ELECTRONIC CASH REGISTER

G356E

SERVICE MANUAL

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TITLE : G356E SERVICE　MANUAL

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1 Introduction

G356E consist of 5 block

(1)Main CPU board

Main CPU:M16C/80　Renesas device 16 bit　MPU

RAM　4M bit (battery back up)

EPROM　4M bit CMOS

(2) Front display unit

(3) Rear display unit

(4) Key board unit

(5) Power supply unit

2 Installation procedure

2.1 unpacking

The ECR packing method is shown fig 2-1.

Unpack the ECR an check that the following items are present.

(1) two rolls of thermal rolls 38mm

(2) one journal Take-up reel

(3) key set

(4) G356E owners manual

(5) Dust cover

If the ECR was received in a damaged carton, unpack and inspect for physical damage immediately, As described in table 2-1. If damage is found, contact the freight carrier and file a claim promptly,. If any parts are missing, contact JCM within one week of receiving the ECR.

Initial inspection

Perform the appearance and mechanical checks as listed on table 2-1.

The ECR cabinet can be detached by removing the three screw on the upper side of the cabinet.

The two screw is on the printer side. And other one is under the customer display unit.

It is concealed under a small cover.

Table 2-1　Check List

Inspection	check
Appearance	A. surface of cabinet , keyboard, and cash drawer for damage such as dents and scratches. B. display windows for damage such as cracks or scratches.
Mechanical	A. all electrical connections for proper seating B. keys in mode lock for proper operation. C. Cash drawer for smooth operation when released manually. See selection 2.3 for release details.

2.2 Emergency cash drawer release

In the unlikely event of a machine malfunction or a prolonged power failure, the model G356E is equipped with an emergency cash drawer release.

The release is located on the rear underside of the cash drawer. To manually release the drawer, carefully lift one side of the ECR with your left hand and push the release tab with the other.

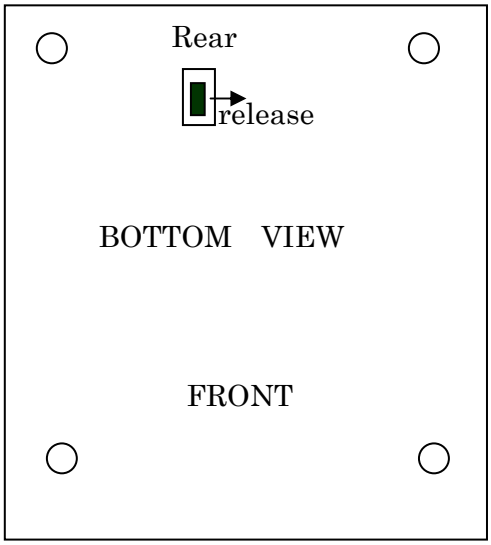


FIGURE 2-2

2.3 Preparation for use

Dip switch setting

Dip switch is located on the front right corner of the main PCB.

It is used for initialization and hardware configuration purposes.

1: ON initial reset

OFF normal operation

Initial reset procedure

(a) Initial reset

(1)set DIP sw1 to ON.

(2)Power ON.

Clears RAM work area only (current transaction)

Does not effect totals/counters or program memory.

Operation mode become “P” mode.

(b)RAM clear(all clear)

(1)Turn the mode lock key to the “P”mode.

(2)Set DIP sw1 to ON

(3)Power ON while depressing the tenkey ”1”.

(4)All clear is displayed.

Clears all Totals/counters and user programmed memory. Loads default operation program

After all clear operation, you must preset the date and time in “X” mode.
The machine does not work without setting date and time.

Diagnostics

(1) turn the mode lock key to “P” position, or assign to “P” mode(4---key).

(2) Enter xxxxxxxxx(9digit) --- #/NS

555555555-----#/NS automatic receipt issue at 3 minutes interval.

555555551-----#/NS automatic receipt issue at 5 second interval without cutter.

555555552-----#/NS automatic receipt issue at 5 seconds interval with cutter.

666666666-----#/NS communication port loop back test

check the com. Port from 1 to 4.

Following result message is printed

Error2 RTS---CTS defect

Error4 RxD ---TxD defect

777777777-----#/NS automatic printing test

All characters are printed on receipt and journal automatically.

You can do a check of printing quality.

It’s terminated by depressing “CL” key

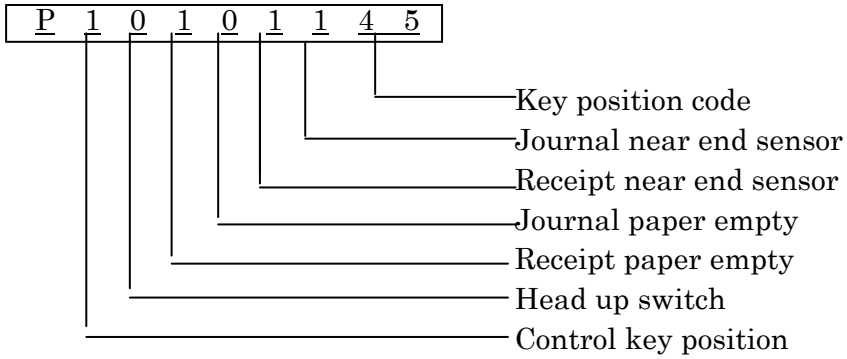
888888888-----#/NS key board test

the display will show the each key s position number on the right side 2 digit

various signal status will be showed each digit on the display.

It’s terminated by depressing “CASH” key.

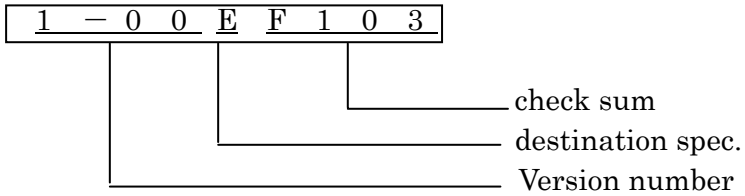
For example(display)



