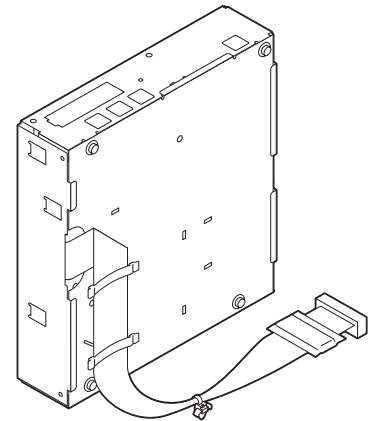


# TOSHIBA

# SERVICE MANUAL

## FACSIMILE

# GD-1210/1250/1270/1160/1260



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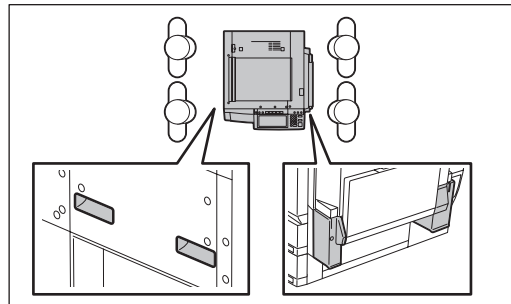
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# GENERAL PRECAUTIONS REGARDING THE SERVICE FOR GD-1210/1250/1270/1160/1260

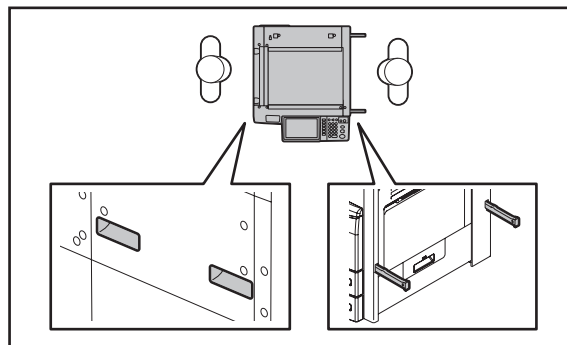
The installation and service shall be done by a qualified service technician.

## 1) Transportation/Installation

- When transporting/installing the equipment, employ four persons and be sure to hold the positions as shown in the figure. The equipment is quite heavy and weighs approximately 120 kg (264.55 lb.), therefore pay full attention when handling it. (e-STUDIO2500c/3500c/3510c, e-STUDIO2330C/2820C/2830C/3520C/3530C/4520C, e-STUDIO2040C/2540C/3040C/3540C/4540C)



- When transporting/installing the equipment, employ two persons and be sure to hold the positions as shown in the figure. The equipment is quite heavy, and e-STUDIO205L/255/305 weighs approximately 57 kg (125.66lb.), and e-STUDIO355/455 weighs approximately 60 kg (132.28 lb.), therefore pay full attention when handling it. The equipment is quite heavy, and e-STUDIO206L/256/306 weighs approximately 58 kg (127.87 lb.), and e-STUDIO356/456 weighs approximately 61 kg (134.48 lb.), therefore pay full attention when handling it.



- When transporting/installing the equipment, employ four persons and be sure to move it by the casters while lifting the stoppers. The equipment is quite heavy and weighs approximately 245 kg (540.12 lb), therefore pay full attention when handling it. (e-STUDIO5520C/6520C/6530C, e-STUDIO5540C/6540C/6550C)
- When transporting/installing the equipment, employ four persons and be sure to move it by the casters while lifting the stoppers. The equipment is quite heavy and weighs approximately 202 kg (445.33 lb), therefore pay full attention when handling it. (e-STUDIO555/655/755/855, e-STUDIO556/656/756/856)
- Be sure not to hold the movable parts or units (e.g. the control panel, ADU or RADF) when transporting the equipment.
- Be sure to use a dedicated outlet with AC 110 V / 13.2 A, 115 V or 127 V / 12 A, 220-240 V / 8 A for its power source.
- The equipment must be grounded for safety.

- Select a suitable place for installation. Avoid excessive heat, high humidity, dust, vibration and direct sunlight.
- Provide proper ventilation since the equipment emits a slight amount of ozone.
- To insure adequate working space for the copying operation, keep a minimum clearance of 80 cm (32") on the left, 80 cm (32") on the right and 10 cm (4") on the rear.
- The equipment shall be installed near the socket outlet and shall be accessible.
- Be sure to fix and plug in the power cable securely after the installation so that no one trips over it.

## 2) General Precautions at Service

- Be sure to turn the power OFF and unplug the power cable during service (except for the service should be done with the power turned ON).
- Unplug the power cable and clean the area around the prongs of the plug and socket outlet once a year or more. A fire may occur when dust lies on this area.
- When the parts are disassembled, reassembly is the reverse of disassembly unless otherwise noted in this manual or other related documents. Be careful not to install small parts such as screws, washers, pins, E-rings, star washers in the wrong places.
- Basically, the equipment should not be operated with any parts removed or disassembled.
- The PC board must be stored in an anti-electrostatic bag and handled carefully using a wristband since the ICs on it may be damaged due to static electricity.

**Caution: Before using the wristband, unplug the power cable of the equipment and make sure that there are no charged objects which are not insulated in the vicinity.**

- Avoid expose to laser beam during service. This equipment uses a laser diode. Be sure not to expose your eyes to the laser beam. Do not insert reflecting parts or tools such as a screwdriver on the laser beam path. Remove all reflecting metals such as watches, rings, etc. before starting service.
- Be sure not to touch high-temperature sections such as the exposure lamp, fuser unit, damp heater and areas around them.
- Be sure not to touch high-voltage sections such as the chargers, transfer belt, 2nd transfer roller, developer, high-voltage transformer, exposure lamp control inverter, inverter for the LCD back-light and power supply unit. Especially, the board of these components should not be touched since the electric charge may remain in the capacitors, etc. on them even after the power is turned OFF.
- Make sure that the equipment will not operate before touching potentially dangerous places (e.g. rotating/operating sections such as gears, belts pulleys, fans and laser beam exit of the laser optical unit).
- Be careful when removing the covers since there might be the parts with very sharp edges underneath.
- When servicing the equipment with the power turned ON, be sure not to touch live sections and rotating/operating sections. Avoid exposing your eyes to laser beam.
- Use designated jigs and tools.
- Use recommended measuring instruments or equivalents.
- Return the equipment to the original state and check the operation when the service is finished.
- Be very careful to treat the touch panel gently and never hit it. Breaking the surface could cause malfunctions.

## 3) Important Service Parts for Safety

- The breaker, door switch, fuse, thermostat, thermofuse, thermistor, IC-RAMs including lithium batteries, etc. are particularly important for safety. Be sure to handle/install them properly. If these parts are short-circuited and their functions become ineffective, they may result in fatal accidents such as burnout. Do not allow a short-circuit or do not use the parts not recommended by Toshiba TEC Corporation.

## 4) Cautionary Labels

- During servicing, be sure to check the rating plate and cautionary labels such as “Unplug the power cable during service”, “CAUTION. HOT”, “CAUTION. HIGH VOLTAGE”, “CAUTION. LASER BEAM”, etc. to see if there is any dirt on their surface and if they are properly stuck to the equipment.

**5) Disposal of the Equipment, Supplies, Packing Materials, Used Batteries and IC-RAMs**

- Regarding the recovery and disposal of the equipment, supplies, packing materials, used batteries and IC-RAMs including lithium batteries, follow the relevant local regulations or rules.

**6) When the option has been installed:**

When the EFI printer board has been installed, be sure to unplug the power cable before performing maintenance and inspection, otherwise troubles such as a communication error may occur.

**Caution:**

Dispose of used batteries and IC-RAMs including lithium batteries according to this manual.

**Attention:**

Se débarrasser de batteries et IC-RAMs usés y compris les batteries en lithium selon ce manuel.

**Vorsicht:**

Entsorgung der gebrauchten Batterien und IC-RAMs (inclusive der Lithium-Batterie) nach diesem Handbuch.



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# 1. SPECIFICATIONS AND OUTLINE OF SYSTEM

## 1.1 FAX Options

Equipments can be used as a FAX by installing the FAX unit.

Some options can be added when the FAX unit is installed or to extend the FAX functions (📖 P. 1-8 "1.5 Options").

Be sure to use the FAX unit and the 2nd line for the FAX unit only in the following combinations.

| Models  | FAX unit | 2nd line for FAX unit |
|---|----------|-----------------------|
| e-STUDIO2500c/3500c/3510c   | GD-1210  | GD-1160               |
| e-STUDIO2330C/2820C/2830C/3520C/3530C/4520C,<br>e-STUDIO2040C/2540C/3040C/3540C/4540C | GD-1250  | GD-1260               |
| e-STUDIO5520C/6520C/6530C,<br>e-STUDIO5540C/6540C/6550C                               | GD-1270  | GD-1260               |
| e-STUDIO205L/255/305/355/455<br>e-STUDIO206L/256/306/356/456                          | GD-1250  | GD-1260               |
| e-STUDIO555/655/755/855<br>e-STUDIO556/656/756/856                                    | GD-1250  | GD-1260               |

## 1.2 Specifications

### 1) Main system

- Type  
Desktop type transceiver
- Operation  
Transmission Manual/Automatic  
Reception Manual/Automatic

### 2) Scanner

<Scanning density> [ ]: at rotation transmission

- Horizontal direction  
16 lines/mm, 8 lines/mm  
[15.4 lines/mm, 7.7 lines/mm, 3.85 lines/mm]
- Vertical direction  
15.4 lines/mm, 7.7 lines/mm, 3.85 lines/mm  
[16 lines/mm, 8 lines/mm]
- Combination  
U-Fine: 16 x 15.4 lines/mm [15.4 x 16 lines/mm]  
Semi-U-Fine: 8 x 15.4 lines/mm [15.4 x 8 lines/mm]

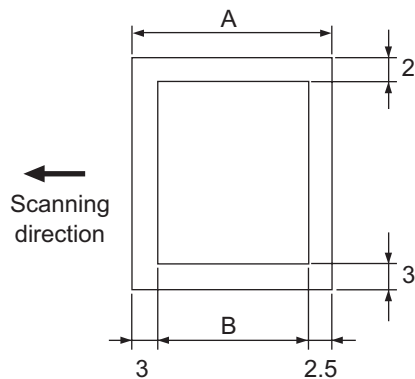
#### Note:

Operation from the panel is automatically converted at the receiving capability of "U-Fine" combination.

Fine: 8 x 7.7 lines/mm [7.7 x 8 lines/mm]

Normal: 8 x 3.85 lines/mm [3.85 x 8 lines/mm]

- Effective scanning area



(Mechanical system error  $\pm 2$  mm included)

Fig. 1-1

(mm)

| Original size | A   | B     |
|---------------|-----|-------|
| A4            | 210 | 204.5 |
| B4            | 364 | 358.5 |
| A3            | 420 | 414.5 |
| FOLIO         | 330 | 324.5 |
| LT            | 216 | 210.5 |

| Original size | A     | B     |
|---------------|-------|-------|
| LG            | 355.6 | 350.1 |
| LD            | 431.8 | 426.3 |

### 3) Transmission system

#### Circuits to be used: Subscriber line/FAX communication network (G3)

- Calling automatic transmission (including the sequential multi-address transmission)
- Calling automatic reception (polling reception)
- Called automatic transmission (polling transmission)
- Called automatic reception
- Calling manual transmission
- Calling manual reception
- Called manual transmission
- Called manual reception

#### Communication mode

High-speed mode (Toshiba original procedure mode)

G3 mode

ECM (Error Correction Mode)

#### Circuit carrier link equalization function

Embedded

#### Output level

-16 dBm to -8 dBm (The setting can be changed by "1 dB".)

#### Input level

-43 dBm to 0 dBm

(Level -55 dBm or lower cannot be detected)

#### Specifications of the communication mode

|   | High-speed mode<br>(Toshiba original procedure mode)                        | G3 mode             | ECM   |
|---|---|---------------------|---|
| Horizontal scanning density                             | 8 dots/mm<br>300 dpi (Reception only)<br>16 dots/mm                         | Same as on the left | Same as on the left   |
| Vertical scanning density                               | 3.85 lines/mm<br>7.7 lines/mm<br>300 dpi (Reception only)<br>15.4 lines/mm  | Same as on the left | Same as on the left   |
| Encoding system   | MH/MR/MMR/JBIG  | MH/MR               | MH/MR/MMR/JBIG  |
| Minimum transmission time for 1 line                    | 2.5 ms  | Same as on the left | Same as on the left   |
| Transmission speed (image signal) and modulation method | 14.4 k/12 k/9600<br>7200/4800/2400 bps<br>Conformance to V.17/V.29/V.27 ter | Same as on the left | 33.6 k/31.2 k/28.8 k/<br>26.4 k/24 k/21.6 k/<br>19.2 k/16.8 k/14.4 k/<br>12 k/9600/7200/<br>4800/2400 bps |
| Control signal  | 300 bps<br>V.21   | Same as on the left | 2400/1200/600/<br>300 bps<br>V.34/V.8/V.21  |
| Procedure to control the transmission                   | Toshiba original procedure  | T.30 conformance    | Same as on the left   |

#### 4) Recording paper

- Recording method  
Electrophotographic recording method by LSU (Laser Scanning Unit)
- Horizontal printing density  
24 lines/mm (96 lines/mm with the smoothing processing)  
[23.1 lines/mm (92.4 lines/mm with the smoothing processing)]
- Vertical printing density  
23.1 lines/mm (24 lines/mm with the smoothing processing)
- Recording paper size and the effective printing area

Unit: mm (inch)

| Paper size | Dimension (width x length) | Printing area |
|------------|----------------------------|---------------|
| A5-R       | 148 x 210                  | 143 x 204.5   |
| B5-R       | 182 x 257                  | 177 x 251.5   |
| B5         | 257 x 182                  | 252 x 176.5   |
| A4-R       | 210 x 297                  | 205 x 291.5   |
| A4         | 297 x 210                  | 292 x 204.5   |
| B4         | 257 x 364                  | 252 x 358.5   |
| A3         | 297 x 420                  | 292 x 414.5   |
| FOLIO      | 210 x 330                  | 205 x 324.5   |
| ST-R       | 139.7 x 216 (5.5 x 8.5)    | 134.7 x 210.5 |
| LT-R       | 216 x 279.4 (8.5 x 11)     | 211 x 273.9   |
| LT         | 279.4 x 216 (11 x 8.5)     | 274.4 x 210.5 |
| LG         | 216 x 355.6 (8.5 x 14)     | 211 x 350.1   |
| LD         | 279.4 x 431.8 (11 x 17)    | 274.4 x 426.3 |
| COMP       | 257 x 356 (10.125 x 14)    | 252 x 350.5   |

## 1.3 Features

- A3/LD scanning  
Scans data across A3/LD width and transmits in A3/LD actual size.
- High-speed scanning  
Inputs an A4/LT-size transmitted document in about 0.7 seconds (A4/LT document transmitted widthwise).
- High-speed transmission  
33.6 Kbps high speed modem  
Toshiba original high-speed communication modes EX and HS  
JBIG encoding system
- Dual Access
  - FAX transmission  
There are two types of FAX transmission: Page-by-page direct transmission and memory transmission that all pages are stored in the memory before being transmitted.
  - FAX reception  
Basically, all pages are input in the memory before being output. This reduces the time that the FAX communication occupies the machine, making Dual Access between the copying/faxing and printing operation possible.

Namely, the followings are possible:

  - Memory input during the memory transmission
  - Memory input during the memory reception
  - Copying during the memory transmission
  - Reception during the copying
  - Reception during the memory output
  - Reception during the list output
- Laser printing on plain paper  
Printing is made on the standard size paper (A3/LD, B4/COMP, A4/LT/LG, A4-R/LT-R, B5, B5-R, FOLIO, and A5-R/ST-R) with the laser system.
- Gradation  
256 tones, error diffusion method
- Memory communication function  
Image data can be stored in the HDD. In the delayed transmission, image data read from an original are stored in the memory, then sent when the specified time comes.  
Other memory functions: multi transmission, memory reception, ECM communication, etc.
- Smoothing  
The smoothing process is applied to the received images so that they are changed from  $8 \times 3.85$ ,  $8 \times 7.7$ ,  $8 \times 15.4$  or  $16 \times 15.4$  to  $24 \times 92.4$  (equivalent to  $600 \times 2400\text{dpi}$ ), then printed out.
- Editing function  
Duplex transmission and duplex printing are possible.
- FAX data file storage capacity  
1 GB (for transmission and reception)

**Note:**

For hard drivers, GB means 1 billion bytes.

- Phone Book (3,000 addresses)  
Up to 3,000 addresses can be registered in the Phone Book using the large LCD control panel.
- Multi-address transmission function  
Data are sent to multiple addresses (400 destinations) in sequence in a single operation.  
There are three ways to choose/enter the address
  - Choose from the Phone Book (up to 400 destinations)
  - Direct dialing (up to 400 destinations)
  - Mix operation (Phone Book, Direct dialing, Group destinations: up to 400 destinations)
- Memory reception function  
When the recording paper has run out or a paper jam has occurred, the memory receives and stores the data.
- Auto-dialing function
  - Delayed dialing  
Documents are transmitted automatically to the preset number at the preset time.
  - Redialing  
When the receiving side is busy during the automatic dialing, the machine keeps dialing at a fixed interval for a specified number of times.
- Receiving tone/completion tone  
Sound notifies that the reception of a FAX document or printing of a received document has been completed.
- List output  
The following data stored in the RAM can be printed out
  - Phone book information
  - Function list
  - Transmission journal
  - Reception journal
  - Memory transmission report
  - Power failure list                      etc.
- Power saver mode  
During hours in which the reception amount is small, the weekly timer works to shut off the main power and the heater power to save power consumption.
- Drawer selection  
It is possible to choose a drawer on to whose paper the received images are to be printed.

[Options]

- 2nd line  
One extra line can be added by installing the 2nd line unit (option).

## 1.4 Accessories and Parts

The following accessories and parts come with the FAX unit:

| Accessory                                  | GD-1210 | GD-1250 | GD-1270 |
|--|---------|---------|---------|
| Operator's manual (for facsimile function) | 1 pc.   | 1 pc.   | 1 pc.   |
| Modular cord (2 m)                         | 1 pc.   | 1 pc.   | 1 pc.   |
| Unpacking instruction                      | 1 set   | 1 set   | 1 set   |

| Parts   | GD-1210 | GD-1250 | GD-1270 |
|---|---------|---------|---------|
| Fax unit  | 1 pc.   | 1 pc.   | 1 pc.   |
| SG3 label   | 1 pc.   | 1 pc.   | 1 pc.   |
| FCC Part 68 label (U.S.A.) / IC label (Canada): NA only | 1 pc.   | 1 pc.   | 1 pc.   |
| DTS label (EU): EU only                                 | 1 pc.   | 1 pc.   | 1 pc.   |
| Teleprompt label (New Zealand): AU only                 | 1 pc.   | 1 pc.   | 1 pc.   |
| Notice to users label (New Zealand): AU only            | 1 pc.   | 1 pc.   | 1 pc.   |
| Screw   | 5 pc.   | 5 pc.   | 4 pc.   |
| Ground plate  | 1 pc.   | 1 pc.   | -       |
| Gasket  | 1 pc.   | 1 pc.   | -       |
| Ferrite core  | -       | 1 pc.   | -       |
| Bracket   | -       | -       | 2 pc.   |
| Harness clamp   | -       | -       | 1 pc.   |
| Cover   | -       | -       | 3 pc.   |

\* Apply the each label to the specified positions following the Unpacking/Setup Instruction.

## 1.5 Options

Extends the FAX functions when the FAX unit is installed.

| Option                                     | Function   | e-STUDIO2500c/<br>3500c/3510c | e-STUDIO2330C/<br>2820C/2830C/<br>3520C/3530C/<br>4520C | e-STUDIO5520C/<br>6520C/6530C |
|--|--|-------------------------------|---|-------------------------------|
| Reversing Automatic Document Feeder (RADF) | Feeds originals  | MR-3018                       | MR-3018   | -                             |
| Finisher                                   | Sorts out documents to be output for the FAX/copying operation | MJ-1101<br>MJ-1030            | MJ-1101<br>MJ-1030<br>MJ-1031                           | MJ-1103<br>MJ-1104            |
| 2nd line for FAX unit                      | Adds one extra communication line                              | GD-1160                       | GD-1260   | GD-1260                       |

| Option                                     | Function   | e-STUDIO205L/255/305/355/<br>455  | e-STUDIO555/655/755/855       |
|--|--|---|-------------------------------|
| Reversing Automatic Document Feeder (RADF) | Feeds originals  | MR-3021/3022  | -                             |
| Finisher                                   | Sorts out documents to be output for the FAX/copying operation | MJ-1101<br>MJ-1031<br>MJ-1024<br>MJ-1025<br>MJ-5004<br>MJ-5005<br>MJ-5006 | MJ-1027<br>MJ-1028<br>MJ-1029 |
| 2nd line for FAX unit                      | Adds one extra communication line                              | GD-1260   | GD-1260                       |

| Option                                     | Function   | e-STUDIO2040C/<br>2540C/3040C/<br>3540C/4540C | e-STUDIO5540C/<br>6540C/6550C | e-STUDIO556/656/<br>756/856   |
|--|--|---|-------------------------------|-------------------------------|
| Reversing Automatic Document Feeder (RADF) | Feeds originals  | MR-3021<br>MR-3022                            | -                             | -                             |
| Finisher                                   | Sorts out documents to be output for the FAX/copying operation | MJ-1101<br>MJ-1031<br>MJ-1106                 | MJ-1103<br>MJ-1104            | MJ-1027<br>MJ-1028<br>MJ-1029 |
| 2nd line for FAX unit                      | Adds one extra communication line                              | GD-1260                                       | GD-1260                       | GD-1260                       |



| <b>Option</b>                              | <b>Function</b>  | <b>e-STUDIO206L/256/306/356/<br/>456</b>                                  |
|--|--|---|
| Reversing Automatic Document Feeder (RADF) | Feeds originals  | MR-3021/3022  |
| Finisher                                   | Sorts out documents to be output for the FAX/copying operation | MJ-1101<br>MJ-1106<br>MJ-1032<br>MJ-1033<br>MJ-5004<br>MJ-5005<br>MJ-5006 |
| 2nd line for FAX unit                      | Adds one extra communication line                              | GD-1260   |

