RICOH FAX 2500L

(CRO)

SERVICE MANUAL

INFOTEC 3661

(CRO)

SERVICE MANUAL

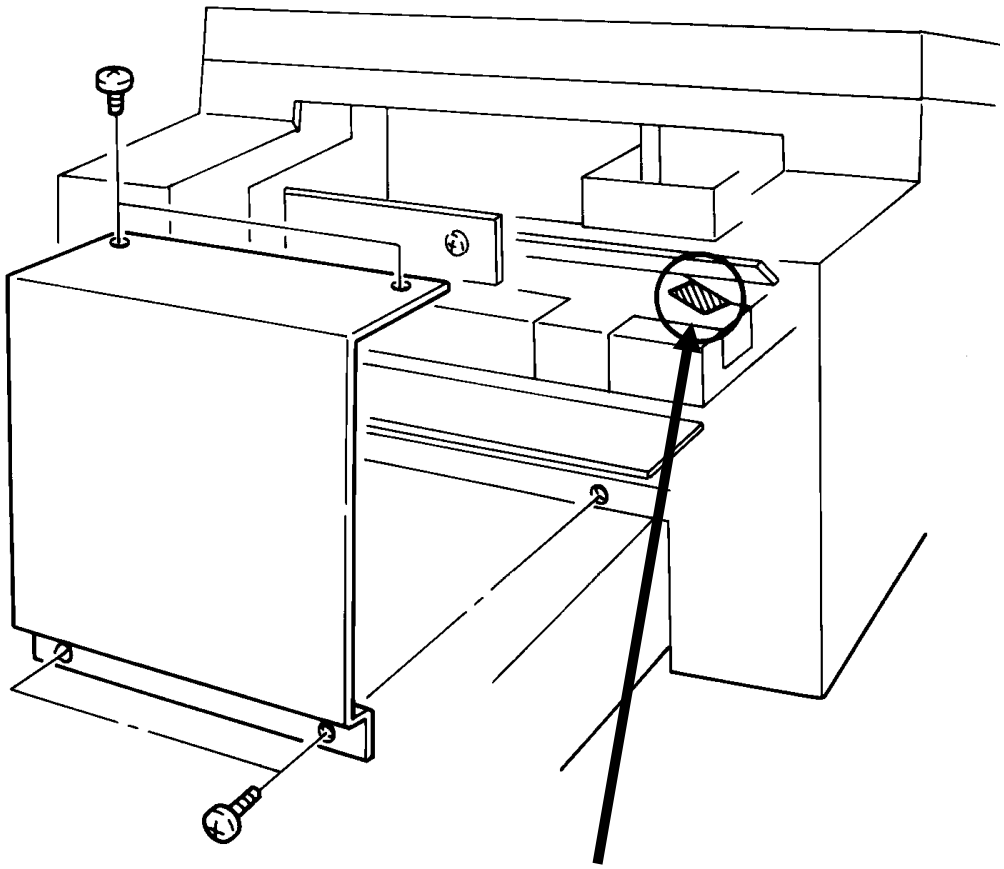
NRG 9650

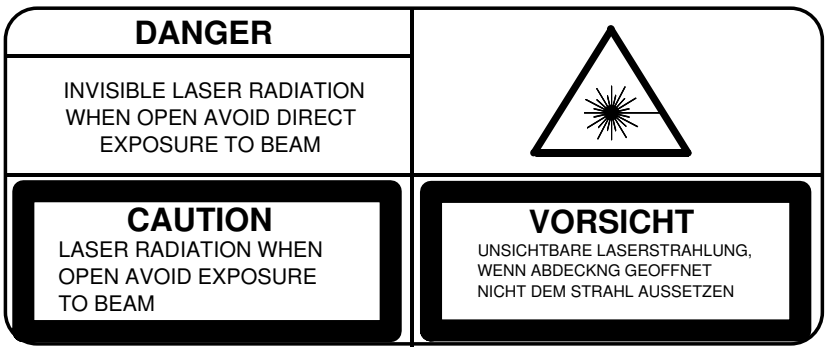
(CRO)

SERVICE MANUAL

WARNING

THIS MACHINE CONTAINS A LASER BEAM GENERATOR. LASER BEAMS CAN CAUSE PERMANENT EYE DAMAGE. DO NOT OPEN THE LASER UNIT OR LOOK ALONG THE LASER BEAM PATH WHILE THE MAIN POWER IS ON.





Lithium Batteries (Memory Back-up)

CAUTION: The danger of explosion exists if a battery of this type 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.

1. OVERALL MACHINE INFORMATION

1.1. SPECIFICATIONS

Type
Desktop transceiver

Circuit
PSTN, PABX

Connection
Direct couple

Document Size
Length: 105 - 1200 mm
[4.1 - 47.2 ins]
Up to 100 m [328 ft] after adjustment
Width: 148 - 304 mm
[5.8 - 12.0 ins]
Thickness: 0.05 to 0.2 mm
[2 to 8 mils]

Document Feed
Automatic feed, face down

ADF Capacity
30 sheets (using 80 g/m^2 paper)

Scanning Method
Flat bed, with CCD

Maximum Scan Width
256 mm [10.1 ins] ± 1%

Scan Resolution
Main scan: 8 dots/mm [203 dpi]
Sub scan:
Standard - 3.85 lines/mm [98 lpi]
Detail - 7.7 lines/mm [196 lpi]
Fine - 15.4 lines/mm [392 lpi]

Memory Capacity
ECM: 128 kbytes (double buffer)
SAF: 128 kbytes (7 pages), with optional extra 1 Mbyte or 2 Mbytes (max 64 or 121 pages respectively)

Compression
MH, MR, EFC, MMR, SSC
Storage to SAF memory for tx: MH
MMR only with ECM

Protocol
Group 3 with ECM

Modulation
V.29 (QAM), V.27ter (PHM), V.21 (FM)

Data Rate (bps)
9600/7200/4800/2400
Automatic fallback

I/O Rate
With ECM: 0 ms/line
Without ECM: 5, 10, 20, or 40 ms/line

Transmission Time
10 s at 9600 bps, Measured with G3 ECM using memory for a CCITT #1 test document (Slerexe letter) using standard resolution

Printing System
Laser printing, using the Ricoh CS (Compact Seamless) Engine, plain paper, dry toner

Paper Size
A4, A5

Maximum Printout Width
210 mm [8.3 ins]

Maximum Printer Resolution
Main scan: 16 dots per mm [406 dpi]
Sub scan: 15.4 lines/mm [392 lpi]

Power Supply
220 - 240 Vac, 50 Hz

Power Consumption (Base Machine Only)
Standby: 35 W, **Transmit:** 50 W
Receive: 200 W, **Copying:** 270 W

Operating Environment
Temperature: 17 - 28 °C [63 - 82 °F]
Humidity: 40 - 70 %Rh

Dimensions (W x D x H)
496 x 475 x 293 mm [19.5 x 18.7 x 11.5 ins]
Excluding handset, trays, and optional units

Weight
19 kg [41.8 lbs]
Excluding handset, trays, and optional units

1.2. FEATURES

KEY: O = Used X = Not used,
A = With optional memory only,
B = With printer interface kit only

Equipment	
ADF	O
Bar code reader	X
Built-in handset	X
Cabinet	X
Connection for ans. machine	X
Connection for handset	O
Counter (optional)	O
Cutter	X
Handset (optional)	O
Hard disk	X
Magnetic card reader	X
Manual feed mechanism	X
Microphone	X
Monitor speaker	X
Printer mode (optional)	B
Remaining memory indicator	O
Speakerphone	X
Stamp	X

Video Processing Features	
Contrast	O
Halftone (Basic & Error Diffusion)	O
MTF	O
Reduction	O
Resolution	O
Smoothing to 16 x 15.4 l/mm	O

Communication Features - Auto	
Automatic fallback	O
Automatic redialing	O
Confidential reception	A
Dual Access	X
Substitute reception (in Europe version with standard memory, 1 file only)	O
Transmission Reserve	O

Communication Features - User Selectable	
Action as a transfer broadcaster	X
AI Redial (Last one number)	O
Alternative Destination	O
Answering machine	X
Authorized Reception	X
Auto-answer delay time	X
Auto dialing (pulse or DTMF)	O
Auto Document	X
Automatic Voice Message	X
Auto-note	X
Batch Transmission (max 5 batches)	A
Broadcasting	O
Chain Dialing	O
Communication Result Display	X
Confidential ID Override	O
Confidential Transmission	O
Direct Fax Number Entry	O
Economy Transmission	X
Economy Transmission Time	X
Forwarding (5 stations)	X
Free Polling	O
Groups (7 groups)	O
Group Transfer Station	X
Hold	X
ID Transmission Option	X
Immediate Redialing	O
Immediate transmission (this is the default mode)	O
Keystroke Programs	O
Mailbox	X
Memory transmission	O
Multi-step Transfer	X
Next Transfer Station	X
Notify	X
On Hook Dial	X
Page Count	O
Personal Codes	O
Personal Codes with Conf. ID	O
Polling Reception	O
Polling Transmission	O
Polling tx file lifetime in the SAF	X
Quick Dial (16 stations)	O
Reception modes (Fax, Tel)	O
Reduction	O
Remote control features	X

Communication Features - User Selectable	
Remote Transfer	X
Restricted Access	X
Secured Polling	O
Secured Polling with Stored ID Override	O
Secure Transmission	X
Send Later	O
Silent ringing detection	X
Speed Dial (50 stations)	O
Telephone Directory	X
Tonal Signal Transmission	O
Transfer Request	O
Transmission Deadline	X
Turnaround Polling	X
Two in One	X
Two-step Transfer	X
Voice Request (immed. tx only)	O

Communication Features - Service Selectable	
AI Short Protocol	O
Auto-reduction override option	O
Busy tone detection	O
Closed Network (tx and rx)	O
Continuous Polling Reception	O
Dedicated tx parameters	O
ECM	O
EFC	O
Inch-mm conversion	X
MV1200 compatibility	X
Page retransmission	O
Page separation mark	O
Protection against wrong conn.	O
Resol'n stepdown override option	X
Short Preamble	O
Well log	O

Other User Features	
Area Code Prefix	X
Auto Service Call	O
Center mark	O
Checkered mark	X
Clearing a memory file	O
Clearing a polling file	O
Clock	O
Confidential ID	O
Copy mode	O
Counters	O
Country code	X
Daylight Saving Time	O
Destination Check	X
Direct entry of names	O
Function Programs	O
ID Code	O
Label Insertion	X
Language Selection	O
LCD contrast control	Service
Memory Lock	A
Memory Lock ID	A
Modifying a memory file	X
Multi Sort Document Reception	X
Multicopy mode	O
Night Timer	O
OMR Sheet	X
Ordering Toner	O
Own telephone number	O
Printing a memory file	O
RDS on/off	O
Reception Mode Switching Timer	X
Reception Time	X
Remote ID	X
Reverse Order Printing	X
RTI, TTI, CSI	O
Secure ID	X
Speaker volume control	X
Specified Cassette Selection	X
Substitute reception on/off	O
Telephone line type	O
TTI on/off	O
User Function Keys	X
User Parameters	O
Wild Cards	X

Reports - Automatic	
Charge Control Report	X
Communication Failure Report	O
Confidential File Report	A
Error Report	O
Memory Storage Report	O
Mode Change Report	X
Polling Clear Report	X
Polling Confirmation List	X
Polling Reserve Report	O
Polling Result Report	O
Power Failure Report	O
TCR (Journal)	O
Transfer Result Report	X
Transmission Deadline Report	X
Transmission Result Report	O

Reports - User-initiated	
Authorized Reception List	X
Charge Control Report	X
File List	O
Forwarding List	X
Group List	O
Personal Code List	O
Program List	O
Quick Dial List	O
Specified Cassette Selection List	X
Speed Dial List	O
TCR (Journal)	O
Transmission Status Report	X
User Function List	X
User Parameter List	O

Service Mode Features	
Back-to-back test	O
Bit switch programming	O
Buzzer test	O
Cable equalizer	O
Comm. parameter display	O
Counter check	X
DTMF tone test	O
Echo countermeasure	O
Effective term of service calls	O
Error code display	O
Excessive jam calls	O
File Transfer	O
Fusing lamp test	O

Service Mode Features	
LCD contrast adjustment	O
Memory file printout (all files)	O
Modem test	O
NCU parameters	O
Operation panel test	O
Ozone fan test	O
Periodic service call	O
PM call	O
Printer mechanism test	X
Printer test patterns	O
Programmable attenuation	X
Protocol dump list	O
RAM display/rewrite	O
RAM dump	O
RAM test	O
Ringer test	X
Scanner lamp test	O
Scanner mechanism test	O
Sensor initialization	X
Serial number	O
Service monitor report	O
Service station number	O
System parameter list	O
Technical data on the TCR	O
Thermal head parameters	X
Transmission Status Report	X

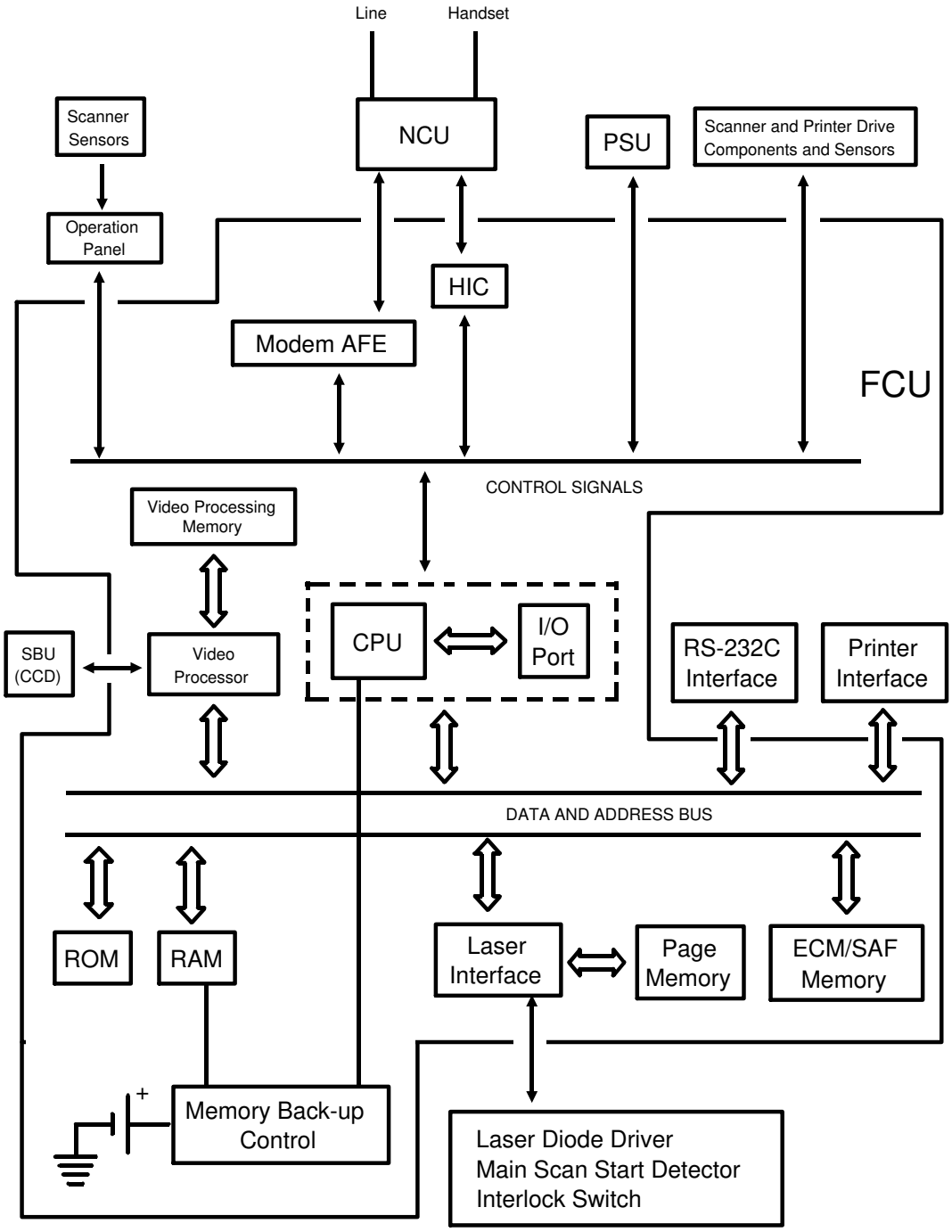
Memory Files

Max. number of files: 20
Max. number of stations/file: 20
Max. number of stations overall: 21
Max. number of pages overall: 128

2. DETAILED SECTION DESCRIPTIONS

2.1. PCBs AND THEIR FUNCTIONS

2.1.1. FCU



1. CPU (AFSP)

- 65C02 compatible microprocessor
- Interrupt and DMA control
- Data compression and reconstruction (high speed MH coding for 4.5-second scanning)
- Modem (digital operations)
- Real time clock (battery backed-up)
- Memory control
- Control of all mechanisms (directly or through other chips)
- NCU control (through the I/O Port)

2. I/O Port (LIOP)

- Clock control
- Sensor monitoring (including A/D conversion where necessary)
- Tone detection
- Motor drive
- Operation panel control
- Laser Interface control

3. Laser Interface (ALIF)

- Page memory control
- Laser diode control
- Smoothing
- Hexagonal mirror motor control
- Printer interface control

4. Modem Analog Front End (AFE2)

- Modem (analog operations)
- Attenuation

5. Video Processor (VPP4A)

- Analog/digital video signal processing

6. Hybrid IC (LHIC)

- Filters

7. RAM

- 256k ECM/SAF memory (no battery back-up)
- 768k page memory
- 32k SRAM and 32k PSRAM for parameter storage, line buffer, FIFO, SAF memory administration

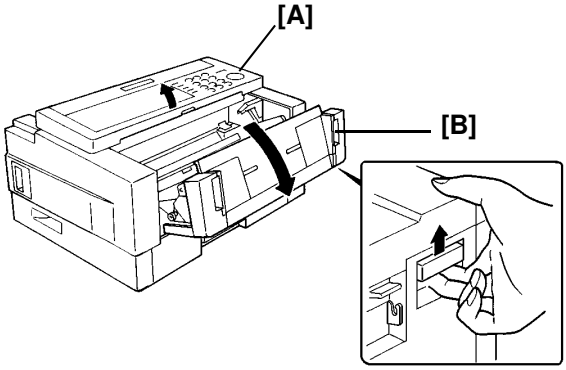
8. ROM

- 256k system ROM for the machine's software

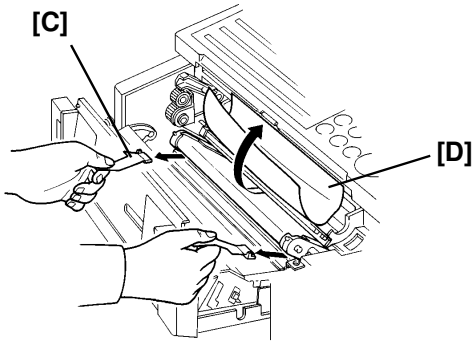
3. INSTALLATION

3.1. INSTALLING THE MACHINE

1. Tear off several tapes from the machine, and remove the protective sheet and tabs from the ADF (Auto Document Feeder) [A]. Make sure that no tape is left inside the machine, especially inside the ADF.

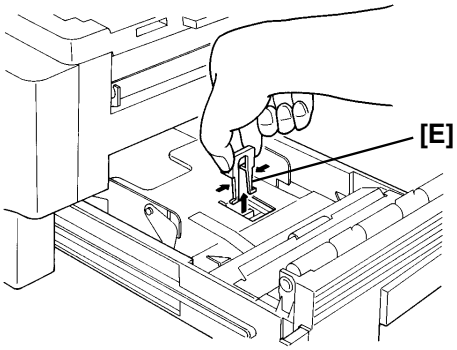


2. Set up the master unit.
Note that the green OPC belt may be damaged if you pull out the paper cassette before installing the machine.



2-1. Make sure that the power cord is not plugged in.
2-2. Open the scanner [A] and the front cover [B].
2-3. Pull out the plastic tabs [C] at both sides of the master unit.
2-4. Tear off the protective paper [D], being careful not to touch the green OPC belt.

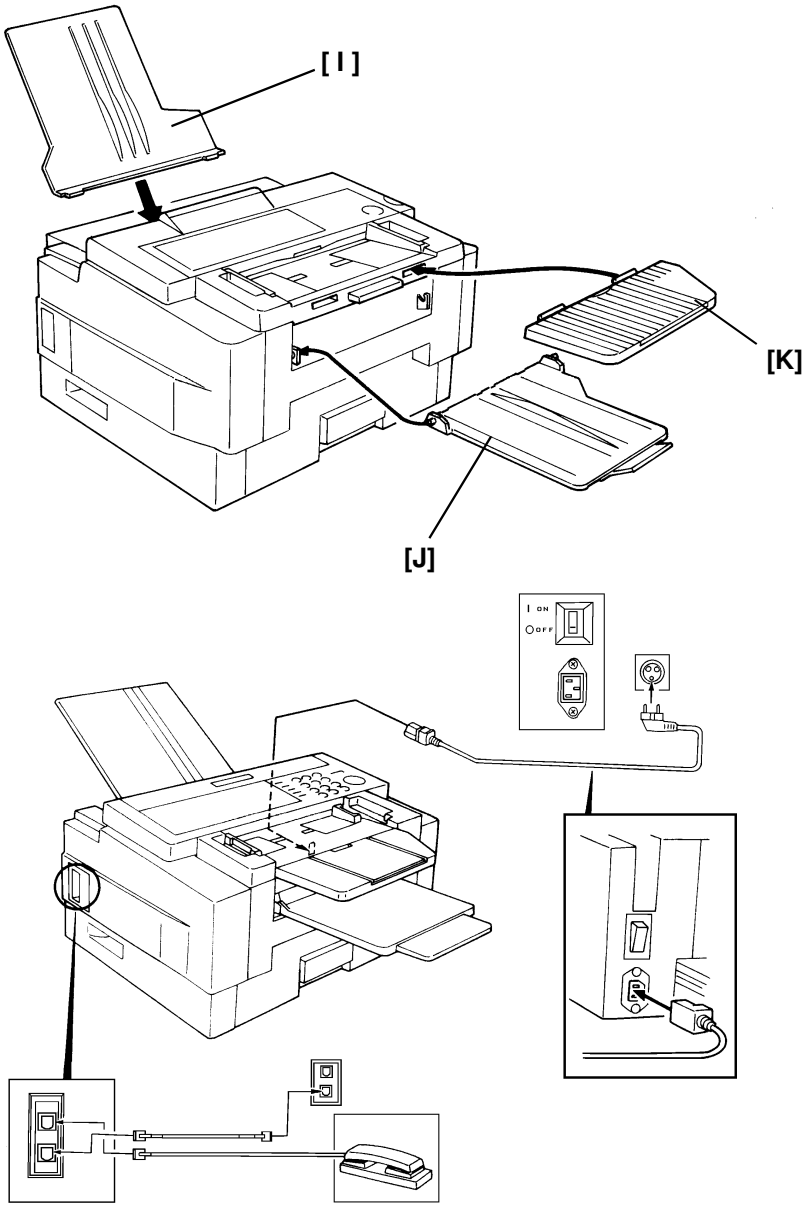
3. Preparing Paper Cassette
3-1. Slide out the cassette. Then remove the green tab [E], while holding both sides of it. Put back the cassette.



4. Install the consumable supplies (paper and toner cassette). Refer to your operator's manual (Section 6) for full details.
   If necessary, change the paper size of the cassette before loading the paper.

5. Attach the document tray [I], copy tray [J], and document table [K] in the appropriate position.

6. Connect the telephone line and power cord.
   If the style of the telephone line is different from the wall socket, contact a telephone company.



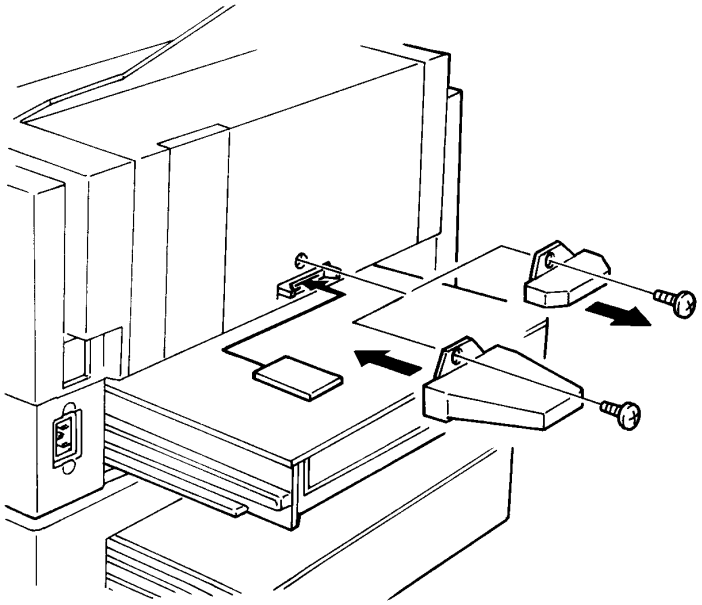
7. Turn on the power switch.

