ICOM

SERVICE MANUAL

GPS RECEIVER

GP-22

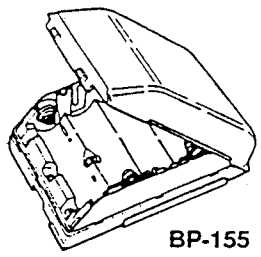
Icom Inc.

When you mention the serial number, write down all 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

TABLE OF CONTENS

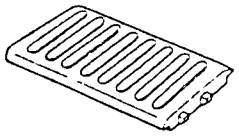
OPTIONAL ACCESSORY

Note: These optional accessories are available through sales route



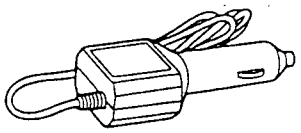
BP-155

Battery Case for
AA Alkaline Batteries



BP-154

Rechargeable Nickel
Hydride Battery Pack



CP-15/CP-16

Battery Charger

GPS TECHNOLOGY

GPS Satellites

GPS satellites are orbiting the earth at an altitude of 20,000 km (12,427 miles) by the U.S. Department of Defense.
GPS is the system that receivers on the ground, on the sea or in the air can receive signals from 3–4 satellites to calculate an accurate position (latitude, longitude, altitude).

When all the 24 satellites are launched and configurated on 6 orbits (each orbit has 4 satellites), this system will be fully implemented. Measurement may not be done all the time, because enough satellites have not been orbiting yet and because GPS satellites are orbiting satellites. When 24 satellites are launched, measurement will be done anytime.
GPS signal will not be received if there is an object between the satellites and a receiving antenna because GPS signal has a similar quality to light.

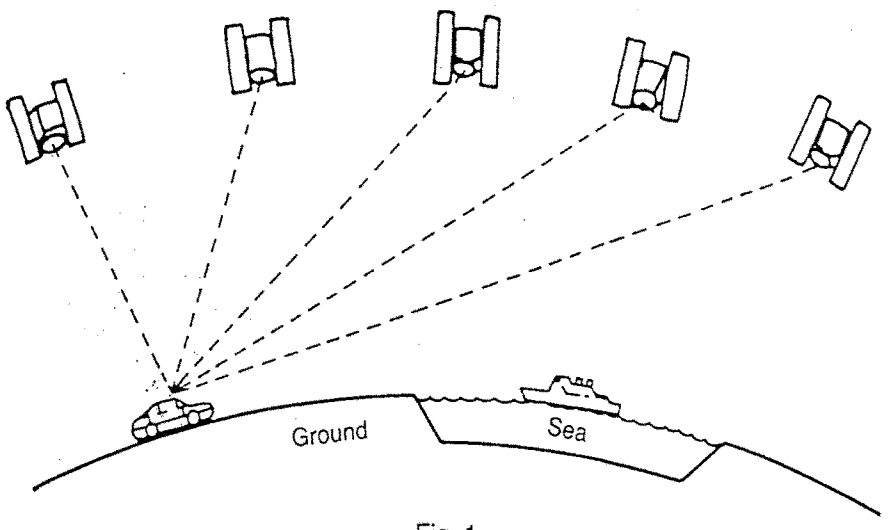
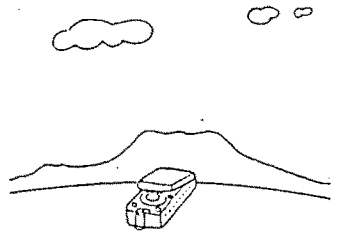


Fig. 1

*GPS satellites are operated and controled by the U.S. Department of Defense. Position Accuracy may be changed. Eighteen satellites have been operating since August of 1992.

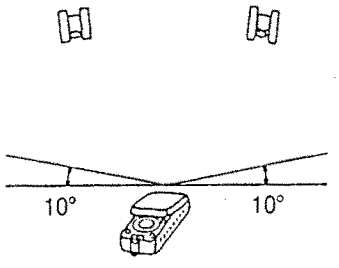
- Depending on the configuration of the GPS satellites, the displayed data may not be the same as actual latitude, longitude and altitude. [Altitude may differ ±0.1 M (150 m).]

Measurement



A good place for measurement

An open-air place where you can see all over the sky with no obstacles.
(Measurement can not be done indoors.)
Measurement may not be done where there is a strong electric wave near a broadcasting antenna.



Direction of Antenna

Place the antenna horizontally.
This unit can receive signals from satellites above an angle of 10 degrees elevation.

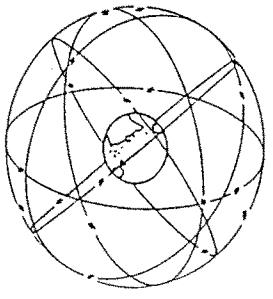


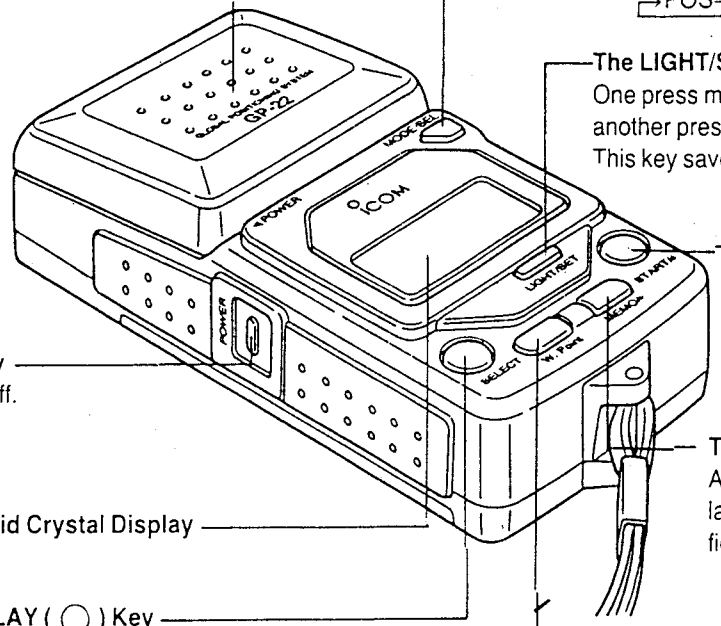
Fig. 2

Notice of Measurement Time

Measurement can not be done for some period of time a day because not enough GPS satellites are orbiting to calculate all the time.
Measurement impossible time changes always because GPS satellites are orbiting.

LOCATION OF CONTROLS

Operation



Antenna
Receives the electric signals from satellites.

The MODE ( ) Key
Each press changes operation mode as bellow.
→POS→NAV→CONF→PROG→

The LIGHT/SET ( ) Key
One press makes the LCD brighter (screen light on), another press makes it darker (screen light off). This key saves a numerical value.

The START ( ) Key
Accesses for starting calculation of a present position or entering a numerical value of the latitude/ longitude.

The POWER ( ) Key
Turns the power on and off.

The MEMO ( ) Key
Accesses entering the calculated data of latitude and longitude or choosing a field for a numerical value.

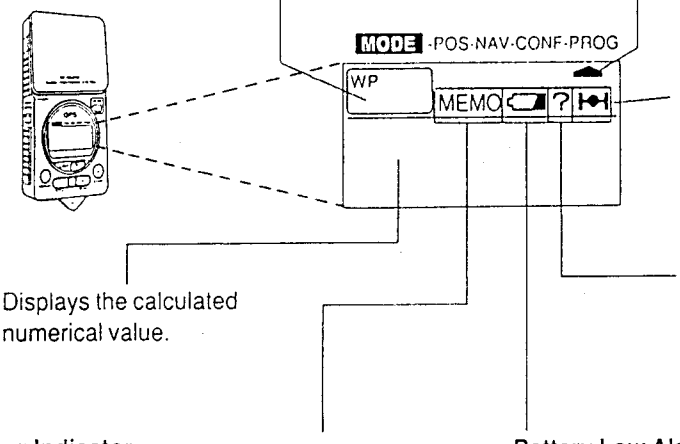
The Liquid Crystal Display

The DISPLAY ( ) Key
Swiches the LCD screen.

The W. POINT ( ) Key
Selects WP number which saves the data of latitude/longitude.

Fig. 3

Display Screen



MODE Indicator
" " will be lit and shows which operation mode is used.

WP Number Display
Displays WP number which saves latitude/longitude.

Satellite Mark Indicator
It will flash while receiving signals from GPS satellites.

Accuracy Low Alarm Indicator
It will be lit when accuracy of calculated data is low.

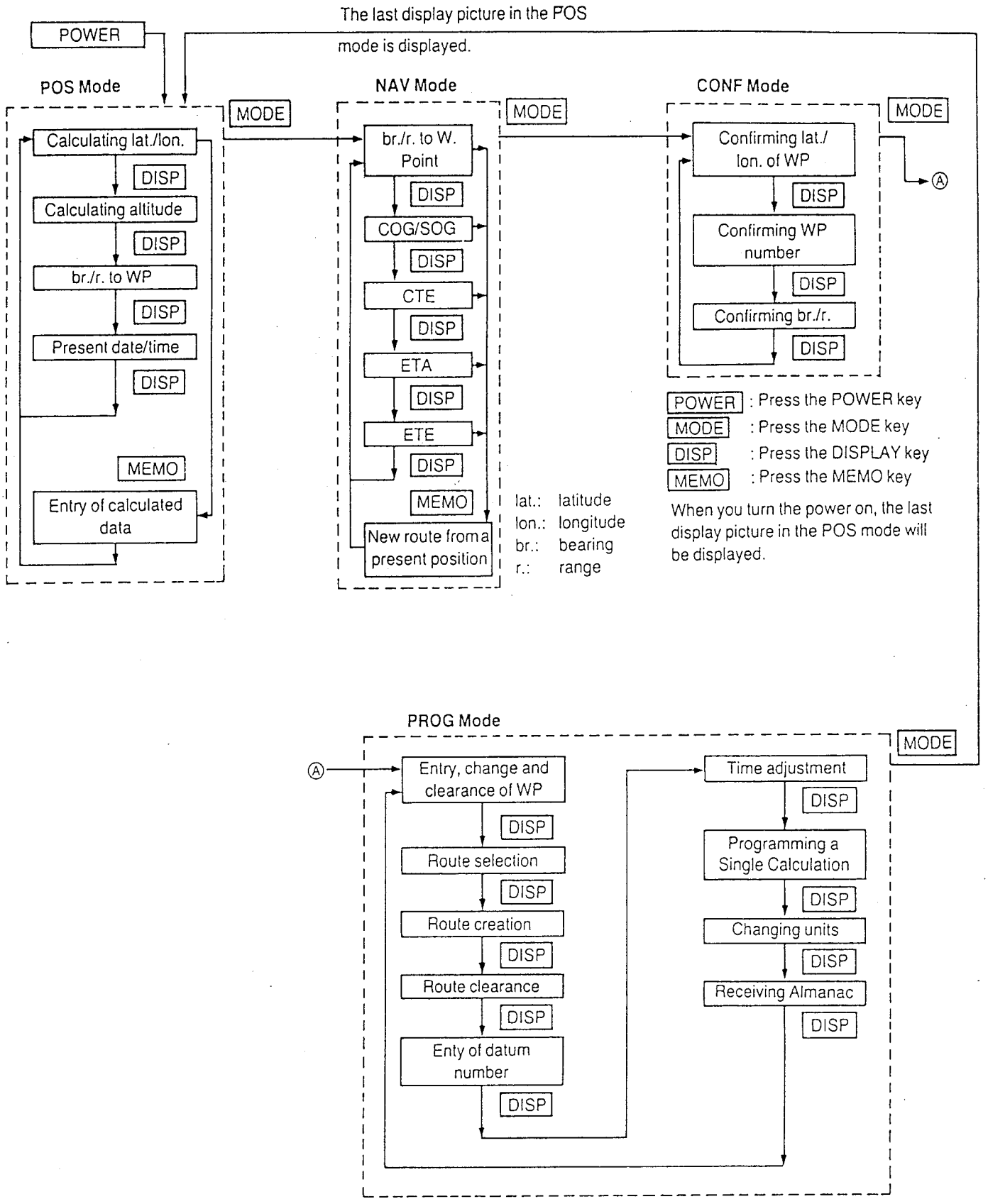
Displays the calculated numerical value.

Memory Operating Indicator
It will be lit when the calculated latitude/longitude are saved.

Battery Low Alarm Indicator
When the batteries are depleted, it will flash.

Fig. 4

OPERATIONS


The last display picture in the POS mode is displayed.
POWER
POS Mode
MODE
Calculating lat./lon.
DISP
Calculating altitude
DISP
br./r. to WP
DISP
Present date/time
DISP
MEMO
Entry of calculated data
NAV Mode
MODE
br./r. to W. Point
DISP
COG/SOG
DISP
CTE
DISP
ETA
DISP
ETE
DISP
MEMO
New route from a present position
CONF Mode
MODE
Confirming lat./ lon. of WP
DISP
Confirming WP number
DISP
Confirming br./r.
DISP
Ⓐ
POWER : Press the POWER key
MODE : Press the MODE key
DISP : Press the DISPLAY key
MEMO : Press the MEMO key
When you turn the power on, the last display picture in the POS mode will be displayed.
lat.: latitude
lon.: longitude
br.: bearing
r.: range
PROG Mode
MODE
Ⓐ
Entry, change and clearance of WP
DISP
Route selection
DISP
Route creation
DISP
Route clearance
DISP
Enty of datum number
DISP
Time adjustment
DISP
Programming a Single Calculation
DISP
Changing units
DISP
Receiving Almanac
DISP

INSTALLATION

Installing the Rechargeable Battery

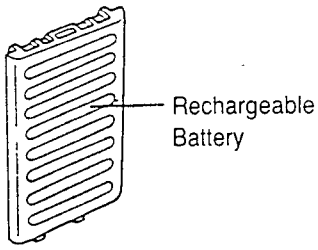


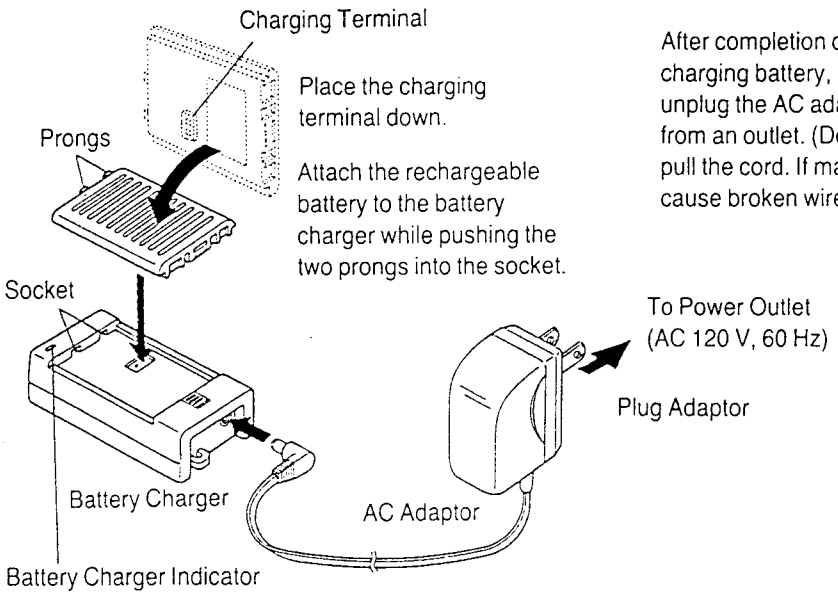
Fig. 5

- Charge the rechargeable battery by using the supplied battery charger before use.
- After completion of charging battery, this unit will function for approx. 80 minutes. [continuous use, screen light is off, ambient temperature at 68°F (20°C)].
- Nickel Hydride Battery is used for the rechargeable battery.

Charging the Rechargeable Battery

Changing the battery for approx. 10 hours at temperature 50°F~95°F (10°C~35°C).
To prevent overcharging, the battery charger indicator will go out in 15 hours and stop charging.

With AC Adaptor



- Use the supplied AC Adaptor for this unit.
- Using a different AC Adaptor will cause malfunction.

Fig. 6

Installing Alkaline Batteries

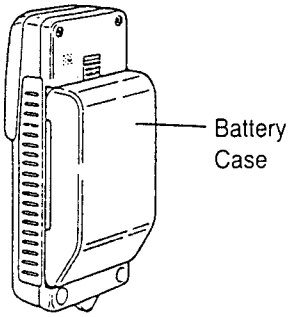


Fig. 7

- This unit will function for approx. 300 minutes by using 5 AA alkaline batteries.
  [Continuous use with Panasonic alkaline batteries, screen light is off, at 68°F (20°C)]
- We recommend you to use alkaline batteries which last long.
  AA Alkaline Battery (LR6 1.5 V)
- This unit will function for approx. 120 minutes by using manganese batteries.
  [Continuous use with Panasonic batteries, at 68°F (20°C)]

Installing Alkaline Batteries into Battery Case

1

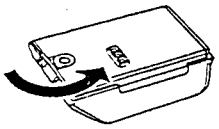


Fig. 8

Loosen the screw on the back side of the battery case.

2

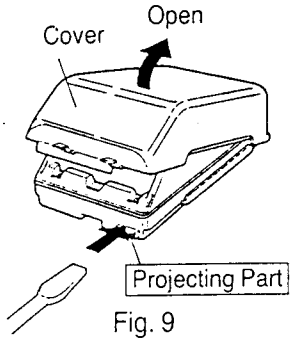


Fig. 9

Open the cover of the battery case slightly by using something like a screwdriver.
Push the projecting part and remove the battery case in the direction of the arrow.

3

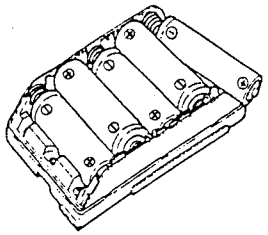


Fig. 10

Install batteries in accordance with the correct polarity indication on the battery case.

4

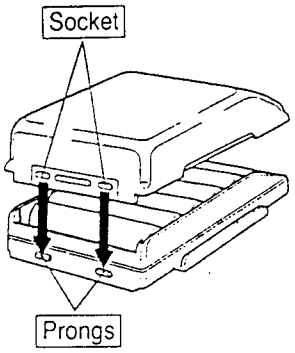


Fig. 11

Place the cover on the battery case by putting the prongs into the socket.

5

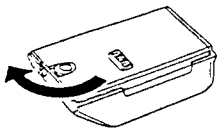


Fig. 12

Screw firmly on the back side of the battery case.

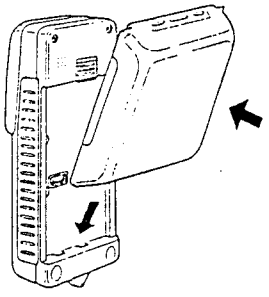


Fig. 13

Attach the battery case to the main body.
Push the battery case until the click sound is heard.

DISASSEMBLY INSTRUCTIONS

1. UNIT (GP-22)

Ref. No. 1	HOW TO REMOVE THE CABINET LID AND HAND STRAP
Procedure 1	1) As showed in fig. 14, remove the battery pack, putting the battery holder upper. 2) Remove the eight screws (A). 3) Remove the cabinet lid and connector. 4) Remove the hand strap.

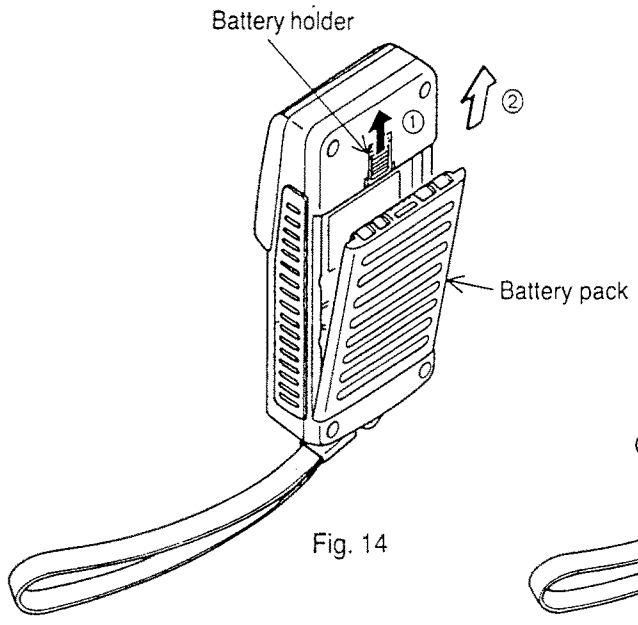


Fig. 14

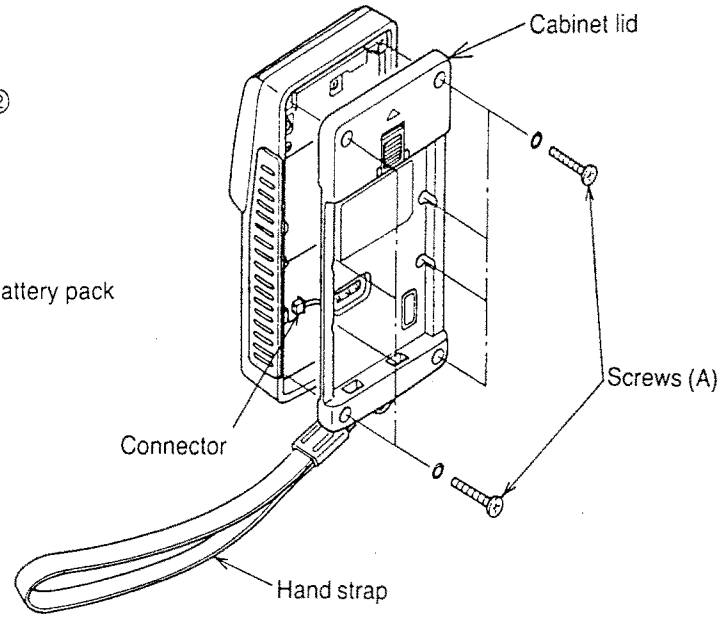


Fig. 15

Ref. No. 2	HOW TO REMOVE THE MAIN BOARD AND ANTENNA
Procedure 1→2	1) Remove the one screw (A). 2) Remove the main board. 3) Remove the flat cable. 4) Remove the one screw (B). 5) Remove the one screw (C).

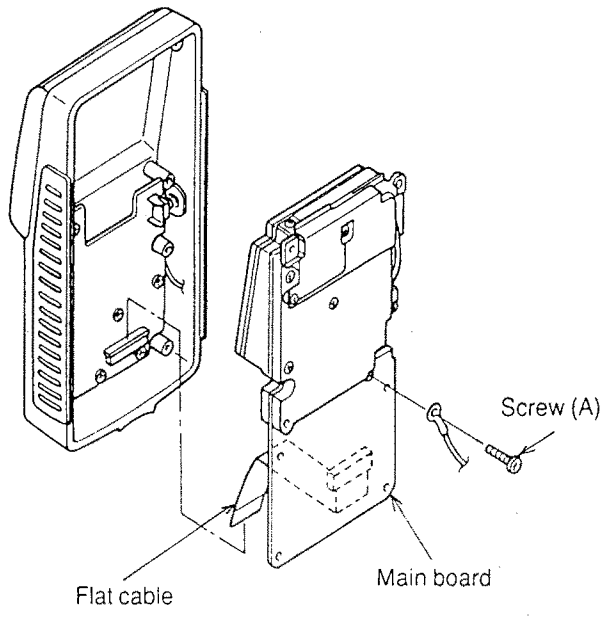


Fig. 16

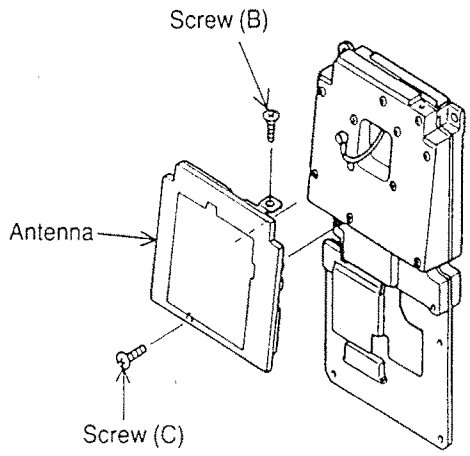


Fig. 17

Ref. No. 3	HOW TO REMOVE THE OPERATION BOARD
Procedure 1→2→3	1) Remove the nine screws (A). 2) Remove the operation board.

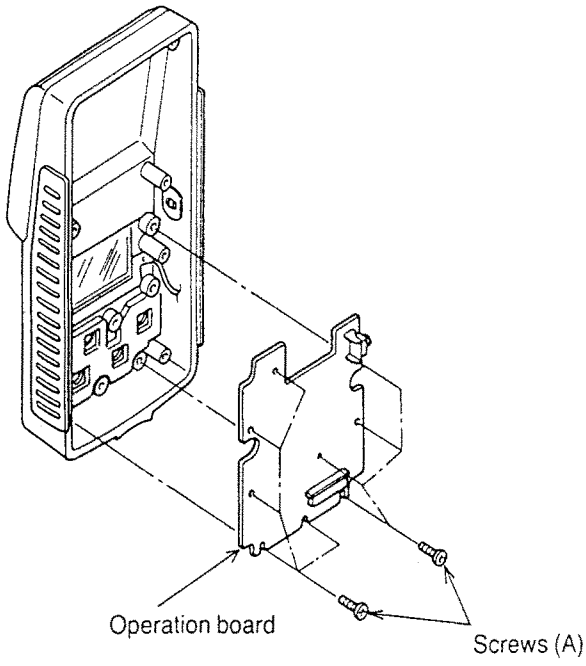


Fig. 18

Ref. No. 4	HOW TO REMOVE THE CABINET
Procedure 1→2→3→4	1) Remove the every button from cabinet. 2) Replace the cabinet.

