SHARP

Version 1.0
Produced in May 2000

LCD Terminal

Model name

TFT color LCD ZM-94T
TFT color LCD with touch panel ZM-95T
Mounting frame ZM-94V1

Instruction Manual

Thank you for purchasing a ZM-94T/95T/94V1 Liquid Crystal Terminal.
Read this manual thoroughly to familiarize yourself with the terminal's operation.
Keep this user's manual handy. It will be helpful if you encounter a problem.

Note

Should you have any questions or inquiries, please feel free to contact our dealers.

The contents of this manual may be revised without prior notice.

＜**Table of contents**＞

Safety Precautions

Read this manual and the attached documents carefully before installing, operating, maintaining or inspecting this device, in order to learn how to use it correctly. Make sure you understand all of the device requirements, safety information, and cautions before starting to use it. In this instruction manual, safety warnings are classified as either WARNINGs or CAUTIONs, as follows.

⚠ WARNING: Failure to heed the advice given may lead to death or serious injury.

⚠ CAUTION: Failure to heed the advice given may lead to personal injury or damage to property.

Even when a **⚠ CAUTION** is given, serious consequences may result from failing to follow the instructions and advice, depending on the circumstances. In all cases, important points regarding safe and correct operation are described. Be sure to follow all advice given.

The symbols used to indicate prohibited or compulsory actions are explained below.

⃠ : This means don't do something. For example, when disassembly is prohibited the (⃠) symbol is used

❗ : This indicates a required action. For example, when grounding is not optional and must be performed for safe operation, the (⏚) symbol is used.

(1) Installation

⚠ CAUTION
- Use this device only in the environments specified in the catalog and instruction manual. Electric shocks, fire or malfunction may result if used at high temperatures, in high humidity, or in dusty or corrosive atmospheres, or in locations subject to vibration or impact. - Install the device according to the manual. Incorrect installation may cause the device to fall, fail, or malfunction. - Never allow wire clippings or other foreign matter to get inside the device. If you do, a fire, a breakdown or a malfunction may occur.

(2) Wiring

⏚ Required action
- Be sure to ground this device correctly. Unless grounded correctly, you may receive an electric shock or the device may malfunction or be damaged.

⚠ CAUTION
- Only supply power as specified. Connecting an inappropriate power source may cause a fire. - Wiring should be done by qualified electrician. Incorrect wiring may lead to a fire, damage to the device or give you an electric shock.

(3) Use

⚠ WARNING
- Don't touch the terminals while power is being supplied or you may receive an electric shock. - When using a ZM-95T, assemble an emergency stop circuit and interlock circuit outside the ZM-95T. Otherwise damage to other machines may be caused by a problem in the ZM-95T.

(4) Maintenance

⃠ Prohibited action
- Don't disassemble or modify the modules. Fire, breakdown, malfunction or injury may occur.

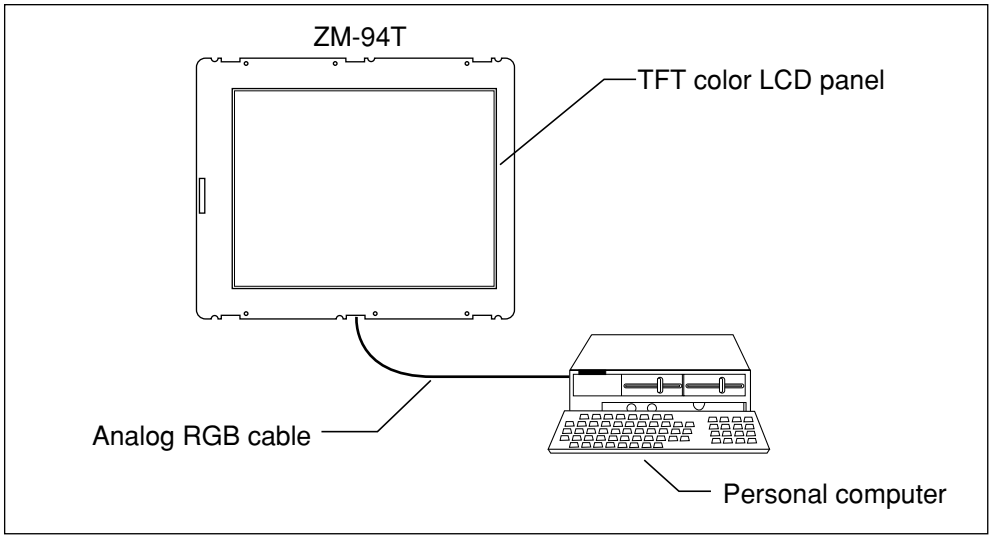
Chapter 1 Outline

The ZM-94T (TFT color LCD) and ZM-95T (TFT color LCD with touch panel) liquid crystal terminals are flat panel displays, one with a touch panel (ZM-95T). These LCD terminals can be used in place of the CRT monitors normally used in personal computers. The panel mount construction allows them to be installed into any type of equipment.

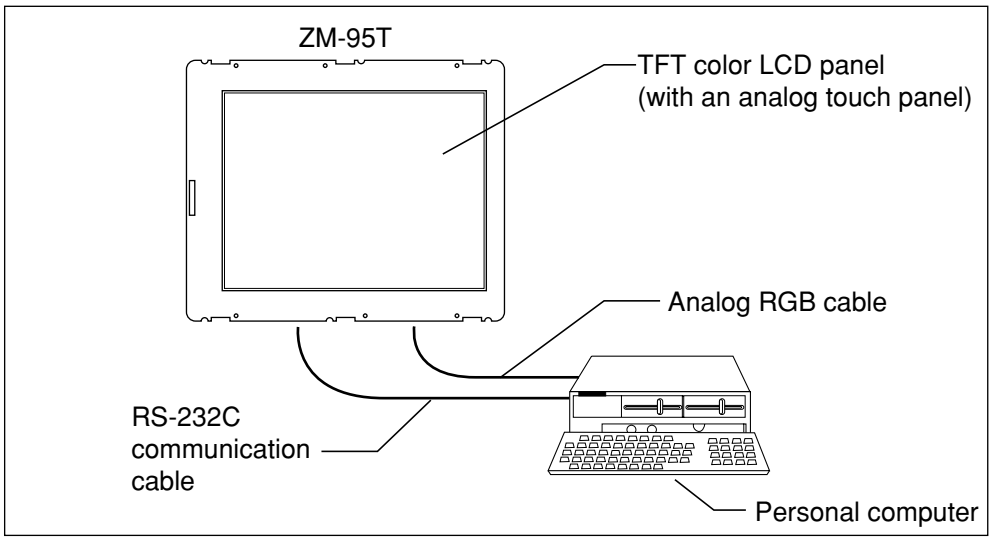
The viewable display screen size is 12.1 inches (diagonal) SVGA with a resolution of 800 x 600 pixels. They receive RGB signals from a personal computer or a board-type computer. The display can be adjusted.

System configuration

- **ZM-94T example**



- **ZM-95T example**



Chapter 2 Safety Precautions

Please note the following considerations for using and storing the ZM-94T/95T (hereafter referred to as "the monitor").

■ High voltage

⚠ · Do not remove the rear cover unless you are replacing the backlight. Inside the rear cover are high voltage parts used to backlight the LCD screen. It is quite dangerous if you touch them.

■ Cautions for static electricity

· Prior to touching the monitor, discharge any static electricity in your body by touching a grounded metal part.
Significant amounts of static electricity may build up on the human body in extremely dry conditions. The monitor employs an open frame system, which is convenient for mounting the display on a panel. For this reason, some sections of the monitor have exposed electric circuits. Touching any of these parts with your body may damage them due to static electricity built up in your body.

■ Wiring

· Be careful not to reverse the polarity on the 12 VDC input connector on the this model. If the polarity is reversed, the monitor may be damaged.
· The 12 VDC power lines should not be longer than 50 cm, in order to prevent an unreasonable voltage drop.
· Keep the RGB input lines and the 12 VDC power supply lines away from high voltage or strong current lines such as commercial power lines separated by 20 cm or more.
· The distance between the touch panel and the computer should be 15 m or less (RS-232C serial communicatio specifications).

■12 VDC external power

· Make sure to use a dedicated 12 VDC power supply (an insulated type able to supply the monitor with sufficient current). Sharing a single power supply with an other device may adversely affect the performance of the monitor.
· The SG and FG lines are connected inside the monitor. Therefore, if the 12 V line (positive side) is accidentally grounded, the monitor may be damaged by excessive current flow. To ground the monitor, make sure to ground it to the negative power line.

■ Liquid crystal panels

· LCD panels are produced using extremely precise technology. 99.99% or more of their pixels are functional when shipped. However, due to the inherent characteristics of LCD panels, you may notice that some panels may have dark or stuck pixels. Even so, they should be less than 0.01% of total.

■ Video input signal

· When the monitor is driven by analog signals, some noise may be seen at specific levels of graduated color.
· The monitor cannot be connected to a computer that is operated at other than the specified dot clock frequencies.
· When the computer signals (see the timing chart) are significantly different from the signals recommended on page 23, the monitor cannot automatically adjust the standard image position.

■ Installation

Avoid storing or using the ZM-94T/95T in the following conditions:

- · Direct sunlight or ambient temperature extremes outside the range of 0 to 50°C
- · Relative humidity exceeding the range of 35 to 85% RH, or sudden temperature changes which may cause condensation.
- · Corrosive or flammable gases.
- · Locations subject to vibration and shock.

■ Installation

- · Fasten the retaining screws in this monitor.
- · Tighten the screens on the RGB cable's connector and the 12 VDC terminal block screws.
- · In order to prevent excess temperature build up inside the monitor, do not block the ventilation holes on the side of the monitor.
- · In the case of the ZM-95T, do not block the hole on the lower right side of the touch panel (marked with an * on page 5). If it is blocked, the operation of the ZM-95T may be affected adversely.

■ Cleaning

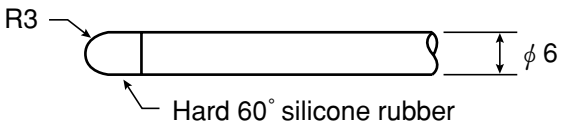
- · Never use any kind of solvent on the screen surface as it may warp or change color.
- · Do not allow any liquid or small metal objects (such as trimmings from copper wires) to get inside the monitor. Using a monitor which is contaminated is quite dangerous and may cause the monitor to malfunction.

