MODEL 1866A EPROM PROGRAMMER

INSTRUCTION MANUAL

MINATO

WARRANTY

MINATO ELECTRONICS Programmer is guaranteed against defect in materials and workmanship.

The warranty period for the Model 1866A is one (1) year.
The warranty period begins upon receipt of the programmer.

During one (1) year period, if the Model 1866A requires any repair due to defective materials or workmanship, contact the sales representative.

CONTENTS

1 GENERAL

The Model 1866A EPROM 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 device to be programmed includes EPROMs/EEPROMs from 16 k to 512 k-bits.

The 1866A 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 64 k-byte programming buffer memory, permitting data up to 512 k-bits to be processed.

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

2 SPECIFICATIONS

○ **CPU**	Z-80A (4.0MHZ)
○ **Buffer RAM**	64 k-bytes (512k- bits)
○ **Monitor RAM**	2 k-bytes
○ **Monitor ROM**	8 k-bytes
○ **Operation switch**	Hexadecimal key switch
○ **Display**	LED
○ **Interface**	Serial: RS-232C, 20mA Current loop, switch selectable
○ **Baud rate**	110, 300, 600, 1200, 2400, 4800, 9600 switch selectable
○ **Tape format**	11 kinds of formats, selectable from keyboard
○ **Tape parity**	Odd, even, no parity switch selectable
○ **Check function**	Memory test, Power test, Reverse inertion test, programmer self test, Others
○ **Temperature**	+5 to +35°C
○ **Power supply**	AC 90V to 130V or 180V to 270V (±10%), 50/60Hz
○ **Power consumption**	30VA
○ **Size**	280(W) x 208(D) x 70(H) (mm)
○ **Weight**	1.5kg

3 CAUTION

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

○ Power supply

(1) The power supply to be used must be capable of generating 90 to 110 percents (50 or 60Hz) of the rated voltage of your country.

(2) The1866A 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 PROM inserted in its socket; otherwise, the PROM may be damaged.

○ Storage and environmental conditions

(1) The1866Aisprovided with vents at the rear to prevent any temperature rise; do not cover any vents and do not put the 1866A in any place with few ventilations.

(2) Do not expose the 1866A to direct sunshine and heat.

(3) Do not put the1866A in any extremely wet or dusty place.

(4) The1866A is composed of electronic precision parts. Do not subject them to any shock.

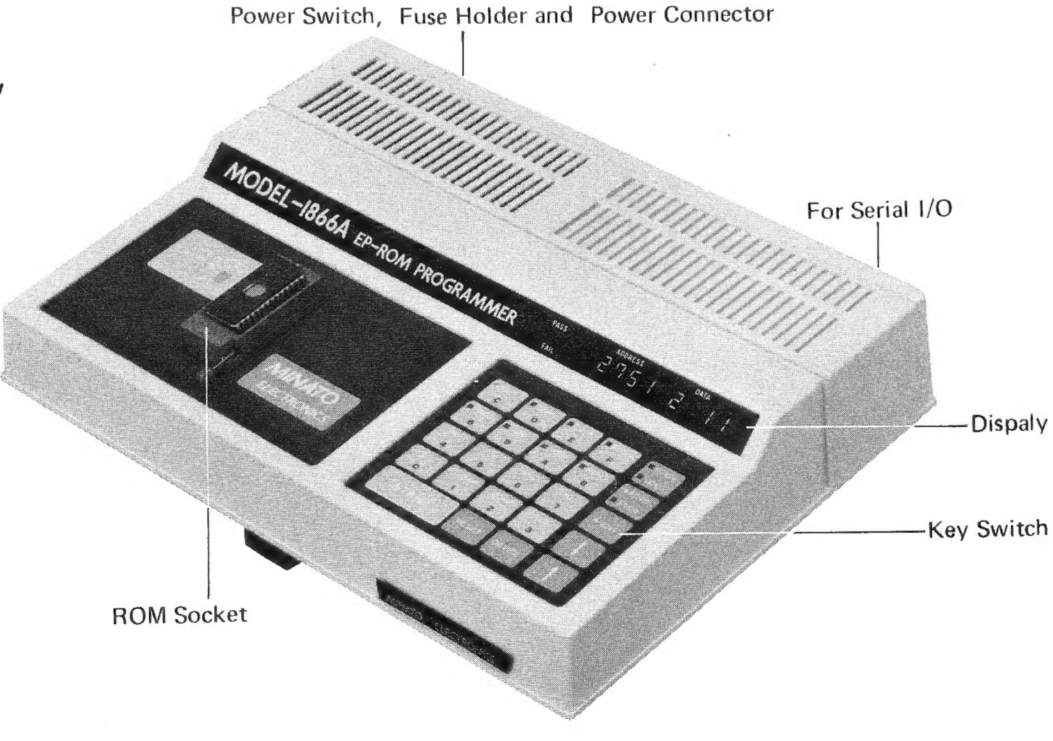
(5) Do not use the 1866A with any foreign materials (water, liquids, metals, etc.) contained; otherwise they may be damaged.

○ Troubles

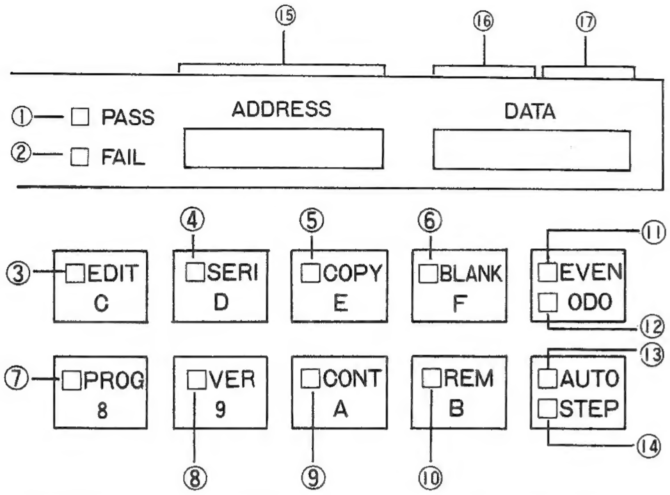
If any troubles (e.g., abnormal odor or over-heat) are found, disconnect the power cord plug and contact the representative or MINATO ELECTRONICS INC.

4 EXTERNAL VIEW AND NAMES OF PARTS

4-1 External View


Power Switch, Fuse Holder and Power Connector
For Serial I/O
Dispaly
Key Switch
ROM Socket
MODEL-1866A EP-ROM PROGRAMMER
MINATO ELECTRONICS

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.

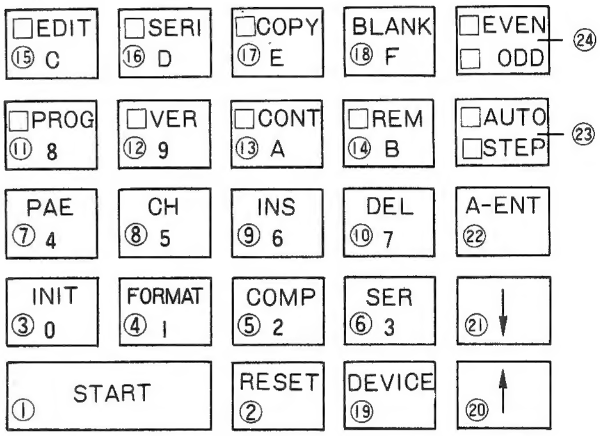
Indicated by ⑭ is the LED which indicates that the set is in the STEP mode. With the lamp lighting, the set stops whenever execution is made on an address.

Indicated by ⑮ are LEDs which indicate an address being operated in the EDIT 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 indicates 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.

○ Out of the switches described below, switches ③ through 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.

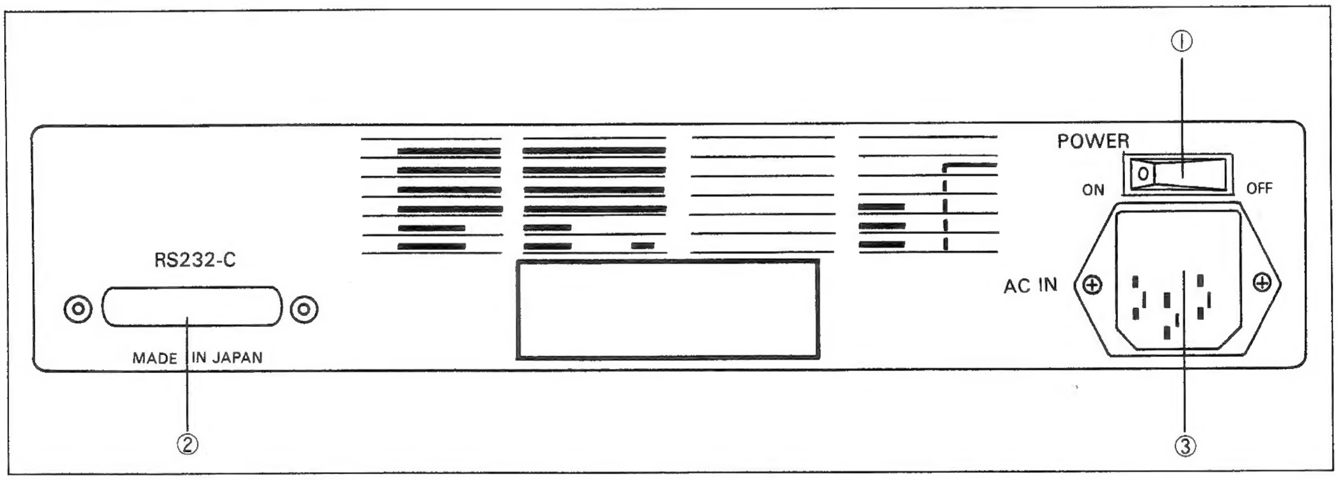
The number ㉑ signifies the switch which decrements an address.

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



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 20mA current loop.

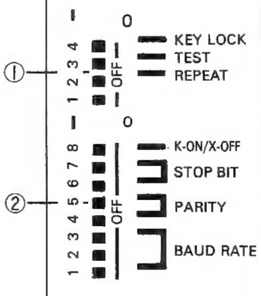
The number ③ signifies the receptacle for AC input.

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

4-5 Bottom Switches

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

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



6 7	STOP BIT
0 0	———
1 0	1 BIT
0 1	1.5BIT
1 1	2 BIT
4 5	PARITY CHECK
0 X	OFF
1 0	ODD
1 1	EVEN
1 2 3	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

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 1866A is provided with eight basic operation modes.

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

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

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

○ BLANK mode
  This mode blank checks PROMs.

○ PROGRAM (PROG) mode
  This mode programs PROMs.

○ VERIFY (VER) mode
  This mode verifies programmed PROMs.

○ CONTINUOUS (CONT) mode
  This mode provides BLANK, PROGRAM and VERIFY operations successively.

○ 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 entry 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.

○ Changeable contents

  ○ PROM start address and PROM stop address
    Specify the portion of a PROM to be programmed. At power on, the start address and stop address are set at 0000_H and the end address of a PROM to be programmed.

  ○ Memory (RAM) start address
    When programming a PROM, specify which portion of the programme data is to be written from. This also applies to reading (Copy and Verify).

  ○ Notes for change
    The start address is equal to or less than the stop address. The stop address is equal to or less than

PROM'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 (PROM start address) in a hexadecimal number consisting of four digits. If no change is required, press "↑" to proceed to the step (5).

(4) Press "A-ENT".

(5) Enter a programming stop address (PROM 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.

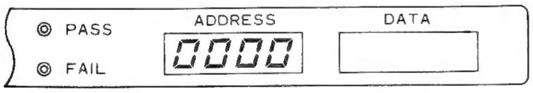
Examples

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 $7FF_H$.

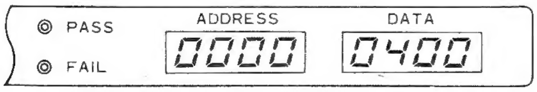
(1) Set 2732 by the DEVICE select switch.

(2) Press "EDIT".

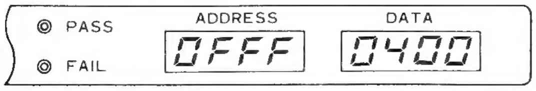
(3) Press "PAE". The ROM start address is displayed.



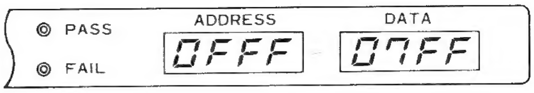
(4) Enter the PROM start address (0400_H) in a hexadecimal number consisting of four digits.



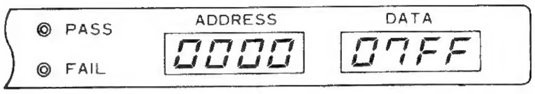
(5) Press "A-ENT". The ROM start address is set and the ROM stop address is displayed on the ADDRESS portion.



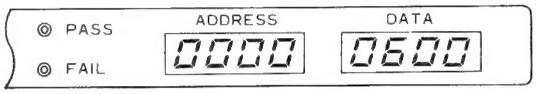
(6) Enter the PROM stop address ($07FF_H$) in a hexadecimal number consisting of four digits.



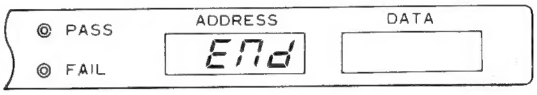
(7) Press "A-ENT". The ROM stop address is set and the RAM start address is displayed on the ADDRESS portion.



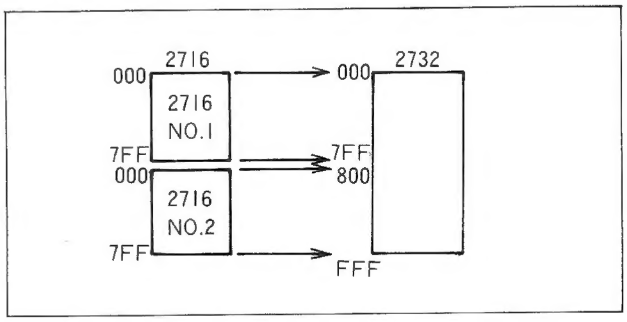
(8) Enter the memory (RAM) start address (0600_H) in a hexadecimal number consisting of four digits.



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



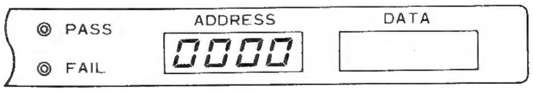
2. Shift two 2716's data to 2732 (only by changing the RAM start address).



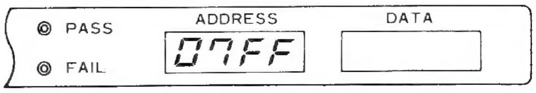
(1) Set 2716 by the DEVICE select switch.

(2) Insert the first 2716 into the socket, and press "COPY" and "START" in that order.

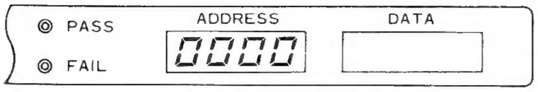
(3) Press "EDIT" and "PAE" in that order.



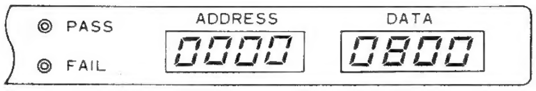
(4) Press "↑". (No ROM start address is changed.)



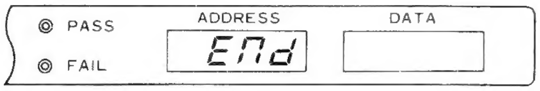
(5) Press "↑". (No ROM stop address is chagned.)



(6) Enter the memory (RAM) start address as 0800$_H$.



(7) Press "A-ENT".



(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.

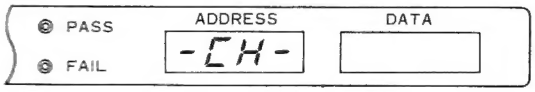
(10) Program 2732.

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).

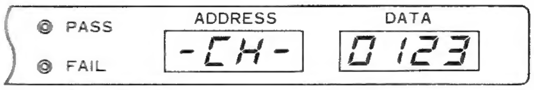
6-1-2 CH (Change mode)

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.

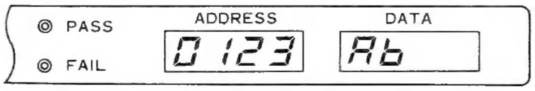


3. Enter an address in a four-digit hexadecimal number.

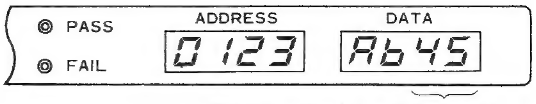


In this example, 0, 1, 2 and 3 are entered.

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.)



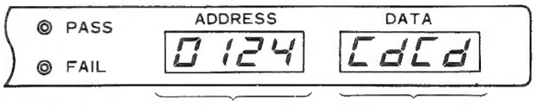
The new entered data is displayed here.

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 step 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.

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.

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.
3. Press the "↑" switch.

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.

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.

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" through "1F" or the "↑" switch.

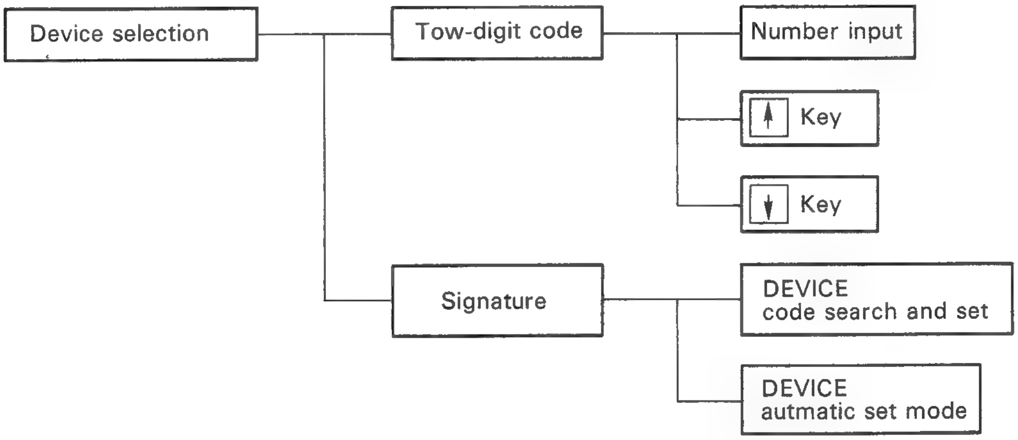
1. Press the "DEVICE" switch. Now, the name and number of a PROM currently selected are displayed on address

and data sections, respectively.

2. Select a PROM concerned using the "↑" or "↓" switch, or keys "00" through "1F".
   - ○ The switch "↑" permits selecting the PROM with the number following that of a PROM currently selected.
   - ○ The switch "↓" permits selecting the PROM with the number preceding that of a PROM currently selected.
   - ○ Number "00" through "1F" permits directly selecting a PROM. The correspondence between number and PROM is shown in Figure.
3. Press the "↑" switch.
4. Press the "A-ENT" switch. Now, "END" is displayed and operation stop.

6-1-10 Device Selection

This mode selects PROM to be programmed and read. A PROM can be selected using a two-digit ROM code, ↑ and ↓ keys, and a silicon signature code.

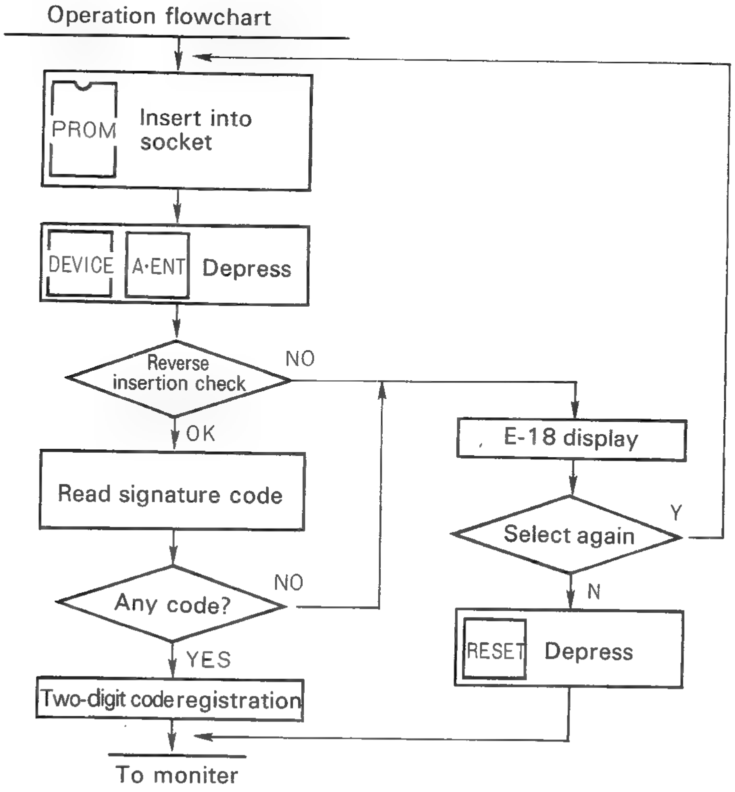


When a device is once selected, PROM operation range corresponds to its overall capacity. However, BUFF's operation start address remains the same.

