USER'S MANUAL

P-ROM PROGRAMMER
■ PKW-3000

TOYO TELESONICS CO.,LTD.

C O N T E N T S

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INTRODUCTION

The PKW-3000 is a PROM programmer, capable of programming 16K∿64K bit EP-ROM. It is a portable PROM programmer with an internal buffer RAM, capable of editing the programming data as well.

For full utilization of the PKW-3000's many functions, the users are requested to read this operation manual carefully.

OUTLINE

The PKW-3000 is provided with a number of checking and protection functions developed by pursuing reliabilities to their extremes from both hardware and software side. Simplicity of the operation is considered as well, anyone can learn how to operate the system in a short period of time.

The PKW-3000 can input data from a master PROM and through key operation. Furthermore, as a standard feature, the PKW-3000 has a RS232C serial interface which allows the input of data from a terminal or a host CPU. 5 tape formats and 6 different baud rates, 110 baud ∿ 4800 baud are standard features that can be specified simply through the keyboard. As the PKW-3000 is provided with an internal RAM, it is possible to edit the programming data or execute a program or programs on the buffer RAM.

The PKW-3000 is a portable programmer which includes all the above functions in a 28cm x 19cm x 6.5cm main unit. Therefore, it can meet a wide range of user's needs from those arising in manufacturing, R&D departments, and field service departments where the device is frequently carried around.

CHAPTER 1 CONFIGURATION AND CAUTIONS

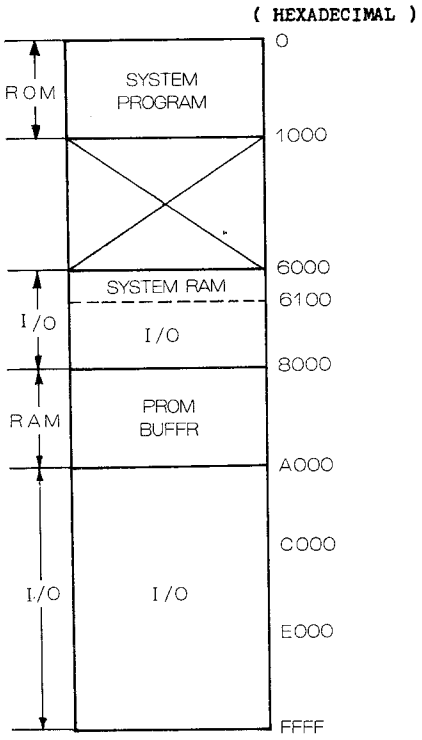
1-1 Specifications

° Type	PKW-3000
° Programmable PROMs	2716 (INTEL)*
	2732 (INTEL)
	2732A (INTEL)
	2532 (TI)
	48016 (HITACHI)
	2564 (TI)
	2764 (INTEL)
	*Equivalent PROMs to the above
° Selection of PROMs	Select Switch
° RAM Capacity	8K Byte
° Display	Hexadecimal 7 segments LEDs,
	8 digit LED
° Keyboard	7 Command Keys
	16 Data Keys
	1 Reset Key
° External Interface	RS232C serial interface
° Baud Rate	110 Baud
	300 Baud
	600 Baud
	1200 Baud
	2400 Baud
	4800 Baud
° Tape Formats	Intel HEX
	Binary
	Motorola MIKBUG
	ASCII HEX
° Operating Temperature ..	4°C∿40°C (39.2°F∿104°F)
° Operating Humidity	30%∿80% (above dew point)
° Power Requirement	AC100/115V±10% 50/60Hz
	AC220/240V±10% 50/60Hz
° Dimensions	W; 280mm (11.02")
	D; 190mm (7.48")
	H; 65mm (2.56")
° Weight	1.8kg (3.96 lbs.)

(Note): TI's 2716 is not available for programming.

1-2 Memory Map

The physical (hardware) address of the buffer RAM starts at 8000H, but it is supposed to set a virtual address at 0000H. Therefore, the user can consider 0000H as the start address of the buffer RAM. The capacity of the buffer RAM is automatically set to the selected PROM.



1-3 Block Diagram of the System

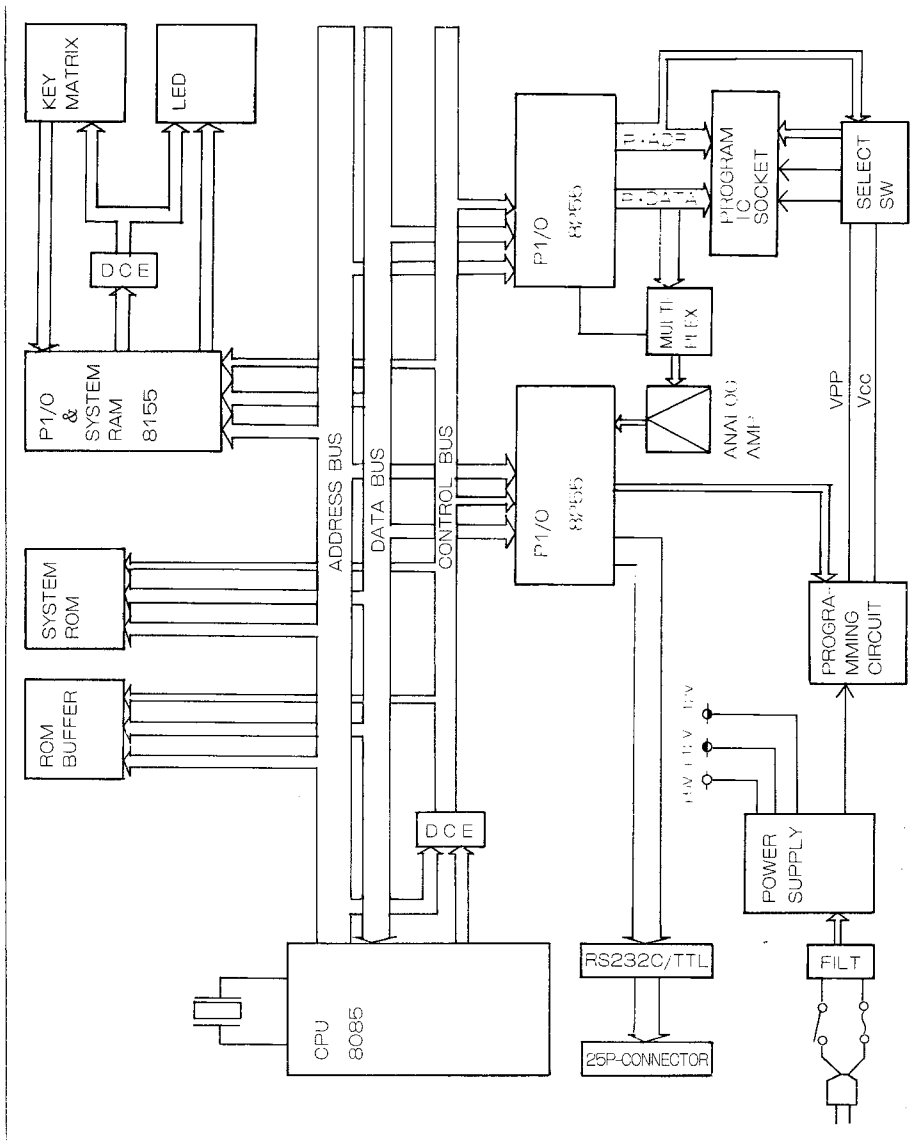


Fig. 1-1 Block Diagram of the System

1-4 The External Appearance

1-4-1 The Top View of the PKW-3000

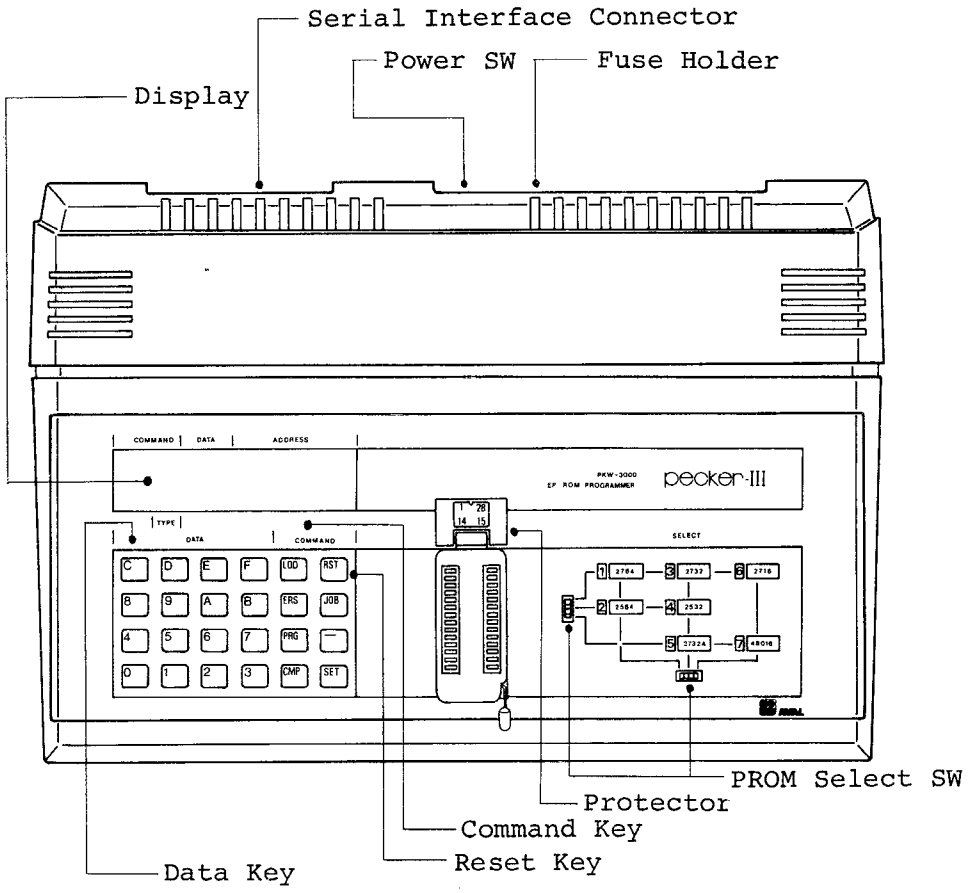


Fig. 1-2 The Top View of the PKW-3000

1-4-2 Rear Panel

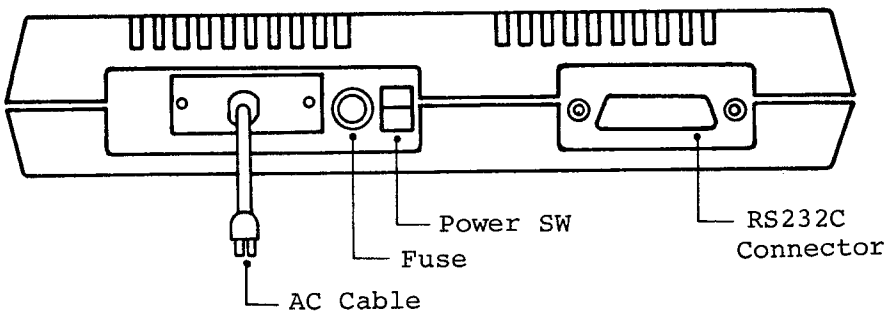


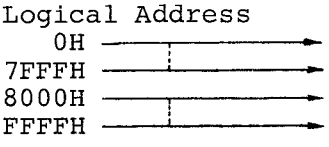
Fig. 1-3 The View of Rear Panel

1-5 The Definition of Nomenclature, Abbreviations, and Symbols

The nomenclature, abbreviations, and symbols used in the description of the operations and functions are defined in the following.

1-5-1 The Definition of Nomenclature and Abbreviations

- Programming Data
  Data to be programmed.
- Master PROM
  PROM that contains a programming data.
- Clear
  To store data representing the erase-state of the PROM in the buffer RAM.
- JOB Mode
  Wait-state for a command input by the operator.
- Physical Address
  Addresses of the memory on the hardware.
- Logical Address
  Virtual memory addresses with "0" corresponding to the start address of the actually incorporated RAM. The correspondence between the logical address and physical address is shown in the following:



  A logical address also means a virtual address on the PROM socket wherein 0000H corresponds to the 0000H of the PROM.
- TTY
  Terminal such as a teletypewriter.
- PTR
  Paper tape reader.
- PTP
  Paper tape puncher.

1-5-2 The Definition of Symbols

- □

  Indicates a key input.
  Name of Keys

  [LOD] ... LOAD Command
  [ERS] ... ERASE Command
  [PRG] ... PROGRAMMING Command
  [CMP] ... COMPARE Command
  [JOB] ... JOB Command
  [SET] ... SET
  [RST] ... RESET

Ex. [PRG] : Key input from the [PRG] Key.
[4] [F] [B] : Key inputs from the 3 Keys 4, F, B in that order.

° [ ] ( )

Symbols inside the [ ] shows the display on the LEDs, and characters in the ( ) specify a section of the LED display.

(CM): Command Section
(DT): Data Section
(AD): Address Section
(AH): Upper 2 Digits of the Address Section
(AL): Lower 2 Digits of the Address Section

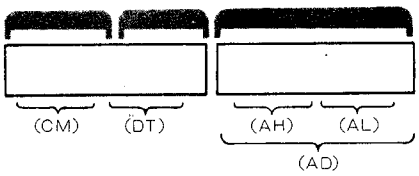


Fig. 1-4 Symbols for the LED Section

Ex. [2F] (DT): Displays 2F on the Data Section of the LED

° [ ]

Indicates execution of a function.
Ex. [Programming] : Execution of Programming

° ◇

Indicates a condition for a branch.

° [JOB]

Indicates the JOB Mode.

