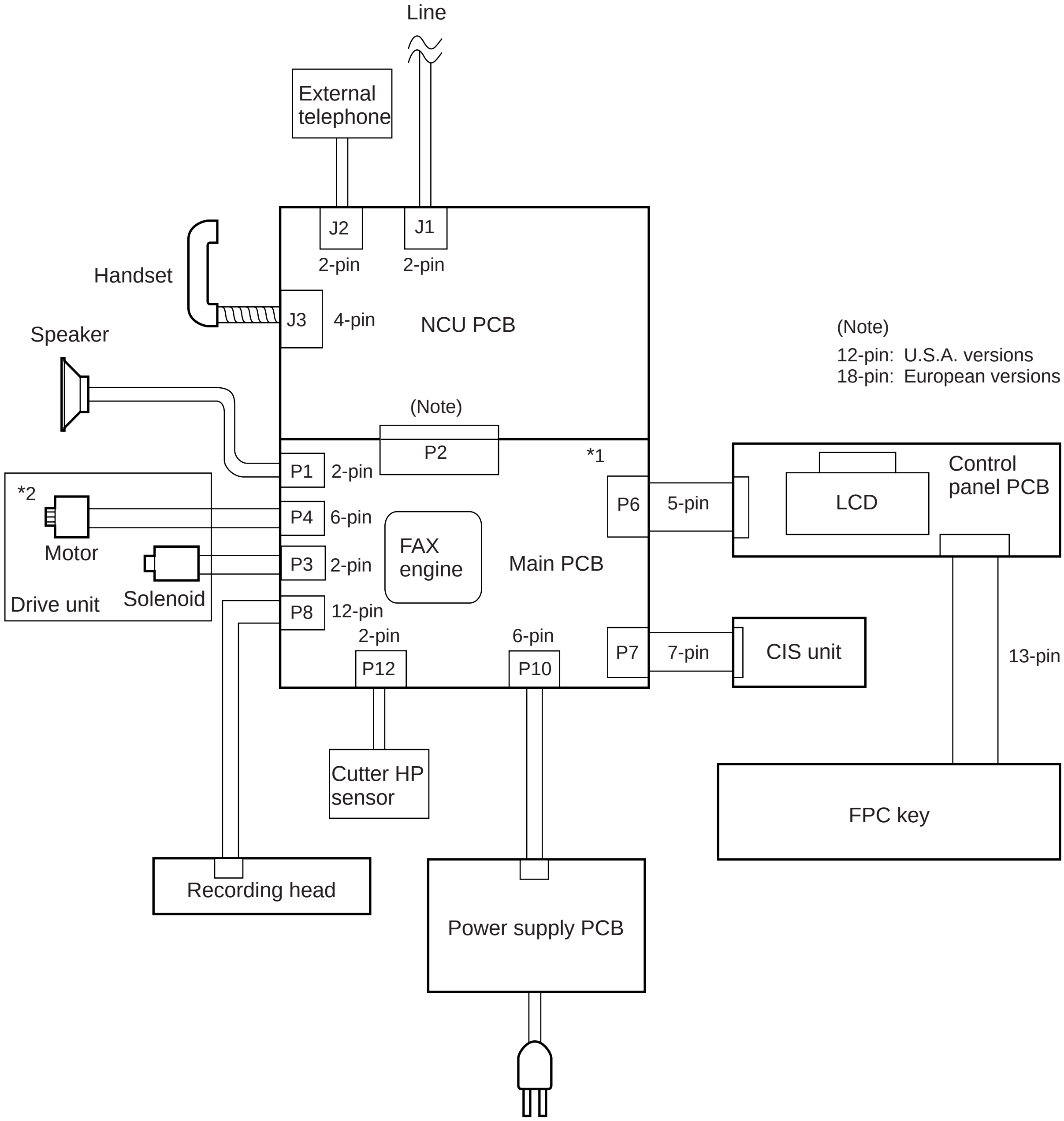
3. CONTROL ELECTRONICS

3.1 Configuration

The hardware configuration of the facsimile equipment is shown below.



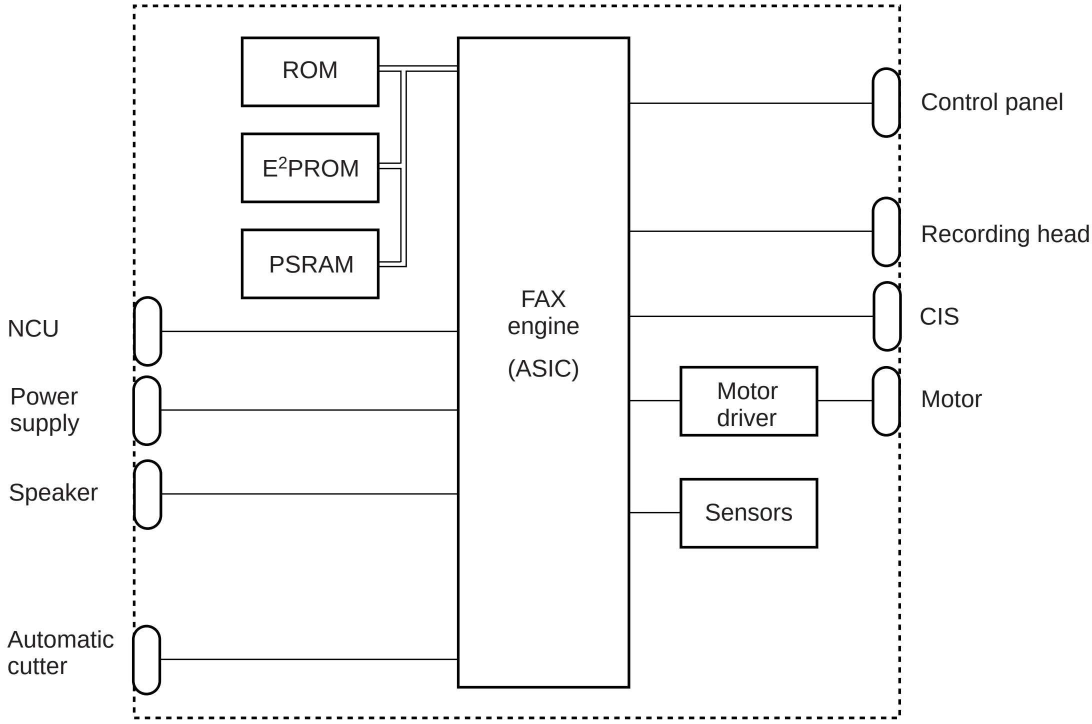
*1 On the main PCB are these sensors:
- PE sensor (SW1)
- Cover sensor (SW2)
- Hook switch sensor (SW3) (This sensor serves no function in those versions equipped with a Binatone handset.)
- Document front sensor (PH1)
- Document rear sensor (PH2)

*2 On the drive unit is the cutter HP sensor.

