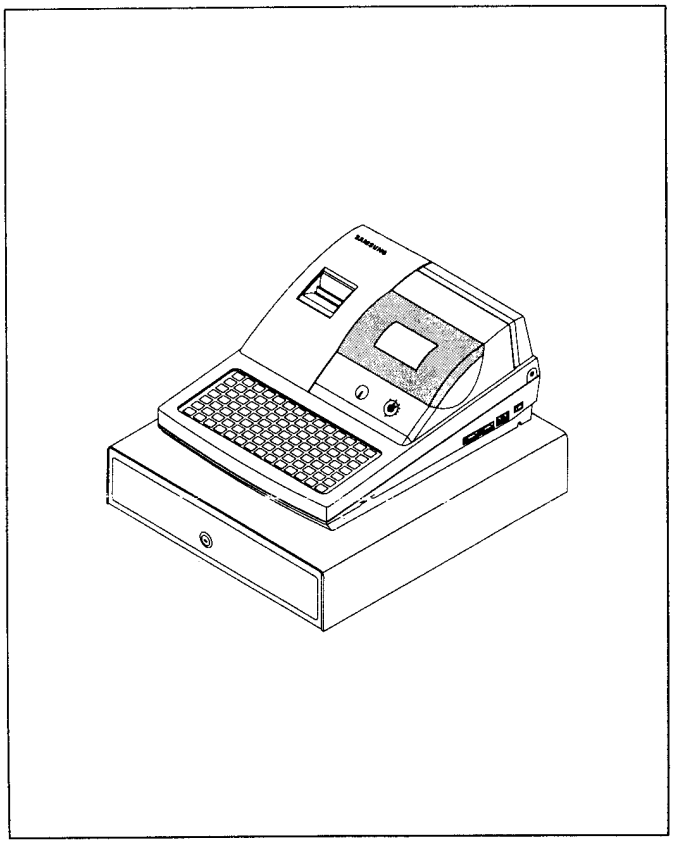
SAMSUNG

ELECTRONIC CASH REGISTER
ER-650

SERVICE Manual

ELECTRONIC CASH REGISTER



CONTENTS

Overview of this System ECR

This System ECR is a microprocessor-based system, using a 16 bit-microprocessor .

This service manual provides the technical information for many individual component systems, circuits and gives an analysis of the operations performed by the circuits. If you need more technical information, please contact our service branch or R&D center. Schematics and specifications provide the needed information for the accurate troubleshooting.

All information in this manual is subject to change without prior notice. Therefore, you must check the correspondence of your manual with your machine. No part of this manual may be copied or reproduced in any form or by any means, without the prior written consent of Samsung Electronics Co., Ltd. .

Note: Before using this System Electronic Cash Register (SECR) for the first time, leave it powered on in the REG mode for at least twenty-four hours. This allows the Ni-Cad battery, which maintains the memory of the SECR while the power is off, to charge completely.

About this Manual

This service manual describes how to perform hardware service maintenance for the Samsung ER-650 System Electronic Cash Register.

Notes

Notes may appear anywhere in the manual. They draw your attention to additional information about the item.

Precaution symbols

⚠. Indicates a Safety Precaution that applies to this part component.

⚠. indicates the part or component is an electro-statically sensitive device. Use caution when handling these parts.

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V1.0

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1 Precaution Statements

Follow these safety, servicing and ESD precautions to prevent damage and to protect against potential hazards such as electrical shock.

1-1 Safety Precautions

1. Be sure that all built-in protective devices are replaced. Restore any missing protective shields.
2. When reinstalling the chassis and its assemblies, be sure to restore all protective devices, including nonmetallic control knobs and compartment covers.
3. Make sure there are no cabinet openings through which people - particularly children - might insert fingers and contact dangerous voltages. Such openings include excessively wide cabinet ventilation slots and improperly fitted covers and drawers.
4. Design Alteration Warning: Never alter or add to the mechanical or electrical design of the SECR. Unauthorized alterations might create a safety hazard. Also, any design changes or additions will void the manufacturer's warranty.
5. Components, parts and wiring that appear to have overheated or that are otherwise damaged should be replaced with parts that meet the original specifications. Always determine the cause of damage or over- heating, and correct any potential hazards.
6. Observe the original lead dress, especially near the following areas : sharp edges, and especially the AC and high voltage supplies. Always inspect for pinched, out-of-place, or frayed wiring. Do not change the spacing between components and the printed circuit board. Check the AC power cord for damage. Make sure that leads and components do not touch thermally hot parts.
7. Product Safety Notice: Some electrical and mechanical parts have special safety-related characteristics which might not be obvious from visual inspection. These safety features and the protection they give might be lost if the replacement component differs from the original - even if the replacement is rated for higher voltage, wattage, etc.

   Components that are critical for safety are indicated in the circuit diagram by shading, (⚠) or (⚠). Use replacement components that have the same ratings, especially for flame resistance and dielectric strength specifications. A replacement part that does not have the same safety characteristics as the original might create shock, fire or other hazards.

CAUTION

Danger of explosion if battery is incorrectly replaced.

Replace only with the same or equivalent type recommended by the manufacturer.

Dispose used batteries according to the manufacturer's instructions.

ATTENTION

Il y a danger d'explosion s'il y a remplacement incorrect de la batterie.

Remplacer uniquement avec une batterie du même type ou d'un type équivalent recommandé par le constructeur.

Mettre au rebut les batteries usagées conformément aux instructions du fabricant.

1-2 Servicing Precautions

WARNING: First read the-Safety Precautions-section of this manual. If some unforeseen circumstance creates a conflict between the servicing and safety precautions, always follow the safety precautions.

WARNING: An electrolytic capacitor installed with the wrong polarity might explode.

1. Servicing precautions are printed on the cabinet. Follow them.
2. Always unplug the units AC power cord from the AC power source before attempting to:
   (a) Remove or reinstall any component or assembly
   (b) Disconnect an electrical plug or connector
   (c) Connect a test component in parallel with an electrolytic capacitor
3. Some components are raised above the printed circuit board for safety. An insulation tube or tape is sometimes used. The internal wiring is sometimes clamped to prevent contact with thermally hot components. Reinstall all such elements to their original position.
4. After servicing, always check that the screws, components and wiring have been correctly reinstalled. Make sure that the portion around the serviced part has not been damaged.
5. Check the insulation between the blades of the AC plug and accessible conductive parts (examples : metal panels and input terminals).
6. Insulation Checking Procedure:
   Disconnect the power cord from the AC source and turn the power switch ON. Connect an insulation resistance meter (500V) to the blades of AC plug.
   The insulation resistance between each blade of the AC plug and accessible conductive parts (see above) should be greater than 1 megohm.
7. Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.
8. Always connect an instrument's ground lead to the instrument chassis ground before connecting the positive lead ; always remove the instrument's ground lead last.

1-3 Precautions for Electrostatically Sensitive Devices (ESDs)

1. Some semiconductor (solid state) devices are easily damaged by static electricity. Such components are called Electrostatically Sensitive Devices (ESDs); examples include integrated circuits and some field-effect transistors. The following techniques will reduce the occurrence of component damage caused by static electricity.
2. Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist-strap device. (Be sure to remove it prior to applying power - this is an electric shock precaution.)
3. After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of electrostatic charge.
4. Do not use freon-propelled chemicals. These can generate electrical charges that damage ESDs.
5. Use only a grounded-tip soldering iron when soldering or unsoldering ESDs.
6. Use only an anti-static solder removal device. Many solder removal devices are not rated as anti-static; these can accumulate sufficient electrical charge to damage ESDs.
7. Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are packaged with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.
8. Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.
9. Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together, or lifting a foot from a carpeted floor can generate enough static electricity to damage an ESD.

2 Product Specifications

Specifications are correct at the time of printing. Product specifications are subject to change without notice. See below for product specifications.

2-1 General Specifications

Item	Description	Remark
Processor	• MITSUBISHI M16C/62 Group M30622SFP (16 Bit)	External ROM Version
Memory	• RAM SRAM (KM681000) : 1Mbits × 2EA SRAM (KM684000) : 4Mbits × 2EA(Option) • EP-ROM ER-ROM(27C040) : 4Mbits	
Battery	• Type : Ni-Cd, 3.6V 60mAh • Charging Time : 24 Hours • Life : 3 Years	
Data Storage	• 60 Days	When battery is Full charged
Interface Serial (RS-232C)	• Flow Control : ① DTR / DSR : H/W Flow Control ② XON / XOFF : S/W Flow Control • Baud Rate : 4800 / 9600 / 19200 Bps • Connector : DB9P Female (I/F PBA)	RS-232C #1 RS-232C #2
Interface Serial (IRC)	• Flow Control : ① XON/XOFF : S/W Flow Control • Baud Rate : 9600 Bps • Connector : Modular Jack Connector 12Pin (2 Port-6Pin)	Same as RS-485 2-Wire Communication Method
Printer	• Model : EPSON M-T102 • Printing Speed : 35 mm / Sec (9.3 Line / Sec)	Detail Spec refer to Next Page
Display	• Operator Display : LCD (128 × 64 Dots) • Customer Display : VFD (10 Digits)	
Key Board	• Flat Rubber Key : 98 Key	
Power Consumption	• Approx. 15W (Regularity), Approx. 28W (Peak)	
Power Requirement	• AC 120V 60Hz, 230V 50Hz	
Environment Condition	• Temperature : 0℃ ~ 45℃ • humidity : 30% ~ 80% RH	
Weight	• 13.4 Kg (SET), 15.6Kg(Box Packing)	
Dimensions(mm)	• 400(W) × 450(D) × 282.7(H)	

Table2-1 General Specifications

2-2 Appearance

2-2-1 Appearance Dimensions (mm)

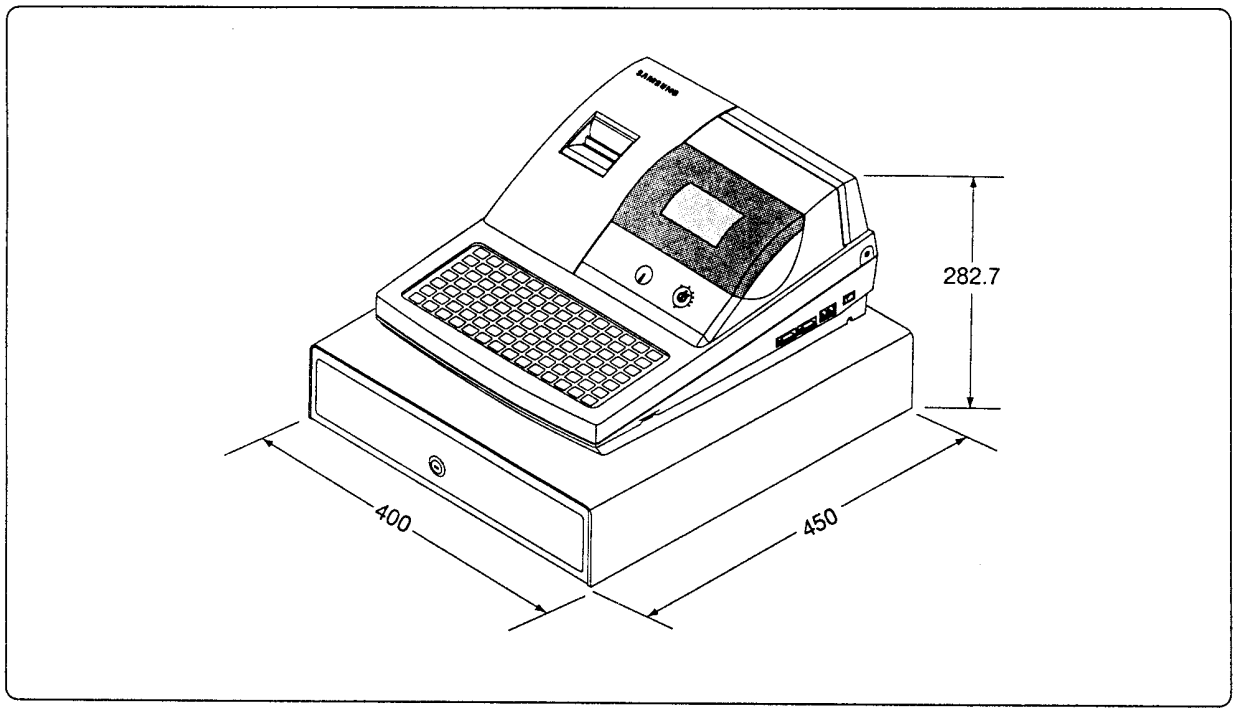
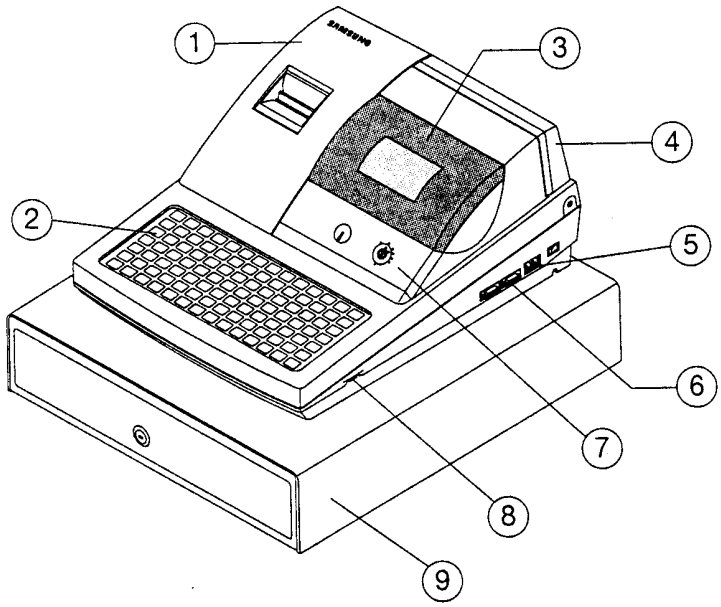


Figure2-1 Dimensions

2-2 Appearance

2-2-2 Feature Locations



① Printer Cover
② Key Board
③ Operator LCD Display
④ Customer VFD Display
⑤ IRC I/F Connector
⑥ RS-232 Serial I/F Connector
⑦ Mode Key and Clerk Key
⑧ Contrast Adjustment Knob
⑨ Drawer

Figure2-2 Feature Locations

2-3 Thermal Printer Specifications

2-3-1 Printer Specification

Item		Description	Remark
Model		• M-T102	EPSON
Print Method		• Thermal Line Printing	
Printing Format	Total number of dots	• 384 Dots / I Line	
	Dot Pitch	• Vertical : 0.125 mm • Horizontal : 0.125 mm	
Printing Speed		• 35 mm/Sec (At 7V of Motor Terminal Voltage)	
Printing Direction		• Unidirection with friction feed	
Paper Feeding	Feeding Method	• Friction Feed	
	Minimum Feed Pitch	• 0.0625 mm	
	Feeding Speed	• 40 mm/Sec (At 7V of Motor Terminal Voltage)	
Power Supply Volt	Power Voltage	• 5V ~ 7.5V (Recommend)	Head/Motor
	Circuit input Voltage	• 5V	Head Control/Sensor
Printer Head	Heat Element Density	• 8 Dots/mm (0.125 mm/Dot)	
	Total Head Elements	• 384 Dots/Dot Line	
	Available Printing Width	• 48 mm	
	Heat element typical Ω	• 142 Ω ±4%	
Motor	Paper Feed Motor	• 4-Phase Bi-Polar Stepping Motor	
Sensor	Head Temperature	• Thermister	
	Paper-End Sensor	• Reflecting Photo Sensor	
	Head Unload Sensor	• Micro Switch	
Reliability	Life	• 2,000,000 Lines	
	MCBF	• 5,000,000 Line	
Dimension (mm)		• 69.15 (W) ×51.2 (D) ×20 (H)	
Weight		• Approx. 85 g	

Table2-2 Thermal Printer Specifications

2-3 Thermal Printer Specifications

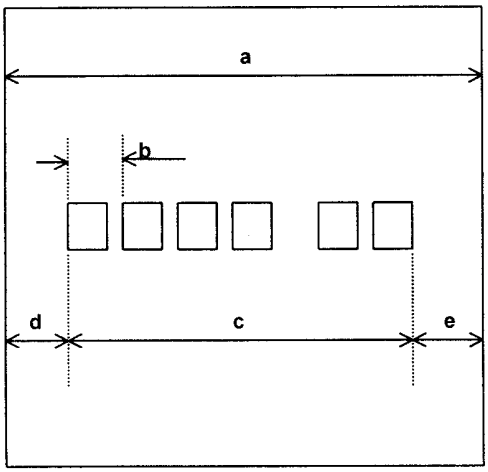
2-3-2 Paper Specification

Item	Description	Remark
Paper Type	• Single-ply Thermal Paper Roll	
Paper Size	• 57.5 mm±0.5 mm (Width) ×65 mm or less	
Specified Paper	• Original Paper No. TF50KS-E (Nippon Paper Industries Co.,Ltd) • Original Paper No. AF50KS-E (JUJO Thermal) • Original Paper No. KF50 (KANZAN)	

Table2-3 Paper Specification

2-3-3 Printable Area

The Printable area of a paper with width of 80-1.0mm(3.13"±0.02") is 72.2±0.2mm(2.84""±0.008")(512 dots) and the space on the right and left sides are approximately 3.7mm(0.146").



a = 57.5±0.5 mm (Paper Width)

b = 0.125 mm (1 Dot)

c = 48 mm (384 Dots/Printable Area)

d = 4.75 mm (Left Space)

e = 4.75 mm (Right Space)

Figure2-3 Printable Area

2-3-4 Character Specification

Item	Description	Remark
Character Structure	• 12(W) × 24(H) Font (Including a horizonteal)	
Character Size	• 1.25 mm(W) ×3.0 mm(H)	
Column Pitch	• 1.5 mm	
Line Pitch	• 3.75 mm (Including 6-dot line spacing)	
Number of Column	• 32 (12×24 Dots/Character)	

Table2-4 Character Specification

2-3 Thermal Printer Specifications

2-3-5 Other Component Specification

Item		Description	Remark
Paper Feed Motor	Type	• 4-Phase 20 Step PM Stepping Motor	
	Power Supply Voltage	• 4.5V ~ 7.5V DC	
	Coin Resistance	• 15 Ω ±1Ω (25℃/Phase)	
	Current Consumption	• Peak : 2A or less • Mean : Approx. 250 mA	
	Drive Method	• Constant-Voltage Driving using 2-2 Phase Excitation	
Printer Head	Number of Heat Element	• 384 Dots	
	Heat Element Density	• 8 Dots/mm (0.125 mm/Dot)	
	Typical Resistance Value	• 142 Ω ±4%	
	Current	• Approx. 3.1 A	
Thermister	Constant B	• 3950K ±2%	
	Resistance Value	• 30kΩ ±5% (25℃)	
	Temperature Character	• Rt=R(25)×Exp[B×{1/(T+273)-1/(25+273)}]	
	Operating Temperature	• -20℃ ~ 80℃	
Paper End Sensor	Type	• Reflecting Photo Sensor	Refer to data sheet on Matsushita home page
	Spec	• ON2270-R (Matsushita)	
Head Unload Sensor	Type	• Micro Switch	This Sensor is not used in ER-650
	Supply Voltage	• 5 VDC ±5%	
	Current Rating	• 1A ~ 50 mA	
	Detect Method	• On when the printer head is load	

Table2-5 Other Component Specification

2-3-6 Printer Connector

2-3-6-(a) Head Unload Sensor Pin Assignments

Pin No.	Signal Description	Remark
1	VCC	This Sensor is not used in ER-650
2	GND	

Table2-6 Printer Pin Assignment

2-3 Thermal Printer Specifications

2-3-6-(b) Paper Feed Motor Pin Assignments

Pin No.	Signal Description	Remark
1	Phase A	
2	Phase B	
3	Phase A_	
4	Phase B_	

2-3-6-(c) Paper-End Sensor Pin Assignments

Pin No.	Signal Description	Remark
1	GND	
2	Paper End Signal	
3	VCC	

2-3-6-(d) Thermal Head Connector#1 Pin Assignments

Pin No.	Signal Description	Remark
1	VH	
2	VH	
3	D0	
4	/LAT	
5	CLK	
6	STB1	
7	STB2	
8	GND	
9	GND	

2-3-6-(e) Thermal Head Connector#2 Pin Assignments

Pin No.	Signal Description	Remark
1	GND	
2	GND	
3	TM	
4	STB3	
5	STB4	
6	VDD	
7	DI	
8	VH	
9	VH	

2-4 Power Specifications

2-4-1 Power Specification

Item	Description	Remark
Input Voltage & Current	• U.S.A : AC 120V, 150mA, 60Hz (Min : 90V, Max : 132V) • Europe : AC 230V, 80mA, 50Hz (Min : 198V, Max : 264V)	
Power Consumption	• Stand-By : 10W • Operating : 15W	
Output Voltage	• AC 19V 2.3A (Wire Color : Blue-Blue) • AC 24V 0.15A (Wire Color : Red-Red)	Power Transformer Output

Table2-7 Power Specification

2-5 Interface Specifications

2-5-1 RS-232C Serial Interface

2-5-1-(a) Specification

Item	Description	Remark
Data Transmission	• Serial	
Synchronization	• Asynchronous	
HandShaking (Flow Control)	• H/W : DTR / DSR • S/W : XON / XOFF	XON : ASC Code 11h XOFF : ASC Code 13h
Signal Level	• Logic"1" (MARK) : -3V ~ -15V • Logic"0" (SPACE) : +3V ~ +15V	
Baud Rate	• 4800 / 9600 / 19200 bps	
Data Word Length	• 7 Bit / 8 Bit	
Parity	• None / Even / Odd	
Connector	• DB9P Female (I/F PBA Side)	

Table2-8 RS-232C Specification

2-5-1-(b) RS-232C I/F Cable

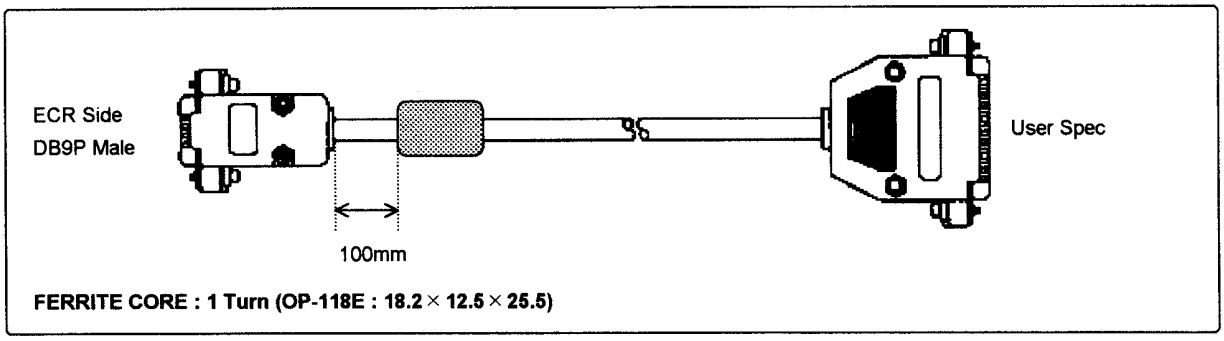


Figure2-4 RS-232C Cable

2-5-1-(c) Cable Connection

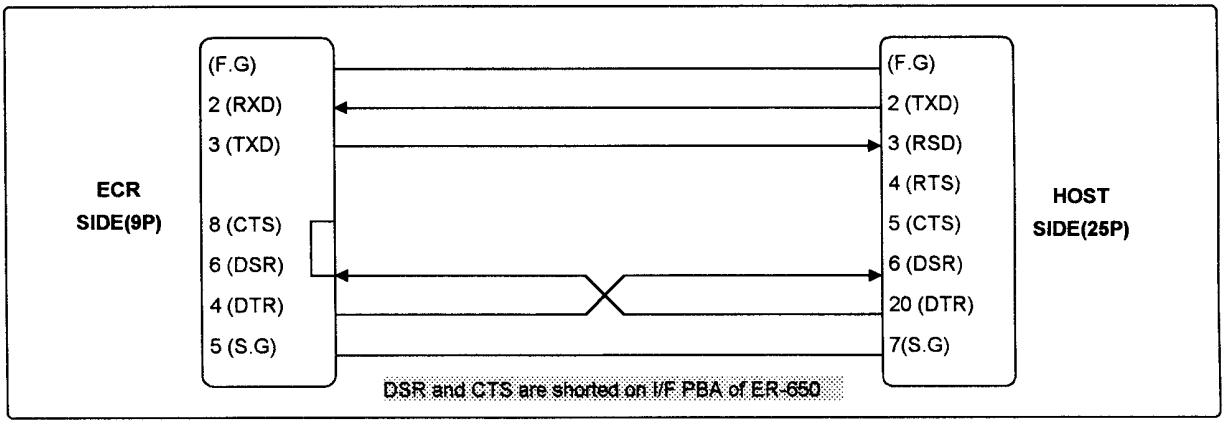


Figure2-5 RS232C Cable Connection

2-5 Interface Specifications

2-5-1 RS-232C Serial Interface

2-5-1-(d) Signal Description

Pin No.	Signal Name	Signal Direction	Function
BODY	Frame GND	-	Frame Ground
3	TXD	Output	Transmit Data
2	RXD	Input	Receive Data
6	DSR	Input	This signal indicates whether the host computer or receipt printer can receive data. (H/W flow control) ① MARK(Logic1) : The host can receive a data. ② SPACE(Logic0) : The host can not receive a data ③ The ECR transmits a data to the host or receipt printer, after confirming this signal. ④ When XON/XOFF flow control is selected, the printer does not check this signal.
5	Signal GND	-	Signal Ground
4	DTR	Output	This Signal indicates whether the ECR(ER-650) is busy. (H/W flow control) ① MARK(Logic1) : The ECR is busy ② SPACE(Logic0) : The ECR is not busy ③ The host transmits a data to the ECR, after confirming this signal. ④ When XON/XOFF flow control is selected, the host does not check this signal.

Table2-9 RS-232C Signal Description

2-5-1-(e) H/W Flow Control Timing

When DTR/DSR flow control is select, before transmitting a data, the ECR checks whether the host is BUSY or not. If the host is BUSY, ECR does not transmit a data to the host. If the host is not BUSY, ECR transmits a data to the Host. The host is the same. Refer to the Interface Part of Chapter 7(Special Circuit Diagrams).

2-5-1-(f) S/W Flow Control Timing

When XON/XOFF flow control is selected, the ECR transmits XON(ASCII 11h) or XOFF(ACSII 13h) signal through the Serial Data Line.

If the ECR is busy, the printer transmits XOFF(ASCII 13h) to host through the Serial Data Line. Then the host recognize that the ECR is busy. So, the host does not transmit a data to the ECR. If the ECR is released from busy, the ECR transmits XON(ASCII 11h) to host through the Serial Data Line. Then the host recognize that the ECR is not busy. And the host transmit a data to the ECR.

2-5 Interface Specifications

2-5-2 IRC Serial Interface

2-5-2-(a) Specification (Same as RS-485 2-Wire Communication Method)

Item	Description	Remark
Data Transmission	• Serial	
Synchronization	• Asynchronous	
Signal Level (Receive)	• Logic"1" : $(V_A\text{-}V_B) \geq 0.2V$ • Logic"0" : $(V_A\text{-}V_B) \leq -0.2V$	
Baud Rate	• 9600 bps	
Data Word Length	• 7 Bit / 8 Bit	
Parity	• None / Even / Odd	
Connector	• Modular Jack Connector 12P (2Port-6Pin)	

Table2-10 IRC Specification

2-5-2-(b) IRC I/F Cable

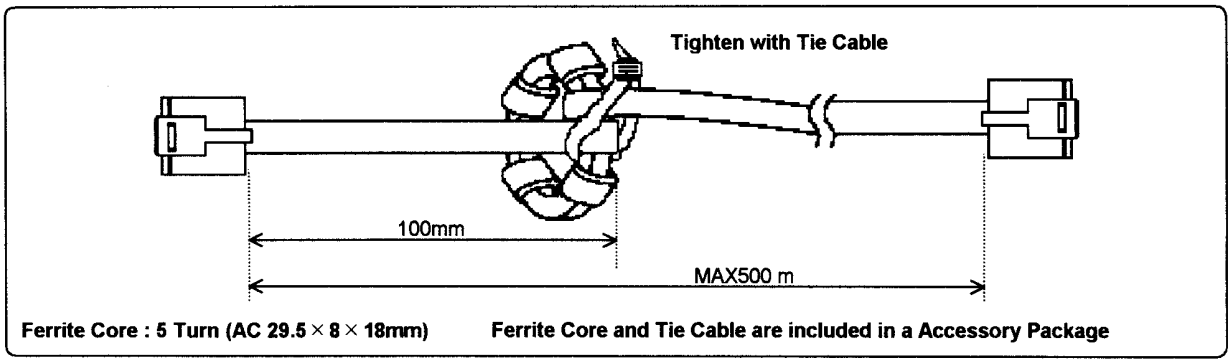


Figure2-6 IRC Cable

2-5-2-(c) Cable Connection

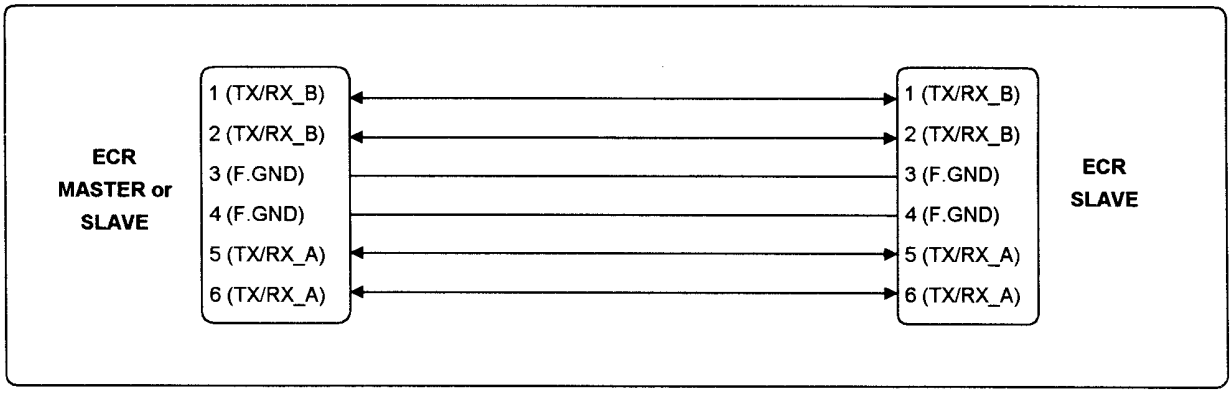


Figure2-7 IRC Cable Connetion

2-5 Interface Specifications

2-5-2-(d) Signal Description (Port#1)

Pin No.	Signal Name	Signal Direction	Function
1(7)	TX/RX_B	In/Out	Transmit/Receive Data Line B
2(8)	TX/RX_B	In/Out	Pin 1 and Pin 2 are shorted each other on I/F PBA.
3(9)	F.GND	-	Frame Ground
4(10)	F.GND	-	
5(11)	TX/RX_A	In/Out	Transmit/Receive Data Line A
6(12)	TX/RX_A	In/Out	Pin 5 and Pin 6 are shorted each other on I/F PBA.

Table2-11 IRC Signal Description

Note : The signal description of the Port#2 are same as it of the Port#1

3 Installation and Operation

3-1 System Configuration

3-1-1 Configuration

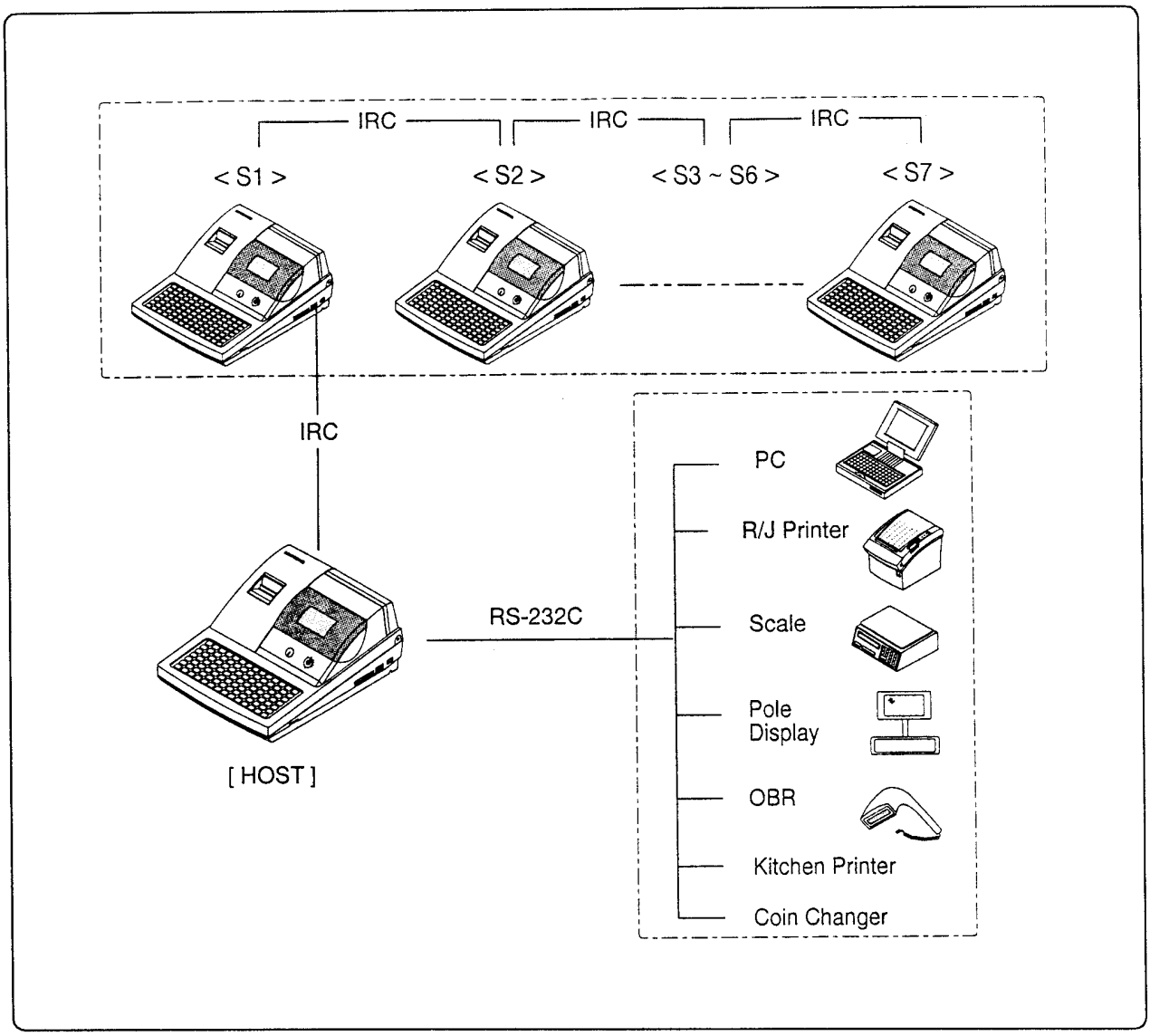


Figure3-1 System Configuration

Note : Do not use a terminator

3-2 Installation

3-2-1 Paper Roll Installation

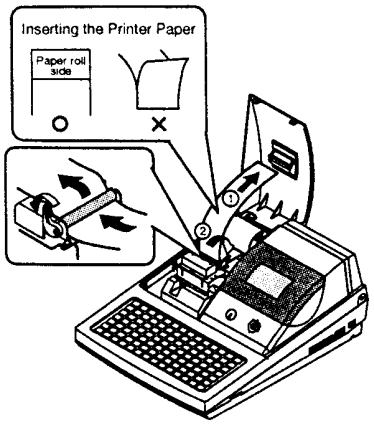


Figure3-3 Paper Installation

1. Open the cover printer and remove the used paper roll core if there is one.
2. Plug the paper roll guide in the new paper roll core.
3. Load the paper roll and guide on the paper holder
4. Pull the printer release lever on the printer.
5. Insert the paper into the slot of the printer.
6. Close the printer cover.

