# C64GS
## TECH DATA

## *SPECIFICATIONS*

### FEATURES

| | |
|---|---|
| *MICROPROCESSOR:* | 6510A, 1MHz clock — Compatible with 6502 |
| *MEMORY:* | 64K |
| *ROM:* | 20K ROM standard includes operating system |
| *DISPLAY:* | 40 columns x 25 lines of text |
| *COLOURS:* | 16 background, border and characters |
| *DISPLAY MODE:* | Text characters — High resolution graphics |
| *RESOLUTION:* | 320 x 200 pixels |
| *SPRITES:* | 8 independent sprites, each consists of 24 x 21 pixels and up to 4 colours, each independently expandable horizontally and vertically |
| *SOUND:* | 6581 Sound Interface Device includes 3 independent tone generators |
| *PORTS:* | ROM cartridge port, 2 joystick ports |

### SYSTEM INTERFACES
### SIDE PANEL CONNECTIONS

| | |
|---|---|
| *POWER CONNECTOR:* | Uses standard C64 power supply |
| *POWER SWITCH:* | Supplies power to the system |
| *JOYSTICK PORTS:* | Two standard DB9 connectors |

### TOP CONNECTIONS

| | |
|---|---|
| *CARTRIDGE SLOT:* | The rectangular slot accepts program or game cartridges |

### REAR CONNECTIONS

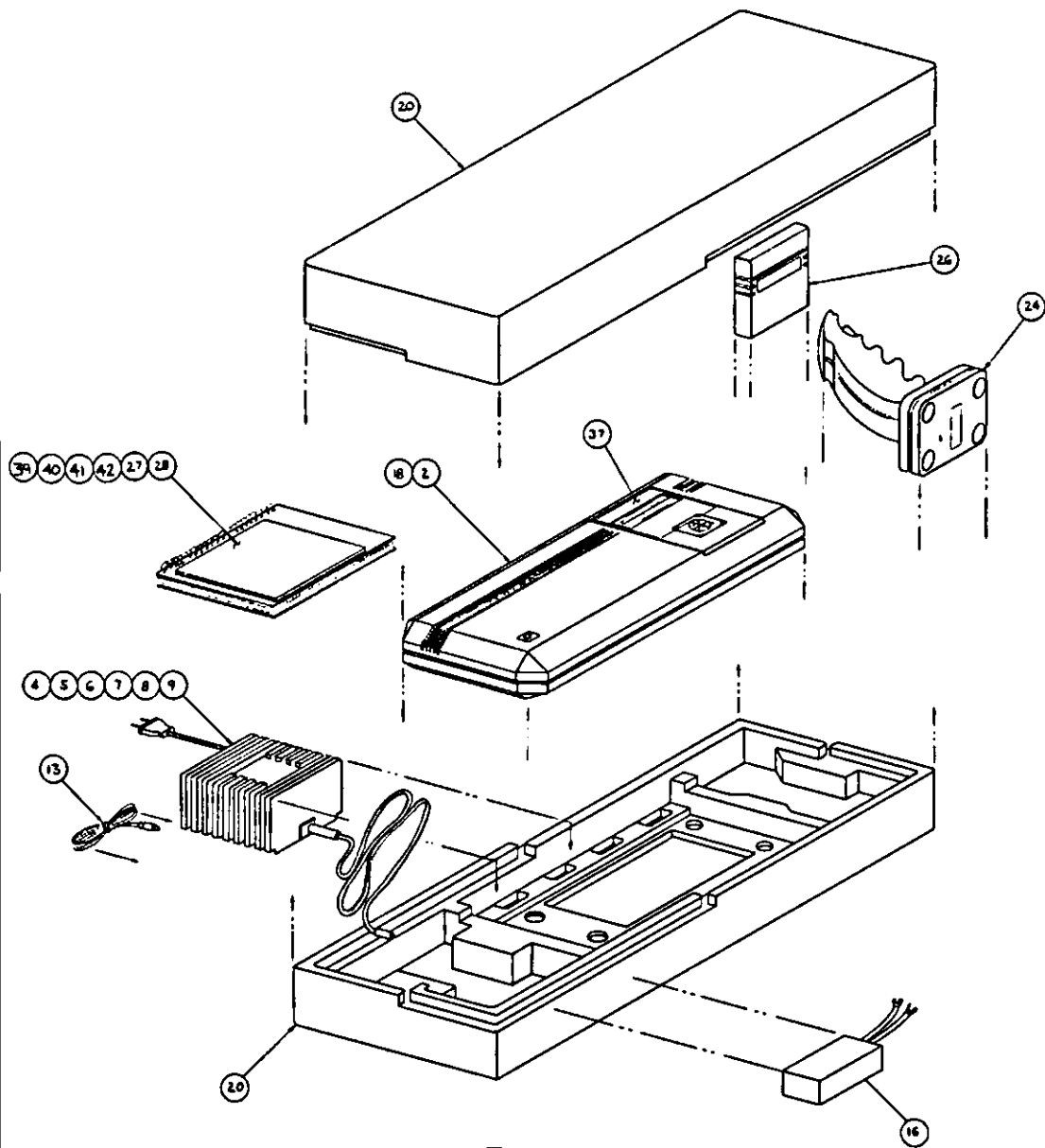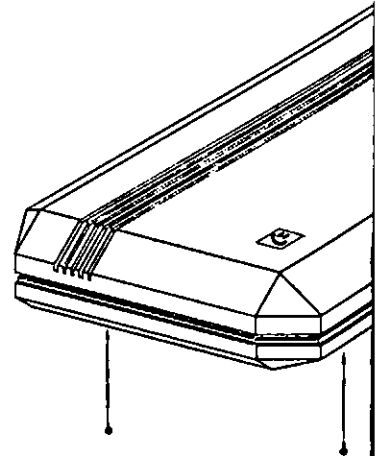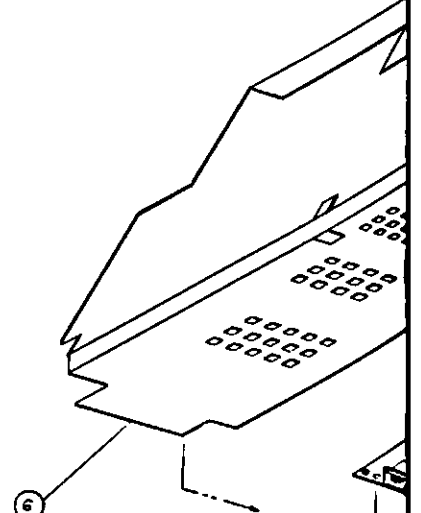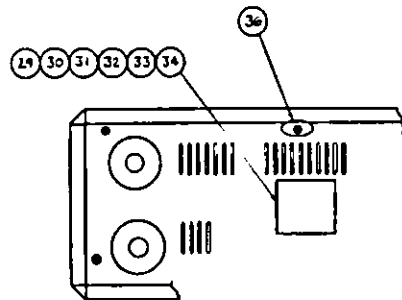| | |
|---|---|
| *MODULATOR SWITCH:* | A switch is provided on the modulator to change the audio carrier between 6MHz (UK) and 5.5MHz (continental Europe). |
| *RF OUTPUT:* | Supplies both the picture and sound to a PAL television set. |
| *AUDIO/VIDEO OUTPUT:* | This is a C64 style 8 pin DIN connector for Luma Chroma Audio connections to a PAL monitor |

