PIONEER®

1940

Service Manual

CIRCUIT DESCRIPTIONS
REPAIR & ADJUSTMENTS

ORDER NO.
ARP-615-0

VIDEO DISC INTERFACE

IU-04

- **This service manual is applicable to the KU type.**

CONTENTS

PIONEER ELECTRONIC CORPORATION 4-1, Meguro 1-Chome, Meguro-ku, Tokyo 153, Japan
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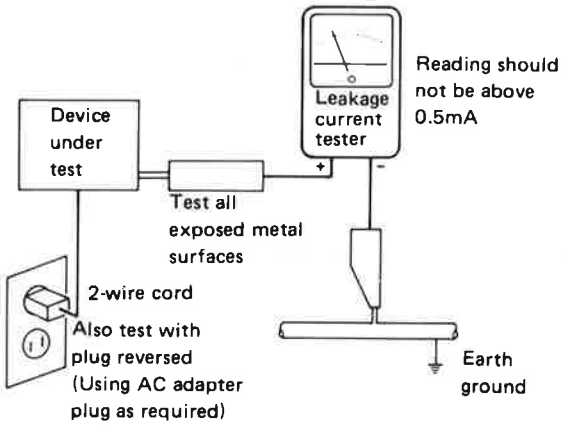
1. SAFETY INFORMATION

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which dose not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

QUESTIONNAIRE MODEL _____

One Model per questionnaire

Dear Servicer,

Thank you for your cooperation in the post-sale service of Pioneer products.

This questionnaire is used as a tool to improve the serviceability of our products and service manuals. Please evaluate this model and service manual by answering the following questions. Your ideas may be realized in our future products. Your answers will be appreciated. Thank you.

PIONEER ELECTRONIC CORP.

T. Nakagawa, Manager, Service Section, International Division

1. SERVICING EVALUATION	Circle applicable number:	Good		Fair		Poor
a. Disassembly/Re-assembly:		1	2	3	*4	*5
b. Circuit Checks:		1	2	3	*4	*5
c. Replacement of Parts:		1	2	3	*4	*5
d. Adjustment (s):		1	2	3	*4	*5

* If (4) or (5) was circled, please be specific.

e. Your advice, opinion or ideas related to servicing this product.

2. SERVICE MANUAL EVALUATION

a. Circuit & Mechanism Description

b. Circuit Diagram

3. OTHER

Please describe other areas of servicing which you may find difficult.

Completed by : Date :

Company Name :

Address :

City/State/Zip :

Please send this form filled to the distributor in your country.

2. SPECIFICATIONS

VIDEO SIGNAL SECTION

■ Input level/Impedance
Video Disc ..... 1 V_{p-p}/75 Ohm (RCA pin jack)
Computer Video ..... 1 V_{p-p}/75 Ohm (RCA pin jack)
Computer RGB ... TTL level (8-Pin Rectangular connector)
■ Output Level/Impedance
Video ..... 1 V_{p-p}/75 Ohm (RCA pin jack)
RGB ..... TTL level (8-Pin DIN jack)
VHF ..... U.S. ch 3/4 switchable 75 Ohm unbal. (F type connector)

CONTROL SECTION

■ Video Disc I/O port .....
Corresponds to LD-700, LD-V4000 I/O port: (8-Pin DIN jack)
■ Display .....
Corresponds to SD-25 remote control port (mini 3P jack)

COMPUTER INTERFACE SECTION

Serial transmission in conformity to RS-232C
(D-sub 25P connector)
Input by ASCII or HEX code

Mode selector switch
Baud rate ..... 600, 1200, 2400, 4800 baud
Parity bit ..... ODD, EVEN, or NON
Stop bit ..... 1 or 2
Data bit ..... 7 or 8
Code ..... ASCII or HEX

MISCELLANEOUS

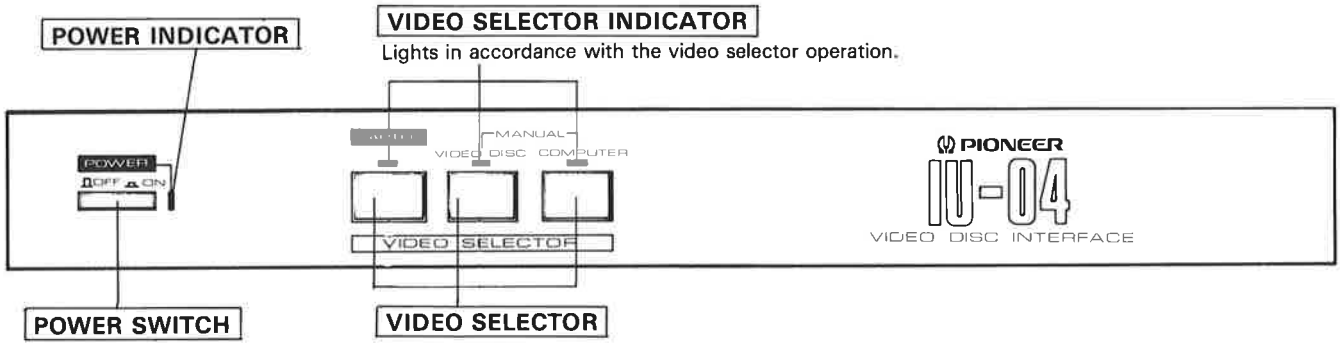
Power source ..... AC 120 Volts, 50/60 Hz
Power consumption ..... 10 Watts
External Dimensions ..... 420(W) x 50(H) x 300(D) mm
16-9/16(W) x 2(H) x 11-13/16(D) in
(excluding legs and protuberances)
Weight ..... 3.6 kg (7 lb 15 oz)
Ambient temperature during use ..... +5°C ~ +35°C

ACCESSORIES

8-Pin DIN - 8-Pin DIN cord (for connection to LD-700) 1
RF Switch 1
F Type-Pin connection cord 1
Operating Instructions 1

NOTE:
Specifications and design subject to possible modifications without notice due to improvements.

3. FRONT PANEL FACILITIES



POWER SWITCH

When power is switched on, if the video selector is in the AUTO position the monitor will display the video disc player screen, and the control device will be switched to video disc player.

VIDEO SELECTOR

AUTO:

Monitor screen is automatically switched between computer and video disc by computer command.
The control device automatically switches between video disc player and display SD-25 by computer command.

NOTE:
In this case, the video disc player's remote control unit cannot be used.

MANUAL:

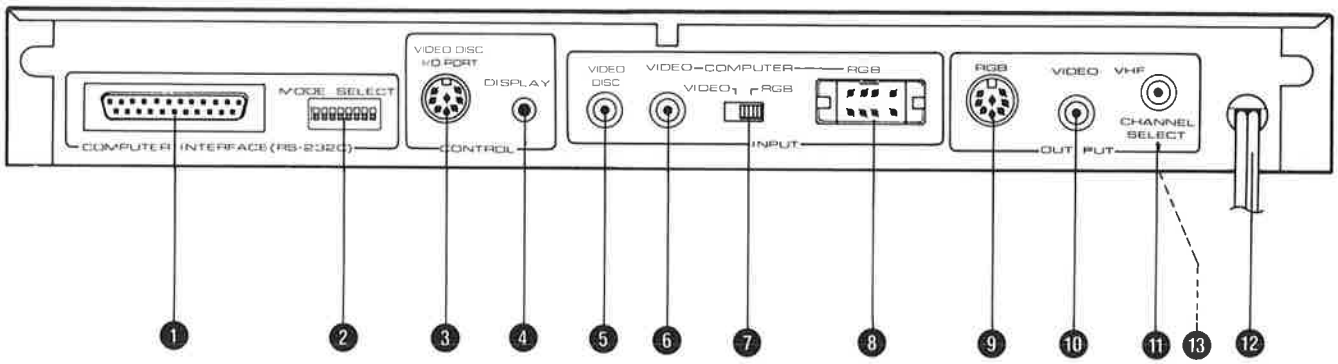
VIDEO DISC: Monitor screen functions as video disc display.

NOTE:
In this case, the personal computer cannot be used to control the video disc player, but the video disc player's remote control unit can be used.

COMPUTER: Monitor screen functions as personal computer display.
The control device switches automatically between video disc player and display SD-25 by computer command.

NOTE:
In this case, the video disc player's remote control unit cannot be used. In either the [AUTO] or [MANUAL] modes, the display SD-25 can be controlled by computer command.

4. REAR PANEL FACILITIES



❶ COMPUTER INTERFACE PORT (RS-232C specification)

❷ RS-232C MODE SELECTOR SWITCH

Used to select transmission rate, and bit number (for details see pages 27 and 28).

❸ VIDEO DISC I/O PORT CONTROL TERMINALS

These are the input/output terminals for controlling the video disc player. Connect to the external control terminals of the LD-700 or the LD-V4000.

❹ DISPLAY COMMAND OUTPUT TERMINALS

Connect to the RGB/composite terminals of the RGB pack SD-R5 installed on the Component Display SD-25.

❺ VIDEO DISC INPUT TERMINAL (1Vp-p/75 Ω)

Connect to the video output terminal of the video disc player.

❻ COMPUTER VIDEO INPUT TERMINAL (1Vp-p/75 Ω)

Connect to the video output terminals of your computer.

❼ COMPUTER VIDEO SELECTOR SWITCH

Used for selecting the video signal input terminal from the computer.

❽ RGB INPUT TERMINAL (TTL level)

Connect to the computer's RGB output terminal.

❾ RGB OUTPUT TERMINAL (TTL level)

Connect to the computer's RGB monitor TV.
The signal from the RGB input terminal is output here to the RGB monitor TV regardless of the position of the computer video selector switch.

❿ VIDEO OUTPUT TERMINAL (1Vp-p/75 Ω)

Connect to the monitor's video input terminal. The signal from the RGB input terminal is converted to a monochrome (black and white) signal, and output here.

⓫ VHF OUTPUT TERMINAL (75 Ω)

Connect to the antenna terminal of a normal television set. The signals from the RGB input terminal are converted to a monochrome signal and output here.

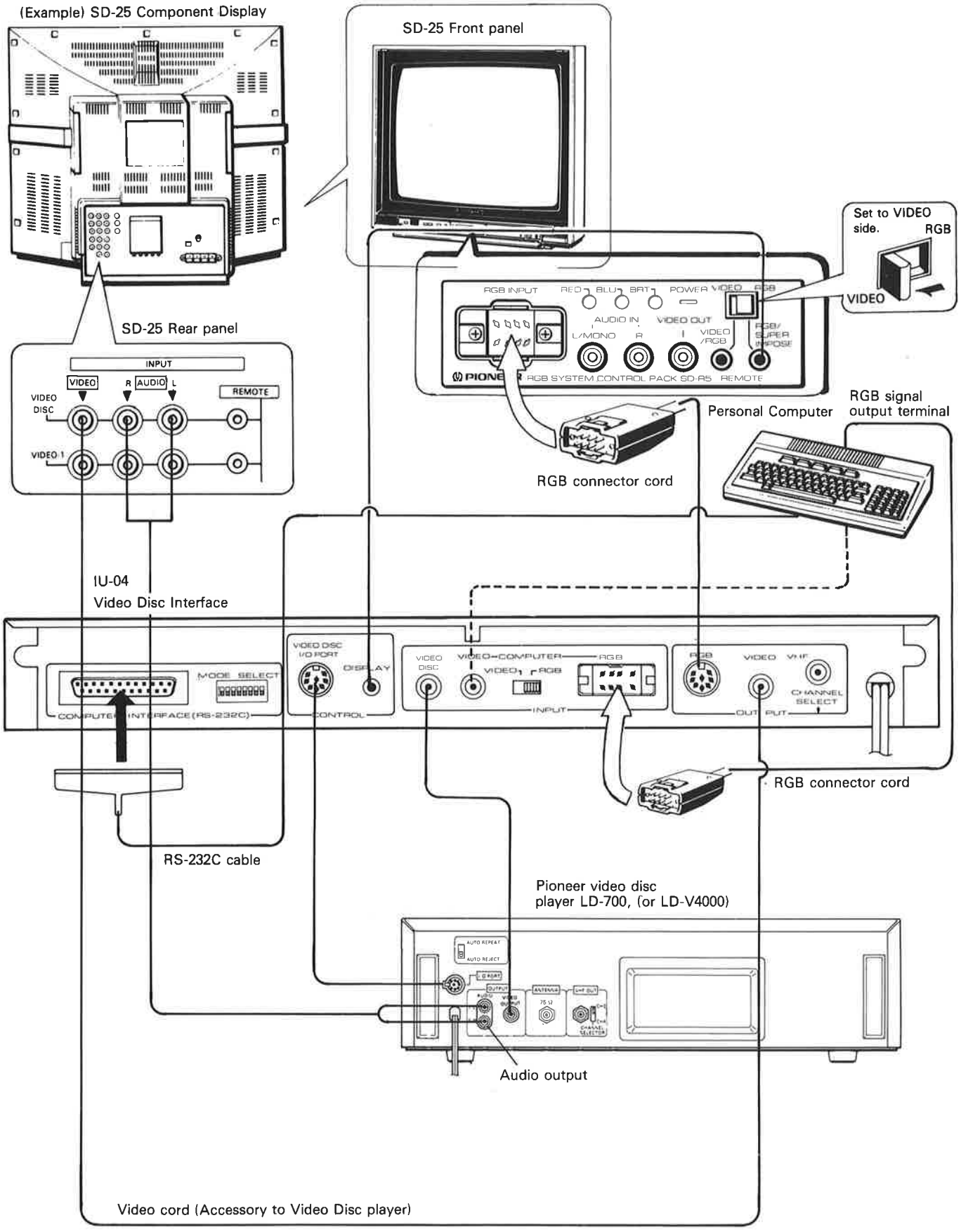
⓬ POWER CORD

Connect to an AC 120 V 50/60 Hz wall outlet.