° ↧ ( )

Indicates insertion of a PROM.
The characters in ( ) are for:
(M): Master PROM
(P): Programmed PROM
(E): Erased PROM

° ↕ ( )
  Indicates extraction of a PROM.
° XXXX, YYYY, ZZZZ
  Indicates any 16 Bit address. (in hexadecimal)
° DD, TT
  Indicates any 4 Bit or 8 Bit data. (in hexadecimal)
° EE
  Indicates data representing the erased state. (in hexadecimal)
° SM (16 Bit)
  Indicates sum-check of the buffer RAM. (in hexadecimal)
° (·)
  Indicates a tone for 0.1 sec. on the speaker.
  Ex. (···): Three 0.1 sec. tones on the speaker.

° (-)
  Indicates a tone for 0.4 sec. on the speaker.

1-5-3 Notes on Key Input

Data input through the Data Key are shifted left as they are keyed in. Therefore, the operator can repeat the key operations until the required data has been input. When a single digit data "X" is input, both [x] , and [0] [x] are accepted correctly.

1-6 Display Panel

1-6-1 Display Panel

The display consists of an 8-digit 7-segment LED, and displays the key inputs and the system status.

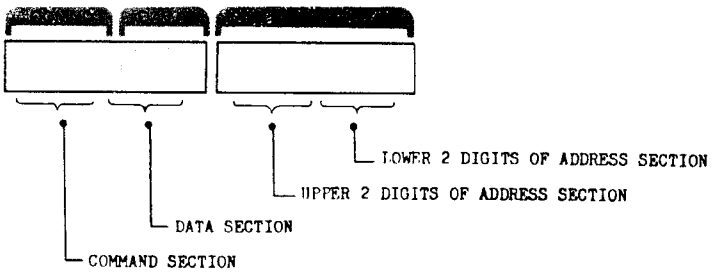


Fig. 1-5 Display Panel

1-6-2 Association of Keys and Displays

The display pattern for each key is shown in List 1-1 and List 1-2.

Data Key

DISPLAY	0	1	2	3	4	5	6	7	8	9	A	b	C	d	E	F
KEY	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

LIS1-1 Data Keys and Associated Displays

Command Key

DISPLAY	C	E	J	L	P	-	
KEY	CMP	ERR	JOB	LOD	PRG	(NOTE)	SET

(Note): Some Personality modules display the pattern shown in the left-hand figure when this Key is input first in the JOB Mode.

LIS1-2 Command Keys and Associated Displays

1-7 Microspeaker

The tones on the microspeaker are for acknowledging key inputs indicating an error, or at the end of a command execution.

- Key Input ..... a 0.1 sec. tone (·)
- End of Command Execution ... a 0.4 sec. tone (-)
- Error ..... three 0.1 sec. tones (···)

(Note): The symbols for acknowledging key inputs are omitted in the description of the Commands.

1-8 Basic Precautions

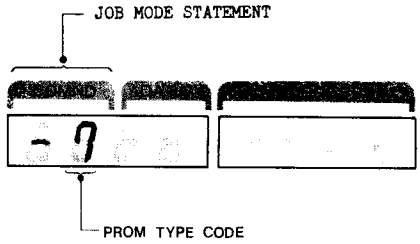
The basic procedures to be followed in the operation of the PKW-3000 are listed below.

1-8-1 Power On

The procedures and cautions for POWER ON are as follows.

° Confirm that the POWER Switch is OFF (thrown downward).
° Confirm that there is no PROM in the PROM socket.
° Connect the AC plug to the AC outlet.
° Throw the POWER Switch upward.

The display panel indicates the following pattern representing the JOB Mode.



(Note): If the system does not display this pattern for the JOB Mode at this point, press the RST Key.

Fig. 1-6 JOB Mode Statement

1-8-2 Power Off

Described below are the procedures and precautions for turning off the power.

° Confirm that there is no PROM in the PROM socket.
° Switch off the power.
° Pull the AC plug out.

1-8-3 PROM Selection

PROM is selected by a slide switch, and the LED indicate the selected PROM's code. The selection must be when the PKW-3000 is in the JOB Mode. The operation must be made carefully because a wrong selection may destroy the PROM. The codes of PROMs are shown below.

1 2764
2 2564
3 2732
4 2532
5 ..... 2732A
6 2716
7 48016

1-8-4 Insertion and Extraction of PROMs

PROMs must be inserted and extracted in the JOB Mode. For inserting PROMs, stand the DIP socket lever upright and insert in PROM into the socket as shown in Fig. 1-7, then press the lever down while pushing the PROM firmly against the socket. For extracting PROM, stand the lever upright and remove the PROM from the socket. PROM may be destroyed if it is carelessly inserted the other way.

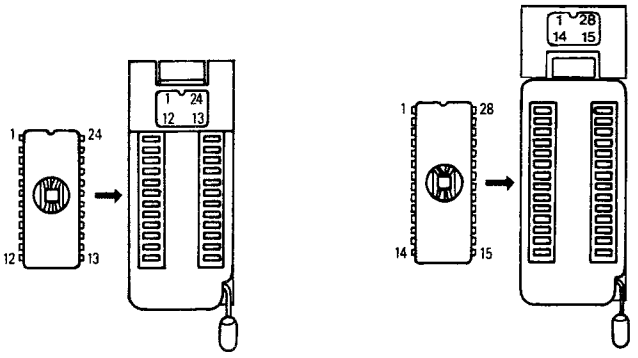


Fig. 1-7 Insertion and Extraction of PROM

1-9 Commands on the PKW-3000

The PKW-3000 is provided with a group of Commands as follows:

° ERS Command
  Executes the erase-check of the PROM in the PRM socket.
° CMP Command
  Compares the contents of the PROM in the PROM socket and the buffer RAM.
° LOD Command
  Loads the content of the PROM in the PROM socket into the buffer RAM.
° PRG Command
  Programs the content of the buffer RAM into the PROM in the PROM socket.
° -PRG Command
  Executes the erase-check and programming automatically.
° JA Command
  Clears the buffer RAM.
° JB Command
  Inverts the content of the buffer RAM.
° JC Command
  Punches out the content of the buffer RAM to the same capacity of the selected PROM.
° JD Command
  Reads the object tape into the buffer RAM.
° JE Command
  Switches usage of command keys from the PKW-3000 to the terminal.
° JF Command
  Sets the PKW-3000 to the COMMUNICATION Mode for communication between the PKW-3000 and the host CPU.
° J0 Command
  Refers and updates the content of the buffer RAM.
° J1 Command
  Refers and programs single byte of the PROM.
° J2 Command
  Executes the block transmission of data.
° J3 Command
  Reads the object tape into the buffer RAM as specified by the location address.
° J4 Command
  Sets the baud rate of the serial transmission.
° J5 Command
  Reallocates the top address of the buffer RAM.
° J6 Command
  Defines the formats for reading and punching the object tape.
° J7 Command
  Sets the various status.
° J8 Command
  Sets the start code for ASCII HEX SPACE format for paper tape.
° J9 Command
  Sets the end code for ASCII HEX SPACE format for paper tape.

CHAPTER 2 PROTECTION FUNCTION

2-1 Protection Function

2-1-1 Blocking the Power Supply to PROM

In the JOB Mode, power is not supplied to the PROM socket. The power is supplied only when a command which accesses the PROM is executed. Both data bus and address bus on the PROM socket are LOW level in the JOB Mode.

2-2 Functions for Checking and Display

2-2-1 Voltage Margin Check

For Erase-check and Compare commands (common to CMP, LOD, and PRG command), the PROM data are confirmed at three voltage levels 5.00, 5.25, and 4.75V.

° LED Display

A point is displayed on the Data Section of the LED to indicate the power supply during the command execution.

5.00V [ ](DT) NONE
5.25V [•](DT) UPPER LEFT CORNER
4.75V [•](DT) LOWER LEFT CORNER

° Errors in the Terminal Mode

If there is an error, a message is printed as shown below.

```
*E
5.00V xxxx DD*EE
4.75V xxxx DD*EE
5.25V xxxx DD*EE ?
                 |    |  |
                 |    |  +--> DATA of Erase-state
                 |    +-----> Contents of PROM
                 +----------> Logical Address
*C
5.00V xxxx DD*TT
4.75V xxxx DD*TT
5.25V xxxx DD*TT SM?
                 |    |
                 |    +-----> Contents of RAM
                 +----------> Contents of PROM
```

It also prints out the power supply voltage if there is an error.

2-2-2 Logic Level Check

This function is for checking the level of the logical data bits read out from the PROM. It is understood as an error when the level is anywhere between the TTL HIGH level (2.4V) and the LOW level (0.8V).

° LED Display for Logic Level Error

The following display is given for a level error of the logic data.

[--](CM)

When the Command Section of the LED gives the display, it indicates a logic level error. The command execution is interrupted at that time, and the system waits for the user's command either for aborting or resuming the execution. To abort, input the [JOB] Key. To continue, input any key except [JOB].

2-2-3 Sum Check

When an execution of compare command is completed (including the case where it is included in programming or load command), sum check data of 4 digits (hexadecimal number) is displayed on LED in the address area.

Sum check data consist of a total summation of the contents of buffer RAM, of which columns beyond 17 bits are rounded down. Use them to check the contents of PROM or buffer RAM.

CHAPTER 3 KEY OPERATIONS AND COMMANDS

3-1 Main Commands

Main commands are a group of basic commands input only through Command Keys.

3-1-1 JOB Command

OPERATION
JOB

All the Command Key inputs must be made in the JOB Mode. When the system is not in the JOB Mode or when the user wishes to abort the execution of a command, the system is brought into the JOB Mode input this key. In case of an error in the key operation the system emits the error tone (•••) and automatically goes into the JOB Mode. The display for the JOB Mode is shown in Fig. 2-1.

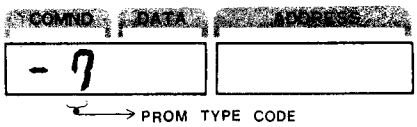


Fig. 3-1 Display for the JOB Mode

Execution of some of the commands results in displaying sum-check, etc. Those displays, however, are made in the JOB Mode in which further new commands can be input. That is, - (CM) means that the system is in the JOB Mode regardless of the displays on other LEDs.

3-1-2 ERASE Command

OPERATION
ERS SET

This command is for checking whether all the bits in a PROM are in the erased state. While executing the erase-check, the content of the PROM is displayed on the Command Section of the LEDs, and the address associated is displayed on the Address Section. If the content of the PROM does not represent

the erased state at an address, the erase-check is interrupted with the display of the address and the JOB Key. When the operator wishes to continue the check, input any key except JOB Key. The flowchart of the command and the associated display are shown in Fig. 3-2.

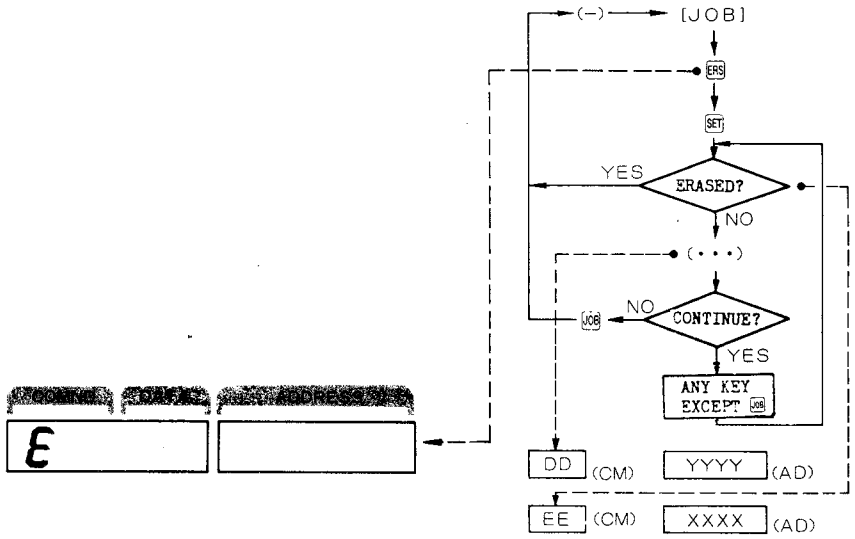


Fig. 3-2 Flowchart of ERASE Command

3-1-3 Compare Command

OPERATION
CMP SET

With this command, the contents of PROM are compared with those of buffer RAM. Then, after displaying sum check data, the operation returns to job mode. During comparison, the contents of ROM and buffer RAM and address are displayed on the command area LED, data area LED and address area LED, respectively.

If there is a compare error, command execution is interrupted while the error address and the contents of ROM and buffer RAM are being displayed. When interrupting compare mode, push JOB key. When continuing the compare mode, freely push any key othe than JOB key. Command flow chart and display are shown below.

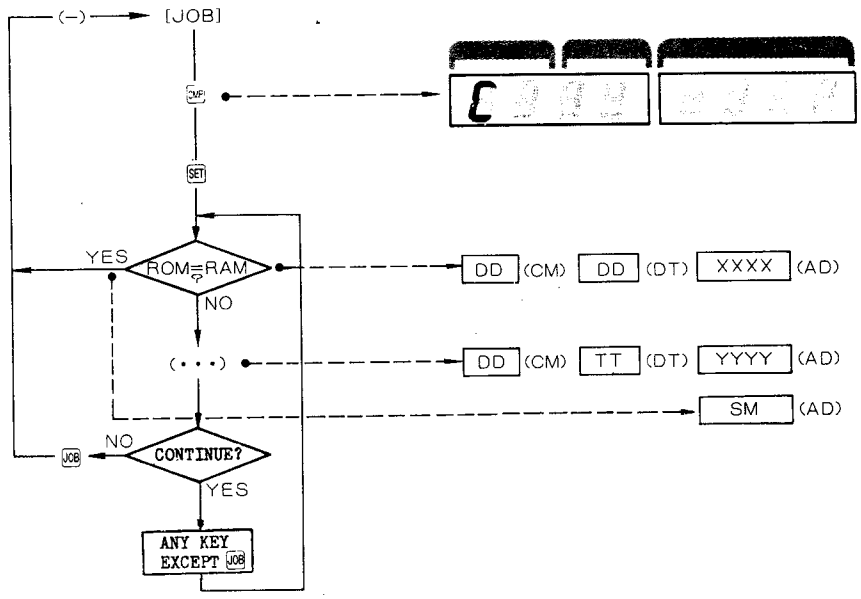


Fig. 3-3 Compare Command Flow

3-1-4 LOAD Command

OPERATION
LOD SET

This command loads the content of the PROM into the buffer RAM and then automatically compares the contents of the PROM and the buffer RAM, and the sum-check data is displayed as

well. The displays given during the compare operation, and the displays and operations associated with a compare error are the same as those for the COMPARE Command. The flowchart of the command and the associated displays are shown in Fig. 3-4.

