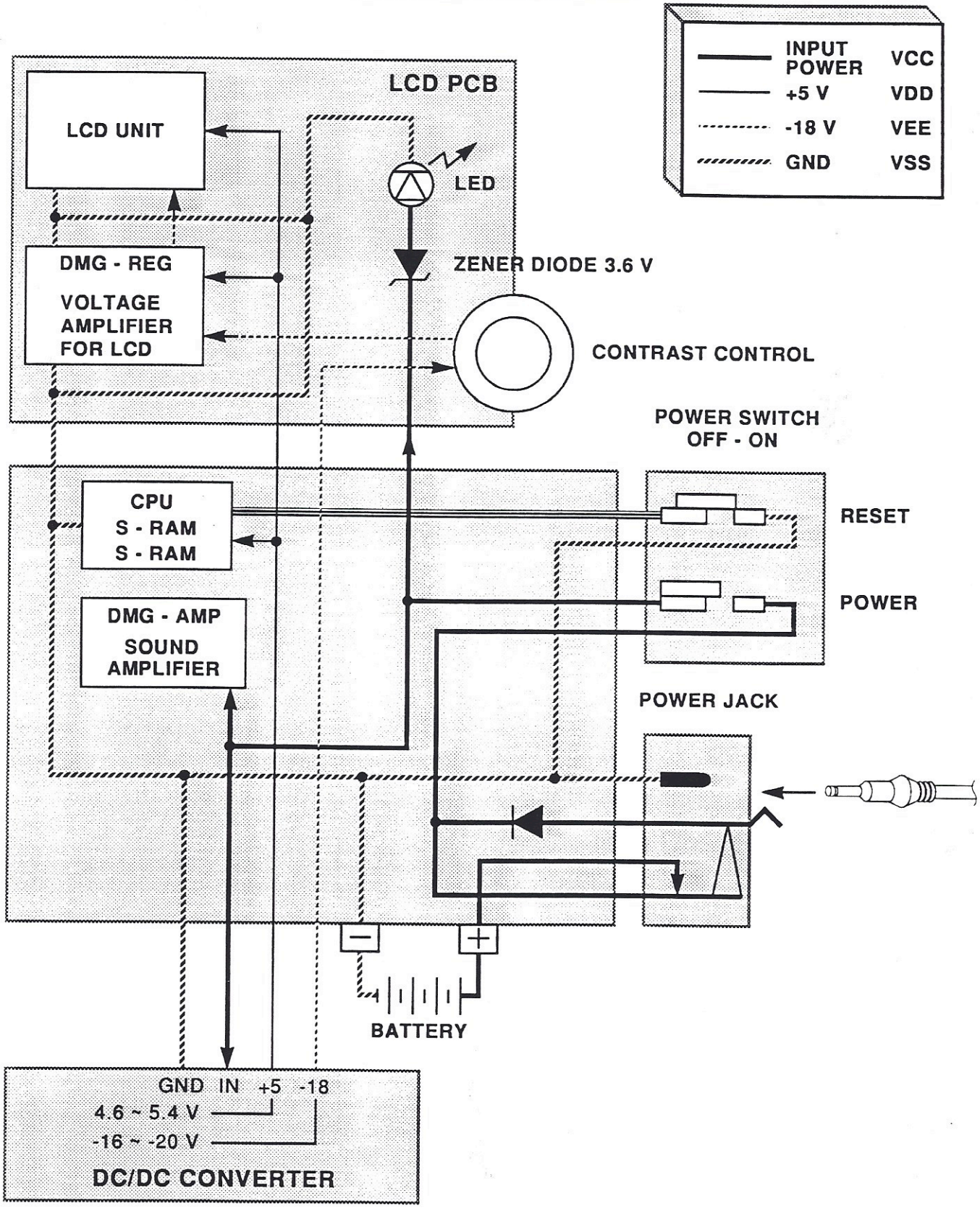


DISPLAY SECTION

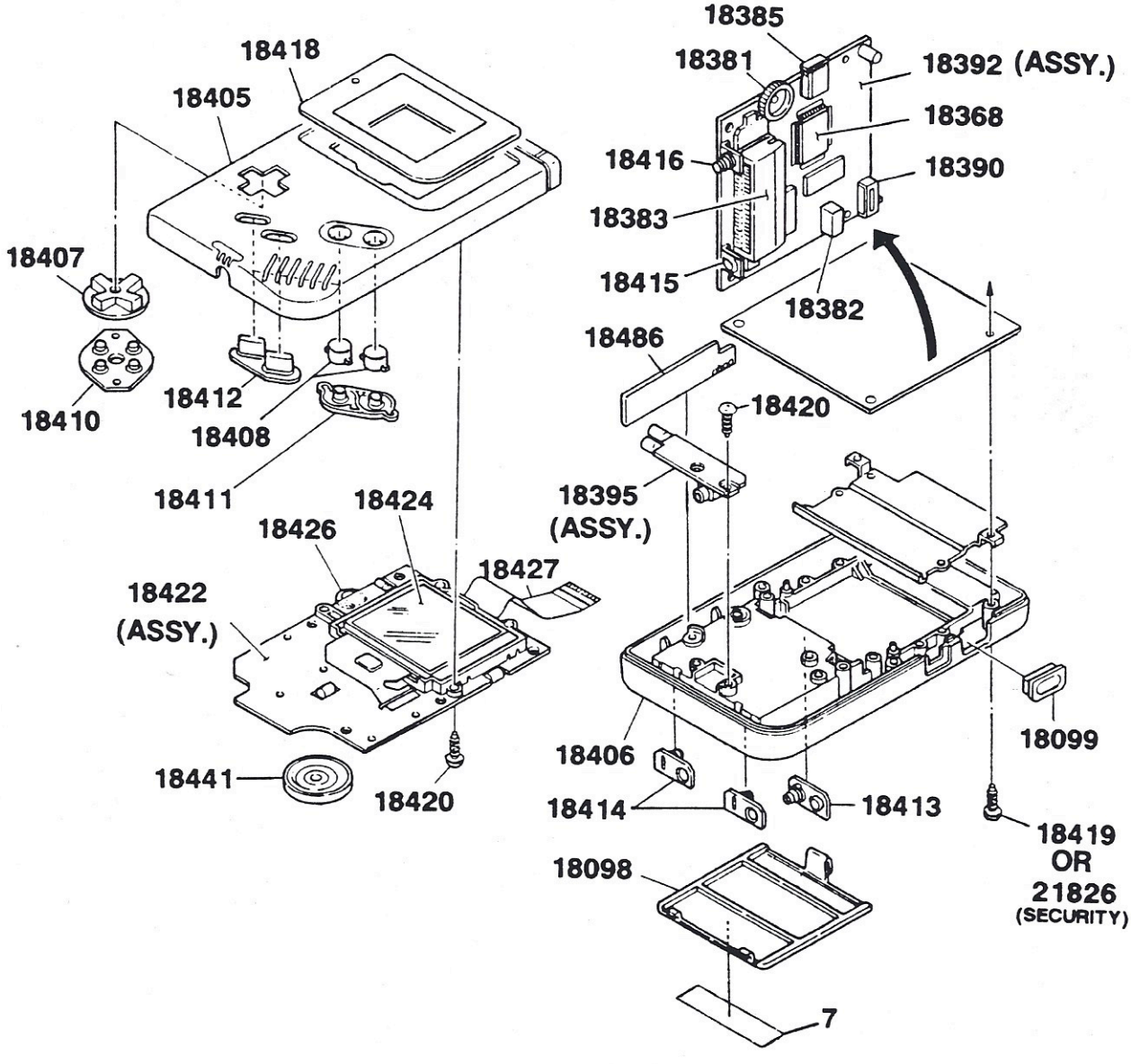
SOUND SECTION



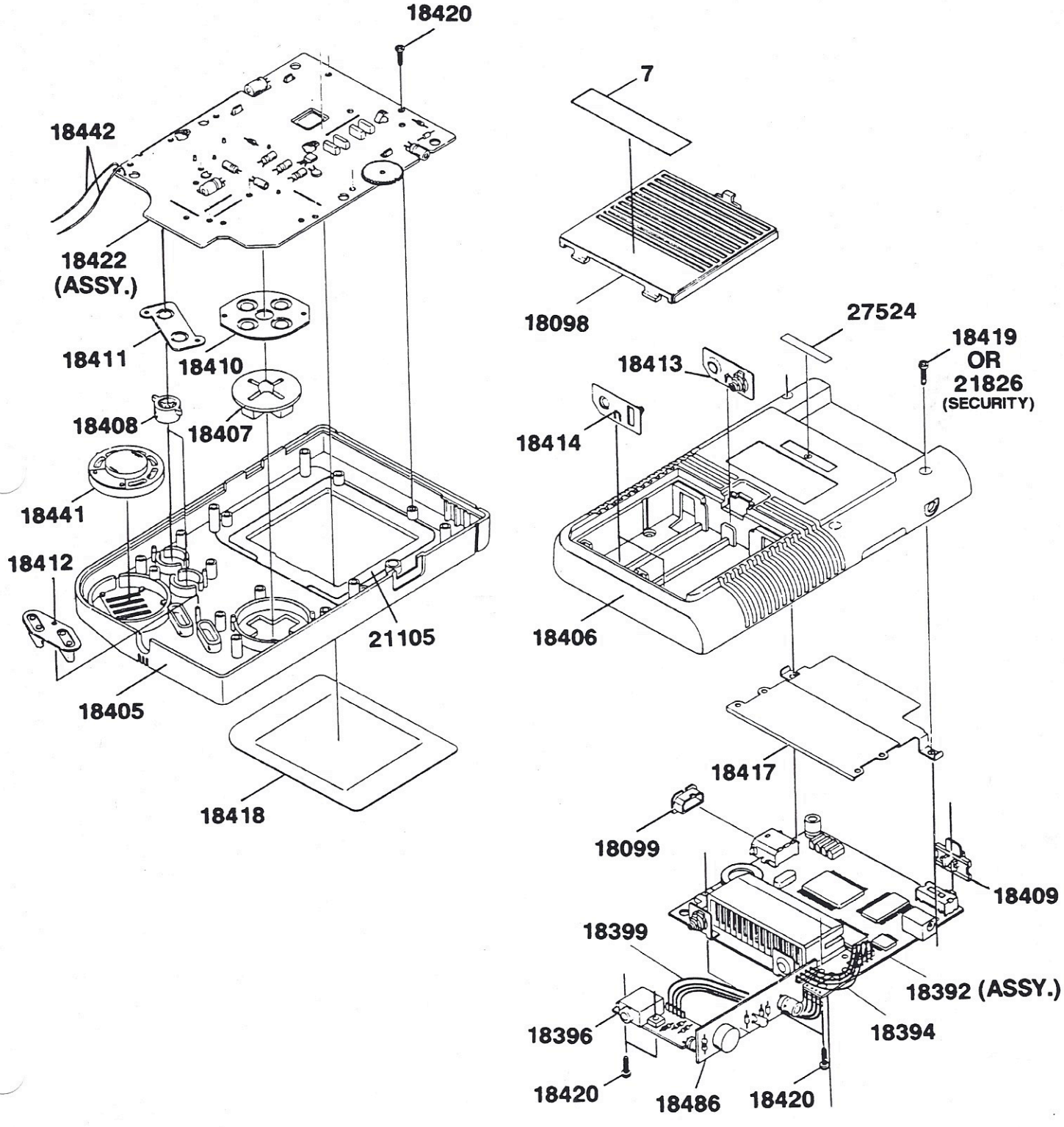
POWER DISTRIBUTION



Exploded View (Top)



Exploded View (Bottom)



GAME BOY

MODEL #: 18404

PART#	DESCRIPTION	QTY. PER UNIT
7	LABEL, NINTENDO SERVICE	1
18098	COVER, BATTERY	1
18099	COVER, EXPANSION CONNECTOR	1
18419	SCREW, M2 x 8.2 PHP CHROME	6
21826	SCREW, M2 x 8.2-Y SELF TAPPING	6
27213	BACK ASSEMBLY, GAME BOY	1
18392*	PCB ASSEMBLY, CPU	1
665	CAP, CERAMIC .01 μF 50V	5
18367*	PCB ONLY, CPU	1
18368	IC, CPU LR35902 QFP	1
18369	RAM, 64K S-RAM SOP	2
18370	IC, IR3R40 SOP	1
18371*	CAP, ELECTRO 100 μF 10V 6.3x7 L	2
18372*	CAP, ELECTRO 10 μF 16V 4x7 L	2
18373*	CAP, ELECTRO 1 μF 50V 4x7 L	2
18374*	CAP, CERAMIC .047 μF 12V	3
18375*	CAP, CERAMIC .1 μF 12V	1
18376*	CAP, CERAMIC 15pF 50V	2
18377*	RES, CARBON 220Ω 1/6W	4
18378*	RES, CARBON 510Ω 1/6W	2
18379*	RES, CARBON 180KΩ 1/6W	1
18380*	RES, CARBON 1MΩ 1/6W	1
18381	RES, VARIABLE 10KΩ 2CH	1
18382	CONN, POWER JACK	1

*Indicates part is not available.

GAME BOY

MODEL #: 18404

PART#	DESCRIPTION	QTY. PER UNIT
18383	CONN, 32 PIN	1
18384	CONN, 21 PIN	1
18385	CONN, 6 PIN EXPANSION	1
18386	X'TAL, OSC. 4.194304 MHZ	1
18387	DIODE, 1SS254	1
18388	DIODE, RB100A	1
18389	DIODE ARRAY, DA216	4
18390	SWITCH, POWER	1
18391*	PLATE, GROUND PLANE	1
18403*	CAP, CERAMIC 100pF 50V	5
20589	CAP, CERAMIC 27pF 50V	2
18393*	PCB ASSEMBLY, DC/DC CONV W/ HARNESS	1
18394	HARNESS, JOINT 4C-49L	1
18486	PCB ASSEMBLY, DC/DC CONV	1
18395	PCB ASSEMBLY, AUDIO JACK	1
18396*	PCB ONLY, AUDIO JACK	1
18397*	CAP, ELECTRO 100 μF 6.3V	2
18398*	COIL, CHOKE 3.3 μH	3
18400	CONN, STEREO JACK 2W	1
18399	HARNESS, JOINT 4C-64L	1
18406	HOUSING, REAR	1
18409	ACTUATOR, POWER SWITCH	1
18413	CONTACT, BATTERY W1	1
18414	CONTACT, BATTERY W2	2

*Indicates part is not available.

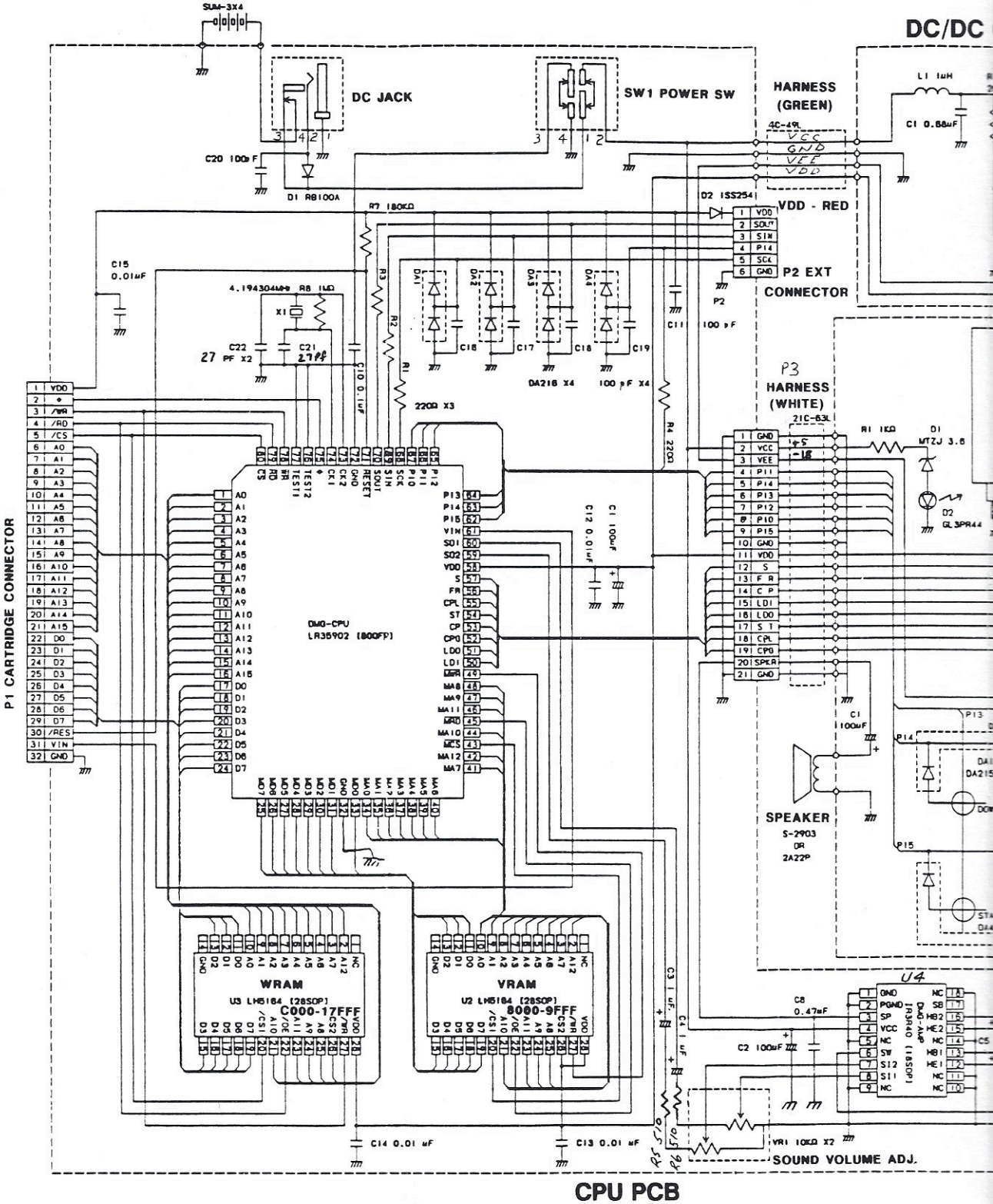
GAME BOY

MODEL #: 18404

PART#	DESCRIPTION	QTY. PER UNIT
18415	CONTACT, BATTERY POS. (+)	1
18416	CONTACT, BATTERY NEG. (-)	1
18417	PLATE, PCB GUARD	1
18420	SCREW, M2 x 7 PHP GOLD	8
27214	FRONT ASSEMBLY, GAME BOY	1
18405	HOUSING, FRONT	1
18407	ACTUATOR, CONTROL PAD	1
18408	ACTUATOR, A/B BUTTON	2
18410	CONTACT, CONTROL PAD	1
18411	CONTACT, A/B BUTTON	1
18412	CONTACT, START/SELECT BUTTON	1
18418	COVER, SCREEN	1
18420	SCREW, M2 x 7 PHP GOLD	10
18422*	PCB ASSEMBLY, LCD	1
18371	CAP, ELECTRO 100 μF 10V	2
18426	RES, VARIABLE 30KΩ 1CH	1
18430	DIODE, ZENER MTZJ3.6	1
18431*	CAP, ELECTRO 10 μF 25V 4X7L TP	1
18436*	RES, CARBON 1KΩ 1/6W TP	1
18439	LED, GL3PR44	1
18441	SPEAKER, S2903 8Ω	1
18442*	WIRE, 40L-YELLOW	2
21105	GASKET, SCREEN COVER	1
27524	LABEL, SERIAL NUMBER	1

*Indicates part is not available.