Configuration of Facsimile Equipment

3.2 Main PCB

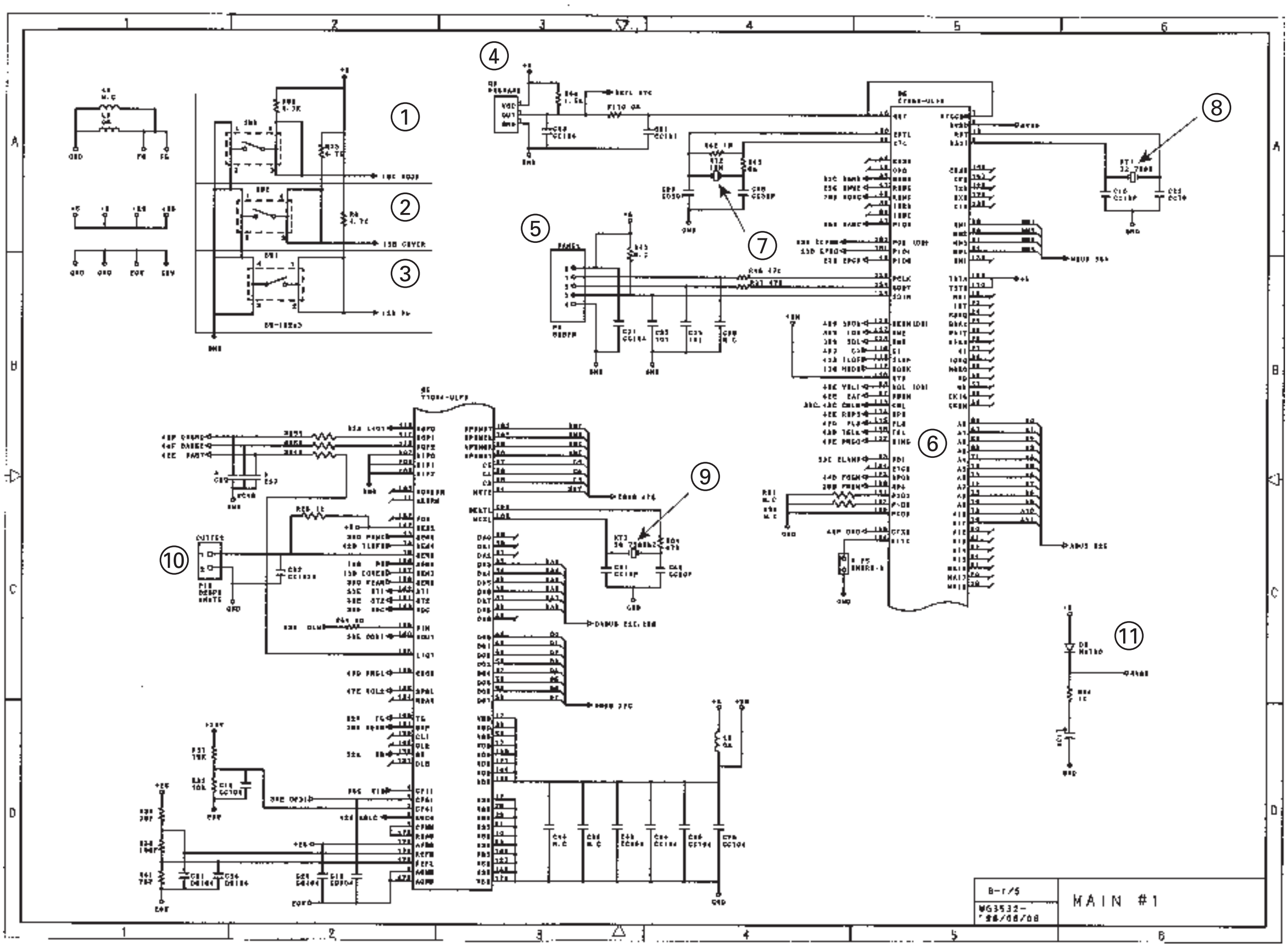
The main PCB, which is the nucleus controlling the entire operation of the equipment, consists of a FAX engine (ASIC), memories, MODEM, motor drive circuitry, sensor detection circuitry, and analog circuits for scanning, recording, and power transmission shifting.



E^{2}PROM: Electrically Erasable Programmable Read-only Memory
PSRAM: Pseudo Static Random Access Memory

Block Diagram of Main PCB

FAX-170/190/510/HOME FAX



Main PCB Circuit Diagram 1/4

① SW3, hook switch sensor (microswitch) (This sensor serves no function in those versions equipped with a Binatone handset.)

② SW2, cover switch sensor (microswitch)

③ SW1, paper empty sensor (microswitch)

④ Reset IC which turns on at the powering-on sequence and at any of the reset operations.

⑤ Connector for the control panel

⑥ FAX engine (ASIC) which integrates a CPU, digital portion of a MODEM and gate array for managing the I/Os, memories, and drivers.

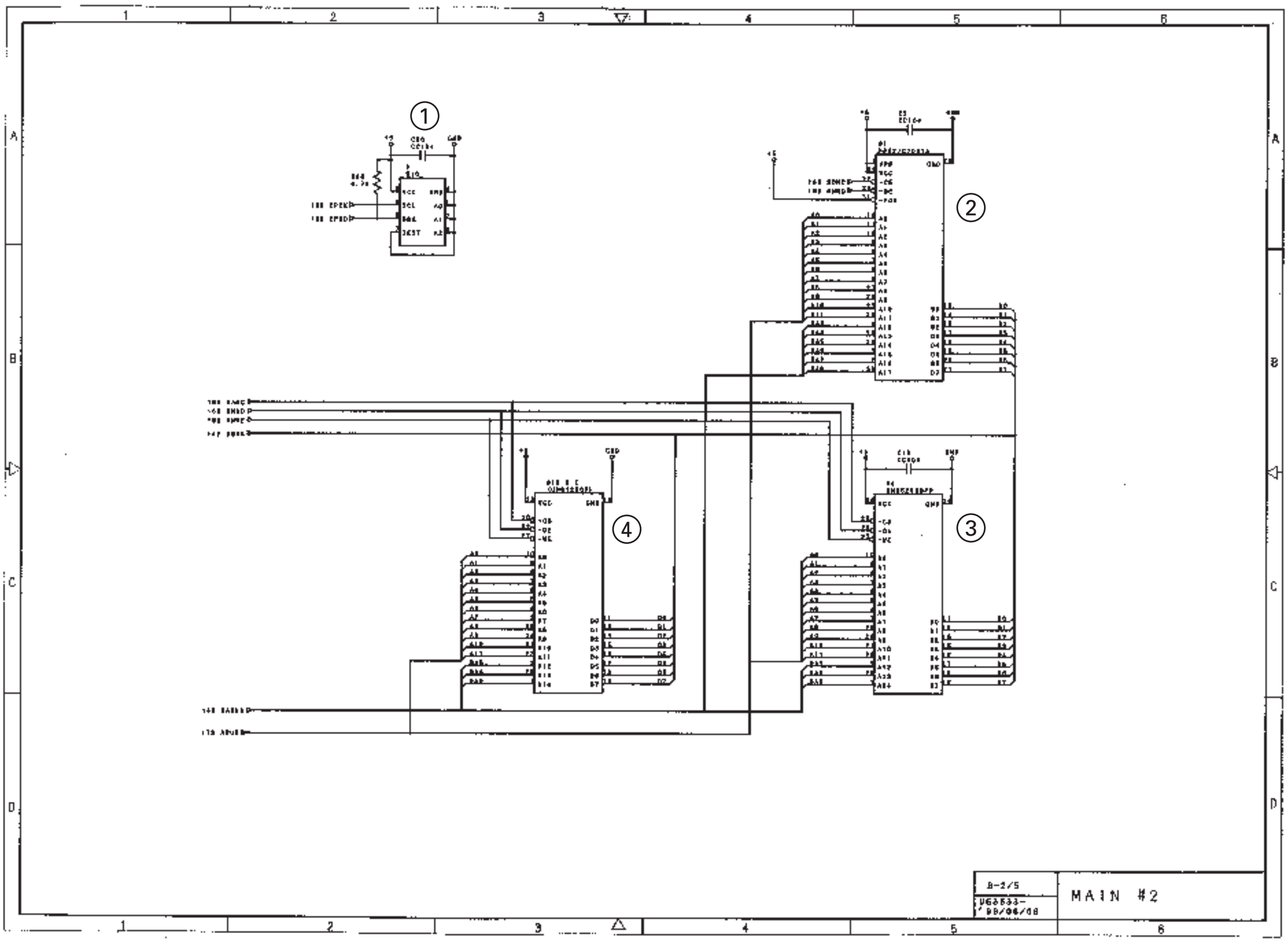
⑦ XT2, oscillator which oscillates at 16 MHz for the CPU.

⑧ XT1, oscillator which oscillates at 32.768 kHz for the calendar clock.

⑨ XT3, oscillator which oscillates at 20.736 MHz for the MODEM.

