

TECHNICAL MANUAL HX-20

PORTABLE COMPUTER

This Technical Manual provides technical information on the structure, maintenance, and repairs of the EPSON PORTABLE Computer HX-20.

Major technical modifications, if made in the future, will be notified through Service Bulletins, and the Technical Manual should be revised accordingly. The details of the Manual are subject to change without notice.

All the information given in the Manual concerns the HX-20, and we are not responsible for any troubles with the industrial copyright of a third party that might arise from your application of the Manual to other products or from the connection of the HX-20 to others.

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CHAPTER 1

GENERAL

1.1 GENERAL

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1.1 Features

The HX-20 is an all-in-one type miniature portable computer with a liquid crystal display and a microprinter built inside the main body, designed to operate on the batteries inside. A variety of options are available to facilitate system configuration and extension.

1.2 System Configuration

The HX-20 normally consists of ① a 24 characters per line microprinter, ② liquid crystal display (20 characters × 4 lines to display 80 characters), ③ typewriter type keyboard (with 68 keys), ④ RS-232C interface, ⑤ high-speed serial interface, ⑥ cartridge (ROM or microcassette) interface, ⑦ audio cassette interface, ⑧ bar code reader interface, ⑨ ROM (32 KB), and ⑩ RAM (16 KB), and permits system configuration that is extendable as shown in Fig. 1-1.

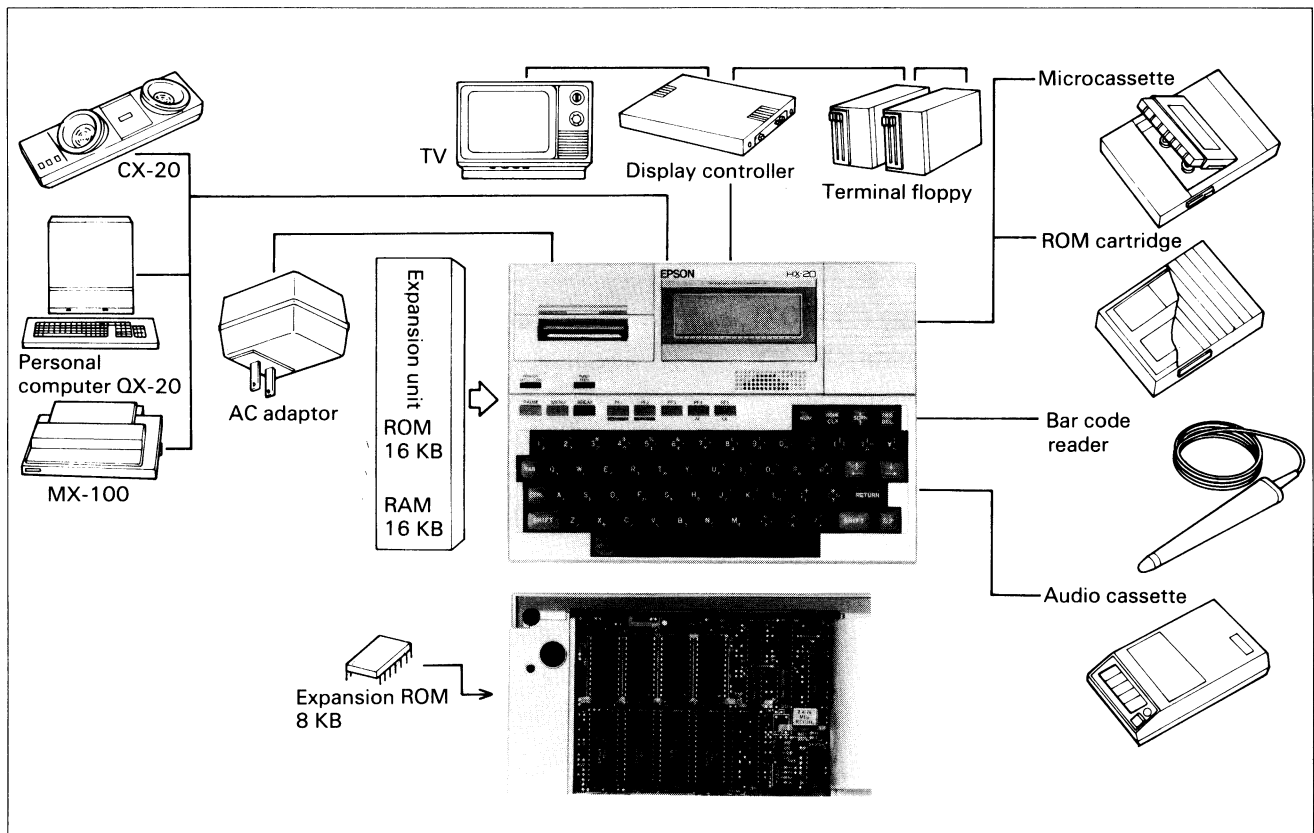


Fig. 1-1

1.2.1 System Connection Diagram

Additional ROMs (8 k each) can be installed in the main body. Other options may be connected to it via the interface connectors on the main body as shown below.

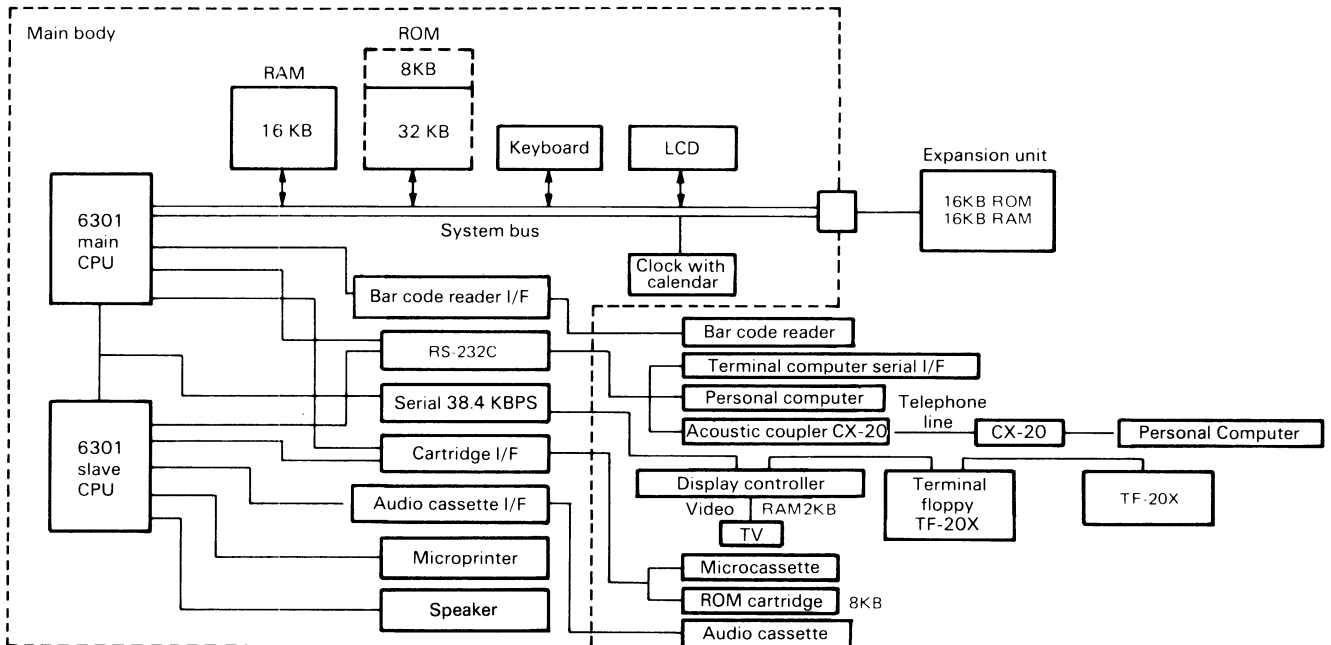


Fig. 1-2

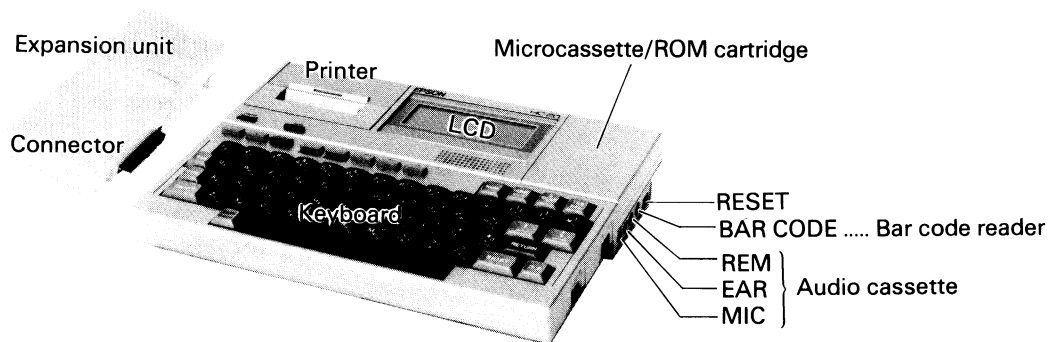


Fig. 1-3

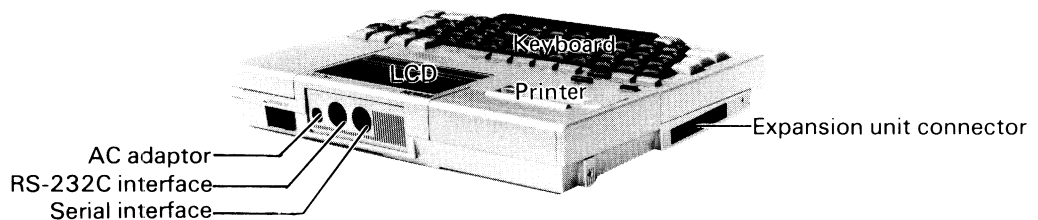


Fig. 1-4

1.3 Main Components

The computer proper consists of ① MOSU control circuit board, ② keyboard unit, ③ liquid crystal display panel (LCD circuit board), ④ microprinter, ⑤ Ni-Cd battery, ⑥ buzzer, and ⑦ case cover.

