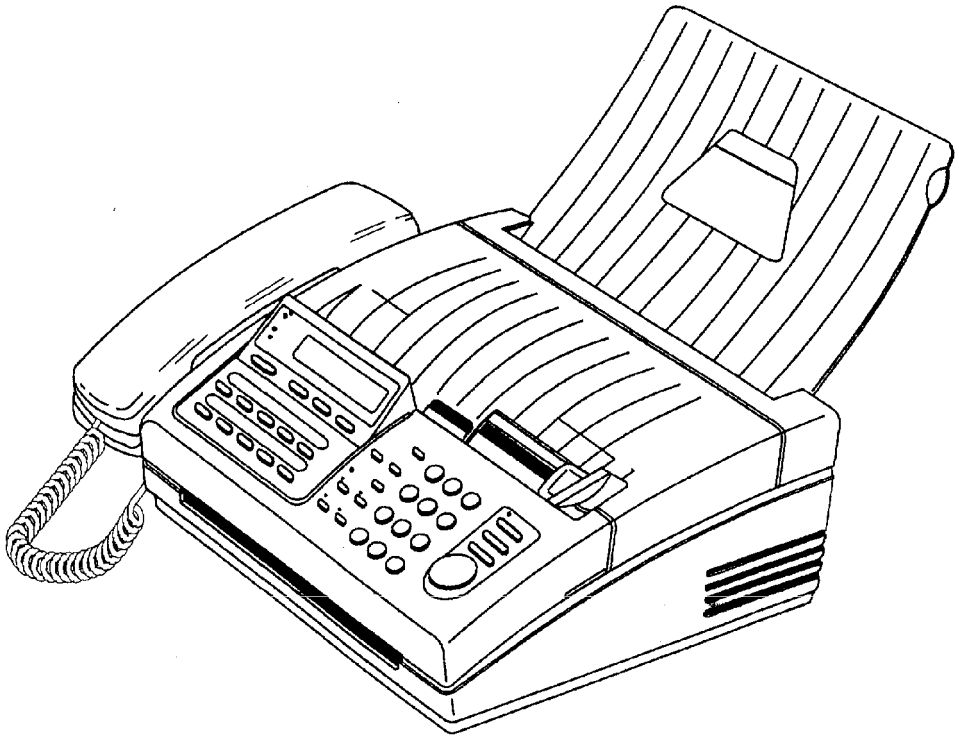
RICOH

# RICOH FAX220/240

# SERVICE MANUAL



# 1. INTRODUCTION

## 1-1. General Specifications

| Item | Specification |
|---|---|
| Type | Desktop transceiver |
| Telephone Circuit | PSTN/PBX |
| Document Size | Width: 148 - 218 mm<br>Length: 105 - 600 mm<br>Thickness: 0.05 - 0.15 mm |
| Scanning Method | Flat bed, CCD |
| Scanning Width | 216 ± 1 mm |
| Effective Printing Width | 210 mm (minimum) |
| Scan Resolution | Standard: 8 x 3.85 dots/mm<br>Detail: 8 x 7.7 dots/mm<br>Fine: 8 x 15.4 dots/mm |
| Transmission Time | FAX220 - 15 s (Measured using a CCITT #1 test chart, Slerexe Letter, at 9,600 bps, MH coding with EFC, 10 ms/line I/O rate, standard resolution)<br>FAX240 - 11 s (Measured using a CCITT #1 test chart, Slerexe Letter, at 9,600 bps, MMR coding with ECM, 10 ms/line I/O rate, standard resolution) |
| Data Compression Method | MH, EFC, SSC, MR, MMR* (*: FAX240 only) |
| SAF Memory Capacity | 128 kbytes (9 CCITT #1 test charts can be stored.) |
| Modulation Method | V29, V27ter, V21 |
| Transmission Data Rate | 9600/7200/4800/2400 bps (Automatic fallback) |
| Protocol | CCITT T.30 standard (NET 30) |
| Printing Method | Thermal printing |
| Printer Paper Size | 216 mm x 50 m roll |
| Dimensions | 355 x 454 x 203 mm |
| Weight | 4.6 kg |
| Input Voltage | H501-50, 51, 52, 53, 54, H502-50, 51, 52, 53, 54:<br>220 - 240 Vac, 50 Hz single phase<br>H501-55, H502-55: 120 Vac, 50/60 Hz, single phase |
| Recommended Operating Environment | Temperature: 17 - 28 °C<br>Humidity: 30 - 85 %RH |

## 1-2. Features LIst

| Features | FAX220 | FAX240 |
|---|---|---|
| **Transmission** | | |
| Automatic transmission | yes | yes |
| Manual transmission | yes | yes |
| ADF capacity | 5 | 5 |
| Automatic Contrast Control | yes | yes |
| Polling transmission | yes | yes |
| Send later | yes | yes |
| Dial via dialpad | yes | yes |
| Quick dial (one touch) | 10 | 10 |
| Speed dial (two touch) | 40 | 40 |
| Automatic redial | yes | yes |
| Manual redial | yes | yes |
| Label programming for Quick/Speed dials | yes | yes |
| Page indicator CSI + P.1 | yes | yes |
| Page indicator TTI + P.1 or P.1/10 | yes | yes |
| Automatic page retransmission in normal tx mode | no | yes |
| **Reception** | | |
| Automatic reception | yes | yes |
| Manual reception | yes | yes |
| Polled reception | yes | yes |
| Automatic cutter | no | yes |
| Manual cutter | yes | no |
| Authorized reception (with TSI) | yes | yes |
| Decurler | no | yes |
| Printing of the TSI on received copies | yes | yes |
| **Communication** | | |
| TTI (page header with name) | yes | yes |
| RTI (own phone number or text) | yes | yes |
| CSI (own phone number) | yes | yes |
| Counters (user function) | no | no |
| Voice request | no | no |
| PD/DTMF change by switch | yes | yes |
| Modified read (MR) | yes | yes |
| ECM with MMR compression | no | yes |
| **Compatibility** | | |
| CCITT group 3 | yes | yes |
| **Copy quality** | | |
| Halftone (16 level) with image/text separation | yes | yes |
| Auto shading | yes | yes |
| MTF | yes | yes |
| 8 x 15.4 lines/mm | yes | yes |
| Automatic contrast (threshold) control | yes | yes |
| **Reports** | | |
| TCR | yes | yes |
| Transmission Report | yes | yes |
| Quick dial list | yes | yes |
| Speed dial list | yes | yes |
| Group dial list | yes | yes |
| Error report | yes | yes |

| Features | FAX220 | FAX240 |
|---|---|---|
| Rejected Call Report in Authorized Reception | yes | yes |
| Stored document list | yes | yes |
| Power failure report | no | yes |
| **SAF features (9 pages memory)** | | |
| SAF capacity in kbytes | no | 128 (256 if ECM off) |
| Memory transmission | no | yes |
| Serial broadcasting | no | yes |
| Substitute reception | no | yes |
| Forwarding (1 number) | no | yes |
| File confirmation/clearance | no | yes |
| Automatic page retransmission in memory tx | no | yes (if ECM on) |
| Remaining memory indication on LCD (during scanning) | no | yes |
| Group dial | no | yes |
| **Telephone features** | | |
| Built-in handset | yes | yes |
| On-hook dial | yes | yes |
| Monitor speaker | yes | yes |
| Music on hold | yes | yes |
| Speakerphone | no | no |
| AI Redial (last 5 numbers) | yes | yes |
| 12 key dialpad | yes | yes |
| Volume control for speaker | yes | yes |
| Volume control for ringer | yes | yes |
| Power down function (Ring, Dial, Speech) | yes | yes |
| **FAX/PHONE switch** | | |
| Auto receive/manual receive switch | yes | yes |
| Auto answer delay time adjustment | no | no |
| Automatic fax/tel switch | yes | yes |
| Speech generation (AVM) | yes | yes |
| **Interfaces** | | |
| Telephone answering machine (TAM) interface | yes | yes |
| PC interface | no | no |
| **Others** | | |
| Copy mode (normal, detail, fine, halftone) | yes | yes |
| Time indicator | yes | yes |
| Clock adjustment | yes | yes |
| LCD display prompt | yes | yes |
| LCD size | 2 x 20 | 2 x 20 |
| Battery backed-up RAM size in kbytes | 32 | 32 |
| **Service features** | | |
| Remote diagnostics | yes | yes |
| Printer test pattern | yes | yes |
| Bit switch setting | yes | yes |
| ROM/RAM data display/list | yes | yes |
| NCU parameter setting | yes | yes |
| Pulse width setting | no | no |
| Service report (last 10 errors) | yes | yes |
| Service counters | yes | yes |

## 1-3. Detailed Features Description

### 1-3-1. Auto Select Mode

There are three reception modes, AUTO, TAM and FAX, one of which can be programmed in the Auto Select key on the operation panel using function 04 “SET FAX SWITCH”.
**AUTO mode** allows the machine to capture the line without any rings being heard by the users. Then, the machine starts to detect CNG for about 30 s while sending back ring-back tone or AVM (Artificial Voice Message) in one or two languages selected by the user. After that, it automatically receives the fax message or, if CNG is not detected, it calls the user by ringing from the speaker.
**TAM mode** allows connection to telephone answering machines (TAM) connected on the same line. There are two types of TAM interface software used depending on the connection between the machine and the telephone answering machine.
The first type of TAM interface is used in the countries where the TAM is connected to the machine as an external device. When the external device captures the line, the machine detects dc at the LIU. Then, the machine starts listening to the line. If the machine detects one or two CNG signals or a period of silence, the machine will capture the line and send CED/NSF/DIS to receive a fax message.
The second type of TAM interface is prepared for the countries (e.g., Germany) where the machine is connected to the TAM as an external device. In this case, the machine cannot detect dc when the TAM goes off-hook. So, it monitors the ringing signal. After the programmed number of rings, the machine listens to the line for about 30 s. If the machine detects one or two CNG signals, the machine will capture the line and send CED/NSF/DIS to receive a fax message. With the second type of TAM interface, the machine cannot receive fax messages from machines which do not send a CNG.
**FAX mode** allows the machine to receive all incoming fax messages.

### 1-3-2. Authorized Reception

The machine automatically stores in RAM the TSI (or RTI) from the terminals programmed in the Quick Dials and Speed Dials, once the user sends a document to these terminals. Then, if Authorized Reception is switched on, the machine compares the TSI from the remote terminal with these TSIs memorized in the RAM, when the machine receives a fax call from any terminal. So, Authorized Reception prevents reception from terminals which are not programmed in the Quick/Speed Dials.
If an unauthorized sender sends a fax message while this feature is switched on, the machine rejects the call and notifies the users by printing a rejection report with the unauthorized sender’s TSI or RTI.

### 1-3-3. Automatic Tx Speed Updating (AI Dial)

The machine memorizes the last five modem speeds that were used during transmission to the Forwarding terminal and each destination programmed in the Quick/Speed dials. Then, the machine chooses the most appropriate modem speed from the record for the next transmission, in order to reduce the time for modem rate fallback (approx. 5 s). This feature works only when the machine has more than two modem speed records fdor that destination. The modem speed is recorded in the memory if there are no error pages during transmission. This feature can work with other manufacturers’ terminals.

### 1-3-4. Page Retransmission in Normal Tx Mode - FAX240 only

In the normal transmission mode, the machine can retransmit failed pages as if in memory tx mode, if ECM is on. While sending the document, the machine backs up the document in the ECM memory in case page retransmission is needed. If the machine receives a negative code (RTN or PIN) after a page, the machine retransmits the whole page from the ECM memory.

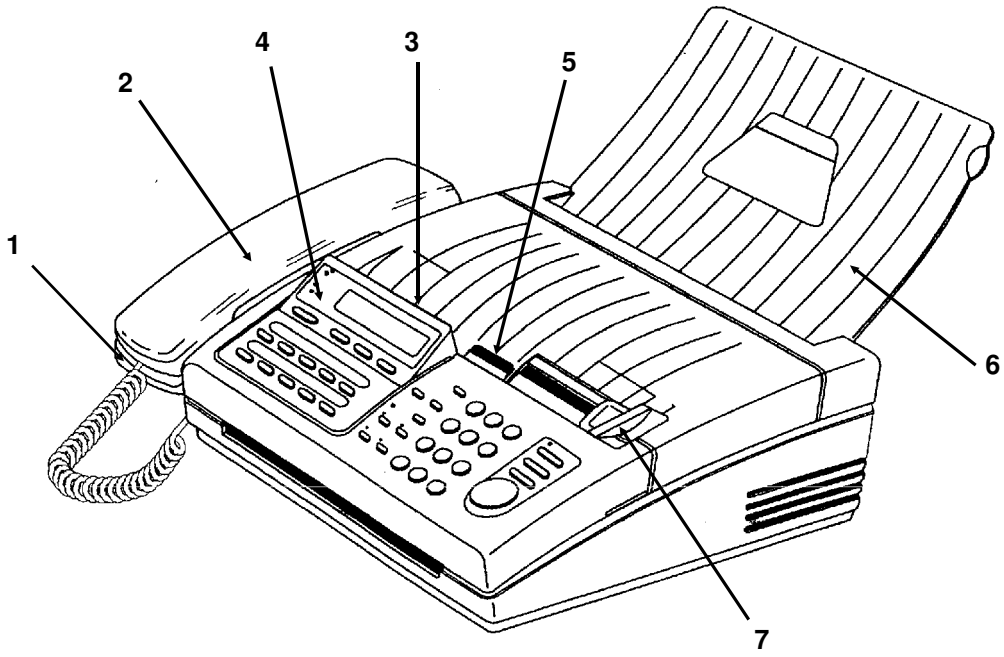
### 1-3-5. Forwarding - FAX240 only

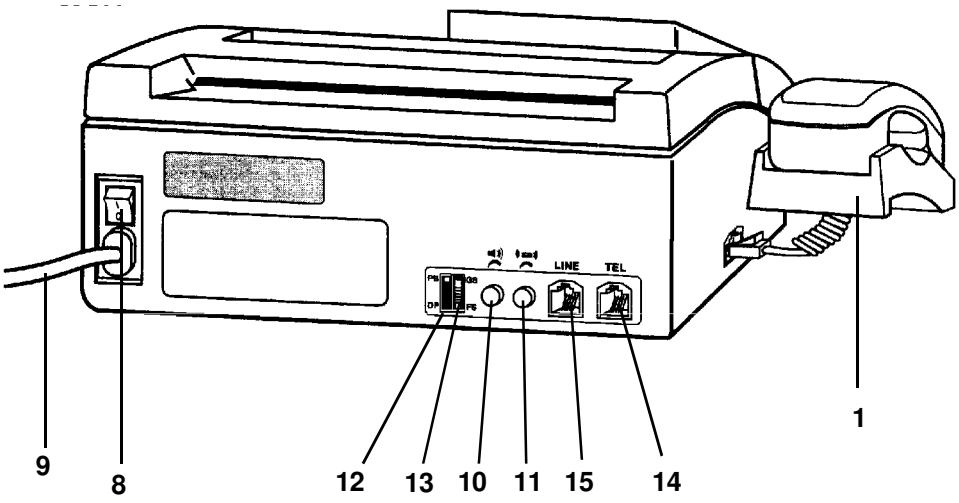
The machine can forward all received messages to the programmed Forwarding terminal. You can program the month, date and time for Forwarding to be switched on and for it to be switched off. Also, local printing of forwarded messages can be switched on and off.

## 1-4. Exterior

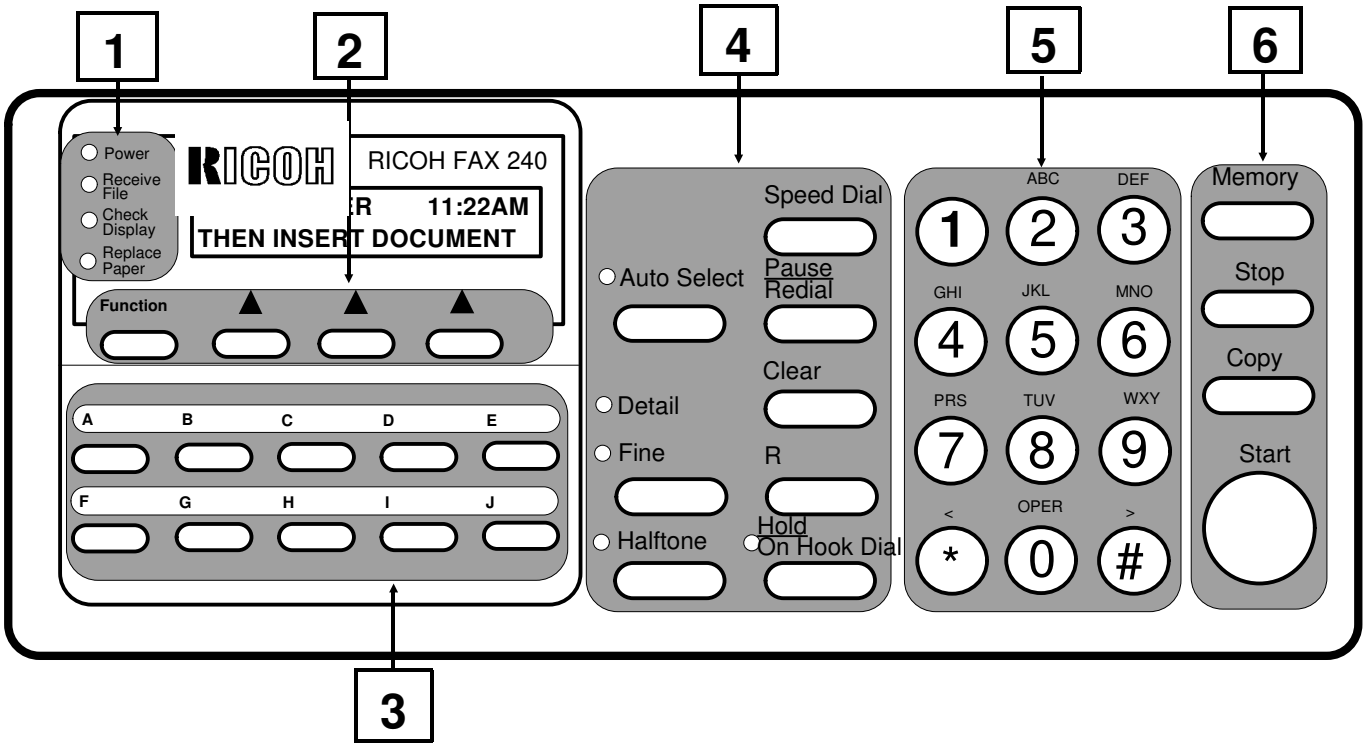
### 1-4-1. Component Layout

1. Handset Cradle
   This contains a hook switch and a ringer.
2. Telephone Handset
   This contains a microphone and an earphone.
3. ADF
   Up to 5 pages can be fed automatically.
4. Operation Panel
   Refer to section 1-4-2.
5. Printer Cover/Cover Release Lever
   To open the cover, push the release lever forward and pull up the cover.
6. Copy Tray
7. Document Guide
8. Power Switch
9. Power Cord
10. Speaker Volume Control
11. Ringer Volume Control
12. Pulse/Tone Switch
13. GS/FS Switch
    … Not used
14. Telephone Jack
15. Line Jack



**1-4-2. Operation Panel**




| No. | Name | Function |
|---|---|---|
| 1 | Power indicator | Lights when the power is switched on. |
| | Receive File indicator | Lights when received messages are stored into memory because of a printer problem. Up to 10 messages can be stored. |
| | Check Display indicator | Lights when the machine has a problem. |
| | Replace Paper indicator | Lights when the paper has been used up. |
| 2 | Function key and three softkeys | Press to access a function in the function list, and choose one of the soft keys below the required instruction indicated on the LCD. |
| 3 | Quick Dial keys | Each of these keys can be programmed with a telephone number and a label. |
| 4 | Auto Select key and indicator | If it is not lit, Tel (manual receive) mode is selected.<br>If it is lit, either FAX (automatic receive) mode, AUTO (automatic Tel/Fax switch) mode, or TAM (Telephone Answering Machine) mode is selected, depending on the mode selected with function 04. |
| | Resolution key and indicators | Press this key to change the resolution. If neither of the Detail or Fine indicators are lit, Standard resolution is selected. |
| | Halftone key and indicator | Press this key when you wish to send a photograph. |
| | Speed Dial key | Press this key to use a Speed Dial code. |
| | Pause/Redial key | Press this key when you want to enter a pause in a telephone number, or when you want to redial one of the last five numbers dialed. |
| | Clear key | Press this during programming to erase the last character. |
| | “R”(Recall) key* | Press this key when you want to access the PSTN from behind a PBX which requires the Flash Start method. |
| | Hold/On Hook Dial key and indicator* | Press this key to dial without picking up the handset. Also, press this key to place the other party on hold during a telephone conversation. |
| 5 | Dialpad* | Dial using these keys and use to input characters during programming. |

| No. | Name | Function |
|---|---|---|
| 6 | Memory key (FAX240 only) | Press to use memory transmission. |
| | Stop key | Press to stop the machine and return it to standby mode. |
| | Copy key | Press to copy the document now in the feeder. |
| | Start key | Press to start sending or receiving a fax message. |

The keys with an asterisk (*) can be used for making a telephone call if the main power is switched off.

# 2. PROGRAMMING, TESTING, AND PRINTING REPORTS

## 2-1. USER LEVEL PROGRAMMING

**Function List**

| No. | Function | Brief Explanation |
|---|---|---|
| 01 | Quick Dial Programming | Use to program a telephone number and a label in each Quick Dial key. |
| 02 | Speed Dial Programming | Use to program a telephone number and a label in each Speed Dial code. |
| 03 | Telephone List Printing | Use to print the telephone list, which contains Quick Dials, Speed Dials, and Groups. |
| 04 | Set Fax Switch | Use to select the function of Auto Select mode from among AUTO mode (Auto Tel/Fax switch), TAM mode, and FAX mode (Automatic Receive). |
| 05 | Send Later | Use to program the machine to send a document at a later time. |
| 06 | Polling Transmission | Use to set up a document to be polled from a remote terminal. |
| 07 | Polling Reception | Use to program the machine to poll documents from remote terminals. |
| 08 | TCR Printing and On/Off | Use to print a TCR or to set the machine up to print reception only on the TCR. |
| 09 | Transmission Report On/Off | Use to switch automatic Transmission Report output on or off. |
| 10 | Page Header (TTI) On/Off | Use to switch the TTI printout on each transmitted page on or off. |
| 11 | Enter Page Header (TTI) | Use to program the TTI. |
| 12 | Enter Your Name (RTI) | Use to program the RTI. |
| 13 | Enter Your Fax Number (CSI) | Use to program the CSI. |
| 14 | Clock Adjustment | Use to adjust the date and time. |
| 15 | Set PBX | Use to program the machine for the actual PBX type. |
| 16 | ID Code Programming | Use to program the ID code, which is used for secured polling and the closed network feature (closed network can only be switched on in service mode). |
| 17 | Key Touch Tone On/Off | Use to switch the key touch tone off or on. |
| 18 | RDS On/Off | Use to switch RDS on or off.<br>This function cannot be accessed by the users, unless bit 6 of bit switch 1 is set to 1 by RDS installation operation or by service later. |
| 19 | Set Language | Use to change the LCD and report language. |
| 20 | Authorized Reception On/Off | Use to prevent reception from terminals other than those programmed in the Quick/Speed Dials. |
| 21 | Reviewing Stored Documents | Use to review the documents stored in the memory. |
| 22 | Forwarding | Use to program the machine to forward received messages to a programmed terminal. |
| 23 | Group Dial Programming | Use to make dialing groups (up to 5 groups can be made). |
| 24 | ECM On/Off | Use this to switch ECM on or off. |

## 2-2. SERVICE LEVEL OPERATION

### 2-2-1. Entering and Exiting Service Mode

**ENTERING SERVICE MODE**

Press Start → Stop → Start → Stop → Start sequentially within 5 seconds.

After entering service mode, the following service functions are available.

| No. | Function | Brief Explanation |
|---|---|---|
| Functions 30 to 38 are mainly prepared for factory use. | | |
| 30 | RAM Test | Use to test the SRAM and DRAMs on the FCE. |
| 31 | Key Test | Use to test all keys on the operation panel. |
| 32 | LED Test | Use to test all LEDs on the operation panel. |
| 33 | LCD Test | Use to test the LCD on the operation panel. |
| 34 | Speaker Test | Use to test the monitor speaker. |
| 35 | Printer Test | Use to print a test pattern. |
| 36 | PTT Test | Use to test the modem signals, DTMF tones, and transmission level. |
| 37 | Frequency Test | Use to generate signals of the desired frequency and level. |
| 38 | Burn-in Test | Do not use this function. If this function is used, the RAM will all be cleared. |
| The following functions are prepared for service use. | | |
| 40 | Factory Adjustment | Use to check the ROM version, to adjust the tx level and to clear the RAM. |
| 41 | Not used | |
| 42 | Not used | |
| 43 | Bit Switch Programming | Use to change the bit switch settings. |
| 44 | Scanner Adjustment Mode | Use to switch on the LED array for scanner adjustment. |
| 91 | Display ROM/RAM Data | Use to display and change the ROM/RAM data. |
| 92 | Print System Report | Use to print the system report. |
| 93 | Print ROM/RAM Data | Use to print ROM/RAM data. |
| 94 | Not used | |
| 95 | Print Service Report | Use to print the service report. |
| 96 | Not used | |
| 97 | Not used | |
| 98 | NCU Parameter Programming | Use to adjust the NCU parameters. |

**EXITING SERVICE LEVEL**

Press Stop, Function, or EXIT at any time.

The machine will automatically exit service mode 40s after you enter it.

**Note:** In the functions, the new settings will not be saved by pressing the Function key. To save the new settings, you have to press “SET” or “OK”, then exit the service mode.

### 2-2-2. RAM Test (Function 30)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 30, then press SET.
3. The machine starts to check the SRAM and the two DRAMs without clearing any RAM data stored.
   If the RAM test succeeded, the machine prints “RAM TEST OK”, and goes to the Key Test.
   If the RAM test failed, the machine displays “RAM ERROR AT ##AAAA” (## = type of RAM; AAAA = address) for 3 s, then “RAM TEST FAILED” is printed
   (Type of RAM: 09 = SRAM, 00 - DRAM0, 10 - DRAM1)

   After this test, the machine automatically goes into function 31.

### 2-2-3. Key Test (Function 31)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 31, then press SET.
3. The display shows the name of a key. If the key is pressed the display shows the next one until the last key “J” is pressed.
   If the key test was successful, the machine prints “KEY TEST OK”.
   If the key test was failed or aborted, the machine prints “KEY TEST FAILED.
   After this test, the machine automatically goes to the LED test.

| Display | Key | Display | Key | Display | Key |
|---|---|---|---|---|---|
| 1 through # | Keys in the dialpad | ONL | On Hook Dial | CLR | Clear |
| SPE | Speed Dial | FUN | Function | FIN | Detail/Fine |
| MLT | Memory | LEF | Softkey (Left) | STO | Stop |
| AUT | Auto Select | MID | Softkey (Middle) | CPY | Copy |
| RED | Redial | RIG | Softkey (Right) | STA | Start |
| HOL | R | PHO | Halftone | A through J | Quick Dial keys |

### 2-2-4. LED Test (Function 32)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 32, then press SET.
3. All the LEDs on the operation panel blink sequentially until OK or ERROR is pressed.
   If OK is pressed, the machine prints “LED TEST OK” and goes to the LCD test.
   If ERROR is pressed, the machine prints “LED TEST FAILED”, and goes to the LCD test.

### 2-2-5. LCD Test (Function 33)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 33, then press SET.
3. The two lines on the LCD alternately show a line of solid black characters until OK or ERROR is pressed.
   If OK is pressed, the machine prints “LCD TEST OK” and goes to the Speaker Test.
   If ERROR is pressed, the machine prints “LCD TEST FAILED”, and goes to the Speaker Test.

### 2-2-6. Speaker Test (Function 34)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 34, then press SET.
3. The machine emits a tone from the speaker until OK or ERROR is pressed.
   If OK is pressed, the machine prints “VOL TEST OK” and goes to the Printer Test.
   If ERROR is pressed, the machine prints “VOL TEST FAILED” and goes to the Printer Test.

### 2-2-7. Printer Test (Function 35)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 35, then press PRINT.
3. A test pattern with diagonal lines is printed. After printing, the machine goes to standby mode.

### 2-2-8. PTT Test (Function 36)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 36, then press SET.
3. Press “MDM” for modem test, “DTMF” for DTMF test, or “LEV.” for tx level adjustment.