### POWER REQUIREMENTS
240V, 50Hz

**CPU BOTTOM**

| REF. NO. | PART NO. | PART NAME |
|---|---|---|
| 1 | 363494-01 | MAIN ASSY (NTSC) |
| 2 | 363494-02 | MAIN ASSY (PAL) |
| 4 | 251053-07 | POWER SUPPLY SEV |
| 5 | 251053-09 | POWER SUPPLY UL |
| 6 | 251053-11 | POWER SUPPLY VDE |
| 7 | 251053-12 | POWER SUPPLY BSI |
| 8 | 251053-10 | POWER SUPPLY UL/CSA |
| 9 | 251053-13 | POWER SUPPLY SEV SUB |
| | 251053-15 | POWER SUPPLY SAA |
| 13 | 251846-01 | CABLE, RF - PAL |
| 16 | 325228-01 | SWITCH, RF - SWEDEN |
| 18 | 1540025-01 | BAG, PLASTIC |
| 19 | 324257-01 | BAG, DRYING AGENT |
| 20 | 363528-01 | END CAP, FOAM |
| 21 | 363529-01 | SLEEVE, C64 CONSOLE |
| 23 | 363530-01 | BOX, MASTER SHIPPING (1/4) |
| 24 | 363531-01 | JOYSTICK |
| 26 | 363535-01 | CARTRIDGE |
| 27 | 363536-01 | MANUAL, C64GS SYSTEM GUIDE |
| 28 | 363357-01 | MANUAL, C64GS GAME GUIDE |
| 29 | 366386-01 | LABEL, RATING (W. GERMAN PROD) |
| 30 | 366386-02 | LABEL, RATING (W. GERMAN PROD) |
| 31 | 366386-03 | LABEL, RATING (HK PROD) |
| 32 | 366386-04 | LABEL, RATING (HK PROD) |
| 33 | 366386-05 | LABEL, RATING (CHINA PROD) |
| 34 | 366386-06 | LABEL, RATING (CHINA PROD) |
| 36 | 325090-02 | STICKER, SEAL |
| 37 | 366427-01 | LABEL, STATIC CLING |

| REF. NO. | PART NO. | PART NAME |
|---|---|---|
| 1 | 363495-01 | TOP CASE ASSY |
| 2 | 313491-01 | BOTTOM CASE ASSY NTSC |
| 3 | 313491-02 | BOTTOM CASE ASSY PAL |
| 4 | 390177-02 | SCREW, SELF TAP #5 TORX 3/8" QTY = 5 |

