

# **TOSHIBA**

TOSHIBA Bar Code Printer

## **B-EX Series**

# **Expansion I/O Specification**

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**TOSHIBA TEC CORPORATION**

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## **1. SCOPE**

This specification applies to expansion input/output (I/O) specification for the B-EX series industrial high-performance class general-purpose bar code printers.

## **2. GENERAL DESCRIPTION**

By using the expansion I/O, the printer can feed and issue labels or indicate printer states, according to the external input/output signals, in addition to using commands from the PC. This allows interfacing with external equipment such as a labeler.

### 3. ELECTRICAL SPECIFICATIONS

#### 3.1 Pin Assignment

Connector: FCN-685JO024 or equivalent

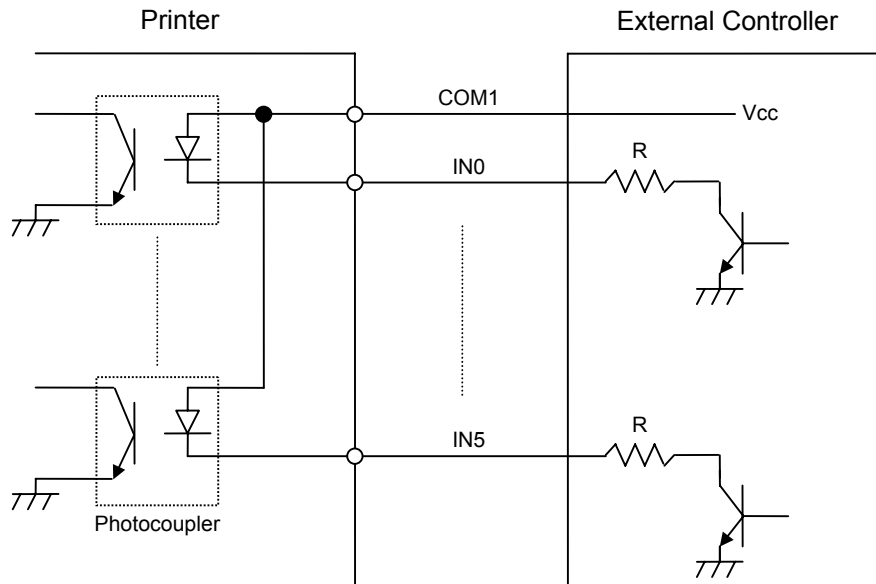
Connector of the controller:  
FCN-781P024-G/P or equivalent

No.	Signal Name	Direction
1	IN0	Input
2	IN1	Input
3	IN2	Input
4	IN3	Input
5	IN4	Input
6	IN5	Input
7	OUT0	Output
8	OUT1	Output
9	OUT2	Output
10	OUT3	Output
11	OUT4	Output
12	OUT5	Output

No.	Signal Name
13	OUT6
14	N.C
15	COM1
16	N.C
17	N.C
18	N.C
19	N.C
20	N.C
21	COM2
22	N.C
23	N.C
24	N.C

#### 3.2 INTERFACE CIRCUIT

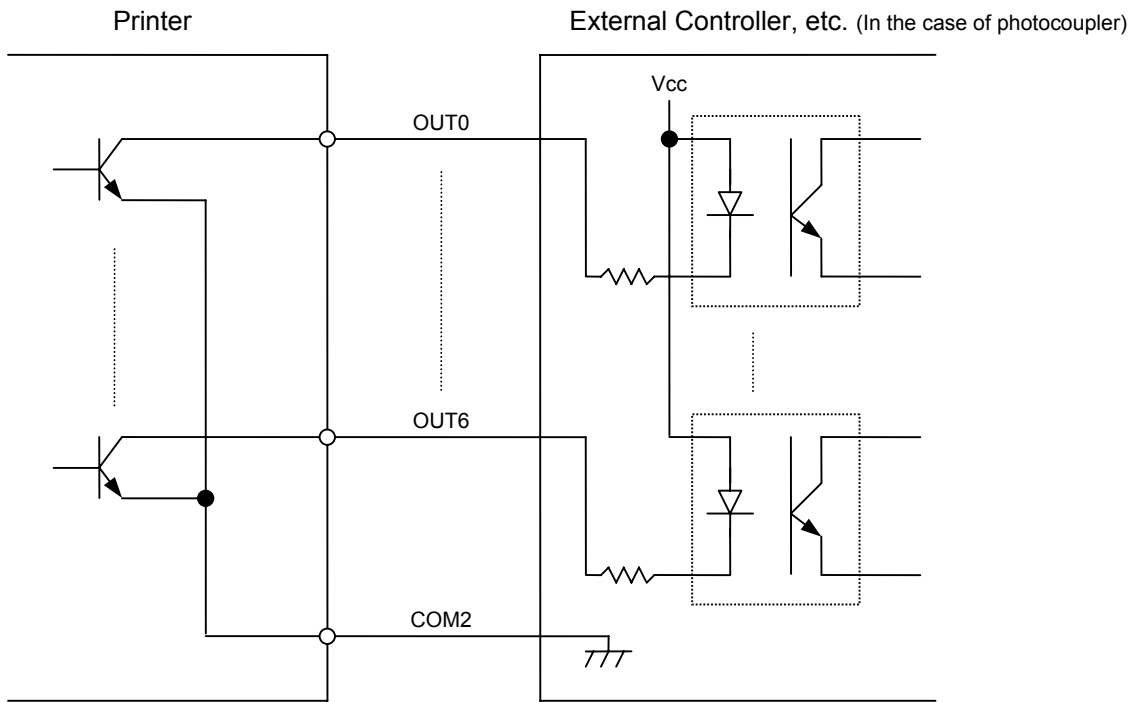
(1) Input circuit



Photocoupler: TLP521 (TOSHIBA)

There are 6 input circuits, and each input is a current loop using the photocoupler. The anode of the photocoupler in each of the 6 circuits is connected to the common pin COM1. The cathodes are independent. The voltage of Vcc is 24 V (max.), while the diode operating current is 16 mA.

(2) Output circuit



There are 7 output circuits, and each output is an open collector. The voltage of  $V_{cc}$  is 24 V (max.), while the drive current is 150 mA.

## 4. SOFTWARE SPECIFICATIONS

There are two types of software specifications: The standard mode and the in-line mode. They can be selected in the system mode setting.

TYPE1: Standard mode

TYPE2: In-line mode

### 4.1 Standard Specifications

#### 4.1.1 Outline of Signals

##### Input

- IN0. FEED .....Feeds one label.
- IN1. ISSUE .....Issues one label.
- IN2. PAUSE .....Temporarily stops label printing.
- IN3. PRE-BACKFEED .....Feeds a label back to the home position.
- IN4. Not used
- IN5. Not used

##### Output

- OUT0. FEEDING .....Indicates the printer is feeding a label.
- OUT1. ISSUING.....Indicates the printer is issuing a label.
- OUT2. PAUSING .....Indicates the printer is in a pause state.
- OUT3. ERROR .....Indicates the printer is in an error state.
- OUT4. Not used .....The signal is always off.
- OUT5. POWER ON .....Indicates the printer power is on (without software control).
- OUT6. RIBBON NEAR END .....Indicates the printer is in a ribbon near end state.

#### 4.1.2 Detailed Descriptions for Signals

[Standard]

INO

FEED

When the signal goes from off to on, the printer feeds one label. When the signal is on at the end of the label feed, the printer feeds one more label.

The FEED signal input while the printer is in any of the following states is ignored.

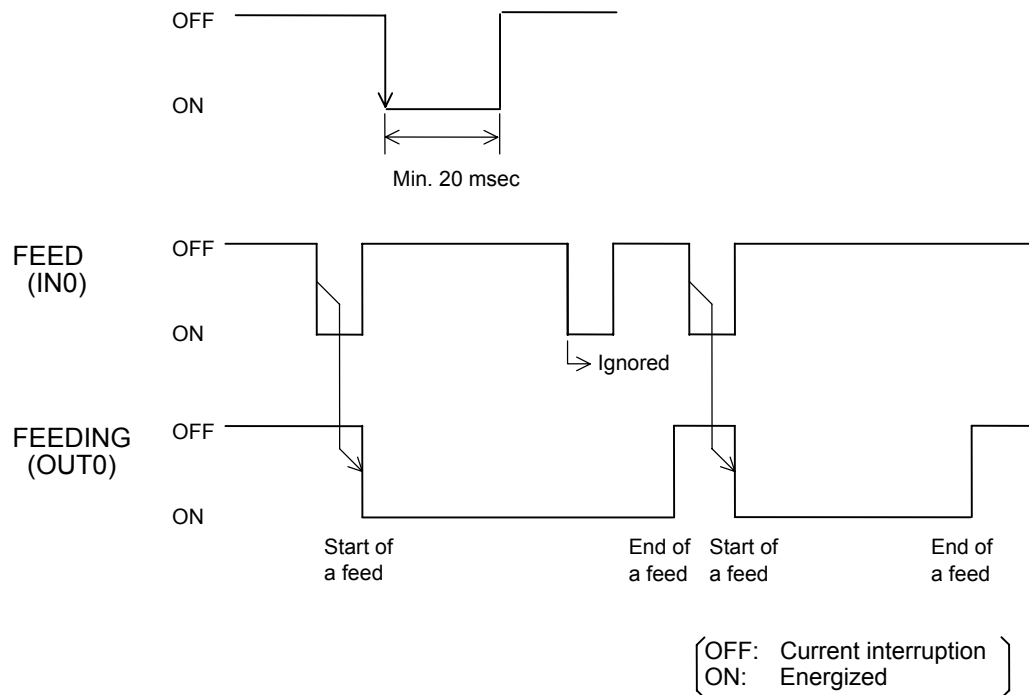
- Issuing
- Feeding
- Ejecting
- Manual feeding
- Checking for print head broken dots
- Waiting for the printed label to be removed
- Command save mode
- Storing writable characters
- Communication error (command error or hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

When the manual forward feed length has been set, the printer feeds the label for the amount equivalent to one label feed length plus a manual forward feed length.

When the printer is in a state of an auto forward feed standby after a cut operation, it performs the following operations.

One label feed → Feed to the cut position → Cut → Reverse feed to the home position → Forward feed

When the printer is in a state after a pre-backfeed, it feeds the label for the amount equivalent to a pre-backfeed length plus one label feed length.



When the signal goes from off to on, the printer prints the data in the image buffer on one label. When the signal is on at the end of the label feed, the printer issues one more label.

The ISSUE signal input while the printer is in any of the following states is ignored.

- Issuing
- Feeding
- Pausing
- Engine error
- Ejecting
- Manual feeding
- Checking for print head broken dots
- Waiting for the printed label to be removed
- Command save mode
- Storing writable characters
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

After a label is issued with an Issue Command sent from the host, the ISSUE signal allows the same label to be printed. This signal does not substitute for the Issue Command. If the ISSUE signal is turned to on under the following conditions, printing is not performed properly.

- An Issue Command is not sent.
- After an Issue Command is sent, the image buffer is cleared and drawing is performed, however, an Issue Command is not sent again.

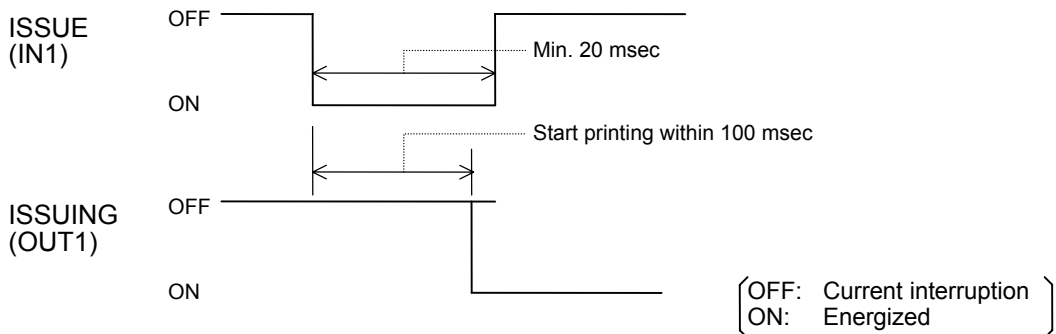
In this case, a status response may be returned without issue the label.

When the printer is in a state of an auto forward feed standby after a cut operation, it performs the following operations.

One label feed → Feed to the cut position → Cut → Reverse feed to the home position → Forward feed

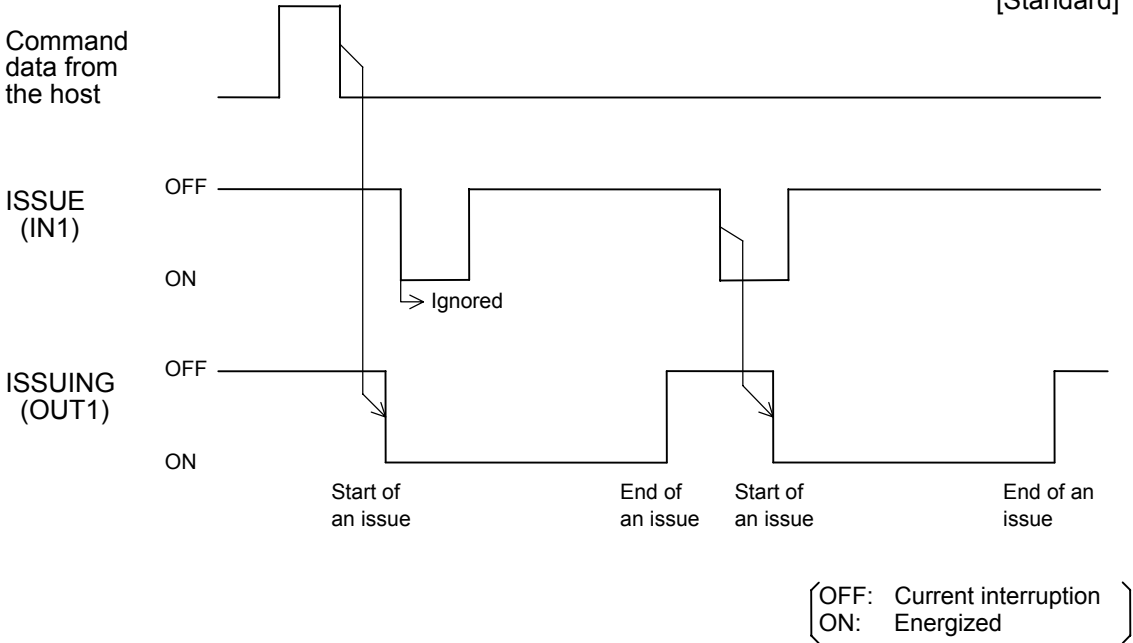
When the printer is in a state after a pre-backfeed, it feeds the label for the amount equivalent to a pre-backfeed length plus one label feed length (+ forward feed to the peel-off position.)

**NOTE:** When print data includes a command for printing real time clock data and the RTC parameter has been set to "PAGE" in the system mode, on-the-fly issue is disabled.