⓭ CHANNEL SELECT SWITCH (Bottom panel)

This is the interface's VHF output channel selector switch. In the United States, it can be switched to TV channel 3 or 4, whichever is empty (non-broadcasting). Set to the number (3 or 4) of the empty channel in your area.

5. CONNECTIONS

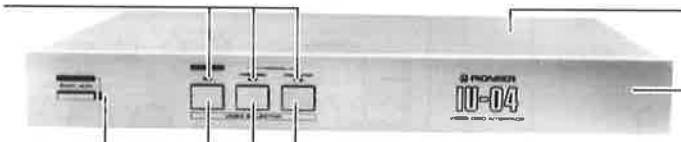


6. PARTS LOCATION

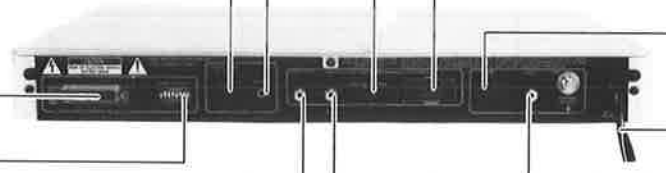
NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

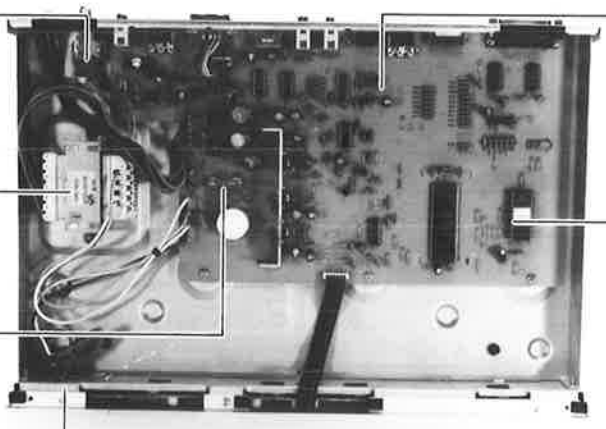
Front Panel View



Rear Panel View



Top View with Bonnet Case Removed

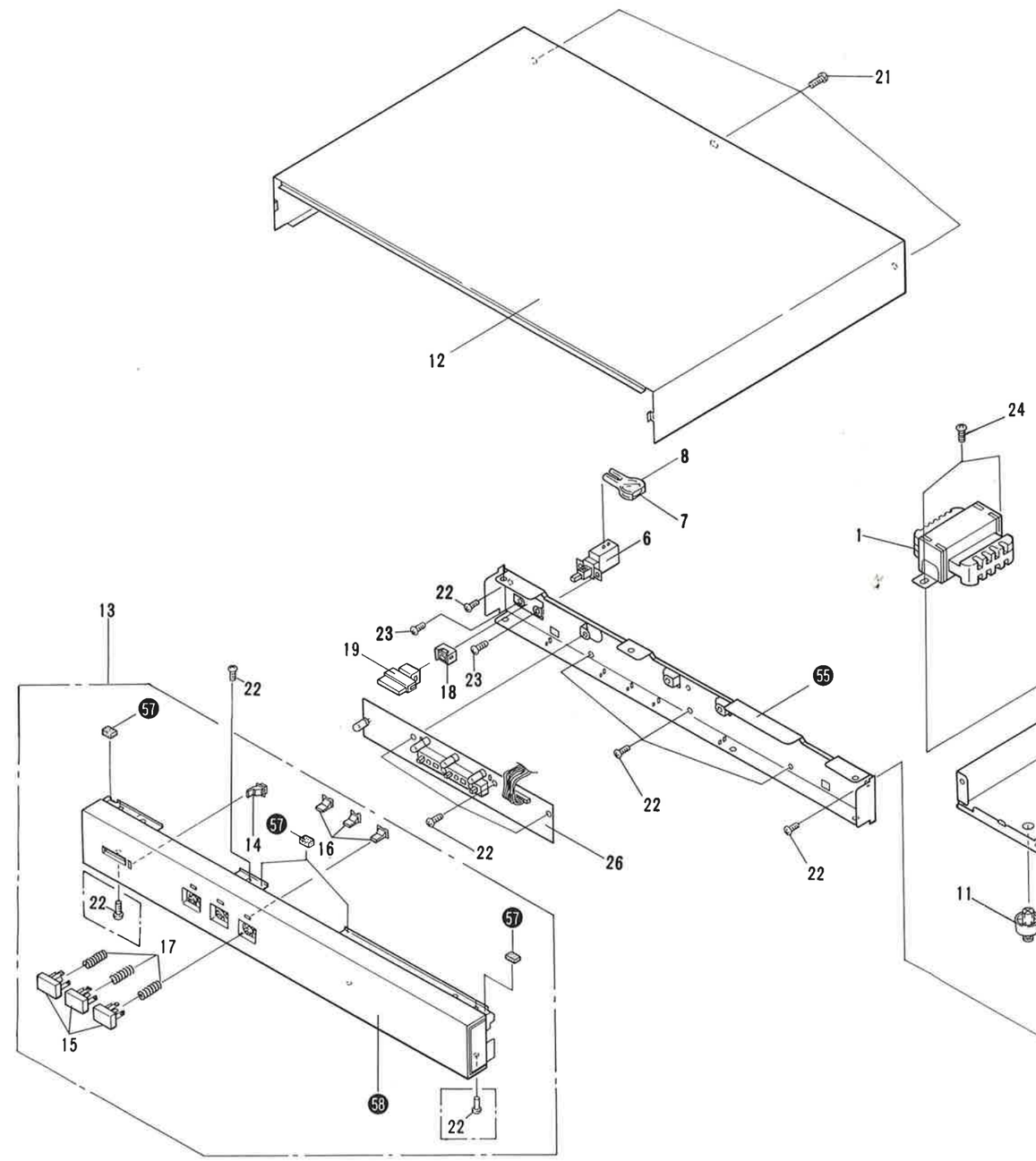


7. EXPLODED VIEW

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Mark	No.	Part No.	Description
⚠ ★	1	DTT-103	Power transformer
⚠	2	VDG-016	AC Power cord
	3	VEC-174	Strain relief
⚠ ★★	4	REK-080	Fuse 1A
	5	DKP-116	Socket 8-p
⚠ ★★	6	RSA-063	Switch (POWER)
⚠	7	RCG-006	Capacitor (C1, 0.01/AC125V)
	8	REC-297	Capacitor cover
	9	VNE-270	F-washer
	10	VLL-082	F-nut
	11	DEC-108	Foot assembly
	12	DXA-105	Bonnet case assembly
	13	DXA-104	Front panel assembly
	14	DAT-101	Indicator (POWER)
	15	DAC-104	Knob (VIDEO SELECTOR)
	16	DAT-102	Indicator (VIDEO SELECTOR)
	17	DBH-107	Spring
	18	VEC-151	Flexible joint
	19	DAC-105	Knob (POWER)
	20	BMZ20P080FZK	Screw 2 x 8

Mark	No.	Part No.	Description
	21	BBZ30P080FZK	Screw 3 x 8
	22	BBZ30P080FMC	Screw 3 x 8
	23	PMA30P060FMC	Screw 3 x 6
	24	PMB40P080FMC	Screw 4 x 8
	25	DWX-107	Main unit
	26	DWX-109	Front unit
	51		Mounting case
	52		Connector 8-p
	53		RF unit
	54		Chassis
	55		Front stay
	56		Rear panel
	57		Cushion
	58		Panel

