HITACHI
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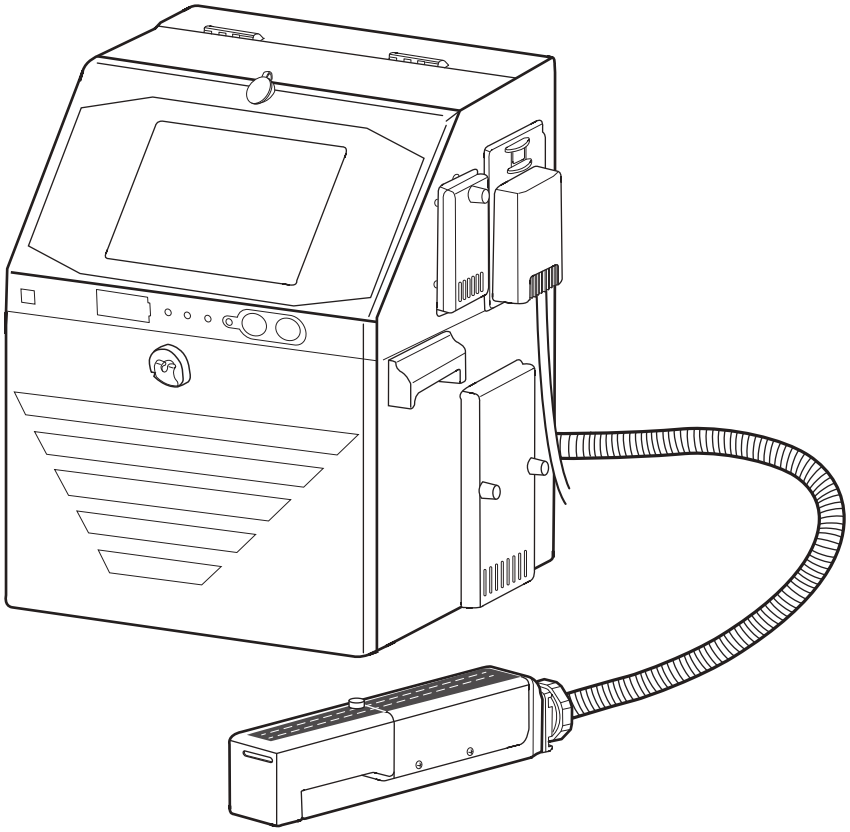
Technical Manual

INK JET PRINTER FOR INDUSTRIAL MARKING

HITACHI IJ Printer

Model UX Twin-Nozzle



Thank you for purchasing the Hitachi IJ Printer Model UX Twin Nozzle.
This printer employs a noncontact, ink-jet method to print onto a print target.
This instruction manual describes the basic operating procedures, maintenance procedures, and other detailed handling procedures of the Hitachi IJ Printer Model UX Twin Nozzle.
If the printer is improperly handled or maintained, it may not operate smoothly and may become defective or cause an accident. It is therefore essential that you read this manual to gain a complete understanding of the printer and use it correctly.
After thoroughly reading the manual, properly store it for future reference.

IF you changed the language of screen by mistake,see "7.8 Selecting Languages" in the Instruction Manual.

SAFETY PRECAUTIONS

- You should observe the precautions set forth below in order to use the product properly and avoid endangering you or other persons or damaging property. For the purpose of clarifying the severity of injury or damage and likelihood of occurrence, the precautions are classified into two categories, WARNING and CAUTION, which both describe hazardous situations that may arise if you ignore the precautions and perform an incorrect handling or operating procedure. The precautions in these two categories are both important and must therefore be observed without fail.

⚠ **WARNING**	WARNING is used to indicate the presence of a hazard which may cause severe personal injury or death if the warning against performing an incorrect handling procedure is ignored.
⚠ **CAUTION**	CAUTION is used to indicate the presence of a hazard which may cause personal injury or property damage if the warning against performing an incorrect handling procedure is ignored.

Pictograph Examples

	The △ symbols are used to indicate precautions (including those related to potential warnings) to be observed. Detailed information is furnished by a picture within the symbol outline (a shock hazard is indicated by the example shown at left).
	The ⃠ symbols are used to describe prohibited actions. The details of a prohibited action are given by a picture within or near the symbol outline (the example shown at left dictates that you must keep flames away).
	The ● symbols are used to describe required actions. Detailed instructions are given by a picture within the symbol outline (the example shown at left dictates that a ground connection must be made).

SAFETY PRECAUTIONS (Continued)

Installation Environment of Printer

WARNING

● Ensure that there is no flame- or arc-generating device around the printer.

The ink and makeup are both flammable and may cause fire.
Fire can be generated by matches, lighters, cigarettes, heaters, stoves, gas burners, welders, grinders and static electricity. Arcs may be generated from open-type relays, switches, and brush motors. Before handling the ink and makeup, remove static electricity from your body, peripheral equipment, and so on. In the interest of safety, position a dry-chemical fire extinguisher near the printer.

● Since the ink and makeup contain organic solvents, install the printer at an adequately ventilated location.

①Never install the printer in an enclosed space.
②Connect exhaust equipment to the printer in order to prevent it from filling with organic solvent vapor.
③Secure adequate space for the ink/makeup handling area and printer installation site. At least 400 m^3 must be provided per print head.
Ensure that adequate ventilation is provided.

CAUTION

● If extraneous noise enters the printer, it may malfunction or break down.

For maximum noise immunity, observe the following installation and wiring precautions.
①Ensure that 100 to 120 VAC or 200 to 240 VAC power cables are not bundled with other power supply cables.
②Insulate the printer main body and print head so that they do not come into direct contact with the conveyor or other devices.
③If the employed print target detector is housed in a metal case, use a plastic mounting brace for the purpose of insulating the detector from the conveyor and other devices.
④Be sure that the print target detector wiring is not bundled together with other power supply cables.

SAFETY PRECAUTIONS (Continued)

Grounding

WARNING

- Ensure that all electrical wiring, connections and grounding comply with applicable cords. Properly connect the printer to its dedicated ground.
  Complete the above procedure to avoid electrical shock hazards.

- When welding, keep enough space between the IJ printer and the welding work area to prevent the arc from starting a fire. Also, be sure to insulate the printhead and IJ printer frame to keep the welding current from flowing to the control section of the printer, and to make a separate ground connection for the printer.

- If you wish to receive ink particles in a beaker, for a printing test for example, use an electrically conductive beaker and connect the beaker securely to the ground.
  Do not let the tip of the printing head enter the beaker.

  Ink particles used for printing are electrically charged. An ungrounded beaker has a gradually rising charge, possibly catching on or causing a fire.

Cable Handling

WARNING

- Use an AC voltage of 100 to120 V or 200 to 240 V ±10% only and a power frequency of 50 or 60 Hz only.
  If the above requirements are not met, the electric parts may overheat and burn, creating a risk of fire or electric shock.

SAFETY PRECAUTIONS (Continued)

Ink and Makeup Handling

⚠ WARNING

● When charging a refill of ink or makeup, exchanging ink, or otherwise handling ink or makeup, take enough care not to spill ink or makeup.
If you spill any ink or makeup by mistake, wipe it off neatly and promptly with wiping paper or something similar. Do not close the maintenance cover until you make sure that the portion you have just wiped is completely dry.
You must pay particular attention when you have spilled ink or makeup inside the printer and it is not completely dry. Why? Because vapors of ink or makeup will stay inside the printer and may catch on or cause a fire.

If you find it hard to wipe the printer when it is turned on, stop it with the maintenance cover open. Power it down, and then wipe it off again.

● If you wish to clean the casing of the printer with wiping paper impregnated with makeup, be sure to do so with the power off.

Attempting to clean it when the power is on will cause makeup or vapors of makeup to enter the printer, possibly catching on or causing a fire.
When the cleaning is over, open the maintenance cover and make sure that no makeup has entered and no vapors remain inside.

● Should you find a leak of ink or makeup inside the printer while the printer is running or being maintained, wipe it off promptly with wiping paper or something similar. Then, with the maintenance cover open, stop the printer, power it down, and repair the leak.

Continuing operation with a leak of ink or makeup will cause an anomaly, resulting in abnormal printing.
Ink and makeup are flammable. They may therefore catch on or cause a fire.

● The ink and makeup, their waste solution, used wiping papers and empty containers are flammable. Waste disposal must comply with appropriate regulations. Consult the appropriate regulatory agency for further information.

⚠ CAUTION

● Since the ink and makeup contain organic solvents, observe the following handling precautions.

①When handling the ink or makeup, wear protective gloves and safety goggles to avoid direct skin contact. If the ink or makeup comes into contact with skin, wash thoroughly with soap and warm or cold water.
②When transferring the ink or makeup to or from a bottle, exercise caution to prevent it coming into contact with the printer or surrounding articles.
If there is any spillage, immediately wipe it clean using a cloth moistened with makeup.

● Ink and makeup must be stored as flammable liquids. Storage must comply with local regulatory requirements. Consult the appropriate regulatory agency for further information.

SAFETY PRECAUTIONS (Continued)

Main Body Handling

⚠ WARNING

- Do not insert tweezers, a screwdriver, or any other metal article into the ink ejection hole in the end of the print head.
  When the printer is ready to print, a high voltage (approximately 6 kV) is applied to the deflection electrode section in the print head.
  Exercise caution to avoid electric shock, injury, and fire.

- Do not remove covers and/or screws which are not specified on this manual.
  A high voltage is applied to some sections of the printer.
  Exercise caution to avoid electric shock and injury.

- Exercise caution to avoid inadvertently disconnecting, forcibly pulling, or bending piping tubes.
  Since the ink and makeup in some portions of piping tubes are pressurized, they may splash into your eyes or mouth or onto your hands or clothing.
  If any ink or makeup enters your eyes or mouth, immediately flush with warm or cold water and consult a physician.

- While the printer is operating, do not look into the ink ejection hole in the end of the print head.
  Ink or makeup may enter your eyes or mouth or soil your hands or clothing.
  If any ink or makeup enters your eyes or mouth, immediately flush with warm or cold water and consult a physician.

- When ejecting the ink, do it after confirming that there is no one in the ejection direction.
  (Operate with the end of the print head inserted in a beaker, etc.)

- Before servicing the printer, be sure to stop the ink ejection.
  Because ink or makeup may splash into your eyes or mouth or onto your hands or clothing. If any ink or makeup enters your eyes or mouth, immediately flush with warm or cold water and consult a physician.

- If an earthquake, fire, or other emergency occurs while the printer is engaged in printing or just turned on, press the Main power switch to turn off the power.

⚠ CAUTION

- Only persons who have completed an operator training course for Hitachi IJP can operate and service the printer.
  If the printer is operated or serviced incorrectly, it may malfunction or break down.

- Do not attempt to make repairs for any purpose other than operation or maintenance.

SAFETY PRECAUTIONS (Continued)

Related Regulations

WARNING

- Never drain the ink or makeup waste solution into a public sewer system.
  Waste disposal must comply with all appropriate regulations.
  Consult the appropriate regulatory agency for further information.

- The printer must be managed in compliance with all appropriate regulations.

  Read and understand the appropriate Safety Data Sheet (SDS) before using any ink or makeup.

FCC Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

SAFETY PRECAUTIONS (Continued)

WARNING

<Keep all fire away.>
○ Ink and Makeup are flammable.
○ All fire must be kept away from the machine.
○ Spilled Ink and Makeup must be wiped off and dried up immediately.

<Caution when handling Ink/Makeup>
○ Strage must comply with local regulatory requirements .
○ Read and understand Safety Data Sheet(SDS).
○ Be sure to wear protective gloves and safety goggies.
○ If the Ink/Makeup in used is an organic solvent,it must be managed in compliance with the Ordinance on the prevention or Organic Solvent poisoning.Refer to the "Instruction Manual"and the "Handling guidance of each ink" for details.

AVERTISSEMENT

< Tenir hors de portée du feu. >
○ L’encre et la composition sont inflammables.
○ Tenir la machine hors de portée du feu.
○ Nettoyez et séchez immédiatement les projections d’encre et de composition.

<Soyez prudent lorsque vous manipulez l’encre/la composition>
○ Le stockage doit respecter les obligations réglementaires locales.
○ Lisez attentivement la fiche signalétique de sécurité de l’appareil (FSSP).
○ Assurez-vous de porter des gants et des lunettes de protection.
○ Si l’encre/la composition utilisée est un solvant biologique, vous devez le manipuler conformément au décret sur la prévention des empoisonnements par solvant biologique. Reportez-vous au «Mode d’emploi» et aux «Conseils de manipulation de chaque type d’encre» pour plus de détails.

CONTENTS

2. INSTALLING PRECAUTIONS

⚠ WARNING

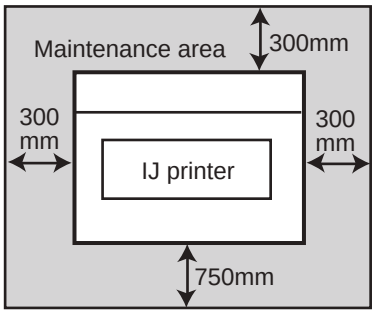
- **Ensure that there is no flame- or arc-generating device around the printer.**
  The ink and makeup are both flammable and may cause fire.
  Fire can be generated by matches, lighters, cigarettes, heaters, stoves, gas burners, welders, grinders and static electricity. Arcs may be generated from open-type relays, switches, and brush motors. Before handling the ink and makeup, remove static electricity from your body, peripheral equipment, and so on. In the interest of safety, position a dry-chemical fire extinguisher near the printer.

- **Since the ink and makeup contain organic solvents, install the printer at an adequately ventilated location.**
  ①Never install the printer in an enclosed space.
  ②Connect exhaust equipment to the printer in order to prevent it from filling with organic solvent vapor.

⚠ CAUTION

- **The employed ink and makeup contain organic solvents. Furnish an adequate space for the ink/makeup handling area and printer installation site. A space of at least 400 m^3 must be provided per print head. Ensure that adequate ventilation is provided. Follow all regulation in your country.**

(1) Provide a clearance around the IJ printer for daily operation, handling, and maintenance access (see the figure at right).
(2) The print head needs to be cleaned with the makeup while the printer is operated and stopped (daily maintenance). Adopt a fixed structure in consideration of print head cover and print head removal.
(3) Installation must be completed so that no vibration will be applied to the IJ printer main body, print head, or print head cable.
If they are vibrated, print quality deterioration and print irregularity may be incurred (the maximum permissible vibration value is 1.96m/s^2).
(4) The IJ printer main body must be installed with a levelness error of not over ±1°.
(5) The IJ printer main body must be electrically insulated from the other equipment (conveyors, packing machines,etc.), photoelectric switches, and the rotary encoder.
(6) The standard distance between the printing head and the object to be printed on is as indicated in the right-hand table.
The smaller the clearance between the print head and print target, the smaller the character height and the better printing.
(7) The IJ printer proper requires maintenance as the occasion may demand including replenishment of ink and makeup and replacement of filter.
(8) If ambient humidity is 85 to 90%RH, you must purge inside of print head by air. It is necessary for dry-clean air, regulator for pressure of air and air filter. (Quantities of the air are 1L / minutes.)



Top view

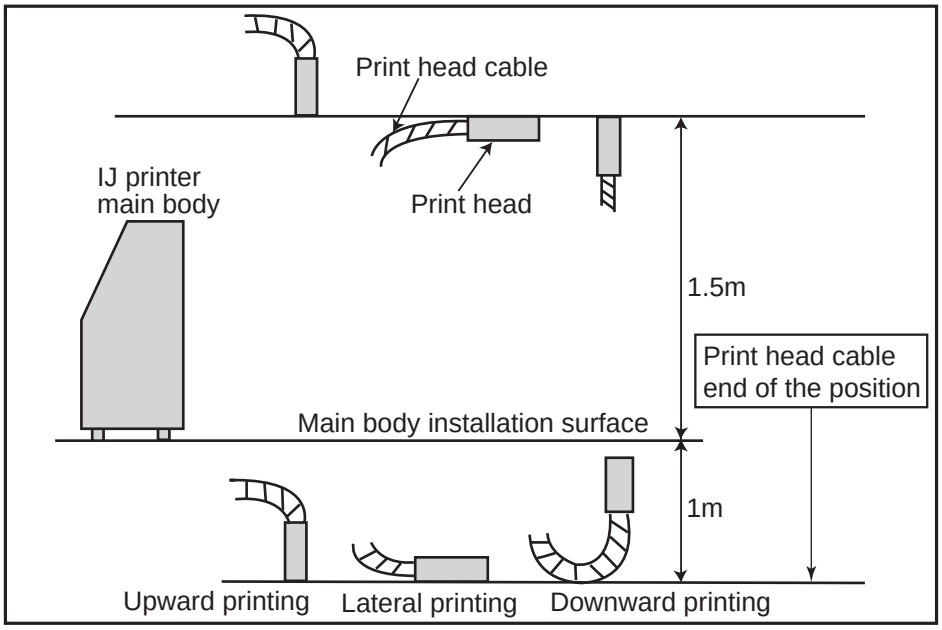
* Leave a maintenance area of at least 20 cm for the upside of printer.

Distance between the printing head and the object to be printed on

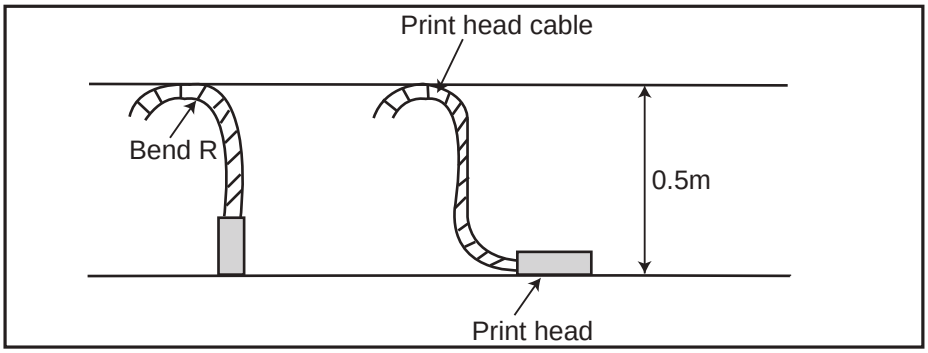
Nozzle diameter	Distance
65μm	10 to 30mm

(9) When installing the print head and print head cable, comply with the following conditions or it will increase the risk of degraded performance of the ink supply and ink recovery behavior.

①When positioning the end of the print head above the printer main body installation surface,ensure that the distance between the end of the print head and the installation surface does not exceed 1.5 m.
②When positioning the end of the print head below the printer main body installation surface, ensure that the distance between the end of the print head and the installation surface does not exceed 1 m.

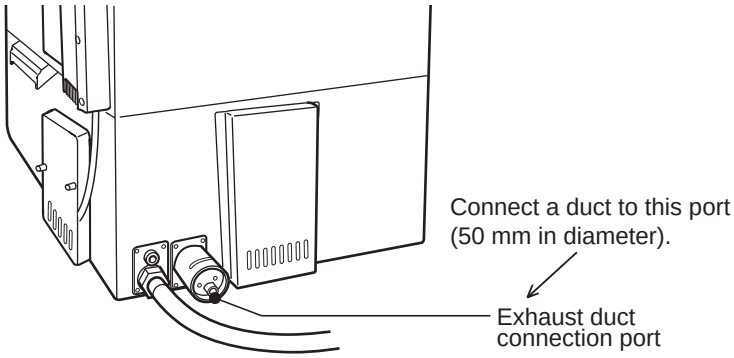


(10) When using the printer for upward or lateral printing, ensure that the rising print head cable upper end is positioned not more than 0.5 m above the print head.



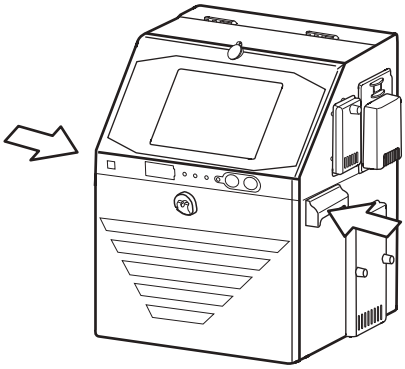
(11) If you fixed the print head, ensure that the minimum bend radius of the print head cable is at least 150 mm. Handle the headcable with care when wiring it.
If the minimum bend radius is less than 150mm, the tubes and wires inside the headcable might be broken.
(12) The ink stream may bend for some reason or other (due, for instance, to dirt).
The facilities positioned in the direction of ink ejection should be partially covered as needed to avoid ink accumulation.

(13) When connecting an exhaust duct to the printer, install a damper and adjust the wind velocity at the intake port to 0.3 to 0.5 m/s. (Use an anemometer for verification. If the wind velocity is too high, the makeup consumption increases.)



(14) If you try to fix the print head with a magnetic substance (such as iron), the cover switch will malfunction resulting in an "Cover Open" error.
This, you must only use nonmagnetic resins or metals for fixing the print head.

(15) In the case of carrying the printer proper, use the handles in the drawing below.



3. INSTALLATION CHECK ITEMS

3.1 Print head air purge

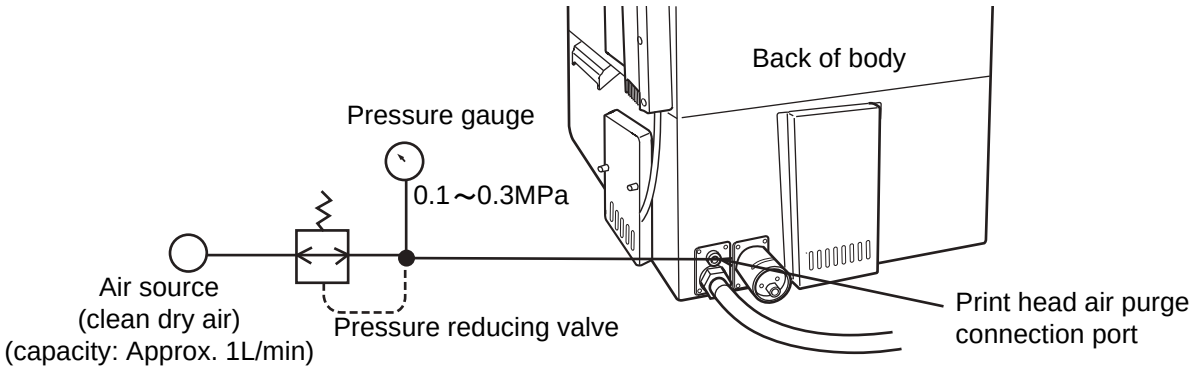
If the makeup remains in the electrode section after cleaning or if you use the IJ printer at a high humidity, moisture condensation may occur within the print head, causing leakage from the deflection electrode section. It is also important to remember that dust or splashed ink accumulation on the deflection electrode section may cause leakage. Performing the following air purge procedure for the print head interior is effective in preventing such leakage.

(1) Situations requiring an air purge

①When the printer is used in a highly humid place such as a beer or other beverage can line (If you use the printer in an environment in which the relative humidity is 85% or higher, complete the print head air-purge procedure).
②When a water drainage blow sequence is performed before printing.
③When the printer is used in a place where a considerable amount of paper powder or other dust exists.
④When the printing distance is short so that the end of the print head is splashed with ink.
⑤When you use inks that are indicated on the handling guidance of each ink to complete air-purge procedure.

(2) Air-purging procedure

Introduce clean dry air into the print head air purge connection port (Rc 1/8 (PT 1/8)×screw) in the rear of the printer main body at a pressure of about 0.1 to 0.3 MPa. If it is possible that the employed air tanks oil or water, turn it into clean dry air with an air filter, micro-mist separator, or the like before introducing it into the printer main body.



Made of resin. Be careful not to tighten too tightly when connecting with a metal joint.

Max. tightening torque:1.5N▪m

NOTICE

If the air-purge amount is excessive, print irregularities may occur. After air-purge pressure adjustment, be sure to perform a printing test to verify the printing results.

3.2 Setting functions which can be performed

(1) Functions

- ●Sets whether or not each function is enabled or disabled for each login user.
- ●The operation buttons of disabled functions are not displayed or the screen cannot be entered.
- ●”User conditions setup” and “Using environment setup” can be started when the administrator logs in.
- ●The function restrictions state can be checked at the function restrictions screen. (Refer to “Instruction manual 5.5 Checking functions that can be performed”)

Protected functions

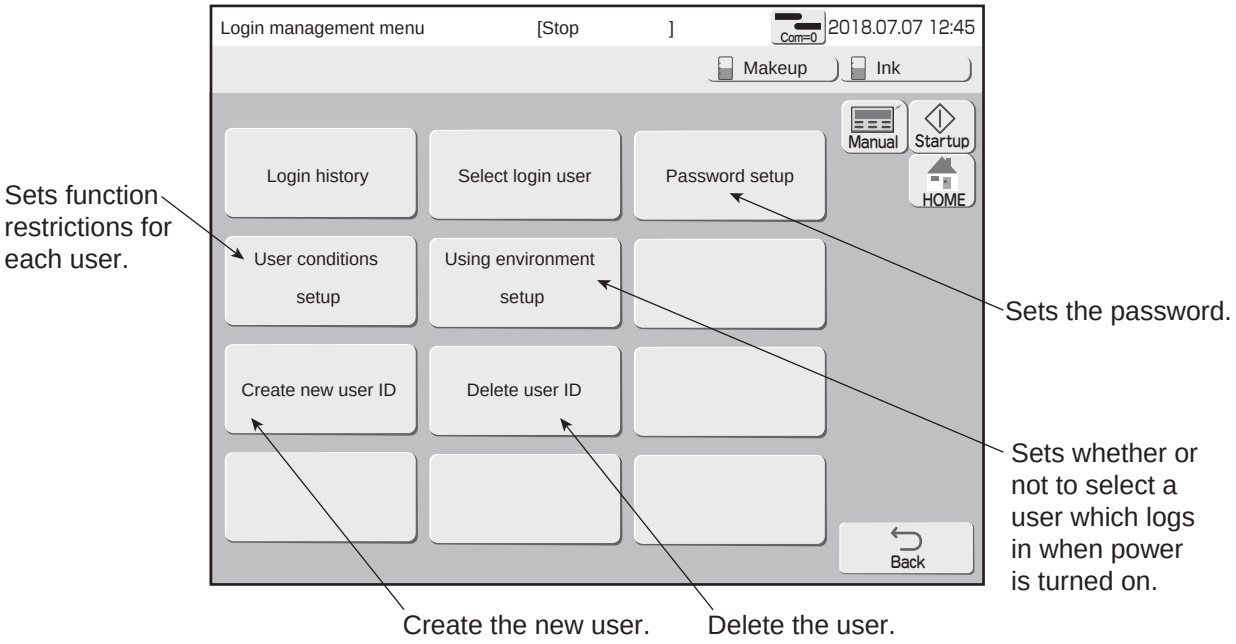
Item	Protected function name
Edit message	●Edit message ●Calendar conditions ●Substitution rules setting ●Count conditions
Select message	●Select message
Save message	●Save message ●Overwrite message
Print specifications	●Print specifications ●Various print setup ●Adjust print parameters
Print format	●Print format ●Adjust inter-character space
Maintenance	[Auxiliary functions] ●Manage messages/group ●Create user pattern ●Calibrate touch screen coordinates ●Copy data (IJP→USB) ●Copy data (USB→IJP) ●Edit standard pattern ●Edit substitution rules ●Select language [Environment setup] ●User environment setup ●Date/time setup ●Communication environment setup ●Touch screen setup [Maintenance work] ●Operation management ●Excitation V update ●Circulation control ●Solenoid valve/pump test ●Periodic replacement parts mgmt.
Password setup	●Password setup

(2) Operation

The administrator is logged in.

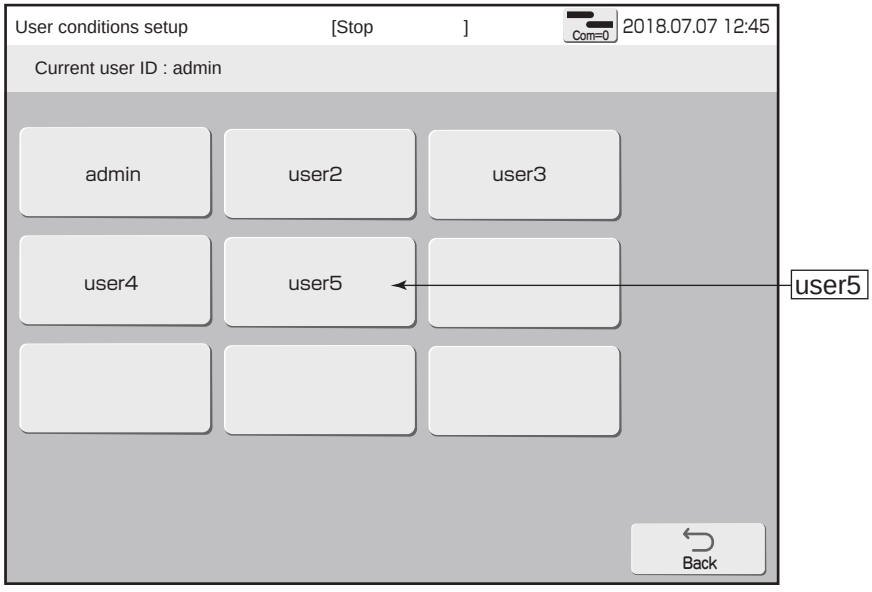
1 Press Login management of the Environment setup menu.

The Login management menu is displayed.
Log in as a user with administrator rights when User conditions setup or Using environment setup are not displayed on Login management menu.



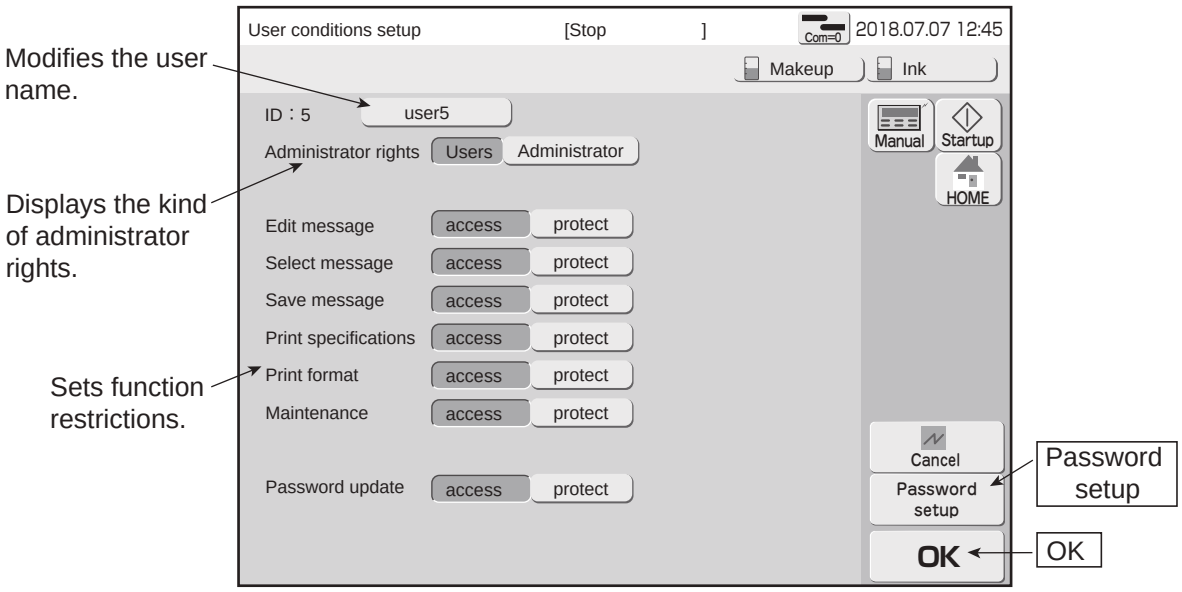
2 Press User conditions setup.

The User conditions setup screen is displayed.
A user list is displayed.



3 **Select user5.**

"user5" settings are displayed.



4 **Select the administrator rights.**

5 **Select "access" or "protect" for each function item.**

6 **Press Password setup and set the password.**

> An error message appears when the entry in the old password input field does not agree with the current password.
> However, the error does not occur if you type in "IGNOREPW" as the password.
> Use this word if you forget your password.

7 **Press OK.**

The administrator rights, function restrictions, user name, and password for user "user5" are set.

3.2.1 Password protection will be canceled in units of Print item

(1) Overview

●When Password protection is valid, it can be canceled in units of Print item.
●When Administrator logs in, Password protection can be canceled.

(2) Operation

●The character input is made as follows.

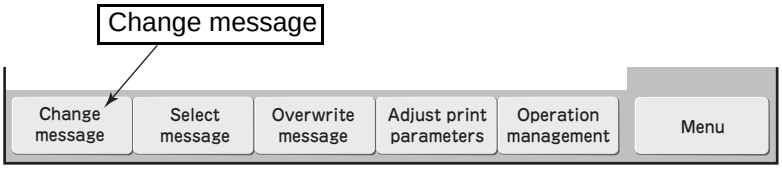
(Column 1)	(Column 2)
USE BY ·	18.07.07 ·

●For “user5” whose “Administrator rights” is “Users", set “Edit message” to “protect”.
●Password protection for Column 2 will be canceled.

1 **Administrator logs in.**

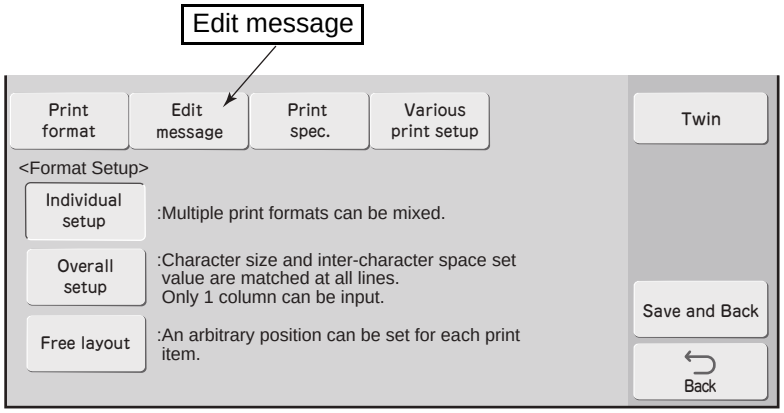
2 **As described in Section 3.2 “Setting functions which can be performed”, make “User conditions setup” enabled for “user5” and set “Edit message” to “protect”. At this time, Administrator still logs in.**

3 **Return to “Print description” screen from “Login management menu”.**



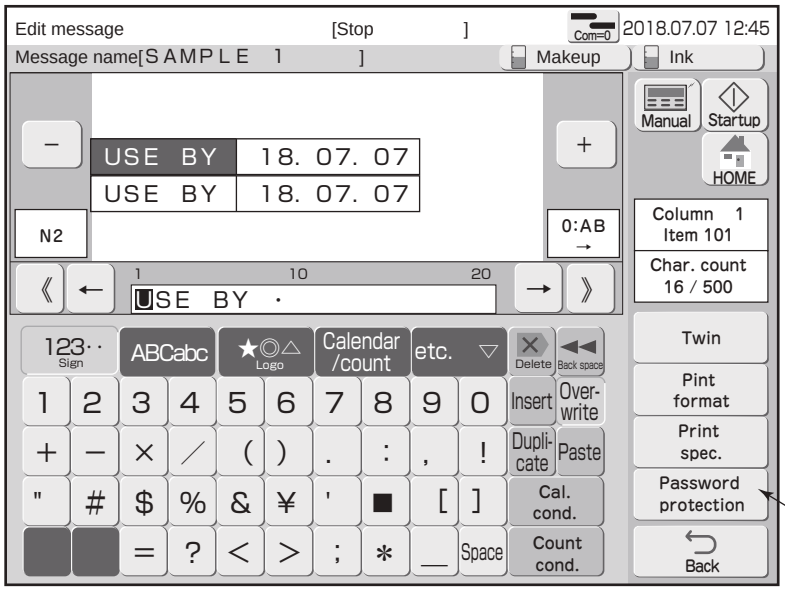
4 **Press Change message on “Print description” screen.**

“Change message” screen will be displayed.



5 **Press Edit message on “Change message” screen.**

“Edit message” screen will be displayed.

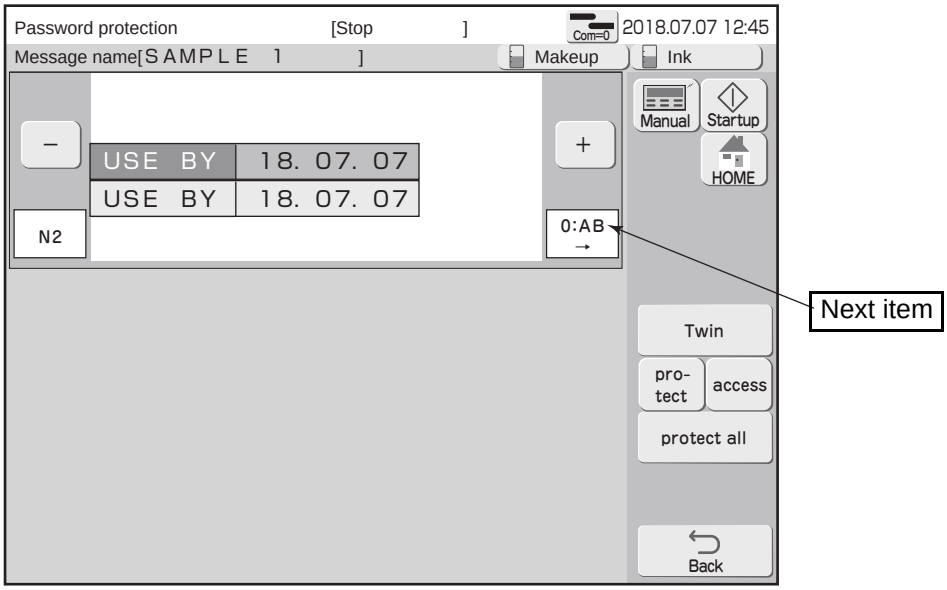


6 **Press Password protection on “Edit message” screen.**

“Password protection” screen will be displayed.

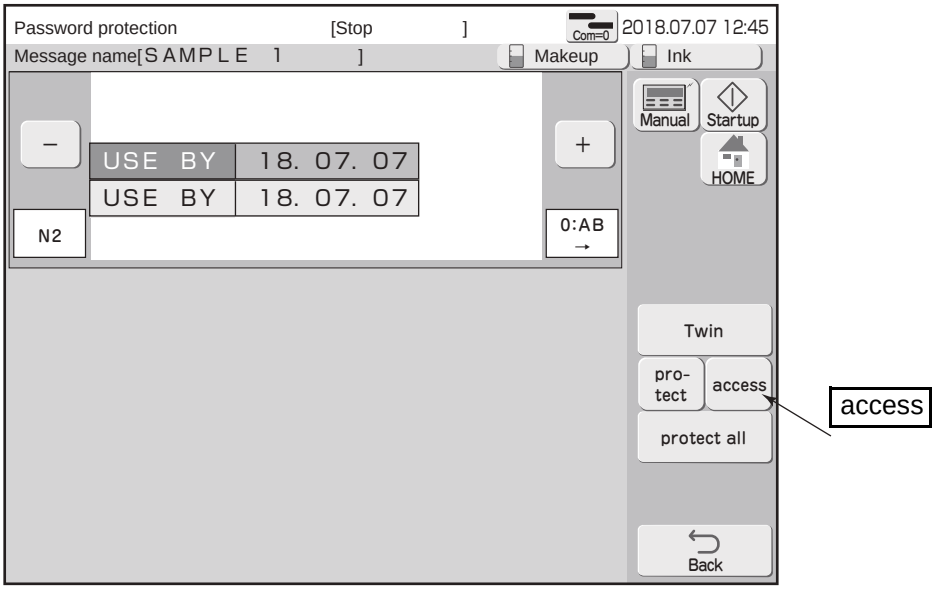
The character input of all the items is restricted by showing shaded characters.

The cursor is placed on Column 1.



7 **Press Next item.**

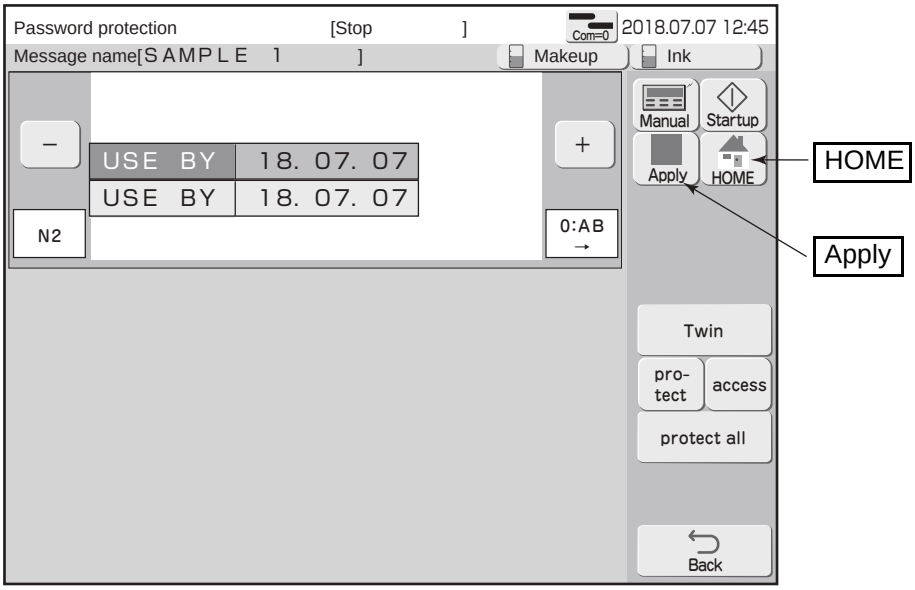
The cursor moves to Column 2.



8 **Press access.**

Password protection where the cursor is placed will be canceled and the character's shade will disappear.

The character input will be available on Column 2.



9 **Press Apply.**

All inputs which are set on "Password protection" screen will be applied.

10 **Press HOME .**

It will return to "Print description" screen.

11 **Login as "user5" on "Select login user" screen.**

Administrator rights "Users" is now applied.

The character input will be available ONLY on Column 2 on "Edit message" screen.

3.3 Selecting login user when power is turned on

(1) Functions

●Sets whether or not to select a user which logs in when power is turned on.

Possible login methods

	Login method “Disable”	Login method “Enable”
Operation when power is turned on	Immediately displays the Print description screen when the power is turned on. The login user is decided beforehand.	Selects the user which logs in when the power is turned on.

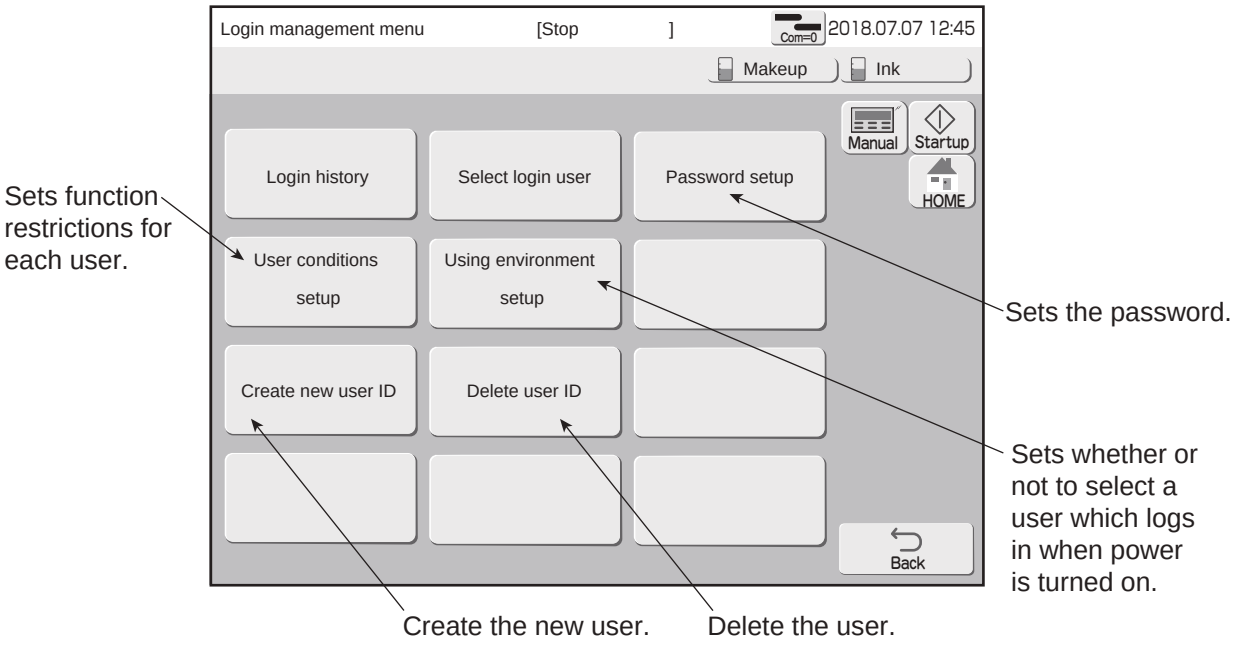
●The login user can be changed by login user change function even when the login method is “Disable”.
●”User conditions setup” and “Using environment setup” can be started when the administrator is logged in.

(2) Operation

Log in the administrator.

1 Press Login management of the Environment setup menu.

The Login management menu is displayed.

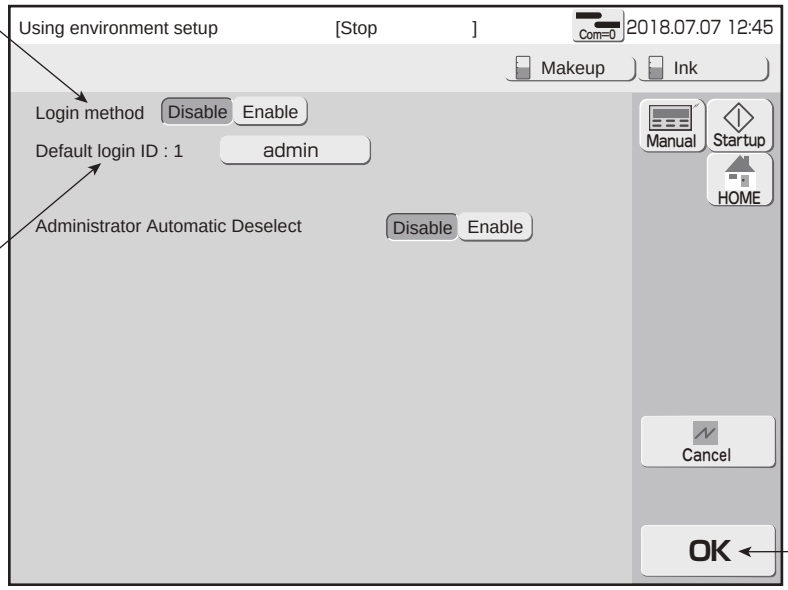


2 Press Using environment setup.

The Using environment setup screen is displayed.

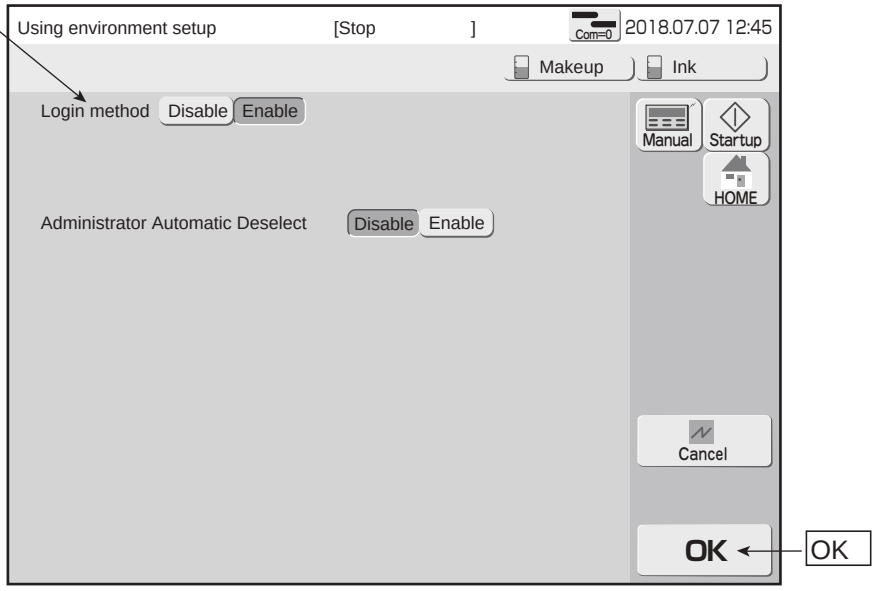
When "Disable" is selected, the Print description screen is immediately displayed when the power is turned on.

Specifies the login user



3 Press Login method Enable.

When "Enable" is selected, selects the user which logs in when the power is turned on.



4 Select the login method and press OK.

Sets whether or not to select a user which logs in when power is turned on.

CAUTION

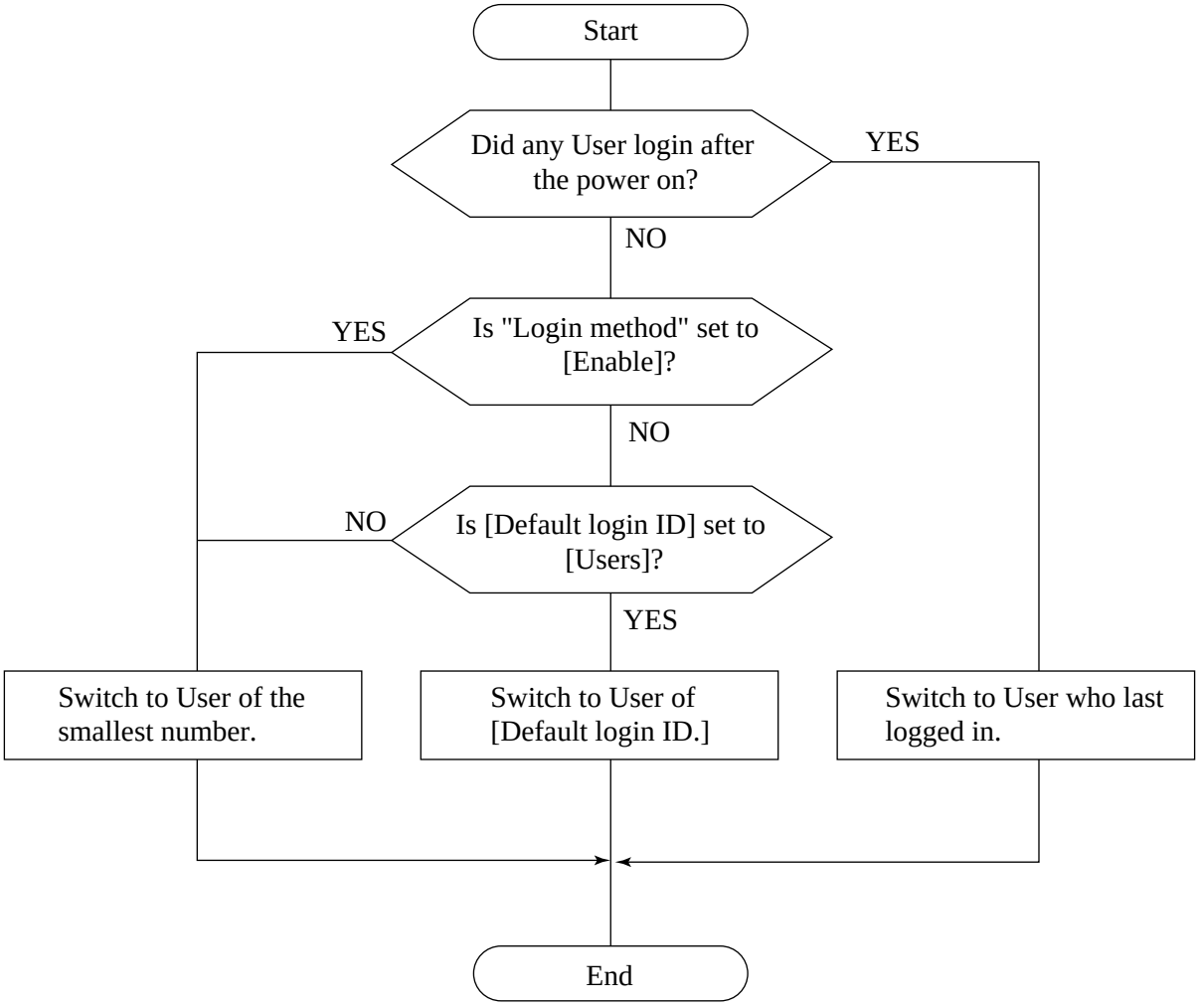
When the Login method is "Enable", the Select login user screen is displayed when the power is turned on. At this time, if the set password is forgotten, the program will not advance to the print description screen. Set and manage the password carefully.
If you forget the password, consult your nearest local distributor.

3.4 The state where the administrator login is returned automatically

(1) Function details

●In case that Administrator logged in to printer and left the screen untouched for 15 minutes, the new function will switch the login condition to Users from Administrator.

●Flow diagram below shows the steps of switching to User login condition.



(2) Working conditions

●The working conditions of this new function are listed in Table1 below.
Only when all the conditions are met, this new function will work.

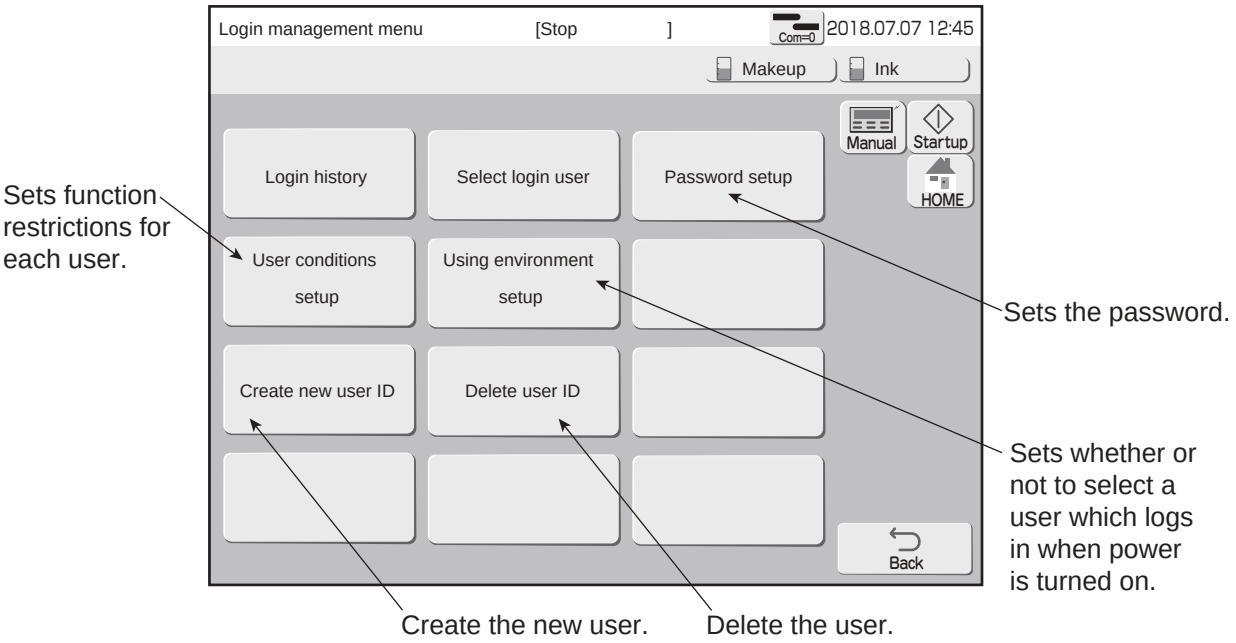
No.	Working conditions
1	"Administrator Automatic Deselect" is set to [Enable].
2	One or more than one user are registered as the Login user.
3	One of the menus below appears on the screen. (Print description, Change message, Print format, Adjust Inter-character space, Edit message, Count conditions, Print specifications, Various print setup, Save message, Select message, Adjust print parameters, Operation management, Maintenance menu, Aux. function menu, Environment setup menu)
4	[Apply] key does not appear on the screen.