999999999-----#/NS version and check sum display

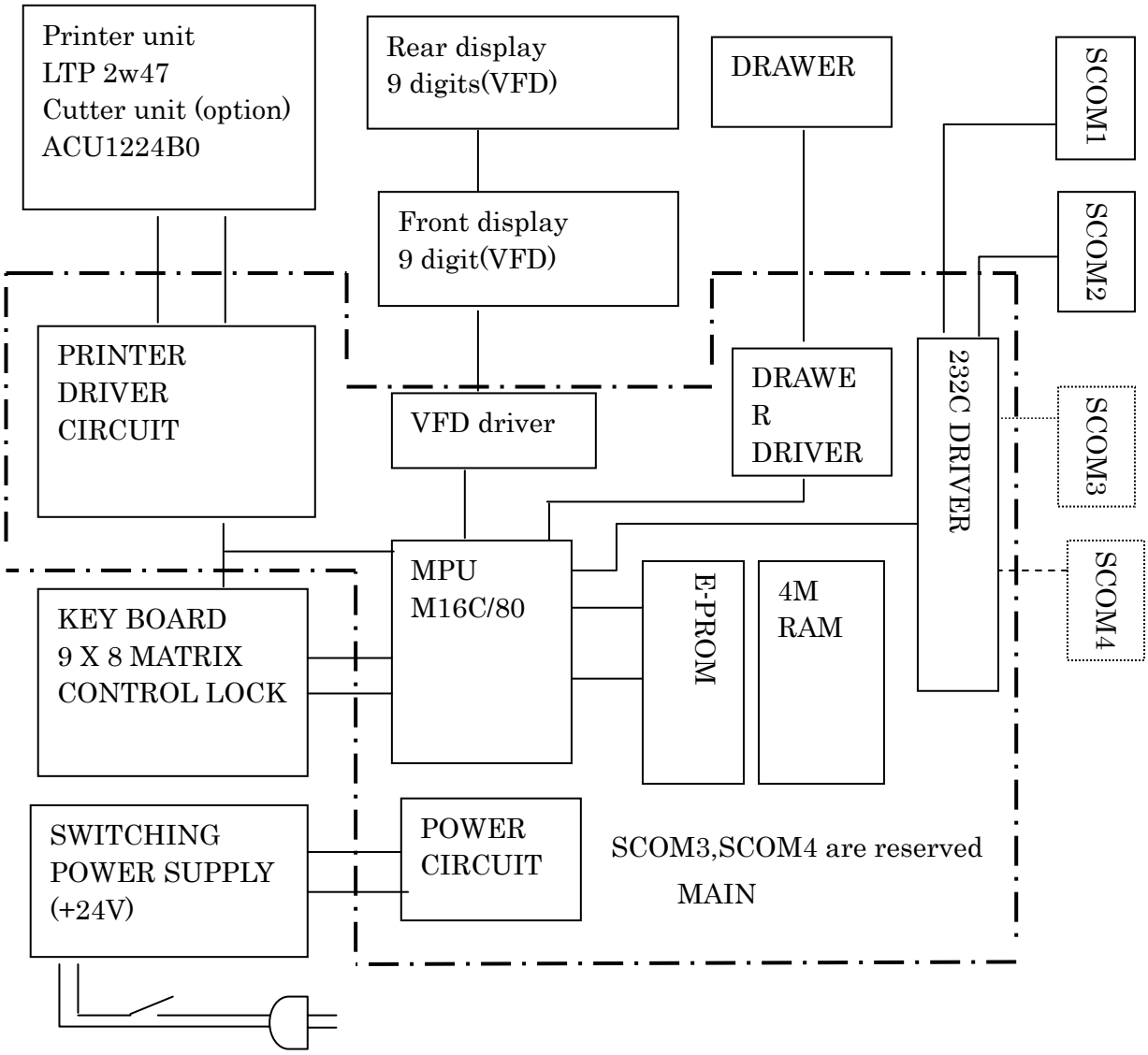
The software version number and checksum of EP-ROM will displayed.

For example(display)



3 Theory of operation

3.1 system block diagram



The ECR circuitry can be broken down into six major sections: MPU, Memory, Display, Key board, Printer, and power supply.
The heart of this system consists of a M16C/80, Sixteen bit microprocessor implementing L.S.I, high speed, and low power consumption.
Standard memory includes a 512k x 8 bit EPROM and a 512k x 8 bit static RAM chip.

3.2 circuit description

3.2.1 power circuit

POWER VOLTAGE (+5V,-30V,V_{EE},,VF1,VF2) REGULATOR CIRCUIT

After passing through the switching regulator. There is a +24V DC power via JP1.

This power supply circuit employs fly back converter type switching regulator system.

At the initial condition, as the level of point "I" is 0V, PQ4 keeps OFF condition.

When +24V begins to rise up after power ON, the level of point "H" rises up and PQ1 turns ON.

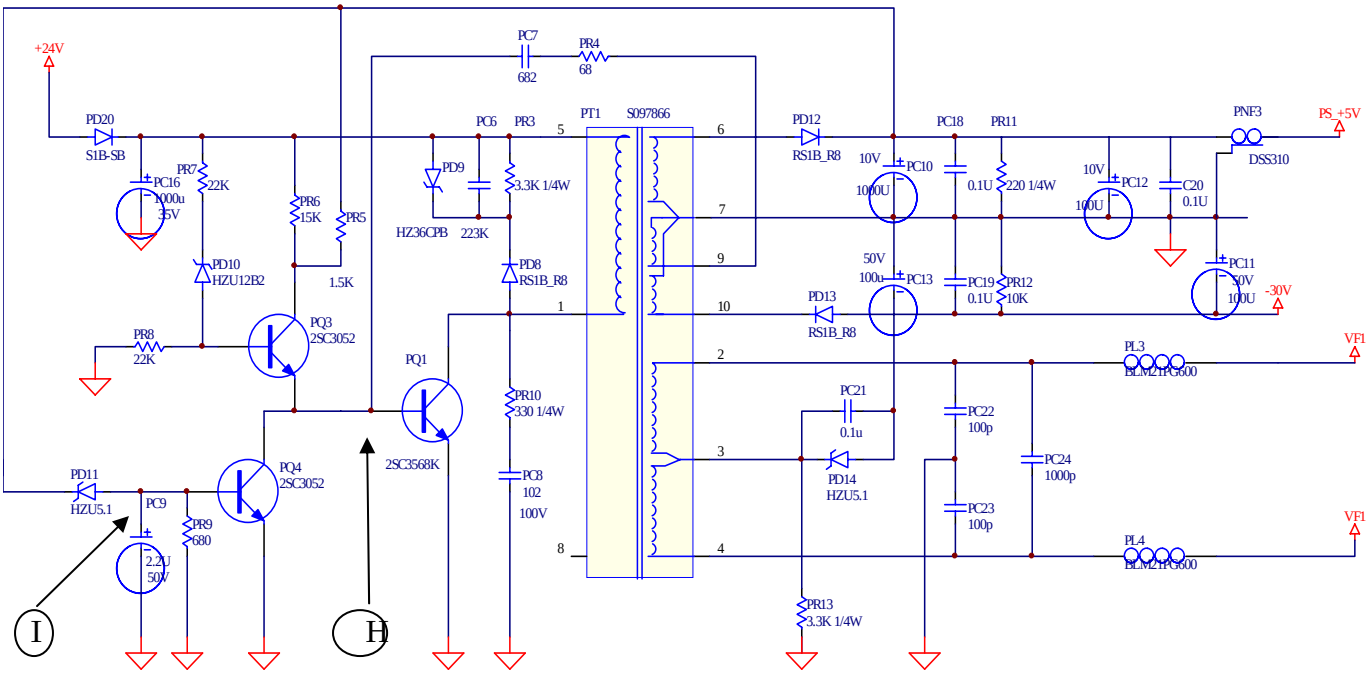
And then the power is applied to primary side of pulse transformer (PT1).

