

TOSHIBA

TOSHIBA TEC Bar Code Printer

B-SX4T Series, B-SX5T 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) (B-7704-IO-XX) for the B-SX4T series (hereinafter referred to as "B-SX4T") and B-SX5T series (hereinafter referred to as "B-SX5T") 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 the printer state, according to the external input/output signals, in addition to using commands from the PC. This allows interfacing with the external equipment such as a labeler.

3. ELECTRICAL SPECIFICATIONS

3.1 PIN ASSIGNMENT

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

Connector: FCN-685JO024 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

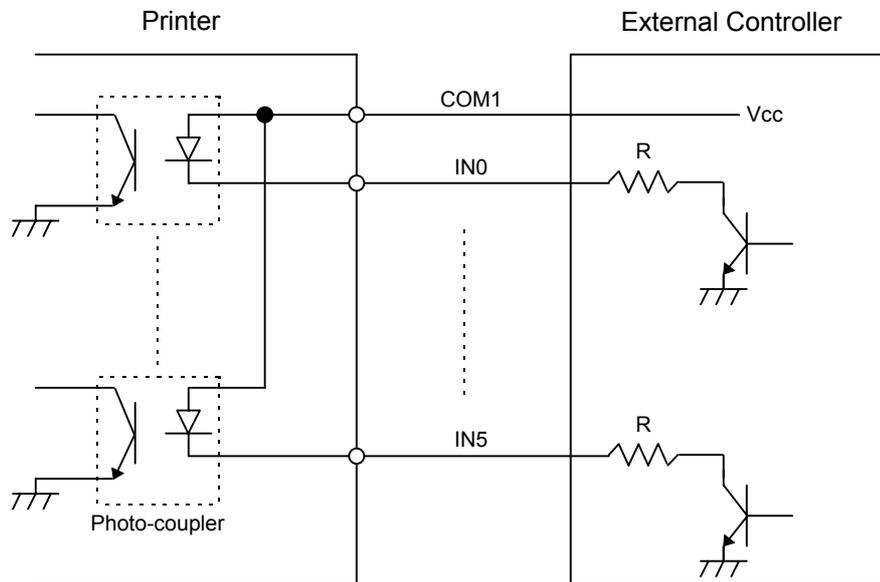
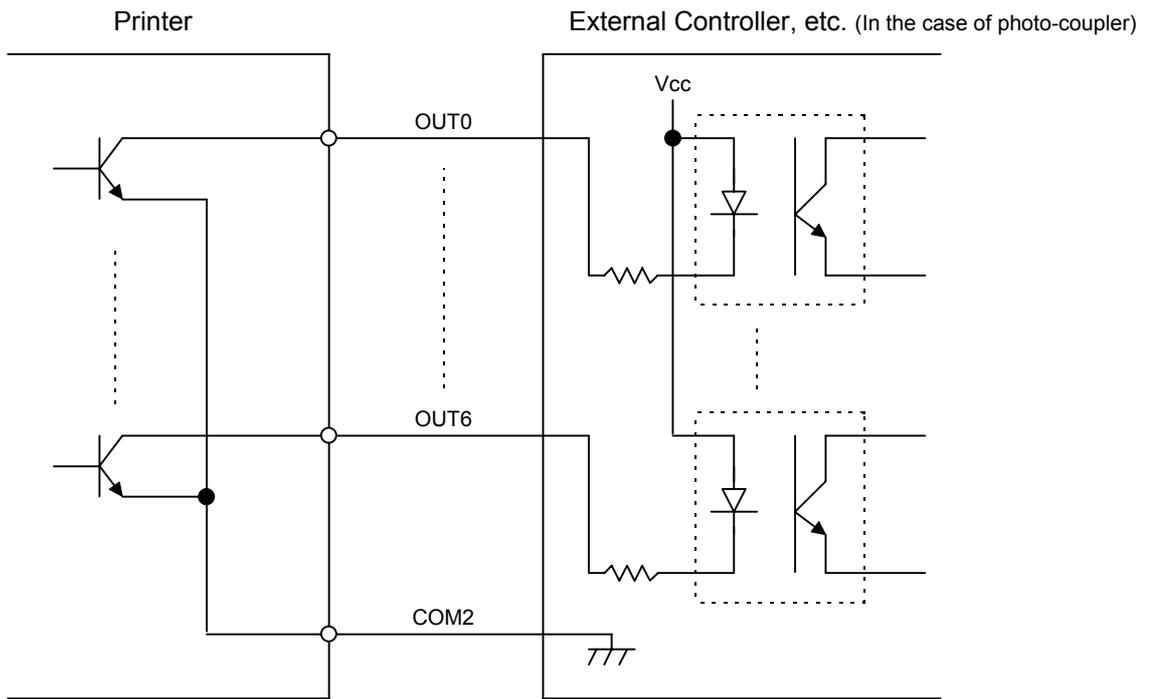


Photo-coupler: TLP521 (TOSHIBA)

There are 6 input circuits, and each input is a current loop using a photo-coupler. The anode of the photo-coupler is connected to the common pin COM1 in each of the 6 circuits. 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, for the standard mode and the in-line mode. The type can be selected in the system mode setting.

TYPE1: Standard mode

TYPE2: In-line mode

4.1 STANDARD SPECIFICATIONS

[Standard]

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 ribbon is near the end.

4.1.2 DETAILED DESCRIPTIONS FOR SIGNALS

[Standard]

INO

FEED

When the signal goes from off to on, the printer feeds one label. If the signal is on when the feed is completed, the printer feeds one more label.

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

- Issuing
- Feeding
- Ejecting
- Manual feeding
- Checking broken head dots
- Waiting for stripping
- Command save mode
- Writable character store mode
- Communication error (command error or hardware error)
- System mode
- Performing a pre-backfeed

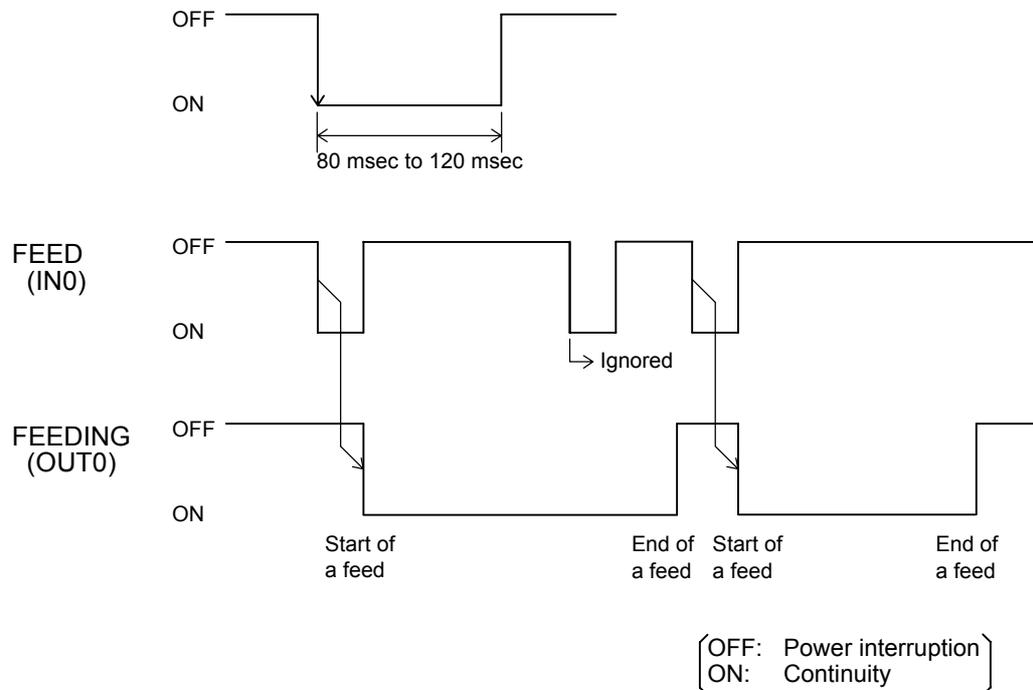
When the manual forward feed length has been set, a feed is performed by a value of one label feed length plus a manual forward feed length.

When the printer is in a waiting state for a forward feed in the cut issue mode, 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 feeding a label back to the home position (pre-backfeed), a feed length (described below) is actually performed.

A feed length to be performed = Pre-backfeed length + Feed length of a label



When the signal goes from off to on, the printer prints the data in the image buffer on one label. If the signal is on when the issue is completed, the printer issues one more label.

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

- Issuing
- Feeding
- Pausing
- Engine error
- Ejecting
- Manual feeding
- Checking broken head dots
- Waiting for stripping
- Command save mode
- Writable character store mode
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed

After a label is issued by the Issue Command sent from the host, the ISSUE signal allows the same label to be printed. However, this signal cannot be substituted for the Issue Command. If the ISSUE signal goes on under the following conditions, printing is not performed properly.

- The ISSUE Command is not sent.
- The image buffer clear and drawing are performed after the Issue Command is sent. However, the Issue Command is not sent again.

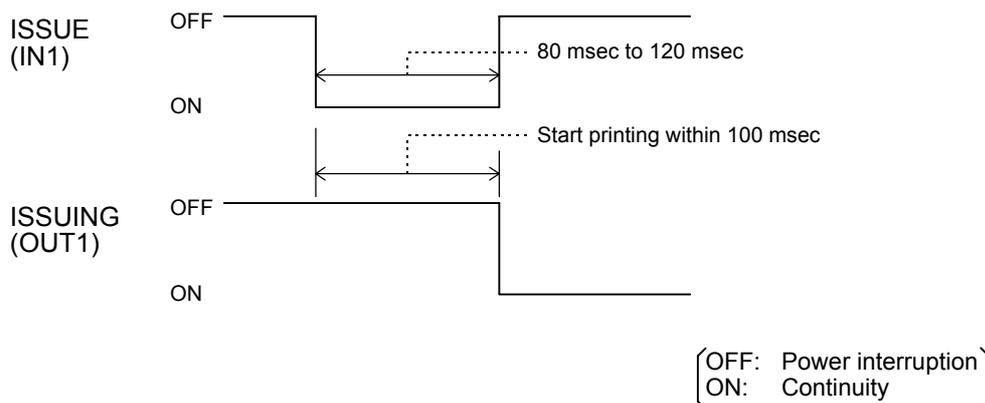
In this case, a label may not be issued, and a status response may be returned.

When the printer is in a waiting state for a forward feed in the cut issue mode, it performs the following operations.

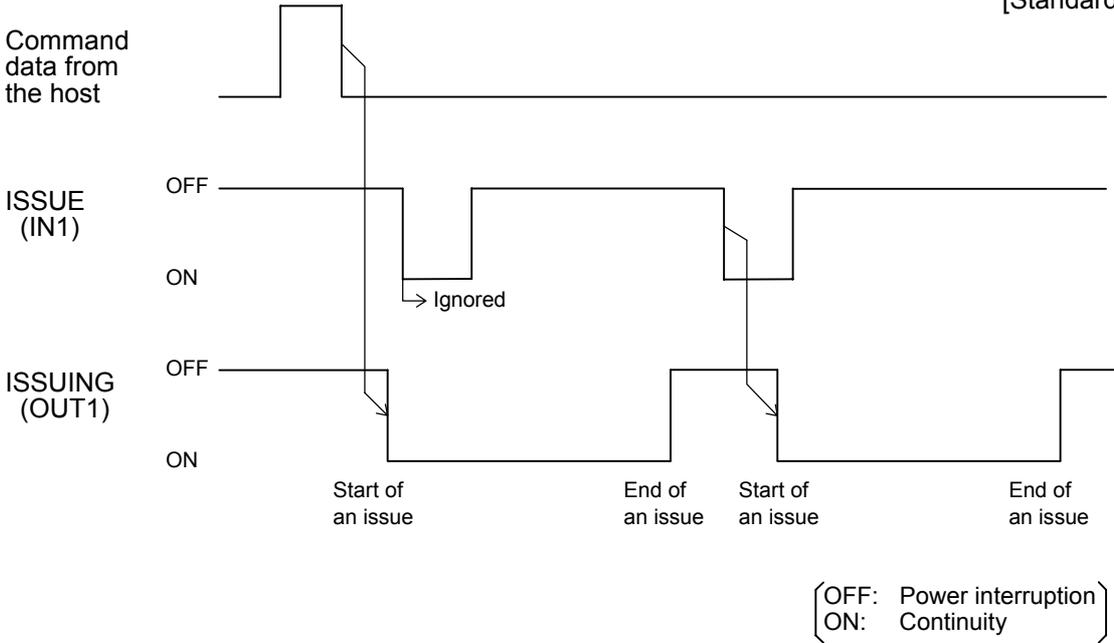
One label feed → Feed to the cut position → Cut → Reverse feed to the home position → Forward feed

When the printer is feeding a label back to the home position (pre-backfeed), a feed length (described below) is actually performed.