PROM name display	Operation range	
	Capacity	Address
2716、48016、2815、2816 2816A、5213、27C16	2 KByt	0000～07FF
2732、2732A、2532、2833 27C32、27C32A	4 KByt	0000～0FFF
2764、i64H、i·64AH、F64H、 2564、2564H、68764、2864A 58064、5764、64b、A64、27C64 C64H、iC64H、FC64H	8 KByt	0000～1FFF
27128、i128、i128H、i286 A128、C128、C128H、FC128	16KByt	0000～3FFF
i256、256H、2566、A256 C256、FC255	32KByt	0000～7FFF
27512、27513、C512	64kByt	0000～FFFF
·········Signature mode		To be determined

· **Device code search and set**

When a device is selected with a signatured PROM inserted into a socket, a corresponding two-digit code for the PROM is registered. When PROM has no signature, or when PROM's signature code is not registered to 1866A, error "E-18" is displayed. In this case, device selection state is as of before operation.

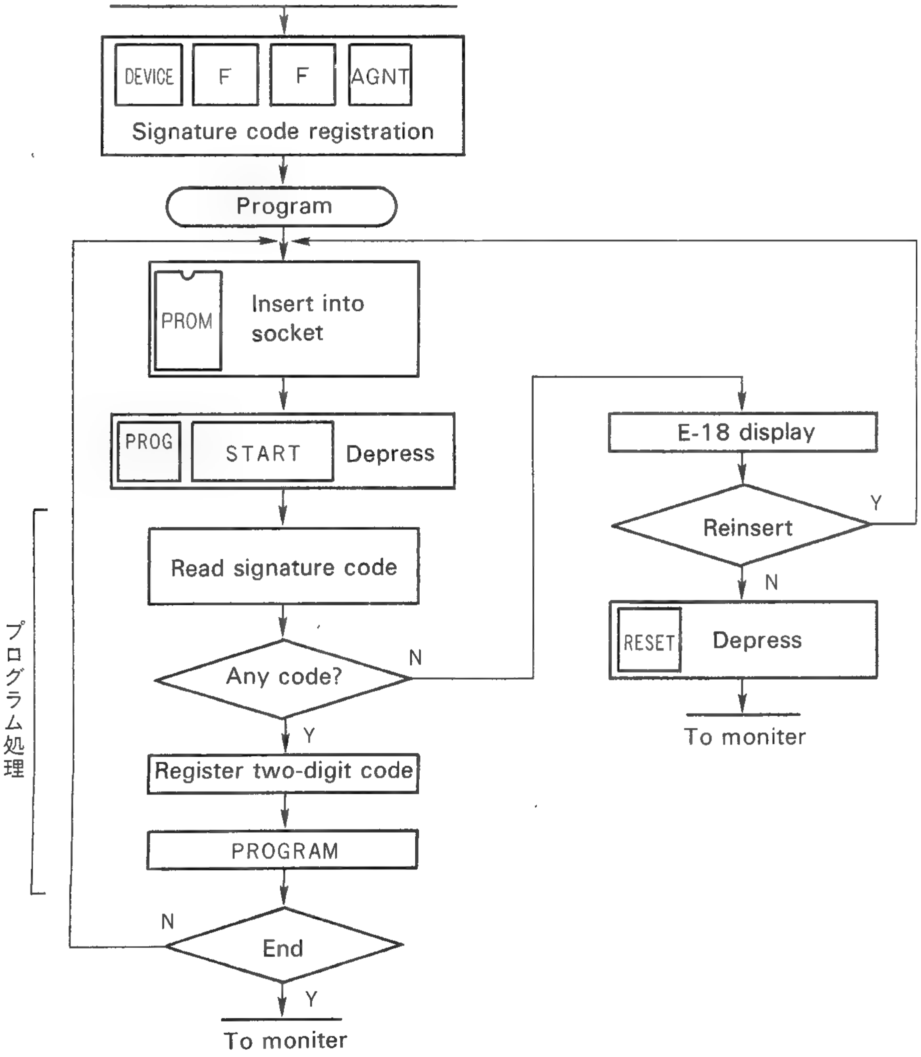


• **Device automatic set mode**

When signature code "FF" is registered at device selection, PROM's signature code is read, and then corresponding read/write method and capacity for the PROM are autmatically set and operation starts every time start key is depressed. However, when PROM has no signature, or when PROM's signature code is not registered to 1866A, error "E-18" is displayed. In this case, select a device using a two-digit code.

Note : In this mode, PROM to be programmed is not identified until operation starts. Also, setting of operation range and use of block mode can not be done. When the above setting is required, perform selection using a two-digit code, or code search and set mode.

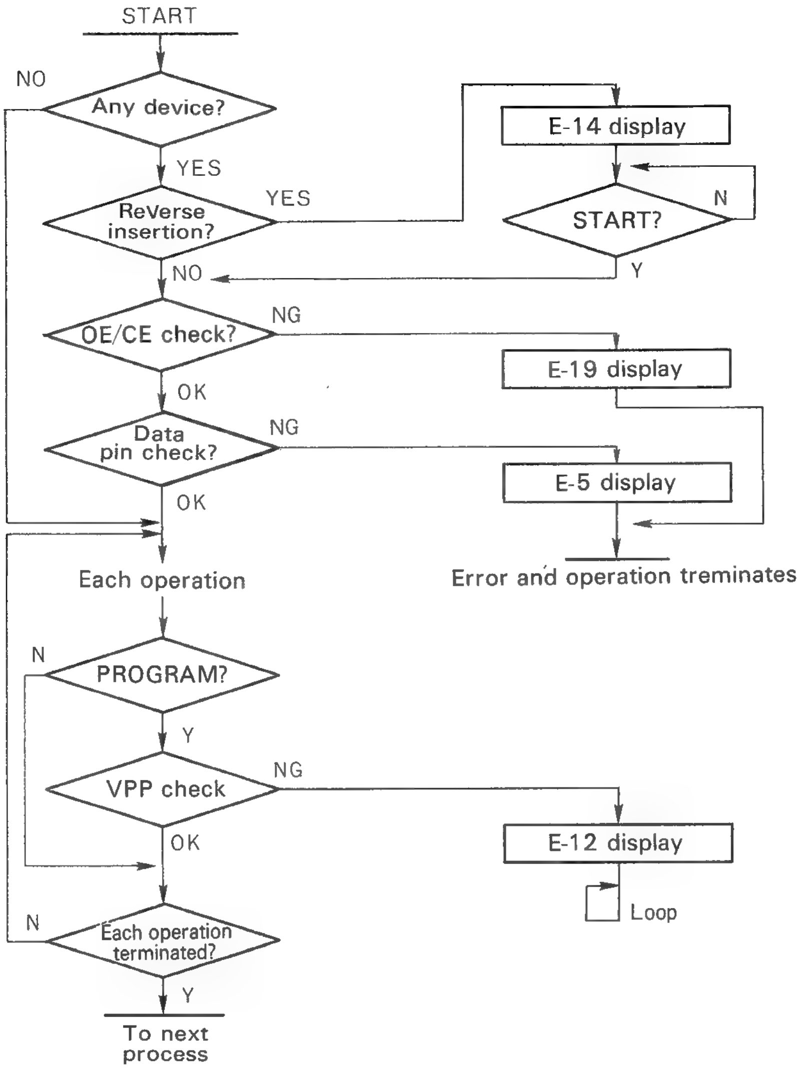
Operation flowchart



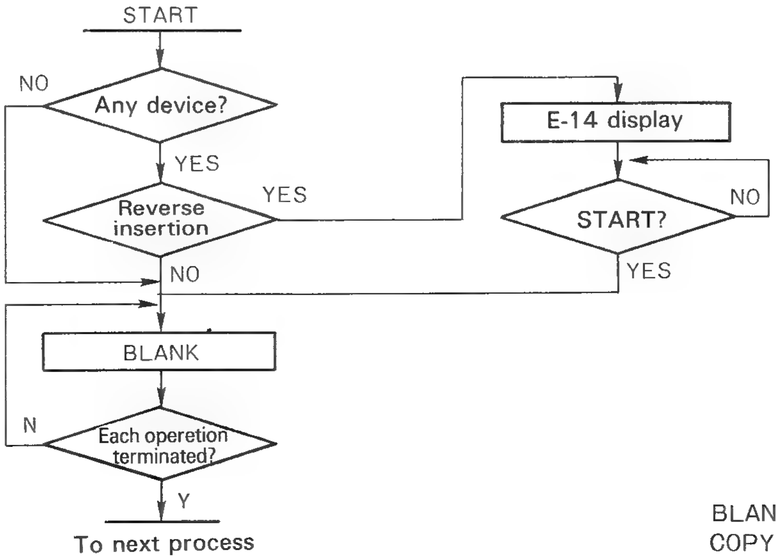
Operation flowchart

- **When a device is registered:**

◦ COPY、PROGRAM、VERI FY



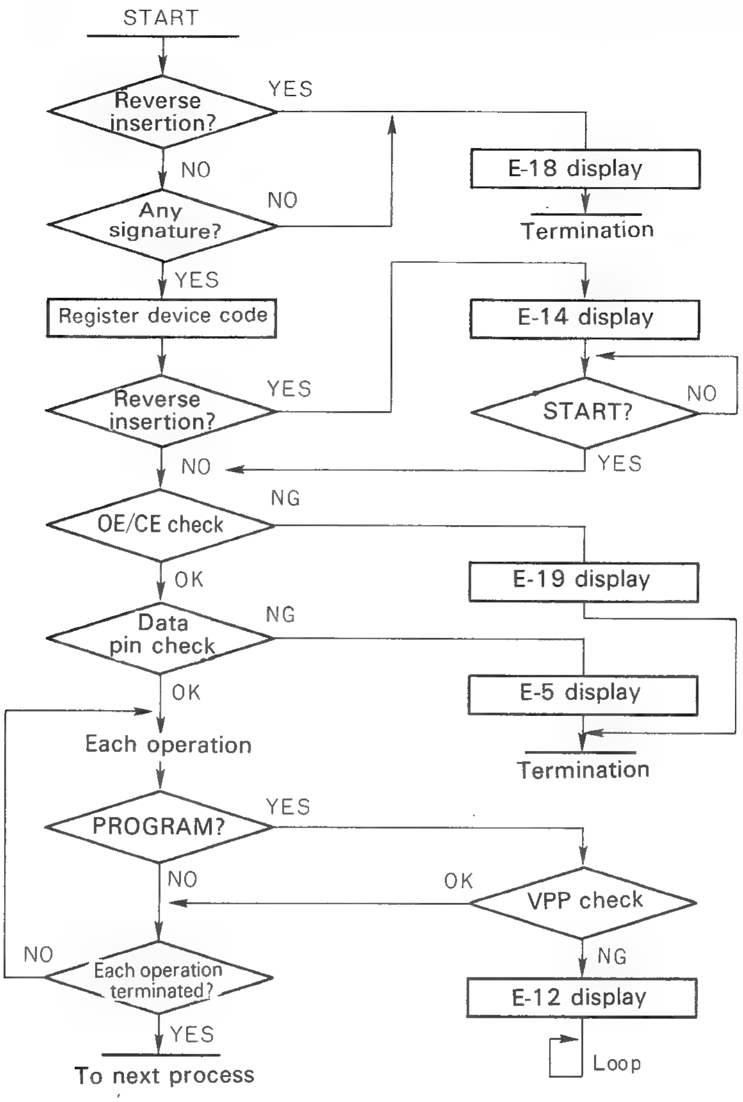
◦ BLANK



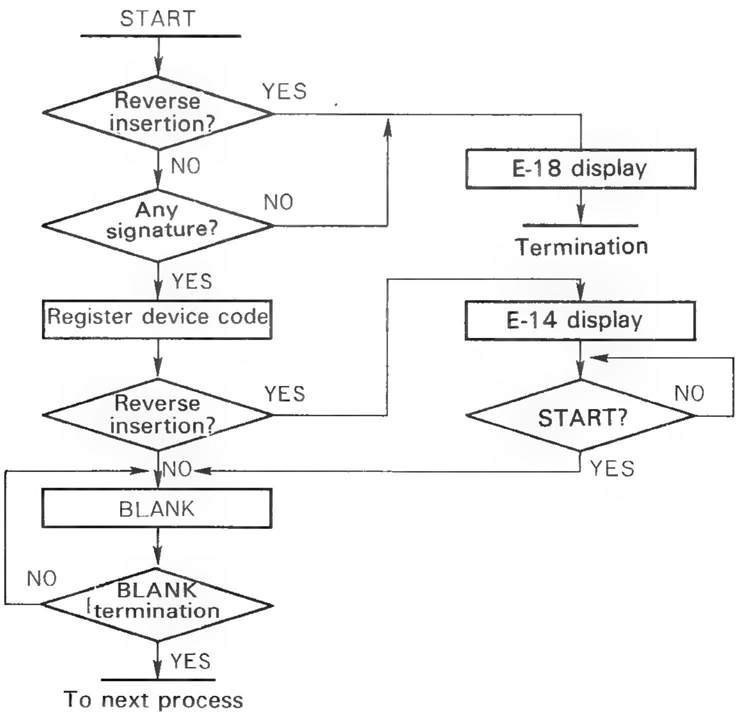
BLANK
COPY、PRoGRAM、VERIı

When a device has a signature code:

◦ COPY, PROGRAM, VERIFY



◦ BLANK



6-1-11 List of Device Codes
NMOS type list

Device code	Display	Covered PROM	Programming Algorithm	Programing voltage
00	2716 00	i 2716 or equivalent	Standard(50mS)	25
01	2732 01	i 2732 or equivalent	Standard(50mS)	25
02	2732A 02	i 2732A or equivalent	Standard(50mS)	21
03	2532 03	TMS2532 or equivalent	Standard(50mS)	25
04	2764 04	i 2764 or equivalent	Standard(50mS)	21
05	64H 05	i 2764 or equivalent	Intelligent- I	21
06	64AH 06	i 2764A or equivalent	Intelligent- II	12.5
07	F64H 07	MBM2764 or equivalent	Quick	21
08	2564 08	TMS2564 or equivalent	Standard(50mS)	25
09	2564H 09	TMS2564 or equivalent	Quick(12mS)	25
0A	68764 0A	MCM68764 or equivalent	Loop	25
0B	27128 06	i 27128 or equivalent	Standard(50mS)	21
0C	128 0C	i 27128 or equivalent	Intelligent- I	21
0D	128A 0d	i 2128 or equivalent	Intelligent- II	12.5
0E	F128H 0E	MBM27128 oz equivalent	Quick	21
0F	256 0F	i 27256 or equivalent	Intelligent- II	12.5
10	256H 10	TMM27256 or equivalent'	Quick(20mS)	21
11	27512 11	i 27512 or equivalent	Standard(60mS)	12.5
12	48016 12	HN48016 or equivalent	Quick(10ms)	25
13	2815 13	i 2815 or equivalent	Quick(10ms)	21
14	2816 14	i 2816 or equivalent	Quick(10ms)	21
15	2816A 15	X2816A or equivalent	Quick(10ms)	5
16	5213 16	5213 or equivalent	Quick(10ms)	5
17	2864A 17	X2864A or equivalent	Quick(10ms)	5
18	2833 18	MCM2833 or equivalent	Quick(10ms)	5
19	58064 19	HN58064 or equivalent	Intelligent- II	5
1A	5764 1A	LH5764J or equivalent	Quick	12.5
1B	27513 1b	i 27513 or equivalent	Intelligent- II	12.5
Spare				
Spare				
Spare				
Spare				
20	646 20	iP2764A or equivalent	Intel quick	12.75
21	128b 21	iP27128A or equivalent	Intel quick	12.75
22	256b 22	iP27256A or equivalent	Intel quick	12.75
23	512b 23	iP27512A or equivalent	Intel quick	12.75
Spare				
Spare				
Spare				
Spare				
28	A64 28	AM2764A or equivalent	AMD quick	13.0
29	A128 29	AM27128A or equivalent	AMD quick	13.0
2A	A256 2A	AM27256A or equivalent	AMD quick	13.0
2B	A512 2b	AM27512A or equivalent	AMD quick	13.0
Spare				
Spare				
Spare				
Spare				
FF	---- FF	Signature code		

* As of June'86(Above List is subject to change without notice)

* Programming methods

Intelligent : Intelligent programming algorithm(Intel methods)
Intel Quick : Quick Pulse Programming algorithm
Quick : Quick programming method
Standard : 50 mS Pulse

6-1-12 List of Device Codes

CMOS type list

Device code	Display	Covered PROM	Programming Algorithm	Programing voltage
40	27C16 40	27C16 or equivalent	Standard(50mS)	25
41	27C32 41	27C32 or equivalent	Standard(50mS)	25
42	C32A 42	MBM27C32A or equivalent	Standard(50mS)	21
S				
44	27C64 44	27C64 or equivalent	Standard(50mS)	25
45	C64H 45	27C64 or equivalent	Intelligent- I	21
46	C64H 46	27C64 or equivalent	Intelligent- II	12.5
47	FC64H 47	MBM27C64 or equivalent	Quick	21
S				
S				
S				
4B	C128 4b	27C128 or equivalent	Standard(50mS)	21
4C	C128H 4C	27C128 or equivalent	Intelligent- I	21
Spare				
4E	FC128 4E	MBM27C128 or equivalent	Quick	21
4F	C256 4F	127C256	Intelligent- II	12.5
50	FC256 50	MBM27C256 or equivalent	Quick	21
51	C512 51	MBM27C512 or equivalent	Intelligent- II	12.5
Spare				
Spare				
Spare				
Spare				
Spare				
Spare				
Spare				
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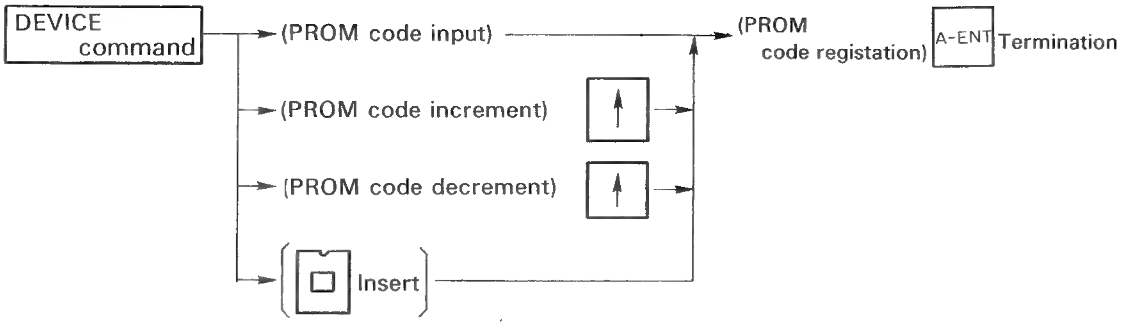
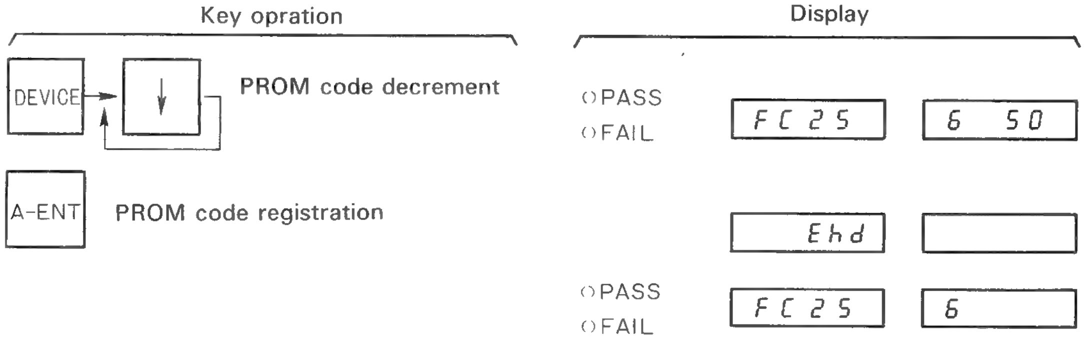
Spare				
FF		Signature code		