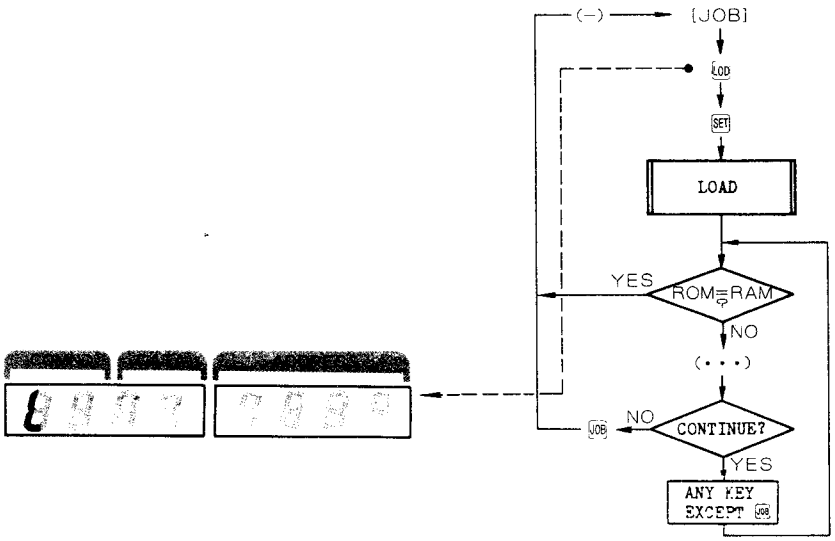


Fig. 3-4 Flowchart of LOAD Command

3-1-5 PROGRAMMING Command

OPERATION
PRG SET

This command is for programming the content of the buffer RAM into the PROM on the PROM socket. Then the content of the PROM and buffer RAM are automatically compared. If an anomaly in the content of the buffer RAM is detected during

the programming, the speaker continues to sound until the JOB Key is input. The system executes a compare operation only when there is no anomaly. The displays given during the compare operation and the operations associated with a compare error are the same as those for the COMPARE Command. The flowchart of the command and the associated displays are shown in Fig. 3-5.

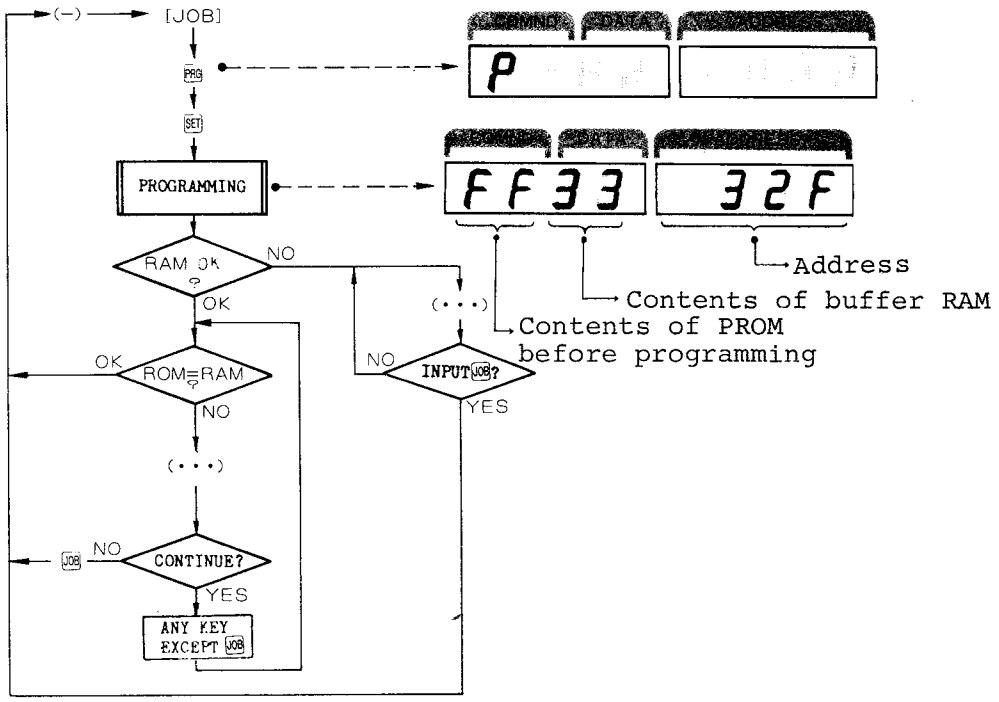


Fig. 3-5 Flowchart of PROGRAMMING Command

° Programming 2716, 2732, 2764, and 2564 Family
The programming method of these devices is regulated to execute the programming by 50ms program pulse per address. Under the programming, it displays an address of PROM on the Address Section of the LED, the content of the buffer RAM on the Data Section of the LED, and the content of the PROM before the programming on the Command Section of the LED.

° These PROMs are available for single byte programming.

° Programming NH48016
NH48016 (HITACHI) is an electrically erasable EE-PROM, pin compatible to 2716.

° Programming Method
The programming method of NH48016 is regulated to execute the programming by 20ms program pulse per address. The display under the programming is the same as 2716's.

° Electrical Erase

OPERATION
ERS SET

The electrical erase is available for NH48016 on the erase command, it executes erase-check after the automatic electrical erase (200ms).

° Execution of Only Erase-check

OPERATION
JOB A SET CMP SET

The Erase command executes the automatical electrical-erase. But if the operator wishes to execute only erase-check, use both buffer clear command and compare command. It compares the erased-data and the contents of EE-PROM.

° Quick·Programming Method
The programming method under the "PRG" command can be changed as follows by setting the parameter of the "JOB 7" command.

. Parameter = 00
Programs the content of the buffer RAM into the PROM unconditionally.

. Parameter = 01
By checking the contents of buffer RAM and PROM, if the contents of buffer RAM is FF (erase-data) or the contents of RAM and PROM are the same, it becomes the Quick-programming method which skips these above-mentioned addresses.

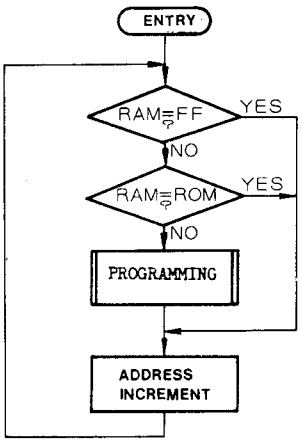


Fig. 3-6 Flowchart of Quick Programming

3-1-6 AUTO Command

OPERATION
— PRG SET

This command executes the erase-check programming consectively. If the erase-error is detected, it does not execute the programming.

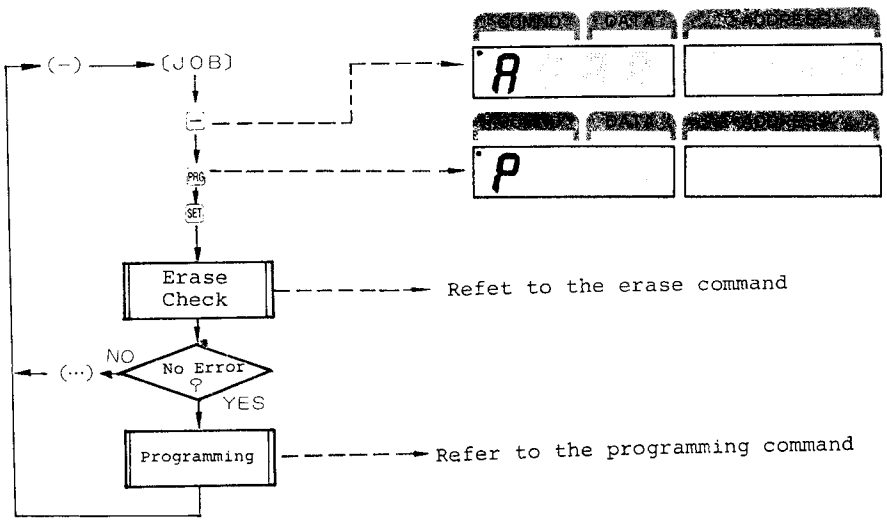


Fig. 3-7 Flowchart of AUTO Command

3.2 Subcommands

These are a group of commands for expanding the functions of the PKW-3000, requiring key operations starting with the JOB Key.

3-2-1 BUFFER CLEAR and RAM CHECK Command

OPERATION
JOB A SET

This command clears the buffer RAM and checks the hardware error in the buffer RAM. If an error is detected during the RAM-check the system returns to the JOB Mode with an error tone. The flowchart of the command and the associated displays are shown in Fig. 3-8.

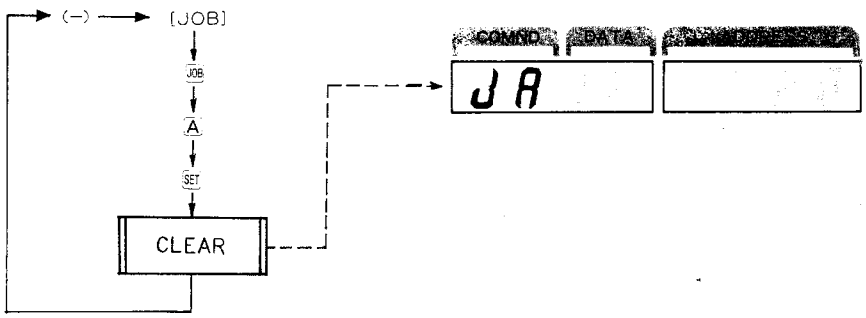


Fig. 3-8 Flowchart of Buffer Clear and RAM check Command

3-2-2 BUFFER INVERT Command

OPERATION
JOB B SET

This command inverts all the bits in the buffer RAM. The flowchart of the command and displays associated are shown in Fig. 3-9.

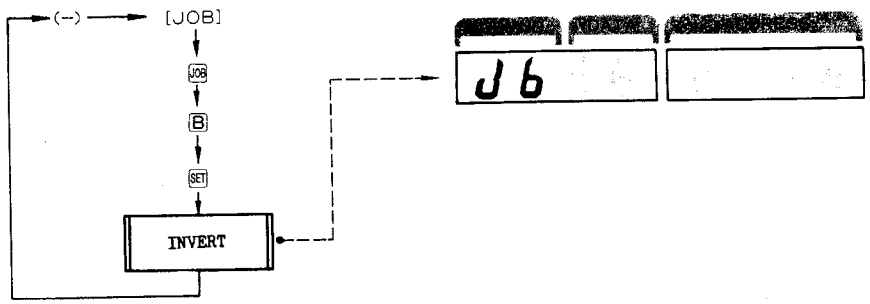
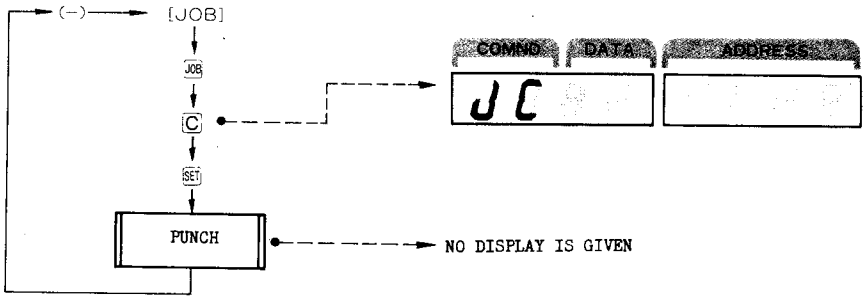


Fig. 3-9 Flowchart of BUFFER INVERT Command

3-2-3 OBJECT TAPE PUNCH Command

OPERATION
JOB C SET

This command outputs the content of the buffer RAM to the PTP via the serial interface. At POWER ON and RESET, the tape format is set in the INTELLEC HEX. The other formats can be set using the "JOB6" command. For those formats with the location address the logical address is punched as a location address. No display is given during the punch out. The flowchart of the command and associated displays are shown in Fig. 2-8.



(Note): The location address is the address for storing the data.

Fig. 3-10 Flow of PUNCH Command

3-2-4 OBJECT TAPE READ Command

OPERATION
JOB D SET

This command reads the object tape through the PTR via the serial interface and stores the content into the buffer RAM. At POWER ON and RESET, the tape format for the tape is set in INTELLEC HEX. The other formats can be set using "JOB6" command. Nothing is displayed during the read operation. At completion, however, the RAM location next to the last address of the data storing operation is displayed in terms of its physical address. It can select the Read-data by setting a status used "JOB7" command. The flowchart of the command and the displays associated are shown in Fig. 3-11.

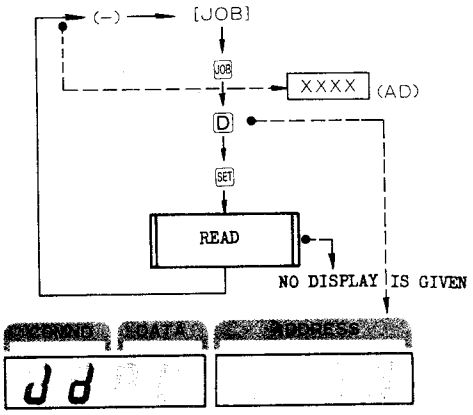


Fig. 3-11 Flowchart of READ Command

3-2-5 TERMINAL Command

OPERATION
JOB E SET

This command switches usage of command keys from the PKW-3000 to the Terminal. The system prints out the following and goes into the JOB Mode.