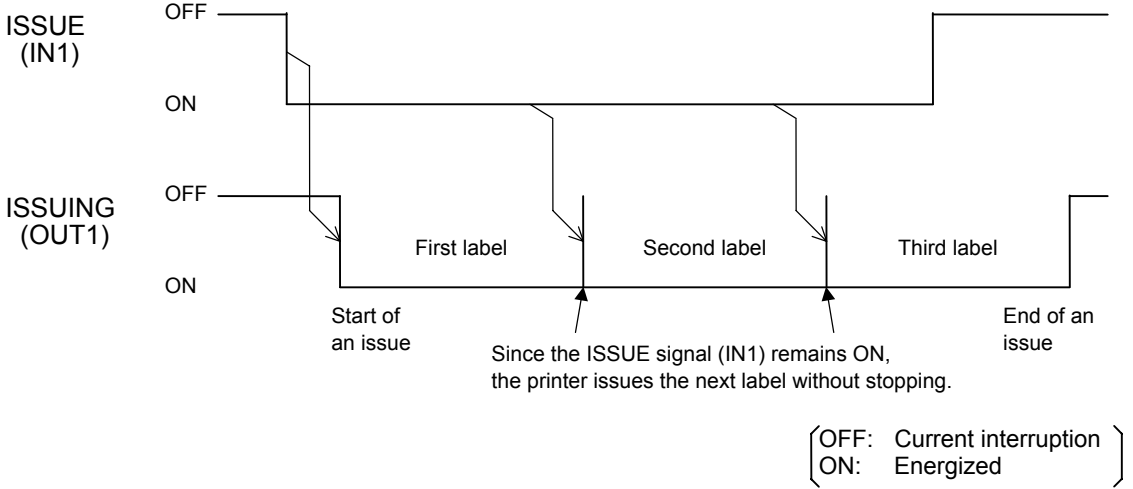




[Standard]



**NOTE:** A Clear Command or Drawing Command shall not be sent from the host while a label is being issued by the ISSUE signal (IN1). Doing so may cause the print data to be printed improperly.

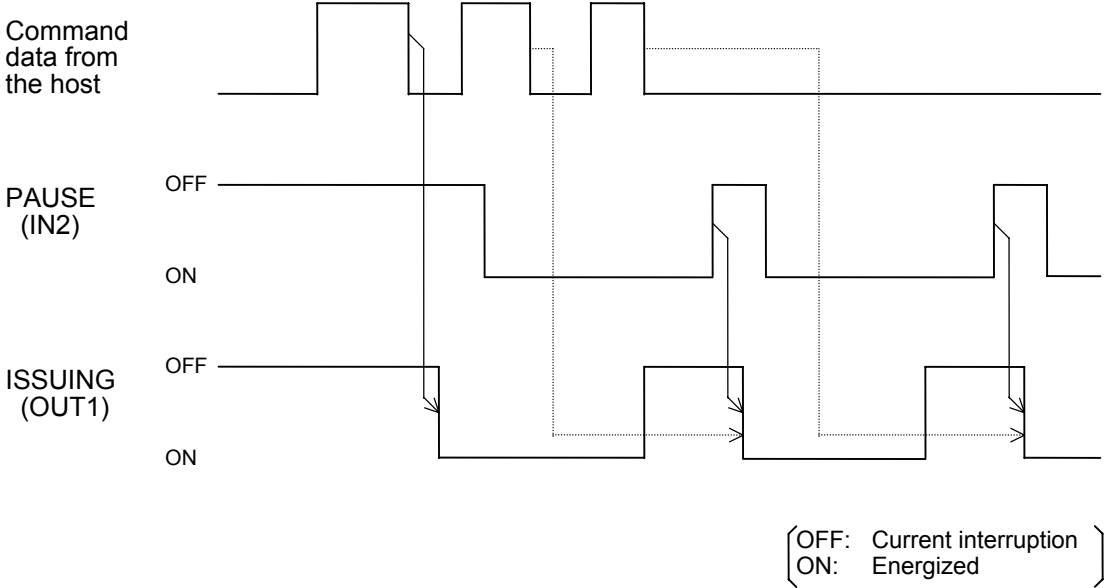


IN2

PAUSE

[Standard]

This signal causes the printer to enter a pause state. While the PAUSE signal is on, the printer does not issue a label. When the signal turns off, the printer starts issuing. Even if the PAUSE signal turns on while the printer is issuing or feeding a label, the printer does not stop the issue or feed immediately. After issuing or feeding one label, the printer enters the pause state.



A pause state caused by the PAUSE signal cannot be cleared only by a depression of the [RESTART] key on the printer. However, the pause state, caused by the [PAUSE] key, can be cleared by switching the PAUSE signal from on to off.

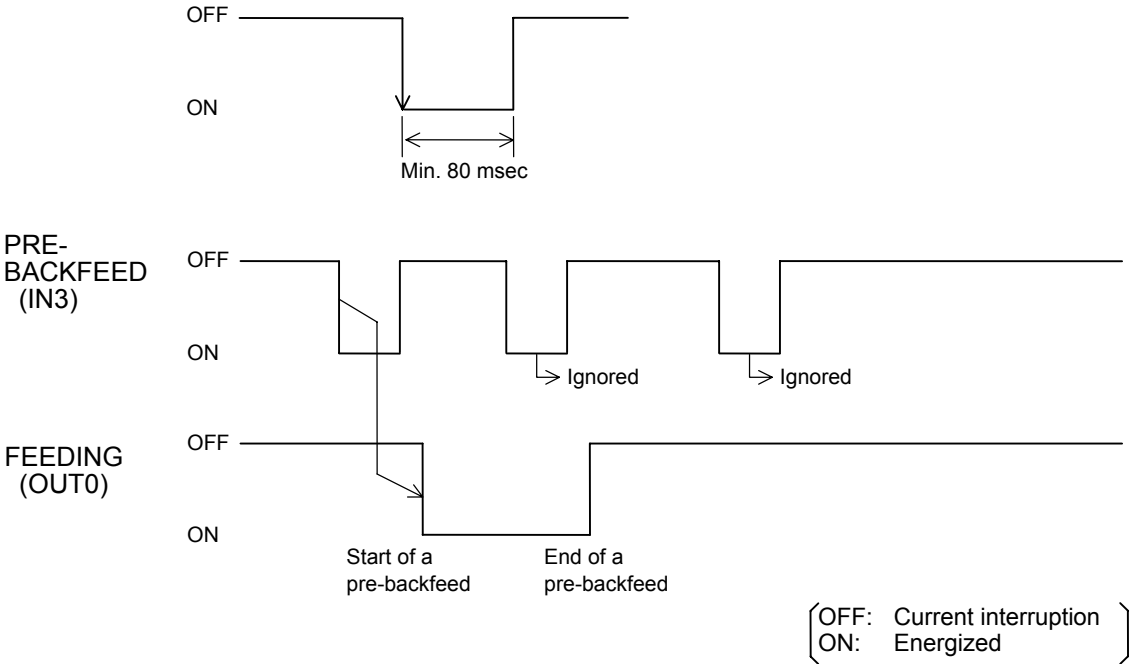
An error can be cleared only by the [RESTART] key on the printer.  
(The error cannot be cleared by switching the PAUSE signal from on to off.)

When the peel-off issue mode (Issue mode D or E) has been selected, the printer feeds a label back to the home position when this signal goes from off to on.

The PRE-BACKFEED signal input while the printer is in any of the following states is ignored.

- Issuing
- Feeding
- Engine error
- Ejecting
- Manual feeding
- Checking for print head broken dots
- Command save mode
- Storing writable characters
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

While the label is at the home position due to a pre-backfeeding, the subsequent PRE-BACKFEED signals are ignored.



This output signal indicates that the printer is feeding a label. The signal is on during a feed. Feeding means the following states.

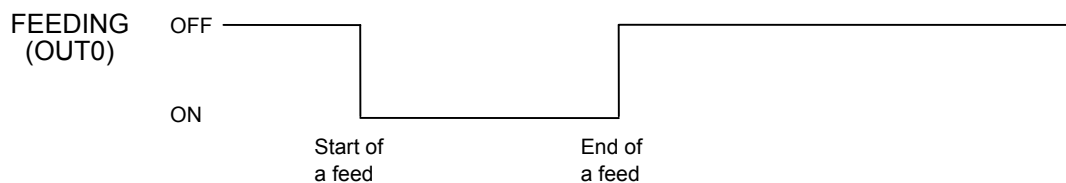
- Normal feeding
- Ejecting a label by an Eject Command from the host
- Ejecting a label in the cut issue
- Reverse feeding in the peel-off issue mode
- Manual forward/reverse feeding
- Initial feed when the printer restarts after an error is cleared.
- Performing a pre-backfeed

When the printer completes a feed normally, the signal turns off.

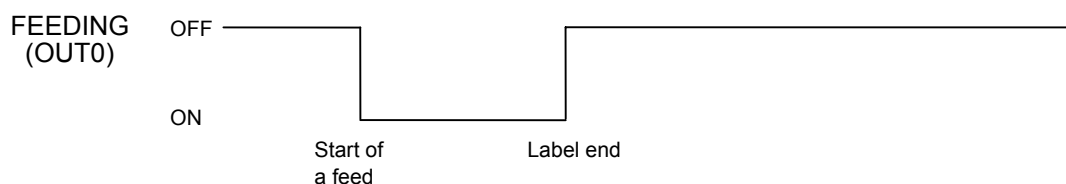
The FEEDING signal is output when a feed is caused by a depression of the [FEED] key, a command from the host, or the FEED signal.

When an error occurs during a feed and the printer stops feeding, the FEEDING signal turns off.

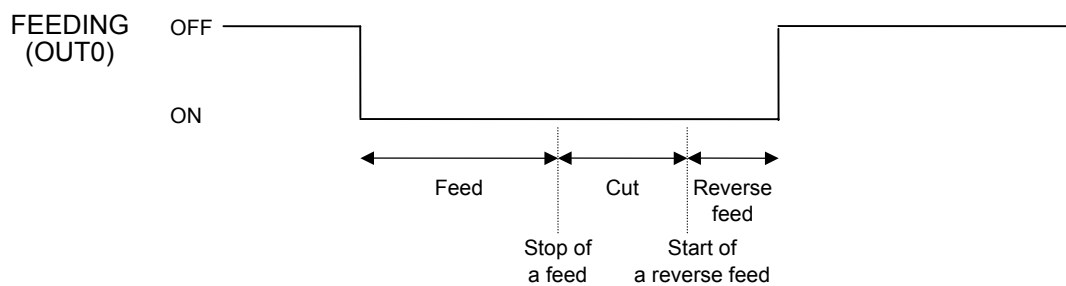
(1) Normal feed



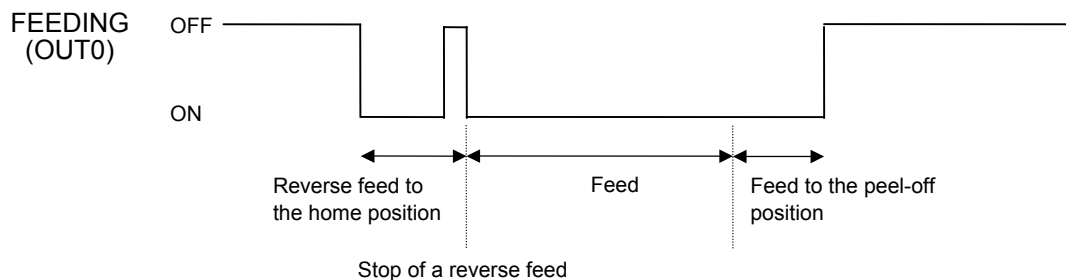
(2) Label end in the middle of a feed



(3) Feed with a cut



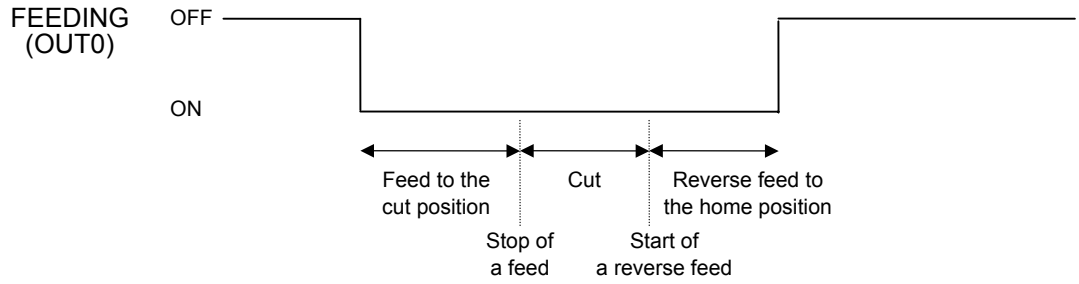
(4) Feed to the peel-off position



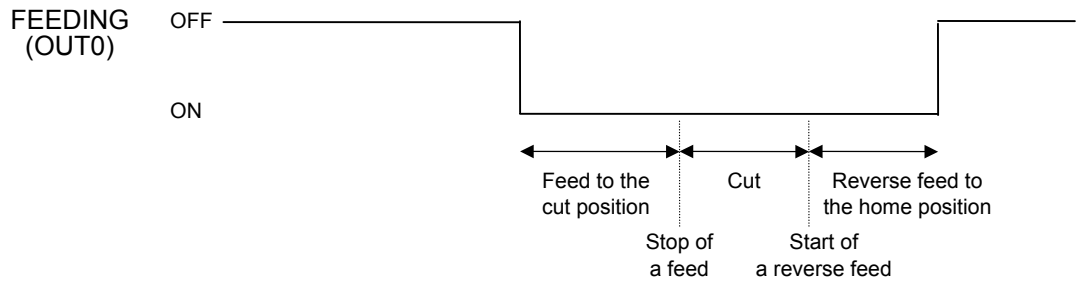
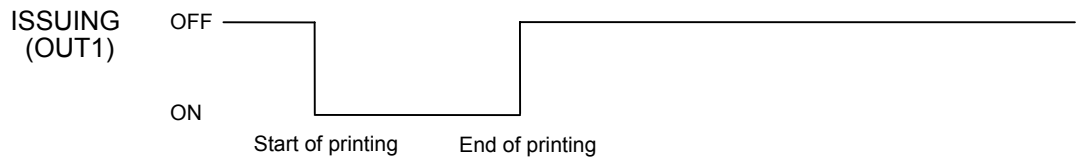
( OFF: Current interruption )  
 ( ON: Energized )

(5) Ejection

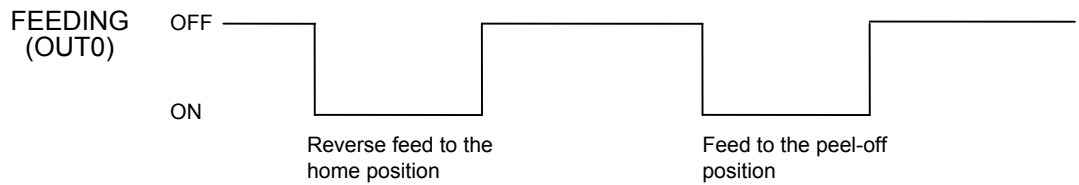
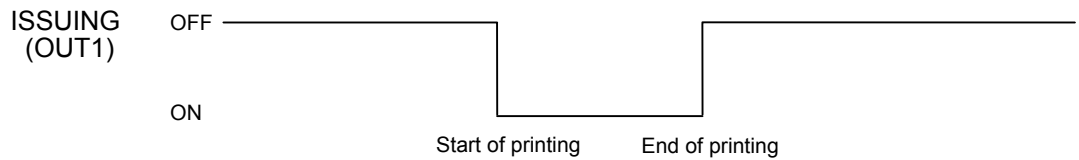
[Standard]



(6) Cut issue



(7) Peel-off issue



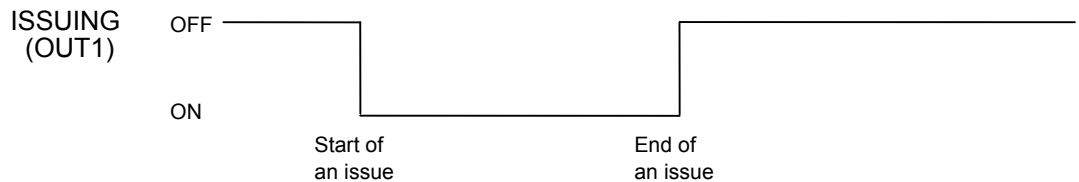
( OFF: Current interruption  
ON: Energized )

This output signal indicates that the printer is issuing a label.  
 The signal is on during an issue. When the specified number of labels have been issued normally in the batch issue mode, the signal turns off. However, in the case the printer performs batch does not stop between different batches, the signal remains on. In the peel-off issue mode, the signal turns off every time the printer normally issues a label. In the cut issue mode, the signal turns off while the printer is ejecting a label to cut.