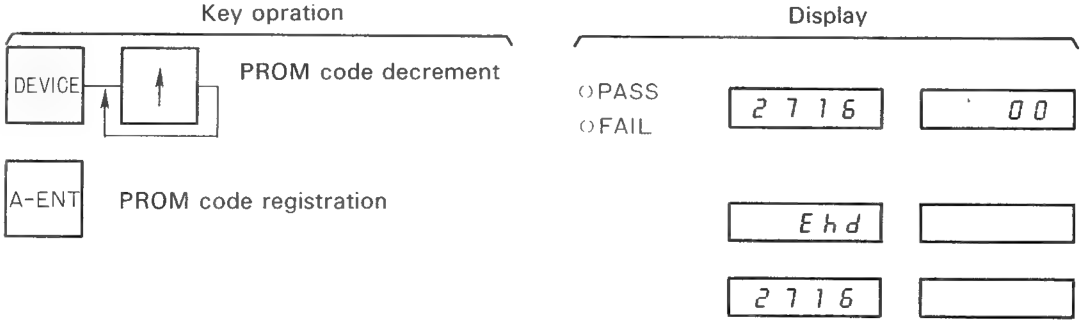
Operation method



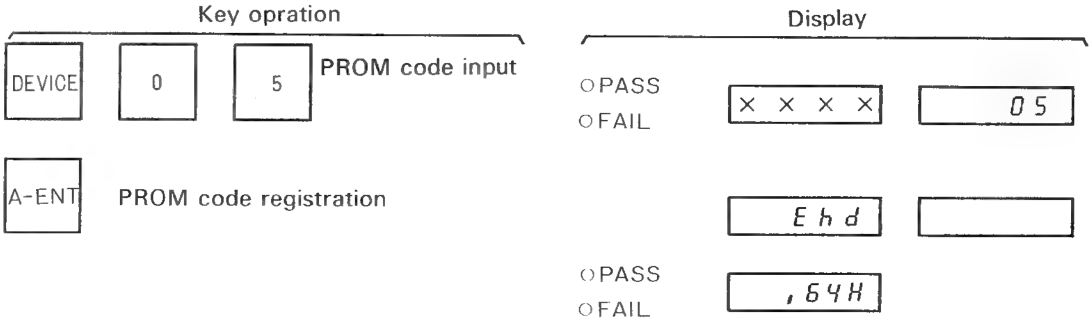
◦ MBM27C256 selection method(using decrement)



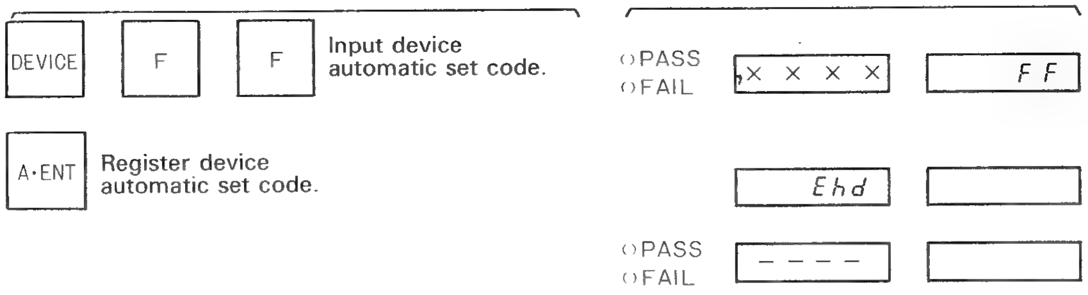
◦ 2716 selection method(using increment)



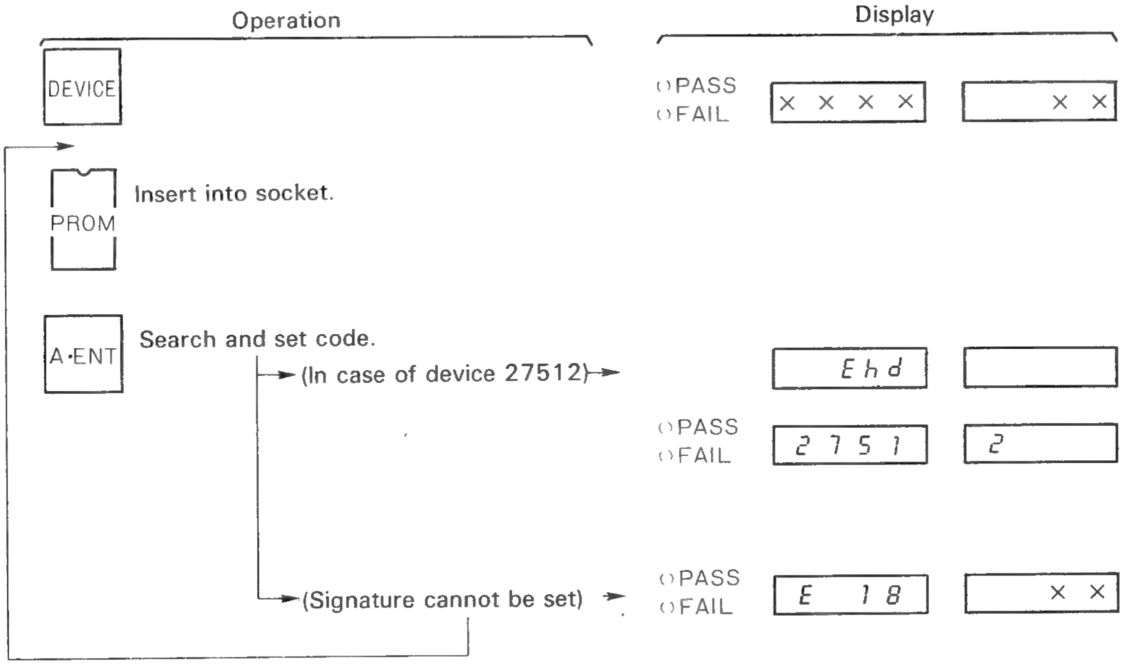
◦ i27C64(Intelligent-I)selection method(using code input)



◦ Device automatic set mode


DEVICE
F
F
Input device automatic set code.
○PASS
○FAIL
× × × ×
F F
A·ENT
Register device automatic set code.
E h d
○PASS
○FAIL
- - - -

◦ Device code search and set



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

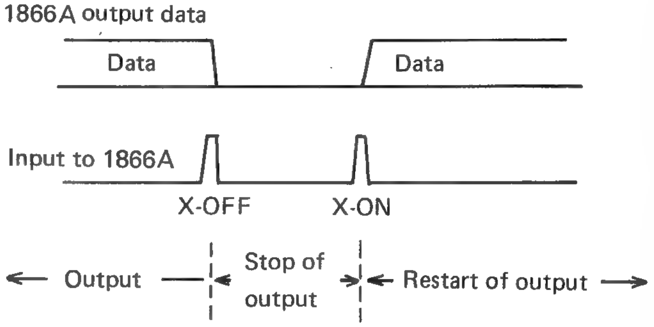
6-2-5 Handshake

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 to transmit/receive data.
   This Programmer uses a code of "11_H" for the X-ON signal, and a code of "13_H" for the X-OFF signal.

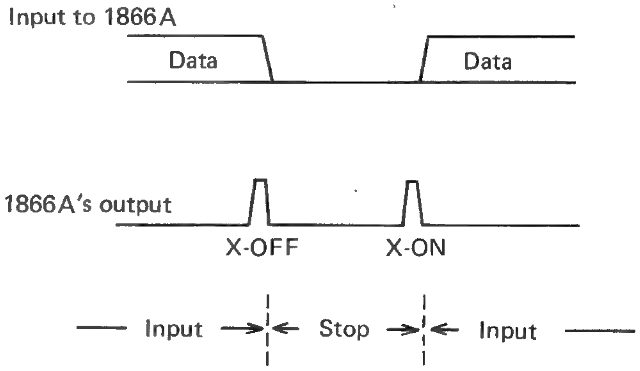
Example 1:

This example outputs data from the 1866A.



Example 2:

This example enters data from the 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 [*1] is displayed, and operation stops.

○ 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 [*2] is displayed, and operation stops.

○ The copy mode does not perform "STEP" operation. In the copy mode, the address specified in the "PAE" mode is invalid. However, the "RAM START" address is valid.

○ In the copy mode, the address mode [*3] is valid.

○ 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 "PASS" LED lights and operation stops.

○ The blank check mode is capable of step operation.

○ In the blank check mode, every PAE is valid.

○ The order of executing steps 1 and is left to the user's discretion.

○ 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.

○ The program mode, on the termination of programming, carries out the verify check.

○ 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.

○ Verify operation is conducted four times, as conditions are varied.

○ 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

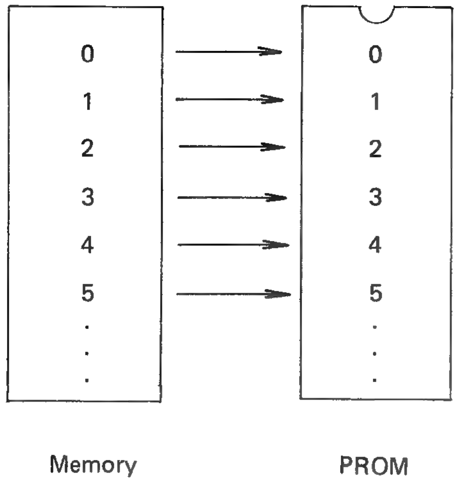
The Programmer, in copy, program and verify operations, is capable of selecting an address to be programmed.

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.

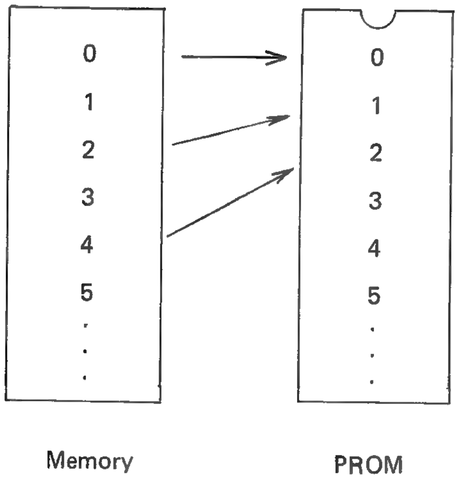
If the address mode display LED "EVEN" lights, this signifies that the even address mode has been set up. Only the even memory addresses will be programmed.

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.

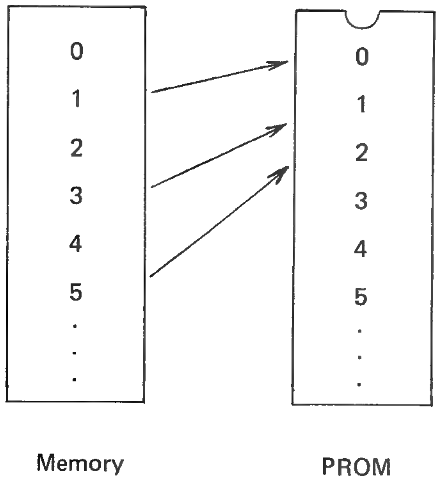
Normal address mode



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.

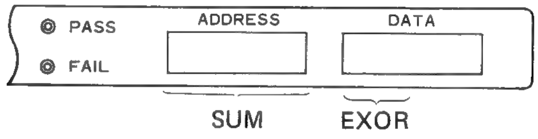
During the step mode, the auto mode may be set up.

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	Erase error
E-10	Buffer over error (RS-232C)
E-11	RS-232C DSR undetected error
E-12 m *1	Vpp error

E-13	n *2	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 through 9.

*2: n refers to alphabetics A through D.

The numerics and alphanumerics signify:

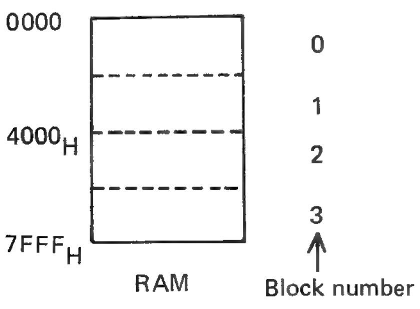
1	Vpp 12.5V	Pin 23
2	Ditto	Pin 21
3	Ditto	Pin 1
4	Vpp 21.0V	Pin 23
5	Ditto	Pin 22
6	Ditto	Pin 1
7	Vpp 25.0	Pin 23
8	Ditto	Pin 22
9	Ditto	Pin 1
A	Vcc 4.75V	
B	Vcc 5.00V	
C	Vcc 5.25V	
D	Vcc 6.00V	

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 1866A'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.

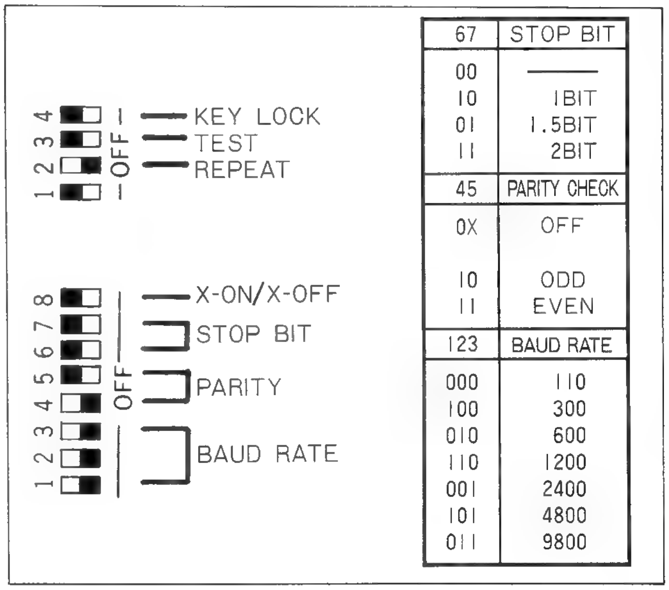
The subsequent operations may be carried out only by the "START" switch. The set block number may be altered and this mode may be released by pressing an operation mode switch such as "COPY" or the "RESET" switch.

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.



67	STOP BIT
00	———
10	1BIT
01	1.5BIT
11	2BIT

45	PARITY CHECK
0X	OFF
10	ODD
11	EVEN

123	BAUD RATE
000	110
100	300
010	600
110	1200
001	2400
101	4800
011	9800

   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.

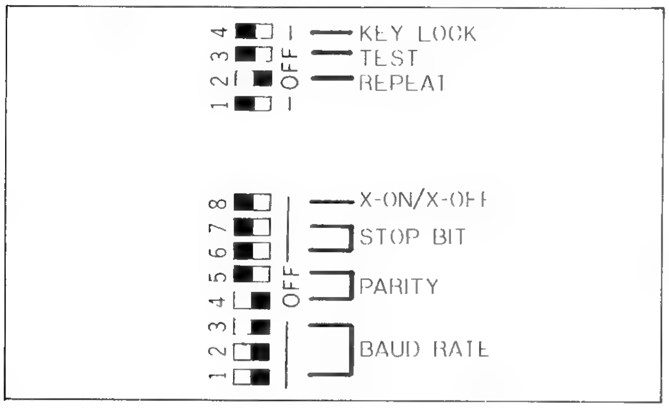
6-15-2 Test

Turning on this switch causes the 1866A 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 1866A provides are not operated. Note that erroneous operations may destroy the 1866A and PROMs.

6-15-3 Repeat

Turning on this switch causes Copy, Blank, Program, Verify and Cont operations to be excuted 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 120 seconds upon absence of data reception as Serial mode, or the command of "RL", "RLn", "RLV", or "RLVn" at Remote mode.

7 REMOTE OPERATION

The PROM 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:

No.	Command	Content
1	A	Address select.
2	B	Device blank check.
3	Bo	Checksum output.
4	C	Prepare, and correct data.
5	D	Data deletion.
6	E	Release remote operation.
7	F	Initialize memory.
8	G	Execute within memory (not to be used)
9	I	Data insertion
10	L	Output list.
11	MD	Output operation address range.
12	MS	Assign device start address.
13	MP	Assign device end address.
14	MR	Assign memory start address.
15	N	Device select.
16	OP	Copy.
17	OPn	Copy specified block.
18	OT	Continue.
19	OTn	Continue specified block.
20	P	Output data using data format. (0 ~32K)
21	RL RL,xxxx	Input data format. (0 ~64K)
22	RL1	// (0 ~32K)
23	RL2	// (32~64K)
24	RLV RLV,xxxx	Compare data using data format. (0 ~64K)
25	RL1	// (0 ~32K)
26	RL2	// (32~64K)
27	S	Assign data format.
28	T	Move data.
29	V	Verify
30	Vn	Verify specified block.
31	W	Program.
32	Wn	Program specified block.
33	Z	EEPROM chip erase
34	ZB	EEPROM byte erase

The signal formats for terminal equipment connected are RS-232C and 20mA current loop. The tape parity and baud rate are 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 exclusivery used and that any underlined character is an entry from terminal equipment.

7-1 Terminal equipment Connection

The PROM 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 alway 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 provided 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, cuases"?" 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, 8 or more at the highest digit will be masked; for example, 8100 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)   (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)   (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 instruciton.
(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
```

Bank 1 0000-7FFF, Bank 2 Bank 8000-FFFF
When assignmeut of data elimination
is through above 2 Banks,an error
is generated.

When an inserted address exceeds
7.FFF or F FFF, operation
terminates.

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 dispalyed.

(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 instruciton "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 DDCCBBAA99 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 BB BB BB BB BB BB BB BB 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) Indicate a delete start address.

(3) Indicates a delete end address. The delete and 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 delected.

```
 #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
```

Bank 1:0000-7FFF, Bank 2:8000-FFFF When assignm-eut of data elimination is through avove 2 Banks, an error is generated.

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)  (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 erronuous.

(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 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 PROM 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 [illegible] 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.

(a) 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 PROM 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
0010  AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA
0020  AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA AA
0030  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 PROM 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 wait 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 PROM 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 PROM 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 PROM 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. O CR
    ↑          O : 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.

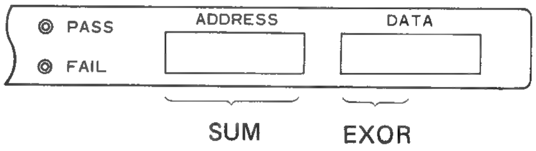
```
#RLV CR (Entry through TTY reader)
```

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 PROM 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 PROM 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 EEPROM's erase

Entering a EEPROM chip erase instruction "Z" allows erase instruction.

```
#Z CR
```

L → [illegible]

[illegible]

7-12-13 EEPROM's byte erase

Entering a EEPROM 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.

7-12-14 Remote Operation Release Command

The execution of this command releases the serial I/F and returns to LOCAL mode.

Input method and output format.

