SM.ECG8830A.03

Cardiofax
ELECTROCARDIOGRAPH
ECG-8830A

0634-000023C

CONTENTS

Section 1 GENERAL

1-1 Introduction

The ECG-8830A is a 3, 4, 6-channel, automatic/manual ECG recorder with a built-in rechargeable battery and user presettable recording mode.
The enhanced reliability have been realized by the following:

(1) Smaller number of components

The number of components is minimized,reducing the number of connections, enhancing the operational reliability, and making troubleshooting easier.

(2) NKC custom LSIs

Newly developed 2 NKC custom LSIs dedicated to the ECG-8830G are used. Each LSIs contains the equivalent of about 100 discrete ICs, contributing to the greatly enhanced reliability.

(3) Greatly reduced number of adjustments

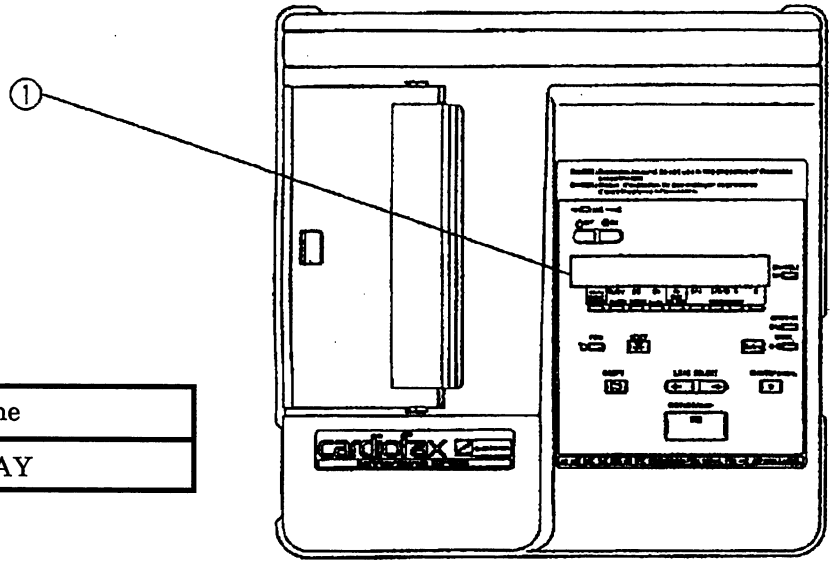
Unlike the conventional cardiographs requiring adjustments of the preamp, main amp, and other circuits, the ECG-8830G eliminates the adjustment of the preamp and employs a thermal head on the recorder to eliminate the need for a main amp.

CAUTION

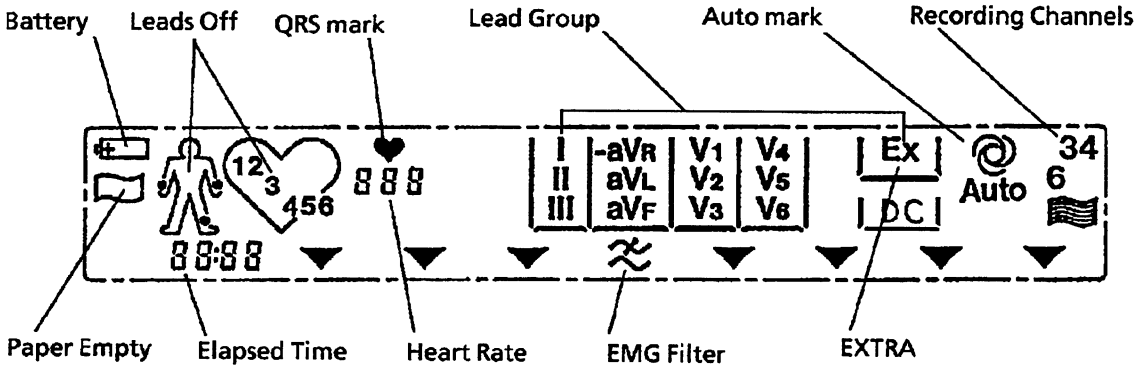
Multi-layer printed circuit boards are used in this unit.

1-2 Explanation of Panels and Controls

◆LCD Display

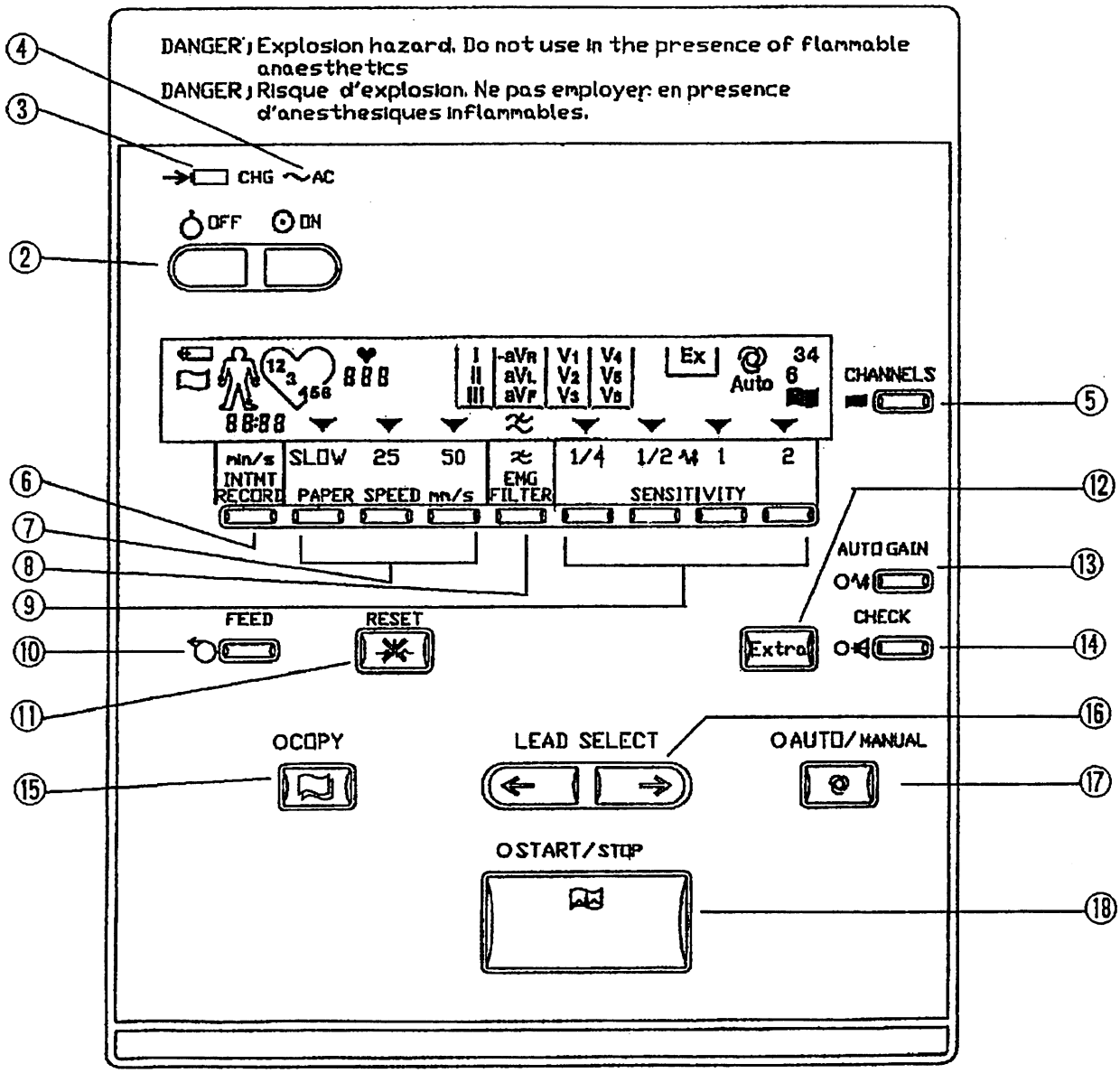


Name
① LCD DISPLAY



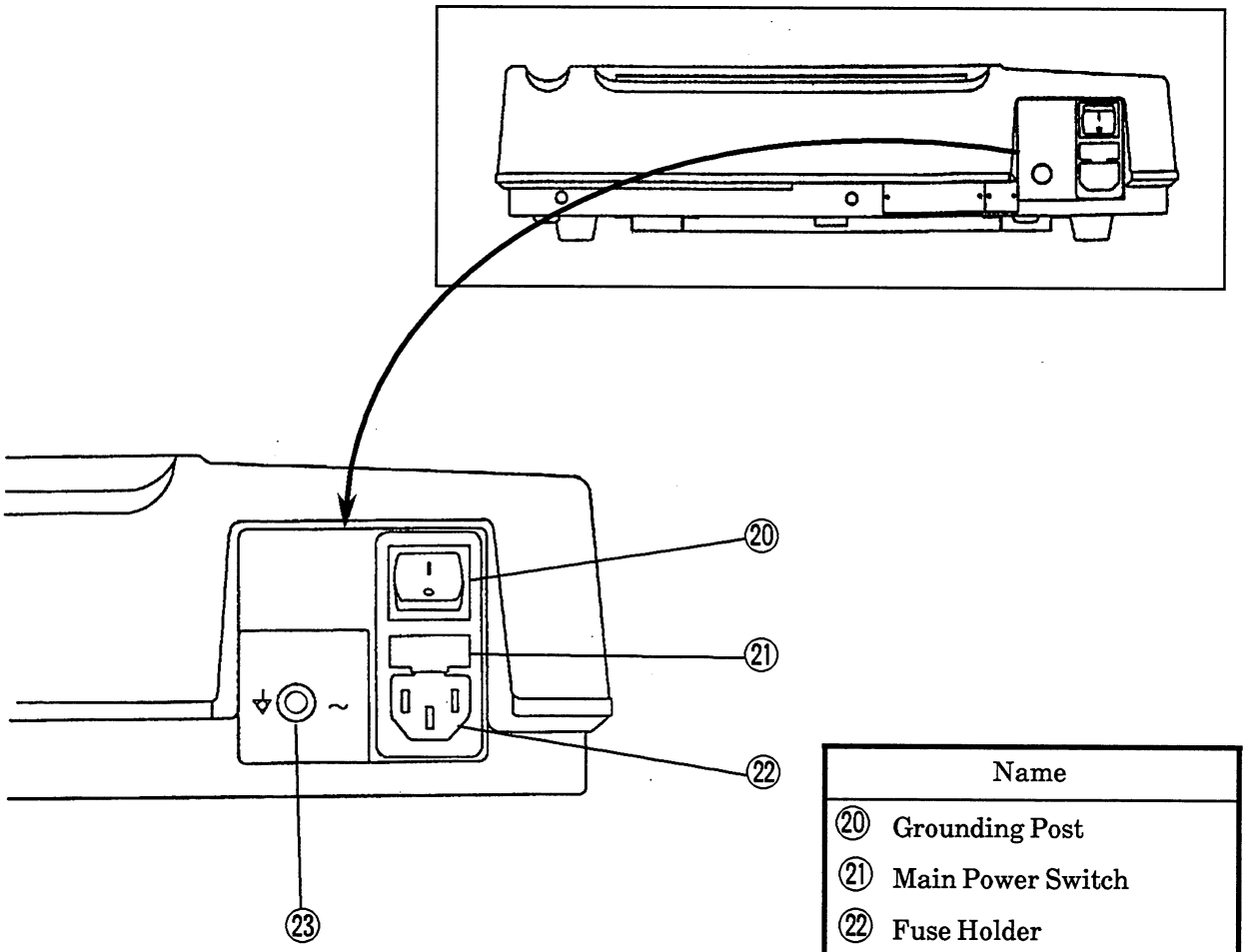
Name	Name	Name
② ON/OFF	⑤ CHANNELS Channel Select Switch	⑧ EMG FILTER EMG Filter Switch
③ CHG Battery Charging Lamp	⑥ INTMT RECORD Intermittent Recording Select Switch	⑨ SENSITIVITY Sensitivity Select Switch
④ AC AC Power Lamp	⑦ PAPER SPEED Paper Speed Select Switch	⑩ FEED Paper Feed Switch

◆Controls and Switches



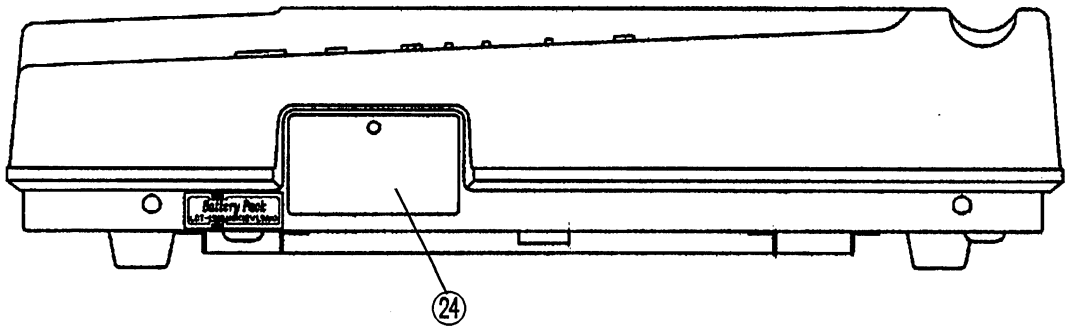
Name		
⑪ RESET Reset Switch	⑭ CHECK Check Switch	⑰ AUTO/MANUAL AUTO/MANUAL Select Switch
⑫ Extra Extra Lead Select Switch	⑮ COPY Copy Switch	⑱ START/STOP Switch
⑬ AUTO GAIN Auto Gain Switch	⑯ LEAD SELECT Lead Select Switch	

◆**Left side panel**

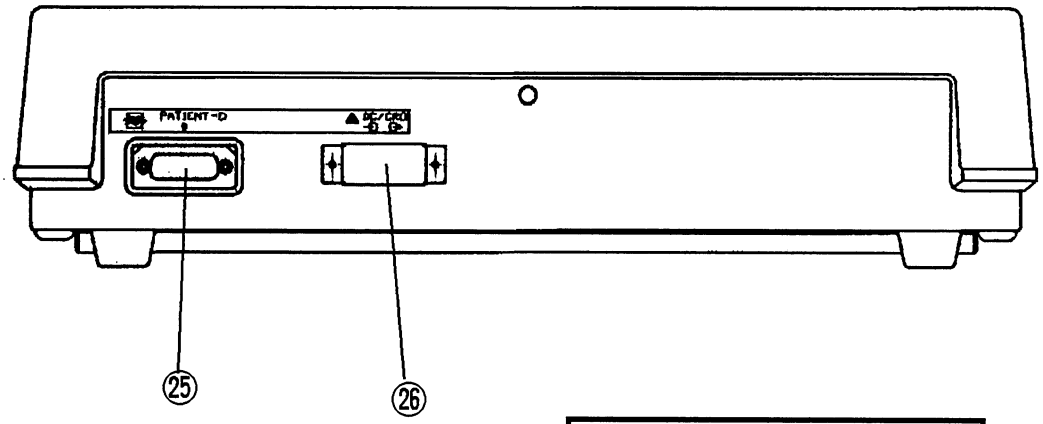


Name	
⑳	Grounding Post
㉑	Main Power Switch
㉒	Fuse Holder
㉓	Power Socket

◆**Right side panel**

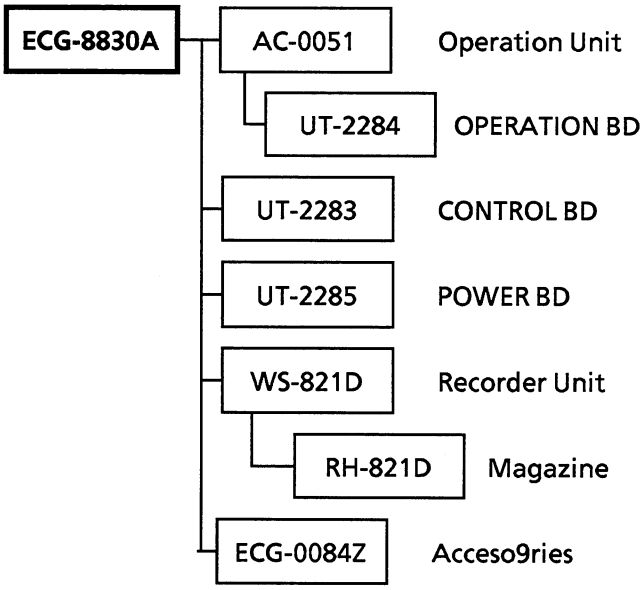


◆**Rear panel**



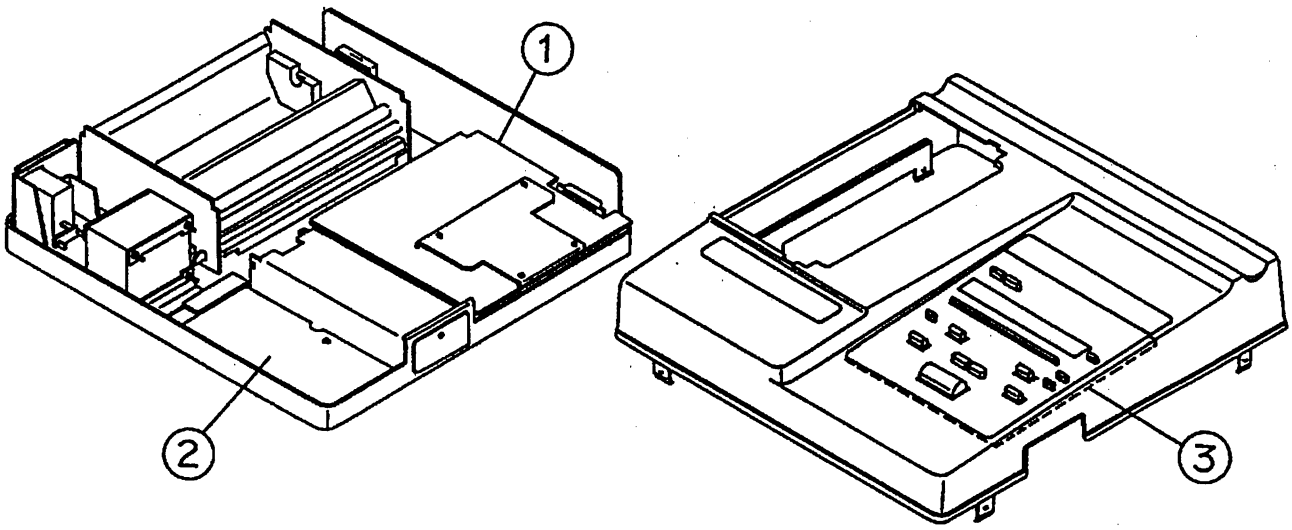
Name
㉔ Battery Compartment
㉕ PATIENT Input Connector
㉖ DC/CRO DC input, CRO output terminal

1-3 Composition



Location of components

① CONTROL BD
② POWER BD
③ OPERATION BD

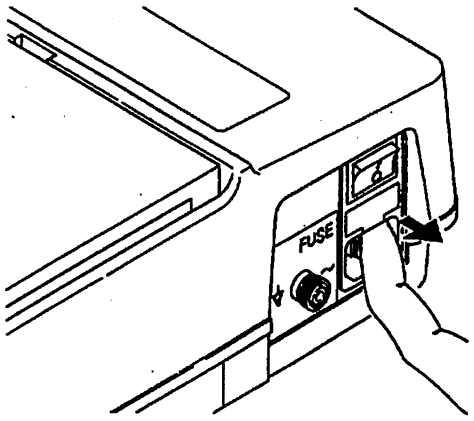


1-4 Fuse Replacement

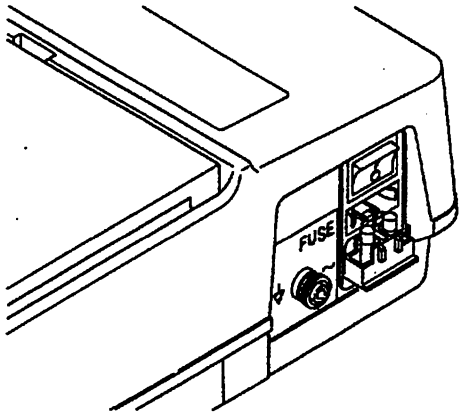
CAUTION

Replacement should be done only by a technical person.
Before the fuse replacement, turn the power OFF and disconnect the power cord.

1-4-1 Power Fuse Replacement



Pull the fuse cover off with a finger.



Remove the fuse with a pair of tweezers and replace it with specified one.

Section 2 SPECIFICATIONS

1. ECG Amplifier

Input circuit	Isolated and defibrillation protected
ECG leads	Standard 12 leads
Calibration voltage	1 mV ±2 %
Input impedance	≧ 10 MΩ
CMRR	≧ 100 dB
Sensitivity	10 mm/mV (Standard), ×1/4, ×1/2, ×1, ×2
Electrode offset tolerance	≧400 mV
Digital conversion	Sampling rate: 4000 samples/sec/CH Accuracy: 1.25 μV/bit
Frequency response	Meets AAMI standard EC11(1982),3.2.7.2 Test sequence A, C, and D * 0.05 Hz to 75 Hz (−3 dB)
Time constant	> 3.2 sec.
EMG filter	35 Hz to 45 Hz (−3 dB) or 20 Hz to 25 Hz (−3 dB) selectable
DC input	10 mm/0.5 or 1V
CRD output	0.5V or 1V/1mV

2. Recorder

Paper speed	5, 10, 25, 50 mm/sec selectable
Recording width	216 mm
ECG waveform channels	3, 4, 6 selectable
Printing density	Horizontal: 40 dots/mm (25 mm/sec) Vertical: 8 dots/mm

3. Power requirement

AC asource	117V ±10%, 60Hz, 120VA
Rechargeable battery operation	Battery used: lead acid battery, 12 V, 1.9 Ah Operating time: ≧ 30 min. in continuous operation Charging time: 12 hours or more Charging method: constant current 200 mA with overcharge protection circuit

* The frequency response of this ECG is in accordance with the Standard for Electrocardiographic Devices 1982 by AAMI using the triangular waveform.
Standard for diagnostic Electrocardiographic Device, 1982 A.A.M.I.

4. Safety

Leakage Current	risk class 3 (CSA standard) Chassis: ≧ 100 μA (Source) Patient-Applied Part: ≧ 20 μA (Source or Sink)
Withstand voltage	1500V AC rms across primay and chassis, 2500 V AC rms across patient circuit and primary for 1 minute.

6. Operation condition

Operating Temperature	10 to 40 °C
Operating Humidity	25 to 95 %
Storage temperature	−10 to 60 °C 70 to 106 kPa
Storage Humidity	15 to 95 %

7. Dimensions and weight

415 (W) × 420 (D) × 106 (H) mm
Approx. 13 kg (including battery)

Section 3 THEORY OF OPERATION

3-1 General

The instrument consists of four units.

(1) Control Board

The Control Board controls all of functions in this instrument.
Major hardware functions:
Communication with the operation unit
ECG signal data processing
Patient circuit isolation
Power supply for isolation circuit by DC-DC converter
Recorder control
A/D - D/A converter
Pen movement tone generator

(2) Operation Board

A 4-bit CPU controls the key scanning, LED and LCD display.
The 4-bit CPU can be communicated with the main CPU through the control Gate Array on the control board.

(3) Power Unit

The power unit consists of a battery charging circuit, AC/DC selection circuit, and provides +5 V, +24 V, and ±8 V for the control unit and +24 V for the thermal head.

(4) Recorder Unit

The recorder unit consists of the thermal head, paper driving, motor, marker and paper-empty detection sensor. The recorder unit is connected to the control board.

3-2 Control Board

The control board consists of an ECG input section, a main CPU section, a pen movement tone generator, and a recorder control section.

(1) ECG input section

This section includes an input protection circuit capable of withstanding voltage 5 KV against defibrillator discharge, input buffer amplifiers, an electrode check circuit, an 8ch lead selector, a multiplex A/D converter, an 8 bit CPU, a serial interface for communicating with the main CPU and the DC-DC converter for electrical isolation.

Main functions:

1. Input circuit protection
2. ECG waveform acquisition: I, II, V1-V6 8 channels
   4000 samples/sec/ch
3. Electrode check
4. QRS detection
5. Communication with the main CPU via serial interface (8M baud per second).

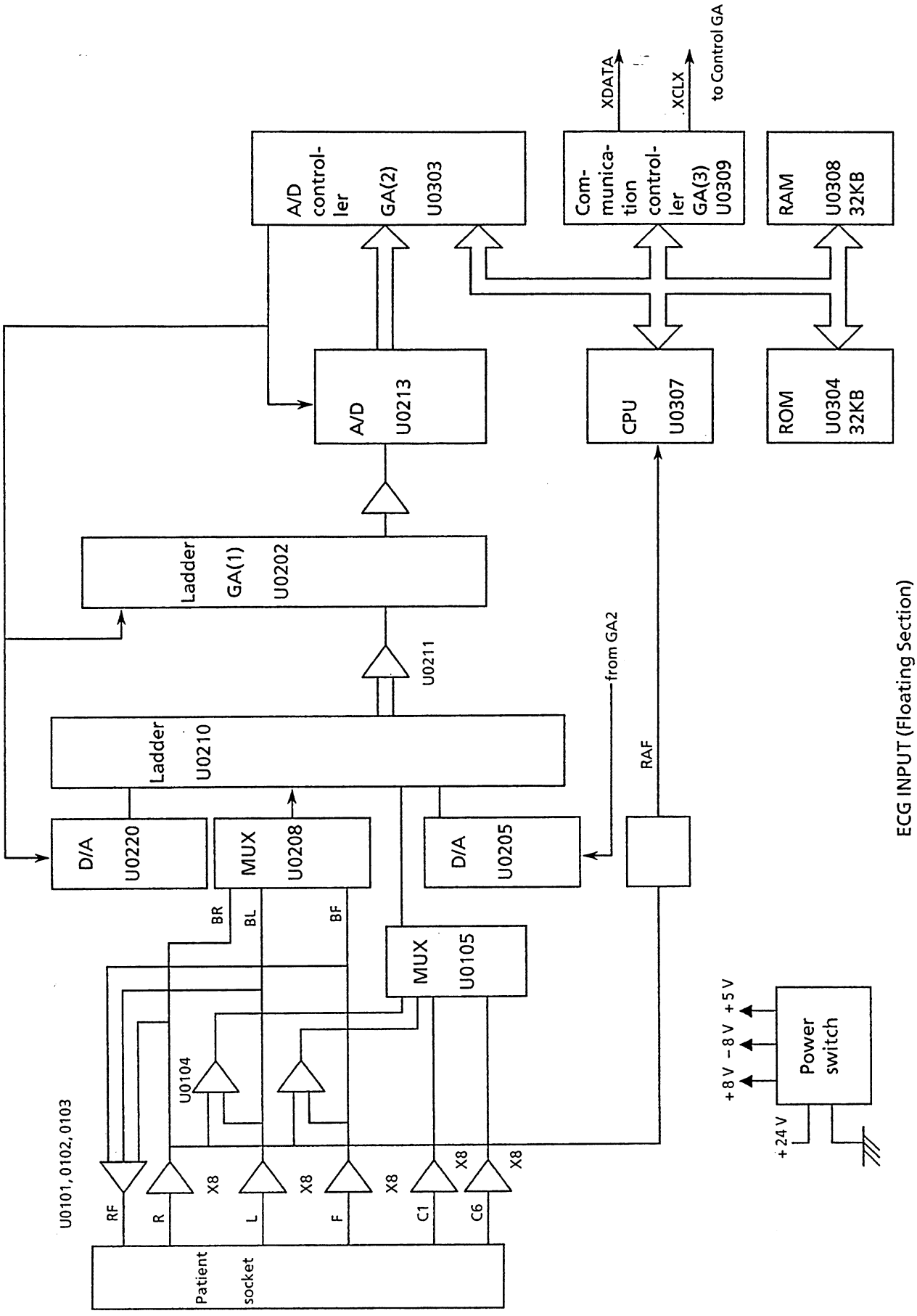
ECG Acquisition Procedure:

The ECG signals from the patient connecter go through the protection circuit and are amplified 8 times by U0101, U0102, and U0103. Lead I, II signals are derived from R, L, F (BR, BL, BF) signals by U0104. The R, L, and F are mixed and negatively fed back to the RF lead.

One lead among the amplified ECG signals (I, II, and V1 to V6) is derived by the ladder (U0210) when selected by the multiplexer (U0105) and is sent to the A/D converter (U0213) with the R, L, and F signals. A/D conversion is performed at the rate of 250 μsec per 8-channels controlled by U0303. Eight leads (I, II, and V1 to V6) are converted from analog to digital. The digital ECG signal undergoes the pace maker pulse check, is averaged and converted to 1000 sample/sec per channel. Electrode failure in each channel is detected when an overflow or underflow of the A/D converted value appears.

This A/D converter is an extension type. The DC component superimposed on the ECG signal is fed back through the D/A converter (U0220, 0205) to apply the off-set to the input ECG signal by the ladder circuit (U0210) and the differential amplifier (U0140).

An 8-bit CPU (U0307) controls the communication with the main CPU section at the rate of 18 bytes/ms and detects QRS information, electrode failure and noise through the communication Gate Array (U0309).


A/D controller GA(2) U0303
Communication controller GA(3) U0309
RAM U0308 32KB
XDATA
XCLX
to Control GA
A/D U0213
CPU U0307
ROM U0304 32KB
Ladder GA(1) U0202
U0211
Ladder U0210
from GA2
RAF
D/A U0220
MUX U0208
D/A U0205
BR
BL
BF
MUX U0105
U0104
U0101, 0102, 0103
RF
R
L
F
C1
C6
X8
Patient socket
+8 V -8 V +5 V
+24 V
Power switch
ECG INPUT (Floating Section)

(2) Main CPU section

The main CPU section consists of an MC68000 CPU, ROM, RAM, and a control Gate Array. The control Gate Array (U1101) controls the communication with the ECG input section, recorder control, and operation board.

Main functions:

1. Various filtering:
   AC interference and EMG rejection/Hi-cut filter, drift filtering
2. ECG waveform storage for copy function
3. Control of each operation

The control Gate Array receives ECG data every 1ms and generates an interrupt control signal. The main CPU section's operations are controlled by this interrupt signal.