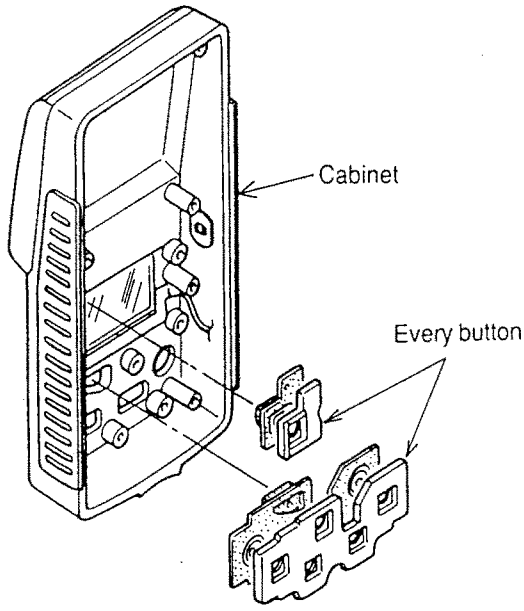


Fig. 19

2. CHARGE BOARD

Ref. No. 1	HOW TO REMOVE THE CABINET AND CHARGE BOARD
Procedure 1	1) Remove the two screws (A). 2) Remove the lower cabinet. 3) Remove the charge board, putting the latch to the direction of arrow.

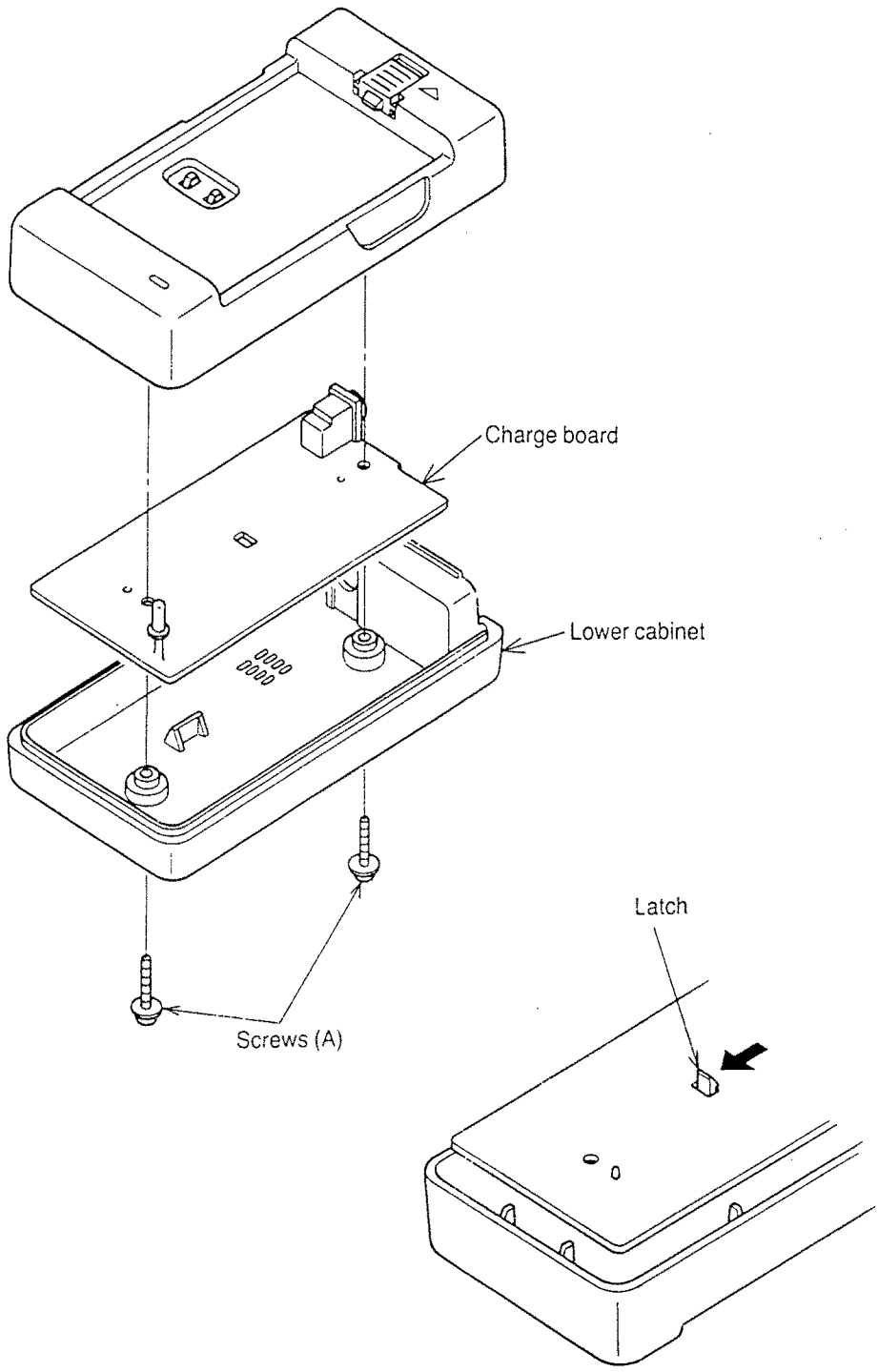


Fig. 20

ADJUSTMENTS

Feedback Voltage of PLL Circuit

At indoor temperature, measuring the feedback voltage (TP1A) of the low pass filter output with the Digital Voltmeter, rotate C244 with adjusting driver and set the feedback voltage DC 3 V.

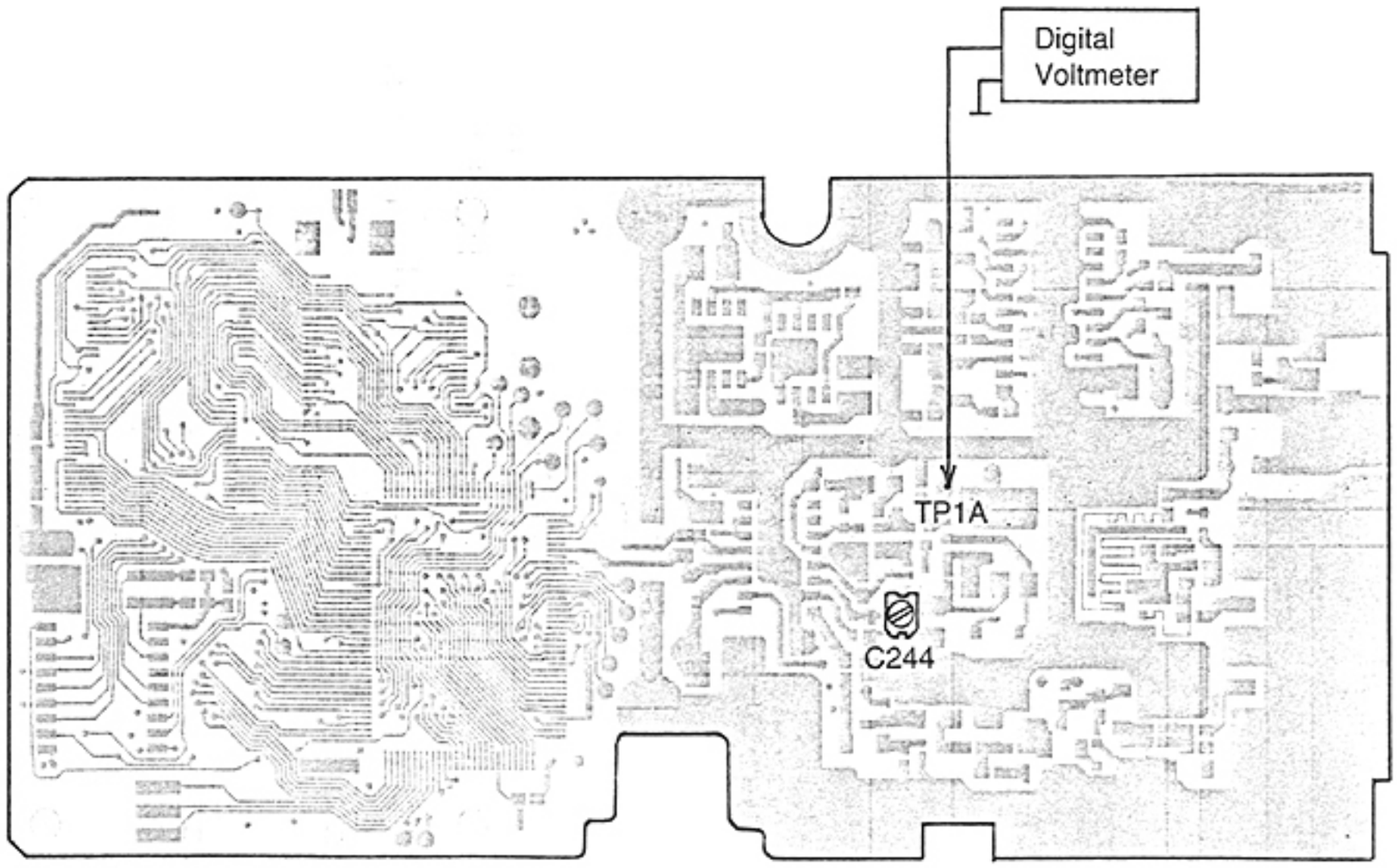


Fig. 21

Center Frequency of IFT

Connect CN301 with the signal generator output, and the 1st IF amp output (TP2A) with the spectrum analizer via resistor 5.6 kΩ. Set the spectrum analizer at fcent=18.414 MHz/span=10 MHz/reference level=−40 dBm/MAX hold mode.
And set the signal generator at fcent=1575.42 MHz/output level=−70 dBm and apply the auto-sweep at sweep range=10 MHz. And confirm the frequency character of IFT appearing at the spectrum analizer a few minutes after, if its center frequency is higher than 18.414 MHz, turn the core of L303, L304 left, and if it's lower than 18.414 MHz, turn the core of L303, L304 right with adjusting driver. After then, clear the display of the spectrum analizer and confirm the frequency character again. Do such action over again to set the center frequency of IFT 18.414 MHz. Take care of treating core because it's easy to be destroyed.

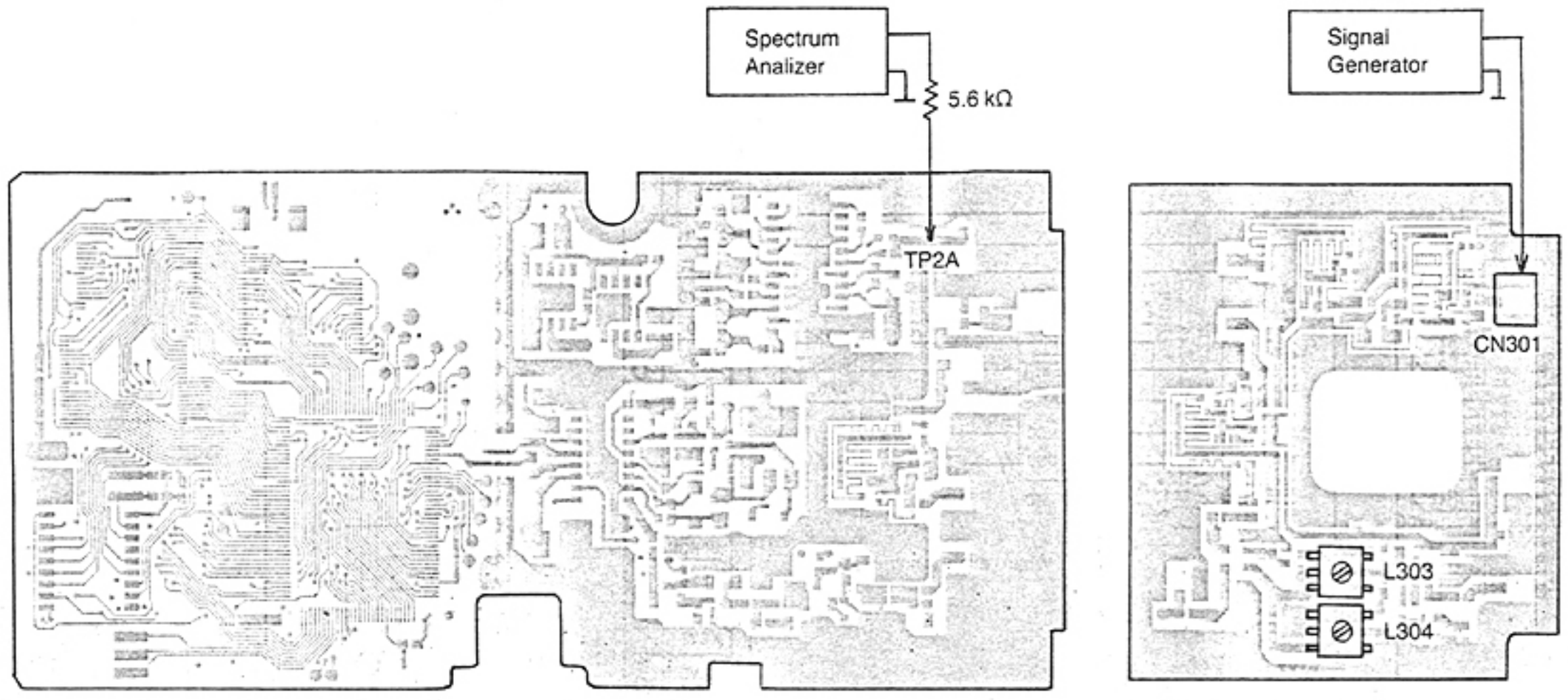


Fig. 22

Oscillating Frequency of Temperature Compensating Oscillator

At indoor temperature, connect IC202-6P to the frequency counter via capacitor, and rotate the trimmer capacitor of the temperature compensating Oscillator (X201) to adjust the frequency at 16.368000 MHz.

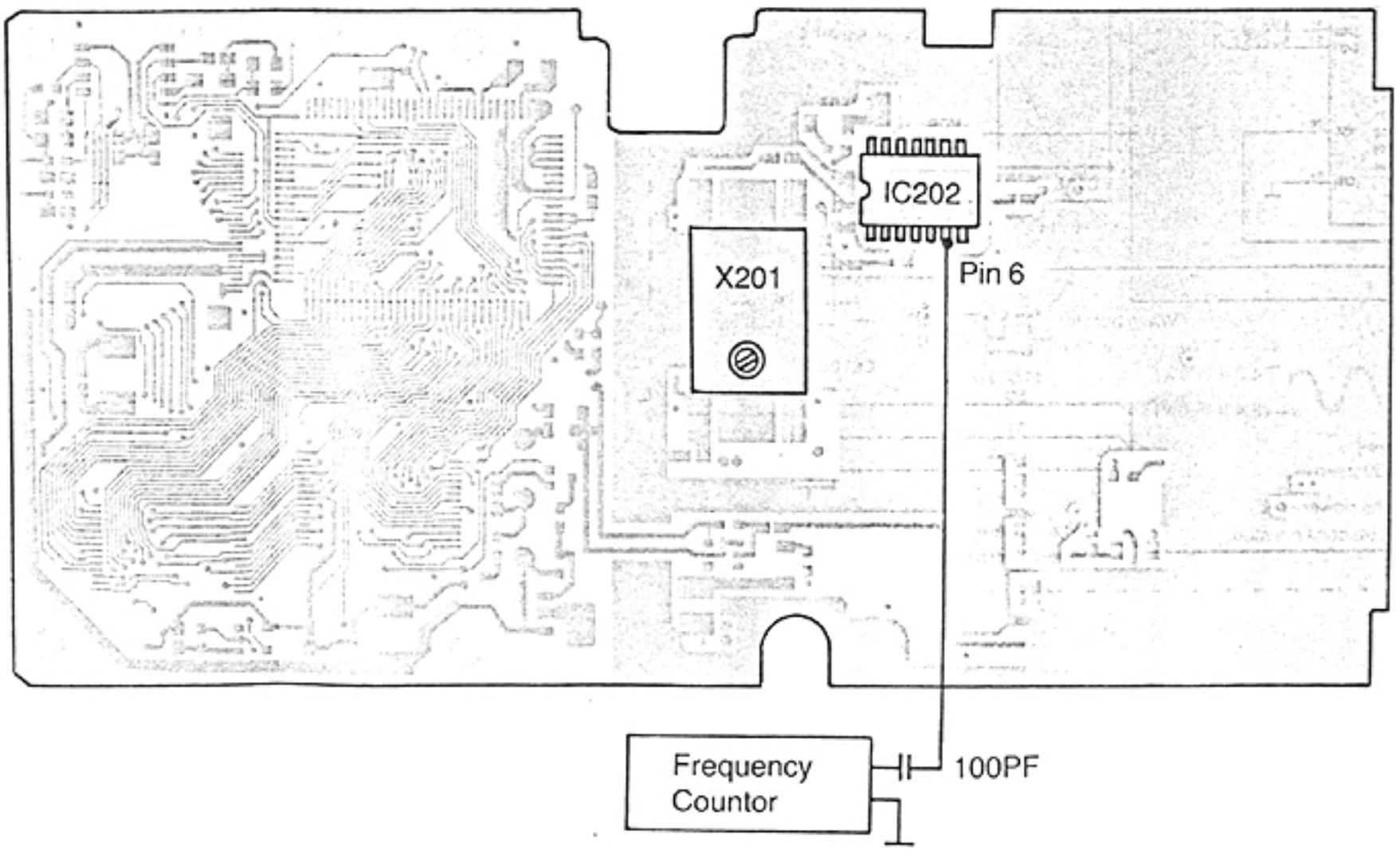
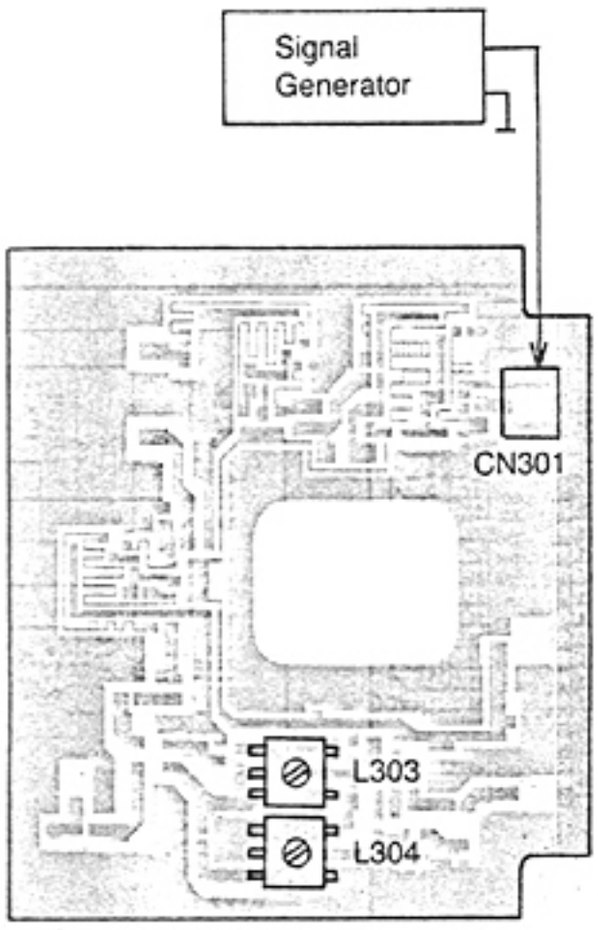


Fig. 23

CPU DATA



IC101 PQVI400BFKX

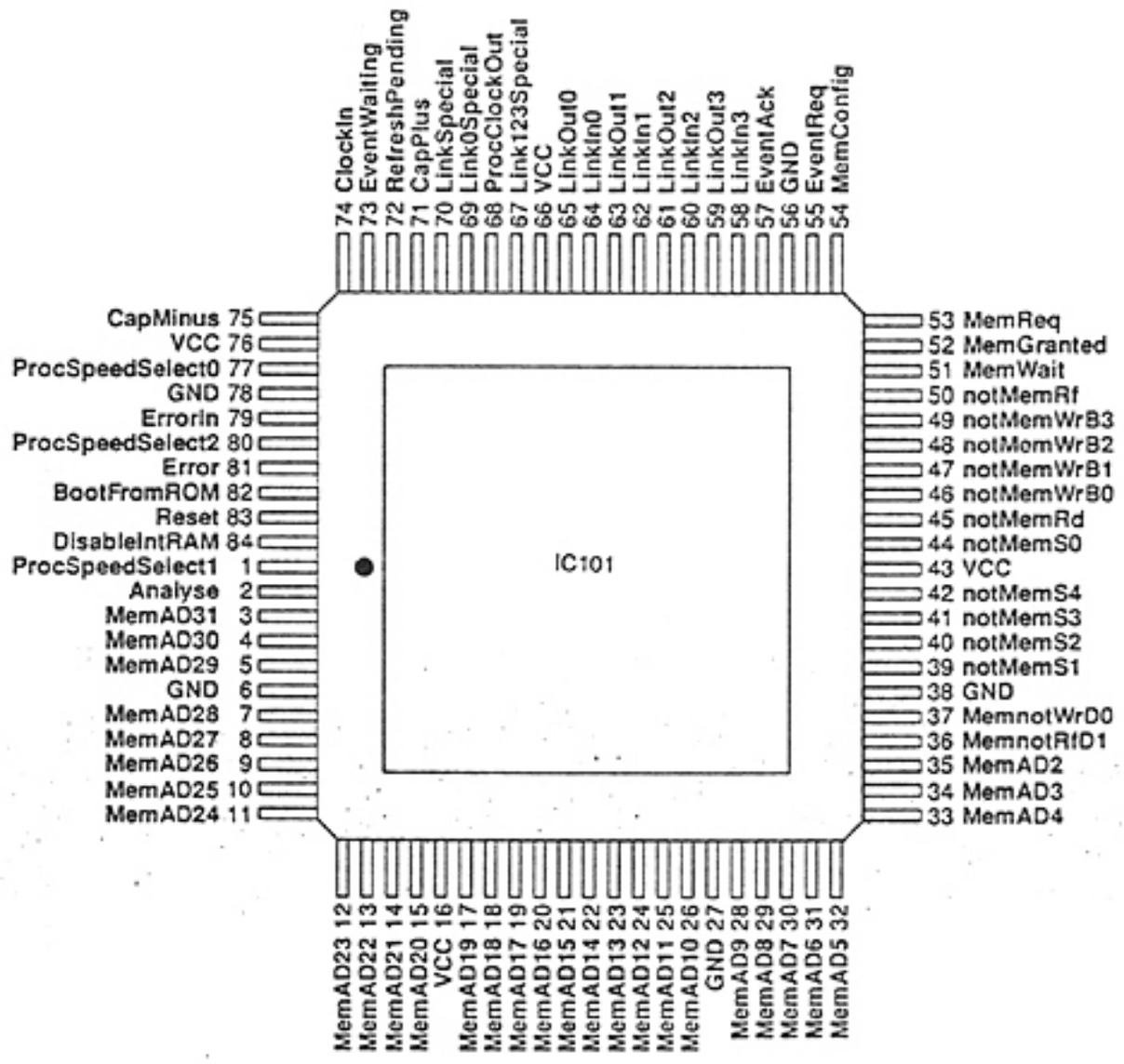
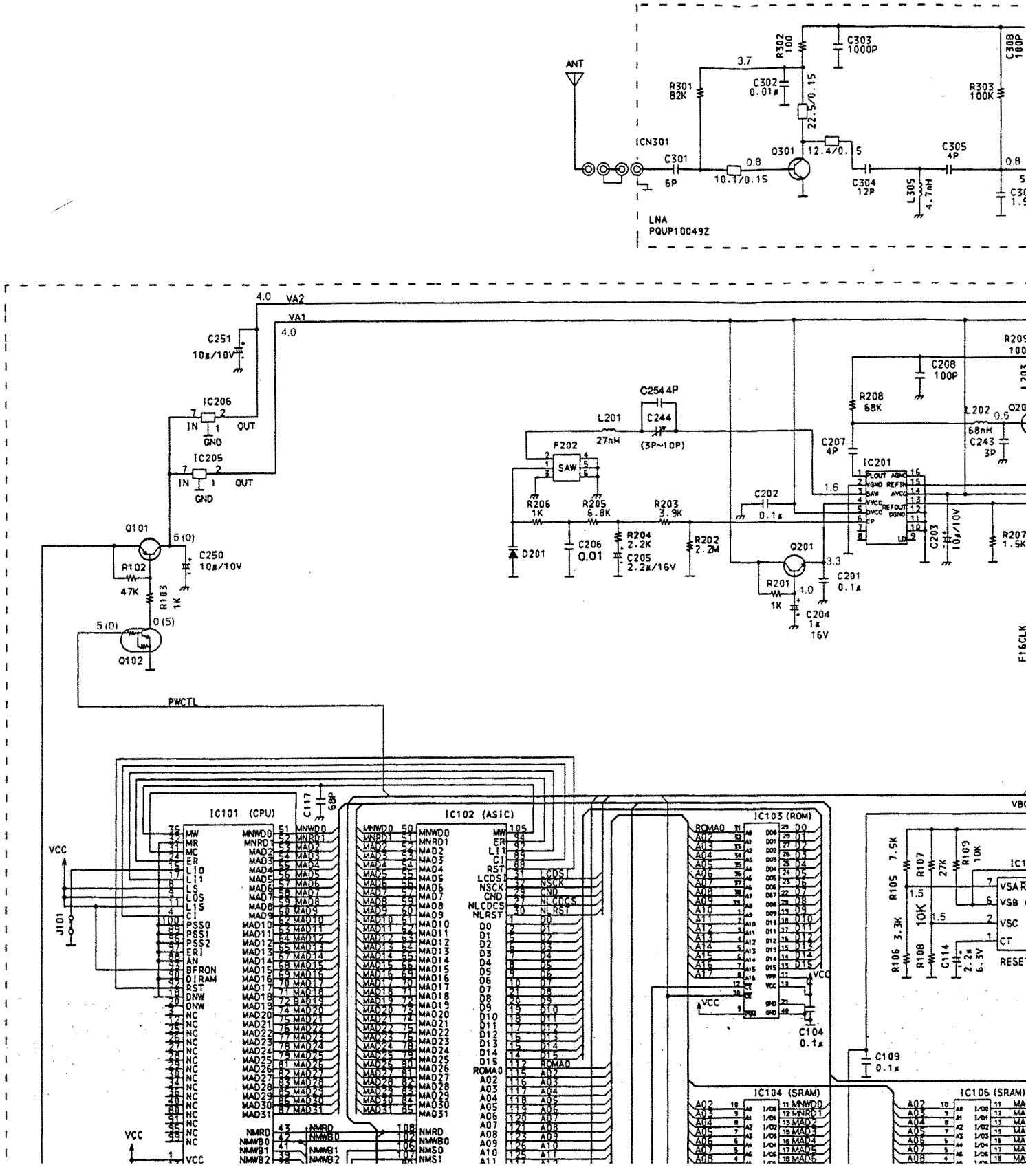