```
# E CR LF * * △ S E R I A L △
  E N D △ * * CR LF
```

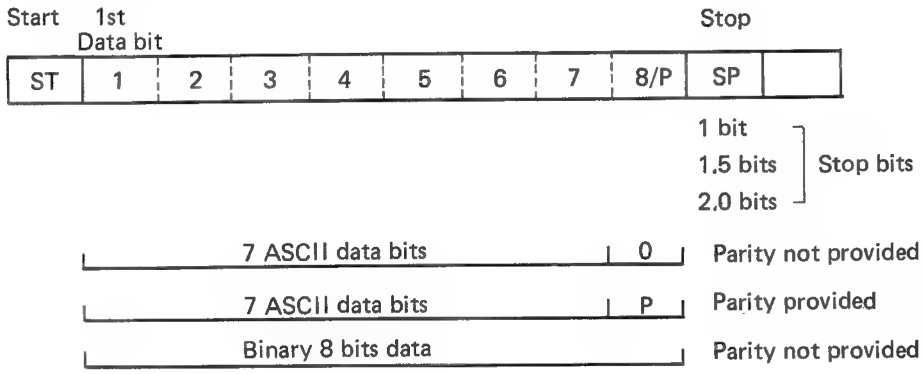
8 SERIAL INTERFACE

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

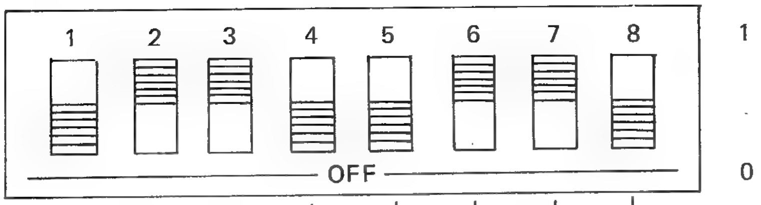
(1) Baud rates: 110, 300, 600, 1200, 2400, 4800 and 9600
(2) Start bit: 1 bit fixed
(3) Data bit: Parity bit provided (7 data bits plus 1 parity bit = 8 bits)
Parity bit not provided (8 data bits = 8 bits)
(4) Parity bit: Parity bit not provided.
Even parity: 1 bit
Odd parity: 1 bit
(5) Stop bits: 1 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 switches sets a desired baud rate, and specifies the presence or absence of parity check, a stop bit and X-ON/X-OFF control.



8 → X-ON/OFF; Specifies the transmission procedure.
0; Transmission procedure not controlled.
1; Transmission procedure X-ON/OFF controlled.

→ Specifies stop bit.

6	7
0	0 ; Inhibit
0	1 ; 1 bit
1	0 ; 1.5 bits
1	1 ; 2 bits

→ Specifies parity

4	5	
0	1 or 0	; Parity bit not provided (8 data bits)
1	0	; Odd parity (7 data bits plus parity)
1	1	; Even parity (7 data bits plus parity)

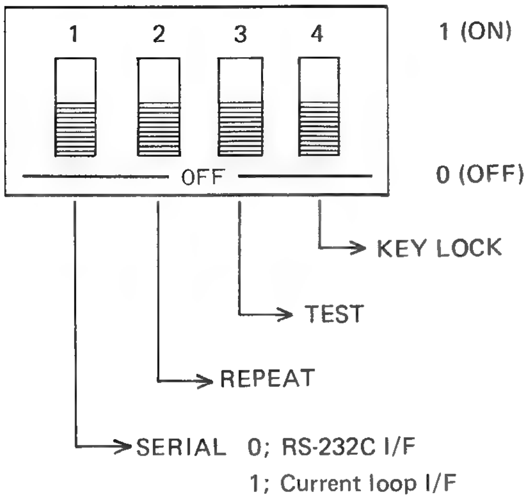
→ Specifies baud rate

1	2	3		
0	0	0	;	110 bauds
1	0	0	;	300 bauds
0	1	0	;	600 bauds
1	1	0	;	1200 bauds
0	0	1	;	2400 bauds
1	0	1	;	4800 bauds
0	1	1	;	9600 bauds
1	1	1	;	Inhibit

* 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.



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		→

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.

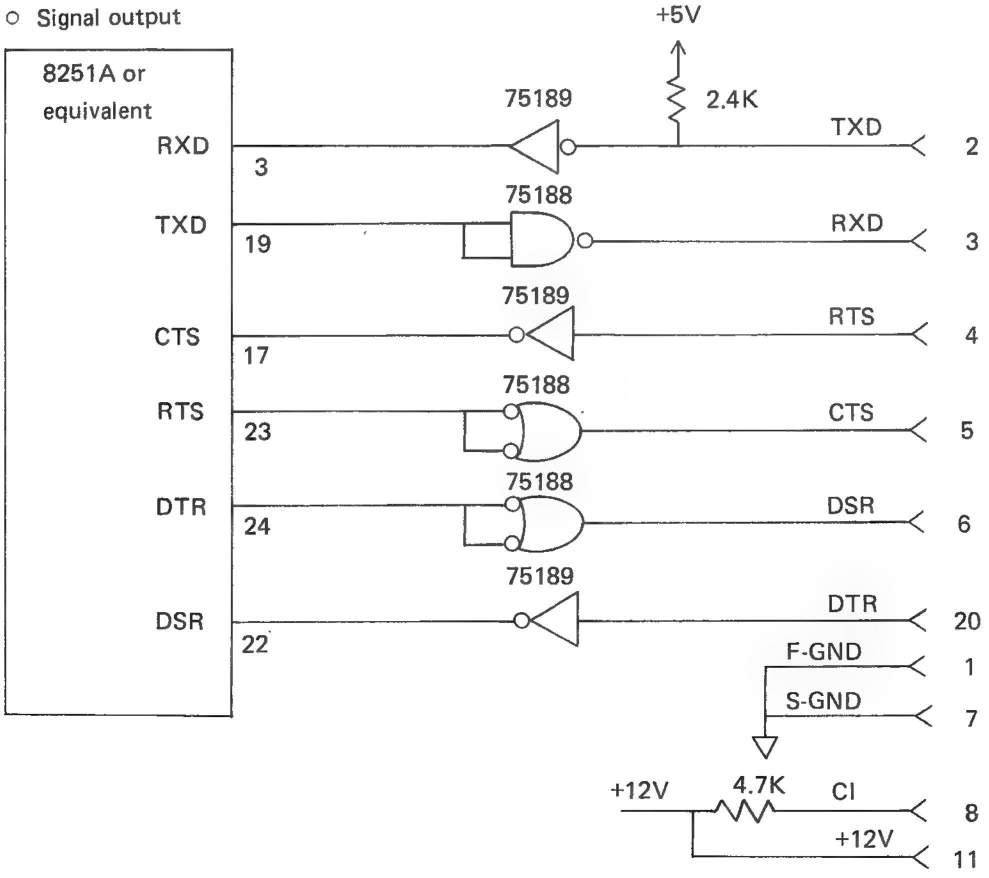
8. CE; Carrier detector (CD)
   ON: Informs an external equipment that the Programmer has detected a carrier.
   OFF state not provided.

○ Polarity of interface signals

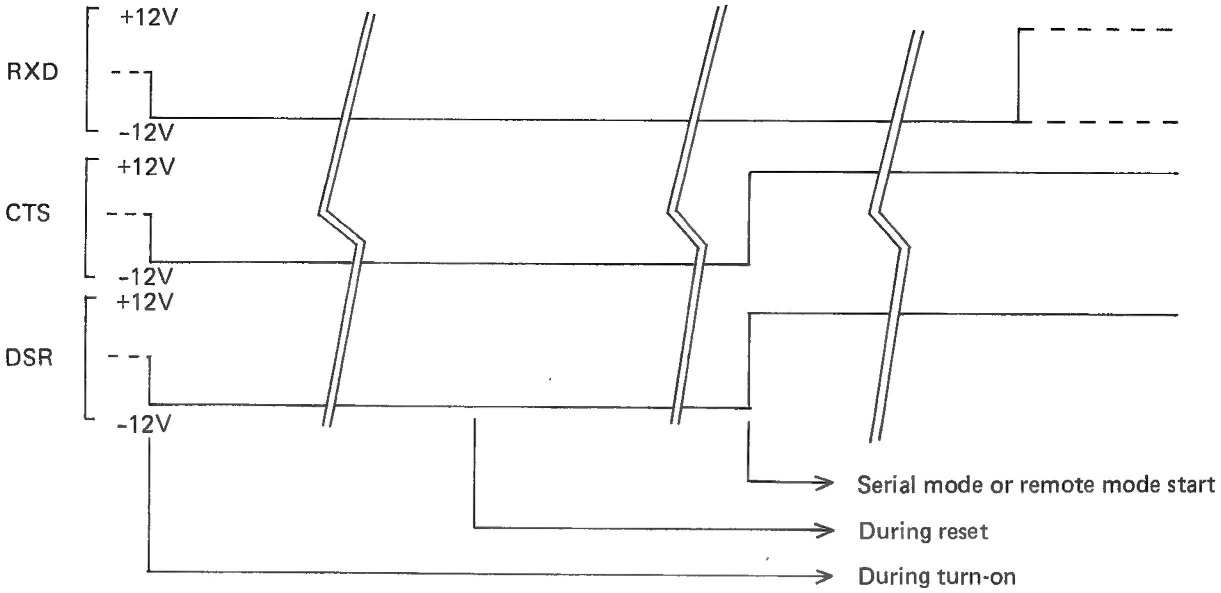
Voltage	Data signal	Control signal
+3 to +12 V	0	ON
-3 to -12 V	1	OFF

8-2-2 Interface signal output

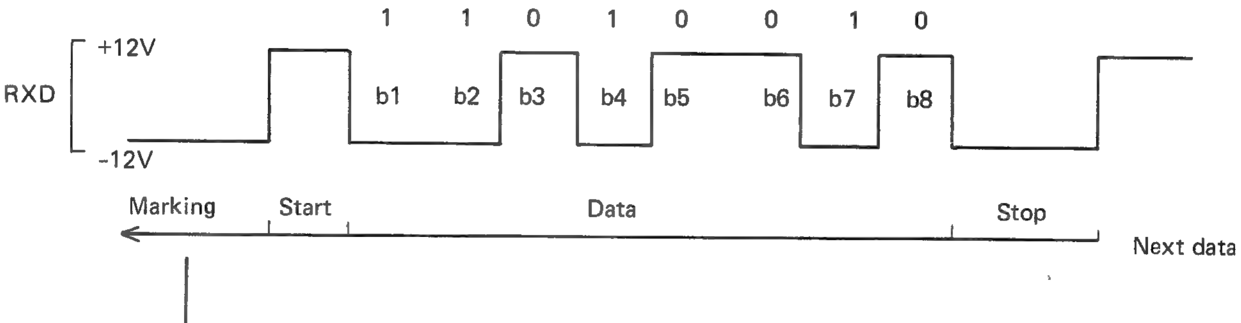
○ Signal output



○ Signal output level



○ Sent data



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

In the above example

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

○ 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 refered 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.

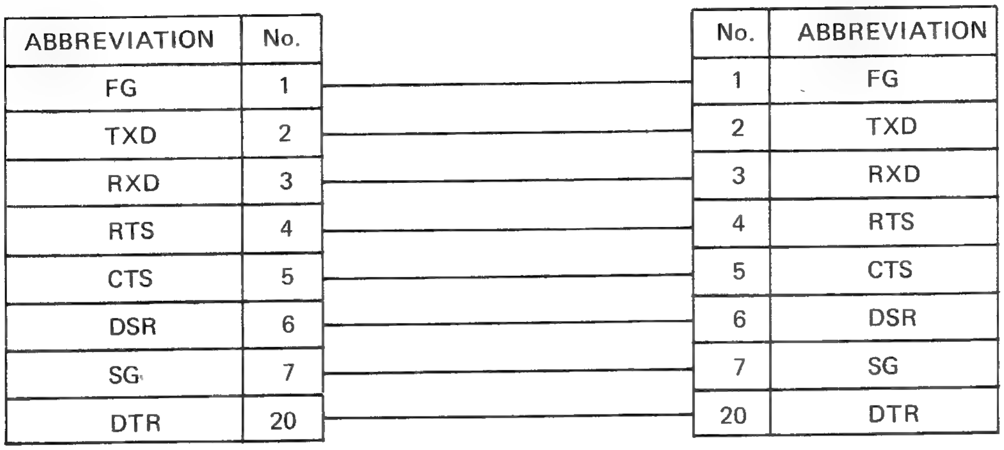
Paragraphs 8-2-3-1 and 8-2-3-2 show typical sample connections for the Programmer and DTE or DCE equipment. Allowing for a connector signals assignment and data send/receive control, the connection cable should be determined.

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

○ Connection with DTE incorporating DTR and 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

The following are the devices adapted to such connection:

○ HP64000 to modem connection

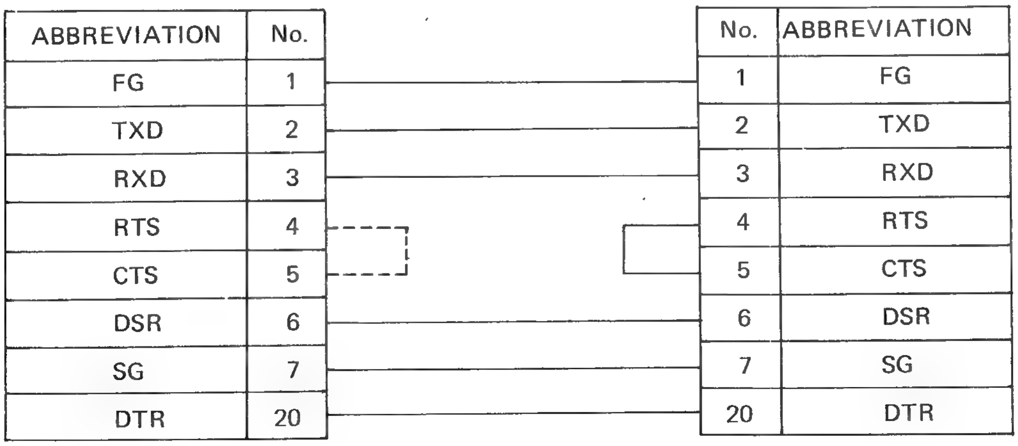
○ ADM-3A (CRT terminal)

○ MDS (Intel) ○ PC-8800 (NEC)

○ Connection with DTE incorporating DTR

DTE

PROGRAMMER (DCE)

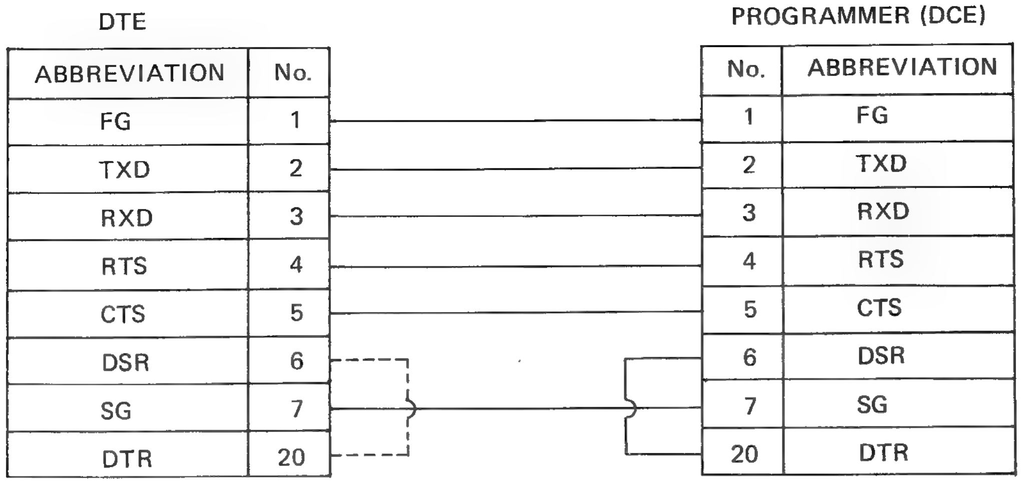


ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

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

Note) When shorting Nos. 4 and 5 of the DTE, refer to respective operations manual.

○ Connection with DTE incorporating RTS



DTE

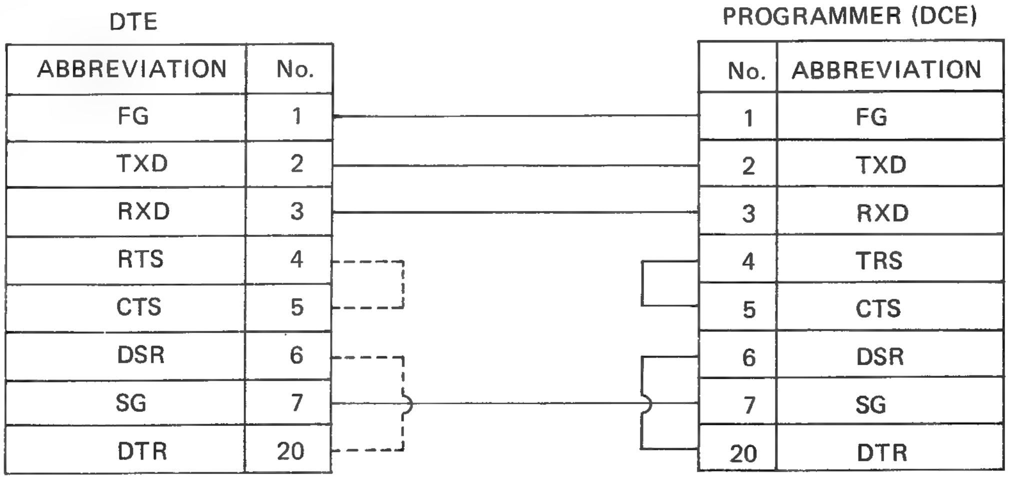
ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

PROGRAMMER (DCE)

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

Note) When short-circuiting Nos. 6 and 20 of the DTE, refer to respective operations manuals.