3.2. INSTALLING ADDITIONAL UNITS

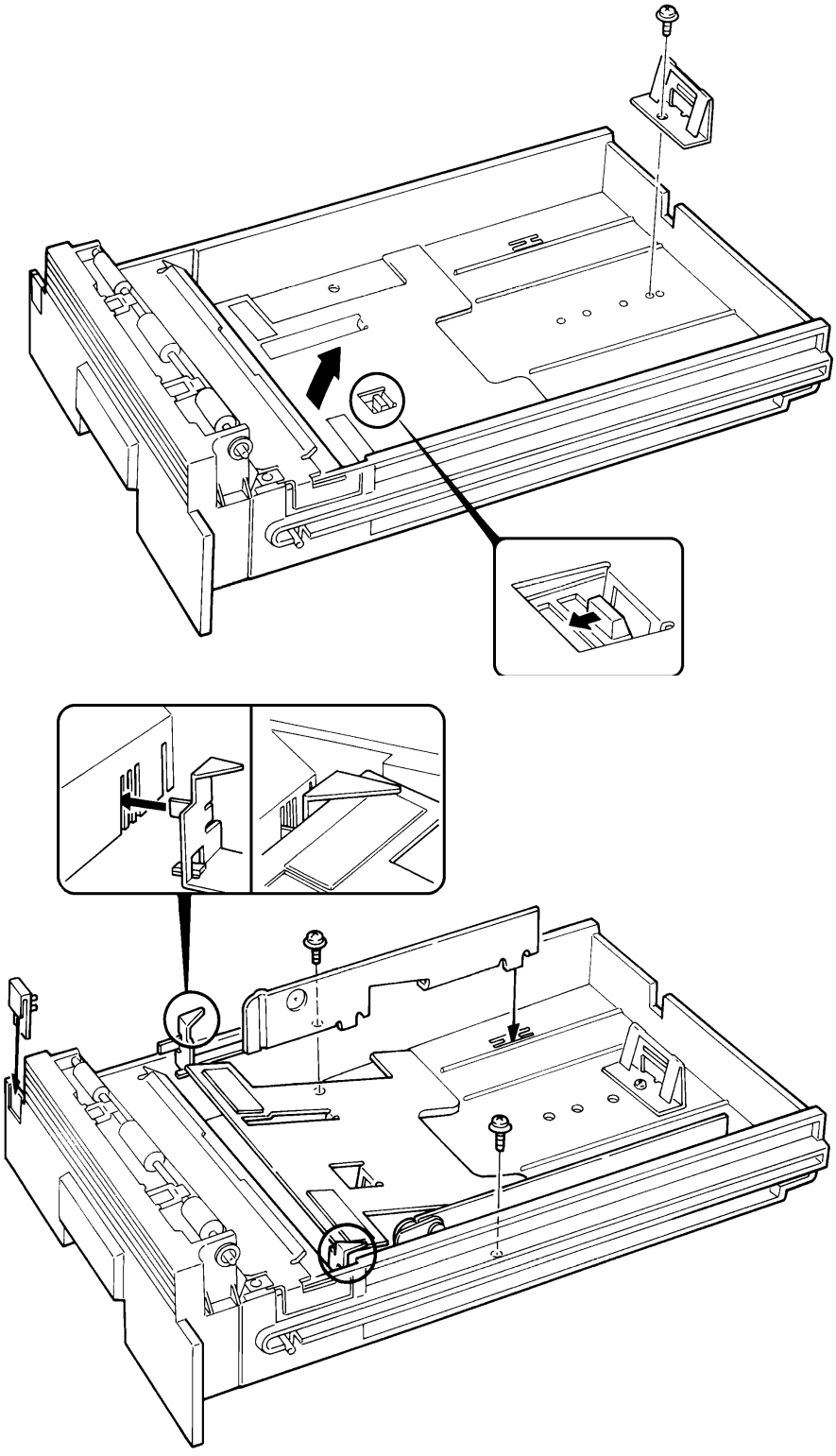
Check whether there are any messages in the memory. If there are, you must install the lower cassette and turn the power back on within an hour.

3.2.1. Memory Card

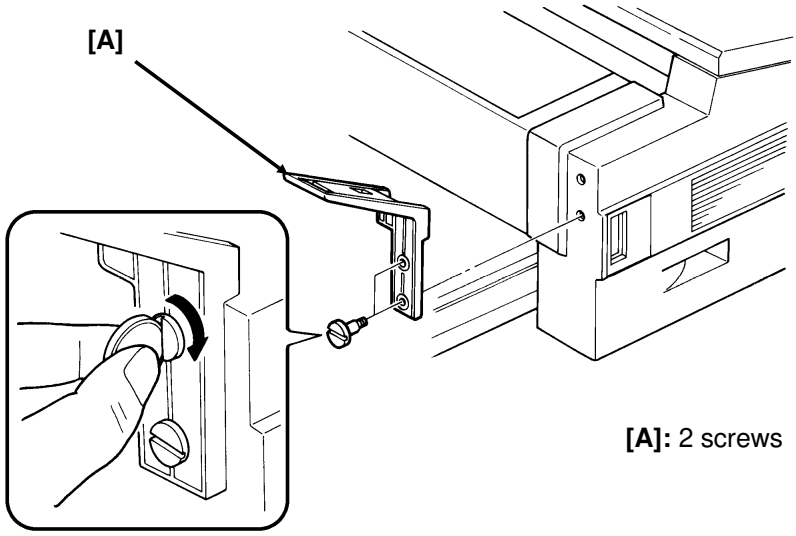
- Turn off the power before installing or removing a memory card.
- Make sure that 100% is displayed on the operation panel before installing or removing a memory card, or data will be lost.



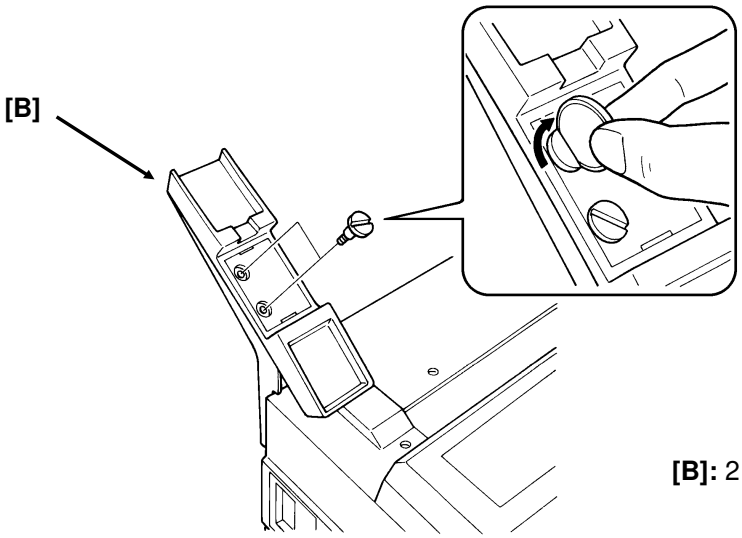
3.2.2. Cassette (250 Sheets)



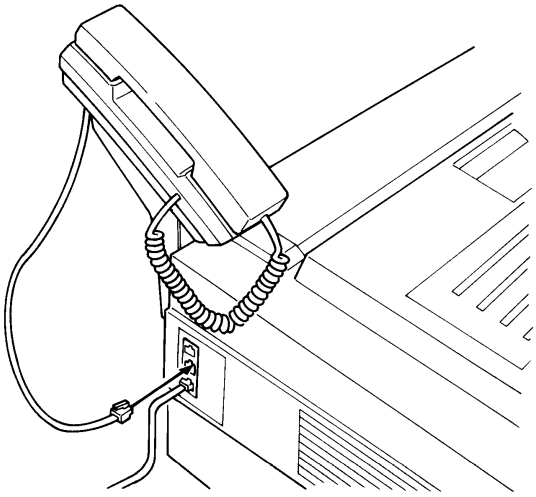
3.2.3. Handset



[A]: 2 screws



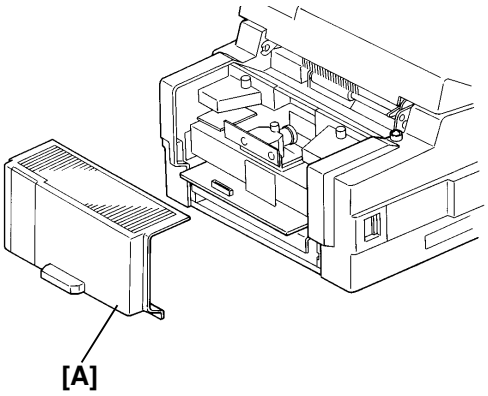
[B]: 2 screws



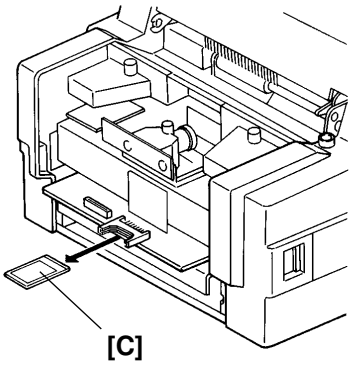
3.2.4. Printer Interface Kit

Installing the Interface Kit

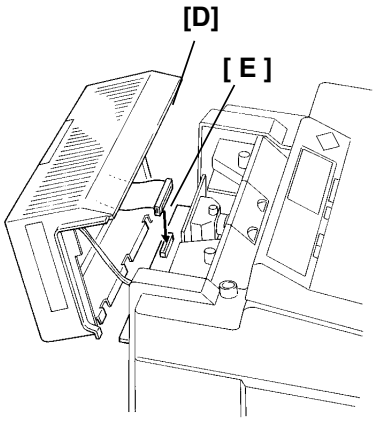
1. First, print any messages still stored in the SAF.
2. Turn off the power, and unplug the machine from the wall socket.
3. Slide out the cassettes.
4. Take off the rear cover [A].



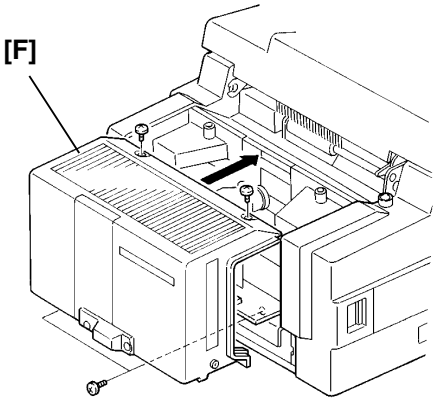
5. If a memory card [C] is installed on the machine, remove it. Go to step 8.



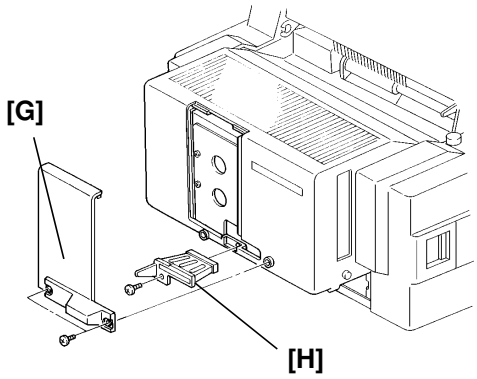
6. Hold the printer interface unit [D] near the machine with one hand, and plug the flat cable [E] into the connecter on the FCU board.



7. Attach the printer interface unit [F].



8. Remove the memory option cover [G].
9. Attach the memory card guide [H]. Then install the memory card if necessary.
10. Put back the option memory cover.
11. Put back the cassettes.
12. Plug in the machine, then turn on the power.

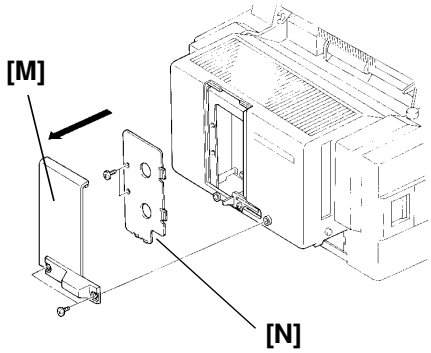


CAUTION

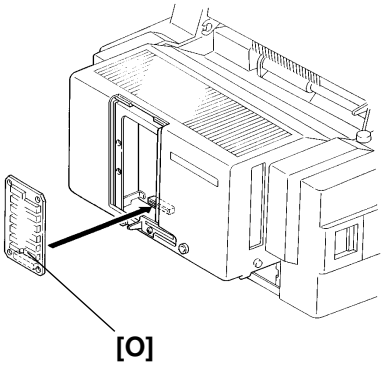
If an optional memory card is used with the printer interface unit and you wish to disassemble the machine, be sure to remove the memory card first, before removing the printer interface unit. Removing the printer interface unit without removing the memory card will cause the card or the connector on the FCU to be physically damaged.

Installing the Memory Expansion Board

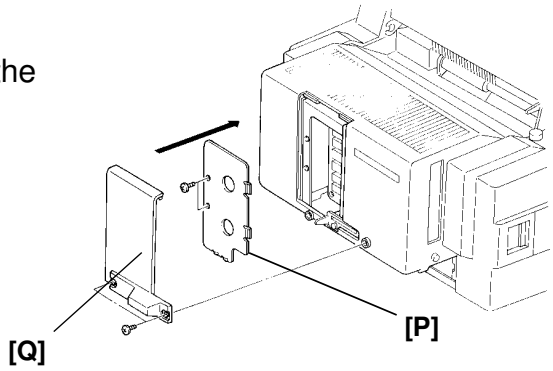
1. Print any messages still stored in the SAF.
2. Turn off the power and unplug the machine from the wall socket.
3. Remove the memory option cover [M] and the memory board cover [N].



4. Insert the memory expansion board [O].



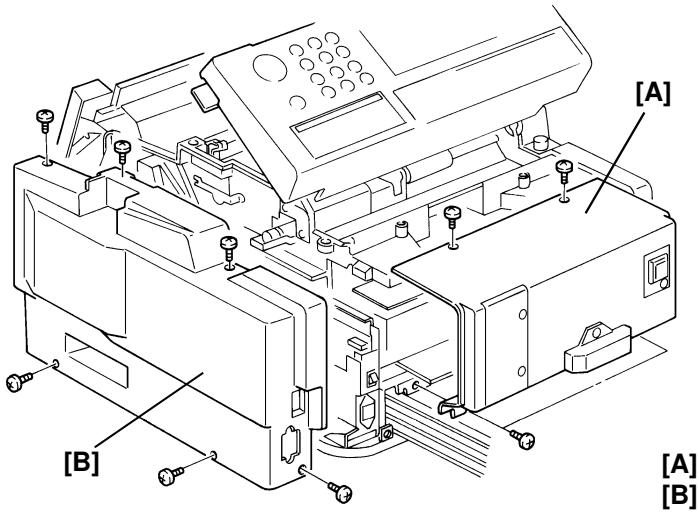
5. Put back the memory board cover [P] and the memory option cover [Q].
6. Plug in the machine, then turn on the power.



Caution: Do not plug in or switch on until everything is connected up.

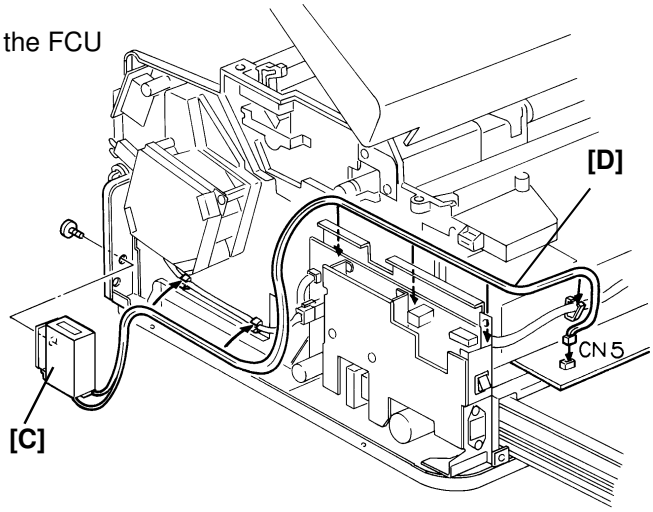
3.2.5. Counter

Turn off the power before beginning this procedure.



[A]: 4 screws
[B]: 6 screws

[C]: 1 screw
[D]: To CN5 on the FCU



Make sure that the harness is fed through the machine without getting entangled around components.

Test the counter before reassembling the machine.

1. Carefully turn on the power.
   Caution: Do not touch the PSU.
2. Copy a few sheets.
3. Check that the counter increments correctly.
   Then turn off the power, put back the covers, and switch on the machine.

3.3. INITIAL PROGRAMMING

Check the following:

- Is the country code in the NCU parameters (Function 96, parameter 00) correct for the country of installation? In the UK, it should be 02.
- Do any bit switch or other settings have to be changed to match line conditions or user requirements?
- Have you programmed the serial number (Function 98, section 4-1-19)

The user should program the following items after installation:

- Telephone Line Type (Europe only)
- RTI, TTI, and CSI
- ID Codes (ID Code, Confidential ID, Memory Lock ID)
- The fax machine's own telephone number
- Date and Time
- Daylight Saving Time On/Off
- Language Selection

4. SERVICE TABLES AND PROCEDURES

4.1. SERVICE LEVEL FUNCTIONS

4.1.1. Bit Switch Programming (Function 91)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

FUNCTION Y/▽
9 SERVICE FUNCTIONS

2. **9** **1** **Yes**

DEFAULT: 0000 0000
BITSW 00: 0000 0000

   Bit 7 is displayed at the left, and bit 0 at the right.

3. Increment bit switch: **#**

   Decrement bit switch: *****

   Example: Display bit switch 3: **#** x 3

DEFAULT: 0000 0000
BITSW03: 0000 0000

4. Adjust the bit switch.
   Example: To change the value of bit 7, press **7**

DEFAULT: 0000 0000
BITSW03: 1000 0000

5. Either:
   - Adjust more bit switches - go to step 3.
   - Finish - **Function**

4.1.2. System Parameter List (Function 92)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

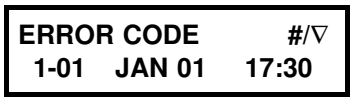
2. **9** **2** **Yes** **Start**

   After printing, press **Function**

4.1.3. Error Code Display (Function 93)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

2. **9** **3** **Yes**



3. Either:

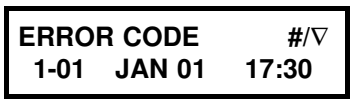
   Scroll through the error codes - **#**

   Finish - **Function**

4.1.4. Service Monitor (Function 93)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

2. **9** **3** **Yes**



3. **No/▽** **Start**

4.1.5. Protocol Dump (Function 94)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

2. **9** **4** **Yes**

3. **Start**

4.1.6. RAM Display/Rewrite (Function 95)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

```
FUNCTION          Y/▽
9 SERVICE FUNCTIONS
```

2. **9** **5** **Yes**

```
                  Y/▽
DISPLAY MEMORY
```

3. **Yes**

```
ADDRESS = 2044C
DATA    = 03
```

4. Input the address that you wish to see. **Example:** Address 20202

   2 **0** **2** **0** **2**

```
ADDRESS = 20202
DATA = 00
```

   Note: The first digit must always be 2.

5. If you wish to change the data, type in the new data.

   Example: 80, press **8** **0**

```
ADDRESS = 20202
DATA = 80
```

   Note: If you wish to move the cursor, press **→**

6. Either:
   - View more addresses - go to step 4.
   - Finish - **Yes** **Function**

4.1.7. RAM Dump (Function 95)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

```
FUNCTION          Y/▽
9 SERVICE FUNCTIONS
```

2. **9** **5** **Yes**

```
                  Y/▽
DISPLAY MEMORY
```

3. **▽** **Yes**

```
MEMORY DUMP START/N
B=02, S=0000,E=00FF
```

4. Input the bank number. The value of parameter “B” is always “02”. Then, input the first two digits of start and end addresses at “S=” and “E=” prompts. For example, enter “12” for start address 1200(H), and enter 13 for end address 13FF(H). Then, press Start to print the dump list.
Example: Start at 1200, end at 13FF.

[0] [2] [1] [2] [1] [3] [Start]

```
MEMORY DUMP  START
B=02, S=1200,E=13FF
```

4.1.8. SAF/ECM Memory Test (Function 95)

1. [Function] [5] [1] [9] [9] [1]
then immediately [Yes]

```
FUNCTION                Y/∇
9 SERVICE FUNCTIONS
```

2. [9] [5] [Yes]

```
                        Y/∇
DISPLAY MEMORY
```

3. [∇] [∇] [Yes] . The machine starts to check the DRAMs used as ECM and SAF memory.

```
BUSY
CHECK DRAM
```

4. After the test, either “PASS” or “ERR (Error)” will be displayed.
If “ERR: B=nnH ADR=mmmm” is displayed, replace the FCU (“nn” and “mmmm” represents the bank number and the address of the defective portion of the memory.

```
PASS
CHECK DRAM
```

5. [Stop]

4.1.9. Page Memory Test (Function 95)

1. [Function] [5] [1] [9] [9] [1]
then immediately [Yes]

```
FUNCTION                Y/∇
9 SERVICE FUNCTIONS
```

2. [9] [5] [Yes]

```
                        Y/∇
DISPLAY MEMORY
```

3. [▽] [▽] [▽] [Yes] . The machine starts to check the DRAMs used as page memory.

```
BUSY
CHECK PAGE MEMORY
```

4. After the test, either “PASS” or “ERR (Error)” will be displayed. If “ERR: B=nnH ADR=mmmm” is displayed, replace the FCU (“nn” and “mmmm” represents the bank number and the address of the defective portion of the memory.

```
PASS
CHECK PAGE MEMORY
```

5. [Stop]

4.1.10. NCU Parameters (Function 96)

1. [Function] [5] [1] [9] [9] [1]
   then immediately [Yes]

```
FUNCTION                Y/▽
9 SERVICE FUNCTIONS
```

2. [9] [6] [Yes]

```
NCU PARAMETER     KPAD/Y
   NO.00          017
```

3. Scroll through the parameters - [Yes]

   Enter new values at the keypad.
   Example: Set NCU parameter 04 to 005.

   [Yes] [Yes] [Yes] [Yes] [0] [0] [5]

```
NCU PARAMETER     KPAD/Y
   NO.04          005
```

4. To finish: [Function]

Note: Parameter 00 is the Country Code, and Parameter 01 is the Tx Level (if the Tx level should be -9 dB, input 9).
Refer to section 4-3 for full details on NCU parameters.

4.1.11. ADF Test (Function 97)

1. [Function] [5] [1] [9] [9] [1]
   then immediately [Yes]

```
FUNCTION                Y/▽
9 SERVICE FUNCTIONS
```

2. **9** **7** **Yes**

```
SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7
```

3. **1**

```
SCANNER TEST   KPAD
    ADF-1 LAMP-2
```

4. **1**

5. **Function** **Function**

6. Place a document in the feeder,
   then press **Copy** **Start**

4.1.12. Xenon Lamp and Fusing Lamp Test (Function 97)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

```
FUNCTION              Y/▽
9 SERVICE FUNCTIONS
```

2. **9** **7** **Yes**

```
SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7
```

3. **1**

```
SCANNER TEST   KPAD
    ADF-1 LAMP-2
```

4. **2**

```
SCANNER LAMP TEST
```

The xenon lamp lights up for 5 minutes,
and the fusing lamp is switched on.

4.1.13. DTMF Tone Test (Function 97)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

```
FUNCTION              Y/▽
9 SERVICE FUNCTIONS
```

2. **9** **7** **Yes**

```
SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7
```

3. **2**

```
 DTMF TEST
DUAL-1    SINGLE-2
```

4. Either:

   - Test dual tones - **1** . Go to step 5.
   - Test single tones - **2** . Go to step 8.

5. The display is as shown opposite.

   DUAL TONE
   PRESS KEYPAD

   Press a key on the ten key pad.

   Example: **1** **Start**

6. To stop the test: **Stop**

7. Either:
   Test another tone: Go to step 5.

   Finish: **Function**

8. The display is as shown opposite.

   SINGLE TONE
   PRESS KEYPAD

   Press the required key.

697 Hz	1	852 Hz	3	1209 Hz	5	1477 Hz	7
770 Hz	2	941 Hz	4	1336 Hz	6	1633 Hz	8

   Example: To test 1633 Hz, press **8** **Start**

9. To stop the test: **Stop**

10. Either:

    Test another tone: Go to step 8.

    Finish: **Function**

4.1.14. Printer Test Patterns (Function 97)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

   FUNCTION Y/▽
   9 SERVICE FUNCTIONS

2. **9** **7** **Yes**

   SCN-1 DT-2 PL-3 LD-4
   MDM-5 RI-6 CK-7

3. [3]

```
PATTERN PRINT   KPAD
   1-7
```

5. Press a key from 1 to 7, excluding 5 and 6. (Patterns 5 and 6 are not used in this model.) A test pattern is printed.

4.1.15. Operation Panel and Ozone Fan Test (Function 97)

1. [Function] [5] [1] [9] [9] [1]
   then immediately [Yes]

```
FUNCTION              Y/▽
9 SERVICE FUNCTIONS
```

2. [9] [7] [Yes]

```
SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7
```

3. [4]
4. To stop the test, press [Stop] .

4.1.16. Modem Test (Function 97)

1. [Function] [5] [1] [9] [9] [1]
   then immediately [Yes]

```
FUNCTION              Y/▽
9 SERVICE FUNCTIONS
```

2. [9] [7] [Yes]

```
SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7
```

3. [5]

```
 MODEM TEST
 G3-1 TONE-2
```

4. Either:

   Test G3 carrier signals - [1] . Go to step 5.

   Test frequencies - [2] . Go to step 8.

5. The display is as shown opposite.

```
9600-1  7200-2
4800-3  2400-4  300-5
```

   Press the required key.
   Example: Test the 9600 bps carrier [1] [Start]

6. To stop the test: [Stop]

7. Either:
   Test another tone: Go to step 5.

   Finish: **Function**

8. The display is as shown opposite.

2100-1 1100-2 800-3
PRESS KEYPAD

   Press the required key.
   Example: To test 1100 Hz, press **2** **Start**

9. To stop the test: **Stop**

10. Either:
    - Test another tone: Go to step 8.
    - Finish: **Function**

4.1.17. Ringer Test (Function 97)

Not used; do not try to use this function.

4.1.18. Buzzer Test (Function 97)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

FUNCTION Y/▽
9 SERVICE FUNCTIONS

2. **9** **7** **Yes**

SCN-1 DT-2 PL-3 LD-4
MDM-5 RI-6 CK-7

3. **7**

   Press the Stop key to stop the buzzer.

4.1.19. Serial Number (Function 98)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

FUNCTION Y/▽
9 SERVICE FUNCTIONS

2. **9** **8** **Yes**

SERIAL # KPAD
■■■■■■■■■■■■

3. Enter the machine's serial no at the keypad.

SERIAL # KPAD/Y/N
7940479186

   To correct a mistake: **No**

4. If the display is correct: **Yes**

4.1.20. Service Station Telephone Number (Function 99)

1. **Function** **5** **1** **9** **9** **1**
   then immediately **Yes**

FUNCTION Y/▽
9 SERVICE FUNCTIONS

2. **9** **9** **Yes**

TEL NUMBER KEYPAD

3. Input the telephone number of the service station that will receive Auto Service calls from this machine.

TEL NUMBER KPAD/Y/N
2125555242

4. **Yes** **Function**

4.1.21. Printing all Memory Files (Function 24)

First, set bit 5 of bit switch 01 to 1.

1. **Function** **2** **4** **Yes**

2. Press **No/▽** **Yes** **Start** .

All files in the memory, including confidential messages, will be printed one by one. The files will not be erased.

After you have finished, set bit 5 of bit switch 01 back to 0.

Note: To erase memory files, set bit 2 of bit switch 00 to 1. All files will be erased, and some RAM addresses will also be cleared.

4.1.22. CSI Programming

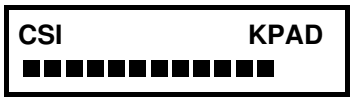
This procedure is for use in countries where CSI programming is a service function.

First, set bit 5 of bit switch 01 to 1. Then do the following procedure.