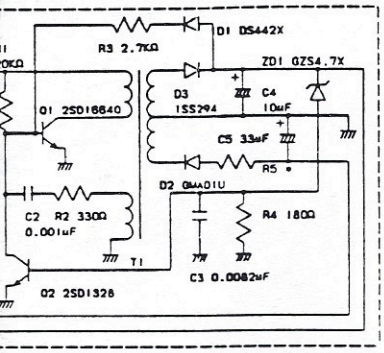
GAME BOY SCHEM

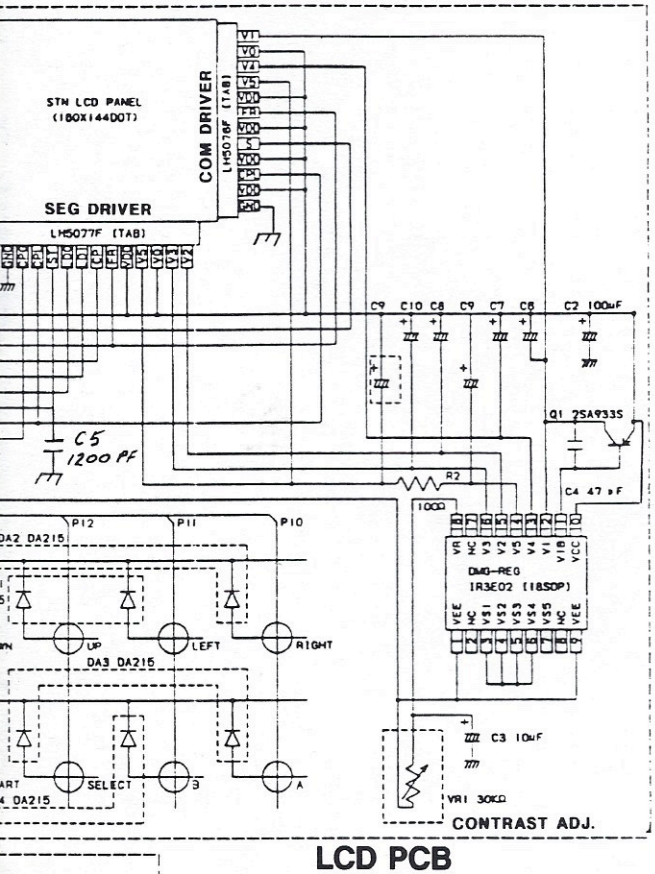


CPU SIGNALS:

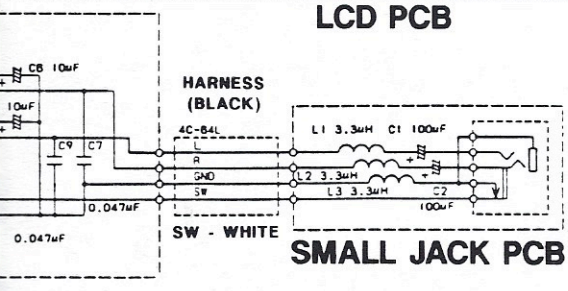
S	COMMON DISPLAY SYNC. SIGNAL (V-SYNC.)
FR	LCD ALTERNATING SIGNAL
ST	LCD START SIGNAL (H-SYNC.)
CPG	LCD CONTRAST CONTROL SIGNAL
CPL	SEGMENT DATA LATCH SIGNAL
CP	SEGMENT DRIVER SHIFT CLOCK SIGNAL
LDO, LD1	CONTRAST DATA

CONVERTER

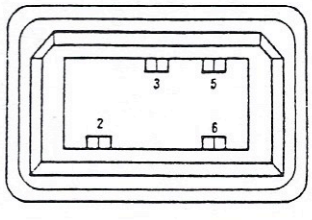




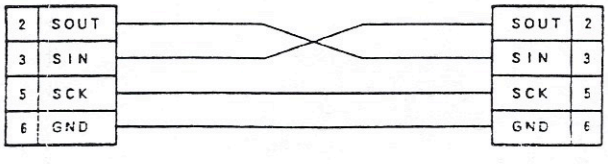
LCD PCB



SMALL JACK PCB



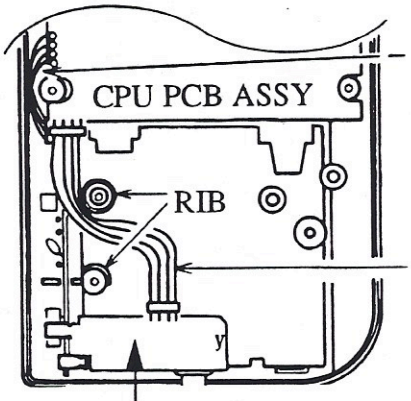
PLUG TERMINAL LOCATION



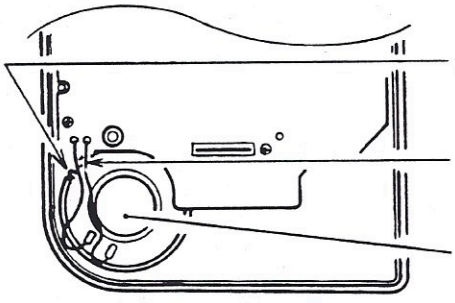
GAME LINK CABLE TERMINAL LOCATION AND CONNECTION

INTERNAL CABLE AND WIRE ROUTING

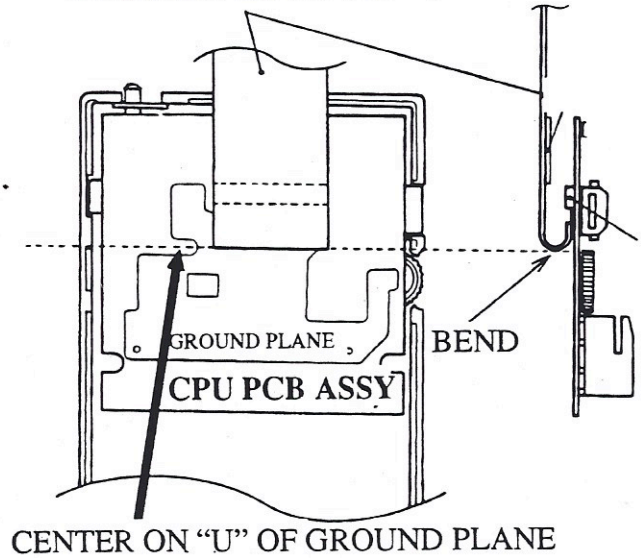
JOINT HARNESS 4C - 49L AND 4C - 64L



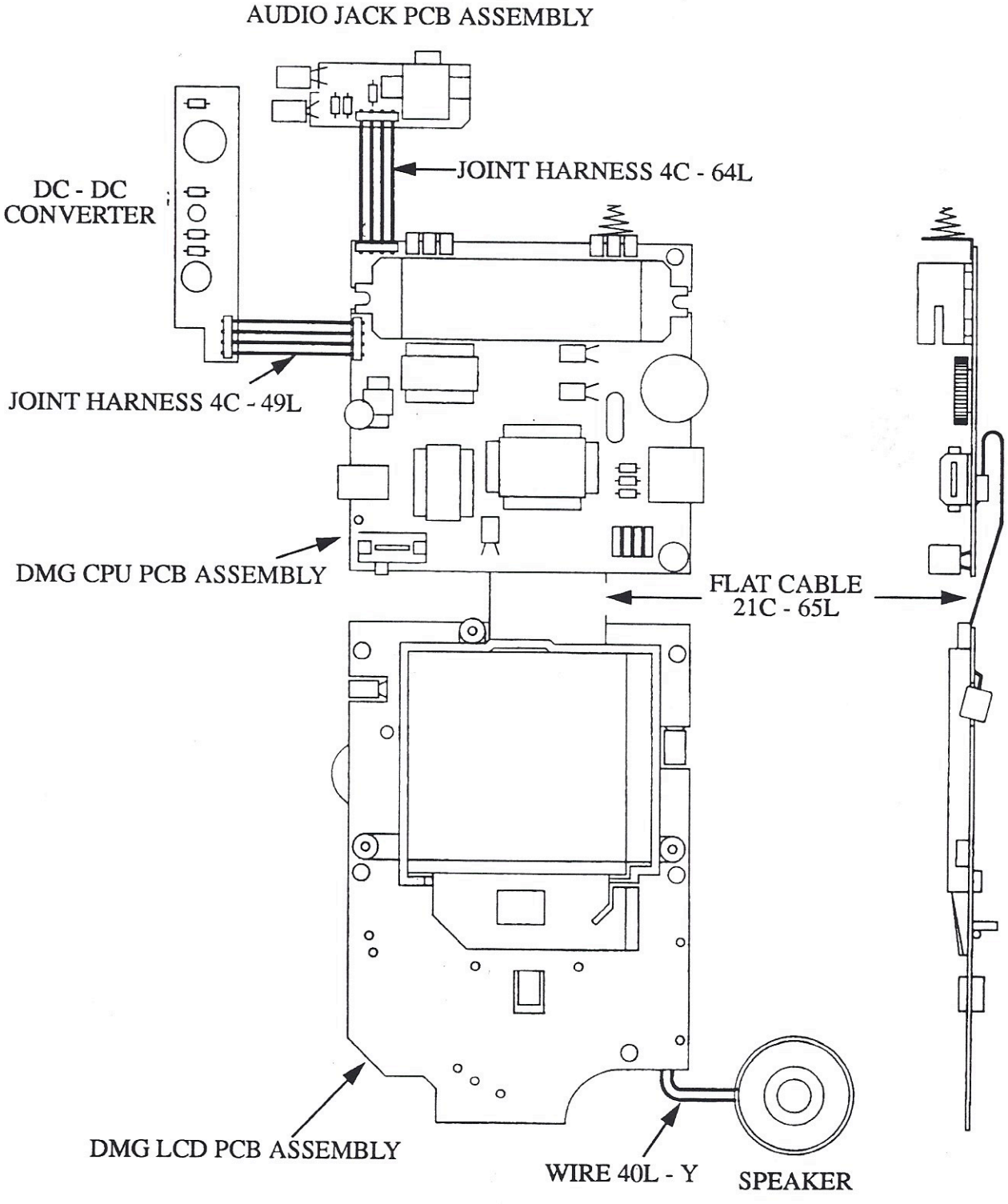
SPEAKER LEAD WIRE



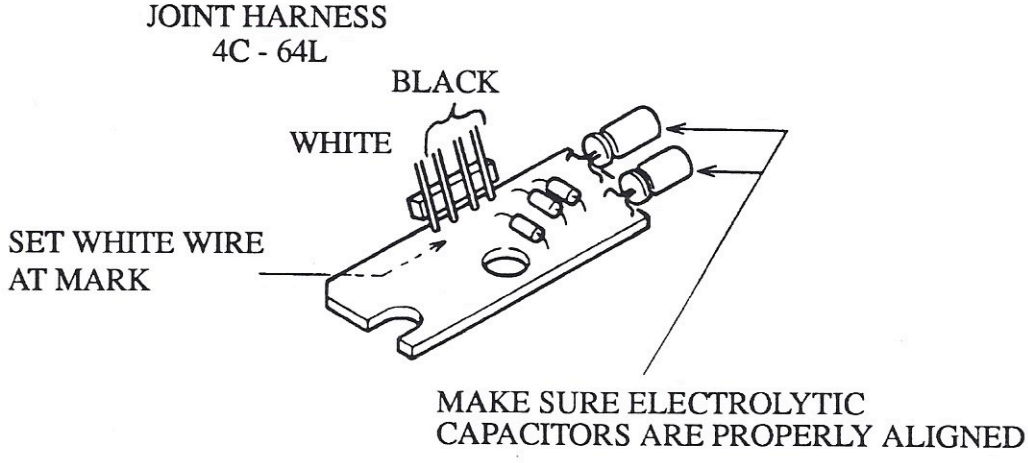
FLEXIBLE CABLE 21C - 65L



PCB AND SPEAKER INTERCONNECTIONS

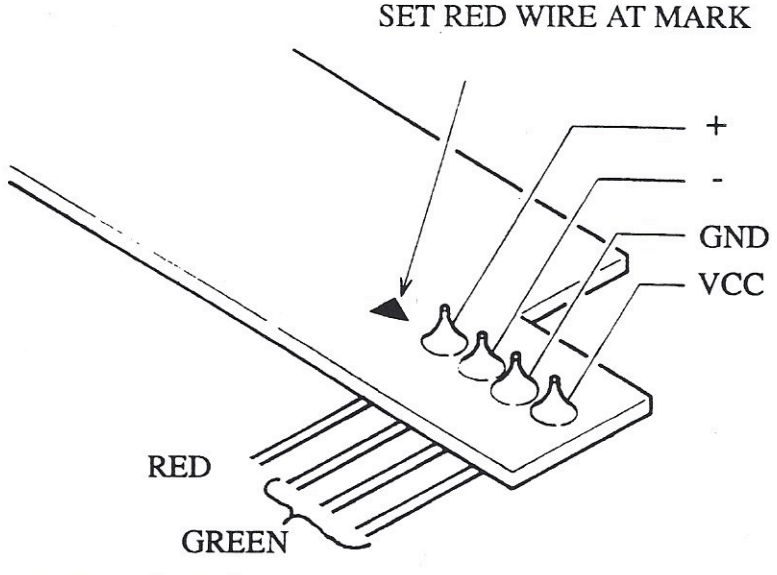


AUDIO JACK PCB COMPONENT MOUNTING AND WIRE DESIGNATION



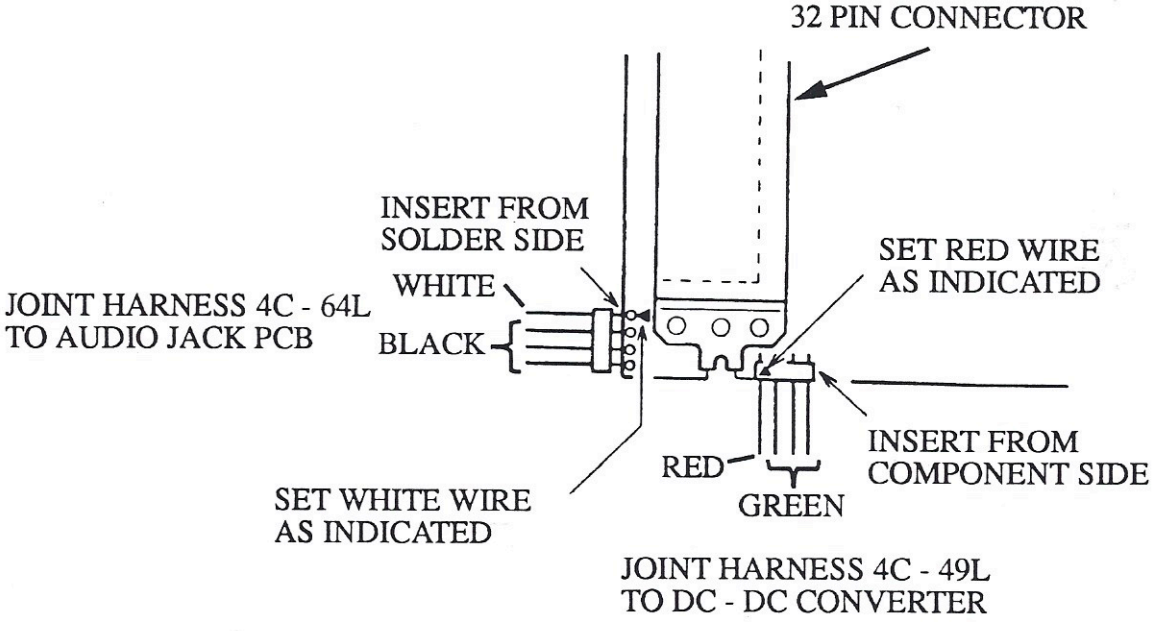
COMPONENT SIDE

DC - DC CONVERTER WIRE DESIGNATION



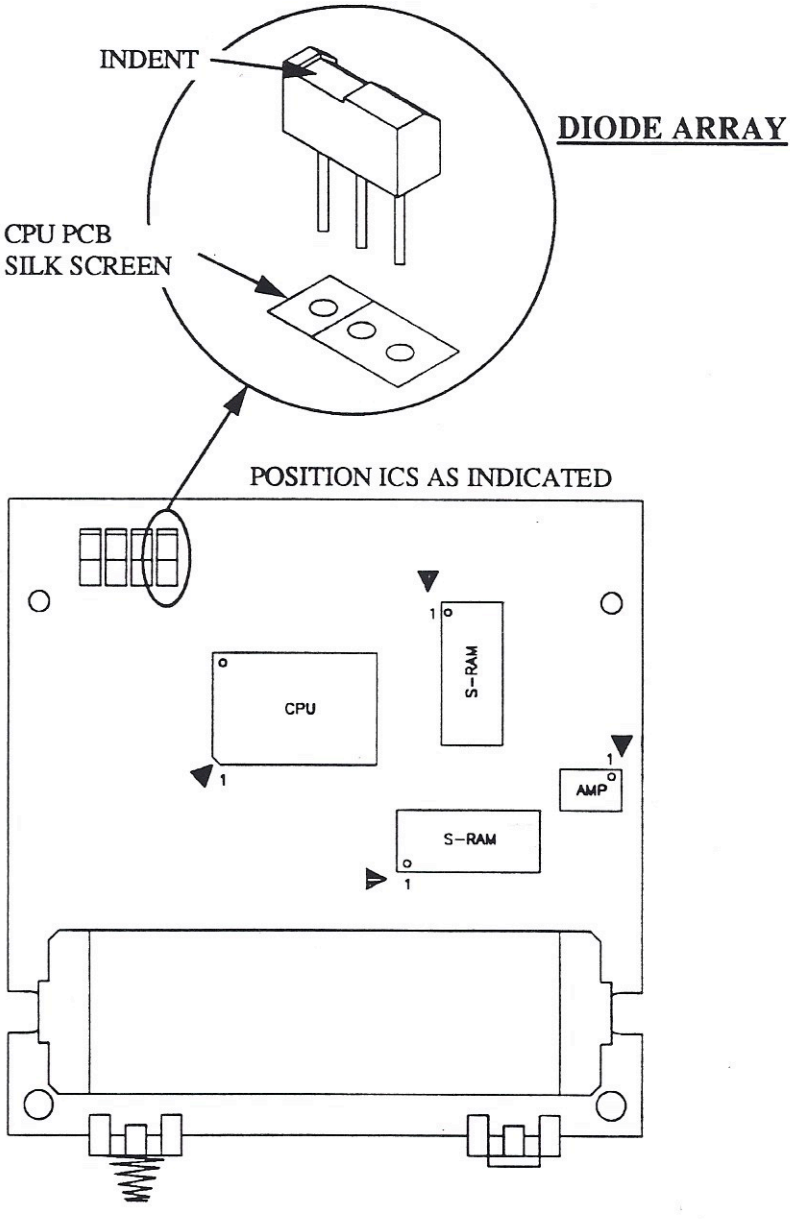
JOINT HARNESS 4C - 49L

JOINT HARNESS 4C - 49L AND 4C - 64L ATTACHMENT

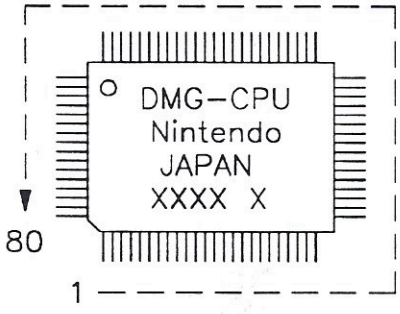


CPU PCB COMPONENT SIDE

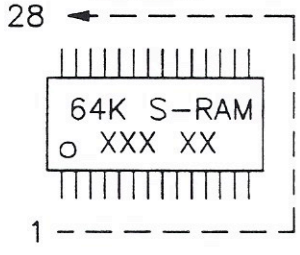
CPU PCB COMPONENT MOUNTING



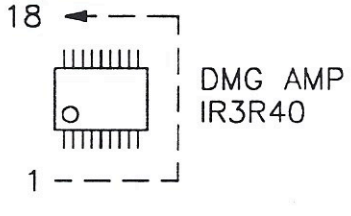
CPU

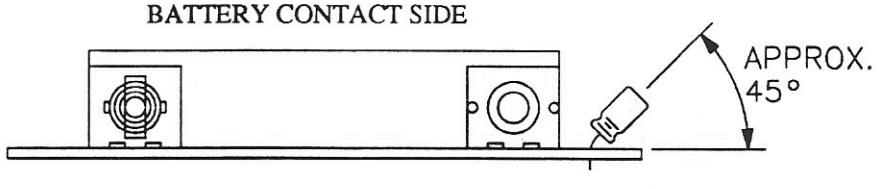


S-RAM



AMP





C5 ELECTROLYTIC CAPACITOR ATTACHMENT

GAME BOY TEST PROCEDURE

EQUIPMENT REQUIRED:

1. Any two same game paks with Game Link capability
2. Rechargeable Battery Pack
3. Four AA batteries
4. Stereo headphones
5. Game Link cable
6. Game Boy Test Cartridge
7. Test Game Boy Unit

TESTING PROCEDURE:

NOTE: Before inserting a game pak into the Game Boy unit, check the 32 pin connector for damage or contamination

1. Insert four AA batteries and the Game Boy Test Cartridge into the Game Boy unit.

2. Turn the Game Boy system on.

3. Wait until the test starts, then plug the Rechargeable Battery Pack into the Game Boy system.

4. Cycle through the test by pressing the A button.

5. When test is complete, turn off the Game Boy system and remove the test cartridge.

6. Insert a game pak and turn the Game Boy system on. Briefly play the game, observing proper operation and full controller response.

7. Check the contrast control, and the volume control with and without the stereo headphones.

8. Using the test Game Boy unit, test the Game Link cable hook-up. When testing the Game Boy system make sure:
   - The LCD screen shows a clear picture.
   - There is no corrosion on the battery contacts.
   - The Screen Cover is clear and does not obscure vision of the LCD. (Dust should not be trapped between the screen cover and the LCD)

GAME BOY GENERAL DISASSEMBLY INSTRUCTIONS

The Game Boy unit is made up of two main parts, the front half (Fig. 1) and the back half (Fig. 2). Open the Game Boy unit by removing the six silver screws (Fig. 3).

A white flexible flat cable is used for the electrical connections between the two halves. Remove this cable from the CPU PCB by holding the back half on both sides with the palms of your hands. Placing both index fingers on top and thumbs on the bottom of the flat cable, grasp both edges and pull slightly downward until the cable and connector are separated.

NOTE: When reconnecting the cable, grip in the same manner and push cable into the 21 pin connector (Fig. 4).

LCD PCB Removal: Remove the ten gold screws (Fig. 5). The mounting holes for the screws are designated with a white circle around them. Lift out the LCD PCB to expose the controller contacts and buttons (Fig. 6). When removing the screen cover, face the front housing away from you. Place fingers on the front and push out the screen cover with your thumbs. The screen cover is held in place with an adhesive tape, so some force will need to be applied to remove it from the housing (Fig. 7).

NOTE: When reassembling, install/replace the screen cover gasket.

Lower Housing Disassembly: Remove the four gold screws (Fig. 8,9). Lift the main, audio, and DC/DC converter PCBs out of the rear housing (Fig. 10). The three battery contacts in the housing are held by a retaining clip. Press the clip inward and pull contact out if replacement is required. The PCB guard plate is held in place by four additional gold screws (Fig. 10).

NOTE: Observe wire routing precautions for proper reassembly (p. 2-12).

LCD PCB Replacement

1. See general disassembly for removal of LCD PCB from front housing.

2. Remove all contacts and actuators from housing.

3. Remove screen cover from housing by pushing it out from the inside of the housing (Fig. 7).

4. Clean housing, especially around the control pad and A/B button actuators.

5. Clean control pad actuator and A/B buttons, replace if necessary.

6. Reinstall the control pad actuator, A, and B buttons into the housing.

7. Inspect contacts for wear and replace if necessary. Reinstall control pad, start/select, and A/B contacts in the housing.

8. There is not a speaker on the new LCD PCB, remove the speaker from the old PCB and install it on the new one.

9. Install/replace the screen cover gasket.

10. Remove protective film from the LCD.

11. Place LCD PCB in the front housing, making sure the speaker and all contacts are in place and wires are routed correctly (refer to p. 2-12).

12. With all components mounted correctly in the front housing, reinstall the ten gold screws. (Make sure that the screw driver torque setting is not higher than 2 ft-lb/in.)

13. Turn the front housing over. Make sure there are no dust particles or foreign objects on the LCD. Remove any dirt or objects from the LCD with a soft, lint-free, anti-static cloth or deionized air.

14. Remove backing on a new screen cover and place the new cover on the front housing (Fig. 14).

15. The new screen cover has a protective plastic cover to protect it from scratches. This cover should be removed before the Game Boy unit is returned to the consumer (Fig. 15).