## 1.6 System List

### 1.6.1 e-STUDIO2500c/3500c/3510c

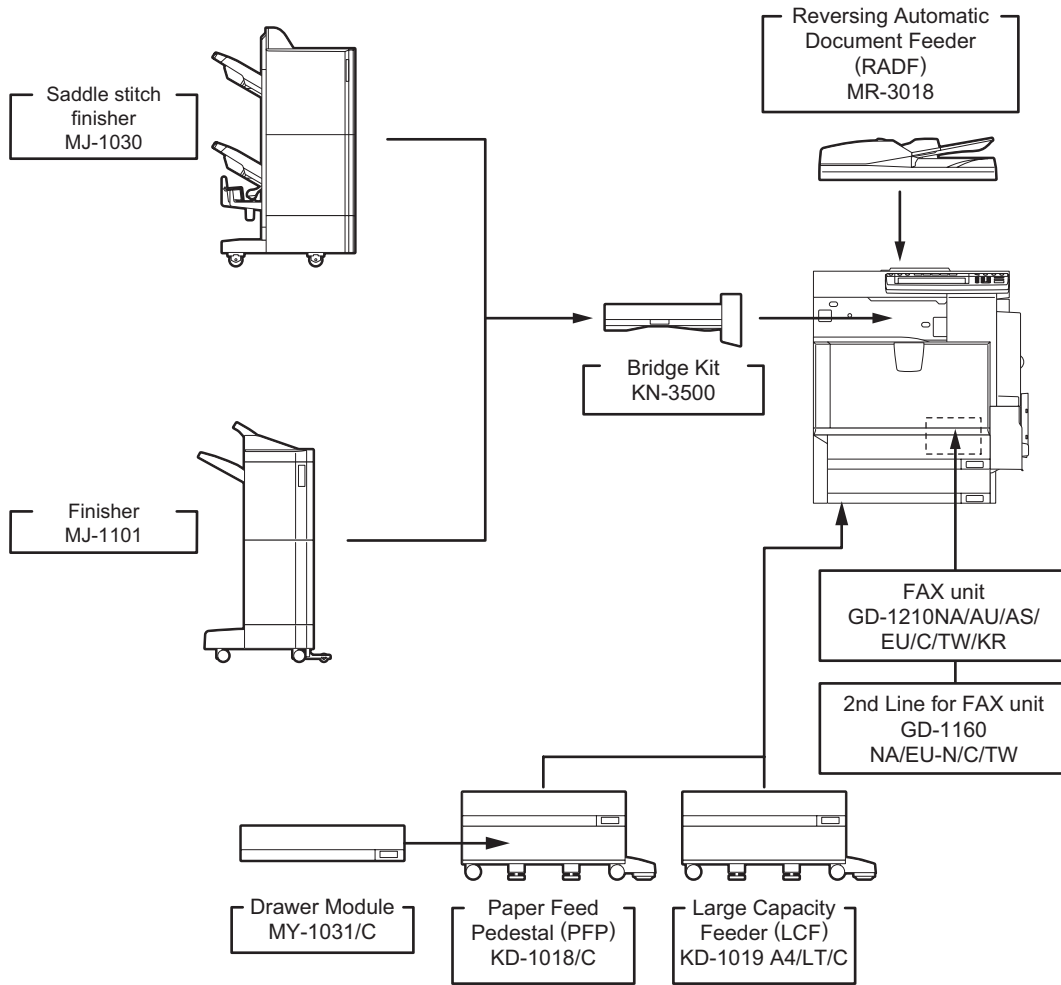


Fig. 1-2

## 1.6.2 e-STUDIO2330C/2820C/2830C/3520C/3530C/4520C

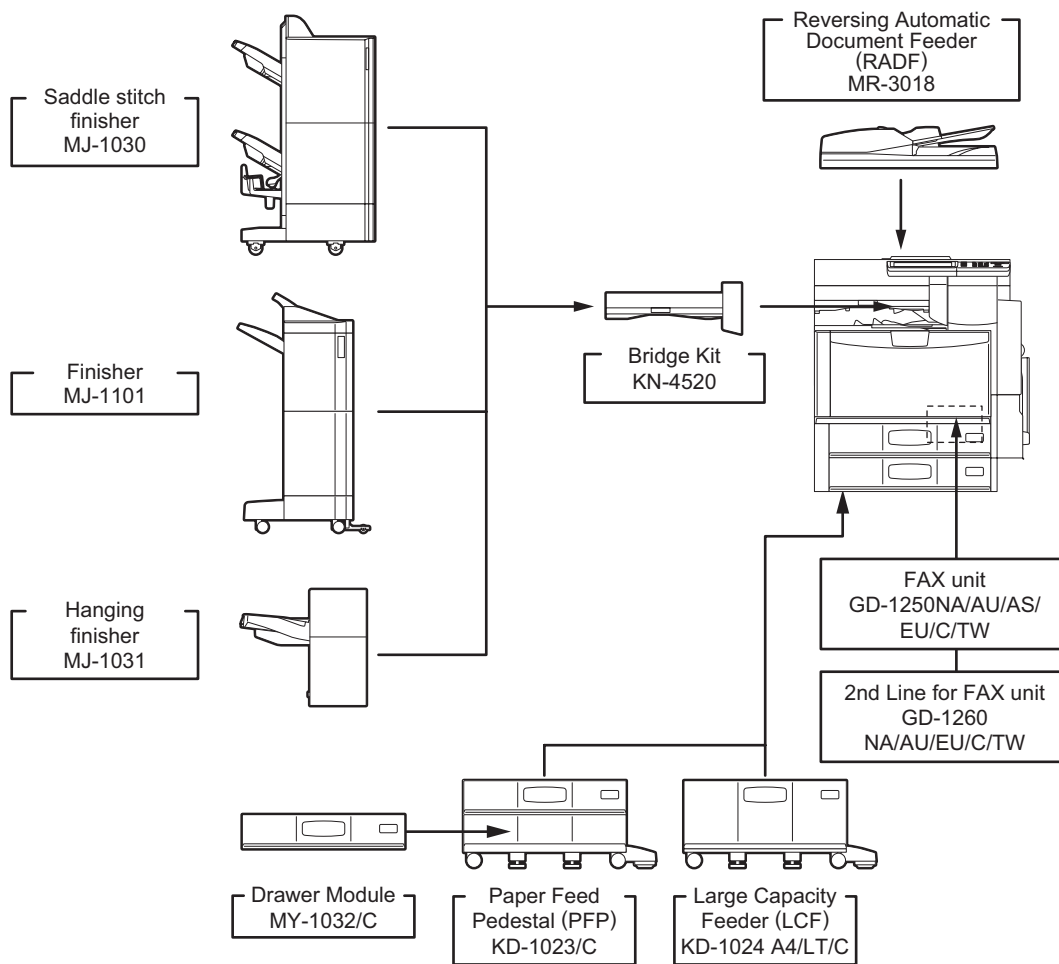


Fig. 1-3

### 1.6.3 e-STUDIO5520C/6520C/6530C

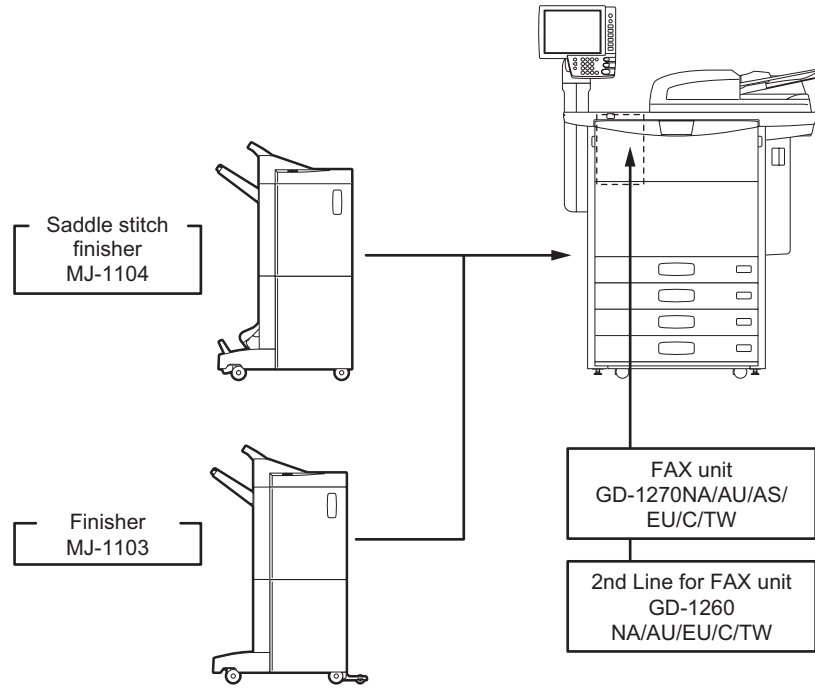


Fig. 1-4

### 1.6.4 e-STUDIO205L/255/305/355/455

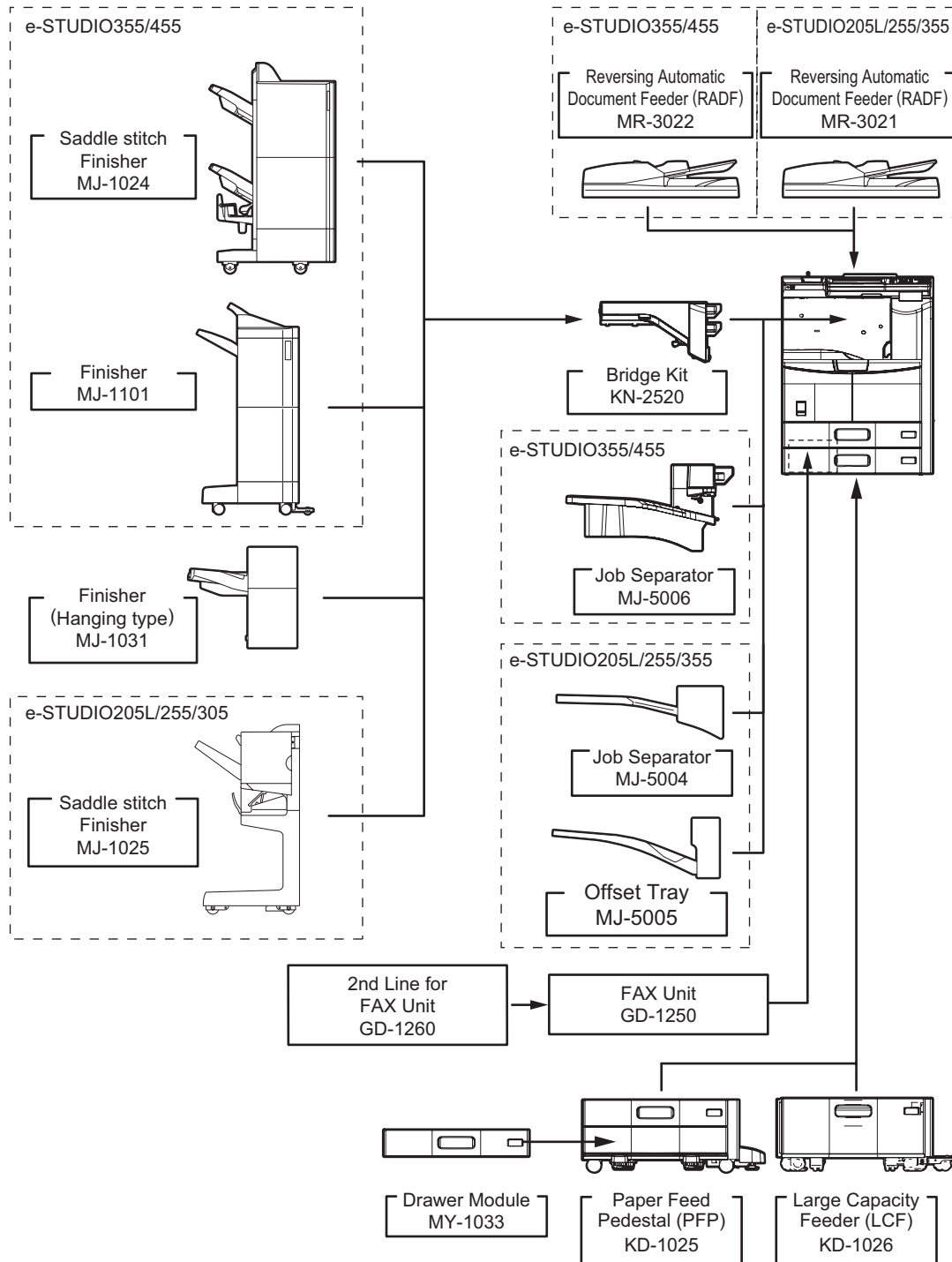


Fig. 1-5

1.6.5 e-STUDIO555/655/755/855

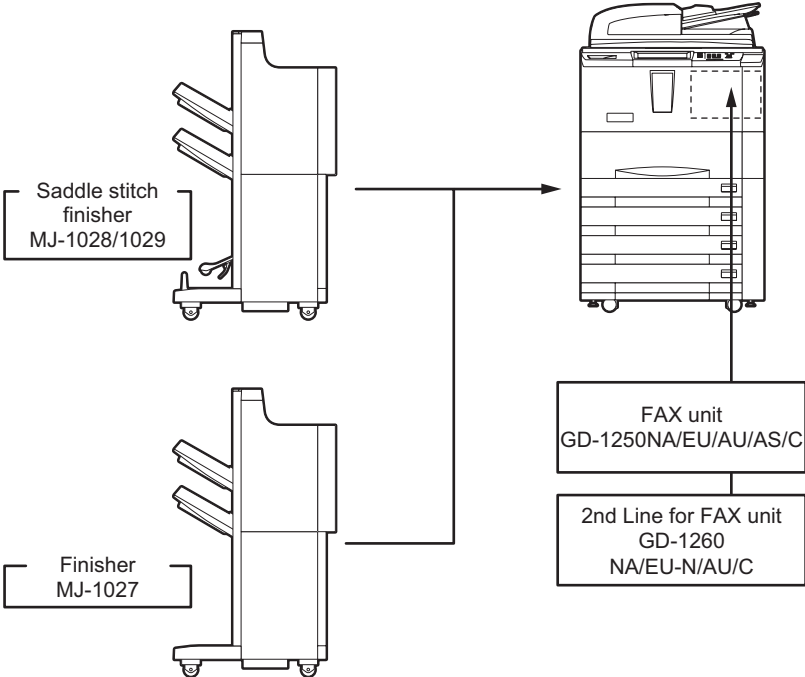


Fig. 1-6

# 1.6.6 e-STUDIO2040C/2540C/3040C/3540C/4540C

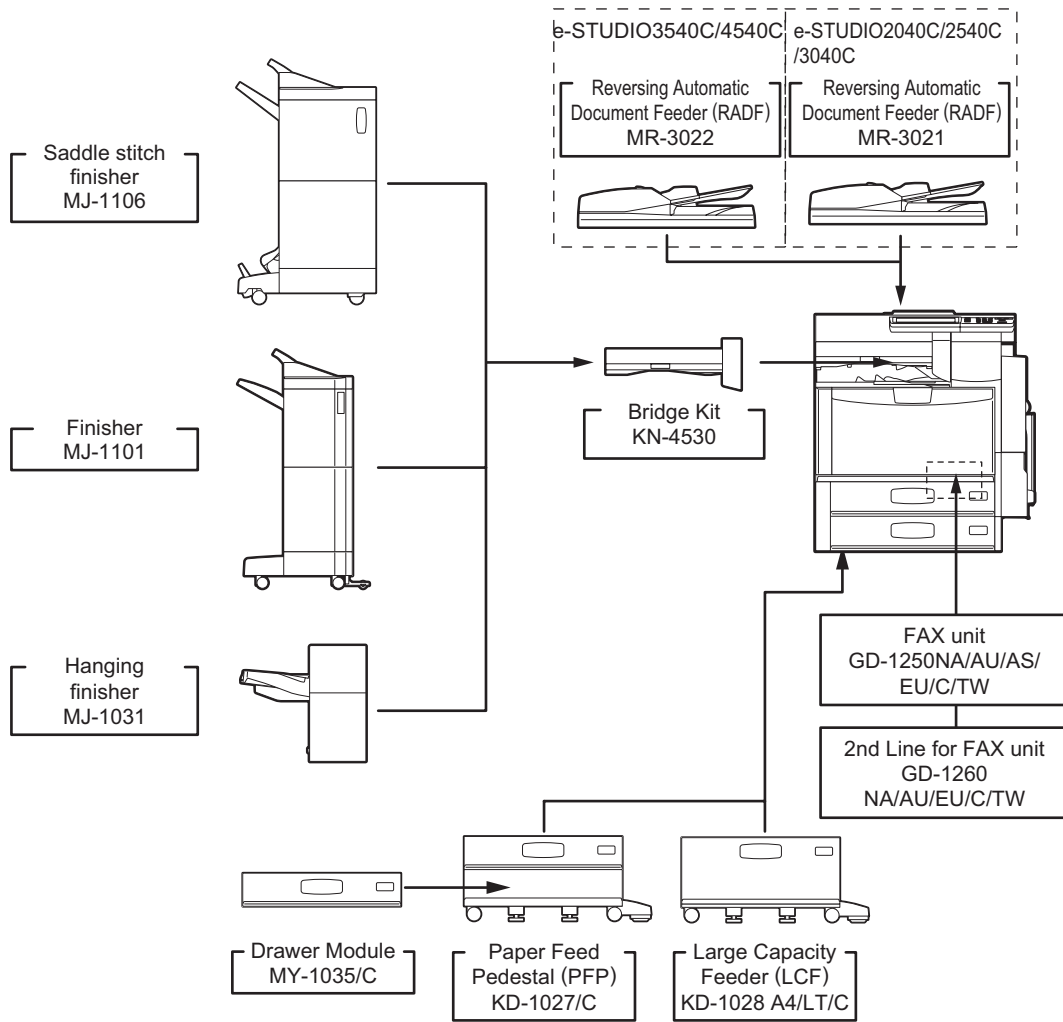


Fig. 1-7

## 1.6.7 e-STUDIO5540C/6540C/6550C

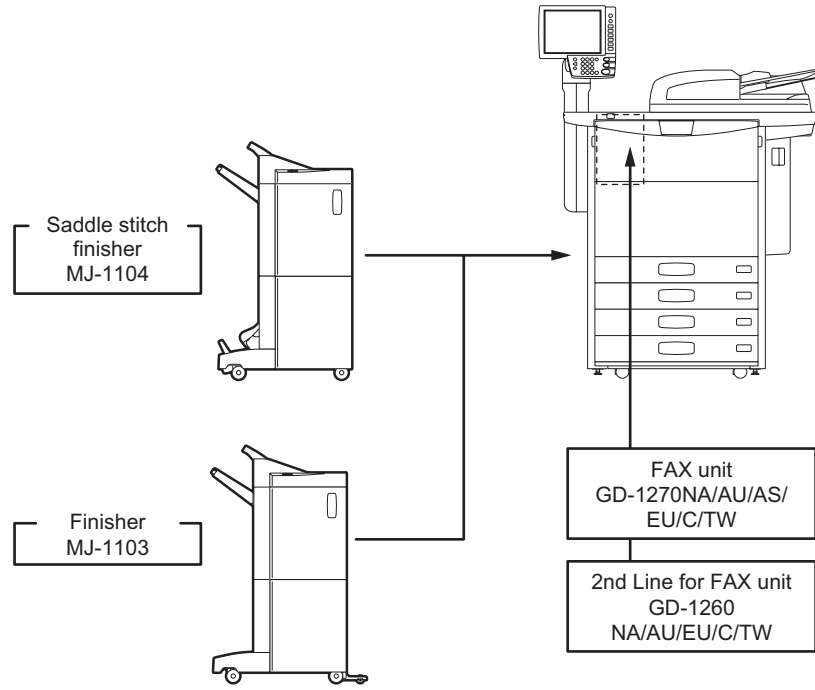


Fig. 1-8



1.6.8 e-STUDIO556/656/756/856

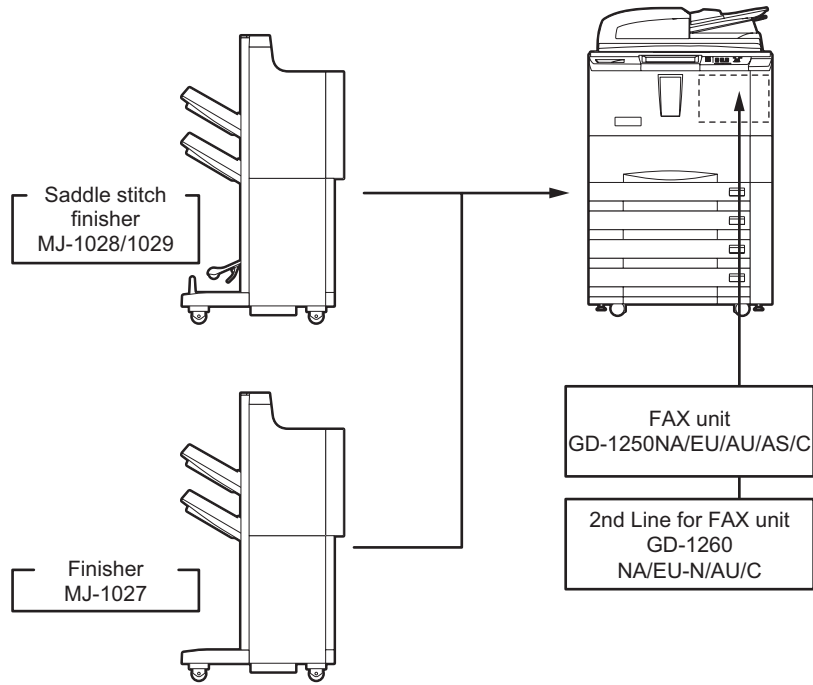


Fig. 1-9

# 1.6.9 e-STUDIO206L/256/306/356/456

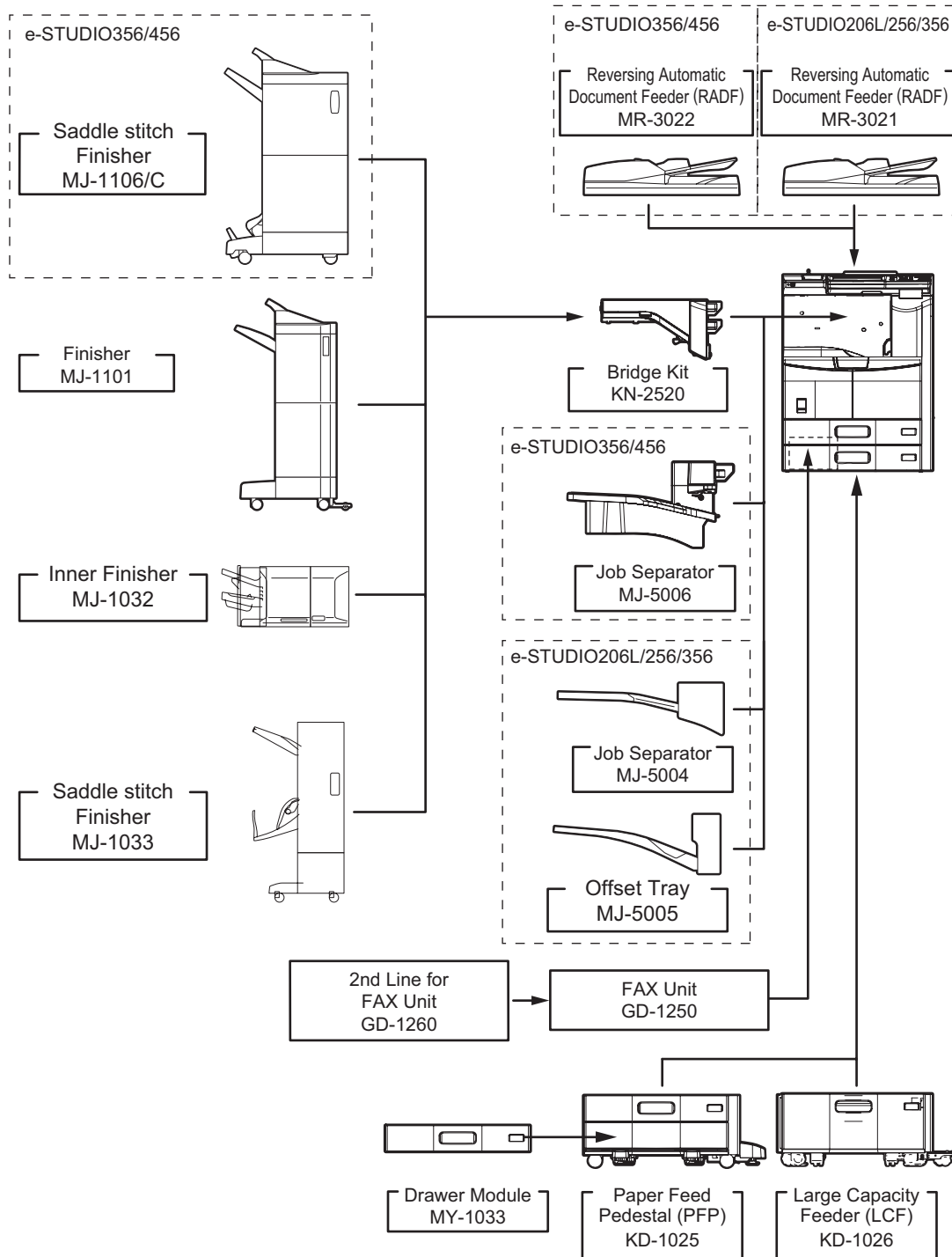


Fig. 1-10

# 1.7 Overview

## 1.7.1 e-STUDIO2500c/3500c/3510c

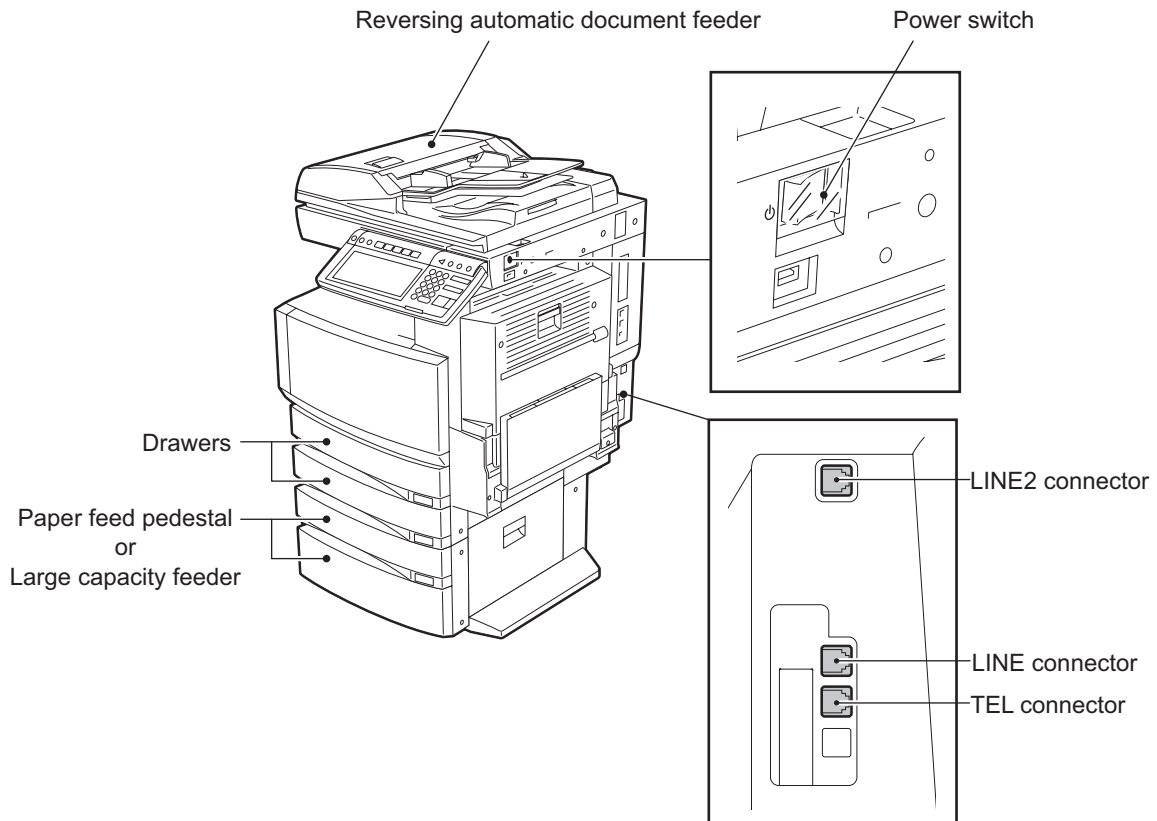


Fig. 1-11

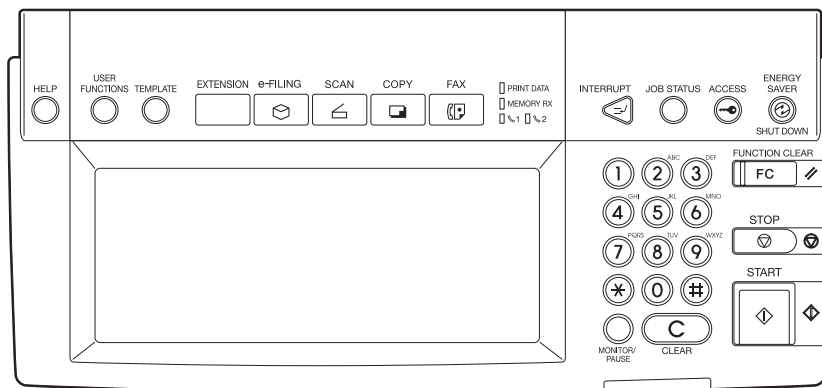


Fig. 1-12

## 1.7.2 e-STUDIO2330C/2820C/2830C/3520C/3530C/4520C, e-STUDIO2040C/2540C/3040C/3540C/4540C

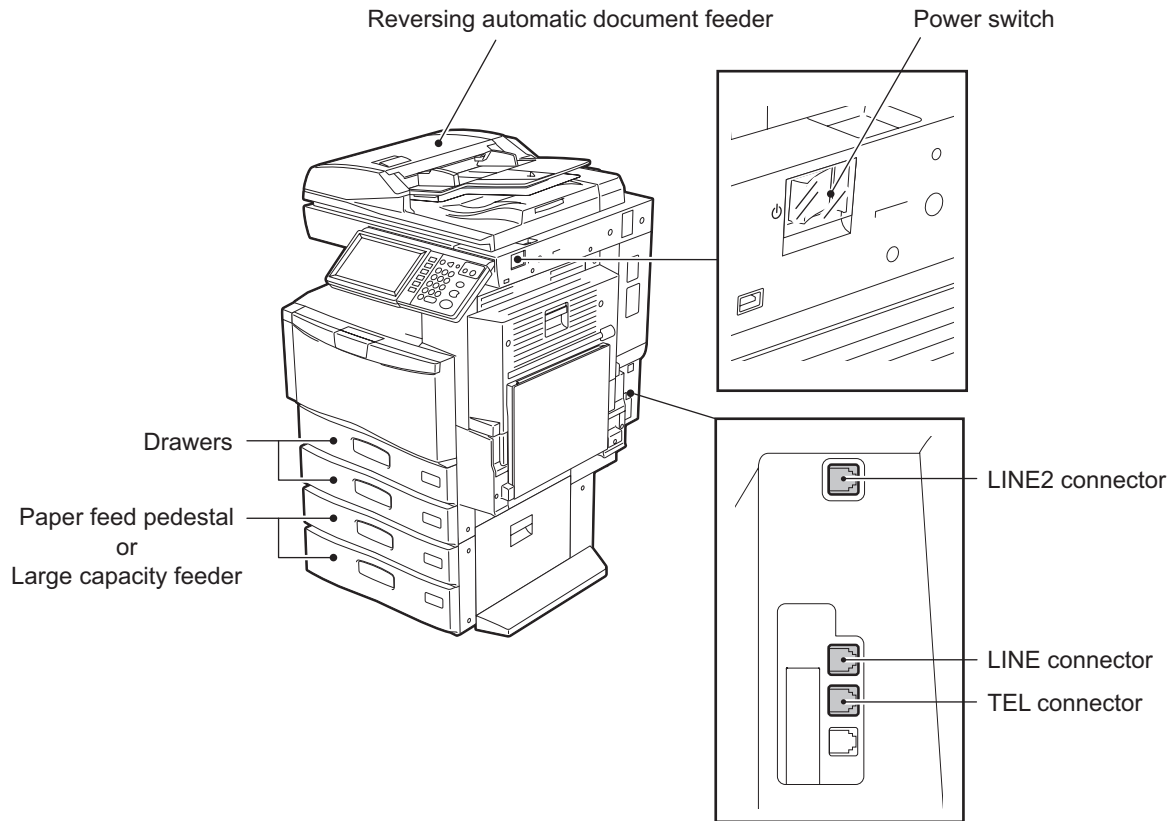


Fig. 1-13

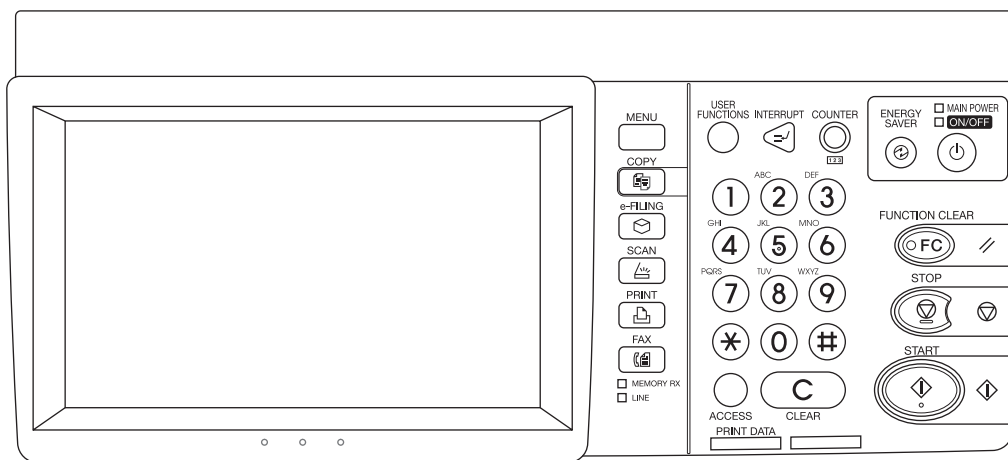


Fig. 1-14

### 1.7.3 e-STUDIO5520C/6520C/6530C, e-STUDIO5540C/6540C/6550C

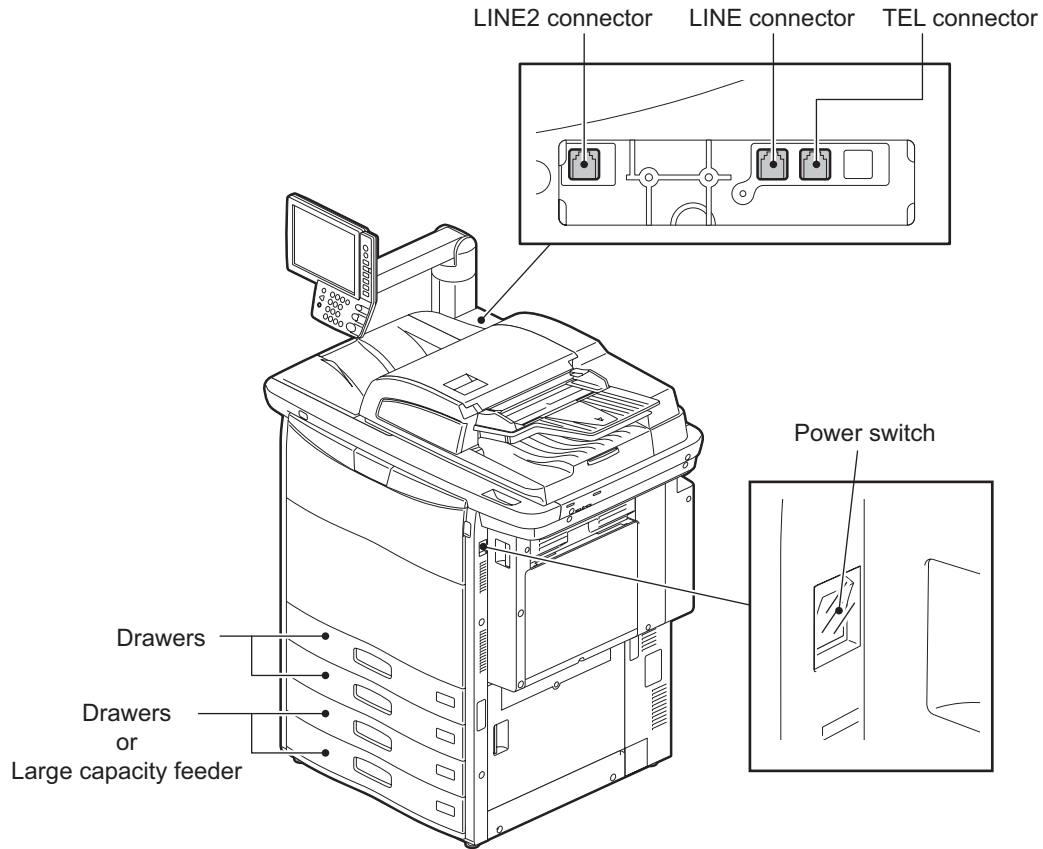


Fig. 1-15

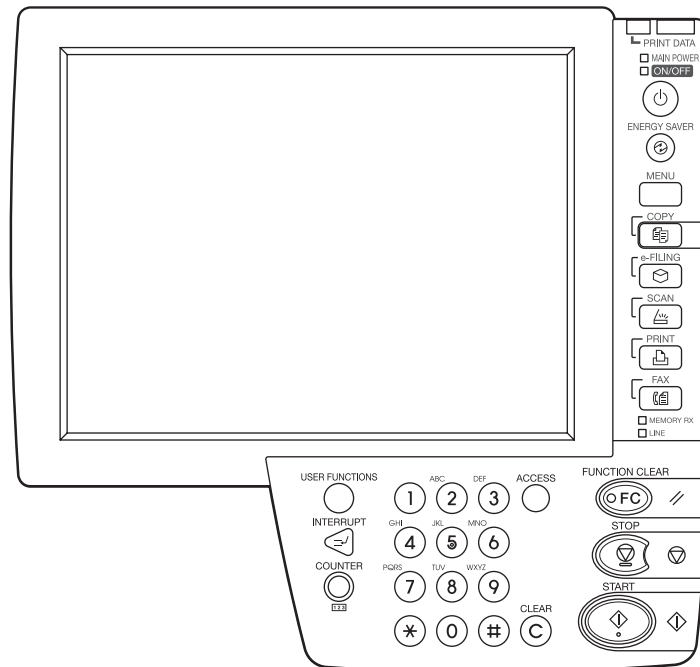


Fig. 1-16

# 1.7.4 e-STUDIO205L/255/305/355/455, e-STUDIO206L/256/306/356/456

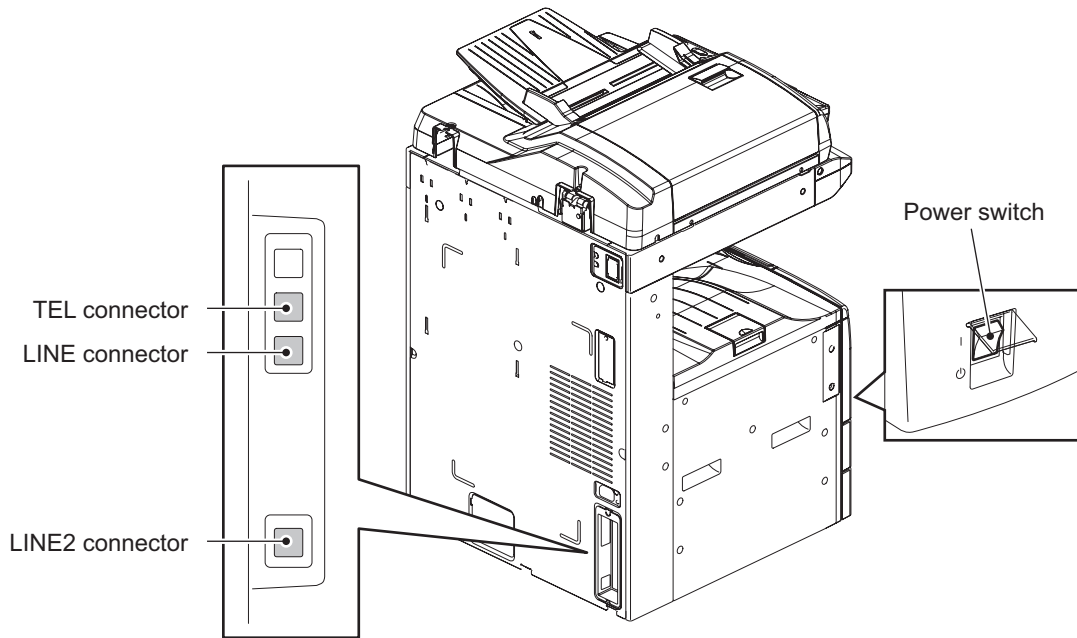


Fig. 1-17

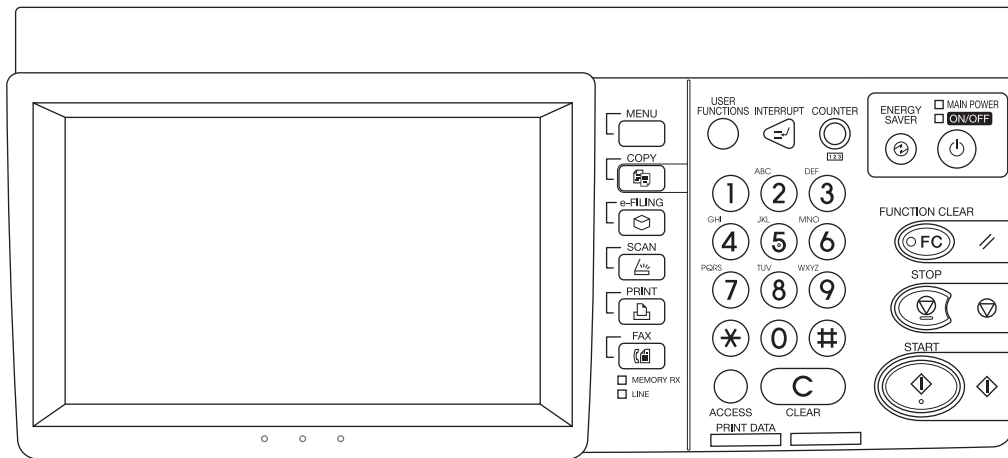


Fig. 1-18

## 1.7.5 e-STUDIO555/655/755/855, e-STUDIO556/656/756/856

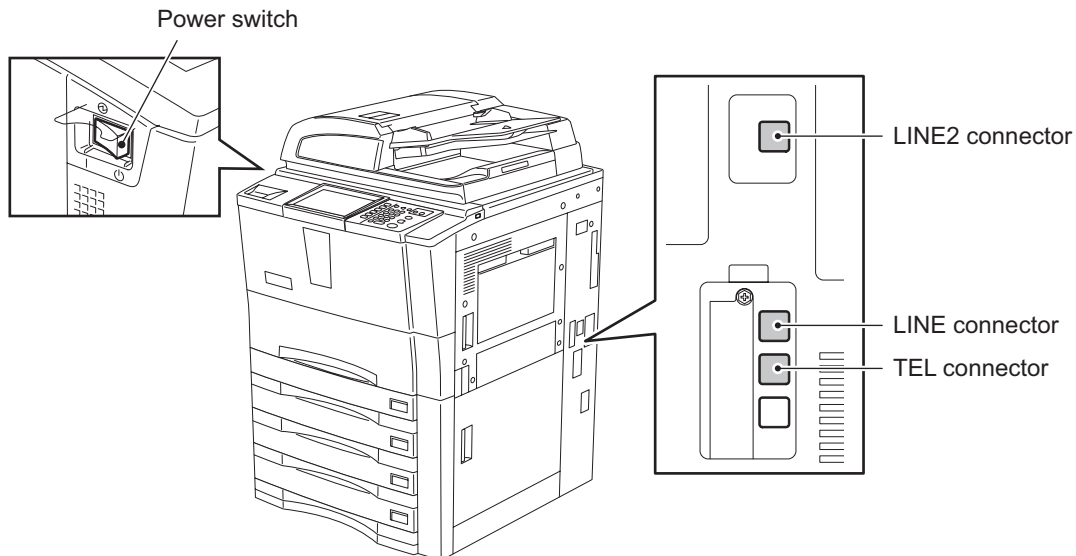


Fig. 1-19

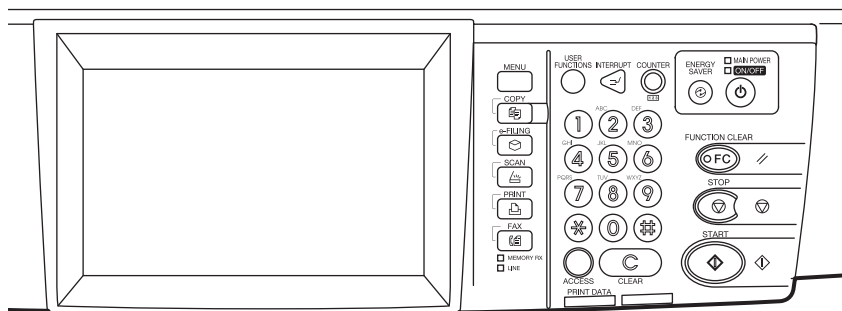


Fig. 1-20

## 1.8 Layout of PC Boards

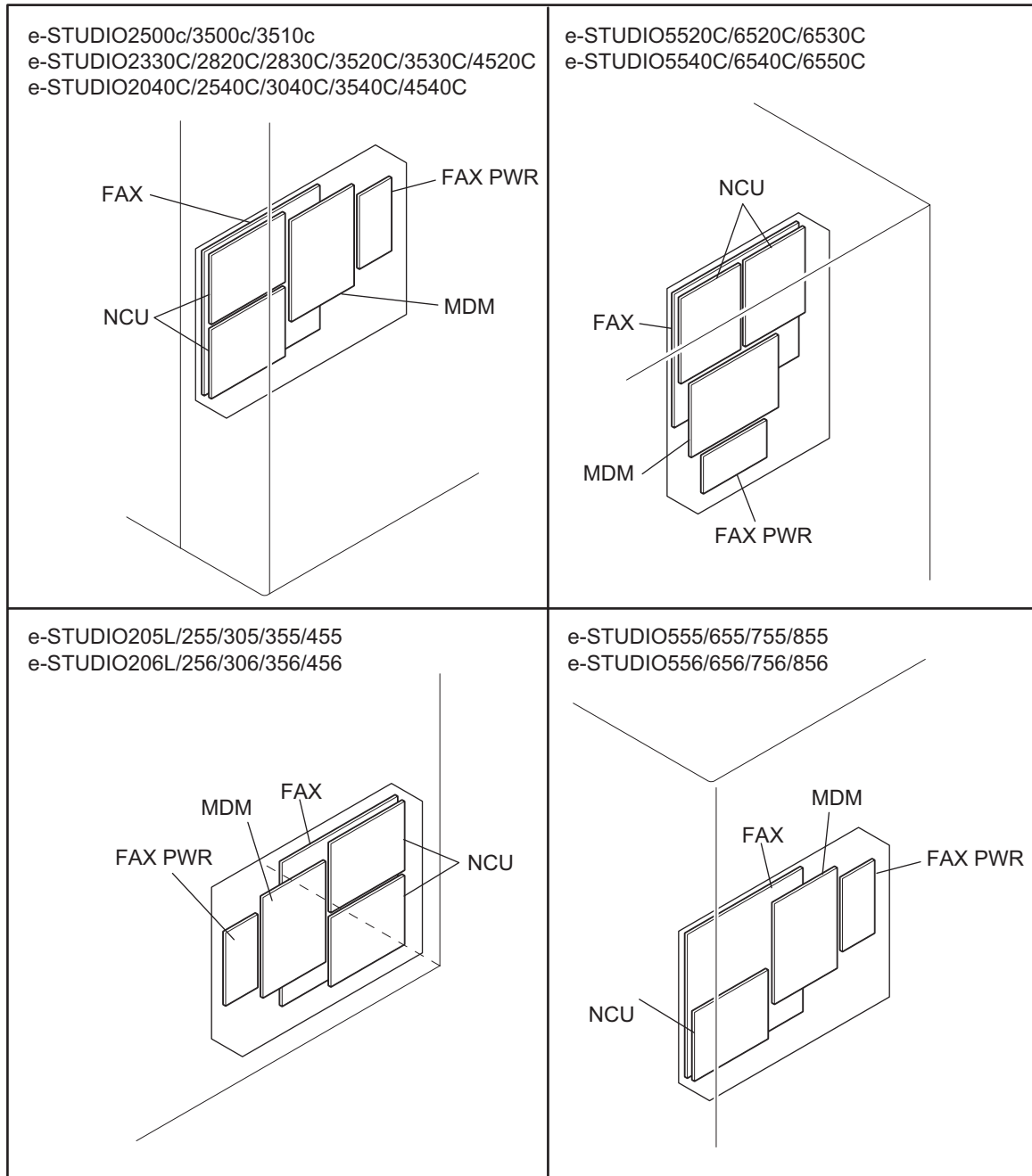


Fig. 1-21 Rear side of the equipment

| Symbol  | Name            | Function                                     |
|---------|-----------------|--|
| FAX     | FAX board       | Controls the FAX function                    |