Control Gate Array general function:

1. Interface for the main CPU (U1404)
   - Address decoder
     Produces an internal register, Dip SW, ROM and interface select signals
   - Interrupt control
     Masking control and decoding interrupt signals
     Produces an IPL signal for the main CPU

2. Dynamic RAM control
   256K × 4 bit (1M × 4) dynamic RAM is provided in the control Gate Array.

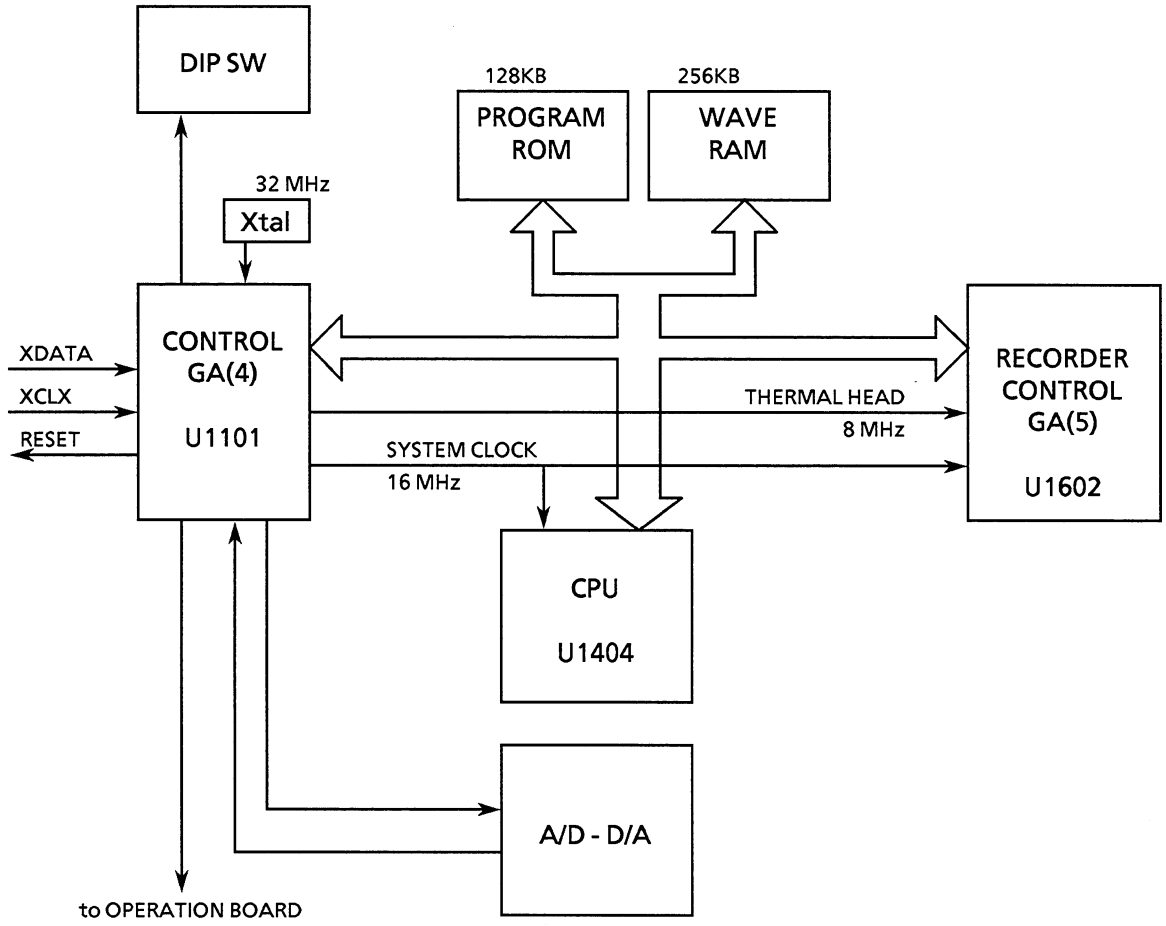
3. Keyboard interface
   Two-way communication interface for the CPU on the operation board

4. Serial communication interface with the ECG input section

5. A/D-D/A interface
   An interface module is provided to compose a successive approximate A/D and D/A converter with a 12-bit D/A converter.

6. Dip switch interface
   Interface to encode the Dip switch setting

7. Parallel interface
   Interface to detect the power status (AC or battery operation, battery voltage), and send the power OFF control signal to the power unit.


DIP SW
128KB
PROGRAM ROM
256KB
WAVE RAM
32 MHz
Xtal
CONTROL GA(4)
U1101
XDATA
XCLX
RESET
THERMAL HEAD
8 MHz
SYSTEM CLOCK
16 MHz
RECORDER CONTROL GA(5)
U1602
CPU
U1404
A/D - D/A
to OPERATION BOARD

Main CPU

(3) A/D, D/A converter section

It consists of a D/A converter with a sample hold circuit, multiplexer and amplifiers. The A/D converter, the sample and hold circuit, and Control Gate Array GA4 (U1101) compose a successive approximate A/D converter. The A/D-D/A converter is controlled by the D/A converter control signals XLD, SD, and XSCK, D/A sample and hold signal DAHOLD, A/D sample and hold signal ADHOLD, the channel select signal MUXO from GA4, and A/D comparator signal ADCMP.
A/D-D/A conversion is performed every 2 ms.
D/A converter: ± 2.56V, 12 bits

A/D conversion for DC input signals

GA4 sets MUX0 Low or High to select the DC-IN1 or DC-IN2 analog signal through the multipelxer(U0515).
When ADHOLD goes High, at the same time the multipexer output is held by the U0507. The comparator (U0506) compares the U0507 voltage with the reference voltage from the D/A converter (U0512). The A/D conversion is performed using the output signal ADCMP from the comparator (U0506).

D/A conversion for CRO output signal

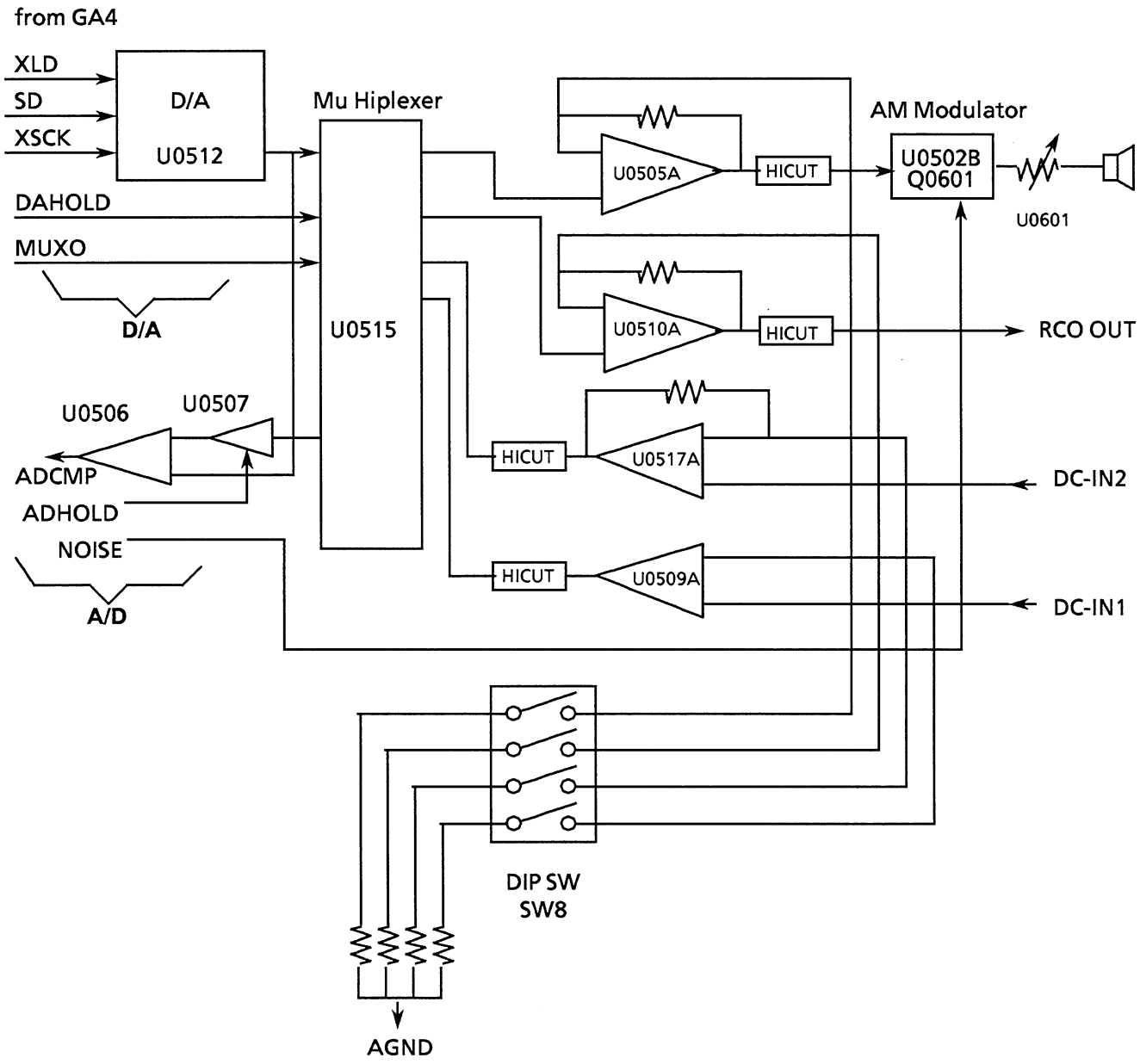
GA4 sets MUXO to Low and sends the rhythm lead data to the D/A converter (U0512). U0512 produces the CRO-output signal from the rhythm lead data.
This signal is sampled by the multiplexer(U0515) while DAHOLD is High and held when DAHOLD goes Low. The output signal is sent to the CRO output terminal through the amplifier(U0510A) and the filter(U0510B) which eliminates high frequency component.

D/A conversion for pen movement tone signal

GA4 sets MUXO Low and sends the averaged value of the absolute ECG signal which is to be printed out to the D/A converter (U0512).
The D/A converted signal is sampled by the multiplexer (U0515) while the DAHOLD is set to High and held when DAHOLD goes Low.
The output signal(PENCNT) is sent to the A/M modulator through the amplifier (U0505A) and the filter (U0505B) which eliminates high frequency component.
The pen movement tone is produced from the white noise(NOISE) modulated by the this D/A converted ECG signal(PENCNT).
The volume can be adjusted by VR0601.

DIP SW 8: There are two possible sensitivities using DIP switch 8.
Refer to Section 5-3-3 DIP Switch Setting.

A/D, D/A converter section



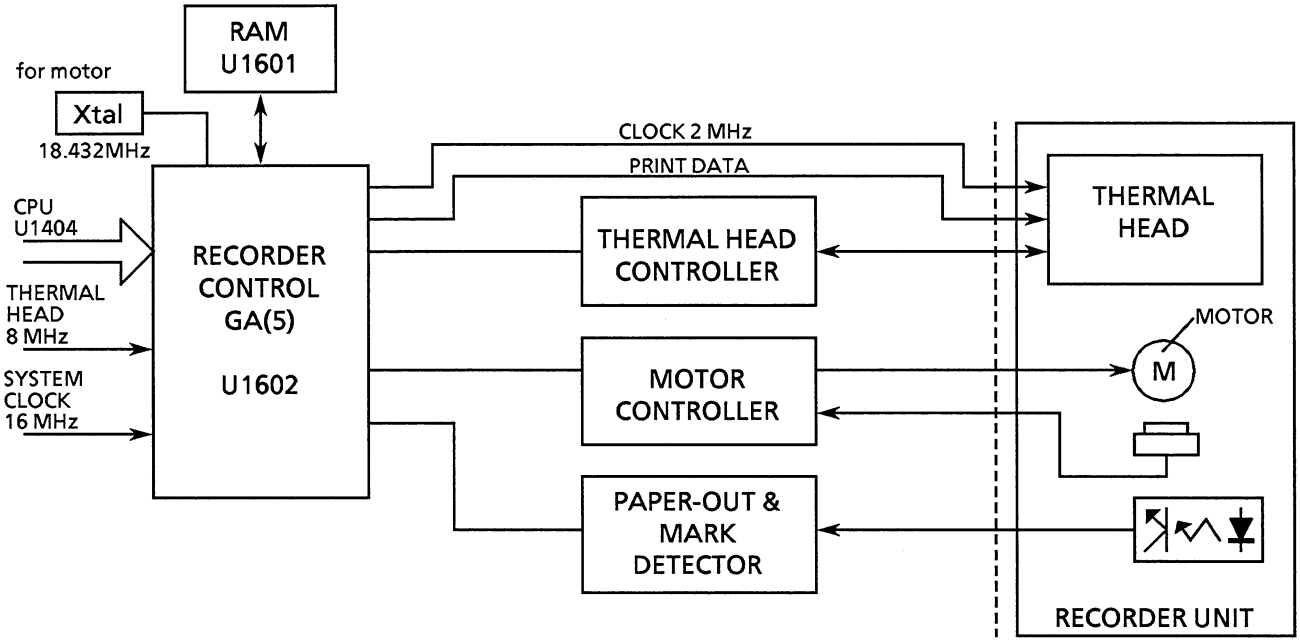
(4) Recorder controller contains of the four blocks:
Recorder control gate array,
Thermal head controller,
Motor controller,
Mark and paper-out detector

Recorder control gate array (U1602)

Contains: ECG data converter, character font buffer RAM controller, motor control frequency generator, I/O port for the recorder unit, and the thermal head interface.

The recorder control gate array converts the ECG data from the main CPU into data to be transferred to the thermal head.

This converted ECG data and character data delivered to the character font buffer is converted into serial data and transferred to the thermal head.



Recorder Control

Thermal head controller

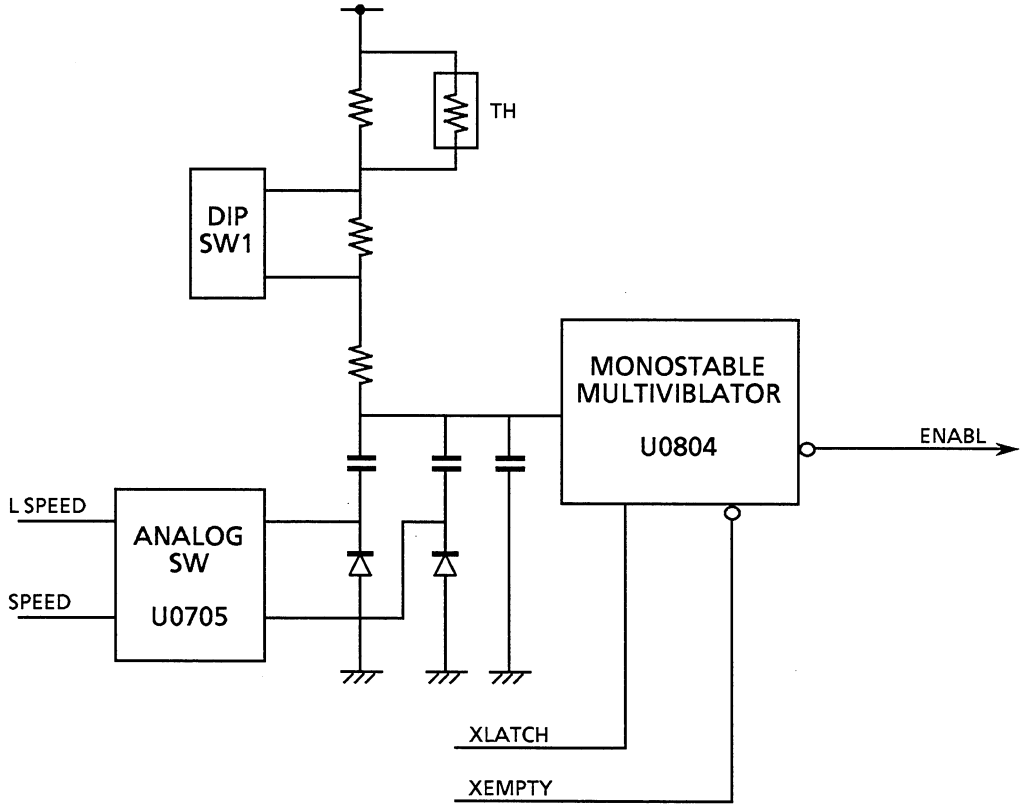
This circuit keeps the print density constant against variations in the thermal head temperature by applying to the thermal head the appropriate enable pulse. The enable pulse is controlled by a monostable multivibrator (U0804) with the paper speed and timing capacitor's charge current varied.

The thermister in the thermal head controls the voltage applied to the timing capacitor's charge circuit.

This pulse is also controlled by XLACH from the recorder control gate array.

*Each thermal head heating unit has a unique resistance. Dip SW 1 should be set according to the thermal head resistance to get the same energy level and the darker print.

*When the paper is empty, to protect the thermal head, the monostable multivibrator stops to apply the pulse.



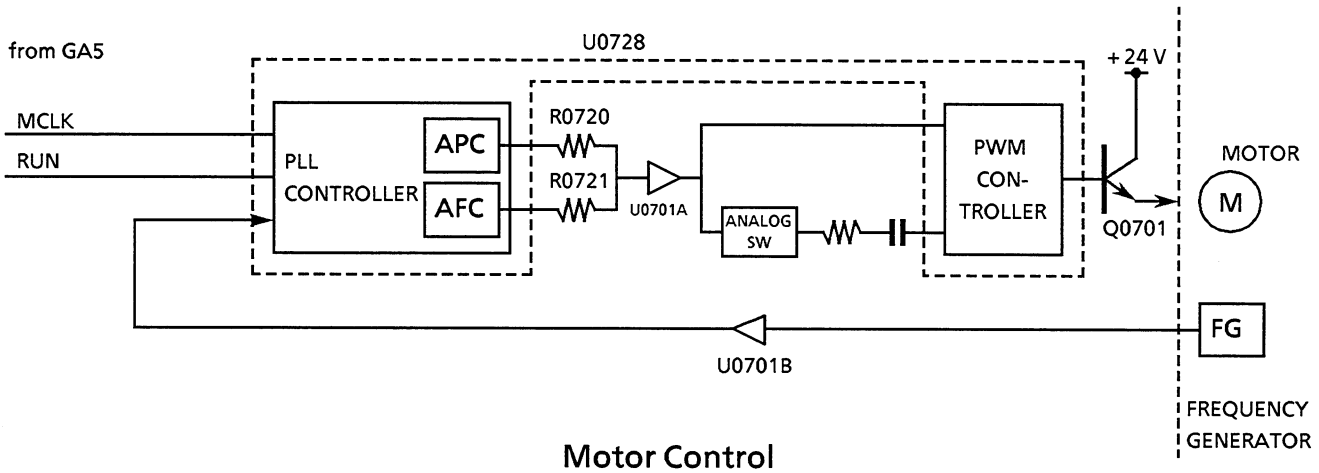
Head Control

Motor controller

The motor speed control circuit uses a phase-locked loop (PLL). The recorder control gate array outputs the reference clock (MCLK) and RUN signal. The phase comparator compares the reference clock with the motor rotation signal detected by the speed sensor. If there is any phase difference between the two inputs of the phase comparator (motor speed is slower or faster than specified speed), the comparator provides an error signal to the motor through the low-pass filter included in the APC, AFC to keep the motor speed constant. Motor speed control is performed by the pulse-wide-modulation (PWM).

To protect the motor, an overcurrent limiter (Max 1A) is provided.

APC: Auto Phase Controller
AFC: Auto Frequency Controller



Motor Control

Mark and paper-out detection

Mark detection

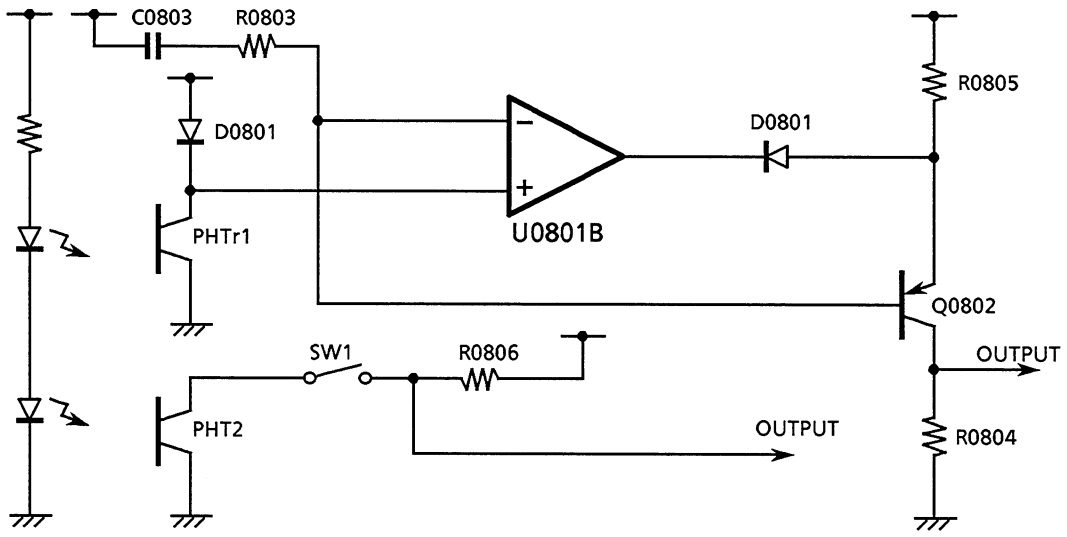
This circuit detects the recording paper marks. It employs a reflectance detector using a photoreflector. The voltage obtained by linearizing the photo transistor output is applied to the buffer type op-amplifier to operate Tr (Q0802) with the output ON or OFF.

When a mark is detected, the intensity of the incoming light turns OFF PHTr1, the positive input of U0801 goes high which raises the output and turns OFF D0801 so Vbe of Tr goes high and turns Tr ON.

When the space after the mark is detected, the reverse take place.

Paper-out detector

This circuit detects the recording paper-out condition and recording paper magazine release. When one or both conditions take place, the paper-out condition is detected. The paper-out condition is detected by the photo transistor state through reflectance detection using a photoreflector. Magazine release is detected by the microswitch SW1.

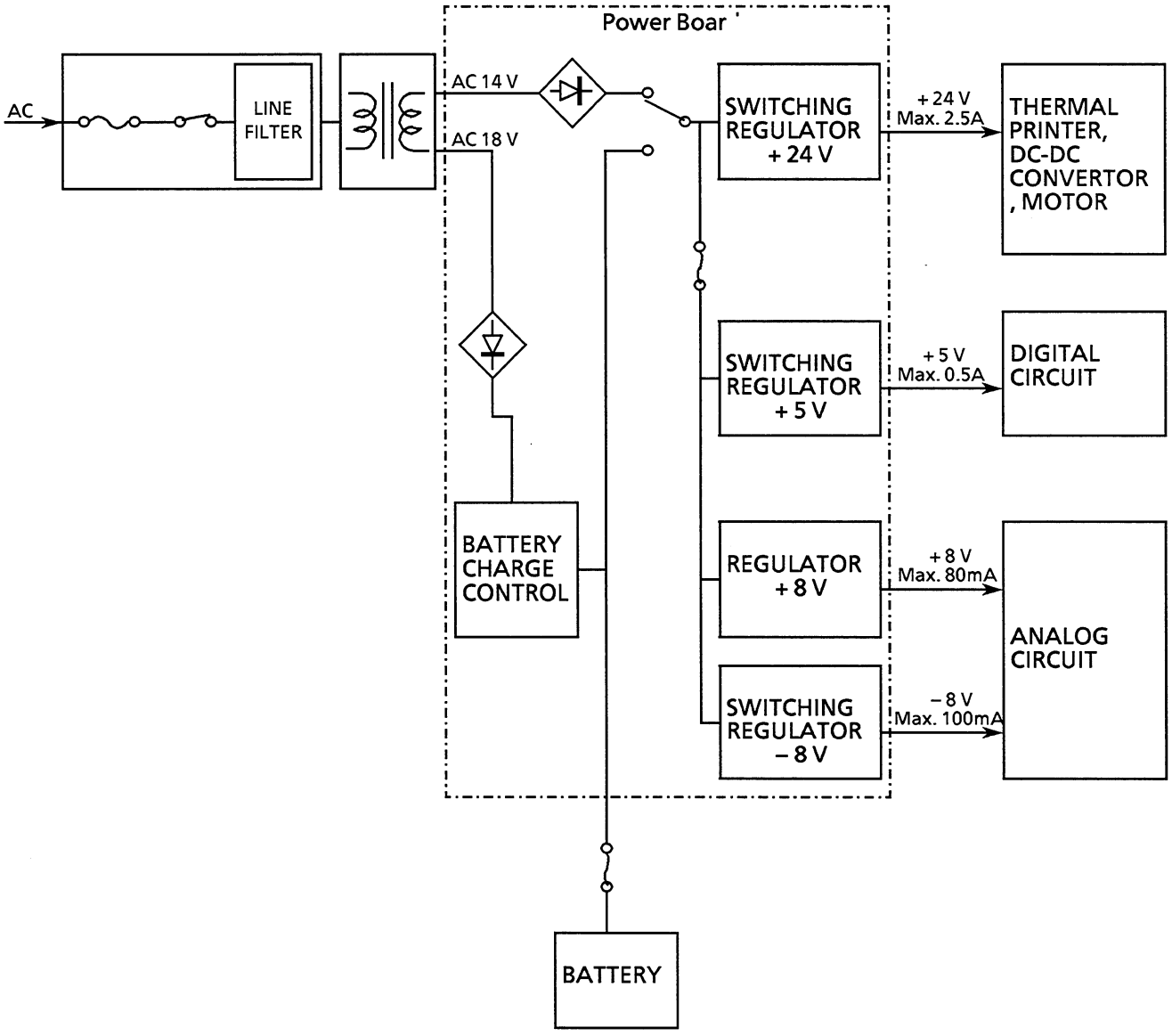


3-3 Operation Board

Contains the operation switches, LEDs, LCD and control 1-chip CPU.
Communication with the control board is via an 8-bit two way parallel interface in the 1-chip CPU (U0101). The scan line is decoded by the decoder (U0102) every 10 ms. When a switch is pressed and the scan line (SWS0-3) for that switch goes LOW, the return line (SWX0-7) for that switch goes LOW, indicating switch operation. The LED is on and driven by the drive IC (U0103). The LCD is controlled and driven by U0101.

3-4 Power Unit

The power unit consists of the AC input section, battery, and power board.



Power Unit

(1) AC input section

This section supplies 14 Vac for the power board and 18 Vac for the battery charging circuit. An AC inlet contains a fuse holder, a power switch, and a noise filter.

CAUTION

1. **When a fuse blows: Use only specified fuses for the replacement.**
   Confirm that no internal parts or boards are burn.
   Confirm that there is no shortage in the power line.
2. **The power transformer is provided with a thermal fuse not to burn out the instrument. When the fuse is cut off, do not replace the transformer if the cause or faulty part is not found.**

(2) Battery

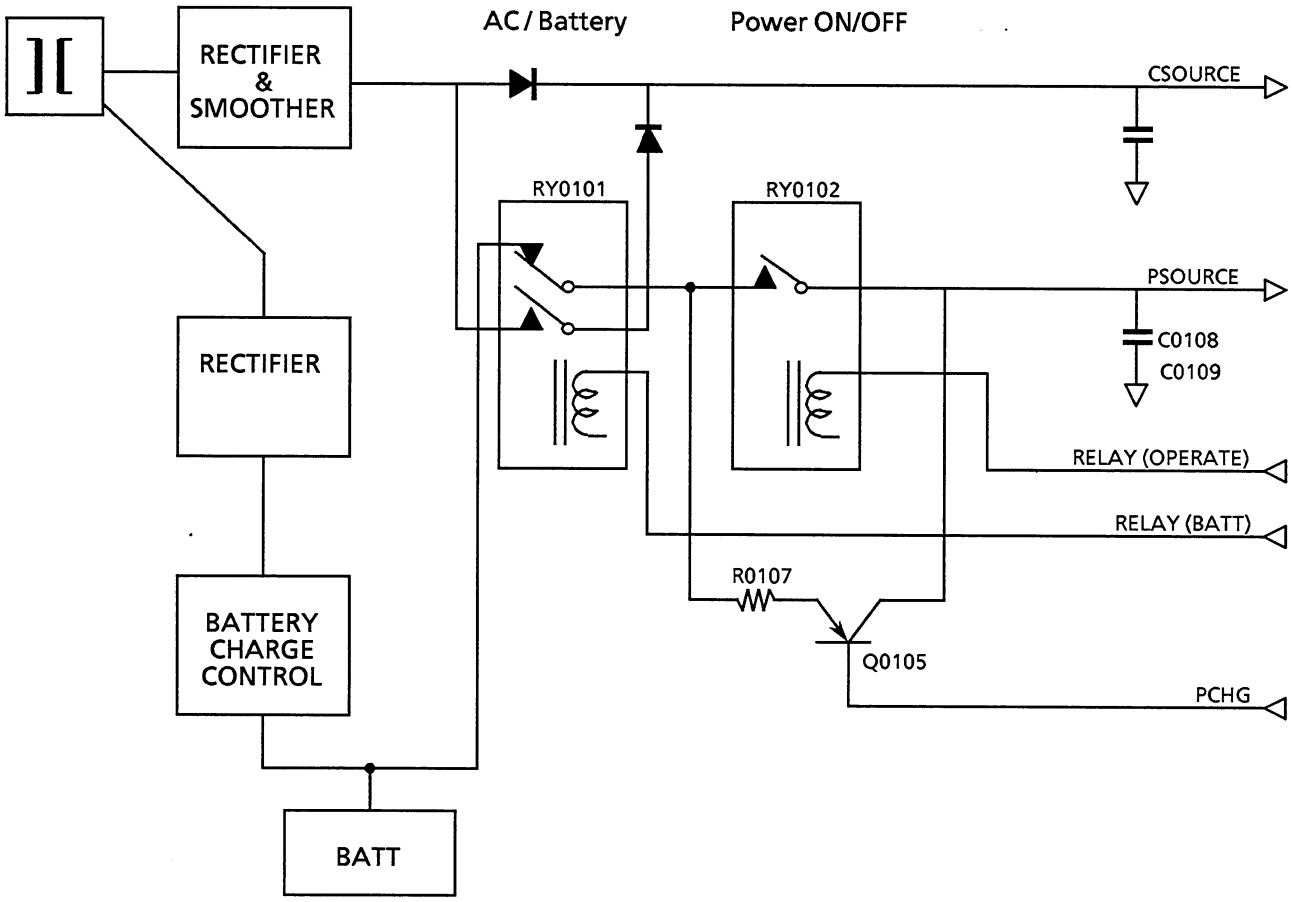
The specified battery is LCT-1912ANK. A fuse between the battery and the power board protects the battery.

(3) Power Board

It consists of a relay drive circuit, a battery charge circuit, a relay control circuit, and +24 V (Thermal head, DC-DC converter on the control board, and Motor), +5 V for digital, ±8 V for analog circuit.

(3-1) Relay drive circuit

AC or Battery operation is selected by the relay (RY0101). To reduce rush current Capacitors (C0108, 0109) are charged by Q0105 through R0107 for about 1 second then the relay (RY0102) is set to ON.



Battery Charge and Relay Drive

(3-2) Battery charging circuit

The battery charging circuit is controlled by the hybrid IC (U0113).

Charging operation

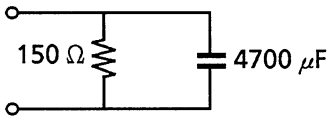
When the battery is almost discharged, a constant current (about 200 mA) is applied to the battery and the battery charging lamp lights up. This lamp is driven by Q0103.

When the battery voltage becomes about 15 V (at 20°C), constant voltage is applied to the battery. This voltage depends on the battery surface temperature. (0.8 V down / 20°C up)

When the battery is almost charged (80%) and charging current drops below 50mA as a result of the charging, the applied voltage decreases to 13.5 V. As the charging current continues to flow, the charging will eventually cease and resume repeatedly. The maximum charging current is limited by R0109.

Charging voltage adjustment

VR0101 is provided for adjustment of the battery charging voltage. Remove the battery and connect the dummy load, and adjust this voltage to 15 V at 20°C.



Dummy load for charging voltage adjustment

(3-3) Relay control circuit

This circuit controls the relay drive circuit and sends the power status to the main CPU on the control board.

Relay ON control

When the Power switch is turned ON, XPON goes Low and Q0203 goes ON. +5 V (Vcc) for the relay control circuit is supplied by the three-terminal regulator (U0215). This voltage is detected by the voltage detector (U0216).