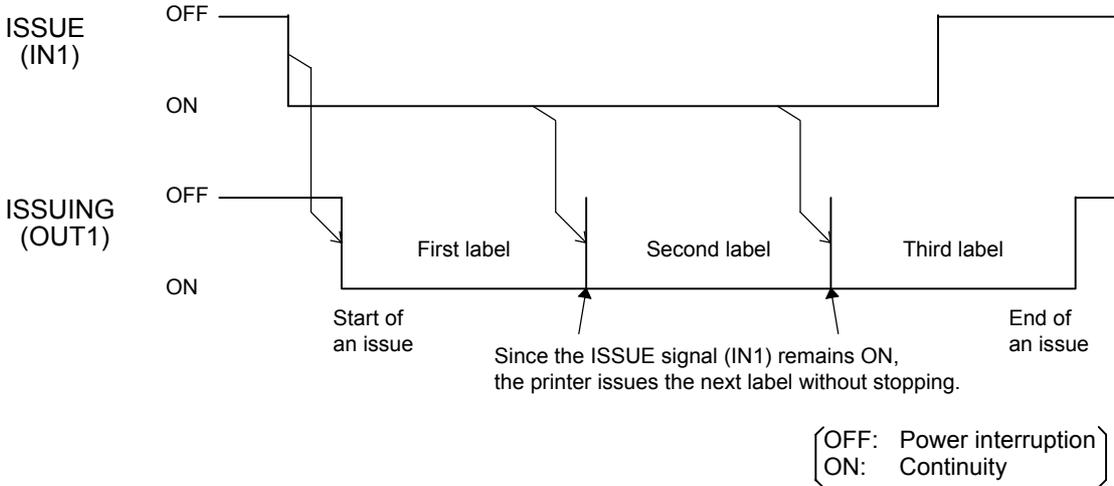
A feed length to be performed = Pre-backfeed length + Feed length of a label (+ Forward feed length to the strip position)



[Standard]



NOTE: While an issue is being performed by the ISSUE signal (IN1), the Clear Command or Drawing Command should not be sent from the host, since the data may not be printed properly.

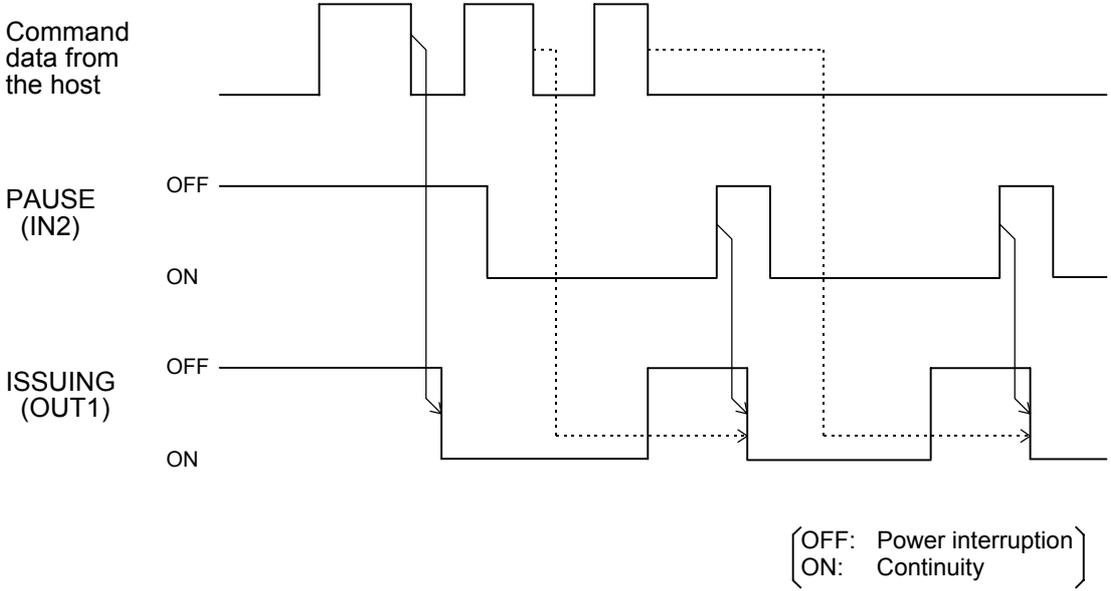


IN2

PAUSE

[Standard]

The printer enters a pause state by this signal. While the PAUSE signal is on, the printer does not issue a label. When the signal goes off, the printer starts issuing. If the PAUSE signal goes on while the printer is issuing or feeding a label, the printer does not stop an issue or a feed immediately. After issuing or feeding one label, the printer enters the pause state.



A pause state generated by the PAUSE signal cannot be cleared only by the RESTART key of the printer. The pause state, generated by the PAUSE key, can be cleared when the PAUSE signal goes from on to off.

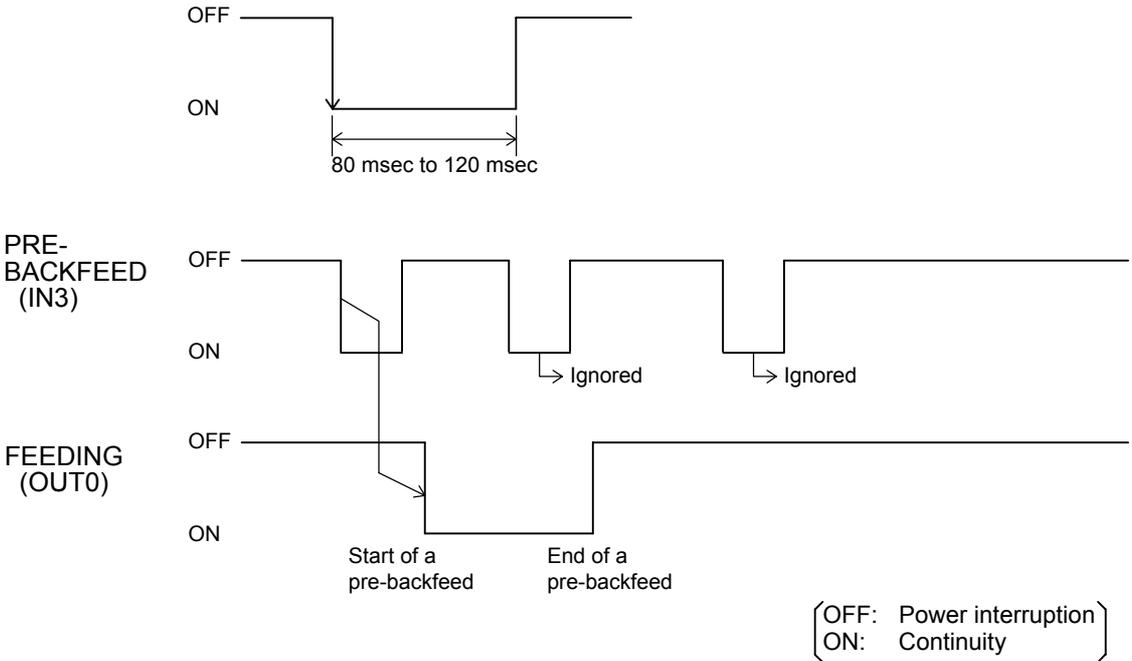
An error can be cleared only by the RESTART key on the printer.
(The error cannot be cleared when the PAUSE signal goes from on to off.)

When the strip issue (Issue modes D and E) is selected, or this signal goes from off to on, the printer feeds a label back to the issue standby position.

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

- Issuing
- Feeding
- Engine error
- Ejecting
- Manual feeding
- Checking broken head dots
- Command save mode
- Writable character store mode
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed

Once the label is fed back to the issue standby position, thereafter, the PRE-BACKFEED signal input is ignored.



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

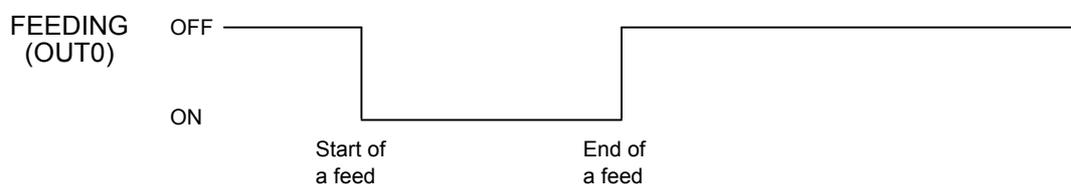
- Normal feeding
- Ejecting by the Eject Command from the host
- Ejecting for an issue with a cut
- Reverse feeding for a strip issue
- Manual forward/reverse feeding
- Initial feed when the printer restarts after an error is cleared.
- Performing a pre-backfeed

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

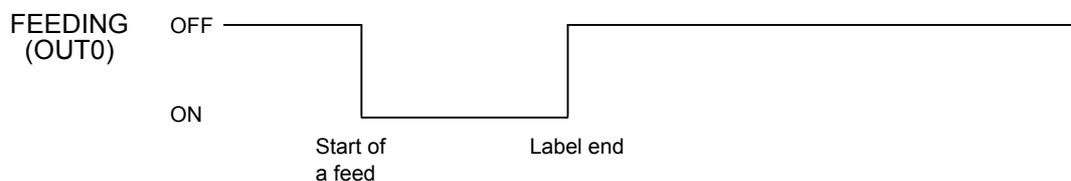
The FEEDING signal is output for a feed by any of the following: the printer key, a command from the host, or the FEED signal.

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

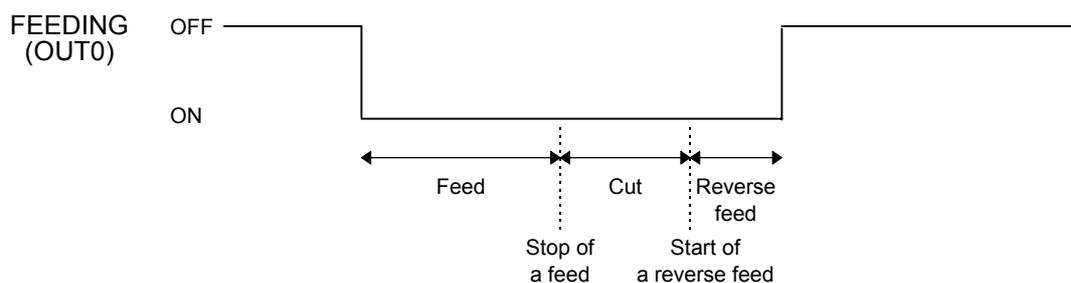
(1) Normal feed



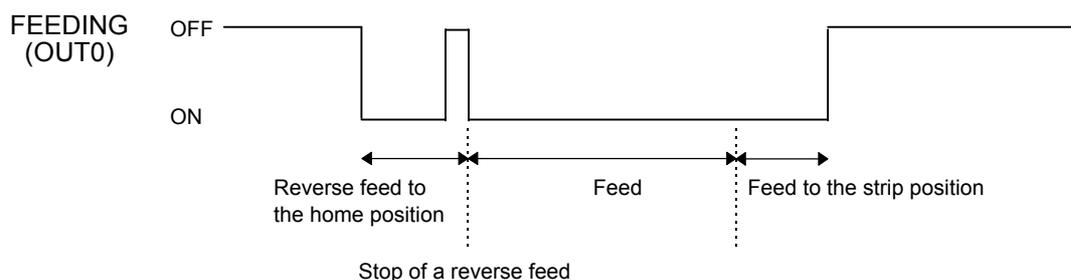
(2) Label end in the middle of a feed



(3) Feed with a cut



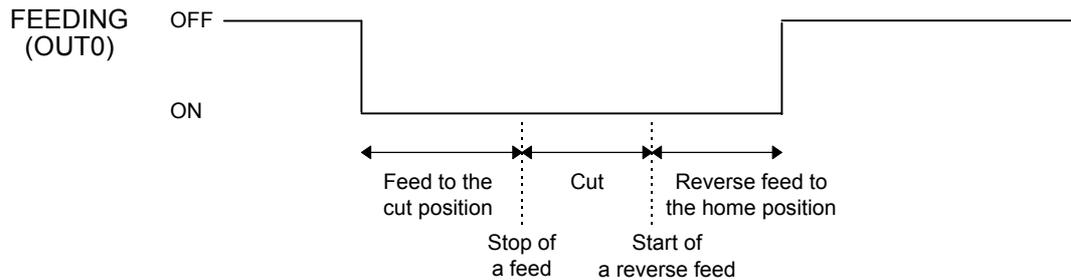
(4) Strip feed



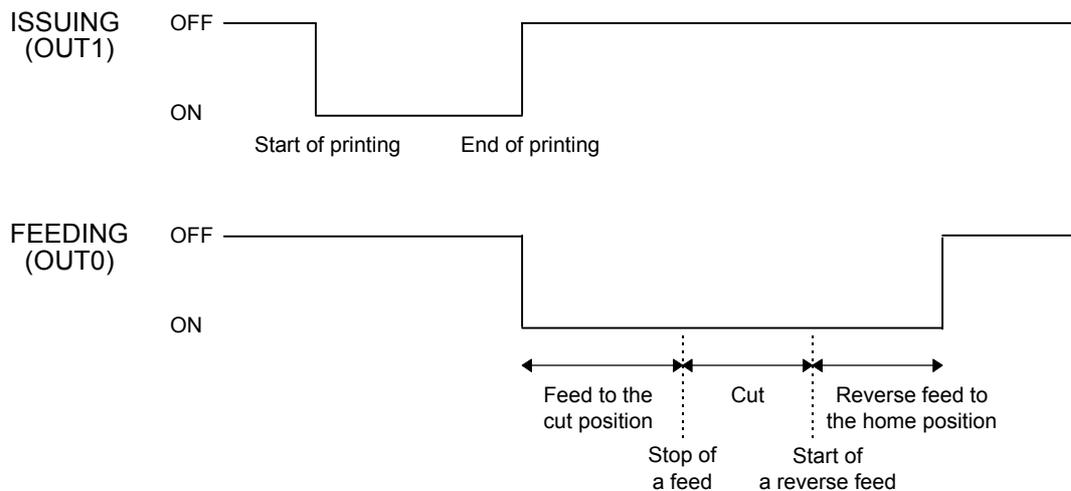
(OFF: Power interruption)
 (ON: Continuity)

(5) Ejection

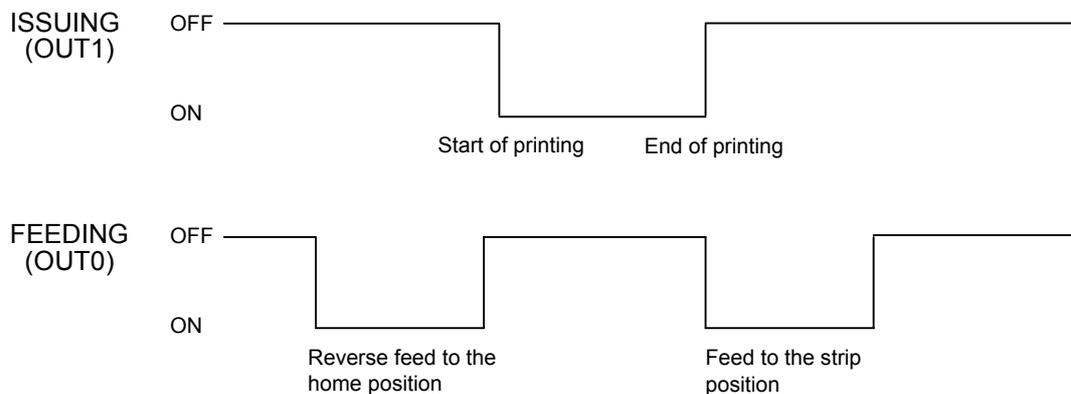
[Standard]



(6) Issue with a cut



(7) Strip issue



{ OFF: Power interruption }
{ ON: Continuity }

This output signal indicates that the printer is issuing a label.