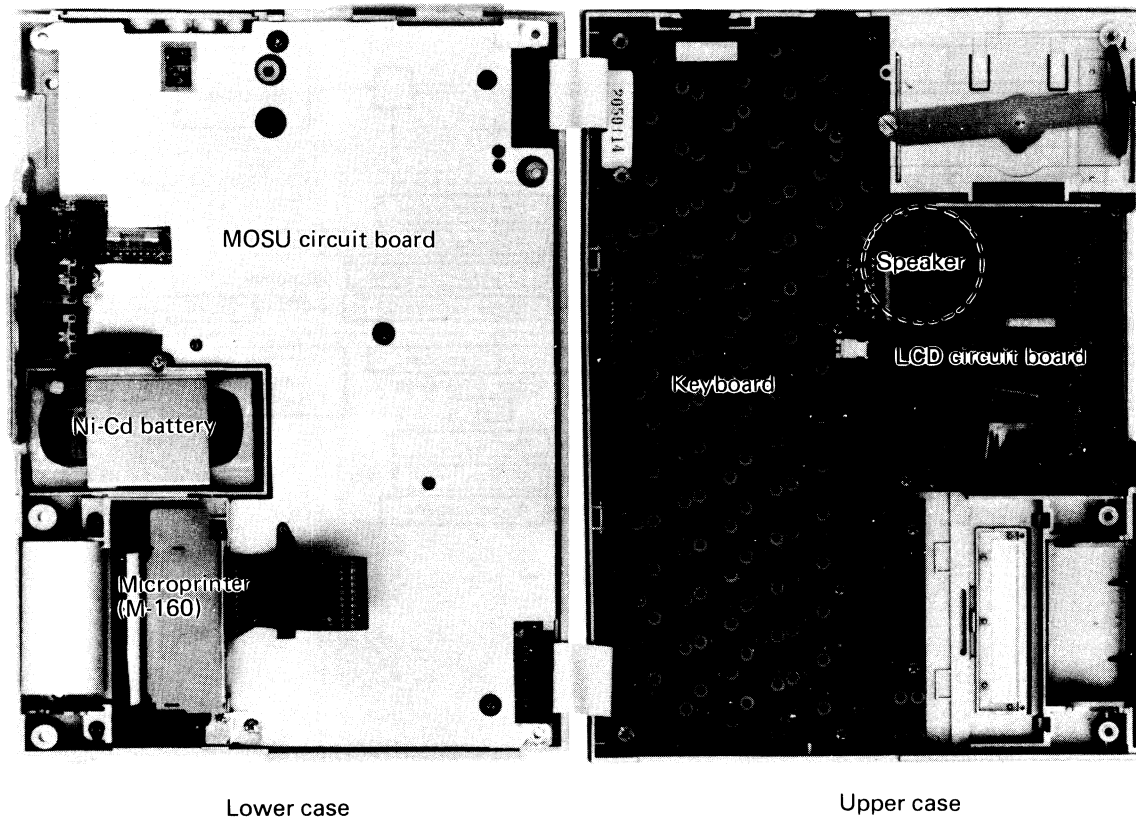


Fig. 1-5

- (1) The MOSU circuit board has connectors for the RS-232C interface, serial interface, audio cassette interface, bar code reader interface, expansion unit interface, AC adaptor, cartridge interface. It employs dual CPU control system using two CMOS CPU6301s, which permits dispersed processing of the interface and thus improves system performance.
- (2) The keyboard has a power switch, view angle volume for LCD, and its control circuit.

1.4 Specifications of HX-20

1.4.1 Dimensions and Ambient Conditions

Dimensions and Weight

- (1) Dimensions: 290 mm wide × 215.5 mm deep × 44 mm high
- (2) Weight: Approx. 1.7 kg

Ambient Conditions

- (1) Temperature: 5°C to 35°C (operating)
5°C to 35°C (charging)
–5°C to 40°C (data storage) (RAM battery backup)
–20°C to 60°C (non-operating)
- (2) Relative humidity: 10% to 80% (operating, no condensation)
10% to 80% (non-operating, no condensation)
- (3) Shock resistance: 1 G for 1 ms maximum (operating)
- (4) Vibration resistance: 0.25G 55 Hz maximum (operating)

1.4.2 Power Supply (Nict batteries)

- (1) Voltage: 4.5V to 6.0V (operating)
4.0V to 6.0V (data storage)
4.5V (low voltage detection)
- (2) Battery capacity: Approx. 1100 mAH

1.4.3 AC Adaptor

- (1) Input voltage: U.S. – AC 115V ± 10%
Europe – AC 220V/240V ± 10%
- (2) Power consumption: 8W
- (3) Insulation resistance: 10 megohms between AC power supply and case
- (4) Insulation strength: Can withstand 1 kV applied between AC power supply and case for 1 minute or more.

1.4.4 Microprinter (M-160)

- (1) Printing system: Dot impact (4 printing solenoids)
- (2) Printing format
 - 1) Total number of dots: 144 dots maximum/dot line
 - 2) Number of characters per line: 24 maximum
(5 × 7 dots; character-to-character space 1 dot)
(6 characters/printing solenoid)
- (3) Printing speed
 - 1) 1 dot line: Approx. 150 ms (continuous printing)
 - 2) 5 × 7 dot matrix (inter-line space 3 dots): Approx 0.7 line/s (continuous printing)

- (4) Character size
 - 1) Dot spacing: 0.33 mm horizontal
0.33 mm vertical
 - 2) 5 × 7 dot matrix: 1.7 mm wide, 2.4 mm high
- (5) Recording paper
 - 1) Kind: Ordinary paper
 - 2) Paper width: 57.5 ± 0.5 mm
 - 3) Outside diameter: 50 mm or less
 - 4) Thickness: 0.07 mm
 - 5) Weight: 52.3 g/m² (45 kg/1000 sheets/1091 sheets × 788 mm)
- (6) Paper feed: Automatic feed every dot line; with paper release
- (7) Inking
 - Ribbon cartridge type
 - Automatic continuous feed during motor operation
 - 1) Color: Purple/Black
 - 2) Dimensions: Approx. 91 mm wide, 25 mm deep, 7 mm high
 - 3) Life: Approx. 10,000 lines
 - 4) Standard: ERC-09

1.4.5 Liquid Crystal Display

- (1) Text: English capitals, large letters, small letters, numerals, symbols, characters, etc.; 20 characters per line; 4 lines in total (20 × 4 = 80 characters)
- (2) Graphic: 120 dots (horizontal) × 32 dots (vertical)
- (3) View angle adjustment: Adjustable with VIEW ANGLE volume

1.4.6 Keyboard

- (1) Key switches: 68 keys (including 5 function keys and 13 special keys)
- (2) Contact points:
 - Function keys Electroconductive rubber contact point
 - Data and special keys..... F.P.C. carbon contact point
- (3) Others: Power on switch, VIEW ANGLE volume for LCD, and adjusting circuit built in

1.4.7 RS-232C Interface

- (1) Connector: DIN (8-pin) TCS 4480
- (2) Input and output levels: RS-232C standard
- (3) Transfer speed: 110, 150, 300, 600, 1200, 2400, 4800 bps (selectable by operator)

1.4.8 Serial Interface

- (1) Connector: DIN (5-pin) TCS 4450
- (2) Input and output levels: RS-232C standard
- (3) Transfer speed: 150, 600, 4800, 38, 400 bps (selectable by operator)

1.5 Specifications of Options

1.5.1 Expansion ROM

- (1) Capacity: 8 KB maximum (plugged into the IC socket of the main body)

1.5.2 Cartridge (ROM/microcassette)

ROM Cartridge

- (1) Capacity: 8 KB to 32 KB (2764 pins compatible × 1)
- (2) Data transfer: Serial transfer

Microcassette

- (1) Tape: Microcassette MC-30
- (2) Tape drive: Center capstan
- (3) Tape speed: 2.4 cm/sec.