PKW-3000
*

In the JOB Mode, key inputs on the PKW-3000 are inhibited, and no displays are given. The J Key on the PKW-3000, however, is enabled when some of the commands are executed through the keyboard on the Terminal. For the operations in the JOB Mode through the keyboard on the Terminal, the usears are referred to Chapter 3. The flowchart of the command and the displays associated are shown in Fig. 3-12.

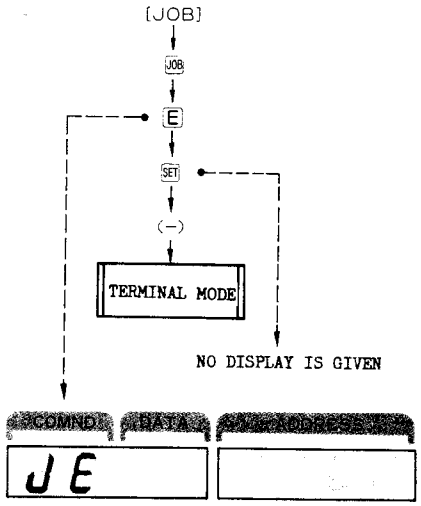


Fig. 3-12 Flowchart of TERMINAL Command

3-2-6 COMMUNICATION Command

OPERATION
JOB F SET

This command sets the PKW-3000 to the COMMUNICATION Mode for communication between the host CPU and the PKW-3000. The system outputs the following character code (ASCII) and goes into the JOB Mode and monitors the response from the host CPU.

ODH (CR), OAH (LF), and 2AH (*)

In the JOB Mode, key inputs on the PKW-3000 are inhibited, and no displays are given. The JOB Key on the PKW-3000, however, is enabled when some of the commands are executed on the host CPU. The user is referred to Chapter 4. The flowchart of the command and associated displays are shown in Fig. 3-13.

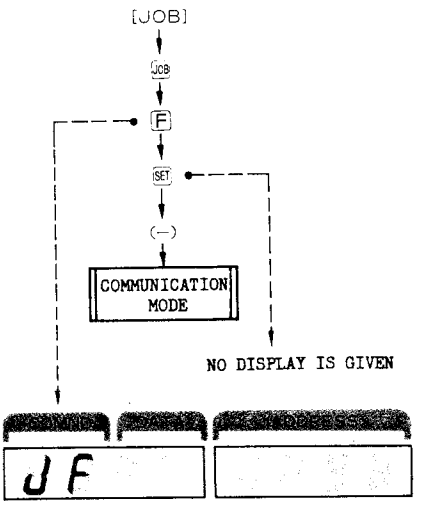


Fig. 3-13 Flowchart of COMMUNICATION Command

3-3 Compound Parameter Commands

There are a group of commands for extending a number of functions of the PKW-3000 starting with key input JOB, and requiring a parameter (variable) input.

3-3-1 RAM EDIT Command

OPERATION
JOB 0 X X X X SET D D
SET JOB

This command is for referring and updating the content of the buffer RAM. Inputting JOB 0 , followed by the target address X X X X , and then inputting SET Key produces the RAM content at that address on the Data Section of the LEDs. Inputting new data D D and then inputting the SET Key result in updating the data. If the RAM content is only to be (referred, the address is incremented by inputting the SET Key and decremented by space inputting the − Key). The input address must be a logical address (whose 0 correspounds the address 0 of the PROM in the programming operation). The flowchart of the command and the displays associated are shown in Fig. 3-14.

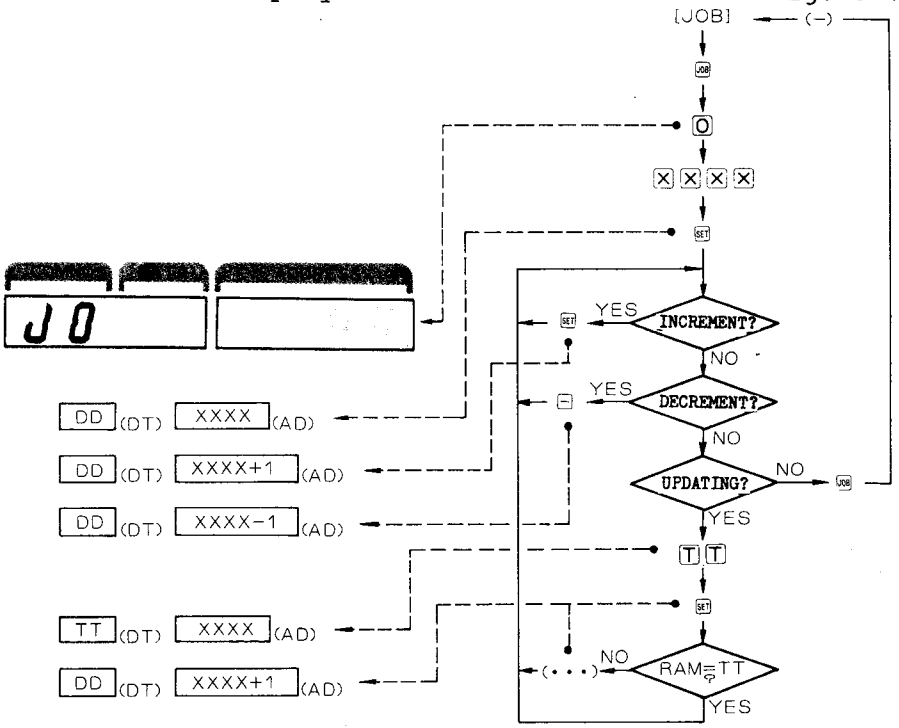
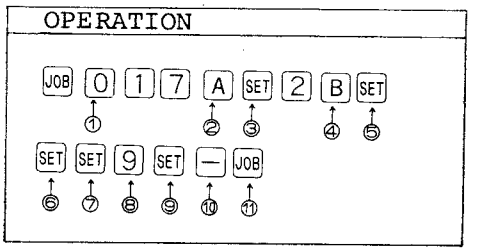


Fig. 3-14 Flowchart of RAM EDIT Command



① JOB 0 (CM)
Inputs a RAM EDIT Command.

② 17A (AD)
Inputs a RAM address 17AH (logical address)

③ 04 (DT) 17A (AD)
Inputs the SET to display the RAM data.

④ 2B (DT) 17A (AD)
Updates the data 04H at 17AH to 2BH.

⑤ B1 (DT) 17B (AD)
Stores the input data into the RAM and increments the address.

⑥ 24 (DT) 17C (AD)
Increments the address.

⑦ C3 (DT) 17D (AD)
Increments the address.

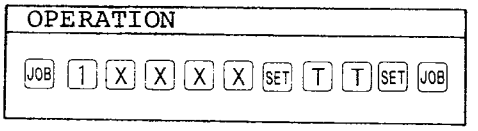
⑧ 09 (DT) 17D (AD)
Updates the data C3H at 17DH to 09H.

⑨ 81 (DT) 17E (AD)
Stores the data input into the RAM and increments the address.

⑩ 09 (DT) 17D (AD)
Decrements the address.

⑪ — (CM)
Sets the JOB Mode.

3-3-2 PROM EDIT Command



This command is used for the referring to and the programming of a single byte of PROMs that are single of the byte-programmable type (See Note 1). This command is not for editing RAM but for edition PROMs. The input address ☒ ☒ ☒ ☒ must be a logical address. The address 0 corresponds to the address 0 of the PROM in the PROM socket. The displays and operations associated are the same as those for the JOB command.

(Note): The programming operation is not executed even with single byte-programmable PRMs unless the system is set in the condition for single byte-programming using the "JOB7" command.

The programming operation is executed by inputting the programming data T T followed by a key input SET. If the programming is not done properly the system emits an error tone (...), and displays the next address and the content. With correct programming the system immediately displays the next address and the content there. The flowchart of the command and associated displays are shown in Fig. 3-15.

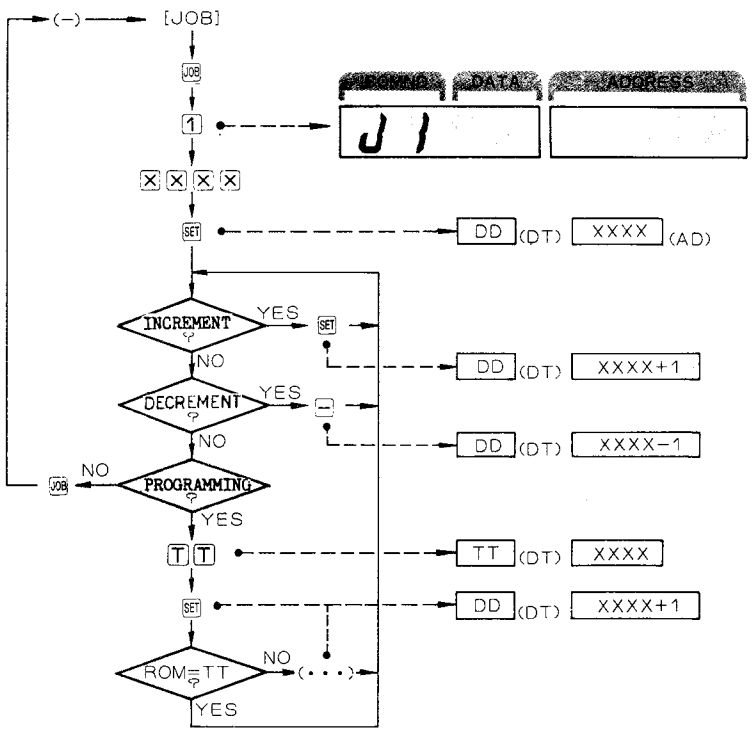


Fig. 3-15 Flowchart of PROM EDIT Command

3-3-3 OBJECT TAPE LOCATION READ Command

OPERATION
JOB 3 X X X X SET

This command is for reading an object tape through the PTE via the serial interface and storing the content at an address Location Address on the Tape +XXXX. The input address x x x x must be a physical address. At POWER ON and RESET, the tape format is set in the INTELLEC HEX. The other format cn be set by using "JOB6" command. No displays are given during the read operation. At completion of the read, however, the RAM location next to the last address of the data storage is displayed in terms of a physical address. The flowchart of the command and the associated displays are shown in Fig. 3-16.

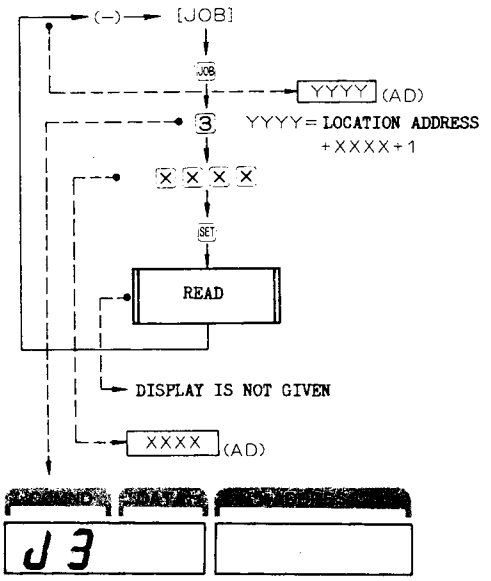


Fig. 3-16 Flowchart of TAPE LOCATION READ Command

3-3-4 BAUD RATE SET Command

OPERATION
JOB 4 D D SET

This command sets the baud rate for the serial transmission. At POWER ON and RESET, the baud rate is set at 4800 baud. The prameter D D is associated with the baud rate as shown in LIS 3-1.

PARAMETER	BAUD RATE
0	4800
1	2400
2	1200
3	600
4	300
5	110

LIS 3-1 Association of the Parameter and Baud Rate

When JOB 4 are input, the current value of the parameter is displayed on the Data Section of the LEDs. To just confirm the current value of the parameter, input JOB Key. To update the current parameter, input a new parameter value. The flowchart of the command and associated displays are shown in Fig. 3-17.

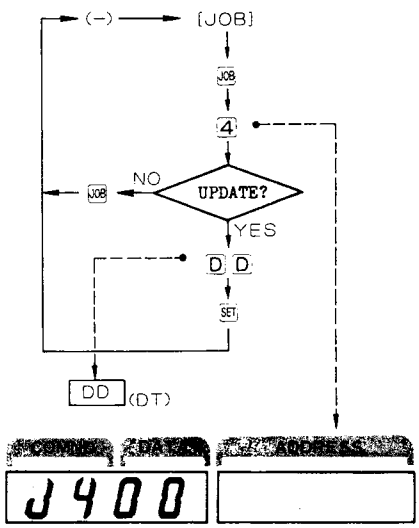


Fig. 3-17 Flowchart of BAUD RATE SET Command

3-3-5 REALLOCATE BUFFER TOP ADDRESS Command

OPERATION
JOB 5 D D SET

This command reallocates the top address of the buffer RAM by steps of 256 bytes. AT POWER ON and RESET, it is allocated to the top address of the RAM area. The parameter D D and the top address are associated as shown in LIS 3-2.

(EEXADECIMAL)

Parameter	LOGICAL ADDRESS	PHYSICAL ADDRESS
0	0	8000
1	100	8000+100
2	200	8000+200
3	300	8000+300
↓	↓	↓

LIS 3-2 Association of the Logical and Physical Addresses

Values up to "FF" can be specified for the parameter logically. Specifying an address outside the actual RAM area is meaningless. The flowchart for referring and updating the parameter is the same as that for the "JOB4" Command.

3-3-6 TAPE FORMAT Command

OPERATION
JOB 6 D D SET

This command reallocates the top address of the buffer RAM by steps of 256 bytes. At POWER ON and RESET, it is allocated to the top address of the RAM area. The parameter D D and the top address are associated as shown in LIS 3-2.

PARAMETER	FORMAT
1	INTELLEC HEX
2	BINARY
3	MOTOROLA MIKBUG
4	ASCII HEX SPACE
5	TEKTRONIX HEX DECIMAL

LIS 3-2 Association of the Logical and Physical Addresses

When an error is detected during a read operation the system goes back to the JOB Mode giving an error tone (•••) regardless of the format in use. As to the details of the formats the reader is referred to Appendix 2. The flowchart for referring and updating the paremater is the same as that for the "J4" command.