| MDM     | MDM board       | Control the MODEM function (for 2nd line)    |
| NCU1    | NCU1 board      | Control the line of telephone (for 1st line) |
| NCU2    | NCU2 board      | Control the line of telephone (for 2nd line) |
| FAX PWR | FAX power board | Supplies the power (-12V, +24V) of FAX       |



## 2. LSU-RELATED FUNCTIONS

### 2.1 Recording Mode

This machine offers various printing modes such as the selection of the applicable recording paper and the recording method, etc. to meet users' needs. To take full advantage of these features, it is important to understand the concepts of the recording paper selection algorithm and printing algorithm as described in 2. 2.

## 2.2 Recording Paper Selection Algorithm and Printing Algorithm

Before printing the received image, the preset settings are evaluated in the order of the following 1) and 2), and the printing is performed based on the result.

### 1) Recording paper selection algorithm

- Basically, the received image is printed on a sheet of paper of the same size as the original. However, if this size is not available, this algorithm determines on which size of recording paper the output should be made. (Actual Size Mode/Free Mode)

### 2) Printing algorithm

- Determines how the received image is to be printed. (Discard printing/Vertical reduction printing/Regular size reduction printing/Split printing)

### 2.2.1 Recording paper selection algorithm

It is possible to distinguish the size of each received image (A3(LD)/B4(LG)/A4(LT)/B5/A5). Basically, recording paper of the same size as the original is used for printing. If recording paper of the size is not available, this algorithm selects paper of another size according to the setting in the Setting Mode.

#### 1) Actual Size Mode (13-517: 0)

- Printing is performed when regular size reduction is not applied to the received image. In this mode, an A4/LT received image is printed on a B4 recording paper.

#### 2) Free Mode (13-517: 1)

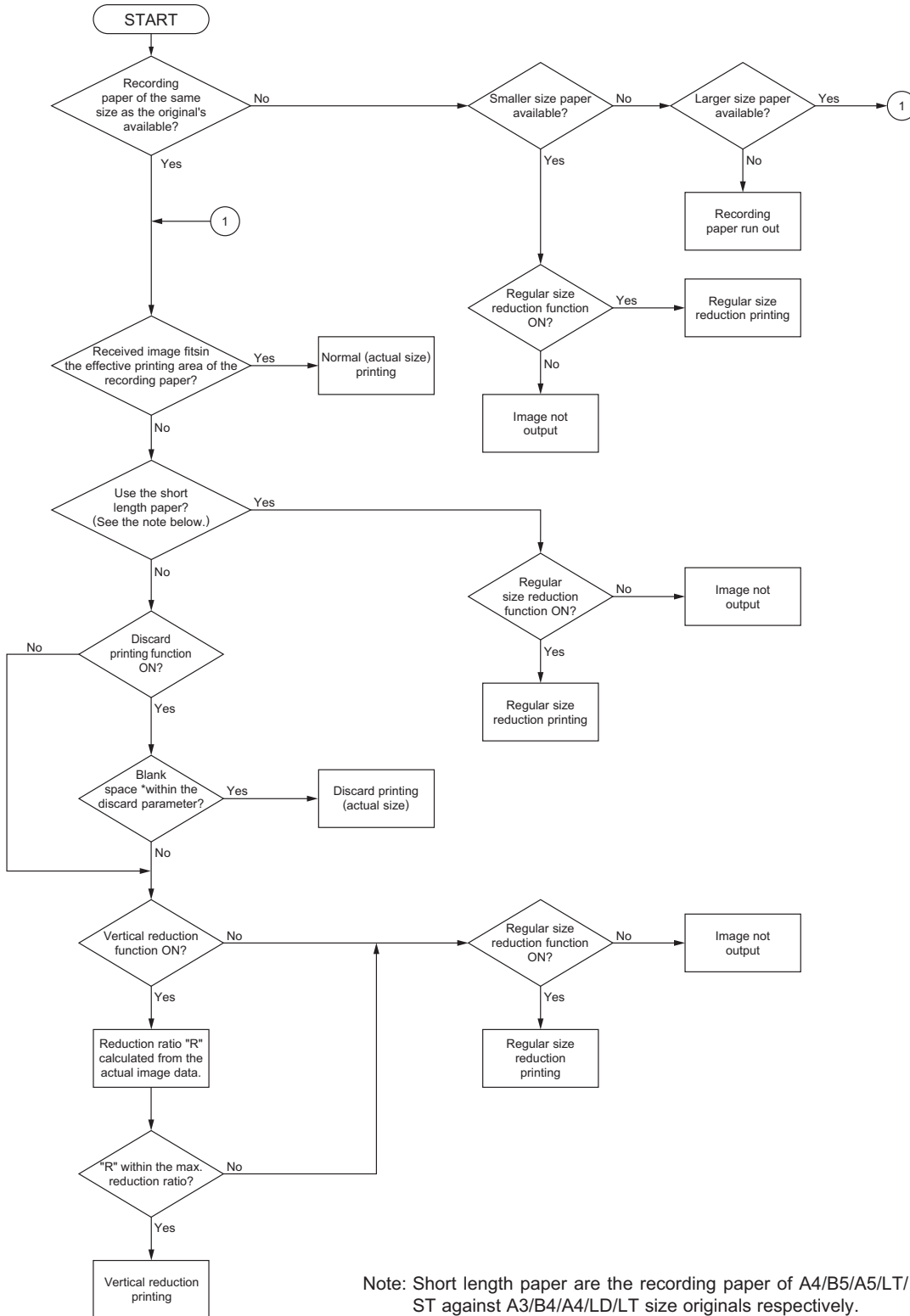
- Printing is performed on any available recording paper.

