

EP-ROM PROGRAMMER

MODEL 1866

INSTRUCTION MANUAL



MINATO ELECTRONICS INC.

EP-ROM PROGRAMMER

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It is provided that a 16-byte program can be stored, operating data up to 255 items can be processed.

The programmer is a small size and light-weight tool. It can be carried anywhere and can be used in field applications.

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## 1. GENERAL

The Model 1866 PROM Programmer is a PROM programmer which incorporates 8 bit micro-processors and current state-of-the-art LSIs at its control section and avails itself of their functions fully,

The object to be programmed includes EPROMs/EEPROMs from 16 k to 256 k.

The 1866 Programmer is provided with an interface RS232C for outside service. If it is connected to a computer, programmed data may be transferred with ease from memories, disks, etc. of the computer thereinto.

It is provided with a 32 k-byte programming buffer memory, permitting data up to 256 k-bits to be processed.

The 1866, owing to its small size and light weight, may be transported with ease, and may be used in wide applications.

## 2. SPECIFICATIONS

o CPU	Z-80A (4.0MHz)
o Buffer RAM	32 k-bytes (256 bits)
o Monitor RAM	2 k-bytes
o Monitor ROM	8 k-bytes
o Operation switch	Hexadecimal key switch
o Display	LED
o Interface	Serial: RS-232C, 20 mA Current loop, switch selectable
o Baud rate	110, 300, 600, 1200, 2400, 4800, 9600 switch selectable
o Tape format	11 kinds of formats, selectable from keyboard
o Tape parity	Odd, even, no parity switch selectable
o Check function	Memory test, Power test, Reverse insertion test, Machine self test, Others
o Temperature	+5 to +35°C
o Power supply	AC 90 V to 130 V or 180 V to 270 V (+10 %), 50/60 Hz
o Power consumption	30 VA
o Size	280 (W) x 208 (D) x 70 (H) (mm)
o Weight	1.5 kg

### 3. CAUTION

When operating the Model 1866, the following items must be observed:

- o Power supply

- (1) The power supply to be used must be capable of generating 90 to 110 percents (50 or 60 Hz) of the rated voltage of your country.
- (2) The 1866 must be separated from equipment which is likely to produce noises (copier, cooler or eraser, etc.).
- (3) Do not turn on and off power with any P-ROM inserted in its socket; otherwise, the P-ROM may be damaged.

- o Storage and environmental conditions

- (1) The 1866 is provided with vents at the rear to prevent any temperature rise; do not cover any vents and do not put the 1866 in any place with few ventilations.
- (2) Do not expose the 1866 to direct sunshine and heat.
- (3) Do not put the 1866 in any extremely wet or dusty place.
- (4) The 1866 is composed of electronic precision parts. Do not subject them to any shock.
- (5) Do not use the 1866 with any foreign materials (water, liquids, metals, etc.) contained; otherwise they may be damaged.

- o Troubles

If any troubles (e.g., abnormal odor or over-heat) are found, disconnect the power cord plug and contact the representative or MINATO ELECTRONICS INC.

#### 4. EXTERNAL VIEW AND NAMES OF PARTS

Figs. 4-1, 4-2, 4-3 and 4-4 show the external view, the display, the key switches and the rear panel, respectively.

##### 4-1 External View

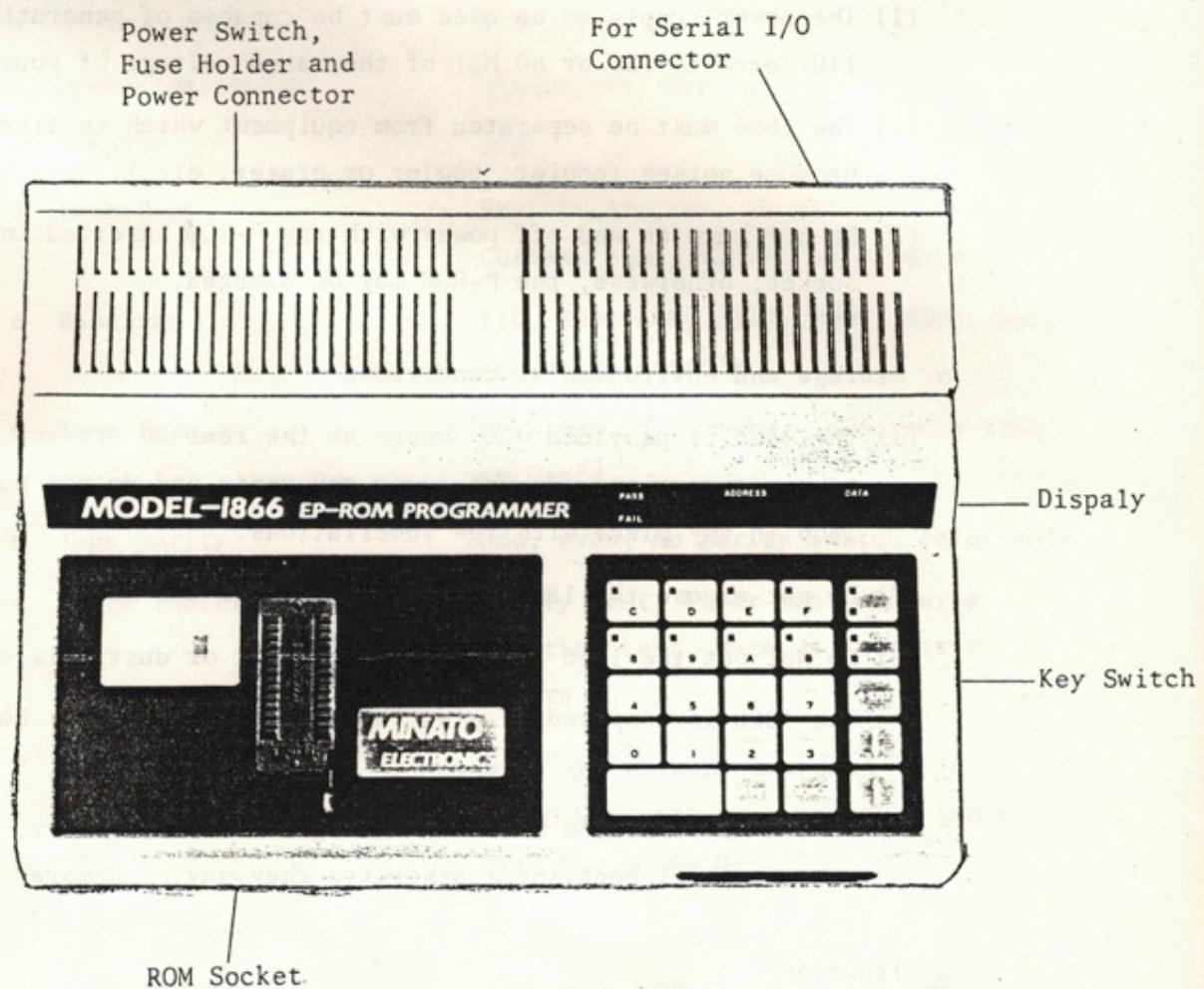
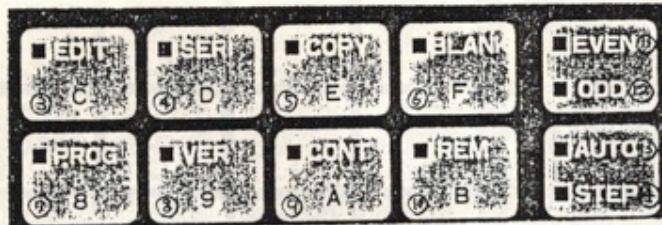
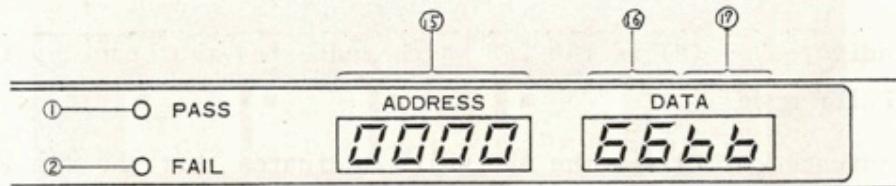


Fig. 4-1 External View

#### 4-2 Display



Indicated by the number (1) is the Pass indicator. The indicator (PASS) lights if, in the set, all operation including programming terminates in a desirable manner.

Indicated by (2) is the Fail indicator. The indicator (FAIL) lights if, in the set, an error occurs in operation including programming.

Indicated by (3) is the LED which indicates that the set is in the EDIT operation mode.

Indicated by (4) is the LED which indicates that the set is in the SERIAL I/O operation mode.

Indicated by (5) is the LED which indicates that the set is in the COPY mode.

Indicated by (6) is the LED which indicates that the set is in the

BLANK check mode.

Indicated by (7) is the LED which indicates that the set is in the PROGRAM mode.

Indicated by (8) is the LED which indicates that the set is in the VERIFY mode.

Indicated by (9) is the LED which indicates that the set is in the CONT. (continuous) mode.

Indicated by (10) is the LED which indicates that the set is in the REMOTE mode.

Indicated by (11) is the LED which indicates that the set is in the EVEN address mode.

Indicated by (12) is the LED which indicates that the set is in the ODD address mode.

Indicated by (13) is the LED which indicates that the set is in the AUTO mode. With the lamp lighting, the set continuously operates on all addresses.

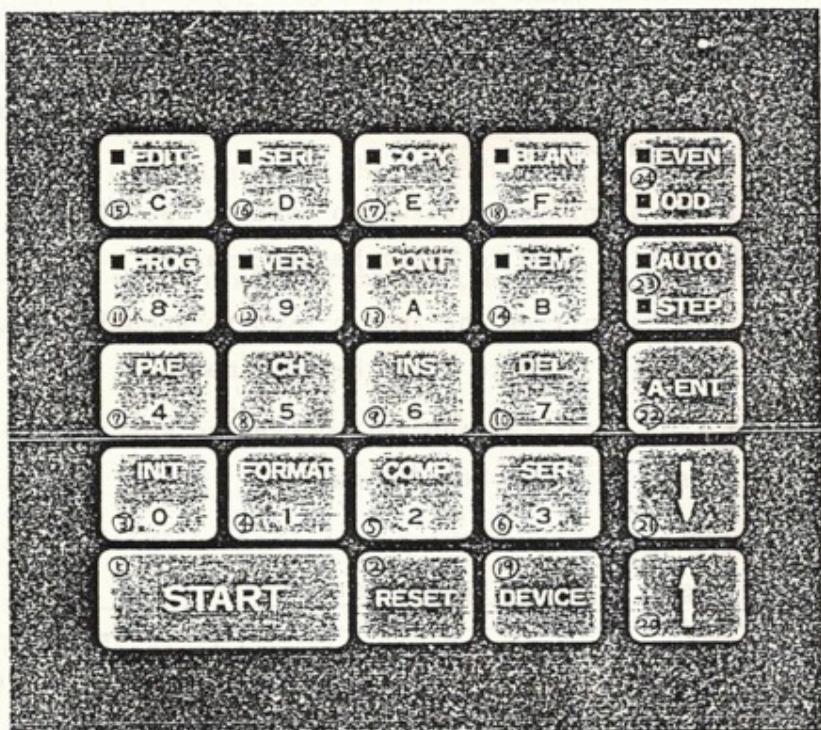
Indicated by (14) is the LED which indicates that the set is in the STEP mode. With the lamp lighting, the set stops whenever execution is made on an address.

Indicated by (15) are LEDs which indicate an address being operated in the PANEL mode and an address to be given to the P-ROM in the other modes. These LEDs are also used to indicate various kinds of messages.

Indicated by (16) are LEDs which indicate the contents of the buffer memory for data to be written.

Indicated by (17) are LEDs which indicate data read from the P-ROM.

#### 4-3 Key Switches



The number (1) signifies the START switch. Pressing the switch in COPY, BLANK, PROGRAM, VERIFY and CONTINUOUS modes causes operation concerned to be started.

The number (2) signifies the RESET switch. Pressing the switch provides resetting and causes operation to be interrupted.

- o Out of the switches described below, switches (3) thru (10), (19), (21), and (22) are valid only in the EDIT mode.

The number (3) signifies the memory INITIALIZE switch, which is also used to enter hexadecimal 0.

The number (4) signifies the switch used to enter hexadecimal 1, which is also used to data format.

The number (5) signifies the switch used to enter hexadecimal 2, which is also used to invert buffer memory data.

The number (6) signifies the switch used to enter hexadecimal 3, which is also used to search data.

The number (7) signifies the switch used to specify an operation address range in each operation mode. The switch is also used to enter hexadecimal 4.

The number (8) signifies the switch used to specify the CHANGE mode. The switch is also used to enter hexadecimal 5.

The number (9) signifies the switch used to specify the INSERT mode. The switch is also used to enter hexadecimal 6.

The number (10) signifies the switch used to specify the DELETE mode. It is also used to enter hexadecimal 7.

The number (11) signifies the switch used to specify the PROGRAM mode. It is also used to enter hexadecimal 8.

The number (12) signifies the switch used to specify the VERIFY mode. It is also used to enter hexadecimal 9.

The number (13) signifies the switch used to specify the CONTINUOUS mode. It is also used to enter hexadecimal A.

The number (14) signifies the switch used to specify the REMOTE mode. It is also used to enter hexadecimal B.

The number (15) signifies the switch used to specify the EDIT mode. It is also used to enter hexadecimal C.

The number (16) signifies the switch used to specify the SERIAL I/O mode. It is also used to enter hexadecimal D.

The number (17) signifies the switch used to specify the COPY mode. It is also used to enter hexadecimal E.

The number (18) signifies the switch used to specify the BLANK check mode. It is also used to enter hexadecimal F.

The number (19) signifies the switch used to specify the DEVICE select mode.

The number (20) signifies the switch which increments an address.

The number (21) signifies the switch which decrements an address.

The number (22) signifies the switch which directs an address to be entered.

The number (23) signifies the switch used to change over AUTO and STEP.

The number (24) signifies the switch used to change over EVEN and ODD address modes.

#### 4-4 Rear Panel

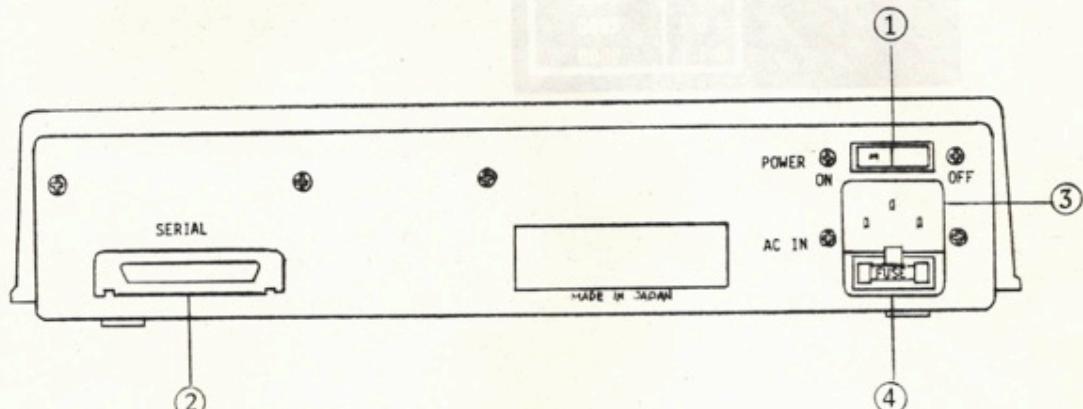


Fig. 4-4 Rear Panel

The number (1) signifies the POWER switch.

The number (2) signifies the receptacle for serial I/O. The connector is used to RS-232C or 20 mA current loop.

The number (3) signifies the receptacle for AC input.

The number (4) signifies the fuse holder which contains a fuse and a spare fuse.

#### 4-5 Bottom Switches

		6 7	STOP BIT
① {	1 2 3 4	0	
	OFF	1	1 BIT
	TEST	0	1.5BIT
	REPEAT	1	2BIT
		4 5	PARITY CHECK
② {	1 2 3 4 5 6 7 8	0	OFF
	X-ON/X-OFF	1 0	ODD
	STOP BIT	1 1	EVEN
	PARITY	1 2 3	BAUD RATE
	BAUD RATE	0 0 0	110
		1 0 0	300
		0 1 0	600
		1 1 0	1200
		0 0 1	2400
		1 0 1	4800
		0 1 1	9600

The switch (1) selects "KEY LOCK", "TEST" or "REPEAT" operation..

The switch (2) selects I/O's baud rate, parity or protocol.

## 5. OPERATION

### Turning on power

1. Check the power switch of the set to see if it is placed in the OFF position.
2. After checking that the receptacle is for AC volt, connect power.
3. Place the power switch in the ON position. If set operation is normal, turning on power causes the address to display the name of a programmable device. (Initially, 2716 is selected.)

And the subsequent operation is waited for.

## 6. OPERATION MODES

The 1866 is provided with eight basic operation modes.

- o EDIT mode

This mode edits data to be written and specifies an address to be programmed.

- o SERIAL (SERI) mode

This is the SERIAL I/O mode which inputs/outputs data to be written using the serial I/O port.

- o COPY mode

This mode enters data to be written from the master ROM.

- o BLANK mode

This mode blank checks PROMs.

- o PROGRAM (PROG) mode

This mode programs PROMs.

- o VERIFY (VER) mode

This mode verifies programmed PROMs.

- o CONTINUOUS (CONT) mode

This mode provides BLANK, PROGRAM and VERIFY operations successively.

- o REMOTE (REM) mode

This mode remotely controls the Programmer from an external CPU or terminal using the SERIAL I/O port.

### 6-1 EDIT Mode

This mode has nine instructions.

### 6-1-1 PAE (Programming address specification mode)

This instruction specifies an operating range during data writing or reading. This instruction is capable of specifying a ROM's start address and stop address, and a RAM's start address.

In the Programmer, the operating address range is automatically determined by power on, but may be changed at need.

- o Changeable contents

- o P-ROM start address and P-ROM stop address

Specify the portion of a P-ROM to be programmed. At power on, the start address and stop address are set at  $0000_H$  and the end address of a P-ROM to be programmed.