(3) Operation

Log in the administrator.

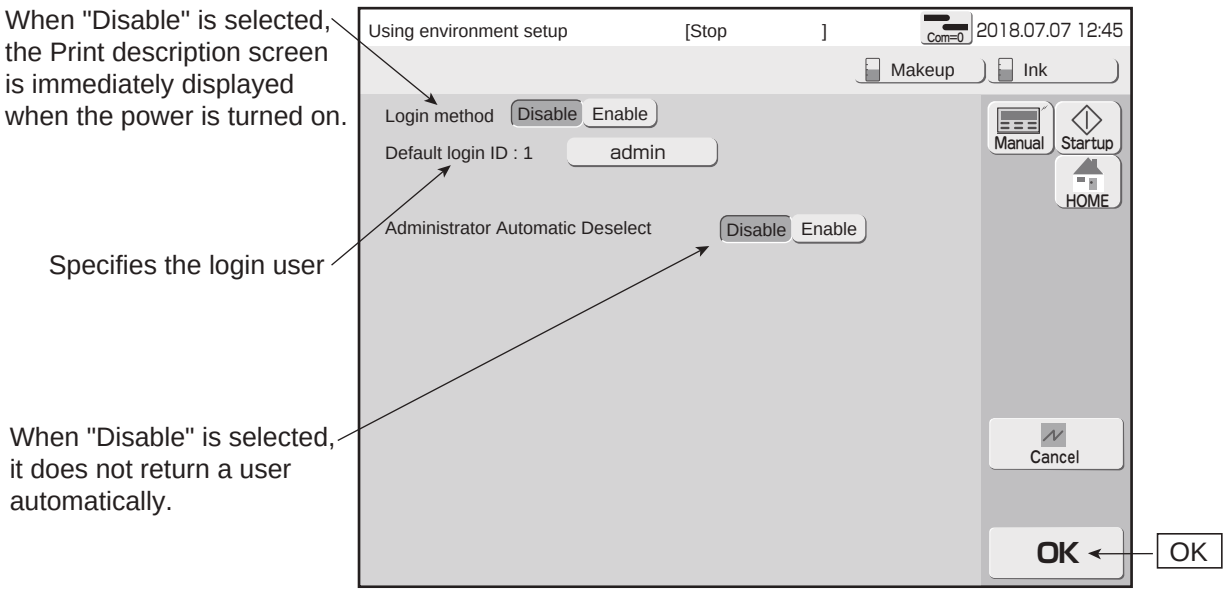
1 Press Login management of the Environment setup menu.

The Login management menu is displayed.



2 Press Using environment setup.

The Using environment setup screen is displayed.

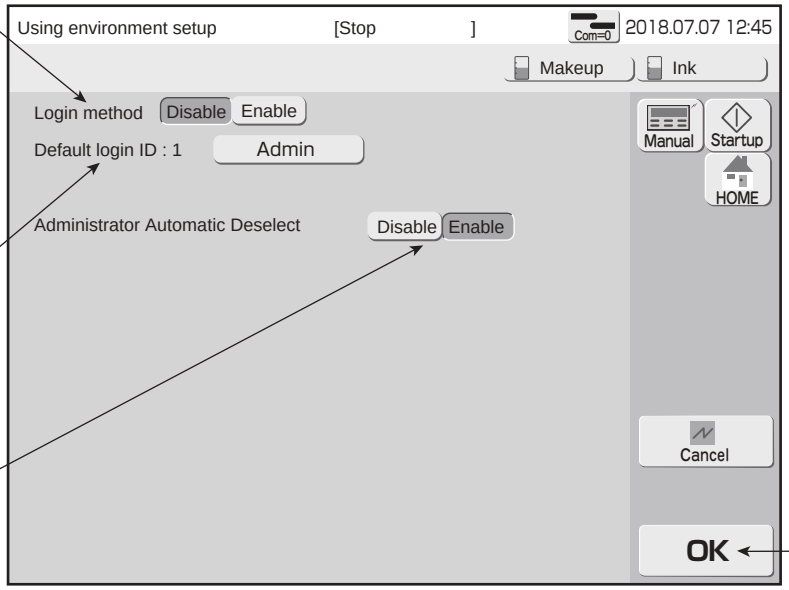


3 Press Administrator Automatic Deselect **Enable**.

When "Disable" is selected, the Print description screen is immediately displayed when the power is turned on.

Specifies the login user

When "Enable" is selected, it does return a user automatically.



4 Select the Administrator Automatic Deselect and press **OK**.

Administrator Automatic Deselect is set up.

3.5 Human Machine Interface [HMI] setup

(1) Function

- When you log in as a general user, you can set "Human Machine Interface [HMI]" to either Previous or New.
- It is set by "Human Machine Interface [HMI]" on "Touch screen setup" screen. This item is available for display/selection when the administrator user logs in.
- When "Human Machine Interface [HMI]" is set to New, the general user can have an access only to the following seven screens: (Seven screens are hereinafter called [New HMI screens].)
  [New HMI screens (New icons)]:
  - Print description screen (HOME)
  - Open screen (OPEN)
  - Save screen (SAVE)
  - Adjust print parameters screen (ADJUST)
  - Edit screen (EDIT)
  - Operation management screen (SETTINGS)
  - Select login user screen (LOGIN)
- When Human Machine Interface [HMI] is set to New, the general user cannot leave [New HMI screens].
- You can select one item which will appear on Print description screen of [New HMI screens]. The item selected will be one of the following:
  "Ink Pressure", "Ink Filter Replacement Time Left", "Recovery Filter Replacement Time Left", Circulation Filter Replacement Time Left", "Makeup Filter Replacement Time Left", "Air Filter Replacement Time Left" or "Count Reset".

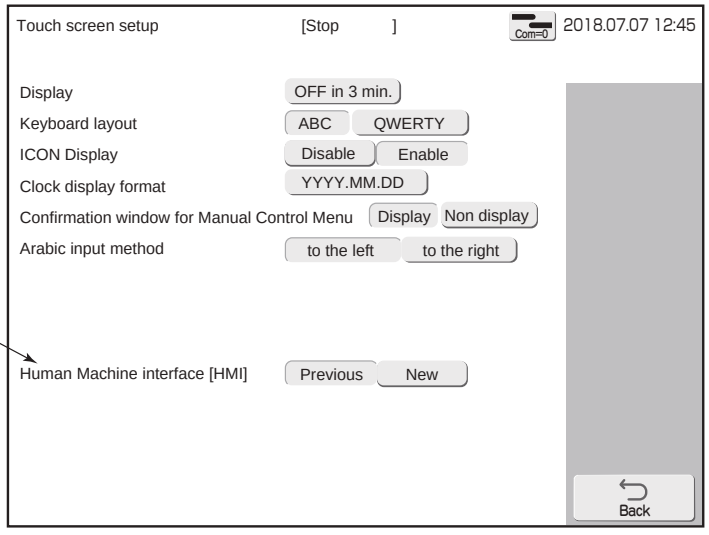
(2) Operation

Administrator user logs in.

1 Press Touch screen setup on Environment setup menu screen.

The Touch screen setup screen will be displayed.

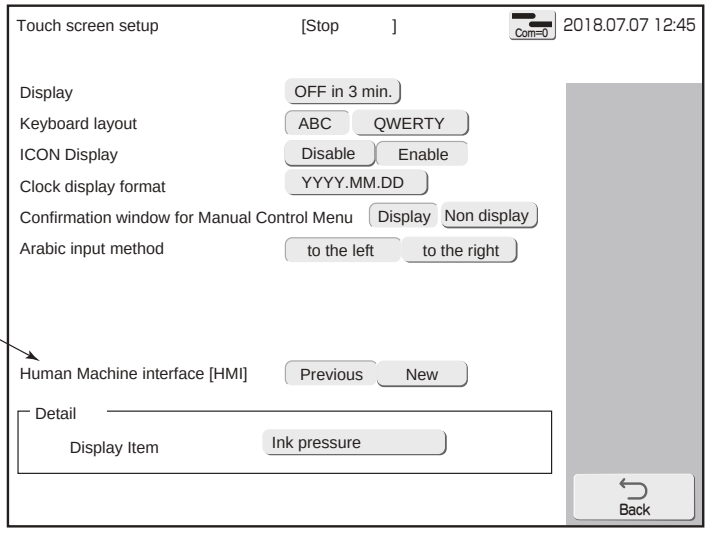
If Previous is selected, the conventional HMI screens will be displayed.



2 Press New of Human Machine Interface [HMI].

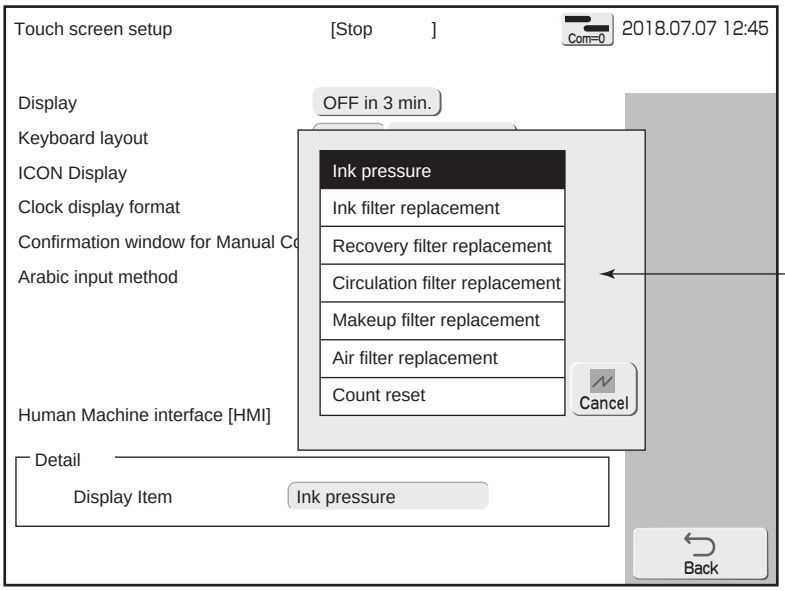
Detailed specifications will then be displayed.

If New is selected, the new HMI screens will be displayed.



3 **Press “Display Item” button.**

List of display items is then displayed.



Select the item to be displayed on Print description screen of New HMI screen.

4 **Select the item you want to display.**

The selected item will be displayed on Print description screen of New HMI screen.

5 **Press Back**  **.**

The screen display [HMI] used by general users can be set to new system screen or conventional screen.

CAUTION

- When Human Machine Interface [HMI] is set to "New," the general user cannot change perform maintenance operations such as circulation control.
  In the case of these operations, you must login again as the administrator user.
- When Human Machine Interface (HMI) is set to "New", the [New HMI screens] will be displayed at system boot-up, even when the administrator user is selected as a default login ID.
- The functional limitations set for each general user will still apply on [New HMI screens].
  For example, when the general user logs in and when "Edit message" is restricted for him/her, "Edit message" is prohibited even if Edit message screen is displayed.
- When Human Machine Interface [HMI] is set to "New," if the administrator mode is automatically canceled while the screen other than the new HMI screen, such as Environment setup screen, etc. is displayed, Print description screen of New HMI screen will be displayed.
  (See "3.3.2 Operating Scheme" in Instruction Manual.)

4. ELECTRIC SIGNAL CONNECTION

4.1 Wiring precautions

(1)If noise enters the IJ printer from the outside, there is the danger of erroneous operation or trouble.
To improve noise resistance, perform wiring work as follows:

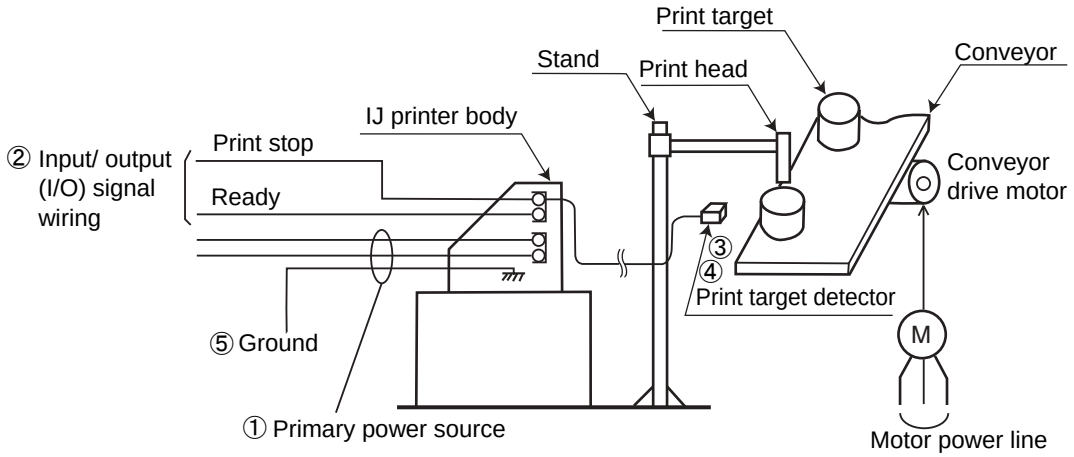
① Separate the power cable to the IJ printer from other power lines for powering use (especially, power line for a speed control inverter, etc.).
Wiring the power cable through a separate duct is even better.

② Do not bundle input/output (I/O) signal wiring together with other power lines. Wire them independently instead.

③ Electrically isolate the print target detector, print head, stand, and IJ printer body from other machinery and equipment (conveyor, etc.).

④ Separate the print target detector wiring from other power lines.

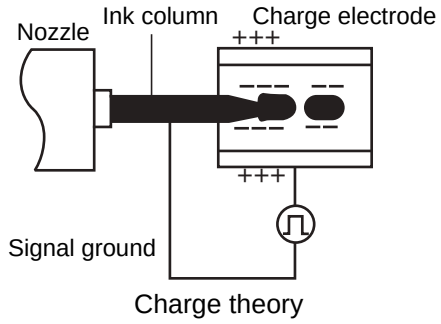
⑤ Perform that all electrical wiring, connections and grounding comply with applicable cords. (When erroneous operation was caused by noise, etc., use a dedicated ground.)



(2) Connection to power supply
Use a suitable plug and always connect the power source to a protective ground. In addition, arrange the receptacles near the IJ printer so that removal is easy.

(3) Precautions related to welding current of welder

Signal (weak electric) ground and frame ground are connected because the ink drops of the IJ printer are electrically charged.



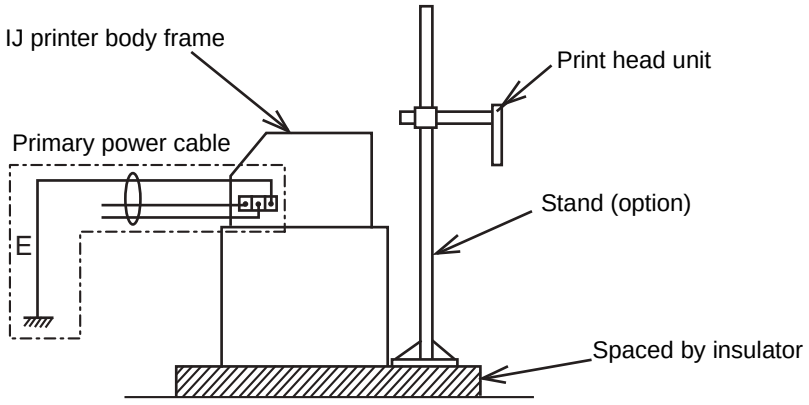
Charge theory

The ink drops are electrically charged by impressing a voltage between the charging electrode and ink column as shown at the left.
Therefore, the ink always becomes signal ground.
In addition, since the ink is always connected to frame ground by the clamp, etc. of the circulation path, separating signal ground and frame ground is difficult.

Therefore, when a large current (for example, the welding current of a welder) flows from the outside through frame ground, the current is also diverted to signal ground and the PC boards may be damaged and the earth cable may be fused. For this reason, whenever performing welding work near the IJ printer, proceed as follows:

Method

Be sure to insulate the printhead and IJ printer frame to keep the welding current from flowing to the control section of the printer, and to make a separate ground connection for the printer.
If this method is used, welding work becomes possible even while the IJ printer is operating.



Welding work cautions

⚠ WARNING

●Fire is strictly forbidden around the IJ printer

The ink and makeup are both flammable. Welding sparks may cause ignition or a fire.
Take measures so that sparks do not enter the surrounding area whether or not the IJ printer is operating, and ventilate sufficiently.
Just in case, ensure safety by installing a powder type fire extinguisher nearby.

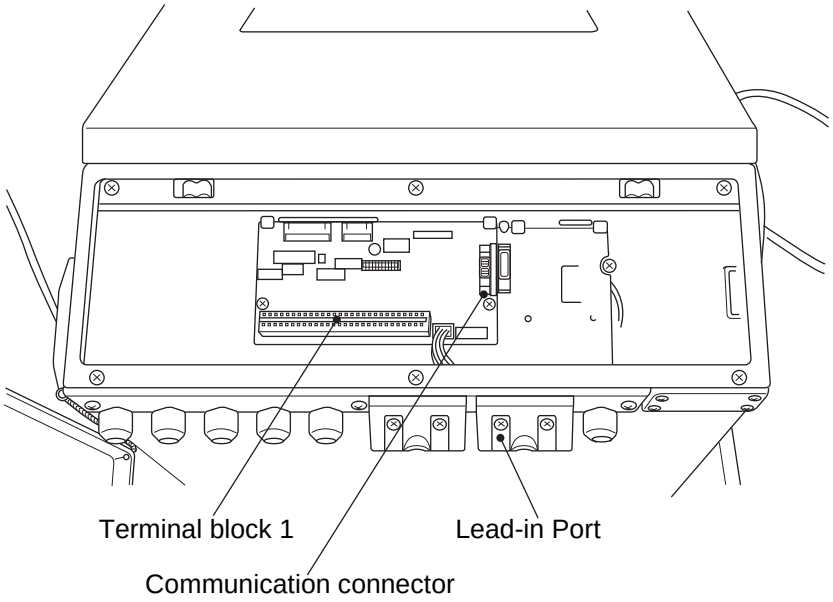
4.2 Input/output (I/O) signal connection

4.2.1 Wiring the I/O line

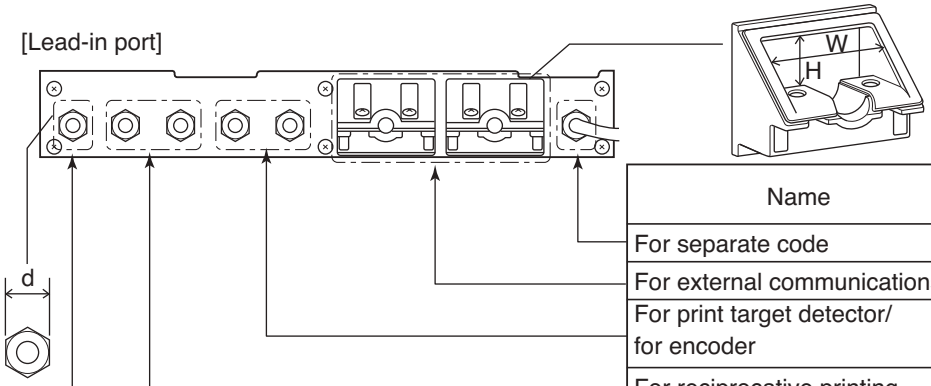
Open the top cover and run the I/O line wiring from the lead-in port on the side and connect it to external connection terminal boards 1 and 2 and the external communications connector inside the IJ printer.

⚠ CAUTION

When performing wiring work, always turn off the power.
During normal use, leave the top cover closed.



[Lead-in port]

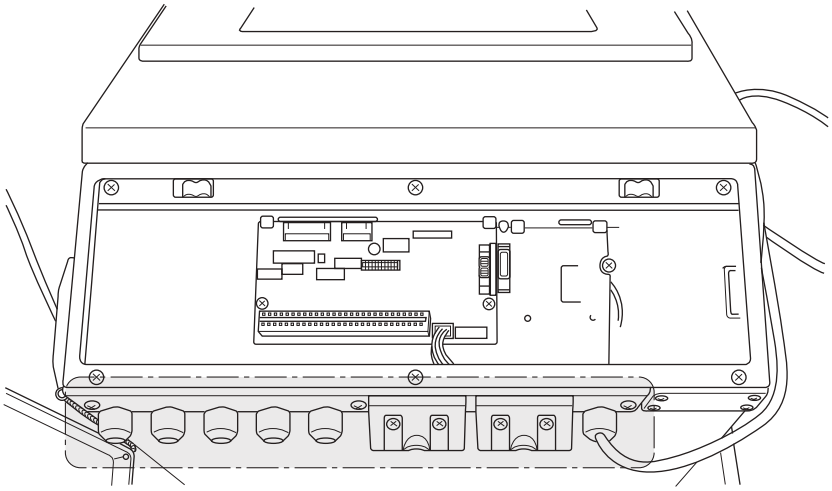


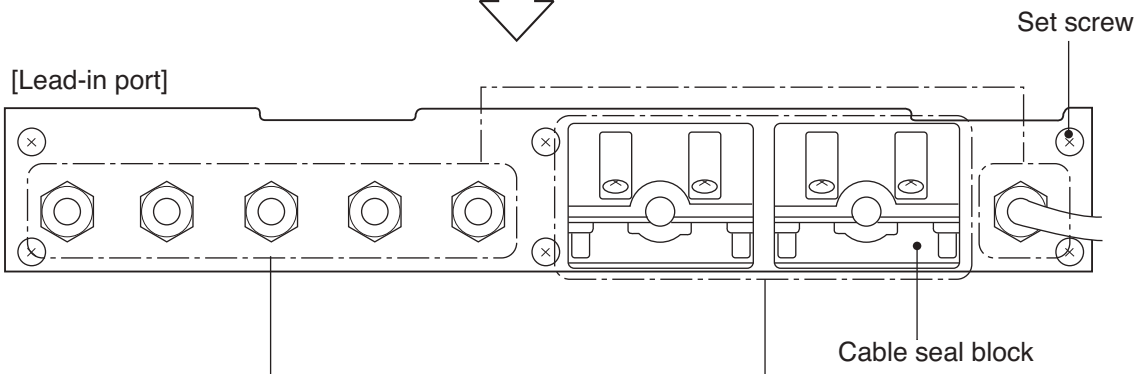
Name	Cable outside diameter range	Size/Dimension
For separate code	ϕ4.5～10(M16)	19(d)
For external communications	ϕ3.5～10	38(W)×17(H)
For print target detector/ for encoder	ϕ3.5～7(M12)	15(d)
For reciprocative printing, Print-in-progress, Print.complete, print stop, online, remote signal	ϕ4.5～10(M16)	19(d)
For Ready, Fault, Warning	ϕ4.5～10(M16)	19(d)

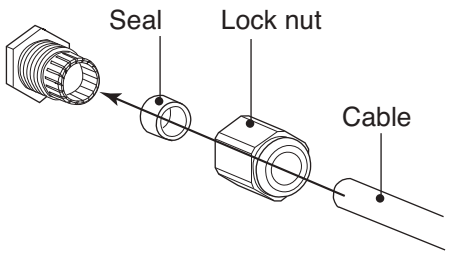
⚠ CAUTION

Use cables with an outside diameter within the range specified above. Firmly tighten the lead-in port lock nut.
In addition, do not bundle weak electric system and strong electric system cables together inside and outside the IJ printer so that the weak electric system signals (signals to terminal block 1 and external communication connector) are not affected by strong electric system signals (power source).
Especially, absolutely never bundle together the print target detector and print stop signals and the power source and Ready to print signal cable and do not wire them inside the same duct.

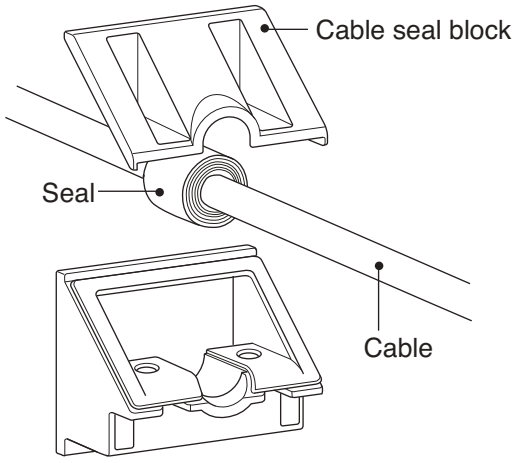
Lead-in port connection method







① Remove the lock nut.
② Pass the cable through as shown in the figure.
③ Tighten the lock nut.
(Tighten the lock nut securely using a tool.)

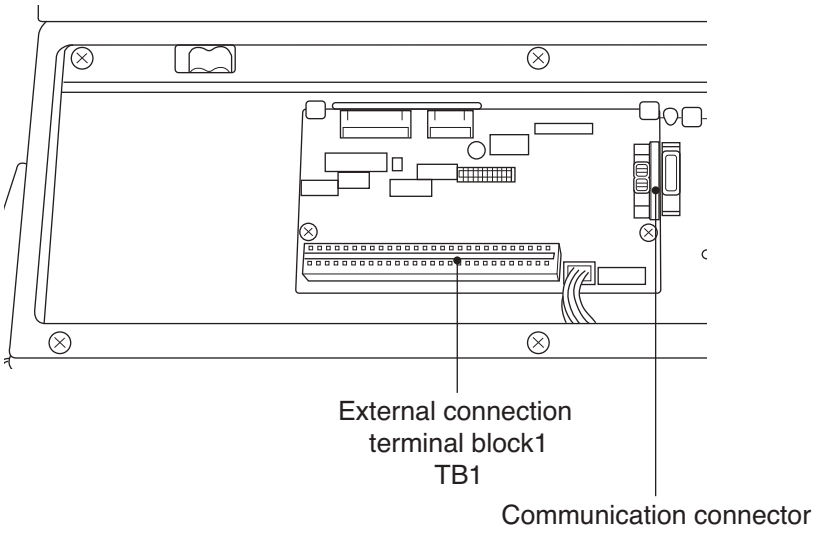


① Remove the set screw and remove the cable seal block from the body.
② Separate the cable seal block.
③ Wrap the outside of the cable with seal as shown in the figure.
(Wrap the seal so that there is no gap between it and the cable seal block.)
④ Reassemble the cable seal block by following the opposite procedure.

4.2.2 Connection to input/output (I/O) terminals

[Overview of Terminals and Connectors]

The terminal block and connectors for wiring are located behind the electrical access door (upper front panel door).

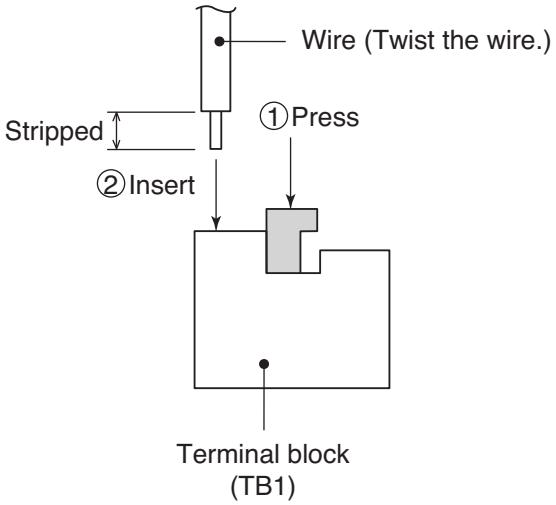


⚠ CAUTION

Faulty wiring causes the substrate breakdown.
Before wiring, be sure to confirm the terminal signal.

[Usage for the External connection terminal block 1 (TB1)]

- Applicable cable size : AWG24 to 16 (Φ0.5 to 1.3)
- Wire covering to be stripped : 8 to 9 mm

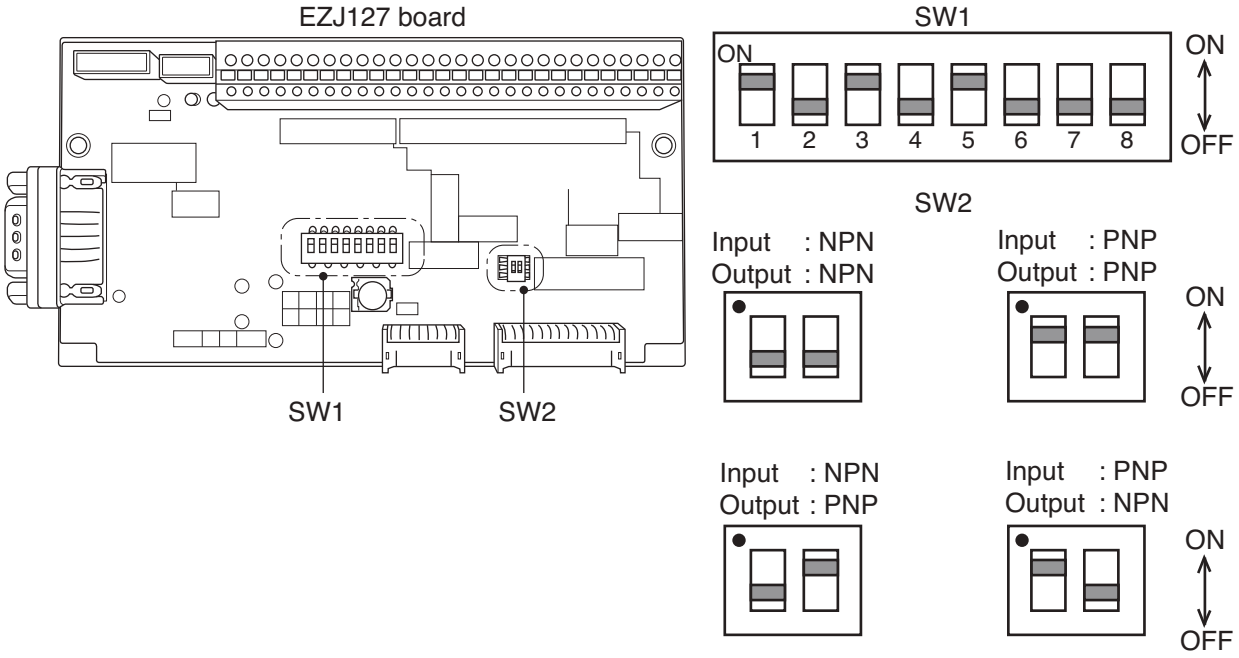


[Connection to the external connection terminal block (TB1 of EZJ127 board)]

- The I/F signal with conveyor is connected.
- NPN/PNP interface can be selected for the print target detector and a part of I/O signals.
- Totem pole/Open collector(NPN) can be selected for the encoder signal.

Pin No.	Name		Input/output		Remarks
	NPN Interface	PNP Interface	NPN	PNP	
1	Power supply for Print target detector		Output		● DC24V, 100mA max. (*1) ● Power supply, NPN / PNP can be selected by SW1.
2	Print target detector		Input		
3	Ground for Print target detector		-		
4	Print stop		Input		● NPN / PNP can be selected by SW2
5	Signal ground		-		
6	Power supply for encoder		Output		● DC24V, 100mA max. (*1) ● Totem pole / Open collector (NPN) can be selected by SW1 ● Power supply can be selected by SW1
7	Encoder signal (Totem pole)		Input		
8	Encoder signal (Open collector NPN)		Input		
9	Ground for Encoder		-		
10	Ready	-	Output	-	● Open collector (NPNn) only.
11	Signal ground	-	-	-	
12	Fault	-	Output	-	
13	Warning	-	Output	-	
14	Deflection voltage ON/OFF signal		Input		● NPN / PNP can be selected by SW2
15	Reciprocative print signal		Input		
16	Run signal		Input		
17	Reset signal		Input		
18	Stop signal		Input		
19	Print-in-progress / Print-complete		Output		● Print-in-progress/ Print-complete can be selected with screen operation. ● NPN / PNP can be selected by SW2
20	Online output		Output		
21	Universal output 1		Output		
22	Universal output 2		Output		
23	Signal ground		-		

(*1): The supplying power capacity for print target detector and encoder is up to 100mA in total.



(Precautions when using combination of NPN/PNP interfaces)

- Use either NPN or PNP interface for input/output signals #4 to 5 and #14 to 23. Do not use a combination of the interfaces for these input/output signals.
- Interfaces can be combined for units of print material sensor signals (#1 to 3), encoder signals (#6 to 9), input/output signals (#4 to 5, #14 to 18) and status output signals (#19 to 22).
  (For example, PNP interface can be used for print target detector and NPN interface can be used for status output signals (#19 to 22).

4.3 Input/output (I/O) specifications

When handling external signals, observe the voltage, current, and time given in this manual.
Operation is not guaranteed if external signals are not handled properly. If external signals are not handled properly, it may damage the board and operation is not guaranteed.

[Input / Output Signal Specifications]
(1) Input signals (external device →IJ printer)

No.	Signal name	Function	Electrical characteristics	
			+NPN input	PNP input
1	Print object detection	Indicates the arrival of a print object.	+24 V output (Up to 100mA *1)	
			ON state : I out : 12 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 12 mA max. OFF state: V in: 1V max. *3)
2	Printing stop	Issues instructions so that printing does not start even if a print object is detected.	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)
3	Reciprocative printing	Issues instructions so as to change the order of characters to be printed. OFF:Transport in normal direction ON :Transport in reverse direction	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)
4	Encoder (for speed follow-up)	Makes a pulse entry in proportion to the print object transport speed.	+24 V output (Up to 100mA *1)	
			NPN open collector ON state : I out : 20mA max.; OFF state: Vout : 24 V *3)	Totem pole ON state : I in(at24V): 20mA max. OFF state: V in: 1V max. *3)
5	Run *2)	Functionally the same as the RUN key on the operator panel. Performs processing from "ink injection" to "ready to print"	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)
6	Reset	Functionally the same as the Reset key and the Message Delete key on the Error Message window. Resets an error.	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)
7	Stop	Functionally the same as the STOP key on the operator panel. Stops injection of ink (automatic flushing).	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)
8	High voltage ON/OFF	Functionally the same as the Deflection Voltage Control function in a message which appears when the CONTROL key on the operator panel is pressed. The deflection voltage is turned on (Ready) and off (Standby) alternately each time this signal is entered.	ON state : I out : 6 mA max.; OFF state: Vout : 24 V *3)	ON state : I in(at24V): 6 mA max. OFF state: V in: 1V max. *3)

*1) The current supply capacity of +24V for Print object detector and encoder is up to 100mA in total.
*2) RUN signal instructs to inkjet ink. Handle the signal with care.
*3) Ensure that the external device transistor leak current doesn't exceed 0.1mA while the input signal is OFF.

(2) Output signals (IJ printer →external device)

No.	Signal name	Function	Electrical characteristics	
1	Ready	Operates when the IJ printer is ready for printing or in input mode.	Open collector (NPN) ● Sink current: 20 mA max. ● ON voltage: 0.5 V or less ● Operating voltage: 30 V or less	
2	Fault	Operates when the IJ printer is fault state.		
3	Warning	Operates when the IJ printer is in alarm condition.		
4	Print. in Progress *4)	Operates when the IJ printer is engaged in printing.	Open collector (NPN) ● ON voltage: 0.5 V or less ● Sink current: 20 mA max. ● Operating voltage: 30 V or less	Open collector (PNP) ● I in: 10 mA max. (Load resister: 2.2kΩ or more) ● ON voltage: +24V
	Print. Completed *4)	Operates when the IJ printer completes a printing process (outputs a pulse of up to 1 second).		
5	Online output	Operates when the IJ printer is in online mode		

*4) As regards "Print. in progress" and "Print. completed", one must be selected from a screen.

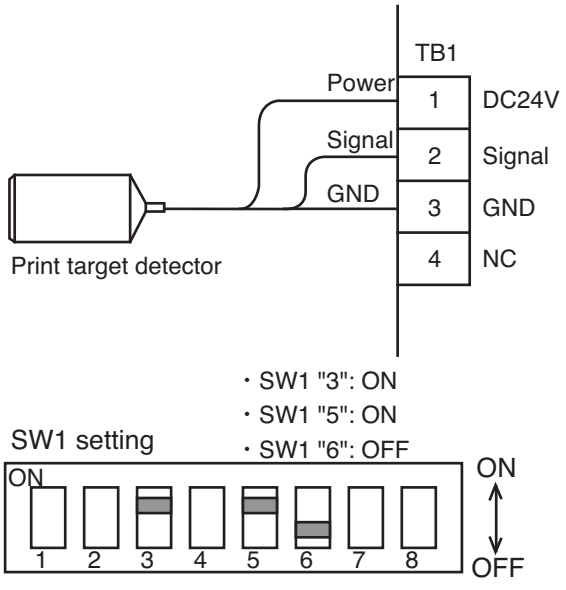
4.3.1 Print target detector input

This function inputs the IJ printer print start signal.

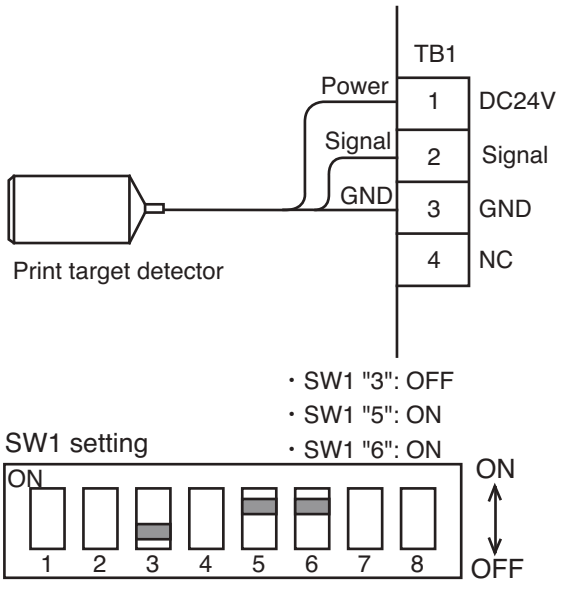
Use a no-contact (transistor) type print target detector. An optoelectronic sensor with built-in amplifier which uses a light beam to detect the print target is ideal. When the total current consumption of the print target detector and the rotary encoder is 100mA or less, power can be supplied from the power supply built into the IJ printer. When the total current consumption exceeds 100mA, provide a dedicated power supply.
In this case, perform wiring and setting as described below.

(1) Print target detector connection method

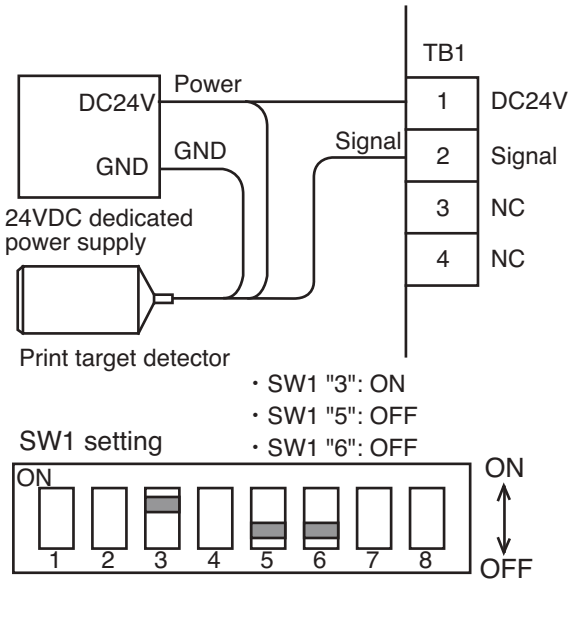
(a) When NPN interface and IJ printer built-in power supply are used



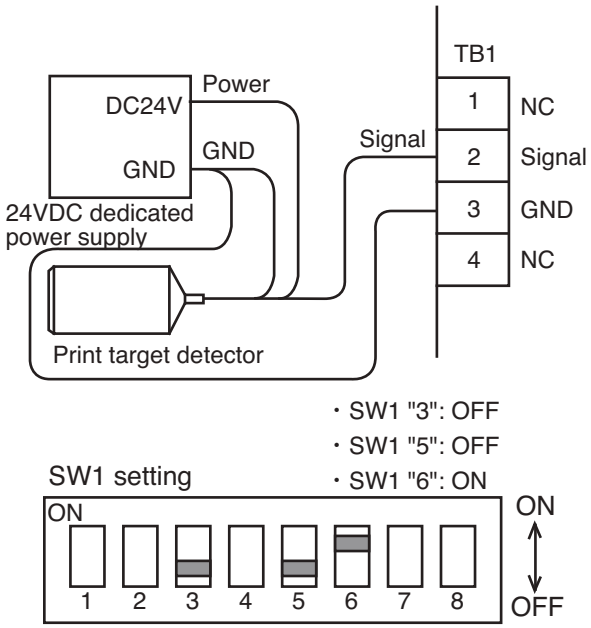
(b) When PNP interface and IJ printer built-in power supply are used



(c) When NPN interface and dedicated power supply are used



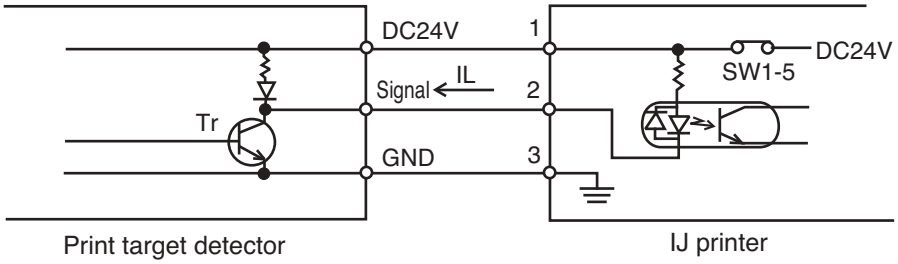
(d) When PNP interface and dedicated power supply are used



(2) Print target detector specifications

(a) When NPN interface is used

■Internal circuit diagram



When the IJ printer input circuit is a current drive load for the print target detector output circuit and output transistor Tr of the print target detector is ON, it becomes the print start signal input.
Use an output transistor Tr which satisfies the following specifications (NPN/PNP):

Withstand voltage	: 24VDC or greater
Maximum drive current	: 12mA or greater (IL= 10mA)
Residual voltage	: 2V or less
Leakage current	: 0.1mA or less

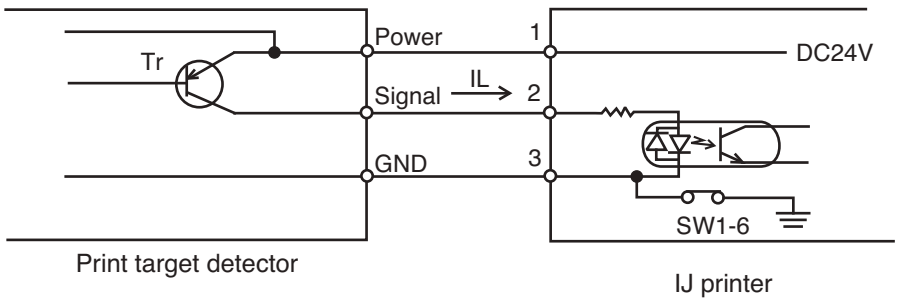
■The IJ printer built-in power supply specifications are:

Power supply voltage	: 24V
Maximum supply current	: 100mA *Note 1

*Note 1: Total power supply to print target detector and rotary encoder is max. 100mA

(b) When PNP interface is used

■Internal circuit diagram



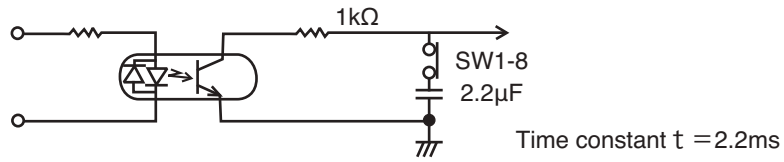
(3) Print target detector signal noise filter

(a) IJ printer built-in noise filter setting.

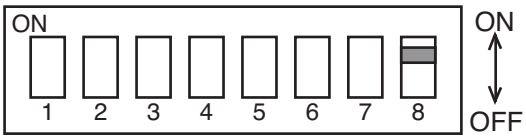
This function uses to filter the normal noise generated at the print target detector signal and noise generated by water drops, etc. with CR.

The target sensor filter function (See “4.14 Set the print specifications” in the Instruction Manual) is effective against sensor chattering.

■ Internal circuit diagram

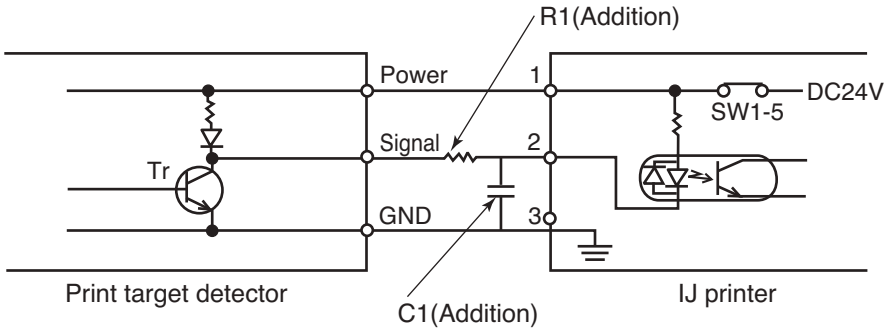


SW1 setting ・SW1 "8" ON : Filter ON
OFF: Filter OFF



(b) Addition of external noise filter

In case that the built-in noise filter cannot eliminate the noise, add the following additional CR filter outside of IJ Printer.

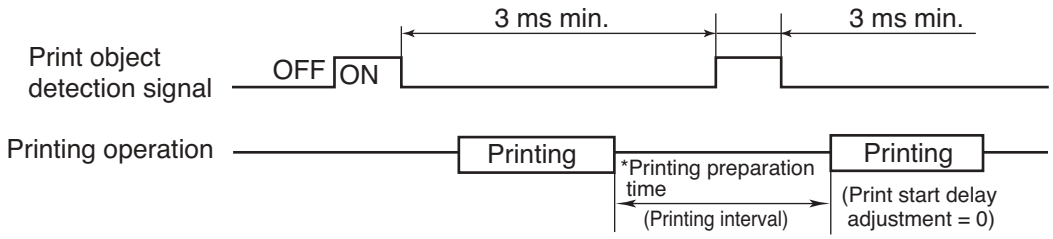


If R1=1kohm (0.5W) and C1=1micro farad /25V, the CR time constant=1ms. If R1=1kohm (0.5W) and C1=1micro farad /25V, the CR time constant=1ms. The filter could eliminate a several hundred micro-seconds of noise. If you need to eliminate bigger noise, add an additional capacitor in parallel with C1.

Notes for addition of CR filter:

- R1 has to be less than 1kohm.
- C1 should be temperature compensating ceramic capacitor. If it is difficult to find such type of capccitor, select high-precision and good temperature characteristics type of high dielectric ceramic capacitor as much as possible.
- R1 and C1 should be placed near IJ Printer as much as possible.

(4) Relationship between print object detection signal and printing operation



*: The printing preparation time minimum value varies with the print dot matrix, ink drop use, etc., however, the right table can be used as a reference.

Nozzle diameter	Reference of printing preparation time minimum value
65µm	9 ms

The accurate printing preparation time can be calculated by following formula.

Necessary printing preparation time (Note 1) = [(One scan time) × (N + 1)] (ms)

$$\text{(One scan time)} = \frac{\text{(Number of vertical dots + Character width)} \times \text{Ink drop use percentage}}{\text{Excitation frequency (kHz)}} \text{ (ms)}$$

N : (One scan time × N) ≧ Remaining number that is set to "a"
(a: Refer to the right table.)

Nozzle diameter	a
65µm	5.5

Excitation frequency: 68.9 (Model UX, with 65µm nozzle and 1067K ink)

Refer to “Handling guidance of each ink” manual to check the supported excitation frequency.

(Note 1) Time for repeated printing of fixed characters. When using the communications function or 2-dimensional bar code function, it will be longer than the time calculated from this formula.

When the speed is followed up, the number of encoder pulses shown below will serve as reference for the minimal value of print space:

$$\text{Minimal time of 1 pulse} = \frac{\text{(Number of vertical dots + Character width)} \times \text{Ink drop use percentage}}{\text{Excitation frequency (kHz)}} \text{ (ms)}$$

$$\text{Number of necessary encoder pulses} = \frac{a}{\text{Minimal time of 1 pulse}} \times \text{Frequency division setting value (pulse)}$$

(5) Tracking function

- This function achieves printing even when two or more print objects are positioned between the print object detector and print head.
- Up to four print objects can be positioned between the print object detector and print head.
- This function cannot be exercised simultaneously with the repeat-printing function.

4.3.2 Product speed matching function using a rotary encoder

The product speed matching function is used when the speed of the print target or the conveyor carrying the print target changes while the IJ printer is printing. If this function is not used, when the speed changes, the width of the printed characters may change and the characters may be difficult to read.
When the product speed matching function is used, it is necessary to input an external electric pulse having a period proportional to the speed to the IJ printer. Ordinarily a rotary encoder is used for this purpose. The IJ printer can print each vertical line of the printed message in synchronization with the pulses from the rotary encoder.

4.3.2-1 Rotary encoder specifications wiring and switch setting

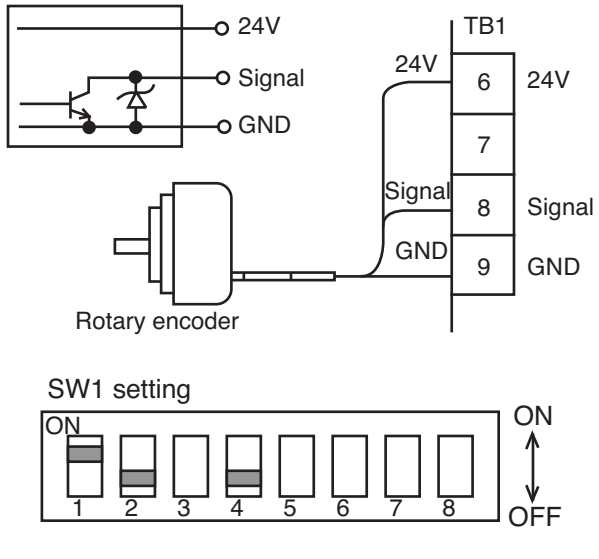
(1) The specifications of the connectable rotary encoders are:

Output waveform	: Square wave (duty: 30 to 70%)
Output withstand voltage	: 24VDC or greater
Load current	: 20mA or greater
Leakage current	: 0.1mA or less
Power supply voltage	: 24VDC
Current consumption	: 100mA or less *Note 1 (When the IJ printer built-in power supply is used, the total current consumption with the detectors is 100mA or less.)
Input signal frequency	: 200kHz or less
Number of pulses	: Decided by production line conditions

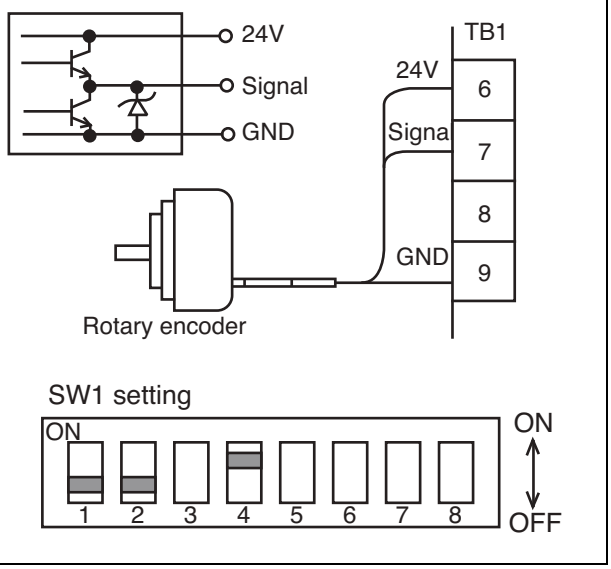
*Note 1) The maximum power supply capacity of the IJ printer built-in power supply (24VDC) is 100mA. When the current consumption of the detector and encoder exceeds 100mA and the power supply voltage is outside 24V, use a dedicated power supply and perform the wiring work described in (3) below.

(2) Encoder wiring and setting of SW1 on PC board EZJ127 when IJ printer built-in power supply is used

(a) When open collector output and IJ printer built-in power supply are used

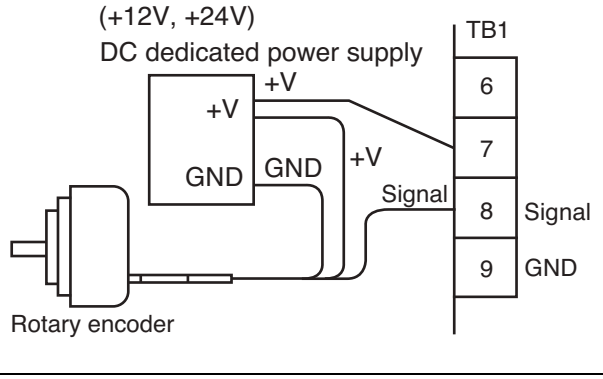
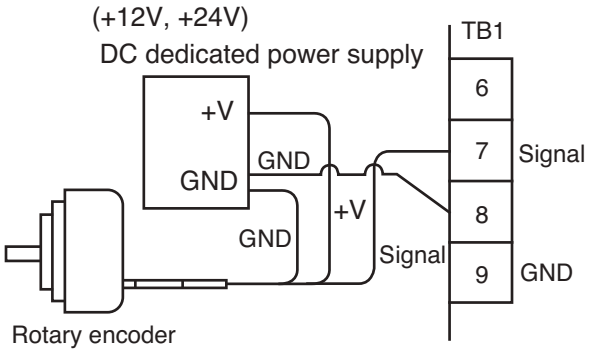


(b) When totem pole output and IJ printer built-in power supply are used



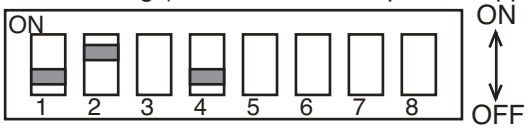
(3) Encoder wiring and setting of SW1 on EZJ127 board when used with a dedicated power supply.

- Wiring used for a dedicated power supply differs according to output interface of the encoder, but can be the same depending on power supply voltage.