1.5.3 Expansion Unit

- (1) Capacity: ROM 16 KB (2365 × 2), RAM 16 KB (2KB × 8)
- (2) Data transfer: Parallel transfer (directly coupled to data bus line)
- (3) Access: Direct access (directly coupled to address bus)

1.5.4 Display Controller

- (1) Text: 32 characters × 16 lines (512 characters)
- (2) Graphic: 128 × 64 dots – 4 colors
128 × 96 dots – monochrome
- (3) Kinds of characters: 256
- (4) Interface: Serial interface
- (5) Video RAM: 2 KB
- (6) Output: Composite RF (Japan and U.S.)
- (7) Power supply: U.S. – AC 115V
Europe – AC 220V

1.5.5 Terminal Floppy (TF-20)

- (1) Memory capacity: 328 KB/drive × 2 drives; 16 sectors/track × 80 tracks;
double density double sided 5.25 inches
- (2) Memory density: 5896 bpi
- (3) Data transfer speed: 250 KB/sec.
- (4) Recording system: MFM
- (5) Interface: RS-232C level (High-speed serial interface used)

1.5.6 Acoustic Coupler CX-20

- | | |
|----------------------|--------------------------------------|
| (1) Transfer system: | Half duplex/full duplex (selectable) |
| (2) Transfer speed: | 300 BPS |
| (3) Modulation: | FSK (Frequency modulation) |
| (4) Interface: | RS-232C |
| (5) Power supply: | UM3 Ni-Cd battery × 4, AC adaptor |

CHAPTER 2

HARDWARE COMPOSITION AND INTERFACES

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2.1 HX-20

2.1.1 Hardware Composition

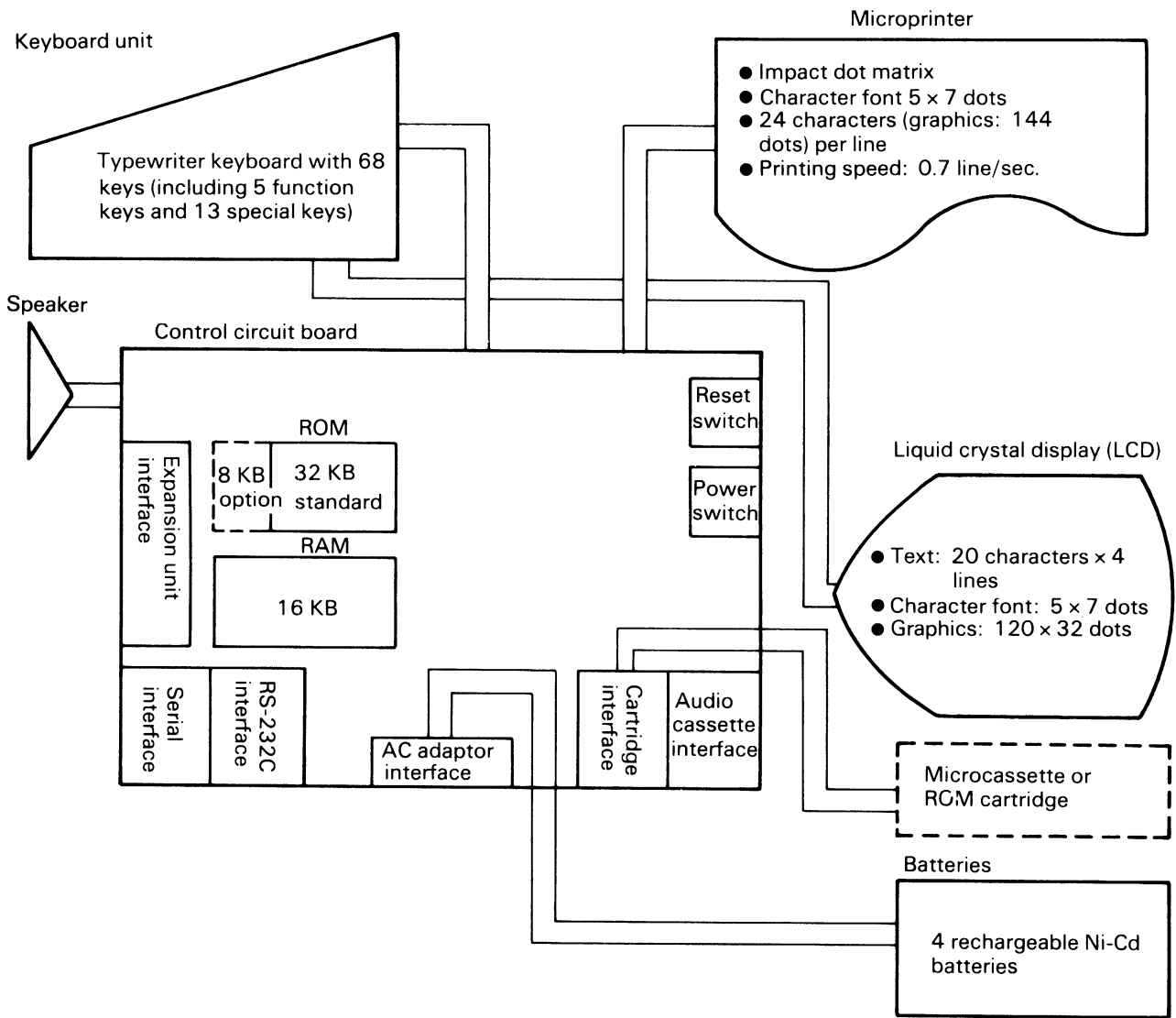


Fig. 2-1 Block Diagram

As shown in the above block diagram, the HX-20 consists of 6 blocks, i.e., control circuit board, keyboard, microprinter, liquid crystal display, buzzer, and batteries. Each block is connected to the control circuit board, and installed in the casing of the HX-20 proper.

2.1.2 MOSU Control Circuit Board Block Diagram

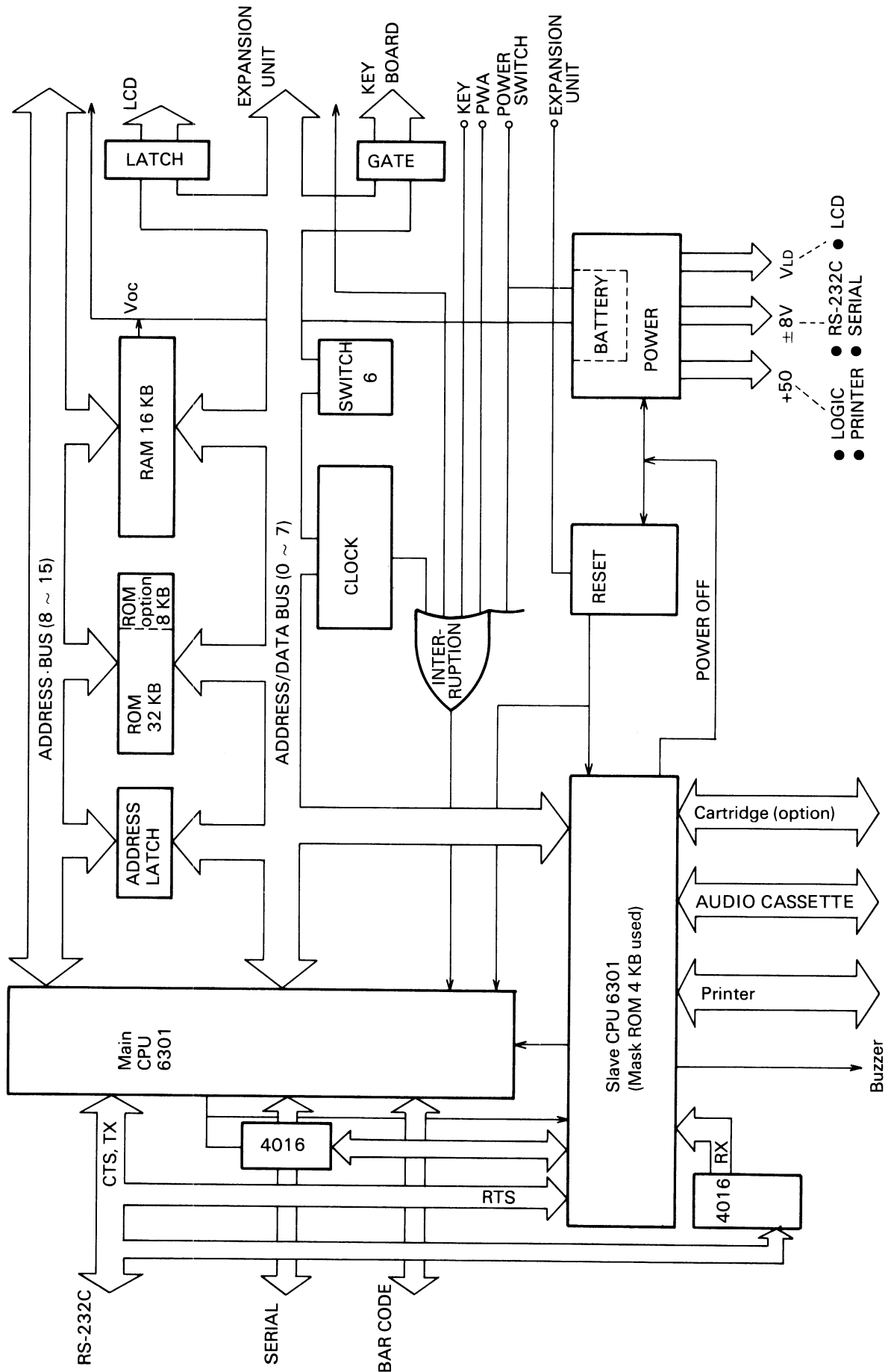


Fig. 2-2 Control Circuit Board Block Diagram

2.1.2.1 MOSU Control Circuit Board

The HX-20 is a dual CPU type with two built-in CMOS CPU 6301s on the control circuit board, and its printer, keyboard, LCD and other interfaces are separately processed by the main CPU and slave CPU. The main and slave CPUs have an independent oscillator and control programs to control inputs and outputs. Data transfer between the main CPU and the slave CPU is performed through a high-speed (38,400 BPS) serial port. The HX-20 is designed to control data transfer at a minimum.