1. **Function** **5** **2** **2** **2** **2**
   5 **3** **Yes**

2. Press **No** twice.

3. Press **Yes** .



4. Input the CSI.
   Note: Not more than 20 digits.

5. Press **Yes** **Function**

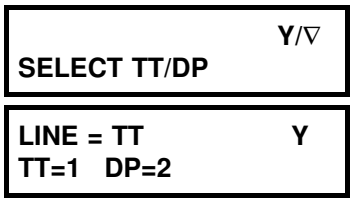
After you have finished, set bit 5 of bit switch 01 back to 0.

4.1.23. Telephone Line Type Selection

This procedure is for use in countries where telephone line type selection is a service function.

First, set bit 5 of bit switch 01 to 1. Then do the following procedure.

1. **Function** **5** **2** **2** **2** **2**
   7 **1** **Yes**



2. Press **Yes** .

3. Either:

   Select tone dialing - **1** .

   Select pulse dialing - **2** .

   Finish: **Function**

After you have finished, set bit 5 of bit switch 01 back to 0.

4.2. BIT SWITCHES

4.2.1. Definitions

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. Such bits are for use only in other areas, such as Japan.

Bit Switch 00		
	FUNCTION	**COMMENTS**
0	MTF process **0:** Enabled **1:** Disabled	**0:** The MTF process is used when required by the software. **1:** The MTF process is never used.
1	RAM reset level 2 **1:** Reset	When this bit is set to 1, all items stored in the RAM are reset except the clock, and then this bit changes back to 0 automatically. Also, all image files in the SAF memory are erased.
2	RAM reset level 3 **1:** Reset **Note:** RAM reset level 1 is a RAM adjustment. It is not described in this manual.	When this bit is set to 1, some items stored in the RAM are reset, then this bit changes back to 0. All items are reset except the bit switch and NCU parameter settings, clock, own tel. no., CSI, RTI, TTI, Quick Dials, Speed Dials, Groups, and the TCR memory. Also, all image files in the SAF memory are erased. This bit switch is recommended for use when it is necessary to clear the SAF, as fewer RAMs will need reprogramming.
3	Memory file forwarding **1:** Forward the files	Use this if the printer does not work, but the user wishes to print the files. First, change the fax machine's telephone number (Function 51) to the number to which you wish to forward the files, then set this bit to 1. All files in the memory will be forwarded. This bit resets to 0 automatically. However, you must return the fax machine's telephone number to the original setting. The files stay in memory.
4	Inclusion of technical data on the Journal **0:** No **1:** Yes	**1:** Instead of the personal code, the following data are listed on the TCR as a six-figure number. First two numbers: Final modem rate (for example, 96 means 9,600 bps) Second two numbers (Rx mode only): Rx signal level (Level = 0 - 0.375x, where x is the value on the report; accurate to 3 dB) Third two numbers (Rx mode only): Rx cable equalizer; 00 = Equalizer is Off, 01 = Equalizer is On
5,6	Not used	Do not change the factory settings.
7	Communication parameter display **0:** Disabled **1:** Enabled	This is a fault-finding aid. The LCD shows the key parameters (see below). This is normally disabled because it cancels the CSI display for the user. Make sure that you reset this bit after testing.

Communication parameter display

Mode	DCS: CCITT G3 NSS: Non-standard G3
Modem rate	96: 9600 bps 72: 7200 bps 48: 4800 bps 24: 2400 bps
Communication mode	ECM: With ECM SSC: Using SSC EFC: Using EFC NML: With no ECM, SSC, or EFC
Compression mode	MMR: MMR compression MR: MR compression MH: MH compression
Resolution	SSF: Fine, transmitted at 8 x 15.4 dots per mm PSF: Fine, transmitted at 8 x 7.7 dots per mm and smoothed at the rx side DTL: Detail STD: Standard
I/O Rate	0M: 0 ms/line 2/M: 2.5 ms/line 5M: 5 ms/line 10M: 10 ms/line 20M: 20 ms/line 40M: 40 ms/line
Width and reduction	=A4: A4 (8.3"), no reduction >A4: Reduced to A4 (8.3") before transmission

Bit Switch 01

	FUNCTION	COMMENTS
0 **1**	LCD contrast **Bit 1 0 Contrast** 0 0 Brightest 0 1 ↓ 1 0 ↓ 1 1 Darkest	Use these bit switches to adjust the brightness of the LCD on the operation panel.
2	Not used	Do not change the factory setting.
3 **4**	Memory read/write by RDS **Bit 4 3 Setting** 0 0 Always enabled 0 1 User selectable 1 0 User selectable 1 1 Always disabled	**(0,0):** At any time, an RDS system can read or write RAM data such as TTI and bit switches. **(0,1), (1,0):** Normally, RDS systems are locked out, but the user can temporarily switch RDS on to allow an RDS operation to take place. RDS will automatically switch off again after a certain time, which is stored in a RAM address (see section 4-5). Note that, if an RDS operation takes place, RDS will not switch off until this time limit has expired. **(1,1):** All RDS systems are always locked out.
5	Dedicated transmission parameter programming/printing all SAF files **0:** Disabled **1:** Enabled	This bit must be set to 1 before attempting to program dedicated transmission parameters or printing all files stored in the SAF memory. If CSI and /or telephone line type is a service mode in your area, this bit must also be at 1 before programming.
6	Not used	Do not change the factory setting.
7	Auto Service Call for PM **0:** Enabled **1:** Disabled	**0:** The machine will send an Auto Service Call when the PM interval has expired. This interval is adjustable by RAM address. The default setting is every 30,000 copies (based on the Print counter). **1:** The user will do maintenance as explained in the Operator's Manual whenever problems occur.

Bit Switch 02		
	FUNCTION	**COMMENTS**
0	Page separation mark **0:** Enabled **1:** Disabled	**0:** If a received page has to be printed out on two sheets, an "x" inside a small box is printed at the bottom right hand corner of the first sheet, and a "2" inside a small box is printed at the top right hand corner of the second sheet. This helps the user to identify pages that have been split up. **1:** No marks are printed.
1	Repetition of data when the received page is longer than the printer paper **0:** Disabled **1:** Enabled	**0:** The next page continues from where the previous page left off **1:** The final few mm of the previous page are printed at the top of the next page.
2	Reduction of the length of received data **0:** Enabled **1:** Disabled	This bit determines whether incoming pages are reduced to fit on the copy paper if they are almost the same length as the copy paper in the cassette.
3 **4** **5**	Not used	Do not change the factory settings.
6 **7**	Maximum transmittable document length **Bit 7 6 Setting** 0 0 600 mm 0 1 1200 mm 1 0 14 m 1 1 100 m	If the user wants to send very long documents such as well logs, use the 14 m or 100 m setting.

Bit Switch 03		
	FUNCTION	**COMMENTS**
0	Dialing with the handset off-hook **0:** Enabled **1:** Disabled	If this bit is 1, the user will not be able to dial if the handset is off hook.
1	Lifetime of polling standby files in the memory **0:** Erased after being polled **1:** Kept until user erases	**0:** Messages stored for polling transmission will be erased immediately after polling. **1:** This setting allows the user to keep messages in the memory to be polled by more than one station.
2	Inclusion of communications on the TCR when no image data was exchanged. **0:** No **1:** Yes	If communication did not reach phase 3 of CCITT T.30 protocol (such as for a telephone call), this communication can be listed on the TCR if this bit is at 1.
3	Printing of the error code on the error report **0:** No **1:** Yes	If this bit is 1, error codes are printed on the error reports for the user.
4	Not used	Do not change the factory setting.
5	Printing the TTI in copy mode **0:** No **1:** Yes	If this bit is 1, the TTI stored in the machine is printed at the top of the copy.
6	Not used	Do not change the factory setting.
7	Reconstruction time for the first line in receive mode **0:** 6 s **1:** 10 s	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.

Bit Switch 04

	FUNCTION	COMMENTS
0 1	Compression modes available in receive mode **Bit 1 0 Modes** 0 0 MH only 0 1 MR or MH 1 0 MR or MH, with EFC 1 1 MMR, MR, or MH, with EFC	These bits determine what capabilities are informed to the transmitting side in the protocol exchange.
2	Error counting method **0:** 10 (20) [40] **1:** In accordance with the settings of bits 3 to 7	The machine counts data errors caused by a noisy line or defective machine. **0:** If the count reaches 10 (Standard mode), 20 (Detail mode), or 40 (Fine mode), the machine sends RTN to the other end in reply to the post-message command. As 10 (or 20 or 40) good lines cause the count to decrement, RTN will only occur in bad conditions. The number of good lines for counter decrement and the value of error threshold can be changed by rewriting the RAM addresses 40CB(H) and 40CC(H).
3 4	Burst error threshold **Bit 4 3 Threshold** 0 0 3 (6) [12] 0 1 4 (8) [16] 1 0 5 (10) [20] 1 1 6 (12) [24]	If there are more consecutive error lines in the received page than the threshold specified by these bits, the page is rejected. Values in parenthesis are for Detail resolution, and those in square brackets are for Fine resolution.
5 6 7	Error line ratio **Bit 7 6 5 Value** 0 0 0 5% 0 0 1 6% 0 1 0 7% 0 1 1 8% 1 0 0 9% 1 0 1 10%	If the number of error lines divided by the total number of lines reaches the value determined by the settings of these bits, RTN will be sent to the other end.

Bit Switch 05

	FUNCTION	COMMENTS
0 1	Compression modes available in transmit mode **Bit 1 0 Modes** 0 0 MH only 0 1 MR or MH 1 0 MR or MH, with EFC 1 1 MMR, MR, or MH, with EFC	These bits determine what capabilities are informed to the receiving side in the protocol exchange.
2	PABX dial tone detection **0:** Enabled **1:** Disabled	**0:** PABX dial tone is detected in accordance with the parameters programmed in RAM. The machine will wait for the dial tone before trying to gain access to the PSTN.
3	PSTN dial tone detection **0:** Enabled **1:** Disabled	**0:** PSTN dial tone is detected in accordance with the parameters programmed in RAM. The machine will wait for the dial tone before dialing out.
4	Busy tone detection **0:** Enabled **1:** Disabled	**0:** Busy tone is detected in accordance with the parameters programmed in RAM. The machine will not have to wait out the CCITT T1 time before hanging up if the line is busy.
5	Not used	Do not change the factory setting.
6 7	PSTN access method through PABX **Bit 7 6 Method** 0 0 No PABX 0 1 Loop Start 1 0 Ground Start 1 1 Flash Start	Set these bits to match the type of signal accepted by the PABX. If there is no PABX between the machine and the network, set both bits to 0.

Bit Switch 06

	FUNCTION	COMMENTS
0 1 2 3 4 5 6 7	PSTN access number Access No. Hex value of bit switch 0 F0 ↓ ↓ 9 F9 00 00 ↓ ↓ 99 99	Program this bit switch if the machine is behind a PABX. The access number is the number the user must dial to get an outside line. If the machine detects the access number at the start of a telephone number, it will connect with the PABX, pause for a few seconds, then dial the number. Example: If the access number for the PABX is 9, the bit switch must be F9. To do this, set all bits to 1 except bits 1 and 2. If there is no PABX, set all bits to 1.

Bit Switch 07		
	FUNCTION	**COMMENTS**
0	Back to back test **0:** Disabled **1:** Enabled	Set this bit to 1 when you wish to do a back to back test.
1	Short preamble **0:** Enabled **1:** Disabled	If this bit is 0, the Short Preamble feature is switched on.
2	AI Short Protocol (transmission and reception) **0:** Enabled **1:** Disabled	If this bit is 0, the AI Short Protocol feature is switched on.
3	Echo countermeasure **0:** Enabled **1:** Disabled	If the setting is 1, the machine will hang up if it receives the same signal twice. If the setting is 0, the machine will ignore echoes from the line.
4	DIS detection number **0:** 1 **1:** 2	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.
5	ECM **0:** On **1:** Off	If this bit is 0, ECM is switched on.
6	Post-message response timing (rx) **0:** After feed-out **1:** When the leading edge reaches the copy feed-out sensor	**0:** Data cannot be stored in the SAF during reception if the memory is full, so, if this bit is 0, the machine will wait until the page has been fed out. However, communication will take longer to complete. **1:** The post message response is sent earlier, but the paper has not been fed out yet, so if there is a jam after this, data may be lost. This bit is ignored during memory reception.
7	FTZ protocol **0:** Disabled **1:** Enabled	This bit must be set to 1 in Germany.

Bit Switch 08 (Transmission)

	FUNCTION	COMMENTS
0 **1** **2** **3**	Initial Tx modem rate **Bit 3 Bit 2 Bit 1 Bit 0 Setting (bps)** 0 0 1 1 9,600 0 0 1 0 7,200 0 0 0 1 4,800 0 0 0 0 2,400	These bits set the initial starting modem rate for transmission. This rate may fall back to a slower rate depending on line conditions and the remote terminal's capabilities. **Note** Do not change the factory settings of bits 2 and 3.
4 **5**	Not used.	Do not change the factory setting.
6 **7**	Cable equalizer (tx mode) **Bit 7 Bit 6 Setting** 0 0 None 0 1 Medium 1 0 High 1 1 Not used	Use a higher setting if there is signal loss at higher frequencies because of the length of wire between the modem and the telephone exchange. Also, try using the cable equalizer if one or more of the following symptoms occurs. •Communication error •Modem rate fallback occurs frequently.

Bit Switch 09 (Transmission)		
	FUNCTION	**COMMENTS**
0	CNG signal transmission in manual transmission mode **0:** Disabled **1:** Enabled	CNG (calling tone) is normally used by auto-dial fax machines to alert a manual machine operator that an auto-transmitting machine is on the line waiting to transmit. This tone is not needed for manual operation (full number dialing).
1 **2**	Wrong connection prevention method **Bit 2 Bit 1 Setting** 0 0 None 0 1 8 digit CSI 1 0 4 digit CSI 1 1 CSI/RTI	**(0,1) -** The machine will not transmit if the last 8 digits of the received CSI do not match the last 8 digits of the dialed telephone number. This does not work for manual dialing. **(1,0) -** The same as above, except that only the last 4 digits are compared. **(1,1) -** The machine will not transmit if the other end does not identify itself with an RTI or CSI. **(0,0) -** Nothing is checked; transmission will always go ahead.
3	Closed network (transmission) **0:** Disabled **1:** Enabled	**1:** Transmission will not go ahead if the ID code of the other terminal does not match the ID code of this terminal. This feature may not be reliable when communicating with another maker's product.
4	Not used	Do not change the factory settings.
5		
6		
7		

Bit Switch 0A (Reception)

	FUNCTION	COMMENTS
0 1 2 3	Initial Rx modem rate **Bit 3 Bit 2 Bit 1 Bit 0 Setting (bps)** 0 0 1 1 9,600 0 0 1 0 7,200 0 0 0 1 4,800 0 0 0 0 2,400	The setting of these bits 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 a lower setting. **Note** Do not change the factory settings of bits 2 and 3.
4 5	Not used.	Do not change the factory setting.
6 7	Cable equalizer (rx mode) **Bit 7 Bit 6 Setting** 0 0 None 0 1 Medium 1 0 High 1 1 Not used	Use a higher setting if there is signal loss at higher frequencies because of the length of wire between the modem and the telephone exchange. Also, try using the cable equalizer if one or more of the following symptoms occurs. •Communication error with error codes such as 0-20, 0-23, etc. •Modem rate fallback occurs frequently.

Bit Switch 0B (Reception)

	FUNCTION	COMMENTS
0	Closed network (reception) **0:** Disabled **1:** Enabled	**1:** Reception will not go ahead if the ID code of the other terminal does not match the ID code of this terminal. This feature may not be reliable when communicating with another maker's product.
1	Training error tolerance **0:** Type 1 **1:** Type 2	This bit determines the values available with bits 2 and 3.
2 **3**	Training error tolerance **Bit 3 2 Type 1 Type 2** 0 0 15 14 0 1 10 9 1 0 2 4 1 1 0 1	Type 1 can be used anywhere. Type 2 is normally used only in Europe. If the machine detects more errors during training than the number set by these bits, training fails and the machine will send FTT. The data will be resent at a lower rate.
4	Not used	Do not change the factory settings.
5		
6		
7		

Bit Switch 0C

	FUNCTION	COMMENTS
0	European protocol requirements **0:** Disabled **1:** Enabled	Adjust these bits in accordance with the country of installation.
1	German dialing requirements **0:** Disabled **1:** Enabled	
2	Austrian dialing requirements **0:** Disabled **1:** Enabled	
3	Norwegian dialing and protocol requirements **0:** Disabled **1:** Enabled	
4	Danish dialing requirements **0:** Disabled **1:** Enabled	
5	French requirements **0:** Disabled **1:** Enabled	
6	Swiss requirements **0:** Disabled **1:** Enabled	
7	Not used	Do not change the factory setting.

Bit Switch 0D		
	FUNCTION	**COMMENTS**
0	Not used	Do not change the factory settings.
1		
2		
3		
4		
5		
6	Contents of the top line of the LCD when handset mode is in use **0:** Telephone number dialed **1:** HANDSET MODE	**0:** The telephone number being dialed is displayed. **1:** Only HANDSET MODE is displayed.
7	Not used	Do not change the factory setting.

Bit Switch 0E		
	FUNCTION	**COMMENTS**
0	Not used	Do not change the factory settings.
1		
2		
3		
4		
5	Conditions for reception **0:** Normal **1:** RTI or CSI needed	**1:** If the sending machine does not transmit an RTI or CSI, the call will be rejected, and the machine will send DCN.
6	Not used	Do not change the factory settings.
7		

Bit Switch 0F

	FUNCTION	COMMENTS
0 to 7	Country Code 00: France 10: Not used 01: Germany 11: USA 02: UK 12: Asia 03: Italy 13: Japan 04: Austria 14: Hong Kong 05: Belgium 15: South Africa 06: Denmark 16: Australia 07: Finland 17: New Zealand 08: Ireland 18: Singapore 09: Norway 19: Malaysia 0A: Sweden 0B: Switzerland 0C: Portugal 0D: Holland 0E: Spain 0F: Israel	This country code determines the factory settings of a wide range of bit switches and RAM addresses. However, it has no effect on the NCU parameter settings and communication parameter RAM addresses; these are determined by the setting of NCU parameter 00 (function 96).

Bit Switch 10

	FUNCTION	COMMENTS
0	Pulse dialing method **Bit 1 Bit 0 Setting** 0 0 Normal (P=N) 0 1 Oslo (P=10 - N) 1 0 Sweden (N+1) 1 1 Sweden (N+1)	P=Number of pulses sent out, N=Number dialed.
1		Do not change the factory settings.
2	Not used	Do not change the factory settings.
3		
4		
5		
6		
7		

Bit switch 11 is not used

Bit Switch 12		
	FUNCTION	**COMMENTS**
0	Not used	Do not change the factory settings.
1		
2		
3	Item displayed if a Quick Dial key is pressed to dial the other party **0:** Name stored in the Quick Dial **1:** Telephone number	
4	Not used	Do not change the factory setting.
5		
6		
7		

Bit switches 13 to 1C are not used.

Bit Switch 1D		
	FUNCTION	**COMMENTS**
0	Not used	Do not change the factory setting.
1		
2		
3	8-minute close **0:** Disabled **1:** Enabled	
4	Not used	Do not change the factory settings.
5		
6		
7		

Bit Switch 1E		
	FUNCTION	**COMMENTS**
0	Use of the buzzer to call the user to the machine if there is no reply to NSF/DIS **0:** Enabled **1:** Disabled	Set this bit to 1 if the user complains about the tone from the buzzer when no reply is received to NSF or DIS.
1	Not used	Do not change the factory setting.
2		
3		
4		
5	RTI or CSI display selection **0:** RTI **1:** CSI	This bit determines which of the other party's identifiers is shown on the display during communication. If the other terminal is by another manufacturer, the RTI is not shown even if this bit is at 0; the CSI will appear.
6	Not used	Do not change the factory setting.
7	Error report output **0:** Enabled **1:** Disabled	If this bit is at 1, the error report will not be printed when an error occurs.

Bit Switch 1F		
	FUNCTION	**COMMENTS**
0 **1**	V.21 signal detection method Bit 1 0 Method 0 0 Six consecutive 1's 0 1 A one-byte flag 1 0 A two-byte flag 1 1 A two-byte flag	
2	Not used	Do not change the factory setting.
3		
4		
5		
6		
7		

4.2.2. Factory Settings

The factory settings of all the bit switches are shown below in hexadecimal code. The first digit represents bits 7 to 4, and the second digit represents bits 3 to 0.

Universal version

Switch	Setting	Switch	Setting	Switch	Setting	Switch	Setting
00	00	08	03	10	00	18	00
01	01	09	01	11	00	19	00
02	42	0A	03	12	08	1A	00
03	00	0B	00	13	00	1B	00
04	03	0C	01	14	00	1C	00
05	23	0D	00	15	00	1D	00
06	FF	0E	00	16	00	1E	01
07	42	0F	02	17	00	1F	81

Asia version

Switch	Setting	Switch	Setting	Switch	Setting	Switch	Setting
00	00	08	03	10	00	18	00
01	01	09	01	11	00	19	00
02	42	0A	03	12	08	1A	00
03	08	0B	00	13	00	1B	00
04	03	0C	00	14	00	1C	00
05	23	0D	00	15	00	1D	00
06	FF	0E	00	16	00	1E	01
07	42	0F	12	17	00	1F	81

The following changes show the changes in the factory settings for each country. The settings depend on the country code (Bit Switch 0F).

Note: Changes to the country code (bit switch 0F) are not included in the following tables.

Table 1: Based on the Universal version

Country	Code	Differences (switch settings given in hex code)
France	00	None
Germany	01	Switch 02: 46, Switch 03: 01, Switch 05: 27, Switch 07: C2, Switch 0C: 03, Switch 12: 28
UK	02	None (the settings for the Universal version are based on those required for the UK)
Italy	03	None
Austria	04	Switch 0C: 05
Belgium	05	None
Denmark	06	Switch 0C:11
Finland	07	None
Ireland	08	None
Norway	09	Switch 0C: 09
Sweden	0A	Switch 06: F0, Switch 10: 02
Switzerland	0B	Switch 0C: 41
Portugal	0C	None
Holland	0D	None
Spain	0E	None

Table 2: Based on the Asia version (Country code 12)

Country	Code	Differences (switch settings given in hex code)
Israel	0F	Switch 03: 09
Hing Kong	14	None
South Africa	15	
Australia	16	
New Zealand	17	
Singapore	18	
Malaysia	19	

4.3. NCU PARAMETERS

The following tables give the RAM addresses and units of calculation of the parameters that the machine uses for ringing signal detection and automatic dialing. The factory settings for each country are also given. Most of these must be changed by RAM read/write (Function 95), but some can be changed using NCU Parameter programming (Function 96); if Function 96 can be used, this will be indicated in the Remarks column. The RAM is programmed in hex code unless (BCD) is included in the Unit column.

When using RAM read/write, you must add the bank number before the four-digit RAM address number. See section 4-1-6 for details.