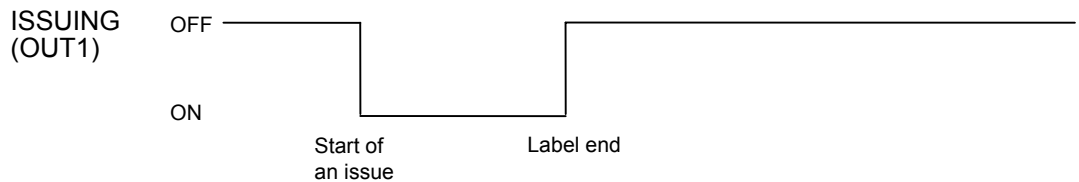
The ISSUING signal is output when an issue is caused by a self test results printout, test print in the system mode, a command from the host, or the ISSUE signal. However, there may be a moment where all output signals turn to on during a self-test because Expansion I/O loop back check is performed.

When the printer stops printing due to an error, the ISSUING signal turns off. When the printer pauses while more than one label is issued, this signal turns to OFF. After the pause state is cleared, the signal turns on again and the printer resumes printing the remaining labels.

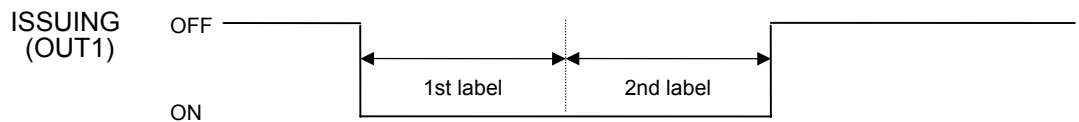
(1) Normal issue



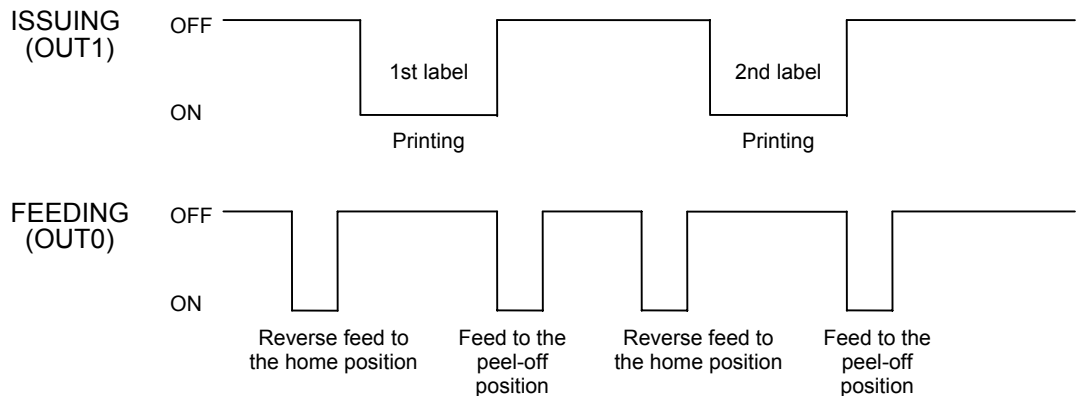
(2) Label end in the middle of an issue



(3) Batch issue (2 labels to issue)



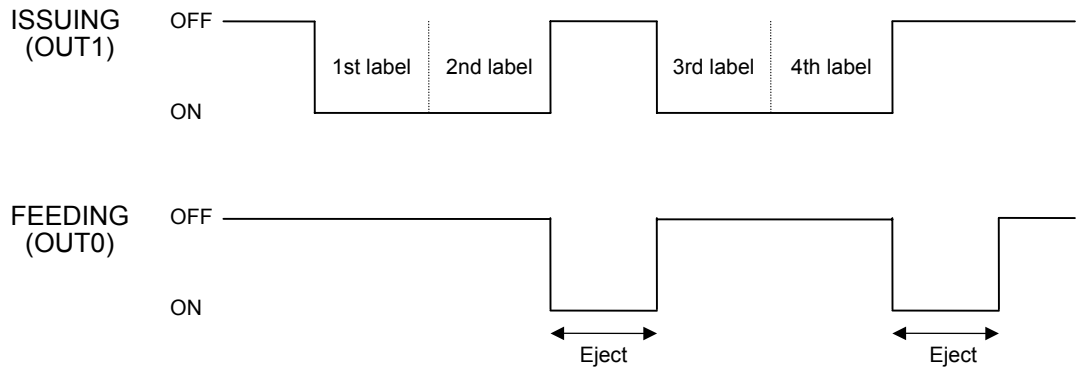
(4) Peel-off issue mode (2 labels to issue)



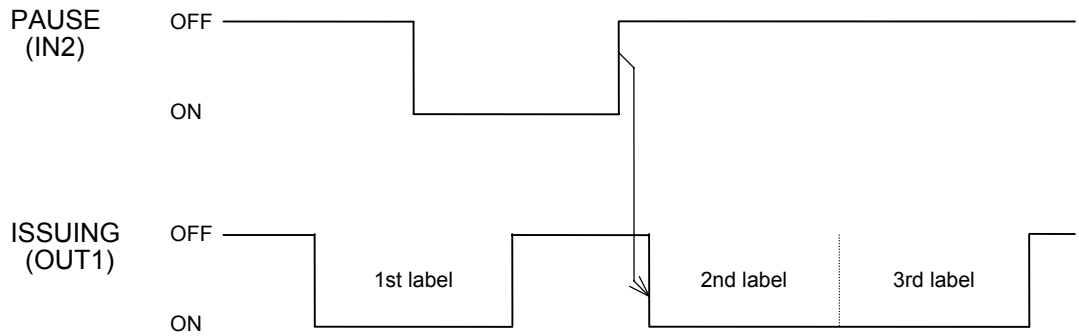
(OFF: Current interruption )  
 (ON: Energized )

(5) Cut issue (4 labels to issue, cut every 2 labels)

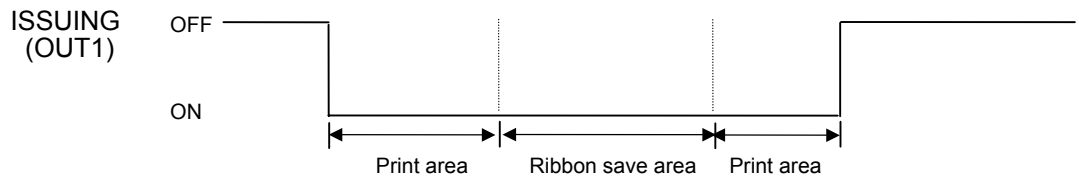
[Standard]



(6) Batch issue (3 labels to issue, pause during printing)



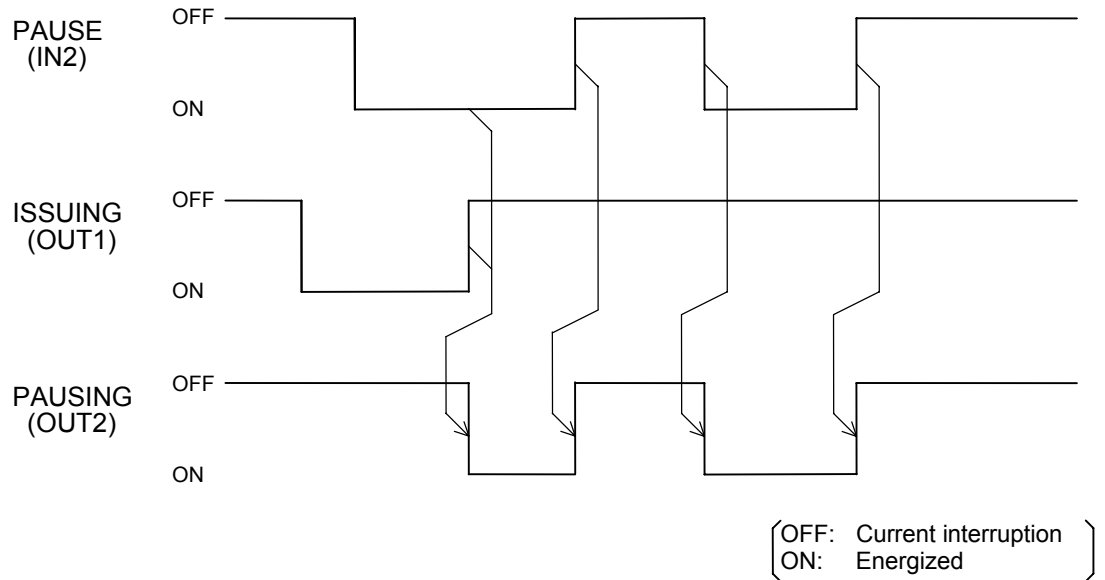
(7) Ribbon save issue



This output signal indicates that the printer is in a pause state.

While the printer is in a pause state, the signal is on. The PAUSING signal is output when a pause state is caused by either a depression of the [PAUSE] key or PAUSE signal.

Also, when the print head block is opened, the PAUSING signal turns on.



Even if the PAUSE signal is input during issuing or feeding, the PAUSING signal is not output until the issuing or feeding is completed.

If the PAUSE signal (IN2) is input when the printer is in an error state, it is ignored.

The PAUSING signal (OUT2) turns to OFF when an error occurs.



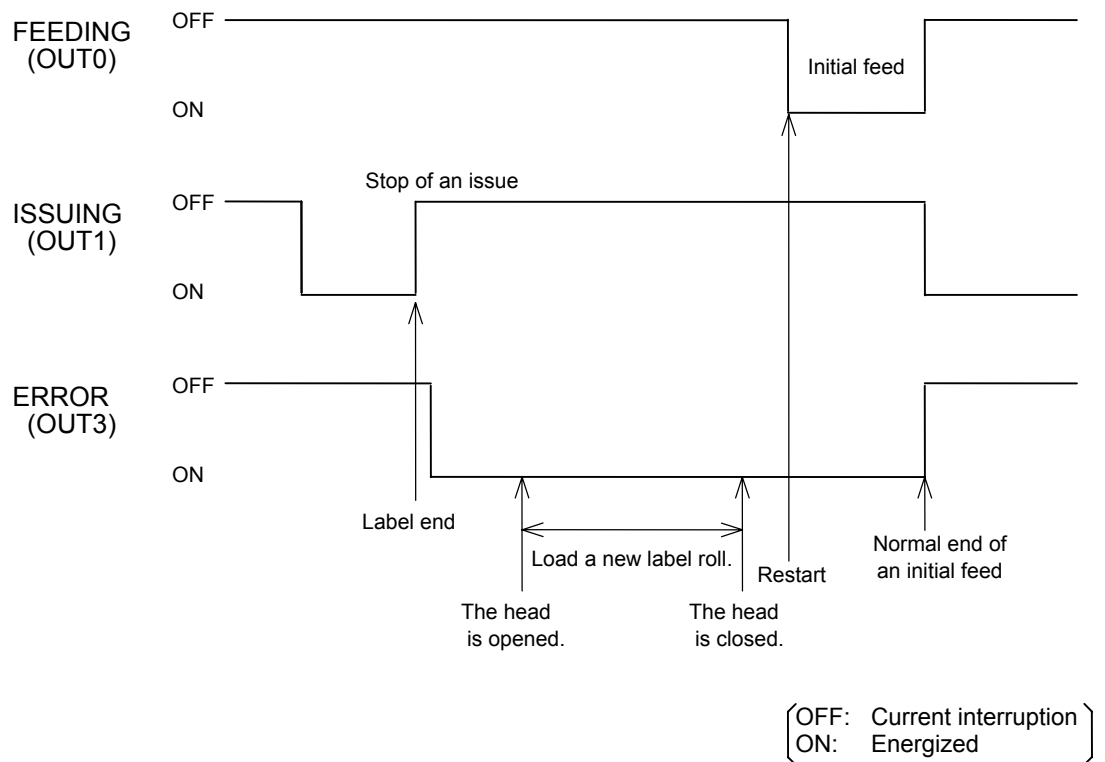
This output signal indicates that the printer is stopping due to an error. The signal turns on while the printer is in an error state.

When any of the following errors occur, the ERROR signal turns on.

- Communication error (Command error)
- Communication error (Hardware error)
- Paper jam
- Cutter error
- Paper end
- Ribbon end
- Ribbon error
- Head open error
- Thermal head error
- Thermal head overheating
- Rewinder overflow
- Write error on the flash memory
- Erase error on the flash memory
- Insufficient free space of the flash memory

When the error state is cleared, the ERROR signal turns off.

In the case of an error which cannot be recovered by pressing the [RESTART] key, the printer power needs to be turned off and on again.



OUT5

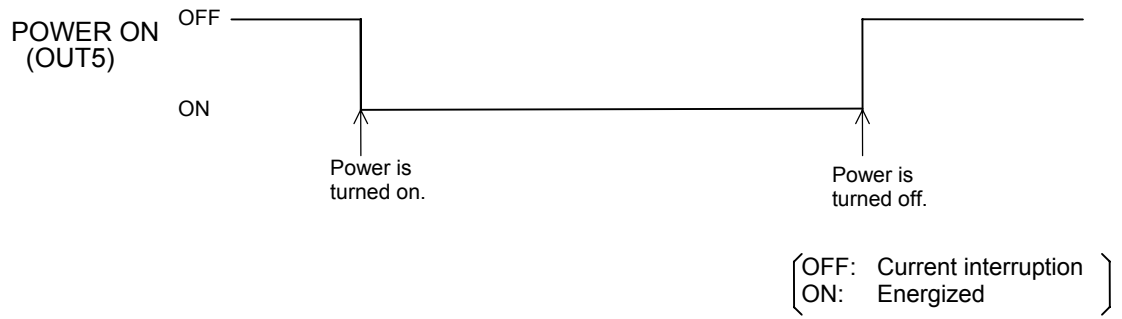
POWER ON

[Standard]

This output signal indicates that the printer power is on.