○ Connection with DTE using no control signal



DTE

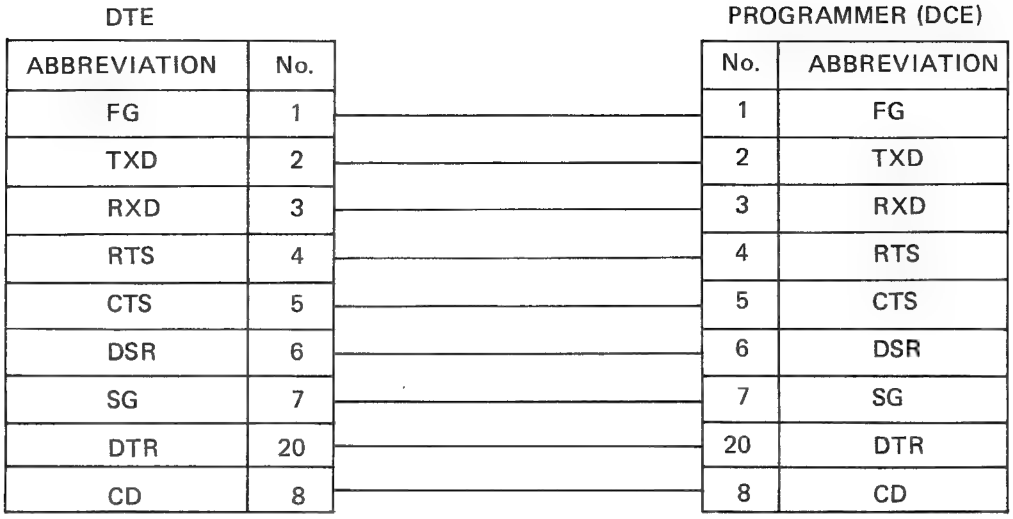
ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

PROGRAMMER (DCE)

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

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

○ Connection with Casio typuter (Model 750)



DTE

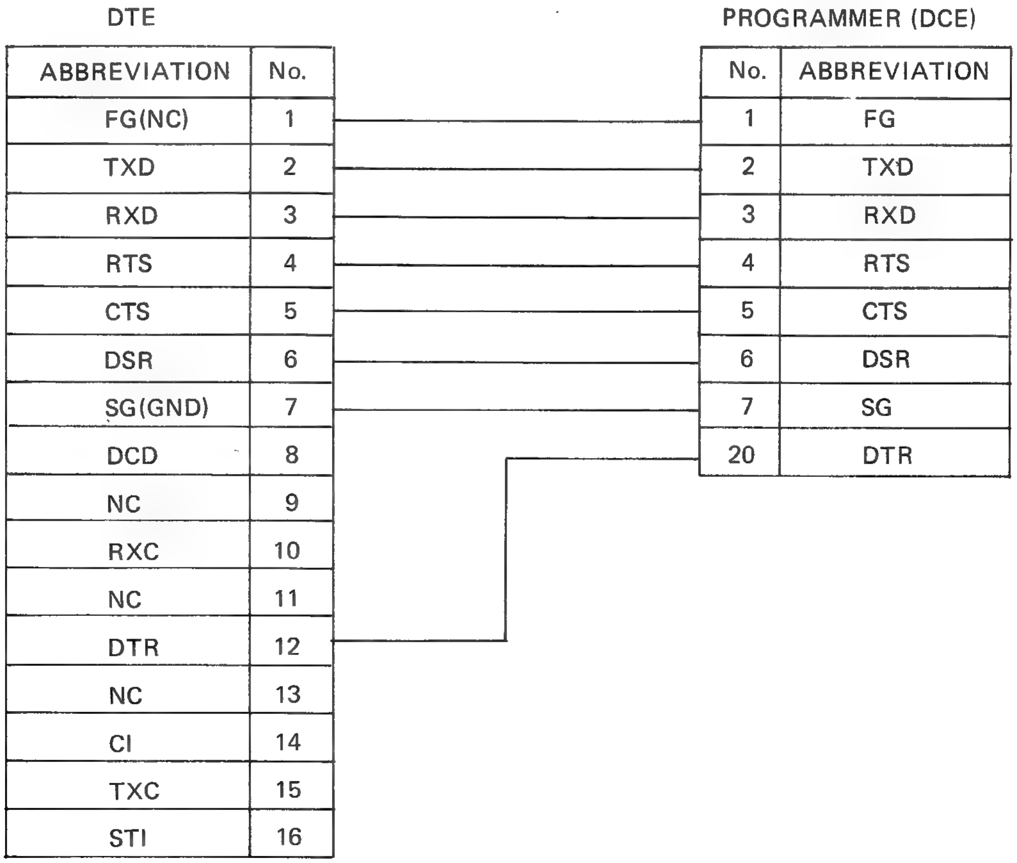
ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20
CD	8

PROGRAMMER (DCE)

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

Note) 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 typuter must be modeified. Refer to the operations manual for the typuter.

○ Connection with TOSHIBA personal computer (PASOPIA)



DTE

ABBREVIATION	No.
FG(NC)	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG(GND)	7
DCD	8
NC	9
RXC	10
NC	11
DTR	12
NC	13
CI	14
TXC	15
STI	16

PROGRAMMER (DCE)

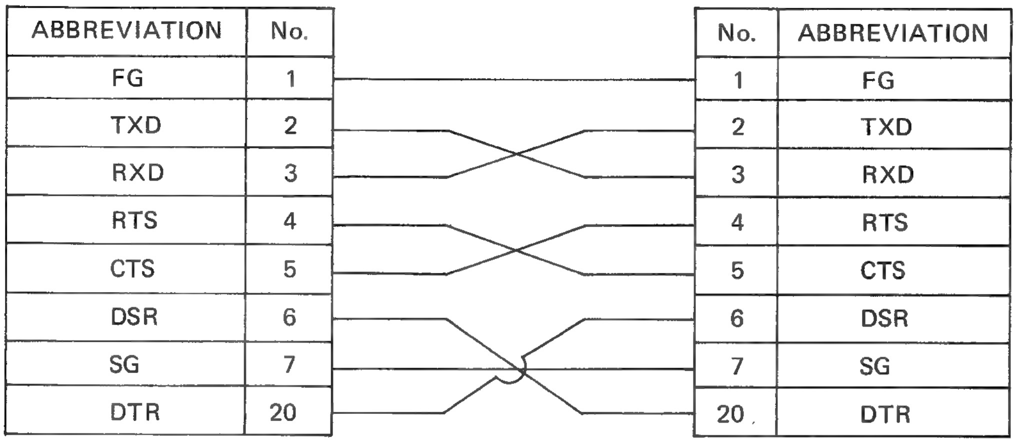
No.	ABBREVIATION
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
20	DTR

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

○ Connection with DCE incorporating DTR and RTS

DCE

PROGRAMMER (DEC)



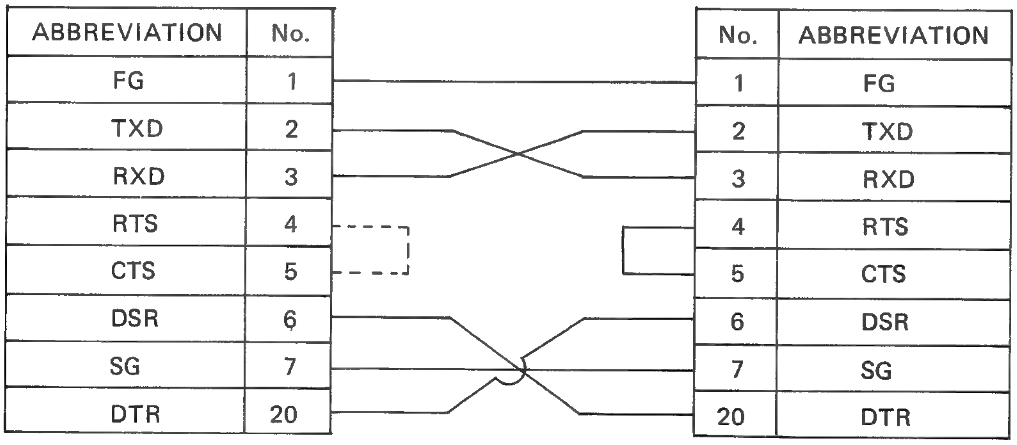
ABBREVIATION	No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
DTR	20

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

○ Connection with DCE incorporating DTR

DCE

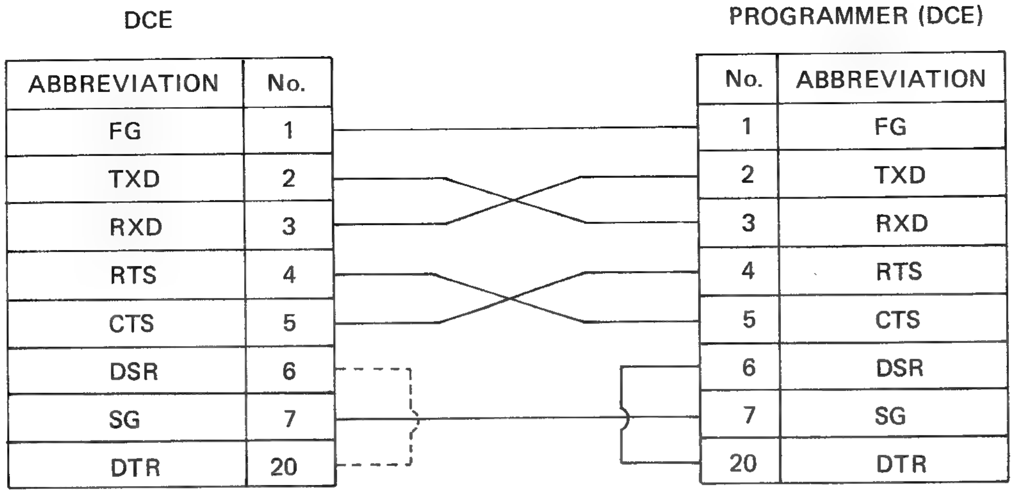
PROGRAMMER (DCE)



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

○ Connection with DCE incorporating RTS



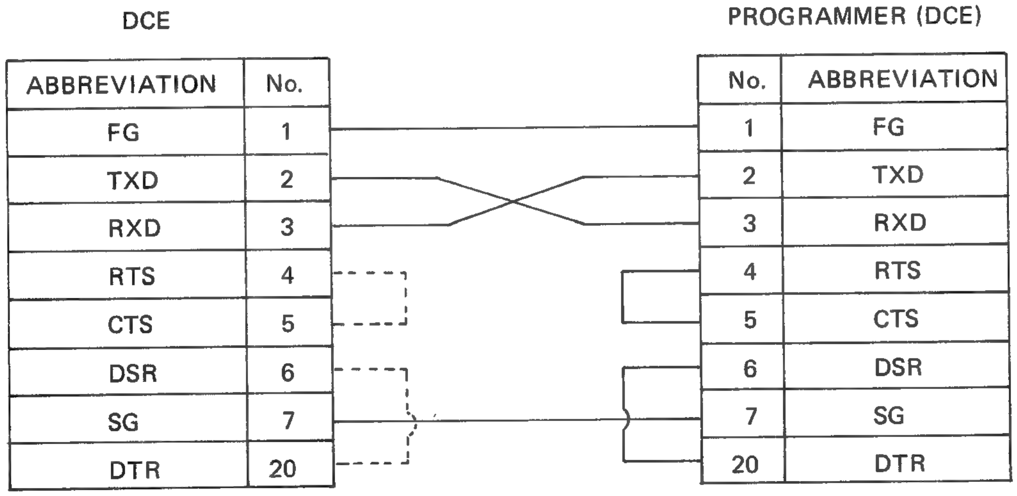
DCE

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

PROGRAMMER (DCE)

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

○ Connection with equipment using no control signal



DCE

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

PROGRAMMER (DCE)

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

8-3 Current Loop Interface

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

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		

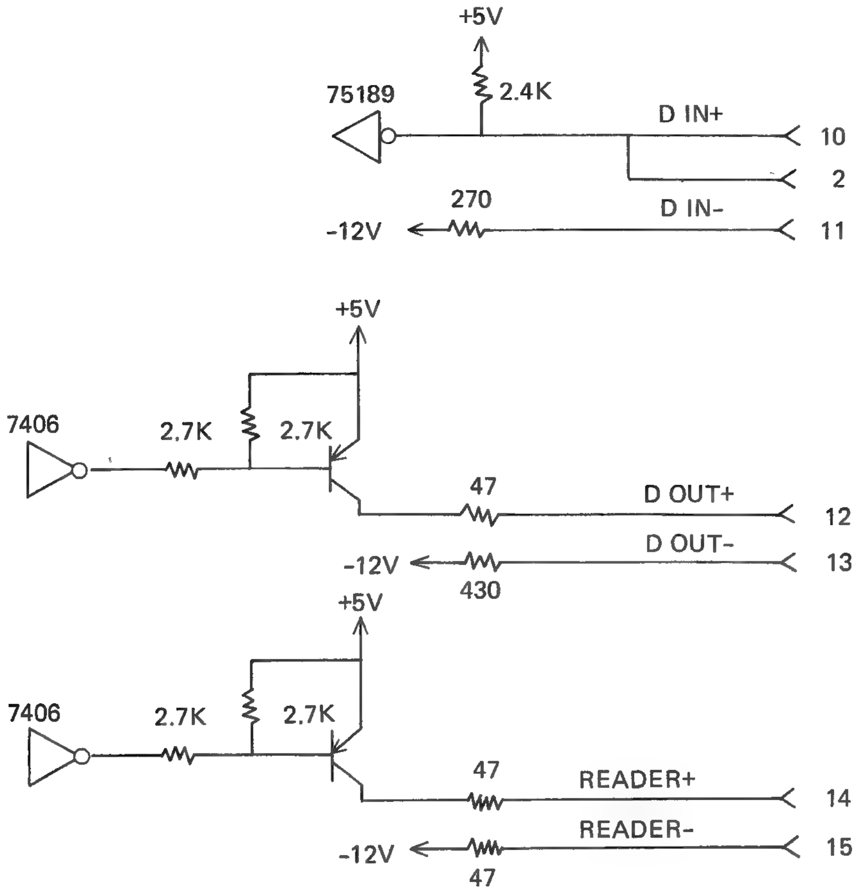
10. DIN+;
11. DIN-; The Programmer receives data from an external equipment.
12. DOUT+;
    DOUT-; The Programmer sends data to an external equipment.
14. READER+;
15. READER-; ON: PTR drives an external equipment.
    OFF: PTR stops an external equipment.

○ Polarity of interface signals

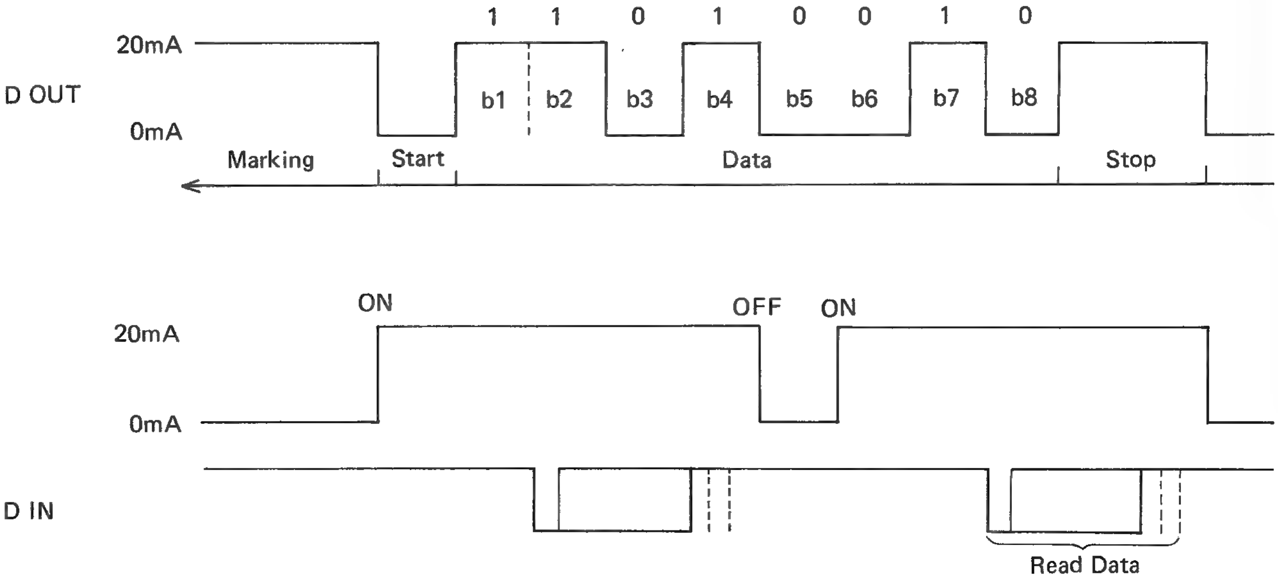
Drive circuit	Data signla	Control signal
ON	1	ON
OFF	0	OFF

8-3-2 Current loop interface signal output

○ Signal output

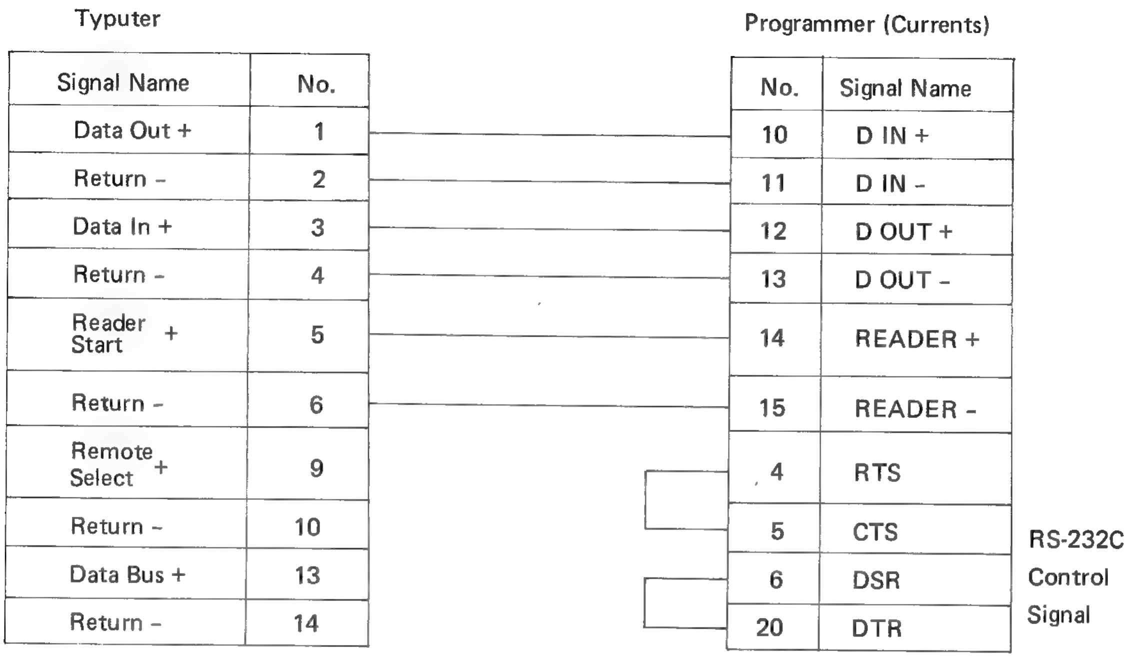


○ Output signal levels



8-3-3 Example of connection with external equipment

○ Connection with CASIO typuter (Model 750)



Typuter

Signal Name	No.
Data Out +	1
Return -	2
Data In +	3
Return -	4
Reader Start +	5
Return -	6
Remote Select +	9
Return -	10
Data Bus +	13
Return -	14

Programmer (Currents)

No.	Signal Name
10	D IN +
11	D IN -
12	D OUT +
13	D OUT -
14	READER +
15	READER -
4	RTS
5	CTS
6	DSR
20	DTR

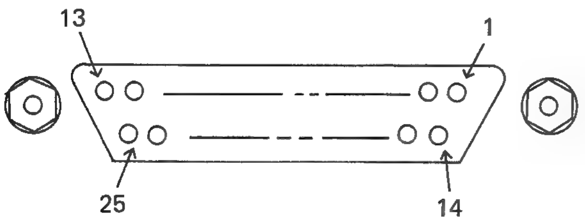
RS-232C Control Signal

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.



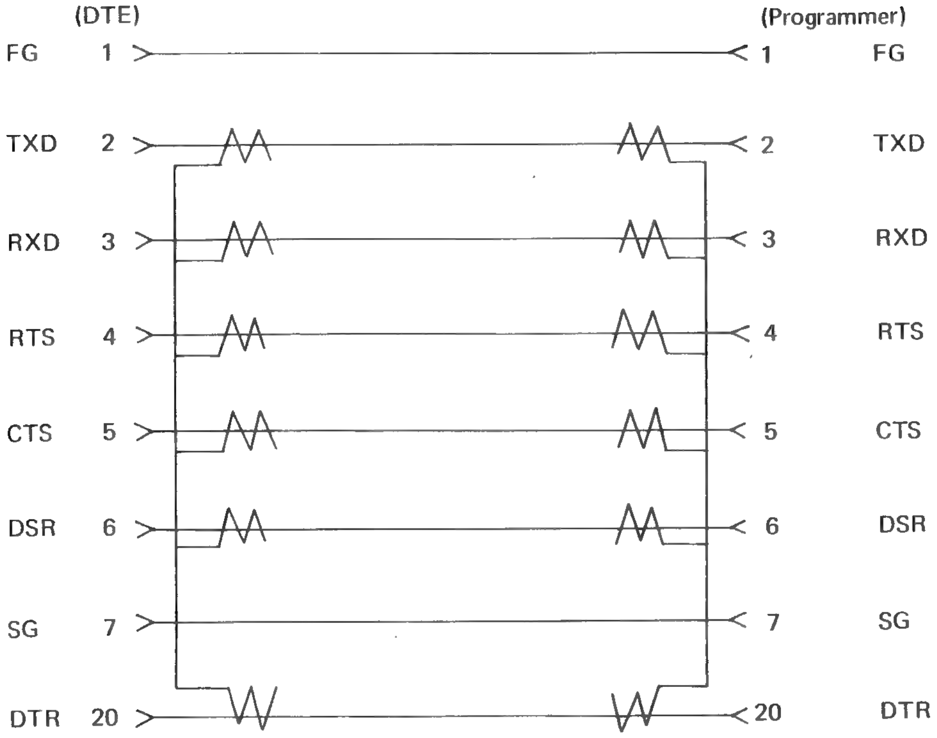
8-4-2 Table of serial I/F connector pins

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	

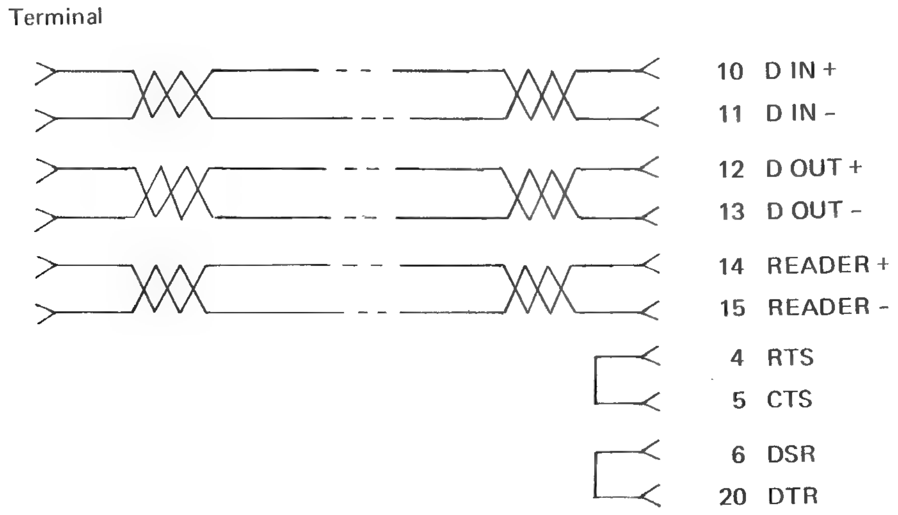
8-4-3 Cable

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

() RS-232C I/F



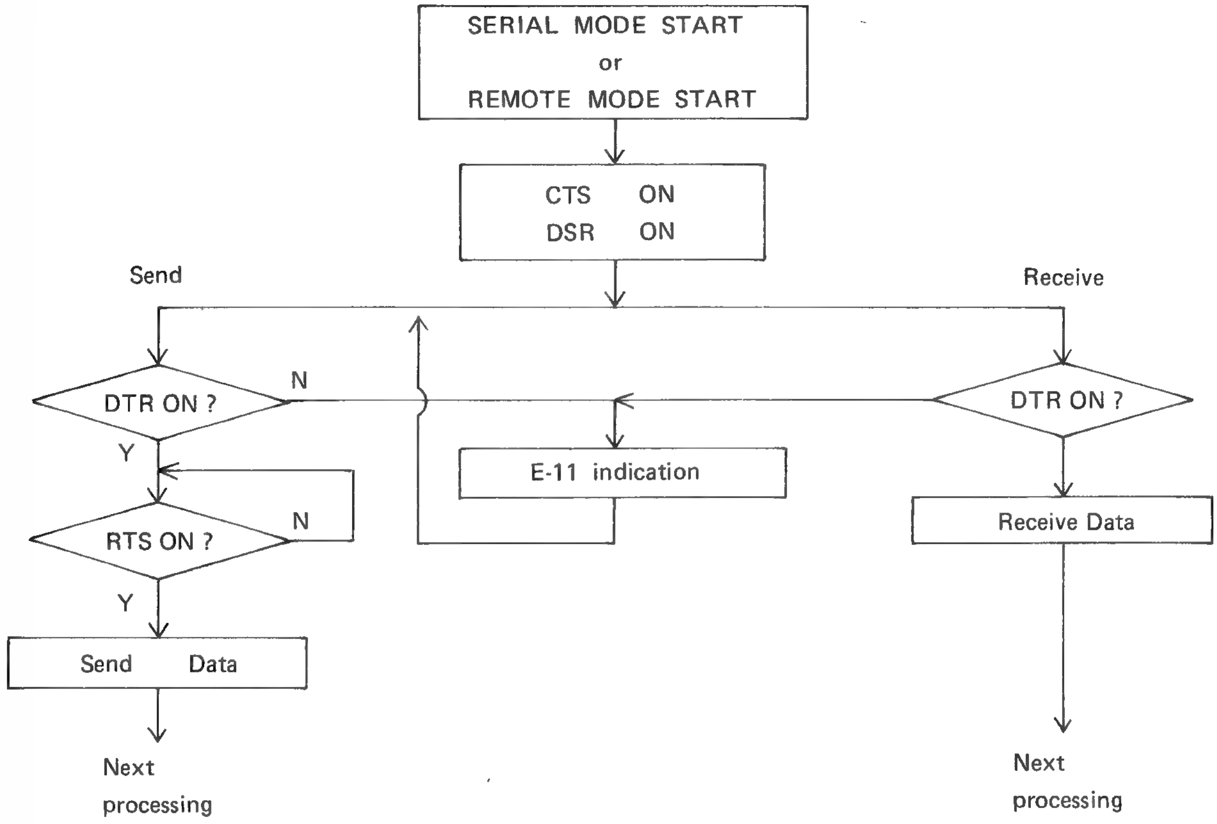
() Current loop I/F



8-5 Control Method and Transmission Protocol