When the power is applied to primary side of the PT1 , the level of point "I" (secondary side of the PT1) rises up, and if it is exceed the zenner voltage of PD11(+5V), PQ4 turns on and the level of point "H" becomes 0V.

Therefore PQ1 is in OFF condition and supplement to primary input of PT1 is cut off, with that the level of point "I" becomes initial condition again and PQ1 turns ON.

Thus , switching the supplement of power to primary side of PT1, secondary output(+5V,-30V,VF1,Vf2) is stable.

The +24V DC pass through u1(LM2575S-5.0 voltage regulator)become Vcc-c steady.



3.2.2 KEY BOARD CIRCUIT

Input and output signal for key board scanning are passing through J1,J2
The output signals from output port (P110-P113) of U17 are encoded signals.
By passing through U25,U26(74HC138), they are decoded to key scan signals. And they are applied to key matrix via J1.

When a certain key is depressed, one of decoded signal is applied to buffer(U20:74HC245) via J2. Thus U17(MPU) recognizes which key is depressed and executes key's specific operation.

The scanning signals are also used for digit indicator signals for display tube as well.

The scanning signal from U26 –Y0 scans control lines KR0-KR4 and they are applied to U17(MPU) as control signals.

According to the status of control signals, U17(MPU) executes specific operation.

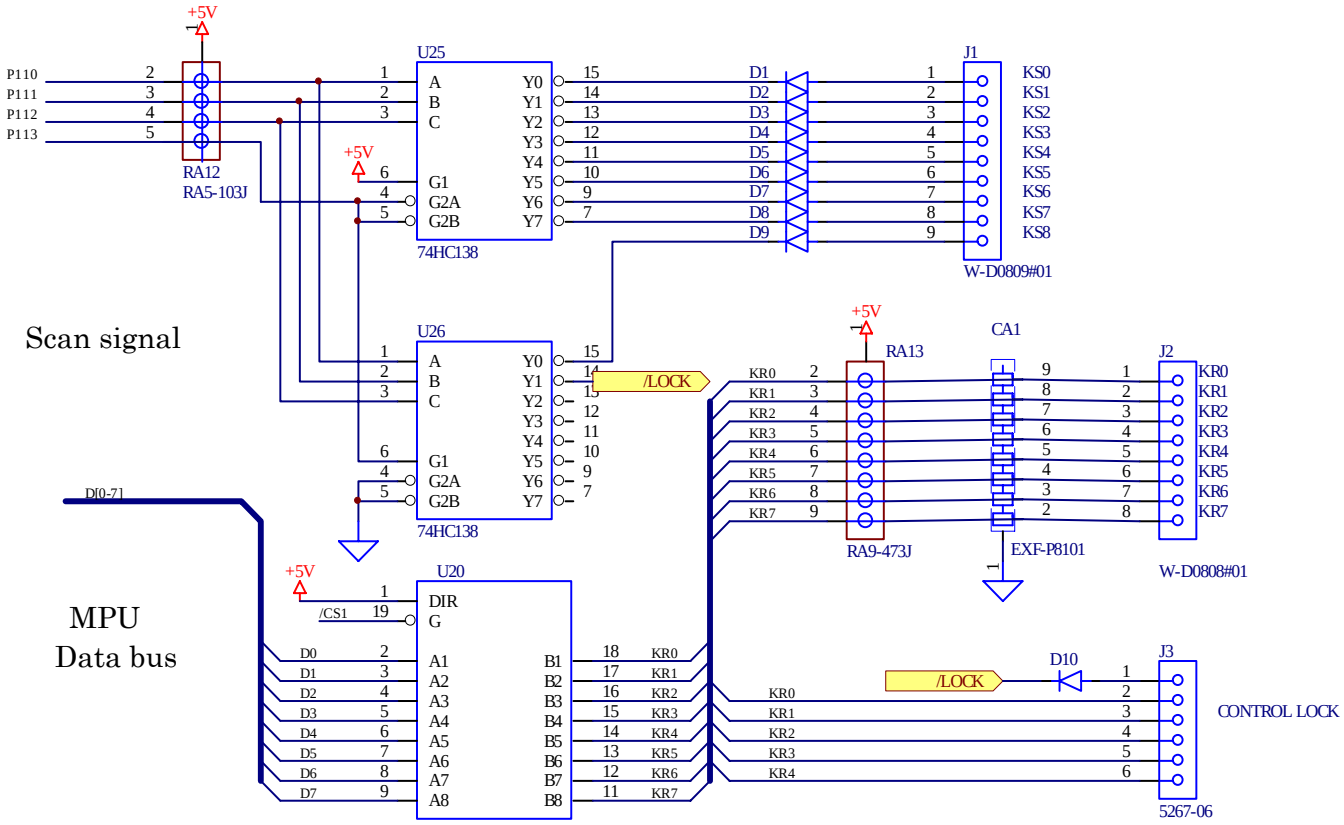
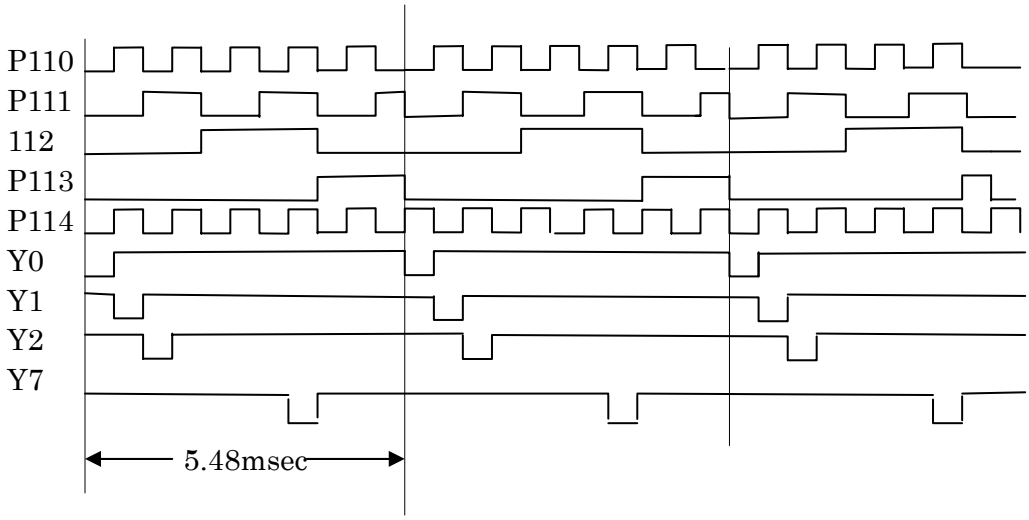