Main CPU 6301

This is the main processor to control the HX-20, and uses the external ROM which stores programs to read and execute commands and control the various blocks. The main kinds of control performed by the main CPU are as follows:

- (a) Keyboard control
- (b) Liquid crystal display control (Display buffer built in the LCD circuit board)
- (c) Built-in ROM and RAM address control
- (d) Bar code reader
- (e) Clock function control

Note: The main CPU 6301 does not use the built-in mask ROM.

Slave CPU

The built-in mask ROM (4 KB) has a control program to control the interfaces independently of the main CPU. The main functions of the slave CPU are as follows:

- (a) Audio cassette control
- (b) Microprinter (M-160) control
- (c) Bar code reader control
- (d) RS-232C interface control
- (e) High-speed serial interface control
- (f) Cartridge option (ROM/microcassette) control
- (g) Power off control

2.1.2.2 Power Supply

The power supply consists of batteries, charging circuit with an AC adaptor, voltage detector circuit, LCD voltage circuit, RS-232C voltage circuit, and backup circuit, and is designed for low power consumption.

- (a) Fuse: 5A fuse is used for protection from overcurrent.
- (b) Charging circuit: This circuit consists of a noise filter, reverse current preventing diode and resistor, and also has a zener diode for protection from high voltage on the output side of the fuse.
- (c) Voltage detector circuit: This circuit keeps monitoring the battery voltage after power is turned on. If the battery voltage drops to less than 4.5V, the circuit sends a POWER ABNORMAL signal to the main CPU to notify of the low voltage.
- (d) LCD voltage circuit: This circuit converts the battery voltage into a DC voltage of approximately +7V to operate the liquid crystal display.
- (e) RS-232C voltage circuit: This circuit generates a voltage of approximately $\pm 8V$ from the battery voltage to meet the RS-232C requirements. This voltage circuit is designed to output the $\pm 8V$ only when the RS-232C is used, and this voltage is switched on and off by the slave CPU.
- (f) Backup circuit: This circuit supplies the minimum current required to protect the data stored in the RAM when the power switch is off, to keep the clock going, and to maintain the components ready for operation when power is turned on.

2.1.2.3 System Buses

- (a) Address data buses: There are 16 address buses, of which the 8 lower buses are also used as data buses by switching with a timing pulse.
- (b) RS-232C: Data is transferred within the range of 110 BPS to 4,800 BPS.
- (c) Serial: This interface is used for data transfer between the main CPU and slave CPU, and data transfer with the display controller at speeds of up to 38,400 BPS.

2.2 Interfaces

2.2.1 Connector Locations

The HX-20 has a total of 12 connectors, including 9 on the MOSU control circuit board, 2 on the keyboard, and 1 on the cartridge option. See the diagrams below for the locations of the connectors and general information on them.

(1) MOSU Circuit Board Connectors

Connector	No. of Pins	Connection
CN1	5	Serial interface
CN2	8	RS-232C
CN3	2	AC adaptor
CN4	20	Keyboard
CN5	20	Keyboard
CN6	20	Printer
CN7	40	Expansion unit
CN8	14	Cartridge option
CN9	2	Batteries

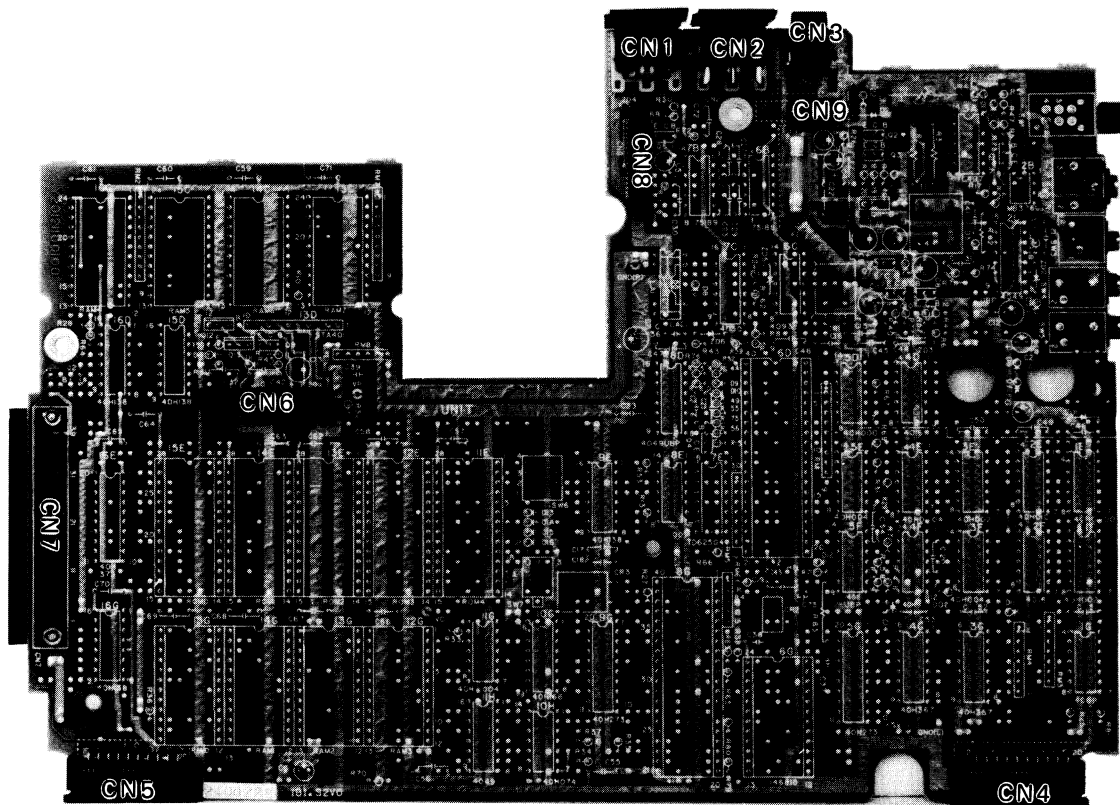


Fig. 2-3 Rear View of MOSU Circuit Board

(2) Keyboard Connectors

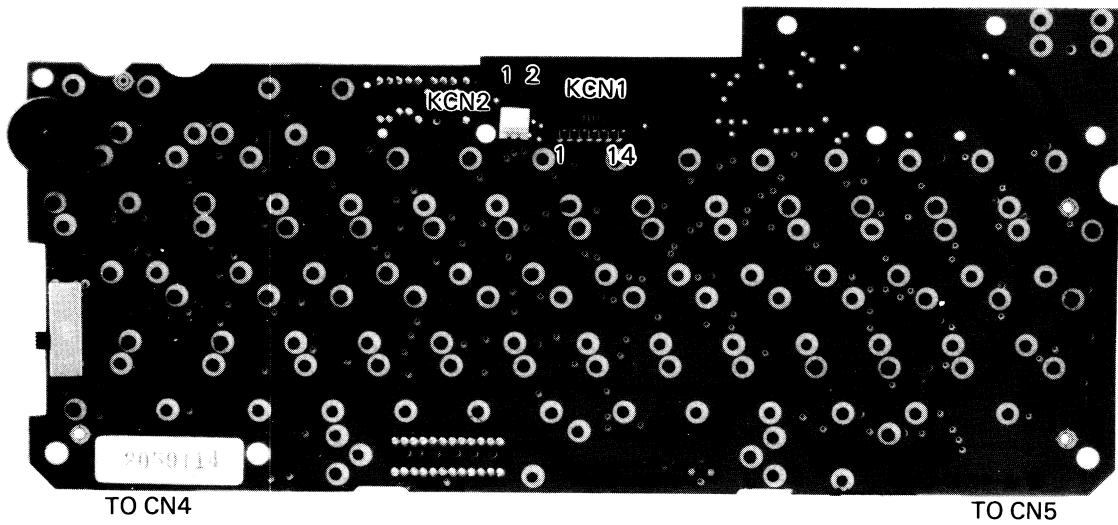


Fig. 2-4

Connector	No. of Pins	Connection
KCN1	2	Speaker
KCN2	14	LCD

(3) Connector for Cartridge Option

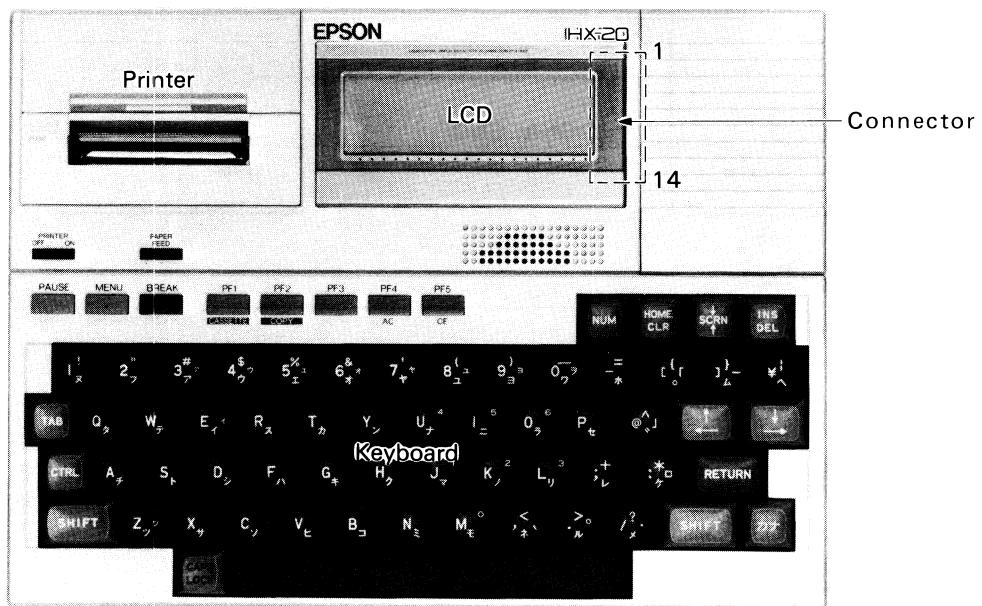


Fig. 2-5

2.2.2 CN1 Connector (Serial Interface)

- (a) Use: Connector for the high-speed serial interface to exchange data with the display controller
- (b) Connector: DIN 5-pin connector TCS4450