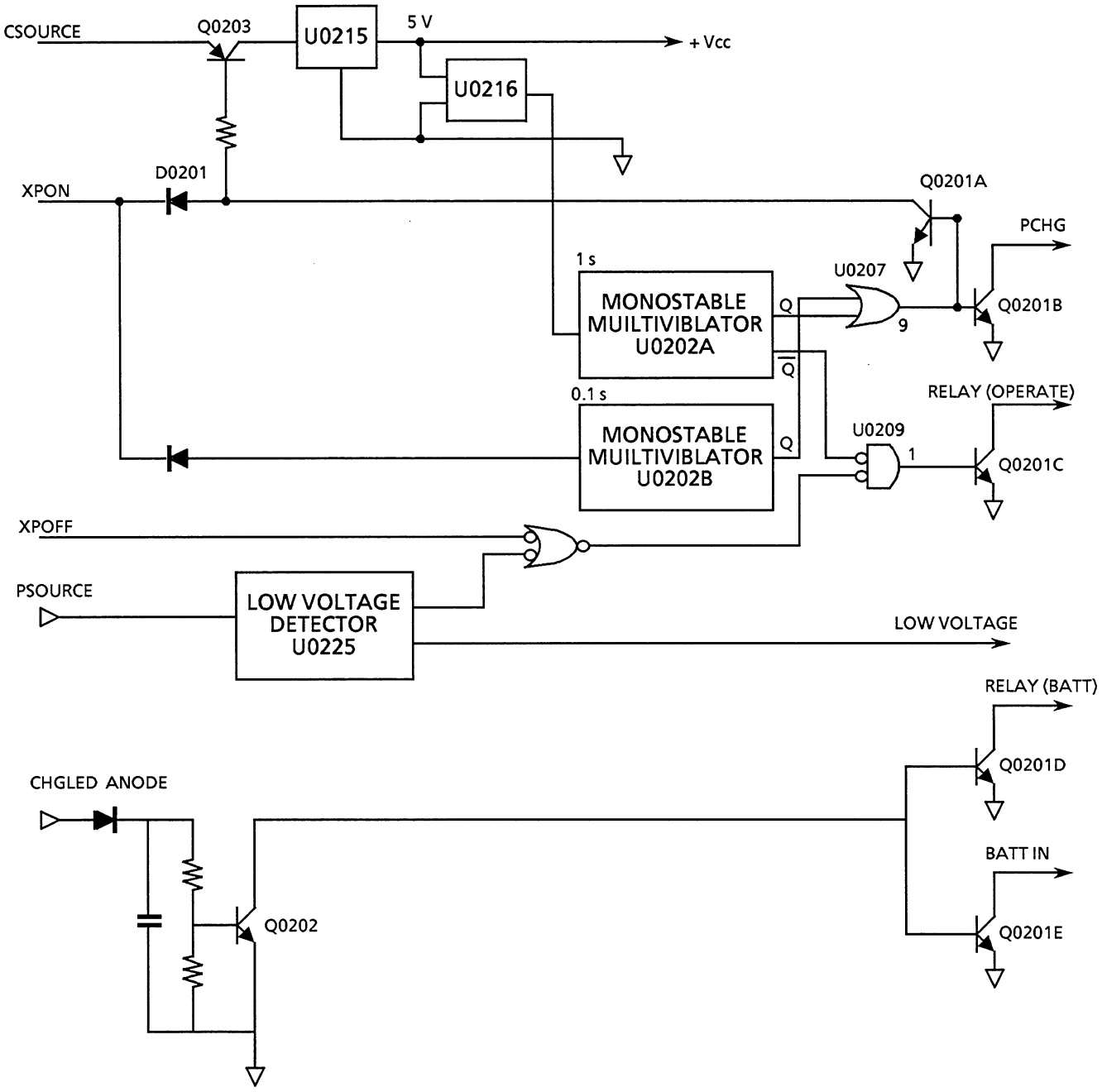
When U0202A produces the one-shot pulse (pulse width: 1 second), Pin-9 of U0207 goes High. Q0203 and Q0105 goes ON so that the U0215 continues to supply the Vcc. When the one-shot pulse goes LOW, Pin-1 of U0209 goes Low and RELAY (OPERATE) goes Low. The relay (RY0102) is turned ON to supply power to the regulators. When 18 Vac for battery charge is detected by Q0202, RELAY (BATT) goes Low. The relay (RY0101) is turned ON to supply AC power.

Relay OFF control

1. The Power switch is turned OFF. (XPOFF = > Low, PCHG = > High)
2. There is no switch operation in 3 minutes.
   (The main CPU makes XCPU Low.)
3. The battery voltage(PSOURCE) falls below 10.5 V (±2.5%) during battery operation.
4. +5 V of the control board decreases to about 4.2 V

Battery voltage detection

During battery operation, when the PSOURCE voltage decreases to about 11.24 V, the voltage detector (U0205) makes LOWVOLTAGE Low and informs the main CPU. When the PSOURCE voltage falls below 10.5 V (±2.5%), the the relay (RY0102) is turned to OFF.



Relay Control

3-5 Regulators

+24 V Regulator

This regulator supplies +24 V for the control board and thermal head.

Input voltage: 10 to 20 V

Output voltage: 24 V ±2.5%

Output current: Max. 2.5 A

Current limiter for thermal head power supply

Approx . current: 2 A

Shut-off characteristics: When the supplied current becomes 2 A and then supplied voltage decreases about 1.3 V, +24 V power is shut OFF.

5 V Regulator

This regulator supplies 5 V for the control board and the operation board via the control board.

Input voltage: 10 to 20 V

Output voltage: 5 V ±2.5%

Output current: Max. 0.5 A

F0401 protects the circuit when output voltage goes over about 6.5 V

+ 8 V Regulator

This regulator supplies 8 V for analog circuit.

Input voltage: 10 to 20 V

Output voltage: 8 V ±10%

Output current: Max. 80 mA

−8 V Regulator

This regulator supplies −8 V for analog circuit.

Input voltage: 10 to 20 V

Output voltage: −8 V ±2.5%

Output current: Max. 100 mA

Section 4 TROUBLE SHOOTING

Problem	Board	Note
Power cannot be turned ON. (No marks on LCD and No Lamps light up.)	POWER BD	Check that the power cord is attachment and the main Power is turned ON. *
Waveform cannot be recorded. (Lamp light up.)	CONTROL BD	Check the connector on each BD.
Noisy ECG waveform	CONTROL BD	Check the patient cable, electrodes, and electrical devices in the immediate area.
Papermark is not detected.	CONTROL BD	Clean the mark sensor. Check that Dip SW2 - No.8 is set to ON.
Paper feed cannot be stopped.	CONTROL BD	Clean the mark sensor. Check that marked paper is loaded. If not, set Dip SW2 - No.8 to OFF.
One or all switches faulty.	CONTROL BD OPERATION BD	Check the Control BD and OPERATION BD connections. Check that the board is not damaged. by liquid. Check that the switch is not stuck down.

* AC power line operation and battery operation

Main power switch	Power ON/OFF switch	
	OFF	ON
OFF	——	Battery operation Battery mark appears on the LCD and starts blinking when the battery is almost discharged.
ON (AC power lamp lights up.)	Allows for Battery charging Battery charging lamp lit - Being charged blinks - Almost charged off - Fully charged	AC power line operation Power ON lamp lights. Allows for Battery charging

Note

Power is automatically turned OFF when there is no switch operation for about 3 minutes. If the power shuts off before resuming recording, turn the Power switch OFF and ON again.

Section 5 ADJUSTMENTS

5-1 Assembly and Mechanical Adjustment of Thermal Head

5-1-1 Assembly

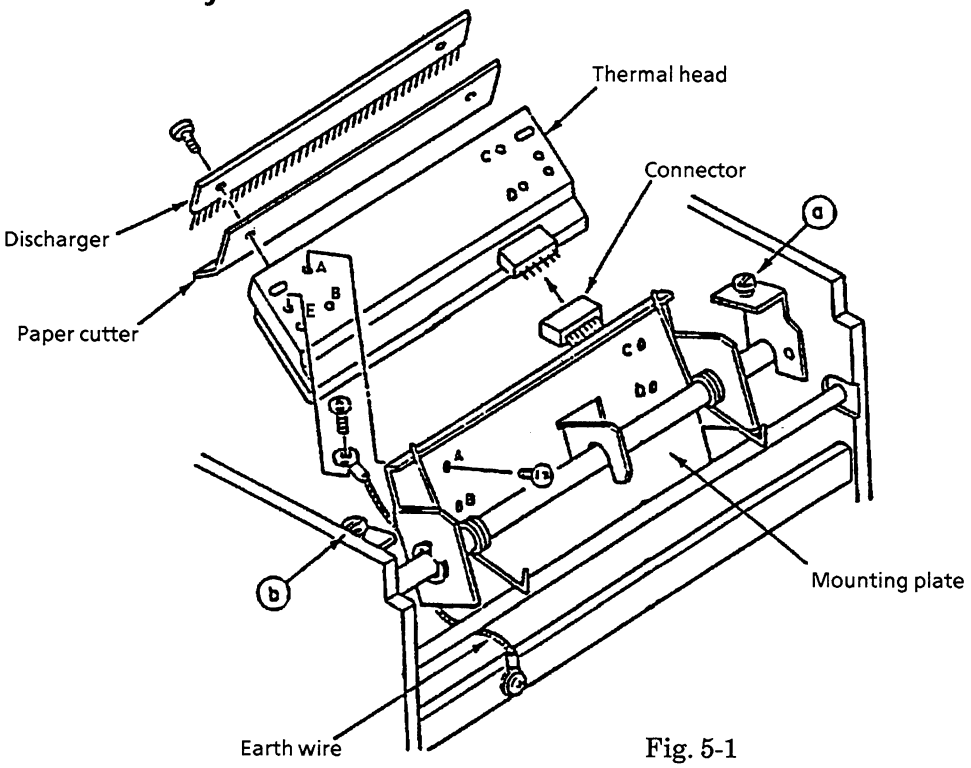
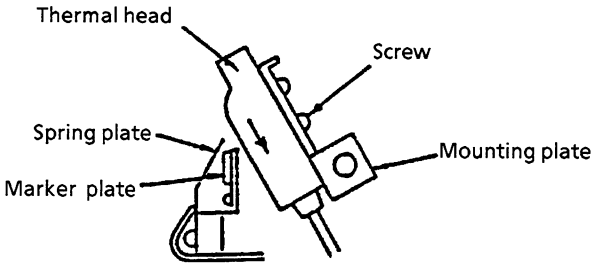
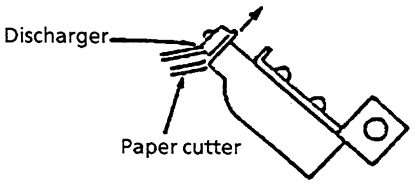


Fig. 5-1

1) Plug in the connectors to the thermal head.
2) Attach the earth wire to the thermal head.
3) Place the thermal head on the mounting plate, loosely fix the screws. Shift the thermal head fully along the direction of the arrow-head, then tighten the screws. (take care to avoid bending the spring plate and marker plate.)



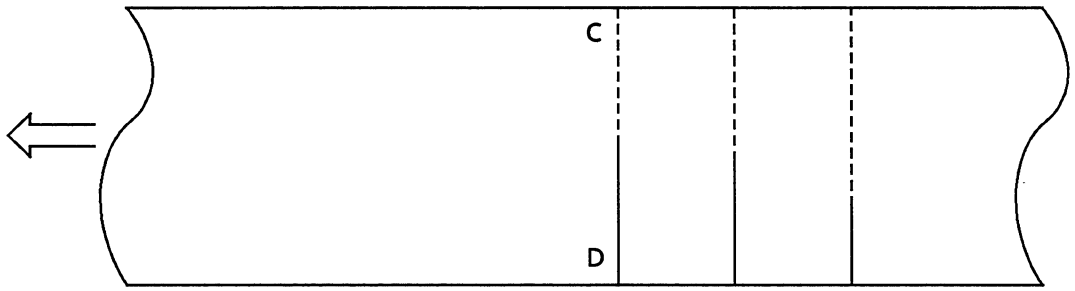
4) Mount and fix the paper cutter and the discharger onto the thermal head. .



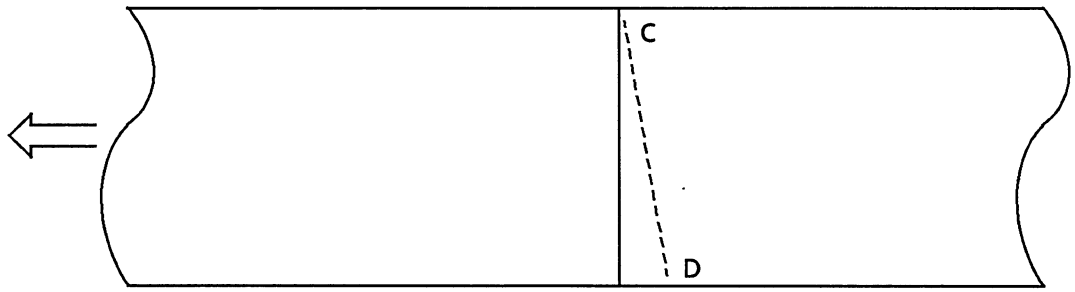
5-1-2 Paper Feed Adjustment

1) Connect the top casing assy and the bottom casing assy with the connector and turn the Power Switch ON with pressing the Reset Switch

2) Observe the print-out of the test waveform and characters by using the recorder check mode in the self check .

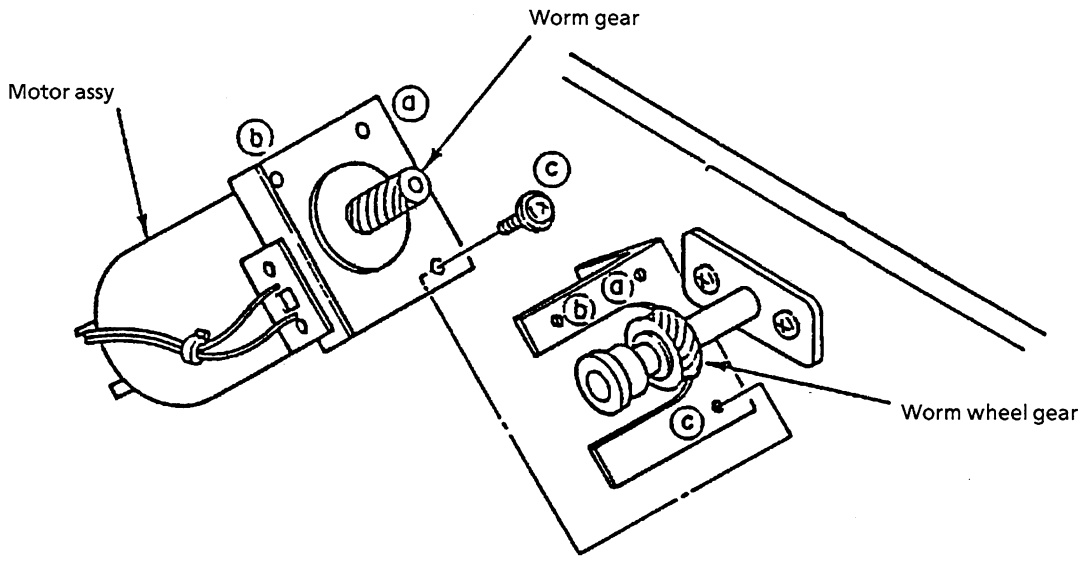


Check that the recorded line (C) (D) is parallel to the scale lines.
No adjustment is required if it is the case. Otherwise, adjust the screws (a) (b) (Fig. 5-1) for proper alignment.
Adjusting the screws in the clockwise direction moves the thermal head along the direction of the paper feed and vice versa (0.7mm displacement per turn of screw).

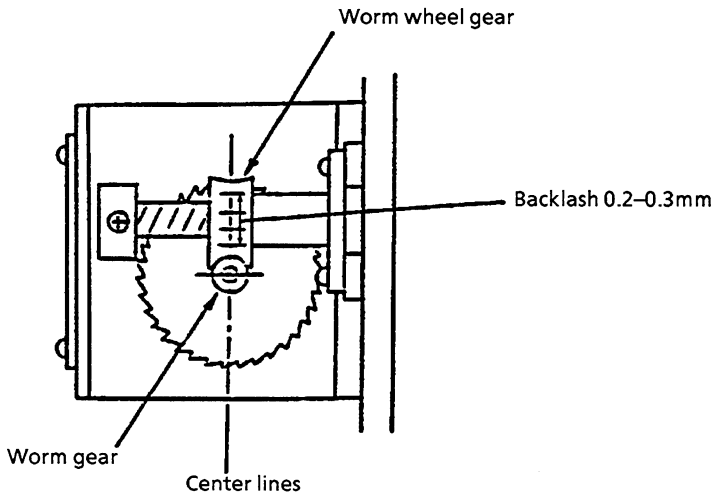


In the above figure, since (D) is lagging, adjust the screw (b) in the clockwise direction

5-2 Assembly and Mechanical Adjustment of Motor



1) Mount the motor assy in such a way that the worm gear and the worm wheel gear couple to each other. Loosely tighten the screws.
2) Align the center lines of the worm gear and the worm wheel gear. Slightly rotate the worm wheel gear to check that there is backlash of 0.2-0.3mm between the gears; tighten the screws.



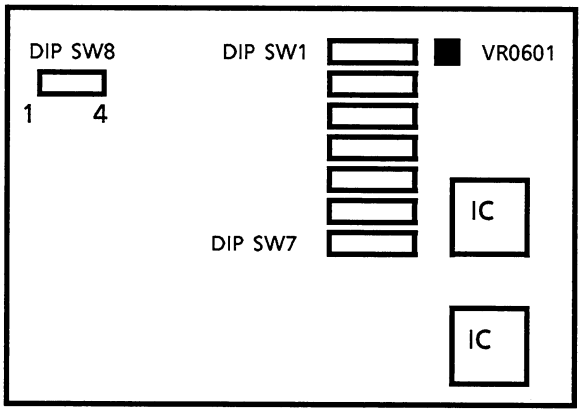
5-3 DIP Switch

5-3-1 DIP Switch Location

There are DIP switches on the control board.

Turn the power OFF and disconnect the AC power cord.

Remove the DIP switch cover on the bottom of the instrument and set the DIP switches accordingly. After DIP Switch setting is finished, confirm the setting by the Self-Check. Refer to Section 6-2.



CONTROL BD

VR0601, DIP SW8-1:
Volume adjustment for the Pen movement tone

5-3-2 Setting Thermal Head Resistance and Dip Switch 1

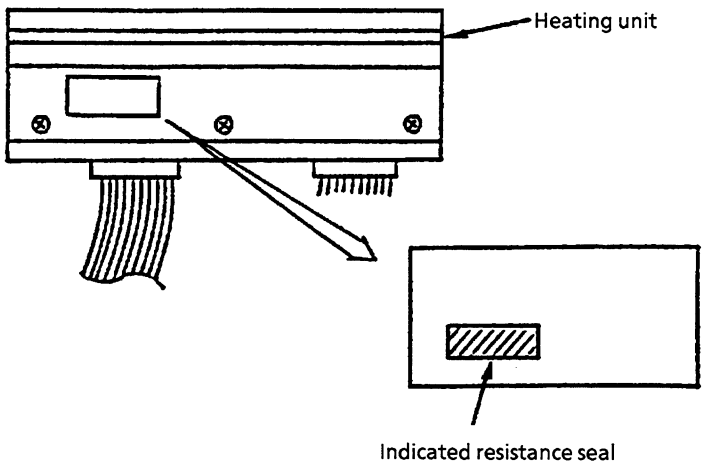
Each thermal head heating unit has a unique resistance. At the same energy level, the lower the resistance, the darker the print. To get an approximately constant shading regardless of the resistance, the width of the pulse applied to the thermal head must be adjusted to the resistance.

To adjust the print pulse width, set the Dip Switch 1 on the control board according to the thermal head resistance as shown below:

Setting of Dip SW1

	Thermal head resistor	NO.							
	R OHM	1	2	3	4	5	6	7	8
	952 ~ 1049	ON	ON	ON	ON	ON	ON	ON	ON
	1050 ~ 1103	OFF	ON	ON	ON	ON	ON	ON	ON
	1104 ~ 1161	OFF	OFF	ON	ON	ON	ON	ON	ON
	1162 ~ 1221	OFF	OFF	OFF	ON	ON	ON	ON	ON
	1222 ~ 1288	OFF	OFF	OFF	OFF	ON	ON	ON	ON

The resistance of the thermal head's heating unit is indicated on the seal on the thermal head.



5-3-3 DIP Switch Setting

Switch 2: System data set

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	Factory use			ON
2	Factory use			ON
3	Factory use			OFF
4	Rhythm lead	II	V5	ON
5	Factory use			ON
6	Factory use			ON
7	Pen tone	Present	Absent after recording	OFF
8	Paper mark detection	Yes	No	ON

Switch 3: System data set

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	Slow speed	5 mm/sec	10 mm/sec	OFF
2	Factory use			OFF
3	Type of Auto recording mode	Sequence Auto	Page Auto	OFF
4	Auto recording speed	25 mm/sec	50 mm/sec	ON
5	Auto Cal	Yes	No	ON
6	Auto Cal location	Before ECG recording	After ECG recording	OFF
7	Auto Gain	Yes	No	ON
8	CRO output time-constant	4 sec	1 sec	ON

Switch 4

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	EMG filter	Yes	No	OFF
2	Recording mode	Auto	Manual	ON
3	Number of recording channels			OFF
4	Number of recording channels			ON
5	Factory use			ON
6	Drift filter	Yes	No	ON
7	EMG filter cut-off frequency	35 Hz	25 Hz	ON
8	Extra lead recording in the Auto mode	Recording	Not recording	OFF

Number of recording channels	3	4
3 channel recording	ON	ON
4 channel recording	OFF	ON
6 channel recording	ON	OFF
Factory use	OFF	OFF

Switch 5: Auto recording format

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	3 channel recording format	2.5 sec × 4 sequence	5 sec × 4 sequence	ON
2	6 channel recording format	5 sec × 2 sequence	10 sec × 2 sequence	ON
3	Factory use			OFF
4	Factory use			OFF
5	Factory use			OFF
6	Factory use			OFF
7	Factory use			OFF

Switch 6: Intermittent recording condition

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	Extra lead waveform recording	Yes	No	ON
2	Recording order in the Auto recording	Limb	Chest	ON
3	30 sec and 1 minute recording	Yes	No	OFF
4	Recording interval			ON
5	Recording interval			ON
6	Recording interval			ON
7	Auto start	Yes	No	ON
8	Trace width	2 dots	3 dots	OFF

Recording interval

Interval	4	5	6
1 minute	ON	ON	ON
2 minutes	OFF	ON	ON
3 minutes	ON	OFF	ON
5 minutes	OFF	OFF	ON
10 minutes	ON	ON	OFF
20 minutes	OFF	ON	OFF
30 minutes	ON	OFF	OFF
60 minutes	OFF	OFF	OFF

Switch 7: Extra lead set

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	3 channel recording			OFF
2	3 channel recording			OFF
3	3 channel recording			ON
4	3 channel recording			ON
5	6 channel recording			ON
6	6 channel recording			ON
7	6 channel recording			ON
8	6 channel recording			ON

3 channel recording

Extra lead	1	2	3	4
II, aVF, V5	ON	ON	ON	ON
aVF, V1, V6	OFF	ON	ON	ON
V1, aVF, V5	ON	OFF	ON	ON
V1, II, V5	OFF	OFF	ON	ON
V3R, V4R, II	ON	ON	OFF	ON
DC1, DC2, II	OFF	ON	OFF	ON
V2, V4, V6	ON	OFF	OFF	ON

6 channel recording

Extra lead	5	6	7	8
I, II, aVF, V1, V5, V6	ON	ON	ON	ON
I, aVF, III, V1, V2, V6	OFF	ON	ON	ON
I, II, aVF, V4, V5, V6	ON	OFF	ON	ON
I, II, aVF, V3R, V4R, V5R	OFF	OFF	ON	ON
DC1, II, aVF, V1, V5, V6	ON	ON	OFF	ON
DC1, DC2, II, aVF, V1, V5	OFF	ON	OFF	ON

NOTE

Other settings are prohibited.

Switch 8:

No.	Name	DIP Switch		Factory setting
		ON	OFF	
1	Pen movement tone	× 2	× 1	OFF
2	CRT - OUT	1V/1mV	0.5V/1mV	OFF
3	DC - IN 2	10mm/0.5V	10mm/1V	ON
4	DC - IN 1	10mm/0.5V	10mm/1V	ON

Section 6 SELF CHECK

6-1 Error Messages

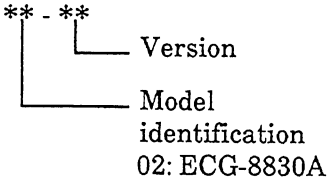
When an error occurs in the instrument, the following system information is printed on the recording paper. Contact your nearest NK distributor.

```
        SYSTEM INFORMATION

DATE : FRI, 17 MAY 1991, 14:45
VER  : 0.7
REV  : 047

****************Exception Message****************

Exception Cause : Bus Error

SSP  : 00D7DFB6   D0 : 00000000   A0 : 00D00377
USP  : 00D7CD10   D1 : 00000010   A1 : 00D7CD04
FC   :     3D91   D2 : FFFFFFFF   A2 : FFFFFFFF
ADDR : 00070D0C   D3 : FFFFFFFF   A3 : FFFFFFFF
IR   :     3D9C   D4 : 00000000   A4 : 00070D0E
SR   :     0004   D5 : 00000000   A5 : 00D7FBF4
PC   : 00009206   D6 : FFFFFFFF   A6 : 00D7CD5C
                  D7 : FFFF0000

USP = 00D7CD10
      FFFF 0001 0000 0000 00D7 CD68 FFFF 0001
      0000 0000 00D7 CD68 FFFF 0001 0000 0000
      00D7 CD68 FFFF 0001 0000 0000 00D7 CD68
      FFFF 0001 0000 0000 00D7 CD68 FFFF 0001
```

6-2 Self-Check

To perform the self-check, turn the power switch ON with pressing the Reset switch. The checking result and recorder test data are printed on the recording paper. After the system check is finished, the instrument is ready for ECG recording.

1. Software version



2. Dip switch setting

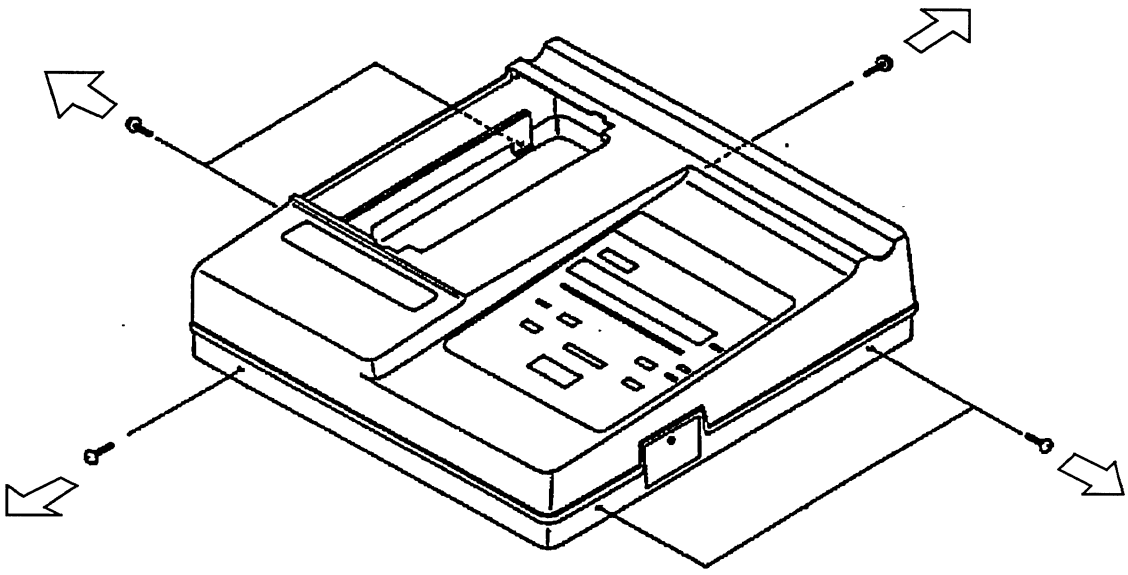
3. Memory Check
   ROM check
   RAM check

```
System Condition (02-12)

          12345678
----------------
SW2 ON   ** *** *
    OFF    *   *
----------------
SW3 ON       ** **
    OFF ***   *
----------------
SW4 ON    * *****
    OFF * *
----------------
SW5 ON   **
    OFF    ******
----------------
SW6 ON   ** ****
    OFF    *    *
----------------
SW7 ON     ******
    OFF **
----------------

Memory Check

  ROM Check : Normal

  RAM Check : Normal
```

4. Recorder Check
   The following recorder test data are seriously recorded on the recording paper.
   1) Printout density
      "X" marks are recorded to check the printout density and uneven thickness.
   2) Drop out of the thermal head printout
      Slant lines are printed to check drop out the thermal head.
   3) Paper speed
      Timing makers are printed at 0.1 sec interval on the recording paper.
   4) Symmetry of the thermal head printout
      Vertical test lines are printed at 1 mm interval on the recording paper to check whether the thermal head is correctly aligned with the paper.
   5) Baseline wandering
   6) Mark detection
      When a mark is detected, "MARK" is printed on the recording paper to indicating that the mark detection functions correctly.