■ Operation

- · Do not use excessive force when handling the monitor switches and connectors.

■ Touch panel

- · The touch panel on the monitor is made of glass. Be careful not to place any stress on the touch panel during installation. If it is stressed, the touch panel may be broken easily.
- · The touch panel surface can be scratched easily. Do not hit or draw on the surface using any pointed object such as a ball point pen. Otherwise it may cause a malfunction. We recommend using a touch pad operation pen, like the one shown below:

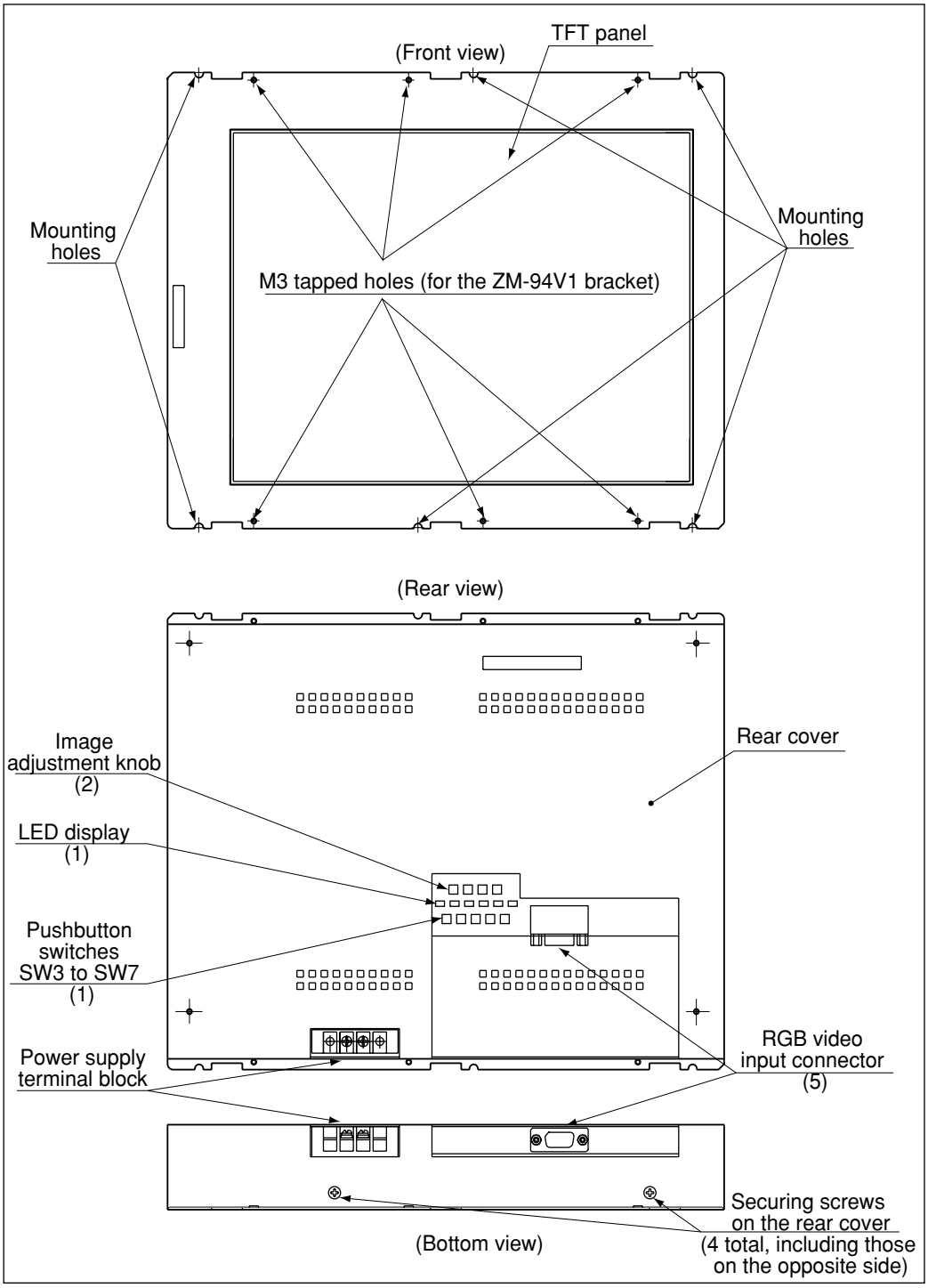


- · Remove the protective sheet covering the touch panel before use it.

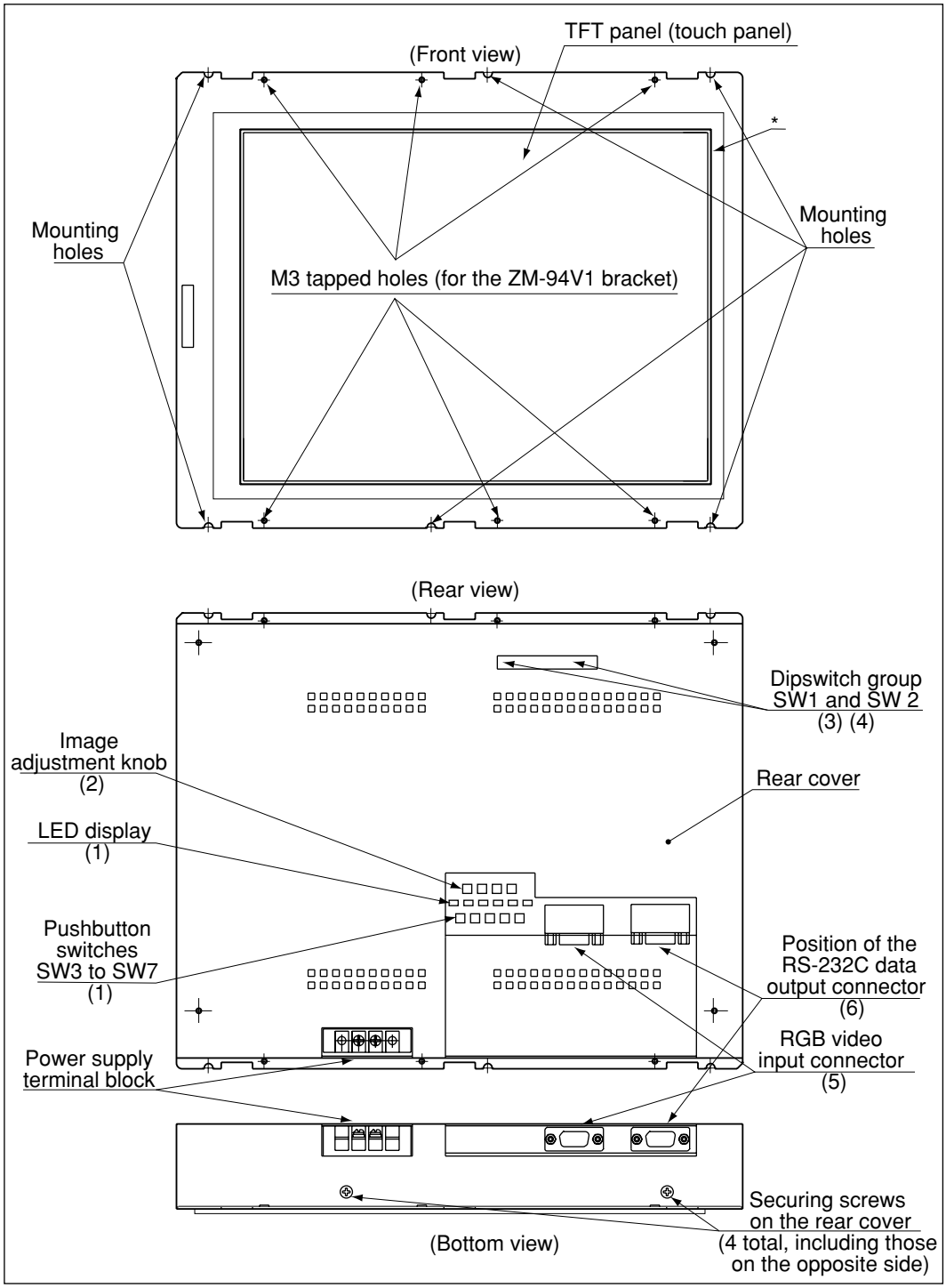
Chapter 3 Name and function of each part

[1] ZM-94T/95T

■ ZM-94T



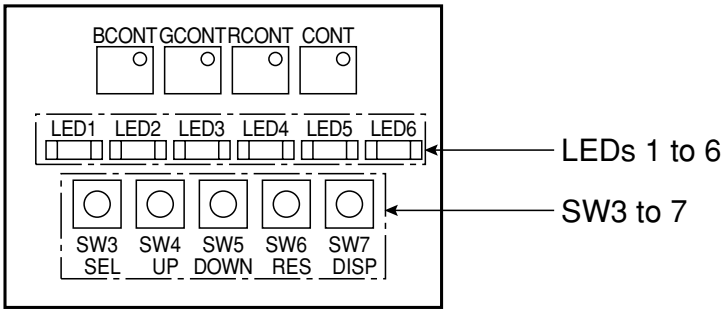
■ **ZM-95T**



* Do not block this area (upper right on the front view) or the operation of the ZM-95T may be adversely affected.

(1) Pushbutton switches SW3 to SW7 and LEDs 1 to 6 (ZM-94T/95T)

Used to set the screen variables (cycle, phase difference, horizontal position, and vertical position).