Fig 3-1 key board circuit

Timing chart of key scan signals

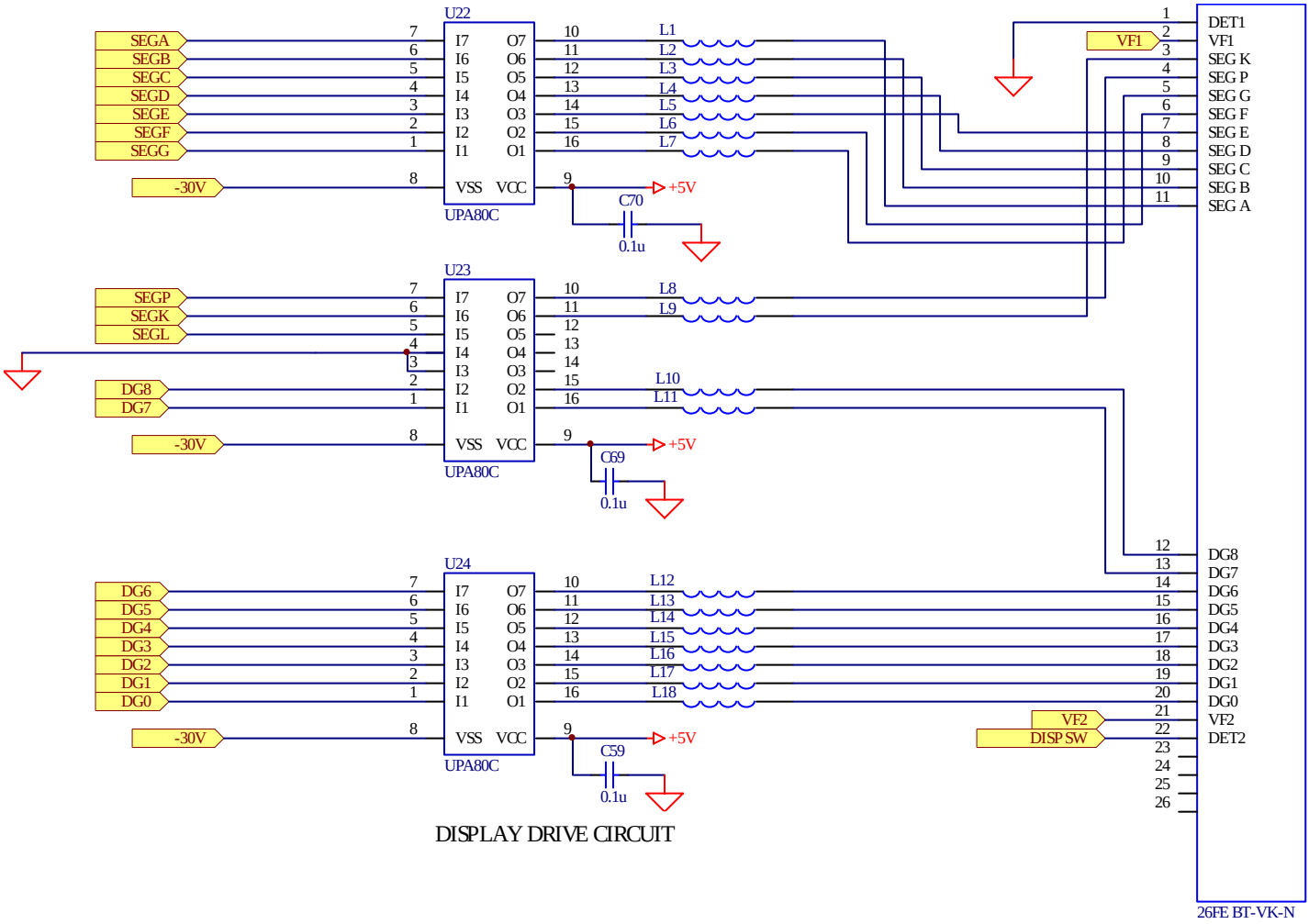


3.2.3. display circuit

Display signals are applied to the display circuit board via J4..

The display signals for digit indication are also used for key scan signals which are decoded At U25,U26(VHC138). The decoded signals from U25,U26 are amplified at U23,U24(driver:uPA80C) and applied to the display tube on display circuit board.

The display signals for segment indication are output from port of CPU(P150-P157,P76,P77). They are amplified at U22,U23 (driver:uPA80C) and applied to the display tube on display circuit board.



DISPLAY DRIVE CIRCUIT

3.2.4. printer drive circuit

Printer drive circuit consists of CPU(U17),U11,U12 and U9,U10 (driver), U13 (comparator)

Usually, P142 outputs "L" level. When one of department key is depressed, CPU outputs printer power

Signal "H"(PR_PWR) from output port P142 of U17. Q3and Q4 turn ON. Thus the thermal head On the printer mechanism is activated.

Serial print data input from "PR_DAT" is transferred to the shift register synchronously with the Clock "PR_CLK", then stored in the latch register at the timing of the latch "PR_/LA" signal.

The heat elements which correspond to the latched print data are activated while each gate is on.

The gates are on while each head activation signal (DST1 –DST4) is low.

3.2.5. Comparator circuit

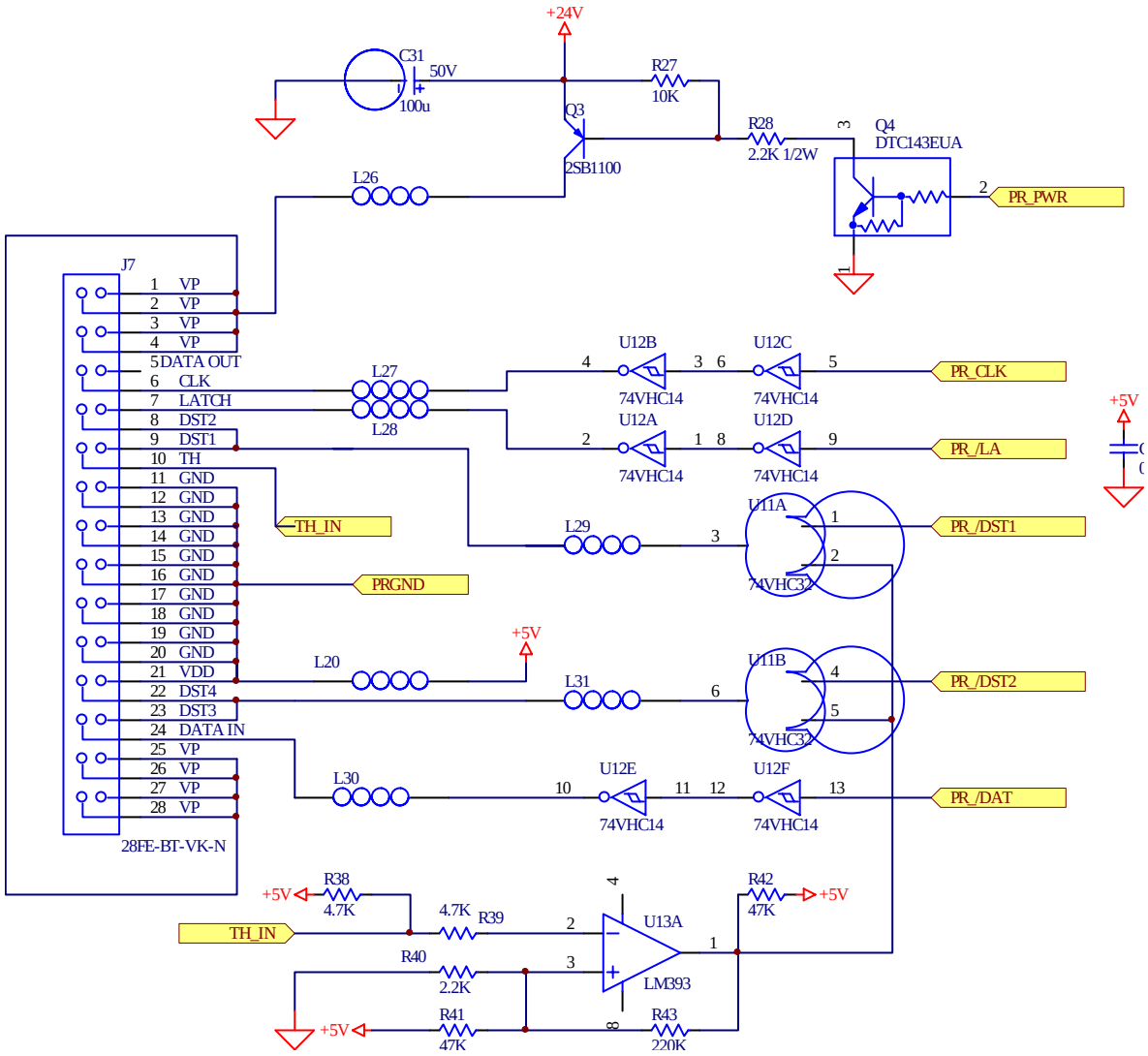
The thermal head has a thermistor for detect the head temperature.