(c) When open collector output and dedicated power supply are used	(d) When totem pole output and dedicated power supply are used
	

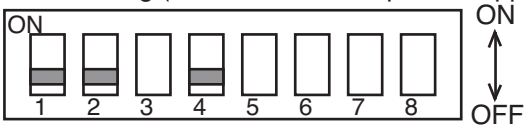
- Switch setting for a dedicated power supply differs according to power supply voltage, but can be the same depending on output interface of the encoder.

- SW1 setting (for 12V dedicated power supply)



*For open collector output and totem pole output

- SW1 setting (for 24V dedicated power supply)



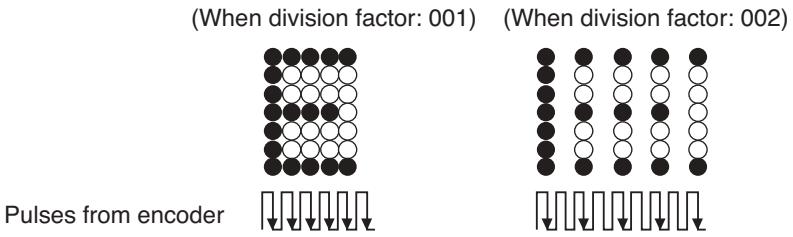
*For open collector output and totem pole output

4.3.2-2 Setting to IJ printer

(1) Make the settings related to “Product speed matching” and “Pulse rate div. factor” at the “Print specifications” screen. (See “4.14 Set the print specifications” in the Instruction Manual.)

- Set “Product speed matching” to “1: Enable”.
- Set “Pulse rate div. factor” as required. This function lowers (makes the period longer) the frequency of the input pulses inside the IJ printer. The divided pulses become the pulses used in printing.

<Description of pulse division function>



- The rotary encoder signal pulse frequency, the print scan frequency and the division factor have the relationship shown in (Eq. 1).

$$\text{Encoder pulse frequency [kHz]} = \frac{\text{Print scan count [kHz]}}{\text{Division factor (l/n)}} \quad \text{----(Eq. 1)}$$

- Set “Speed compensation” at the “Print specifications” screen to “Enable”, as required.

<What is “Speed compensation”?>

This function reduces changes in the print start delay when the conveyor speed changes.

CAUTION

This function cannot be used when the product speed matching function is not used.
In addition, this function cannot be used when “Repeat print” mode is set at the “Print specifications” screen.
When “Speed compensation” is enabled, print start is delayed for 10 scans.

4.3.2-3 Method of calculating the conditions which allow product speed matching

Calculate to find whether the Ink drop use and division factor are the conditions which allow product speed matching, based on the following.
Print quality improves as the calculation shown below is performed and the Ink drop use becomes smaller.
In addition, when changing Ink drop use, check the print quality.

(1) Set the Character width on the "Print specifications" as below depending on the Ink drop use.
High speed character model : Refer to “4.14 Set the print specifications Table 4.14.2 Setting of character width” in the Instruction Manual.

Large ↕ Small

Ink drop use	Character width set value
1/1	002
1/2	001
1/3 to 1/16	000

(2) The maximum print scan frequency is found from the following equation by means of the printed character width and highest conveyor speed. Substitute the value according to the nozzle diameter of the type used at d.

$$\text{Max. number of print scans [kHz]} = \text{Highest conveyor speed [m/min]} \times \frac{1}{60} \times \frac{\text{Number of horizontal dots -1}}{\text{Print length [mm]-d[mm]}} \quad \text{------(Eq. 2)}$$

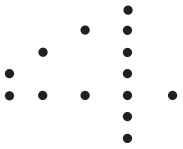
Nozzle diameter	d
65µm	0.33

(3) Next, use (Eq. 3) to check if the maximum print scan frequency found from (Eq. 2) can be matched at IJ printer set print speed.

$$\frac{\text{Excitation frequency (f)}}{(\text{Number of vertical dots + character width set value +1}) \times (\text{Denominator of ink drop use (*1)})}\ \text{[kHz]} \quad \text{(Eq. 3)}$$
$$> \text{Max. number of print scans [kHz]}$$

● When the result of (Eq. 3) is smaller than the maximum print scan frequency (Eq. 2), product speed matching is not performed normally and the character width becomes large.

Normal



Character width large

(*1) The value is 3 when the ink drop use is 1/3.

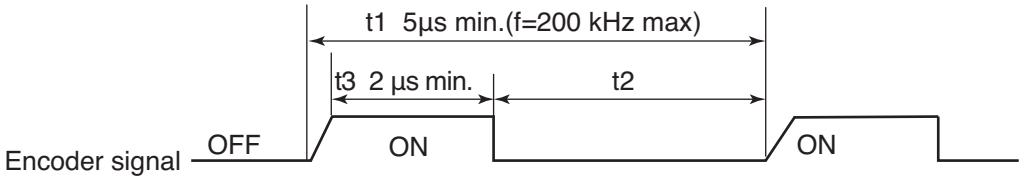
●In addition, when “Product speed matching error” warning is set, a warning is generated.
In this case, (1) lower the conveyor speed, (2) widen the print character width, or (3) set Ink drop use larger, so that the maximum print scan frequency becomes smaller than the calculated value of (Eq. 3).
(Makes the IJ printer set print speed faster than the highest conveyor speed.)

(4) The excitation frequency (f) in (Eq. 3) depends on the type of ink used. The excitation frequency by typical nozzle diameter and ink is shown below. For other inks, refer to the handling guidance of each ink.

Nozzle diameter	Type of ink	Excitation frequency (f)
65µm	1067K	68.9kHz
65µm	1069K	68.9kHz

(5) When a rotary encoder is used, the print character width cannot be changed by changing the IJ printer character width set value.
When the print character width must be changed, a device (timing belt, pulley, etc.) which varies the conveyor speed and rotary encoder speed synch signal pulse frequency ratio must be installed.

(6) Restriction of the speed synchronization signal pulse frequency from the rotary encoder



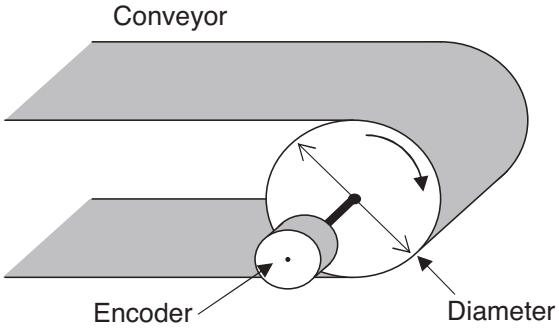
See that the duty is between 30% and 70%. $\text{Duty} = \frac{t2}{t1} \times 100\%$

Arrange for encoder signal cycle time (t1) to be at least 5 µs.

Flat period of encoder signal (t3) : 2 µs min.

(7) Rotary encoder selection method and calculation method
The print character width when the product speed matching function is used is determined by the amount of movement of the product per encoder pulse.
Several examples are introduced below.

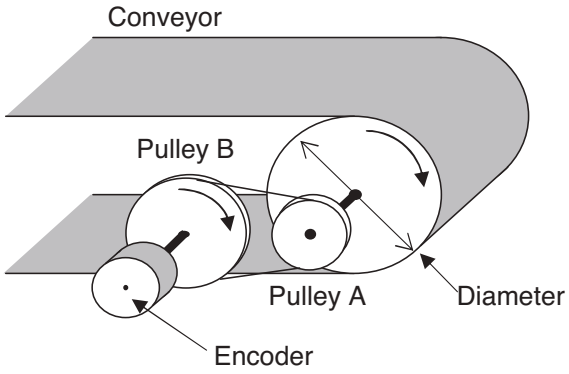
Example 1: Calculate the resolution of the rotary encoder when the rotary encoder is connected directly to the conveyor shaft.



<Calculation conditions>
- ●Dot font : 5×7 dots (horizontal direction 5, vertical direction 7)
- ●Inter-character space : 1 dot (1 scan)
- ●Inter-character interval : 1.8mm [horizontal direction 6 dots (6 scans)]
  (Inter-character dots 5 + inter-characters space 1)
- ●Diameter of conveyor pulley : 60mm

① Distance the conveyor moves per 1 revolution of the rotary encoder
60mm×3.14=188.4mm/rev
② Number of scans which must be executed while the conveyor is moving 1mm
6 scans/1.8mm=3.33 scans/mm
③ Required resolution of the rotary encoder (number of output pulses per 1 revolution of the rotary encoder)
188.4mm/rev × 3.33 scans/mm=628PPR (≒2500PPR, Division factor=4)

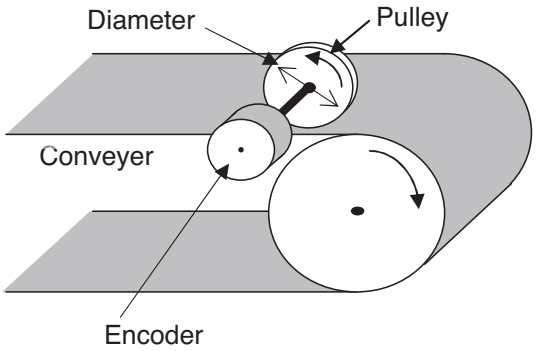
Example 2: Calculate the diameter ratio (RT) of the pulley when the rotary encoder is connected to the conveyor through a pair of pulleys.



<Calculation conditions>
- ●Dot font : 5×7 dots (horizontal direction 5, vertical direction 7)
- ●Inter-character space : 1 dot (1 scan)
- ●Inter-character interval : 1.8mm [horizontal direction 6 dots (6 scans)] (inter-character dots 5 + inter-character space 1)
- ●Diameter of conveyor pulley : 60mm
- ●Resolution of rotary encoder : 1,000PPR

① Amount of movement of conveyor per 1 revolution of rotary encoder
60mm × 3.14=188.4mm/rev
② Number of scans which must be executed while conveyor moves 1mm
6 scans/1.8mm=3.33 scans/mm
③ Necessary number of output pulses (resolution) from rotary encoder
188.4mm/rev × 3.33 scans/mm=628PPR
④ Diameter ratio (RT) of pulley
RT=Diameter of pulley B/diameter of pulley A=1,000PPR/628PPR=Approx. 1.6/1

Example 3: Calculate the necessary rotary encoder resolution when a pulley is installed to the shaft of the rotary encoder and this pulley is connected to the conveyor.



<Calculation conditions>
- ●Dot font : 5×7 dots (horizontal direction 5, vertical direction 7)
- ●Inter-character space : 1 dot (1 scan)
- ●Inter-character interval : 1.8mm [horizontal direction 6 dots (6 scans)] (Inter-character dots 5 + inter-character space 1)
- ●Diameter of rotary encoder pulley : 95.5mm

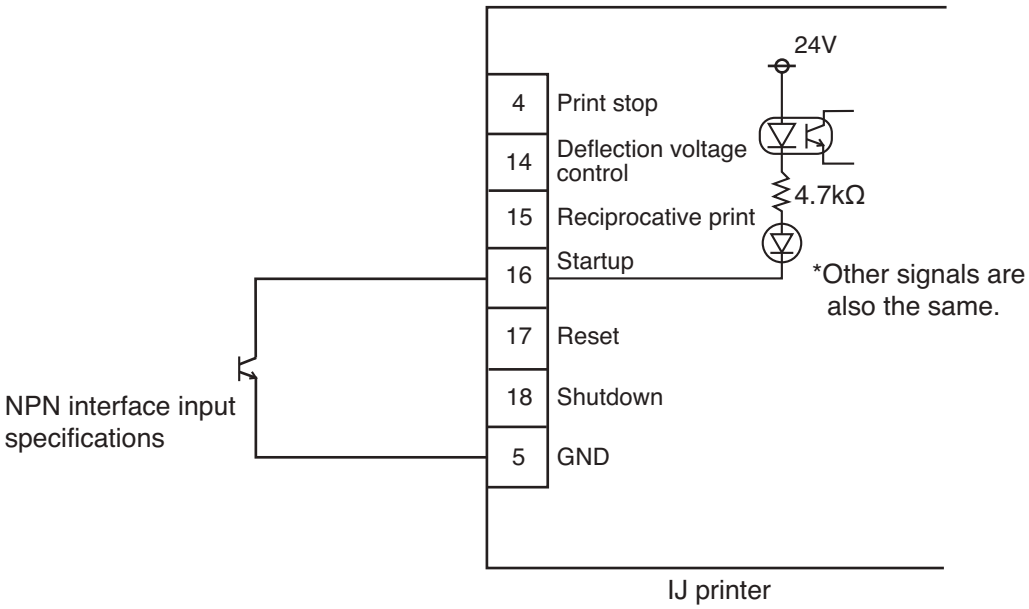
① Amount of movement of conveyor per 1 revolution of rotary encoder
95.5mm × 3.14=300mm/rev
② Number of scans which must be executed while the conveyor is moving 1mm
6 scans/1.8mm=3.33 scans/mm
③ Necessary number of output pulses (resolution) from rotary encoder
300mm/rev × 3.33 scans/mm=1,000PPR

4.3.3 Input function

The IJ printer can be controlled by inputting print stop, remote operation (“Startup”, “Shutdown”, “Reset”, “Deflection voltage control”) and reciprocative print switching to pins 4, 5, and 14 to 18 of TB1 by switch or contact signal from the outside.

■Internal circuit diagram

(a) NPN interface input (no voltage input)



●Each input is activated when contact ON.

●No-contact signal (transistor)

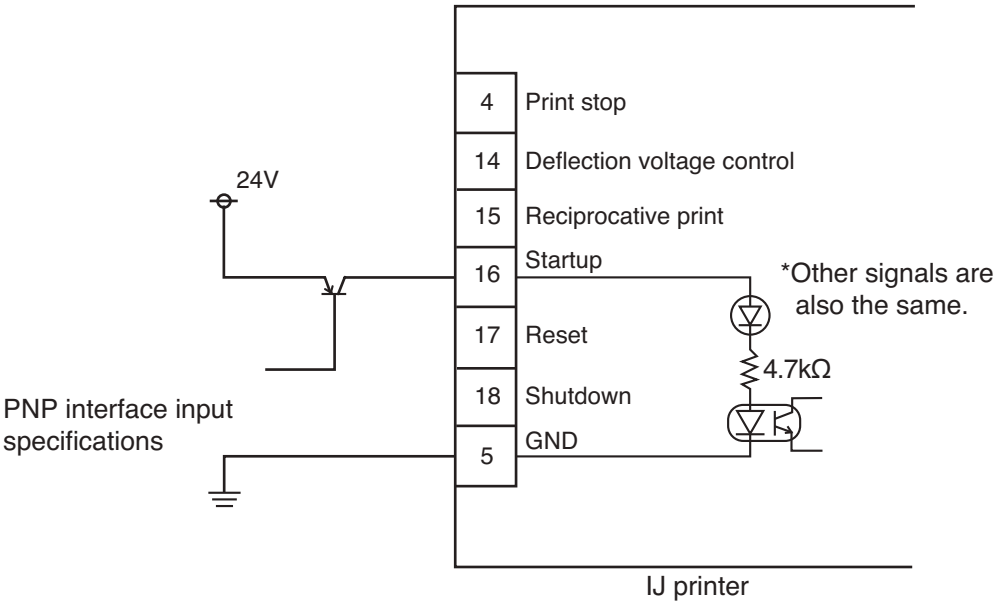
Withstand voltage	: 30VDC or greater
Maximum drive current	: 6mA or greater
Residual voltage	: 2V or less
Leakage current	: 0.1mA or less
Drive method	: Open collector

●Contact signal

Use a relay whose contacts chattering at contacts ON/OFF is 2.0ms or less.

(b) PNP interface input (voltage input)

●Impressed voltage 24 to 30V



●Each input is activated when contact ON.

●No-contact (transistor)

Withstand voltage	: 30VDC or greater
Maximum drive current	: 6mA or greater
Residual voltage	: 2V or less
Leakage current	: 0.1mA or less
Drive method	: Open collector

●Contact signal

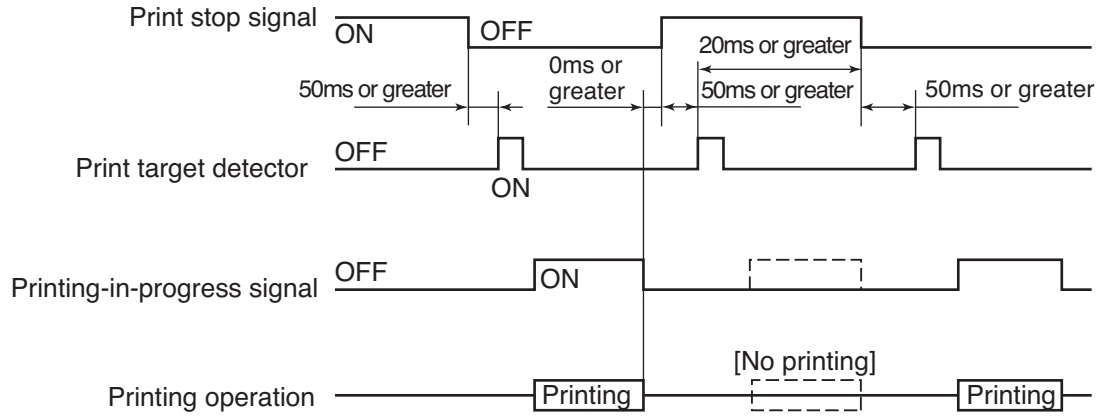
Use a relay whose contacts chattering at contacts ON/OFF is 2.0ms or less.

4.3.3-1 Print stop signal input

[Function] This function prevents printing from the outside. (Note that the Ready to print output signal does not change even if this signal is input from the outside.)

Input ON - In the IJ printer Ready to print state, the printer does not print even if the product target detector is turned ON. However, the product being printed cannot be aborted.

Input OFF - In the IJ printer Ready to print state, the printer prints when the product target detector is turned ON.



●Regarding the signal levels, the ON state indicates low level and the OFF state indicates high level.

●The tracking function cannot be used.

In the tracking mode, the timing which stops printing by print stop signal cannot be specified.

●When Repeat print is set, the IJ printer is controlled by a print start signal generated internally.

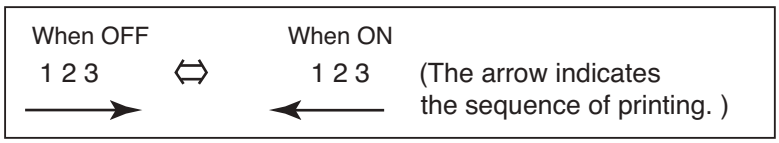
4.3.3-2 Reciprocative print signal input

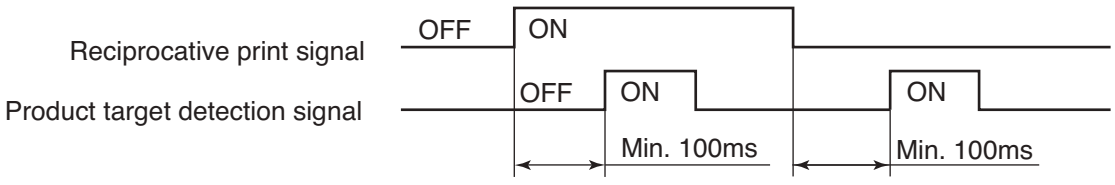
[Function] This function switches the order of the characters to be printed.

Input OFF : Forward direction

Input ON : Reverse direction

(Example)





*When the user environment setup item "Change Character Orientation" was set to "Reverse direction printing", provide a minimum interval of 100ms up to input of the print target detector signal after changeover (ON→OFF, OFF→ON) of the reciprocative printing signal.

When the Change Character Orientation was set to "normal or inverted" or "Character orientation 0 or 3", provide a minimum interval of 400ms up to input of the print target detector signal after signal changeover.

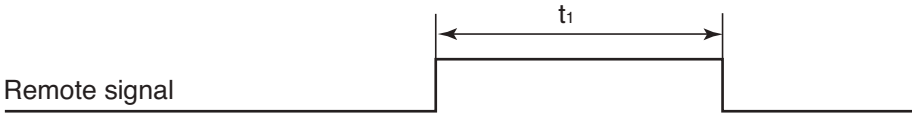
4.3.3-3 Remote startup signal input

[Function] This function inputs the same operations as the IJ printer operation state operation keys (“Startup”, “Shutdown”, “Reset”, “Deflection voltage control”(standby state and Ready to print state switching)) by external switch or contact signal.

(a) Judgment conditions

(a-1) Remote signals in general

① Remote signal ON time t1 shall be 100ms or greater.



② Take measures so that multiple remote signals are not turned ON simultaneously.
If multiple signals are turned ON simultaneously, the signals will not be accepted.

③ Signals cannot be received in the following cases:

ⓘ When a confirmation window is open

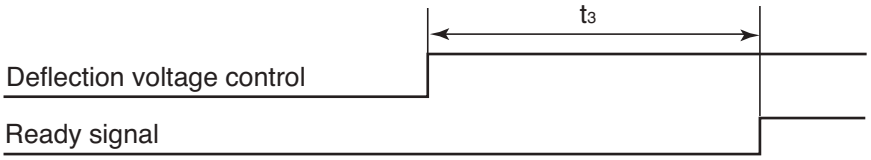
ⓘⓘ When the Circulation control screen is opened by maintenance function

ⓘⓘⓘ When the Touch screen coordinate correction screen is opened by auxiliary function

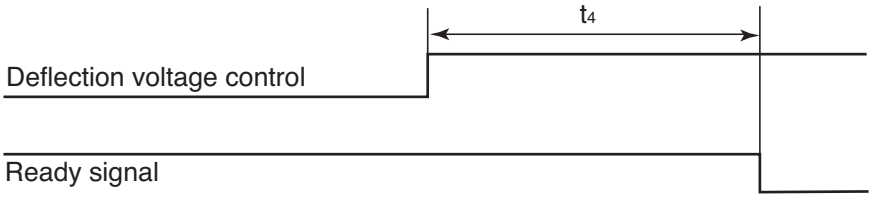
(a-2)“Deflection voltage control”

① When “Deflection voltage control” is input continuously, a certain OFF period is necessary.
When t2 is 10ms or less, OFF is not detected and the signal is not received.

② Time until state changes after “Deflection voltage control” is input
t3: Within 3 seconds (Standby→Ready)



t4: Within 100ms (Ready→Standby)



③ When “Deflection voltage control” is turned ON, state confirmation is necessary.
If “Deflection voltage control” is turned on by mistake during printing, printing is aborted even in the process of printing and the IJ printer is switched from the Ready state to the Standby state.
To prevent erroneous printing, input this signal when the printer is in a not printing state.

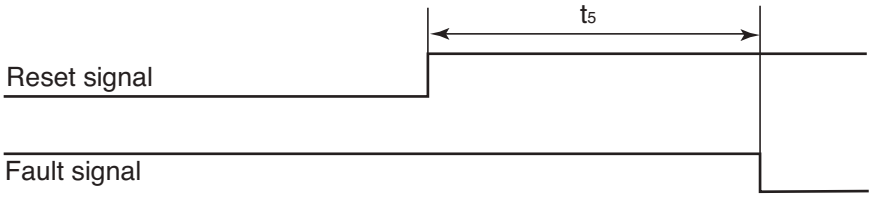
④ When the Product speed matching function is used, and when the print description is changed when the line is stopped during printing, etc., the IJ printer will enter the Standby state by this signal and the print description can be changed.

(a-3) “Reset signal”

① Input this signal when the fault signal is ON.
In addition, after signal input, check if “Fault” is cleared.

② Turn on the “Reset signal” 30 seconds or longer after the IJ printer power is turned on.

③ The time until the fault is cleared after the “Reset signal” is input
t5: within 100ms



(a-4)“Startup signal”

① The “Startup signal” is a signal that specifies an automatic procedure up to ink ejection.
Handle it with care.

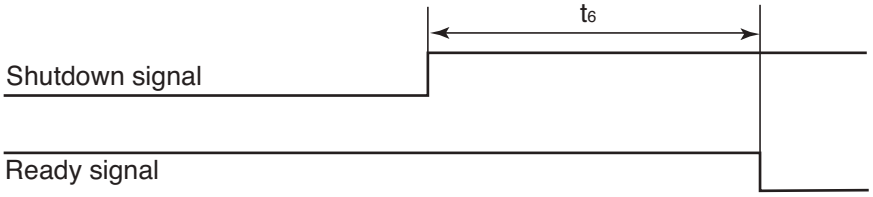
② When the “Startup signal” is turned ON during ink stop processing, it is ignored.

③ Turn on the “Startup signal” 30 seconds or longer after the IJ printer power is turned on.
In addition, input this signal after checking if the “Fault” is cleared.
Moreover, it takes about 2 minutes for the IJ printer to enter the Ready to print state after the “Startup signal” is turned ON.

(a-5) “Shutdown signal”

① Turn off the power after confirming that the IJ printer has entered the Stop state after the “Shutdown signal” is turned ON
It takes about 3 minutes for the IJ printer to enter the Stop state after the “Shutdown signal” is turned ON.

② The time until the state changes after the “Shutdown signal” is input
t6: within 100ms



(Notes)

(1) For key input, input must be confirmed, but when an external signal is input, processing is performed in accordance with the signal instructions. Especially, since “Startup”(startup signal) specifies ejection of the ink, handle it with care.

(2) When a confirmation window is opened, input of all remote operation signals is disabled. Re-input the signals after the confirmation window is closed.
When the line monitor screen is displayed, input of all the remote operation signals is disabled.

(3) When the Touch screen coordinate correction or Circulation control screen is displayed, input of all the remote operation signals is disabled. Re-input the signals after a different screen was displayed.

(4) The remote operation signals are enabled even when a rotary encoder is used and the conveyor is stopped during printing.

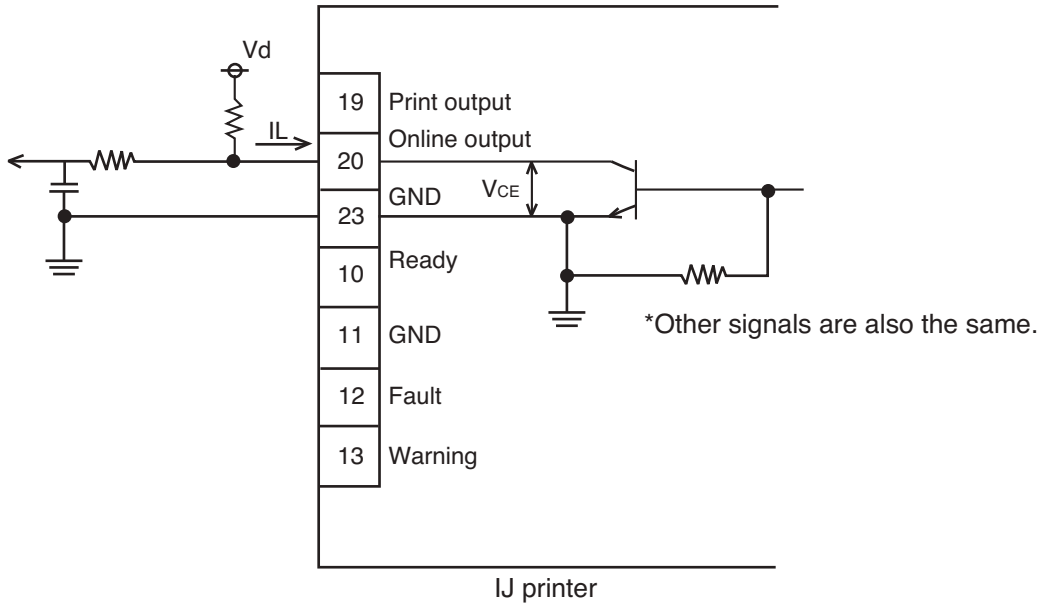
(5) When the Shutdown signal is input while the Fault window is open, the ink is stopped with the window remaining displayed.

4.3.4 Output function

The state of the IJ printer is monitored by connecting the print output (“Print-in-progress” or “Print.complete”), online output, Ready, Fault, and Warning signals to pins 10 to 23 of TB1. (No-contact (transistor) output)

■Internal circuit diagram

(a) NPN interface output (no-voltage output)



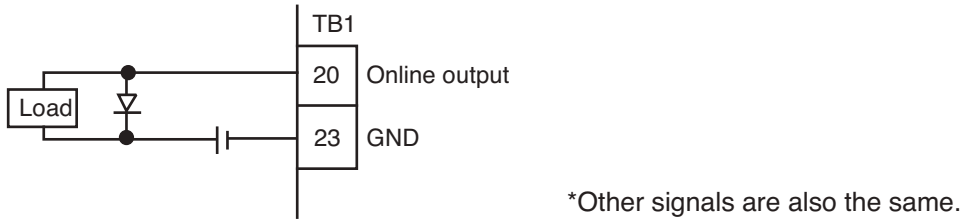
●The output transistor is open collector, and the logic is transistor ON at operation ON.

●The voltage and current used by the external equipment must satisfy the following specifications:
Operation is not guaranteed and the board may be damaged, if the specifications are not satisfied.

IL ≦ 20mA (VCE : TYP0.6V, MAX2V)

Vd ≦ DC30V

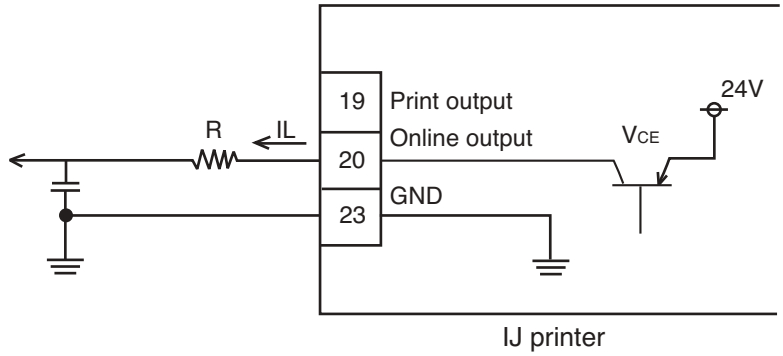
●Wiring precautions



●When the load is a relay, solenoid, or other inductive load, connect a diode to prevent generation of a counter electromotive force in parallel with the load.

●The load circuit is DC dedicated. It cannot be used with an AC load.

(b) PNP interface output (voltage output)



●The output transistor is open collector and the logic is transistor ON (voltage output) at operation ON.

●When used with external equipment, the following shall be satisfied:

IL ≦ 10mA(VCE : TYP0.6V, MAX2V), Guide line of R : R ≧ 2.2kΩ

Withstand voltage 50VDC or greater (2 times or more of the voltage used)

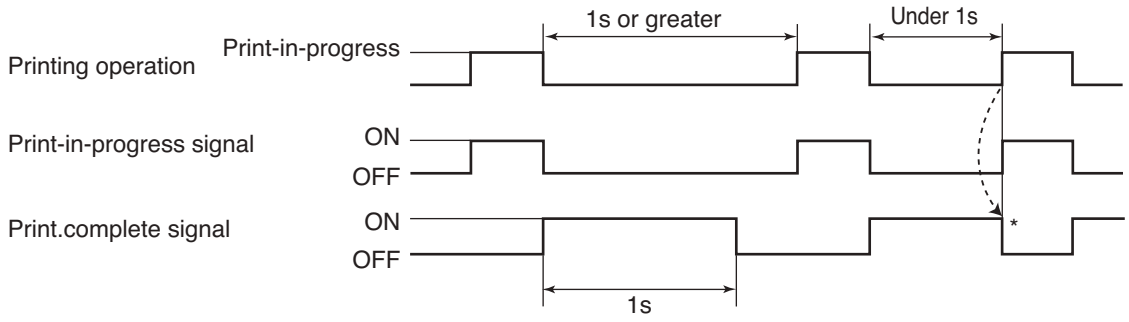
4.3.4-1 Print output signal (NPN/PNP interface output : TB1-19)

[Function] This function outputs a signal to the outside at IJ Printer Print.complete or Print-in-progress.

(a) Print-in-progress and Print.complete switching

Switching of the Print-in-progress and Print.complete signals is set at the User environment setup screen. (See “6.1 Set the user environment” in the Instruction Manual.)

(b) Signal timing



*When the next printing operation started within 1 second, turned OFF at the stage at which the printing operation started.

4.3.4-2 Online output signal (NPN/PNP interface output : TB1-20)

[Function] This function outputs a signal to the outside when the IJ printer is online.

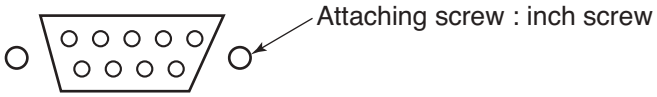
4.3.4-3 Ready output (NPN interface output only : TB1-10)

[Function] This function outputs a signal to the outside to indicate IJ printer Ready-to-print state or input mode state. (It is used to stop the conveyor when the IJ printer cannot print to prevent the product from flowing without being printed.)

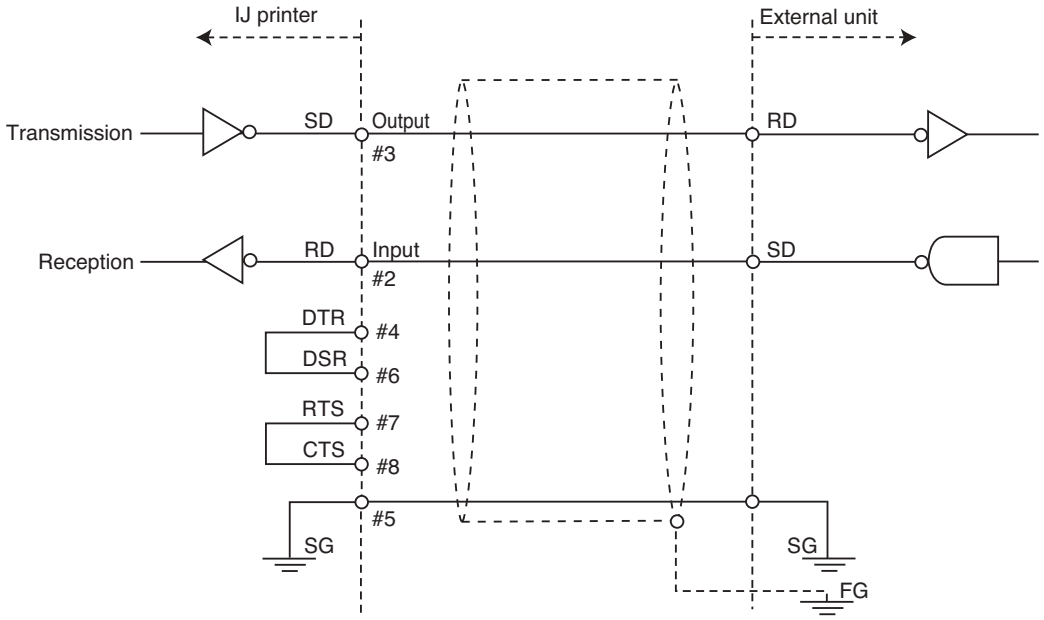
4.3.4-6 External communication (RS-232C)

External equipment is connected to the IJ printer by serial communication of RS-232C.

Pin No.	Name	Input/Output	Remarks
1	(NC)	-	
2	RD	Input	
3	SD	Output	
4	DTR	-	Connect with DSR by IJ printer side.
5	SG	-	
6	DSR	-	Connect with DTR by IJ printer side.
7	RTS	-	Connect with CTS by IJ printer side.
8	CTS	-	Connects with RTS by IJ printer side.
9	(NC)	-	

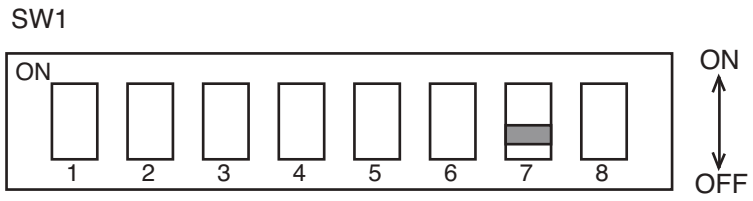


Connector on EZJ127 board :9-pin D sub-connector(plug)



Cable length : maximum 5 m

Turn OFF SW1-bit7 on EZJ 127 board.



⚠ CAUTION

- **Do not bundle it together with heavy-current signals inside and outside the equipment so that it will not be influenced by noise from a heavy-current signals (a connection signal to the power supply, etc).**
- **Use a cable which is as short as possible.**

4.3.5 Product speed matching function without a rotary encoder

4.3.5-1 Auto product speed matching function

Auto product speed matching function is used for detecting the change of speed of the conveyor carrying print target using the print target detector connected to the IJ printer, and prints each vertical line of the print according to the change of speed in the same way as the Speed matching function using a rotary encoder.

Ensure to confirm the print start position and check for the slip of the print target by thoroughly testing before using this function. If the print start position or the character width of print vary widely as a result of the test, use the Speed matching function using a rotary encoder.

Cases that the speed can not be matched

No.	Conditions of use
1	In case the print target slips on the conveyor between after the print target passes the print target detector and before IJ printer complete printing.
2	In case the carrying speed changes or the conveyor stops between after the print target passes the print target detector and before IJ printer complete printing.

4.3.5-2 Print target detector

- ●Use a no-contact (transistor) output type print target detector with a photoelectric sensor with built-in amplifier which detects the target using the optical beam.
- ●To start the print from the edge of the print target, place the print target detector so that the "Distance between the print head and print target detector" is larger in width than print target.

4.3.5-3 IJ Printer setup

- ●Configure the setting for "Product speed matching", "Print target width", and "Actual print width" on "Print Specifications" screen. (See "4.14 Set the print specifications" in the Instruction Manual.)
- ●Set "Auto" for "Product speed matching".
- ●Enter "Print Target width" and "Actual Print width" in mm.

The value for "Actual Print width" must be smaller than "Print Target width".

- ●"Enable" the "Speed compensation" as required.

⚠ Precaution

When "Speed compensation" is enabled, the print start position is delayed 2 scans because calculation is performed to reduce the change of the print start position. The position accuracy of the print start position may be worse than the product speed matching function using a rotary encoder, because calculation is performed by sensing the print target detector.

- ●When setting the "Sensor filter" on "Print specifications", set the value as small as possible so that the Sensor filter function is completed before the target passes the print target detector.
- ●"Repeat count" on "Print specifications" can not be used at the same time.
- ●The Character width on the "Print specifications" is automatically set as below depending on the Ink drop use.

Ink drop use	Character width
1/1	002
1/2	001
1/3 to 1/16	000

4.3.5-4 Carrying speed

- ●Set the minimum speed the target print is carried by conveyor to 1m/min.
- ●If the carrying speed the IJ printer detects is faster than the speed of when the printed without Speed matching, print is made with the same interval as when the Speed matching function is not used. (At the time speed exceeds the limit speed in the condition)
- ●If "Print Target width" or "Actual Print width" on the "Print specifications" is not entered, the print is made with the same interval as when the Speed matching function is not used.

5.COMMUNICATION

5.1 Overview

The functions described in this document are used to transmit printings and their registration numbers and enter them into the IJ printer with an external device connected to the IJ printer via an RS-232C serial communication line.

(1) Printings transmission
- An "item number" and "character string" are transmitted from the external device to the IJ printer.
- The IJ printer receives the "item number" and "character string" and then makes preparations for making designated prints.
- The printings of print item for which bar codes or increased-width printings can also be transmitted by the communication functions.
- When a number (alphabetical character) is transmitted via a communications link to a count setting digit, the default value can be set.

(2) Print data recall transmission
- A print data "message number" is transmitted from the external device to the IJ Printer.
- The IJ printer recalls print data designated by a "message number" and makes preparations for making prints.

(3) Print data registration transmission
- Transmits Print data's "message number" and "message name" from external unit to the IJ printer.
- The IJ printer provides a "message name" and registers data currently being printed as print data of "registration No."

(4) Print condition transmission
- The external device transmits "print specifications" and "print format" to the IJ printer.
- The IJ printer receives the "print specifications" and "print format", and prepares for making prints under the specified conditions.

(5) Free layout transmission
- This function is not available for High speed character model.
- An "item number" and "amount of move" are transmitted from the external device to the IJ printer.
- The IJ printer receives the "item number" and "amount of move", and then moves the item specified to the specified position.

(6) Calendar conditions transmission, count conditions transmission
- Transmits and sets "initial values", "range" of count conditions, and "offset", "zero suppress" of calendar condition etc. from external unit to the IJ printer.

(7) User pattern character transmission

- This function is used to transmit a user pattern and enter it into the IJ printer.
- A transmitted user pattern can be edited using the "Create user pattern" function, which is provided as an auxiliary function.

(8) On-line/off-line transmission procedure

- Specifies switch of online state and offline state from external unit to the IJ printer.

(9) Remote operation transmission

- Specifies ink ejection/stop, deflection voltage control (on/off) and error reset from external unit to the IJ printer.

(10) Time control

- Transmits and sets "current time", "calendar time", etc., from external unit to the IJ printer.
- Inquires current time from external unit to the IJ printer and the IJ printer returns "current time".

(11) Print item deletion transmission

- Specifies print item deletion from external unit to the IJ printer.
- The first print item will be left.

(12) Count Reset Transmission

- This function will change the count value to the preset value (reset value).
- All count blocks which have the preset “Reset” value will be reset to “Reset” value.

(13) Communication buffer

- The print contents received through print content transmission will not be reflected in printing immediately, but will be temporarily held in buffer.
- The print contents are fetched from the buffer one by one for each printing, and reflected in subsequent printing.

(14) Ethernet communication (LAN communication TUP-I)

- Function for Ethernet communication between the IJ Printer and external unit employing a LAN environment.
- Type of Ethernet communication can be selected from Modbus communication.
- Modbus communication require development of a communication program on the external unit side. For the development purpose of communication program, IJP control library will be provided as a development kit.
- See the instruction manual for Ethernet Communication TUP-I for details.

5.2 Setting Communication Environment

5.2.1 Setting Communication Environment

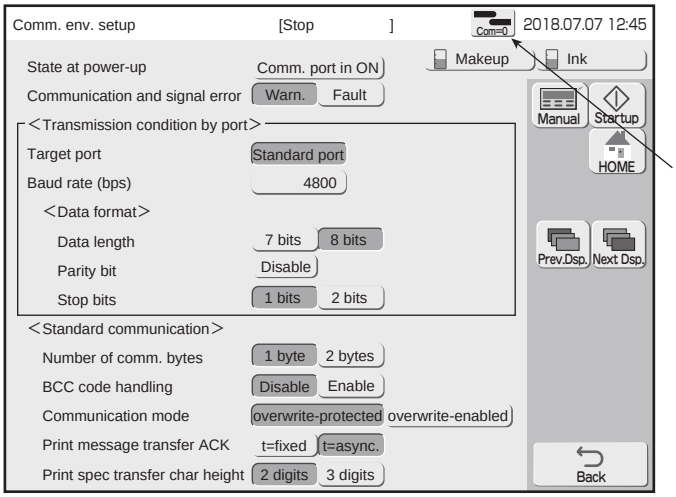
(1) Overview

Function	Description	Default
State at power-up	● Comm. port is OFF : Offline mode when the power is turned on. ● Comm. port is ON : Online mode when the power is turned on. ● OFF fixed : Always offline mode and you cannot change to the online mode.	Comm. port is OFF
Communication and signal error	● Warning : An external communication error and external signal error are considered to be "Warning." ● Fault : An external communication error and external signal error are considered to be "Fault." The printer does not print even if the product target detector is turned ON.	Warning
Baud rate	● Sets the baud rate at which communication is established with the outside. ● Eleven different settings are selectable: 150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, or 115,200 bps.	4,800bps
Data format	● Sets the data length, parity bit, and stop bits for communication with the outside. ● The following settings are available. ①Data length: 7 or 8 bits ②Parity bit: none, odd, or even ③Stop bits: 1 bit or 2 bits	Data length: 8 bit Parity bit : none Stop bits : 1 bit
Number of comm. bytes	● Sets the number of character code bytes for communication with the outside. ● A setting of 1 byte or 2 bytes can be selected.	1 byte
BCC code handling	● Setup can be performed so that no communication error occurs even if BCC code attached data is received.	Disable
Communication mode	● Overwrite-protected: No new data will be received until the previously received data is printed. ● Overwrite-enabled : New data is received even if the previously received data has not been printed. The newly received data overwrites the old data.	Overwrite- protected
Print message transfer ACK	● t=fixed : The time from receiving the print description from an external device to sending ACK becomes nearly fixed regardless of the transmission volume. ● t=async. : The system will be ready to print immediately after returning ACK.	t=async.
Print spec. transfer char. height	● 2 digits: Uses 2-digit data for character height setting ([00] to [99]) transmission. ● 3 digits: Uses 3-digit data for transmission.	2 digits

(2) Operating procedure

1 **Press Communication environment setup from the Environment setup menu.**

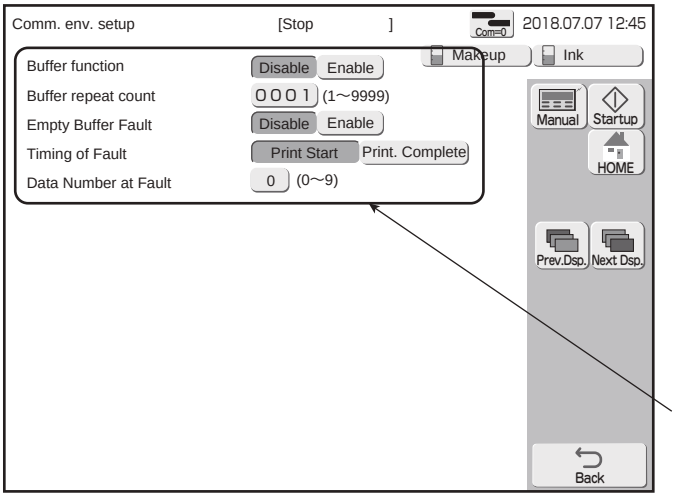
The "Communication environment setup" screen appears.



Change the on-line or off-line.

2 **Press Next settings.**

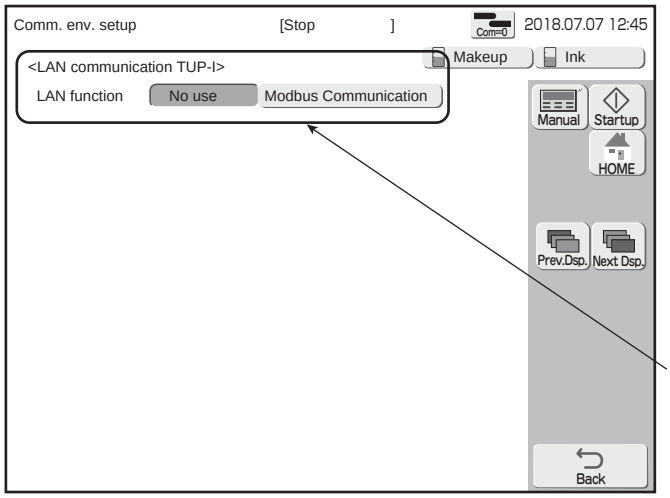
The second screen appears.



Setting of communication buffer
(Refer to " 5.9 Communication buffer".)

3 **Press Next settings.**

The third screen appears.



Setting of LAN communication TUP-I
(Refer to the Instruction manual for
Ethernet Communication TUP-I.)

5.2.2 Transmission Specifications

(1) Communication method : Half duplex
(2) Startup method : Started up by host
(3) Synchronization method : Asynchronous
(4) Transmission method : Bit serial transmission
(5) Baud rate : 150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 115,200(bps)
(6) Codes transmitted : Alphanumerical characters, symbols, dedicated characters, user pattern characters, and punctuation characters
(7) Data format : Formats A through J are selectable (see the table below). No other formats can be chosen.

Data format table

Item / Format	Start bit (bits)	Data length (bits)	Parity bit (bits)	Stop bits (bits)
A	1	7	1 (even)	2
B	1	7	1 (odd)	2
C	1	7	1 (even)	1
D	1	7	1 (odd)	1
E	1	8	None	2
F (default)	1	8	None	1
G	1	8	1 (even)	1
H	1	8	1 (odd)	1
I	1	8	1 (even)	2
J	1	8	1 (odd)	2

Selecting a data length of 7 bits allows you to transmit alphanumerical characters and symbols but inhibits you from transmitting punctuation characters and using 2-byte codes to send dedicated characters and user pattern characters.

(8) Bit configuration

Formats A and B

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	Parity	Stop	Stop

Formats C and D

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	Parity	Stop

Formats E

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	Stop	Stop

Formats F

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	Stop

Formats G and H

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	Parity	Stop

Formats I and J

Start	b_0	b_1	b_2	b_3	b_4	b_5	b_6	b_7	Parity	Stop	Stop

Order of code transmission: Transmission occurs beginning with the least significant bit (b0).

(9) Error control

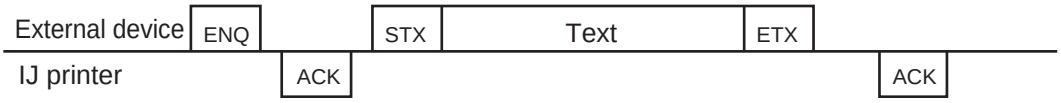
- Vertical parity error (detection on an individual character basis)
- Overrun error
- Framing error

5.3 Transmission Sequences

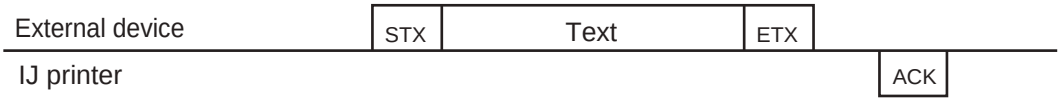
5.3.1 Common Transmission Sequences

(1) Basic transmission operation.

① When ENQ and ACK are present:

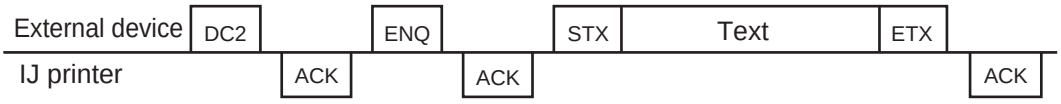


② When ENQ is omitted:

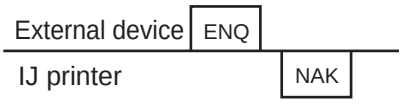


(2) When DC2 (retransmission) code is used

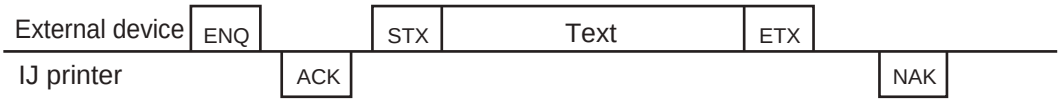
(When no response is received though ENQ has been issued and yet the contents of print area switched)



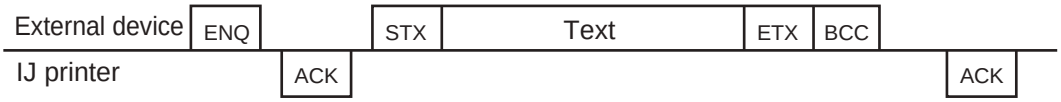
(3) When the IJ printer is incapable of receiving data or is off-line



(4) Abnormal transmission operation (when the text contains an erroneous message)



(5) When BCC code is included



(6) When the IJ printer power is OFF

No response will be returned for any code transmission from the external decice.

(7) The printings, print specifications, print format, and user pattern data can be consecutively transmitted in the following order in a single session.

① Print format
② Print specifications
③ Printings

(Example)

Print format	Print format	Print format	Print specification	Print specification	Print content

The user pattern can be positioned anywhere within the above data chain.
"Line count / print format uniformity", "Format setup change", "Free layout transmission", "Print item deletion transmission" and "Count reset transmission" must be transmitted independently. If an attempt is made to send it together with the other data, a communication error (NAK response) occurs.
The print data recall must also be transmitted independently. Even if it is sent together with the other data, no error occurs. However, the print data recall takes precedence, rendering the other data invalid.

(8) Up to 3000 bytes of data can be transmitted at a time, including "STX" and "ETX". If the 3000-byte limit is exceeded, a communication error (NAK response) occurs.

(9) Any data transmitted by communication (print contents, print specifications, print format, and user pattern) is not stored except in the following cases.

[Conditions for storing the data]

① When the ink is stopped after communication by the Shut down key or a stop signal.

② At 01 minute of every hour.

(10) Transmit to the existing print item after creating a transmission objective print item.

5.3.2 Printings Transmission

5.3.2-1 Text

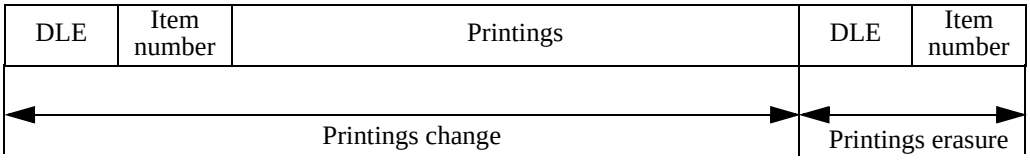
(1) When printings are to be changed

DLE	Item number	Printings

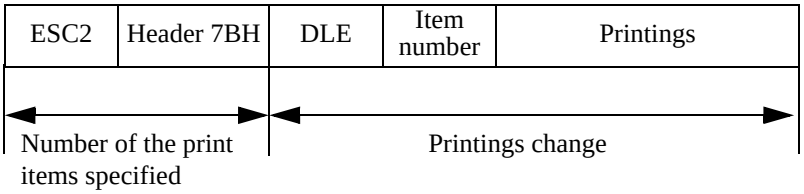
(2) If deleting character string within print item

DLE	Item number

(3) When multiple printings are to be designated



(4) When the print contents are changed by specifying the number of the print items



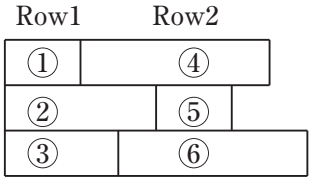
- Multiple print items can be consecutively transmitted within one session.
- Print items are to be designated by specifying the item numbers. The item numbers need not be sorted
- Print items not transmitted are not changed.
- When “the number of the print items” and the print items are transmitted at a item by Number-of-the-print-items specifying transmission, the print items beyond “the number of the print items” will be deleted.
- Number-of-the-print-items specifying transmission shall NOT be made with the other data, such as the print format or the print specification.
- Both calendar characters and count characters can be transmitted.
- If printings are transmitted for a print item for which Micro QR setup is completed, a communication error occurs.
- If transmission is made to the item number(s) which does NOT exist, the new item number(s) of the message will be added, which format type is either "Individual" or "Free layout".

5.3.2-2 Item number

Item number	1	2	3	4	5	6	7	8	9	10
Code	31H	32H	33H	34H	35H	36H	37H	38H	39H	3AH
Item number	11	12	13	14	15	16	17	18	19	20
Code	3BH	3CH	3DH	3EH	3FH	40H	41H	42H	43H	44H
Item number	21	22	23	24	25	26	27	28	29	30
Code	45H	46H	47H	48H	49H	4AH	4BH	4CH	4DH	4EH
Item number	31	32	33	34	35	36	37	38	39	40
Code	4FH	50H	51H	52H	53H	54H	55H	56H	57H	58H
Item number	41	42	43	44	45	46	47	48	49	50
Code	59H	5AH	5BH	5CH	5DH	5EH	5FH	60H	61H	62H
Item number	51	52	53	54	55	56	57	58	59	60
Code	63H	64H	65H	66H	67H	68H	69H	6AH	6BH	6CH
Item number	61	62	63	64	65	66	67	68	69	70
Code	6DH	6EH	6FH	70H	71H	72H	73H	74H	75H	76H
Item number	71	72	73	74	75	76	77	78	79	80
Code	77H	78H	79H	7AH	7BH	7CH	7DH	7EH	7FH	80H
Item number	81	82	83	84	85	86	87	88	89	90
Code	81H	82H	83H	84H	85H	86H	87H	88H	89H	8AH
Item number	91	92	93	94	95	96	97	98	99	100
Code	8BH	8CH	8DH	8EH	8FH	90H	91H	92H	93H	94H

- The order of print items is indicated below.