### 2.2.2 Printing algorithm

Recording paper has its effective printing area. Even if the size of the original paper and the recording paper are the same, the length of the original is normally longer.

This means that the received image would be divided onto two sheets. To prevent this, the printing algorithm works as described in the following pages.

# Discard / Vertical reduction / Regular size reduction / Split printing flow chart



Note: Short length paper are the recording paper of A4/B5/A5/LT/ST against A3/B4/A4/LD/LT size originals respectively.

## 1) Discard printing

- Since the trailing edge area of the original is normally blank, this blank area is cut off to allow the image fit in one sheet in this mode. Image reduction is not performed.
  - Maximum discarding amount:
    - 0 mm: Discard not performed
    - 10 mm: Corresponding to the inside the TTI
    - 18 mm: Corresponding to the outside the TTI 1
    - 22 mm: Corresponding to the outside the TTI 2
    - 34 mm: A4 → LT conversion
- (TTI: Transmission Terminal Identifier)

When the discard function is ON (13–378:1):

Actual size recording is performed with no vertical reduction nor division. The original image is recorded as it is. Namely, the data exceeding the effective printing area are discarded.

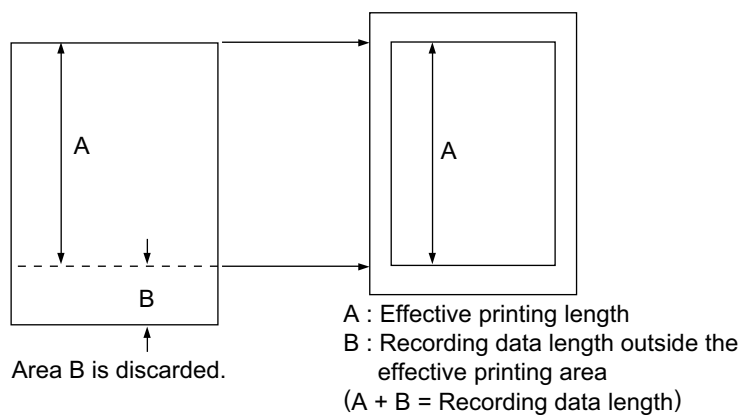


Fig. 2-1

Discard parameter (13-375: 0 to 4)

The following parameters are available:

| Discard function | Length of B (Discard parameter) | Set value |
|------------------|---------------------------------|-----------|
| OFF              | 0 mm                            | 0         |
| ON               | 10 mm                           | 1         |
|                  | 18 mm                           | 2         |
|                  | 22 mm                           | 3         |
|                  | 34 mm                           | 4         |

**Reference:** These parameters should be set by the service technician (in the FAX Function Mode).

## 2) Vertical reduction printing (13–377: 0)

- The recording data length is reduced so that the image fits in the recording paper. The data can be reduced up to 90/75%, and the machine automatically selects the appropriate ratio.

3) Regular size reduction printing (13-517: 1)

- When the discard and vertical reduction printing cannot be applied to the received image, and any of the combinations A3 → B4, A3 → A4, B4 → A4, B4 → B5, B4 → A5, A4 → B5, A4 → A5, COMP → LT, COMP → ST, LD → COMP, LD → LG/LT, LD → ST, LT → ST, FOLIO → B5, FOLIO → A5 is satisfied, the regular size reduction printing is performed.

In case that the recording data length is within the effective printing length A, but the recording paper of the same size as the original's or larger size is not available;

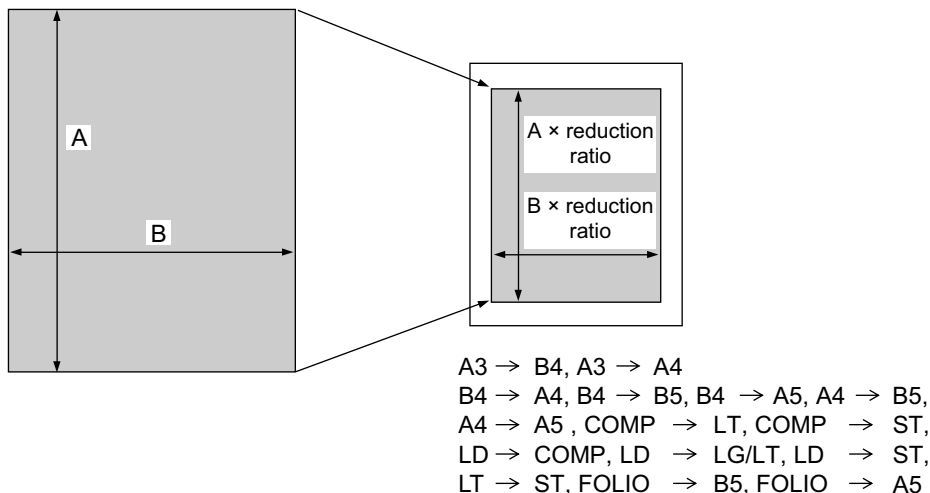


Fig. 2-2

In case that the recording data length exceeds the effective printing length A, the vertical reduction printing is not applicable and larger size recording paper is not available;  
 (In the following example, A4/LT original was sent but the recording length exceeds A4 size and the data do not fit in A4/LT even if the vertical reduction is performed. The reduction B4 → A4 or A3 → A4 is applied in this case.)

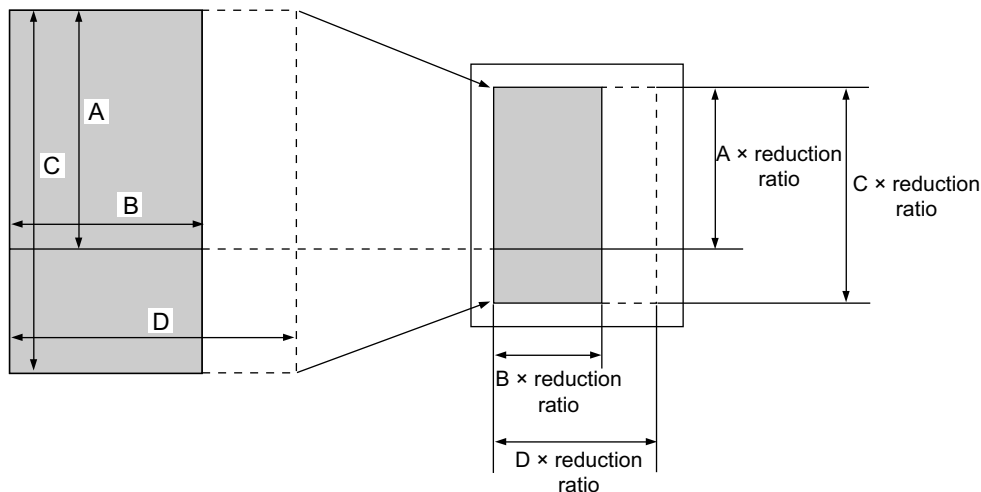


Fig. 2-3

#### 4) Split printing

When the recording data do not fit in a recording paper even if vertical reduction is performed for the recording data length (the recording data length is exceeding the effective printing length of the largest recording paper in the drawer installed in the machine), the recording data are divided onto two sheets while vertical reduction is performed.

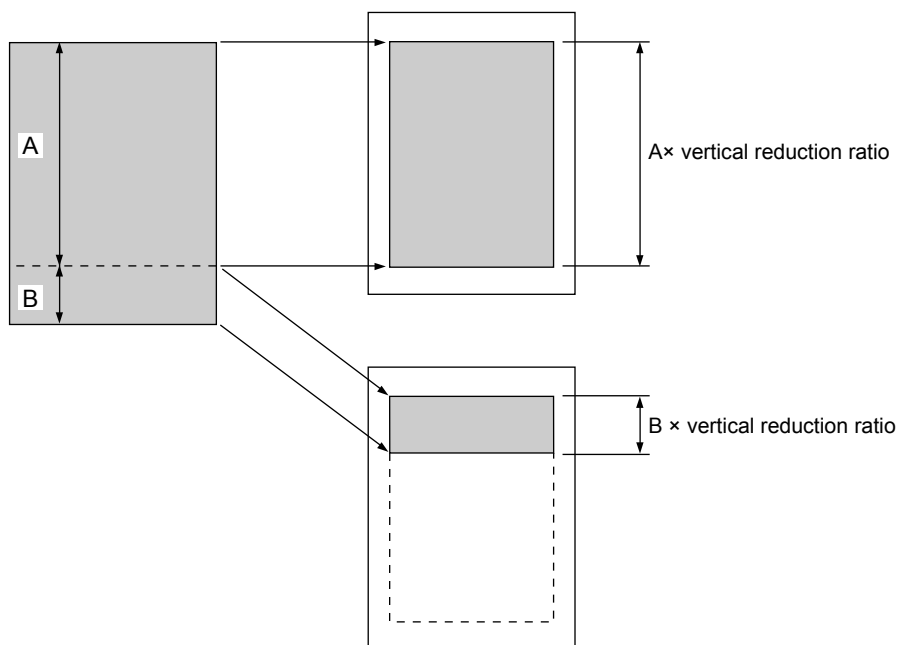


Fig. 2-4

### 2.2.3 Setting for the split recording

#### 1) Split recording onto A4/B5/A5/ST

Set as to whether split recording onto the short length paper (A4/B5/A5/ST) is to be performed or not.

When this function is disabled, split recording for A3/B4/A4 data onto A3/B4/A4/LG/LT recording paper is not performed.

## 2.3 Recording Paper and Function

The size of the recording paper on which the received image data are printed is determined according to the presence/absence of the recording paper and the above-mentioned function settings. Relation between the recording paper size and the function settings is described in this section.

## 2.3.1 Table of the recording paper selection modes

<Selection of recording paper: in case the recording data length do not exceed the effective recording length of the recording paper>

|          |   | Recording data size |             |             |            |             |            |            |            |            |            |            |            |            |
|----------|---|---------------------|-------------|-------------|------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|
|          |   | A4-R                | B4          | A3          | A4         | B5          | A5         | LT-R       | LT         | LG         | COMP       | LD         | ST         | FOLIO      |
| Priority | 1 | A4-R                | B4          | A3          | A4         | B5          | A5         | LT-R       | LT         | LG         | COMP       | LD         | ST         | FOLIO      |
|          | 2 | A4                  | A3<br>*2    | B4<br>*1    | A4-R       | B5-R        | A4-R       | LT         | LT-R       | COMP       | LD         | COMP<br>*1 | LT-R       | B4<br>*2   |
|          | 3 | FOLIO               | A4-R<br>*1  | A4-R<br>*1  | A3         | B4          | A4         | LG<br>*2   | LD         | LD         | LT-R<br>*1 | LG<br>*1   | LT         | A3<br>*2   |
|          | 4 | B4<br>*2            | A4<br>*1    | A4<br>*1    | FOLIO      | A4<br>*1    | FOLIO      | COMP<br>*2 | LG<br>*1   | LT-R<br>*1 | LT<br>*1   | LT-R<br>*1 | LG         | A4-R<br>*1 |
|          | 5 | A3<br>*2            | FOLIO<br>*1 | FOLIO<br>*1 | B4<br>*1   | A4-R<br>*1  | B5<br>*2   | LD<br>*2   | COMP<br>*1 | LT<br>*1   | LG<br>*1   | LT<br>*1   | COMP<br>*2 | A4<br>*1   |
|          | 6 | B5-R<br>*1          | B5-R<br>*1  |             | B5-R<br>*1 | A3<br>*2    | B5-R<br>*2 | ST-R<br>*1 | ST-R<br>*1 |            |            |            | LD<br>*2   | B5-R<br>*1 |
|          | 7 | B5<br>*1            | B5<br>*1    |             | B5<br>*1   | FOLIO<br>*1 | B4<br>*2   |            |            |            |            |            |            | B5<br>*1   |
|          | 8 | A5-R<br>*1          |             |             | A5-R<br>*1 | A5-R<br>*1  | A3<br>*2   |            |            |            |            |            |            |            |

\*1: Can be used when the regular size reduction function is ON (when it is OFF, the data are stored in the memory.)

\*2: When the data are output in the primary scanning direction, it is printed in the center of the recording paper.

## 2.3.2 Others

1) For the users with the TTI outside setting, it is recommended to set the discard parameter to 18 mm.



## 2.4 Energy Saver Mode

The fuser unit, main power and power supply for the control panel can be shut off during a specified period of time such as night time that the machine is in the ready mode, using a weekly timer function of the equipment. When a FAX is received in the Energy Saver Mode, the fuser unit, main power and power supply for the control panel are automatically turned ON. Printing is then started when the machine reaches the specified temperature. The Energy Saver Mode is useful for hours in which the amount of communication is small and immediate printing is not necessary.

The setting of the Energy Saver Mode and time (start time, end time) are made on the USER FUNCTIONS screen. (Default setting is made by the weekly-timer function of the equipment.)

| Energy Saver Mode    | How to enter the mode  | Timer setting                            | How to cancel the mode  |
|----------------------|--|--|---|
| Auto Power Save Mode | Automatically  | Can be set in the USER FUNCTIONS Screen. | Returns to the default screen by receiving FAX document, or by pressing the [START] button<br>Returns to the FAX screen by pressing the [FAX] button/ |
| Sleep Mode           | Automatically or by pressing the [ENERGY SAVER] button         | Can be set in the USER FUNCTIONS Screen. | Returns to the default screen by receiving FAX document, or by pressing the [START] button<br>Returns to the FAX screen by pressing the [FAX] button. |
| Super Sleep Mode     | Automatically or by pressing the [ON/OFF] button for 2 seconds | Can be set in the USER FUNCTIONS Screen. | Returns to the default screen by receiving FAX document, or by pressing the [ON/OFF] button.  |

## 2.5 Memory Reception

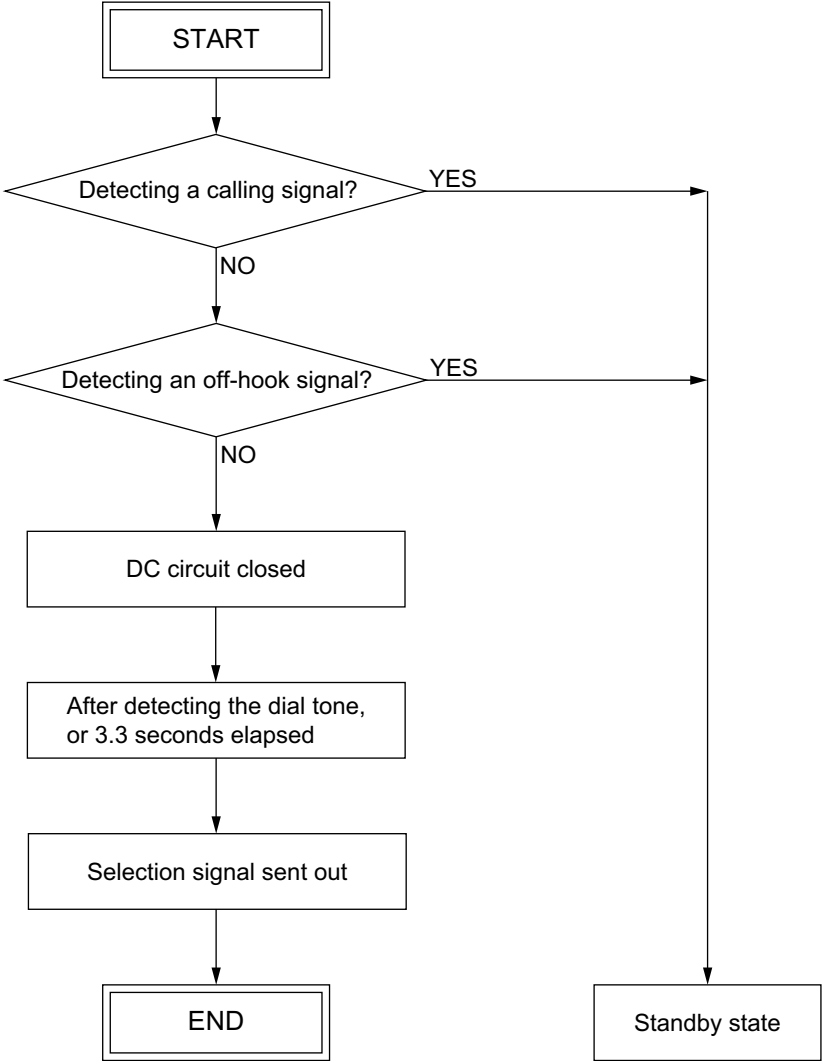
Basically, the receiving FAX data are once stored in the HDD, then the data are printed out after the reception process is finished.

The memory reception is performed until the 1 GB HDD (for transmission and reception) becomes full.

### 3. DIALING/COMMUNICATION CONTROL

#### 3.1 Circuit Connection and Procedure to Change Mode

##### 3.1.1 Dial call-up transmission to a telephone circuit

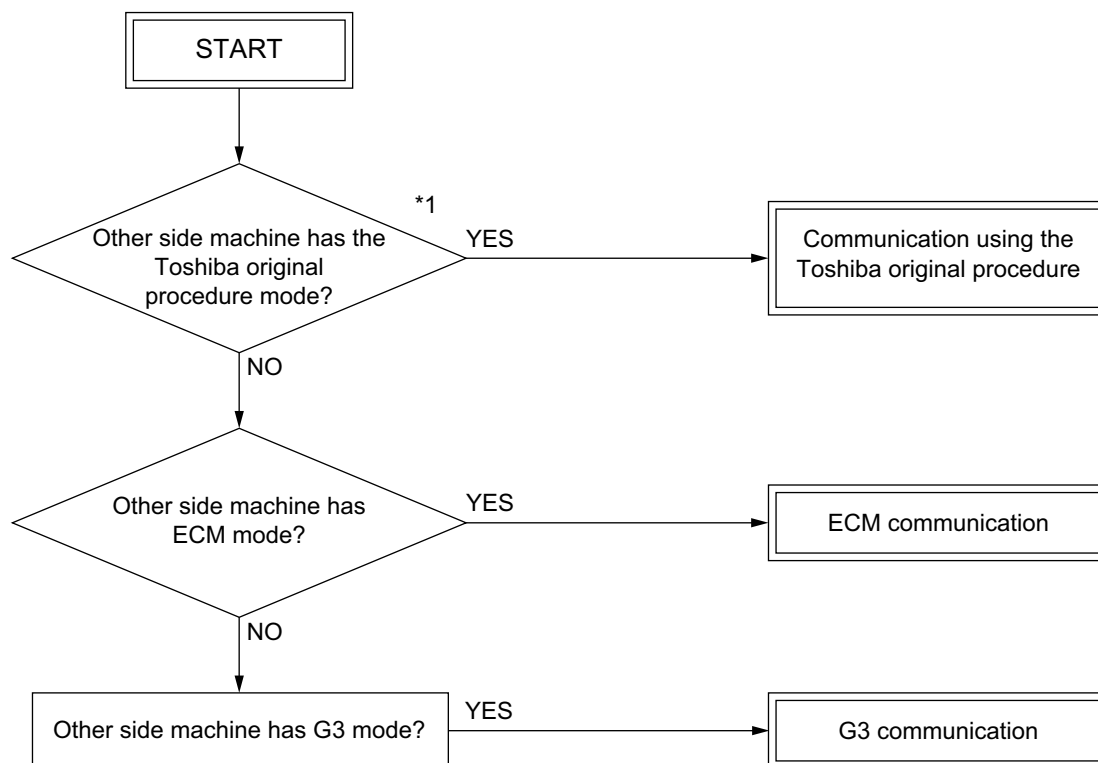


### 3.1.2 Selection of the communication mode

This machine has three types of communication mode. The mode to be used is determined according to the combination of the types of the circuits and communication and available function of the other side's machine.

|                   | Communication mode         |     |    |
|-------------------|----------------------------|-----|----|
|                   | Toshiba original procedure | ECM | G3 |
| Telephone circuit | ○                          | ○   | ○  |

### 3.1.3 Procedure to select the transmission mode



\*1 This step is only checked when the other side machine has CRP2 (+ CRP1) or when the transmission is started by the CRP calling. (The first transmission to the other side with CRP1 only is performed in the ECM mode.)

## 3.2 Signaling System Diagram and Signal Forms

### 3.2.1 Circuit control signals

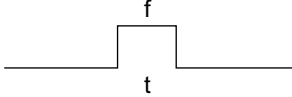
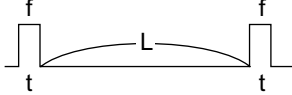
The following circuit control signals are used in the binary and tonal procedures.

- Circuit control signals

|     |  |
|-----|--|
| CED | Called station identification<br>Indicates that the sender is a FAX machine in the automatic called mode. (*1) |
| CNG | Calling tone<br>Indicates that the sender is a FAX machine in the automatic calling mode. (*1)                 |

\*1: This signal can be sent manually.

- Signal form

| Signal name | Signal form  | Signal form                                     |
|-------------|--|---|
| CED         |   | f: 2100 ±15 Hz<br>t: 2.6 - 4.0 sec              |
| CNG         |  | f: 1100 ±38 Hz<br>t: 0.5 sec ±15%<br>(L: 3 sec) |

### **3.2.2 Communication with the binary signals**

In the Toshiba original procedure/G3 modes, communication is performed with the binary procedure as follows.

- (1) Binary procedure
  - Transmission and reception in the Toshiba original procedure/G3 modes

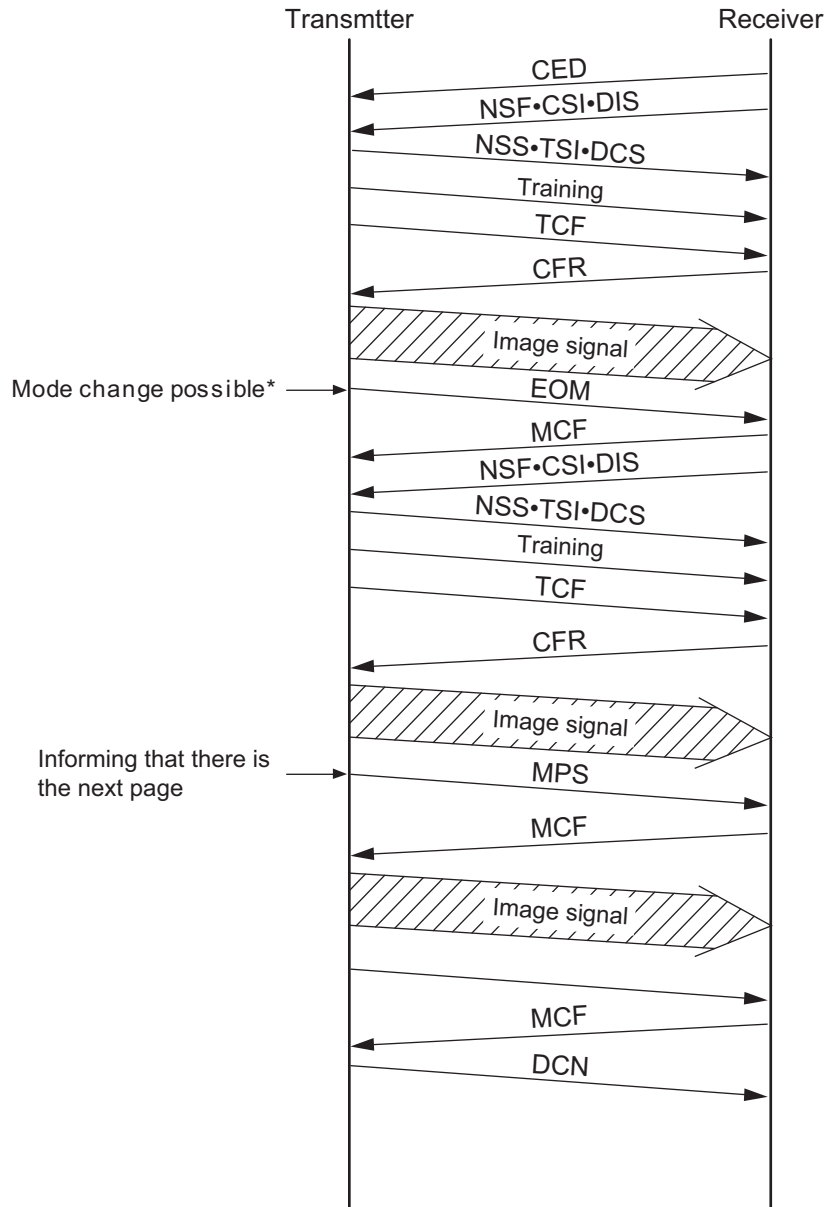


Fig. 3-1

\* Mode change is possible only for the original set manually.

- Transmission and reception in the ECM mode  
 ECM (Error Correction Mode) conforms to T.30.  
 When an error has occurred to the received image data, the receiving station informs the sending station of the occurrence of the error, and the sending station sends the image data again.