| REF. NO. | PART NO. | PART NAME |
|---|---|---|
| 1 | 313490-02 | BOTTOM CASE |
| 2 | 950150-03 | FOOT, SELF ADHESIVE QTY = 4 |
| 3 | 250469-09 | PCB ASSY C64E NTSC |
| 4 | 250469-10 | PCB ASSY PAL |
| 5 | 906883-03 | SCREW SELF TAP M3 X 6.0 |
| 6 | 363532-01 | SHIELD, PAPER WRAP AROUND |

| REF. NO. | PART NO. | PART NAME |
|---|---|---|
| 1 | 313489-01 | TOP CASE |
| 2 | 313488-01 | ACCENT PLATE |
| 3 | 251191-01 | DOOR |
| 4 | 251194-01 | DOOR SHAFT |
| 5 | 251193-01 | DOOR SPRING |
| 6 | 390866-01 | DOOR SHAFT BRACKET |
| 7 | 363694-01 | RIVET, PLASTIC |
| 8 | 380016-02 | LED, POWER ON L + 360MM |
| 9 | 380133-06 | LOGO |
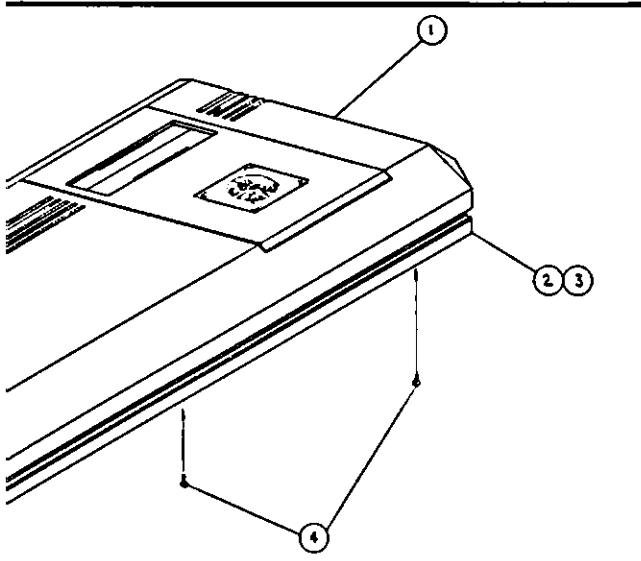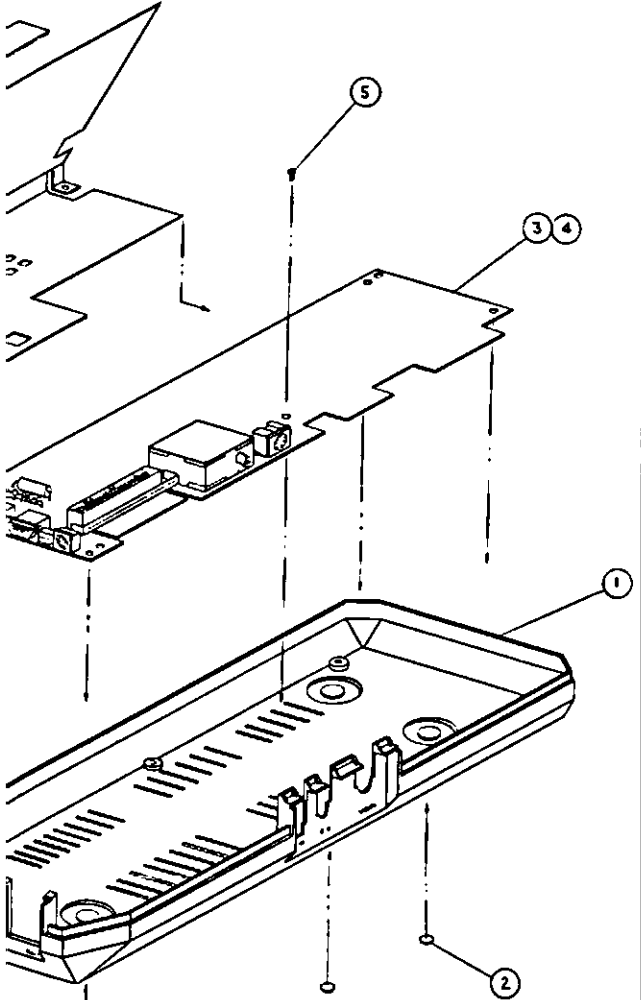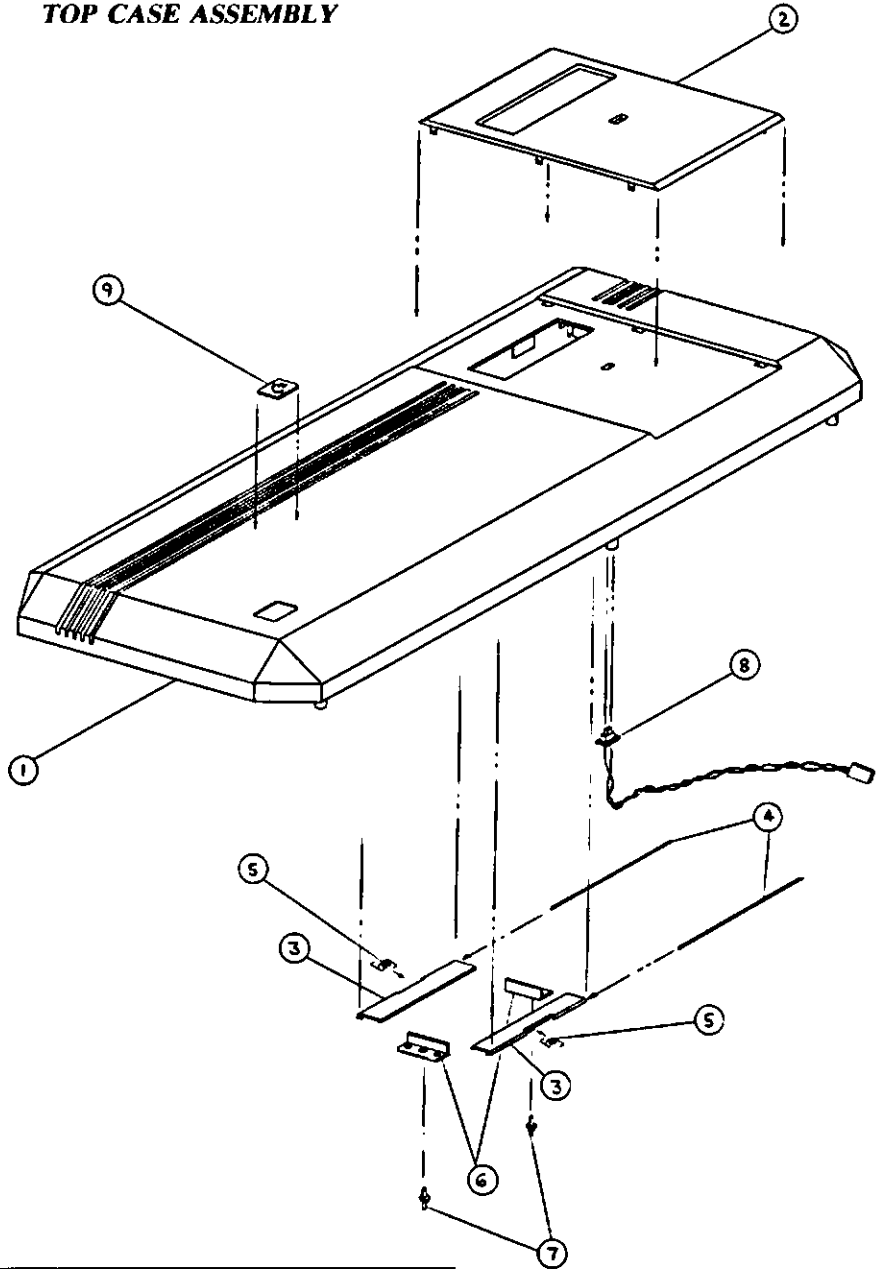
# C64 GAME SYSTEM
# ASSEMBLY DIAGRAMS