4.1 Modem Test
The test starts from silence (the machine only goes off-hook), then by pressing the # key consecutively, the signal changes to 9,600bps - 7,200bps - 4,800bps - 2,400bps - 300bps - 600Hz - 1100Hz - 2100Hz. (Press the * key to go backwards through the sequence.)
After you have finished the test, press Stop to go back to step 3.

4.2 DTMF Test
Press a key on the dialpad (0 - 9, * and #) to test the DTMF signal.
After you have finished the test, press Stop to go back to step 3.
Note that the machine will emit a DTMF signal of the correct length for the country code, even if the slide switch on the rear of the machine is not set at “Tone”.
If you wish to get a continuous DTMF tone, set the slide switch at “Tone”, switch off the power, then press the required key on the dialpad.

4.3 Tx Level Adjustment
The current tx level setting is displayed in the upper right corner of the LCD. To change the setting, press # to increment or press * to decrement. After adjustment, press Stop to save the setting.

### 2-2-9. Frequency Test (Function 37)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 37, then press SET.
3. The machine emits a sine wave of the displayed frequency. The frequency can be changed in units of 100Hz by pressing # (increment) or * (decrement). Also, the output level can be changed by pressing LEV.

### 2-2-10. Burn-in Test (Function 38)

Do not use this function.

### 2-2-11. Factory Adjustment (Function 40)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 40, then press SET.
   The upper line on the LCD shows the ROM version “VER x.xx dd.mm.yy c” (x.xx = version, dd.mm.yy = date, c = country setting). The lower line on the LCD shows “CLK 0.LEV RAMC”.
3. Press RAMC for RAM clear.

4.1 Clock Oscillator Adjustment
This function is not for service.
**WARNING:** Do not use this function.

4.2 Tx Level Fine Adjustment
This function is not for service.
**WARNING:** Do not use this function.

4.3 RAM Clear
RAM is all reset to the initial settings and the CPU is restarted.
**WARNING:** With this function, all the previous settings will be reset to the initial settings for Hong Kong. Program the correct country code after clearing the RAM (bit switch 2; see section 3-1).

### 2-2-12. Bit Switch Programming (Function 43)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 43, then press SET.
3. The setting of bit switch 0 is displayed.
   To change the setting of a bit, press the bit number on the dialpad (0 - 7). Press < or > to display other bit switches.
4. To store the new setting, press OK.

**Important Notice for Back-to-Back Mode (Bit Switch 0, Bit 7)**
When in back-to-back mode, you cannot enter service mode unless you exit back-to-back mode first. This is because the machine starts communication if you press Start - Stop - and so on while you are in back-to-back mode. To exit back-to-back mode, do the following:

1. Make sure that the machine is not communicating.
2. Press Halftone to light the Halftone LED, then press Stop.
3. Enter the service mode.
4. After finishing with service mode, re-enter back-to-back mode if required.

### 2-2-13. Scanner Adjustment (Function 44)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 44, then press SET.
3. The LED array is switched on until “OK” is pressed. Refer to section 4-5 for more details on scanner adjustment.

### 2-2-14. Display and Rewrite ROM/RAM Data (Function 91)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 91, then press SET.
3. The upper line on the LCD shows “ADD: aaaa  VAL: ddd/hh” (aaaa = address, ddd = decimal value of the data, and hh = hexadecimal value of the data).
4. Select the address where the data you want to display or change is stored, using keys 0 through 9 and Quick Dial keys A through F, or using the *  key to decrement the address and the # key to increment the address.
5. Press EDIT if you want to rewrite the data.
6. Rewrite the data in the hexadecimal data field. (The “<” and “>” keys are used to move the cursor in the data field.)
7. Press OK to save the new data.
8. Press Stop to exit this function or go back to step 3 to change another address.

### 2-2-15. System Report (Function 92)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 92, then press PRINT. The system report will be printed.

### 2-2-16. Print ROM/RAM Data (Function 93)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 93, then press SET.
3. Enter the start address then press OK.
   The address field has 5 digits, as the first digit is used for bank identification and the following 4 digits are for the actual address. Use the bank identification number “0” for addresses 0000 - 3FFF(H) and C000 - FFFF(H), and “9” for addresses 4000 - 7FFF(H).
4. Enter the end address then press OK. The machine prints a list of ROM/RAM data in the selected address range.

### 2-2-17. Service Report (Function 95)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 95, then press PRINT. The service report will be printed.

### 2-2-18. NCU Parameter Programming (Function 98)

1. Enter the service mode (see section 2-2-1).
2. Press Function, enter 98, then press SET.
3. The upper line on the LCD shows “ADD: aa  VAL: ddd/hh” (aa = parameter number, ddd = decimal value of the data, and hh = hexadecimal value of the data).
4. Select the required parameter number with keys 0 through 9, or press # or * to scroll through the parameters.
5. Press EDIT if you want to change the data.
6. Rewrite the data in the decimal data field. (The “<” and “>” keys are used to switch the cursor between the address and data fields, and the * and # keys are used to decrement/increment the data value.)
   Refer to section 3-2-1 (address 0377 - 0381 (H)) for the definition of NCU parameters.

# 3. SERVICE TABLES

## 3-1. BIT SWITCHES

**WARNING**
**Do not adjust a bit switch that is described as "Not used", as this may cause the machine to malfunction or to operate in a manner that is not accepted by local regulations.**

| Bit Switch 0 | | | |
|---|---|---|---|
| | **FUNCTION** | **SETTINGS** | **COMMENTS** |
| **0** | Not used | | |
| **1** | Rx cable equalizer | 0: Disabled<br>1: Enabled | Set this bit to 1 when there is a serious signal loss at higher frequencies during reception. The cable equalizer will amplify the signal in this range by +3 dBm. |
| **2** | DIS detections | 0: Once<br>1: Twice | The machine will send DCS (G3 set-up signal) if it receives DIS. If echoes are frequent, setting this bit to 1 will allow the machine to wait for the second DIS before sending DCS. |
| **3** | TSI (RTI) printout on received copies | 0: Disabled<br>1: Enabled | If this bit is 1, the TSI or RTI received from the sender will be printed on the top of each page. |
| **4** | Burst error threshold/ error line ratio | 0: 6 (12) [24] lines/10%<br>1: 3 (6) [12] lines/5% | If there are more consecutive error lines in the received page than the threshold specified by this bit, the page is rejected. Values in parenthesis ( ) are for Detail resolution, and those in square brackets [ ] are for Fine resolution.<br>Also, if the number of error lines divided by the total number of lines reaches the ratio determined by this bit, the machine will send RTN to the other end.<br>If you want to receive messages with fewer error lines, set this bit to 1. |
| **5** | Training error threshold | 0: 4 bits<br>1: 1 bit | If the machine detects more errors during training than the number set by this bit, training fails and the machine will send FTT to ask the other terminal for modem rate shift-down.<br>Set this bit to 1 if you want to receive messages at a more reliable modem speed. |
| **6** | Initial Rx modem rate | 0: 9,600 bps<br>1: 4,800 bps | The setting of this bit is used to inform the sending machine of the initial starting modem rate for the machine in receive mode. If 9,600 bps presents a problem during reception, use 4,800 bps. |
| **7** | Back to back test | 0: Disabled<br>1: Enabled | Set this bit to 1, when you want to test a back-to-back communication. |

**Important Notice for Back-to-Back Mode**
When in back-to-back mode, you cannot enter service mode unless you exit back-to-back mode first. This is because the machine starts communication if you press Start - Stop - and so on to enter service mode while you are still in back-to-back mode.
Refer to the notice in section 2-2-12 for how to exit back-to-back mode.

| Bit Switch 1 | | | |
|---|---|---|---|
| | **FUNCTION** | **SETTINGS** | **COMMENTS** |
| **0** | Reconstruction time for the first line | 0: 6 seconds<br>1: 10 seconds | When the sending terminal is controlled by a computer, there may be a delay in receiving page data after the local machine accepts set-up data and sends CFR. If this occurs, set this bit to 1 to give the sending machine more time to send data. |
| **1** | Substitute reception file forwarding (FAX240 only) | 0: Normal operation<br>1: Forward all files | Set this bit to 1 if the printer is out of order.<br>The machine will forward all files to the Forwarding terminal. |
| **2** | ECM transmission/reception (FAX240 only) | 0: Enabled<br>1: Disabled | Set this bit to 1 when you want to switch off ECM. |
| **3** | PSTN/PBX dial tone and busy tone detection | 0: Enabled<br>1: Disabled | Set this bit to 1 when you wish to disable tone detection. |
| **4** | Closed network in reception | 0: Disabled<br>1: Enabled | Set these bits to 1 to switch on Closed Network.<br>With Closed Network, communication will not go ahead if the ID code of the other terminal does not match the ID code of this terminal.<br>The ID code has to be programmed with function 16 before switching on these bits.<br>This feature may not be reliable when communicating with another maker's machine. |
| **5** | Closed network in transmission | 0: Disabled<br>1: Enabled | |
| **6** | Remote read/write request | 0: Always enabled<br>1: User selectable | 0: RDS is always enabled. The user cannot switch it off.<br>1: If a technician or RDS operator sets this to 1 after installation, the user can select either "ON for 24 hours" or "OFF". |
| **7** | Communication parameter display and line monitoring after handshaking | 0: Disabled<br>1: Enabled | This is a fault-finding aid. If this bit is set to 1, the LCD shows the key parameters (see below) and the speaker is enabled during message transmission and reception.<br>This should be normally disabled because it cancels the CSI/TSI (RTI) display for the user. |

| **Modem rate (bps)** | **Sub-scan resolution (lines/mm)** | **Coding** | **Width and reduction** | **Mode** | **I/O rate (ms/line)** |
|---|---|---|---|---|---|
| 96: 9,600<br>72: 7,200<br>48: 4,800<br>24: 2,400 | S: 3.85<br>D: 7.7<br>F: 15.4 | 1D: MH<br>2D: MR<br>1E: MH + EFC<br>2E: MR + EFC<br>1S: MH + SSC<br>2S: MR + SSC<br>1C: MH + ECM<br>2C: MR + ECM<br>MC: MMR + ECM | A: A4<br>N: No reduction | DCS: CCITT G3<br>NSS:<br>Non-standard G3 | 0M: 0<br>5M: 5<br>10M: 10<br>20M: 20<br>40M: 40 |

| Bit Switch 2 | | | |
|---|---|---|---|
| | **FUNCTION** | **SETTINGS** | **COMMENTS** |
| **0**<br>**1**<br>**2**<br>**3**<br>**4** | Country code<br>Bit 4 3 2 1 0 Country<br>1 0 0 0 1 USA<br>1 0 1 0 0 Hong Kong<br>1 0 1 0 1 Australia<br>1 0 1 1 0 New Zealand<br>1 0 1 1 1 Israel<br>1 1 0 0 0 Thailand<br>1 1 0 0 1 Singapore<br>1 1 0 1 0 Indonesia | | Set the country code after clearing the RAM. |
| **5** | TAM interface type | 0: Normal<br>1: German type | 0: The normal type of TAM interface monitors the line current on the LIU, to detect whether the external TAM goes off-hook or on-hook.<br>1: The German type of TAM interface does not monitor the line current on the LIU, because the TAM and the fax are connected in parallel to the line.<br>Refer to section 1-3-1 for more details. |
| **6** | TAM (Telephone Answering Machine) interface | 0: Enabled<br>1: Disabled | If this bit is 1, TAM mode cannot be selected with function 04 by the user. |
| **7** | Not used | | |

**Default Settings**

| Bit Switch | H501/502-50 | H501/502-51 | H501/502-52 | H501/502-53 | H501/502-54 | H501/502-55 |
|---|---|---|---|---|---|---|
| **0** | 00 | 00 | 00 | 00 | 00 | 00 |
| **1** | 00 | 00 | 00 | 00 | 00 | 00 |
| **2** | 14 | 15 | 16 | 1A | 17 | 11 |

## 3-2. USEFUL RAM ADDRESSES

In the equations that occur in the following tables, N represents the decimal value stored in the RAM address.

**WARNING**
**Changing any RAM data that are not listed in this table may cause the machine to malfunction.**

### 3-2-1. Address Table

Use service function 91 to view or adjust the contents of a RAM address. See section 2-2-14 for details.

| Address (Hex) | Function |
|---|---|
| 0000 - 0002 | Bit switches 00 to 02 (0000 = Bit switch 00, 0001 = Bit switch 01, and so on); refer to section 3-1 for details. |
| 0009 | User function parameters<br>Bit 7: Transmission Report On/Off [Function 09] (1: On)<br>Bit 6: TTI (Page Header) On/Off [Function 10] (1: On)<br>Bit 5: Key Touch Tone On/Off [Function 17] (1: On)<br>Bit 4: RDS On/Off [Function 18] (1: On for 24 hours)<br>Bit 3: AM/PM Indication on LCD clock **Note 1** (1: On)<br>Bit 2: Forwarding On/Off [Function 22] **Note 2** (1: On)<br>Bit 1: Forwarding Mode [Function 22] **Note 2** (0: Now or Later mode, 1: Daily mode)<br>Bit 0: Forwarding File Local Printing On/Off [Function 22] (1: On) |
| 000A | User function parameters<br>Bit 7: Communication record listing on TCR [Function 08] (1: On)<br>Bit 6: Authorized Reception On/Off [Function 20] (1: On)<br>Bits 5 through 0: Not used |
| 0039 | Exchanger type connected to the machine Bit 2 = 0: PSTN<br>Bit 2 = 1: PBX |
| 0300 - 0302: Line current detection parameters | |
| 0300 | Line current detection time [Time = N x 10 (ms), detection disabled if N = FF] |
| 0301 | Line current reset time [Time = N x 20 (ms)] |
| 0302 | Line current dropout detection time [Time = N x 10 (ms)] |
| 0303 - 0320: PSTN tone detection parameters | |
| 0303 - 030E | Modem data for PSTN dial tone frequency range<br>**Caution:** Do not adjust. |
| 030F | PSTN dial tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 0310 | PSTN dial tone reset time [Time = N x 0.16 (s)] |
| 0311 | PSTN dial tone continuous tone time [Time = N x 20 (ms)] |
| 0312 | PSTN dial tone permissible dropout time [Time = N x 20 (ms)] |
| 0313 | PSTN pause time [Time = N x 0.16 (s)] |
| 0314 | PSTN ringback tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 0315 - 0320 | Modem data for PSTN busy tone frequency range<br>**Caution:** Do not adjust. |
| 0321 - 033E: PBX tone detection parameters | |
| 0321 - 032C | Modem data for PBX dial tone frequency range<br>**Caution:** Do not adjust. |
| 032D | PBX dial tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 032E | PBX dial tone reset time [Time = N x 0.16 (s)] |
| 032F | PBX dial tone continuous tone time [Time = N x 20 (ms)] |

| Address (Hex) | Function |
|---|---|
| 0330 | PBX dial tone permissible dropout time [Time = N x 20 (ms)] |
| 0331 | PBX pause time [Time = N x 0.16 (s)] |
| 0332 | PBX ringback tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 0333 - 033E | Modem data for PBX busy tone frequency range<br>**Caution:** Do not adjust. |
| 033F - 0348: Busy tone detection parameters | |
| 033F | Busy tone ON time (range 1) [Time = N x 10 (ms)] |
| 0340 | Busy tone OFF time (range 1) [Time = N x 10 (ms)] |
| 0341 | Busy tone ON time (range 2) [Time = N x 10 (ms)] |
| 0342 | Busy tone OFF time (range 2) [Time = N x 10 (ms)] |
| 0343 | Busy tone ON time (range 3) [Time = N x 10 (ms)] |
| 0344 | Busy tone OFF time (range 3) [Time = N x 10 (ms)] |
| 0345 | Busy tone ON time (range 4) [Time = N x 10 (ms)] |
| 0346 | Busy tone OFF time (range 4) [Time = N x 10 (ms)] |
| 0347 | Continuous busy tone detection time [Time = N x 10 (ms)] |
| 0348 | Bits 0 to 3: Busy tone signal state time tolerance (for all ranges)<br>Bit 3 2 1 0 Tolerance<br>0 0 0 1 ± 50%<br>0 0 1 0 ± 25%<br>0 0 1 1 ± 12.5%<br>Bits 4 to 7: Number of cycles required for detection |
| 0349 - 0359: International dial tone detection parameters | |
| 0349 - 0354 | Modem data for international dial tone frequency range<br>**Caution:** Do not adjust. |
| 0355 | International dial tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 0356 | International dial tone reset time [Time = N x 0.16 (s)] |
| 0357 | International dial tone continuous tone time [Time = N x 20 (ms)] |
| 0358 | International dial tone permissible dropout time [Time = N x 20 (ms)] |
| 0359 | International dial pause time [Time = N x 0.16 (s)] |
| 035A - 036A: National dial tone detection parameters | |
| 035A - 0365 | Modem data for domestic dial tone frequency range<br>**Caution:** Do not adjust. |
| 0366 | National dial tone detection time [Time = N x 20 (ms), detection disabled if N = FF] |
| 0367 | National dial tone reset time [Time = N x 0.16 (s)] |
| 0368 | National dial tone continuous tone time [Time = N x 20 (ms)] |
| 0369 | National dial tone permissible dropout time [Time = N x 20 (ms)] |
| 036A | National dial pause time [Time = N x 0.16 (s)] |
| 036B - 036C | International dial access number<br>Example: If the number is 100, store F1 in address 036B, and 00 in address 036C. |
| 036D | PBX operator pause [Time = N x 20 (ms)] |
| 036F | CCITT T1 time [Time = N x 2.56 (s)] |
| 0370 | Maximum number of dialing attempts to the same station in normal tx mode |
| 0371 | Redial interval in normal tx [Time = N (minutes)] |
| 0372 | Maximum number of dialing attempts to the same station in memory tx mode |
| 0373 | Interval between dialing to different stations [Time = N x 2.56 (s)] |
| 0374 | Dial tone detection level [Level = 0 - N x 0.375 (dBm)] |
| 0375 | Busy tone detection level [Level = 0 - N x 0.375 (dBm)] |
| 0376 | Minimum signal detection level [Level = 0 - N x 0.375 (dBm)] |

| Address (Hex) | Function |
|---|---|
| 0377 - 037B: Ringing signal detection parameters **(Use function 98 to change)** | |
| 0377 | **NCU Parameter 00:** Acceptable ringing signal frequency, upper limit<br>[Frequency = 1/(N x $10^{-3}$) (Hz)] |
| 0378 | **NCU parameter 01:** Acceptable ringing signal frequency, lower limit<br>[Frequency = 1/(N x $10^{-3}$) (Hz)] |
| 0379 | **NCU parameter 02:** Number of rings until a call is detected [Number = N x 1] |
| 037A | **NCU parameter 03:** Minimum required length of a ring [Length = 20 x N (ms)] |
| 037B | **NCU parameter 04:** Minimum required length of an interval between rings [Length = 40 x N (ms)] |
| 037C - 037D: Pulse dial parameters **(Use function 98 to change)** | |
| 037C | **NCU parameter 05:** Time between closing the dc loop and the first dialed digit [Time = N (ms)] |
| 037D | **NCU parameter 06:** Pause between dialed digits (pulse dial mode) [Time = N x 20 (ms)] |
| 037E | **NCU parameter 07:** Time waited when a pause is entered at the operation panel [Time = N x 20 (ms)] |
| 037F - 0380: Tone dial parameters **(Use function 98 to change)** | |
| 037F | **NCU parameter 08:** DTMF tone length [Time = N x 5 + 60 (ms)] |
| 0380 | **NCU parameter 09:** Time between dialed digits (DTMF dial mode) [Time = N x 5 + 60 (ms)] |
| 0381 | **NCU parameter 10:** Modem transmission level [Level = - N (dBm)] |
| 0382 | Language selected for LCDs and reports<br>0(D): English 1(D): Spanish 3(D): French |
| 0386 | Redial interval for memory transmission [ N x 1 (min.)] (Default: 5 minutes) |
| 0387 - 0388 | Intercity access code for France: 16(D) [0386 = FF(H), 0387 = 16(BCD)] |
| 039A | Ringing time in Auto mode [Time = N (s)]<br>The value of N should be a multiple of 5 between 5 and 25. |
| 039E - 03A1: CNG detection parameters | |
| 039E | Maximum acceptable CNG OFF-time [Time = N x 20 (ms)] **Note 3** |
| 039F | Minimum acceptable CNG OFF-time [Time = N x 20 (ms)] **Note 3** |
| 03A0 | Maximum acceptable CNG ON-time [Time = N x 20 (ms)] **Note 3** |
| 03A1 | Minimum acceptable CNG ON-time [Time = N x 20 (ms)] **Note 3** |
| 03A2 | Country code<br>11: USA 14: Hong Kong 15: Australia 16: New Zealand 17: Israel 18: Thailand<br>19: Singapore 1A: Indonesia |
| 03C5 | Mode selection in Auto Select mode<br>Bit 3 2 1 0 Mode<br>0 0 0 1 Auto Tel/Fax switch with AVM<br>0 0 1 0 Auto Tel/Fax switch with ringback tone<br>0 0 1 1 Semi-Auto (TAM) mode<br>0 1 0 0 Fax mode |
| 03C9 | Continuous silent period detection time in TAM mode [Time = N x 65 (ms)]. See Note 4. |
| 03CA | PSTN access code from behind Loop Start PBX (BCD) |
| 03CF | Number of rings until a call is detected in TAM mode [N (times)] |
| 20A1 | Forwarding start date and time Minute (BCD) |
| 20A2 | Forwarding start date and time Hour (BCD) |
| 20A3 | Not used |
| 20A4 | Forwarding start date and time Day (BCD) |
| 20A5 | Forwarding start date and time Month (BCD) |
| 20A6 | Forwarding start date and time Year (BCD) |
| 20A7 | Forwarding end date and time Minute (BCD) |
| 20A8 | Forwarding end date and time Hour (BCD) |
| 20A9 | Not used |

| Address (Hex) | Function | | |
|---|---|---|---|
| 20AA | Forwarding end date and time | Day (BCD) | |
| 20AB | Forwarding end date and time | Month (BCD) | |
| 20AC | Forwarding end date and time | Year (BCD) | |
| 20AD - 226E | TCR generation area (30 bytes x 15 communications) | | |
| 2272 - 2433 | Service report and error report generation area (45 bytes x 10 communications) | | |
| 2438 - 24F7 | Error code memory (up to 32 codes x 6 bytes) | | |
| 2736 - 2737 | Polling ID code | Example: ABCD | 2736 (High) = A, (Low) = B<br>2737 (High) = C, (Low) = D |
| 2A7B | Received page counter (BCD) | High: Tens digit | Low: Units digit |
| 2A7C | | High: Thousands digit | Low: Hundreds digit |
| 2A7D | | High: Hundred thousands digit | Low: Ten thousands digit |
| 2A7E - 2A80 | Transmitted page counter | (Refer to the received page counter) | |
| 2A81 | Printed page counter (BCD) | High: Tens digit | Low: Units digit |
| 2A82 | | High: Thousands digit | Low: Hundreds digit |
| 2A83 | | High: Hundred thousands digit | Low: Ten thousands digit |
| 2A84 - 2A86 | Scanned page counter | (Refer to the printed page counter) | |
| 5002 - 5100 | Modem rates used in the last five communications to the terminals programmed in the Quick/Speed dials and to the forwarding terminal. (5 bytes x 51 destinations)<br>[0: No history, 1: 2400 bps, 2: 4800 bps, 3: 7200 bps, 4: 9600 bps] | | |
| 5101 | Number of characters in the RTI - 14 (H) | | |
| 5102 - 5115 | RTI (ASCII) | | |
| 5116 | Number of characters in the CSI - 14 (H) | | |
| 5117 - 512A | CSI (ASCII) | | |
| 512B | Number of characters in the TTI - 20(H) | | |
| 512C - 514B | TTI (ASCII) | | |
| 514C | Number of digits in the forwarding terminal's telephone number | | |
| 514D - 516C | Forwarding terminal's telephone number (ASCII) | | |
| 63F6 | Continuous silent period detection time in TAM mode indicated on the LCD [Time = N (s)].<br>See Note 4. | | |
| 6408 | AVM language in AUTO and TAM modes.<br>1(D): English 2(D): German 3(D): Dutch 4(D): French | | |
| 6409 | Second AVM language in AUTO and TAM modes. (Same as above) | | |
| ROM Version •<br>The following addresses are ROM addresses. The data in these addresses cannot be changed. | | | |
| C00C | Version (High) | (ASCII) | |
| C00D | A period " . " | (ASCII) | |
| C00E | Version (Low) | (ASCII) | |
| C00F | Version (Low) | (ASCII) | |
| C010 | A blank space " " | (ASCII) | |
| C011 | Day (Tens digit) | (ASCII) | |
| C012 | Day (Units digit) | (ASCII) | |
| C013 | A period " . " | (ASCII) | |
| C014 | Month (Tens digit) | (ASCII) | |
| C015 | Month (Units digit) | (ASCII) | |
| C016 | A period " . " | (ASCII) | |
| C017 | Year (Tens digit) | (ASCII) | |
| C018 | Year (Units digit) | (ASCII) | |
| C019 | A blank space " " | (ASCII) | |

| Address (Hex) | Function |
|---|---|
| C01A | Hour (Tens digit) (ASCII) |
| C01B | Hour (Units digit) (ASCII) |
| C01C | A colon ":" (ASCII) |
| C01D | Minute (Tens digit) (ASCII) |
| C01E | Minute (Units digit) (ASCII) |
| C01F | A blank space " " (ASCII) |
| C020 | Suffix (ASCII) |
| C021 | Machine code 13 (H) - FAX 220/240 |

**Notes:**

1. This bit only changes the language displayed on the LCD. The report language cannot be changed.
2. Forwarding requires the following switches and data.

| ON/OFF Bit 2 of 0009 (H) | Mode Bit 1 of 0009 (H) | Start Date and Time 20A1 - 20A6 (H) | End Date and Time 20A7 - 20AC (H) |
|---|---|---|---|
| OFF (0) | | | |
| ON (1) | NOW (0) | Current date and time is stored. | End time and date is stored here (user programmable). If "UNDEFINED" is selected, the start date and time is copied here. |
| | LATER (0) | Start date and time is stored here (user programmable). | |
| | DAILY (1) | The daily start time is stored here. | The daily end time is stored here. |

3. These addresses are cleared if the power is switched off.
4. If you change RAM address 63F6, you must also change RAM address 03C9, and vice versa.