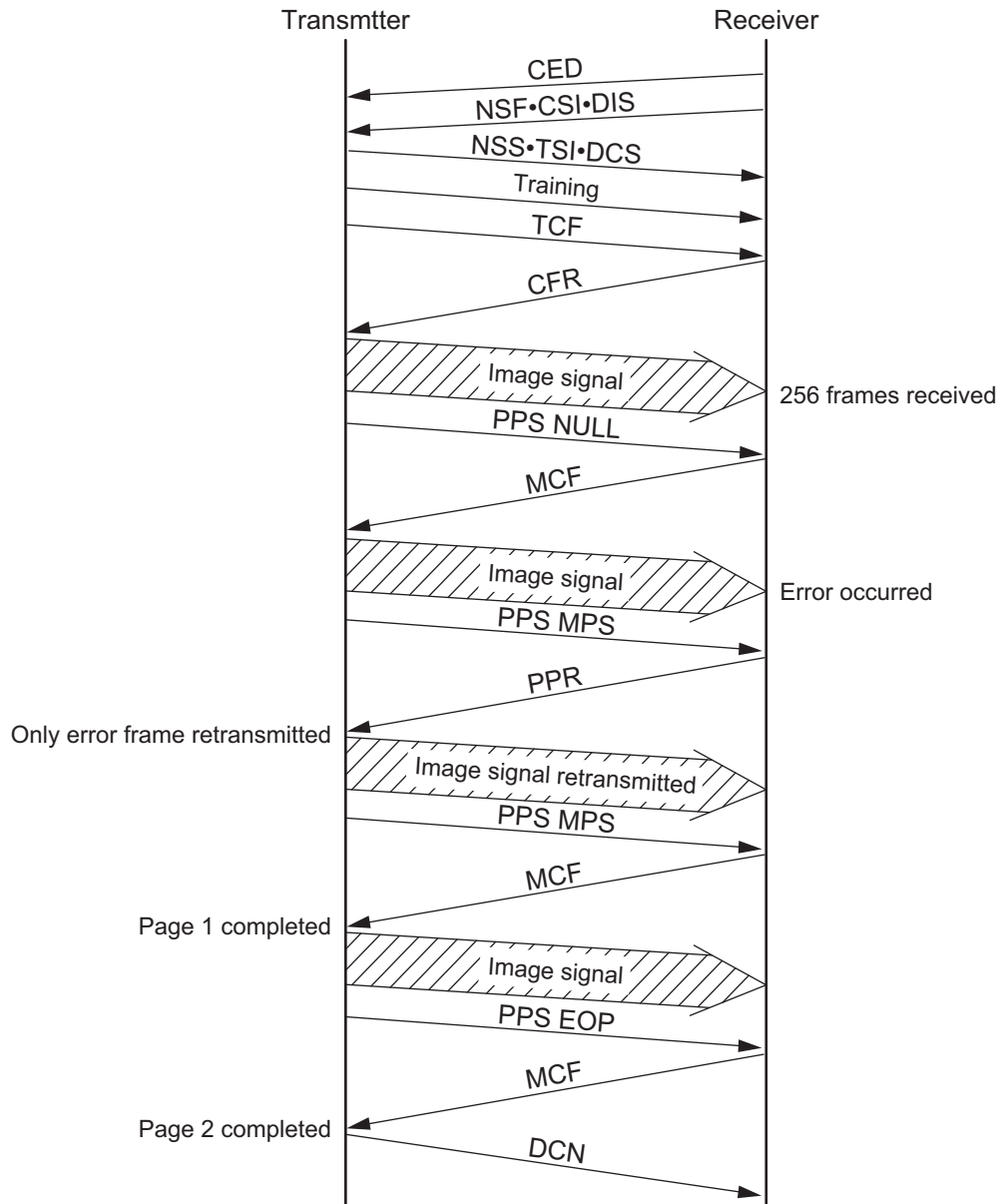


Fig. 3-2



- Cancellation during the transmission  
 If the [STOP] button is pressed during the direct transmission or memory input, the display to confirm the cancellation appears. The communication is finished normally regardless of the presence/absence of the next page or mode changes by pressing the [STOP] button.  
 If the [STOP] button is pressed anytime except during the transmission of the image data, DCN is forcibly sent to terminate the communication.  
 Press the [JOB STATUS] button, and select the transmission job to cancel, then press the [CANCEL] button on the LCD display to cancel the memory transmission or polling transmission.

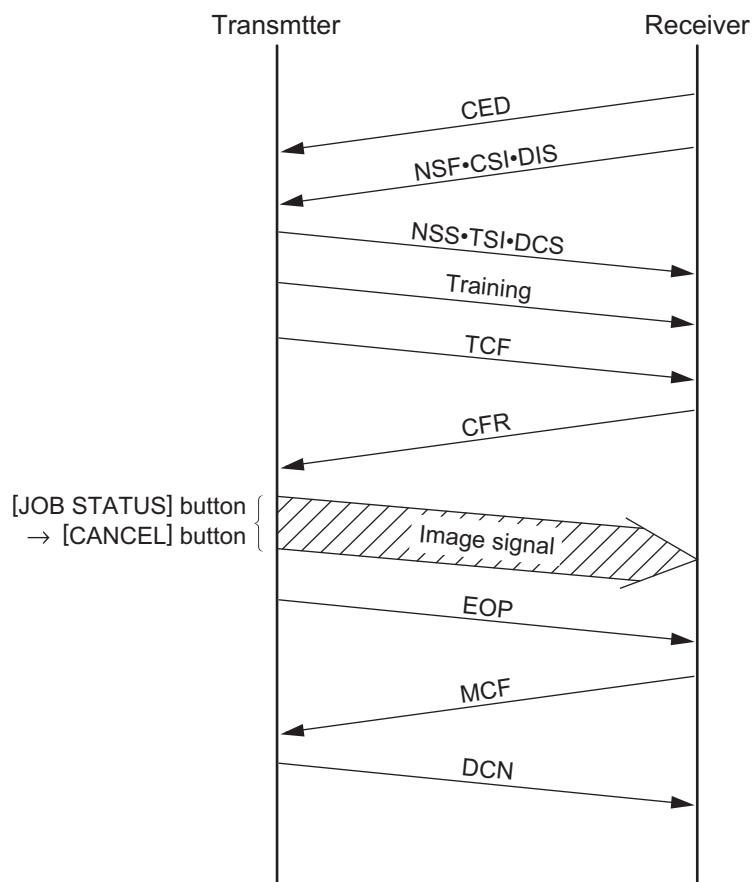


Fig. 3-3

(2) Binary signals

|     |   |
|-----|---|
| NSF | Non-Standard Facility<br>Informs that the receiving station (machine) has a non-standard facility.  |
| NSC | Non-Standard Facility Command<br>Command to transmit using the non-standard facility which is selected corresponding to NSF (i.e., Polling etc.).   |
| NSS | Non-Standard Facility Setup<br>Command to transmit using the non-standard facility which is selected corresponding to NSF or NSC.   |
| CSI | Called Subscriber Identification<br>Provides the telephone number of the called station. Used to check the identity of the called station.  |
| CIG | Calling Subscriber Identification<br>Provides the telephone number of the calling station. Used to check the identity of the calling station (Polling, etc.).                             |
| TSI | Transmitting Station Identification<br>Provides the telephone number of transmitting station. Used to check the identity of the transmitting station.                                     |
| DIS | Digital Identification Signal<br>Informs that the receiving station (machine) has a standard facility (G3/G2).  |
| DTC | Digital Transmit Command<br>Command to transmit using the standard facility which is selected corresponding to DIS (i.e., Polling, etc.).   |
| DCS | Digital Command Signal<br>Commands to transmit using the standard facility which is selected corresponding to DIS or DTC.   |
| SUB | Sub-address<br>Indicates that the FIF information is a sub-address in the domain on the call-in side.   |
| SEP | Select Polling<br>Indicates that the FIF information is a sub-address for the polling mode.   |
| PWD | Password<br>Indicates that the FIF information is a password for the polling mode in a reception.<br>Indicates that the FIF information is a password for transmission in a transmission. |
| CFR | Confirmation of Reception<br>Informs that the FAX is ready to receive data.   |
| FTT | Failure to Train<br>Informs that the TCF signal has not received correctly and requests the re-training.  |
| EOM | End of Message<br>Informs that the the 1st page has been transmitted and there is the next page; command to return to the beginning of the phase B.                                       |
| MPS | Multi-page Signal<br>Informs that the 1st page has been transmitted and there is the next page; command to return to the beginning of the phase C.  |
| EOP | End of Procedure<br>Informs that a document has been transmitted and there is no more pages.  |
| MCF | Message Confirmation<br>A reply to MPS, EOM or EOP; informing that image signals have been received correctly and the FAX is ready to receive data.                                       |
| RTN | Retrain Negative<br>Informs that a document has not been received correctly; requests for the retraining or phase synchronization to receive the next page.                               |

|         |   |
|---------|---|
| PIP     | Procedure Interrupt Positive<br>Informs that the image signals have been received correctly and requests the operator's reply by telephone or to return to the beginning of the phase B to continue the communication (i.e., CALL Request, etc.). |
| PIN     | Procedure Interrupt Negative<br>Informs that the image signals have not been received correctly and requests for operator's reply by telephone or to return to the beginning of the phase B to continue the communication.                        |
| PRI-EOM | Procedure Interrupt EOM<br>Command similar to EOM. Operation by operator is necessary.  |
| PRI-MPS | Procedure Interrupt MPS<br>Command similar to MPS. Operation by operator is necessary.  |
| PRI-EOP | Procedure Interrupt EOP<br>Command similar to EOP. Operation by operator is necessary.  |
| DCN     | Disconnect<br>Command to disconnect the FAX line and to connect the telephone line. Reply from the other side is not necessary.   |
| RR      | Receive Ready<br>Informs that the FAX is ready to receive documents and requests for data to set the reception mode. (ECM mode)   |
| RNR     | Receive Not Ready<br>Informs that the FAX is not in the receivable state. (ECM mode)  |
| PPR     | Partial Page Request<br>Informs that a part of page (ECM block) has not been received correctly. The number of the frame needs to be corrected is informed by the FIF. (EC mode)  |
| PPS     | Partial Page Signal<br>Informs that a part of page (ECM block) or one page has been transmitted. (EC mode)  |
| CTC     | Continue to Correct<br>Replies to the 4th PPR which requests to correct the image signal; informs that the transmitting station will continue to correct the frame data. (ECM mode)   |
| CTR     | Response for Continue to Correct<br>Replies to CTC and informs that the receiving station has received and accepted the CTC. (EC mode)  |
| EOR     | End of Retransmission<br>Informs that the transmitting station has completed the correction of the error frame data (binary signal) of the previous ECM block. (ECM mode)   |
| ERR     | Response for End Retransmission<br>Replies to EOR and requests to transmit the image signal of the next ECM block. (ECM mode)   |
| RTP     | Retrain Positive<br>Informs that the message has been received completely and that the subsequent message can be continued after receiving the synchronization signal and CFR signal.   |
| CRP     | Command Repeat<br>Requests to resend all the commands including optional frames because the preceding command has been received incorrectly.  |

(3) Frame structure of binary signals

Each binary signal frame is comprised of the following sequence and fields. However, some binary signals do not have the FIF field inserted.

|   |   |   |   |     |     |     |   |
|---|---|---|---|-----|-----|-----|---|
| F | F | A | C | FCF | FIF | FCS | F |
|---|---|---|---|-----|-----|-----|---|

Preample

F : Flag sequence

Indicates the start or end of a frame. Also establishes the frame synchronization.

A : Address field

Informs the address.

C : Control field

Informs if this frame is the last one in this procedure.

FCF: FAX control field

Informs the type of the binary signal.

FIF: FAX information field

Informs FAX information such as the functions.

FCS: Frame check sequence

Checks if there was any error in the transmission from A to FIF.

• Format of F, A and C

|   | Format         |                |                |                |                |                |                |                |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|   | b <sub>1</sub> | b <sub>2</sub> | b <sub>3</sub> | b <sub>4</sub> | b <sub>5</sub> | b <sub>6</sub> | b <sub>7</sub> | b <sub>8</sub> |
| F | 0              | 1              | 1              | 1              | 1              | 1              | 1              | 0              |
| A | 1              | 1              | 1              | 1              | 1              | 1              | 1              | 1              |
| C | 1              | 1              | 0              | 0              | x              | 0              | 0              | 0              |

\* When this frame is the last frame, X = 1.

- FCF format of each binary signal

| Binary signal | Format         |                |                |                |                |                |                |                |
|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|               | b <sub>1</sub> | b <sub>2</sub> | b <sub>3</sub> | b <sub>4</sub> | b <sub>5</sub> | b <sub>6</sub> | b <sub>7</sub> | b <sub>8</sub> |
| NSF           | 0              | 0              | 0              | 0              | 0              | 1              | 0              | 0              |
| NSC           | 1              | 0              | 0              | 0              | 0              | 1              | 0              | 0              |
| NSS           | x              | 1              | 0              | 0              | 0              | 1              | 0              | 0              |
| CSI           | 0              | 0              | 0              | 0              | 0              | 0              | 1              | 0              |
| CIG           | 1              | 0              | 0              | 0              | 0              | 0              | 1              | 0              |
| TSI           | x              | 1              | 0              | 0              | 0              | 0              | 1              | 0              |
| DIS           | 0              | 0              | 0              | 0              | 0              | 0              | 0              | 1              |
| DTC           | 1              | 0              | 0              | 0              | 0              | 0              | 0              | 1              |
| DCS           | x              | 1              | 0              | 0              | 0              | 0              | 0              | 1              |
| SUB           | x              | 1              | 0              | 0              | 0              | 0              | 1              | 1              |
| SEP           | 1              | 0              | 0              | 0              | 0              | 1              | 0              | 1              |
| PWD(Rx)       | 1              | 0              | 0              | 0              | 0              | 0              | 1              | 1              |
| PWD(Tx)       | x              | 1              | 0              | 0              | 0              | 1              | 0              | 1              |
| CFR           | x              | 0              | 1              | 0              | 0              | 0              | 0              | 1              |
| FTT           | x              | 0              | 1              | 0              | 0              | 0              | 1              | 0              |
| EOM           | x              | 1              | 1              | 1              | 0              | 0              | 0              | 1              |
| MPS           | x              | 1              | 1              | 1              | 0              | 0              | 1              | 0              |
| EOP           | x              | 1              | 1              | 1              | 0              | 1              | 0              | 0              |
| MCF           | x              | 0              | 1              | 1              | 0              | 0              | 0              | 1              |
| RTN           | x              | 0              | 1              | 1              | 0              | 0              | 1              | 0              |
| PIP           | x              | 0              | 1              | 1              | 0              | 1              | 0              | 1              |
| PIN           | x              | 0              | 1              | 1              | 0              | 1              | 0              | 0              |
| PRI-EOM       | x              | 1              | 1              | 1              | 1              | 0              | 0              | 1              |
| PRI-MPS       | x              | 1              | 1              | 1              | 1              | 0              | 1              | 0              |
| PRI-EOP       | x              | 1              | 1              | 1              | 1              | 1              | 0              | 0              |
| DCN           | x              | 1              | 0              | 1              | 1              | 1              | 1              | 1              |
| RR            | x              | 1              | 1              | 1              | 0              | 1              | 1              | 0              |
| RNR           | x              | 0              | 1              | 1              | 0              | 1              | 1              | 1              |
| PPR           | x              | 0              | 1              | 1              | 1              | 1              | 0              | 1              |
| PPS           | x              | 1              | 1              | 1              | 1              | 1              | 0              | 1              |
| CTC           | x              | 1              | 0              | 0              | 1              | 0              | 0              | 0              |
| CTR           | x              | 0              | 1              | 0              | 0              | 0              | 1              | 1              |
| EOR           | x              | 1              | 1              | 1              | 0              | 0              | 1              | 1              |
| ERR           | x              | 0              | 1              | 1              | 1              | 0              | 0              | 0              |
| RTP           | x              | 0              | 1              | 1              | 0              | 0              | 1              | 1              |
| CRP           | x              | 1              | 0              | 1              | 1              | 1              | 0              | 0              |

- X = 1 for the station which received DIS.
- X = 0 for the station which received a response signal to DIS.

(4) Training

The training is performed in the binary procedure to surely transmit the image signals.

- Training signal

The training signal is transmitted following the DCS signal at the modem speed specified by the DCS signal. Responding to this training signal, the receiving side adjusts the auto-equalizer.

- Format of the training signal

- 14.4 Kbps, 12 Kbps

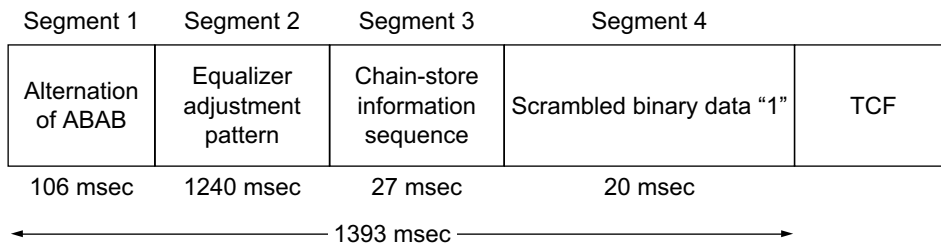


Fig. 3-4

- 9600 bps, 7200 bps

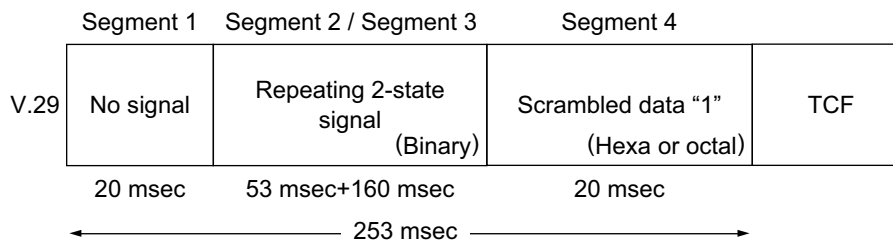


Fig. 3-5

- 4800 bps, 2400 bps

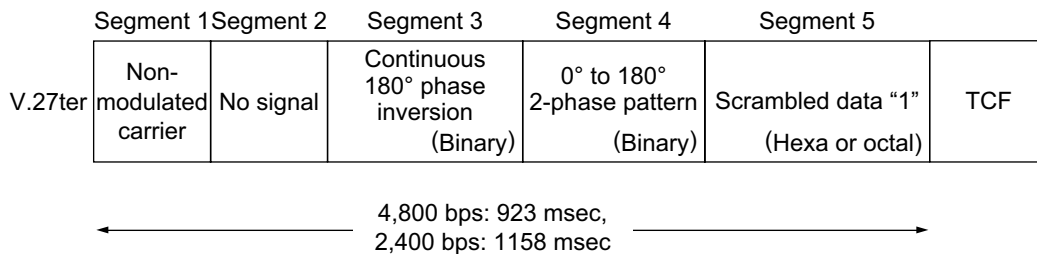


Fig. 3-6

- TCF signal

An error may occur in the image data if the training is not performed correctly. The transmitting side sends a TCF signal and checks if any error occurs in image data before the image data communication to follow. When the receiving side detects an error in the TCF signal, it transmits an FTT signal to the transmitting side to request the retraining. When there is no error, the receiving side transmits a CFR signal.

The TCF signal transmits all zeros for 1.5 seconds at the same modem speed as that for the training signal.

### 3.2.3 V.8/V.34 communication sequence

#### 1) Outline

- V.8 is performed as a startup procedure to switch to V.34. V.8 can connect an existing facsimile machine to the equipment using a data modem or other V-series modems. The V.34 modem has a modem circuit previously recommended, allowing it to be also connected to the existing modems while they are upper compatible.
  
  - New technologies such as the pre-emphasis technology \*1 and the probing technology \*2 are fully used. The pre-emphasis technology \*1 not only speeds up the modulation, but also gains the S/N ratio. The probing technology examines the line characteristics and optimizes the modem for the line condition. Therefore, not only do these technologies speed up the transmission momentarily, but also the average speed of the process during the data transmission is increased.
  
  - For V.8 and the pre/post-FAX transmission for V.34, the procedure is speeded up by the full duplex communication.
  
  - Following 14 types of the image transmission speed are available: \*3  
33.6 kbps/31.2 kbps/28.8 kbps/26.4 kbps/24.0 kbps/21.6 kbps/19.2 kbps/16.8 kbps/14.4 kbps/  
12.0 kbps/9.6 kbps/7.2 kbps/4.8 kbps/2.4 kbps
  
  - The modulating speed (baud rate) \*4 can be selected from 2,400, 3,000, 3,200 symbol/sec (mandatory), or 2,743, 2,800, 3,429 symbol/sec (option). The data rate can be set more accurately than the conventional modem.
- \*1: A signal is sent while raising the output level in the high-frequency band in which the noise is relatively loud.
- \*2: Tone signal called "Probing Tone" is sent for the receiver to examine the line characteristics of the line.
- \*3: In the ITU-T Recommendation, it is described as "data rate". "Image transmission speed" is the same as "data rate".
- \*4: In the ITU-T Recommendation, it is described as "symbol speed". The "Symbol rate", "Modulating speed", and "Baud rate" are the same thing. This machine cannot realize the speed of 2,743 symbol/sec.

#### Notes:

1. ECM is used in the V.34 procedure. If the setting for the ECM transmission/reception of the user data is set to "Not performed", the V.8 procedure is not performed and the procedure is not switched to V.34. V.17 or lower is selected in this case.
2. When the transmission/reception speed is set to 14.4 kbps or slower, the V.8 procedure is not performed, and V.17 or lower is selected.
3. See "Late start (P3-20)" to move to the V. 8/V.34 procedure after starting with the V.21 procedure.
4. After the V.34 procedure is started, the fallback for the V.34 procedure is performed. However, the fallback for the V.17 mode or lower mode is not performed.

## 2) Standard procedure

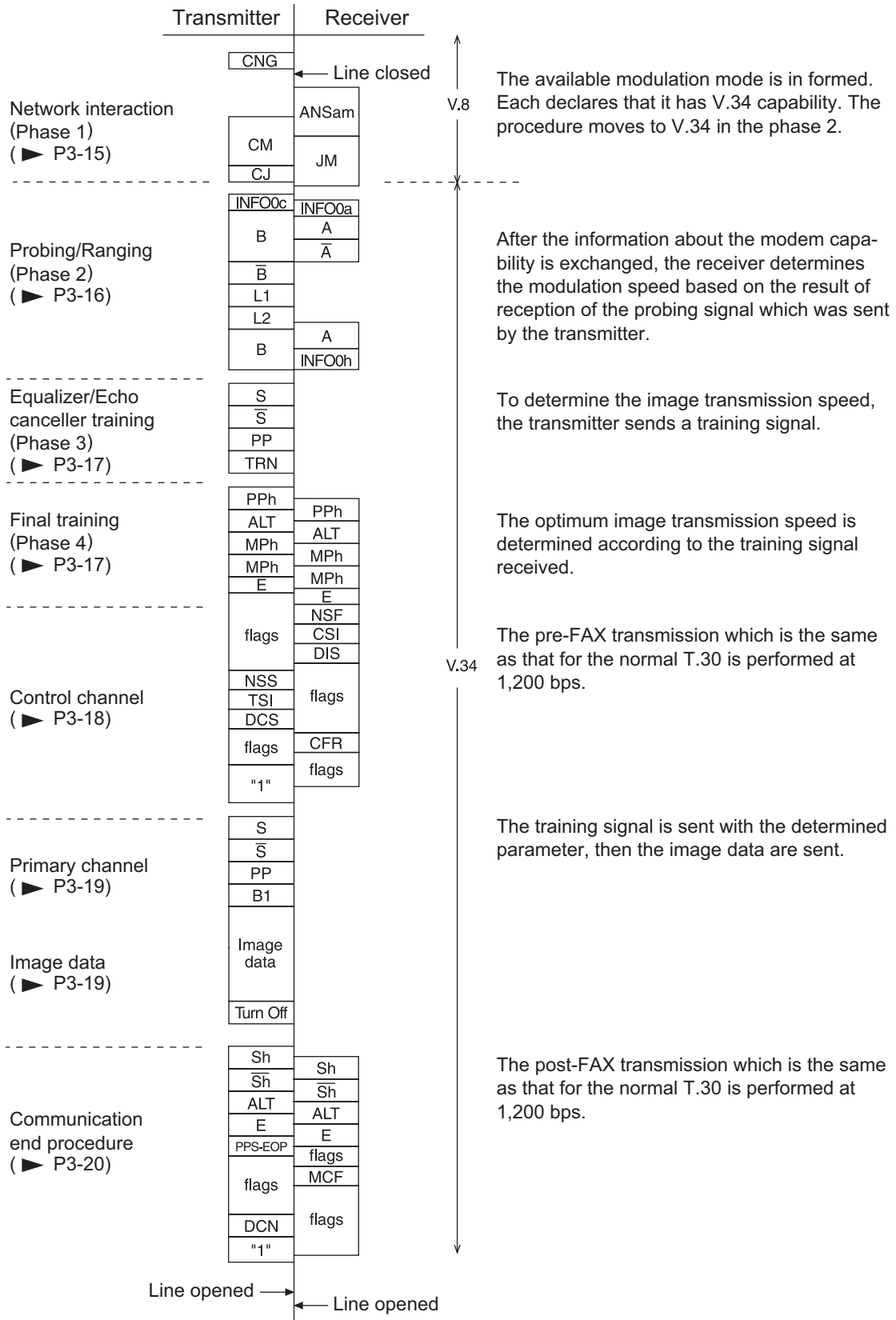


Fig. 3-7



- Network interaction (Phase 1)

The V.8 procedure is performed as the startup procedure for the V.34 high-speed modem. In the V.8 procedure, mainly the optimum modulation method (V series modem mode) that can be operated between the transmitter and receiver is determined.

Transmitter

| Signal name           | Abbreviation | Function  | Remarks  |
|-----------------------|--------------|---|--|
| Calling tone          | CNG          | 1100 Hz tone signal specified by T.30 indicating the sender is a FAX machine in the automatic calling mode. | -  |
| Call Menu signal      | CM           | Mainly indicates an available modulation method such as V.21, V.27ter, V.29, V.17, V.34, etc.               | Modulated by V.21 (L) *1.<br>Transmission rate: 300 bps  |
| CM terminator         | CJ           | Indicates the detection of the JM signal or the termination of CM signal.                                   | Modulated by V.21 (L) *1.<br>Transmission rate: 300 bps  |
| Call Indicator signal | CI           | Indicates the general communication functions. It is sent when the V.8 procedure is restarted.              | For the late start only.<br>(P3-20)<br>Modulated by V.21 (L) *1.<br>Transmission rate: 300 bps |

Receiver

| Signal name           | Abbreviation | Function   | Remarks   |
|-----------------------|--------------|--|---|
| Answer amplitude tone | ANSam        | 2100 Hz tone signal amplitude-modulated to 15 Hz.  | Tone equivalent to CED of the conventional machine.     |
| Joint Menu signal     | JM           | Indicates the terminal type such as a FAX machine. Response to a CM sent from the transmitter and informs available modulation method. | Modulated by V.21 (H) *1.<br>Transmission rate: 300 bps |

\*1 V.21 (L) .....Low frequency channel defined by the V.21 recommendation 1,080±100 Hz (980 Hz: 1, 1,180 Hz: 0)

V.21 (H) .....High frequency channel defined by the V.21 recommendation 1,750±100 Hz (1,650 Hz: 1, 1,850 Hz: 0)

- Probing/Ranging (Phase 2)  
Examines the line characteristics and sets the parameters for the modulation related items such as the modulating speed.