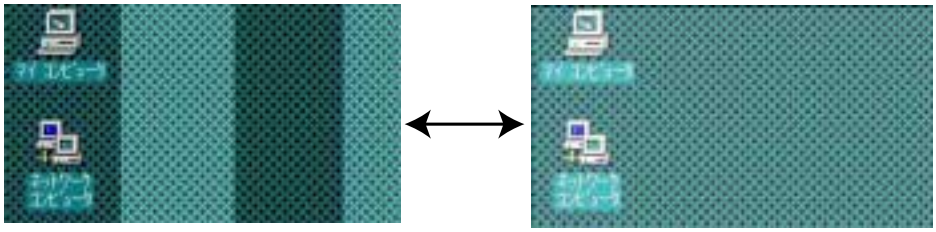


Switch name	Description
SEL (SW3)	Enable mode settings 0 to 4. - Modes 0 to 4 are selected in order by pressing this switch (each mode is displayed for approximately 0.2 sec.). LEDs show the mode currently selected. => Se the next page. - The UP/DOWN switch is enabled when any of the LEDs is lit. When the UP/DOWN switch is not enabled, press the SEL switch again to reenable mode selection. (The enabled condition will be released if no buttons are pushed for 5 seconds.)
UP (SW4)	Increment the value of the mode selected with the SEL key, by one.
DOWN (SW5)	Decrement the value of the mode selected with the SEL key, by one.
RES (SW6)	Return the values for the mode to their initial settings. - Press and hold the RES key for approximately 2 seconds while the touch panel status allows a mode to be selected. Only the values for the enabled mode will be returned to their initial settings. - Press and hold the RES key for approximately 5 seconds while the touch panel status allows a mode to be selected. Only the values for the enabled mode will be returned to their initial settings, and the mode will be disabled. - Press and hold the SEL key while pressing the RES switch for approximately 5 seconds while the touch panel status allows a mode to be selected. All of the modes will be reset to their initial values.
DISP (SW7)	When the DISP switch is pressed while the touch panel status allows a mode to be set, the values for each mode will be displayed in binary. - The display value will be increased/decreased by pressing the UP/DOWN switch. - LED 6 displays the LSB (lowest bit). LED 1 displays the MSB (highest bit).
	When the DISP switch is pressed while the touch panels status does not allow a mode to be selected, it will display the current input resolution. - When the resolution is SVGA800 x 600 pixels, binary value 5 (LEDs 4 and 6 will be lit) or binary value 4 (LED 4 lights) will be displayed. - When the screen display is not in normal mode, video signals other than the default resolution may be input. (Ex.: XGA 1024 x 768) If you want to do this, check the display resolution setting on the personal computer.

- Relationship between the mode selected and the LED display

Mode	LED status	Description
0 (normal mode)	All OFF	Normal status.
1 (cycle setting mode)	Only LED1 is lit.	Adjust the dot clock frequency. - Adjust it when the horizontal screen size is not correct (the screen has vertical stripes). (64 steps of adjustment using the UP/DOWN switches.)
2 (phase setting mode)	Only LED2 is lit.	Adjust the phase when the screen flickers, or characters are dim. (16 steps of adjustment using the UP/DOWN switches.)
3 (horizontal position setting mode)	Only LED3 is lit.	Adjust the screen's horizontal position. (64 steps of adjustment using the UP/DOWN switches.)
4 (vertical position setting mode)	Only LED4 is lit.	Adjust the screen's vertical position. (64 steps of adjustment using the UP/DOWN) switches.)

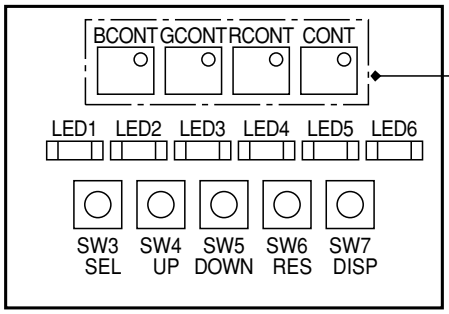
* Ex. The way a screen looks with vertical stripes.



Normal apperance

(2) Image adjustment knobs (ZM-94T/95T)

Adjust the CONT, RCONT, GCONT, and BCONT knobs using a flat blade screwdriver (Size: 1.5 mm wide and 0.3 mm thick)

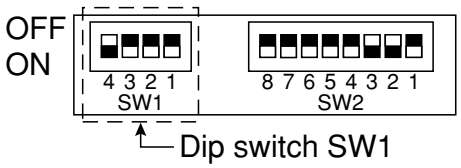


Screen image adjustment knobs (Positions marked with an "o" are the locations of the knobs.).

Dial name	Adjustment detail
BCONT	Blue level/hue
GCONT	Green level/hue
RCONT	Red level/hue
CONT	Brightness level/hue

(3) Dipswitch group SW1 (ZM-95T only)

Sets the backlight OFF interval and the buzzer sound.



- SW1-3 must not be changed.

- To change the settings, you have to turn the touch panel power supply OFF and ON again.

① Backlight OFF time

SW1-1	SW1-2	Backlight conditions
OFF	OFF	Never turns OFF the backlight. (Factory setting) - However, when the horizontal cycle signal is OFF, the backlight will go OFF.(See below.)
ON	OFF	Goes OFF after 10 minutes if no signal has arrived from the touch panel
OFF	ON	Goes OFF after 20 minutes if no signal has arrived from the touch panel
ON	ON	Goes OFF after 30 minutes if no signal has arrived from the touch panel

② Touch panel buzzer

SW1-4	Enable/disable buzzer
OFF	Disable
ON	Enable

How to turn OFF the backlight

This touch panel can respond to the power saving mode on a personal computer.
In addition to allowing the touch panel to turn the backlight ON and OFF automatically, based on the using dipswitch group SW1 settings, the touch panel will also automatically turn the backlight ON/OFF in the following conditions:

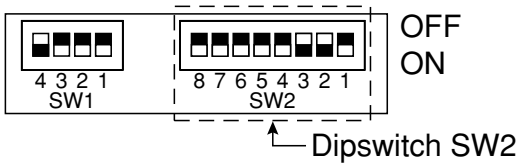
[Backlight ON/OFF conditions]

12 VDC power supply	Horizontal synchronous signal	Backlight
OFF	—	OFF
ON	OFF	OFF
ON	ON	ON

- When the horizontal synchronous signal is turned OFF by the power saving mode on the personal computer, the backlight will also turn OFF.
- If a horizontal synchronous signal is not input, the backlight will not turn ON, even though 12 VDC power is supplied.

(4) Dipswitchgroup SW2 (ZM-95T only)

Use these switches to set the touch panel serial communication mode and format.



- After changing the setting, turn the power to the touch panel OFF and then ON again.

① Communication mode

SW2-1	SW2-2	Operation mode
ON	ON	Continuous mode
OFF	ON	Make mode (setting when delivered)
ON	OFF	Make and break mode
OFF	OFF	Invalid setting

- "Continuous mode," "make mode," and "make and break mode." => See page 26.

② Serial communication format (communication baud rate)

SW2-3	SW2-4	Communication baud rate (bps)
ON	ON	2400
OFF	ON	4800
ON	OFF	9600 (Setting when delivered)
OFF	OFF	19200

③ Serial communication format (parity bit)

SW2-5	SW2-6	Parity
OFF	OFF	None (setting when delivered)
ON	ON	Even
ON	OFF	Odd
OFF	ON	Invalid setting

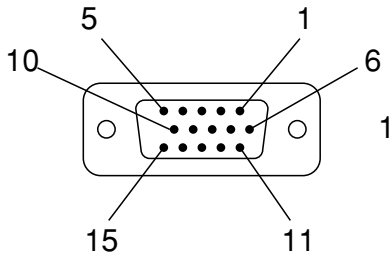
④ Serial communication format (data length)

SW2-7	Data length
ON	7 bits
OFF	8 bits (setting when delivered)

⑤ Serial communication format (stop bit)

SW2-8	Stop bit
ON	2 bits
OFF	1 bit (setting when delivered)

(5) RGB video input connector (ZM-94T/95T)



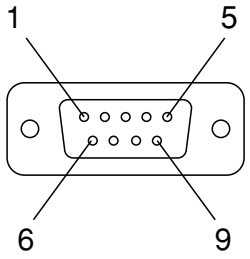
15 pin D-Sub mini female

Pin No.	Signal name
1	R
2	G
3	B
4	—
5	—
6	RGND
7	GGND
8	BGND
9	—
10	GND
11	GND
12	—
13	/H
14	/V
15	—

(See page 19 for connection details)

(6) Touch panel position data output connector RS-232C (ZM-95T only)

Outputs position data from the touch panel.