Fig. 24

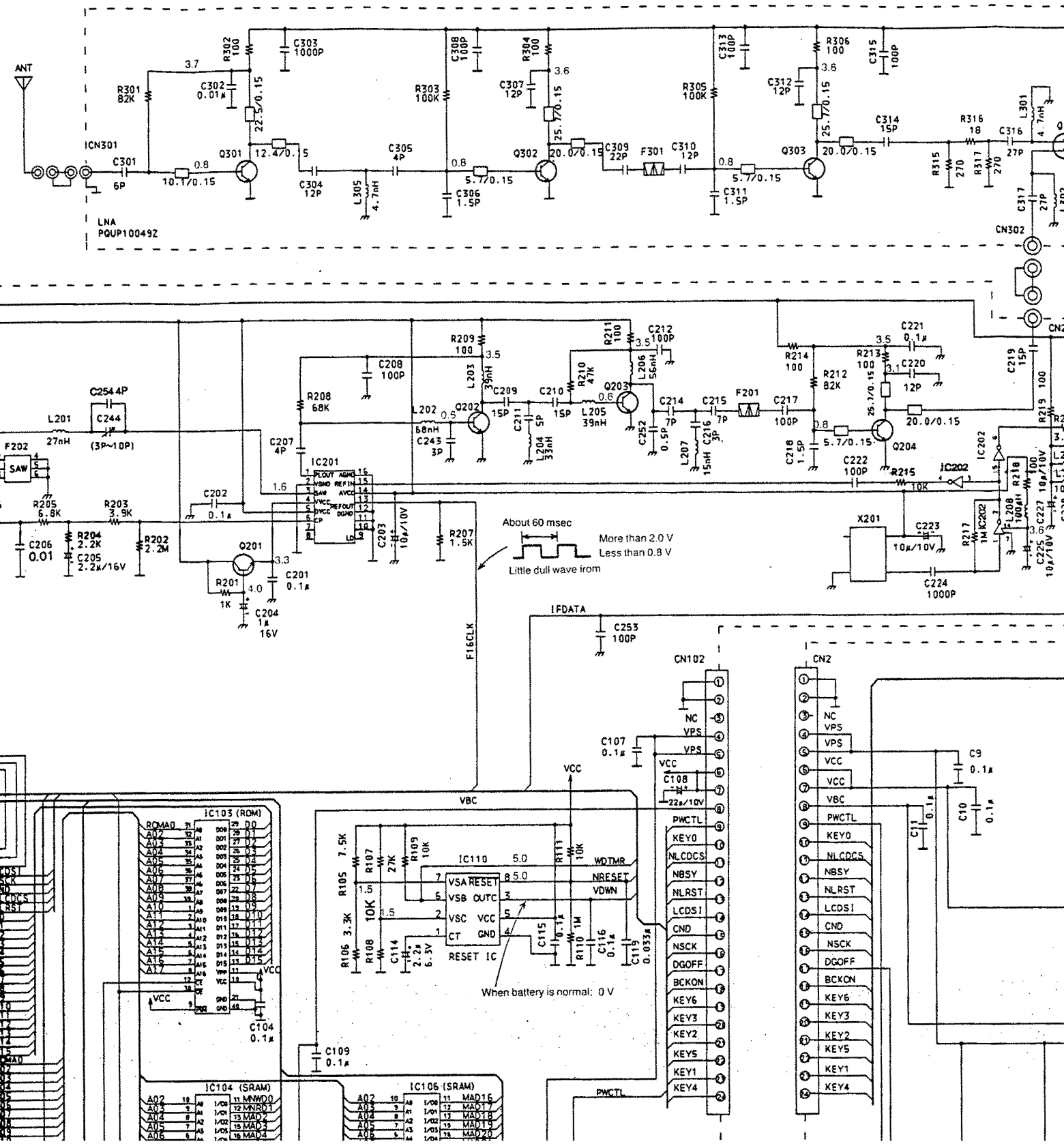
Note: Signal names are prefixed by not if they are active low, otherwise they are active high.

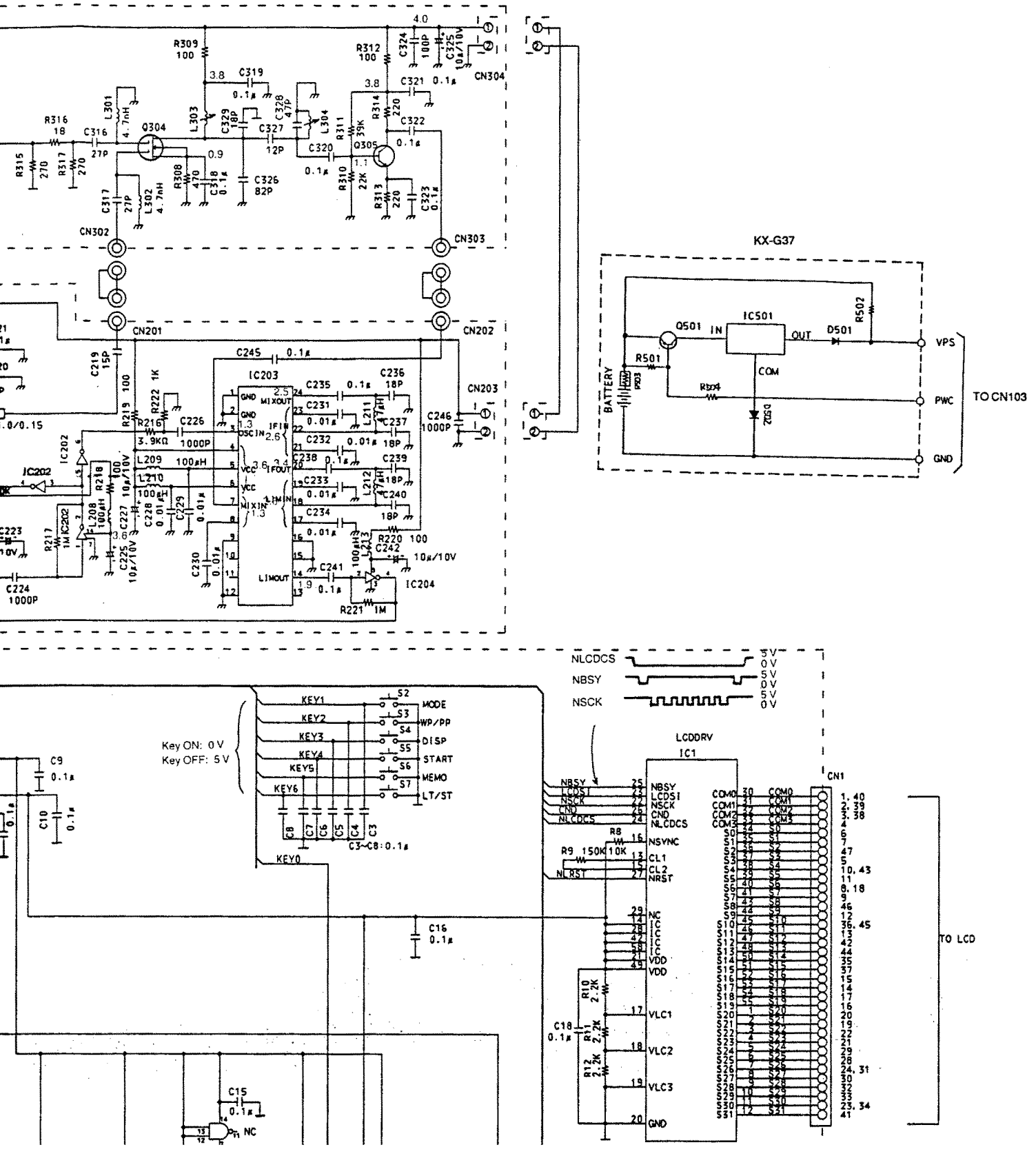
Pin No.	Mark	I/O	Function
	V_{CC}, GND		Power supply and return
71, 75	CapPlus, CapMinus		External capacitor for internal clock power supply
74	ClockIn	in	Input clock
1, 77, 80	ProcSpeedSelect0-2	in	Processor speed selectors
83	Reset	in	System reset
81	Error	out	Error indicator
79	ErrorIn	in	Error daisychain input
2	Analyse	in	Error analysis
82	BootFromRom	in	Boot from external ROM or from link
84	DisableIntRAM	in	Disable internal RAM
68	ProcClockOut	out	Processor clock
37	MemnotWrD0	in/ out	Multiplexed data bit 0 and write cycle warning
36	MemnotRfD1	in/ out	Multiplexed data bit 1 and refresh warning
3~5, 7~15, 17~26, 28~35	MemAD2-31	in/ out	Multiplexed data and address bus
45	notMemRd	out	Read strobe
46~49	notMemWrB0-3	out	Four byte-addressing write strobes
39~42, 44	notMemS0-4	out	Five general purpose strobes

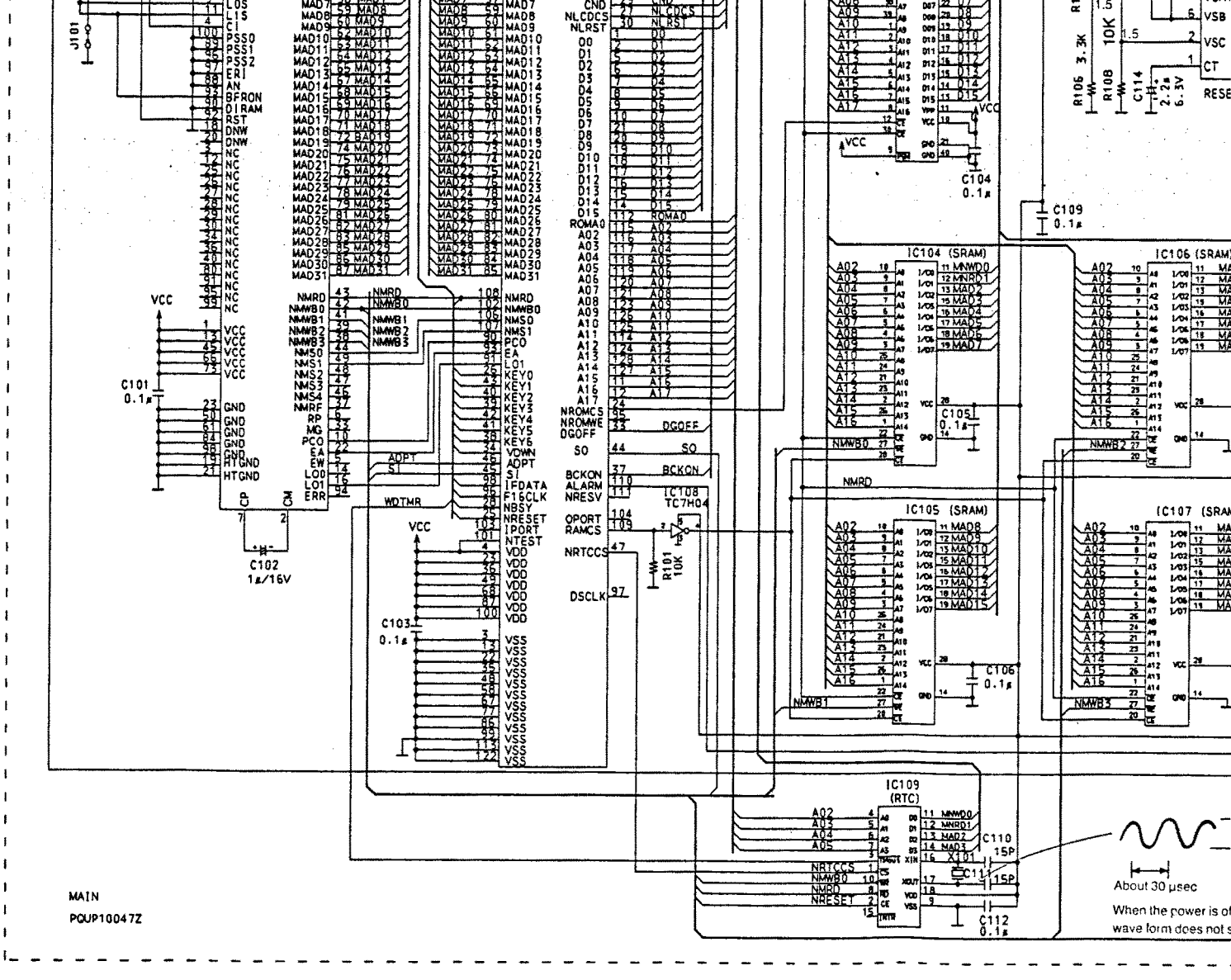
Pin No.	Mark	I/O	Function
50	notMemRf	out	Dynamic memory refresh indicator
72	RefreshPending	out	Dynamic refresh is pending
51	MemWait	in	Memory cycle extender
53	MemReq	in	Direct memory access request
52	MemGranted	out	Direct memory access granted
54	MemConfig	in	Memory configuration data input
55	EventReq	in	Event request
57	EventAck	out	Event request acknowledge
73	EventWaiting	out	Event input requested by software
58, 60, 62, 64	LinkIn0-3	in	Four serial data input channels
59, 61, 63, 65	LinkOut0-3	out	Four serial data output channels
70	LinkSpecial	in	Select non-standard speed as 5 or 20 Mbits/sec.
69	Link0Special	in	Select special speed for Link 0
67	Link123Special	in	Select special speed for Links 1, 2, 3


ANT
ICN301
C301
6P
R301
82K
R302
100
C302
0.01μ
C303
1000P
R303
100K
Q301
C304
12P
C305
4P
L305
4.7nH
LNA
PQUP10049Z
VA2
VA1
4.0
C251
10μ/10V
IC206
IC205
IN
OUT
GND
Q101
Q102
R102
47K
R103
1K
C250
10μ/10V
PWCTL
C2544P
L201
27nH
C244
(3P~10P)
F202
SAW
R206
1K
R205
6.8K
R203
3.9K
C206
0.01
R204
2.2K
C205
2.2μ/16V
R202
2.2M
D201
C202
0.1μ
Q201
R201
1K
C204
1μ
16V
C201
0.1μ
C208
100P
R208
68K
L202
68nH
C243
3P
C207
4P
IC201
C203
10μ/10V
R207
1.5K
F16CLK
IC101 (CPU)
IC102 (ASIC)
IC103 (ROM)
IC104 (SRAM)
IC106 (SRAM)
C117
68P
J101
VCC
C104
0.1μ
C109
0.1μ
R105
3.3K
R107
27K
R109
10K
R108
10K
C114
2.2μ
6.3V
VSA
VSB
VSC
CT
RESET

SCHEMATIC DIAGRAM




KX-G37
CN302
CN303
CN304
CN201
CN202
CN203
IC202
IC203
IC204
Q304
Q305
Q501
IC501
D501
R502
R501
BATTERY
VPS
PWC
GND
TO CN103
NLCDCS
NBSY
NSCK
LCDDRV
IC1
CN1
KEY0
KEY1
KEY2
KEY3
KEY4
KEY5
KEY6
MODE
WP/PP
DISP
START
MEMO
LT/ST
Key ON: 0 V
Key OFF: 5 V
C1-C8: 0.1µ
TO LCD

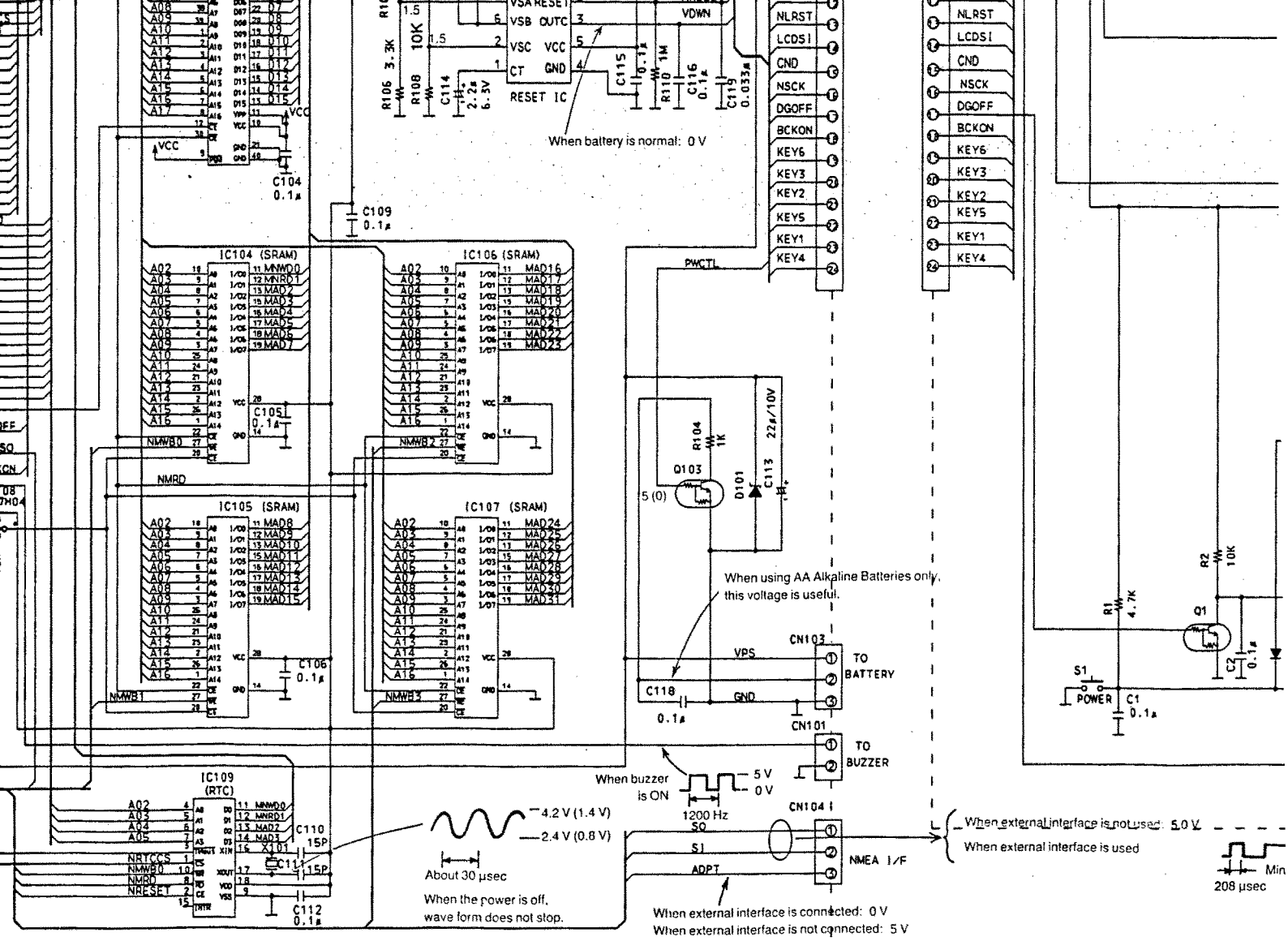


Notes: 1. S1: Power switch.
2. S2: Mode switch.
3. S3: W. Point switch.
4. S4: Display switch.
5. S5: Start switch.
6. S6: Memo switch.
7. S7: Light/Set switch.
8. DC voltage measurements are taken with electronic voltmeter from negative voltage line.