(3-column example) Circled number: Item number



5.3.2-3 Printings

- An array of “character codes”.
- The coding system varies with the mode which is designated by the “Number of communication bytes” setting entered from the communication environment setup screen.

Number of communication bytes	Alphanumerical characters and symbols	Dedicated characters	User pattern		Punctuation mark	Katakana	Calendar characters, Count characters
			(00 to 47)	(48 to 199)			
1-byte mode	ASCII	ASCII	ASCII	2-byte code	2-byte code	2-byte code	2-byte code
2-byte mode	ASCII	2-byte code	2-byte code	2-byte code	2-byte code	2-byte code	2-byte code

5.3.2-4 Character codes

(1) 2-byte code (number of communication bytes: 1-byte mode)

- For 1-byte mode, 2-byte codes are sandwiched between "SI" and "SO."

- One character

SI	High-order byte	Low-order byte	SO

- Two or more characters

SI	High-order byte	Low-order byte	High-order byte	Low-order byte	High-order byte	Low-order byte	SO

(2) 2-byte code (number of communication bytes: 2-byte mode)

High-order byte	Low-order byte

(3) Mixture of ASCII and 2-byte codes (number of communication bytes: 1-byte mode)

ASCII	ASCII	SI	High-order byte	Low-order byte	High-order byte	Low-order byte	SO	ASCII

(4) Mixture of ASCII and 2-byte codes (number of communication bytes: 2-byte mode)

ASCII	ASCII	High-order byte	Low-order byte	High-order byte	Low-order byte	ASCII

5.3.2-5 Example of print contents transmission

(1) Example when No. of communication bytes: 1 byte mode

02H	10H	31H	41H	42H	43H	10H	32H	0FH	F2H	52H	F2H	52H	0EH	03H
STX	DLE	1	A	B	C	DLE	2	SI	Calendar		Calendar		SO	ETX

Print item 1 — Print item 2

(2) Example when No. of communication bytes: 2 byte mode

02H	10H	31H	41H	42H	43H	10H	32H	F2H	52H	F2H	52H	03H
STX	DLE	1	A	B	C	DLE	2	Calendar		Calendar		ETX

Print item 1 — Print item 2

[Transmission results]

Print item 1 → ABC

Print item 2 → DD

DD:Calendar character "day"

(3) Example when the number of the print items is changed to three (3) from two (2)

02H	1FH	7BH	10H	32H	61H	62H	10H	33H	63H	64H	03H
STX	ESC2	Header	DLE	2	a	b	DLE	3	c	d	ETX

Number of the print items specified — Print item 2 — Print item 3

[Transmission results]

Print item 1	Print item 2	Print item 3	Print item 4
A B C	D E F	G H I	J K L

⇨

Print item 1	Print item 2	Print item 3
A B C	a b	c d

5.3.3 Print Data Recall Transmission

5.3.3-1 Text

ESC2	Header 20H	Classification 31H	1000s place	100s place	10s palce	Units place

Print data message number (0001 to 2000)

[Existing machine message] Existing machine message can also be used.

ESC	Header 56H	100s place	10s place	Units place

Print data message number (001 to 999)

ESC	Header 26H	10s place	Units place

Print data message number (01 to 99)

5.3.3-2 Print data message number

- An already saved print data number is to be designated as the print data message number.
- The message number is expressed by a combination of three ASCII codes.

5.3.3-3 Example of print contents transmission

(1) Example of specifying 4-digit print data registration No.

02H	1FH	20H	31H	30H	30H	31H	32H	03H
STX	ESC2		1	0	0	1	2	ETX

Header, classification　　Print data message number

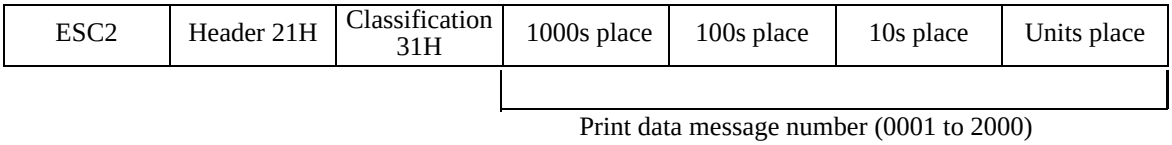
[Transmission results]

Calls print data of print data message number 12.

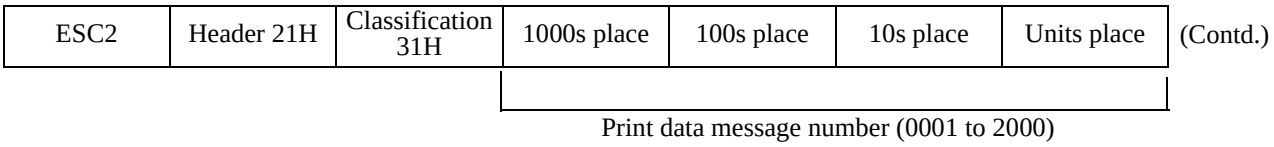
5.3.4 Print data registration transmission

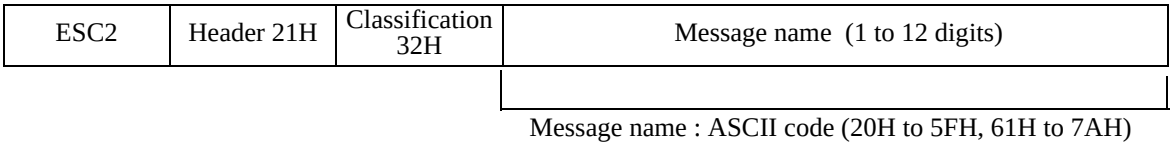
5.3.4-1 Text

● Specifies message number



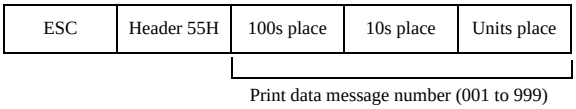
● Specifies registration No. and message name.

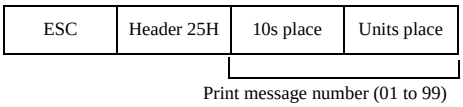




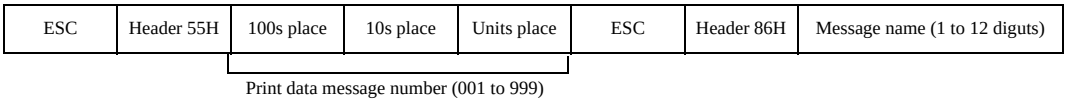
[Existing machine message] Existing machine message can also be used.

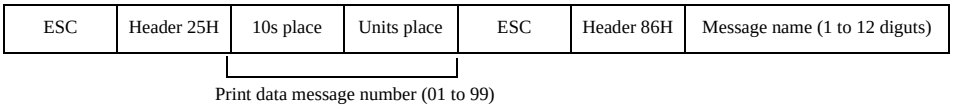
● Specifies registration No.





● Specifies registration No. and message name.





5.3.4-2 Message name

(1) message number specified

- A message name is automatically attached when print data is registered.
- Based on the message name displayed in the upper left hand corner of the screen, the last 4 digits are replaced with the message number and used as the new message name.

(Example) Registering for No. 123

Contents displayed in upper left hand corner of the screen :"ABCDEFGHIJKL"
Message name after registration :"ABCDEFG 0123"

(2) Message number and message name specified

- The specified message name attached when print data is registered.

(3) Same message name is used for other message number

- If a message name is in use for other message number, new message name will be created by using original message name as a base and replacing its 7th and 8th digits with AA to ZZ.

(Example) Message name [ABC] is already registered on No.1. Register on No.2 using identical message name.

Message name of No.1: [ABC]
Message name of No.2: [ABC AA]

(4)Characters available for message name

- Characters used for setting the message name transmission are different from characters used in manual input on registration screen.

Function	Alphameric character/ Symbols	Accent character/ Arabic character
Manual input	Available	Available
Message name transmission	Available	Unavailable

Numbers/symbols (ASCII code): 20H to 5FH, 61H to 7AH

5.3.4-3 Supplement

- When transmitting print data together with the print contents, send the print contents last.

5.3.4-4 Example of print data registration transmission

(1) Example of registering by specifying message name

02H	1FH	21H	31H	30H	30H	31H	32H	1FH	21H	32H	41H	42H	43H	03H
STX	ESC2	!	1	0	0	1	2	ESC2	!	2	A	B	C	ETX

Header, classification | Print data message unmber | Header, classification | Message name

[Transmission results]

Massage name "ABC" is assigned to current print data and is registered under message number 12.

5.3.5 Print Condition Transmission

5.3.5-1 Text

(1) Line count / print format uniformity

ESC2	Header 22H	Classification 31H

- Line count and print format are made uniform for all print items.
- Line count of all rows are made uniform based on the first row.
- Space between stages, character size, space between characters, whether or not to use bar code and double width size are made uniform based on the setting value of the first print item.
- Send the message independently. The message cannot be sent together with print format, print specs., and print contents.
- If transmission is made to the message which format setup is "Free layout", a communication error will occur.

[Existing machine message] Existing machine message can also be used.

ESC	Header 2BH	30H

(2) Format setup change

ESC2	Header 22H	Classification33H	Format setup

Format setup (30H to 32H)

Format setup
30H:Individual
31H:Overall
32H:Free layout

- This transmission can change the format setup.
- The print data will be adjusted to match the "After-change" Format setup.
- Print condition transmission shall be made independently.
  Print condition can not be transmitted with Print format or Print specification or Print description.

(3) Configuration of print format text

- Print item not specified

Print format text

If item No. is not specified, it is set for all items.
To transmit print format and print specs. consecutively, transmit in the order of ① print format and ② print specs. If transmitted the other way round, an error will occur.

- Print item specified

ESC2	Header 70H	Item No.	Print format text

Item No. specified (1 to 100)

Only specified print item is applicable for change.

[Existing machine message] Existing machine message can also be used.

ESC2	Header 24H	Item No.	Print format text

Item No. specified (1 to 100)

(4) Print format text

● Line count and Line spacing

ESC2	Header 22H	Classification 32H	Line count	Line spacing

Line count (1 to 5)　Line spacing (0 to 4)
(5 lines : 0 to 2)

● Character size and inter-character space

ESC2	Header 23H	Classification 31H	Character size	10s place	Units place

Character size
(30H to 3CH)　Inter-character space (0 to 28)

Character size
30H : 4×5
31H : 5×5
32H : 5×8(5×7)
33H : 9×8(9×7)
34H : 7×10
35H : 10×12
36H : 12×16
37H : 18×24
38H : 24×32
39H : 11×11
3AH: 5×3(Chimney)
3BH: 5×5(Chimney)
3CH: 7×5(Chimney)
3EH : 30×40
3FH : 36×48

● Increased width

ESC2	Header 23H	Classification 32H	Increased width

Increased width (1 to 9)

● Bar code type (Type change, Bar code "not used" → "used")

ESC2	Header 23H	Classification 33H	Type

Bar code type (30H to 47H)

Bar code type
30H : not used
31H : code 39
32H : ITF
33H : NW-7
34H : EAN-13
35H : DM8×32
36H : DM16×16
37H : DM16×36
38H : DM16×48
39H : DM18×18
3AH: DM20×20
3BH: DM22×22
3CH: DM24×24
3DH: Code 128 (Code set B)
3EH: Code 128 (Code set C)
3FH: UPC-A
40H: UPC-E
41H: EAN-8
42H: QR21×21
43H: QR25×25
44H: QR29×29
45H: GS1 DataBar (Limited)
46H: GS1 DataBar (Omnidirectional)
47H: GS1 DataBar (Stacked)

● Bar code "used"→ "not used"

ESC2	Header 23H	Classification 33H	30H

30H :Bar code "not used"

● Readable code (Bar code EAN-13)

ESC2	Header 23H	Classification 34H	Code

Readable code type (0: None, 1: 5×5, 2: 5×7)

● Prefix code (Bar code EAN-13)

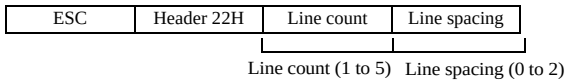
ESC2	Header 23H	Classification 35H	Tens position	Units position

Prefix code (00 to 99)

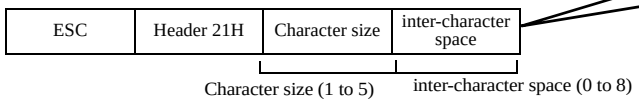
● Two or more print format items can be consecutively transmitted in a single chain.

[Existing machine message] Existing machine message can also be used.

● Line count and Line spacing

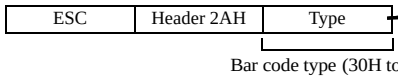


● Character size and inter-character space



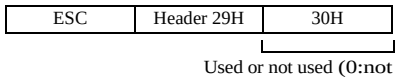
Character size
30H:5×5
31H:5×8(5×7)
32H:7×10
33H:12×16
34H:18×24
35H:24×32

● Bar code type

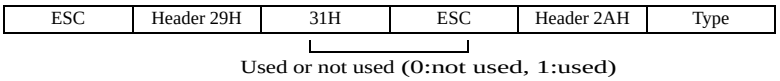


Bar code type
30H : code 39
31H : ITF
32H : NW-7
33H : EAN-13
34H : DM16×16
35H : DM8×32
36H : Code 128
37H : DM16×36
38H : DM16×48
39H : DM18×18
3AH: DM20×20
3BH: DM22×22
3CH: DM24×24

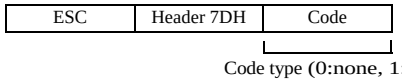
● Bar code "used"→ "not used"



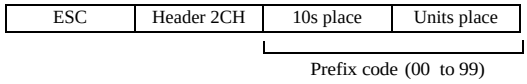
● Bar code "not used"→ "used"



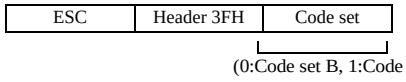
● ID code (Bar code EAN-13)



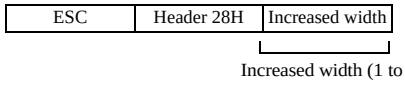
● Prefix code (Bar code EAN-13)



● Code set (Code128)

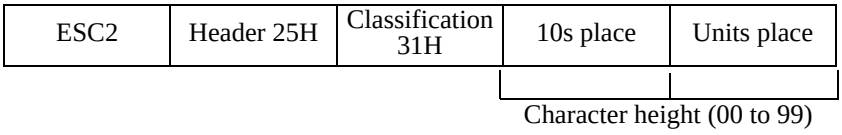


● Increased width

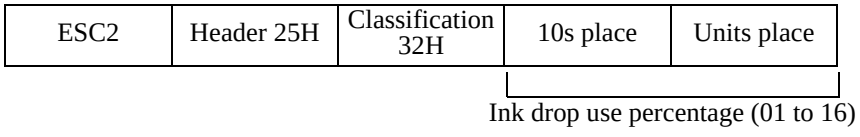


(5) Print specifications

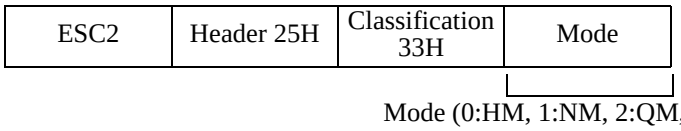
● Character height



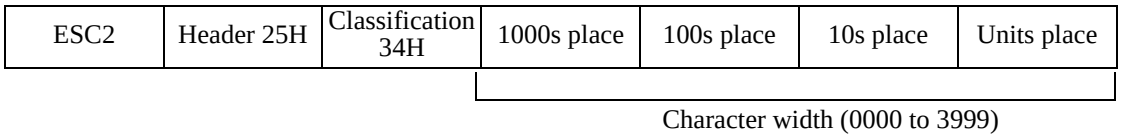
● Ink drop use percentage



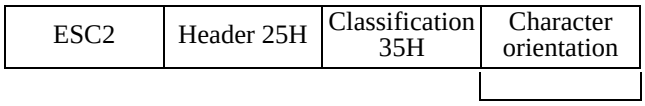
● High-speed printing



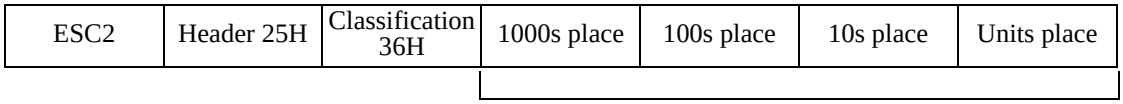
● Character width



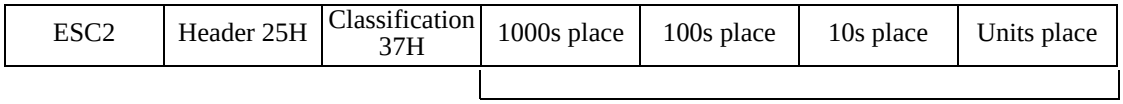
● Character orientation



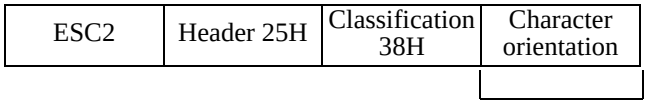
● Print start delay



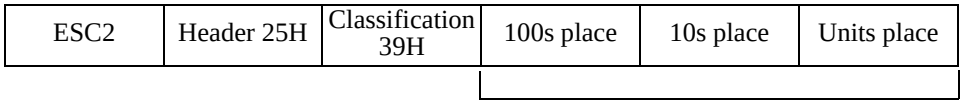
● Print start delay (reverse)



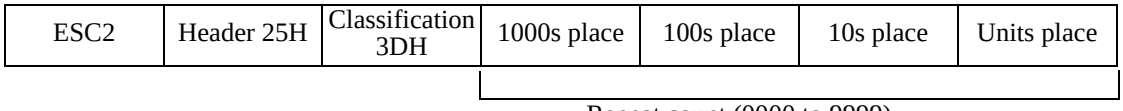
● Product speed matching



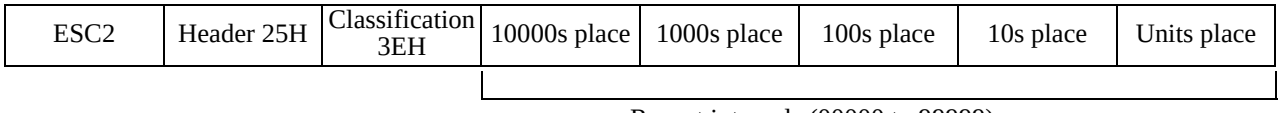
● Pulse rate division Factor



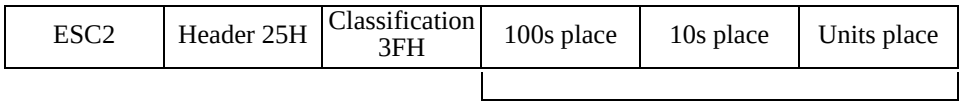
● Repeat count



● Repeat intervals



● Target sensor timer



● Target sensor filter

ESC2	Header 25H	Classification 40H	Division

Division (1:time setup, 2:until end of print)

● Target sensor filter setting value

ESC2	Header 25H	Classification 41H	1000s place	100s place	10s place	Units place

Value (0000 to 9999)

● Ink drop charge rule

ESC2	Header 25H	Classification 42H	Charge rule

Charge rule (31H:Standard, 32H:Mixed single scan and interlaced 33H:Dot mixed)

● Leading character width control

ESC2	Header 25H	Classification 43H	Leading character width control

Leading character width control (0:Disable, 1:Enable)

● Leading character width control (width)

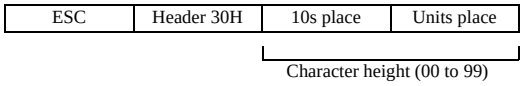
ESC2	Header 25H	Classification 44H	10s place	Units place	10s place	Units place

1st row width (00 to 32) 2nd row ridth (00 to 32)

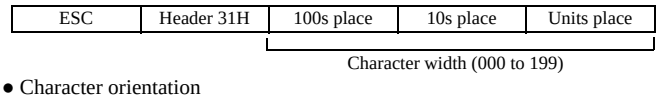
● Two or more print specification items can be consecutively transmitted in a single chain.

[Existing machine message] Existing machine message can also be used.

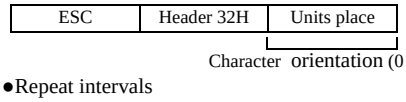
●Character height



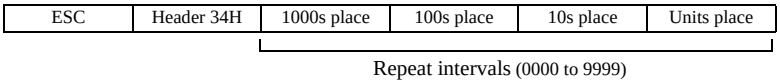
● Character width



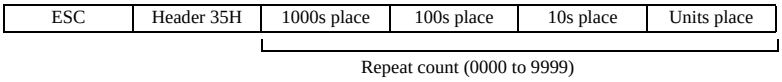
● Character orientation



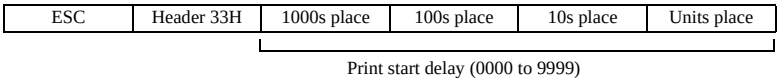
●Repeat intervals



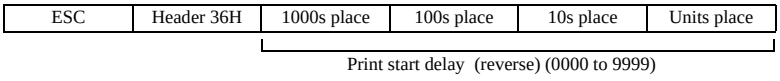
●Repeat count



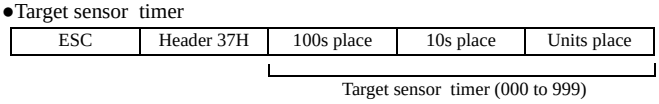
● Print start delay



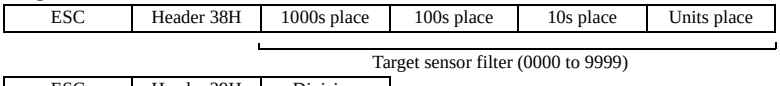
● Print start delay (reverse)

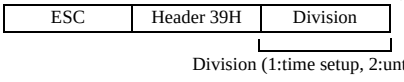


●Target sensor timer

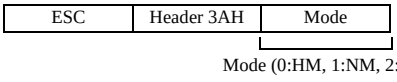


●Target sensor filter

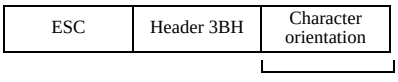




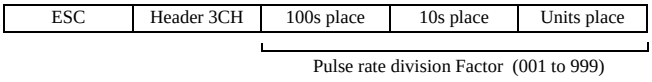
●High-speed printing



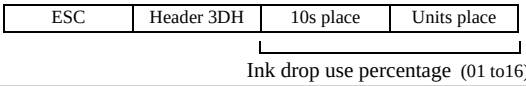
●Product speed matching



●Pulse rate division Factor



●Ink drop use percentage

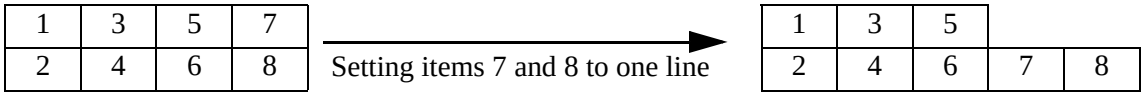


5.3.5-2 Text setup rules

(1) Line count

- When you change the line count for a print item in a certain column, you must also set the line count for the other print items that belong to the same column.

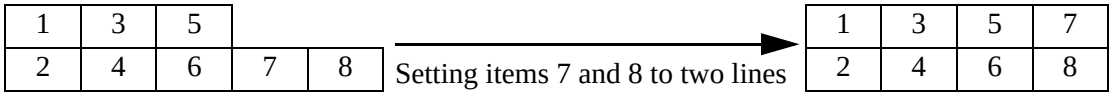
(Example)



Transmit the line count consecutively to items 7 and 8. If you transmit the line count to only one of them, a communication error occurs.

- When you change the line count for a print item, you must also set the line count for the other print items that belong to the same column as the former one.

(Example)



Transmit the line count consecutively to items 7 and 8. If you transmit the line count to only one of them, a communication error occurs.

(2) Line spacing

- When you transmit one-line setup data for a certain print item, you have to transmit a line spacing setting of "0" as well as for the same chain as the one-line setup data.
  If you do not transmit an line spacing setting of "0", a communication error occurs.
- Ensure that the same line spacing setting is selected for print items belonging to the same column. In other words, when you transmit a new line spacing setting for a print item in a certain column, you must consecutively transmit the same setting to the other print items in the same column.

(3) Character size and inter-character space

- The available inter-character space varies with the character size.
  See "4.7.4 Set dot matrix, inter-character space, and other parameters" ④ of the Instructions Manual.
- The total number of vertical dots cannot exceed the limit.

Machine type	Maximum number of vertical dots
UX-D8	64 dots

- Some characters cannot be entered depending on the character size. If a print item contains an unavailable character after a character size change, its contents are changed to a space.
  See "4.7.4 Set dot matrix, inter-character space, and other parameters" ③ of the Instructions Manual.
- If an inter-character space other than "0" is transmitted for a print item for which bar code setup is completed, a communication error occurs.

(4) Bar code use and bar code type

- Two or more bar code types can coexist.
- When bar code set up is completed for a print item, its inter-character space can not be changed. (The inter-character space need not be transmitted in this case.)
- When the bar code type is ITF or code128(code set C), you have to observe the following input rules. If you violate the rules, the contents of an illegal print item will be deleted.

ITF or code128(code set C) input rules

No.	Input rule	Input example
1	Characters must be paired to make an entry.	(Correct) [012345] (Incorrect) [01234]

- Some characters cannot be entered depending on the bar code type. If any unacceptable character is included in a print item for which bar code setup is completed, the contents of the print item are changed to a null character. See "4.7.5 Print a bar code" of the Instructions Manual.
- FNC1 is a control code used for Code128, 2-byte code of 81A6, indicated as ※on print layout screen.

5.3.5-3 Caution for format type "Free layout"

- When the format setup is "Free layout" and if "Line count / print format uniformity" or "Line count and line spacing" or "High-speed printing" or "Ink drop charge rule" is transmitted, a communication error will occur.

5.3.5-4 Example of print conditions transmission

(1) Example where print item is not specified

02H	1FH	22H	32H	31H	30H	1FH	25H	36H	30H	31H	32H	33H	03H
STX	ESC2	“	2	1	0	ESC2	%	6	0	1	2	3	ETX

Header, classification — Line count 1 line spacing 0 — Header, classification — Write position 123

[Transmission results]

All print items are set as 1 stage, write position is changed to 0123.

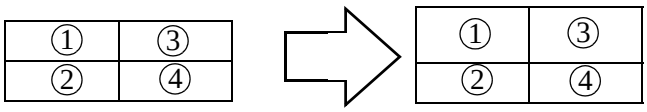
(2) Example where print item is specified

02H	1FH	70H	31H	1FH	23H	31H	34H	30H	30H	1FH	70H	33H	1FH	23H	31H	34H	30H	30H	03H
STX	ESC2	p	1	ESC2	#	1	4	0	0	ESC2	p	3	ESC2	#	1	4	0	0	EXT

Header, item No. — Header, classification — Character size 7×10, inter-character space 0 — Header, item No. — Header, classification — Character size 7×10, inter-character space 0

[Transmission results]

Upper stage character size is changed.



5.3.6 Free Layout Transmission

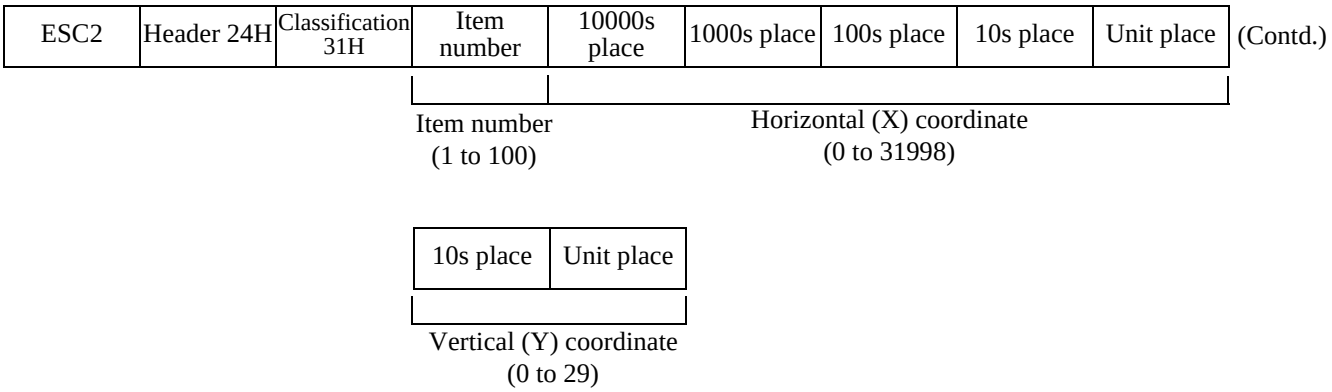
5.3.6-1 Overview

- When Format setup is "Free layout", the selected print item can be moved individually.
- Free layout transmission shall be made independently. Free layout transmission can NOT be transmitted with Print format or Print specification or Print description.
- If transmission is made to the item number(s) which does not exist, a communication error will occur.
- If transmission is made when the format setup is either "Individual" or "Overall", a communication error will occur.

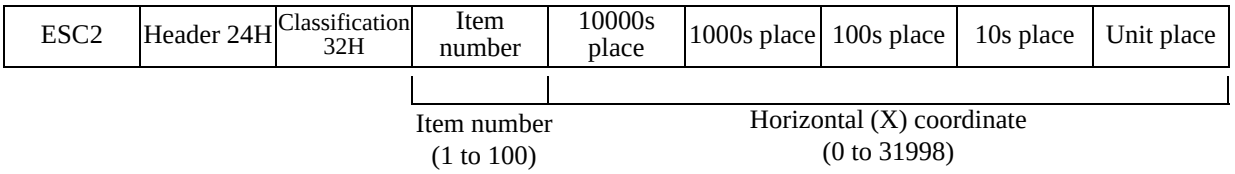
5.3.6-2 Text

(1) Specify Horizontal/Vertical coordinate and move

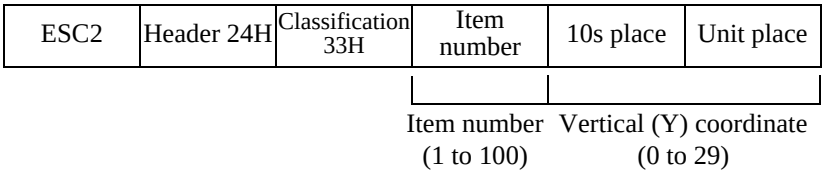
- Specify the bottom-left coordinate and the print item will be moved.
- Horizontal and Vertical coordinate



- Horizontal coordinate

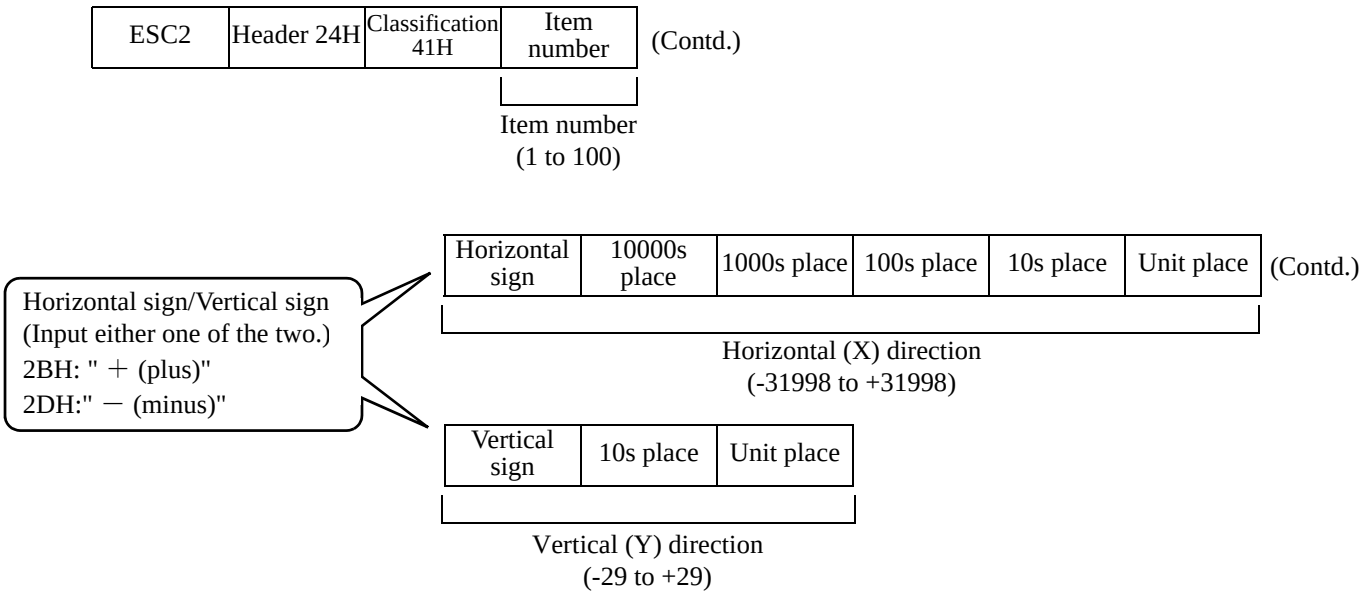


- Vertical coordinate



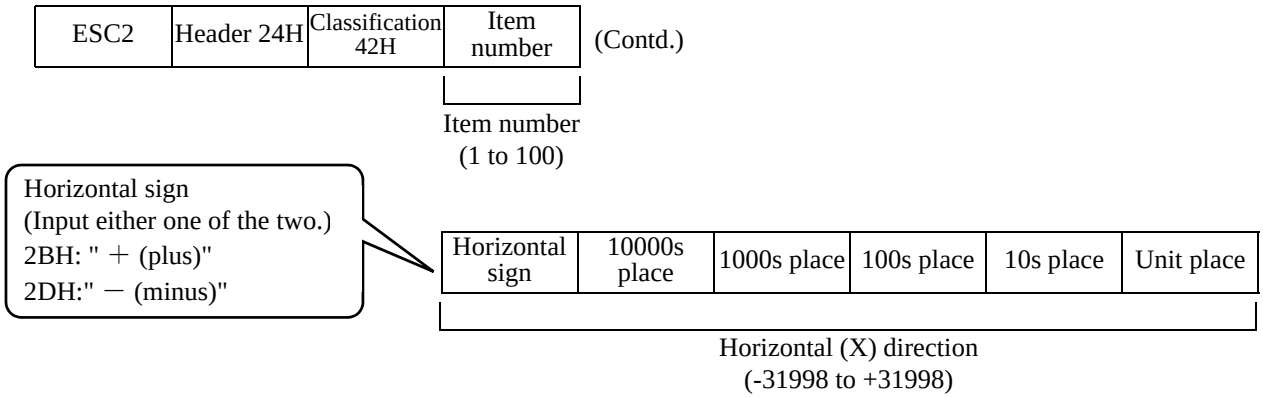
(2) Specify Horizontal/Vertical directions and move

- Specify the number of dots for moving and the print item will be moved.
- Horizontal and Vertical move



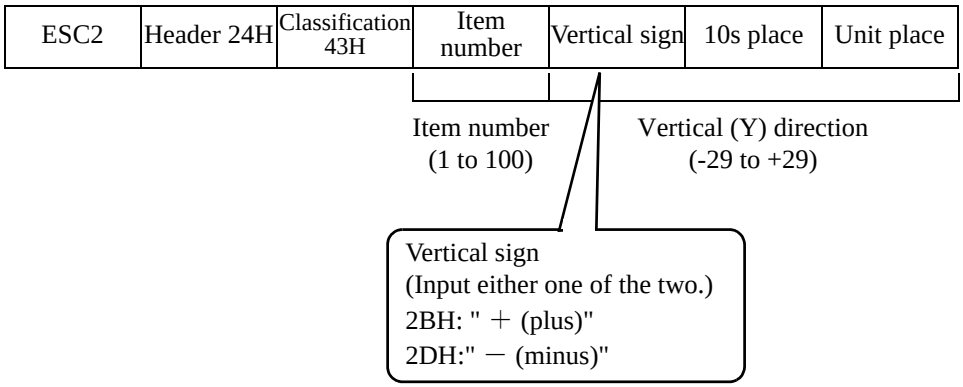
-- Either plus(+) or minus(-) sign to be input for both Horizontal/Vertical directions.
-- In case there will be NO horizontal move, input either "+00000" or "-00000".
-- In case there will be NO vertical move, input either "+00" or "-00".

- Horizontal move



-- Either plus(+) or minus(-) sign to be input for Horizontal direction.
-- In case there will be NO horizontal move, input either "+00000" or "-00000".

- Vertical move

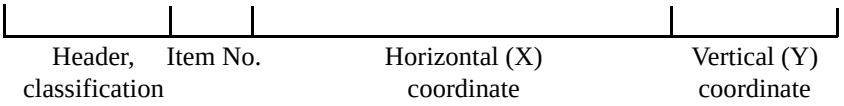


-- Either plus(+) or minus(-) sign to be input for Vertical direction.
-- In case there will be NO vertical move, input either "+00" or "-00".

5.3.6-3 Example of Free layout transmission

(1) Specify Horizontal/Vertical coordinate and move

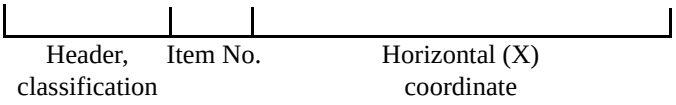
02H	1FH	24H	31H	35H	30H	30H	31H	32H	30H	32H	35H	03H
STX	ESC2	$	1	5	0	0	1	2	0	2	5	ETX



[Transmission result]

Print item 5: Horizontal (X) coordinate will be set to 120 and Vertical (Y) coordinate to 25.

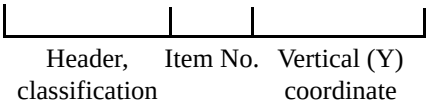
02H	1FH	24H	32H	31H	31H	32H	33H	34H	35H	03H
STX	ESC2	$	2	1	1	2	3	4	5	ETX



[Transmission result]

Print item 1: Horizontal (X) coordinate will be set to "12345".

02H	1FH	24H	33H	94H	30H	30H	03H
STX	ESC2	$	3	100	0	0	ETX



[Transmission result]

Print item 100: Vertical (Y) coordinate will be set to "0".

(2) Specify Horizontal/Vertical directions and move

02H	1FH	24H	41H	3AH	2BH	30H	30H	31H	30H	30H	2BH	32H	30H	03H
STX	ESC2	$	A	10	+	0	0	1	0	0	+	2	0	ETX

Header, classification | Item No. | Horizontal (X) direction | Vertical (Y) direction

[Transmission result] Move print item 10 rightward by 100 and upward by 20.

02H	1FH	24H	41H	44H	2DH	30H	30H	30H	32H	30H	2DH	30H	35H	03H
STX	ESC2	$	A	20	—	0	0	0	2	0	—	0	5	ETX

Header, classification | Item No. | Horizontal (X) direction | Vertical (Y) direction

[Transmission result] Move print item 20 leftward by 20 and downward by 5.

02H	1FH	24H	41H	32H	2BH	31H	32H	33H	34H	35H	2DH	30H	30H	03H
STX	ESC2	$	A	2	+	1	2	3	4	5	—	0	0	ETX

Header, classification | Item No. | Horizontal (X) direction | Vertical (Y) direction

[Transmission result] Move print item 2 rightward by 12345.

02H	1FH	24H	41H	62H	2BH	30H	30H	30H	30H	30H	2DH	31H	30H	03H
STX	ESC2	$	A	50	+	0	0	0	0	0	—	1	0	ETX

Header, classification | Item No. | Horizontal (X) direction | Vertical (Y) direction

[Transmission result] Move print item 50 downward by 10.

02H	1FH	24H	42H	34H	2DH	30H	30H	31H	30H	30H	03H
STX	ESC2	$	B	4	—	0	0	1	0	0	ETX

Header, classification | Item No. | Horizontal (X) direction

[Transmission result] Move print item 4 leftward by 100.

02H	1FH	24H	43H	80H	2BH	30H	35H	03H
STX	ESC2	$	C	80	+	0	5	ETX

Header, classification | Item No. | Vertical (Y) direction

[Transmission result] Move print item 80 upward by 5.

5.3.7 Calendar Conditions Transmission

5.3.7-1 Text

(1) Calendar Conditions Transmission

● Offset

ESC2	Header 28H	Classification 32H	Calendar block No.	Type	1000s place	100s place	10s place	Units place

Offset

Calendar block No.
(1 to 8)

Type
30H : Year
31H : Month
32H : Day
33H : Hour
34H : Minute

Offset setting range

Setting item	Offset setting range
Year	0000 to 9999
Month	0000 to 9999
Day	0000 to 1999
Hour	-023 to 0099
Minute	-059 to 0099

"-" (2DH) when setting negative offset to hour, minute.

● Zero-suppression

ESC2	Header 28H	Classification 34H	Calendar block No.	Type	Mode

Calendar block No.
(1 to 8)

Type
30H : Year
31H : Month
32H : Day
33H : Hour
34H : Minute
35H : Weeks
36H : Day of week

Mode
30H : Disable
31H : Zero-suppression (space)
32H : Zero-suppression (character fill)

[Existing machine message] Existing machine message can also be used.

● Offset

ESC2	Header 76H	Item No.	Type	1000s place	100s place	10s place	Units place

Offset

● Zero-suppression

ESC2	Header 77H	Item No.	Type	Disable or Enable

Disable or Enable (0: Disable;
1: Zero-suppression (space))

Type
30H : Year
31H : Month
32H : Day
33H : Hour
34H : Minute

(2) Count Conditions Transmission

ESC2	Header 2CH	Classification	Count block No.	Setting value

Calendar block No. (1 to 8)

Classification	Item name	Setting value
31H	Initial value	Character code
32H	Range 1	Character code
33H	Range 2	Character code
34H	Update setting range (In progress)	000000 to 999998
35H	Update setting range (Unit)	000001 to 999999
36H	Increment setting range	01 to 99
37H	Direction	0: up, 1: down
38H	Jump from	Character code
39H	Jump to	Character code
3AH	Reset	Character code
3BH	Reset signal (option)	0:signal 1, 1:signal 2
3EH	External signal count (option)	0: Disable, 1: Enable

Character code of setting value

Mode	Alphanumeric	User pattern
1-byte mode	ASCII	ASCII
2-byte mode	ASCII	2-byte code

*) When count characters has been divided (e.g., [CC CC]), transmit four-digits characters.

[Existing machine message] Existing machine message can also be used.

(1) Initial value, Range, Jump from, Jump to, Reset

ESC	Header 80H	Item No.	Type	Setting value

Code of type

	Initial value	Range 1	Range 2	Jump from	Jump to	Reset
ASCII	30	31	32	33	34	35

ASCII is hexadecimal number.

Character code of setting value

Mode	Alphanumeric	User pattern
1-byte mode	ASCII	ASCII
2-byte mode	ASCII	1-byte code

*) When count characters has been divided (e.g., [CC CC]), transmit four-digits characters.

(2) Update setting range

ESC	Header 81H	Item No.	Type	100000s place	10000s place	1000s place	100s place	10s place	Units place

Code of type

	In progress	Unit
ASCII	30	31

ASCII is hexadecimal number.

Update setting range

Set item	Update setting range
In progress	000000 to 999998
Unit	000001 to 999999

(3) Direction, External signal count, Reset signal

ESC	Header 82H	Item No.	Type	0/1

Direction (0: up, 1: down)
External signal count (0: Disable, 1: Enable)
Reset signa (0:Signal1, 1:Signal2)

Code of type

	Direction	External signal count	Reset signal
ASCII	30	31	32

ASCII is hexadecimal number.

(4) Increment

ESC	Header 83H	Item No.	Type	10s place	Unit place

Increment setting range

Set item	Increment setting range
Increment	01 to 99

5.3.7-2 Example of calendar conditions transmission

(1) Example of offset

02H	1FH	28H	32H	32H	32H	30H	30H	31H	32H	03H
STX	ESC2	(	2	2	Day	0	0	1	2	ETX

Header, classification
Calendar block No.
Offset 12 days

[Transmission results]

Defines offset 12 days for calendar block 2.

5.3.7-3 Example of count conditions transmission

(1) Example of reset

02H	1FH	2CH	3AH	31H	30H	30H	30H	30H	30H	03H
STX	ESC2	,	:	1	0	0	0	0	0	ETX

Header, classification — Count block No. — Reset value 00000

[Transmission results]

Defines reset value 00000 for count block 1.

5.3.8 User Pattern Character Transmission

5.3.8-1 Text

● When the number of communication bytes is set to "1" for communication

ESC2	Header 32H	Classification	Character code	Pattern data array

Character size

● When the number of communication bytes is set to "2" for communication environment setup purposes

ESC2	Header 32H	Classification	High-order byte	Low-order byte	Pattern data array

Character size — Character code

[Existing machine message] Existing machine message can also be used.

● When the number of communication bytes is set to "1" for communication environment setup purposes

ESC2	Header 20H	Character size	Character code	Pattern data array

Character size
0 : 5x5
1 : 5x8(5x7)
2 : 7x10
3 : 12x16
4 : 18x24
5 : 24x32

● When the number of communication bytes is set to "2" for communication environment setup purposes.

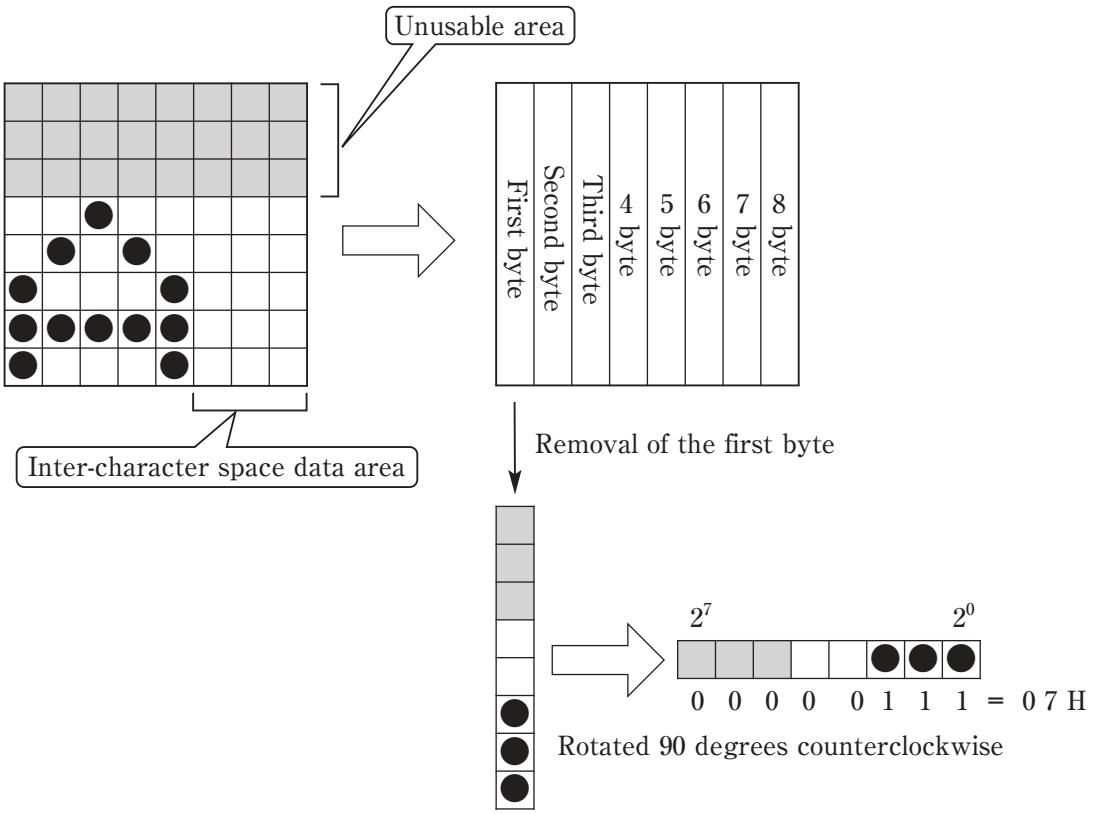
ESC2	Header 20H	Character size	High-order byte	Low-order byte	Pattern data array

Character code

● For pattern data composition purposes, the data is arranged in successive order, beginning from the bottom left, from bottom to top and from left to right.

b) Pattern data example

[For a character size of 5×5]



Composition order	1	2	3	4	5	6	7	8
Pattern data	07H	0AH	12H	0AH	07H	00H	00H	00H

5.3.8-4 Character codes

For character code designation, either ASCII codes or 2-byte codes are used.

(1) ASCII codes (when the number of communication bytes is 1)

User pattern character	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
ASCII	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
User pattern character	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
ASCII	E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
User pattern character	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
ASCII	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF

ASCII codes are in hexadecimal notation.

Applicable to cases where the number of user pattern characters does not exceed 48 (user pattern characters 00 through 47).

(2) 2-byte codes (when the number of communication bytes is 2)

User pattern character 00: F140 = high-order byte F1 + low-order byte 40
See “5.4.1 Code Tables”.

5.3.8-5 Supplement

(1) If the same character code is used to transmit two or more user pattern character data in a single message, the last-transmitted data takes effect.
(2) When two or more user pattern characters having differing character sizes or character codes are transmitted in a single message, no limitations are imposed on the order in which they are transmitted.

5.3.8-6 Example of user registration character transmission

(1) Example where number of communication bytes of communication environment settings is "1 byte," character size is "5 x 5" and character code is "47."

02H	1FH	32H	31H	FFH	07H	0AH	12H	0AH	07H	00H	00H	00H	03H
STX	ESC2	2	5x5	47	-	-	-	-	-	-	-	-	ETX

Header, classification
Code 47
Pattern data arrangement

[Transmission results]
Defines character size 5×5, character code 47 user pattern.

5.3.9 On-line/off-line Transmission Procedure

5.3.9-1 Text

(1) Change to online

ESC2	Header 73H

(2) Change to offline

ESC2	Header 74H

[Existing machine message] Existing machine message can also be used.

(1) Change to online

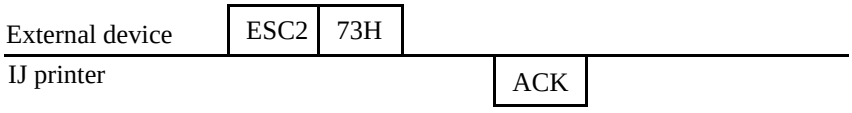
ESC	Header 79H

(2) Change to offline

ESC	Header 7AH

- In the following cases, Online/Offline transmission cannot be performed.
  If it is attempted, NAK code will be the reply:
  ① "Apply" key is displayed while inputting set value.
  ② In the "Communication environment setup" screen, "Off fixed" is selected for "State at power-up" item.
  ③ During input of count conditions.
  ④ The confirmation window is open.
  ⑤ The circulation control screen is opened by the maintenance function.
  ⑥ The touch screen setup screen is opened by the auxiliary function.
  ⑦ The communication monitor screen is opened.

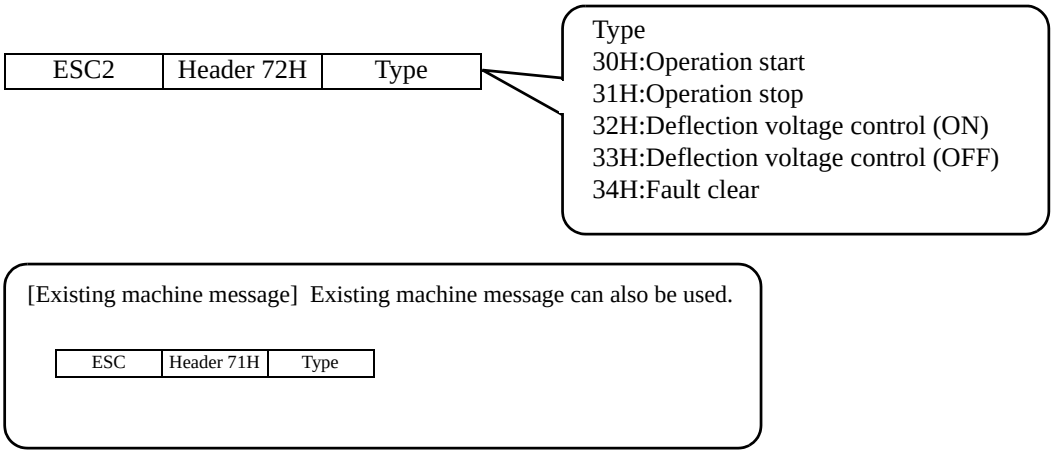
5.3.9-2 Transmission example



ENQ, STX and ETX are not required.

5.3.10 Remote Operation Transmission

5.3.10-1 Text



5.3.10-2 Types of control

Types of control for operation

No.	Type	Content	Function enabled status
1	Operation start	Starts to eject ink, and shifts from stop status to ready status. (Same process as with <Startup> button)	Stop status
2	Operation stop	Stops ink ejection, and shifts to stop status (Same process as with <Shutdown> button)	When ink is being ejected (standby, ready status, etc.)
3	Deflection voltage control (ON)	Turns deflection voltage on (Same process as with <Ready> button in Manual control menu window)	Standby status
4	Deflection voltage control (OFF)	Turns deflection voltage off (Same process as with <Standby> button in Manual control menu window)	Ready status
5	Fault clear	Closes the window for any fault that has occurred. However, the window will remain if the cause of fault is not resolved.	When fault has occurred

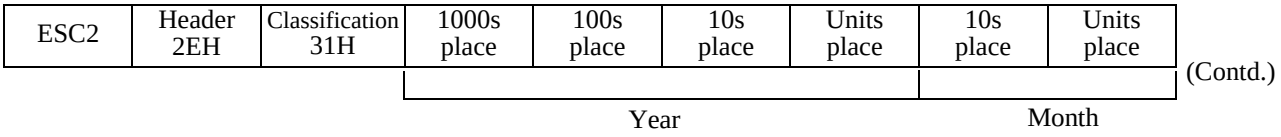
- Specify only one category of control at a time.
- Even if executing function is not possible, ACK will be answered, but no function will be executed.