Address	Function	Unit	Remarks
413B	Country code [NCU parameters only]	Hex	Function 96 (parameter 00).
413C	Line current detection time	20 ms	Line current is not detected if 413C contains FF.
413D	Line current wait time		
413E	Line current drop detect time		
413F	PSTN dial tone upper frequency limit (HIGH)	Hz (BCD)	See Note 2.
4140	PSTN dial tone upper frequency limit (LOW)		
4141	PSTN dial tone lower frequency limit (HIGH)		
4142	PSTN dial tone lower frequency limit (LOW)		
4143	PSTN dial tone detection time	20 ms	If 4143 contains FF, the machine pauses for the pause time (4147).
4144	PSTN dial tone reset time	160 ms	
4145	PSTN dial tone continuous tone time	20 ms	
4146	PSTN dial tone permissible drop time		
4147	PSTN wait interval	160 ms	
4148	Ringback tone detection time	20 ms	Detection is disabled if this contains FF.
4149	PSTN busy tone upper frequency limit (HIGH)	Hz (BCD)	If 4149 is FF, detection is disabled. See Note 2.
414A	PSTN busy tone upper frequency limit (LOW)		
414B	PSTN busy tone lower frequency limit (HIGH)		
414C	PSTN busy tone lower frequency limit (LOW)		

Address	Function	Unit	Remarks
414D	PABX dial tone upper frequency limit (HIGH)	Hz (BCD)	See Note 2.
414E	PABX dial tone upper frequency limit (LOW)		
414F	PABX dial tone lower frequency limit (HIGH)		
4150	PABX dial tone lower frequency limit (LOW)		
4151	PABX dial tone detection time	20 ms	If 4151 contains FF, the machine pauses for the pause time (4155).
4152	PABX dial tone reset time	160 ms	
4153	PABX dial tone continuous tone time	20 ms	
4154	PABX dial tone permissible drop time		
4155	PABX wait interval	160 ms	
4156	PABX ring back tone detection time	20 ms	Detection is disabled if this contains FF.
4157	PABX busy tone upper frequency limit (HIGH)	Hz (BCD)	If this is FF, detection is disabled. See Note 2.
4158	PABX busy tone upper frequency limit (LOW)		See Note 2.
4159	PABX busy tone lower frequency limit (HIGH)		
415A	PABX busy tone lower frequency limit (LOW)		
415B	Busy tone ON time: range 1	20 ms	
415C	Busy tone OFF time: range 1		
415D	Busy tone ON time: range 2		
415E	Busy tone OFF time: range 2		
415F	Busy tone ON time: range 3		
4160	Busy tone OFF time: range 3		
4161	Busy tone ON time: range 4		
4162	Busy tone OFF time: range 4		
4163	Busy tone continuous tone detection time		
4164	Busy tone signal state time tolerance for all ranges, and number of cycles required for detection (a setting of 4 cycles means that ON-OFF-ON or OFF-ON-OFF must be detected twice). Tolerance (±) Bit 1 0 0 0 75% 0 1 50% 1 0 25% 1 1 12.5% Bits 7, 6, 5, 4 - number of cycles required for detection		

Address	Function	Unit	Remarks
4165	International dial tone upper frequency limit (HIGH)	Hz (BCD)	See Note 2.
4166	International dial tone upper frequency limit (LOW)		
4167	International dial tone lower frequency limit (HIGH)		
4168	International dial tone lower frequency limit (LOW)		
4169	International dial tone detection time	20 ms	If 4169 contains FF, the machine pauses for the pause time (416D).
416A	International dial tone reset time	160 ms	
416B	International dial tone continuous tone time	20 ms	
416C	International dial tone permissible drop time		
416D	International dial wait interval	160 ms	
416E	Country dial tone upper frequency limit (HIGH)	Hz (BCD)	See Note 2.
416F	Country dial tone upper frequency limit (LOW)		
4170	Country dial tone lower frequency limit (HIGH)		
4171	Country dial tone lower frequency limit (LOW)		
4172	Country dial tone detection time	20 ms	If 4172 contains FF, the machine pauses for the pause time (4176).
4173	Country dial tone reset time	160 ms	
4174	Country dial tone continuous tone time	20 ms	
4175	Country dial tone permissible drop time		
4176	Country dial wait interval	160 ms	
4177	Grounding time (ground start mode)	20 ms	The Gs relay is closed for this interval.
4178	Break time (flash start mode)	1 ms	The Di relay is open for this interval.
4179	International dial access code	BCD	For a code of 100: 4179 - F1 417A - 00
417A			
417B	PABX pause time	20 ms	
417C	Progress tone detection level, and cadence detection enable flags	Bit 7 Bit 6 dBm 1 1 -52.7 1 0 -32.7 0 1 -40.2 0 0 -28.7 Bits 3, 2, 1, 0 - See Note 3.	
417D	CCITT T1 time	2.56 s	

Address	Function	Unit	Remarks
417E	Max. number of dials per station (not using memory)	1	
417F	Redial interval (not using memory)	1 min	
4180	Interval between dialing to different stations	2.56 s	
4181	Tx level from modem	- dBm	Function 96 (parameter 01).
4182	Acceptable ringing signal frequency: range 1, upper limit	1000/ .672N (Hz). N is the value stored using Function 96.	Function 96 (parameter 02).
4183	Acceptable ringing signal frequency: range 1, lower limit		Function 96 (parameter 03).
4184	Acceptable ringing signal frequency: range 2, upper limit		Function 96 (parameter 04).
4185	Acceptable ringing signal frequency: range 2, lower limit		Function 96 (parameter 05).
4186	Number or rings until a call is detected	1	Function 96 (parameter 06).
4187	Minimum required length of the first ring	20 ms	See Note 6. Function 98 (parameter 07).
4188	Minimum required length of the second and subsequent rings		Function 96 (parameter 08).
4189	Ringing signal detection reset time	40 ms	Function 96 (parameter 09).
418A	Time between opening or closing the Ds relay and opening the Di relay	1 ms	See Notes 5 and 8. Function 96 (parameter 10).
418B	Break time for pulse dialing		See Note 5. Function 96 (parameter 11).
418C	Make time for pulse dialing		See Note 5. Function 96 (parameter 12).
418D	Time between final Di relay closure and Ds relay opening or closing		See Notes 5 and 8. Function 96 (parameter 13).
418E	Pause between dialed digits (pulse dial mode)	20 ms	See Note 5. Function 96 (parameter 14).
418F	Time waited when a pause is entered at the operation panel		Function 96 (parameter 15).
4190	DTMF tone on time	1 ms	Function 96 (parameter 16).
4191	DTMF tone off time		Function 96 (parameter 17).
4192	DTMF tone attenuation value	-dBm (C60) -dBm/2 (C31)	Function 96 (parameter 18). See Note 7.
41A0	CED detection interval	20 ms	Factory setting: 11 x 20 ms
41A1	CNG detection interval		Factory setting: 11 x 20 ms
41A2	800 Hz detection interval		Factory setting: 10 x 20 ms
41A3	CED detection frequency: upper limit	10^6/4.873N Hz	Factory setting: 94 [2183 Hz]
41A4	CED detection frequency: lower limit		Factory setting: 102 [2012 Hz]

Address	Function	Unit	Remarks
41A5	CCITT T4 timer	160 ms	Factory setting: 20 x 160 ms
41AA	CNG detection frequency: upper limit	10^6/4.873N Hz	Factory setting: 169 [1214 Hz]
41AB	CNG detection frequency: lower limit		Factory setting: 207 [991 Hz]
41AC	800 Hz signal detection frequency: upper limit		Factory setting: 233 [881 Hz]
41AD	800 Hz signal detection frequency: lower limit	See Note 9.	Factory setting: 29 [720 Hz]
41B3	Max. time limit to dial a number	2.56 s	All countries: 15[H] (53.76 s)
41B4	Max. no of consecutive pauses in a telephone number	Hex	Germany: 1, Others: 250

Notes

1. If a setting is not required, store FF in the address.

2. Tone frequencies are stored in BCD in the following format.
   Examples:
   a) 380 Hz HIGH 0 3 LOW 8 0
   b) 1210 Hz HIGH 1 2 LOW 1 0

3. Italy and Belgium only

   RAM address 417C: the lower four bits have the following meaning.
   Bit 3 1: Country dial tone cadence detection enabled
   Bit 2 1: International dial tone cadence detection enabled
   Bit 1 1: PABX dial tone cadence detection enabled
   Bit 0 1: PSTN dial tone cadence detection enabled

   If bit 3 is 1, the functions of the following RAM addresses are changed.
   4172: tolerance for on or off state duration (%), coded as in 4164.
   4174: on time, hex code (unit = 10 ms)
   4175: off time, hex code (unit = 10 ms)

   If bits 2, 1, or 0 are 1, the functions of the following addresses are changed in a similar way to that described for bit 3 = 1.
   Bit 2 = 1: 4169, 416B, 416C
   Bit 1 = 1: 4151, 4153, 4154
   Bit 0 = 1: 4143, 4145, 4146

4. Belgium only

   Address 4144 for DTMF dialing is 3.04 s. This can be adjusted by RAM read/write. However, if pulse dial mode is selected, a value of 20 ms from the ROM is used, and this cannot be adjusted.

5. Pulse dial parameters (addresses 418A to 418F) are the values for 10 pps. If 20 pps is used, the machine automatically compensates.

6. The first ring may not be detected until 1 to 2.5 wavelengths after the time specified by this parameter.

7. N must be between 0 and 15. The attenuation levels are as follows.
   High frequency tone: - N dBm
   Low frequency tone: - N - 2 dBm

8. 418A: Europe - Between Ds opening and Di opening, France - Between Ds closing and Di opening
   418D: Europe - Between Ds closing and Di closing, France - Between Ds opening and Di closing

9. For address 41AD, the formula is slightly different.
   Frequency = 1,000,000/(4.873 x [N+256]) Hz

10. Bits 7, 6, and 5 are for the volume during transmission
    Bits 4, 3, and 2 are for the volume during reception
    The three bit values range from 0 (off), 1 (minimum), to 7 (maximum)

11. Bits 7, 6, and 5 are for the volume during on-hook dial
    Bits 4, 3, and 2 are for the volume during dialing
    The three bit values range from 0 (off), 1 (minimum), to 7 (maximum)

On the following pages, there are tables of factory settings for each country. To enable the factory settings for a particular nation, program the Country Code (RAM address 413B [use hex codes] or use Function 96 [input the decimal value]) to the appropriate setting. The country code also affects the NCU signal status.

For each RAM address, there are two columns.

- The left hand column shows the actual value of the parameter.
- The right hand column shows the value of the factory setting that is stored in the RAM. The factory settings are quoted either in hexadecimal code (the actual contents of the RAM address) if there is a H after the value in the table, or in decimal (converted from the actual hex contents of the RAM address) if there is no H after the value.
- Some RAMs must be stored using BCD; see the NCU Parameter definition table for details.
- If the table entry is blank, this means that the value is not used.

Country Code, NCU Parameter 00 [or RAM Address 413B, in hex code]:
France: 00, Germany: 01, UK: 02, Italy: 03, Austria: 04, Belgium: 05, Denmark: 06, Finland: 07, Ireland: 08, Norway: 09, Sweden: 10 [0A], Switzerland: 11 [0B], Portugal: 12 [0C], Holland: 13 [0D], Spain: 14 [0E], Israel: 15 [0F], USA: 17 [11], Asia: 18 [12], Japan: 19 [13], Hong Kong: 20 [14], S. Africa: 21 [15], Australia: 22 [16], New Zealand: 23 [17], Portugal: 24 [18], Malaysia: 25 [19]

Country	413C		413D		413E		413F/4140		
France							480 Hz	04(H)	80(H)
Germany	1.1 s	55	4.1 s	205	1.06 s	53	498 Hz	04(H)	98(H)
UK/Univ									
Italy							471 Hz	04(H)	71(H)
Austria							526 Hz	05(H)	26(H)
Belgium							520 Hz	05(H)	20(H)
Denmark							512 Hz	05(H)	12(H)
Finland							536 Hz	05(H)	36(H)
Ireland	1.1 s	55	4.1 s	205	1.06 s	53	452 Hz	04(H)	52(H)
Norway							512 Hz	05(H)	12(H)
Sweden							512 Hz	05(H)	12(H)
Switz.	1.1 s	55	4.1 s	205			608 Hz	06(H)	08(H)
Portugal							450 Hz	04(H)	50(H)
Holland							563 Hz	05(H)	63(H)
Spain							480 Hz	04(H)	80(H)
Israel	1.1 s	55	4.1 s	205	1.06 s	53	498 Hz	04(H)	98(H)
USA									
Asia									
Australia							450 Hz	04(H)	50(H)
N. Zealand									

Country	4141/4142			4143		4144		4145	
France	400 Hz	04(H)	00(H)	2 s	100	12 s	75	1 s	50
Germany	370 Hz	03(H)	70(H)	2.1 s	105	20 s	125	2.1 s	105
UK									
Italy	391 Hz	03(H)	91(H)	2, 50%	21(H)	10.9 s	68	0.6 s	30
Austria	380 Hz	03(H)	80(H)	0.8 s	40	10.1 s	63	0.74 s	37
Belgium	300 Hz	03(H)	00(H)	0.6 s	30	3.04 s	19	0.6 s	30
Denmark	340 Hz	03(H)	40(H)	1.3 s	65	10.1 s	63	1.3 s	65
Finland	315 Hz	03(H)	15(H)	4.1 s	205	10.1 s	63	4.1 s	205
Ireland	200 Hz	02(H)	00(H)	2.1 s	105	10.2 s	64	2.1 s	105
Norway	340 Hz	03(H)	40(H)	1.1 s	55	20 s	125	1.1 s	55
Sweden	340 Hz	03(H)	40(H)	0.8 s	40	5.12 s	32	0.8 s	40
Switz.	338 Hz	03(H)	38(H)	0.8 s	40	10.9 s	68	0.8 s	40
Portugal	300 Hz	03(H)	00(H)	2.1 s	105	9.9 s	62	2.1 s	105
Holland	76 Hz	00(H)	76(H)	1.1 s	55	15.04 s	94	1.1 s	55
Spain	320 Hz	03(H)	20(H)	1.5 s	75	12.8 s	80	1.02s	51
Israel	340 Hz	03(H)	40(H)	2.1 s	105	20 s	125	2.1 s	105
USA									
Asia									
Australia	130 Hz	01(H)	30(H)	3.0 s	150	6 s	38	2 s	100
N. Zealand									

4144: The actually used value for Belgium comes from the ROM; it is 125.

Country	4146		4147		4148		4149/414A		
France	0.04 s	2	0.16 s	1			488 Hz	04 (H)	88 (H)
Germany	0.08 s	4	4 s	25			510 Hz	05 (H)	10 (H)
UK/Univ			4 s	25			430 Hz	04 (H)	30 (H)
Italy	1 s	50	4 s	25			529 Hz	05 (H)	29 (H)
Austria	0.08 s	4	4 s	25	0.1 s	5	512 Hz	05 (H)	12 (H)
Belgium	0.08 s	4	4 s	25			471 Hz	04 (H)	71 (H)
Denmark	0.08 s	4	4 s	25			460 Hz	04 (H)	60 (H)
Finland	0.08 s	4	4 s	25					
Ireland	0.08 s	4	4 s	25			430 Hz	04 (H)	30 (H)
Norway	0.08 s	4	4 s	25			512 Hz	05 (H)	12 (H)
Sweden	0.06 s	3	4 s	25			512 Hz	05 (H)	12 (H)
Switz.	0.04 s	2	4 s	25	0.1 s	5	608 Hz	06 (H)	08 (H)
Portugal	0.08 s	4	4 s	25					
Holland	0.08 s	4	4 s	25			563 Hz	05 (H)	63 (H)
Spain	0.1 s	5	3.04 s	19			460 Hz	04 (H)	60 (H)
Israel	0.08 s	4	4 s	25			498 Hz	04 (H)	98 (H)
USA			2.08 s	13					
Asia			2.08 s	13					
Australia	0.16 s	8	3.04 s	19			450 Hz	04 (H)	50 (H)
N. Zealand			2.08 s	13					

Country	414B/414C			414D/414E			414F/4150		
France	396 Hz	03(H)	96(H)	900 Hz	09(H)	00(H)	300 Hz	03(H)	00(H)
Germany	350 Hz	03(H)	50(H)						
UK/Univ	360 Hz	03(H)	60(H)						
Italy	329 Hz	03(H)	29(H)	512 Hz	05(H)	12(H)	391 Hz	03(H)	91(H)
Austria	380 Hz	03(H)	80(H)						
Belgium	405 Hz	04(H)	05(H)	520 Hz	05(H)	20(H)	300 Hz	03(H)	00(H)
Denmark	390 Hz	03(H)	90(H)	512 Hz	05(H)	12(H)	340 Hz	03(H)	40(H)
Finland									
Ireland	370 Hz	03(H)	70(H)						
Norway	340 Hz	03(H)	40(H)						
Sweden	340 Hz	03(H)	40(H)	512 Hz	05(H)	12(H)	340 Hz	03(H)	40(H)
Switz.	338 Hz	03(H)	38(H)	608 Hz	06(H)	08(H)	338 Hz	03(H)	38(H)
Portugal									
Holland	320 Hz	03(H)	20(H)	563 Hz	05(H)	63(H)	76 Hz	00(H)	76(H)
Spain	380 Hz	03(H)	80(H)						
Israel	370 Hz	03(H)	70(H)	563 Hz	05(H)	63(H)	370 Hz	03(H)	70(H)
USA									
Asia									
Australia	390 Hz	03(H)	90(H)	450 Hz	04(H)	50(H)	390 Hz	03(H)	90(H)
N. Zealand									

Country	4151		4152		4153		4154		4155	
France	2 s	100	12 s	75	1 s	50	40 ms	2	0 s	0
Germany									4 s	25
UK/Univ									4 s	25
Italy	2 s	100	10.1 s	63	0.18 s	9	80 ms	4	4 s	25
Austria									4 s	25
Belgium	0.6 s	30	3.04 s	19	0.6 s	30	80 ms	4	4 s	25
Denmark	1.3 s	65	10.8 s	63	1.3s	65	80 ms	4	4 s	25
Finland									4 s	25
Ireland									4 s	25
Norway									4 s	25
Sweden	0.8 s	40	5.12 s	32	0.8 s	40	60 ms	3	4 s	25
Switz.	0.8 s	40	9.9 s	62	0.8 s	40	80 ms	4	4 s	25
Portugal									4 s	25
Holland	1.1 s	55	15.04s	94	1.1 s	55	80 ms	4	4 s	25
Spain									3.04 s	19
Israel	2.1 s	105	20 s	125	2.1 s	105	80 ms	4	4 s	25
USA									4 s	25
Asia									4 s	25
Australia	3 s	150	6 s	38	2 s	100	20 ms	1	3.04 s	19
N. Zealand									4 s	25

Country	4156		4157/4158			4159/415A		
France								
Germany								
UK/Univ								
Italy			600 Hz	06(H)	00(H)	100 Hz	01(H)	00(H)
Austria								
Belgium								
Denmark			460 Hz	04(H)	60(H)	390 Hz	03(H)	90(H)
Finland								
Ireland								
Norway								
Sweden								
Switz.			608 Hz	06(H)	08(H)	338 Hz	03(H)	38(H)
Portugal								
Holland								
Spain								
Israel			563 Hz	05(H)	63(H)	370 Hz	03(H)	70(H)
USA								
Asia								
Australia			450 Hz	04(H)	50(H)	390 Hz	03(H)	90(H)
N. Zealand								

Country	415B		415C		415D		415E		415F	
France	0.5 s	25	0.5 s	25						
Germany	0.24 s	12	0.24 s	12	0.48 s	24	0.48 s	24	0.14 s	7
UK/Univ	0.38 s	19	0.38 s	19	0.4 s	20	0.34 s	17	0.22 s	11
Italy	0.3 s	15	0.3 s	15						
Austria	0.2 s	10	0.2 s	10	0.3 s	15	0.3 s	15	0.4 s	20
Belgium	0.5 s	25	0.5 s	25	0.16 s	8	0.16 s	8		
Denmark	0.24 s	12	0.24 s	12	0.16 s	8	0.46 s	23		
Finland										
Ireland	0.5 s	25	0.5 s	25	0.74 s	37	0.74 s	37	0.36 s	18
Norway	0.2 s	10	0 s	0	0.5 s	25	0 s	0		
Sweden	0.24 s	12	0.24 s	12	0.24 s	12	0.74 s	37		
Switz.	0.48 s	24	0.6 s	30	0.3 s	15	0.44 s	22	0.22 s	11
Portugal										
Holland	0.24 s	12	0.24 s	12	0.5 s	25	0.5 s	25		
Spain	0.16 s	8	0.16 s	8	0.16 s	8	0.16 s	8		
Israel	0.24 s	12	0.24 s	12	0.48 s	24	0.48 s	24		
USA										
Asia										
Australia	0.36 s	18	0.36 s	18	0.38 s	19	0.38 s	19	0.24 s	12
N. Zealand										

Country	4160		4161		4162		4163		4164	
France									4, 12.5	43(H)
Germany	0.48 s	24							3, 50	31(H)
UK/Univ	0.52 s	26					2 s	100	4, 25	42(H)
Italy									4, 75	40(H)
Austria	0.4 s	20							4, 25	42(H)
Belgium									4, 12.5	43(H)
Denmark									4, 25	42(H)
Finland										
Ireland	0.36 s	18					0.7 s	35	4, 12.5	43(H)
Norway									4, 75	40(H)
Sweden									4, 12.5	43(H)
Switz.	0.22 s	11	0.16 s	8	0.6 s	30			5, 50	51(H)
Portugal										
Holland									4, 50	41(H)
Spain									4, 50	41(H)
Israel									4, 50	41(H)
USA										
Asia										
Australia	0.24 s	12	0.5 s	25	0.5 s	25			4. 50	41(H)
N. Zealand										

Country	4165/4166			4167/4168			4169	
France	474 Hz	04(H)	74(H)	406 Hz	04(H)	06(H)	1.5 s	75
Germany								
UK/Univ								
Italy								
Austria								
Belgium	1160Hz	11(H)	60(H)	1110Hz	11(H)	10(H)	4, 50%	41(H)
Denmark								
Finland								
Ireland								
Norway								
Sweden								
Switz.								
Portugal								
Holland	563 Hz	05(H)	63(H)	76 Hz	00(H)	76(H)	1.1 s	55
Spain	630 Hz	06(H)	30(H)	570 Hz	05(H)	70(H)	1.5 s	75
Israel								
USA								
Asia								
Australia								
N. Zealand								

Country	416A		416B		416C		416D		416E/416F
France	12 s	75	1.5 s	75	0.04 s	2	0	0	Only used by Sweden: 512 Hz 416E: 05(H) 416F: 12(H)
Germany							0	0	
UK/Univ							0	0	
Italy							0	0	
Austria							0	0	
Belgium	20 s	125	0.32 s	16	0.68 s	34	0	0	
Denmark							0	0	
Finland							0	0	
Ireland							0	0	
Norway							0	0	
Sweden							0	0	
Switz.							0	0	
Portugal							0	0	
Holland	15.04s	94	1.1 s	55	0.08 s	4	0	0	
Spain	12.8 s	80	0.72 s	36	0.1 s	5	3.04 s	19	
Israel							0	0	
USA							0	0	
Asia							0	0	
Australia							0	0	
N. Zealand							0	0	

Country	4170/4171			4172		4173		4174	
France									
Germany									
UK/Univ									
Italy									
Austria									
Belgium									
Denmark									
Finland									
Ireland									
Norway									
Sweden	340 Hz	03(H)	40(H)	0.8 s	40	5.12 s	32	0.8 s	40
Switz.									
Portugal									
Holland									
Spain									
Israel									
USA									
Asia									
Australia									
N. Zealand									

Country	4175		4176		4177		4178	
France			0	0	0	0	0	0
Germany			0	0	0.3 s	15	90 ms	90
UK/Univ			0	0	0.3 s	15	90 ms	90
Italy			0	0	0.3 s	15	90 ms	90
Austria			0	0	0.3 s	15	100 ms	100
Belgium			0	0	2 s	100	90 ms	90
Denmark			0	0	0.3 s	15	90 ms	90
Finland			0	0	0.3 s	15	90 ms	90
Ireland			0	0	0.3 s	15	90 ms	90
Norway			0	0	0.5 s	25	90 ms	90
Sweden	0.06 s	3	4 s	25	0.3 s	15	90 ms	90
Switz.			0	0	0.3 s	15	90 ms	90
Portugal			0	0	0.3 s	15	90 ms	90
Holland			0	0	0.3 s	15	90 ms	90
Spain			0	0	2 s	100	90 ms	90
Israel			0	0	0.3 s	15	90 ms	90
USA			0	0	0	0	0	0
Asia			0	0	0	0	0	0
Australia			0	0	0	0	0	0
N. Zealand			0	0	0	0	0	0

Country	4179/417A			417B		417C		417D	
France	19	FF(H)	19(H)			-40.2	40(H)	53.8 s	21
Germany	00	FF(H)	00(H)			-52.7	C0(H)	53.8 s	21
UK/Univ	010	F0(H)	10(H)	1 s	50	-52.7	C0(H)	53.8 s	21
Italy	00	FF(H)	00(H)			-40.2	41(H)	53.8 s	21
Austria	00	FF(H)	00(H)			-52.7	C0(H)	35.8 s	14
Belgium	00	FF(H)	00(H)			-32.2	84(H)	58.9 s	23
Denmark	009	F0(H)	09(H)			-32.2	80(H)	53.8 s	21
Finland	990	F9(H)	90(H)	2 s	100	-32.2	80(H)	53.8 s	21
Ireland	16	FF(H)	16(H)			-40.2	40(H)	53.8 s	21
Norway	095	F0(H)	95(H)			-32.2	80(H)	53.8 s	21
Sweden	009	F0(H)	09(H)			-32.2	80(H)	53.8 s	21
Switz.	00	FF(H)	00(H)			-40.2	40(H)	92.2 s	36
Portugal	00	FF(H)	00(H)			-32.2	80(H)	53.8 s	21
Holland	09	FF(H)	09(H)			-28.7	00(H)	53.8 s	21
Spain	07	FF(H)	07(H)			-40.2	40(H)	79.4 s	31
Israel	00	FF(H)	00(H)			-52.7	C0(H)	58.9 s	23
USA						-52.7	C0(H)	53.8 s	21
Asia						-52.7	C0(H)	53.8 s	21
Australia						-52.7	C0(H)	53.8 s	21
N. Zealand						-52.7	C0(H)	53.8 s	21

Norway: 417C =- 52.7 for busy tone detection

Country	417E		417F		4180		4181 (-dB)		4182 (Hz)		4183 (Hz)	
France	6	6	5	5	7.68 s	3	10	10	57.2	26	42.5	35
Germany	4	4	2	2	12.8 s	5	12	12	57.2	26	20.1	74
UK/Univ	3	3	3	3	12.8 s	5	10	10	19.8	75	11.6	128
Italy	3	3	2	2	17.92s	7	6	6	55.1	27	12.7	117
Austria	10	10	1	1	12.8 s	5	6	6	74.4	20	18.6	80
Belgium	4	4	6	6	15.36s	6	6	6	29.8	50	13.5	110
Denmark	3	3	1	1	12.8 s	5	10	10	29.8	50	19.6	76
Finland	3	3	2	2	12.8 s	5	10	10	32.3	46	17.3	86
Ireland	3	3	2	2	12.8 s	5	10	10	27.1	55	14.4	103
Norway	3	3	2	2	12.8 s	5	10	10	59.5	25	17.3	86
Sweden	3	3	2	2	12.8 s	5	10	10	30.3	49	19.1	78
Switz.	5	5	1	1	12.8 s	5	5	5	59.5	25	19.1	78
Portugal	3	3	1	1	12.8 s	5	6	6	64.7	23	12.5	119
Holland	3	3	2	2	12.8 s	5	6	6	74.4	20	18.6	80
Spain	3	3	1	1	48.64s	19	10	10	29.2	51	19.6	76
Israel	14	14	1	1	12.8 s	5	6	6	59.5	25	11.7	127
USA	3	3	5	5	12.8 s	5	9	9	23.3	64	11.7	127
Asia	3	3	5	5	12.8 s	5	6	6	23.3	64	11.7	127
Australia	3	3	5	5	15.36s	6	12	12	73.2	21	9.9	154
N. Zealand	3	3	5	5	12.8 s	5	8	8	23.3	64	11.7	127

Country	4184 (Hz)		4185 (Hz)		4186		4187		4188	
France					2	2	0.1 s	5	0.1 s	5
Germany					1	1	0.2 s	10	0.2 s	10
UK/Univ	49.6	30	17.3	86	1	1	0.2 s	10	0.2 s	10
Italy					2	2	0.2 s	10	0.2 s	10
Austria					1	1	0.18 s	9	0.2 s	10
Belgium					2	2	0.1 s	5	0.2 s	10
Denmark	59.5	25	40.2	37	1	1	0.2 s	10	0.2 s	10
Finland	62.0	24	19.3	77	2	2	0.5 s	25	0.5 s	25
Ireland					1	1	0.2 s	10	0.2 s	10
Norway					1	1	0.2 s	10	0.2 s	10
Sweden	55.1	27	24.0	62	1	1	0.1 s	5	0.1 s	5
Switz.					3	3	0	0	0	0
Portugal	59.5	25	40.2	37	1	1	0.2 s	10	0.2 s	10
Holland	74.4	20	18.6	80	2	2	0.3 s	15	0.3 s	15
Spain	39.2	38	19.3	77	2	2	0.7 s	35	0.7 s	35
Israel					2	2	0.1 s	5	0.1 s	5
USA	74.4	20	22.2	67	1	1	0.2 s	10	0.2 s	10
Asia	57.2	26	22.2	67	1	1	0.2 s	10	0.2 s	10
Australia					3	3	0.2 s	10	0.2 s	10
N. Zealand	57.2	26	22.2	67	3	3	0.2 s	10	0.2 s	10

Country	4189		418A		418B		418C		418D	
France	5.2 s	130	67 ms	67	65 ms	65	35 ms	35	50 ms	50
Germany	8 s	200	53 ms	53	59 ms	59	39 ms	39	50 ms	50
UK/Univ	8 s	200	255ms	255	61 ms	61	33 ms	33	50 ms	50
Italy	8 s	200	61 ms	61	60 ms	60	40 ms	40	50 ms	50
Austria	8 s	200	43 ms	43	61 ms	61	39 ms	39	40 ms	40
Belgium	8 s	200	61 ms	61	67 ms	67	33 ms	33	50 ms	50
Denmark	8 s	200	53 ms	53	67 ms	67	33 ms	33	50 ms	50
Finland	8 s	200	61 ms	61	56 ms	56	40 ms	40	50 ms	50
Ireland	8 s	200	200ms	200	67 ms	67	33 ms	33	50 ms	50
Norway	8 s	200	61 ms	61	59 ms	59	41 ms	41	50 ms	50
Sweden	8 s	200	100ms	100	60 ms	60	40 ms	40	70 ms	70
Switz.	8 s	200	60 ms	60	60 ms	60	40 ms	40	60 ms	60
Portugal	8 s	200	200ms	200	66 ms	66	34 ms	34	50 ms	50
Holland	8 s	200	58 ms	58	58 ms	58	39 ms	39	42 ms	42
Spain	6 s	150	75 ms	75	60 ms	60	33 ms	33	75 ms	75
Israel	8 s	200	61 ms	61	61 ms	61	39 ms	39	50 ms	50
USA	8 s	200	80 ms	80	62 ms	62	41 ms	41	80 ms	80
Asia	8 s	200	61 ms	61	66 ms	66	34 ms	34	50 ms	50
Australia	8 s	200	255ms	255	68 ms	68	32 ms	32	70 ms	70
N. Zealand	8 s	200	61 ms	61	66 ms	66	34 ms	34	50 ms	50

Country	418E		418F		4190		4191		4192 (-dB)	
France	0.8 s	40	0	0	70 ms	70	70 ms	70	6	6
Germany	0.92 s	46	0.92 s	46	90 ms	90	90 ms	90	8	8
UK/Univ	0.54 s	27	0.66 s	33	0.1 s	100	0.1 s	100	10	10
Italy	0.8 s	40	3 s	150	70 ms	70	70 ms	70	7	7
Austria	0.8 s	40	0.92 s	46	80 ms	80	80 ms	80	8	8
Belgium	0.86 s	43	0.52 s	26	70 ms	70	70 ms	70	7	7
Denmark	0.52 s	26	0.52 s	26	90 ms	90	90 ms	90	10	10
Finland	0.8 s	40	1.2 s	60	70 ms	70	75 ms	75	10	10
Ireland	0.5 s	25	0.66 s	33	70 ms	70	70 ms	70	10	10
Norway	0.66 s	33	0.66 s	33	70 ms	70	70 ms	70	10	10
Sweden	0.36 s	18	0.52 s	26	70 ms	70	70 ms	70	10	10
Switz.	0.52 s	26	0	0	70 ms	70	70 ms	70	7	7
Portugal	0.66 s	33	0.66 s	33	70 ms	70	70 ms	70	10	10
Holland	0.66 s	33	0.66 s	33	70 ms	70	70 ms	70	10	10
Spain	0.64 s	32	2 s	100	70 ms	70	0.14 s	140	7	7
Israel	0.92 s	46	2.02 s	101	90 ms	90	90 ms	90	7	7
USA	0.8 s	40	2.02 s	101	0.1 s	100	0.1 s	100	8	8
Asia	0.72 s	36	2.02 s	101	0.1 s	100	0.11 s	110	7	7
Australia	0.72 s	36	2.02 s	101	0.1 s	100	0.11 s	110	11	11
N. Zealand	0.72 s	36	2.02 s	101	0.1 s	100	0.11 s	110	7	7

Additional NCU Parameters

4193: V.21 detection level
All countries 73(H), except Germany, which is 7B(H).