While the printer power is on, the signal is on.

As long as the printer power is on, the POWER ON signal remains on regardless of the printer state.

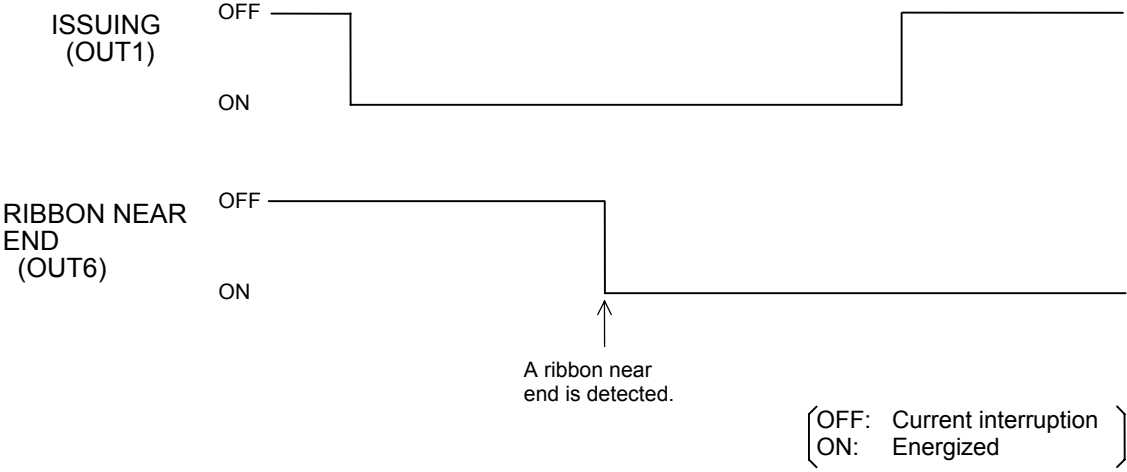


OUT6

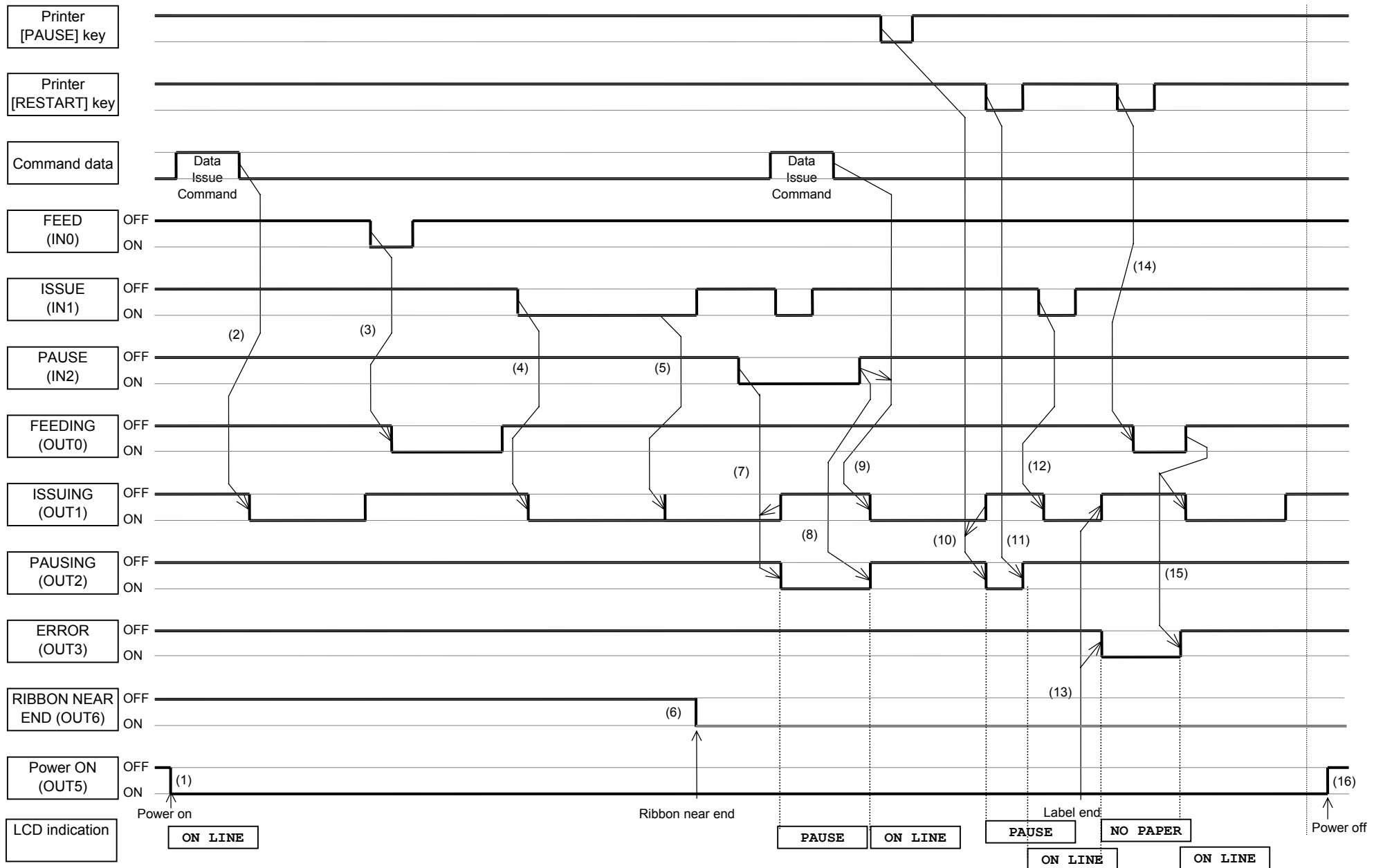
RIBBON NEAR END

[Standard]

This output signal indicates that the printer is in a ribbon near end state. While the printer is in the ribbon near end state, the signal is on. The signal turns off when the printer status changes to a ribbon end. The RIBBON NEAR END signal (OUT6) remains off when the ribbon near end detection is disabled in the system mode.



### 4.1.3 Example of Timing Chart (Standard Specifications)



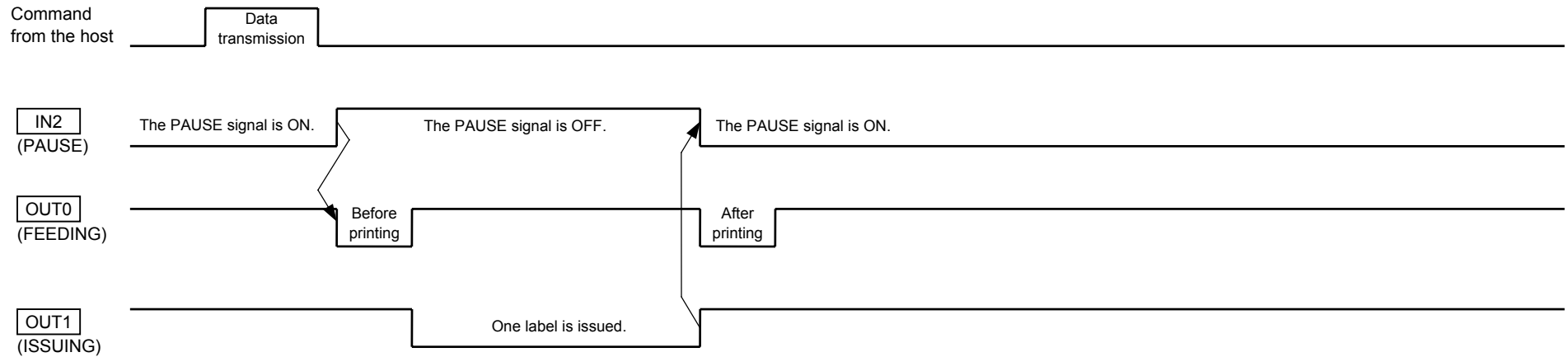
#### 4.1.3.1 Explanation of Timing Chart (Standard Specifications)

- (1) When the power is turned on, the **OUT5** (POWER ON) turns on.
- (2) The printer starts issuing with the command from the host. The **OUT1** (ISSUING) turns on.
- (3) The printer starts feeding by the **IN0** (FEED). The **OUT0** (FEEDING) turns on.
- (4) The printer starts issuing by the **IN1** (ISSUE). The **OUT1** (ISSUING) turns on.
- (5) The printer starts issuing by the **IN1** (ISSUE). The **OUT1** (ISSUING) turns on.
- (6) As a ribbon near end state is detected, the **OUT6** (RIBBON NEAR END) turns on.
- (7) After the issue is completed, the printer enters a pause state by the **IN2** (PAUSE). The **OUT2** (PAUSING) turns on.
- (8) The pause state is released when the **IN2** (PAUSE) turns off. The **OUT2** (PAUSING) turns off.
- (9) The pause state is released when the **IN2** (PAUSE) turns off. Then the printer starts issuing with the command from the host. The **OUT1** (ISSUING) turns on.
- (10) After the issue is completed, the printer enters a pause state by a depression of the [PAUSE] key on the printer. The **OUT2** (PAUSING) turns on.
- (11) The pause state is released by a depression of the [RESTART] key on the printer. The **OUT2** (PAUSING) turns off.
- (12) The printer starts issuing by the **IN1** (ISSUE). The **OUT1** (ISSUING) turns on.
- (13) The printer stops issuing due to a label end error. The **OUT1** (ISSUING) turns off and the **OUT3** (ERROR) turns on.
- (14) The printer starts an initial feed by a depression of the [RESTART] key on the printer. (The **OUT0** (FEEDING) turns on.)
- (15) After the initial feed is completed, the error state is cleared (the **OUT3** (ERROR) turns off) and the printer resumes issuing (the **OUT1** (ISSUING) turns on).
- (16) When the power is turned off, the **OUT5** (POWER ON) turns off.

( OFF: Current interruption  
ON: Energized )

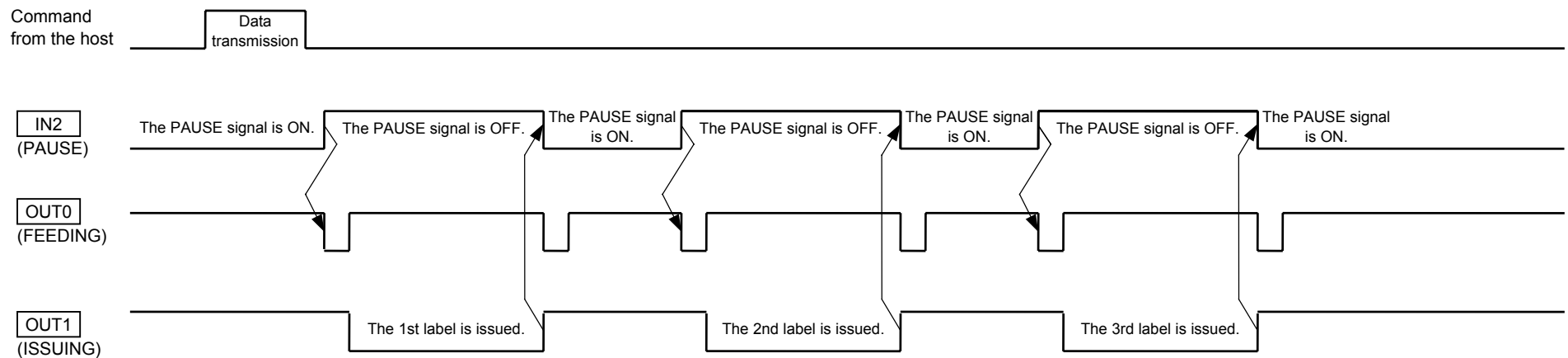
#### 4.1.4 Example of Timing Charts for Issue/Feed Mode E (Back feed enabled, strip sensor is ignored, applicator is supported.)

(1) When one label is issued:



- When issue mode E is selected, an issue is triggered by the IN2 (PAUSE).
- The data transmission is performed when the IN2 (PAUSE) turns on, and an issue is started when the IN2 (PAUSE) turns off.
- The IN2 (PAUSE) turns on again at the timing of the rise of the OUT1 (ISSUING).
- When the same data is printed again, an issue is triggered by turning the IN2 (PAUSE) to off.
- When different print data is to be issued next, an issue is triggered by turning the IN2 (PAUSE) to off after the next print data is sent.

(2) When three labels are issued:



## 4.2 EXPANSION I/O SIGNAL LINES SPECIFICATIONS (STANDARD)

Signal		Min.	Max.	Unit of measure	Remarks
IN0	Request for a feed	20	--	ms	
IN1	Request for an issue	20	--	ms	
IN2	Request for a pause	20	--	ms	
IN3	Request for a pre-backfeed	20	--	ms	
IN4	---				
IN5	---				
OUT0	Feeding	2	--	ms	
OUT1	Issuing	1	--	ms	
OUT2	Pausing	2	--	ms	
OUT3	Error	2	--	ms	
OUT4	---				
OUT5	PowerON	2	--	ms	
OUT6	Ribbon near end	2	--	ms	

## 4.3 IN-LINE SPECIFICATIONS

### 4.3.1 OUTLINE OF SIGNALS

#### Input

- IN0. FEED ..... Feeds one label.
- IN1. ISSUE ..... Issues one label.
- IN2. ACTIVATE ..... Triggers a label issue.
- IN3. PRE-BACKFEED ..... Feeds a label back to the home position.
- IN4. Not used
- IN5. Not used

#### Output

- OUT0. FEEDING ..... Indicates the printer is feeding a label.
- OUT1. ISSUING ..... Indicates the printer is issuing a label.
- OUT2. ACTIVE ..... Indicates whether or not the printer is active.
- OUT3. ERROR ..... Indicates the printer is in an error state.
- OUT4. Not used ..... The signal is always off.
- OUT5. POWER ON ..... Indicates the printer power is on (without software control).
- OUT6. RIBBON NEAR END ..... Indicates the printer is in a ribbon near end state.

### 4.3.2 DETAILED DESCRIPTIONS FOR SIGNALS

[In-line]

INO

FEED

When the signal turns from off to on, the printer feeds one label. When the signal is on at the end of the label feed, the printer feeds one more label.

The FEED signal input when the printer is in any of the following states is ignored.