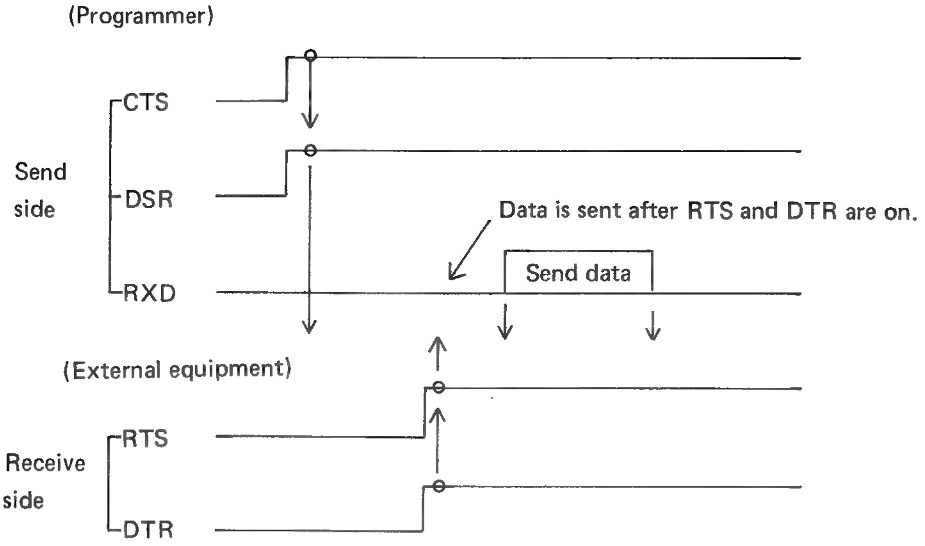
In the RS-232C level interface, the data send/receive control method and the transmission protocol are not standardized. Various control methods and transmission protocols are used depending on equipment. Presented below are the control method and the transmission protocol used in the Programmer.

8-5-1 Control method

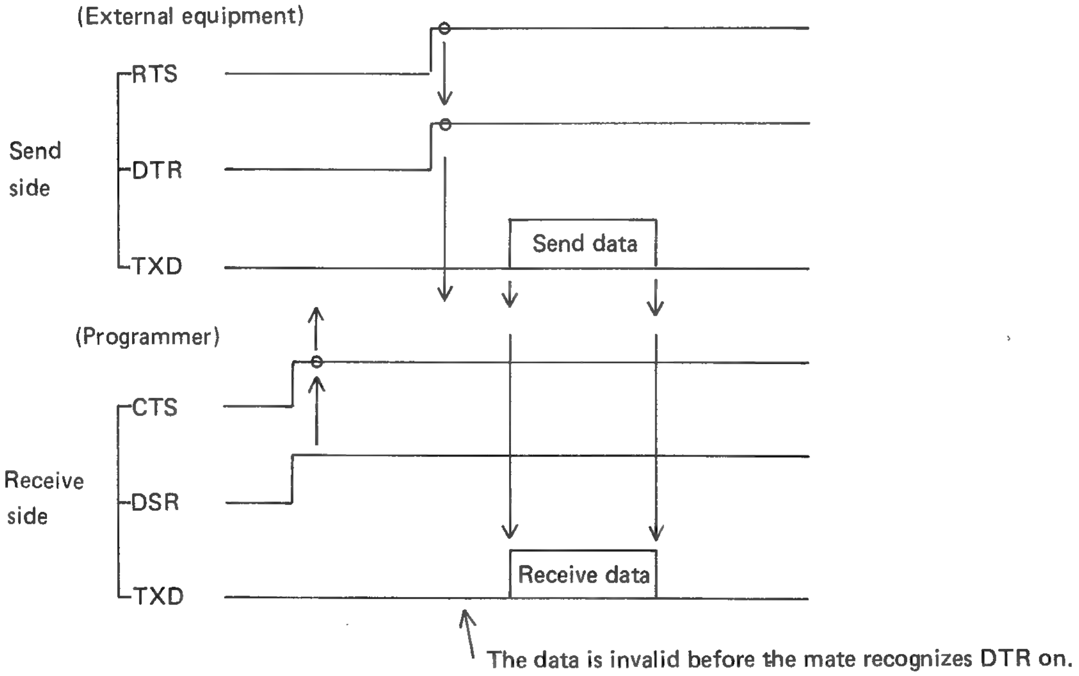


Notes: The RS-232C I/F for the Programmer uses communication interface ICs equivalent to 8251A. Data may be sent only with the RTS signal on; (otherwise, the 8251A provides hardware inhibition.) Both send and receive are enabled by the turned on DTR signal. If this signal is off, "E-11" is displayed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

○ Send (sample signals)



○ Receive (sample signals)



8-5-2 Transmission protocol

The Programmer offers the following two transmission protocols:

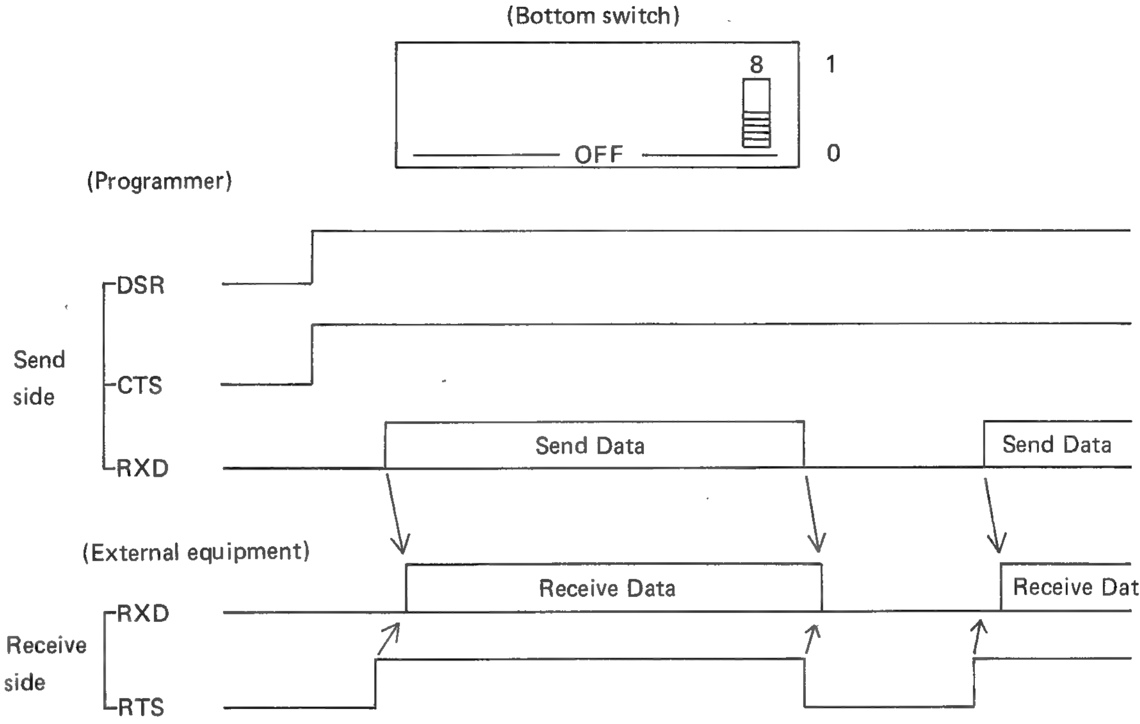
1) Non-control

2) X-ON/X-OFF control

256 bytes of the receive buffer are provided.

8-5-2-1 Non-control

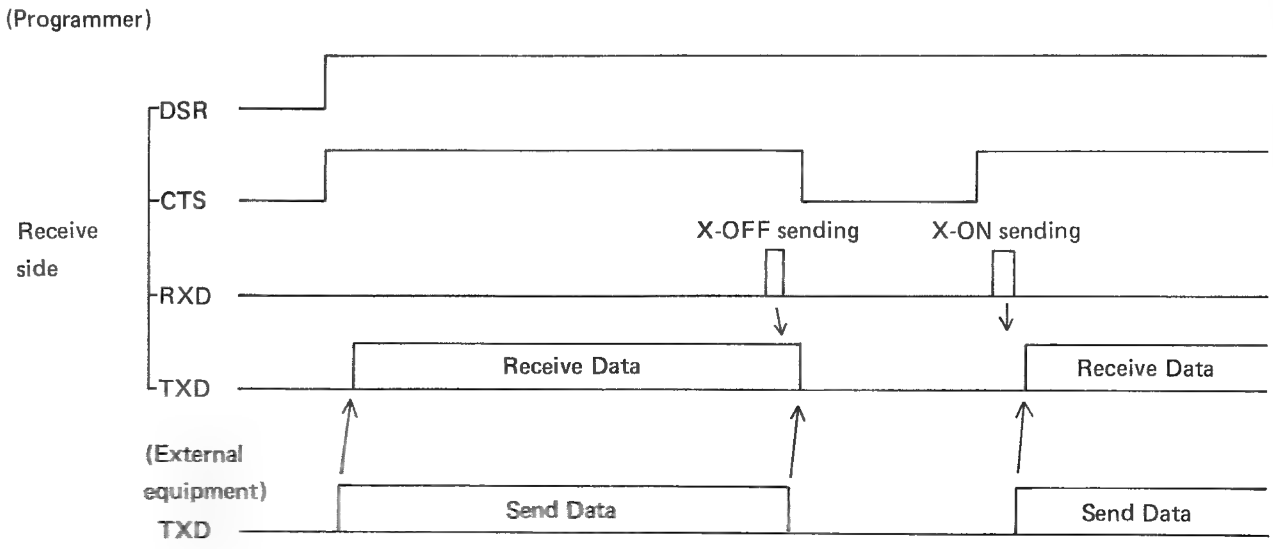
The transmission protocol gets free from control by placing X-ON/X-OFF (bottom switch) in the "0" (OFF) position. However, control by DTR and RTS signals described in 8-5-1 is available.



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

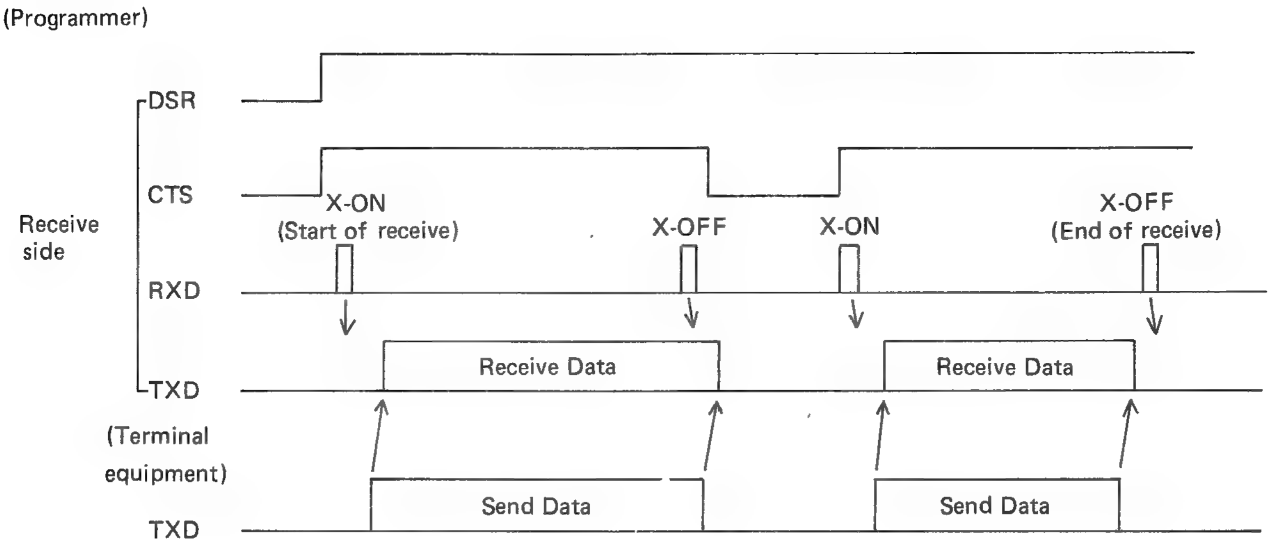
a) Remote mode, receive

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)

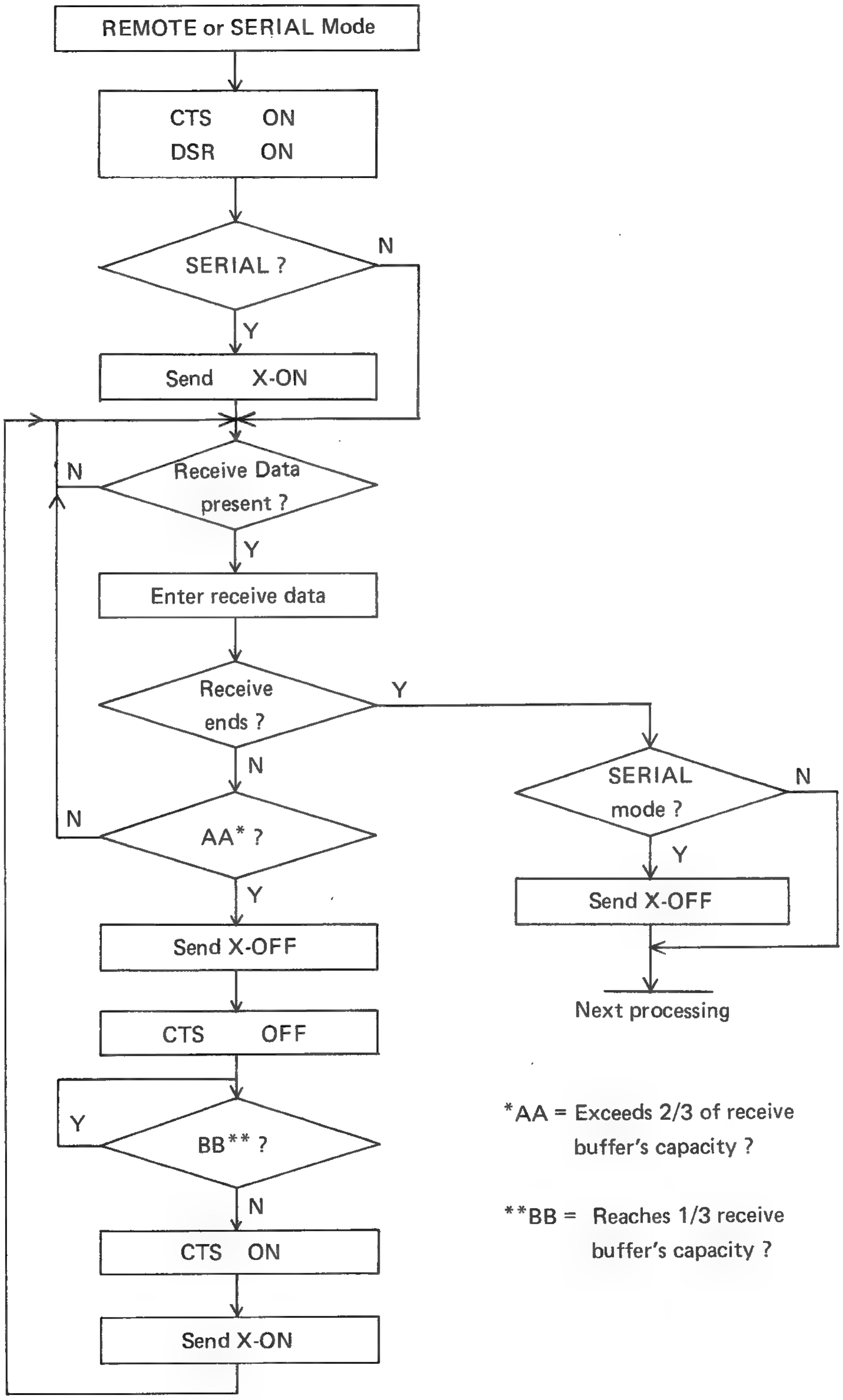


b) Serial mode, receive

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

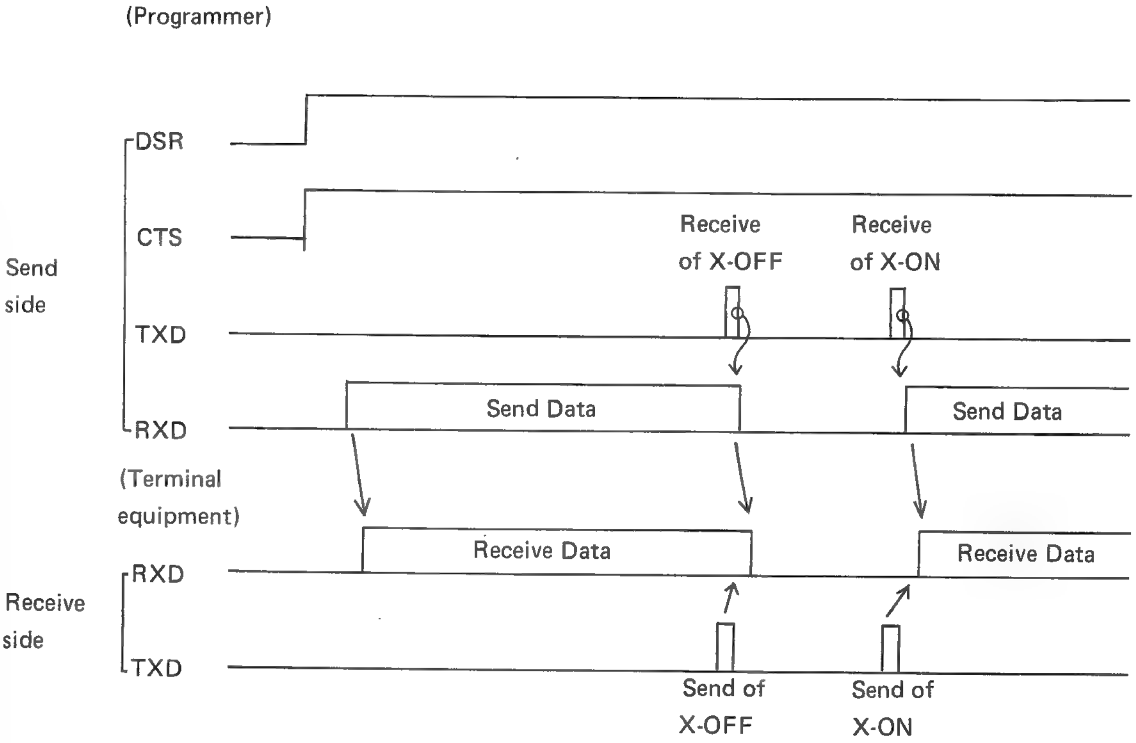


*AA = Exceeds 2/3 of receive buffer's capacity ?

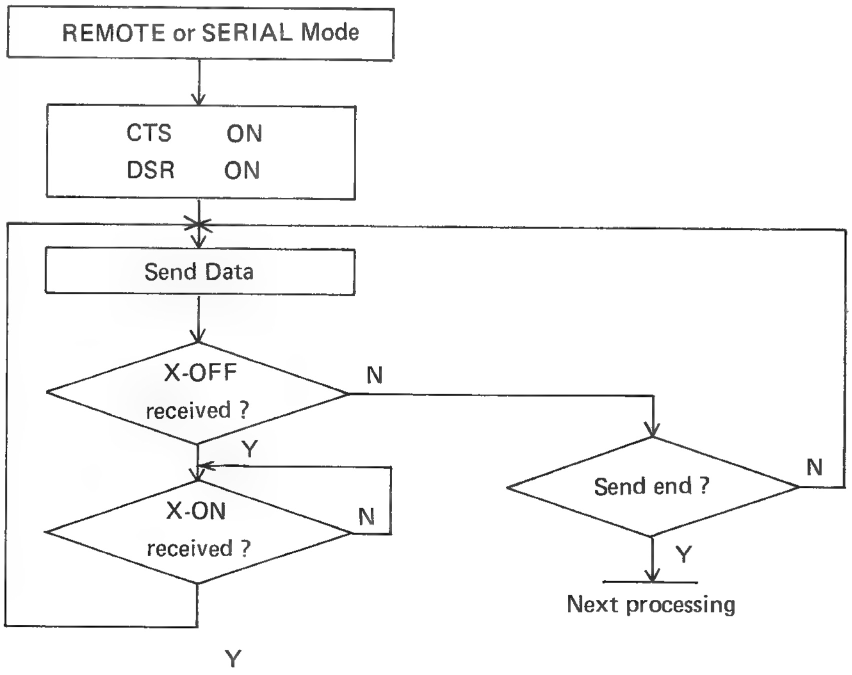
**BB = Reaches 1/3 receive buffer's capacity ?

d) Remote or serial mode, receive

While the Programmer sends data to an external equipment if it receives the "X-OFF" 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 flow chart



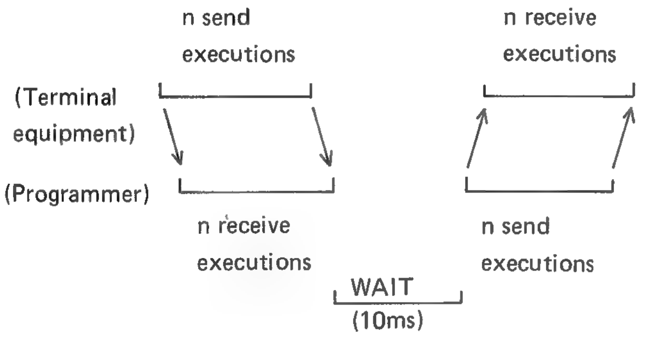
8-6 Instructions in Remote Mode

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.

○ Echo-back

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



○ 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.

n: Output from the Programmer.

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

△: SP code

○ Instruction error

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

CR LF ? CR LF #

○ Initial operation

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

CR LF #

○ 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: "△" (space), "," , CR

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:

CR LF ? CR LF #

○ 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
	FFFCR	0FFF
	9FFFCR	1FFF
	F1234CR	1234

8-6-2 Instructions description

8-6-2-1 Instructions for data transfer

○ Data transfer format specify instruction "S"

#S . n CR   Normal   CR LF #

Abnormal   CR LF ? CR LF #

└A format number is to be entered.

○ 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   LF D1 [data format] D3 CR LF #

(Note 3)

└Abnormal LF D1[Note1]D3 CR LF ? CR LF #

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

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

○ 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. 120 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.

○ Data punch instruction

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