The level of the "TH_IN" is changed according to head temperature.

When head is heated too high temperature, the output level of comparator goes to "H" level.

Thus thermal head will be non-activity.

This status is released when the head become cool.



3.2.6 Paper near end sensor circuit

This circuit detects paper near end of receipt and journal individually.

The sensor is consist of a LED and a photo transistor.

It attached under the bottom base. There are two windows in order to sense the roll paper,

The light from LED reflect at the paper and be returned to the photo transistor.

Thus sensor output level become “H”(about 4V)

If paper roll slip out from holder, the light from LED cannot reflect, so the photo transistor cannot receive the return light. Thus sensor output level become “L”(about 0.3V)

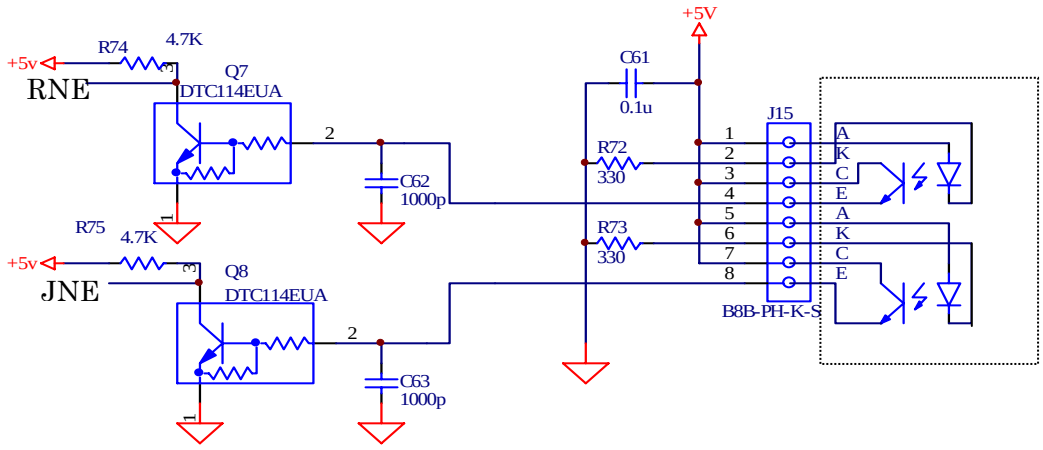
There is transistor on the CPU board in order to amplify the inputted signal.

So the inputted signal is not stable, that Q7,Q8 amplify the signal to “0V” or “5V”.

If paper roll slip out from holder, JNEND or RNEND will become to 5V.

When paper roll is on the holder, JNEND or RNEND is “0V”.

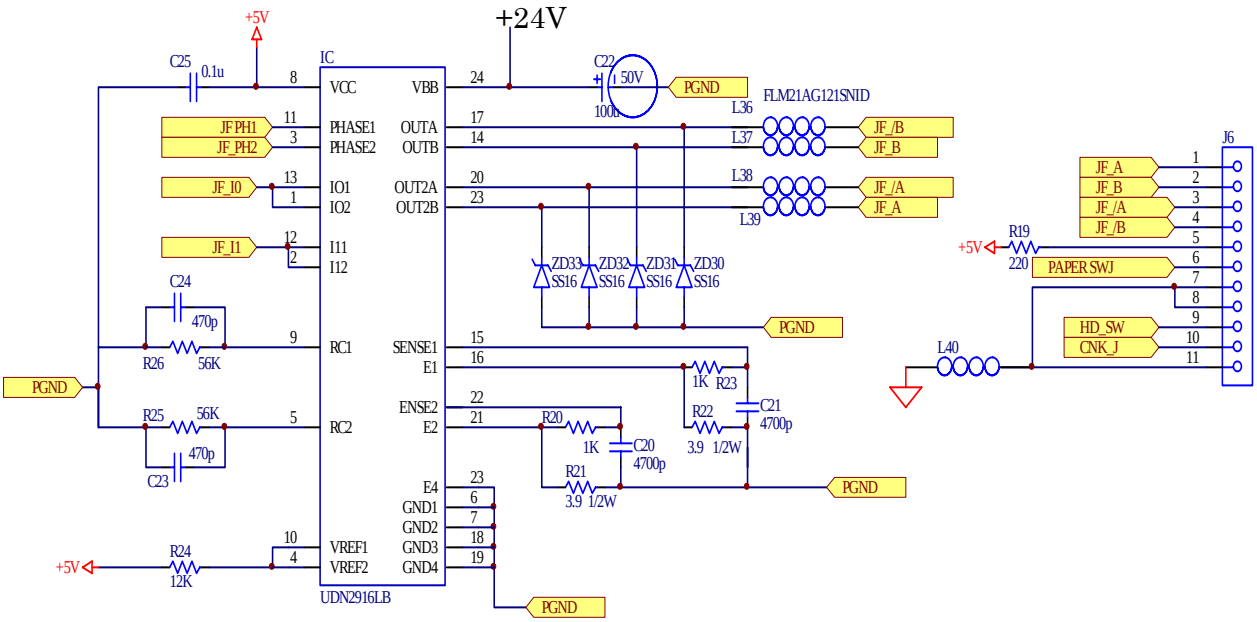
R72,R73 limit the current to supply to LED.