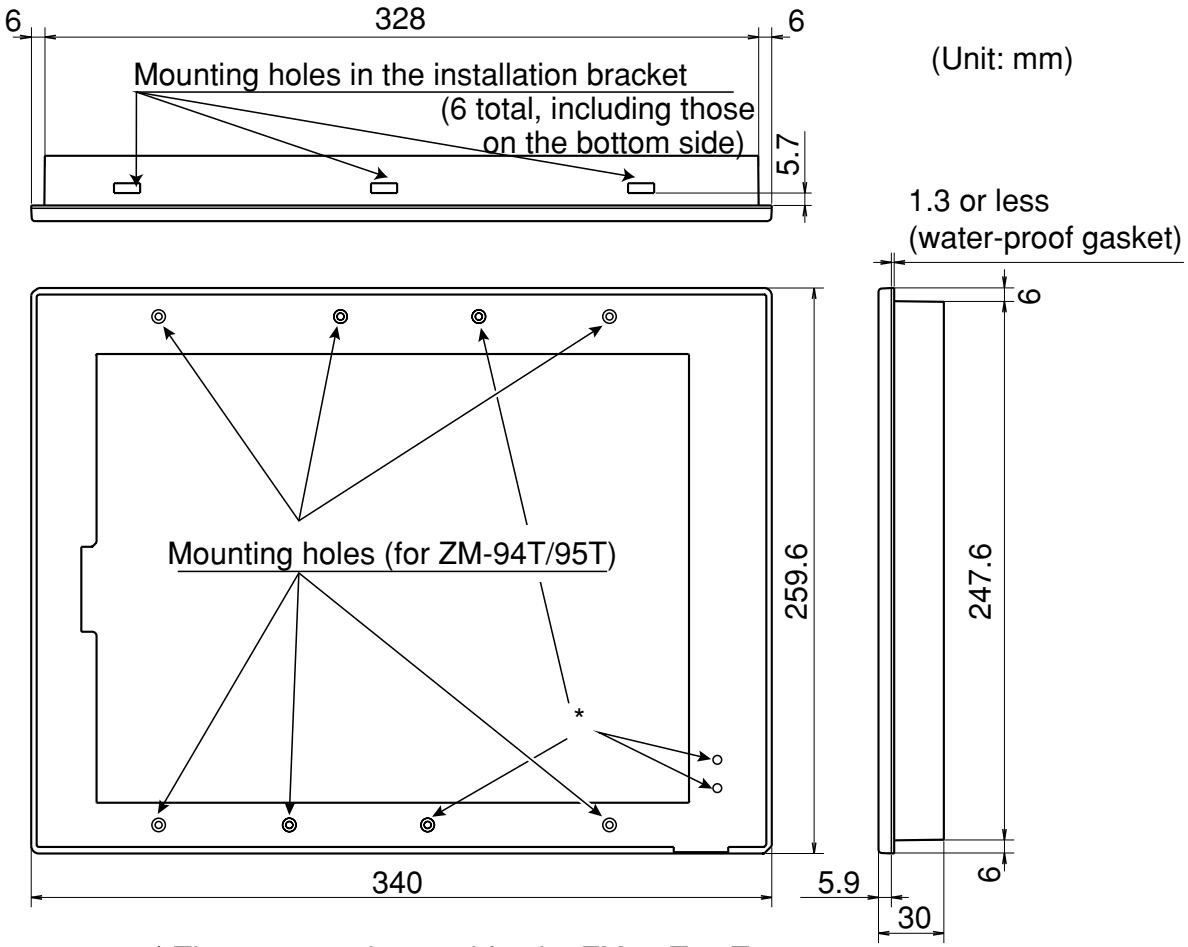


9 pin D-Sub male

Pin No.	Signal name
1	—
2	RD
3	SD
4	—
5	GND
6	—
7	RTS
8	CTS
9	—
Connector case	GND

(See pages 20 to 21 for connection details)

[2] ZM-94V1



(Unit: mm)

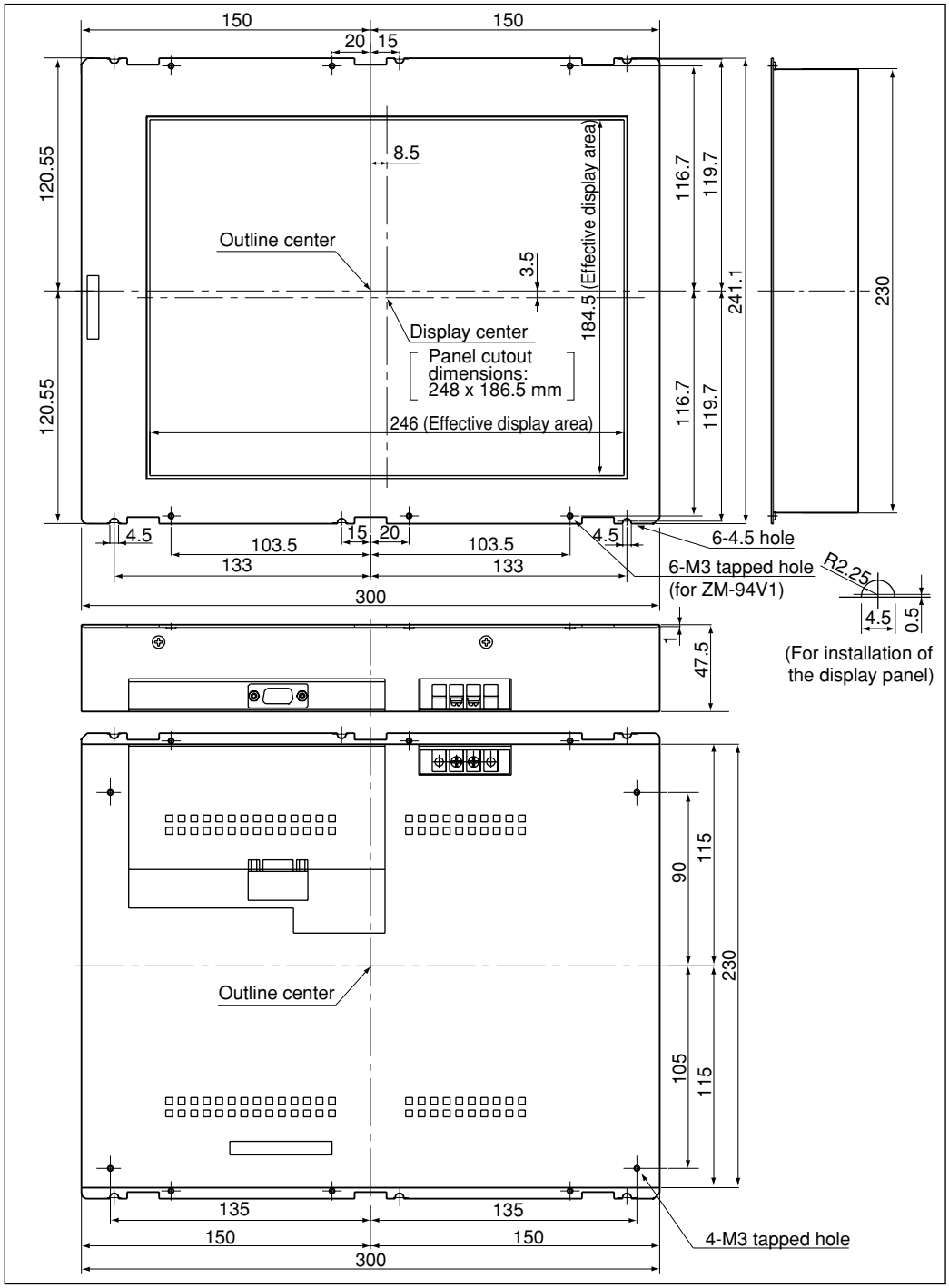
* These cannot be used for the ZM-94T/95T.

Chapter 4 Installation

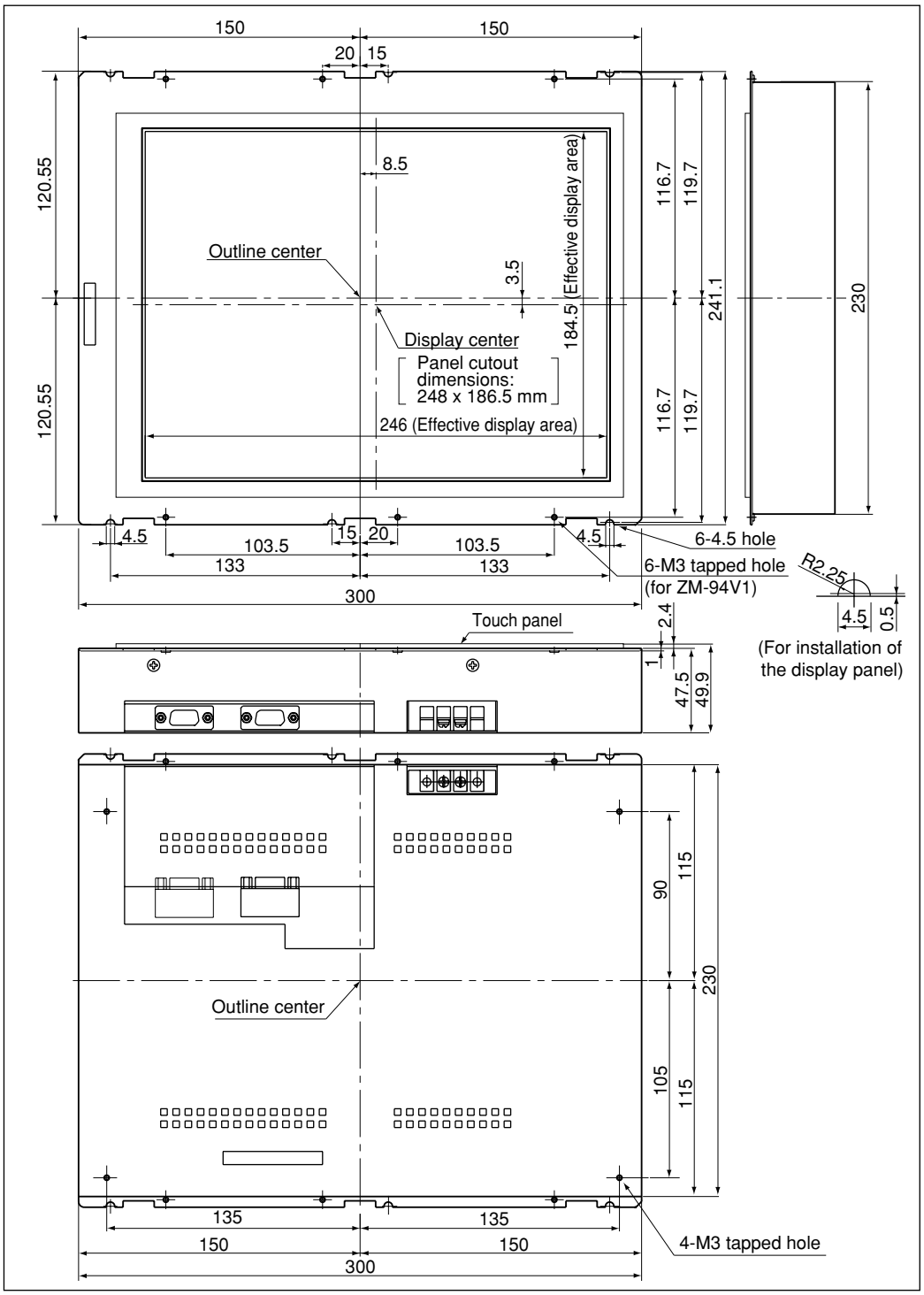
[1] Installation of the ZM-94T/95T

Secure the monitor by using the six mounting holes on the panel. Be careful not to pinch the monitor cable during installation.The cutout dimensions for the installation panel (for display) are 248 x 186.5 mm.

