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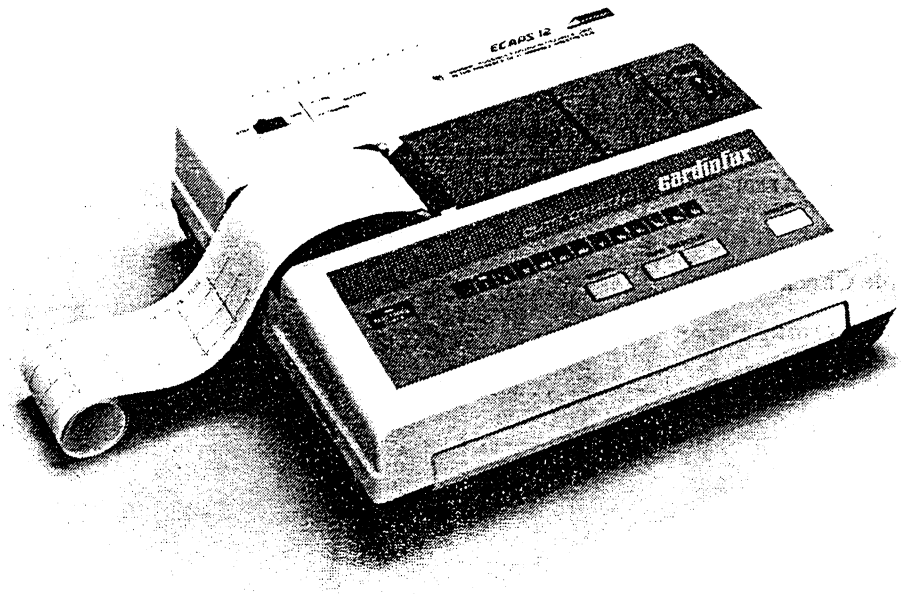
1 Introduction

1 Introduction

The ECG-8110 series electrocardiograph is a versatile 1, 2 or 3-channel ECG recorder with built-in analysis capability utilizing Nihon Kohden's exclusive ECAPS 12 analysis program. The ECG-8110 series provides both manual and automatic recordings in a compact and lightweight instrument. Its built-in battery pack allows use in emergencies and environments where access to an AC power source is limited.

In order to use this instrument safely and to take full advantage of its features, it is recommended that this user's guide be read thoroughly in advance.

For detailed explanation of the ECAPS 12 12-lead simultaneous analysis program, refer to the "ECG Analysis Guide" (separately available).



CAUTION

Federal Law restricts this device to sale by or on the order of a physician. This equipment is intended for use by qualified medical personnel only.

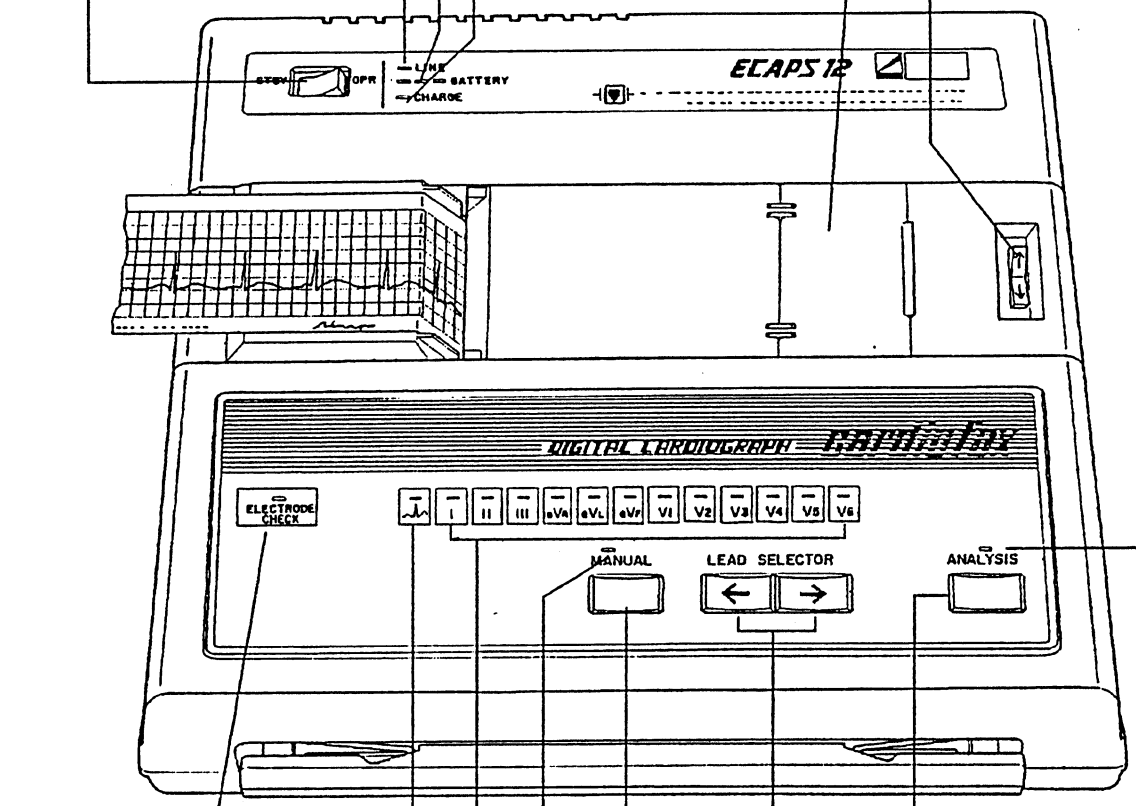
Servicing

In this ECG-8110 series, adjustments have been largely reduced as a result of the use of mini flat package ICs and custom LSIs.

Since special jigs are required for the repair of the data processing board UT-22021 / UT-2202 (multi-layer printed circuit board) and the control board UT-2204X / UT-2220X, exchange of PCBs is preferred in order to maintain the reliability.

During repair, care should be taken over possible static electricity to avoid any damage to the CMOS and HCMOS devices.

Front Panel



AC power lamp

Auxiliary panel

BATTERY lamp

Power switch

Trace position key
Allows the user to manually position the trace in the manual mode of operation.

Battery charge lamp

Electrode check lamp

Analysis lamp

QRS synchronized lamp

Analysis switch

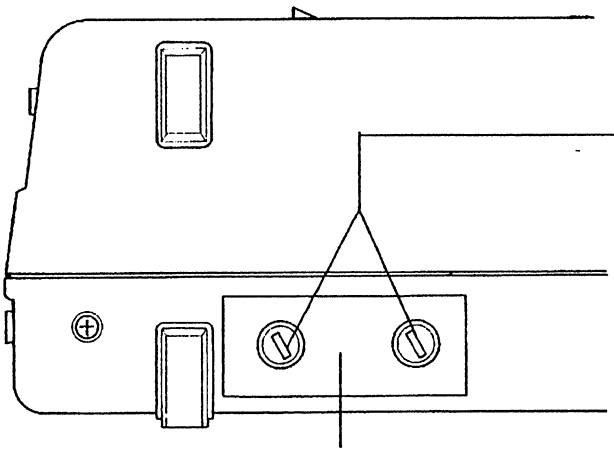
Lead indicator lamp

Lead selector switch
Controls manual recording.
By pressing the"←" switch, the lead to the immediate left is selected, and by pressing the "→" switch, to one to the right is selected. The indicator lamp of the lead which is selected is lit.

Recording lamp

Manual switch
Press to start or stop manual recording.

Rear Panel

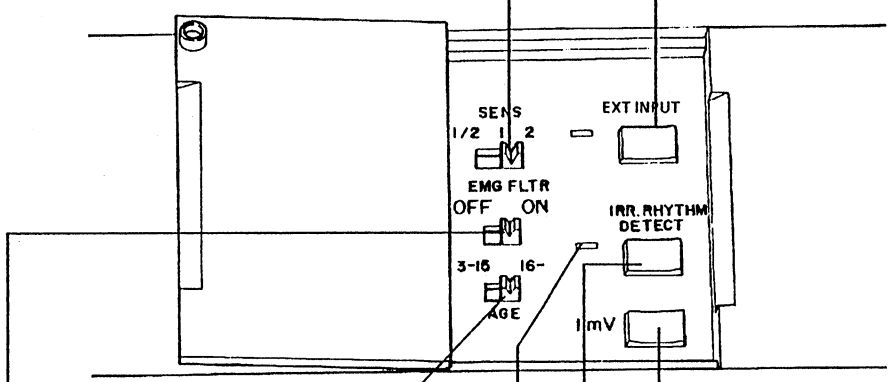


Fuse holder
A time-lag fuse is set in the fuse holder. Unscrew the fuse holder with a screw driver when replacing fuses. Any service required for this device should be referred to qualified technical personnel only.

Caution : refer to indications on individual units for power rating of fuse.

Fuse Indications
J: FUSE 250V / 1A (TIME LAG)
F, E, R, K, D, G, Q: FUSE T500mA / 250V

Auxiliary Panel



SENS switch
Controls ECG sensitivity only during manual recording.

***EXT input switch**

CAL (1 mV) switch
Used only for manual recording.

EMG filter switch

AGE switch

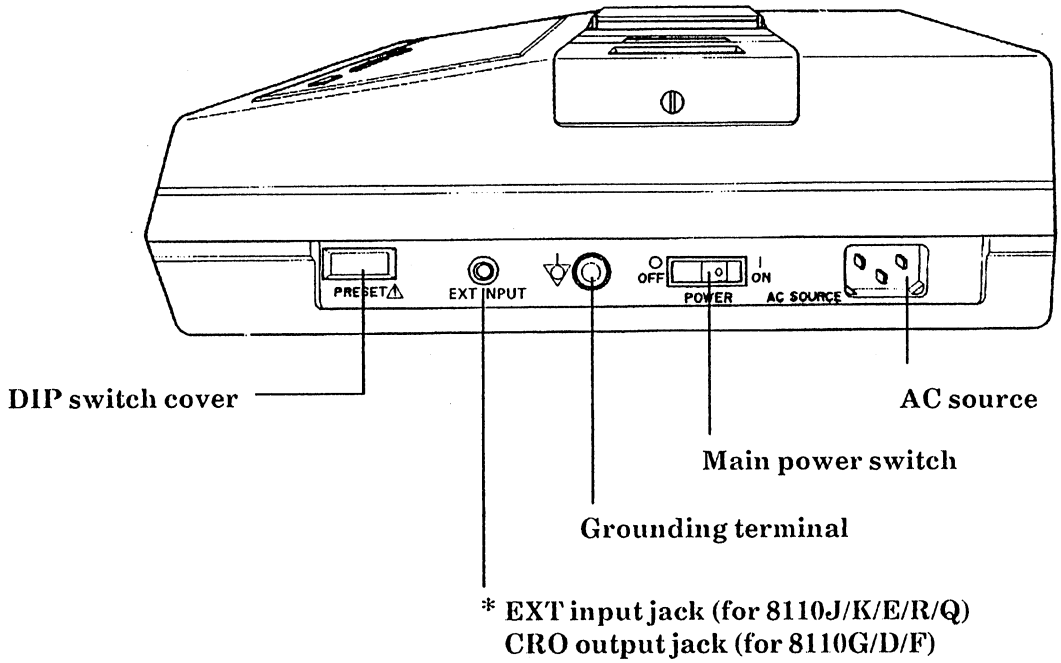
***Automatic arrhythmia recording switch**

***Automatic arrhythmia recording lamp**

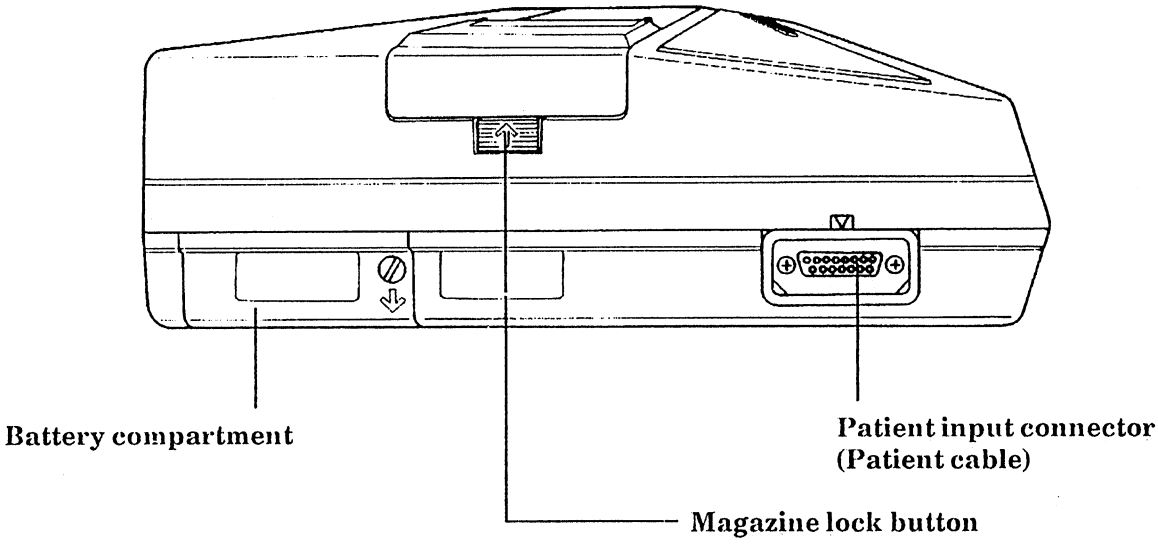
*applicable to 8110J/K/E/R/Q only

Note: Controls, connections and displays on models other than J and K are presented by means of symbols. Refer to "Explanation of the Symbols in This Manual/Instrument."

Right Side Panel



Left Side Panel



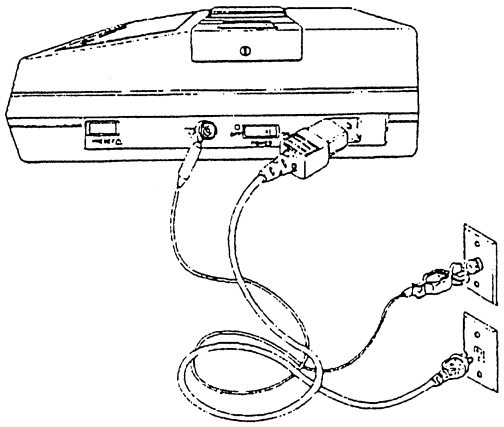
*applicable to 8110J/K/E/R/Q only

Note: Controls, connections and displays on models other than J and K are presented by means of symbols. Refer to "Explanation of the Symbols in This Manual/Instrument."

Instrument Grounding and Cable Connections

Connect the female end of the 3-prong power cord provided with the instrument to the AC socket marked AC SOURCE on the right side panel of the instrument, and connect the plug to a convenient AC wall outlet where the third contact is properly grounded.

When a 3-contact grounded outlet is not available, be sure to ground the instrument prior to connecting the power cord using the ground lead provided using the following procedure.

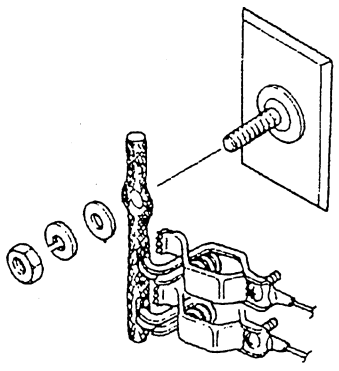


CAUTION

Use of water pipes as a ground should be avoided to assure proper grounding.
When the 3-prong power cord is connected to a 3-contact outlet where the third contact is properly grounded, the instrument is grounded automatically. To avoid shock hazard in case of disconnection of the ground lead in the power cord, use of the additional ground lead is recommended as double grounding.
Battery operation is recommended where the integrity of the protective ground system is in doubt.

EQUIPOTENTIAL GROUNDING

When using several medical instruments, to protect the patient from electrical shock the ground should not generate a potential between instruments. Complete grounding is very important to protect the patient and operator from electrical shock as well as to assure 50 or 60 Hz AC-interference-free display. Therefore be sure to arrange one-post grounding.
As an example, refer to the illustration.
Prepare 2 - 3 cm diameter and 15 cm long shield wires. Solder both ends so that the wires do not fray and then make a hole with a screw driver. By fixing the shield wires to the grounding post, several ground leads can be clipped together.



Composition

ECG-8110A

ECG-0040Z	1	Accessories
# UT-22021	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22041	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110J

ECG-0041Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-2220	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110K

ECG-0042Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-2220	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

Composition

ECG-8110E

ECG-0059Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22203	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110F

ECG-0058Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22044	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110G/D

ECG-0051Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22043	1	Control Board
# UT-22051	1	Key Board 1
# UT-2206	1	Key Board 2

Composition

ECG-8110R

ECG-0065Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22204	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110Q

ECG-0079Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22202	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

ECG-8110P

ECG-0117Z	1	Accessories
# UT-2202	1	Data Processing Board
# UT-2203	1	Power Board
# UT-22045	1	Control Board
# UT-2205	1	Key Board 1
# UT-2206	1	Key Board 2

2 Specifications

2 Specifications

Main unit

ECG leads	Standard 12 leads
Input circuit	Isolated
Calibration voltage	1 mV ± <2 %
Patient leakage current	<10μA
Defibrillator protection	Provided
Frequency response	0.05 Hz to 100Hz (– 3dB) Meets AAMI standard EC 11 (1982), 3.2.7.2 Test sequence A, C, D*
Time constant	>3.2 sec.
CMRR	>100dB with digital filter processing
EMG filter	35 Hz~45 Hz (– 3dB)
Sensitivity selection	×1/2 (5 mm/mV), ×1 (10 mm/mV), ×2 (20 mm/mV)

Recorder

Printing method	Thermal printhead 8 dots/mm Vertical 20 dots/mm Horizontal
Paper speed	25, 50 mm/s

Other electrical and physical information

Safety rating	IEC class I , type CF
Power requirements	AC source: A: 117 V, 60 Hz, 35VA (approx.) J: 100–120 V, 50, 60 Hz, 35VA (approx.) K/G/D/E/F/R/Q: 200–240 V, 50, 60 Hz, 35VA (approx.) P: 220 V, 50, 60 Hz, 35VA (approx.) DC source: lead acid battery, 12 V, 2 Ah 2 hours or longer in continuous operation
Charging time	approx. 10 hours
Battery saver circuit	Power is automatically turned OFF when the battery operation is not used for 5 minutes (approx.).
Dimensions	W 330 × H 90 × D 290 mm (13"W × 3.5"H × 11.4"D)
Weight (including battery)	Approx. 5.6kg (12.3 lbs)

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

3.2.7 Accuracy of Input Signal Reproduction

3.2.7.1 Overall System Error. Input signals, limited in amplitude and rate of change to ± 5mV and 125 mV/sec, respectively, shall be reproduced on the output recording medium with a maximum instantaneous deviation from the ideal of ±10 percent or ± 50uV, whichever is greater.

3.2.7.2 Frequency Response. The device shall exhibit a frequency response conforming to the following specifications, at a gain setting of 10 mm/mV:

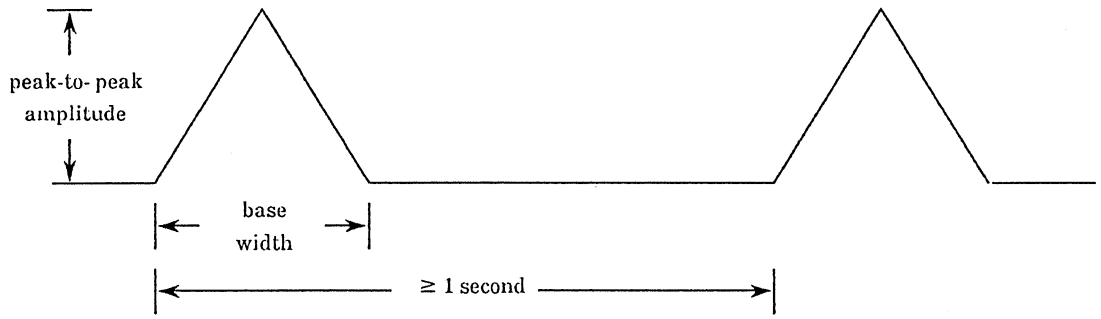
Method	Nominal Input Amplitude (mV p-p)	Input Frequency and Waveform	Relative Output Response (cm)
A	1.0	0.5 - 40 Hz, sinusoidal	±10% 1
B	0.5	40 - 100 Hz, sinusoidal	+10%, -30% 1
C	0.5	100 - 500 Hz, sinusoidal	+10%, -100% 1
D	1.5	20 msec, triangular	+0, -20% 2

[1] relative to 10 Hz output

[2] relative to 200 msec output

Note: The instrument must meet the requirements of either A, B, and C, or those of A, C, and D. The manufacturer must disclose which of these two sets of requirements (or both) are met by the instrument. (see 3.1.2.1 (3))

For Methods A, B, and C, the output response is relative to that obtained at 10 Hz. For Method D, the output response is relative to that obtained for a repetitive, triangular wave signal with a base width of 200 msec and a repetition rate of 1Hz or less:

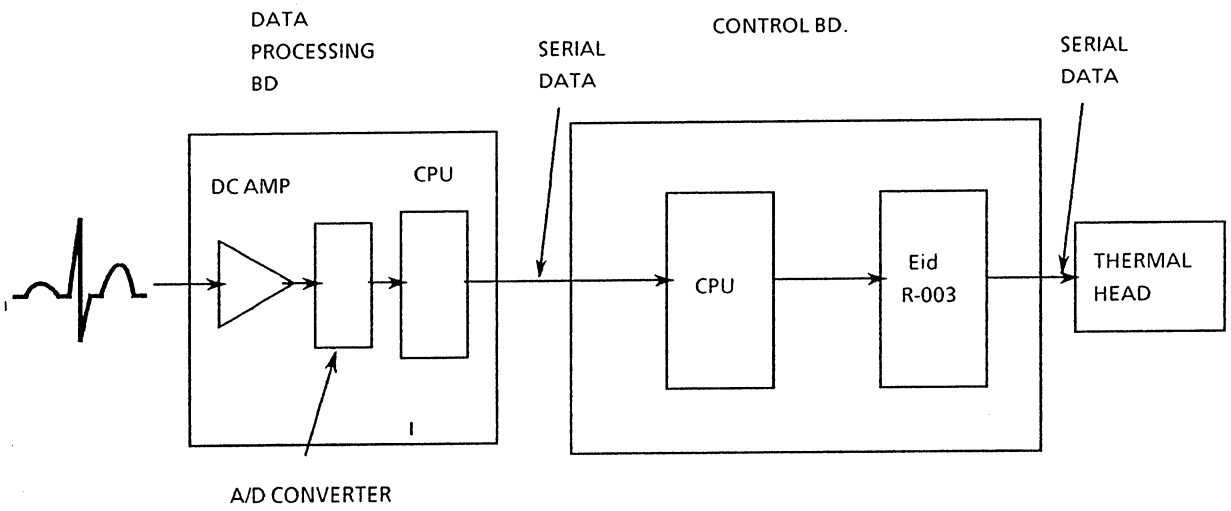


3 Theory of Operation

3 Theory of Operation

3-1 General

In the ECG-8110 series electrocardiograph, the 12-lead ECG waveforms are inputted to DC amplifiers, processed in digital signals and delivered to the thermal head. The analog ECG signal flow only exists in a very small portion between the lead and the A-D converter, the time-constant and filter processing are all performed in digital signals. Output to the thermal head is in the form of serial digital data.



The ECG signals inputted to the data processing unit are amplified 16 times and applied to the A-D converter. A-D conversion is performed using 4000 samples/second per channel. Eight leads (I, II, and V1 to V6) are A-D converted. The ECG signals A-D converted using 4000 samples undergo the pace maker pulse check and 16-point average addition to provide signals of 250 samples/second. These signals are serially transferred from the CPU (IC220) on the data processing board to the CPU (IC408) on the control board. The data processing board and the control board are isolated from each other, and the signals are transferred via the isolation pulse transformer (T202 to T205) on the data processing board .

In the CPU (IC408) on the control board, with the ECG data received, lead III, aV_R, aV_L, and aV_F are developed from leads I and II. Various filter processing, control of SW, LED, thermal head and motor are also performed by this CPU.

The +9V and +5V from the power board are delivered to the individual boards via the control board. A DC/DC converter on the data processing board converts the + 9V to the ± 8V and +5V for the floating circuit.

3-2 Data Processing Board (UT-22021 / 2202)

This board consists of the following :
Preamplifier, I & II lead generator, lead chopper, A-D converter, bus controller, microprocessor, interface circuit, DC-DC converter, PROMs, RAM, back-up battery and real-time clock.
The ECG signals inputted from the patient connector are amplified 16 times by IC201, IC202, and IC203. The I & II lead generator (IC280) produces signals of lead I and II from those of the R, L, F . The composite potential of the R, L, F signals is fed back to the right foot as the RF Drive. One lead among the amplified ECG signals (I, II, V1 through V6) is selected by the lead chopper (IC204) and is sent to the A-D converter with the R, L, F signals.
This A-D converter is of the extension type. The DC component superimposed on the ECG signal is fed back to the input side from the A-D controller (IC218) . It is then passed through the D-A converter (IC214, IC209) to apply the offset to the ECG signal inputted to the radder circuit (IC213) and the differential amplifier (IC211).
IC214 is a coarse D-A converter with a resolution of 10mV/bit. It operates in the range of ±320mV and gives the offset. IC209 is a fine D-A converter with a resolution of 40uV/bit and gives the offset .

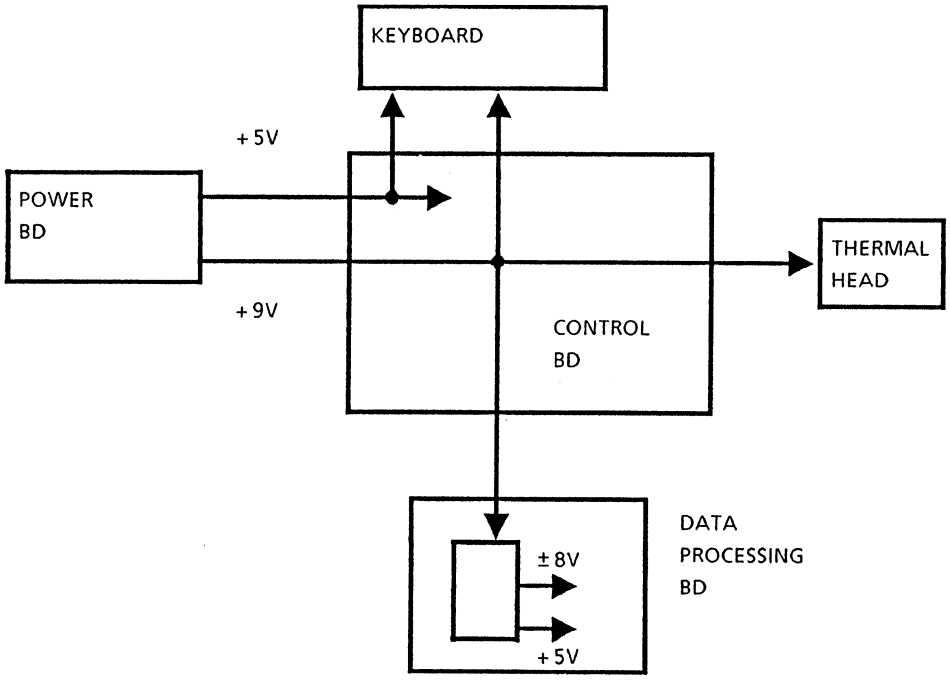
- Channel switching time 31.25 μs
- Number of channels 8
- Sampling interval 250 μs (31.25 μs × 8) .... 4 KHz sampling rate

A-D converted data in 8 bit is retrieved from the A-D controller (IC218) and stored into the memory by the CPU(IC220).
Electrode failure in each channel is detected when an overflow or underflow of A-D converted value appears.
The time constant is determined by software with the CPU(IC408) on the system control board(UT-22041).
The microprocessor (CPU) is 63B03(IC220) which operates with a 8.192 MHz clock. The address signal(16 bit) and control signal from the CPU are decoded in the bus controller for the controlling of the A-D converter and data transfer to the memory.
Communication with the control board is governed by this CPU (IC220) . Data signal is fed through the isolation pulse transformer and modulated with 2.048MHz in IC222 and serially transferred. Looking from the CPU(IC220) side, Tx signal is the data transmitted while Rx signal is the data received. Communication speed is 128K baud/second.
The DC-DC converter provides ± 8V and+5V for the floating circuit from the +9V. Output fluctuation is fed back to the primary through a photo-coupler to obtain a constant voltage output.