- o Memory (RAM) start address

When programming a P-ROM, specify which portion of the programmer data is to be written from. This also applies to reading (Copy and Verify)

- o Notes for change

The start address is equal to or less than the stop address.

The stop address is equal to or less than P-ROM's end address.

Unless the above requirements are met, "E-4" is displayed, when "START" is pressed.

Presented below is the procedure.

- (1) Press "EDIT".
- (2) Press "PAE". (PAE refers to Program Address Entry.)
- (3) Enter a programming start address (P-ROM start address) in a hexadecimal number consisting of four digits. If no change is required, press " $\wedge$ " to proceed to the step (5).
- (4) Press "A-ENT".

- (5) Enter a programming stop address (P-ROM stop address) in a hexadecimal number consisting of four digits. If no change is required, press "↑" to proceed to the step (7).
- (6) Press "A-ENT".
- (7) Enter a memory's (RAM's) start address in a hexadecimal number consisting of four digits. If no change is required, press "↑". "END" is displayed and all operation terminates.
- (8) If "A-ENT" is pressed, "END" is displayed and all operation terminates.

**Examples**

1. Write the contents of the address  $0600_H$  of the memory (RAM) into the portion of 2732 from the address  $0400_H$  to the address  $7FF_H$ .
  - (1) Set 2732 by the DEVICE select switch.
  - (2) Press "EDIT".
  - (3) Press "PAE". The ROM start address is displayed.

<input type="radio"/> PASS <input checked="" type="radio"/> FAIL	ADDRESS	DATA
	0000	

- (4) Enter the P-ROM start address ( $0400_H$ ) in a hexadecimal number consisting of four digits.

<input type="radio"/> PASS <input checked="" type="radio"/> FAIL	ADDRESS	DATA
	0000	0400

- (5) Press "A-ENT". The ROM start address is set and the ROM stop address is displayed on the ADDRESS portion.

<input type="radio"/> PASS <input checked="" type="radio"/> FAIL	ADDRESS	DATA
	0FFF	0400

- (6) Enter the P-ROM stop address ( $07FF_H$ ) in a hexadecimal number consisting of four digits.

<input checked="" type="radio"/> PASS <input type="radio"/> FAIL	ADDRESS <b>0FFF</b>	DATA <b>07FF</b>
---	------------------------	---------------------

- (7) Press "A-ENT". The ROM stop address is set and the RAM start address is displayed on the ADDRESS portion.

<input checked="" type="radio"/> PASS <input type="radio"/> FAIL	ADDRESS <b>0000</b>	DATA <b>07FF</b>
---	------------------------	---------------------

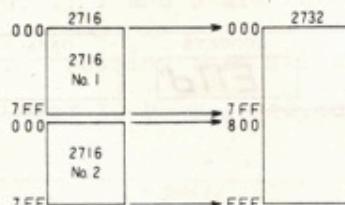
- (8) Enter the memory (RAM) start address ( $0600_H$ ) in a hexadecimal number consisting of four digits.

<input checked="" type="radio"/> PASS <input type="radio"/> FAIL	ADDRESS <b>0000</b>	DATA <b>0600</b>
---	------------------------	---------------------

- (9) Press "A-ENT". "END" is displayed.

<input checked="" type="radio"/> PASS <input type="radio"/> FAIL	ADDRESS <b>End</b>	DATA
---	-----------------------	------

2. Shift two 2716's data to 2732 (only by changing the RAM start address).



- (1) Set 2716 by the DEVICE select switch.
- (2) Insert the first 2716 into the socket, and press "COPY" and "START" in that order.
- (3) Press "EDIT" and "PAE" in that order.

<input checked="" type="radio"/> PASS	ADDRESS	DATA
<input type="radio"/> FAIL	0000	

- (4) Press "↑". (No ROM start address is changed.)

<input checked="" type="radio"/> PASS	ADDRESS	DATA
<input type="radio"/> FAIL	07FF	

- (5) Press "↑". (No ROM stop address is changed.)

<input checked="" type="radio"/> PASS	ADDRESS	DATA
<input type="radio"/> FAIL	0000	

- (6) Enter the memory (RAM) start address as 0800<sub>H</sub>.

<input checked="" type="radio"/> PASS	ADDRESS	DATA
<input type="radio"/> FAIL	0000	0800

- (7) Press "A-ENT".

<input checked="" type="radio"/> PASS	ADDRESS	DATA
<input type="radio"/> FAIL	End	

(8) Insert the second 2716 (No.2) into the socket, and press "COPY" and "START" in that order.

(9) Set 2732 by the DEVICE select switch.

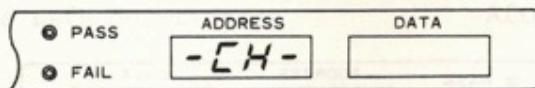
(10) Program 2732.

Through the above operations, two 2716's data can be shifted into 2732. By the same procedure, four 2716s and two 2732s (2532s) may be shifted into 2764 (2564).

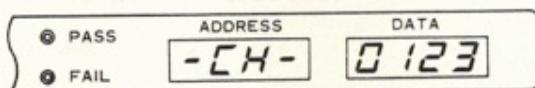
#### 6-1-2 CH (Change mode)

Described here is the operating method for altering data stored in the memory for programmed data.

1. Press the "EDIT" switch. (The EDIT lamp located on the display panel flashes.)
2. Press the "CH" switch.



3. Enter an address in a four-digit hexadecimal number.

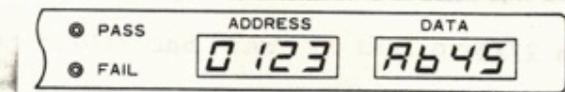


In this example, 0, 1, 2 and 3 are entered.

4. Press "A-ENT". Pressing this switch causes the already entered hexadecimal number to be registered as the address



5. Enter data in a two-digit hexadecimal number. (In this example, 4 and 5 are entered.)



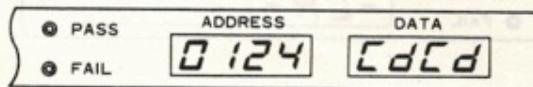
The new entered data is displayed here.

6. Press "↑" or "↓". Pressing these switches causes the already entered hexadecimal number to be registered as data.

Pressing "↑" causes the address to increment by one address, while pressing "↓" causes the address to decrement by one address.

If the address of data are subsequently entered, repeat steps 5 and 6.

To enter data with a separate address, repeat from the step 3.



Pressing the "↑" advances one address.

RAM data of address 124

7. For getting out of this mode, press the "RESET" switch. The procedure also applies to the "INS" mode.

#### 6-1-3 INS (Insert mode)

This mode inserts new data into memory data. In this mode, the data from inserted data on are moved by one address.

Operations in this mode are identical to those in the CH mode except for mode specification. However, the "↑" switch cannot be used.

Before data insertion		After data insertion	
Address			
N-2	00		00
N-1	01	Data 10 is	01
N	02	inserted into	10
N+1	03	address N.	02
N+2	04		03

#### 6-1-4 DEL (Delete mode)

This mode deletes memory data. This mode is broken down into one address deletion and block deletion.

Execution this operation causes the data from deleted data on to be left justified by one address.

Before data deletion		After data deletion	
Address			
N-2	00		00
N-1	01		01
N	02	Address N is	03
N+1	03	deleted.	04
N+2	04		05

##### One address deletion

1. Press "EDIT".
2. Press "DEL".
3. Enter an address to be deleted in a four-digit hexadecimal number.
4. Press "A-ENT" to register the already entered hexadecimal number as an address.

5. Press "↑". Pressing "↑" causes the data of the already entered address to be deleted.

#### Block deletion

1. Press "EDIT".
2. Press "DEL".
3. Enter a deletion start address in a four-digit hexadecimal number.
4. Press "A-ENT" to register the entered hexadecimal number as an address.
5. Enter a deletion end address in a four-digit hexadecimal number.
6. Press "↑". Pressing "↑" causes the data between the entered start address and end address to be deleted.

#### 6-1-5 INIT (INITIALIZE mode)

This mode initializes a memory to be programmed.

- *Enter edit mode*
1. Press the "INIT" switch. Now, "-CL-" is displayed on the address display.
  2. Enter a start address consisting of four digits, and press the "A-ENT" switch.
  3. Enter an end address consisting of four digits, and press the "A-ENT" switch.
  4. Enter initialize data consisting of two digits.
  5. Press the "↑" switch. Now, the memory range specified through steps 2 and 3 is initialized by the data specified by the step 5.

Steps 2 and 3 may be omitted. In such a case, all memories are initialized. The step 4 may be omitted. In such a case, the selected ROM is initialized to an unprogrammed status.

#### 6-1-6 FORMAT

This mode specifies a communication format to be used when Serial I/O is employed. → Enter EDIT mode.

1. Press the "FORMAT" switch. Now, "-FO-" is displayed on the address display, and the number of a format currently selected format is displayed on the data display.
2. Specify a format to be selected using its number. Press ↑

Data format	Code number
Extended Tektronix Hex. (16 bits)	0
Standard Tektronix Hex. (8 bits)	1
Intel MCS-86 Hex. Object (16 bits)	2
Intel Intellec 8/MDS (8 bits)	2
Motorola Exormax (16 bits)	3
Motorola Exorciser (8 bits)	3
Texas Instruments SDSMAC (8/16 bits)	4
Minato Hex.	5
ASCII Hex. (Space)	6
Binary	7
Hewlett Packard 64000 Absolute	8

#### 6-1-7 COMP (COMPLEMENT mode)

This mode inverts memory data. → Enter EDIT mode

1. Press the "COMP" switch. Now, "-CP-" is displayed on the address display.
2. Press the "↑" switch. On the termination of operation, "END" is displayed.

#### 6-1-8 SER (SEARCH mode)

This mode searches for a data string in a memory. Data up to four bytes may be searched for.

→ Enter edit mode

1. Press the "SER" switch. Now, "-SH-" is displayed on the address display.
2. Enter a start address consisting of four digits, and press the "A-ENT" switch.
3. Enter an end address consisting of four digits, and press the "A-ENT" switch.
4. Enter data to be searched for using two digits, and press the "↑" switch. This step may be repeated up to four times.
5. Press the "START" switch. When specified data is found, its address is displayed.
6. If the "START" switch is pressed again, data begins to be searched from the subsequent address.
7. If the data is not found, "END" is displayed, and operation stops.

Steps 2 and 3 may be omitted. In such a case, the whole memory is subjected to this operation.

#### 6-1-9 DEVICE

This mode selects a PROM to be programmed or read.

The PROM concerned may be selected by means of keys "0" thru "1F" or the "↑" switch.

→ Enter edit mode

1. Press the "DEVICE" switch. Now, the name and number of a PROM currently selected are displayed on address and data sections, respectively.
2. Select a PROM concerned using the "↑" or "↓" switch, or keys "00" thru "1F".

- o The switch " $\uparrow$ " permits selecting the PROM with the number following that of a PROM currently selected.
- o The switch " $\downarrow$ " permits selecting the PROM with the number preceding that of a PROM currently selected.
- o Number "00" thru "1F" *followed by 1* permits directly selecting a PROM.

The correspondence between number and PROM is shown in Figure.

3. Press the "A-ENT" switch. Now, "END" is displayed and operation stop.

Command Number	Display	P-ROM concerned	Programming methods
00	2716	00	Standard
01	2732	01	"
02	2732A	02	"
03	2532	03	TMS2532
04	2764	04	2764
05	,64H	05	2764
06	,64AH	06	2764A
07	F64H	07	MBM2764
08	2564	08	TMS2564
09	2564H	09	TMS2564
0A	6876H	0A	MCM68764
0B	27128	0B	27128
0C	,128H	0C	27128
0D	,128A	0D	27128A
0E	F128H	0E	MBM27128
0F	,256	0F	27256
12	48016	12	HN48016 (EEP-ROM) or equivalent
13	2815	13	2815
14	2816	14	2816
15	2816A	15	X2816A
16	5213	16	5213
17	2864	17	X2864A
40	27C16	40	27C16 (C-MOS EP-ROM) or equivalent
41	27C32	41	27C32
42	C32A	42	27C32A
44	27C64	44	27C64
45	,C64H	45	27C64
47	FC64H	47	MBM27C64
4B	C128	4B	27C128
4E	FC128	4E	MBM27C128
50	FC256	50	MBM27C256

\* JAN. 84' (Data subject to change without notices)

\* Programming methods

Intelligent: Intelligent programming algorithm (INTEL method)

Quick : Quick Programming metod (FUJITSU method)

Standard : 50ms pulse

## 6-2 SERI (SERIAL I/O mode)

This mode enters data from the serial I/O port.

### 6-2-1 Entering Data

1. Press the "SERI" switch to set up the serial I/O mode.
2. Press "0" and "START". Now, data is entered in accordance with a selected format.

### 6-2-2 Outputting Data

1. Press the "SERI" switch to set up the serial I/O mode.
2. Press "1" and "START". Now, data is output in accordance with a selected format.

### 6-2-3 Issuing List

1. Press the "SERI" switch to set up the serial I/O mode.
2. Press "2" and "START". Now, the list is issued.

### 6-2-4 Outputting Control Code

1. Press the "SERI" switch to set up the serial I/O mode.
2. Press "3" and "START". Now, the code is output as follows:

Key Number	Control Code	Remarks
0	SOH (01H)	
1	STX (02H)	
2	ETX (03H)	
3	EOT (04H)	
4	ENQ (05H)	
5	DC1 (11H)	X-ON
6	DC2 (12H)	
7	DC3 (13H)	X-OFF
8	DC4 (14H)	
9	ETB (17H)	
A	EM (19H)	
B	SUB (1AH)	End Code of "MDS", End Code of "CP/M"
C	ESC (1BH)	
D	NUL (00H)	Spare
E	NUL (00H)	Spare
F	NUL (00H)	Spare

#### 6-2-5 Handshake

This programmer adopts two methods for handshakes between devices to be applied when the serial I/O port is used.

##### 1. RS232C's control wire

The first method utilizes the RS232C's control wire. This is the easiest method for connection to a device which uses the control wire

##### 2. X-ON/X-OFF signal

This method is utilized when the RS232C's control wire is not used,

or for interfacing with a current loop.

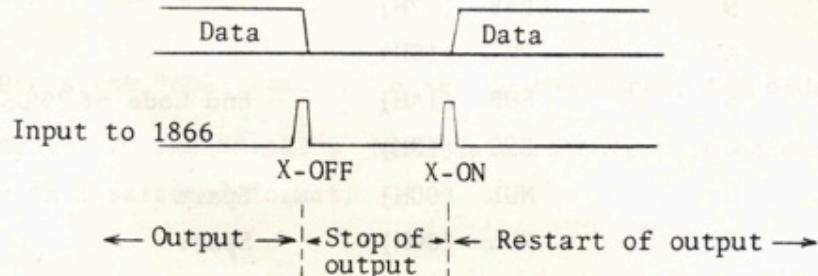
This method uses an X-ON signal to request data transmission, and an X-OFF signal to stop data transmission. X-ON and X-OFF signals are output to a line used to transmit/receive data.

This Programmer uses a code of "11<sub>H</sub>" for the X-ON signal, and a code of "13<sub>H</sub>" for the X-OFF signal.

Example 1:

This example outputs data from the 1866.

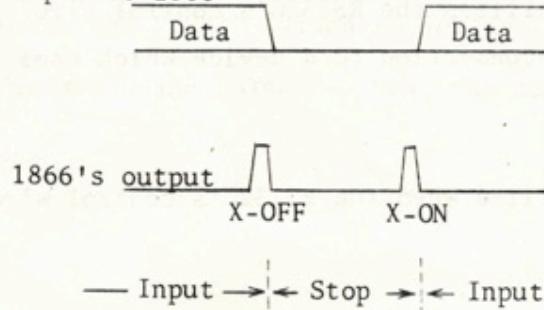
1866 output data



Example 2:

This example enters data from the 1866.

Input to 1866



#### 6-3 COPY

This mode enters data from a programmed PROM.

1. Press the "COPY" switch to set up the copy mode. When the copy mode is set, the COPY LED begins to flash.
2. Insert a master PROM into a socket.
3. Press the "START" switch. When the "START" switch is pressed, the Programmer begins to operate.
4. After all data have been read, the "PASS" LED flashes and the check sum value <sup>\*1</sup> is displayed, and operation stops.
  - o The copy mode reads two data from a PROM and compares the data with each other to detect reading errors. When a reading error is detected, the "FAIL" LED flashes and an error message <sup>\*2</sup> is displayed, and operation stops.
  - o The copy mode does not perform "STEP" operation.
  - o In the copy mode, the address specified in the "PAE" mode is invalid. However, the "RAM START" address is valid.
  - o In the copy mode, the address mode <sup>\*3</sup> is valid.
  - o The order of executing steps 1 and 2 is left to the user's discretion.

\*1: See 6-11.

\*2: See 6-12.

\*3: See 6-9.

#### 6-4 BLANK

This mode checks a PROM's unprogrammed or delete state.

1. Press the "BLANK" switch to set up the blank mode. When the blank mode is set up, the BLANK LED flashes.

2. Insert a PROM into a socket.
3. Press the "START" switch. Now, operation starts. When an error is found, its address data is displayed and operation stops. When the "↑" switch is pressed, operation restarts from the next address. If the "START" switch is pressed, operation is carried out from the start.
4. After the termination of checking all addresses, the "PALL" LED lights and operation stops.
  - o The blank check mode is capable of step operation.
  - o In the blank check mode, every PAE is valid.
  - o The order of executing steps 1 and is left to the user's discretion.
  - o In the blank check mode, the address mode is valid.

#### 6-5 PROG (PROGRAM) Mode

This mode programs a PROM.

1. Press the "PROG" switch to set up the program mode. When the program mode is set up, the "PROG" LED flashes.
2. Insert a PROM into a socket.
3. Press the "START" switch. Now, program operation starts.
4. After all addresses have finished being programmed, the "PASS" LED lights and the check sum is displayed, and operation stops.  
If an error is found, the same processing as the blank check is conducted.
  - o The program mode, on the termination of programming, carries out the verify check.
  - o For notes, see 6-4 "BLANK".

#### 6-6 VER (VERIFY) Mode

This mode compares the contents of a programmed PROM with those of the RAM, to check if it has been programmed normally.