The signal is on during an issue. In the batch issue mode, the signal goes off when the specified number of labels are issued normally. However, when the printer performs batch issues without stopping between different batches, the signal remains on. In the strip issue mode, the signal goes off every time the printer issues one label normally. In the cut issue mode, the signal goes off while the printer is ejecting a label to cut.

The ISSUING signal is output for any issue for the self test results printout or test print in the system mode, or by a command from the host or the ISSUE signal. However, since the checks such as the Expansion I/O loop back check are performed in the self-test, there may be moments where all output signals go on.

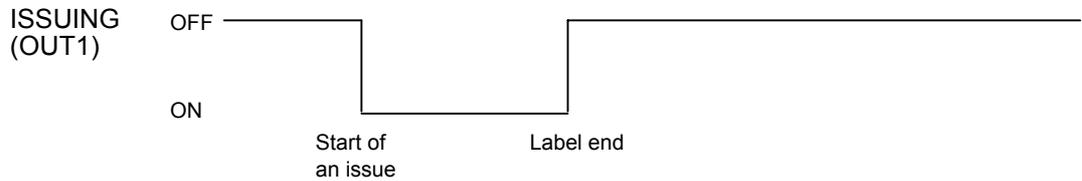
When an error occurs during issuing and the printer stops issuing, the ISSUING signal goes off.

When the printer pauses during issuing one label or more, the signal goes off. After the pause state is cleared, the signal goes on again and the printer resumes printing the remaining number of labels.

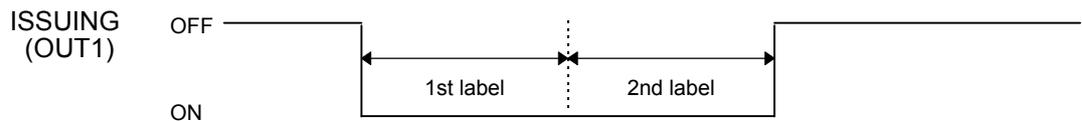
(1) Normal issue



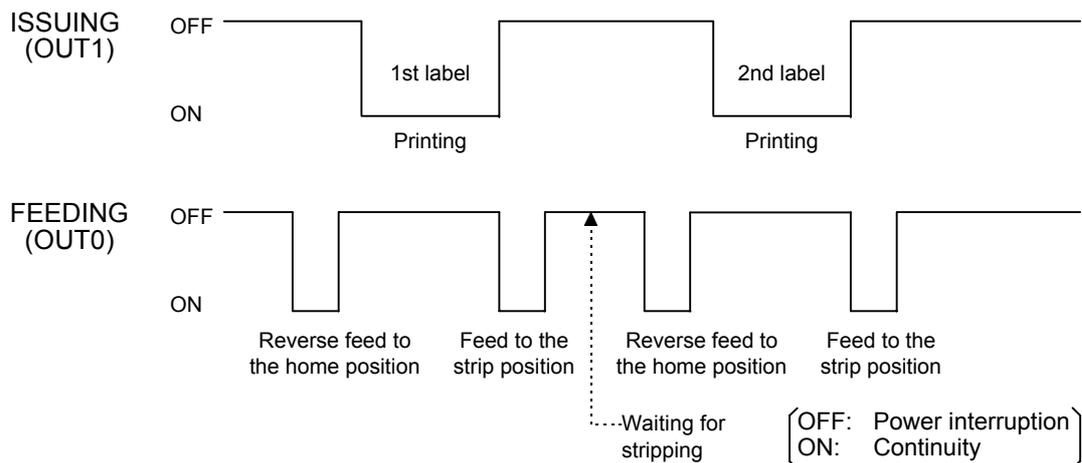
(2) Label end in the middle of an issue



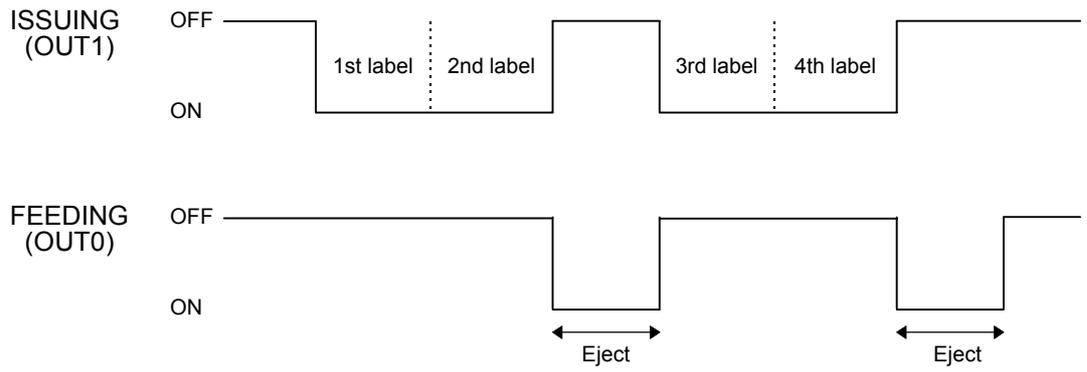
(3) Batch issue (2 labels to issue)



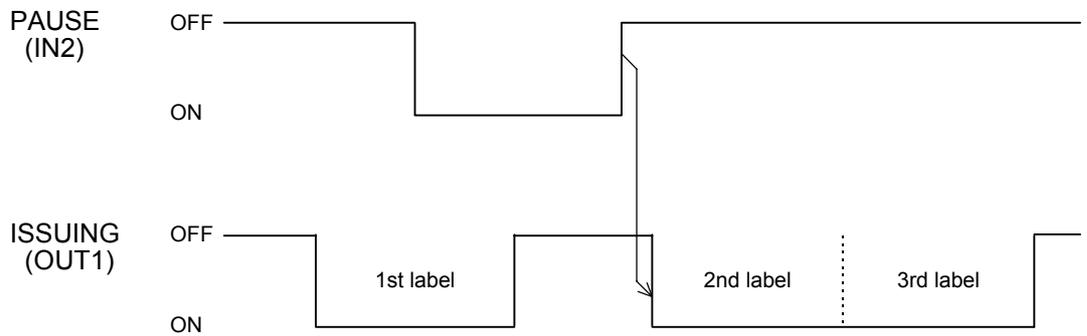
(4) Strip issue (2 labels to issue)



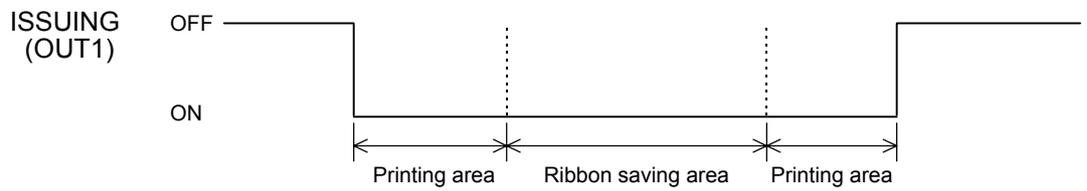
(5) Cut issue (4 labels to issue, cut every 2 labels) [Standard]
 (When the swing cutter is used)



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

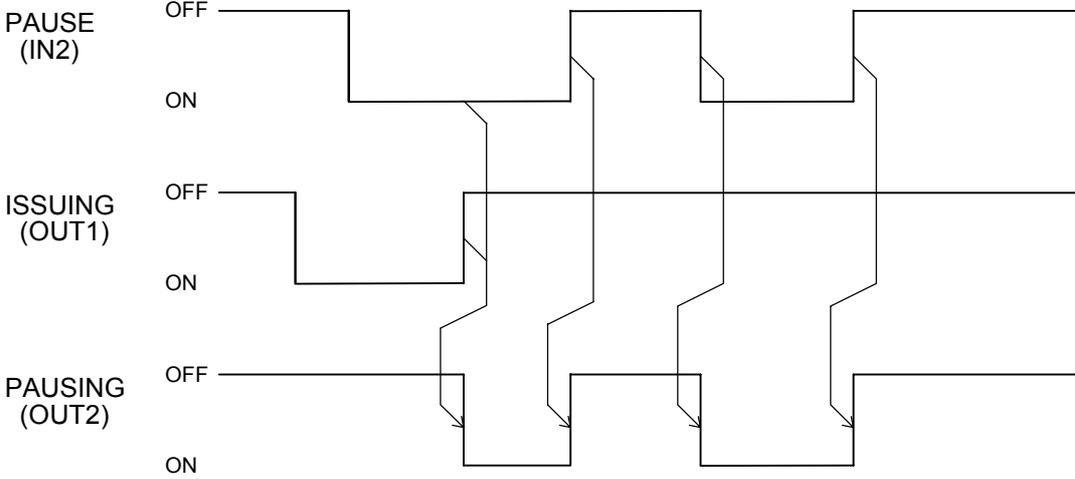


(7) Ribbon saving issue



(OFF: Power interruption)
 (ON: Continuity)

This output signal indicates that the printer is in a pause state. While the printer is in a pause state, the signal goes on. The PAUSING signal is output for any pausing state caused by either the printer key or PAUSE signal. Also, when the head is opened, the PAUSING signal goes on.



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.

{ OFF: Power interruption }
{ ON: Continuity }

This output signal indicates that an error occurred, stopping the printer.

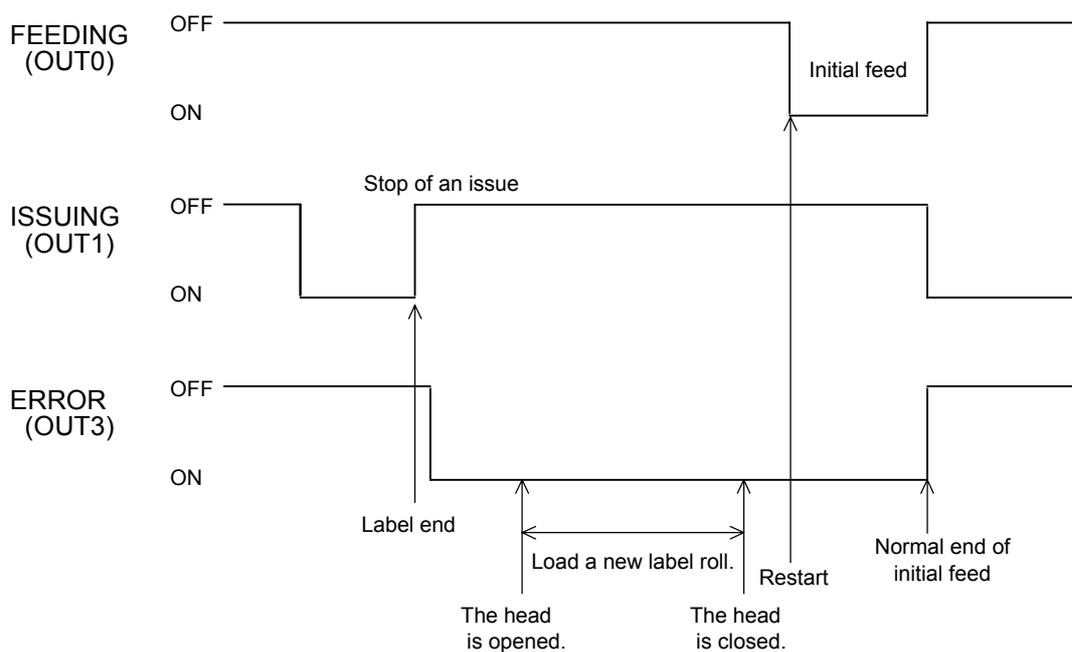
The signal goes on while the printer is in an error state.