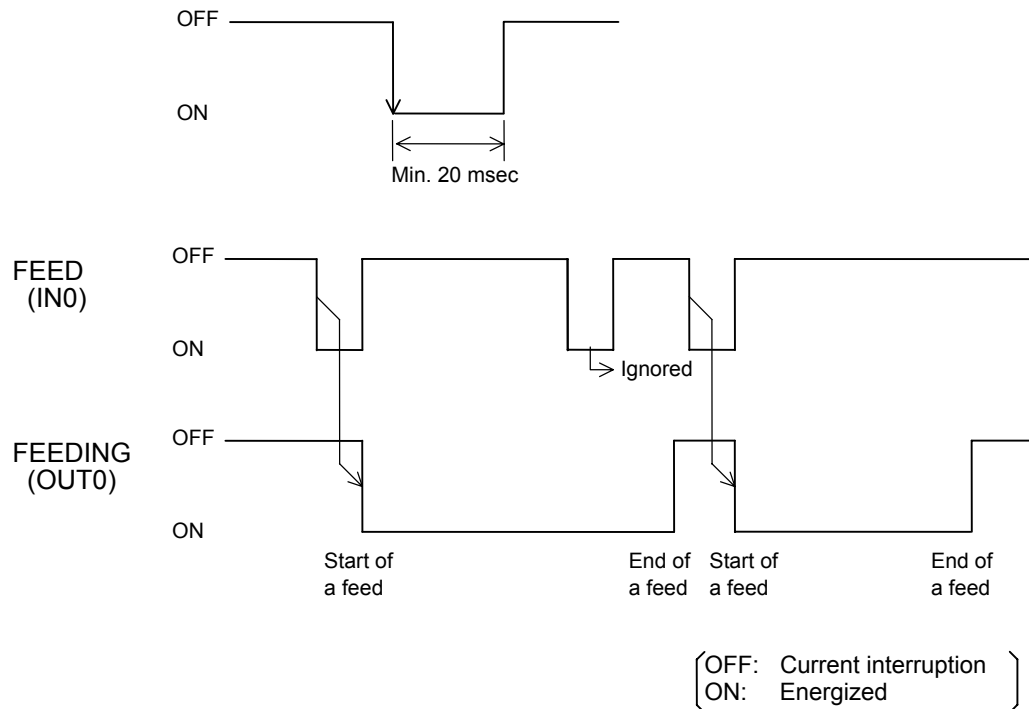
- Issuing
- Feeding
- Manual feeding
- Ejecting
- Checking for print head broken dots
- Waiting for the printed label to be removed
- Command save mode
- Storing writable character
- Communication error (command error or hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

When the manual forward feed length has been set, the printer feeds the label for the amount equivalent to one label feed length plus a manual forward feed length.

When the printer is in a state of an auto forward feed standby after a cut operation, it performs the following operations.

One label feed → Feed to the cut position → Cut → Reverse feed to the home position → Forward feed

When the printer is in a state after a pre-backfeeding, it feeds the label for the amount equivalent to a pre-backfeed length plus one label feed length.





When the signal turns from off to on, the printer prints the data in the image buffer on one label. When the signal is on at the end of the label feed, the printer issues one more label (\*1).

The ISSUE signal input when the printer is in any of the following states is ignored.

- Issuing
- Feeding
- Pausing
- Inactive
- Engine error
- Manual feeding
- Checking for print head broken dots
- Waiting for the printed label to be removed
- Command save mode
- Storing writable character
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

After a label is issued with an Issue Command sent from the host and the ACTIVATE signal (IN2), the ISSUE signal allows the same label to be printed. This signal does not substitute for the Issue Command. If the ISSUE signal turns on under the following conditions, printing is not performed properly.

- An Issue Command is not sent.
- After an Issue Command is sent, an issue is not triggered by the ACTIVATE signal.
- After an Issue Command is sent, the image buffer is cleared and drawing is performed, however, an Issue Command is not sent again.

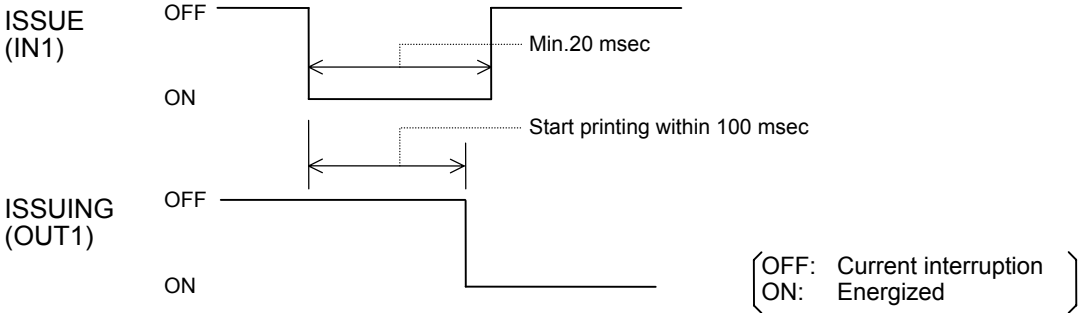
In this case, a status response may be returned without issue the label.

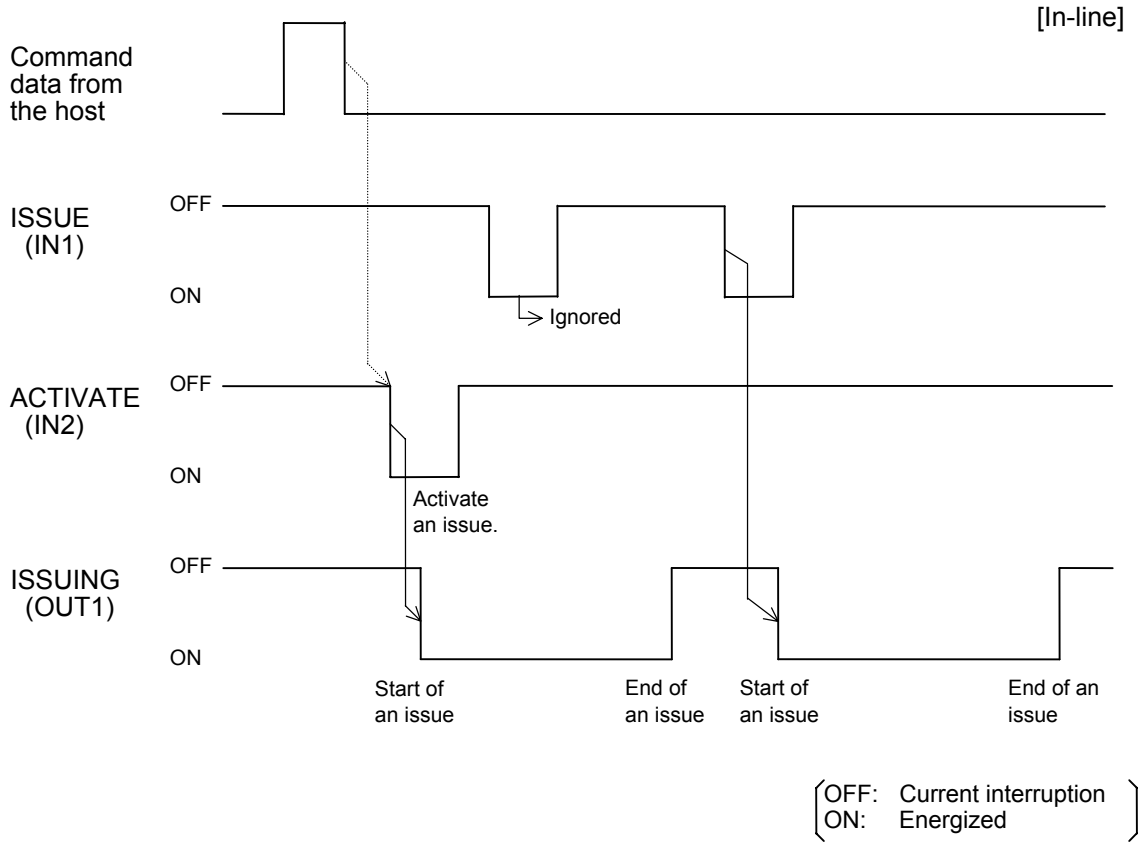
When the printer is in a state of an auto forward feed standby after a cut operation, it performs the following operations.

One label printing → Feed to the cut position → Cut → Reverse feed to the home position → Forward feed

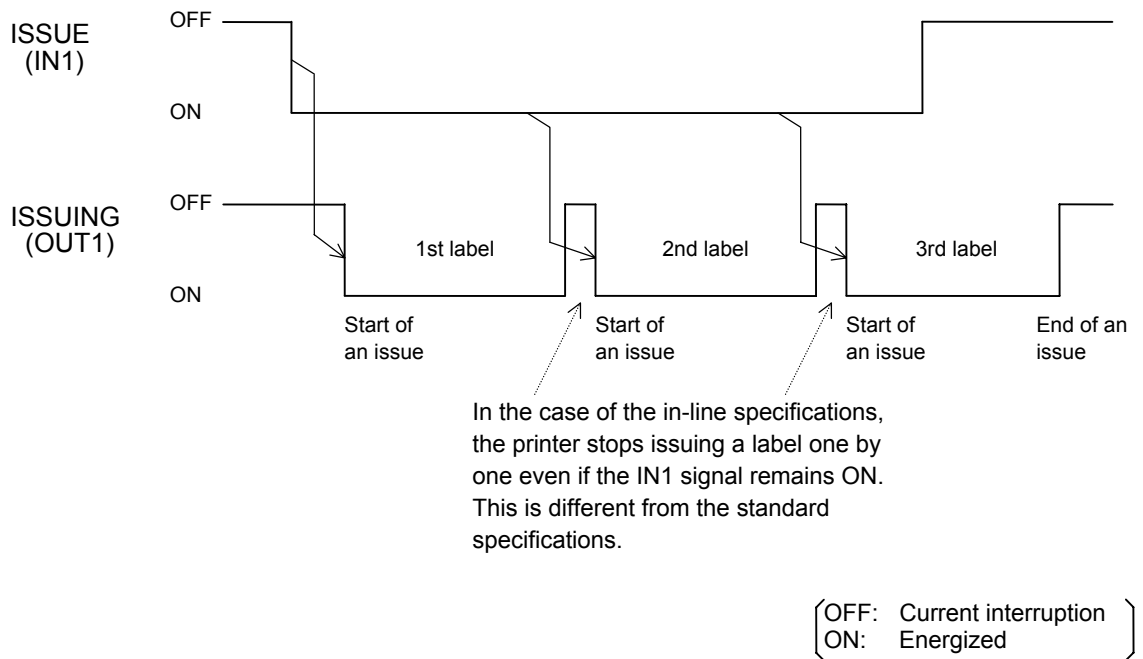
When the printer is in a state after a pre-backfeeding, it feeds the label for the amount equivalent to a pre-backfeed length plus one label feed length (+ forward feed to the peel-off position.)

**NOTE:** When print data includes a command for printing real time clock data and the RTC parameter has been set to "PAGE" in the system mode, on-the-fly issue is disabled.





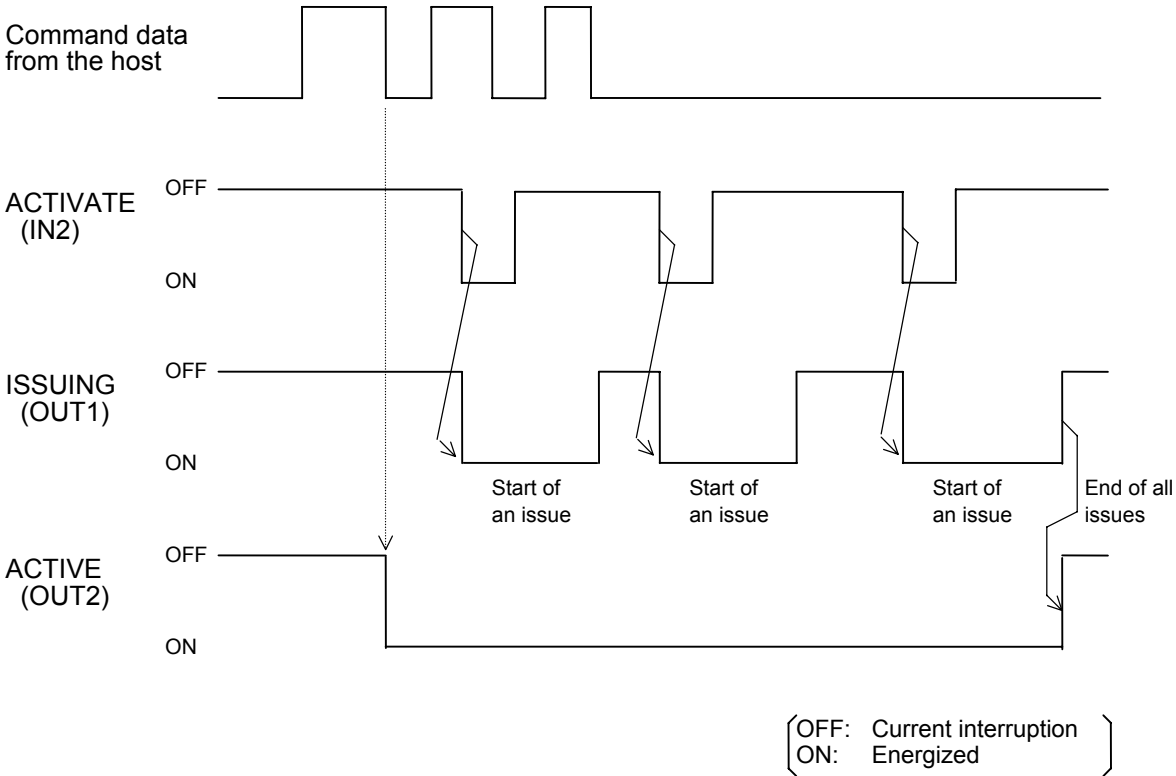
**NOTE:** A Clear Command or Drawing Command shall not be sent from the host while a label is being issued by the ISSUE signal (IN1). Doing so may cause the print data to be printed improperly.



This signal causes the printer to process an Issue Command which has been sent from the host. While the ACTIVATE signal is off, the printer does not issue a label. The printer executes the Issue Command sent from the host by an ON pulse of 20 msec or more. An ON pulse enables the printer to execute the processing for one label in the received Issue Commands. However, the ACTIVATE signal input when the printer is in any of the following states is ignored.

- Issuing
- Feeding
- Inactive
- Engine error
- Ejecting
- Manual feeding
- Checking for print head broken dots
- Command save mode
- Storing writable character
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

When the printer is in a state after a pre-backfeeding, it feeds the label for the amount equivalent to a pre-backfeed length plus one label feed (+ forward feed to the peel-off position.)

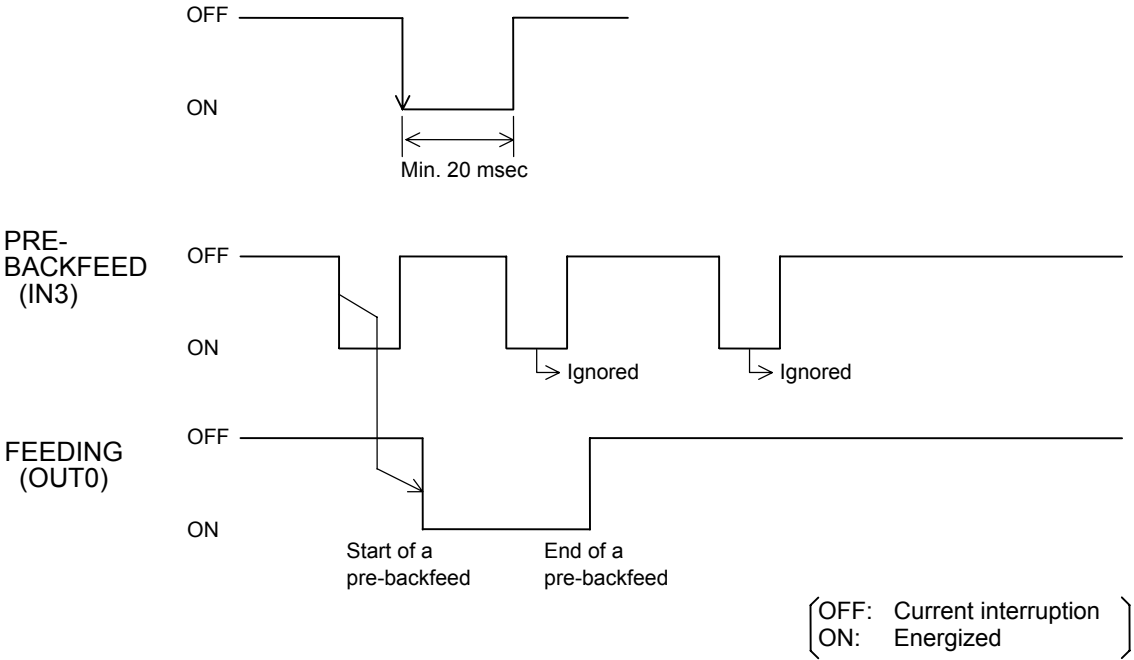


When the peel-off issue mode (Issue mode D or E) has been selected, the printer feeds a label back to the home position when this signal turns from off to on.