3-2-2 RS-232C Serial Cable Installation

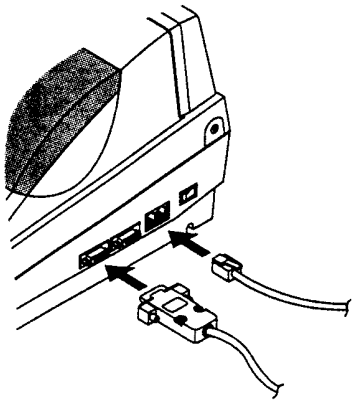


Figure3-4 RS-232C and IRC Cable Installation

1. Connect the RS-232C serial cable to the RS-232C serial port on the right side of ECR.
2. Secure the serial cable with screws.
3. Connect the other end of the RS-232C serial Cable to your host computer.

3-2 Installation

3-2-3 IRC Serial Cable Installation

1. Connect the IRC serial cable to the IRC port on the right side of ECR.
2. Connect the other end of the IRC serial Cable to other ECR.

3-2-4 Options

No.	Item	Description	Remark
1	RS-232 / IRC I/F Board	I/F PBA	
2	Clerk Key	5EA, 10EA, 15EA	Selectable

Table 3-1 Option

3-2-5 Supplies

No.	Item	Description	Remark
1	Paper Roll	1 EA	
2	Cable Tie	2 EA	
3	Ferrite Core	RING-TR29A : 2 EA	
4	Mode Key	VD, REG, X, Z, P, C	
5	User Manual	1 EA	
6	Shaft Paper	1 EA	
7	Clerk Key	5EA, 10EA, 15EA	Option

Table 3-2 Supplies

3-2 Operation

Note: Before using this Electronic Cash Register(ECR) for the first time, leave it powered ON in the REG mode for a at least 24 hours. This allows the Ni-Cad battery, which maintains the ECR's memory while the power is OFF, to fully charge.

3-3-1 Mode Switch

The position of the Mode Switch determines the action of the ECR. The modes are as shown in Table 3-1

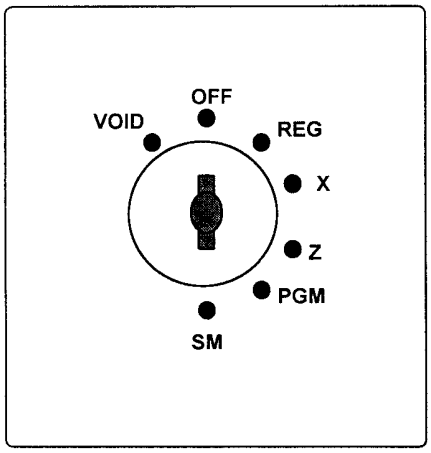


Figure3-5 Mode Switch

Mode	Function
VOID	Use to void (correct) items outside of a sale.
OFF	The Register is inoperable.
REG	Use for normal registrations.
X	Use to read register reports and perform other manager functions.
Z	Use to read register reports and reset totals to zero.
PGM	Use to program the register
SM	Use for H/W tests and special setting.

Table3-3 Mode Switch Function

The mode keys can be used to access the following key lock positions.

Key	Accessible Position	Remark
VOID	Void, Off, Register, Manager	
X	Off, Register, Manager	
Z	Off, Register, Manager, Clear Totals	
PGM	Void, Off, Register, Manager, Clear Totals, Program	
C	Void, Off, Register, Manager, Clear Totals, Program, Service Mode	

Table3-4 Key Function

Note : The Key can be removed from the key lock in the OFF or REGISTER position.

3-3 Operation

3-3-2 Key Board Matrix(Dealer Option)

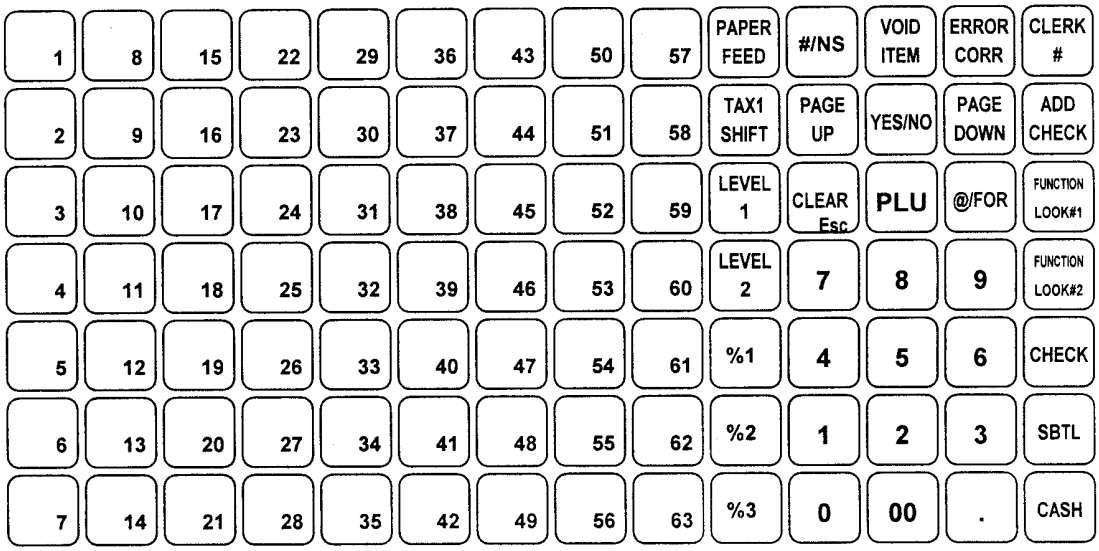


Figure3-6 Key Board

3-3-3 All Clear

This step insures that the cash register is cleared of any totals or programming. After this procedure, the cash register is ready for programming and operation.

WARNING: This is a one time procedure. Do not repeat this procedure after the cash register is programmed, it causes all programs and totals to be erased and to be default.

1. Turn off the power switch.
2. Turn the Mode key marked '**C**' to Service Mode position.
3. Press and hold the **CHECK** key on key board and turn on the power switch at the same time.
4. When "*RAM ALL CLEAR SERV.*" message display, press **PLU1**, **PLU7**, **CLERK#** and **CASH** in sequence.
5. When memory is cleared, the register prints a message "*RAM ALL CLEAR OK!*"

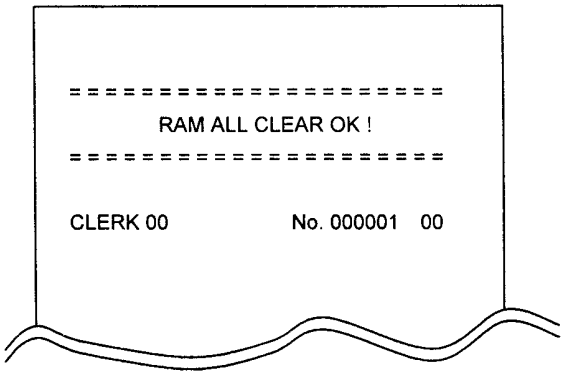


Figure3-7 All Clear

3-3 Operation

3-3-4 Self Test

1. Turn the Mode key marked '**C**' to Service Mode position.
2. Select "*0. SELF TEST*" from the menu and Press **0** on the key board.
3. H/W test menu will be displayed.
4. Select the number from the menu.

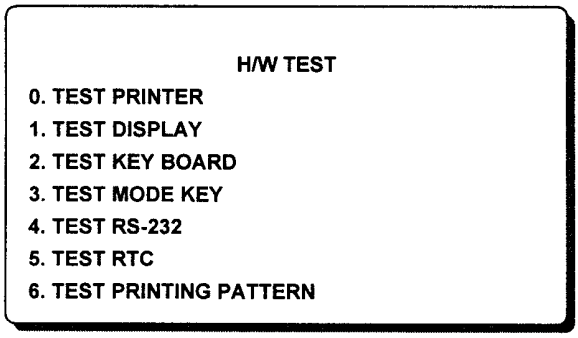


Figure3-8 Self Test

3-3-4-(a) Test Printer

1. Press **0** key on key board.
2. Then the printer prints a test pattern. The printing message shows some information sush as 'TM value','stbIdx (Strobe index)'.
3. After printing, The drawer is opened. Then the printer test is finished.

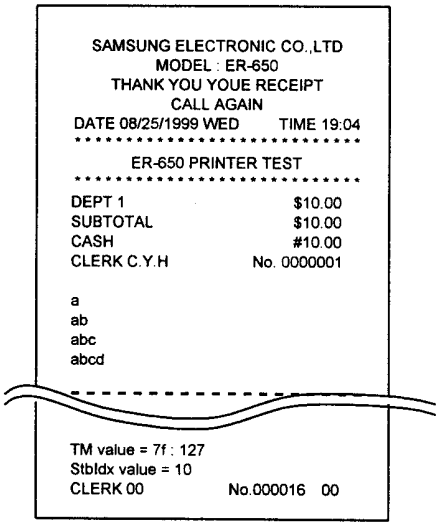


Figure3-9 Printer Self Test

3-3-4-(b) Test Display

1. Press **1** key on key board.
2. Then the buzzer will work for 1 sec.
3. After testing the buzzer, Some characters are displayed on the rear VFD display
4. After testing the rear VFD display, the LCD display tests. The LCD is filled with a black screen. And then the black screen erase.

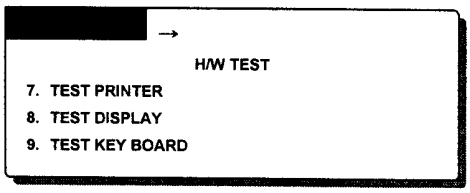


Figure3-10 Display Self Test

3-3 Operation

3-3-4-(c) Test Key Board

1. Press **2** key on key board.
2. Press any key you want on the key board.
3. Already pressed key will be showed on the LCD screen that the position of key pressed with a black square and key code.
4. Turn the mode key to any position to finish this test.

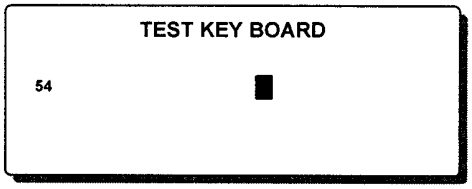


Figure3-11 Key Board Self Test

3-3-4-(d) Test Mode Key

1. Press **3** key on key board.
2. Turn the mode key to any position.
3. The corresponding Mode name will be showed on the LCD screen.

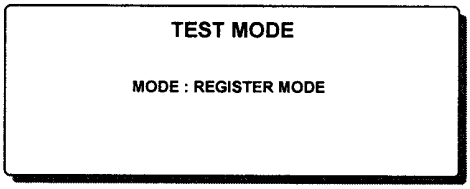


Figure3-12 Mode Key Self Test

3-3-4-(e) Test RS232C

1. Press **4** key on key board.
2. Press **0** key on the key board. (0= Loop Back Test for RS232 Port#1)
   If error occur, the message (*PORT#1 TEST N.G*) is displayed on LCD and the Buzzer beep. Then Press "**C**" key.
4. Press **1** key on the key board. (1= Loop Back Test for RS232 Port#2)
   If error occur, the message (*PORT#2 TEST N.G*) is displayed on LCD and the Buzzer beep. Then Press "**C**" key.
5. Press **2** key on the key board. (2= Loop Back Test for IRC)
   The message (*TEST IRC OK*) is displayed on LCD.

Note : When the ports is no connection or the cable is open, the Error occur.

4 Disassembly and Assembly

Caution :

- Before installation, be sure to turn off the power switch.
- Use gloves to protect your hand from being cut by the angle and the chassis.
- Connect all the cables correctly. When connecting or disconnecting the cables, be careful not to apply stress to the cables. (It may cause disconnection)
- Be careful not to bind interface cables and AC power cord together.

4-1 Disassembling the Case Upper Block

4-1-1 Case Upper Block

1. Open the Printer Cover.
2. Remove the two screws (A21,A22).
3. Lift off the Case Upper Block.
4. Separate the harness from the Main PBA
5. Remove the screw(B22) and separate the GND wire(b) from GND plate.
6. Separate the Case Upper Block.

Note : Refer to the disassemble picture on next page.
Note : To Install, Reverse the removal procedure.

4-1-2 LCD and VFD Display Block

1. Remove the two screws(A24).
2. Remove the mold fixed(A23).
3. Separate the LCD Display part from the Case Upper.
4. Separate the VFD Display part from the Case Upper.

Note : Refer to the disassemble picture on next page.
Note : The position of Ferrite core and the number of turn refer to the display part of chapter specification.
Note : To Install, Reverse the removal procedure.

4-1-3 Mode and Clerk Key Block

1. Remove the three screws(A15). And separate the mode and clerk key assembly from case upper.
2. Remove the two screws(A13). And separate the mode key(A16) from mode and clerk key assembly.
3. Remove the two screws(A12). And separate the clerk key(A14) from mode and clerk key assembly.

Note : Refer to the disassemble picture on next page.
Note : The position of Ferrite core and the number of turn refer to the display part of chapter specification.
Note : To Install, Reverse the removal procedure.

4-2 Disassembling the Case Lower Block

4-2-1 Printer

1. Remove the three screws(B8,B9) on the Printer Plate. And separate the GND wire(a).
2. Remove the four screws(B12,B14).
3. Separate the three harnesses from the Main PBA.
4. Separate the Printer Assembly from the Case Lower Block.
5. Remove the screw(B1). And separate the Mold Bracket(M-1).
6. Remove the screw(B3). And separate the Printer from the Printer Plate.

Note : Refer to the Disassemble Picture on next page.
Note : To Install, Reverse the removal procedure.

4-2-2 RS-232 / IRC I/F PBA

1. Remove the two screws(B20) on the I/F PBA.
2. Separate the two I/F harnesses from the Main PBA.
3. Separate the I/F PBA from Lower Case Assembly

Note : Refer to the Disassemble Picture on next page.
Note : The position of Ferrite core and the number of turn refer to the Serial I/F part of chapter specification.
Note : To Install, Reverse the removal procedure

4-2-3 Power Transformer and Filter PBA

1. Separate the Harness Connector from the Main PBA and Filter PBA.
2. Remove the two screws(B16) on the Power Transformer..
3. Remove the Power Transformer.
4. Separate the Power S/W Harness Connector and Power Cord Connector from Filter PBA.
5. Remove the two screws(B18) on the Filter PBA.
6. Remove the Power Filter PBA.

Note : Refer to the Disassemble Picture on next page.
Note : To Install, Reverse the removal procedure.

4-2-4 Main PBA

1. Separate the Drawer, Compulsory harness connector from the Main PBA.
2. Remove the five screws(B26) on the Main PBA.
3. Remove the Main PBA.

Note : Refer to the Disassemble Picture on next page.
Note : To Install, Reverse the removal procedure.

4-3 Disassembling Diagram

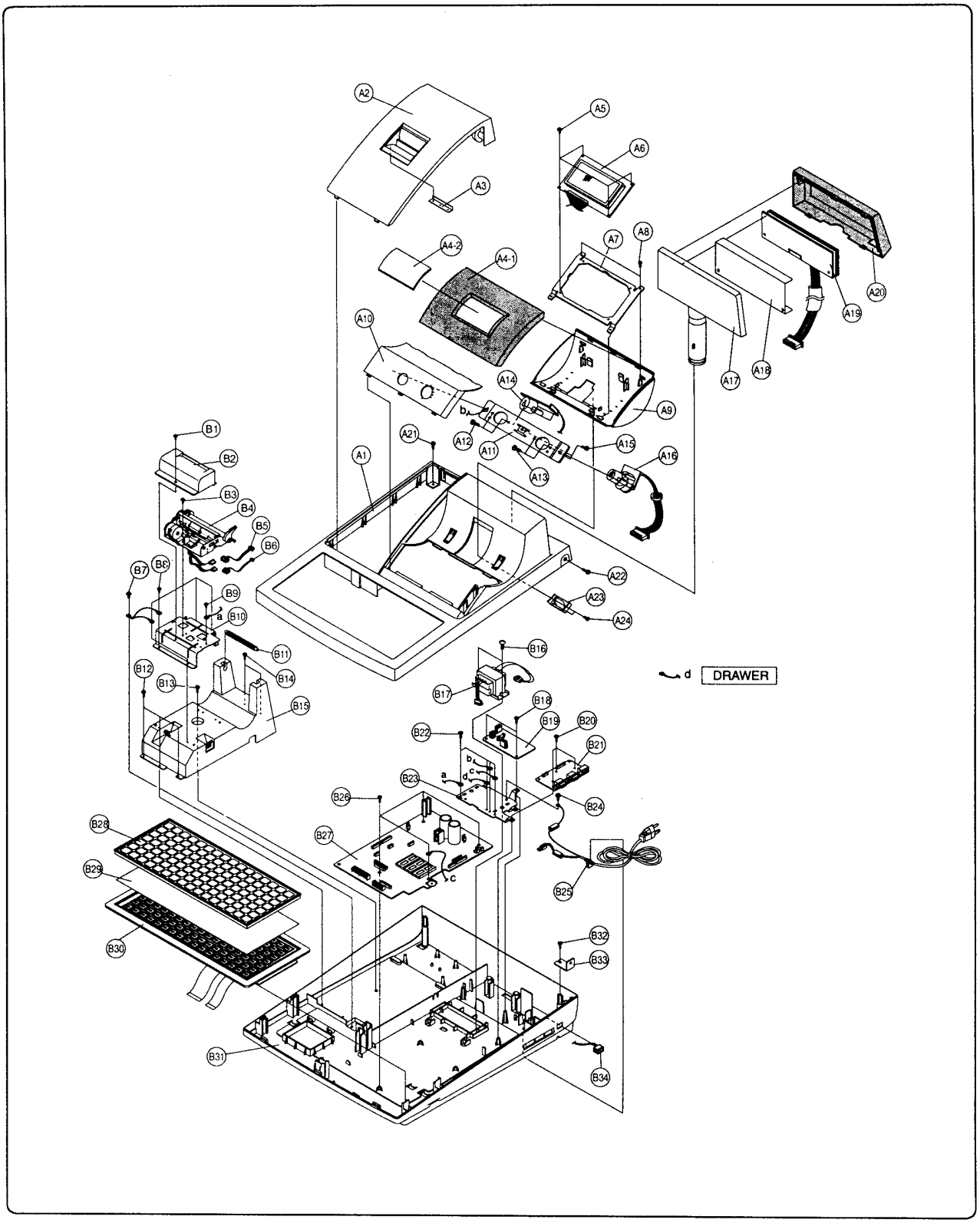


Figure4-1 Disassembly and Assembly

5 Maintenance and Adjustment

5-1 Maintenance

5-1-1 Cleaning the Printer Head

After printing, the printer head can be very hot. Be careful not to touch it. Also let it cool before you clean it.

Do not damage the printer head by touching it with your fingers or any hard object.

1. Turn the ECR power switch off.
2. Open the Printer Cover.
3. Open the paper lock rubber with pulling the green lever.
4. Clean the Printer Head Thermal Element with a cotton swab moistened with alcohol solvent. (ethanol, methanol or IPA)
5. After confirming that alcohol solvent has been dried up completely, close the paper lock rubber with pushing the Green lever.

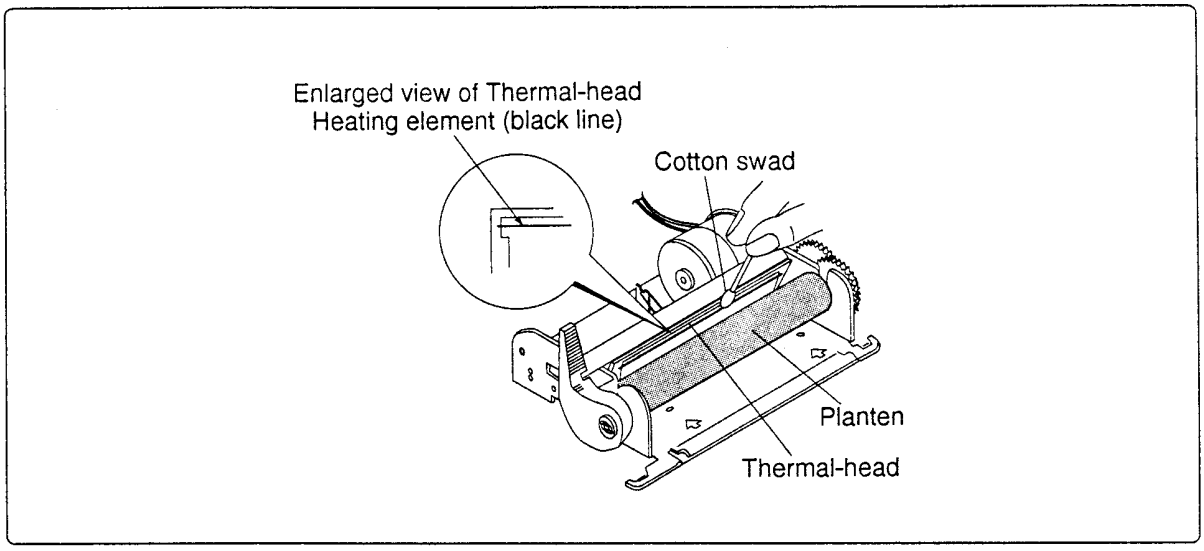


Figure 5-1 Clean the Printer Head

Caution: Note that the thermal head becomes very hot during normal operation. To prevent the danger of Burn injury from thermal, be sure to wait for about 10 minutes after turning power off before beginning the cleaning.

5-2 Adjustment

5-2-1 LCD Display Angle

You can adjust the view angle of the Operator LCD Display

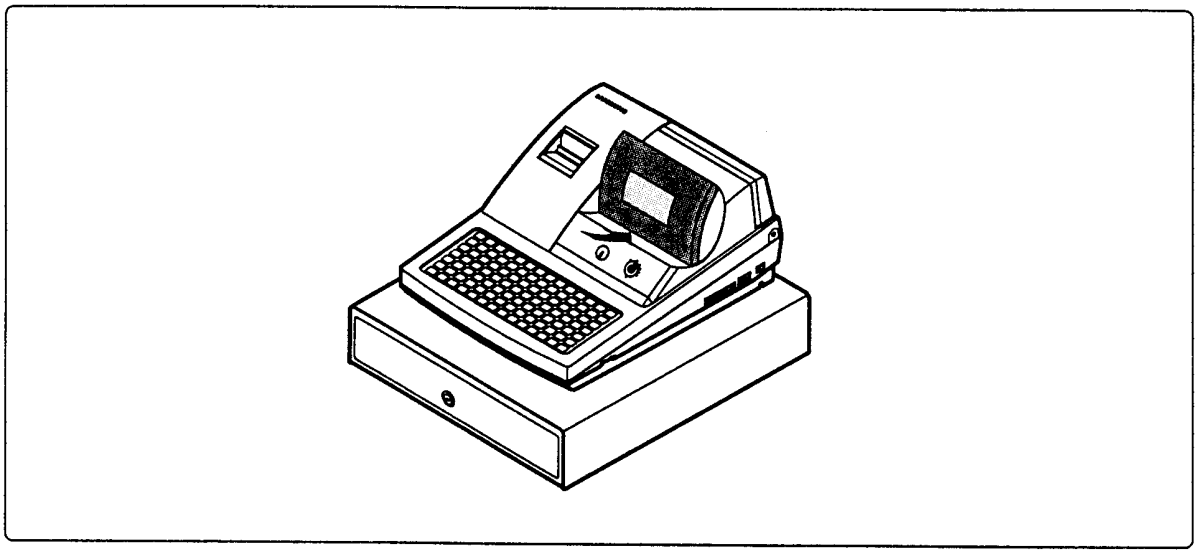


Figure 5-2 Adjustment of the View Angle

5-2-1 LCD Display Contrast

You can adjust the contrast of the Operator LCD Display by using the VR on the left side.

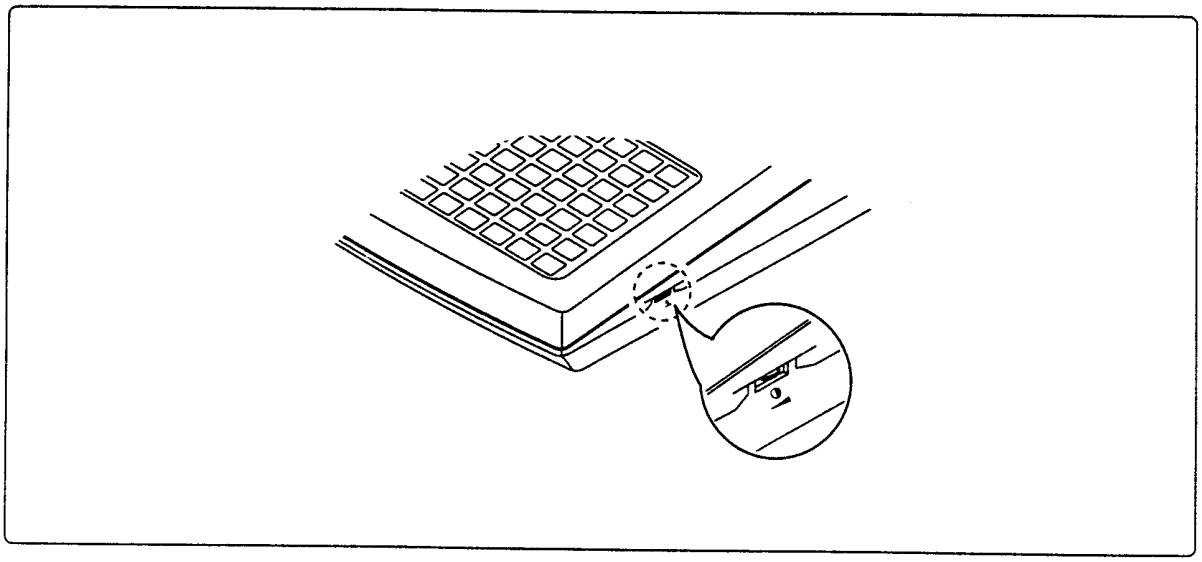
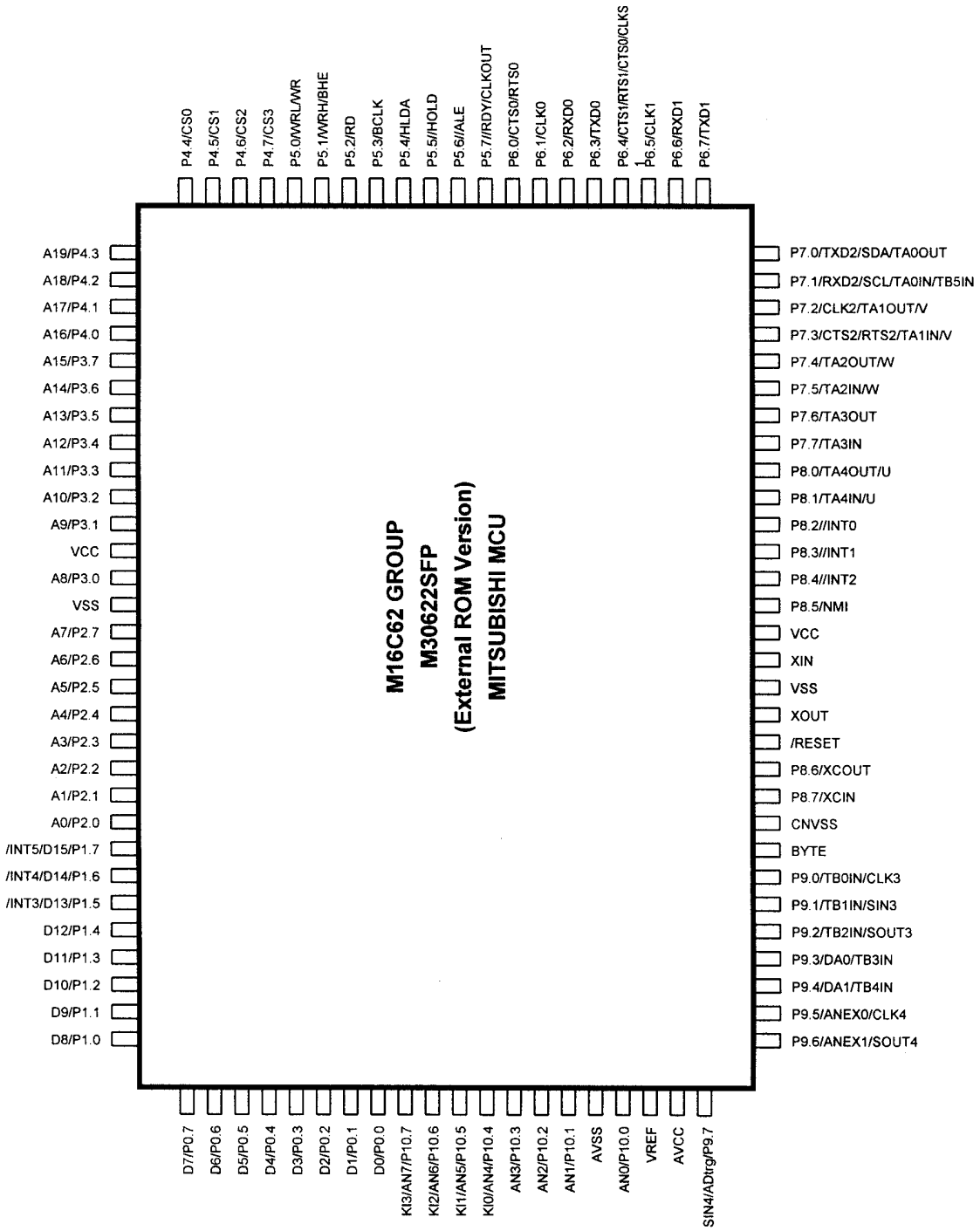


Figure 5-3 Adjustment of Contrast

6 Reference Information

6-1 Semiconductor Base Diagram

6-1-1 CPU

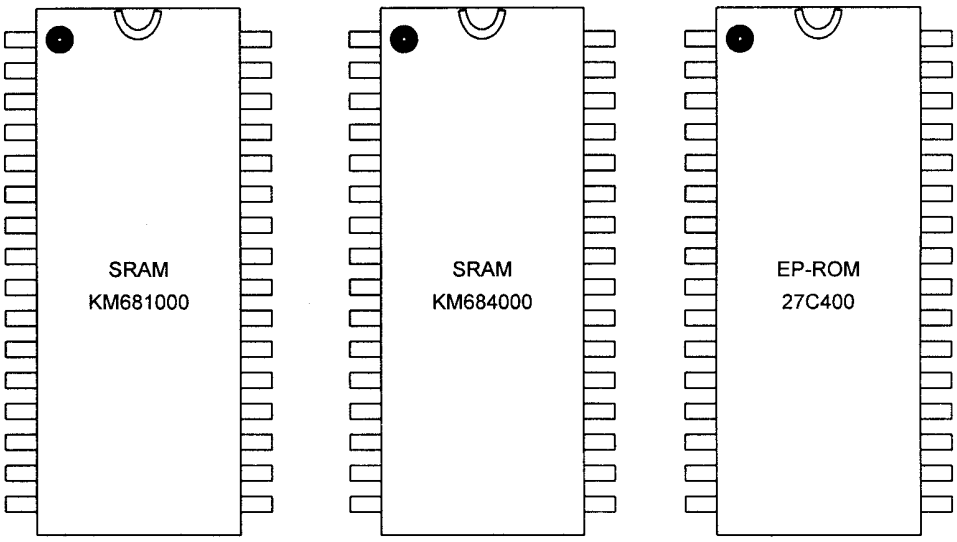


6-1 Semiconductor Base Diagram

Pin	Port	Function	I/O	Pin	Port	Function	I/O
1	P9.6	Rear Display Serial Data	Out	51	P4.3	Address19	Out
2	P9.5	Rear Display Clock	Out	52	P4.2	Address 18	Out
3	P9.4	Rear Display Latch	Out	53	P4.1	Address 17	Out
4	P9.3	Fiscal Chip Select	Out	54	P4.0	Address 16	Out
5	P9.2	Thermal Printer Serial Data	Out	55	P3.7	Address 15	Out
6	P9.1	Thermal Printer Strobe 3,4	Out	56	P3.6	Address 14	Out
7	P9.0	Thermal Printer Clock	Out	57	P3.5	Address 13	Out
8	BYTE	+5V (VCC)	-	58	P3.4	Address 12	Out
9	CNVSS	+5V (VCC)	-	59	P3.3	Address 11	Out
10	P8.7	Drawer #2	Out	60	P3.2	Address 10	Out
11	P8.6	Thermal Printer Strobe 1,2	Out	61	P3.1	Address 9	Out
12	RESET	Reset	In	62	VCC	+5V / VCC	-
13	XOUT	N.C	-	63	P3.0	Address 8	Out
14	VSS	Ground	-	64	VSS	Ground	-
15	XIN	X-TAL(14.7456MHz)	In	65	P2.7	Address 7	Out
16	VCC	+5V (VCC)	-	66	P2.6	Address 6	Out
17	P8.5	Pull-Up (VCC)	-	67	P2.5	Address 5	Out
18	P8.4	Drawer #1	Out	68	P2.4	Address 4	Out
19	P8.3	Power Fail Interrupt	In	69	P2.3	Address 3	Out
20	P8.2	LCD Data / Instruction	Out	70	P2.2	Address 2	Out
21	P8.1	Fiscal Address 17	Out	71	P2.1	Address 1	Out
22	P8.0	Fiscal address 16	Out	72	P2.0	Address 0	Out
23	P7.7	Fiscal Memory Writing Voltage On/Off	Out	73	P1.7	Thermal Head Voltage On/Off	Out
24	P7.6	Buzzer	Out	74	P1.6	Thermal Printer Latch	Out
25	P7.5	Memory Chip Enable	Out	75	P1.5	Step Motor Phase MD	Out
26	P7.4	LCD Read / Write	Out	76	P1.4	Step Motor Phase MC	Out
27	P7.3	IRC Read	Out	77	P1.3	Step Motor Phase MB	Out
28	P7.2	IRC Enable	Out	78	P1.2	Step Motor Phase MA	Out
29	P7.1	RXD #3 (IRC-Receive)	In	79	P1.1	LCD Chip Select #2	Out
30	P7.0	TXD #3 (IRC-Transmit)	Out	80	P1.0	LCD Chip Select #1	Out
31	P6.7	TXD #2 (RS-232C #2)	Out	81	P0.7	Data 7	In/Out
32	P6.6	RXD #2 (RS-232C #2)	In	82	P0.6	Data 6	In/Out
33	P6.5	DSR #2 (RS-232C #2)	In	83	P0.5	Data 5	In/Out
34	P6.4	DTR #2 (RS-232C #2)	Out	84	P0.4	Data 4	In/Out
35	P6.3	TXD #1 (RS-232C #1)	Out	85	P0.3	Data 3	In/Out
36	P6.2	RXD #1 (RS-232C #1)	In	86	P0.2	Data 2	In/Out
37	P6.1	DSR #1 (RS-232C #1)	In	87	P0.1	Data 1	In/Out
38	P6.0	DTR #1 (RS-232C #1)	Out	88	P0.0	Data 0	In/Out
39	P5.7	Pull-Up (VCC)	-	89	P10.7	Display PCB Disconnection Check	In
40	P5.6	N.C (ALE)	-	90	P10.6	Power Fail AD Converter	In
41	P5.5	Pull-Up (VCC)	-	91	P10.5	LCD Chip Select Detector (For ESD)	In
42	P5.4	N.C (/HLDA)	-	92	P10.4	Drawer Compulsory #2	In
43	P5.3	N.C (BCLK)	-	93	P10.3	Drawer Compulsory #1	In
44	P5.2	/RD (Read)	Out	94	P10.2	Mode Key Input	In
45	P5.1	N.C (/WRH)	-	95	P10.1	All Clear Switch	In
46	P5.0	/WR (Write)	Out	96	AVSS	Ground	-
47	P4.7	/CS3 (Chip Select 3)	Out	97	P10.0	AD Thermal Printer Temperature	In
48	P4.6	/CS2 (Chip Select 2)	Out	98	VREF	AD Reference Voltage Input	In
49	P4.5	/CS1 (Chip Select 1)	Out	99	AVCC	+5V (VCC)	-
50	P4.4	/CS0 (Chip Select 0)	Out	100	P9.7	Paper End Sensor #1	