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

- Communication error (Command error)
- Communication error (Hardware error)
- Paper jam
- Cutter error
- Paper end
- Ribbon end
- Ribbon error
- Head open error
- Thermal head abnormal
- Thermal head temperature abnormal (overheating)
- Rewinder overflow
- Write error of memory for storage
- Format error of memory for storage
- Full memory for storage

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

However, the printer is not restored unless the power goes off then on, when an error cannot be cleared by the [RESTART] key.



OUT5

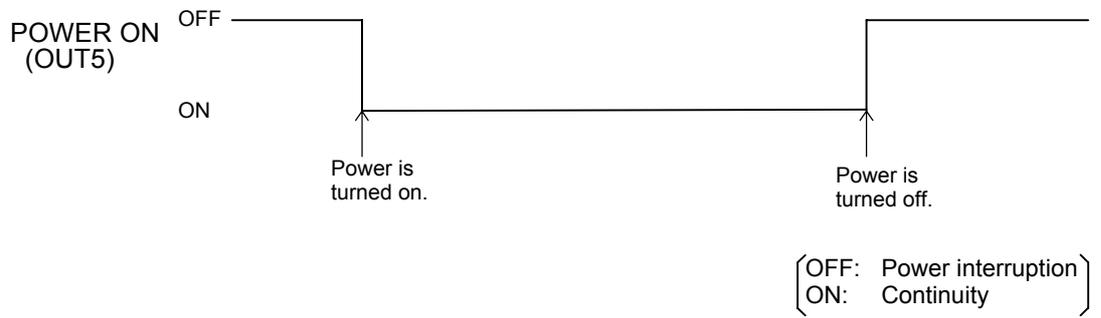
POWER ON

[Standard]

This output signal indicates that the printer power is on.

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

While the printer power is on, the POWER ON signal remains on, no matter what state the printer is in.

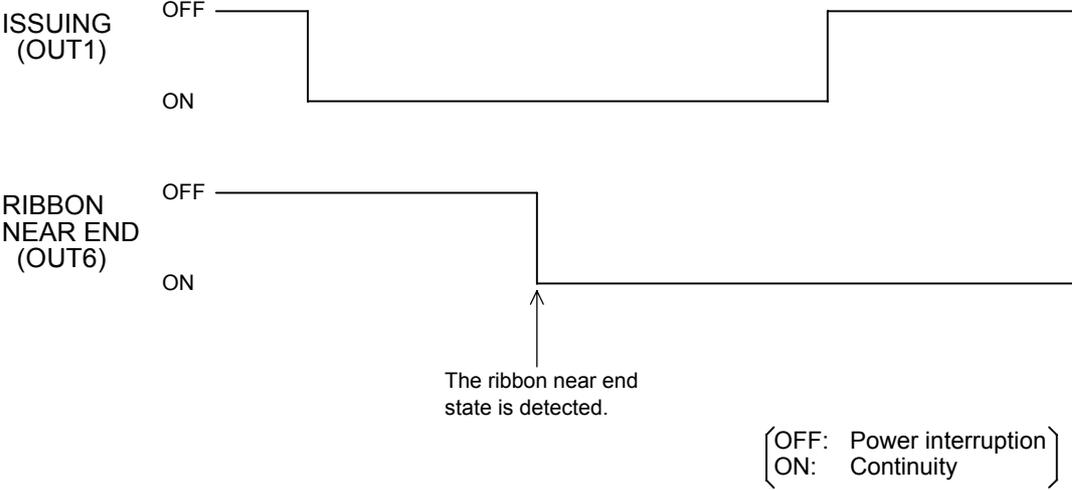


OUT6

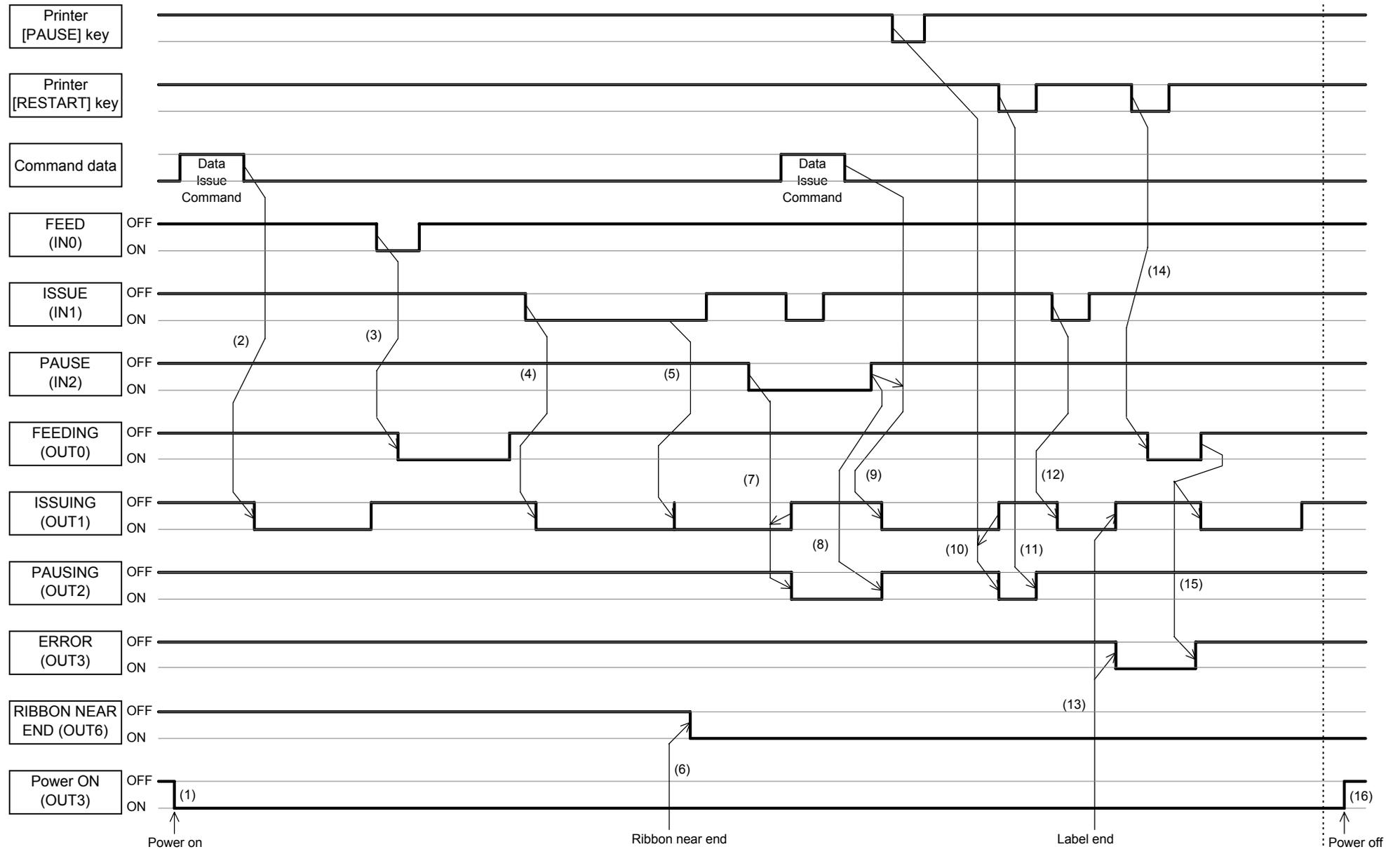
RIBBON NEAR END

[Standard]

This output signal indicates that the printer ribbon is near the end. While the printer is in a ribbon near end state, the signal goes on. When the printer has run out of ribbon, the signal goes off. If the ribbon near end detection is set to OFF (not performed) in the system mode, the OUT6 signal remains OFF even if the printer is in a ribbon near end state.



4.1.3 EXAMPLE OF TIMING CHART (STANDARD SPECIFICATIONS)



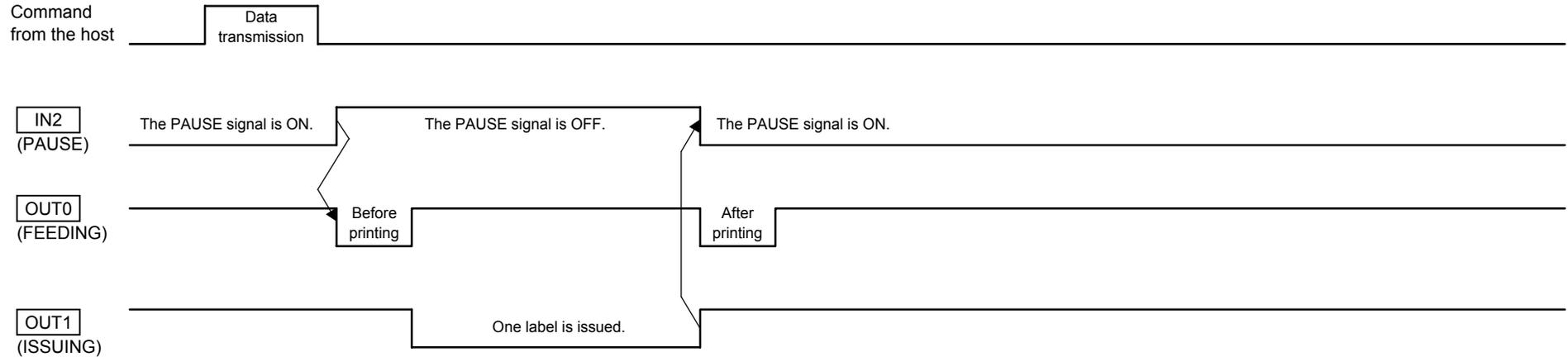
Explanation of Timing Chart (Standard Specifications)

- (1) When the power is turned on, the (POWER ON) goes on.
- (2) The printer starts issuing by the command from the host. The (ISSUING) goes on.
- (3) The printer starts feeding by the (FEED). The (FEEDING) goes on.
- (4) The printer starts issuing by the (ISSUE). The (ISSUING) goes on.
- (5) The printer starts issuing by the (ISSUE). The (ISSUING) goes on.
- (6) Since a ribbon near end state is detected, (RIBBON NEAR END) goes on.
- (7) After the issue is completed, the printer enters into a pause state by the (PAUSE). The (PAUSING) goes on.
- (8) The pause state is cleared when the (PAUSE) goes off. The (PAUSING) goes off.
- (9) The pause state is cleared when the (PAUSE) goes off. Then the printer starts issuing for the command from the host. The (ISSUING) goes on.
- (10) After the issue is completed, the printer enters into a pause state by the printer PAUSE key. The (PAUSING) goes on.
- (11) The pause state is cleared by the printer RESTART key. The (PAUSING) goes off.
- (12) The printer starts issuing by the (ISSUE). The (ISSUING) goes on.
- (13) The printer stops issuing because a label end error occurred during an issue. The (ISSUING) goes off and the (ERROR) goes on.
- (14) The printer starts an initial feed by the printer RESTART key. (The (FEEDING) goes on.)
- (15) After the initial feed is completed, the error state is cleared (the (ERROR) goes off), the printer resumes issuing (the (ISSUING) goes on).
- (16) When the power is turned off, the (POWER ON) goes off.

OFF: Power interruption
 ON: Continuity

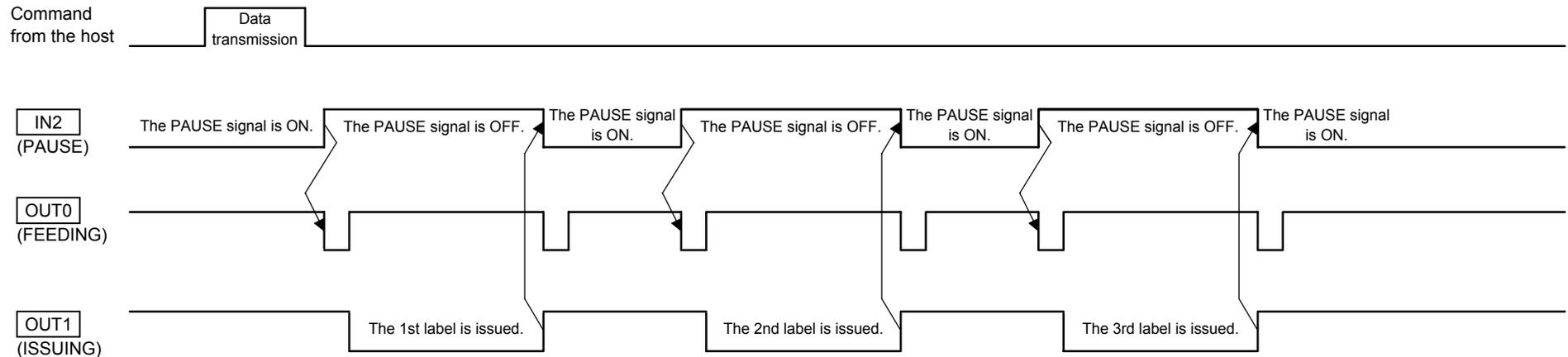
Example of Timing Charts for Issue/Feed Mode E (Strip mode: with back feed, the peel-off sensor is ignored, the applicator is supported.)

(1) When one label is issued:



- When issue mode E is selected, an issue is started by the IN2 (PAUSE).
- The data transmission is performed when the IN2 (PAUSE) goes on, and an issue is started when the IN2 (PAUSE) goes off.
- The IN2 (PAUSE) goes on at the timing of the rise of the OUT1 (ISSUING).
- If the label to be issued is the same as the previous one, an issue is started when the IN2 (PAUSE) goes off.
- If the label to be issued is different from the previous one, an issue is started when the IN2 (PAUSE) goes off, after the next label data is sent.