   No Mark: Power switch ON

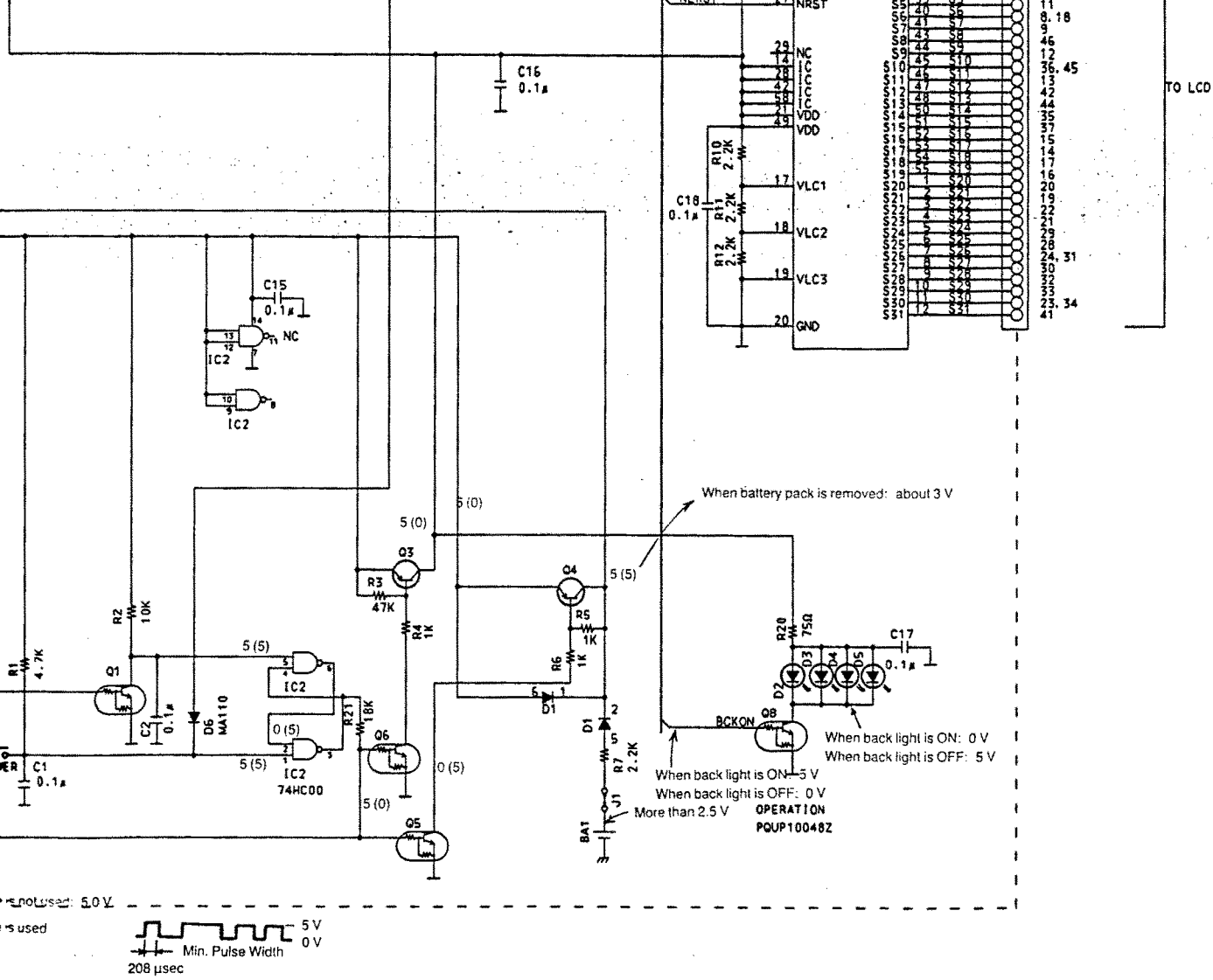
   ( ): Power switch OFF

This schematic diagram may with the development of new



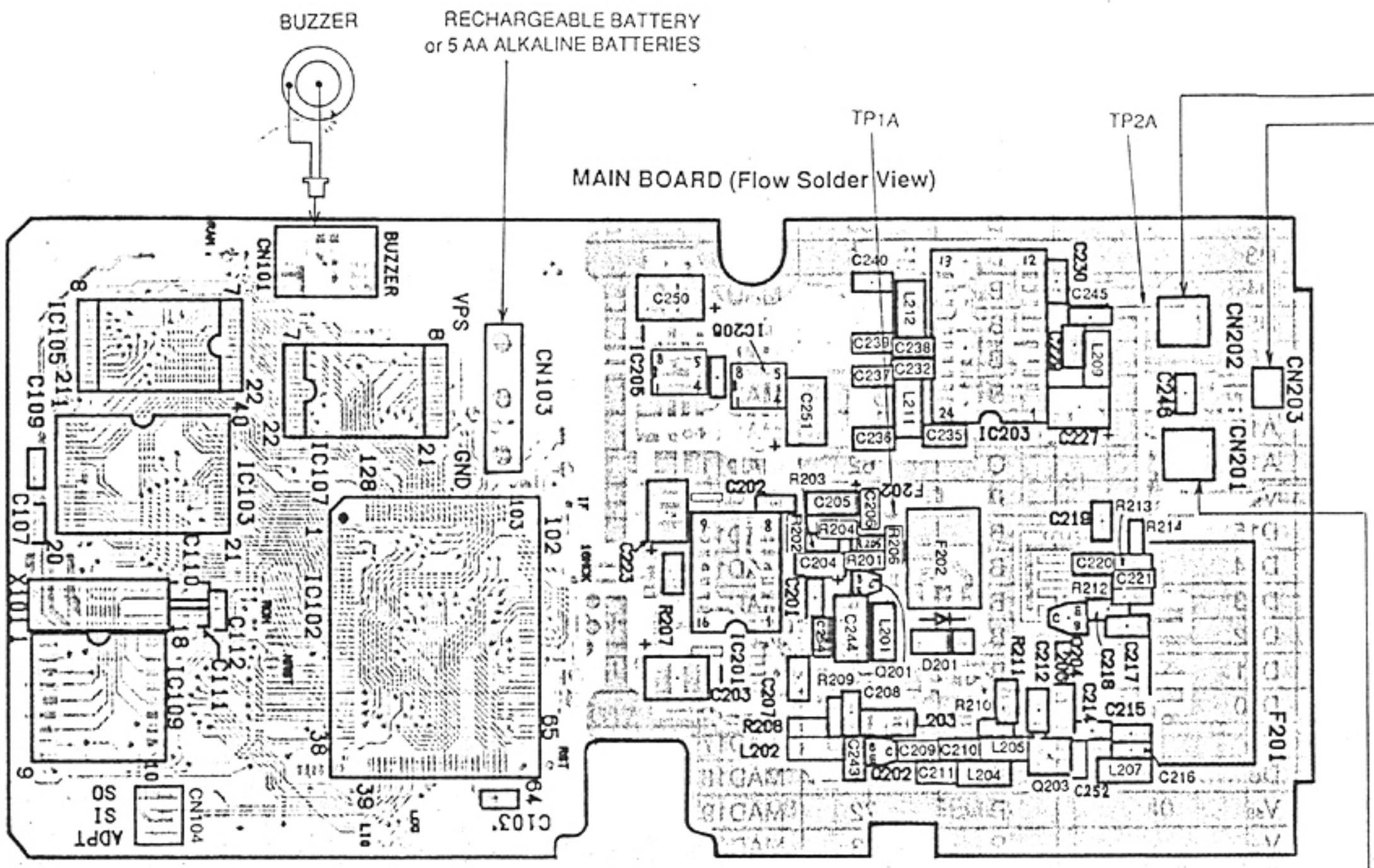
This schematic diagram may be modified at any time with the development of new technology.

taken with
tive voltage line.

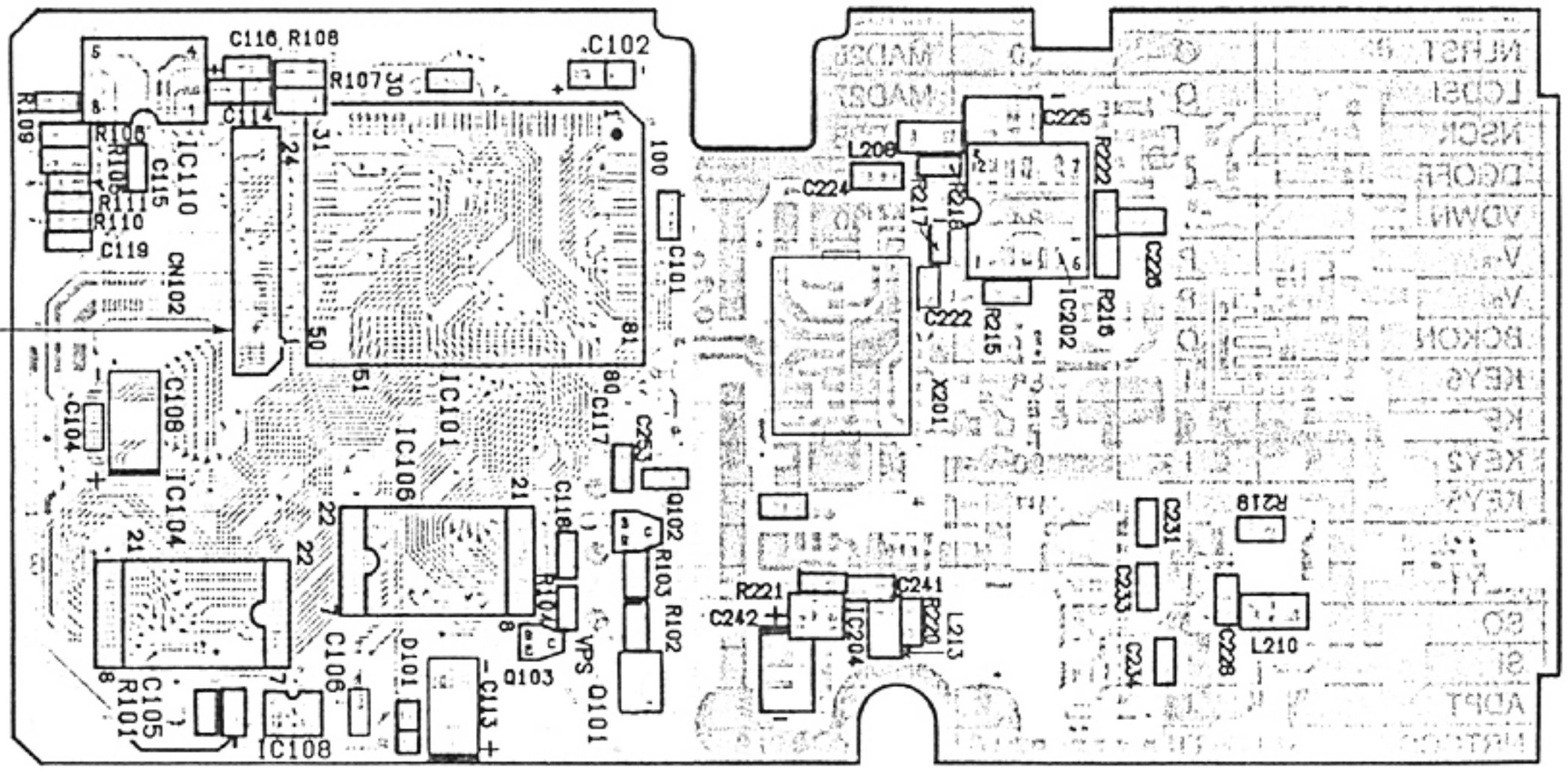

C16
0.1µ
NRST
NC
VDD
VDD
VLC1
VLC2
VLC3
GND
R10
2.2K
R11
2.2K
R12
2.2K
C18
0.1µ
TO LCD
C15
0.1µ
NC
IC2
IC2
When battery pack is removed: about 3 V
5 (0)
5 (0)
Q3
Q4
R3
47K
R4
1K
R5
1K
R6
1K
5 (5)
R2
10K
R1
4.7K
Q1
C2
0.1µ
D6
MA110
IC2
0 (5)
R21
18K
Q6
5 (5)
IC2
74HC00
0 (5)
5 (0)
Q5
C1
0.1µ
D1
D1
R7
2.2K
J1
BAT
When back light is ON: 5 V
When back light is OFF: 0 V
More than 2.5 V
OPERATION
PQUP10048Z
R20
75Ω
C17
0.1µ
D2
D3
D4
D5
BCKON
Q8
When back light is ON: 0 V
When back light is OFF: 5 V
not used: 5.0 V
is used
5 V
0 V
Min. Pulse Width
208 µsec

CIRCUIT BOARD AND WIRING CON

MAIN BOARD (Flow Solder View)

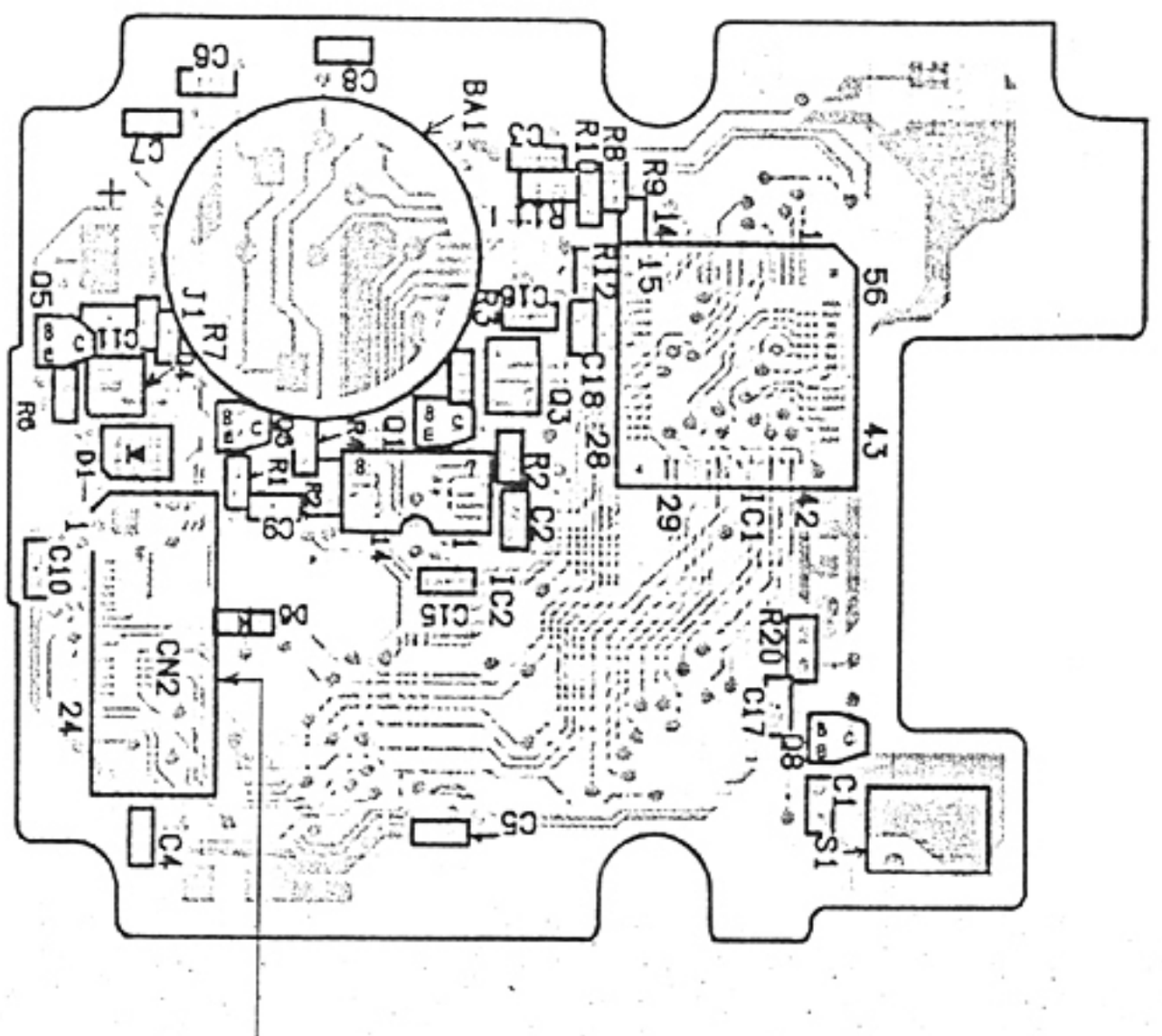


MAIN BOARD (Component View)



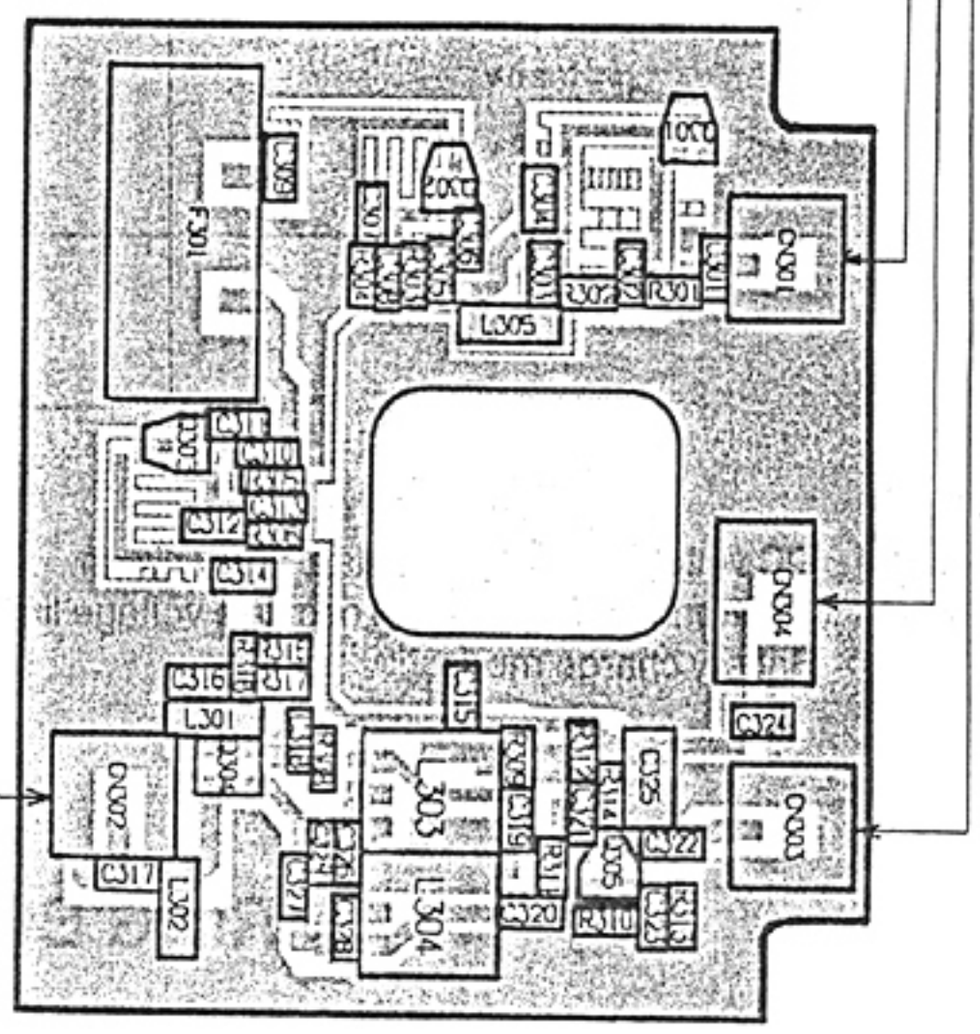
NG CONNECTION DIAGRAM (GP-22)

OPERATION BOARD (Flow Solder View)

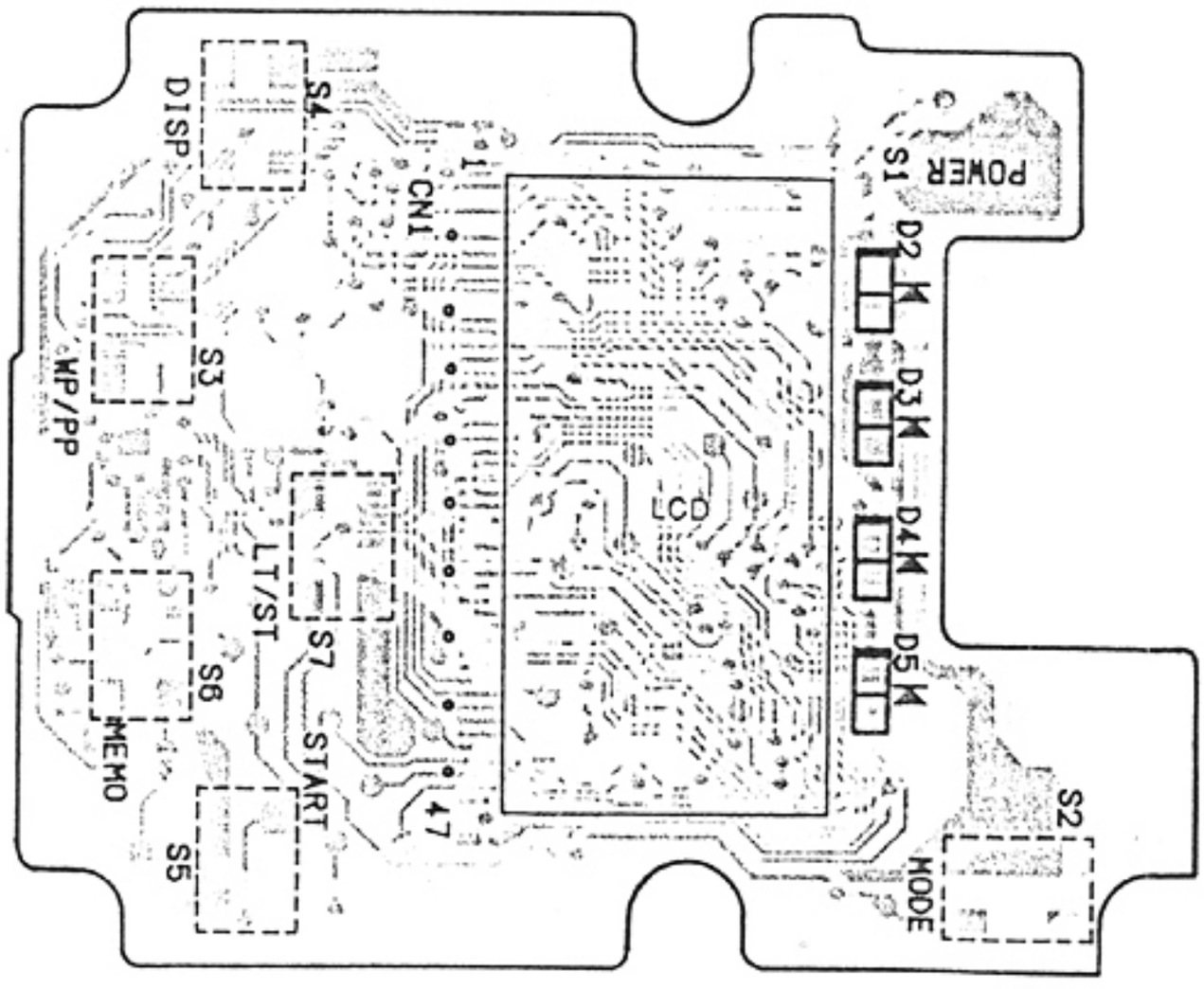


PATCH ANTENNA

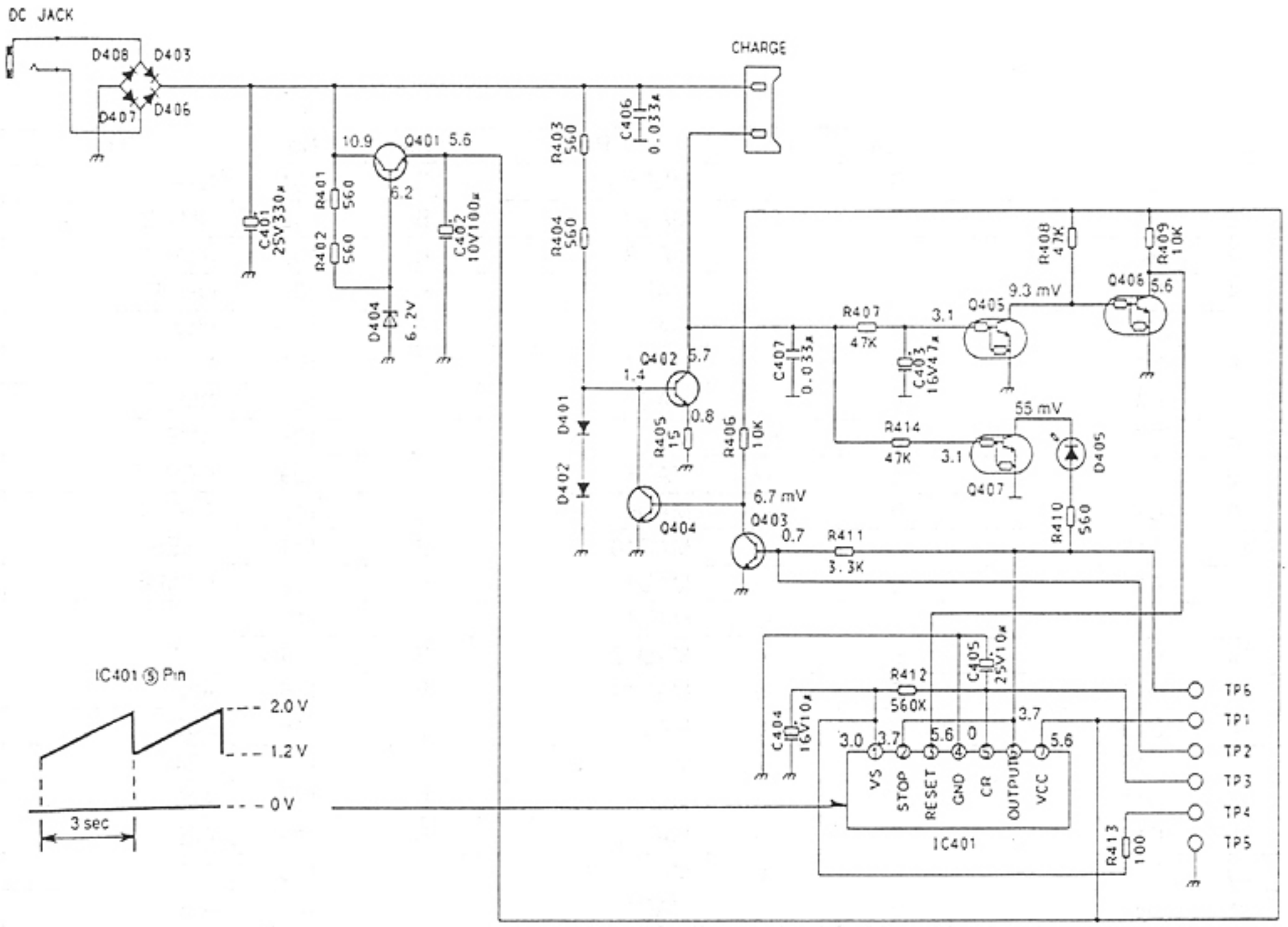
LNA BOARD (Component View)



OPERATION BOARD (Component View)



SCHEMATIC DIAGRAM (BC-101)

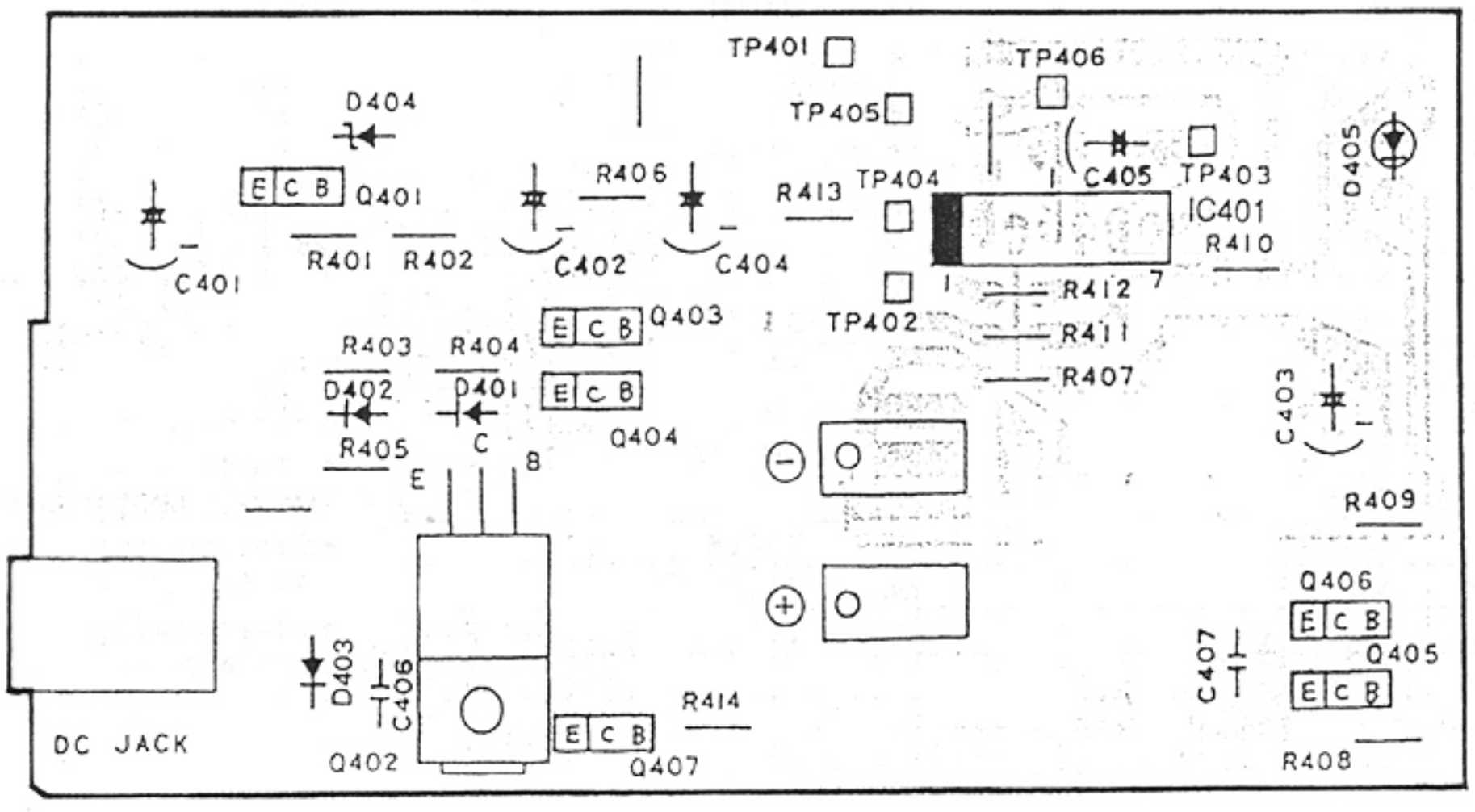


Notes: 1. DC voltage measurements are taken with electronic voltmeter from negative voltage line. Battery charge mode.