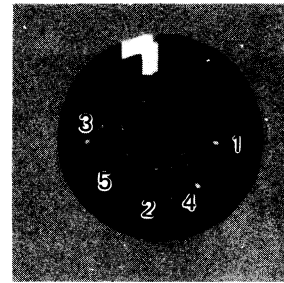


Fig. 2-6

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	GND	–	Signal GND
2	$\overline{\text{PTX}}$	OUT	Transmitting data
3	$\overline{\text{PRX}}$	IN	Receiving data
4	P OUT	IN	Transmitting mode
5	P IN	OUT	Receiving mode
6	CG	–	Case GND

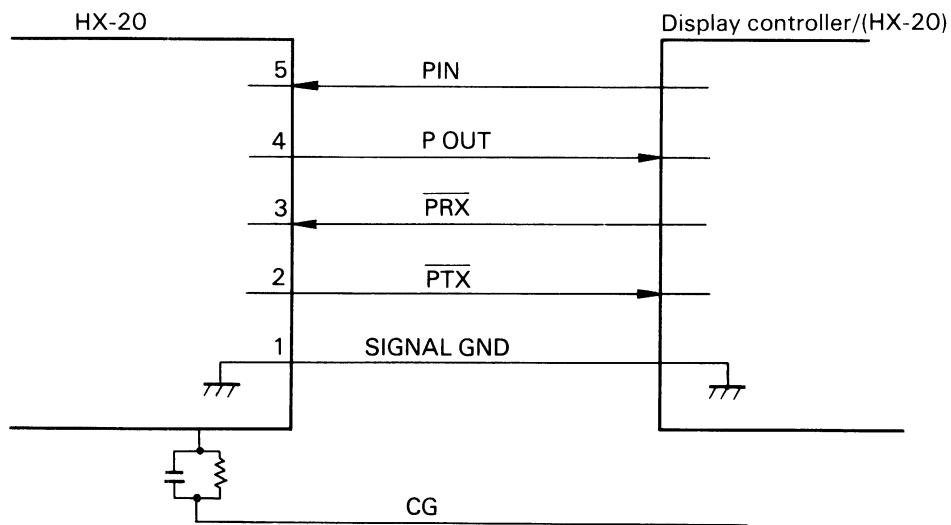


Fig. 2-7

2.2.3 CN2 Connector (RS-232C Interface)

- (a) Use: Interface connector for sending data to and receiving data from the coupler and a developed unit etc.
- (b) Connector: DIN 8-pin connector TCS 4480

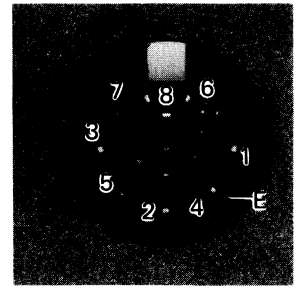


Fig. 2-8

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	GND	-	Signal GND
2	TXD	OUT	Transmitting data
3	RXD	IN	Receiving data
4	RTS	OUT	Request to send
5	CTS	IN	Clear to send (ready for sending)
6	DSR	IN	Data set ready (Modem ready)
7	DTR	OUT	Data terminal ready
8	CD	IN	Carrier detect
E	FG	-	Case GND

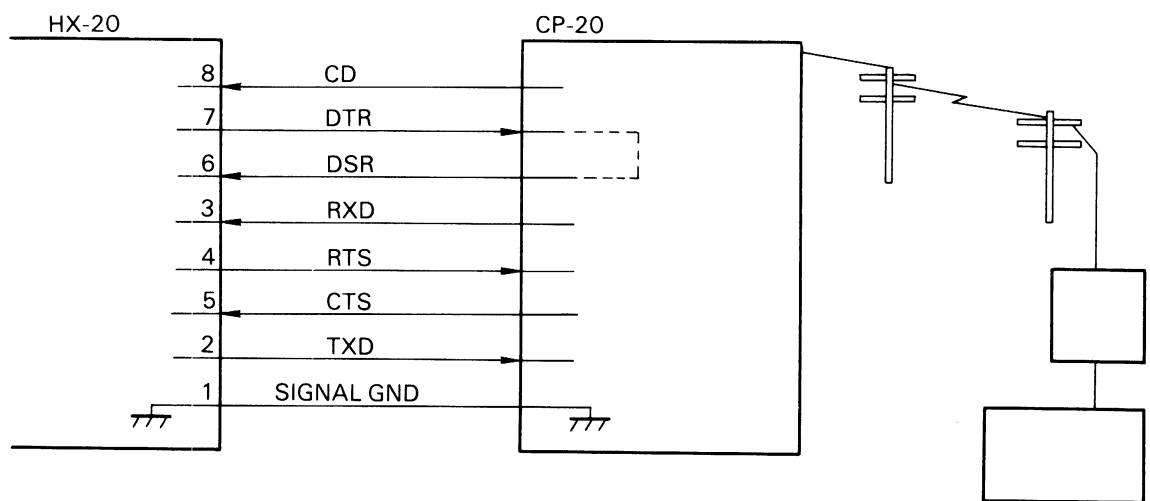


Fig. 2-9

2.2.4 CN3 Connector (AC Adaptor)

- (a) Use: AC adaptor connector for recharging the built-in batteries
- (b) No. of pins: 2

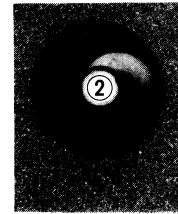


Fig. 2-10

Signal Pin No.	Signal	Meaning of Signal
1	AC+	AC adaptor positive output (+6V)
2	AC-	AC adaptor ground (GND)

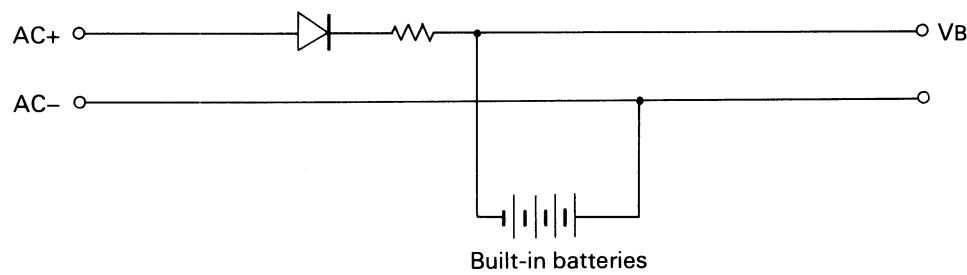


Fig. 2-11

2.2.5 CN4 Connector (Keyboard Interface)

- (a) Use: For connecting keyboard and LCD control signals
 (b) No. of pins: 20



Fig. 2-12

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	KSC 0	OUT	Keyboard column 0 scan 1 2 3 4 5 6 7
2	KSC 1	OUT	
3	KSC 2	OUT	
4	KSC 3	OUT	
5	KSC 4	OUT	
6	KSC 5	OUT	
7	KSC 6	OUT	
8	KSC 7	OUT	
9	KPTN 9	IN	Keyboard return 9 10 7 6 5 4 3 2 1 0
10	KPTN 10	IN	
11	KPTN 7	IN	
12	KPTN 6	IN	
13	KPTN 5	IN	
14	KPTN 4	IN	
15	KPTN 3	IN	
16	KPTN 2	IN	
17	KPTN 1	IN	
18	KPTN 0	IN	
19	$\overline{\text{PW SW}}$	IN	Power switch
20	$\overline{\text{BUSY (S0)}}$	IN	LCD busy/serial data output

2.2.6 CN5 Connector (Keyboard Interface)

- (a) Use: For connecting keyboard, LCD and piezoelectric buzzer control signals
 (b) No. of pins: 20