PAPER NEAR END DETECT CIRCUIT

3.2.7. Motor drive circuit(paper feed motor)

After PF_I0,PF_I1 set to “L” level, the signal PF_PH1,PF_PH2 are sequentially changed for to feed the receipt paper. Similarly after JF_I0,JF_I1 set to “L” level, the signal JF_PH1, JF_PH2 are sequentially changed for to feed the journal paper.



3.2.8 cutter motor drive circuit

Cutter unit have a motor and sensor switch(CUT_S).

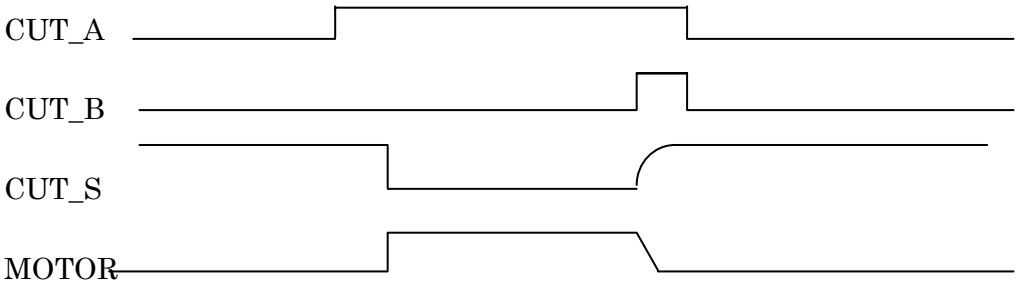
“CUT A” is used as motor ON signal.

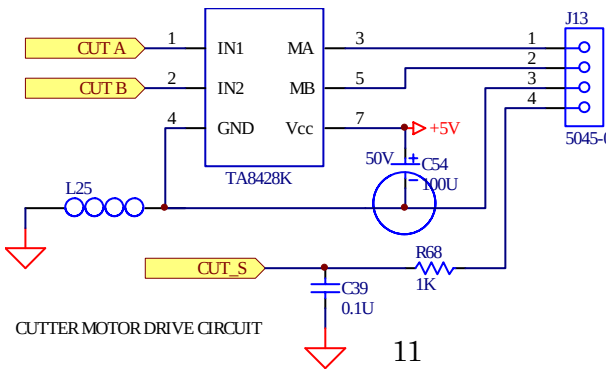
“CUT B” is used as motor brake signal.

When receipt is issued, “CUT A” becomes to “H” then cutter motor begin to cut the receipt paper. Sensor switch detects the cutter position. After motor begin to cut the paper, switch becomes ON (CUT_S=”L”) until cutting is complet. When “CUT_S” goes to “H”, the machine brakes the cutter motor

by make “CUT_B” to “H”. The brake time is about 100msec.

Timing chart is following.



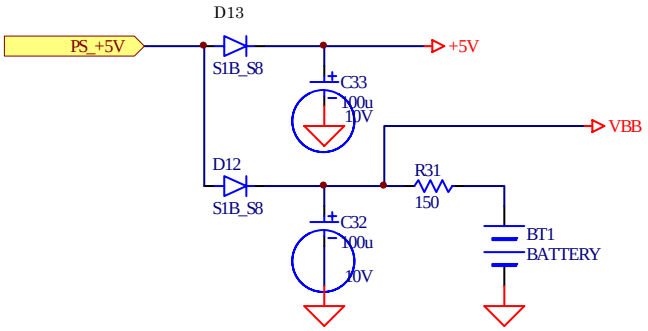


CUTTER MOTOR DRIVE CIRCUIT

3.2.9. Battery charge circuit

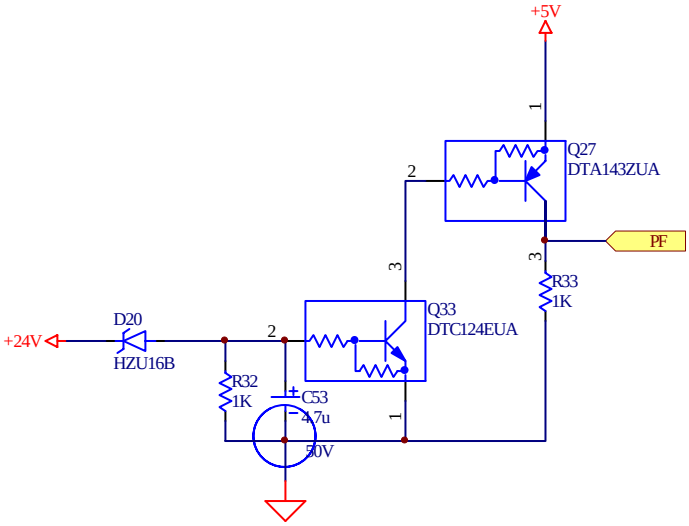
When the power is turn on, D12 and D13 turn on, thus +5V is applied to VBB line and Recharge current is applied to the rechargeable battery via R31.

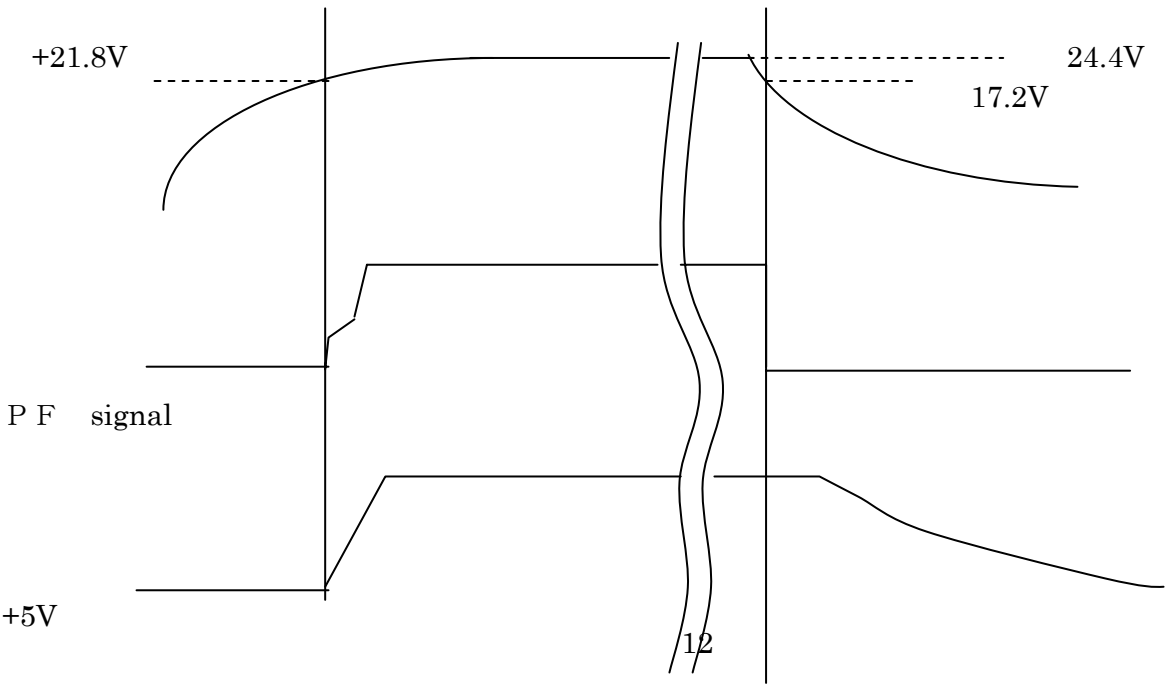
When the power is turned off, D12 and D13 turned off, thus battery output is applied to VBB. When the power is turned off, battery output backs up the memory contents of RAM chip and CPU internal RAM.



