

MULTI DISPLAY MT-100

ALARM DISPLAY MT-150

INSTRUCTION MANUAL

Contents

Introduction	1
System Configuration	2
Part Names	3
Operating Procedures	5

SCREEN LAYOUT

Laying Out Screen	6
Handwriting Console Functions & Connection to MT-100/150	7
Inputting Data (EDIT mode)	10
Data Input - Handwriting	12
Notes on Writing in Characters	13
Setting Area for Numeric Data Insertion	14
Alarm Window (MT-150 Only)	15
Registering External Characters	16
Characters/Area	18
Setting Switch Window	19
Setting Screen Functions	20
PAGING	22
OVERLAPPING Function	23
Copying and Canceling Screen Layout	24
Using Memory Card	26

CONNECTION & OPERATION

Setting Operating Conditions	29
Description of Terminals & Connection Diagram	31
Control in PARALLEL Mode	32
Calling Page	33
Inserting Numeric Data (BCD Input)	34
Displaying Percentage Representation Bar	36
Inserting Alarm Messages (BCD Input)	37
Histry of Displayed Alarm Messages and Its Usage	38
Function Switches	39
Processing Time for Inserted Numeric Data	40
Retrieving Desired File on Memory Card to MT-100/150 (During Operation)	41
Control in SERIAL Mode	43
Communication Command Table (1)	45
Communication Command Table (2)	46

SPECIFICATIONS & DATA

Specifications	48
Input Equipment & Precautions on Output Wiring	50
Hints on Correct Use	51
Stroke Order	53
Troubleshooting	54
Message List	56

Introduction

Thank you for selecting the KEYENCE MT series.

This instruction manual describes detailed wiring and operating procedures for the MT-100 and MT-150. Please read this manual carefully to get the best from your MT-100 or MT-150.

Features

- **Serving as man-machine interface at the production site**

- **Easy data-editing using handwriting console**

Data entry using handwriting console MT-1 makes it easy to edit data on the screen. After installing the main unit, you can easily make modification or addition to the screen data.

- **Bright and clear screen**

The MT-100 employs a highly bright CFL (cold-cathode tube) for the back light, ensuring bright and clear display.

- **3-color screen**

The MT-150 employs colored LED (light-emitting diode) for the back light, allowing you to view the state of equipment in real time through change in color.

- **Storing up to 500-page screen data**

Up to 500-page (6 file max.) screen data can be stored using the large capacity memory card. The data stored on the memory card can be copied onto multiple MT-100/150 screens.

- **Displaying production information**

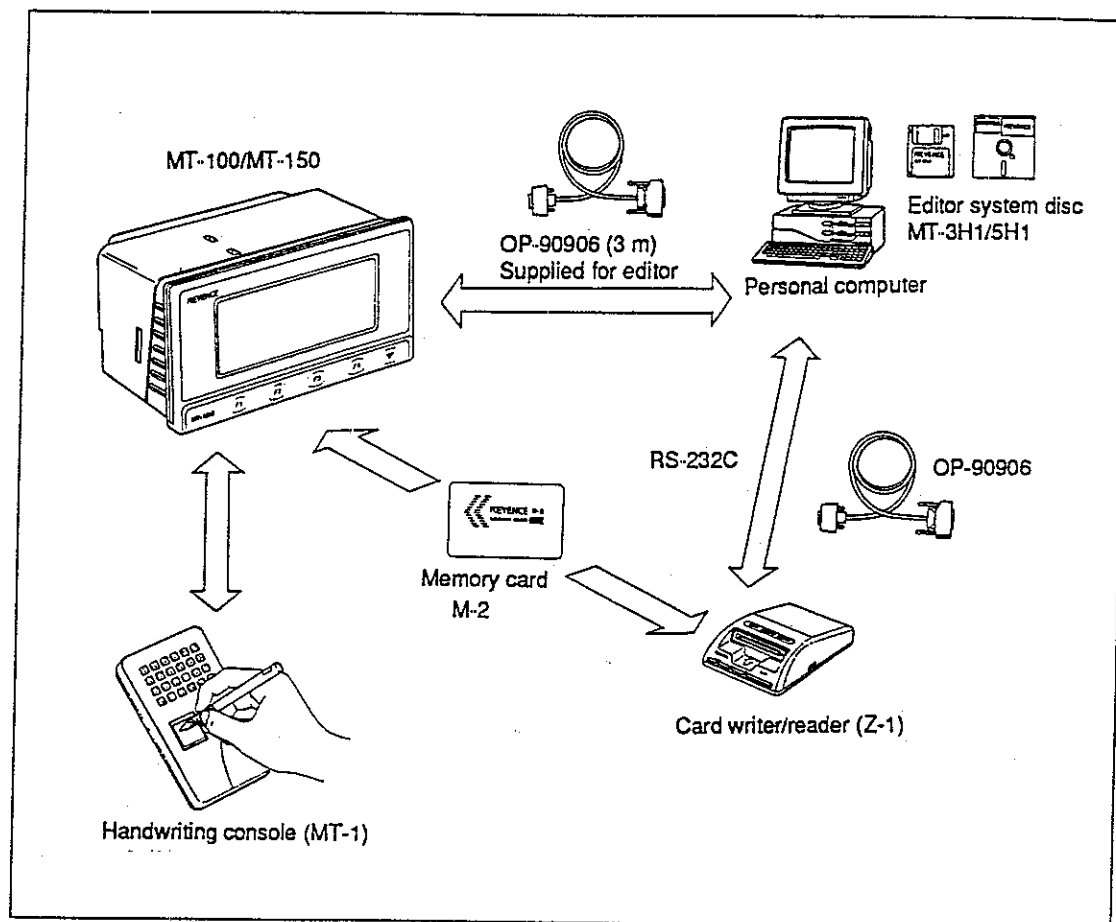
Data on production information can be displayed using numerals or bar (percentage representation), allowing you to view production state in real time.

- **Displaying state of equipment**

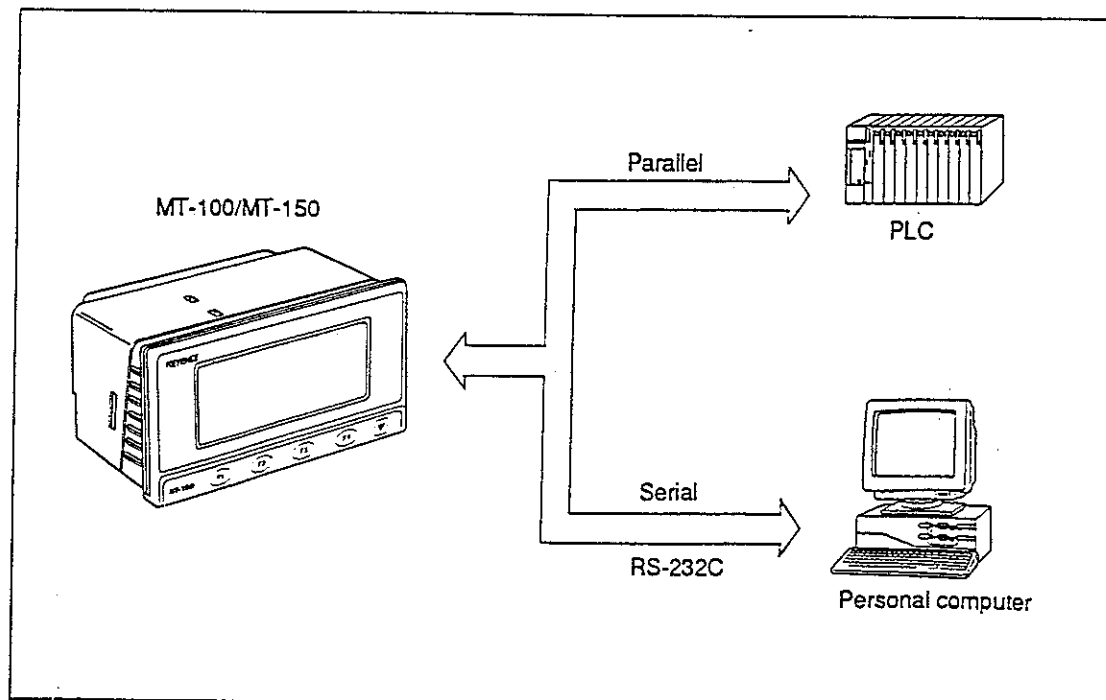
The MT-150 is equipped with an alarm-message insertion function. Also the state of equipment can be displayed in real time.

System Configuration

Editing data on screen



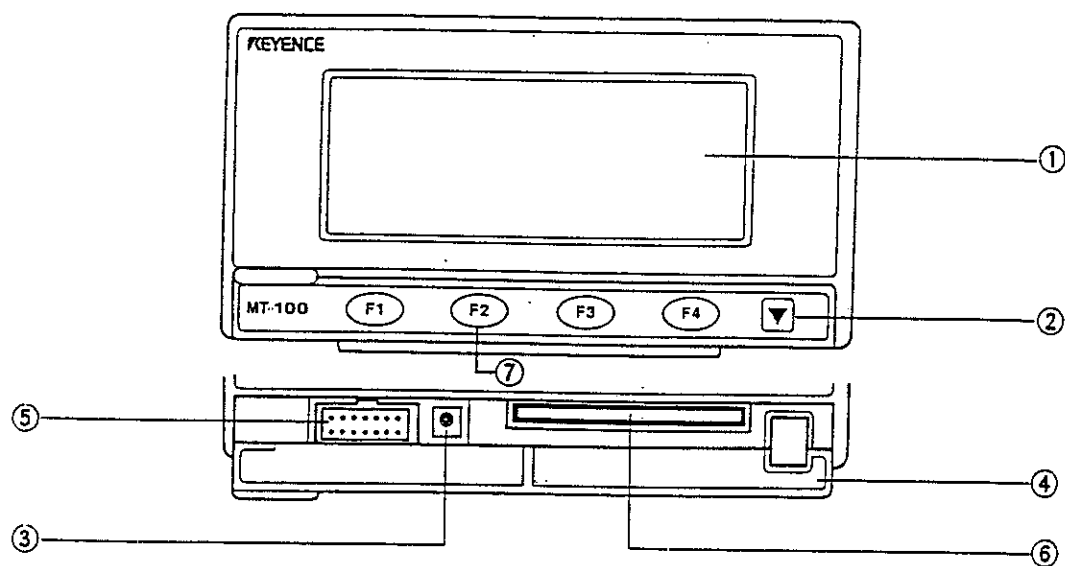
Operation



Part Names

Main unit

The MT-100 and MT-150 are nearly identical in construction.



① **Display Panel**

Displays and edits messages on the screen.

② **Next Page Key**

Allows the next page to be displayed.

③ **Contrast Adjustment Trimmer**

Adjusts the display panel liquid crystal to an optimal contrast.

④ **Front Cover**

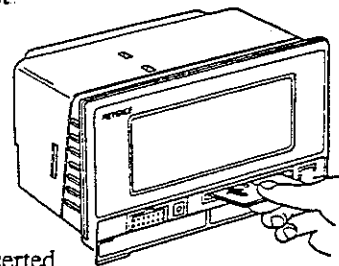
⑤ **Handwriting Console Connector Port**

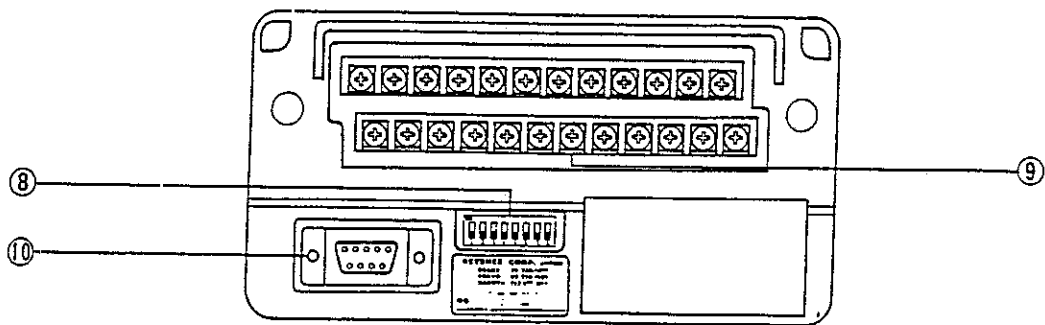
Connects the unit with the handwriting console.

⑥ **Memory Card Insertion Slot**

Allows a memory card for storing created messages to be inserted.

⑦ **Function Switches**





⑧ **Mode Change Dip Switches**

(The MT-150 is not equipped with these switches.)
Switches operation modes.

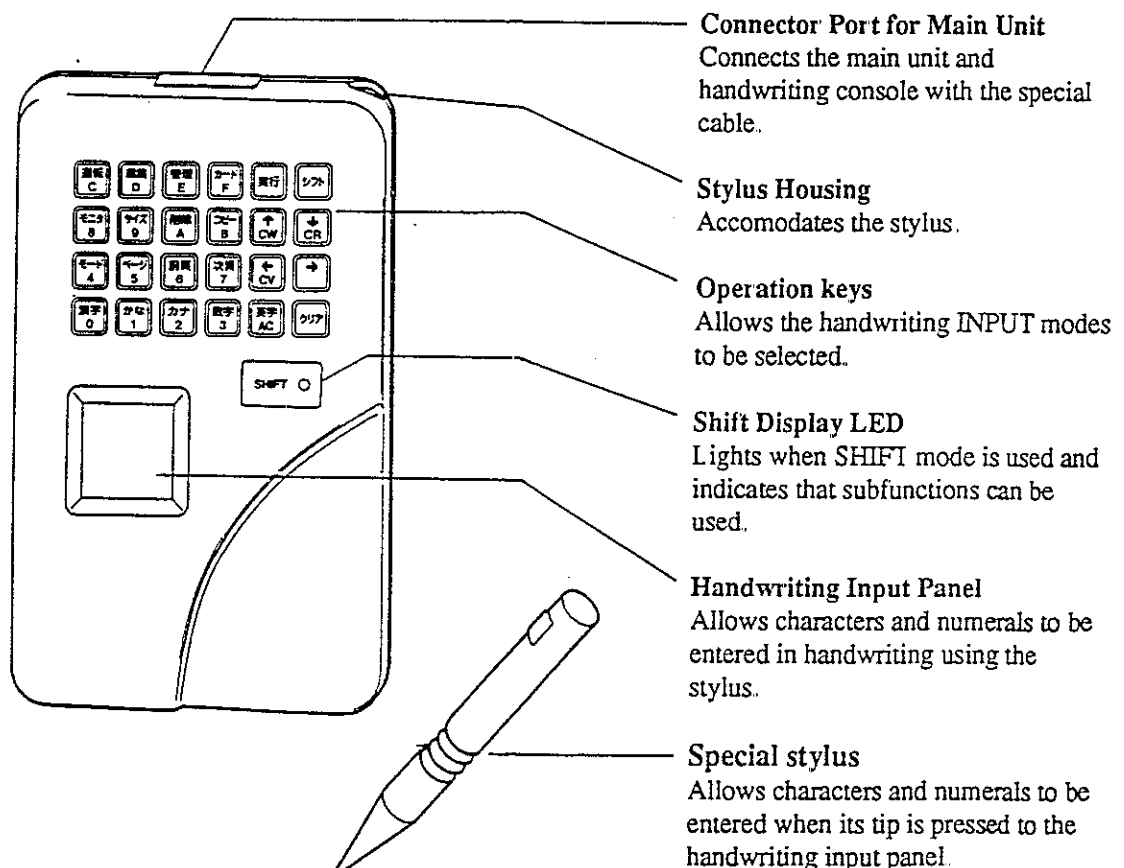
⑨ **I/O Terminal Board**

Allows connection for parallel input, READY output, alarm output, and power supply.