PCB ASSY NO. 250469
PCB NO. 252311 REV.B
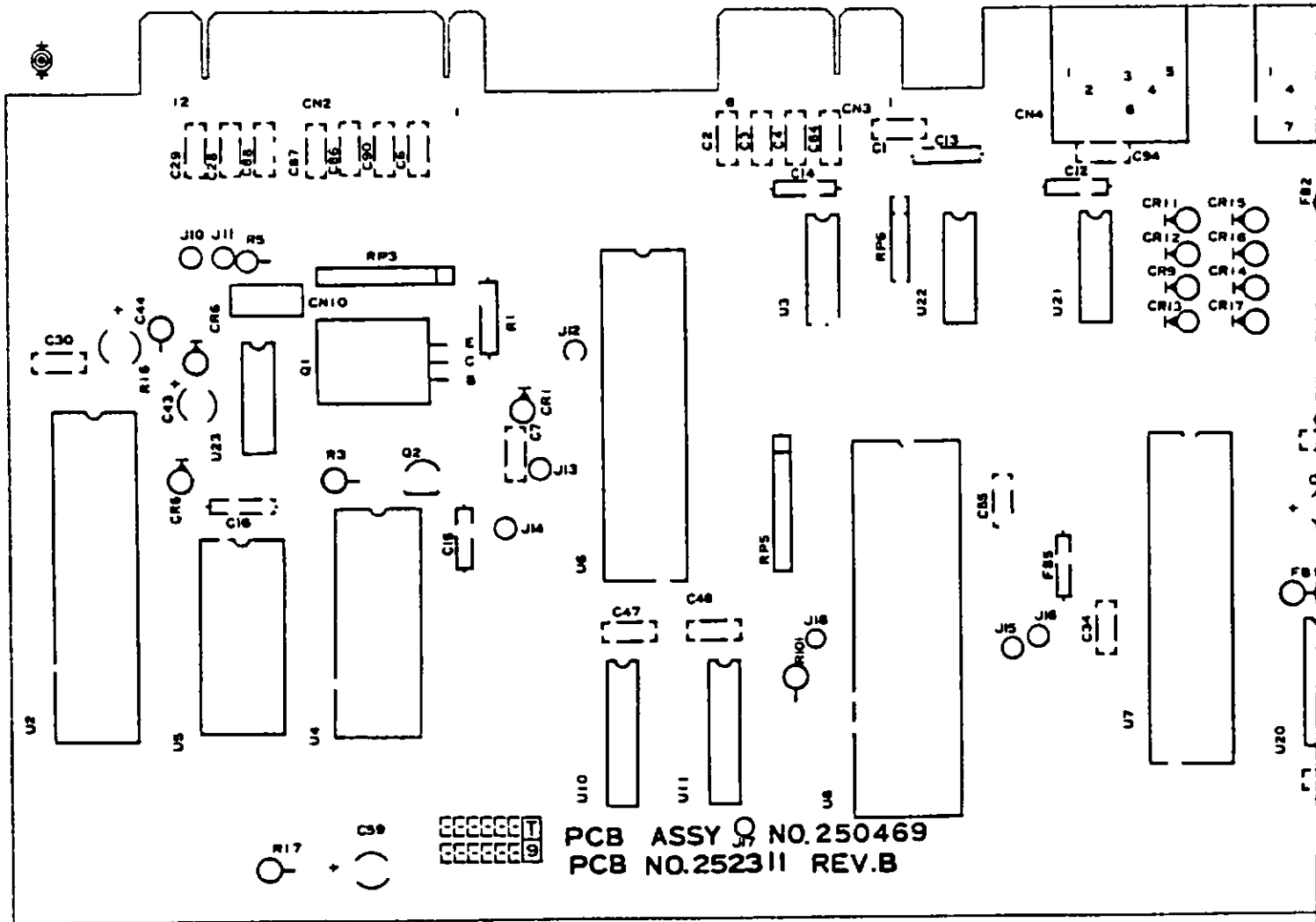
Commodore Internat[ional]
PCB Co[...]
PCB Assembly #25[0...]