⑩ Connector for the cutter HP sensor

⑪ Backup circuit for the calendar clock of the control panel



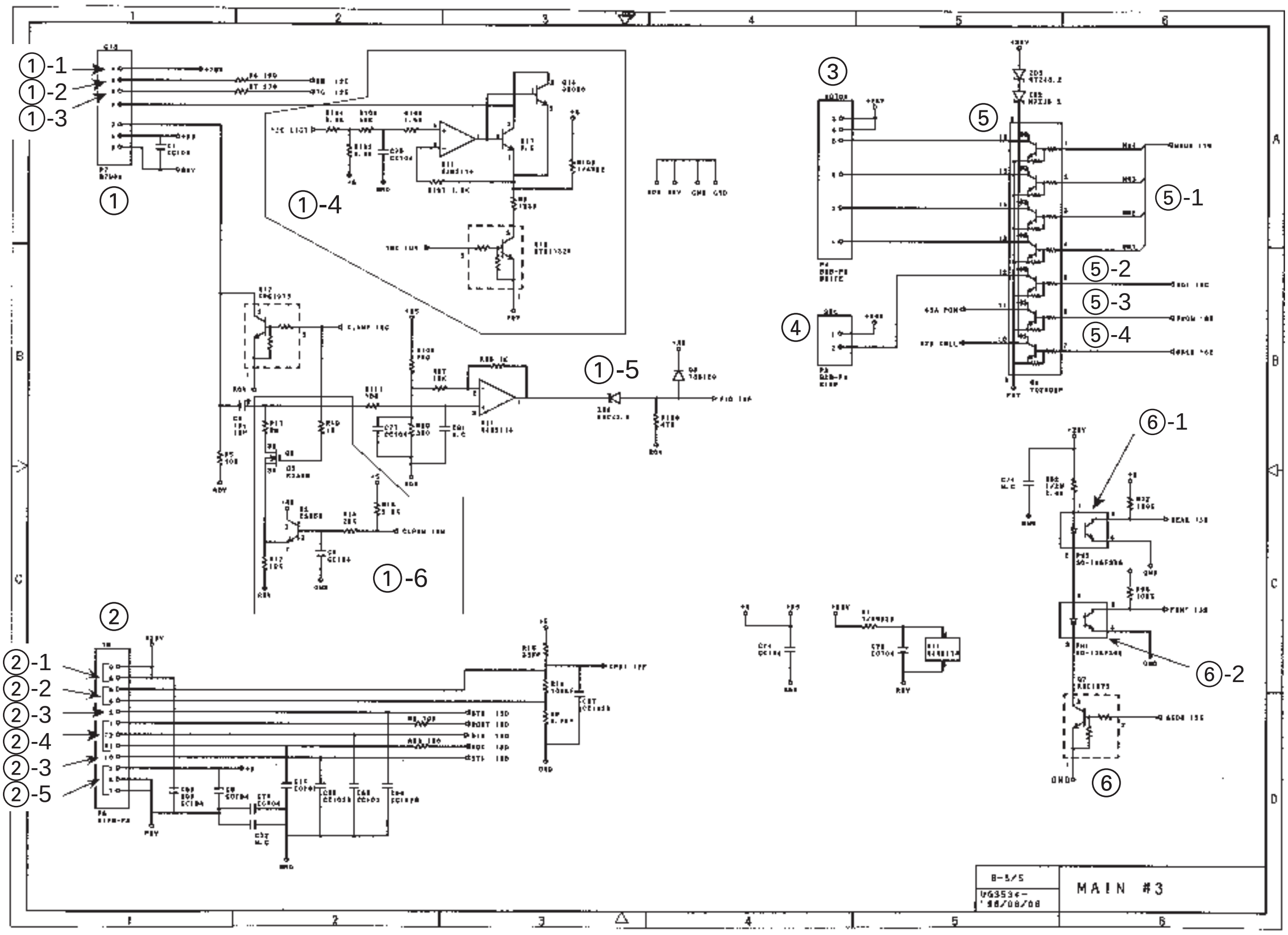
Main PCB Circuit Diagram 2/4

① E^2PROM (16k x 1 bit in the European versions, 8k x 1 bit in other versions)

② ROM (128k x 8 bits. Note that the qualification machines for demonstration have a 2-megabit ROM.)

③ PSRAM (32k x 8 bits)

④ Not mounted.



Main PCB Circuit Diagram 3/4

① Connector for the CIS

- ①-1: Power for the CIS LED array
- ①-2: Clock output
- ①-3: Trigger signal output. One shot of this signal triggers a line of scan.
- ①-4: LED control signal output circuit which controls the intensity of the CIS LED array.
- ①-5: Input of video data (VID) to the FAX engine
- ①-6: Clamp circuit that gives the bias level to the amplifier of the VID input circuit according to the CLAMP and CLPWM signals issued by the CPU (that monitors the current video data input) for compensating the DC component of video signals for the next scan line

② Connector for the thermal recording head

- ②-1: Power 26V for the thermal recording head
- ②-2: Thermister signals which are normalized by the resistor network and fed to the FAX engine
- ②-3: Strobe signals
- ②-4: Data signals
- ②-5: Power 5V for the logic circuit of the thermal recording head

③ Connector for the motor

④ Connector for the solenoid (that switches the power transmission)

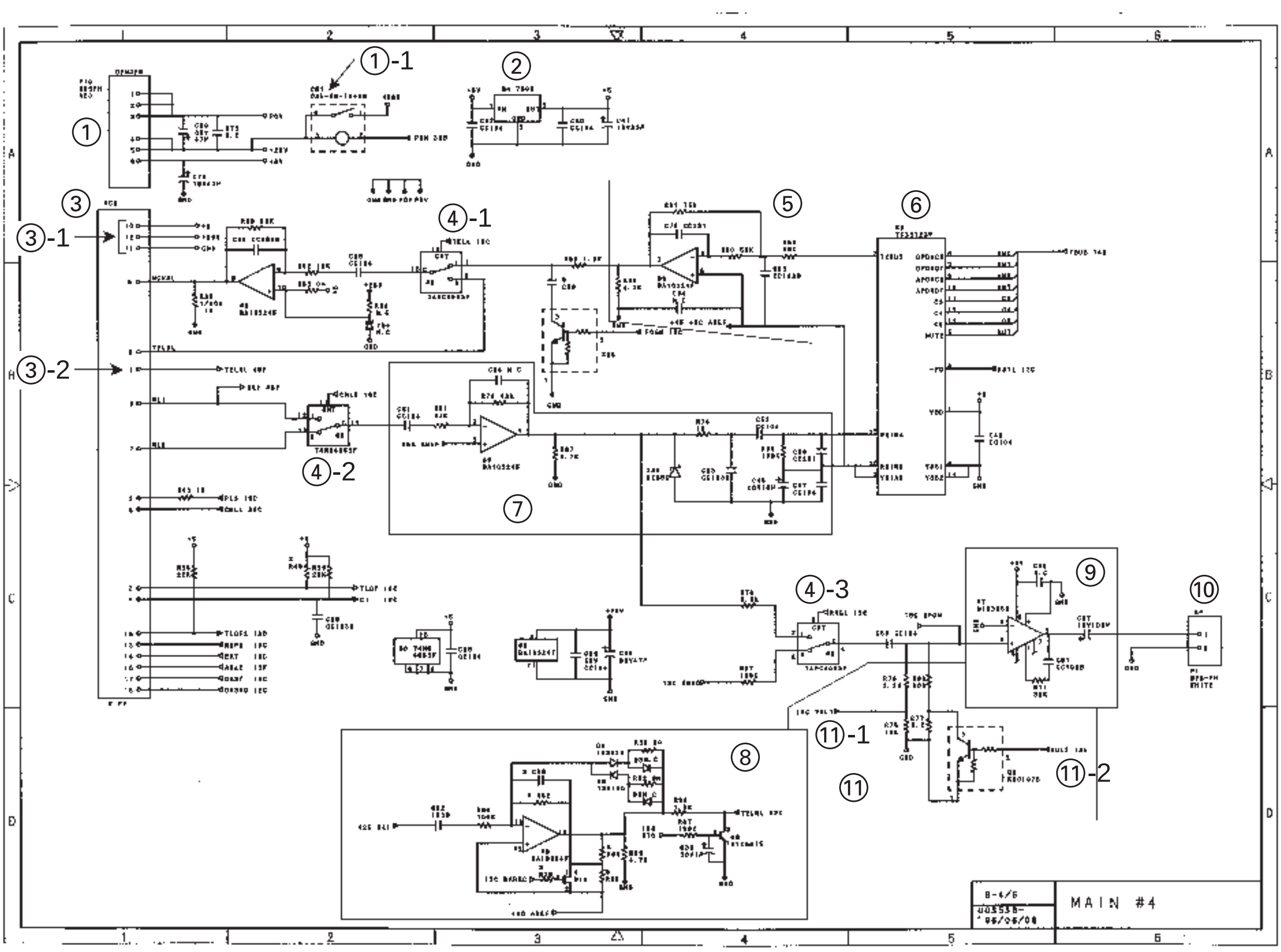
⑤ Transistor array which consists of seven transistors

- ⑤-1: Transistors that control the rotation direction of the motor according to the MM4 through MM1 signals.
- ⑤-2: Transistor that turns on and off the solenoid.
  The combination of the solenoid state and the motor rotation direction determines to which the motor torque should be transmitted, the cutter, the document feeding mechanism, or the paper feeding mechanism.
- ⑤-3: Transistor that turns on and off the CR1 relay for switching on and off the +26V power source to the thermal recording head.
- ⑤-4: Transistor that turns on and off the CML relay.

⑥ Document front and rear sensor circuitry that is active only while the SEON signal is on.

The LEDs for the sensors are driven by the +26V source.

- ⑥-1: PH2, document rear sensor
- ⑥-2: PH1, document front sensor



Main PCB Circuit Diagram 4/4

① Connector for the power supply PCB

①-1: CR1, recording head on/off relay

② 3-terminal regulator which eliminates unstabilized components of the +8V source to generate stabilized 5V source.

③ Connector for the NCU

③-1: Power for the NCU

③-2: Signals from the telephone

④ Analog signal selectors

④-1: Selects either input signals from the handset or those from the MODEM.

④-2: Selects either RL1 or RL2 signals inputted from the communications network.

④-3: Selects either sound signals (e.g., alarm beeps, key clicks and ringer sounds) generated by the FAX engine or signals selected by ④-2.