This schematic diagram may be modified at any time with the development of new technology.

WIRING BOARD (BC-101)

Component View



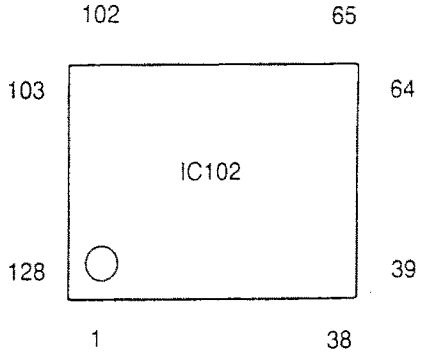
ASIC, LCD AND CONNECTOR DATA

TABLE 1

IC102 PQVI1039F0F

No.	Pin	Type	No.	Pin	Type	No.	Pin	Type
1	D0	B	51	MNRD1	B	101	NTEST	I
2	D1	B	52	MAD2	B	102	NMWB0	I
3	V_{SS}	P	53	MAD3	B	103	IPORT	I
4	V_{DD}	P	54	MAD4	B	104	OPORT	O
5	D2	B	55	MAD5	B	105	MW	O
6	D3	B	56	MAD6	B	106	NMS0	I
7	D4	B	57	MAD7	B	107	NMS1	I
8	D5	B	58	V_{SS}	P	108	NMRD	I
9	D6	B	59	MAD8	B	109	RAMCS	O
10	D7	B	60	MAD9	B	110	ALARM	O
11	A16	O	61	MAD10	B	111	NRESV	O
12	A17	O	62	MAD11	B	112	ROMAO	O
13	V_{SS}	P	63	MAD12	B	113	V_{SS}	P
14	D15	B	64	MAD13	B	114	A12	O
15	D14	B	65	MAD14	B	115	A02	O
16	D13	B	66	MAD15	B	116	A03	O
17	D12	B	67	V_{SS}	P	117	A04	O
18	D11	B	68	V_{DD}	P	118	A05	O
19	D10	B	69	MAD16	B	119	A06	O
20	D9	B	70	MAD17	B	120	A07	O
21	D8	B	71	MAD18	B	121	A08	O
22	V_{SS}	P	72	MAD19	B	122	V_{SS}	P
23	V_{DD}	P	73	MAD20	B	123	A09	O
24	NROMCS	O	74	MAD21	B	124	A13	O
25	NRESET	I	75	MAD22	B	125	A11	O
26	KEY0	I	76	MAD23	B	126	A10	O
27	NLCDCS	O	77	V_{SS}	P	127	A15	O
28	NBSY	I	78	MAD24	B	128	A14	O
29	CND	O	79	MAD25	B			
30	NLRST	O	80	MAD26	B			
31	LCDSI	O	81	MAD27	B			
32	NSCK	O	82	MAD28	B			
33	DGOFF	O	83	MAD29	B			
34	VDWN	I	84	MAD30	B			
35	V_{SS}	P	85	MAD31	B			
36	V_{DD}	P	86	V_{SS}	P			
37	BCKON	O	87	V_{DD}	P			
38	KEY6	I	88	RST	O			
39	KEY3	I	89	CI	O			
40	KEY2	I	90	PCO	I			
41	KEY5	I	91	LO1	I			
42	KEY4	I	92	LI1	O			
43	KEY1	I	93	EA	I			
44	SO	O	94	ER	O			
45	SI	I	95	NROMWE	O			
46	ADPT	I	96	F16MCK	I			
47	NRTCCS	O	97	DSCLK	O			
48	V_{SS}	P	98	IFDATA	I			
49	V_{DD}	P	99	V_{SS}	P			
50	MNWD0	B	100	V_{DD}	P			

P: Power, GND I: Input B: Bidirection



Simultaneous Transition

- bidirectional bus
  MNWD0, MNRD1, MAD2~MAD31 (32)
- bidirectional bus
  D0~D15 (16)
- bidirectional bus
  A02~A17 (16)

TABLE 2. LCD CONNECTION

SEG	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
COM0	1a	1f	2a	2f	3a	3f	4a	4f	5a	5f	6a	6f	7a	7f	8a	8f
COM1	1b	1g	2b	2g	3b	3g	4b	4g	5b	5g	6b	6g	7b	7g	8b	8g
COM2	1c	1e	2c	2e	3c	3e	4c	4e	5c	5e	6c	6e	7c	7e	8c	8e
COM3	WP	1d	POS	2d	MEMO	3d	$^{1}/_{2}$	4d	NAV	5d	$^{1}/_{3}$ $^{2}/_{3}$	6d	BATT	7d	$^{3}/_{3}$	8d

SEG	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
COM0	9a	9f	10a	10f	11a	11f	12a	12f	13a	13f	14a	14f	3	S	ft	?
COM1	9b	9g	10b	10g	11b	11g	12b	12g	13b	13g	14b	14g	N	m	W	
COM2	9c	9e	10c	10e	11c	11e	12c	12e	13c	13e	14c	14e	N^2	E	/h	PROG
COM3	15bc	9d	COL	10d	•P1	11d	•P2	12d	$^{6}/_{6}$	13d	$^{4}/_{4}$ $^{5}/_{5}$	14d	M	km	•P3	CONF

TABLE 3. LCD PIN NO.

No.	PIN	No.	PIN	No.	PIN	No.	PIN
1	COM0	13	SEG11	25	NC	37	SEG15
2	COM1	14	SEG17	26	NC	38	COM2
3	COM2	15	SEG16	27	NC	39	COM1
4	COM3	16	SEG19	28	SEG25	40	COM0
5	SEG3	17	SEG18	29	SEG24	41	SEG31
6	SEG0	18	SEG30	30	SEG27	42	SEG12
7	SEG1	19	SEG6	31	SEG26	43	SEG4
8	SEG6	20	SEG21	32	SEG28	44	SEG13
9	SEG7	21	SEG20	33	SEG29	45	SEG10
10	SEG4	22	SEG23	34	SEG30	46	SEG8
11	SEG5	23	SEG22	35	SEG14	47	SEG2
12	SEG9	24	SEG26	36	SEG10		

LCD DISPLAY

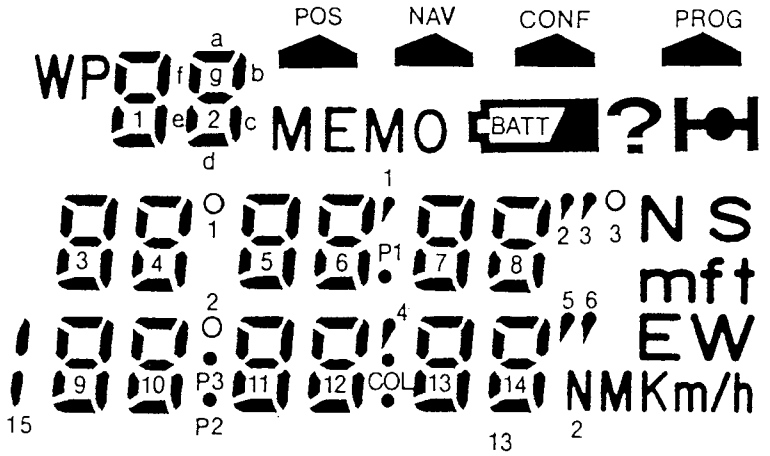


TABLE 4. CONNECTOR PIN LOCATION

CN101 (Buzzer)

No.	Signal	Type	Operation
1	ALARM	MAIN→BU	Alarm signal from gate array
2	GND	MAIN→BU	Ground

CN103 (Battery)

No.	Signal	Type	Operation
1	VPS	MAIN←BATT	Power supply
2	S	MAIN→BATT	Operation signal when using alkaline battery
3	GND	MAIN←BATT	Ground

CN104 (NMEA I/F)

No.	Signal	Type	Operation
1	SO	MAIN→I/F	External interface output signal
2	SI	MAIN←I/F	External interface input signal
3	ADPT	MAIN←I/F	Adaptor detecting signal

CN102-CN2

No.	Signal	Type	Operation
1	GND	MAIN→OP	Ground
2	GND	MAIN→OP	Ground
3	NC		No connect
4	VPS	MAIN→OP	Power source of system
5	VPS	MAIN→OP	Power source of system
6	VPS	MAIN←OP	Digital power source
7	VPS	MAIN←OP	Digital power source
8	VBC	MAIN←OP	Backup power source
9	PWCTL	MAIN←OP	Power control
10	KEY0	MAIN←OP	Signal of power key: OFF="H", ON="L"
11	NLCDCS	MAIN→OP	Chip select of LCD driver: "L"=select
12	NBSY	MAIN←OP	Busy signal from LCD driver: "H"=busy

No.	Signal	Type	Operation
13	NLRST	MAIN→OP	Reset signal of LCD
14	LCDSI	MAIN→OP	Serial data input terminal for LCD
15	CND	MAIN→OP	Command/data select signal for LCD
16	NSCK	MAIN→OP	Serial clock for LCD
17	DGOFF	MAIN→OP	OFF signal of digital power source: normal="1", off="H"
18	BCKON	MAIN→OP	Burning signal of backlight for LCD
19	KEY6	MAIN←OP	Signal of LT/ST key: OFF="H", ON="L"
20	KEY3	MAIN←OP	Signal of DISP key: OFF="H", ON="L"
21	KEY2	MAIN←OP	Signal of WP/PP key: OFF="H", ON="L"
22	KEY5	MAIN←OP	Signal of MEMO key: OFF="H", ON="L"
23	KEY1	MAIN←OP	Signal of MODE key: OFF="H", ON="L"
24	KEY4	MAIN←OP	Signal of START key: OFF="H", ON="L"

CN201-CN302

No.	Signal	Type	Operation
1	1stLo	MAIN→RF	1st Local signal
2	GND	MAIN→RF	Ground

CN202-CN303

No.	Signal	Type	Operation
1	1stIF	MAIN←OP	1st IF signal
2	GND	MAIN←RF	Ground

CN203-CN304

No.	Signal	Type	Operation
1	VA2	MAIN→RF	Analog power source
2	GND	MAIN→RF	Ground

ANT-CN301

No.	Signal	Type	Operation
1	ANTOUT	ANT←RF	Antenna receiving signal
2	GND	ANT←RF	Ground

CIRCUIT EXPLANATION

1. GENERAL BLOCK DIAGRAM

The sumary GENERAL BLOCK DIAGRAM is shown in follow.
This circuit can be devided mainly following 3 blocks.

1) ANALOG SECTION

This block executes the frequency conversion to the signal inputted through antenna from satellite, makes frequency down to be able to be processed in digital section, after that, converts it to bainary signal.
This block is developed in RF board and upper half of Main board (shield section).

2) DIGITAL SECTION

This block executes operation based on signal from analog section and ditects the present location of receiver, and holds 7 keys, LCD, buzzer, external interface (based on NMEA0183A) as method of input or output.
This block is developed in lower half of Main board and a part of Operation board.

3) POWER SOURCE SECTION

This block controls the ON/OFF operation of power source needed for each analog and digital section.
This block is developed in Operation board and a part of Main board.

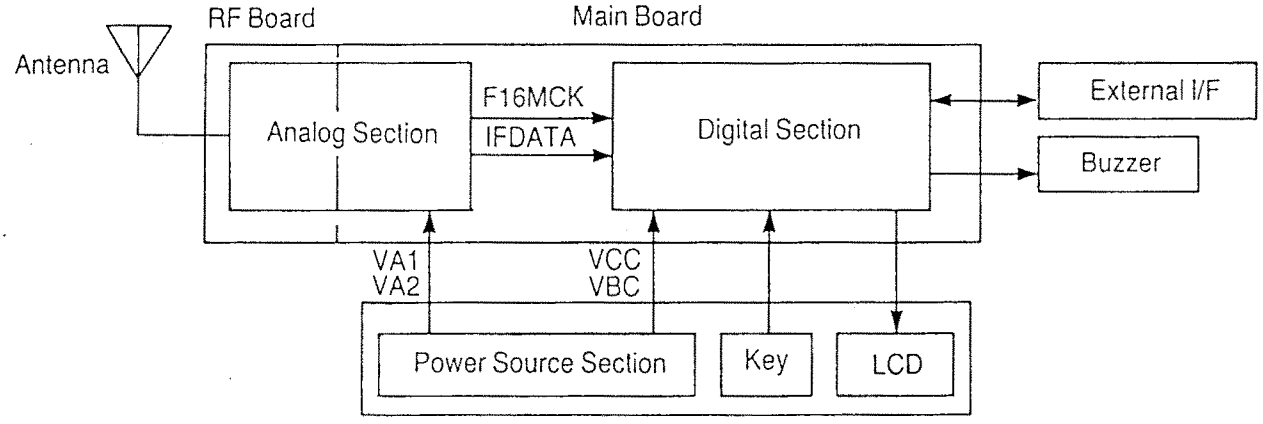


Fig. 25

2. DESCRIPTION OF CIRCUIT

Following is the description of mentioned 3 blocks.

2-1. ANALOG SECTION

The Block diagram of analog section is shown in Fig. 26. The analog section consists of following 6 blocks.

1) Antenna
2) RF amplifier
3) 1st IF circuit
4) 2nd IF circuit
5) Reference signal divider circuit
6) 1st Local signal generator circuit

The power source of analog section supplies VA1 to the 1st Local signal generator circuit and the reference signal divider circuit except the local amp, and VA2 to the 1st IF circuit, the 2nd IF circuit and the local amp.

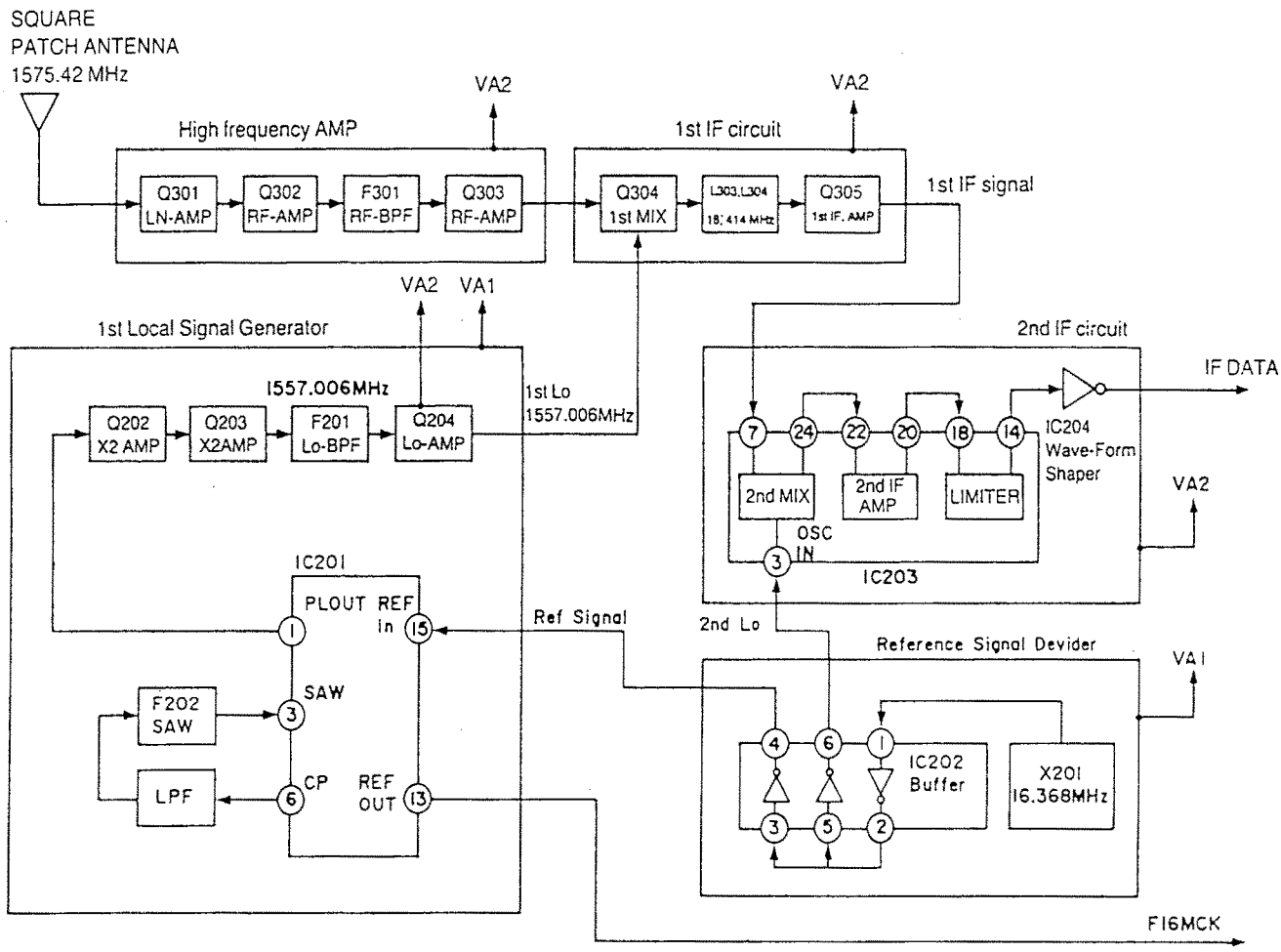


Fig. 26

1) Antenna

Use the square patch antenna to receive the GPS satellite electoric wave of 1575.42 MHz carrier frequency and output on RF board.

2) RF amplifier

The RF amplifier consists of 3-phases amp and BPF filter. The RF signal which is inputted to CN301 from antenna is amplified by the wideband low noise amp (Q301) and RF amp (Q302), then narrowed the band pass 1575.42±1.023 MHz (within 3 dB attenuation band ±10 MHz) by the bandpass filter (F301), after that amplified by RF amp (Q303) in the following stage.

Circuit Diagram

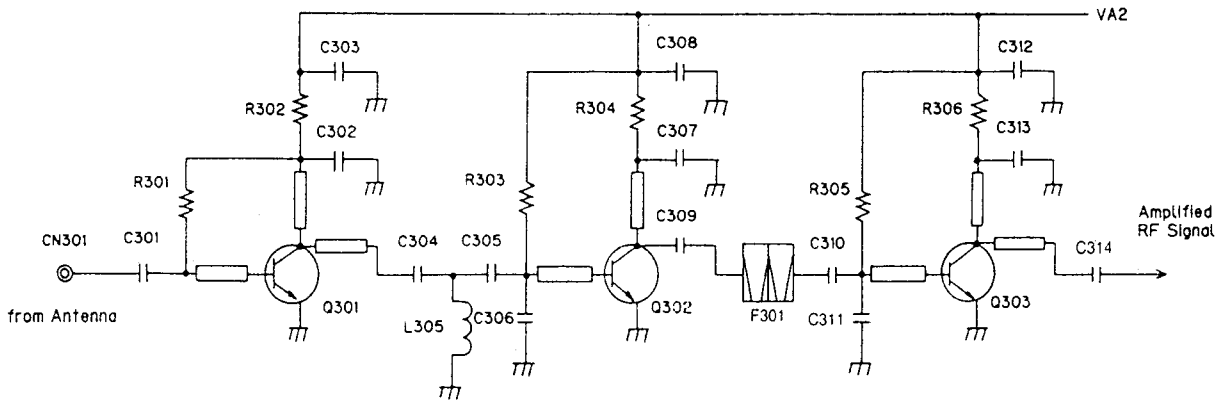


Fig. 27

3) 1st IF circuit

As the 1st mixer (Q304), the dual gate FET is used. The source of FET is resistance grounded (R308) and applied to about −9 V auto-bias.

By inputting the RF signal which is amplified via 3rd attenuator to gate 1, and injecting 1st local signal (1557. 006 MHz, 0 dBm) from CN302 to gate 2, the 1st IF signal which is converted into frequency of 18.414 MHz is gained in drain. After the band limit of 18.414 MHz±1 MHz is applied to the 1st IF signal by IFT (L303, L304), the 1st IF signal is amplified by 1st IF amp (Q305) which is emitter grounded. The gained 1st IF signal is output from CN303 to Main Board.

Circuit Diagram

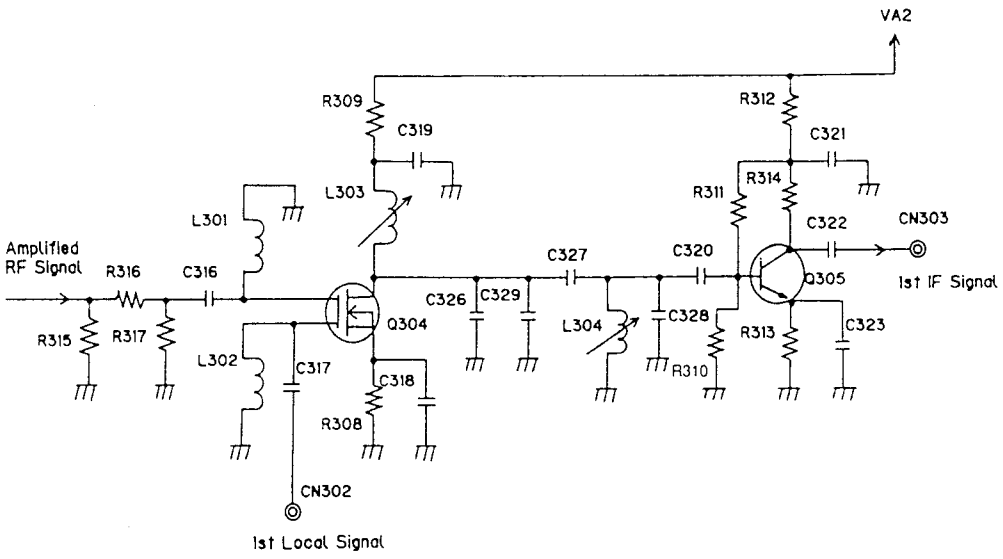


Fig. 28

4) 2nd IF circuit

As the 2nd IF circuit, IC203 which contained a mixer, IF amp and limiter amp is used. The 1st IF signal is input from RF board to CN202 of Main board. The 2nd Local signal of 16.368 MHz is inputted to OSCIN terminal (3P) and the 1st IF signal is inputted from CN202 to MIXIN terminal (7P), the 2nd IF signal of 2.046 MHz is gained in MIXOUT terminal (24P). The 2nd IF signal attenuates the 2nd Local signal which is leaking via LPF (C236, L211, C237) with cut-off frequency of 5 MHz, and then amplify it by inputting to AMPIN terminal (22P). After the 2nd IF signal which is output from AMPOUT terminal (20P) passes through LPF (L212, C239, C240), input it to LIMITIN terminal (18P). The about 6 Vp-p output of LIMITOUT terminal (14P) is made binary by the wave form shapor (IC204), hence the digital signal (IFDATA) that low level is less than 0.8 V and high level is more than 2 V, is output to ASIC (IC102).