3.2.10. PF circuit

When the power is off, the PF is “L”. But when the power is on, the Q27,Q33 are turn on the PF is “H”.





PF signal　timing chart

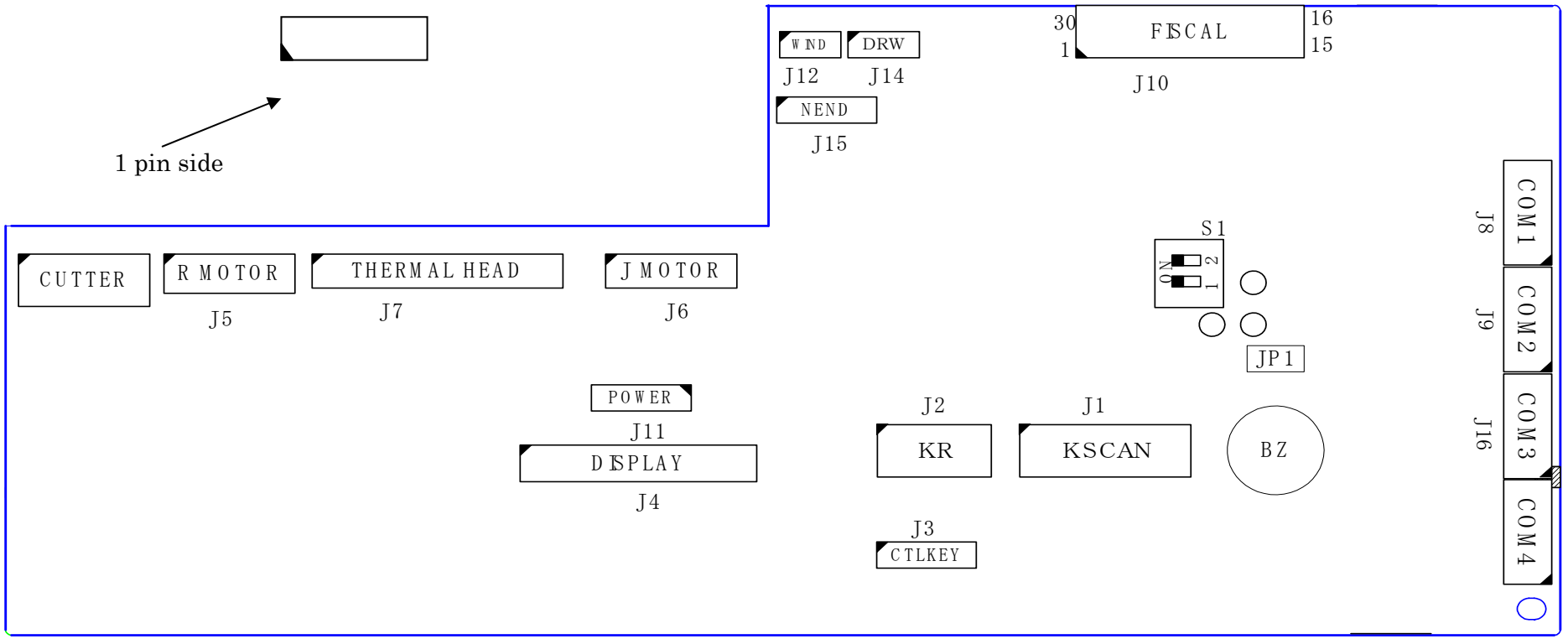
4 Trouble shooting

Phenomenon	condition	Considerable cause	Check point/method	Remedy
Machine doesn't work at all	Printer doesn't work after power on	AC power is not supplied AC power is not applied to switching power supply.	Is AC power plug connected to outlet? Is outlet voltage normal? Is fuse (primary side of switching Power supply? Is 24V output from secondary side of switching power supply?	Connect the plug to outlet. Replace the fuse Replace the switching power supply.
		Is DC power voltage normal? +24V is not generated +5V is not generated.	Does collector of PQ1 output oscillation wave ? Is PD11 defect?	Replace PQ1 Replace PD11 Replace converter transformer.
		Crystal is not oscillating.	Check wave form pin 20 and Pin 22 of U17(frequency 20MHz)	Replace crystal(x1) Replace U17
		The levels of PF lines don't become "H"	Is D20 defect? Are	Replace D20 Replace U27 and U33
Date/time data fails.	Date doesn't increment. Date /time data doesn't increment correctly	Crystal(x2:32.768kHz) is not oscillating properly.	Check wave form of pin 17 and pin 18 of U17(frequency:32.768kHz)	Replace crystal(X2)
Buzzer doesn't sound		Trouble in buzzer circuit.	When pin 8(P146)of U17 output "H", buzzer is driven. Is Q1 defect?.	Replace the buzzer. Replace Q1
Drawer is not opened	Drawer solenoid doesn't operate.	Trouble in drawer circuit	When pin 29(P145)of U17 output "H", drawer solenoid is driven. Is Q6 defect?.	Replace Q6
Abnormal print out	Printed character is Not desired.	The level of timing signal is not stable. Printer is defect.	Is the signal level of pin 1(U13) stable?	Replace U13

PHENOMENON	CONDITION	CONSIDERABLE CAUSE	CHECK POINT/ METHOD	REMEDY
Printer doesn't work at all	Printer motor doesn't rotate	Is the head unit over heat?	When the head is over heated, printing is stop.	Wait for head becomes cool.
		Stepping signal does not generated.	Is the stepping signal output from P13X(U17)? Is the stepping signal output from U9 or U10?	Replace U17 Replace U9 or U10
Printer feed the paper without printing	Printer motor does work correctly	DC power for print head unit is not output	When pin12(P142) of U17 outputs "H" , the head become active.	Replace Q3,Q4.
Abnormal display	Display doesn't light	The FPC for CPU and FD units connection is broken	Check conduction of FPC.	Replace FPC
		Display voltage(-30v) is not generated	Is PD13 defect?	Replace PD13 Replace converter transformer
		Filament voltage (VF1,VF2) is not generated.	Check the voltage between VF1 and VF2(tolerance3.46Vrms)	Replace converter transformer
		Center tap voltage of filament is not correct.	Is the cathode voltage of PD14-23.5V?	Replace PD14.
		Display tube is broken.	Is the display tube cracked?	Replace the display tube
	Some ghost are displayed.	Cut off voltage is generate from PD21	Is cathode voltage of PD14 –23.5V?	Replace PD14
Specific digit is not lit correctly	Key input correct	Trouble in FD driver.	Check the condition of the FPC	Replace FPC Replace U23,U24
Specific segment is not lit correctly	Display data and time data are correct.	Trouble in segment drive.	Check the condition of the FPC.	Replace FPC Replace U22
Key input cannot be accepted	Specific key input cannot be accepted.	2 key are depressed together	Check whethe r any key keeps depressing.	Replace key board unit.
		Control mode is lock position	When control lock is released, lock signal is applied to KR lines(KR0-KR4)	Replace D10 Check conduction of the control key.
		Diodes (D1-D9) are defect.	Check the diode on the output line of specific key's key matrix.	Check diode on key Matrix output.