The PRE-BACKFEED signal input when the printer is in any of the following states is ignored.

- Issuing
- Feeding
- Engine error
- Ejecting
- Manual feeding
- Checking for print head broken dots
- Command save mode
- Storing writable character
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed
- Print head block is open.

While the label is at the home position due to a pre-backfeeding, the subsequent PRE-BACKFEED signals are ignored.



This output signal indicates that the printer is feeding a label. The signal is on during a feed. Feeding means the following states.

- Normal feeding
- Ejecting a label by an Eject Command from the host
- Ejecting a label in the cut issue
- Reverse feeding in the peel-off issue mode
- Manual forward/reverse feeding
- Initial feed when the printer restarts after an error is cleared.
- Performing a pre-backfeed

When the printer completes a feed normally, the signal turns off.

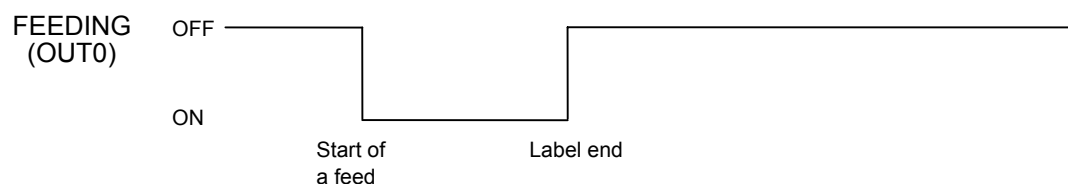
The FEEDING signal is output when a feed is caused by a depression the [FEED] key, a command from the host, or the FEED signal.

When an error occurs during a feed and the printer stops feeding, the FEEDING signal turns off.

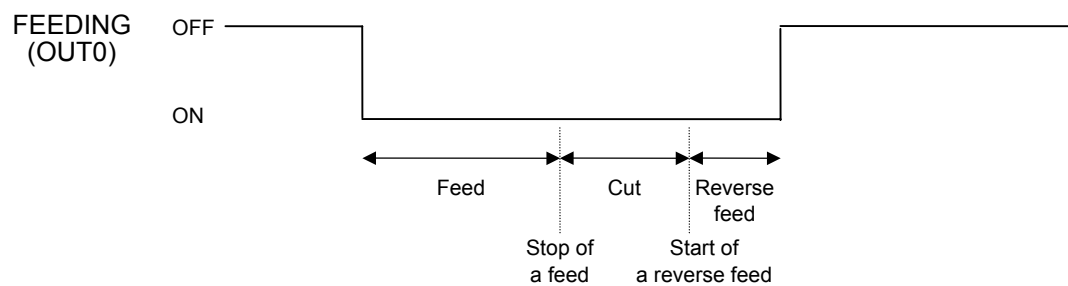
(1) Normal feed



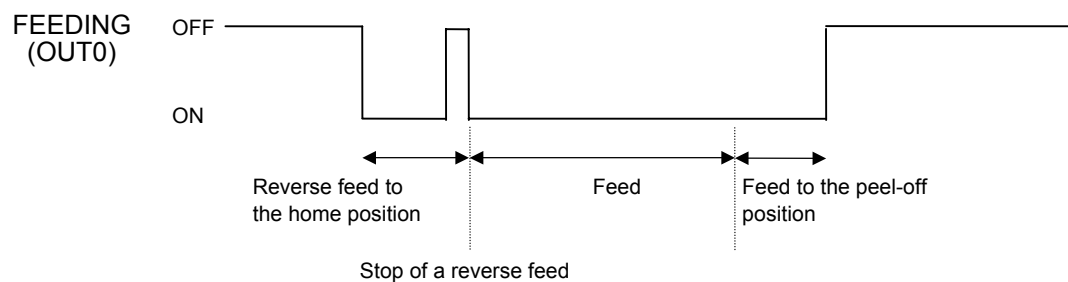
(2) Label end in the middle of a feed



(3) Feed with a cut



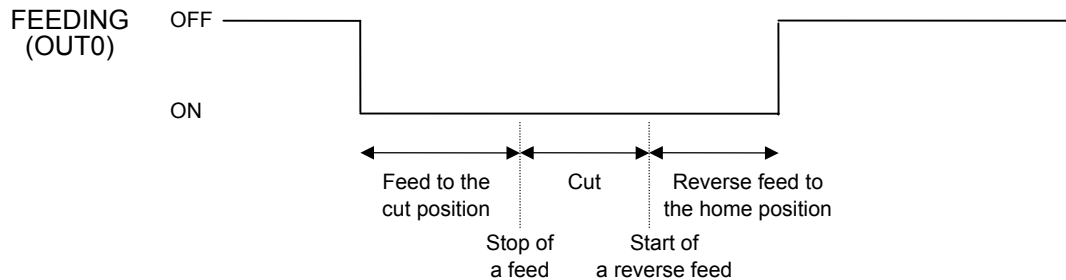
(4) Feed to the peel-off position



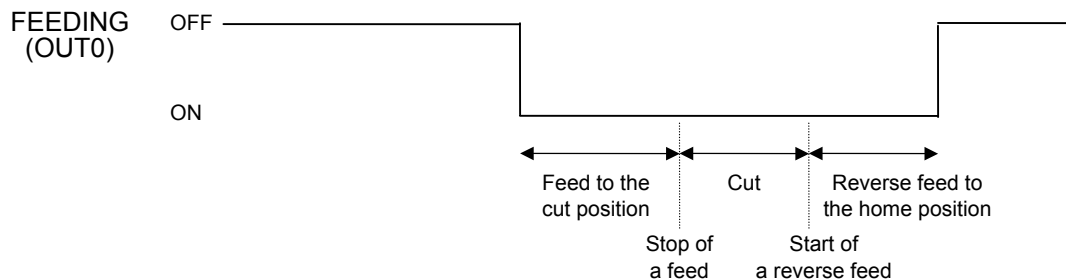
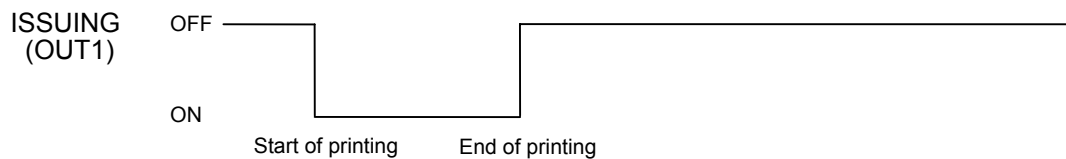
( OFF: Current interruption )  
 ( ON: Energized )

(5) Ejection

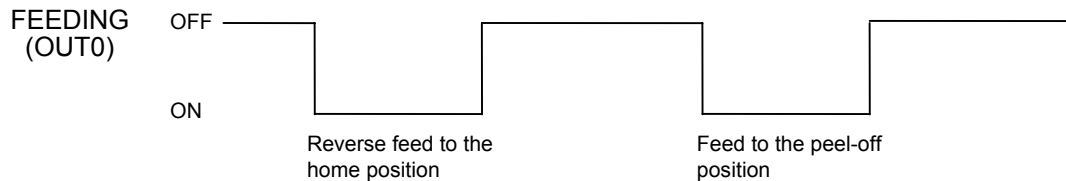
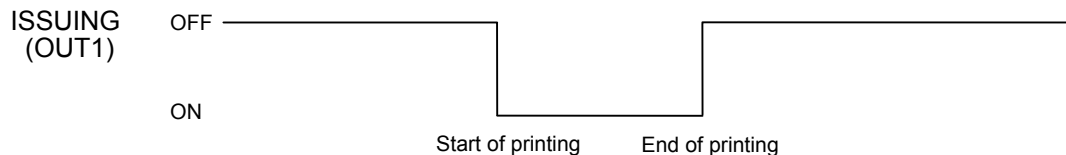
[In-line]



(6) Cut issue



(7) Peel-off issue



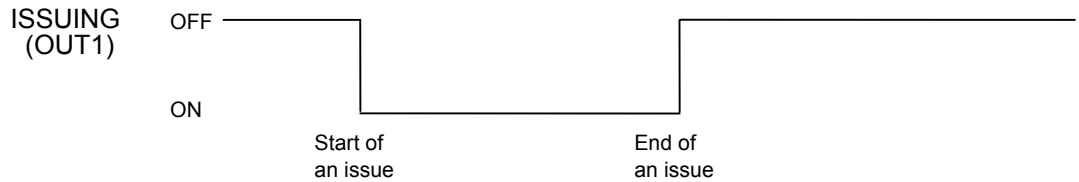
( OFF: Current interruption  
ON: Energized )

This output signal indicates that the printer is issuing a label.  
The signal is on during an issue.

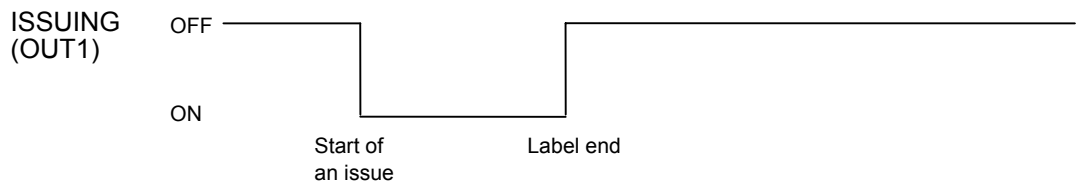
The ISSUING signal is output when an issue is caused by a self test results printout, test print in the system mode, a command from the host, or the ISSUE signal. However, there may be a moment where all output signals turn on during a self-test because Expansion I/O loop back check is performed.

When the printer stops printing due to an error, the ISSUING signal turns off.

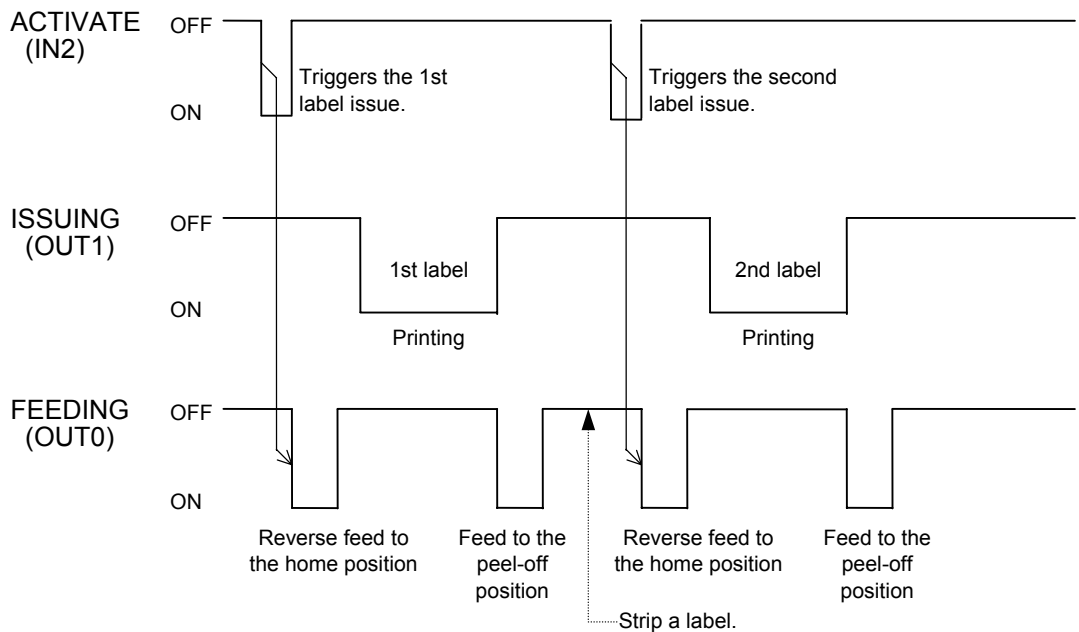
(1) Normal issue



(2) Label end in the middle of an issue



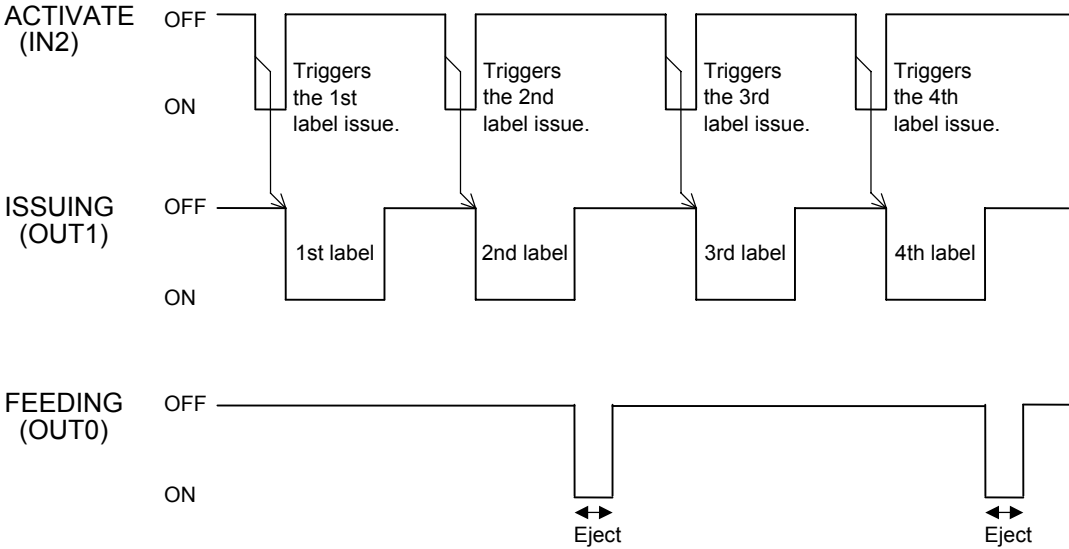
(3) Peel-off issue mode (2 labels to issue)



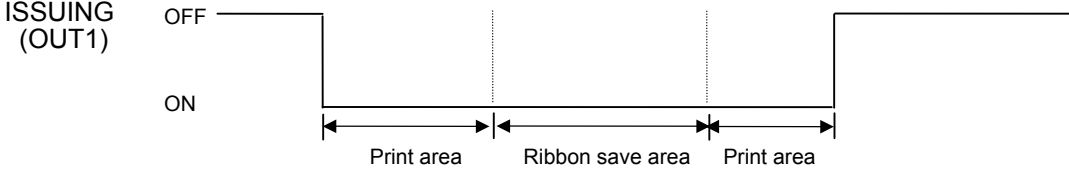
(OFF: Current interruption  
ON: Energized )