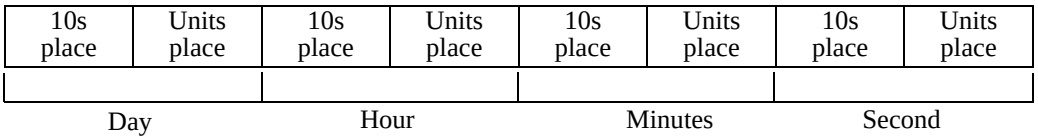
5.3.11 Time control

5.3.11-1 Text

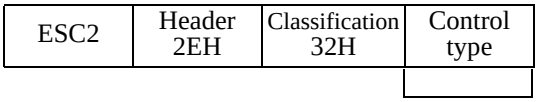
(1) Date/time setup transmission

● Current time

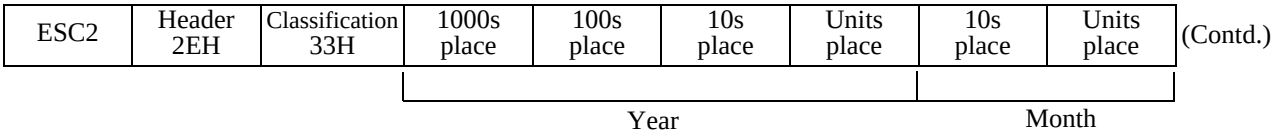


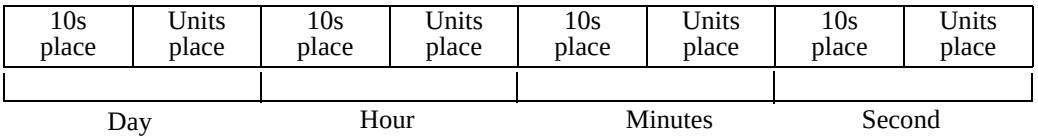


● Calendar time control

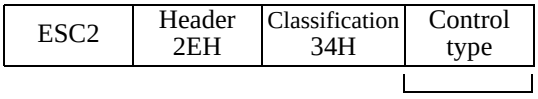


● Calendar time



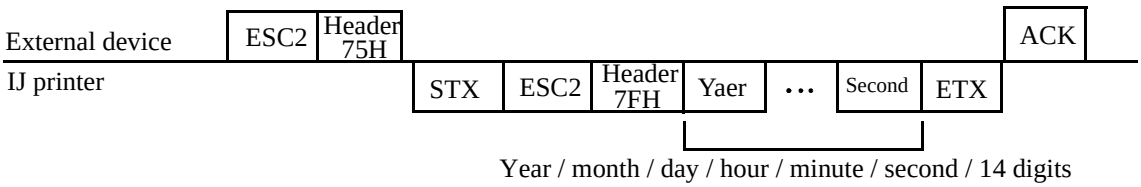


● Clock system



(2) Current time output transmission

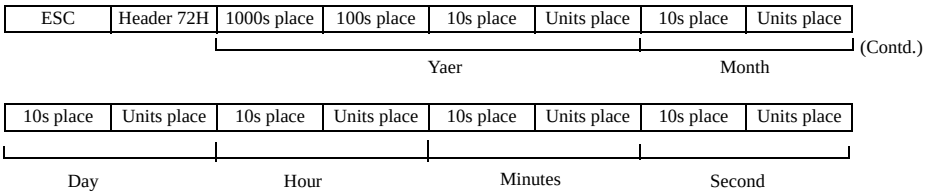
Outputs current time of IJ printer internal calendar.



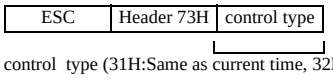
[Existing machine message] Existing machine message can also be used.

(1) Date/time setup transmission

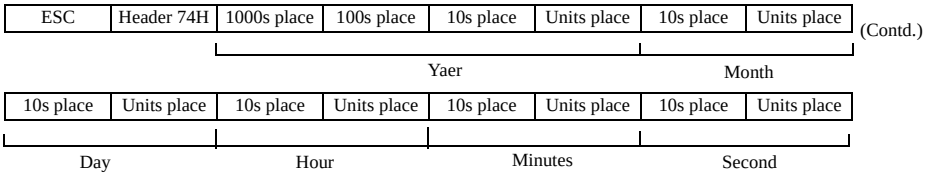
● Current date/time



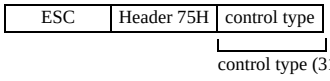
● Calendar time control



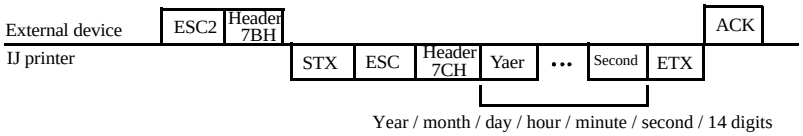
● Calendar time



● Clock system



(2) Current time output transmission



5.3.11-2 Date/time setup

(1) This function allows operator to set each item on "Date/time setup screen" for Maintenance menu.

No.	Setting item	Setting contents
1	Current time	Current date time displayed across the very top of screen (year/month/day/hour/minute/second)
2	Calendar time control	Same as current time, clock stopped
3	Calendar time	Time reflected in calendar characters of print contents
4	Clock system	24/12-hour system

(2) After receiving date and time setting transmission, the print contents calendar characters and current time display are updated.

(3) When transmitting "calendar time", first transmit the message for "calendar time: clock stop": Simultaneous transmission is also possible.

(4) When changing the calendar time control from "clock stop" to "same as current time", the values on calendar time will not be saved.

5.3.11-3 Example of time control transmission

(1) Example of setting current time

02H	1FH	2EH	31H	32H	30H	31H	35H	30H	37H	30H	37H	31H	32H	34H	35H	30H	30H	03H
STX	ESC2	.	1	2	0	1	8	0	7	0	7	1	2	4	5	0	0	ETX

Header, classification | Yaer | Month | Day | Hour | Minutes | Second

[Transmission results]

Set current time to 2018/07/07, 12:45:00.

5.3.12 Print item deletion transmission

5.3.12-1 Overview

- The first print item will be left.
- All the print message in the first print item will be deleted.
- The print format of the first print item will be kept.
- The transmission shall be made independently. Do NOT make this transmission with the other data such as the print format, the print specification or the print message.

5.3.12-2 Text

ESC2	Header 7AH

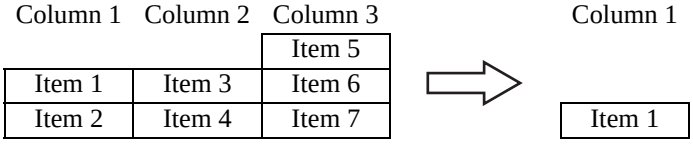
5.3.12-3 Example of print item deletion transmission

02H	1FH	7AH	03H
STX	ESC2	Header	ETX

Print item deletion

[Transmission results]

Only the first print item will be left and transmitted.



5.3.13 Count Reset Transmission

5.3.13-1 Overview

- Count Reset Transmission will change the count value to the preset value (reset value), and simultaneously reset the ongoing count figures to zero.
- Count Reset Transmission will not be executed unless the reset value is entered to “Reset” on the second screen of “Count conditions”.
  Input the reset value in “Reset” on the second screen of “Count conditions”, and then send Count Reset Transmission.
- The transmission shall be made independently. Do NOT make this transmission with the other data such as the print format, the print specification or the print message.
  If an attempt is made to send it together with the other data, a communication error (NAK response) occurs.

5.3.13-2 Text

ESC2	Header 2CH	Classification 41H

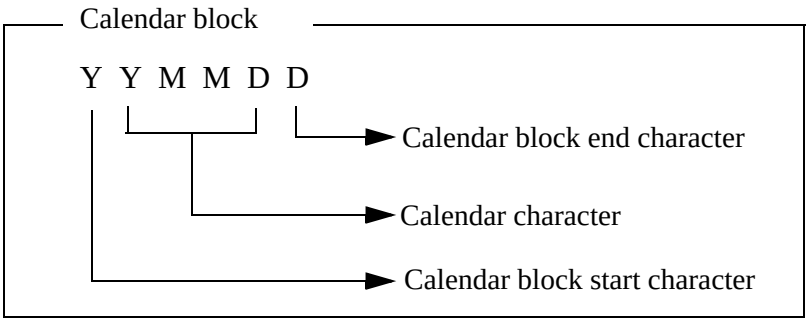
5.3.13-3 Example of Count Reset Transmission

02H	1FH	2CH	41H	03H
STX	ESC2	Header 2CH	Classification 41H	ETX

(7) Calendar character code

- Set "calendar block starting character"as the first character and set "calendar block ending charater" as the last character.

(Example)



	Yaer	Month	Day	Hour	Minute	Second	Total number of days	Weeks	Day of week
Calendar character	F250	F251	F252	F253	F254	F255	F256	F258	F259
Calendar block start chracter	F260	F261	F262	F263	F264	F265	F266	F268	F269
Calendar block end chracter	F270	F271	F272	F273	F274	F275	F276	F278	F279

Calendar character is 2-byte code only.

Specified number of digits for calendar characters

Calendar character	Specified number of digits
Yaer	1 to 4 digits
Month	1 to 3 digits
Day	1 to 3 digits
Hour	1 to 2 digits
Minute	1 to 2 digits
Second	1 to 2 digits
Total number of days	1 to 3 digits
Weeks	1 to 3 digits
Day of week	1 to 3 digits

Example of when performing printings transmission of calendar character
(Example 1) Example of when setting a calendar block to print item 1

02H	10H	31H	0FH	F2H	60H	F2H	50H	F2H	51H	F2H	71H	0EH	03H
STX	DLE	1	SI	Start chracter		Calendar		Calendar		End chracter		SO	ETX

Calendar block

[Transmission results]

Print item1 → YYMM

: Calendar block range

YM : Calendar character “Year, Month”

(Example 2) Example of when setting 2 calendar blocks to print item 1

02H	10H	31H	0FH	F2H	60H	F2H	50H	F2H	51H	F2H	51H	F2H	52H	F2H	72H	0EH
STX	DLE	1	SI	Start chracter		Calendar		Calendar		Calendar		Calendar		End chracter		SO

(Contd.)

Calendar block 1

41H	42H	43H	0FH	F2H	62H	F2H	52H	F2H	53H	F2H	73H	0EH	03H
A	B	C	SI	Start chracter		Calendar		Calendar		End chracter		SO	ETX

Calendar block 2

[Transmission results]

Print item1 → [YYMMDD] AND [DDHH]

[ ] : Calendar block range

YMDH : Calendar character “Year, Month, Day, Hour”

[Existing machine message] Existing machine message can also be used.

02H	10H	31H	0FH	F2H	50H	F2H	50H	F2H	51H	F2H	51H	0EH	03H
STX	DLE	1	SI	Calendar		Calendar		Calendar		Calendar		SO	ETX

Calendar block

[Transmission results]

Print item1 → [YYMM]

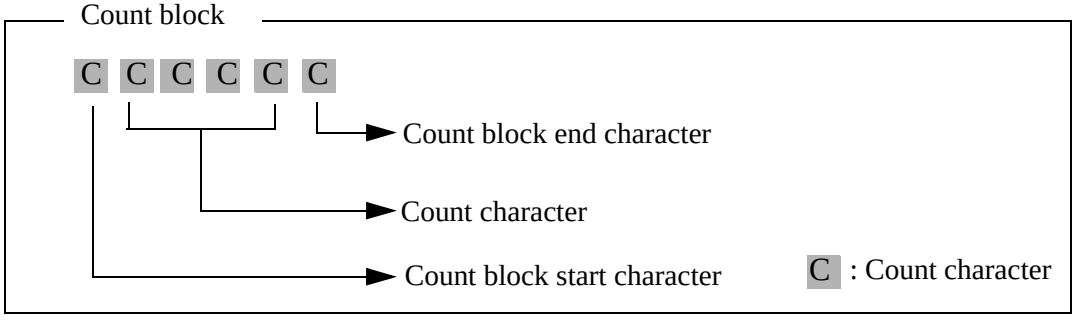
[ ] : Calendar block range

YM : Calendar character “Year, Month”

(8) Count character code

- Set "count block starting character"as the first character and set "count block ending charater" as the last character.

(Example)



Count character	Count block start character	Count block end character
F25A	F26A	F27A

Count character is 2-byte code only.

Example of when performing printings transmission of count character
(Example 1)Example of when setting a count block to print item 1

02H	10H	31H	0FH	F2H	6AH	F2H	5AH	F2H	5AH	F2H	7AH	0EH	03H
STX	DLE	1	SI	Start chracter		Count		Count		End chracter		SO	ETX

Count block

[Transmission results]

(Example 2)Example of when setting 2 count blocks to print item 1

02H	10H	31H	0FH	F2H	6AH	F2H	5AH	F2H	5AH	F2H	5AH	F2H	5AH	F2H	7AH	0EH
STX	DLE	1	SI	Start chracter		Count		Count		Count		Count		End chracter		SO

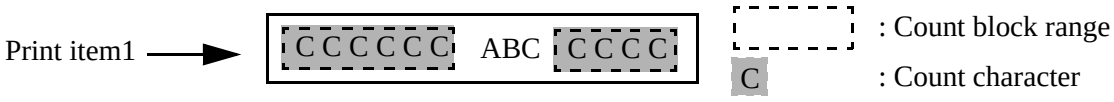
(Contd.)

Count block 1

41H	42H	43H	0FH	F2H	6AH	F2H	5AH	F2H	5AH	F2H	7AH	0EH	03H
A	B	C	SI	Start chracter		Count		Count		End chracter		SO	ETX

Count block 2

[Transmission results]



[Existing machine message] Existing machine message can also be used.

02H	10H	31H	0FH	F2H	5AH	F2H	5AH	F2H	5AH	F2H	5AH	0EH	03H
STX	DLE	1	SI	Count		Count		Count		Count		SO	ETX

Countr block

[Transmission results]

5.4.2 Header Table

ESC2	Header	Classification	

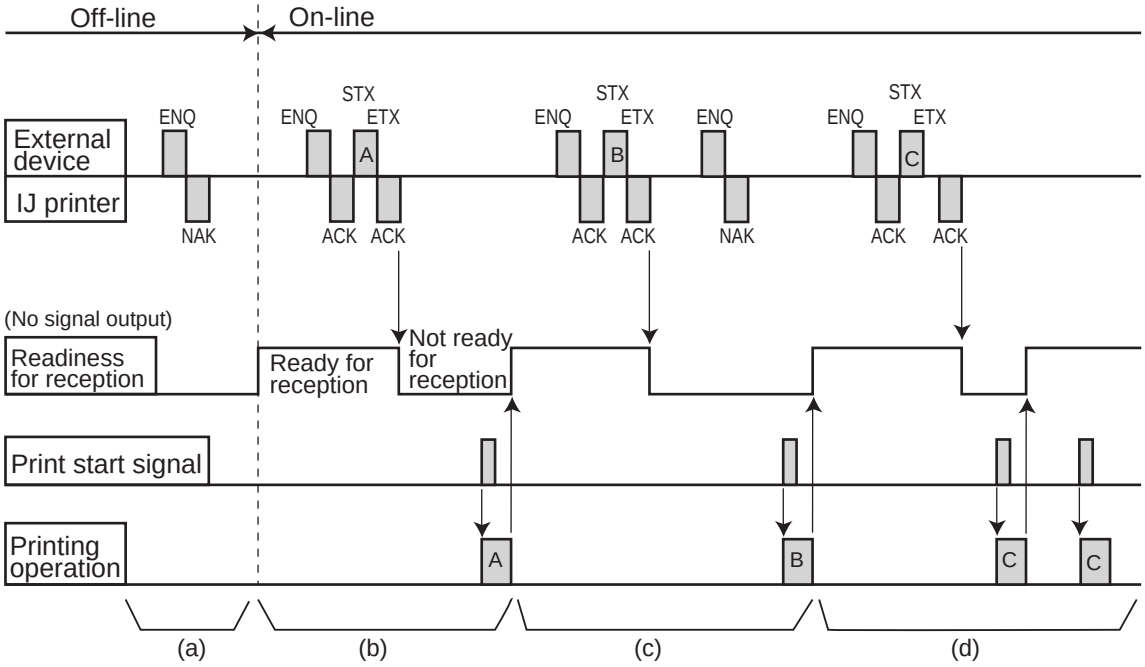
	Type	Header	Classification	Data count	Data section
Recall	Message number	20H	31H	4	0001 to 2000
Registration	Message number	21H	31H	4	0001 to 2000
	Message name		32H	1 to 12	Message name: Max 12 digits
Print format	Line count, print format uniformity	22H	31H	0	-
	Line count/Line spacing		32H	2	Line count : 1 to 6 Line spacing: 0 to 4 (5 or 6 lines : 0 to 2)
	Format setup change		33H	1	Format setup : 30H to 32H
	Character size/ inter character space	23H	31H	3	Character size : 30H to 3FH Inter character space : 00 to 28
	Increased width		32H	1	1 to 9
	Bar code		33H	1	30H to 47H
	Readable code		34H	1	0 to 2
	Prefix Code		35H	2	00 to 99
Free layout	Horizontal and Vertical coordinate	24H	31H	8	Item number : 1 to 100 Horizontal (X) coordinate: 0 to 31998 Vertical (Y) coordinate : 0 to 29
	Horizontal coordinate		32H	6	Item number : 1 to 100 Horizontal (X) coordinate : 0 to 31998
	Vertical coordinate		33H	3	Item number : 1 to 100 Vertical (Y) coordinate : 0 to 29
	Horizontal and Vertical move		41H	10	Item number : 1 to 100 Horizontal (X) direction : -31998 to +31998 Vertical (Y) direction : -29 to +29
	Horizontal move		42H	7	Item number : 1 to 100 Horizontal (X) direction : -31998 to +31998
	Vertical move		43H	4	Item number : 1 to 100 Vertical (Y) direction : -29 to +29
Print specifications	Character height	25H	31H	2	00 to 99
	Ink drop use percentage		32H	2	01 to 16
	High-speed printing		33H	1	0 to 3
	Character width		34H	4	0000 to 3999
	Character orientation		35H	1	0 to 3
	Print start delay		36H	4	0000 to 9999
	Print start delay (reverse)		37H	4	0000 to 9999
	Product speed matching		38H	1	0 to 2
	Pulse rate division Factor		39H	3	001 to 999
	Repeat count		3DH	4	0000 to 9999
	Repeat intervals		3EH	5	00000 to 99999
	Target sensor timer		3FH	3	000 to 999
	Target sensor filter		40H	1	1 to 2
	Target sensor filter value		41H	4	0000 to 9999
	Ink drop charge rule		42H	1	Charge rule : 31H to 33H

	Type	Header	Classification	Data count	Data section
Calendar condition	Offset (Year / month / day / hour / minute)	28H	32H	6	Calendar block : 1 to 8 Type : 0 to 4 Offset : Yaer 0000 to 0099 Month 0000 to 0099 Day 0000 to 1999 Hour -023 to 0099 Minute -059 to 0099
	Zero suppress usage (Year / month / day / hour / minute / week / Day of week)		34H	3	Calendar block : 1 to 8 Type : 0 to 6 Mode : 0 to 2
Count condition	Initial value	2CH	31H	Variable	Count block : 1 to 8 Initial value : max 20 digits
	Range 1		32H	Variable	Count block : 1 to 8 Range 1 : max 20 digits
	Range 2		33H	Variable	Count block : 1 to 8 Range 2 : max 20 digits
	Update (in progress)		34H	7	Count block : 1 to 8 Update (in progress) : 000000 to 999998
	Update (unit)		35H	7	Count block : 1 to 8 Update (unit) : 000001 to 999999
	Increment		36H	3	Count block : 1 to 8 Increment : 01 to 99
	Direction		37H	2	Count block : 1 to 8 Direction : 0 to 1
	Jump from		38H	Variable	Count block : 1 to 8 Jump from : max 20 digits
	Jump to		39H	Variable	Count block : 1 to 8 Jump to : max 20 digits
	Reset		3AH	Variable	Count block : 1 to 8 Reset : max 20 digits
	Reset signal		3BH	2	Count block : 1 to 8 Reset signal : 0 to 1
	External signal count		3EH	2	Count block : 1 to 8 External count : 0 to 1
Date/time setup	Current time	2EH	31H	14	Yaer, Month, Day, Hour, Minute, Second (14 digits)
	Calendar time control		32H	1	1 to 2
	Calendar time		33H	14	Yaer, Month, Day, Hour, Minute, Second (14 digits)
	Clock system		34H	1	1 to 2
User pattern character transmission	Character size fixed pattern	32H	30H to 3FH	-	Character code + pattern data
Other	Count Reset	2CH	41H	-	
	Item No. specification	70H	Item No.	-	Used together with print format message
	Remote operation	72H	30H to 34H	-	
	Online	73H	-	-	No STX/ETX
	Offline	74H	-	-	No STX/EXT
	Current time inquiry	75H	-	-	No STX/ETX; Inquiry
	Communication buffer Claer buffer	76H	-	-	
	Communication buffer Reset printing	77H	-	-	
	Print item deletion	7AH	-	-	

5.5 Communication Timing

5.5.1 Signal Timing

(1) In overwrite-protected mode



(a) When the IJ printer is off-line

- The NAK code is transmitted in response to an ENQ code reception from the outside.

(b) When the IJ printer is on-line

①When transmitting printing only

- Transmission data is received from the external device. When the received data is not in error, the ACK code is transmitted and the "not ready for reception" state prevails.
- To switch from the "not ready for reception" state to the "ready for reception" state, perform one of the following procedures.
  1) Perform a printing operation once.
  2) Transmit the DC2 (retransmission) code to the IJ printer.
  3) Press the Comm On/Off buttun to enter the off-line mode, and then switch back to the on-line mode.
- If the data transmitted from the external device is in error, the NAK code is transmitted after receipt of the ETX code.
  Since the "ready for reception" state is maintained in this instance, retransmit the data beginning.

②When transmitting print conditions, user pattern characters, and print data recall

- When the data received from the external device is not in error, the ACK code is transmitted.
  In this instance, the "ready for reception" state is maintained.

③When transmitting printing, print conditions, user pattern characters, and print data recall

- When transmitting printing, print conditions, user pattern characters, and print data recall, ensure that the print conditions, user pattern characters, and print data recall are transmitted prior to the printing. If the printing is transmitted earlier than the other data, the "not ready for reception" state prevails. Therefore, the subsequent transmission of the print conditions, user registration characters, and print data recall causes a communication error.

(c) When the "not ready for reception" state prevails after transmission data reception from the external device

- The NAK code is transmitted in response to the ENQ code reception from the outside.

(d) Transmission data received from the external device

- Error-free transmission data is stored in the IJ printer. The same contents are printed until different transmission data is transmitted to the IJ printer.
- If the data transmitted from the external device is in error, the IJ printer printings remain unchanged. In such an instance, retransmit the data beginning as explained in (b).
  The retransmission count setup must be determined from the device side.

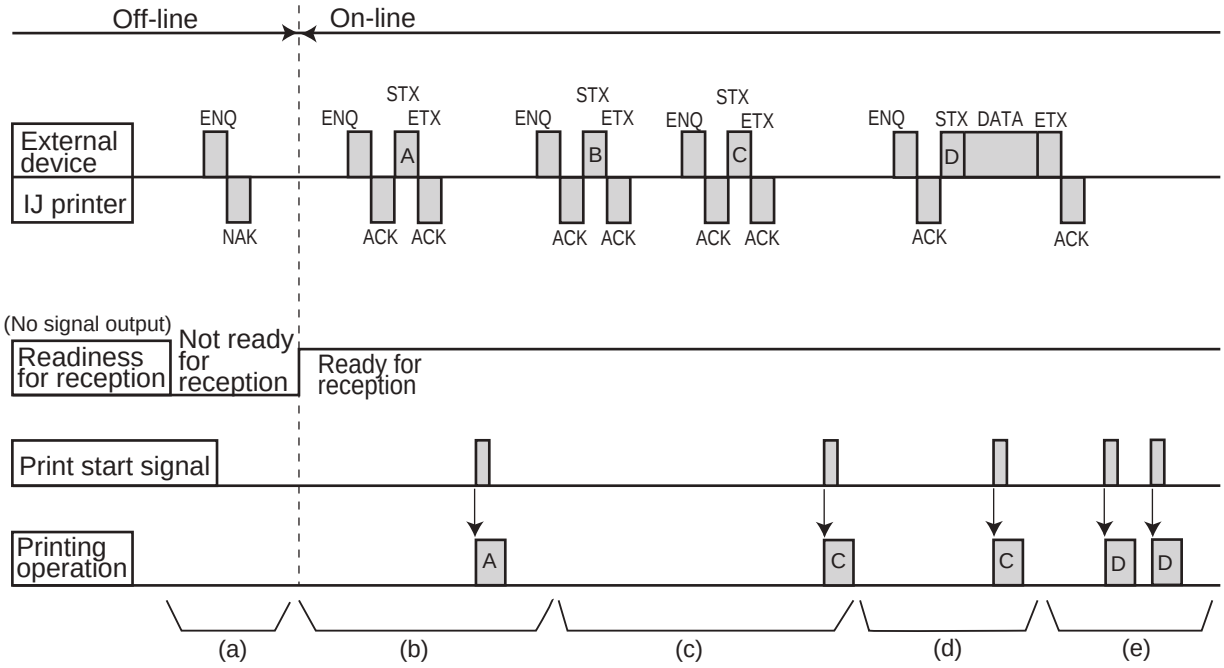
(e) When a data transmission is aborted (the transmission of up to the ETX code is not completed)

- The IJ printer printings remain unchanged. For data retransmission, perform either of the following procedures.

  ①Transmit the DC2 (retransmission) code to the IJ printer.

  ②Press the Comm On/Off buttun to enter the off-line mode, and then switch back to the on-line mode.

(2) In overwrite-enabled mode



(a) When the IJ printer is off-line

- The NAK code is transmitted in response to an ENQ code reception from the outside..

(b) When the IJ printer is on-line

- Transmission data is received from the external device. When it contains no error, the ACK code is transmitted. In this instance, the "ready for reception" state is maintained.
- If the data transmitted from the external device is in error, the NAK code is transmitted after receipt of the ETX code.

  In this instance, retransmit the data beginning.

(c) Data retransmission

- Transmission data is received from the external device, and subsequent transmission data is accepted. In this case, the received data is accepted even if the DC2 (retransmission) code is not attached.

(d) Printing during reception

- While data is being received from the external device, the previously printed contents are printed.

(e) Transmission data received from the external device

- Error-free transmission data is stored in the IJ printer. The same contents are printed until different transmission data is transmitted to the IJ printer.

(f) When a data transmission is aborted (the transmission of up to the ETX code is not completed)

- The IJ printer printings remain unchanged. For data retransmission, perform either of the following procedures.

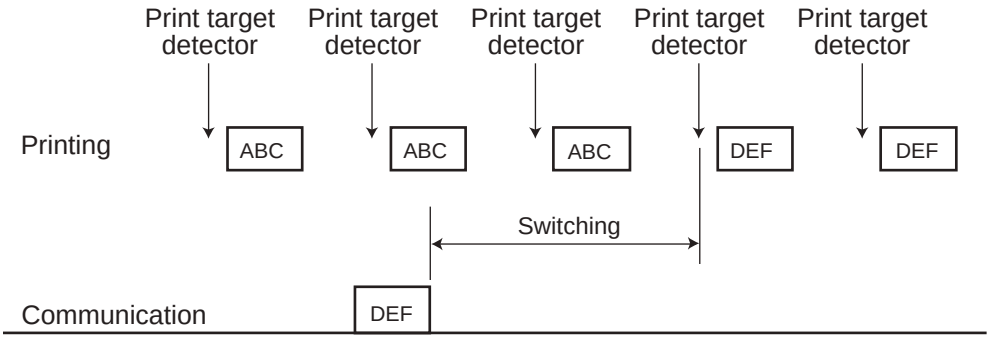
  ① Transmit the DC2 (retransmission) code to the IJ printer.

  ② Press the Comm On/Off buttun to enter the off-line mode, and then switch back to the on-line mode.

(3) Switching print data with no occurrence of fault "Print data changeover in progress M"

The following shows the method of use with no occurrence of "Print data changeover in progress M" when switching the print contents during transmission:

(a) Print timing schematic diagram



① The IJ printer receives contents "DEF" in communication while printing contents "ABC".
② The IJ printer switches printing to the received contents: It will print the previous data during switching.

Switching time

No.	Transmission type	Conditions	Maximum time (ms)
1	Print description	-	100
2	Print data recall	When the character height, character width, character orientation, ink drop use percentage, or print format changes before or after recall.	500
		When the character height, character width, character orientation, ink drop use percentage, or print format does not change before or after recall.	100
3	Print conditions	-	500

- The fewer characters, the shorter the time.
- The fewer different time of the print format, the shorter the time.

(b) Restrictions

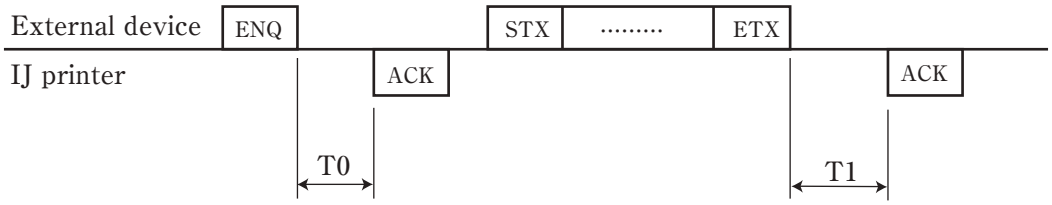
Perform communications only under the conditions shown below. If even one of these conditions is not met, any input to print target detector while the communicated contents are being printed will cause fault "Print data changeover in progress M" to occur.

Conditions that the print target detector input will not cause an abnormality

No.	Conditions
1	Make sure that none of the following software options are provided: Barcode Reader Connection (SOP-08)
2	Set the Print data changeover on User environment setup screen to "Disable".
3	Set the Communication mode on Communication environment setup screen to "overwrite-enabled".
4	Set the Buffer function on Communication environment setup screen to "Disable".
5	Transmit print contents independently, and do not package print content transmission with print condition transmission.
6	Transmit to print items with no count block.
7	Do not transmit the count characters.

5.5.2 Response Time

5.5.2-1 Time interval (T1) between external device communication and IJ printer response



Baud rate (bps)	T0 Maximum time (ms)
150 to 1200	5
2400 to 115200	1

(1) When Print format is set to "Individual" or "Overall"

Time interval T1 when Print format is set to "Individual" or "Overall"

No.	Transmission type	Conditions	T1 Maximum time (ms)		Remarks
			Within 24 items	25 items or more	
1	Print description	The print message transfer ACK condition is t=fixed.	10	45	*1
		The print message transfer ACK condition is t=async.	$\frac{M}{10}$ +25 (M: Number of communication characters)	$\frac{M}{10}$ +75 (M: Number of communication characters)	*1 *2
2	Print data recall	-	5	30	
3	Print data registration	-	1800	1800	
4	Print conditions	Print specifications	10	10	
5		Print format	20	50	
6		Line count / print format uniformity	20	50	
7		Format setup change	100	100	
	Free layout	-	-	-	
8	User pattern character	-	M+10 (M: Number of communication patterns)	M+10 (M: Number of communication patterns)	
9	Date/time setup	-	5	5	*3
10	Remote operation	Error reset	15	15	
		Operation start, operation stop, deflection voltage control	20	50	
11	Print item deletion	-	100	100	
12	Number of the print items specified	-	100	100	
13	Count Reset	-	5	30	

● When the Print format is set to "Individual" or "Overall" and Free layout transmission is made, a communication error will occur.

*1 For "t=fixed" and "t=async.", see Section 5.2.1, "Setting Communication Environment ".

*2 When there is a data matrix , QR code and GS1 DataBar setting, the time is as follows:

*3 If time changes just before 3ACK transmission, ACK transmission may be delayed about 20 ms.

Time T1 when there is a data matrix , QR code and GS1 DataBar setting

Barcode type	Character size	T1 Maximum time (ms)	
		Within 24 items	25 items or more
Data matrix	5×8	8×N+20	100
	12×16, 18×24	15×N+40	150
QR code	QR (21×21)	200×N	200×N
	QR (25×25)	300×N	300×N
	QR (29×29)	400×N	400×N
GS1 DataBar		15× N+30	15×N+30

(N : Number of Barcode)

(2) When Print format is set to "Free layout"

Time interval T1 when Print format is set to "Free layout"

No.	Transmission type	Conditions	T1 Maximum time (ms)		Remarks
			Within 24 items	25 items or more	
1	Print description	The print message transfer ACK condition is t=fixed.	60	120	*4
		The print message transfer ACK condition is t=async.	$\frac{M}{10}$ +110 (M: Number of communication characters)	$\frac{M}{10}$ +270 (M: Number of communication characters)	*4 *5
2	Print data recall	-	30	30	
3	Print data registration	-	1800	1800	
4	Print conditions	Print specifications	20	20	
5		Print format	20	50	
		Line count / print format uniformity	-	-	
6		Format setup change	100	100	
7	Free layout	-	20	20	
8	User pattern character	-	M+10 (M: Number of communication patterns)	M+10 (M: Number of communication patterns)	
9	Date/time setup	-	5	5	*6
10	Remote operation	Error reset	15	15	
		Operation start, operation stop, deflection voltage control	100	250	
11	Print item deletion	-	100	100	
12	Number of the print items specified	-	100	100	
13	Count Reset	-	30	30	

● When the Print format is set to "Free layout" and Print condition transmission of "Line count/Print format uniformity" is made, a communication error will occur.

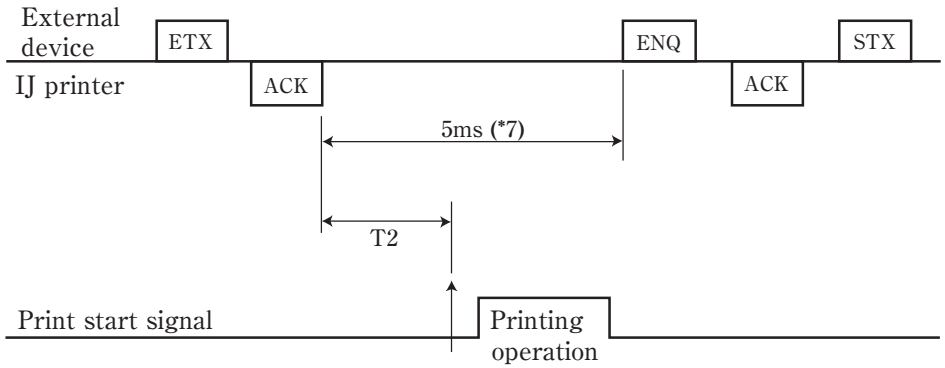
*4 For "t=fixed" and "t=async.", see Section 5.2.1, "Setting Communication Environment ".
*5 When there is a data matrix , QR code and GS1 DataBar setting, the time is as follows:
*6 If time changes just before 3ACK transmission, ACK transmission may be delayed about 20 ms.

Time T1 when there is a data matrix , QR code and GS1 DataBar setting

Barcode type	Character size	T1 Maximum time (ms)	
		Within 24 items	25 items or more
Data matrix	5×8	58	250
	12×16, 18×24	85	600
QR code	QR (21×21)	300	600
	QR (25×25)	400	600
	QR (29×29)	500	700
GS1 DataBar		60	250

(N : Number of Barcode)

5.5.2-2 Time interval (T2) between IJ printer response and printing start



(1)When Print format is set to "Individual" or "Overall"

Time interval T2 when Print format is set to "Individual" or "Overall"

No.	Transmission type	Conditions	T2 Minimum time (ms)		Remarks
			Within 24 items	25 items or more	
1	Print description	The print message transfer ACK condition is t=fixed.	$\frac{M}{10}$ +15 (M: Number of communication characters)	$\frac{M}{10}$ +30 (M: Number of communication characters)	*8 *11
		The print message transfer ACK condition is t=async.	0	0	
2	Print data recall	When the character height, character width, character orientation, ink drop use percentage, or print format changes before or after recall	400	400	*9
		When the character height, character width, character orientation, ink drop use percentage, or print format does not change before or after recall	40	40	*10
3	Print data registration	-	30	30	
4	Print conditions	Print specifications	400	400	*9
5		Print format	400	400	*9
6		Line count / print format uniformity	200	200	*10
7		Format setup change	200	200	
	Free layout	-	-	-	
8	User pattern character	-	25	25	
9	Date/time setup	-	$\frac{M}{10}$ +15 (M: Number of printing characters)	$\frac{M}{10}$ +30 (M: Number of printing characters)	*8
10	Print item deletion	-	200	200	
11	Number of the print items specified	-	400	400	
12	Count Reset	-	40	40	

- The IJ printer executes an internal process to make printing preparations in accordance with the received print data. Do not enter the print start signal during internal process execution.
- In the overwrite-protected mode, initiate the next communication after completion of printing.
- In the overwrite-enabled mode, the next communication can be transmitted during printing, but the ACK/NAK response does not return until the ongoing printing operation is complete. (t=async.)
- When a print start signal is input with shorter timing than T2, the fault "Print data changeover in progress M" occurs.
- The more different items of the print format, the longer the time until ready to print.
- When the Print format is set to "Individual" or "Overall" and Free layout transmission is made, a communication error will occur.

*7 If the communication time interval is not sufficiently secured, it may not operate normally.
*8 When there is a data matrix and QR code setting, the time is as follows:
*9 When there is a QR code setting, T2 Minimum time is 400xN (ms) (N : Number of QR codes).
*10 When there is a QR code setting, the time is as follows:
*11 When there is a GS1 DataBar setting, the time is as follows:

Time T2 when there is a data matrix, QR code and GS1 DataBar setting

Barcode type	Character size	T2 Minimum time (ms)	
		Within 24 items	25 items or more
Data matrix	5×8	8×N+20	100
	12×16, 18×24	15×N+40	150
QR code	QR (21×21)	200×N	200×N
	QR (25×25)	300×N	300×N
	QR (29×29)	400×N	400×N
GS1 DataBar		15×N+30	15×N+30

(N : Number of Barcode)

(2) When Print format is set to "Free layout"

Time interval T2 when Print format is set to "Free layout"

No.	Transmission type	Conditions	T2 Minimum time (ms)		Remarks
			Within 24 items	25 items or more	
1	Print description	The print message transfer ACK condition is t=fixed.	$\frac{M}{10}$ +50 (M: Number of communication characters)	$\frac{M}{10}$ +150 (M: Number of communication characters)	*12
		The print message transfer ACK condition is t=async.	0	0	
2	Print data recall	When the character height, character width, character orientation, ink drop use percentage, or print format changes before or after recall	400	400	
		When the character height, character width, character orientation, ink drop use percentage, or print format does not change before or after recall	40	250	*12
3	Print data registration	-	150	250	
4	Print conditions	Print specifications	400	400	
5		Print format	400	400	
		Line count / print format uniformity	-	-	
6		Format setup change	200	250	
7	Free layout	-	400	400	
8	User pattern character	-	25	25	
9	Date/time setup	-	$\frac{M}{10}$ +50 (M: Number of printing characters)	$\frac{M}{10}$ +150 (M: Number of printing characters)	*12
10	Print item deletion	-	200	200	
11	Number of the print items specified	-	400	400	
12	Count Reset	-	40	250	

- The IJ printer executes an internal process to make printing preparations in accordance with the received print data. Do not enter the print start signal during internal process execution.
- In the overwrite-protected mode, initiate the next communication after completion of printing.
- In the overwrite-enabled mode, the next communication can be transmitted during printing, but the ACK/NAK response does not return until the ongoing printing operation is complete. (t=async.)
- When a print start signal is input with shorter timing than T2, the fault "Print data changeover in progress M" occurs.
- The more different items of the print format, the longer the time until ready to print.
- When the Print format is set to "Free layout" and Print condition transmission of "Line count/Print format uniformity" is made, a communication error will occur.

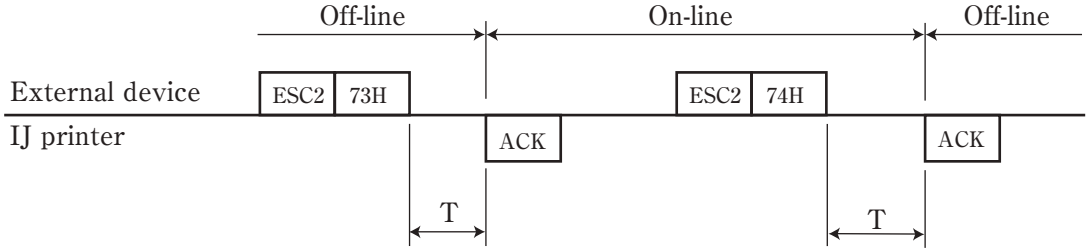
*7 If the communication time interval is not sufficiently secured, it may not operate normally.
*12 When there is a data matrix, QR code and GS1 DataBar setting, the time is as follows:

Time T2 when there is a data matrix, QR code and GS1 DataBar setting

Barcode type	Character size	T2 Minimum time (ms)	
		Within 24 items	25 items or more
Data matrix	5×8	58	250
	12×16, 18×24	85	600
QR code	QR (21×21)	300	600
	QR (25×25)	400	600
	QR (29×29)	500	700
GS1 DataBar		60	250

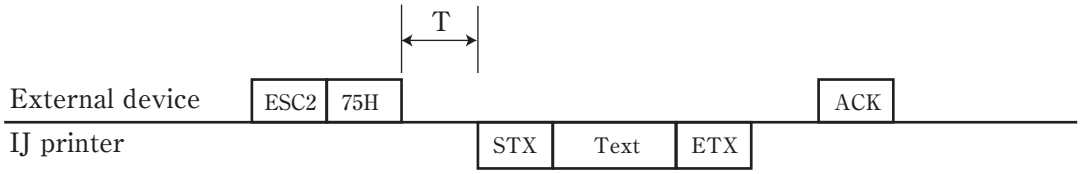
(N : Number of Barcode)

5.5.2-3 On-line/Off-line Transmission



T Maximum time (ms)
50

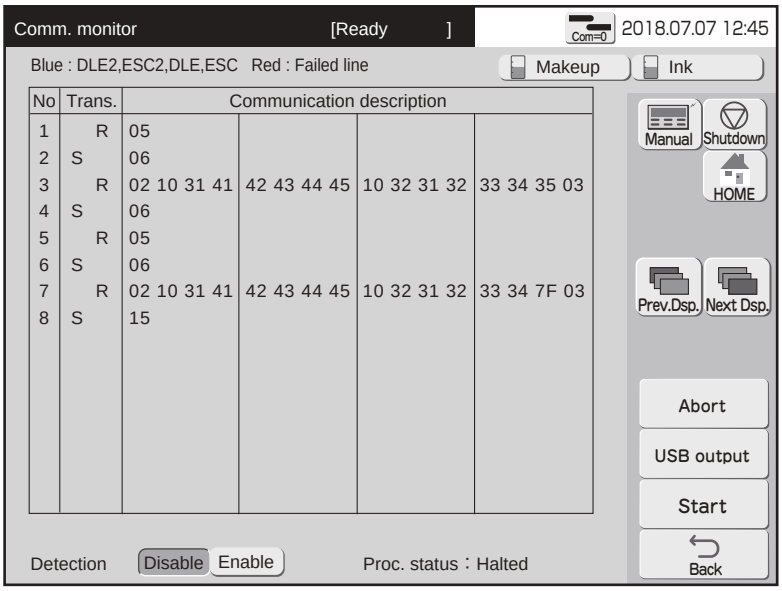
5.5.2-4 Current time output Transmission



Baud rate (bps)	T Maximum time (ms)
150 to 1200	15
2400 to 115200	5

5.6 Communication Monitor Function

- The contents of serial communications between the external device and IJ printer are displayed.
- Up to 3,000 bytes of data can be acquired at a time.
- When you press the Start button, the system erases monitored data and acquires new data.
- When you press the USB output button, the communication description which is displayed on screen can be output to USB memory.



(1) Screen display

Item	Description
Trans.	External device → IJ printer : R (Receive) IJ printer → External device : S (Send)
Communication description	Sended/received data are displayed in hexadecimal notation. Sixteen bytes of data are displayed per line.
Proc. status	The current status is indicated (monitoring or interrupted).

(2) Input keys

Item	Description
Start	Starts exercising the line monitor function. Erases the monitored information.
Abort	Aborts the execution of the line monitor function.
Error detection	This switches over whether the system is to detect error-ridden locations. ● Disable: The system will not detect error-ridden locations. The system will memorize up to bytes 3,000 of data transmitted and received. ● Enable: The system will display error-ridden locations in red. The system will memorize up to transmitted and received data up to the location where an error was detected.
Previous list/ Next list	Used to switch to another screen when the amount of information to be displayed is too large to fit on a single screen.
USB output	The Communication description which is displayed on screen can be output to USB memory.
Back	Returns you to the maintenance menu.

(3) Explanation of USB output function.

- When you press the USB output button, the Communication description which is displayed on screen can be output to a USB memory.
- The Communication description which is displayed on screen can be output to a USB memory. when "Comm. monitor"screen is displayed AND Comm. monitor is in "Halted" status.
- The Communication description is output in a Text file format.

- Explanation of file composition and file name.
  - ・UXCLOG holder is automatically created right below the USB memory.
  - ・The Communication description is output in the name of LOG_Serial number_YYMMDDhhmmss.txt right below the UXCLOG holder.

■ USB Memory

■ UXCLOG ¥ LOG_Serial number_YYMMDDhhmmss.txt

YYMMDDhhmmss stands for Year, Month, Date, Hour, Minute and Second.

- Explanation of content of output.
  - ・A Target port is output in the lead, such as "Standard" for the standard port and "Secondary" for the expansion port.
  - ・Compositions of the Text file are output in the order of No., Trans, and Communication description. (No.: 4 digit number; Trans.: "S" for sending and "R" for receiving.)
  - ・An asterisk (*) is output in front of the error part when an error was detected.

(Example of output text file)

```
Standard
0001,R,05,
0002,S,06,
0003,R,02,10,31,41,42,43,44,45,10,32,31,32,33,34,35,03,
0004,S,06,
0005,R,05,
0006,S,06,
0007,R,02,10,31,41,42,43,44,45,10,32,31,32,33,34, *7F, 03,
0008,S,15,
```

A Target port is output.

It is an error part.

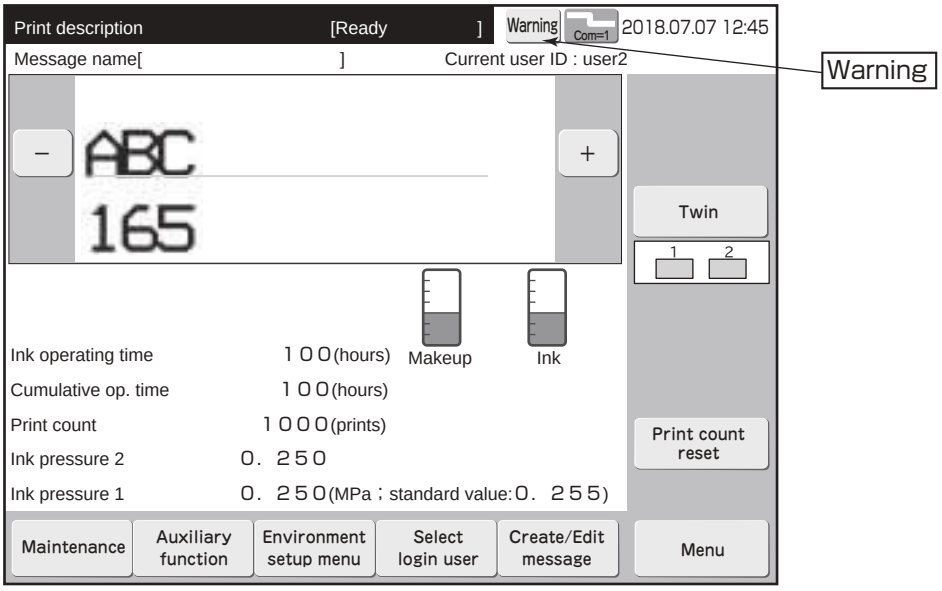
Trans. is output with "S" for sending and "R" for receiving.

No. is output in 4 digit number.

- Explanation of content of notes.
  - ・The data is NOT output by pressing the USB output button if the Communication description does NOT Exist.
  - ・The data is NOT output by pressing the USB output button when the Line monitor is in operation.
  - ・<USB Memory Error> is displayed when the USB memory is NOT installed on the IJP.
  - ・<USB Memory Error> is displayed when the USB memory runs out of its capacity.
  - ・The data is overwritten if the same file name already exists in the USB memory.
  - ・Do NOT remove the USB memory when the USB data output is in process.

5.7 Warning Messages

- If any communication is in error, the associated warning message appears below the status display area.
- Note the message to confirm the error and then take remedial action as appropriate for the indicated error code.



Error code table

Error code	Name	Description	Check
001	Transmissioncode error	● The transmitted code was not defined for communication use. ● The transmitted message had an illegal structure.	Check the baud rate and transmission code.
002	Print specifications code error	The print specifications data value was illegal.	Check the print specifications communication text.
003	Print character code error	The maximum value was exceeded by the number of characters for printings that could be received as one item.	Check the printings communication text.
004	Item number error	The item number code value was illegal.	Check the printings communication text.
005	Header error	The header value was illegal.	Check the header.
006	Ready-for-reception error	● An attempt was made to establish communication while the "not ready for reception" state prevailed. ● "Apply" key and message window were both displayed. ● "Off-line fixed" has been set in Communication environment. ● Communication monitor screen was displayed. ● Communication was conducted during the stop or shutdown process.	Check the transmission timing.
008	Print specifications code error	The maximum value was exceeded by the print specifications data.	Check the print specifications communication text.
009	ETX code error	The ETX code position was illegal.	Check the transmission procedure and ETX code.
010	DLE code error	The DLE code position was illegal.	Check the transmission procedure and DLE code.
011	STX code error	The STX code position was illegal.	Check the transmission procedure and STX code.
012	ENQ code error	The ENQ code position was illegal.	Check the transmission procedure and ENQ code.
013	ESC code error (ESC, ESC2)	The ESC code position was illegal.	Check the transmission procedure and ESC code.

Error code	Name	Description	Check
014	Parity error	The parity error occurred.	Check the baud rate and data format.
015	Print format code error	The print format data value was illegal.	Check the print format transmission text section.
016	Overrun error	The overrun error occurred.	Check the baud rate and data format.
017	Framing error	The framing error occurred.	Check the baud rate and data format.
019	2-byte code error	● An illegal 2-byte code (2 bytes per character) was transmitted. ● Only one byte of 2-byte code was transmitted.	Check the 2-byte code transmission text.
020	Print data code error	● The print data registration number was illegal. ● An unregistered number was encountered.	Check the print data recall / transmission code.
021	SI/SO code error	The SI (shift in) or SO (shift out) code position was illegal.	Check the printings communication text.
022	User pattern character size/ character code error	The character size or character code values were illegal.	Check the user pattern communication text.
023	High-speed printing setup error	● When necessary conditions for high speed printing were not satisfied, NM or QM mode was transmitted. ● When High speed printing NM or QM mode was set, a setting which did not satisfy necessary conditions for high speed printing was transmitted. [High speed character model] ● When necessary conditions for high speed printing were not satisfied, M1-M7 mode was transmitted. ● When High speed printing M1-M7 mode was set, a setting which did not satisfy necessary conditions for high speed printing was transmitted.	Check the print specifications communication text.
024	Calendar/count conditions error	● Transmitted to block where calendar/count characters were not present. ● Set value was outside specifications. ● Zero suppression transmission was performed to print item for which barcode had been set.	Check calendar/count condition communication text.
026	Bar code setup error	● A character undefined for bar code use was found in the printings. ● The number for ITF did not consist of an even number of numerals beginning with an odd digit position. ● The input data for EAN-13 was not numeric. ● The number of DM, QR code, Micro QR code or GS1 DataBar is 2 or more when Format setup is Free Layout.	Check the printings print format communication text.
027	Printings error	● A dedicated character or katakana was transmitted in a character size which cannot be inputted. ● The three characters of a dedicated character string were not properly grouped. ● A count value is out of a count range.	Check the printings communication text

Error code	Name	Description	Check
031	Create messages error	● While "Create messages" function was operating, on-line transmission was performed. ● On-line transmission was performed when print data which was controlled separately from data created and registered by print description screen, was present.	Check the timing of on-line transmission.
032	Setting conditions error	● Setting value does not satisfy the required conditions.	Communication text re-check.
033	Setting range error	● Setting value is out of stipulated range.	Communication text re-check.
036	Free layout transmission-Communication error	● Free layout transmission was made when Format setup is "Individual" or "Overall".	Check the Communication text.
037	Free layout transmission-Setup error	● The specified item number does not exist. ● Character other than "+" or "-" is input to Horizontal sign or Vertical sign. ● Set value of the Coordinate or Horizontal/Vertical dot count is invalid.	Check the free layout communication text.
038	Free layout transmission-Reflection error	When the item was moved by Free layout transmission, the item after move went to the area other than Free layout area.	Check the free layout communication text.
039	Free layout transmission-Format setup reflection error	● When the Print content was changed by Print content transmission, the print item after move went to the area other than Free layout area. ● When Character size, Inter-character spacing, Bold, or Barcode of the item is changed by Print condition transmission, the print item after move went to the area other than Free layout area.	Check the Printings text and Print format communication text.
040	Free layout transmission-Format setup communication error	When the Format setup is set to "Free layout", Print condition transmission of "Line count/Print format uniformity", "Line count, Line spacing", "High speed printing" or "Ink drop charge rule" was made.	Check the Communication text.

5.8 Precautions

5.8.1 Notes on Product speed matching Feature Use

(1) If the product speed matching signal cannot be entered during printing, the printing state continues to prevail so that communication may not be established (no response can be made). If such a situation is encountered, perform procedure ① or ② below.
① Enter the standby state and then initiate the communication.
② Issue the print abort code "DC3". After the IJ printer returns an "ACK" response,

(2) Number of pulses necessary for a rotary encoder from print signal detection until the start of printing.
Number of pulses necessary = Number of printing preparation pulses (①) + Print start delay.
① Number of printing preparation pulses = A / 1 scan time

Use an integer by rounding up the fractional portion.

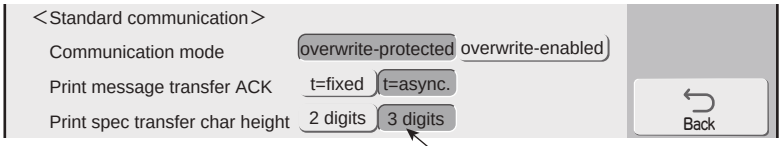
Nozzle diameter	Value of A
65µm	5.5

$$1 \text{ scan time} = \frac{(\text{Vertical dot count} + \text{character width setting}) \times \text{Ink drop use percentage}}{\text{Excitation frequency (kHz)}} \text{ (ms)}$$

When “Speed compensation” is enabled, print start is delayed for 30 scans.

5.8.2 Notes on Print Condition Transmission

(1) The number of digits for character height data is 2 by default. However, the preceding IJ printer models GX and HX use 3 digits by default for print condition transmission (optional function). If the new model of the IJ printer is used as a replacement for such a predecessor, open the following screen from the communication environment setup screen and change the number of digits for character height data to 3.



Data digts of the character height

● Character height (when the 3-digit data format is chosen)

ESC	Header 30H	100s place	10s place	Units place

Character height (000 to 099)

Note: If the value is within the range from 100 to 999, an error occurs.