Section 7 DISASSEMBLING AND MECHANICAL PARTS LIST

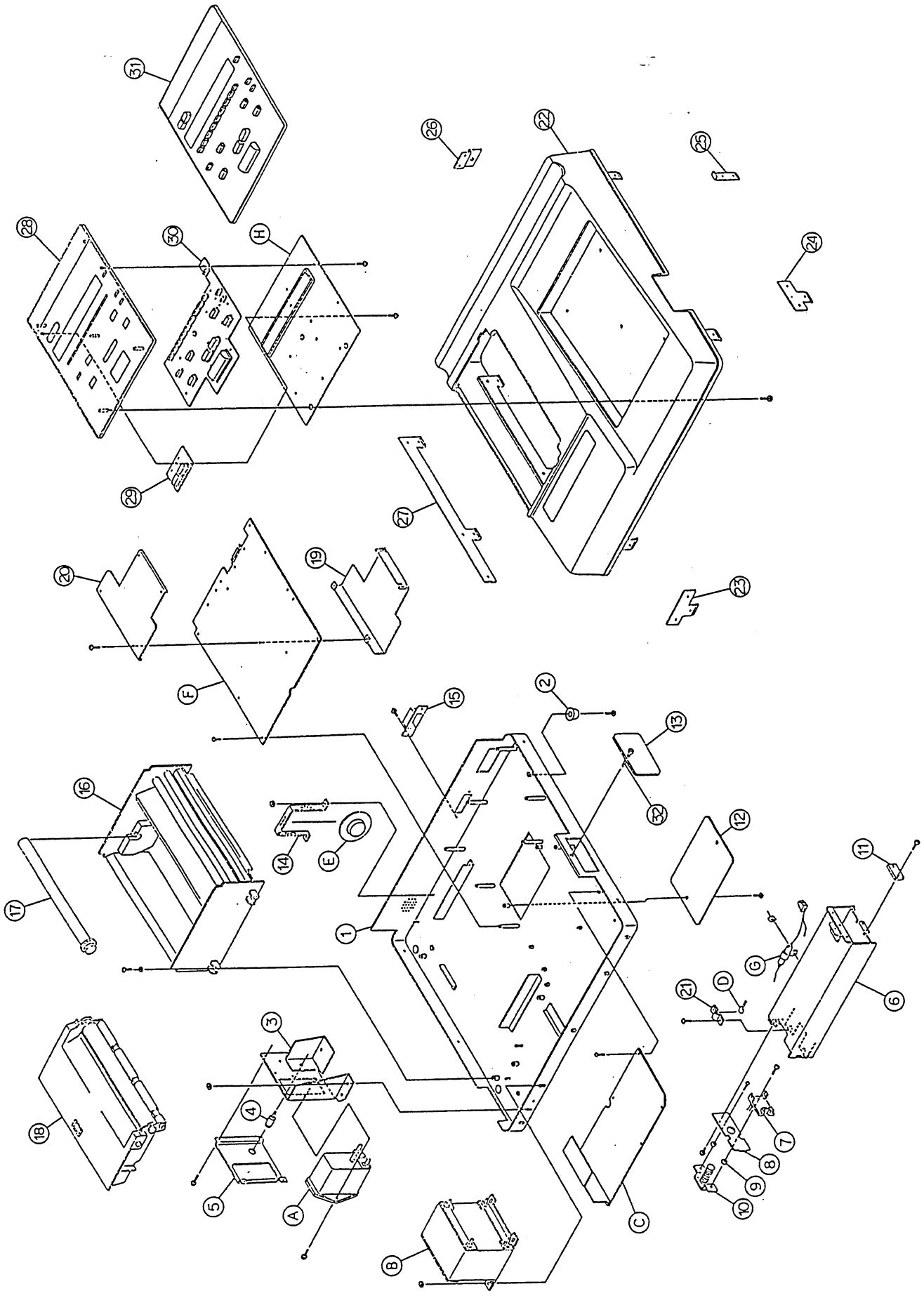
7-1 Disassembling the Top Casing Assy and Bottom Assy



7-2 General Mechanical Part List and Exploded Diagram

Index	NK Part No.	Q'ty	Description
1	YZ-003D9	1	Bottom Casing ASSY
2	111345B	4	Rubber Foot K-30
3	2218-006599A	1	AC Bracket (W)
4	2144-008933A	1	Earth terminal ASSY
5	2229-005605	1	AC Input Panel (W)
6	2218-007197D	1	Battery Case (W)
7	YZ-004D5	1	Battery Terminal ASSY
8	2219-023203A	1	Battery Terminal Plate
9	2114-018604	2	Spacer
10	YZ-004D4	1	Battery Case Spring ASSY
11	2219-027119	1	Battery Stopper
12	2219-027066	1	Dip SW Cover
13	2219-027075	1	Battery Cover
14	2219-025398	1	Speaker Securing Bracket
15	2219-027084A	1	I/O Cover
16	WS-821D	1	Recorder ASSY
17	YZ-001D7	1	Paper Shaft ASSY
18	RH-823D	1	Magazine ASSY
19	2219-027012	1	Shield Cover 1
20	2219-027021	1	Shield Cover 2
21	2219-027093	1	Tr. Securing Bracket
22	2216-001046D	1	Top Casing ASSY (W)
23	2219-024015	1	Mounting Bracket Front
24	2219-027057	1	Mounting Bracket Right 2
25	2219-027048	1	Mounting Bracket Right 1
26	2219-024024	1	Mounting Bracket Rear
27	2218-006581	1	Mounting Bracket Left
28	YZ-004D2	1	Operation Panel(W) ASSY
29	2218-006901	1	Rubber SW Top (W) 3
30	2227-000953D	1	Rubber SW Top (W) 1
31	YZ-004D3	1	Operation Unit ASSY*
32	2219-027039	1	Battery Cover Lock Screw
A	332187	1	AC Inlet FN284B-2/06
B	331277E	1	Transformer C-001
C	UT-2285	1	Power BD
D	001223	1	Transistor
E	332383	1	Speaker EAS-45P106S
F	UT-2283	1	Control BD
G	2835-100097	1	Battery Cable
H	UT-2284	1	Operation BD

* The Operation Unit(31) consists of (28), (29), and (30).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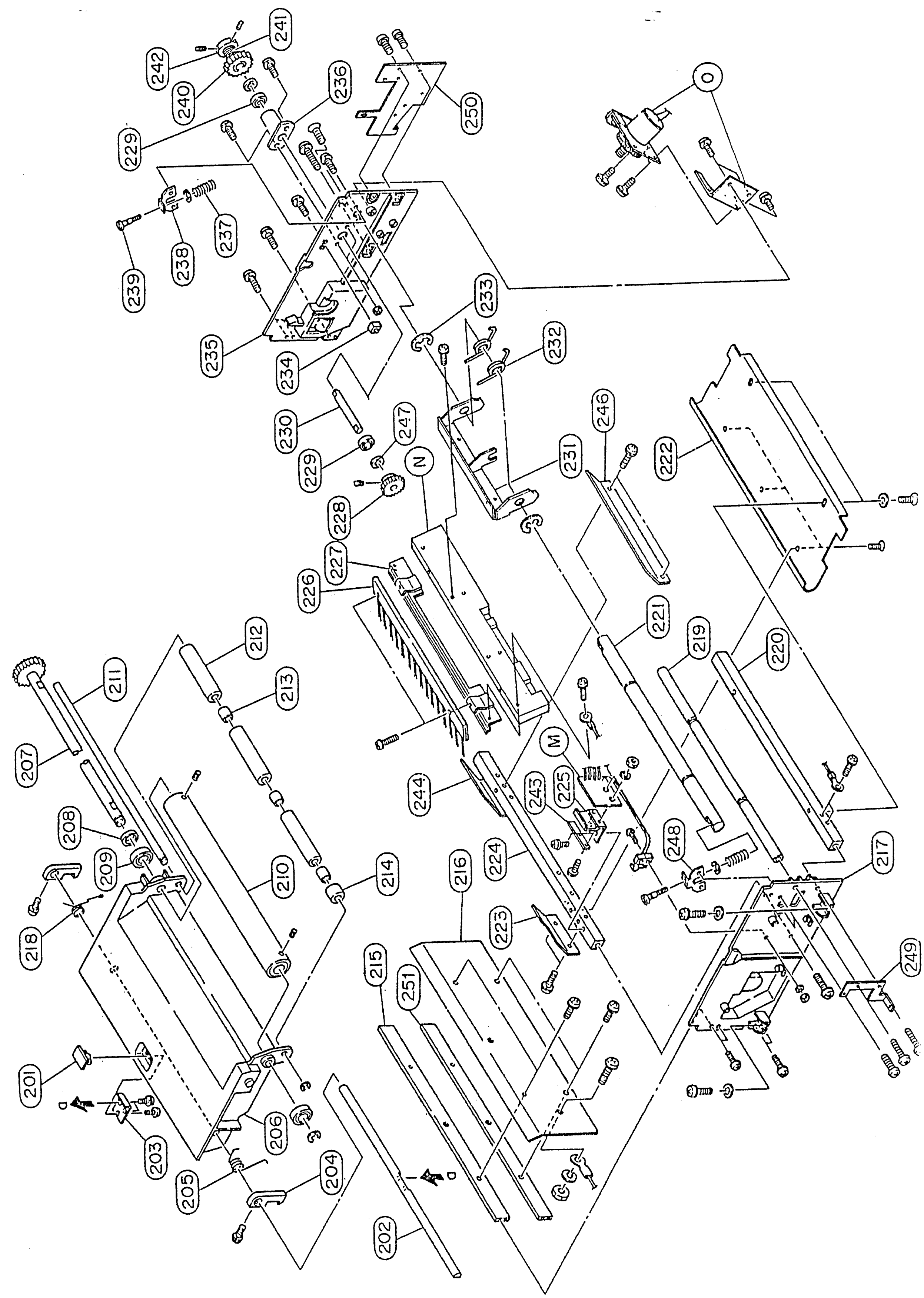
5
A
C
B

7-3 Recorder Unit Mechanical Part List and Exploded Diagram

Index	NK Part No.	Q'ty	Description
201	2219-026896	1	Magazine Rel. knob
202	2219-006204B	1	Lock Shaft
203	2219-008247A	1	Rel. Plate
204	2219-005999	2	Lock plate
205	2219-012527	1	Magazine Spring 2A
206	6114-007214	1	Magazine (216)A
207	2249-003053	1	Shaft Assy
208	2219-008372	1	Stopper
209	294949	2	Bearing SS5-8ZZ
210	2249-000983A	1	Rubber Roller (216) ASSY
211	2219-008087	1	Paper Roller Shaft (216)
212	2219-007471A	3	Paper Roller 1
213	2219-007453	1	Roller Spacer 1
214	2219-007533	1	Paper Roller 2
215	2218-001817	1	Shaft 1
216	2218-001835	1	Spacer
217	2217-000847	1	WS-Base 1
218	2219-012518	1	Magazine Release Spring
219	2219-008309	1	Stopper Shaft
220	2219-008327	1	Shaft
221	2218-001808	1	Head Shaft (216)
222	2218-001782C	1	Slide plate
223	2219-008434	1	Spring Plate 2
224	2218-001791A	1	Shaft 2
225	2219-008425A	1	Marker Bracket
226	2219-008256	1	Discharger
227	2219-007179B	1	Paper Cutter (216)A
228	2219-010333	1	Drive Gear A
229	294949	2	Bearing SS5-8ZZ
230	2219-008354A	1	Drive Shaft
231	2218-006224	1	Head Plate
232	2219-024274	2	Head Spring 2(216)
233	294503	2	Retainer Ring E-85 (SUS)
234	2219-008265	1	Magazine Stop Shaft
235	2217-000856A	1	WS-Base 2
236	2219-008336	1	Shaft Holder
237	2219-006124	2	Head Shaft Spring
238	2219-022801	1	Head Adj. Plate 1
239	2219-007738	2	Head Adj. Screw
240	2144-000103A	1	Wheel ASSY
241	1114-012094	1	Clatch Spring 2
242	1114-011888	1	Clatch 1
243	2219-011822	1	Marker Spacer
244	2219-008399	1	Spring Plate 1
245	----------		----------
246	2219-011484	1	Blank Panel(216)
247	2219-008372	1	stopper
248	2219-022819	1	Head Adj. Plate 2
249	2219-026985	1	Earth Plate 1
250	2219-026994	1	Earth plate 2
251	2218-007205	1	Shaft 1A
M	YZ-004D7	1	Sensor ASSY (ECG-8830)
N	366916	1	Thermal Head (KJT-24-8MGF1-NK)
O	YZ-004D6	1	Motor ASSY (ECG-8830)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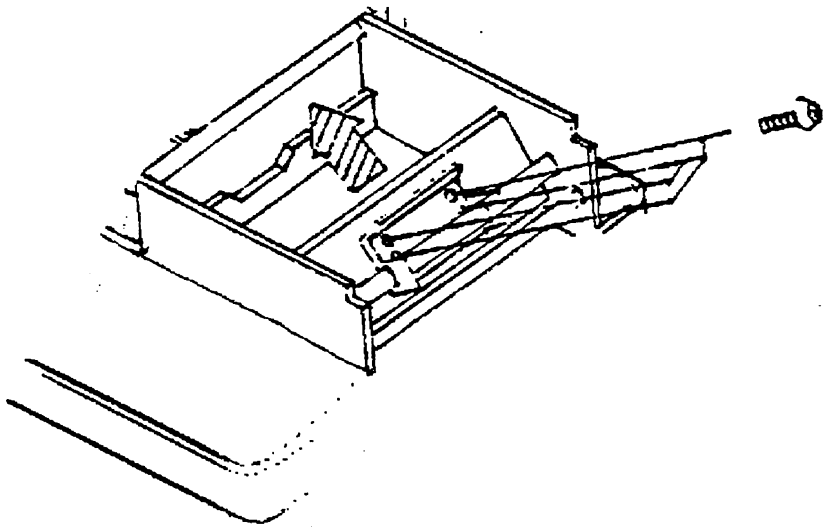
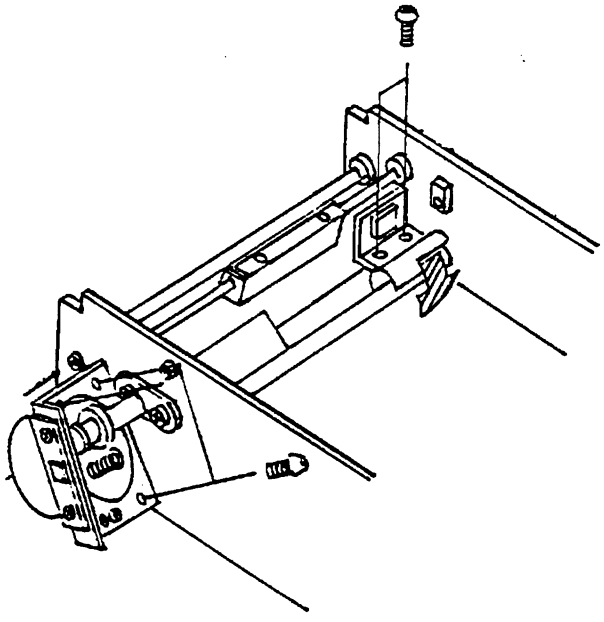
7-4 Disassembling the Thermal Head Assy



7-5 Disassembling the Mark Detection Unit, Motor Assy



Section 8 ELECTRICAL PARTS LIST

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
ECG8830A				
ECG8830A		332187	1	CN AC INLET
ECG8830A	CNA001	332507D	1	CORD AC INLET CABLE
ECG8830A	CNA002	339732C	1	CORD BATTERY CABLE (BATTERY SIDE)
ECG8830A	CNA003	331936A	1	CNA M63-03-0000SA L=200
ECG8830A	CNA004	331954C	1	CNA CONTROL BD CABLE
ECG8830A	CNA009	331945A	1	CNA M63-02-0000SA L=300
ECG8830A	CNP001	156671	1	CN 1-480700-0 (3P)
ECG8830A	CNP002	339679	1	CN ELR-04V
ECG8830A	F001	338867	2	FUSE 239002 2A (UL/CSA)
ECG8830A	F002	313831	1	FUSE 21806.3 (6.3A)
ECG8830A	SP001	332383	1	SP EAS-45P106S
ECG8830A	TF001	331277E	1	PT C-001
ECG8830A	TR001	001223	1	TR 2SC1345-D
UT-2283 CONTROL BOARD				
UT-2283		339688	1	CN ICSOCKET IC26-4006-GS4 (40PIN)
UT-2283	AR0101-AR0106	341328	6	TUBE ARRESTOR 3YVJ-90P1
UT-2283	CNJ111	331794	1	PCN LX-28P-DT1-P1
UT-2283	CNJ123	331785	1	PCN LX-26P-DT1-P1
UT-2283	CNJ131	262912	1	PCN LX-24P-DT1-P1
UT-2283	CNJ132	331571	1	PCN DX-10A-20S
UT-2283	CNJ143	270351	1	CN DALC-J15SAF-10L6
UT-2283	CNJ634	090206	1	PCN M60-02-30-114P (10P STRAIGHT)
UT-2283	CNJ741	089672	1	PCN M60-06-30-114P (6P STRAIGHT)
UT-2283	CNJ819	090215	1	PCN M60-04-30-114P (4P STRAIGHT)
UT-2283	CNJ921	344209	1	PCN B11B-PH-K-S
UT-2283	C0101	249286	1	CEC UML212CH 221J-T 220pF
UT-2283	C0102-C0105	249366	4	CEC UML212F104Z-T 50V 0.1μF
UT-2283	C0106-C0110	249286	5	CEC UML212CH 221J-T 220pF
UT-2283	C0111-C0112	249366	2	CEC UML212F104Z-T 50V 0.1μF
UT-2283	C0113-C0114	249286	2	CEC UML212CH 221J-T 220pF
UT-2283	C0115-C0120	330973	6	CEC UML212B472K-T 4700pF
UT-2283	C0121-C0124	249366	5	CEC UML212F104Z-T 50V 0.1μF
UT-2283	C0201-C0204	249366	5	CEC UML212F104Z-T 50V 0.1μF
UT-2283	C0205	330982	1	CEC UML212CH470J-T 47pF

ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2283	C0206	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0208	330982	1	CEC	UML212CH470J-T 47pF
UT-2283	C0209	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0210	330982	1	CEC	UML212CH470J-T 47pF
UT-2283	C0211	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0213	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0214	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0215	341444	1	TAC	ECST1CV336R 16V 33μF
UT-2283	C0216	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C0217-C0219	249366	3	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0220	249312	1	CEC	UML212CH 100D-T 10pF
UT-2283	C0221	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0223	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0225	330982	1	CEC	UML212CH470J-T 47pF
UT-2283	C0226-C229	249366	4	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0301	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0401	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C0402	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0403	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C0404-C0405	330982	2	CEC	UML212CH470J-T 47pF
UT-2283	C0406	331197	1	FLC	ECW-U1H332JA5 50V 0.0033μF
UT-2283	C0407	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0408	339599	1	TAC	ECST1VD106R 35V 10μF
UT-2283	C0409	330509	1	EC	URS1V471MNA 35V 470μF
UT-2283	C0410-C0420	249366	11	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0421	341444	1	TAC	ECST1CV336R 16V 33μF
UT-2283	C0422	331134	1	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0423-C0424	330982	2	CEC	UML212CH470J-T 47pF
UT-2283	C0425	339599	1	TAC	ECST1VD106R 35V 10μF
UT-2283	C0426	330492	1	EC	URS1E471MPA 25V 470μF
UT-2283	C0427-C0434	249366	8	TAC	ECST1VD106R 35V 10μF
UT-2283	C0436	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C0437	331134	1	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0438	331197	1	FLC	ECW-U1H332JA5 50V 0.0033μF
UT-2283	C0440	341444	1	TAC	ECST1CV336R 16V 33μF
UT-2283	C0441	339599	1	TAC	ECST1VD106R 35V 10μF
UT-2283	C0442	330492	1	EC	URS1E471MPA 25V 470μF
UT-2283	C0443-C0446	249366	4	CEC	UML212F104Z-T 50V 0.1μF

ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2283	C0447	330982	1	CEC	UML212CH470J-T 47pF
UT-2283	C0448	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C0449	330982	1	CEC	UML212CH470J-T 47pF
UT-2283	C0501-C0503	341435	3	CEC	GRM42-6F105Z16 1μF
UT-2283	C0504-C0509	249366	6	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0510	249312	1	CEC	UML212CH 100D-T 10pF
UT-2283	C0511-C0513	331134	3	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0514	331107	1	FLC	ECW-U1H223JA5 50V 0.022μF
UT-2283	C0515	341435	1	CEC	GRM42-6F105Z16 1μF
UT-2283	C0516	249312	1	CEC	UML212CH 100D-T 10pF
UT-2283	C0517	243202	1	FLC	ECQ-P1472JZ 0.0047U
UT-2283	C0518	341435	1	CEC	GRM42-6F105Z16 1μF
UT-2283	C0519	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0520-C0521	331134	2	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0522	243202	1	FLC	ECQ-P1472JZ 0.0047U
UT-2283	C0523	331107	1	FLC	ECW-U1H223JA5 50V 0.022μF
UT-2283	C0524	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0525	243202	1	FLC	ECQ-P1472JZ 0.0047U
UT-2283	C0526-C0527	341435	2	CEC	GRM42-6F105Z16 1μF
UT-2283	C0528-C0530	331134	3	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0601-C0602	341444	2	TAC	ECST1CV336R 16V 33μF
UT-2283	C0603-C0604	339616	2	FLC	ECW-U1C104JA5 16V 0.1μF
UT-2283	C0605	331179	1	FLC	ECW-U1H472JA5 50V 0.0047μF
UT-2283	C0701	311156	1	CEC	UML212CH331J-T 50V 330pF
UT-2283	C0702	331072	1	FLC	ECW-U1H102JA5 50V 0.001μF
UT-2283	C0703	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0704	339599	1	TAC	ECST1VD106R 35V 10μF
UT-2283	C0705	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0706	341435	1	CEC	GRM42-6F105Z16 1μF
UT-2283	C0707	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0708	341435	1	CEC	GRM42-6F105Z16 1μF
UT-2283	C0709	341444	1	TAC	ECST1CV336R 16V 33μF
UT-2283	C0710	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0711	331197	1	FLC	ECW-U1H332JA5 50V 0.0033μF
UT-2283	C0712	339607	1	FLC	ECW-U1H222JA5 50V 0.0022μF
UT-2283	C0713	339616	1	FLC	ECW-U1C104JA5 16V 0.1μF
UT-2283	C0714	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0715	341435	1	CEC	GRM42-6F105Z16 1μF

ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2283	C0716	339599	1	TAC	ECST1VD106R 35V 10μF
UT-2283	C0717	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0718	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0801	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0802	339607	1	FLC	ECW-U1H222JA5 50V 0.0022μF
UT-2283	C0803	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0804	339616	1	FLC	ECW-U1C104JA5 16V 0.1μF
UT-2283	C0805	331134	1	FLC	ECW-U1H103JA5 50V 0.01μF
UT-2283	C0806	249366	1	CEC	UML212F104Z-T 50V 0.1μF
UT-2283	C0807	331072	1	FLC	ECW-U1H102JA5 50V 0.001μF
UT-2283	C0808	249339	1	CEC	UML212CH471J-T 470pF
UT-2283	C0901	331107	1	FLC	ECW-U1H223JA5 50V 0.022μF
UT-2283	C0902	341471	1	FLC	ECW-U1H473JA5 50V 0.047μF
UT-2283	C0903	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C0904	341462	1	FLC	ECW-U1H333JA5 50V 0.033μF
UT-2283	C1101-C1102	249312	2	CEC	UML212CH 100D-T 10pF
UT-2283	C1201	330518	1	EC	ECEA1HSS470 50V 47μF
UT-2283	C1202-C1203	244121	2	EC	UVS1C101MCA 16V 100μF
UT-2283	C1204	249598	1	TAC	267M1602 106K/ML 16V 10μF
UT-2283	C1205	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C1301	244121	1	EC	UVS1C101MCA 16V 100μF
UT-2283	C1401	341435	1	CEC	GRM42-6F105Z16 1μF
UT-2283	C1601-C1602	330964	2	CEC	UML212CH330J-T 33pF
UT-2283	D0101	190954	1	D	1SS272 TE85L
UT-2283	D0201	328575	1	ZD	HZM5.1NB2 TR 5V
UT-2283	D0202	341088	1	ZD	HZK7BL TR
UT-2283	D0203	190954	1	D	1SS272 TE85L
UT-2283	D0205	341079	1	ZD	HZK3CLL TR
UT-2283	D0206-D0207	190954	2	D	1SS272 TE85L
UT-2283	D0401-D0402	190954	2	D	1SS272 TE85L
UT-2283	D0404	341061	1	D	MA701A TX
UT-2283	D0405	190954	1	D	1SS272 TE85L
UT-2283	D0406-D0407	341061	2	D	MA701A TX
UT-2283	D0409-D0411	190954	3	D	1SS272 TE85L
UT-2283	D0412	341061	1	D	MA701A TX
UT-2283	D0501	190954	1	D	1SS272 TE85L
UT-2283	D0503	190954	1	D	1SS272 TE85L
UT-2283	D0505	190954	1	D	1SS272 TE85L

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2283	D0601	190954	1	D 1SS272 TE85L
UT-2283	D0701-D0702	341061	2	D MA701A TX
UT-2283	D0801	190954	1	D 1SS272 TE85L
UT-2283	D0901	190954	1	D 1SS272 TE85L
UT-2283	D1301-D1304	328619	3	ZD RD27P T1
UT-2283	D1305	190954	1	D 1SS272 TE85L
UT-2283	FIL031	331393	1	NFLT NFM41R00C470T1
UT-2283	FIL111-FIL112	331393	2	NFLT NFM41R00C470T1
UT-2283	FIL161-FIL162	331393	2	NFLT NFM41R00C470T1
UT-2283	L0101	251595	1	NFLT BLM32A06PT
UT-2283	L0201-L0202	339643	2	COIL LEM3225B470K 47μH
UT-2283	L0301-L0302	341489	1	NFLT BLM21A05PT
UT-2283	L0401-L0403	339643	2	COIL LEM3225B470K 47μH
UT-2283	L0701	339634	1	COIL LEM4532B221K 220μH
UT-2283	PC0401	193434	1	PTR TLP621-1
UT-2283	Q0201	328726	1	TR RN1403 TE85R
UT-2283	Q0202	193202	1	TR 2SA1298 TE85L
UT-2283	Q0401	328744	1	TR 2SC4409 TR
UT-2283	Q0402	328735	1	TR 2SA1681 TE12L
UT-2283	Q0501-Q0502	328717	2	TR FMG2-T98
UT-2283	Q0601	328708	1	TR 2SA1122-D OR E
UT-2283	Q0701	328735	1	TR 2SA1681 TE12L
UT-2283	Q0801	193274	1	TR RN1404 TE85L
UT-2283	Q0802	328708	1	TR 2SA1122-D OR E
UT-2283	Q1301-Q1302	328717	2	TR FMG2-T98
UT-2283	RM0101-RM0102	230002	2	RM CMR017-10K OHM
UT-2283	SW1	341551	1	SW KSS08S
UT-2283	SW2-SW7	331464	6	SW WCDF803KS
UT-2283	SW8	341542	1	SW KHS04
UT-2283	T0401-T0402	251399	2	TF T-2657000113 (ECG-8000)
UT-2283	T0450	331312	1	TF T-B001A
UT-2283	U0101-U0103	328798	3	OPIC EHD-SX454A
UT-2283	U0104	201203	1	OPIC MC34002AM
UT-2283	U0105	206876	1	CMOS DG508ACWE
UT-2283	U0201	201203	1	OPIC MC34002AM
UT-2283	U0202	201667	1	IC 2995-010A
UT-2283	U0203	206902	1	CMOS TC74HC04AF
UT-2283	U0204	201203	1	OPIC MC34002AM

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2283	U0205	329502	1	CMOS AD7543KCWE
UT-2283	U0206	201203	1	OPIC MC34002AM
UT-2283	U0208	206769	1	CMOS TC4053BF
UT-2283	U0209	201203	1	OPIC MC34002AM
UT-2283	U0210	201676	1	IC 2995-011A
UT-2283	U0211	329003	1	OPIC OPA27GU
UT-2283	U0213	329057	1	CMOS AD7820KCWP
UT-2283	U0220	206885	1	CMOS TC74HC595AF
UT-2283	U0231	201373	1	IC LM385BM-1.2
UT-2283	U0301	196369	1	CMOS TC74HC132AF
UT-2283	U0303	207607	1	IC 2996-001B
UT-2283	U0307	206653	1	CPU HD63B03RF
UT-2283	U0308	329476	1	RAM TC55257BFL-85
UT-2283	U0309	329494	1	IC 2997-002A
UT-2283	U0401	201346	1	REG TA78L05F TE12L
UT-2283	U0402	329164	1	REG AN79L08M-E2
UT-2283	U0403	206733	1	CMOS TC74HC14AF
UT-2283	U0451	201337	1	REG TA78L08F TE12L
UT-2283	U0501	196342	1	CMOS TC74HC08AF
UT-2283	U0502	329547	1	CMOS TC74HC74AF
UT-2283	U0505	201203	1	OPIC MC34002AM
UT-2283	U0506	201301	1	OPIC NJM311M
UT-2283	U0507	329128	1	IC LF398S8
UT-2283	U0509-U0510	201203	2	OPIC MC34002AM
UT-2283	U0511	201391	1	REG NJM431U TE1
UT-2283	U0512	329502	1	CMOS AD7543KCWE
UT-2283	U0513	329012	1	OPIC NJM072M
UT-2283	U0515	206769	1	CMOS TC4053BF
UT-2283	U0517	201203	1	OPIC MC34002AM
UT-2283	U0601	328985	1	OPIC LM386M-1 M08A
UT-2283	U0701	328994	1	OPIC MC33172M
UT-2283	U0705	199785	1	CMOS TC4052BF
UT-2283	U0728	329155	1	IC TA8443F
UT-2283	U0801	201203	1	OPIC MC34002AM
UT-2283	U0802	201346	1	REG TA78L05F TE12L
UT-2283	U0804	200044	1	CMOS TC74HC4538F OR AF
UT-2283	U1101	329458	1	IC EID-C014
UT-2283	U1201	329431	1	CMOS TC74HC05AF

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2283	U1403	329137	1	IC M51953BFP
UT-2283	U1404	329342	1	CPU MC68HC000FC16
UT-2283	U1501-U1504	329467	4	RAM TC514256AJ-80
UT-2283	U1601	329476	1	RAM TC55257BFL-85
UT-2283	U1602	329449	1	IC EID-R007
UT-2283	U1604	206992	1	CMOS TC7S04F TE85L
UT-2283	VR0601	330349	1	VR G4B 10K OHM
UT-2283	X0301	332418	1	XTAL SG-615 8.192M HZ
UT-2283	X1101	332409	1	XTAL MA-505 32.000M HZ
UT-2283	X1601	332392	1	XTAL MA-505 18.432M HZ

UT-2284 OPERATION BOARD

UT-2284	CNA101	331963B	1	CNA OPERATION BOARD CABLE
UT-2284	C101	249598	1	TAC 267M1602 106K/ML 16V 10μF
UT-2284	C102	249366	1	CEC UML212F104Z-T 50V 0.1μF
UT-2284	C103-C104	311085	2	CEC UML212CH220J-T 22pF
UT-2284	C105-C106	330991	2	CEC UML212CH300J-T 30pF
UT-2284	C107	249366	1	CEC UML212F104Z-T 50V 0.1μF
UT-2284	D101-D109	190009	9	LED PG5785X
UT-2284	IC101	329369	1	CPU UPD75P308GF-3B9
UT-2284	IC102	206804	1	CMOS MC74HC138F OR AF
UT-2284	IC103	329485	1	IC M66311FP
UT-2284	LCD01	332302	1	DISP LT-5728M-35S
UT-2284	X101	277041	1	XTAL CSAC4.19MGC040-TC
UT-2284	X102	022931A	1	XTAL KF-38G 32.768KHZ

UT-2285 POWER BOARD

UT-2285	CNJ133	339759A	1	CORD AC POWER CABLR (BD SIDE)
UT-2285	CNJ143	339741C	1	CORD BATTERY CABLE (BD SIDE)
UT-2285	CNJ160	339768A	1	CORD TH SESOR CABLE (BD SIDE)
UT-2285	CNJ321	345128	1	PCN B4B-PH-K-S (4P)
UT-2285	CNJ425	331785	1	PCN LX-26P-DT1-P1

ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2285	C0101	248019	1	CEC	DD18-B103K500 500V 0.01μF
UT-2285	C0102	330385	1	FLC	ECQB1104JF 100V 0.1μF
UT-2285	C0103	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0104	248019	1	CEC	DD18-B103K500 500V 0.01μF
UT-2285	C0105	330385	1	FLC	ECQB1104JF 100V 0.1μF
UT-2285	C0106	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0107	243933	1	EC	ECEA1VSS471 35V 470μF
UT-2285	C0108-C0109	339581	2	EC	UVX1V472MRA 35V 4700μF
UT-2285	C0110	243933	1	EC	ECEA1VSS471 35V 470μF
UT-2285	C0201-C0202	246877	2	TAC	ECSF1VE105BB 35V 1μF
UT-2285	C0203-C0205	248545	3	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0206	245094	1	EC	UVX1H100MAA 50V 10μF
UT-2285	C0207-C0208	246886	2	TAC	ECSF1EE106BB 25V 10μF
UT-2285	C0209-C0210	248545	2	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0211	245566	1	EC	UVX1H470MPA1TD 50V 47μF
UT-2285	C0212-C0213	248545	2	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0214	245521	1	EC	UVX1H010MAA1TD 50V 1μF
UT-2285	C0301	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0302	310308	1	FLC	ECQ-B1H102JZ3 50V 0.001μF
UT-2285	C0303	330563	1	EC	LGK1H153MHSC
UT-2285	C0304	044872	1	FLC	ECQ-V1H105JZ 50V 1μF
UT-2285	C0305	246886	1	TAC	ECSF1EE106BB 25V 10μF
UT-2285	C0306	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0307	071343	1	CEC	DD05-989B471K500 500V 470pF
UT-2285	C0308	245566	1	EC	UVX1H470MPA1TD 50V 47μF
UT-2285	C0309	330572	1	EC	ECOS1HP682BB
UT-2285	C0310	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0401-C0402	245512	2	EC	UVX1C101MPA1TD 16V 100μF
UT-2285	C0403	071343	1	CEC	DD05-989B471K500 500V 470pF
UT-2285	C0404	244335	1	EC	UVX1H010MAA 50V 1μF
UT-2285	C0405	245566	1	EC	UVX1H470MPA1TD 50V 47μF
UT-2285	C0406	248545	1	CEC	K104Z20Z5UF5TH5 50V 0.1μF
UT-2285	C0407	245708	1	EC	ECEA1CS222 16V 2200μF
UT-2285	C0408	244335	1	EC	UVX1H010MAA 50V 1μF
UT-2285	C0409	071325	1	CEC	DD05-989B221K500 500V 220pF
UT-2285	C0410	245512	1	EC	UVX1C101MPA1TD 16V 100μF
UT-2285	D0101-D0102	328414	2	ZD	05AZ13Z
UT-2285	D0103	189279	1	D	S1VB10