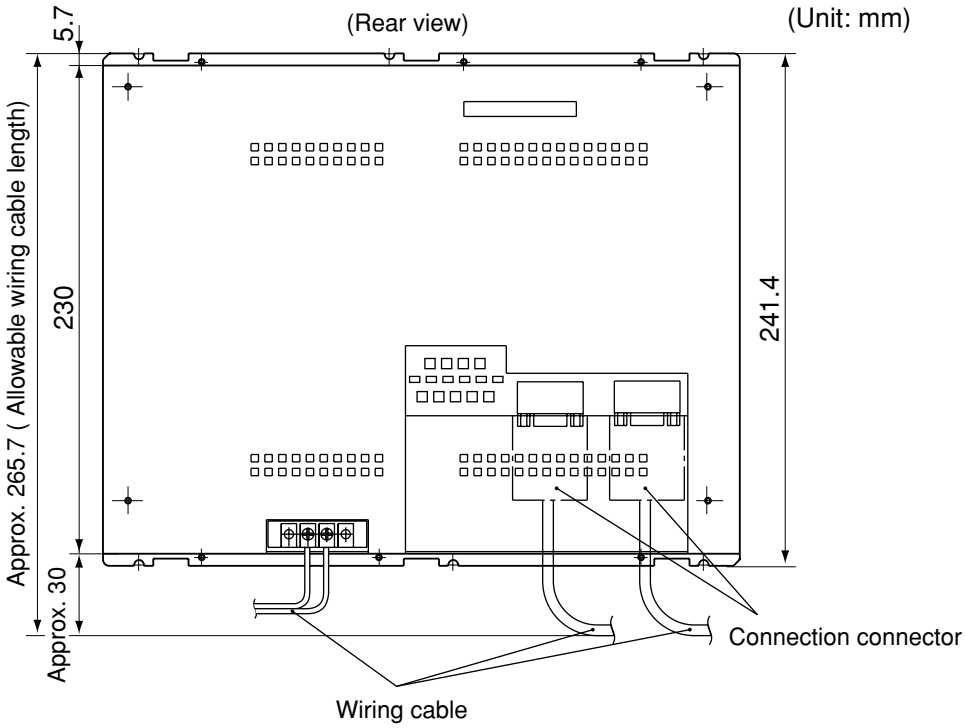
■ **ZM-94T**



■ ZM-95T


150
150
20
15
120.55
8.5
Outline center
3.5
184.5 (Effective display area)
116.7
119.7
241.1
230
Display center
Panel cutout
dimensions:
248 x 186.5 mm
246 (Effective display area)
120.55
116.7
119.7
4.5
15
20
4.5
103.5
103.5
133
133
300
6-4.5 hole
6-M3 tapped hole
(for ZM-94V1)
R2.25
4.5
0.5
(For installation of
the display panel)
Touch panel
2.4
1
47.5
49.9
90
115
230
Outline center
105
115
135
135
150
150
300
4-M3 tapped hole

• **Allowable length of wiring cable**



The ZM-95T is shown above. The dimensions for the ZM-94T are the same.

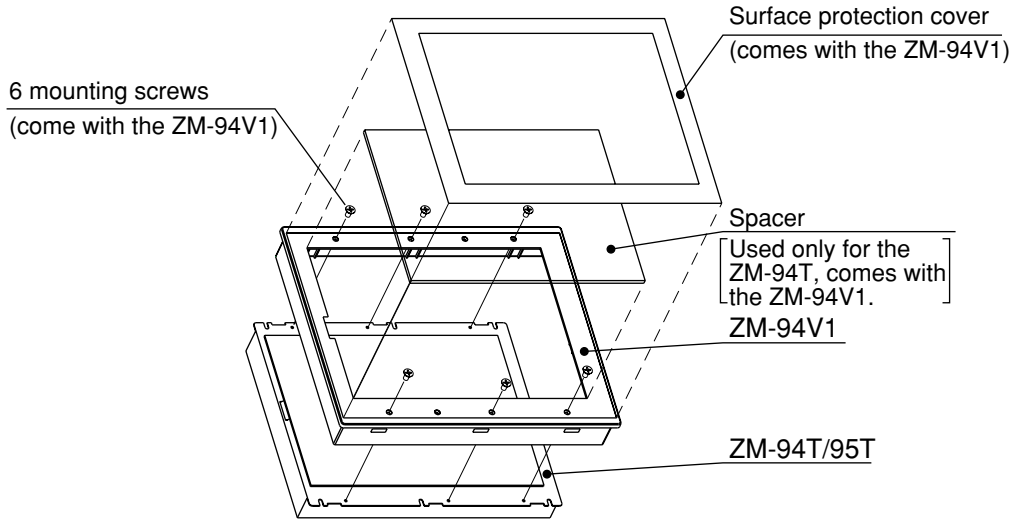
[2] Installation using the ZM-94V1

This section describes how to install the ZM-94T/95T using the ZM-94V1 installation bracket.

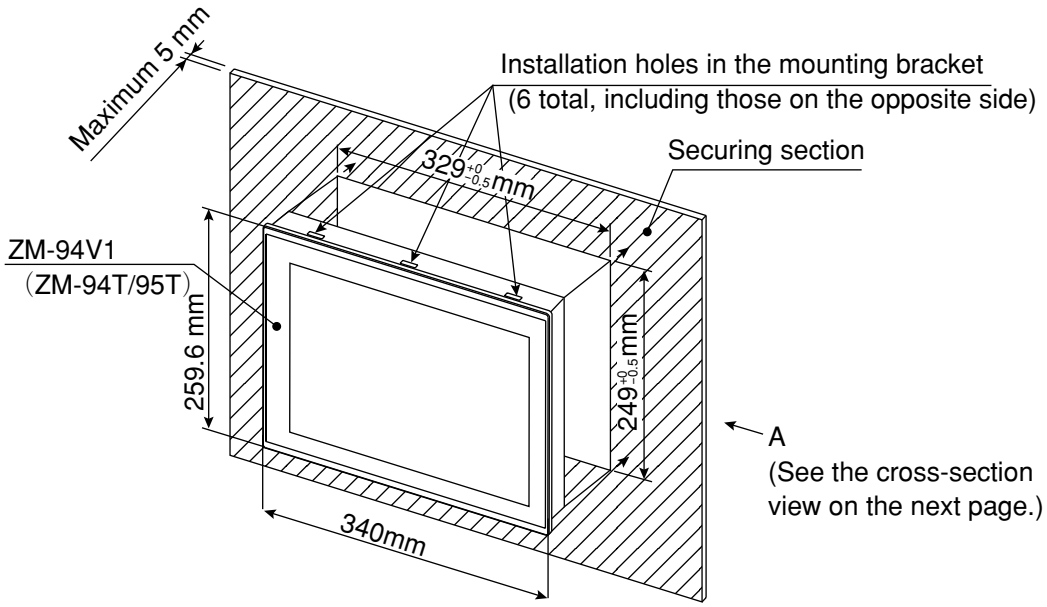
(1) Attach the ZM-94V1 to the ZM-94T/95T using 6 screws (Six, M3 flat head screws come with the ZM-94V1).

(2) When you are attaching the ZM-94V1 to the ZM-94T, add a spacer (it comes with the ZM-94V1) on the ZM-94T. (This is not required for the ZM-95T.)

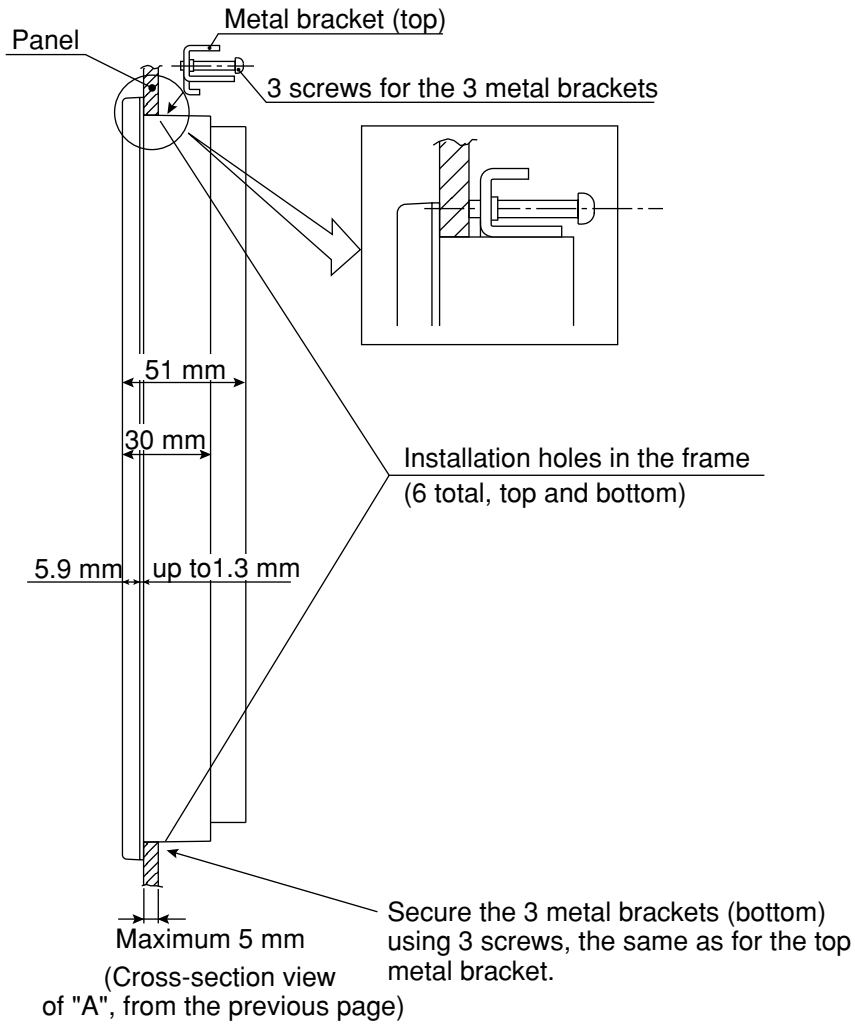
(3) Attach the surface protection cover (comes with the ZM-94V1).



(4) Cut a rectangular hole (329 x 249 mm) in the installation panel (max. panel thickness: 5 mm), and insert the assembly into the hole.