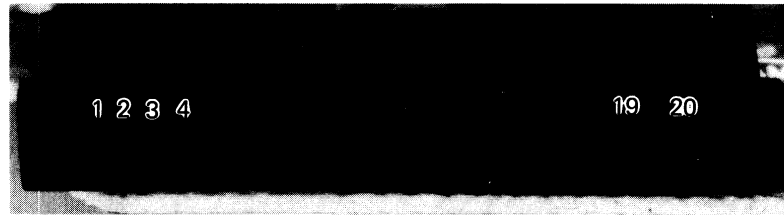


Fig. 2-13

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	VCL	IN	LCD voltage (generated from VLD via view angle control circuit)
2			
3	R	OUT	Reset
4	$\overline{C/D}$	OUT	SI input mode designation command/data; SO/busy designation in read mode
5	CLK	OUT	Control timing (\overline{ENABLE} signal)
6	SD	OUT	Display serial data/command
7	\overline{SCK}	OUT	Serial register shift clock to input or output in units of 8 bits
8	$\overline{CS5}$	OUT	Chip select 5 (Chip No. 5)
9	$\overline{CS4}$	OUT	Chip select 4 (Chip No. 4)
10	$\overline{CS3}$	OUT	Chip select 3 (Chip No. 3)
11	$\overline{CS2}$	OUT	Chip select 2 (Chip No. 2)
12	$\overline{CS1}$	OUT	Chip select 1 (Chip No. 1)
13	$\overline{CS0}$	OUT	Chip select 0 (Chip No. 0)
14	GND	-	Signal ground
15			
16			
17	VLD	OUT	LCD voltage
18	\overline{PWSW}	IN	Power switch
19	SP	OUT	Speaker signal
20	SPG	-	Speaker ground

2.2.7 CN6 Connector (Printer Interface)

- (a) Use: Connecting for the built-in printer
 (b) No. of pins: 20

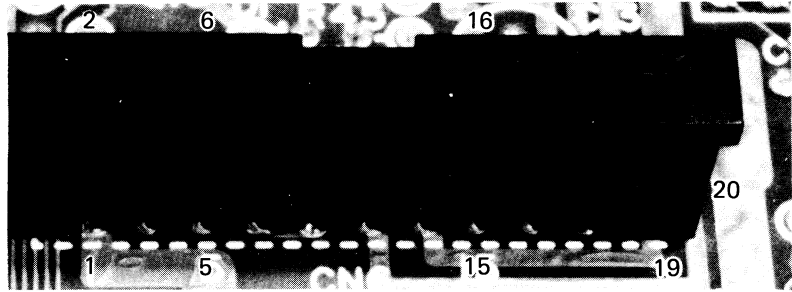


Fig. 2-14

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	RSG	-	Reset signal ground
2			
3	RS	IN	Reset signal
4			
5	M -	-	Motor ground
6			
7	M +	-	Motor +5V
8			
9	SL	-	Head solenoid common (+5V)
10			
11	H4	OUT	Head solenoid 4 (Dot positions 109 to 144)
12			
13	H3	OUT	Head solenoid 3 (Dot positions 73 to 108)
14			
15	H2	OUT	Head solenoid 2 (Dot positions 37 to 72)
16			
17	H1	OUT	Head solenoid 1 (Dot positions 1 to 36)
18			
19	TS	IN	Timing signal
20	TSG	-	Timing signal ground

2.2.8 CN7 Connector (Expansion Unit Interface)

- (a) Use: For connecting the expansion unit control signals and data lines
 (b) No. of pins: 40

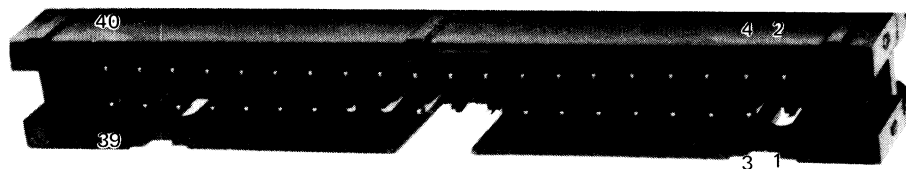


Fig. 2-15

Signal Pin No.	Signal	Signal Direction	Meaning of Signal	Signal Pin No.	Signal	Signal Direction	Meaning of Signal	
1	VB	-	+5V	18	ADDR 3	OUT	Address line 3 4 5 6 7 8 9 10 11 12 13 14 15	
2	$\overline{\text{NMI}}$	-	Unused	19	ADDR 4	OUT		
3	+5V	-	Logic voltage	20	ADDR 5	OUT		
4				21	ADDR 6	OUT		
5	DATA 7	IN/OUT	Data line 7	22	ADDR 7	OUT		
6	DATA 6	IN/OUT	6	23	ADDR 8	OUT		
7	DATA 5	IN/OUT	5	24	ADDR 9	OUT		
8	DATA 4	IN/OUT	4	25	ADDR 10	OUT		
9	DATA 3	IN/OUT	3	26	ADDR 11	OUT		
10	DATA 2	IN/OUT	2	27	ADDR 12	OUT		
11	DATA 1	IN/OUT	1	28	ADDR 13	OUT		
12	DATA 0	IN/OUT	0	29	ADDR 14	OUT		
13	$\overline{\text{IOCS}}$	OUT	I/O chip select	30	ADDR 15	OUT		
14	VC	-	RAM backup voltage	31	R	OUT		Reset
15	ADDR 0	OUT	Address line 0	32	$\overline{\text{R/W}}$	OUT		Read write
16	ADDR 1	OUT	1	33	$\overline{\text{R}}$ (RAM)	OUT	RAM reset	
17	ADDR 2	OUT	2	34	E	OUT	Enable signal	
				35	ROME	IN	ROM enable	
				36	INTEX	IN	External interruption signal	
				37	GND	-	Signal ground	
				38				
				39	C.G.	-	Case ground	
				40				

2.2.9 CN8 Connector (Microcassette)

Signals are routed via cable set 701 to connector CN8 on the MOSU circuit board.

- (a) Use: For connecting the microcassette/ROM cartridge
 (b) No. of pins: 14



Fig. 2-16

Microcassette

CN8 Pin No.	Signal Pin No.	Signal		Signal Direction	Meaning of Signal
		Special Name	General Name		
13, 14	1	* 1 RD/WE	Si1	IN	Selected according to CLK value (Pin No. 4) CLK = 0 : RD Microcassette read data CLK = 1 : WE Accidental erasing prevention signal WE = 0 Write inhibit
11, 12	2	CNT/HSW	Si $\bar{0}$ 1	IN	Selected according to CLK value (Pin No. 4) CLK = 0 : CNT Rpm detection signal CLK = 1 : HSW Head switch, HSW = 0 (Head off)
10	3	WD	S $\bar{0}$ 1	OUT	Microcassette write data
9	4	CLK	Si $\bar{0}$ 2	OUT	Command set clock; RD/WE, CNT/HSW select signal
8	5	CMMND	Si $\bar{0}$ 3	OUT	Command serial data output
7	6	PWSW	Si $\bar{0}$ 4	OUT	*2 Power on-off switch
6	7	Vp		-	+5V (for microcassette mechanism drive)
5	8	MCMT/CNT	Mi1	IN	Power off: Microcassette or no microcassette { = 1 Microcassette = 0 No microcassette Power on: Rpm detection signal is input.
4	9		M $\bar{0}$ 2	OUT	Unused
3	10		M $\bar{0}$ 1	OUT	Unused
2	11	GND		-	Ground
1	12	VL		-	+5V (for write read circuit, selector, instruction register)

CN8 Connector (ROM Cartridge)

CN8 Pin No.	Signal Pin No.	Signal	Signal Direction	Meaning of Signal
13, 14	1	Si1	IN	ROM cassette judging input (always 0)
11, 12	2	Si $\bar{0}$ 1	IN	ROM cassette judging input (always 0)
10	3	S $\bar{0}$ 1		Unused
9	4	Si $\bar{0}$ 2	OUT	Address counter clear
8	5	Si $\bar{0}$ 3	OUT	ROM power on
7	6	Si $\bar{0}$ 4	OUT	Shift register clear (0 : Clear)
6	7	V \bar{B}		Battery power
5	8	Mi1	IN	Shift register output
4	9	M $\bar{0}$ 2	OUT	Shift register clock input
3	10	M $\bar{0}$ 1	OUT	Counter input () Shift register Shift/ \bar{L} OAD switching
2	11	G		Ground
1	12	+5V		5V power (supplied when switch is on)

2.2.10 CN9 Connector (Battery Connector)

- (a) Use: For connecting rechargeable battery cable
 (b) No. of pins: 2

Signal Pin No.	Signal	Meaning of Signal
1	+VB	Battery positive (+5V)
2	-VB	Battery negative (GND)