3-3-7 STATUS SET Command

OPERATION
JOB 7 D D SET

This command sets a various status. The correspondences of status and data are shown below.

D7	D6	D5	D4	D3	D2	D1	D0

Don't Care Below

D0: Single byte programming protect and Quick·programming status bit

H = Single byte programming and Quick·programming are effective
L = Single byte programming and Quick·programming are not effective

D1: RS232C Communication Mode Status bit

It is controlled by "DC1" and "DC" when the "punch" command is executed.

H = Sense the "DC1" and "DC3"
L = Not sense the "DC1" and "DC3"

(Note): "DC1" and "DC3" are the device control charactor of ASC11 code.

DC1 (11H): X-ON
DC3 (13H): X-OFF

D2: RS232C Terminal Mode Status bit

The "DC1" and "DC3" are output when it executes "READ" command.

H = Output "DC1" and "DC3"
L = Not output "DC1" and "DC3"

D3: VCC Control Status bit

It reduces the execution time of "ERS", "CMP", and "LOD" commands. Generally, PROM's VCC executes above commands by three steps as 4.75V, 5.00V, and 5.25V. However, it executes these commands by only two steps as 4.75V and 5.25V by setting this status.

H = 2 steps
L = 3 steps

D4: Read Data Selection Status bit

The status of ordinal read or reading even number or odd number data shall be set when the "JOB D", "JOB 3", "R", "Rn", and "Cn" commands are executed.

H = Selection of a read data
L = Ordinal reading

(Note): Please refer to Chapter 4 "Operation in the Terminal Mode" for "R", "Rn", and "Cn" commands.

D5: Odd and Even Number Selection Status bit

This status bit is effective, when "D4 = H". The case of "D4=L" is not effective. It selects reaching in odd numbers or even numbers on the location address of data format.

H = Read odd numbers
L = Read even numbers

The first data of data format with no location address is assumed as "0"th address. The displayed or output address is not the substantial address, therefore, the last address of stored data can be found as follows.

The last address of stored data + 1 : Z
The display address : XXYY
Buffer RAM TOP Address Change Parameter: *xx*

```
  XXYY
 -xxOO
 -8000
------
    W
```

W/2 = *w* (cut off decimal point)

```
  8000
 +xxOO
 +  w
------
    Z
```

(Note): The address where the error is occured by executing "Cn" command, that is a substantial address.

3-3-8 ASCII HEX START CODE SET Command

OPERATION
JOB 8 D D SET

This command sets the start code for the ASCII HEX SPACE format. This command, in association with the following "JOB9" command, makes it possible to use various ASCII HEX SPACE formats. At POWER ON and RESET, the parameter is set to 02H (STX: START OF TEXT). The parameter D D must be a 7 bit ASCII code with the MSB (most significant bit) of 0, and D D = 00 is understood as no start code. In the case of a data output, however, the code set is output as it stands. The flowchart for referring and updating the parameter is the same as that for the "JOB4" command.

3-3-9 ASCII HEX END CODE SET Command

OPERATION
JOB 9 D D SET

This command sets the end code of the ASCII HEX SPACE format. At POWER ON and RESET, the parameter is set in 03H (EXT: END OF TEXT). The parameter D D must be an ASCII code, and an MSB of 1 is understood as no end code. When the data is output, however, the code set is output as it stands. The flowchart for referring and updating the parameter is the same as that for the "JOB4" command.

3-3-10 TEST PROGRAM Command

OPERATION
JOB — SET D

This command checks the LEDs, Key sensing and the serial interface in the PKW-3000. The additional checking functions are specified by each of the Personality Modules. For details, the operator is referred to the instructions for each of the Personality Modules. Displays shown in Fig. 3-18 are given upon a key input ST .

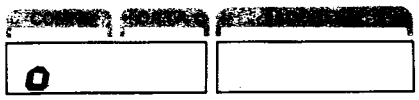


Fig. 3-18 Displays Associated with the TEST PROGRAM Command

The parameter [D] can be input only when the above displays are given. For returning to the JOB Mode, input [0] when the above displays are given as well.

° [D] = 0 : LEDs TEST

When [0] is input, a segment of the LED shifts from left to right in a rotating order as shown below. There are 4 digits on the right side and another 4 digits on the left side; the configuration and rotating order are shown in Fig. 3-19.

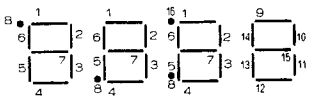


Fig. 3-19 Configuration of the LEDs

For aborting the [LED] test, input the [JOB] key. For interrupting the test, input any keys except the [SET]. The test can be resumed by inputting any keys except the [JOB]. The flowchart of the key inputs described above is shown in Fig. 3-20.

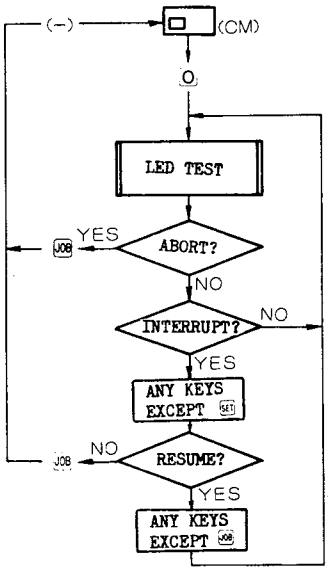


Fig. 3-20 Flowchart of the LED Test

° [D] = 1 : KEY TEST

When inputting [1], [□ 1] (CM) is displayed, and the code for the key input is shown on the Data Section of the LEDs. The key codes are the internal numbers assigned in the system to each key. The key code display operation is aborted only when the same key is input twice in a row. The association of the keys and the key code is shown in LIS 3-4.

□ DATA KEY

KEY	0	1	2	3	4	5	6	8	9
CODE	00	01	02	03	04	05	06	08	09

KEY	A	B	C	D	E	F
CODE	0A	0B	0C	0D	0E	0F

□ COMMAND KEY

KEY	(−)	SET	PRG	LOG	ERS	DMP	JOB
CODE	11	12	13	14	15	16	17

LIS 3-4 Association of Keys and Key Codes

° [D] = 2 : Serial Output TEST

When inputting [2], [□ 2] (CM) is displayed. Inputting a code for output through the data key will now result in the display of that code on the Data Section of the LEDs, and that code is output by inputting the [SET] Key. The test is aborted by inputting the [JOB] Key. The flowchart of the test for the serial output is shown in Fig. 2-20.

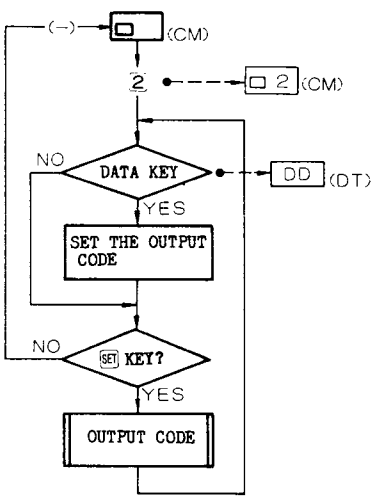


Fig. 3-21 Flowchart of the Serial Output

(Note): Set in the ASCII Code for output

° [D] = 3 : Serial Input TEST

LEDs are turned off at inputting [3], and the system waits for serial data. When it receives the serial data, the ASCII code for it is displayed on the Data Section of the LEDs. Then the system waits for serial data again upon inputting any Key except [JOB]. the test is aborted by inputting the [JOB] Key. The Flowchart of the test for serial input is shown in Fig. 3-22.

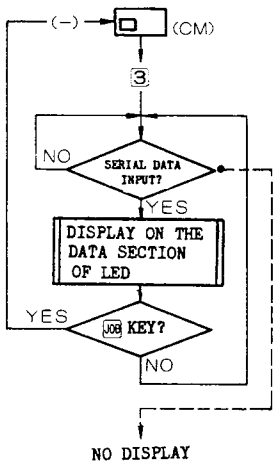


Fig. 3-22 Flowchart of the Test for Serial Input

3-3-11 Addition of MOVE Command

The data block in the assigned address section is transferred with the assigned leading address.

Operation
JOB 2 X X X X SET Y Y Y Y SET Z Z Z Z SET Where XXXX $\leq$ YYYY

A data block from XXXX address to YYYY address is block-transferred with the leading address of ZZZZ.

The address display disappears every time the SET key is pushed and only the top address of destination, i.e. ZZZZ is ultimately displayed.

The address of the transferring destination may be either more or less significant than the address section between XXXX and YYYY or may overlap with the section.

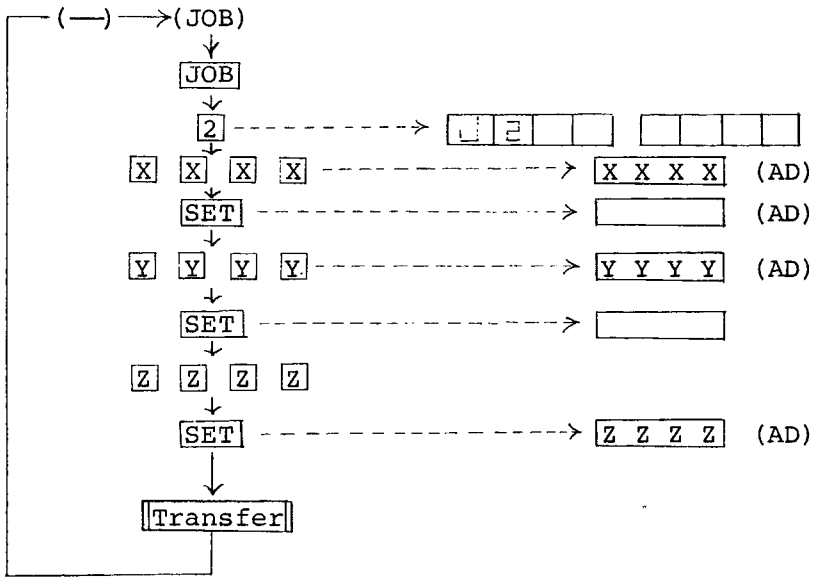


Fig. 3-23 Flowchart of MOVE Command

CHAPTER 4 OPERATION IN THE TERMINAL MODE

Key operation [JOB] [ERS] [SET] on the PKW-3000 causes the TTY to print out the following comment:

```
PKW-3000
*
```

The system goes into the TERMINAL Mode, and key inputs on the PKW-3000 are inhibited and the system waits for the key operations on the TTY (in the JOB Mode). LEDs are turned off. It only display type code of PROM.

4-1 Definition of Symbols and Input Keys Definition

4-1-1 Definition of Symbols

° * Asterisk

Indicates the JOB Mode

° - Underscore

Underscored characters are automatically printed on the TTY

° XXXX, YYYY, ZZZZ Capital Letters

Represents physical addresses

° xxxx, yyyy, zzzz Small Letters

Represents logical addresses

° n

Represents any parameter or parameters

° ? Question Mark

Represents an error

°<CR> Carriage Return Key

A termination code

°<LF> Line Feed Key

A termination code

°<SP> Space Key

A termination code (For details see 3-5)

° </> Slash Key

A termination code (For details see 3-5)

° , Comma Key

Delimiter of the parameters (For details see 3-5)

4-1-2 Input Key Definition

The parameter input procedure is performed as a flow-out type. The parameters are recognized as shown in the following:

Single Byte Parameters

```
    A  <CR>
   0A  <CR>
  20A  <CR>
 320A  <CR>
```

All the four inputs above are understood as "OA"; that is, only the last two digits input are effective.

```
  321  <CR>
 0321  <CR>
A0321  <CR>
5A0321 <CR>
```

All the four inputs above are understood as "0321"; that is, only the last four digits input are effective.

An input error causes the system to print a "?" and go into the JOB Mode. If (CR) and (LF) are input without inputting the parameter required for a command, the command is understood as the one with the same designation and not requiring the parameter.

4-2 Commands in the Terminal Mode

The following group of commands are available in the TERMINAL Mode:

- E Command

  Executes the erase-check of the PROM

- C Command

  Compares the PROM and the buffer RAM

- L Command

  Loads the content of the PROM into the buffer RAM

- W Command

  Programs the content of the buffer RAM into the PROM

- A Command

  Executes the E command and W command automatically and consecutively.

- B Command

  Checks hardware errors in the buffer RAM and clears the buffer RAM

- O Command

  Inverts the content of the buffer RAM

- P Command

  Punches out the content of the buffer RAM to the same capacity as the selected PROM

- R Command

  Reads the content of an object tape into the buffer RAM

- Ln Command

  Edits the RAM

- Wn Command

  Edits the PROM

° Rn Command

Reads the object tape into the buffer RAM address as specified by the location address

° Xn Command

Sets various types of control codes

° G Command

Punches out the content of the buffer RAM in Binary format to the same capacity as the selected PROM

° S Command

Reads a Binary format tape into the buffer RAM

° D Command

Dumps all the content of the buffer RAM to the same capacity as the selected PROM

° Dn Command

Dumps the content of the specified address range

° Cn Command

Compares the content on the tape with the content of the specified memory area

° Pn Command

Punches out the memory content of the specified address range

° / (Slash) Slash Command

Changes to the key mode

4-3 Commands of the Same Functions as Key Mode

Commands of this group have different designations and formats, but the functions are the same as those of the key mode.

4-3-1 E Command

Erase-check

OPERATION
*E<CR>OK

This command executes the erase-check of the PROM. The system prints out "OK" when no error is detected. With an error the message is as shown below. The voltage value of PROM is displayed before the Logical address.

```
*E
5.00V  xxxx  DD*EE
5.25V  xxxx  DD*EE
4.75V  yyyy  DD*EE ?
```

- DD*EE → DATA REPRESENTING THE ERASED STATUS
- DD*EE → CONTENT OF THE PROM
- yyyy → LOGICAL ADDRESS
- 4.75V → VOLTAGE VALUE OF PROM

This command is executed down to the last address of the PROM even with an error, but can be aborted by inputting the [JOB] Key as that for the "E" Command.