⑤ Amplifier circuit for signals outputted from the MODEM.

⑥ Analog front end IC which processes the analog I/O signals from/to the MODEM.

⑦ Amplifier & shaper circuit for signals inputted from the communications network.

⑧ Telephone circuit for transmitting signals.

⑨ Speaker amplifier circuit which amplifies sounds issued from the above analog signal selector ④-3 and feeds them to the speaker.

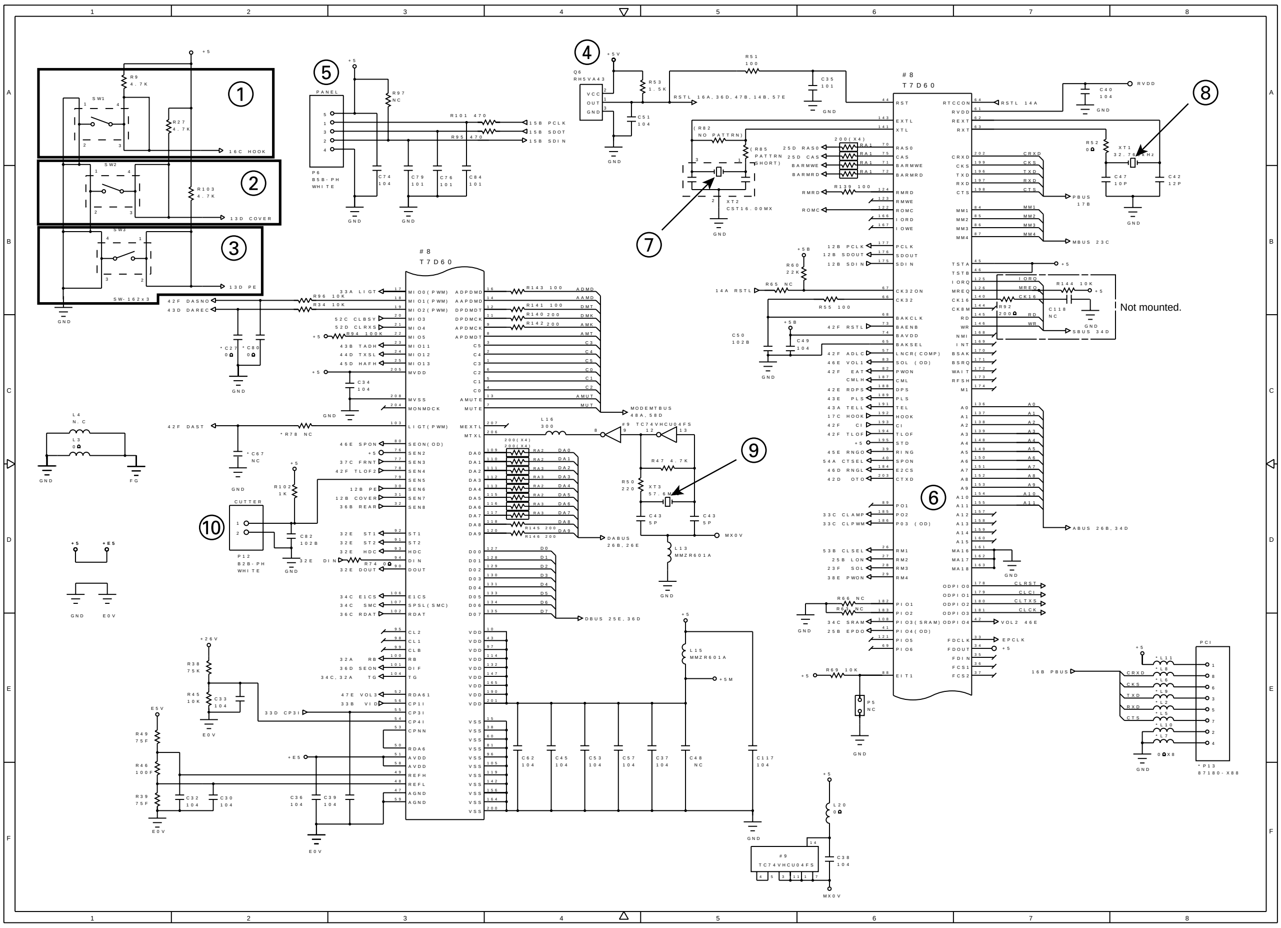
⑩ Connector for the speaker

⑪ Speaker volume control circuit

⑪-1: VOL1	OFF	ON	ON
⑪-2: VOL2	OFF	OFF	ON
Speaker volume	High	Medium	Low

(ON: Closed OFF: Opened)

FAX-270MC/290MC/520DT/520MC/MFC370MC/390MC



Main PCB Circuit Diagram 1/5

① SW1, hook switch sensor (microswitch)

② SW2, cover switch sensor (microswitch)

③ SW3, paper empty sensor (microswitch)

④ Reset IC which turns on at the powering-on sequence and at any of the reset operations.

⑤ Connector for the control panel

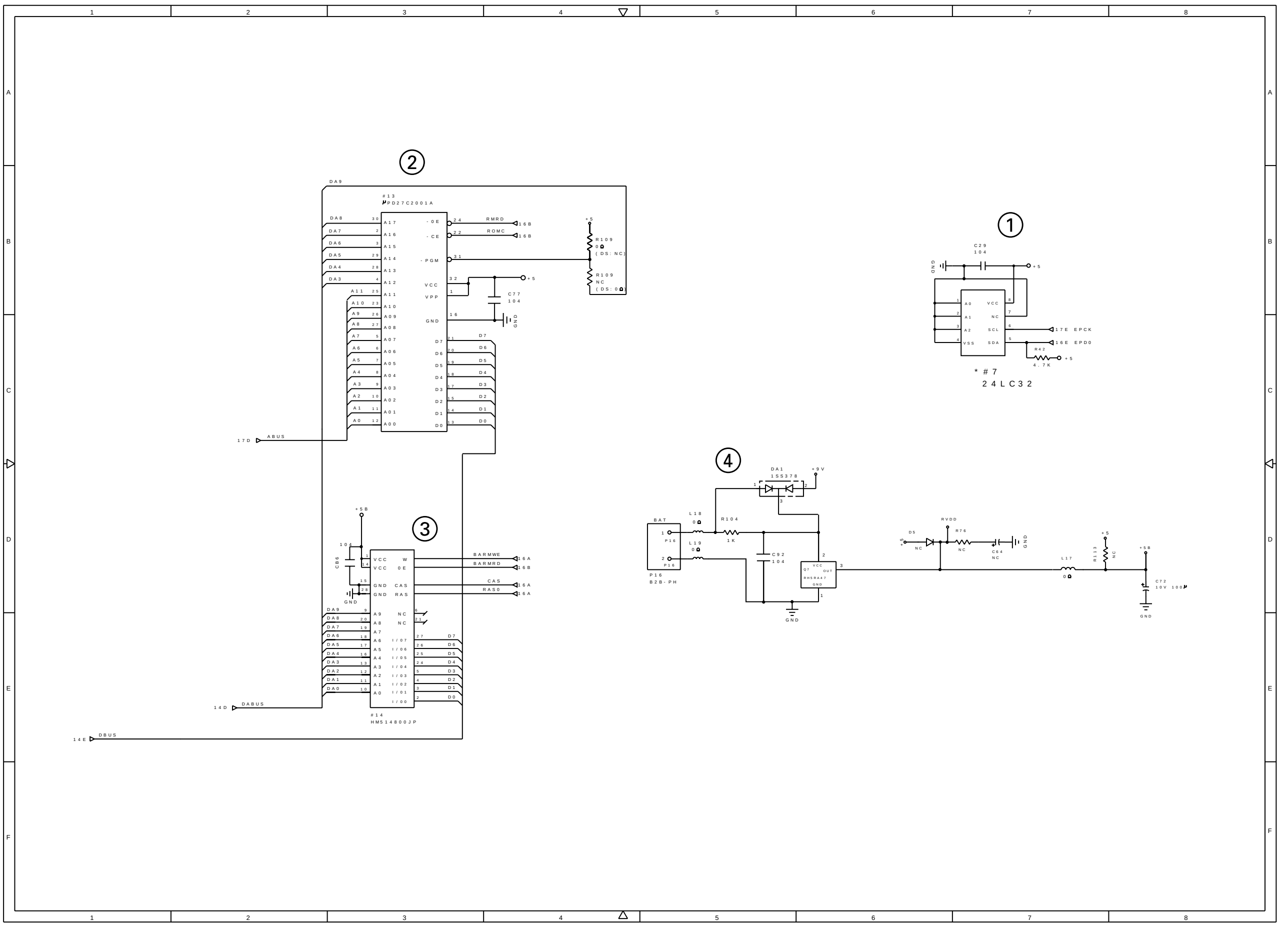
⑥ FAX engine (ASIC) which integrates a CPU, digital portion of a MODEM and gate array for managing the I/Os, memories, and drivers.