4194: Rx data detection level
All countries 73(H), except Germany, which is 7B(H).

4195/4196: 800 Hz tx level
All countries 31BF(H), except Germany, which is 2641(H).

4197/4198: 1100 Hz tx level
All countries 31BF(H), except Germany, which is 2917(H).

4199/419A: 2100 Hz tx level
All countries 31BF(H), except Germany, which is 3774(H).

4.4. SERVICE RAM ADDRESSES

4040
TTI printing position (from the left side) BCD: 00 - 98 (mm) [Even numbers only]

4045
Bit 0: Display of both RTI and CSI on the LCD 0: Disabled, 1: Enabled
Bit 2: Printout of forwarded messages 0: Disabled, 1: Enabled
Bit 3, 4: Printable paper length notification to sending terminal

Bit 3	Bit 4	Setting
0	0	No limit
1	0	B4
0	1	A4
1	1	Not used

4047
Number of page retransmission attempts (Hex code)

4048
Bit 1: Modem rate after receiving a negative code (RTN or PIN) 0: No change, 1: Fallback
Bit 2: Hang-up decision when a negative code (RTN or PIN) is received
0: No hang-up, 1; Hang-up
Bit 3: Polarity reversal after DIS/NSF detection 0: Yes, 1: No
Bit 4: Addition of TCF when AI short protocol is used 0: No, 1: Yes
Bit 5: Stop key during memory transmission 0: Disabled, 1: Enabled
Bit 6: First page to be retransmitted (memory tx)
0: The page that was not sent correctly, 1: Page 1

4049
Bit 0: Keystroke Program execution method
0: Press the programmed Quick Dial Key
1: Press the programmed Quick Dial Key then the Start key
Bit 2: RDS 0: Enabled, 1: Disabled

404A
Bit 0, 1: Modem eye pattern output
Bit 0 = 0, Error vector, Bit 0 = 1, Eye pattern

404B
Contrast threshold - Lighten (Hex code, from 00 to 1F) 00: All Black, 1F: All White
404C
Contrast threshold - Normal (Hex code, from 00 to 1F) 00: All Black, 1F: All White
404D
Contrast threshold - Darken (Hex code, from 00 to 1F) 00: All Black, 1F: All White

404F - 4051
Page separation and data reduction parameters

4052
Bit 1: Error Diffusion Halftone 0: Disabled, 1: Enabled

4053
Bit 0: Default resolution used for copy mode 0: As selected by the user, 1: Fine

4054
Bit 0: Reduction during printing 0: Disabled, 1: Enabled

4055
The amount of remaining memory below which ringing detection (and therefore substitute reception) is disabled if the printer is out of action (hex code, from 00 to FF, unit = 2 kbytes)
- One page is about 24 kbytes.
- If this setting is kept at 0, the machine will detect ringing signals and go into receive mode even if there is no memory space left. This will result in communication failure.

4057
Image/Text detection threshold in halftone mode (Hex: 00 - 1F)
- 01: Almost all the data will be processed without halftone, even if the fax message contains photographs.
- The threshold increases with increments in the setting from 01 to 1F.
- 00, 1F: Almost all the data will be halftone processed, even if the fax message contains only text.

4058
Number of redialing attempts, including the first dialling attempt (memory tx) Hex : 00 - FF

4059
Redialing interval (memory tx) Hex: 00 - FF (minutes)

405D
Time for which RDS is enabled after the user has switched it on BCD: 00 - 99 (hours)

405E - For use only in France
Bit 0, 1: Handshake modem rate for transmission

Bit 0	0	300 bps	1	2400 bps	0	1	300 and 2400 bps
Bit 1	0		0		1	1	

Bit 2, 3: Handshake modem rate for reception

Bit 2	0	300 bps	1	2400 bps	0	1	300 and 2400 bps
Bit 3	0		0		1	1	

Bit 4: Deletion of a Speed or Quick Dial when the stored number reaches a destination that is not a fax machine 0: Disabled, 1: Enabled
Bit 5: Tranmission of a blank CSI (all spaces) if no CSI is programmed 0: Disabled, 1: Enabled
Bit 6: 3-minute close 0: Enabled, 1: Disabled
Bit 7: Action after 3-minute close 0: Disconnect, 1: Continue with MPS

405F - For use only in France
Bit 1: NCU parameter values 0: Adjustable, 1: Fixed
Bit 2: Action upon PRI-Q after DIS 0: CCITT standard procedure, 1: The buzzer rings
Bit 4: NSF (CSI) transmission 0: Normal (sent if CSI has been programmed, 1: Not sent
Bit 5: Action when sending out a post-message response 0: Standard
1: French PTT special action
Bit 7: French requirements (DCR timer 5 s, carrier drop detection based on rx level, redialing from 1 to 12 minutes) 0: Disabled, 1: Enabled

40CB
Number of good lines for error line counter decrement (Hex: 01 - FF)
- The setting of 00(H) is equal to the initial setting 0A(H).

40CC
Error line threshold (Hex: 01 - FF)
- The setting of 00(H) is equal to the initial setting 0A(H).

40CD
Acceptable reconstruction time for 1 line (Hex; unit 160 ms)

41DF

Acceptable modem carrier drop time (Hex; unit 20 ms)

- If communication errors with the error code 0-22 are frequent, increase the drop time.
- Only settings below 1 s (32[H]) are effective. Settings below 500 ms (19[H]) are recommended.
- Using longer settings with a line that has a higher noise level might cause the modem to hang-up. In such cases, try using shorter settings.

4B8B

Wait time after the last page has been printed, when printing from optional printer interface. (Hex; unit 2.56 s)

Factory Settings

The factory settings of the above RAM addresses are shown below in hexadecimal code. The first digit represents bits 7 to 4, and the second digit represents bits 3 to 0.

Universal version

RAM Address	Setting	RAM Address	Setting
4040	18	4053	00
4045	00	4054	00
4047	03	4055	40
4048	08	4057	06
4049	1E	4058	05
404A	00	4059	05
404B	10	405D	24
404C	0E	405E	20
404D	0C	405F	00
404F	FF	40CB	0A
4050	00	40CC	0A
4051	AF	40CD	1F
4052	03	41DF	0A
		4B8B	05

Asia version

RAM Address	Setting	RAM Address	Setting
4040	18	4053	00
4045	00	4054	00
4047	03	4055	0C
4048	08	4057	06
4049	1E	4058	03
404A	00	4059	05
404B	10	405D	24
404C	0E	405E	20
404D	0C	405F	00
404F	FF	40CB	0A
4050	00	40CC	0A
4051	AF	40CD	1F
4052	03	41DF	0A
		4B8B	05

The following tables show the changes in the factory settings with the different country code settings.

Table 1: Based on the Universal version

Country	Code	Differences (switch settings given in hex code)
France	00	None
Germany	01	4045: 01
UK	02	None (the settings for the Universal version are based on those required for the UK)
Italy	03	None
Austria	04	4049: 1F
Belgium	05	None
Denmark	06	
Finland	07	
Ireland	08	
Norway	09	
Sweden	0A	
Switzerland	0B	
Portugal	0C	
Holland	0D	
Spain	0E	4048: 00

Table 2: Based on the Asia version (Country code 12)

Country	Code	Differences (switch settings given in hex code)
Israel	0F	None
Hong Kong	14	
South Africa	15	
Australia	16	
New Zealand	17	
Singapore	18	
Malaysia	19	

Note: When programming a RAM address, you have to enter the bank number before the four-digit RAM address. In this machine, the bank number is always 2. For example, to program RAM address 4044 using function 95, you have to input 24044.

4.5. DEDICATED TRANSMISSION PARAMETERS

Each Quick Dial Key and Speed Dial Code has three bytes of programmable parameters allocated to it. If transmissions to a particular machine often experience problems, store that terminal's fax number as a Quick Dial or Speed Dial, and adjust the parameters allocated to that number.

The programming procedure will be explained first. Then, the three bytes will be described.

4.5.1. Programming Procedure

1. Set bit 5 of bit switch 01 to 1.
2. Either use Function 32 (for a Quick Dial number) or Function 33 (for a Speed Dial number)

   Example: Change the Parameters in Quick Dial 10.

3. **Function** **3** **2** **Yes**

   ```
   QUICK ■        QUICK/▽
   PRINT LIST ▽
   ```

4. Press Quick Dial key **10**

   ```
   QUICK 10            Y/N
   SET PARAMETER?
   ```

   Note: When selecting Speed Dial 10 with Function 33: **1** **0** at the ten key pad

5. **Yes**

   ```
   TX PARAMETER 1      Y
                1111 1111
   ```

6. The settings for byte 1 are now displayed. Press a number from 0 to 7 corresponding to the bit that you wish to change.

   Example: Change bit 7 to 0: **7**

   ```
   TX PARAMETER 1      Y
                0111 1111
   ```

7. Either:

   - Select another byte: **Yes** until the correct byte is displayed. Then go to step 6. If you press Yes while the byte 4 is displayed, you can go back to step 4 and select another number.
   - Finish: **Function**

8. After finishing, set bit 5 of bit switch 01 to 0.

4.5.2. Parameters

Byte 1

	FUNCTION	COMMENTS
0 **1**	Initial Tx modem rate **Bit 1 Bit 0 Setting** 0 0 9,600 bps 0 1 7,200 bps 1 0 4,800 bps 1 1 2,400 bps	If training with a particular remote terminal always takes too long, the initial modem rate may be too high. Reduce the initial Tx modem rate using these bits.
2 **3** **4** **5**	Tx level **Bit 5 4 3 2 Level (dBm)** 0 0 0 0 0 0 0 0 1 -1 0 0 1 0 -2 0 0 1 1 -3 and so on until 1 1 1 1 -15	If communication with a particular remote terminal often contains errors, the signal level may be inappropriate. Adjust the Tx level for communications with that terminal until the results are better.
6	Not used	Do not change the factory setting.
7	Dedicated transmission parameters for this Quick/Speed Dial number **0:** Disabled **1:** Enabled	**0:** The parameters in these three bytes will be ignored. The current settings of the relevant bit switches, NCU parameters, and RAM addresses will be used. **1:** The parameters in these three bytes will be used when transmitting to the fax number stored in the Quick Dial Key or Speed Dial Code that these bytes are allocated to.

Byte 2

	FUNCTION	COMMENTS
0	DIS/NSF detection method **0:** First DIS or NSF **1:** Second DIS or NSF	Set this bit to 1 if echoes on the line are interfering with the set-up protocol at the start of transmission. The machine will then wait for the second DIS or NSF before sending DCS or NSS.
1	ECM during transmission **0:** Enabled **1:** Disabled	For example, if ECM is switched on but is not wanted when sending to a particular terminal, set this bit to 1.
2	Not used	Do not change the factory settings.
3	AI short protocol **0:** Disabled **1:** Enabled	If this bit is 1, AI short protocol is always used when transmitting to this terminal.
4	TCF transmission after NSS(A) **0:** Disabled **1:** Enabled	Set this bit to 1, if line condition is not stabilized and the modem rate should be updated in each transmission, when AI short protocol is enabled.

Continued on the next page

Byte 2

	FUNCTION	COMMENTS
5 6	Compression modes available in transmit mode **Bit 6 5 Modes** 0 0 MMR, MR, or MH 0 1 MR or MH 1 0 MH only 1 1 MH only	These bits determine the capabilities that are informed to the other terminal during transmission.
7	Short preamble **0:** Disabled **1:** Enabled	If this bit is 1, Short Preamble is always used when transmitting to this terminal.

Byte 3

FUNCTION AND COMMENTS
CCITT T1 timer If you wish to use a different T1 timer than the NCU parameter setting when sending to a particular terminal, adjust this byte. The T1 timer is the BCD value of this byte, multiplied by 2.56 seconds. **Caution:** Note that if the value of this byte is 0, the T1 timer will be 35 s.

Caution: If the value of byte 3 is 0, the CCITT T1 timer is 35 s, which may not be appropriate for your area. Therefore, every time you program a set of dedicated transmission parameters, be sure to check the contents of byte 3 and adjust if necessary.

Byte 4

	FUNCTION	COMMENTS
0 1 2 3 4 5	Not used	Do not change the factory settings.
6 7	Tx cable equalizer **Bit 6 5 Setting** 0 0 Off 0 1 Middle 1 0 High 1 1 Not used	Use a higher setting if there is signal loss at higher frequencies because of the length of wire between the modem and the telephone exchange. Also, try using the cable equalizer if one or more of the following symptoms occurs. • Communication error • Modem rate fallback occurs frequently.

4.6. SERVICE CALLS

4.6.1. Excessive Jam Calls

There are two types of excessive jam call, one is the excessive scanner jam call and the other is the excessive printer jam call. The excessive jam call automatically notifies the service station programmed with function 99 when the machine's scanner or printer frequently has jam problems.

The excessive jam call algorithm uses three parameters and three counters for the scanner and for the printer, as shown in the following table.

Parameters	Address (H)		Initial Settings	Sys. Para. List
	Scanner	Printer		
DEC: Number of fed pages used to decrease the JAM counter. (1 - 255; 0 = Disabled)	4B6D	4B75	10 (H)	X
CALL: Threshold number for service call (3 - 15; 0 = Disabled)	4B6E	4B76	06 (H)	Y
CLR: Number of fed pages used to clear the JAM counter to zero.	4B6F (Low)	4B77 (Low)	30 (H)	—
	4B70 (High)	4B78 (High)	00 (H)	

Counters	Address (H)		Sys. Para. List
	Scanner	Printer	
A: Counter used for JAM counter decrement	4B71	4B79	—
JAM: Jam counter used to place a service call	4B72	4B7A	Z
B: Counter used for clearing JAM counter	4B73 (Low)	4B7B (Low)	—
	4B74 (High)	4B7C (High)	

The excessive jam call for scanner and printer work individually, but the algorithms are the same.

The JAM counter increases when a jam occurs, and the counters A and B increases when a page is fed successfully.

When the JAM counter reaches the value stored in the CALL parameter (with the initial setting, when it reaches 6), the machine places a service call to the service station and sends three reports (auto service report, service monitor report, and system parameter list). Either "document jam monitor" or "copy jam monitor" is printed on the auto service report as an error message.

However, the JAM counter will be decreased when counter A reaches the value stored as DEC (with the initial setting, when 16 pages have been fed successfully), and the JAM counter will be cleared when counter B reaches the value stored as CLR (with the initial setting, when 48 pages have been fed successfully).

So, this algorithm will alert the service station only when jams frequently occur within a short period.

These parameters can be changed by rewriting RAM data with function 95 in the following range.

DEC: 1 through 255 (01(H) - FF(H))
CALL: 3 through 15
CLR: 1 through 65535 (0001(H) - FFFF(H))
(Usually, CLR should be three times the value of DEC.)

If either DEC or CALL is zero, the excessive jam call is disabled.
The parameters DEC, CALL and the JAM counter are listed on the system parameter list as X, Y and Z.

The Call Service indicator does not light with an excessive jam call, so that the machine can be operated normally after the call. However, the following RAM address should be reset to zero after the call, in order to reactivate the excessive jam call.

4B6C

Bit 0: Scanner Excessive Jam Call	1: A call has occurred.	0: Standby (Initial setting)
Bit 1: Printer Excessive Jam Call	1: A call has occurred.	0: Standby (Initial setting)

4.6.2. Periodic Service Call

The periodic service call notifies the condition of the machine to the service station programmed with function 99. The call is made periodically at a time interval programmed in the following RAM addresses.

Parameters		Address (H)
Call interval: 01 through 15 month(s) (BCD) 00: Periodic Service Call Disabled		4B7F
Date and time of the next call		
	Year: last two digits of the year (BCD)	4B80
	Month: 01 through 12 (BCD)	4B81
	Day: 01 through 31 (BCD)	4B82
	Hour: 00 through 23 (BCD)	4B83

Caution: Data stored in these addresses have to be within the specified range and in BCD format. Otherwise, the service call will not work correctly.

When the date and time programmed at these addresses has passed, the machine automatically places a service call to the service station and sends three reports (auto service report, service monitor report, and system parameter list). “PM MANUAL CALL” is printed on the auto service report as an error message.

The default setting for this feature is off. To switch periodic service call on, just program the Call Interval at address 4B7F(H). Then, the date and time of the next call are automatically programmed. For example, if the call interval is programmed as 03 (BCD) months and the current date and time is Dec. 24, 1993; 03:10PM, the following data are stored:

94 at 4B80(H) for 1994
03 at 4B81(H) for March
24 at 4B82(H) for 24th
15 at 4B83(H) for 3PM

To change these settings after programming, change the interval first with function 95, exit the function, then change the remaining parameters one by one if the settings are not the expected ones.

The Call Service indicator does not light with a periodic service call, so that the machine can be operated normally after the call.

4.6.3. PM Call

If bit 7 of Bit Switch 01 is set to 0, the PM call will notify the service station that the time for PM has come. To switch on the call, program the counter interval at the following RAM addresses in BCD format. The initial setting is 30,000 sheets.

Address	Bits 7 - 4	Bits 3 - 0
410E	Tens	Units
410F	Thousands	Hundreds
4110	Hundred thousands	Ten thousands

When the date and time programmed at these addresses has passed, the machine automatically places a service call to the service station and sends three reports (auto service report, service monitor report, and system parameter list). “PM CALL” is printed on the auto service report as an error message.

The Call Service indicator does not light with a PM service call, so that the machine can be operated normally after the call.

4.6.4. Effective Term of Service Calls

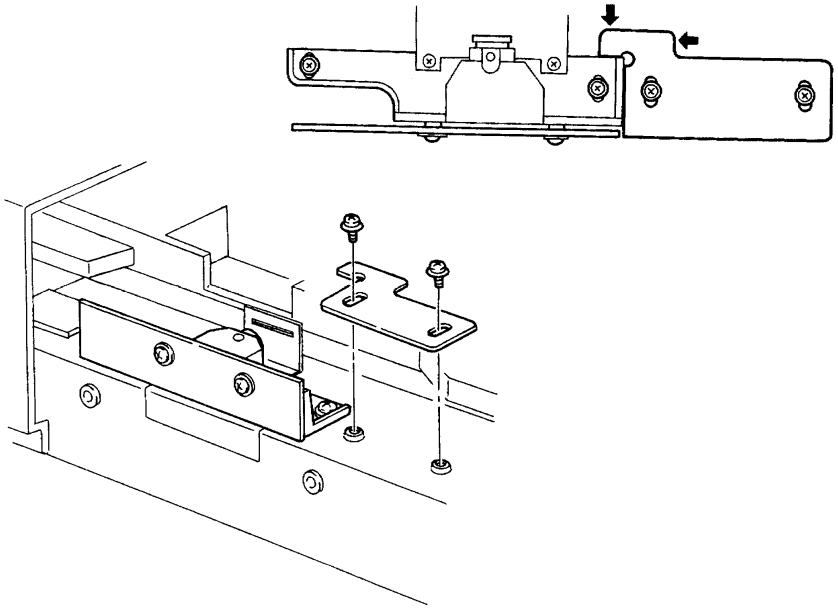
A time limit for the effectiveness of service calls can be programmed at the following addresses.

	Address (H)
Year: last two digits of the year (BCD)	4B91
Month: 01 through 12 (BCD)	4B92
Day: 01 through 31 (BCD)	4B93

After the date programmed in these addresses has passed, all types of service call are disabled. This function is disabled when all of these addresses are 00(H).

4.7. SPECIAL TOOLS AND LUBRICANTS

- Scan line test chart: P/N H0819502
- 8 line/mm test pattern: P/N H0419001
- Test lead: P/N H0419002
- SBU adjustment knobs: P/N H0129300
- Allen wrench
- Lens block positioning tool: P/N H0819503
  For how to use, see the following diagram



4.8. PM TABLE

Scanner

C: Clean, L: Lubricate, R: Replace

Item	10K	30K	60K	1 year	Notes
Exposure Glass	C	C	C	C	Soft cloth and alcohol
R1 and R2 Rollers	C	C	C	C	Soft cloth and alcohol
Pick-up Torque Limiter		L	L		Use Mobil Temp 78.
White Plate	C	C	C	C	Soft cloth and water
Feed Roller	C	R	R	C	Soft cloth and water
Pick-up Roller	C	R	R	C	Soft cloth and water
Separation Roller	C	R	R	C	Soft cloth and water
Shutter Torque Limiter		L	L		Use Mobil Temp 78.

Printer and Paper Cassette

Item	10K	30K	60K	1 year	Notes
Paper Feed Roller	C	C	R	C	Soft cloth and alcohol
Relay Roller	C	C	C	C	Soft cloth and alcohol
Registration Rollers	C	C	C	C	Soft cloth and alcohol
Thermistor		C	C		Soft cloth and alcohol
Hot Roller Strippers		C	C		Cotton swab and alcohol
Feed-out Roller	C	C	C	C	Soft cloth and alcohol
Hot Roller			R		Soft cloth and alcohol
Pressure Roller (Fusing)			R		
Thermostat		C	C		Soft cloth and alcohol
Cleaning Pad	R	R	R		
Transfer Corona Unit	C	C	R	C	Soft cloth/cotton swab and alcohol
Charge Corona Unit	C	C	R		
Corona Wires	C	C		C	
Quenching Lamp	C	C	C	C	
Laser Shield Glass	C	C	C	C	
Development Unit			R		
Ozone Filter	R	R	R		

Other

Item	10K	30K	60K	1 year	Notes
Exterior and Covers	C	C	C	C	Soft cloth and water

5. TROUBLESHOOTING

5.1. COPY QUALITY TROUBLESHOOTING

If there is a copy quality problem that cannot be solved easily, try using the following troubleshooting flow chart, while referring to the point-to-point diagram. The flow chart may not be exhaustive, but it may help you to find the problem.

Symptom: Blank copies		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 15.	Go to step 2.
2. Is the master installed correctly?	Go to step 3.	Install it properly.
3. Does the master rotate correctly during the copy cycle?	Go to step 4.	Correct any problems with the mechanism.
4. Is the master grounded properly?	Go to step 5.	Check the grounding wire, terminals and plates. Clean or replace if necessary.
5. Are any of the laser optical components broken, blocked, or misaligned?	Correct the problem.	Go to step 6.
6. Are the transfer corona unit and wire correctly installed?	Check the connections between the corona wire and the FCU. Go to step 7.	Correct the problem.
7. Does the FCU output the power and corona trigger signal to the power pack?	Clean the transfer corona unit. Go to step 8.	Change the FCU.
8. Does the problem go away if you change the power pack?	Finished.	Go to step 9.
9. Does the development bias terminal reach the correct voltage (about -530 Vdc)?	Go to step 12.	Go to step 10. Do not adjust the variable resistors on the power pack.
10. Does the FCU output the power and bias trigger signal to the power pack?	Clean the area around the bias terminal. Go to step 11.	Change the FCU.
11. Does the problem go away if you change the power pack?	Finished.	Clean the development roller. Go to step 12.
12. Does the development roller attract toner?	Check all LDDR - FCU - interlock switch connections. Go to step 13.	Replace the roller.