1. Press the "VER" switch to set up the verify mode. When the verify mode is set up, the "VER" LED flashes.
2. Insert a PROM into a socket.
3. Press the "START" switch. Now, the verify check starts.
4. After the termination of programming all addresses, the "PASS" LED lights and the check sum is displayed, and operation stops.  
If an error is found, the same processing as the blank check is conducted.
  - o Verify operation is conducted four times, as conditions are varied.
  - o For the other notes, see 6-4 "BLANK".

#### 6-7 CONT (CONTINUOUS) Mode

This mode provides three operations of Blank check, Program and Verify continuously.

For operations, see descriptions for the above three modes.

#### 6-8 REM (REMOTE) Mode

This mode remotely controls the Programmer from the outside using the serial I/O port. For details of this function, see Chapter 7.

#### 6-9 Address Mode Selection

The Programmer, in copy, program and verify operations, is capable of selecting an address to be programmed.

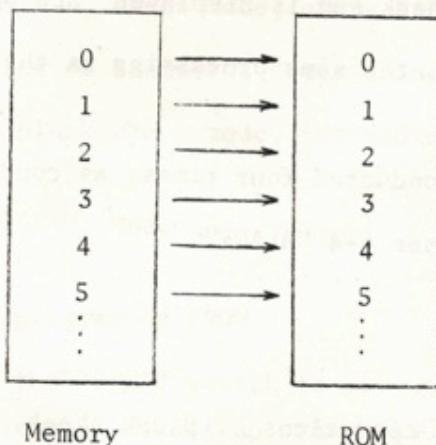
If the two address mode indication LEDs go out, this signifies that

the normal address mode has been set up. The successive memory addresses will be programmed.

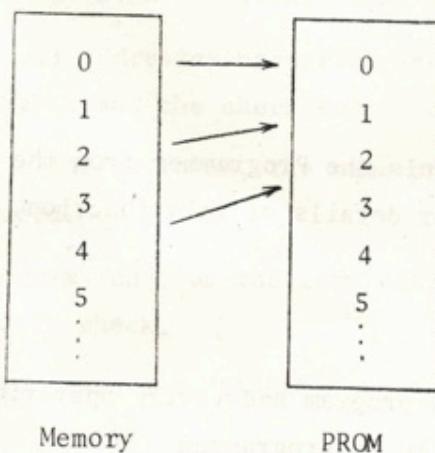
If the address mode display LED "EVEN" lights, this signifies that the even address mode has been set up. Only the even memory addresses will be programmed.

If the address mode display LED "ODD" lights, this signifies that the odd address mode has been set up. Only the odd memory addresses will be programmed.

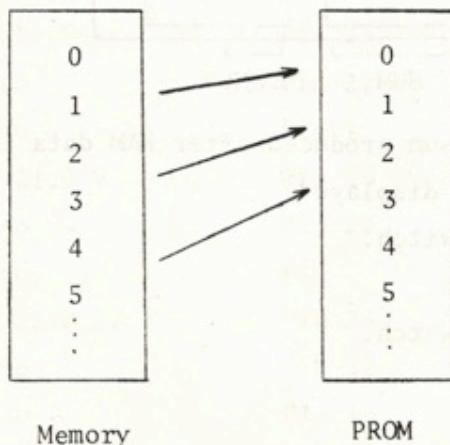
#### Normal address mode



#### Even address mode



### Odd address mode



### 6-10 AUTO/STEP Selection

In Blank, Program, Verify and Cont operations, Auto and Step modes are valid.

Auto/Step is selected by pressing the "AUTO/STEP" switch. This switch is an alternate type.

In the step mode, operation is stopped by one address execution.

Pressing the "START" switch causes the next address to be subjected to execution.

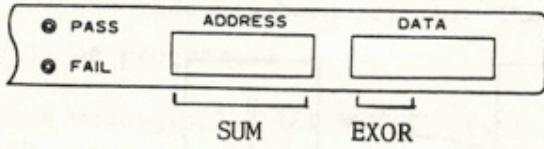
During the step mode, the auto mode may be set up.

The auto mode provides successive execution from the start. During the auto mode, the step mode cannot be set up.

### 6-11 Check Sum

This Programmer, at the end of the Copy, Program or Verify mode, generates and displays a PROM's check sum.

The check sum is obtained by adding and exclusively ORing data by address, and is displayed as shown below.



In addition, the check sum produced after RAM data in the programmer has been changed may be displayed.

1. Press the "BLANK" switch.
2. Press the "0" switch.
3. Press the "START" switch.

#### 6-12 Error Messages

This Programmer, when power is turned on or during operation, carries out a number of checks. When an error is detected by these checks, the error message is displayed, and operation stops.

##### 6-12-1 Table of error codes

E-1	Memory error
E-2	Parity error (RS-232C)
E-3	Format error (Data format)
E-4 ADRS	Address entry error
E-5	PROM Socket data pin error
E-6	Uncataloged format
E-7	Load verify error
E-8	Instruction specify error
E-9 ERAS	Eraser error
E-10	Buffer over error (RS-232C)
E-11	RS-232C DSR undetected error
E-12 m <sup>*1</sup>	Vpp error
E-13 n <sup>*2</sup>	Vcc error
E-14	Reverse insertion error
E-15	Other error
E-16	Power-on protection error
E-17	Time-out error

\*1: m refers to numerics 1 thru 9.

\*2: n refers to alphabetics A thru D.

The numerics and alphanumerics signify:

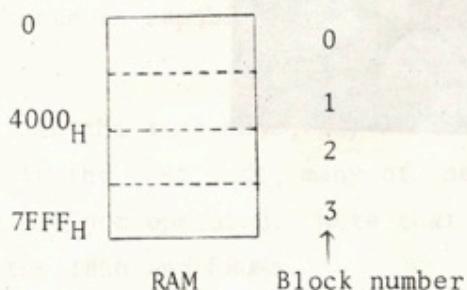
1	Vpp 12.5 V	Pin 23
2	Ditto	Pin 22
3	Ditto	Pin 1
4	Vpp 21.0 V	Pin 23
5	Ditto	Pin 22
6	Ditto	Pin
7	Vpp 25.0	Pin 23
8	Ditto	Pin 22
9	Ditto	Pin 1
A	Vcc 4.75 V	
B	Vcc 5.00 V	
C	Vcc 5.25 V	
D	Vcc 6.00 V	

#### 6-13 Block Operations in Copy, Program, Verify and Cont modes

Usually, the RAM's addresses used in Copy, Program, Verify and Cont modes are specified by the PAE mode.

This mode, irrespective of specifications in PAE, splits the RAM into several blocks by selected ROM's capacity, numbers the blocks, and specifies RAM's locations to be used by these numbers.

In the following example, the 2764 (8 k-bytes) is selected.



The 1866's RAM is split into 4 blocks composed of 8K-bytes.

## Operations

1. Press the "↑" switch.
2. Enter a block number.
3. Press the "START" switch.

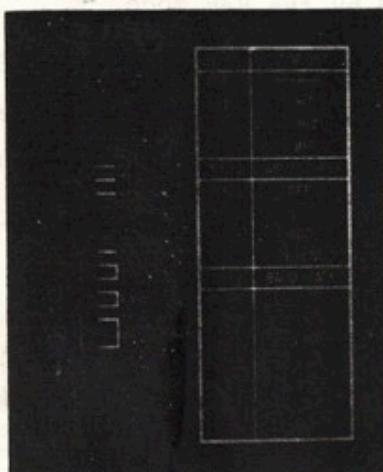
The subsequent operations may be carried out only by the "START" switch. The set block number may be altered and this mode may be released by pressing an operation mode switch such as "COPY" or the "RESET" switch.

### 6-14 Setting Serial I/O Mode

The serial I/O's baud rate, parity, stop bit and X-ON/X-OFF may be selected by means of the bottom switch.

#### 1. Baud rate selection

The desired baud rate may be selected by switch's three bits.



This Programmer is capable of setting 110 bauds to 9600 bauds.

## 2. Parity selection

The desired parity may be selected by switch's bits 4 and 5.

Any of no parity, even and odd may be selected.

## 3. Stop bit selection

The desired stop bit may be selected by switch's bits 6 and 7.

Any of 1 bit, 1.5 bits and 2 bits may be selected.

## 4. X-ON/X-OFF selection

X-ON/X-OFF may be selected by the switch's bit 8.

# 6-15 Others

Three operations of Key Lock, Test and Repeat may be selected by means of the bottom switch.

## 6-15-1 Key Lock

Turning on this switch makes any switch operations other than "START" invalid.

If this mode is used, any RAM data is not destroyed by erroneous operations, which contributes considerably to mass production.

## 6-15-2 Test

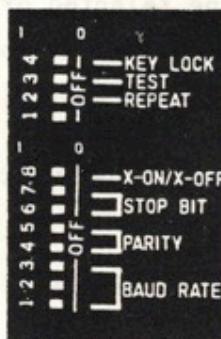
Turning on this switch causes the 1866 to be put in the test mode.

The test mode is capable of checking voltages and waveforms, etc. with ease.

Caution: In the test mode, any PROM must not be inserted into a socket. In the test mode, many of the protection functions the 1866 provides are not operated. Note that erroneous operations may destroy the 1866 and PROMs.

### 6-15-3 Repeat

Turning on this switch causes Copy, Blank, Program, Verify and Cont operations to be executed repeatedly.



### 6-15-4 Power-on protection

If power is on with PROM being inserted, "E-16" is indicated on the display to stop operation. (PROM could be damaged.)

### 6-15-5 Time-out function

Indication "E-17" is given in the display when time-out so as to put out "?" into the peripheral equipment, if the data input from peripheral is not made for about 15 seconds upon absence of data reception at Serial mode, or the command of "RL", "RLn", "RLV", or "RLVn" at Remote mode.

## 7. REMOTE OPERATION

The P-ROM programmer is provided with a Serial Interface as the standard. When it is connected to an external terminal equipment, the following functions are available by software:

Contents	Instruction
1. Data creation	C or I
2. Data correction	C
3. Data deletion	D
4. Data insertion	I
5. Data shifting	T
6. List creation	L
7. Paper tape creation	P
8. Data entry from paper tape	RL or RH
9. Memory initialization	F
10. Operating address range specification	MD, MS, MP, MR
11. Copy	OP
12. Blank	B
13. Program	W
14. Verify	V
15. Cont.	OT
16. Data format select	S
17. PTR verify	RLV or RHV
18. Buffer's (RAM) check sum	BO
19. P-ROM device select	N
20. Address select	A
21. EEP-ROM's erase	Z
22. EEP-ROM's byte erase	ZB

The signal formats for terminal equipment connected are RS-232C and 20mA current loop. The tape parity and baud rate vary depending on the terminal equipment connected; for their setting, refer to Chapter 8.

Remember, in the description which follows, the hexadecimal notation (0-9 and A-F) is exclusively used and that any underlined character is an entry from terminal equipment.

#### 7-1 Terminal equipment Connection

The P-ROM programmer can be remotely operated if it is connected to a terminal equipment. For such information as connector pin number, refer to 8 Serial Interface.

#### 7-2 Start of Remote Operation

This program start its operation by selecting "REM" (REMoTe) out of the function switches located on the panel of the programmer and displays "#", being put into instruction wait status.

#### 7-3 Creating New Data

The change instruction or the insert instruction described later is used to create new data.

##### 7-3-1 How to use Change Instruction

(a) Clear all memories by means of the "F" instruction.

This operation is not always required.

(b) By the use of the change instruction, specify an address where new data is to be created. Specifying an address causes the address specified on the terminal equipment and the contents stored in the address to be displayed, and provided the wait status of input from the terminal equipment. (See example 1.)

- (c) If the wait status of input from the terminal equipment is provided, enter data. Entering data causes the data stored in the next address to be displayed and then provides wait status for the subsequent data.
- (d) After data is created, enter "CR". Entering "CR" causes "#" to be displayed in the terminal equipment and then provides wait status for the subsequent instruction.
- (e) Using the change instruction allows eight (8) data to be created in one line. The 9th data is created in the next line.
- (f) Using an erroneous character (a character other than characters 0 through F) provides the shift to the start of the next line, causes "?" to be displayed, provides the shift to the start of the next line, causes "#" to be displayed, and then provides wait status for the subsequent instruction. (This operation is common in all instruction.) (See example 2.)

(NOTE) In remote operation, any address can consist of up to 4 digits in entry. Notice, however, 4 or more at the highest digit will be masked; for example, 4100 results in 0100. This applies to all the address entry which follows.

Example 1: Normal Case

#C . 0 CR  
(1) (2) (3)

0000 00-11 00-22 00-33 00-44 00-55 00-66 00-77 00-88  
(4) (5)(6) (6) (6) (6) (6) (6) (6)

0008 00-99 00-AA 00-BB 00-CC 00-DD 00-EE 00-FF 00-CR  
(6) (6) (6) (6) (6) (6) (6) (6) (7)

- (1) Enter "C" which signifies the change instruction.
- (2) Enter an address to be changed (or to be created)  
in not more than 4 digits.
- (3) Enter "CR" at the end of the instruction.
- (4) The specified address is displayed.
- (5) The contents of the specified address are displayed.
- (6) Enter new data.
- (7) After all data has been entered, enter "CR" at the end.

Example 2: Where Erroneous Character is Entered.

#C.100 CR

0100 00-11 00-AA 00-BG  
(1)

?

(2)

#

(3)

- (1) "G" is other than characters 0 through F and is an erroneous input.
- (2) The shift to the start of the next line is provided and "?" is displayed.
- (3) The shift to the start of the next line is provided again, "#" is displayed, and wait status for the subsequent instruction is provided.

(Note) In that case, the contents before an address to which "BG" has been entered are changed as specified, while the contents of the address to which "BG" has been entered are not changed.

#### 7-3-2 How to Use Insert Instruction

- (a) Clear all memories. (This operation is not always required.)
- (b) Specifying an address where new data is to be created by the use of the insert instruction and entering "CR" provide the shift to the start of the next line and cause an stored data to be displayed. Enter new data to be created. After entering data, enter "Sp" and proceed to the subsequent address.  
(See example 3.)
- (c) After all data has been entered, enter "CR" at the end, which provides the shift to the start of the next line, causes "#" to be displayed, and provides wait status for the subsequent instruction.
- (d) In entered data, two characters before "Sp" or "CR" are valid and the other characters are ignored. (See example 4.)

Example: 3

#I . 0 CR  
(1) (2)(3)

0000	00	11	22	33	44	55	66	77	88	99	AA	BB	CR
(4)	(5)	(6)	(5)										(7)

(1) Enter "I" which signifies the insert instruction.

(2) Enter an address to be inserted in alphanumerics  
consisting of not more than 4 digits.

(3) Enter "CR" at the end of the instruction.

(4) The specified address is displayed.

(5) Enter new data.

(6) Enter "Sp" between data.

(7) After all data has been entered, enter "CR".

The contents of the memory after this example has been  
executed are:

#L.0,B CR

0000 00 11 22 33 44 55 66 77 88 99 AA BB

Example: 4

#I.5 CR

0005 1234 5678 CR

(1) (2)

(1), (2) In both (1) and (2), data is entered in four digits.

Valid data is two characters before "Sp" and "CR". In (1),  
"3" and "4" are valid, while, in (2), "7" and "8" are valid.

The contents of the memory after the instruction has been  
executed are:

#L.0,F CR

0000 00 00 00 00 00 34 78 00 00 00 00 00 00 00 00 00 00 00

#### 7-4 Modifying Data

The change instruction "C" is used to modify data. The using method is identical to that described in the subsection "Creating New Data".

Example: 5

#L.0,F CR

0000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 00 0E 0F

Shown above are the contents of the memory before modification.

#C . D CR

(1) (2)

000D 00-0D 0E-CR

(3) (4) (5) (6)

- (1) Enter the change instruction "C".
- (2) Enter an address to be changed.
- (3) The address to be changed is displayed.
- (4) The contents of the address to be changed are displayed.
- (5) Indicates new data.
- (6) After change, enter "CR".

Shown below are the contents of the memory after modification.

The characters enclosed by a rectangle are the changed portion.

#L.0,F CR

0000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

## 7-5 Deleting Data

The delete instruction "D" is used to delete data. (See example 6.)

- (a) Enter "D" which signifies the delete instruction.
- (b) Enter a delete start address and a delete end address.  
And then enter "CR".
- (c) An entered delete start address, if greater than a delete end address, is an erroneous input. (See example 7.)
- (d) To delete only one address, enter only the delete start address and enter "CR". (See example 8.)

Example: 6

Shown below are the contents of the memory before the delete instruction is executed.

#L.0,1F CR

0000 00 11 22 33 44 55 66 77 88 99 AA BB CC DD EE FF  
0010 FF EE DD CC BB AA 99 88 77 66 55 44 33 22 11 00

Delete Instruction

#D ..A , 15 CR

(1) (2) (3)(5)

(4)

- (1) Enter "D" which signifies the delete instruction.
- (2) Enter a delete start address in not more than four digits.
- (3) Enter a delete end address in not more than four digits.
- (4) Place "," between addresses.
- (5) Finally enter "CR". Entering "CR" causes operation to be executed.

Shown below are the contents of the memory after the delete instruction has been executed.

0000 00 11 22 33 44 55 66 77 88 99 99 88 77 66 55 44  
0010 33 22 11 00 BB BB

Example of subsequent addresses data

Example: 7

#D . 150 , 100 CR  
(1) (2) (3)

?

(4)

#

(5)

- (1) Enter "D" which signifies the delete instruction.
- (2) Indicates a delete start address.
- (3) Indicates a delete end address. The delete end address, which is smaller than the delete start address (2), is an erroneous input.
- (4) The shift to the start of the next line is provided and "?" is displayed.
- (5) The shift to the start of the next line is provided, "#" is displayed, and wait status for the subsequent instruction is provided.

Example: 8

Shown below is an example for one-address deletion. The following are the contents of the memory before deletion. The characters enclosed by the rectangle are deleted.

#L.0,F CR

0000 00 01 02 03 04 [05] 06 07 08 09 0A 0B 0C 0D 0E 0F

Enter an address to be deleted and then enter "CR".