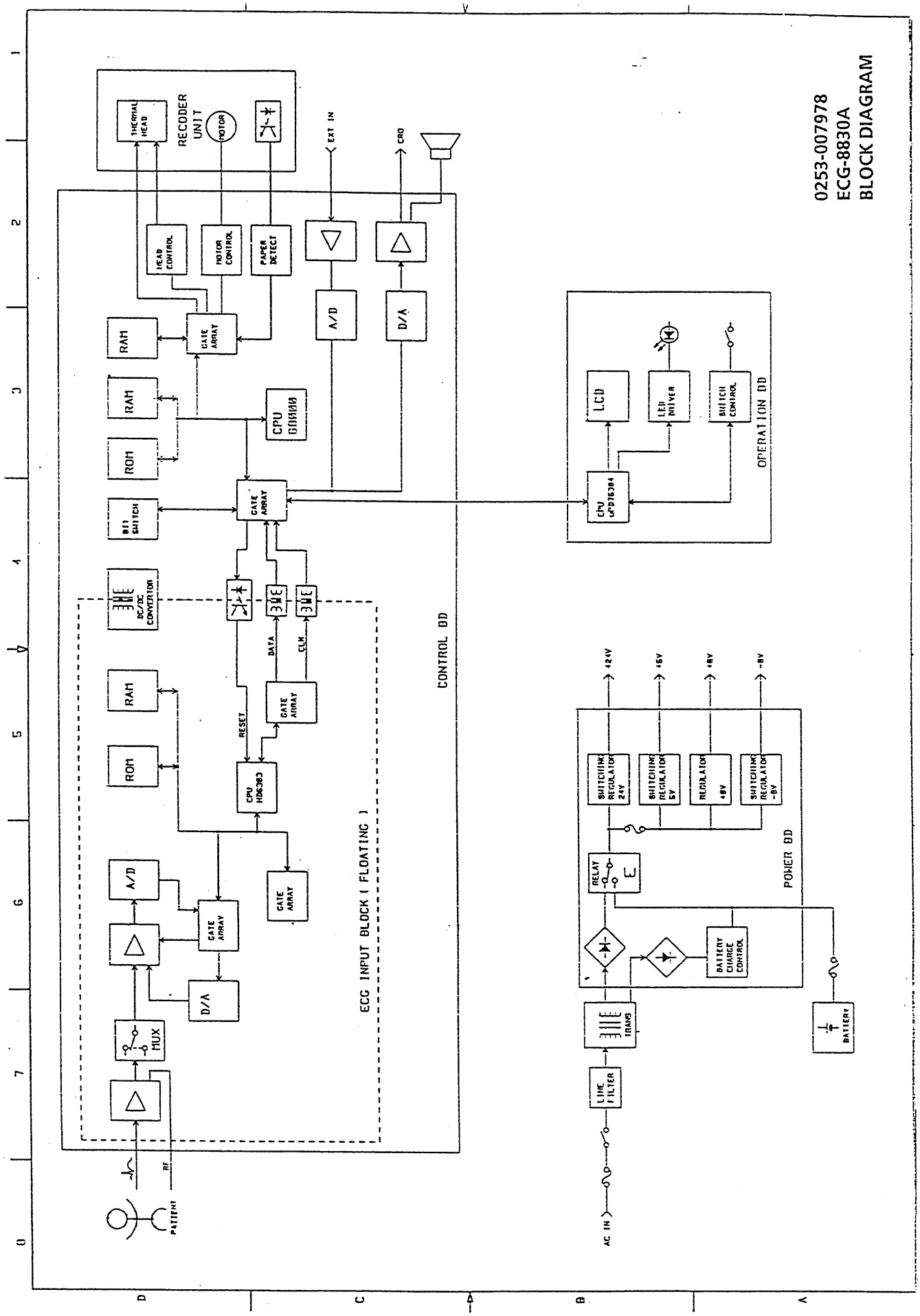
ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2285	D0104	189332	1	D	KBU8D
UT-2285	D0105-D0106	003979	2	D	EK03
UT-2285	D0201	003382	1	D	1S2076A
UT-2285	D0202	003979	1	D	EK03
UT-2285	D0203-D0207	003382	5	D	1S2076A
UT-2285	D0301	003382	1	D	1S2076A
UT-2285	D0302	328423	1	D	MA750/MA750A
UT-2285	D0401	003382	1	D	1S2076A
UT-2285	D0402	005246	1	ZD	HZ-6C2
UT-2285	D0403	189083	1	D	S3S3M
UT-2285	D0404	328432	1	D	D1NS4
UT-2285	D0405	003382	1	D	1S2076A
UT-2285	FH0401	332222	1	FUSE	FUSE HOLDER F-60A
UT-2285	F0401	274026	1	FUSE	218001 (1A)
UT-2285	L0301	251924	1	COIL	SKC-103
UT-2285	L0302	301693	1	BALL	AB3X2X3
UT-2285	L0401	331321	1	COIL	LAL02NA100K 0.1A 10μH
UT-2285	L0402-L0403	331348	2	COIL	SK-13BS-035-300
UT-2285	Q0101-Q0102	191178	2	TR	2SA1357Y
UT-2285	Q0103	192097	1	TR	2SC1345-D TZ
UT-2285	Q0104	191623	1	TR	2SB1018
UT-2285	Q0105	191294	1	TR	2SA1451 O-Y
UT-2285	Q0106	328691	1	TR	DTA114ES
UT-2285	Q0201	328682	1	TR	DT5C114E C5
UT-2285	Q0202	192097	1	TR	2SC1345-D TZ
UT-2285	Q0203	328691	1	TR	DTA114ES
UT-2285	Q0301	191356	1	TR	2SA836-D TZ
UT-2285	Q0302	328673	1	FET	SMP50N06-25
UT-2285	Q0303	328646	1	FET	2SJ113
UT-2285	Q0304	192097	1	TR	2SC1345-D TZ
UT-2285	Q0305	191356	1	TR	2SA836-D TZ
UT-2285	RM0201	214341	1	RM	M9-2-103J 10K OHM
UT-2285	RY0101	331508	1	RY	G6C-2114P-US 12V
UT-2285	RY0102	331491	1	RY	G6C-1114P-US 12V
UT-2285	R0107	329859	1	WR	ERF5TLK1R8 1.8 OHM 5W
UT-2285	R0314	329886	1	WR	ERF5TLJ151 150 OHM 5W
UT-2285	SCR041	328459	1	D	SF10G41A
UT-2285	U0113	328806	1	OPIC	EHD-SX407B

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2285	U0202	200614	1	CMOS TC74HC4538P OR AP
UT-2285	U0206	199446	1	CMOS TC74HC14AP
UT-2285	U0207	199099	1	CMOS TC74HC4075AP
UT-2285	U0209	162726	1	CMOS HD74HC02P
UT-2285	U0215	194977	1	REG NJM78L05A
UT-2285	U0216	328833	1	IC M51953BL
UT-2285	U0225	328842	1	IC MB3771 (DIP-8P-M01)
UT-2285	U0301	194086	1	IC TL594CN
UT-2285	U0401-U0402	195994	2	IC MC34063AP1/34063P1
UT-2285	U0413	195049	1	REG NJM2930-08
UT-2285	VR0101	062799	1	VR GF06P 5K OHM

WS-821D RECODER UNIT

WS-821D	CNA005	331909B	1	CNA THERMAL HEAD POWER CABLE
WS-821D	CNA006	331918A	1	CNA THERMAL HEAD SIGNAL CABLE
WS-821D	CNA007	331892B	1	CNA M63-06-0000SA L=200
WS-821D	CNA008	265081C	1	CNA M63-04-0028SA L=450
WS-821D	M101	332463	1	MOTR DC MOTOR LN30-00901-M100
WS-821D	PHC101-PHC102	190535	2	PTR NJL5161KA
WS-821D	SW101	253477	1	SW AH3242
WS-821D	S101	277531B	1	SENS FP-2R-02 (FRP05PF01AA)
WS-821D	TH101	366916	1	HEAD THERMAL HEAD KJT-216-8MGF1-NK

Section 9 CIRCUIT DIAGRAMS & PARTS LOCATION GUIDE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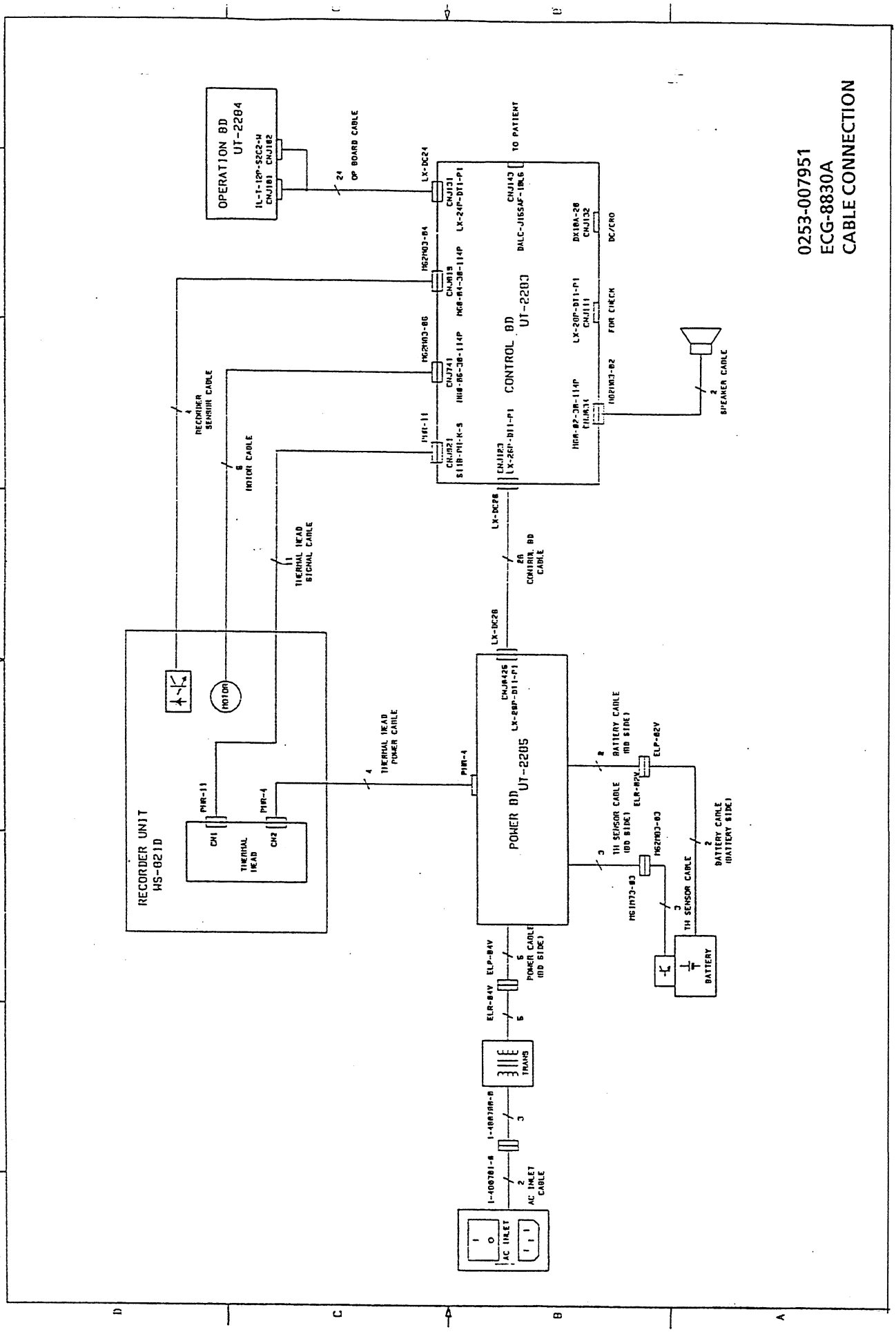
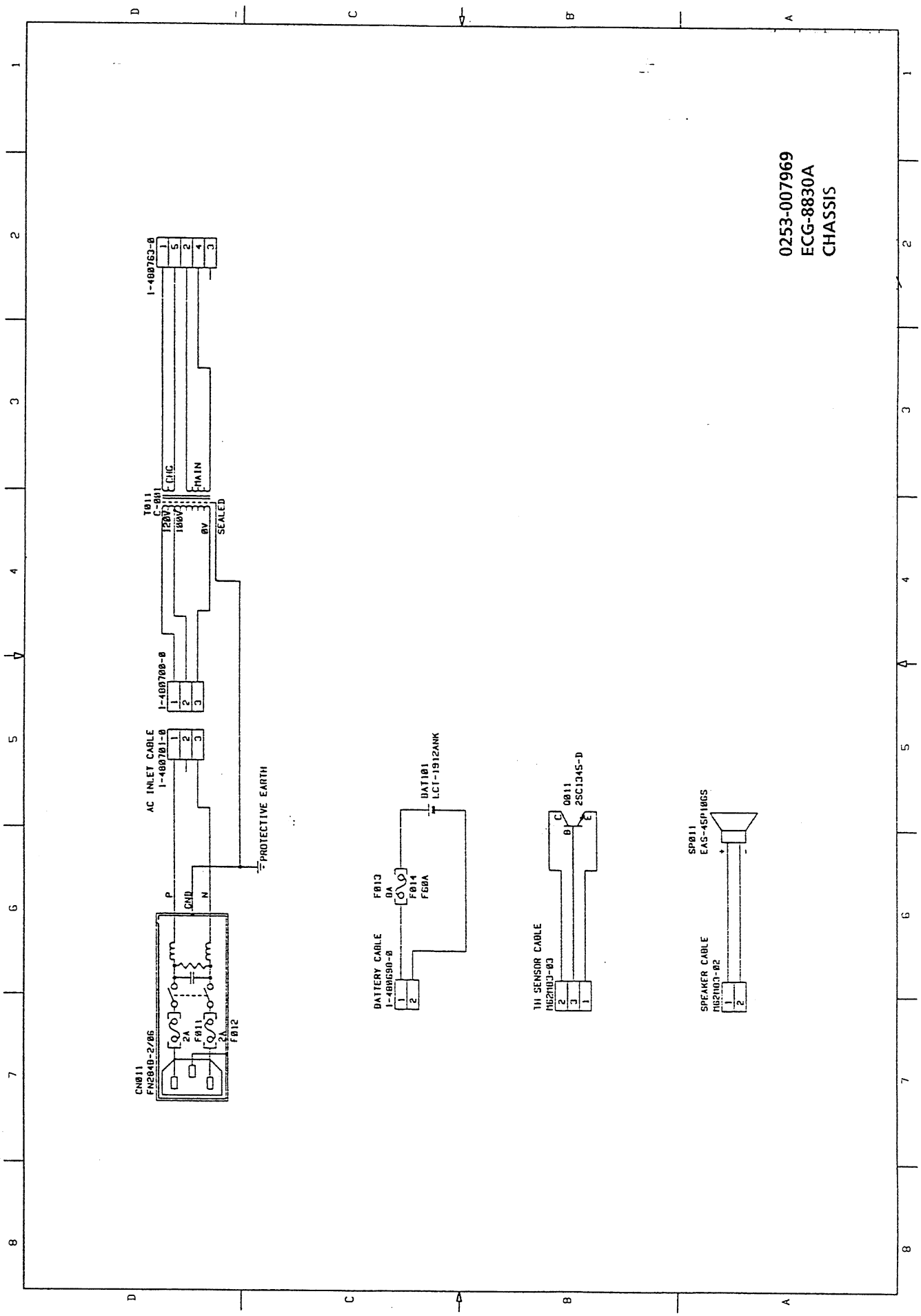
ECG-8830A
BLOCK DIAGRAM
RECODER UNIT
THERMAL HEAD
MOTOR
HEAD CONTROL
MOTOR CONTROL
PAPER DETECT
EXT IN
CRO
A/D
D/A
RAM
ROM
GATE ARRAY
CPU
BIT SWITCH
DC/DC CONVERTER
CONTROL BD
OPERATION BD
LCD
LED DRIVER
SWITCH CONTROL
CPU
RESET
DATA
CLK
ECG INPUT BLOCK (FLOATING)
MUX
PATIENT
RF
POWER BD
SWITCHING REGULATOR 24V
SWITCHING REGULATOR 5V
REGULATOR 18V
SWITCHING REGULATOR -8V
RELAY
BATTERY CHARGE CONTROL
TRANS
LINE FILTER
AC IN
BATTERY