### 3-2-2. Format of the TCR and Transmission Report Generation Areas

The TCR and the Transmission Report are generated in addresses 20AD - 226E (H). The record of each communication is stored in blocks of 30 bytes as explained in the following table.

| Byte No. | Functions |
|---|---|
| 0 | Header Bit 7: Transmission Report (1: Enabled)<br>Bit 6: TCR (1: Enabled)<br>Bits 5 through 0: Not used |
| 1 | Communication start time Month (BCD) |
| 2 | Communication start time Day (BCD) |
| 3 | Communication start time Hour (BCD) |
| 4 | Communication start time Minute (BCD) |
| 5 - 24 | Remote terminal's RTI, TSI or CSI (ASCII) |
| 25 | Communication mode<br>Bit 7: Resolution step down (1: Yes)<br>Bit 6: Reduction (1: Yes)<br>Bit 5: 0: Standard 0: Fine 1: Detail 1: Not used<br>4 0 1 0 1<br>Bit 3: Forwarding (1: On)<br>Bit 2: Memory tx/rx (1: Yes)<br>Bit 1: ECM (0: Non-ECM, 1: ECM)<br>Bit 0: Tx or Rx (0: Rx, 1: Tx) |
| 26 | Communication time Minutes (BCD) |
| 27 | Communication time Seconds (BCD) |
| 28 | Communication result and causes of error<br>Bit 7: Result (0: OK, 1: Error)<br>Bit 6: Document jam (1: Yes)<br>Bit 5: Authorized reception (0: Not rejected, 1: Rejected)<br>Bit 4: Not used<br>Bit 3 - 0: Cause of error (BCD)<br>7 (BCD): Not used<br>6 (BCD):<br>5 (BCD): 8 minutes close<br>4 (BCD): Busy<br>3 (BCD): T1 time over during a telephone call<br>2 (BCD): T1 time over during a fax call<br>1 (BCD): Errors during fax communication<br>0 (BCD): No error |
| 29 | Total page(s) (BCD) |

### 3-2-3. Format of the Service Report and Error Report Generation Area

The Service Report and the Error Report are generated in addresses 2272 - 2433 (H). The record of each error communication is stored in blocks of 45 bytes as explained in the following table. There can be up to 10 records.

| Byte No. | Functions |
|---|---|
| 0 | Header Bit 7: Service Report or Error Report (1: Enabled)<br>Bit 6 through 0: Not used |
| 1 - 29 | Same as the TCR memory |
| 30 | Error page #1 (BCD) |
| 31 | Error page #2 (BCD) |
| 32 | Error page #3 (BCD) |
| 33 | Error page #4 (BCD) |
| 34 | Error page #5 (BCD) |
| 35 | Error code #1 (High) (BCD) |
| 36 | Error code #1 (Low) (BCD) |
| 37 | Error code #2 (High) (BCD) |
| 38 | Error code #2 (Low) (BCD) |
| 39 | Error code #3 (High) (BCD) |
| 40 | Error code #3 (Low) (BCD) |
| 41 | Error code #4 (High) (BCD) |
| 42 | Error code #4 (Low) (BCD) |
| 43 | Error code #5 (High) (BCD) |
| 44 | Error code #5 (Low) (BCD) |

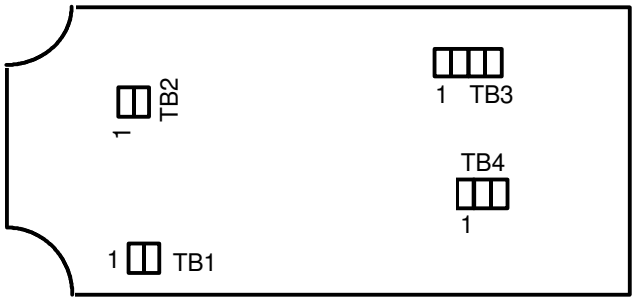
### 3-2-4. Format of the Error Code Memory

The error codes are stored in 2438 - 24F7 (H). Each error code is stored in blocks of 6 bytes as explained in the following table. The machine can store up to 32 error codes.

| Byte No. | Functions |
|---|---|
| 0 | Error code (High) (BCD) |
| 1 | Error code (Low) (BCD) |
| 2 | Month (BCD) |
| 3 | Day (BCD) |
| 4 | Hour (BCD) |
| 5 | Minute (BCD) |

## 3-3. JUMPERS

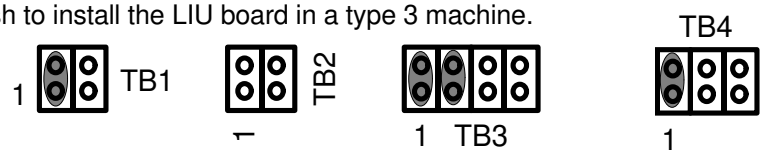
**LIU**



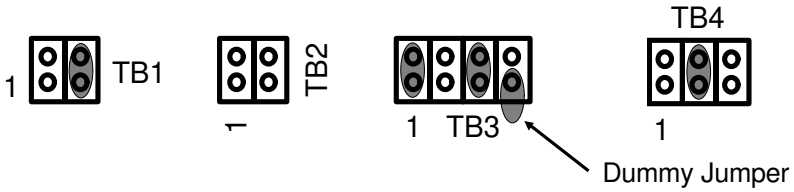

The jumper wires are set as shown below in the factory for each version.

**WARNING:** Service parts for types 1, 4, and 6 are set to type 6, and service parts for types 2 and 3 are set to type 2. When installing a new LIU, make sure that it is at the correct setting for the machine. Also, note that the LIU for type 2 has a dummy jumper on pin 4 of TB3; this is a spare jumper for use if you wish to install the LIU board in a type 3 machine.

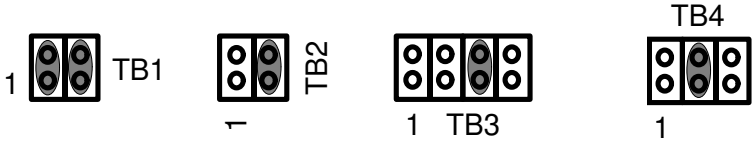
H501/502-50 (Type 1)



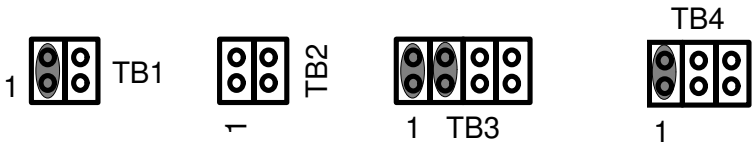

H501/502-51 (Type 2)



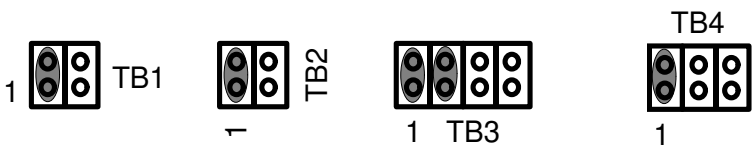

H501/502-52 (Type 3)



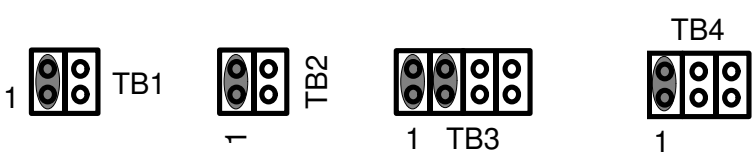

H501/502-53 (Type 4)




H501/502-54 (Type 5)




H501/502-55 (Type 6)



## 3-4. VARIABLE RESISTORS AND SWITCHES

| PCB | Address | Function |
|---|---|---|
| LIU | VR1 | Ringer volume adjustment (user adjustable) |
| | VR2 | Speaker volume adjustment (user adjustable) |
| | VR3 | DTMF signal Tx level adjustment |
| | SW1 | GS/FS select switch (not used) |
| PSU | S001 | A thermostat; this switches the power off automatically when the temperature goes higher than 95 ± 5 °C, and recovers after switching the power switch off and on |

## 3-5. SENSORS

| No. | Name | Function |
|---|---|---|
| SB-1 | Document Sensor | Detects whether a document is placed in the feeder or not. The 58th bit on the SBU is used as this sensor. |
| SB-2 | Scan Line Sensor | Detects when the top of a page is at the scan line position. The 4th bit on the SBU is used as this sensor. |
| SB-4 | Paper End Sensor | Detects whether paper is in the paper holder or not. |
| SB-5 | Paper Jam Sensor | Detects whether paper is jammed in the printer or not. |
| SB-7 | Cutter Start Sensor | Detects whether the cutter blade is at the home (start) position or not. |
| SB-8 | Cutter End Sensor | Detects whether the cutter blade is at the end position or not. If the cutter blade is detected at the cutter end position, the cutter motor reverses to move the blade to the cutter start position. |
| SB-10 | Cover Sensor | Detects whether the printer cover is closed or not. |

# 4. REMOVAL AND ADJUSTMENT

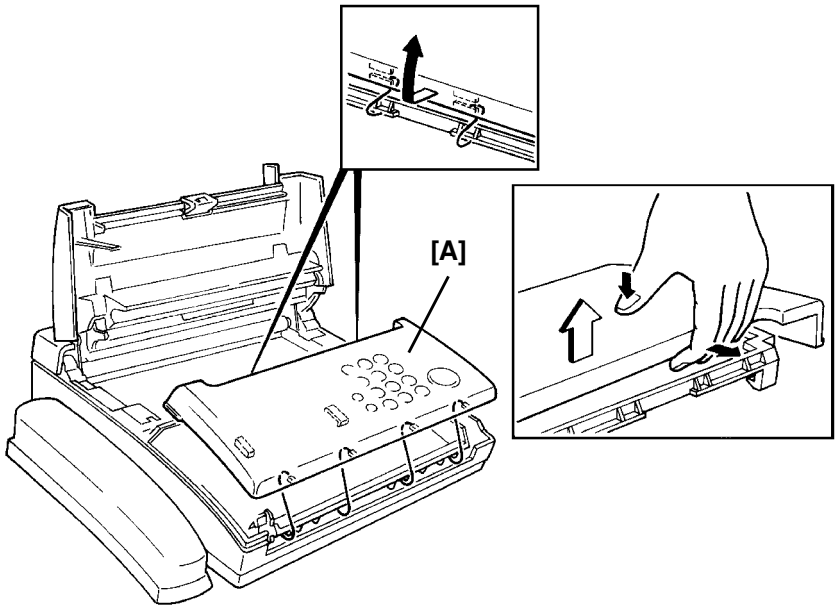
**CAUTION**

**1.Unplug the machine from the power outlet before removing any of the covers.**
**2. The danger of explosion exists if the lithium battery on the FDU is incorrectly replaced. Replace only with the same or an equivalent type recommended by the manufacturer. Discard used batteries in accordance with the manufacturer's instructions.**

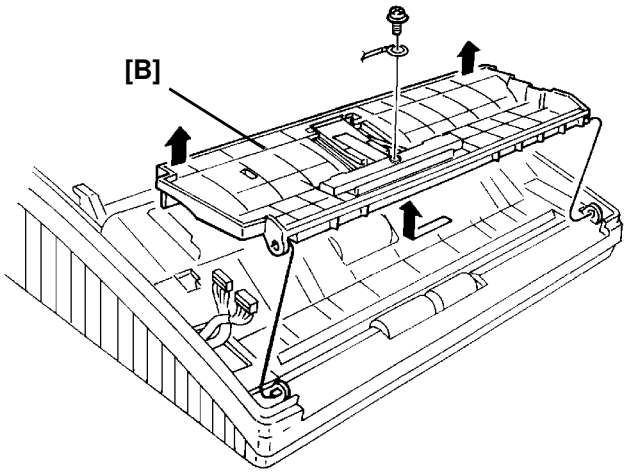
## 4-1. COVERS

### 4-1-1. Operation Panel Assembly

1. Open the ADF.
2. Remove the operation panel cover [A] as shown below.

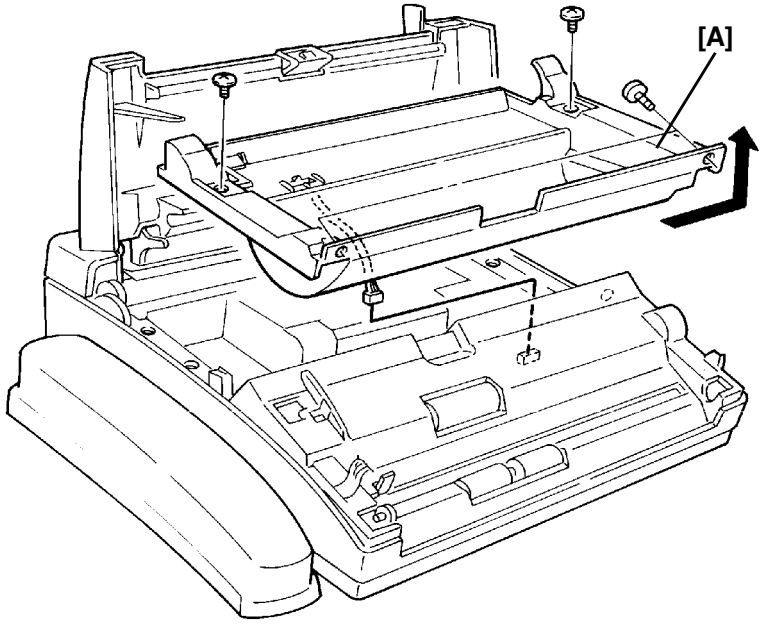



3. Disconnect three connectors.
4. Remove the lower cover [B] (1 ground wire).

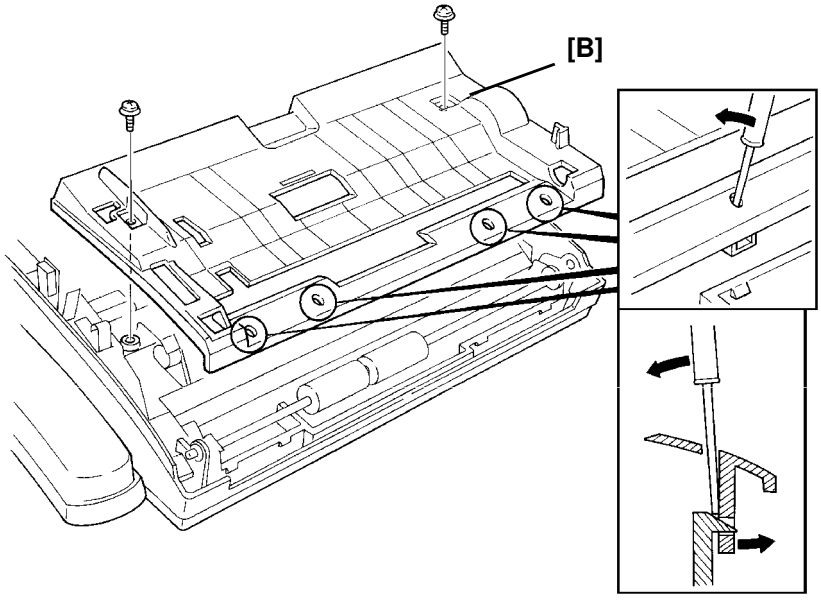


### 4-1-2. Paper Holder and Scanner Cover

1. Open the printer cover.
2. Remove the paper holder [A] (4 screws, 1 connector).




3. Remove the operation panel assembly (see section 4-1-1).
4. Remove the scanner cover [B] with a screwdriver as shown below (2 screws).

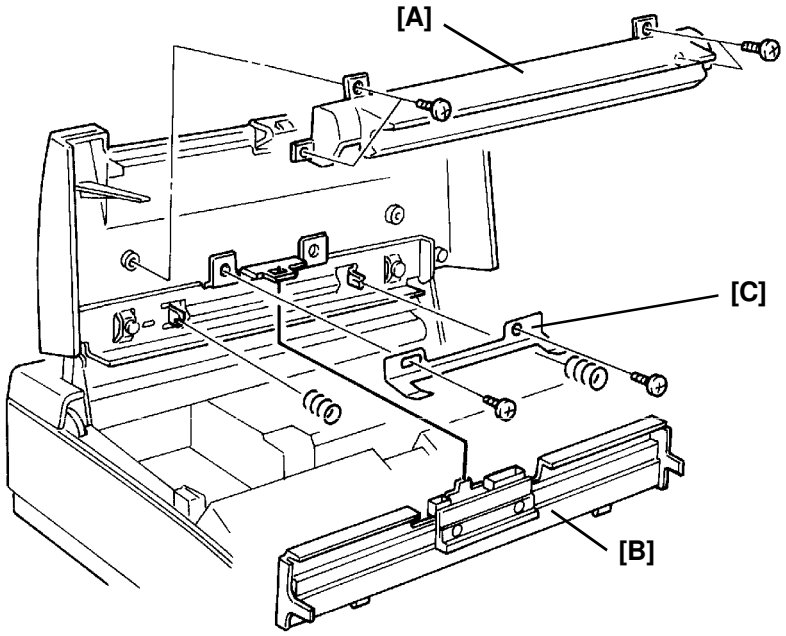


### 4-1-3. Thermal Head and Printer Cover

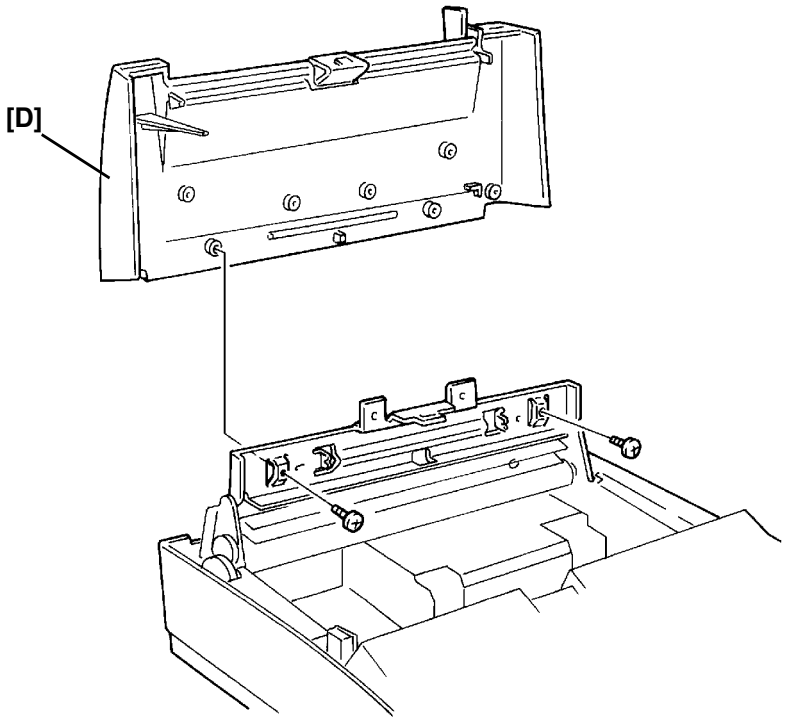
1. Open the printer cover.
2. Remove the thermal head cover [A] (4 screws).
3. Remove the thermal head [B] and the spring plate [C] (2 connectors, 2 springs, 2 screws).

**Reassembly Note**

- The dents on the thermal head bracket must fit into the slots on the thermal head.



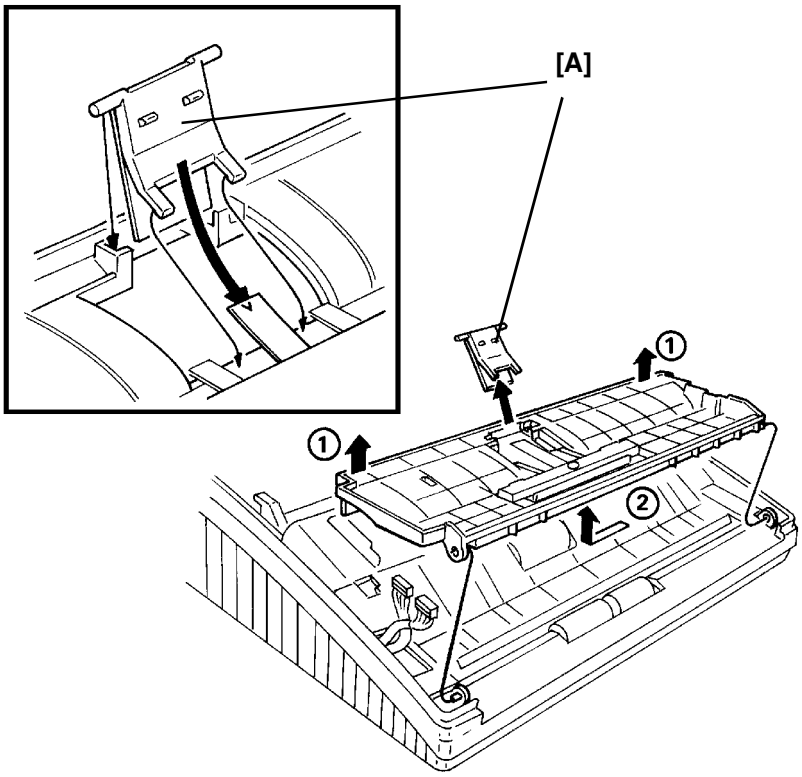

4. Remove the printer cover [D] (2 screws).



## 4-2. SCANNER

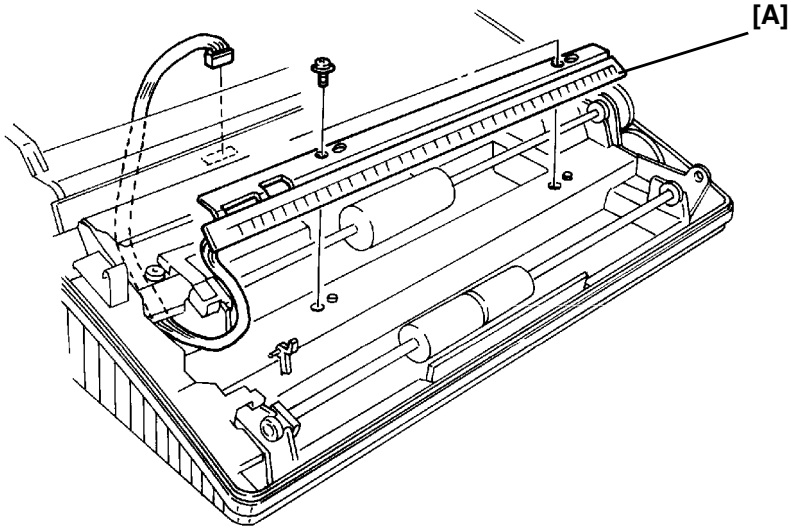
### 4-2-1. Separation Rubber Plate

1. Remove the operation panel assembly (see section 4-1-1).
2. Remove the rubber plate [A].




### 4-2-2. LED Array

1. Remove the operation panel assembly, the paper holder and the scanner cover (see section 4-1).
2. Remove the LED array [A] (2 screws, 1 connector).

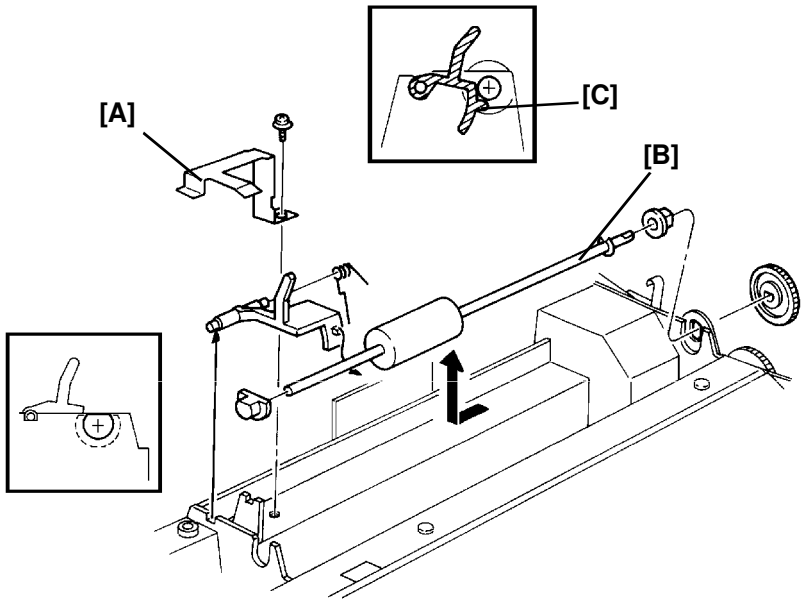


### 4-2-3. Feed Roller

1. Remove the operation panel assembly, the paper holder and the scanner cover (see section 4-1).
2. Remove the metal bracket [A] (1 screw).
3. Remove the feed roller [B].

**Note for Reassembly**

- Pin [C] on the document sensor actuator must be under the feed roller shaft.

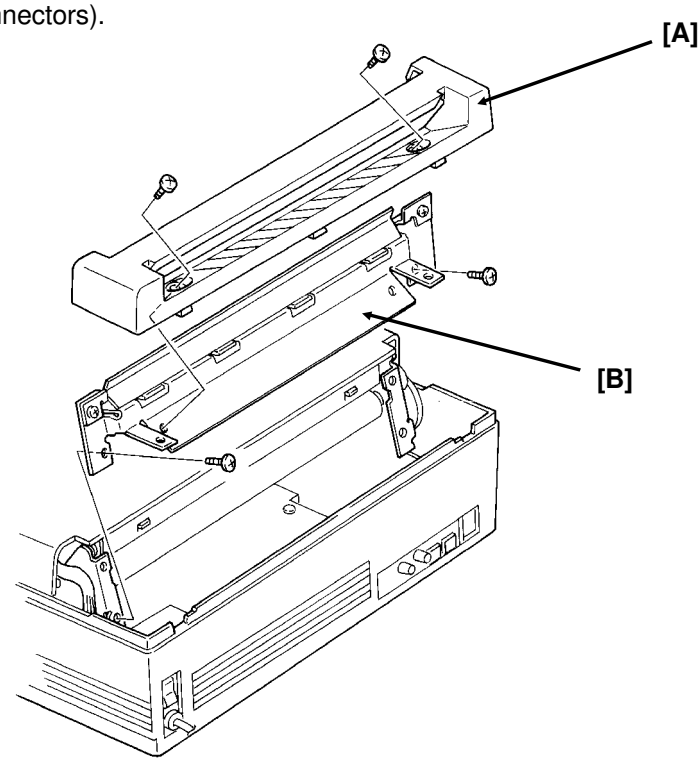


## 4-3. PRINTER

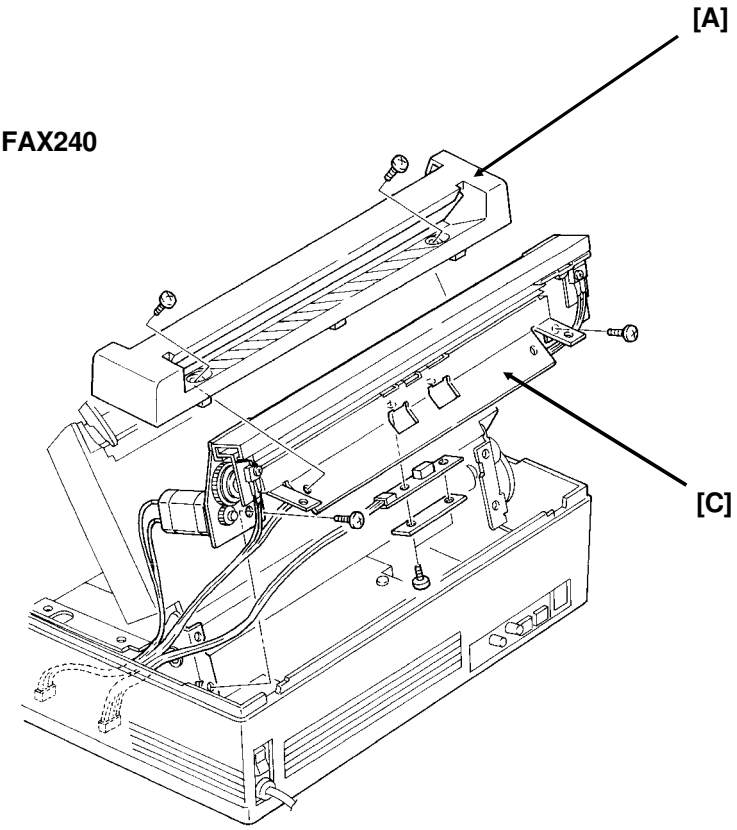
### 4-3-1. Rear Cover, Cutter Unit (FAX240 only), and Platen Roller

1. Remove the rear cover [A] (2 screws).
2. Remove the paper guide bracket [B] (FAX220), or the paper holder and the cutter unit [C] (FAX240) (4 screws, 2 connectors).