Symptom: Blank copies		
Check	**Action if Yes**	**Action if No**
13. Is the laser diode unit screwed in properly?	Go to step 14.	Install it properly.
14. Do the interlock switches close when the cover is closed, and do they pass power to the LDDR?	Change the LD unit, FCU, master unit, or varistor.	Change them.
15. Check the FCU - SBU connection. Is there a signal from the SBU (AVIDEO)?	Go to step 16.	Light the xenon lamp. Align the SBU; replace the FCU or SBU if impossible.
16. Does the problem only occur when printing from memory?	Check the connection to the memory card. Change the memory card, FCU, or MBU.	Go to step 17.
17. If the problem only occurs during communication, check the FCU - NCU - line connections. Check for severe line problems. If the problem cannot be found, replace the NCU or FCU.		

Symptom: Black copies		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 10.	Go to step 2.
2. Are the charge corona unit and wire correctly installed?	Check the connections between the corona wire and the FCU. Go to step 3.	Correct the problem.
3. Does the FCU output the power and corona trigger signal to the power pack?	Clean the charge corona unit. Go to step 4.	Change the FCU.
4. Does the problem go away if you change the power pack?	Finished.	Go to step 5.
5. Is the varistor shorted?	Change the varistor.	Go to step 6.
6. Is the master grounded properly?	Go to step 7.	Check the grounding wire, terminal and plate. Clean or replace if necessary.
7. Does the development bias terminal reach the correct voltage (about -530 Vdc)?	Go to step 10.	Go to step 8. Do not adjust the variable resistors on the power pack.
8. Does the FCU output the power and bias trigger signal to the power pack?	Clean the area around the bias terminal. Go to step 9.	Change the FCU.
9. Does the problem go away if you change the power pack?	The laser beam may always be on. Change the FCU or LD unit.	Clean the development roller. Go to step 10.
10. Check the connections from the FCU to the xenon lamp. Does the lamp work?	Go to step 12.	Go to step 11.

Symptom: Black copies		
Check	**Action if Yes**	**Action if No**
11. Does the FCU output the power and drive signals to the lamp driver?	Change the xenon lamp or the drive board.	Change the FCU.
12. Check the FCU - SBU connection. Is there a signal from the SBU (AVIDEO)?	Go to step 13.	Light the xenon lamp. Align the SBU; replace the FCU or SBU if impossible.
13. Does the problem only occur when printing from memory?	Check the connection to the memory card. Change the memory card, FCU, or MBU.	Go to step 14.
14. If the problem only occurs during communication, check the FCU - NCU - line connections. Check for severe line problems. If the problem cannot be found, replace the NCU or FCU.		

Symptom: Faint copy		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 7.	Go to step 2.
2. Try the following steps (a to f) to solve the problem. If they fail, check the connections through the machine between the FCU, toner near-end sensor, and toner supply motor. Then go to step 3. a) Replace the master. b) If the Add Toner indicator is lit, add toner. c) Clean or replace the corona wires. d) Clean the toner metering blade (soft cloth and alcohol). e) If the copy paper is damp, replace it. f) If the toner contains dirt or paper particles, replace it.		
3. Has the toner run out even though the Add Toner indicator is not lit?	Check the sensor actuator mechanism. Change the sensor if necessary.	Go to step 4.
4. Does the toner supply motor turn just after the main power is switched on?	Go to step 5.	Change the toner supply motor or the FCU.
5. Work through steps 4 to 12 of "Blank copies".		
6. Change the varistor, FCU, or LD unit .		
7. Clean the exposure glass and the white plate in the scanner.		

Symptom: Faint copy at leading or trailing edge		
Check	**Action if Yes**	**Action if No**
The paper in the cassette may be curled at the leading edge The paper in the cassette may be damp. The paper may be too thick or too thin. Instruct the user how to store paper, and instruct them to use recommended types and weights of copy paper.		

Symptom: Dirty background all over the copy

Check	Action if Yes	Action if No
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 13.	Go to step 2.
2. Try the following steps (a to f) to solve the problem. If they fail, go to step 3. a) Clean the quenching lamp and cleaning blade. b) Tighten the toner metering blade securing screws. c) If the toner contains dust or paper particles, change the CTM. d) Clean the area around the bias terminal of the development unit. e) If the pattern is constant down the page, clean the laser optics with a blower brush, or clean or replace the corona wires.		
3. Is the master grounded properly?	Go to step 4.	Check the grounding wire, terminals and plates. Clean or replace if necessary.
4. Is the varistor shorted?	Change the varistor.	Go to step 5.
5. Does the development bias terminal give a constant correct voltage (about -530 Vdc)?	Go to step 8.	Go to step 6. Do not adjust the variable resistors on the power pack.
6. Does the FCU output constant power and bias trigger signals to the power pack?	Clean the area around the bias terminal. Go to step 7.	Change the FCU.
7. Does the problem go away if you change the power pack?	Finished.	Go to step 8.
8. Are the charge corona unit and wire correctly installed?	Check the connections between the corona wire and the FCU. Go to step 9.	Correct the problem.
9. Does the FCU output constant power and corona trigger signals to the power pack?	Clean the charge corona unit. Go to step 10.	Change the FCU.
10. Does the problem go away if you change the power pack?	Finished.	Go to step 11.
11. Does the quenching lamp operate correctly?	Go to step 13.	Check the connections between the FCU and lamp. Go to step 12.
12. Does the FCU send constant power and drive signals to the lamp?	Replace the quenching lamp.	Replace the FCU.
13. Try replacing the master unit.		
14. Clean the scanner optics, exposure glass, and white plate. Check the SBU white waveform for peaks, dropouts, or noise in the signal. Change the SBU or FCU if such wave patterns are present. Adjust the RAM addresses containing contrast threshold levels.		

Symptom: Stray toner flecks fused into the copy		
Check	**Action if Yes**	**Action if No**
1. Clean the inside of the machine, especially around the development and transfer unit. Clean the cleaning blade. Clean the rollers in the fusing unit.		
2. Replace the master unit or CTM.		

Symptom: Previous copy shows faintly		
Check	**Action if Yes**	**Action if No**
1. Does the quenching lamp operate correctly?	Clean or replace the master.	Check the connections between the FCU and lamp. Go to step 2.
2. Does the FCU send constant power and drive signals to the lamp?	Replace the quenching lamp.	Replace the FCU.

Symptom: Density changes gradually across the printout		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 3.	Go to step 2.
2. Check that the charge corona wire is clean and that it is installed correctly. Check that none of the laser optic components are out of position. Check that toner is being distributed evenly across the development unit. If it is not, change the CTM, development unit, or toner supply motor. Try changing the master unit, quenching lamp, or the charge corona wire.		
3. The xenon lamp may need to be changed.		
4. Is the SBU scan line alignment is correct ?	Change the FCU.	Change the SBU.

Symptom: Uneven density in vertical bands		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 3.	Go to step 2.
2. Clean or change the charge corona wire. Clean or change the quenching lamp. Clean the laser optic components with a blower brush or dry cloth. Check that toner is being distributed evenly across the development unit. If it is not, change the CTM, development unit, or toner supply motor.		
3. Clean the exposure glass, white plate, and scanner optics. Change the xenon lamp, especially if bands appear on the sides of copies made using copy mode.		
4. Are there any bands in the SBU white waveform ?	Change the SBU.	Change the FCU.

Symptom: Uneven density in horizontal bands		
Check	**Action if Yes**	**Action if No**
1. Does the xenon lamp flicker?	Change the lamp.	Go to step 2.
2. Is there a clear boundary between the bands?	Clean the charge and transfer corona units (there could be a leak, so check if any Auto Service Calls were made).	Clean the development unit, its bearings, and drive mechanism. or replace the master unit and/or development unit.

Symptom: Thin vertical white lines		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 5.	Go to step 2.
2. Clean the grid plate, toner metering blade, and laser optics. Clean or replace the corona wires. Add toner if the toner supply is getting low. Check for foreign objects around the master that could cause leakage of charge form the belt.		
3. Is the surface of the hot roller scratched?	Replace the component that is damaging the hot roller, then replace the hot roller. If the hot roller strippers are badly stained with toner, replace them, and the thermistor (or FCU or PSU).	Go to step 4.
4. Is the master scratched?	Replace the component that is doing the damage, then replace the master.	Finished
5. Clean the white pressure plate above the exposure glass.		
6. Are there any peaks in the SBU white waveform ?	Change the SBU.	Change the FCU.

Symptom: Fuzzy vertical white lines		
Check	**Action if Yes**	**Action if No**
Clean or replace the corona wires.		

Symptom: Wavy vertical black lines or bands		
Check	**Action if Yes**	**Action if No**
The cleaning blade or toner metering blade may be dirty or damaged. Replace the hexagonal mirror motor.		

Symptom: Vertical dotted lines		
Check	**Action if Yes**	**Action if No**
1. If the master is scratched, replace the master, and the component that is scratching it.		
2. If the development roller is scratched, replace the roller, and the component that is scratching it.		
3. Clean the corona wires.		

Symptom: Vertical black band at the left or right edge of the printout		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 3.	Go to step 2.
2. Make sure that the charge corona wire cleaner is at home position. Clean the laser optics with a blower brush or soft dry cloth.		
3. Clean the scanner optics. Replace the xenon lamp.		

Symptom: Vertical black lines or bands at constant positions on the copy		
Check	**Action if Yes**	**Action if No**
1. Make a printer test (see section 4.1.14). Is it OK?	There may be a scanner problem; go to step 5.	Go to step 2.
2. Clean the thermistor, hot and pressure rollers, and hot roller strippers. Change the cleaning pad if it is dirty. Is the surface of the hot roller scratched?	Replace the component that is damaging the hot roller, then replace the hot roller. If the hot roller strippers are badly stained with toner, replace them, and the thermistor (or FCU or PSU).	Go to step 3.
3. Is the master scratched?	Replace the component that is doing the damage, then replace the master.	Go to step 4.
4. Clean the corona wires and guide plates in the paper feed path. Clean the quenching lamp. Replace the toner metering blade if it is damaged. Clean the laser optics carefully with a blower brush or soft dry cloth. If the problem remains, change the FCU or LD unit.		
5. Clean the white pressure plate above the exposure glass.		
6. Are there any peaks in the SBU white waveform ?	Change the SBU.	Change the FCU.

Symptom: Black stripes at the left and right edges of printouts		
Check	**Action if Yes**	**Action if No**
Clean the following components, or change them if the problem remains: Master unit, quenching lamp, xenon lamp, development roller.		

Symptom: Defects at repeating intervals on the printout		
Check	**Action if Yes**	**Action if No**
There is a defect on the master belt or on one of the rollers (the most likely ones are the hot roller, pressure roller, or development roller		

Symptom: Black streaks at the leading edge		
Check	**Action if Yes**	**Action if No**
Clean the hot roller strippers or change the master unit.		

Symptom: Black spots at the leading edge		
Check	**Action if Yes**	**Action if No**
Clean inside the machine, especially around the fusing unit and transfer unit entrances. Clean the transfer corona wire and check that it is installed properly. If the problem remains, change the transfer corona wire or the power pack.		

Symptom: Horizontal white lines or stripes across printouts		
Check	**Action if Yes**	**Action if No**
1. Make sure that the user is using the correct type of copy paper, and storing it in a dry place.		
2. Does the printout have a crease mark where the white band appears?	Check the paper feed mechanism and path from paper feed through transfer; correct any faults.	Go to step 3.
3. Does the development bias terminal stay at a constant voltage (about -530 Vdc)?	Go to step 6.	Go to step 4. Do not adjust the variable resistors on the power pack.
4. Does the FCU output the power and bias trigger signal to the power pack?	Clean the area around the bias terminal. Go to step 5.	Change the FCU.
5. Does the problem go away if you change the power pack?	Finished.	Clean the development roller. Go to step 6.
6. Clean the transfer corona unit (wire, endblocks, casing). Check and replace any parts that may be causing the corona charge to leak.		
7. Check that the development roller and master unit are both rotating smoothly, and that the start and stop at the same time. If there are any problems, do the following: a) Check the roller, master unit, and drive mechanism for any defective components, such as gears. b) Try changing the main motor.		

Symptom: Black page with horizontal white stripes		
Check	**Action if Yes**	**Action if No**
Replace the optic fiber cable from the main scan start detector. If the problem remains, change the LD unit or FCU.		

Symptom: Random black spots on the printout		
Check	**Action if Yes**	**Action if No**
The grid plate may not be grounded properly. If the problem cannot be corrected, try changing the charge corona unit, which contains the grid plate. If the surface of the development roller is dirty, clean it. The laser diode may be out of control. Change the LDDR or FCU.		

Symptom: Horizontal black stripes		
Check	**Action if Yes**	**Action if No**
1. Is the Call Service indicator lit?	Replace the LD unit or FCU.	Go to step 2.
2. Check that the master unit is installed properly and correctly grounded. Change the master unit if it is damaged. If the problem only occurs in copy mode, the xenon lamp may be flickering: change the lamp, driver, or FCU. If the problem remains, go to step 3.		
3. Does the development bias terminal stay at a constant voltage (about -530 Vdc)?	Go to step 6.	Go to step 4. Do not adjust the variable resistors on the power pack.
4. Does the FCU output the power and bias trigger signal to the power pack?	Clean the area around the bias terminal. Go to step 5.	Change the FCU.
5. Does the problem go away if you change the power pack?	Finished.	Clean the development roller. Go to step 6.
6. Check that the toner metering blade is screwed in securely.		

Symptom: White spots in black areas		
Check	**Action if Yes**	**Action if No**
Clean the development roller (soft cloth and alcohol). Clean the corona wires. If the problem cannot be solved, change the development unit, master, or power pack.		

Symptom: Data missing at the leading edge		
Check	**Action if Yes**	**Action if No**
1. Does the problem only occur during copying?	Go to step 2.	Go to step 3.
2. Check that the scan line sensor is in the correct position. Try changing the FCU.		
3. Is the correct type of copy paper being used, and is it curled at the leading edge? Check for dust on the rollers in the paper feed path. Lower cassette: Is the registration mechanism working correctly?		

Symptom: Part of the copy missing at the left or right edges		
Check	**Action if Yes**	**Action if No**
1. Does the problem only occur during copying?	Go to step 2.	Go to step 3.
2. Check the scanner optic path. Change the SBU or FCU.		
3. Check the laser optic path. Change the FCU.		

Symptom: Distorted printout		
Check	**Action if Yes**	**Action if No**
1. Does the problem only occur during copying?	Go to step 2.	Go to step 3.
2. Check that the document feed mechanism is operating smoothly.		
3. Poorly installed or defective hexagonal mirror motor. Blockage in the paper path. Check that the main motor, gears, rollers, and drive belts are moving smoothly.		

Symptom: Fuzzy copy		
Check	**Action if Yes**	**Action if No**
1. Does the problem only occur during copying?	Go to step 8.	Check the connections between the ozone fan and the FCU. Go to step 2.
2. Does the ozone fan turn on?	Go to step 4.	Go to step 3.
3. Does the fan receive the power and drive signals?	Replace the fan.	Replace the FCU (or PSU).
4. Change the ozone filter. Check for obstructions between the transfer unit and the fusing unit. Check that the master is grounded properly. Change the master unit. Clean or replace the corona wires. Clean the laser optics carefully with a blower brush or soft dry cloth. If the problem remains, go to step 5.		
5. Does the development bias terminal stay at a constant voltage (about -530 Vdc)?	Go to step 8.	Go to step 6. Do not adjust the variable resistors on the power pack.
6. Does the FCU output the power and bias trigger signal to the power pack?	Clean the area around the bias terminal. Go to step 7.	Change the FCU.
7. Does the problem go away if you change the power pack?	Finished.	Clean the development roller.
8. Clean the scanner optics and the xenon lamp. Check the SBU waveforms, especially MTF and reduction rate (section 5-2-9).		

Symptom: Unfused copy		
Check	**Action if Yes**	**Action if No**
Clean the thermistor in the fusing unit. Check the pressure roller spring mechanism. Change the thermistor, fusing unit, FCU, or PSU.		

Symptom: Jitter, image stretched down the page		
Check	**Action if Yes**	**Action if No**
1. Does the problem only occur during copying?	Go to step 3.	Go to step 2.
2. Check the paper feed drive mechanism (motors, gears, timing belts). Check for obstructions in the paper feed path. Jitter: Try changing the LD unit or FCU.		
3. Check the document feed drive mechanism (motors, gears, timing belts). Check the tx motor timing belt tension. Replace the FCU or tx motor if the motor is making abnormal noise.		

Symptom: Magnification or reduction, filled-in characters		
Check	**Action if Yes**	**Action if No**
Adjust the SBU reduction rate. If the problem only occurs in copy mode, check the paper size sensors. Replace the sensors or the FCU (or the PFU for the lower cassette).		

Symptom: Misaligned output - data shifted to the left or right		
Check	**Action if Yes**	**Action if No**
1. Check that the laser diode unit is screwed in properly. Check that the laser optics are not misaligned. Try changing the LD unit or FCU.		
2. Adjust the SBU scan start position. Check that the scanner optics are not misaligned. Check that the document table is aligned properly. Try changing the LD unit or FCU.		

5.2. MECHANICAL PROBLEMS

The following flow charts may help you find the problem. They do not include such obvious steps as checking the power connection or changing the PSU or FCU if nothing appears on the operation panel.

5.2.1. ADF/Scanner

Symptom: Non feed		
Check	**Action if Yes**	**Action if No**
1. Are the covers closed properly?	Go to step 2.	Close the covers securely.
2. Are the pick-up and feed rollers clean?	Go to step 3.	Clean the rollers with a soft cloth and water. Replace them if they are damaged.
3. Is the shutter mechanism blocked? (If the shutter does not lift up after pressing Start, the tx motor may be defective; see step 10.)	Free the mechanism.	Go to step 4.
4. Is the problem corrected by adjusting the separation roller ?	Finished	Put the separation roller adjustment back to the original setting. Try replacing the separation roller. If that does not help, go to step 5.
5. Are the gears and spring clutches clean and working properly?	Go to step 6.	Clean the gears and clutches. Remove any debris from the mechanism.
6. Are the connections between the operation panel, FCU, and document sensor loose?	Connect the cables properly.	Go to step 7.
7. Does the LCD prompt change when a document is placed in the feeder?	Go to step 8.	Replace the document sensor, operation panel PCB, or FCU.
8. Are the connections between the PSU and FCU and the tx motor loose?	Connect the cables properly.	Go to step 9.
9. Does the tx motor work?	This troubleshooting procedure has finished.	Go to step 10.
10. Does the FCU receive +24V from the PSU?	Go to step 11.	Change the PSU.
11. Does the FCU output power and phase drive signals to the tx motor?	Replace the tx motor.	Replace the FCU.

Symptom: Skew caused by the scanner mechanism		
Check	**Action if Yes**	**Action if No**
1. Are the scanner rollers clean?	Replace the separation roller and or separation plate.	Clean the rollers using a oft cloth and water

Symptom: Jam		
Check	**Action if Yes**	**Action if No**
1. Are the scanner rollers clean?	Go to step 2.	Clean the rollers using a soft cloth and water
2. Is the document feed path blocked?	Go to step 3.	Remove any debris.
3. Is the scanner mechanism in good shape, and is the tx motor timing belt tension correct?	Go to step 4.	Correct the problem.
4. Are the connections between the operation panel, FCU, document width sensor, and scan line sensor loose?	Connect the cables properly.	Go to step 5.
5. Does the operation panel PCB receive signals from the scan line sensor and the document width sensor?	Replace the operation panel PCB or FCU.	Replace the document width sensor and/or scan line sensor.

Symptom: Abnormal noise		
Check	**Action if Yes**	**Action if No**
1. Is the machine assembled properly.	Go to step 2.	Correct the problem.
2. Are the springs and clutches in the feed/pick-up mechanism clean?	Replace the tx motor or the FCU.	Clean them.

Symptom: Double feed		
Check	**Action if Yes**	**Action if No**
1. Is the problem solved by cleaning or lubricating the separation roller?	Finished	Try cleaning or replacing the separation plate. If that does not help, go to step 2.
2. Does adjusting the separation roller solve the problem ?	Finished	Put the adjustment back to the original position, and replace the separation roller.

Symptom: Dirty document		
Check	**Action if Yes**	**Action if No**
Clean the rollers and guide plates using a soft cloth and water.		

Symptom: Second page not fed in		
Check	**Action if Yes**	**Action if No**
1. Clean the rollers using a soft cloth and water.		
2. Are the connections between the operation panel, FCU, and scan line sensor loose?	Connect the cables properly.	Go to step 3.
3. Does the operation panel PCB receive signals from the scan line sensor?	Replace the operation panel PCB or FCU.	Replace the scan line sensor.

5.2.2. Printer

Symptom: Non-feed		
Check	**Action if Yes**	**Action if No**
1. Check that non-feed is not due to another problem, such as "Call Service" being lit, or the power cord not being plugged in. Check that the feed-in area is not jammed with debris. Check that the covers are closed properly. Clean or replace the pick-up and feed rollers, and check that the paper lift and feed mechanisms are working properly. If the problem only happens during communication, check the connections between the FCU, NCU, and telephone line.		
2. Are the connections between the FCU and the paper size and end sensors loose?	Connect the cables properly.	Go to step 3.
3. Does the Add Paper indicator light even if paper is present?	Go to step 4.	Go to step 7.
4. Does the Add Paper indicator light when the cassette is installed in the machine?	Go to step 5.	Go to step 6.
5. Are the connections between the PSU, FCU, front cover switch and front cover interlock switch cover loose?	Connect the cables properly.	Go to step 8.
6. Does the signal from the front cover switch change when the cover is closed?	Go to step 8.	Change the switch and/or the actuator mechanism.
7. Does the front cover interlock switch pass +24V and +5V from the FCU through to the FCU?	Go to step 8.	Change the switch and/or the actuator mechanism.
8. Do the paper feed motor and clutch operate?	Go to step 13.	Go to step 9 (motor) or 11 (clutch).
9. Are the connections between the FCU and the paper feed motor loose?	Connect the cables properly.	Go to step 10.
10. Does the FCU output power and drive signals to the motor?	Replace the defective motor.	Replace the FCU.
11. Are the connections between the FCU and the paper feed clutch loose?	Connect the cables properly.	Go to step 12.
12. Does the FCU output power and drive signals to the clutch?	Replace the defective clutch.	Replace the FCU.

Symptom: Non-feed		
Check	**Action if Yes**	**Action if No**
13. If the main and paper feed motors do not turn on but are in good condition, the basic starting conditions for printing may not have been met. The conditions are as follows: The fusing lamp must be at the correct temperature. See "Service Call Conditions: Hot Roller Down". The hexagonal mirror motor must have reached the correct speed. See "Service Call Conditions: Mirror Motor Locked". One page must have been stored in the page memory. Check the connections between the components of the video data path and replace any defective PCBs.		

Symptom: Copy Jam - General		
Check	**Action if Yes**	**Action if No**
1. Is the printer jammed with debris?	Clear the debris.	Go to step 2.
2. Is the correct type of paper being used, and is it correctly loaded in the cassette?		
3. Is a paper jam indicated when the power is switched on, even if there is no jam.	Go to step 4.	Go to step 5.
4. Is the correct paper size sensor actuator being used?	Go to step 6.	Install the correct actuator.
5. Is the paper size sensor outputttting the correct signals for the installed actuator? The signals that should be seen are shown in the following table.	If you suspect that the FCU is processing the sensor signals wrongly, change the FCU.	Change the sensor.
FCU Connector / 29-4 / 29-3 / 29-2 A5 / L / L / L Letter / H / L / L A4 / L / H / L		
6. Are the connections between the FCU and the main motor loose?	Connect the cables properly.	Go to step 7.
7. Does the main motor work?	Go to step 9.	Go to step 8.
8. Does the FCU output power and drive signals to the main motor?	Replace the main motor.	Replace the FCU.
9. Do the paper feed motor and clutch work? See steps 8 to 12 of "Non-feed".		

Symptom: Copy jam in the paper feed entrance (error code 9-07)		
Check	**Action if Yes**	**Action if No**
1. Clean the rollers in the paper feed entrance. Replace any defective rollers		
2. Check the registration sensor and lower paper feed sensor (see steps 3 and 4 of "Copy jam - General").		
3. Do the paper feed motor and clutch work? See steps 8 to 12 of "Non-feed".		

Symptom: Copy jam inside the machine (error code 9-08)		
Check	**Action if Yes**	**Action if No**
1. Clean the registration rollers (metal rollers - soft cloth and alcohol, rubber rollers - soft cloth and water). Check the paper feed path and mechanism, especially the area around the entrance to the transfer/fusing unit. Check the fusing unit drive mechanism. Replace the pressure springs or fusing unit rollers or gears if necessary.		
2. Check the registration sensor and copy feed-out sensor (see steps 3 and 4 of "Copy jam - General").		

Symptom: Copy jam at the feed-out area (error code 9-09)		
Check	**Action if Yes**	**Action if No**
1. Clean the rollers in the copy feed-out area.		
2. Check the copy feed-out sensor (see steps 3 and 4 of "Copy jam - General").		

Symptom: Double feed		
Check	**Action if Yes**	**Action if No**
Check the paper cassette's corner separator mechanism and side fences, and replace if necessary.		

Symptom: Dog-eared copies		
Check	**Action if Yes**	**Action if No**
Excessive copy paper curl Defective hot roller stripper Incorrect corner separator/side fence position		

Symptom: Wrinkled copies		
Check	**Action if Yes**	**Action if No**
Check whether the problem can be solved by using another stack of paper. Check paper transport through the printer and replace the defective component. Replace the fusing unit pressure springs, or the entire fusing unit.		

Symptom: Soiled copy paper		
Check	**Action if Yes**	**Action if No**
Clean the rollers in the printer. If the dirt is part of the image, then clean the ADF and scanner rollers. Also, see Copy Quality Troubleshooting (section 6-1).		

Symptom: Dirt along the leading edge on the reverse side		
Check	**Action if Yes**	**Action if No**
See "Soiled Copy Paper" above. Clean the following components: transfer corona unit and vicinity, paper feed path, registration rollers (soft dry cloth), feed-out rollers.		

Symptom: Skew caused by the printer mechanism		
Check	**Action if Yes**	**Action if No**
Clean the rollers in the cassette and paper feed path. Replace any defective rollers.		

Symptom: Ozone odor		
Check	**Action if Yes**	**Action if No**
1. Is the ozone fan working?	Change the ozone filter.	Go to step 2.
2. Does the FCU send power and drive signals to the fan?	Change the ozone fan.	Change the FCU.

5.3. SERVICE CALL CONDITIONS

If the Call Service indicator is lit, one of the following conditions has occurred.