⑩ **RS-232C Connector Port**

Serial input/output connector for communication with personal computer. (RS-232C compatible except connector contour)

Handwriting console (MT-1)



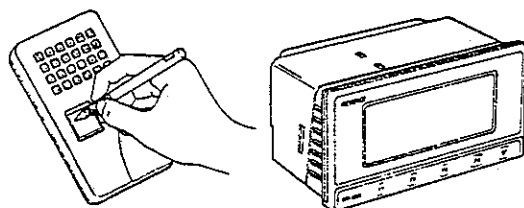
⇒ Refer to "Handwriting Console Functions & Connection to MT-100/150" (p.7) for the operation keys.

Operating Procedures

1. Laying out a screen

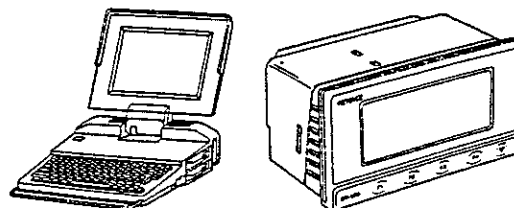
Using handwriting console

⇒ See p.7.



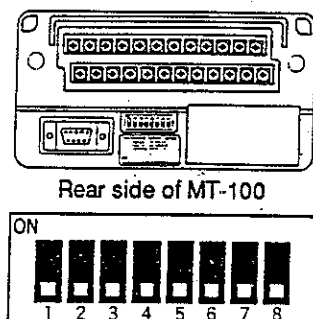
Using personal computer and special editor

⇒ See p.6.

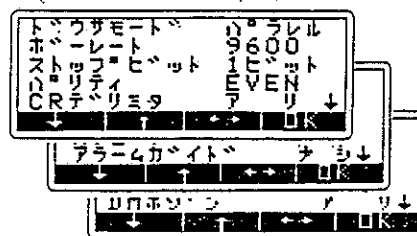


2. Setting input/output forms into/from main unit

MT-100



MT-150



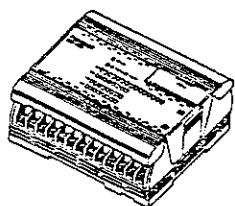
Perform setting using the DIP switches to match the MT-100 with the external equipment to be connected.

⇒ See p.29.

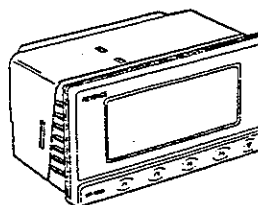
Perform setting using the memory switches (displayed on the screen) to match the MT-150 with the external equipment to be connected.

⇒ See p.29.

3. Connecting MT-100/150 to external equipment (PLC, etc.)



PLC
(KV series)



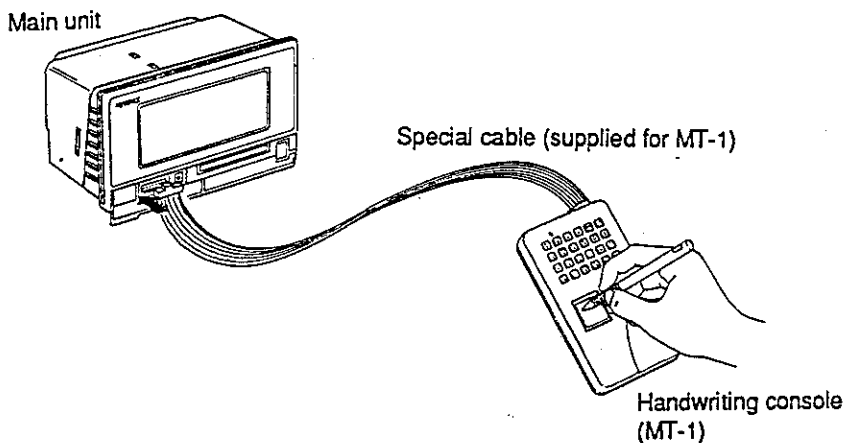
MT-100, MT-150
⇒ See p.31.

SCREEN LAYOUT

Laying Out Screen

Using handwriting console

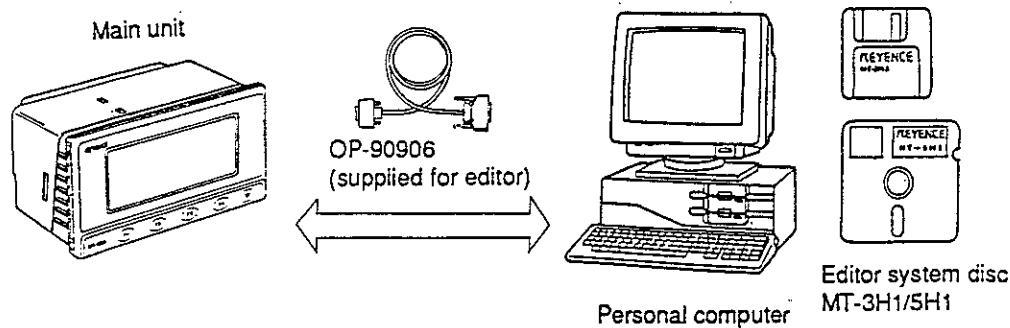
Connect the handwriting console to the main unit using the special cable, then start to lay out a screen.
(When connecting the handwriting console, be sure to set the MT-100 to the PARALLEL mode.
⇒ See p.29.)



Note: Before connecting, make sure that the projected sides of the connector face up (as shown above).

Using editor

Connect the personal computer to the main unit using the special cable, then start to lay out a screen using the editor.
(When connecting the personal computer, be sure to set the MT-100 to the SERIAL mode.
⇒ See p.29.)



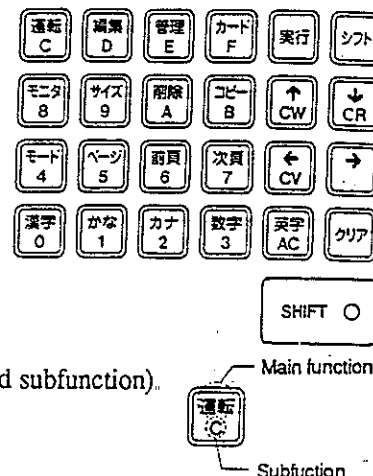
Procedures for laying out a screen using the editor are described in "MT-3H1/5H1 Instruction Manual".

Procedures for laying out a screen using the handwriting console will be described on the following pages.

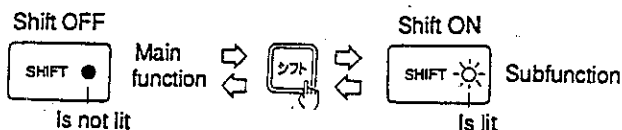
Handwriting Console Functions & Connection to MT-100/150

Functions of handwriting console MT-1

Entering and deleting characters
Viewing screens
Copying and deleting screen data
Setting switch windows
Setting screen functions
Data storing, retrieving and verification using memory card
Setting memory switches (only with MT-150)



- Keys with double-staged characters have two functions (main and subfunction).
- To switch the main and subfunctions, press SHIFT.

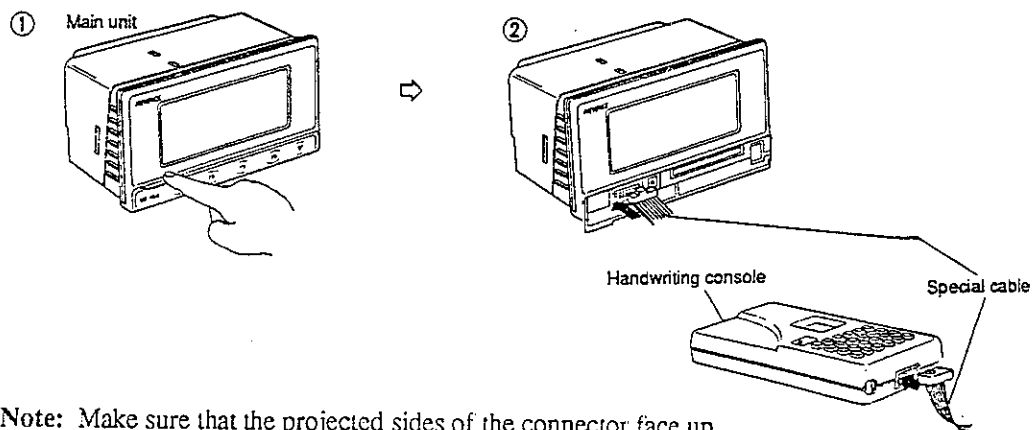


Connecting handwriting console to MT-100/150

Be sure to set the MT-100 to the PARALLEL mode before connecting it with the handwriting console (not required with the MT-150).

⇒ See p.29.

1. Open the front cover.
2. Connect the handwriting console to the main unit using the special cable.



Note: Make sure that the projected sides of the connector face up.

Key	Main function		Subfunction (When SHIFT mode is used)	
<div>シフト</div>	SHIFT key	Toggles main and subfunctions.		
<div>実行</div>	ENTER key	Allows DELETE, COPY, CW, CR and CV key functions to be executed and also allows numeral value, code, and file name to be entered.		
<div>削除 A</div>	DELETE key	Allows characters, entire sections of text, file to be deleted.	Hexadecimal code entry key	Allows hexadecimal code A to be entered.
<div>コピー B</div>	COPY key	Allows text to be copied by page in CONTROL mode		Allows hexadecimal code B to be entered.
<div>運転 C</div>	OPERATION key	Sets OPERATION mode. Allows numeric data from external equipment to be displayed on the desired page		Allows hexadecimal code C to be entered.
<div>編集 D</div>	EDIT key	Sets EDIT mode. Allows data to be input for editing screen layout and display functions (attributes) to be set.		Allows hexadecimal code D to be entered.
<div>管理 E</div>	CONTROL key	Sets CONTROL mode. Allows data on an entire screen to be copied or deleted or data on all pages to be deleted.		Allows hexadecimal code E to be entered.
<div>カード F</div>	CARD key	Sets CARD mode. Allows a file to be written to or read from the memory card. Allows a file in the main unit and on the memory card to be compared, and a file on the memory card to be deleted. Also, allows all files on the memory card to be deleted.		Allows hexadecimal code F to be entered.
<div>クリア</div>	CLEAR key	Cancels the DELETE, COPY, CW, CR, and CV key functions and also allows the entry of numeral and code file names.		
<div>英字 AC</div>	ALPHABET key	Allows English characters to be recognized during handwriting input.	ALL CLEAR key	Allows all text on screen, all pages in the main unit, all files in the card to be cleared.
<div>漢字 0</div>	KANJI key	Allows kanji characters to be recognized during handwriting input	Numeric input key	Allows numeric 0 to be entered.
<div>かな 1</div>	HIRAGANA key	Allows hiragana characters to be recognized during handwriting input.		Allows numeric 1 to be entered.
<div>カナ 2</div>	KATAKANA key	Allows katakana characters to be recognized during handwriting input.		Allows numeric 2 to be entered.
<div>数字 3</div>	NUMERAL key	Allows numeric characters and codes to be recognized during handwriting input.		Allows numeric 3 to be entered.
<div>モード 4</div>	CHARACTER INPUT MODE key	Allows character input modes (handwriting, JIS code, ASCII code, numerical data input area designation) to be switched.		Allows numeric 4 to be entered.

Key	Main function		Subfunction (When SHIFT mode is used)	
	PAGE key	Allows a specified page to be called in EDIT or MONITOR mode.	Numeric input key	Allows numeric 5 to be entered.
	PREVIOUS PAGE key	Allows the previous page to be displayed in EDIT or MONITOR mode.		Allows numeric 6 to be entered.
	NEXT PAGE key	Allows the next page to be displayed in EDIT or MONITOR mode.		Allows numeric 7 to be entered.
	MONITOR key	Sets MONITOR mode. Allows the laid-out screen to be viewed on screen.		Allows numeric 8 to be entered.
	CURSOR SIZE key	Allows the cursor size to be changed.		Allows numeric 9 to be entered.
	ARROW keys	Moves the cursor up.	Card write key	Allows a file to be written from the main unit to the card.
		Moves the cursor down.	Card read key	Allows a file to be read from a card to the main memory.
		Moves the cursor to the left.	Compare key	Compares a file in the main unit and on the memory card to be compared for identicalness.
		Moves the cursor to the right.		

Inputting Data (EDIT mode)

1. Calling up the EDIT mode



Press the "EDIT key"

2. Selecting page (Selects on which page characters are to be entered.)

	<div> Abbreviation for SHIFT PAGE Current page number (example) </div>
<p>Example P.17</p>	<p>If you enter an incorrect page number, press the orange and reenter the correct page number.</p>

When "999" is entered as the page No., the empty page having the lowest page No. will automatically be searched for and displayed.

Pressing automatically activates the shift function, and the characters displayed on the lower section of the keys may then be input.

* If data is input on page 254, that screen will be displayed for several seconds after the power is turned ON.

To call the next page or the previous page.



1. Next page

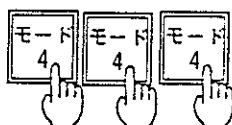


2. Previous page

* Note that the system must be in either EDIT or MONITOR mode

3. Selecting INPUT mode

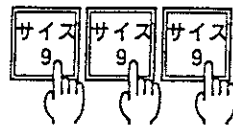
Press according to the desired INPUT mode.