**FAX220**



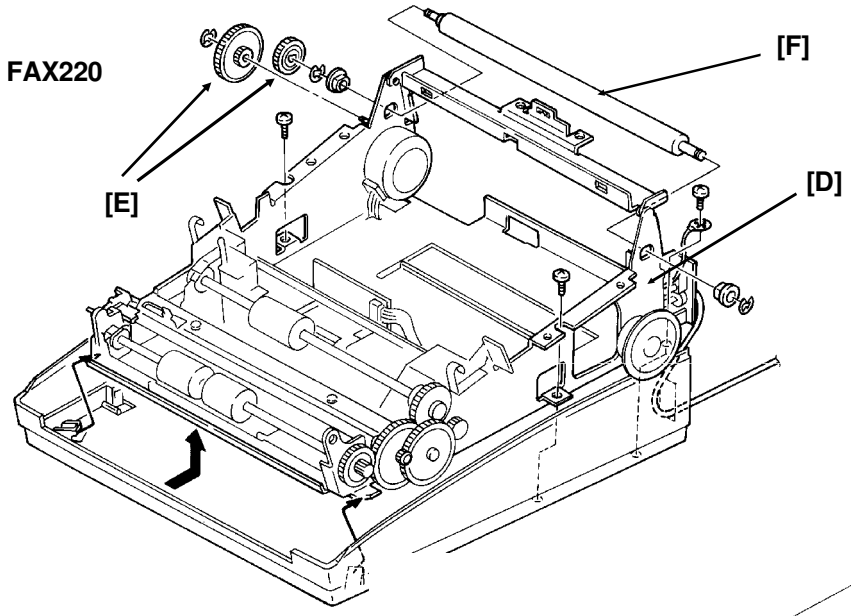

**FAX240**

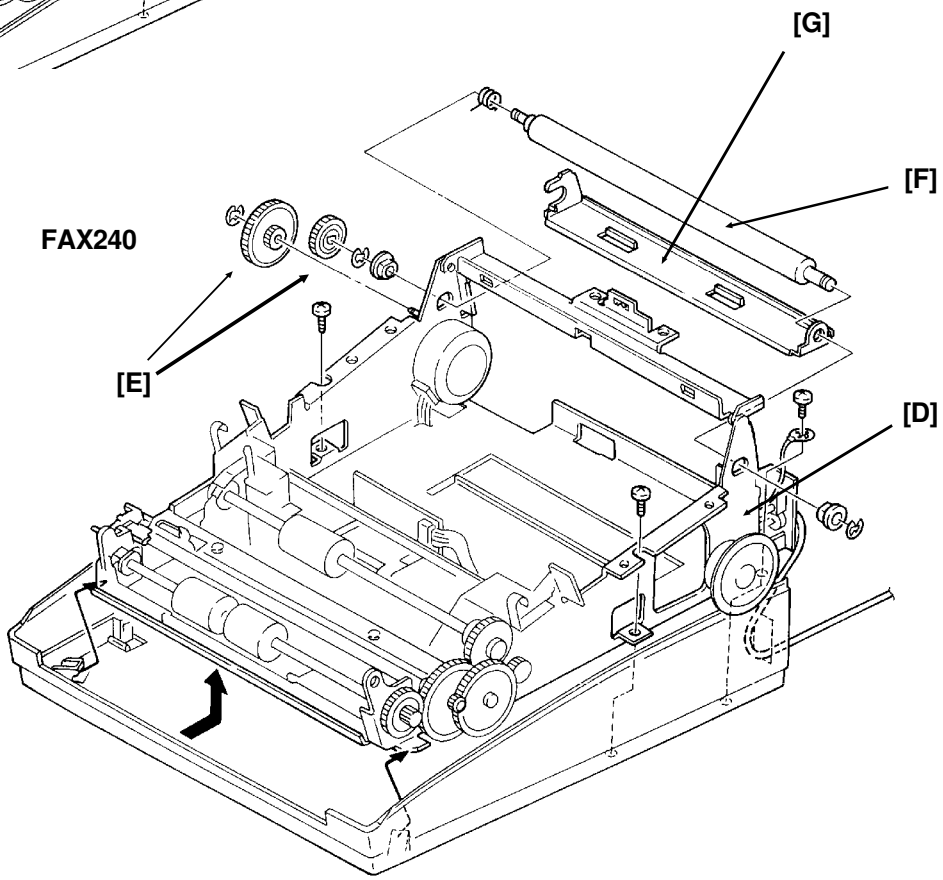


3. Remove the FCE, FDU, PSU and LIU (see section 4-4).
4. Remove the mono-chassis [D] (2 screws, 1 ground wire).
5. Remove two gears [E] (1 E-ring).
6. FAX220: Remove the platen roller [F] (2 E-rings, 2 bushings).
   FAX240: Remove the decurler bracket [G] and platen roller [F] (2 E-rings, 2 bushings, 1 spring).

**Reassembly Note**

- Be careful not to assemble the gears the wrong way round.
- The left platen roller bushing is smaller than right bushing.
- FAX240: Lubricate the left shaft of the platen roller all the way round after changing the platen roller or the spring clutch for the decurler (Use Mobil Temp 78, part no. 54479078).

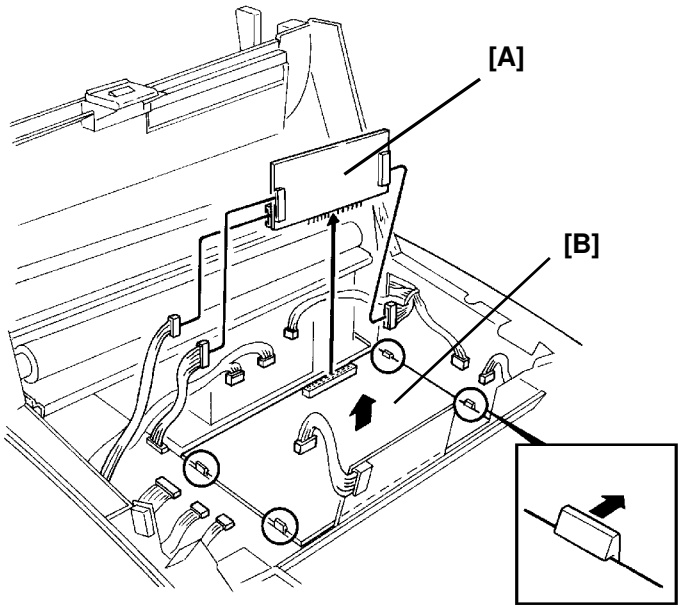


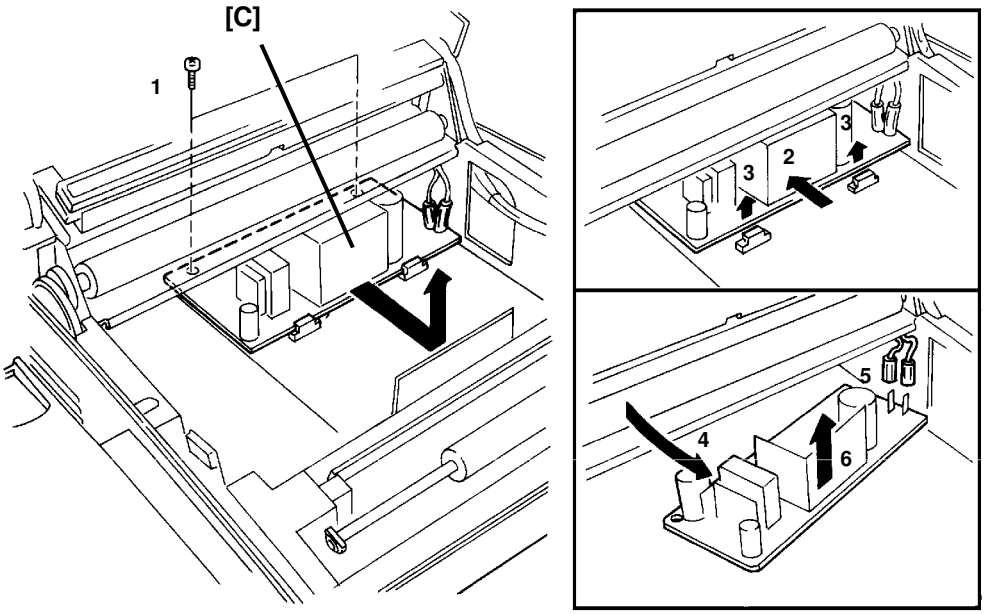
## 4-4. PCBs

### 4-4-1. FCE, FDU, and PSU

1. Remove the paper holder (see section 4-1-2).
2. Remove the FCE [A] (3 connectors).
3. Remove the FDU [B] (9 connectors).

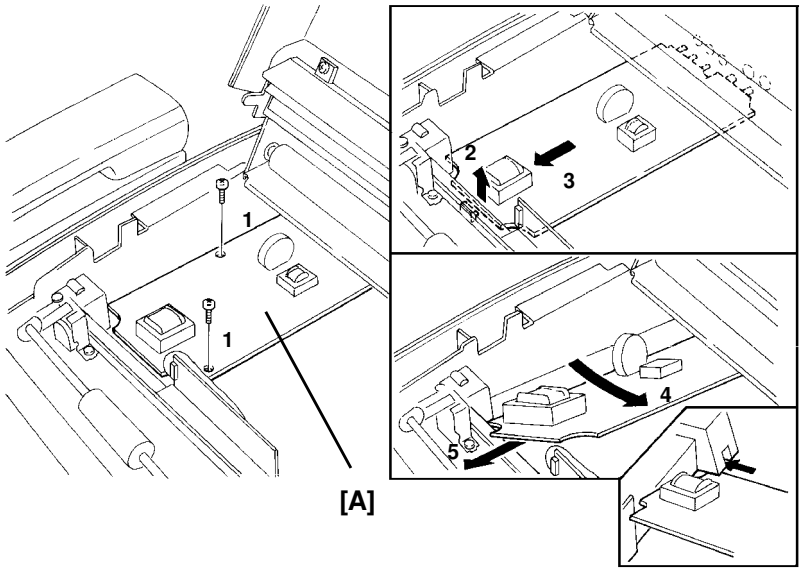



4. Remove the rear cover (2 screws).
5. Remove the PSU [C] (2 connectors).



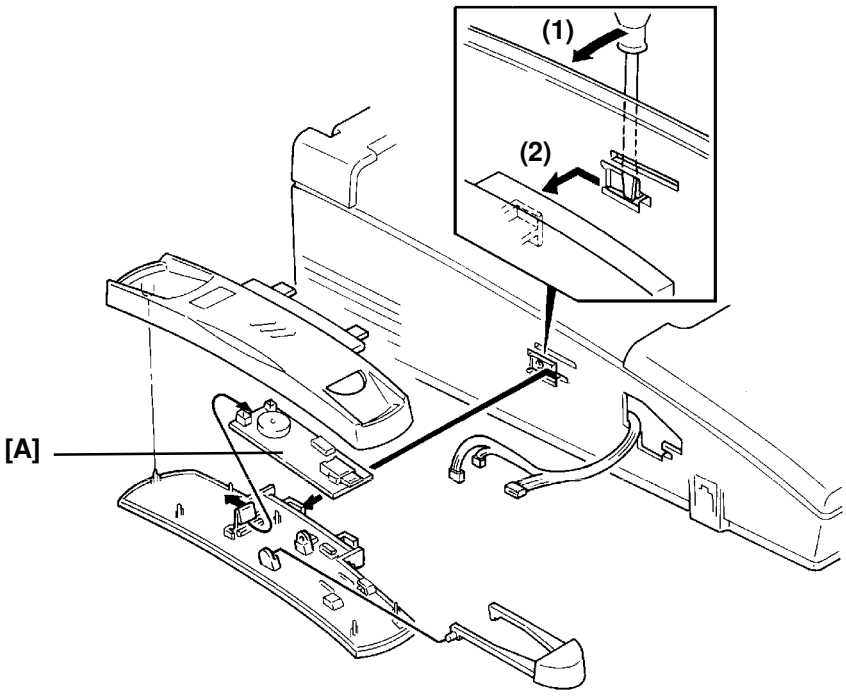
### 4-4-2. LIU

1. Remove the paper holder and the scanner cover (see section 4-1-2).
2. Remove the LIU [A] (2 screws, 6 connectors).



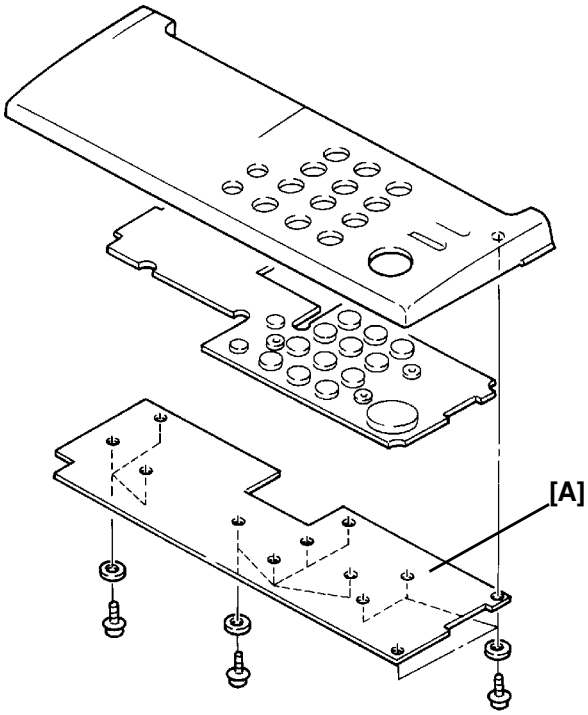

### 4-4-3. HSB

1. Remove the paper holder (see section 4-1).
2. Remove the cradle unit as shown below.
3. Remove the HSB [A] (3 connectors).



### 4-4-4. OPU

1. Remove the operation panel cover (see section 4-1-1).
2. Remove the OPU [A].



## 4-5. SBU REPLACEMENT AND SCANNER/SENSOR ADJUSTMENT

### 4-5-1. SBU Adjustment Tools

1. Adjustment Kit (P/No. H0809600)
2. Test PCB (P/No. H0939650)

Additionally, the test chart which is included in the adjustment kit is available as part number H0809602.

### 4-5-2. SBU Replacement

1. Unplug the machine from the wall outlet.
2. Remove the printer cover, operation panel assembly, and scanner cover (see sections 2-1 and 2-3).
3. Remove the SBU (2 screws, 1 connector at CN7 on the FDU).

### 4-5-3. Scanner/Sensor Adjustment

Every time you replace the SBU or when the machine has a document non-feed or jam problem because of incorrect scanner/sensor adjustment, adjust the scanner/sensor mechanism as shown in the following pages.

As the scanner has 2 features, scanning document and detecting sensor actuator movement, the scanner needs exact adjustment. Refer to Appendix D for more details on the scanner/sensor mechanism.

This section is divided into 4 parts:

1. Preparation
2. Horizontal Scan Line Adjustment
3. Vertical Scan Line Adjustment
4. Focusing

**"Preparation"** explains how to set up the SBU adjustment tools in the machine.

**"Horizontal Scan Line Adjustment "** explains how to adjust the horizontal position of the SBU with the tools. This section is quite important because the machine cannot detect sensor movement unless the SBU is adjusted properly.

**"Vertical Scan Line Adjustment "** explains how to adjust the vertical position of the SBU with the tools. The new test chart is designed so that the SBU can be adjusted vertically.

**"Focusing"** explains how to adjust focusing on the CCD. Adjusting the lens position is a bit more difficult than for other current models.

## 1. Preparation

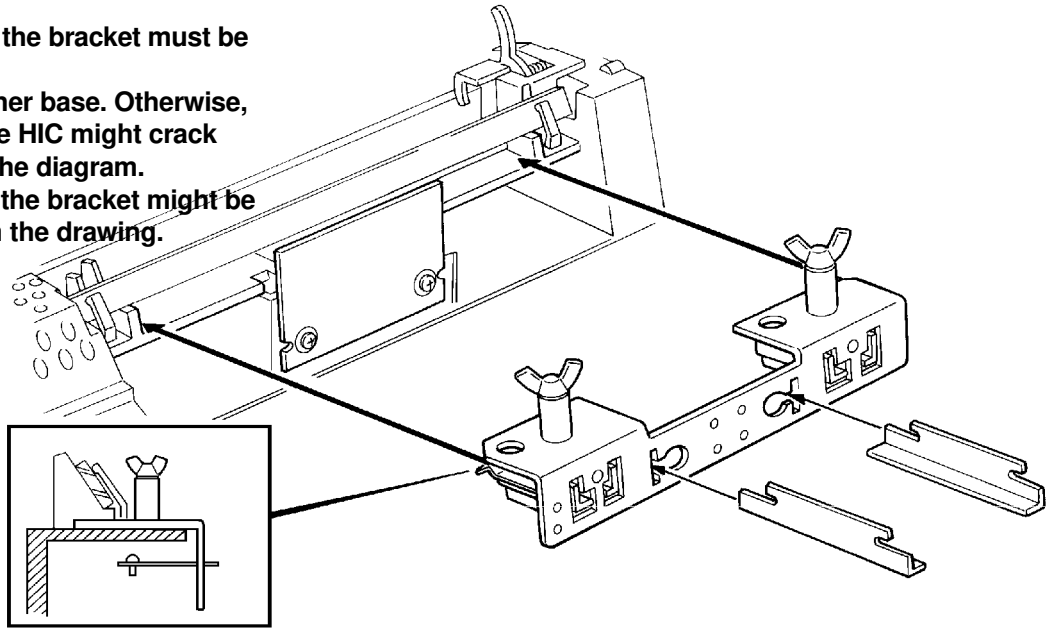
1. Install a new SBU in the machine. (Do not connect the harness to the FDU.)

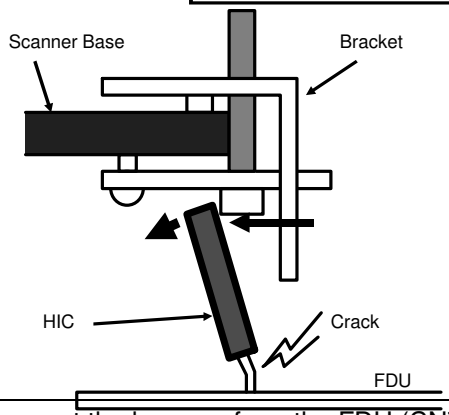
2. Clamp the bracket to the scanner base. Set the left side of the bracket first as shown below.

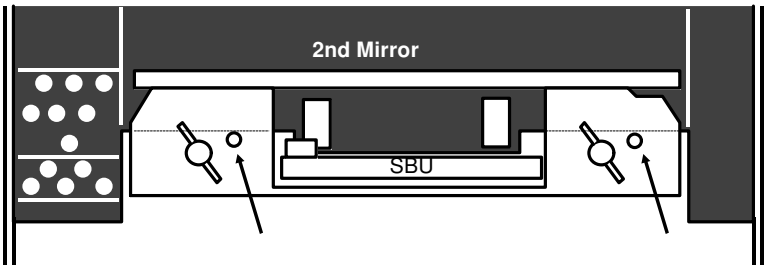
**Notes:**

**1. The dents on the bracket must be fit to the edge of scanner base. Otherwise, the pins of the HIC might crack as shown in the diagram.**

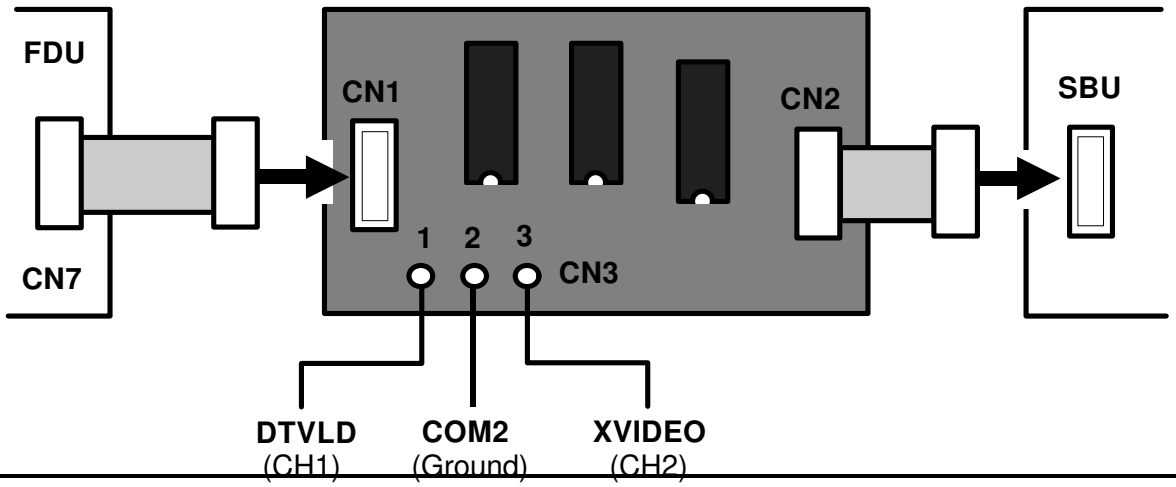
**2. The shape of the bracket might be different from the drawing.**





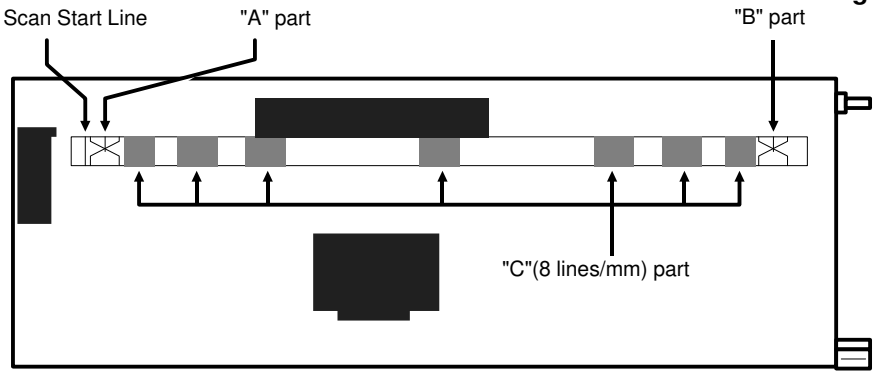



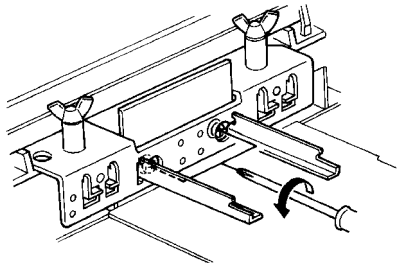

3. Connect the harness from the FDU (CN7) to CN2 on the test PCB, then connect the harness from the test PCB to the SBU.



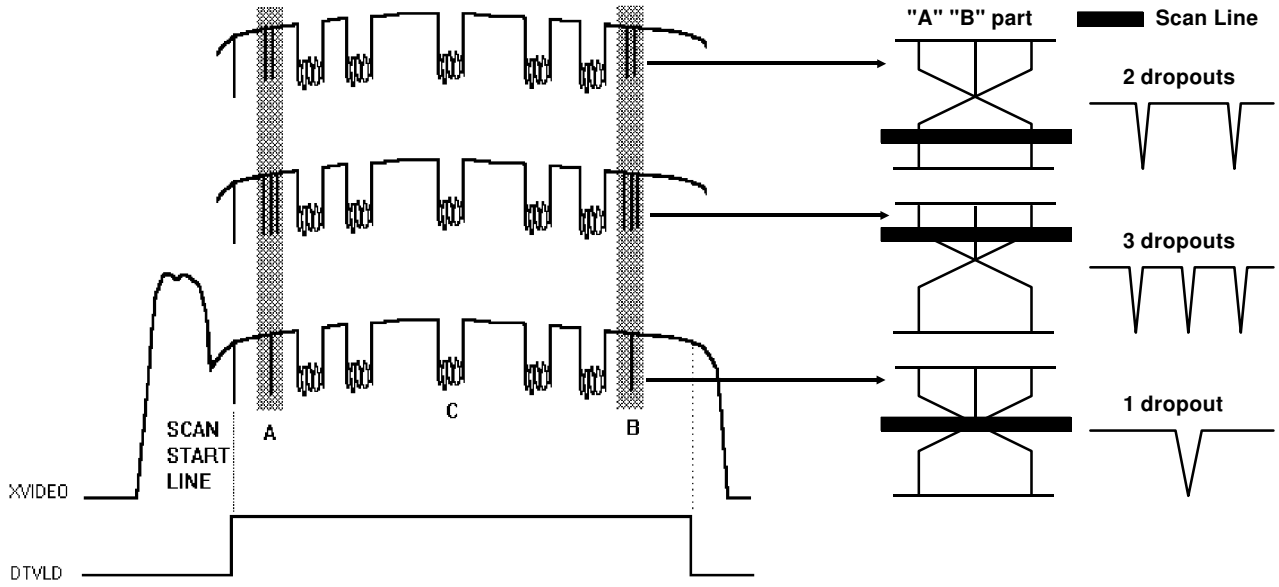
**1. Preparation**

4. Connect the test pins to the oscilloscope as follows:
   Pin 1 (DTVLD) - Channel 1 (CH1) on the oscilloscope
   Pin 2 (COM2) - Ground
   Pin 3 (XVIDEO) - Channel 2 (CH2) on the oscilloscope
5. Attach the test chart to the machine.
6. Connect the operation panel to the machine.
7. Enter the service mode and switch the LED array on (see section 2-2-13).
8. Set up the oscilloscope as follows:
   CH2 (XVIDEO) - 0.2 V/div.
   TIME - 1 ms/div.
   Then, select CH2 (XVIDEO) on the oscilloscope.
9. The XVIDEO signal shows one of the waveforms shown below. One, two or three dropouts should appear at "A" and "B" depending on the vertical scan line position, and moire should appear at "C".
   If this waveform cannot be seen on the oscilloscope screen, loosen the SBU securing screws and adjust the SBU position until this waveform appears on the screen.
   The moire sometimes does not appear on the screen unless the lens is well focused. So, if the moire does not appear on the screen, go to the **"Focusing"** procedure first, then go to the **"Horizontal/Vertical Scan Line Adjustment"** procedures.
   If this waveform appears on the screen, go to the **"Horizontal/Vertical Scan Line Adjustment "** procedures, then check that the moire at "C" satisfies the criterion in the **"Focusing"** section.



Test Chart attached on the Pressure Plate

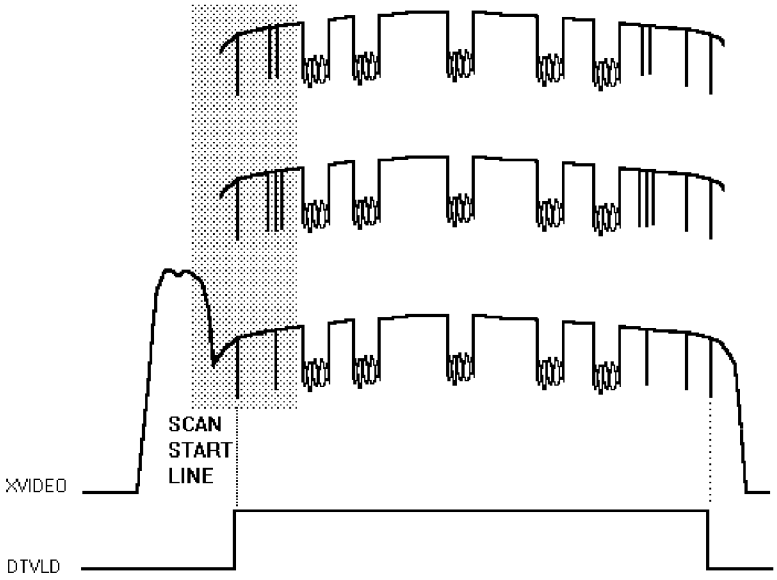


## 2. Horizontal Scan Line Adjustment

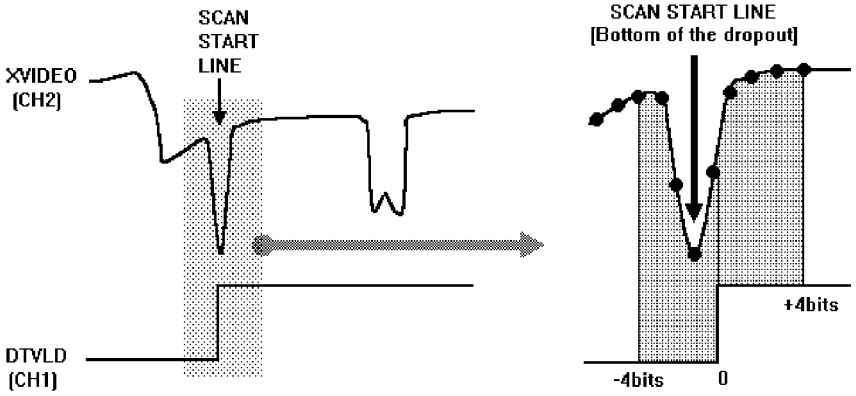
1. Set up the oscilloscope as follows:
   CH1 (DTVLD) - 5 V/div.
   CH2 (XVIDEO) - 0.2 V/div.
   TIME - 1 ms/div.
   Use ALT mode to display CH1 and CH2 at the same time.

2. Loosen the SBU securing screws.

3. The XVIDEO signal shows one of the waveforms shown below.



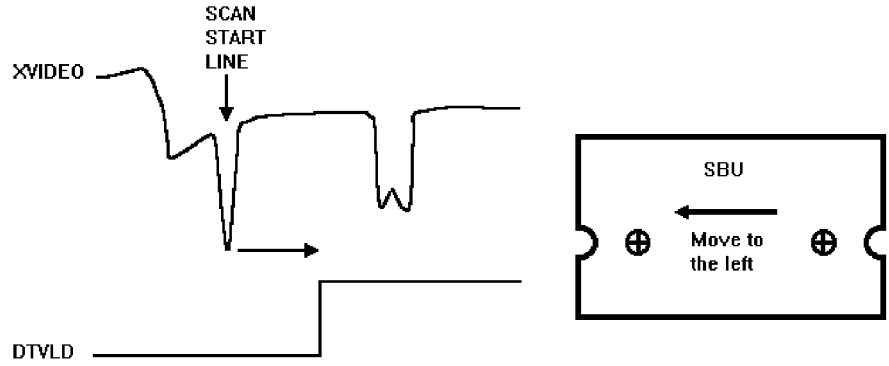

4. Enlarge the shaded part of the waveform above by changing the TIME scale to 50 µs/div or 20 µs/div.
   The scan start line appears as the first sharp dropout from the left of the XVIDEO signal on the oscilloscope. The dropout of the waveform has to be within ±4 bits from the rising edge of the DTVLD signal as shown below.