| IC COMPONENTS | | |
|---|---|---|
| 318012-01 | 8500 | U6 |
| 906108-01 | 6526 | U1,U2 |
| 318027-01 | 8565 | U7 |
| 318013-01 | 8580 | U9 |
| 901225-01 | 2332 ROM CHAR | U5 |
| 901502-01 | 4066 | U18,U21 |
| 901522-06 | 7406 | U22 |
| 901521-03 | 74LS08 | U3 |
| 901521-30 | 74LS14 | U23 |
| 251527-08 | 8701T6 | U20 |
| 251527-09 | 8701L6 | SUB FOR 251527-08 |
| 901453-07 | 2114 | U19 (USE W/U8 & REV A PCB) |
| 390083-02 | 64K X 4 BIT DRAM, QTY 2 | U10,U11 |
| 390083-01 | 64 X 4 BIT DRAM | SUB FOR 390083-02 |
| 901453-09 | 2114 | U19 |
| 901522-14 | 7416 | U22 SUB FOR IC 7406 |
| 390083-12 | 64K X 4 BIT DRAM | U10,U11 SUBSTITUTE |
| 390083-05 | 64K X 4 BIT DRAM | U10, U11 SUBSTITUTE |
| 390889-01 | 128K ROM (GAME) U.S. PAL | U4 |
| 251715-01 | MEMORY CONTROLLER | U8 SUB USE W/REV A PCB |
| 252535-01 | MEMORY CONTROLLER | U8 |

| RESISTOR PACKS | | |
|---|---|---|
| 902441-22 | 1K 6PIN 5EL | RP6 |
| 902412-07 | 3.3K 9PIN 8EL | RP4 |
| 902442-29 | 3.3K 6PIN 7EL | RP3,RP5 |

| RESISTORS 5% @ ¼ WATT, CARBON FILM, UNLESS OTHERWISE SPECIFIED | | |
|---|---|---|
| 251068-65 | 390 OHM | R5 |
| 251068-69 | 560 OHM | R16 |
| 251068-76 | 1K | R3,R12 |
| 251068-101 | 10K | R9,R17 |
| 251068-126 | 100K | R14 |
| 251068-51 | 100 OHM | R101 |
| 901600-14 | 10 OHM, ½ W, 5% | R19 |
| 251068-82 | 1.8K | R100 |