Circuit Diagram

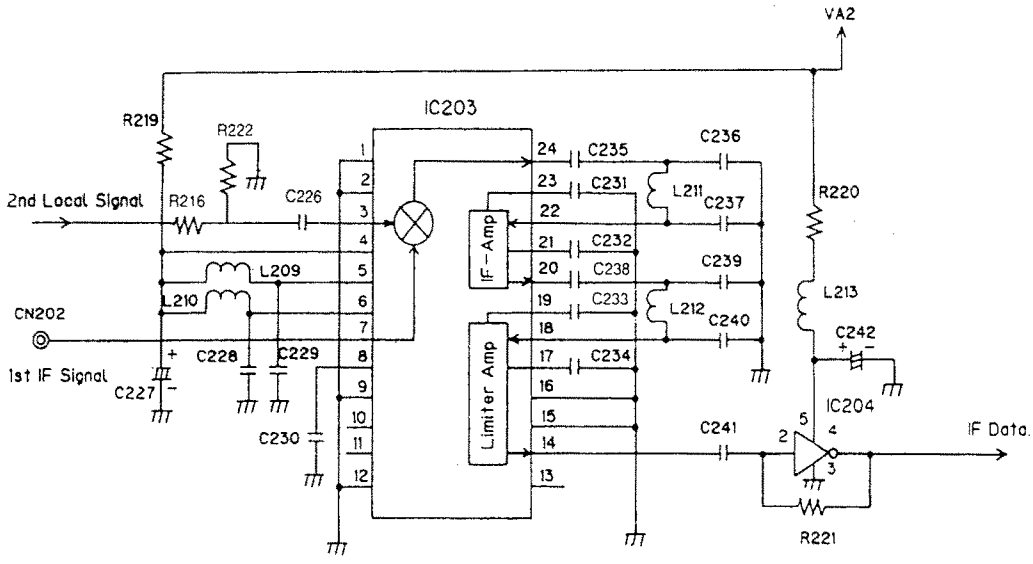


Fig. 29

5) Reference signal divider circuit

The signal of 16.368 MHz which is generated by the temperature compensating oscillator (X201) is divided by inverter (IC202), the standard signal of 2 Vp-p is output to IC201, and the 2nd Local signal of 3 Vp-p is output to IC203. And then, the clock (F16MCK) that low level is less than 0.8 V and high level is more than 2 V is output to ASIC (IC202) after buffering by IC201.

Circuit Diagram

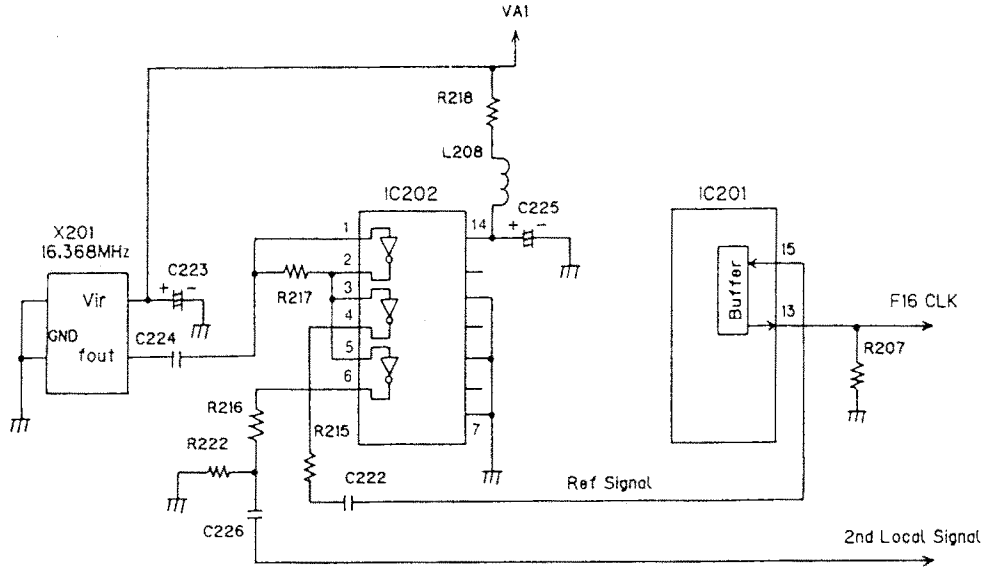


Fig. 30

6) 1st Local signal generator circuit

The 1st Local signal generator circuit consists of PLL circuit, 2-stage 2 multipliers, BPF and a local amp. PLL circuit consists of IC201 of PLL-IC which contains VCO amp, a dividing amp, a prescaler and a phase comparator, a variable capacitor (D201) which constructs the low pass filter and VCO in discrete and SAW resonator. IC201 compares the phase of reference signal of 16.368 MHz which is input to REFIN terminal (15P) with the prescaler output, then output the result of phase comparation from CP terminal (6P). The CP output is multipled by the low pass filter and the feedback voltage is given to SAW resonator. The output of SAW resonator is input to SAW terminal (3P) via L201 and C244 for feedback voltage adjusting to oscillate the VOC, and output to prescaler and PLOUT terminal (1P) by dividing amp. When PLL circuit is lockin, the 1/4 Local signal of 389.2515 MHz • −8 dBm is gained at PLOUT terminal (1P). The 1/4 Local signal is multipled by 4 using 2 stage 2 multipliers (Q202, Q203), limited the band by BPF (F201) of 1557.006 MHz, amplified to 0 dBm by local amp (Q204), and output from CN201 to RF board. But the ripple filter (Q201) is inserted at the front place of V_{VCO} terminal (4P) of IC201.

Circuit Diagram

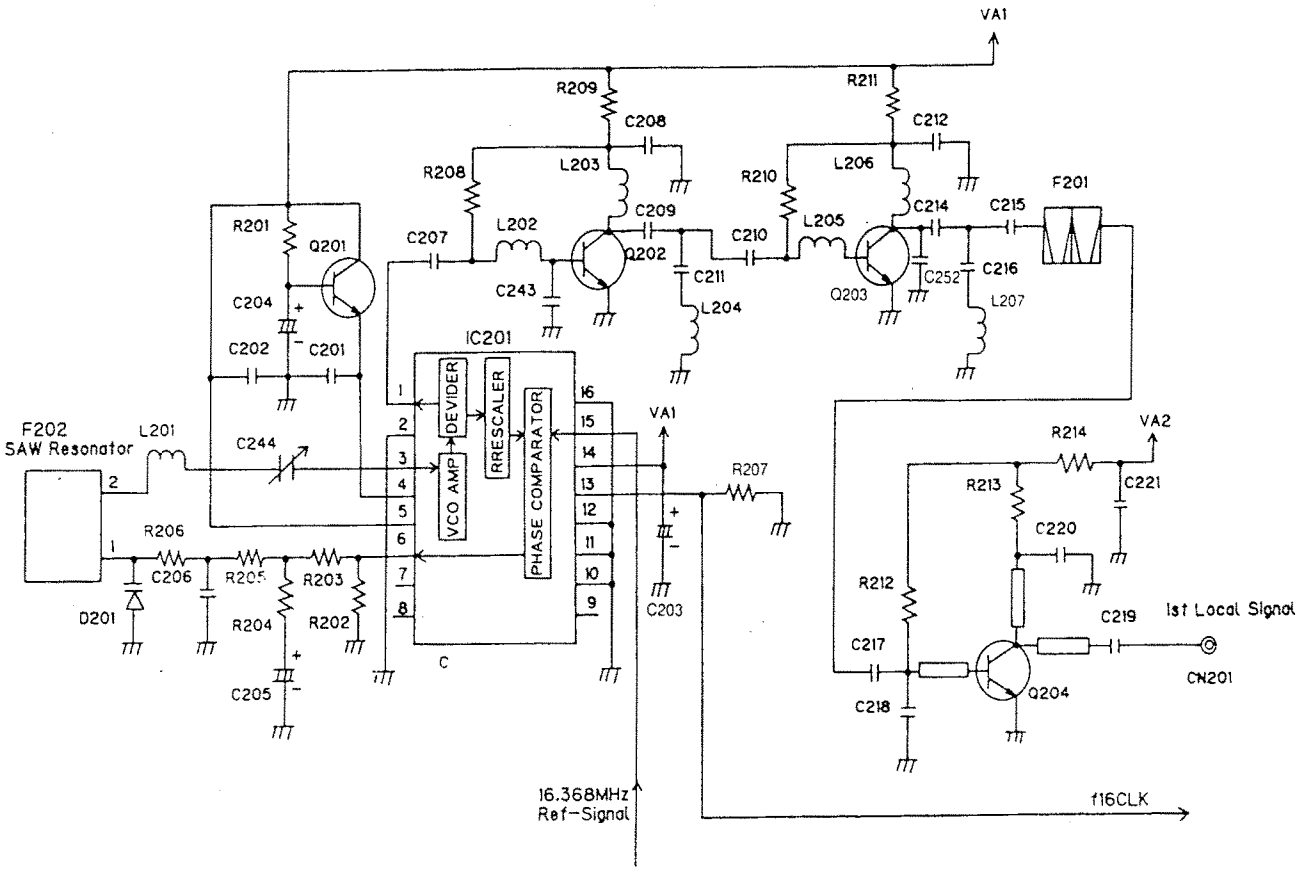


Fig. 31

2-2. Digital Section

The Block Diagram of Digital Section is shown in Fig. 32, 33.
After dividing this section as following main 8 blocks, each block is explained.

1) CPU peripheral section
2) Satellite homing section
3) RTC (Real Time Clock) section
4) Power source voltage supervisory section
5) LCD control section
6) External interface control section
7) Key control section
8) Buzzer control section

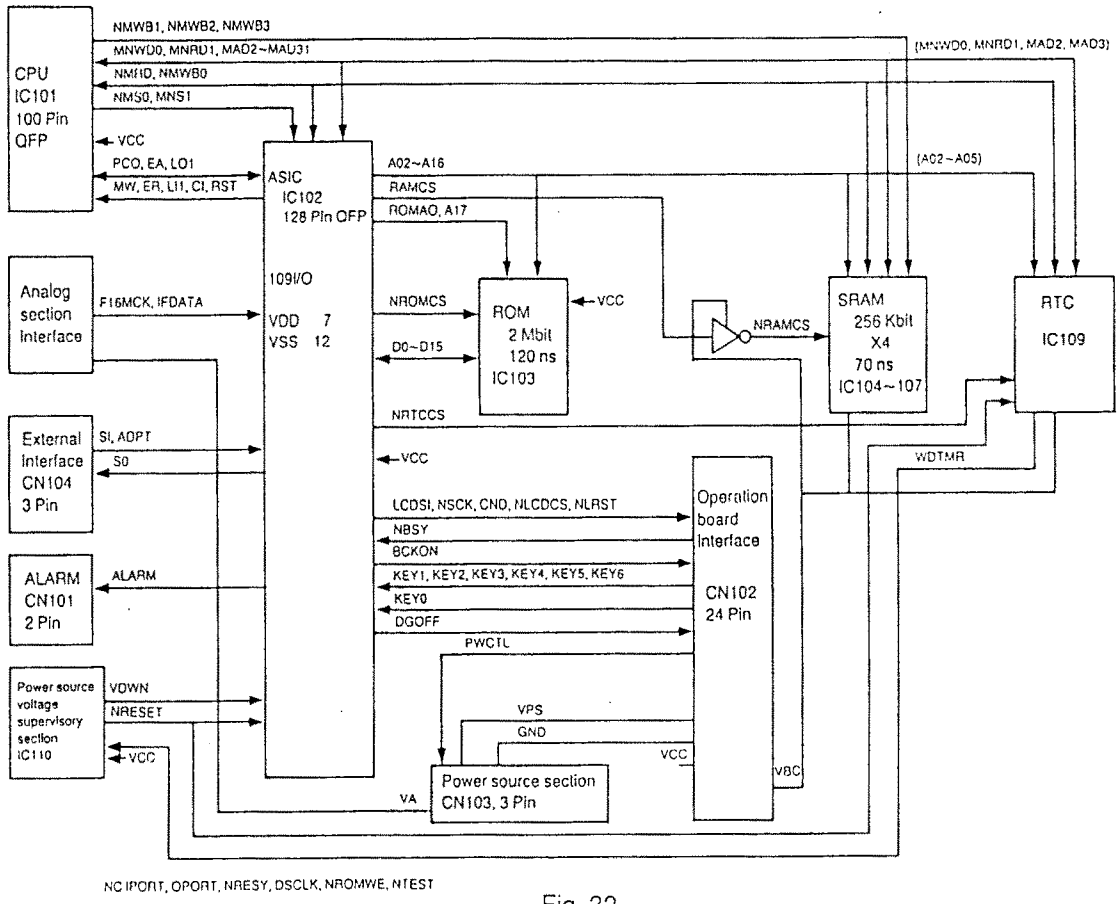


Fig. 32

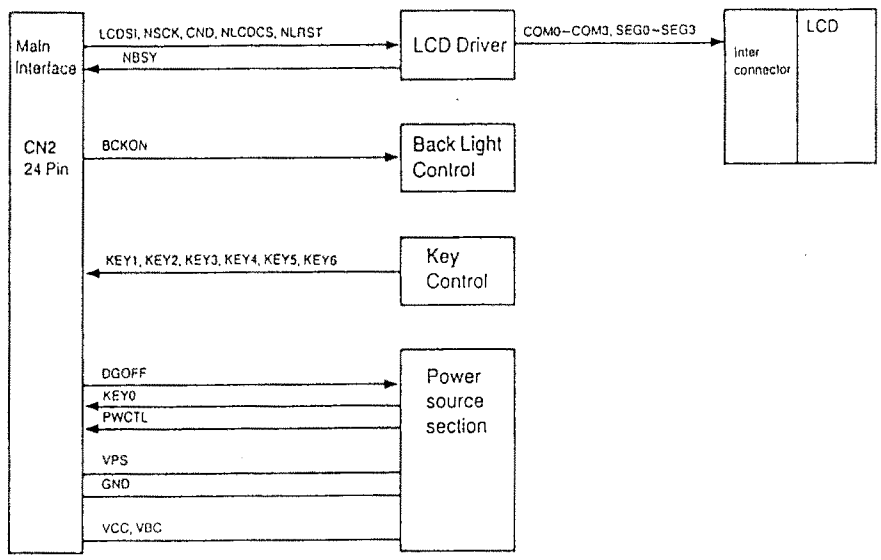


Fig. 33

1) **CPU peripheral section**

The CPU peripheral section consists of CPU (IC101), ROM (IC103), RAM (IC104~107) and the ASIC (IC102).
As to memory access of CPU, ASIC includes the address latch, address decord and wait control function of CPU. As to ROM access especially, convertion from 16 bit to 32 bit is executed by ASIC.
As showing in follow Fig. 34, the drive clock of CPU (CI: 4 MHz) is generated by dividing the fundamental clock (F16MCK: 16 MHz) which is input from the analog section by 4 at ASIC. Then, CPU multiples it by 4 and returns the timing synchronous clock (PCO: 16 MHz) to ASIC.
The pin location of ASIC is shown in Table 1 (Page 15).

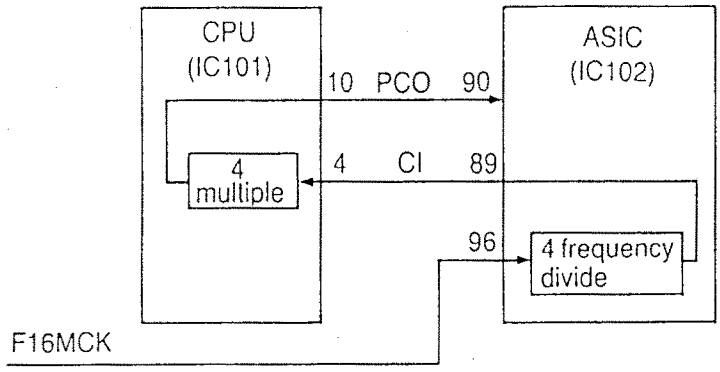


Fig. 34

2) **Satellite homing section**

Based on the signal (IFDATA) which is input from the analog section, the operation necessary for satellite homing is executed in ASIC, and the result is translated to CPU as data using the serial link. (Refer to following Fig. 35.) CPU executes the position operation based on receiving data and outputs the result to LCD.

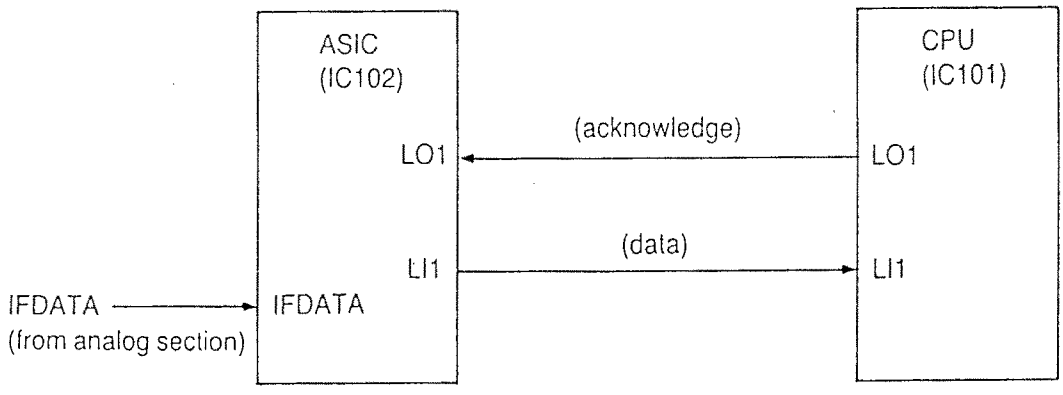


Fig. 35

3) **RTC (Real Time Clock) section**

The Real Time Clock IC (IC109) starts the clock operation by being written the correct time which is obtained by measuring once. As the oscillator for clock (X101) isn't stop and keeps clock operation when the power source is OFF because the power source is connected with the backup power source (VBC). CPU can read out the correct time when the power source became ON after then.
Also, as including the speed detecting timer inside, when CPU runs away and doesn't clear in certain time, the WDTMR signal is output to the power source voltage supervisory IC (IC3), therefore the same IC resets the whole system.

4) Power source voltage supervisory section

The power source voltage supervisory IC (IC110) supervises the power source voltage (V_{CC}), and includes functions which detects the power source voltage is under the reset voltage (4.1 V) to resets whole system via ASIC and it is under the battery mark lights voltage (4.3 V) that shows the power source voltage becomes low and informs via ASIC to CPU.

Both the reset voltage and the battery mark light voltage can be controlled minutely by the external register of the same IC, also the reset time can be controlled as same by external capacitor.

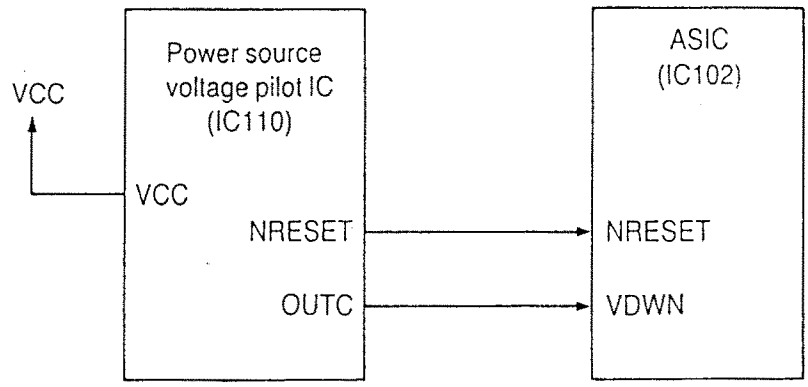


Fig. 36

5) LCD control section

The LCD Display data which is written with byte-type from CPU to ASIC was executed parallel-serial conversion at ASIC and sended to LCD driver (IC1) via connector (CN102). The LCD driver divides the inputted display data into common and segment and supplies them to LCD via the inter connector.

The back light of LCD (4 LCDs) controls the ON/OFF operation using of the port setting from CPU to ASIC.

The connections of LCD are shown in Tables 2, 3. And the pin No. of inter connectors are shown in Table 4 (Page 17, 18).

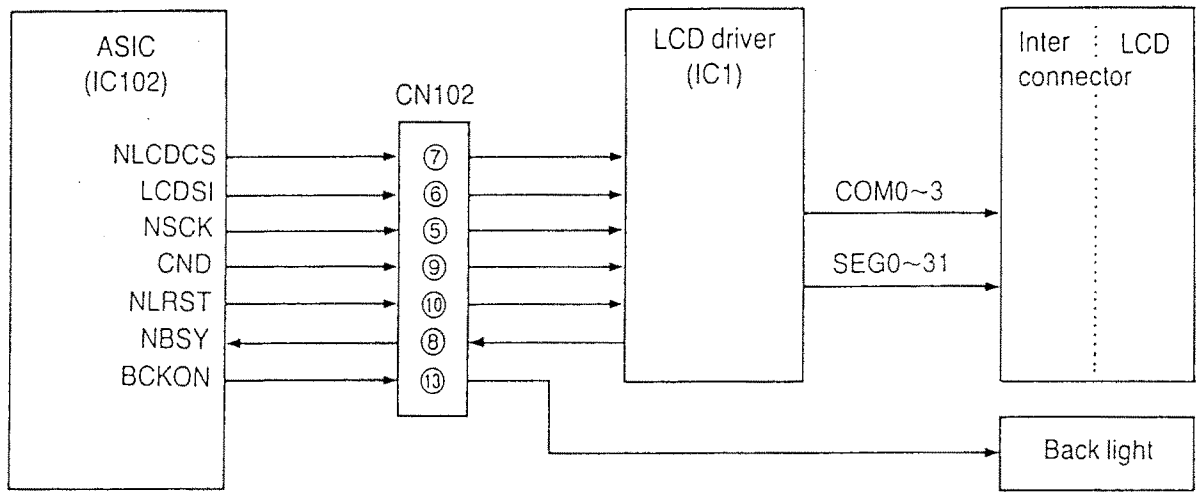


Fig. 37

6) External interface control section

When connecting the optional interface board to connector (CN104), the serial interface based on NMEA 0183A can be used. A portlate can be input and output at 4800 bps.

When outputting, ASIC executes parallel-serial conversion of data from CPU and outputs external, and when inputting, ASIC executes serial-parallel conversion of the data from external and outputs to CPU. But to make the external interface function enable, the ADPT signal must be fixed low.

The optional interface board fixes the ADPT signal low, and alse includes the function which converts the voltage level of 2 signal lines.

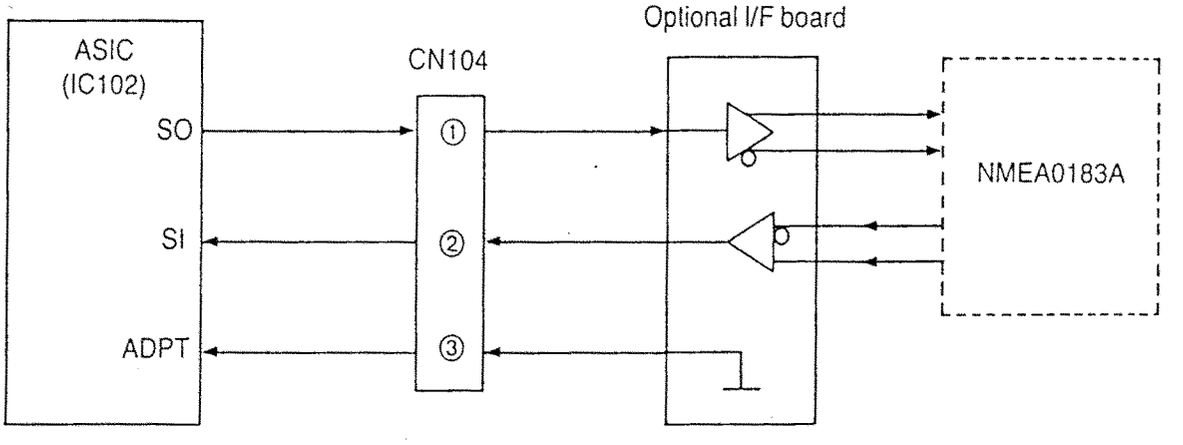


Fig. 38

7) Key control section

The 7 key inputs from the operation board are all fetched to ASIC via connector (CN102) in following diagram, and read to CPU after excepting chattering.