6-1 Semiconductor Base Diagram

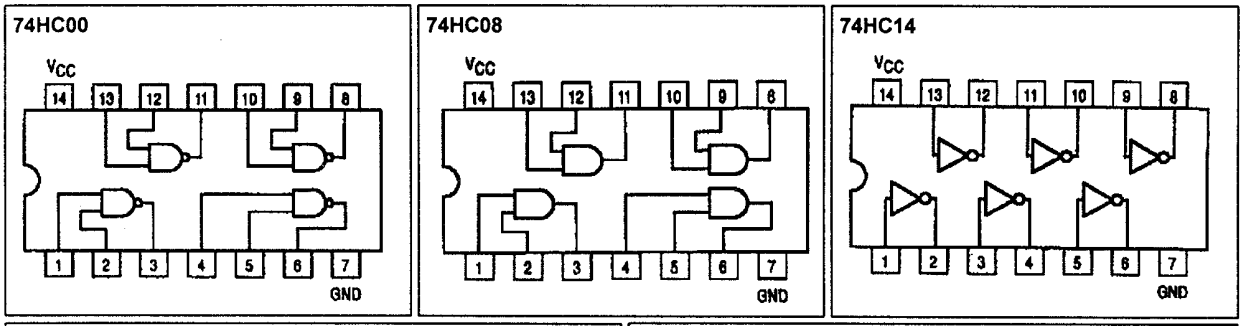
6-1-2 Memorys

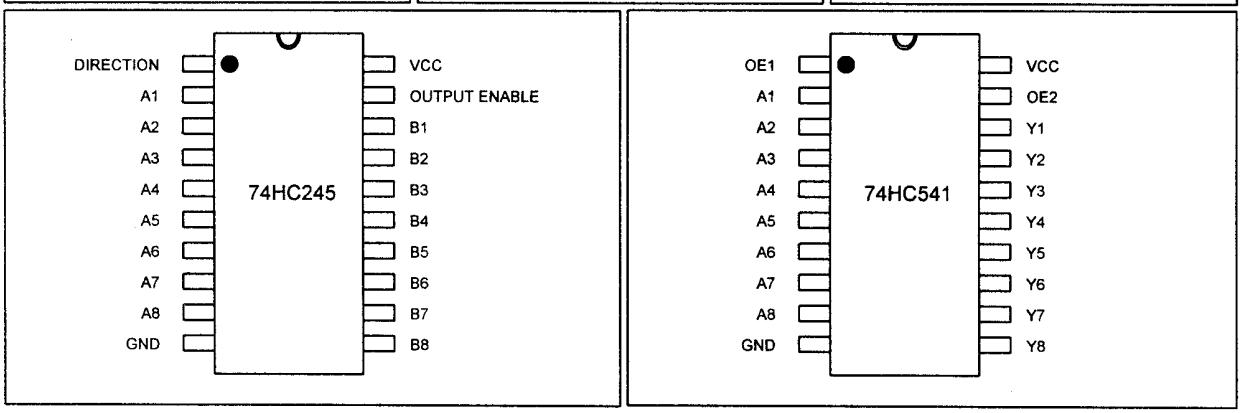


Pin	SRAM KM681000	SRAM KM684000	EPROM 27C400	Pin	SRAM KM681000	SRAM KM684000	EPROM 27C400
1	N.C	Address 18	VPP	32	VCC	VCC	VCC
2	Address 16	Address 16	Address 16	31	Address 15	Address 15	Address 18
3	Address 14	Address 14	Address 15	30	CS2	Address 17	Address 17
4	Address 12	Address 12	Address 12	29	/WE	/WE	Address 14
5	Address 7	Address 7	Address 7	28	Address 13	Address 13	Address 13
6	Address 6	Address 6	Address 6	27	Address 8	Address 8	Address 8
7	Address 5	Address 5	Address 5	26	Address 9	Address 9	Address 9
8	Address 4	Address 4	Address 4	25	Address 11	Address 11	Address 11
9	Address 3	Address 3	Address 3	24	/OE	/OE	/OE
10	Address 2	Address 2	Address 2	23	Address 10	Address 10	Address 10
11	Address 1	Address 1	Address 1	22	/CS1	/CS	/CE
12	Address 0	Address 0	Address 0	21	Data 7	Data 7	Data 7
13	Data 0	Data 0	Data 0	20	Data 6	Data 6	Data 6
14	Data 1	Data 1	Data 1	19	Data 5	Data 5	Data 5
15	Data 2	Data 2	Data 2	18	Data 4	Data 4	Data 4
16	GND	GND	GND	17	Data 3	Data 3	Data 3

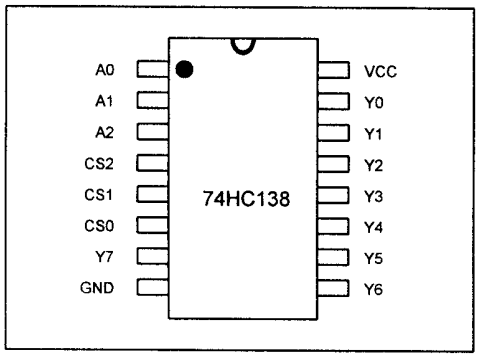
6-1 Semiconductor Base Diagram

6-1-3 Logic ICs





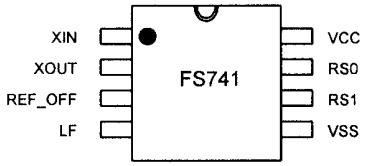
74HCT245 FUNCTION TABLE			74HCT541 FUNCTION TABLE			
INPUT		OPERATION	INPUT			OUTPUT Y
OUTPUT ENABLE	DIRECTION		OE1	OE2	A	
L	L	Data Transmitted B A	L	L	L	L
L	H	Data Transmitted A B	L	L	H	H
H	X	Bus Isolated (Z State)	H	X	X	Z
Z : High Impedance			X	H	X	Z



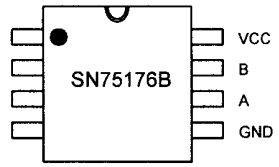
6-1 Semiconductor Base Diagram

6-1-4 Other Semiconductor Chip

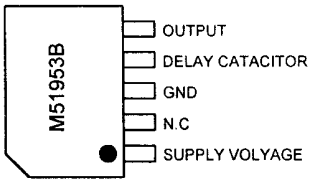
Low EMI Spectrum Spread Clock



Differential Bus Transceivers

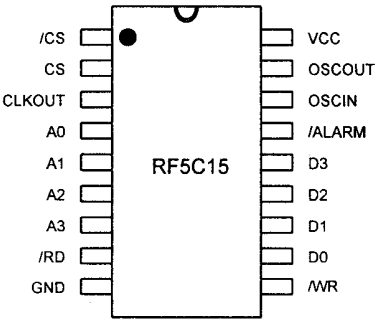


Voltage Detect System Reset IC

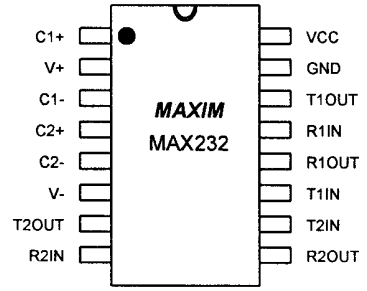


SN75175B DRIVER				SN75176B RECEIVER		
INPUT D	ENABLE DE	OPERATION A	OPERATION B	DIFFERENTIAL INPUT A-B	ENABLE /RE	OUTPUT R
H	H	H	L	$V_{ID} \geq 0.2$ V	L	H
L	H	L	H	-0.2 V < V_{ID} < 0.2 V	L	?
X	L	L	Z	$V_{ID} \leq$ -0.2 V	L	L
Z : High Impedance				X	H	Z
				OPEN	L	?

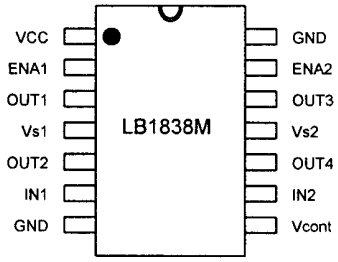
Real Time Clock



Serial Comm Driver/Receiver



Step Motor Driver

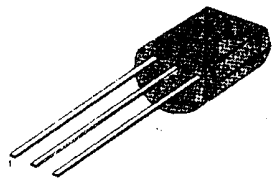


LB1838M DRIVER TRUTH TABLE				
IN1,2	ENA1,2	OUT1,3	OUT2,4	MODE
L	H	H	L	FORWARD
H	H	L	H	REVERSE
L	L	OFF	OFF	STANDBY
H	L	OFF	OFF	STANDBY

6-1 Semiconductor Base Diagram

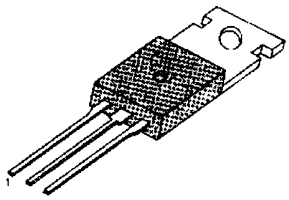
6-1-5 TR , Diode Chip Component

A708



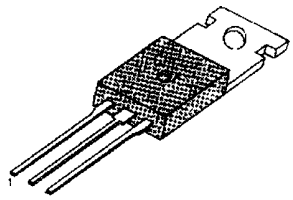
1:Emitter 2: Base 3: Collector

A1010



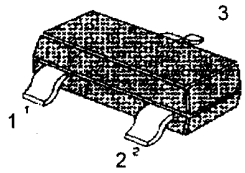
1: Base 2: Collector 3: Emitter

D288



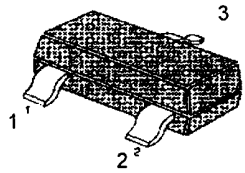
1:Base 2: Collector 3: Emitter

TR MMBT2222



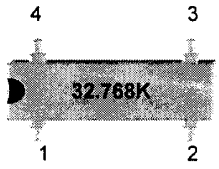
1:Base 2: Emitter 3: Collector

DIODE MMBD6050L



1:Anode 2: N.C 3: Cathode

OSCILLATOR
32.768[KHz]



1:X1 2: N.C 3: N.C 4. X2

7 Special Circuit Descriptions

7-1 Power Circuit

This system is operated under 120Vac or 230Vac. All data is saved by the Battery when the Main power is turned off. The power circuit supplies the five different DC voltage sources and one AC voltage source.

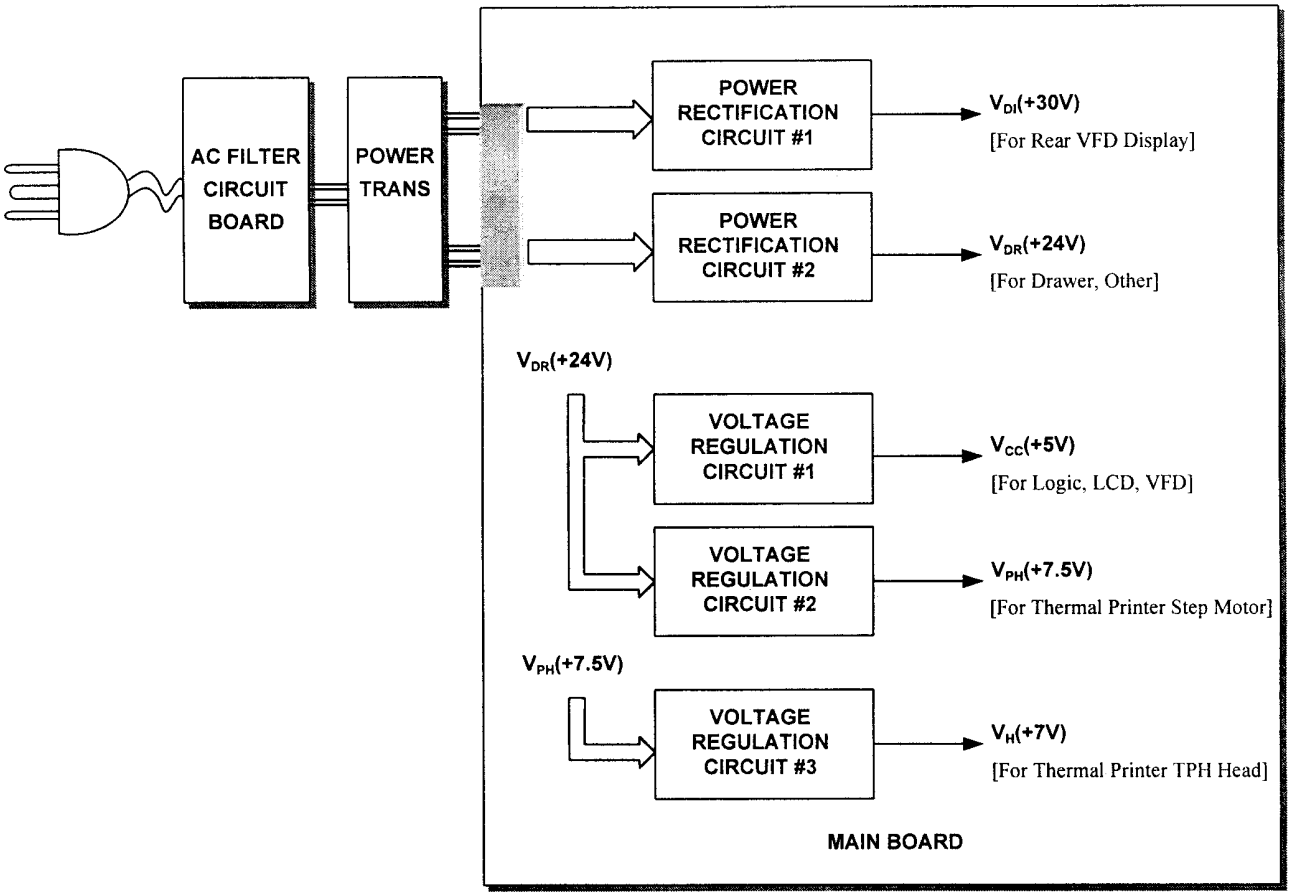


Figure 7-1 Power Block Diagram

No.	Voltage	Description
1	V_{DI} (+30VDC)	Rear VFD Grid/Anode Driving Voltage
2	V_{DR} (+24VDC)	Cash Drawer Solenoid Driving Voltage
3	V_{CC} (+5VDC)	Logic IC Driving / LCD / VFD Filament Voltage
4	V_{PH} (+7.5VDC)	Thermal Printer Step Motor Driving Voltage
5	V_H (+7.0VDC)	Thermal Printer Head Driving Voltage

Table 7-1 Power Source Voltage Descriptions

7-1 Power Circuit

7-1-1 Cash Drawer Solenoid Driving Voltage : +24Vdc

+24VDC is produced by the bridge diode (BD2) and the capacitors(C11,C8,C7,C5). This voltage is used as a Cash Drawer Solenoid driving voltage and a source voltage of the other voltage sources.

7-1-2 Logic IC Driving Voltage: +5V

+5Vdc Logic driving voltage is produced by the step-down dc-dc converter U2(34063A). That is, U2 produces rectangular wave at the collector of Q11(A1010) by switching Q11 using +24Vdc. This makes D3(IN5822) and L10 store energy. The voltage is smoothed by C13(470uF) and then +5Vdc Logic voltage is produced .

7-1-3 Front LCD Back Light Driving Voltage: +4.2Vdc

U14(2222) is turned on by INTP1 (P10.6;Power Fail) signal and then +5Vdc drops +4.3Vdc by D30(6050) and D29(EK04). This +4.2Vdc drives Front LCD Back Light.

7-1-4 Rear VFD Grid/Anode Driving Voltage : +30Vdc

+30VAC is rectified by the bridge diode (BD1) and the capacitors(C1). And it is regulated by ZD1,Q1. And then +30VDC Rear VFD Grid/Anode driving voltage is produced.

7-1-5 Thermal Printer Driving Voltage : +7.5Vdc

+7.5VDC Thermal Printer driving voltage is produced by the step-down dc-dc converter U1(34063A). That is, U1 produces rectangular wave at the collector of Q3(A1010) by switching Q3 using +24VDC. This makes D2(IN5822) and L2 store energy. The voltage is smoothed by C12(470uF) and then +7.5VDC thermal printer driving voltage is produced .

7-1-6 Thermal Printer Head Driving Voltage : +7.0Vdc

+7.0VDC Thermal Printer Head driving voltage is produced by VH_On/Off of CPU and the related Circuit(Q6,Q7). The Source Voltage is V_{PH}(7.5V).

7-2 RESET and Power Fail Circuit

7-2-1 Reset Circuit

Reset signal is a signal in order to start-up CPU under Power-on. Reset circuit uses a reset ICM51953B(U4). When +5Vdc is fallen under 4.3Vdc by Power-off, reset signal prohibits the system from misoperating by lowering down to 0V.

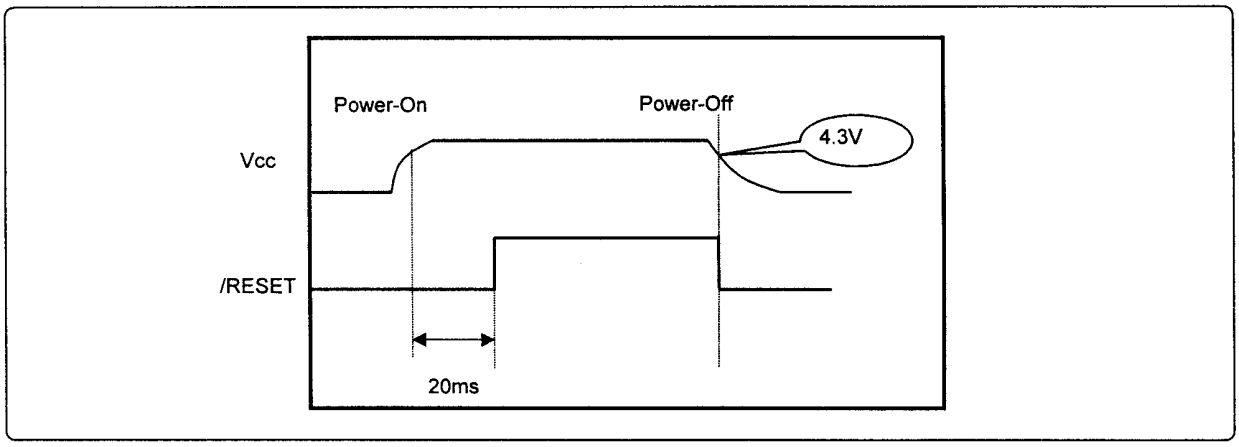


Figure 7-2 Reset Waveform

7-2-2 Power Fail Sensing Circuit

Power Fail Sensing Circuit detects sudden power-off to backup the needed data and current CPU status into RAM before 35ms just before +5V drops. When power is turned on, the CPU does the operations which were working before power-off. This system is designed to sense the time when the AC Line voltage is goes down to 89Vac(USA) or 170Vac(Europe) . That is, when +24Vdc goes down to +10Vdc.

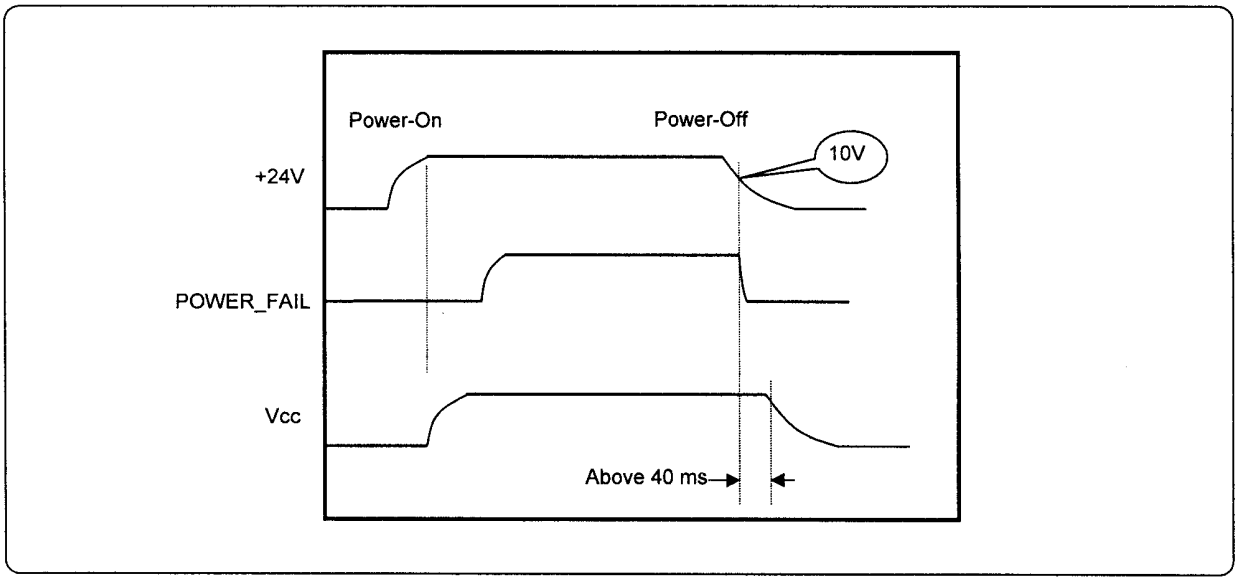


Figure 7-3 Power Fail Waveform

7-3 Battery, RTC(Clock), Buzzer and Cash Drawer circuits

7-3-1 Battery Circuit

Battery Circuit supplies SRAMs and RTC (U18, RF5C15) with voltage source and is used to drive clock and to save data when the main Power is turned off. When the Power is turned on, Vcc source(+5VDC) is supplied to SRAMs and RTC through the D11(EK04), and the Battery is charged. When the Power is turned off, D11 is shut and the source charged in the Battery is supplied to SRAM and RTC.

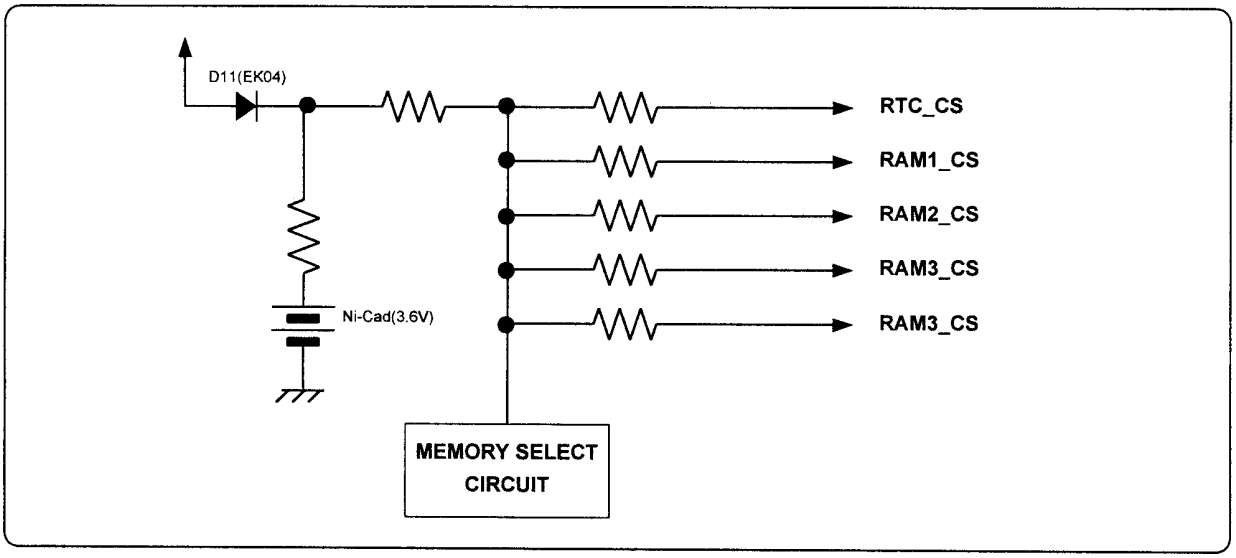


Figure 7-4 Battery Block Diagram

7-3-2 RTC(Clock) Circuit

This uses an Clock IC RF5C15, is driven by the Battery when the main Power is turned off.

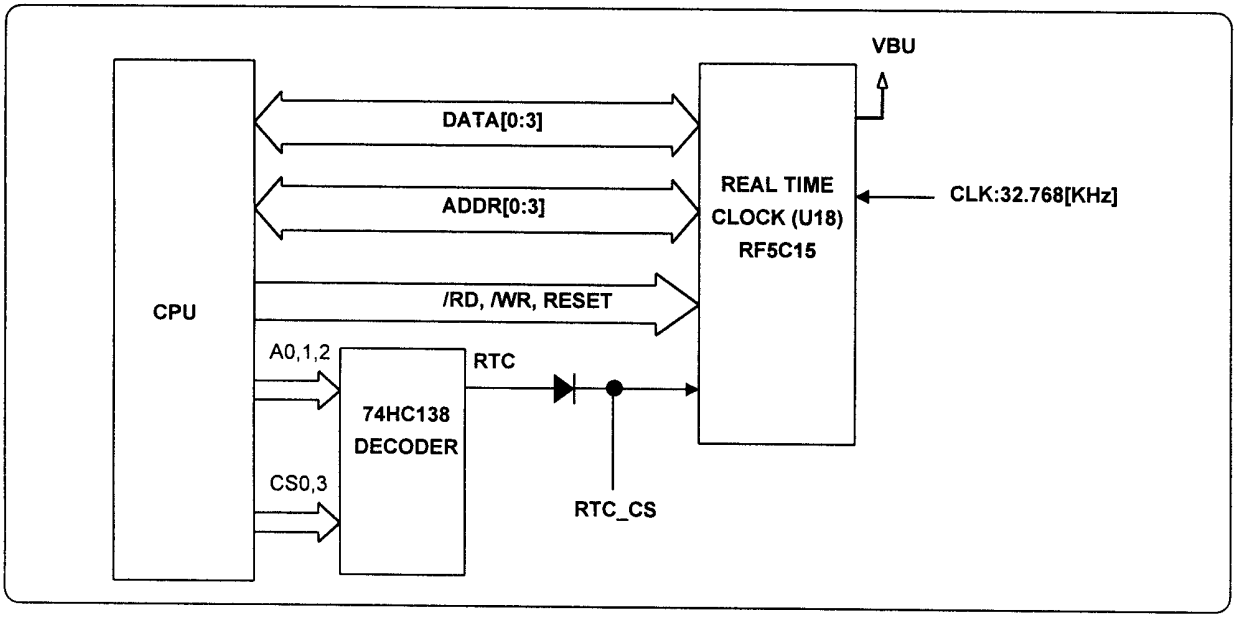


Figure 7-5 RTC Block Diagram

7-3 Battery, RTC(Clock), Buzzer and Cash Drawer circuits

7-3-3 Buzzer Driving Circuit

The Buzzer is used to inform several kinds of states which occur under system operating and gives some information to users by controlling the P7.6 pin of CPU.

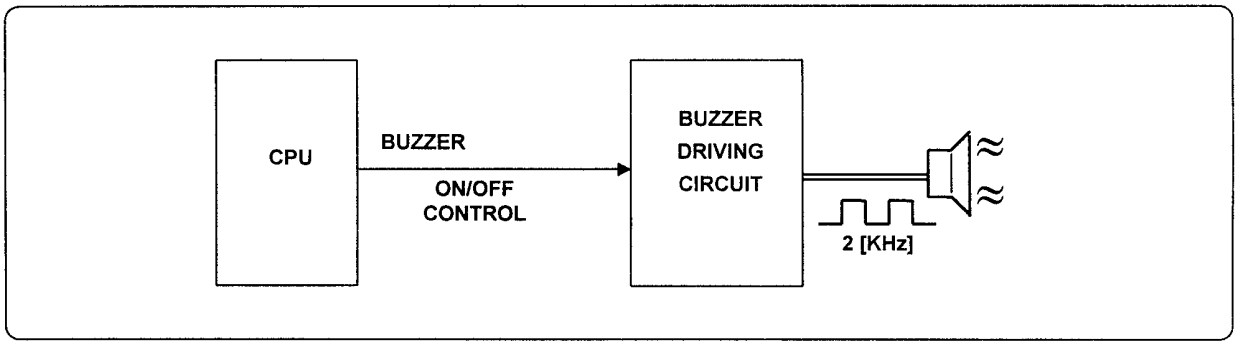


Figure 7-6 Buzzer Block Diagram

7-3-4 Cash Drawer Driving Circuit

The circuit is used for opening cash drawer and driven by the Q4,Q5(D288). When its state is high level signal, Q4 or Q5 (D288) drive the solenoid to open the cash drawer. As an optional item, we provide sensor switch (we call it a compulsory switch) which checks the drawer whether it is opened or not. This sensor switch turns on for the drawer open condition, and turns off for the other.

Caution: make sure that the Cash Drawer solenoid resistance is more than 20Ω

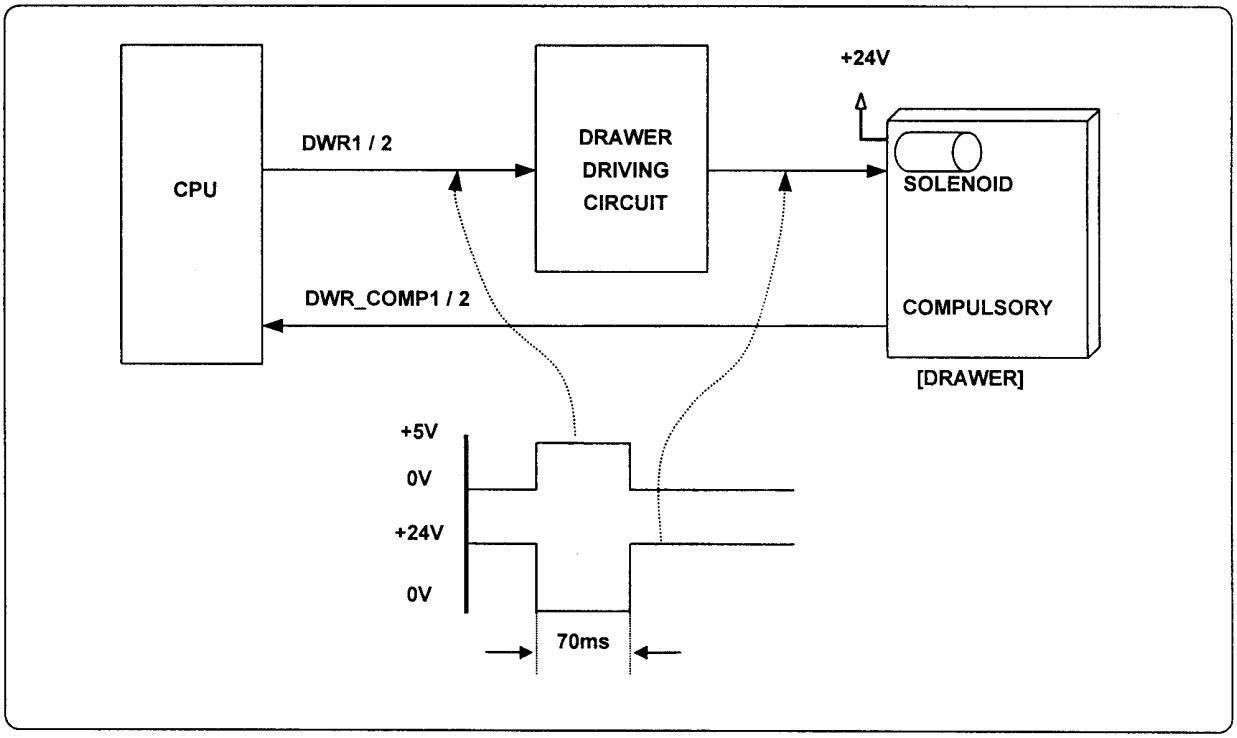


Figure 7-7 Cash Drawer Block Diagram

7-4 Display Block Diagram

7-4-1 Front LCD Display Block Diagram

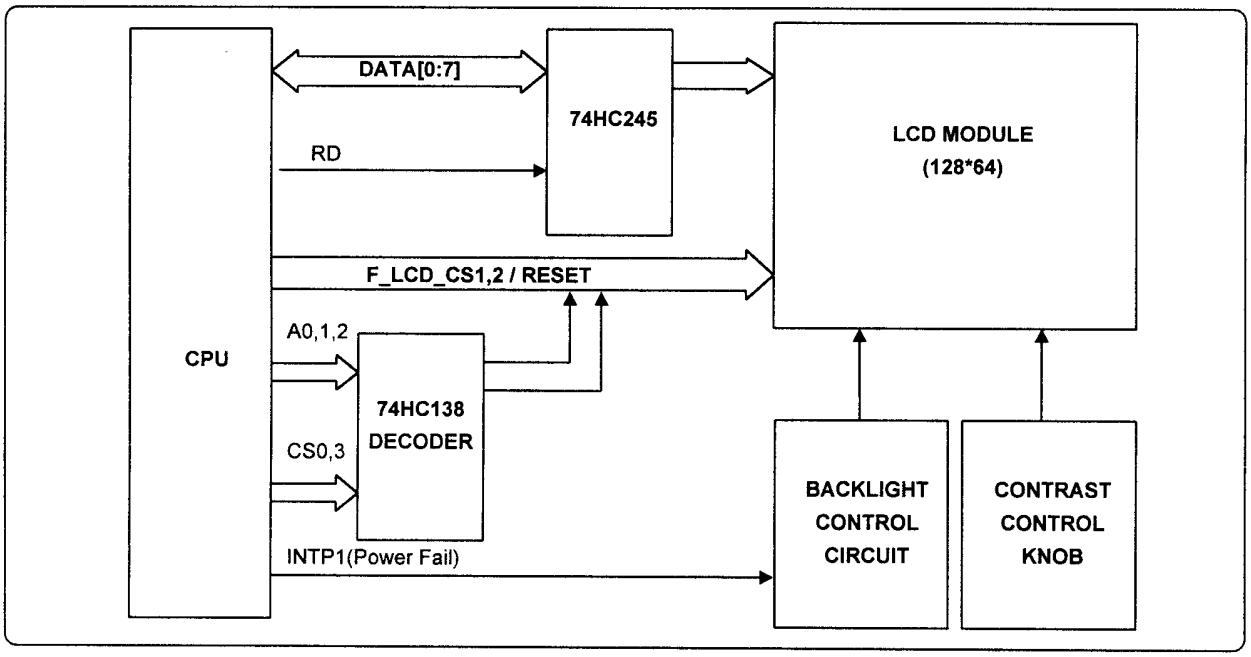


Figure 7-8 Front LCD Block Diagram

7-4-2 Rear VFD Display Block Diagram

This uses 10digit Fluorescent Display and uses UCN5812AF (is located on the Rear VFD PCB) for the driver. CPU sends Display data to the driver repeatedly having given time interval in series and then Fluorescent Display is operated.