#D.5 CR

The following are the contents of the memory after deletion:

#L.0,F CR

0000 00 01 02 03 04 06 07 08 09 0A 0B 0C 0D 0E 0F 10

#### 7-6 Inserting Data

The insert instruction "I" is used to insert data. The insert instruction allows new data to be inserted to an arbitrary address.

- (a) Enter "I" which signifies the insert instruction.
- (b) Enter an address to which data is to be inserted and "CR".
- (c) After the above items have been entered, the terminal equipment provides the shift to the start of the next line, displays the entered address, and waits for data input.
- (d) In entered data, only the last two digits are valid and the other entered characters are ignored.
- (e) This instruction allows up to 16 data to be described in one line. When 16 data are entered, the terminal equipment automatically provides the shift to the start of the next line and waits for data input.

Example: 9

Shown below are the contents of the memory before insertion.

#L.0,1F CR

0000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F

0010 10 11 12 13 14 15 16 17 AA AA AA AA AA AA AA AA

#I . 0A CR

(1) (2)(3)

00A    A0    A1    A2    A3    A4    A5    CR  
      (5)(6) (5)(6) (5)(6) (5)(6) (5)(6) (5)(6) (5)(7)

- (1) Enter "I" which signifies the insert instruction.
- (2) Enter an address to which data is to be inserted, in alphanumerics consisting of not more than four digits.
- (3) After entering the address, enter "CR".
- (4) The entered address is displayed.
- (5) Enter data. When entered data is of not less than two digits, the last two characters are valid.
- (6) Place "Sp" between data.
- (7) After the completion of insertion, enter "CR".

Shown below are the contents of the memory after the execution of insertion.

#L.0,1F CR

0000	00	01	02	03	04	05	06	07	08	09	A0	A1	A2	A3	A4	A5
0010	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	AA	AA

#### 7-7 Transferring Data

The transfer instruction "T" is used to transfer data between specified addresses to another specified address.

- (a) Enter "T" which signifies the transfer instruction, the start and end addresses of data to be transferred, and the start address of a destination, in that order. Finally enter "CR". Entering "CR" causes the instruction to be executed.
- (b) The end address of data to be transferred must be greater than its start address. Otherwise, the input is considered to be erroneous.
- (c) The destination may be any address other than the start and end addresses of data to be transferred.

Example: 10

Shown below are the contents of the memory before transfer.

#L.100,12F CR

0100 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
0110 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
0120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Shown below is data to be transferred.

#L.0,1F CR

0000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F  
0010 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F

#T . 0 , 1F , 100 CR

(1) (2) (3) (4)

(5) (5)

- (1) Enter "T" which signifies the transfer instruction.
- (2) Enter the start address of data to be transferred.
- (3) Enter the end address of data to be transferred.
- (4) Enter the address of a destination.
- (5) Place "," between addresses.

Shown below are the contents of the memory after transfer.

#L.100,12F CR

0100 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F  
0110 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F  
0120 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

## 7-8 Preparing List

The list instruction "L" allows the contents of an arbitrary address of the RAM in the P-ROM Programmer to be printed in the terminal equipment.

- (a) Enter "L" which signifies the list instruction and then the start and end addresses of data to be displayed.  
And finally enter "CR".
- (b) After all the items in (a) have been entered, the shift to the start of the next line is provided, and addresses and data are displayed. After the specified addresses have been displayed, the shift to the start of the next line is provided and "#" is displayed. And the terminal equipment waits for the subsequent instruction.
- (c) The list format is shown in the following example:

Example: 11

#L . 0 , 3F CR

(1) (2)(3)(4)

0000 03 13 3D FA F6 10 03 7F 10 3A 55 13 32 5D 13 3A  
0010 5B 13 D6 05 CA 1B 10 3D C2 24 10 21 A3 13 22 49  
0020 13 03 31 10 21 4F 13 22 49 13 3A 5D 13 3D FA 32  
0030 01 3A 5B 13 3D CA 61 10 2A 49 13 7E 23 22 49 13

- (1) Enter "L" which signifies the list instruction.
  - (2) Enter the start address of a memory to be listed.
  - (3) Place "," between addresses.
  - (4) Enter the end address of a memory to be listed.
- (d) The end address of the list must be greater than its start address. Otherwise, the input is considered to be erroneous.

### 7-9 Punching Paper Tape

The punch instruction is used to write the contents of the RAM of a specified address to a paper tape by means of the TTY.

Enter "P" which signifies the punch instruction and the start and end addresses of a memory for punching.

And finally enter "CR".

Example: 12

#P . 0 , 2F CR  
\_\_\_\_\_  
(1) (2)(4)(3)

#0000 40 C1 00 08 02 44 08 00 00 00 00 40 00 4C 0A CC  
#0010 00 DC 00 44 01 C4 00 FC 00 F4 00 CC 00 CC 00 CC  
#0020 03 03 00 00 11 20 13 EB 33 A0 03 F0 00 B2 10 38

- (1) Enter "P" which signifies the punch instruction.
- (2) Indicates the start address for punching.
- (3) Indicates the end address for punching.
- (4) Place "," between addresses.

### 7-10 Reading Data from Paper Tape

The "R" instruction is used to read data on a paper tape from the TTY or the PTR.

Example: 13

#RL CR  
\_\_\_\_

Shown above is the read instruction from the reader of the TTY. Entering "CR" causes data to begin to be read. After data has been read, the shift to the start of the next line is provided, "#" is displayed, and wait status for the subsequent instruction is provided.

#RH CR  
\_\_\_\_

Shown above is the read instruction from the PTR.

### 7-11 Initializing Memory Contents

The "F" instruction is used to initialize an arbitrary address of the RAM located in the P-ROM Programmer for arbitrary data.

The "F" instruction also allows a memory to be cleared.

Enter "F" which signifies the initialize instruction, start and end addresses, and data, in that order. And finally enter "CR".

Example: 14

#F . 10 , 2F , AA CR  
(1) (2) (3) (4)  
      (5) (5)

- (1) Enter "F" which signifies the initialize instruction.
- (2) Enter the start address.
- (3) Enter the end address.
- (4) Enter data.
- (5) Place "," between addresses and between an address and data.

Shown below is the result after execution of the instruction.

#L.0;3F CR  
0000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  
0010 AA  
0020 AA  
0030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

## 7-12 Programmer Control

### 7-12-1 Operation Address Range Specification

The P-ROM programmer allows a terminal equipment to specify the range of operation in programs.

#### 1) Display of operation range registered

An entry of "MD" allows the current registered operation range to be displayed.

#M D CR

XXXX 0000 ΔΔΔΔ

(1) (2) (3)

(1) ROM start address

(2) ROM stop address

(3) RAM start address

#### 2) ROM start address change

To change the ROM start address. Enter an "MS" which indicates the ROM start address is to be changed; the system displays the current registered address and waits for a new address to come. Enter a new address made up of 4 digits.

#M S CR

xxxx - 0000

(1) (2)

(1) Current registered address

(2) Newly entered address

#### 3) ROM stop address

To change the ROM address for stop operation. Enter an "MP" which indicates the ROM address for stop operation is to be changed; the system displays the current registered address and

waits for a new address to come. Enter a new 4-digit address.

#M P CR

XXXX - 0000

(1) (2)

(1) Current registered address

(2) Newly entered address

#### 4) RAM start address

To change the RAM start address. Enter an "MR" which indicates the RAM start address is to be changed; the system displays the current registered address and waits for a new address to come.

#M R CR

XXXX - 0000

(1) (2)

(1) Current registered address

(2) Newly entered address

#### 7-12-2 Blank Check

Entering instructions through a terminal equipment permits the P-ROM programmer to perform blank checks. The operation is quite the same as the to all of 7-12-2 through 7-12-8.

#B CR

The "B" is a blank-check instruction. After the operation is completed, the system displays another "#" and waits for a new instruction to come. If the P-ROM is defective (or has been already programmed), the system displays a "?" and waits for a new instruction to come.

#### 7-12-3 Program

Entering a program instruction "W" allows P-ROM program operation.

#W CR

If the program is defective, the system displays a "?".

#### 7-12-4 Verify

Entering a verify instruction "V" allows a verify operation.

#V CR

If the verify operation fails, the system displays a "?".

#### 7-12-5 Copy

Entering a copy instruction "OP" allows a copy operation.

#OP CR

If the copy operation fails, the system displays a "?".

#### 7-12-6 Cont

Entering a CONT instruction "OT" allows a CONT operation.

#OT CR

#OTn CR (n = Block number at block mode)

If the blank, program or verify fails, the system displays a "?".

#### 7-12-7 Format Specification

Entering an "S", format specification instruction, allows the format to be specified.

#S. Ø CR

Ø: MINATO format

Only the lowest digit is effective

#### 7-12-8 PTR Verify

Entering a PTR verify instruction. "RLV", allows PTR verify operation to be carried out.

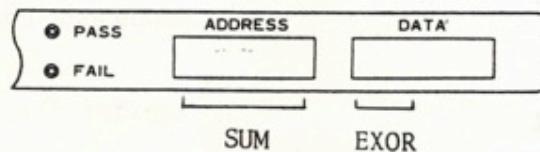
#RLV CR (Entry through TTY reader)

#### 7-12-9 Buffer's check sum

Entering a buffer's (RAM) check sum instruction "BO" allows a buffer's check sum operation.

#BO CR

The check sum is obtained by adding and exclusively ORing data by address, and is displayed as shown below.



#### 7-12-10 PROM device select

Entering a P-ROM device select instruction "N" allows PROM select instruction. (See a command number on page 23)

#N mm - nn CR

mm = The current device number is displayed.

nn = Entering a P-ROM select command number.

For the device number, two entered lower digits are valid.

If only one digit has been entered, the second digits is assumed to be "0".

#### 7-12-11 Address select

Entering a address select instruction "A" allows address select instruction.

#A m - n CR

m = The current address mode is displayed.

n = Entering address select command.

N: All address mode

m and n E: Even address mode

O: Odd address mode

#### 7-12-12 EEP-ROM's erase

Entering a EEP-ROM chip erase instruction "Z" allows erase instruction.

#Z CR

#### 7-12-13 EEP-ROM's byte erase

Entering a EEP-ROM chip's byte erase instruction "ZB" allows byte  
erase instruction

#ZB CR

ADRS - xxx CR

↑  
—Address to be erased.

NOTE: Any remote operation has no data complement instruction.

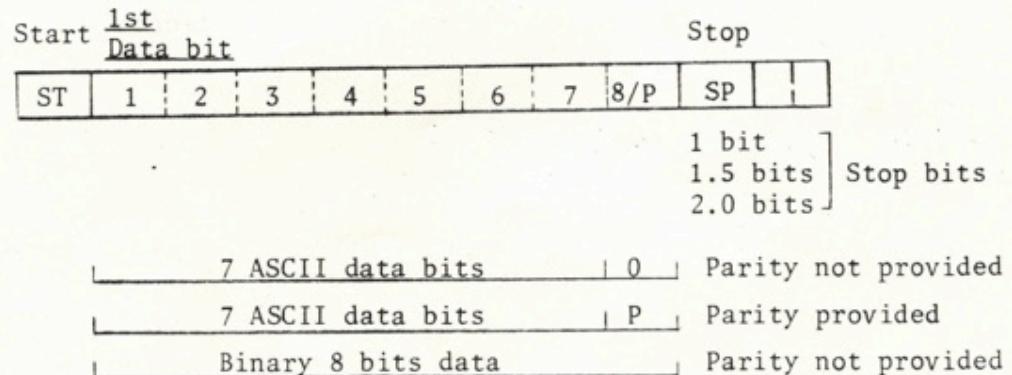
## 8. SERIAL INTERFACE

### 8-1 Introduction

The serial interface is broken down into an RS-232C level interface and a current loop interface. Presented below are descriptions of the meanings of the interface signals, and of the signal levels and transmission procedure.

#### 8-1-1 Serial I/F ratings

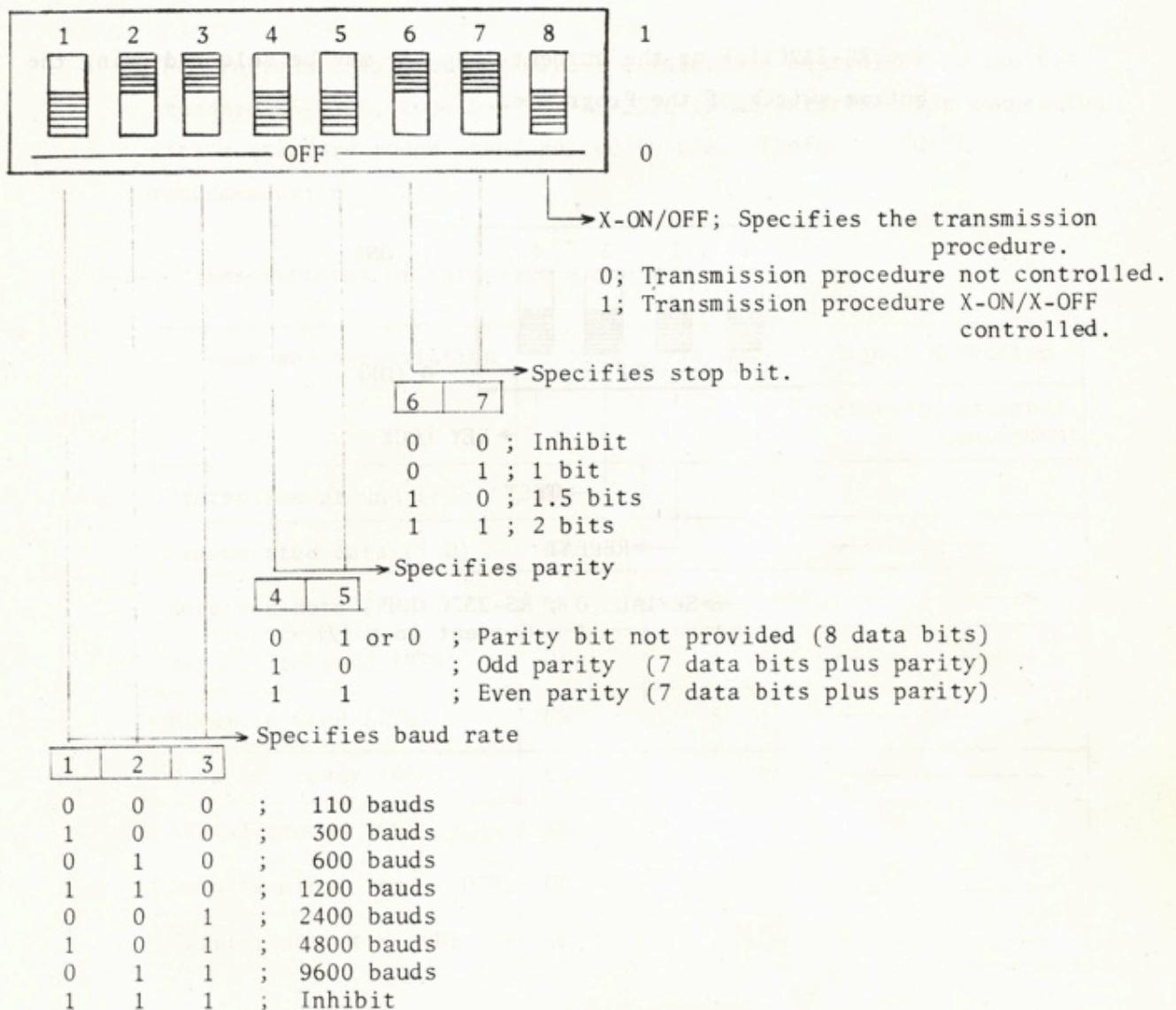
- (1) Baud rates: 110, 300, 600, 1200, 2400, 4800 and 9600
- (2) Start bit: 1 bit fixed
- (3) Data bit: Parity bit provided (7 data bits plus 1 parity bit  
= 8 bits)  
Parity bit not provided (8 data bits = 8 bits)
- (4) Parity bit: Parity bit not provided.  
Even parity: 1 bit  
Odd parity: 1 bit
- (5) Stop bits: 1 bits, 1.5 bits, 2 bits
- (6) Sync system: Start-stop sync system



(7) Communication system: Full duplex communication/half duplex communication

#### 8-1-2 Setting the serial I/F

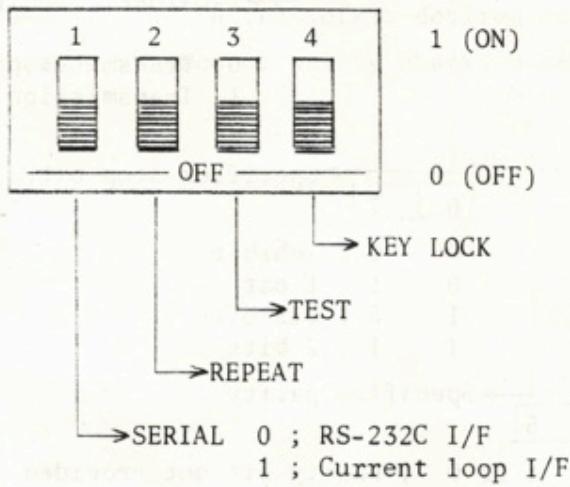
Serial interface selection is made by means of the bottom switch of the Programmer. The switch sets a desired baud rate, and specifies the presence or absence of parity check, a stop bit and X-ON/X-OFF control.



- \* The above sample setting is such that the transmission rate is 9600 bauds, no parity is provided, 2 stop bits are provided and the transmission procedure is not controlled.

### 8-1-3 Serial I/F selection

The RS-232C I/F or the current loop I/F may be selected using the bottom switch of the Programmer.



start baud setting

abaud 011	0	0	0
abaud 005	0	0	1
abaud 004	0	0	0
abaud 0024	0	1	1
abaud 0016	0	0	0
abaud 0014	0	0	1
abaud 0008	0	0	0
abaud 0002	0	0	1

## 8-2 RS-232C Level Interface

The Programmer is provided with the interface equivalent to the EIA standard RS-232C, type D. The RS-232C is an interface for connection with a standard modem standardized in EIA. (Refer to CCITT recommendation, V.24.)