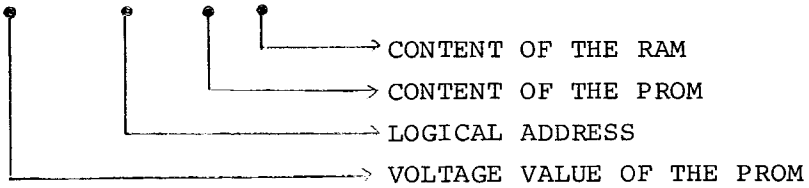
4-3-2 C Command

Compare

OPERATION
*C<CR>SM OK

This command compares the contents of the PROM and the buffer RAM. The system prints out the sum-check data (SW) and "OK" when no error is detected. With an error, the message is as shown below.

```
*C
5.25V  xxxx  DD*TT
9.75V  yyyy  DD*TT  SM  ?
```



The system displays the supply voltage to the PROM before the logical address. This command is executed down to the last address of the PROM even with an error, but can be aborted by inputting the [JOB] Key on the PKW-3000. The given displays are the same as those for the "C" Command.

4-3-3 L Command

Load

OPERATION
*L<CR>SM OK

This command loads the content of the PROM into the buffer RAM, and then automatically compares the contents of the PROM with the buffer RAM. Operations during the comparison are the same as those for the "C" Command.

4-3-4 W Command

Programming

OPERATION
*W<CR>SM OK

This command programs the content of the buffer RAM into the PROM in the PROM socket. When an anomaly in the content of the buffer RAM is detected during the programming, the system repeats the error tone after the programming operations are completed. The system returns to the JOB Mode only by inputting the [JOB] Key on the PKW-3000. If there is no anomaly in the content of the buffer RAM, the system automatically executes the COMPARE function.

4-3-5 A Command

Automatic

OPERATION
*A <CR> SM OK

This command executes E command and W command automatically and consecutively. W command can not be executed when the erase-errors are detected.

4-3-6 B Command

Buffer Clear and RAM Check

OPERATION
*B<CR>OK

This command clears the buffer RAM and checks hardware errors in the buffer RAM. If there are no errors, the system prints out "OK".

4-3-7 O Command

Invert Buffer RAM

OPERATION
*O<CR>OK

This command inverts all the bits of the buffer RAM. Upon completion the system prints out "OK".

4-3-8 P Command

Punch Out Buffer RAM

OPERATION
*P<CR> *

This command punches out the content of the buffer RAM to the same capacity as the selected PROM. The system returns to the JOB Mode upon completion of the execution. At POWER ON, and RESET, the tape format is set in the INTELLEC HEX. The other formats can be set used with the "Xn" command. For those formats with the location address, the logical address is punched as the location address.

4-3-9 R Command

Tape Read to Buffer RAM

OPERATION
*R<CR> xxxx OK
°xxxx=LAST ADDRESS+1

This command reads the content of an object tape into the buffer RAM. At completion of the execution, the RAM location next to the last address of the data storage (physical address) and "OK" are printed. At POWER ON and RESET, the tape format is set in INTELLEC HEX. The other formats can be used with the "Xn" command.

4-3-10 Ln Command

RAM Edit

OPERATION
∘ REFERENCE TO THE CONTENT OF THE SPECIFIED ADDRESS XXXX
* L x x x x <CR>
x x x x DD<CR>
∘ UPDATING THE CONTENT OF THE SPECIFIED ADDRESS XXXX
* L x x x x <CR>
x x x x DD TT<CR>

This command refers and updates a specified single byte of the memory. The input address must be a logical address.

EX. 4-1

```
*L0
0000    F3<SP>----┐
0001    C3  01<SP>-┤
0002    49  43<CR>  |
                    ADDRESS INCREMENT
```

(SP) refers to the content of the next address

EX. 4-2

```
*L5
0005    62</>-----┐
0004    C3  23</>--┤
0003    80</>------┘
0002    43  12<CR>  |
*                   ADDRESS DECREMENT
```

(/) refers to the content of the previous address.

4-3-11 Wn Command

PROM Edit

OPERATION

□ FOR REFERENCE THE SEE CONTENT OF THE SPECIFIED ADDRESS OF THE PROM

*Wxxxx<CR>
xxxx DD<CR>

□ SINGLE BYTE PROGRAMMING OF THE PROM AT THE SPECIFIED ADDRESS XXXX

*Wxxxx<CR>
xxxx DD TT<CR>

This command refers and programs the content of the single byte of the PROM at the specified address. The programming function, however, is not effective unless the system is available for single-byte programming using the "Xn" command. The function of the termination codes for "Wn" command is the same as for the "Ln" command.

4-3-12 Rn Command

Tape Read to Location Address

OPERATION
*RXXXX<CR> YYYY OK
□ YYYY = LAST ADDRESS + 1

This command reads the content of an object tape and stores it at the Location Address on the Tape + XXXX. Upon completion of the execution, the RAM location next to the last address of the data storage (physical address) and "OK" are printed. The input address must be a physical address. At POWER ON and RESET, the tape format is set in INTELLEC HEX. The other formats can be set used with the "Xn" command.

4-3-13 Xn Command

Set Control Code

OPERATION
□ REFERENCE TO THE CONTROL CODE *Xn<CR> DD<CR>
□ UPDATING THE CONTROL CODE *Xn<CR> DD TT<CR>
□ ON CONCLITION THAT $4 \leq n \leq 9$

This command sets code for controlling the PKW-3000 system. ▨ is POWER ON and RESET, the states are set as below.

n	FUNCTION	DD	DD SPECIFICATIONS
4	SET BAUD RATE	00	4800 BAUD
		01	2400 BAUD
		02	1200 BAUD
		03	600 BAUD
		04	300 BAUD
		05	110 BAUD
5	SET THE START ADDRESS OF THE BUFFER	00	OH
		01	100H
		02	200H
6	SET THE FORMAT	01	INTELLEC HEX
		02	BINARY
		03	MOTROLA MIKBUG
		04	ASCII HEX
7	SET THE STATUS	00	REFER TO THE 'JOB7' COMMAND
8	SET THE START CODE	02	STX
			ANY CODES(ASCII)
9	SET THE END CODE	03	ETX
			ANY CODES(ASCII)

4-4 Terminal Mode Command

These commands can be used only in the TERMINAL Mode.

4-4-1 G Command

Binary Punch Out

OPERATION
*G<CR>

This command punches out the content of the buffer RAM in Binary format to the same capacity as the selected PROM.

4-4-2 S Command

Binary Read

OPERATION
*S<CR> XXXX OK □XXXX= LAST ADDRESS + 1

This command reads a Binary format tape, and the read data is stored in the buffer RAM. Upon completion of the execution, the RAM location next to the last address of the data storage (physical address) and "OK" are printed.

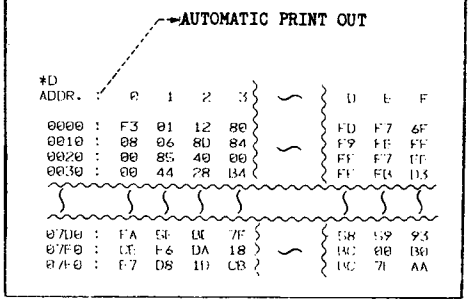
4-4-3 D Command

Buffer RAM Dump Out

OPERATION
*D<CR>

This command dumps all the content of the buffer RAM to the same capacity as the selected PROM. The printed addresses are logical addresses. For aborting the operation, input the JOB Key on the PKW-3000, which puts the system into the JOB Mode.

EX. 4-3



The above example ..... Buffer RAM = 2K byte

4-4-4 Dn Command

Memory Dump Out

OPERATION

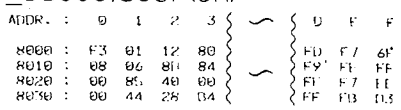
□ **FOR DUMPING FROM THE START ADDRESS XXXX TO THE END ADDRESS YYYY**

*PXXXX, YYYY<CR>

This command dumps the content of the specified address range of the memory. Both the input parameter and printed address are physical addresses. The start address must be less than or equal to the end address.

EX. 4-4

*D8000,803F<CR>

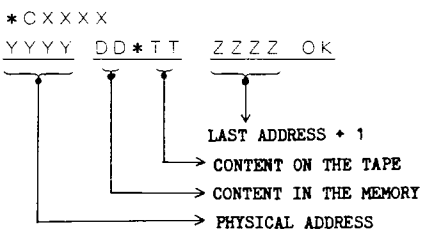


4-4-5 Cn Command

Tape Compare

OPERATION
*CXXXX<CR> YYYY OK □YYYY= LAST ADDRESS + 1

This command compares the content of the memory with the content of object tape at the location address on the tape + XXXX. The input parameter must be a physical address. When there are no errors, the address next to the last address and "OK" are printed. If an error is detected, the message will be as follows:



At POWER ON and RESET, the tape format is set in INTELLEC HEX. The other formats can be set used with the "Xn" command. For aborting the operation, input [JOB] Key on the PKW-3000, which puts the system into the JOB Mode.

4-4-6 Pn Command

Memory Punch-Out

OPERATION
□ FOR PUNCHING OUT THE CONTENT OF THE MEMORY FROM THE START ADDRESS XXXX TO THE END ADDRESS YYYY *PXXXX, YYYY<CR>

This command punches out the content of the specified address range of the memory. The input parameters XXXX and YYYY must be physical addresses. At POWER ON and RESET, the tape format is set in INTELLEC HEX. The other formats can be set by using the "Xn" command.

4-4-7 / Command

OPERATION
*/<CR>

This command changes the Terminal Mode to the Key mode.

4-5 How to Input a Termination Code

When an input parameter value is "0" immediately after the command name, "0" can be omitted by using these code shown below.

$$\underline{*}\ \mathrm{L}\ \left\{\begin{matrix}\langle \mathrm{SP}\rangle \\ \langle\ '\ \rangle \\ \langle\ /\ \rangle\end{matrix}\right\} \quad \text{Input of one of these} = \mathrm{LO}$$

$$\underline{*}\ \mathrm{D}\ \left\{\begin{matrix}\langle \mathrm{SP}\rangle \\ \langle\ ,\ \rangle \\ \langle\ /\ \rangle\end{matrix}\right\} \quad \mathrm{XXXX\ CR} = \mathrm{DO,\ XXXX}$$

Where ( ) denotes "either one of".

Caution: If <CR> or <LF> is input immediately after the command name, it is recognized as a command with the same name without parameter. After parameter or parameters are input, <CR> or <LF> can be used

4-6 Serial Interface

4-6-1 Specifications

° Communication

Half Duplex communication system

° Baud Rate

4800, 2400, 1200, 600, 300, 110 BPS.
The Baud rate can be set by using "JOB 4" command

° Synchronization

Start Stop System

4-6-2 Type of Signals

° TRANSMIT DATA: TXD (Output)

° RECEIVE DATA: RXD (Input)

° REQUEST TO SEND: RTS (Output)

Prohibit to transmit a data to Modem at LOW level.

° CLEAR TO SEND: CTS (Input)

Capable to transmit a data at HIGH level, prohibit to transmit a data at LOW level.

° DATA SET READY: DSR (Input)

Signal for capable to transmit and receive data.

At LOW level, it recognizes to unable transmitting and receiving a data and repeats a Buzzer Sound. It becames the JOB Mode by input [JOB] Key.

° DATA TERMINAL READY: DTR (Output)

Signal for capable to transmit and receive data.
At the POWER-ON, it is always HIGH level.

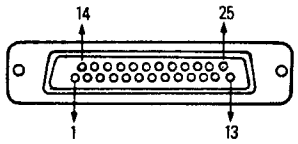
4-6-3 Connecter

° Connecter Standard

DB-25SA-J4 Japan Aviation Electronics Industry Co., Ltd.

° Connecter Terminal Nos. and Signal Name

Pin No.	RS232C
1	FG
2	TXD
3	RXD
4	RTS
5	CTS
6	DSR
7	SG
8 ∫ 19	NC
20	DTR
21 ∫ 25	NC



LIS 4-2 Pin Number List

° Cable Set-up

When cables are set up, the following connecters are to be used.

DB-2SP Japan Aviation Electronics Industry (or equivalent)

DB-C2-J9 Japan Aviation Electronics Industry (or equivalent)

4-6-4 Signal Timing

◦ DATA Timing

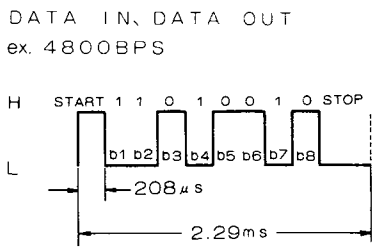


Fig. 4-1 Data Timing Waveform

START bit :1bit
DATA bit :8bit
STOP bit :2bit
1 bit :208μs
1charactor :2.29ms

◦ TXD and CTS signal

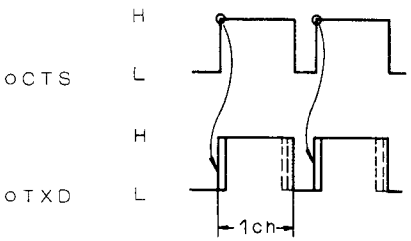


Fig. 4-2 TXD and CTS

When CTS signal is "L", data output is prohibited and the next data output is executed after a rise of CTS signal.

4-6-5 Device Control Character

For the RS-232C-interface, ASCII , functional characters "CC1 (11H)" and "DC3 (13H)" becomes ready to use.

- "P"-command, "R"-command on communicate mode
  Upon "P"-command, data output is generated after recognizing an input of "DC1".
  Upon "R"-command, output of either "DC1" or "DC3" is not generated.

- "P"-command, "R"-command on terminal mode
  Upon "P"-command, "DC1" or "DC3" is not recognized.
  Upon "R"-command, output of "DC1" or "DC3" is generated.

4-6-6 I/O Character

Output characters totally consist of 7 bit (MSB-L) ASCII. Echo back also comprises 7 bit ASCII. Input character may be either 7 bits or 8 bits.