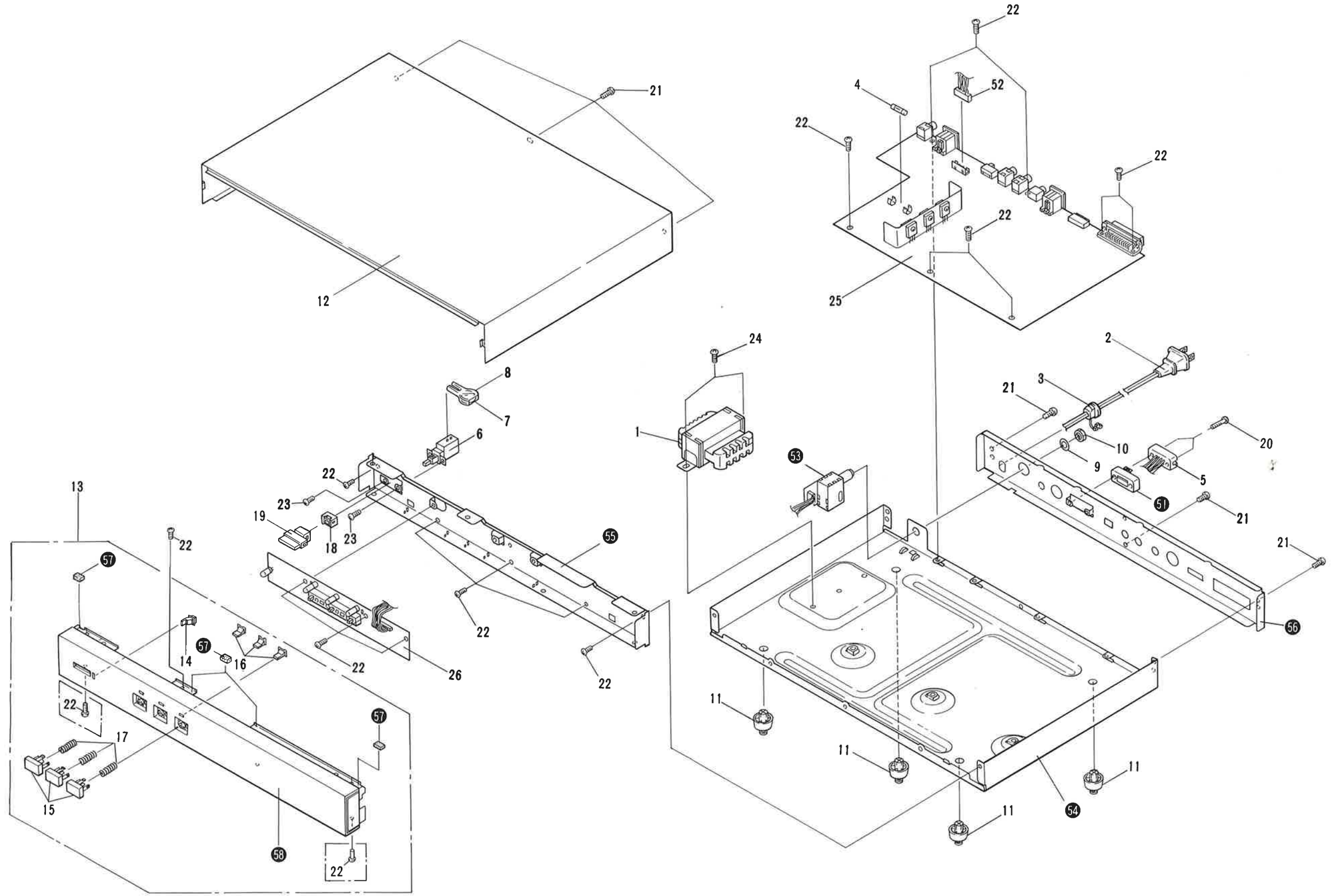


icates the importance of the
e sure to use parts of identical

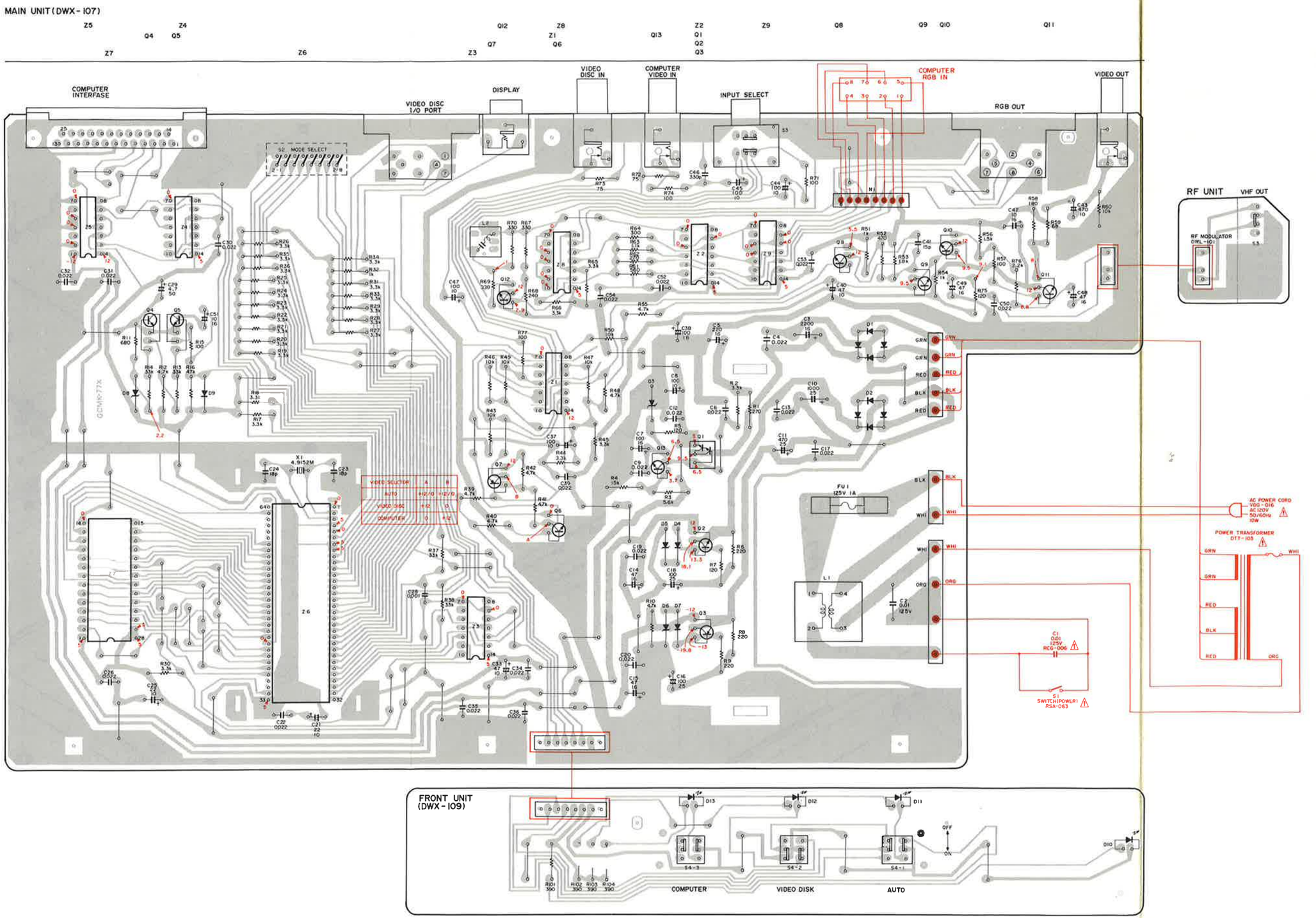
are indicated with the marks

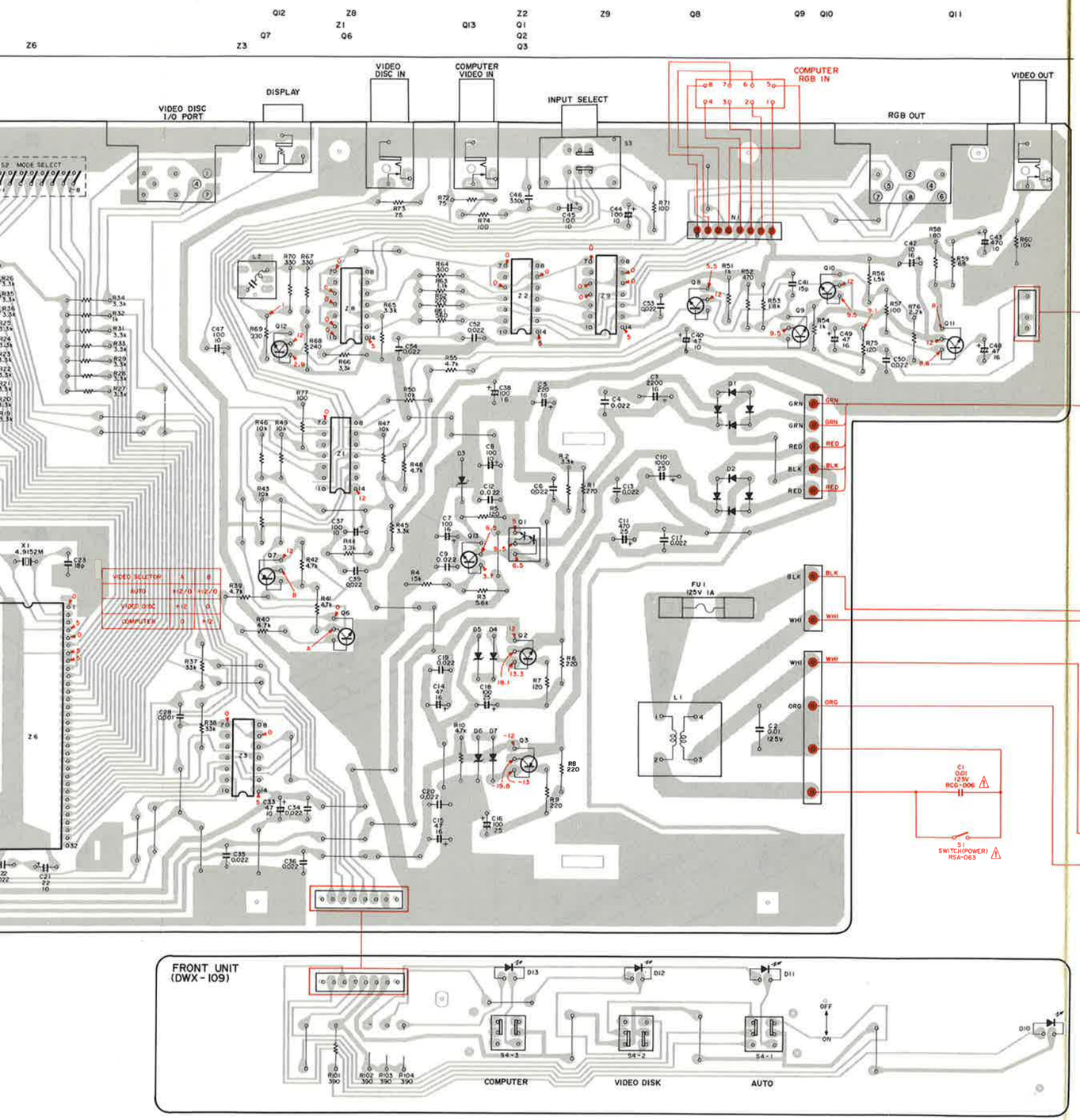
because it depends on model

	Description
	Screw 3 x 8
	Screw 3 x 8
	Screw 3 x 6
	Screw 4 x 8
	Main unit
	Front unit
	Mounting case
	Connector 8-p
	RF unit
	Chassis
	Front stay
	Rear panel
	Cushion
	Panel



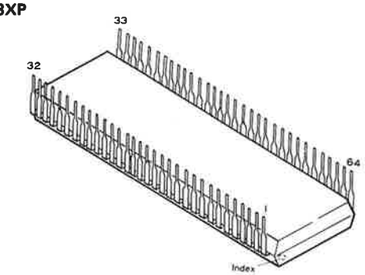
8. P.C.BOARDS CONNECTION DIAGRAM



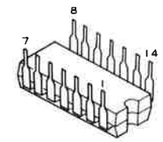


External Appearance of Transistor and ICs

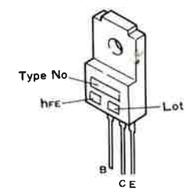
HD63A03XP



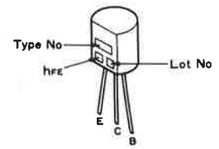
SN75188N
SN75189AN
SN7406N
(M53206P)
(HD7406P)
SN7407N
(M53207P)
(HD7407P)
SN74LS32N
(M74LS32P)
SN74LS136N
(M74LS136P)
TC4066BP



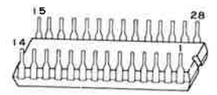
2SD1275
2SD1266
2SB941



2SA933
2SC1740

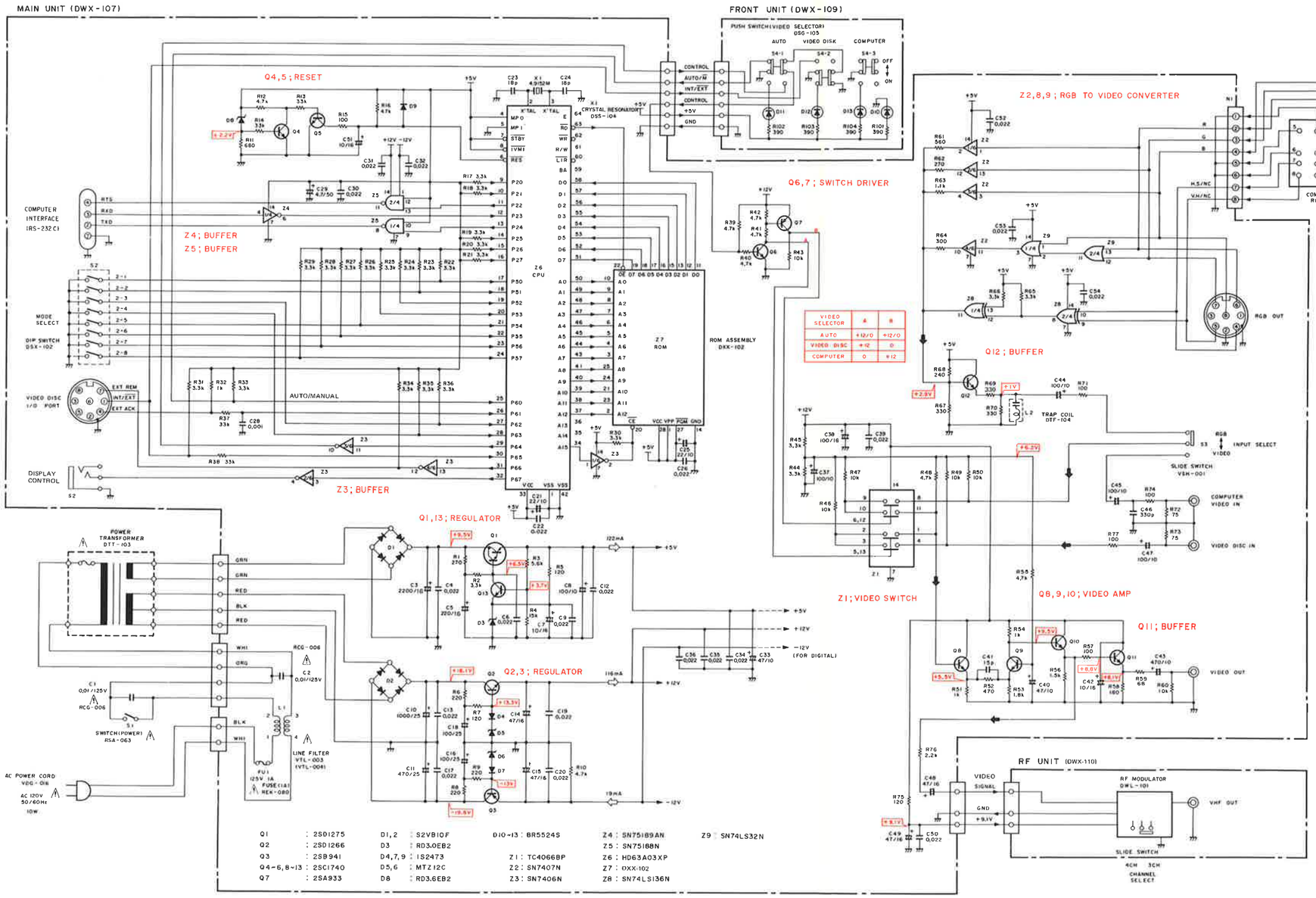


DXX-102



9. SCHEMATIC DIAGRAM

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



1. RESISTORS:
   Indicated in Ω, 1/8W & 1/4W, ±5% tolerance unless otherwise noted k; kΩ, M; MΩ (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance
2. CAPACITORS:
   Indicated in capacity (μF)/voltage (V) unless otherwise noted p, pF; Indication without voltage is 50V except electrolytic capacitor.
3. VOLTAGE, CURRENT:
   , DC voltage (V) at no input signal
   Value in ( ) is DC voltage at rated power.
   ⇦ mA; DC current at no input signal
4. OTHERS:
   ➡, Signal route.
   The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation
   ! marked capacitors and resistors have parts numbers.
   The underlined indicated the switch position

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

SWITCHES
- S1: POWER ON OFF
- S2: MODE SELECT (See table 1)
- S3: INPUT SELECT RGB VIDEO
- S4: VIDEO SELECTOR
  - S4-1 AUTO ON OFF
  - S4-2 VIDEO DISC ON OFF
  - S4-3 COMPUTER ON OFF
- S5: CHANNEL SELECT 4CH 3CH (There is bottom side of set)

	FUNCTION	OFF	ON
2-1	BAUD RATE		
2-2			
2-3	PARITY	NON	YES
2-4		EVEN	ODD
2-5	STOP BITS	1	2
2-6	DATA BIT LENGTH	7	8
2-7	CODE SELECT	HEX	ASCII
2-8			

2-1	2-2	BAUD RATE
ON	ON	600
OFF	ON	1200
ON	OFF	2400
OFF	OFF	4800

TABLE 1

10. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω	*56 x 10¹*	*561*	*RD¼PS 5 6 1 J*
47kΩ	*47 x 10³*	*473*	*RD¼PS 4 7 3 J*
0.5Ω		*0R5*	*RN2H 0 R 5 K*
1Ω		*010*	*RS1P 0 1 0 K*

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 x 10¹*	*5621*	*RN¼SR 5 6 2 1 F*

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number , temperature, humidity, etc.