- Mirror Motor Locked (hexagonal mirror motor lock failure)
- Hot Roller Down (fusing lamp failure)
- LD Power Control Failure (laser diode power control failure)
- Main Motor Locked (main motor lock failure)
- Charger Leak (transfer corona charge leak)

If the Call Service indicator is not lit, one of the following conditions has occurred.

- Excessive scanner jam call - scanner has jam problems frequently. (see section 4.5.1)
- Excessive printer jam call - printer has jam problems frequently. (Sub-code: 51; see section 4.5.1)
- Periodic service call (see section 4.5.2)
- PM call (see section 4.5.3)

To find out which problem has occurred, either:

- See the Auto Service Report, System Parameter List, and Service Monitor Report that were sent to the service station for the problem with the machine.
- Check the error code history using function 93.
- Try to clear the service call condition: switch the power off, wait 10 seconds, then switch back on.
- Check the sub-code which is stored at RAM address 4B7E(H). Note that the sub-codes do not appear on the reports that were sent to the service station, but they are stored in the above mentioned RAM.

If the problem remains, work through the appropriate troubleshooting procedure from the following pages.

After each troubleshooting attempt, reset the machine and try to operate it. If the machine still does not work, continue troubleshooting.

Symptom: Charger Leak (Error Code 9-17)

This error occurs if FCU CN23-3 stays high for 3 s or more while the transfer corona is on (sub-code 31)

Check	Action if Yes	Action if No
Clean the transfer corona wire and unit. Check that the FCU outputs the power and trigger signals to the power pack. If not, replace the FCU. Replace the FCU, power pack or transfer corona unit if the problem still occurs.		

Symptom: LD Power Control Failure (Error Code 9-20)

This error occurs in either of the following conditions:

- Error in the Laser Interface (LIF) chip on the FCU (sub-code 41 or 42)
- Laser power failure (sub-code 43)

Check	Action if Yes	Action if No
1. Do the front cover interlock switch and front cover microswitch both pass +5V?	Replace the FCU or laser diode drive board.	Replace the defective switch or actuator mechanism.

Symptom: Hot Roller Down (Error Code 9-22)

This error occurs in any of the following conditions:

Standby mode: If the fusing lamp takes more than 40 s to reach 80 °C (sub-code 01)
During printing: If the fusing lamp takes more than 30 s to rise to 150 °C from 80 °C (sub-code 02)
During printing: If the fusing lamp stays below 150 °C for more than 10 s (sub-code 04)
During printing: If the thermistor is accidentally disconnected (sub-code 07)
After printing: If the fusing lamp takes more than 10 minutes to fall back to 150 °C (sub-code 03)
After printing: If the thermistor is accidentally disconnected for more than 15 s (sub-code 06)
At any time: If the fusing lamp temperature reaches 280 °C (sub-code 05)

Check	Action if Yes	Action if No
Is the fusing unit thermistor disconnected (FCU CN36)? Is the thermistor open or shorted? If so replace it. Otherwise clean it. Replace the fusing lamp if it is open circuit. Replace the thermostat if it is broken. Replace the FCU or PSU. Replace the front cover interlock switch if it does not pass +24V from the PSU to the FCU.		

Symptom: Mirror Motor Locked (Error Code 9-23)

This error occurs in either of the following conditions:

- If FCU CN2-2 does not go low within 10 s of the hexagonal mirror motor being switched on (sub-code 21)
- If FCU CN2-2 goes back to high for 10 s or more during hexagonal mirror motor operation (sub-code 22)

Check	Action if Yes	Action if No
1. Check the connections through the machine between the PSU, FCU, interlock switches, hexagonal mirror motor and laser diode unit.		

Symptom: Mirror Motor Locked (Error Code 9-23)		
2. Does the FCU receive +24V from the PSU?	Go to step 3.	Change the PSU or the front cover interlock switch.
3. Does the FCU send +24V to the motor?	Replace the motor and driver.	Replace the FCU.

Symptom: Main Motor Locked (Error Code 9-24)

This error occurs in either of the following conditions:

- If FCU CN22-4 does not go low within 10 s of the main motor being switched on (sub-code 11)
- If FCU CN22-4 goes back to high for 10 s or more during main motor operation (sub-code 12)

Check	Action if Yes	Action if No
1. Check that the mechanism is not obstructed.		
2. Does the front cover interlock switch pass +24V?	Replace the FCU or the main motor.	Replace the defective switch mechanism.

5.4. ERROR CODES

If an error code occurs, retry the communication. If the same problem occurs, try to fix the problem as suggested below.

Code	Meaning	Suggested Cause/Action
0-00	DIS/NSF not detected within 40 s of Start being pressed	Check the line connection Check the NCU - FCU connectors. The machine at the other end may be incompatible. Replace the NCU or FCU. Check for DIS/NSF with an oscilloscope. 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. The other party pressed Stop during communication.
0-03	Incompatible modem at the other end	The other terminal is incompatible.
0-04	CFR or FTT not received after modem training	Check the line connection. Check the NCU - FCU connectors. Try changing the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). Replace the FCU or NCU. The other terminal may be faulty; try sending to another machine. 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. Check the NCU - FCU connectors. Try adjusting the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). Replace the FCU or NCU. Check for line problems.
0-06	The other terminal did not reply to DCS	Check the line connection. Check the FCU - NCU connectors. Try adjusting the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). Replace the NCU or FCU. The other end may be defective or incompatible; try sending to another machine. Check for line problems.
0-07	No post-message response from the other end after a page was sent	Check the line connection. Check the FCU - NCU connectors. Replace the NCU or FCU. The other end may have jammed or run out of paper. The other end user may have disconnected the call. Check for a bad line. The other end may be defective; try sending to another machine.

Code	Meaning	Suggested Cause/Action
0-08	The other end sent RTN or PIN after receiving a page, because there were too many errors	Check the line connection. Check the FCU - NCU connectors. Replace the NCU or FCU. The other end may have jammed, or run out of paper or memory space. Try adjusting the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). The other end may have a defective modem/NCU/FCU; try sending to another machine. Check for line problems and noise.
0-14	Non-standard post message response code received	Check the FCU - NCU connectors. Incompatible or defective remote terminal; try sending to another machine. Noisy line: resend. Try adjusting the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). Replace the NCU or FCU.
0-15	The other end does not have the confidential or transfer function	Incompatible remote terminal. Remote terminal memory full.
0-16	CFR or FTT not detected after modem training in confidential or transfer mode	Check the line connection. Check the FCU - NCU connectors. Replace the NCU or FCU. Try adjusting the tx level (use NCU parameter 01 or a dedicated tx parameter for that address). The other end may have disconnected, or it may be defective; try calling another machine. If the rx signal level is too low, there may be a line problem.
0-20	Facsimile data not received within 6 s of retraining	Check the line connection. Check the FCU - NCU connectors. Replace the NCU or FCU. Check for line problems. Try calling another fax machine. Change the reconstruction time from 6 s to 10 s (bit switch 03, bit 7). Switch the rx cable equalizer on (bit switch 0A, bit 6).
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 FCU, NCU, & line. Check for line noise or other line problems. Replace the NCU or FCU. 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. Check the FCU - NCU connectors. Replace the NCU or FCU. Defective remote terminal. Check for line noise or other line problems.

Code	Meaning	Suggested Cause/Action
0-23	Too many errors during reception	Check the line connection. Check the FCU - NCU connectors. Replace the NCU or FCU. Defective remote terminal. Check for line noise or other line problems. Ask the other end to adjust their tx level.
0-24	Printer failure occurred while the memory was full during non-ECM reception; negative response returned	There is no memory space available, or substitute reception is disabled. Try the following: Change bit 6 of bit switch 07 to 1. Ask the user to change bit 0 of user parameter 05 to 1.
0-52	Polarity has changed during communication	
1-00	Document jam	Improperly inserted document or unsuitable document type. Clean the document jam sensor. See "Mechanical Operation - Document Jam".
1-01	Document length exceeded the maximum	Divide the document into smaller pieces. Clean the sensors in the ADF/scanner. See "Mechanical Operation - Document Jam".
1-17	Document jam in the feed-out area	Clear debris from the sensor actuator. Clean the sensors in the ADF/scanner. Check the connections between the sensors and FCU. Replace defective sensor, operation panel board, or FCU.
1-71	Cover has been opened or cassette has been pulled out during printing.	
2-12	Modem clock irregularity	Replace the FCU.
2-20	Abnormal coding/decoding (cpu not ready)	Check the connections from the FCU to the MBU. Replace the FCU or MBU.
4-00	One page took longer than 8 minutes to transmit	Check for a bad line. Try the communication at a lower resolution, or without halftone. Change the FCU.
4-01	Line current was cut	Check the line connector. Check the connection between the FCU and the NCU. Check for line problems. Replace the FCU or the NCU.
4-10	Communication failed because of ID Code mismatch (Closed Network) or Tel. No./CSI mismatch (Protection against Wrong Connections)	Get the ID Codes the same and/or the CSIs programmed correctly, then resend. The machine at the other end may be defective.
5-00	Data reconstruction not possible	Replace the FCU

Code	Meaning	Suggested Cause/Action
5-20	Storage impossible because of a lack of memory	Temporary memory shortage; otherwise, replace the FCU or memory PCB.
5-21	Memory overflow	
6-01	ECM - no V.21 signal was received	Try adjusting the rx cable equalizer. Replace the FCU or NCU.
6-02	ECM - EOR was received	
6-05	Facsimile data frame not received within 18 s of CFR, but there was no line fail (G3 ECM)	Check the line connection. Check connections from the FCU to the NCU. Check for a bad line or defective remote terminal. Replace the FCU, NCU or MBU. Switch the rx cable equalizer on (bit switch 0A, bit 6).
6-06	Coding/decoding error (G3 ECM)	Defective FCU. The other terminal may be defective.
6-08	PIP/PIN received in reply to PPS.NULL (G3 ECM)	The other end pressed Stop during communication. The other terminal may be defective.
6-09	ERR received (G3 ECM)	Check for a noisy line. Adjust the tx levels of the communicating machines. 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. Adjust the tx level (use NCU parameter 01or the dedicated tx parameter for that address). Check the line connection. Defective remote terminal.
9-07	Copy jam at the cassette entrance	See section 5-2-2. If the problem remains, replace the FCU.
9-08	Copy jam inside the machine	See section 5-2-2. If the problem remains, replace the FCU.
9-09	Copy jam in the copy feed-out area	See section 5-2-2. If the problem remains, replace the FCU.
9-17	Transfer corona power leak	See section 5-3 (Charger Leak). If the problem remains, replace the FCU.
9-20	Laser diode power control failed	See section 5-3 (LD Power Control Failure). If the problem remains, replace the FCU.
9-22	Fusing lamp failure	See section 5-3 (Hot Roller Down). If the problem remains, replace the FCU.
9-23	Hexagonal mirror motor lock failure, or laser main scan synch failure	See section 5-3 (Mirror Motor Locked). If the problem remains, replace the FCU.
9-24	Main motor lock failed	See section 5-3 (Main Motor Locked). If the problem remains, replace the FCU.

5.5. ELECTRICAL COMPONENT DEFECTS

5.5.1. Defective Sensor Table

Sensor	Symptoms if Defective
Document sensor	"CLEAR ORIGINAL" or "TRANSMIT DIAL" is displayed at power-up.
	"READY SET DOCUMENT" is still displayed after a document is placed in the feeder.
Document width sensor	Reduction should take place if the original is wide enough to actuate the sensor and the copy paper is not wide enough to. However, there is no reduction.
	"CLEAR ORIGINAL" is displayed at power-up.
Scan line sensor	"CLEAR ORIGINAL" is displayed at power-up.
	"CLEAR ORIGINAL" is displayed soon after the start of copying.
Front cover sensor	There is no alarm on opening the cover, and "CLOSE COVER" is not displayed.
	"CLOSE COVER" is displayed at power-up.
CTM sensor	"ADD TONER" is displayed at power-up.
Toner near-end sensor	Toner is never transferred from the CTM to the development unit.
Paper size sensor	"ADD PAPER" is displayed at power-up.
	Page separation may be done even if the original is the same size as the copy paper.
Paper end sensor	The Replace Paper indicator lights even if paper is remaining.
	The Replace Paper indicator does not light when the paper has run out.
Registration sensor Copy feed-out sensor	"CLEAR COPY" is displayed at power-up.
	"CLEAR COPY" is displayed soon after the start of copying.

5.5.2. Blown Fuse Table

The only service-replaceable fuse is the following.

Fuse	Symptoms if Defective
PSU - F1	No power to the machine

PRINTER INTERFACE KIT
TYPE 60

SERVICE MANUAL

EUR

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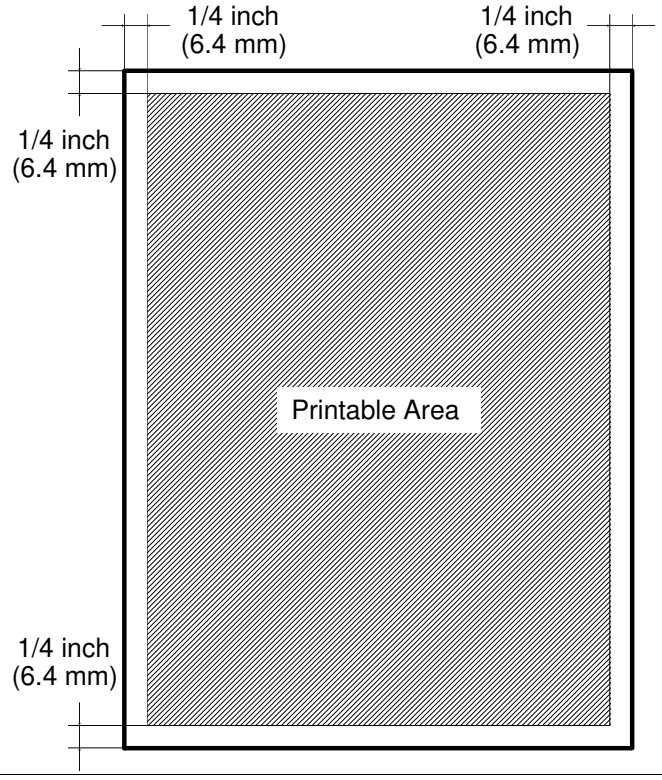
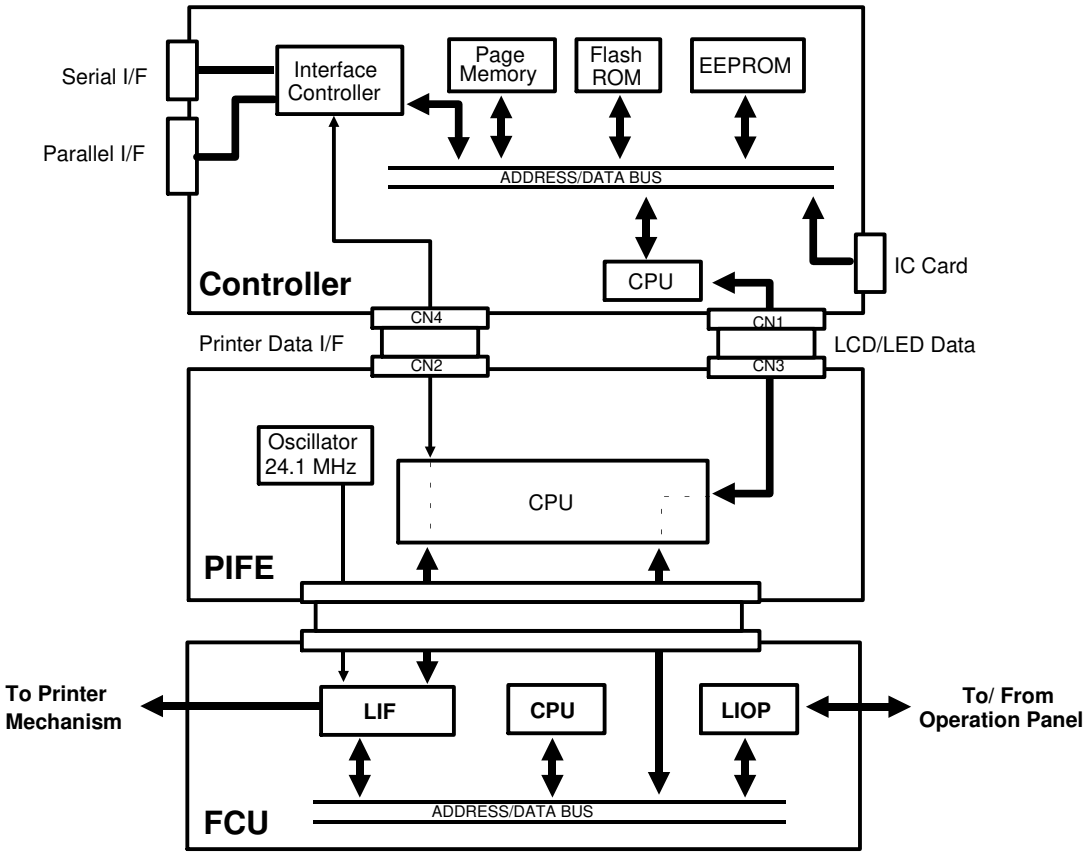
1. OVERALL INFORMATION

1.1. SPECIFICATIONS

Items	Specifications
Printing Resolution	300 dpi
Printing Speed	10 ppm (LT / A4)
First Page Printout TIme	Less than 15 s
Paper Size	Letter, Legal, A4
RAM Capacity	Standard - 2.0 MB
Host PC Interface	1 Serial Port - RS232C 1 Parallel Port - Centronics
Emulation Modes	HP LaserJet III (HP Printer Control Language Level 5, Hp Graphics Language/2) EPSON FX-850 IBM Proprinter XL24E LayOut Document Description Language Turbo Mode (fast bit-image transfer) HEX printout
Printable Area	
Others	IC Card Slot - 1 Font Cartridge Slot - 1

1.2. OVERALL SYSTEM CONTROL



The printer interface kit consists of two PCBs, the printer controller board (Controller) and the printer interface board (PIFE).

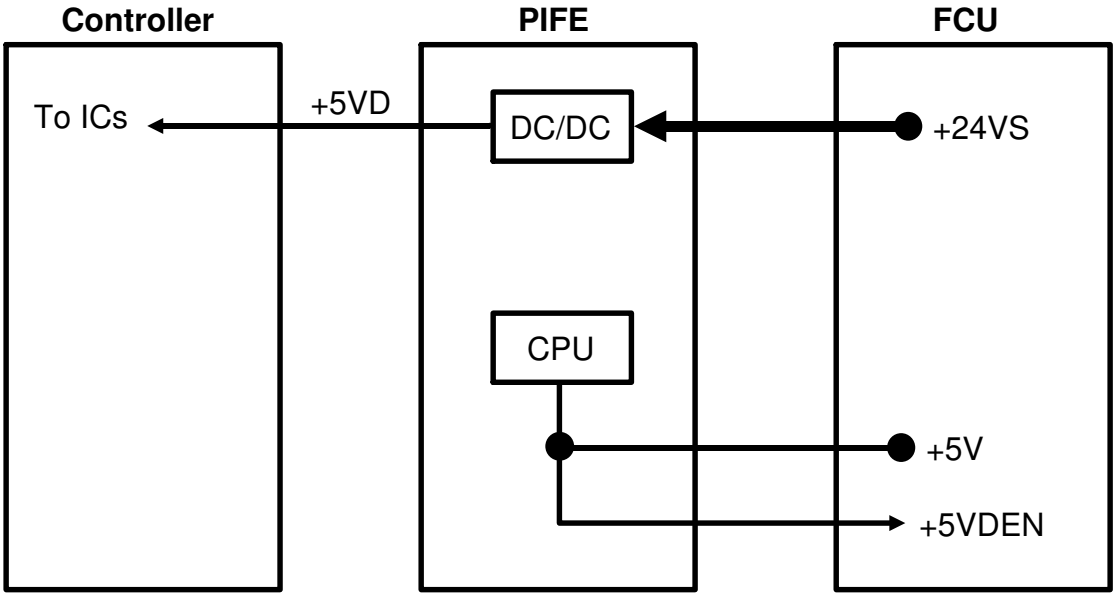
1.2.1. Printer Data Path

Through the serial and/or parallel interface(s), the Controller handshakes with the host(s) and receives print data, using one of the available emulation modes. Then the CPU creates an imaginary page in the memory using the fonts stored in the ROM. After one page of print data has been created, the Controller sends the video data through the printer data interface to the LIF on the FCU for printing. The PIFE emulates the print data and control signals for the LIF to work correctly, and supplies the 24.1 MHz clock signal to the LIF for 300 dpi printing.

1.2.2. LCD/LED Data Path

The three LEDs on the operation panel are always dedicated to the Controller. They indicate the status during printing, and are directly controlled by the Controller.
In Printer Mode (Function 35), the LCD display and four one-touch dial keys are dedicated to the Controller to access Printer functions. Within the Printer functions, some settings are not available because of limitations to the machine's hardware. So, the CPU on the PIFE monitors the function status and the settings to indicate on the LCD, and modifies the data if necessary (e.g., Half Letter size paper will not be displayed as a possible paper size).

1.3. POWER DISTRIBUTION



The PIFE generates +5VD for the Controller from the +24VS supplied by the FCU.
+5V for the PIF CPU is directly supplied by the FCU. The +5V line is returned to the FCU as +5VDEN, so that the FCU can detect whether the printer interface is installed or not.

2. DETAILED SECTION DESCRIPTIONS

2.1. INTERFACE SPECIFICATIONS

2.1.1. Parallel Interface

The parallel interface can use either Centronics or Dataproducts signalling protocols. The selection is made by a user adjustment.

1. Pin Assignment

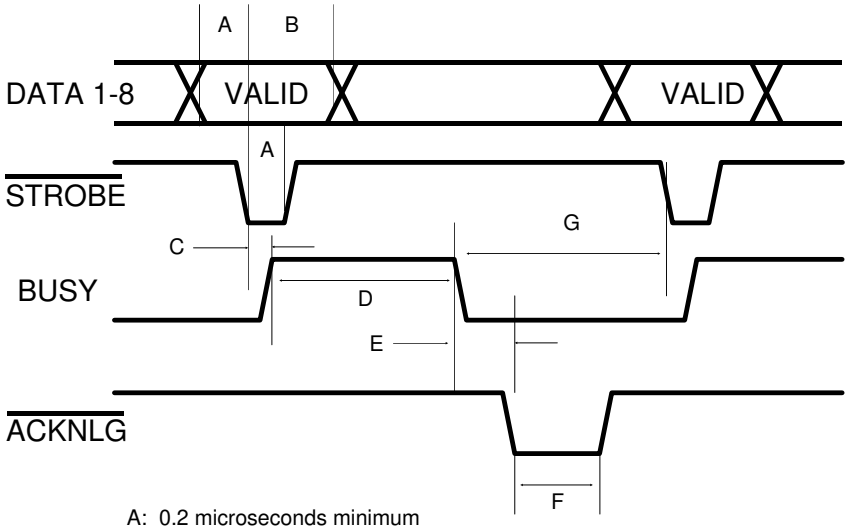
There is an 8-bit parallel interface. The pin assignments are as follows.

Signal Pin	Return Pin	Signal	Direct-ion	Description
1	19	STROBE	IN	The strobe pulse from the host to read data in. Centronics: Active LOW, Dataproducts: Active HIGH.
2 - 9	20 - 27	DATA1-8	IN	Parallel data bits 1 to 8. For 7-wire connections, the most significant bit can be fixed at 0 using a user adjustment.
10	28	ACKNLG	OUT	Indicates that data has been received and the printer is ready to receive more data.
11	29	BUSY/ DEMAND	OUT	A HIGH (Centronics) or LOW (Dataproducts) indicates that the printer cannot receive data. The printer is busy when the interface already contains a byte from the computer but not yet taken by the controller, when the printer is off line, and when there is a printer error. The Centronics signal is called BUSY, and the Dataproducts signal is called DEMAND.
12	30	PE	OUT	Indicates that the printer is out of paper.
13	-	SELECT	OUT	This correcsponds to the Centronics SELECT and the Dataprioducts READY and ONLINE signals.
15	-	DRTN		Reserved for data direction control. If HIGH, data goes from host to printer. If LOW, it goes the other way. The pin is pulled up on the controller board.
16	-	GND	-	Logic ground
17	-	CH-GND	-	Printer's chassis ground
18		5V470R		Pulled up to 5 V through a 470 Ω resistor.
19 - 30	-	GND	-	Twisted pair return signal ground level
32	-	ERROR	OUT	Indicates when the printer is out of paper, off line, or in an error condition.

Other pins: Not used.

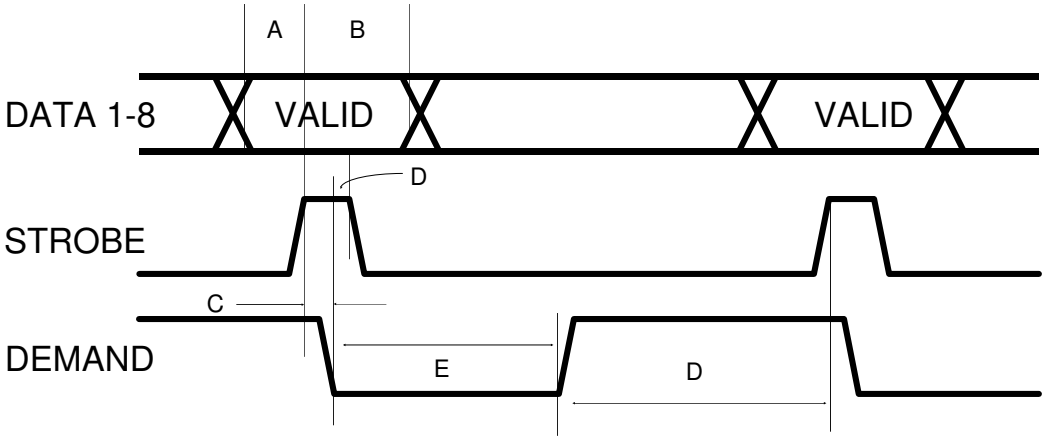
2. Interface Timing

Centronics



A: 0.2 microseconds minimum
B: 0.1 microseconds minimum
C: 0.15 microseconds maximum (normally 0.12)
D: 0.3 microseconds minimum (normally 0.5)
E: 0.07 microseconds maximum (normally 0.03)
F: 1 to 2 microseconds (normally 1.7)
G: Always at least zero

Dataproducts



A: 0.2 microseconds minimum
B: 0.1 microseconds minimum
C: 0.15 microseconds maximum
D: Always at least zero
E: 0.3 microseconds minimum

2.1.2. Serial Interface

1. Data Format

Word Length:	7 or 8 bits
Parity:	None, odd, or even
Stop Bits:	1 or 2
Baud Rate:	300, 600, 1200, 2400, 4800, 9600 bps
Signalling:	RS-232C or RS-422C, selected by user adjustment
Flow Control:	XON/XOFF

2. Pin Assignments

The serial interface pin assignments are compatible with that of the HP Laser-Jet printer, both for the RS-232C and RS-422C configurations.