CHAPTER 5 OPERATIONS IN CPU COMMUNICATION MODE

Key operations [J] [F] [ST] on the PKW-3000 outputs the following character codes: ODH (CR), OAH (LF), and 2AH (*). The system then goes into the COMMUNICATION Mode and key input on the PKW-3000 are inhibited. The PKW-3000 waits for the control from the host CPU. The [JOB] Key on the PKW-3000, however, is enabled when some of the command are executed by the host CPU. LED displays are turned off.

5-1 Command and Message

5-1-1 Command

The commands in the COMMUNICATION Mode are as follows:

° E Command

Executes the erase-check of the PROM.

° C Command

Compares the contents of the PROM with the buffer RAM.

° L Command

Loads the content of the PROM into the buffer RAM.

° W Command

Programs the content of the buffer RAM into the PROM.

° A Command

Executes the "E" command and "W" command consecutively and automatically

° B Command

Clears the buffer RAM and checks hardware errors in the buffer RAM.

° O Command

Inverts the content of the buffer RAM

° P Command

Transmits the content of the buffer RAM to the same capacity as the selected PROM

° R Command

Receives the object data from the host CPU and reads the data into the buffer RAM

° G Command

The same as the "G" Command in the TERMINAL Mode

° S Command

The same as the "S" Command in the TERMINAL Mode

° / Command

The same as the "/" Command in the TERMINAL Mode.

The functions, operations and LED displays for those commands are the same as those for the commands in the TERMINAL Mode.

5-1-2 Message

When any of the commands described in 5-1-1 are executed normally, the system outputs the following message and waits for the next command input:

ODH (CR), OAH (LF), and 2AH (*)

When an error is detected during the command execution, the system outputs the following message, and waits for the next command input:

3FH (?), ODH (CR), OAH (LF), and 2AH (*)

An "?" output after the command execution means that an error is detected during the command execution.

5-2 Communications With the PKW-3000

The flowchart of the communication between the host CPU and the PKW-7000 is shown in Fig. 4-1. Details of the dotted boxes are described later.

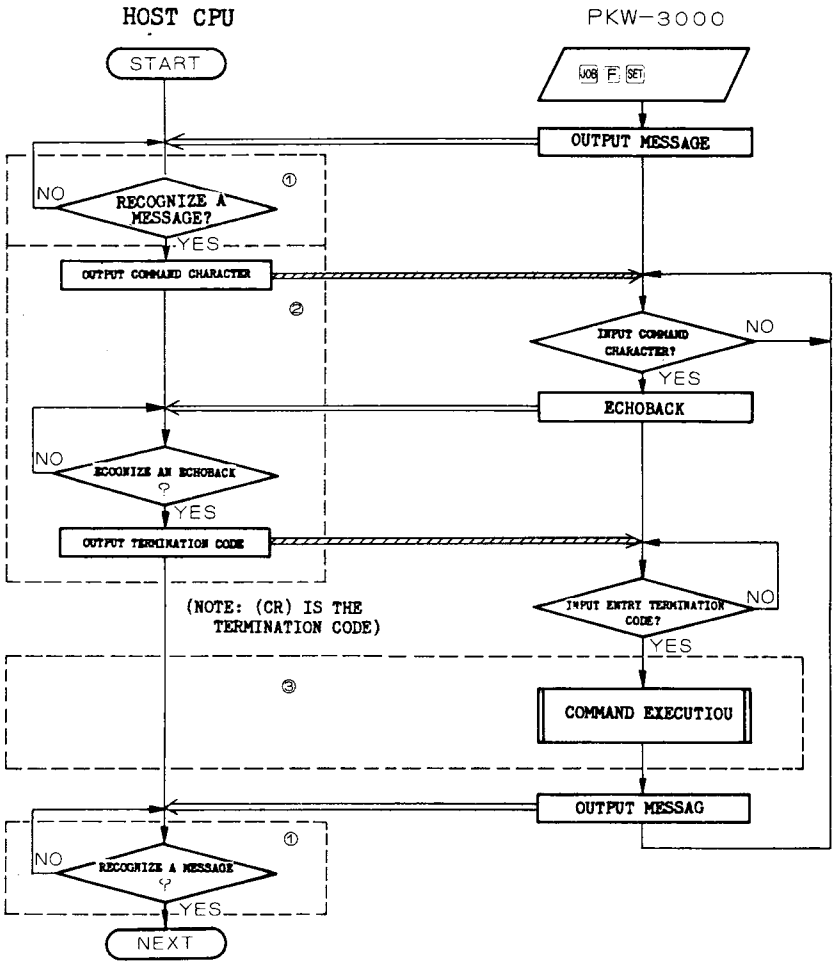


Fig. 5-1

5-2-1 (1) Message Recognition Routine

The flowchart of the message recognition routine in the dotted box (1) on the host CPU side is shown in Fig. 4-2

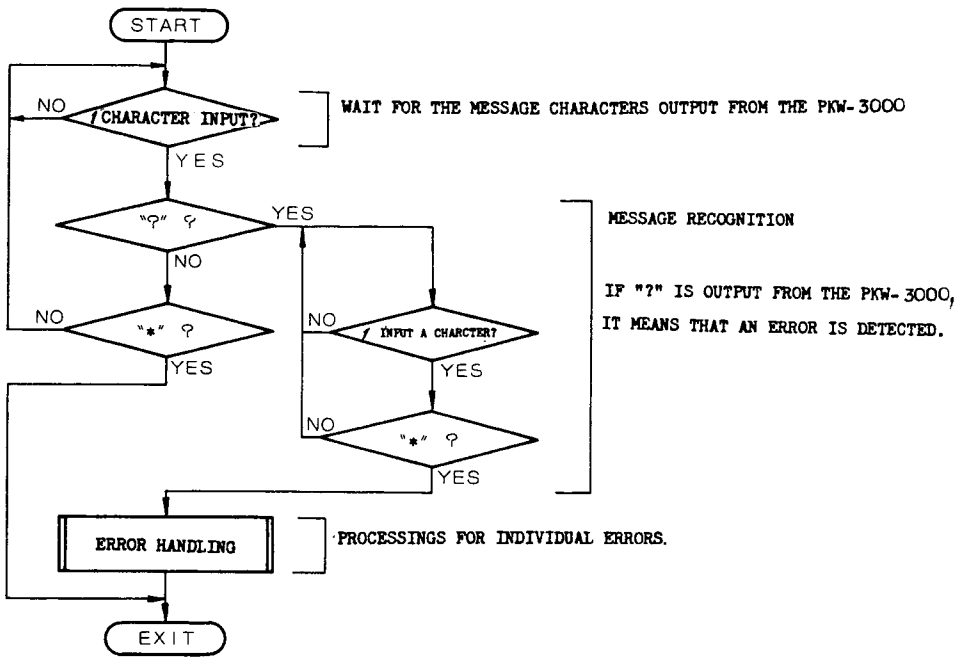


Fig. 5-2 Flowchart of the Message Recognition Routine

An "?" output shows that an error is detected during the command execution, and it is up to the user to cope with that situation.

5-2-2 (2) Command Output Routine

The flowchart of the command output routine in the dotted box (2) on the host CPU side is shown in Fig. 4-3. The command characters are echoed back from the PKW-3000 to the host CPU. The command execution starts when the host CPU outputs the termination code (CR) and the PKW-3000 recognizes the code. The termination code is not echoed back.

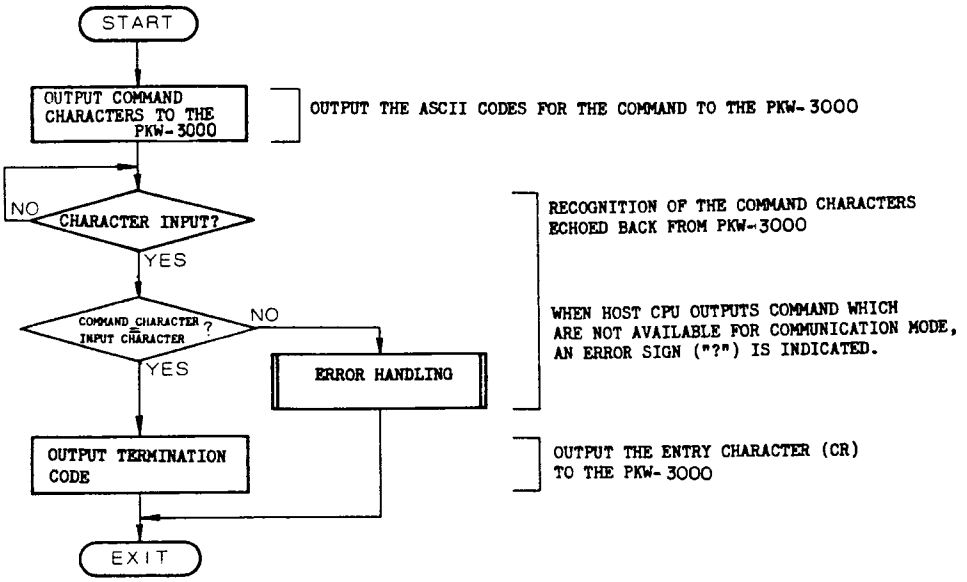


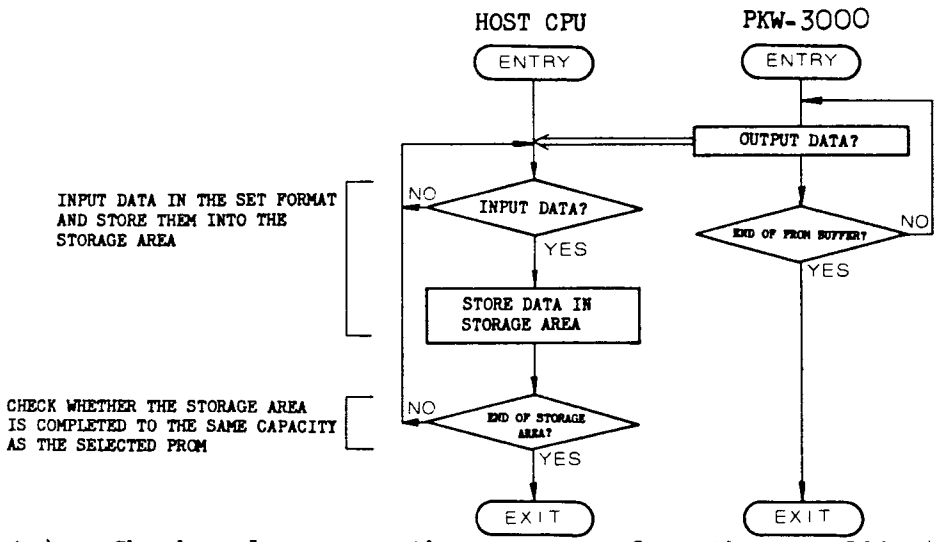
Fig. 5-3 Flowchart of Command Output Routine

5-2-3 (3) Command Execution

Some commands need separate sending and receiving routines.

° Data Receive Routine

It is necessary to use the routines when "P" or "G" command is executed on the PKW-3000.



(Note): Check and process the messages from the PKW-300- even with read error.

Fig. 5-4 Flowchart of Data Reception Routine

° Data Send Routine

It is necessary to use this routine when "R" or "S" Commands are executed on the PKW-3000.

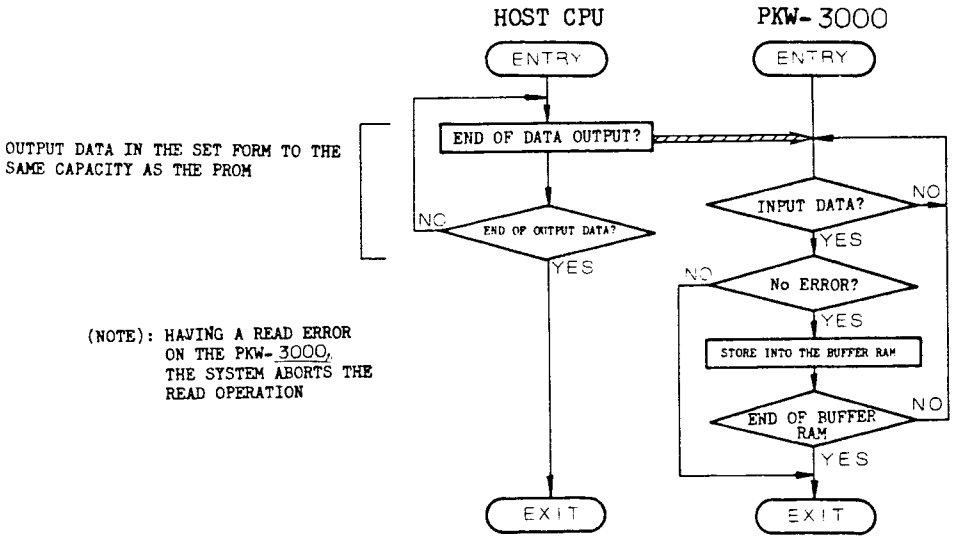


Fig. 5-5 Flowchart of Data Send Routine

CHAPTER 6 BASIC PROCEDURES FOR PROGRAMMING

6-1 Basic Operation

6-1-1 Programming with Data Input Through Manual Key Operations

° 1 [J][A][SET] [JA] (CM)

CLEAR BUFFER RAM

° 2 [J][O][SET] [JO] (CM) [FF] (DT) [ ] (AD)

COMMAND FOR EDITING RAM

° 3 [D][D][SET] [DD] (DT) [1] (AD)

STORE DATA

° 4 [D][D][SET] [DD] (DT) [2] (AD)

⋮

STORE DATA

° 5 [J] [-] (CM)

GO TO THE JOB MODE

° 6 ↕ (E) [E][SET] [E] (CM)

ERASE-CHECK OF PROM

° 7 [W][SET] ↕ (P) [P] (CM)

PROGRAMMING

6-1-2 How to Copy Master PROM

° 1 ↕ (M) [L] [SET] ↕(M) [L] (CM)

LOAD THE PROGRAMMING DATA INTO RAM

° 2 ↕ (E) [E] [SET] [E] (CM)

EXECUTE THE ERASE-CHECK OF THE PROM

° 3 [W] [SET] ↕ <P> [P] (CM)

PROGRAMMING

6-1-3 How to Program by Data Input Through PTR

° 1 [J] [4] [D] [D] [SET] [J4] (CM) [DD] (DT)

SET BAUD RATE

° 2 [J] [6] [D] [D] [SET] [J6] (CM) [DD] (DT)

SET TAPE FORMAT

° 3 [J] [A] [SET] [JA] (CM)

CLEAR BUFFER RAM

° 4 [J] [D] [SET] NO DISPLAY IS GIVEN

READ TAPE

° 5 ↕ (E) [E] [SET] [E] (CM)

EXECUTE THE ERASE-CHECK OF THE PROM

° 6 [W] [SET] ↑ <P> [P] (CM)

PROGRAMMING

(Note): Operations 1 and 2 are not needed for INTELLEC HEX at 4800 baud.