### 8-2-1 Descriptions of interface signals

Name and abbreviation	Symbol	Pin No.	Signal direction	
			Programmer	External equipment
Protective ground (FG)	AA	1		
Transmitted data (TXD)	BA	2	←	
Received data (RXD)	BB	3	→	
Request to send (RTS)	CA	4	←	
Clear to send (CTS)	CB	5	→	
Data set ready (DSR)	CC	6	→	
Signal ground (SG)	AB	7		
Data terminal ready (DTR)	CD	20	←	
Carrier detector (CD)	CE	8	→	

Table 1

1. AA; Protective ground
2. BA; Received data. The Programmer receives data from an external equipment.
3. BB; Transmitted data. The Programmer transmits data to an external equipment.

4. CA; Request to send (RTS)

ON: Informs the Programmer that an external equipment  
is ready for reception.

OFF: Informs the Programmer that an external equipment  
is not ready for reception.

5. CB; Clear to send (CTS)

ON: Informs an external equipment that the Programmer is  
ready for reception.

OFF: Informs an external equipment that the Programmer is  
not ready for reception.

6. CC; Data set ready (DSR)

ON: Informs an external equipment that the Programmer  
is ready for send/receive.

OFF: Informs an external equipment that the Programmer  
is not ready for send/receive.

7. AB: Signal ground

20. CD; Data terminal ready (DTR)

ON: Informs the Programmer that an external equipment  
is ready for send/receive.

OFF: Informs the Programmer that an external equipment is  
not ready for send/receive.

8. CE; Carrier detector (CD)

ON: Informs an external equipment that the Programmer  
has detected a carrier.

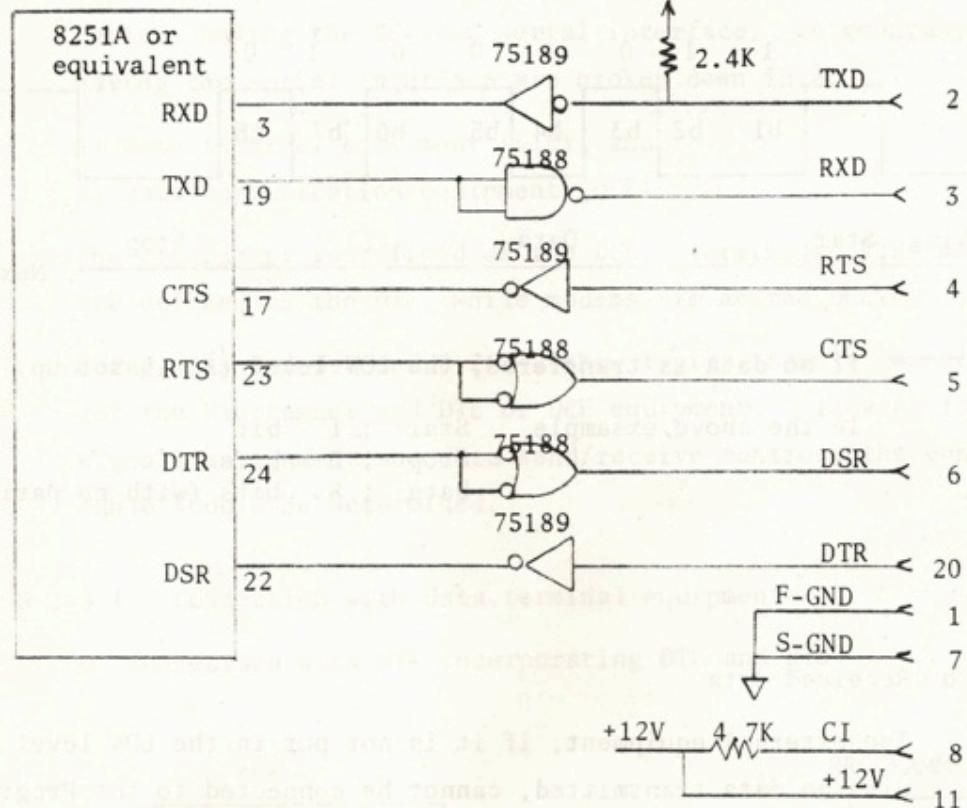
OFF state not provided.

o Polarity of interface signals

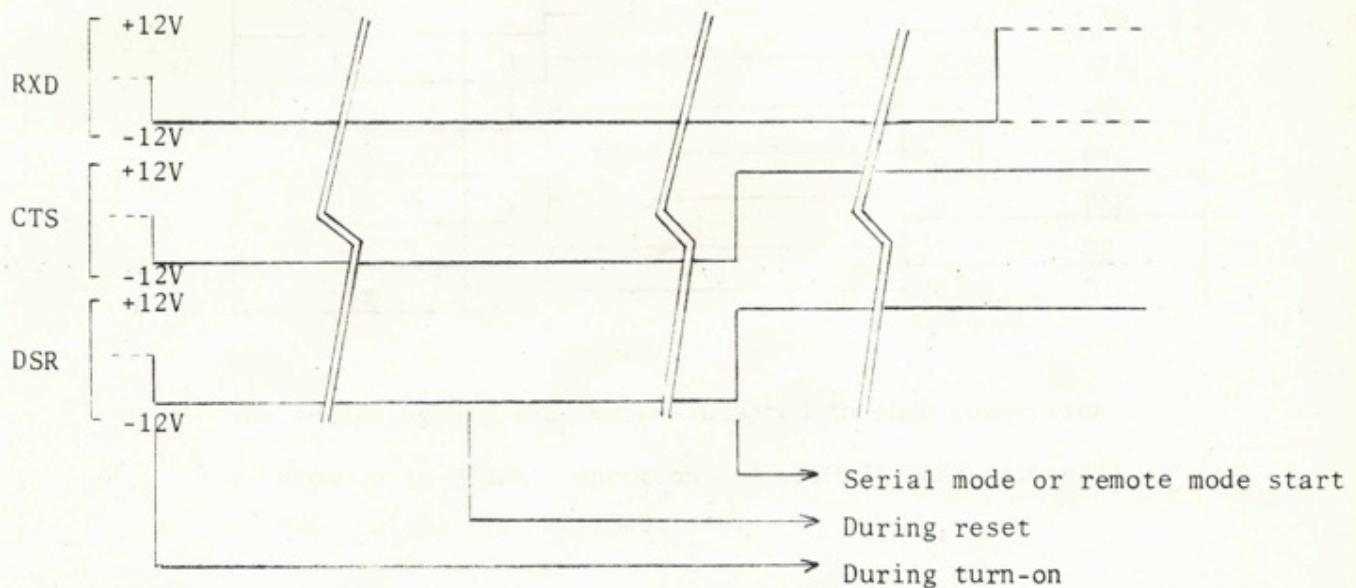
Voltage	Data signal	Control signal
+3 to +12 V	0	ON
-3 to -12 V	1	OFF

### 8-2-2 Interface signal output

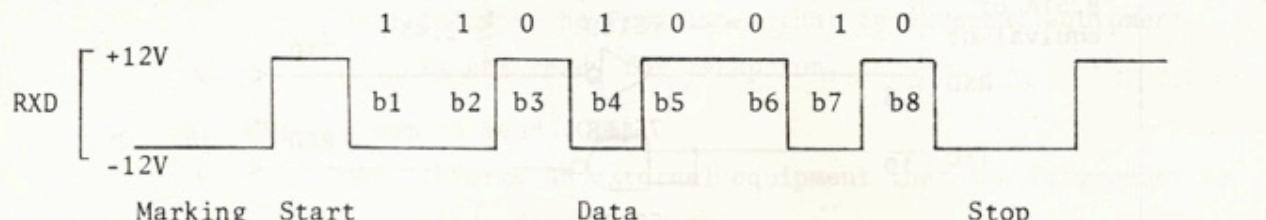
- o Signal output



- o Signal output level



o Sent data



→ If no data is transferred, the LOW level (1) is set up.

In the above example      Start ; 1    bit  
                             Stop ; 2    bits  
                             Data ; 8    bits (with no parity, 2BH)

o Received data

The external equipment, if it is not put in the LOW level (1) with no data transmitted, cannot be connected to the Programmer, (which is referred to marking).

### 8-2-3 Connection to external equipment

Presented below are descriptions on how to connect two separate devices having the RS-232C serial interface. In general, the devices having the serial interface are broken down into:

- 1) data terminal equipment (DTE), and
- 2) data communication equipment (DCE).

The Programmer is defined as the DCE. Terminals, PTRs and printers are defined as the DTE, while modems are as the DCE.

Paragraphs 8-2-3-1 and 8-2-3-2 show typical sample connections for the Programmer and DTE or DCE equipment. Allowing for a connector signals assignment and data send/receive control, the connection cable should be determined.

#### 8-2-3-1 Connection with data terminal equipment

- o Connection with DTE incorporating DTR and RTS

DTE

PROGRAMMER (DCE)

ABBREVIATION	No.		No.	ABBREVIATION
FG	1		1	FG
TXD	2		2	TXD
RXD	3		3	RXD
RTS	4		4	RTS
CTS	5		5	CTS
DSR	6		6	DSR
SG	7		7	SG
DTR	20		20	DTR

The following are the devices adapted to such connection:

- o HP64000 to modem connection
- o ADM-3A (CRT terminal)
- o MDS (Intel)
- o PC-8800 (NEC)

o Connection with DTE incorporating DTR

DTE

PROGRAMMER (DCE)

ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

No.	ABBREVIATION
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

Note) When short-circuiting Nos. 4 and 5 of the DTE, refer to respective operations manuals.

o Connection with DTE incorporating RTS

DTE

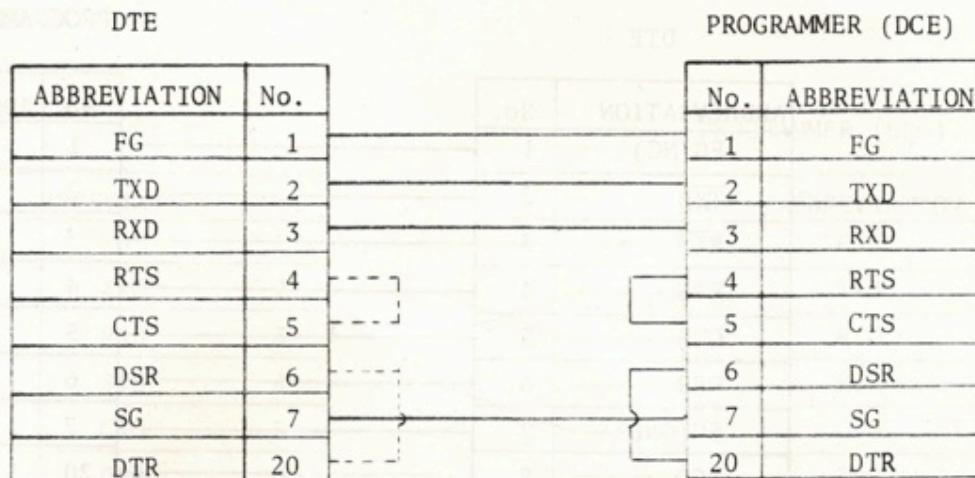
PROGRAMMER (DCE)

ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

No.	ABBREVIATION
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

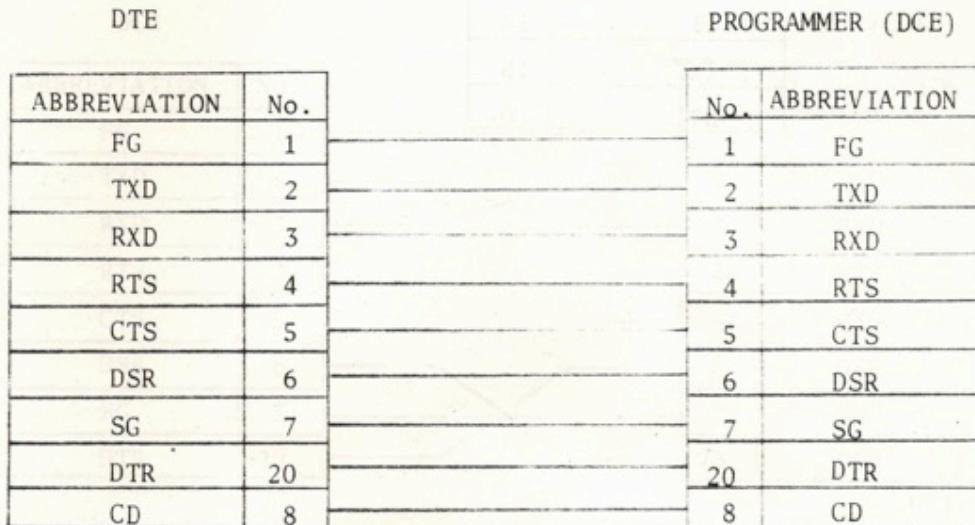
Note) When shorting Nos. 6 and 20 of the DTE, refer to respective operations manual.

- o Connection with DTE using no control signal



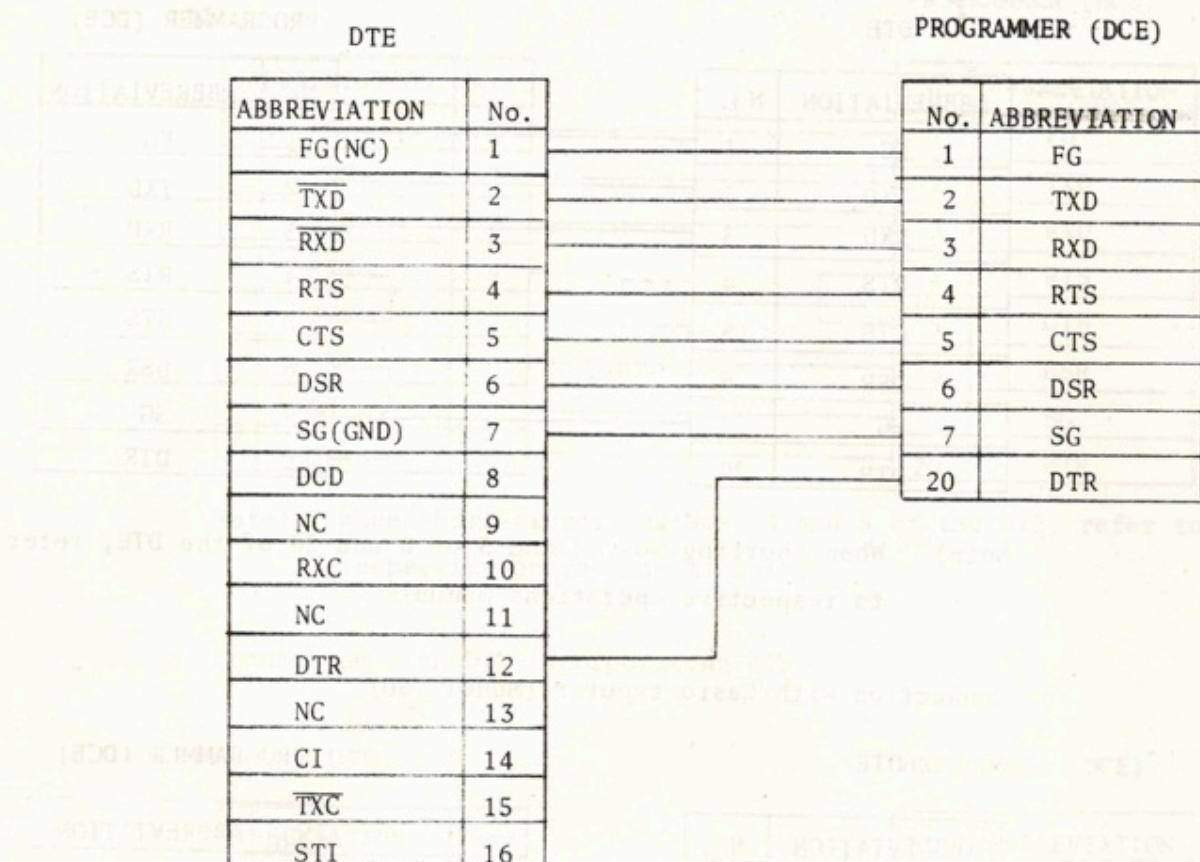
Note) When shorting Nos. 4 and 5 or 6 and 20 of the DTE, refer to respective operations manuals.