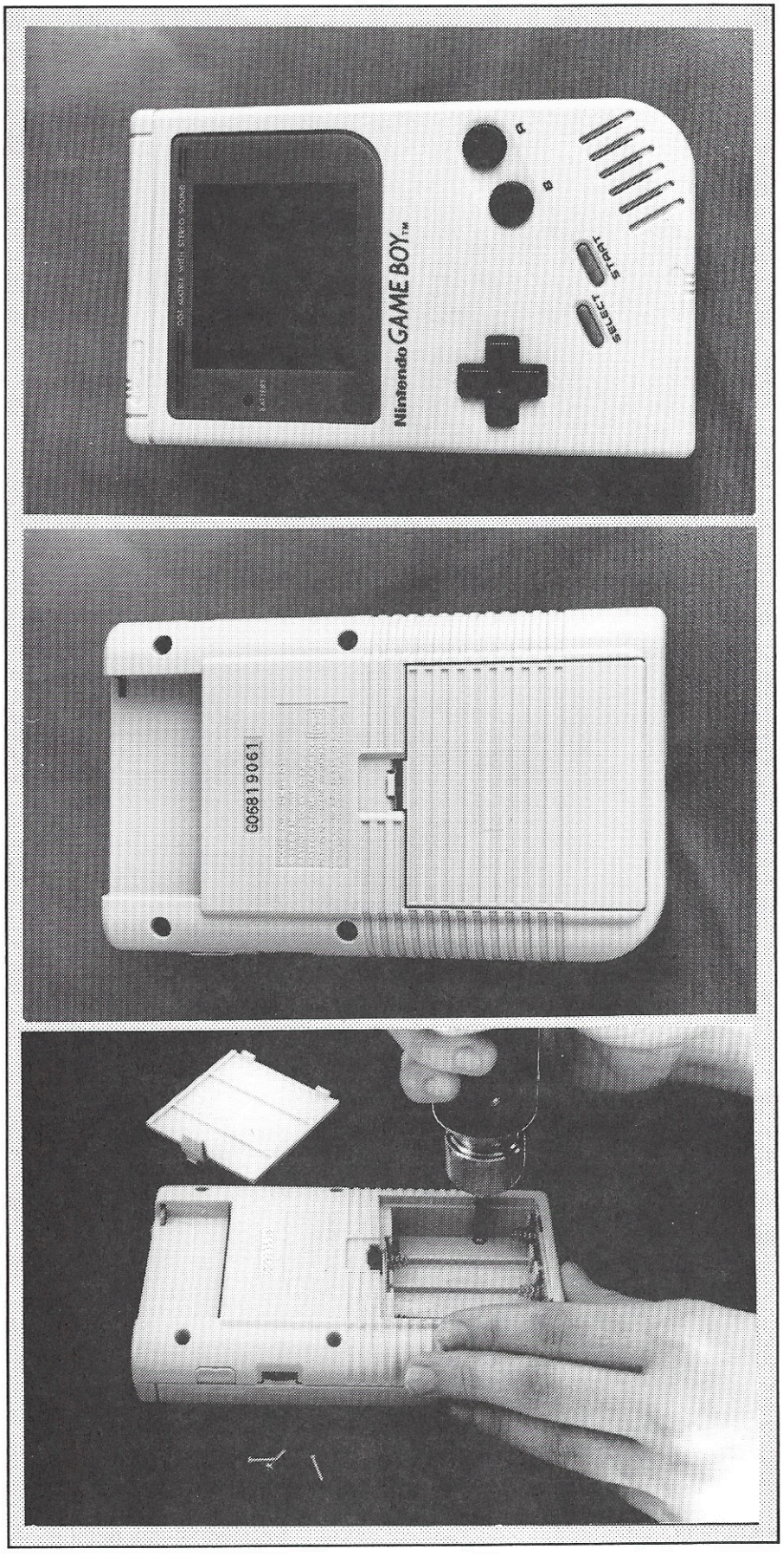


Fig. 1
Front half.

Fig. 2
Back half.

Fig. 3
Opening unit.

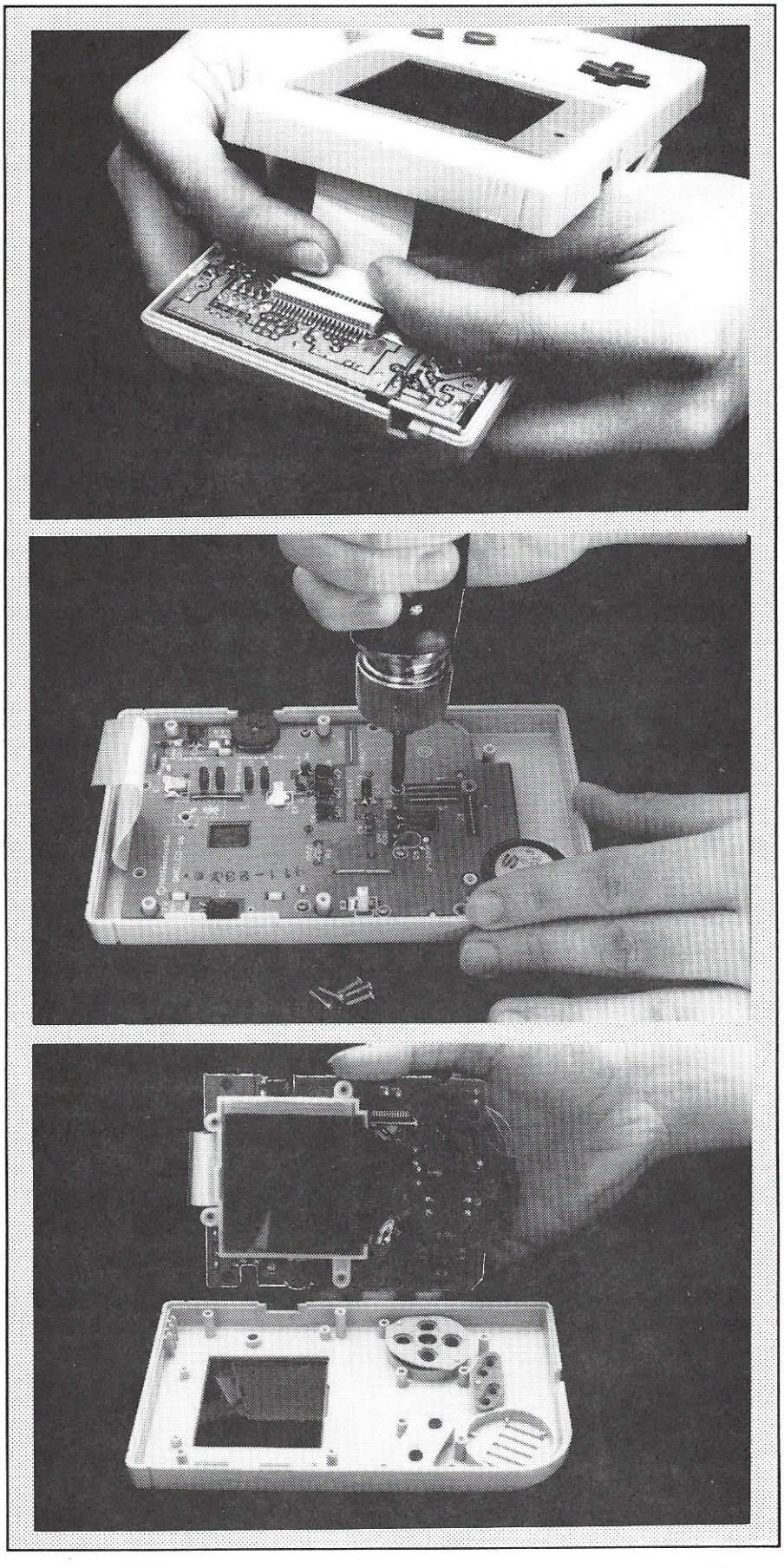


Fig. 4
Removing flexible cable.

Fig. 5
Removing LCD PCB screws.

Fig. 6
Lifting out LCD PCB.

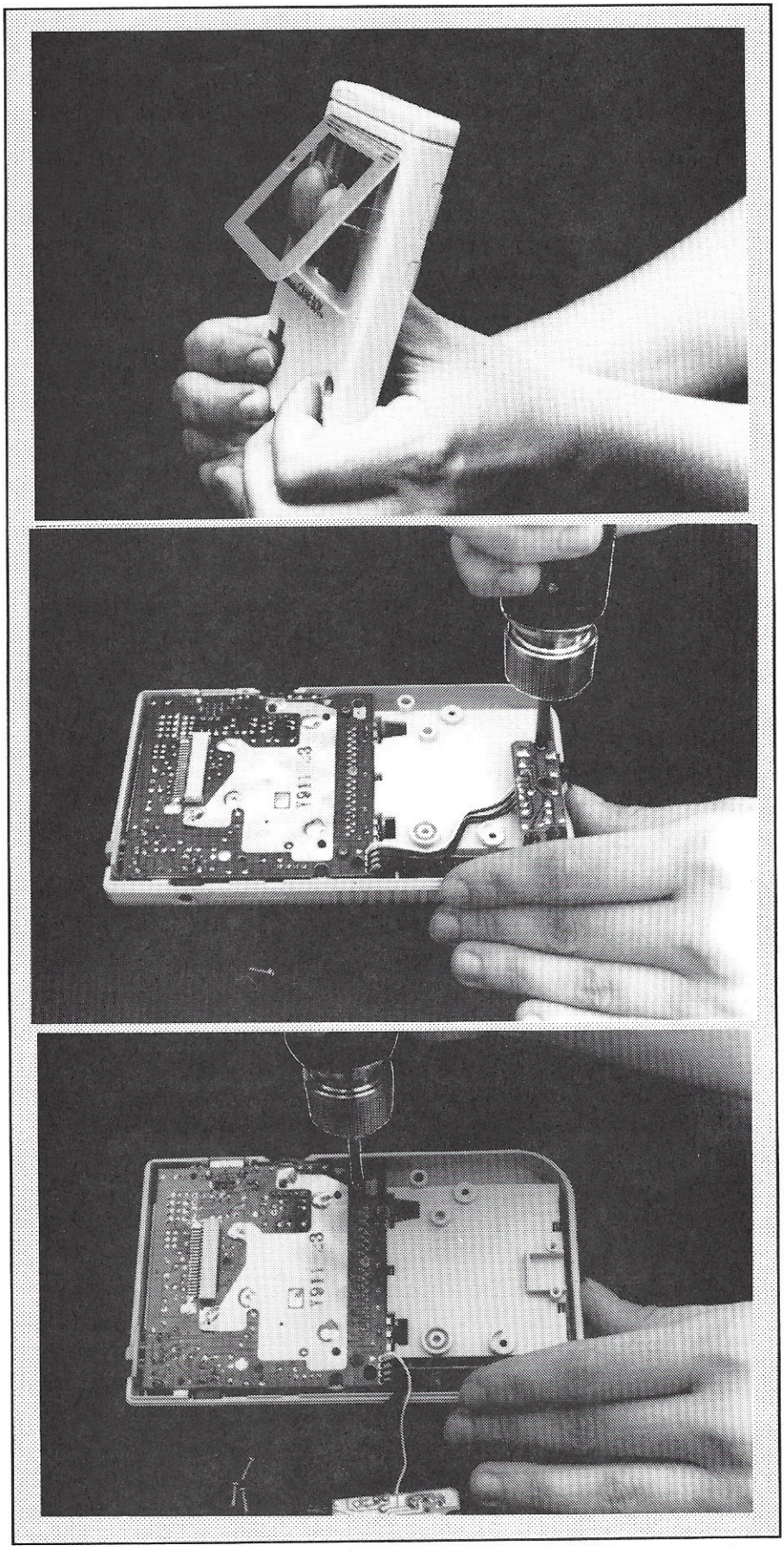


Fig. 7
Removing screen cover.

Fig. 8
Removing Audio PCB screws.

Fig. 9
Removing Main PCB screws.

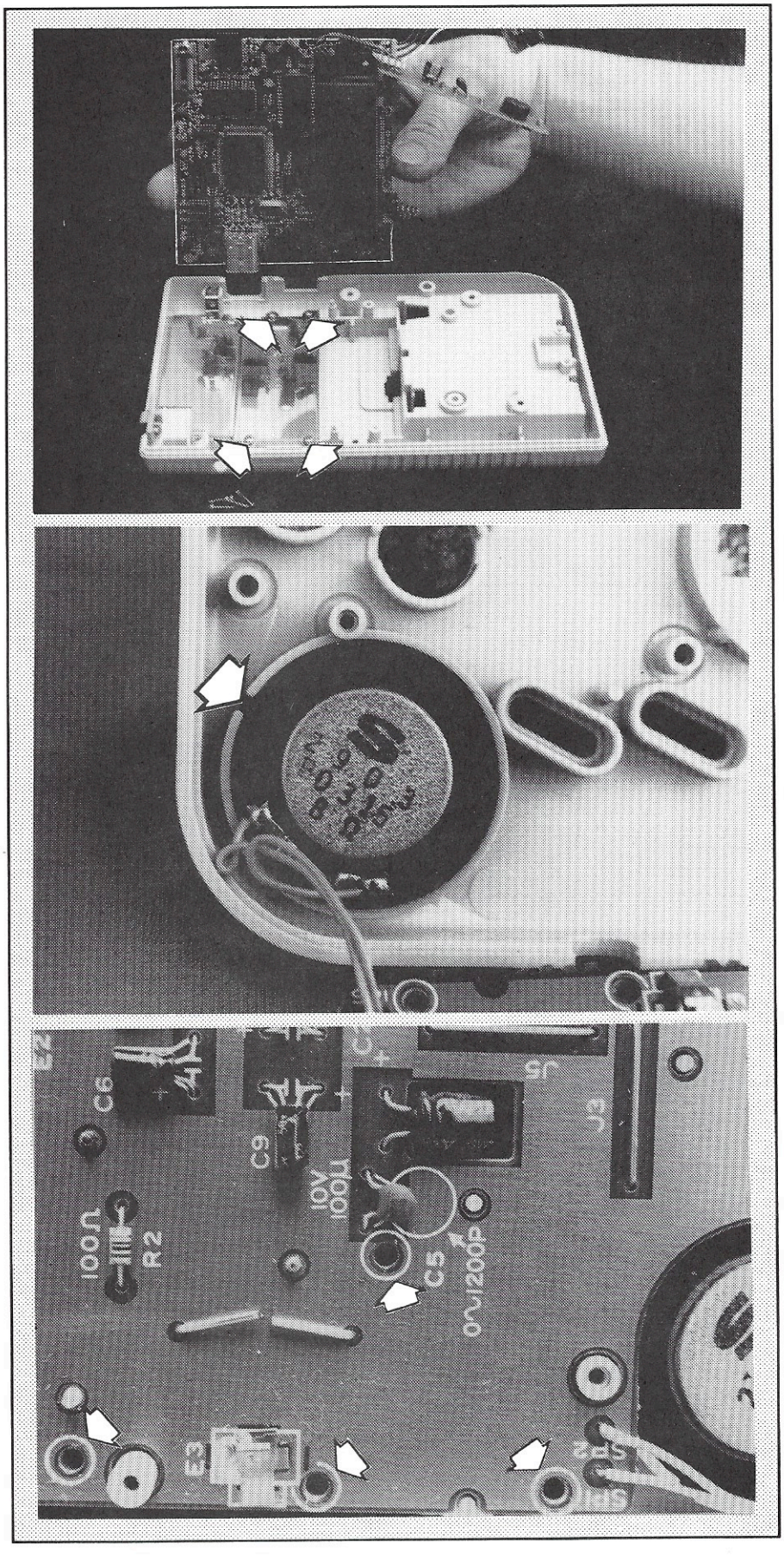


Fig. 10

Lifting out Main, Audio & DC-DC Converter PCB's. (Arrows indicate PCB Guard-plate screws.)

Fig. 11

Speaker positioning tab.

Fig. 12

LCD PCB mounting holes are designated with a white circle around them.

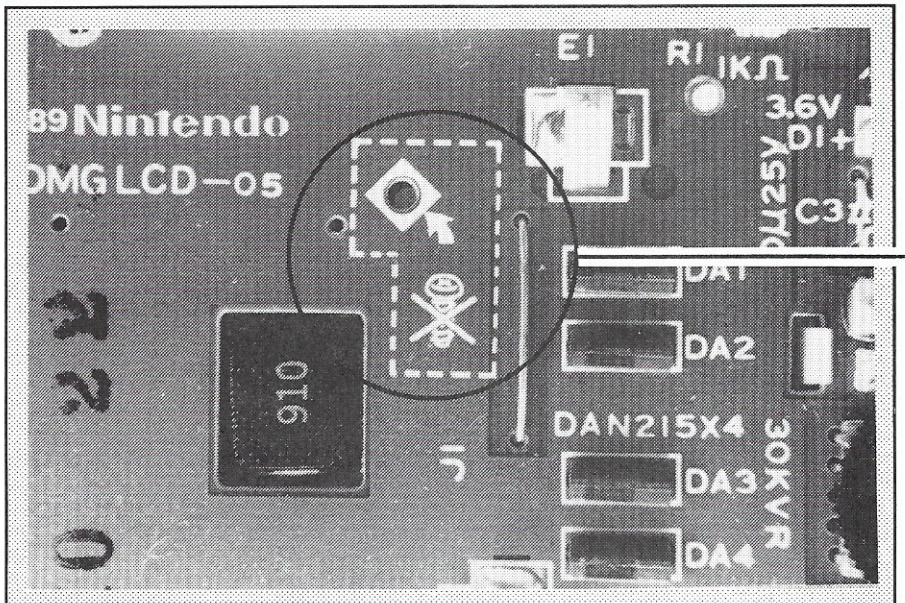


Fig. 13

Note: Early PCB's are not marked as shown.
Use caution when assembling. (Inserting a screw at this location will damage LCD.)

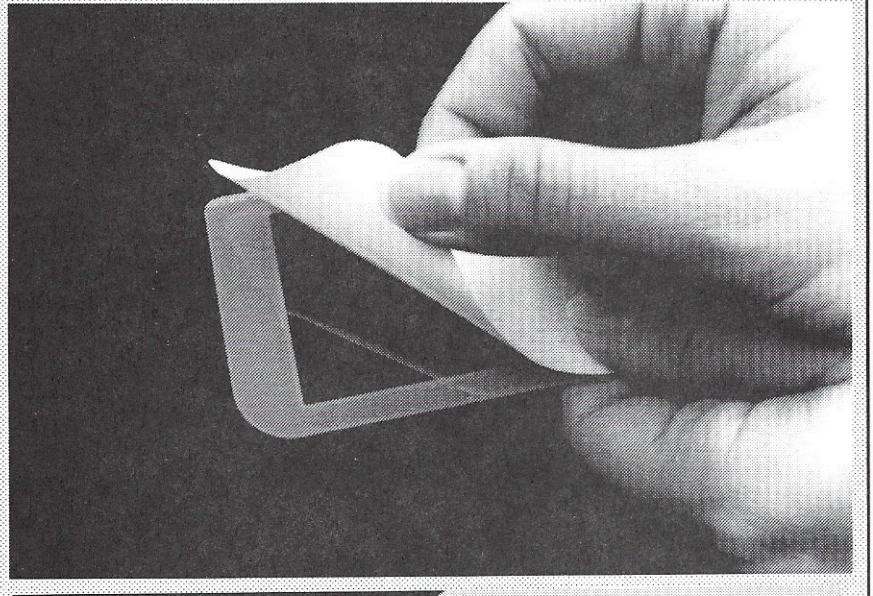


Fig. 14

Removing backing on new screen cover.

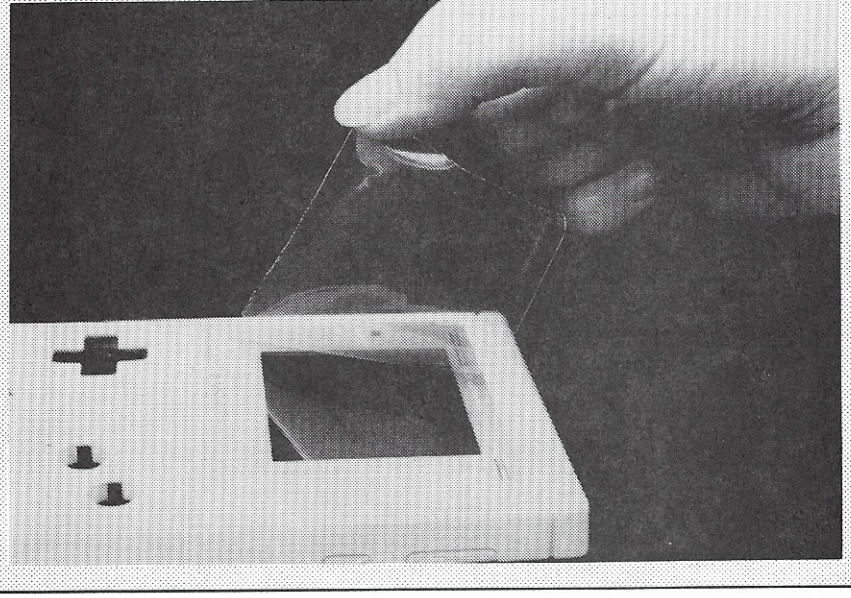


Fig. 15

Removing protective plastic cover.

GAME BOY DIAGNOSTIC TABLE

Before attempting any repairs to the Game Boy unit, disassemble and thoroughly inspect the PCBs. Look for damaged components or traces, solder defects, and dirt or corrosion on the ribbon cable or connector P3. Use a known good unit for substitution in testing to isolate the defective half (front / back). **NOTE: Inspect the 32 pin connector (P1) for any foreign material and replace if necessary. Do not attempt to clean the 32 pin connector.**

MALFUNCTION	PROBABLE CAUSE
No display or sound	Dead batteries Defective SW1 (power switch) Defective DC/DC converter Defective U1 (CPU) Defective connector P3
No display (sound operative)	Defective LCD PCB Defective DC/DC converter Defective U1 (CPU) Defective U2 (SRAM) Defective connector P3
No sound from either internal speaker or stereo headphones	Defective VR1 (sound volume adjust) Defective U4 (amp) Defective U1 (CPU) Defective stereo jack
No sound from internal speaker only	Defective speaker Defective U4 (amp) Defective stereo jack
No sound through stereo headphones only	Defective stereo jack Defective U4 (amp)
Scrambled display	Defective P1 (32 pin connector) Defective LCD PCB Defective U1 (CPU) Defective connector P3 Defective U2 (SRAM)

MALFUNCTION	PROBABLE CAUSE
Distorted or intermittent sound	Defective C2 Defective U4 (amp) Defective U1 (CPU)
Game freezes	Defective P1 (32 pin connector) Defective U1 (CPU) Defective U3 (SRAM)
Intermittent or no controller response	Defective LCD PCB Defective contacts Defective U1 (CPU) Defective connector P3
No contrast adjustment	Defective LCD PCB Defective VR1 (contrast adjust) Defective U1 (CPU)
No volume adjustment	Defective VR1 (sound volume adjust) Defective U4 (amp)
LED not illuminated	Low batteries Defective LED Defective D1 Defective DC jack Defective battery contacts Defective SW1 (power switch) Defective connector P3

Related Service Bulletins

C21 and C22 may require replacement when a new CPU is installed at location U1 (refer to Service Bulletin #90289).