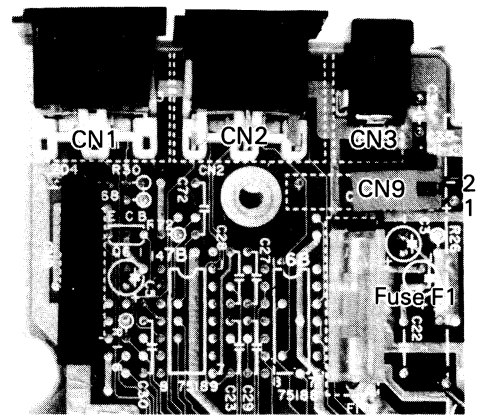


Fig. 2-17

2.2.11 KCN1 Connector (KB ↔ LCD Interface)

- (a) Use: Signal connector for exchanging data with LCD
- (b) No. of pins: 14

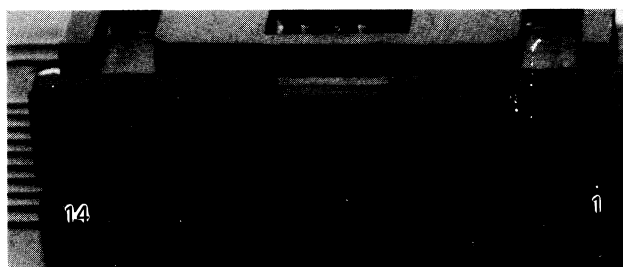


Fig. 2-18

Signal Pin No.	Signal	Signal Direction	Meaning of Signal
1	GND	-	Signal ground
2	$\overline{\text{CS0}}$	Outgoing	Chip select 0 (Chip No. 0)
3	$\overline{\text{CS4}}$	Outgoing	Chip select 4 (Chip No. 4)
4	$\overline{\text{CS2}}$	Outgoing	Chip select 2 (Chip No. 2)
5	$\overline{\text{CS1}}$	Outgoing	Chip select 1 (Chip No. 1)
6	$\overline{\text{CS3}}$	Outgoing	Chip select 3 (Chip No. 3)
7	$\overline{\text{CS5}}$	Outgoing	Chip select 5 (Chip No. 5)
8	RESET	Outgoing	Reset signal
9	CLK	Outgoing	Control timing ($\overline{\text{ENABLE}}$ signal)
10	$\text{C}/\overline{\text{D}}$	Outgoing	SD input mode designation command/data, SO/busy designation in read mode
11	SD	Incoming	Display serial data/command
12	$\overline{\text{SCK}}$	Outgoing	Serial register shift clock
13	$\overline{\text{BUSY}}/(\text{SO})$	Outgoing	Serial output/serial transfer permit signal (Busy)
14	VCC	Outgoing	LCD voltage

2.2.12 KCN2 Connector (Piezoelectric Speaker Connector)

- (a) Use: For supplying built-in speaker drive signal
- (b) No. of pins: 2

Signal Pin No.	Signal	Meaning of Signal
1	Speaker ground	Speaker ground (SPG)
2	Speaker signal	Speaker signal (SP)

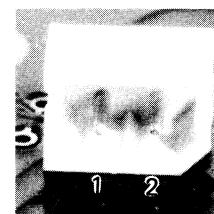


Fig. 2-19

2.3 Interface Cables

2.3.1 Cable Connection Diagram

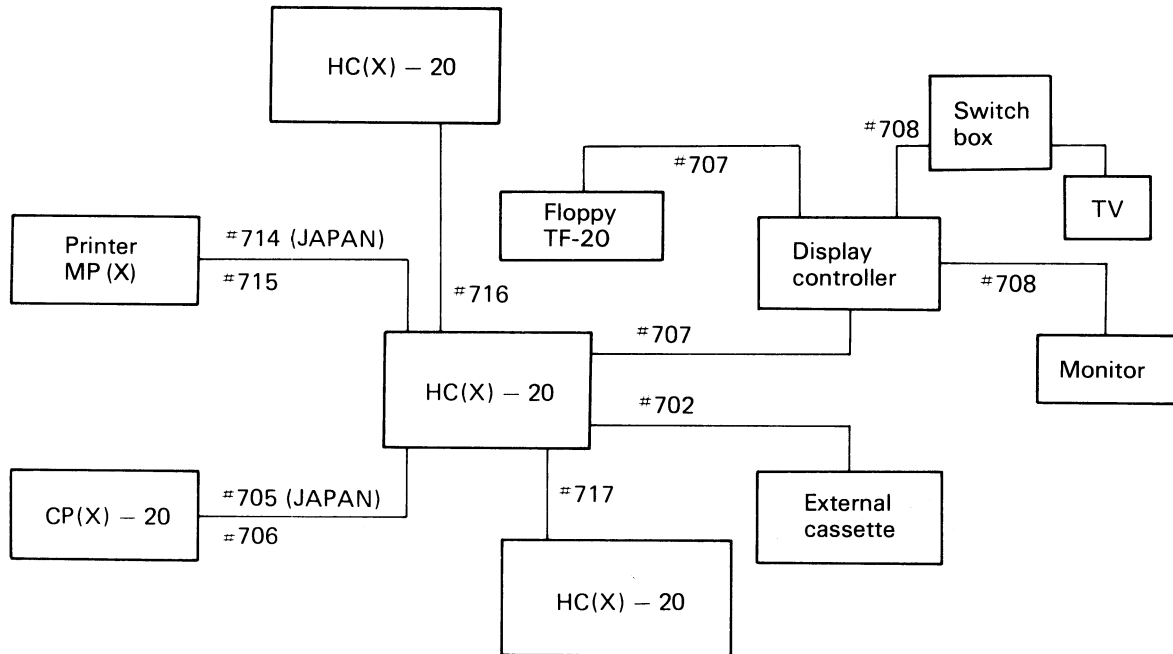


Fig. 2-20

Cable Set No.	Connection	Part No.	Connector
# 702	HC (X)-20 ↔ External cassette	Y201302000	With two adaptors for 3.5φ plug, 2.5φ plug
# 705	HC-20 ↔ CP-20	Y201305000	DIN 8-pin, Canon 25-pin (Japan only)
# 706	HX-20 ↔ CX-20	Y201306000	DIN 8-pin, Canon 25-pin
# 707	HC (X)-20 ↔ DISPLAY CONTR. / DISPLAY CONTR. ↔ TF-20	Y201307000	DIN 5-pin, DIN 6-pin
# 708	DISPLAY CONTR. ↔ MONITOR (TV)	Y201308000	Coaxial cable * In case of TV, connect via switch box.
# 714	HC-20 ↔ PRINTER	Y201309000	DIN 8-pin, Canon 25-pin (Japan only)
# 715	HX-20 ↔ PRINTER	Y201310000	DIN 8-pin, Canon 25-pin
# 716	HC (X)-20 ↔ HC (X)-20	Y201311000	DIN 8-pin, DIN 8-pin
# 717	HC (X)-20 ↔ HC (X)-20	Y201312000	DIN 5-pin, DIN 5-pin

2.3.2 Cable Set No. 702 (with two 2.5φ jack adaptors)

- (a) Use: For connecting HC (X)-20 to external cassette
- (b) Plugs: 3.5 (white, red), 2.5φ (black)

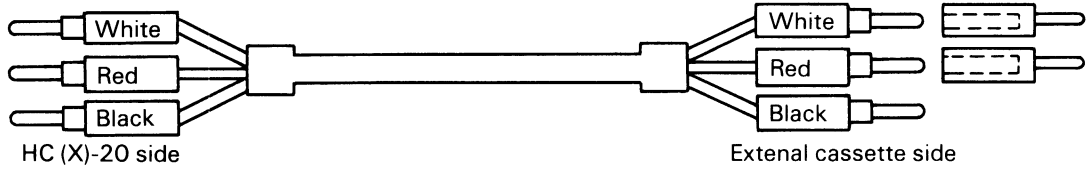


Fig. 2-21

Connecting Method

Connect the HC (X)-20 to an external cassette as shown in the diagram.

- When an input jack of an external cassette is 2.5φ, use the supplied jack adaptor.

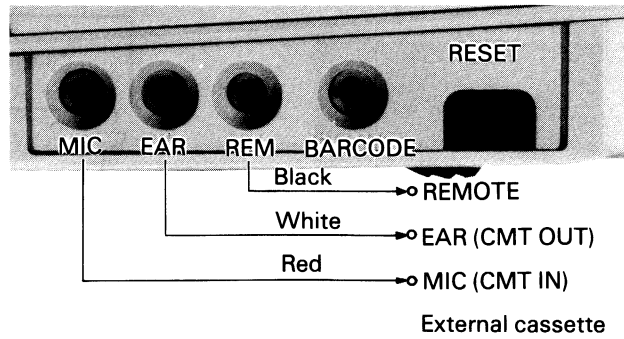


Fig. 2-22

Signals

Signal Pin		Signal
White	1	Shield
	2	Input (IN)
Red	1	Shield
	2	Output (OUT)
Black	1	Remote
	2	Remote

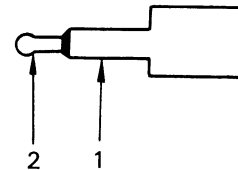


Fig. 2-23

2.3.3 Cable Set No. 705 (Japan)/No. 706 (U.S.A.)

- (a) Use: For connecting the HX-20 to coupler (CX-20)
- (b) Connectors: HX-20 – DIN 8-pin
CX-20 – Canon 25-pin (male)

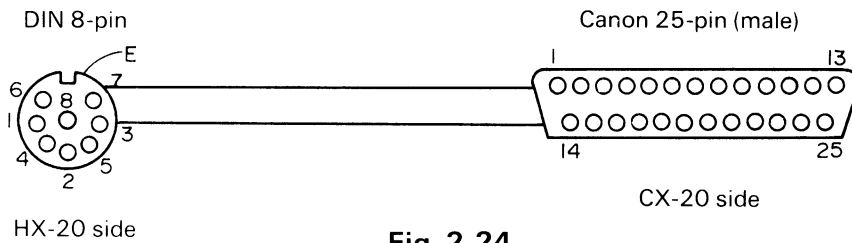


Fig. 2-24

Connecting Method

Engage the DIN connector with the RS-232C interface on the HX-20 proper, and the Canon connector with the interface connector on the CX-20.

Tighten the 2 screws on the Canon connector to fasten it to the CX-20.