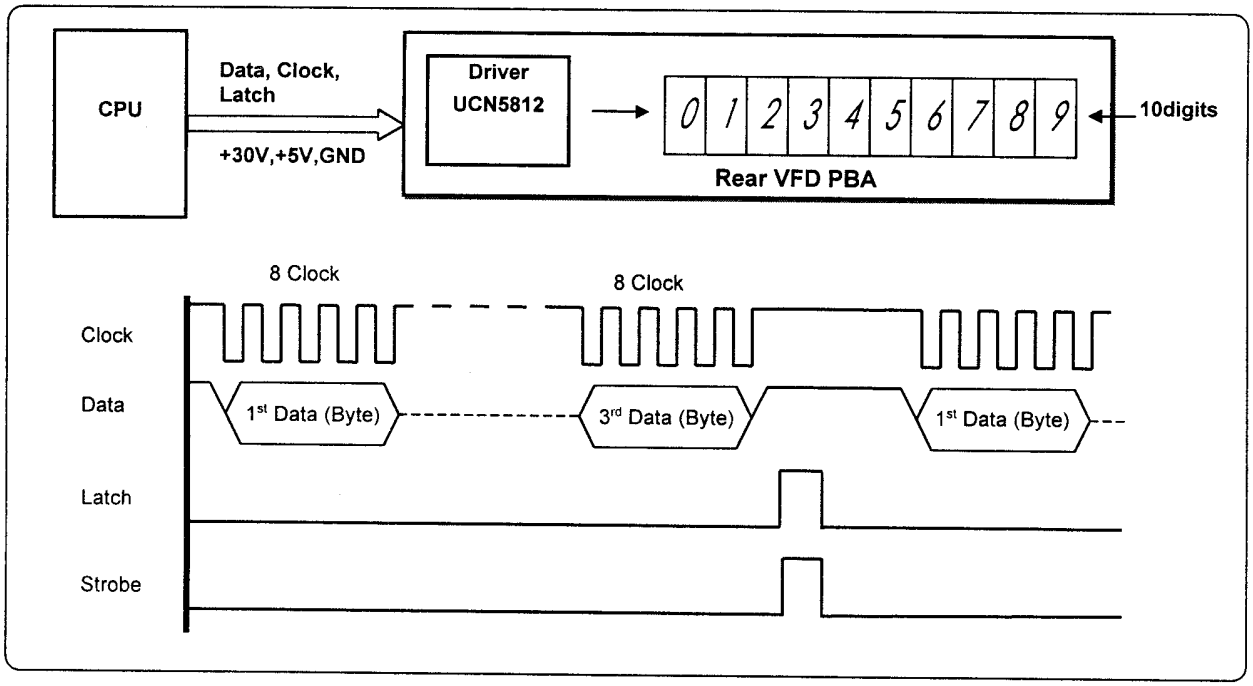


Figure 7-9 Rear VFD Waveform

7-5 RS-232C & IRC Communication Block Diagram

The CPU is used for serial communication 1,2. And also RS-232C Driver(MAX232), is used to serial communication. Show following block diagram

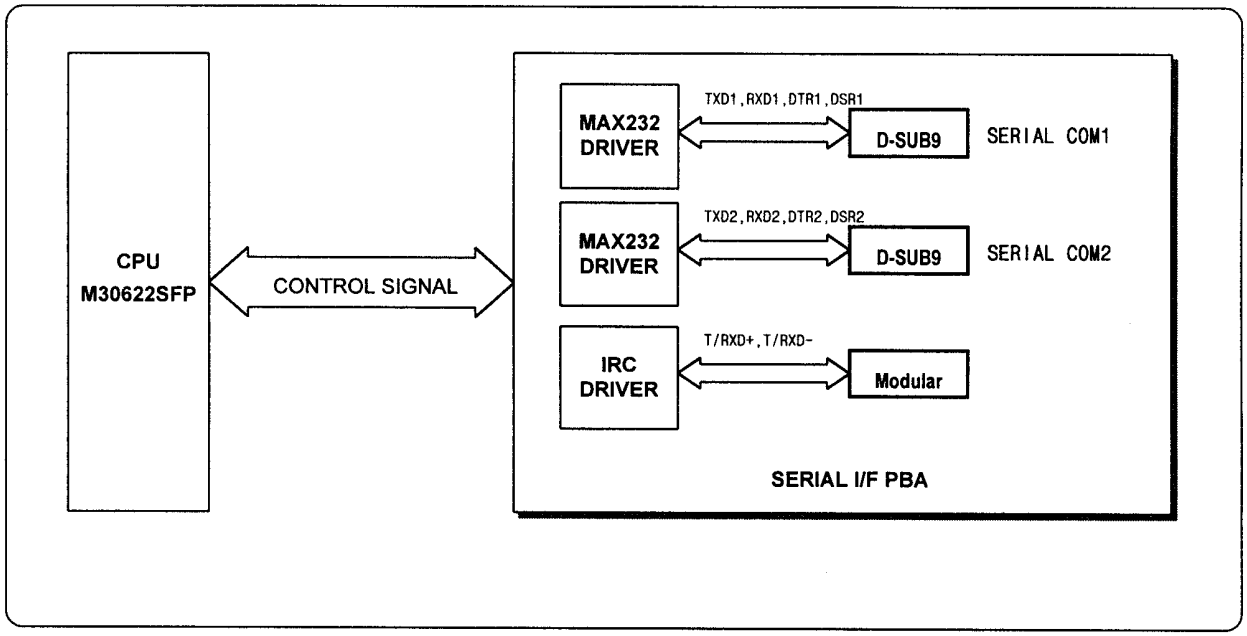


Figure 7-10 RS-232C and IRC Communication Block Diagram

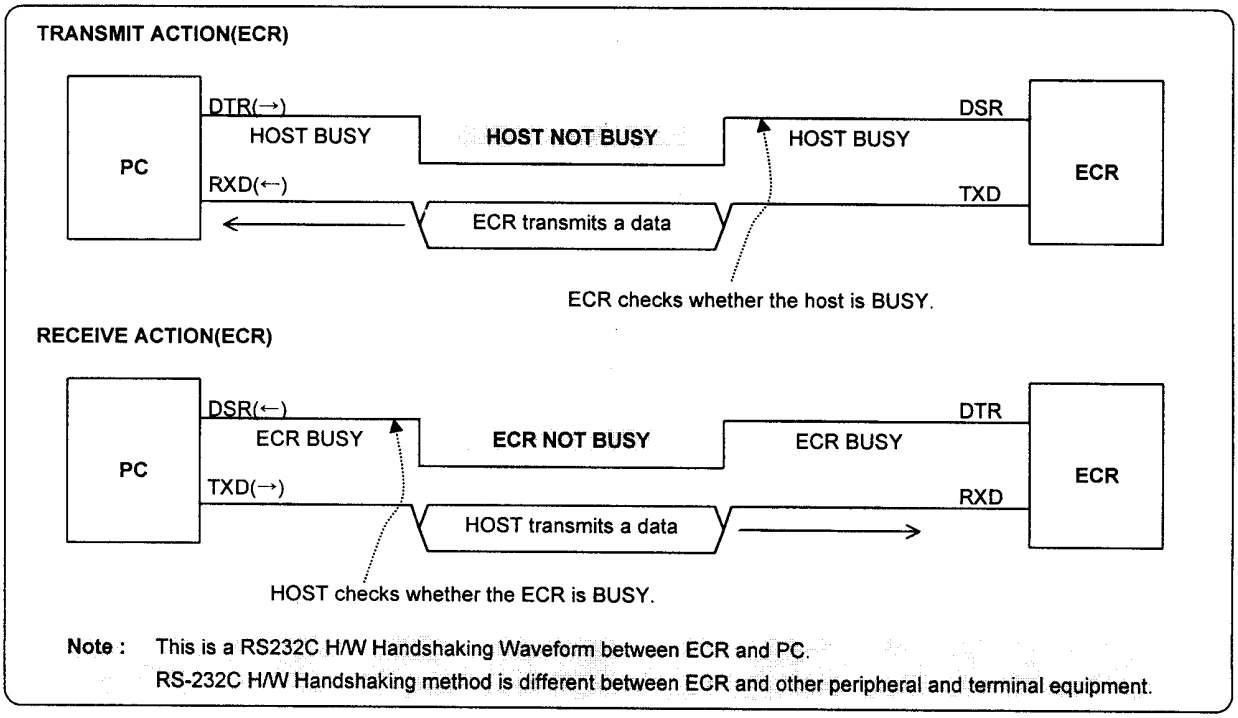


Figure 7-11 RS-232C Waveform

7-5 RS-232C & IRC Communication Block Diagram

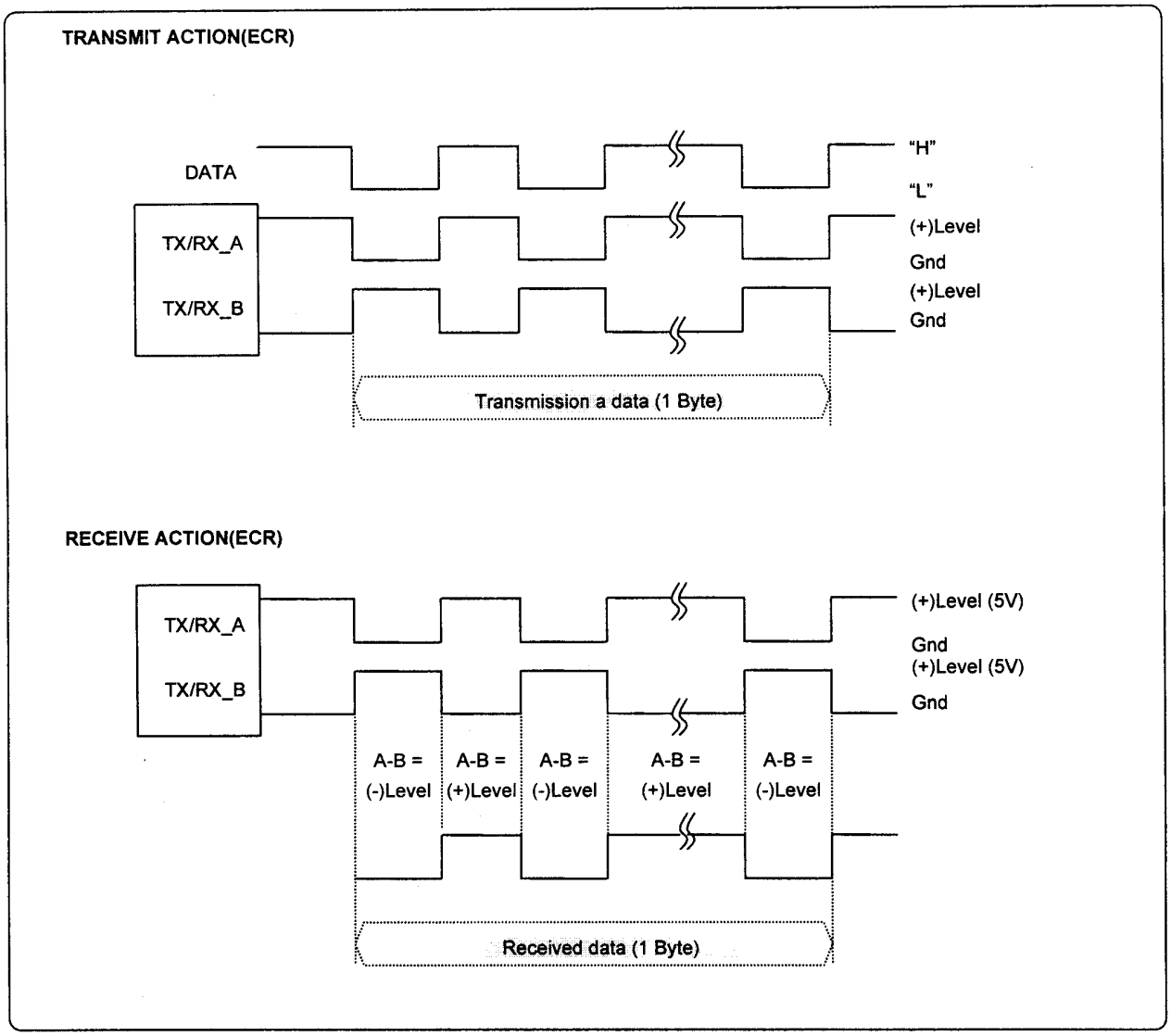


Figure 7-12 IRC Waveform

7-6 Keyboard Circuit

The key Board Circuit consist of the scan signal of 13 lines and the return signal of 8-line. The CPU sends repeatedly and continuously the scan data S0 ~ S12 through the 74HCT138(U24,U25). The key information input in the return signal if the specific key is pressed during the given time. The CPU reads the data through U23(74HC541) and analyzes what key is pressed and transmits this information to the CPU, then performs the selected function. The CPU sends the mode scan signal to the Key-lock switch and takes the return data through the U23(74HC541) and performs the selected function.

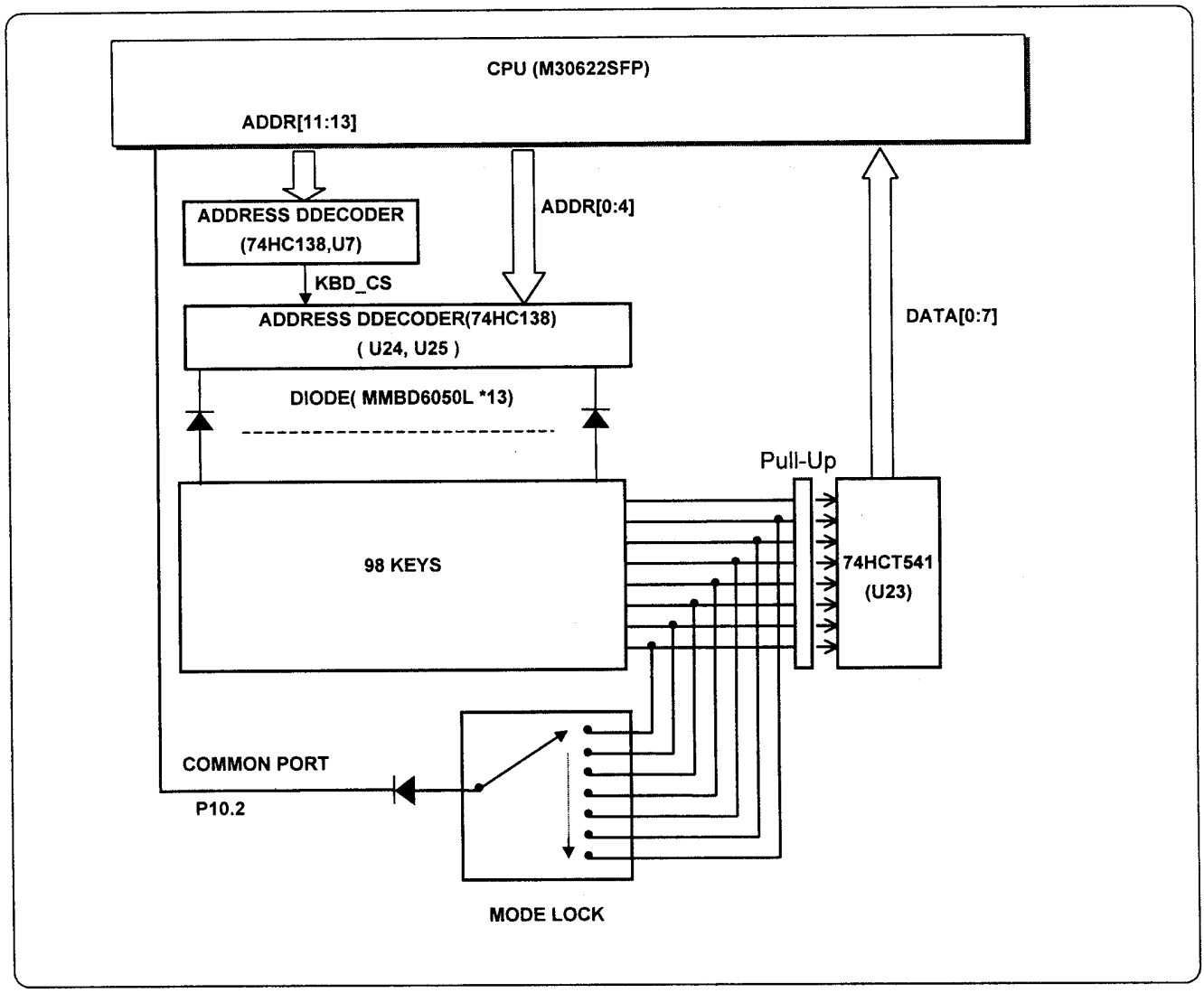


Figure 7-13 Keyboard Block Diagram

7-7 Thermal Printer Circuit

The operating method of the thermal printer is similar to the VFD operating method. First, the CPU send a Serial Clock and Serial Data 384Bits(48 Bytes) to the Thermal Printer. The Serial Data are stored to a Shift Register in the Thermal Printer. Second, the CPU send a Latch Signal to the Thermal Printer. Then, the Serial Data are stored to the Latch Register. After that, the CPU send a Strobe Signal to the Thermal Printer. Then, the Printer outputs the Serial Data. The Strobe Signals (STB1,STB2) are shorted each other on Main PBA (Same STB3,STB4). Each Strobe Signal manage the Printer Dot.

STB No.	DOT No.	DOTs/STB	ER-650 Strobe Processing
STB1	1 ~ 128	128	The STB1 and the STB2 are shorted each other on Main PBA.(192 Dots)
STB2	129 ~ 192	64	
STB3	193 ~ 256	64	The STB3 and the STB4 are shorted each other on Main PBA.(192 Dots)
STB4	257 ~ 384	128	

Table 7-2 Printer Head Strobe Processing

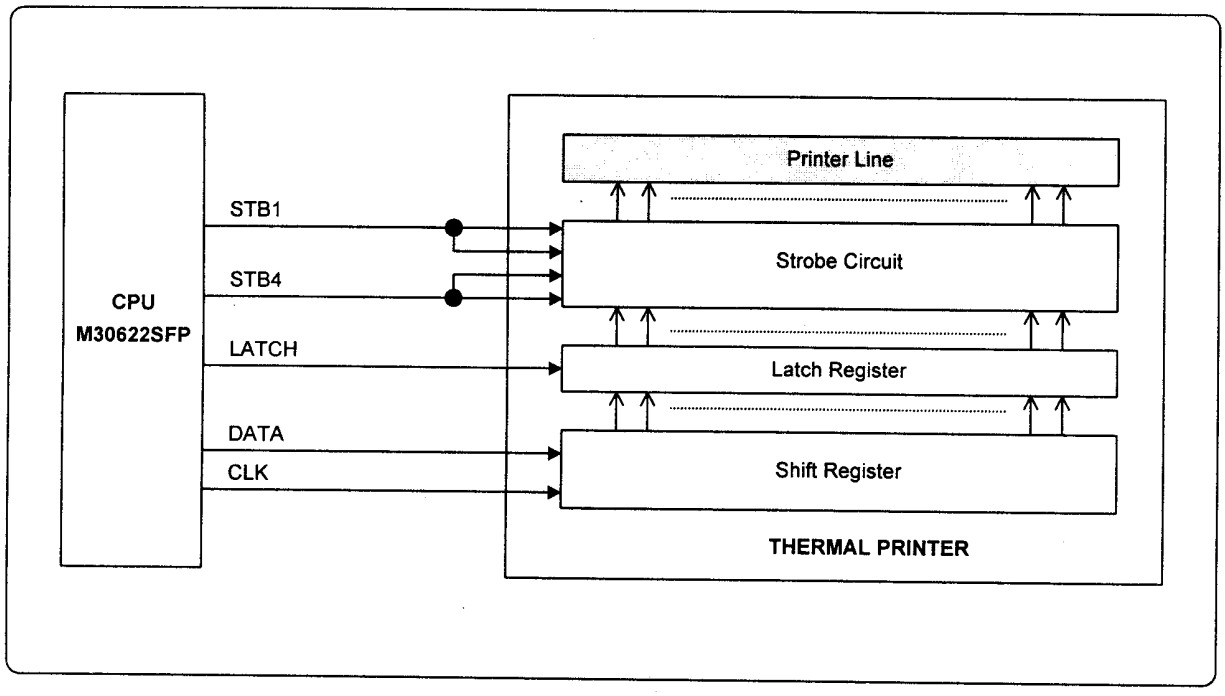


Figure 7-14 Thermal Printer Block Diagram

7-7 Thermal Printer Circuit

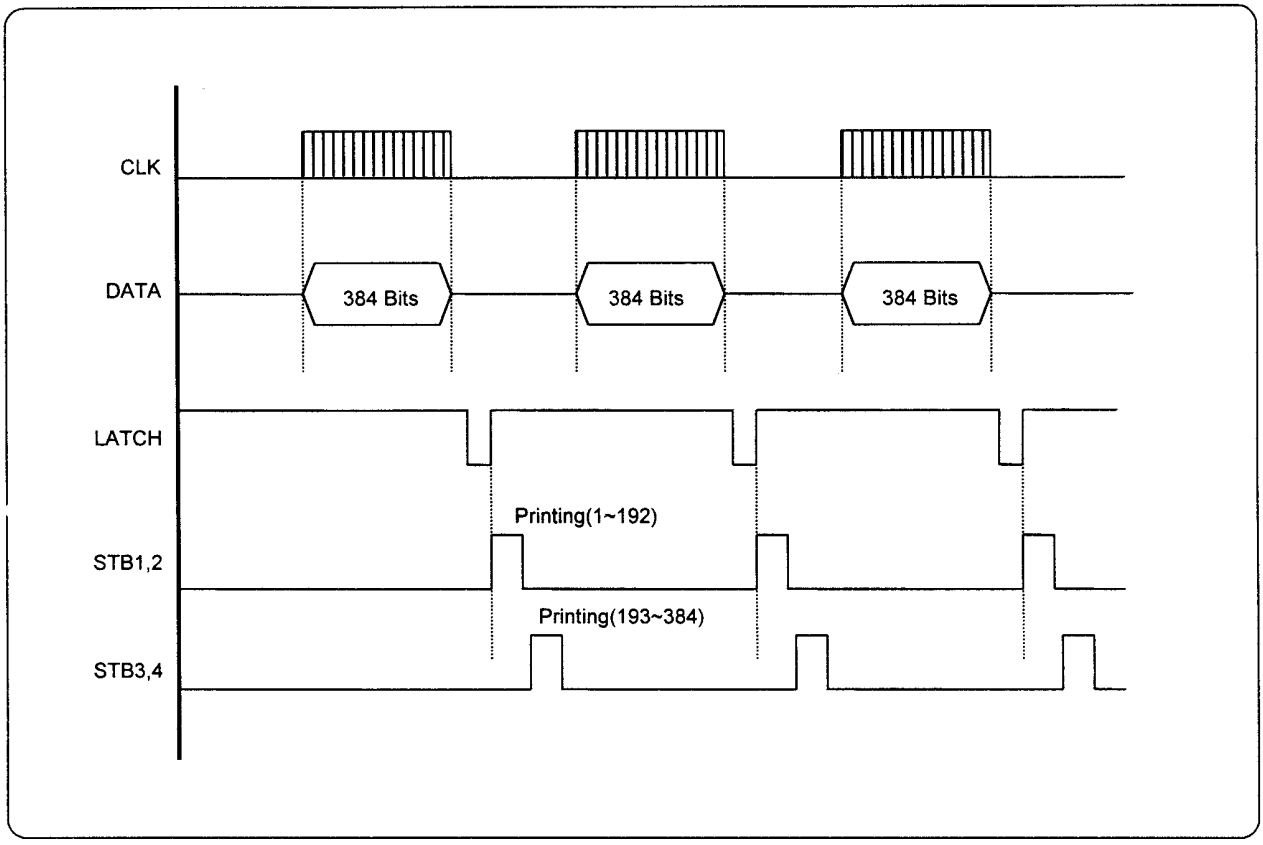
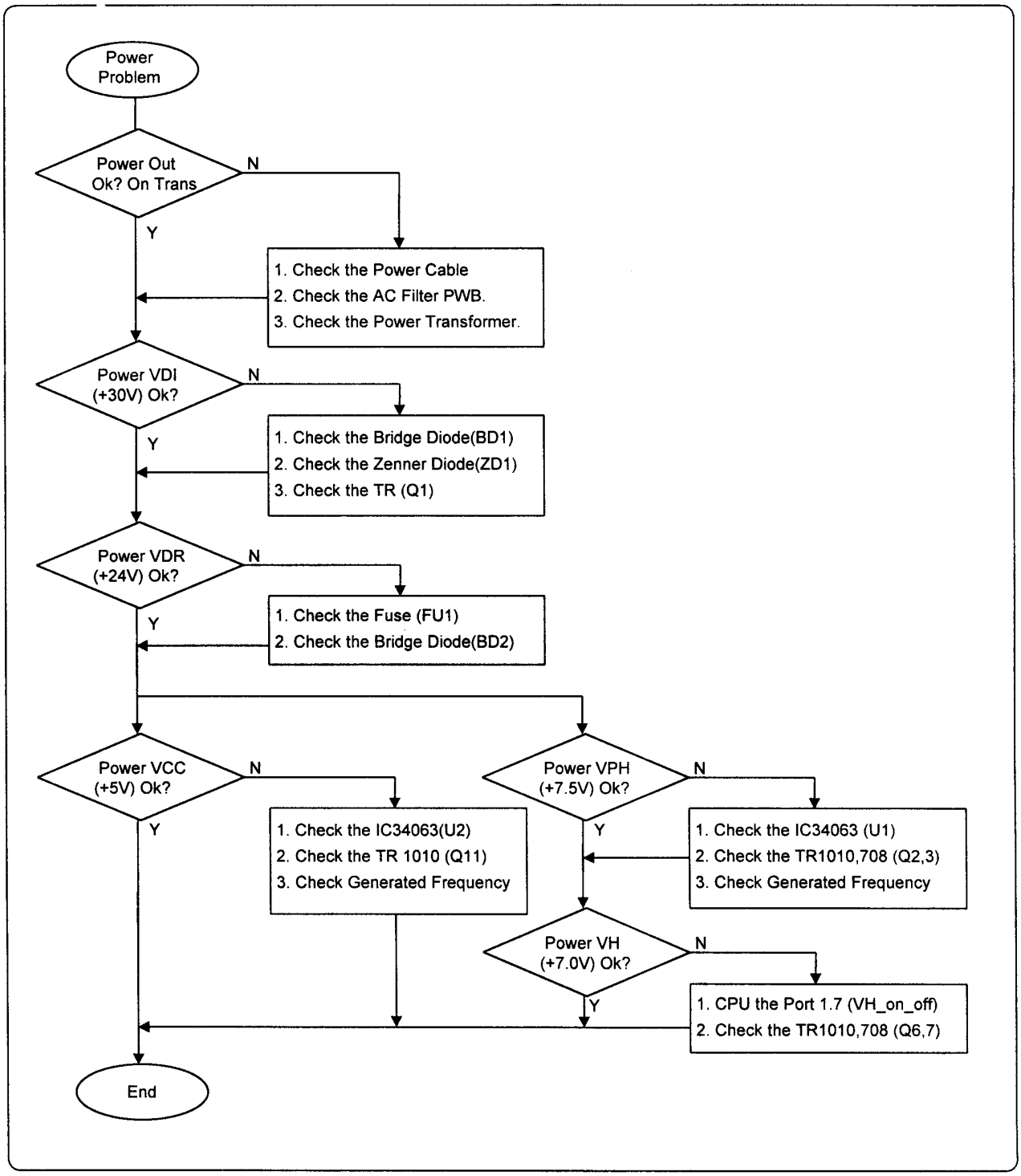


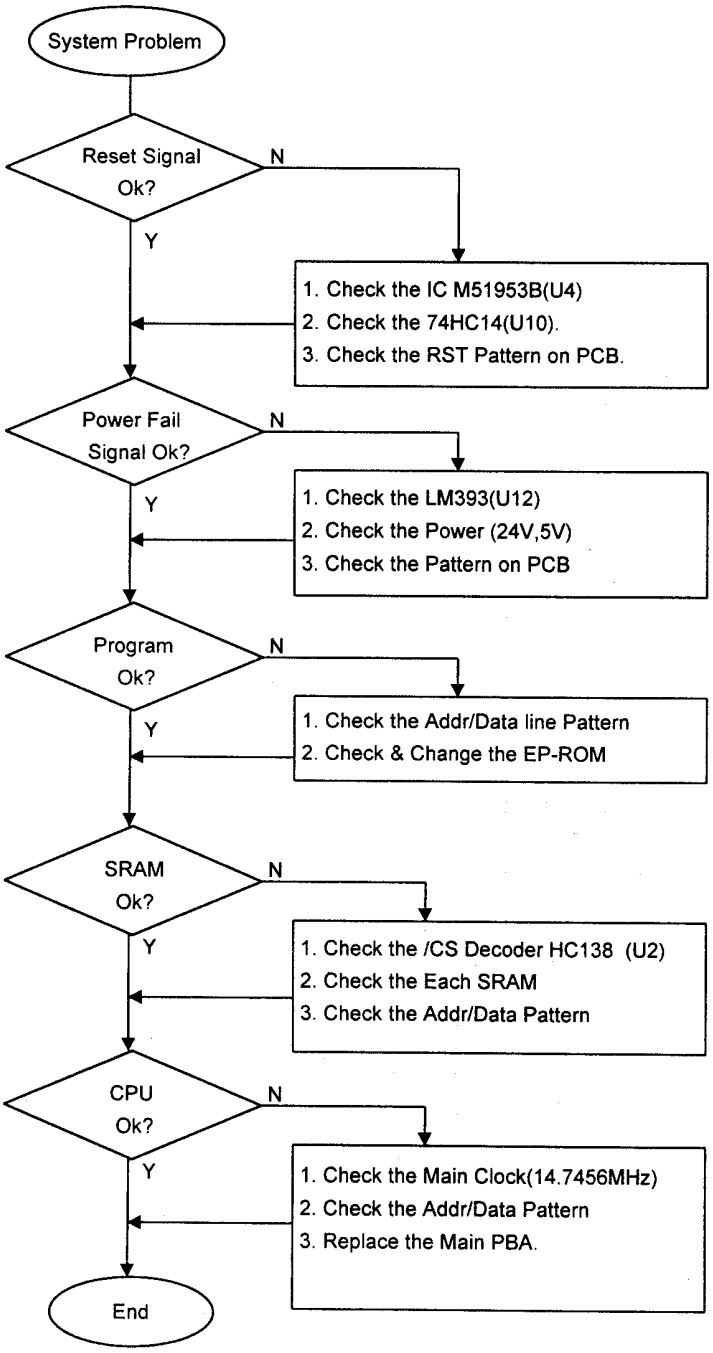
Table 7-15 Thermal Printer Timing Waveform