		Key depressing section is defect.		Replace key depressing section

5 CONNECTOR LAYOUT OF CPU BOARD



5.1 CONNECTOR TABLE

J1 KEY SCAN

Pin	Signal
1	KS0
2	KS1
3	KS2
4	KS3
5	KS4
6	KS5
7	KS6
8	KS7
9	KS8

J2 key return

Pin	signal
1	KR0
2	KR1
3	KR2
4	KR3
5	KR4
6	KR5
7	KR6
8	KR7

J4 DISPLAY

Pin	signal	pin	Signal
1	DET1	14	DG 6
2	VF1	15	DG 5
3	SEG K	16	DG 4
4	SEG P	17	DG 3
5	SEG G	18	DG 2
6	SEG F	19	DG 1
7	SEG E	20	DG 0
8	SEG D	21	VF2
9	SEG C	22	DET2
10	SEG B	23	NC
11	SEG A	24	NC
12	DG 8	25	NC
13	DG 7	26	NC

J3 CTL LOCK

Pin	signal
1	SCAN
2	KR0(R)
3	KR1(X)
4	KR2(Z)
5	KR3(P)
6	KR4

J5 R motor

Pin	Signal
1	A
2	B
3	/A
4	/B
5	/PS
6	PS
7	GND
8	NC
9	NC
10	CNN_R
11	GND

J6 J motor

Pin	Signal
1	A
2	B
3	/A
4	/B
5	/PS
6	PS
7	GND
8	NC
9	NC
10	CNN_J
11	GND

J7 thermal head

Pin	signal	pin	signal
1	VP	15	PGND
2	VP	16	PGND
3	VP	17	PGND
4	VP	18	PGND
5	DATOUT	19	PGND
6	CLK	20	PGND
7	LATCH	21	VCC
8	DST2	22	DST4
9	DST1	23	DST3
10	TH	24	DATIN
11	PGND	25	VP
12	PGND	26	VP
13	PGND	27	VP
14	PGND	28	VP

J8 SCOM1

Pin	Signal
1	Vcc
2	CTS
3	RTS
4	RxD
5	TxD
6	GND

J9 SCOM2

Pin	Signal
1	Vcc
2	CTS
3	RTS
4	RxD
5	TxD
6	GND

J11 POWER

pin	Signal
1	+24V
2	+24V
3	GND
4	GND

J12 Wind

pin	Signal
1	(+)
2	(−)

J13 cutter

pin	signal
1	CUT A
2	CUT B
3	GND
4	CUT S

J14 drawer

pin	signal
1	SOL+
2	SOL−
3	GND
4	SW

J15 near end

pin	signal
1	A
2	K
3	C
4	E
5	A
6	K
7	C
8	E

J16 SCOM3

Pin	Signal
1	Vcc
2	CTS
3	RTS
4	RxD
5	TxD
6	GND

J17 SCOM4

Pin	Signal
1	Vcc
2	CTS
3	RTS
4	RxD
5	TxD
6	GND

5.2 Standard inner cable pin assignment

SCOM1　WI-906 (for DOS/V pin assign hand scanner)

J8,J9,J16,J17	signal		Dsub 9pin(male)	Signal
1	Vcc		9	Vcc
2	CTS		8	CTS
3	RTS		7	RTS
4	RxD		2	RxD
5	TxD		3	TxD
6	GND		5	GND

SCOM2 WI-907 (for DOS/V PC communication)

J8,J9,J16,J17	signal		Dsub 9pin(male)	Signal
1	Vcc			N.C
2	CTS		8	CTS
3	RTS		7	RTS
4	RxD		2	RxD
5	TxD		3	TxD
6	GND		5	GND

It can be connected with scanner which have DOS/V pin assign connector directly.

5.3 Optional cable pin assignment

WI-837N(for GP965 slip printer)

J8,J9,J16,J17	Signal		Dsub 9pin(female)	Signal
1	Vcc		6	Vcc
2	CTS		5	CTS
3	RTS		4	RTS
4	RxD		3	RxD
5	TxD		2	TxD
6	GND		1	GND

Inner cable pin assign for hand scanner ZE84RMD4JK(Panasonic)
Wi-908

J8,J9,J16,J17	Signal		Dsub 9pin(female)	Signal
1	Vcc		9	Vcc
2	CTS		1	CTS
3	RTS		4	RTS
4	RxD		2	RxD
5	TxD		3	TxD
6	GND		7	GND

Interface cable for between G356 and the hand scanner ZE84RMD4JK(Panasonic)
WI-1370

SCOM side(female)	Signal		Dsub 9pin(female)	Signal
9	Vcc		9	Vcc
8	CTS		1	CTS
7	RTS		4	RTS
2	RxD		2	RxD
3	TxD		3	TxD
5	GND		7	GND

Interface cable for between G356 and the GP965
WI-1369

SCOM side(female)	Signal		Dsub 9pin(female)	Signal

9	Vcc		6	Vcc
8	CTS		5	CTS
7	RTS		4	RTS
2	RxD		3	RxD
3	TxD		2	TxD
5	GND		1	GND

Application case

1. G356-----DOS/V scanner
   It can be connected directly.
2. G356-----Panasonic scanner (ZE84RMD4JK)
   Case1: Please exchange the inner cable WI-908 with WI-906.
   WI-908+SCANNER
   Case2: please use the interface cable WI-1370.
   WI-906+WI-1370
3. G356-----DOS/V PC
   It can be connected directly by the cross cable.
4. G356-----GP965
   Case 1: Please exchange the inner cable WI-907 with WI-837N
   WI-837N+ GP965
   Case2 : please use the interface cable WI-1369.
   WI-906+WI-1369 (SCOM1)
   or WI-907+WI-1369 (SCOM2)

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6 Appendix

Number of PLU & PB actually maximum occupation

PLU 12 char.	9269
PLU 20 char.	7657
PLU 15 char.	7657
PB	7657

Paper near end level

Point	Paper yes	No paper
J15-8	4.71	0.320
JNEND	9.3mV	5.02
J15-4	4.13	180.9mV
RNEND	10.7mV	5.02

HARD RESET

procedure

(1) remove the cabinet
(2) DIP SW1 ON
(3) Power ON
(4) Short the JP1 on the CPU board.
(5) After few second display will light.
(6) If “E006” appear on the display, off the power and execute the “ALL CLEAR”.