```
#P.XXXX,YYYYCR
      CR LF D2 NUL 100 BYTE format output
      NUL100BYTE D4 CR LF #
```

○ Data list instruction

```
#L.XXXX,YYYYCR
     1      2
```

Output format

```
          3    Note 1    4
CR LF ZZZZ△△D D△D D△D D△   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
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

○ RAM start address set instruction "MR"

```
#M R△n n n n - m m m m CR LF CR LF #
       |          |
       |          |_____________New set address
       |________________________Old set address
```

○ ROM start address set instruction "MS"

#M S   Same as the "MR" instruction.

○ ROM end address set instruction "MP"

#M P   Same as the "MR" instruction.

○ Set address display "MD"

```
#M D CR  CR LF A A A A△B B B B△C C C C CR LF #
                  1        2        3
```

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

○ Blank instruction "B"

```
#B CR ─┬─Normal        CR LF #
       └─Abnormal      CR LF ? CR LF #
```

○ 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.
```

○ Verify instructions "V" and "Vn"

```
#V CR ─┬─Normal        CR LF #
       └─Abnormal      CR LF ? CR LF #
#V n CR   Same as the "V" instruction.
```

○ Programming instructions "W" and "Wn"

```
#W CR ─┬─Normal        CR LF #
       └─Abnormal      CR LF ? CR LF #
#W n CR   Same as the "W" instruction.
```

8-6-2-3 Buffer operation instructions

○ Buffer initialize instruction

```
#F──►.XXXX,YYYY,ZZ CR LF CR LF #
        1     2   3
```

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

○ Data move instruction "T"

```
#T──►.XXXX, YYYY, ZZZZ 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

○ Data delete instruction "D"

```
#D──►.XXXX,YYYY CR CR LF #
        1     2
```

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

○ Data input instruction "C"

```
#C.XXXX CR LF
     1

   5          2     3
XXXX△FF-00△FF-01----△FF-07 CR LF
          Up to 8 bytes
XXXY _ FF - CR Cr LF #
             4
```

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

○ Data insert instruction "I"

```
#I.XXXXCR LF
   └──┬─┘
      1

 5                 2 3
┌┴──┐             ┌┐ |
XXXX△00△△11△△────---────△FF△CR LF
    └────────────────────────┘
           Up to 16 bytes
XXYX△CR CR LF #
      └┘
      4
```

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

○ CONT instructions "OT" and "OTn"

```
#OTCR─┬─Normal       CR LF #
      └─Abnormal     CR LF ? CR LF #
```

"OTn" block CONT instruction

```
#OTnCR        Same as the OT instruction.
```

○ Buffer check sum instruction "BO"

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

```
#BOCR
882C△4E
 │    └────Exclusive OR
 └─────────Addition
#BOCR     LF 882C△4E CR LF #
```

○ PROM device select instruction "N"

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

```
#N△00-CR
   │   └────If only CR has been entered, the
   │        device is not changed.
   └────────The current device number is dis-
            played.
#N△00-CCR
   │   └────Sample 27128 high-speed program-
   │        ming specification.
   └────────The current device number is dis-
            played.
```

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△00-nnCR─┬─Normal      CR LF #
           └─Abnormal    CR LF ? CR LF #
```

○ 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△O△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△N△ECR
   │  └────Specifies the even address mode.
   └───────At present, the all address mode is
           established.
#A△N△ECR     CR LF #
```

○ 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△N△A          CR LF ? CR LF #
```

○ EEP-ROM chip erase instruction "Z"

Chip-erases an EEPROM. For the EPROM, the instruction is not accepted.

```
#ZCR
#ZCR─┬─Normal          CR LF #
     └─Abnormal        CR LF ? CR LF #
```

○ EEP-ROM byte erase instruction "ZB"

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

```
#ZBCR
ADRS-10CR
     └┘
      └────Address to be erased.
#ZBCR LF ADRS-10CR─┬─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 fu.ictions.

○ Receives a data format sent from an external equipment.

○ Outputs a data format from the Programmer to an external equipment.

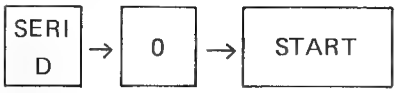
○ Outputs a list from the Programmer to an external equipment.

○ Outputs a control code from the Programmer to an external equipment.

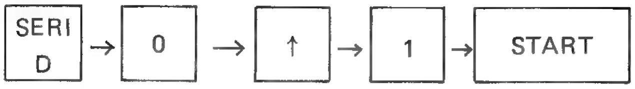
Note 1: See 9-8, Data Format. The format is specified by "EDIT", "FORMAT" and "FORMAT No." keys.

8-7-1 Data format reception

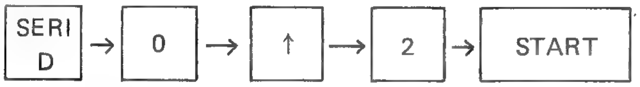
○ All data reception



○ Reception in the range of 0 to 32 k-bytes

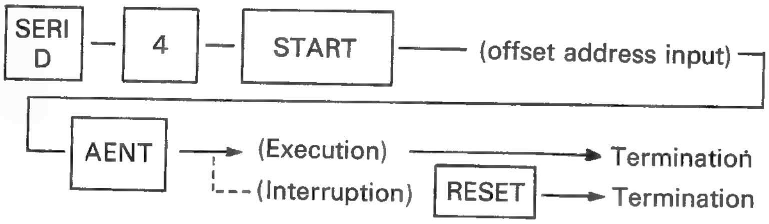


Reception in the range of 32 k to 64 k-bytes

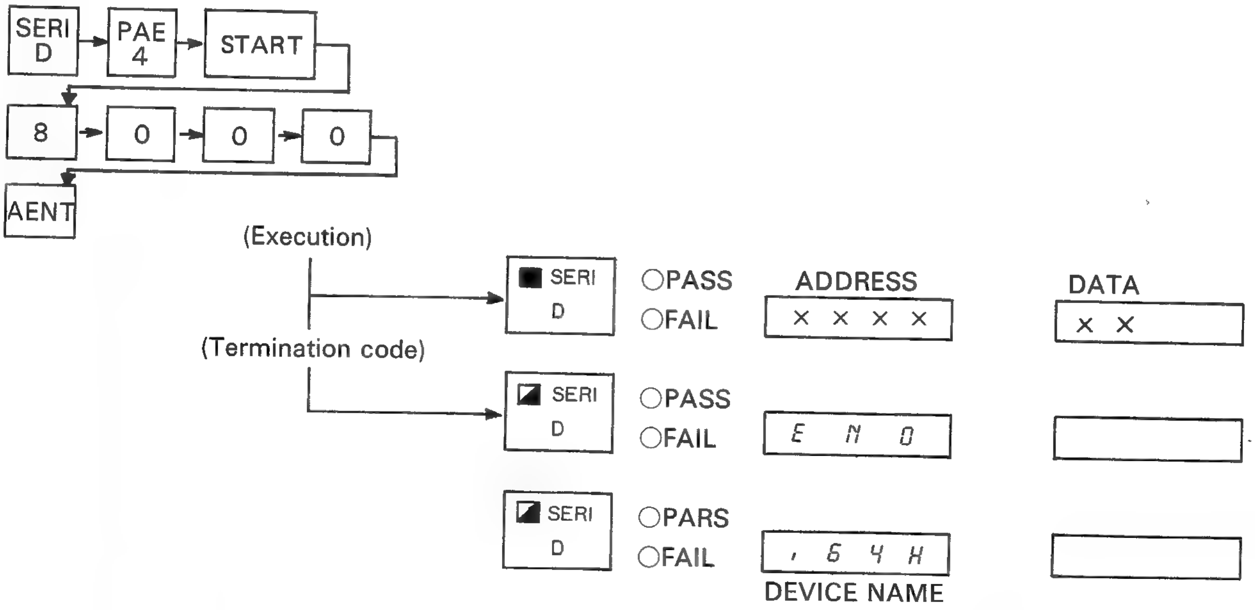


Note 1: If no data sent using this instruction after the Programmer waits for approx. 120 seconds, "E-17" is displayed on the display address section, resulting in time out. "?" is output to an external equipment, and the Programmer waits for a command in the same mode.

○ Reception with Offset command

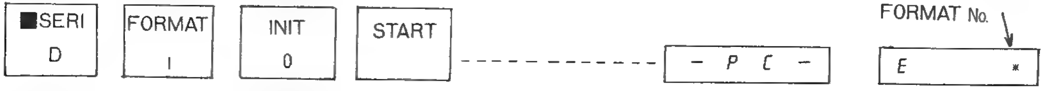


○ Reception with Offset command(from 8000)

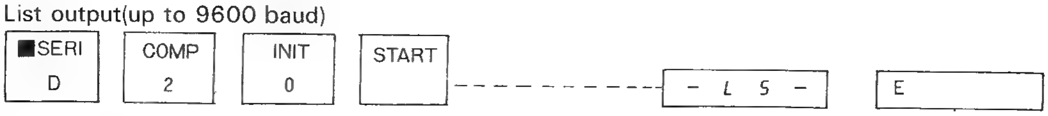


∗Transfer command in CP/M machines where RS-232C is defined as "TTY" (machines with echoback)

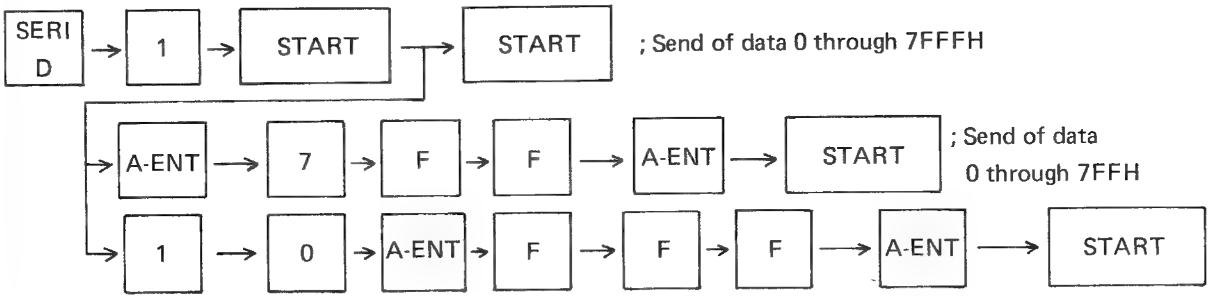
Format output(up to 9600 baud)



List output(up to 9600 baud)



8-7-2 Data format output



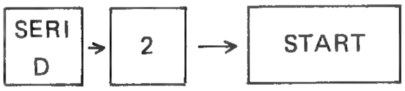
; Send of data 0 through 7FFFH

; Send of data
0 through 7FFH

; Transfer of data
10 through FFFH

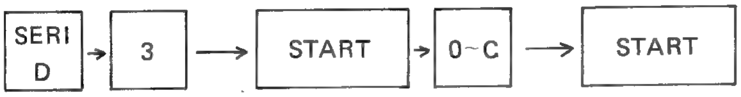
8-7-3 List output

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



(Same as the data format output in 8-7-2.)

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

Note: This is not possible to send data from 1866A to external equipment in remote-mode.

The data as follows:

A) DC1 (Hex. 11) and DC3 (Hex. 13) in RL instruction.

B) DC2 (Hex. 12) and DC4 (Hex. 14) in P instruction.

Presented below is the procedure.

(1) Press the "REM" switch.

(2) Press the "0" switch.

(3) Press the "START" switch.

8-8- Data Format

The following 14 formats are provided as the standards.

Key number	Format
0	Tektronix HEX (16 bits)
1	Tektronix 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	Hewlett Packard 64000 absolute

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

8-8-1 Output format

Presented below are sample data formats output from the Programmer. The data is "11H" bytes from "0000H" to "0010H". "0" corresponds to the address "0", "1" to the address "1", and "10" to the address "10", and so on.

1. TEKTRONIX HEX. (16 bits)

```
NUL 100 byte (Note 1)
%2A68F400000102030405060708090A0B0C0D0E0F10
%0C6194001011
%0A81640000
NUL 100 byte (Note 1)
```

2. TEKTRONIX HEX. (8 bits)

```
NUL 100 byte
/000010010102030405060708090A0B0C0D0E0F1079
/001001021102
/00000000
NUL 100 byte
```

3. INTEL HEX. (8 bits)

```
NUL 100 byte
:100000000102030405060708090A0B0C0D0E0F1068
:0100100011DE
:00000001FF
NUL 100 byte
```

4. MOTOROLA EXERCISER

```
NUL 100 byte
S00900004D494E41544F2E
S11300000102030405060708090A0B0C0D0E0F1064
S104001011DA
S9030000FC
NUL 100 byte
```

5. TEXAS INSTRUMENT SDSMAC

```
NUL 100 byte
00000MINATO 7FCD1F
90000B0102B0304B0506B0708B090AB0B0CB0D0EB
0F107F61DF
90010*117FE43F
:
NUL 100 byte
```

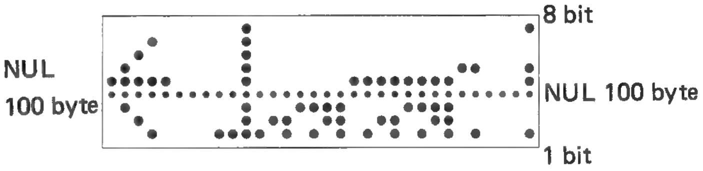
6. MINATO HEX.

```
NUL 100 byte
[#0000 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
10 #0010 11]
NUL 100 byte
```

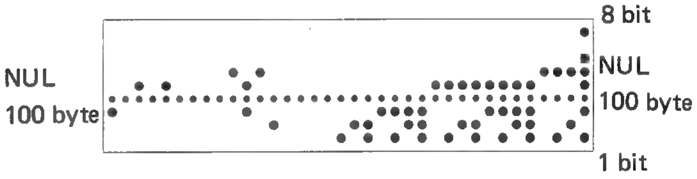
7. ASCII HEX. V1

```
NUL 100 byte
$A0000,
01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10
$A0010,
11
$S0099,
NUL 100 byte
```

8. BINARY



9. HP-64000 ABSOLUTE



Note 1: "NUL 100 byte" before and after the data format are output only in the remote mode.

8-8-2 Formats description

1. TEKTRONIX HEX. (16 bits)

a) Data record

$$\underbrace{\%}_{1}\ \underbrace{LL}_{2}\ \underbrace{6}_{3}\ \underbrace{SS}_{4}\ \underbrace{4AAAA}_{5}\ \underbrace{DDDDDDDD\ ----\ DD}_{6}$$

(1) Record mark ASCII "%"
Indicates the start of a record.

(2) Record digit count ASCII
Indicates in HEX the number of ASCII codes from record digit counts "2" to "6" output in a two-digit ACSII code.

(3) Data record format ASCII "6"
Indicates a data record.

(4) Check sum ASCII

Indicates in HEX the ASCII codes for (2) record digit count, (3) record format, (5) address and (6) data, and in a two-digit ASCII code 8 bits of their addition.