PROMs (IC233, 234) are used to store the operating program. An 8KB RAM(IC232) is used for work area and 32KB RAMs(IC205, 206) are used for ECG data storage.

If the external power is unavailable for the RAMs, the RAM power can be supplied from the lithium battery in the data save mode. The RAM voltage is monitored by IC231 in such a way that when the operating voltage drops below 4.5V, access to the RAM is disabled.

The power for the real-time clock (IC235) is obtained from the backup battery (BAT201, 3V) and is shared by the RAMs. The clock contains a 4-bit register (D0, 1, 2, 3). The CPU reads/writes the time information through built-in ports P10 to P17.



Simplified Block Diagram

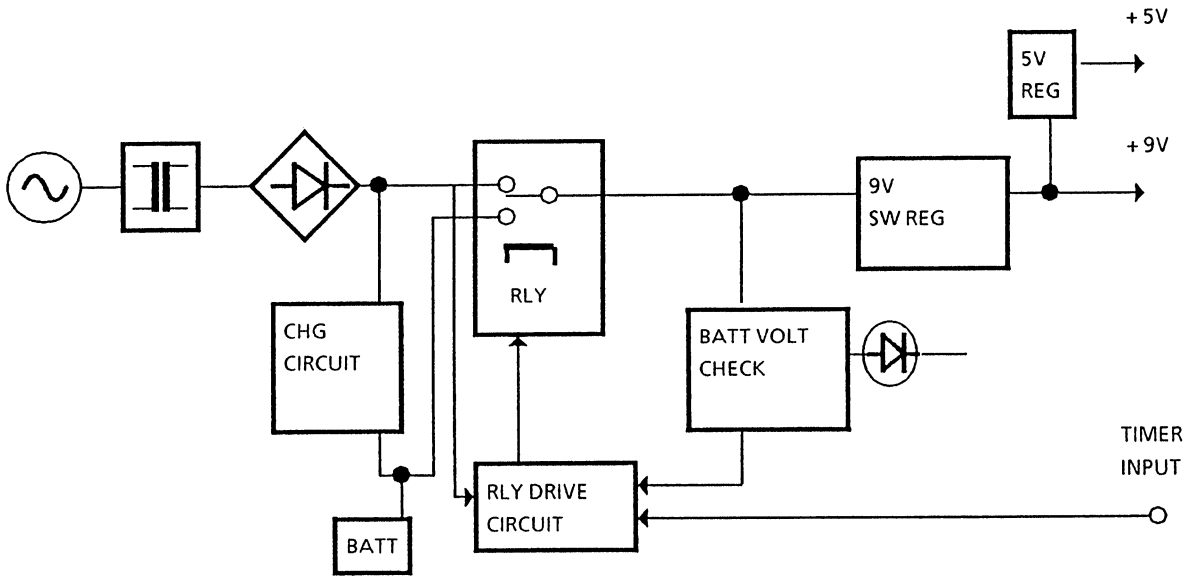
3-3 Function of Dip SW (SW201)

	on (up)	off (down)
1. Hum filter	50Hz	60Hz
2. Auto position, auto gain	on	off
3. Recording speed	25 mm/s	50 mm/s
4. 1-ch recording	on	off
5. 2-ch recording	on	off
6. 3-ch recording	on	off
7. Analysis result	on	off
8. Detailed measurements	on	off

Refer to operator's manual for further details

3-4 Power Board (UT-2203)

The power board consists of a battery charging circuit and AC/DC selection circuit and provides the+9V and +5V..



Block Diagram

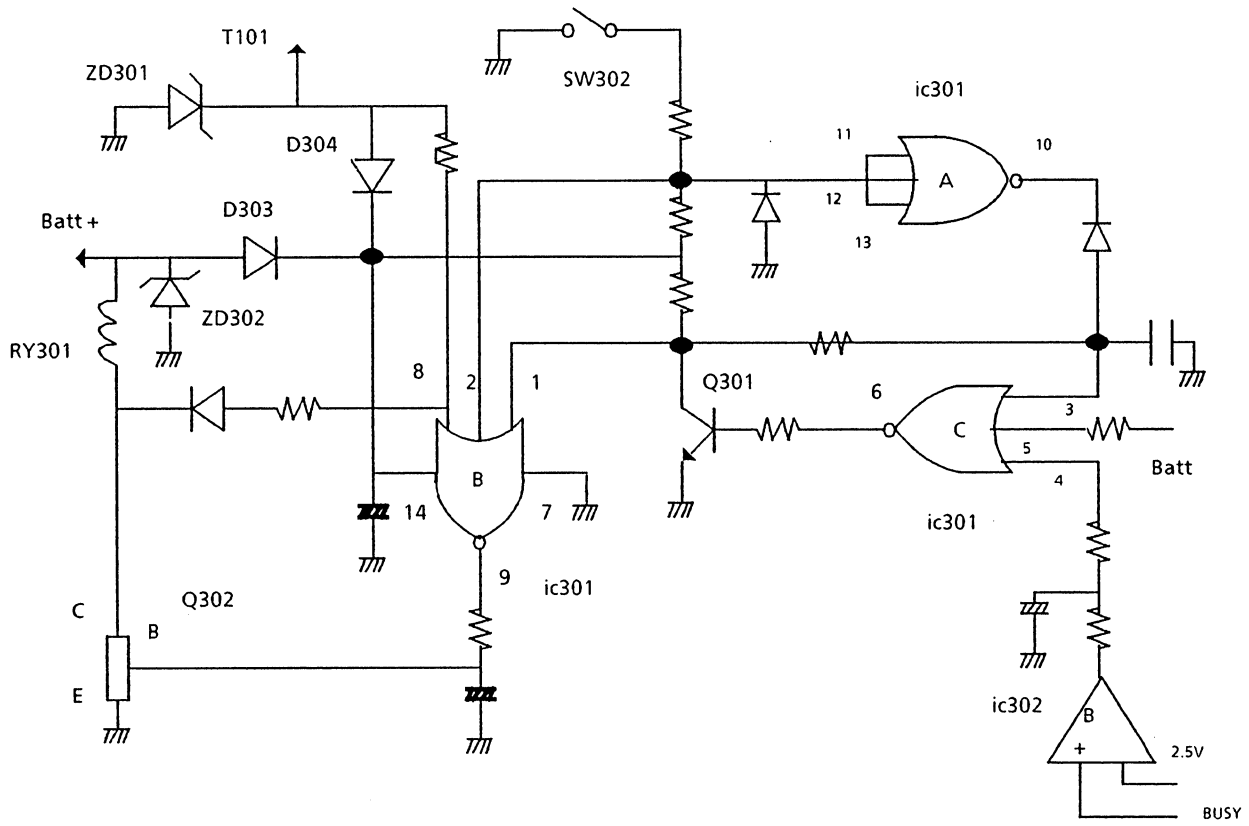
+9V Switching Regulator

This circuit consists of a switching regulator control IC (IC307), switching transistor Q310, flywheel diode D313, and choke coil L301. Oscillation is generated with C316 and R359. IC307 consists of 2 error amplifiers : amplifier of pins 15 and 16 monitors overvoltage while amplifier of pins 1 and 2 monitors overcurrent.

+5V is derived from the +9V through a 3- terminal regulator.

Relay Drive Circuit

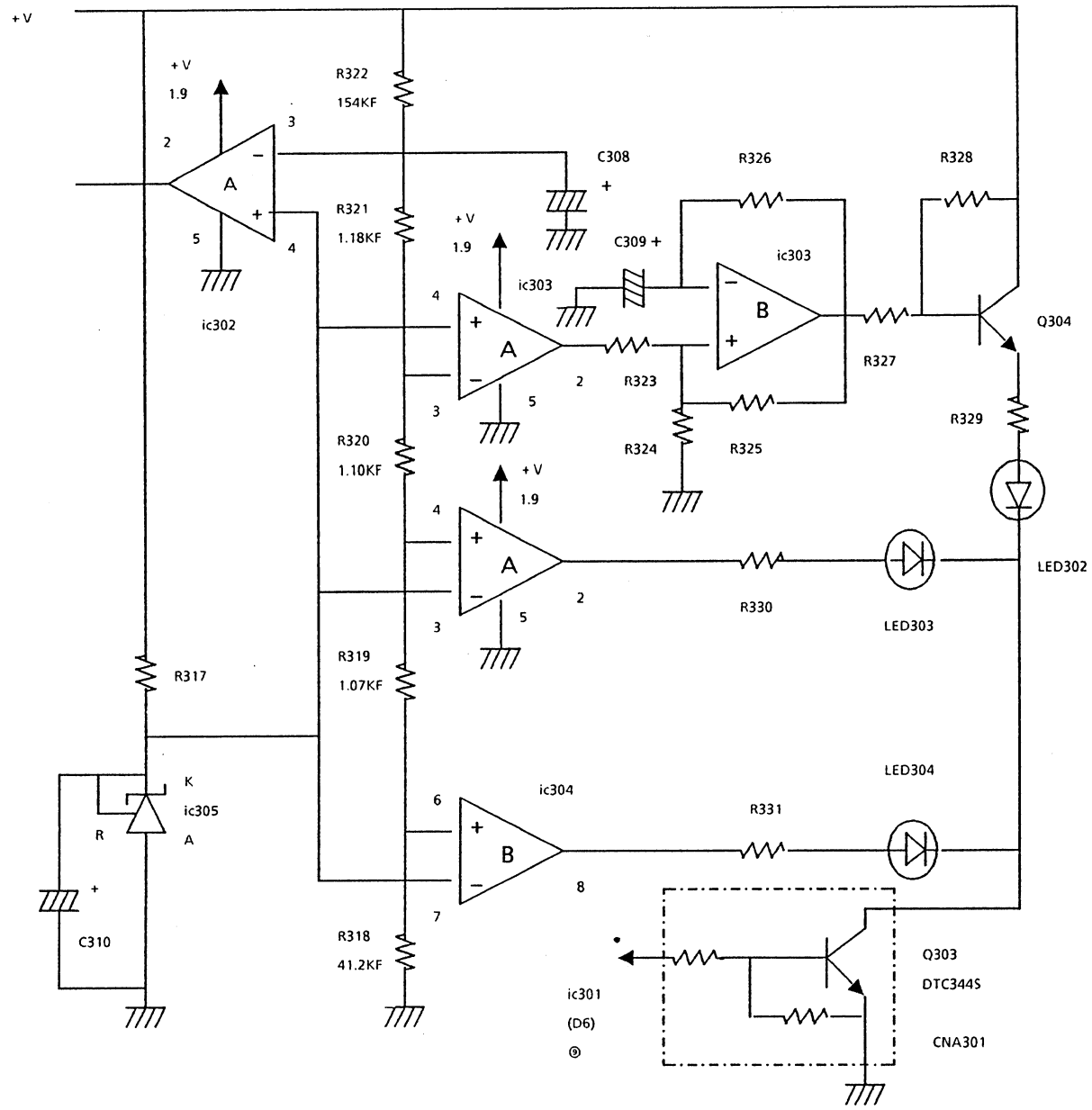
This circuit functions to enable battery operation of the unit.



When a.c. is not supplied, ic301 pin8 is "Lo", as SW302 is set to "on", ic301 pin2 goes "Lo" and RY301 is energized to activiate battery operation.

During battery operation, when the battery voltage decreases below the reference level, ic301 pin5 goes "Hi", in addition, if the unit is left idle for more than 5 min, ic301 pin 4 would go "Hi" to cease battery operation. At this time, set SW302 to "off" and "on" again to resume battery operation if necessary.

Battery Voltage Monitoring Circuit



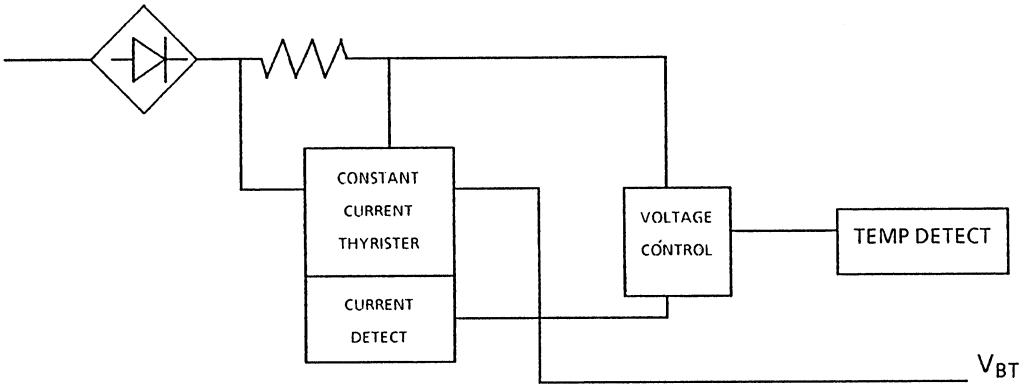
This circuit is operative only when pin 9 of ic301 is "high".

ic305 provides the reference voltage 2.5V. The voltage divider R318~322 controls the LEDs for battery level indication.

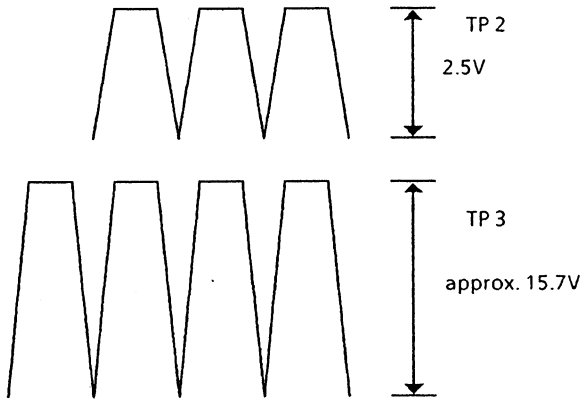
Battery Voltage (±2%)	Indication	Status
≧ 12.05V	LED302, 303, 304	Lighted
11.75V	LED302, 303	Lighted
11.45V	LED302	Lighted
11.14V	LED302	Blinking

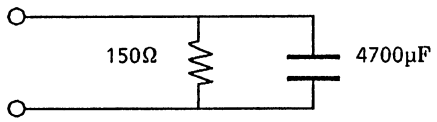
Battery Charging Circuit

Constant voltage and constant current charging is performed with this circuit.
The battery terminal voltage rises during charging and the charging current decreases as a result.This circuit monitors the charging current and decreases the charging voltage to protect the battery from overcharging when the charging current drops below the predetermined level.
The charging is performed initially with a fixed high voltage for 2 to 3 seconds, and then with a voltage



which yields a controlled charging current.
The voltage level is controlled in such a way that the charging voltage V_{BT} decreases when the temperature of the battery increases, and vice versa. At 25 °C, the charging current and charging voltage V_{BT} are adjusted(VR301) to 50mA and 14.5V respectively.
When the charging current decreases below 50mA as a result of charging, V_{BT} decreases to 13.5V ± 0.2V.
As the charging current continues to flow, the charging will eventually cease and resume repeatedly.





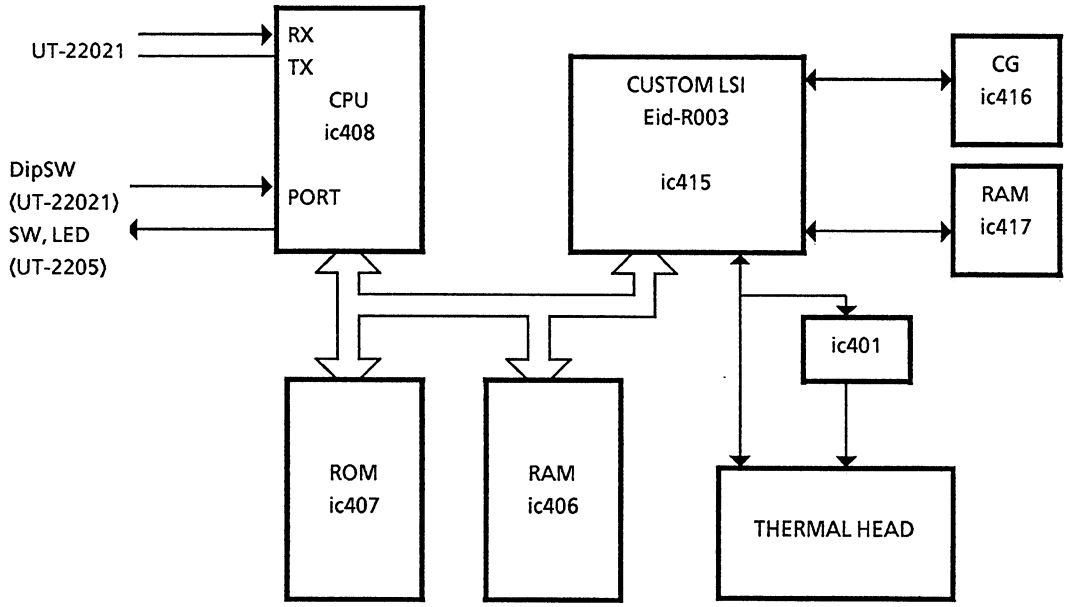
Dummy load for charging voltage adjustment

3-5 Control Board (UT-2220 / 22041 / 22203 / 22044 / 22043 / 22204 / 22202 / 22045)

The control board consists of:

- CPU 637B01YP (IC408)
- Custom LSI Eid-R003 (IC415)
- ROM 64KB (IC407)
- RAM 32KB (IC406)

It performs control of the data processing BD, SW, LED, motor, thermal head. as well as the processing of the ECG data received from the data processing BD.



The fundamental oscillation is of 8.192 MHz, and the system clock (E) is 2.048 MHz. The communication with the data processing BD is performed in a baud rate of 128K baud by the Serial Communication Interface (SCI) contained in the CPU.

The system reset signal is generated by IC414 and is supplied to the entire system.

Memory selection (CS) is performed by the custom LSI (IC415). But selection of the ROM bank 0, 1 is performed by IC411 and IC413 in association with the P_{20}, A13,14, and 15 of the CPU.

The processed ECG and character data are stored into the memory from the CPU.
Character font is derived from the character codes stored and is sent together with waveform data to the thermal head by the custom LSI (IC 415). Character generator (IC 416) (16×16) provides the character font.

IC 401 functions to maintain a constant intensity of print out which is related to the temperature of the thermal head. The thermister inside the thermal head is connected in parallel with R401, when the temperature of the thermal head rises, its resistance decreases and subsequently the pulse width (pin 6) delivered is shortened. The pulse width is also selected with Dip SW connected to C401-406 according to the resistance of the thermal head. A pulse width of 1.4 msec is selected for a thermal head having a resistance of 220Ω.

The control of LED, SW etc. are performed with the I/O ports of the CPU (refer to port table).

This board is connected to the data processing board and keyboard 1 via CNP404 and CNJ402 respectively.

3-6 Keyboard

Keyboard 1 (UT-2205 / 22051)

This board is connected to the control board and keyboard 2 via CNA501 and CNJ504 respectively.

It consists of ICs linking SW, LED to the CPU (refer to port table), and a motor drive circuit.

In the motor control circuit, a PLL motor control IC (IC 512) maintains a constant paper speed and a switching regulator control IC (IC 513) drives the motor in PWM mode for better efficiency. Q501 is a switching transistor and D501 is a fly wheel diode.

10MHz fundamental oscillation frequency is divided by IC508, 509, 510 to supply respective frequencies for the 4 paper speeds.

The output from the F.G is amplified by IC 514 to give sinewaves of $\geqq$ 1Vp-p which are in turn inputted to IC 512 pin 6 for PLL control.

The micro-switch is set to "open" when no paper is loaded and the collector of Q5 becomes "Hi".

Keyboard 2 (UT-2206)

The SW, LED, etc. are connected to keyboard 1via CNA104.

4 Troubleshooting

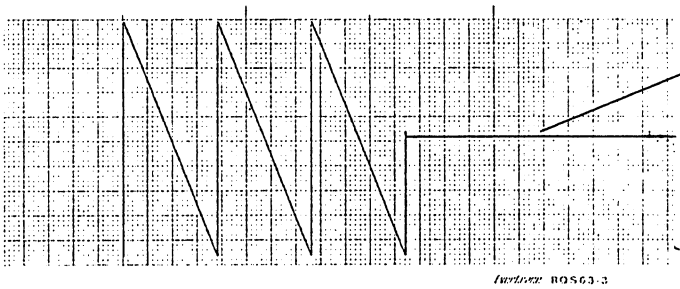
4 Troubleshooting

Checking the Recorder

Keep the "←" or "→" sw depressed and set the power switch to "on" to initiate the recorder check.

* the following printout would be made if the "←" has been depressed :

The recording speed is checked, and the following test data printed:



Check the "l" is 50 mm ± 2.5mm.

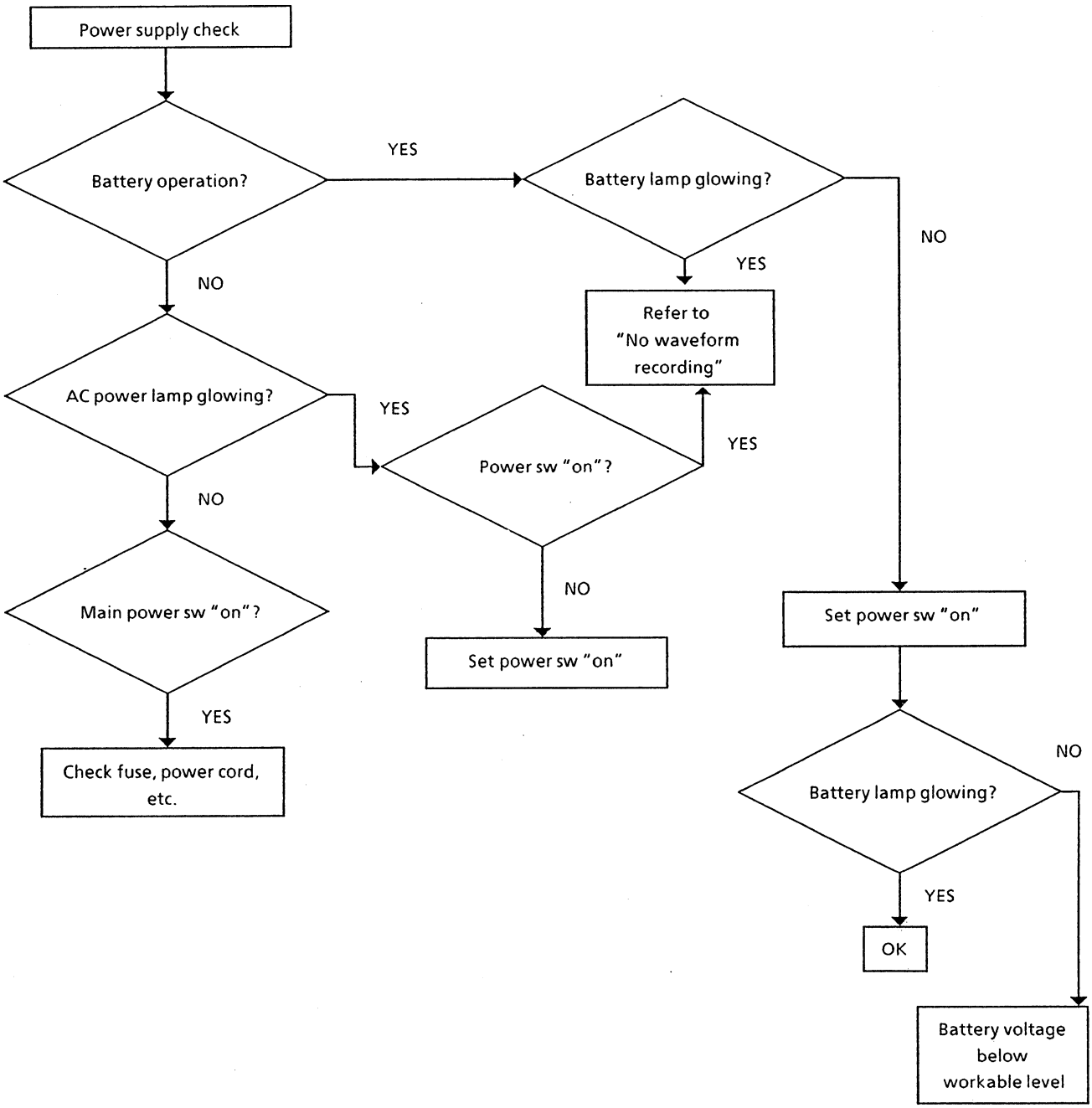
1. Check the linearity of the trace and the uniformity of the paper feed.

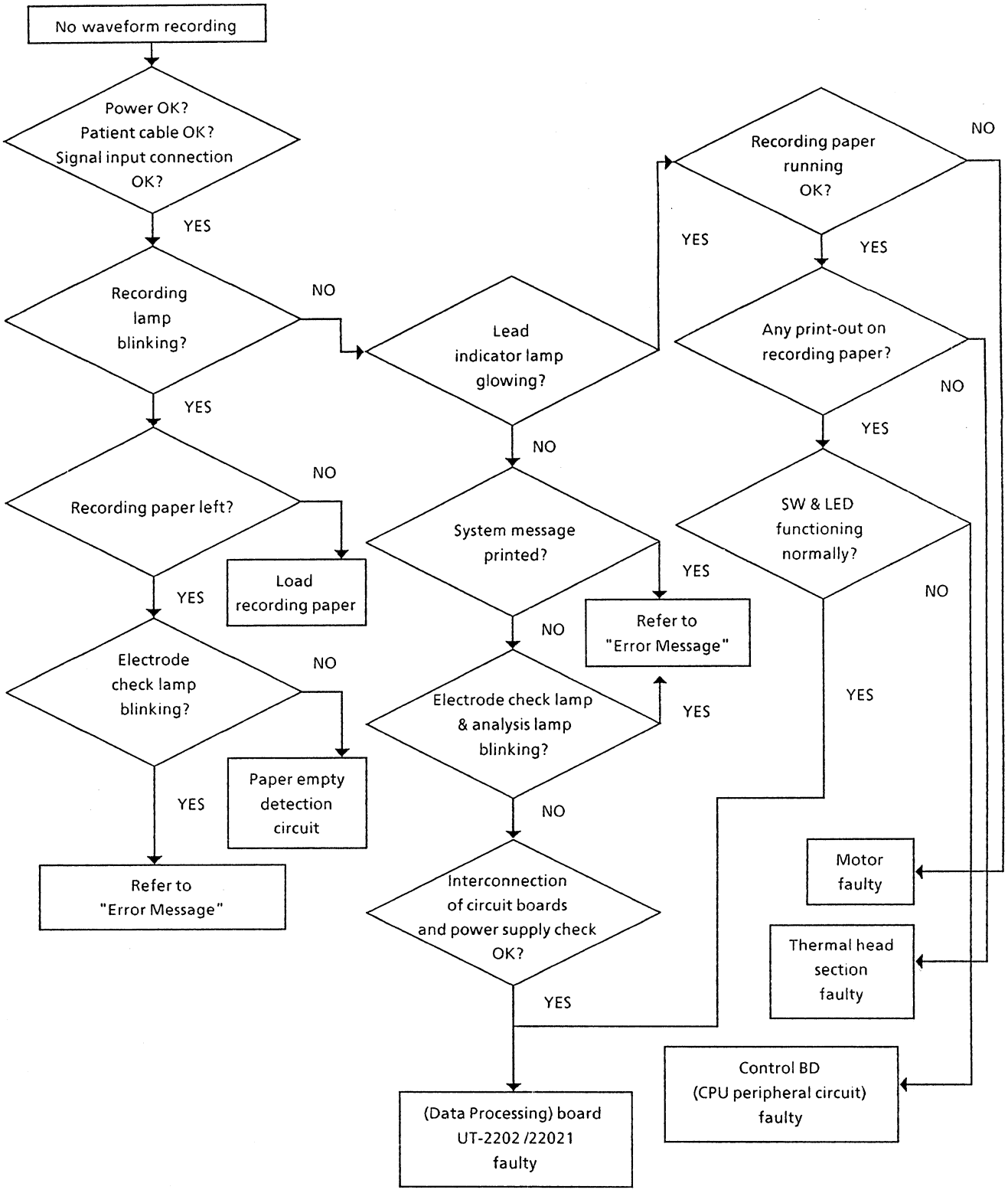
2. Check the continuity of the trace and any drop out of dot.