(2) When three labels are issued:



4.2 IN-LINE SPECIFICATIONS

[In-line]

4.2.1 OUTLINE OF SIGNALS

Input

- IN0. FEED Feeds one label.
- IN1. ISSUE Issues one label.
- IN2. ACTIVATE Starts processing the Issue Command
- 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 ribbon is near the end.

4.2.2 DETAILED DESCRIPTIONS FOR SIGNALS

[In-line]

INO

FEED

When the signal goes from off to on, the printer feeds one label. If the signal is on when the feed is completed, the printer feeds one more label.

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

- Issuing
- Feeding
- Manual feeding
- Ejecting
- Checking broken head dots
- Waiting for stripping
- Command save mode
- Writable character store mode
- Communication error (command error or hardware error)
- System mode
- Performing a pre-backfeed

When the manual forward feed length has been set, a feed length (described below) is performed.

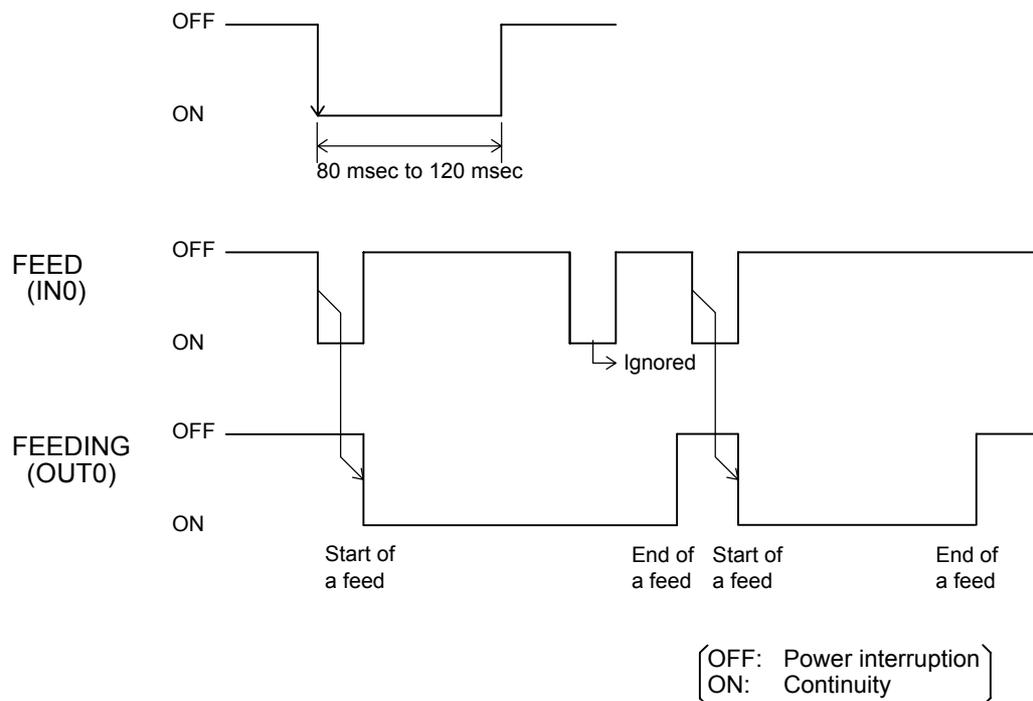
A feed length to be performed = Feed length of a label + Manual forward feed length

When the printer is in a wait state for a forward feed in the cut issue mode, 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 feeding a label back to the home position (pre-backfeed), a feed length (described below) is actually performed.

A feed length to be performed = Pre-backfeed length + Feed length of a label



When the signal goes from off to on, the printer prints the data in the image buffer on one label. If the signal is on when the issue is completed, the printer issues one more label.

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

- Issuing
- Feeding
- Pausing
- Inactive
- Engine error
- Manual feeding
- Checking broken head dots
- Waiting for stripping
- Command save mode
- Writable character store mode
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed

After a label is issued by the Issue Command sent from the host and the ACTIVATE signal (IN2), the ISSUE signal allows the same label to be printed. However, this signal cannot be substituted for the Issue Command. If the ISSUE signal goes on under the following conditions, printing is not performed properly.

- The ISSUE Command is not sent.
- An issue is not performed by the ACTIVATE signal after the Issue Command is sent.
- The image buffer clear and drawing are performed after the Issue Command is sent. However, the Issue Command is not sent again.

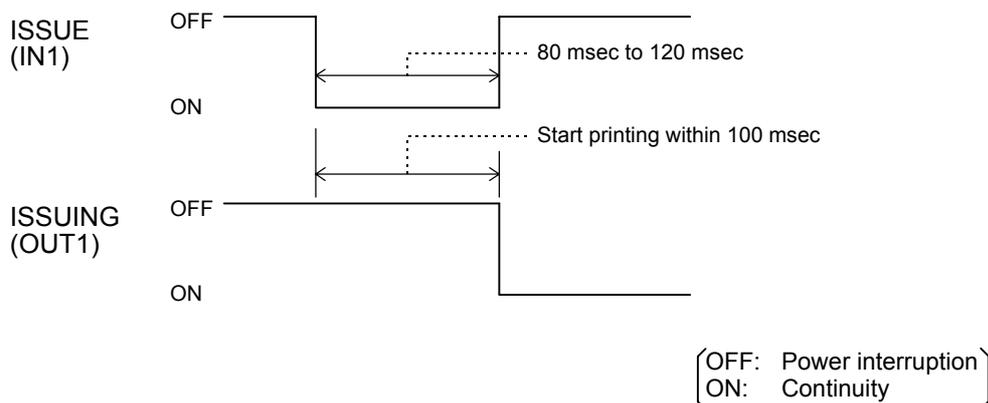
In this case, a label may not be issued, and a status response may be returned.

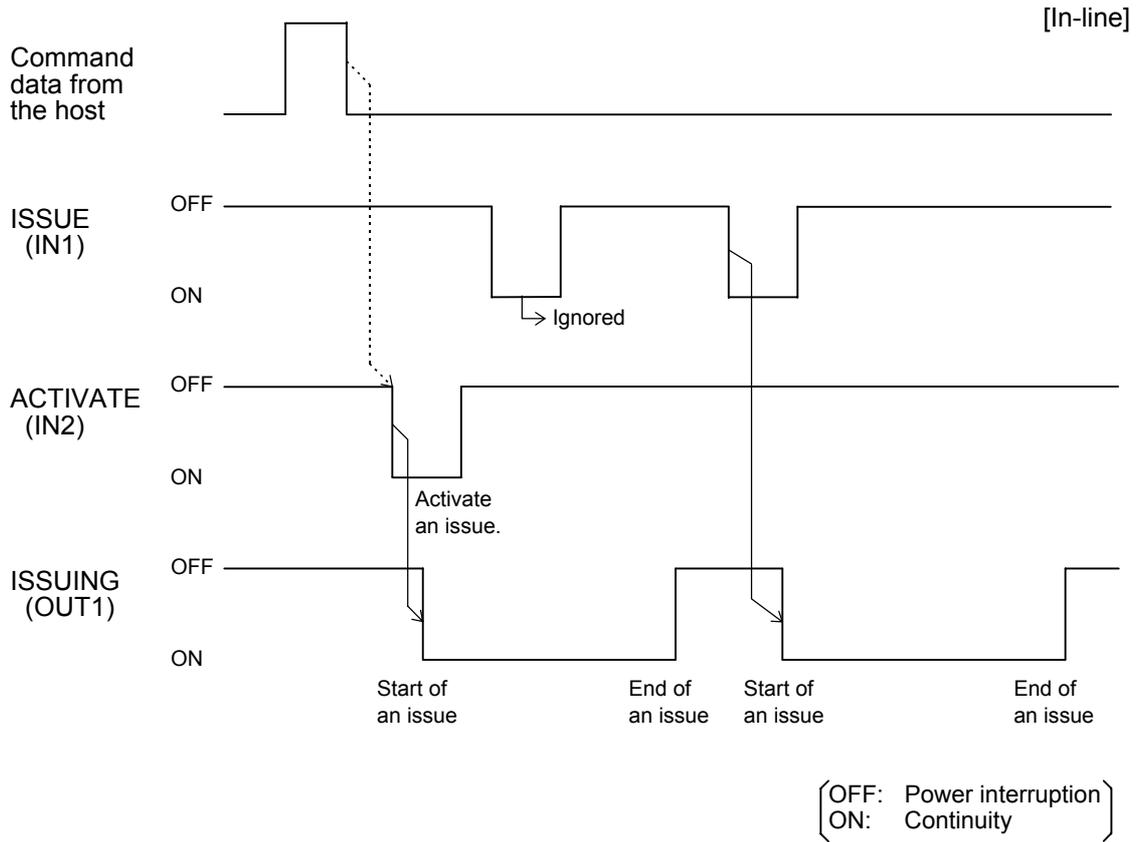
When the printer is in a wait state for a forward feed in the cut issue mode, it performs the following operations.

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

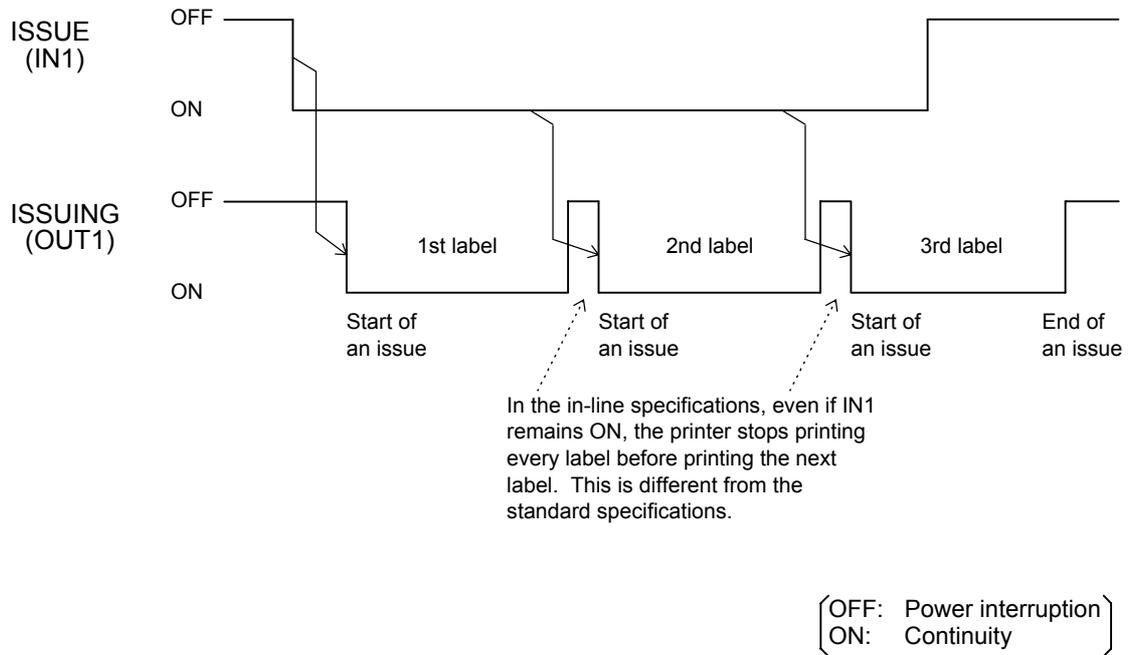
When the printer is feeding a label back to the home position (pre-backfeed), a feed length (described below) is actually performed.

A feed length to be performed = Pre-backfeed length + Feed length of a label (+ Forward feed to the strip position)





NOTE: While an issue is being performed by the ISSUE signal (IN1), the Clear Command or Drawing Command should not be sent from the host, since the data may not be printed properly.

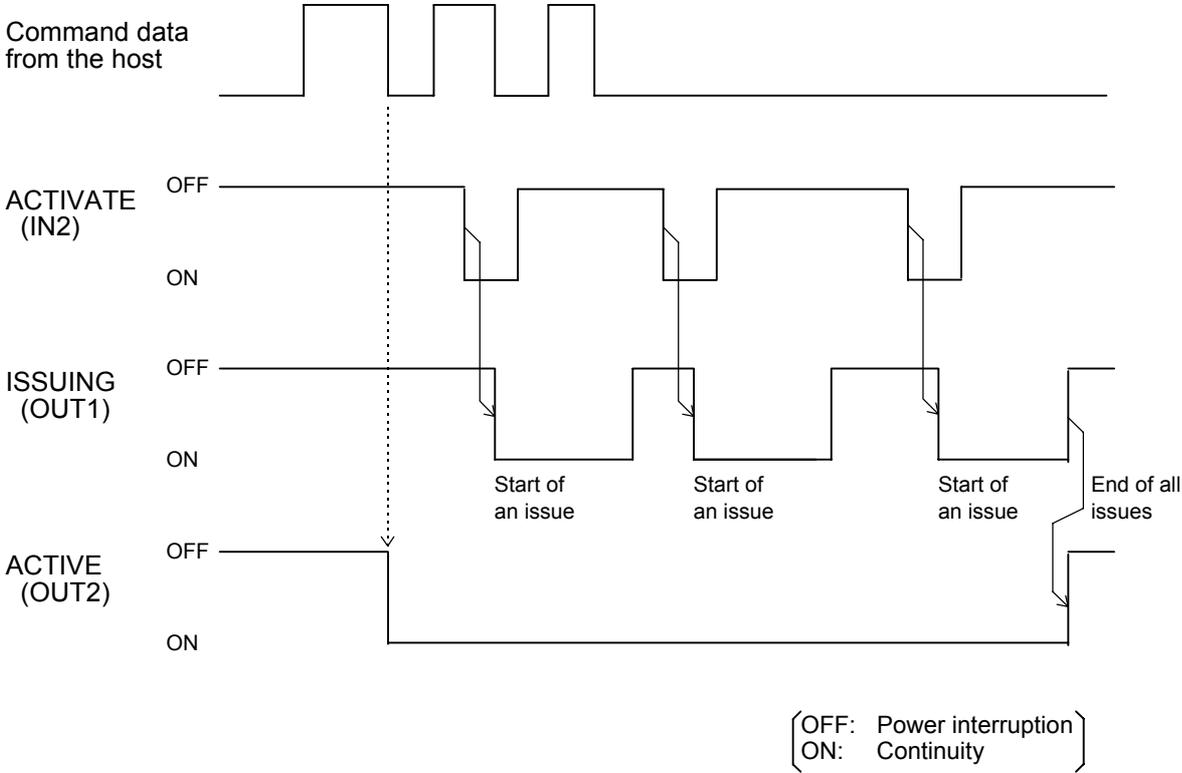


The printer executes the Issue Command which has been sent from the host according to this signal. While the ACTIVATE signal is off, the printer does not issue a label. The printer starts executing the Issue Command sent from the host by an ON pulse of 80 msec or more. One ON pulse allows the printer to execute the process for one label in the received Issue Commands. However, the ACTIVATE signal input is ignored, when the printer is in any of the following states.