Game Boy units with a G03100000 serial number or lower may require a rear housing replacement to prevent Game Boy operation with batteries that are installed in reverse (refer to Service Bulletin #90290).

All Game Boy units with a G02800000 serial number or lower will, after a period of usage, start showing black and/or missing lines. To resolve this difficulty, all LCDs should be replaced under warranty (refer to Service Bulletin #90291).

Game Boy units within serial number range G11200000 to G14000000 may require modification to improve scrolling (refer to Service Bulletin #91154).

A screen cover gasket must be installed/replaced on all Game Boy unit repairs (refer to Service Bulletin #91353).

GAME BOY GAME PAKS

Purpose

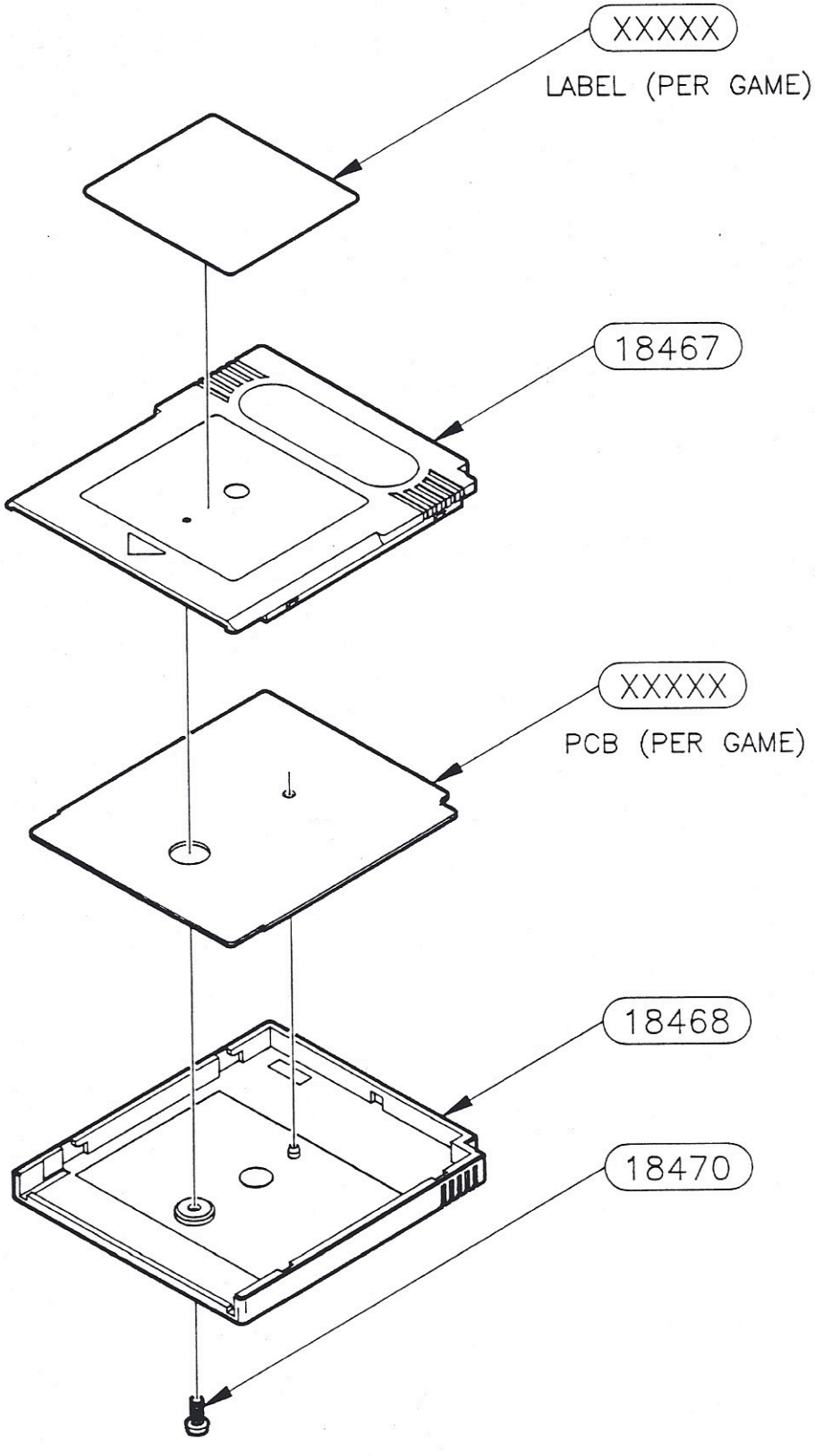
The purpose of the Game Boy Game Pak is to provide operating instructions and character information to the Game Boy unit.

Theory of Operation

Game Boy Game Paks include semiconductor memory ICs. The ICs that can be found in game paks and their functions are as follows:

Program ROM - Contains the game program and character data that is used for game operation.

MBC1/MBC2 - A Memory Bank Controller (MBC) IC that allows the Game Boy hardware to access additional amounts of memory. The MBC2 also contains 2K-bit of internal RAM which can be expanded upto a 2M-bit memory area using external RAM. The MBC2 (or the external RAM) is connected to a battery for memory retention after the game has been removed.


XXXXX
LABEL (PER GAME)
18467
XXXXX
PCB (PER GAME)
18468
18470

GAME PAK REFERENCE TABLE

GAME PAK	PARTS PAGE #	PCB SCHEMATIC PAGE #
Alleyway	3-4	3-30
Balloon Kid	3-5	3-32
Baseball	3-6	3-31
Donkey Kong	3-6.1	3-35
Dr. Mario	3-7	3-30
F-1 Race	3-8	3-33
Golf (SOP)	3-9	3-33
Golf (QFP)	3-9	3-34
Kid Icarus	3-10	3-33
Kirby's Dream Land	3-11	3-32
Kirby's Pinball Land	3-12	3-33
Legend of Zelda: Link's Awakening	3-13	3-35
Metroid II	3-14	3-35
Nintendo World Cup	3-15	3-32
Play Action Football	3-16	3-32
Qix	3-17	3-31
Radar Mission	3-18	3-32
Solar Striker	3-19	3-31
Super Mario Land (QFP)	3-20	3-31
Super Mario Land (SOP)	3-20	3-32
Super Mario Land 2	3-21	3-35
Super RC Pro Am	3-22	3-32
Tennis	3-23	3-30
Tetris	3-24	3-30
Tetris 2	3-25	3-32
Top Rank Tennis	3-26	3-33
Wario Land: SML 3	3-26.1	3-35
Wave Race	3-27	3-33
Yoshi	3-28	3-32
Yoshi's Cookie	3-29	3-32

ALLEYWAY (AW)

GAME CART #: 18495*
GAME PAK #: 18087

PART#	DESCRIPTION	QTY. PER UNIT
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	1
18491	PCB ONLY, DMG AAA	1
18496	LABEL, NAME ALLEYWAY (DMG)	1
18499	ROM, DMG-AWA (QFP) 44 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

BALLOON KID (BT)

GAME CART #: 21688*
GAME PAK #: 20573

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
21689	LABEL, NAME BALLOON KID (DMG)	1
21691	PCB ONLY, DMG-BEAN-01	1
21692	ROM, DMG-BTE-01 (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

BASEBALL (BS)

GAME CART #: 18466*
GAME PAK #: 18088

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18469	LABEL, NAME BASEBALL (DMG)	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18472	PCB ONLY, DMG BBA	1
18473	ROM, DMG-BSA (QFP) 44 PIN (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2

*Use this part number to complete all warranty claims and non-warranty repair reports.

DONKEY KONG (QD)

GAME CART #: 29878*
GAME PAK #: 29014

PART#	DESCRIPTION	QTY. PER UNIT
18369	RAM, 64K S-RAM (SOP) 28 PIN (DMG)	1
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	3
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
23993	PCB ONLY, DMG-DECN	1
29879	LABEL, NAME DONKEY KONG (DMG)	1
29881	ROM, DONKEY KONG (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

DR. MARIO (VU)

GAME CART #: 21220*
GAME PAK #: 20558

PART#	DESCRIPTION	QTY. PER UNIT
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	1
18491	PCB ONLY, DMG AAA	1
21536	ROM, DMG-VUA-0 (QFP) 44 PIN (DMG)	1
21537	LABEL, NAME DR. MARIO (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

F-1 RACE (F1)

GAME CART #: 22256*
GAME PAK #: 22519

PART#	DESCRIPTION	QTY. PER UNIT
438	CAP, CERAMIC .01 μF AXIL	2
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
22220	LABEL, NAME F-1 RACE (DMG)	1
22258	PCB ONLY, DMG-GDAN	1
22259	ROM, F1 RACE (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

GOLF (GF)

GAME CART #: 19079*
GAME PAK #: 18763

PART#	DESCRIPTION	QTY. PER UNIT
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
19447	LABEL, NAME GOLF (DMG)	1
When using Small Outline Package (SOP) program IC		
20251	RESISTOR, CARBON 10KΩ 1/6W ±5%	1
22258	PCB ONLY, DMG-GDAN	1
23361	ROM, GOLF (SOP) 32 PIN (DMG)	1
When using Quad Flat Package (QFP) program IC		
19082	PCB ONLY, DMG-GCA	1
19083	ROM, GOLF (QFP) 44 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

KID ICARUS (KA)

GAME CART #: 23362*
GAME PAK #: 22071

PART#	DESCRIPTION	QTY. PER UNIT
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
22258	PCB ONLY, DMG-GDAN	1
22647	LABEL, NAME KID ICARUS (DMG)	1
23364	ROM, KID ICARUS (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

KIRBY'S DREAM LAND (KY)

GAME CART #: 24656*
GAME PAK #: 24653

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
24657	LABEL, NAME KIRBY'S DREAM LAND (DMG)	1
24659	ROM, KIRBY'S DREAM LAND (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

KIRBY'S PINBALL LAND (K9)

GAME CART #: 27615*
GAME PAK #: 27612

PART#	DESCRIPTION	QTY. PER UNIT
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
22258	PCB ONLY, DMG-GDAN	1
27616	LABEL, NAME KIRBY'S PINBALL LAND (DMG)	1
27618	ROM, KIRBY'S PINBALL LAND (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

LEGEND OF ZELDA: LINK'S AWAKENING (ZL)

GAME CART #: 26546*
GAME PAK #: 26543

PART#	DESCRIPTION	QTY. PER UNIT
18369	RAM, 64K S-RAM (SOP) 28 PIN (DMG)	1
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	3
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
23993	PCB ONLY, DMG-DECN	1
26547	LABEL, NAME ZELDA: LINK'S AWAKENING (DMG)	1
26549	ROM, ZELDA: LINK'S AWAKENING (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

METROID II (ME)

GAME CART #: 22560*
GAME PAK #: 22518

PART#	DESCRIPTION	QTY. PER UNIT
18369	RAM, 64K S-RAM (SOP) 28 PIN (DMG)	1
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	3
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
22561	LABEL, NAME METROID II (DMG)	1
23629	ROM, METROID II (SOP) 32 PIN (DMG)	1
23993	PCB ONLY, DMG-DECN	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

NINTENDO WORLD CUP (NC)

GAME CART #: 21211*
GAME PAK #: 20649

PART#	DESCRIPTION	QTY. PER UNIT
59	CAP, CERAMIC .01 μF-F	2
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
22670	LABEL, NAME NINTENDO WORLD CUP (DMG)	1
22672	ROM, DMG-NCE-0 (SOP) 32 PIN (DMG)	1
22736	PCB ONLY, DMG-BEAN-02	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

PLAY ACTION FOOTBALL (FL)

GAME CART #: 21217*
GAME PAK #: 20627

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
21822	LABEL, NAME PLAY ACTION FOOTBALL (DMG)	1
21824	ROM, DMG-FLE-0 (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

QIX (QX)

GAME CART #: 20584*
GAME PAK #: 19060

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18472	PCB ONLY, DMG BBA	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2
20586	LABEL, NAME QIX (DMG)	1
21538	ROM, DMG-QXA (QFP) 44 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

RADAR MISSION (RM)

GAME CART #: 21214*
GAME PAK #: 20652

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
21948	LABEL, NAME RADAR MISSION (DMG)	1
21950	ROM, DMG-RME-0 (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

SOLAR STRIKER (SS)

GAME CART #: 19324*
GAME PAK #: 18762

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18472	PCB ONLY, DMG BBA	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2
19326	LABEL, NAME SOLAR STRIKER (DMG)	1
19328	ROM, DMG-SSA (QFP) 44 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

SUPER MARIO LAND (ML)

GAME CART #: 18481*
GAME PAK #: 18089

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
18482	LABEL, NAME MARIO LAND (DMG)	1
	When using Quad Flat Package (QFP) program IC	
18472	PCB ONLY, DMG BBA	1
18484	ROM, DMG-MLA (QFP) 44 PIN (DMG)	1
	When using Small Outline Package (SOP) program IC	
21691	PCB ONLY, DMG-BEAN-01	1
22734	ROM, DMG-MLA (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

SUPER MARIO LAND 2 (MQ)

GAME CART #: 25315*
GAME PAK #: 25312

PART#	DESCRIPTION	QTY. PER UNIT
18369	RAM, 64K S-RAM (SOP) 28 PIN (DMG)	1
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	3
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
23993	PCB ONLY, DMG-DECN	1
25316	LABEL, NAME SUPER MARIO LAND 2 (DMG)	1
25318	ROM, SUPER MARIO LAND 2 (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

SUPER RC PRO AM (RC)

GAME CART #: 22574*
GAME PAK #: 21650

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
22575	LABEL, NAME SUPER RC PRO AM (DMG)	1
22770	ROM, SUPER RC PRO AM (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

TENNIS (TN)

GAME CART #: 18547*
GAME PAK #: 18090

PART#	DESCRIPTION	QTY. PER UNIT
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	1
18489	LABEL, NAME TENNIS (DMG)	1
18491	PCB ONLY, DMG AAA	1
18492	ROM, DMG-TNA (QFP) 44 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

TETRIS (TR)

GAME CART #: 18534*
GAME PAK #: 19455

PART#	DESCRIPTION	QTY. PER UNIT
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	1
18491	PCB ONLY, DMG AAA	1
18561	ROM, DMG-TRA (QFP) 44 PIN (DMG)	1
18562	LABEL, NAME TETRIS (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

TETRIS 2 (EH)

GAME CART #: 27635*
GAME PAK #: 27632

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	1
21691	PCB ONLY, DMG-BEAN-01	1
27636	LABEL, NAME TETRIS 2 (DMG)	1
27638	ROM, TETRIS 2 PRG (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

TOP RANK TENNIS (XT)

GAME CART #: 26538*
GAME PAK #: 26535

PART#	DESCRIPTION	QTY. PER UNIT
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	2
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
22258	PCB ONLY, DMG-GDAN	1
26539	LABEL, NAME TOP RANK TENNIS (DMG)	1
26541	ROM, TOP RANK TENNIS (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

WARIO LAND: SUPER MARIO LAND 3 (WJ)

GAME CART #: 27625*
GAME PAK #: 27622

PART#	DESCRIPTION	QTY. PER UNIT
18369	RAM, 64K S-RAM (SOP) 28 PIN (DMG)	1
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .01 μF 3.5L (DMG)	3
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ 1/4W ±5%	1
23993	PCB ONLY, DMG-DECN	1
27626	LABEL, NAME WARIO LAND: SML 3 (DMG)	1
27628	ROM, WARIO LAND: SML 3 (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

WAVE RACE (WA)

GAME CART #: 24649*
GAME PAK #: 24646

PART#	DESCRIPTION	QTY. PER UNIT
18402	IC, MBC-2A (SOP) 28 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2
19084	IC, MM1026AF (SOP) 8 PIN (DMG)	1
19085	BATTERY, CR-1616 W/CLIP	1
20084	RESISTOR, CARBON 10KΩ ¼W ±5%	1
22258	PCB ONLY, DMG-GDAN	1
24650	LABEL, NAME WAVE RACE	1
24652	ROM, WAVE RACE (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

YOSHI (YO)

GAME CART #: 24349*
GAME PAK #: 24346

PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
24350	LABEL, NAME YOSHI (DMG)	1
24352	ROM, YOSHI (SOP) 32 PIN (DMG)	1

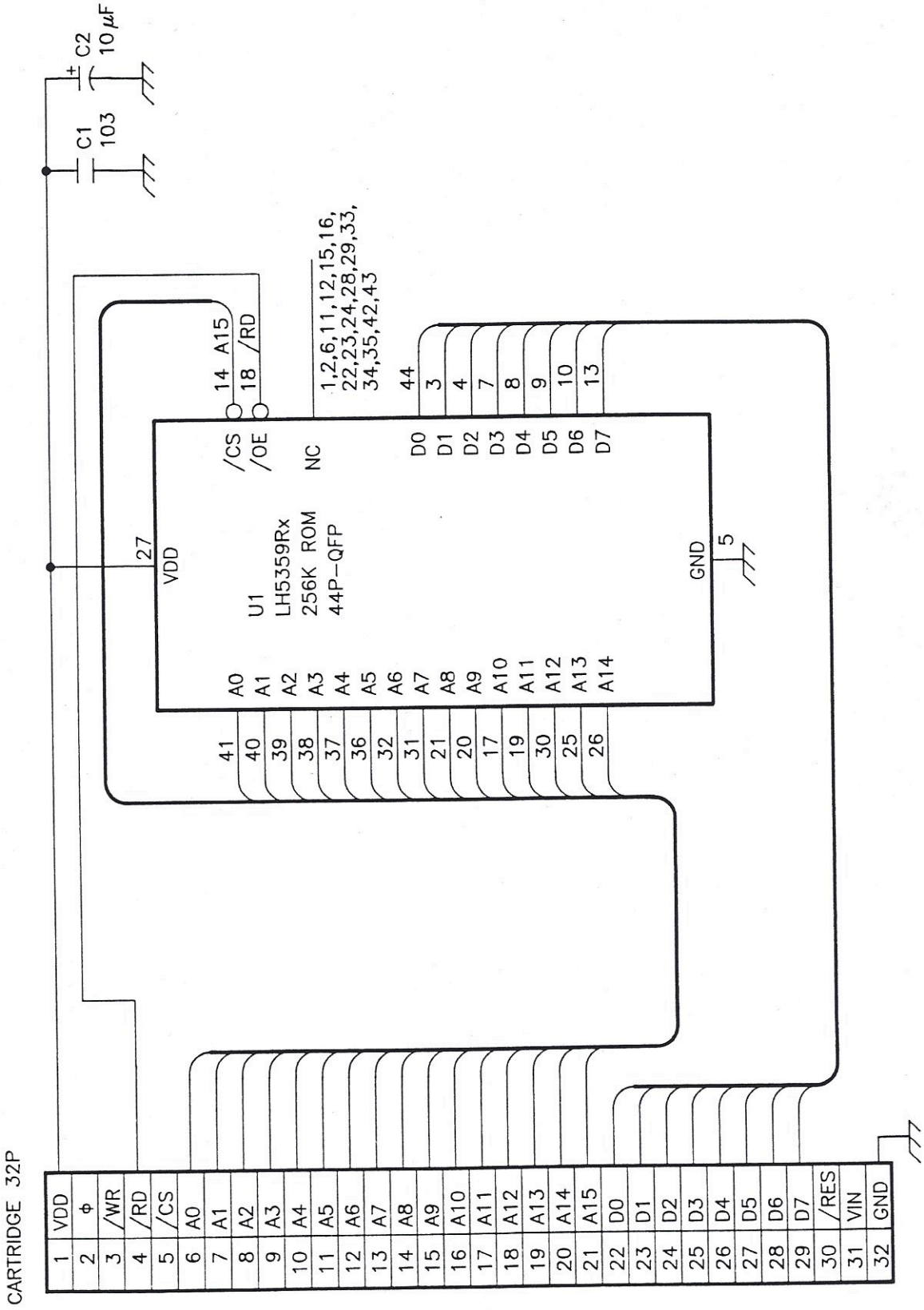
*Use this part number to complete all warranty claims and non-warranty repair reports.