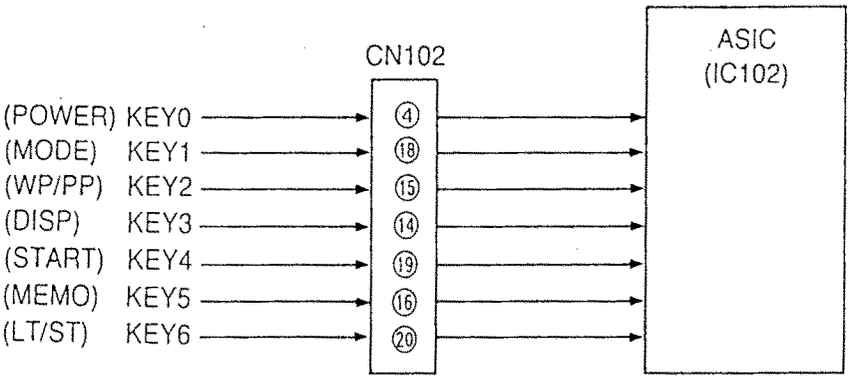


Fig. 39

8) Buzzer control section

The buzzer signal (5 V: 1200 Hz) is generated in ASIC and controlled ON/OFF operation by CPU.

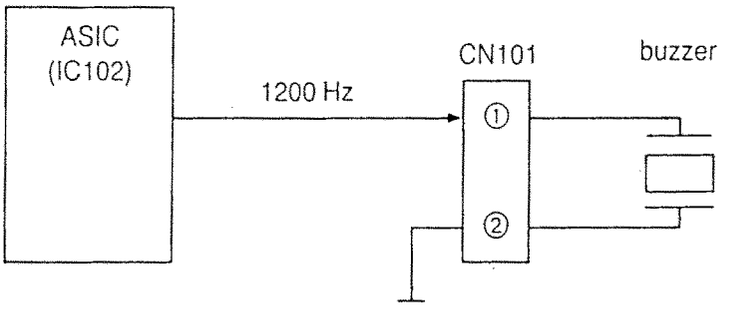


Fig. 40

2-3. Power Source Section

The power source section circuit is developed in the operation board and one portion of the main board, and the power source is supplied by connecting the battery pack (Ni-H Battery pack or AA Alkaline Battery pack) to the unit.
The composition of the power source section circuit makes each the analog power source VA, digital power source VCC and backup power source VBC from the supplied voltage VPS from the battery pack, and makes 2 analog power source VA1, VA2 from the analog power source VA via 2 regulator ICs (IC203, IC204). These power sources are switched ON/OFF by pressing the POWER key to control the PWCTL (Power Control) signal.
However, the backup voltage VBC is supplied about 5 V when installing the battery pack, and supplied about 3 V when removing it.

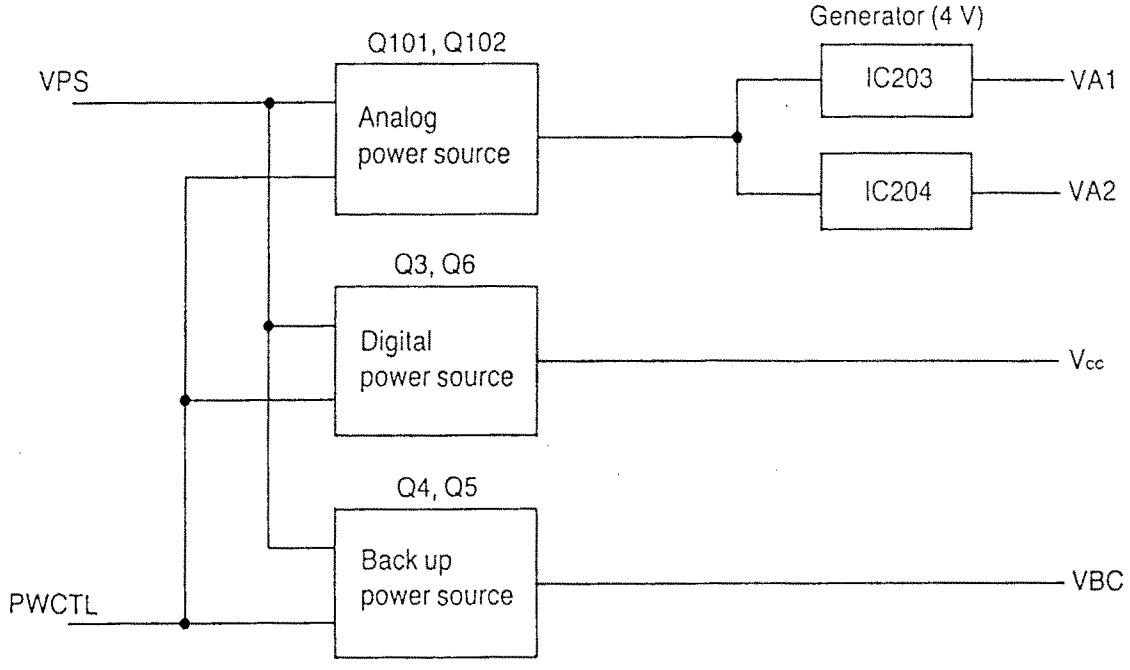
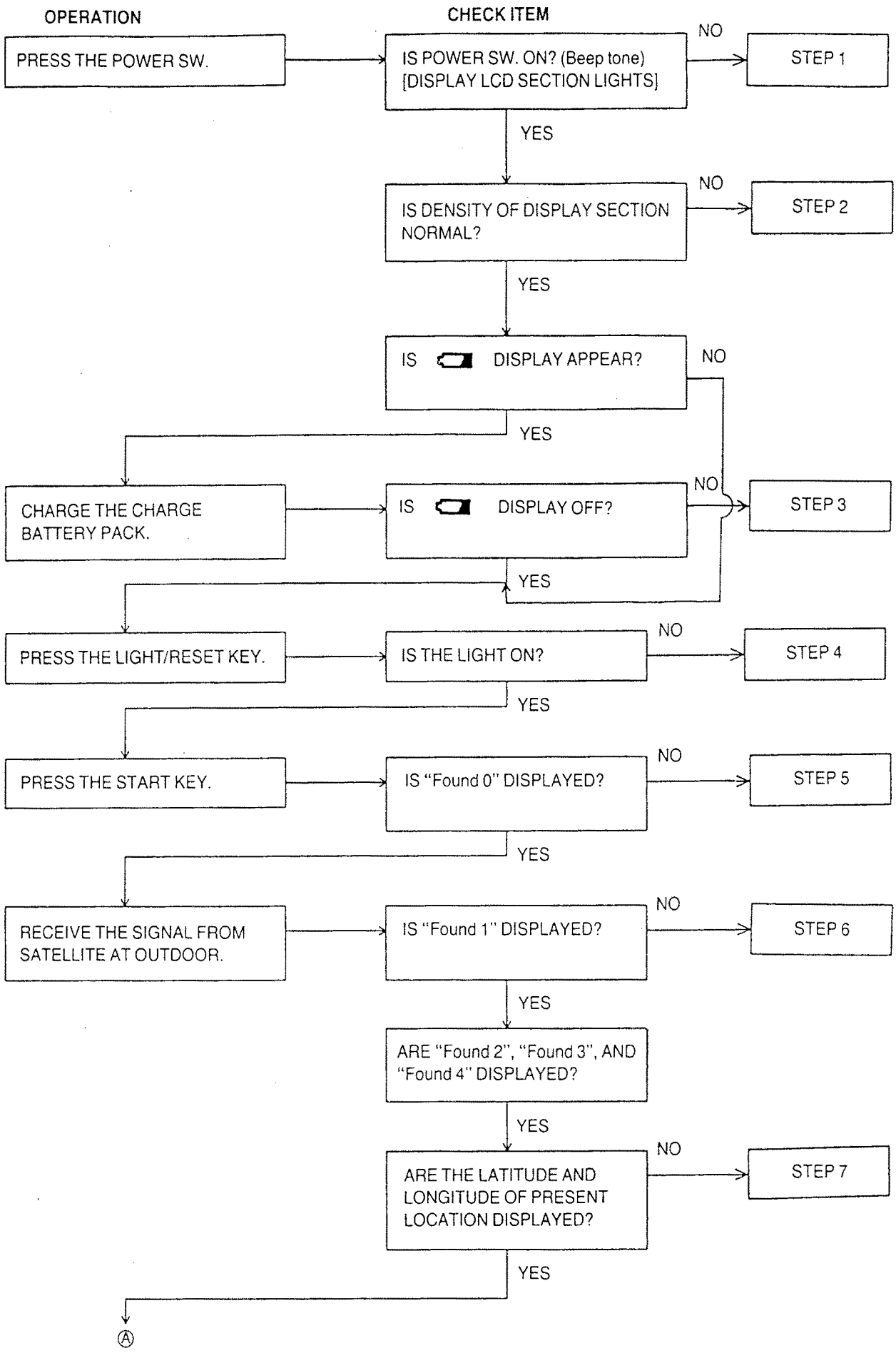
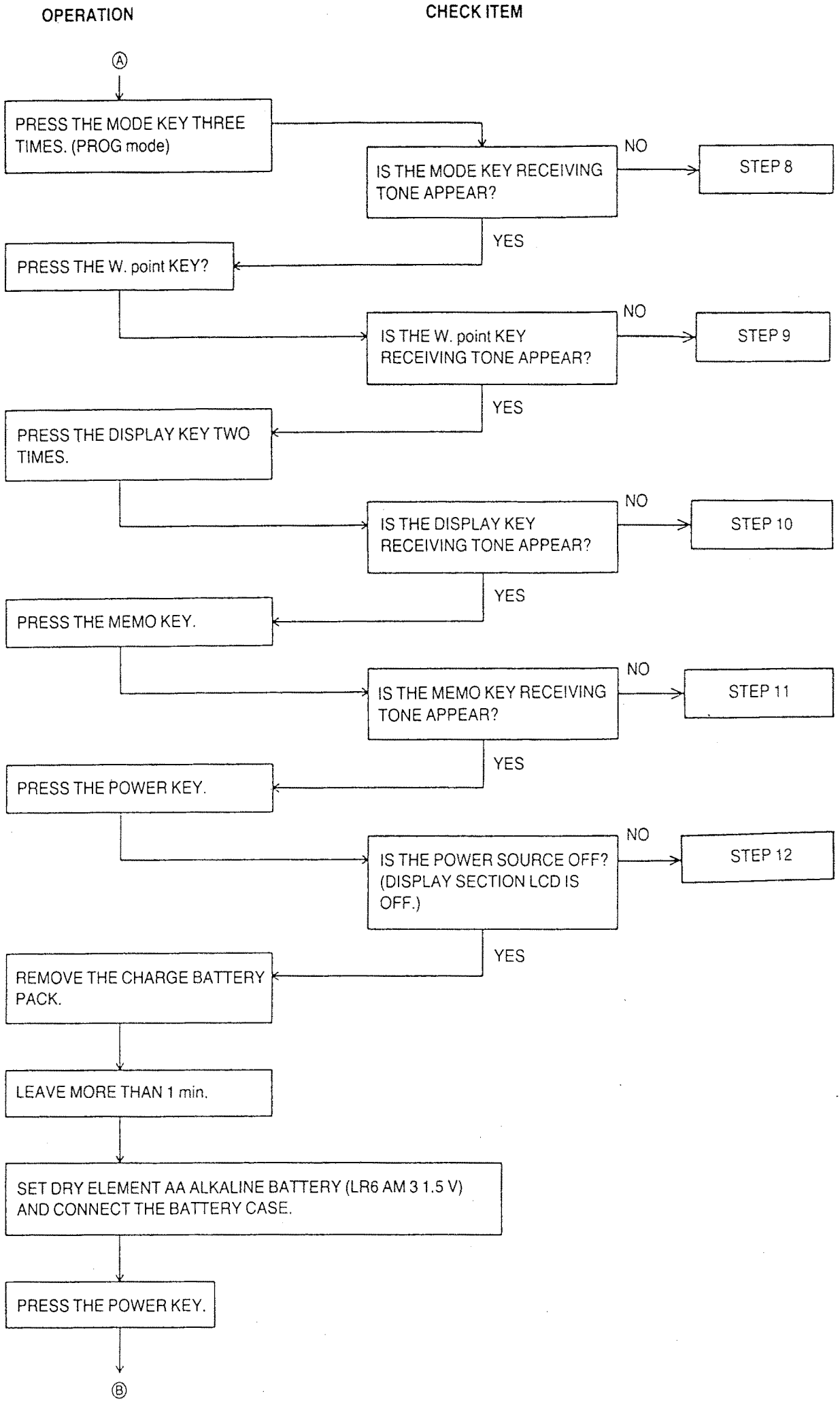


Fig. 41

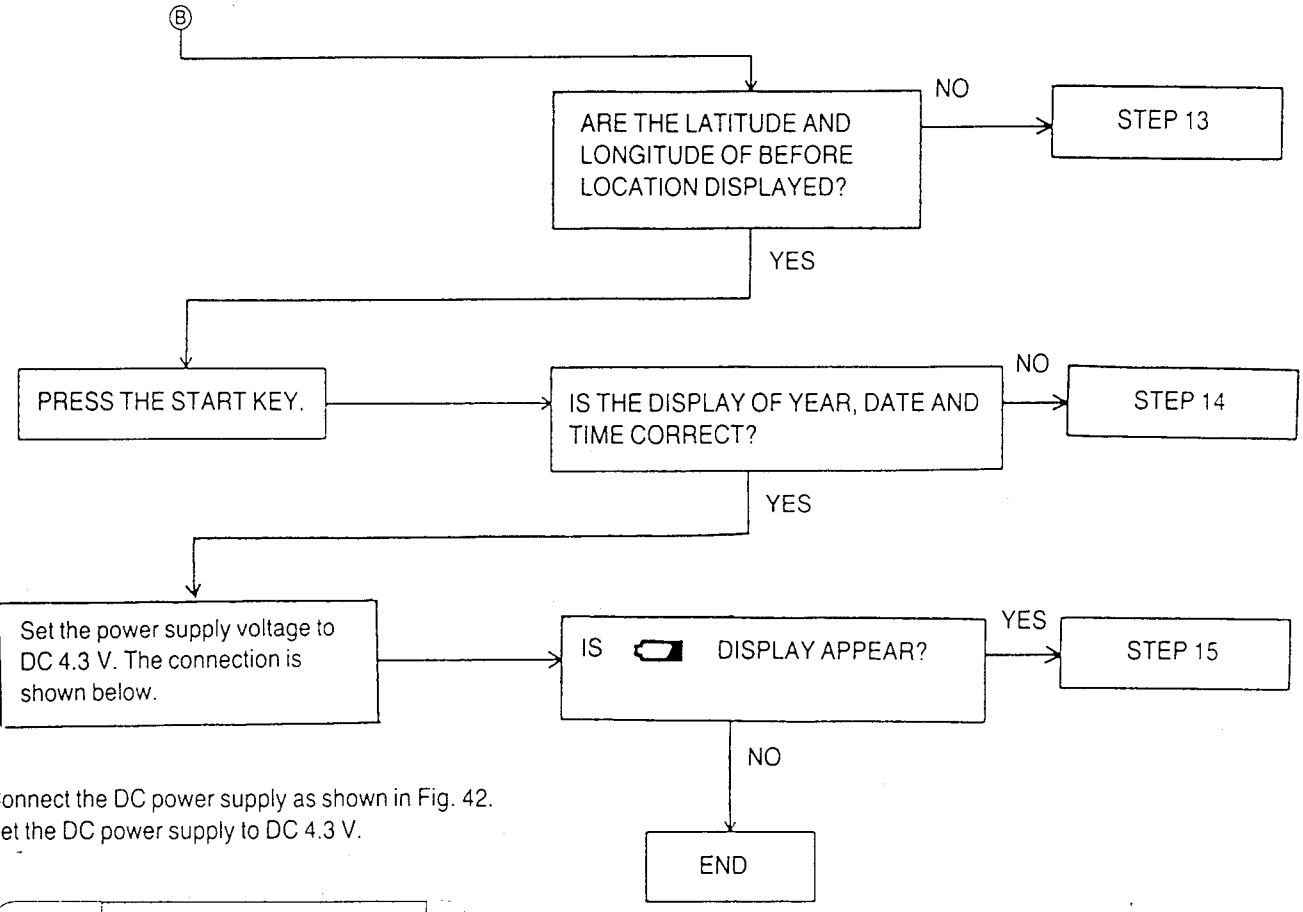
TROUBLESHOOTING GUIDE




OPERATION
CHECK ITEM
Ⓐ
PRESS THE MODE KEY THREE TIMES. (PROG mode)
IS THE MODE KEY RECEIVING TONE APPEAR?
NO
STEP 8
YES
PRESS THE W. point KEY?
IS THE W. point KEY RECEIVING TONE APPEAR?
NO
STEP 9
YES
PRESS THE DISPLAY KEY TWO TIMES.
IS THE DISPLAY KEY RECEIVING TONE APPEAR?
NO
STEP 10
YES
PRESS THE MEMO KEY.
IS THE MEMO KEY RECEIVING TONE APPEAR?
NO
STEP 11
YES
PRESS THE POWER KEY.
IS THE POWER SOURCE OFF? (DISPLAY SECTION LCD IS OFF.)
NO
STEP 12
YES
REMOVE THE CHARGE BATTERY PACK.
LEAVE MORE THAN 1 min.
SET DRY ELEMENT AA ALKALINE BATTERY (LR6 AM 3 1.5 V) AND CONNECT THE BATTERY CASE.
PRESS THE POWER KEY.
Ⓑ

OPERATION

CHECK ITEM



1. Connect the DC power supply as shown in Fig. 42.
2. Set the DC power supply to DC 4.3 V.

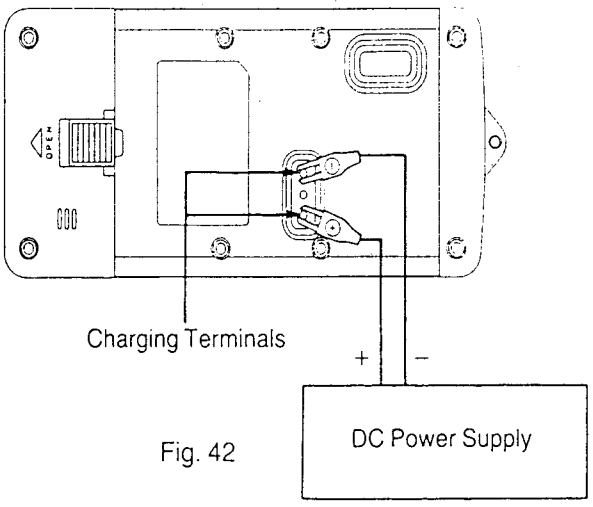


Fig. 42

STEP 1: NO POWER/LCD DOES NOT LIGHT/NO BUZZER.

Major Causes:

1) The power source voltage is low.
2) The battery terminal (CN103) between battery pack and unit is defective contact.
3) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
4) The harness of flex between Main Board and Operation Board is breaking of wire.
5) Installation of POWER button is failure.
6) Operation Board is failure (Power source section).
7) The inter connector of LCD is defective connection.
8) Operation Board is failure (LCD and peripherals).
9) Connection between Main Board and Buzzer is failure (CN101).
10) Failure of buzzer
11) Failure of Main Board

Checks and Repairs:

1) Connect the power source to the unit and confirm the voltage of VPS in a state of pressing the power button.

Check Point	Voltage
CN103 PIN1 (VPS)~PIN3 (GND)	more than 4.4 V

If it is abnormal, raise the power source voltage. In the case the VPS voltage doesn't rise yet after that, it judged that either Operation Board or Main Board is failure.

2) Confirm that the electrode of CN103 comes in contact with the electrode of battery pack firmly.
3) 4) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN1, 2—CN2 PIN1, 2 (conductive test)
CN102 PIN4, 5—CN2 PIN4, 5 (conductive test)
CN102 PIN6, 7—CN2 PIN6, 7 (conductive test)
CN102 PIN8 —CN2 PIN8 (conductive test)
CN102 PIN9 —CN2 PIN9 (conductive test)
CN102 PIN11 —CN2 PIN11 (conductive test)
CN102 PIN12 —CN2 PIN12 (conductive test)
CN102 PIN13 —CN2 PIN13 (conductive test)
CN102 PIN14 —CN2 PIN14 (conductive test)
CN102 PIN15 —CN2 PIN15 (conductive test)
CN102 PIN16 —CN2 PIN16 (conductive test)
CN102 PIN17 —CN2 PIN17 (conductive test)

5) Confirm that the POWER button is installed at correct position.
6) Connect the power source, and confirm the voltage of VPS, V_{cc} and VBC when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)
CN2 4, 5 (VPS)	about 5 V
CN2 6, 7 (V_{cc})	about 5 V
CN2 8 (VBC)	about 5 V

If above value is abnormal, measure the voltage of IC2 and peripherals, compare it with the voltage when power source is ON which is shown in circuit diagram to confirm the abnormal position, and replace the failure parts or Operation Board.

7) Confirm if the LCD inter connector is soiled with dust.
8) Confirm that IC1, R9, R10, R11 and R12 connect firmly.
9) Confirm that buzzer are connected with Main Board firmly.
10) Confirm if the lead line is soldered on the piezoelectric oscillation board of buzzer firmly.

11) Confirm the voltage of VA1 and VA2 when the power source is ON.

Check Point	Voltage (to GND)
IC203 PIN2	4 V
IC204 PIN2	4 V

If above value is abnormal, measure the voltage of Q101, Q102 and peripherals, compare it with the voltage when power source is ON which is shown in circuit diagram to confirm the abnormal position, and replace the failure parts or Main Board.
If above value is normal, observe the wave form of F16CLK with oscilloscope.

Check Point	Wave form	
IC202 PIN13	 (little dull wave form)	more than 2.0 V less than 0.8 V

If wave form is abnormal, confirm that IC202 and X201 are connected firmly.
When it isn't abnormal, exchange the Main Board.

STEP 2: DENSITY OF LCD DISPLAY IS ABNORMAL.

Major Causes:
1) The power source voltage is low.
2) The battery terminal (CN103) between battery pack and unit is defective contact.
3) The voltage for LCD control is failure.
4) The inter connector of LCD is defective connection.
5) Operation Board is failure.

Check and Repairs:
1) Connect the power source to the unit and confirm the voltage of VPS in a state of pressing the power button.

Check Point	Voltage
CN103 PIN1 (VPS)~PIN3 (GND)	more than 4.4 V

2) Confirm that the electrode of CN103 comes in contact with the electrode of battery pack firmly.
3) Remove the optic conductive board (refer to exploded view), install it to Operation Board again after adjusting the location of inter connector, and confirm the driving.
4) Overlook to comfirm that R10, R11 and R12 are installed the correct position on Operation Board, further confirm following check point voltage.

Check Point	Voltage (to GND)
IC1 PIN21	5 V (VCC)
IC1 PIN17	3.3 V (2/3 VCC)
IC1 PIN18	1.7 V (1/3 VCC)
IC1 PIN19	0 V (GND)

If the installation of R10, R11 and R12 are abnormal, correct them. In case that the voltage of above check point is abnormal, replace IC1 or Operation Board.

STEP 3: REDUCED VOLTAGE DISPLAY APPEARS.

Major Causes:
1) The power source voltage is low.
2) The battery terminal (CN103) between battery pack and unit is defective contact.
3) Main Board is failure.

Checks and Repairs:
1) Connect the power source to the unit and confirm the voltage of VPS in a state of pressing the power button.

Check Point	Voltage
CN103 PIN1 (VPS)—PIN3 (GND)	more than 4.4 V

2) Confirm that the electrode of CN103 comes in contact with the electrode of battery pack firmly.
3) Overlook to comfirm that R107 and R108 are installed the correct position on Main Board, and if that are abnormal, correct them, further confirm the voltage of VDWN signal and IC110 PIN2.

Check Point	Voltage (to GND)
IC110 PIN3 (VDOWN)	about 0 V
IC110 PIN2	about 1.5 V

In case that the voltage of above check point is abnormal, replace IC110 or Main Board.

STEP 4: LT/ST BUTTON IS NOT USEFUL/BACKLIGHT DOES NOT LIGHT.

Major Causes:
1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Installation of LT/ST button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:
1) 2) Use the tester to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN19—CN2 PIN19 (conductive test)
CN102 PIN18—CN2 PIN18 (conductive test)

3) Confirm that LT/ST button is installed at correct position.
4) Connect the power source, and confirm the voltage of KEY6 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN19	about 5 V	LT/ST button OFF
CN2 PIN19	about 0 V	LT/ST button ON

If it is abnormal, it is judged that failure of LT/ST button or disconnection of pattern, repair the Operation Board. If it is normal, measure the voltage of Q8 and peripherals and compare it with the voltage when back light ON which is shown in circuit diagram to confirm the abnormal position, and replace the failure parts or Operation Board.
5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 5: START BUTTON IS NOT USEFUL.

Major causes:
1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Installation of START button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:
1) 2) Use the tester to confirm that Main Board connects with Operation Board firlmy.

Check Point
CN102 PIN24—CN2 PIN24 (conductive test)

3) Confirm that the START button is installed at correct position.
4) Connect the power source, and confirm the voltage of KEY4 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN24	about 5 V	START button OFF
CN2 PIN24	about 0 V	START button ON

If it is abnormal, it is judged that failure of START button or disconnection of pattern, and repair the Operation Board.
5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 6: RECEIVING WITH SATELLITE IS IMPOSSIBLE.