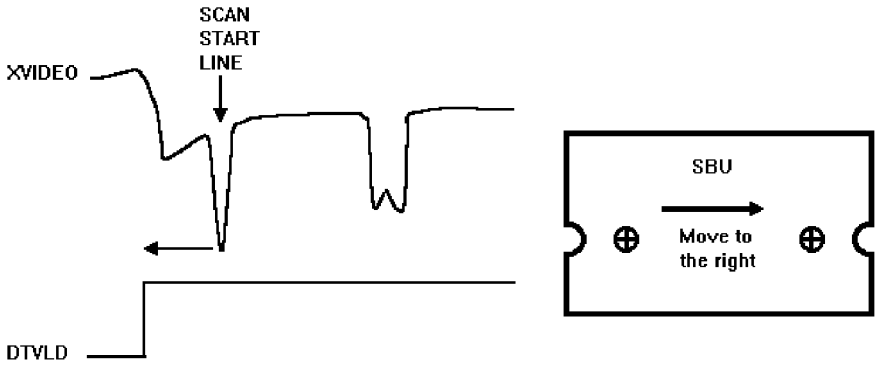

If the scan start line is not at the correct position, go to step 5 to adjust the horizontal scan line position.

## 2. Horizontal Scan Line Adjustment

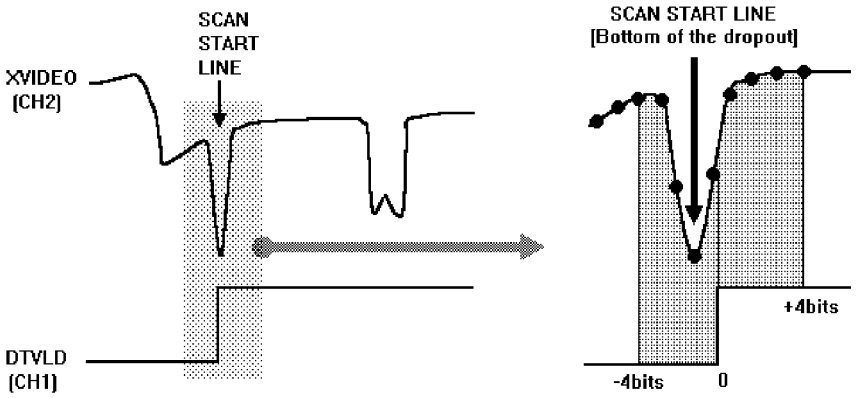
5. Adjust the horizontal scan line position as shown below.
   If the scan start line is to the left of the rising edge of the DTVLD signal, move the SBU to the left.




   If the scan start line is to the right of the rising edge of the DTVLD signal, move the SBU to the right.




6. After adjustment, be sure that the scan start line is within ± 4 bits from the rising edge of the DTVLD signal, then go to the **"Vertical Scan Line Adjustment"** procedure.

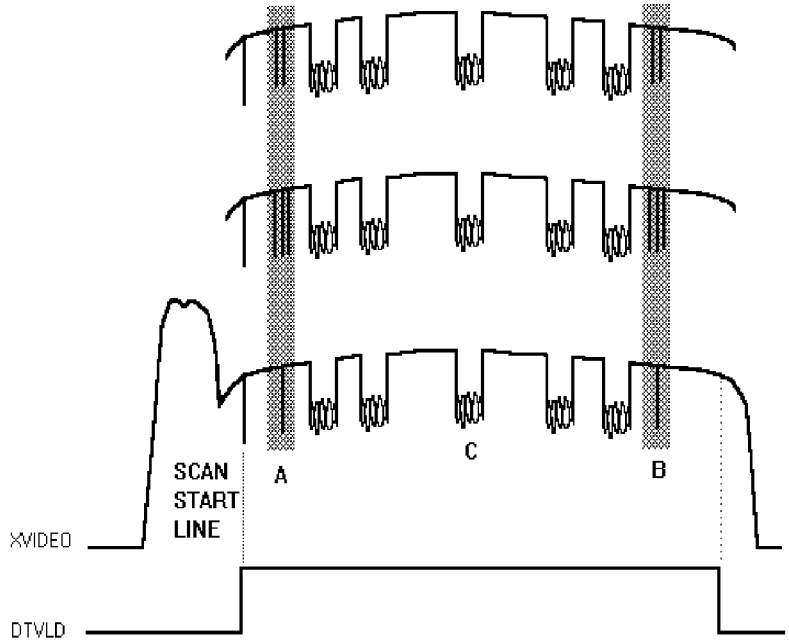



**Note:** Scan end line adjustment is not necessary.

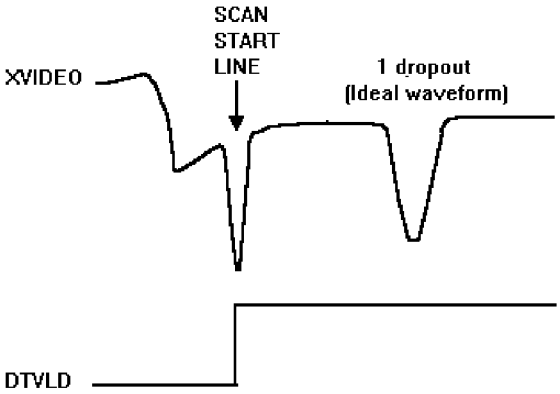
### 3. Vertical Scan Line Adjustment

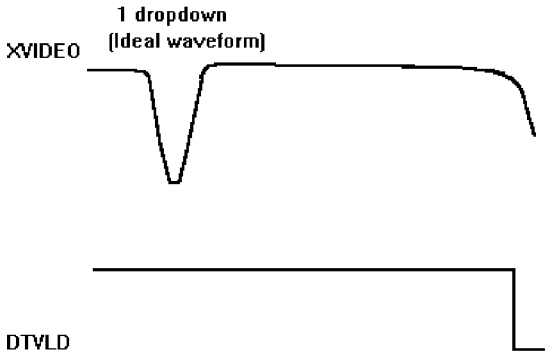
1. Set up the oscilloscope as follows:
   CH1 (DTVLD) - 5 V/div.
   CH2 (XVIDEO) - 0.2 V/div., not inverted
   TIME - 1 ms/div.
   Use ALT mode to display CH1 and CH2 at the same time.

2. The XVIDEO signal shows one of the waveforms shown below.
   At “A” and “B” on the XVIDEO waveform, one, two or three dropouts are seen now.



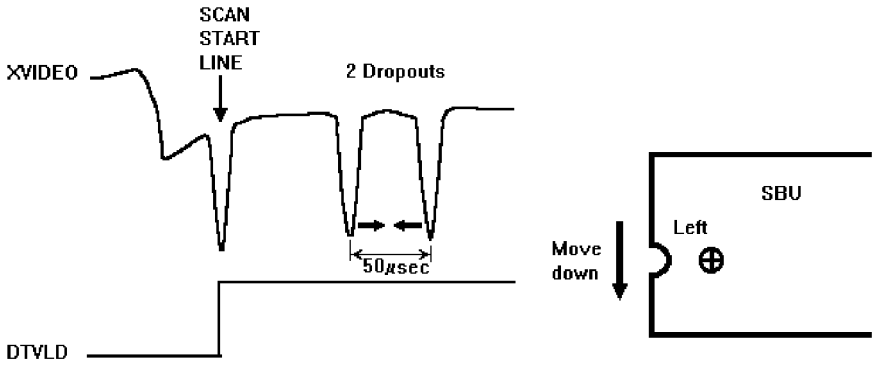

Enlarge areas “A” and “B” by changing the time scale to 50 μs/div or 20 μs/div.
The ideal waveform should have only one dropout at each of “A” and “B”. If the waveform has two or three dropouts there, go to step 3 to adjust the “A” part (scan start side) and/or step 4 to adjust the “B” part (scan end side).



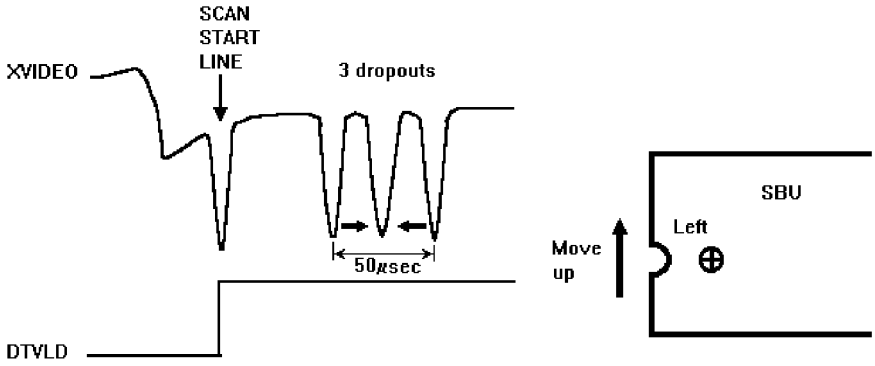



## 3. Vertical Scan Line Adjustment

3. Adjustment at the scan start side.
   If the waveform has two dropouts at the scan start side, move down the left side of the SBU to make the distance between peaks narrower. The distance between peaks has to be within 50 µs.

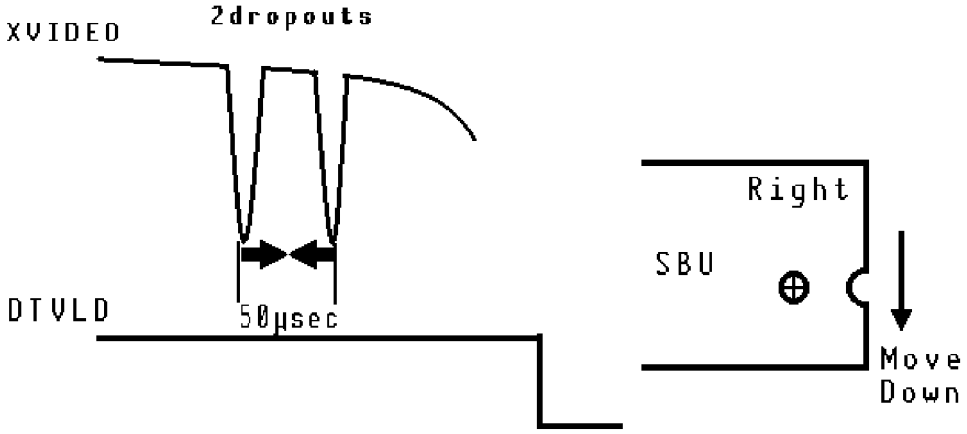



   If the waveform has three dropouts at the scan start side, move up the left side of the SBU to make the distance between peaks narrower. The distance between peaks has to be within 50 µs.

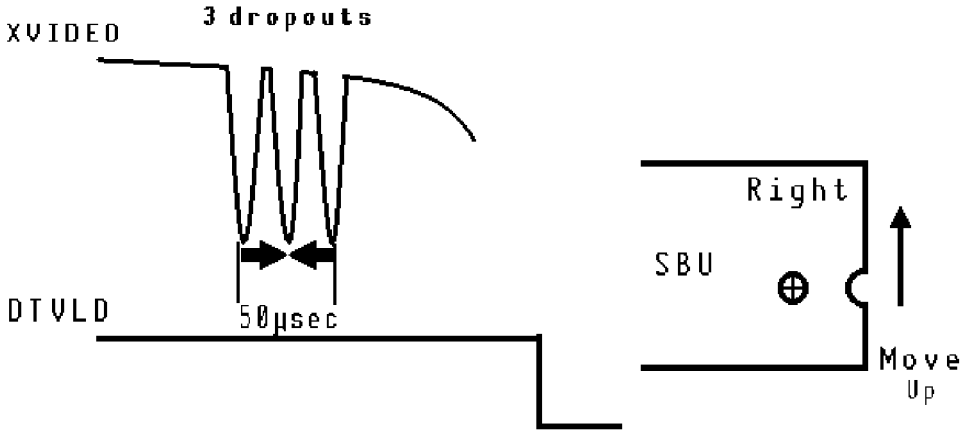


**3. Vertical Scan Line Adjustment**

4. Adjustment at the scan end side.
   If the waveform has two dropouts at the scan end side, move down the right side of the SBU to make the distance between peaks narrower. The distance between peaks has to be within 50 µs.



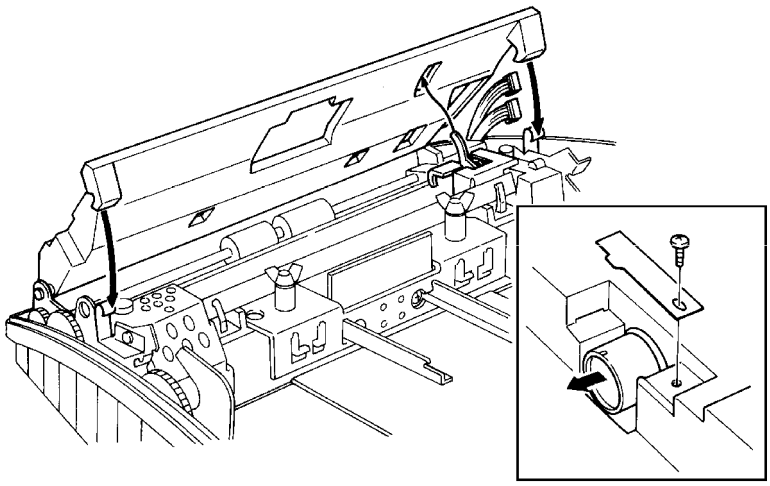

   If the waveform has three dropouts at the scan end side, move up the right side of the SBU to make the distance between peaks narrower. The distance between peaks has to be within 50 µs.



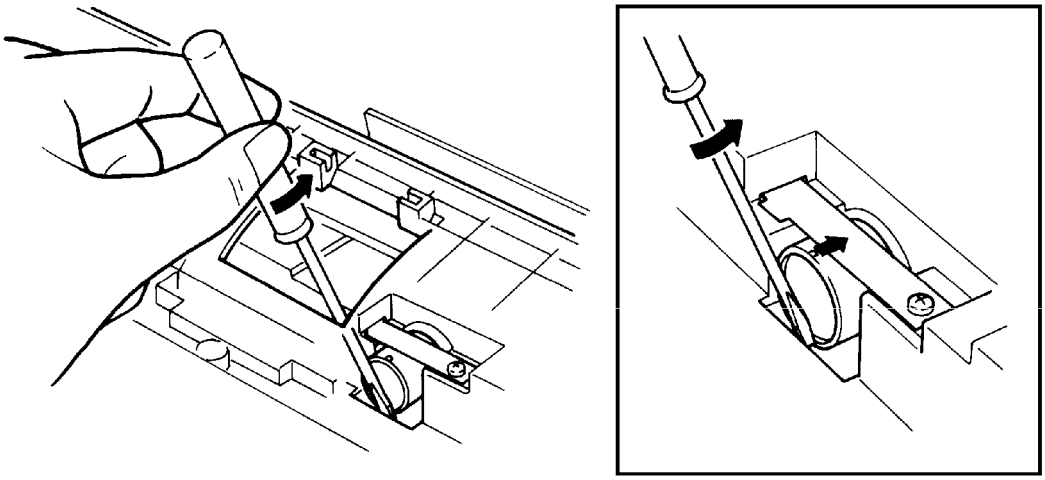

5. After adjusting the scan end side, confirm that the scan start side is still adjusted properly, as the adjustment at one side often changes the waveform at the other side.

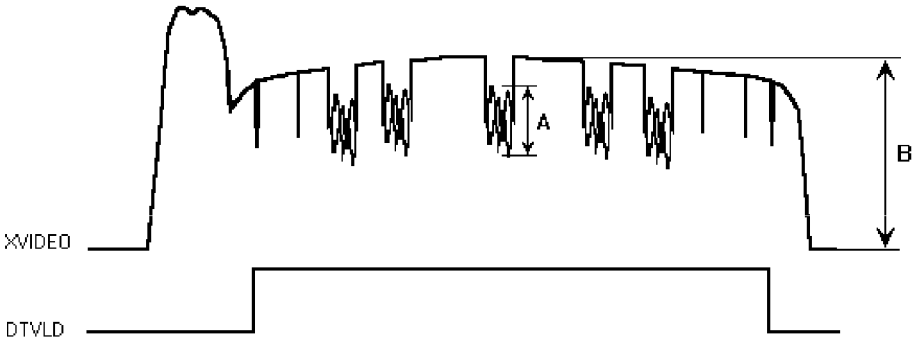
**4. Focusing**

1. Loosen the lens securing screw [A] and pull out the lens 1 or 2 mm from the scanner base surface as shown on the right.



2. Move back the lens using a small (-) screwdriver so that the amplitude of each moire [A] becomes more than 20% of the white level output [B].






3. Tighten the lens securing screw.

After finishing the adjustments, switch off the power, take out the adjustment tools, bracket, test lead and the white pressure plate from the machine. Then reassemble the machine.

# 5. TROUBLESHOOTING

## 5-1. COPY QUALITY PROBLEMS

### 5-1-1. Received Copies

If there is no fault in the receiving terminal or on the line, but the copy quality is bad, do the following:

- Check that the thermal head, platen roller and spring plate assembly are assembled completely.
- Clean the thermal head (soft cloth and alcohol).
- Replace the thermal head or FDU.

### 5-1-2. Printouts Made in Copy Mode

If printouts of received fax messages are OK but printouts made using copy mode are not, the following faults must be considered in addition to the printer faults mentioned above.

| Symptom | Remedies |
|---|---|
| Blank or black copies | • Check the scanner/sensor mechanism and adjust or replace any defective parts.<br>• Replace the SBU or FDU. |
| Vertical black lines on the copy | • Clean the scanner optics and LED array (soft cloth).<br>• Replace the SBU if there are any sharp peaks or dropouts in the CCD waveform. |
| Uneven density | • Adjust the scan line position (see section 4-5-3).<br>• Clean the scanner optics and LED array (soft cloth).<br>• Replace the LED array if it is defective. |
| Magnification | • Check that the mirrors are assembled correctly on the scanner base. |
| Blurred characters | • Adjust the focusing (see section 4-5-3). |
| Filled-in characters | • Adjust the focusing (see section 4-5-3). |
| Side-to-side registration error | • Adjust the scan start position (see section 4-5-3). |
| One side darker than the other | • Adjust the CCD waveform flatness (see section 4-5-3).<br>• Check the LED array; replace it if it is defective. |
| Image only partially scanned | • Adjust the scan line position and/or scan start position (see section 4-5-3). |

### 5-1-3. Effects of Line Problems on Copy Quality

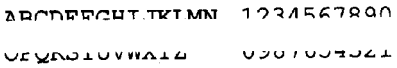
**Missing lines; shrinkage in the sub scan direction**

**- Original -**

ABCDEFGHIJKLMN 1234567890

OPQRSTUVWXYZ 0987654321

**- Bad Copy Sample -**



**Cut off**

ABCDEFGHIJKLMN 1234567890



Some lines may be missing
just before the cut off.

## 5-2. MACHINE OPERATION

Use the following procedures while referring to the point-to-point diagram and signal tables. The procedures may not be exhaustive, but they may help you to solve the problem.

### 5-2-1. Scanner/Document Feeder

**1. Non-feed**

| Test | Action if Yes | Action if No |
|---|---|---|
| 1. Is the scanner cover closed properly? | | |
| 2. Was the document placed in the feeder correctly? Was the document of a recommended type? | | |
| 3. Is the document fed into scanner after you place it in the ADF ? | Finished. | Go to test 4. |
| 4. Does the document sensor actuator move correctly. | Go to test 5. | Reassemble or replace the actuator. Go back to test 3. |
| 5. Do the two red LEDs on the left hand side of the LED array light correctly, without a document in the feeder ? | Go to step 8. | Go to step 6. |
| 6. Check the +5V output from the FDU. Is the output correct ? | Replace the LED array, then go back to test 3 | Go to step 7. |
| 7. Does the PSU output +24V? | Check the PSU-FDU connection or replace the FDU. | If the wall socket is good, replace the PSU. |

| Test | Action if Yes | Action if No |
|---|---|---|
| 8. Is the scan start line of the SBU adjusted properly? | Go to step 9. | Adjust the scan start position. |
| 9. Check the connection to the tx motor. Does the FDU both:<br>a) output +24V to the tx motor,<br>b) output stepper motor drive phase signals to the motor? | Replace the FCE. | Replace the FDU. |

**2. Double Feed**

| Test | Action if Yes | Action if No |
|---|---|---|
| 1. Was the document placed in the feeder carefully and in the correct manner? | | |
| 2. Clean or replace the separation rubber plate. | | |
| 3. Is the operation panel closed at each side ? | | |

**3. Jam**

| Test | Action if Yes | Action if No |
|---|---|---|
| 1. Check that the document is not curled seriously or not longer than 600 mm. | | |
| 2. Clean the rollers in the feeder/scanner with a soft cloth and water. | | |
| 3. Check for blockages in the document feed path. Check the scanner drive mechanism. | | |
| 4. Does the scan line sensor actuator move correctly ? | Go to test 5. | Reassemble or replace the actuator. |
| 5. Do the two red LEDs on the left hand side of the LED array light correctly, without a document in the feeder ? | Go to step 8. | Go to step 6. |
| 6. Does the FDU output +5V output correctly ? | Replace the LED array. | Go to step 7. |
| 7. Does the PSU output +24V? | Check the PSU-FDU connection or replace the FDU. | If the wall socket is good, replace the PSU. |
| 8. Does the CCD on the SBU have defective elements in the scan line sensor detection part ? | Replace the SBU. | Replace the FCE. |

**4. Skew**

| Test | Action if Yes | Action if No |
|---|---|---|
| 1. Clean the rollers in the feeder/scanner with a soft cloth and water. | | |
| 2. Clean or replace the separation rubber plate. | | |
| 3. Is the operation panel closed at each side ? | | |

**5. Dirty Document**

| Test | Action if Yes | Action if No |
|---|---|---|
| 1. Clean the rollers in the feeder/scanner with a soft cloth and water. | | |

**5-2-2. Printer**

**1. Non Feed**

| **Symptom:** Non feed | | |
|---|---|---|
| **Check** | **Action if Yes** | **Action if No** |
| 1. Is the printer jammed with debris? | Clear the debris. | Go to step 2. |
| 2. Is the printer cover closed properly? | Go to step 3. | Close the cover. |
| 3. Are the connections between the FCE, FDU, and cover sensor loose? | Connect the cables properly. | Go to step 4. |
| 4. Does the FDU switch on +24VSW when a ringing signal is detected or when Copy is pressed? | Go to step 8. | Go to step 5. |
| 5. Does the signal from the cover switch change when the cover is opened and closed? | If CLOSE PAPER COVER is not displayed when the cover is open, change the FCE. Go to step 6. | Change the cover switch and/or the actuator mechanism. |
| 6. Are the connections between the FDU, LIU, and telephone line loose? | Connect the cables properly. | Go to step 7. |
| 7. Does the FCE send the POWON signal to the FDU when a ringing signal is detected or when Copy is pressed? | Replace the PSU. | Replace the FDU or LIU. |
| 8. Are the connections between the FDU and the paper end sensor loose? | Connect the cables properly. | Go to step 9. |
| 9. Does the Replace Paper indicator light when paper is present? | Go to step 11. | Go to step 10. |
| 10. Does the signal from the paper end sensor change in the correct way? | Change the FCE. | Replace the paper end sensor. |
| 11. Are the connections between the PSU, FDU, and the rx motor loose? | Connect the cables properly. | Go to step 12. |
| 12. Does the FDU output power and phase drive signals to the rx motor? | Replace the rx motor. | Replace the FDU. |

**2. Jam**

| **Symptom:** Jam | | |
|---|---|---|
| **Check** | **Action if Yes** | **Action if No** |
| 1. Is the printer jammed with debris? | Clear the debris. | Go to step 2. |
| 2. Is the printer jam sensor good? | Go to step 5. | Go to step 3. |
| 3. Are the connections between the printer jam sensor and the FDU loose? | Connect the cables properly. | Go to step 4. |
| 4. Does the signal from the printer jam sensor change correctly? | Change the FDU. | Replace the printer jam sensor. |
| 5. Is the cutter blade at the home position after cutting (left hand side of the machine) ? | Replace the FCE. | Open the printer cover, set the paper correctly, and close the printer cover. Go to step 6. |
| 6. Does the cutter initialize itself ? | Go to step 7. | Replace the cutter unit. |
| 7. Are the connections between the FDU and the paper end sensor loose? | Connect the cables properly. | Go to step 8. |
| 8. Does the Replace Paper indicator light when paper is present? | Go to step 10. | Go to step 9. |
| 9. Does the signal from the paper end sensor change in the correct way? | Change the FDU. | Replace the paper end sensor. |
| 10. Are the connections between the PSU, FDU, and the rx motor loose? | Connect the cables properly. | Go to step 11. |
| 11. Does the FDU output power and phase drive signals to the rx motor? | Replace the rx motor. | Replace the FDU. |

| **Symptom:** Abnormal noise | | |
|---|---|---|
| **Check** | **Action if Yes** | **Action if No** |
| 1. Is the cover closed? | Go to step 2. | Close the cover. |
| 2. Are the printer mechanisms assembled correctly? | Replace the rx motor or the FDU. | Assemble the machine properly. |

## 5-3. ERROR CODES

If an error code occurs, retry the communication. If the same problem occurs, try to fix the problem as suggested below. Note that error codes 4-00, 01, 02, and 10 only appear in the error code display and on the service report.

| Code | Meaning | Suggested Cause/Action |
|---|---|---|
| 0-00 | DIS/NSF not detected within 40 s of Start being pressed | Check the line connection.<br>Check the LIU - FDU - FCE connectors.<br>The machine at other end may be incompatible.<br>Replace the FDU or LIU.<br>Check for DIS/NSF with an oscilloscope.<br>If the rx signal is weak, there may be a bad line. |
| 0-01 | DCN received unexpectedly | The other party is out of paper or has a jammed printer.<br>The other party pressed Stop during communication. |
| 0-03 | Incompatible modem at other end | The other terminal is incompatible. |
| 0-04 | CFR or FTT not received after modem training | Check the line connection.<br>Check the LIU - FDU -FCE connectors.<br>Try changing the tx level (use NCU parameter 10).<br>Replace the FCE, FDU or LIU.<br>The other terminal may be faulty; try sending to another machine.<br>If the rx signal is weak or defective, there may be a bad line. |
| 0-05 | Unsuccessful after modem training at 2400 bps | Check the line connection.<br>Check the FCE - LIU - FDU connectors.<br>Try adjusting the tx level (use NCU parameter 10).<br>Replace the FCE, FDU or LIU.<br>Check for line problems. |
| 0-06 | The other terminal did not reply to DCS | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Try adjusting the tx level (use NCU parameter 10).<br>Replace the FCE, LIU or FDU.<br>The other end may be defective or incompatible; try sending to another machine.<br>Check for line problems. |
| 0-07 | No post-message response from the other end after a page was sent (3rd try failed) | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Replace the FCE, LIU or FDU.<br>The other end may have jammed or run out of paper.<br>The other end user may have disconnected the call.<br>Check for a bad line.<br>The other end may be defective; try sending to another machine. |
| 0-08 | The other end sent RTN or PIN after receiving a page, because there were too many errors | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Replace the FCE, LIU or FDU.<br>The other end may have jammed, or run out of paper or memory space.<br>Try adjusting the tx level (use NCU parameter 10).<br>The other end may have a defective modem/NCU/FCU; try sending to another machine.<br>Check for line problems and noise. |