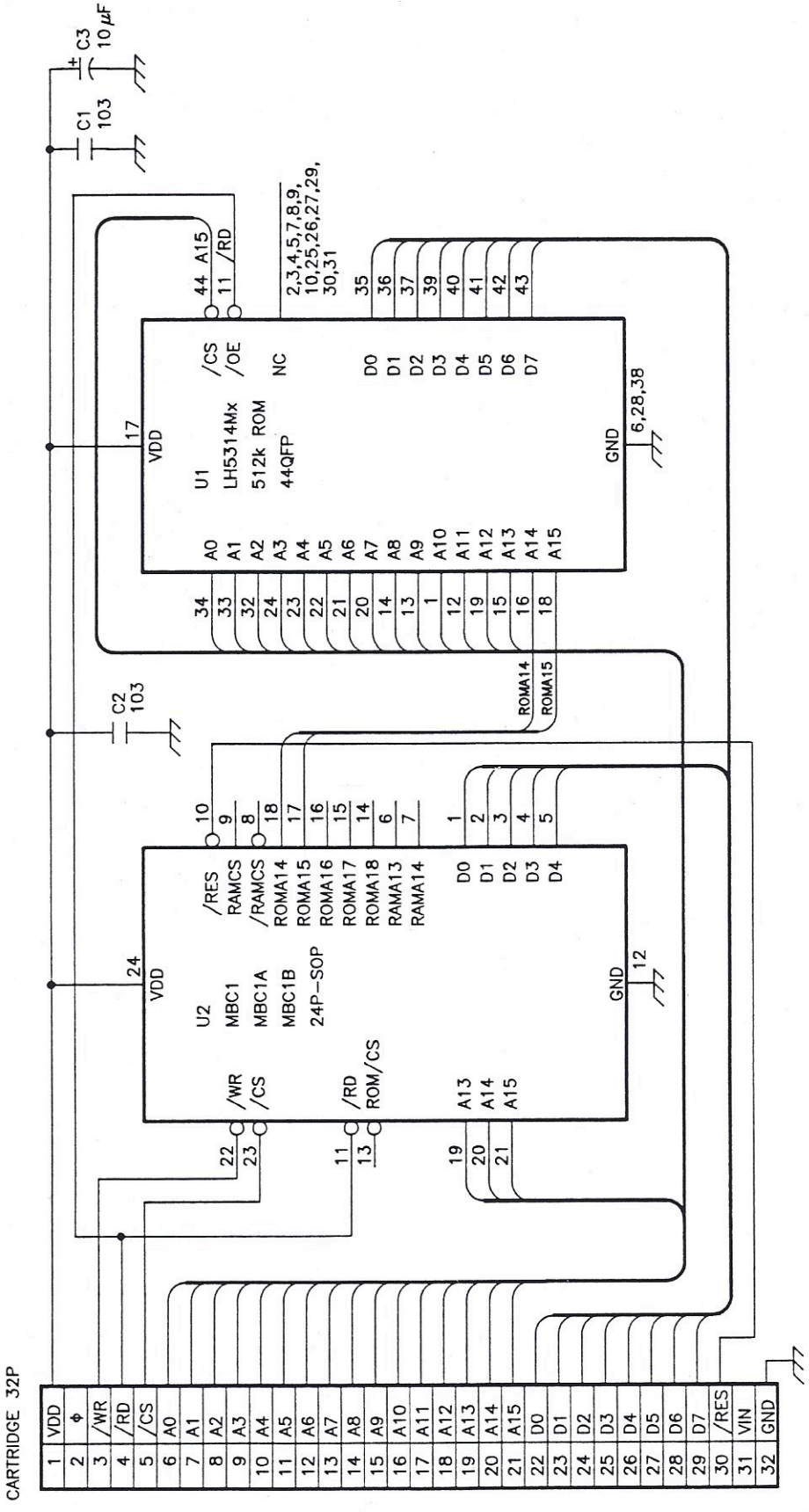
YOSHI'S COOKIE (CI)

GAME CART #: 26414*
GAME PAK #: 26411

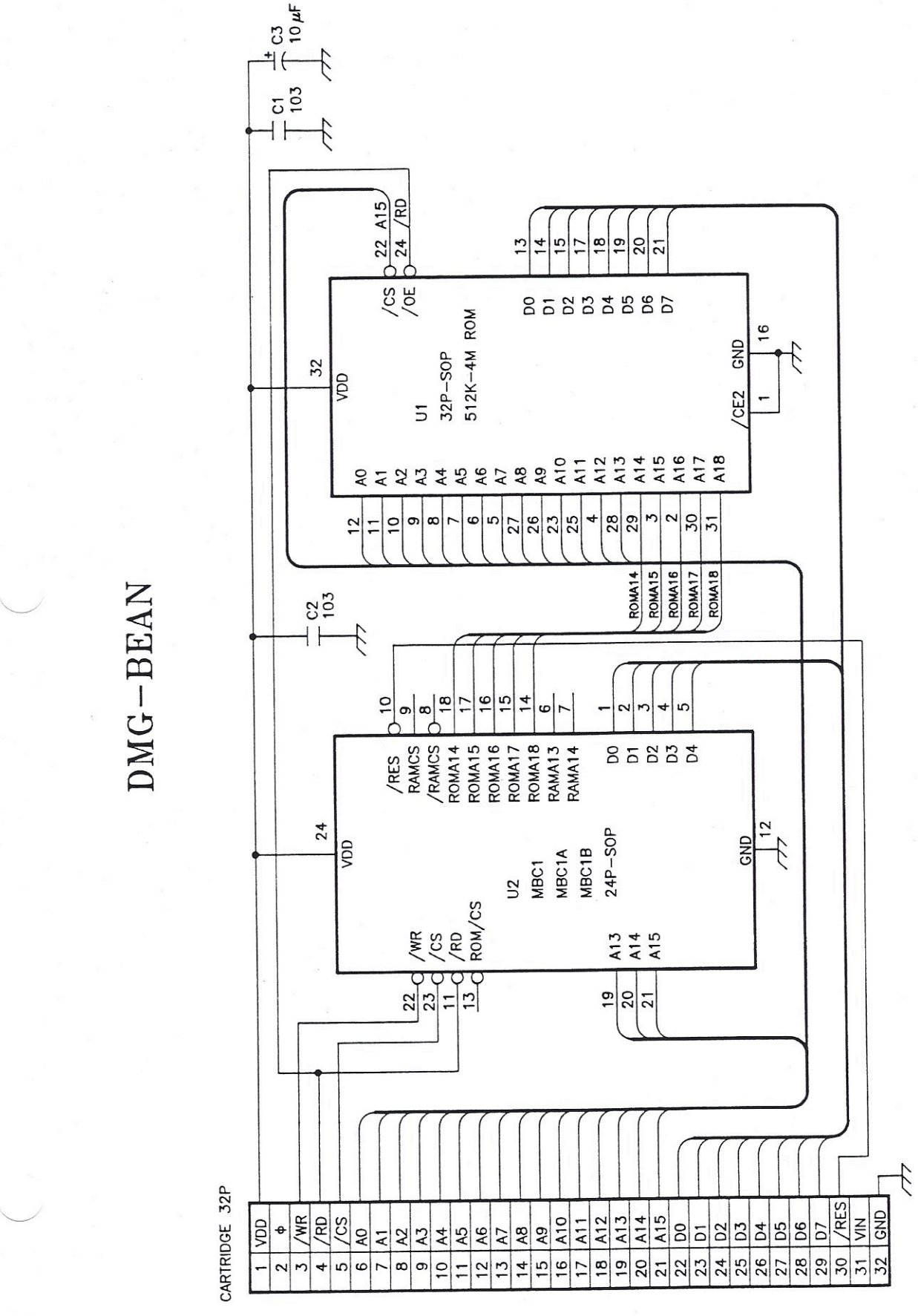
PART#	DESCRIPTION	QTY. PER UNIT
18401	IC, MBC-1 (SOP) 24 PIN (DMG)	1
18467	HOUSING, DMG GAME PAK FRONT	1
18468	HOUSING, DMG GAME PAK BACK	1
18470	SCREW, M2 x 5 LH CHROME (DMG)	1
18477	CAP, CERAMIC .O1 μF 3.5L (DMG)	2
21691	PCB ONLY, DMG-BEAN-01	1
26415	LABEL, NAME YOSHI'S COOKIE (DMG)	1
26417	ROM, YOSHI'S COOKIE (SOP) 32 PIN (DMG)	1

*Use this part number to complete all warranty claims and non-warranty repair reports.

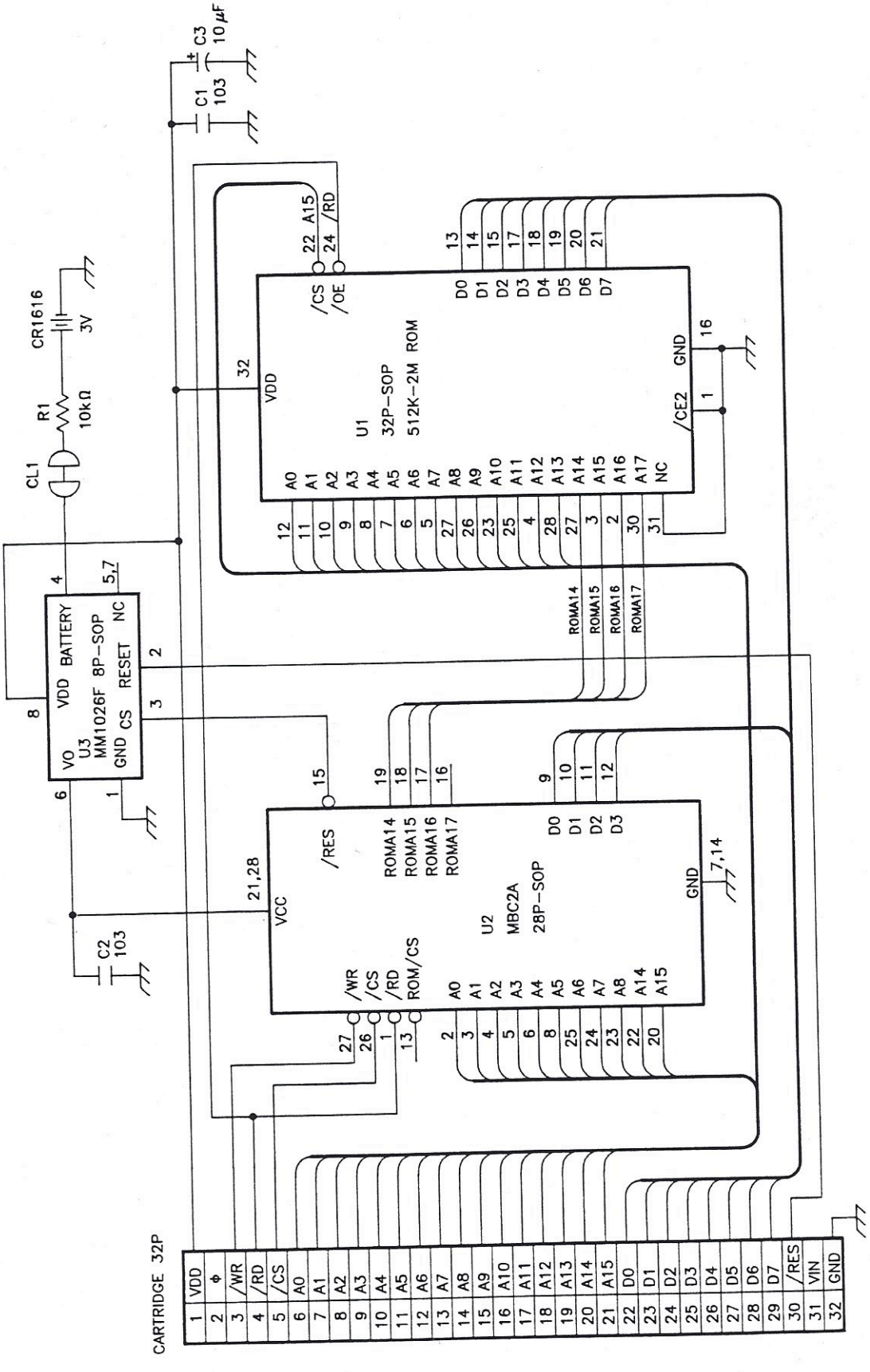

DMG-AAA -01-02
CARTRIDGE 32P
1 VDD
2 Φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
C1 103
C2 10 µF
U1
LH5359Rx
256K ROM
44P-QFP
VDD
27
GND
5
/CS
/OE
NC
14 A15
18 /RD
1,2,6,11,12,15,16,
22,23,24,28,29,33,
34,35,42,43
44
3
4
7
8
9
10
13
D0
D1
D2
D3
D4
D5
D6
D7
41
40
39
38
37
36
32
31
21
20
17
19
30
25
26
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14


DMG-BBA -02
CARTRIDGE 32P
1 VDD
2 Φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
C3 10 µF
C1 103
C2 103
U1 LH5314Mx 512k ROM 44QFP
VDD
GND
/CS
/OE
NC
A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15
D0 D1 D2 D3 D4 D5 D6 D7
2,3,4,5,7,8,9,10,25,26,27,29,30,31
6,28,38
ROMA14
ROMA15
U2 MBC1 MBC1A MBC1B 24P-SOP
/RES
RAMCS
/RAMCS
ROMA14
ROMA15
ROMA16
ROMA17
ROMA18
RAMA13
RAMA14
/WR
/CS
/RD
ROM/CS
A13
A14
A15
D0 D1 D2 D3 D4

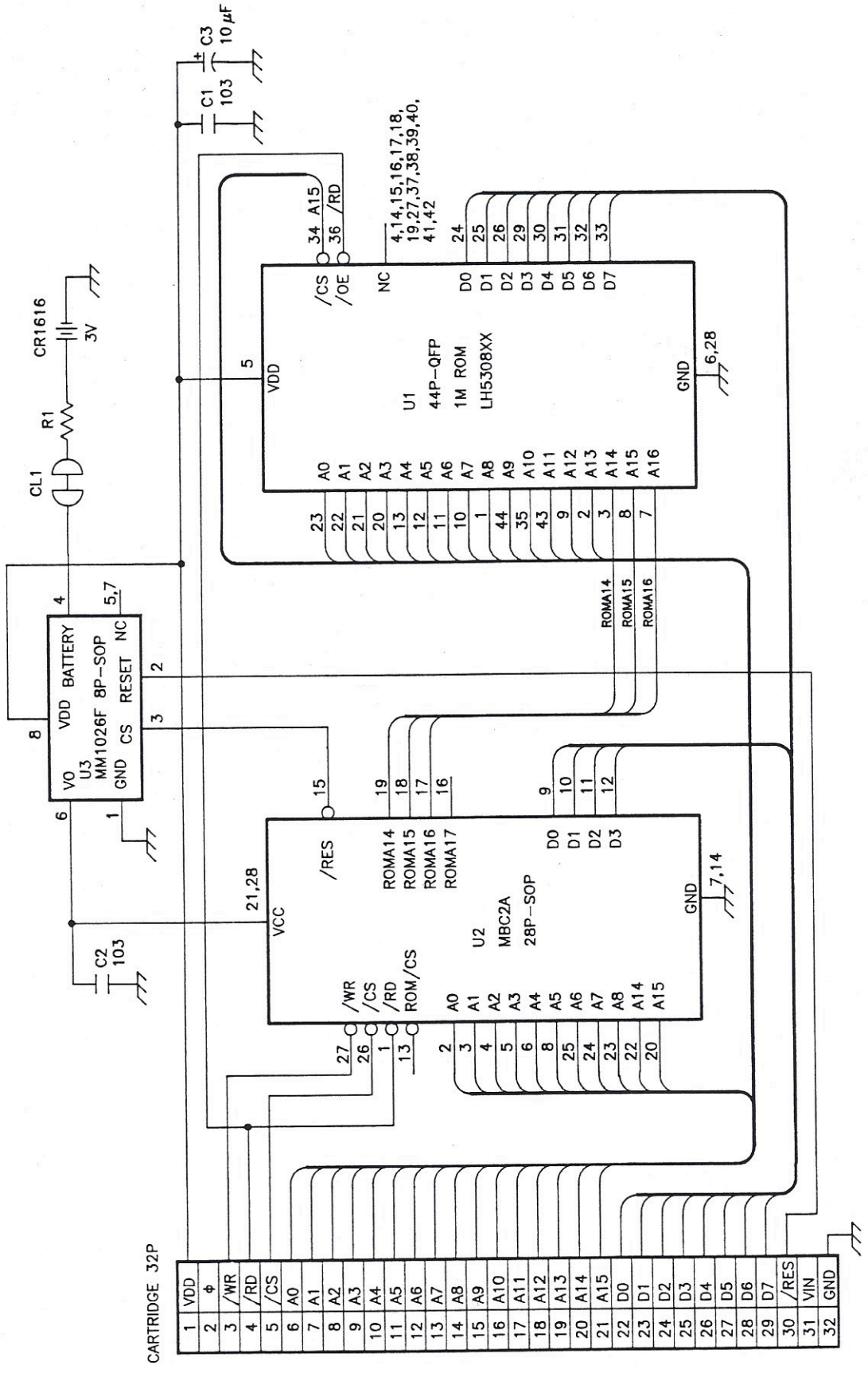
DMG-BEAN


CARTRIDGE 32P
1 VDD
2 Φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
C1 103
C2 103
C3 10 µF
U1 32P-SOP 512K-4M ROM
/CS /OE
/CE2
VDD
GND
A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18
D0 D1 D2 D3 D4 D5 D6 D7
ROMA14 ROMA15 ROMA16 ROMA17 ROMA18
U2 MBC1 MBC1A MBC1B 24P-SOP
/RES /RAMCS /RAMCS ROMA14 ROMA15 ROMA16 ROMA17 ROMA18 RAMA13 RAMA14
/WR /CS /RD ROM/CS
A13 A14 A15
D0 D1 D2 D3 D4

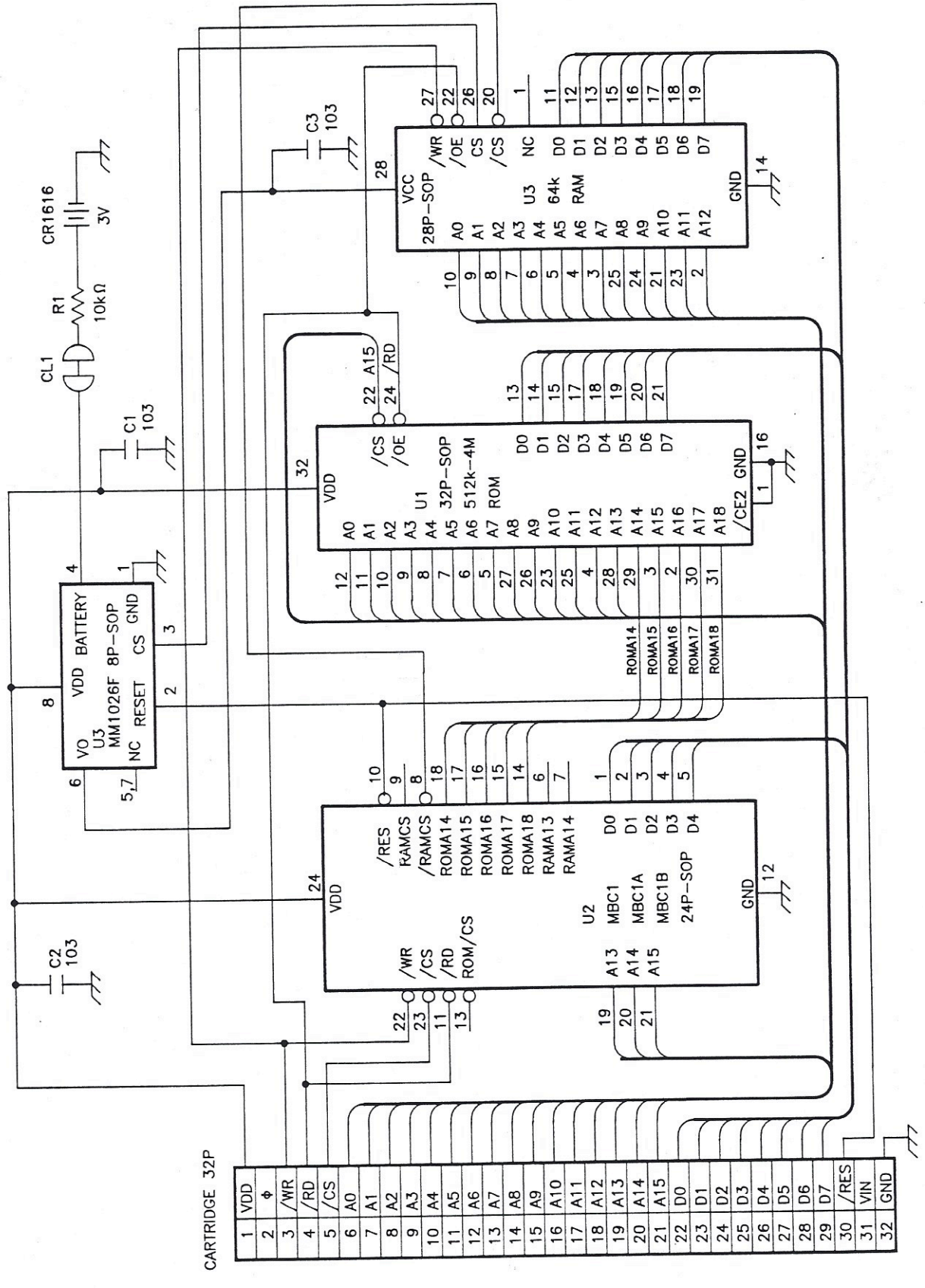
DMG-GDAN


CARTRIDGE 32P
1 VDD
2 Φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
U1
32P-SOP
512K-2M ROM
VDD
/CS
/OE
/CE2
GND
NC
U2
MBC2A
28P-SOP
VCC
/RES
/WR
/CS
/RD
ROM/CS
ROMA14
ROMA15
ROMA16
ROMA17
U3
MM1026F 8P-SOP
VO
VDD BATTERY
GND CS RESET NC
CR1616
3V
R1
10kΩ
CL1
C1
103
C2
103
C3
10 μF

DMG-GCA -01-02-03



DMG-DECN


CARTRIDGE 32P
1 VDD
2 Φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
U1 32P-SOP 512k-4M ROM
U2 24P-SOP MBC1
U3 MM1026F 8P-SOP
U3 28P-SOP 64k RAM
CR1616
3V
R1
10kΩ
CL1
C1 103
C2 103
C3 103
/RES
/RAMCS
ROMA14
ROMA15
ROMA16
ROMA17
ROMA18
RAMA13
RAMA14
/WR
/CS
/RD
ROM/CS
MBC1
MBC1A
MBC1B
/CS
/OE
A15
/RD
/CE2
/WR
/OE
CS
/CS
NC
VDD
GND
VO
RESET
BATTERY

GAME PAK TEST PROCEDURE

Equipment Required:

1. Game Boy
2. Four AA batteries or Rechargeable Battery Pack

NOTE: Some game paks may require use of a Four Player Adapter to enable a thorough test.

Procedure:

Prior to testing a game pak, ensure that the edge connector is clean. If a battery is included, check the voltage. It should read between 2.7 and 3.2 volts DC.

1. Insert four AA batteries or plug the Rechargeable Battery Pack into the Game Boy unit.

2. Insert the game pak to be tested and apply power to the Game Boy.

3. Watch for the title screen and any game simulation.

4. Start the game and briefly play it (two or three game screens should be sufficient). Look for any signs of failure. This would include, but is not limited to; scrambled video images, erratic program operation, a blank screen, or improper scrolling.