3. Check the "l" is 50 mm ± 2.5mm.

* the following printout would be made if the "→" has been depressed :

The following test data is printed:


Power supply check
Battery operation?
YES
Battery lamp glowing?
NO
YES
NO
Refer to "No waveform recording"
AC power lamp glowing?
YES
Power sw "on"?
YES
NO
NO
Main power sw "on"?
Set power sw "on"
Set power sw "on"
YES
Check fuse, power cord, etc.
Battery lamp glowing?
NO
YES
OK
Battery voltage below workable level


No waveform recording
Power OK?
Patient cable OK?
Signal input connection OK?
YES
Recording lamp blinking?
NO
YES
Recording paper left?
NO
Load recording paper
YES
Electrode check lamp blinking?
NO
Paper empty detection circuit
YES
Refer to "Error Message"
Lead indicator lamp glowing?
NO
System message printed?
YES
Refer to "Error Message"
NO
Electrode check lamp & analysis lamp blinking?
YES
NO
Interconnection of circuit boards and power supply check OK?
YES
(Data Processing) board UT-2202 /22021 faulty
Recording paper running OK?
NO
YES
Any print-out on recording paper?
NO
YES
SW & LED functioning normally?
NO
YES
Motor faulty
Thermal head section faulty
Control BD (CPU peripheral circuit) faulty

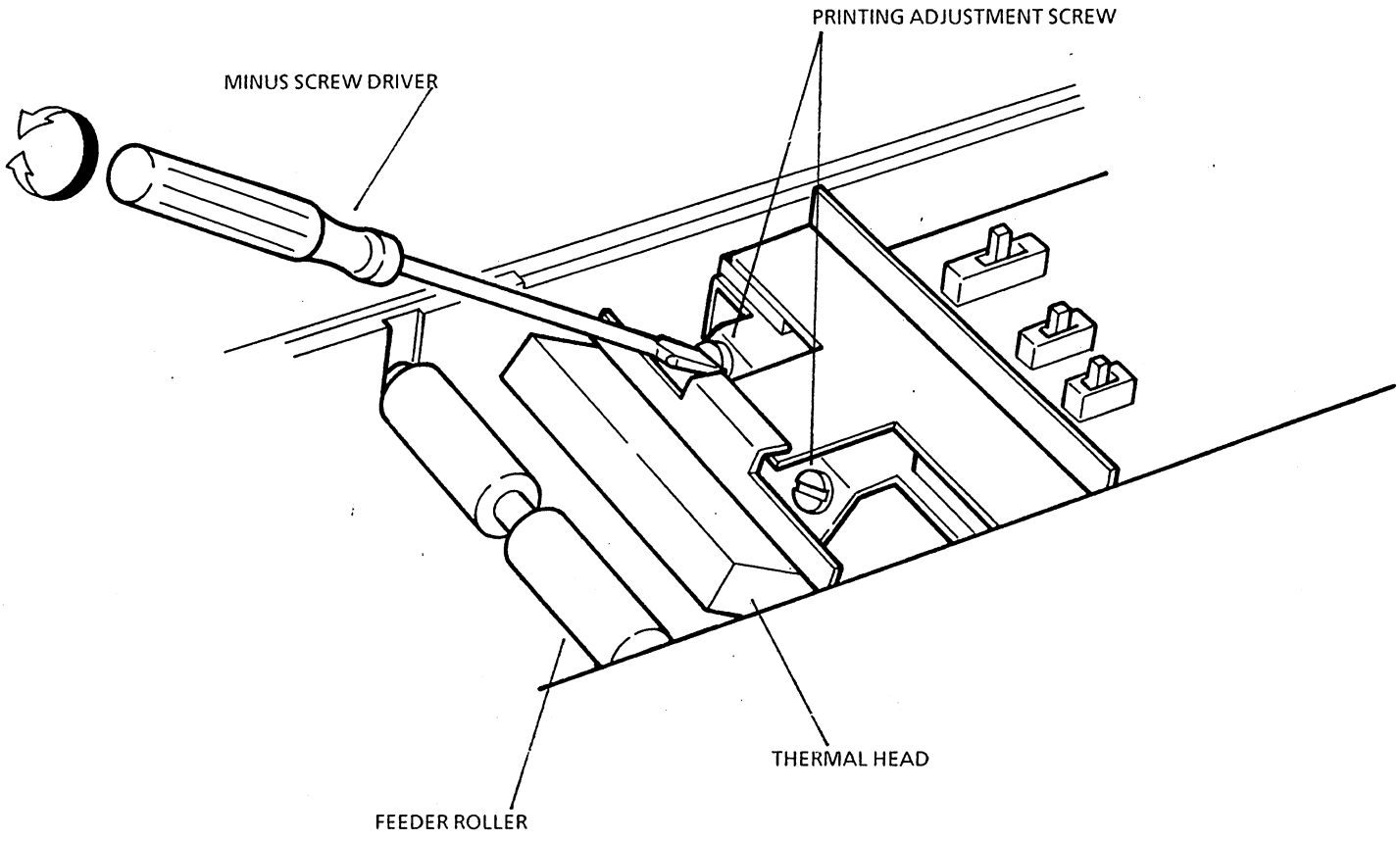
5 Adjustments

5 Adjustments

5-1 Adjusting the thermal head for the print-out

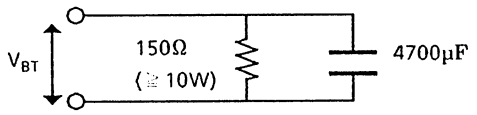
a) Remove the thermal head cover.

b) Adjust the screws in such a way that the darkness of the print-out is in the greatest intensity and is even at both the top and bottom.



5-2 Adjusting battery charging voltage

Disconnect the cable connecting the battery case and UT-2203, connect the dummy load as shown below and adjust VR301 in such a way that V_{BT} = 14.5V (at 25°C).



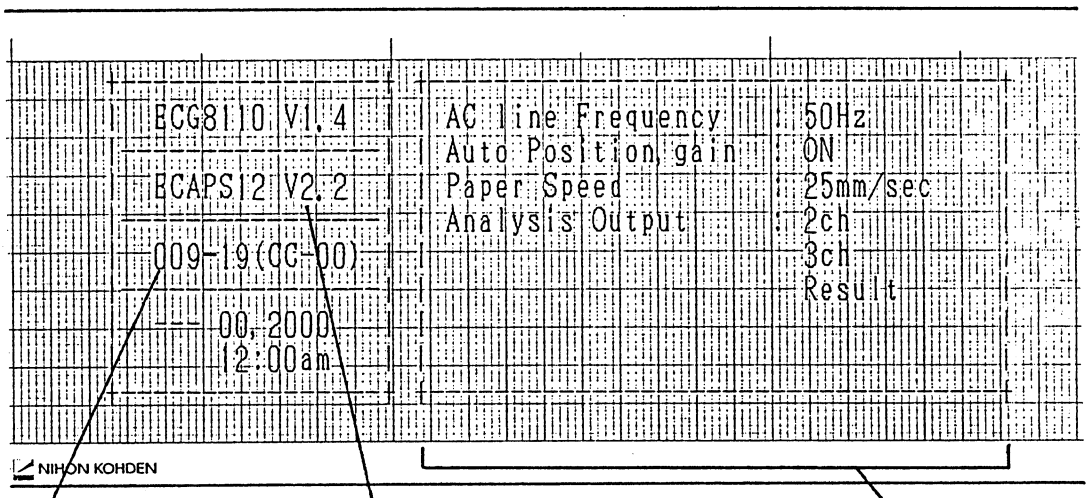
Dummy load for charging voltage adjustment

6 System Message

6 System Message

A system check would be automatically carried out whenever the unit is powered up. The following message would be delivered if there is any abnormality detected during the system check.

1. Electrode check lamp and recording lamp blinking	ROM (ic407)	faulty
2. Electrode check lamp and analysis lamp blinking	RAM (ic406)	faulty
3. The following system message would be printed	Data processing board	faulty

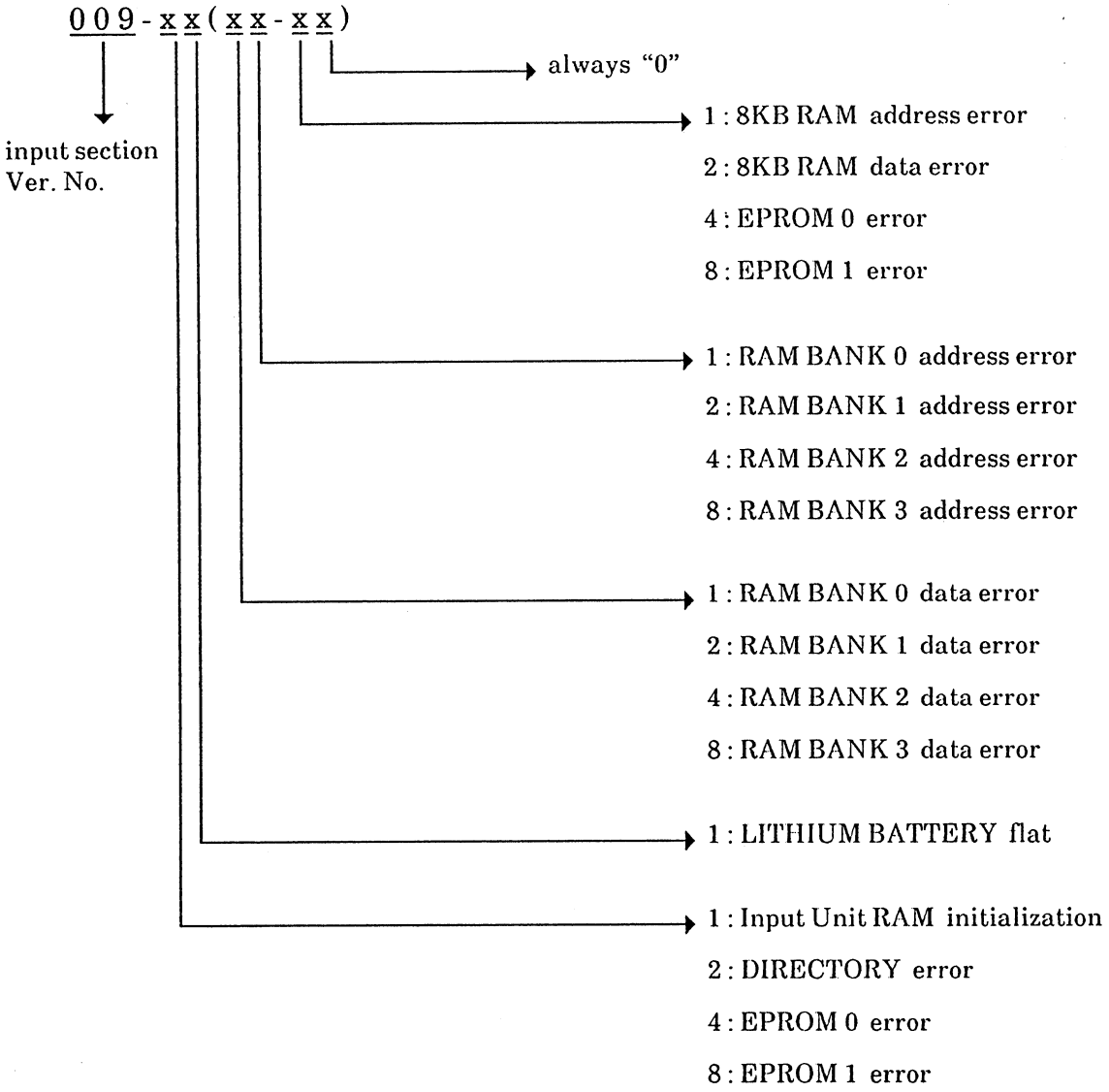


Input section version number

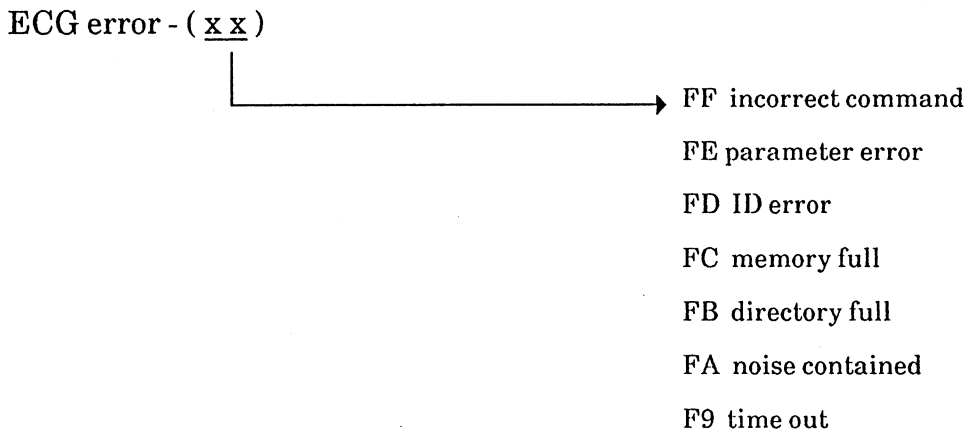
Analysis program version number

DIP switch settings

Contents of System Message



4. Communication error : Data processing BD ↔ Control BD

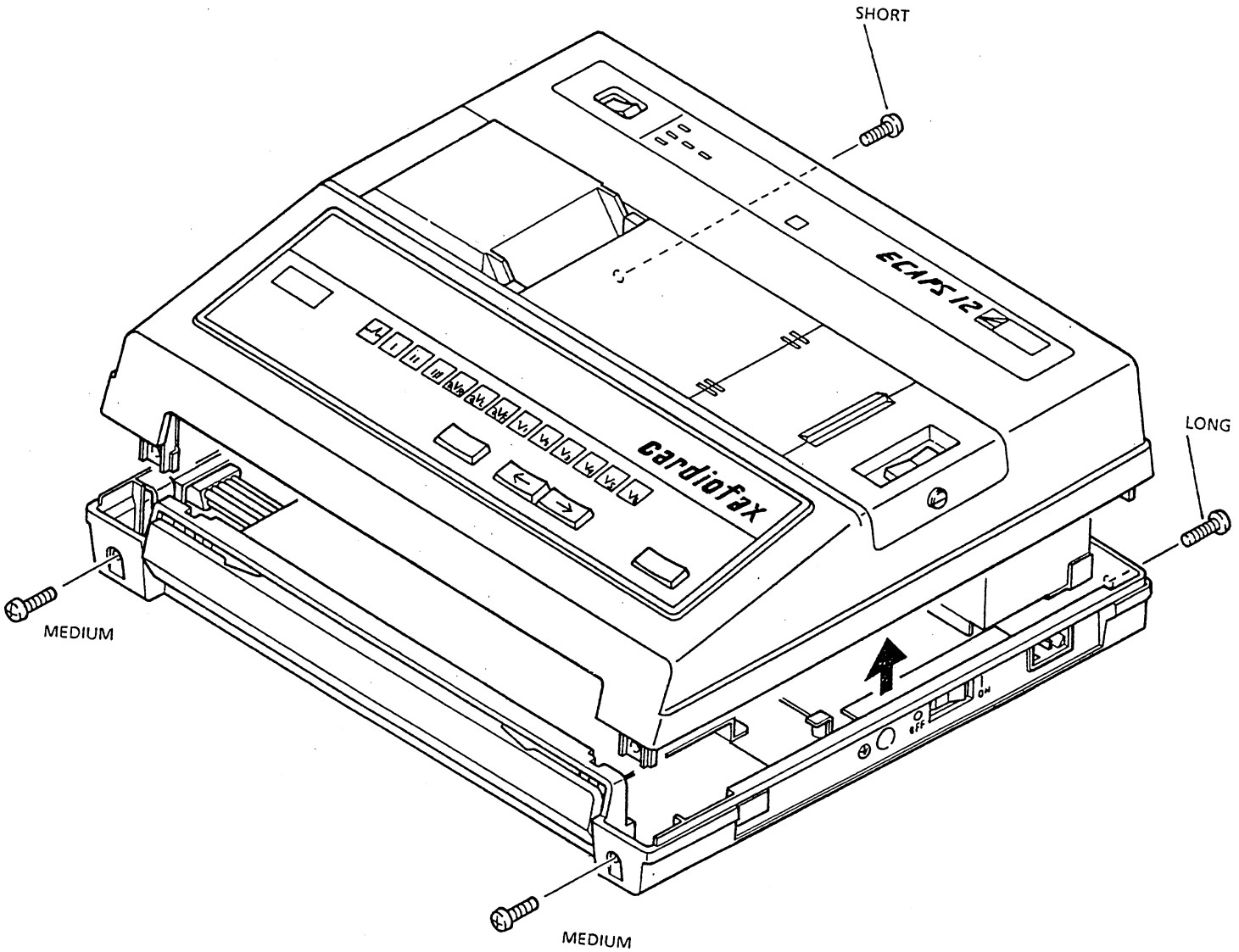


7 Disassembling

7 Disassembling

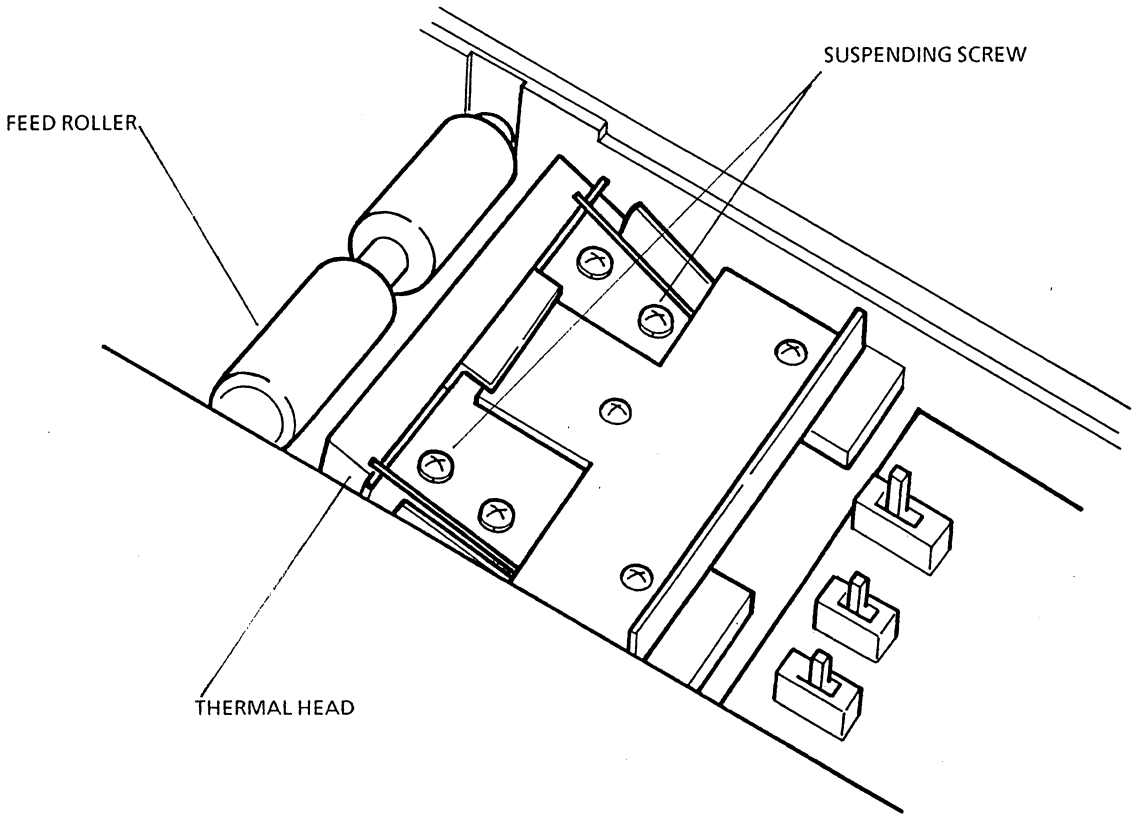
7-1 Disassembling the Casing

Undo the four screws at the corners with a plus screw-driver and lift up the upper part to open the casing.



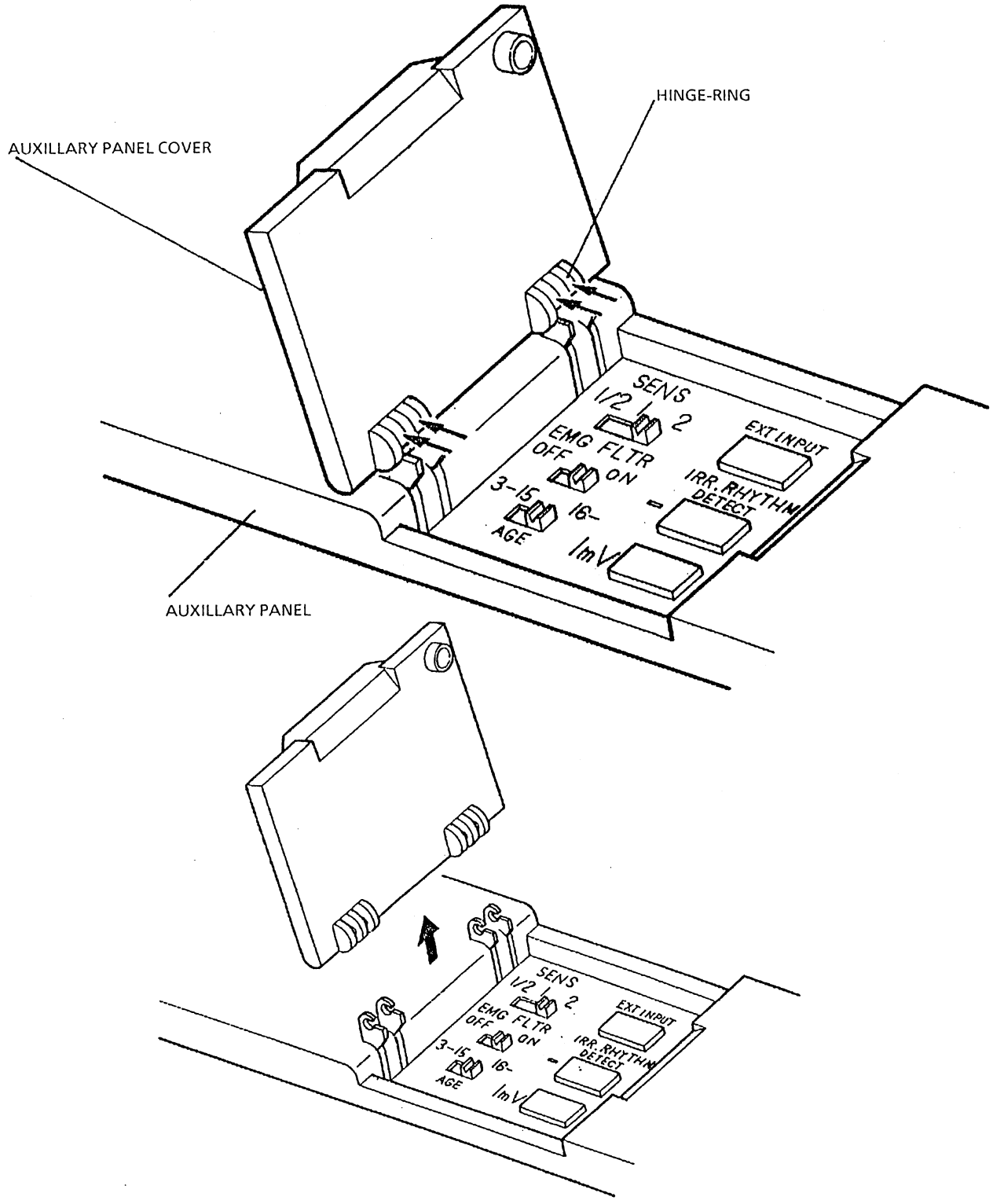
7-2 Removing the thermal head

a) Remove the thermal head cover
b) Disassemble and open up the casing
c) Undo the four screws suspending the thermal head.
d) Draw out the thermal head from the inside of the upper part of the casing.



7-3 Removing the auxiliary panel cover

Depress the hinge-rings with an appropiate hard tip in the direction as indicated and lift up the cover as shown.



Caution

When replacing the thermal head :

1. Remove or refit the thermal head with the magazine in place to protect it from any possible damage which might be caused by the back-tension spring.