0253-007951
ECG-8830A
CABLE CONNECTION
OPERATION BD
UT-2284
OP BOARD CABLE
CONTROL BD
UT-2283
TO PATIENT
RECORDER SENSOR CABLE
MOTOR CABLE
THERMAL HEAD SIGNAL CABLE
CONTROL BD CABLE
SPEAKER CABLE
RECORDER UNIT
WS-8210
THERMAL HEAD
THERMAL HEAD POWER CABLE
POWER BD
UT-2285
BATTERY CABLE (BD SIDE)
TH SENSOR CABLE (BD SIDE)
POWER CABLE (BD SIDE)
BATTERY CABLE (BATTERY SIDE)
TH SENSOR CABLE
BATTERY
TRANS
AC INLET
AC INLET CABLE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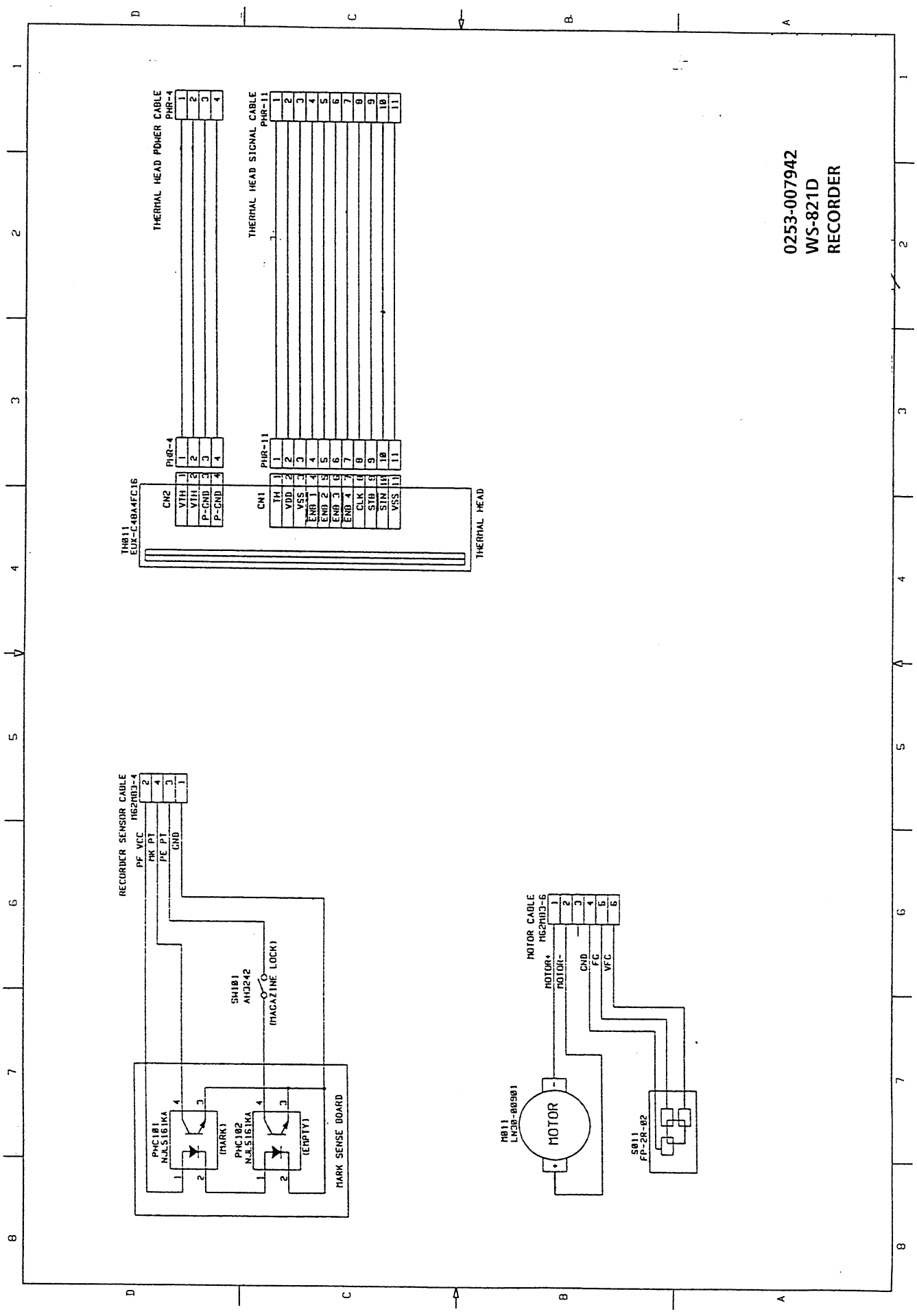
ECG-8830A
CHASSIS
I-400763-0
CHG
MAIN
T011
C-001
120V
100V
0V
SEALED
I-400700-0
AC INLET CABLE
I-400701-0
PROTECTIVE EARTH
P
GND
N
CN011
FN2040-2/06
F011
2A
F012
2A
F013
0A
F014
F60A
BATTERY CABLE
I-400690-0
BAT101
LCI-1912ANK
TH SENSOR CABLE
MG2103-03
Q011
2SC1345-D
SP011
EAS-45P10GS
SPEAKER CABLE
MG2103-02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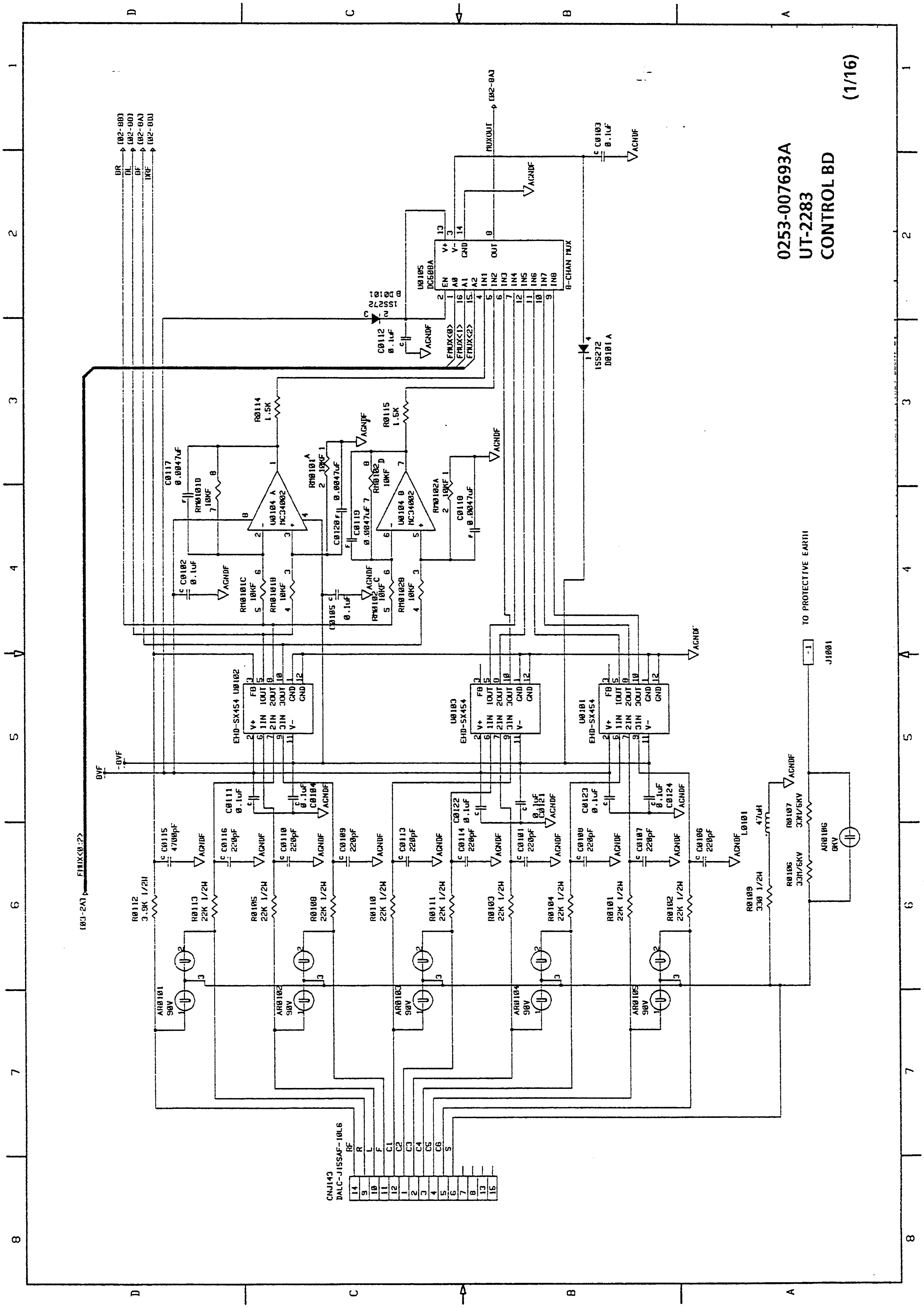
WS-821D
RECORDER
THERMAL HEAD POWER CABLE
PHR-4
THERMAL HEAD SIGNAL CABLE
PHR-11
CN2
CN1
TH811
EUX-C48A4FC16
THERMAL HEAD
RECORDER SENSOR CABLE
MG2H03-4
PF VCC
MK PT
PE PT
GND
SH101
AH3242
(MAGAZINE LOCK)
PHC101
NJL5161KA
(MARK)
PHC102
NJL5161KA
(EMPTY)
MARK SENSE BOARD
MOTOR CABLE
MG2H03-6
MOTOR+
MOTOR-
GND
FG
VFC
M811
LN30-00901
MOTOR
S811
FP-2R-02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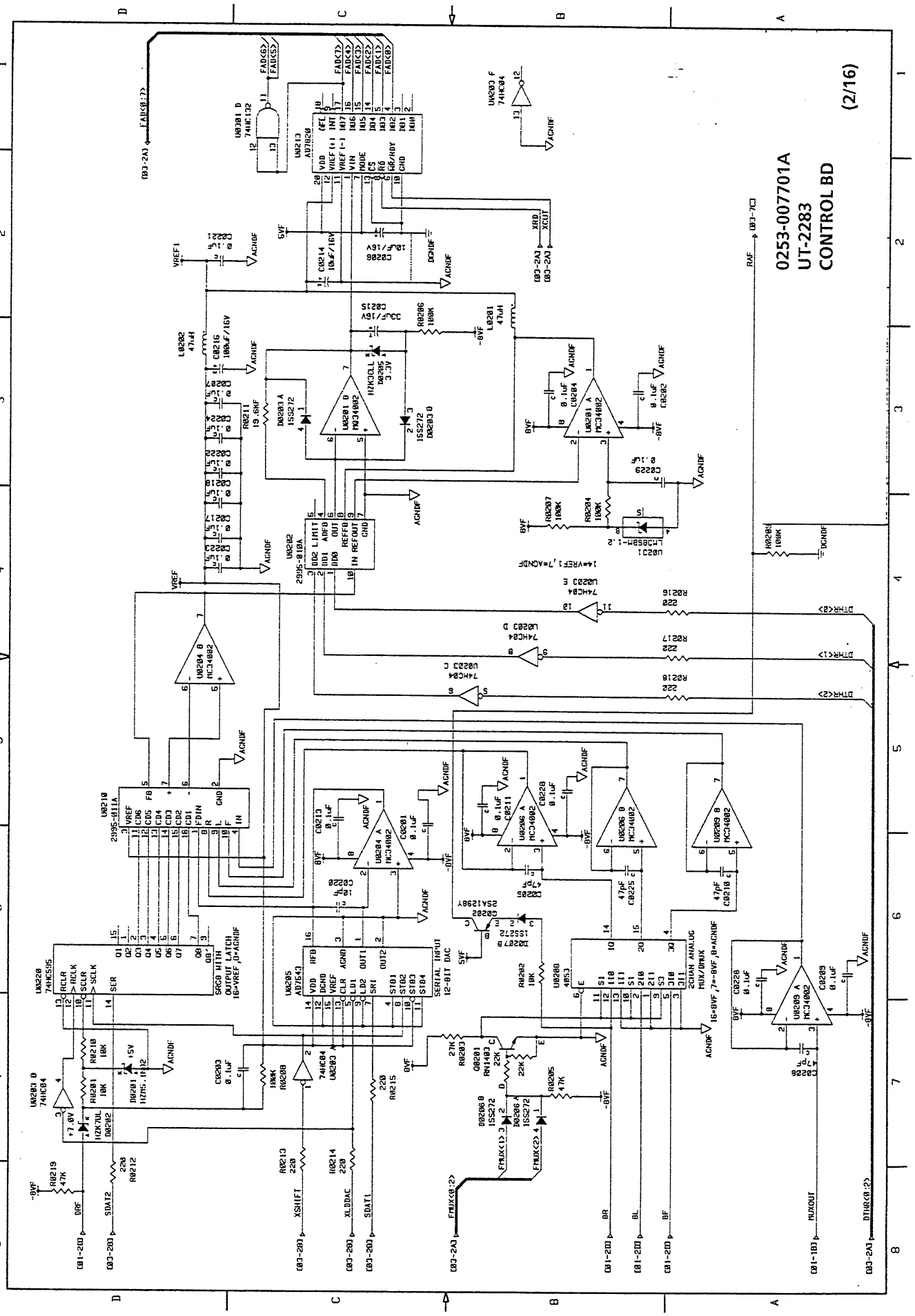
UT-2283
CONTROL BD
(1/16)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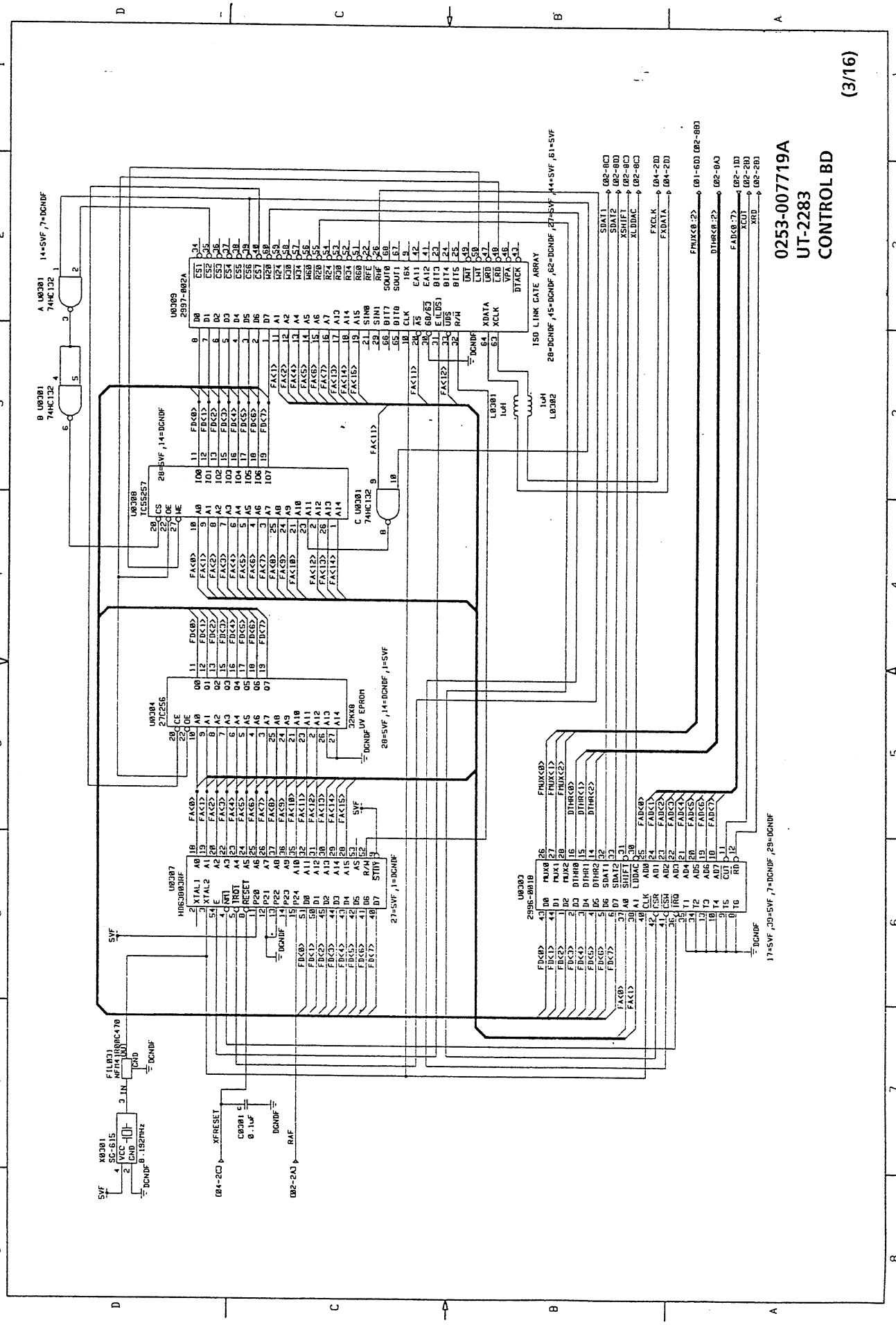
UT-2283
CONTROL BD
(2/16)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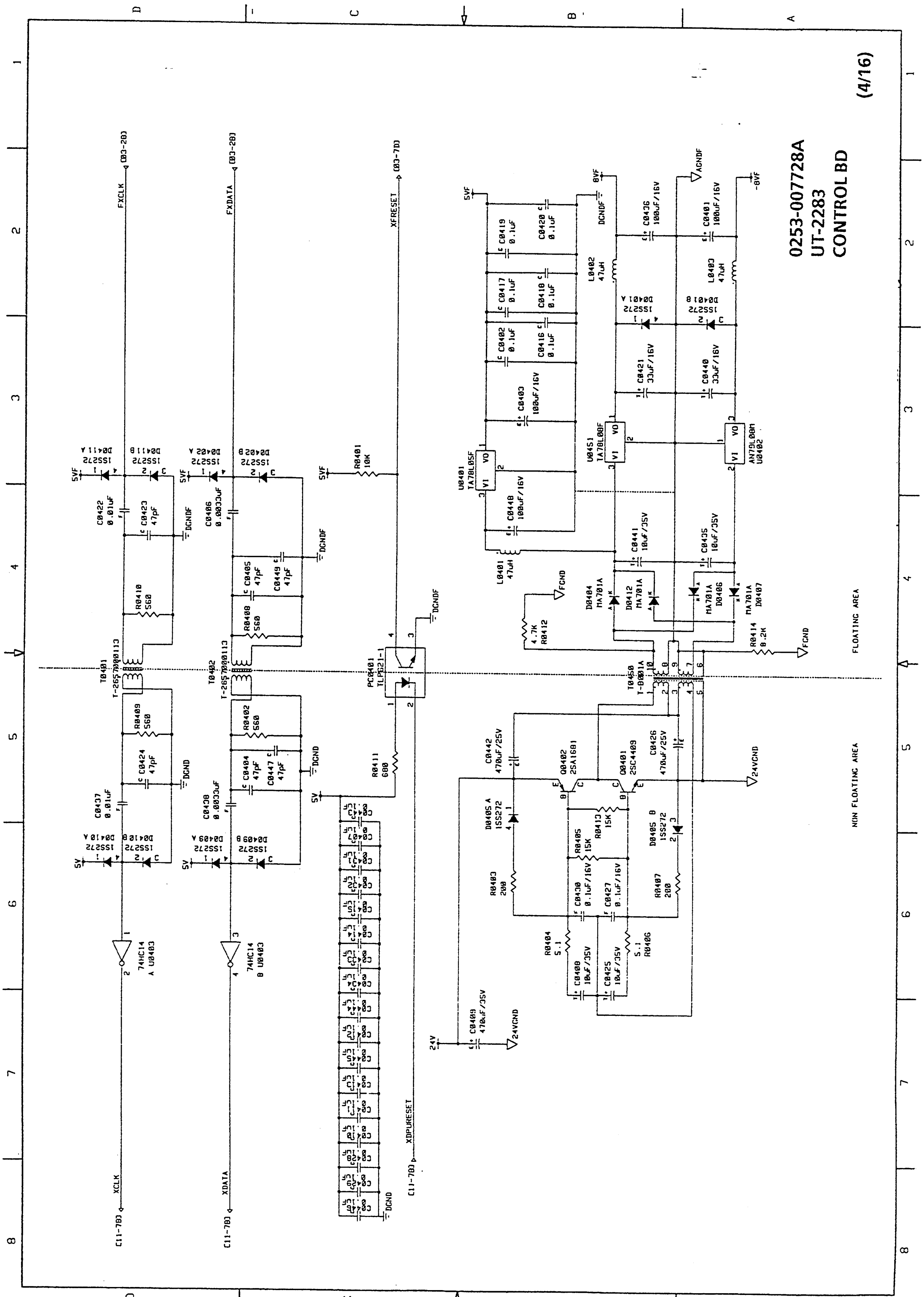
CONTROL BD
(3/16)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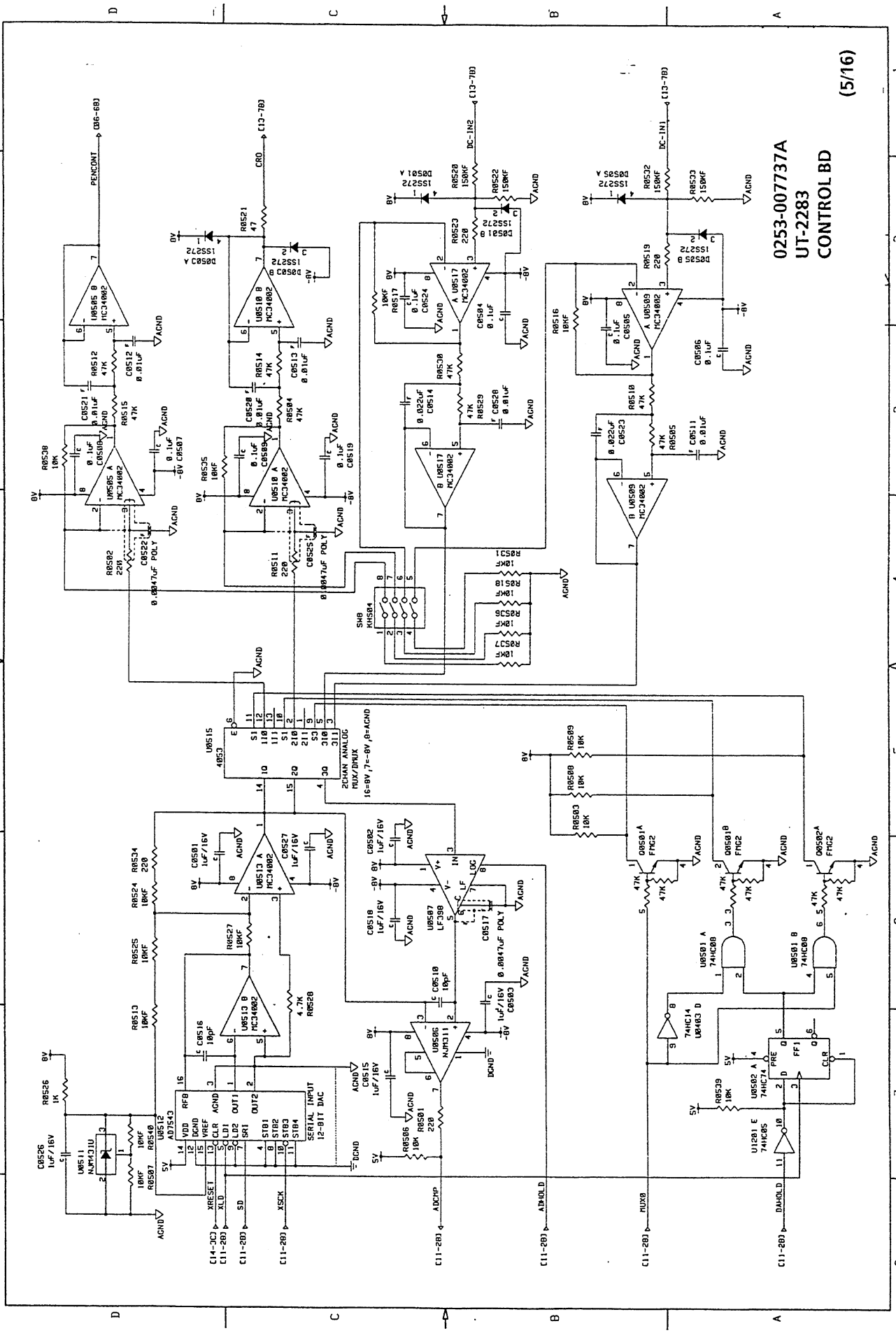
UT-2283
CONTROL BD
(4/16)
FLOATING AREA
NON FLOATING AREA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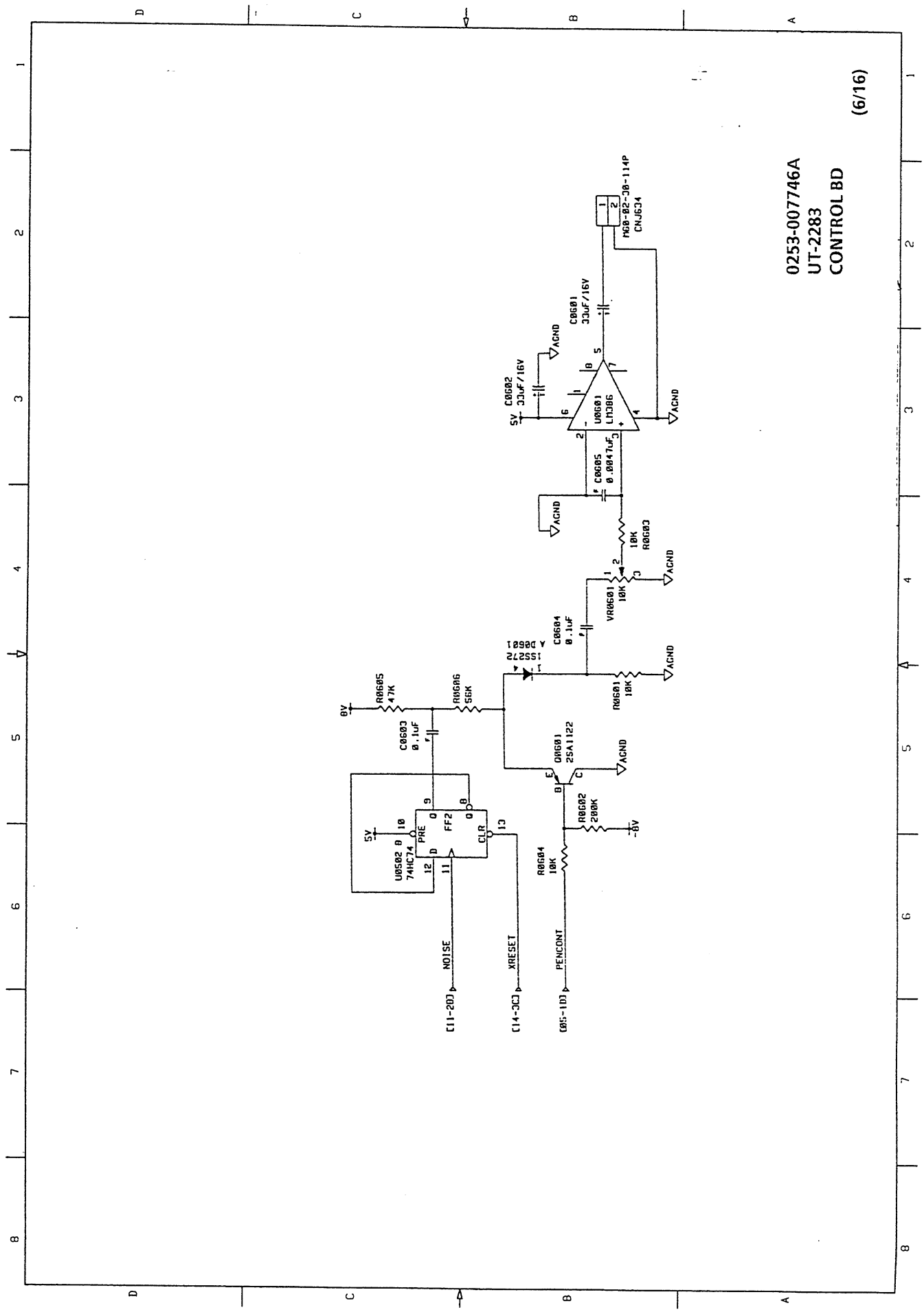
UT-2283
CONTROL BD
(5/16)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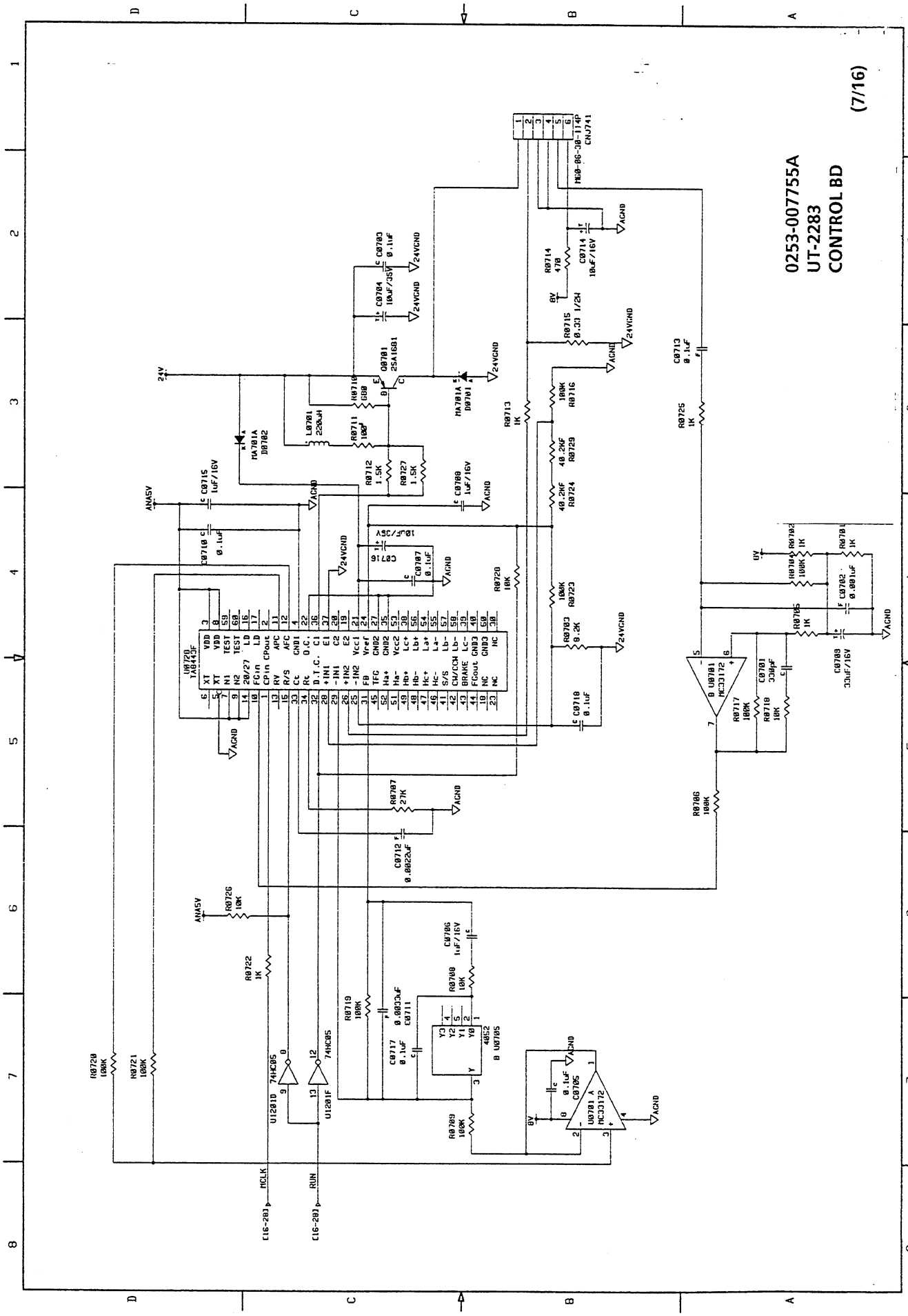
UT-2283
CONTROL BD
(6/16)
CNJ634
HG0-02-30-114P
C0601
33uF/16V
C0602
33uF/16V
5V
AGND
U0601
LM386
C0605
0.0047uF
R0603
10K
VR0601
10K
C0604
0.1uF
D0601
1SS272
R0605
47K
R0606
56K
8V
C0603
0.1uF
R0601
10K
Q0601
2SA1122
R0602
200K
-8V
R0604
10K
U0502 B
74HC74
PRE
FF2
CLR
NOISE
XRESET
PENCONT
[11-2D]
[14-3C]
[05-1D]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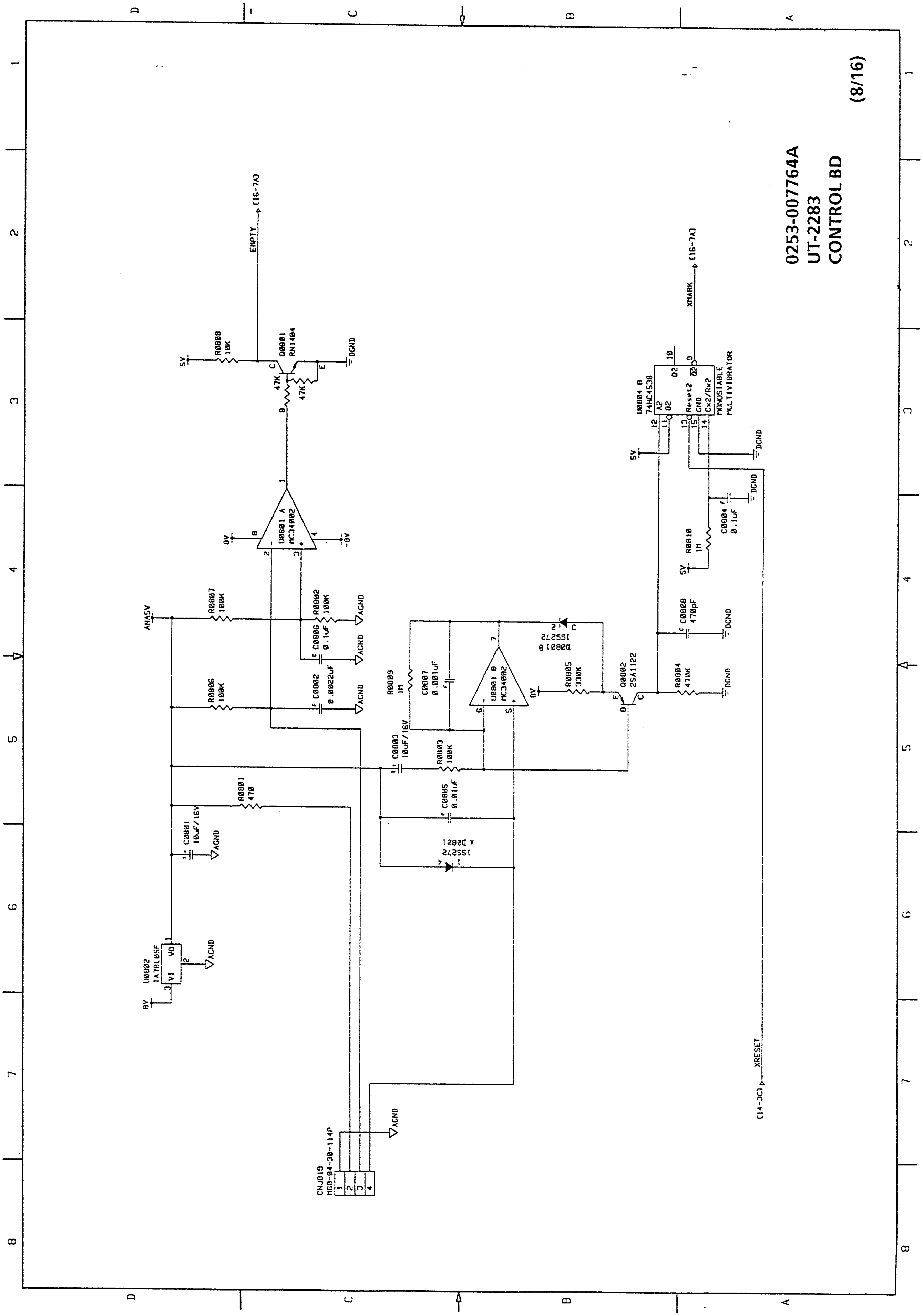
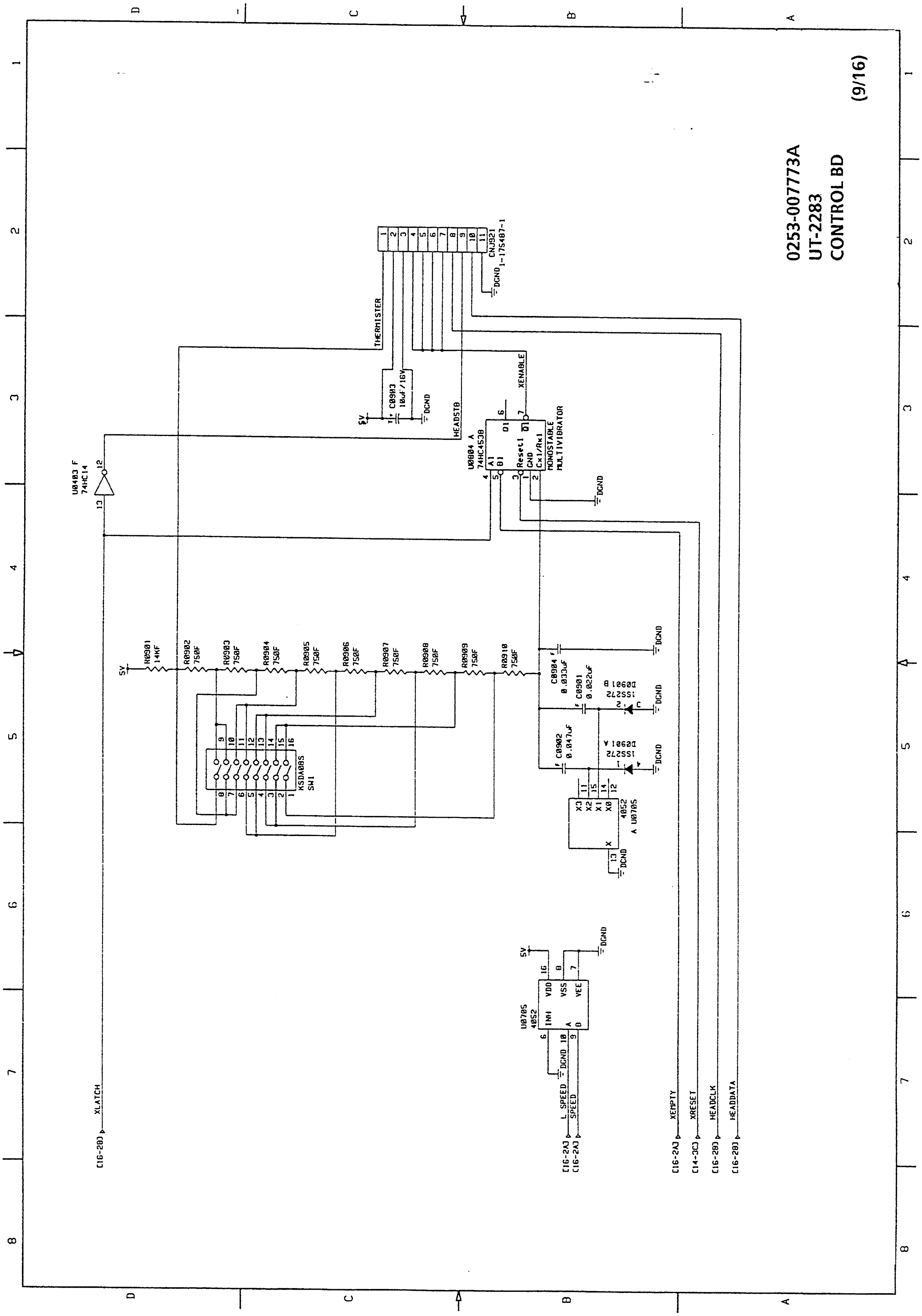
UT-2283
CONTROL BD
(7/16)