5. If the game pak is a memory game, check to see if it will hold saved information.

6. Refer to the game pak diagnostic table, following this procedure, for troubleshooting.

GAME PAK DIAGNOSTIC TABLE

Before attempting any repairs to the game pak, disassemble and thoroughly inspect the PCB. Look for a damaged or dirty edge connector, solder defects, or missing/damaged components. **Always clean the edge connector before testing.**

MALFUNCTION	PROBABLE CAUSE (in order of priority)
Solid color blank screen	Dirty or corroded edge connector Defective Program ROM Defective MBC Defective PCB
Scrambled video images	Dirty or corroded edge connector Defective Program ROM Defective MBC Defective PCB
Frozen screen / erratic program operation	Dirty or corroded edge connector Defective Program ROM Defective MBC Defective PCB
Memory problems	Defective Battery Defective MBC2 or RAM Defective Program ROM Defective PCB

GLOSSARY OF TERMS

Liquid Crystal Display (LCD)

A display device consisting of a liquid crystal sealed between two polarized glass plates. Voltage is applied through the segment and common drivers to opposing electrodes in the LCD. This alters the alignment of the liquid and affects the passage of light through the region, resulting in a visible display.

Memory Bank Controller (MBC)

An IC used in a game pak which allows the Game Boy hardware to access additional amounts of memory. The MBC2 also contains 2K-bit of internal RAM which can be expanded up to a 2M-bit memory area using external RAM. The MBC2 (or the external RAM) is connected to a battery for memory retention after the game has been removed.

Monitor ROM

An internal ROM to the Game Boy CPU. When power is applied to a Game Boy unit, the monitor ROM verifies the validity of character data stored in the game pak. If this data is valid, "Nintendo" will be displayed on the screen and program execution will occur. If it is invalid, the screen will flash repeatedly.

Quad Flat Package (QFP)

A square surface mount IC package, used for larger pin-count LSI functions. All packages are symmetrical, with an equal lead-count on all four sides.

Small Outline Package (SOP)

A rectangular surface mount IC package, assembled in either narrow or wide body widths. All packages have an equal lead-count with leads on two sides of the IC.

Thermometric Fuse

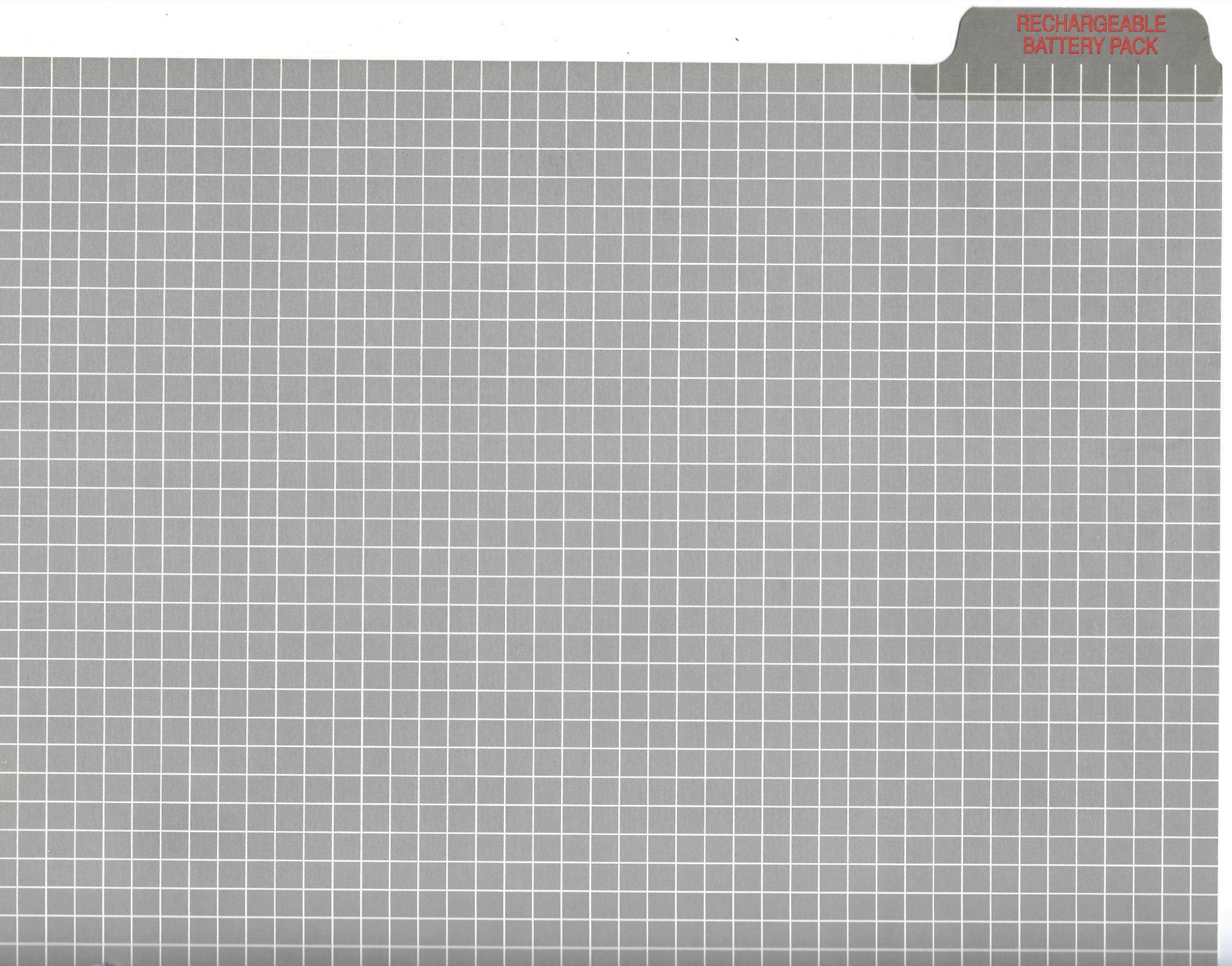
A fuse used in the Rechargeable Battery Pack which will open if exposed to excessive heat.

Video RAM (VRAM)

A Static RAM used by the CPU to store video information.

Work RAM (WRAM)

A Static RAM used by the CPU to store sprite location, game score, time, and miscellaneous "housekeeping" information.


RECHARGEABLE
BATTERY PACK

RECHARGEABLE BATTERY PACK OPERATION

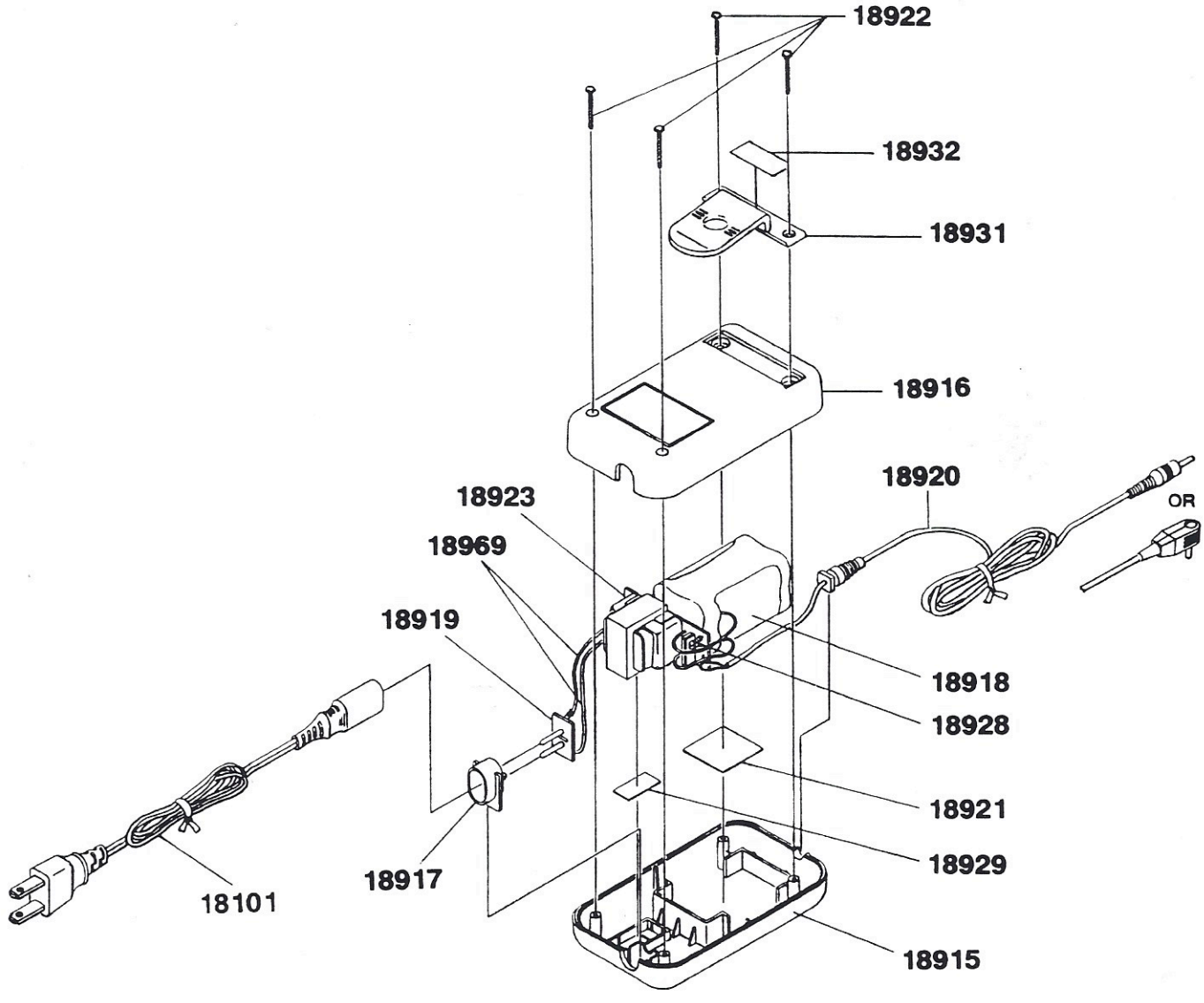
Purpose

The Rechargeable Battery Pack is a self contained module designed to provide operating power to the Game Boy system. The Rechargeable Battery Pack acts as an AC adapter when plugged into a 110 volt source. Using nickel-cadmium batteries, this unit will also hold a charge for approximately 10 hours of use and may be recharged about 300 times.

Theory of Operation

The Rechargeable Battery Pack receives its power when the AC line is connected to a 110 volt AC 60Hz voltage source. This is connected to a step down transformer producing 6 volts AC. The output is connected to a bridge rectifier to produce approximately 4.8 volts DC, then to the Game Boy system through the DC harness of the Battery Pack. The 6 volt DC output of the bridge rectifier is also in parallel with a four pack of AA Nickel-cadmium batteries that are connected in series. The batery pack also contains a 1Ω fusible resistor for current protection to the Game Boy unit.

When the AC line is disconnected, power is supplied to the Game Boy system by the Ni-Cd batteries. When the AC line is connected, the batteries are continuously charged with the Game Boy power off and bypassed when on.



Rechargeable Battery Pack

EXPLODED VIEW

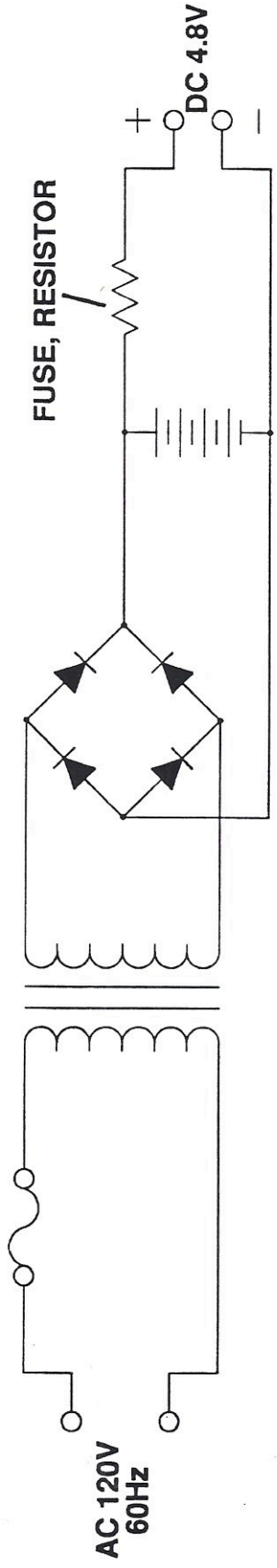
RECHARGEABLE BATTERY PACK

MODEL #: 18798

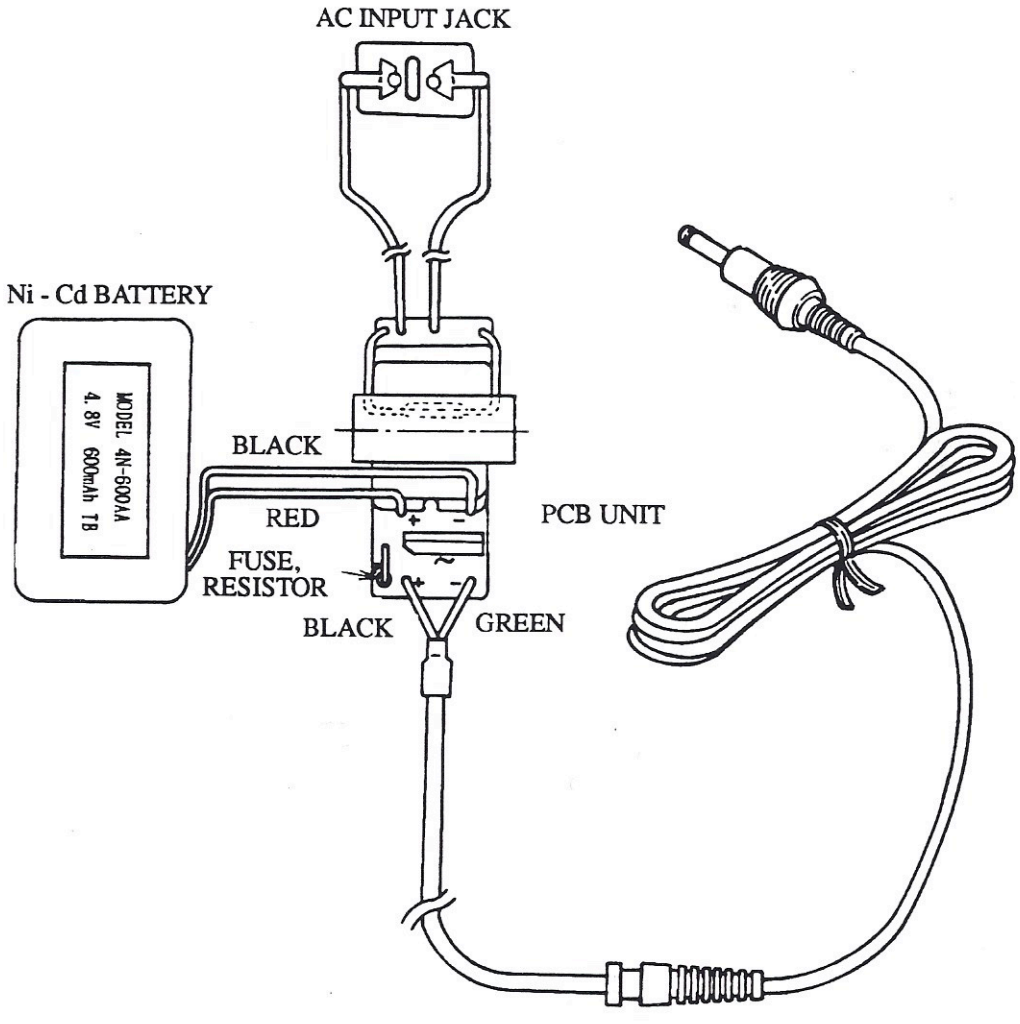
PART #	DESCRIPTION	QTY. PER UNIT
18915	HOUSING, FRONT	1
18916*	HOUSING, REAR	1
18917	CASE, AC PLUG	1
18918*	BATTERY, NI-CD (4 PACK)	1
18919	SOCKET, PCB UNIT	1
18920	HARNESS, DC OUTPUT	1
18921*	CUSHION, BATTERY	1
18922	SCREW, M3 x 25 LH CHROME TAPPING	4
18923	PCB ASSEMBLY, TRANSFORMER	1
18924*	PCB ONLY, TRANSFORMER	1
18925*	TRANSFORMER	1
18926	DIODE, RECTIFIER	1
18927*	FUSE, THERMOMETRIC	1
18928	FUSE, RESISTOR	1
18929*	CUSHION, TRANSFORMER	1
18930	BELT CLIP ASSEMBLY	1
18931*	CLIP, BELT	1
18932*	LABEL, CAUTION	1
18969*	WIRE, LEAD	1

*Indicates part is not available.

RECHARGEABLE BATTERY PACK SCHEMATIC



WIRING DIAGRAM



USE CAUTION ON REPAIR:

1. Follow all wire color codes from above because of different polarities.
2. Lead on wire should be no longer than 1.8mm from solder side of the PCB.
3. Care should be taken when routing wires because shorting of some wires can cause extreme heat or fire.

RECHARGEABLE BATTERY PACK TEST PROCEDURE

Equipment Required:

1. Game Boy unit
2. Rechargeable Battery Pack AC Cord
3. Test Game Pak

Testing Procedure:

1. Insert the test Game Pak into the Game Boy unit, plug in the Rechargeable Battery Pack and turn the power switch to the ON position.

2. Briefly play the game and watch for any power consumption abnormalities. Plug the AC Cord into the Rechargeable Battery Pack (and an electrical outlet) and retest the Battery Pack to ensure AC adapter operation.

   NOTE: If the Rechargeable Battery Pack has completely discharged, it may not function as an AC adapter. Recharge the unit for a short while (from several minutes to 1 hour) for proper AC adapter operation.

3. Turn off the Game Boy unit and disconnect the Battery Pack. Refer to the Rechargeable Battery Pack diagnostic table to determine the most probable cause of a failure condition.

RECHARGEABLE BATTERY PACK DIAGNOSTIC TABLE

Before attempting any repairs to the Rechargeable Battery Pack, visually inspect and check continuity of the AC cord and the DC output harness.

MALFUNCTION	PROBABLE CAUSE
No power output	Defective DC output harness Defective fuse resistor Poor solder on PCB Defective Ni - Cd battery (4 pack) Defective PCB assembly
Will not hold a charge	Defective Ni - Cd battery (4 pack)

FOUR PLAYER ADAPTER

FOUR PLAYER ADAPTER OPERATION

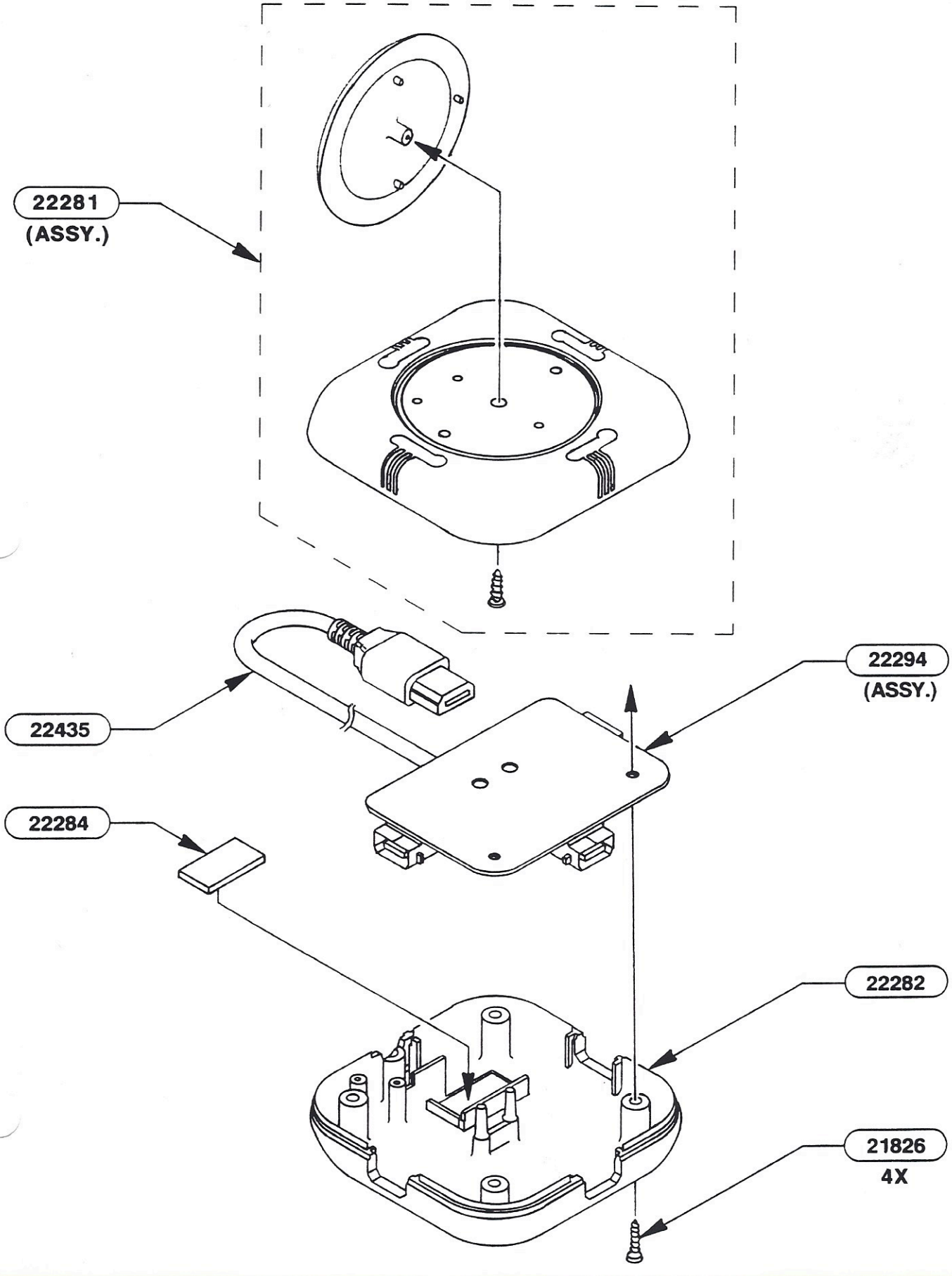
Purpose

The Four Player Adapter is designed to allow four players to play simultaneously when using special four player games. Special four player games are identified by the "MULTI GAME" select option on the title screen and the "GAME LINK" symbol on the label and packaging.