| CAPACITORS | | |
|---|---|---|
| 251069-04 | CER RAD 470 PF 50V | C2-4,6,76,90 |
| 251069-12 | CER RAD 2000 PF 50V | C80,C81 |
| 251075-06 | CER RAD 0.1 UF 25V | C1,7,28-30,34,35,37,39, 40,47,48,55,61,69,79,84 |
| 251304-71 | CER RAD 22000 PF 50V | C70,C71 |
| 251079-06 | ELEC 2.2 PF 50V | C44 |
| 900100-11 | ELEC RAD 4.7 PF 25V | C59 |
| 900100-01 | ELEC RAD 10 PF 25V | C77 |
| 900100-40 | ELEC RAD 100 PF 16V | C58 |
| 900100-03 | ELEC RAD 220 PF 25V | C65 |
| 900101-52 | ELEC RAD 1000 PF 16V | C63 |
| 900100-33 | ELEC RAD 47 PF 16V | C36 |
| 900100-18 | ELEC RAD 220 PF 16V | C43 |
| 390101-07 | ELEC RAD 470 PF 35V | C66 |
| 251074-09 | ELEC RAD 22000 PF 25V | C70,C71 SUB FOR 251304-71 |
| 251029-02 | TRIMMER 7.7-40 PF | CT-1 |
| 251075-01 | CER RAD 0.01 UF | C56 |

TW-2594V-0

OPEN: NTSC
SHORT: PAL
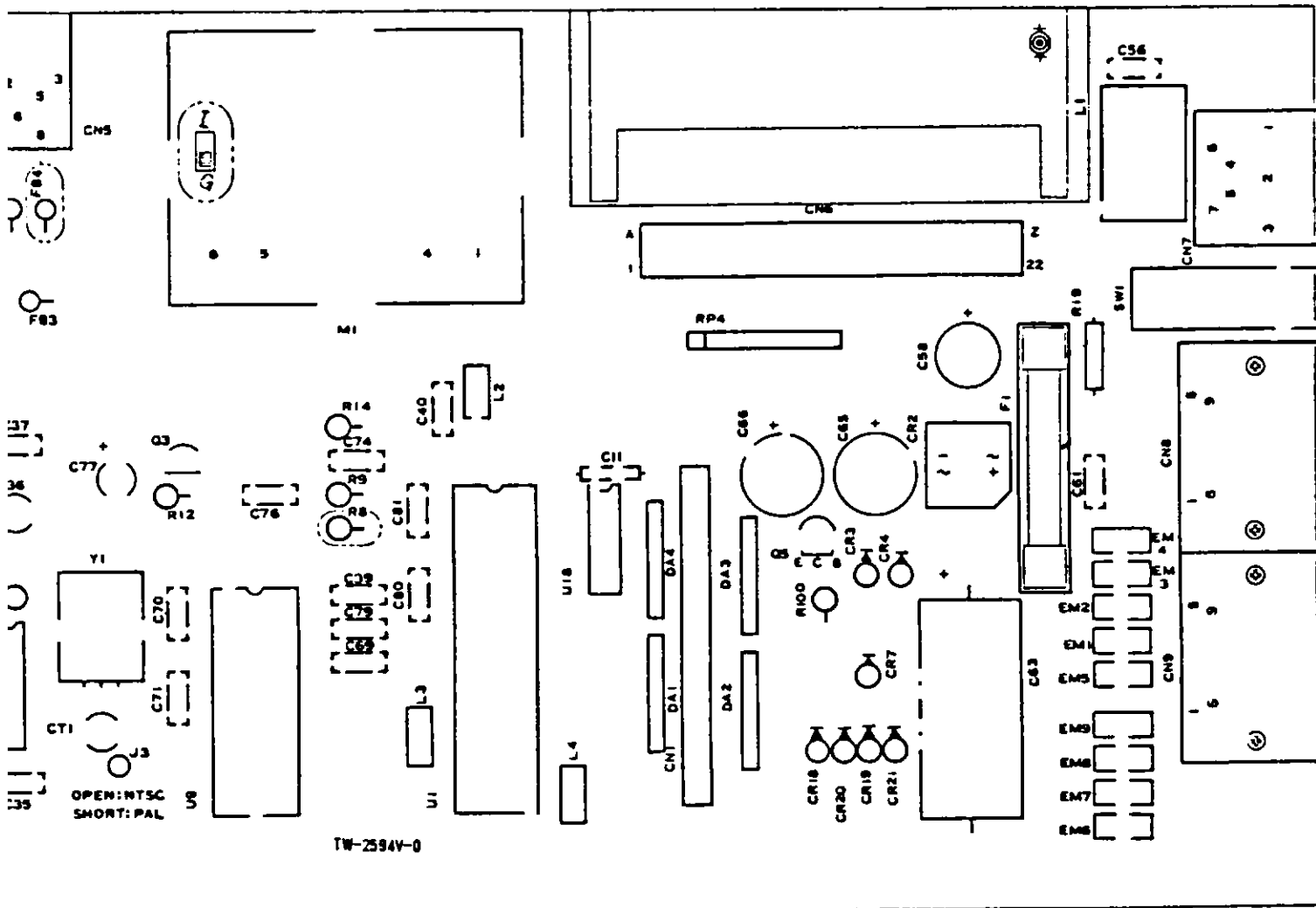
## ional Spare Parts List
### mponents
### 469-09, -10, REV. B