2. Refrain from touching the surface (heating elements) of the thermal head.

3. Set SW401 according to the internal resistance of the thermal head :

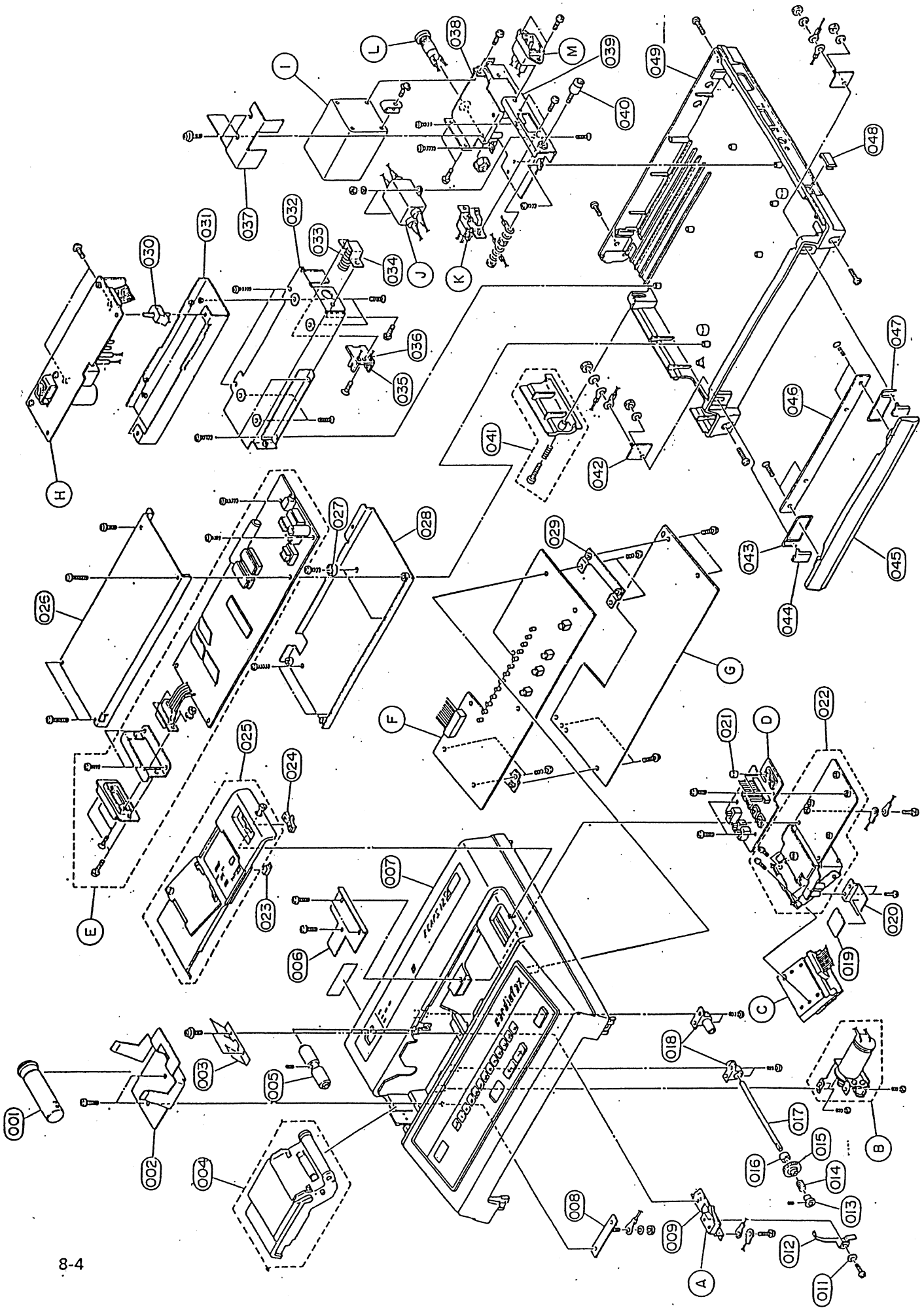
Resistance (Ohm)	SW401 ON
≦179	2
180~199	1
≧200	1 and 2

8 Mechanical Parts list

INDEX NO.	NK PART NO.	QTY	DESCRIPTION
001	YZ-009D8	1	PAPER ROLLER SHAFT (63mm)
002	2219-014516	1	Z-FOLD PAPER GUIDE
003	2219-013277	1	BACK TENSION FRONT
004	RH-803D	1	MAGAZINE ASSY
005	2114-048474B	1	FEEDER ROLLER
006	2219-012358	1	BACKING PLATE
007	YZ-008D5 (ECG-8110A) YZ-008D6 (ECG-8110J) YZ-008D7 (ECG-8110K) YZ-008D8 (ECG-8110E) YZ-008D9 (ECG-8110F/Q) YZ-009D1 (ECG-8110G) YZ-009D2 (ECG-8110R) YZ-023D2 (ECG-8110P)	1	CASING ASSY UPPER
008	2219-014534	1	TAPED PLATE
009	2219-013321	1	MOUNTING PLATE SENSOR
010	N.A.	0	(deleted as for modification)
011	2219-003733	1	SENSOR ARM SHAFT
012	2219-011965	1	SENSOR ARM (Ø16)
013	2114-034132	1	PLASTIC BUSH
014	2114-034061	1	FEEDER ROLLER PLASTIC PANEL
015	2249-000109	1	WORM WHEEL ASSY
016	2114-048492A	1	FEEDER ROLLER SHAFT SPACER
017	2114-048483	1	FEEDER ROLLER SHAFT
018	2114-034408	2	FEEDER ROLLER SOCKET
019	2219-014605	1	GUM PLATE MOTOR
020	2219-014597	1	MOUNTING PLATE MOTOR
021	2219-012171	2	SPACER KEY TOP
022	YZ-009D9	1	FEEDER ASSY
023	2114-058632A	4	KEY SQUARE TOP
024	2124-009088	1	KEY SEESAW TOP

INDEX NO.	NK PART NO.	QTY	DESCRIPTION
025	YZ-010D1 (ECG-8110A) YZ-011D1 (ECG-8110J/K) YZ-011D2 (ECG-8110E/Q/R) YZ-011D3 (ECG-8110G/F) YZ-023D4 (ECG-8110P)	1	THERMAL HEAD COVER
026	2218-003245	1	SHIELDING PLATE PREAMP TOP
027	2219-012215	2	PCB SPACER
028	YZ-010D9	1	SHIELDING PLATE PREAMP BOTTOM
029	2219-012198	2	MOUNTING PLATE PCB
030	2875-100155	2	SIDE KEYBOARD SUPPORT HL-CBS-7N
031	YZ-010D2	1	HEAT SINK ASSY
032	2113-015494C	1	CASE BATT
033	2114-048652	1	SPRING BATT
034	2114-048643	1	BRACKET SPRING BATT
035	2113-013175	1	TERMINAL PLATE BATT
036	2114-040865	2	TERMINAL BATT
037	2219-015631	1	COVER S LINE FILTER
038	2219-012189	1	COVER CHASSIS POWER UNIT
039	2218-003227	1	CHASSIS POWER UNIT
040	2144-008933	1	TERMINAL ASSY EARTH CSA . L
041	YZ-010D7	1	COVER BATT ASSY
042	2219-012376	2	MOUNTING PLATE HANDLE
043	2114-048697	1	RING HANDLE
044	2114-043185	2	BRACKET HANDLE
045	2113-015556	1	HANDLE
046	2114-048777	1	MOUNTING BRACKET HANDLE
047	2114-048688	1	RING HANDLE
048	2219-005081	1	COVER DIP SW
049	YZ-009D4 (ECG-8110A) YZ-009D5 (ECG-8110J) YZ-009D6 (ECG-8110K) YZ-009D7 (ECG-8110E/F/R/Q) YZ-009D3 (ECG-8110G) YZ-023D3 (ECG-8110P)	1	CASING ASSY LOWER

INDEX NO.	NK PART NO.	QTY	DESCRIPTION
A	2684-300133	1	AH-3242
B	YZ-010D8	1	MOTOR ASSY
C	2746-900025	1	THERMAL HEAD TPH48R1
D	UT-2206	1	KEY BOARD 2
E	UT-22021	1	DATA PROCESSING BOARD
F	UT-2205	1	KEY BOARD 1
G	UT-2204X, UT-2220X	1	CONTROL BOARD
H	UT-2203	1	POWER BOARD
I	2650-000787A (ECG-8110J/A) 2650-000796A (ECG-8110K/E/F/R/G/D/P)	1	T101
J	2670-100169	1	LINE FILTER FN610B-6106
K	2682-300144	1	SW101
L	2725-000127	2	FUSE CAP FEK031-1661
L	2725-000136	2	FUSE HOLDER FEU031-1637
M	2720-400115	1	3P INLET NC-174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9 Electrical Parts list

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
ECG8110A				
ECG8110A		2684-300113-	1	SW AH3242
ECG8110A		2803-000122-	1	DC MOTOR LN30-02001
ECG8110A		2809-800102-	1	SENSOR FP-2R-02
ECG8110A	CNA103	2701-400044-	1	CNA HIF3BA-20D-AA-17
ECG8110A	CNA105	2702-408016-	1	CN-ASSY M62-02-0009SA L=250
ECG8110A	CNA106	2702-409104-A	1	CN-ASSY M62-05-0012SA L=200
ECG8110A		2670-100169-	1	LINE FILTER FN610B-6/06
ECG8110A		2720-400115-	1	3P INLET NC-174
ECG8110A		2725-000127-	2	FUSE CAP FEK031.1661
ECG8110A		2725-000136-	2	FUSE HOLDER FEU031.1673
ECG8110A		2726-101007-	2	FUSE GDL-1 1A (UL)
ECG8110A	SW101	2682-300144-	1	SW SDDT-B-DPST-5A 250V-2
ECG8110A	T101	2650-000787-A	1	PTF T-2650000787A (ECG-8110)
ECG8110A		2746-900025-	1	THERMAL HEAD TPH48R1

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
ECG8110J				
ECG8110J		2684-300113-	1	SW AH3242
ECG8110J	CNA103	2701-400044-	1	CNA HIF3BA-20D-AA-17
ECG8110J	CNA105	2702-408016-	1	CN-ASSY M62-02-0009SA L=250
ECG8110J	CNA106	2702-409104-A	1	CN-ASSY M62-05-0012SA L=200
ECG8110J		2746-900025-	1	THERMAL HEAD TPH48R1
ECG8110J		2803-000122-	1	DC MOTOR LN30-02001
ECG8110J		2809-800102-	1	SENSOR FP-2R-02
ECG8110J	T101	2650-000787-A	1	PTF T-2650000787A (ECG-8110)
ECG8110J		2670-100169-	1	LINE FILTER FN610B-6/06
ECG8110J	SW101	2682-300144-	1	SW SDDT-B-DPST-5A 250V-2
ECG8110J		2720-400115-	1	3P INLET NC-174
ECG8110J		2725-000127-	2	FUSE CAP FEK031.1661
ECG8110J		2725-000136-	2	FUSE HOLDER FEU031.1673
ECG8110J		2726-101007-	2	FUSE GDL-1 1A (UL)

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
ECG8110K				
ECG8110K		2684-300113-	1	SW AH3242
ECG8110K	CNA103	2701-400044-	1	CNA HIF3BA-20D-AA-17
ECG8110K	CNA105	2702-408016-	1	CN-ASSY M62-02-0009SA L=250
ECG8110K	CNA106	2702-409104-A	1	CN-ASSY M62-05-0012SA L=200
ECG8110K		2746-900025-	1	THERMAL HEAD TPH48R1
ECG8110K		2803-000122-	1	DC MOTOR LN30-02001
ECG8110K		2809-800102-	1	SENSOR FP-2R-02
ECG8110K	T101	2650-000796-B	1	PTF T-2650000796A (ECG-8110)
ECG8110K		2670-100169-	1	LINE FILTER FN610B-6/06
ECG8110K	SW101	2682-300144-	1	SW SDDT-B-DPST-5A 250V-2
ECG8110K		2720-400115-	1	3P INLET NC-174
ECG8110K		2725-000118-	2	FUSE CAP FEK031.1663
ECG8110K		2725-000127-	2	FUSE CAP FEK031.1661
ECG8110K		2725-000136-	2	FUSE HOLDER FEU031.1673
ECG8110K		2726-000107-A	2	FUSE 218.500 (0.5A)
ECG8110K		2726-101105-	2	FUSE GDL-1/2 0.5A (UL) T500mA/250V(IEC)

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
ECG8110E/F/G/D/R/Q/P				
ECG8110E		2684-300113-	1	SW AH3242
ECG8110E	CNA103	2701-400044-	1	CNA HIF3BA-20D-AA-17
ECG8110E	CNA105	2702-408016-	1	CN-ASSY M62-02-0009SA L=250
ECG8110E	CNA106	2702-409104-A	1	CN-ASSY M62-05-0012SA L=200
ECG8110E		2746-900025-	1	THERMAL HEAD TPH48R1
ECG8110E		2803-000122-	1	DC MOTOR LN30-02001
ECG8110E		2809-800102-	1	SENSOR FP-2R-02
ECG8110E	T101	2650-000796-B	1	PTF T-2650000796A (ECG-8110)
ECG8110E		2670-100169-	1	LINE FILTER FN610B-6/06
ECG8110E	SW101	2682-300144-	1	SW SDDT-B-DPST-5A 250V-2
ECG8110E		2720-400115-	1	3P INLET NC-174
ECG8110E		2725-000118-	2	FUSE CAP FEK031.1663
ECG8110E		2725-000136-	2	FUSE HOLDER FEU031.1673
ECG8110E		2726-000107-A	2	FUSE 218.500 (0.5A)

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2202/22021 DATA PROCESSING BOARD				
UT-2202		2720-103115-A	2	IC SOCKET DICF-28C-E
UT-2202	AR201-AR210	2546-900608-	10	ARRESTOR Y-06S-90B
UT-2202	BAT201	2840-000231-	1	BATT CR1260OSE-FT3
UT-2202	CNA208	2702-400087-C	1	CNA INPUT CABLE (1C)
UT-2202	CNJ201	2701-200019-	1	CNJ HIF3F-20PA-2.54DSA
UT-2202	CNJ202	2724-000013-	1	JACK SG8036
UT-2202	C201	2622-200472-	1	FLC ECQ-P1472JZ 0.0047uF
UT-2202	C202-C210	2632-200132-	9	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C211	2632-201603-	1	CEC DD104-SL100D50V02 10pF
UT-2202	C212-C215	2632-200649-	4	CEC RAU05SL470K-L05AC 47pF
UT-2202	C216-C225	2632-200132-	10	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C226	2630-210107-A	1	EC USA1C470MCA 16V 47uF
UT-2202	C227-C228	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C229	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2202	C230	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2202	C231-C232	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C234	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2202	C235	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C236-C237	2632-200631-	2	CEC RAU04SL220K-L05AC 22pF
UT-2202	C238-C242	2632-200132-	5	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C243	2632-200658-	1	CEC ROU04B101K-L05AC 100pF
UT-2202	C244-C246	2632-200132-	3	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C248	2630-201162-	1	EC UPF1C471MPH6 16V 470uF
UT-2202	C249-C250	2630-201037-	2	EC ECEA1EF100 25V 10uF
UT-2202	C251-C252	2630-200011-	2	EC UPF1E470MAH 25V 47uF
UT-2202	C253	2622-200133-	1	FLC ECQ-V1H104JZ 50V 0.1uF
UT-2202	C257	2630-200929-	1	EC UPX1E221MRH 25V 220uF
UT-2202	C258	2632-200542-	1	CEC UAT04X222M-L05AC 25V 2200pF
UT-2202	C260-C263	2632-200132-	4	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C264	2632-200658-	1	CEC ROU04B101K-L05AC 100pF
UT-2202	C265-C273	2632-200587-	9	CEC RAU05SA221K-L05AC 220pF
UT-2202	C280-C282	2632-200132-	3	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C283-C284	2632-200542-	2	CEC UAT04X222M-L05AC 25V 2200pF
UT-2202	C285	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2202	C291-C292	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2202	C293	2632-200667-	1	CEC D55Y5V1H473Z21 0.047uF
UT-2202	C300-C301	2630-201037-	2	EC ECEA1EF100 25V 10uF
UT-2202	D201-D204	2500-100115-A	4	D 1S2075K
UT-2202	D206	2500-200462-	1	ZD HZ3CLL
UT-2202	D207-D208	2500-100115-A	2	D 1S2075K

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2202	D209	2501-000079-	1	D DINK-20H
UT-2202	D210	2500-100115-A	1	D 1S2075K
UT-2202	D211-D212	2500-100151-	2	D 1S2076A
UT-2202	D213	2500-100115-A	1	D 1S2075K
UT-2202	D215-D223	2500-100115-A	9	D 1S2075K
UT-2202	D232	2500-100115-A	1	D 1S2075K
UT-2202	D280-D282	2500-100115-A	3	D 1S2075K
UT-2202	D283	2500-200444-	1	ZD HZ7B2L
UT-2202	D284	2500-202005-	1	ZD HZ-5C1
UT-2202	D291	2500-100169-	1	D HRP22
UT-2202	IC201-IC203	2524-900276-	3	LIC 2995-007C
UT-2202	IC204	2522-901199-	1	DIC DG508ACJ
UT-2202	IC205-IC206	2527-000127-	2	RAM HM62256LFP-12T
UT-2202	IC207-IC208	2520-000863-	2	LIC uPC812C
UT-2202	IC209	2522-900886-	1	LIC AD7543KN
UT-2202	IC210	2520-000756-	1	LIC uPC811C
UT-2202	IC211	2520-000836-	1	LIC OP-27GN8
UT-2202	IC212	2520-000863-	1	LIC uPC812C
UT-2202	IC213	2524-900267-	1	LIC 2995-011A
UT-2202	IC214	2522-400231-	1	DIC HD74HC595P
UT-2202	IC215	2524-900258-A	1	LIC 2995-010A
UT-2202	IC216	2522-100172-	1	DIC uPD74HC04C
UT-2202	IC217	2520-900266-	1	LIC SM6100
UT-2202	IC218	2528-900571-	1	LSI 2996-001A
UT-2202	IC219	2528-900535-	1	LSI EID-1001
UT-2202	IC220	2528-000259-	1	CPU HD63B03RP
UT-2202	IC221	2522-100181-	1	DIC uPD74HC14C
UT-2202	IC222	2522-000342-	1	DIC uPD74HC86C
UT-2202	IC223-IC224	2520-400173-	2	LIC NJM2930L-8
UT-2202	IC225	2520-000854-	1	IC AN1431T
UT-2202	IC227	2522-000342-	1	DIC uPD74HC86C
UT-2202	IC228	2520-900257-	1	LIC LM385BZ-1.2
UT-2202	IC231	2520-400012-	1	LIC MAX8212CPA
UT-2202	IC232	2527-000136-	1	RAM TC5565AFL-12
UT-2202	IC235	2522-500373-	1	DIC RTC-58321B
UT-2202	IC236	2522-200153-	1	DIC uPD74HC138C
UT-2202	IC280	2520-000872-	1	LIC uPC4072HA
UT-2202	IC281	2522-900823-	1	DIC MC74HC4053N
UT-2202	L201-L202	2662-000167-	2	COIL FL5H470K 47uH
UT-2202	L203	2662-000194-	1	COIL 3C-101 (FB-225)

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2202	L204-L205	2662-002307-	2	COIL FL5H 331K 330uH
UT-2202	PC201-PC202	2519-000142-	2	PHOTOCOUPLER TLP621-1
UT-2202	Q201	2510-002906-	1	TR 2SA836-D
UT-2202	Q206	2510-002906-	1	TR 2SA836-D
UT-2202	Q207	2511-000158-A	1	TR 2SC2562-Y
UT-2202	Q211	2511-003306-	1	TR 2SC1345-D
UT-2202	Q213	2510-002906-	1	TR 2SA836-D
UT-2202	Q280	2513-900118-	1	TR DTC144S
UT-2202	RM201	2554-202162-	1	RM M6-1-104J 100K OHM
UT-2202	RM280-RM281	2559-200519-	2	R MODULE CMR017-10 KOHM
UT-2202	R270-R271	2588-000039-	2	MR RK14B3A 33M OHM J
UT-2202	SW201	2690-000257-	1	SW BP-8
UT-2202	T201	2657-000229-	1	PTF T-2657000229 (ECG-8000)
UT-2202	T202-T205	2657-000113-	4	TF T-2657000113 (ECG-8000)
UT-2202	X201	2783-000357-	1	XTAL HC-49/U-70 8.192M HZ

UT-2203 POWER BOARD

UT-2203	CNP301	2702-400096-	1	CNA 1C-101
UT-2203	C301	2630-201429-	1	EC ECEA1HU471 50V 470uF
UT-2203	C302	2630-200038-	1	EC LLR1V562MHSA 35V 5600uF
UT-2203	C303	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2203	C304	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2203	C305	2630-200127-A	1	EC USA1H3R3MCA 50V 3.3uF
UT-2203	C306	2632-202602-	1	CEC DD104-B681K50V02 680pF
UT-2203	C307	2630-200528-	1	EC UVS1C101MCA 16V 100uF
UT-2203	C308	2630-200582-	1	EC UVX1V4R7MAA 35V/4.7uF
UT-2203	C309	2630-200127-A	1	EC USA1H3R3MCA 50V 3.3uF
UT-2203	C310	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2203	C311	2630-210107-A	1	EC USA1C470MCA 16V 47uF
UT-2203	C312	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2203	C313	2630-210107-A	1	EC USA1C470MCA 16V 47uF
UT-2203	C314	2630-200698-	1	EC UVX1V220MAA 35V/22uF
UT-2203	C315	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2203	C316	2622-200392-	1	FLC ECQ-B1H472JZ 50V 0.0047uF
UT-2203	C317-C318	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2203	C319	2630-200813-	1	EC UVX1H010MAA 50V 1uF
UT-2203	C320	2630-200029-	1	EC UPF1C392MRH-6 16V 3900uF
UT-2203	C321	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2203	C330-C331	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2203	C335	2630-210009-A	1	EC USA1C220MCA 16V 22uF
UT-2203	D301	2501-100256-	1	D S5VB10
UT-2203	D302	2501-100024-	1	D S3VC10
UT-2203	D303-D308	2500-100115-A	6	D 1S2075K
UT-2203	D309-D310	2501-000034-	2	D IN4004
UT-2203	D311-D312	2500-100115-A	2	D 1S2075K
UT-2203	D313	2501-100318-	1	D MA650
UT-2203	F303	2726-000125-	1	FUSEMC-5 5A 125V
UT-2203	IC301	2522-001305-	1	DIC MC14025BCP
UT-2203	IC302-IC304	2520-005403-	3	LIC AN6561
UT-2203	IC305-IC306	2520-000854-	2	IC AN1431T
UT-2203	IC307	2520-000827-	1	LIC TL594CN
UT-2203	IC308	2520-402509-	1	LIC MC7805CT
UT-2203	LED301-LED305	2503-000182-	5	LED GL-9NG2 Green
UT-2203	L301	2664-900403-	1	COIL SKP-5-50 5A 150uH
UT-2203	Q301	2511-006303-	1	TR 2SC982TM
UT-2203	Q302-Q303	2513-900118-	2	TR DTC144S
UT-2203	Q304	2510-002906-	1	TR 2SA836-D
UT-2203	Q305	2510-100016-	1	TR 2SB1018
UT-2203	Q306	2511-006508-	1	TR 2SC2270-C
UT-2203	Q307	2510-002906-	1	TR 2SA836-D
UT-2203	Q308-Q309	2511-003306-	2	TR 2SC1345-D
UT-2203	Q310	2510-000392-	1	TR 2SA1451 O-Y
UT-2203	RY301	2695-000113-A	1	RY G2U-112PD (12V)
UT-2203	R352	2588-300018-	1	WR TS2-0.1 OHMJ
UT-2203	SW302	2682-300135-	1	SW SDDJA3(E3549376M)
UT-2203	VR301	2611-400517-	1	VR GF06P 2 KOHM
UT-2203	ZD301	2500-200613-	1	ZD 05Z-12
UT-2203	ZD302	2500-207107-	1	ZD HZ-18-1

UT-2220/22203/22204/22202 CONTROL BOARD

UT-2220	CNJ401	2701-200019-	1	CNJ HIF3F-20PA-2.54DSA
UT-2220	CNJ402	2701-201918-	1	CNJ HIF3F-26PA-2.54DSA
UT-2220	CNJ403	2690-000025-	1	CNJ B9B-EH
UT-2220	CNP404	2701-400026-	1	CNA HIF2BR(S)A.3BA-20D-AA-17
UT-2220	C401-C404	2622-200222-	4	FLC ECQ-V1H473JZ 50V 0.047uF
UT-2220	C405	2622-200276-	1	FLC ECQ-V1H683JZ 50V 0.068uF
UT-2220	C406	2622-200222-	1	FLC ECQ-V1H473JZ 50V 0.047uF
UT-2220	C407	2622-200231-	1	FLC ECQ-V1H224JZ 50V 0.22uF
UT-2220	C408	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2220	C409	2630-200047-	1	EC UVS1C222MRA 16V 2200uF

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2220	C410	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2220	C411	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2220	C413	2622-200329-	1	FLC ECQ-B1H103JZ 50V 0.01uF
UT-2220	C414-C418	2632-200132-	5	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2220	C421	2630-200528-	1	EC UVS1C101MCA 16V 100uF
UT-2220	C422	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2220	C423-C424	2632-200631-	2	CEC RAU04SL220K-L05AC 22pF
UT-2220	C425	2631-201347-	1	TAC S89 1E105MA1 25V 1uF
UT-2220	C426-C428	2632-200132-	3	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2220	C451	2630-209902-A	1	EC USA1C100MCA 16V 10uF
UT-2220	C452-C453	2630-201028-	2	CEC UAT05X103M-L05AC 0.01uF
UT-2220	C454	2622-200276-	1	FLC ECQ-V1H683JZ 50V 0.068uF
UT-2220	C455-C457	2632-200132-	3	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2220	D401	2500-100115-A	1	D 1S2075K
UT-2220	D451-D456	2500-100115-A	6	D 1S2075K
UT-2220	IC401	2522-900021-	1	DIC TC74HC4538F
UT-2220	IC404	2521-000032-	1	DIC TC74HC132F
UT-2220	IC406	2527-000127-	1	RAM HM62256LFP-12T
UT-2220	IC409	2521-900014-	1	DIC TC74HC251F
UT-2220	IC410	2520-900016-	1	LIC MAX635ACPA
UT-2220	IC411	2521-000023-	1	DIC TC74HC08F
UT-2220	IC412	2521-000059-	1	DIC TC74HC32F
UT-2220	IC413	2521-000041-	1	DIC TC74HC10F
UT-2220	IC414	2528-900366-	1	LIC PST-520C
UT-2220	IC415	2528-900018-	1	LSI EID-R003(UPD65013GF-219)
UT-2220	IC417	2527-000047-	1	RAM HM6264FP-12 OR 15
UT-2220	IC451	2520-000854-	1	IC AN1431T
UT-2220	IC452	2520-006001-	1	LIC TL062CP (OP AMP)
UT-2220	IC453	2522-900039-	1	LSI UPD7004C
UT-2220	L401	2662-002307-	1	COIL FL5H 331K 330uH
UT-2220	Q401-Q402	2513-900118-	2	TR DTC144S
UT-2220	RM401	2554-203241-	1	RM M9-2-473J-M1 47K OHM
UT-2220	SW401	2690-200023-	1	SW BS6-SE
UT-2220	X401	2783-000357-	1	XTAL HC-49/U-70 8.192M HZ

UT-22041/22044/22043/22045 CONTROL BOARD

UT-2204		2720-103115-A	1	IC SOCKET DICF-28C-E
UT-2204	CNJ401	2701-201125-	1	CNJ FCN 744Q020-AU/O-HN
UT-2204	CNJ402	2701-201143-	1	CNJ FCN 744Q026-AU/O-HN

ASSY	CKT NO.	NK PART NO.	Q'TY		DESCRIPTION
UT-2204	CNJ403	2690-000025-	1	CNJ	B9B-EH
UT-2204	CNP404	2701-400026-A	1	CNA	HIF2B(SA)3BA-20D-AA-17
UT-2204	C401-C404	2622-200222-	4	FLC	ECQ-V1H473JZ 50V 0.047uF
UT-2204	C405	2622-200276-	1	FLC	ECQ-V1H683JZ 50V 0.068uF
UT-2204	C406	2622-200222-	1	FLC	ECQ-V1H473JZ 50V 0.047uF
UT-2204	C407	2622-200231-	1	FLC	ECQ-V1H224JZ 50V 0.22uF
UT-2204	C408	2632-200132-	1	CEC	D55Y5V1H104Z21 50V 0.1uF
UT-2204	C409	2630-200047-	1	EC	UVS1C222MRA 16V 2200uF
UT-2204	C410	2632-200132-	1	CEC	D55Y5V1H104Z21 50V 0.1uF
UT-2204	C411	2630-000192-	1	EC	USR1C101MCA 16V 100uF
UT-2204	C412	2622-200133-	1	FLC	ECQ-V1H104JZ 50V 0.1uF
UT-2204	C413	2622-200329-	1	FLC	ECQ-B1H103JZ 50V 0.01uF
UT-2204	C414-C420	2632-200132-	7	CEC	D55Y5V1H104Z21 50V 0.1uF
UT-2204	C421	2630-200528-	1	EC	UVS1C101MCA 16V 100uF
UT-2204	C422	2630-209902-A	1	EC	USA1C100MCA 16V 10uF
UT-2204	C423-C424	2632-200631-A	2	CEC	RAU04SL220J-L05AC 22pF
UT-2204	C425	2631-201347-	1	TAC	S89 1E105MA1 25V 1uF
UT-2204	C426-C428	2632-200132-	3	CEC	D55Y5V1H104Z21 50V 0.1uF
UT-2204	C430	2632-200132-	1	CEC	D55Y5V1H104Z21 50V 0.1uF
UT-2204	D401	2500-100115-A	1	D	1S2075K
UT-2204	IC401	2522-900021-A	1	DIC	TC74HC4538F OR Red
UT-2204	IC402	2521-300092-	1	DIC	TC74HC373AF
UT-2204	IC403	2520-006001-	1	LIC	TL062CP (OP AMP)
UT-2204	IC404	2521-000674-	1	DIC	TC74HC132AF
UT-2204	IC405	2521-900041-	1	LIC	PCM55HP
UT-2204	IC406	2527-000127-A	1	RAM	HM62256LFP-10T/12T
UT-2204	IC409	2521-900611-	1	DIC	TC74HC251AF
UT-2204	IC410	2520-900016-	1	LIC	MAX635ACPA
UT-2204	IC411	2521-000656-	1	DIC	TC74HC08AF
UT-2204	IC412	2521-000683-	1	DIC	TC74HC32AF
UT-2204	IC413	2521-000665-	1	DIC	TC74HC10AF
UT-2204	IC414	2528-900366-	1	LIC	PST-520C
UT-2204	IC415	2528-900018-	1	LSI	EID-R003(UPD65013GF-219)
UT-2204	IC417	2526-100574-	1	RAM	HM6264ALFP-12 OR 15
UT-2204	L401	2662-002307-	1	COIL	FL5H 331K 330UH
UT-2204	Q401-Q403	2513-900118-A	3	TR	DTC144ES
UT-2204	RM401	2554-203241-	1	RM	M9-2-473J-M1 47K OHM
UT-2204	SW401	2690-200023-A	1	SW	BS6-SE
UT-2204	X401	2783-000357-	1	XTAL	HC-49/U-70 8.192M HZ