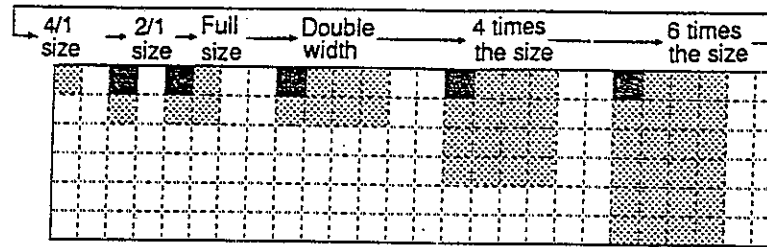
H: Handwriting
Characters can be input by handwriting

D: Specifying numeric input area
Specifies an area for insertion of numeric data input from external.

4. Magnifying the Cursor (to set the character size)



Pressing changes the character size. Six different sizes are available, but Hiragana and kanji cannot be input when either quarter or half size is specified for the character size.



■ Reference position for each character size.

Number of characters able to be input for each size*

Size	1/4 size	1/2 size	Full size	Double width	4 times the size	6 times the size
Horizontal	16	6	8	4	4	4
Vertical	6	3	3	3	1	1
Total	52	48	24	12	4	4

* Note that the actual number of characters that can be input depends on the cursor position and the frequency of changing character size.

Make sure that the number of characters entered does not exceed the number given on the "Total" line of the table.

5. Moving the cursor (to specify a position for input)

To the right



To the left



Up

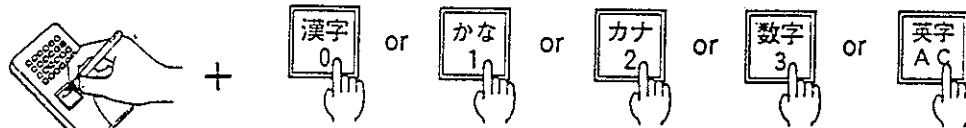


Down



* The cursor moves according to the arrow key.

6. Inputting data (handwriting)



Press the key according to the INPUT mode.

7. Checking screen layout



The system changes to the monitor screen when data is registered.

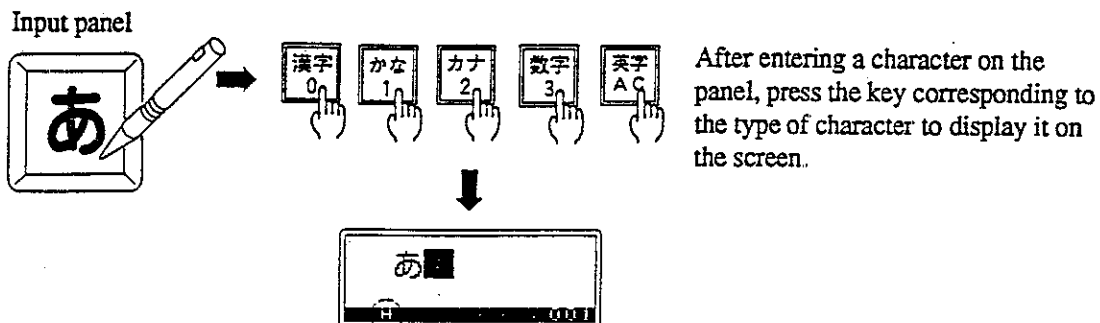
Data Input - Handwriting

With the handwriting console MT-1, characters and numerals can be entered in handwriting.

■ Procedures

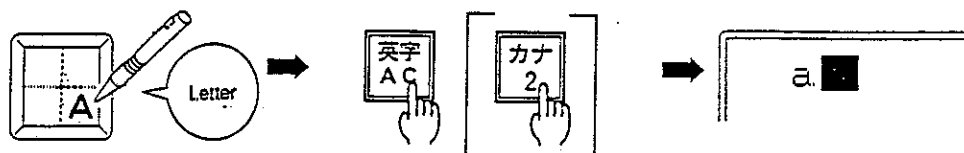
Enter characters using the procedure described in "Inputting Data" (p.10). Set the INPUT mode to "H".

To enter a character or numeral on the handwriting input panel, use the special stylus.



Displaying a letter in lowercase

To display a letter in lowercase on the screen, enter it in uppercase in the lower right quarter of the input panel.



Note: Be sure to enter a letter in uppercase on the input panel.

Correcting an entered character

- To cancel a character after it has been entered:



- If the character entered is recognized incorrectly and displayed as a different character:

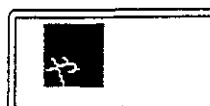


If a character is entered incorrectly, an alarm will sound three times. If this happens, reenter the character.

Notes on Writing in Characters

Characters cannot be entered when:

- The character size is different from the cursor size.



Change the cursor size, then enter the character.

- Uneven pressure is applied to the handwriting input panel. (This may cause the character to be incorrectly recognized.)

The maximum number of characters that can be input on each screen is shown in the following table. When laying out a screen, refer to the numbers given here.

1/4 size	1/2 size	Full size	Double width	4 times the size	6 times the size
52 characters	48 characters	24 characters	12 characters	4 characters	4 characters

* The number of characters that can be input onto each screen varies according to the arrangement of data on the screen.

Enter a character in the specified area of the input panel in as large strokes as possible. If the pressure on the panel is not uniform, the character may be recognized incorrectly.

Be sure to use the special stylus to enter characters.

Using anything other than the stylus may cause damage to the panel surface.

Setting Area for Numeric Data Insertion

In this mode, numeric data (such as data on production information) sent from external equipment using BCD signals can be inserted in a preset area.

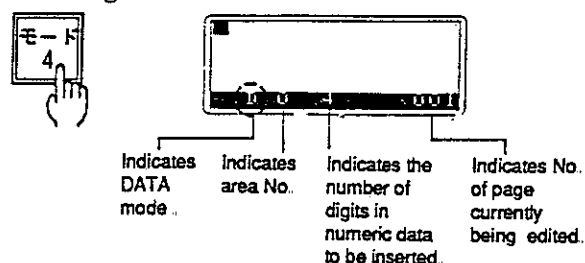
Also, numeric data can be displayed in a percentage graph in this area.

⇒ See pp 34-36.

■ Procedure

Set area using the procedure described in "Inputting Data" (p.10).

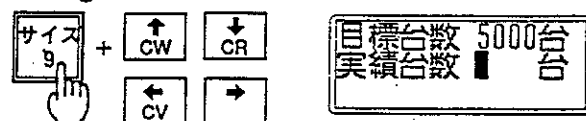
1. Selecting the DATA mode



Area No.

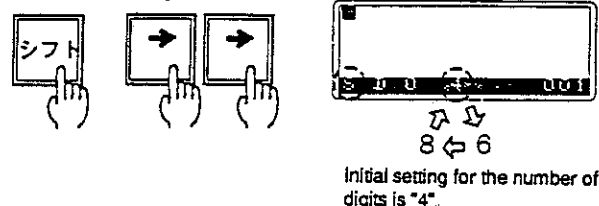
To insert numeric data from external equipment, an insertion area must be called up before data can be input in it. Therefore, each area must be assigned a No. (0 to 9). Initial area No. setting is "0".

2. Setting insertion area.



Move the cursor to the left side of the insertion area using and arrow keys (, , , and). For example, if the numeric data to be inserted consists of 4 digits, space for 3 digits is required in addition to the space where the cursor is currently placed.

3. Selecting the number of digits (4, 6, or 8 digits)

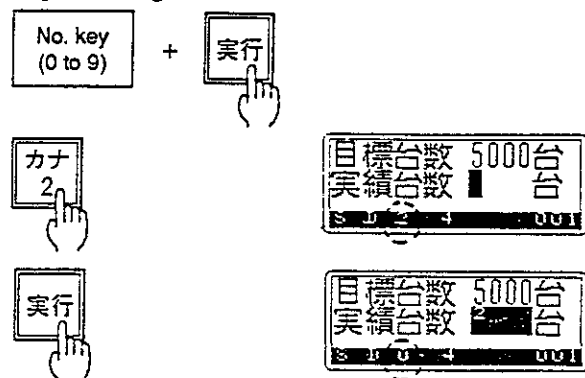


Note:

To confirm that you are in SHIFT mode, check whether "S" is displayed on the bottom left corner of the screen.

4. Setting insertion area No. (0 to 9)

Example: Setting area No. 2



You must be in SHIFT mode. (See step 3.)

Area No. displayed on the bottom of the screen will change to "2".

Space for 4 digits is highlighted and the cursor moves to the right. The area No. displayed on the bottom of the screen will return to "0".

Note: Insertion areas cannot be assigned the same No. on one screen.

When setting is complete, press SHIFT to release this key and cancel the SHIFT mode.

⇒ For insertion of numeric data during operation, see "Inserting Numeric Data" in the section "CONNECTION & OPERATION" (p.34)

Alarm Window (MT-150 Only)

Set the alarm window and register alarm messages as follows (This function is available only with the MT-150.):

■ Procedures

1. Setting the alarm window

In MONITOR or OPERATION mode

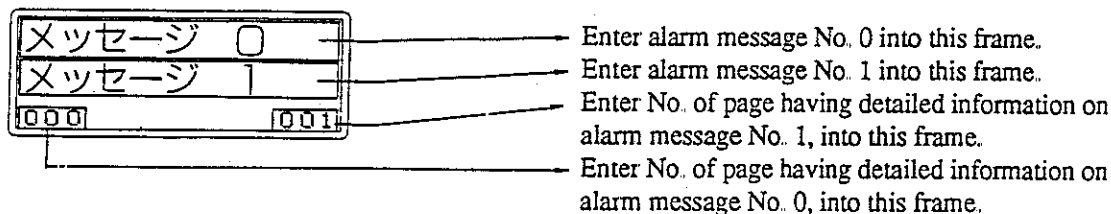


Set "ALARM WINDOW" to "O" on the screen function menu screen. Enter the MONITOR or OPERATION mode to check whether the alarm window is set properly. When it is set properly, one-line (full-size character width) display on the screen is highlighted as shown above (fixed).

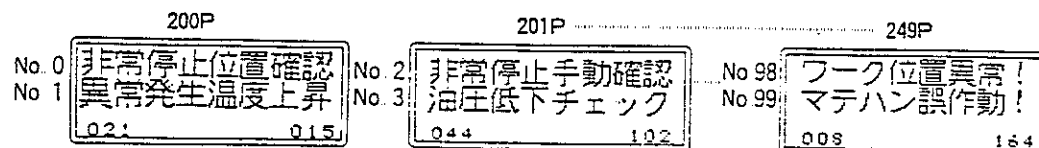
2. Registering alarm messages onto registration pages (pages 200 to 249).

Register alarm messages to be inserted into the alarm window and No. of page having detailed information on each alarm message. (The registration can be made using the same procedures as those for laying out a screen.)

Example: Registering alarm messages onto page 200 (The frame lines shown in the figure are not actually displayed.)



- Character sizes that can be used to enter alarm messages are quarter, half, full, and double width.
- Enter No. of page having detailed information on each alarm message, into the specified position (shown above) using 3-digit numeral.
- Enter proper information on each alarm message onto the specified-page screen beforehand.
⇒ See p.38.
- Up to 100 alarm messages (No. 0 to 99) can be registered.



⇒ For insertion of the alarm message during operation, see "Inserting Alarm Messages (BCD input)" of section "CONNECTION & OPERATION" (p.37).

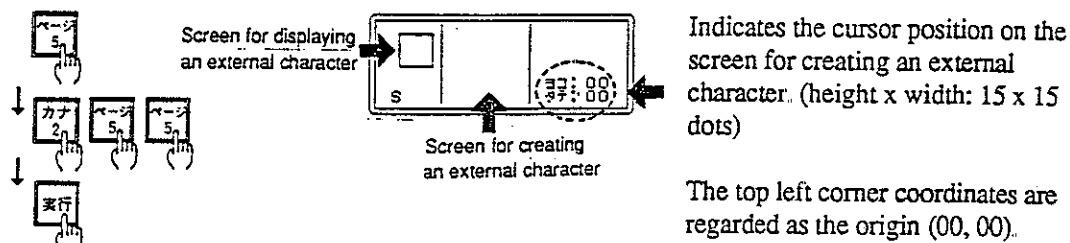
Registering External Characters

Up to 14 illustrations or symbols can be created and registered as external characters on a specified page.

■ Procedure

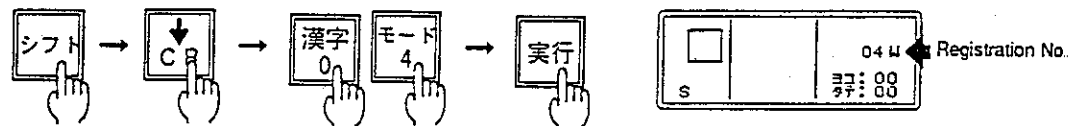
Create and register an illustration or symbol using the procedure described in "Inputting Data" (p.10).

1. Calling up the page for creating and registering an external character (page 255)



2. Selecting registration No. (1 to 14)

Example: Selecting No. 4



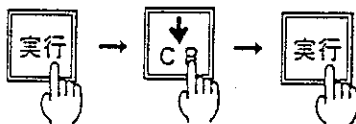
3. Creating an external character (by highlighting dots)

Move the cursor to the desired position using the arrow keys, then highlight the dots using **実行**.

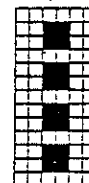
• To create a vertical line



Repeat as many times as desired.



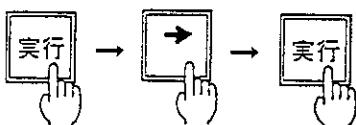
Part of screen for creating external character



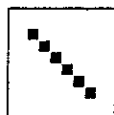
• To create a horizontal line



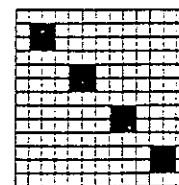
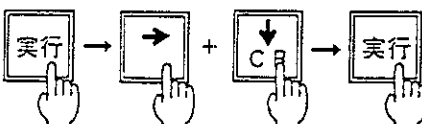
Repeat as many times as desired.




• To create a slanted line



Repeat as many times as desired.

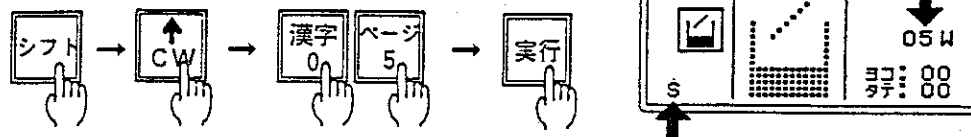




If you make a mistake in highlighting dots, press  again. The dots will no longer be highlighted.

By combining vertical, horizontal and slanted lines as required, you can create a full-size external character on the creating screen. (width x height: 35 x 32 mm)

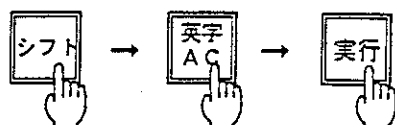
4. Registering the created external character

Example: Registering the character as No. 5



* To register the character as No. 4, press, in order, SHIFT, , and .