0253-007764A
UT-2283
CONTROL BD
(8/16)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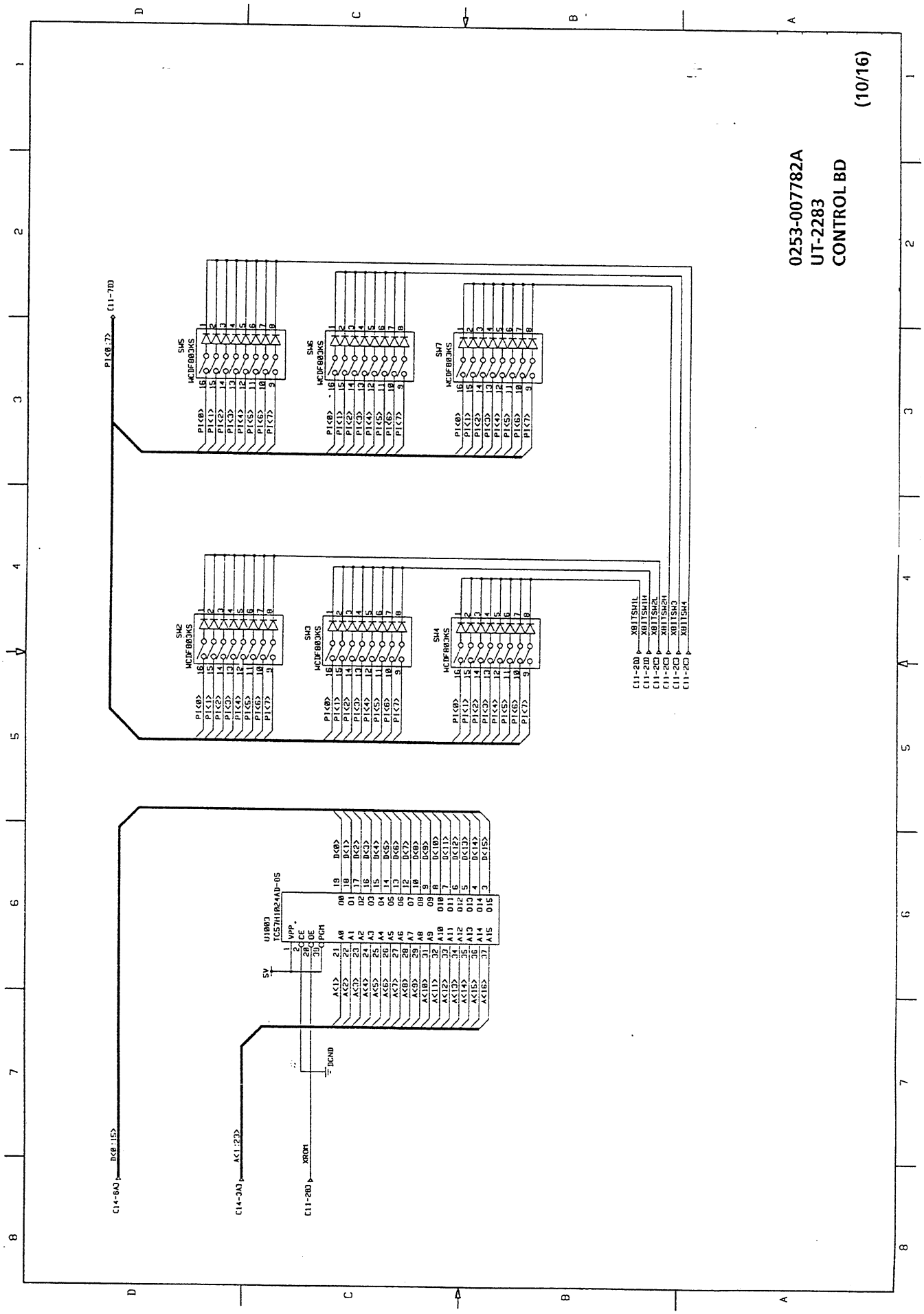
UT-2283
CONTROL BD
(9/16)
THERMISTER
XENABLE
HEADSTB
MONOSTABLE MULTIVIBRATOR
XLATCH
L_SPEED
SPEED
XEMPTY
XRESET
HEADCLK
HEADDATA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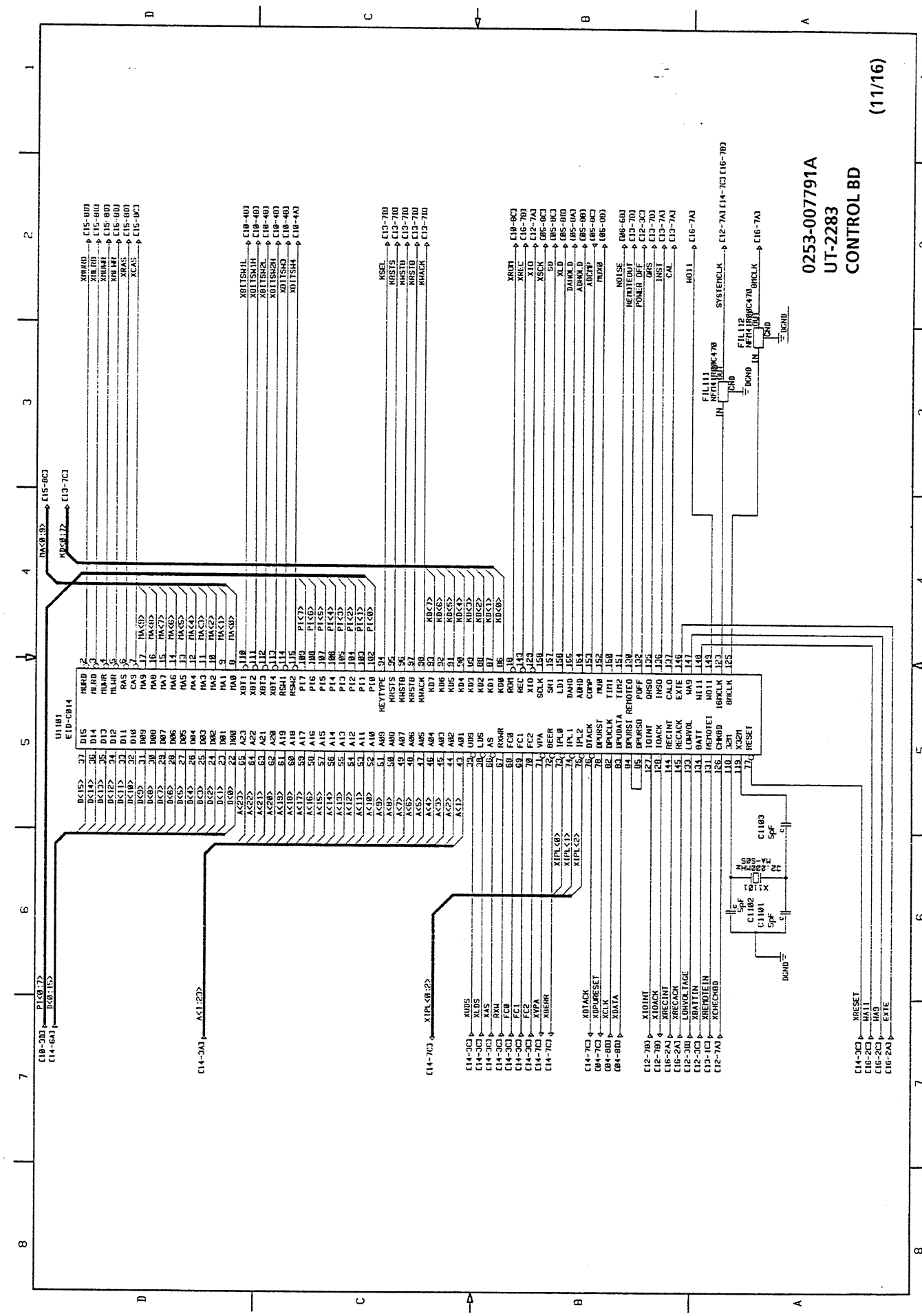
UT-2283
CONTROL BD
(10/16)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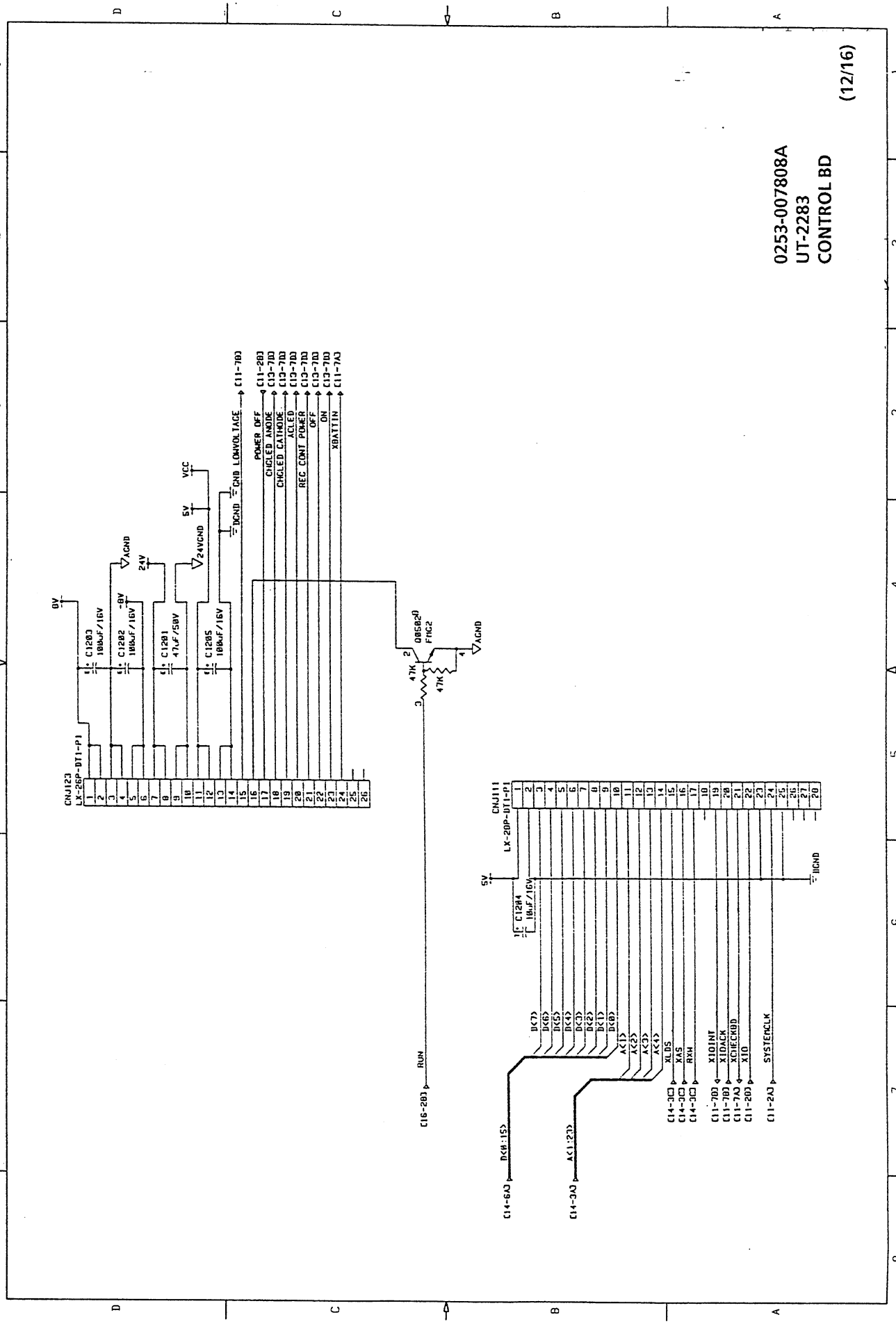
UT-2283
CONTROL BD
(11/16)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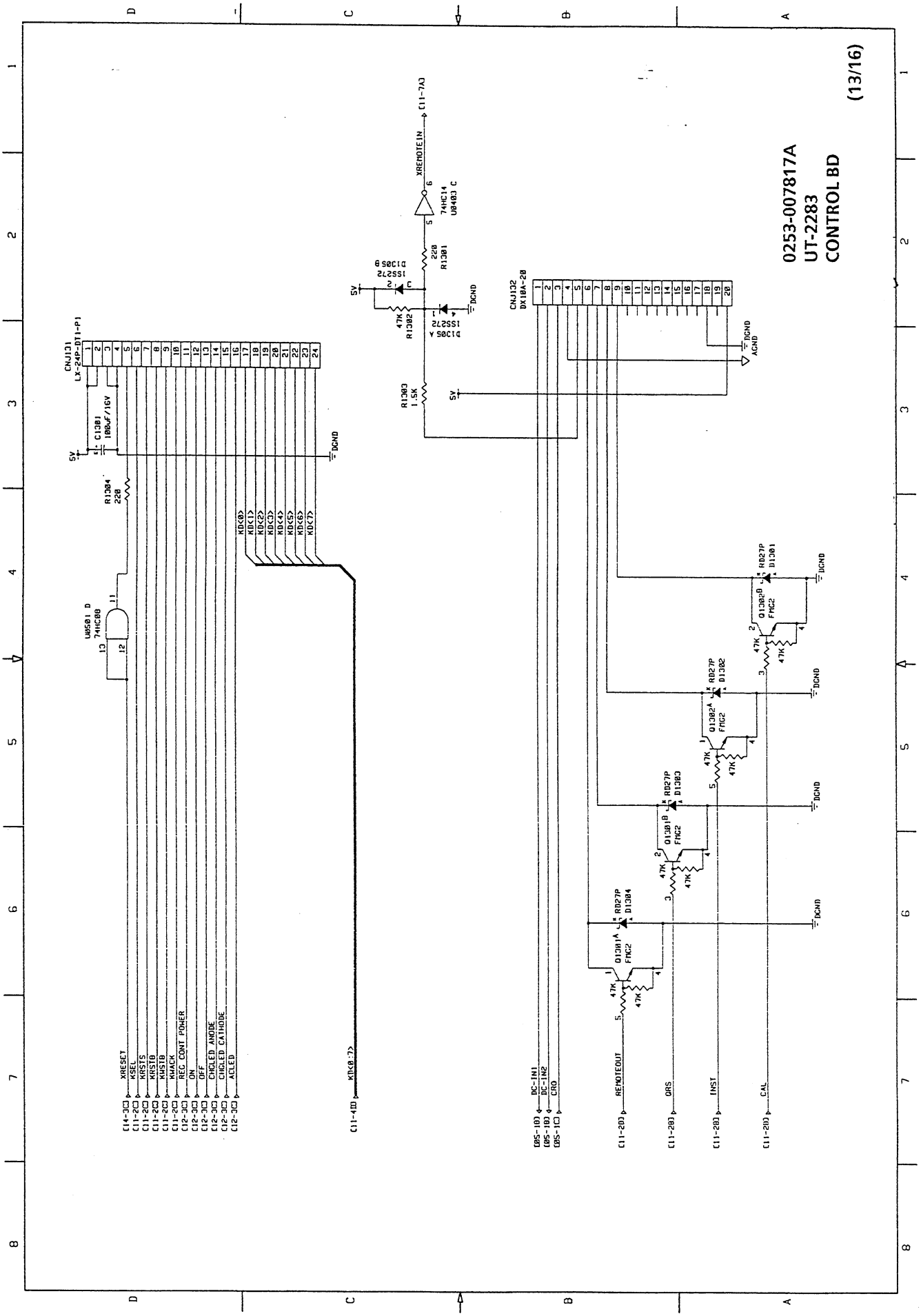
UT-2283
CONTROL BD
(12/16)
CNJ123
LX-26P-DT1-P1
C1203
100uF/16V
C1202
100uF/16V
C1201
47uF/50V
C1205
100uF/16V
0V
AGND
-8V
24V
24VGND
5V
VCC
DGND
GND LOWVOLTAGE
C11-7B3
POWER OFF
CHGLED ANODE
CHGLED CATHODE
ACLED
REC CONT POWER
OFF
ON
XBATTIN
C11-2B3
C13-7D3
C13-7D3
C13-7D3
C13-7D3
C13-7D3
C13-7D3
C13-7D3
C11-7A3
Q8582D
FMG2
47K
47K
C16-2B3
RUN
CNJ111
LX-20P-DT1-P1
C1204
10uF/16V
UGND
DX7
DX6
DX5
DX4
DX3
DX2
DX1
DX0
AX12
AX2
AX3
AX4
XLDS
XAS
RXH
X10INT
X10ACK
XCHECKUD
X10
SYSTEMCLK
C14-6A3
DX0:15>
C14-3A3
AX1:23>
C14-3C3
C14-3C3
C14-3C3
C11-7D3
C11-7D3
C11-7A3
C11-2B3
C11-2A3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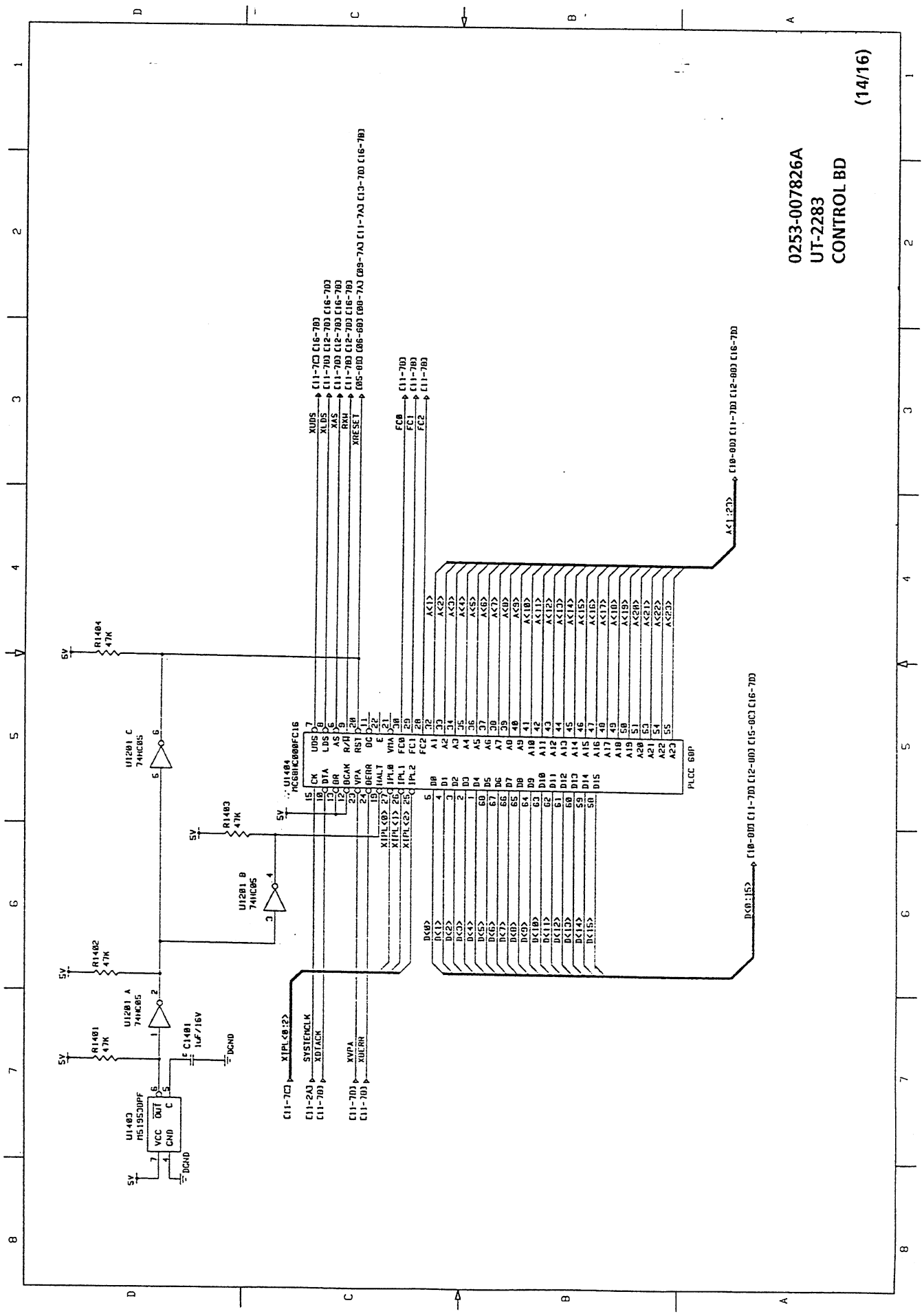
UT-2283
CONTROL BD
(13/16)
CNJ131
LX-24P-DT1-P1
CNJ132
DX10A-20
C1301
100uF/16V
R1304
220
R1303
1.5K
R1302
47K
R1301
220
U8501 D
74HC08
U8403 C
74HC14
XRESET
KSEL
KRSTS
KRSTB
KWSTB
KWACK
REG CONT POWER
ON
OFF
CHGLED ANODE
CHGLED CATHODE
ACLED
KDC07
REMOTEOUT
QRS
INST
CAL
DC-IN1
DC-IN2
CRO
5V
DGND
AGND
RD27P
FMG2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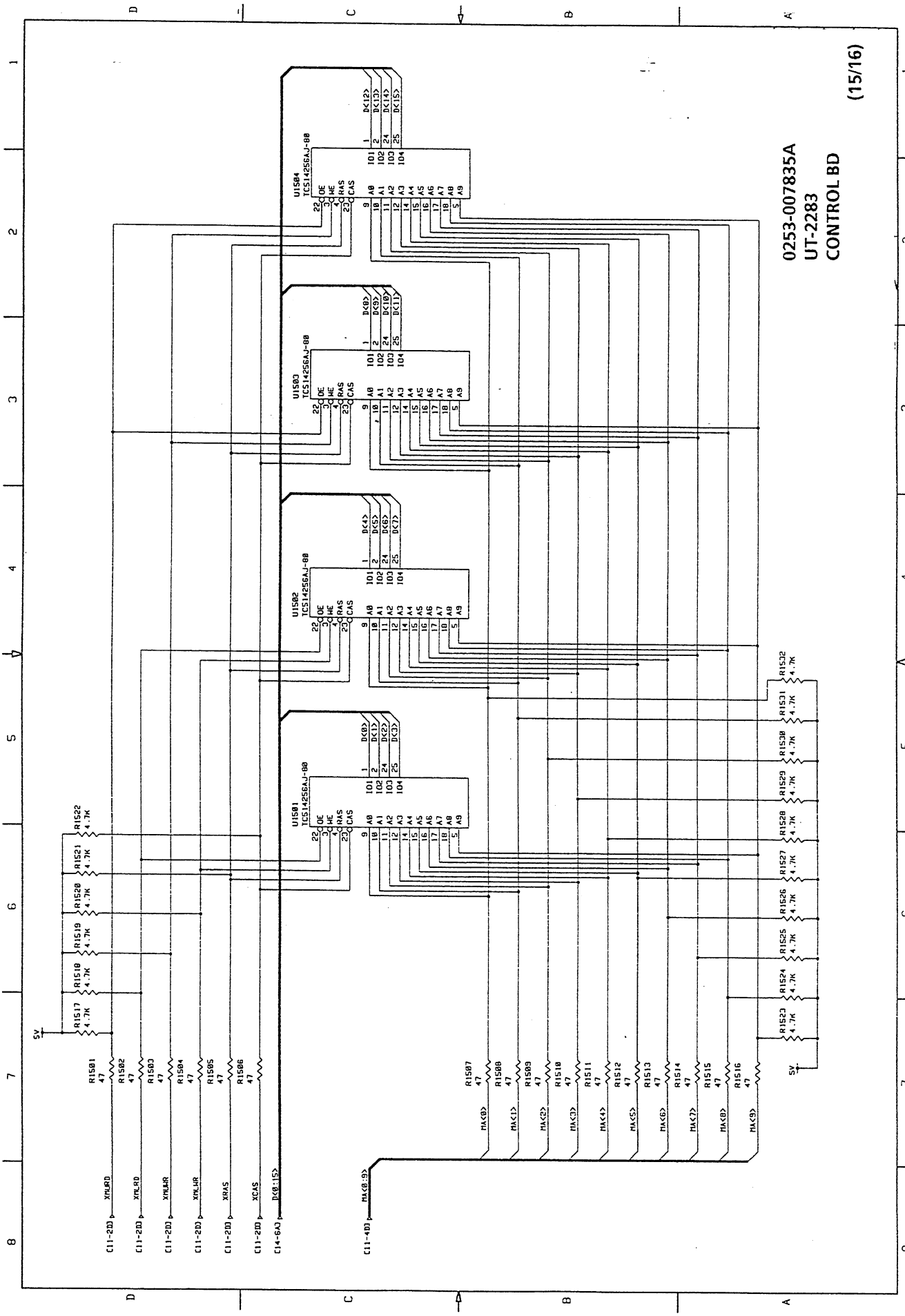
CONTROL BD
(14/16)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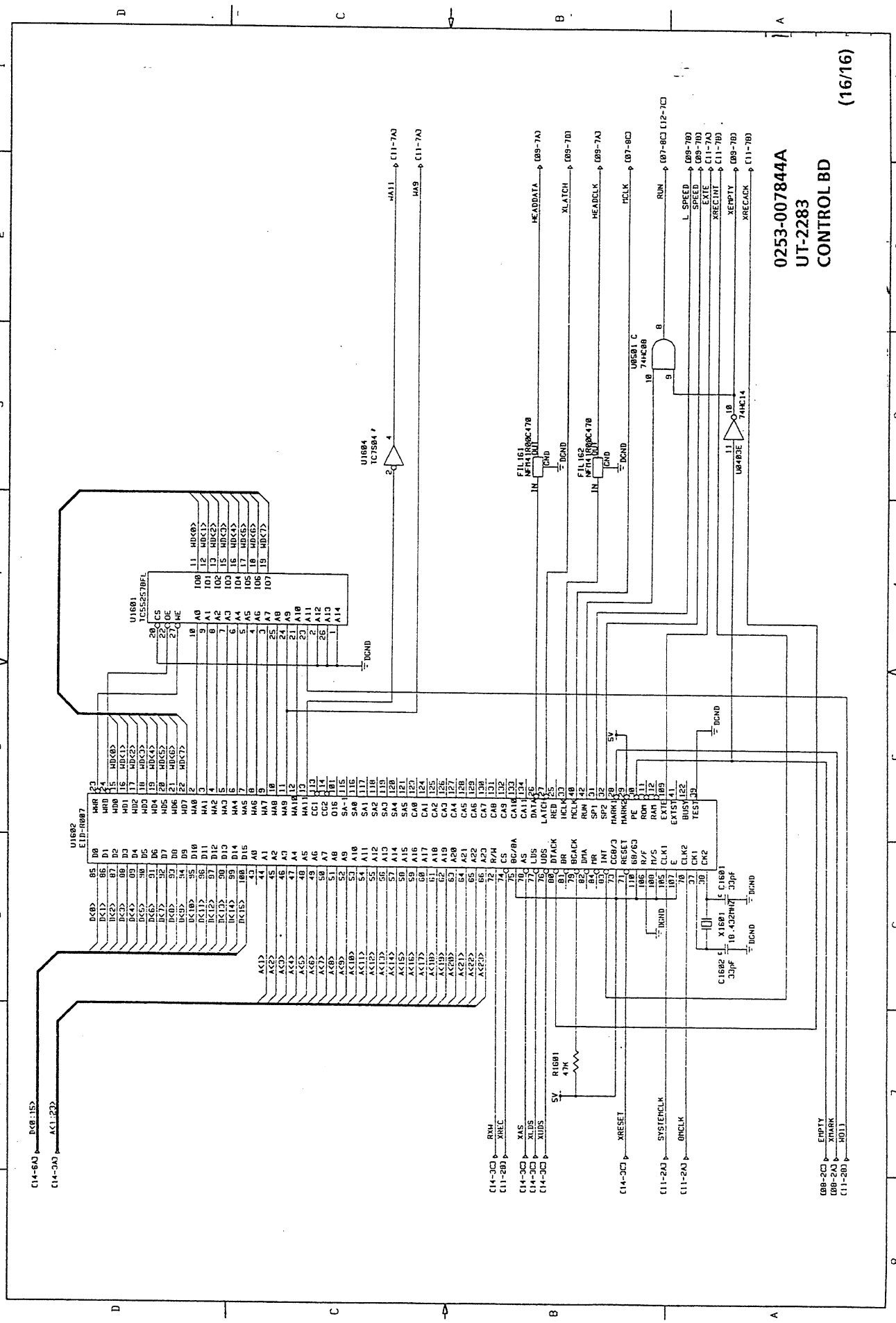
UT-2283
CONTROL BD
(15/16)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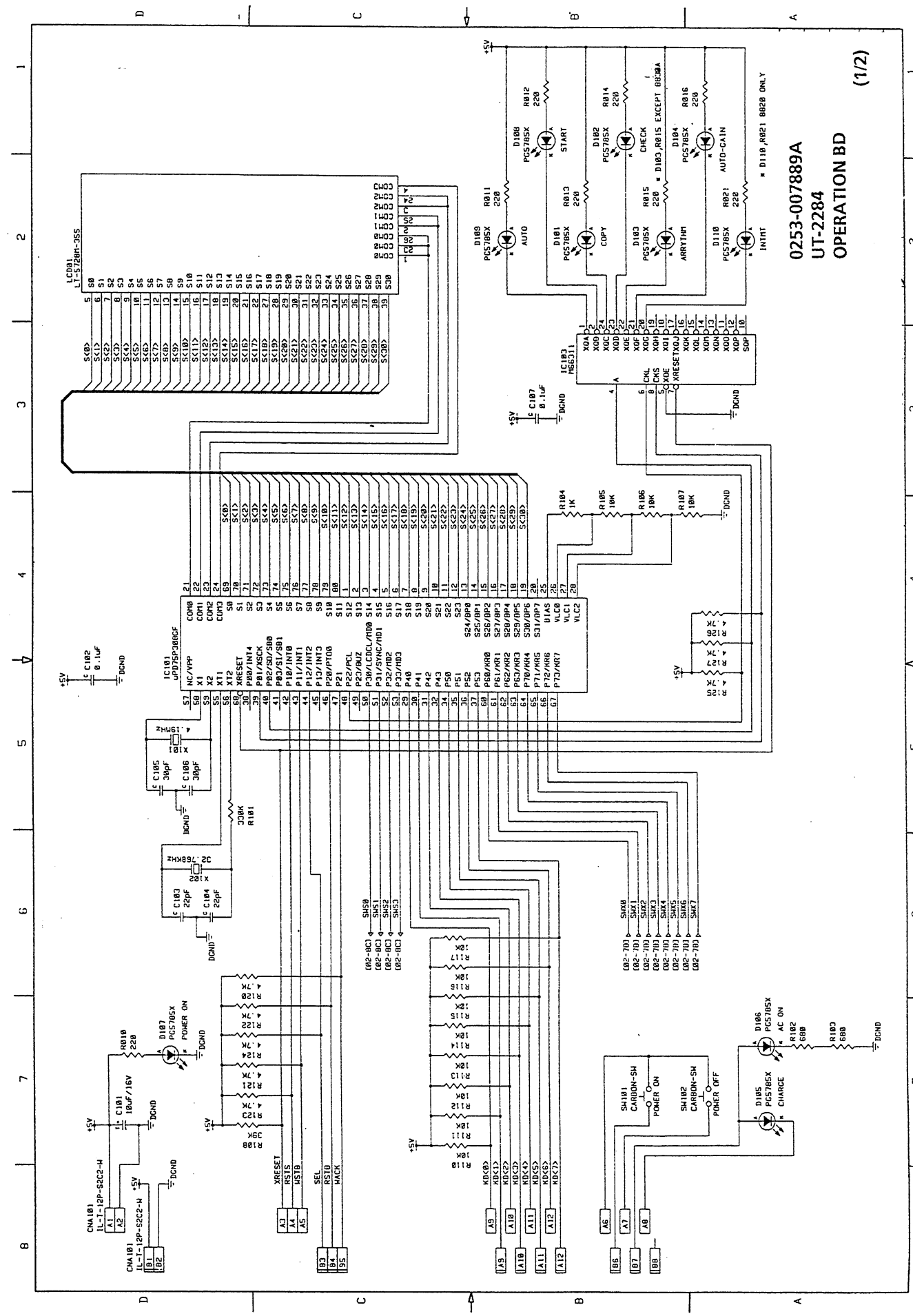
UT-2283
CONTROL BD
(16/16)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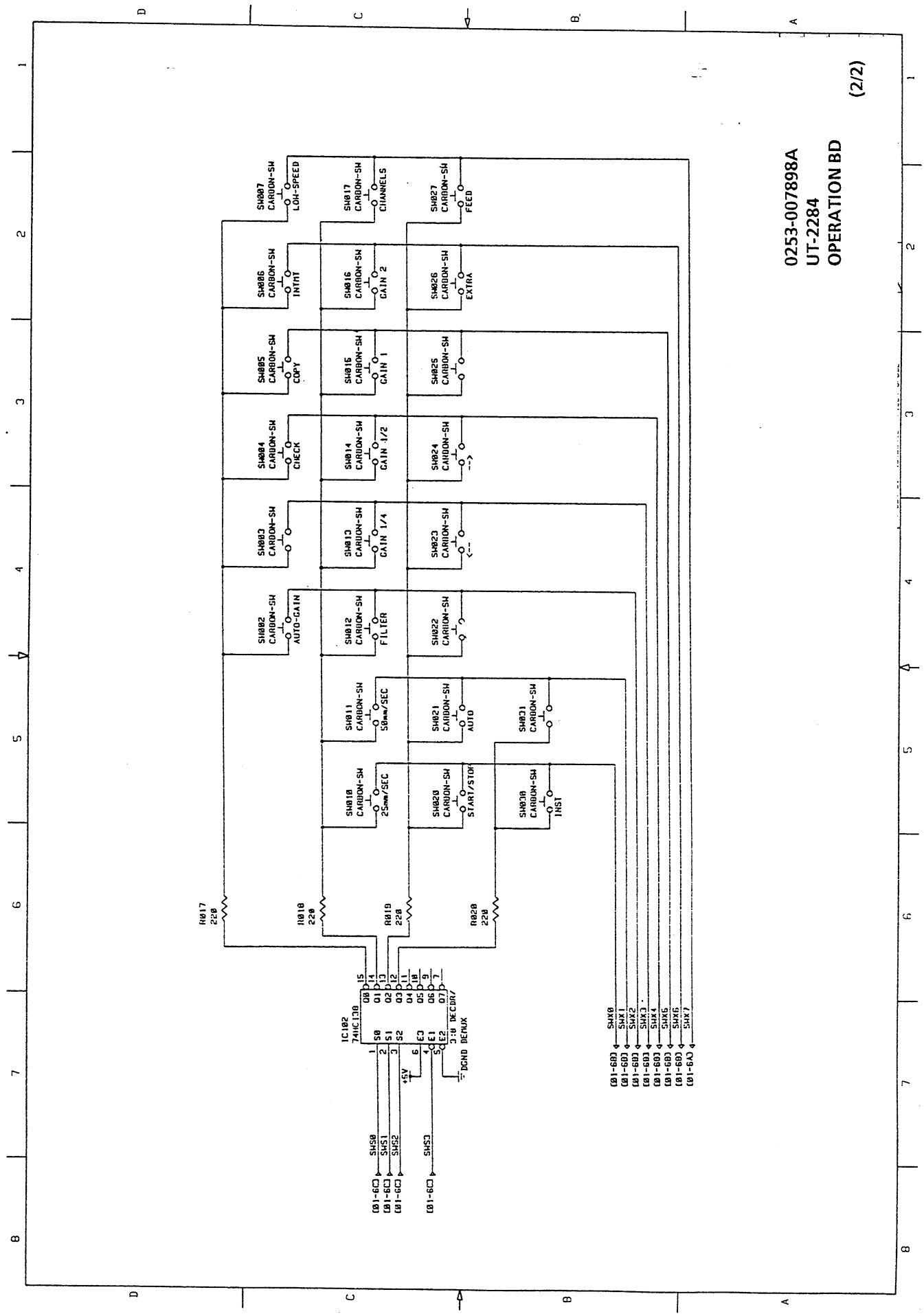
UT-2284
OPERATION BD
(1/2)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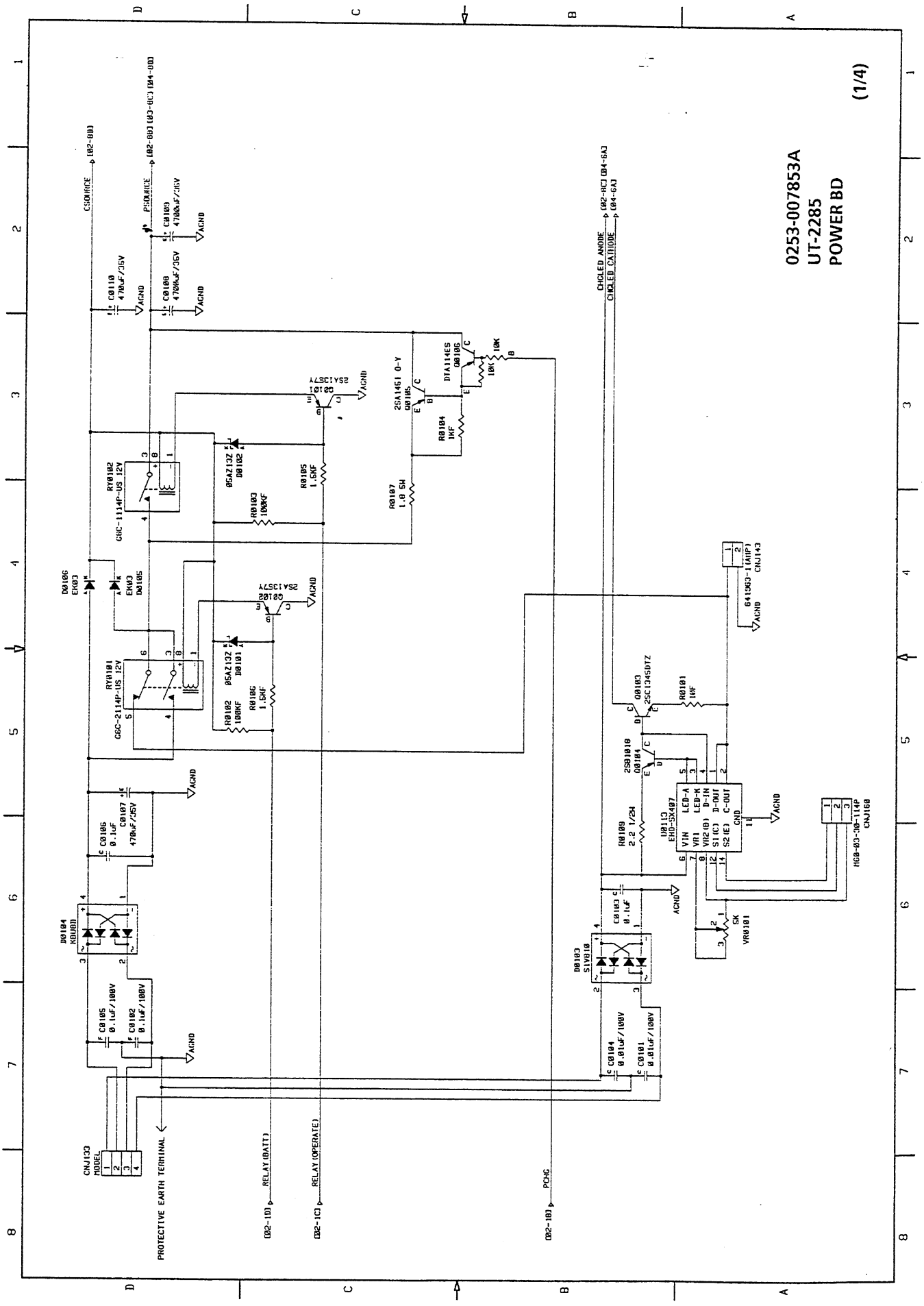
UT-2284
OPERATION BD
(2/2)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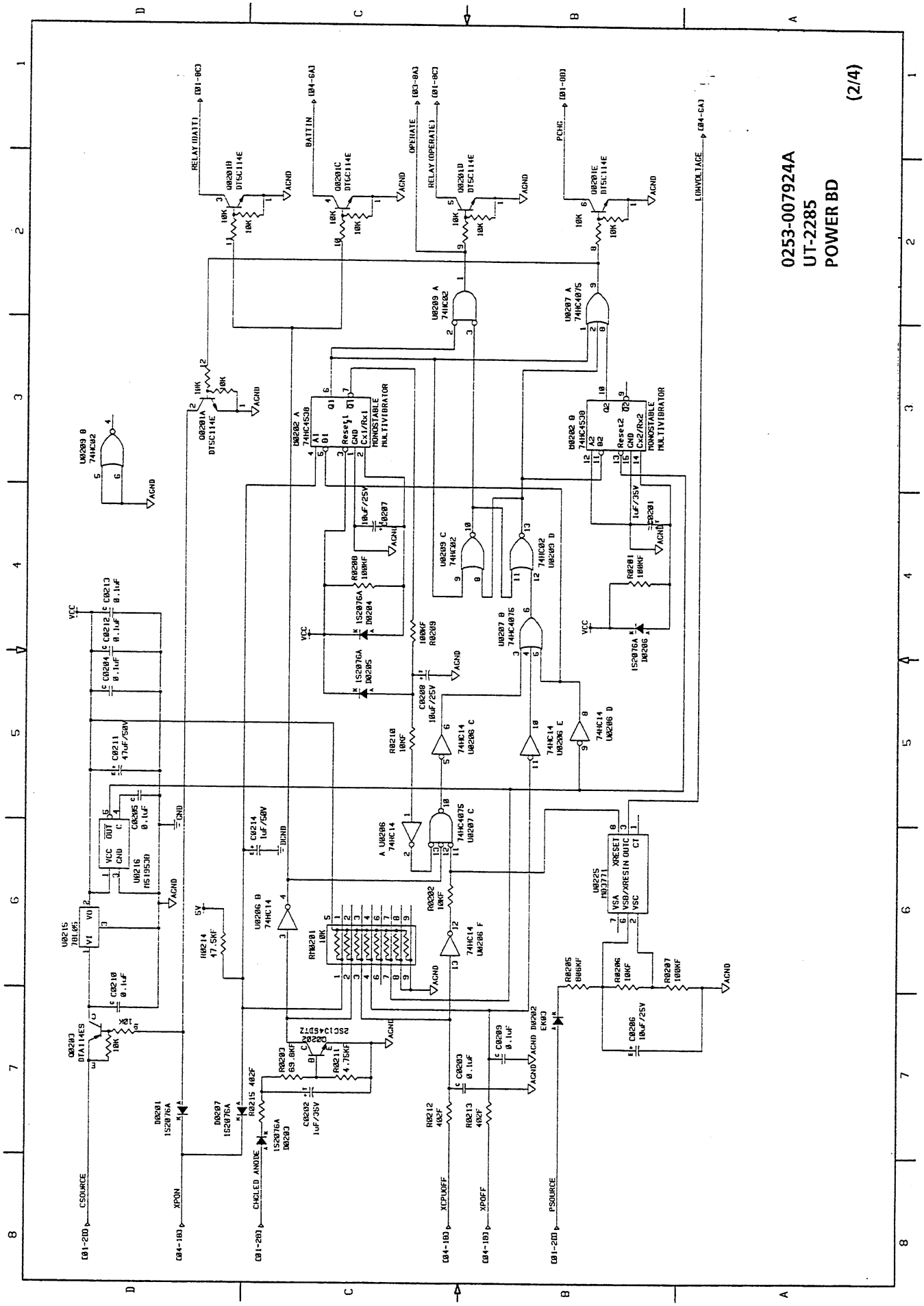
UT-2285
POWER BD
(1/4)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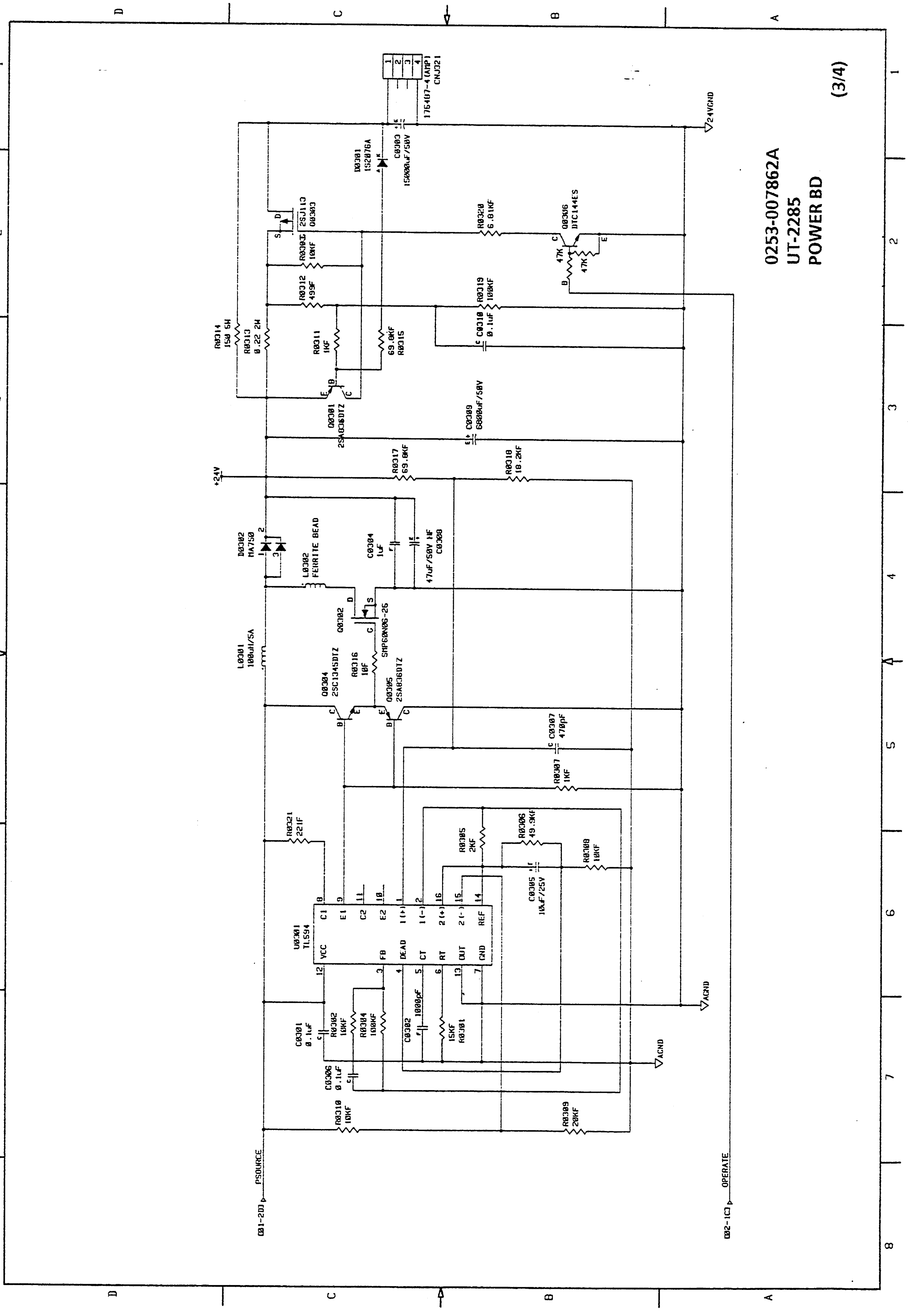
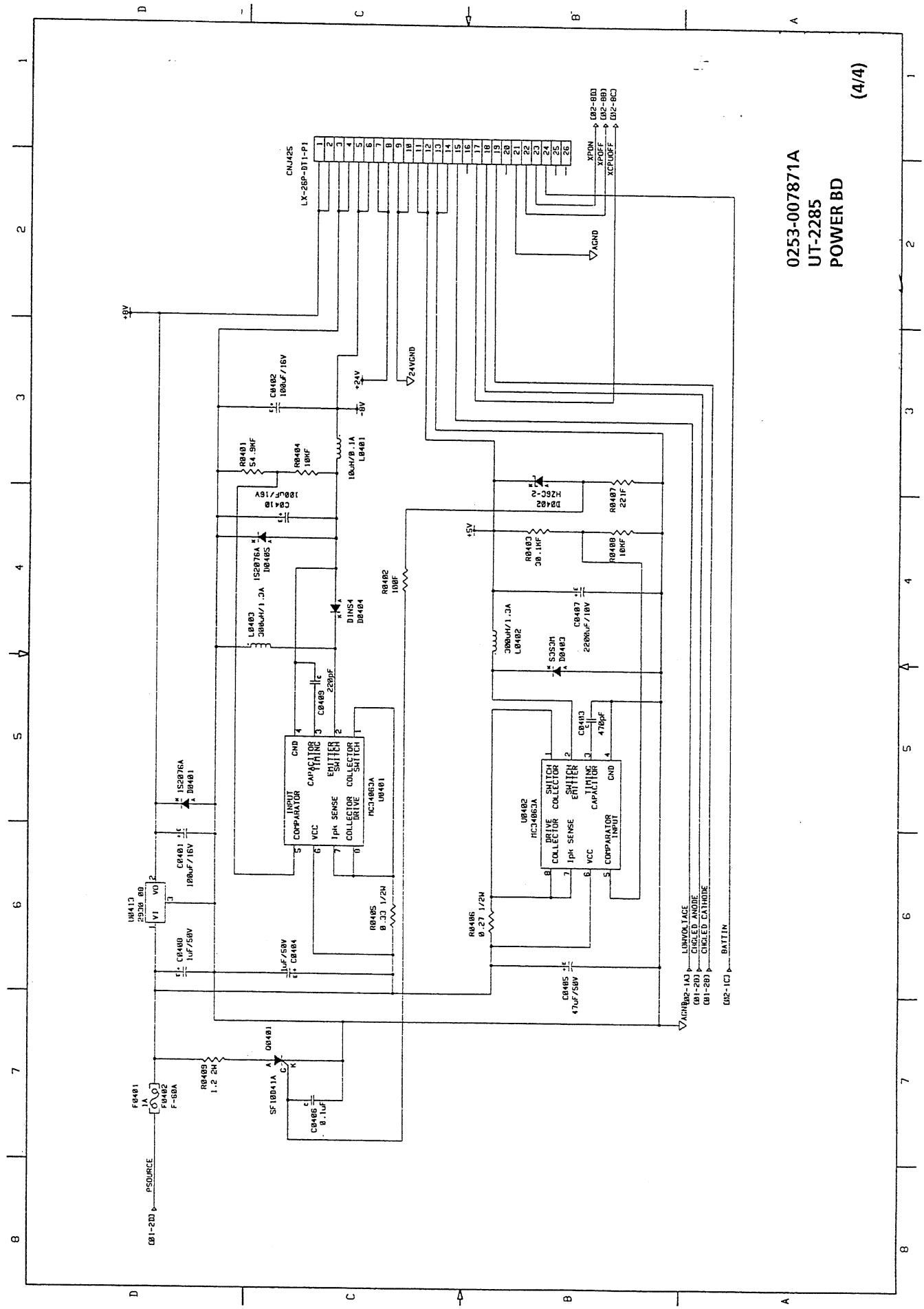
UT-2285
POWER BD
(2/4)