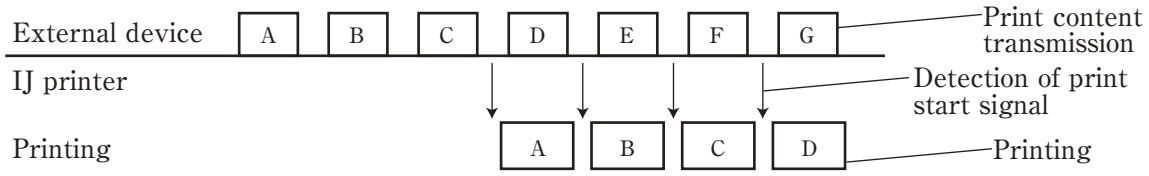
5.9 Communication Buffer

5.9.1 Overview

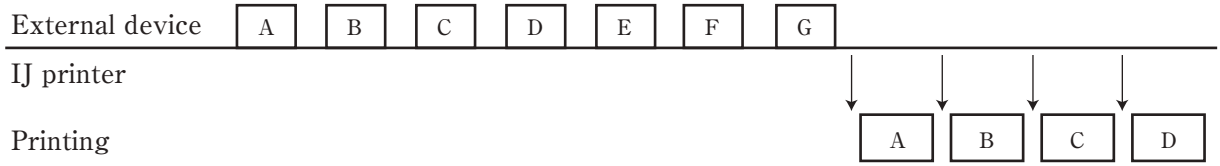
(1) Print content transmission

- The print contents received through print content transmission will not be reflected in printing immediately, but will be temporarily held in buffer.
- The print contents are fetched from the buffer one by one for each printing, and reflected in subsequent printing.

[Example of transmitting print contents constantly during printing]



[Example of transmitting collective print contents at the beginning]



5.9.2 Description of Functions

(1) Application procedure

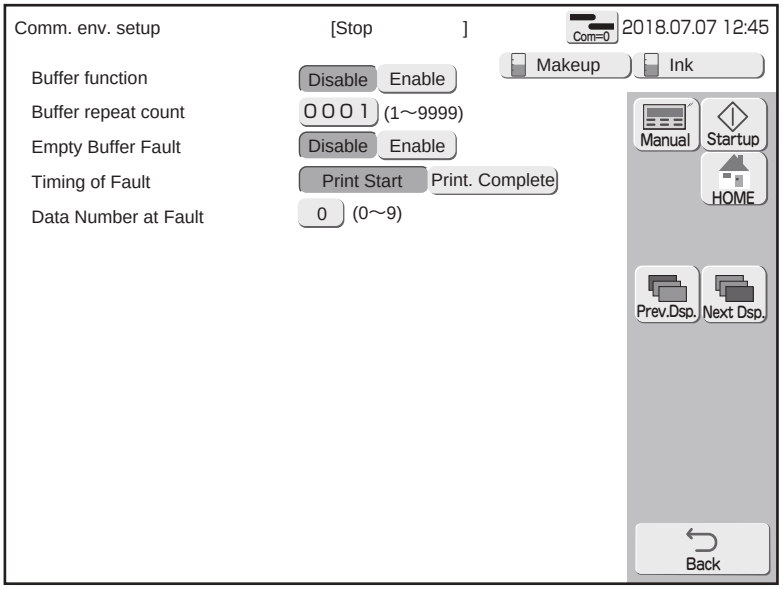
● Prepare the following in advance:

Preliminary Preparation Items

No.	Procedure
1	Specify "overwrite-enabled" for communication mode on the communication environment screen. In addition, specify "t=fixed" for print message transfer ACK.
2	Set the buffer function on the second page of the communication environment setting screen to "enable."
3	Confirm the setting values for "Buffer repeat count", "Empty Buffer Fault", "Timing of Fault" and "Data number at Fault" on the second page of the communication environment setting screen.

Setting items of communication environment setting screen

Setting items	Description	Initial values
Buffer function	Selects enable/disable for buffer function.	Disable
Buffer repeat count	Sets how many times printing is to be executed before switching the printing contents.	1
Empty Buffer Fault	Selects whether or not communication buffer errors are to be generated. The conditions for occurrence are set by "Timing of Fault" and "Data number at Fault".	Disable
Timing of Fault	Selects timing by which communication buffer errors are to be generated.	Print Start
Data number at Fault	Sets the number of print data items by which a communication buffer error is to be generated.	0



● The function (application) will be valid only when the printer is online and in the ready status. Offline will set to standard-mode printing.

● The following shows the application procedure :

Application Procedure

No.	Procedure
1	Switch to online.
2	Set to the ready status.
3	Transmit print contents accordingly so that print contents sent at least N times remain in the buffer. (N: Data number at Fault)
4	Print.
5	Subsequently repeat steps 3 and 4 above.

Procedure No.1 and 2 can be in random order

(2) Buffer

- The print content receive buffer has a queue structure (beginning with oldest data, in sequence).

- Print content is fetched from the buffer for each printing.
- Once the Ready status is set, the first print content will be fetched from the buffer.

- The buffer capacity is 100 print items (total 1000 chracters). An alarm will be raised if it exceeded its capacity.

- The buffer will be cleared when offline is set.
- The buffer is always empty immediately after power is turned on.
- The buffer will not be cleared even if the status is changed to that other than the print enable status.

- When offline is switched to online, the contents in buffer will be cleared, and then the standard-mode print operation will continue. In this case, print contents of at the time it was changed offline will be printed, then subsequently same print contents will be printed. However, this option feature will be effective again by reconfiguring the setting according to the procedure described in the previous page.

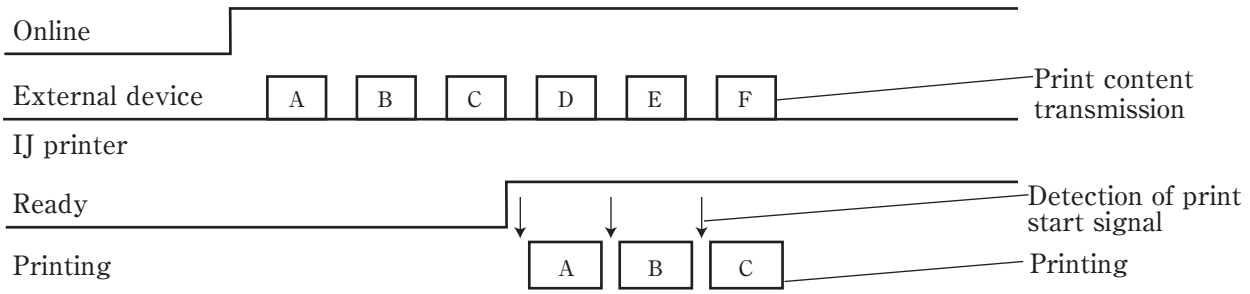
- If printing is interrupted because of some fault (print overlap fault, etc.), printing will restart from the subsequent data in buffer.

(3) Character types available

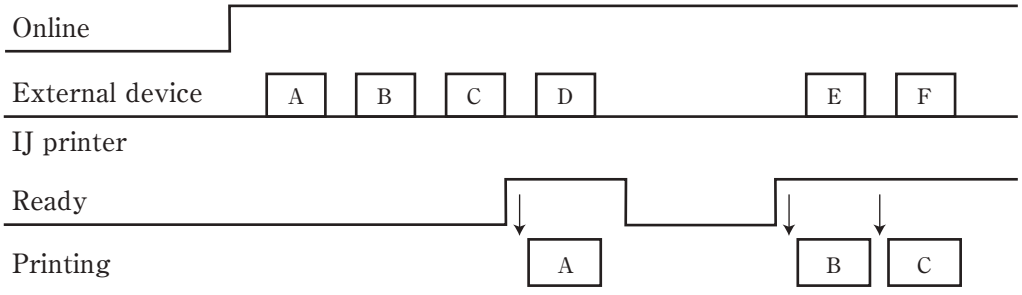
- Calendar characters and count characters are not available.
- To use user pattern characters, define them in advance using "Create user pattern" function. Undefined user pattern characters will be printed as spaces.

(4) Examples of operational procedure

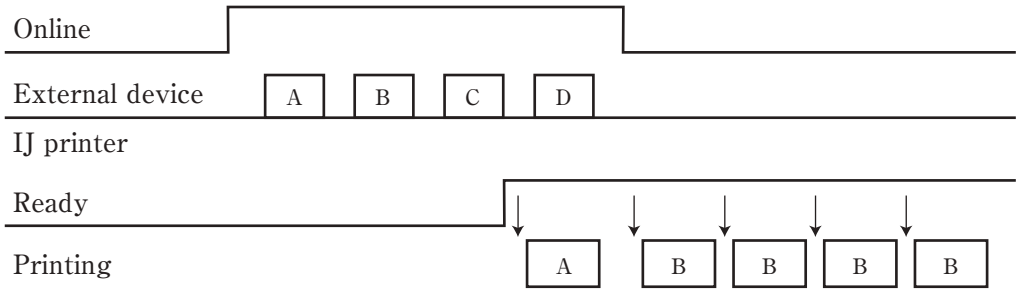
(Example 1) Normal operation:



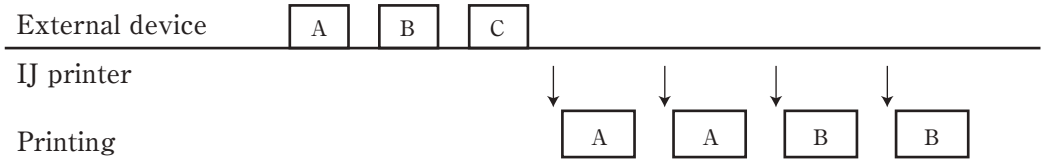
(Example 2) When status is restored to that other than ready during normal operation, and printing is to restart in ready status:



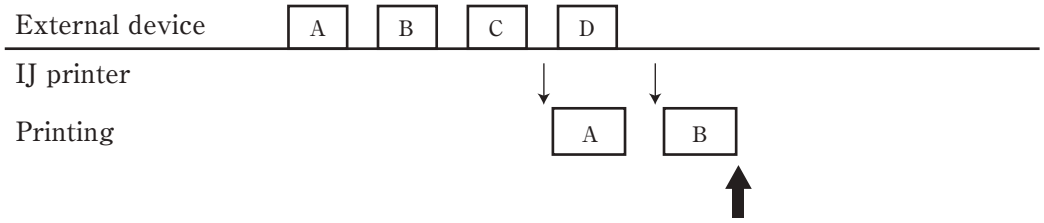
(Example 3) When offline is restored during normal operation, and printing is subsequently performed in standard mode:



(Example 4) Buffer repeat count is 2.

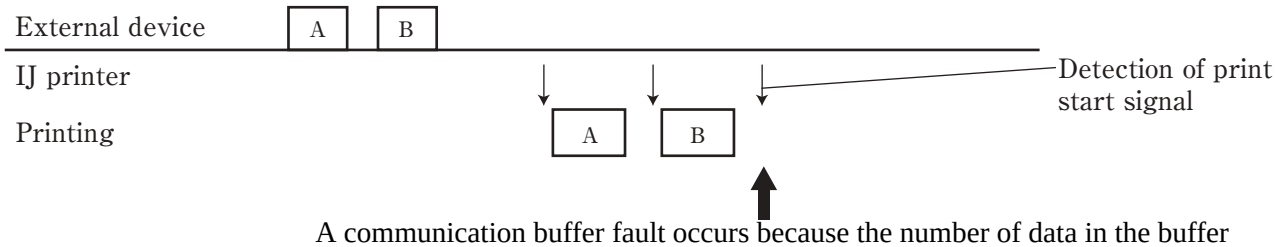


(Example 5) Timing of Fault : Print completed, Data count when error occurs : 2



A communication buffer fault occurs because the number of data in the buffer is 2 after B is printed.(C and D in the buffer are not printed)

(Example 6) Timing of Fault : Print started, Data count when error occurs : 0



A communication buffer fault occurs because the number of data in the buffer is 0 after B is printed followed by detection of print start signal.

5.9.3 External Communications

5.9.3-1 Transmitting print contents

(1) Function

- The received print content will not be reflected in printing immediately, but temporarily held in buffer.

- To facilitate operation, first input fixed characters that do not need to be changed, and then transmit only the print items to be changed.

(2) Restriction

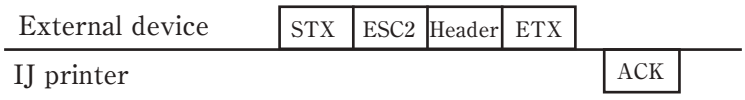
- The maximum number of print items which can be sent at 1 time is 8 print items (maximum 80 characters).

5.9.3-2 Clearing buffer and restarting printing

(1) Function

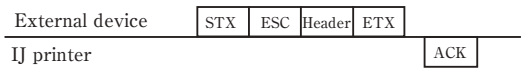
- When text “clear buffer” is transmitted, the print contents held in buffer will be cleared.
- To restart printing, perform the following procedure after transmitting text "clear buffer".
  If this procedure is not followed, the print contents stored before the buffer cleared may be printed.

Procedure:
① Transmit print contents so that print contents sent at least N times remain in the buffer. (N: Data number at Fault)
② Transmit text "restart printing".
③ Printing is possible whenever the print start signal is input.



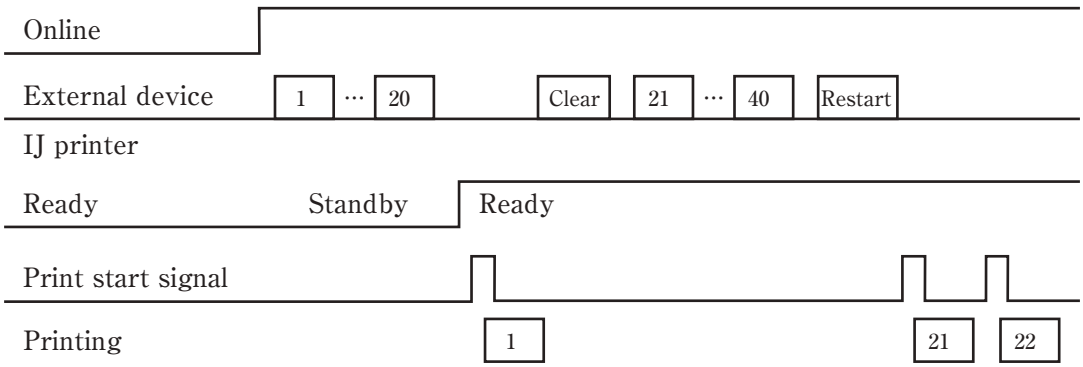
Header 76h : Clear buffer
Header 77h : Restart printing

[Existing machine message] Existing machine message can also be used.



Header 2Dh : Clear buffer
Header 5Ah : Restart printing

[Conceptual diagram of transmission procedure]



(2) Restriction

- Independently transmit text "clear buffer" or "restart printing": These cannot be transmitted with another text (print content transmission, print data call-up transmission, etc.).
- Transmit text "clear buffer" or "restart printing" only while printing is not in progress.
- Input the print start signal at least 500 ms after ACK is returned to "restart printing".

5.9.3-3 Print data call-up transmission

(1) When calling up print data via communication, always execute the call-up before transmitting data to the buffer. If call-up is executed in the Ready status, the called up print content will be printed.

5.9.4 Errors

(1) Errors during external communications

Errors during print content transmission and print data call-up

No.	Condition	Type of error
1	Not all received print contents could be held in buffer because its capacity was exceeded	NAK is returned. However, this will not cause any external communication error.
2	Number of print items of received contents is more than 9.	External communication error 030
3	Calendar or count character was included in print data call-up transmission	External communication error 027

Error when buffer is cleared

No.	Condition	Type of error
1	Text was transmitted together with another text	External communication error 002

(2) Errors during printing

Errors during printing

No.	Condition	Type of error
1	The number of received contents in buffer was less than "Data number at Fault".	Fault "Communication Buffer Fault"
2	Print start signal was received during print data switching immediately after ACK was returned to "restart printing"	Fault "Invalid Data Change Timing"

- When "communication buffer fault" occurs, the window will be cleared, followed by standby status.

(3) Error when status is changed

Error when status is changed

No.	Condition	Type of error
1	Calendar characters or count characters were included to existing print contents when restored to online.	Confirmation message "Communication buffer error"

6. CIRCULATION SYSTEM WORK AND ADJUSTMENT METHOD

⚠ WARNING

- **Never pour the ink and makeup waste into a sewer, etc.**
  Have the ink and makeup drainage processed by an industrial waste processor as special control industrial waste and used wiping papers and the empty container as industrial waste.
- **Do not remove, apply unreasonable force to, or bend the piping tubes unnecessarily.**
  Since high pressure is applied to parts of the ink and solvent inside the piping tube, the ink and solvent may spurt out and get into your eyes and mouth or soil your hands and clothing.
  If the ink or solvent gets into your eyes or mouth, immediately rinse it out with warm water and see a doctor.

- **When replenishing the ink and makeup, changing the ink, or performing other work in which the ink and makeup are handled, be sure not to spill the ink and makeup.**
  If the ink and makeup is accidentally spilled, quickly wipe it off with wiping paper, etc.
  Do not close the maintenance cover until you verify that the wiped parts are completely dry.
  Since the ink and makeup vapor will collect inside the printer especially in the state in which the ink and makeup was spilled inside the printer and was not wiped off completely, it will cause ignition and fire.
  When wiping is difficult in the energized state, perform shutdown processing with the maintenance cover remaining open and turn off the power, then perform wiping again.
- **If leaking of the ink and makeup inside the printer was detected during printer operation or maintenance, quickly wipe it with wiping paper, etc. and perform shutdown processing with the maintenance cover remaining open and turn off the power, then repair the leak.**
  If operation is continued when the ink and makeup is leaking, it will cause trouble and prevent normal printing will become.
  In addition, since the ink and makeup are combustible, they may cause a fire.
- **The ink and makeup, their waste solution, used wiping papers and empty containers are flammable. Waste disposal must comply with appropriate regulations.**
  Consult the appropriate regulatory agency for further information.
- **When the ink particles are caught in a beaker during test printing, etc., use a conductive beaker and securely connect the beaker to a ground.**
  In addition, be sure that the print head is not inserted into the beaker.
  Since the ink particles used in printing are electrically charged, if the beaker is not connected to a ground, the charge load will gradually increase and cause a fire.

⚠ CAUTION

- **Pay careful attention to the following items regarding handling of the ink and makeup:**
  ① Wear gloves and goggles so that the ink and makeup will not directly contact your skin.
  If the ink or makeup gets on your skin, wash it off with soap and warm water.
  ② When taking the bottle from the printer, be careful that the ink does not get on the printer or surroundings. If the ink or makeup gets on the equipment or surroundings, immediately wipe it off with makeup.
  ③ Since the vapor pressure of the makeup is generally high, if the ambient temperature is high such as in the summer, etc., the internal pressure will rise and makeup could spurt out when the outside cover is removed. Therefore, when unplugging,
  - **do not hold the bottle near your face**
  - **place the can on a level surface**
  - **open while covering the opening with a rag, etc.**

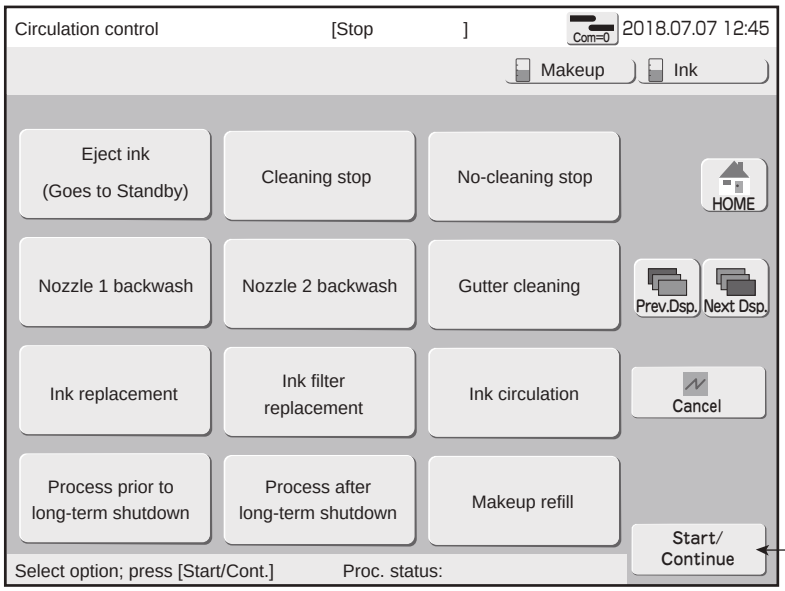
6.1 Circulation control screen operation and contents

6.1.1 Circulation control screen operation

1 **Start from the Maintenance menu.**

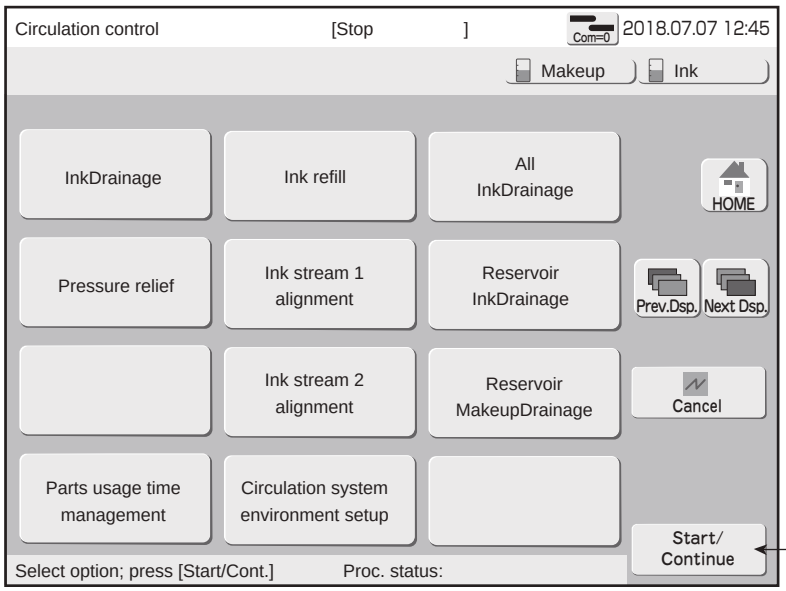
Perform menu 1 and menu 2 switching using Prev. menu and Next menu.

1st menu



Start/Continue

2nd menu



Start/Continue

2 **Select the function you want to perform and press Start/Continue.**

3 **Different operation guides are displayed depending on the selected function.**

- Perform operation in accordance with the operation guide.
- When you want to stop operation, press Abort.

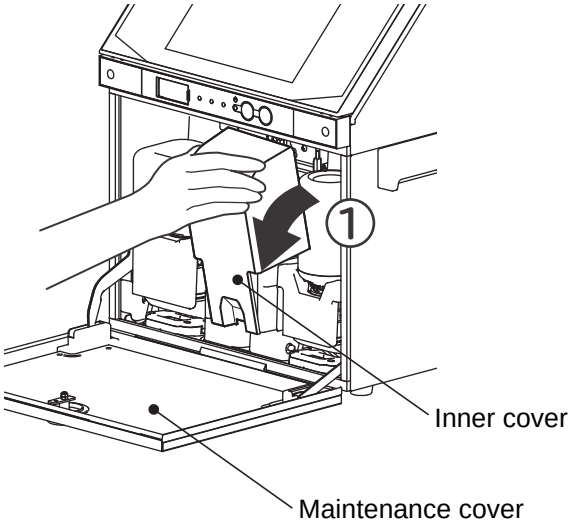
6.1.2 Circulation control contents

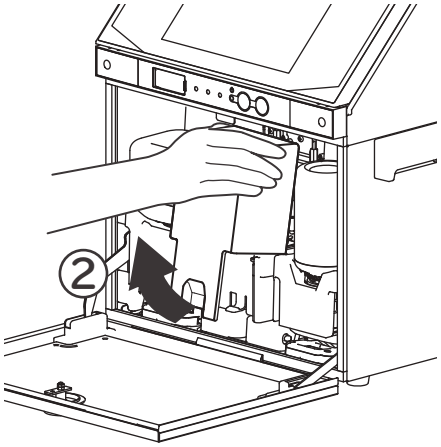
- During generation of an “Main Ink Tank Too Full” fault, input from any of the keys is not accepted. Perform operation after referring to par. “6.12 Draining ink from the main ink tank” and clearing the fault.
- The receivable states are different depending on the contents of circulation control. Note that operation cannot be performed from states other than those shown in the table below.

Circulation control name	Contents	Receivable state
Eject ink (Goes to Standby)	Used for startup at maintenance. (Ink ejection only. The IJ printer does not enter the Ready state.)	Stop
Cleaning stop	Normal shutdown processing. The nozzle is automatically cleaned and the printer is stopped.	Ready or Standby
No-cleaning stop	Shutdown processing used when stopping temporarily. Automatic nozzle cleaning is not performed.	Ready or Standby
Nozzle 1 backwash Nozzle 2 backwash	Makeup is sucked in from the nozzle and the nozzle is cleaned. Perform this operation while pouring makeup from the cleaning bottle onto the nozzle tip (orifice plate surface).	Stop
Gutter cleaning (Recovery-line cleaning)	Makeup is sucked in from the gutter and cleaning of the recovery-line is performed. Perform this operation while pouring makeup from the cleaning bottle onto the end of the gutter.	Stop
Ink replacement	Used when replacing the ink inside the IJ printer with new ink. This operation performs from ink drainage to refilling consecutively.	Stop
Ink filter replacement	Used when replacing the ink filter. This operation performs from ink drainage to refilling consecutively.	Stop
Ink circulation	Used when bleeding the air from inside the circulation line and when making the ink inside the flow lines uniform. This operation can be performed even while ink is being ejected. At the end of this operation, the IJ printer enters the Eject ink (standby) state.	Standby
Process prior to long-term shutdown	Used before printer is shutdown for a long time.	Stop
Process after long-term shutdown	Used when the printer is restarted after long-term shutdown.	Stop
Makeup refill	Used to fill the cleaning path with the makeup at the time of printer installation.	Stop
Ink drainage	Used when draining the ink inside the ink drainage unit.	Stop
Ink refill	Used when refilling the IJ printer with ink. The amount of ink in the main ink tank is set to the initial level. After refilling, the IJ printer enters the Eject ink (standby) state.	Stop
Pressure relief	Depressurizes the inside the entire circulation system. (Used when performing maintenance work.)	Stop
Ink stream 1 adjustment Ink stream 2 adjustment	Used when adjusting the ink stream position. Ejects makeup from the nozzle.	Stop
Parts usage time management	Used when managing the usage time of the circulation system parts. Used when checking the amount of ink and makeup consumption.	All status
Circulation system environment setup	Used when selecting ink concentration management.	Stop
All ink drainage	Used when disposing of the ink cartridge, ink container, and the main ink container and the ink inside the path.	Stop
Reservior ink drainage	Used when disposing of the ink cartridge and the ink container ink.	Stop
Reservior makeup drainage	Used when disposing of the makeup cartridge, makeup container and main ink container and the ink inside the path.	Stop

6.2 Removing Inner Cover

- Open the Maintenance cover.
- Remove the inner cover while tilting it to the direction of an arrow ① and then lifting it up to the direction of an arrow ②.





6.3 Replacing the ink

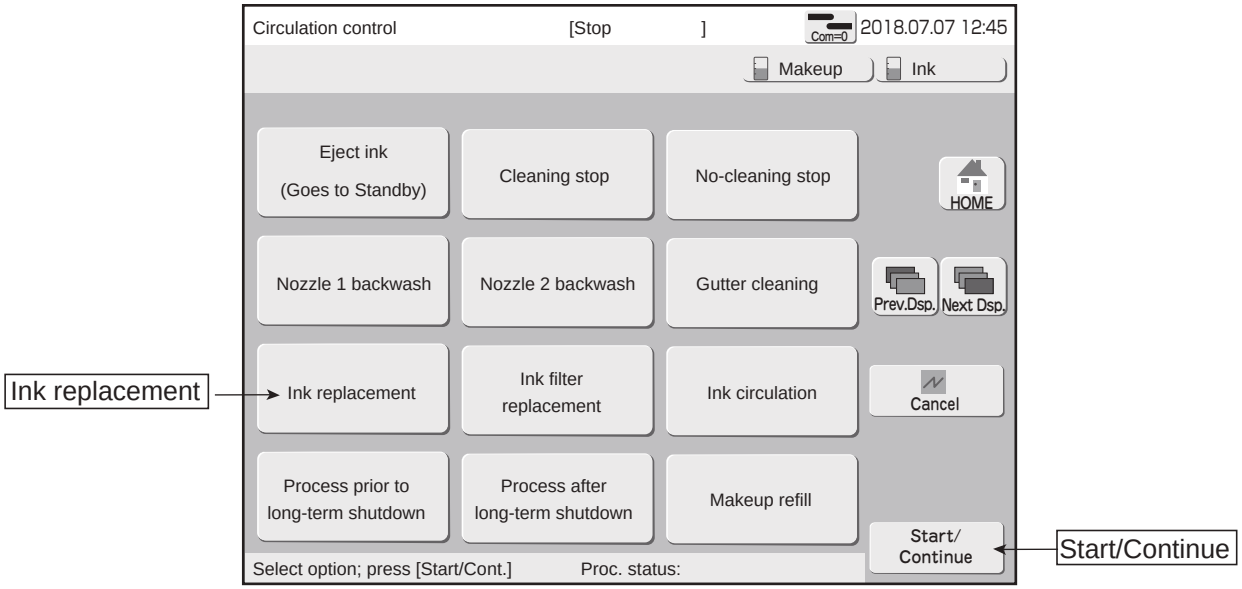
(1) Overview

- This operation is performed when replacing old ink with new ink.
- Consecutively performs from ink drainage to ink replacement to ink refilling.
- Do not perform this operation while ink is being ejected. Perform it after setting the IJ printer to the “Stop” state.

*If replacement of the filters is matched to replacement of the ink, ink will not be wasted.
*When performing ink drainage or ink refilling separately, proceed by selecting each function at menu 2 of the Circulation control screen.

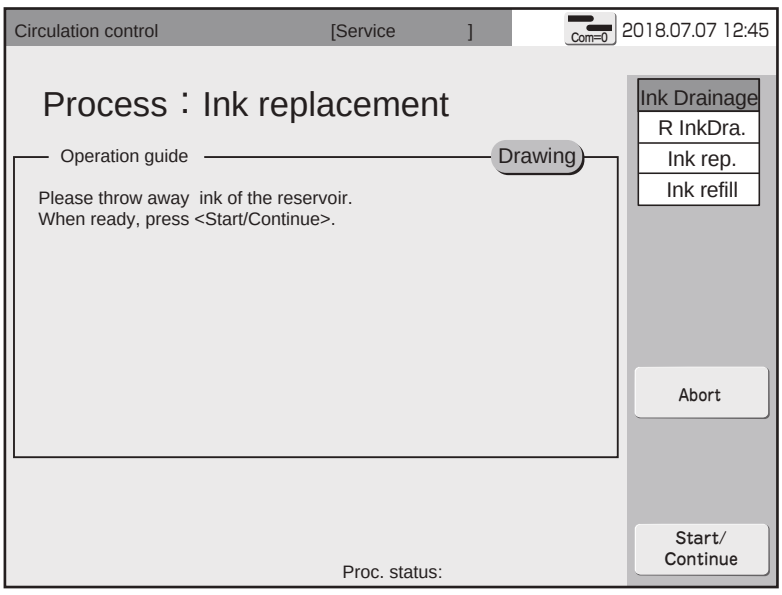
(2) Operation

1 **Display the Circulation control screen and press the Ink replacement → Start/Continue.**



2 **Drain ink in accordance with the operation guide on the screen.**

- When you want to stop drainage, press Abort.
- When abort processing was performed, repeat operation from step **1** .

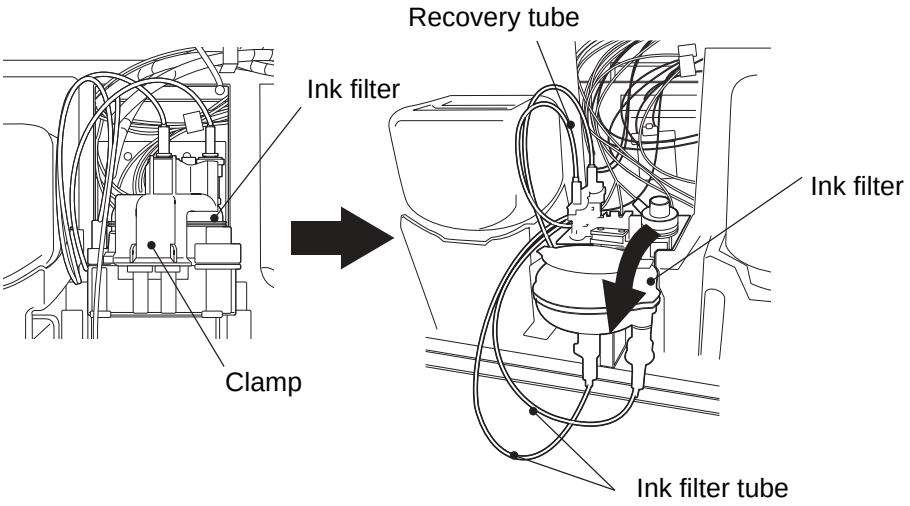


(a) Put the ink filter tubes down, and disconnect the recovery tube and connect it to the waste solution bottle.

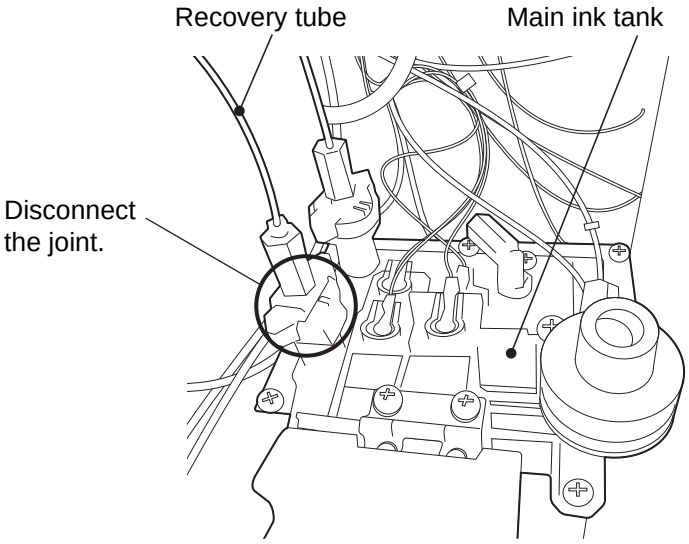
⚠ CAUTION

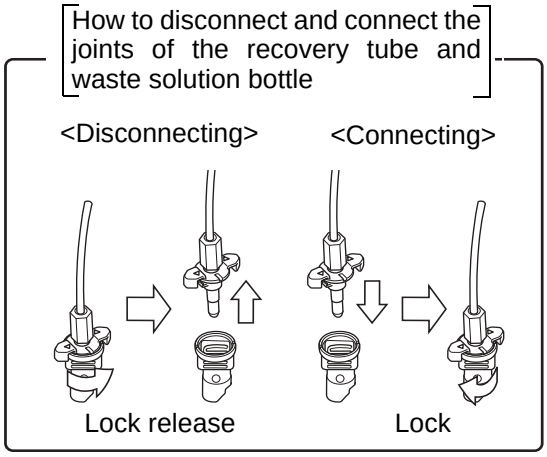
- **If the waste bottle is not available at hand, a container which holds more than 1.5 liter of content shall be used. Do not use a container mode of other rhan polypropylene, polyethylene, fluororesin, glass or stainless. Also avoid using soft container.**

- Open the maintenance cover and remove the inner cover.
- Pull down the clamp toward you and turn the ink filter upside down.

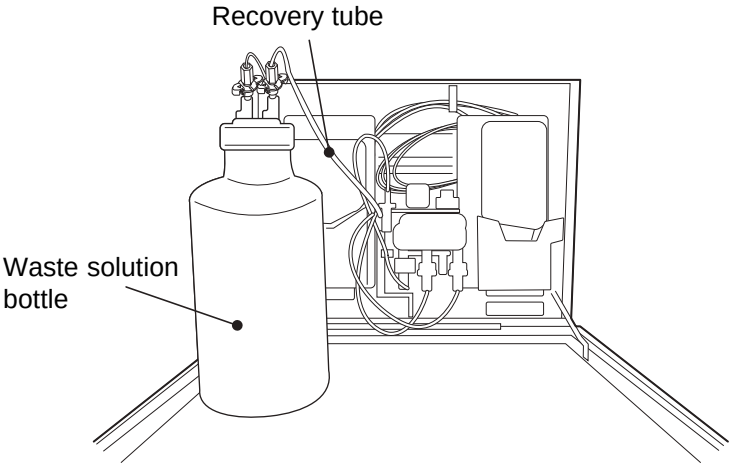


- Disconnect the recovery tube from the main ink tank.





- [If using the waste solution bottle]
  - Connect the recovery tube to the accessory waste solution bottle.

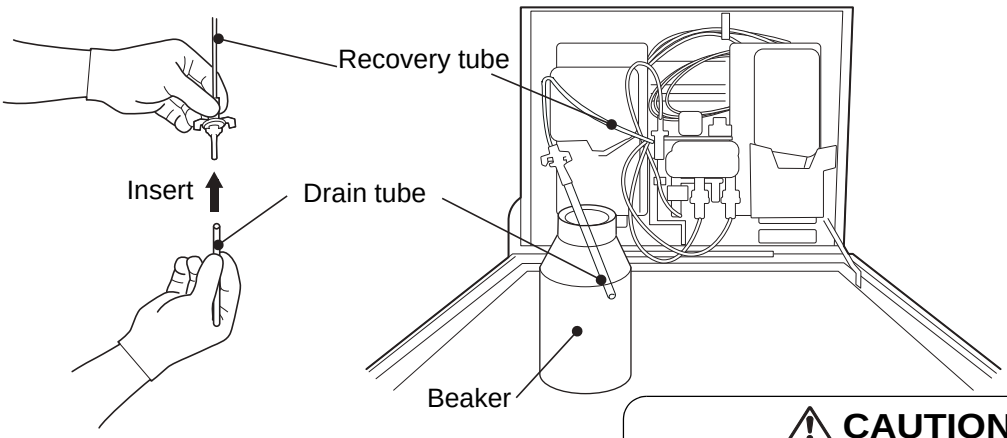


⚠ CAUTION

- **Clean the waste solution bottle with makeup after using. Otherwise it may be clogged with ink and cause the pressure in the recovery line to rise abnormally the next time it is used.**
- **Do not leave ink contained in the waste solution bottle for an extended period of time.**
- **Do not store the waste solution bottle in places exposed to high temperatures.**
- **Be careful that the ink does not spill when disconnecting the joint of the waste solution bottle.**

● [If not using the waste solution bottle]

● Connect the recovery tube to the accessory drain tube and insert it into the beaker.



⚠ CAUTION

Clean the drain tube with makeup after using. Otherwise it may be clogged with ink and cause the pressure in the recovery line to rise abnormally the next time it is used.

⚠ CAUTION

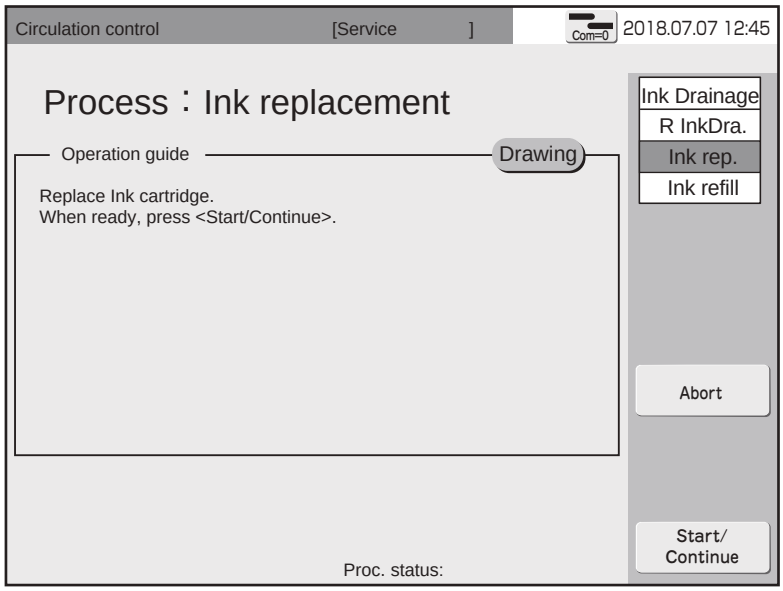
● If ink is accidentally spilt, wipe it up promptly with wiping paper or something similar. In addition, do not close the maintenance cover until you are sure that the wiped portion has completely dried.

(b) Press the Start/Continue .

Ink circulating inside the printer is drained from the recovery tube into the waste solution bottle or the beaker.

● To stop drainage, press the Abort.

(c) There is no need to drain ink if it is within the replacement period for the ink in the ink tank. Press Abort and proceed to step 2 (e).



Follow the on-screen instructions to return the recovery tube to its original position and press Start/Continue.

You are returned to the "Circulation control" screen.

● If you have aborted the sequence, perform the procedure from step 1 again.

* If you have aborted the sequence, be sure to return the recovery tube to its original position.

⚠ CAUTION

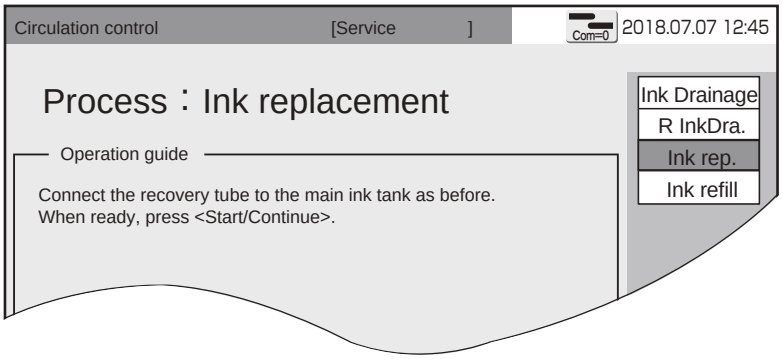
[If using the waste solution bottle]

- **During ink drainage, hold the waste solution bottle so as not to knock it over.**

[If not using the waste solution bottle]

- **During ink drainage, hold the beaker as well as the recovery tube so as not to knock over the beaker.**

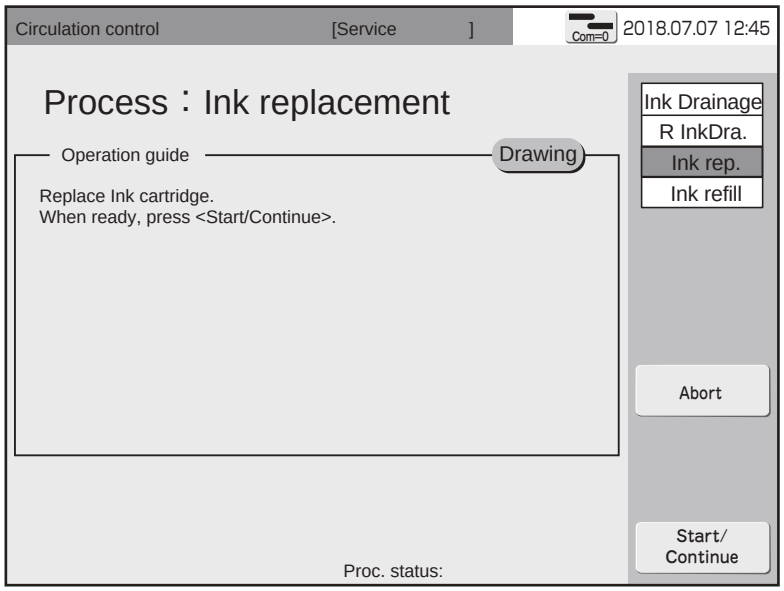
(d) When the predetermined period of time elapses, follow the operation guidance on the screen and connect the recovery tube to its original position.



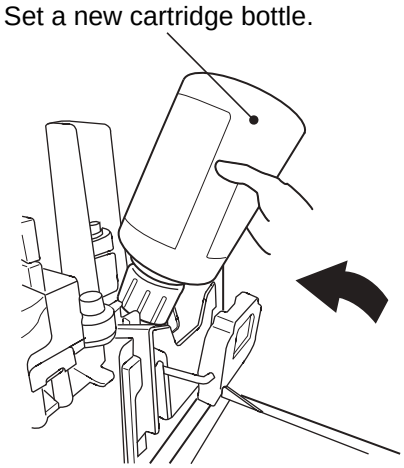
***1 Clean the connection part at the tip of the recovery tube well with makeup before connecting to its original position.**

***2 In order to prevent the recovery tube from getting bent, be sure not to tangle it with any other tube.**

3 Replace the ink cartridge.



(a) Set a new ink cartridge bottle in the ink tank.

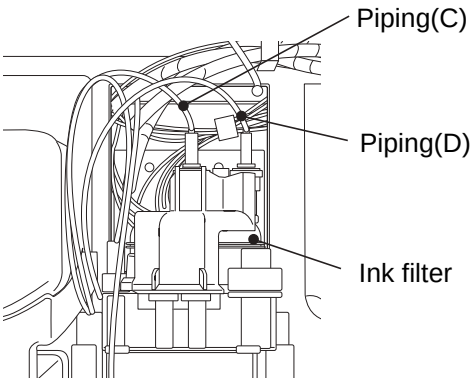


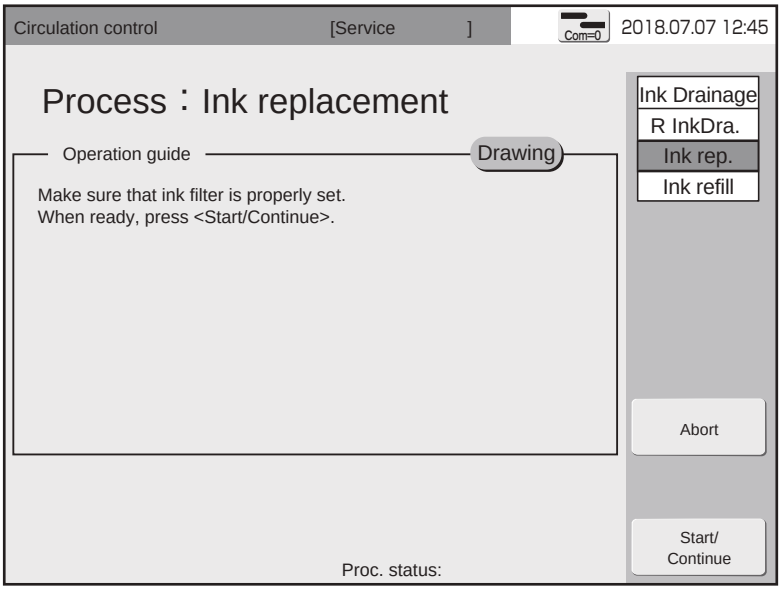
⚠ CAUTION

If ink is accidentally spilt, wipe it up promptly with wiping paper or something similar.
In addition, do not close the maintenance cover until you are sure that the wiped portion has completely dried.

(b) Return top and bottom reversal of the ink filter to its original state in accordance with the guidance.

● Confirm that the ink filter is set as shown in the figure below. (Piping D is on the right.)





(c) Return the inner cover to its original position.

(d) Place the end of the print head in the beaker.

● Provide against an ink beam bend.

(e) When Start/Continue is pressed, refilling of the lines with ink begins.

- After a while, ink is ejected from the nozzle. Check the position of the ink beam.
- To abort the sequence, press Abort and operate in accordance with the operation guidance on the screen.
  After aborting, you are returned to "Circulation control" screen.
- When abort processing was performed, select "Ink refill" from the "Circulation control" screen and execute.

4 Display the "Operation management" screen and set the ink operating time to "0".

- Refer to "5.2 Monitor operational status" in the Instruction Manual and operate.

6.4 How to correct ink stream bending and nozzle clogging

⚠ WARNING

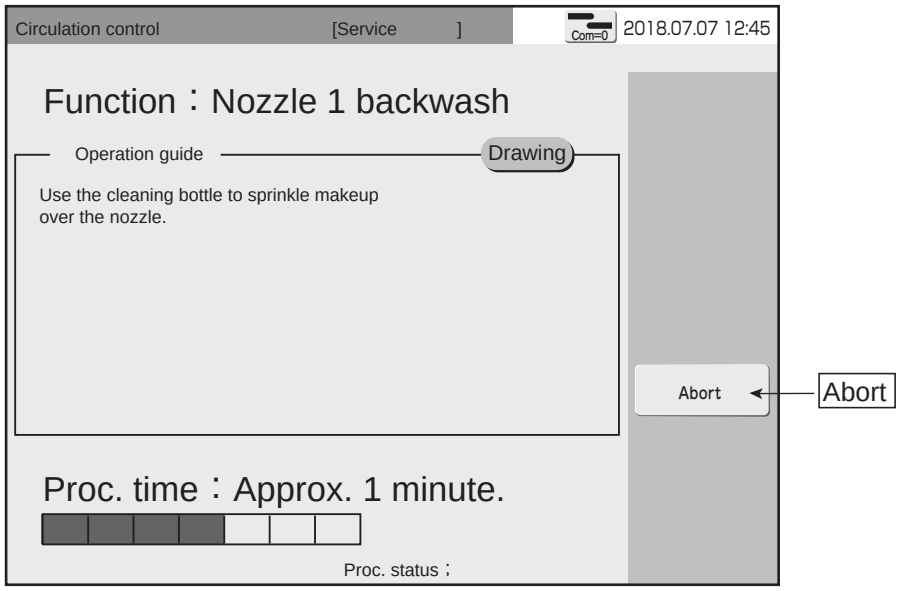
- Wear protective gear (goggles and mask).
- If the ink or makeup gets in your eyes or mouth, immediately rinse with warm water and consult a doctor.
- Perform work after confirming that there is no one in the ink ejection direction. (Perform this work by inserting the print head tip into a beaker, etc.)

6.4.1 Nozzle 1 backwash (including Nozzle 2)

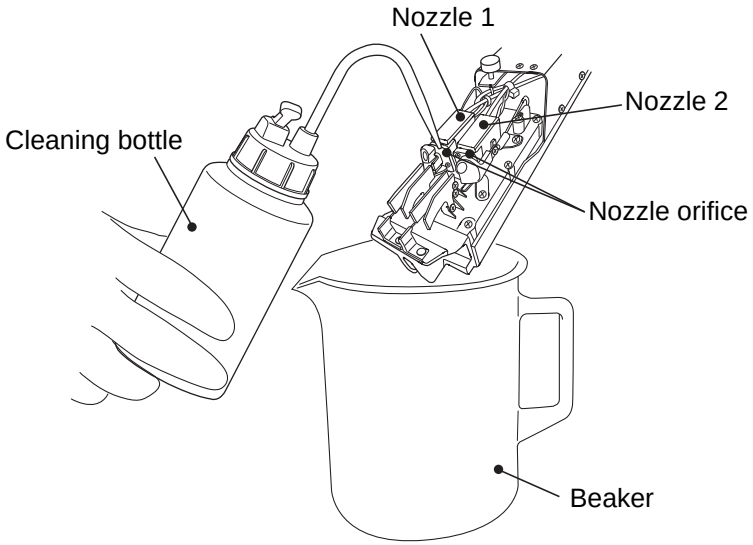
- Sucks in makeup from the nozzle and remove clinging foreign matter, etc.
- To prevent thinning of the ink, do not perform this more than total 3 consecutive times on both of the Nozzle 1 and Nozzle 2.
- Do not perform this work while the ink is being ejected. Perform it after setting the IJ printer to the Stop state.

1 Procure a cleaning bottle filled with makeup and a beaker and remove the print head cover.

2 Press the Maintenance menu Circulation control → Nozzle 1 backwash.
The nozzle backwash screen is displayed.



3 Suction begins automatically. Sprinkle the nozzle orifice with makeup.

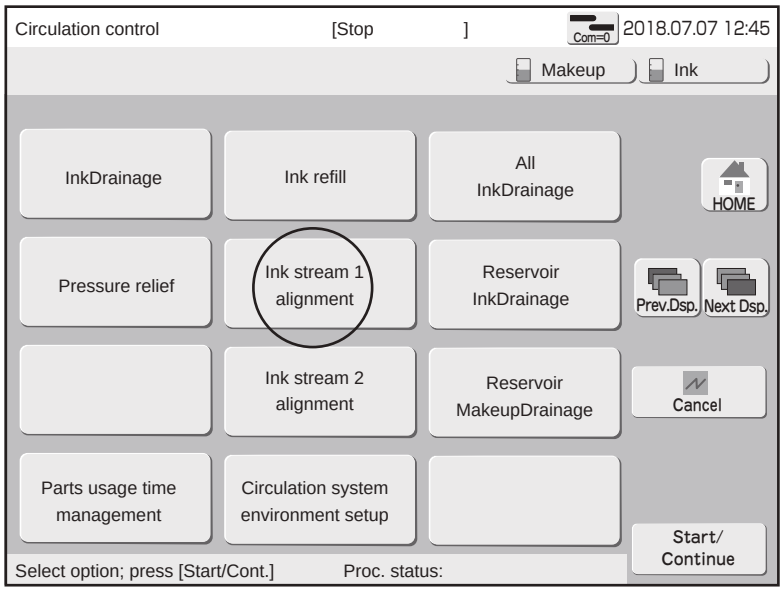


4 **Suction ends in about 1 minute and the screen returns to the Circulation control screen.**

- To stop operation, press Abort.

5 **Check if ink stream bending or nozzle clogging has been repaired.**

- Display the screen after the Circulation control screen.

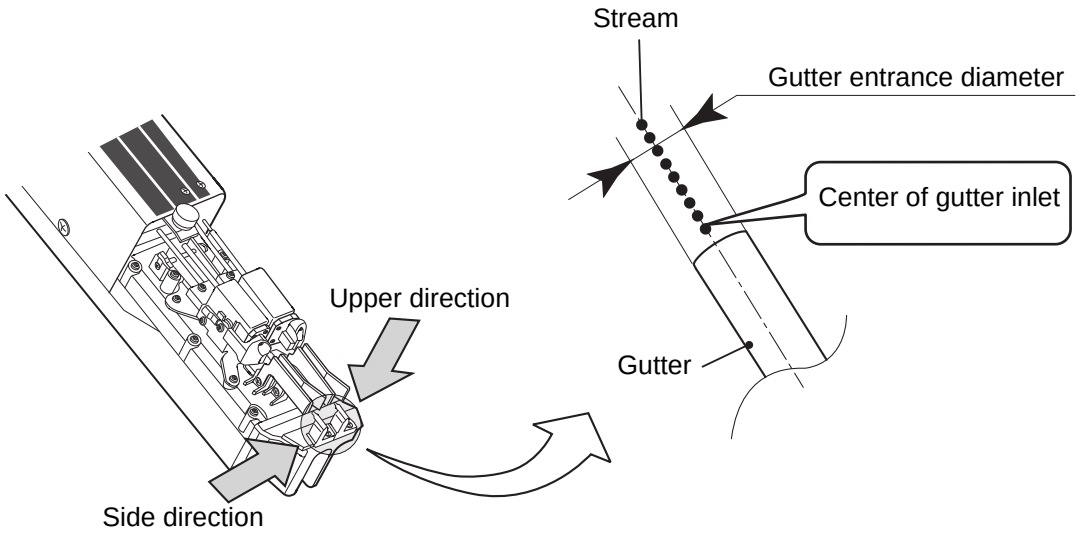


6 **With the print head cover removed, press the Ink stream 1 alignment → Start/Continue to eject the makeup.**

- Perform this work with the print head tip inserted into a beaker.