8 Troubleshooting

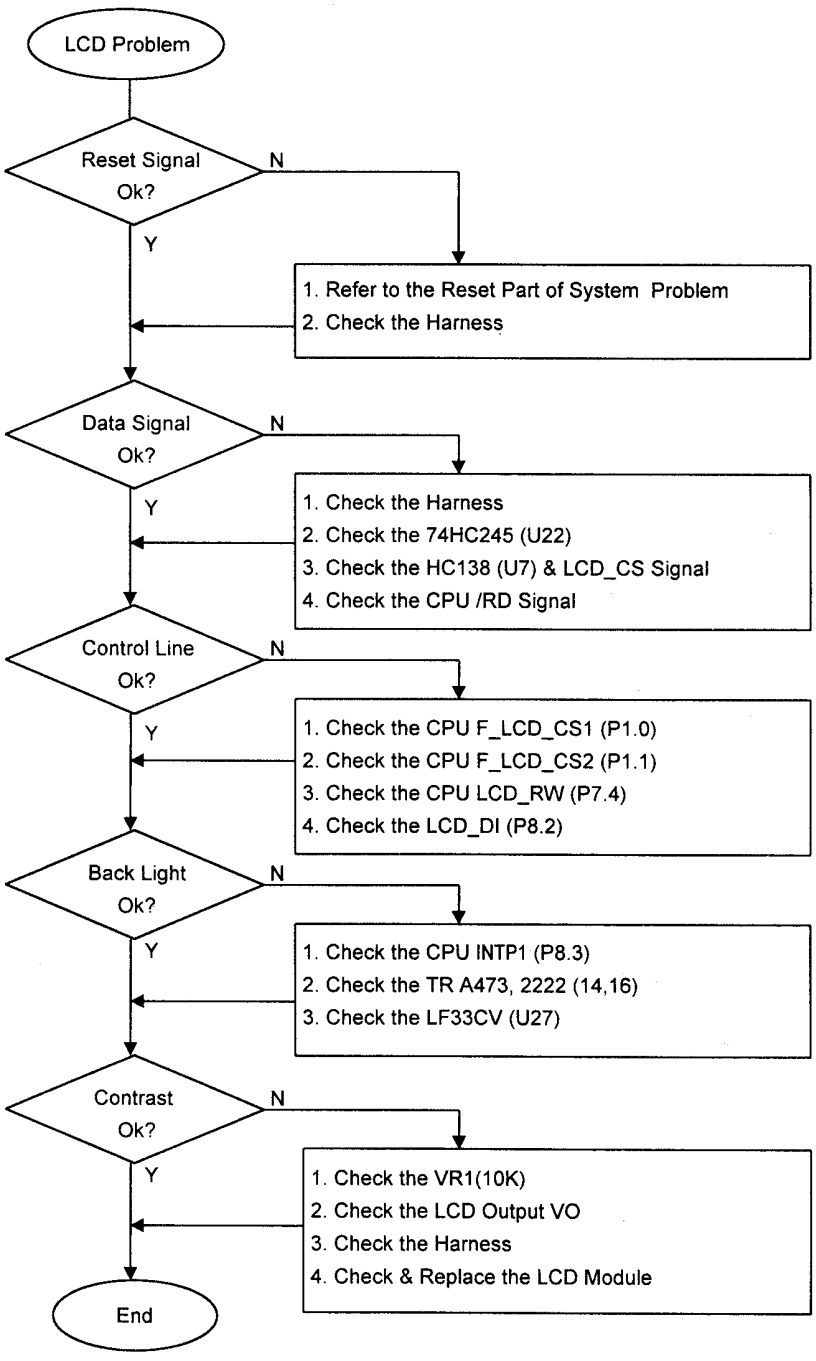
8-1. Power Problem



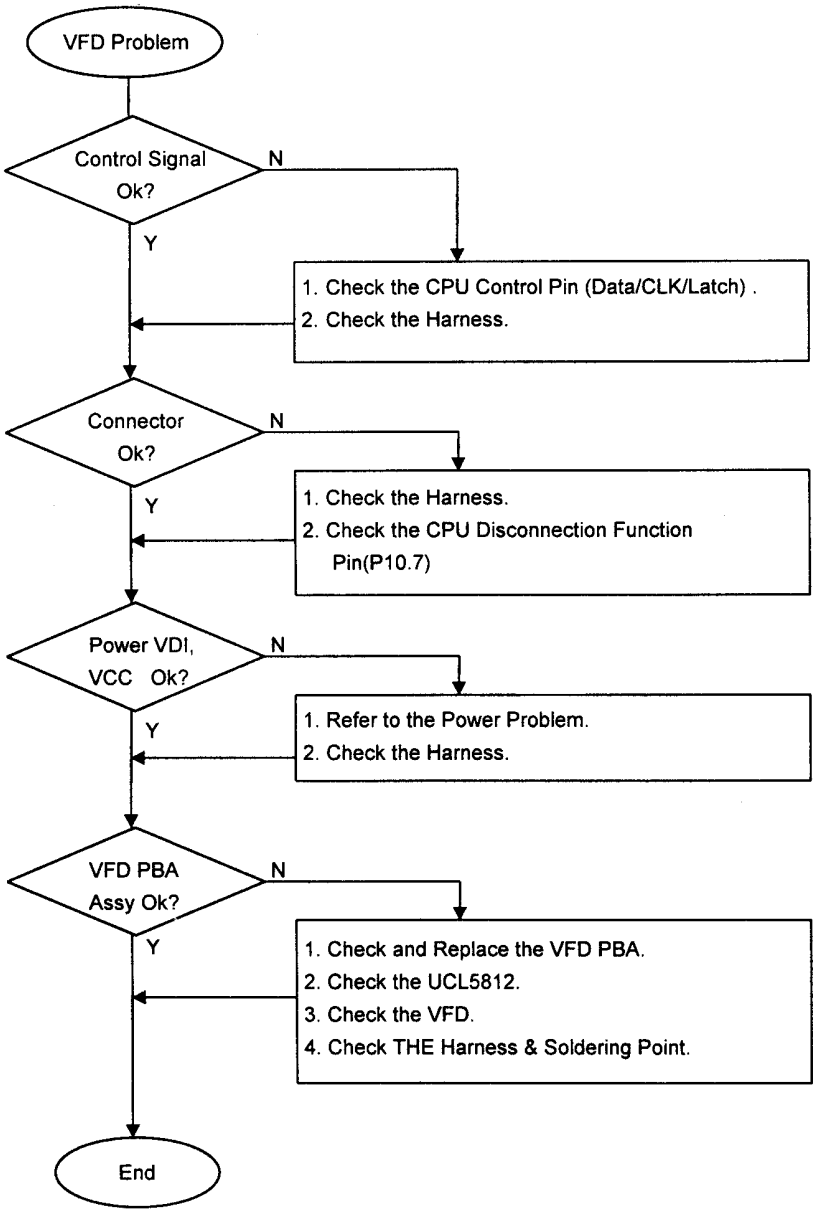
8-2 System Problem



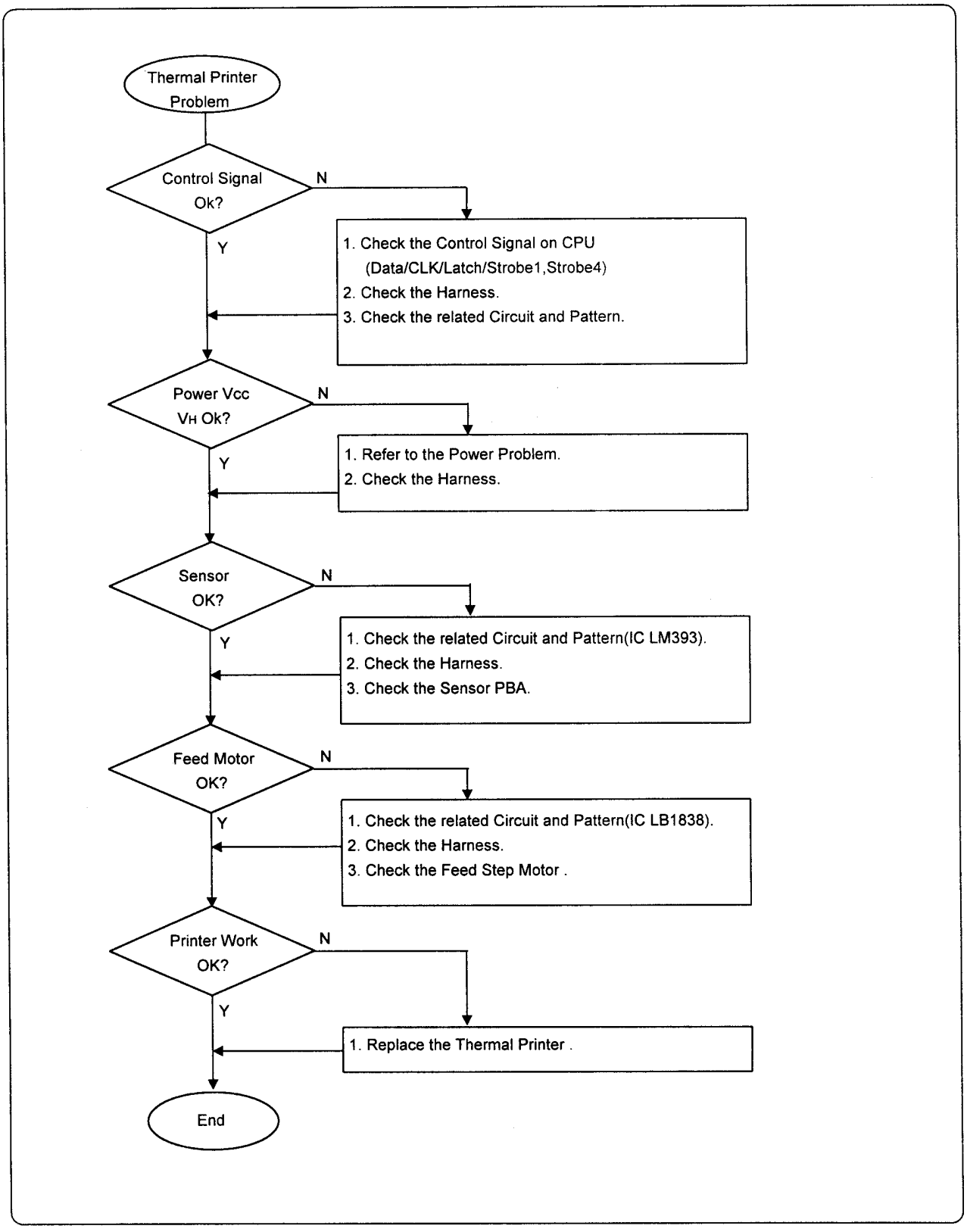
8-3 LCD Display Problem



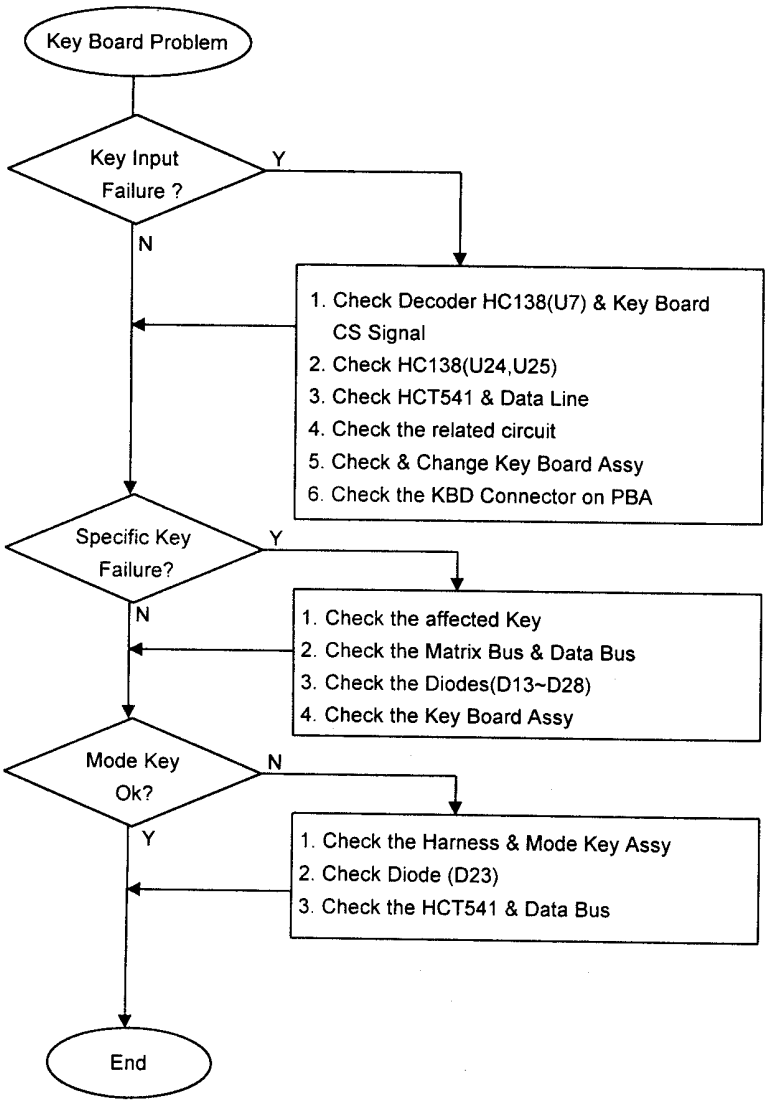
8-4 VFD Display Problem



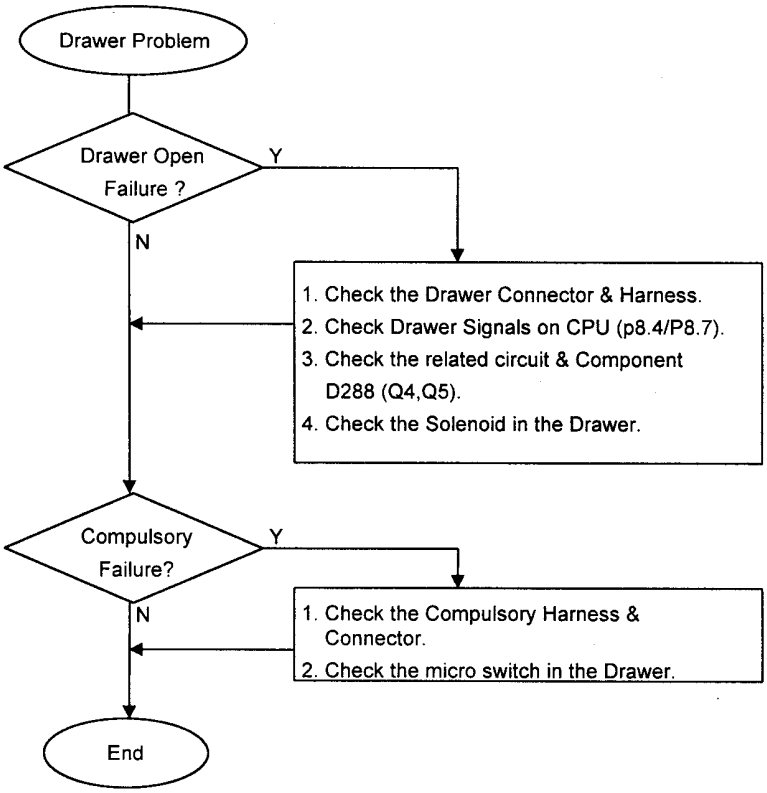
8-5 Thermal Printer Problem

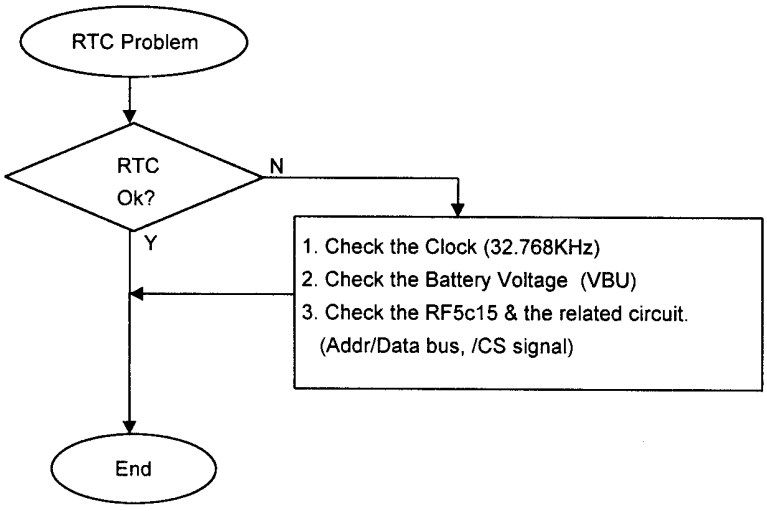


8-6 Key Board Problem

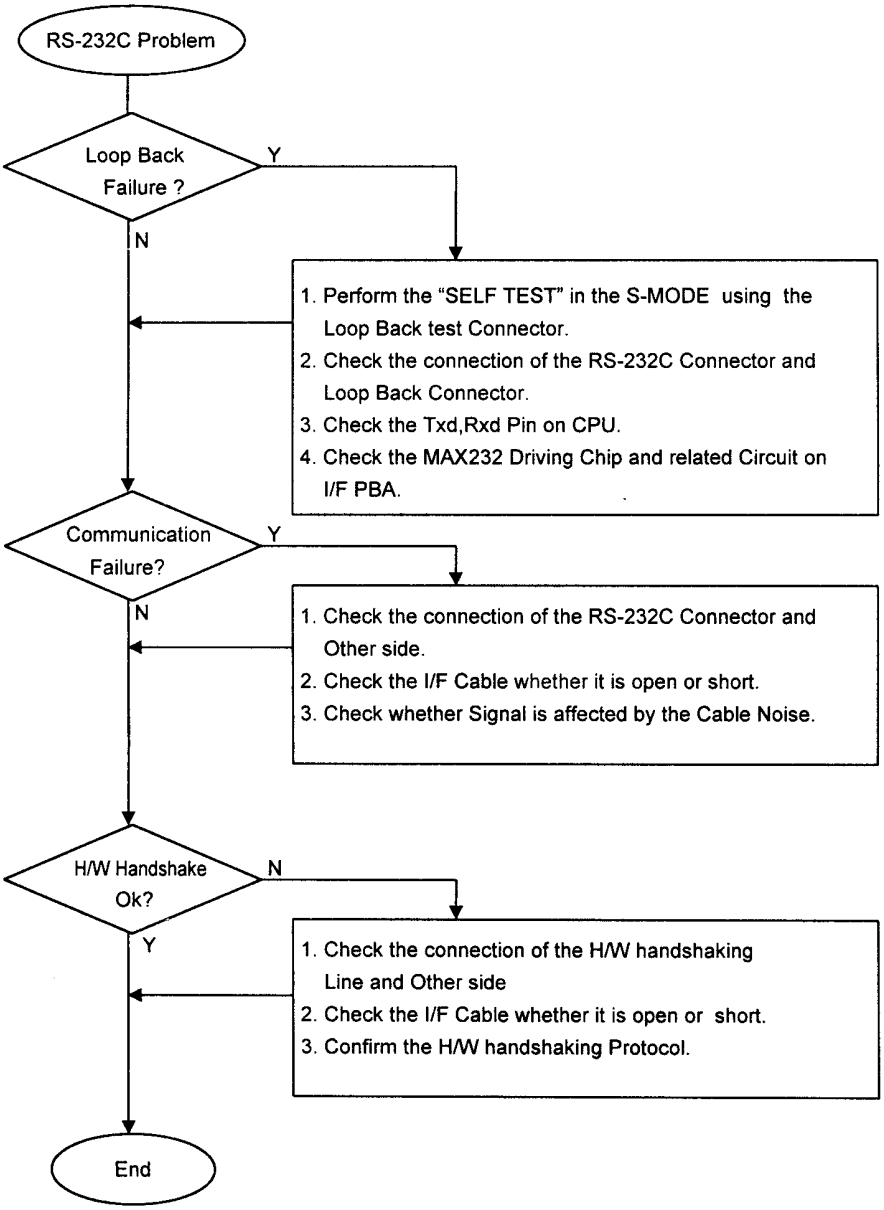


8-7 Drawer and RTC(Real Time Clock) Problem

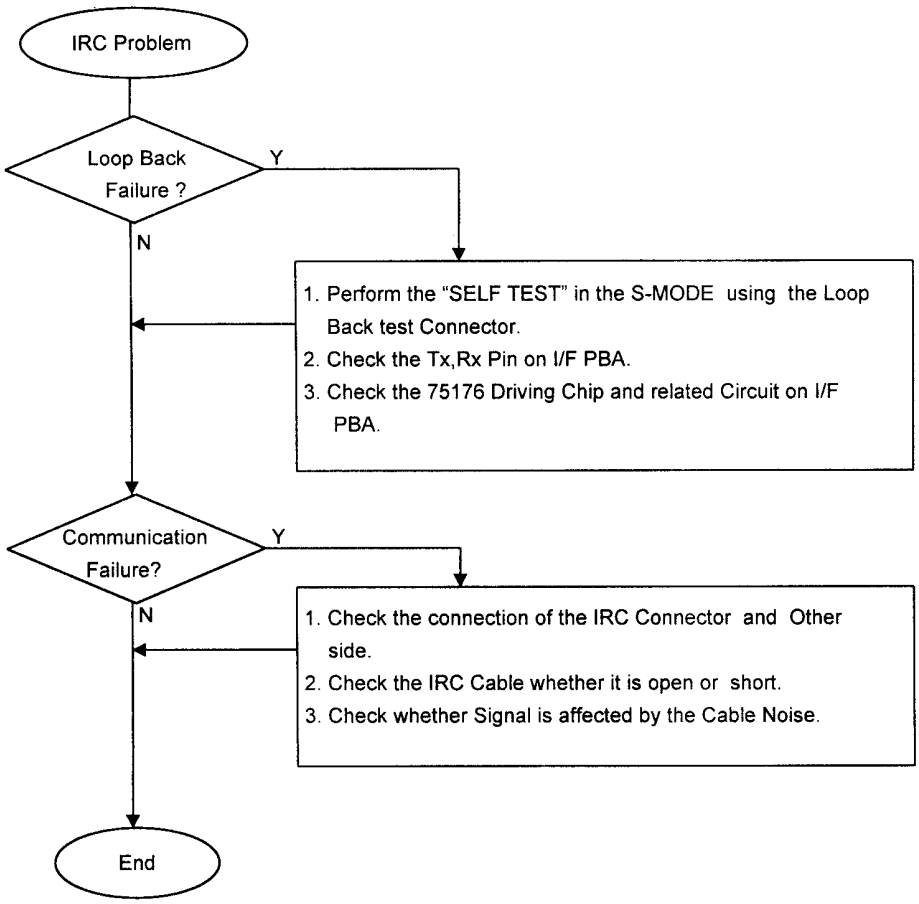




8-8 RS-232C Serial Communication Probem



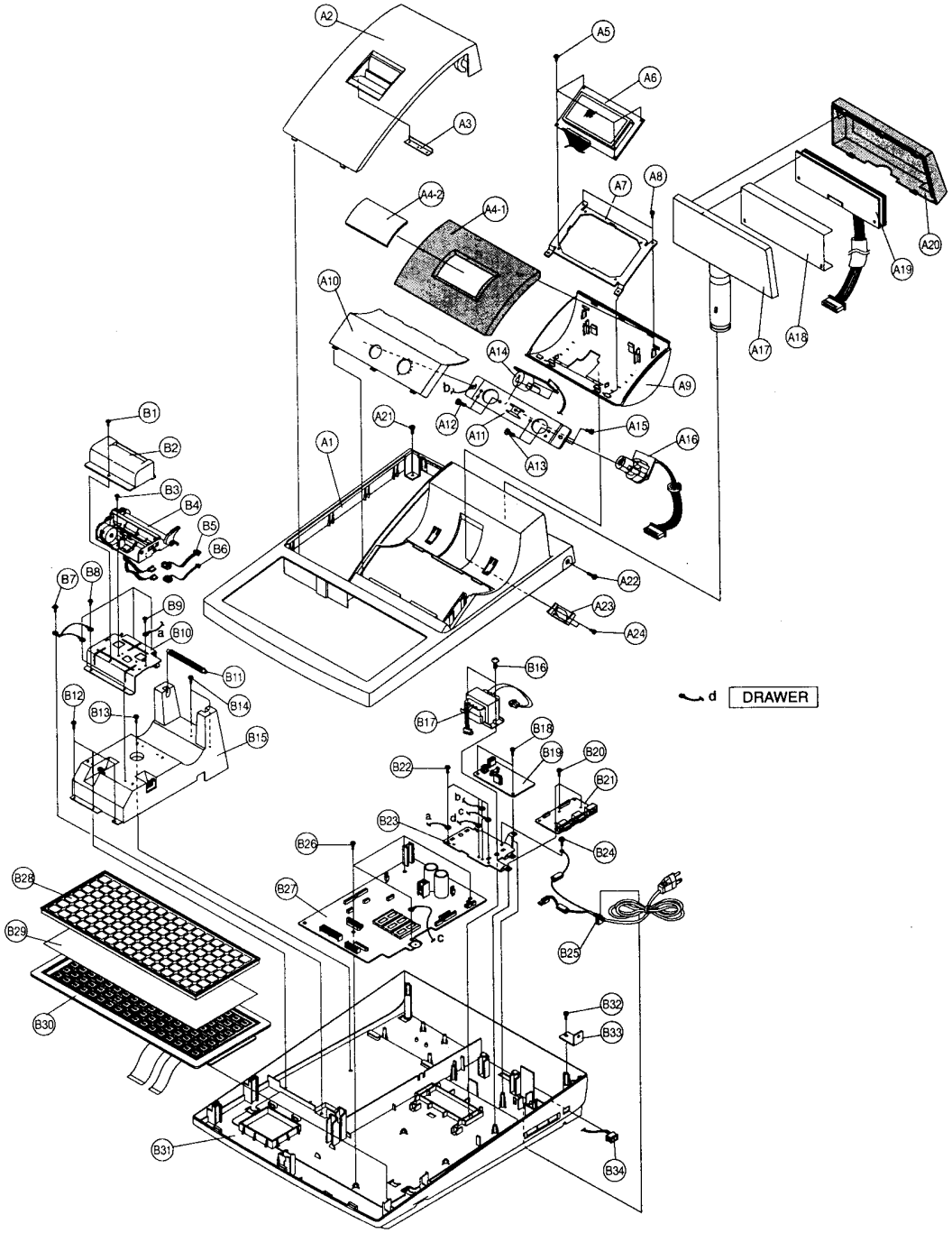
8-9 IRC Serial Communication Problem



9 Exploded Views and Parts List

9-1 Main Set

9-1-1 Exploded View



9-1 Main Set

9-1-2 Parts List

9-1-2-(a) Upper Assembly

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
A1	JK72-00038A	PMO-CASE UPPER	HIPS,VO,IV30	1		Y
A2	JK72-00040A	PMO-CASE PRINTER	HIPS,VO,IV30	1		Y
A3	JK70-10320A	CUTTER	STS304,T=0.3	1		Y
A4-1	JK72-00045A	PMO-WINDOW LCD	ER-650,PC,BL05,HB	1		Y
A4-2	JK72-00046A	PMO-WINDOW VIEW	ER-650,ACRYL,WHITE	1		Y
A5	6006-000003	SCREW-ASS'Y TAPTITE	WT,BH,+,M2.6,L6	4		Y
A6	JK96-01080A	ELA ETC-DISPLAY(650)	ER-650,BASIC	1		Y
A7	JK70-10408A	IPR-BRKT WINDOW_LCD	SECC,T=1.0	1		Y
A8	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	2		Y
A9	JK72-00047A	PMO-WINDOW LOWER	HIPS,VO,IV30	1		Y
A10	JK72-00050A	PMO-COVER MODE S/W	HIPS,VO,IV30	1		Y
	JK72-00057A	PMO-COVER CLERK KEY	HIPS,VO,IV30	1		Y
A11	JK70-00052A	IPR-BRKT MODE S/W	SECC,T=1.0	1		Y
A12	6002-000319	SCREW-TAPPING	PH,+,2,M3,L8	2		Y
A13	6002-000319	SCREW-TAPPING	PH,+,2,M3,L8	2		Y
A14	JK96-01081A	ELA ETC-CLERK	ER-650,BASIC	1		Y
A15	6002-000319	SCREW-TAPPING	PH,+,2,M3,L8	3		Y
A16	JK96-00956A	ELA-MODEKEY ASSY	ER-650,BASIC	1		Y
A17	JK72-00016A	PMO-TURRET BODY	HIPS,VO,IV30	1		Y
A18	JK68-00013A	LABEL(P)-TURRET SHEET	PE,T=0.1	1		Y
A19	JK96-01084A	ELA ETC-TURRET(650)	ER-650,BASIC	1		Y
A20	JK72-00034A	PMO-WINDOW TURRET	PC,BL05	1		Y
A21	6002-000172	SCREW-TAPPING	PH,+,2S,M4,L15	1		Y
A22	6001-000367	SCREW-MACHINE	FH,+,M4,L10	1		Y
A23	JK72-00048A	PMO-WINDOW HOLDER	POM,WHITE	1		Y
A24	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	2		Y

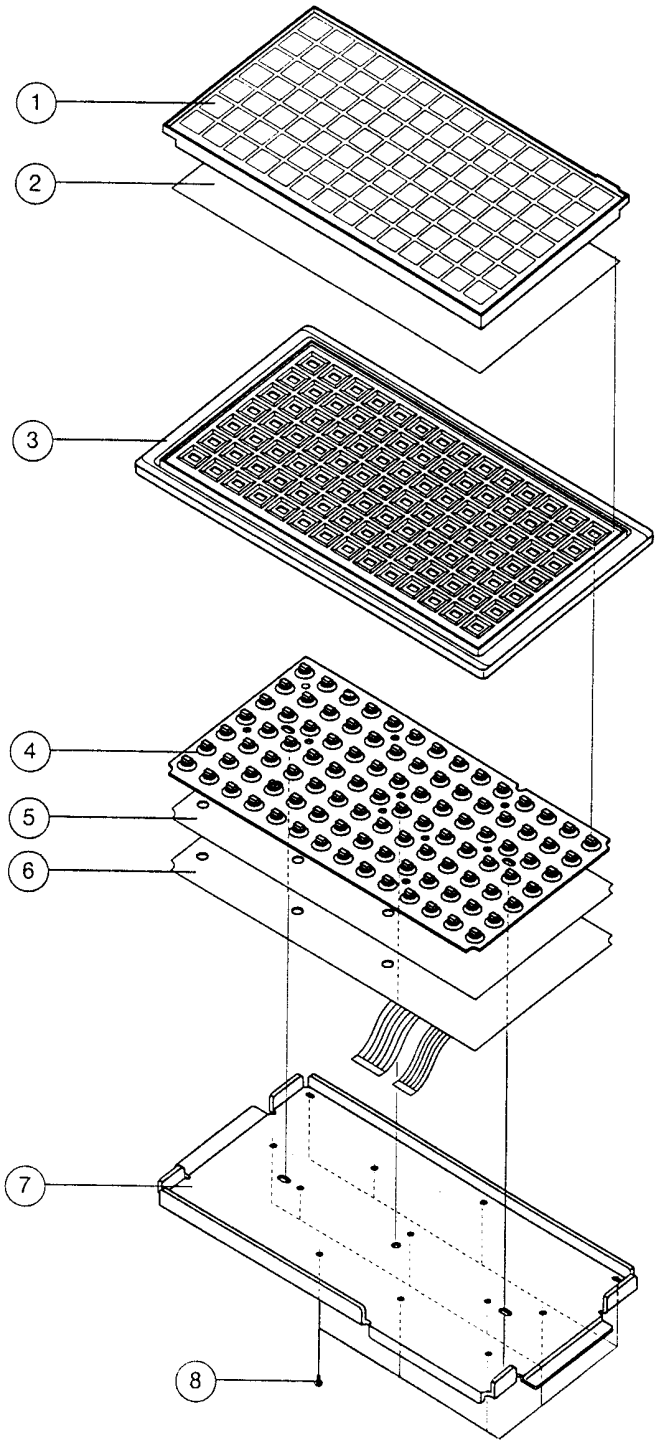
9-1 Main Set

9-1-2-(b) Lower Assembly

No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
B1	6003-000267	SCREW-TAPTITE	PWH,+,S,M3,L8	1		Y
B2	JK72-00053A	PMO-PROTECTOR	HIPS,V0,IV30	1		Y
B3	6001-000001	SCREW-MACHINE	BH,+,M2.6,L6	1		Y
B4	JK59-00005A	UNIT-PRINTER	UNIT-PRINTER;M-T102-001	1		Y
B5	JK39-00041A	CBF HARNESS-TPH9	ER-650,FLAT	1		Y
B6	JK39-00036A	CBF HARNESS-TPH10	ER-650,FLAT	1		Y
B7	6003-000221	SCREW-TAPTITE	PWH,+,S,M4,L8	1		Y
B8	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	4		Y
B9	JK60-00001A	SCREW-ASSY TAPTITE	WT,BH,M3,L8	1		Y
B10	JK70-00048A	IPR-HOLDER PRINTER	SECC T=1.0	1		Y
B11	JK72-40973A	PMO-SHAFT PAPER(S)	POM,BLACK	1		Y
B12	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	2		Y
B13	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	1		Y
B14	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	2		Y
B15	JK72-00043A	PMO-PAPER SUPPLY(T)	HIPS,V0,IV30	1		Y
B16	6006-000195	SCREW-ASS'Y TAPPING	WS,BH,+,M4,L12	2		Y
B17	JK26-00013A	POWER-TRANS	120V			Y
	JK26-00012A	POWER-TRANS	230V			Y
B18	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	2		Y
B19	JK92-00949A	POWER BOARD	ER-650	1		Y
B20	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10,Z	2		Y
B21	JK92-00948A	SERIAL BOARD	ER-650, RS-232,IRC			Y
B22	JK60-00001A	SCREW-ASSY TAPTITE	WT,BH,M3,L8	4		Y
B23	JK70-00049A	IPR-GROUND PLATE	SECC T=1.0	1		Y
B24	6006-000199	SCREW-ASS'Y TAPTITE	WT,BH,+,M4,L8	1		Y
B25	JK39-10003A	CBF-POWER CORD	120V			Y
	JK39-10501A	CBF-POWER CORD	230V	1		Y
B26	6002-000174	SCREW-TAPPING	PWH,+,2,M3,L10	4		Y
B27	JK92-00947A	MAIN PCB ASS'Y	ER-650	1		Y
B28	JK73-00006A	RMO-WATER PROOF	SILICON	1		Y
B29	JK68-00054A	LABEL/MARK-KBD SHEET	PC,T=0.12,WHITE	1	ER-650	Y
B30	JK59-00006A	UNIT-KEYBOARD	ER-650,BASIC	1		Y
B31	JK72-00039A	PMO-CASE LOWER	HIPS,V0,IV30	1		Y
B32	6002-000172	SCREW-TAPPING	PH,+,2S,M4,L15	1		Y
B33	JK70-00046A	IPR-BRKT CASING	SECC,T=1.6	1		Y
B34	JK39-00008A	CBF-HARNESS-POWER S/W	ER-650,BASIC	1		Y

9-2 Key Board

9-2-1 Exploded View



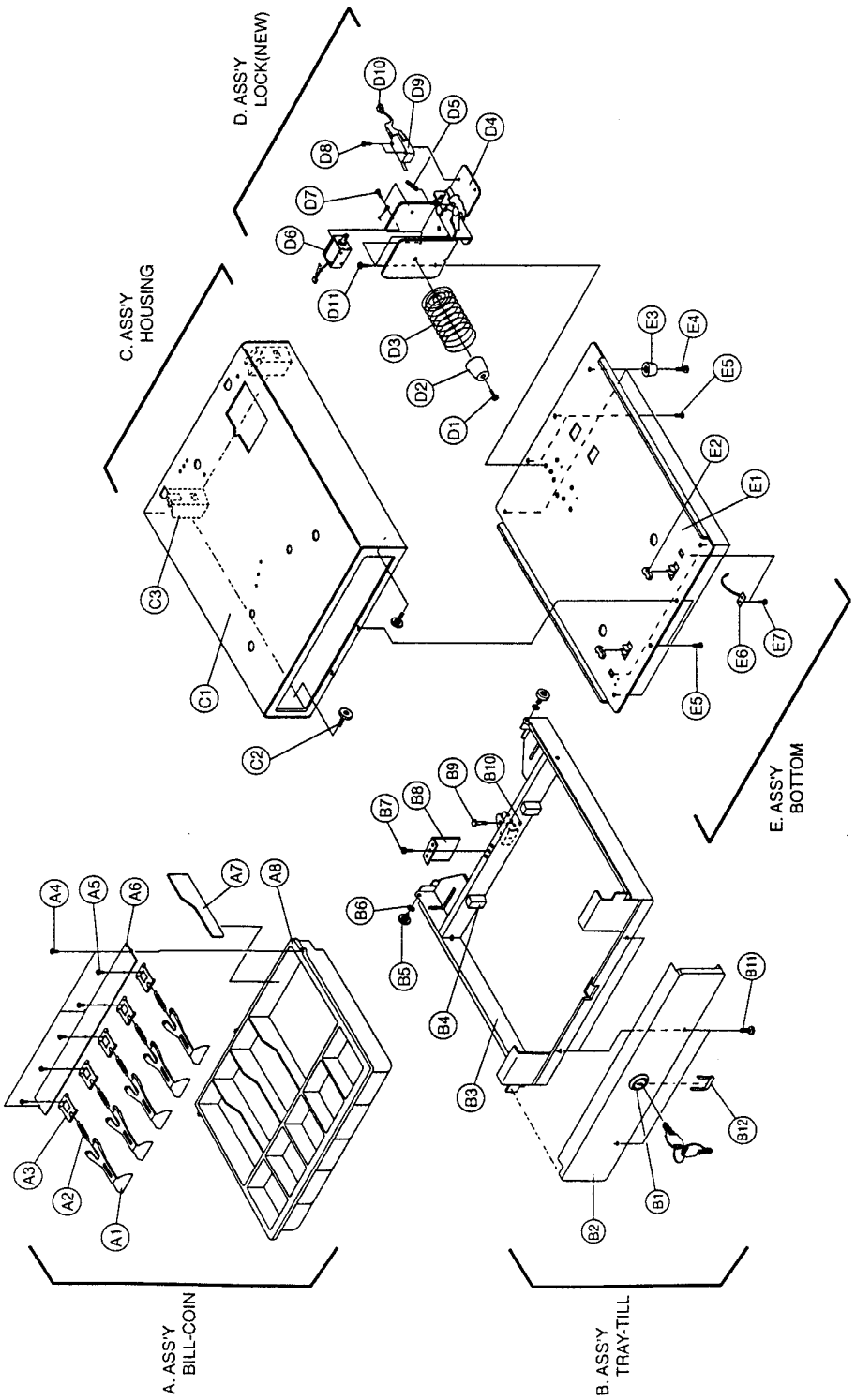
9-2 Key Board

9-2-2 Parts list

No.	Code No.	Description	Specification	Q`ty	Remark	Serviceable
1	JK73-00006A	RMO-WATER PROOF	SILICON	1		Y
2	JK68-00054A	LABEL/MARK-KBD SHEET	PC,T=0.12,WHITE	1	ER-650	Y
3	JK72-00051A	PMO-KEYBOARD HOUSING	HIPS,V0,IV30	1		N
4	JK73-00007A	RMO-KEY RUBBER	SILICON,GRAY	1		N
5	JK41-00004A	PCB-FPC(A)	PET,T=0.1	1		N
6	JK41-00005A	PCB-FPC(B)	PET,T=0.1	1		N
7	JK70-00053A	IPR-KBD FRAME	SECC T=0.8	1		N
8	-	SCREW-TAPPING	BH,M2,L6	13		N

9-3 Drawer

9-3-1 Exploded View



9-3 Drawer

9-3-2 Parts List (4 Bill / 8 Coin)