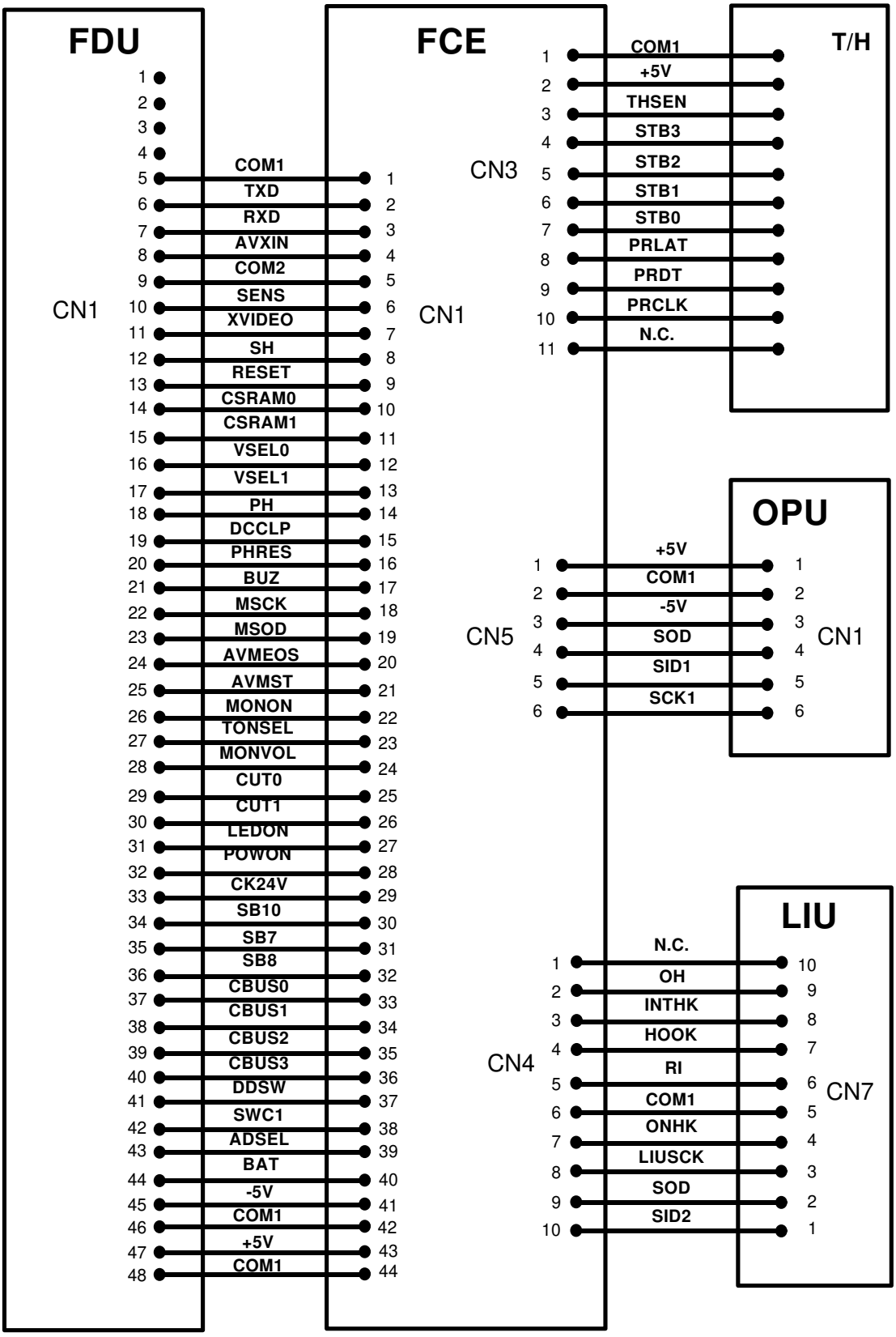
| Code | Meaning | Suggested Cause/Action |
|---|---|---|
| 0-10 | The other end did not send a reply to EOP, EOM or MPS | Check the line connection.<br>Check the FCE - FDU - LIU connection.<br>Replace the FCE, LIU or FDU.<br>Try adjusting the tx level (use NCU parameter 10).<br>The other end may have a defective modem/NCU/FCU; try sending to another machine.<br>Check for line problems and noise. |
| 0-14 | Non-standard post message response code received | Check the FCE - FDU - LIU connectors.<br>Incompatible or defective remote terminal; try sending to another machine.<br>Noisy line: resend.<br>Try adjusting the tx level (use NCU parameter 10).<br>Replace the FCE, LIU or FDU. |
| 0-20 | Facsimile data not received within 6 s of retraining | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Replace the FCE, LIU or FDU.<br>Check for line problems.<br>Try calling another fax machine.<br>Change the reconstruction time from 6 s to 10 s (bit switch 01, bit 0).<br>Switch the rx cable equalizer on (bit switch 00, bit 1). |
| 0-21 | EOL signal (end-of-line) from the other end not received within 5 s of the previous EOL signal | Check the connections between the FCE, FDU, LIU, & line.<br>Check for line noise or other line problems.<br>Replace the FCE, LIU or FDU.<br>The remote machine may be defective or may have disconnected. |
| 0-22 | The signal from the other end was interrupted for more than 0.2 s | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Replace the FCE, LIU or FDU.<br>Defective remote terminal.<br>Check for line noise or other line problems. |
| 0-23 | Too many errors during reception | Check the line connection.<br>Check the FCE - FDU - LIU connectors.<br>Replace the FCE, LIU or FDU.<br>Defective remote terminal.<br>Check for line noise or other line problems.<br>Switch the rx cable equalizer on (bit switch 00, bit 1).<br>Ask the other end to adjust their tx level. |
| 1-00 | Document jam | Improperly inserted document or unsuitable document type.<br>See "Mechanical Operation - Document Jam". |
| 1-01 | Document length exceeded the maximum | Divide the document into smaller pieces.<br>See "Mechanical Operation - Document Jam". |
| 1-10 | Document in the scanning position at power-up | Clear debris from the sensor actuators.<br>Check the SBU horizontal adjustment.<br>Replace SBU, FCE or FDU. |
| 1-17 | Document jam in the feed-out area | |
| 1-20 | Printer jam - paper did not reach the exit | Clear any debris from the sensors and the paper path.<br>Clean the sensors in the printer.<br>Check that the copy tray is not overloaded.<br>Check the paper feed mechanism and paper path for faults.<br>Check the connections from the FDU to the rx motor and printer sensors.<br>Replace the rx motor, printer jam sensor, or FDU. |
| 1-21 | Printer jam - paper stuck at the exit | |

| Code | Meaning | Suggested Cause/Action |
|---|---|---|
| 1-23 | Cutter jam | Clear any debris from the sensors and the paper path.<br>Clean the cutter sensor.<br>Check the cutter mechanism.<br>Check the connections from the FDU to the cutter motor and cutter sensors.<br>Replace the cutter motor, cutter sensor, or FDU. |
| 1-24 | Cutter failed to initialize | |
| 1-30 | Paper ran out during printing | Add paper. |
| 1-33 | Paper end was detected when the machine was switched on | If paper is present, clean the paper end sensor and check the sensor circuit for defects. Replace the FCE, FDU or the paper end sensor. |
| 1-71 | The printer cover was opened during printing | Check whether the user opened the cover during printing.<br>Check the cover lock mechanism.<br>Check the cover switch position and actuation mechanism.<br>Check connections between the cover switch and the FDU.<br>Replace the cover switch, FCE or FDU. |
| 2-12 | Modem clock irregularity | Replace the FCE. |
| 2-20 | Abnormal coding/decoding (cpu not ready) | Replace the FCE. |
| 4-00 | One page took longer than 8 minutes to transmit | Check for a bad line.<br>Try the communication at a lower resolution, or without halftone.<br>Change the FCE. |
| 4-01 | Line current was cut | Check the line connector.<br>Check the connection between the FDU and the LIU.<br>Check for line problems.<br>Replace the FDU, the FCE or the LIU. |
| 4-02 | The other end cut the received page as it was longer than the maximum limit. | Ask the other end to change their maximum receive length setting, then resend. |
| 4-10 | Communication failed because of ID Code mismatch (Closed Network) or TSI mismatch (Authorized Reception) | Get the ID Codes the same and/or the TSIs programmed correctly, then resend.<br>The machine at the other end may be defective. |
| 5-21 | Memory overflow | Temporary memory shortage or the document takes up too much data.<br>Use a lower resolution or do not use Halftone.<br><br>Replace the FCE. |
| 6-01 | Post message could not be received after a page was sent (G3 ECM) | Check the line connection.<br>Check the connections between LIU - FDU - FCE.<br>Try adjusting rx cable equalizer.<br>The other end may have a defective Modem/FCU/NCU; try sending to another machine.<br>Check for line problems and noise. |
| 6-02 | EOR received (G3 ECM) | Check the line connection.<br>Check the connections between LIU - FDU - FCE.<br>Try adjusting rx cable equalizer.<br>The other end may have a defective Modem/FCU/NCU; try sending to another machine.<br>Check for line problems and noise. |

| Code | Meaning | Suggested Cause/Action |
|---|---|---|
| 6-05 | Facsimile data frame not received within 18 s of CFR, but there was no line fail (G3 ECM) | Check the line connection.<br>Check the connections from the FCE, FDU to the LIU.<br>Check for a bad line or defective remote terminal.<br>Replace the FCE or LIU.<br>Switch the rx cable equalizer on (bit switch 00, bit 1). |
| 6-06 | Coding/decoding error (G3 ECM) | Defective FCE.<br>Defective remote terminal. |
| 6-08 | PIP/PIN was received in reply to PPS.NULL (G3 ECM) | The other end pressed Stop during communication.<br>The other terminal may be defective. |
| 6-09 | ERR received (G3 ECM) | Check for a noisy line.<br>Adjust the tx levels of the communicating machines.<br>See code 6-05. |
| 6-10 | Error frames still received at the other end after all communication attempts at 2400 bps (G3 ECM) | Check for line noise.<br>Adjust the tx level (use NCU parameter 01).<br>Check the line connection.<br>Defective remote terminal. |

# 6. ELECTRICAL DATA

## 6-1. CONNECTION FROM FCE



### 6-1-1. FCE - FDU

| CN1 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | N.C. | No connection | |
| 2 | N.C. | No connection | |
| 3 | N.C. | No connection | |
| 4 | N.C. | No connection | |
| 5 | COM1 | Digital ground | 0 |
| 6 | TXD | Transmit data | X |
| 7 | RXD | Receive data | X |
| 8 | AVXIN | AVM send signal | X |
| 9 | COM2 | Analog ground | 0 |
| 10 | SENS | SB4 or SB5 | X |
| 11 | XVIDEO | Analog video signal | X |
| 12 | SH | Shift clock to CCD | C |
| 13 | RESET | Reset out | 5 |
| 14 | CSRAM0 | N.C. in FDU (EIO2 control in FCE) | 5 |
| 15 | CSRAM1 | N.C. in FDU (EIO2 control in FCE) | 5 |
| 16 | VSEL0 | Gain control of video signal | 0 - 5 |
| 17 | VSEL1 | Gain control of video signal | 0 - 5 |
| 18 | PH | 1st phase transfer clock to CCD | C |
| 19 | DCCLP | DC restore request of video signal | C |
| 20 | PHRES | Reset clock to CCD | C |
| 21 | BUZ | Buzzer drive signal | 0 |
| 22 | MSCK | S/P clock of motor | C |
| 23 | MSOD | Data of motor | C |
| 24 | AVMEOS | from AVM IC | 5 |
| 25 | AVMST | to AVM IC | 0 |
| 26 | MONON | Monitor speaker control | 0 |
| 27 | TONSEL | Tone/Rx control | 0 |
| 28 | MONVOL | to AVM IC | 0 |
| 29 | CUT0 | Cutter control | 0 |
| 30 | CUT1 | Cutter control | 0 |
| 31 | LEDON | LED array control | 0 |
| 32 | POWON | +24VSW control | 0 |
| 33 | CK24V | T/H check | 5 |
| 34 | SB10 | SB10 (Cover open) | 0 |
| 35 | SB7 | SB7 (Cutter position) | 5 |
| 36 | SB8 | SB8 (Cutter position) | 0 |
| 37 | CBUS0 | AVM IC data | 0 |
| 38 | CBUS1 | AVM IC data | 0 |
| 39 | CBUS2 | AVM IC data | 0 |
| 40 | CBUS3 | AVM IC data | 0 |

| CN1 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 41 | DDSW | N.C. in FDU | 0 |
| 42 | SWC1 | N.C. in FDU | 0 |
| 43 | ADSEL | SB4/SB5 exchange control | C |
| 44 | BAT | Battery Power | 3 |
| 45 | -5V | Power | -5 |
| 46 | COM1 | Digital ground (N.C. in FDU) | 0 |
| 47 | +5V | Power | 5 |
| 48 | COM1 | Digital ground | 0 |

### 6-1-2. FCE - Thermal Head

| CN3 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | COM1 | Ground | 0 |
| 2 | +5V | Power | 5 |
| 3 | THSEN | Thermistor input | X |
| 4 | STB3 | Fourth strobe | 5 |
| 5 | STB2 | Third strobe | 5 |
| 6 | STB1 | Second strobe | 5 |
| 7 | STB0 | First strobe | 5 |
| 8 | PRLAT | Print data latch pulse | 5 |
| 9 | PRDT | Print data | 5 |
| 10 | PRCLK | Print data sampling clock | 5 |
| 11 | N.C. | No connection | 0 |

### 6-1-3. FCE-OPU

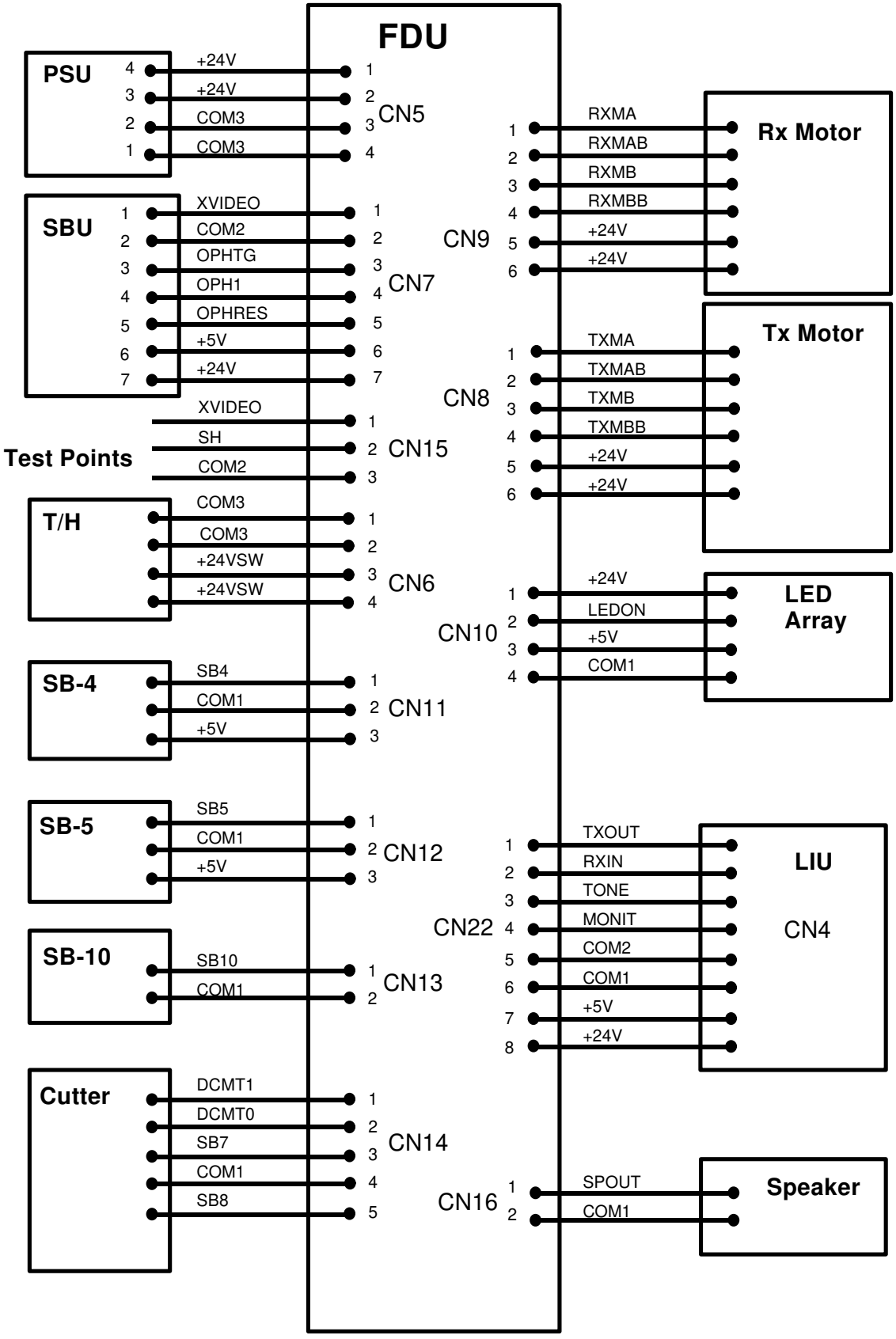
| CN5 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | +5V | Power | 5 |
| 2 | COM1 | Ground | 0 |
| 3 | -5V | Power | -5 |
| 4 | SOD | Serial output data | C |
| 5 | SID1 | Serial input data | C |
| 6 | SCK1 | Serial shift clock | C |

### 6-1-4. FCE - LIU

| CN4 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | N.C. | No connection | 0 |
| 2 | OH | OH relay control | 0 |
| 3 | INTHK | Internal hook SW detect | 5 |
| 4 | HOOK | Current detect | 5 |
| 5 | RI | Ringing detect | 5 |
| 6 | COM1 | Ground | 0 |
| 7 | ONHK | On hook relay control | 0 |
| 8 | LIUSCK | Serial clock and rest | C |
| 9 | SOD | Sereal output data | C |
| 10 | SID2 | Serial input data | C |

**Note:** "V" is the level of the signal after power on.
C: Clock (0 - 5V)
X: Analog (0 - 5V)
L: Telephone line

## 6-2. CONNECTION FROM FDU



### 6-2-1. FDU - PSU

| CN5 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | +24V | DC power | 24 |
| 2 | +24V | DC power | 24 |
| 3 | COM3 | Ground for +24V | 0 |
| 4 | COM3 | Ground for +24V | 0 |

### 6-2-2. FDU - SBU

| CN7 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | XVIDEO | Analog video signal | X |
| 2 | COM2 | Analog ground | 0 |
| 3 | OPHTG | Shift clock to CCD | C |
| 4 | OPH1 | First phase transfer clock | C |
| 5 | OPHRES | Reset clock (CCD output buff.) | C |
| 6 | +5V | +5V DC power | 5 |
| 7 | +24V | DC power | 24 |

### 6-2-3. Scanner Test Points

| CN15 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | XVIDEO | Analog video | X |
| 2 | COM2 | Ground | 0 |
| 3 | SHT | Shift clock to CCD | C |

### 6-2-4. FDU - Thermal Head

| CN6 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | COM3 | Ground for +24V | 0 |
| 2 | COM3 | Ground for +24V | 0 |
| 3 | +24VSW | Switched 24V | 5 |
| 4 | +24VSW | Switched 24V | 5 |

### 6-2-5. FDU - FCE

CN1: See FCE CN1 (section 6-1-1).

### 6-2-6. FDU - Paper End Sensor (SB-4)

| CN11 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SB4 | Signal from sensor | X |
| 2 | COM1 | Ground | 0 |
| 3 | +5V | DC power | 5 |

### 6-2-7. FDU - Paper Jam Sensor (SB-5)

| CN12 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SB5 | Signal from sensor | X |
| 2 | COM1 | Ground | 0 |
| 3 | +5V | DC power | 5 |

### 6-2-8. FDU - Cover Sensor (SB-10)

| CN13 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SB10 | Signal from sensor | 0 |
| 2 | COM1 | Ground | 0 |

### 6-2-9. FDU - Cutter

| CN14 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | DCMT1 | Cutter drive 1 | 0 |
| 2 | DCMT0 | Cutter drive 0 | 0 |
| 3 | SB7 | Signal from cutter end position sensor | 5 |
| 4 | COM1 | Ground | 0 |
| 5 | SB8 | Signal from cutter home position sensor | 0 |

### 6-2-10. FDU - Rx Motor

| CN9 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | RXMA | Rx motor phase A drive | 24 |
| 2 | RXMAB | Rx motor phase $\overline{A}$ drive | 24 |
| 3 | RXMB | Rx motor phase B drive | 24 |
| 4 | RXMBB | Rx motor phase $\overline{B}$ drive | 24 |
| 5 | +24V | +24V DC power | 24 |
| 6 | +24V | +24V DC power | 24 |

### 6-2-11. FDU - Tx Motor

| CN8 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | TXMA | Tx motor phase A drive | 24 |
| 2 | TXMAB | Tx motor phase $\overline{A}$ drive | 24 |
| 3 | TXMB | Tx motor phase B drive | 24 |
| 4 | TXMBB | Tx motor phase $\overline{B}$ drive, | 24 |
| 5 | +24V | +24V DC power | 24 |
| 6 | +24V | +24V DC power | 24 |

### 6-2-12. FDU - LED Array

| CN10 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | +24V | DC power | 24 |
| 2 | LEDON | LED array drive | 14 |
| 3 | +5V | DC power | 5 |
| 4 | COM1 | Ground | 0 |

### 6-2-13. FDU - LIU

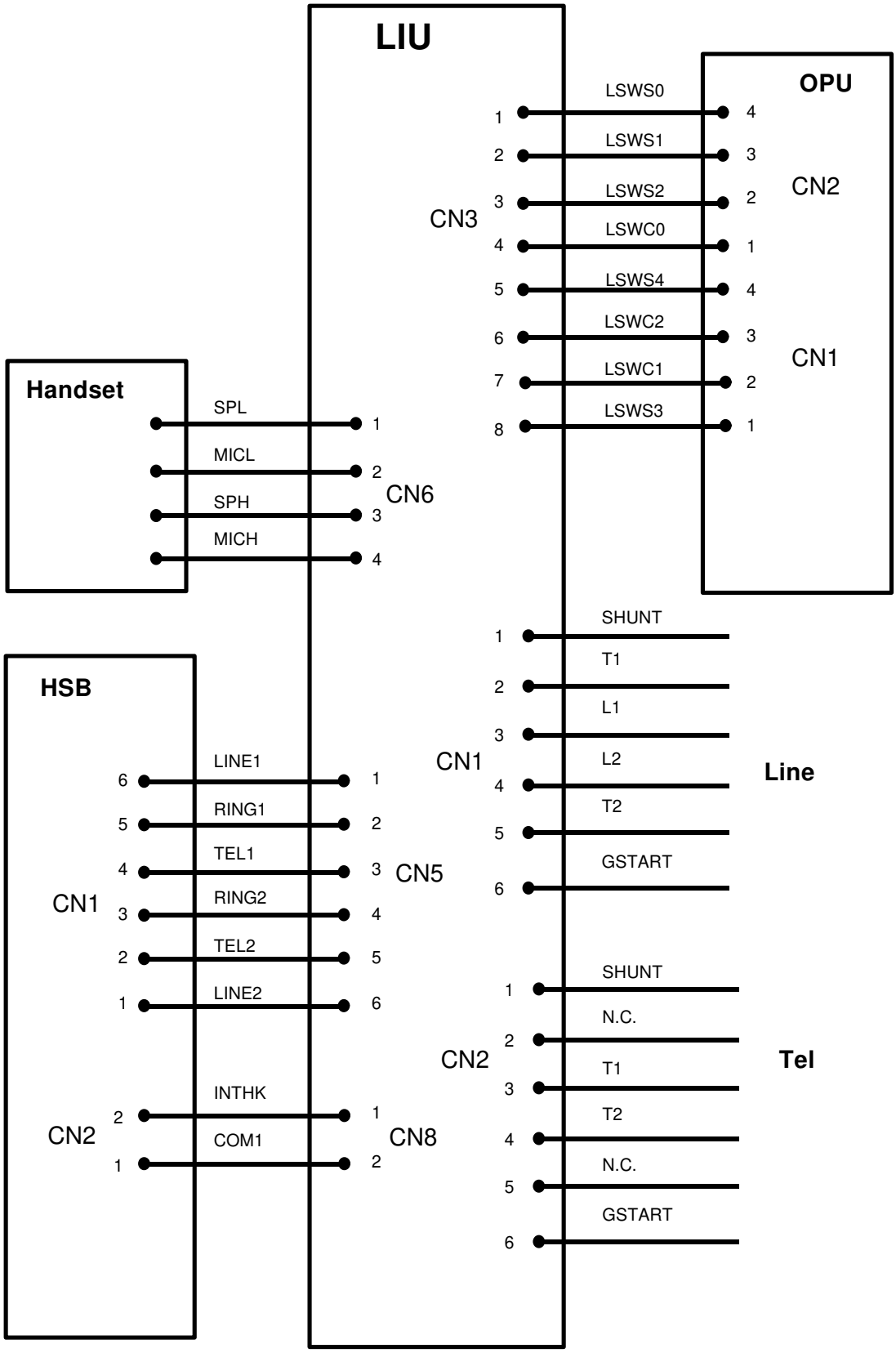
| CN22 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | TXOUT | Transmit data | 0 |
| 2 | RXIN | Receive data | 0 |
| 3 | TONE | Tone input | 0 |
| 4 | MONIT | Monitor input | 0 |
| 5 | COM2 | Analog ground | 0 |
| 6 | COM1 | Ground | 0 |
| 7 | +5V | +5V DC power | 5 |
| 8 | +24V | DC power | 24 |

### 6-2-14. FDU - Speaker

| CN16 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SPOUT | Speaker out | 0 |
| 2 | COM1 | Ground | 0 |

**Note:** "V" is the level of the signal after power on.
C: Clock (0 - 5V)
X: Analog (0 - 5V)
L: Telephone line

## 6-3. CONNECTION FROM LIU



### 6-3-1. LIU-Line

| CN1 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SHUNT | Shunt signal | 0(L) |
| 2 | T1 | External phone tip | L |
| 3 | L1 | Phone line tip | L |
| 4 | L2 | Phone line ring | L |
| 5 | T2 | Extermal phone ring | L |
| 6 | GSTART | Tel ground | 0(L) |

### 6-3-2. LIU - Handset

| CN6 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SPL | Speaker - | 0 |
| 2 | MICL | Microphone - | 0 |
| 3 | SPH | Speaker + | 0 |
| 4 | MICH | Microphone + | 0 |

### 6-3-3. LIU - FCE

CN7: See FCE CN4 (section 6-1-4).

### 6-3-4. LIU - FDU

CN4: See FDU CN22 (section 6-2-13).

### 6-3-5. LIU - HSB

| CN5 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | LINE1 | Connection from the line | L |
| 2 | RING1 | Connection to the ring detection circuit | L |
| 3 | TEL1 | Connection to the handset | 0 |
| 4 | RING2 | Connection to the ring detection circuit | L |
| 5 | TEL2 | Connection to the handset | 0 |
| 6 | LINE2 | Connection from the line | L |

### 6-3-6. LIU - HSB

| CN8 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | INTHK | Handset off-hook | 5 |
| 2 | COM1 | Ground | 0 |

### 6-3-7. LIU - OPU Dialpad

| CN3 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | LSWS0 | Key input | 3 |
| 2 | LSWS1 | Key input | 3 |
| 3 | LSWS2 | Key input | 3 |
| 4 | LSWC0 | Common signal to the dialpad | 0 - 4 |
| 5 | LSWS4 | Key input | 3 |
| 6 | LSWC2 | Common signal to the dialpad | 0 - 4 |
| 7 | LSWC1 | | 0 - 4 |
| 8 | LSWS3 | Key input | 3 |

### 6-3-8. LIU-Tel

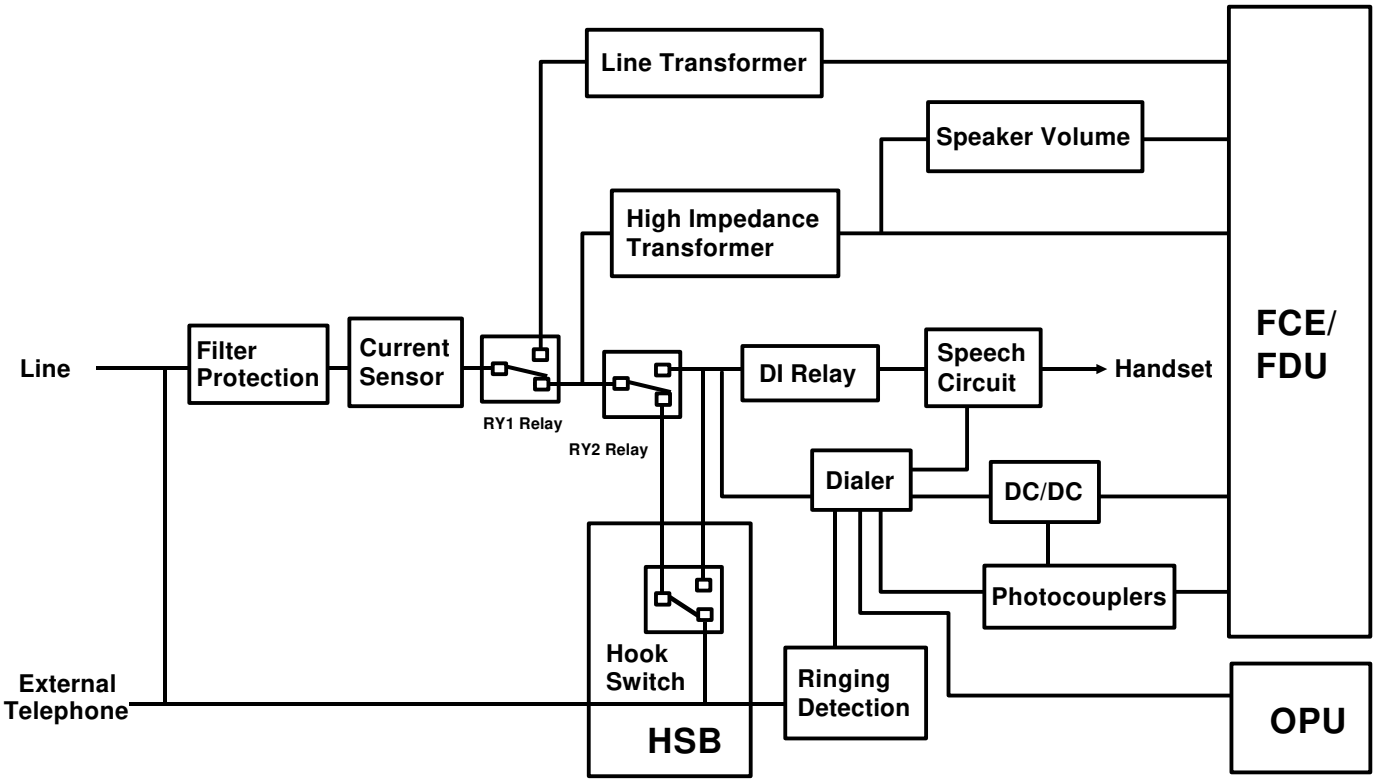
| CN2 | | | |
|---|---|---|---|
| **No** | **Name** | **Function** | **V** |
| 1 | SHUNT | Shunt signal | 0(L) |
| 2 | N.C. | No connection | |
| 3 | T1 | Phone line tip | L |
| 4 | T2 | Phone line ring | L |
| 5 | N.C. | No connection | |
| 6 | GSTART | Tel ground | 0(L) |

**Note:** "V" is the level of the signal after power on.
C: Clock (0 - 5V)
X: Analog (0 - 5V)
L: Telephone line

# APPENDIX A. LINE INTERFACE

## 1. Overall LIU Description

**LIU Block Diagram**




The LIU (Line Interface Unit) has all the telephone line interface functions and contains a telephone unit which is powered by the machine when the machine is switched on, and is alternatively powered from the telephone line when the machine is switched off.