7 **Confirm that the stream is in the center of the gutter.**

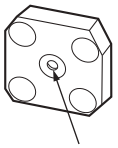
- Confirm the stream position from the horizontal direction and vertical direction of the print head as shown in the figure.



- If the ink stream is not in the center of the gutter, perform nozzle backwash again. If the stream is not corrected even after the nozzle backwash has been performed 3 times, perform par. “6.4.2 Nozzle orifice disassembly and cleaning”.

8 **At the end of confirmation, press Abort and stop ejection of the makeup.**

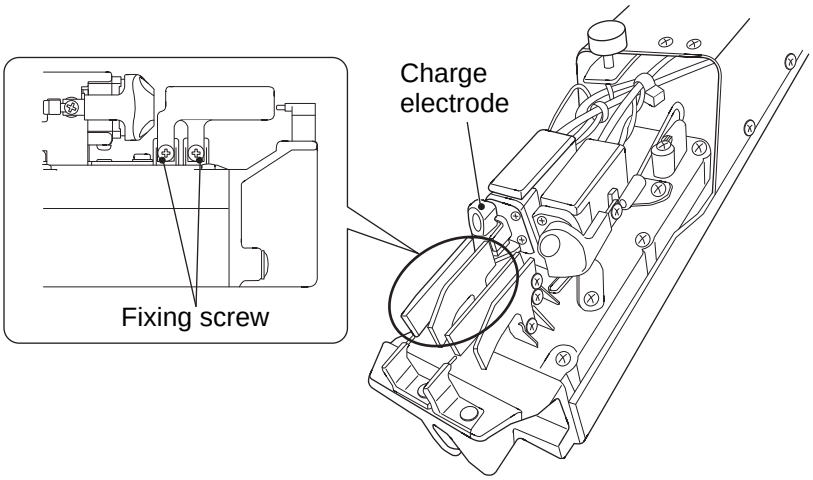
6.4.2 Nozzle orifice disassembly and cleaning



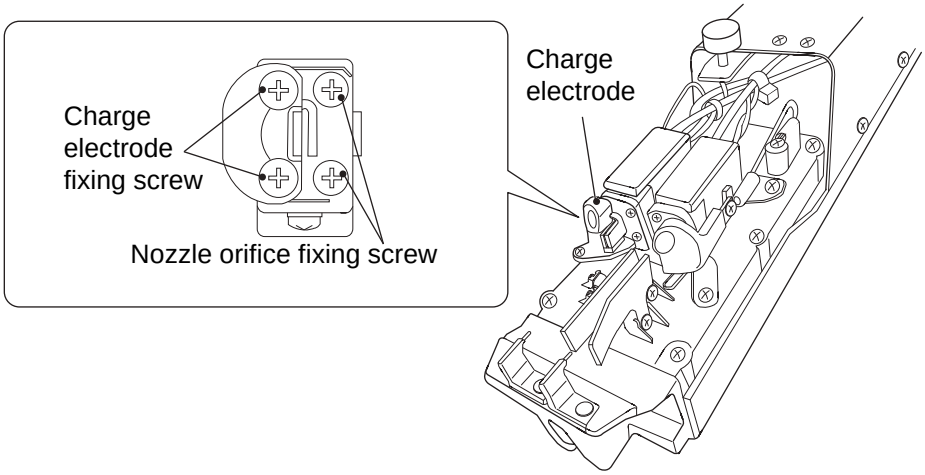
- This is the processing method when ink stream bending or nozzle clogging is not repaired even when nozzle backwash was performed.
- Do not perform this work while ink is being ejected. Perform it after setting the IJ printer to the Stop state.
- Do not touch the ejection port of the nozzle orifice directly with your hand. (Use the accessory tweezers.)
- If the ejection port of the nozzle orifice is damaged, it may be impossible to fulfill its function.
  Handle the nozzle orifice carefully so that the ejection port is not damaged by the tool.

1 **Remove and clean the nozzle orifice 1. (Use the same procedure for nozzle orifice 2.)**

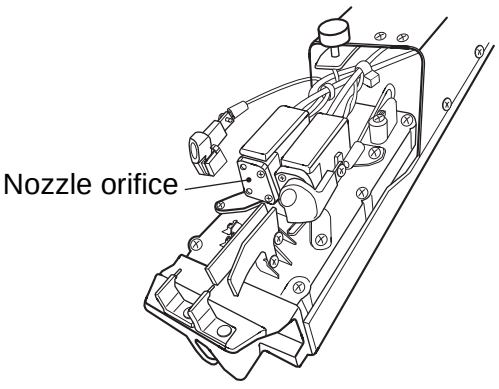
(a) Loosen the fixing screw and remove the charge electrode and two deflection electrodes. To prevent dropping, do not remove the screw.



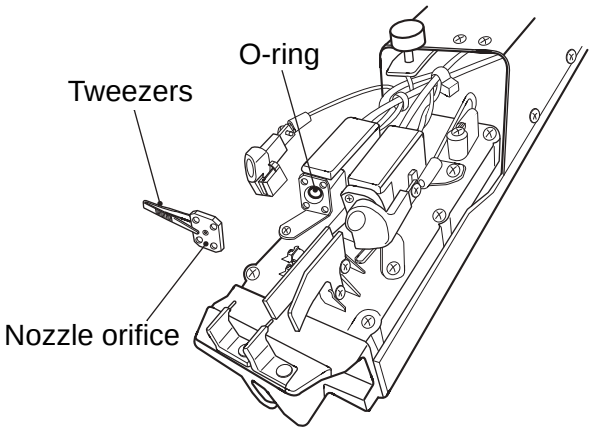
(b) Remove the two screws holding the charge electrode and remove the charge electrode.



(c) Remove the two screws holding the nozzle orifice.

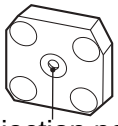


(d) Use the tweezers to remove the nozzle orifice from the nozzle body.



Notice

Do not touch the ink ejection port on nozzle orifice.

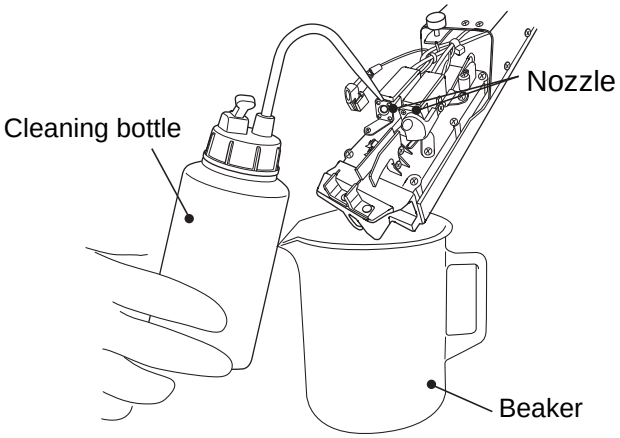


The O-ring may detach from the nozzle orifice at this time. If it does, put the O-ring in a beaker with makeup ink and take care not to lose it.

(e) Place the removed nozzle orifice into a beaker containing makeup and clean the orifice.

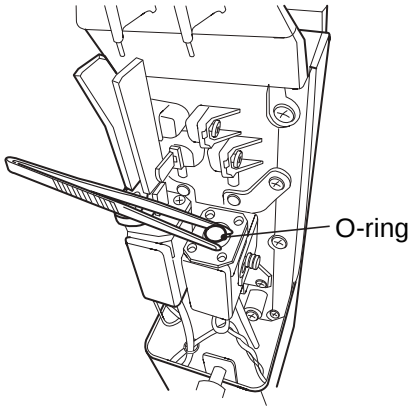
2 Clean the nozzle.

Using the cleaning bottle, pour the makeup over the nozzle to clean it, from which the nozzle orifice has been removed.

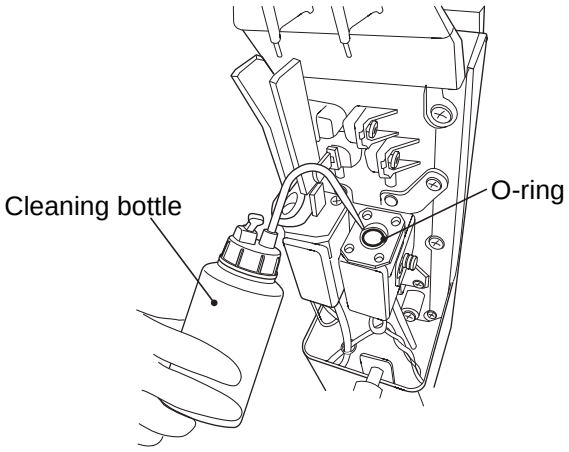


3 Install the nozzle orifice.

(a) Use the tweezers to hold the O-ring and put it into the nozzle body.



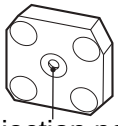
(b) Use the cleaning bottle and splash a few droplets of makeup on the O-ring.

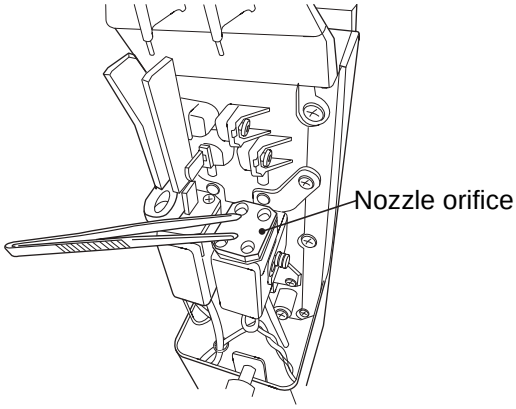


(c) Insert the nozzle orifice and use tweezers to lightly depress the nozzle orifice from the top.

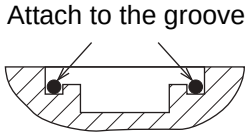
Notice

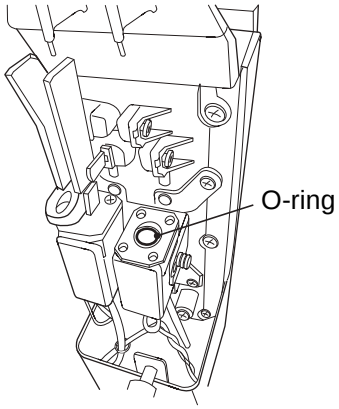
Do not touch the ink ejection port on nozzle orifice.





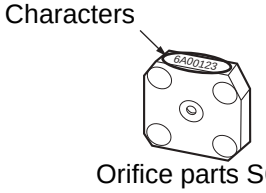
(d) Remove the nozzle orifice once and make sure that the O-ring has been installed.

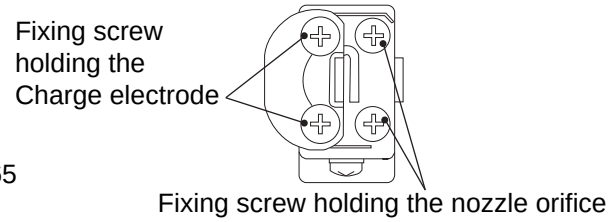




(e) Insert the nozzle orifice again, and use the two screws to hold the nozzle ofifice, and next, use the (rest of the) two screws to hold the charge electrode.

● Use the four screws to secure the nozzle orifice so that the characters on it face inward.





(f) Install the two deflection electrodes.

4 **Press the Ink stream 1 alignment → Start/Continue and confirm that bending of the stream and clogging of the nozzle have been repaired.**

- Perform this operation with the tip of the print head inserted into a beaker.
- When the ink stream is way outside the gutter, cleaning of the nozzle orifice may not be sufficient. Disassemble and clean the nozzle orifice again.
- When the ink stream position has deviated from the center of the gutter, adjust it in accordance with par. “6.5 Stream alignment”.

6.5 Stream alignment

⚠ WARNING

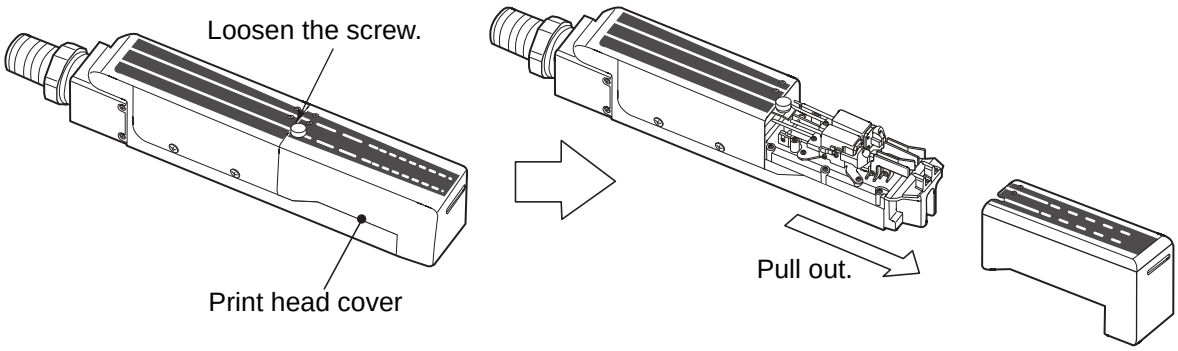
- Wear protective gear (goggles and mask).
- If the ink or makeup gets in your eyes or mouth, immediately rinse with warm water and consult a doctor.
- Perform work after confirming that there is no one in the ink ejection direction. (Perform this work by inserting the print head tip into a beaker, etc.)

This operation is performed when the nozzle or nozzle orifice has been replaced. Ordinarily, ink stream alignment is unnecessary.

- Adjust the stream position so that the stream ejected from the nozzle is at the center of the gutter.
- Adjustment in 2 directions, horizontal direction and vertical direction, is necessary.

Steram alignment of Nozzle 1 (Nozzle 2 is also the same)

1 Remove the print head cover in the stop state.



2 At the Circulation control screen, press the Ink stream 1 alignment → Start/Continue. (Press the Ink stream 2 alignment to align Ink stream 2.)

- Perform this operation with the print head tip inserted into a beaker.

3 Adjust the horizontal direction and vertical direction positions.

⚠ CAUTION

- **Do not simultaneously loosen the horizontal direction lock screw and vertical direction lock screw because the adjustment is difficult.**

(a) Horizontal direction adjustment procedure

①Slightly loosen the two horizontal direction lock screws.
As to the screw loosening, please see the (precautions) next page.

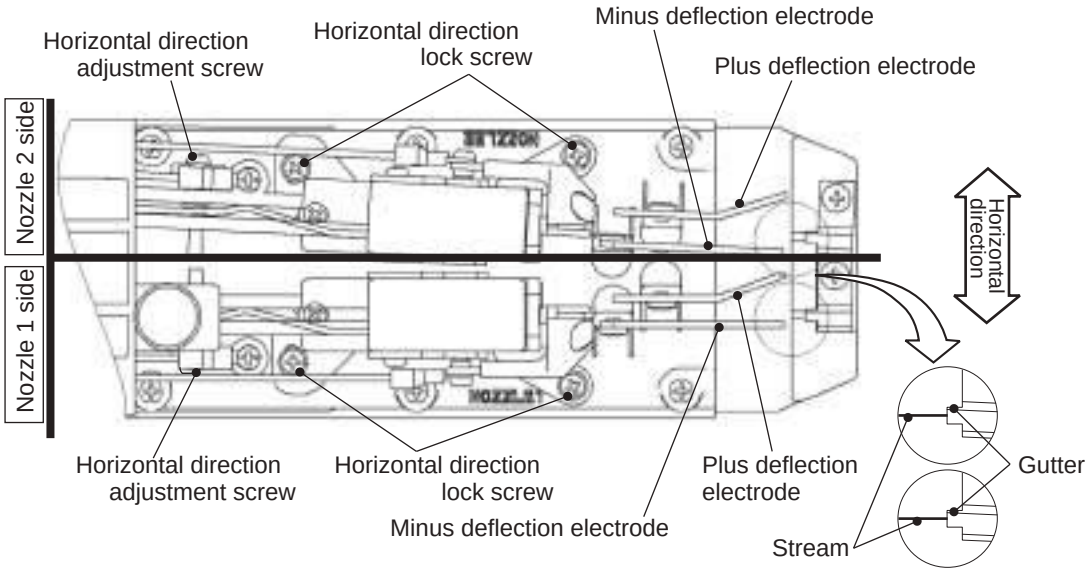
②Turn the horizontal direction adjustment screw and adjust the position of the makeup.

[Nozzle 1]
When you want to move in the minus electrode direction : Turn counterclockwise
When you want to move in the plus electrode direction : Turn clockwise

[Nozzle 2]
When you want to move in the minus electrode direction : Turn clockwise
When you want to move in the plus electrode direction : Turn counterclockwise

Adjust so that the stream is approximately at the center of the gutter.

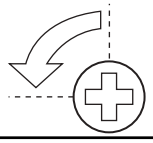
③After adjustment, tighten the two horizontal direction lock screws.



PRECAUTIONS

Horizontal direction lock screw.

Indication of the loosening
[60 degree to 120 degree]



- It will be difficult to make fine adjustment when the lock screw is loosed too much because the resistance from the base is lost then.

(b) Vertical direction adjustment procedure

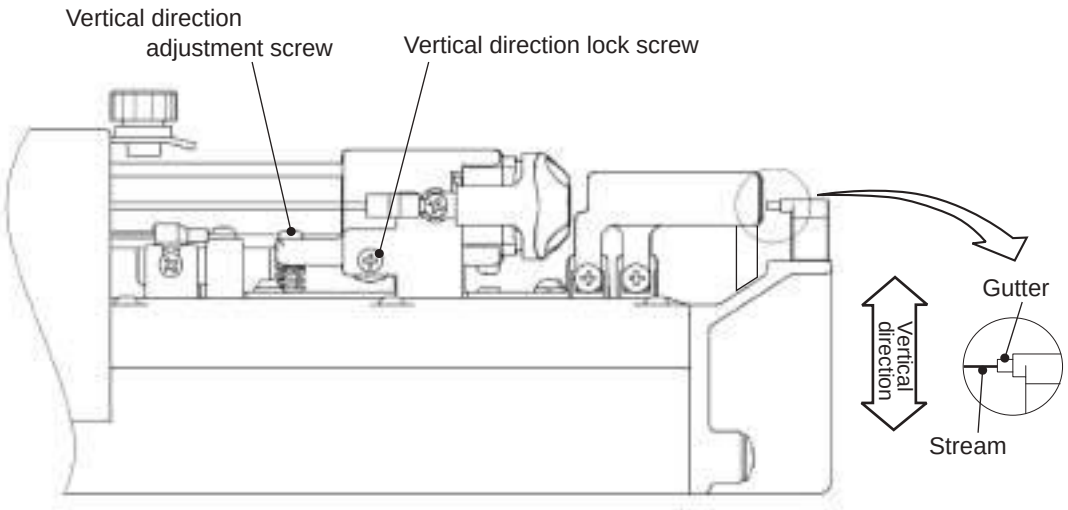
①Slightly loosen the two vertical direction lock screws.

②Turn the vertical direction adjustment screw and adjust the position of the stream.

When you want to move to the bottom of the gutter : Turn counterclockwise
When you want to move to the top of the gutter : Turn clockwise

Adjust so that the stream is approximately at the center of the gutter.

③After adjustment, tighten the two vertical direction lock screws.



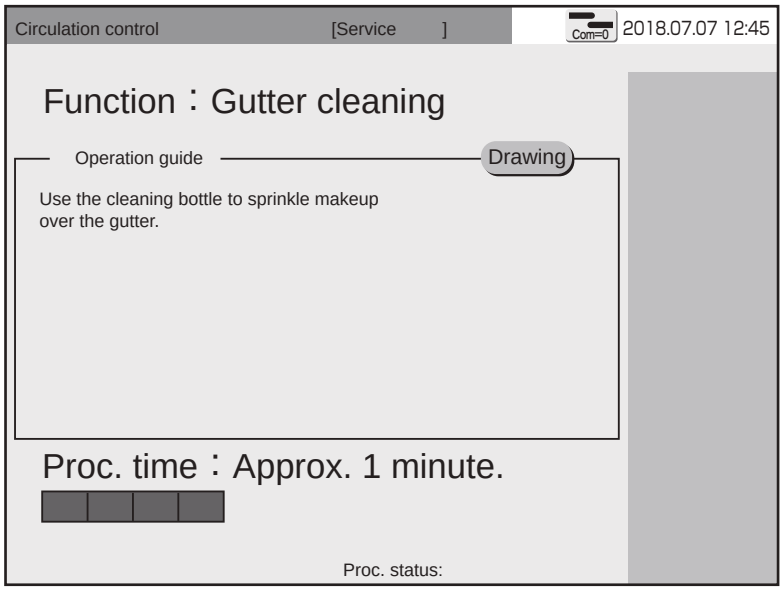
4 At the end of adjustment, press Abort.

6.6 Cleaning the Gutter

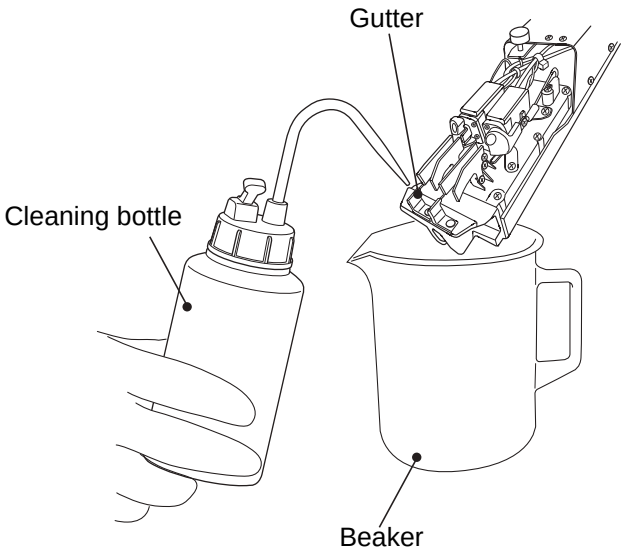
- When the ink recovery system becomes dry or clogged, the line from the gutter to the ink main tank can be cleaned by performing “Gutter cleaning”.
- Do not perform this operation while ink is being ejected. Perform it after setting the IJ printer to the “Stop” state.
- Have ready a cleaning bottle filled with makeup and a beaker and remove the print head cover.
- If recovery-line cleaning is performed continuously, the ink will become thin and cause printing distortion. Since ink replacement may become necessary after repair, do not perform cleaning more than total 2 consecutive times on both of the Nozzles.
- Do not pour makeup onto the opposite gutter which is not to be cleaned, because the makeup on both of the gutters may be sucked in this operation.

1 **Display the Circulation control screen and press the Gutter cleaning → Start/Continue.**

2 **Perform cleaning in accordance with the operation guide.**



- Pour makeup onto the gutter.



- To stop operation, press Abort.

3 **Cleaning ends in about 1 minute and the screen returns to the Circulation control screen.**

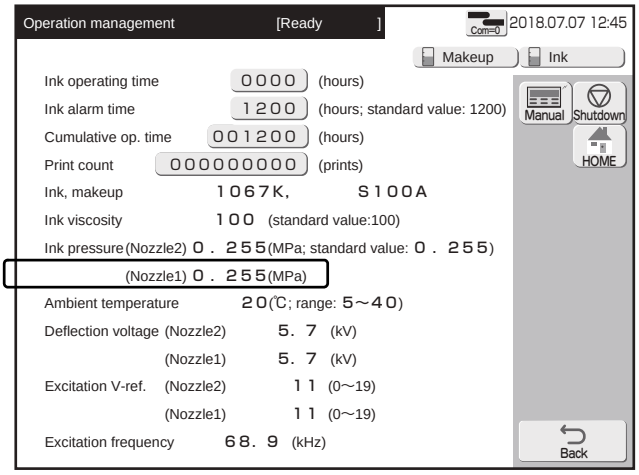
6.9 Adjusting the pressure

- Check the pressure before printing state check at the start of operation.
- Do not perform this operation in the Stop state. Perform it in the state in which ink is ejected.

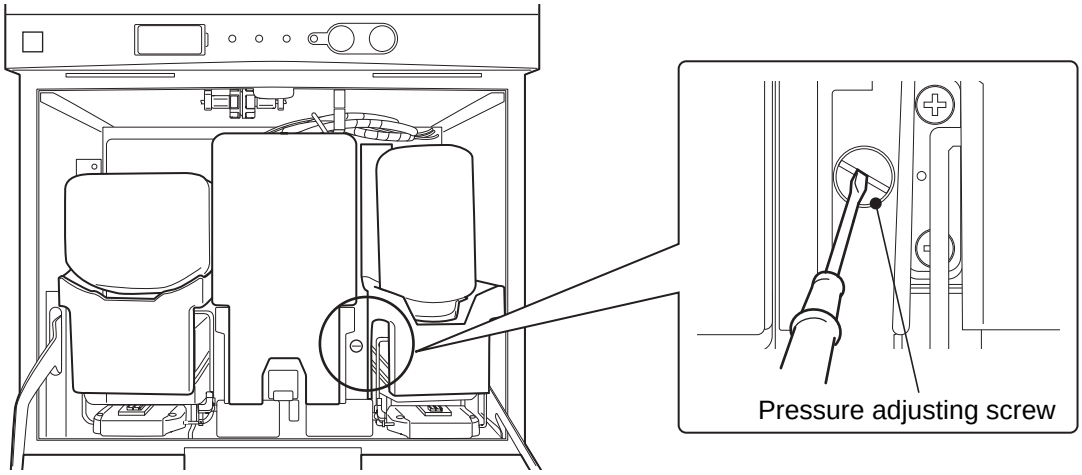
1 Open the Operation management screen.

(a) New HMI

(b) Previous HMI



2 Check the displayed ink pressure value of nozzle 1. If there is a difference of 0.010 or more from the standard value, adjust the pressure to the standard value ±0.002 with a flat-blade screwdriver.



To raise the pressure : rotate clockwise.
To lower the pressure : rotate counterclockwise.

6.10 Excitation V adjustment

(1) Overview

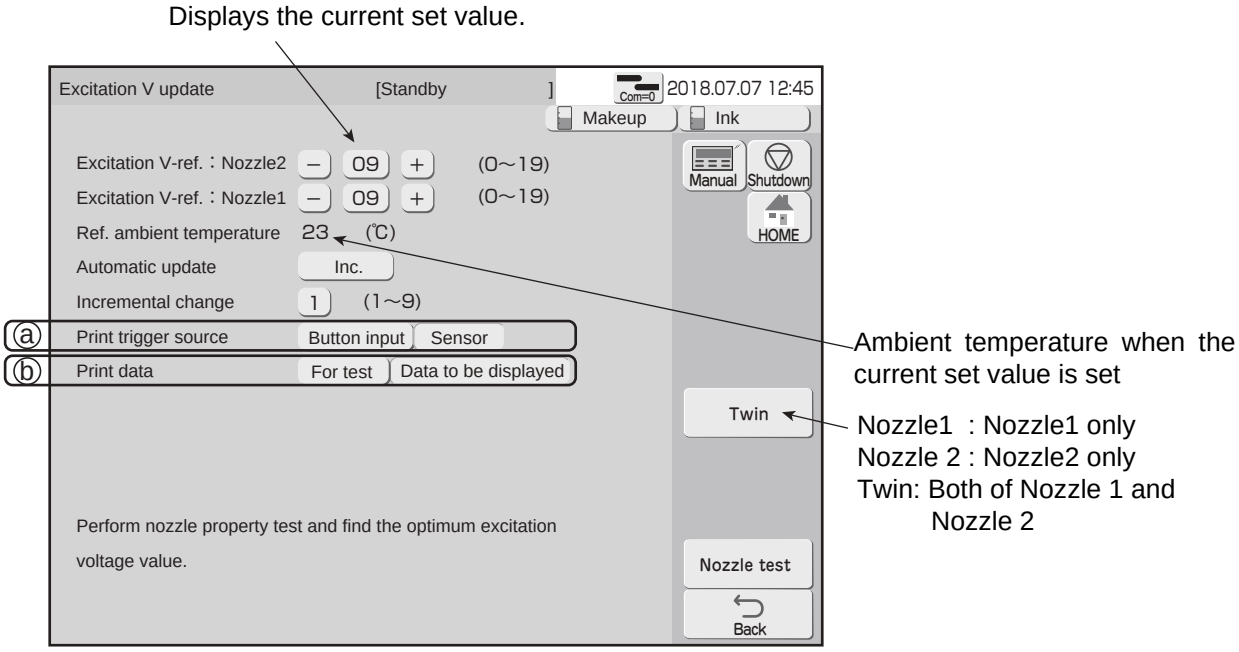
- The Excitation V set value is 0 to 19. The state of the ink drops is different for each setting.
- The optimum Excitation V set value must be input to maintain good print quality.
- Perform nozzle property test printing, and the center value of the range where printing is good is the optimum Excitation V set value.
  (Example) When printing is good at the Excitation V set value 5 to 15 range at nozzle property test, the optimum Excitation V set value is the center value 10.
- Memorizes the ambient temperature when the Excitation V set value was updated as the reference ambient temperature.
  If the ambient temperature and the reference ambient temperature difference exceeds a certain value during use, “Check Excitation V set value” warning will be generated. In that case, readjust the Excitation V setting.

(2) Operation

- For Excitation V setting, select the optimum set value from the result of test printing for each set value and input the selected value from the operation panel. Perform operation in accordance with the following procedure:

1 **At the Maintenance menu, press Excitation V update (nozzle test).**

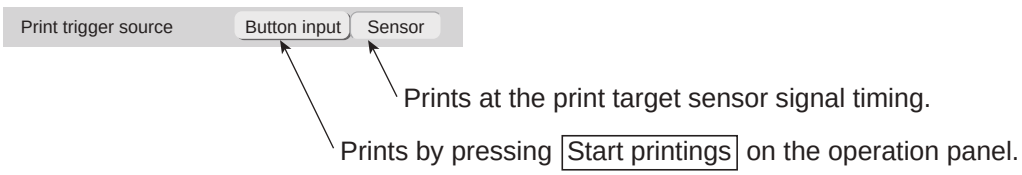
- The Excitation V update screen is displayed.



2 **Set ⓐ Print trigger source and ⓑ Print data of nozzle property test printing.**

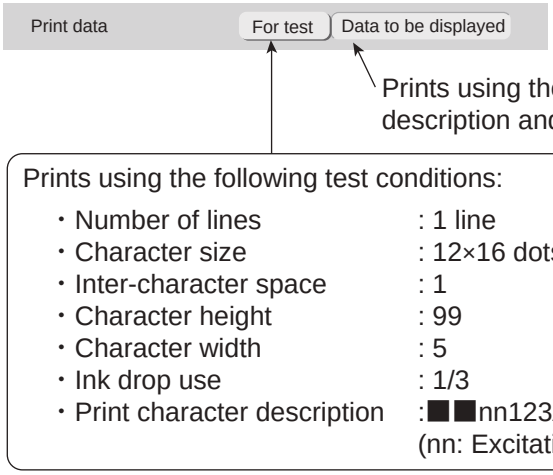
ⓐ Print trigger source

Select the timing at which printing is performed.



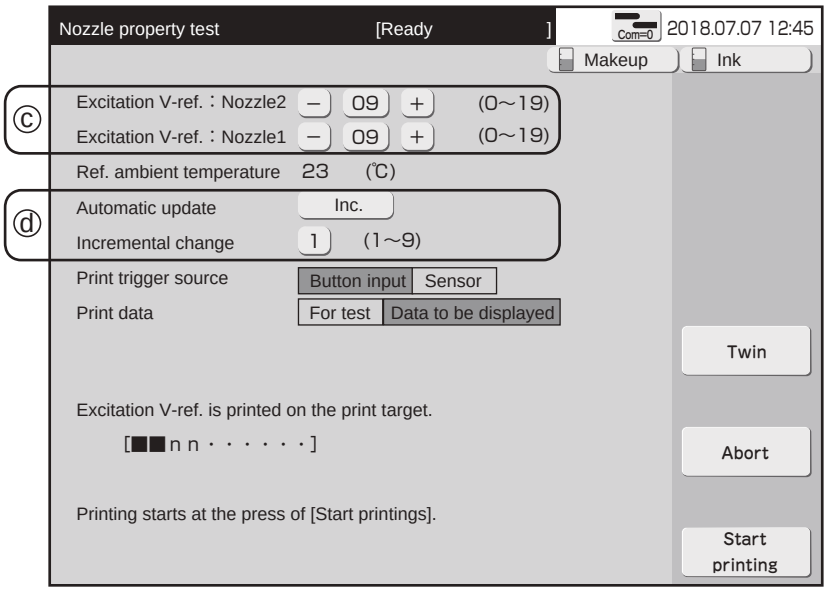
ⓑ Print data

Select the contents and conditions of the characters to be printed.



3 Confirm that the IJ printer is in the Standby state and press Nozzle test.

- The Nozzle property test screen is displayed. The IJ printer enters the Ready to print state.



ⓒ Excitation V-ref.

Input the set value you want to print. (Set value is 00 to 19.)
Change the setting using − + or input a value by touching the number.

ⓓ Automatic update

Select whether or not to automatically switch to the next set value after printing one setting.

Disable	: Set value does not change.
Dec.	: Set value is automatically decremented at each printing.
Inc.	: Set value is automatically incremented at each printing.

At “Inc.”, the change width by which the value is automatically switched is set.

4 Perform nozzle property test printing.

● When "Print trigger source" is Button input , press Start printings.
When "Print trigger source" is Sensor , input the sensor signal.

⚠ CAUTION

● During the nozzle property test, the state of creation of the ink drops may become poor and an "Ink Drop Charge Too High" or other fault may be generated and the ink may stop, depending on the Excitation V value.
In this case, after cleaning the print head, eject the ink again. (Refer to par. "3.1.2 When an error occurred at the start of operation" of the instruction manual and perform the same work.)
The possibility of fault is high when Excitation V is set less than 5. When performing test printing again, start from setting 10 and test print while decrementing.

5 Check the printed result.

● Check the Excitation V range at which printing is good. The center of that range is the optimum value.

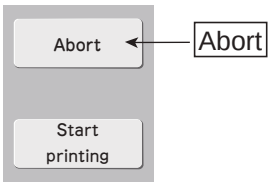
(Example) Printing good range 5 to 15→Optimum value 10

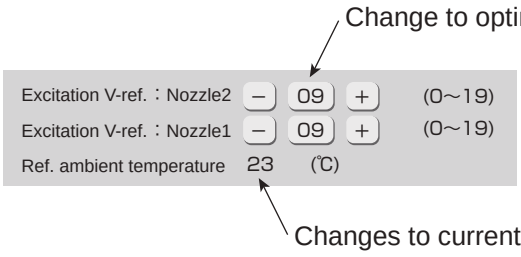
O: Good ×: Bad Space: Not checked

Check date	Ambient temperature	Excitation V value																			optimum value
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
2018.07.07	25℃			×	×	×	○	○	○	○	○	○	○	○	○	○	○	×	×	×	×	10

6 Update the Excitation V-ref. value.

(a) At the end of test printing, press [Abort] of the "Nozzle property test" screen and return to the "Excitation V update" screen.
(b) Change "Excitation V-ref." to the optimum value confirmed at step **5**.





7 When the screen is returned to the "Maintenance menu" by Back Back , set value change is complete.

⚠ CAUTION

● Repeat print setting is disabled during the nozzle property test.
Only one printing is performed by one input signal.
● Product speed matching setting is disabled during the nozzle property test.
The character width may be different from the actual character width.

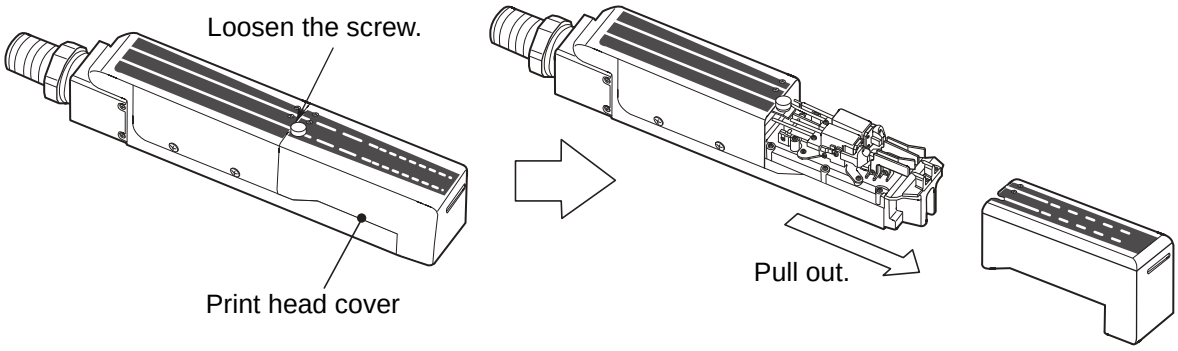
6.11 Ink drop state check method

- The state of the ink drops can be checked by using a magnifying glass.
- Perform this work in the Eject ink state.

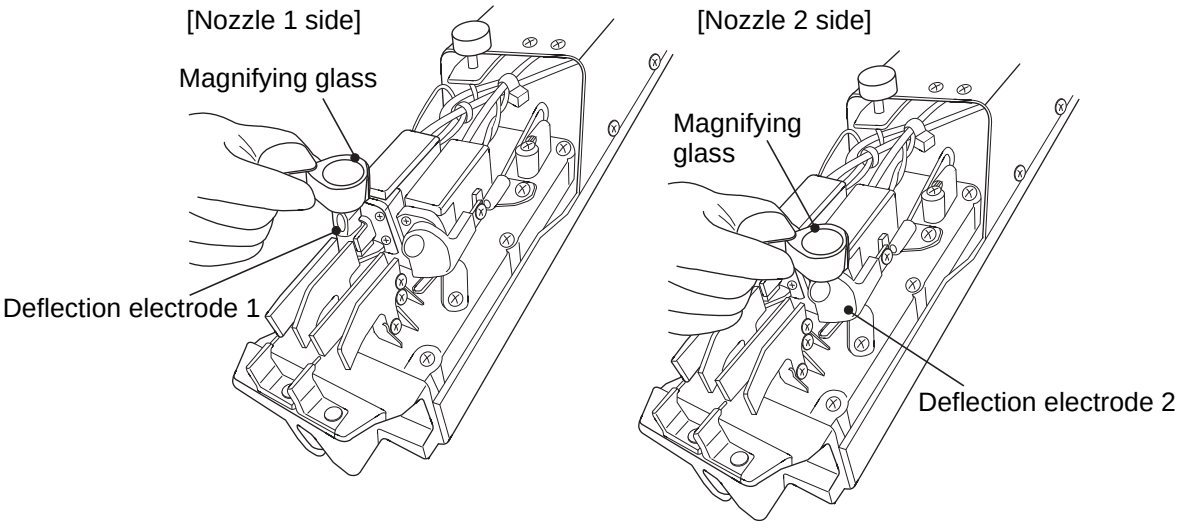
⚠ WARNING

- **Wear protective gear (goggles and mask).**
- **If the ink or makeup gets in your eyes or mouth, immediately rinse with warm water and consult a doctor.**
- **Perform work after confirming that there is no one in the ink ejection direction. (Perform this work by inserting the print head tip into a beaker, etc.)**

1 Confirm that the IJ printer is in the Standby state and then remove the print head cover.



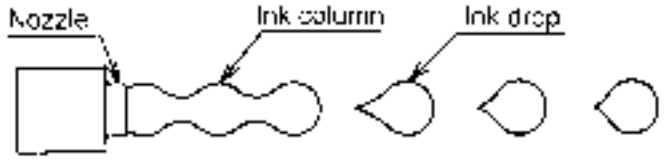
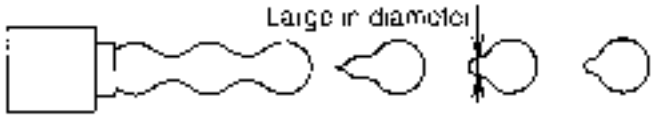
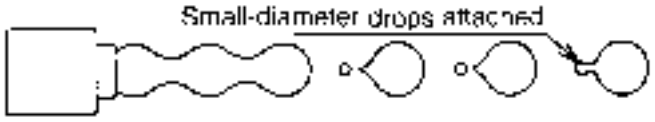
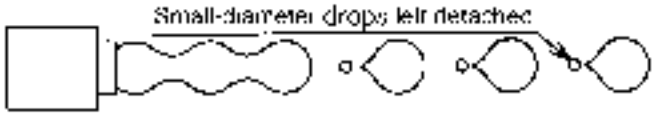
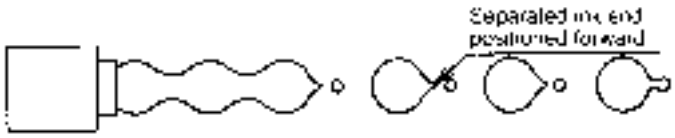
2 Using a magnifying glass, observe the ink drops in the charging electrode.



⚠ CAUTION

- **Don't stare at the red LED for a long time OR it may adversely affect your eyes.**

Ink drops creation state confirmation table

Ink drop shape	Judgment	Name	Remarks
	○	A mode	Good
	○	B mode	Perfect
	○	High-speed small-diameter mode Two or fewer small-diameter drops	Allowable
	×	Constant-speed small-diameter mode	Not allowed
	×	Low-speed small-diameter mode	Not allowed

When the shape of the ink drops is not allowed, update to the optimum set value at par. “6.10 Excitation V adjustment” and check again. Or contact your local distributor.

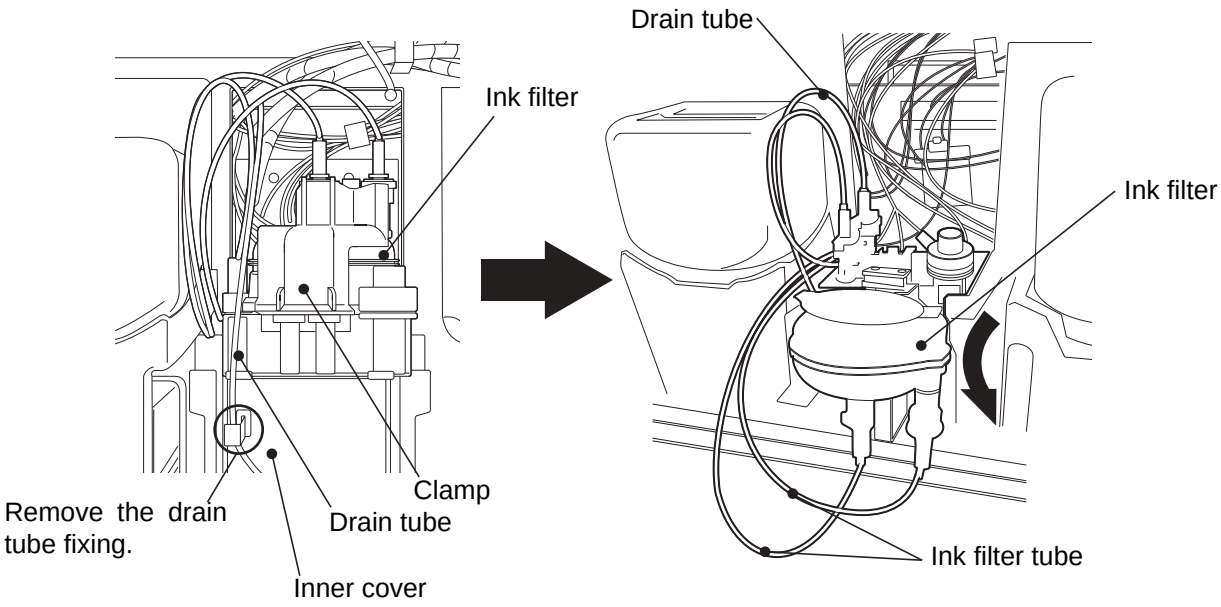
3 **After the check, install the print head cover.**

6.12 Draining ink from the main ink tank

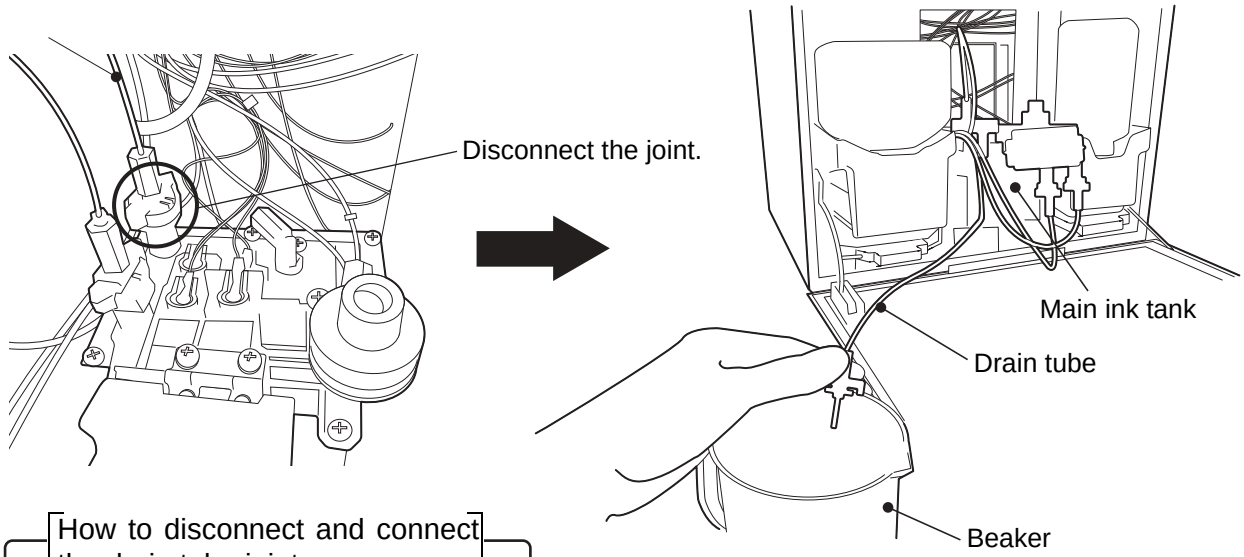
- When the main ink tank full fault is generated, the ink cannot be drained by screen operation. Drain the ink and refill with new ink as follows:

1 **Disconnect the drain tube of the main ink tank as shown in the figure below and drain the ink in the tank by approximately 50 ml.**
After draining, return the ink filter and the drain tube to their original positions.

- Open the maintenance cover and remove the inner cover.
- Remove the drain tube from the fixing part of the inner cover (B).
- Pull down the clamp toward you and turn the ink filter upside down.

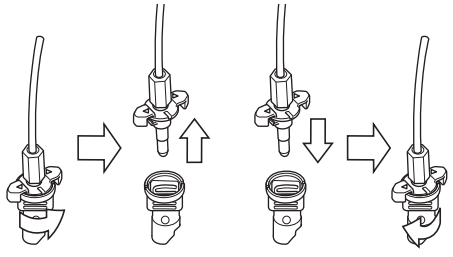


- Disconnect the drain tube from the main ink tank and insert it into the beaker.
  *Set the beaker at a position lower than the main ink tank.



How to disconnect and connect the drain tube joint

<Disconnecting> <Connecting>



Clean the tip of the drain tube with makeup after using.
Failure to clean the tip of the drain tube may result in clogging and ink cannot be drained next time.

2 **Return the circulation system to its original state and display the Circulation control screen and press the Ink refill → Start/Continue.**

*Note that if operation is started without refilling the ink, a “Replenishment Time-out” fault will be generated.

⚠ CAUTION

- **If the ink is accidentally spilled, quickly wipe if off with wiping paper, etc. In addition, do not close the maintenance cover until you confirm that the wiped part is completely dry.**

6.13 Testing operation of solenoid valve and pump

● The operation confirmation of solenoid valve and pump is performed.

① Supply valve	(MV1)	② Replenishment valve	(MV2)	③ Recovery valve	(MV3)
④ Agitation valve	(MV4)	⑤ Circulation valve	(MV5)	⑥ Pressure relief valve	(MV6)
⑦ Makeup valve	(MV7)	⑧ Cleaning valve	(MV8)	⑨ Shutoff valve	(MV9)
⑩ Pump		⑪ Viscosity meter	(MV10)	⑫ Recovery valve 2	(MV23)
⑬ Circulation valve 2	(MV25)	⑭ Cleaning valve 2	(MV28)	⑮ Shutoff valve 2	(MV29)

●If circulating system can not be operated due to no ink ejection, ink overflow from the gutter and such, there are possibilities of solenoid valve or pump failure. Please perform operation test under service personnel's guidance.

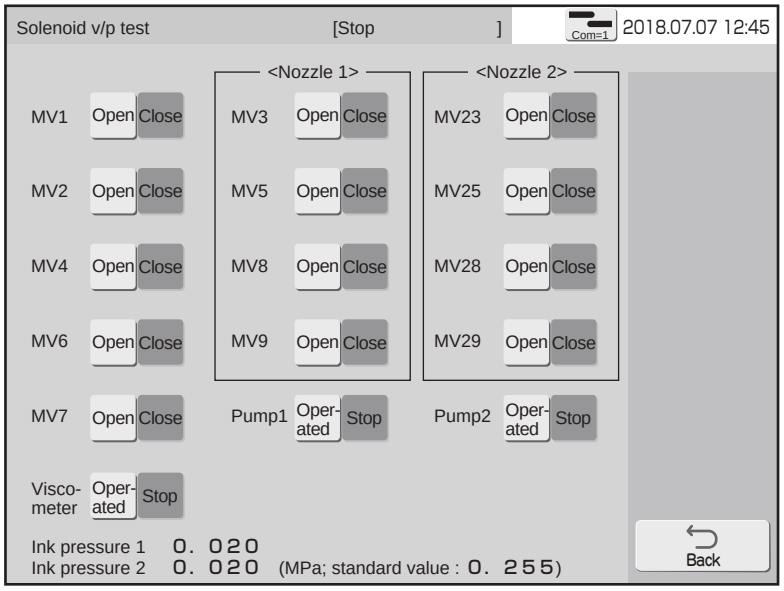
●In an operation state, only an operating state is displayed.

Different operations by state

Ink stop state	Except for Ink stop state
The operation confirmation of solenoid valve and pump is performed (Operates each valves individually).	Displays operating state only. Operating test such as open/close valve cannot be performed.

1 **At the maintenance menu, press Solenoid valve / pump test.**

The solenoid valve / pump test screen is displayed.



2 **Press operation button.**

The operating state of the solenoid valve and the pump is displayed.
(Confirm the operation by an operating sound.)

Open : The solenoid valve is opened.
Close : The solenoid valve is closed.
Operated : The pump is operated.
Stop : The pump is stopped.

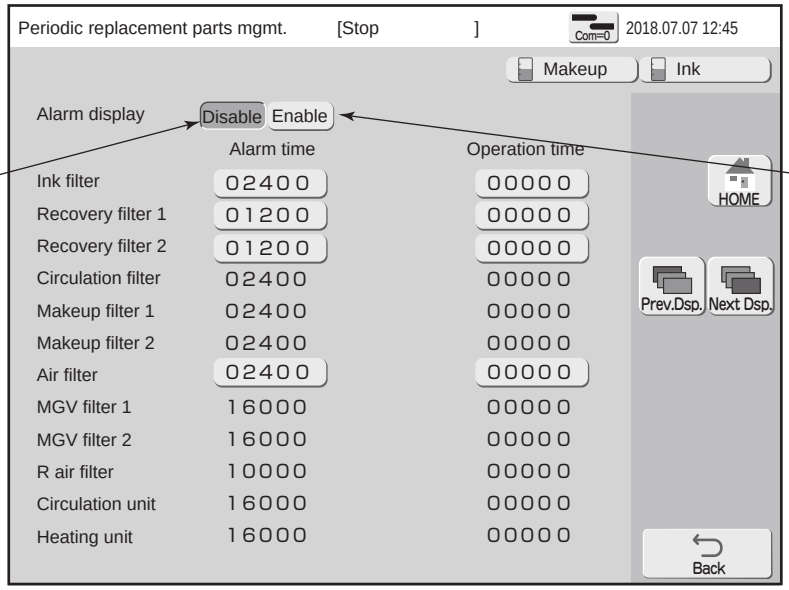
6.14 On-Screen reminder for maintenance parts replacement

- When the maintenance parts replacement period arrives, a message that informs the operator can be displayed.
  (Objective maintenance parts)
  "Ink filter, Recovery filter 1, Recovery filter 2, Air filter, Controlling air filter L, Controlling air filter R".
- The maintenance parts operating time is incremented by 1 each hour in the ink ejection state.
- When the maintenance parts operating time exceeds the alarm time, the message "Parts life Expired" is displayed.

1 **Press Periodic replacement parts mgmt. in the maintenance menu.**

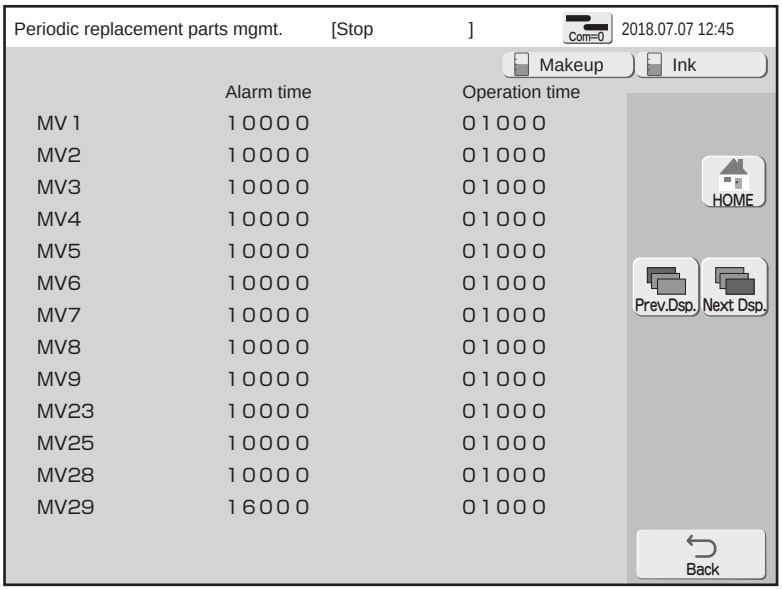
The Periodic replacement parts mgmt. screen is displayed.

"Disable" is selected as the initial value.