Miscellaneous Parts

Mark	Symtol & Description		Part No.
⚠★★	FU1	Fuse (1A)	REK-080
⚠ ★		Power transformer (120V)	DTT-103
⚠		AC Power cord	VDG-016
		Socket 8-p	DKP-116
⚠★★		Switch (POWER)	RSA-063
⚠	C1	Capacitor (0.01/AC 150V)	RCG-006

Main Unit (DWX-107)

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★★	Q1	2SD1275
★★	Q2	2SD1266
★★	Q3	2SB941
★★	Q7	2SA933
★★	Q4 – Q6, Q8 – Q13	2SC1740
★	D1, D2	S2VB10F
★	D4, D7, D9	1S2473
★	D3	RD3.0EB2
★	D8	RD3.6EB2
★	D5, D6	MTZ12C (RD12EB3)
★★	Z6	HD63A03XP
★★	Z7 ROM assembly	DXX-102
★★	Z5	SN75188N
★★	Z4	SN75189AN
★★	Z3	SN7406N (M53206P) (HD7406P)
★★	Z2	SN7407N (M53207P) (HD7407P)
★★	Z9	SN74LS32N (M74LS32P)
★★	Z8	SN74LS136N (M74LS136P)
★★	Z1	TC4066BP

SWITCHES

Mark	Symbol & Description		Part No.
★★	S3	Slide switch (INPUT)	VSH-001
★★	S2	DIP switch (MODE)	DSX-102

COILS

Mark	Symbol & Description		Part No.
⚠	L1	Line filter	VTL-003 (VTL-004)
	L2	Trap coil	DTF-104

CAPACITORS

Mark	Symbol & Description		Part No.
⚠	C2	Capacitor (0,01/AC150V)	RCG-006
	C21, C25		CEA 220M 10
	C33, C40		CEA 470M 10
	C8, C37, C44, C45, C47		CEA 101M 10
	C5		CEA 221M 16
	C43		CEA 471M 10
	C3		CEA 222M 16
	C7, C42, C51		CEA 100M 16
	C14, C15, C48, C49		CEA 470M 16
	C38		CEA 101M 16
	C16, C18		CEA 101M 25
	C11		CEA 471M 25
	C10		CEA 102M 25
	C29		CEA 4R7M50
	C41		CCDSL 150J 50
	C23, C24		CCDSL 180J 50
	C46		CCDSL 331J 50
	C28		CKDYB 102K 50
	C4, C6, C9, C12, C13, C17, C19, C20, C22, C26, C30, C31, C32, C34 – C36, C39, C50, C52 – C54		CKDYF 223Z 50

RESISTORS

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	All resistors	RD1/4PM □□□J

OTHERS

Mark	Symbol & Description		Part No.
	Terminal (1-p) (VIDEO IN/OUT)		DKN-104
	Phone jack (DISPLAY CONTROL)		RKN-083
	Connector (DIN type 8-p) (RGB OUT)		DKP-117
	Connector U (DIN type 8-p) (PLAYER I/O PORT)		DKP-118
	D-Sub connector (25-p) (RS-232C PORT)		DKP-150
	IC socket (28-p)		VKH-027 (VKH-019)
X1	Crystal resonator (4.9152 MHz)		DSS-104

Front Unit (DWX-109)

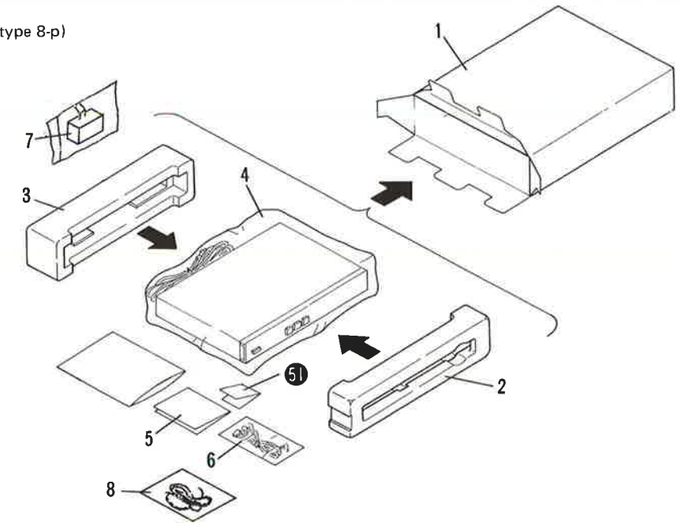
Mark	Symbol & Description		Part No.
★★	S4	Push switch (VIDEO SELECTOR)	DSG-105
	R101 – R104		RD1/4PM391J
★	D10 – D13		BR5524S

RF Unit

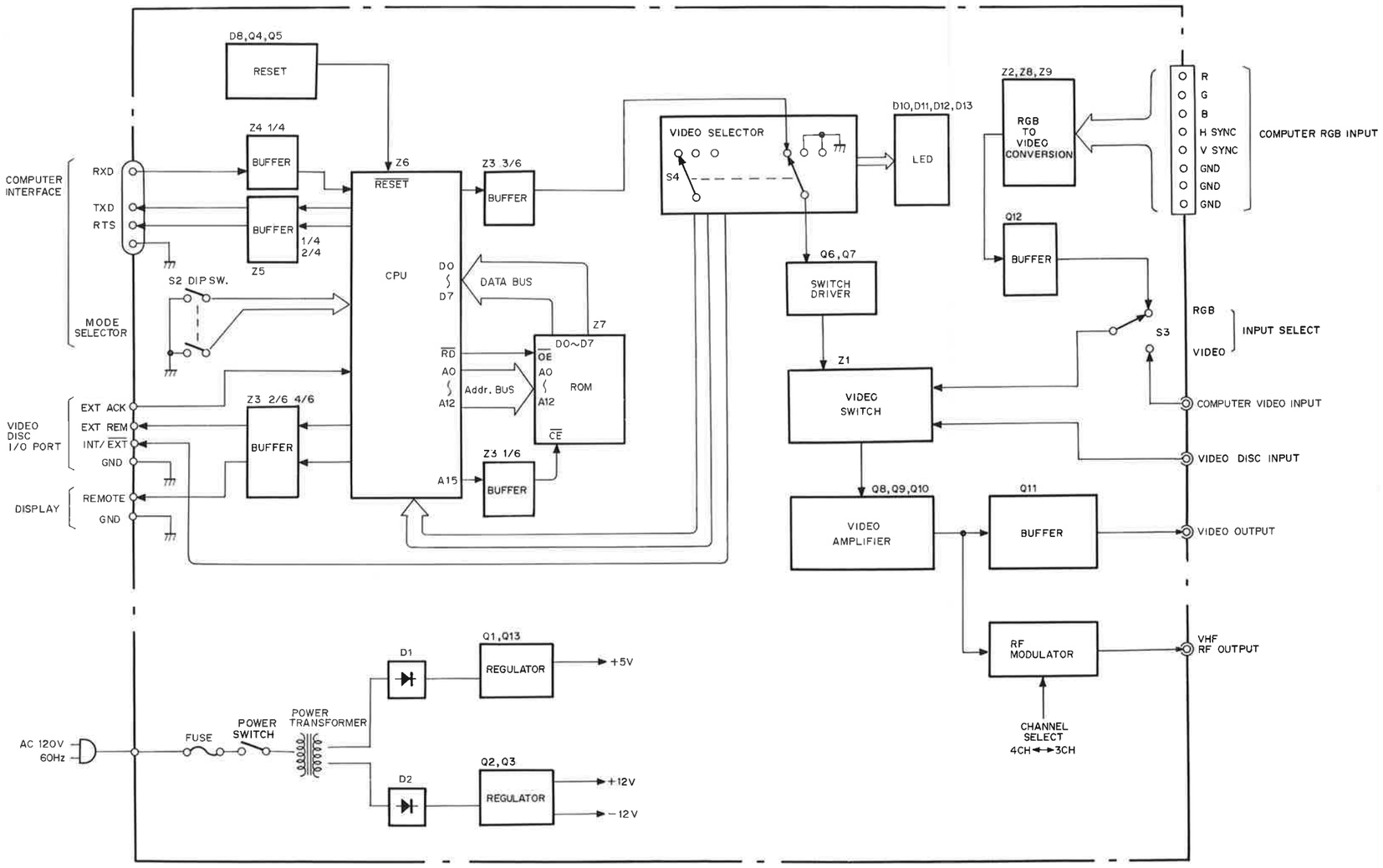
Mark	Symbol & Description	Part No.
	RF modulator	DWL-101

11. PACKING

Mark	No.	Part No.	Description
	1	DHG-105	Packing case
	2	DHA-105	Front pad
	3	DHA-106	Rear pad
	4	DHL-109	Bag
	5	DRB-102	Operating instructions
	6	DDE-104	Cord set (DIN type 8-p)
	7	DSH-102	RF switch
	8	DDE-108	F-PIN cord
	51		Warranty card



12. BLOCK DIAGRAM



1. Receiving Buffer (Z4 1/4)

It converts RS-232C level signals from a personal computer into TTL level signals and sends the signals to the CPU.

2. Transmitting Buffer (Z5 1/4 and 2/4)

It converts TTL level signals into RS-232C level signals and transmits them to the personal computer.

3. CPU (Z6)

It performs communication with the personal computer through RS-232C port and gives commands to the video disc player (LD-700 or LD-V4000) and to the display (SD-25), in response to the commands from the personal computer.
Furthermore, if it is in AUTO mode, it generates the signals to control the video switch which is located in the IU-04.

4. ROM (Z7)

It stores commands to operate the CPU and data.

5. Video Selector (S4)

The video selector (S4) is a push-button switch (three linked locking and releasing type) to select "AUTO", "VIDEO DISC" and "COMPUTER".

6. Switch Driver (Q6 and Q7)

It controls the IC (Z1) for video switch in response to the output from the VIDEO SELECTOR.

7. RGB to VIDEO CONVERSION (Z2, Z8 and Z9)

It converts the RGB signals, vertical synchronizing signals and horizontal synchronizing signals into monochromatic signals.

8. VIDEO SWITCH (Z1) and VIDEO AMPLIFIER (Q8 to Q10)

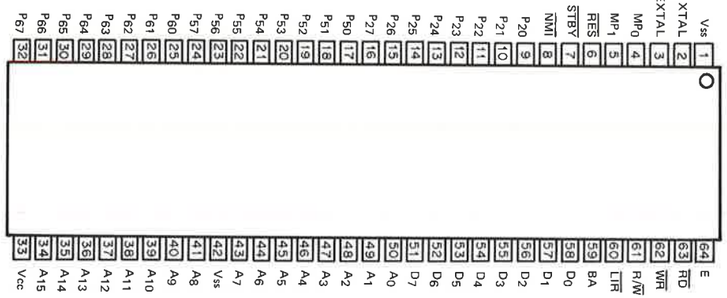
It switches the video signals from the personal computer and the video signals from the video disc player by controlling signals from the switch driver, and output them to the VIDEO OUTPUT terminal.