(4) Cut issue (4 labels to issue, cut every 2 labels with the disc cutter)

[In-line]

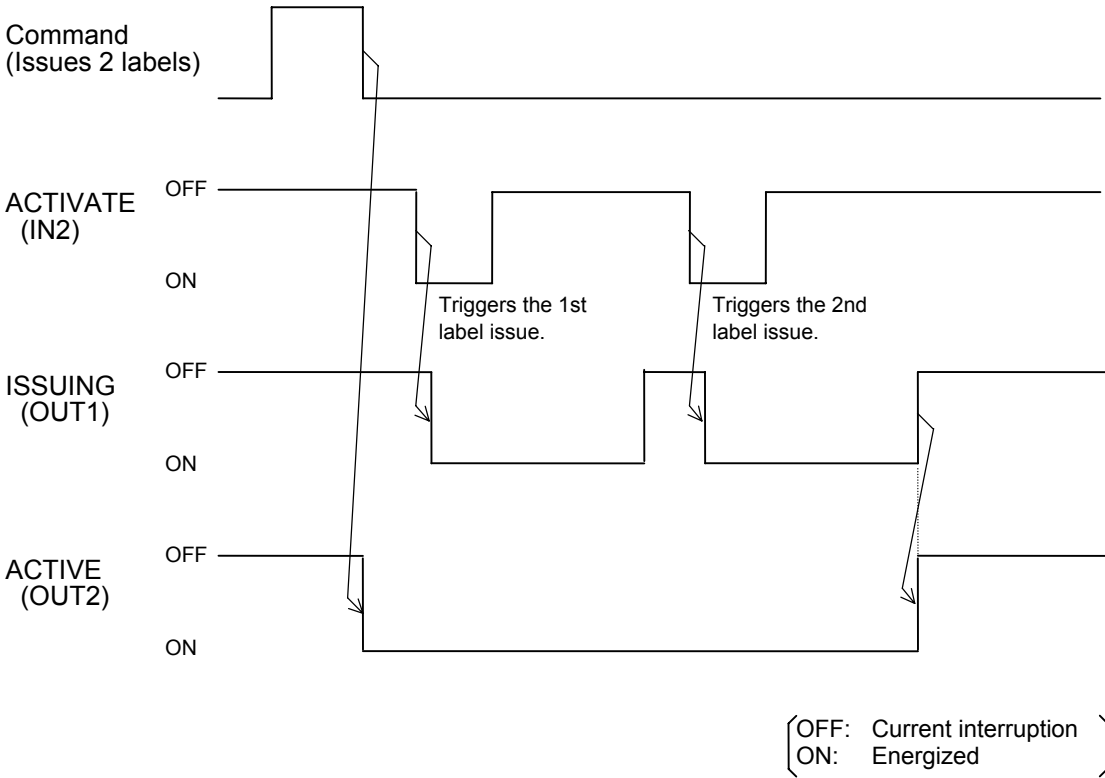


(5) Ribbon save issue





This output signal indicates that the printer is active.  
When the printer receives a Feed Command or an Issue Command sent from the host, the signal turns on (active). When the printer completes processing the all Feed Commands or Issue Commands, the signal turns off (inactive).  
Even if an error occurs while the printer is in active state, the printer remains in active as it has the data to resume printing.



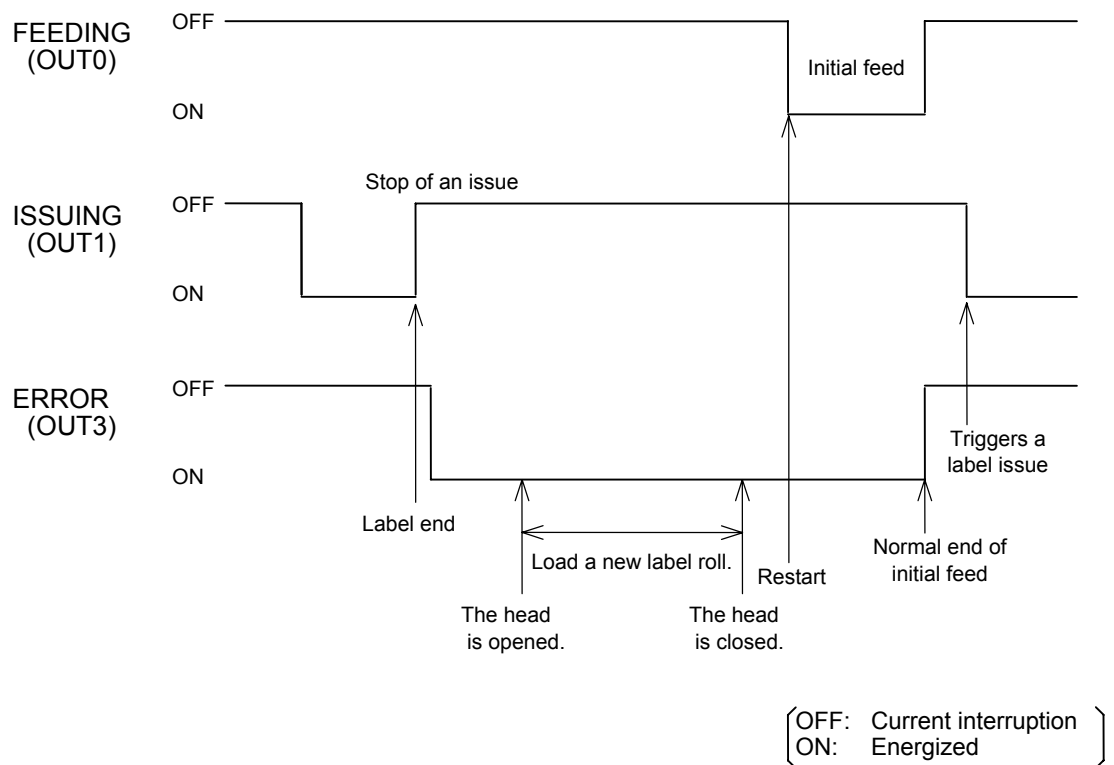
This output signal indicates that the printer is stopping due to an error. The signal is on while the printer is in an error state.

When any of the following errors occur, the ERROR signal turns on.

- Communication error (Command error)
- Communication error (Hardware error)
- Paper jam
- Cutter error
- Paper end
- Ribbon end
- Ribbon error
- Head open error
- Thermal head error
- Thermal head overheating
- Rewinder overflow
- Writing error on the flash memory
- Erase error on the flash memory
- Insufficient free space of the flash memory

When the error state is cleared, the ERROR signal turns off.

In the case of an error which cannot be recovered by pressing the [RESTART] key, the printer power needs to be turned off and on again.

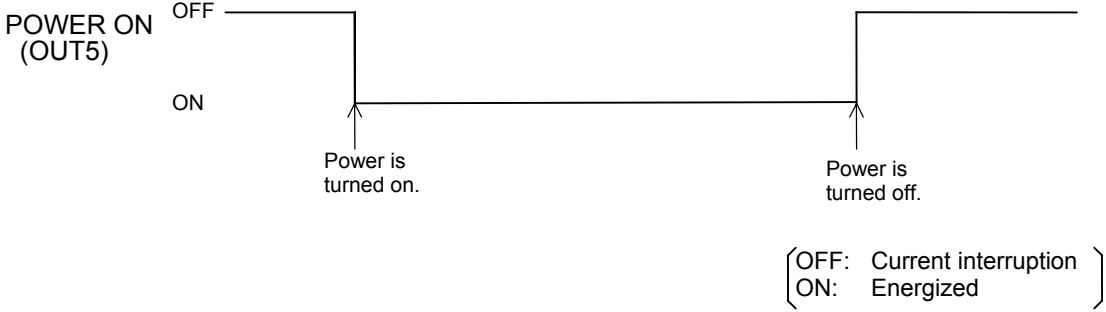


OUT5

POWER ON

[In-line]

This output signal indicates that the printer power is on.  
While the printer power is on, the signal is on.  
As long as the printer power is on, the POWER ON signal remains on regardless of the printer state.

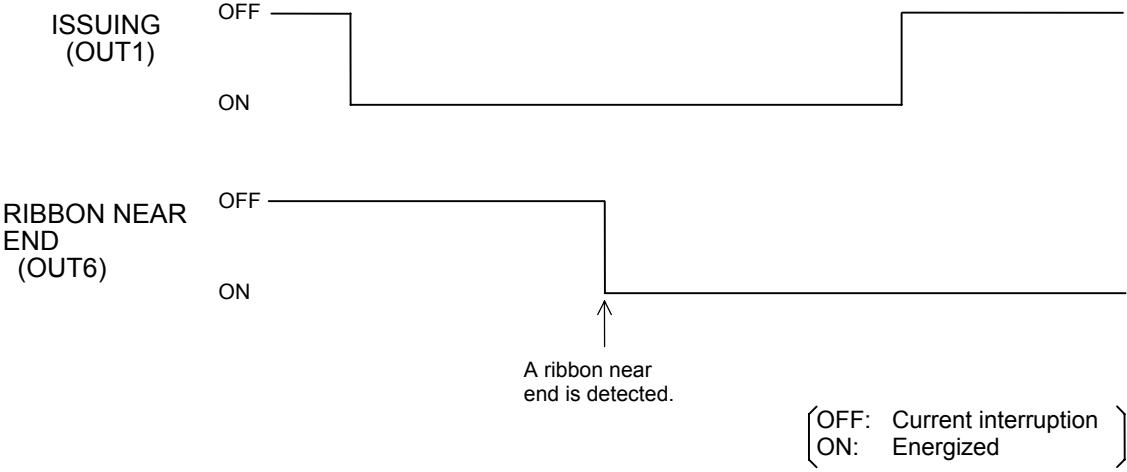


OUT6

RIBBON NEAR END

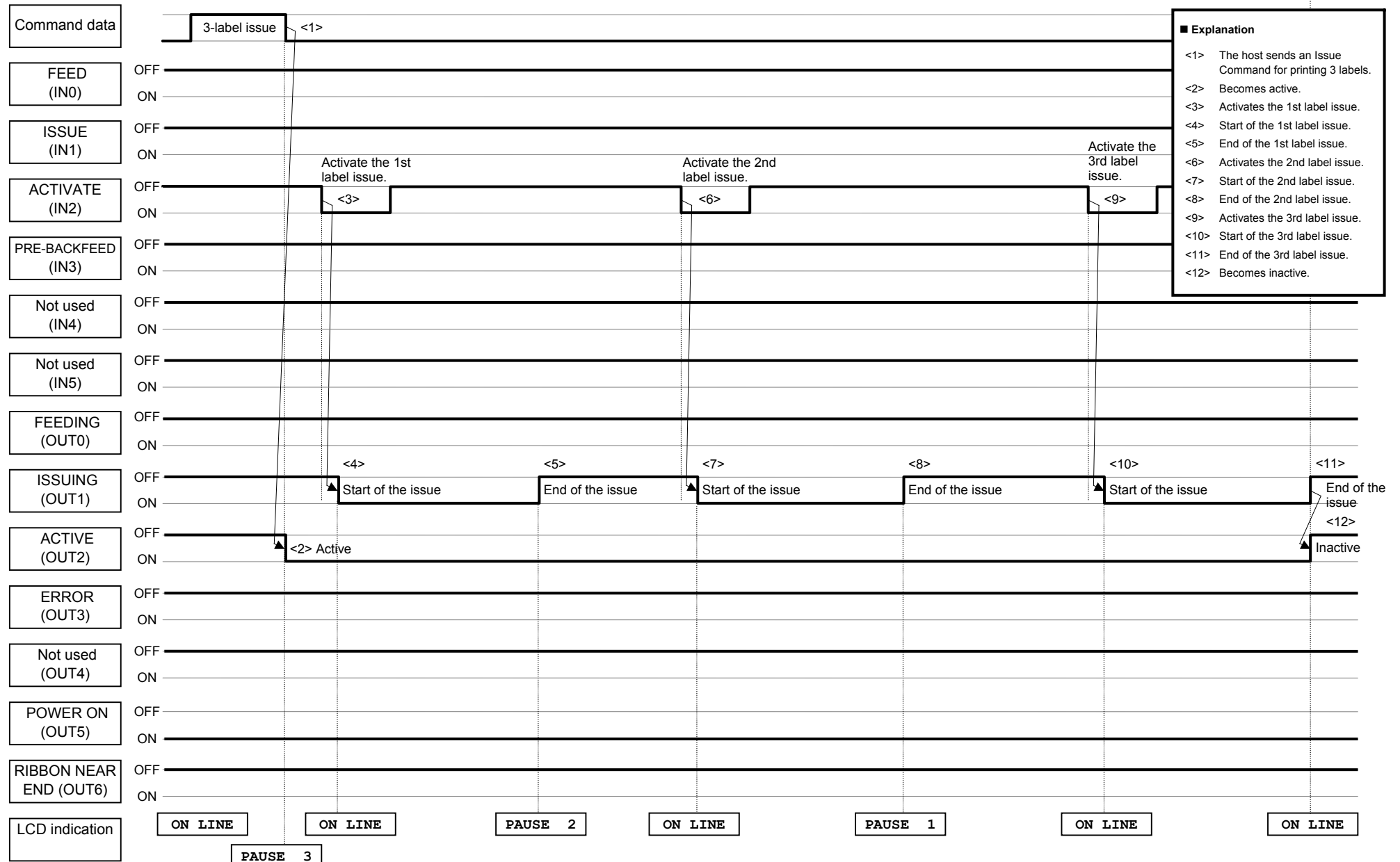
[In-line]

This output signal indicates that the printer is in a ribbon near end state. While the printer is in the ribbon near end state, the signal is on. The signal turns off when the printer status changes to a ribbon end. The RIBBON NEAR END signal (OUT6) remains off when the ribbon near end detection is disabled in the system mode.