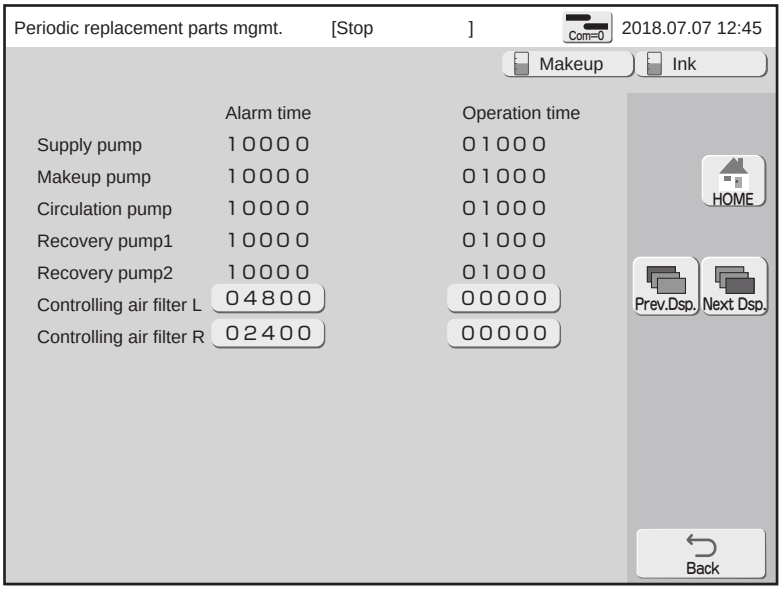


When"Enable"is selected, when the operating time exceeded the alarm time, the message "Parts Life Expired" is displayed.

(2-page)



(3-page)



2 **Set "Alarm display" to "Enable".**

3 **Press Back.**

6.15 Long-term Shutdown

⚠ CAUTION

- **A special work is required to perform the Long-term Shutdown procedure. It is recommended to contact your local distributor and ask for the work. Should you desire to conduct the work by yourself, the cautions must be fully understood beforehand. It is recommended to contact the local distributor and ask for an advice even you desire to conduct it by yourself, too.**
- **Even the Long-term shutdown is conducted, ink fixing may occur in the circulation system depending on the ink or the storage temperature or the storage period. It is strongly recommended to contact your local distributor and ask for the work when you conduct "Startup process after long-term shutdown", especially in case the storage temperature is high (30 degrees Celsius or more) or the storage period exceeds 6 months.**
- **To secure safety, make sure to follow the procedures explained in "6.15.2 Startup process after long-term shutdown".**
- **When the IJ Printer was left for a period of time without conducting Long-term shutdown, make sure to follow the procedures explained in "6.15.2 Startup process after long-term shutdown".**
- **In "6.15.2 Startup process after long-term shutdown", should the circulation system be operated continuously when the printer does not operate normally, the pressure in the recovery line would be increased and it is going to be dangerous. There is a possibility that the ink is ejected from the nozzle strongly or the ink is reversely ejected from the gutter strongly. In such cases, stop the printer operation immediately and contact the local distributor.**

6.15.1 Process prior to long-term shutdown

(1) Overview

- This operation is the storage work performed when the IJ printer is shut down for exceeding the period indicated in Table 1.
- The storage procedure for long-term shutdown is completed by draining the ink from the ink circulation system and cleaning it with the makeup.

Table 1 Storage temperature and its period

Storage temperature	Shutdown Period Guideline *1
0 to 35 ℃	3 weeks
35 to 40 ℃	2 weeks
40 to 45 ℃	1 week

*1: Maximum period when the printer can be continuously shutdown without being operated.
- The figures in the table are for MEK-based ink.
- Handling of ink other than the above requires special handling in accordance with the handling guidance of each ink.
- Please note the ink may harden within a week when it is stored in 45℃ or higher.

⚠ CAUTION

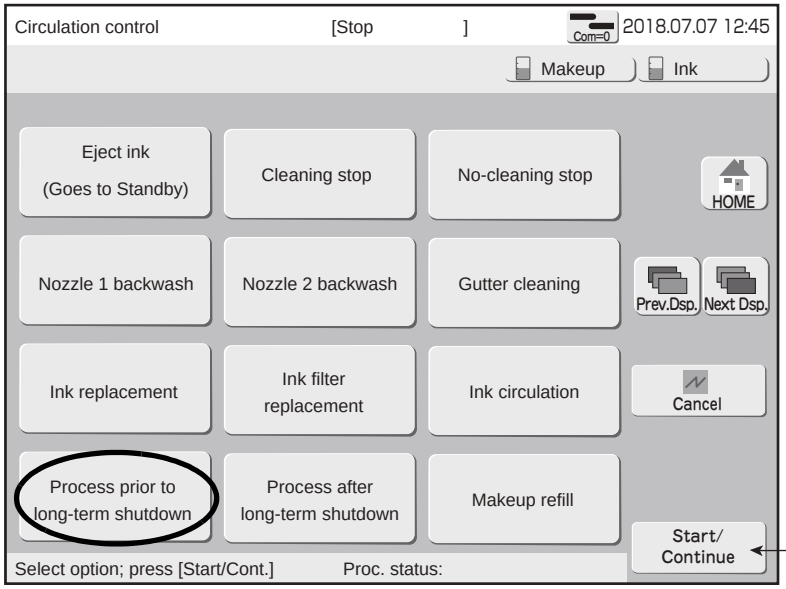
1. Store the printer at a temperature as low as possible.
This operation is not necessary in case that the printer can be operated at least once during the period indicated in Table 1. Follow Instruction manual "1.5 Cautions on operating time when printer is in service" and Handling guidance of each ink as to the operating time.
2. Even the process prior to long-term shutdown is conducted, ink fixing may occur in the circulation system depending on the ink or the storage temperature or the storage period.
3. If the printer was shutdown for a period mentioned above without conducting the long-term shutdown, check the printer status in "6.15.2 Startup process after long-term shutdown, 1 Operation check". If the problem exists, contact your local distributor.

(2) Operating procedure

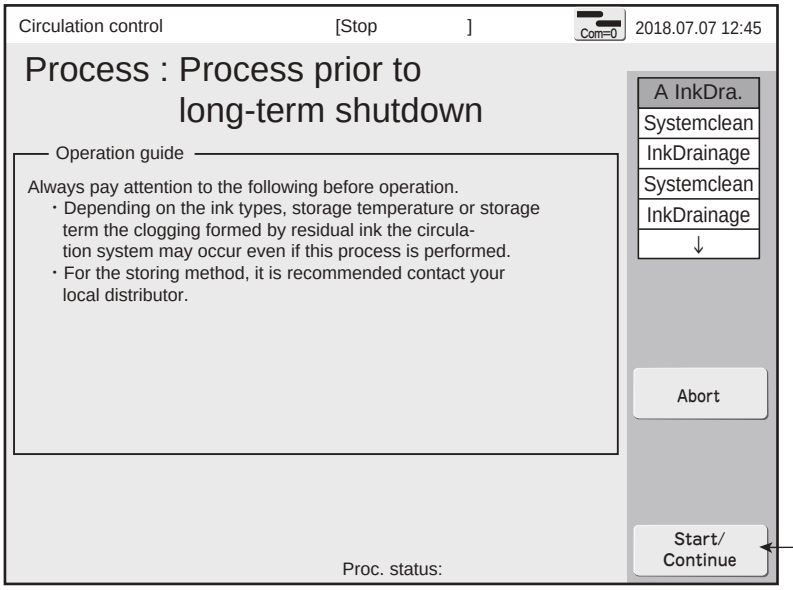
⚠ WARNING

- **Wear protective gear (goggles and mask).**
- **If the ink or makeup gets in your eyes or mouth, immediately rinse with warm water and consult a doctor.**
- **Perform work after confirming that there is no one in the ink ejection direction. (Perform this work by inserting the print head tip into a beaker, etc.)**

1 **Open the "Circulation control" screen, and press the Process prior to long-term shutdown key and the Start/Continue key.**



2 **The following guidance appears. Confirm the message and Press Start/Continue key.**

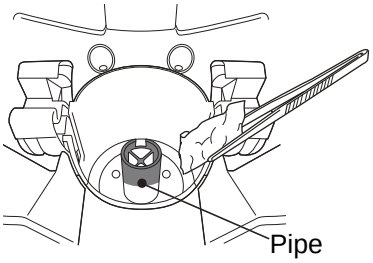


3 **Drain the Ink.**

Perform procedures 2-(a) to 2-(e) of (2) operation in "6.3 Replacing the ink".

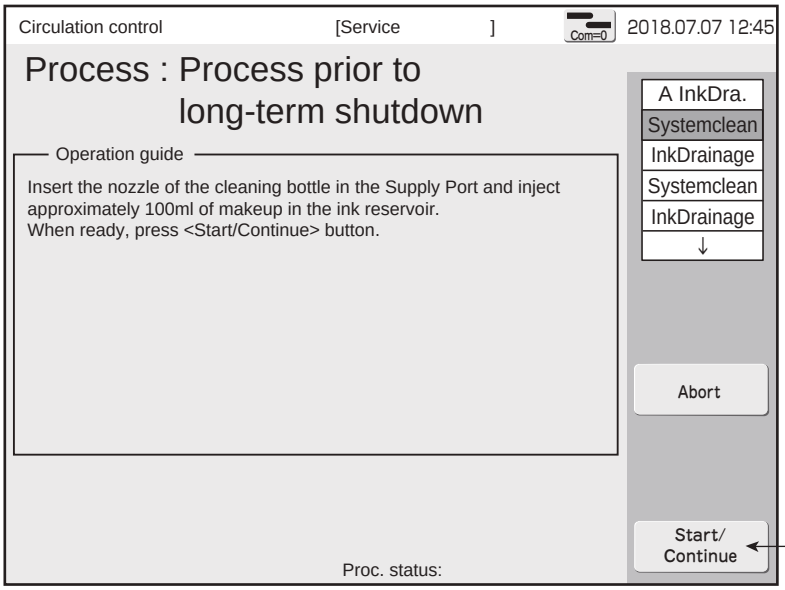
- Conduct until ink drainage.
- Perform operation in accordance with the operation guide on the screen and drain the ink.

4 **Release the ink-side Lock Pin and remove the empty ink cartridge bottle.**
Wipe the pipe surface of the ink reservoir up using wiping paper dampened with makeup.
Be careful not to damage the pipe.

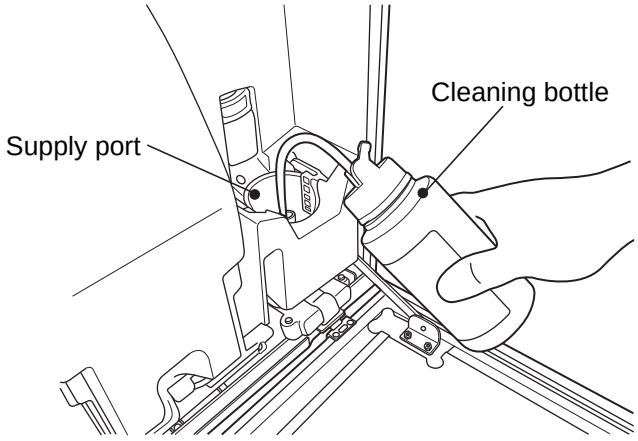


5 **Clean the circulation system.**

● Perform operation in accordance with the operation guide on the screen.



(a) Insert the nozzle of the cleaning bottle in the supply port and Inject approximately 150ml of makeup int the ink reservoir..



⚠ CAUTION

If ink is accidentally spilt, wipe it up promptly with wiping paper or equivalent.
In addition, do not close the maintenance cover until you are sure that the wiped area is completely dried.

(b) Press Start/Continue .

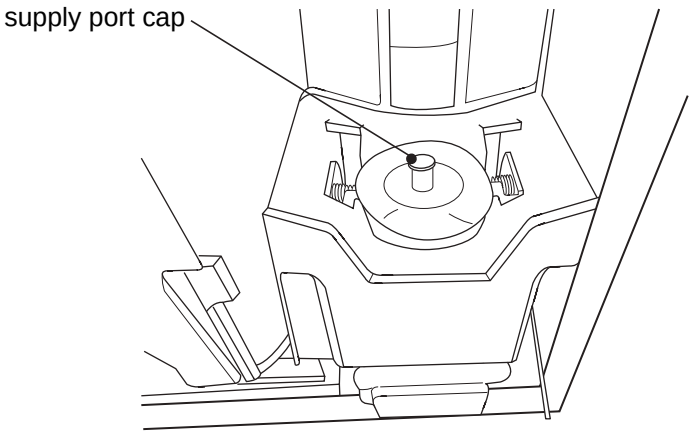
● Cleaning in the circulation system starts.

6 **Repeat steps 4 and 6 one more time.**

(Perform the ink drainage four times; circulation system cleaning four times)

7 **Insert the nozzle of the cleaning bottle in the Supply Port and inject approximately 100ml of makeup in the ink reservoir.**

8 **Mount the supply port cap on the ink supply port.**



9 **Mount the nozzle rubber seal.**

● Mount the "nozzle rubber seal" between the charge electrode and the orifice plate.

⚠ CAUTION

1. Before installing the nozzle rubber seal, be sure to thoroughly clean it with the makeup.
2. When installing the nozzle rubber seal, be careful not to deform the charge electrode.

The "Process prior to long-term shutdown" is now completed.
The circulation system is now charged with the makeup.
When starting up the printer after a long-term shutdown, be sure to perform the "6.15.2 Startup process after long-term shutdown."

6.15.2 Startup process after long-term shutdown

[Overview]

- This operation is the work for draining the makeup which cleaned the ink circulation system at "Process prior to long-term shutdown" and the work for refilling it with the ink.
- To completely drain the makeup from the circulation system, you should charge the circulation system with the ink, drain the ink, and refill the ink into the system.
- To secure safety, conduct " 1 Operation check" before "Startup after long-term shutdown".

⚠ CAUTION

Make sure to conduct "1 Operation check" before "Startup after long-term shutdown". If the printer does not operate normally after operation check, a special work is required for restoration. Contact your local distributor. Should the circulation system be operated continuously before normal operation is confirmed, the pressure in the recovery line would be increased and it is going to be dangerous. There is a possibility that the ink is ejected from the nozzle strongly or the ink is reversely ejected from the gutter strongly. In such case, stop the operation immediately and contact the local dis-

1 Procedure of the operation check

⚠ WARNING

- **Wear protective gear (goggles and mask).**
- **If the ink or makeup gets in your eyes or mouth, immediately rinse with warm water and consult a doctor.**
- **Perform work after confirming that there is no one in the ink ejection direction. (Perform this work by inserting the print head tip into a beaker, etc.)**

(a) Remove the nozzle rubber seal.

(b) Press "Solenoid valve/pump test" on Circulation maintenance screen to confirm that each valve of MV1 to MV9, MV23, MV25, MV28 and MV29 operates normally. Refer to Technical manual "6.13 Test of solenoid valve/pump" for detail. (It is operating normally if the solenoid valve gives out the operation sound.)

⚠ CAUTION

The solenoid valve maybe firmly fixed if the operational sound is not heard. For restoration, a special work is required. Contact your local distributor.

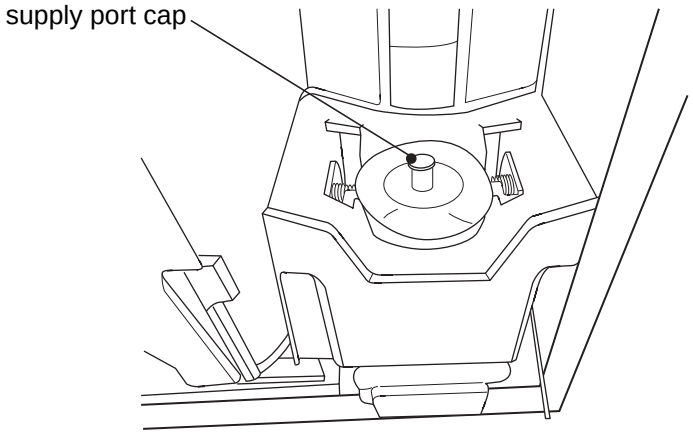
(c) Open the "Circulation control" screen, and press the Ink stream 1 alignment key and then the Start/Continue key.

- Check if the ink stream is going into the gutter and it's in the center of the gutter.
- Check whether the gutter absorbs the liquid.

⚠ CAUTION

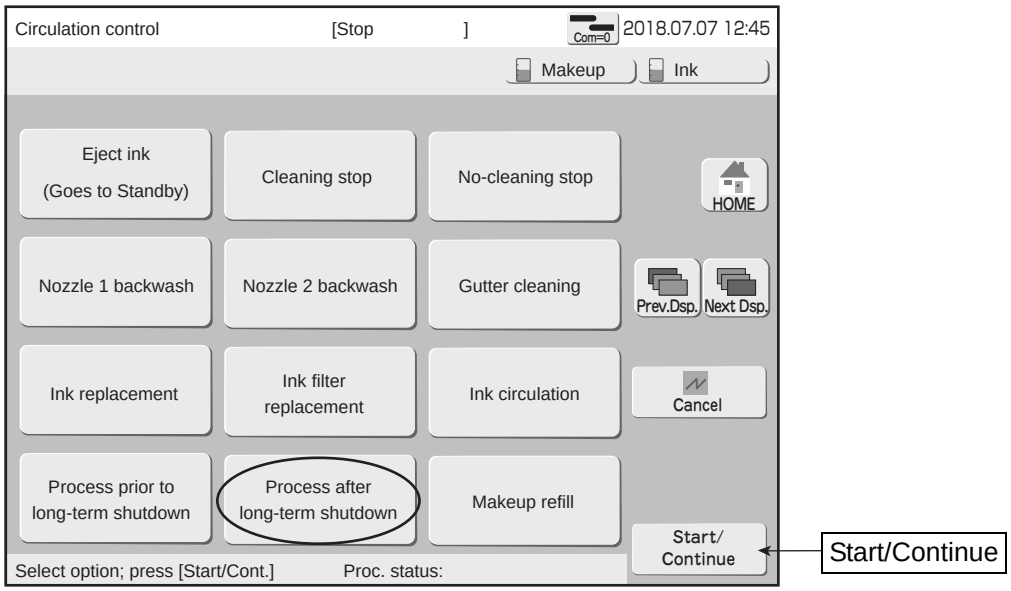
If the ink is not being ejected, press Ink stream 1 alignment key again. An ink fixing may be caused if the ink is not ejected after Ink stream 1 alignment is conducted two times. An ink fixing may be caused if the suction of the liquid is not confirmed. A special work is required for restoration. Contact your local distributor. If the "Ink steam bending" occurs, refer to Technical manual "6.4 How to correct ink stream bending and nozzle clogging" for restoration. If the ink stream bending is not corrected, a special work is required. Contact your local distributor.

(d) Remove the supply port cap on the ink supply port.



2 Operating procedure- "Process after long-term shutdown"

(a) Open the "Circulation control" screen, and press the Process after long-term shutdown key then the Start/Continue key.



(b) Follow the on-screen instructions for the operation.

- Repeat the same procedure twice as explained in "6.3 Replacing the ink".

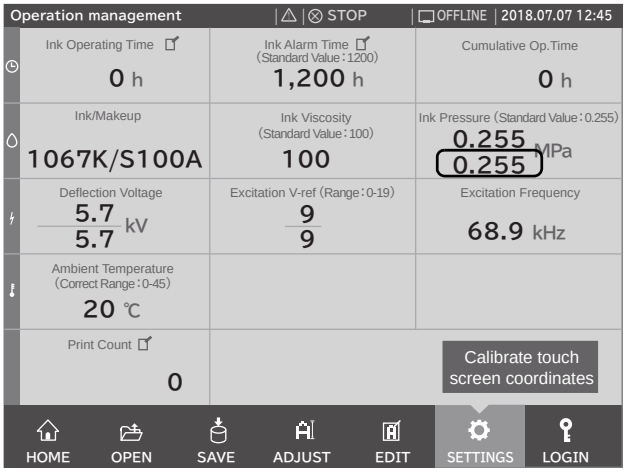
(c) At the end of operation, screen returns to the Circulation control screen.

⚠ CAUTION

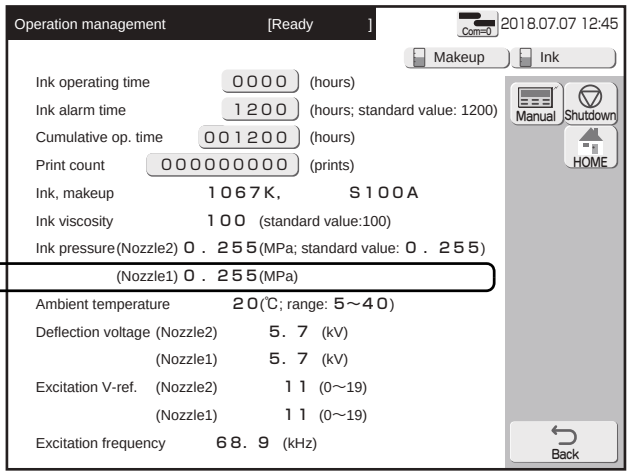
Put the end of print head into the beaker then press Ink refill key and Start/Continue key. The ink will be ejected in a few minutes.
If the ink does not eject after pressing Ink refill key and Start/Continue key or "Ink pressure low" or "No ink drop charge" is displayed, a special work is required for restoration. Contact the local distributor near you.
Ink may be hardened in the viscometer when the message of "Viscosity Reading Out of Range" is displayed on the screen. A special work is required for restoration. Contact the local distributor near you.

3 Open the "Operation management" screen. Arbitrarily rotate the handle of Pressure-reducing valve clockwise/counterclockwise and check if the pressure changes. After confirming the change, adjust the valve and set the Ink pressure to standard setting with a tolerance of 0.002.

(a) New HMI



(b) Previous HMI



⚠ CAUTION

A special work is required when the Ink pressure does not change by rotating the handle of Pressure-reducing valve. Contact your local distributor.

The "Startup process after Long-term shutdown" is now completed.

7. MAINTENANCE SERVICE

● For the IJ printer to operate smoothly, the following maintenance work is necessary.

⚠ CAUTION

Use Hitachi approved consumables and periodic replacement parts.
Using products that are not designated by Hitachi could cause s failure in certain functions.

(1) Replacement of consumables

Replace the following filters according to the “Replacement guideline”.

No.	Consumable	Replacement guideline	Replacement procedure description
1	Ink filter	2,400h	"6.7 Replacing the ink filter"
2	Recovery filter 1	1,200h	"6.8.1 Replacing the recovery filter 1 "
3	Recovery filter 2	1,200h	"6.8.2 Replacing the recovery filter 2 "
4	Air filter	2,400h	"7.(4) Replacing the circulating air filter"
5	Controlling Air filter R	4,800h (L) 2,400h (R)	"7.(5) Replacing the controlling air filter"

- In the case of standard operation (8 hrs/day, 25 days/month operation), 2400 hours corresponds to 1 year.
- The minimum retention period of IJ printer repair parts, including consumables, is 7 years after discontinuation of manufacture.
- When ordering consumables, please specify the following order name and part code No.

No.	Consumable	Order name	Part code No.	Remarks
1	Ink filter	Filter capsule parts	451867	
2	Recovery filter 1	Mini filter	451857	2 pcs/pack
3	Recovery filter 2	Nozzle flat filter 75	451037	
4	Air filter	Air filter AF3 parts	451963	2 pcs/pack
5	Controlling Air filter R	Air filter AF4 parts	-	2 pcs/pack

(2) Other maintenance

a. About once a week, check whether or not the pump makes an abnormal sound (metal sound, etc.).
b. Before performing print state check at the start of operation, check whether or not the pressure is suitable.
(See par. “6.9 Adjusting the pressure” for a description of the check procedure.)
c. For a description of ink drops and excitation voltage checks, see pars. “6.10 Excitation V adjustment” and “6.11 Ink drops state check method”.

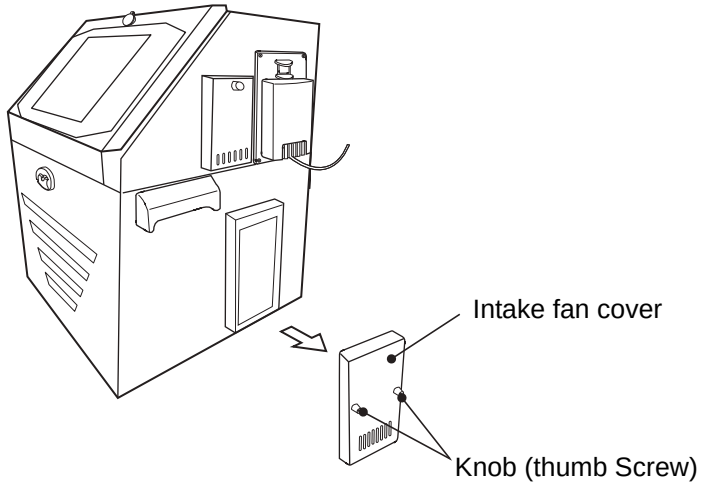
(3) About periodic replacement parts

a. To use the IJ printer stably, clock battery, circulation system parts (pump, solenoid valve, etc) and heating unit must be periodically replaced. Please consult your nearest local distributor.

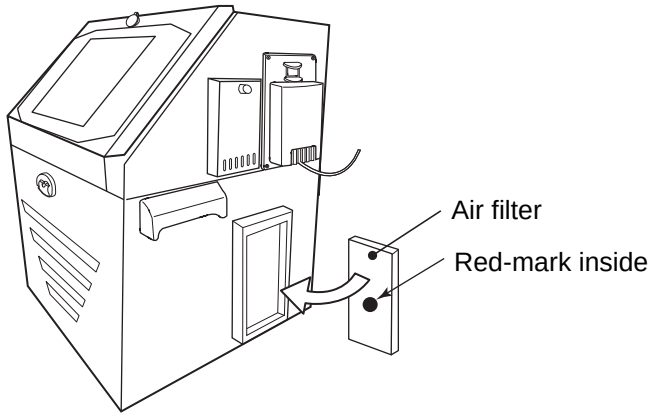
(4) Replacing the circulating air filter

1 **Trun off the power.**

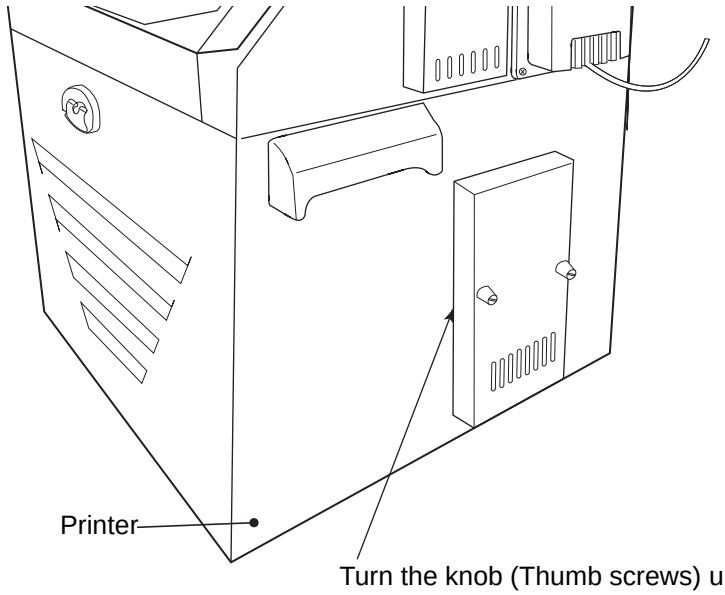
2 **Loosen the knobs (thumb screws) and remove the intake fan cover.**



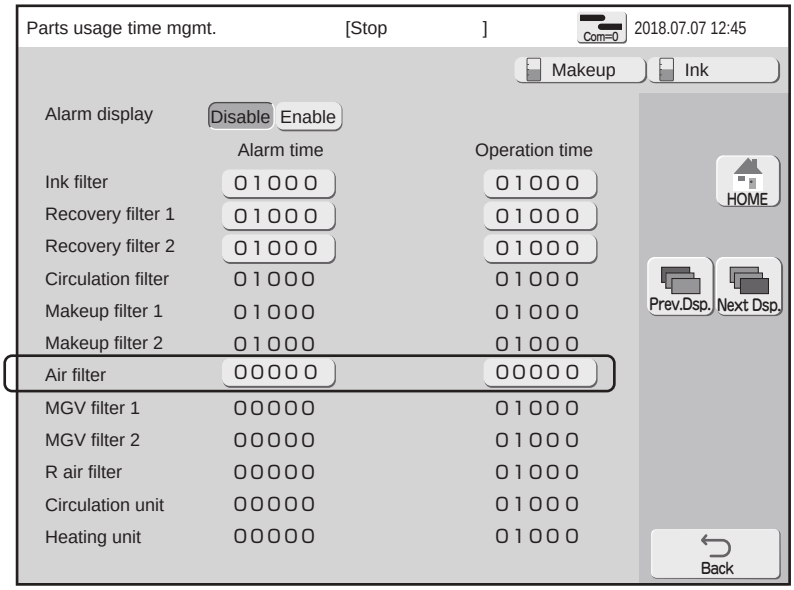
3 **Remove the old filter and set the new filter.**
(Please set the new filter with red-mark being invisible.)



4 **Set the intake fan cover. (Turn the knobs until the intake fan cover comes into contact with the printer.)**



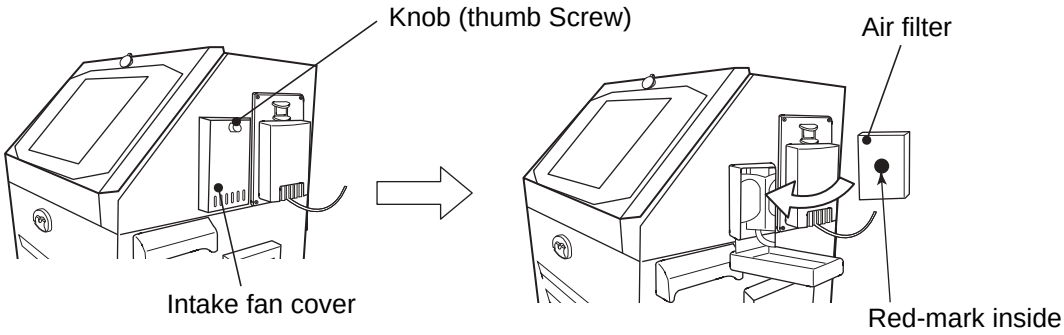
5 **Open the Part usage time mgmt. screen (menu 2 of the Circulation control screen) and set the time of the air filter to “0”.**



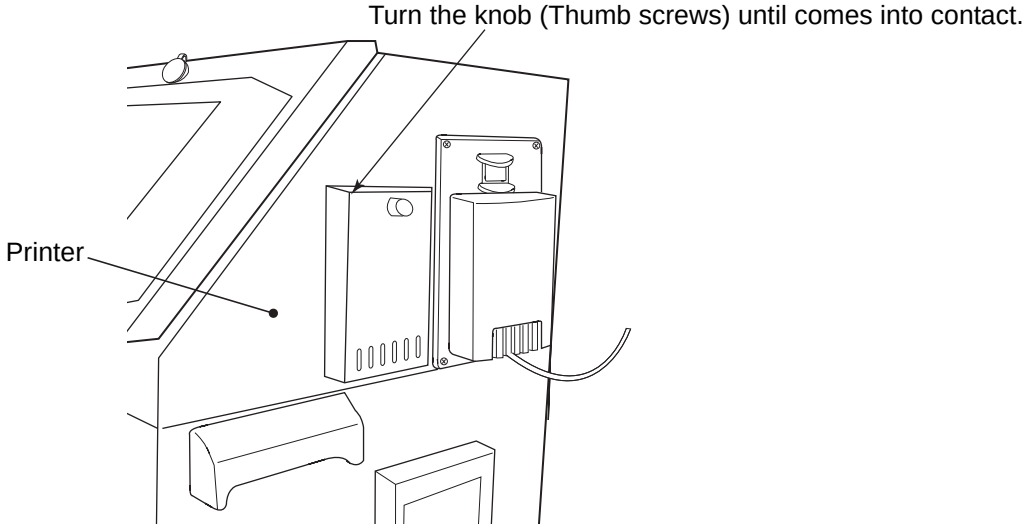
(5) Replacing the controlling air filter

1 **Trun off the power.**

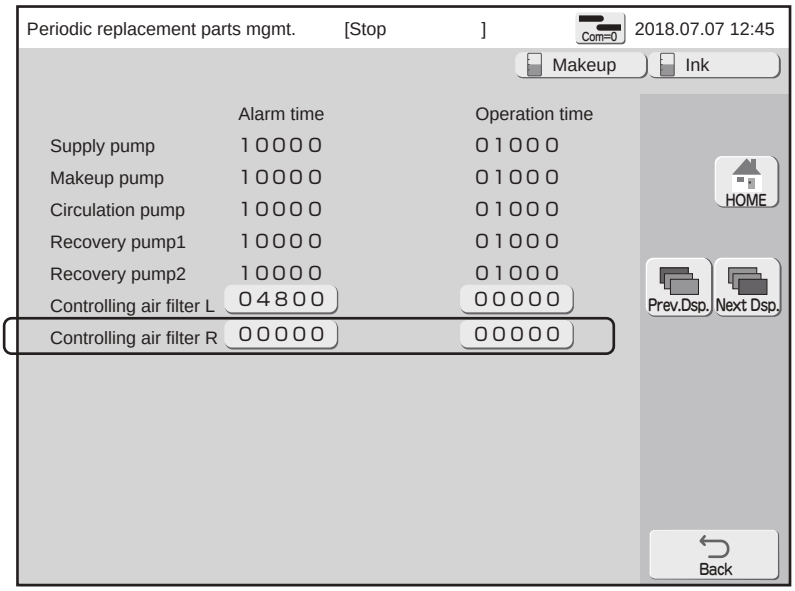
2 **Loosen the knobs (thumb screws) and remove the intake fan cover. Remove the old filter and set the new filter. (Please set the new filter with red-mark being invisible.)**



3 **Set the intake fan cover. (Turn the knobs until the intake fan cover comes into contact with the printer.)**



4 **Open the Part usage time mgmt. screen (menu 3 of the Circulation control screen) and set the time of the Controlling air filter R to “0”.**



About maintenance service

If trouble or damage occurs within 1 year after delivery or accumulated operating time of 2400 hours, whichever is sooner, repairs will be made free of charge. However, the following cases are outside the warranty even within the free warranty period:

(1) When trouble was due to handling outside the instruction manual
(2) When materials and parts other than ours, including the ink, were used and damage was caused by them
(3) When repair was performed by other than us or our designated representative and damage was caused by this
(4) When trouble was due to external causes (abnormal print material, etc.) other than this equipment or by moving or transportation of the equipment after delivery
(5) When operated in a usage environment outside the specifications of par. “12. Specifications” of the instruction manual.
(6) When damaged by fire, water, or other natural disaster

Loss of production due to down time and physical loss due to trouble or error of delivered equipment (loss of print material, related facility, etc.) is outside the warranty. If trouble occurs, an engineer shall be dispatched as quickly as possible and maximum efforts will be made so that the down time is as short as possible.

If there is no danger of being misread, excessive or insufficient dot configuration shall be considered allowable.

The IJ printer has an alarm function to prevent major printing faults before they happen, but this function does not inspect the quality of the printed characters.
Consideration shall be given so that the printed character state is visible at some process.

Parts retention period

The retention period of the performance parts for repair of this equipment is 7 years after discontinuation of manufacture.
“Performance parts for repair” are parts necessary to maintain the functions of the product.

Customer memo: Please fill in for later use.
Useful when communicating with the service in charge.

Your Hitachi sales representative: Tel:

Person in charge:

Your Hitachi distributor: Tel:

Person in charge:

Date of purchase: year month day

8. SCHEMATIC DIAGRAMS

8.1 Outside Dimensions

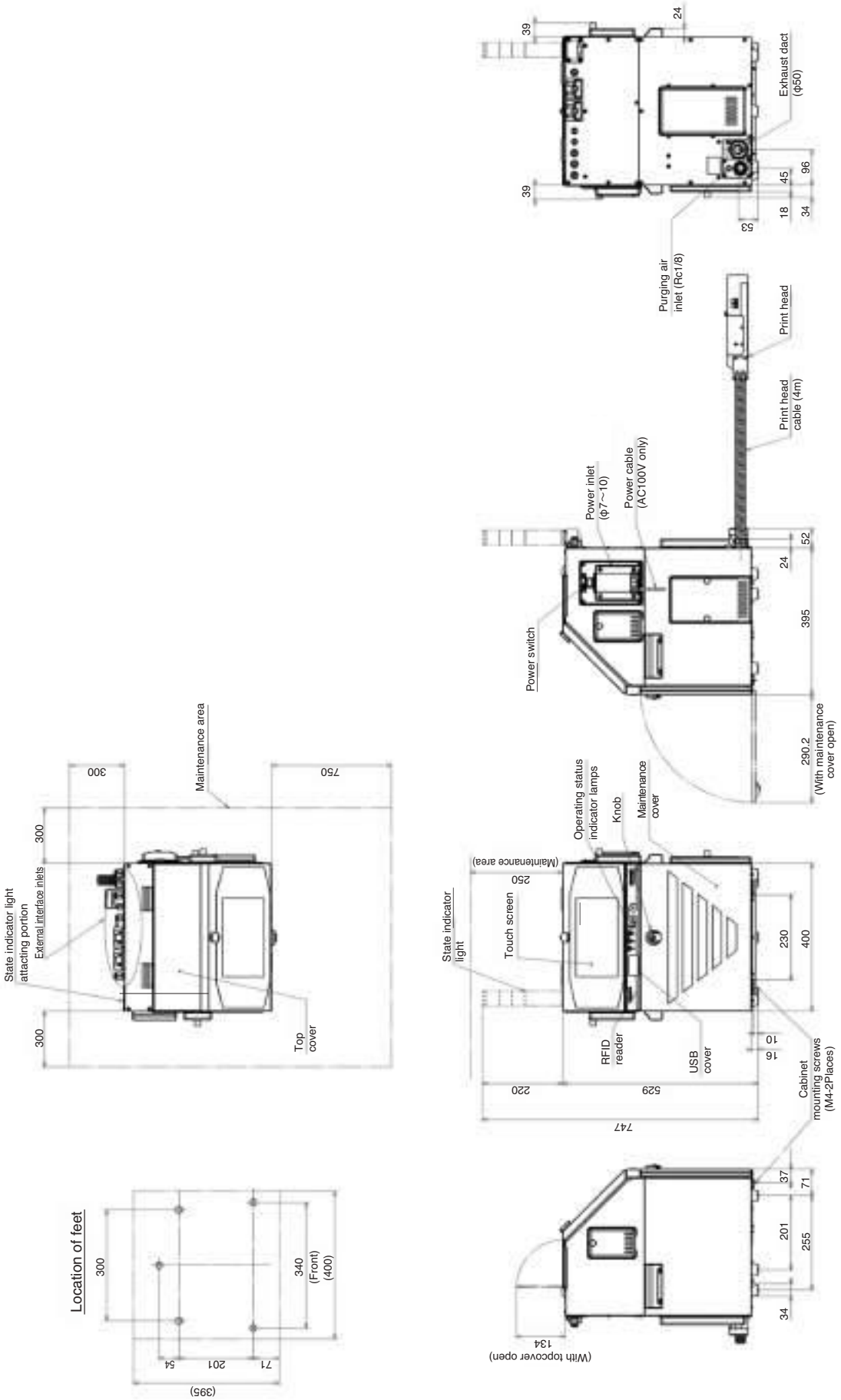


Fig.8-1 Model UX-D860 IJ printer outside dimensions

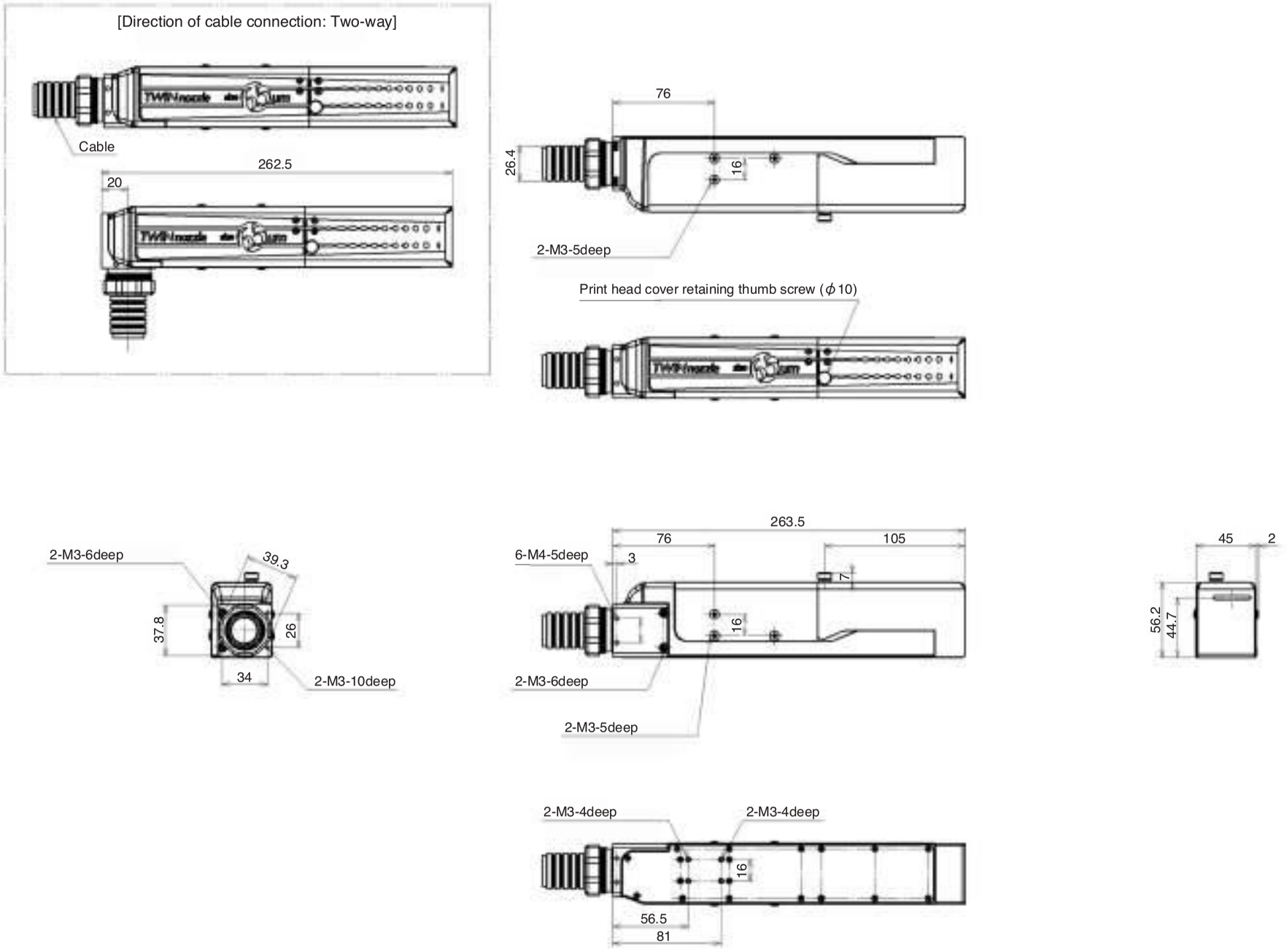


Fig.8-2 Model UX-D860 Print head outside dimensions

8.2 Electrical Connection Diagram

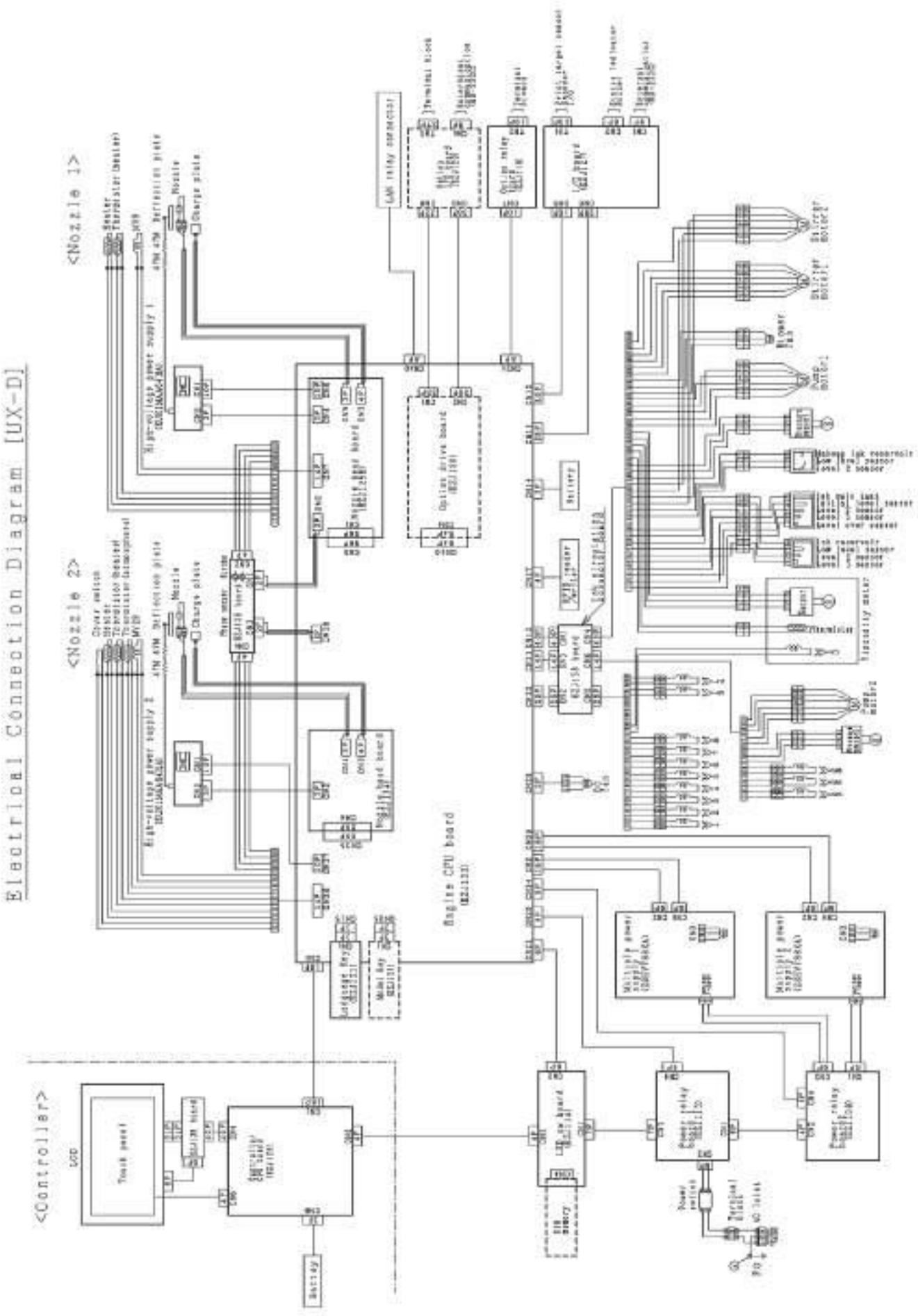


Fig.8-3 Model UX-D860 Electrical connection diagram

8.3 Circulation System Diagram

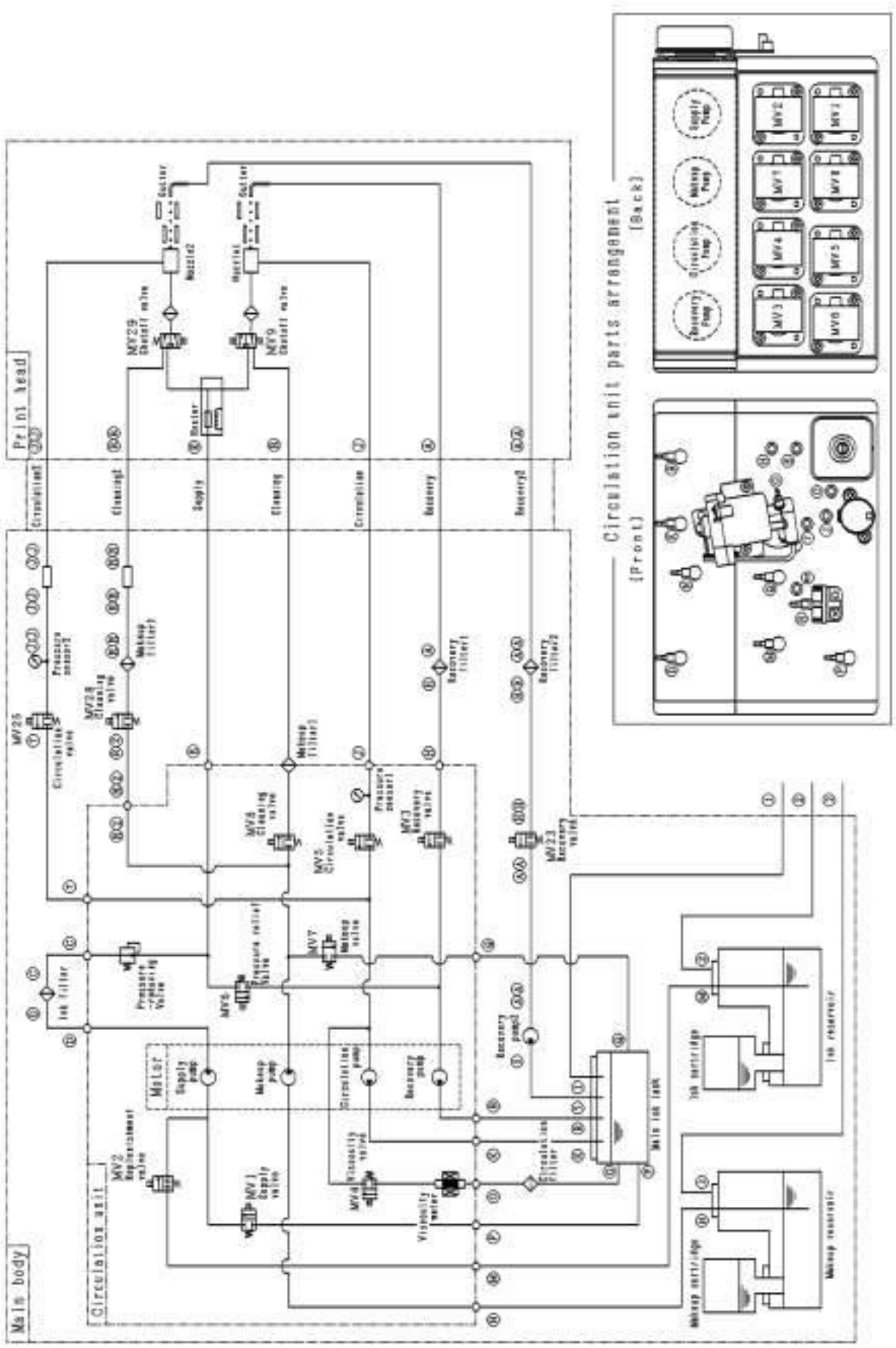
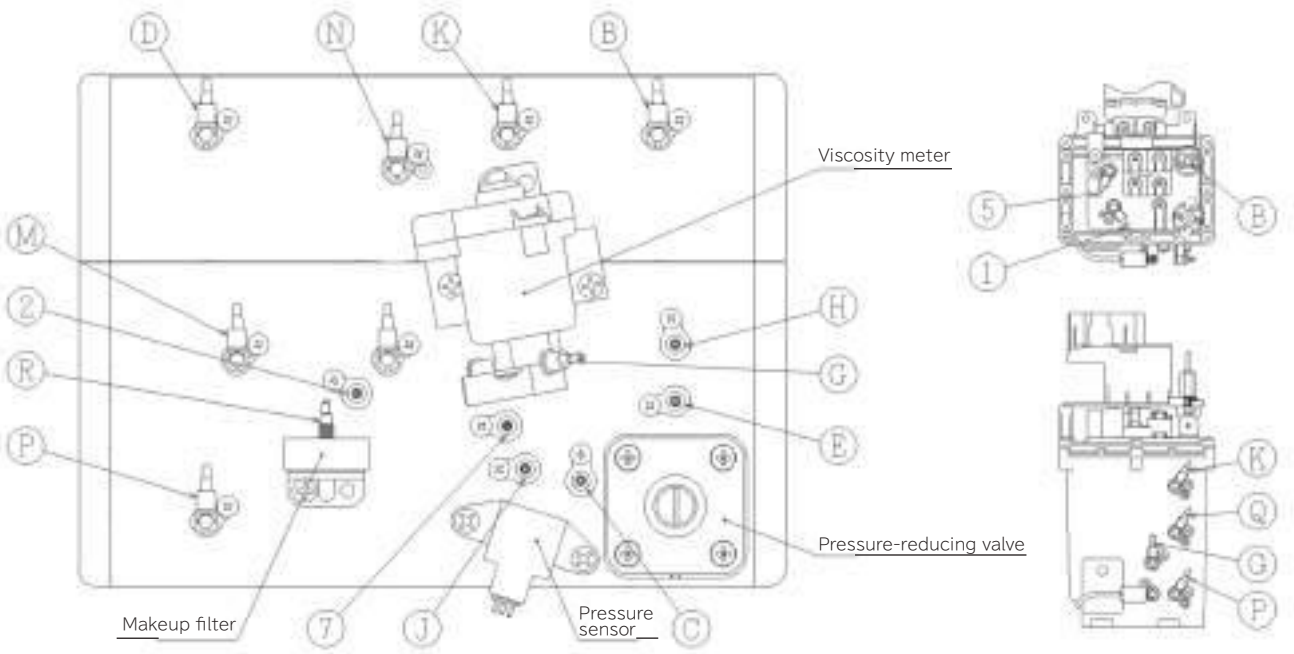


Fig.8-4 Model UX-D860 Circulation system diagram

8.4 Tube Connection

<Front side>



<Rear side>

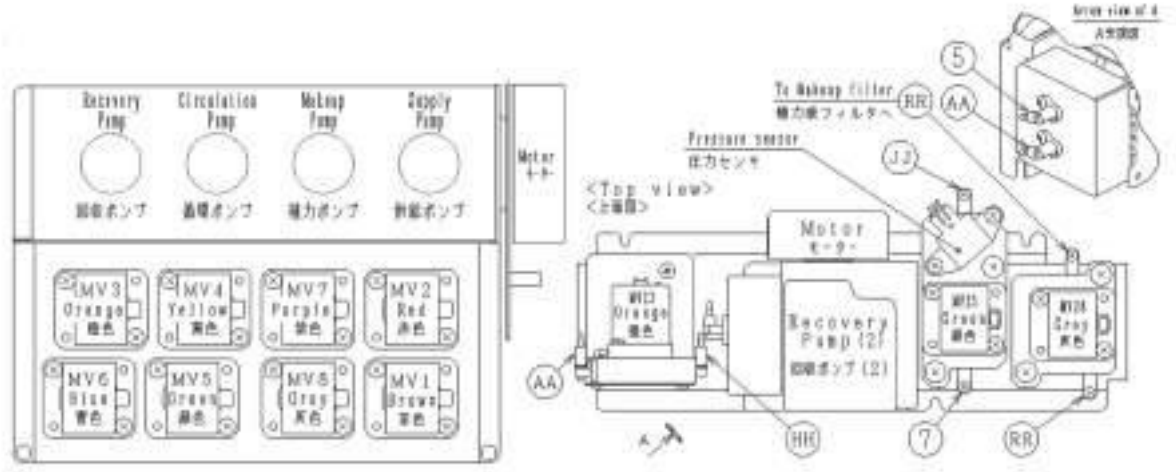


Fig.8-5 Model UX-D860 Tube connection