9. RF Modulator

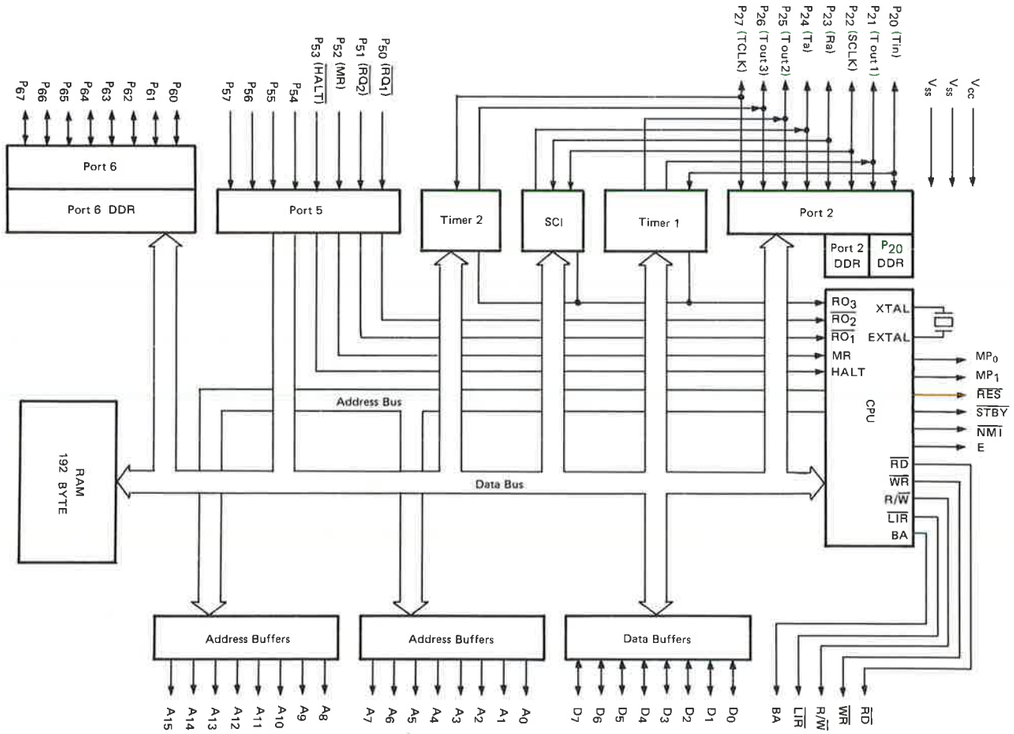
It modulates the video signals selected by the video switch and outputs them as the RF signals of the frequency of CH3 or those of CH4.

13. IC DESCRIPTIONS

CPU (HD63A03XP)



Top view of HD63A03XP

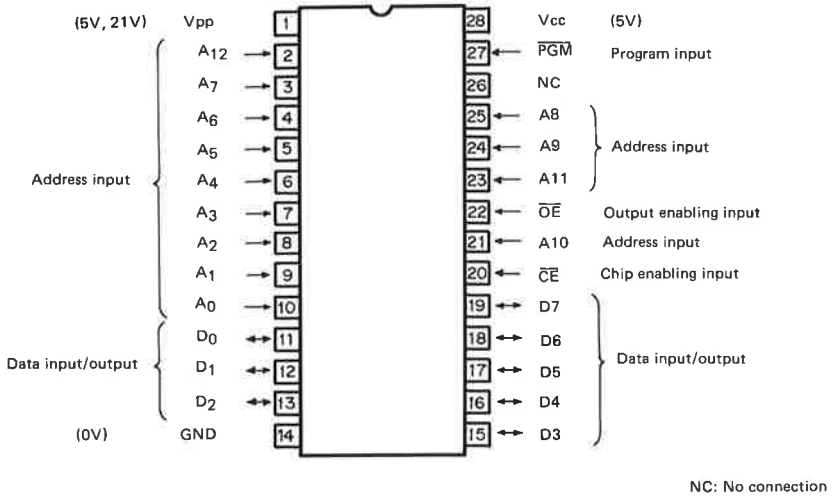


Block diagram of HD63A03XP

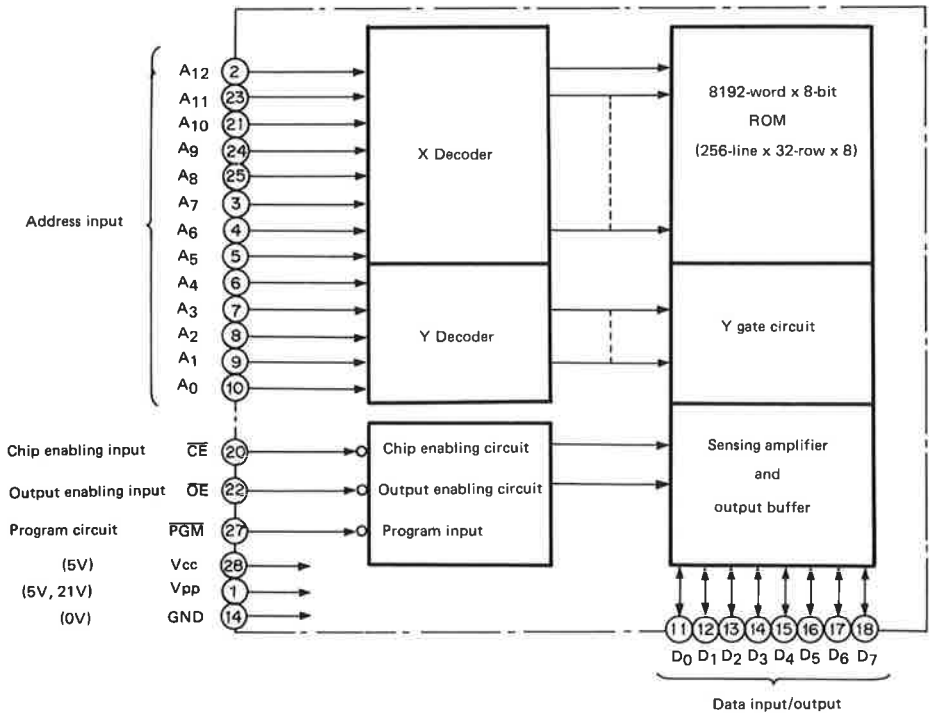
Pin No.	Pin name	Terminal Function
33	V_{CC}	Power supply terminal
1, 42	V_{SS}	GND terminal. The V_{SS} terminal has two terminals. Ground both of them.
2, 3	XTAL, EXTAL	Crystal connection terminal. When clock is input from outside, it should be input to EXTAL.
6	$\overline{RES}$	Reset input terminal (active low)
7	$\overline{STBY}$	Standby input terminal (active low). If this terminal becomes low, MCU becomes standby mode.
8	$\overline{NMI}$	Non-maskable insertion input terminal of the edge detecting (going down edge)
4, 5	MP_0 and MP_1	MCU Operation mode setting terminal. MP_1 | MP_0 | Operation mode 0 | 1 | Mode 1 to expand mode (built-in ROM prohibited)
43 to 50	A_0 to A_7	Lower position address (A_0 to A_7) output terminal
9	Tin (P_{20})	Timer 1 input capture input terminal
10	Tout 1 (P_{21})	Timer 1 OCR 1 output terminal
11	SCLK (P_{22})	SCI clock input/output terminal
12	Rx (P_{23})	SCI receiving terminal
13	Tx (P_{24})	SCI transmitting terminal
14	Tou 2 (P_{25})	Timer 1 OCR 2 output terminal
15	Tout 3 (P_{26})	Timer 2 output terminal
16	TCLK (P_{27})	Timer 2 external clock input terminal
51 to 58	D_0 to D_7	Data bus (D_0 to D_7)
34 to 41	A_8 to A_{15}	Upper position address (A_8 to A_{15}) output terminal
17	P_{50}	Exclusion input port of 8-bit.
18	P_{51}	
19	P_{52}	
20	P_{53}	
21 to 24	P_{54} to P_{57}	
25 to 32	PORT 6	Input/Output port of 8-bit: This port can specify input and output of one bit unit.
63	RD	Read signal output terminal
62	WR	Write signal output terminal
61	R/W	Read/Write signal output terminal
60	LIR	LIR signal output terminal which indicates operation code fetch cycle
59	BA	BA signal output terminal which indicates that halt is accepted and the bus is released.
64	E	Frequency output terminal of 1/4 of crystal oscillating frequency.

Terminal Function

ROM Assembly (DXX-102)

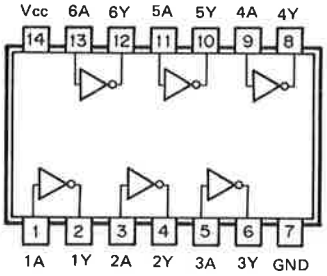


Top view of DXX-102



Block diagram of DXX-102

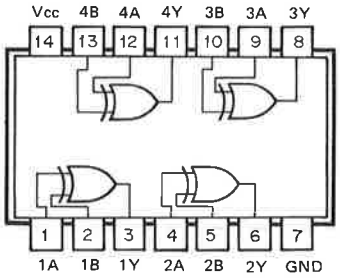
Hex Inverter Buffers/Drivers with Open-collector (SN7406N, HD7406P, M53206P)



positive logic: $Y = \overline{A}$

Pin assignment (Top view)

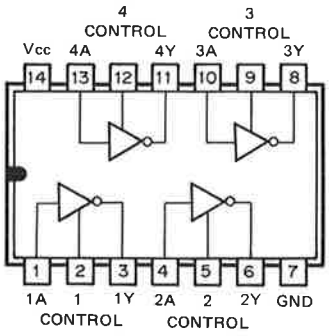
Quad Exclusive — or Gates with Open-collector Outputs (SN74LS136N, M74LS136P)



positive logic: $Y = A \oplus B = A\overline{B} + \overline{A}B$

Pin assignment (Top view)

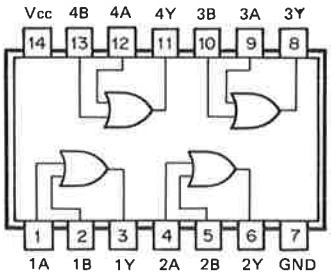
Quad Inverter Buffers (SN75189AN)



SN75189A (N) positive logic: $Y = \overline{A}$

Pin assignment (Top view)

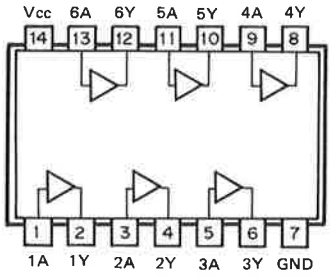
Quad 2-input Positive — or Gates (SN74LS32N, M74LS32P)



positive logic: $Y = A + B$

Pin assignment (Top view)

Hex Buffers/Drivers with Open-collector (SN7407N, M53207P, HD7407P)

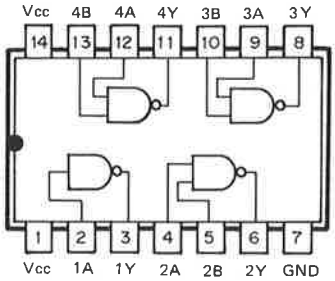


positive logic $Y = A$

Pin assignment (Top view)

Quad 2-input Positive-nand Buffers (SN75188N)

positive logic: $Y = \overline{AB}$



FUNCTION TABLE

A	B	Y
H	H	L
L	X	H
X	L	H

Pin assignment (Top view)

14. CIRCUIT DESCRIPTIONS

14.1 IU-04 OPERATION

Function of the IU-04

By connecting the IU-04 to your personal computer, you will be enabled to issue commands from your personal computer for operating the Video Disc Player LD-700 (or LD-V4000), and Component Display SD-25.