Theory of Operation

The Four Player Adapter uses a custom built CPU (U1) which receives, synchronizes and sends data from one Game Boy system to another. The processor U1 receives data signal pulses (SIN) from the individual Game Boy units about the players position in the game. U1 then encodes these signals and sends the data signal pulses (SOUT) to each Game Boy system. The data is used by the Four Player Adapter to detect each individual Game Boy unit position in the game and establish a common reference point. The Four Player Adapter outputs the data signal of each individual Game Boy system to the other Game Boy units.

The Four Player Adapter derives V_{DD} and GND from the #1 Game Boy unit through Port #1. All four ports pass a signal clock (SCLK) to U1 from each Game Boy unit, along with SIN from and SOUT to the individual Game Boy units. The SCLK is used by U1 to establish synchronization for data transfer. The SIN and SOUT pulses each contain four separate groups of 8-bit data pulses. The data received by U1 is processed to determine each players position in comparison to one another. The data is then transferred out to each Game Boy unit (through software) to display your opponents position on the screen.

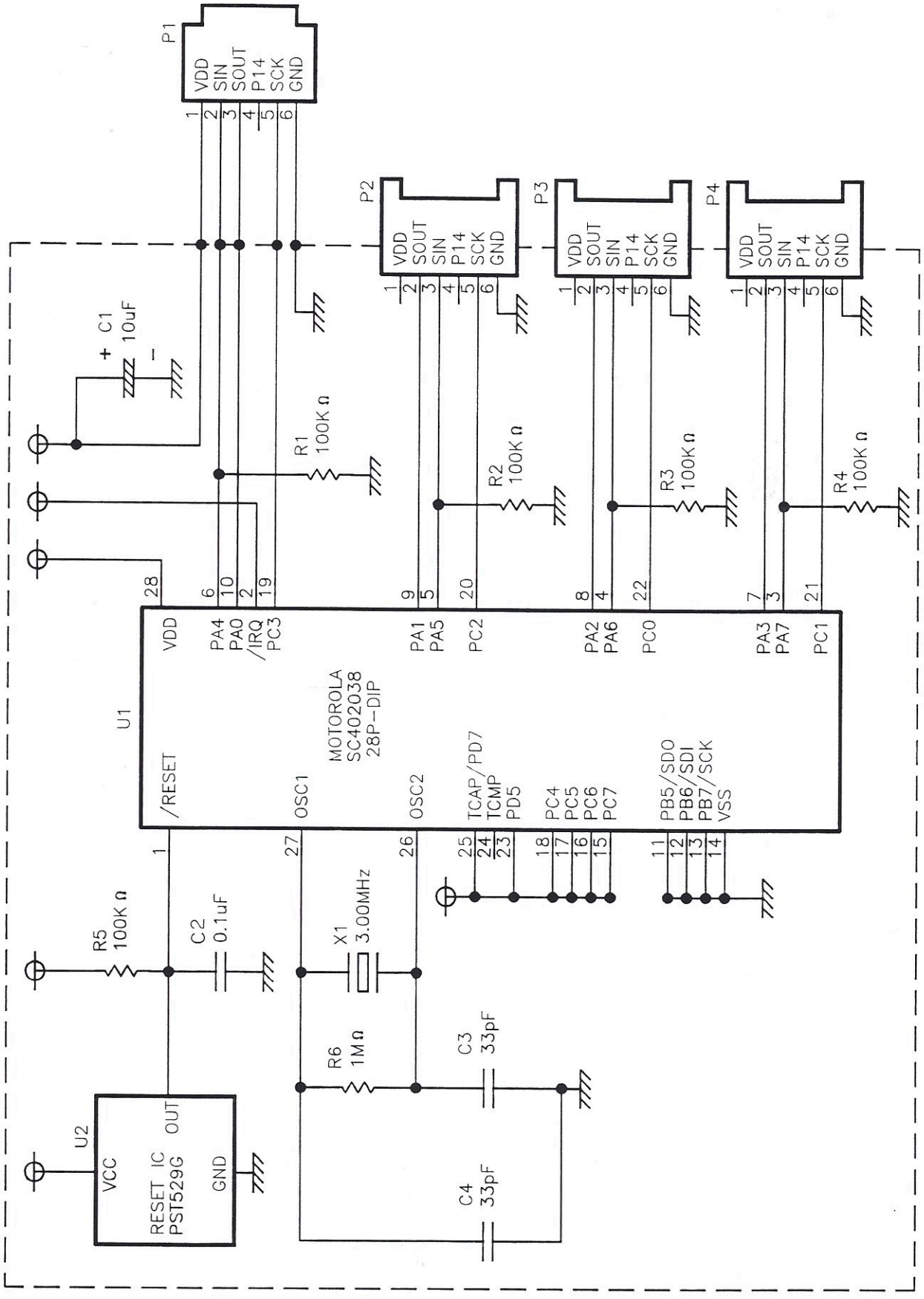

22281
(ASSY.)
22435
22294
(ASSY.)
22284
22282
21826
4X

GAME BOY FOUR PLAYER ADAPTER

MODEL#: 22293

PART#	DESCRIPTION	QTY. PER UNIT
21826	SCREW, M2 x 8.2 - Y SELF TAPPING (DMG)	4
22281	HOUSING, FRONT 4-PLAYER ASSEMBLY	1
22282	HOUSING, BACK 4-PLAYER ADAPTER	1
22284*	SPONGE, URETHANE 10 x 20 x 6 mm	1
22294	PCB ASSEMBLY, FOUR PLAYER ADAPTER	1
18375	CAP, CERAMIC 0.1 μF 12V RADIAL	1
18380	RESISTOR, CARBON 1MΩ 1/6W	1
18385	CONN, 6P EXPANSION	3
18431	CAP, ELECTRO 10 μF 25V RADIAL	1
18685	RESISTOR, CARBON 100KΩ 1/6W ± 5%	5
22432*	PCB ONLY, 4-PLAYER ADAPTER	1
22433*	OSCILLATOR, CERAMIC 3MHz	1
22434*	IC, CPU SC402038B	1
22435	CABLE ASSEMBLY, 4-PLAYER ADAPTER	1
22439*	CORE, FERRITE EMI 1/4" L x 3/8" DIA	1
22436*	IC, PST 529G	1
22437	CAP, CERAMIC 33pF 50V	2

*Indicates part is not available at this time.


P1
VDD
SIN
SOUT
P14
SCK
GND
P2
P3
P4
C1
10uF
R1
100K Ω
R2
100K Ω
R3
100K Ω
R4
100K Ω
R5
100K Ω
C2
0.1uF
X1
3.00MHz
R6
1M Ω
C3
33pF
C4
33pF
U1
MOTOROLA
SC402038
28P-DIP
/RESET
OSC1
OSC2
VDD
PA4
PA0
/IRQ
PC3
PA1
PA5
PC2
PA2
PA6
PC0
PA3
PA7
PC1
TCAP/PD7
TCMP
PD5
PC4
PC5
PC6
PC7
PB5/SDO
PB6/SDI
PB7/SCK
VSS
U2
RESET IC
PST529G
VCC
OUT
GND

FOUR PLAYER ADAPTER TEST PROCEDURE

Equipment Required:

1. Four Game Boy units
2. Four "MULTI GAME" game paks of the same title (F-1 Race recommended)
3. Three Game Link cables
4. Sixteen AA batteries or four Rechargeable Battery Packs

Testing Procedure:

1. Insert the light gray connector plug of the Four Player Adapter to be tested, into the first (#1) Game Boy unit's Expansion Connector.

2. Connect the three other Game Boy units to the Four Player Adapter by plugging one end of a Game Link cable to the Expansion Connector of each Game Boy. Then plug the other end of each of the Game Link cables to the connector sockets on the Four Player Adapter.

3. Insert the same Game Pak title into each of the Game Boy units. Turn on the power to Game Boy #1. Then turn on the power to the other Game Boy units.

4. Briefly play the game and verify operation with all four Game Boy units. Refer to the Four Player Adapter diagnostic table to determine the most probable cause of a failure condition.

FOUR PLAYER ADAPTER DIAGNOSTIC TABLE

Before attempting any repairs to the Four Player Adapter, visually inspect the cable assembly and housings for damage.

MALFUNCTION	PROBABLE CAUSE
Does not operate	Game Boy #1 was not the first Game Boy turned on Defective cable assembly Defective PCB assembly
Input is not received from one Game Boy unit	Defective expansion connector socket Defective PCB assembly Defective cable assembly

TEST FIXTURES

GAME BOY TEST CARTRIDGE OPERATION

Purpose

The Game Boy Test Cartridge is designed to thoroughly test all functions of a Game Boy unit.

Theory of Operation

The diagnostic tests performed on the Game Boy include a SCREEN TEST, CONTROLLER TEST, SCROLL TEST, and a SOUND TEST. Each of these tests may be run individually by selecting the appropriate title on the menu screen, or they may be run all together by selecting the AUTO TEST on the menu screen. A brief description of each section is provided below.

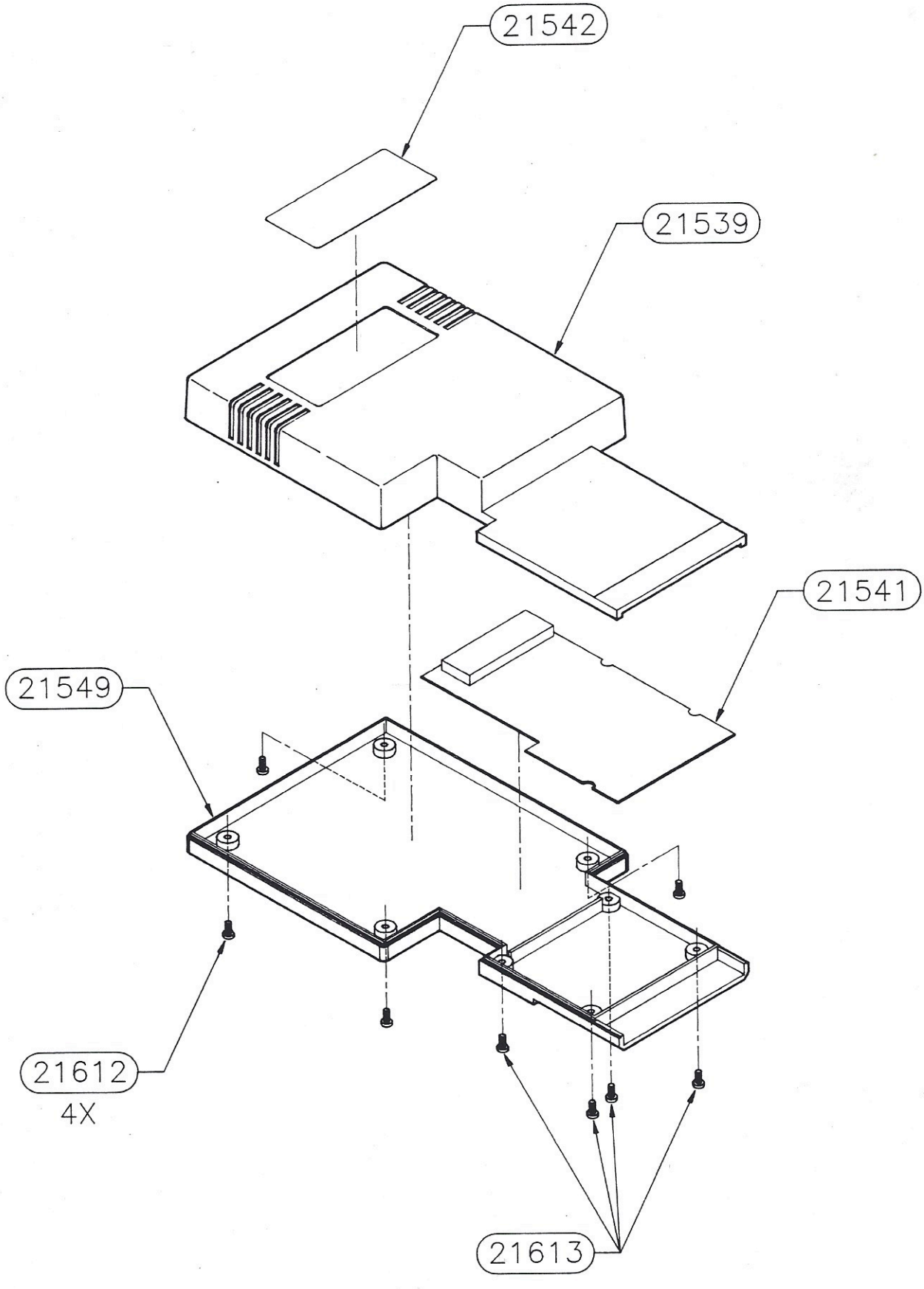
SCREEN TEST - Displays three different patterns to test all the pixels.

CONTROLLER TEST - Displays the figure of a Game Boy and when each actuator is pressed, the corresponding graphic on the LCD changes in intensity.

SCROLL TEST - Used to test the scrolling capabilities of the CPU.

SOUND TEST - Used to test the sound functions of the CPU and the sound Amplifier.

AUTO TEST - All of the aforementioned functions and incorporates the addition of a RAM test.

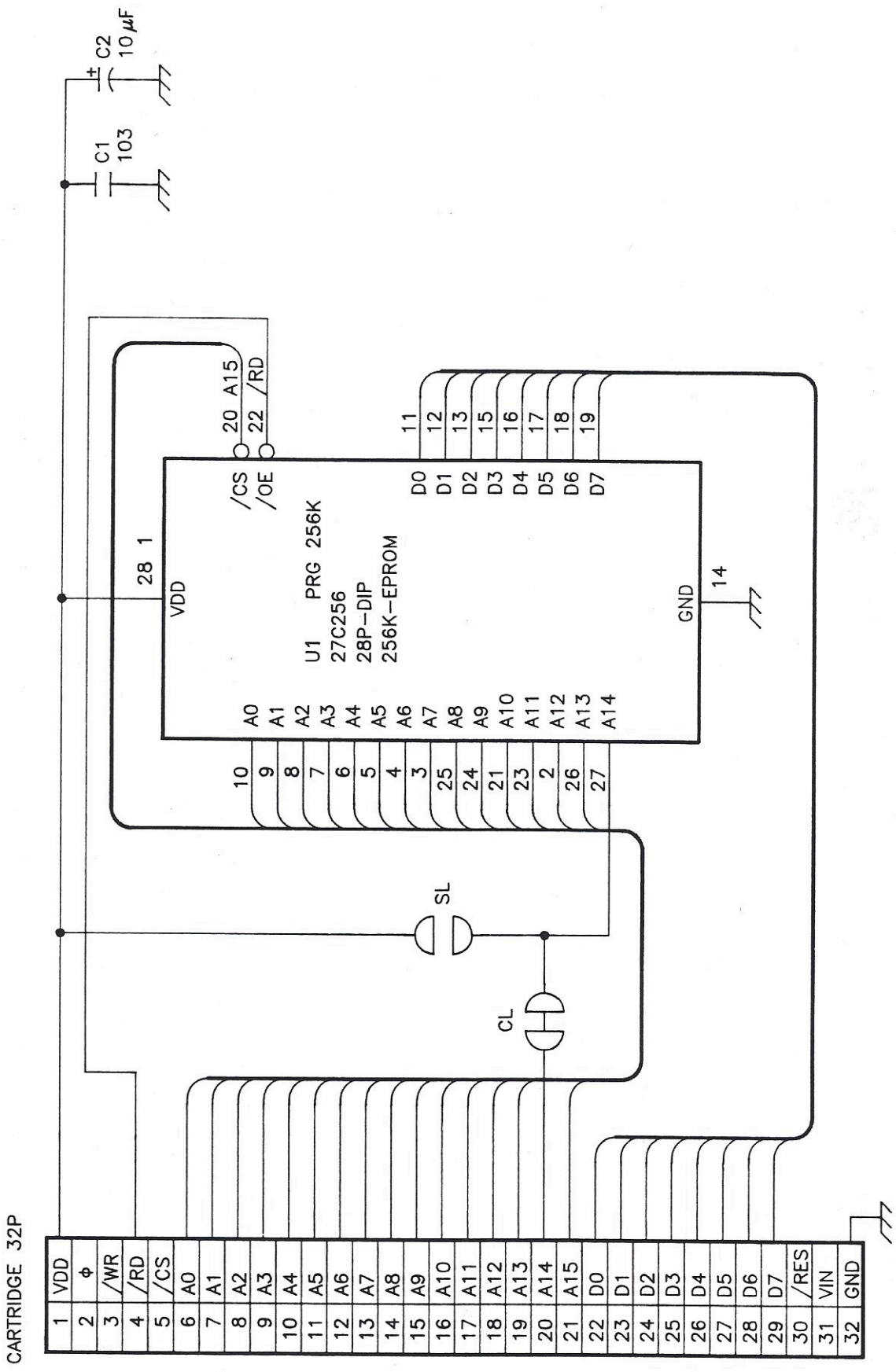

21542
21539
21541
21549
21612
4X
21613

GAME BOY TEST CARTRIDGE

MODEL #: 21528

PART #	DESCRIPTION	QTY. PER UNIT
21539*	HOUSING, FRONT	1
21540*	HOUSING, BACK	1
21541*	PCB ONLY, DMG-AGING-01	1
21542*	LABEL, NAME GAME BOY TEST CARTRIDGE	1
21543*	ROM, GAME BOY TEST CARTRIDGE (PRG) 256K	1
21612*	SCREW, M2 x 8.2 HIOS	4
21613*	SCREW, M2 x 3.4 HIOS	4

* Indicates part is not available at this time.


DMG-AGING-01
CARTRIDGE 32P
1 VDD
2 φ
3 /WR
4 /RD
5 /CS
6 A0
7 A1
8 A2
9 A3
10 A4
11 A5
12 A6
13 A7
14 A8
15 A9
16 A10
17 A11
18 A12
19 A13
20 A14
21 A15
22 D0
23 D1
24 D2
25 D3
26 D4
27 D5
28 D6
29 D7
30 /RES
31 VIN
32 GND
C1 103
C2 10 µF
U1 PRG 256K
27C256
28P-DIP
256K-EPROM
VDD
GND
/CS
/OE
SL
CL

IC - FUNCTIONS
& SPECIFICATIONS

HANDLING NOTES ON ICs

The ICs used in the Game Boy system are semiconductor packages with MOSFETs as their basic element. These ICs are susceptible to insulation breakdown and are easily damaged by static electricity and current leakage from improperly grounded solder irons. The following are safety practices that should be followed at all times:

A) When handling ICs, be sure to ground yourself using a wrist strap or similar device. The line from your body to earth should pass through a resistance of several Mega Ohms to prevent electrical shock should you come into contact with a high voltage power source. Avoid wearing gloves or clothing made of synthetic fabrics or wool which readily generate static electricity. Wear cotton clothing whenever possible.

B) During troubleshooting, ICs should be placed on a grounded static free surface, or other such surface that will prevent the build up of static electricity (conductive sponges, etc.).

C) Use a grounded soldering iron! Even though ICs are diode-protected, a strong enough voltage will destroy the protective diode and ruin the insulator in the ICs gates.

D) Avoid touching the IC package. The material used for surface mount ICs is porous and will absorb moisture from the skin. This moisture will expand when the IC heats up and will cause the casing to crack. Use of finger cotts or latex gloves is recommended when handling ICs. Do not reuse ICs that have been removed.

E) When installing an IC onto a PCB, make absolutely certain of the direction. The IC will be destroyed if installed in reverse (refer to p. 2-16).

F) When storing or shipping ICs, place them in an aluminum box or insert them in conductive sponge (MOS mat) so that the pins are all at the same potential.

G) Although storage temperatures for ICs are quoted as -20° C to +70° C, ICs should be stored as close to room temperature as possible. Also, they should not be stored where they will be subject to extremely high humidity.

H) Avoid exposing ICs to excessive mechanical shock.

I) Avoid using VOMs on ICs. Doing so may result in damage to the IC since the meter uses a significant voltage to determine resistance. If you want to measure the resistance of an IC, despite the risk, do so carefully... and with the meter set to the lowest resistance range.

J) Solder IC leads in as short a time as possible so that they are not exposed to more thermal shock than necessary.

BURN-IN STATION

BURN-IN STATION

Burn-in is required for all Game Boy units. After repairs have been completed it is important to ensure that any possible thermal or previously undetected problems are located before returning the Game Boy unit to the consumer. This is achieved by inserting a game pak, powering up the unit, and letting it operate undisturbed for a minimum of eight hours.

The burn-in station that you setup will depend on the amount of space available to you and the volume of repairs you have. You will have to best determine the way to setup your burn-in station.

The basic requirements for a burn-in station are:

- 5 volt DC Power supply (Rechargeable Battery Pack)
- Burn-in test game pak (Tetris recommended)
- Game Boy Test Cartridge

At the completion of the eight hour burn-in period, observe the Burn-in test game pak for normal operation by starting the game and briefly playing it. Perform a final test on the unit using the Game Boy Test Cartridge.

Rev. 11/93

SERVICE DEPARTMENT BULLETIN

BULLETIN #90291

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: Liquid Crystal Display (LCD) Replacement

UNITS AFFECTED: G02800000 or Lower

All LCDs subject to this notice would, after a period of usage, start showing black and/or missing lines. To resolve this difficulty, the Game Boy front assembly should be replaced under warranty. The repair may only be performed once during the life of the Game Boy.