| CONNECTORS | | |
|---|---|---|
| 251116-01 | 7 PIN - POWER | CN7 |
| 252168-01 | 8 PIN - AUDIO/VIDEO | CN5 |
| 251057-01 | 9 PIN MINI D - CONTROL PORTS | CN8, CN9 |
| 903332-03 | HEADER ASSY 3 PIN | CN10 |
| 251251-01 | 44 PIN CARD EDGE - EXPANSION | CN6 |

| MISCELLANEOUS | | |
|---|---|---|
| 903025-08 | FERRITE BEAD LONG | FB7-FB10 |
| 252214-01 | FERRITE BEAD 2 TURN | FB1 |
| 325563-01 | FERRITE BEAD | FB2,3,4 (FB4 S/B COVERED W/ ASHRINK TUBE) |
| 252341-01 | RF CHOKE COIL | L3,4 |
| 251878-02 | LINE FILTER 8 TERMINAL | L1 |
| 251878-01 | LINE FILTER 8 TERMINAL | L1 SUB FOR 251878-02 |
| 251468-01 | CRYSTAL 17.73447 MHZ | Y1 CL 18PF |
| 200018-13 | JUMPER WIRE | USE ON Y1 |
| 901151-17 | COIL INDUCTOR 2.2 | L2 |
| 900750-01 | DIODE IN4001 | CR3,4 |
| 251819-16 | DIODE IN914 R | CR5,9,11-21 |
| 251819-01 | DIODE IN4148 R | CR5,9,11-21 SUB FOR 251819-16 |
| 906103-04 | DIODE ZENER RD30EB1 | CR6 |
| 906103-05 | DIODE ZENER RD3.0EB2 | SUB FOR 906103-04 |
| 252313-63 | DIODE ZENER RD10ESB2 | CR7 FOR 8580 (HMOS SID) Vz = 9.48-9.90 AT 5mA |
| 252337-61 | DIODE ZENER HZ11A1 | SUB FOR 252313-63 |

| MISCELLANEOUS *(Continued)* | | |
|---|---|---|
| 252026-01 | DIODE BRIDGE RECT S2VB10 | CR2 |
| 251026-02 | DIODE BRIDGE RECT DBA20B | SUB FOR 251026-01 |
| 251026-03 | DIODE BRIDGE RECT DBA20C | SUB FOR 251026-01 |
| 251842-01 | EMI FILTER 270PF | EMI1-9 DST310-55Y5S271M |
| 390257-03 | EMI FILTER 270PF | EMI1-9 SUB DSS310-55Y5S271M |
| 902694-01 | TRANSISTOR 2SC1815 | Q2,Q3 |
| 902671-01 | TRANSISTOR 2SC945 | Q2,Q3 SUB |
| 251526-01 | TRANSISTOR 2SC2458 | Q2,Q3 SUB |
| 252338-01 | TRANSISTOR NPN 900mW | Q5 |
| 252405-03 | MODULATOR - PAL | M1 |
| 904150-02 | SOCKET 16 PIN (USE ON U20) | |
| 904150-05 | SOCKET 28 PIN (USE ON U4,U9) | |
| 904150-06 | SOCKET 40 PIN (USE ON U7) | |
| 903556-18 | FUSE, NORMAL BLO 250V 1.5A | F1 |
| 906102-02 | FUSE, CLIP (USE ON F1) | |
| 906102-01 | FUSE CLIP | SUB FOR 906102-01 |
| 904500-01 | SWITCH, ROCKER DPDT | SW1 |
| 363531-01 | CARTRIDGE GUIDE - CONSOLE | |
| 906683-03 | SCREW SELF TAP M3 X 6 (FOR 9PIN DSUB) | |
| 332299-01 | INSULATION TAPES | |

NOTES-UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTORS ARE 1/4 WATT ±5%.

2. ALL CAPACITOR VALUES ARE IN μF.

[3] Y1 : 14.31818 MHz FOR NTSC    CL=18P
        17.734472 MHz FOR PAL    CL=18P

[4] DOT CLOCK : 8.18 MHz FOR NTSC
               7.88 MHz FOR PAL

[5] JUMPER CONECTION J3 OPEN : NTSC
                    J3 SHORT : PAL

[6] POWER SUPPLY
    6581 SID VERSION :
        CR7-12.6V SHOULD BE USED
    8580 SID VERSION :
        CR7-9.6V SHOULD BE USED

[7] FRANCE VERSION
    R2 : 20Ω RESISTOR & C63 : 2200μF CAPACITOR REQUIRED

[8] R8 RESISTOR SHOULD BE REMOVED FOR 8580 SID.