⑦ XT2, oscillator which oscillates at 16 MHz for the CPU.

⑧ XT1, oscillator which oscillates at 32.768 kHz for the calendar clock.

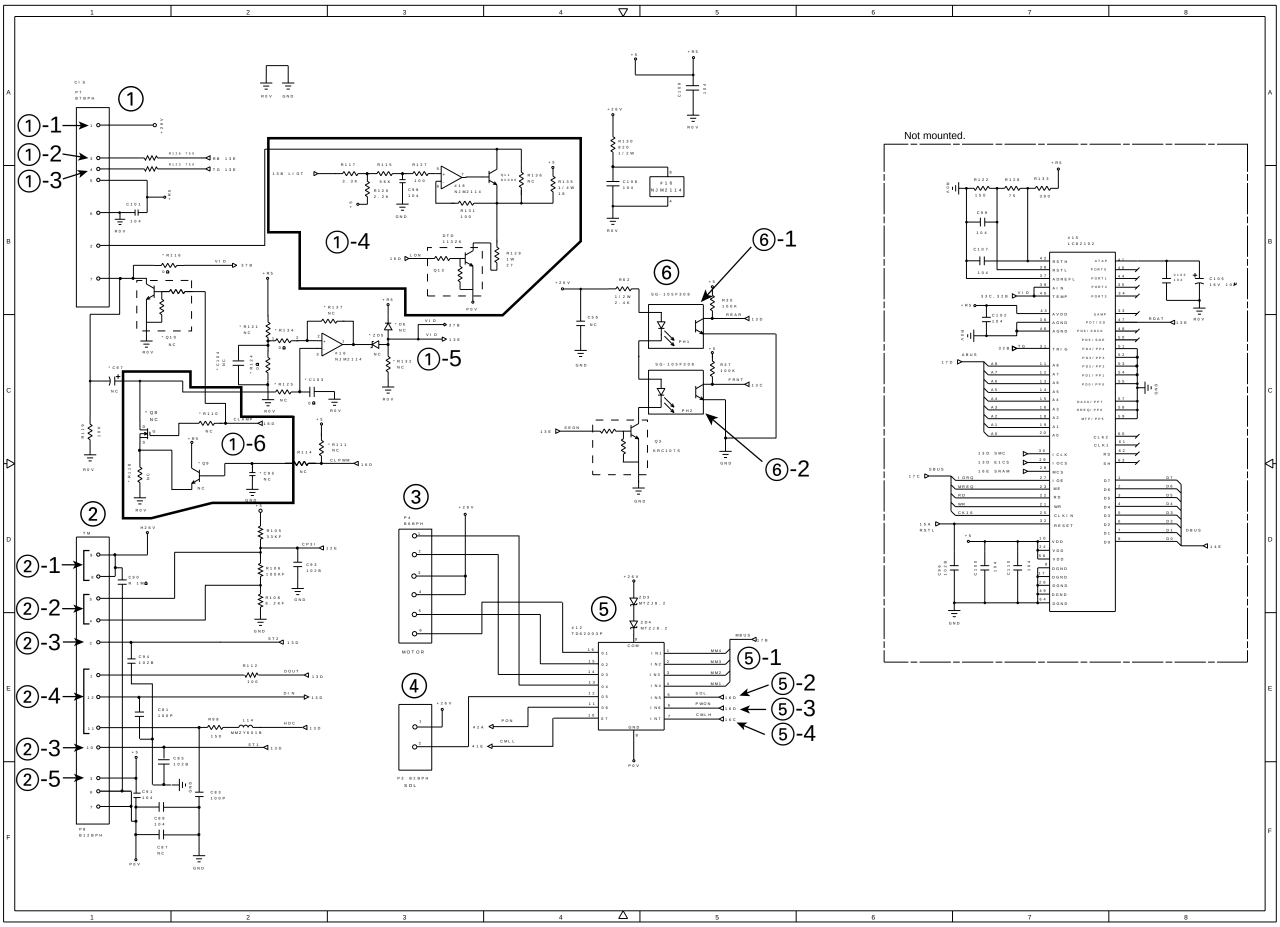
⑨ XT3, oscillator which oscillates at 57.6 MHz for the MODEM.

⑩ Connector for the cutter HP sensor



Main PCB Circuit Diagram 2/5

1. E^{2}PROM (16k x 1 bit)
2. ROM (256k x 8 bits. Note that the qualification machines for demonstration have a 2-megabit ROM.)
3. DRAM (512k x 8 bits)
4. Backup circuit for the calendar clock of the control panel and DRAM.



Main PCB Circuit Diagram 3/5

① Connector for the CIS

- ①-1: Power for the CIS LED array
- ①-2: Clock output
- ①-3: Trigger signal output. One shot of this signal triggers a line of scan.
- ①-4: LED control signal output circuit which controls the intensity of the CIS LED array.
- ①-5: Input of video data (VID) to the FAX engine
- ①-6: Clamp circuit that gives the bias level to the amplifier of the VID input circuit according to the CLAMP and CLPWM signals issued by the CPU (that monitors the current video data input) for compensating the DC component of video signals for the next scan line

② Connector for the thermal recording head

- ②-1: Power 26V for the thermal recording head
- ②-2: Thermister signals which are normalized by the resistor network and fed to the FAX engine
- ②-3: Strobe signals
- ②-4: Data signals
- ②-5: Power 5V for the logic circuit of the thermal recording head

③ Connector for the motor

④ Connector for the solenoid (that switches the power transmission)

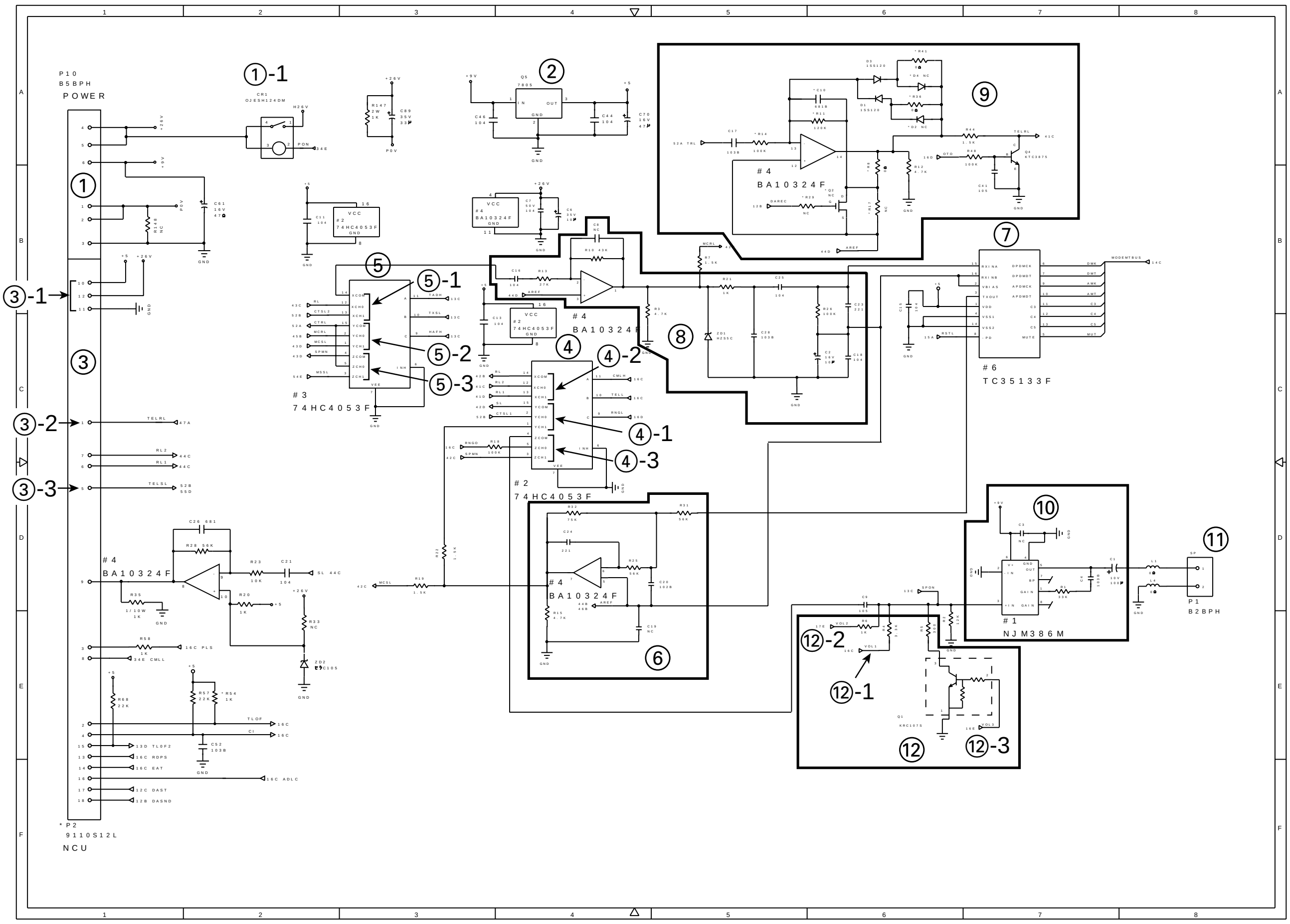
⑤ Transistor array which consists of seven transistors

- ⑤-1: Transistors that control the rotation direction of the motor according to the MM4 through MM1 signals.
- ⑤-2: Transistor that turns on and off the solenoid.
  The combination of the solenoid state and the motor rotation direction determines to which the motor torque should be transmitted, the cutter, the document feeding mechanism, or the paper feeding mechanism.
- ⑤-3: Transistor that turns on and off the CR1 relay for switching on and off the +26V power source to the thermal recording head.
- ⑤-4: Transistor that turns on and off the CML relay.