Transmitter

| Signal name            | Abbreviation | Function   | Remarks   |
|------------------------|--------------|--|---|
| INFO sequence          | INFO0c       | Informs the modem capability such as modulating speed and frequency transmission capability (two frequency bands (high and low) used to examine the line characteristics), and requests for adjusting. | Transmission rate: 600 bps  |
| Tone B                 | B            | Synchronization between the modems by 1200 Hz tone signal  | $\bar{B}$ is a signal that shifts the phase B 180°.   |
| Tone $\bar{B}$         | $\bar{B}$    |  |   |
| Line probing signal L1 | L1           | Tone signal to analyze the line characteristics by probing   | Probing is to examine the line characteristics.<br>Tone signal between 150 Hz and 3,750 Hz in units of 150 Hz |
| Line probing signal L2 | L2           |  |   |

Receiver

| Signal name    | Abbreviation | Function  | Remarks   |
|----------------|--------------|---|---|
| INFO sequence  | INFO0a       | Informs the modem capability such as the modulating speed and frequency transmission capability.  | Transmission rate: 600 bps                          |
| Tone A         | A            | Synchronization between the modems by 2,400 Hz tone signal  | $\bar{A}$ is a signal that shifts the phase A 180°. |
| Tone $\bar{A}$ | $\bar{A}$    |   |   |
| INFO sequence  | INFO0h       | Based on the analysis of the line probing signal sent from the transmitter, it informs the pre-emphasis filter and modulating speed to be used for the data transmission. | Transmission rate: 600 bps                          |

- Equalizer and echo canceller training (Phase 3)  
Training (adjustment) is performed according to the parameters set in the phase 2 to optimize the filters such as an equalizer.

Transmitter

| Signal name      | Abbreviation | Function  | Remarks  |
|------------------|--------------|---|--|
| S signal         | S            | Short training  | $\bar{S}$ is a signal made as the result of phase transition of S. |
| $\bar{S}$ signal | $\bar{S}$    |   |  |
| PP signal        | PP           | Used by the modem of the receiver to train the equalizer. |  |
| TRN signal       | TRN          | Used by the receiver to determine the transmission rate.  |  |

- Final training (Phase 4)  
The settings such as the maximum value for the data rate, selection of the trellis encoder, and data rate which can be supported are made in this phase.

Transmitter/receiver

| Signal name          | Abbreviation | Function   | Remarks                           |
|----------------------|--------------|--|-----------------------------------|
| PPh signal           | PPh          | Used by the modem of the other side to train the equalizer.  |                                   |
| ALT signal           | ALT          | -  |                                   |
| Modulation parameter | MPh          | Informs the parameters used for the image transmission such as maximum data signal rate and type of the trellis coding/pre-coding. |                                   |
| E sequence           | E            | -  | 20 bit sequence of "1"s in binary |

- Control channel  
The conventional T.30 procedure is performed. The transmission rate is 1200 bps.

Transmitter

| Signal name                     | Abbreviation | Function   | Remarks                   |
|---------------------------------|--------------|--|---------------------------|
| Flag                            | flags        | Maintains the synchronization.   | 7E (H)                    |
| Non-standard facilities setting | NSS          | Receives an NSF sent from the receiver. It selects the available mode from the received NSF, and specifies the mode for the reception. |                           |
| Transmitting Subscriber ID      | TSI          | Informs the telephone number of the transmitter.   |                           |
| Digital Command Signal          | DCS          | Specifies the mode that can be used for the communication.   |                           |
| -                               | 1            | Declares to switch to the high-speed procedure.  | "1" is sent continuously. |

Receiver

| Signal name                   | Abbreviation | Function   | Remarks |
|-------------------------------|--------------|--|---------|
| Non-Standard Facilities       | NSF          | Informs the presence of the facilities other than those recommended by ITU-T, abbreviated user names, and manufacturer codes, etc. |         |
| Called Subscriber ID          | CSI          | Informs the telephone number of the receiver.  |         |
| Digital Identification Signal | DIS          | Informs the standard facilities recommended by ITU-T.  |         |
| Flag                          | flags        | Maintains the synchronization.   | 7E (H)  |
| Confirmation for Reception    | CFR          | Informs that the training of the modem is completed, and the receiver is ready to receive the image signal.                        |         |

**Reference:** In the control channel, the frequency of the signals to be sent is different between the transmission and reception. The signal echoed back has never been misidentified as a signal sent from the other side. Therefore, this channel is not influenced by signals echoed back.

- Primary channel  
The training is performed according to the parameters set in the phase 4. The transmission rate is 1,200 bps.

Transmitter

| Signal name      | Abbreviation | Function  | Remarks   |
|------------------|--------------|---|---|
| S signal         | S            | Short training  | $\bar{S}$ is a signal that makes a transition from phase S. |
| $\bar{S}$ signal | $\bar{S}$    |   |   |
| PP signal        | PP           | Used by the modem of the receiver to train the equalizer.             |   |
| B1 sequence      | B1           | Scrambled data frame to be sent when the startup process is completed |   |

- Image data  
Image data are sent.

Transmitter

| Signal name | Abbreviation | Function           | Remarks                        |
|-------------|--------------|--------------------|--------------------------------|
| Image data  | Image data   | Encoded image data |                                |
| -           | Turn off     | -                  | Scrambled 1 is sent for 35 ms. |

- Communication end procedure  
This procedure is to terminate the communication. The transmission rate is 1,200 bps.

Transmitter

| Signal name             | Abbreviation | Function                                   | Remarks |
|-------------------------|--------------|--|---------|
| Sh signal               | Sh           | Short training                             |         |
| $\bar{S}h$ signal       | $\bar{S}h$   |  |         |
| ALT signal              | ALT          | -  |         |
| E sequence              | E            | -  |         |
| End of procedure signal | PPS-EOP      | The transmission of one page is completed. |         |
| Flag                    | flags        | Maintains the synchronization.             | 7E (H)  |
| Disconnection signal    | DCN          | Informs to disconnect the line.            |         |

Receiver

| Signal name          | Abbreviation | Function  | Remarks |
|----------------------|--------------|---|---------|
| Sh signal            | Sh           | Short training  |         |
| $\bar{S}h$ signal    | $\bar{S}h$   |   |         |
| ALT signal           | ALT          | -   |         |
| E sequence           | E            | -   |         |
| Flag                 | flags        | Maintains the synchronization.  | 7E (H)  |
| Message confirmation | MCF          | Indicates that the image signal is received normally, and the receiver is ready to receive the next page. |         |

3) Example of protocol

The signals shaded in the following figure are the most important signals in the procedure.

- Late start

The receiver cannot detect CM signal while it is sending the ANSam signal. Therefore, it sends a DIS signal to inform the availability of V.8 support. The transmitter sends a CI signal that causes the receiver to send another ANSam signal which makes the receiver move to the V.8 procedure.

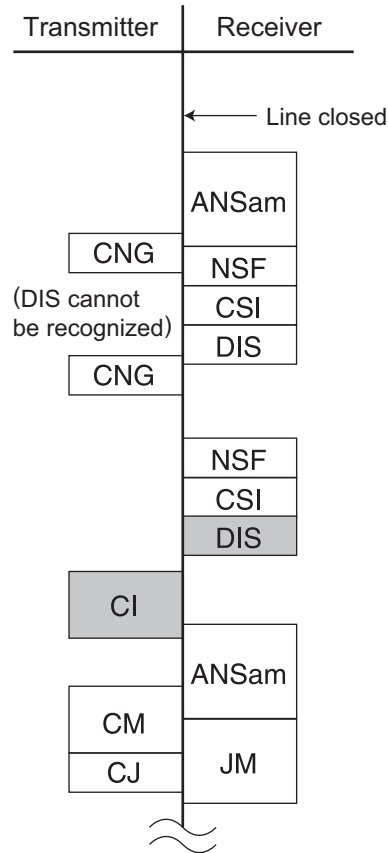


Fig. 3-8

- Multi-page sequence

In the same manner as the T.30 procedure, the transmitter sends a PPS-MPS signal after sending the image data. The receiver sends an MCF signal and moves to the next page transmission.

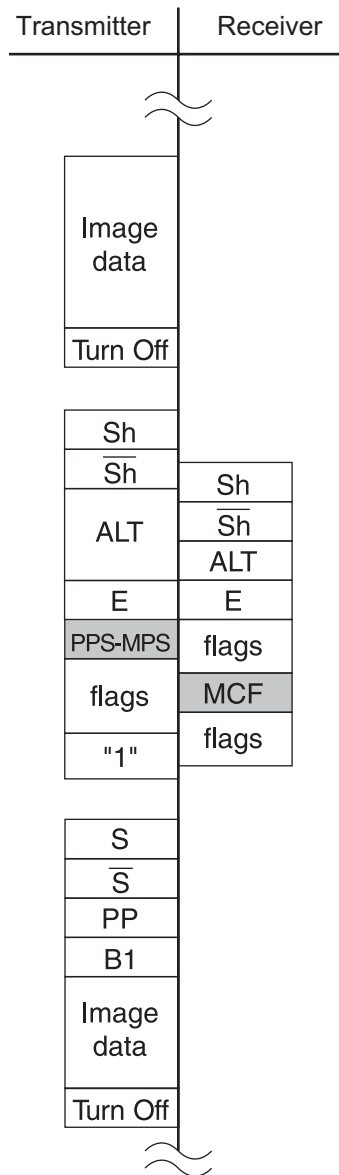


Fig. 3-9



- Mode change  
The transmitter and receiver send a PPS-EOM signal and an MCF signal respectively. Then the receiver and transmitter send a DIS signal and a DCS signal respectively to change the mode.

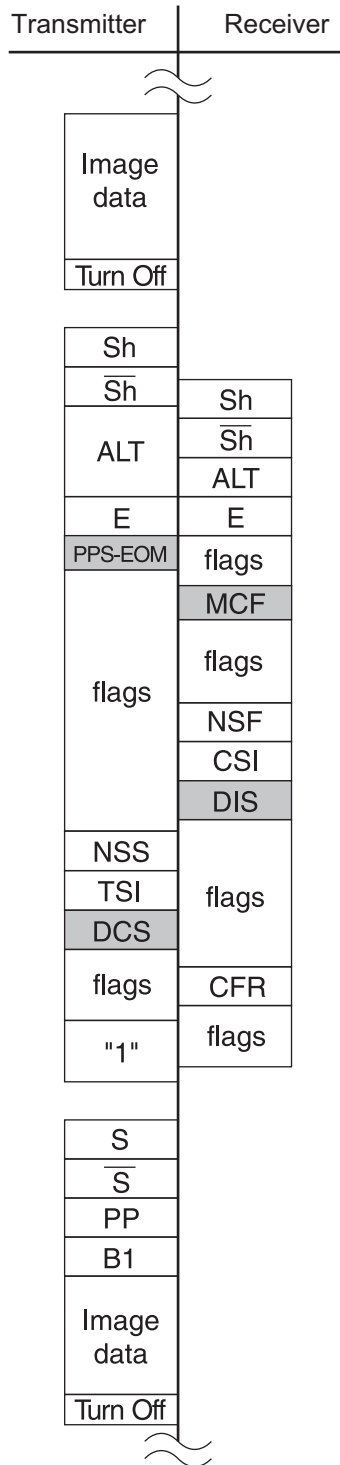


Fig. 3-10

- Change of the image transmission speed by the receiver  
The receiver sends a PPh signal responding to an Sh signal sent from the transmitter. Then, the image transmission speed is determined according to the MPh sequence sent from the both modems.

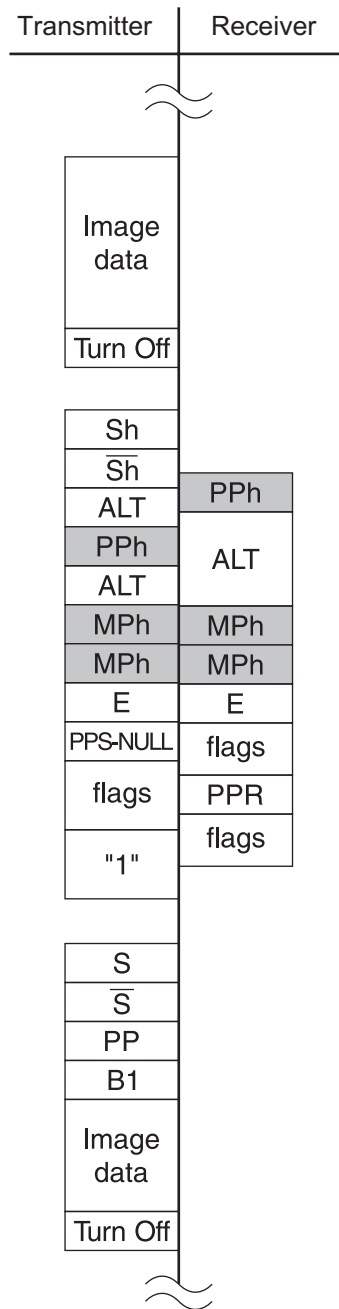


Fig. 3-11

- Change of the image transmission speed by the transmitter  
The transmitter sends a PPh signal after sending the image data. The receiver returns a PPh signal. Then, the image transmission speed is determined according to the MPh sequence sent from the both modems.

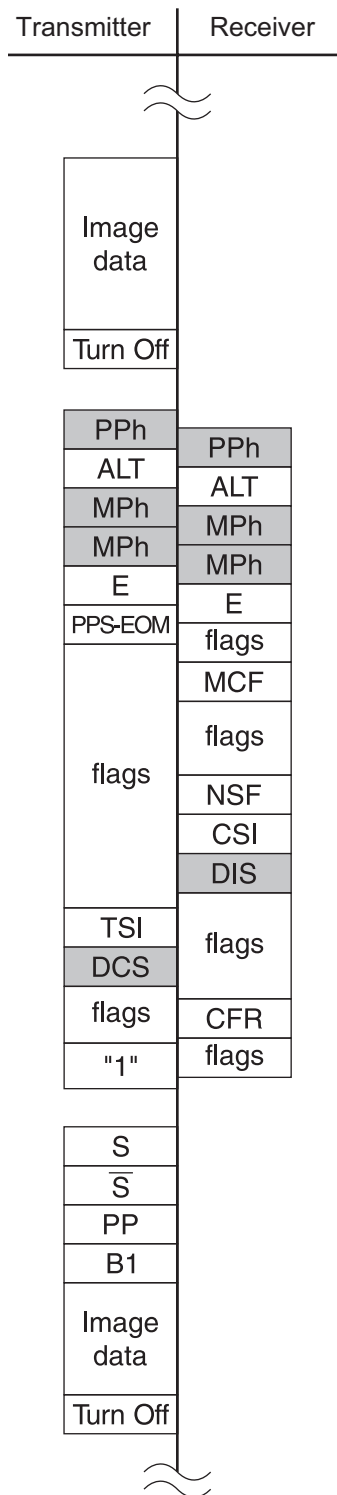


Fig. 3-12

## 3.3 FAX Automatic Switching

### 3.3.1 General functions

There are two types of setting for the FAX Auto-Switching Mode Selection: TEL Mode and FAX Mode.

### 3.3.2 TEL mode

This mode is selected to prioritize telephone communication when the frequency of the fax reception is low. When the TEL mode is selected, the automatic FAX reception function does not work. Therefore, when a calling signal comes from the exchange, the telephone ringer continues ringing until the operator picks up the handset. When the operator has learned that the caller is sending a FAX, he has to perform the manual reception operation.

### 3.3.3 FAX mode

This mode is selected when the telephone circuit is used only for FAX communication. When the FAX mode is selected and a calling signal comes from the exchange, the FAX reception operation starts automatically without ringing the telephone ringer.

In the FAX mode, a calling number can be set up to 15 calls in the self-diagnosis setting "CI detection counter" (13-372).

<Method of judging CNG detection>

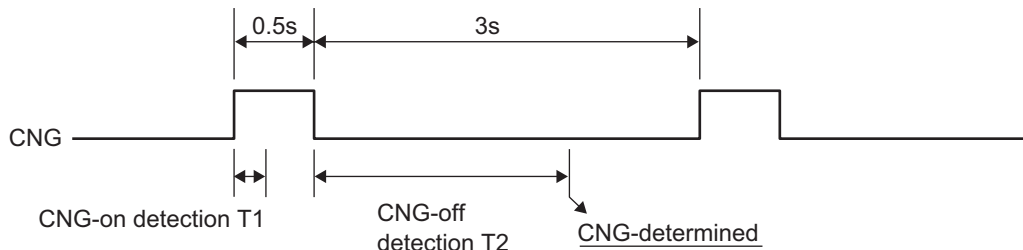


Fig. 3-13

- As shown above, after CNG-on detection time T1 (175 ms) and CNG-off detection time T2 (350 ms) have elapsed, and the T1 period has been turned on and then the T2 period off, CNG is determined to have occurred once.

## 4. ELECTRICAL CIRCUITS

### 4.1 Configuration

e-STUDIO2500c/3500c/3510c

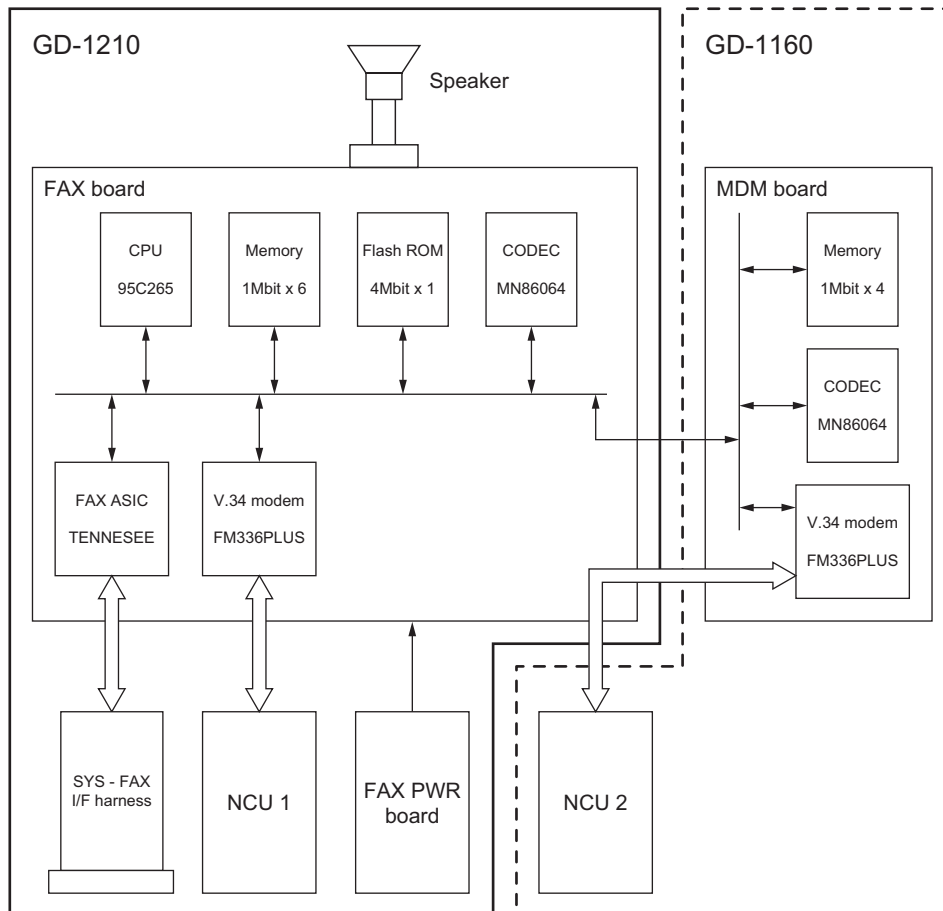
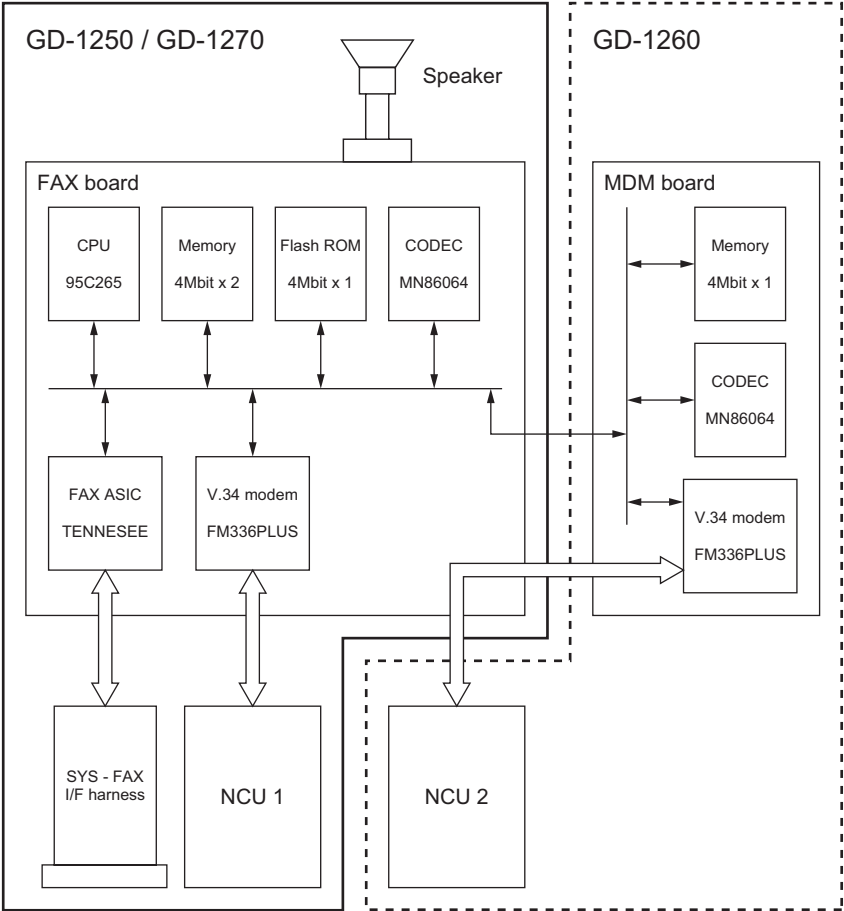


Fig. 4-1

**e-STUDIO2330C/2820C/2830C/3520C/3530C/4520C**  
**e-STUDIO2040C/2540C/3040C/3540C/4540C**  
**e-STUDIO5520C/6520C/6530C**  
**e-STUDIO5540C/6540C/6550C**  
**e-STUDIO205L/255/305/355/455**  
**e-STUDIO555/655/755/855**  
**e-STUDIO206L/256/306/356/456**  
**e-STUDIO556/656/756/856**



**Fig. 4-2**

## 4.2 Description of Circuits

### 4.2.1 Configuration

This section describes the function of each circuit.

The NCU board consists of the transformer, relay, analog switch and other peripheral devices. It controls switching of the line path, generates the dial pulses, detects the line current and ring signal, and monitors the line.

The NCU board is connected to CN501 on the FAX board. It can be also connected optionally to CN502.

The description in this section is based on the NCU board for Line 1.