The line interface contains filters, a current sensor, RY1 relay, RY2 relay, and ring detection circuit. The RY1 relay switches the line connection either to the internal telephone unit or to the modem. The RY2 relay switches the line either to the external telephone and the ring detection circuit or to the internal dialing circuit.
In standby mode, both relays are switched down to connect the line to the external telephone and the ring detection circuit. When the internal handset is picked up, the hook switch goes up to connect the line to the dialer and speech circuit for dialing and voice communication. The RY2 relay is only switched up when the “On Hook Dial” key is pressed for On-hook dialing.
The internal telephone unit contains the handset interface, speech circuit, and a dialer (microcontroller with built-in CPU, ROM, RAM and DTMF tone generator).

The single tone signals, CNG, CED, dial tone, and busy tone are detected by the modem on the FCE through a high impedance transformer.

## 2. Making a Telephone Call

### 2-1. Manual Dialing from the External Telephone

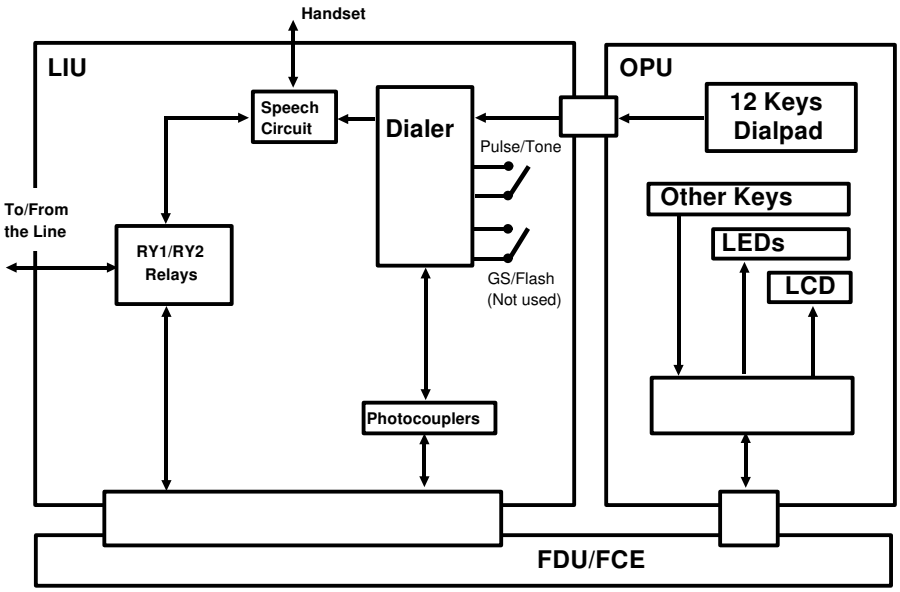
In standby mode, the line is connected to the external telephone. Then the user can dial from the external handset. If the user presses Start to send or receive a fax message, the RY1 relay switches up to connect the line to the modem.

### 2-2. Manual Dialing from the Built-in Telephone

There are two ways to dial manually from the built-in telephone: handset mode and on-hook mode.

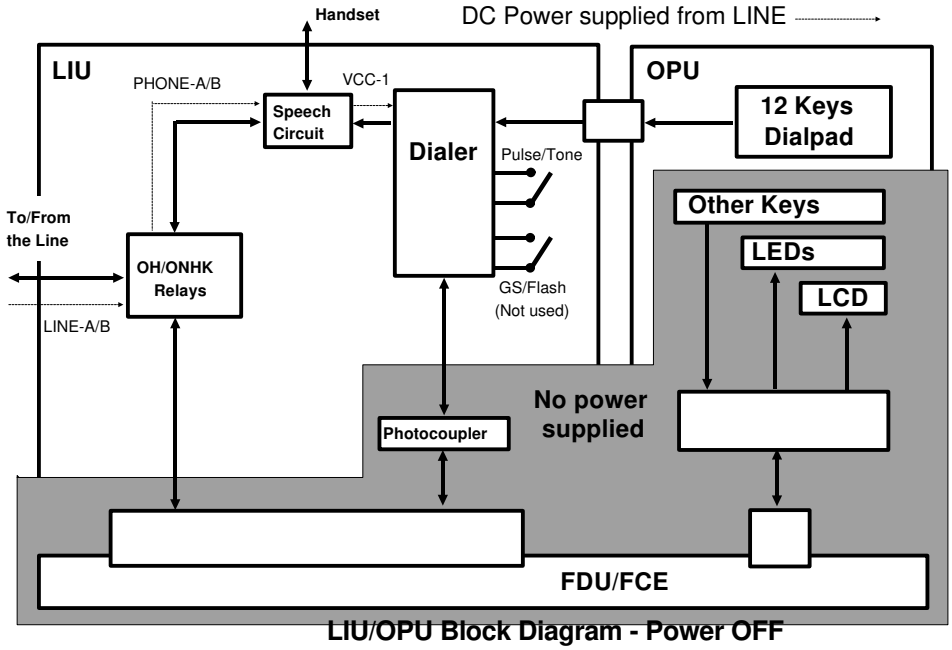
**Handset mode:** When the user picks up the handset, the Hook Switch goes up to connect the line to the dialer and speech circuit. The digits dialed at the dialpad are directly informed to the dialer, and the dialer dials the number and passes them to the FCE to indicate the dialed number on the LCD. If the user presses Start to send or receive a fax message, the RY1 relay switches up to connect the line to the modem on the FCE.

**On-hook mode:** When the user presses the On Hook Dial key, the RY2 relay switches up to connect the dialer to the line. Then the dialer acts in the same way as explained for handset mode.




**LIU/OPU Block Diagram**

The telephone features (dialing, voice communication) can also be used when the machine is switched off.
When the handset goes off-hook or the On Hook Dial key is pressed, the dialer is powered by the dc voltage from the line.
Then the dialed digits are directly informed to the dialer.




**LIU/OPU Block Diagram - Power OFF**

**2-3. Automatic Dialing**

When the machine starts to dial, the RY2 relay switches up to close the DC loop. After line current is detected, (see the diagram on page A-1), the dialer starts dialing. Then the machine waits for the line connection and CED before it starts sending the fax message. If busy tone is detected before line connection, the machine will disconnect the line.

**2-4. Dialing Method (Pulse/Tone)**

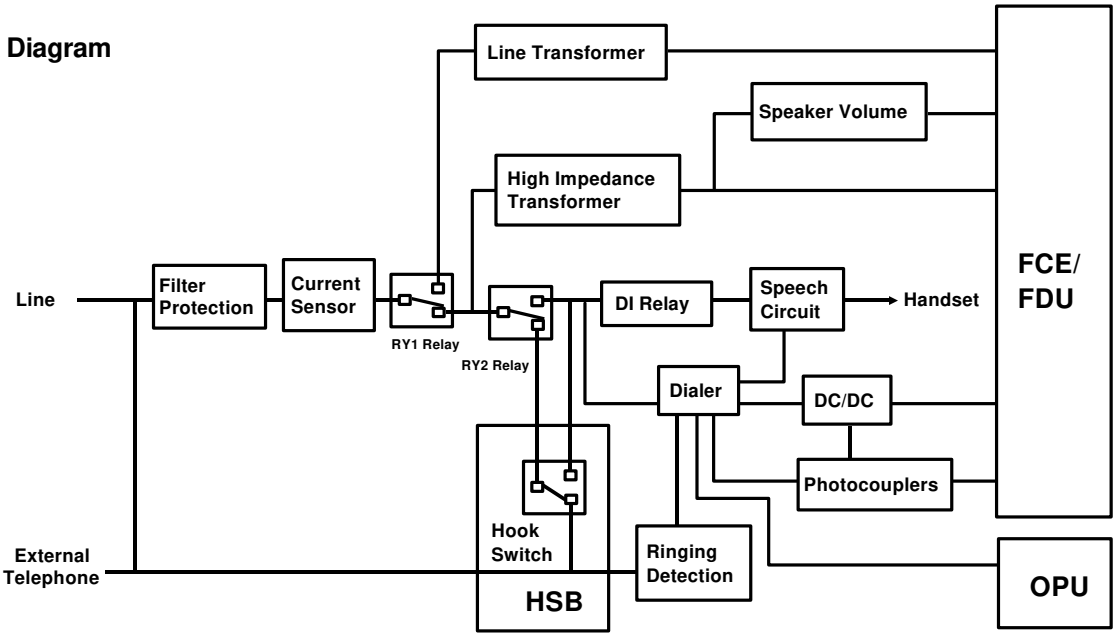
The LIU has a mechanical switch beside the modular jack to select either pulse dial or DTMF dial. This switch can be accessed by the user. The dialer checks the setting of this switch every time the FCE detects off-hook, then dials the number using the indicated method.

**2-5. PSTN Access from behind the PBX**

When the machine is behind a PBX, the user can program which type of access method is required.
**Loop Start:** The user has to program an access code with Function 15.
**Ground/Flash Start:** Ground Start cannot be used. The user has to select the function of the R (Recall) key on the operation panel for Flash Start. Even if the user selects Ground Start with the slide switch at the rear of the machine, the machine is set to Flash Start mode.
After the dc loop is closed, the machine detects the line current, detects PBX dial tone, accesses the PSTN using the correct method, detects PSTN dial tone, then dials the number.

## 3. Receiving a Telephone Call

**LIU Block Diagram**




### 3-1. Manual Receive Mode

When the user picks up the handset, the Hook Switch goes up to connect the line to the speech circuit for voice conversation. If the user presses Start to send or receive a fax message, the RY1 relay switches up to connect the line to the modem, which is on the FCE.

### 3-2. FAX (Automatic Receive) Mode

When the machine detects a ringing signal, the machine switches up the RY1 relay and starts to send CED/DIS/NSF for fax reception.

### 3-3. AUTO (Auto Tel/Fax Switch) Mode

This mode switches the line automatically to the internal telephone unit or to the modem, depending on the type of remote terminal (phone or fax).
When the machine detects a ringing signal, the machine switches up the RY1 relay (the ringer is disabled by the dialer in this mode). Then the machine starts CNG detection, starts to send a voice message (3.5 s after ring detection), and starts to call the user to the machine (7 s after ring detection). If a CNG is detected during these periods, the machine starts to send CED/DIS/NSF for fax reception. If the user picks up the handset (the Hook Switch goes up), the machine switches down the RY1 relay to connect the line to the speech circuit. If CNG is not detected and the user does not respond to the call within 30 s, the machine sends CED/DIS/NSF before disconnecting the line.

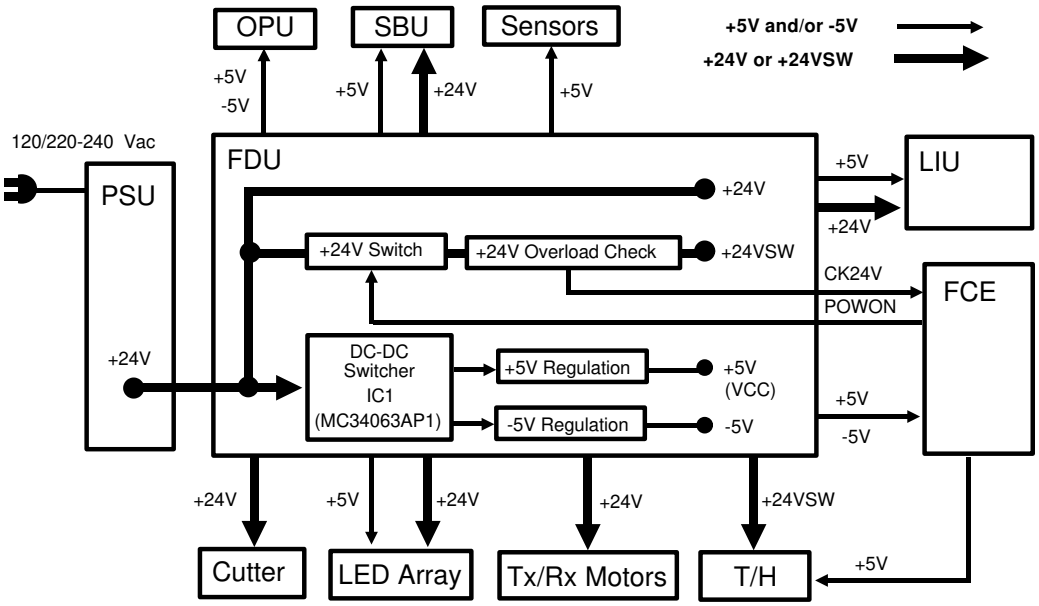
### 3-4. TAM (Telephone Answering Machine) Mode

This mode is only for use when a telephone answering machine (TAM) is connected to the same line.
When a call is coming in, the external TAM first catches the call; the machine can detect this by checking the HOOK signal. To let the TAM catch the line first, the number of rings (N) until TAM detects a call has to be programmed in the machine. The machine automatically waits N+1 rings before it catches the call, in order to let the external TAM catch the call first when the TAM is active.
After catching the call, the TAM sends the pre-recorded message to the other end, and the machine starts to detect a CNG and a 5 s (variable) silent period. If the machine detects a CNG or a 5 s silent period, the machine regards the other end as a fax terminal and sends CED/DIS/NSF to receive the fax message.
Refer to section 1-3-1 for more information.

# APPENDIX B. POWER DISTRIBUTION

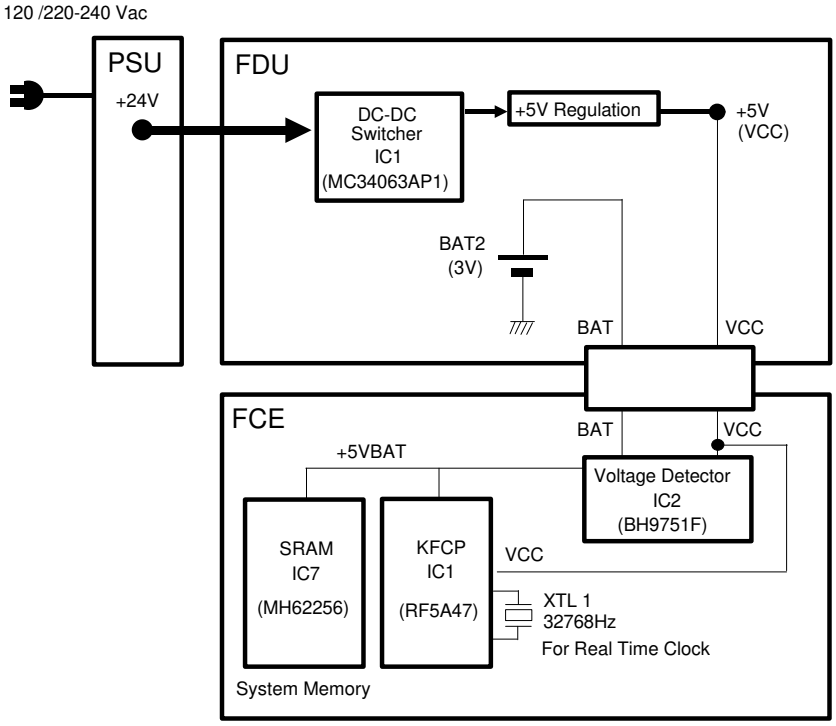
## 1. PSU/FDU

The PSU regulates the 120 or 220 to 240 Vac input to generate +24 Vdc. The +24Vdc is then supplied to the secondary power supply circuit on the FDU to generate ± 5 Vdc. The +24VSW for the thermal head is switched on by the FCE when a fax call is coming in; this voltage is watched by the FCE to check for overload.




## 2. Battery Back-up

On the FCE board, the system memory SRAM and the KFCP, which controls the real time clock's oscillator, always have to be backed up by dc voltage. When the power is supplied from the PSU, VCC (+5V) and +5VBAT back up these ICs. When power is not supplied from the PSU, the voltage detector on the FCE connects the BAT signal, upon which +3Vdc is supplied from the battery on the FDU, to +5VBAT, so that it can back-up these ICs.



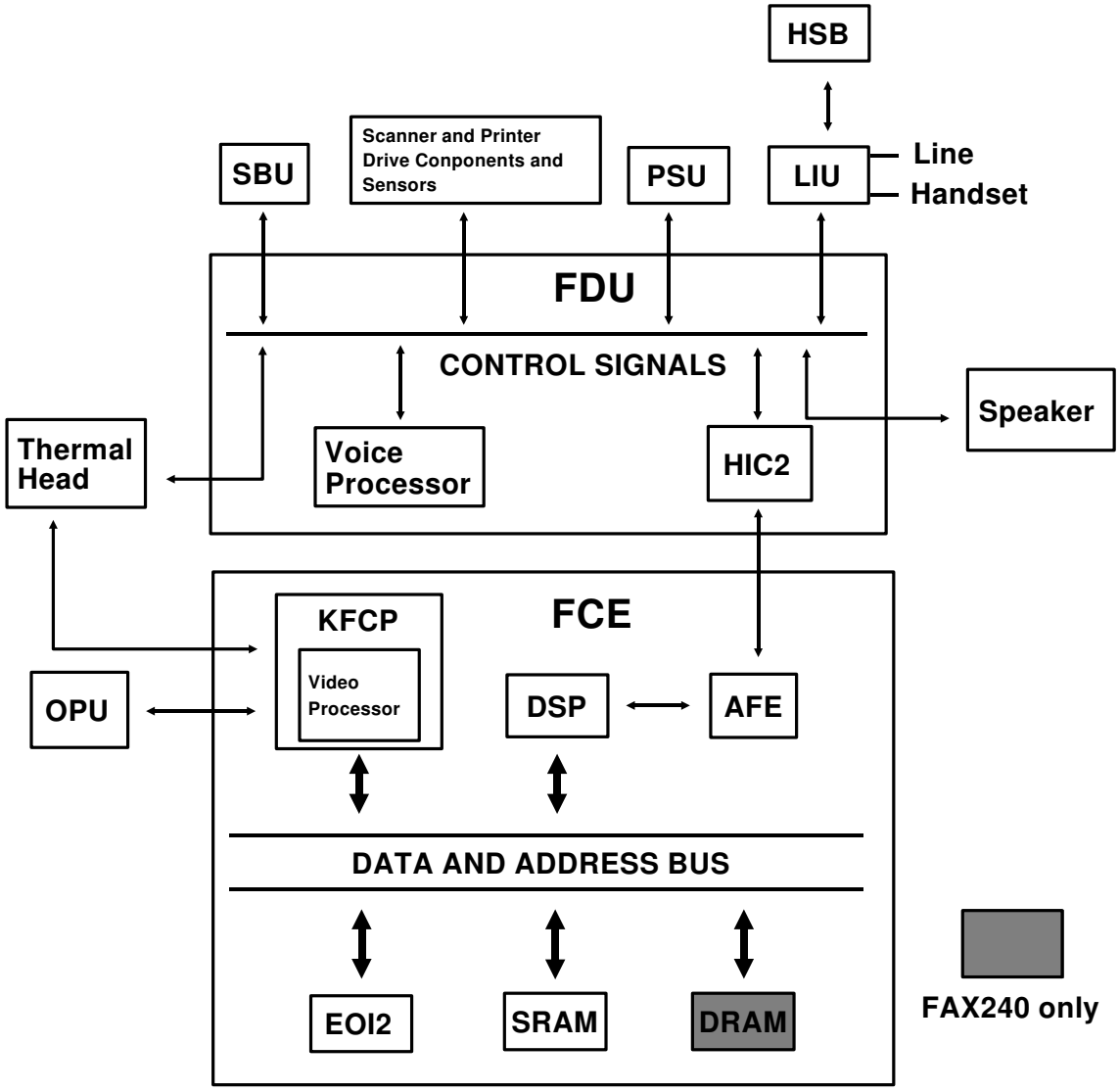

## 3. LIU Back-up

When the power is not supplied from the PSU, the internal telephone unit is still active. When the handset is picked up or the On Hook Dial key is pressed, the dc loop in the LIU circuit is closed. Then the speech and ring detection circuit regulates the line voltage to wake up the microcontroller on the LIU. For more details, see Appendix A "Line Interface".

# APPENDIX C. ELECTRICAL COMPONENT DESCRIPTION/DATA FLOW

### 1. PCBs

This section explains the functions of the PCBs and their components.




### 1-1. FCE (Facsimile Control Engine)

This engine board performs all control tasks, image processing, and Tx/Rx data processing. It contains the KFCP (which contains a CPU and a video processor), DSP (which contains the modem), a ROM (1 Mbits), an SRAM (32 kbytes), and two 128 kbyte DRAMs (one for SAF, and the other for ECM in the FAX240 only). There is an OTP (One Time Programmable) ROM in an SOP type package.

### 1-2. FDU (Facsimile Driver Unit)

This driver unit interfaces with the peripherals. It contains Tx, Rx and cutter motor drivers, the scanner interface, secondary power supply (which generates ±5V from the +24V output from the PSU), a battery for FCE back-up, a HIC for modem signal amplification and filtering, and an AVM generation circuit.

### 1-3. LIU (Line Interface Unit)

This unit performs all interface functions to the telephone line and contains an internal telephone unit. Refer to Appendix A “Line Interface” for details.

### 1-4. PSU (Power Supply Unit)

This unit regulates the 120/220-240 V ac input and generates +24V for the FDU and thermal head. The power cord and the main switch are separate from the PSU assembly and are fixed to the body frame.

### 1-5. SBU (Sensor Board Unit)

This unit has a CCD which scans the document and detects light path blockage by the document/scan line sensor actuators.

### 1-6. OPU (Operation Panel Unit)

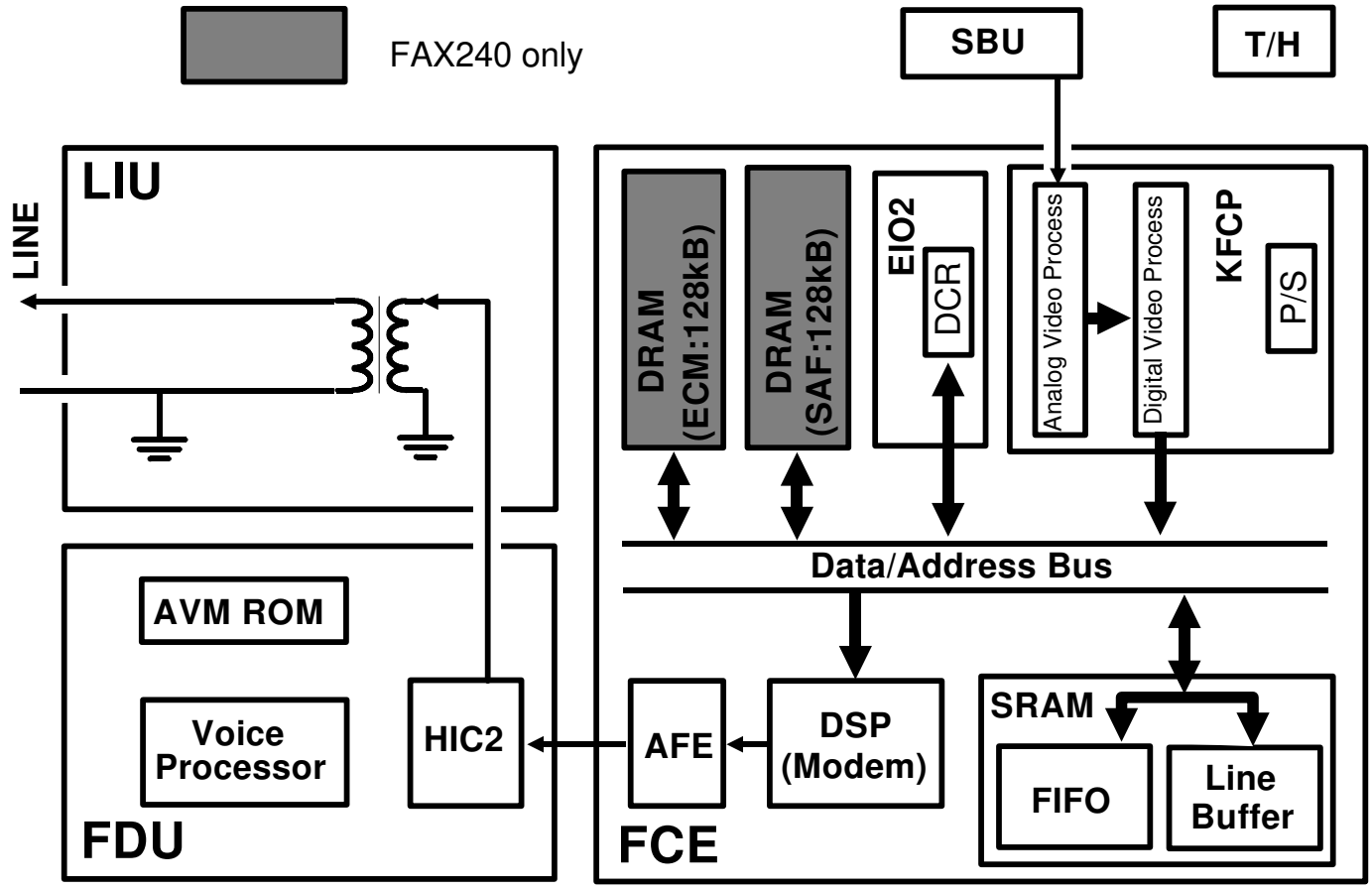
This unit receives all keypad input information and indicates instructions for users using LEDs and an LCD. The ten key pad is still available for dialing even if the main power is switched off.

### 1-7. HSB (Hook Switch Board)

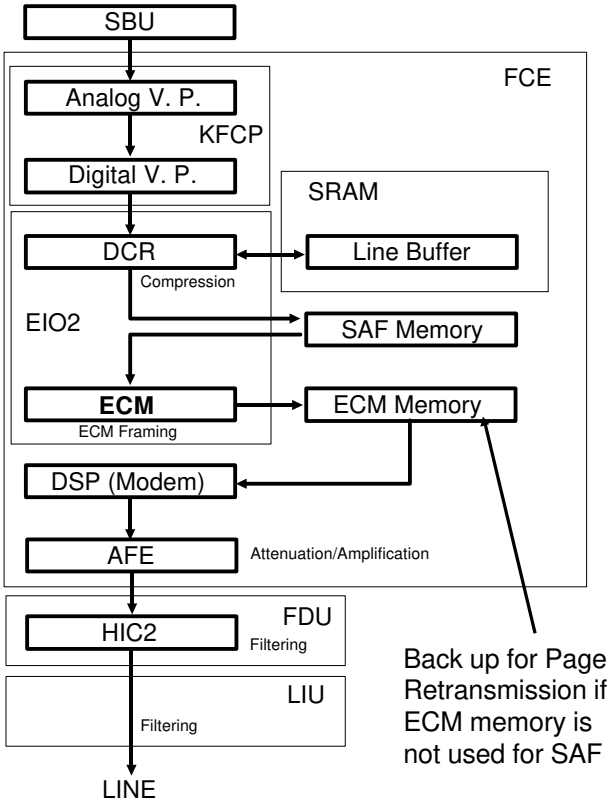
This board has a hook switch and a ringer.