(5) Insert 2 metal brackets (One each on the top and bottom. They come with the ZM-94V1) into the mounting holes on the ZM-94V1. Secure the assembly by screwing the M4 screws into the metal brackets. (Tightening torque: 0.49±0.10N-m)



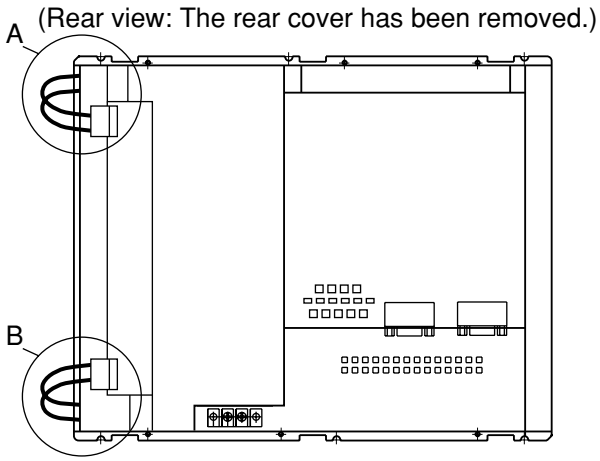
[3] How to replace the backlight

The backlight used in the ZM-94T/95T will wear out. When you have to replace the backlight because it has worn out, make sure to turn OFF the power to the ZM-94T/95T. Then, replace it as described in the procedures below.

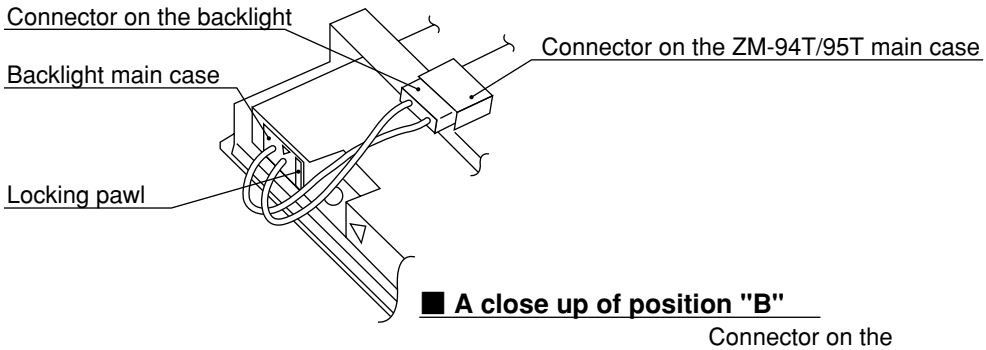
Note: Since the backlight may have a residual high voltage charge, touching it may give you an electrical shock. Replace both backlights at the same time.

(1) Remove the 4 screws securing the rear cover on the ZM-94T/95T and then remove the rear cover. (See pages 4 and 5.)

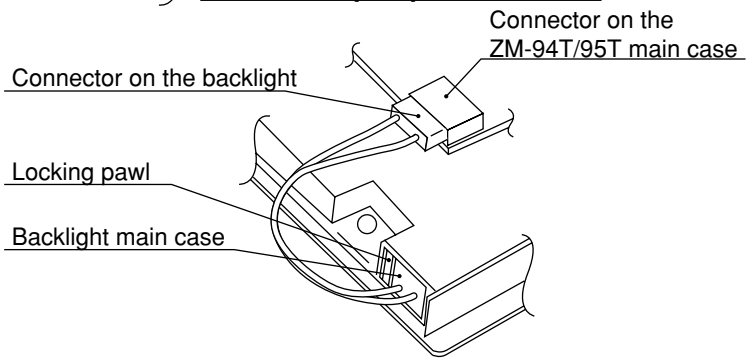
(2) Remove the connectors on the backlights from the ZM-94T/95T main housing.



■ **A close up of position "A"**



■ **A close up of position "B"**

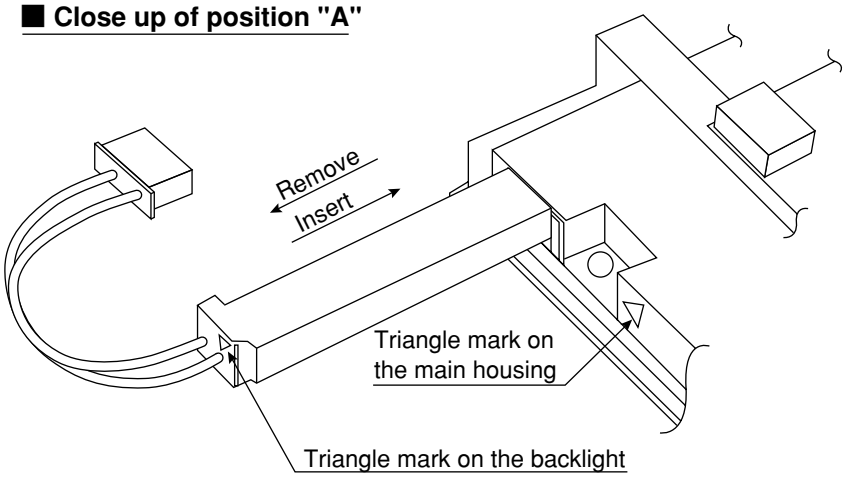


(3) Press down and hold the locking pawl that secures the backlight using a small, flat blade screwdriver, and pull out the backlight.

(4) Find the triangle mark on the new backlight (only on one of the two backlights), and insert it into the hole on the side of the ZM-94T/95T marked with a triangle (position A). Insert the backlight without a triangle mark into the hole that also does not have a triangle mark (position B). Press the backlight all the way in until you hear a click.

Note: Be careful not to break the backlights and not to allow any foreign objects to get into the holes while replacing the backlight.

■ Close up of position "A"



- Remove and insert the backlight at position "B," the same as for position "A." Note that position B does not have triangle marks.

Note: When you are using the ZM-94V1, you will have to peel off the surface protection cover, and remove the main housing from the plastic frame.

Chapter 5 Connections

[1] Connection to an output device (video board)

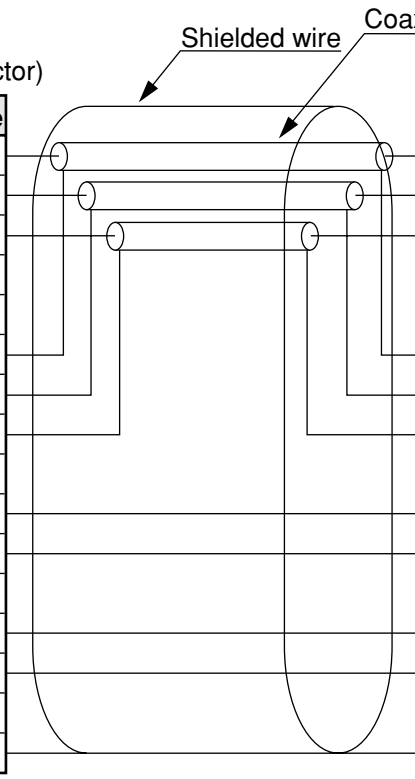
Connect the terminal according to the following connection diagram.

Turn OFF all power to the monitor and any external devices before connecting the cables.

■ Connecting an RGB video signal

ZM-94T/ 95T
(RGB video input connector)

Pin No.	Signal name
1	R
2	G
3	B
4	-
5	-
6	RGND
7	GGND
8	BGND
9	-
10	GND
11	GND
12	-
13	/H
14	/V
15	-
Connector case	



RGB

Pin No.	Signal name
1	R
2	G
3	B
4	-
5	-
6	RGND
7	GGND
8	BGND
9	NC
10	GND
11	GND
12	-
13	/H
14	/V
15	-
Connector case	

Use a male 15 pin D-sub mini connector.

· Approved connector

JK-C15-1V made by JST (JST: Japan Solderless Terminal)

[2] Connection to an input device (ZM-95T only)

Connect the output connector (9 pin D-sub male), which outputs the touch panel position data from the ZM-95T, to the input device, as shown in the connection diagrams. Make sure to limit the cable length to less than 15 m. Use a 17JE-13090-02 cable made by Daiichi Electric Industries Co., Ltd.

①Connection with personal computer (IBM-PC/AT)

ZM-95T (Position data output connector RS-232C)

Pin No.	Signal name
1	-
2	RD
3	SD
4	-
5	GND
6	-
7	RTS
8	CTS
Connector case	

Shielded wire

IBM-PC/AT (9 pin)

Pin No.	Signal name
1	CD
2	SD
3	RD
4	DTR
5	GND
6	DSR
7	CTS
8	RTS
Connector case	

②Connection to a JW-10SU

ZM-95T (Position data output connector RS-232C)

Pin No.	Signal name
1	-
2	RD
3	SD
4	-
5	GND
6	-
7	RTS
8	CTS
Connector case	

Shielded wire

JW-10SU PORT0 (25 pin)

Pin No.	Signal name
17	SD
4	RD
2	-
7	SG
14	DCD
6	CTS
22	RTS
1	FG

ZM-95T (Position data output connector RS-232C)

Pin No.	Signal name
1	-
2	RD
3	SD
4	-
5	GND
6	-
7	RTS
8	CTS
Connector case	

Shielded wire

JW-10SU PORT0 (15 pin)

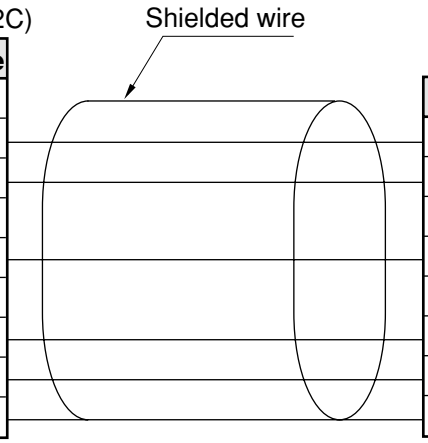
Pin No.	Signal name
2	SD
3	RD
6	-
7	SG
8	-
5	CTS
4	RTS
1	FG

- The JW-10SU is a serial interface module for the JW50H/70H/100H programmable controllers.