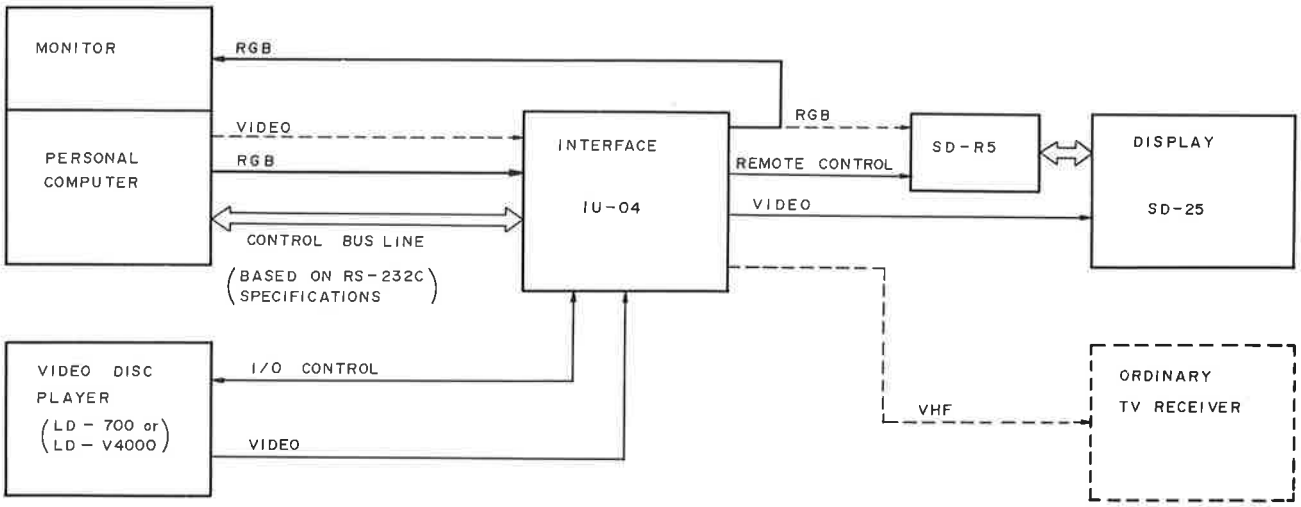
In addition, an RF converter is built in, allowing you to use an ordinary television receiver as well. Finally by using the video selector, you can switch between personal computer screen and video disc screen.

Regarding Operation

When this interface is connected to the RS-232C port of your computer, it discriminates whether the signals passing through the RS-232C line are video disc commands, display SD-25 commands, or IU-04 commands. Based upon that discrimination, it performs the operation appropriate to the command, and sends a return message to the computer (for details, see the COMMAND and MESSAGE).

Commands from Computer to Interface

Up to 20 characters can be sent together at a single time. When using hexadecimal notation, 2 digits are counted as a single character.



Connection diagram

VIDEO SELECTOR			CONTROL			VIDEO OUT		CONTROL IN		Remarks
AUTO	VIDEO DISC	COM-PUTER	VIDEO DISC		SD	from COM-PUTER	from VIDEO DISC	AUTO/ MANUAL (P60)	INT/ EXT (P65)	
			from COM-PUTER	from RE-MOTE	COM-PUTER/ REMOTE					
ON			○	X	○	SELECTABLE*		H	L	
	ON		X	○	○	X	○	L	H	
		ON	○	X	○	○	X	L	L	
ON	ON		X	○	○	SELECTABLE*		H	H	
ON		ON	○	X	○	SELECTABLE*		H	L	
	ON	ON	X	○	○	X	○	L	H	
ON	ON	ON	X	○	○	SELECTABLE*		H	H	
OFF	OFF	OFF	○	X	○	○	X	L	L	

***SELECTABLE:** As the video switch (Z1) is being controlled by the computer command, either one signal from the computer or that from the VIDEO DISC is output from the VIDEO OUT terminal.

IU-04 Operation table

14.2 COMMANDS AND MESSAGES

1. CONTROL DEVICE

ASCII	HEX	FUNCTION	ASCII	HEX	FUNCTION
"L:"	70 7F	Selects LD player	"V:"	71 7F	Selects SD monitor

2. VIDEO SELECT

ASCII	HEX	FUNCTION	ASCII	HEX	FUNCTION
"D:"	72 7F	Selects LD video	"U:"	73 7F	Selects computer video

3. LD COMMANDS

ASCII	HEX	FUNCTION	ASCII	HEX	FUNCTION
P	17	PLAY	Q	18	PAUSE
M	10	SCAN FWD.	N	11	SCAN REV.
H	51	x3 FWD.	G	59	x 3 REV.
O	54	STEP FWD.	I	50	STEP REV.
K	58	MULTI SPEED FWD.	J	55	MULTI SPEED REV.
U	47	SPEED UP	D	46	SPEED DOWN
E	16	REJECT	S	42	SEARCH
F	41	FRAME	C	40	CHAPTER
V	43	DISPLAY ON/OFF	Y	45	CLEAR
L	4B	AUDIO 1 /L	R	49	AUDIO 2/R
Z	4A	AUDIO L and R	X	5F	ESCAPE
1 ~ 9	01 ~ 09	NUMERIC (1 ~ 9)	0	30*	NUMERIC (0)
A	28*	NUMERIC	B	0B	NUMERIC

4. SD COMMANDS

ASCII	HEX	FUNCTION	ASCII	HEX	FUNCTION
V	28*	VOLUME UP	W	0B	VOLUME DOWN
X	10	CHANNEL UP	Y	11	CHANNEL DOWN
S	43	STANDARD	P	40	PICTURE
Q	41	PICTURE UP	R	42	PICTURE DOWN
0	29*	V.D.P	1	0E	VIDEO 1
2	0F	VIDEO 2	3	0C	T V
O	49	AUDIO MUTE	N	4A	DISPLAY ON/OFF
T	48	SLEEP TIMER	Z	1C	POWER OFF
A ~ I	01 ~ 09	DIRECT CHANNEL	J	30*	DIRECT CHANNEL
K, L	46, 47	DIRECT CHANNEL	M	1E	AUDIO MULTIPLEX

5. OTHER COMMANDS

ASCII	HEX	FUNCTION	ASCII	HEX	FUNCTION
@	74	WAIT	!	75	BREAK STOP
1 ~ 9	01 ~ 09	NUMERIC	#	76	BREAK REJECT

Commands are treated identically regardless of whether they are input in large case or small case characters.

NOTES:

- *The HEX (hexidecimal) code has been made to conform as far as possible with Pioneer's uniform remote control code, but some parts may involve modifications (marked with *) or additional items (1, 2, 5).*
- *When using HEX code always use two-digit expressions. For example, 0 becomes 00, 1 becomes 01, etc.*

Explanation of Commands:

① **"L:"** = When this command is received by the interface, all subsequent commands are treated as LD player commands.
"V:" = When this command is received by the interface, subsequent commands are treated as SD monitor commands.
The "L:" command given above is enabled only when the front switch is at the AUTO position.

② **"D:"** = The IU-04's built-in video switch outputs LD player screen.
"U:" = The IU-04's built-in video switch outputs computer screen.
The two commands above are enabled only when the front switch is in the AUTO position.

③ **LD command** = Refer to the function operations for the LD-700 (or LD-V4000). For use of "X", see the section on execution samples.

④ **SD command** = Refer to the function operations for the SD-25.

⑤ **Other commands** = Commands for IU-04 other than ① and ②.
"@" = Indicates standby time. The condition indicated previous to this command will continue only for the time proportionate to the single-digit number entered following the @.
Format: @# where # indicates a single digit number of seconds.
Example: P@50
Continue play for 5 seconds and change to still picture.

NOTE:
This cannot be used with commands which must be given continuously, like SCAN FWD, SCAN REV, x3FWD, and x3REV.

⑥ **"!"** = BREAK STOP command.
This command is used to cause an interruption when operating with "X" sequence commands (explained later). For example, if the upper-lower relationship is designated mistakenly as shown below, the screen will never stop moving.

F10000SX01100SPI↵

In this event, if the "!" command is given to the IU-04, the presently executing mode will be cancelled, and the player will enter the pause status.

"1~9" = Used together with the "@" command listed above to indicate seconds.

Example: I@9@6I@9@6I@9@6I↵

STEP REV performed every 15 seconds.

"#" = Used in the same way as "!". The currently executing mode will be cancelled, and player will enter the reject status.

NOTE:
In order to use "!" or "#" it is necessary to initiate a program in which these key inputs are constantly monitored by the basic side.

↵ : Indicates C/R (carriage return key)

Message

```
MESSAGE
"ERR  1" = CAN'T SELECT THE CONTROL DEVICE
"ERR  2" = CAN'T SELECT THE VIDEO
"ERR  3" = TIME OUT ERROR
"ERR  4"
"ERR  5"
"ERR  6" = WORD FORMAT ERROR
"ERR  7" = PARITY ERROR
"ERR  8" = OVER RUN / FRAMING ERROR
"ERR  9" = BUFFER OVER FLOW

"READY" = READY - IU-04 CAN RECEIVE THE NEXT COMMAND
```

If a single line exceeds 20 characters, an "ERR 9" message will immediately be sent to the personal computer, but commands of up to 20 characters will continue to be transmitted. As a result, it is necessary to deal with this on the side of the basic program.
Refer to Sample Program 4 (page 8).

14.3 "X" SEQUENCE

① X0, X1

(Wait till arrival at numbers designated after 0,1 at less than normal speed, then execute subsequent commands). The 0 placed immediately after the X means that the following characters indicate frame numbers. 1 means that following characters indicate chapter numbers. In either case, after the frame or chapter numbers, "S" and then immediately "P", "K", or "J" command must be input.

FORMAT:

(1) X 0 1 2 3 4 5 S P I ↵
a) b) c) d) e)

(2) X 1 1 0 S P I ↵
f) b) c) d) e)

a): Indicates that (b) is frame number.

b): Frame no. 12345, or chapter 10.

c): Set above number

d): Command for speed of arrival at numbers designated by a) b), and c) [STEP FWD, STEP REV not possible].

e): Mode designation following arrival at designated number.

f): Indicates that b) is chapter number.

If nothing is designated in e), "READY" message will be returned when number designated in b) is reached.

NOTE:
When using set frame numbers, the processing of the following commands will be delayed by 2~3 frames due to the restrictions of BASIC execution speed and transmission speed.

The following shows an example of execution following search for frame number 2,000 [in ①, ②, and ③].

```
READY
COMMAND? F2000SX02200SPI↵ ..... ①
                          Play until reaching
READY                     frame 2200, then stop.
COMMAND? F2000SUX02100SKI↵ ..... ②
                          Advance to frame 2100 at
READY                     MULTI FWD speed, then stop.
COMMAND? F2000SDDX01980SJI↵ ..... ③
                          Advance to frame 1980 at
READY                     MULTI REV speed, then stop.
COMMAND? C8SX19PI↵ ..... ④
                          Search for chapter 8, then
READY                     PLAY until chapter 9, then stop.
```

In example ①, if the number following X0 is designated as smaller than the present position number, the "READY" message will not be returned, no matter how long you wait. In the same way, if the above/below relation is inverted in ②, ③, ④, the "READY" message will not be returned, so care should be taken when making these commands. If this kind of condition should occur by mistake, input the LD command "!" or "#". (This is not possible, however, in sample programs 1, 2, 3). Refer to the section EXPLANATION OF COMMANDS regarding "!" and "#" (See page 25).

② X2~X9

These may be used in the same way as normal LD commands.

X2 = VIDEO OFF
Disables video output from LD player. (also effective for VHF output)

X3 = VIDEO ON
Restores video output from VIDEO OFF command. However, when video output is disabled by an internal player function (during PAUSE, SEARCH, etc), that mode is given priority, and video is output after that prior mode is cancelled.

X4 = AUDIO OFF
Disables audio output (also effective for VHF output)

X5 = AUDIO ON
Restores audio output after AUDIO OFF command (same conditions apply as VIDEO ON).

X6 = DISPLAY OFF
Disables message output to screen (frame number, multi-speed ratio, etc.).

X7 = DISPLAY ON
Restores display function after DISPLAY OFF command.

X8 = TV ANTENNA
Switches TV VHF input to antenna.

X9 = TV-LD
Switches TV VHF input to LD player.

③ XA, XB (LD-V4000 only)

XA = When LD player has reached LEAD-IN range at normal or lower speed, subsequent commands are executed immediately.

XB = The same as XA, operates at LEAD-OUT range.

FORMAT:

X A S J I ↵
a) b) c) d)

X B S K I ↵
e) b) c) d)

a): Indicates lead-in area.
b): Statement of range of a).
c): Command for speed of movement to a) (STEP REV, STEP FWD not possible).
d): Execution command after arrival at a) or e).
e): Indicates LEAD-OUT area.

Speed commands which can be designated in c) include "P", "K", and "J".

④ AUTO STOP (LD-V4000 only)

When [STEP FWD] is written between b) and c) of the aforementioned formats (①, X0, X1), automatic stop will occur at the number designated by b).