## 2. Data Flow

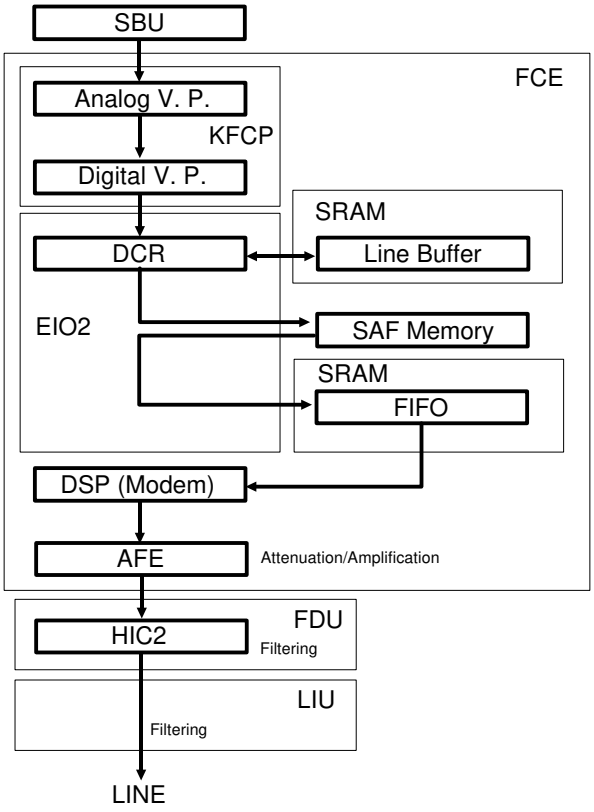
### 2-1. Transmission



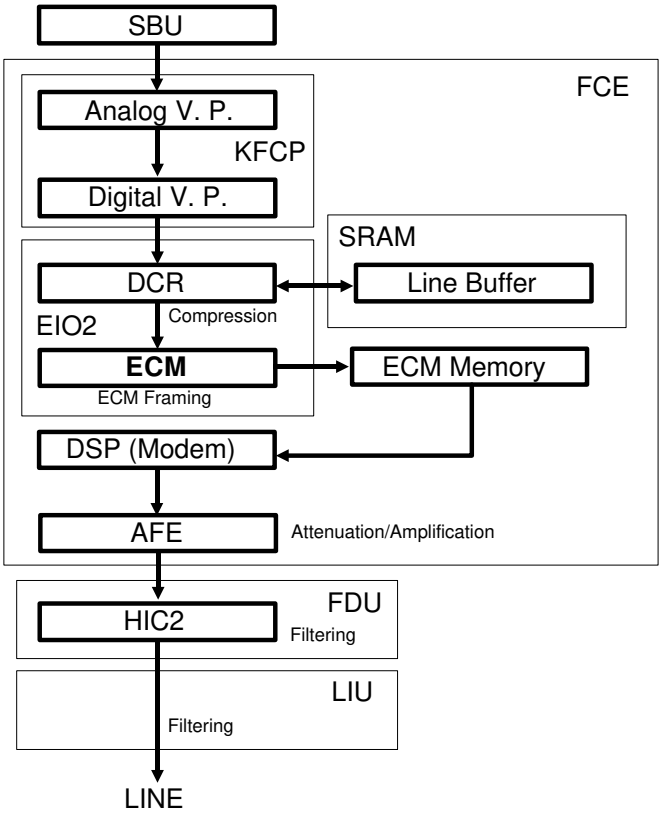
### 2-1-1. Direct Transmission (non ECM)



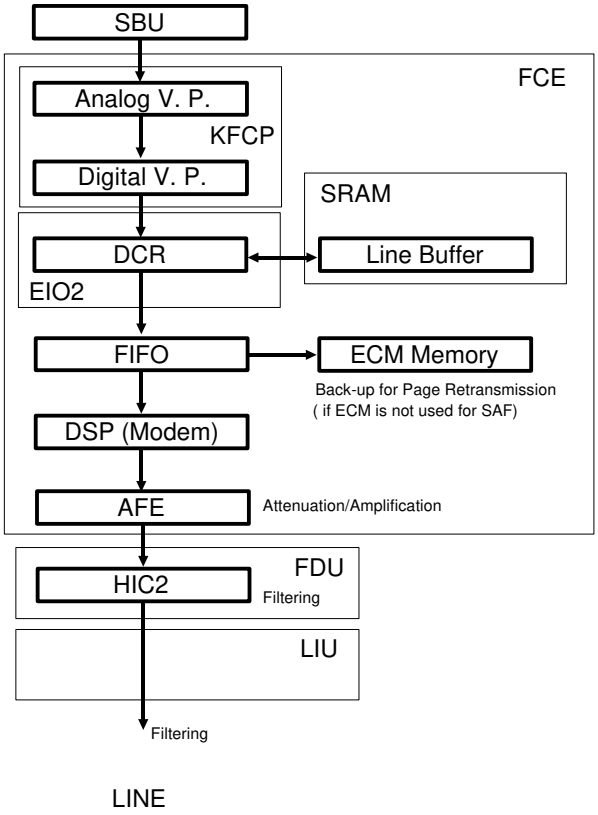

### 2-1-2. Direct Transmission (ECM)



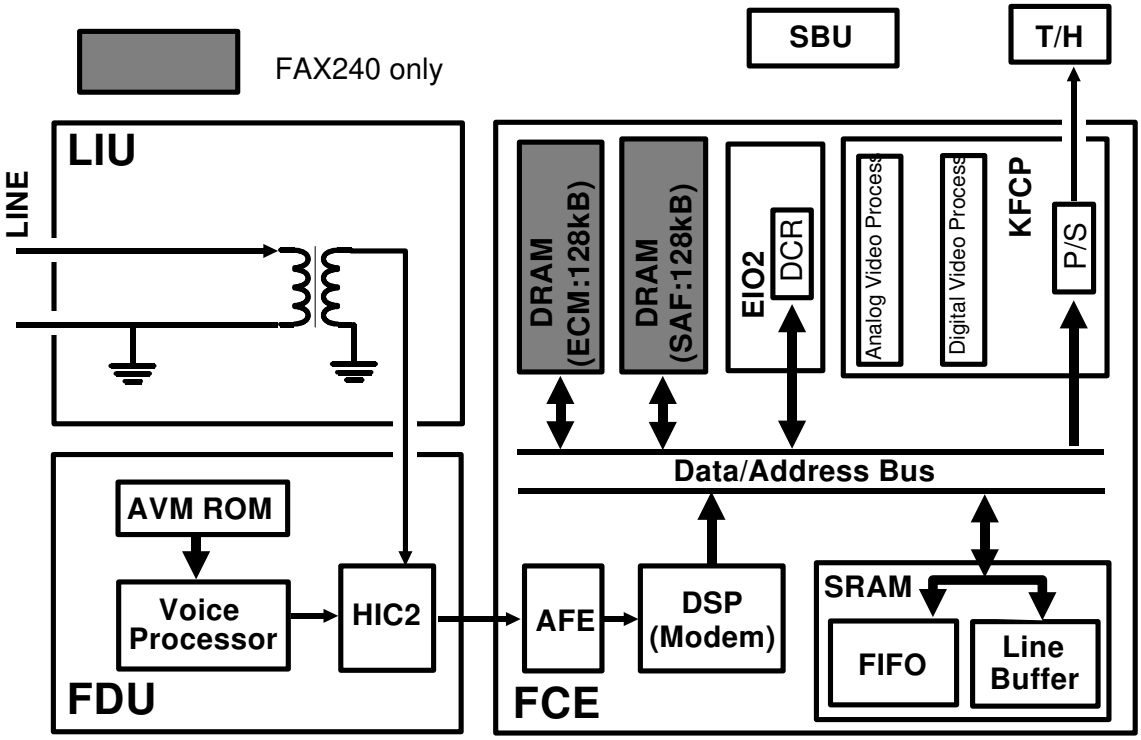

### 2-1-3. Memory Transmission (non ECM)



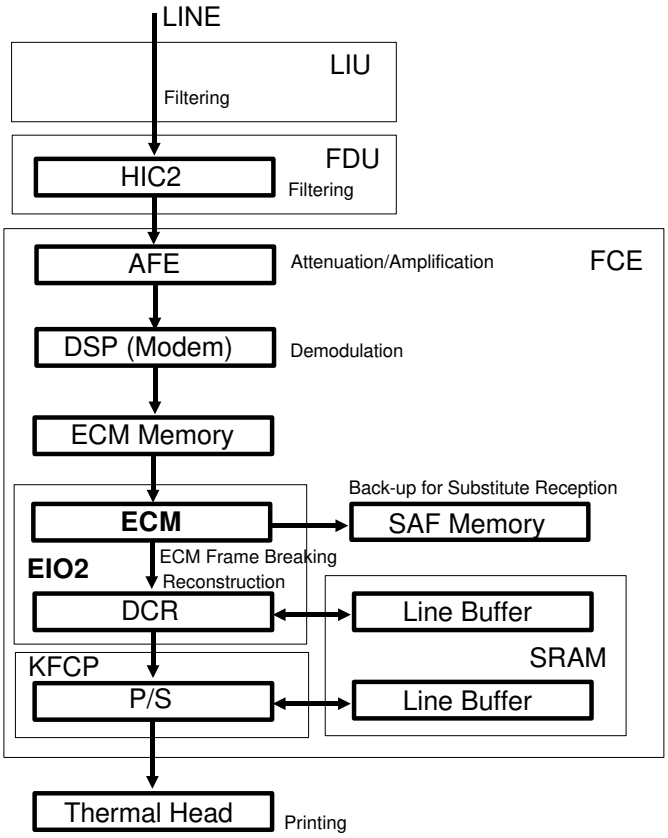

### 2-1-4. Memory Transmission (ECM)



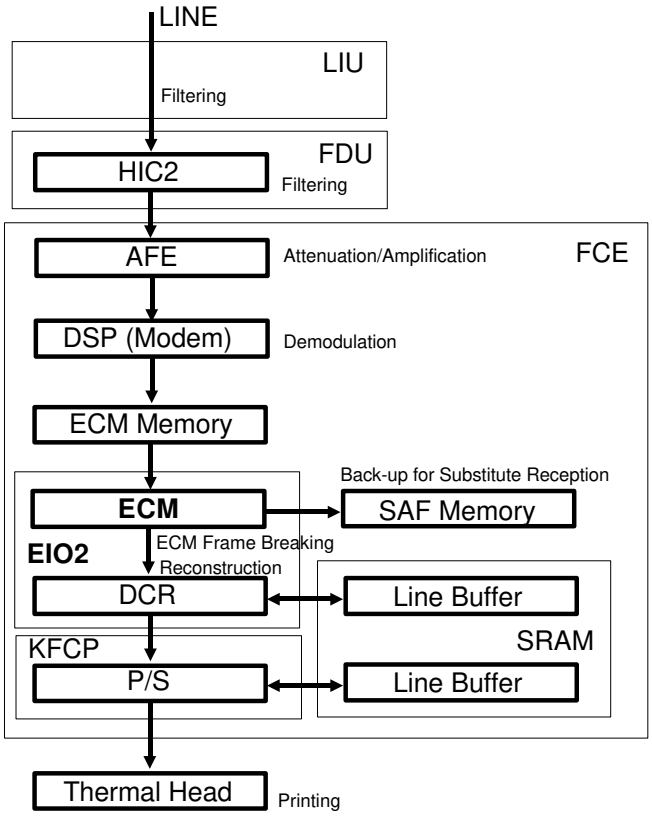
## 2-2. Reception




### 2-2-1. Non ECM Reception




### 2-2-2. ECM Reception



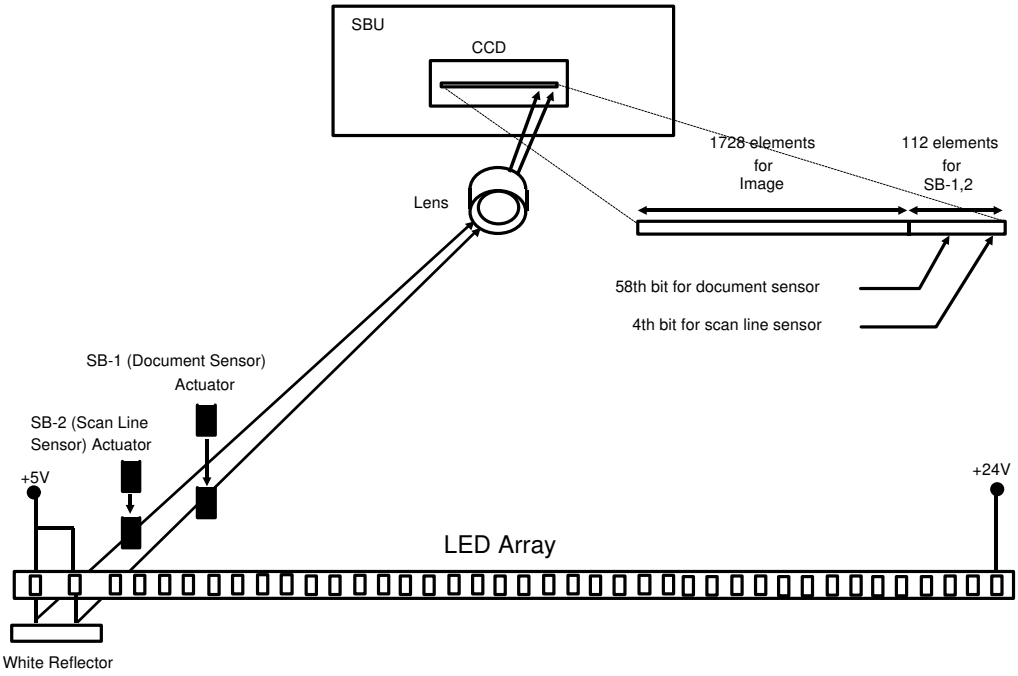
# APPENDIX D. MECHANICAL DESCRIPTION

## 1. ADF/Scanner

The machine has two significantly different points in the ADF/scanner mechanism from older models. The first point is the integrated scanner and sensor mechanism, and the second point is the simplified ADF mechanism.

### 1-1. Integrated Scanner/Sensor Mechanism

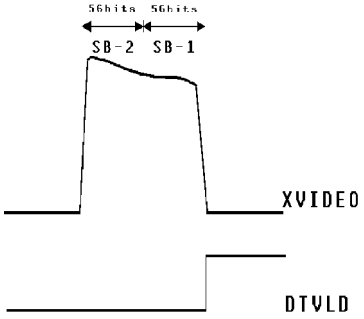
The document sensor (SB-1) and scan line sensor (SB-2) are integrated into the scanner mechanism. The basic composition of these sensors is similar to photointerrupters. However, instead of using discrete photodiode/phototransistor assemblies for each sensor, elements of the LED array and CCD are used.



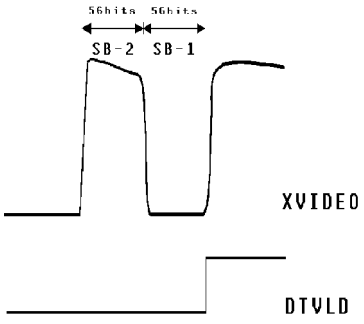

On the left hand side of the LED array, there are red LEDs dedicated for the two scanner sensors. These LEDs are always on. Light from these LEDs passes through the lens to the right hand side of the CCD, where there are 112 elements specially provided to detect this light (the 4th bit is allocated to the scan line sensor (SB-2) and the 58th bit is allocated to the document sensor (SB-1)).

If a sensor actuator blocks the light path, the CCD waveform shows a dropout, then the CPU will detect it.

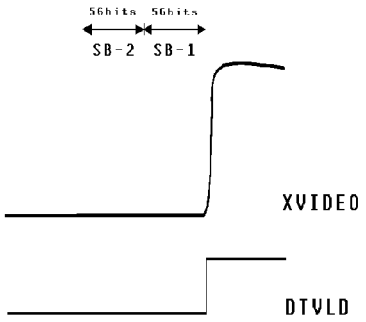
In standby mode, the CCD output is as shown on the right. The peak on the left side of the waveform indicates that the light path in both of the sensors is unblocked.



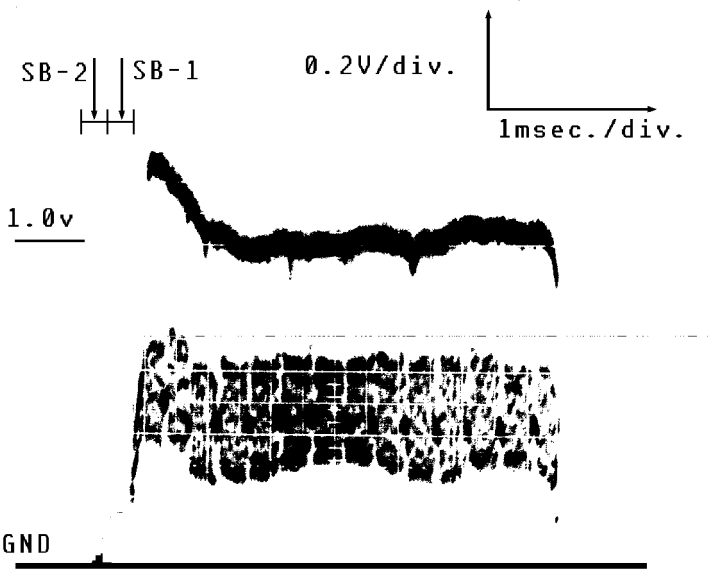

When a document is placed in the feeder, the document sensor actuator blocks the light path to the CCD. When the cpu detects this, it starts prefeeding the document and switches on the rest of the LED array.



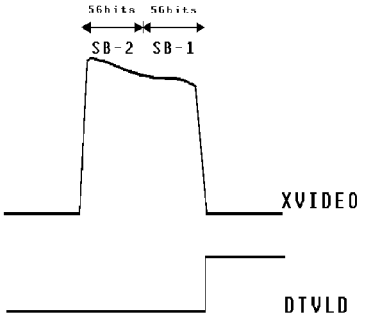
When the document reaches the scan line sensor, the actuator blocks the light path through that sensor. Then prefeed stops to prepare for scanning.




The XVIDEO output while the machine is scanning the document is shown on the right. While scanning the document, the LED array flashes every 10 ms.

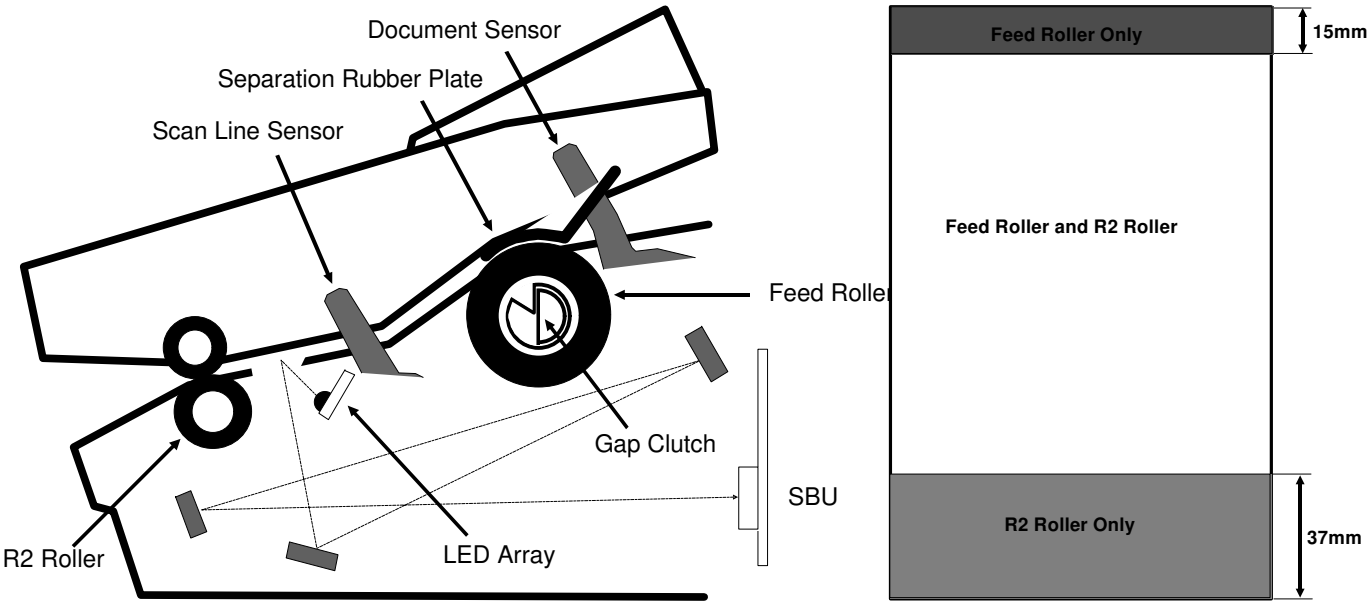



As the trailing edge of the page leaves the scan line sensor, the light path through that sensor becomes unblocked again. However, if there are some pages remaining in the feeder, the light path through the document sensor remains blocked.




After the transmission has ended, or after the copy has been printed, the LEDs for scanning the original switch off. The scanner is back in standby mode.

### 1-2. ADF Mechanism




The ADF consists of the feed roller, R2 roller, document/scan line sensors and separation rubber plate.
When a document is placed in the feeder, the document sensor detects it as explained in the previous section. Then, the CPU switches the LED array on and turns the feed roller until the document reaches the scan line position. After the handshake is completed or the Copy key is pressed, the feed roller feeds the document until the leading edge reaches the R2 roller (the machine scans the first 15 mm of the document). From this point, the R2 roller feeds the document until the trailing edge of the document passes the feed roller. Both the R2 roller and the feed roller are in contact with the document. However, the R2 roller turns a bit faster than the feed roller. After the trailing edge passes the feed roller, only the R2 roller feeds the document.
So, the document is fed into scanner slowly during the first 15 mm, at the normal speed when the document is fed by both rollers, then at a faster speed when the document is free from the feed roller. The magnification rate of the scanned image varies in these three parts.

## 2. Printer

The printer mechanism for FAX220 is different from the FAX240. Only the FAX240 has a cutter and decurler unit.

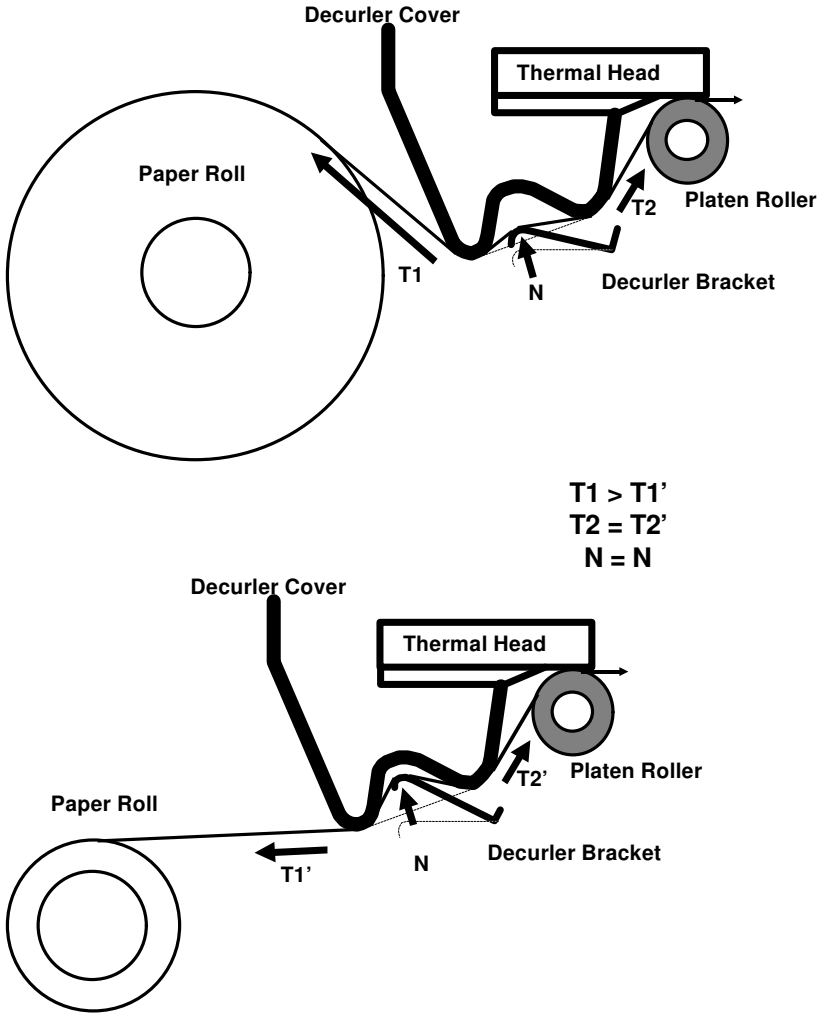
### 2-1. FAX220 (Manual Cutter Models)

The printer is very simple. After printing has finished, the machine feeds the paper 22 mm to the cutting position. So received messages will have a 22 mm blank space at the top.

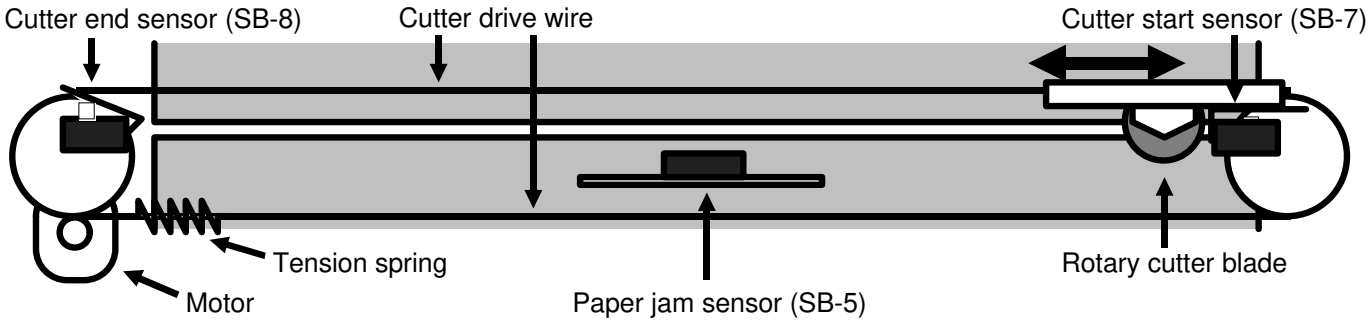
## 2-2. FAX240 (with Shuttle Cutter and Decurler)

### 2-2-1. Decurler

The decurler unit consists of the decurler cover, decurler bracket and the decurler spring on the platen roller shaft.
In standby mode, the decurler bracket is down at the standby position. When the machine starts printing, the decurler spring on the platen roller shaft lifts up the decurler towards the bend in the decurler cover. Then the paper path is curved as shown in the bottom diagram, so that the two bends on the decurler cover can apply negative stress to the curled paper to get rid of the curl from the paper.
The decurler bracket always applies the same negative force (N) to the paper, but the negative stress on the paper varies depending on the amount of paper remaining. The tension (T1) when the roll is almost full is stronger than the tension (T1') when the roll is almost empty, and the tension (T2) equals to (T2').
So, the paper path is curved more strongly as the paper roll gets lighter.
After printing has finished, the machine cuts the paper then reverses the Rx motor to feed back the paper to the printing position and to move the decurler bracket down to the standby position.




### 2-2-2. Shuttle Cutter




The shuttle cutter consists of a paper guide frame, rotary cutter blade, motor, cutting start sensor (SB-7), cutting end sensor (SB-8), and jam sensor (SB-5).
In standby mode, the cutter blade is always at the cutting start position. When the machine has finished printing, the Rx motor stops then the cutter blade shuttles across the paper. The cutting end sensor detects that the cutter blade has finished cutting, then the CPU reverses the cutter motor to move the cutter blade to the cutting start position. After cutting, the Rx motor feeds out the copy, then it reverses to feed the paper back to the printing position and to move the decurler bracket down to the standby position.