9-3-2-(a) Bill & Coin Assembly (4B/8C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
A	JK97-00409A	MEA UNIT-BILL/COIN	A-DRAWER,4B/8C,WORLD	1		N
A1	JK72-40267A	PMO-LEVER PRESS	A-DRAWER,POM	4		Y
A2	6107-000134	SPRING-ES	SUS304	4		Y
A3	JK70-10314A	IPR-HOLDER LEVER	A-TYPE,T1.2,ZPC	4		Y
A4	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	3		Y
A5	6002-001078	SCREW-TAPPING	PWH,+,B,M3,L5	4		Y
A6	JK70-10304A	IPR-PLATE HOLDER	A-TYPE,SBHG-1,T1.2	1		N
A7	JK72-40269A	PMO-PANEL PARTETION	A-TYPE,HIPS,BLK	3		Y
A8	JK72-40291A	PMO-BILL/COIN TILL	A-TYPE,4B/8C,HIPS,BLK	1		Y

9-3-2-(b) Tray Till Assembly (4B/8C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
B	JK97-00991A	MEA UNIT-TRAY TILL	A-DRAWER,4B/8C,2 LATCH	1		N
B1	JK75-10389A	MEC-LOCK KEY	DRAWER	1		Y
B2	JK70-10014A	IPR-PLATE FRONT	A-TYPE,SBC-1,T1	1		N
B3	JK97-00378B	MEA-TRAY TILL	A-TYPE,4B/8C,2 LATCH	1		N
B4	JK73-10203A	RPR-TENSION	DRAWER,SPONGE,-,BLK,-	2		N
B5	JK75-10386A	MEC-ROLLER	DRAWER,DR-19-B1/PI19	2		Y
B6	6031-000549	WASHER-PLAIN	ID6.5,OD13,T1.0	2		N
B7	6002-000207	SCREW-TAPPING	RH,+,2S,M4,L8	1		N
B8	JK70-10324A	IPR-SUPPROT TRAY	DRAWER,SBHG-1,T1.2	1		N
B9	JK70-40302A	ICT-SHAFT PIN	A-TYPE,SUM45C,D5,	1		N
B10	6044-000124	RING-E	ID3,OD7,TO.6,ZPC(BLK),STSC	1		Y
B11	6002-001042	SCREW-TAPPING	FH,,+,2S,M3,L6	2		N
B12	JK70-10323A	IPR-PLATE CLIP	DRAWER,SWP,T0.5	1		Y

9-3-2-(c) Housing Assembly (4B/8C)

No.	Code No.	Description	Specification	Q'ty	Remark	Rank
C	JK97-00194A	MEA-COVER HOUSING	A-TYPE,BASIC	1		N
	JK97-00194B	MEA-COVER HOUSING	A-TYPE,NONE HOLE,OPTION	1		N
C1	JK97-00195A	MEA-SUB HOUSING	A-TYPE,BASIC	1		N
	JK97-00195B	MEA-SUB HOUSING	A-TYPE,NONE HOLE,OPTION	1		N
C2	JK75-10386A	MEC-ROLLER	DRAWER,DR-19-B1/PI19	2		Y
C3	JK73-20207A	REX-PAD DRAWER	DRAWER,NR,BLK	2		N

9-3 Drawer

9-3-2-(d) Lock Assembly (4B/8C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
D	JK97-00985A	MEA UNIT-LOCK	A-TYPE,2-LATCH,LONG LEVER	1		N
	JK97-00987A	MEA UNIT-LOCK	A-TYPE,2-LATCH,SHORT LEVER	1		N
D1	6001-000592	SCREW-MACHINE	TH,+,M4,L8,ZPC(YEL)	1		N
D2	JK73-20210A	REX-BUMPER	DRAWER,NR,BLK	1		Y
D3	JK61-70100A	SPRING-PUSH	DRAWER,FZN	1		Y
D4	JK97-00989A	MEA UNIT-SUB LOCK	A-TYPE,2-LATCH,LONG LEVER	1		N
	JK97-00988A	MEA UNIT-SUB LOCK	A-TYPE,2-LATCH,SHORT LEVER	1		N
D5	6107-001014	SPRING-ES	PI0.4,D4.8,L18,-,STS304WPB	1		N
D6	JK33-10500A	SOLENOID-DC	A-DRAWER,KSD-2013-S(200)	1		Y
D7	6001-000131	SCREW-MACHINE	BH,+,M3,L6	2		Y
D8	6001-000525	SCREW-MACHINE	PH,+,M3,L14	2		Y
D9	3405-001013	SWITCH-MICRO	125V,5A,60gf,SPST-NO	1		Y
D10	JK39-40301R	CBF-HARNESS	2P,150MM,BRN,1007	1		Y
D11	6002-000161	SCREW-TAPPING	PH,+,2,M4,L8	3		N

9-3-2-(e) Bottom Assembly (4B/8C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
E	JK97-00995A	MEA UNIT-BOTTOM	A-DRAWER	1		N
E1	JK70-10938A	IPR-PLATE BOTTOM	A-DRAWER,SBHG-1,T1.0	1		N
E2	JK73-10902A	PMO-STOPPER	DRAWER,NR,BLK,UNIVERSAL	2	USA	Y
	JK73-40200A	PMO-STOPPER	DRAWER,NR,BLK	2		Y
E3	JK61-40200A	FOOT-RUBBER	DRAWER,NR,GRAY,80HB	4		Y
E4	6002-000234	SCREW-TAPPING	TH,+,2S,M4,L16	4		Y
E5	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	4		Y
E6	JK70-10401A	IPR-PLATE SPRING	DRAWER,STS304,T0.3	2		Y
E7	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	4		Y

9-3 Drawer

9-3-3 Parts List (5 Bill / 5 Coin)

9-3-3-(a) Bill & Coin Assembly (5B/5C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
A	JK97-00407A	MEA UNIT-BILL/COIN	A-DRAWER,5B/5C,WORLD	1		N
A1	JK72-40267A	PMO-LEVER PRESS	A-DRAWER,POM	5		Y
A2	6107-000134	SPRING-ES	SUS304	5		Y
A3	JK70-10314A	IPR-HOLDER LEVER	B-TYPE,T1.2,ZPC	5		Y
A4	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	3		Y
A5	6002-001078	SCREW-TAPPING	PWH,+,B,M3,L5	5		Y
A6	JK70-10304A	IPR-PLATE HOLDER	A-TYPE,SBHG-1,T1.2	1		Y
A7	JK72-40269A	PMO-PANEL PARTETION	A-TYPE,HIPS,BLK	4		Y
A8	JK72-40268A	PMO-BILL/COIN TILL	A-TYPE,5B/5C,HIPS,BLK	1		Y

9-3-3-(b) Tray Till Assembly (5B/5C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
B	JK97-00991A	MEA UNIT-TRAY TILL	A-DRAWER,4B/8C,2 LATCH	1		N
B1	JK75-10389A	MEC-LOCK KEY	DRAWER	1		Y
B2	JK70-10014A	IPR-PLATE FRONT	A-TYPE,SBC-1,T1	1		Y
B3	JK97-00378B	MEA-TRAY TILL	A-TYPE,4B/8C,2 LATCH	1		N
B4	JK73-10203A	RPR-TENSION	DRAWER,SPONGE,-,BLK,-	2		N
B5	JK75-10386A	MEC-ROLLER	DRAWER,DR-19-B1/PI19	2		Y
B6	6031-000549	WASHER-PLAIN	ID6.5,OD13,T1.0	2		Y
B7	6002-000207	SCREW-TAPPING	RH,+,2S,M4,L8	1		N
B8	JK70-10324A	IPR-SUPPROT TRAY	DRAWER,SBHG-1,T1.2	1		N
B9	JK70-40302A	ICT-SHAFT PIN	A-TYPE,SUM45C,D5,	1		Y
B10	6044-000124	RING-E	ID3,OD7,TO.6,ZPC(BLK),STSC	1		Y
B11	6002-001042	SCREW-TAPPING	FH,,+,2S,M3,L6	2		Y
B12	JK70-10323A	IPR-PLATE CLIP	DRAWER,SWP,T0.5	1		Y

9-3-3-(c) Housing Assembly (5B/5C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
C	JK97-00194A	MEA-COVER HOUSING	A-TYPE,BASIC	1		N
	JK97-00194B	MEA-COVER HOUSING	A-TYPE,NONE HOLE,OPTION	1		N
C1	JK97-00195A	MEA-SUB HOUSING	A-TYPE,BASIC	1		N
	JK97-00195B	MEA-SUB HOUSING	A-TYPE,NONE HOLE,OPTION	1		N
C2	JK75-10386A	MEC-ROLLER	DRAWER,DR-19-B1/PI19	2		Y
C3	JK73-20207A	REX-PAD DRAWER	DRAWER,NR,BLK	2		N

9-3 Drawer

9-3-3-(d) Lock Assembly (5B/5C)

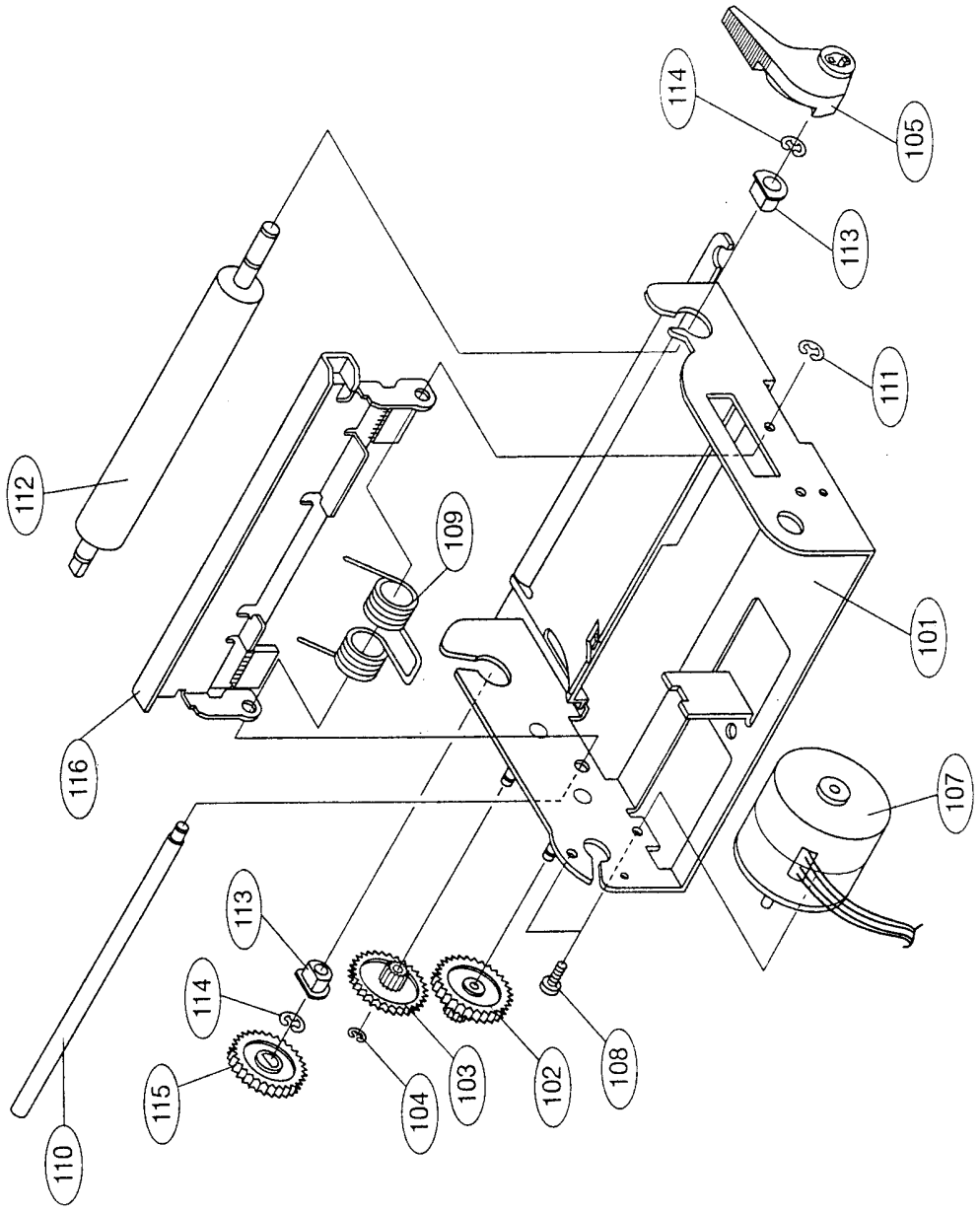
No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
D	JK97-00985A	MEA UNIT-LOCK	A-TYPE,2-LATCH,LONG LEVER	1		N
	JK97-00987A	MEA UNIT-LOCK	A-TYPE,2-LATCH,SHORT LEVER	1		N
D1	6001-000592	SCREW-MACHINE	TH,+,M4,L8,ZPC(YEL)	1		Y
D2	JK73-20210A	REX-BUMPER	DRAWER,NR,BLK	1		Y
D3	JK61-70100A	SPRING-PUSH	DRAWER,FZN	1		Y
D4	JK97-00989A	MEA UNIT-SUB LOCK	A-TYPE,2-LATCH,LONG LEVER	1		N
	JK97-00988A	MEA UNIT-SUB LOCK	A-TYPE,2-LATCH,SHORT LEVER	1		N
D5	6107-001014	SPRING-ES	PI0.4,D4.8,L18,-,STS304WPB	1		Y
D6	JK33-10500A	SOLENOID-DC	A-DRAWER,KSD-2013-S(200)	1		Y
D7	6001-000131	SCREW-MACHINE	BH,+,M3,L6	2		Y
D8	6001-000525	SCREW-MACHINE	PH,+,M3,L14	2		Y
D9	3405-001013	SWITCH-MICRO	125V,5A,60gf,SPST-NO	1		Y
D10	JK39-40301R	CBF-HARNESS	2P,150MM,BRN,1007	1		Y
D11	6002-000161	SCREW-TAPPING	PH,+,2,M4,L8	3		Y

9-3-3-(e) Bottom Assembly (5B/5C)

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
E	JK97-00995A	MEA UNIT-BOTTOM	A-DRAWER	1		N
E1	JK70-10938A	IPR-PLATE BOTTOM	A-DRAWER,SBHG-1,T1.0	1		Y
E2	JK73-10902A	PMOSTOPPER	DRAWER,NR,BLK,UNIVERSAL	2	USA	Y
	JK73-40200A	PMO-STOPPER	DRAWER,NR,BLK	2		Y
E3	JK61-40200A	FOOT-RUBBER	DRAWER,NR,GRAY,80HB	4		Y
E4	6002-000234	SCREW-TAPPING	TH,+,2S,M4,L16	4		Y
E5	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	4		Y
E6	JK70-10401A	IPR-PLATE SPRING	DRAWER,STS304,T0.3	2		Y
E7	6002-000175	SCREW-TAPPING	PWH,+,2,M3,L8	4		Y

9-4 Printer (M-T102)

9-4-1 Exploded View



9-4 Printer (M-T102)

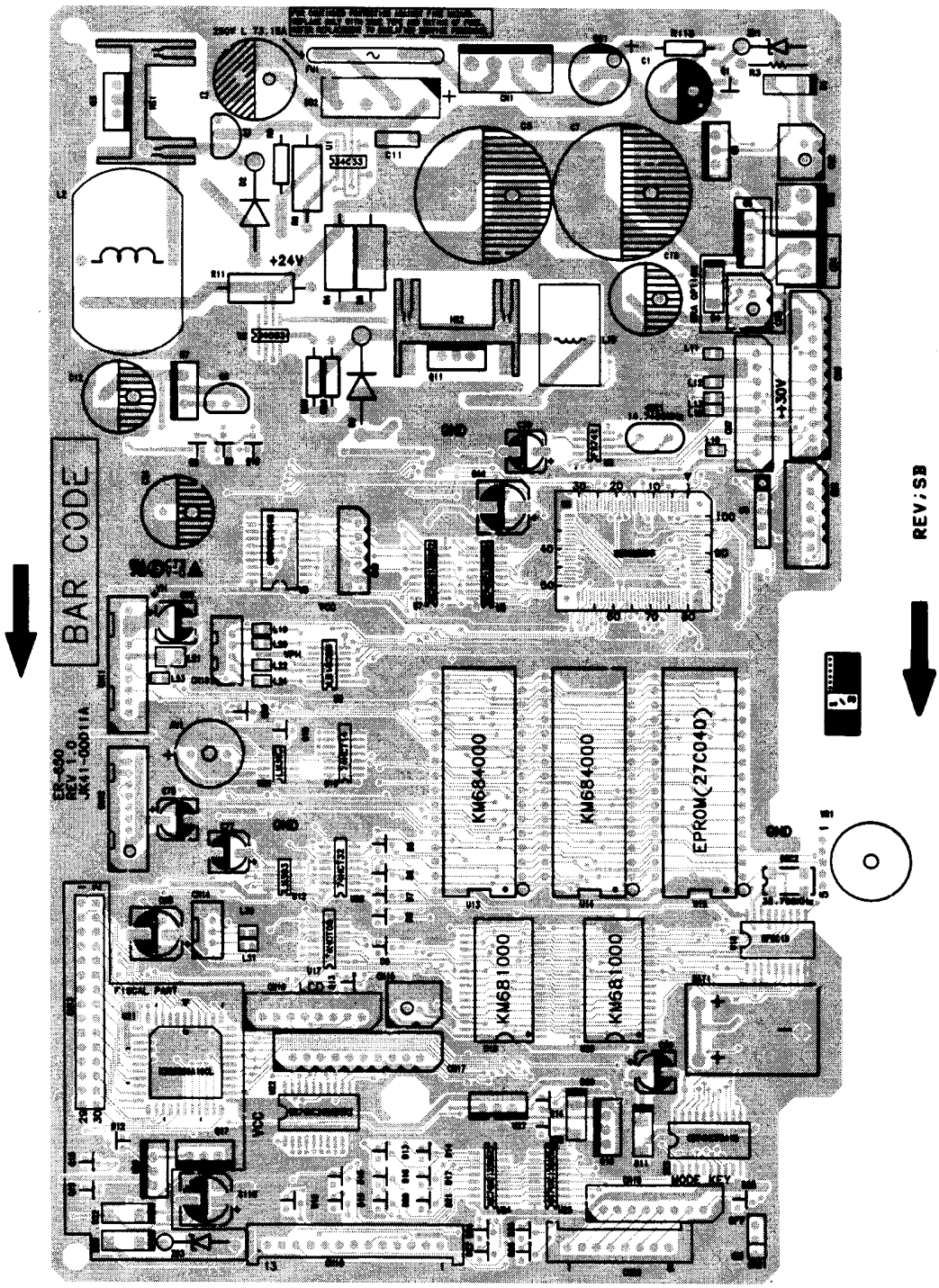
9-4-2 Parts List

No.	Code No.	Description	Specification	Q'ty	Remark	Serviceable
101	JK81-00101A	AS-FRANE UNIT	1040307,M-T102	1		Y
102	JK81-00102A	AS-GEAR,FIRST REDUCTION	1034294,EPSON,M-T102	1		Y
103	JK81-00103A	AS-GEAR,SECOND REDUCTION	1034295,EPSON,M-T102	1		Y
104	JK81-00104A	AS-RETAINING RING	B150300314,EPSON, M-T102,TYPE-E(1.5)	1		Y
105	JK81-00105A	AS-LEVER,PRINT HEAD SHIFTING	1034297,EPSON,M-T102	1		Y
106	JK81-00106A	AS-SEAL,JAPAN	1036031,EPSON,M-T102	1		Y
107	JK81-00107A	AS-MOTOR	2024461,EPSON,M-T102	1		Y
108	JK81-00108A	AS-C.P,2X2,F/ZN	1017870,EPSON,M-T102	2		Y
109	JK81-00109A	AS-SPRING,PRESS HEAD	1034298,EPSON,M-T102	1		Y
110	JK81-00110A	AS-SHAFT,FIXED PLATE	1034288,EPSON,M-T102	1		Y
111	JK81-00111A	AS-RETAINING RING	B150300314,EPSON, M-T102,TYPE-E(1.5)	1		Y
112	JK81-00112A	AS-PLATEN	1034299,EPSON,M-T102	1		Y
113	JK81-00113A	AS-SHAFT HOLDER,PLATEN	1005775,EPSON,M-T102	2		Y
114	JK81-00114A	AS-RETAINING RING	1004399,EPSON,M-T102, TYPE-E(2.5)	2		Y
115	JK81-00115A	AS-GEAR,PLATEN	1034296,EPSON,M-T102	1		Y
116	JK81-00116A	AS-PRINT HEAD ASS'Y	1041857,EPSON,M-T102	1		Y

10 PCB Layout and Parts List

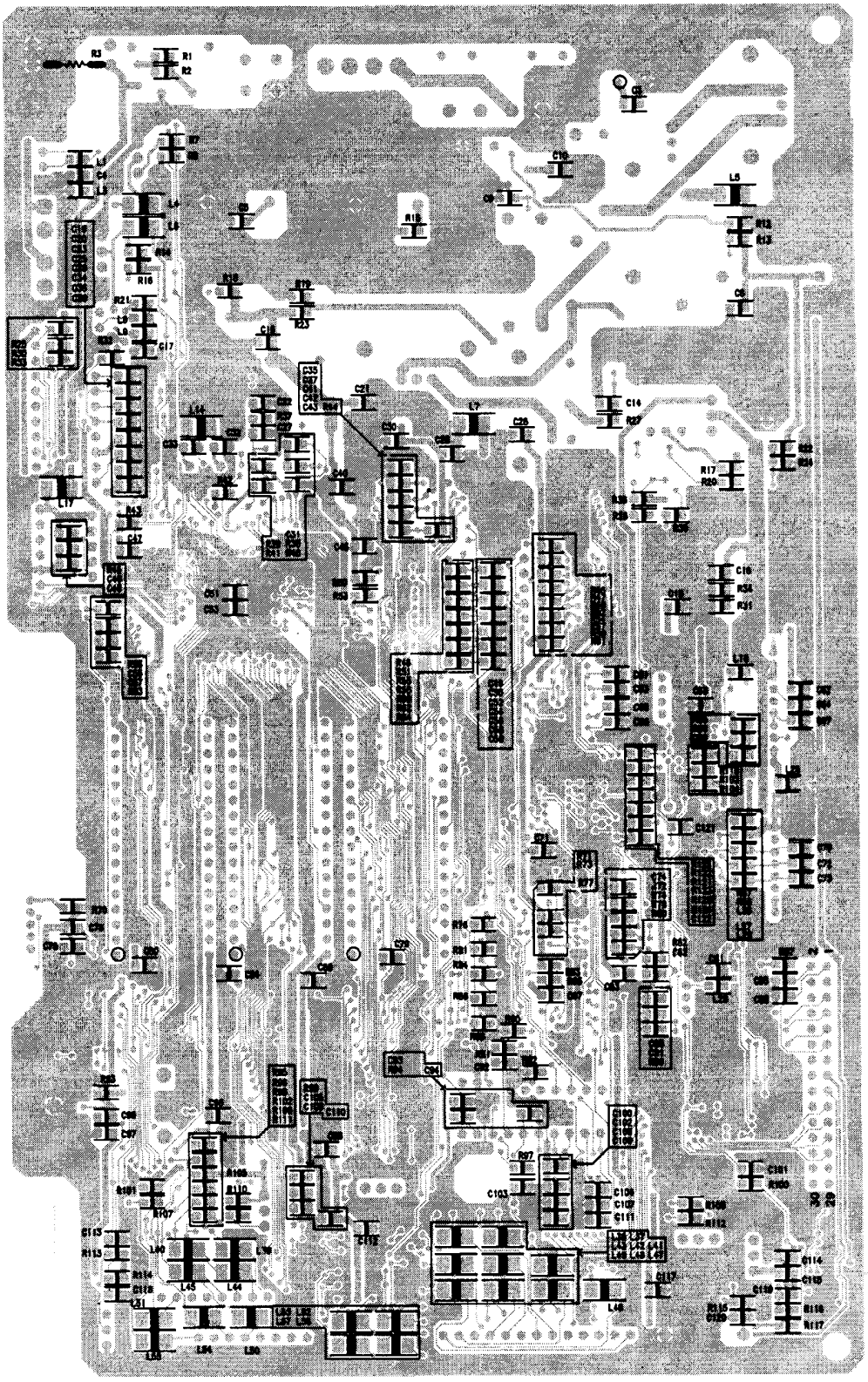
10-1 Main PCB Layout

10-1-1 Component Side



10-1 Main PCB Layout

10-1-2 Solder Side



10-1 Main PCB Layout

10-1-3 Parts List (Manual)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-00947A	PBA MAIN-THERMAL(650);ER-650,B	1		Y
0402-000119	DIODE-BRIDGE;W02G,200V,1.5A,-,	1	BD1	Y
0402-000168	DIODE-RECTIFIER;1N5822,40V,3A,	1	D3	Y
0402-000168	DIODE-RECTIFIER;1N5822,40V,3A,	1	D2	Y
0402-000290	DIODE-BRIDGE;KBU6B,100V,6A,-,B	1	BD2	Y
0502-000234	TR-POWER;KSA1010Y,PNP,40W,TO-2	1	Q7	Y
0502-000238	TR-POWER;KSA473-Y,PNP,-10W,TO-	1	Q16	Y
0502-000288	TR-POWER;KSD288,NPN,25W,TO-220	2	Q4,5	Y
1102-000161	IC-EPROM;27C040,512Kx8BIT,DIP,	1	U15	Y
1203-001752	IC-POSI.FIXED REG.;LF33CV,TO-2	1	U27	Y
1209-001089	IC-DETECTOR;M51953B,SIP,5P,-,P	1	U4	Y
2101-001023	VR-ROTARY;10Kohm,30%,0.03W,BUT	1	VR1	Y
2401-001312	C-AL;4700uF,20%,50V,GP,BK,22x4	2	C7,8	Y
2401-001429	C-AL;470uF,20%,50V,GP,TP,13x20	1	C2	Y
2801-003263	CRYSTAL-UNIT;14.7456MHz,50ppm,	1	OSC1	Y
3002-001027	BUZZER-PIEZO;85dB,1.5V,24mA,2.	1	AU1	Y
3601-000261	FUSE-FERRULE;250V,3.15A,TL,GLA	1	FU1	Y
3704-000255	SOCKET-IC;32P,DIP,SN,2.54mm	3	U13,14,15	Y
3708-000327	CONNECTOR-FPC/FC/PIC;8P,2.54mm	1	CN20	Y
3708-001389	CONNECTOR-FPC/FC/PIC;13P,2.54M	1	CN19	Y
3711-000028	CONNECTOR-HEADER;BOX,4P,1R,2mm	1	CN10	Y
3711-000033	CONNECTOR-HEADER;BOX,2P,1R,2.5	1	CN15	Y
3711-000041	CONNECTOR-HEADER;BOX,8P,1R,2.5	1	CN7	Y
3711-000183	CONNECTOR-HEADER;1WALL,2P,1R,3	2	CN3,4	Y
3711-000247	CONNECTOR-HEADER;1WALL,4P,1R,3	1	CN1	Y
3711-000588	CONNECTOR-HEADER;BOX,10P,1R,2.	2	CN6,17	Y
3711-000596	CONNECTOR-HEADER;BOX,10P,1R,2m	1	CN11	Y
3711-001011	CONNECTOR-HEADER;BOX,5P,1R,2.5	1	CN9	Y
3711-001054	CONNECTOR-HEADER;BOX,6P,1R,2.5	1	CN8	Y
3711-001133	CONNECTOR-HEADER;BOX,8P,1R,2.5	2	CN16,18	Y
3711-002810	CONNECTOR-HEADER;BOX,9P,1R,2mm	1	CN12	Y
3711-003409	CONNECTOR-HEADER;BOX,3P,1R,2mm	1	CN14	Y
3711-003969	CONNECTOR-HEADER;BOX,2P,1R,2.5	2	CN2,5	Y
4302-000126	BATTERY-NICD(2ND);3.6V(1.2Vx3)	1	BAT1	Y
JK27-60100B	COIL-FILTER;SER-6500,220 UH,-,	1	L2	Y

10-1 Main PCB Layout

10-1-3 Parts List (Manual)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK27-60100D	COIL FILTER-;ER-350,140 UH,-,-	1	L10	Y
JK39-40541A	CBF HARNESS-MAIN;ER-4615,1R,UL	1	MAIN+GND_PLATE	Y
JK96-01082A	ELA ETC-HEAT SINK(650);1010;ER	1		Y
0502-000234	TR-POWER;KSA1010Y,PNP,40W,TO-2	2	Q3,11	Y
6002-000175	SCREW-TAPPING;PWH,+,2,M3,L8,ZP	2	Q3,11	Y
6203-000107	HEAT SINK;NONE,T2,W17,L22,H45,	2	Q3,11	Y

10-1 Main PCB Layout

10-1-4 Parts List (Auto)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK94-00025A	PHANTOM AU JK92-00947A	1		N
0401-001003	DIODE-SWITCHING;MMBD6050LT1,70	20	D5,6,7,8,9,13,14,15,16,17,18, D19,20,21,23,24,25,27,28,30	Y
0402-001189	DIODE-RECTIFIER;M4,400V,1A,SMD	2	D1,D4	Y
0403-000161	DIODE-ZENER;1N4751,5%,1000MW,D	1	ZD1	Y
0404-001051	DIODE-SCHOTTKY;SK14,40V,1A,DO-	2	D11,29	Y
0501-000294	TR-SMALL SIGNAL;KSA708-Y,PNP,8	2	Q2,6	Y
0501-000457	TR-SMALL SIGNAL;MMBT2222A,NPN,	8	Q1,8,9,10,13,14,15,20	Y
0801-000523	IC-CMOS LOGIC;74HCT541,BUFFER/	2	U5,23	Y
0801-000642	IC-CMOS LOGIC;74HC138,3-TO-8 D	4	U7,8,24,25	Y
0801-000696	IC-CMOS LOGIC;74HC245,TRANSCEI	1	U22	Y
0801-000887	IC-CMOS LOGIC;74HCT08,AND GATE	1	U17	Y
0801-000891	IC-CMOS LOGIC;74HCT32,OR GATE,	1	U28	Y
0801-001090	IC-CMOS LOGIC;74HC14,SCHIMITT	1	U10	Y
0903-001154	IC-MICROCOMPUTER;30622,16BIT,Q	1	U6	Y
0909-000136	IC-REAL TIME CLOCK;5C15,16BIT,	1	U18	Y
1003-001234	IC-MOTOR DRIVER;LB1838M,SOP,14	1	U9	Y
1106-000131	IC-SRAM;681000,128Kx8BIT,SOP,3	2	U19,20	Y
1202-000164	IC-VOLTAGE COMP.;393,SOP,8P,15	2	U12,29	Y
1203-000404	IC-DC/DC CONVERTER;34063,SOP,8	2	U1,2	Y
2001-000027	R-CARBON;100OHM,5%,1/4W,AA,TP,	1	R118	Y
2001-000065	R-CARBON;10KOHM,5%,1/4W,AA,TP,	1	R3	Y
2001-000119	R-CARBON;680OHM,5%,1/4W,AA,TP,	1	R28	Y
2001-000855	R-CARBON;560OHM,5%,1/4W,AA,TP,	2	R8,29	Y
2003-000003	R-METAL OXIDE(S);75ohm,5%,2W,A	1	R6	Y
2005-000210	R-WIRE WOUND;0.33ohm,5%,1W,AC,	1	R11	Y
2005-001001	R-WIRE WOUND;0.1ohm,5%,1W,AA,T	2	R4,5	Y
2007-000001	R-CHIP;68KOHM,5%,1/10W,DA,TP,2	3	R120,121,122	Y
2007-000026	R-CHIP;200OHM,5%,1/10W,DA,TP,2	4	R7,16,41,93	Y
2007-000221	R-CHIP;1.2KOHM,5%,1/10W,DA,TP,	1	R70	Y
2007-000254	R-CHIP;1.62KOHM,1%,1/10W,DA,TP	1	R68	Y
2007-000290	R-CHIP;100OHM,5%,1/10W,DA,TP,2	2	R43,94	Y
2007-000300	R-CHIP;10KOHM,5%,1/10W,DA,TP,2	20	R15,18,21,25,30,31,34,35,36, R91,95,96,98,99,101,102,105, R106,107,111	Y
2007-000308	R-CHIP;10OHM,5%,1/10W,DA,TP,2	1	R40	Y
2007-000352	R-CHIP;12KOHM,1%,1/10W,DA,TP,2	1	R19	Y

10-1 Main PCB Layout

10-1-4 Parts List (Auto)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
2007-000395	R-CHIP;150KOHM,5%,1/10W,DA,TP,	2	R65,66	Y
2007-000406	R-CHIP;15KOHM,1%,1/10W,DA,TP,2	1	R22	Y
2007-000457	R-CHIP;18KOHM,5%,1/10W,DA,TP,2	1	R13	Y
2007-000468	R-CHIP;1KOHM,5%,1/10W,DA,TP,20	9	R1,2,20,72,77,82,86,110,119	Y
2007-000493	R-CHIP;2.2KOHM,5%,1/10W,DA,TP,	6	R37,76,81,84,88,92	Y
2007-000642	R-CHIP;270OHM,5%,1/10W,DA,TP,2	2	R89,97	Y
2007-000686	R-CHIP;3.3KOHM,5%,1/10W,DA,TP,	2	R80,90	Y
2007-000703	R-CHIP;3.6KOHM,5%,1/10W,DA,TP,	1	R12	Y
2007-000872	R-CHIP;4.7KOHM,5%,1/10W,DA,TP,	37	R9,14,26,32,33,42,44,45,46, R47,48,49,50,51,52,53,54,55, R56,57,58,59,60,61,62,63,64, R71,73,74,78,83,85,103,113, R114,125	Y
2007-000941	R-CHIP;47KOHM,5%,1/10W,DA,TP,2	3	R27,38,39	Y
2007-001013	R-CHIP;51OHM,5%,1/10W,DA,TP,20	1	R104	Y
2007-001071	R-CHIP;6.8KOHM,5%,1/10W,DA,TP,	1	R67	Y
2007-001113	R-CHIP;680KOHM,5%,1/10W,DA,TP,	1	R123	Y
2007-001118	R-CHIP;680OHM,5%,1/10W,DA,TP,2	1	R124	Y
2007-001152	R-CHIP;750OHM,1%,1/10W,DA,TP,2	1	R24	Y
2007-001662	R-CHIP;36KOHM,1%,1/10W,DA,TP,2	2	R17,23	Y
2203-000192	C-CERAMIC,CHIP;100nF,+80-20%,5	45	C3,4,5,6,10,15,16,18,21,26, C28,29,30,31,39,45,46,47,51, C53,55,62,65,69,71,79,80,81, C82,84,86,87,93,95,96,97,98, C103,105,108,110,112,117, C118,122	Y
2203-000239	C-CERAMIC,CHIP;0.1nF,5%,50V,NP	22	C61,63,64,66,67,68,70,72,73, C83,89,91,92,94,100,102,104 C106,107,109,111,113	Y
2203-000260	C-CERAMIC,CHIP;10NF,10%,50V,X7	4	C36,40,57,74	Y
2203-000634	C-CERAMIC,CHIP;22pF,5%,50V,NPO	3	C27,32,33	Y
2203-000748	C-CERAMIC,CHIP;30pF,5%,50V,NPO	15	C9,35,37,41,42,43,49,50,52, C54,56,58,59,76,78	Y
2203-000938	C-CERAMIC,CHIP;0.47nF,5%,50V,N	8	C14,19,20,22,23,25,34,121	Y
2203-000989	C-CERAMIC,CHIP;47NF,10%,50V,X7	1	C48	Y
2301-000010	C-FILM,PEF;100nF,5%,100V,TP,11	1	C11	Y
2401-000032	C-AL;100uF,20%,50V,GP,TP,8x12,	1	C1	Y
2401-001363	C-AL;470uF,20%,16V,GP,TP,10x12	3	C12,13,24	Y