- Issuing
- Feeding
- Inactive
- Engine error
- Ejecting
- Manual feeding
- Checking broken head dots
- Command save mode
- Writable character store mode
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed

When the printer is feeding a label back to the home position (pre-backfeed), a feed length (described below) is actually performed.

$$\text{A feed length to be performed} = \text{Pre-backfeed length} + \text{Feed length of a label}$$

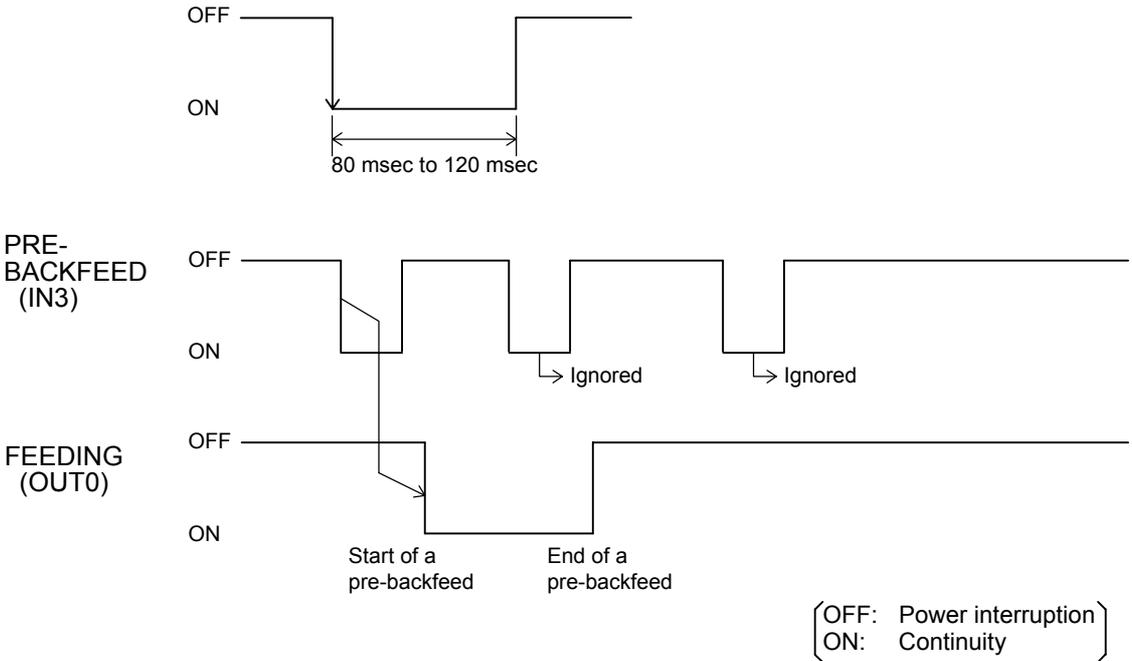


When the strip issue (Issue modes D and E) is selected, or this signal goes from off to on, the printer feeds a label back to the issue standby position.

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

- Issuing
- Feeding
- Engine error
- Ejecting
- Manual feeding
- Checking broken head dots
- Command save mode
- Writable character store mode
- Communication error (command error, hardware error)
- System mode
- Performing a pre-backfeed

Once the label is fed back to the issue standby position, thereafter, the PRE-BACKFEED signal input is ignored.



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

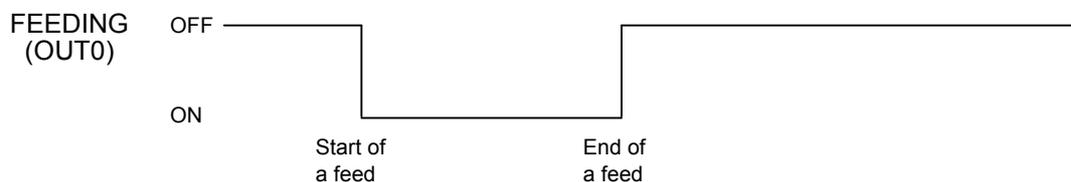
- Normal feeding
- Ejecting by the Eject Command from the host
- Ejecting for an issue with a cut
- Reverse feeding for a strip issue
- Manual forward/reverse feeding
- Initial feed when the printer restarts after an error is cleared.
- Performing a pre-backfeed

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

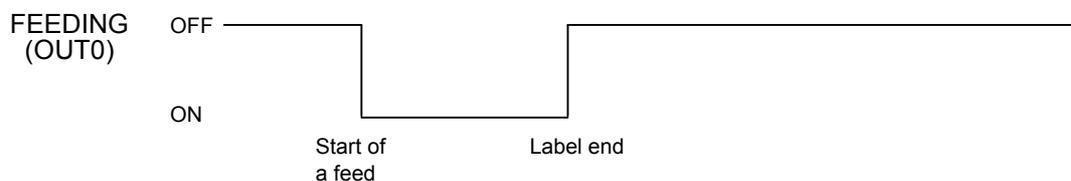
The FEEDING signal is output for a feed by any of the following: the printer key, a command from the host, or the FEED signal.

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

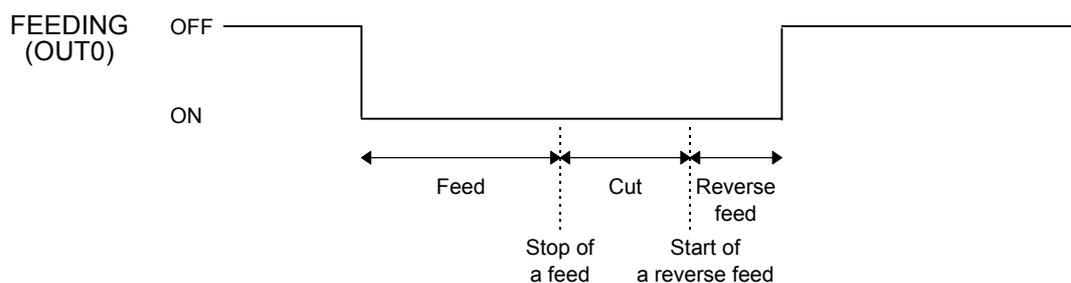
(1) Normal feed



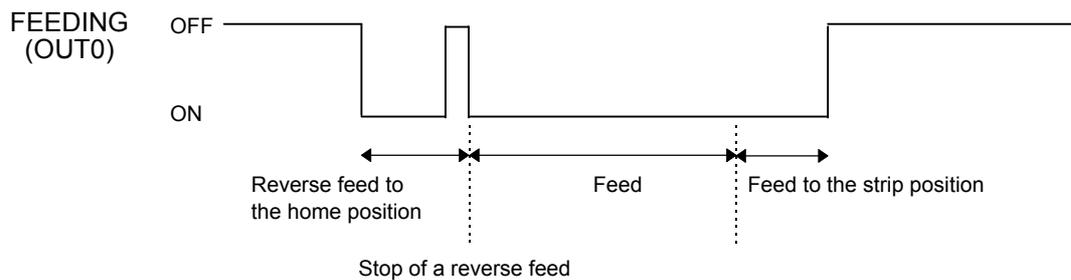
(2) Label end in the middle of a feed



(3) Feed with a cut



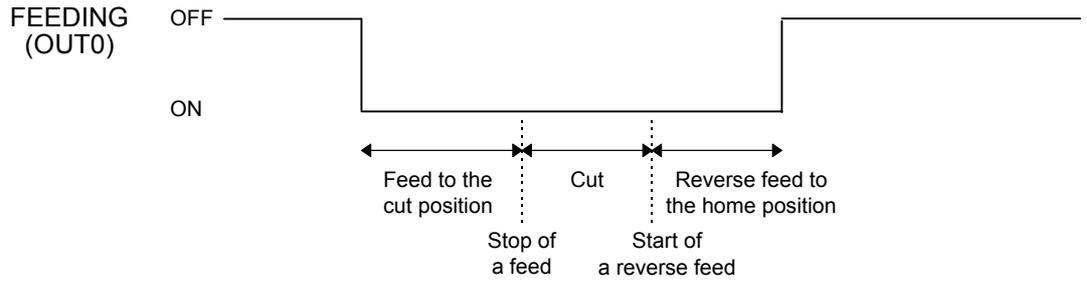
(4) Strip feed



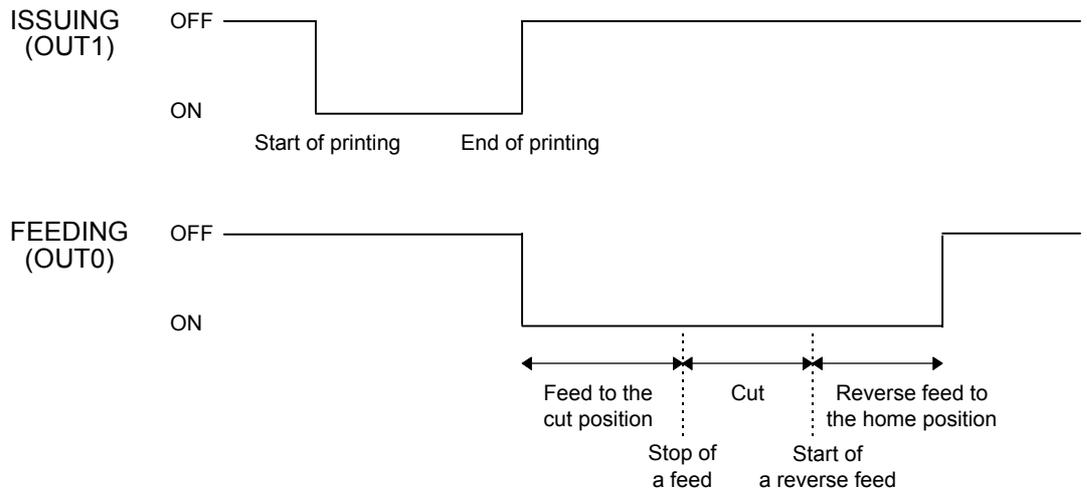
(OFF: Power interruption)
 (ON: Continuity)

(5) Ejection

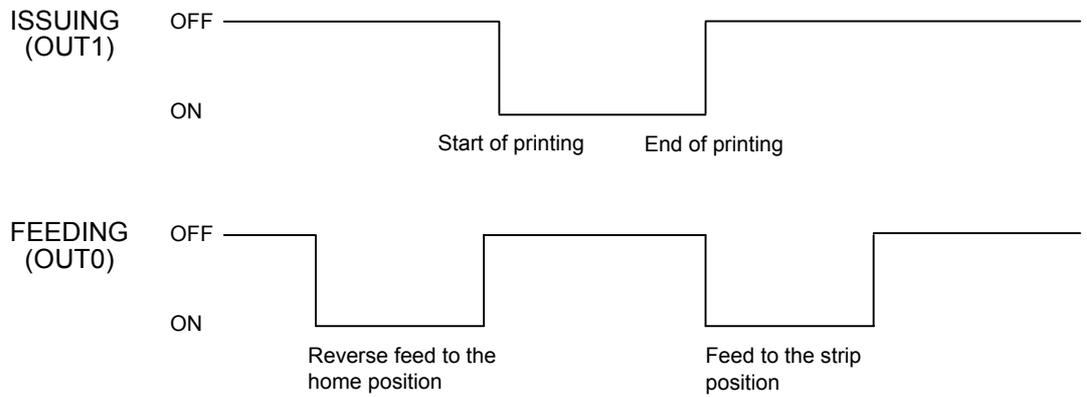
[In-line]



(6) Issue with a cut



(7) Strip issue



{ OFF: Power interruption }
{ ON: Continuity }

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

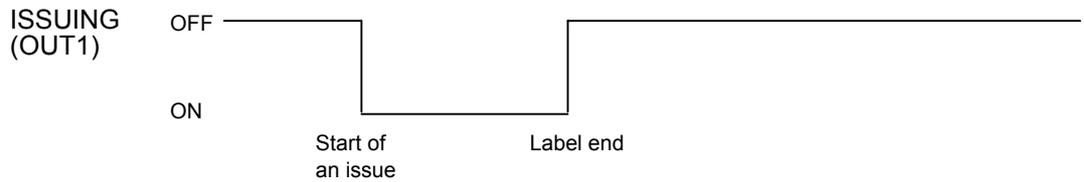
The ISSUING signal is output for any issue for the self test results printout or test print in the system mode, or by a command from the host or the ISSUE signal. However, since the checks such as the Expansion I/O loop back check are performed in the self-test, there may be moments where all output signals go on.