#### NA/TW models

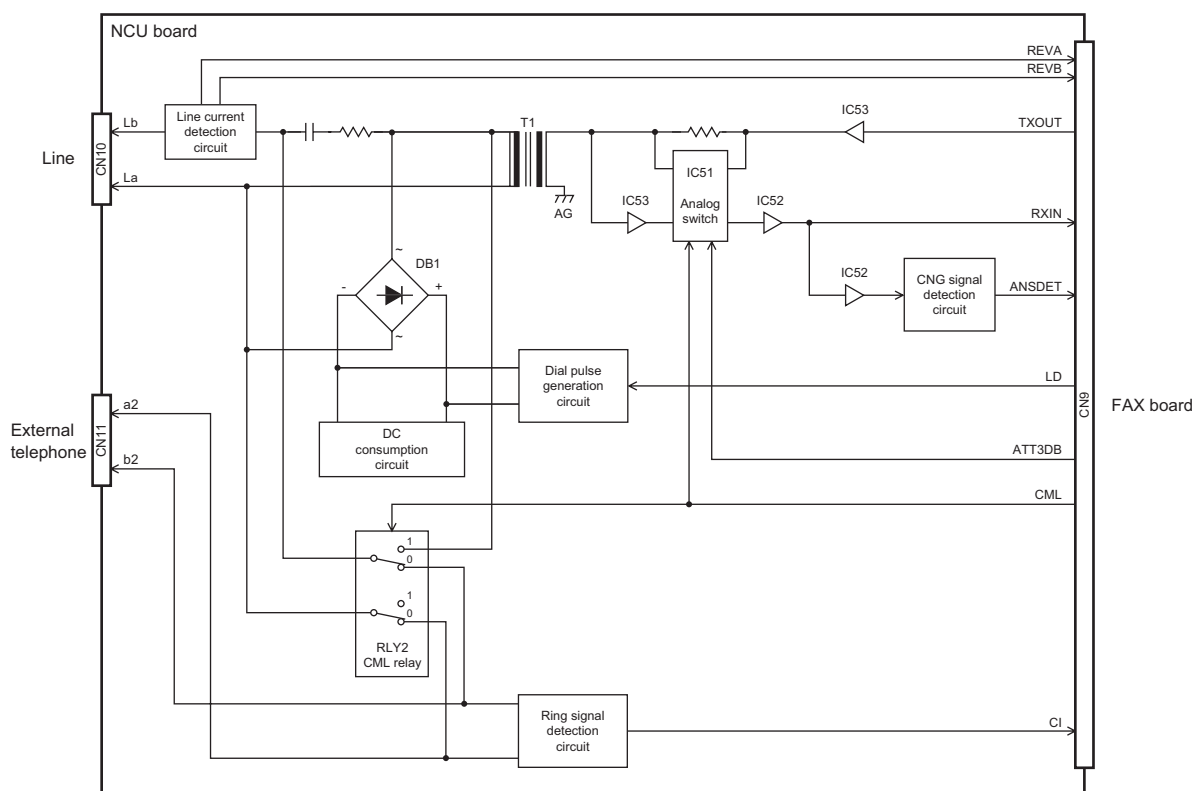
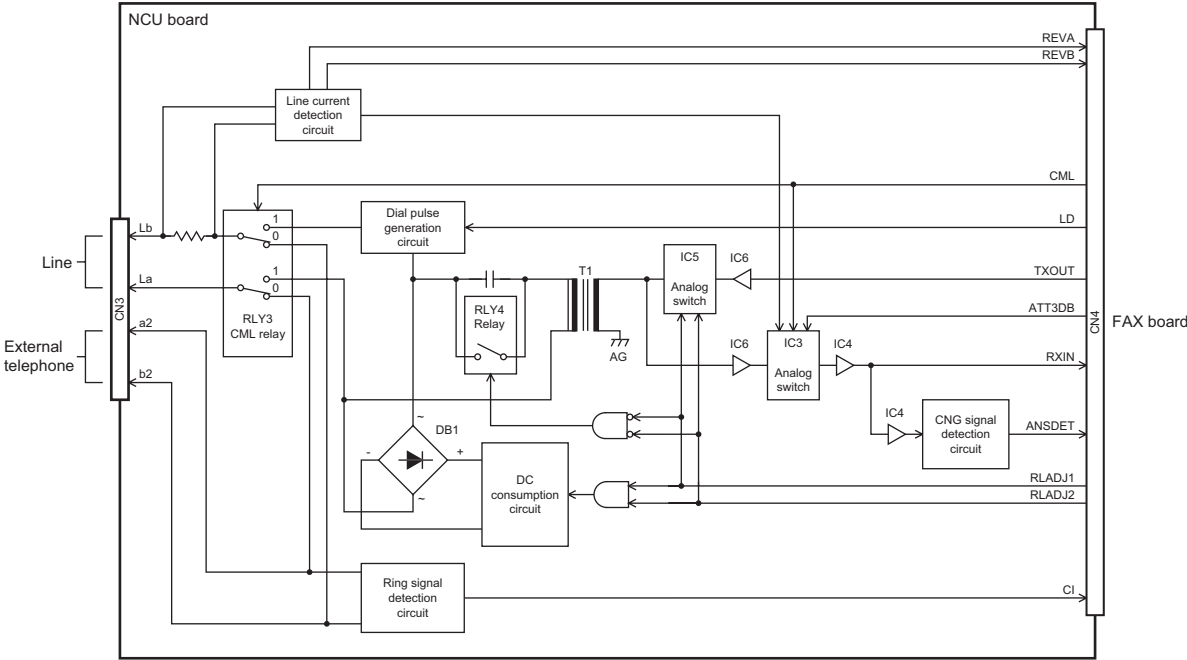


Fig. 4-3

**EU/AU/AS/C models**



**Fig. 4-4**



## 4.2.2 Line path switching control circuit

### NA/TW models

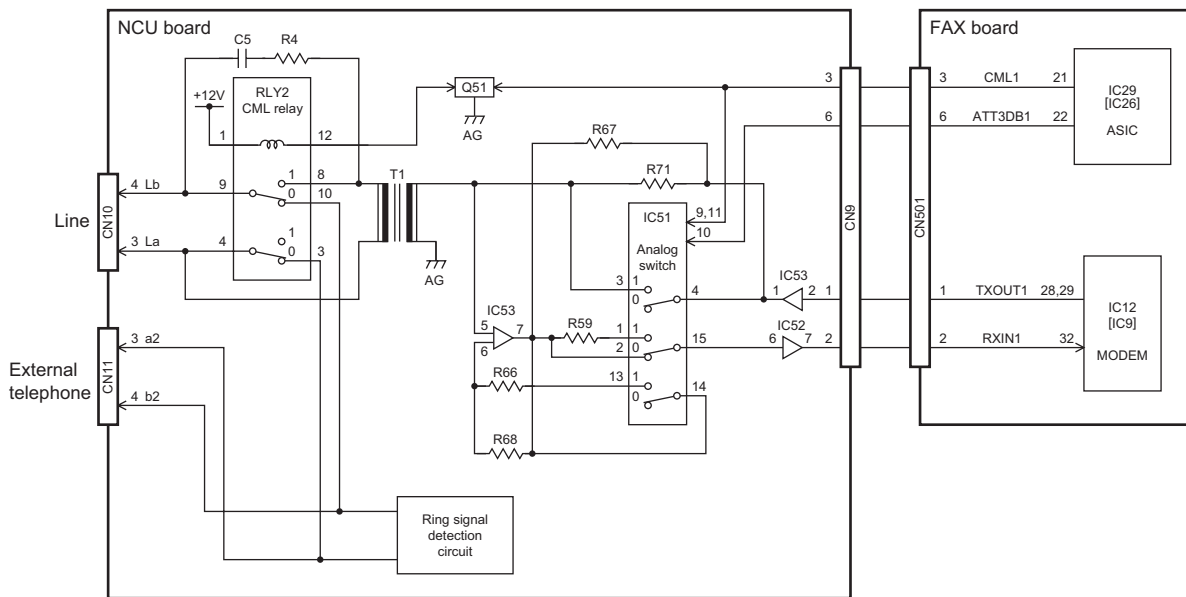


Fig. 4-5

The line path switching control circuit consists of the CML relay (RLY2) and analog switch (IC51) on the NCU board, the ASIC (IC29 [IC26]) on the FAX board and the other peripheral devices.

The CML relay is switched according to the CML1 signal output from the ASIC on the FAX board. When the CML1 signal goes HIGH, Q51 comes on to turn ON the CML relay.

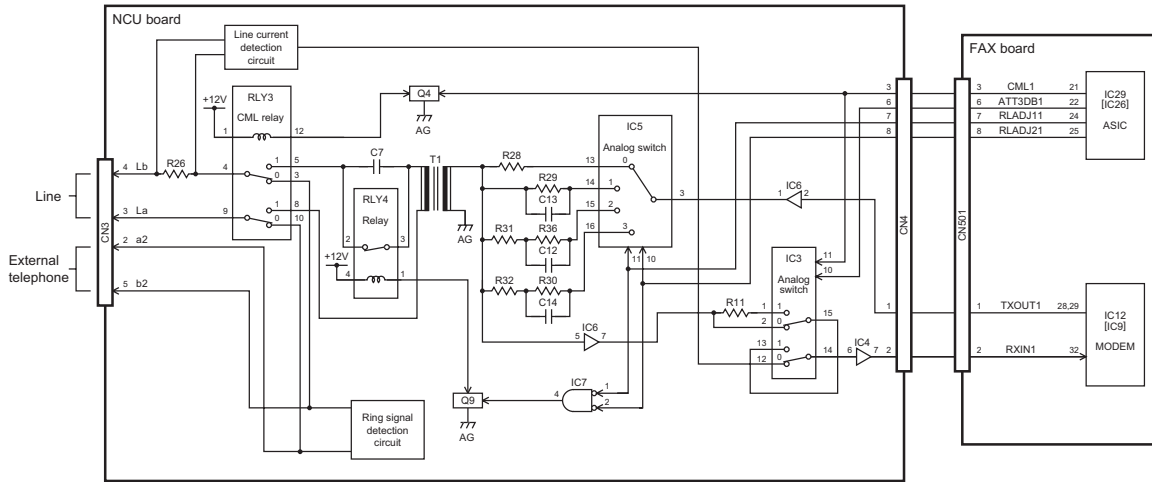
The analog switch is switched according to the CML1 signal and ATT3DB1 signal. When the CML1 signal or ATT3DB1 signal goes HIGH, the analog switch is turned ON.

Turning ON the CML relay and analog switch allow the MODEM to be connected to the line.

| Signal Name | Type | Active | Description                      | Destination |
|-------------|------|--------|----------------------------------|-------------|
| CML1        | O    | H      | Line 1 CML Relay Control Signal  | RLY2, IC51  |
| ATT3DB1     | O    | H      | Line 1 Attenuator Control Signal | IC51        |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

**EU/AU/AS/C models**



**Fig. 4-6**

The line path switching control circuit consists of the CML relay (RLY3) and analog switch (IC3, IC5) on the NCU board, the ASIC (IC29 [IC26]) on the FAX board, and the other peripheral devices. It changes the path for the FAX send/receive signals and connects it to each control circuit.

The CML relay is switched according to the CML1 signal output from the ASIC on the FAX board. When the CML1 signal goes HIGH, Q4 comes on to turn ON the CML relay.

The analog switch (IC3) is switched according to the CML1 signal and ATT3DB1 signal. When the CML1 signal or ATT3DB1 signal goes HIGH, the analog switch is turned ON.

The analog switch (IC5) is switched according to the RLADJ11 and RLADJ12 signals. The analog switch is switched according to the states of the RLADJ11 and RLADJ21 signals. Turning ON the CML relay and analog switch allow the MODEM to be connected to the line.

| Signal Name | Type | Active | Description                          | Destination |
|-------------|------|--------|--------------------------------------|-------------|
| CML1        | O    | H      | Line 1 CML Relay Control Signal      | RLY3, IC3   |
| ATT3DB1     | O    | H      | Line 1 Attenuator Control Signal     | IC3         |
| RLADJ11, 21 | O    | H      | Line 1 Return Loss Adjustment Signal | IC5         |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

## 4.2.3 Dial pulse generation circuit

### NA/TW models

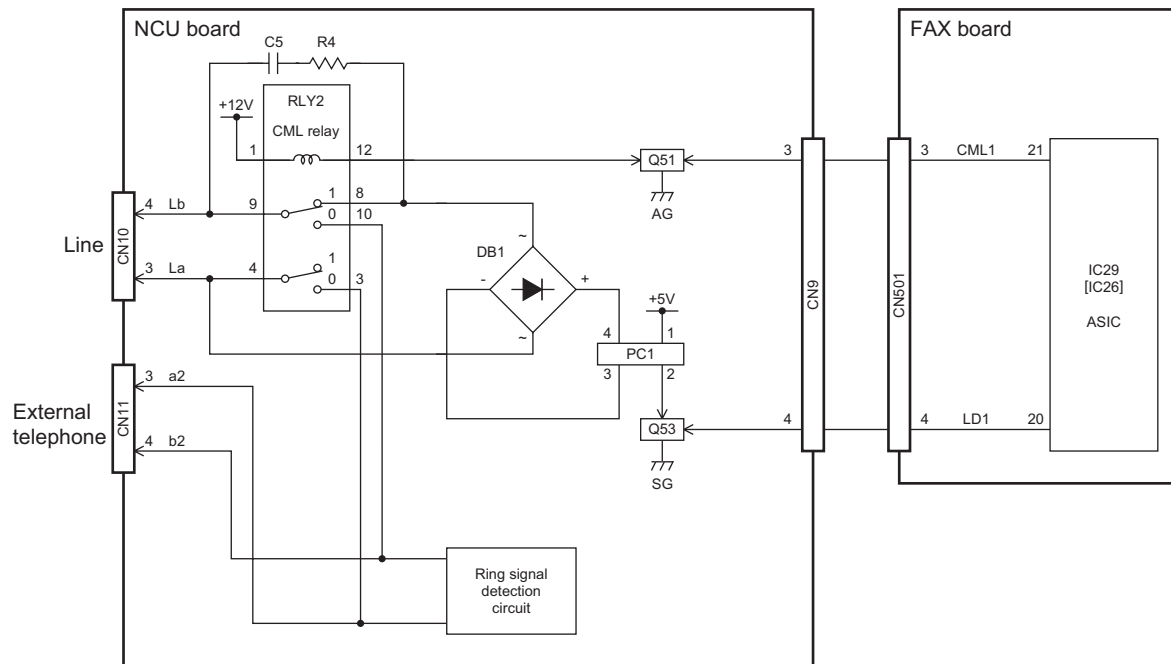


Fig. 4-7

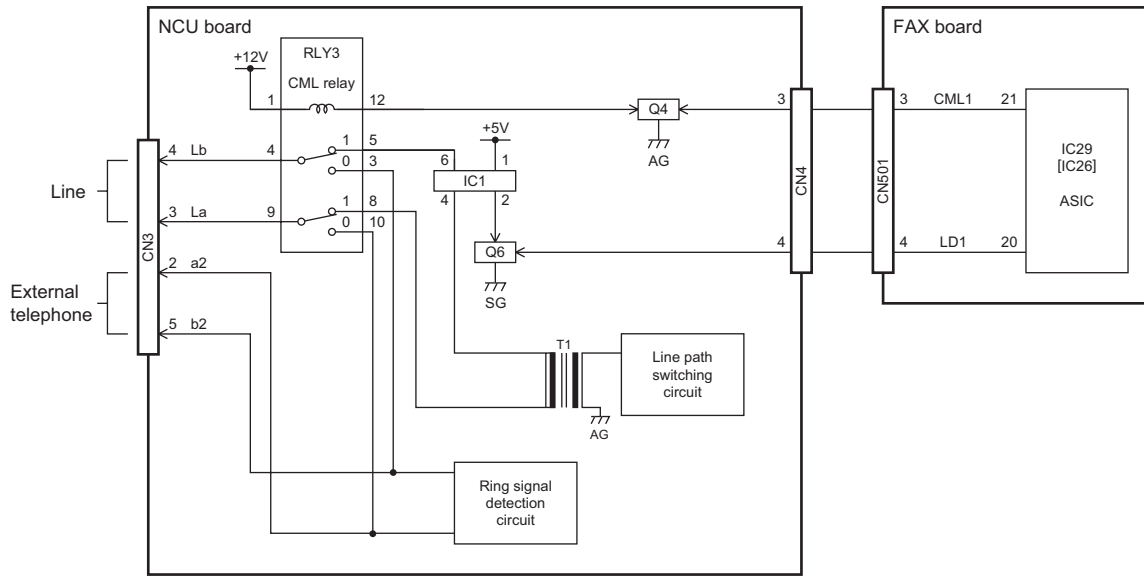
The dial pulse generation circuit consists of the diode bridge (DB1), photocoupler (PC1), the ASIC (IC29 [IC26]) on the FAX board and the other peripheral devices. It generates the dial pulses in the FAX transmission and dialing to the outside.

The ASIC makes the CML1 signal become HIGH to connect the line to the MODEM side. To generate the dial pulse, the ASIC makes the LD1 signal become HIGH to turn ON Q53. This allows the photocoupler to come on and the current flows through the DB1 to send the dial pulses to the line.

| Signal Name | Type | Active | Description                         | Destination |
|-------------|------|--------|-------------------------------------|-------------|
| LD1         | O    | H      | Line 1 Dial Pulse Generation Signal | Q53         |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

**EU/AU/AS/C models**



**Fig. 4-8**

The dial pulse generation circuit consists of the photocopler (IC1), the ASIC (IC29 [IC26]) on the FAX board and the other peripheral devices. It generates the dial pulses in the FAX transmission and dialing to the outside.

The ASIC makes the CML1 signal become HIGH to connect the line to the MODEM side. To generate the dial pulses, the ASIC makes the LD1 signal become HIGH to turn ON Q6. This allows the photocopler to come on and the current flows through the line for sending a dial attempt.

| Signal Name | Type | Active | Description                         | Destination |
|-------------|------|--------|-------------------------------------|-------------|
| LD1         | O    | H      | Line 1 Dial Pulse Generation Signal | Q6          |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

## 4.2.4 Line current detection circuit

### NA/TW models

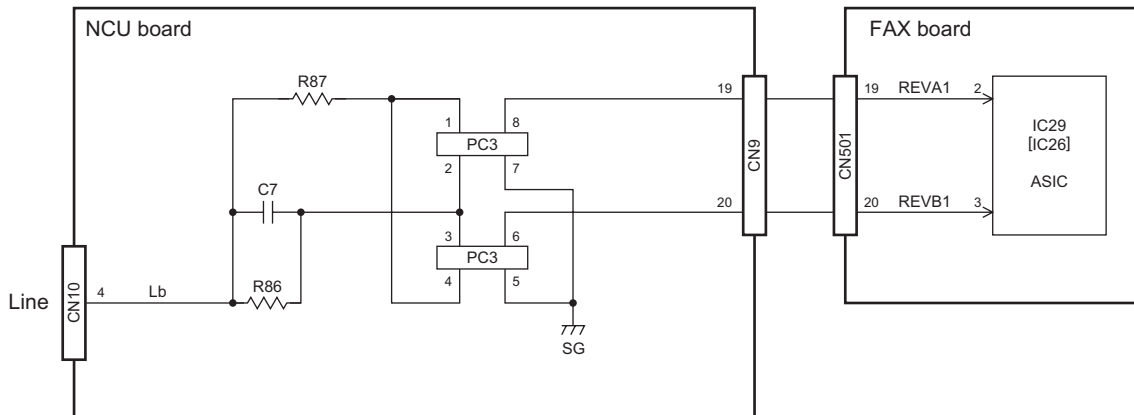


Fig. 4-9

The line current detection circuit consists of the photocoupler (PC3), ASIC (IC29 [IC26]) on the FAX board and the other peripheral devices. It detects a dial tone and the hook status of the external telephone from the current flowing through the line.

When a dial tone is input from the telephone line, current flows through the line and the photocoupler is repeatedly turned ON/OFF. This allows the REVA1 and REVB1 to be the pulse signals and input to the ASIC, then the dial tone is detected.

When the handset is lifted from the external telephone, current also flows through the line and the photocoupler is turned ON/OFF, then the off-hook state is detected.

| Signal Name | Type | Active | Description                             | Destination |
|-------------|------|--------|---|-------------|
| REVA1       | I    | -      | Line 1 Current Detection Signal         | IC29 [IC26] |
| REVB1       | I    | -      | Line 1 Reverse Current Detection Signal | IC29 [IC26] |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

## EU/AU/AS/C models

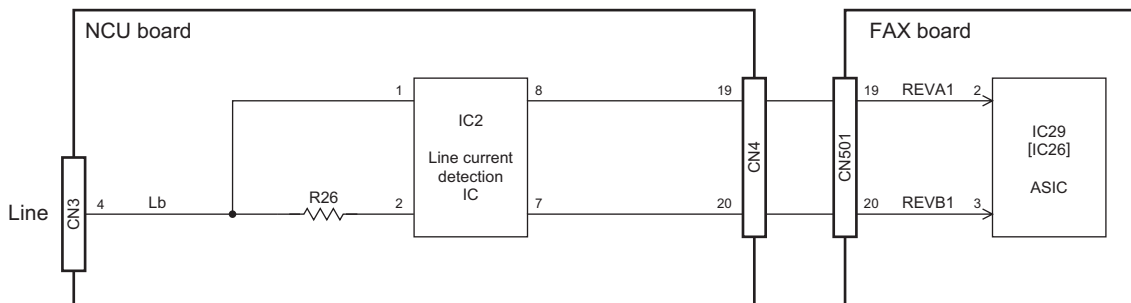


Fig. 4-10

The line current detection circuit consists of the line current detection IC (IC2), ASIC (IC29 [IC26]) on the FAX board, and the other peripheral devices. It detects a dial tone and the hook status of the external telephone from the current flowing through the line.

When a dial tone is input from the telephone line, current flows through the line. The line current detection IC sends REVA1 and REVB1 to the ASIC as pulse signals. This allows a dial tone to be detected.

| Signal Name | Type | Active | Description                                     | Destination |
|-------------|------|--------|---|-------------|
| REVA1       | I    | -      | Line 1 Current Detection Signal                 | IC29 [IC26] |
| REVB1       | I    | -      | Current Reverse Line 1 Current Detection Signal | IC29 [IC26] |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

## 4.2.5 CI detection circuit

### NA/TW models

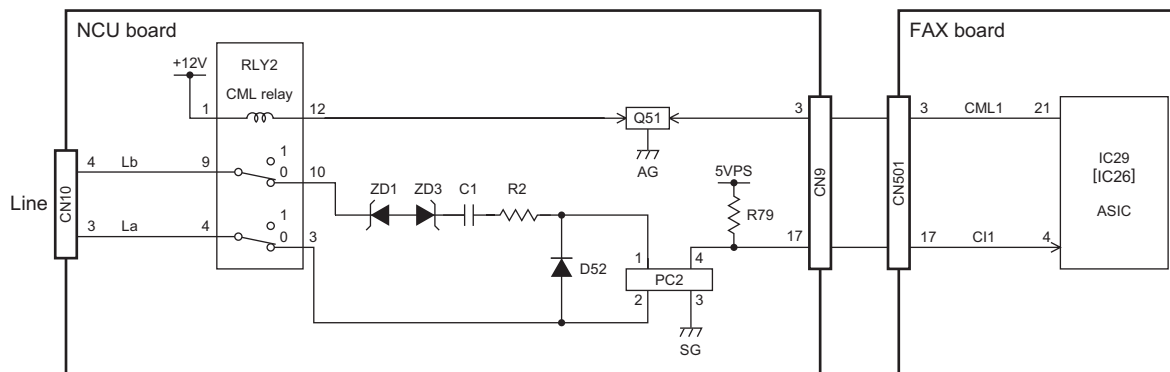


Fig. 4-11

The CI detection circuit consists of the photocopier (PC2), ASIC (IC29 [IC26]) on the FAX board and the other peripheral devices to detect a ring signal input from the telephone line.

The ASIC makes the CML1 signal become LOW to connect the CI detection circuit to the telephone line.

When a ring signal is input from the telephone line, the photocopier is repeatedly turned ON/OFF. This allows the CI1 signal to become a pulse signal and input to the ASIC on the FAX board, thereby detecting the ring signal.

| Signal Name | Type | Active | Description             | Destination |
|-------------|------|--------|-------------------------|-------------|
| CI1         | I    | -      | Line 1 CI Detect Signal | IC29 [IC26] |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

## EU/AU/AS/C models

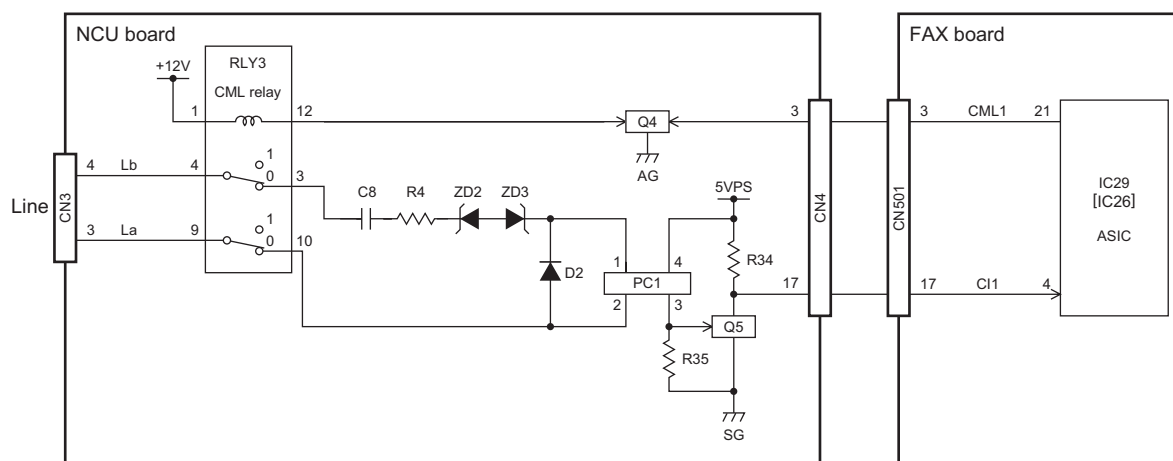


Fig. 4-12

The CI detection circuit consists of the photocoupler (PC1), ASIC (IC29 [IC26]) on the FAX board and other peripheral devices to detect a ring signal input from the telephone line.

The ASIC makes the CML1 signal become LOW to connect the CI detection circuit to the line. When a ring signal is input from the telephone line, the photocoupler is repeatedly turned ON/OFF. This allows Q5 to be turned ON/OFF and the C11 signal to become a pulse signal and input to the ASIC on the FAX board, thereby detecting the ring signal.

| Signal Name | Type | Active | Description                | Destination |
|-------------|------|--------|----------------------------|-------------|
| C11         | I    | -      | Line 1 CI Detection Signal | IC29 [IC26] |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.