⑥ Document front and rear sensor circuitry that is active only while the SEON signal is on.

The LEDs for the sensors are driven by the +26V source.

- ⑥-1: PH1, document rear sensor
- ⑥-2: PH2, document front sensor



Main PCB Circuit Diagram 4/5

① Connector for the power supply PCB
- ①-1: CR1, recording head on/off relay

② 3-terminal regulator which eliminates unstabilized components of the +9V source to generate stabilized 5V source.

③ Connector for the NCU
- ③-1: Power for the NCU
- ③-2: Signals to the telephone
- ③-3: Signals from the telephone

④ Analog signal selectors
- ④-1: Selects either input signals from the handset or those from the MODEM.
- ④-2: Selects either RL1 or RL2 signals inputted from the communications network.
- ④-3: Selects sound signals (e.g., alarm beeps, key clicks and ringer sounds) generated by the FAX engine, hands-free monitor signals, or voice playback signals.

⑤ Analog signal selectors
- ⑤-1 Selects either signals gated by ④-2 or voice signals coming from the handset.
- ⑤-2 Selects either signals gated by ④-2 or voice playback signals.
- ⑤-3 Selects either signals gated by ④-2 or hands-free monitor signals.

⑥ Amplifier circuit for signals outputted from the MODEM

⑦ Analog front end IC which processes the analog I/O signals from/to the MODEM.

⑧ Amplifier & shaper circuit for signals inputted from the communications network.

⑨ Telephone circuit for transmitting signals.

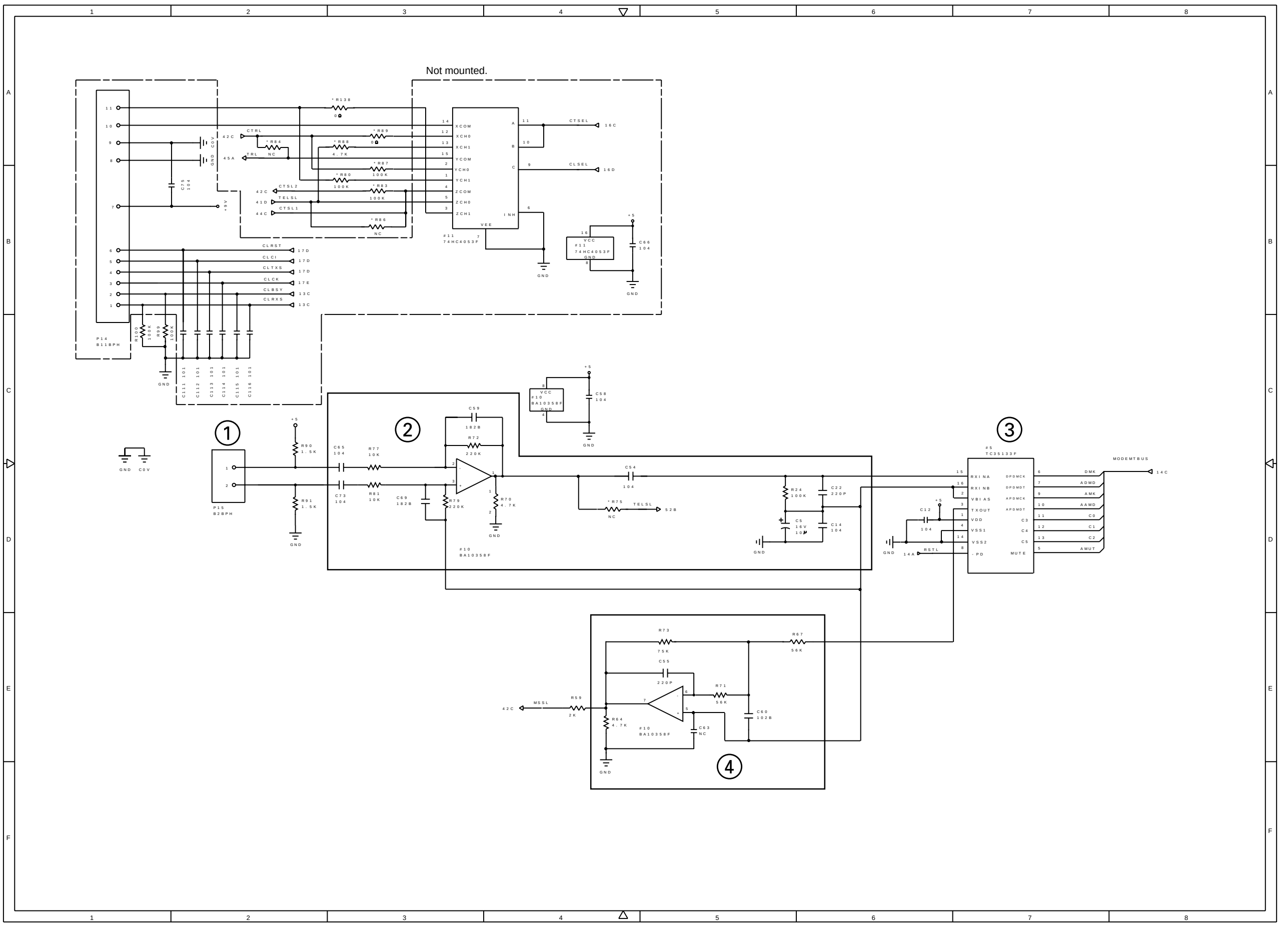
⑩ Speaker amplifier circuit which amplifies sounds issued from the above analog signal selector ④-3 and feeds them to the speaker.

⑪ Connector for the speaker

⑫ Speaker volume control circuit

⑫-1: VOL1	OFF	ON	ON
⑫-2: VOL2	OFF	OFF	ON
⑫-3: VOL3	OFF	OFF	ON
Speaker volume	High	Medium	Low

(ON: Closed OFF: Opened)



Main PCB Circuit Diagram 5/5

① Microphone connector

② Amplifier and shaper circuit for signals inputted from the microphone.