C70,71 : 22000pF FOR 6580
         470pF FOR 6561
C80,81 : 2200pF FOR 8580
         1800pF FOR 6561

## CARTRIDGE EXPANSION SLOT CN6
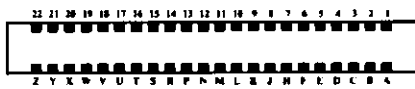
| PIN | TYPE | PIN | TYPE |
|-----|------|-----|------|
| 1 | GND | A | GND |
| 2 | +5V | B | ROMH |
| 3 | +5V | C | RESET |
| 4 | IRQ | D | NMI |
| 5 | R/W | E | S 02 |
| 6 | Dot Clock | F | A15 |
| 7 | I/O 1 | H | A14 |
| 8 | GAME | J | A13 |
| 9 | EXROM | K | A12 |
| 10 | I/O 2 | L | A11 |
| 11 | ROML | M | A10 |
| 12 | BA | N | A9 |
| 13 | DMA | P | A8 |
| 14 | D7 | R | A7 |
| 15 | D6 | S | A6 |
| 16 | D5 | T | A5 |
| 17 | D4 | U | A4 |
| 18 | D3 | V | A3 |
| 19 | D2 | W | A2 |
| 20 | D1 | X | A1 |
| 21 | D0 | Y | A0 |
| 22 | GND | Z | GND |

## JOYSTICK CN8, CN9
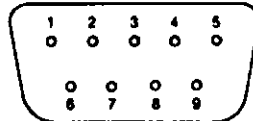
| PIN | PORT 1 TYPE | PORT 2 TYPE |
|-----|-------------|-------------|
| 1 | JOYA0 | JOYB0 |
| 2 | JOYA1 | JOYB1 |
| 3 | JOYA2 | JOYB2 |
| 4 | JOYA3 | JOYB3 |
| 5 | POT AY | POT BY |
| 6 | BUTTON A/LP | BUTTON B |
| 7 | +5V (Max 50MA) | +5V |
| 8 | GND | GND |
| 9 | POT AX | POT BX |

## AUDIO/VIDEO CN5
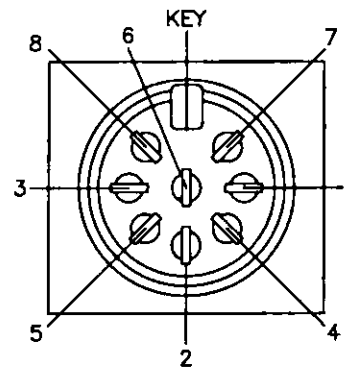
| PIN | TYPE | PIN | TYPE |
|-----|------|-----|------|
| 1 | LUM | 5 | AUD/IN |
| 2 | GND | 6 | COLOR |
| 3 | AUD/OUT | 7 | NC |
| 4 | COMPOSITE | 8 | +5 |

## POWER CN7
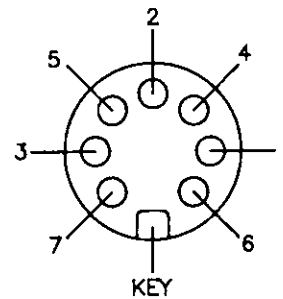
| PIN | TYPE | PIN | TYPE |
|-----|------|-----|------|
| 1 | NC | 5 | +5 VDC |
| 2 | GND | 6 | 9VAC |
| 3 | NC | 7 | 9 VAC |
| 4 | NC | | |

## TROUBLESHOOTING GUIDE C64 GAMES SYSTEM (C64 E PCB)

| SYMPTOM | POSSIBLE SOLUTION |
|---------|-------------------|
| Abnormal colors appear in text | Check U19 (2114 RAM); U21 (4066); U7 (VIC) |
| Wrong characters are displayed | Check RAM (U10,U11) |
| System does not reset | Check U20 (556 IC) |
| White band scrolls down the screen (60/50 Hz Hum) | Check External Power Supply; VR2 (5V regulator) |
| Wavy screen after system warms up | Check External Power Supply — U20, U7 |
| Black band scrolls through screen when system warms up | Check External Power Supply; CR2, C65, C66 |
| Blank screen on power up | Check External Power Supply; U4 (Kernal/Basic ROM); U8 (MMU); U6 (MPU); U7 (VIC); U22, U23; U10, U11 (RAM); C22 |
| System powers up with all characters displayed as blocks | Check U8 (MMU); U7 (VIC) |
| Intermittent display | Check Connectors — C63, C66 |
| Joystick does not operate correctly | Check U1 (CIA); U18 (4066); EMI 1-9 |
| Wrong frequency | Check C70, C41 |
| No text is displayed | Check U4, U5 (ROMS); U2 (CIA); U7 (VIC) |
| Graphic characters displayed instead of text displayed | Check U7 (VIC); U2 (CIA); U8 (MMU) |
| No Sound | Check U19 (SID); F1 (Blown fuse) |