6-1-4 Programming with Data Input Through TTY

° 1 [J] [4] [D] [D] SET [J4] (CM) [DD] (DT)

SET BAUD RATE

° 2 [J] [E] SET [JE] (CM)

GO TO TERMINAL MODE AND INPUT FROM TTY HEREAFTER

° 3 *X6<CR> DD TT<CR>

SET FORMAT

° 4 *B <CR>

CLEAR BUFFER RAM

° 5 *R <CR>

READ TAPE

° 6 *LYYYY<CR> DD TT<CR>

UPDATE THE DATA AT YYYY

° 7 ↓(E) *E<CR>

EXECUTE THE ERASE-CHECK OF THE PROM

° 8 *W<CR> ↑<P>

PROGRAMMING

APPENDICES

APPENDIX 1. COMMAND LIST

KEY MODE	TERMINAL MODE	COMMUNICATION MODE	PARAMETER	FUNCTION OF COMMANDS
E	E	E		ERASE-CHECK OF THE PROM
C	C	C		COMPARE THE PROM WITH THE BUFFER RAM
L	L	L		LOAD PROM DATA INTO THE BUFFER RAM
P	W	W		PROGRAM THE CONTENT OF THE BUFFER RAM INTO THE PROM
-P	A	A		EXECUTE ERASE-CHECK AND PROGRAMMING AUTOMATICALLY AND CONSECUTIVELY
JA	B	B		CHECK AND CLEAR THE BUFFER RAM
JB	O	O		INVERT THE CONTENT OF THE BUFFER RAM
JC	P	P		OUTPUT THE WHOLE CONTENT OF THE BUFFER RAM
JD	R	R		READ DATA INTO THE BUFFER RAM
JE				BRING THE SYSTEM INTO THE TERMINAL MODE
JF				BRING THE SYSTEM INTO THE cpu COMMUNICATION MODE
JO	Ln		Y	EDIT THE CONTENT OF THE BUFFER RAM
J1	Wn		Y	REFERRING TO THE CONTENT OF THE PROM AND SINGLE BYTE PROGRAMMING
J2	Mn		Y	EXECUTES THE BLOCK TRANSMISSION OF DATA
J3	Rn		Y	READ PAPER TAPE INTO THE LOCATION ADDRESS
J4 - J9	Xn		Y	SET VARIOUS CONTROL CODES
J-			Y	TEST PROGRAM
	G	G		OUTPUT THE WHOLE CONTENT OF THE BUFFER RAM IN BINART FORMAT
	S	S		READ DATA INTO THE BUFFER RAM IN BINARY FORMAT
	D			DUMP THE CONTENT OF THE SPECIFIED ADDRESS RANGE
	Dn		Y	DUMP THE WHOLE CONTENT OF THE BUFFER RAM
	Cn		Y	COMPARE THE CONTENT ON THE PAPER TAPE AND IN THE MEMORY
	Pn		Y	PUNCH OUT THE CONTENT OF THE SPECIFIED ADDRESS RANGE
	/	/		PUT THE SYSTEM INTO THE KEY MODE

APPENDIX 2 TAPE FORMATS

The tape formats available on the PKW-3000 are described in detail below

Appendix 2-1 Intel MDS Intellec Hex

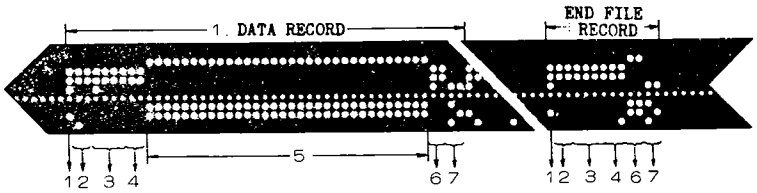


Fig. A2-1 Intellec Hex Format

All the character codes are in ASCII code.

* The codes are as follows:

1: Record Mark

A ":" (colon=3AH) indicates the beginning of a record.

2: Number of Codes

Indicates the number of data (MAX. 16) in the record. 00 means an end file record.

3: Location Address

Indicates the start address of the record.

4: Record Type

Not available at present. Record type is 00 except for the end file record.

5: Data

Indicates the data stored in the memory.

6: Sum Check

A value that produces 00 for a sum of 2 through 6.

7: Carriage Return Line Feed

The read operation ends at 1, and at 2 of the end file record.

Appendix 2-2 Binary Format

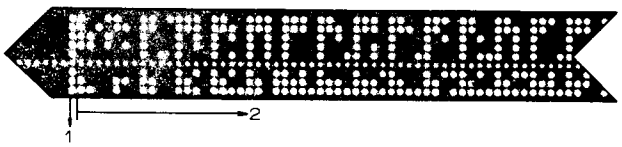


Fig. A2-2 Binary Format

This is a tape format in which each bit of a byte (8 bits) is associated with each of the 8 holes on the tape.

* The codes are as follows:

1: Start Mark

An all-bit punch "FFH" indicates the beginning of the data. The FFH at the beginning is not regarded as data.

2: Data

This is data stored in the memory. 00 through FFH can be used.

No end mark or location address is used.

"J3", "Rn", and "Cn" commands read the tape for 256 bytes and automatically at that point terminate the read operation.

Appendix 2-3 Motorola EXORCiser MIKBUK

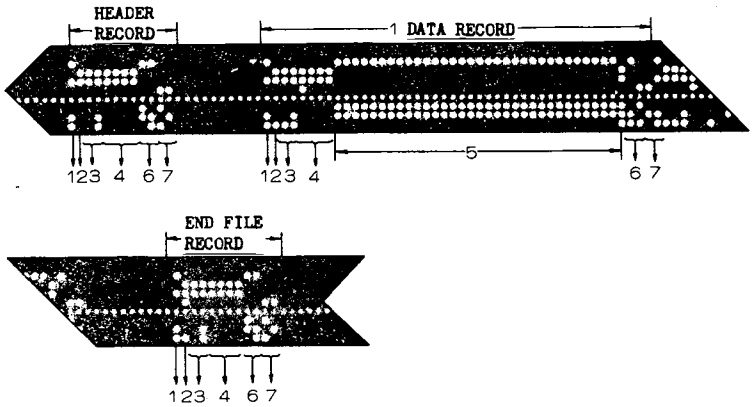


Fig. A2-3 Motorola EXORCise MIKBUG Format

All the character codes are in ASCII code.

*The codes are as follows:

1: Record Mark

"S" (53H) indicates the beginning of a record.

2: Record Type

"O" represents a header record, "1" a data record, and "9" an end file record.

3: Number of Codes

Shows the number of data bytes in a record plus those bytes of 4 and 6.

4: Location Address

Indicates the start address of the record.

5: Data

This is the data stored in the memory.

6: Sum Check

This is a value obtained by summing those bytes of 3 through 5 and inverting the result.

7: Carriage Return Line Feed

The read operation ends at 1, and at 2 of the end record.

Appendix 2-4 ASCII HEX Space

Fig. A2-4 ASCII HEX Space Format

All the character codes are in ASCII code

A space code (20H) is inserted after every single byte of the data.

* The codes are as follows:

1: Start Mark

Indicates the beginning of the data. On the PKW-3000, the start mark is set in "STX" (02), but it can be set in any code by using the "J8" command. 7-bit ASCII must be used, and 00 is understood as not using the start mark. In case of data output, the specified start mark is output as it stands.

2: Data

This is the data stored in the memory

3: Space Code

The space codes can be omitted, or any character codes except the specified start mark and end mark or hexadecimal digits can be used for any number instead.

4: End Mark

Indicates the end of the data. On the PKW-7000 the end mark is set in "ETX" (03), but it can be set in any code by using the "J9" command. A code with MSB-1, however, is understood as not using the end mark. The specified end mark is output as it stands with data output. This tape format does not have the location address. The read operation is terminated upon detection of the end mark.

Appendix 2-5 TEKTRONIX HEXADECIMAL

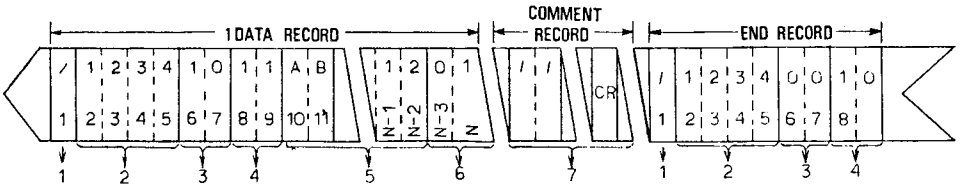


Fig. 2-5 TEKTRONIX HEXADECIMAL

1: Start mark

/ (slash)

2: Address

Frames from 2 to 5 are the address storing 1st data.

3: Byte count

A byte count consists of frames 6 and 7, indicating the number of byte data from the frame 10 to N-2.

4: 1st Check sum

Frames 8 and 9 are 1st check sum which is a summation of hexadecimal numbers from the frame 2 to 7.

1 + 2 + 3 + 4 + 1 + 0 = 11

5: Data record

Frames from 10 to N-2 contain data to be stored in the buffer, RAM. Storing address is added with +1 every time when loading 1 byte data.

6: 2nd Check sum

Frames N-1 and N give 2nd check sum which is a summation of dexadecimal numbers in the frame 10 to N-2. The least significant 8 bits are valid.

A + B + ----- + 1 + 2 = 101

7: Comment record

If / (slash) continues by 2 characters, they are recognized as a comment record. Later, all codes are totally disregarded except for CR (carriage return).

The comment record is reset by CR (carriage return).

8: End record Byte count

End record is recognized at byte count, 0, then data loading stops.

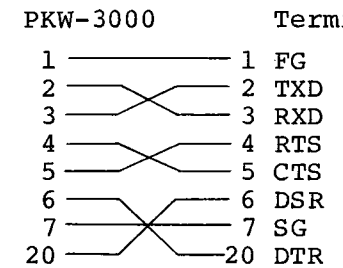
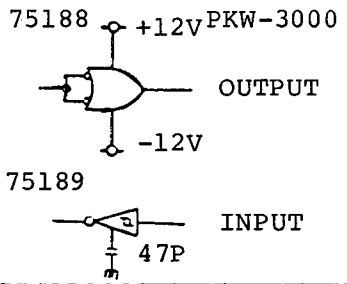
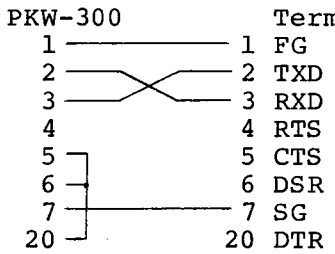
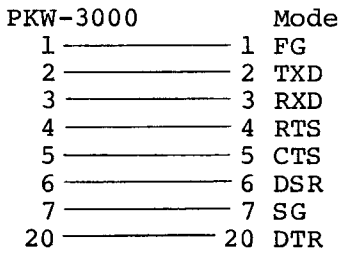
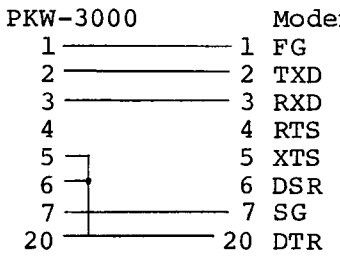
Appendix 3 PIN DESIGNATIONS OF PROMS

	2716	2732	2532
Pin No.	Name	Name	Name
1	A7	A7	A7
2	A6	A6	A6
3	A5	A5	A5
4	A4	A4	A4
5	A3	A3	A3
6	A2	A2	A2
7	A1	A1	A1
8	A0	A0	A0
9	D0	D0	D0
10	D1	D1	D1
11	D2	D2	D2
12	GND	GND	GND
13	D3	D3	D3
14	D4	D4	D4
15	D5	D5	D5
16	D6	D6	D6
17	D7	D7	D7
18	$\overline{CE}$/PGM	CE	A11
19	A10	B10	A10
20	$\overline{OE}$	$\overline{OE}$/VPP	PD/$\overline{PGN}$
21	VPP	A11	VPP
22	A9	A9	A9
23	A8	A8	A8
24	VCC	VCC	VCC

	2764	2564
Pin No.	Name	Name
1	VPP	VPP
2	A12	CS1
3	A7	A7
4	A6	A6
5	A5	A5
6	A4	A4
7	A3	A3
8	A2	A2
9	A1	A1
10	A0	A0
11	D0	D0
12	D1	D1
13	D2	D2
14	GND	GND
15	D3	D3
16	D4	D4
17	D5	D5
18	D6	D6
19	D7	D7
20	CE	A11
21	A10	A10
22	$\overline{OE}$	PD/$\overline{PG}$
23	A11	A12
24	A9	A9
25	A8	A8
26	NC	VCC
27	$\overline{PGM}$	$\overline{CS2}$
28	VCC	VCC

(Note): 2732A is a 2732 family. (2732A, VPP = 21V)
48016 is a 2716 family.

Appendix 4. EXAMPLE OF RS232C INTERFACE CONNECTION

Type	Connection	Remark
RS232C Terminal Handshake YES		
RS232C Terminal Handshake NO		
RS232C Modem Handshake YES		
RS232C Modem Handshake YES		

AVAL