③Connection to a JW-21SU

ZM-95T (Position data output connector RS-232C)

Pin No.	Signal name
1	-
2	RD
3	SD
4	-
5	GND
6	-
7	RTS
8	CTS
Connector case	

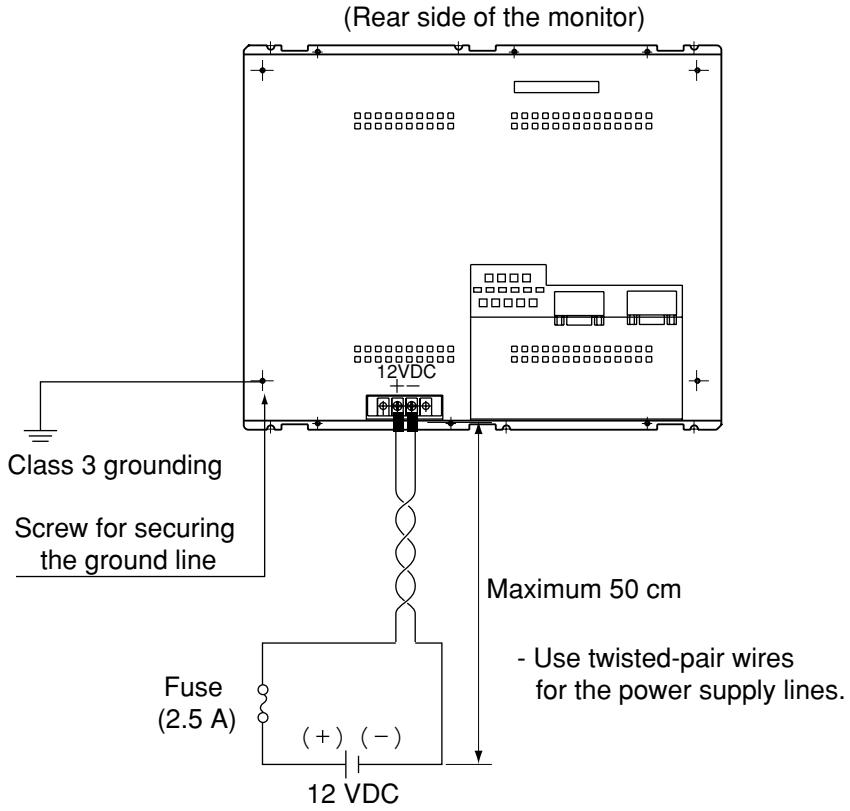


JW-21SU (25 pin)

Pin No.	Signal name
2	SD
3	RD
6	-
7	SG
8	-
5	CTS
4	RTS
1	FG

- The JW-21SU is a serial interface module for the JW20H/30H programmable controllers.

[3] Wiring the power supply



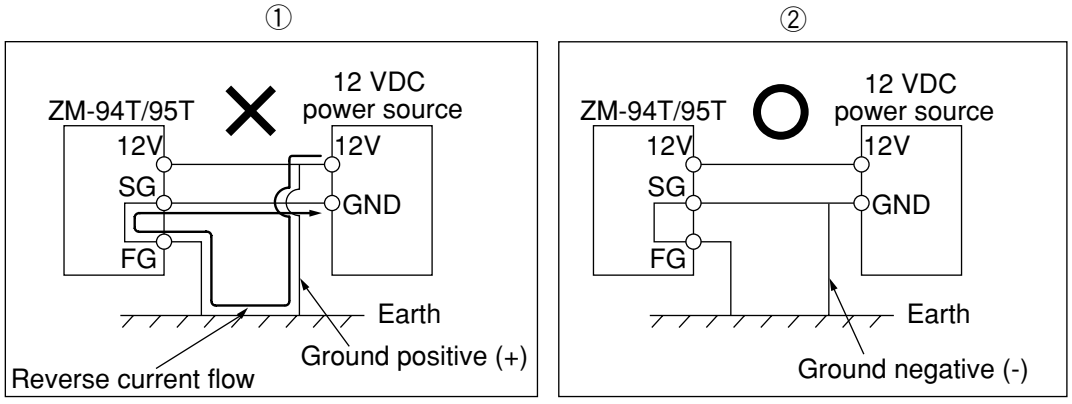
· Make sure to use a dedicated 12 VDC power supply (insulated type able to supply the monitor with 2A or more). Sharing a single power supply with other equipment may adversely affect the performance of the monitor.

· Be careful not to reverse the polarity of the 12 VDC power input on this model. Otherwise, this monitor may be damaged.

· The length of the 12 VDC power lines should not be more than 50 cm, in order to prevent an excessive voltage drop.

· Keep the RGB input lines and 12 VDC lines away from high voltage or strong current lines, such as power lines. (Separate by 20 cm or more.)

· The SG and FG lines are connected inside the monitor. Therefore, if the 12 V line (positive side) is grounded (figure ① below), the monitor may be damaged by excessive current flow. To ground the monitor, make sure to ground it to the negative power line (figure ② below).

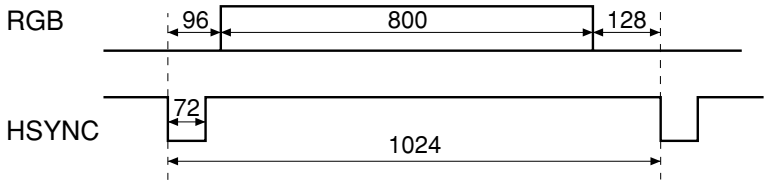


Chapter 6 Video input signal (recommended signal)

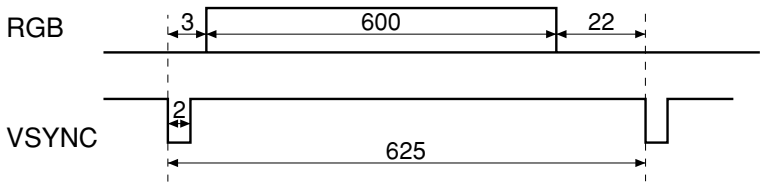
Below is a typical timing chart for the video input signal.

■SVGA — 800 x 600 (dot clock: 36.000 MHz)

① The relationship between the video signal and the horizontal synchronization signal is shown below (Unit : pixels)



② The relationship between the video signal and the vertical synchronization signal is shown below (Unit : lines)



Chapter 7 Touch panel (ZM-95T only)

The output specifications for the ZM-95T touch panel are as follows.

(1) Communication format (RS-232C)

Set using the SW2-3 to SW2-8 switches

	Switches used for setting	
Baud rate	SW2-3, 2-4	For details, => See page 9
Data length	SW2-7	
Parity bit	SW2-5, 2-6	
Stop bit	SW2-8	

(2) Text type (sending)

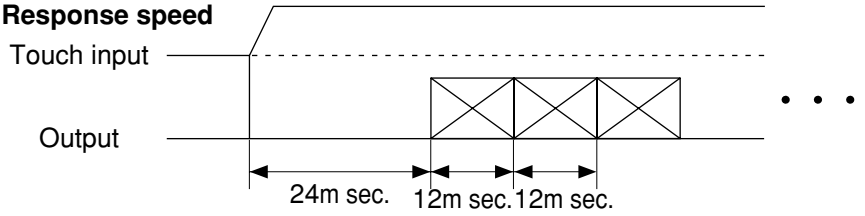
The monitor sends one set of coordinate data as 11 bytes, in 8 bit ASCII format.

Header ("T" or "R")	X data	"," ($2C_{(H)}$)	Y data	CR ($0D_{(H)}$)	Total
1 byte	4 bytes	1 byte	4 bytes	1 byte	11 bytes

[Example] data sent	Condition
T 0 0 0 3, 0 5 0 0 CR	←Contact (Header for T)
T 0 0 0 3, 0 5 0 0 CR	Contact maintained (Header for T)
T 0 0 0 3, 0 5 0 0 CR	
.	
.	
.	
T 0 0 0 3, 0 5 0 0 CR	
T 0 0 0 3, 0 5 0 1 CR	←Contact released (Header for R)

- Normally, the data values sent will be between 0 and 1023. However, due to fluctuations in the data from the touch panel, it must be corrected at the host computer. (Resolution: 1024 (X) × 1024 (Y))
- It is possible that data exceeding the range given above may be output. These data should be ignored by the program reading the touch screen information.
- When more than one point on the panel is turned ON simultaneously, the monitor will not output appropriate data.

(3) Response speed



(4) Sampling rate

The sampling rate is approx. 87 points of data per second (approx. 87 PPS). (PPS : Point Per Second)

(5) Control from a personal computer

When the following commands are sent to the monitor from a personal computer, the monitor's touch panel inputs and outputs can be controlled.

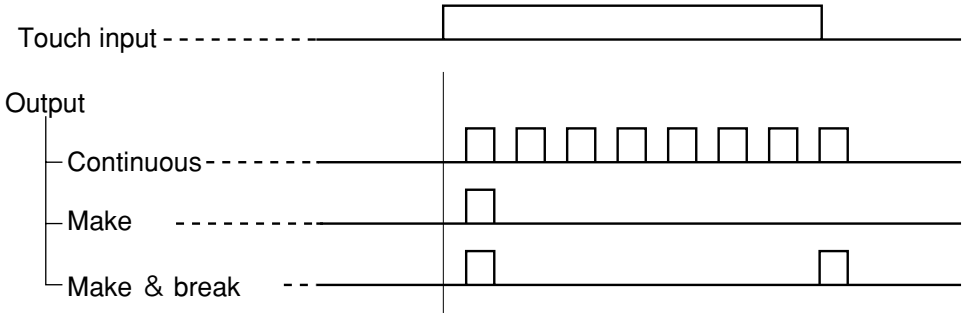
· The monitor's touch panel automatically enters low power consumption mode approximately 30 seconds after the last contact. The touch panel will automatically recover the next time the touch panel is touched. However, to operate the touch panel from a personal computer, you must first confirm that the touch panel is in normal mode by sending a "DI command" from the computer. (In the low power consumption mode, the touch panel will not respond to commands from the computer.)

Command	Operation
RE	Reset Note: If the monitor receives any data while it is sending data, the data it is sending may be corrupted.
DI	Check the board. When the board is functioning normally, the monitor will return "Pass □□□□." (□ means space.)
SR	Stop sending data. However, the monitor can receive commands. Note: When the monitor is sending sets of data, it will stop sending at the end of the current data set.
BR	Restart sending data
SM	Set to data creation mode
MM	(Same as the "SM" command.)
MB	Set to the "data creation & break" mode.
CM	Set to the "continuous" mode.