■ Clearing external characters on the creating screen



Press the keys as shown on the left.
The character on the screen will be cleared.

* The external characters that have been registered are not cleared.

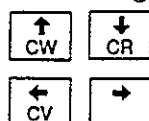
Characters/Area

Deleting a character

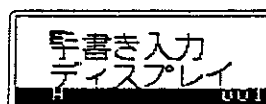
■ Procedures

Follow steps 1 to 5 described in "Inputting Data" (p.10), then proceed as follows:

1. Positioning cursor



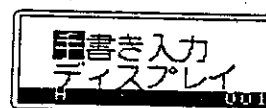
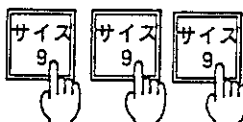
Move the cursor to the upper left of the character to be deleted.



Change the cursor size to quarter and move it to the upper left of the character to be deleted.

The cursor will move.

2. Specifying the cursor size.



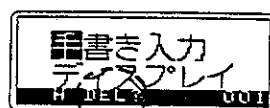
Magnify the cursor size according to the character to be deleted.

The cursor will magnify.

Note:

The character cannot be deleted if the cursor size is different from the character size.

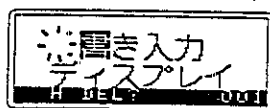
3. Selecting the DELETE



Select the DELETE mode.

"DEL?" will be displayed on the bottom of the screen to confirm whether the character should be deleted.

4. Deleting the character

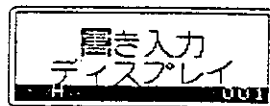


Delete the character.

The character highlighted by the cursor will be deleted and the cursor moves to the right.

Note: Press to delete.

5. Cancel the DELETE mode

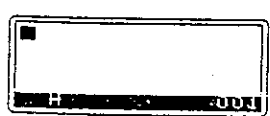
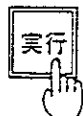
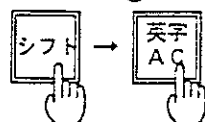


Cancel the DELETE mode.

"DEL?" shown on the bottom of the screen disappears, indicating that the DELETE mode has been canceled.

Press .

■ Deleting all characters



"ACL?" will be displayed on the bottom of the screen to confirm whether all characters should be deleted.

All characters on the screen are deleted. Also, the SHIFT mode is canceled.

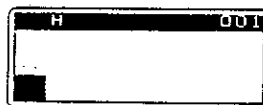
Setting Switch Window

Enter function switch names to be displayed in the switch window on each page as follows. Set the switch window on the screen for displaying an alarm message or instructions for working procedures, as required.

■ Procedures

Perform setting using the procedures described in "Inputting Data" (p.10) as follows:

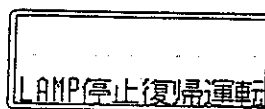
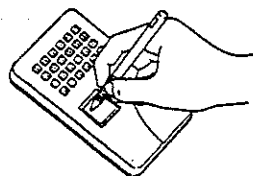
1. Moving the cursor to the bottom left corner.



Set the cursor size to quarter-, half-, or full-size.

(The column for displaying the INPUT mode and current page is moved to the top of the screen.)

2. Entering switch names.



Example: Enter appropriate size characters according to the selected cursor size.

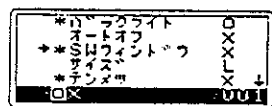
3. Setting the screen functions.



With the MT-100, set "SW WINDOW" and "SIZE" on the screen function menu screen as follows:

SW WINDOW: O (ON)

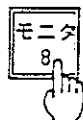
SIZE { Half- or full-size character: L
Quarter-size character: S



With the MT-150, set as follows:

SW WINDOW: S or L (ON), X (OFF)

4. Checking the laid-out screen.



When display is highlighted:




* Enter the OPERATION mode to check whether the switch window is set properly.

⇒ For details, see 'Function Switches' of section "CONNECTION & OPERATION" (p.39)

Setting Screen Functions

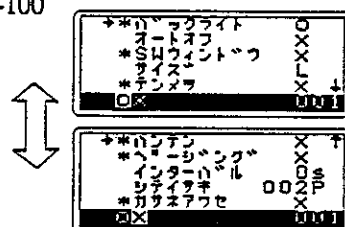
Set the screen functions for each page (000 to 253) of the screens laid out using the procedures described in the preceding pages.

Screen function menu screen

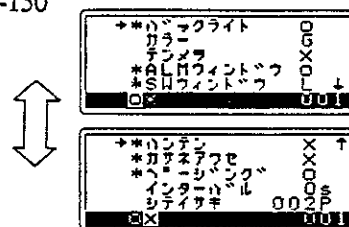
Press  in the EDIT mode to display the screen function menu screen.





Example: page 1

MT-100



MT-150



- Set 10 functions (displayed over 2 screens).
- Use  or  to select the function to be set. (The function selected is indicated by the arrow (→) displayed to the left of the function name.)
- Use  or  to set the function to "O" or "X". (O: ON, X: OFF)

Description of functions





MT-100

Display	Description of functions
BACKLIGHT	Switches back light between ON and OFF.
AUTO OFF	Decreases brightness of back light if the same screen is displayed for more than 3 minutes.
SW WINDOW	Sets switch window when switch function is used on that page.
SIZE	Specifies switch window size. (Set "L" for "Kanji".)
FLASHING	Flashes display. (0.5 s cycle)
REVERSE	Highlights display. (When "SW WINDOW" is set to "ON", display of switch window is not highlighted.)
PAGING	Selects whether desired page (preset) is called either automatically or by using key after current page. (Use to display multiple pages sequentially.)
INTERVAL	Specifies display time (1 to 9 s in increment of 1 s) of each page when PAGING function is used.
ADDRESS	Specifies page No. to be called next when PAGING function is used.
PVERLAP	Displays contents of multiple pages simultaneously by superimposing.

MT-150

Display	Description of functions
BACKLIGHT	Switches back light between ON and OFF.
COLOR	Specifies back light color.
FLASHING	Flashes back light. (Red: 0.5 s cycle, other colors: 1 s cycle)
ALM WINDOW	Sets alarm window to insert alarm message.
SW WINDOW	Sets switch window when switch function is used on that page.
REVERSE	Highlights display. (When "SW WINDOW" is set to "ON", display of switch window is not highlighted.)
PVERLAP	Displays contents of multiple pages simultaneously by superimposing.
PAGING	Selects whether desired page (preset) is called automatically after current page. (Use to display multiple pages sequentially.)
INTERVAL	Specifies display time (1 to 9 s in increment of 1 s) of each page when PAGING function is used.
ADDRESS	Specifies page No. to be called next when PAGING function is used.

Additional information on setting INTERVAL, ADDRESS, COLOR, and SW WINDOW (for MT-150) functions:

- **INTERVAL:** Set 0 to 9 (s) using the numeric keys.
(The SHIFT mode is set automatically.)
- **ADDRESS:** Set the desired page using the numeric keys.
(The SHIFT mode is set automatically.)
- **COLOR:** Select "G" (green)", "R (red)", or "O (orange)" using  or .
- **SW WINDOW (MT-150):** Select "L" or "S" (ON), and "X" (OFF) using  or .

⇒ For details of the PAGING, INTERVAL, or ADDRESS functions, see "PAGING" (p.22).

⇒ For details of the OVERLAPPING functions, see "OVERLAPPING Function" (p.23).

PAGING

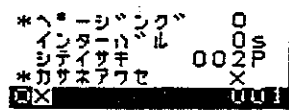
When information is entered over a series of pages (screens), these pages can be displayed sequentially using the PAGING function.

Two methods, KEY PAGING and AUTO PAGING, are available to call up the indicated page.

KEY PAGING

Pages are called up by pressing  on the MT-100/150.

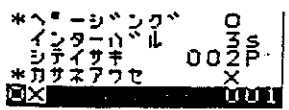
Perform setting on the screen function menu screen as follows:



PAGING: 0
INTERVAL: 0 (s)
ADDRESS: Page No. to follow
(Example: Set 002 (P) to call up page 2.)



AUTO PAGING

Pages are called up in sequence automatically at a specified time interval.




PAGING: 0
INTERVAL: 1 to 9 (s)
ADDRESS: Page No. to follow
(Example: Set 002 (P) to call up page 2.)

Setting INTERVAL

- Move the arrow (→) to the left of "INTERVAL" using .
- Enter any number from "1" to "9" using the numeric key, then press .

Setting ADDRESS

Set in the same manner as for INTERVAL setting. (Enter page No., then press .)

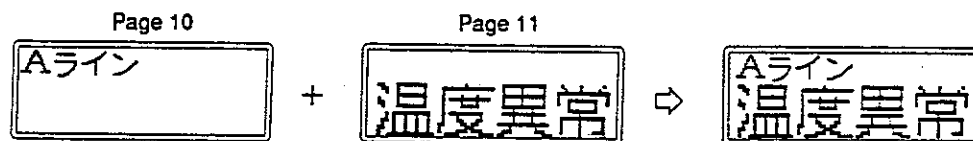
- * When the arrow (→) is moved to the left of "INTERVAL" or "ADDRESS", you are automatically in the SHIFT mode.

After setting INTERVAL or ADDRESS, press SHIFT to release this key and cancel the SHIFT mode.

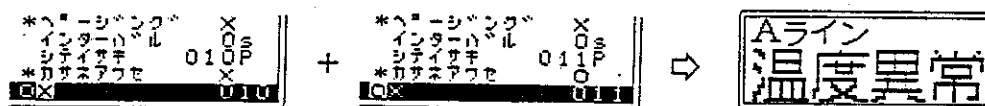
OVERLAPPING Function

Data from multiple pages (screens) are superimposed and displayed simultaneously. Using this function increases the variety of data display patterns.

Example: Calling up pages 10 and 11 from PLC



The screen of page 11 is superimposed on that of page 10.
Set on the screen function menu screen as shown below.



Be sure to set the OVERLAPPING function only on the last page to be called up.

Notes on using OVERLAPPING function

When the OVERLAPPING function is used with other function(s), set as follows:

- REVERSE (highlight)/FLASHING and OVERLAPPING

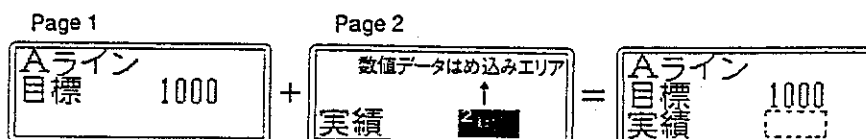
Set REVERSE (highlight)/FLASHING only on the first page to be called up.

- SW WINDOW and OVERLAPPING

Set SW WINDOW only on the first page to be called up.

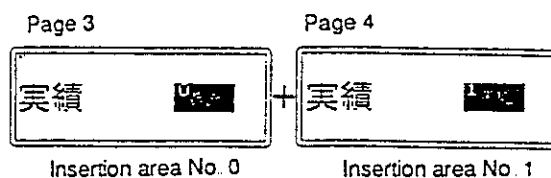
- Numeric data insertion area and OVERLAPPING

Example



When the OVERLAPPING function is used, enter characters on a page such that the characters on different pages do not cover the same area.

When overlapping numeric data insertion areas having different area Nos. the area on the last page to be called up takes priority, so numeric data should be inserted in this area.



In the example shown here, insertion area No. 1 on page 4 takes priority, so numeric data is inserted in this area (Insertion area No. 0 on page 3 is not displayed but stored in the internal memory.)

Copying and Canceling Screen Layout

In the CONTROL mode, data on a desired page (000 to 253) can be copied onto an empty page, or deleted.

■ Procedure

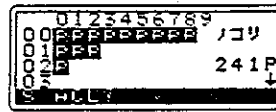
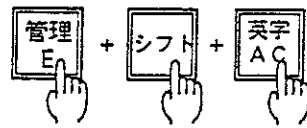
In the CONTROL mode, copy or delete the data using the procedure described in "Inputting Data" (p.10).

<p>1. Calling up the input page list</p>		<p>Indicates the unit digit of the page No. Indicates the number of empty pages remaining. "P" indicates the page having data. Indicates the ten digit of the page No.</p> <p>* Press to display page No. 40 and higher.</p>
<p>Copying the screen</p> <p>2. Calling up COPY mode.</p> <p>Inputting the page number of the screen to be copied.</p> <p>Copying to the specified page.</p>		<p>(Example) Copying page 10 to page 20.</p> <p>"COPY" will be displayed on the bottom of the screen, indicating that the system is in the COPY mode. An "S" will also be displayed on the bottom of the screen, which indicates that the system is in the SHIFT mode.</p> <p>"010" is displayed on the bottom of the screen, waiting for the destination to be input on the right side.</p> <p>"020" is displayed on the right side and "OK" will appear. The specified page is then copied.</p> <p>Note: The screen functions set for that page are also copied.</p>
<p>Canceling a screen layout</p> <p>Calling up the DELETE mode.</p> <p>Canceling</p>		<p>"DEL" will be displayed to confirm whether the screen layout should be canceled. An "S" will be displayed, indicating that the system is in the SHIFT mode.</p> <p>"009" and "OK" will be displayed respectively in the center and on the left side. Page 9 is then canceled.</p>
<p>3. Canceling the COPY or DELETE mode</p>		<p>Screen returns to the CONTROL mode.</p>

Deletion of data on all pages

* Data on all pages will be deleted, therefore be specially careful when using this function.

1. Specifying All CLEAR.




"ACL" will be displayed on the bottom of the screen to confirm whether data on all pages should be deleted.

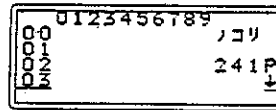
2. Delete data



"???" will be displayed to reconfirm whether data should be deleted.

To cancel, press .



3.



Data on all the pages has been deleted.

Precautions for copying

- Data cannot be copied to a page marked with a "P".

If you specify a page already containing data and press the , an alarm will sound three times and "Bad page number" will be displayed, followed by "NG" appearing on the lower right of the screen. To correct this, press the orange  and enter the correct page number.

- Note that the remaining number of pages shown after copying does not include the initial screen (page 254).

Confirmation after laying out a screen

To check data on a desired page, call up the MONITOR mode and enter the page No. That page will be displayed on the screen.

Using Memory Card

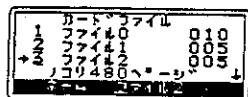
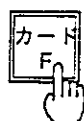
Up to 500-page screen data (6 files) can be stored onto the memory card. Even while the MT-100/150 is in operation, the memory card can be accessed with the MT-100/150.

Note: When data has been stored to memory cards using an MT series unit other than the MT-100/150, the memory cards cannot be used with the MT-100/150. To use these cards with the MT-100/150, it is first necessary to initialize them (ALL CLEAR).