0253-007862A
UT-2285
POWER BD
(3/4)
U0301
TL594
+24V
24VGND
AGND
PSOURCE
OPERATE
L0301
100uH/5A
L0302
FERRITE BEAD
Q0302
SMP60N06-25
Q0306
DTC144ES
D0302
MA750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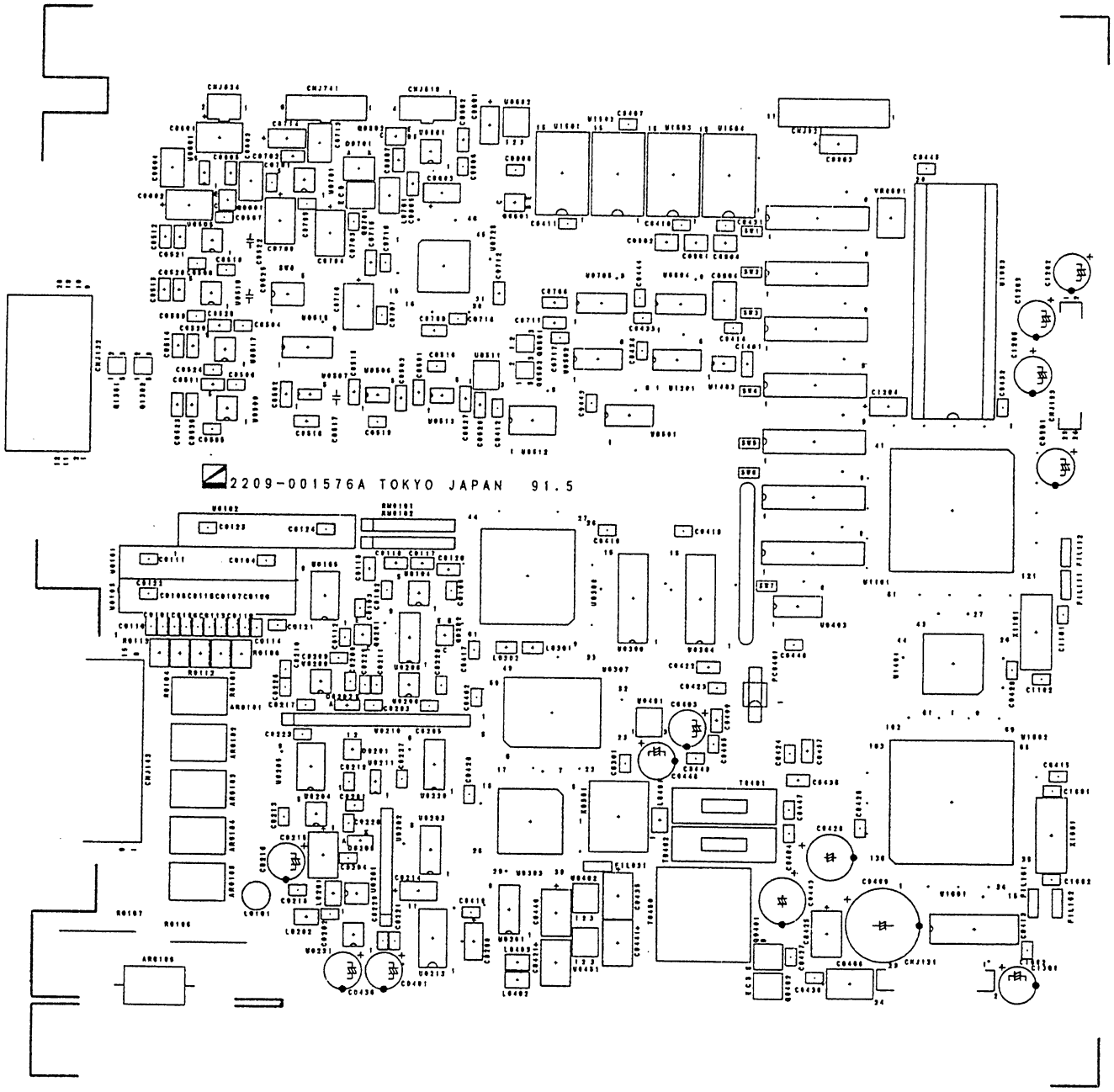
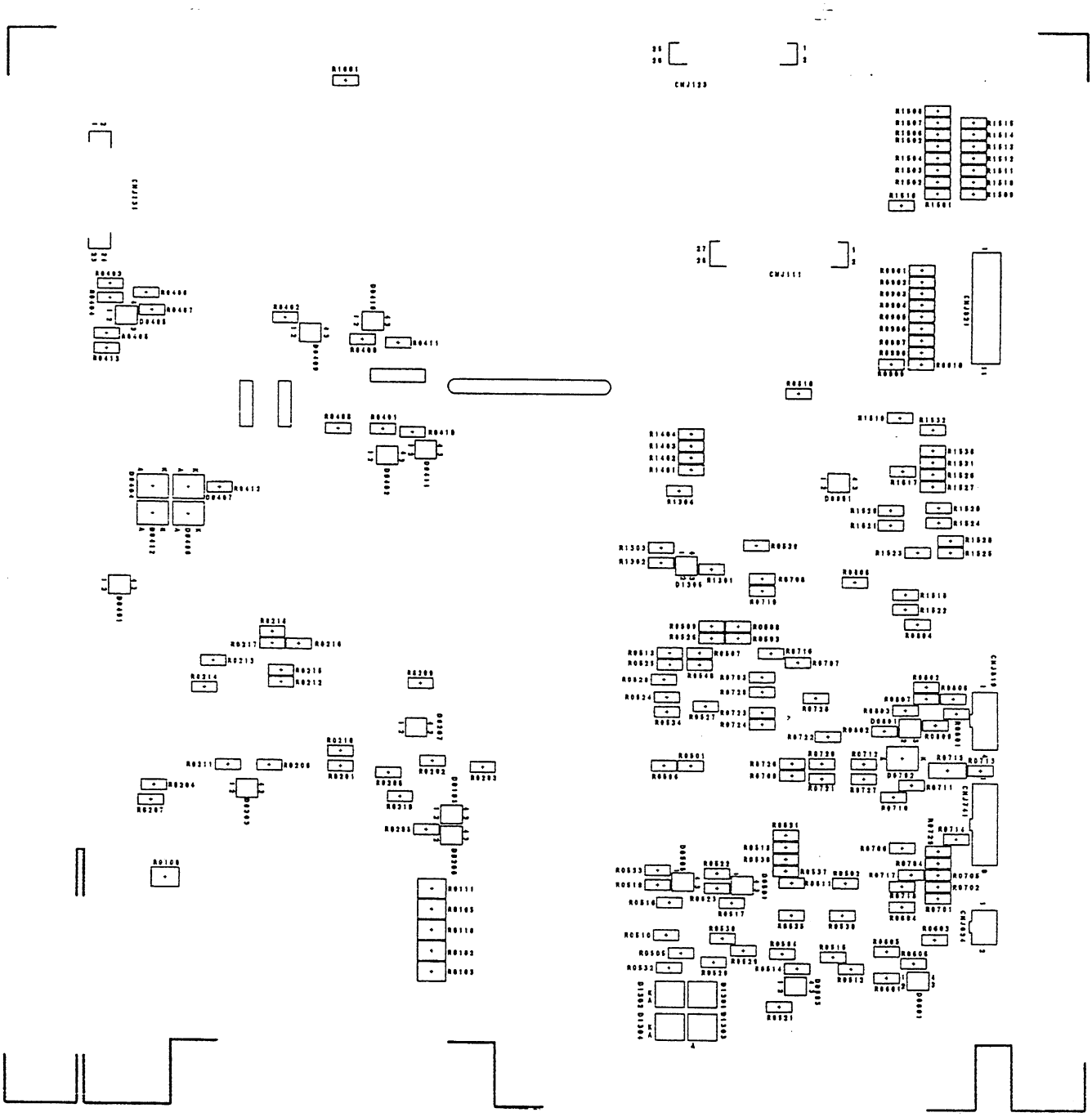
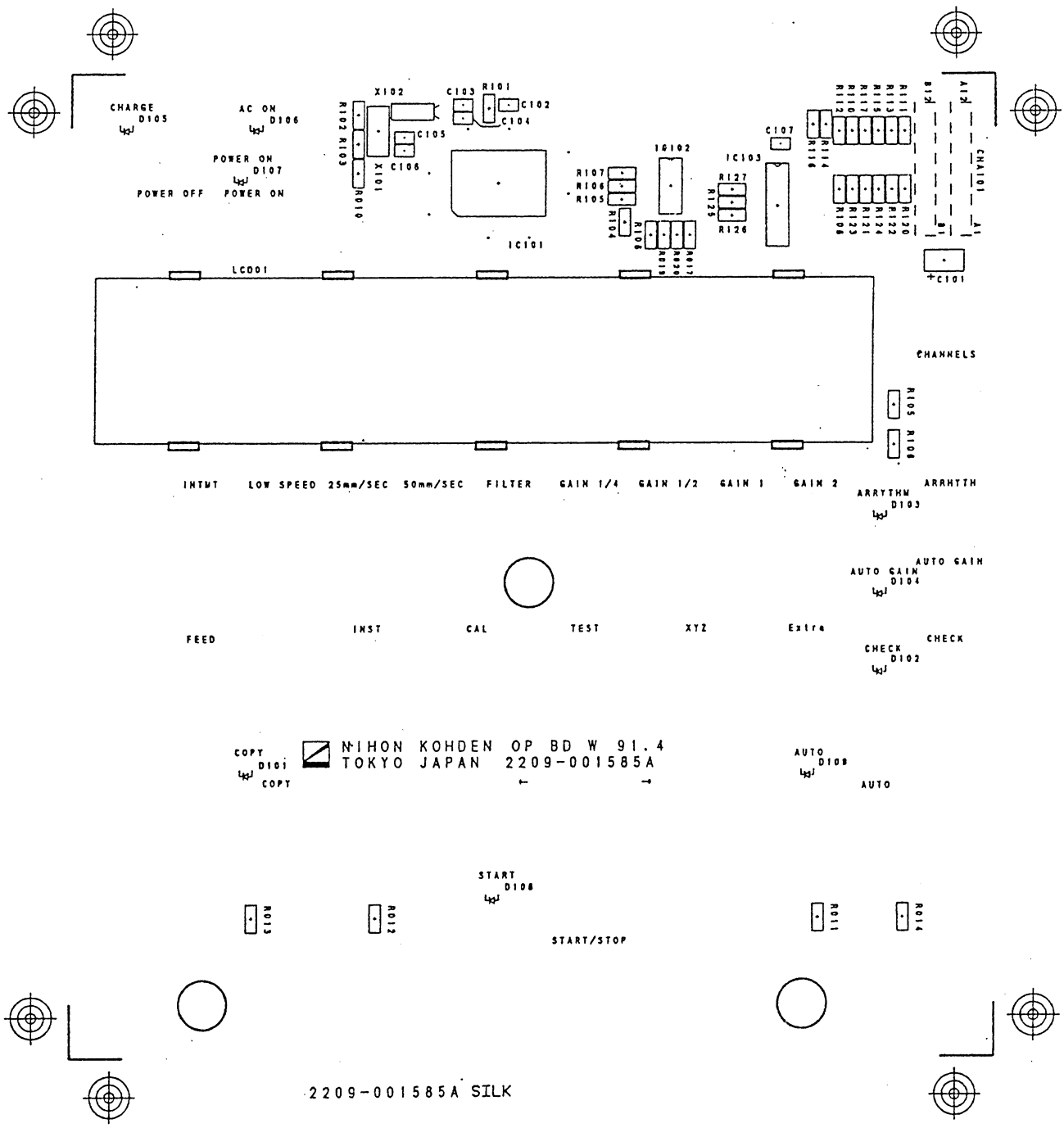
UT-2285
POWER BD
(4/4)
CNJ425
LX-26P-D11-P1
XPON
XPOFF
XCPUOFF
AGND
+8V
+24V
24VGND
-8V
+5V
C0402 100uF/16V
R0401 54.9HF
R0404 10HF
L0401 10uH/0.1A
C0418 100uF/16V
D0402 HZ6C-A
R0407 221F
R0403 30.1HF
R0408 10HF
L0403 300uH/1.3A
IS2076A D0405
DIN54 D0404
R0402 100F
L0402 300uH/1.3A
S3S3M D0403
C0407 2200uF/10V
C0409 220pF
C0403 470pF
U0402 MC34063A
U0401 MC34063A
INPUT COMPARATOR
CAPACITOR TIMING
EMITTER SWITCH
COLLECTOR SWITCH
COLLECTOR DRIVE
Ipk SENSE
VCC
GND
U0413 2930 80
C0400 1uF/50V
C0401 100uF/16V
C0404 1uF/50V
R0405 0.33 1/2W
R0406 0.27 1/2W
C0405 47uF/50V
F0401 1A
F0402 F-60A
R0409 1.2 2W
D0401 SF10D41A
C0406 0.1uF
PSOURCE
CB1-20
LOWVOLTAGE
CHGLED ANODE
CHGLED CATHODE
BATTIN
CB2-1A
CB1-2D
CB2-1C



6190-000288
UT-2283
CONTROL BD

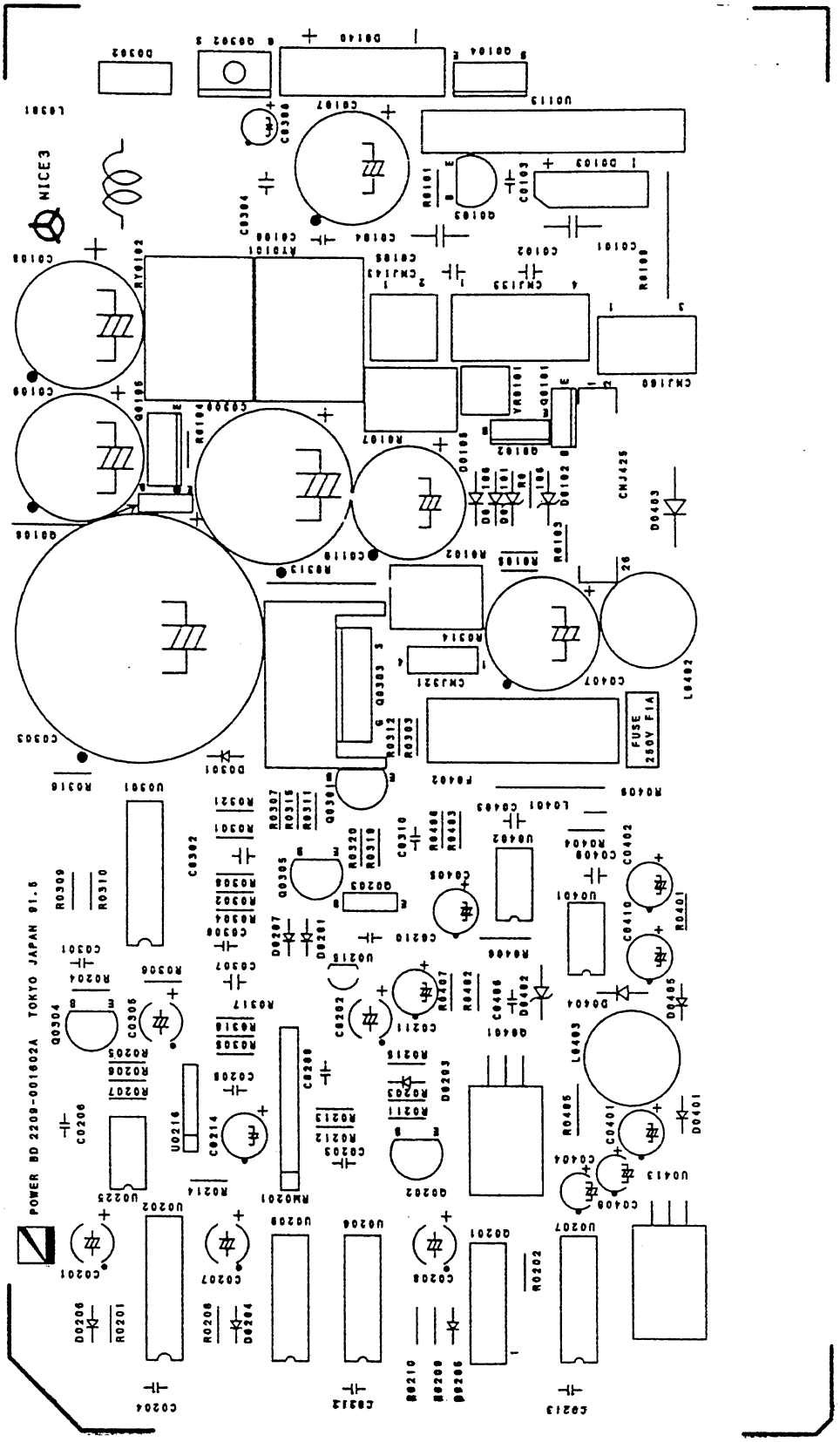


6190-000288
UT-2283
CONTROL BD



2209-001585A SILK

2209-001585A
UT-2284
OPERATION BD



6190-000297
UT-2285
POWER BD