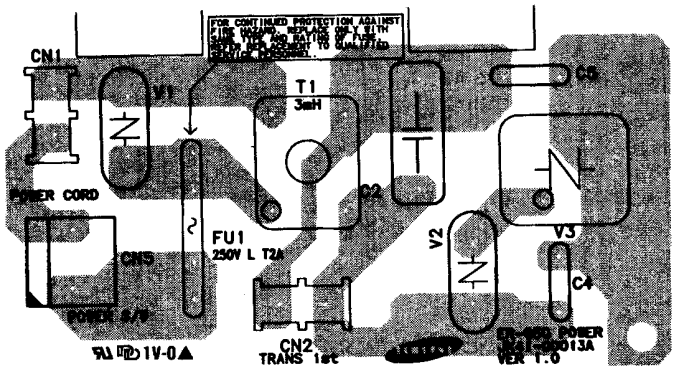
10-1 Main PCB Layout

10-1-4 Parts List (Auto)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
2402-000139	C-AL,SMD;22uF,20%,35V,GP,TP,6.	3	C38,77,99	Y
2402-000168	C-AL,SMD;100Uf,20%,16V,GP,TP,8	3	C44,90,116	Y
2402-000179	C-AL,SMD;47uF,20%,16V,GP,TP,6.	2	C60,75	Y
2801-000111	CRYSTAL-SMD;32.768KHz,20ppm,28	1	OSC2	Y
3301-000325	CORE-FERRITE BEAD;AB,3.2x2.5x1	27	L4,5,7,14,17,21,37,38,39,40, L41,42,43,44,45,46,47,48,49, L50,51,52,53,54,55,56,57	Y
3301-001074	CORE-FERRITE BEAD;AB,2.0x1.25x	25	L1,3,11,12,13,15,16,18,19,20 L22,23,24,25,26,27,28,29,30, L31,32,33,34,35,36	Y
3602-000001	FUSE-CLIP;-,-,30mohm	2	FU1	Y
4701-001020	FREQ-ATTENUATOR;5-80MHz,15dB,-	1	U3	Y
JK41-00011A	PCB-650 MAIN;ER-650,FR-4,2L,T1	1	PCB	N

10-3 Power Filter PCB Layout

10-3-1 Component and Solder Side

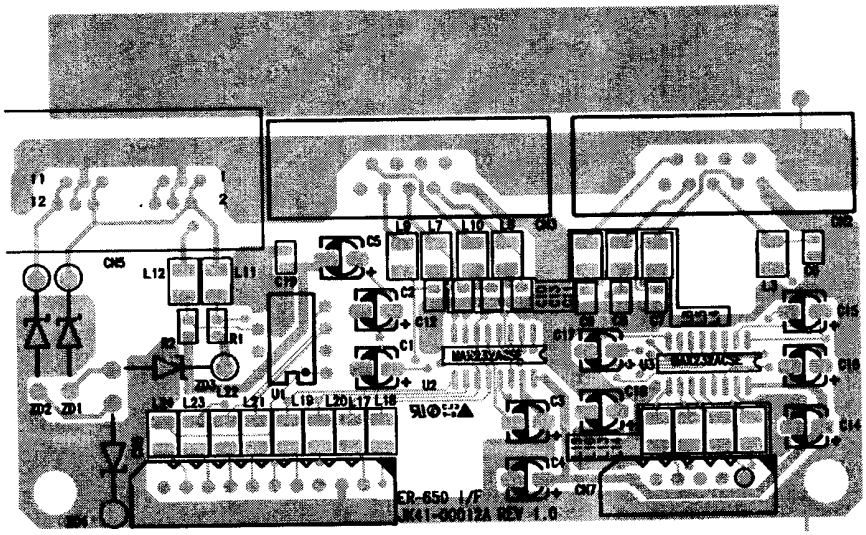


10-3-2 Parts List

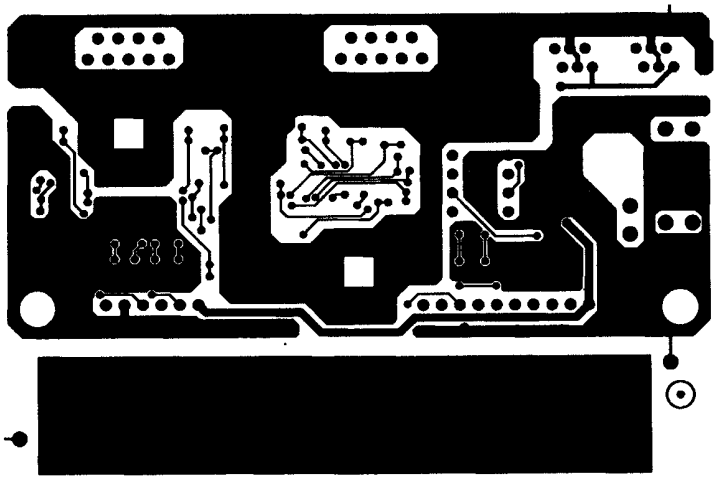
Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-00949A	PBA PWR-650;ER-650,BASIC,WORLD	1		Y
1405-000111	VARISTOR;1800V,4500A,17.5x15mm	1	V3	Y
1405-000147	VARISTOR;470V,4500A,17x12mm,BK	2	V1,2	Y
2201-000023	C-CERAMIC,DISC;2.2nF,20%,125V,	1	C4,5	Y
2305-001021	C-FILM,MPEF;100nF,20%,275V,TP,	1	C2	Y
3601-000246	FUSE-FERRULE;250V,2A,TL,GLASS,	1	FU1	Y
3602-000001	FUSE-CLIP;-,-,30mohm	2	FU1	Y
3711-000829	CONNECTOR-HEADER;BOX,2P,1R,6.2	1	CN2	Y
3711-000829	CONNECTOR-HEADER;BOX,2P,1R,6.2	1	CN1	Y
3711-002104	CONNECTOR-HEADER;1WALL,2P,1R,7	1	CN5	Y
JC27-60503A	COIL FILTER-3mH;ML5500,3.0mH,0	1	T1	Y
JK41-00013A	PCB-650 POWER;ER-650,FR-1,1L,T	1		Y

10-4 RS-232C and IRC PCB Layout

10-4-1 Component Side



10-4-2 Solder Side



10-4 RS-232C and IRC PCB Layout

10-4-3 Parts List

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK92-00948A	PBA SUB I/F-232/IRC;ER-650,BAS	1		Y
0403-000141	DIODE-ZENER;1N4735A,6.2V,5%,1W	4	ZD1,2,3,4	Y
1006-000259	IC-LINE TRANSCEIVER;75176A,DIP	1	U1	Y
3701-000232	CONNECTOR-DSUB;9P,2R,FEMALE,AN	1	CN2,3	Y
3711-000588	CONNECTOR-HEADER;BOX,10P,1R,2.	1	CN6	
3711-001054	CONNECTOR-HEADER;BOX,6P,1R,2.5	1	CN7	
3722-000001	JACK-MODULAR;12P/2C,-,AU,GRAY,	1	CN5	Y
JK39-00037A	CBF HARNESS-I/F;ER-650,FLAT ,U	1	I/F TO MAIN	Y
JK39-00039A	CBF HARNESS-RS232;ER-650,FLAT	1	I/F TO MAIN	Y
JK94-00026A	PHANTOM AU JK92-00948A	1	PBA(AUTO)	N
1006-000133	IC-DRIVER/RECEIVER;232,SOP,16P	2	U2,3	Y
2007-000300	R-CHIP;10KOHM,5%,1/10W,DA,TP,2	2	R1,2	Y
2203-000192	C-CERAMIC,CHIP;100nF,+80-20%,5	1	C19	Y
2203-000938	C-CERAMIC,CHIP;0.47nF,5%,50V,N	8	C6,7,8,9,10,11,12,13	Y
2402-000170	C-AL,SMD;1uF,20%,50V,GP,TP,4.3	10	C1,2,3,4,5,14,15,16,17,18	Y
3301-000325	CORE-FERRITE BEAD;AB,3.2x2.5x1	22	L3,4,5,6,7,8,9,10,11,12,13,14 L15,16,17,18,19,20,21,22,23, L24,	Y
JK41-00012A	PCB-650 I/O;ER-650,FR-4,2L,T1.	1		Y

10-5 Display Layout

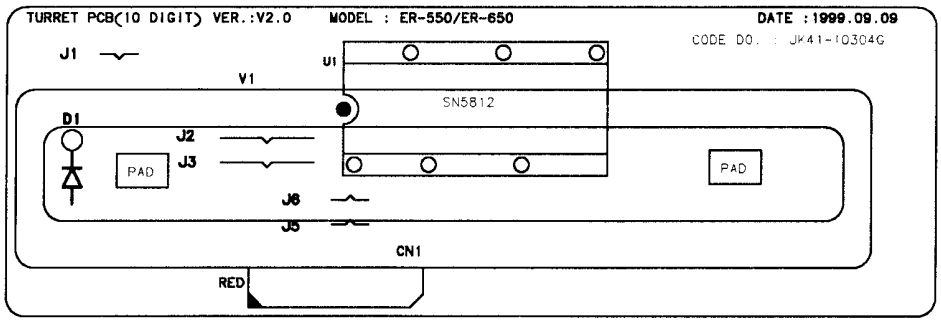
10-5-1 Component and Solder Side (Operator)

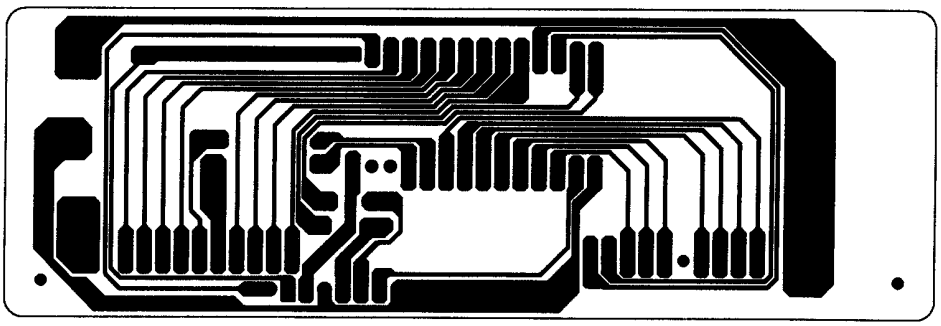
There is no the PCB of the Operator Display

10-5-2 Parts List (Operator)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK96-01080A	ELA ETC-DISPLAY(650);ER-650,BA	1	ER-650	Y
2202-000579	C-CERAMIC,MLC-AXIAL;100nF,+80-	1	ER-550	Y
6202-001034	TUBE-SHRINKAGE;GSHS-1625,ID2,-	0.06	ER-550	Y
JK07-20100A	DISPLAY-LCD;ER-550,PG12864LRS-	1	ER-550	Y
JK39-40305Y	CBF-HARNESS;18P,450MM,RED/WHT,	1	ER-550	Y
JK39-40305Z	CBF-HARNESS;2P,500MM,RED/WHT,U	1	ER-550	Y

10-5-3 Component and Solder Side (Customer)





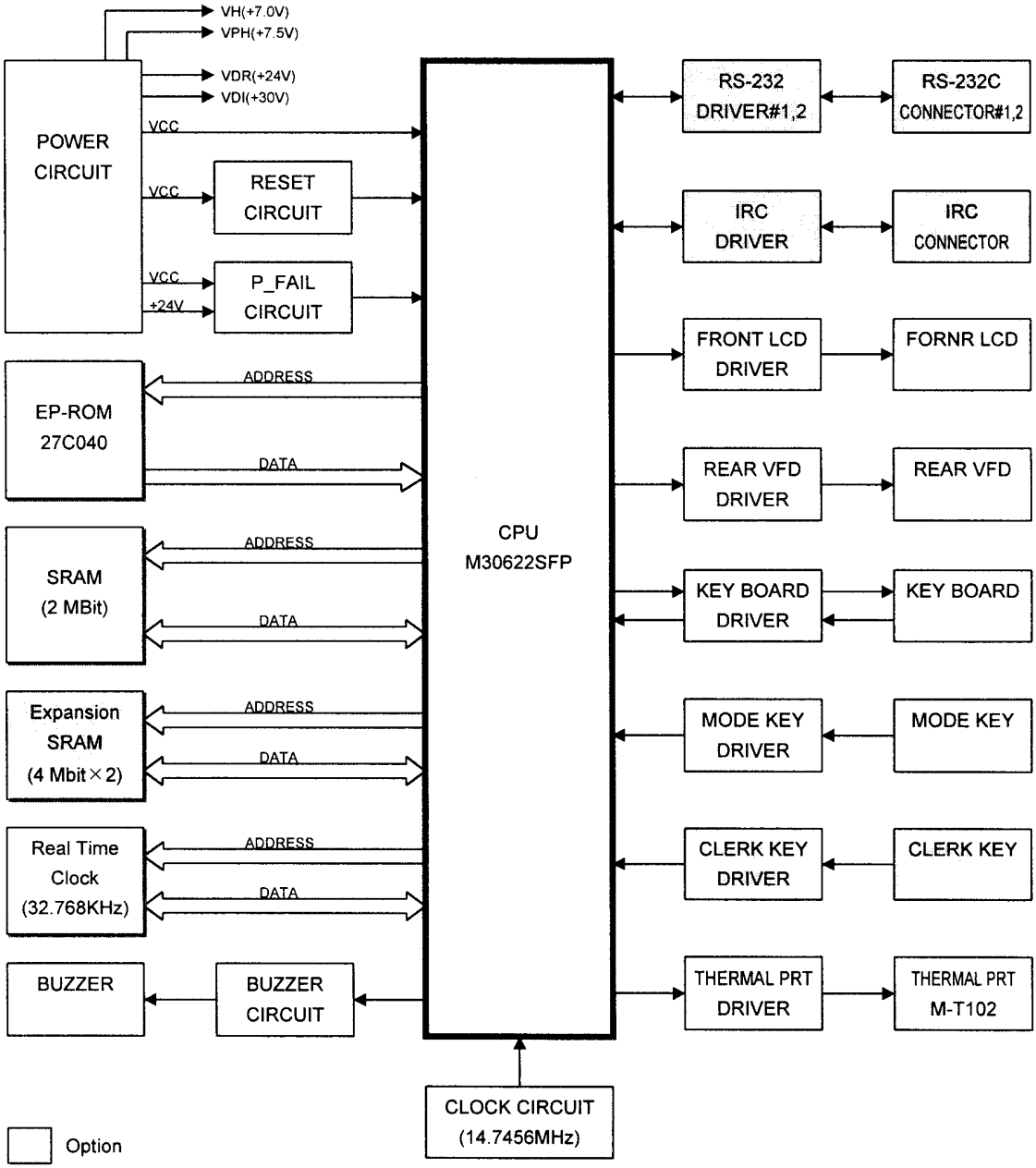
10-5 Display Layout

10-5-4 Parts List (Customer)

Code No.	Description / Specification	Q'TY	Remarks	Serviceable
JK96-01084A	ELA ETC-TURRET(650);ER-650,BAS	1	ER-650	Y
0402-000129	DIODE-RECTIFIER;1N4003,200V,1A	1	D1	Y
1003-000265	IC-DISPLAY DRIVER;75518,DIP,40	1	U1	Y
3711-001133	CONNECTOR-HEADER;BOX,8P,1R,2,5	1		Y
JC39-40511A	CBF-HARNESS;ML-80,JUMPER,AWG22	5	J1,2,3,4,5	Y
JK07-00004A	DISPLAY VFD-DC10G;ER-4615,SVE-	1		Y
JK39-00042A	CBF HARNESS-TURRET(WITH TUBE);	1	TURRET TO MAIN	Y
JK41-10304G	PCB-DISPLAY;ER-550,FR-1,1L,126	1		Y
JK69-90902A	PAC-VINYL;PET,#2126,30X100000X	0.13	DIGITRON	Y
JK73-10207A	RPR-PAD;ER-220N,SPONGE,-,BLK,-	2		Y