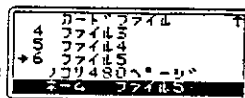
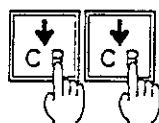
Access to memory card using handwriting console

By using the handwriting console, the memory card data can be manipulated as required. (ALL CLEAR, SAVE, LOAD, VERIFY or DELETE)

Card file list (divided into 2 screens)



- Press to display the first card list screen.
- Numerals "1" to "3" (first screen) and "4" to "6" (second screen) in the leftmost columns show file Nos. (MT-150)
- On the screen of the MT-100, file Nos. are displayed as "0" to "5".
- Arbitrary file names can be entered in the middle column using the handwriting console. (On the screen shown on the right, the file names are entered as "file 0", "file 1", and "file 2".)
- The numerals in the rightmost column show the number of pages in each file.
- The screen on the left shows that this card has already stored 20-page data and it, therefore, can store an other 480-page data.
- At the right of "NAME" on the bottom of the screen, the file name to which the arrow (→) points is displayed.



- Press to display the second card file screen.


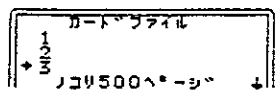



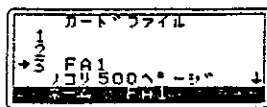



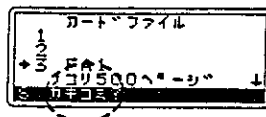



The number of pages for each file and that of the remaining pages do not include page 254 (initial screen).

ALL CLEAR (Initializes memory card or deletes all files stored on memory card. Required when using a new memory card.)




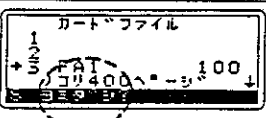
Insert a memory card into the memory card slot.

1			"ACL?" appears
2			"???" appears to confirm whether ALL CLEAR should be executed.
3			ALL CLEAR is executed.







SAVE (Stores desired file onto memory card.)

1. Selecting file No. Example: Selecting file No.3 		Use  to move the arrow to the left of the file No. to which a file name is to be entered.
2. Entering file name using handwriting console Example: Entering "FA1"	  	Entered file name is displayed to the right of "NAME" on the bottom of the screen. *If entering an incorrect file name, press  , and enter the correct one.
3. Storing selected file onto memory card  → 		The message appears to confirm whether SAVE should be executed.
4. Executing SAVE 		"???" appears to reconfirm whether SAVE should be executed.
5. 		SAVE is completed.


LOAD (Retrieves desired file on memory card to the MT-100/150.)

1. Selecting file No.  		LOAD can be executed using the same procedures as those for SAVE.
2. Retrieving selected file from memory card 		The message appears to confirm whether LOAD should be executed.
3. Executing LOAD		LOAD is completed

VERIFY (Checks whether desired file on memory card agrees with that in MT-100/150 memory.)

1. Selecting file No. and then verifying selected file  → 		The message appears to confirm whether VERIFY should be executed.
2. 	When file on memory card agrees with that in MT-100/150 memory  When file on memory card does not agree with that in MT-100/150 memory 	"OK" appears to the right of "VERIFY" on the bottom of the screen. or NG" appears to the right of "VERIFY" on the bottom of the screen. And, "CARD miss match" appears on the screen.

CONNECTION & OPERATION

Press  (operation key) to enter the OPERATION mode when connecting the MT-1 to the MT-100/150.
When using the MT-100/150 independently, turn the power ON, then the unit will start up in the OPERATION mode.

Setting Operating Conditions

Before using the MT-100/150, be sure to set the operating conditions. If setting is performed improperly, the unit may not function properly.

Setting MT-100

To set the operating conditions of the MT-100, use the DIP switches on the rear of the main unit. (All of these switches have been factory-set to OFF.)

Note: Be sure to turn OFF the power
before setting the DIP switches.



No.	Item	Setting menu	DIP switch
1	Transmission mode	SERIAL mode	ON
		PARALLEL mode	OFF
2	Unused		OFF
3	Baud rate (SERIAL mode)	9,600	ON
		4,800	OFF
4	Stop bit (SERIAL mode)	2 bits	ON
		1 bit	OFF
5	Parity (SERIAL mode)	Odd	ON
		Even	OFF
6	AUTO CARD-LOAD	ON	ON
		OFF	OFF
7	Page input method (PARALLEL mode)	Binary input	ON
		BCD input	OFF
8	Switching between Japanese and English	English	ON
		Japanese	OFF


* The shaded boxes indicate default settings.

Caution:

- Be sure to turn OFF the power before setting the DIP switches.
- Set the DIP switch UP or DOWN carefully using a screwdriver (or tool with a small tip). Do not apply excessive force to the switches when setting them.

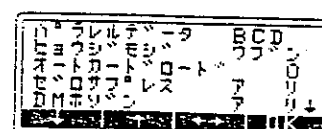
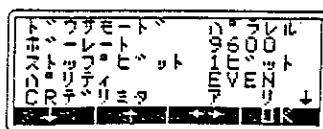
Setting MT-150

To set the operating conditions of the MT-150, use the memory switch menu screen appearing when the power is turned ON.

(The memory switch menu screen will appear when the power is turned ON with function switch  pressed.)

Memory switch menu screen

The memory switch menu is displayed over 3 screens. Select the item to be set using **[F1]** (↓) or **[F2]** (↑), and set it using **[F3]** (←→). When completing the setting, press **[F4]** (OK). The unit is now ready for operation.



Item	Setting menu	Mode used		Description
		PARALLEL	SERIAL	
TRANSMISSION MODE	PARALLEL/SERIAL	✓	✓	Selects the mode to be used.
BAUD RATE	9,600/4,800		✓	Selects data transmission rate.
STOP BIT	1 bit/2 bits		✓	Selects stop bit length.
PARITY	Even/Odd		✓	Selects EVEN or ODD parity check.
CR DELIMITER	ON/OFF		✓	Selects whether delimiter "CR" is added to response command.
SW OUTPUT	ON/OFF		✓	Selects whether function switch output signal is sent.
STROBE	ON/OFF	✓		Selects whether each strobe input signal is received. When "OFF" is selected, only page call function is available.
READY LOW MIN	ON/OFF	✓		Selects whether duration when READY signal is at LOW level is extended by 30 ms. (This duration, however, cannot be extended when page strobe signal or function strobe signal is input.)
STROBE SELECT	ALM/FUN	✓		Selects whether ALM (alarm strobe) or FUN (function strobe) signal is input to terminal No. 18.
ALARM GUIDE	ON/OFF	✓	✓	Selects whether names of (F3) and (F4) switches are displayed when alarm message is inserted.
PARALLEL DATA	BCD/BINARY	✓		Selects the input data form to call pages.
DISPLAY CHARACTER	JAPANESE/ENGLISH	✓	✓	Selects whether Japanese or English characters are used on menu screens.
AUTO CARD-LOAD	0, 1 to 6	✓	✓	Selects which file (No. 1 to 6) should be retrieved (when AUTO CARD-LOAD function is used). When "0" is selected, no file is retrieved using AUTO-CARD LOAD function.
ZERO DELETE	ON/OFF	✓	✓	Selects whether high-order zero(s) of inserted numeric data is deleted.
DM STORAGE	ON/OFF	✓	✓	Selects whether numeric data input into DM is stored when power is turned OFF.

* All the items have been factory-set to the former (left) of the above setting menu.

Description of Terminals & Connection Diagram

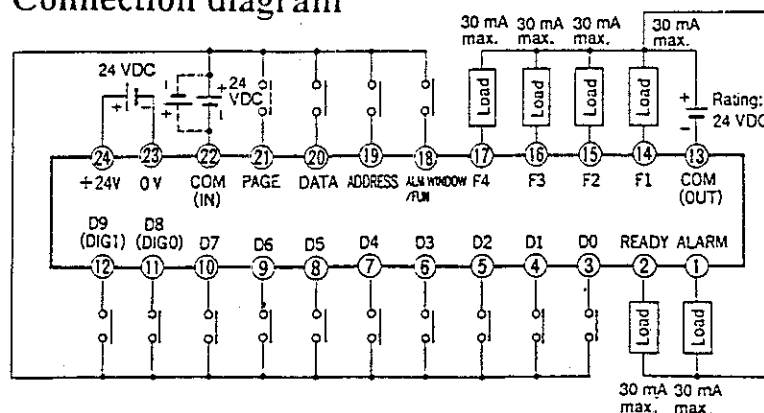
Description of terminals

No.	Input/Output	Symbol	Description
1	Output	ALARM	ALARM output (Outputs when battery voltage or the power supply voltage drops below specified level.)
2		READY	READY output (H: External input is enabled, L: Signal is being processed.)
3	Input	D0	Data 0
4		D1	Data 1
5		D2	Data 2
6		D3	Data 3
7		D4	Data 4
8		D5	Data 5
9		D6	Data 6
10		D7	Data 7
11		D8/DIG0	Data 8/Data digit specification: 0*
12		D9/DIG1	Data 9/Data digit specification: 1* When ALM WINDOW function is used: Input a signal to set or reset alarm message.
13	Output	COM (OUT)	COMMON (output)
14		F1	Function 1 output
15		F2	Function 2 output
16		F3	Function 3 output
17		F4	Function 4 output
18	Input	ALM WINDOW/ FUN	Alarm strobe (Input strobe signal to this terminal for inserting alarm messages.)/Function strobe (Input strobe signal to this terminal for holding function switch display highlighted or not highlighted.)
19		ADDRESS	Data address strobe (Input strobe signal to this terminal for selecting an input area to insert data.)
20		DATA	Data strobe (Input strobe signal to this terminal for inputting numeric data to be inserted.)
21		PAGE	Page strobe (Input strobe signal to this terminal after setting page No., for calling page.)
22		COM (IN)	COMMON (input)
23		0 V	Power supply GND
24		+24 V	Power supply

* When this terminal is used for data digit specification: Specifies input digit for inserted numeric data.

* Required only for BCD input.

Connection diagram



Control in PARALLEL Mode

In the PARALLEL mode, the MT-100/150 is controlled (calling a page, inserting numerals, etc.) using parallel input/output into/from a programmable controller, etc..
Set the MT-100/150 to the PARALLEL mode.

Setting transmission mode

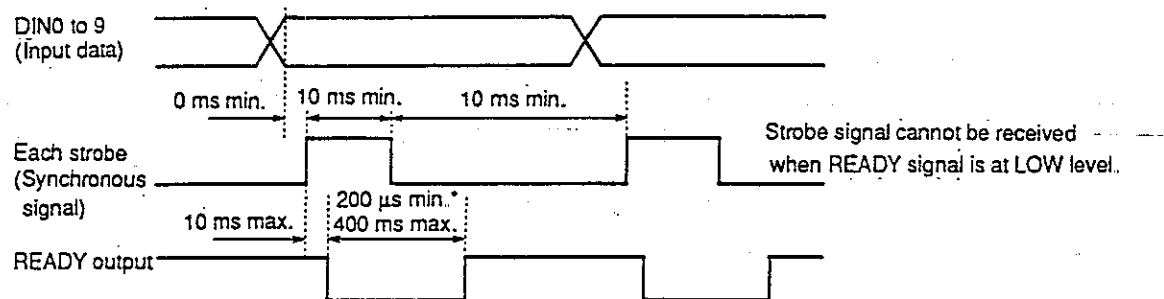
Set the transmission mode to "PARALLEL".

⇒ See p.29.

At this time, set the input data form (for calling a page) to "BINARY" or "BCD". With the MT-150, set "STROBE" to "ON" or "OFF".

I/O operation diagram

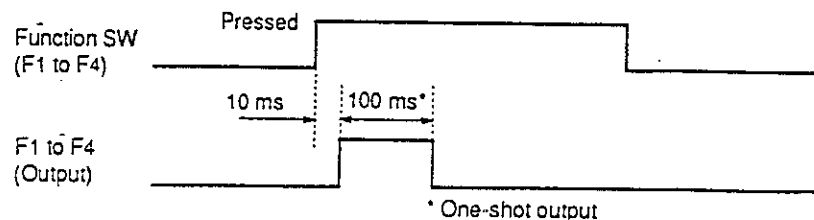
■ Input



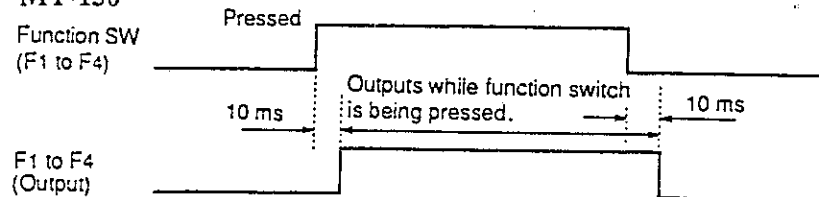
With the MT-150, the duration when READY signal is at LOW level can be extended by 30 ms.
(This duration, however, cannot be extended when page strobe signal or function strobe signal is input.)

■ Output

MT-100



MT-150



Calling Page

The desired page can be called by inputting page No. from external equipment using BCD or binary codes.

Example: Calling page 207

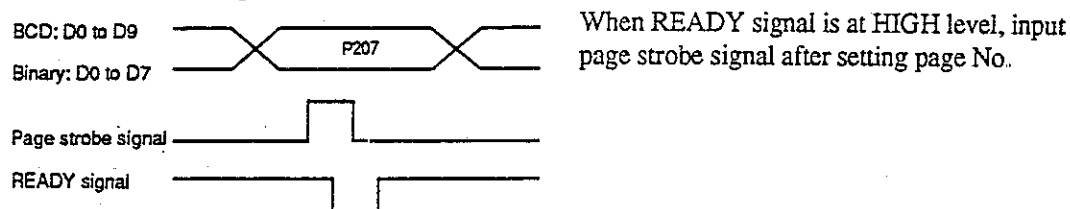
Input using page strobe signal (with MT-100/150)

Input page No. using BCD or binary codes.

⇒ For the setting procedures of "BCD" or "BINARY", see "Setting Operation Conditions" (p.29).

With the MT-150, set "STROBE" to "ON" on the memory switch menu screen.

■ Operation diagram



■ BCD input

D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
1	0	0	0	0	0	0	1	1	1
	↓		↓				↓		
	2		0				7		

■ Binary input

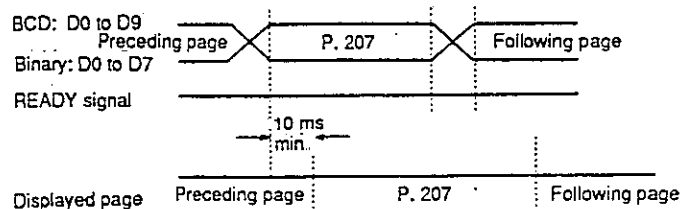
D7	D6	D5	D4	D3	D2	D1	D0
1	1	0	0	1	1	1	1
			↓				
			207				

Input without using page strobe signal (only with MT-150)

Operation diagram

This input method can be used only with MT-150. Set "STROBE" to "OFF" on the memory switch menu screen.