When an error occurs during issuing and the printer stops issuing, the ISSUING signal goes off.

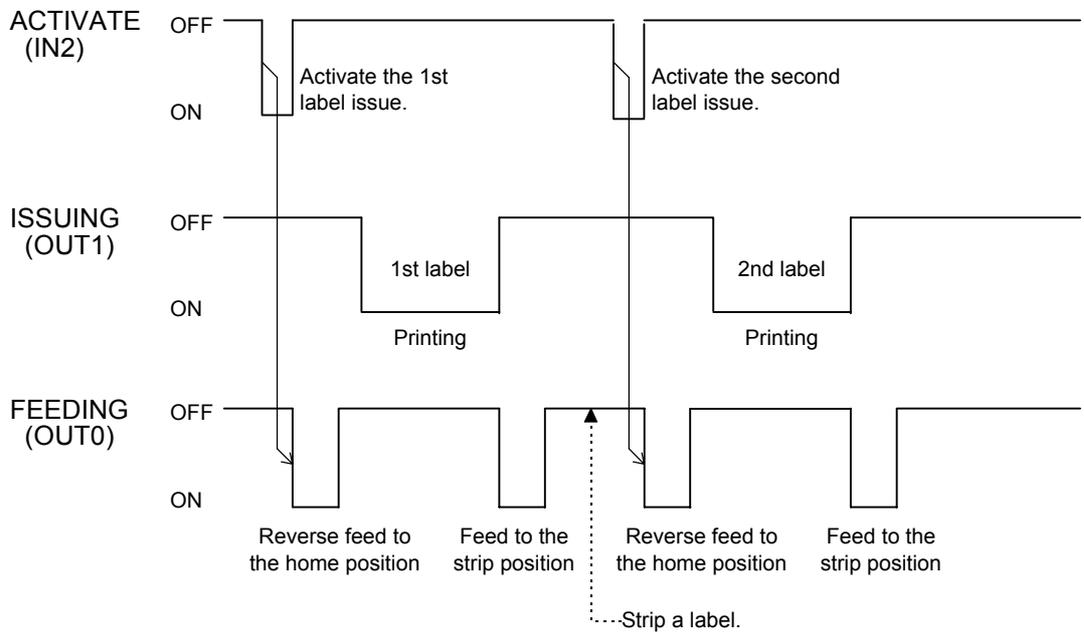
(1) Normal issue



(2) Label end in the middle of an issue



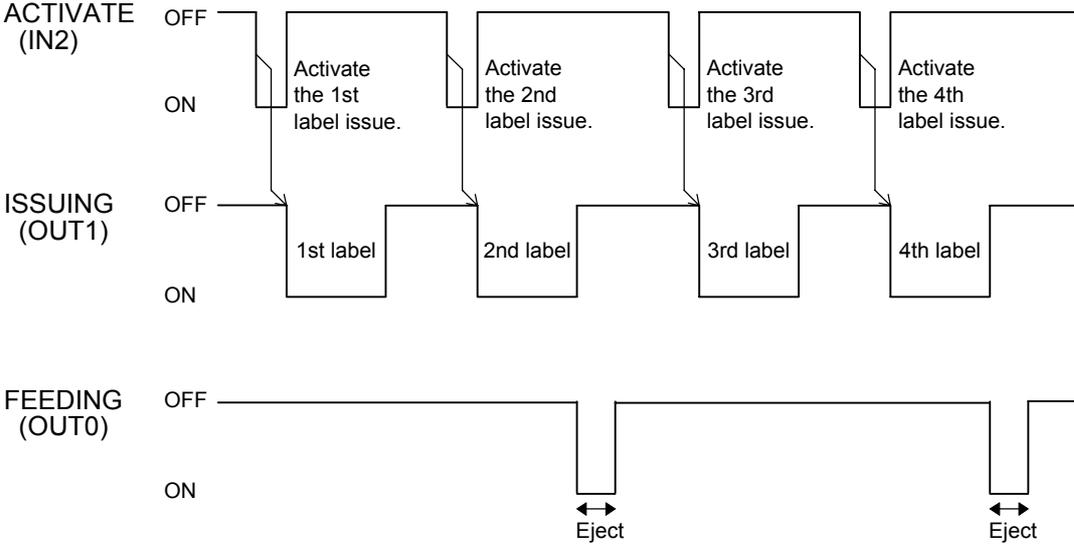
(3) Strip issue (2 labels to issue)



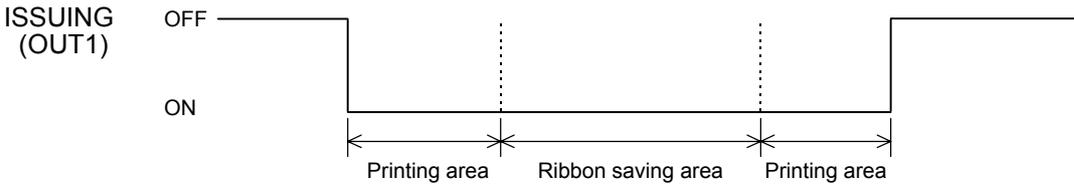
(OFF: Power interruption)
 (ON: Continuity)

(4) Cut issue (4 labels to issue, cut every 2 labels)
 (When the swing cutter is used)

[In-line]



(5) Ribbon saving issue



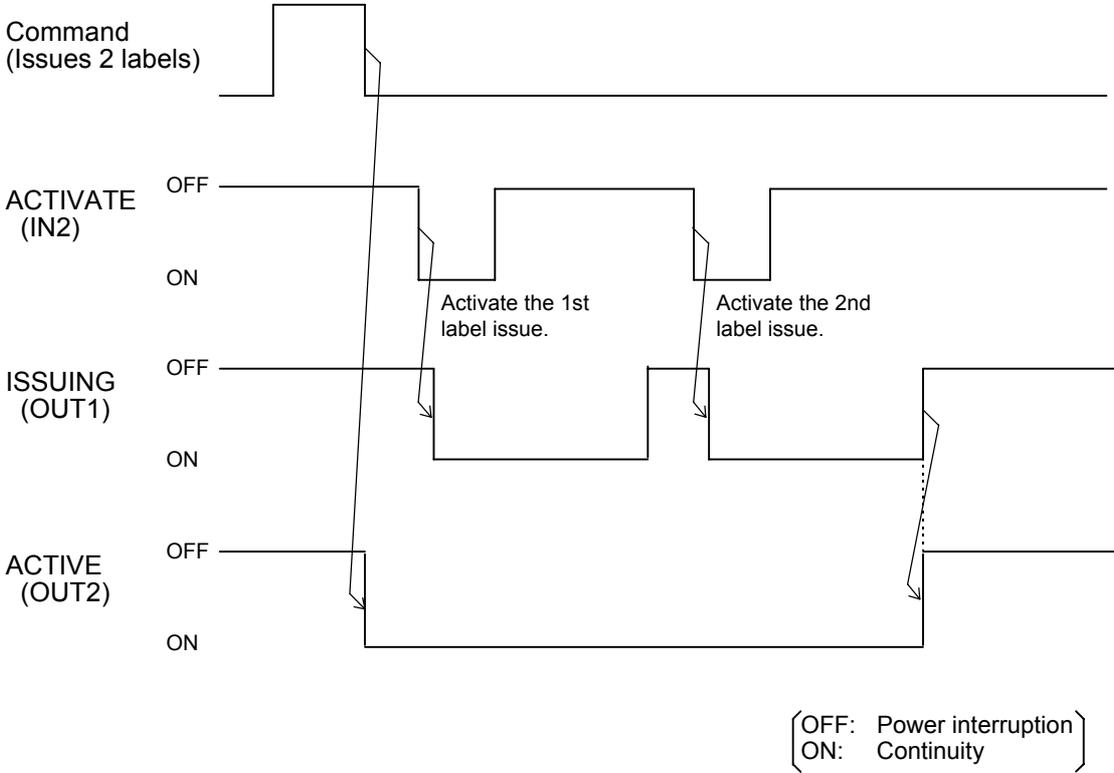
(OFF: Power interruption)
 (ON: Continuity)

OUT2

ACTIVE

[In-line]

This output signal indicates that the printer is active.
When the printer receives the Feed Command or the Issue Command, the signal goes on (active). When the printer completes all Feed Commands or Issue Commands sent from the host, the signal goes off (inactive).



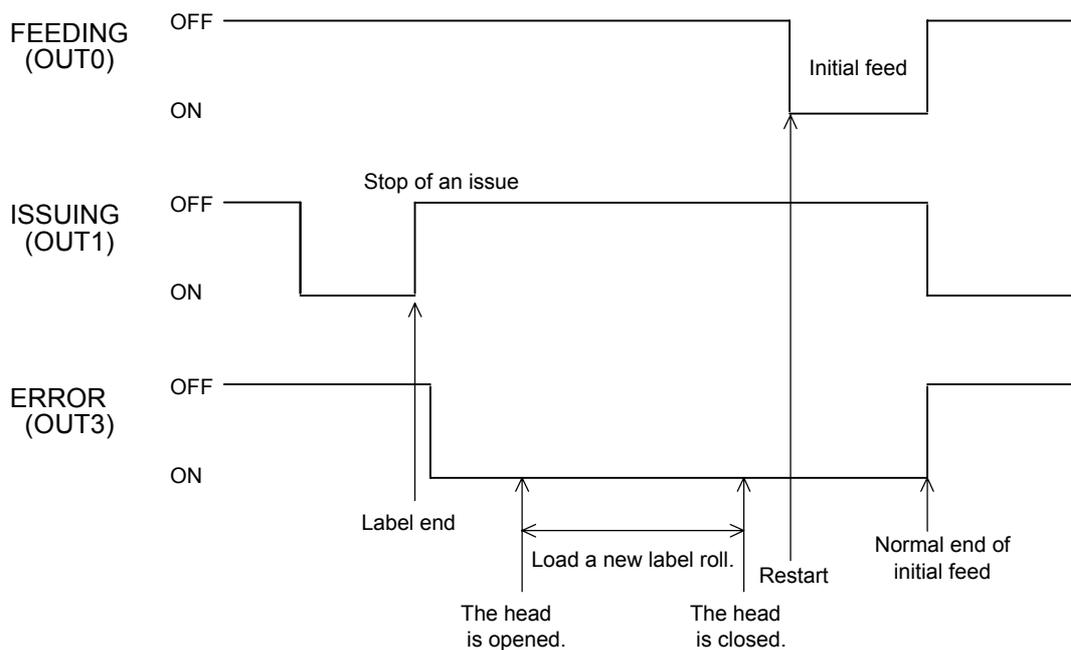
This output signal indicates that an error occurred, stopping the printer. The signal goes on while the printer is in an error state.

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

- Communication error (Command error)
- Communication error (Hardware error)
- Paper jam
- Cutter error
- Paper end
- Ribbon end
- Ribbon error
- Head open error
- Thermal head abnormal
- Thermal head temperature abnormal (overheating)
- Rewinder overflow
- Write error of memory for storage
- Format error of memory for storage
- Full memory for storage

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

However, the printer is not restored unless the power goes off then on, when an error cannot be cleared by the [RESTART] key.

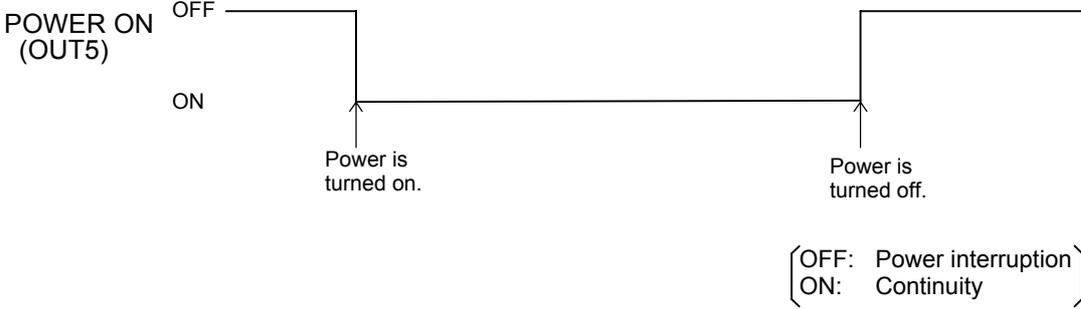


OUT5

POWER ON

[In-line]

This output signal indicates that the printer power is on.
While the printer power is on, the signal is on.
While the printer power is on, the POWER ON signal remains on no matter what state the printer is in.