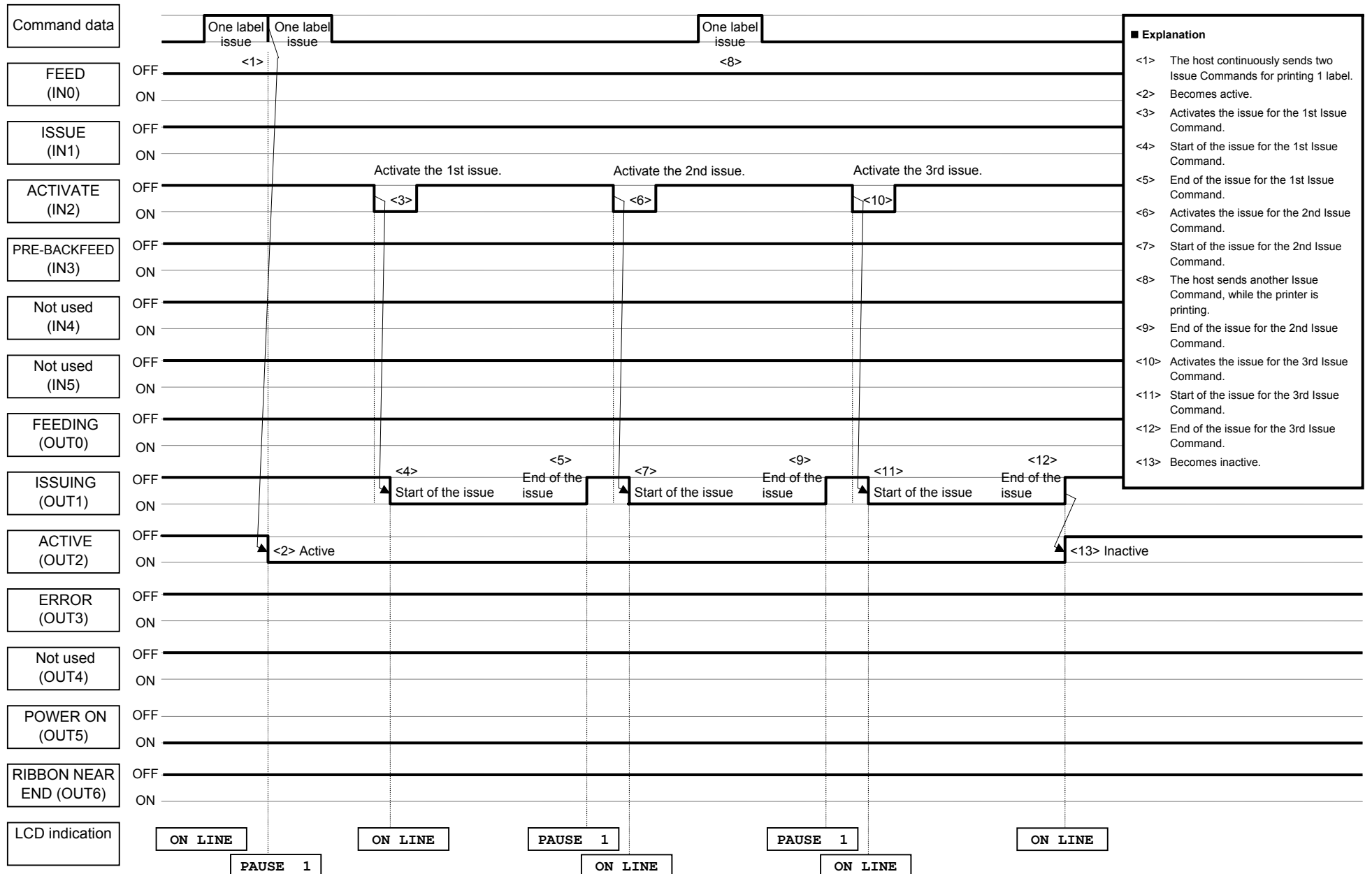


### 4.3.3 example of timing chart (in-line specifications)

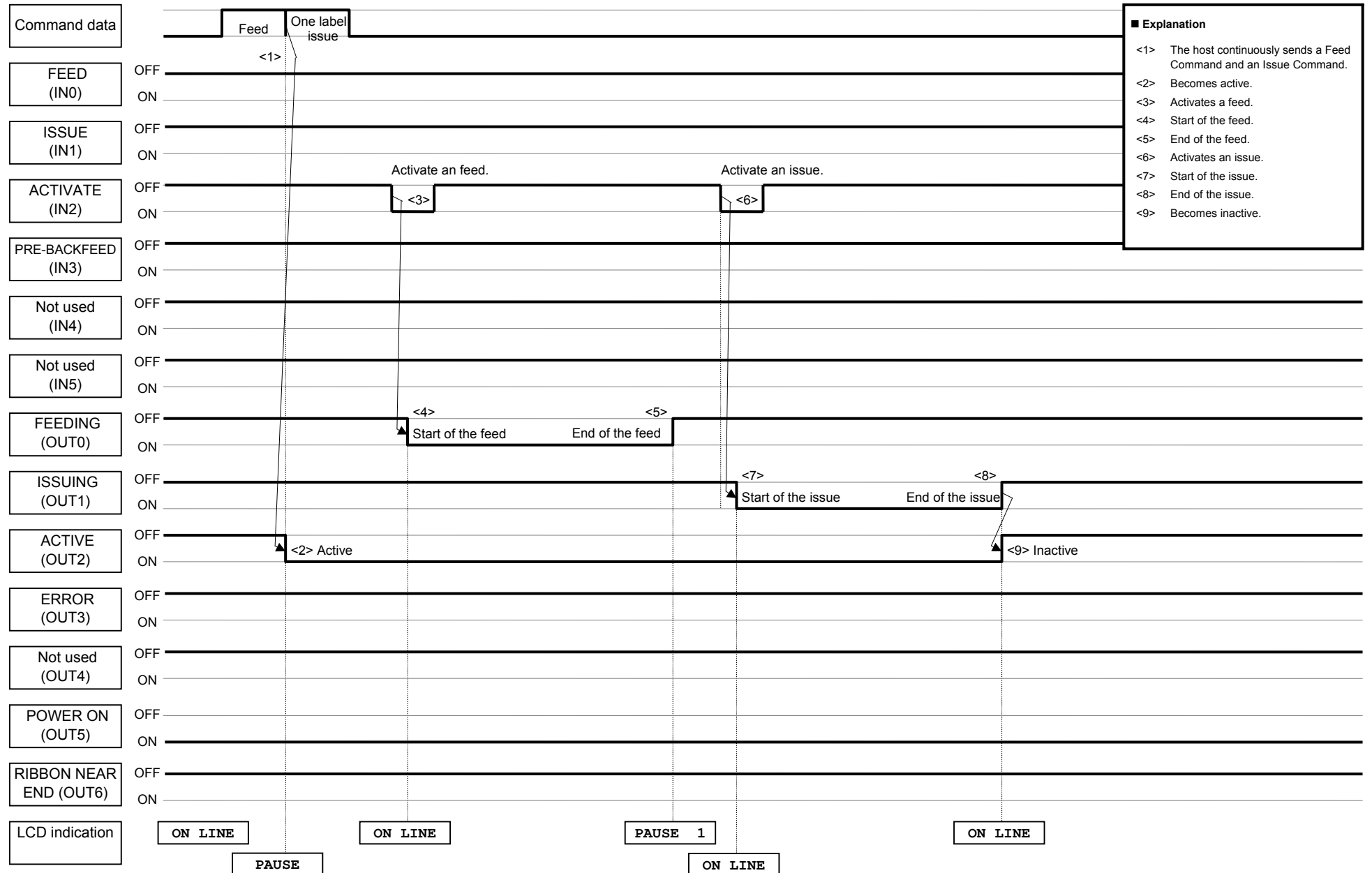
(1) When an Issue Command (for printing 3 labels) is sent.



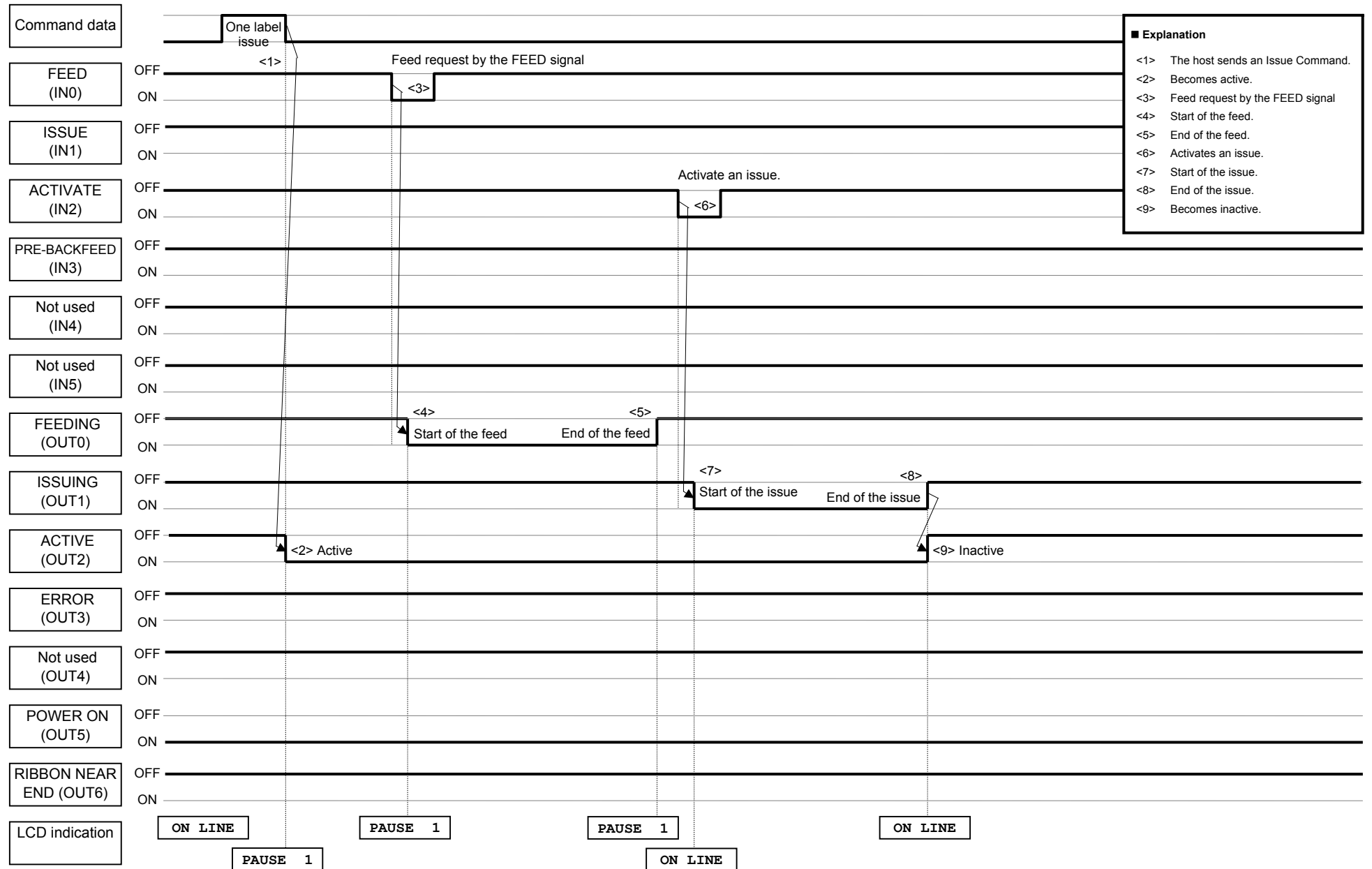
(2) When another Issue Command is sent during printing.



(3) When a Feed Command and an Issue Command are continuously sent.

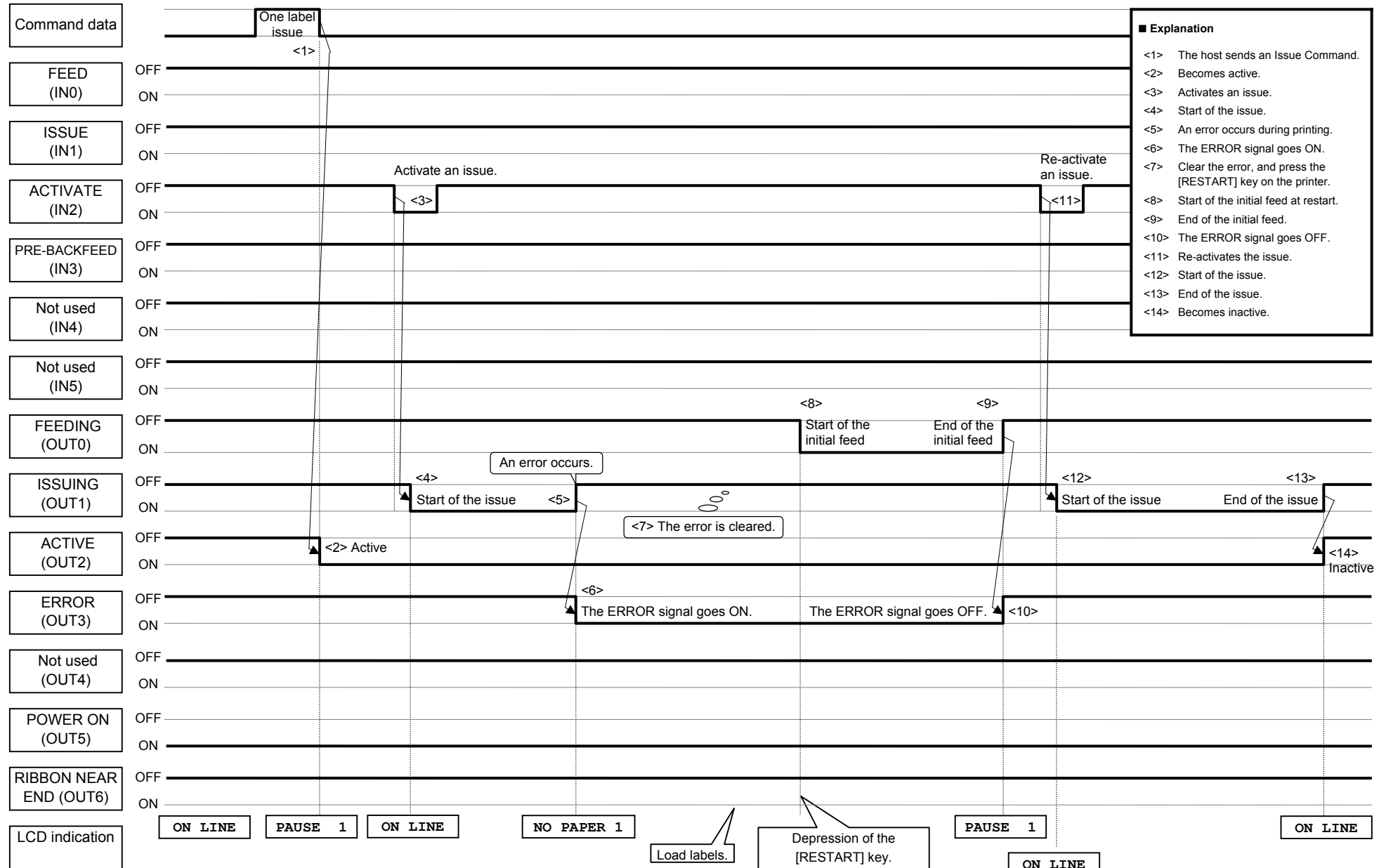


(4) When a feed is performed by the FEED signal during the active state.





(5) When a paper end error occurs during printing.



#### 4.4 EXPANSION I/O SIGNAL LINES SPECIFICATIONS (IN-LINE)

Signal		Min.	Max.	Unit of measure	Remarks
IN0	Request for a feed	20	--	ms	
IN1	Request for an issue	20	--	ms	
IN2	Request for a pause	20	--	ms	
IN3	Request for a pre-backfeed	20	--	ms	
IN4	---				
IN5	---				
OUT0	Feeding	2	--	ms	
OUT1	Issuing	1	--	ms	
OUT2	Pausing	2	--	ms	
OUT3	Error	2	--	ms	
OUT4	---				
OUT5	PowerON	2	--	ms	
OUT6	Ribbon near end	2	--	ms	