## 4.2.6 Line monitor circuit

### NA/TW models

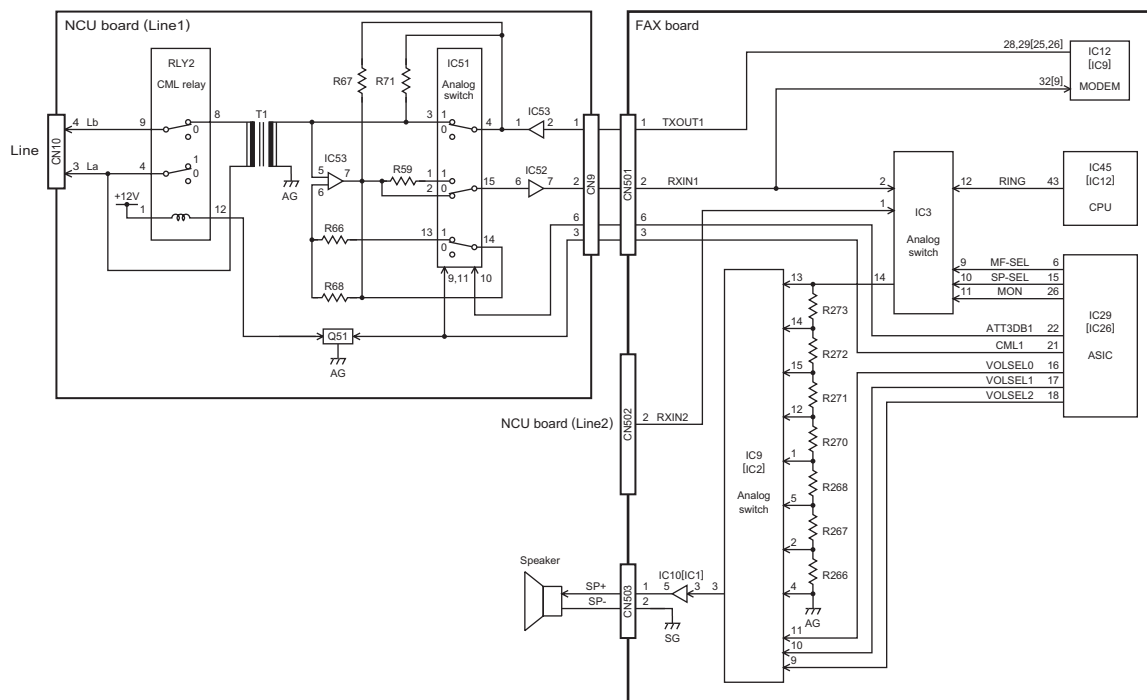


Fig. 4-13

## EU/AU/AS/C models

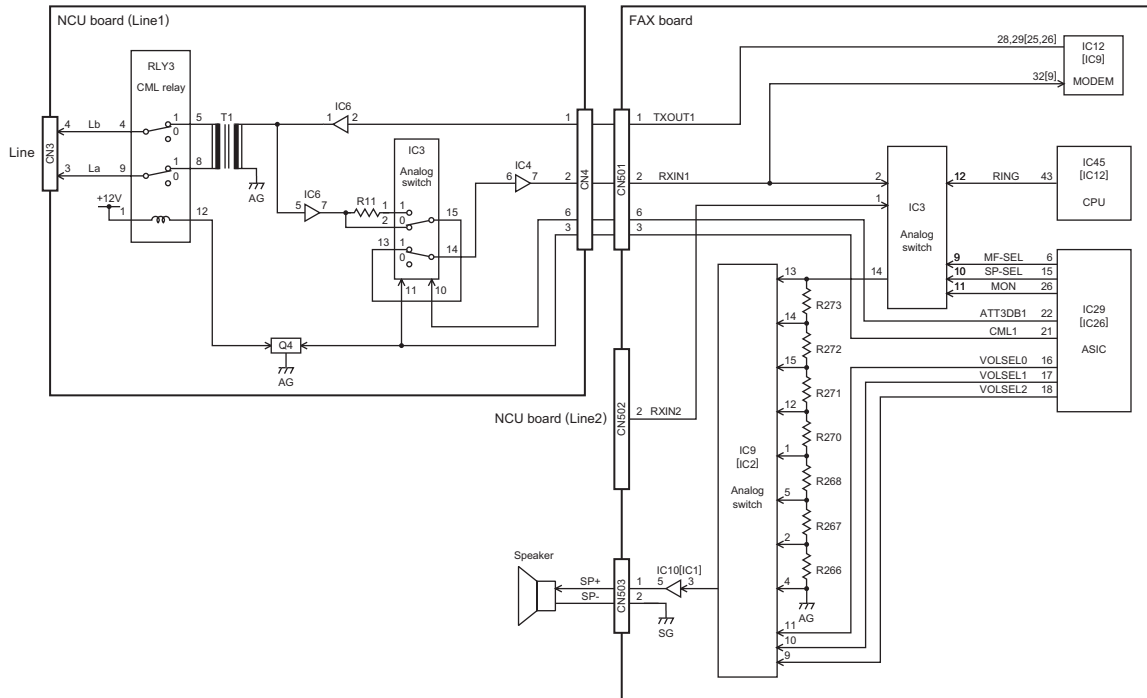


Fig. 4-14

The line monitor circuit consists of the CML relay (NA/TW: RLY2, EU/AU/AS/C: RLY3), analog switch (NA/TW: IC51, EU/AU/AS/C: IC3), the ASIC (IC29 [IC26]) and analog switches (IC3, IC9 [IC3, IC2]) on the FAX board, and other peripheral devices. It switches the telephone line path using the analog switch and monitors the line status and ringer signal in the FAX transmission and reception using the speaker connected to CN503 on the FAX board. It also switches the analog switch to output a buzzer tone from the speaker.

The signal to be monitored is selected by switching the analog switch (IC3) according to SP-SEL signal and MON signal which are output from the ASIC.

To monitor the line during the transmission and reception, the ASIC makes the CML1 signal become HIGH to switch the analog switch and connect the line to the MODEM side.

For the line path switching control, refer to P. 4-5 "4.2.2 Line path switching control".

The relation between the signal levels and monitoring signals is as follows.

| Monitoring signal |        | SP-SEL | MON  |
|-------------------|--------|--------|------|
| LINE Monitor      | Line 1 | LOW    | HIGH |
|                   | Line 2 | HIGH   | HIGH |
| Ringer/Alarm      |        | -      | LOW  |

The monitoring signal selected by IC3 is input to the analog switch (IC9 [IC2]) to select the output sound volume. The sound volume is selected by switching IC8 according to the VOLSEL0-2 signals output from the ASIC and selecting an input resistance for the monitoring signal.

The relation between the signals and sound volume is as follows.

| Sound volume | VOLSEL2 | VOLSEL1 | VOLSEL0 |
|--------------|---------|---------|---------|
| Max. (7)     | LOW     | LOW     | LOW     |
| (6)          | LOW     | LOW     | HIGH    |
| (5)          | LOW     | HIGH    | LOW     |
| (4)          | LOW     | HIGH    | HIGH    |
| (3)          | HIGH    | LOW     | LOW     |
| (2)          | HIGH    | LOW     | HIGH    |
| Min. (1)     | HIGH    | HIGH    | LOW     |
| Silent (0)   | HIGH    | HIGH    | HIGH    |

The monitoring signal whose volume is controlled by IC9 [IC2] is amplified by the OP amplifier (IC10 [IC1]), then output to the speaker.

| Signal Name | Type | Active | Description                        | Destination |
|-------------|------|--------|------------------------------------|-------------|
| SP-SEL      | O    | H      | Line/Tone Selection Signal         | IC3         |
| MON         | O    | H      | Ring/Tone Selection Signal         | IC3         |
| VOLSEL0-2   | O    | H      | Speaker Volume Control Signals 0-2 | IC9 [IC2]   |

\* Values in [ ] are for GD-1250/1270 in case that the descriptions vary between GD-1210 and GD-1250/1270.

# 4.3 PC Boards

## 1) PWA-F-FAX-631 (GD-1210)

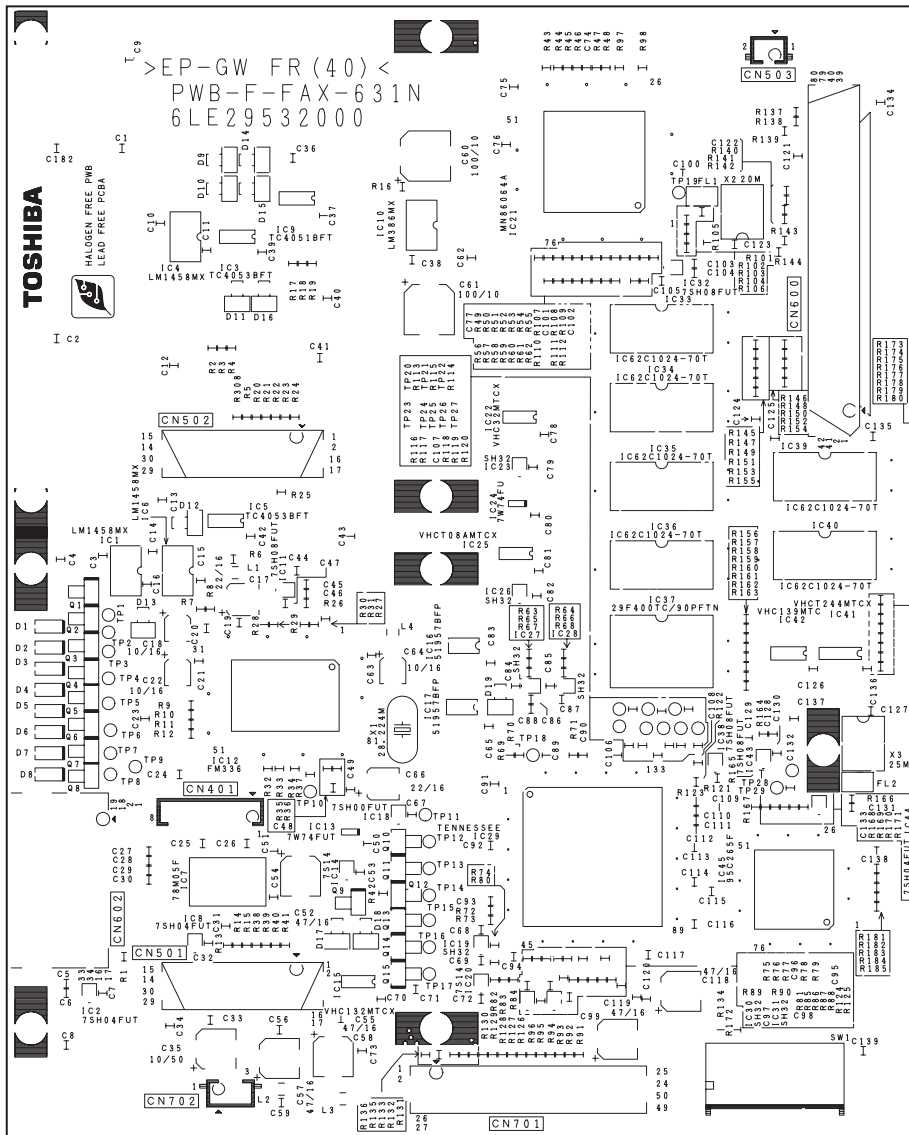


Fig. 4-15

2) PWA-F-FAX-670 (GD-1250/1270)

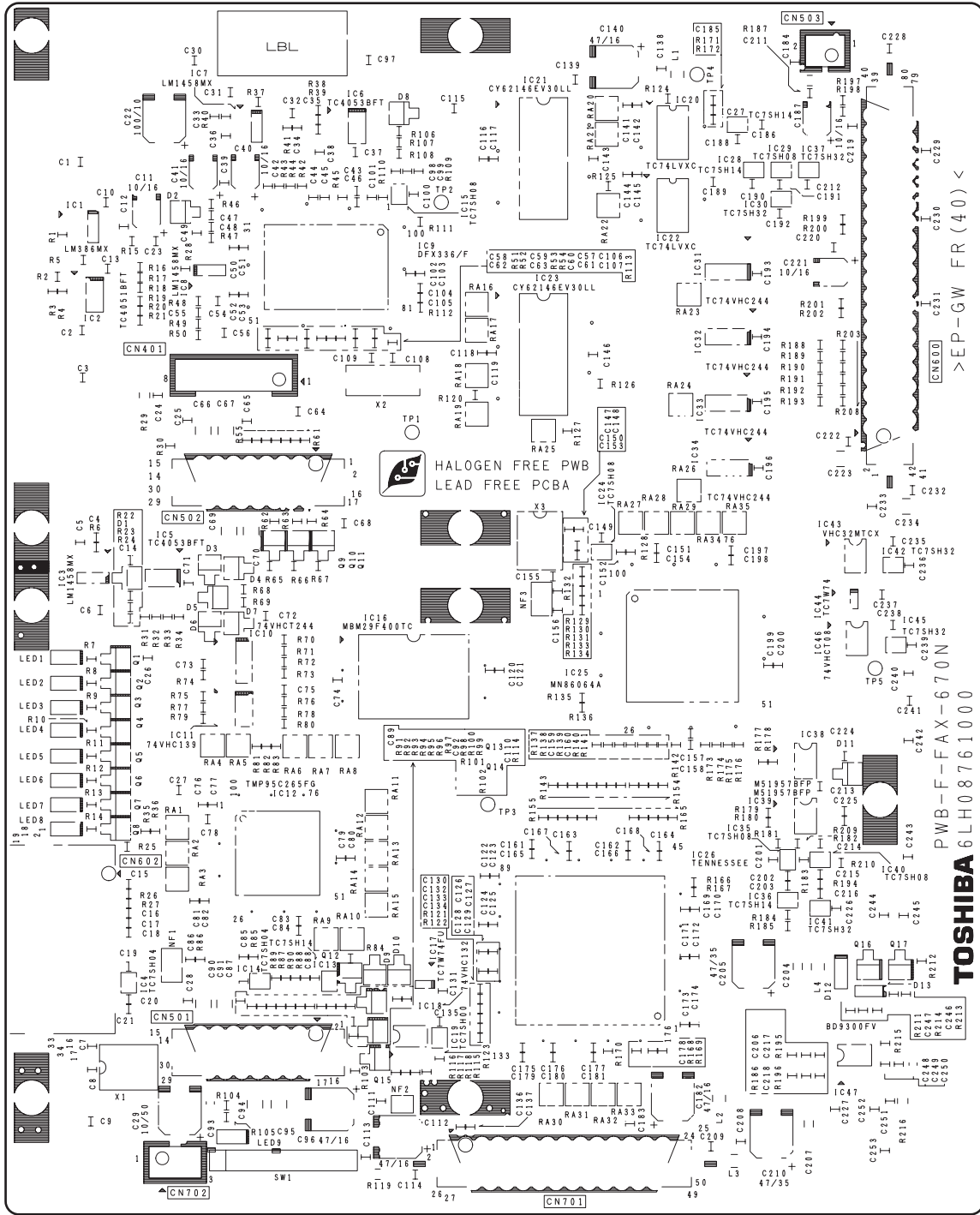


Fig. 4-16



3) PWA-F-NCU-631 (NAD, TWD, SAD) (GD-1210/GD-1250/GD-1270)

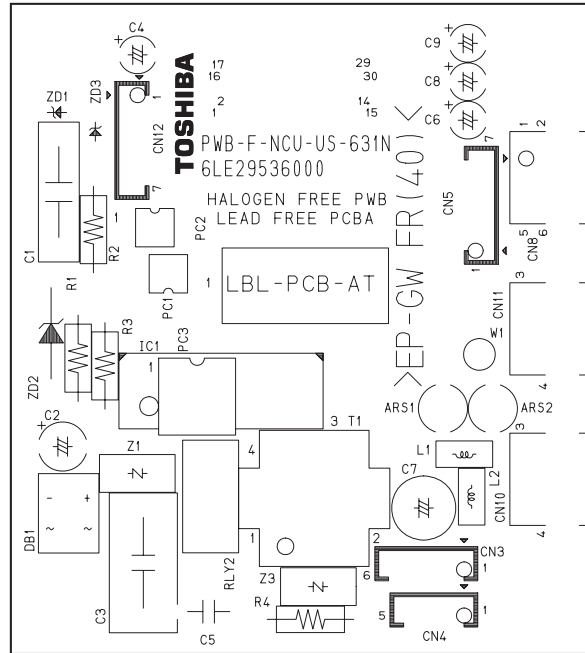


Fig. 4-17

4) PWA-F-NCU-631 (MJD, AUD, ASD, CND, KRD) (GD-1210/GD-1250/GD-1270)

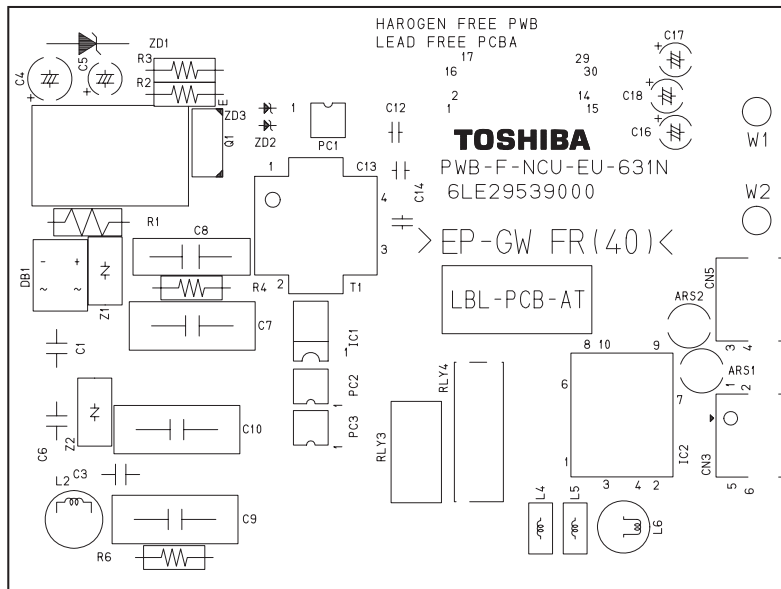


Fig. 4-18

5) PWA-F-NCU-562 (NAD, TWD, SAD) (GD-1160)/PWA-F-NCU-631 (NAD, TWD, SAD) (GD-1260)

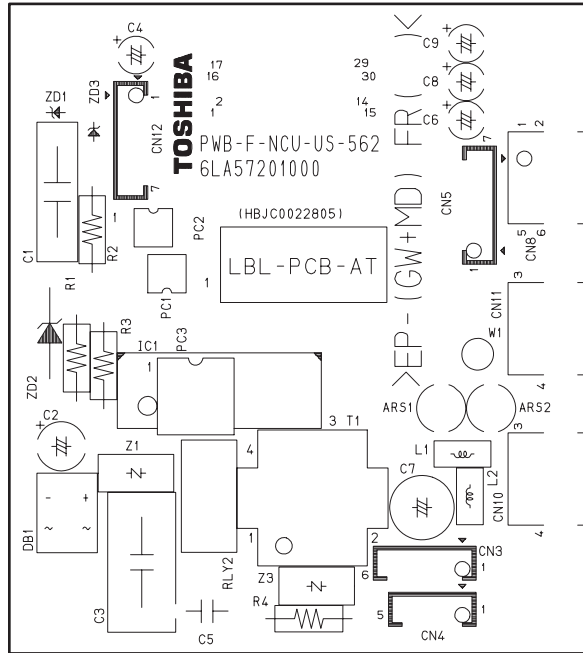


Fig. 4-19

6) PWA-F-NCU-562 (MJD, AUD, ASD, CND, KRD) (GD-1160)/  
PWA-F-NCU-631 (MJD, AUD, ASD, CND, KRD) (GD-1260)

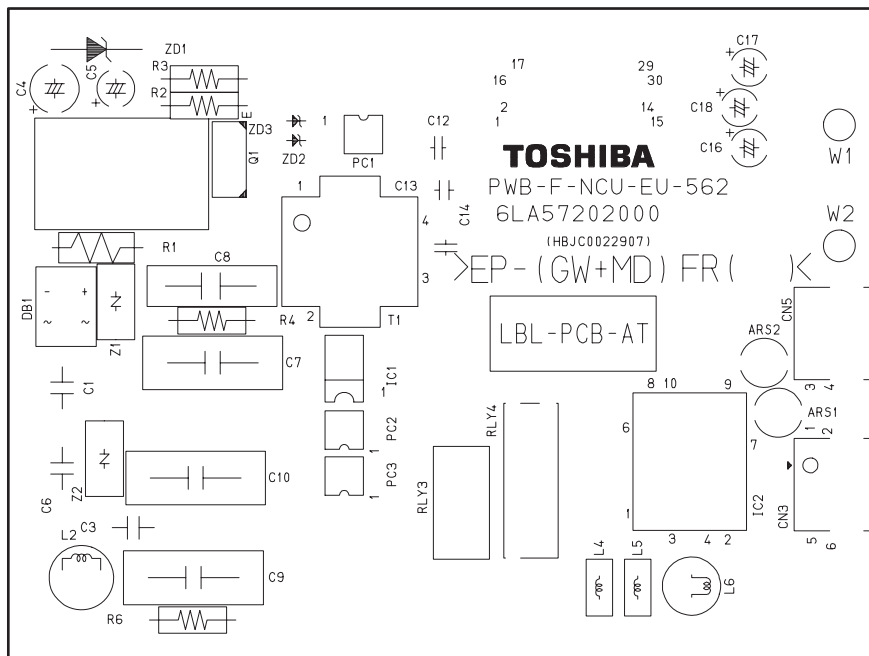


Fig. 4-20

7) PWA-F-MDM-563 (GD-1160)

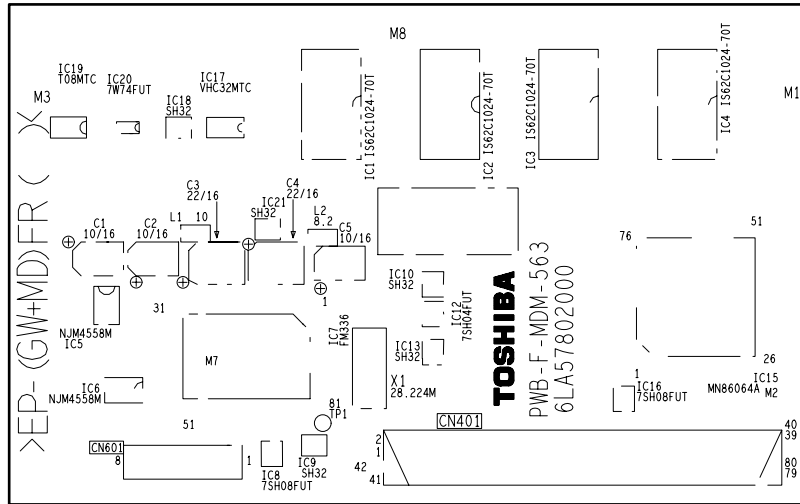


Fig. 4-21

8) PWA-F-MDM-671 (GD-1260)

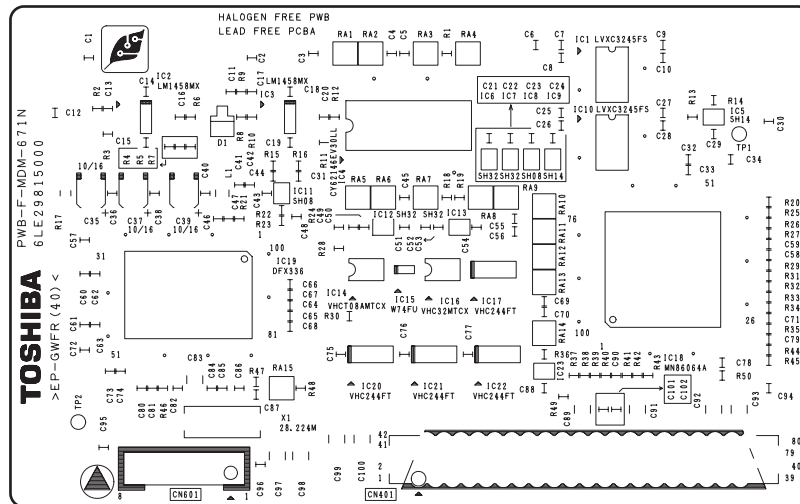


Fig. 4-22



9) PWA-F-FAX-POWER-631 (GD-1210)

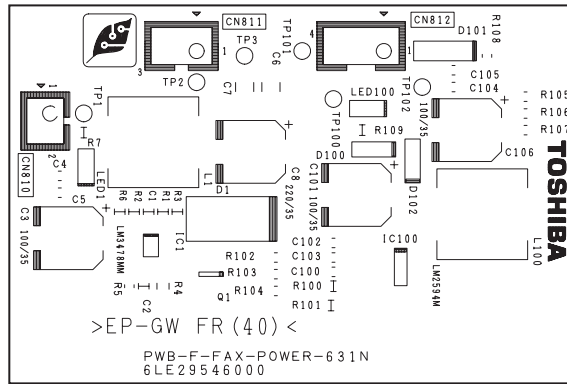


Fig. 4-23



## 5. INSTALLATION

### 5.1 Explanation to the Users

After installing the FAX unit, explain the following items to the user using the Operator's Manual. With the underlined items, actually demonstrate the operation.

Items to be explained

- Switches and control panel
  - Summary of the control panel (FAX functions)
  - After power is turned OFF, image data are kept in HDD.
  
- How to set originals
  - Acceptable original size and scanning width
  - How to insert originals:  
Multiple originals placed on the RADF are scanned from the first page.
  - Unacceptable originals
  - How to set the mode (image quality) and density (contrast)
  
- Transmission method
  - Manual transmission
  - Monitor dialing
  - Direct dialing (with the digital keys)
  - Phone book dialing
  - Delayed transmission
  - Multi transmission
  - Redialing
  
- Recording paper size
  - Recording paper size
  - How to change the recording paper size
  
- Automatic/manual reception
  - How to switch the automatic and manual reception
  - How the machine works and how to operate it when a FAX is received in these modes
  
- Other functions
  - Memory reception (with the power kept ON)
  - How to set the power saving mode
  
- Polling
  - Polling operation
  - How to operate the polling reception and transmission
  - How the multi-polling reception works and how to operate it
  
- How to register addresses
  - How to register new addresses in the Phone Book
  - How to correct or erase the contents of the Phone Book
  - Group registration in the phone book for the multi-transmission or multi-polling
  
- How to output lists
  - How to output the TRANSMISSION JOURNAL and RECEPTION JOURNAL





**TOSHIBA**

**TOSHIBA TEC CORPORATION**

2-17-2, HIGASHIGOTANDA, SHINAGAWA-KU, TOKYO, 141-8664, JAPAN

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