(5) Address, ASCII

The first ACSII code indicates an address output digit count, and the address is output in the ASCII code by a desired digit count.

(6) Data, ASCII

One byte of data is indicated in a two-digit ASCII code and output.

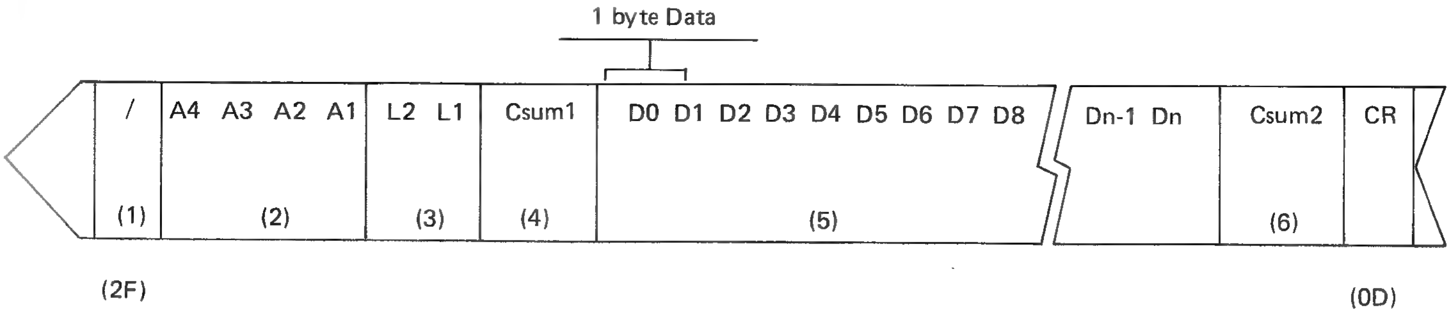
b) End record

$$\underbrace{\%}_{1}\ \underbrace{LL}_{2}\ \underbrace{8}_{7}\ \underbrace{SS}_{5}\ \underbrace{4AAAA}_{6}$$

(7) End record format ASCII "8"

Indicates an end record.

2. TEKTRONIX HEX. (8 bits)



(1) Record mark ASCII "/" HEX "2F"
Indicates the start of a record.

(2) Start address ASCII
Indicates the start address of data to be entered. The address is expressed in 16 bits and is output in a four-digit ASCII code. A4 makes up the most significant digit.

A4	A3	A2	A1
15 12	11 8	7 4	3 0

(3) Record digit count, ASCII
Indicates the data digit count (5). The digit count is expressed in 8 bits and output is a two-digit ASCII code. L2 represents the most significant digit. "00" through "FF" may be specified. "00" signifies the end of data.

Record digit count	"00"	End of data
	"01"	Data digit count 1
	"FF"	Data digit count 255

(4) Header check sum, ASCII
The ASCII data from A4 (2) to L1 (3) is expressed in HEX and 8 bits of addition are expressed in a two-digit ASCII code for output.

(5) Data, ASCII
Indicates one byte of data in a two-digit ASCII code. A data amount specified in data digit count (3) is output. The first data represents the most significant digit.

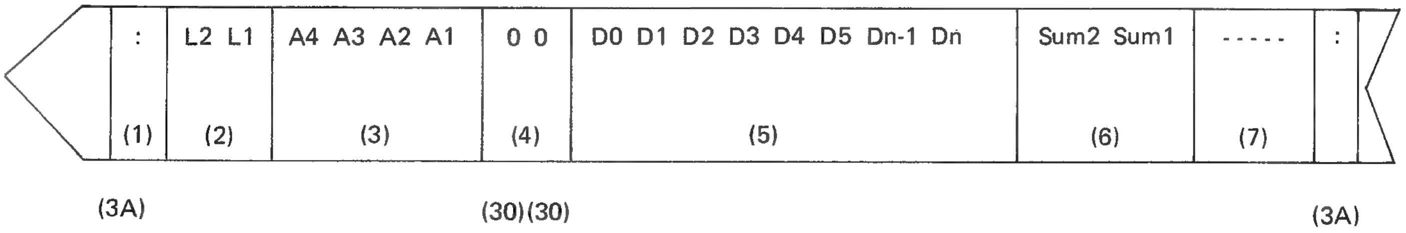
(6) Data check sum, ASCII
This is a check sum for D0 thru Dn of (5). Operated in the same manner as the header check sum (4).

Codes used: ASCII, 7 bits and 8 bits
Numeric characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Alphabetic characters: A, B, C, D, E, F
Symbol: /
The other codes such as DEL, NUL, CR and LF and ignored.
Note: Other than "DEL" and "NUL" must not be entered between (1) and (6).

3. INTEL HEX

3-1 INTEL HEX (8/16 bits)

a) Data record



(1) Record mark
Indicates the start of a record. ":" in the ASCII code and "3A" in the hexadecimal number.

(2) Record digit count
Indicates a data byte count in a two-digit ASCII code. The first data indicates the most significant digit. "0" thru "255" may be specified as the capacity. "00" thru "FF" in the ASCII code, and "3030" thru "4646" in the hexadecimal number.

(3) Start address
Indicates the start address of data to be entered. The data is expressed in a four-digit ASCII code. The first data signifies the most significant digit.

(4) Record type

Indicates the types of records. The data record is "00" in ASCII and "3030" in the hexadecimal indication.

(5) Data
Indicates 1 bytes (8 bits) of data in two bytes of the ASCII codes. The first data indicates the most significant digit.

(6) Check sum
This indicates a check sum for the "record digit count" (2) to the end byte of "data" (5). The calculation method is such that data expressed in two bytes of the ASCII code is converted in 1 byte of the hexadecimal number and byte data is added thereto. And the resulting complement is given in two bytes of the ASCII code. The first data is the most significant digit.

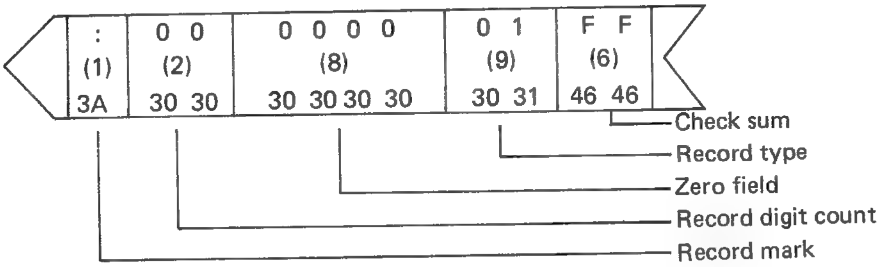
Example:

:	0 8	0 1 0 0	0 0	1 2 3 4 A B C D	C 8	- -
(3A)	(30) (38)	(30) (31) (30) (30)	(30) (30)	(31) (32) (33) (34) (41) (42) (43)	(44) (43)	(38)

Address: 0100 0101 0102 0103
Data : 12 34 AB CD
(Tape for 4 bytes of data from the address "0100")

(7) The data preceding the record mark is ignored. (CR, LF, etc.)

b) End record



(8) Zero field
The contents of the zero field are "0000" in the ASCII code and "30303030" in the hexadecimal number.

(9) Record type
The end record is "01" in the ASCII code and "3031" in the hexadecimal number.

Data used
ASCII: :, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F
NUL (00 in the hexadecimal number) and DEL (7F) are ignored.

3-2 INTEL HEX

a) Data record
Same as the 8 bit format.

b) End record
Same as the 8 bit format.

c) Extended record
The data record address shall be regarded as a relative address, while its addition with the base address given in an extended record shall be regarded as an absolute address.

Absolute address = [extended record address] + [data record address]

$$\underbrace{:}_{1}\ \underbrace{02}_{2}\ \underbrace{0000}_{3}\ \underbrace{02}_{4}\ \underbrace{AAAA}_{5}\ \underbrace{SS}_{6}$$

(1) Record mark: ASCII ":"
Indicates the start of a record.

(2) Record digit count: ASCII "02"
The record digit count is fixed at "02"

(3) Start address: ASCII "0000"
Fixed at "0000".

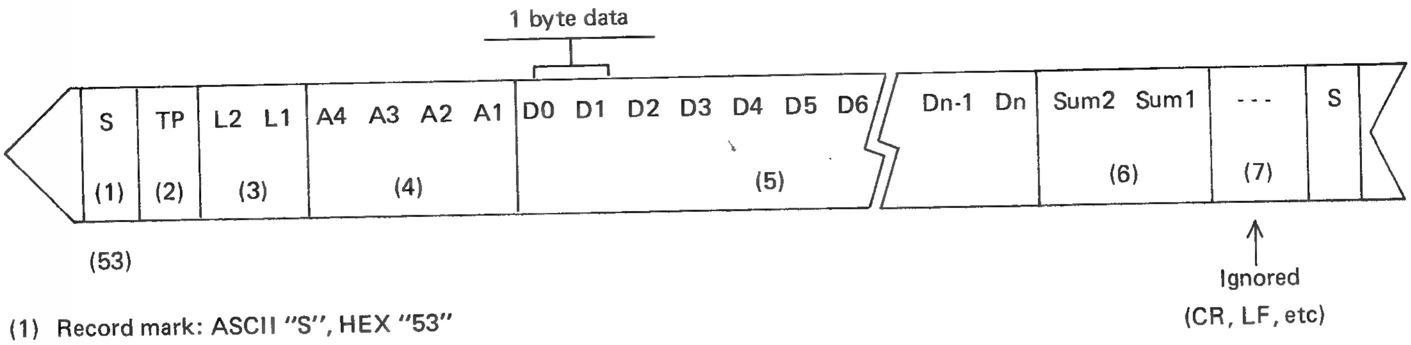
(4) Extended record format: ASCII "02"
Indicates an extended record.

(5) Base address: ASCII
Used along with a data record address. Indicates an absolute address.

(6) Check sum: ASCII
This indicates a check sum from the record digit count (2) to the address (5). Data expressed in two bytes of the ASCII code is converted to 1 byte of the hexadecimal number for addition. The resulting 2's complement is given in two digits of the ASCII code.

4. Motorola

4-1 Motorola Exerciser



(1) Record mark: ASCII "S", HEX "53"
Indicates the start of a record.

(2) Record type: ASCII "0", "1", "9", HEX "30", "31", "39" Indicates a record type.
0: Header record
1: Data record
9: End record

(3) Record digit count: ASCII
Indicates a byte data count from "A4" (4) to "SM1" (6). Data is expressed in 8 bits, and is output in two digits of the ASCII code.

(4) Start address: ASCII
Indicates the start address of data to be entered. The address is expressed in 16 bits, and is output in four digits of the ASCII code. A4 indicates the most significant digit.

A4	A3	A2	A1
15 12	11 8	7 4	3 0

(5) Data: ASCII
Indicates one byte of data in two digits of the ASCII code. The first data indicates the most significant digit. For a data count, see "record digit count" (3).

(6) Check sum: ASCII
This indicates a check sum from "L2" (3) to "Dn" (5).

4-2 Motorola Exermax (16 bits)

a) Header record
Same as the exerciser (8 bits).

b) Data record, 16 bit address range
Same as the exerciser.

c) End record, 16 bit address range
Same as the exerciser.

d) Data record, 24 bit address range

$\underbrace{\text{S}}_{1}\ \underbrace{\text{2}}_{2}\ \underbrace{\text{LL}}_{3}\ \underbrace{\text{AAAAAA}}_{4}\ \underbrace{\text{DDDDDDDD} \ldots \text{DD}}_{5}\ \underbrace{\text{SS}}_{6}$

(1) Record mark: ASCII "S"
Indicates the start of a record.

(2) Record type: ASCII "2"
Indicates the address range of 24 bits of a data record.

(3) Record digit count: ASCII
Indicates a byte data count from the address (4) to the check sum (6).

(4) Start address: ASCII
Indicates the start address of data to be entered.
Gives 24 bits of address data in six digits of the ASCII code.

(5) Data
Indicates one byte of data in two digits of the ASCII code.

(6) Check sum
Indicates a check sum from the record digit count (3) to data (5). Data expressed in two byte of ASCII code is converted to one byte of the hexadecimal number for addition. The resulting complement is given in two digits of the ASCII code.

e) Address range of 24 bits of end record

$\underbrace{\text{S}}_{1}\ \underbrace{\text{8}}_{7}\ \underbrace{\text{C7}}_{3}\ \underbrace{\text{000000}}_{4}\ \underbrace{\text{AAAAAA}}_{8}\ \underbrace{\text{SS}}_{6}$

(7) Record mark: ASCII "7"
Indicates the address range of 24 bits of an end record.

(8) File start address: ASCII
Indicates the start address of an absolute file, in six digits of the ASCII code.

5. Texas SDSMAC

The following tags are appended at the start, followed by data.

a) Header

O or K tag

This is located at the start of an object, followed by two fields.

1st field : 4 bytes. Total number of relative codes.

2nd field: 8 bytes. Program name

b) Data

B tag

The subsequent 4-digit ASCII code indicates two bytes of data.

* tag

The subsequent two-digit ASCII code indicates one byte of data.

c) Check sum

Tag 7

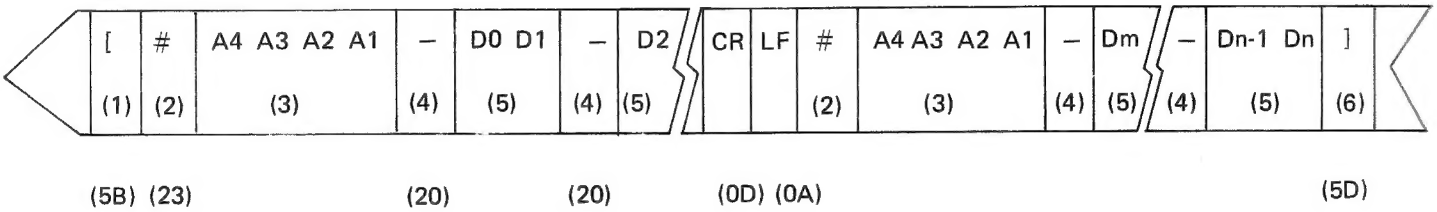
The subsequent four-digit ASCII code indicates a check sum (two byte data).

F tag

Indicates the end mark of a check sum.

The check sum is calculated by totaling characters (hexadecimal addition of ASCII codes) for the start of the record to the tag 7 and by taking the 2's complement of the sum.

6. Minato HEX



(1) Start mark: ASCII "[", HEX "SB".
Indicates the start of a tape.

(2) Address mark: ASCII "#", HEX "23"
Indicates the start of an address.

(3) Start address: ASCII
Indicates the start address of data to be entered. The address is given in 16 bits, and is output in a four-digit ASCII code. A4 indicates the most significant digit.

```
|     A4     |     A3     |     A2     |     A1     |
| 15      12 | 11       8 | 7        4 | 3        0 |
```

(4) Data mark: ASCII "–", HEX "20"
Indicates the start of data.

(5) Data: ASCII
Indicates one byte of data in a two-digit ASCII code. The first data indicates the most significant digit. Four-bit data in expressed in a one-digit ASCII code, and the most significant digit is made to be "0".

Example

```
          (3)  (E)  (–)  (D)  (3)
8 bits   |3 3 |4 5 |2 0 |4 4 |3 3|
         |3  E  D  3|
```

```
          (3)  (–)  (E)
4 bits   |3 2 |2 0 |4 5|
         |0 3 |0 E|
```

(6) Stop mark: ASCII "[", HEX "50"
Indicates the end of a tape.

Codes used: ASCII, 7 bits, 8 bits

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

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

Symbols: [, ˜, –,]

Note: CR and LF must be placed right after an address.
DEL and NUL are skipped.

7. ASCII-HEX

7-1 ASCII-HEX (SPACE), V1

```
STX  $A  NNNN  .  CR  LF
(1)  (2)  (3)  (4)

DD_DD_DD  ----  DD_CR  LF
(5) (6)

$S  CCCC  ,  EXT  CR  LF
(7)  (8) (4)  (9)
```

(1) Start mark: ASCII "STX", HEX "02H"
Indicates the start of data.

(2) Address mark: ASCII "$A"
Regards the portion before the separator (4) as an address.

(3) Address: ASCII
The address is expressed in 16 bits and output is a four-digit ASCII code. If the address consists of less than four digits, zeros are placed. If the address consists of more than four digits, the last four digits are valid.

(4) Separator: ASCII ", "
This is a separator code for an address and a check sum.

(5) Data: ASCII
Indicates one byte of data in a two-digit ASCII code.

(6) Data mark: ASCII "–"
The two-digit ASCII code prior to the mark is regarded as data.

(7) Check sum mark: ASCII "$S
The portion before the separator (4) is regarded as a check sum.

(8) Check sum: ASCII
Adds the data portion (5) as one byte of hexadecimal data, and creates 16-bit data. The result is expressed in a four-digit ASCII code, and is appended after the last data.

(9) End mark: ASCII "EXT", HEX "03H"
Indicates the end of data.

7-2 ASCII-HEX (SPACE), V2

```
STX   DD _ DD _ DD          DD _CR    LF
(1)        (5)  (6)

      DD _  DD  ETX
                (9)
```

(1), (5), (6), (9): Same as ASCII-HEX (SPACE).

7-3 ASCII-HEX (SPACE), V3

```
STX  $H   AAAA     DD  –  DD – DD– - - - - DD – ETX
(1)  (10)  (3)  (4) (5) (6)                     (9)
```

Data includes no CR and LF.

(1), (3), (4), (5), (6), (9): Same as ASCII-HEX (SPACE).

(10): Address mark: ASCII "$H".

The portion before the separator (4) is regarded as an address.

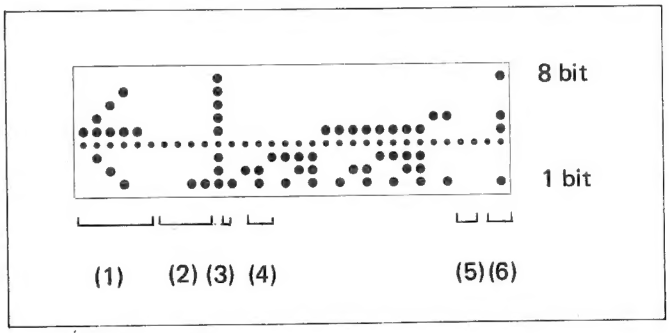
7-4 ASCII-HEX (SPACE), V4

```
STX  AAAA  *  DD  –  DD  –  DD  – - - - - - DD – CR  LF
(1)   (3)  (11) (5) (6)
      AAAA  ?  DD  –  ETX
           (11)       (9)
```

(1), (3), (5), (6), (9): Same as ASCII-HEX (SPACE).

(11): Address separtor: ASCII
Any symbol other than the – code may be used as an address separtor.

8. Binary



(1) Header mark
Indicates the start of a binary format. It consists of six bytes.

(2) Byte digit count
Indicates a data byte count. It is expressed in a hexadecimal number, ranging from 0000H (00000000H) to FFFFH (0F0F0F0FH).

(3) Data mark: HEX "FFH"
Indicates the start of data.

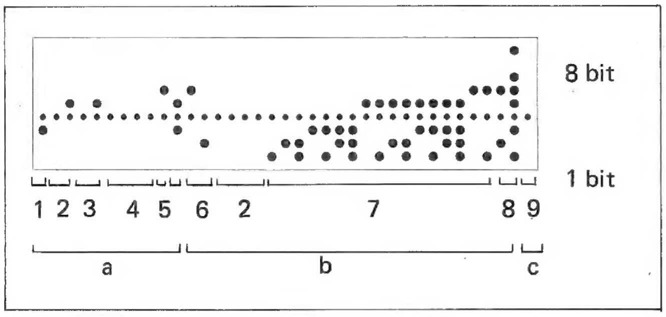
(4) Data
Indicates binary data.

(5) Check sum mark: HEX 0000H
The subsequent two bytes are regarded as a check sum.

(6) Check sum

The check sum is created as 16 bit data by adding data (4).

9. HP-64000 Absolute



a) Header record

(1) Indicates the number of words in a record.

(2) Indicates data word length.

(3) Indicates an address mode base.

(4) Indicates a transfer address.

(5) Indicates check sum data. (2) + (3) + (4) = sum data

b) Data record

(6) Indicates a data byte count.

(7) Indicates binary data.

(8) Indicates check sum data. (6) + (2) + (7) = sum data

c) End record

(9) Indicates the end of data. HEX = 00

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