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2205/22051 KEY BOARD 1				
UT-2205	CNA501	2701-400017-	1	CNA HIF2BR(S)A.3BA-26D-AA-6
UT-2205	CNJ502	2702-212503-	1	CNJ M60-05-30-114P
UT-2205	CNJ503	2702-209507-A	1	CNJ M60-02-30-114P (2P STRAIGHT)
UT-2205	CNJ504	2690-000016-	1	CNJ B15B-EH
UT-2205	C501-C502	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2205	C503-C504	2630-000192-	2	EC USR1C101MCA 16V 100uF
UT-2205	C505-C508	2632-200132-	4	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2205	C509	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2205	C510	2632-200132-	1	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2205	C511-C512	2622-200311-	2	FLC ECQ-B1H102JZ 50V 0.001uF
UT-2205	C513	2630-210107-A	1	EC USA1C470MCA 16V 47uF
UT-2205	C514-C515	2632-200132-	2	CEC D55Y5V1H104Z21 50V 0.1uF
UT-2205	C516	2630-200992-	1	EC UMA1C4R7MCA 16V 4.7uF
UT-2205	C517	2622-200383-	1	FLC ECQ-B1H222JZ 50V 0.0022uF
UT-2205	C518	2632-200578-	1	CEC RAU05SA151K-L05AC 150pF
UT-2205	C519	2630-000192-	1	EC USR1C101MCA 16V 100uF
UT-2205	C520	2630-200377-	1	EC ECEA1VKN2R2 35V 2.2uF
UT-2205	C521	2631-205904-B	1	JAC 202L3502-334K-4 35V 0.33uF
UT-2205	C522	2636-200115-	1	CEC UAT05X103M-L05AE 25V0.01uF
UT-2205	C523	2631-201623-	1	204M2002 225M4 20V 2.2uF
UT-2205	C524	2632-200132-	1	D55Y5V1H104Z21 50V 0.1uF
UT-2205	D101	2501-000284-	1	D EK03
UT-2205	D102	2501-000034-	1	D IN4004
UT-2205	IC501	2522-200028-	1	DIC TC74HC4514P
UT-2205	IC502	2521-900059-	1	DIC TC74HC251P
UT-2205	IC503-IC504	2520-200905-	2	LIC TD62004P
UT-2205	IC505	2521-900059-	1	DIC TC74HC251P
UT-2205	IC506	2522-200108-	1	DIC MC14028BCP
UT-2205	IC507	2520-200905-	1	LIC TD62004P
UT-2205	IC508	2522-900422-	1	DIC uPD74HC153C
UT-2205	IC509	2522-500266-	1	DIC uPD74HC393C
UT-2205	IC510	2521-300029-	1	DIC uPD74HC107C
UT-2205	IC511	2520-400173-	1	LIC NJM2930L-8
UT-2205	IC512	2521-900023-	1	LIC TC9142P
UT-2205	IC513	2520-000827-	1	LIC TL594CN
UT-2205	IC514	2520-006001-	1	LIC TL062CP (OP AMP)
UT-2205	LED501-LED516	2503-000182-	16	LED GL-9NG2 Green
UT-2205	L501	2662-002307-	1	FL5H 331K 330UH
UT-2205	Q501	2510-000169-	1	TR 2SA1120-O,Y
UT-2205	Q502	2513-900118-	1	TR DTC144S

ASSY	CKT NO.	NK PART NO.	Q'TY	DESCRIPTION
UT-2205	RA501-RA502	2554-203241-	2	RM M9-2-473J-M1 47K OHM
UT-2205	SW501-SW504	2686-000389-	4	SW KEL-906
UT-2205	X501	2783-100035-	1	XTAL TCO-707F 10.1M HZ

UT-2206 KEY BOARD 2

UT-2206	CN601	2702-402085-	1	CNA 1C-104
UT-2206	LED601-LED603	2503-000182-	3	LED GL-9NG2 Green
UT-2206	SW601	2687-000021-	1	SW JSA2320-0101
UT-2206	SW602-SW603	2687-000012-	2	SW JSA2220-0101
UT-2206	SW604-SW609	2686-001307-A	6	SW SKHCAC (KHC-10903)

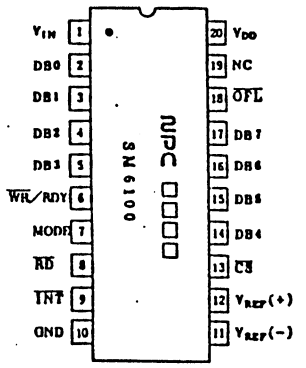
10 IC Data

10 IC Data

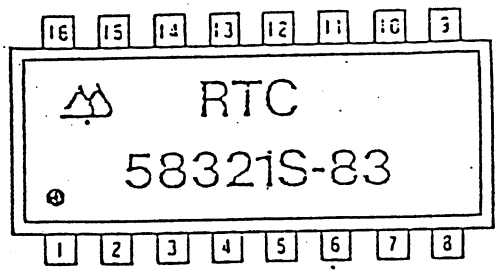
ic217
8 Bit A/D Converter SM6100
Data Processing Board UT-22021

Pin Configuration

TOP VIEW



ic235
Real-time Clock RTC-58321
Data Processing Board UT-22021



(Top View)

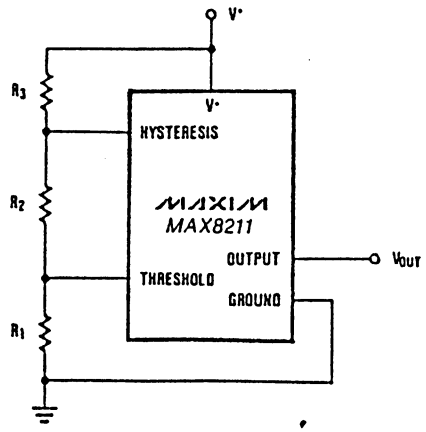
Pin Configuration

1. CS_2	16. V_{DD}
2. WRITE	15. NC
3. READ	14. NC
4. D_0	13. CS_1
5. D_1	12. TEST
6. D_2	11. STOP
7. D_3	10. BUSY
8. V_{SS}	9. ADDRESS WRITE

NC : do NOT connect to exterior

ic231
Programmable Voltage Detector MAX8212
Data Processing Board UT-22021

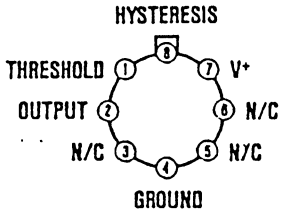
Typical Operating Circuit



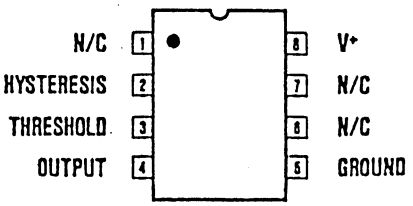
Logic Supply Under-Voltage Detector

Pin Configuration

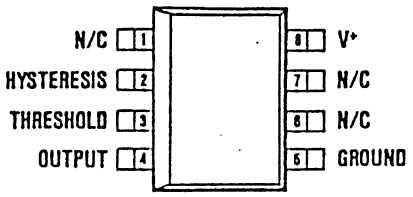
Top View



8 Lead TO-99 Metal Can

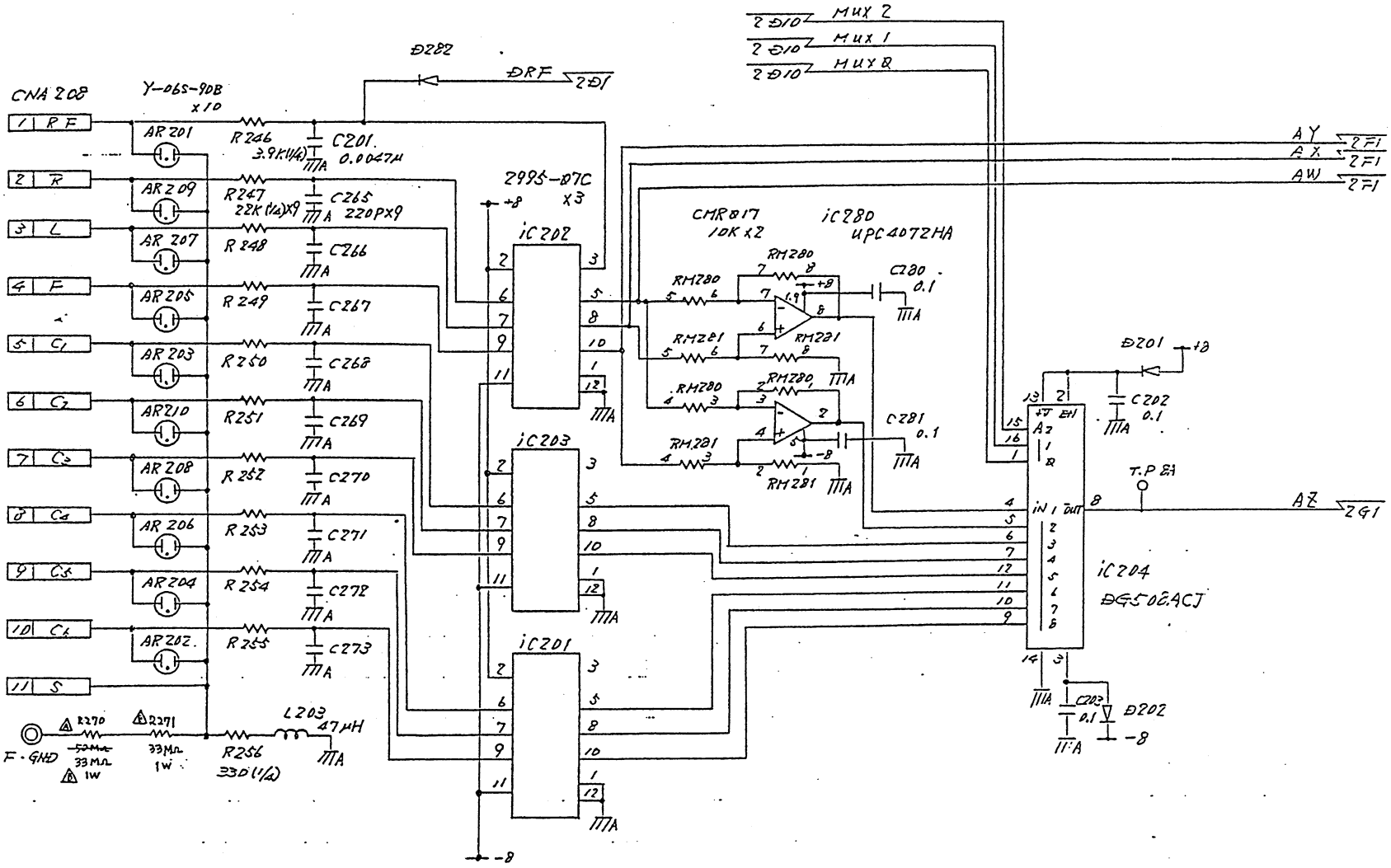


8 Lead Plastic DIP



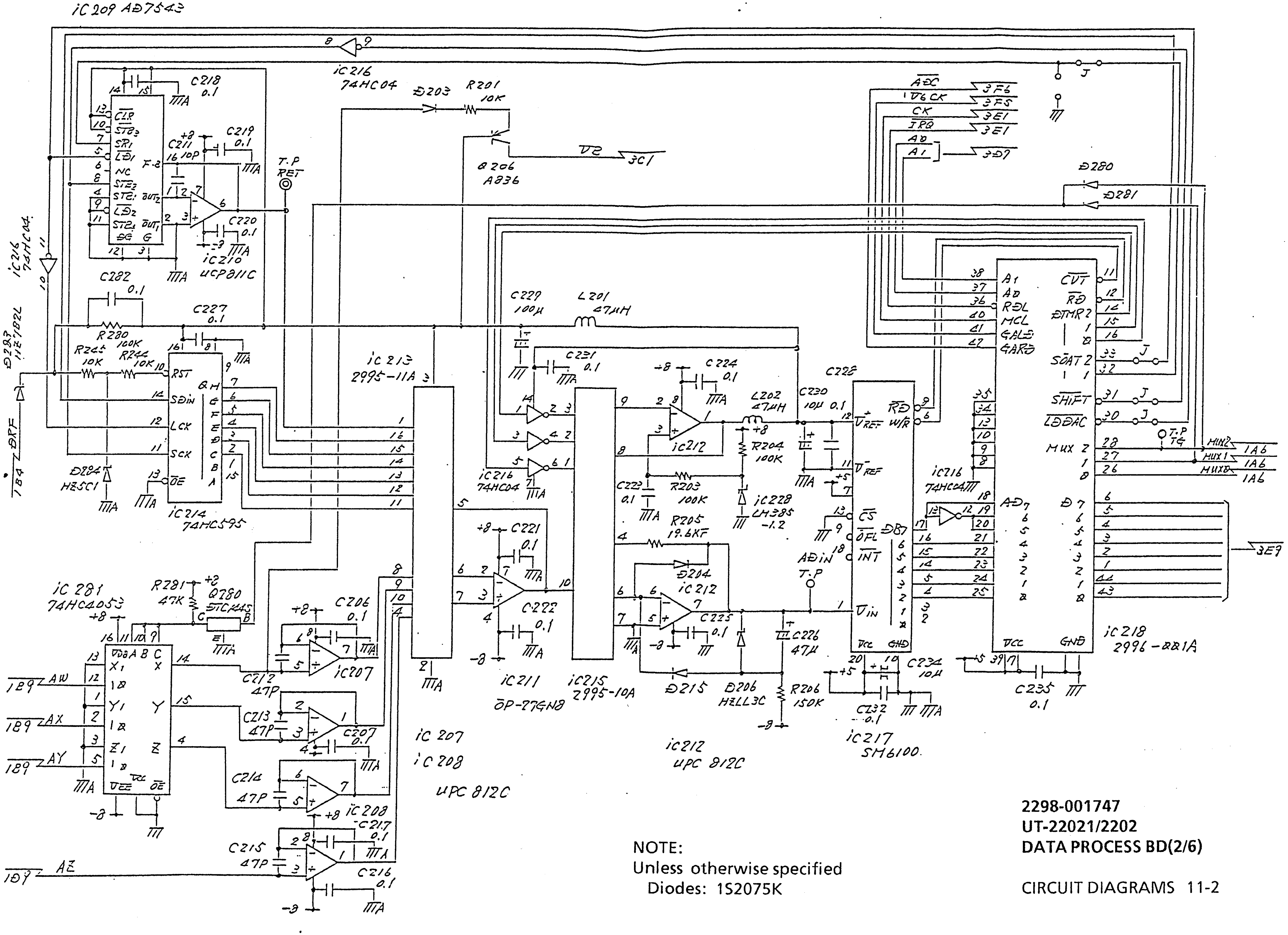
8 Lead Small Outline.

11 Circuit Diagrams & Parts Location guide



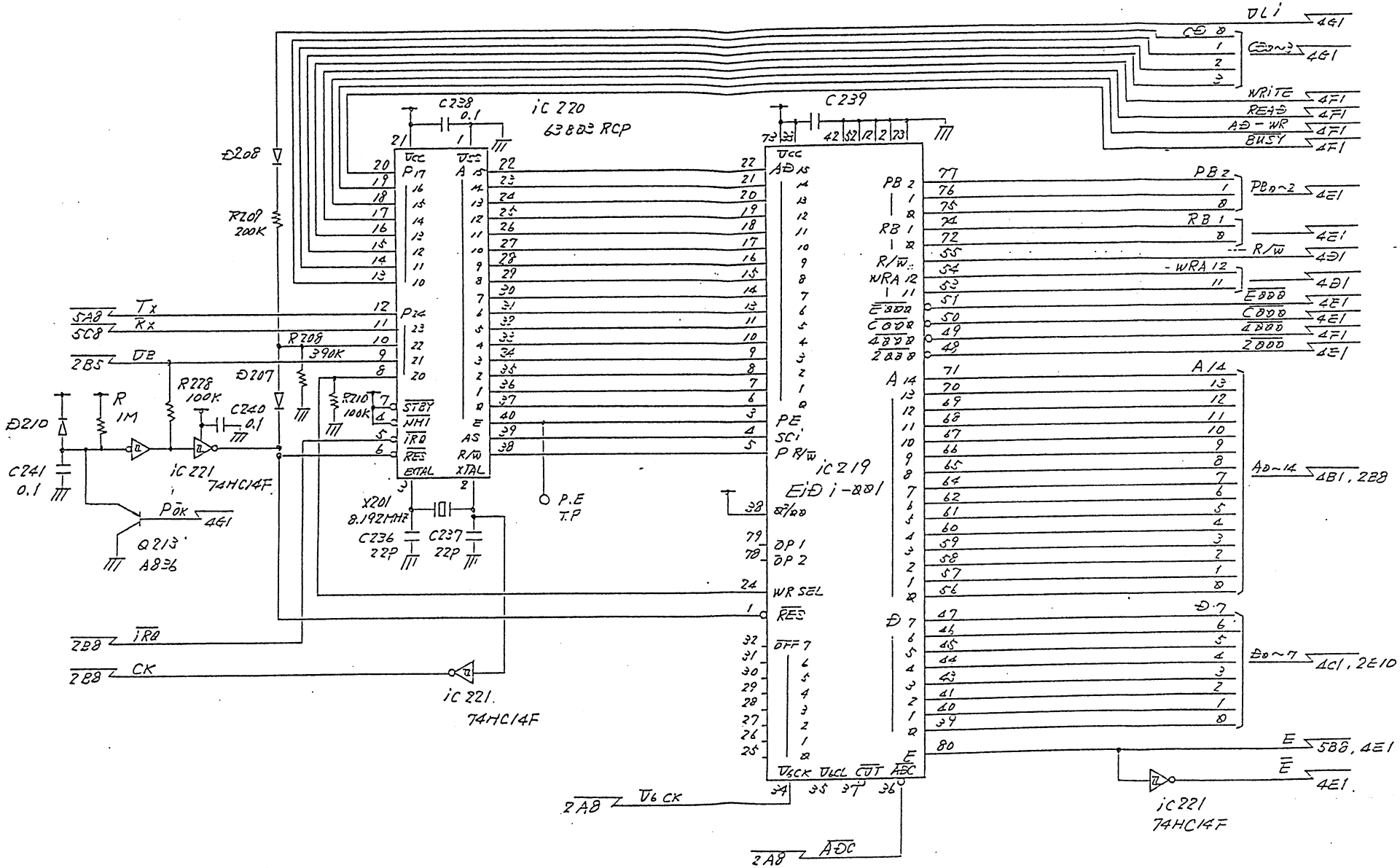
2298-001738B
UT-2202
ECG-8110
DATA PROCESS BD (1/6)

NOTE:
Unless otherwise specified
Diodes: 1S2075K

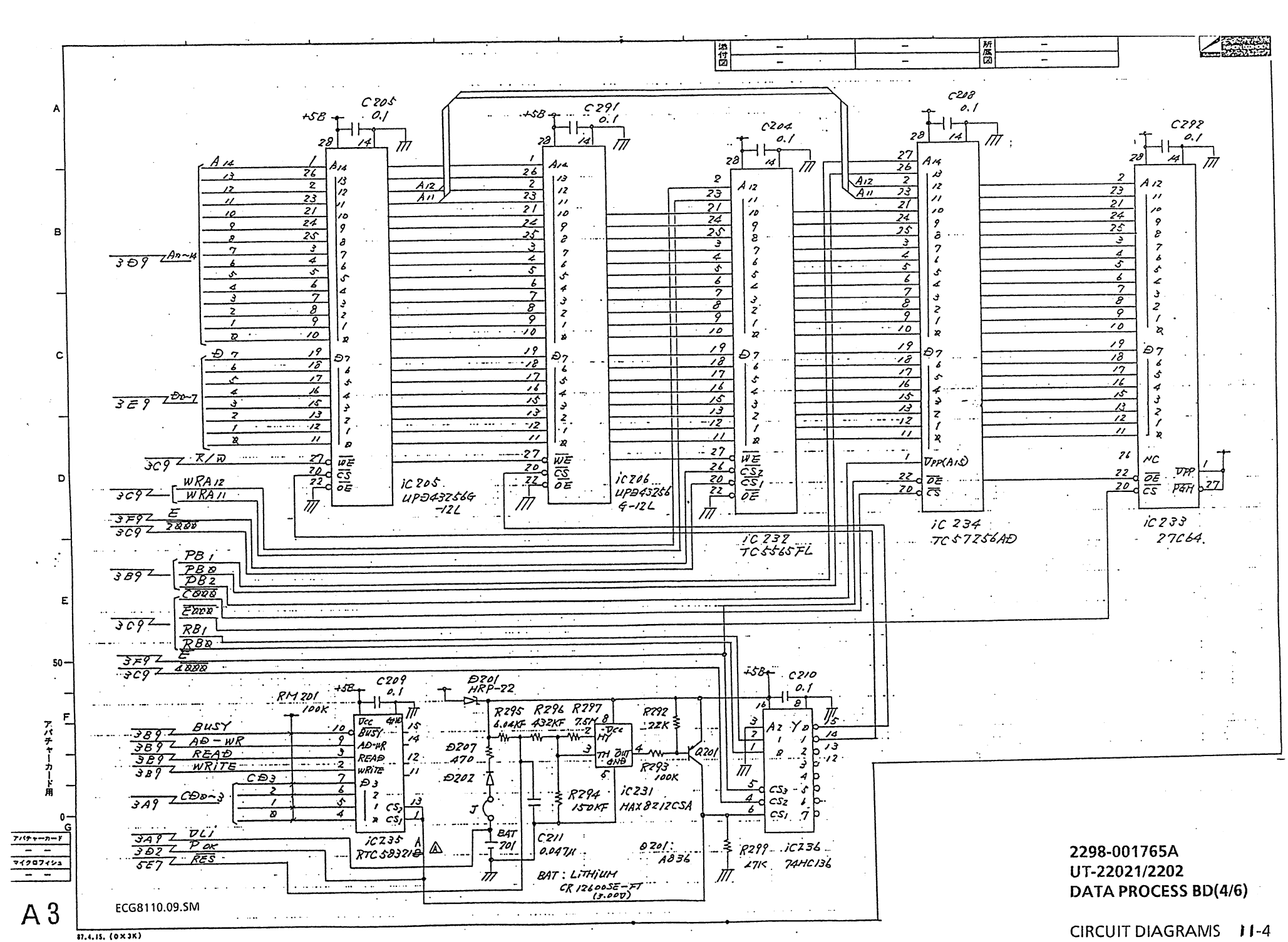


NOTE:
Unless otherwise specified
Diodes: 1S2075K

2298-001747
UT-22021/2202
DATA PROCESS BD(2/6)



2298-001756
UT-22021/2202
DATA PROCESS BD(3/6)

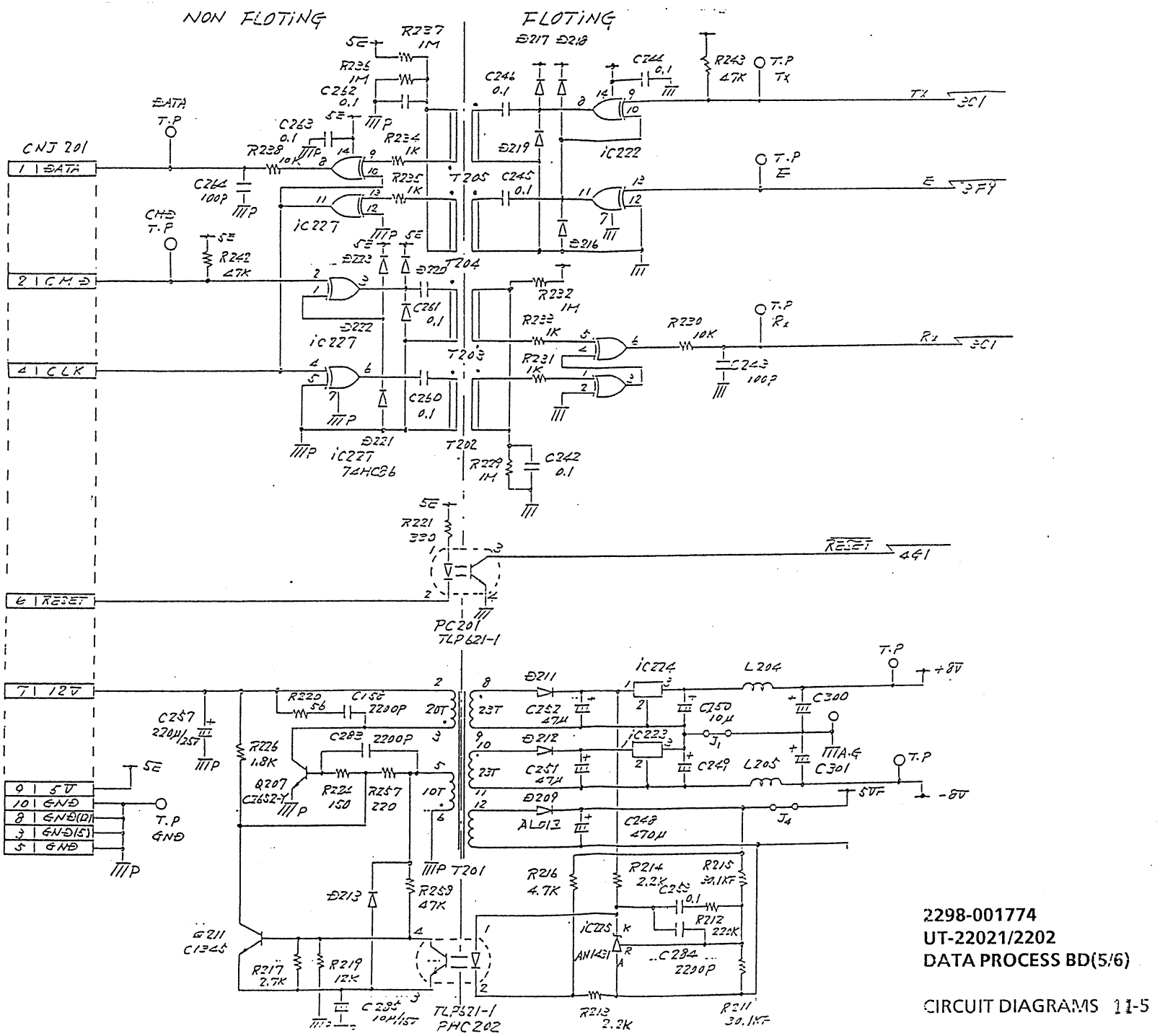


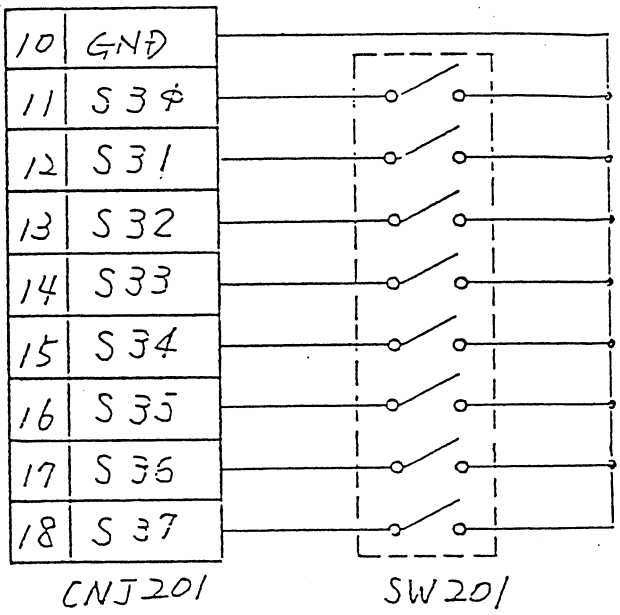
ECG8110.09.SM

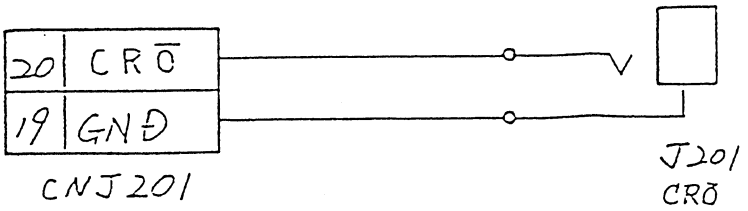
87.4.15. (0×3K)