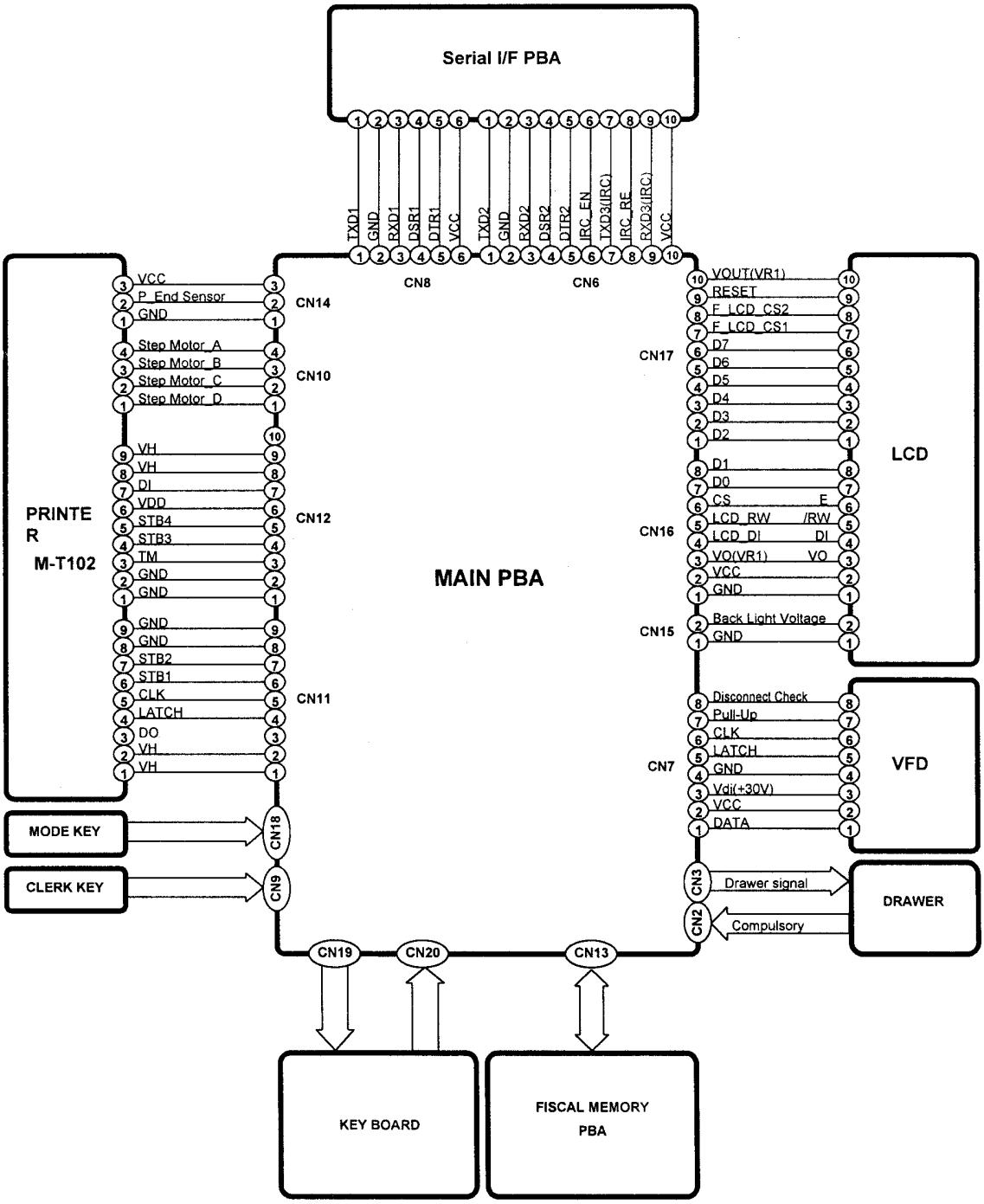
11 Block Diagram

11-1 ER-650

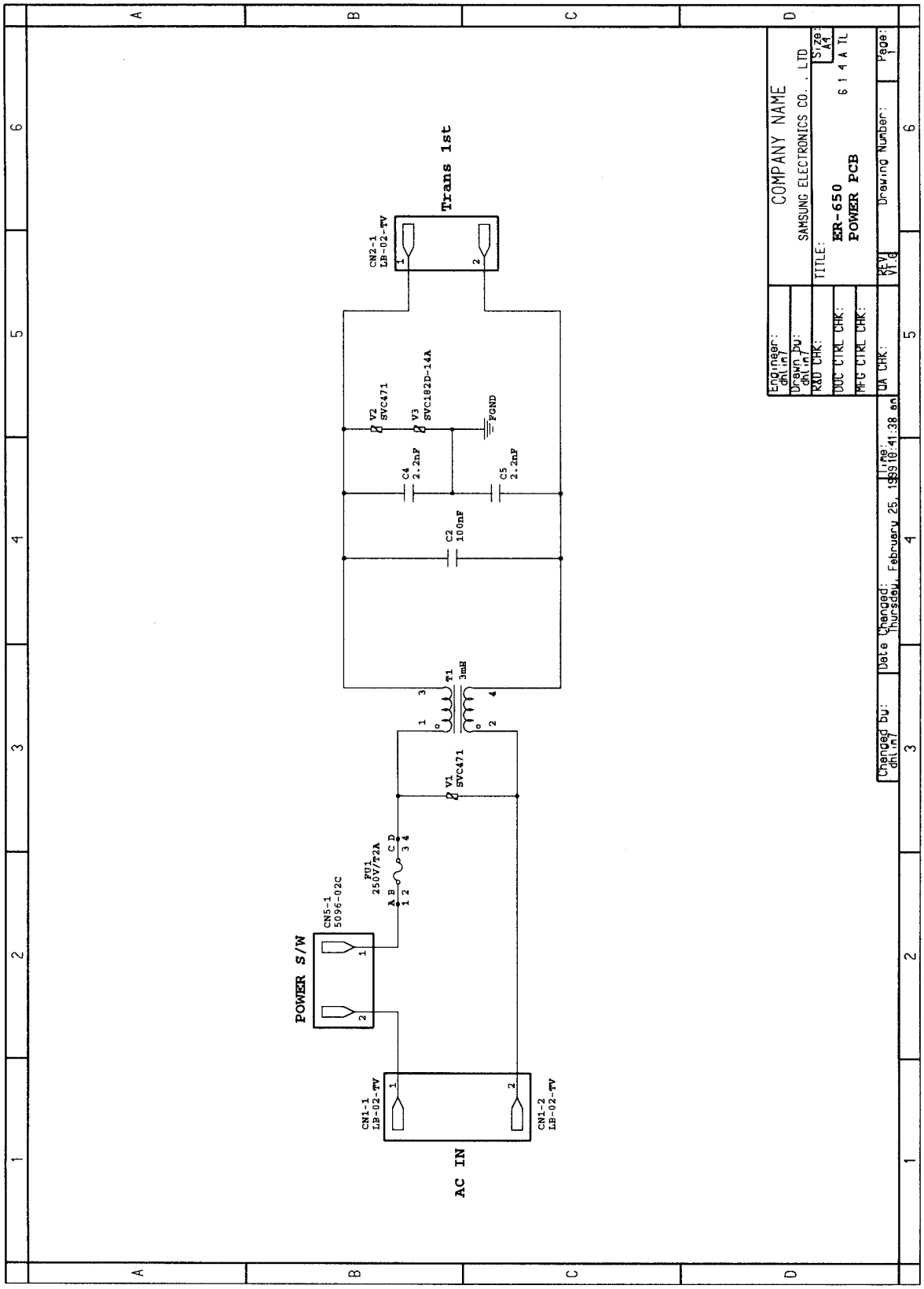


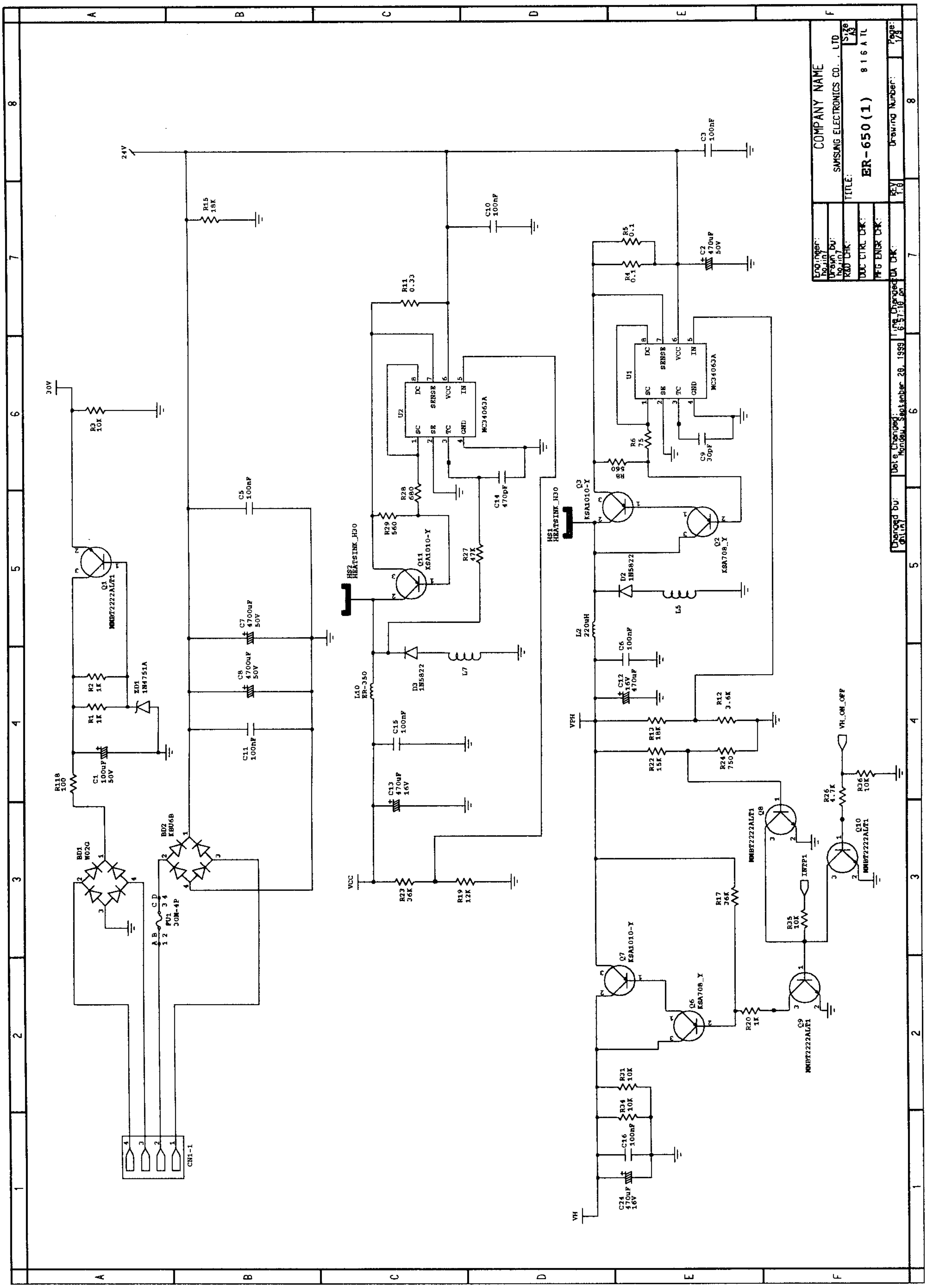
12 Wiring Diagram

12-1 ER-650



13 Schematic Diagrams

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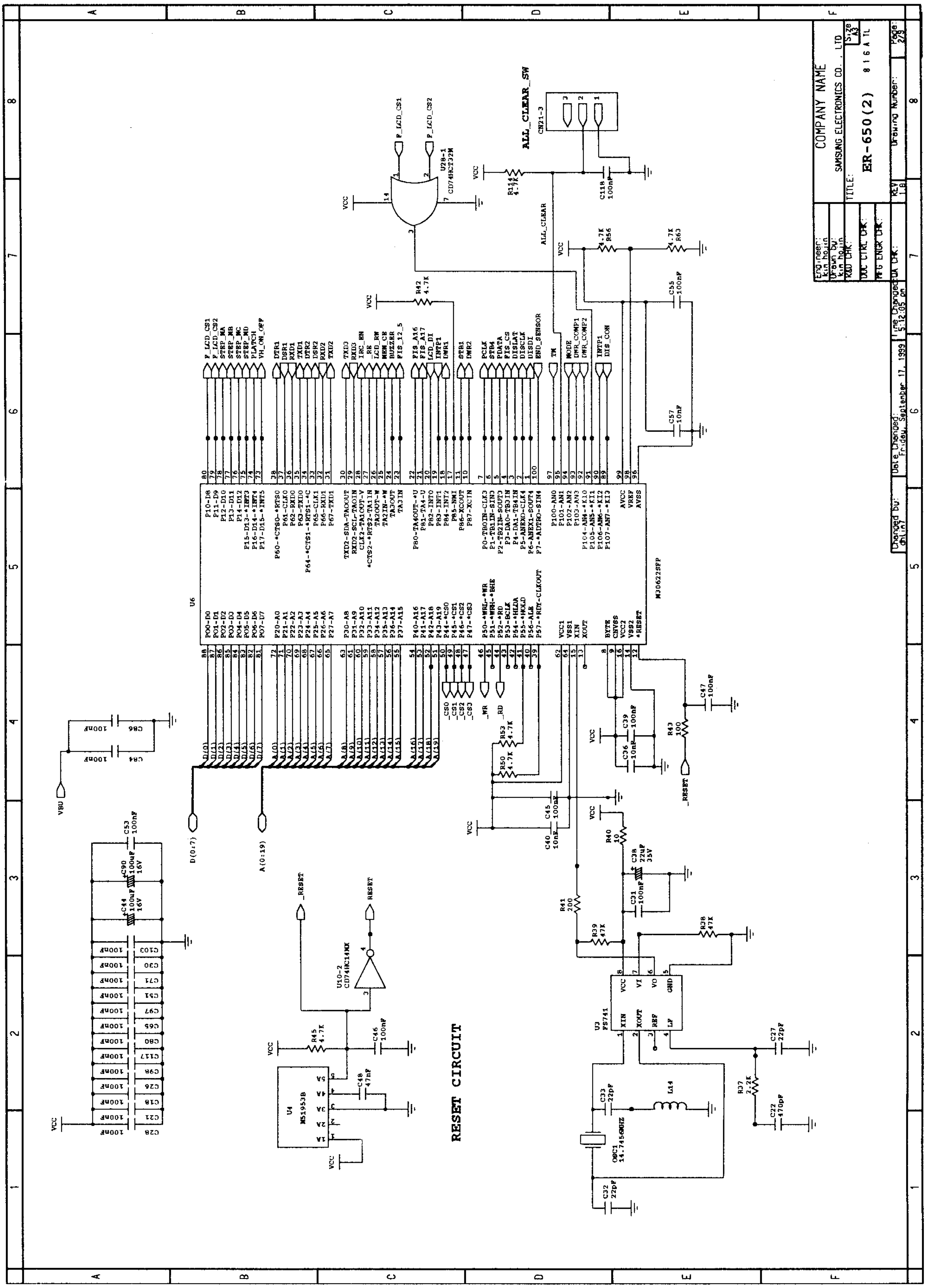
SAMSUNG ELECTRONICS CO., LTD
ER-650(1)
MC34063A
KSA1010-Y
KSA708_Y
MMBT2222ALT1
1N5822
HEATSINK_H30
CN1-1
24V
VPH
VCC
VH
VH_ON_OFF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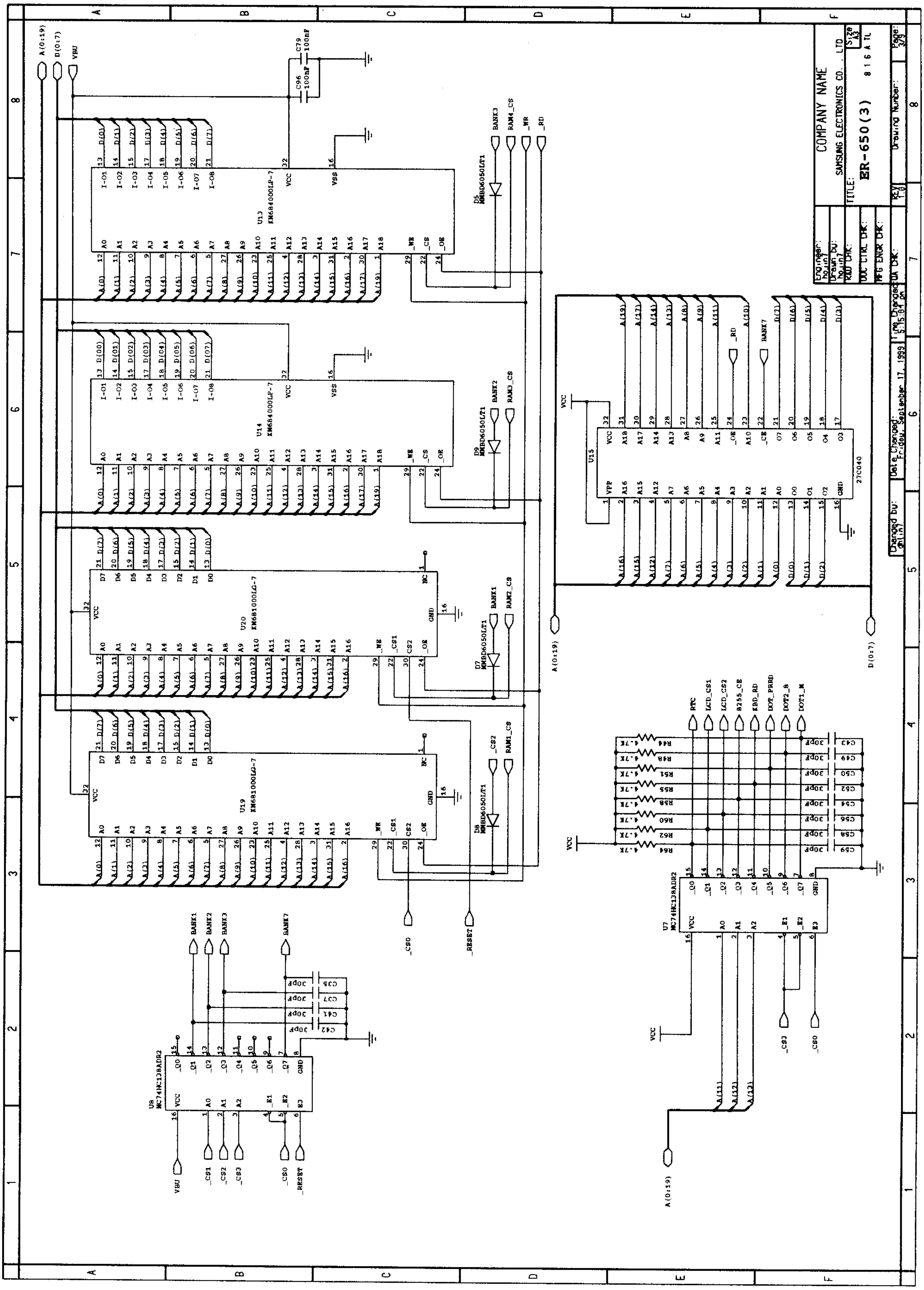
SAMSUNG ELECTRONICS CO., LTD
ER-650(2)
RESET CIRCUIT
ALL_CLEAR_SW
M30622SFP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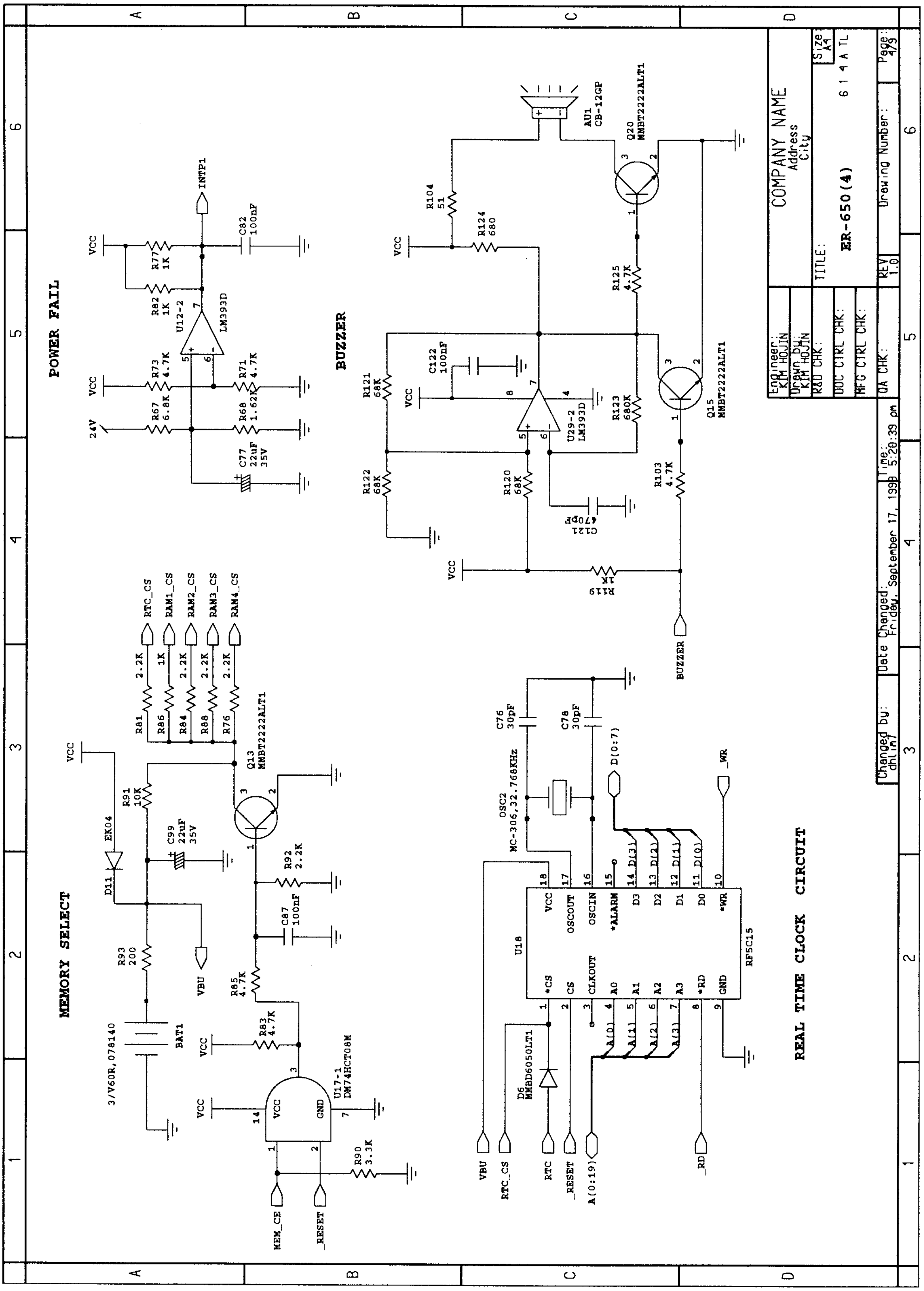
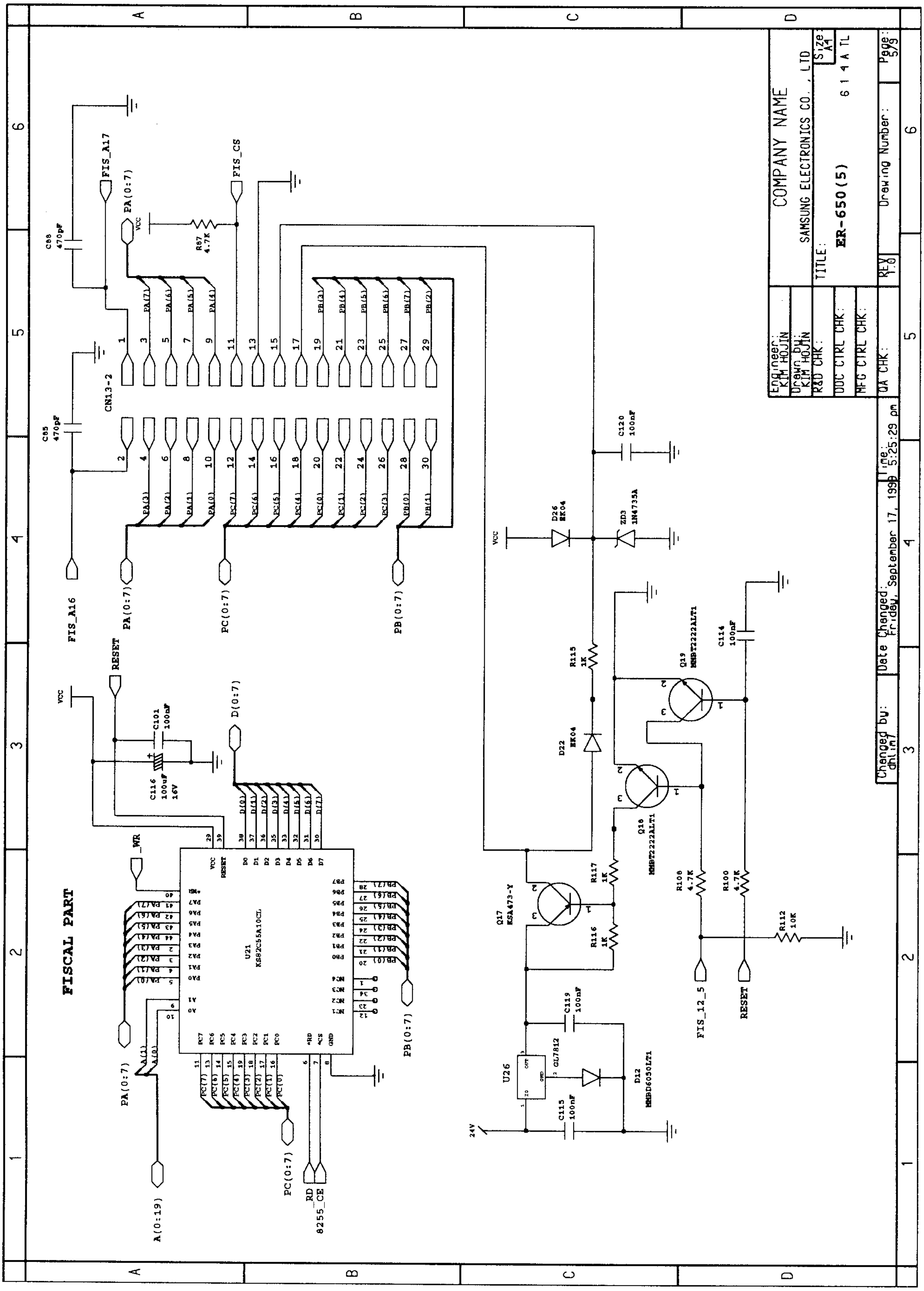
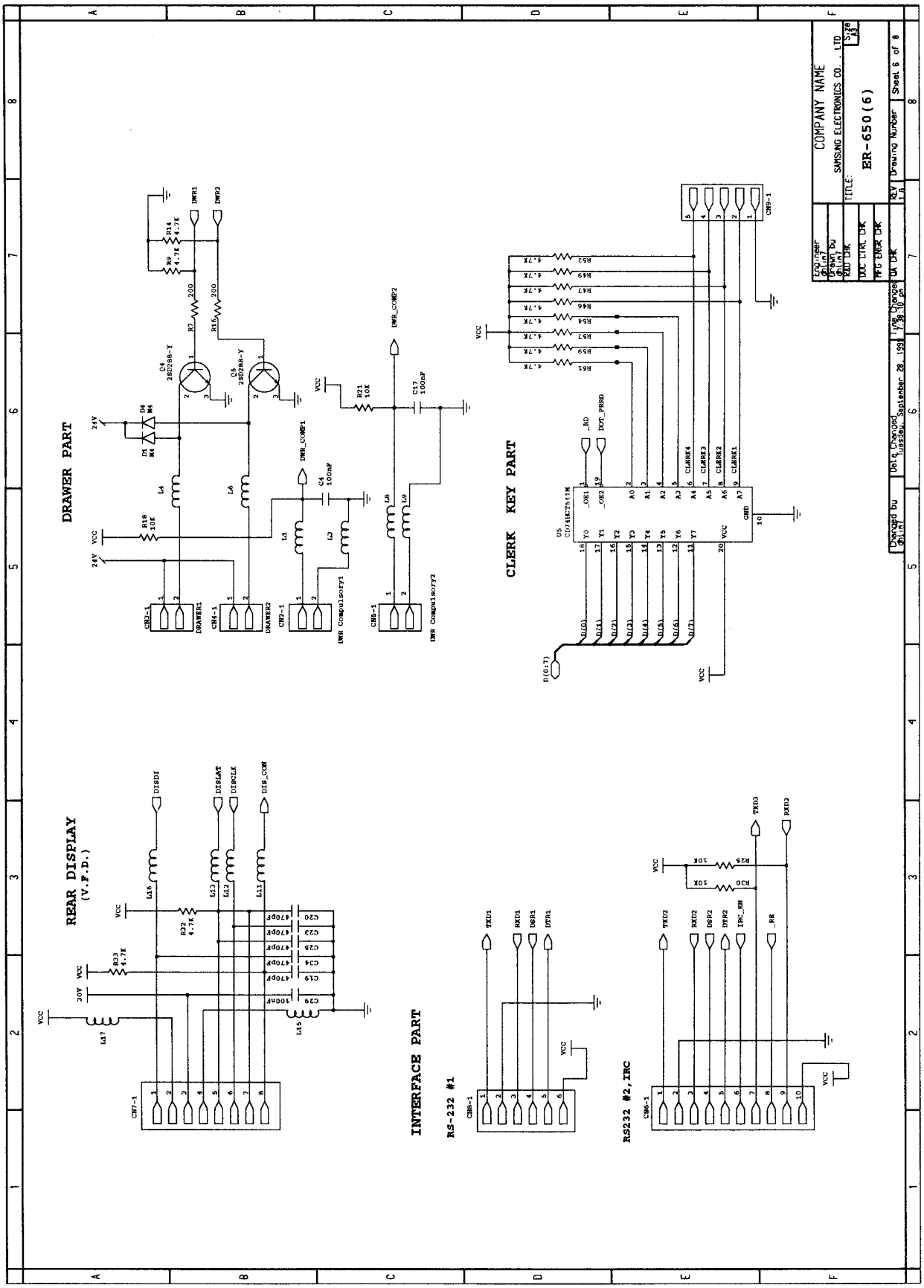
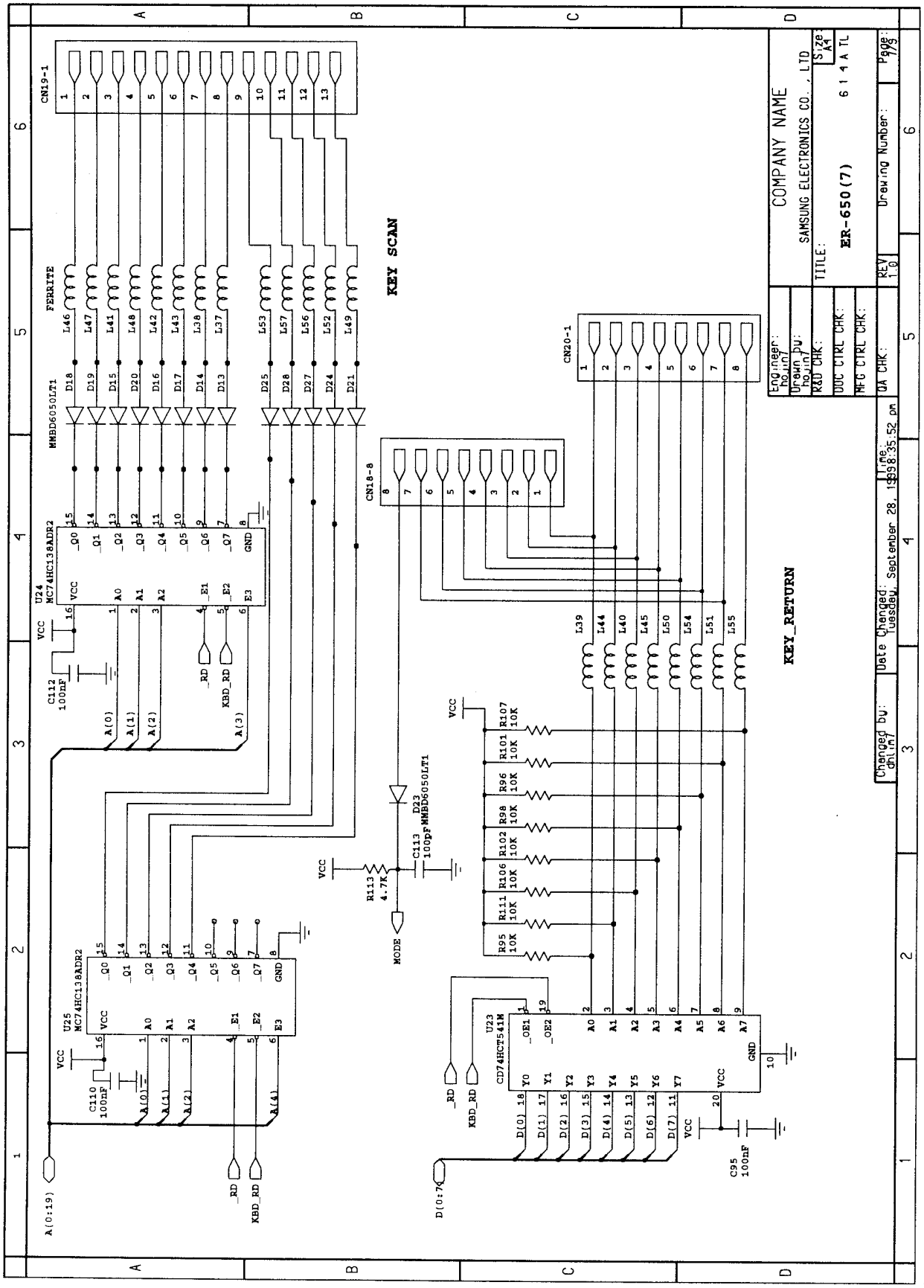
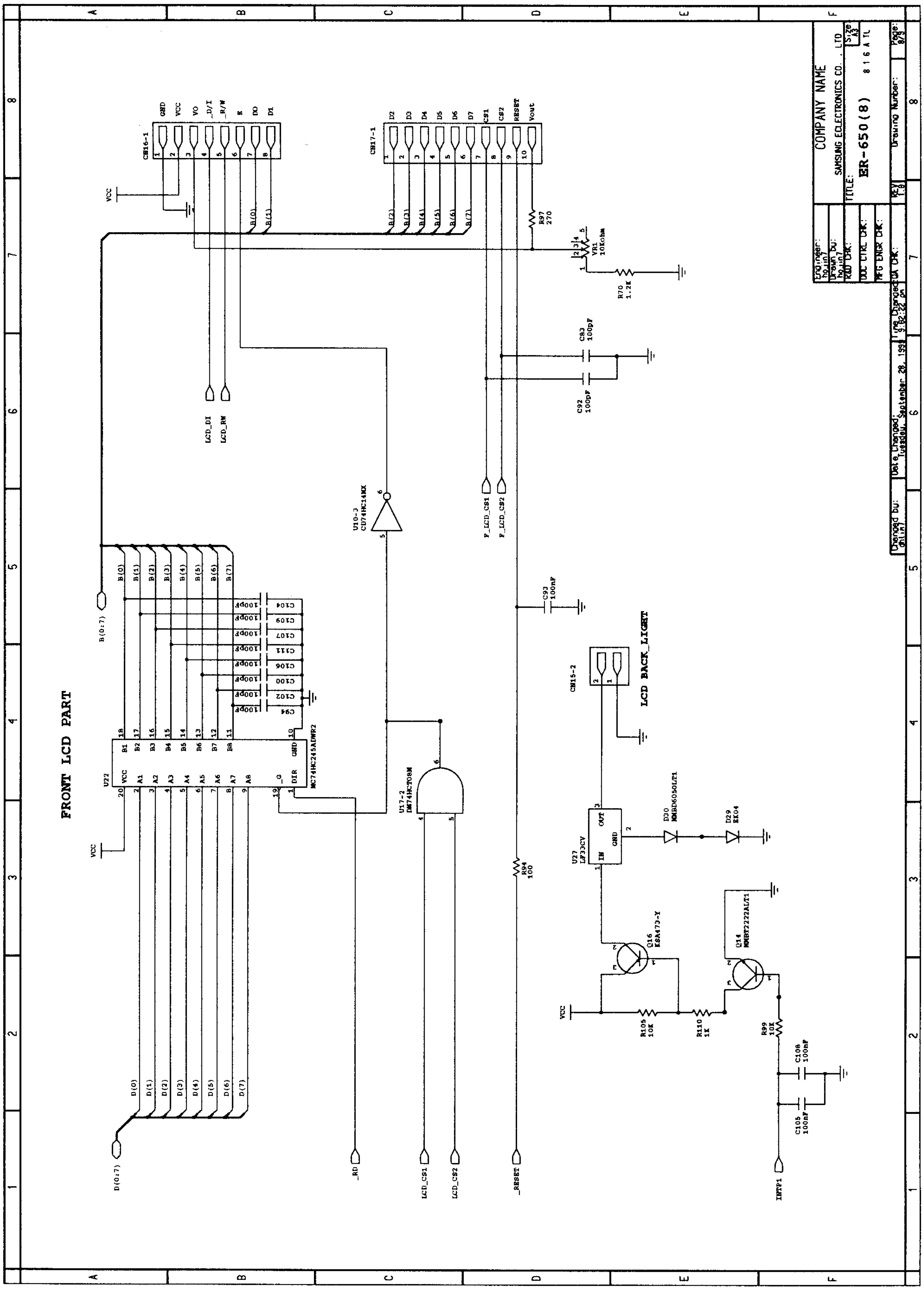
ER-650(3)
27C040
KM684000LP-7
KM681000LG-7
MC74HC138ADR2

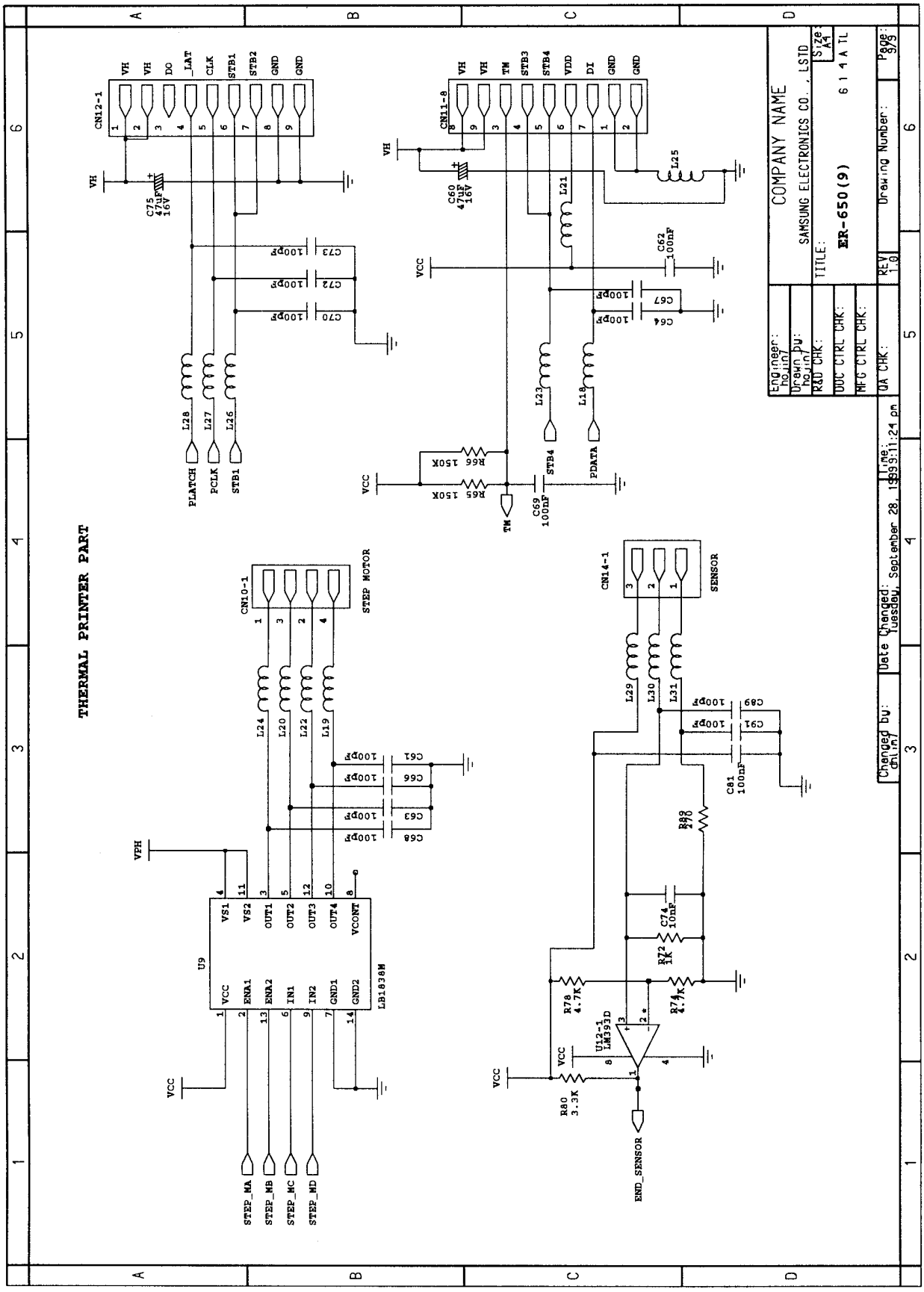

POWER FAIL
BUZZER
MEMORY SELECT
REAL TIME CLOCK CIRCUIT
COMPANY NAME
Address
City
TITLE:
ER-650(4)
Size A4
Page: 4/9
Engineer: KIM HOJIN
Drawn by: KIM HOJIN
REV 1.0


FISCAL PART
COMPANY NAME
SAMSUNG ELECTRONICS CO., LTD
TITLE:
ER-650(5)
Size: A4
Drawing Number:
Page: 5/9
REV: 1.0
Engineer: KIM HOJIN
Drawn by: KIM HOJIN
R&D CHK:
DOC CTRL CHK:
MFG CTRL CHK:
QA CHK:
Date Changed: Friday, September 17, 1999
Time: 5:25:29 pm
Changed by: dhlin7
CN13-2
U21
KS82C55A10CL
FIS_A17
FIS_A16
FIS_CS
FIS_12_5
RESET
PA(0:7)
PB(0:7)
PC(0:7)
D(0:7)
A(0:19)
RD
8255_CE
WR
VCC
24V
U26
GL7812
Q17
KSA473-Y
Q18
MMBT2222ALT1
Q19
MMBT2222ALT1
D12
MMBD6050LT1
D22
KK04
D26
KK04
ZD3
1N4735A
R87 4.7K
R100 4.7K
R108 4.7K
R112 10K
R115 1K
R116 1K
R117 1K
C85 470pF
C88 470pF
C101 100nF
C114 100nF
C115 100nF
C116 100uF 16V
C119 100nF
C120 100nF


DRAWER PART
CLERK KEY PART
REAR DISPLAY
(V.F.D.)
INTERFACE PART
RS-232 #1
RS232 #2,IRC
COMPANY NAME
SAMSUNG ELECTRONICS CO., LTD
ER-650(6)


KEY SCAN
KEY_RETURN
COMPANY NAME
SAMSUNG ELECTRONICS CO., LTD
TITLE:
ER-650(7)
Size: A4
6 1 4 A TL
REV: 1.0
Page: 1/9
Drawing Number:
Engineer:
Drawn by:
R&D CHK:
QUC CTRL CHK:
MFG CTRL CHK:
QA CHK:
Changed by:
Date Changed: Tuesday, September 28, 1998 8:35:52 pm
Line
CN19-1
CN20-1
CN18-8
U24 MC74HC138ADR2
U25 MC74HC138ADR2
U23 CD74HCT541M
FERRITE
MMBD6050LT1
D23 MMBD6050LT1
C110 100nF
C112 100nF
C113 100pF
C95 100nF
R113 4.7K
R95 10K
R111 10K
R106 10K
R102 10K
R98 10K
R96 10K
R101 10K
R107 10K
MODE
VCC
GND
RD
KBD_RD
A(0:19)
D(0:7)


FRONT LCD PART
LCD BACK LIGHT
COMPANY NAME
SAMSUNG ELECTRONICS CO., LTD
ER-650(8)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VH
VH
DO
_LAT
CLK
STB1
STB2
GND
GND
C75 470uF 16V
C73 100PF
C72 100PF
C70 100PF
L28
L27
L26
PLATCH
PCLK
STB1
CN11-8
VH
VH
TM
STB3
STB4
VDD
DI
GND
GND
C60 47uF 16V
L21
L25
C62 100nF
C67 100PF
C64 100PF
L23
L19
R66 150K
R65 150K
C69 100nF
STB4
PDATA
TM
CN10-1
STEP MOTOR
L24
L20
L22
L19
C61 100PF
C66 100PF
C63 100PF
C68 100PF
VFH
U9
VS1
VS2
OUT1
OUT2
OUT3
OUT4
VCONT
VCC
ENA1
ENA2
IN1
IN2
GND1
GND2
LB1838M
STEP_MA
STEP_MB
STEP_MC
STEP_MD
CN14-1
SENSOR
L29
L30
L31
C89 100PF
C91 100PF
C81 100nF
R88 47K
C74 10nF
R72 1K
R78 4.7K
R74 4.7K
U12-1 LM393D
R80 3.3K
END_SENSOR
COMPANY NAME
SAMSUNG ELECTRONICS CO., LSTD
TITLE:
ER-650(9)
Size A4
6 1 4 A TL
REV 1.0
Drawing Number:
Page 3/3
Engineer: hojin7
Drawn by: hojin7
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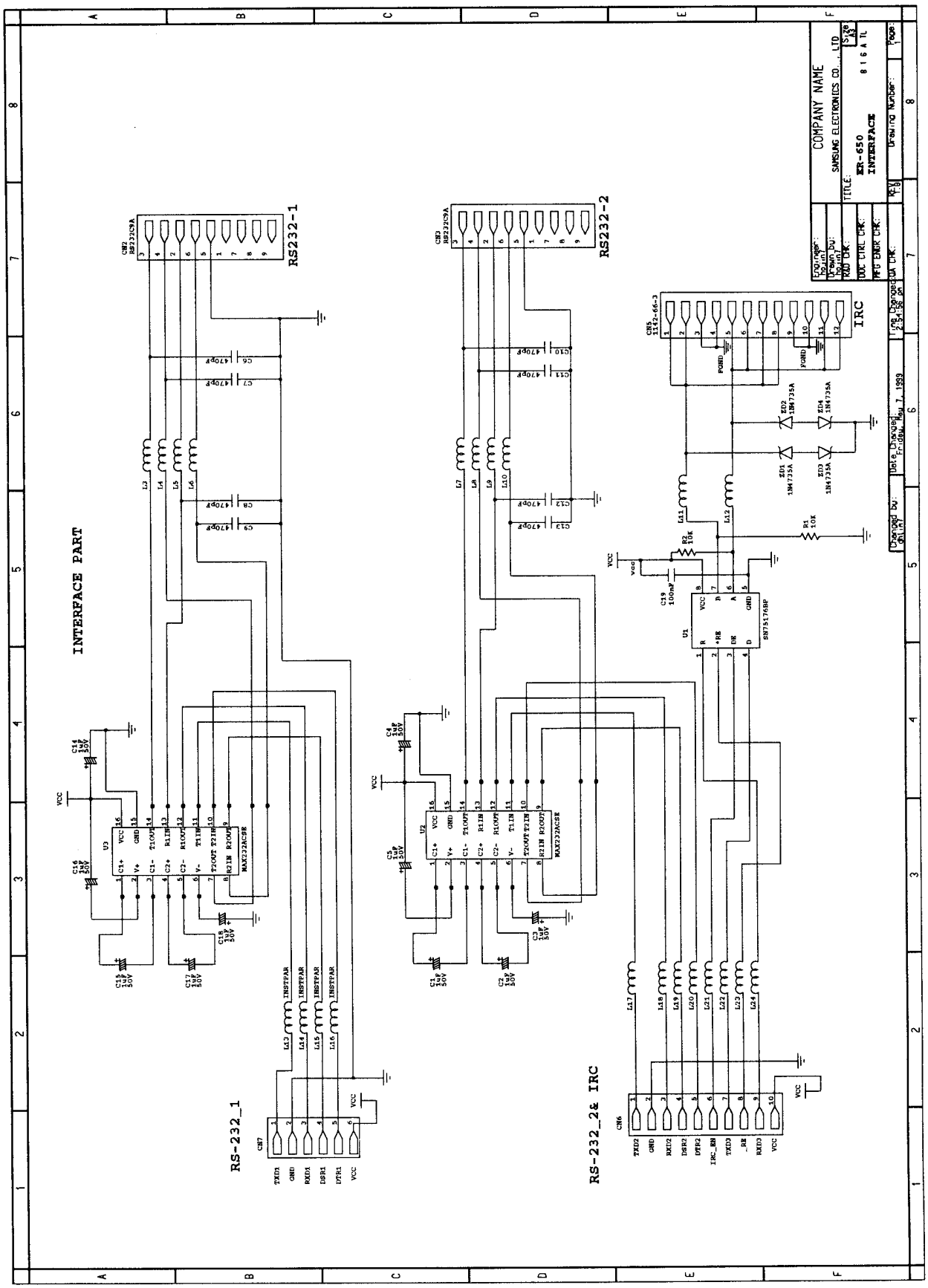
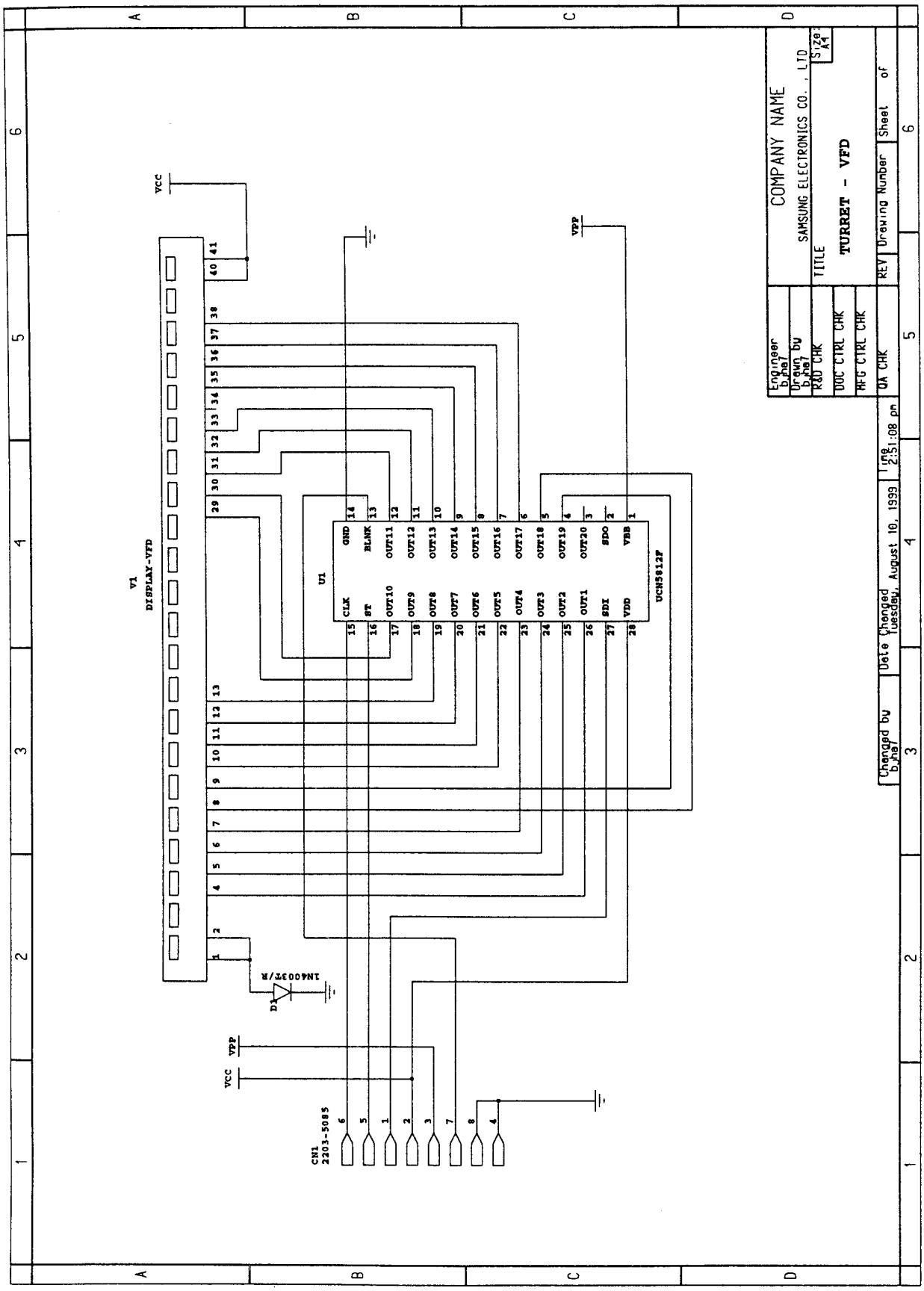
QUC CTRL CHK:
MFG CTRL CHK:
QA CHK:
Changed by: dhlim7
Date Changed: Tuesday, September 28, 1999 11:24 pm
Line:


INTERFACE PART
RS232-1
RS232-2
IRC
RS-232_1
RS-232_2& IRC
COMPANY NAME
SAMSUNG ELECTRONICS CO., LTD
TITLE:
ER-650
INTERFACE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SAMSUNG ELECTRONICS CO., LTD
TURRET - VFD
Engineer b_ha7
Drawn by b_ha7
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DOC CTRL CHK
MFG CTRL CHK
QA CHK
Changed by b_ha7
Date Changed Tuesday, August 10, 1999 2:51:08 pm
Size A4
REV
Drawing Number
Sheet of
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VPP
DISPLAY-VFD
V1
U1
UCN5812F
CLK
ST
OUT10
OUT9
OUT8
OUT7
OUT6
OUT5
OUT4
OUT3
OUT2
OUT1
GND
BLNK
OUT11
OUT12
OUT13
OUT14
OUT15
OUT16
OUT17
OUT18
OUT19
OUT20
SDO
SDI
VDD
VBB
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