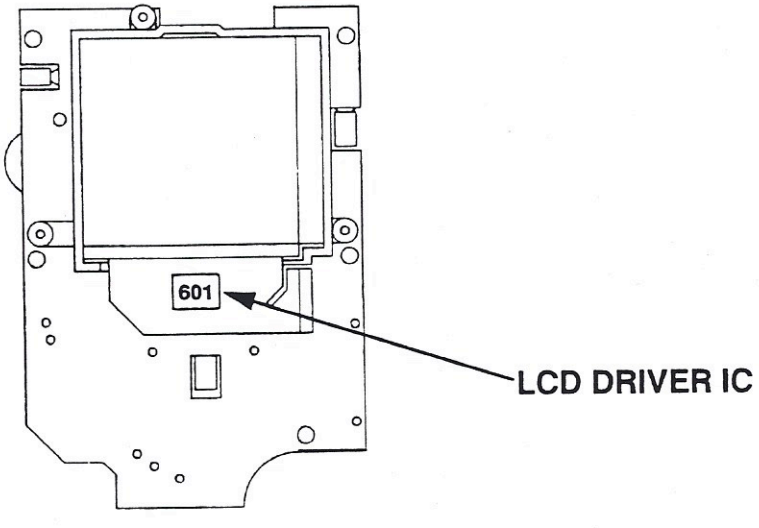
The subject LCDs are identified by the lot number on the LCD driver IC. The old lot numbers, (those requiring replacement), are printed in white, while the newer lot numbers are either underlined or printed in blue.

Under no circumstance is the front assembly to be replaced at no cost to the consumer if the LCD is cracked or shattered. This does not qualify as a manufacturer's defect.

The only part to be replaced under this service bulletin is the Game Boy front assembly (Part No. 27214). Nintendo will also cover up to $2.00 in miscellaneous parts that are needed to make the Game Boy unit usable. **All units within this serial number range require a rear housing replacement (part #18406) per Service Bulletin No. 90290.**

Repair Action

In warranty/Out of warranty - Perform modification and submit warranty claim form to Nintendo. Mark the claim form "special warranty Service Bulletin #90291". No proof of purchase is required.



Nintendo

Rev. 02/92

SERVICE DEPARTMENT BULLETIN

BULLETIN #91353

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: Screen Cover Gasket

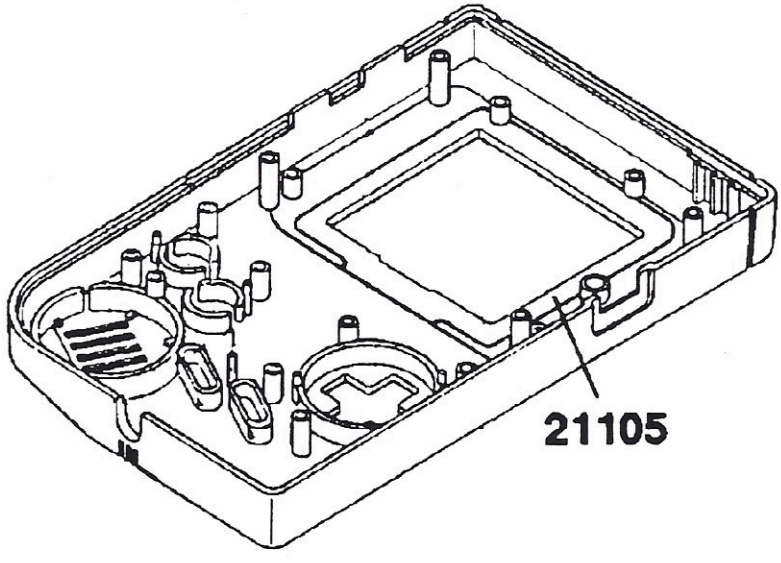
The Screen Cover Gasket (Part No. 21105) is designed to prevent foreign material from entering the viewing area on the Game Boy. This gasket contains an adhesive substance on both the front and rear surface contact areas to provide a seal between the Front Housing and the Liquid Crystal Display (LCD), upon installation. All Game Boy unit repairs require the replacement of the Screen Cover Gasket. Early version Game Boy units do not contain this gasket. Ensure that one is installed during the repair.

Repair Action

If product is:

1. Out of warranty - Install/replace Screen Cover Gasket (Part No. 21105) and charge customer appropriately.

2. In warranty - During normal warranty service, install/replace Screen Cover Gasket (Part No. 21105) and submit warranty claim form to Nintendo.



Rev. 02/92

SERVICE DEPARTMENT BULLETIN

BULLETIN #91353

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: Screen Cover Gasket

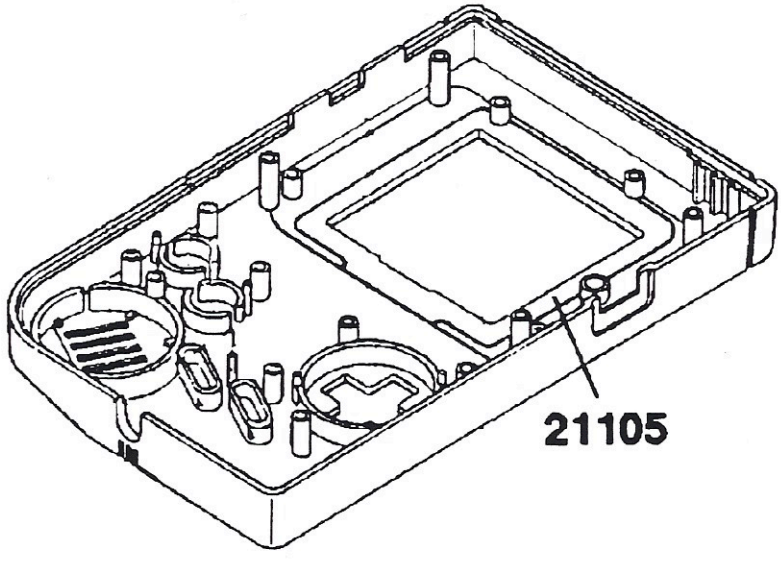
The Screen Cover Gasket (Part No. 21105) is designed to prevent foreign material from entering the viewing area on the Game Boy. This gasket contains an adhesive substance on both the front and rear surface contact areas to provide a seal between the Front Housing and the Liquid Crystal Display (LCD), upon installation. All Game Boy unit repairs require the replacement of the Screen Cover Gasket. Early version Game Boy units do not contain this gasket. Ensure that one is installed during the repair.

Repair Action

If product is:

1. Out of warranty - Install/replace Screen Cover Gasket (Part No. 21105) and charge customer appropriately.

2. In warranty - During normal warranty service, install/replace Screen Cover Gasket (Part No. 21105) and submit warranty claim form to Nintendo.



SERVICE DEPARTMENT BULLETIN

BULLETIN #90290

GENERAL CLASSIFICATION: Game Boy Repair

SPECIFIC SUBJECT: Rear Housing Modification

UNITS AFFECTED: G03100000 or Lower

The rear housings on the subject units allowed battery insertion and contact in either direction. This could, with certain battery brands, cause batteries to leak. Although polarity is clearly marked in the housing cavity, some consumers still insert the batteries in reverse.

The new rear housing will allow battery contact only if inserted correctly.

Housing types are marked on the bottom left side of the battery compartment as follows:

MARK	TYPE
None	Original
N	Modified to prevent reversed insertion
N- (N(Dash))	Modified to prevent reversed insertion
NT	Modified to prevent reversed insertion and to reinforce the Control Pad support

The only parts to be replaced under this service bulletin are the Rear Housing (Part No. 18406) and the Serial Number Label (Part No. 18421). If the serial number on the unit is G02800000 or lower, this modification should be performed in conjunction with Service Bulletin No. 90291. Any other repairs that are required to make the Game Boy usable are the responsibility of the consumer.

Repair Action

If product is:

1. Out of warranty - Perform modification and charge customer appropriately.
2. In warranty - Perform modification and submit warranty claim form to Nintendo.

Rev. 06/92

SERVICE DEPARTMENT BULLETIN

BULLETIN #90291

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: Liquid Crystal Display (LCD) Replacement

UNITS AFFECTED: G02800000 or Lower

All LCDs subject to this notice would, after a period of usage, start showing black and/or missing lines. To resolve this difficulty, all LCDs should be replaced under warranty. The repair may only be performed once during the life of the Game Boy.

The subject LCDs are identified by the lot number on the LCD driver IC. The old lot numbers, (those requiring replacement), are printed in white, while the newer lot numbers are either underlined or printed in blue.

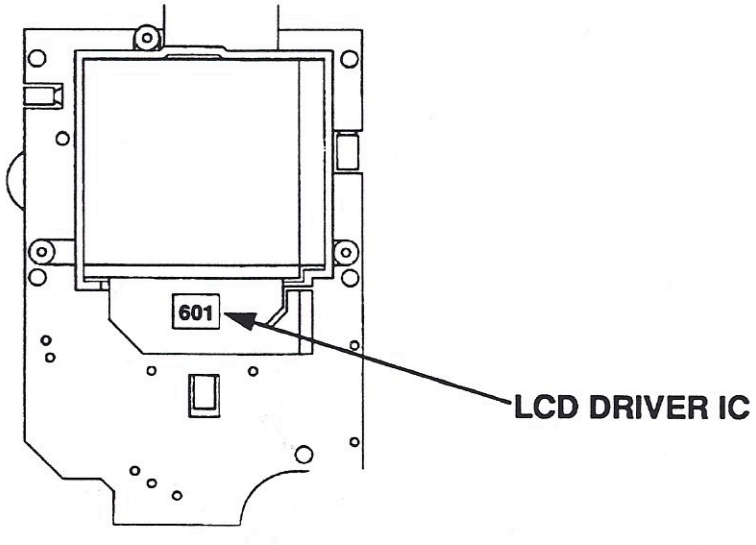
Under no circumstance is the LCD PCB to be replaced at no cost to the consumer if the LCD is cracked or shattered. This does not qualify as a manufacturer's defect.

The only parts to be replaced under this service bulletin are the LCD PCB (part #18422), the Screen Cover Gasket (part #21105), and Serial Number Label (part #18421). Nintendo will also assume the cost of replacing worn contacts (part #'s 18410-18412) and the screen cover (part #18418) if, during the replacement of an old LCD PCB that qualifies under the above guidelines, the technician feels the replacement is necessary to prevent premature failure of the contact pads and enhance visibility of the LCD area. In addition, Nintendo will cover up to $2.00 in miscellaneous parts that are needed to make the Game Boy unit usable. **All units within this serial number range require a rear housing replacement (part #18406) per Service Bulletin No. 90290.**

Repair Action

If the product is:

1. Out of warranty - Perform modification and submit warranty claim form to Nintendo. No proof of purchase is required.
2. In warranty - Perform modification and submit warranty claim form to Nintendo. No proof of purchase is required.



SERVICE DEPARTMENT BULLETIN

BULLETIN #91154

GENERAL CLASSIFICATION: Game Boy Repair

SPECIFIC SUBJECT: DMG-CPU PCB (Part No. 18392) Modification

UNITS AFFECTED: G11200000 to G14000000

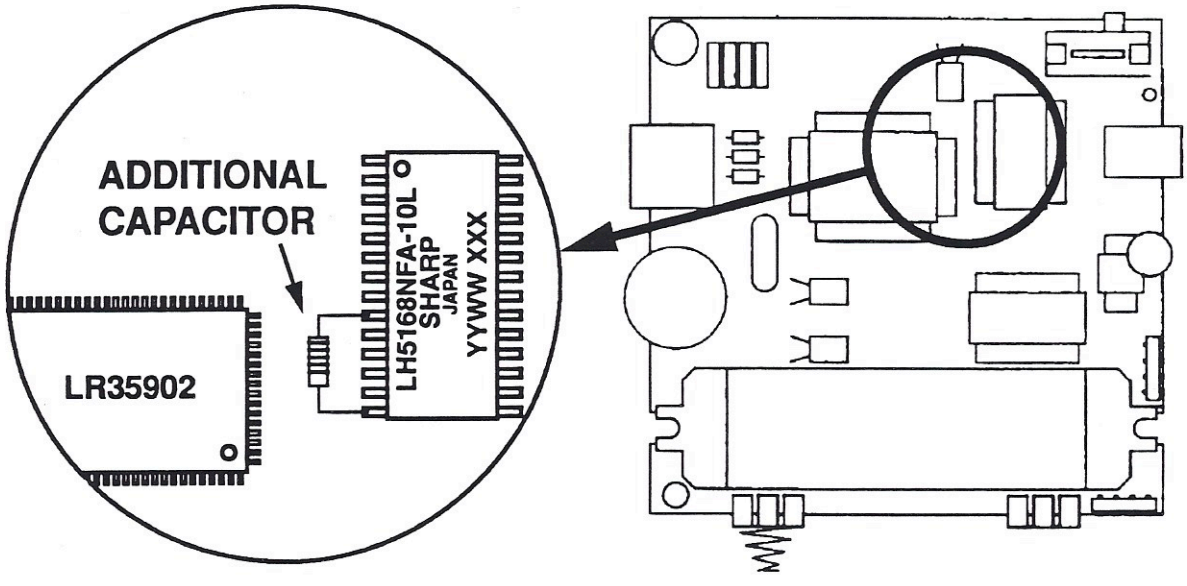
The following modification can be made to improve scrolling when a Sharp 64K SRAM (LH5168NFA-10L) is used at position U2 (VRAM).

Add a 100pF/50V ceramic disc capacitor (Part No. 18403) between pins 9 and 14 on the SRAM being careful not to let capacitor leads touch the CPU leads.

Repair Action

If product is:

1. Out of warranty - Perform modification when this type of Sharp RAM is used (LH5168-NFA-10L) and charge customer appropriately.
2. In warranty - Perform modification when this type of Sharp RAM is used (LH5168N-FA-10L) and submit warranty claim form to Nintendo.



SERVICE DEPARTMENT BULLETIN

BULLETIN #91197

GENERAL CLASSIFICATION: Game Pak Repair

SPECIFIC SUBJECT: MMC1 (Part No. 6471) Enhancement

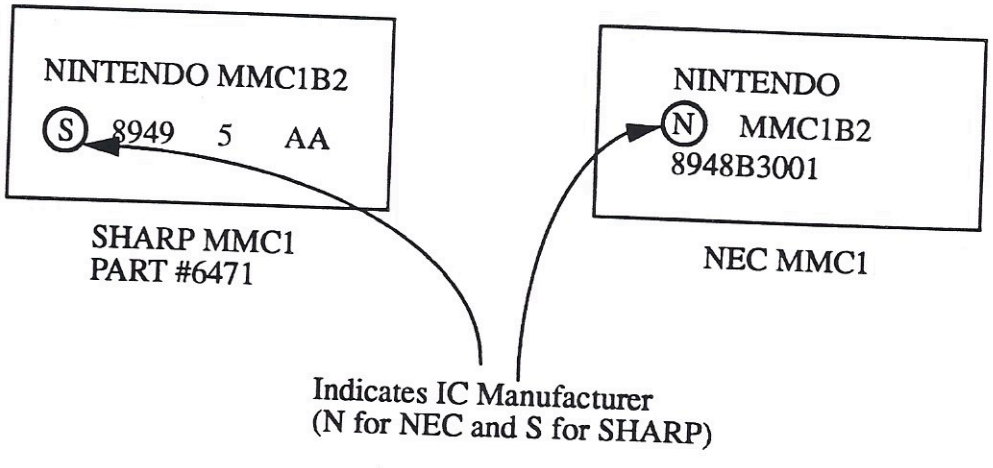
All NES Game Paks that contain an MMC1 manufactured by NEC and which are used in an NES Game Pak with battery back-up, may not save data. **Therefore, all NES Game Paks with battery back-up that come in for repair, containing an NEC MMC1, should be replaced under warranty with an MMC1 manufactured by SHARP.** The NEC MMC1 may be used for all other applications.

Shown below are examples of the labeling that would appear on the two types of MMC1s. The letter that has been circled in both of the examples indicates the manufacturer (N for NEC and S for SHARP).

Repair Action

If product is:

1. Out of warranty - Perform modification on battery backed-up games containing an NEC MMC1 and submit warranty claim form to Nintendo.
2. In warranty - Perform modification on battery backed-up games containing an NEC MMC1 and submit warranty claim form to Nintendo.



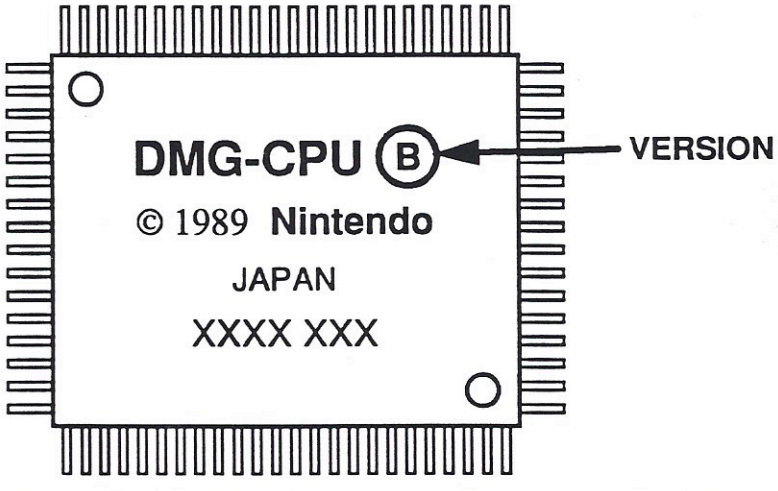
SERVICE DEPARTMENT BULLETIN

BULLETIN #90289

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: CPU PCB Modification

The Game Boy CPU (Part No. 18368) has been changed from version 0 to A and from version A to B. When replacing the CPU, note the version being installed and the required value of C21 and C22 according to the chart below. Replace C21 and C22, if necessary.



CPU VERSION HAS BEEN CHANGED FROM 0 TO A AND FROM A TO B

CPU	C21	C22
NO MARKING	15pF (Part No. 18376)	15pF
A	15 or 27pF	15 or 27pF
B	27pF (Part No. 20589)	27pF

DETERMINE THE VALUE OF C21 AND C22 BY USING CPU VERSION DESIGNATION AND THE TABLE ABOVE

Repair Action

If product is:

1. Out of warranty - Perform modification, if required, when CPU must be replaced and charge customer accordingly.
2. In warranty - Perform modification, if required, when CPU must be replaced and submit warranty claim form to Nintendo.

SERVICE DEPARTMENT BULLETIN

BULLETIN #90290

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: Rear Housing Modification

UNITS AFFECTED: G03100000 or Lower

The rear housings on the subject units allowed battery insertion and contact in either direction. This could, with certain battery brands, cause batteries to leak. Although polarity is clearly marked in the housing cavity, some consumers still insert the batteries in reverse.

The new rear housing will allow battery contact only if inserted correctly.

Housing types are marked on the bottom left side of the battery compartment as follows:

MARK	TYPE
None	Original
N	Modified to prevent reversed insertion
N- (N(Dash))	Modified to prevent reversed insertion
NT	Modified to prevent reversed insertion and to reinforce the Control Pad support

The only parts to be replaced under this service bulletin are the Rear Housing (Part No. 18406) and the Serial Number Label (Part No. 18421). If the serial number on the unit is G02800000 or lower, this modification should be performed in conjunction with Service Bulletin No. 90291. The cost of any other repairs that are required to make the Game Boy unit usable are the responsibility of the consumer.

Repair Action

If product is:

1. Out of warranty - Perform modification and charge customer appropriately.
2. In warranty - Perform modification and submit warranty claim form to Nintendo.

SERVICE DEPARTMENT BULLETIN

BULLETIN #91154

GENERAL CLASSIFICATION: Game Boy Unit Repair

SPECIFIC SUBJECT: DMG-CPU PCB (Part No. 18392) Modification

UNITS AFFECTED: G11200000 to G14000000

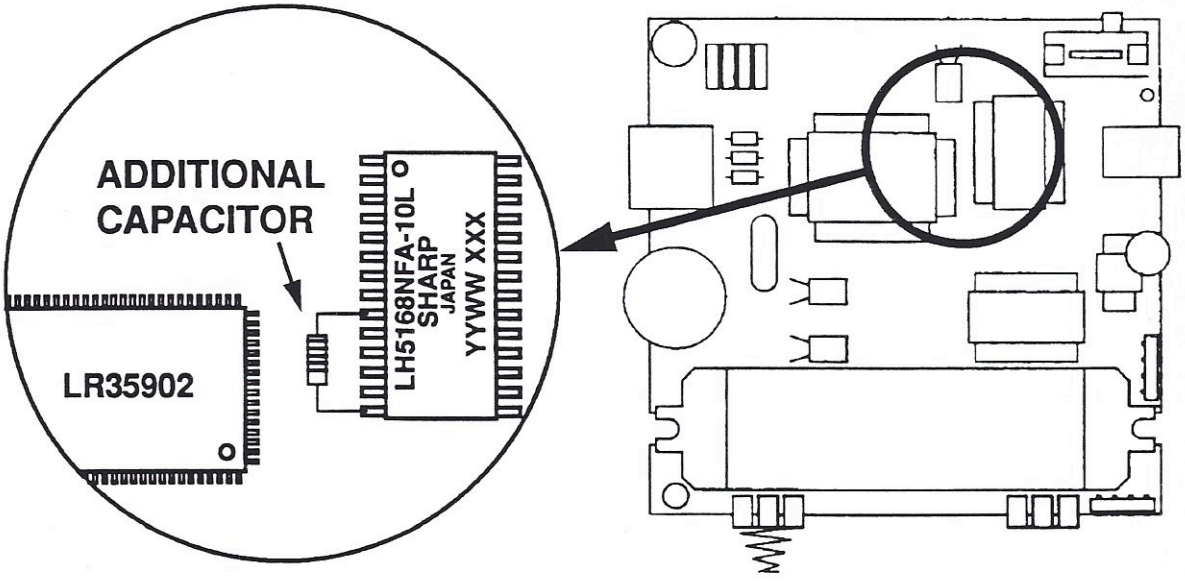
The following modification can be made to improve scrolling when a Sharp 64K SRAM (LH5168NFA-10L) is used at position U2 (VRAM).

Add a 100pF/50V ceramic disc capacitor (Part No. 18403) between pins 9 and 14 on the SRAM being careful not to let capacitor leads touch the CPU leads.

Repair Action

If product is:

1. Out of warranty - Perform modification when this type of Sharp RAM is used (LH5168-NFA-10L) and charge customer appropriately.
2. In warranty - Perform modification when this type of Sharp RAM is used (LH5168N-FA-10L) and submit warranty claim form to Nintendo.



APPENDIX A

CHANGE RECORD

CHG. NO.	CHG. TITLE	CHANGE DATE	ENTERED	COMMENTS

Nintendo of America Inc.
National Field Service Dept.
P.O. Box 97081
Redmond, WA 98073-9781

Toll Free Hotlines:
Service Administration 1-800-447-8373
Technical Questions 1-800-447-8360
Service Parts Orders (Fax) 1-800-447-8362