A3

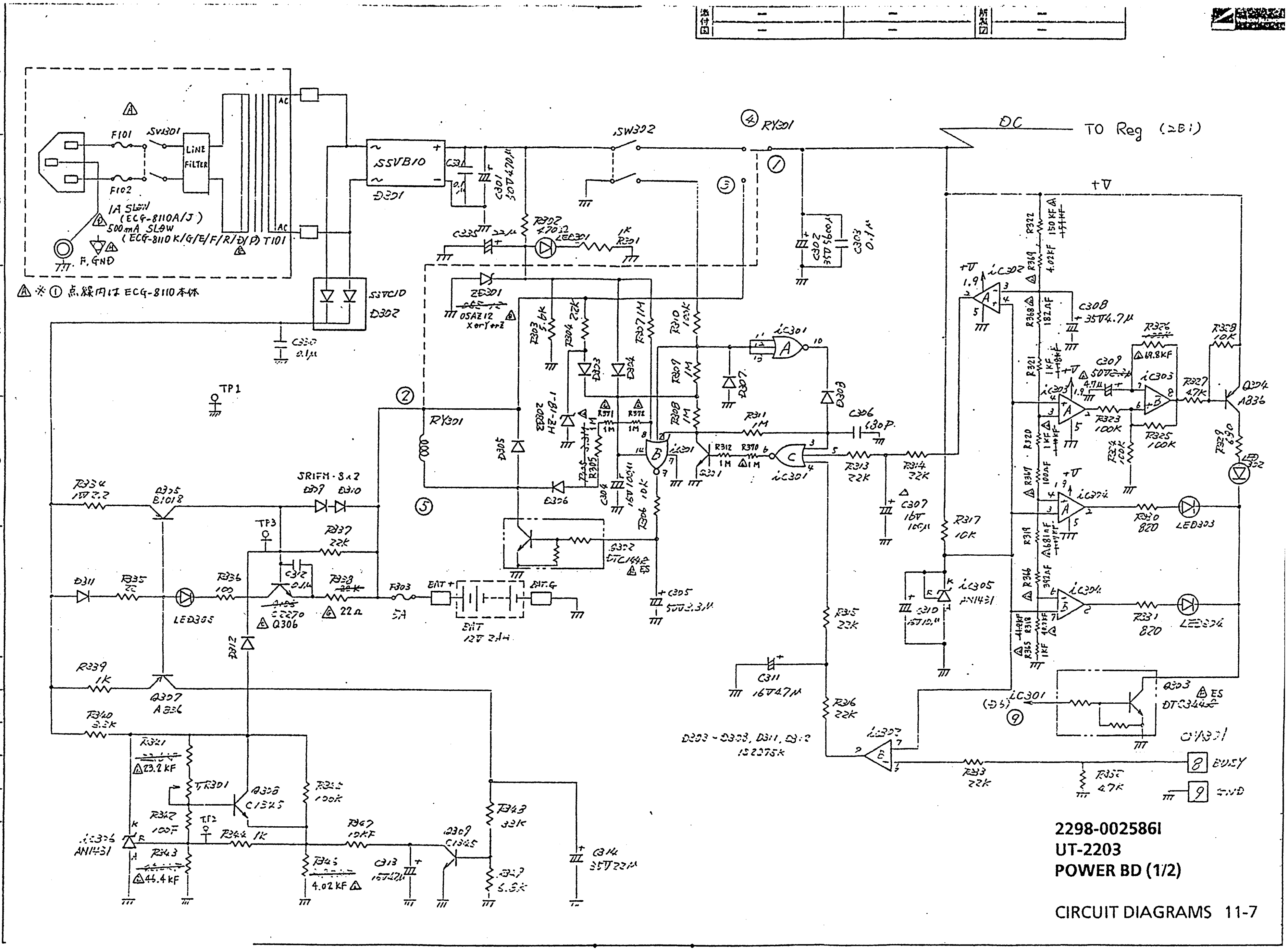
2298-001765A
UT-22021/2202
DATA PROCESS BD(4/6)


NON FLOTING
FLOTING
CNJ 201
1 DATA
2 CMD
4 CLK
6 RESET
7 12V
9 5V
10 GND
8 GND(D)
3 GND(S)
5 GND
DATA T.P
CMD T.P
T.P GND
T.P Tx
T.P R
T.P -8V
T.P +8V
TX 3C1
R1 3C1
RESET 4A1
R237 1M
R236 1M
C262 0.1
C263 0.1
R238 10K
R234 1K
R235 1K
C264 100P
R241 47K
C246 0.1
C244 0.1
R243 47K
C245 0.1
R232 1K
R233 1K
R231 1K
R230 10K
C243 100P
R232 1M
C261 0.1
C260 0.1
C242 0.1
R229 1M
R221 330
PC201 TLP621-1
IC227 74HC86
IC222
IC223
IC224
T201
T202
T203
T204
T205
D211
D212
D209
D213
D216
D217 D218
D219
D220
D221
D222
D223
C252 47M
C250 10M
C249 470M
C300
C301
L204
L205
C257 220M/25V
C256 2200P
C253 2200P
R220 56
R226 1.8K
Q207 C2682-Y
R224 150
R257 220
R259 47K
R216 4.7K
R214 2.2K
R215 30.1KF
C254 0.1
R212 22K
C284 2200P
R211 30.1KF
R213 2.2K
R217 2.7K
R219 12K
C255 10M/16V
G211 C1345
TLP521-1/PHC202
AN1431
2298-001774
UT-22021/2202
DATA PROCESS BD(5/6)





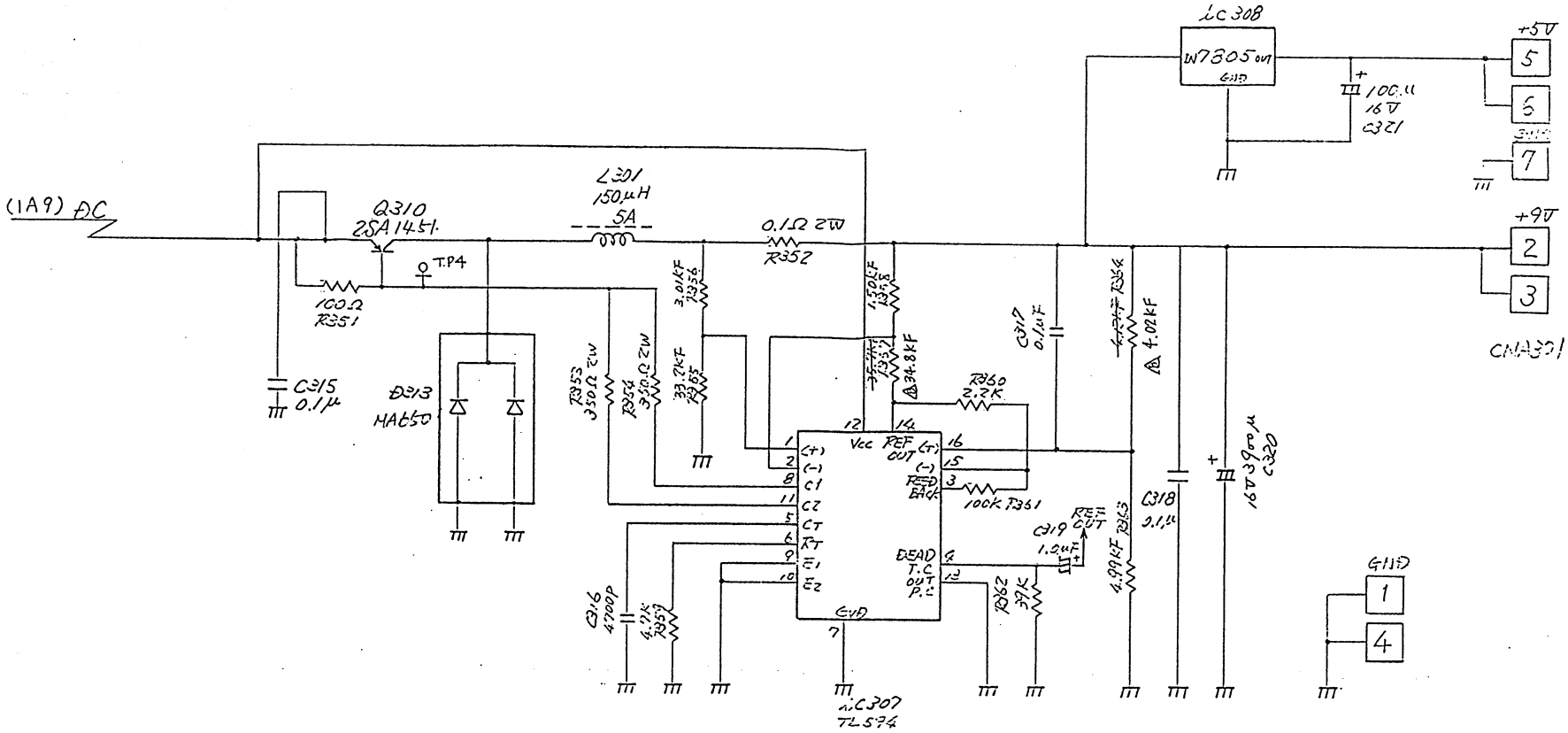
Note:
J202 is implemented on UT-2202 only.


F101
F102
SW301
LINE FILTER
T101
1A SLOW (ECG-8110A/J)
500mA SLOW (ECG-8110 K/G/E/F/R/D/P)
F, GND
※① 点線内は ECG-8110本体
SSVB10
D301
S5VC10
D302
C301 50V470μ
C303 0.1μ
C302 35V5600μ
SW302
RY301
DC
TO Reg (2B1)
+V
TP1
TP2
TP3
LED301
LED302
LED303
LED304
LED305
Q304 A836
Q305 B1018
Q306 C2270
Q307 A836
Q308 C1345
Q309 C1345
IC301
IC302
IC303
IC304
IC305 AN1431
IC306 AN1431
Q303 DTC344ES
Q302 DTC144ES
BAT 12V 2AH
F303 5A
SRIFM-8×2
D303 - D308, D311, D312 1S2275K
BUSY
GND
CN301

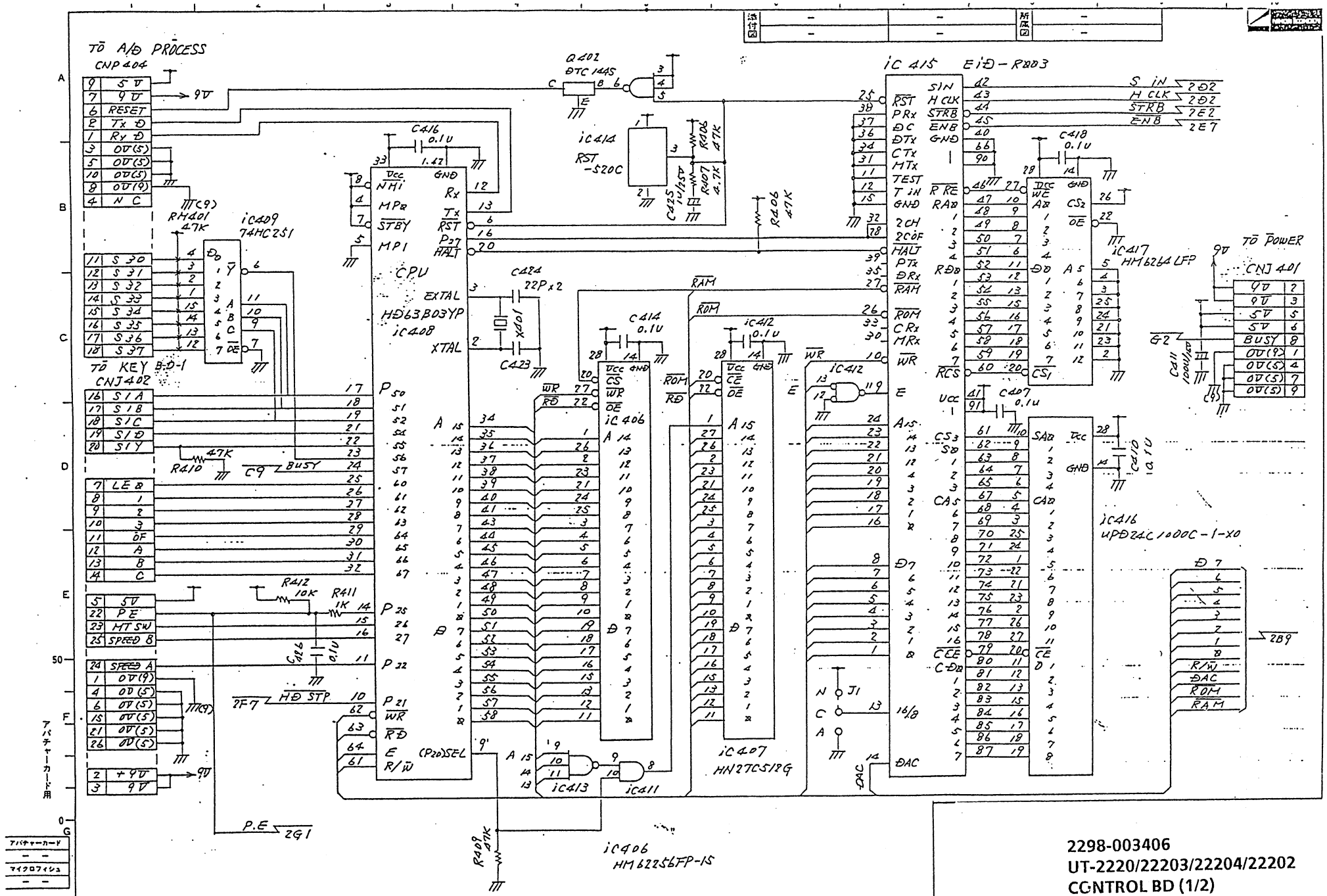
2298-002586I
UT-2203
POWER BD (1/2)

CIRCUIT DIAGRAMS 11-7

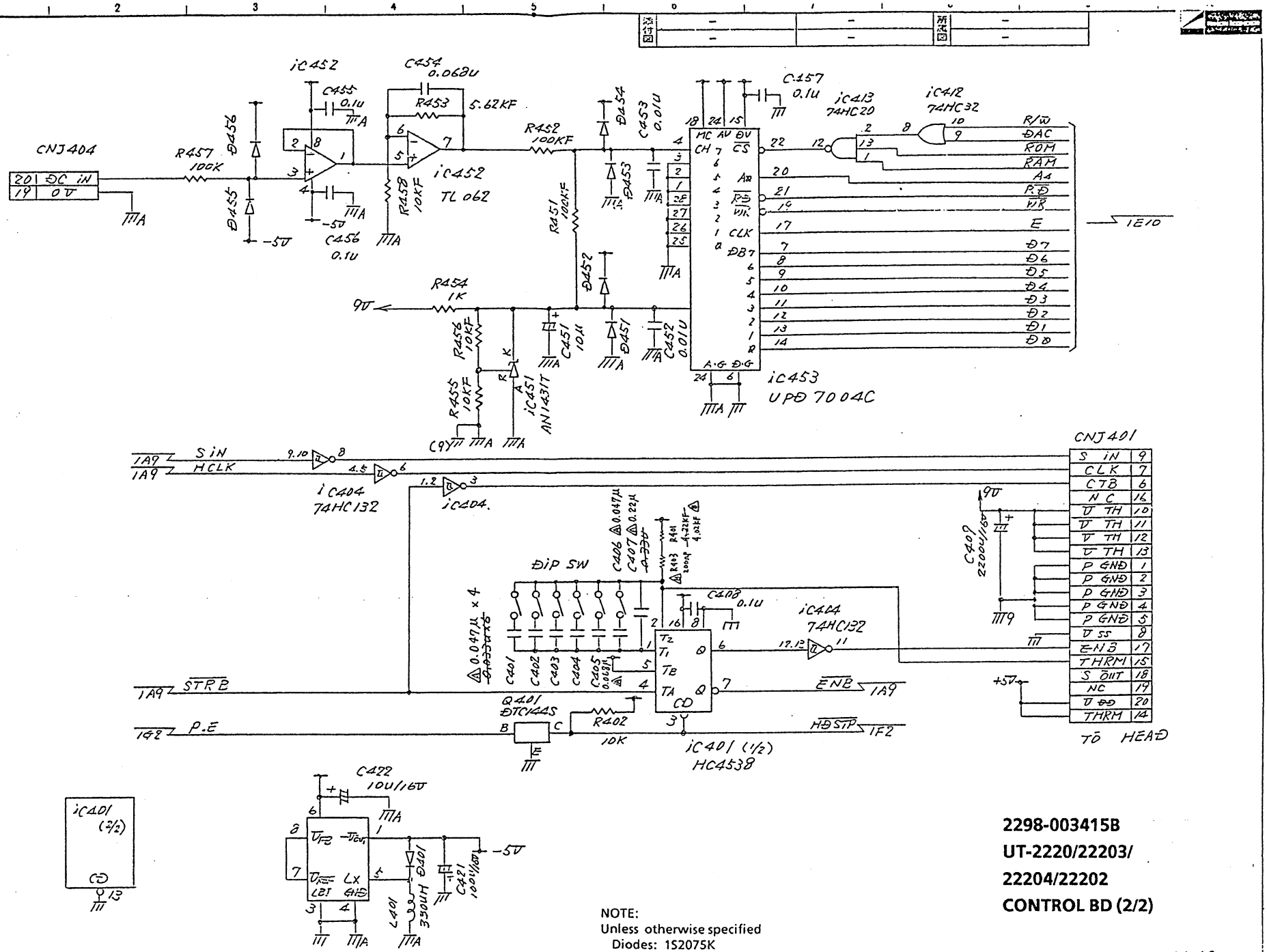
A3



2298-002595B
UT-2203
POWER BD (2/2)

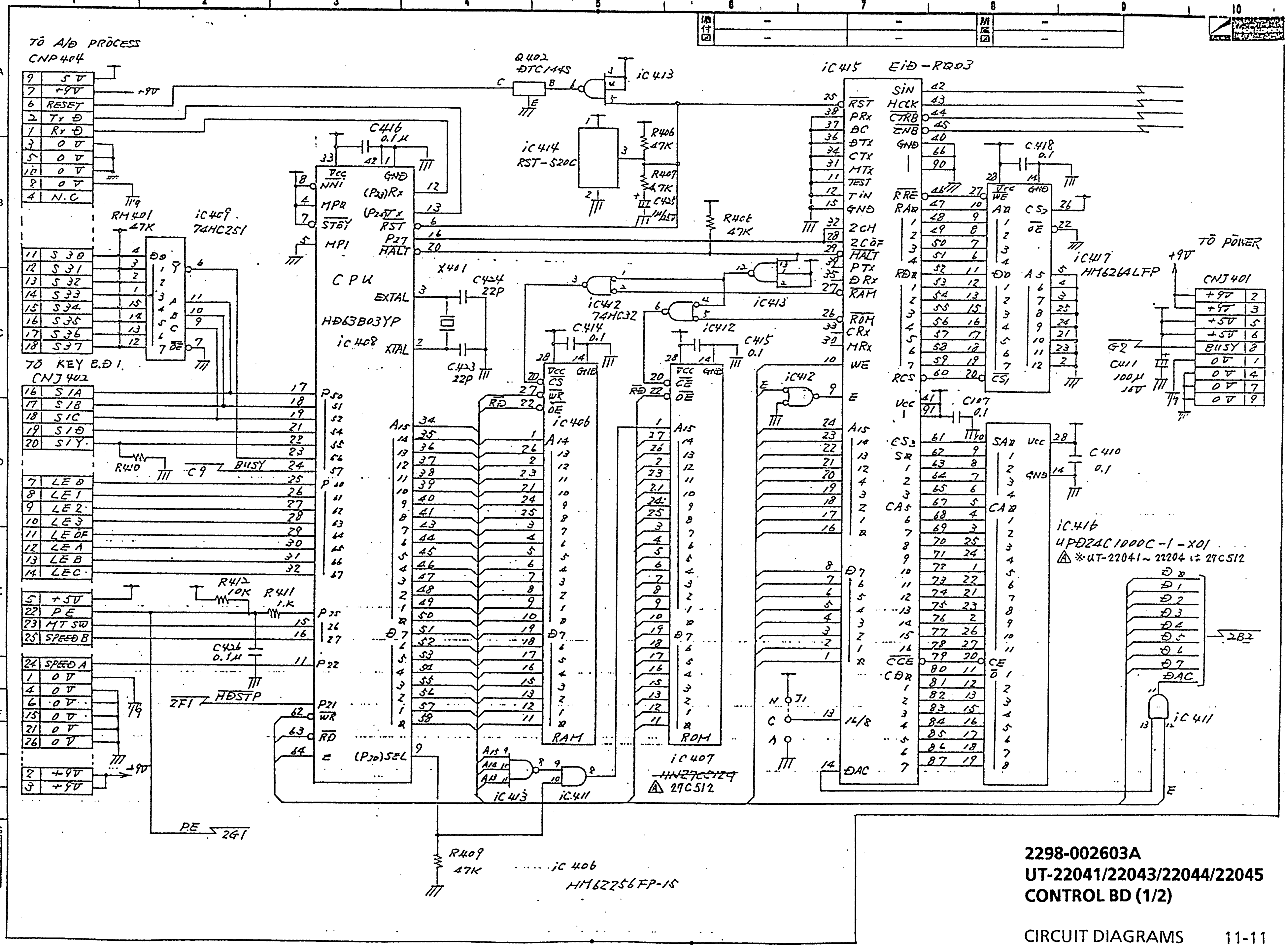


2298-003406
UT-2220/22203/22204/22202
CONTROL BD (1/2)

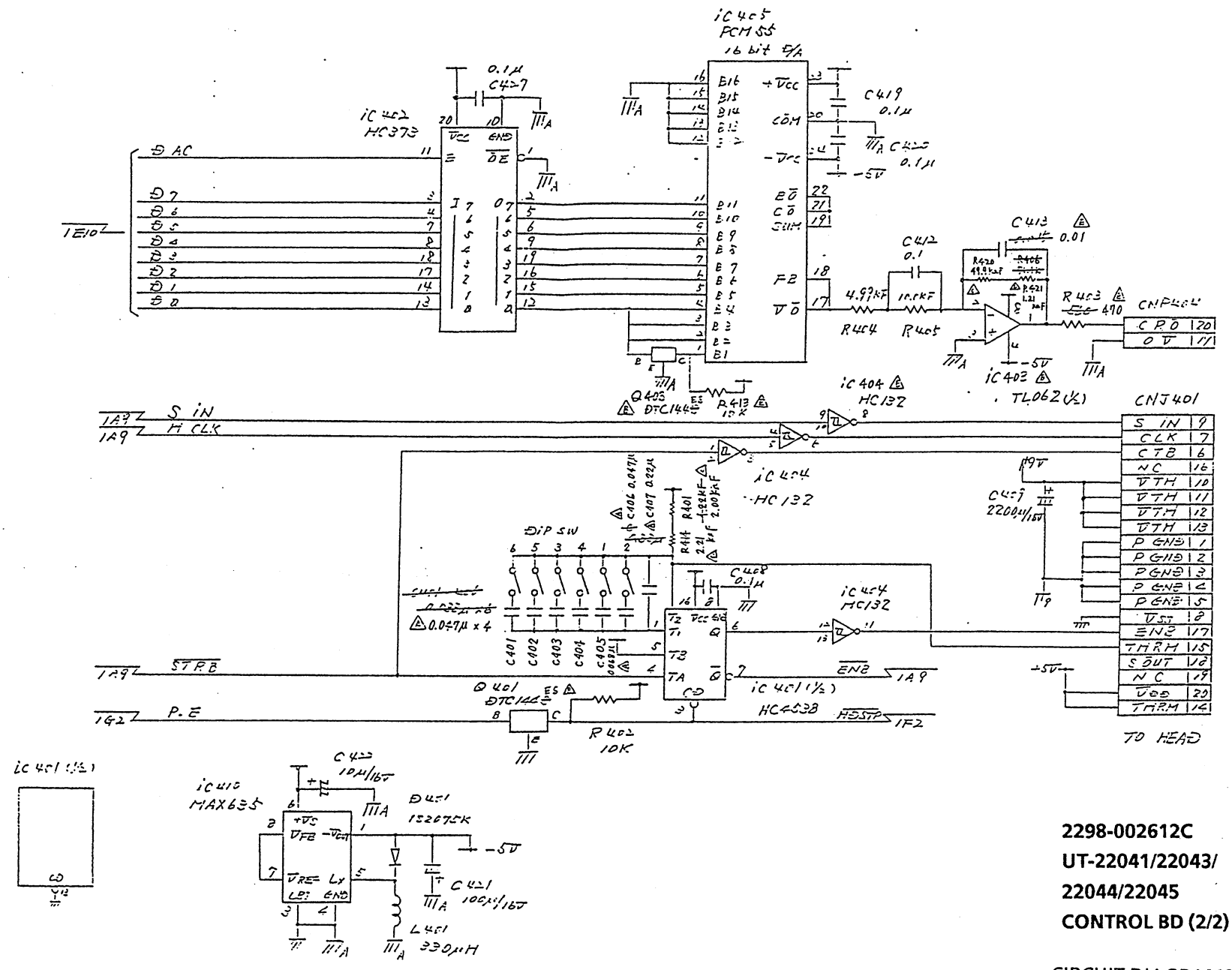


2298-003415B
UT-2220/22203/
22204/22202
CONTROL BD (2/2)