FORMAT:

X 0 1 2 3 4 5 O S P ↵
a) b) g) c) d)

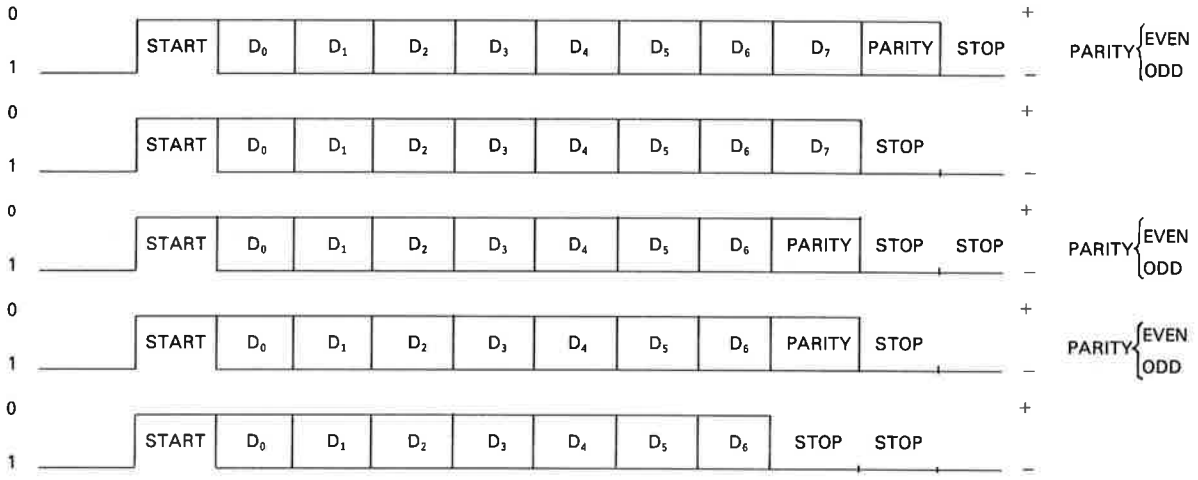
g) can be designated only as " O" (ASCII code only).
If commands continue after d), temporary stop will occur at b), immediately after which execution will begin.
If a) is made X1, automatic stop will occur at the chapter number designated by b).

14.4 RS-232C COMPUTER INTERFACE

BUFFER ..... 20 characters; however, with HEX code, two digits count as one character.
BAUD RATE ..... 600, 1,200, 2,400, 4,800.
PARITY BIT ..... ODD, EVEN, NON.
STOP BIT ..... 1 or 2 *(see NOTE 1)*
DATA BIT LENGTH ..... (7 or 8) *(see NOTE 1, NOTE 2)*
CODE ..... ASCII or HEX *(see NOTE 3)*

NOTE 1: When DATA BIT LENGTH = 8, there is only one STOP BIT.
NOTE 2: When DATA BIT LENGTH = 7, word composition involving NON-PARITY, 1 STOP BIT cannot be used.
When DATA BIT LENGTH = 8, the uppermost ordet bit (D_7) is transmitted fixed at 0.
NOTE 3: Even when HEX code is selected, messages from the IU-04 will be transmitted in ASCII code.

Transmission/Reception Format

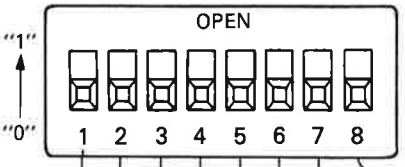


- Commands may be written continuously up to 20 characters per line, but the end of a line must terminate in <CR> (CR: Indicates Carriage Reteurn key.)
<LF> (LF: Indicates Line Feed key.)

- Likeweise, messages from the IU-04 are always sent terminated in <CR> <LF>.
Example: READY <CR> <LF>

RS-232C MODE SETTING

Set by rear panel dip switches (MODE SELECT Switches).
Any time dip switch settings are revised, be sure to turn off the power switch and turn it on again.



OPEN = "1"

FUNCTION	1	0
Not available to user	—	—
CODE SELECT	HEX	ASCII
DATA BIT LENGTH	7	8
STOP BIT	1	2
PARITY	EVEN	ODD
	NON	YES

		BAUD RATE
0	0	600
1	0	1,200
0	1	2,400
1	1	4,800

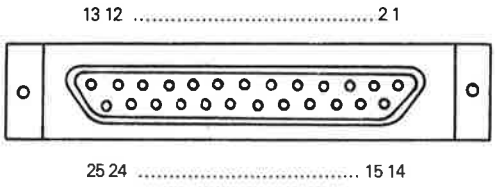
When shipped from the factory dip switches (MODE SELECT Switches) are at the following settings: 2,400 BAUD, NON-PARITY, 2 STOP BIT, 7 BIT LENGTH, ASCII.

NOTES REGARDING CONNECTIONS

- This unit is furnished with a connection cable for the LD-700 only. The user must provide other cables as required.
- Cables should be attached and disconnected only after making sure that the power switches for the personal computer, LD-700 (or LD-V4000), and IU-04 are all OFF.

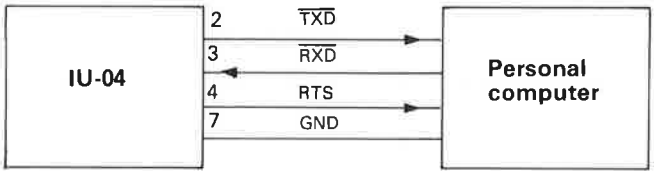
RS-232C CONNECTOR

RS-232C Contact pin layout diagram



Pin number	Symbol	Signal line	Comments
2	$\overline{TXD}$	Transmitted Data	
3	$\overline{RXD}$	Received Data	
4	RTS	Request to Send	Normally outputs "H" level, outputs "L" level when command is received. When ready to receive next command signal, becomes "H" level again.
7	GND	Signal Ground	

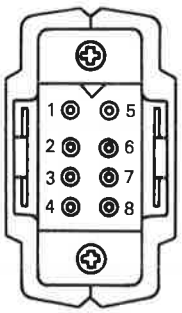
	Input line	Output line
"L" level	Above −12 V, below −5 V	Above −12 V, below −9 V.
"H" level	Above 5 V, below 12 V	Above 9 V, below 12 V.



14.5 OTHER CONNECTOR

RGB Connector

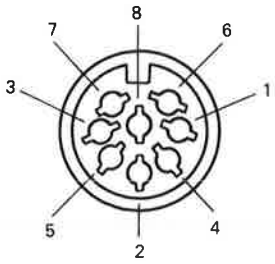
8-Pin Rectangular Input Connector



1. Ground (GND)
2. Red input (R)
3. Green input (G)
4. Blue input (B)
5. Ground (GND)
6. Ground (GND)
7. Horizontal sync signal input (H.SYNC)
8. Vertical sync signal input (V.SYNC)

- R, G, B are TTL level positive logic signal input.
- H, V.SYNC are TTL level negative logic signal input.

8-Pin DIN Output Jack

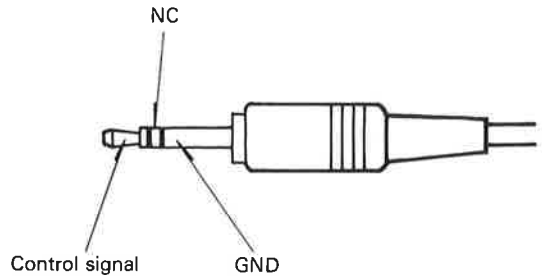


1. N.C.
2. Ground (GND)
3. N.C.
4. Horizontal sync signal output (H.SYNC)
5. Vertical sync signal output (V.SYNC)
6. Red output (R)
7. Green output (G)
8. Blue output (B)

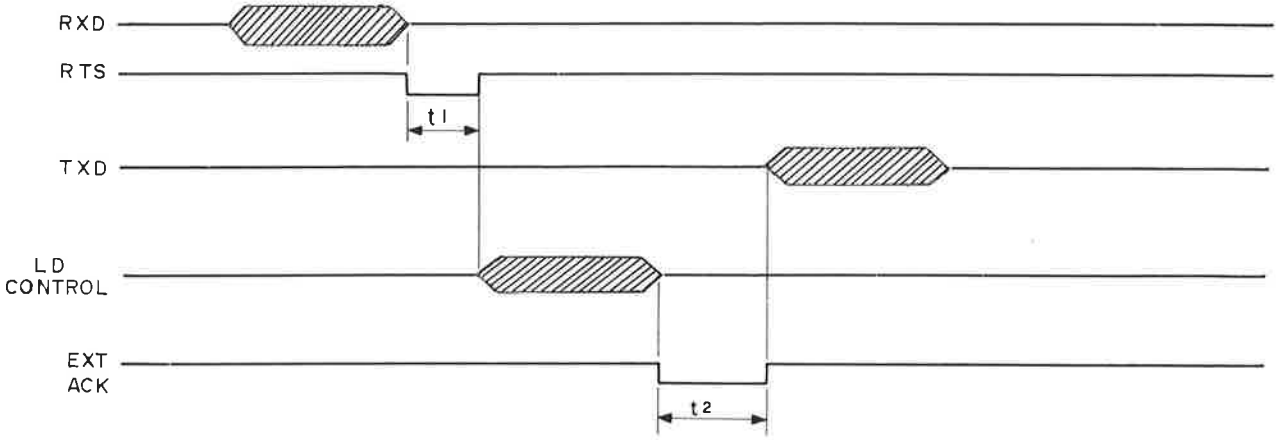
- All outputs are through outputs of signals input from the rectangular connector noted above.

Control terminal (for display)

Use a normal stereo miniplug (ϕ3.5 mm)



14.6 RS-232C TIMING CHART



T1; Personal computer input processing time
It varies depending upon the personal computer input lengths.
From 50ms to 70ms

T2; Command processing time at the LD side.
It varies depending upon the kinds of commands.

RXD; It shows input to IU-04 from a personal computer.
RS-232C line and the third pin of D-Sub 25P.

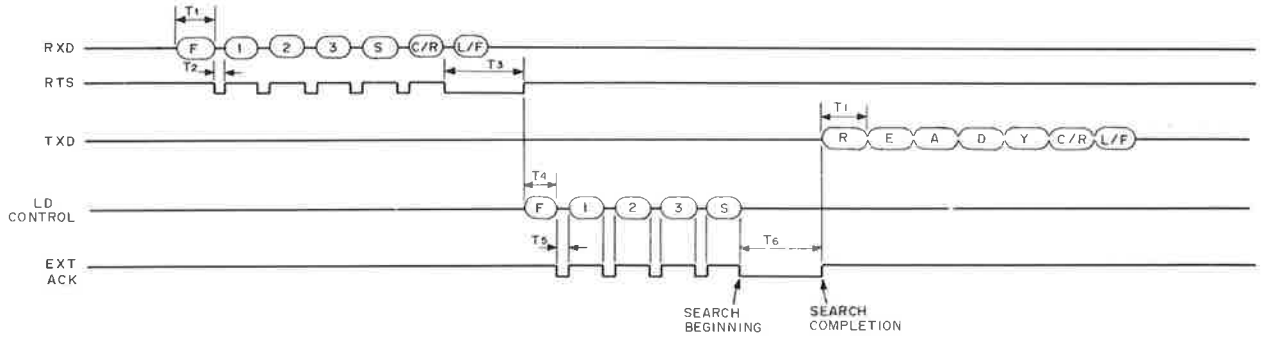
RTS; Input prohibition signal to a personal computer from IU-04 (prohibits at L).

TXD; It shows a message to a personal computer from IU-04.
RS-232C line and the second pin of D-Sub25P.

LD Control; It shows a command output to LD from IU-04.
The seventh pin of DIN8P (U type).

EXT ACK; It shows a response to IU-04 from LD.
The fourth pin of DIN8P (U type).

Example



T1; The time length to be determined by baud rate, bit length, parity or non parity, and stop bit length.
Approximately 3.7ms with 2400 BAUD, 7BIT, NON PARITY and 2STOP BIT.

T2; Checking of communication error of a personal computer input 80μs to 100μs.

T3; Processing time of a personal computer input 50ms to 70ms.
It corresponds to T1 in the Timing Chart.