* READY signal is always at HIGH level.

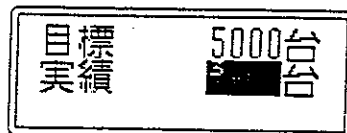


Inserting Numeric Data (BCD Input)

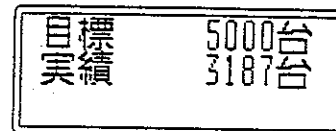
When an insertion area is set on the desired page at laying out a screen, up to 8-digit numeric data sent from external equipment can be displayed in that area.

Example: Inserting "3187" into insertion area No. 3

During editing



During operation



* The insertion area is not displayed during operation.

Procedures for signal input

First, call the page having insertion area No. 3.

⇒ See p.33.

1. Inputting insertion area No. (0 to 9)

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	1	1

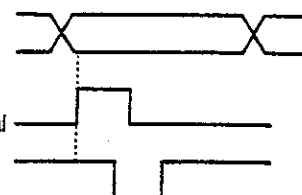
↓
0

↓
3

D0 to D7

ADDRESS signal

READY*



* When READY signal is at HIGH level, an insertion area is specified at the rising edge of ADDRESS signal.

This completes specifying of insertion area No. 3.

2. Specifying digit for input numeric data

Up to 8-digit numeric data can be input into each insertion area. Input 2 digits by 2 digits sequentially.

To specify digit, input a signal to terminals No. 11 (DIG0) and 12 (DIG1).

DIG0	ON	OFF	ON	OFF
DIG1	ON	ON	OFF	OFF

0	0	0	0	0	0	0	0
8th digit	7th digit	6th digit	5th digit	4th digit	3rd digit	2nd digit	1st digit

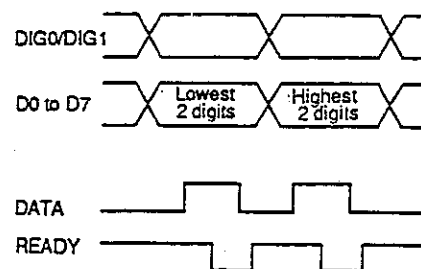
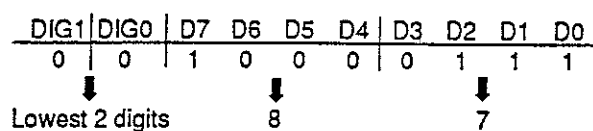
Note: Match the number of input data digits with that preset when editing data on the screen.

⇒ See p. 14.

Input data, however, is stored in the internal memory of the main unit, regardless of the number of digits preset.

3. Inputting numeric data

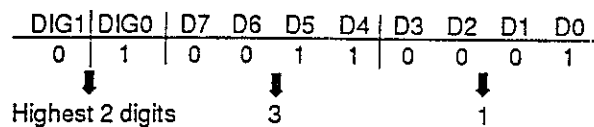
1. Input lowest 2 digits of "3187" (i.e. "87").



2. Input data strobe signal.

* When READY signal is at HIGH level, data is read into the MT-100/150 at the rising edge of DATA signal after numeric data is set.

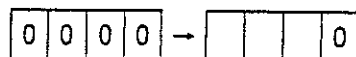
3. Input highest 2 digits of "3187" (i.e. "31").



Numerals and symbols that can be displayed in insertion area

4. Input data strobe signal.

Note: With the MT-100, the zero deletion function allows high order zero(s) not to be displayed.



■ Decimal point display

Example: Inserting "1.35"

As shown in the table on the right, "A" (hex) is assigned to the decimal point. Input "1A35" using the above procedures.

Hex	Input to terminals				Display
	D7 D3	D6 D2	D5 D1	D4 D0	
0	0	0	0	0	0
1	0	0	0	1	1
2	0	0	1	0	2
3	0	0	1	1	3
4	0	1	0	0	4
5	0	1	0	1	5
6	0	1	1	0	6
7	0	1	1	1	7
8	1	0	0	0	8
9	1	0	0	1	9
A	1	0	1	0	.
B	1	0	1	1	+
C	1	1	0	1	-
D	1	1	0	1	*
E	1	1	1	0	:
F	1	1	1	1	Blank

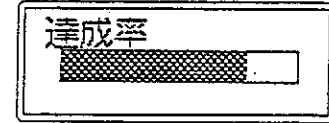
CONNECTIONS & OPERATION

Percentage representation bar can be displayed in an insertion area.
Bar length is changed in 1% increments according to the input data.

Example: Displaying 80% in insertion area No. 1 using bar.

During editing

During operation



* The insertion area frame line is displayed during operation.

Procedures for signal input

First, call the page having insertion area No. 1.











⇒ See p.33.

1. Inputting insertion area No.

Input insertion area No. using the same procedures as those of "Inserting Numeric Data (BCD Input)".

⇒ See p.34.

Shading pattern for bar has been determined according to the insertion area.

Insertion area No.	0	1	2	3	4	5	6	7	8	9
Shading pattern										

2. Inputting percentage

To display percentage representation bar, input the data as follows:

To display 80%:

.	0	8	0				
---	---	---	---	--	--	--	--

1. Input "A (hex)" to the 8th digit. ⇨ See p.35.

2. Input percentage to the 7th to 5th digits.

Input "0" to the 7th digit for displaying percentage other than 100%.

- 3..Input no value to the 4th to 1st digits..

DIG1	DIG0	D7	D6	D5	D4	D3	D2	D1	D0
1	1	1	0	1	0	0	0	0	0

7th and 8th digits

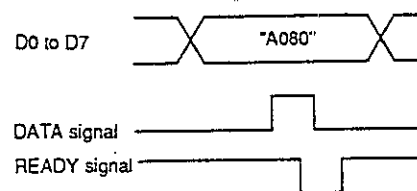
0

DIG1	DIG0	D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	0	0	0	0	0	0	0

5th and 8th digits

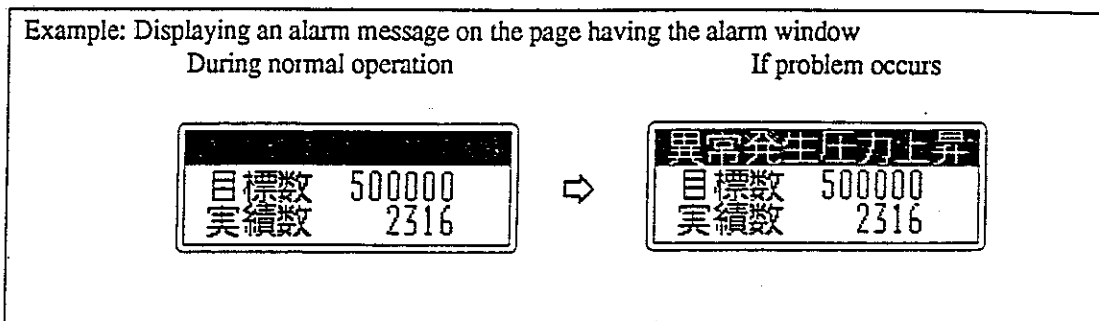
8

0



Inserting Alarm Messages (BCD Input)

When "ALM WINDOW" is set to "O" on the screen function menu screen and alarm messages are registered at laying out a screen, the desired alarm message can be displayed during operation.



Initial setting

Set "STROBE SELECT" to "ALM" on the memory switch menu screen.



Procedures for signal input

First, call the page having the alarm window. (For that page, "ALM WINDOW" is set to "ON" on the screen function menu screen.)

Inputting alarm message No.

When the alarm message shown above as the example has been registered as No. 10, input as follows:

DIG0	D7	D6	D5	D4	D3	D2	D1	D0
1	0	0	0	1	0	0	0	0
↓ Set		↓ 1				↓ 0		

D0 to D7: Message No.

DIG0: 1 (set)

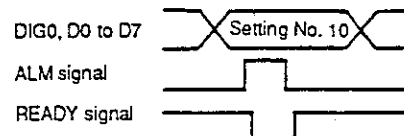
0 (reset)

Input the desired message No., then the alarm message assigned that No. is displayed. Up to 17 displayed alarm messages can be stored.

Operation diagram

To delete the displayed message(s), reset terminal DIG0. Then,

- When the message No. is input to terminals D0 to D7: Only the alarm message assigned that No. is deleted.
- When "FFH" is input to terminals D0 to D7: All alarm messages are deleted.



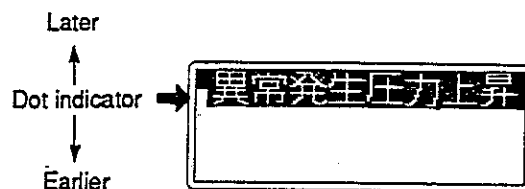
History of Displayed Alarm Messages and Its Usage

History of displayed alarm messages

With the MT-150, up to 17 alarm messages displayed can be stored as the history. Accordingly, you can use the history to see what alarm messages have been displayed.

異常発生圧力上昇	
目標数	500000
実績数	2316

(F1) (F2) (F3) (F4)
User SW User SW ALM + 1 ALM - 1



(F3) switch: Calls the alarm message displayed later.

(F4) switch: Calls the alarm message displayed earlier.

The dot indicator (displayed to the left of the message) shows how much earlier (or later) that alarm message has been displayed.

(The larger the number of non-highlighted indicator dots is, the earlier the alarm message has been displayed.)

Referring to detailed information on alarm message

One page can be used to enter detailed information on each alarm message. To refer to detailed information, use to call the page having that information. ⇨ See p.15.

(Stored alarm messages: 17)

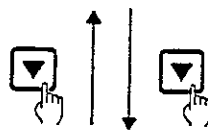
Latest-displayed message of stored 17 messages

Earliest-displayed message of stored 17 messages

All the dots of the indicator are not highlighted.

Screen displayed during operation

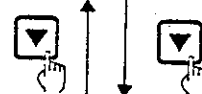
異常発生圧力上昇	
目標数	500000
実績数	2316



Detailed information on alarm message (has been entered at editing data.)

バルブを確認// 圧力の適正値は A:210B:150です	
-------------------------------------	--

部材停滞手動切替	
目標数	500000
実績数	2316



部材が停滞していますので、手動に切替えて下さい。	
--------------------------	--

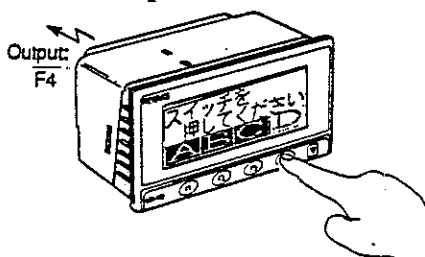
- When no key entry is performed for approx. 10 s, the screen will return to the screen having the latest alarm message. The screen, however, remains unchanged while the screen having detailed information on the alarm message is called out.
- A part or all of the alarm messages stored as the history can be cleared.
- When the power is turned OFF, the earliest-displayed alarm message is cleared so that a new alarm message can be stored.

Function Switches

Use of function switches **F1** to **F4** of the MT-100/150 enables you:

- To send output to external equipment and control it.
- To see from which of switches **F1** to **F4** output is sent to external equipment, because the switch name display corresponding to the switch being pressed is not highlighted.

How output is sent when switch is pressed



	MT-100	MT-150
Output type	100 ms One-shot output	Momentary output*
Duration when the switch name display is not highlighted	0.5 s after pressing switch	During pressing switch

* Momentary output: Output is sent while the switch is pressed and held.

⇒ See the I/O operation diagram shown in "Control in PARALLEL Mode" (p.32).

Keeping switch name display (in switch window) non-highlighted

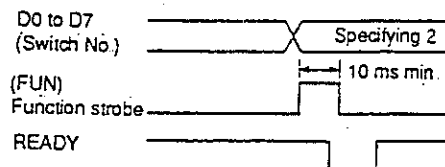
It depends on "ON" or "OFF" of terminals D0 to D3 whether switch name display (corresponding to the switch being pressed) is kept highlighted or not.

Example: Keeping STOP switch (function switch 2) display non-highlighted



1. Setting switch No.

D7	D6	D5	D4	D3	D2	D1	D0
				0	0	1	0



2. Inputting function strobe signal (To terminal No. 18)

* Input the signal when READY signal is at HIGH level.

Note: With the MT-150, switch name display cannot be kept non-highlighted when "ALARM SELECT" is set to "ALM".

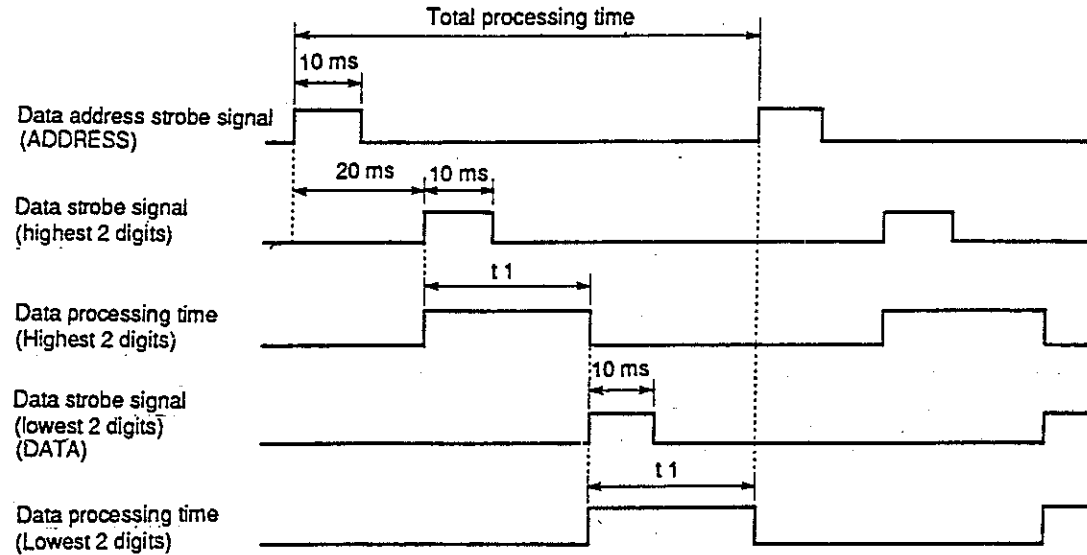
Processing Time for Inserted Numeric Data

READY signal must be at HIGH level.