- o Connection with Casio typewriter (Model 750)



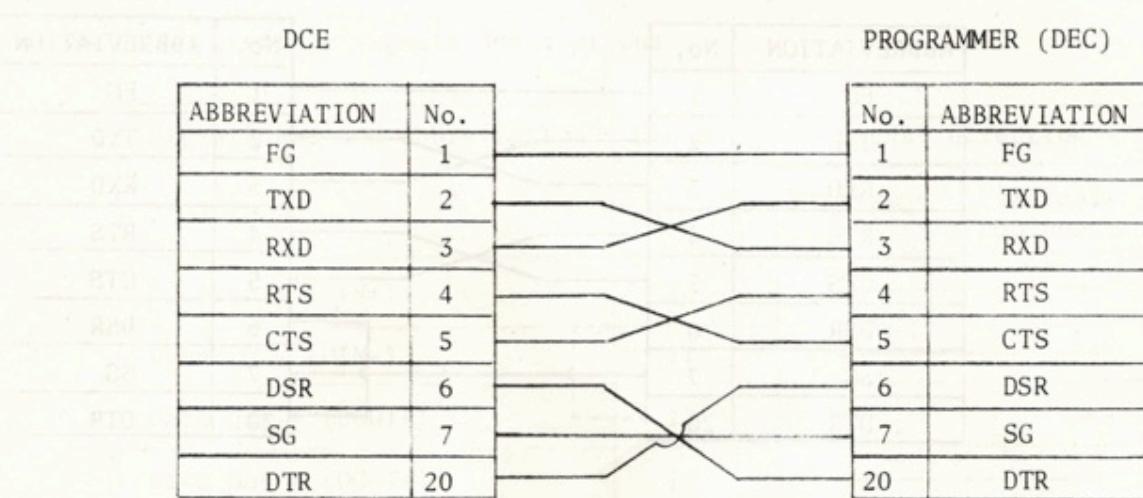
Notes) With the PTP used, the transmission rate must not be more than 300 bauds. With the PTP not used, the transmission rate must not be more than 1200 bauds; otherwise, the typewriter must be modified. Refer to the operations manual for the typewriter.

o Connection with TOSHIBA personal computer (PASOPIA)

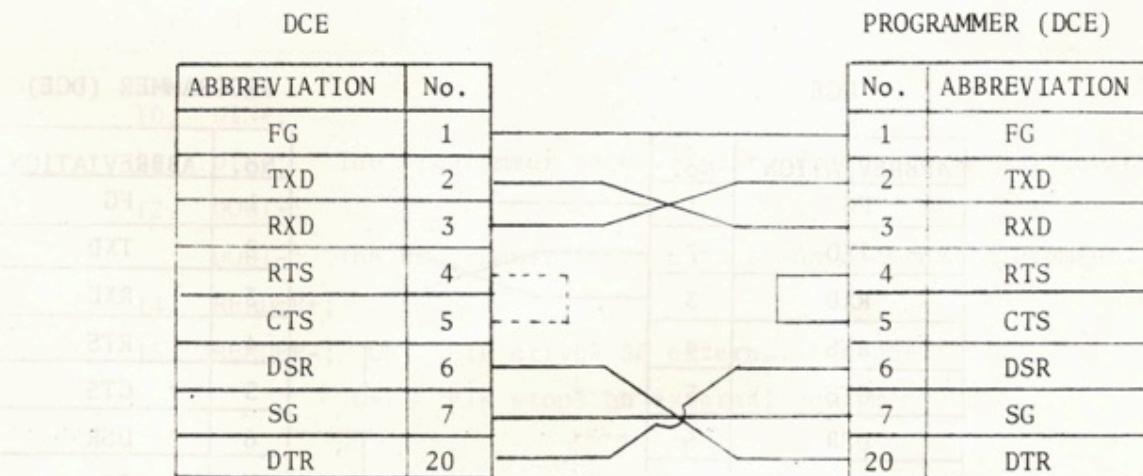


8-2-3-2 Connection with data communication equipment (DCE)

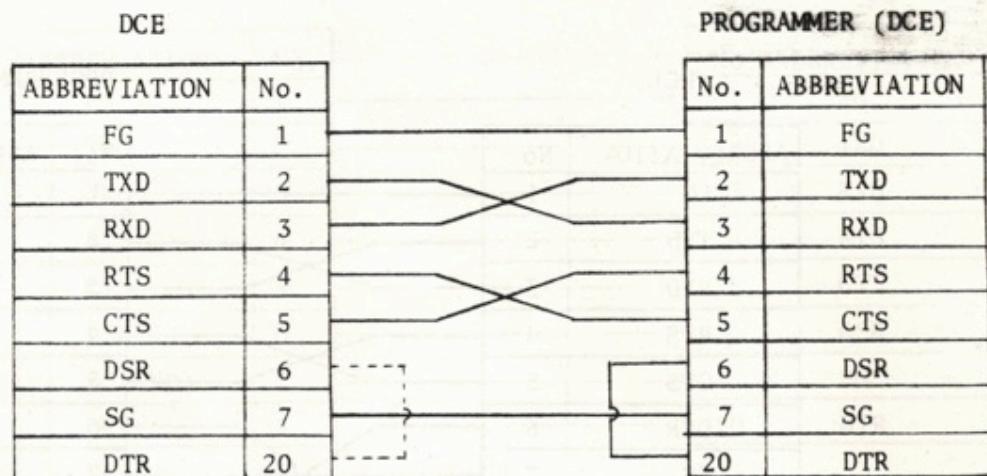
- o Connection with DCE incorporating DTR and RTS



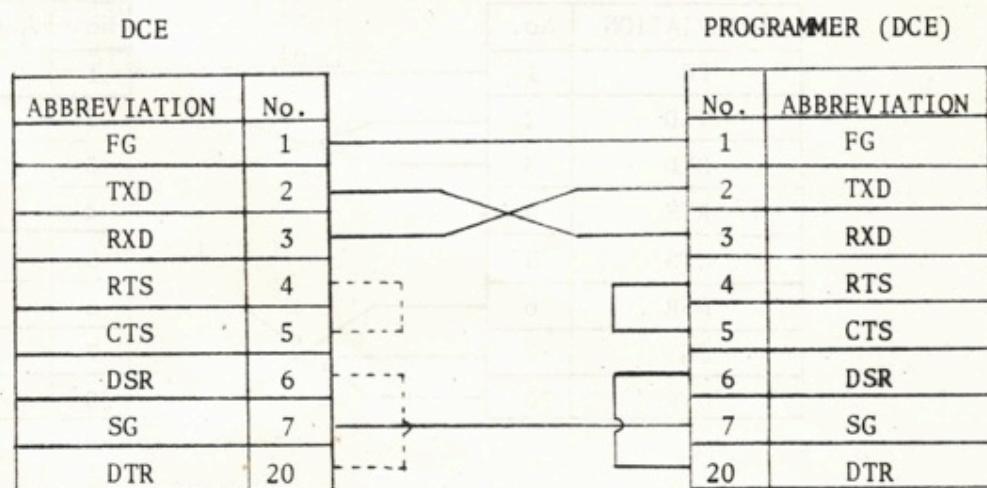
- o Connection with DCE incorporating DTR



- o Connection with DCE incorporating RTS



- o Connection with equipment using no control signal



### 8-3 Current Loop Interface

The current loop used in the Programmer is of the 20 mA full duplex, and the power supply is provided in it.

#### 8-3-1 Interface signals descriptions

Signal name and abbreviation	Pin No.	Signal direction	
		Programmer	External equipment
Data in + (DIN+)	10		→
Data in - (DIN-)	11	←	
Data out + (DOUT+)	12		→
Data out - (DOUT-)	13	←	
Reader control + (READER+)	14		→
Reader control - (READER-)	15	←	
Ground	1, 7		

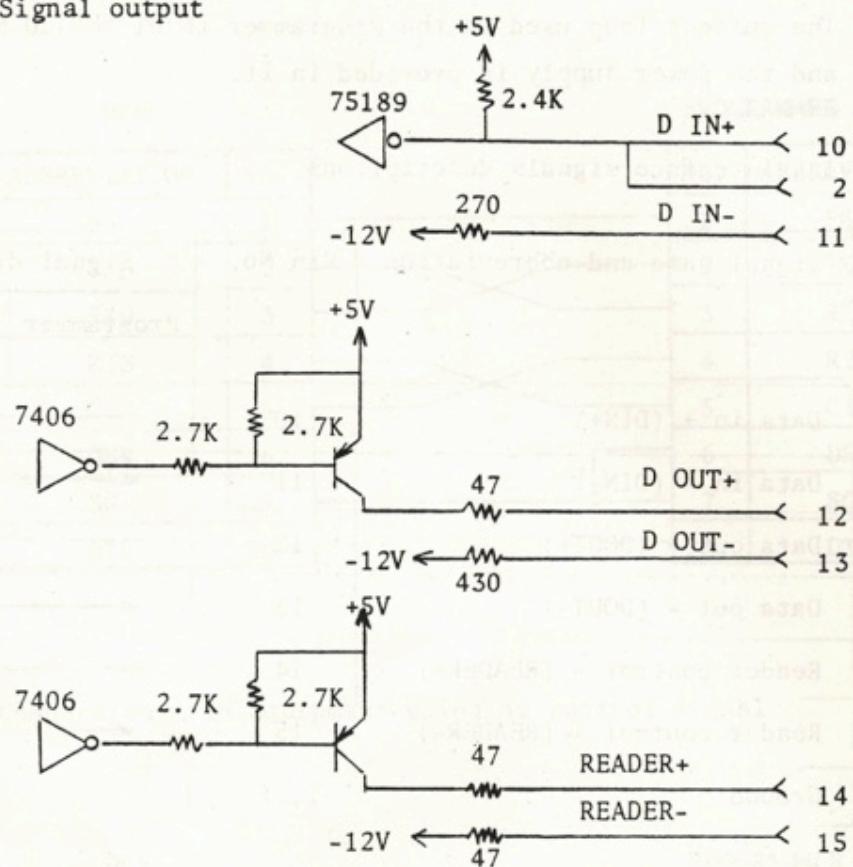
- 10. DIN+;
- 11. DIN-; The Programmer receives data from an external equipment.
- 12. DOUT+;
- DOUT-; The Programmer sends data to an external equipment.
- 14. READER+;
- 15. READER-; ON: PTR drives an external equipment.  
OFF: PTR stops an external equipment.

#### o Polarity of interface signals.

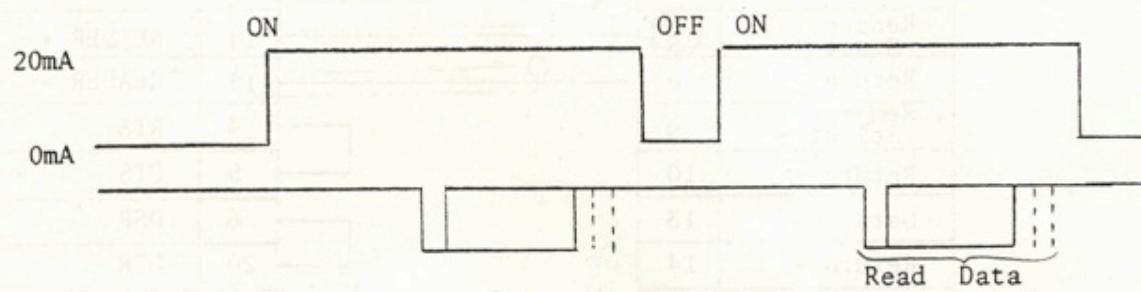
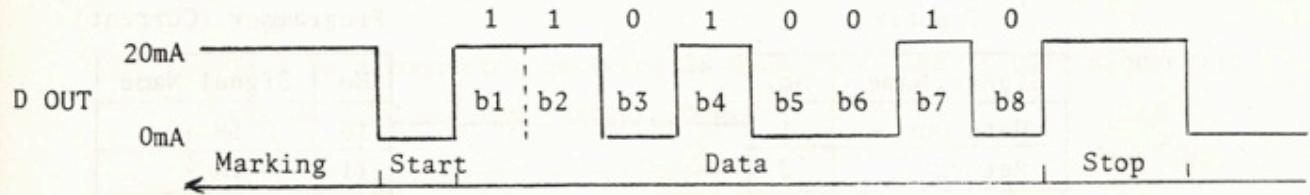
Drive circuit	Data signal	Control signal
ON	1	ON
OFF	0	OFF

### 8-3-2 Current loop interface signal output

#### o Signal output



o Output signal levels



8-3-3 Example of connection with external equipment

- o Connection with CASIO typewriter (Model 750)

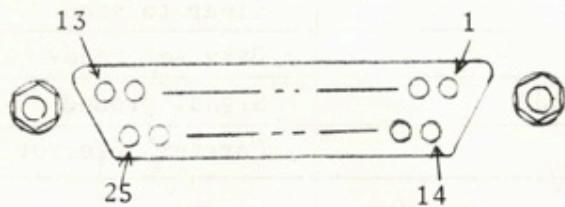
Typewriter		Programmer (Current)		RS-232C Control Signal
Signal Name	No.	No.	Signal Name	
Data Out +	1	10	D IN +	
Return -	2	11	D IN -	
Data In +	3	12	D OUT +	
Return -	4	13	D OUT -	
Reader Start +	5	14	READER +	
Return -	6	15	READER -	
Remote Select +	9	4	RTS	
Return -	10	5	CTS	
Data Bus +	13	6	DSR	
Return -	14	20	DTR	

Note) The transmission rate must not be more than 1200 bauds.

## 8-4 Serial I/F Cable

### 8-4-1 Serial I/F connector

This is a connector covering 25 DSUB pins, and is used along with the RS-232C and the current loop.



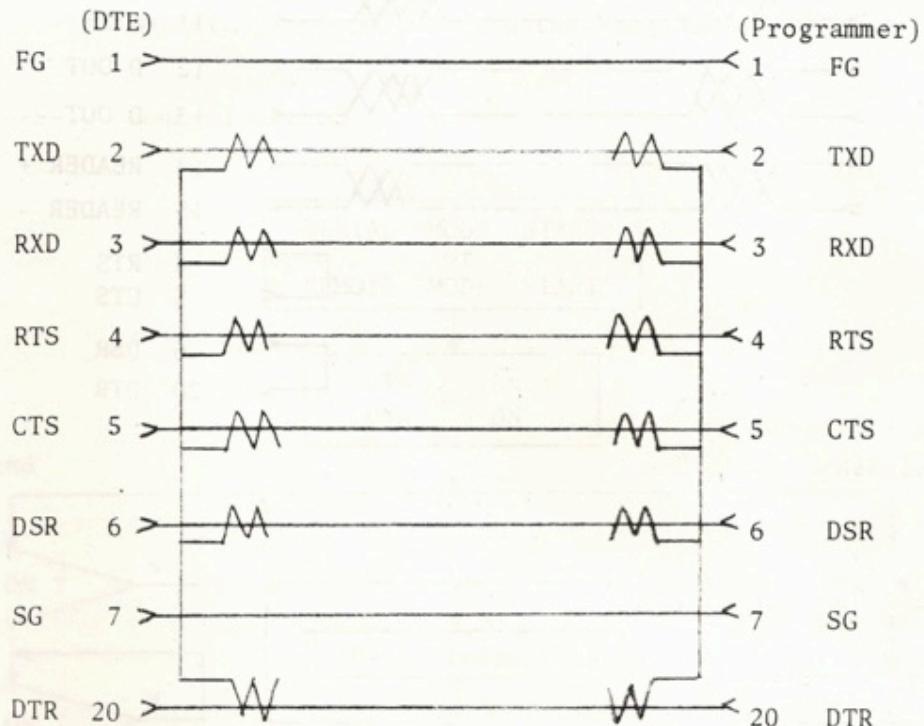
8-4-2 Table of serial I/F connector pins

Pin No.	Current loop I/F	RS-232C I/F
1	Ground	Protective ground
2		Transmitted data
3		Received data
4		Request to send
5		Clear to send
6		Data set ready
7	Ground	Signal ground
8		Carrier detector
9		
10	Data in +	
11	Data in -	
12	Data out +	
13	Data out -	
14	Reader control +	
15	Reader control -	
16		
17		
18		
19		
20		Data terminal ready
21		
22		
23		
24		
25	+12V	

### 8-4-3 Cable

It is recommended that the RS-232C IF or current loop I/F cable be used in the following connection:

- o RS-232C I/F



o Current loop I/F

Terminal

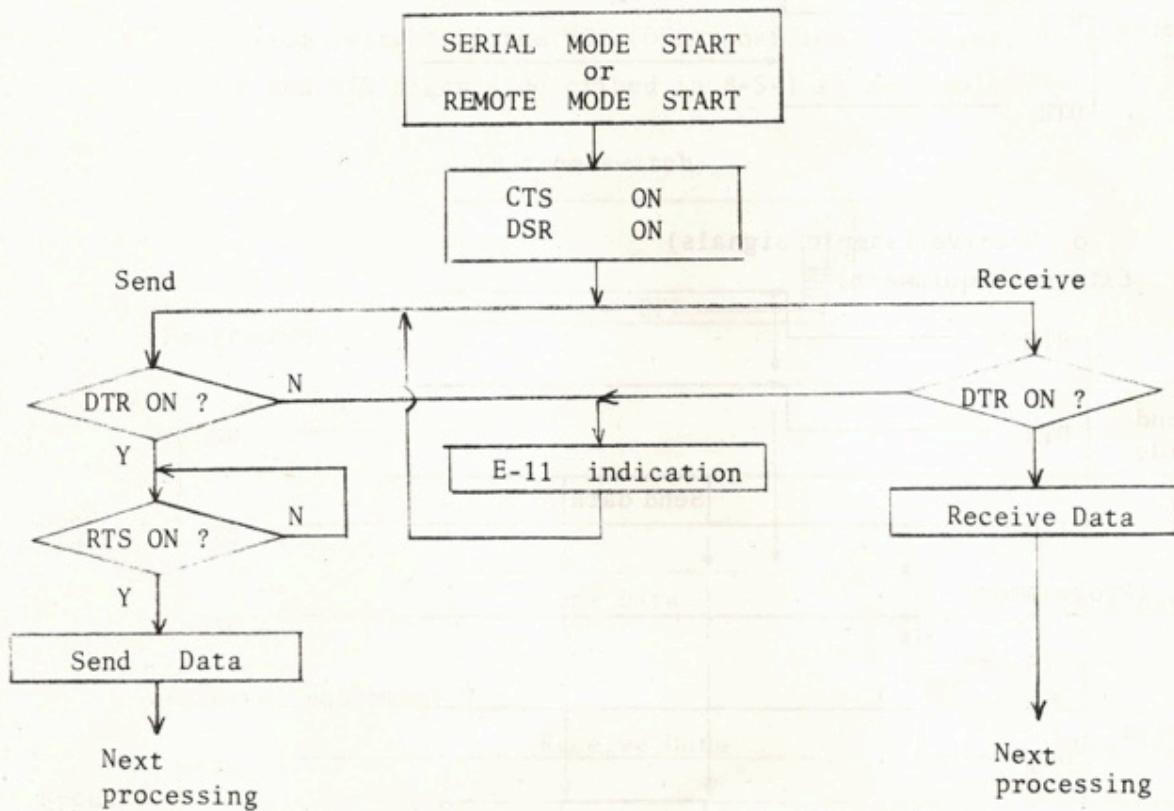
	10 D IN +
	11 D IN -
	12 D OUT +
	13 D OUT -
	14 READER +
	15 READER -
	4 RTS
	5 CTS
	6 DSR
	20 DTR

## 8-5 Control Method and Transmission Protocol

In the RS-232C level interface, the data send/receive control method and the transmission protocol are not standardized.