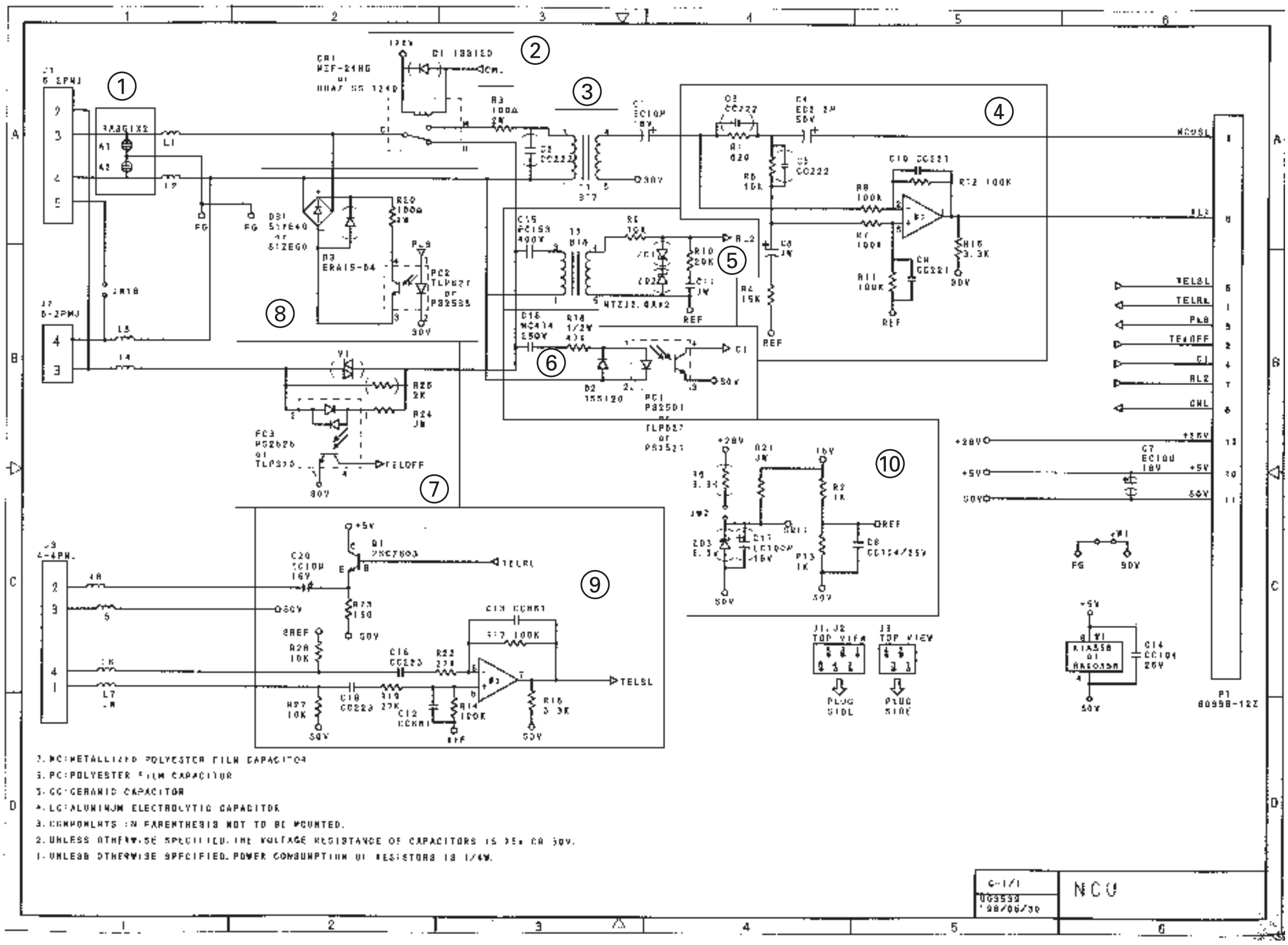
③ Analog front end IC which processes the analog I/O signals from/to the MODEM.

④ Amplifier circuit for signals outputted from the MODEM.

3.3 NCU PCB

The NCU PCB switches the communications line to telephone or built-in MODEM, under the control of the main PCB.

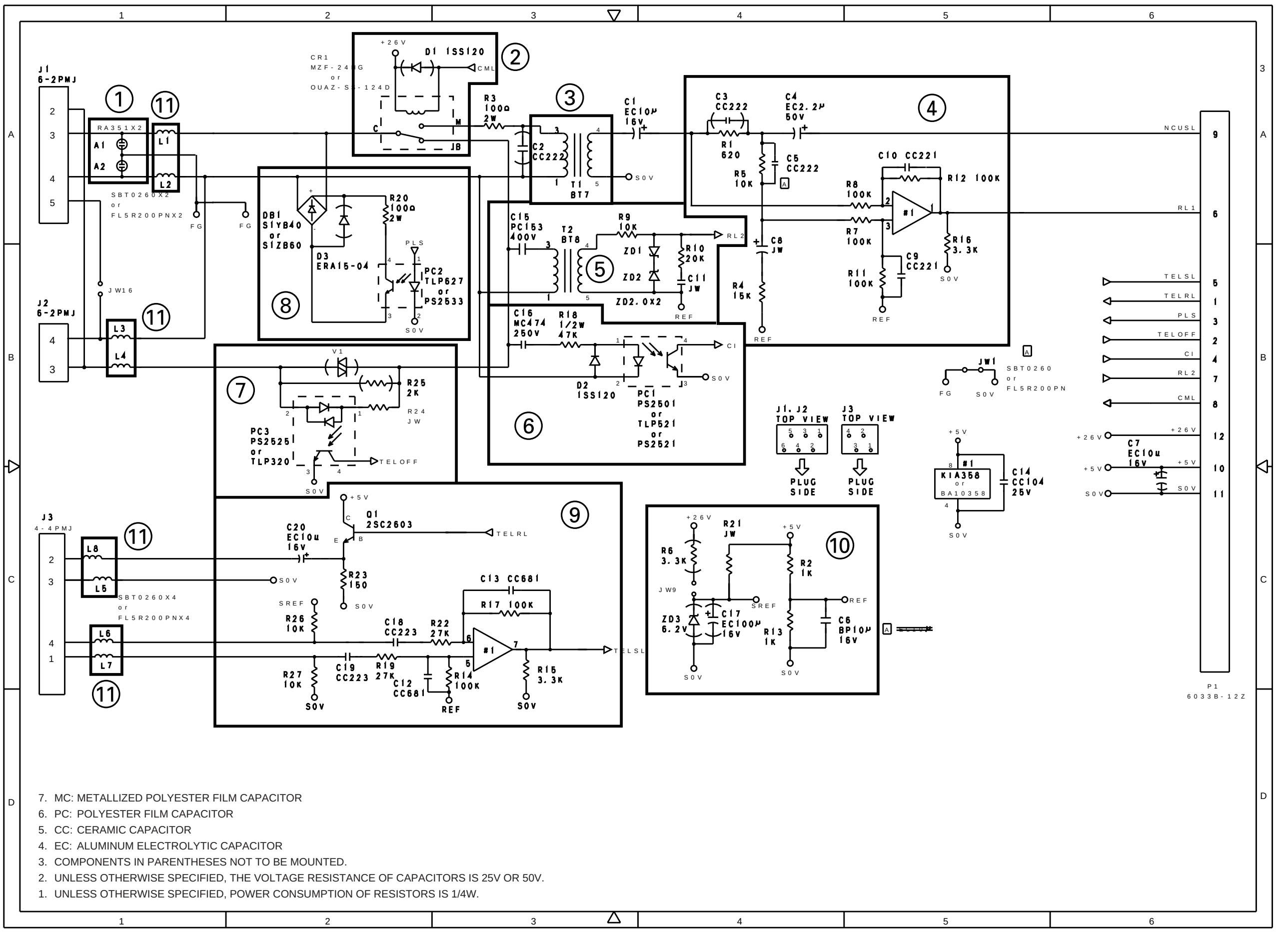
FAX-170/190/510/HOME FAX



NCU PCB Circuit Diagram (U.S.A. versions)

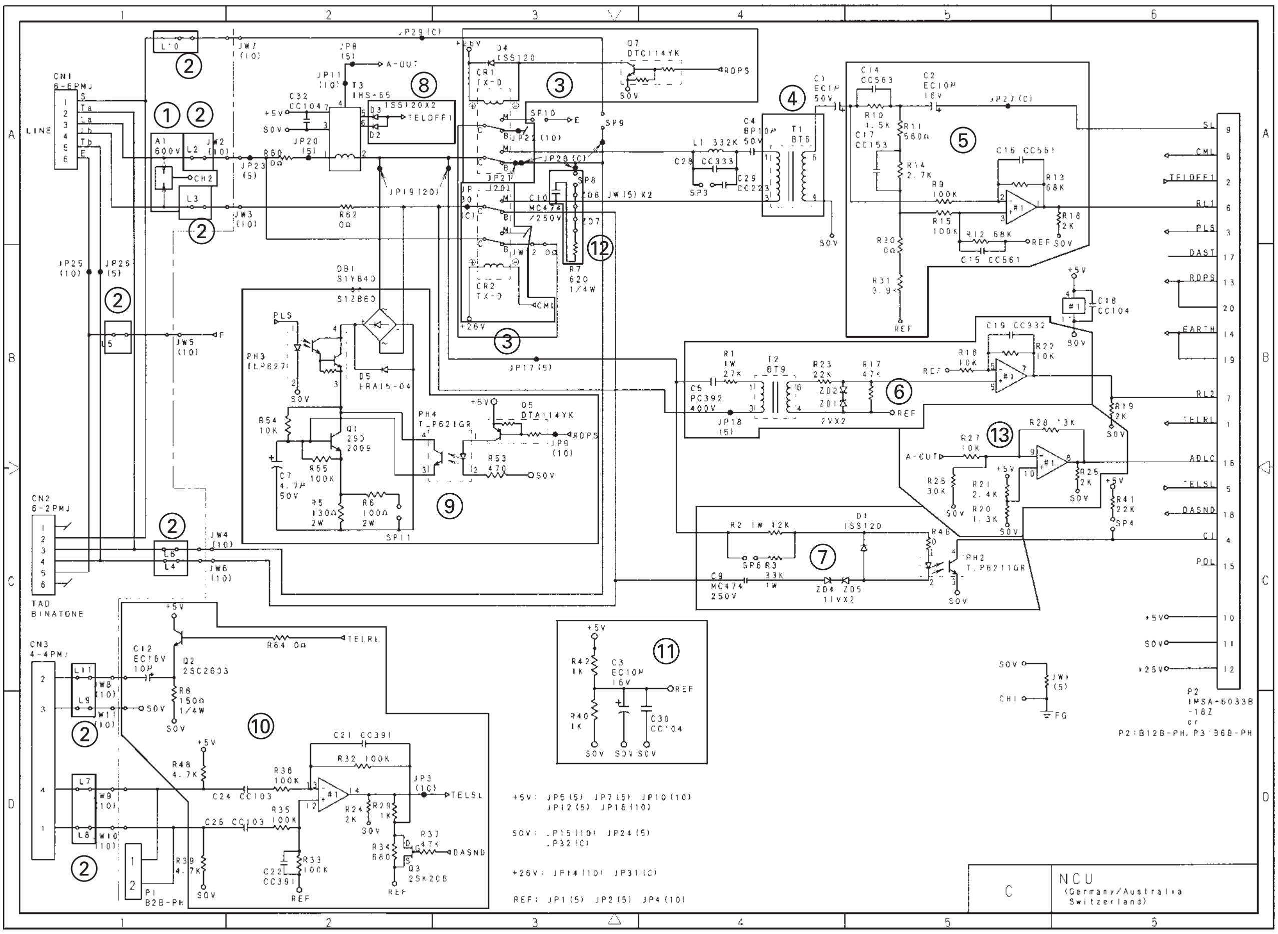
① Surge absorber
② Line relay (CML relay)
③ Line transformer
④ Circuit related to the line transformer
⑤ High-impedance transformer circuit
⑥ Calling signal detector
⑦ Loop current detector
⑧ Dial pulse generator
⑨ Telephone circuit
⑩ Reference voltage generation circuit for the operational amplifier in ④