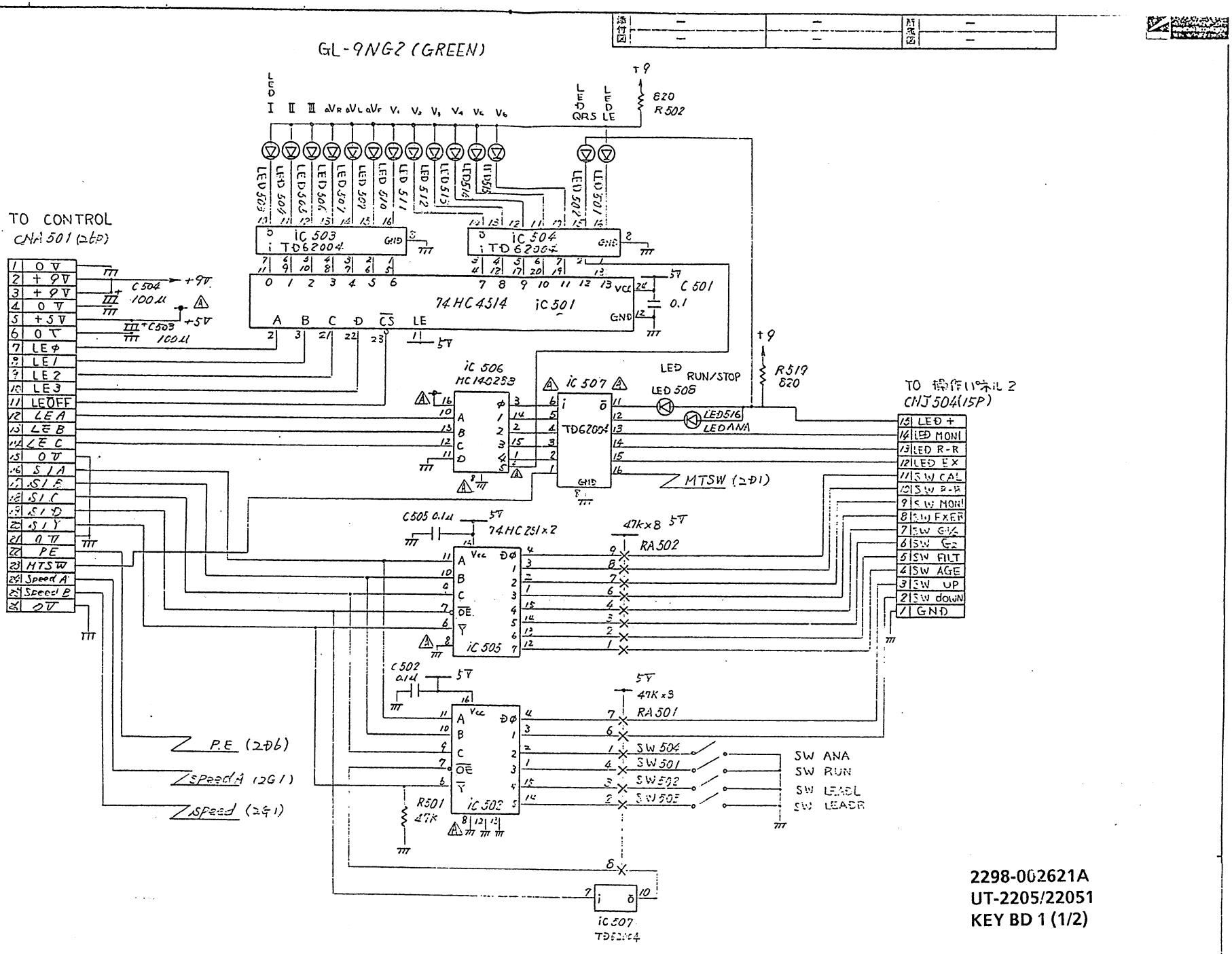
A3



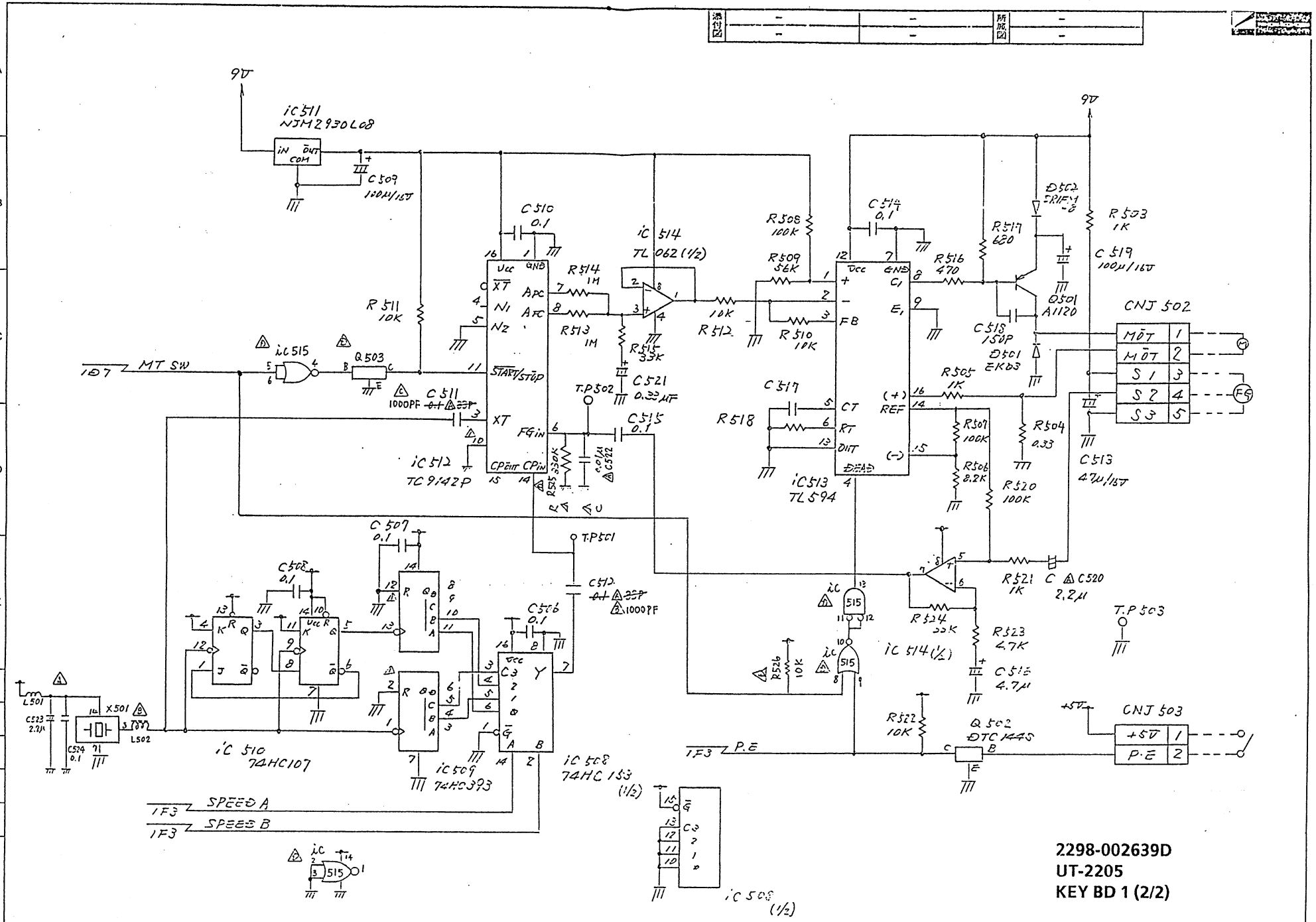
2298-002603A
UT-22041/22043/22044/22045
CONTROL BD (1/2)



2298-002612C
UT-22041/22043/
22044/22045
CONTROL BD (2/2)



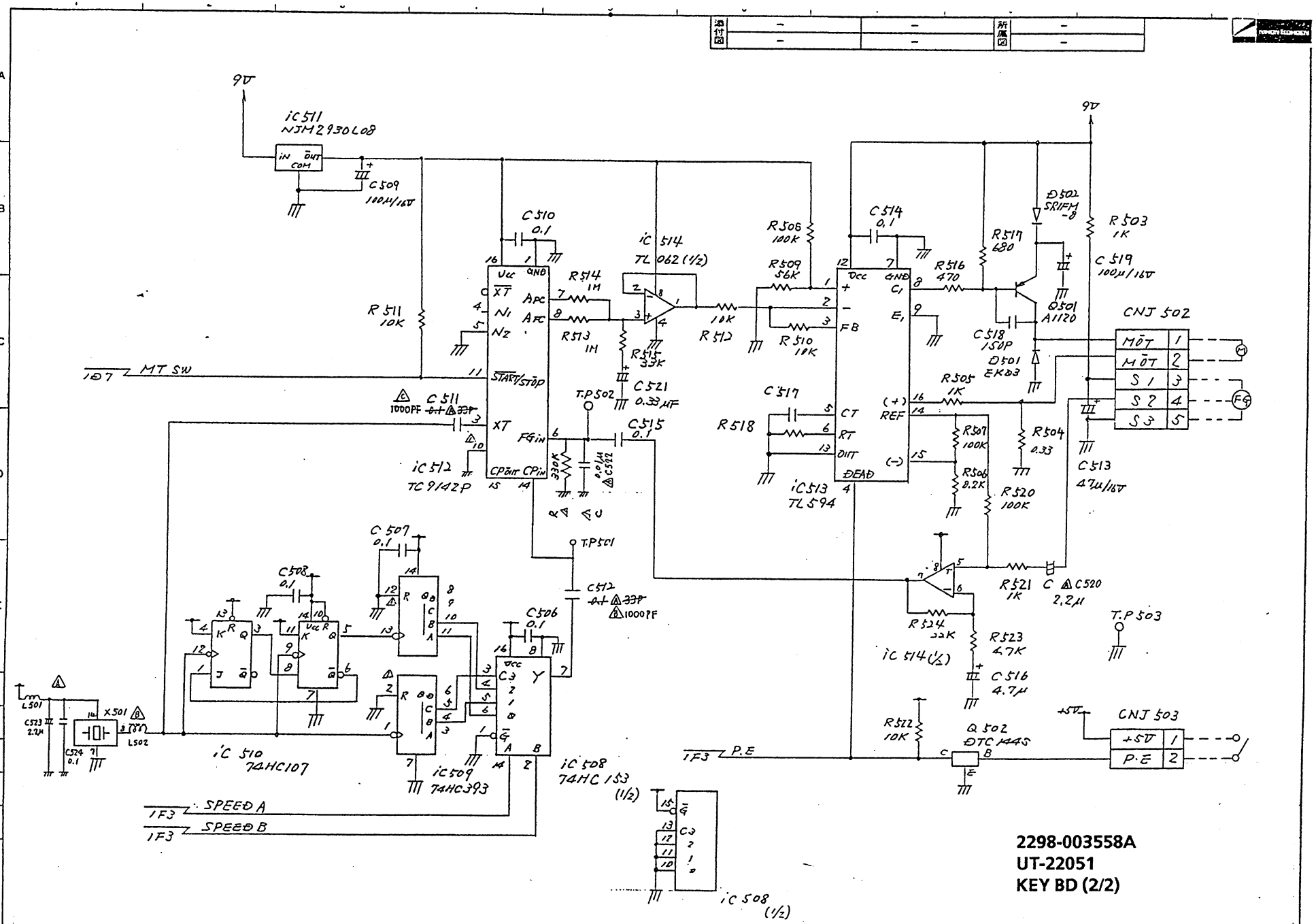
2298-002621A
UT-2205/22051
KEY BD 1 (1/2)



2298-002639D
UT-2205
KEY BD 1 (2/2)

CIRCUIT DIAGRAMS 11-14

87.4.15. (0×3K)

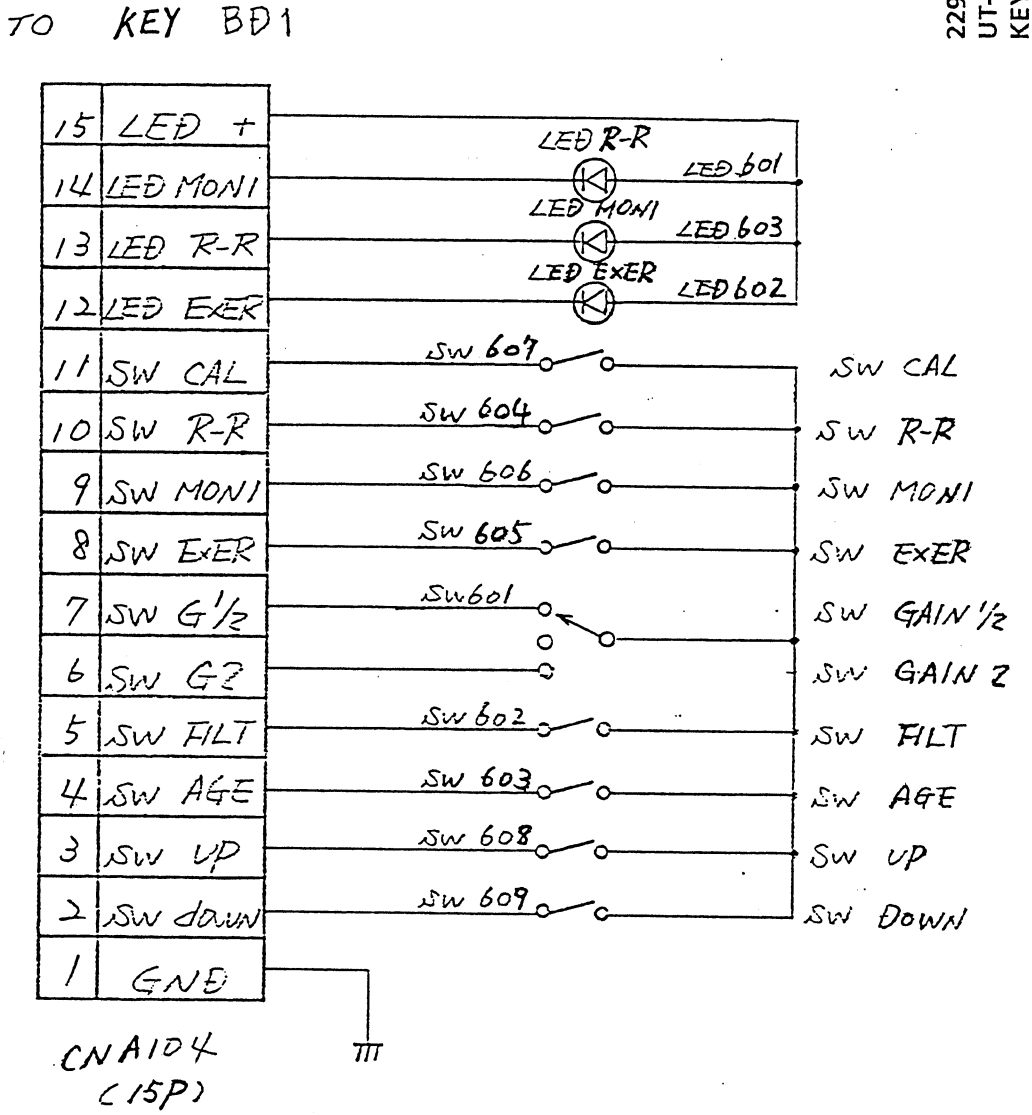


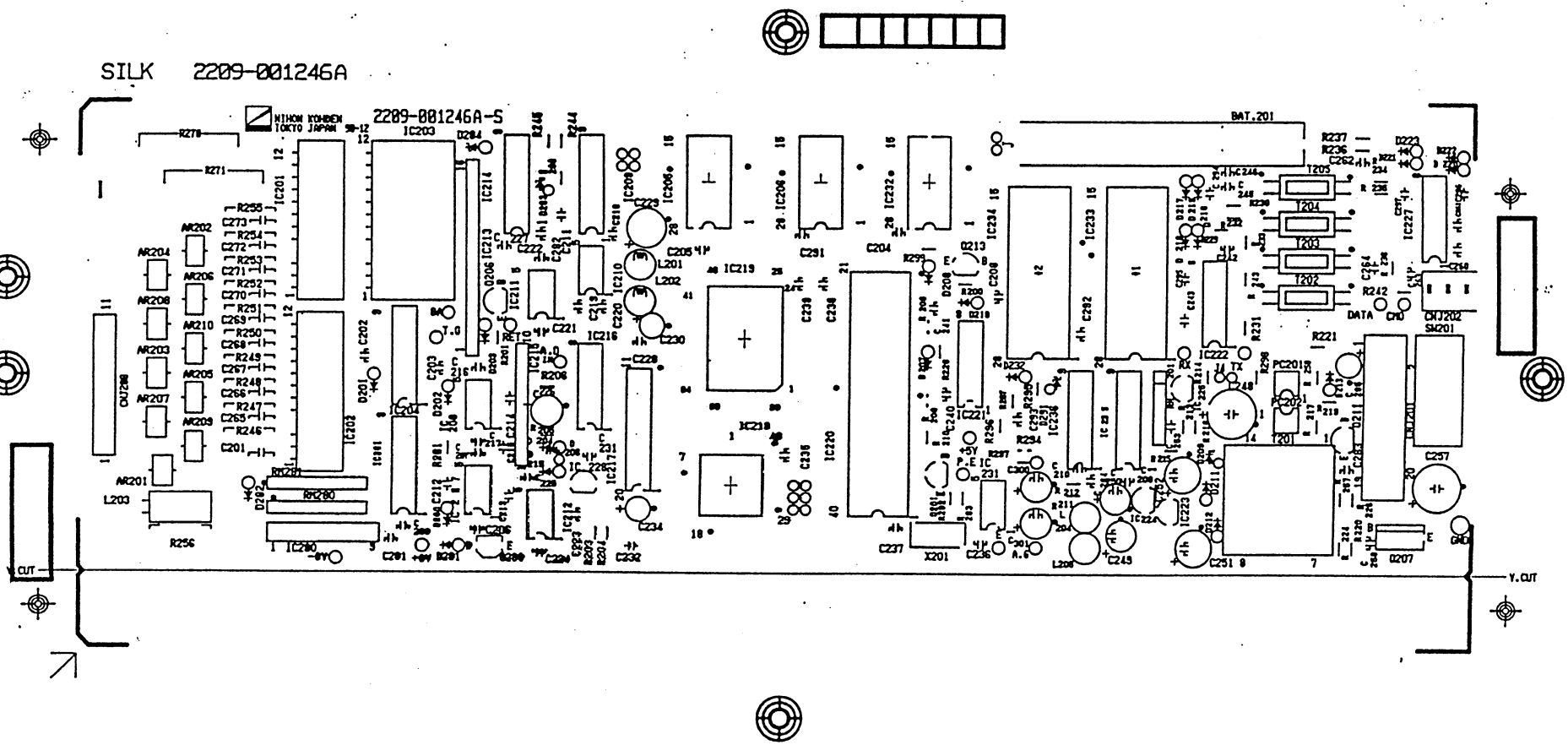
2298-003558A
UT-22051
KEY BD (2/2)

CIRCUIT DIAGRAMS 1-15

A3

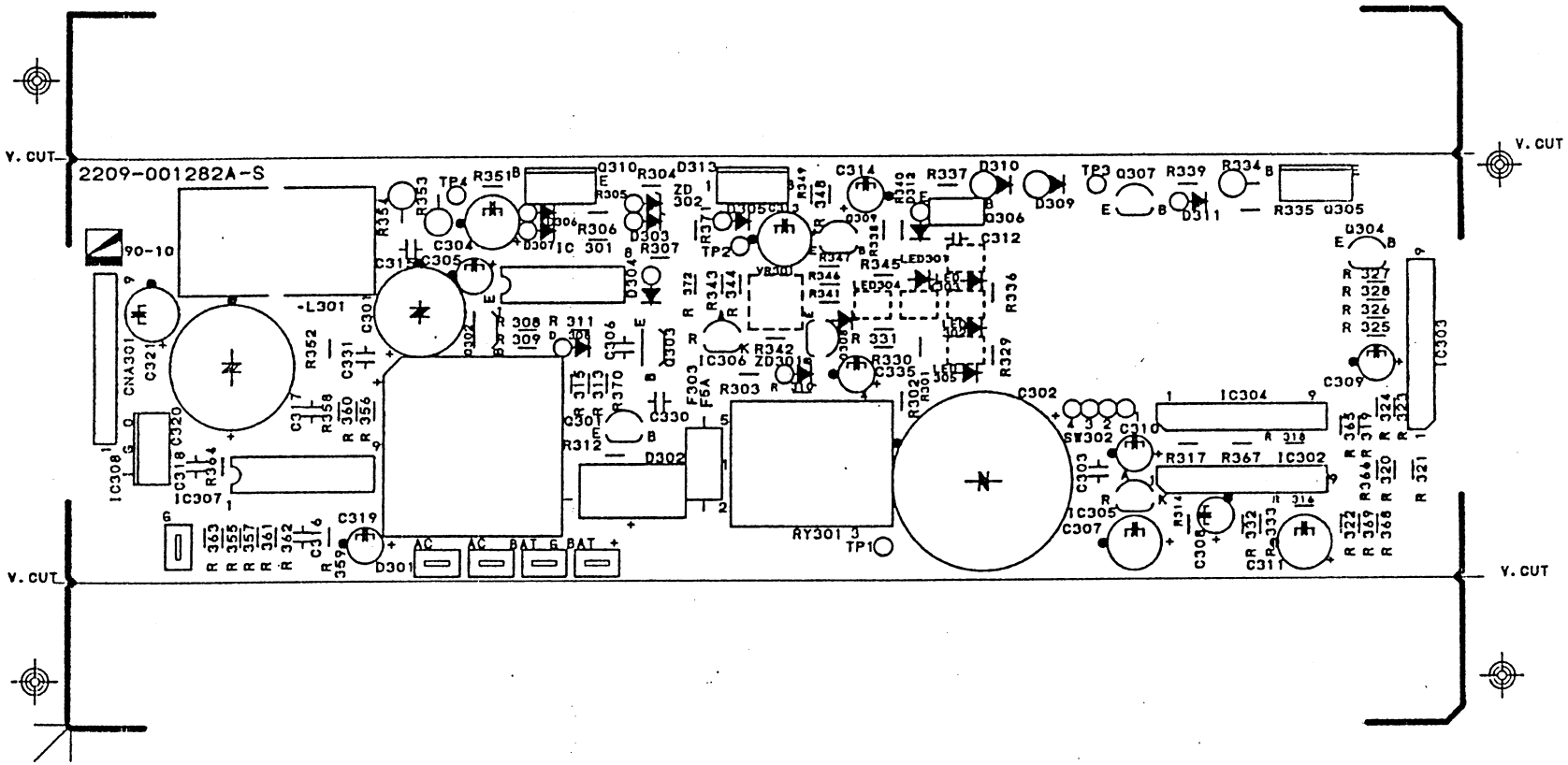
87.4.15. (0×3K)


TO KEY BD1
15 LED +
14 LED MONI
13 LED R-R
12 LED EXER
11 SW CAL
10 SW R-R
9 SW MONI
8 SW EXER
7 SW G1/2
6 SW G2
5 SW FILT
4 SW AGE
3 SW UP
2 SW down
1 GND
CNA104
(15P)
LED R-R
LED 601
LED MONI
LED 603
LED EXER
LED 602
SW 607
SW 604
SW 606
SW 605
SW601
SW 602
SW 603
SW 608
SW 609
SW CAL
SW R-R
SW MONI
SW EXER
SW GAIN 1/2
SW GAIN 2
SW FILT
SW AGE
SW UP
SW DOWN