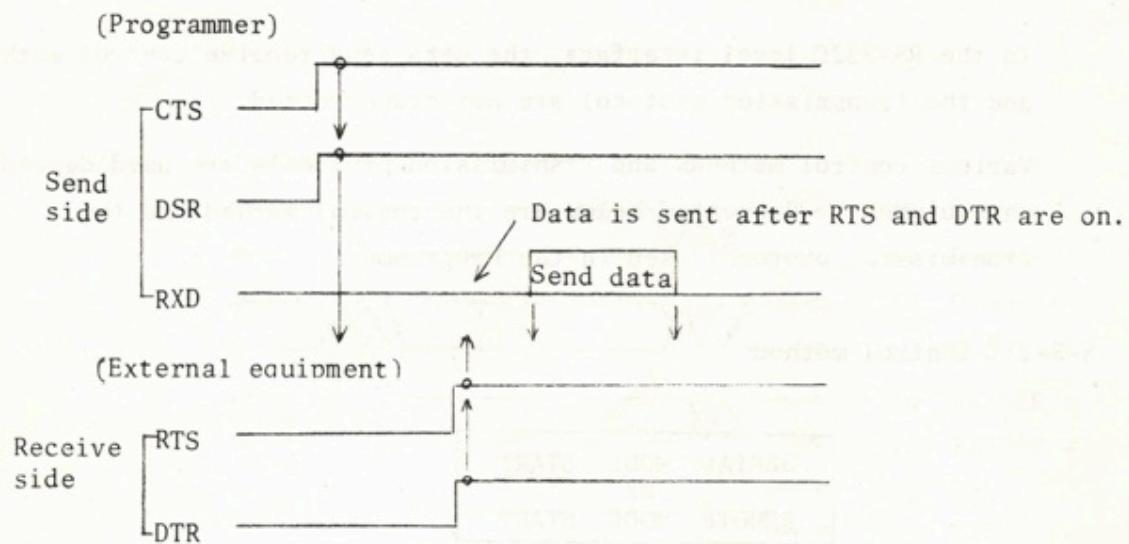
Various control methods and transmission protocols are used depending on equipment. Presented below are the control method and the transmission protocol used in the Programmer.

### 8-5-1 Control method

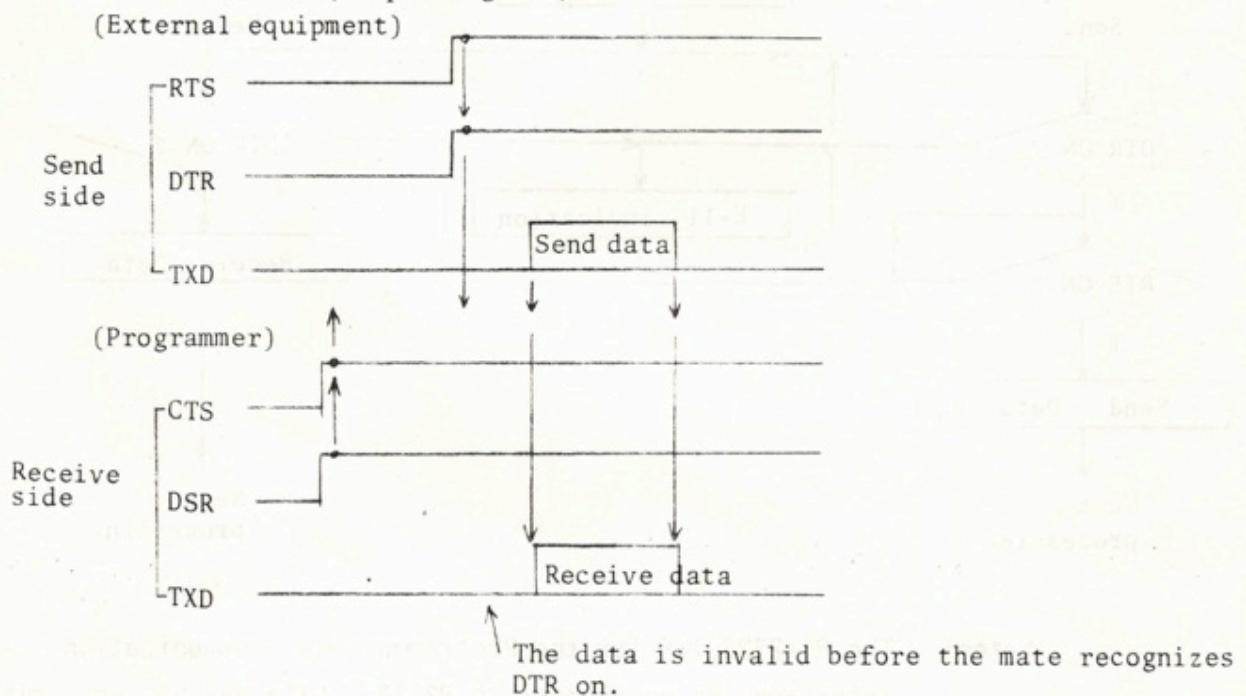


Notes: The RS-232C I/F for the Programmer uses communication interface ICs equivalent to 8251A. Data may be sent only with the RTS signal on; (otherwise, the 8251A provides hardware inhibition.) Both send and receive are enabled by the turned on DTR signal. If this signal is off, "E-11" is displayed on the LED panel, and the Programmer waits for the DTR to be turned on.

o Send (sample signals)



o Receive (sample signals)



## 8-5-2 Transmission protocol

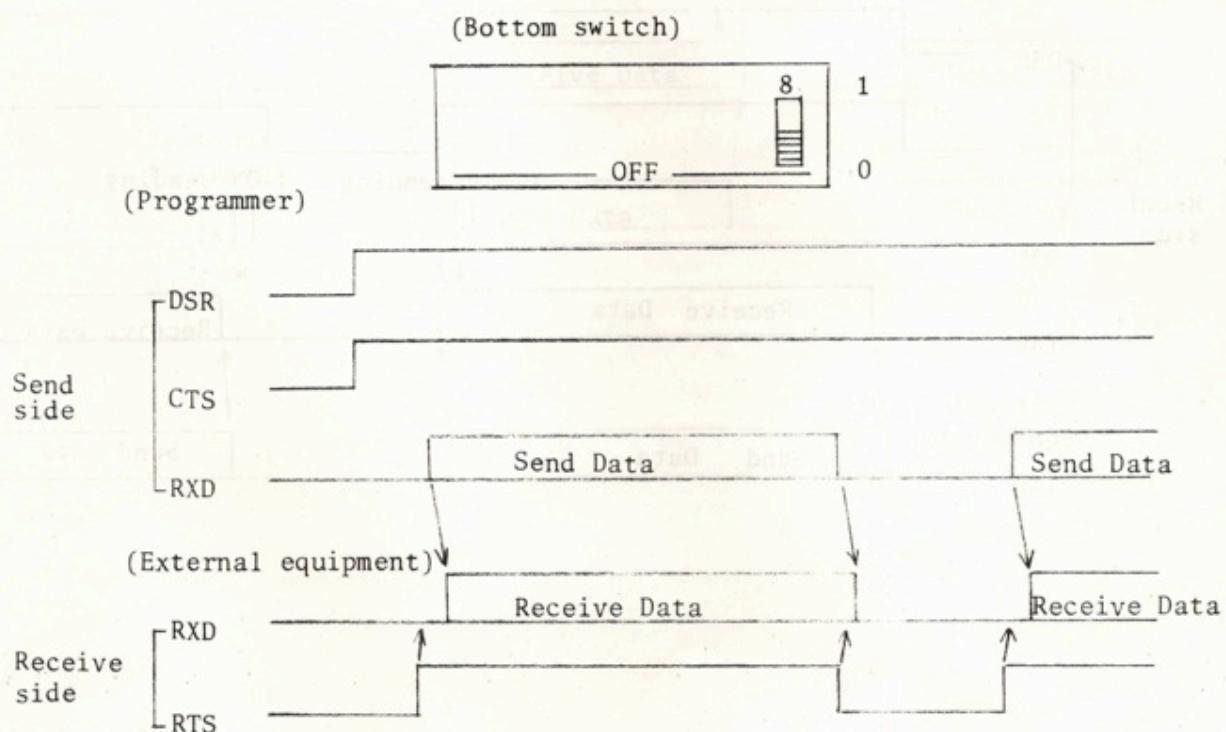
The Programmer offers the following two transmission protocols:

- 1) Non-control
- 2) X-ON/X-OFF control

256 bytes of the receive buffer are provided.

### 8-5-2-1 Non-control

The transmission protocol gets free from control by placing X-ON/X-OFF (bottom switch) in the "0" (OFF) position. However, control by DTR and RTS signals described in 8-5-1 is available.

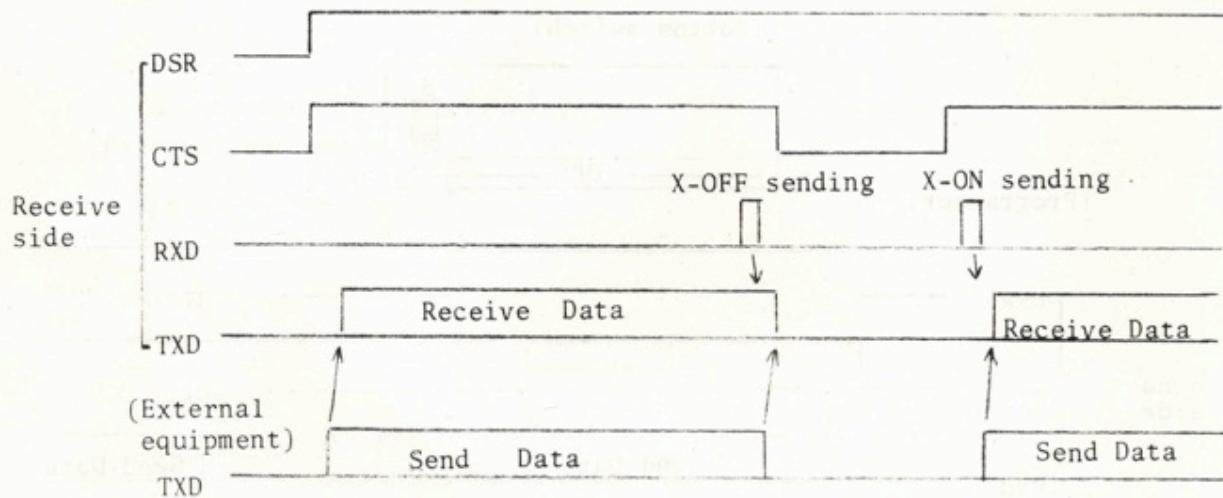


### 8-5-2-2 X-ON/X-OFF control

#### a) Remote mode, receive

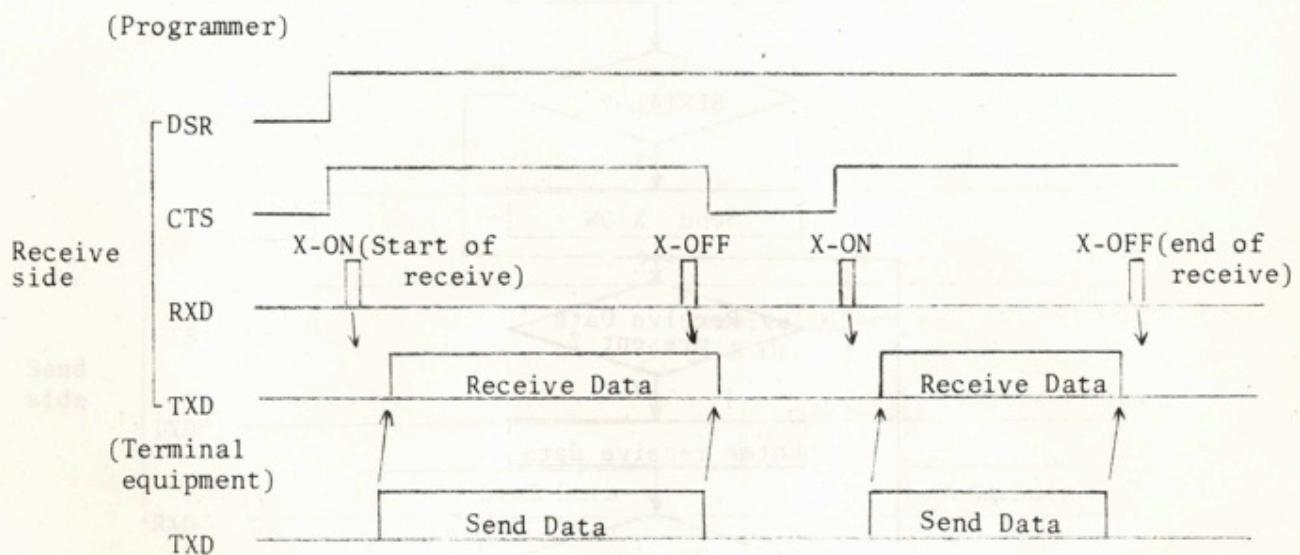
While the Programmer is receiving data from an external equipment if data arrives at the receive buffer which exceeds 2/3 of its capacity, the code "X-OFF (13H)" is sent to an external equipment, and then, the CTS signal is turned off. When the data becomes less than 1/3 of the buffer's data capacity, the Programmer turns on the CTS signal, and then sends the code X-ON (11H) to an external equipment. (Full duplex mode)

(Programmer)

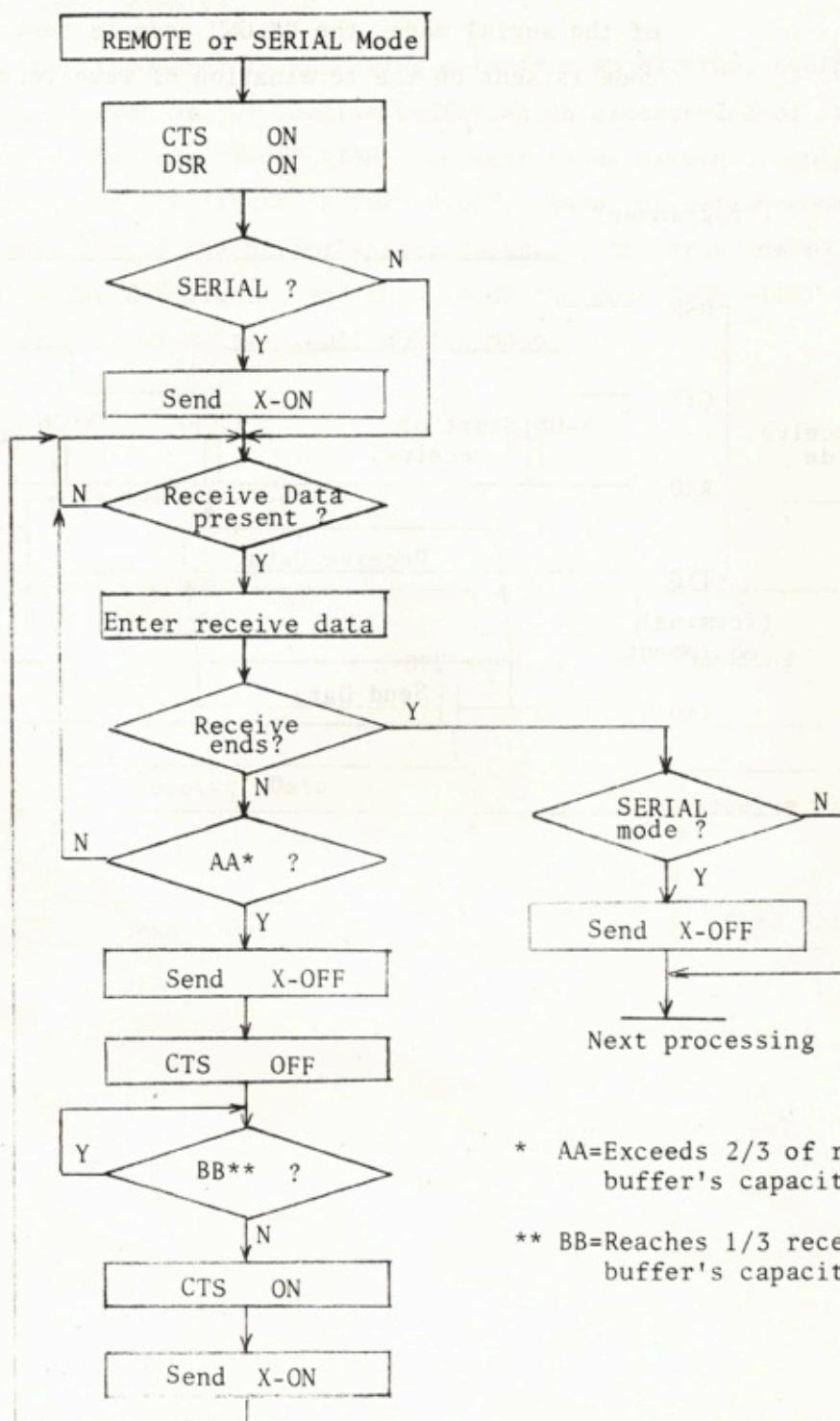


b) Serial mode, receive

Appended to the remote mode (receive) function. At the start of the serial mode, the "X-ON" code is sent, and the "X-OFF" code is sent on the termination of receive of all data.