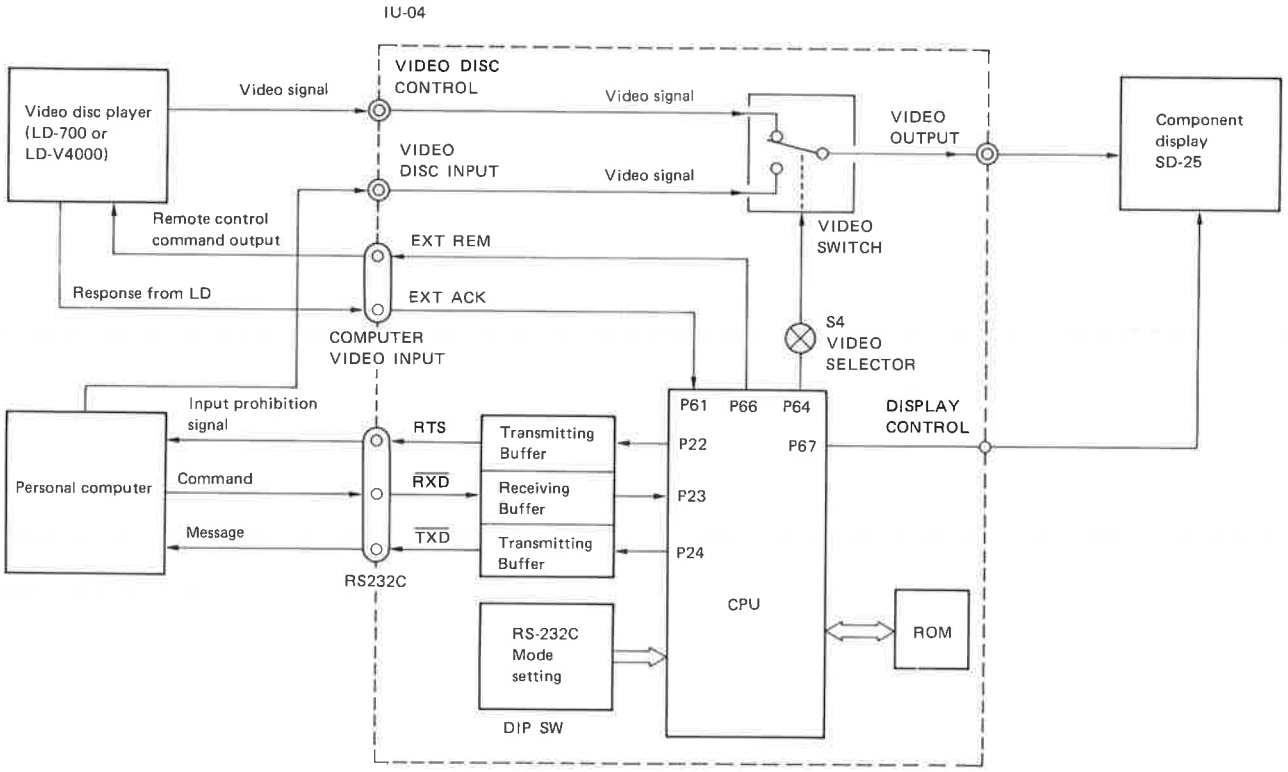
T4; The time length per 1 command to be output to LD.
Approximately 60ms

T5; Command processing time at the LD side.
Approximately 60ms

T6; In the (Example), the actual search time corresponds to T2 in the Timing Chart.

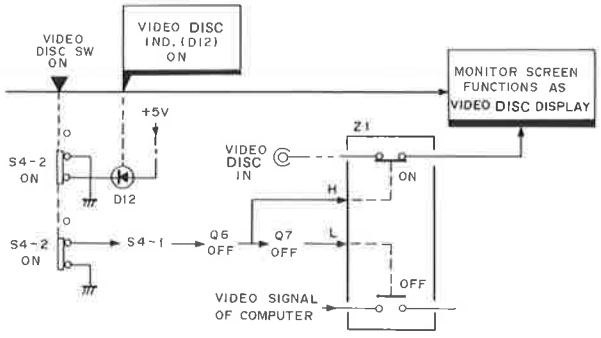
* When signals corresponding to T5 of EXT ACK in the figure do not come, or when T6 is abnormally long, ERR3 is output to a personal computer as a message.

14.7 OPERATING CHART

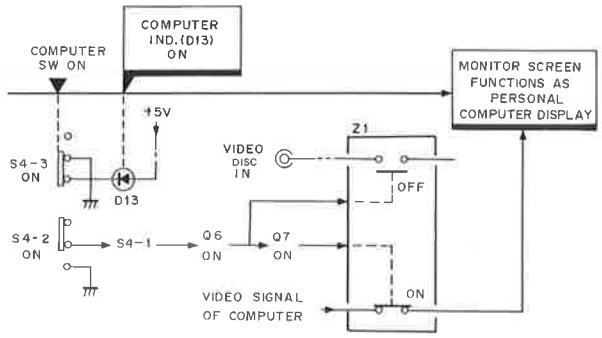


System Block Diagram

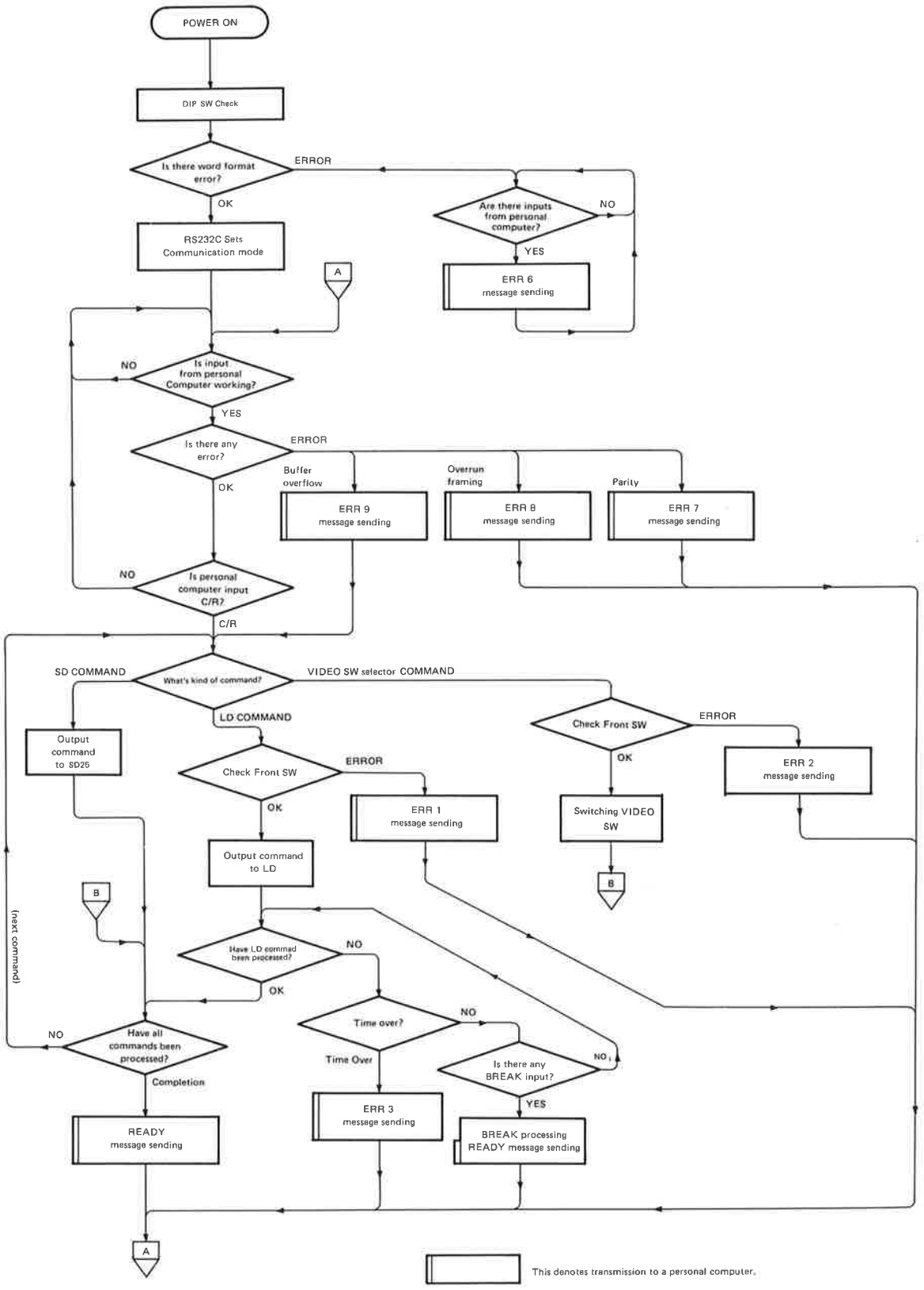
Video Disc Mode



Computer Mode

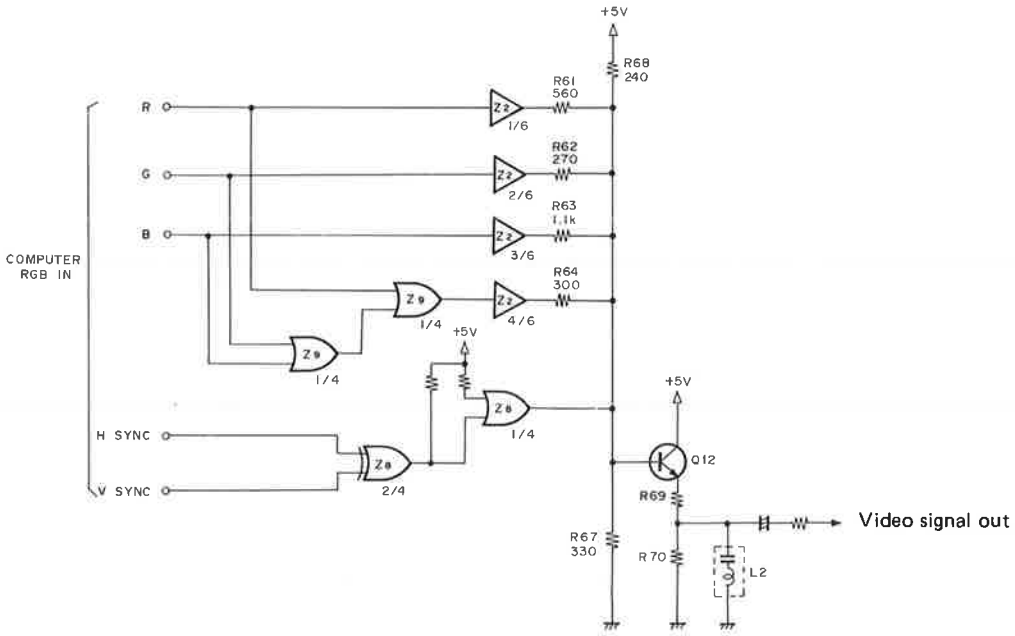


Operating Chart (Auto Mode)



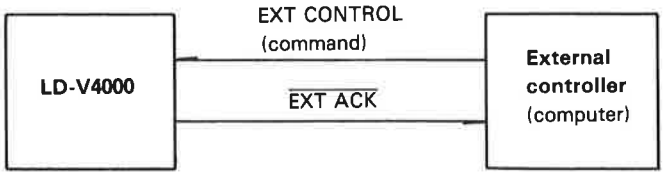
RGB to Video Conversion

- Mixing of H-sync and V-sync is carried out by Z8 (2/4), so that compositive sync is provided.
- The D/A converter, which consists of Z2, Z9, R61 to R64, R67 and R68, RGB is converted into corresponding signal level of the respective colors from the TTL level. Furthermore, it is mixed with the composite sync and applied to Q12 as a composite video signal.
- The L2 filter, which is stored in the Q12 emitter, is tuned to 3.58MHz ± 20kHz and it eliminates the color signal components being mixed in the above mentioned composite video signals. If the tuning of this filter is deviated, unnecessary color may appear in the picture on some of the monitors, due to the color killer not functioning.

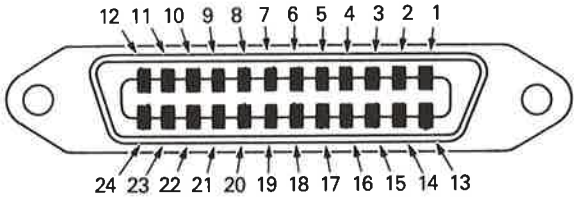


15. WHEN CONNECTING TO VIDEO DISC PLAYER LD-V4000

LD-V4000 has an external control terminal on the rear panel. This terminal permits connection from an external controller (computer), enabling the player to be operated externally.
The terminal is bidirectional communication type.
The external controller provides the commands for operating the player, and the player sends out an acknowledgement, as necessary.



Contact layout of EXTERNAL CONTROL terminal



Applicable plug: AMPHENOL 57-30240 or equivalent

LD-V4000 rear panel EXTERNAL CONTROL

CONTACT NO.	SIGNAL LINE
1 to 3	NC
4	+11 V
5	VIDEO
6	INT/EXT
7	EXT CONT
8	EXT ACK
9	RF
10 to 12	NC
13 to 24	GND

NOTE:
Do not connect to NC terminal.

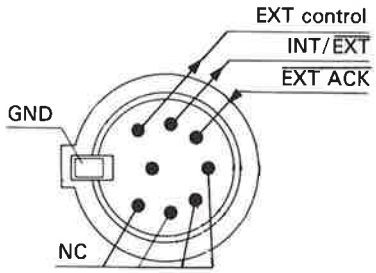
SIGNAL

INT/EXT (input: CONTACT NO. 6)
Performs switching between IR REMOTE CONTROL (HIGH level) and EXT REMOTE CONTROL (LOW level).
When carrying out external control, connect this signal to GND.
From this instant the input of the IR REMOTE signal will be inhibited, and only inputs from the EXT CONTROL will be accepted.

EXT CONTROL (input: CONTACT NO. 7)
Inputs the control signals for the player, which are output from the external controller.
This signal is based on the detected signal from the remote control unit.

EXT ACK (output: CONTACT NO. 8)
ANSWER signal which is output as necessary.

I/O port pin layout



IU-04 rear panel VIDEO DISC I/O