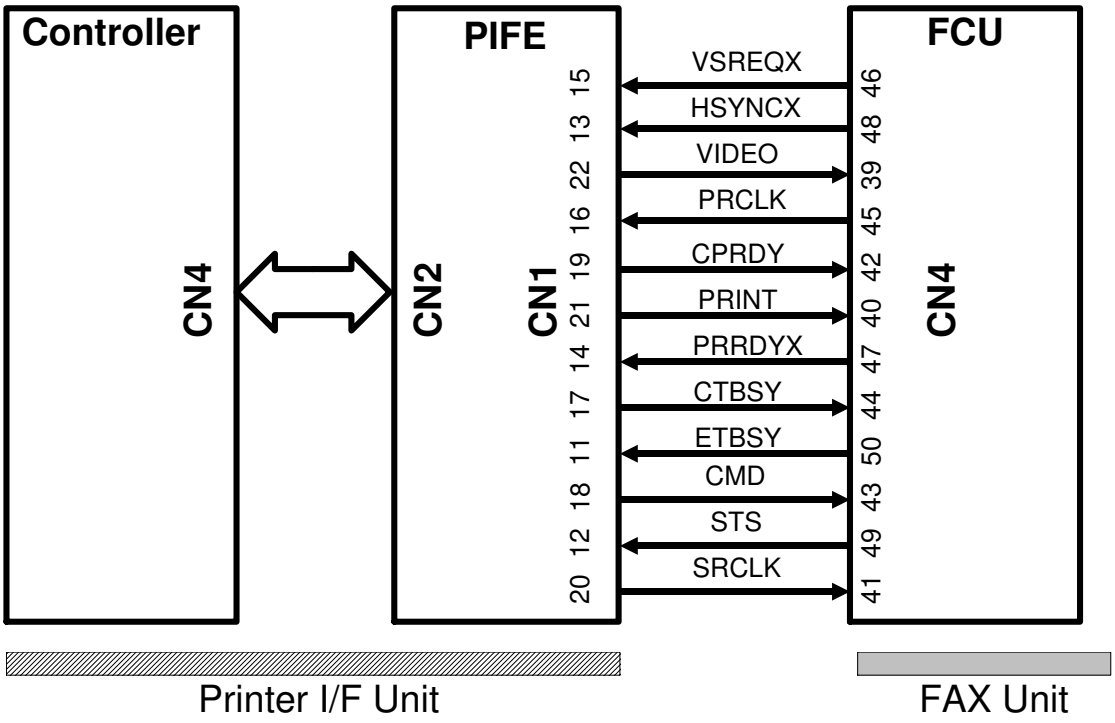
Signal Pin	Signal	Direct-ion	Description
1	FG	-	RS232/RS422: Connected to the printer chassis.
2	TXD	OUT	RS232: Serial data from printer to computer.
3	RXD/RDA	IN	RS232: Serial data from computer to printer. RS422: Serial data from computer to printer, line A.
4	RTS	OUT	RS232: Request To Send. Held HIGH by the printer.
7	SG	-	RS232/RS422: Signal ground. Provides a ground for all signal lines.
9	TDA	OUT	RS422: Serial data from printer to computer, line A.
10	TDB	OUT	RS422: Serial data from printer to computer, line B.
18	RDB	IN	RS422: Serial data from computer to printer, line B.
20	DTR	OUT	Data Terminal Ready. Indicates whether the printer is ready to receive data. If the printer ready protocol is not selected, DTR is always HIGH (always ready to receive). If printer ready protocol is selected, the printer can only accept data when DTR is HIGH. When DTR goes LOW, the computer must stop sending data within 128 characters. The active signal level can be changed with a user adjustment.

2.1.3. Printer Data Interface

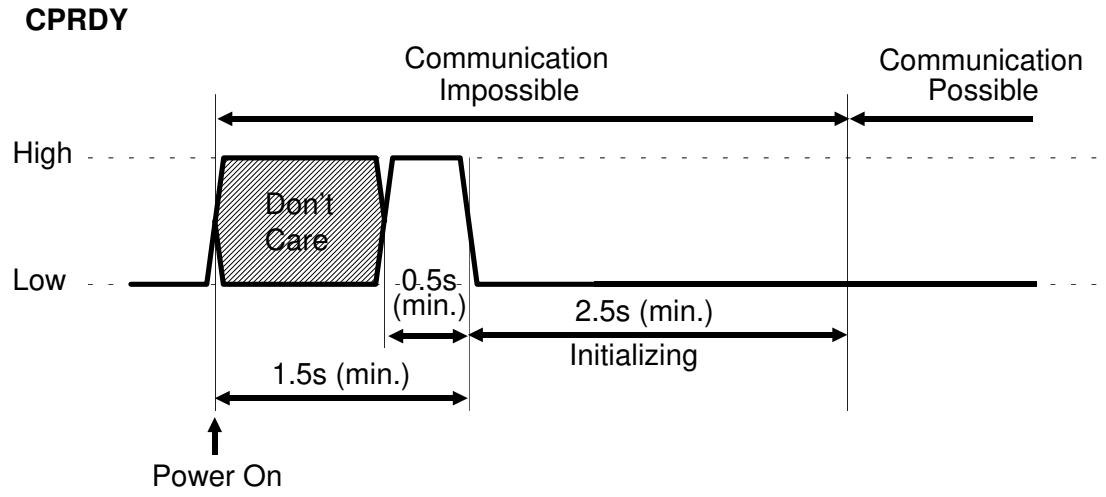
1. Signals

Name	Description
VSREQX	Active (low) while the controller transfers one page of image data to the FCU.
HSYNCX	Clock signal to synchronize each line of image data.
VIDEO	Raster data for printing.
PRCLK	Clock signal to synchronize raster data.
CPRDY	Inactive (high) when initializing or resetting the printer mechamism.
PRINT	Active (low) before transferring one page of image data to the FCU.
PRRDYX	Active (low) while the printer mechanism is in standby status. Inactive (high) while the printer is busy or has a problem.
CTBSY	Active (low) while the controller is sending a command to the FCU.
ETBSY	Active (low) while the FCU is sending status data to the controller.
CMD	Command data (8 bit serial).
STS	Status data (8 bit serial).
SRCLK	Clock signal to synchronize commands and status data.

Signal Directions

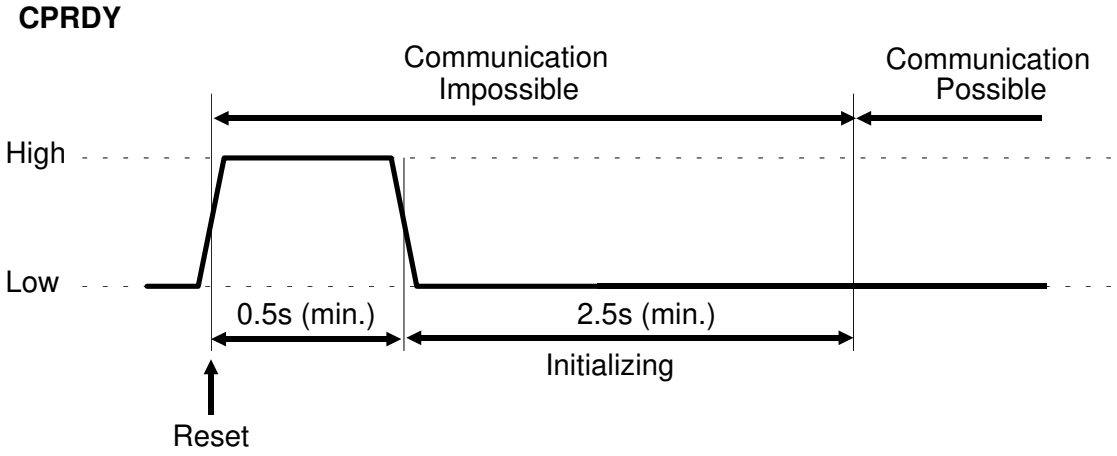


2. Power-On Timing



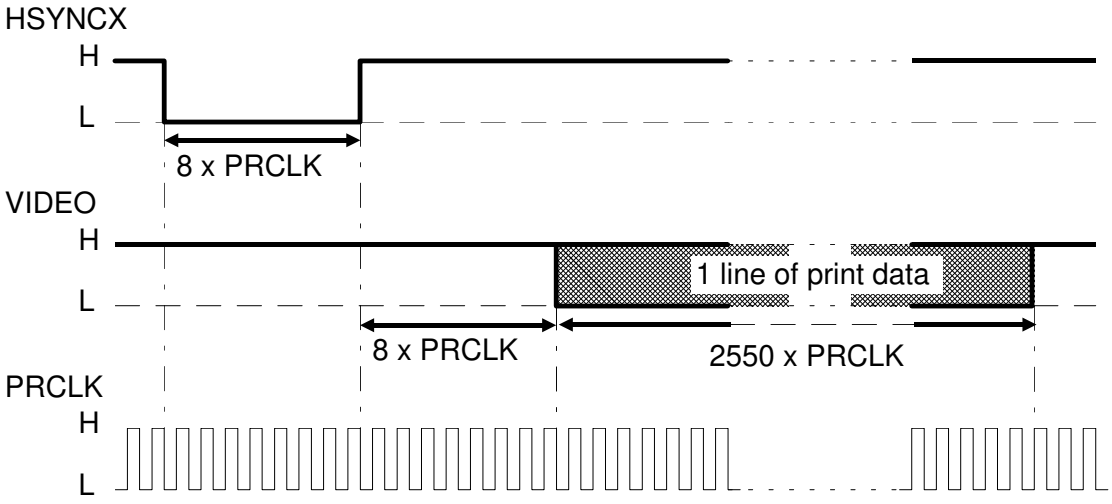
When the power is switched on, the controller raises CPRDY to high for more than 0.5 s, then initializes itself within 2.5 s. After initializing is completed, the controller will be ready to communicate with the host PC(s) and the FCU.

3. Reset Timing

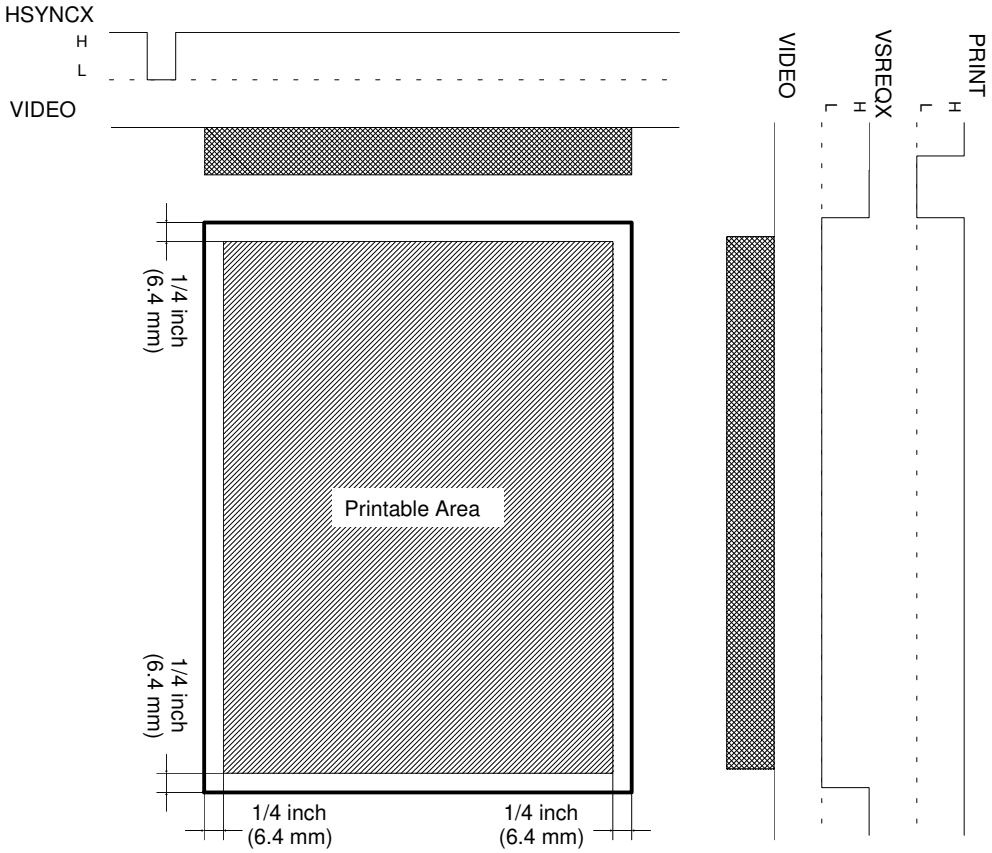


When the user resets the printer using function 35, the controller activates CPRDY for more than 0.5 s, then the controller initializes itself and the printing process is canceled. After initializing is completed, the controller will be ready to communicate with the host PC(s) and the FCU.

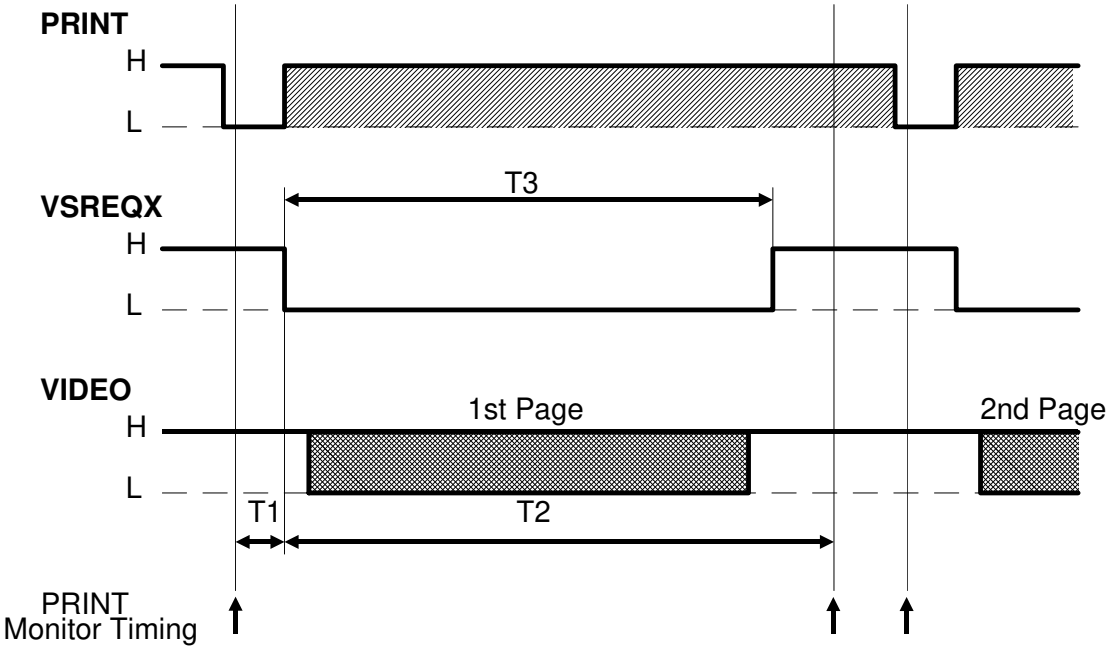
4. Image Data Synchronization (Horizontal)



The FCU drops HSYNCX to low for eight PRCLK clock cycles before receiving each line of image data. Then, after the next eight cycles of PRCLK has passed, the controller starts to transfer one line of image data.
The frequency of the PRCLK clock is between 1.3 MHz and 1.96 MHz.



5. Image Data Synchronization (Vertical)



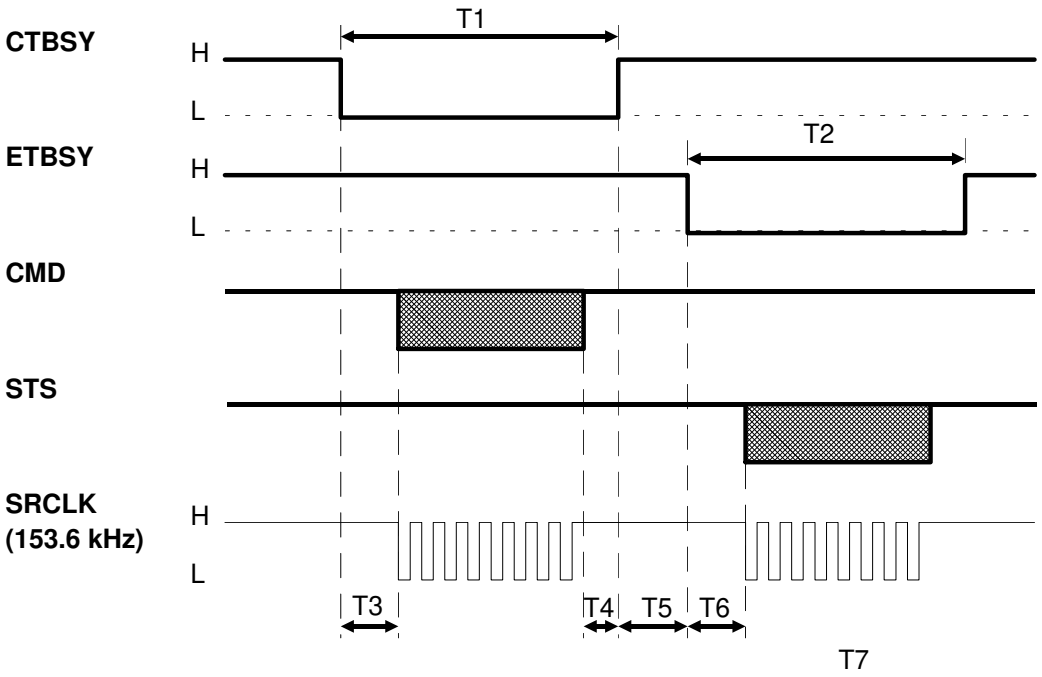
The FCU monitors the PRINT signal from the controller every 2 ms to detect if a print request is coming from the controller or not. After T1 has passed since the FCU detected the PRINT signal to be active, the FCU drops VSREQX to low so that the controller can acknowledge that the printer is ready to receive one page of image data. After one page of data has been received from the controller, the FCU inactivates the VSREQX signal until PRINT is activated again for printing the next page.

The times T1, T2 and T3 vary depending on the following conditions.

Parameter	Time	Condition
T1	1.0 s	When the hexagonal mirror motor is active.
	6.0 s	When the hexagonal mirror motor is inactive.

Parameter	Paper Size	Time
T2	Letter	8.5 s
	Legal	10.6 s
	A4	9.0 s
T3	Letter	7.58 s
	Legal	9.64 s
	A4	8.06 s

6. Command / Status Signal Timing



STS informs the controller of status information, such as the current paper size and any mechanical problems that are encountered.
The FCU informs the controller of the printer status (STS) in an 8 bit serial format, in response to a command (CMD) from the controller. If a status signal (STS) is not received within T5 (100 ms) after the controller sends a command, the controller will resend the command to the FCU.

Refer to the above diagram and to the following table below for the timing.

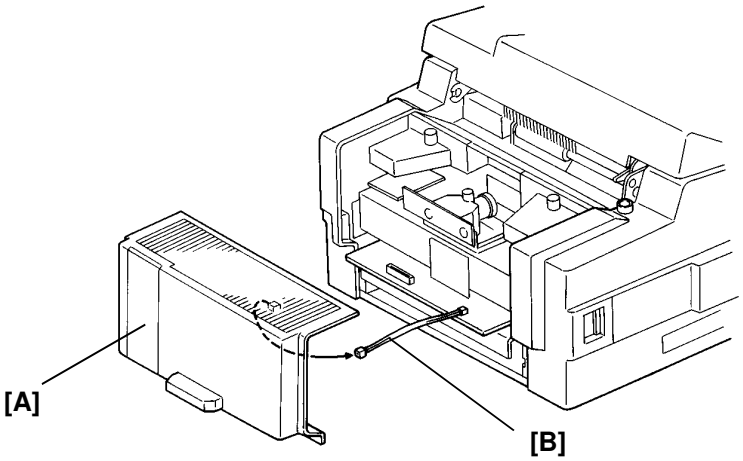
Parameter	Time
T1	62.7 µs
T2	Less than 30 ms
T3	9.77 µs
T4	4.07 µs
T5	Less than 100 ms
T6	9.77 - 10.58 µs

3. INSTALLATION

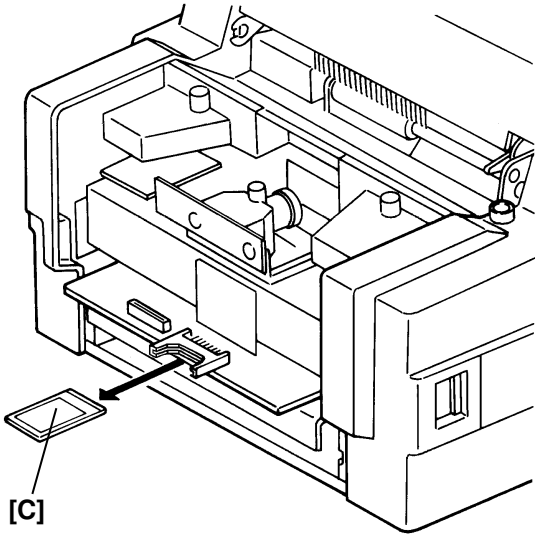
This installation must only be done by qualified service personnel.

3.1. PRINTER INTERFACE UNIT

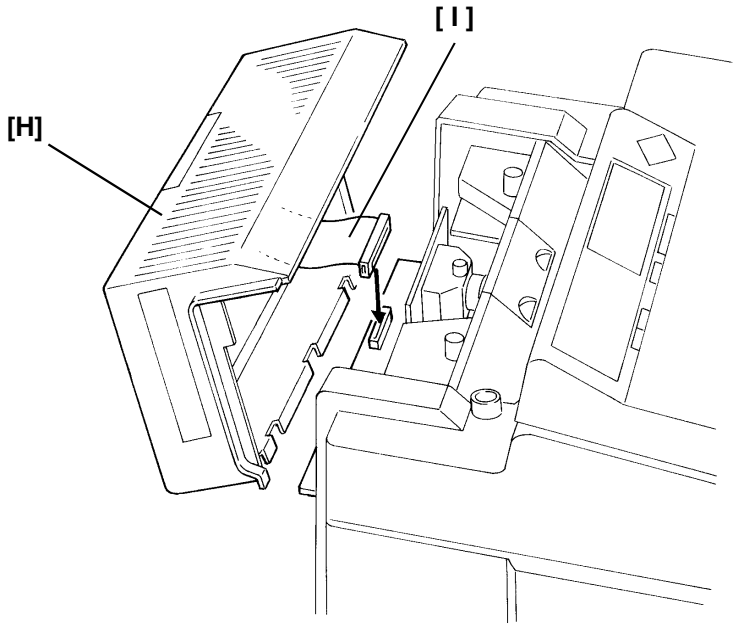
1. First, print any messages still stored in the SAF.
2. Turn off the power, and unplug the machine from the wall socket.
3. Slide out the cassettes.
4. Take off the rear cover [A] and disconnect the monitor speaker [B].



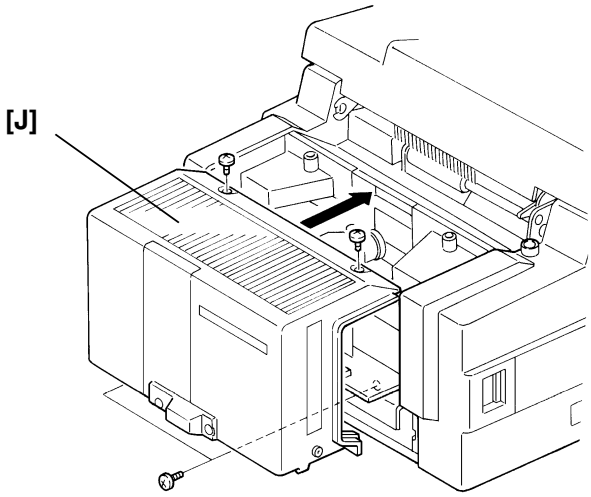
5. If a memory card [C] is installed, remove it.



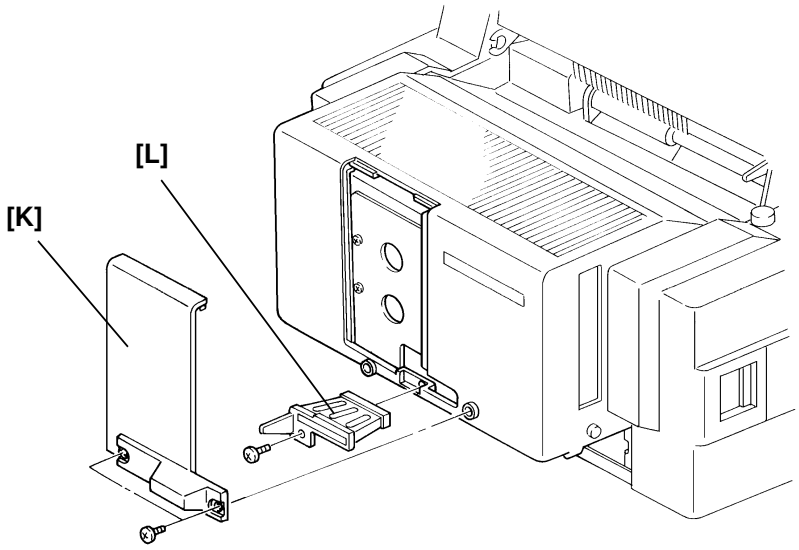
6. Hold the printer interface unit [H] near the machine with one hand, and plug the flat cable [I] into the connector on the FCU board.



7. Attach the printer interface unit [J].



8. Remove the memory option cover [K].
9. Attach the memory card guide [L]. Then install the memory card if necessary.



Caution: To avoid damaging the memory card, always remove the memory card first before removing the printer interface unit.

10. Put back the memory option cover.
11. Put back the cassettes.
12. Plug in the machine, then turn on the power.

4. SERVICE TABLES AND PROCEDURES

4.1. SERVICE LEVEL FUNCTIONS

There are no special service operations. Refer to the operation manual for all printer operation procedures.

4.2. SERVICE RAM ADDRESSES

4B8B
Data wait time after the last page has been printed, when printing from the printer interface. (Hex; unit 2.56 s)

4.3. DIP SWITCHES

Controller
TB1 ~ **TB4** Do not change the default settings.