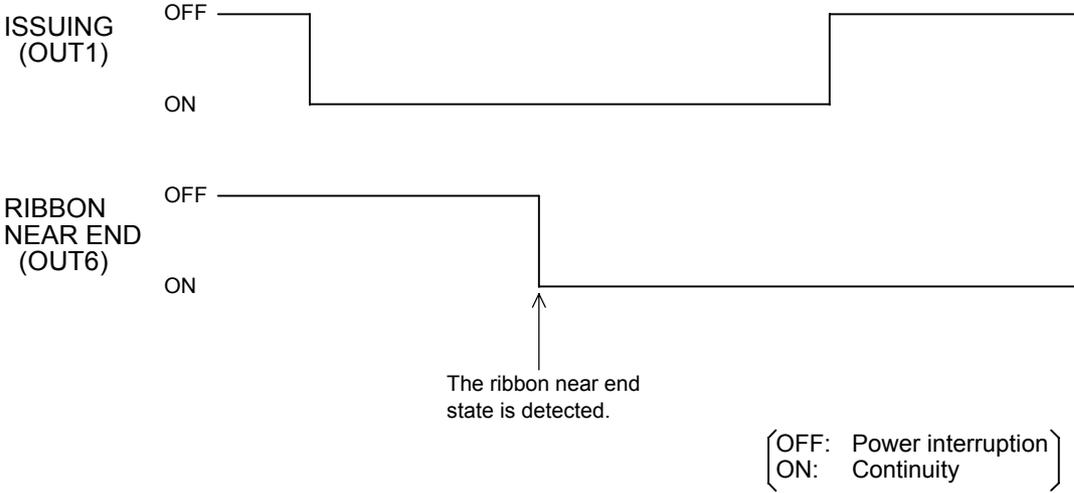


OUT6

RIBBON NEAR END

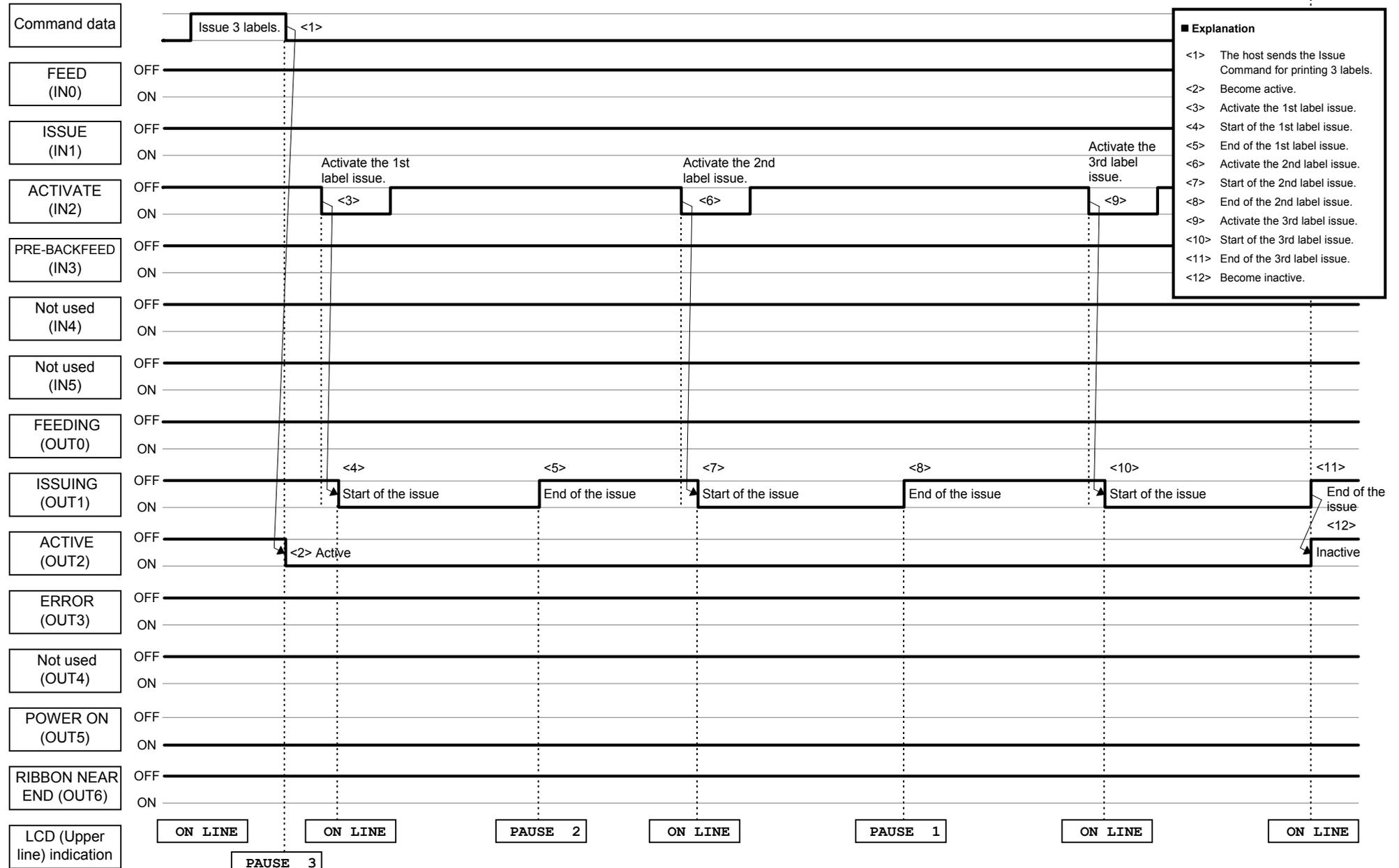
[In-line]

This output signal indicates that the printer ribbon is near the end. While the printer is in a ribbon near end state, the signal goes on. When the printer has run out of ribbon, the signal goes off. If the ribbon near end detection is set to OFF (not performed) in the system mode, the OUT6 signal remains OFF even if the printer is in a ribbon near end state.

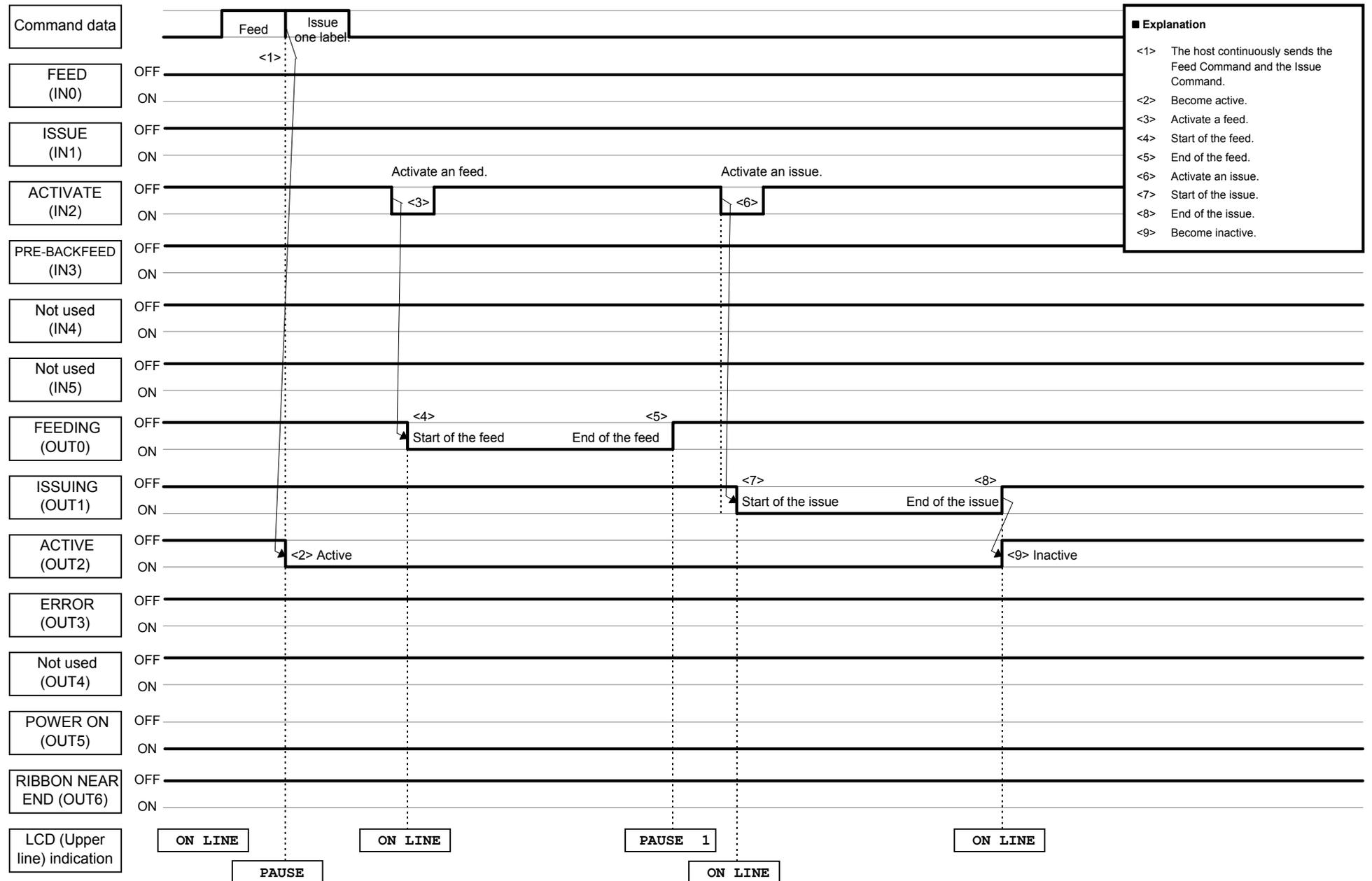


4.2.3 EXAMPLE OF TIMING CHART (IN-LINE SPECIFICATIONS)

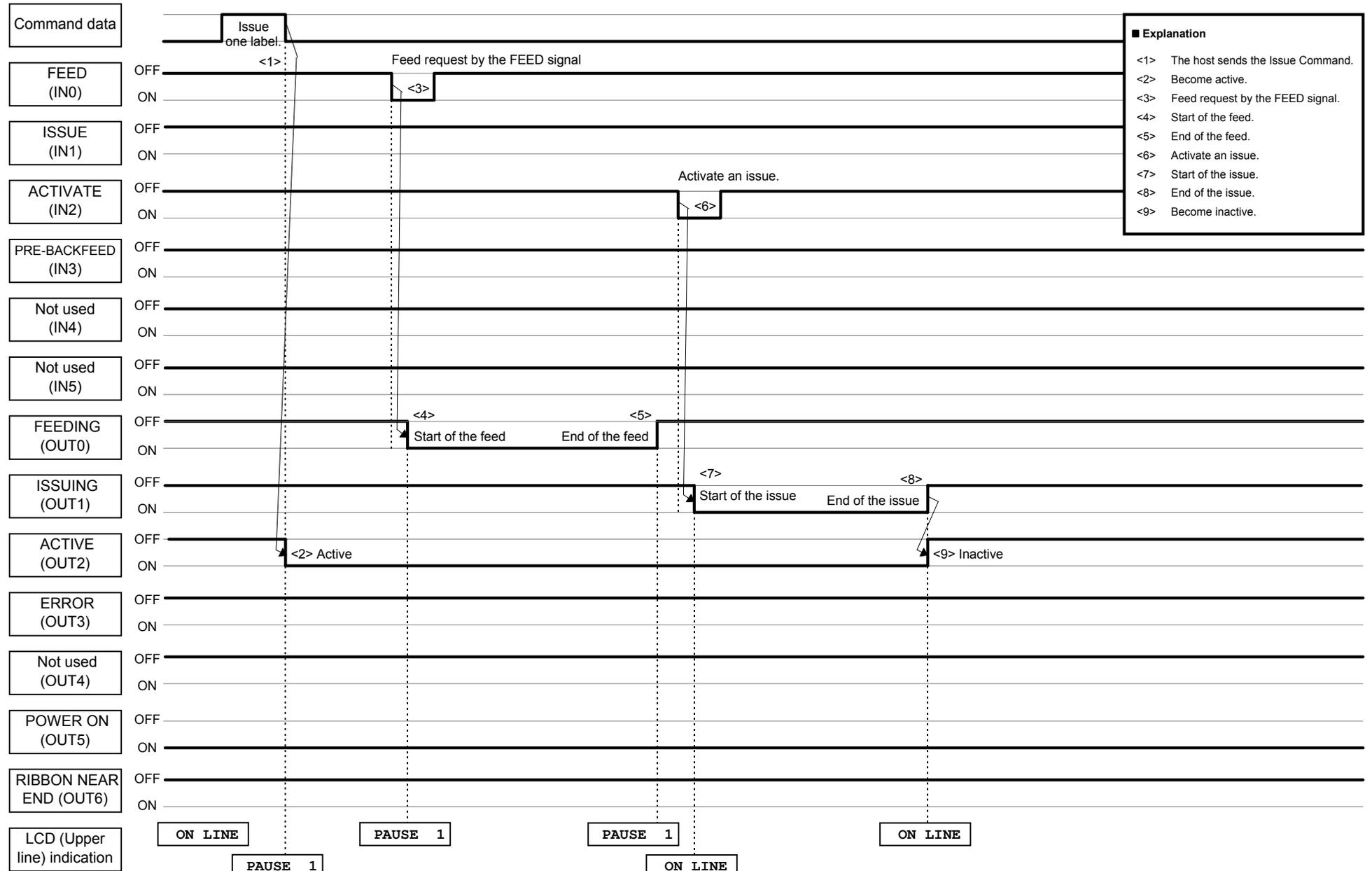
(1) The Issue Command (for printing 3 labels) is sent.



(3) The Feed Command and the Issue Command are continuously sent.



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



(5) A paper end error occurs during printing.