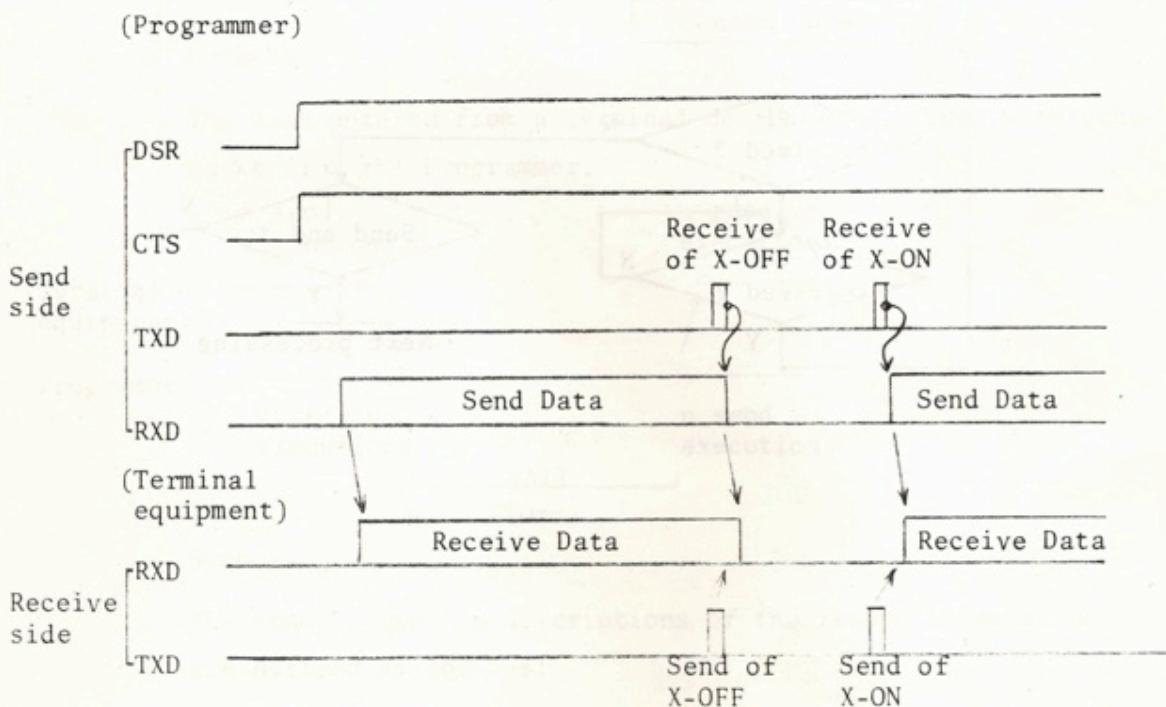


c) X-ON/X-OFF control receive flow chart

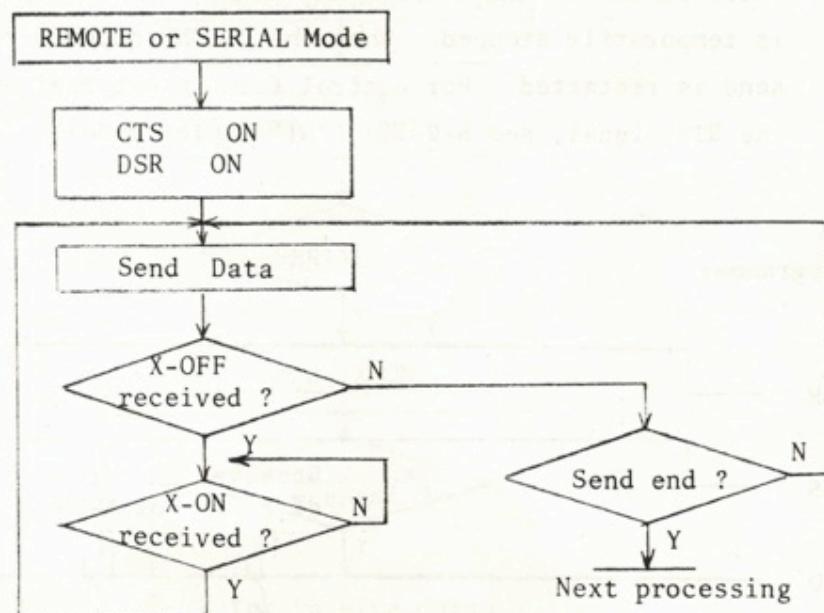


5-5 d) Remote or serial mode, receive

While the Programmer sends data to an external equipment if it receives the "X-OFF" code from the external equipment, data send is temporarily stopped. When the "X-ON" code is received, data send is restarted. For control from an external equipment using the RTS signal, see 5-2-1. (Full duplex mode)



e) X-ON/X-OFF control send flow chart



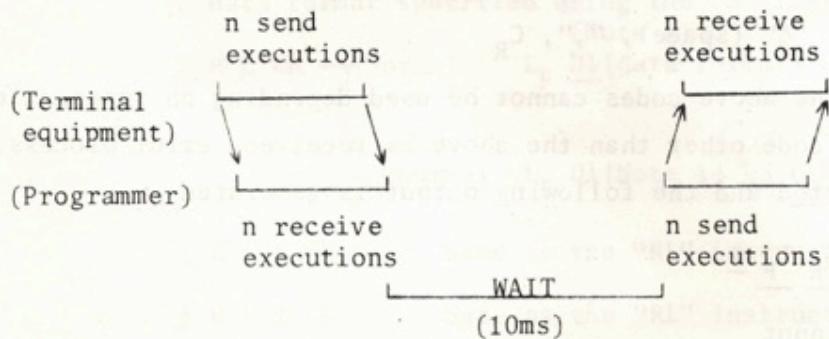
## 8-6 Instructions in Remote Mode

### 8-6-1 Remote Instructions

This Paragraph describes conversion between the instructions provided for remote operations of the Programmer and data. These instructions are generated for connection with terminal devices. Care should be taken to connection with computers because of some echo-backs.

#### o Echo-back

The data entered from a terminal device is provided with echo-backs from the Programmer.



#### o Symbols

The symbols used in descriptions of the remote instructions are defined as follows:

$n$  : Output from a terminal. Provided with echo-backs from the Programmer.

$\underline{n}$  : Output from the Programmer.

[ ]: Output from a terminal. Provided with no echo-backs.

$\Delta$  : SP code

#### o Instruction error

The Programmer processes any received instruction code other than the specified one as an error, and provides the following output:

C<sub>R</sub> L<sub>F</sub> ? C<sub>R</sub> L<sub>F</sub> #

o Initial operation

If the Programmer is put in the remote mode, the following output is generated:

C<sub>R</sub> L<sub>F</sub> #

o Input check

Checks addresses and data input codes. The following are the available codes:

Numeric characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9

Alphabetic characters: A, B, C, D, E, F

Symbols: "Δ" (space), ",", C<sub>R</sub>

Some of the above codes cannot be used depending on instruction.

When any code other than the above is received, error processing is conducted and the following output is generated:

C<sub>R</sub> L<sub>F</sub> ? C<sub>R</sub> L<sub>F</sub> #

o Address input

Up to four digits of address data may be entered. If less than four digits are entered, the remaining digits are regarded as 0. For the forth digit, a number of 8 or more is masked.

Example	Input address	Actual address
	1CR	0001
	FFFFCR	0FFF
	9FFFFCR	1FFF
	F1234CR	1234

## 8-6-2 Instructions description

### 8-6-2-1 Instructions for data transfer

- o Data transfer format specify instruction "S"

# S n CR      Normal      C<sub>R</sub> L<sub>F</sub> #  
                        Abnormal    C<sub>R</sub> L<sub>F</sub> ? C<sub>R</sub> L<sub>F</sub> #

A format number is to be entered.

- o Data transfer instructions "RL", "RL1" and "RL2"

Data is accommodated in a Programmer's buffer in accordance with a data format specified using the "S" instruction.

(Note 4)

# R L CR      Normal      L<sub>F</sub> D1 [data format] D3 C<sub>R</sub> L<sub>F</sub> #  
                        (Note 3) C<sub>R</sub> L<sub>F</sub> #

Abnormal    L<sub>F</sub> D1 [Note 1] D3 C<sub>R</sub> L<sub>F</sub> ? C<sub>R</sub> L<sub>F</sub> #

# R L 1 CR      Same as the "RL" instruction.

# R L 2 CR      Same as the "RL" instruction.

- o Data compare instructions "RLV", "RLV1" and "RLV2" (Note 2)

Buffer data and transferred data are compared with each other.

If the former differs from the latter, the abnormal state is sent back.

# R L V CR      Same as the "RL" instruction.

# R L V 1 CR      Same as the "RL" instruction.

# R L V 2 CR      Same as the "RL" instruction.

#### Notes:

- 1) Error processing is conducted when any format error is detected.
- 2) These instructions transfer data from a terminal to the Programmer.

- 3) The data format is sent out when the end mark or terminate code is detected.
- 4) The Programmer ends out D1 (HEX11) and gets ready for receiving data from an external equipment.
- 5) Time out function

If no data has been sent using the "RL", "RL1", "RL2", "RLV", "RLV1", or "RLV2" instruction after the Programmer waits for approx. 15 seconds, "E-17" is displayed on the display address section, resulting in time out. "?" is output to an external equipment, the Programmer waits for a command in the same mode.

o Data punch instruction

Data is output from the Programmer to a terminal in accordance with a format specified using the "S" instruction.

# P X X X X , Y Y Y Y CR

CR LF D2 NOL 100 BYTE format output NUL100BYTE D4 CR LF #

o Data list instruction

# L 1 X X X X , Y Y Y Y CR  
          2

Output format

3 Note 1 4

CR LF Z Z Z Z Δ Δ D D Δ D D Δ D D Δ      D D CR LF #

Max. 16 bytes (output format)

If data consists of 16 bytes or more, the above output format is repeated.

1. XXXX: Output. Buffer start address      Output from terminal
2. YYYY: Output. Buffer end address
3. ZZZZ: Output data start address. 2 bytes of data are expressed in four digits of ASCII
4. DD: Data. One byte of data is expressed in two digits of ASCII.

### 8-6-2-2 Instructions for P-ROM control

- o RAM start address set instruction "MR"

# M R Δ n n n n - m m m m CR LF CR LF #  
                  |                          |  
                  |                                | New set address  
                  |                                  |  
                  |                                  | Old set address

- o ROM start address set instruction "MS"

# M S              Same as the "MR" instruction.

- o ROM end address set instruction "MP"

# M P              Same as the "MR" instruction.

- o Set address display "MD"

# M D CR            CR LF A A A A Δ B B B B Δ C C C C CR CR LF #  
                      |                  |                  |                  |  
                      1              2              3

1. AAAA: ROM start address
2. BBBB: ROM end address
3. CCCC: RAM start address

- o Blank instruction "B"

# B CR            Normal              CR LF #  
                     |  
                     Abnormal            CR LF ? CR LF #

- o Copy instructions "OP" and "OPn"

# O P CR            Normal              CR LF #  
                     |  
                     Abnormal            CR LF ? CR LF #

# O P n CR        Same as the "OP" instruction.

- o Verify instructions "V" and "Vn"

# V CR            Normal              CR LF #  
                     |  
                     Abnormal            CR LF ? CR LF #

# V n CR        Same as the "V" instruction.

- o Programming instructions "W" and "Wn"

<u># W CR</u>	<u>Normal</u>	<u>CR LF #</u>
	<u>Abnormal</u>	<u>CR LF ? CR LF #</u>

# W n CR      Same as the "W" instruction.

### 8-6-2-3 Buffer operation instructions

- o Buffer initialize instruction

# F  $\longrightarrow$  X X X X, Y Y Y Y, Z Z CR LF CR LF #  
 1                  2                  3

1. Buffer start address
2. Buffer end address
3. Initial data

- o Data move instruction "T"

# T  $\longrightarrow$  X X X X, Y Y Y Y, Z Z Z Z CR LF CR LF #  
 1                  2                  3

1. Start address of data to be moved
2. End address of data to be moved
3. Destination address

- o Data delete instruction "D"

# D  $\longrightarrow$  X X X X, Y Y Y Y CR CR LF #  
 1                  2

1. Start address of data to be deleted
2. End address of data to be deleted

- o Data input instruction "C"

# C X X X X CR LF  
 1  
X X X X △ F F - 0 0 △ F F - 0 1 ----- △ F F - 0 7 CR LF  
 Up to 8 bytes  
X X X Y F F - CR CR LF #  
 4

1. Input start address
2. Data before buffer changes
3. New data
4. Terminate code
5. Data address

o Data insert instruction "I"

# I X X X X CR LF  
      1  
X X X X Δ 0 0 Δ Δ 1 I Δ Δ ----- Δ F F Δ CR LF  
      2   3  
                Up to 16 bytes

X X Y X Δ CR CR LF #  
      4

1. Insert start address
2. Data to be inserted
3. Data separate mark
4. End code
5. Insert address

o CONT instructions "OT" and "OTn"

# O T CR Normal CR LF #  
            Abnormal CR LF ? CR LF #

"OTn" block CONT instruction

# O T n CR Same as the OT instruction.

o Buffer check sum instruction "B0"

Sample output of a check sum for a range specified using PAE

# B 0 CR

882C Δ 4E

            Exclusive OR

            Addition

# B 0 CR LF 8 8 2 C Δ 4 E CR LF #

- o PROM device select instruction "N"

Selected by entering the number assigned to a P-ROM. (See a command number.)

# N Δ 00 - CR

If only CR has been entered, the device is not changed.

The current device number is displayed.

# N Δ 00 - C CR

Sample 27128 high-speed programming specification

The current device number is displayed.

For the device number, two entered lower digits are valid. If only one digit has been entered, the second digit is assumed to be "0".

# N Δ 00 - n n CR

Normal

CR LF #

Abnormal

CR LF ? CR LF #

- o Address select instruction "A"

This selects the all address (N) mode, the even (E) mode or the odd (O) mode as the operation address mode.

# A Δ O Δ CR

If only CR has been entered, the address mode is not changed.

The current address mode is displayed:

N: All address mode

E: Even address mode

O: Odd address mode

# A Δ N Δ E CR

Specifies the even address mode.

At present, the all address mode is established.

# A Δ N Δ E CR      CR LF #

- o In the address mode, only "N", "O" and "E" may be entered as

input data. The other data is considered to be an error.

# A Δ N Δ A      CR LF ? CR LF #

- o EEP-ROM chip erase instruction "Z"

Chip-erases an EEP-ROM. For the EP-ROM, the instruction is not accepted.

# Z CR

# Z CR — Normal      CR LF #  
— Abnormal      CR LF ? CR LF #

- o EEP-ROM byte erase instruction "ZB"

Byte-erases an EEP-ROM. For any device which cannot be byte-erased, the instruction is not accepted.

# Z B CR

A D R S - 10 CR

— Address to be erased.

# Z B CR LF A D R S - 10 CR — Normal      CR LF #  
— Abnormal      CR LF ? CR LF #

## 8-7 Instructions in Serial Mode

The serial instruction for the Programmer permits exchanging data with an external equipment through key operations. Data exchange is activated by a specified data format. (Note 1)

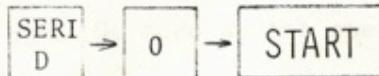
The serial instruction offers four functions.

- o Receives a data format sent from an external equipment.
- o Outputs a data format from the Programmer to an external equipment.
- o Outputs a list from the Programmer to an external equipment.
- o Outputs a control code from the Programmer to an external equipment.

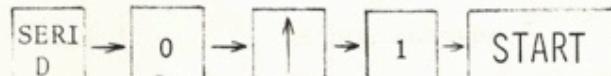
Note 1: See 9-8, Data Format. The format is specified by "EDIT", "FORMAT" and "FORMAT No." keys.

### 8-7-1 Data format reception

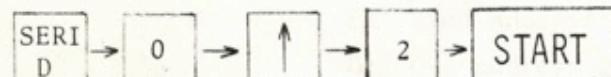
- o All data reception



- o Reception in the range of 0 to 32 K-bytes



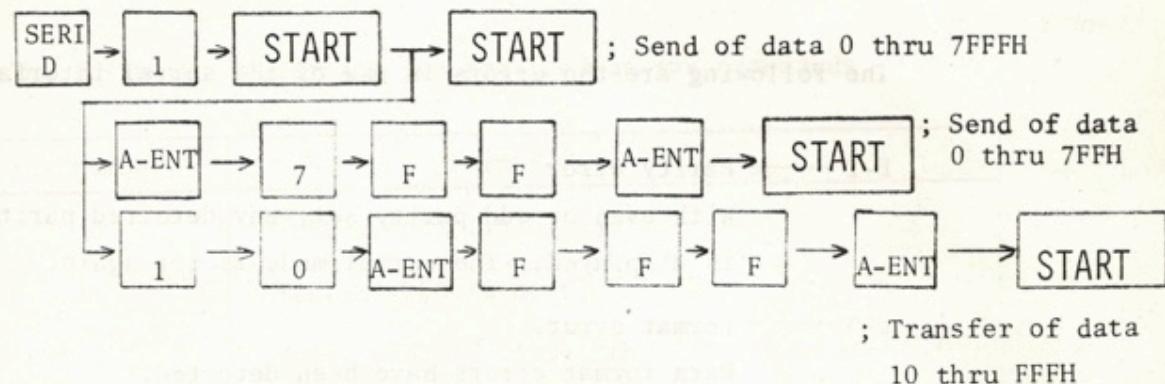
- o Reception in the range of 32 k to 64 k-bytes



Note 1)

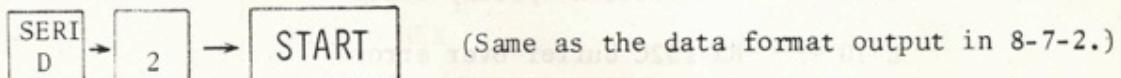
If no data sent using this instruction after the Programmer waits for approx. 15 seconds, "E-17" is displayed on the display address section, resulting in time out. "?" is output to an external equipment, and the Programmer waits for a command in the same mode.

8-7-2 Data format output



8-7-3 List output

Output in the same format as the REMOTE "L" instruction.



8-7-4 Control code output



Key No.	Control code	Remarks
0	SOH (01H)	
1	STX (02H)	
2	ETX (03H)	
3	EOT (04H)	
4	ENQ (05H)	
5	DC1 (11H)	X-ON
6	DC2 (12H)	
7	DC3 (13H)	X-OFF
8	DC4 (14H)	
9	ETB (17H)	
A	EM (19H)	
B	SUB (1AH)	INTEL MDS terminate code, CP/M terminate code
C	ESC (1BH)	

### 8-7-5 Error

The following are the errors in use of the serial interface:

E-2 —— Parity error

With even or odd parity set, any detected parity error is displayed. The serial mode is set again.

E-3 —— Format error

Data format errors have been detected.

E-7 —— Load verify error

This error occurs in the RLV instruction. The buffer differs from the data format.

E-8 —— Instruction specify error

E-10 —— RS-232C buffer over error

E-11 —— RS-232C RTS undetected error

## 8-8 Data Format

The following 14 formats are provided as the standards.

Key number	Format
0	Tektro. HEX (16 bits)
1	Tektro. HEX (8 bits)
2	Intel HEX (16 bits), only for receive. Intel HEX (8 bits)
3	Motorola exermax (16 bits), only for receive. Motorola exerciser (8 bits)
4	Texas SDSMAC
5	Minato HEX
6	ASCII-HEX (SPACE). V1 ASCII-HEX (SPACE). V2. Only for receive. ASCII-HEX (SPACE). V3. Only for receive. ASCII-HEX (SPACE). V4. Only for receive.
7	Binary
8	HP64000 absolute

Note: Data is read into the addresses from the address field for a format on. If there is no address field in the format, data is read into the addresses from the address 0 on.



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