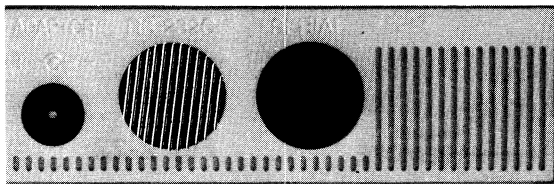


Fig. 2-25

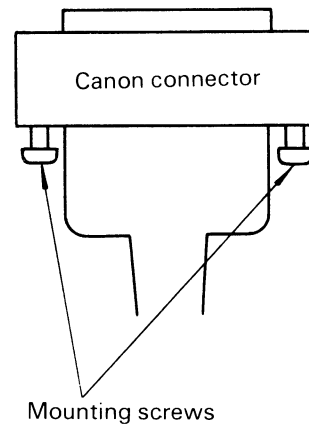


Fig. 2-26

Signals

DIN 8-pin

No.	Signal	Color
1	SG (Signal ground)	Black
2	TXD	Red
3	RXD	Gray
4	RTS	Yellow
5	CTS	Green
6	DSR	Brown
7	DTR	Blue
8	CD	White
E	FG (CG)	(Shield)

DIN 8-pin

No.	Signal	Color
1	FG (CG)	(Shield)
2	TXD	Red
3	RXD	Gray
4	RTS	Yellow
5	CTS	Green
6	DSR	Brown
7	SG (Signal ground)	Black
8	CD	White
9 ~ 19	Unused	-
20	DTR	Blue
21 ~ 25	Unused	-

2.3.4 Cable Set No. 707

- (a) Use: For connecting the HX-20 with display controller; and display controller with terminal floppy
- (b) Connectors: HX-20 (DIN 5-pin) – Display controller (DIN 6-pin)
 Display controller (DIN 5-pin) – Terminal floppy (DIN 6-pin)

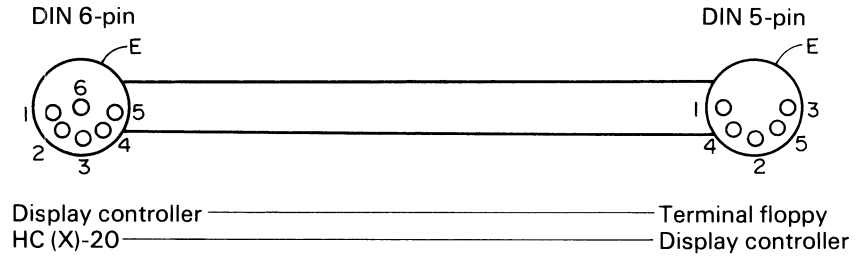


Fig. 2-27

Connecting Method

Engage the DIN connectors on both ends with the interface connectors.

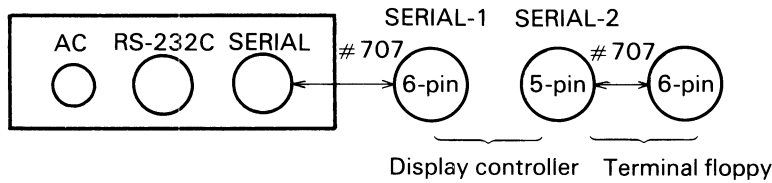


Fig. 2-28

Signals

DIN 6-pin			DIN 5-pin		
No.	Signal	Color	No.	Signal	Color
1	$\overline{\text{PRX}}$	White	1	SG (Signal ground)	Black
2	PIN	Green	2	$\overline{\text{PTX}}$	Red
3	$\overline{\text{PTX}}$	Red	3	$\overline{\text{PRX}}$	White
4	POUT	Yellow	4	POUT	Yellow
5	SG (Signal ground)	Black	5	PIN	Green
6	Unused	–	E	FG (CG)	(Shield)
E	FG (CG)	(Shield)			

2.3.5 Cable Set No. 708

- (a) Use: For connecting the display controller with monitor or TV switch box.
- (b) Connectors: RCA pin plug

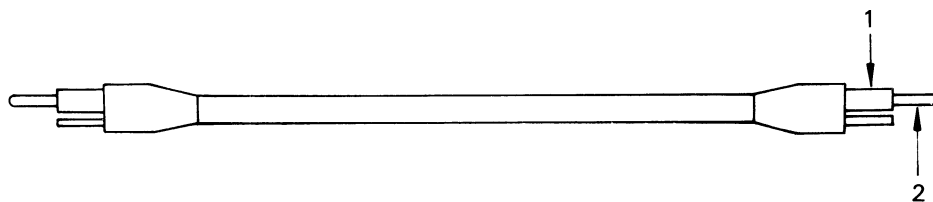


Fig. 2-29

Connecting Method

Insert the cable ends into the interface connectors and make sure that the shielded parts shown in Fig. 1 are in the connectors.

Signals

No.	Signal
1	FG (CG)
2	RF OUT

2.3.6 Cable Set No. 714 (Japan)/No. 715 (U.S.A)

- (a) Use: For connecting the HX-20 with terminal printer
- (b) Connectors: HX – DIN 8-pin
Terminal printer – Canon 25-pin (male)

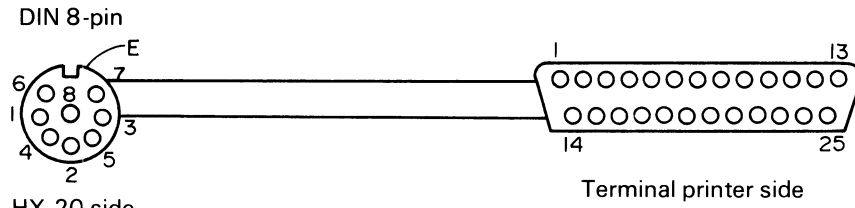


Fig. 2-30

Connecting Method

Insert the DIN connector with the RS-232C interface on the HX-20 proper, and the Canon connector with the interface connector on the terminal printer.

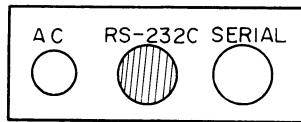


Fig. 2-31

Signals

DIN 8-pin			Canon 25-pin		
No.	Signal	Color	No.	Signal	Color
1	SG (Signal ground)	Black	1	FG (CG)	(Shield)
2	TXD	Red	2	RXD	White
3	RXD	White	3	TXD	Red
4	RTS	Brown	4	Unused	Blue
5	CTS	Brown	5	Unused	Blue
6	DSR	Yellow	6	DTR	Green
7	DTR	Green	7	SG (Signal ground)	Black
8	CD	Blue	8	Unused	Brown
E	FG (CG)	(Shield)	9 ~ 19	Unused	-
			20	DSR	Yellow
			21 ~ 25	Unused	-

* Pins 4 and 5 of the DIN connectors are connected to each other in the connectors and to Pin 8 of the mated connector.

2.3.7 Cable Set No. 716

- (a) Use: For connecting two HX-20s to each other with RS-232C.
- (b) Connectors: DIN 8-pin

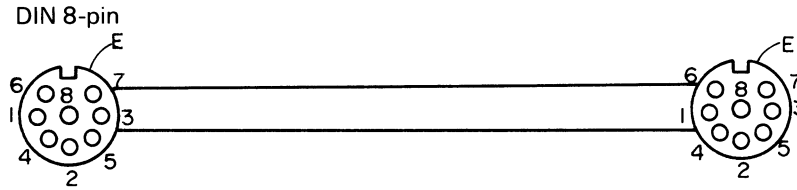


Fig. 2-32

Connecting Method

Connect the DIN connectors with the RS-232C interface on the HX-20.

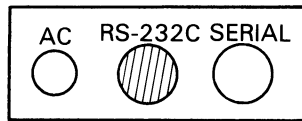


Fig. 2-33

Signals

DIN 8-pin			DIN 8-pin		
No.	Signal	Color	No.	Signal	Color
1	SG (Signal ground)	Black	1	SG (Signal ground)	Black
2	TXD	Red	2	TXD	White
3	RXD	White	3	RXD	Red
4	RTS	Brown	4	RTS	Blue
5	CTS	Brown	5	CTS	Blue
6	DSR	Yellow	6	DSR	Green
7	DTR	Green	7	DTR	Yellow
8	CD	Blue	8	CD	Brown
E	FG (CG)	(Shield)	E	FG (CG)	(Shield)

* Pins 4 and 5 are connected to each other in the respective connectors, and to Pin 8 of the mated connector.

2.3.8 Cable Set No. 717

- (a) Use: For connecting two HX-20s to each other with the serial interface.
 (b) Connectors: DIN 5-pin

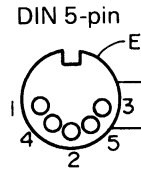


Fig. 2-34

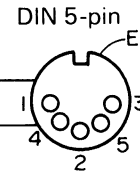


Fig. 2-35

Connecting Method

Connect the DIN connectors with the serial interface on the HX-20.

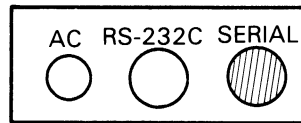


Fig. 2-36

Signals

DIN 5-pin

No.	Signal	Color
1	SG (Signal ground)	Black
2	$\overline{\text{PTX}}$	Red
3	$\overline{\text{PRX}}$	White
4	POUT	Yellow
5	PIN	Green
E	FG (CG)	(Shield)

DIN 5-pin

No.	Signal	Color
1	SG (Signal ground)	Black
2	$\overline{\text{PTX}}$	White
3	$\overline{\text{PRX}}$	Red
4	POUT	Green
5	PIN	Yellow
E	FG (CG)	(Shield)