Time required for processing is shown below.

Operation diagram for data processing

Example: 4 digits



Processing time according to the number of input numeric data digits and character size

Number of input numeric data digits	Character size	Time of t_1	Total processing time
4	Quarter	20 ms	60 ms
	Half	30 ms	80 ms
	Full	40 ms	100 ms
6	Quarter	20 ms	80 ms
	Half	30 ms	110 ms
	Full	40 ms	140 ms
8	Quarter	30 ms	140 ms
	Half	30 ms	140 ms
	Full	40 ms	180 ms

* With the MT-150, the above table shows each processing time when "READY LOW MIN" is set to "OFF"

⇒ See p 31.

Retrieving Desired File on Memory Card to MT-100/150 (During Operation)

The desired file on the memory card can be retrieved using the CARD-LOAD function.

CARD-LOAD methods

- Using AUTO CARD-LOAD function

When the power is turned ON, file No. 0 (MT-100) or No. 1 (MT-150) on the memory card is automatically retrieved to the MT-100/150.

- Using CARD-LOAD screen (MT-100 only)

The desired page can be specified for entering the command that includes the file No. to be retrieved. Any of files 0 to 5 can be selected.


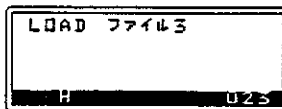
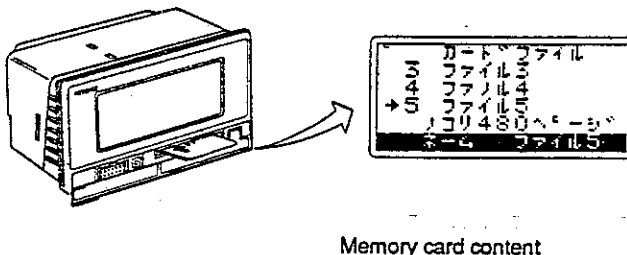
Using AUTO CARD-LOAD function

<p>1. Using the MT-100/150 to the AUTO CARD-LOAD mode.</p>	<p>MT-100</p> <ol style="list-style-type: none"> 1. Turn the power OFF. 2. Set the DIP switches No. 4 & 6 to ON position. 3. Then turn the power ON again. <p>MT-150</p> <ol style="list-style-type: none"> 1. Turn the power OFF. 2. Turn the power ON while pressing [F-3] key. 3. Use [F-1] key (Down arrow key) and [F-2] key (Up arrow key) to select menu for Auto Card Load. 4. Use [F-3] (Right and left arrow key) to select file No. to be loaded (Nos. 1 to 6 selectable) No. 0 cannot be loaded in Auto-Card-Load mode. 5. Press [F-4] key (OK) to set the unit to operation mode.
<p>2. Insert the memory card into the memory card slot and turn ON the power</p>	<p>When the power is turned ON, file No. 0 on the memory card is automatically retrieved to the MT-100 and file No. 1 is retrieved to the MT-150. ⇨See p. 29.</p> <div data-bbox="748 1354 1032 1690"> </div> <p>If you want to display some message on the screen immediately after the power is turned ON, enter the message onto the initial screen beforehand.</p> <ul style="list-style-type: none"> • If the file is not correctly retrieved, "CARD LOAD NG!" will appear on the screen. • When the file is retrieved correctly, "CARD LOAD OK!" will appear first if no message has been entered onto the initial screen

Using CARD-LOAD screen (MT-100 only)

When the specified page (trigger page) is specified from external equipment, the file having been specified with the trigger page is retrieved from the memory card onto the MT-100 screen.

Example: Specifying page 100 as a trigger page and retrieving file No. 3

1. Specifying page 100 as a trigger page		Move the cursor to the top left corner of the screen. From this position, start entering the command to retrieve the desired file.	
2. Entering the command to retrieve "file No. 3"		Use the handwriting console to enter the command ("LOAD desired file name") in half- or quarter-size characters.	
3. Specifying page 100 from external equipment	<div><p>Memory card content</p></div>		The file specified using the command is retrieved from the memory card onto the MT-100 screen.

Precautions on retrieving file using CARD-LOAD screen

- Make sure that the file name entered onto the trigger page is the same as that on the memory card.
- Enter the command to retrieve the file ("LOAD desired file name") to the specified position.
- Be sure to allow one-cursor space between characters "LOAD" and characters "desired file name".

Control in SERIAL Mode

In the SERIAL mode, the MT-100/150 is controlled by sending communication commands through RS-232C interface (serial communication) from a personal computer.

To make communication between the MT-100/150 and a personal computer, match their protocols, and connect them using a cable for RS-232C.

Setting transmission mode

Set the transmission mode to "SERIAL".

⇒ See p.29.

Be sure to match the protocols (baud rate, parity, and stop bit length) of the MT-100/150 with those of the personal computer.

■ Setting personal computer

Match the protocols of the computer with those of the MT-100/150.

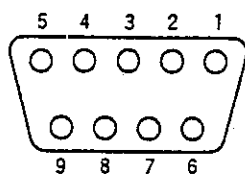
And, set the synchronization mode to "START-STOP", the communication mode to "HALF-DUPLEX", and the data length to "8 BITS".

⇒ To set the computer, see the instruction manual for your personal computer.

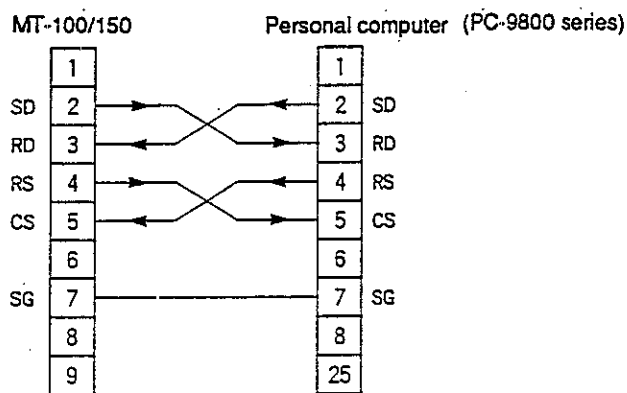
Serial interface

The MT-100/150 is equipped with the RS-232C interface with D-sub 9 pin connector. Connect the MT-100/150 to the computer using a cable wired as shown below.

Wiring diagram



D-sub 9-pin connector
(MT-100/150)



D-sub 9-pin connector D-sub 25-pin connector

* Pins 6, 8, and 9 are not connected to anything.

Communication method

The MT-100/150 is controlled by using external commands (ASCII codes) from the personal computer.

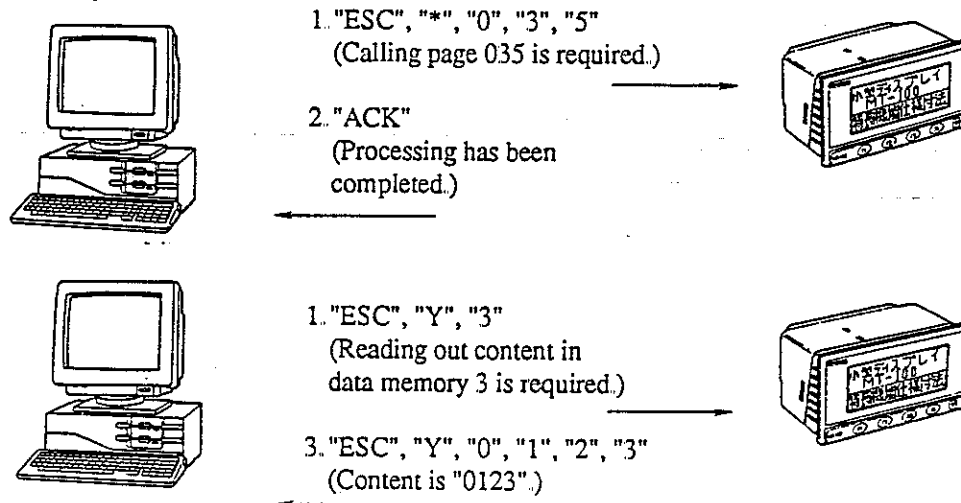
Be sure to use ASCII codes to send/receive commands.

"RS" and "CS" are used to replace handshaking.

■ Communication procedures

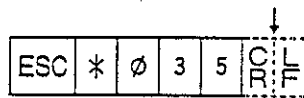
1. Send a command from the personal computer.
2. When the MT-100/150 receives the command, it sends "ACK(06H)" to the computer to indicate that the command can be processed. It then performs the processing. If the command cannot be processed, it sends "NAK(15H)".
3. When some information needs to be sent back to the computer (for example, reading out the content in the data memory), the MT-100/150 sends the required information, instead of "ACK".

Example:



* With the MT-100, each command cannot be transmitted with "CR" or "LF" added to the end of it, while, with the MT-150, it can be transmitted with or without "CR" or "LF". (See below.)

Example



Transmission command.

With the MT-150, response command with "CR" (delimiter) is transmitted when "CR DELIMITER" is set to "ON" on the memory switch menu screen.

⇨ See p.30 and p.47.

Communication Command Table (1)

Function	Transmission command (Computer to MT-100/150)	Byte (s)	MT -100	MT -150	Response (MT-100/150 to computer)	Description
Calling page	ESC ^{1B} * _{2A} <u>nnn</u>	5	✓	✓	ACK ₀₆ or NAK ₁₅	Specified page is called. nnn =000 to 253: Page No. (30H30H30H to 32H35H33H)
Calling next page	ESC ^{1B} + _{2B}	2	✓	✓	ACK ₀₆ or NAK ₁₅	
Calling previous page	ESC ^{1B} - _{2D}	2	✓	✓	ACK _{1B} or NAK ₁₅	
Reading out currently displayed page No.	ESC ^{1B} P ₅₀	2	✓	✓	ESC ^{1B} P ₅₀ <u>nnn</u> or NAK	Currently-displayed page No. is read out. nnn =000 to 253: Page No. (30H30H30H to 32H35H33H)
No operation NOP	NUL ₀₀	1	✓	✓	ACK ₀₆ or NAK ₁₅	No operation is performed.
Inserting numeric data	ESC ^{1B} X ₅₈ <u>a</u> <u>nnnnnnnn</u>	11	✓	✓	ACK ₀₆ or NAK ₁₅	8-digit numeric data is input into specified data memory. * Data is input independent of the number of numeric data digits to be displayed. a = 0 to 9 (30H to 39H): Data memory No. n = 0 to 9 (30H to 39H): Numeric data (8 digits)
Reading out data memory content	ESC ^{1B} Y ₅₉ <u>a</u>	3	✓	✓	ESC ^{1B} Y ₅₉ <u>a</u> <u>mmmmmmmm</u> or NAK	Content in specified data memory is read out. a = 0 to 9 (30H to 39H): Data memory No. n = 0 to 9 (30H to 39H): Numeric data (8 digits)
Controlling switch window	ESC ^{1B} F ₄₆ <u>n m</u>	4	✓	✓	ACK ₀₆ or NAK ₁₅	Switch window display can be highlighted or not highlighted. n = 1 to 4 (31H to 34H): Switch No. 5 (35H): All switches m = 0 (30H): Non-highlighted display 1 (31H): Highlighted display
Reading out current state (ON/OFF) of function switches	ESC ^{1B} Q ₅₁	2	✓	✓	ESC ^{1B} Q ₅₁ <u>abcd</u> or NAK	Current state (ON/OFF) of function switches is read out. a, b, c, d = 0 (30H): OFF 1 (31H): ON "a", "b", "c" and "d" correspond respectively to F1, F2, F3 and F4. Example: Response: ESC Q 1000 This means that F1 only is being pressed (ON).
Reading out state of switch window display	ESC ^{1B} U ₅₅	2		✓	ESC ^{1B} U ₅₅ <u>abcd</u> or NAK	Whether switch window display is highlighted or not is read out. a, b, c, d = 0 (30H): OFF 1 (31H): ON "a", "b", "c" and "d" correspond respectively to F1, F2, F3 and F4. Example: Response: ESC U 0100 This means that F2 switch display only is kept non-highlighted.

Communication Command Table (2)

Function	Transmission command (Computer to MT-100/150)	Byte (s)	MT-100	MT-150	Response (MT-100/150 to computer)	Description
Outputting No. of function switch being turned ON	* Set "SW OUTPUT" to "ON" on memory switch menu screen.	-		✓	ESC 0 m 1B 4F	No. of function switch being turned ON is sent from the MT-150 to computer. m = 1 to 4 (31H to 34H): Switch No. Example: When F2 is pressed: "ESC O 2" is output. When F2 is released: "ESC O 0" is output.
Inserting alarm message	ESC A nnn 1B 41 m	6		✓	ACK or NAK 06 15	Specified alarm message is inserted into alarm window. nnn = 000 to 099: Alarm message No. 100: Display of all alarm messages is canceled. (30H30H30H to 30H39H39H) m = 0 (30H) Canceling display m = 1 (30H) Displaying
Displaying characters input from computer on screen	ESC D cc // 1B 44 - s nn...nn			✓	ACK or NAK 06 15	Characters input from personal computer are displayed on MT-150 screen. * Digit and line are specified based on quarter-size character. cc = 00 to 15: Digit (30H30H to 31H35H) // = 0 to 5: Line (30H30H to 30H35H) s = 0 to 5: Size (30H to 35H) 0: Quarter 1: Half 2: Full 3: Double width 4: Quadruple 5: Sextuple nn...nn = Shift JIS character string
Controlling back light	ESC B n	3		✓	ACK or NAK 06 15	Back light of MT-150 can be controlled. n = 0 (30H): Green 1 (31H): Red 2 (32H): Orange 3 (33H): Green (flashing) 4 (34H): Red (flashing) 5 (35H): Orange (flashing) 6 (36H): OFF

■ Delimiter "CR" (MT-150 only)

With the MT-150, delimiter "CR" can be added to the end of the command when it is sent back to the computer.

Use the memory switch to select whether "CR" is added or not.

⇒ See p.30.

Each format is as follows:

Response (without "CR")

Response (with "CR")

ACK 06	←→	ESC 1B	<u>Command</u> 0 30	CR 0D						
NAK 15	←→	ESC 1B	<u>Command</u> 1 31	CR 0D						
ESC 1B	P 50	nnn 30	←→	ESC 1B	P 50	0 30	nnn 30	CR 0D		
ESC 1B	Y 59	nnn 1B	<u>data</u>	←→	ESC 1B	Y 59	0 30	nnn 1B	<u>data</u>	CR 0D
ESC 1B	U 55	←→	ESC 1B	U 55	0 30	abcd	CR 0D			

* By checking whether "0" or "1" is entered after "ESC Command", judge whether the command can be executed.