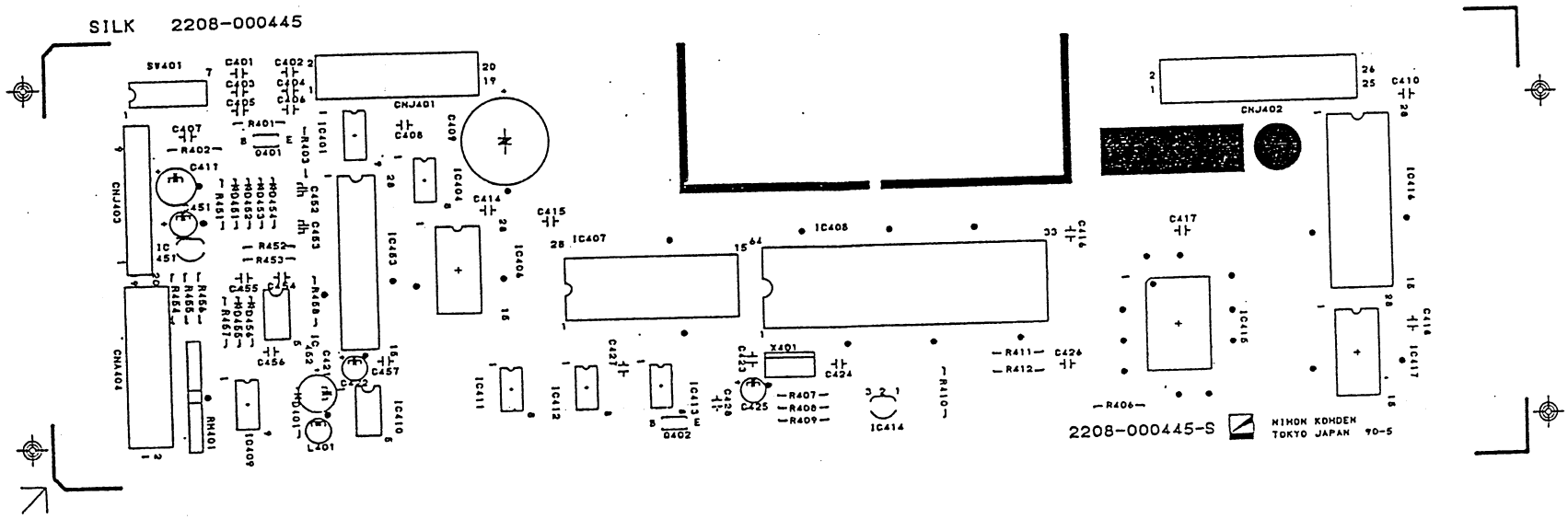


2209-001246A
UT-22021/2202
DATA PROCESSING BD

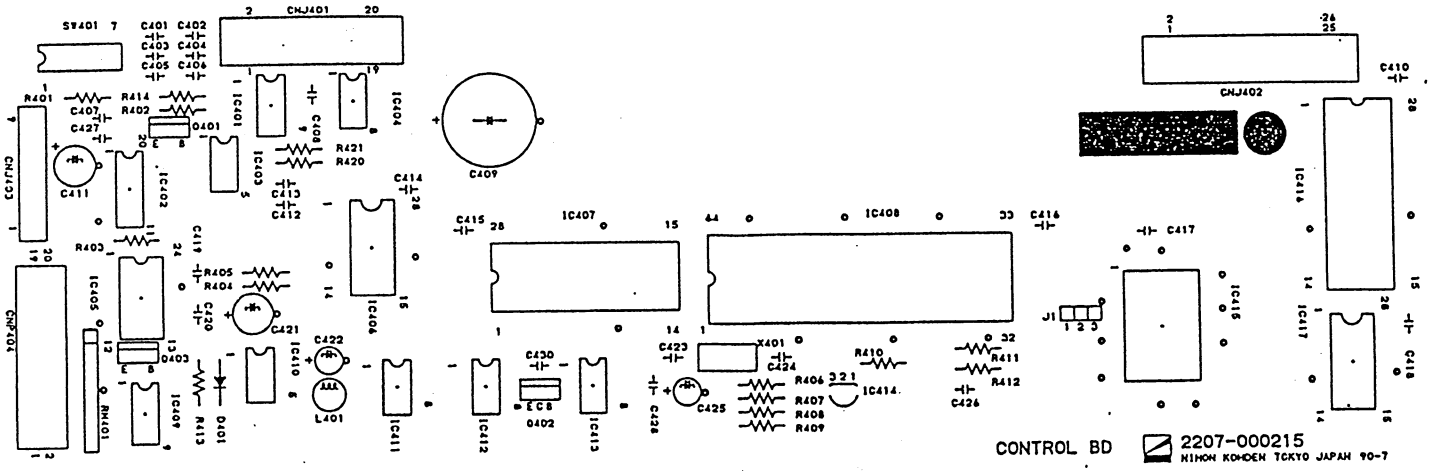
SILK 2209-001282A



2209-001282A
UT-2203
POWER BD

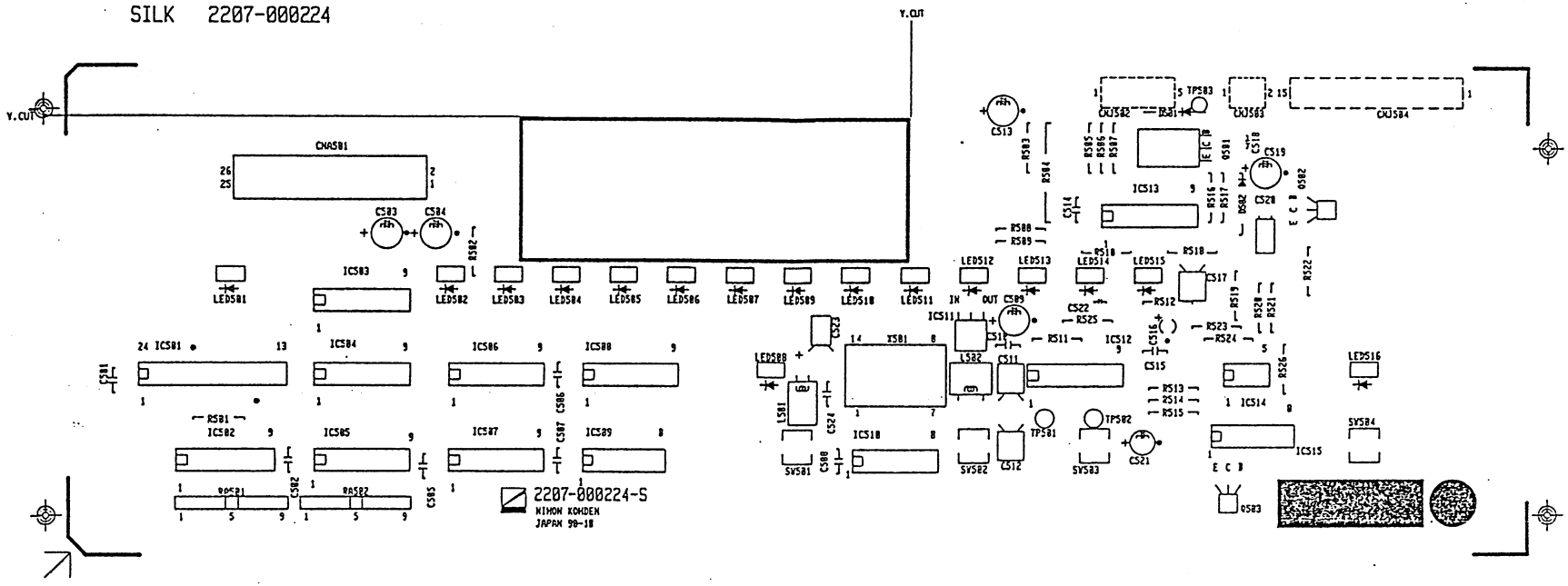


2208-000445
UT-2220
CONTROLBD

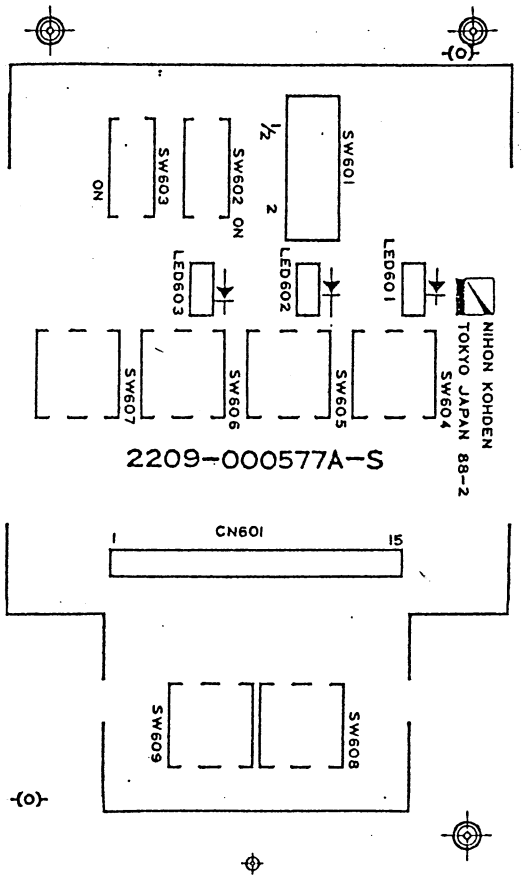


2207-000215
UT-2204
CONTROLBD

PARTS LOCATION GUIDE 11-20

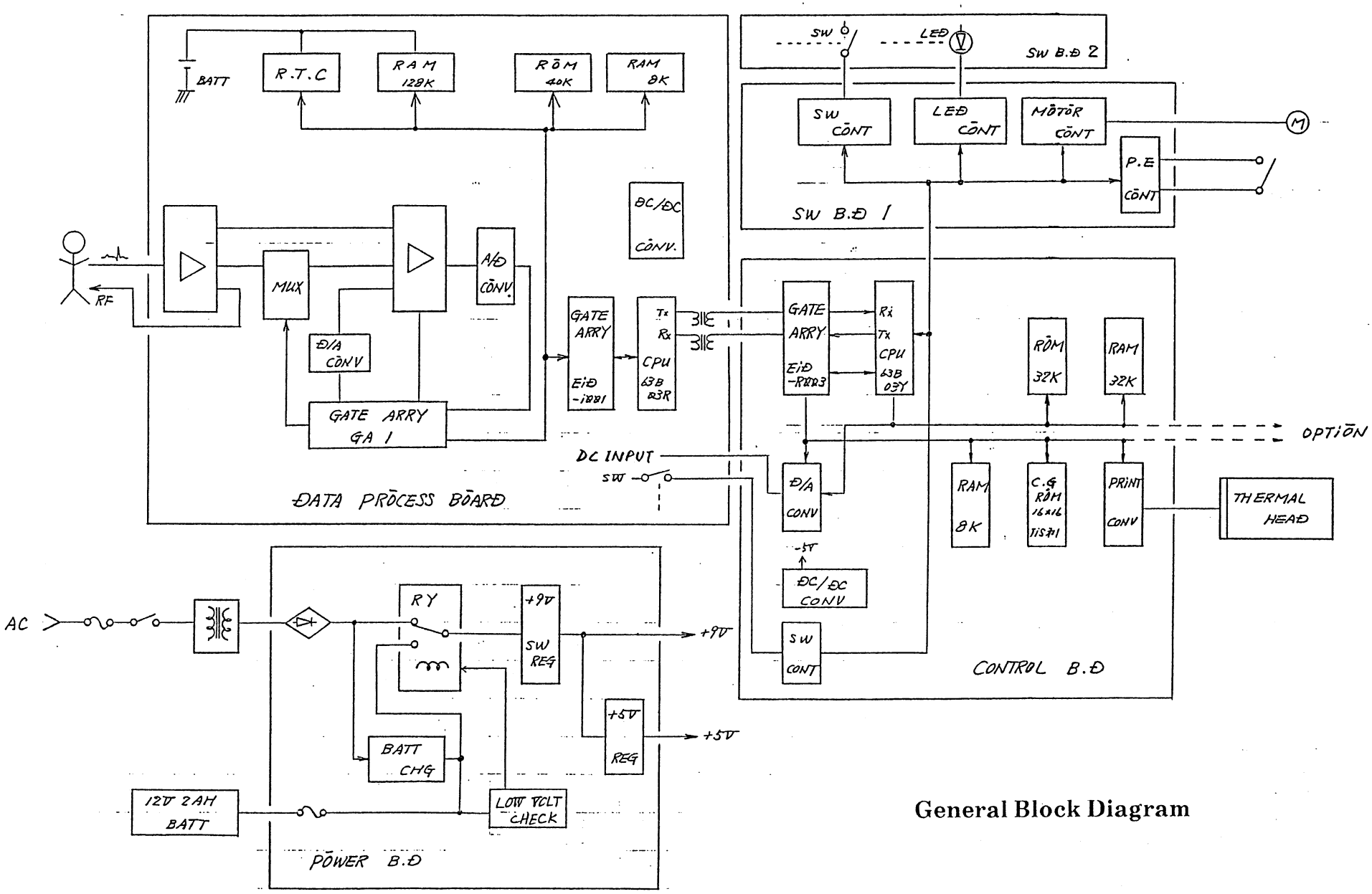


2207-000224
UT-2205
KEY BD 1

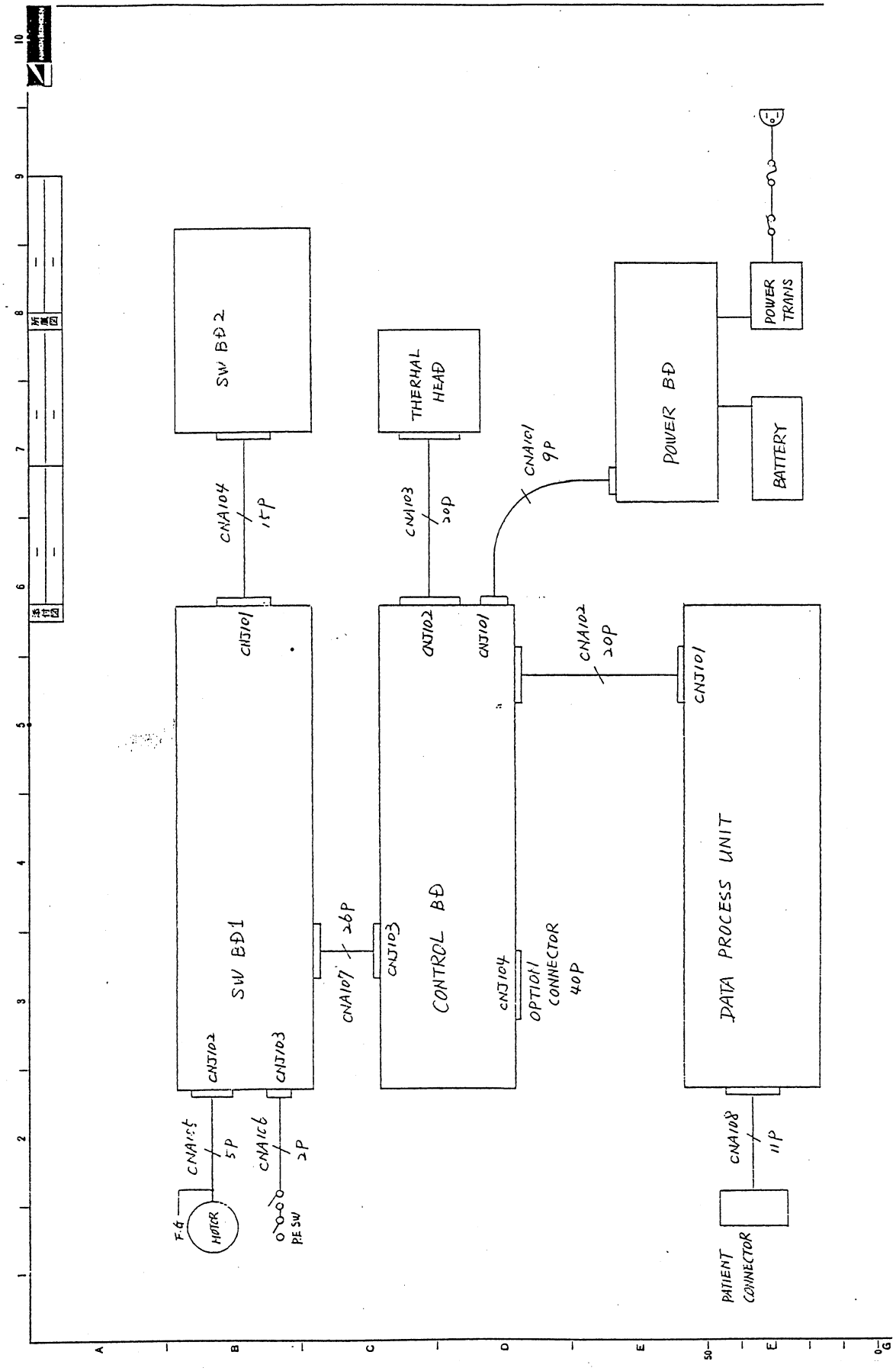


2209-000577A
UT-2206
KET BD 2

12 Block Diagram



General Block Diagram



Cable Connection Diagram

CNA 101

Power BD ↔ Control BD

CNJ 101

1	0V
2	+9V
3	+9V
4	0V
5	+5V
6	+5V
7	0V
8	BUSY
9	0V

CNA 102

DP BD ↔ Control BD

CNJ 101

1	Tx D
2	Rx D
3	0V
4	CLK
5	0V
6	RESET
7	+9V
8	0V
9	+5V
10	0V
11	S30
12	S31
13	S32
14	S33
15	S34
16	S35
17	S36
18	S37
19	0V
20	CRO

CNA 103

Th. Head ↔ Control BD

CNJ 102

1	P.GND
2	P.GND
3	P.GND
4	P.GND
5	P.GND
6	CTB
7	CLK
8	VSS
9	SIN
10	V.TH
11	V.TH
12	V.TH
13	V.TH
14	THRM
15	THRM
16	NC
17	ENB
18	SOVT
19	NC
20	VDD

CNA 104

SW BD 1 ↔ SW BD 2

CNJ 101

1	GND
2	DOWN
3	UP
4	AGE
5	FILT
6	Gain2
7	Gain1/2
8	EXER
9	Moni
10	R-R
11	SW CAL
12	EX
13	R-R
14	LED Moni
15	LED +

CNA 105

SW BD 1 ↔ Motor

CNJ 102

1	MOT 1
2	MOT 2
3	S 1
4	S 2
5	S 3

CNA 106

SW BD 1 ↔ PE SW

CNJ 103

1	+5V
2	P.E

CNA 107

Control BD ↔ SW BD 1

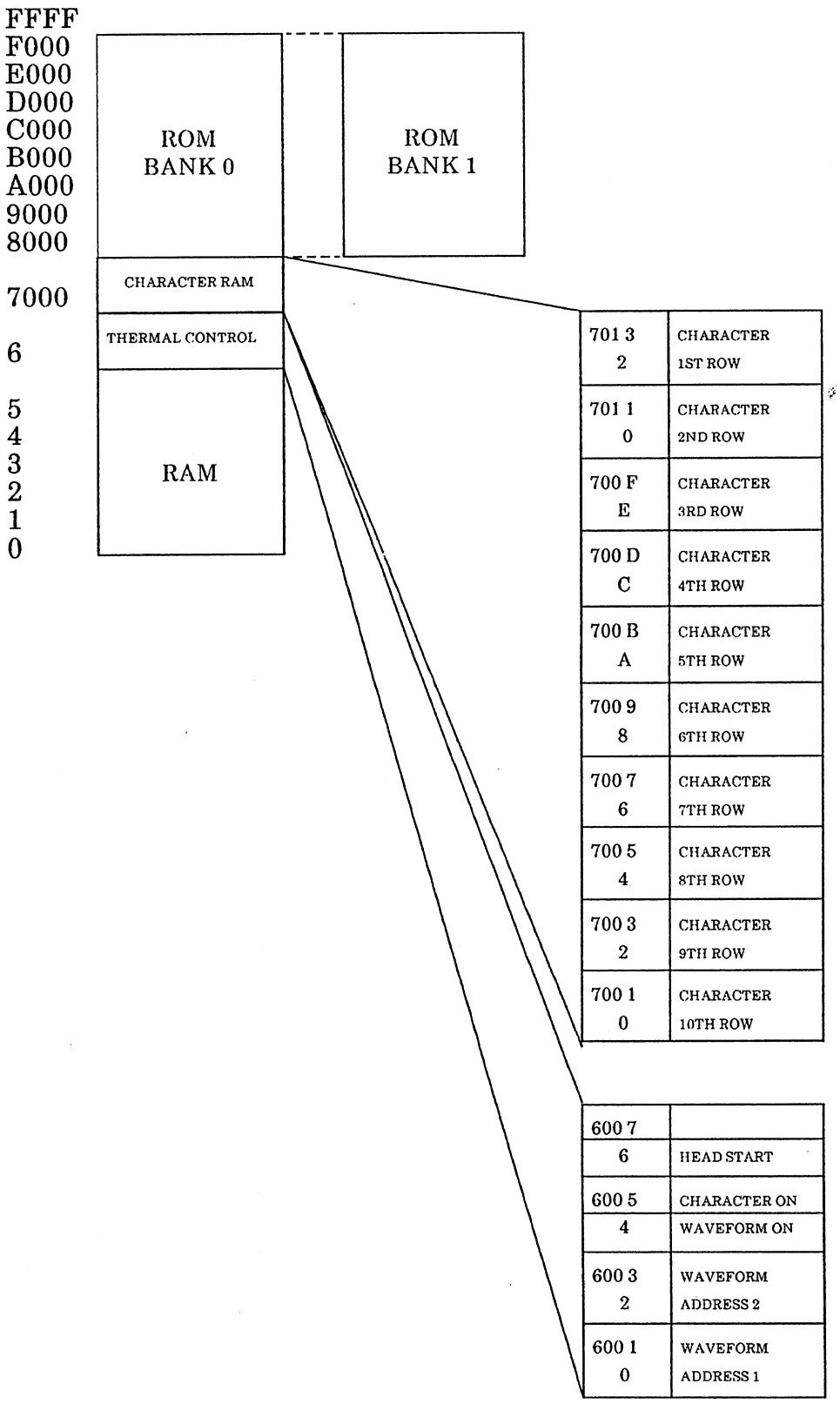
CNJ 103

1	0V
2	+9V
3	+9V
4	0V
5	+5V
6	0V
7	LE 0
8	LE 1
9	LE 2
10	LE 3
11	LE OFF
12	LE A
13	LE B
14	LE C
15	0V
16	S1A
17	S1B
18	S1C
19	S1D
20	S1Y
21	0V
22	PE
23	MTSW
24	SPEED A
25	SPEED B
26	0V

Option Connector
Control BD

1	0V
2	A0
3	A1
4	A2
5	A3
6	A4
7	A5
8	A6
9	A7
10	A8
11	A9
12	A10
13	A11
14	A12
15	A13
16	A14
17	A15
18	0V
19	D0
20	D1
21	D2
22	D3
23	D4
24	D5
25	D6
26	D7
27	0V
28	E
29	WR
30	RD
31	HALT
32	RCT
33	DC
34	DTX
35	DRX
36	0V
37	CTX
38	CRX
39	0V
40	0V

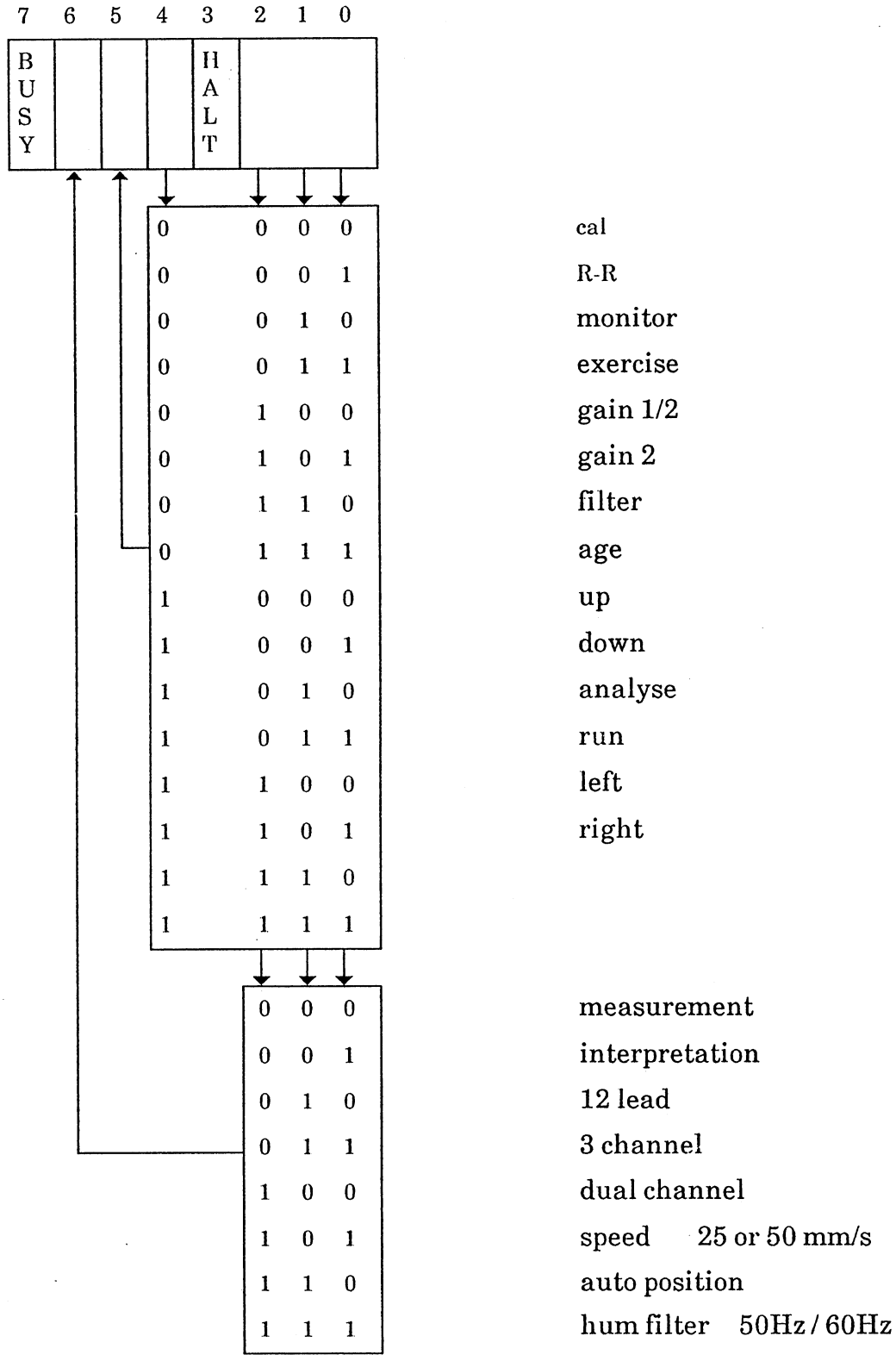
Connection Table


FFFF
F000
E000
D000
C000
B000
A000
9000
8000
7000
6
5
4
3
2
1
0
ROM BANK 0
ROM BANK 1
CHARACTER RAM
THERMAL CONTROL
RAM
701 3 2 CHARACTER 1ST ROW
701 1 0 CHARACTER 2ND ROW
700 F E CHARACTER 3RD ROW
700 D C CHARACTER 4TH ROW
700 B A CHARACTER 5TH ROW
700 9 8 CHARACTER 6TH ROW
700 7 6 CHARACTER 7TH ROW
700 5 4 CHARACTER 8TH ROW
700 3 2 CHARACTER 9TH ROW
700 1 0 CHARACTER 10TH ROW
600 7 6 HEAD START
600 5 4 CHARACTER ON WAVEFORM ON
600 3 2 WAVEFORM ADDRESS 2
600 1 0 WAVEFORM ADDRESS 1

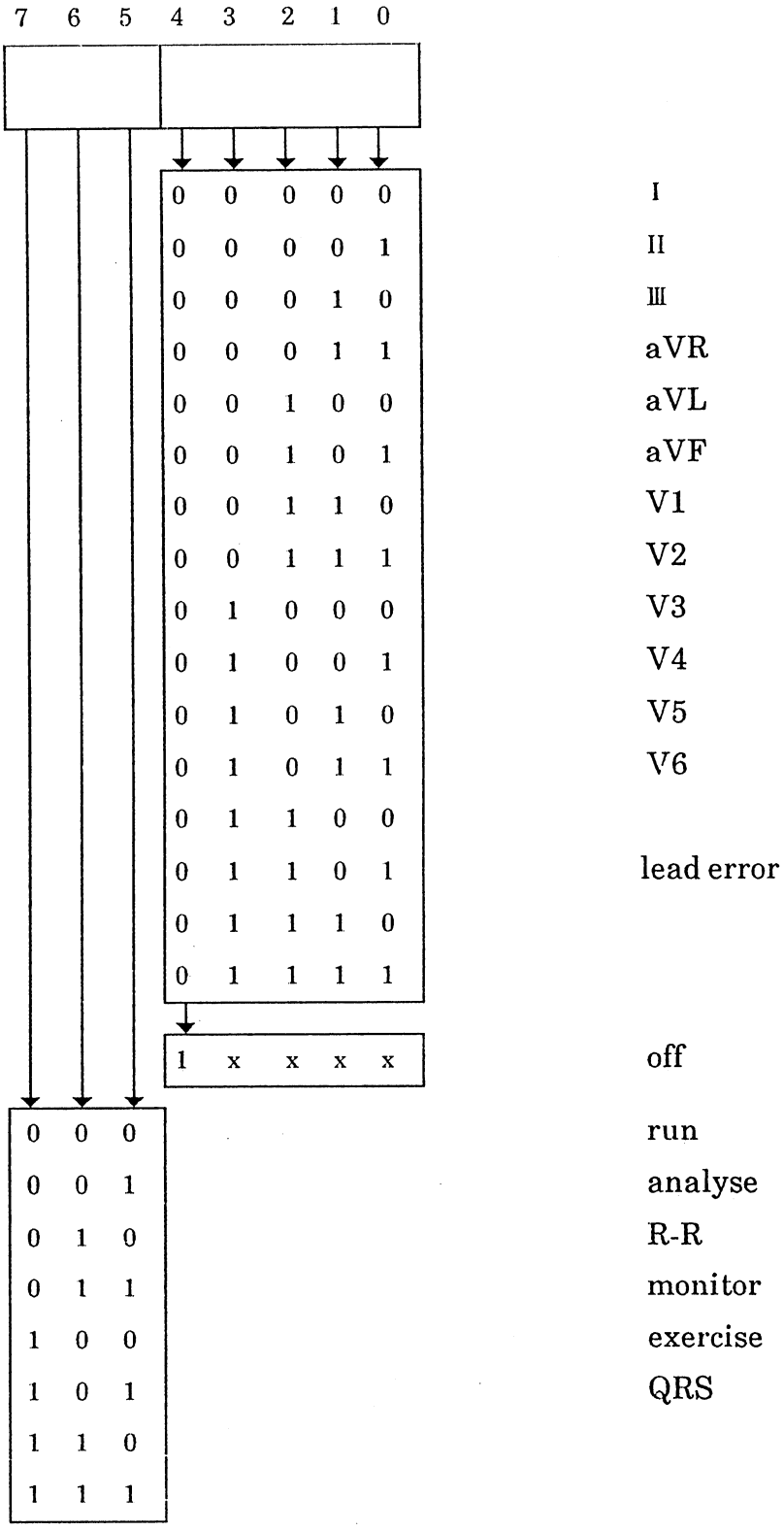
Memory Map

PORT	CPU Pin No.	SIGNAL	0	1
20	9	SEL	ROM#0	ROM#1
21	10	HDSTP	Head Stop	Head Ready
22	11	Speed A	2/3	1
23	12	Rx		
24	13	Tx	Ready	Paper Empty
25	14	PE	Motor off	Motor on
26	15	MTSW	1	1/2
27	16	Speed B 2Ch		
50	17	SIA		
51	18	SIB		
52	19	SIC		
53	20	Halt		
54	21	SID		
55	22	SIY		
56	23	SIY		
57	24	Busy		
60	25	LE0		
61	26	LE1		
62	27	LE2		
63	28	LE3		
64	29	LEOFF		
65	30	LEA		
66	31	LEB		
67	32	LEC		

Port Table



Port 5 Switch Control



Port 6 Lamp Control