Notes: ① A CR ($0D_{(H)}$) must be sent at the end of all commands.
② While the ZM-95T is sending data, it can receive another command from the computer.
③ Lower and upper case characters can be used for commands.
④ The monitor will execute each command as soon as it has been received.
⑤ When the ZM-95T is in the low power consumption mode, it cannot receive commands.
⑥ Leave at least 15 ms between characters.

[Output pattern]

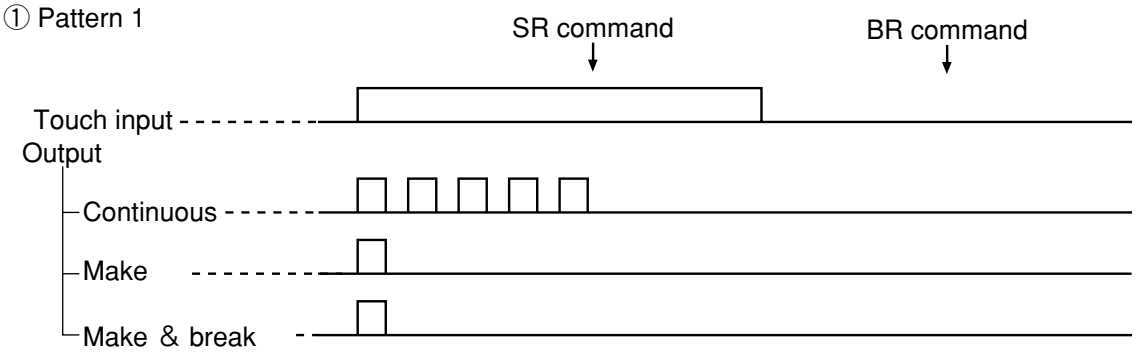
The relation between touch input and the continuous/make/make & break output modes are as follows.



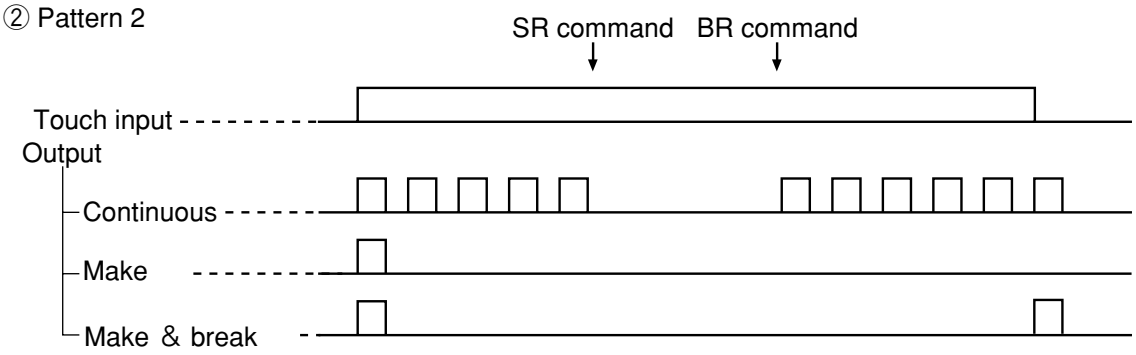
- Each output pulse is 1 set of data.
- The release data will be sent as a single data set when the pen or operator's finger is lifted away from the touch panel.

Shown below are the output patterns when the monitor receives a "stop sending" (SR or CTRL + S) or "restart sending" (BR or CTRL + Q) command.

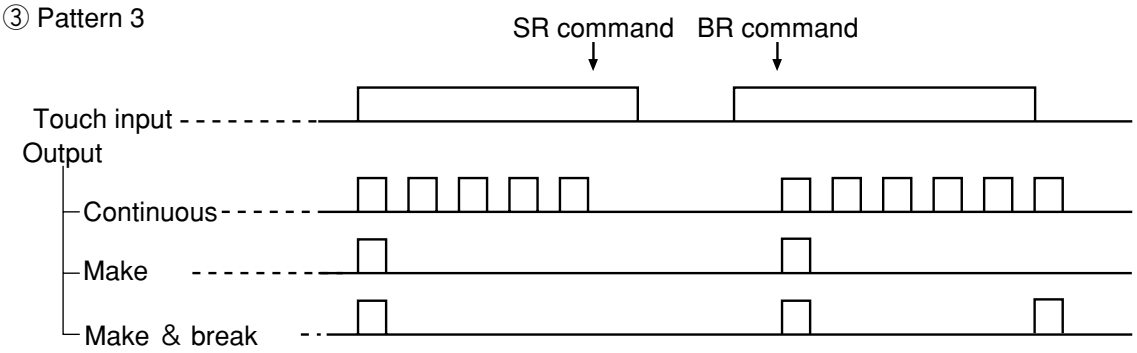
① Pattern 1



② Pattern 2



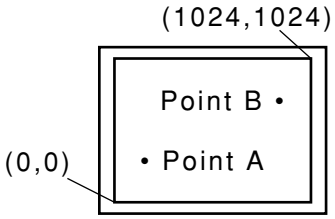
③ Pattern 3



(6) User calibration

The correction used to provide accurate positional information about the location on the touch panel is referred to as a "user calibration." The "user calibration" is needed to eliminate any difference between the position being touched and the position displayed on the monitor. This difference can occur when the touch panel is attached to the display.
Shown below is an example of user calibration.

[Formula used to calculate the user calibration, based on two points on the touch panel]



· Point A data: (X_A, Y_A)
· Point B data: (X_B, Y_B)
Note that $X_A < X_B$ and $X_A < Y_B$.

· Number of pixels in point A (position on the screen): (DX_A , DY_A)
· Number of pixels in point B (position on the screen): (DX_B , DY_B)
Note that $DX_A < DX_B$, $DY_A > DY_B$

The number of pixels (DX_1) per data set in the X direction will be,

$$DX_1 = (DX_B — DX_A) (X_B — X_A)$$

The number of pixels (DY_1) per data set in the Y direction will be,

$$DY_1 = (DY_B — DY_A) (X_B — X_A)$$

Therefore, the number of pixels (DX_D, DY_D) at any given position (X_D, Y_D) shall be,

$$DX_D = DX_A + DX_1 \times (X_D — X_A)$$

$$DY_D = DY_A - DY_1 \times (Y_D — Y_A)$$

The ZM-95T employs a position detection system that has a very small positional deviation caused by variation in the resistance level of the touch panel. However, we recommend that you execute a user calibration for the most accurate results.

Chapter 8 Specifications

[1] ZM-94T/95T

(1) General specifications

Item	Specifications	
	ZM-94T	ZM-95T
Power supply voltage	12 VDC±5% (Input from the terminal block)	
Current consumption	1.3 A	
Storage temperature	-20 to 60 ˚C	
Ambient temperature	0 to 50 ˚C	
Ambient humidity	35 to 85%RH (non-condensing)	
Atmosphere	Free from corrosive gas	
Vibration resistance	JIS C 0911 or equivalent Amplitude or acceleration 0.075 mm (10 to 58 Hz), 9.8 m/s^2 (58 to 150 Hz) Oscillation frequency 10 to 150 to 10 Hz (1 OCT/ minute) X,Y and Z directions (Number of scans: 10)	
Shock resistance	JIS C 0912 or equivalent (147m/s^2 3 times in each X,Y and Z directions)	
Static electricity resistance	· While operating (when the power supply is ON) : 7 kV · When packed in a vinyl case : 20 kV	
Weight	Approx. 2.5 kg	Approx. 2.8 kg
Grounding	Class-3 grounding	
External dimension (mm)	300(W)×241.1(H)×47.5(D)	300(W)×241.1(H)×49.9(D)
Panel cutout dimensions (mm)	248(W)×186.5(H)	
Accessories	One instruction manual	

(2) Performance specifications

Item	Specifications	
	ZM-94T	ZM-95T
Display element	12.1" type TFT color LCD display (use SHARP part LQ12S41)	
Back lighting	Cold-cathode tube (CCFT, life: 30,000 hours*), with an automatic turn OFF function.	
No. of pixels	800 (W) x 600 (H) (Dot pitch: 0.33 mm)	
Viewable display area	246.0 (W) x 184.5 (H)	
Surface brightness	When displaying white: 250 (cd/m^2)	When displaying white: 200 (cd/m^2)
Contrast ratio	1:100 (minimum value)	
Angle of visibility	Up and down (55 degrees each way), left and righ (70 degrees each way)	
No. of display colors	262,144 colors (8 bits each for RGB)	
Touch panel	---	- Analog resistance membrane system (Operational life: 1 millon times or more/per point) - Integrated touch buzzer function. - RS-232C connection (user selectable communication conditions)
Display mode	SVGA 800 x 600 pixels Horizontal synchronization frequency HSYNC: 35.1 to 37.9 kHz Vertical synchronization frequency VSYNC: 56 to 60 Hz	
	Dot clock frequency SVGA: 36 MHz (recommended)	
External signal	Analog RGB video signal: 0.7 VPP, 7.5 ohm	
	H horizontal synchronization signal: TTL level	
	V vertical synchnorization signal: TTL level	
	Signal grounding	

* The operational lifetime is based on an operating temperature of 25±5˚C and is the time until the panel brightness has dropped to 50% of the initial value, or starts flickering.

Driver software for touch panel

Model	Contents
TT-DOS TT-WIN TT-WIN95	Touch panel driver software for the ZM-95T (DOS/V only)

[2] ZM-94V1

Item	Specifications
Dust-proof and water-proof	IP64 *
Ambient storage temperature	-20 to 60˚C
Ambient operating temperature	0 to 50˚C
Ambient operating humidity	35 to 85%RH (non-condensing)
Atmosphere	Non corrosive gas
Weight	Approx. 500 g
External dimensions (mm)	340 (W) X 260 (H) X 30 (D)
Panel cutout dimensions (mm)	329 (W) X 249 (H)
Accessories	1 surface protection cover, 1 metal bracket (top), 1 metal bracket (bottom), 6 screws for metal brackets (M4), 6 mounting screws (M3 flat head), and 1 spacer.

* This is true when the ZM-94T/95T is installed in a panel and it is true only for the front side of the ZM-94T/95T.