0: Processable

1: Unprocessable

SPECIFICATIONS & DATA

Specifications

General

Model	MT-100	MT-150
Supply voltage	24 VDC +10% -5%	
Power consumption	0.4 A max.	
Construction	Flush (panel) mounting type	
Insulation resistance	5 MΩ min. with 500 VDC megger (across external terminals and housing)	
Operating temperature	+10 to 40 °C	0 to +40 °C
Operating humidity	35 to 85%RH (no condensation)	
Operating environment	Free of dust or corrosive gas	
Dielectric strength	1,500 VAC for 1 minute (across external terminals and housing)	
Vibration resistance	10 to 55 Hz, 1.5 mm double amplitude in X, Y and Z directions, 2 hours respectively	
Noise immunity	1,000 VP-P, 1 μs (power line, common mode)	
Weight	Approx. 530 g	

Input/Output

Model		MT-100	MT-150
Parallel Interface	Data input Page strobe input Address strobe input Data strobe input Data digit specification input Function strobe input Alarm window strobe input	Input rating	24 VDC
		Min. ON voltage	19 V
		Max. OFF voltage	2 mA
		Min. input pulse width	10 ms
	READY output ALARM output Function switch output	Output type	NPN open-collector
		Rated load	30 mA max. (24 VDC max.)
		Output type	NPN open-collector
		Rated load	30 mA max. (24 VDC max.)
		Output time	100 ms One-shot
			While being pressed (momentary)
Serial Interface	Serial input/output (D-sub 9-pin)	Standard	Conforms to EIA RS-232C.
		Synchronization mode	Start-stop (half-duplex)
		Transmission code	ASCII
		Data length	8 bits (fixed)
		Stop bit length	1 bit/2 bits (selectable)
		Parity check	Even/odd (selectable)
		Baud rate	4,800 bps/9,600 bps (selectable)

Display

Item	Specifications		
Liquid crystal display panel	Dot matrix LCD panel Valid display area: 92.12 (W) x 32.12 (H) mm Number of dots: 128 (W) x 48 (H) dots Dot size: 0.68 (W) x 0.63 (H) mm Dot pitch: 0.72 (W) x 0.67 (H) mm Service life of liquid crystal: 100,000 hours**		
Back light	MT-100:CFL (cold-cathode tube), direct transmission type, service life: 20,000 hours* ¹ MT-150:Colored LED (green, red, orange), service life: 50,000 hours**		
Display character	Quarter	8 x 8 dots	Alphabet, numerals, "katakana" and symbols: 213
	Half	8 x 16 dots	
	Full	16 x 16 dots	"Kanji" (JIS, level No. 1): 2,965 Alphabet, numerals, "hiragana", "katakana", Greek alphabet, Russian alphabet and symbols: 693 Special symbols: 223 External characters (user-registered): 14
	Double width	32 x 16 dots	
	Quadruple	32 x 32 dots	
	Sextuple	32 x 48 dots	
Screen data storage	Built-in SRAM* ² : 254 screens max. Memory card (M-2)* ³ : SRAM (32 KB), 500 screens (6 files) max.		
Display function	<ul style="list-style-type: none">• Flashing/highlighting• AUTO OFF of back light (MT-100)• Specifying back-light color (green, red, orange) (MT-150)• Inserting alarm message (MT-150)• Inserting numeric data• Displaying percentage representation bar• Key paging and auto paging• Displaying function switch window (divided into 4 parts on each screen)		

*1 Varies according to the operating environment.

*2 Memory backup using lithium battery (service life: 10 years, replaceable)

*3 Memory backup using lithium battery (service life: 5 years, replaceable)

Options

Product name	Model
Handwriting console**	MT-1
Editor for personal computer	MT-3H1 (3.5-inch F.D.) MT-5H1 (5-inch F.D.)
Memory card	M-2 (32 KB)
Card writer/reader**	Z-1
Communication cable for RS-232C**	OP-90906

The MT-1 weighs approx. 280 g.

*4 A special cable (1 m) is supplied for the handwriting console

*5 It can be used with the editor for personal computers

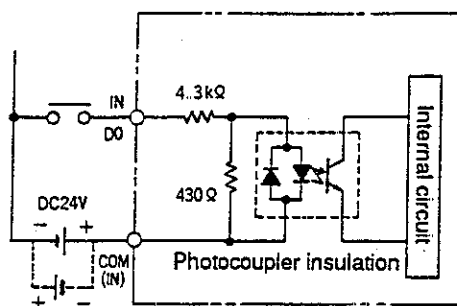
*6 This cable (3 m) is supplied for the editor for personal computers.

Input Equipment & Precautions on Output Wiring

I/O circuit diagram

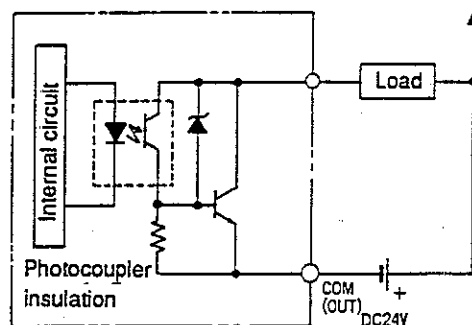
• Input circuit

D₀ to D₇, PAGE, DATA, ADDRESS, ALM, WINDOW, FUN, D8/DIG0, D9/DIG1



• Output circuit

F1 to F4, READY, ALARM

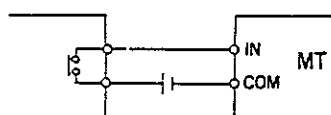


Positive or negative polarity can be connected to terminal COM. Depending on the polarity selected, an appropriate type of BJT must be used: PNP ("-" to "COM"), NPN ("+" to "COM").

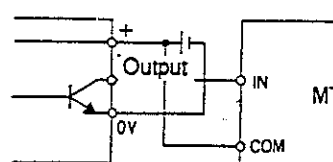
- Rated load of transistor output is 24 VDC, 30 mA max.

■ Connectable input equipment (DC output type)

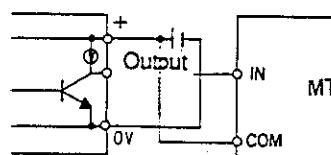
Contact output type



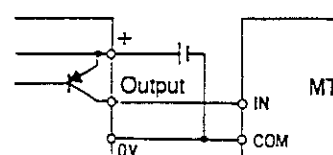
NPN open-collector output type



NPN current output type

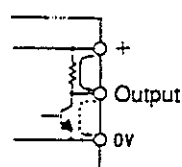


PNP open-collector output type



Unconnectable input equipment

Voltage output type



■ Protection against short-circuiting

If the load connected to the output terminal is short-circuited, the output elements or printed circuit board may burn. We recommend you to insert a protection fuse to the output terminal.

Hints on Correct Use

Installation environment

■ Installation place

Do not install the MT-100/150 in the following places:

- Places directly exposed to sunlight
- Places where the temperature drops below 10°C (for the MT-150, 0°C) or exceeds 40°C
- Places where the humidity drops below 35%RH or exceeds 85%RH
- Places where temperature fluctuation may cause condensation
- Places where there is corrosive gas or flammable gas
- Places exposed to airborne dust, salt, metal particles or soot
- Places where the MT-100/150 may be subjected to vibration or impact
- Places where water, oil or chemicals may splash the MT-100/150
- Places where intense magnetic field or intense electric field is generated

■ Installation inside control console

When installing the MT-100/150 inside a control console, give full consideration to operability, maintainability and operating environment.

To prevent increase in operating temperature, maintain the unit at a temperature of between 10°C (for the MT-150, 0°C) and 40°C.

Give full consideration to the following.

- Allow enough ventilation space around the MT-100/150.
- Do not install the MT-100/150 just above a unit generating high heat (heater, transformer or large capacity resistance).
- If the operating temperature may exceed 40°C, install a fan or cooler.

To prevent malfunction or data error:

- Do not install the MT-100/150 inside a control console equipped with high-voltage equipment.
- Install the MT-100/150 as far from power lines as possible.

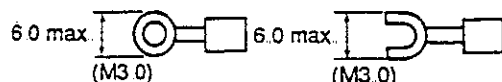
To ensure safety of operation and maintenance service:

Install the MT-100/150 as far from high-voltage equipment or power equipment as possible.

■ Wiring

M3.0 terminal screws are used for the MT-100/150.

When wiring by using crimp-style screws, use the following types:



Handling memory card

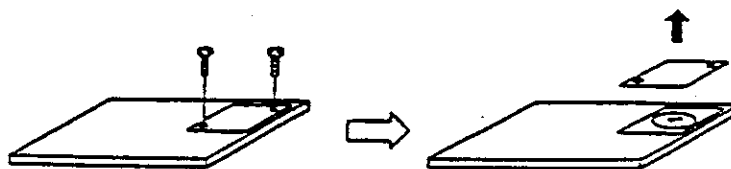
- Do not expose the card to high temperature or direct sunlight.
- Keep the card free from water or high humidity.

Operating temperature	+10 to +40°C during operation -20 to +60°C during non-operation
Operating humidity	35 to 85%RH

- Do not bend, drop, or subject the card to excessive shocks.
- To avoid damage due to static electricity or dust, keep the card in the case supplied.
- Keep the connector cable port free from dust, and do not insert anything other than the connector in this port.
- The service life of the battery is 5 years when used at a temperature range between 10 and 40°C. Storing the memory card in a place where the temperature exceeds 40°C may shorten its service life.

To replace battery

1. Loosen the 2 screws using a jeweler's screwdriver to remove the cover.
2. Replace the battery (model No. CR2016). Make sure that the "+" sign on the battery faces up.
3. Put the cover back on the card.



Caution

The data stored on the card will be automatically lost when the battery is removed. Be sure to prepare a backup copy of the stored data beforehand.


Troubleshooting

If a problem occurs during operation or editing, first apply the remedy in the troubleshooting table below. If this does not solve the problem, please contact your nearest distributor or KEYENCE office.

During operation


Problem	Possible cause	Remedy
Though power is turned ON, back light does not turn ON.	<ul style="list-style-type: none"> Wiring for power supply is not performed properly. Power supply cable is broken. "BACKLIGHT" is set to "OFF" on screen function menu screen. 	<ul style="list-style-type: none"> Perform wiring properly. Replace power supply cable. Set "BACKLIGHT" to "ON".
Back light is dark and display is not clear.	<ul style="list-style-type: none"> "AUTO OFF" function works. Supply voltage drops. Operating temperature drops below 10°C. 	<ul style="list-style-type: none"> Set "AUTO OFF" function to "OFF" on screen function menu screen. Apply 24 VDC. Use the MT-100/150 in a place where temperature is 10°C or more.
Back light flickers.	<ul style="list-style-type: none"> Power supply capacity is insufficient. 	<ul style="list-style-type: none"> Use power supply whose capacity is 0.4 A or more.
Nothing is displayed on screen.	<ul style="list-style-type: none"> Screen having no data is called. Contrast adjustment is performed improperly. 	<ul style="list-style-type: none"> Check the program to confirm whether some data has been entered onto current screen. Use contrast adjustment trimmer to adjust contrast properly.
The MT-100/150 does not work according to preset screen function.	<ul style="list-style-type: none"> Screen function is set on screen having no data. 	<ul style="list-style-type: none"> Enter some data onto that screen, then set screen function.
Screen function menu and guiding messages are displayed in Japanese.	<ul style="list-style-type: none"> JAPANESE mode is set using DIP switch or memory switch. 	<ul style="list-style-type: none"> Set ENGLISH mode. (With the MT-100, turn OFF power before setting DIP switch, then turn it ON again.)
The MT-100/150 does not operate normally.	<ul style="list-style-type: none"> Program created using PLC or personal computer is improper. DIP switches or memory switches are not set properly. 	<ul style="list-style-type: none"> Check the program. Check whether DIP switches or memory switches are set properly.

During editing

Problem	Possible cause	Remedy
No character can be entered onto screen.	<ul style="list-style-type: none"> Character is entered in incorrect stroke order. Character size is improper EDIT mode is not set. Amount of screen data exceeds memory capacity. That character is entered over another character or numeric area DELETE mode is not canceled. 	<ul style="list-style-type: none"> Enter character in correct stroke order. Use proper character size Set EDIT mode. Decrease the number of characters. Enter character so that it does not overlap another character or numeric area. Cancel DELETE mode using , then enter character.
Handwriting console key entry cannot be accepted.	<ul style="list-style-type: none"> SHIFT is pressed and held when SHIFT mode is unnecessary. Improper key is pressed. Connector cable is not connected properly Memory card is not initialized (when memory card is used). SERIAL mode is set. (MT-100 only) 	<ul style="list-style-type: none"> Press SHIFT to release this key. Read instruction manual again Check whether each end of connector cable is firmly connected to the main unit or handwriting console. Initialize memory card. (Execute ALL CLEAR) Set the transmission mode to "PARALLEL". (Be sure to turn OFF the power before setting this mode.)
Switch window is not displayed.	<ul style="list-style-type: none"> OPERATION or MONITOR mode is not set. 	<ul style="list-style-type: none"> Check whether OPERATION or MONITOR mode is set.
Numeric area cannot be set.	<ul style="list-style-type: none"> Numeric area assigned same No. has already been set on that screen. Space enough for numeric data. (in terms of number of digits) to be inserted is not left on that part of screen. 	<ul style="list-style-type: none"> Assign different No. to that numeric area. Reenter other data so that it does not interrupt numeric area.

Message List

Messages appearing during operation using memory card

Insert CARD!!	Appears when  is pressed with the memory card not inserted into the main unit. → Insert memory card M-2.
CARD LOAD NG!!	Appears when the file name stored in the memory card is different from that included in the command for retrieving the file (CARD LOAD function) → Use the same file name.
CARD LOAD OK!	Appears when CARD LOAD is executed properly.
CARD miss match	Appears when the file content on the memory card does not agree with that in the MT-100/150 memory as a result of executing VERIFY.
CARD full!!	Appears when you try to store more than 500-page data onto the memory card. → Decrease amount of data to 500 pages or less, or use another memory card to store excess data.
Bad file name!	Appears when you try to store the data without giving a file name to the data. → Give a file name to the data.
Data Error!!	Appears when the data stored onto the memory card is lost. Check whether the voltage of the memory card battery decreases. → If the data on the card is lost, execute ALL CLEAR to use the card again.

Messages appearing during editing

Out of data area	Appears when the number of entered characters exceeds the limit for each screen. → Decrease the number of entered characters.
Page full!!	Appears when an empty page is searched though all the pages have already been used.
Bad page number	Appears when the page to be copied has no data or the destination page for copying has some data. (CONTROL mode) → Also, appears when page No. larger than No. 256 is called. (EDIT mode) → Enter page No. correctly.