FAX-270MC/290MC/520DT/520MC/MFC370MC/390MC



NCU PCB Circuit Diagram (U.S.A. versions)

① Surge absorber
② Line relay (CML relay)
③ Line transformer
④ Circuit related to the line transformer
⑤ High-impedance transformer circuit
⑥ Calling signal detector
⑦ Loop current detector
⑧ Dial pulse generator
⑨ Telephone circuit
⑩ Reference voltage generation circuit for the operational amplifiers in ④ and ⑨.
⑪ Noise filters



NCU PCB Circuit Diagram (European versions)

① Surge absorber
② Noise filters
③ Line relay (CML relay)
④ Line transformer
⑤ Circuit related to the line transformer
⑥ High-impedance transformer circuit
⑦ Calling signal detector
⑧ Loop current detector
⑨ Dial pulse generator & DC current loop circuit
⑩ Telephone circuit (Not included in the circuit diagram for power failure phone)
⑪ Reference voltage generation circuit for the operational amplifier in ⑤.
⑫ Pulse shaper
⑬ Line current detection input circuit

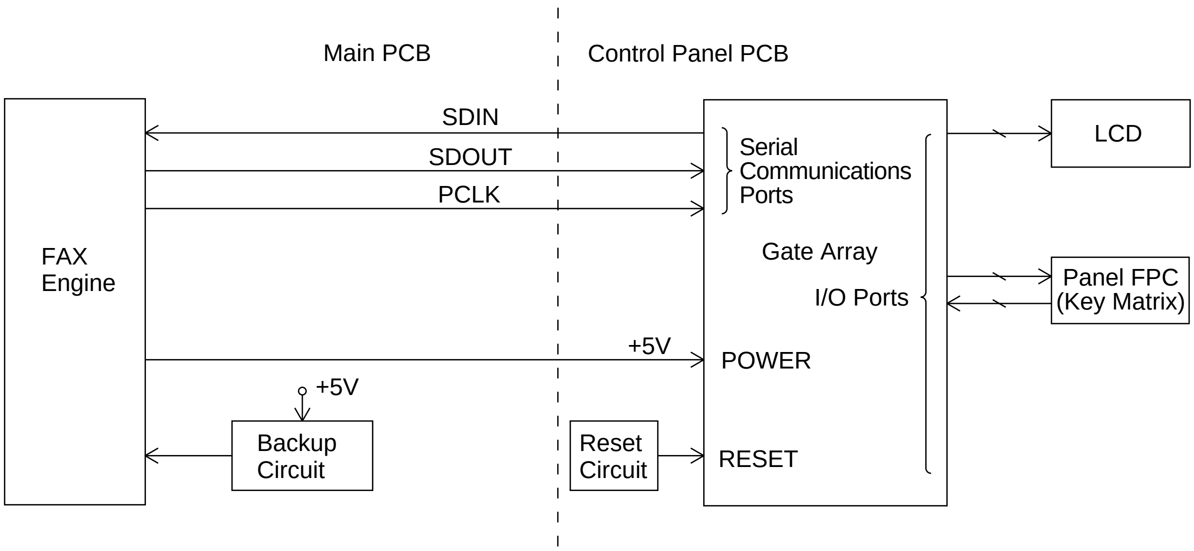
3.4 Control Panel PCB

The control panel PCB and the main PCB communicate with each other by serially transmitting commands and data.

The control panel unit consists of a gate array and LCD, which are controlled by the gate array according to commands issued from the FAX engine on the main PCB.

The calendar clock is backed up by the backup circuit on the main PCB.

The panel FPC is a flexible keyboard PCB which integrates the key matrix having rubber keytops.



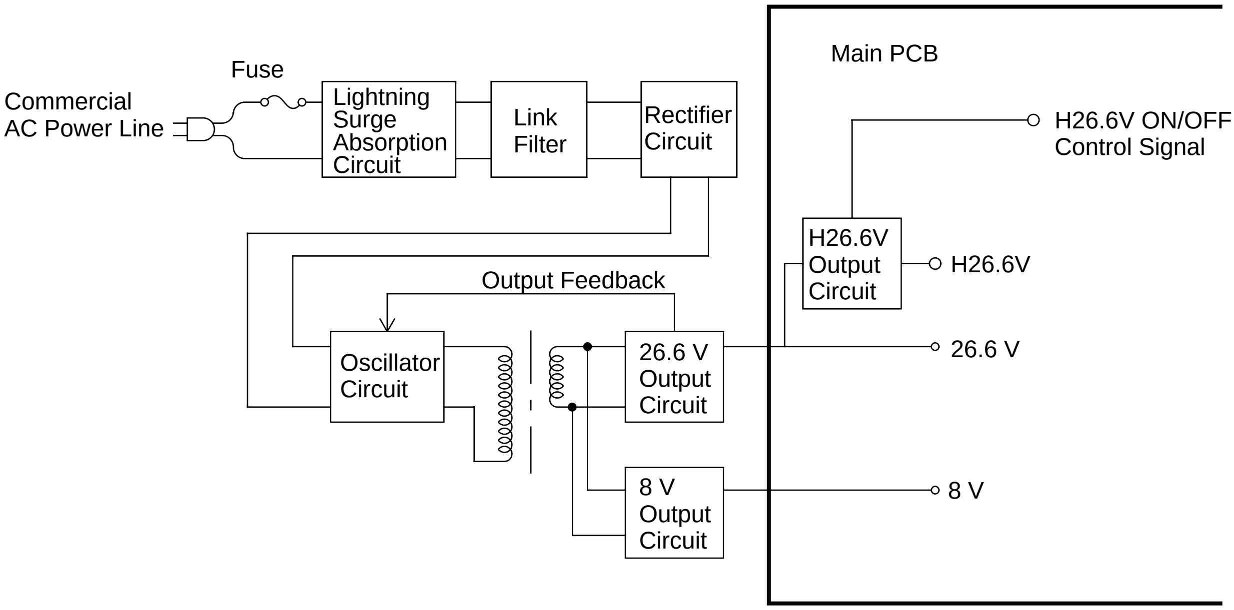
Control Panel PCB and its Related Circuit

3.5 Power Supply PCB

The power supply uses the switching regulation system to generate DC power (+26.6V and +8V) from a commercial AC power supply.

The +26.6V source is stabilized and fed to the motor and solenoid for feeding documents and recording paper or activating the automatic cutter, and also fed to the CIS LED array. It is also fed to the main PCB where the H26.6V source is generated. The H26.6V source outputs 26.6V only when the H26.6V ON/OFF control signal is High, for driving the recording head.

The +8V source is not stabilized and fed to the speaker. It is also fed to the main PCB where the 3-terminal regulator eliminates unstabilized components of the +8V source to generate stabilized +5V source. The +5V source is fed to the logic, control panel, and sensors.



Power Supply Circuit