Major causes:
1) No satellite/invisible.
2) Defective connection between Antenna and RF Board (CN301).
3) Defective connection between RF Board and Main Board (CN302, 303).
4) Failure of Main Board.
5) Failure of RF Board.

Checks and Repairs:
1) Confirm the measuring place and hours that satellites can be seen.
2) Confirm that antenna connects with RF Board firmly.
3) Confirm that RF Board connects with Main Board firmly.
4) If the value of VA1 (IC205-2P) and VA2 (IC206-2P) aren't from 3.75 to 4.25 V, either IC is failure or the power source line is short circuit to ground.
   - Use the spectrum analizer to measure the output of CN201, if the signal of 1557.006 MHz • −3~0 dBm isn't output, the 1st Local signal generator is failure.
   a) If the collector electric potential of Q202, Q203 and Q204 are 4 V, either transistor is failure or base doesn't get bias.
   b) If the emitter voltage of Q201 is 0 V, Q201 or R201 is abnormal.
   c) Use the synchroscope to confirm the wave form of IC201-9P, if short wave of 127.875 kHz isn't appear, either IC201 is failure or signal of IC201-6P is breaking of wire halfway.
   d) If there is no application in a), b) and c) above, the signal line from IC201-1P to CN301 is breaking of wire.
   - Use the synchroscope to confirm the wave form of IC203-3P, if signal of 16.368 MHz isn't appear, either IC202 is failure or signal line may be breaking of wire.
   - Input the signal of 18.414 MHz/about −60 dBm from signal generator to CN202, if short wave of 2.046 MHz/0~4 V doesn't appear at IC204-4P, 2nd IF circuit is failure.
   e) Confirm the voltage of power source terminal of IC203 and IC204.
   f) If the voltage of each terminal of IC203 is abnormal, either IC203 or peripheral circuit is destroyed.
   g) Use the synchroscope to confirm the output of TP2A, if output of 0–4 V isn't gained, IC204 is failure.
   h) If there is no application in e), d) and g) above, the signal line from CN201 to IC204 may be breaking of wire.
5) • Confirm the analog section of Main Board is normal. And then, when inputting the signal of 1575.42 MHz/about −100 dBm from signal generator to CN301 and confirming the wave from of TP2A by synchroscope, if the signal of 2.046 MHz isn't gained, RF Board is failure.
   i) If the collector voltage of Q301, Q302, Q303 and Q305 is 0 V or 4 V, transistor is destroyed.
   j) If the drain voltage of Q304 is 4 V, either FET is destroyed or source is floating.

K) If there is no application in i) and j) left, the signal line may be breaking of wire.

After Executing the checks left, replace destroyed parts or failure Board.

STEP 7: MEASURING IS IMPOSSIBLE.

Major causes:
1) No satellites/invisible
2) Failure of Main Board

Checks and Repairs:
1) Confirm the measuring place and hours that more than 3 satellites can be seen.
2) Check following 4 points about Main Board and Analog Board.
   A) If Output of IC204 is abnormal.
   B) Aging of oscillating frequency
   C) Look out of PLL circuit
   D) Frequency distortion of 1st IF circuit

A) In case observing the period wave form in output of TP2A by using synchroscope, confirm that IC204-7P is neither open nor grounded, and that capacitor terminal for decoupling (17P, 19P, 21P and 23P) isn't touched to other.
B) At normal temparature, use the frequency counter to measure the frequency of IC202-6P correctly. If the distortion is more than 4ppm, re-adjust X201.
C) Measure the frequency character of RF Board in method based on re-adjusting method 4–2. If the center frequency has distortion, re-adjust L303 and L304.
D) At normal temparature, if the voltage of TP1A isn't 2 V, re-adjust the feedback boards because PLL circuit doesn't lock, therefore necessary 1st Local signal may be not gained when temparature is changed.

Execute re-adjusting above or replace boards.

STEP 8: MODE BUTTON IS NOT USEFUL.

Major causes:
1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Installation of MODE button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:
1) 2) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN23–CN2 PIN23 (conductive test)

3) Confirm that the MODE button is installed at correct position.
4) Connect the power source and confirm the voltage of KEY1 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN23	about 5 V	MODE button OFF
CN2 PIN23	about 0 V	MODE button ON

If it is abnormal, it is judged that failure of MODE button or disconnecton of halfway pattern. Replace the Operation Board.
5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 9: WP/PP BUTTON IS NOT USEFUL.

Major Causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Installation of WP/PP button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:

1) 2) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN21–CN2 PIN21 (conductive test)

3) Confirm that the WP/PP button is installed at correct position.
4) Connect the power source, and confirm the voltage of KEY2 signal, when pressing the POWER botton (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN21	about 5 V	WP/PP button OFF
CN2 PIN21	about 0 V	WP/PP button ON

If it is abnormal, it is judged that failure of WP/PP button or disconnection of halfway pattern and replace the Operation Board.

5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 10: DISP BUTTON IS NOT USEFUL.

Major causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between main Board and Operation Board is breaking of wire.
3) Installation of DISP button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:

1) 2) Use the tester to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN20–CN2 PIN20 (conductive test)

3) Confirm that the DISP button is installed at correct position.
4) Connect the power source and confirm the voltage of KEY3 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN20	about 5 V	DISP button OFF
CN2 PIN20	about 0 V	DISP button ON

If it is abnormal, it is judged that failure of DISP button or disconnection of halfway pattern. Replace the Operation Board.

5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 11: MEMO BUTTON IS NOT USEFUL.

Major causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Installation of MEMO button is failure.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:

1) 2) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN22–CN2 PIN22 ("on" period test)

3) Confirm that the MEMO button is installed at correct position.
4) Connect the power source and confirm the voltage of KEY5 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN22	about 5 V	MEMO buton OFF
CN2 PIN22	about 0 V	MEMO button ON

If it is abnormal, it is judged that failure of MEMO button or disconnection of halfway pattern. Replace the Operation Board.

5) If there is no problem with the checks in 1), 2), 3) and 4) above, Main Board is failure and should be replaced.

STEP 12: POWER OFF IS IMPOSSIBLE.

Major causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) Operation Board is failure.
4) Main Board is failure.

Checks and Repairs:

1) 2) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

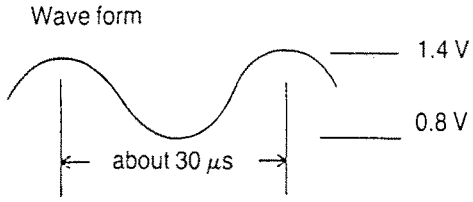
Check Point
CN102 PIN10–CN2 PIN10 ("on" period test)
CN102 PIN17–CN2 PIN17 ("on" period test)

3) Connect the power source, and confirm the voltage of KEY0 signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)	Condition
CN2 PIN10	about 5 V	POWER button OFF
CN2 PIN10	about 0 V	POWER button ON

If it is abnormal, it is judged that failure of POWER button or disconnection of halfway pattern and replace the Operation Board. If it isn't abnormal, confirm that IC2 and Q1 are connected firmly.

4) If there is no problem with the checks in 1), 2) and 3) above, Main Board is failure and should be replaced.

Check Point	Wave form
IC109 PIN17	

When the wave form above is not observed, confirm that IC109, X101, C110, C111 and R110 are connected firmly. If it is abnormal, correct it. After that, if normal operation in not obtained yet, replace main Board.

STEP 15: REDUCE VOLTAGE DISPLAY DOES NOT APPEAR.

Major causes:
1) The power source voltage is low.
2) The battery terminal between battery pack and unit is defective contact (CN103).
3) Main Board is failure.

Checks and Repairs:
same as STEP 3

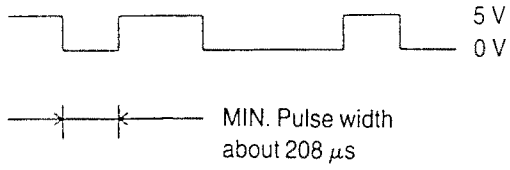
STEP 16: EXTERNAL INTERFACE DOES NOT OPERATE.

Major causes:
1) Measuring operation stops.
2) The battery terminal between battery pack and unit is defective contact (CN103).
3) Main Board is failure.
4) I/F board (option) is failure.

Checks and Repairs:
1) Confirm the mesuring place and hours that more than 3 satellites can be seen.
2) Confirm that Main Board is connected with I/F board firmly.
3) Connect the power source and confirm the voltage of ADPT signal, when pressing the POWER button (Power ON).

Check Point	Voltage (to GND)
CN104 PIN3	about 0 V

If the value of voltage is abnormal, 1) or 4) must be caused. If it is normal, use the oscilloscope to confirm the wave form of SO signal in a state of measuring.

Check Point	wave form
CN104 PIN1	

After measuring, if the value of SO signal is still fixed 5 V and the wave form above is not observed, replace Main Board.

4) If there is no problem with the checks in 1), 2) and 3) above, I/F Board is failure and should be replaced.

STEP 13: BACK UP OF MEASURING RESULT IS IMPOSSIBLE.

Major causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) The lithium battery voltage becomes low.
4) Operation Board is failure.

Checks and Repairs:

1) 2) Use the digital voltmeter to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN8–CN2 PIN8 ("on" period test)

3) Confirm that the lithium battery (BA1) is connected firmly and measure its voltage.

Check Point	Voltage (to GND)
BA1+	more than 2.5 V

If the value of voltage is lack, replace BA1.

4) Measure the voltage of backup power source (VBC) in a state of removing the power source.

Check Point	Voltage (to GND)
CN2 PIN8	more than 2 V

If the value of voltage is lack, confirm that D1, R7 and J are connected firmly.
If it's abnormal, correct it and confirm that VBC becames voltage value above.

STEP 14: CLOCK OPERATION STOPS.

Major causes:

1) The harness and connector between Main Board and Operation Board are defective connection (CN102, CN2).
2) The harness of flex between Main Board and Operation Board is breaking of wire.
3) The lithium battery voltage becomes low.
4) Operation Board is failure.
5) Main Board is failure.

Checks and Repairs:

1) 2) Use the tester to confirm that Main Board connects with Operation Board firmly.

Check Point
CN102 PIN8–CN2 PIN8 ("on" period test)

3) Confirm that the lithium battery (BA1) is connected firmly.

Check Point	Voltage (to GND)
BA1+	more than 2.5 V

If the value of voltage is lack, replace BA1.

4) Measure the voltage of backup power source (VBC) in a state of removing.

Check Point	Voltage (to GND)
CN2 PIN8	more than 2 V

If the value of voltage is lack, confirm that D1, R7 and Jumper J1 are connected firmly, if it is abnormal, correct it and confirm that VBC becomes voltage value above.

5) Use oscilloscope to confirm if the real time clock (IC109) continues oscillating in a state of removing the power source.

CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION (GP-22)

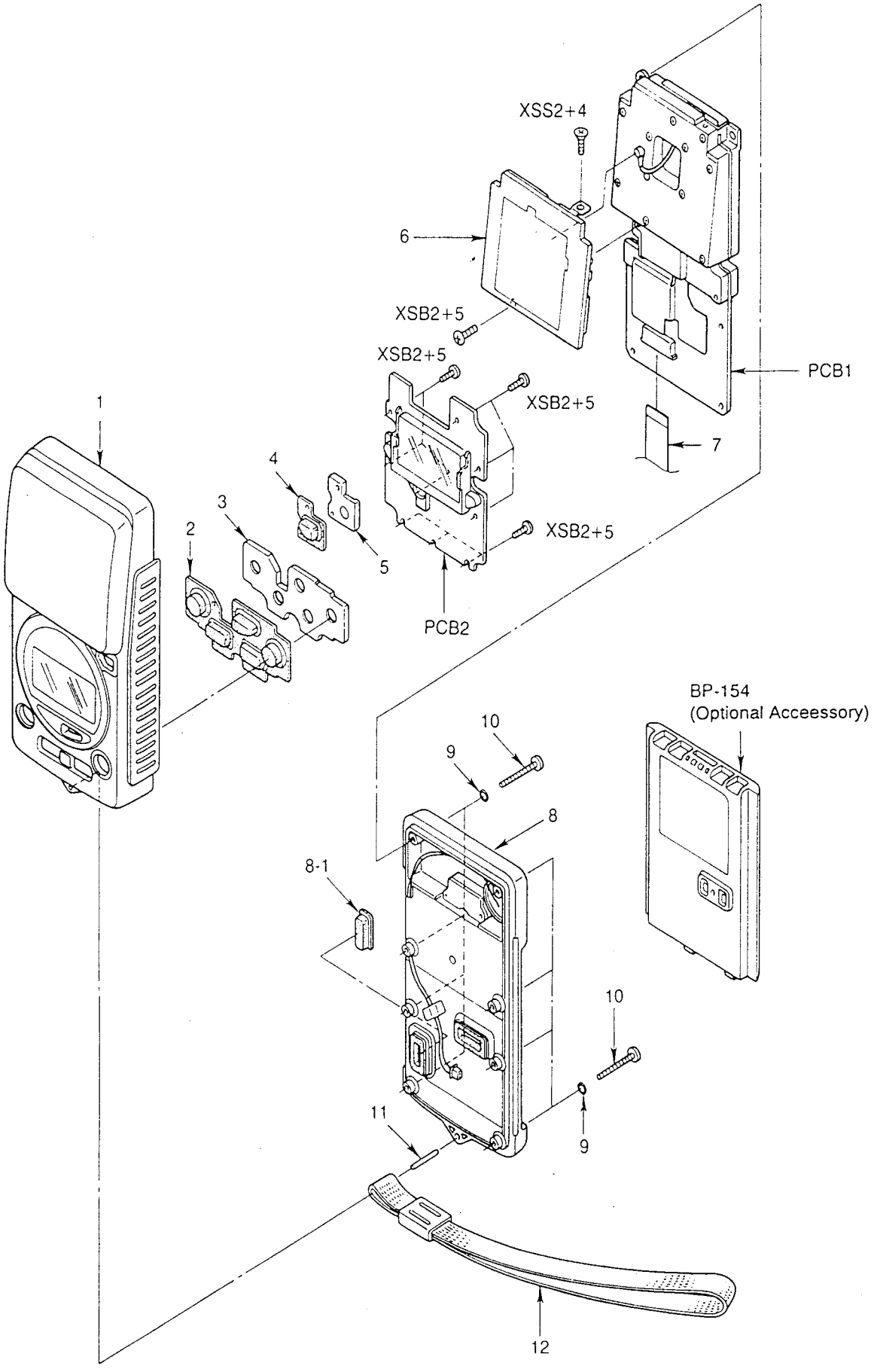


Fig. 43

CABINET AND ELECTRICAL PARTS LOCATION (BC-101)

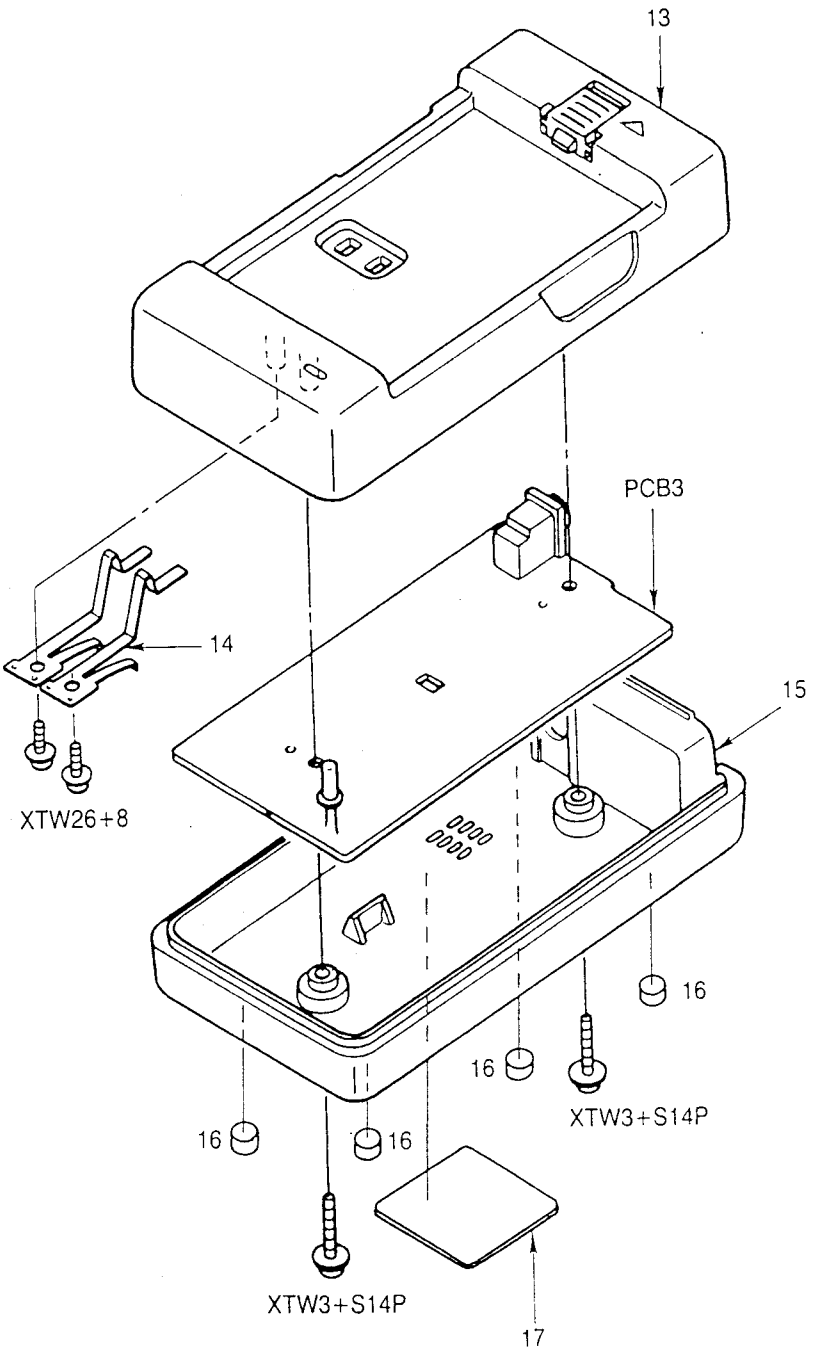


Fig. 44

ACCESSORIES AND PACKING MATERIALS

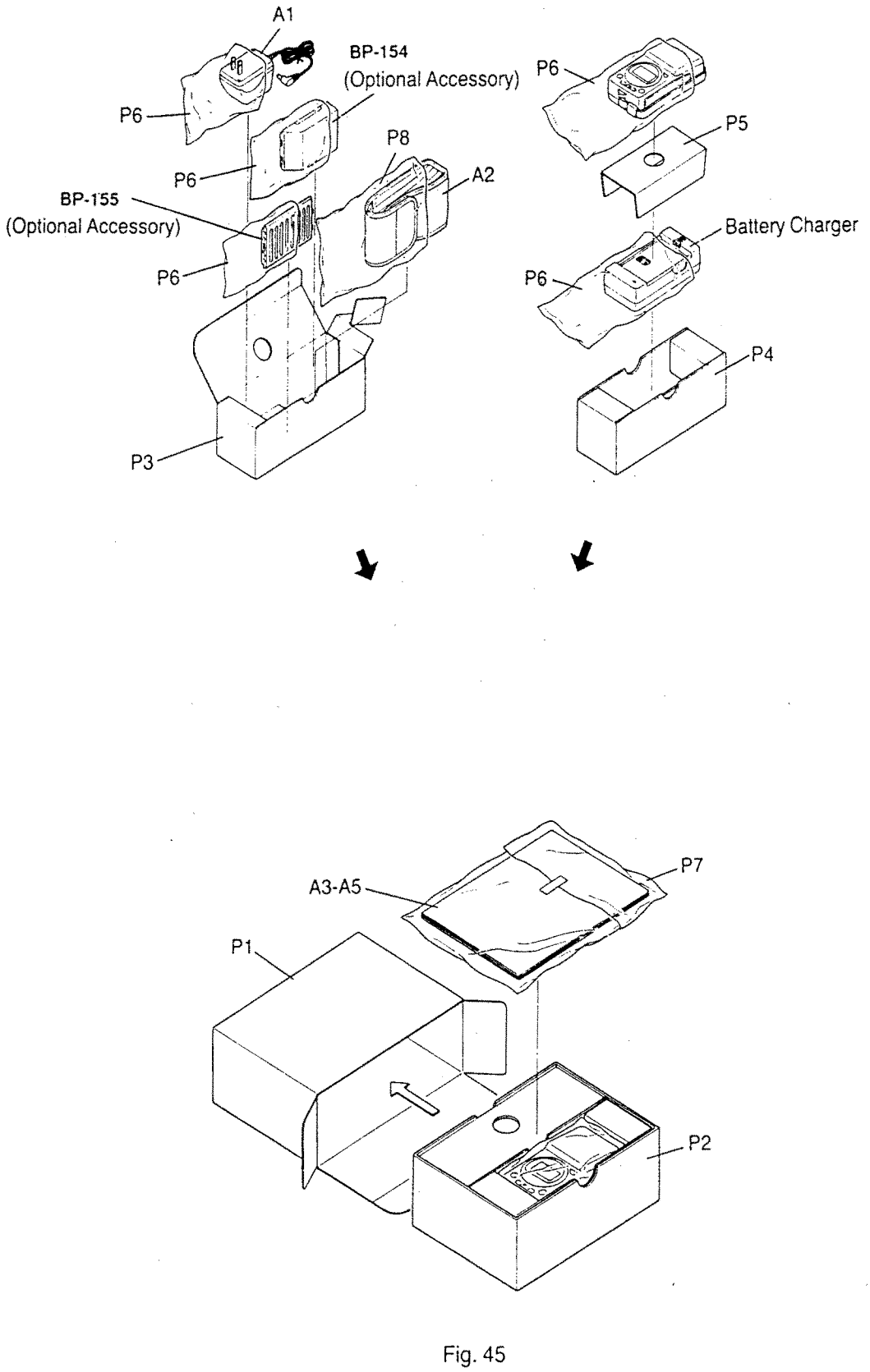


Fig. 45

REPLACEMENT PARTS LIST

Model GP-22

Notes:

1. RTL (Retention Time Limited)
   The marking (RTL) indicates that the Retention Time is limited for this item.
   After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time.
   The retention period of availability is dependant on the type of assembly, and in accordance with the laws governing part and product retention.
   After the end of this period, the assembly will no longer be available.
2. Important safety notice.
   Components identified by the ⚠ mark special characteristics important for safety.
   When replacing any of these components, use only manufacture's specified parts.
3. The Ś mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified.
   All resistors are in ohms(Ω) k=1000Ω,M=1000kΩ
   All capacitors are in MICRO FARADS(μF) P=μμF
   *Type &Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Carbon
ERD:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
PQRD:Carbon	ER0:Metal Film	ERF:Cement Resistor

Wattage

10,16:1/8W	14,25:1/4W	12:1/2W	1:1W	2:2W	3:3W

*Type & Voltage of Capacitor

Type

ECFD:Semi-Conductor	ECCD,ECKD,ECBT,PQCBC : Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG : Polyester
PQCUV:Chip	ECEA,ECSZ : Electrolytic
ECQMS:Mica	ECQP : Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F:3.15V	0J :6.3V	1V :35V
2A:100V	1:100V	1A:10V	1A :10V	50,1H:50V
2E:250V	2:200V	1V:35V	1C :16V	1J :63V
2H:500V		0J:6.3V	1E,25:25V	2A :100V

Ref. No.	Part No.	Part Name & Description		Pcs
		MAIN BOARD PARTS		
PCB1	PQWP1G5500M	MAIN BOARD ASS'Y (RTL)		1
		(ICs)		
IC101	PQVI400BFKX	IC		1
IC102	PQVI1039F0F	IC		1
IC103	PQWIG5500M	IC		1
IC104	PQVICX5825YF	IC		1
IC105, 106	PQVICX5825TF	IC		2
IC107	PQVICX5825YF	IC		1
IC108	PQVITC7S04FR	IC		1
IC109	PQVIRIF5C62	IC		1
IC110	PQVIMB3771F	IC		1
IC201	AN8547S	IC		1
IC202	PQVITC7H04AF	IC		1
IC203	PQVICXA1293M	IC		1
IC204	PQVITC7S04FR	IC		1
IC205, 206	PQVILA5004ME	IC		2
		(TRANSISTORS)		
Q101	2SB956R	TRANSISTOR(SI)		1
Q102	UN5213	TRANSISTOR(SI)	S	1
Q103	PQVTDTC114Y	TRANSISTOR(SI)		1
Q201	2SD2216R	TRANSISTOR(SI)		1
Q202	2SC4808	TRANSISTOR(SI)		1
Q203	2SC4515	TRANSISTOR(SI)		1
Q204	2SC4228R	TRANSISTOR(SI)		1
Q301	2SC4784	TRANSISTOR(SI)		1
Q302, 303	2SC4228R	TRANSISTOR(SI)		2
Q304	3SK228	TRANSISTOR(SI)		1
Q305	2SC2619C	TRANSISTOR(SI)		1
		(DIODES)		
D101	MA8056H	DIODE(SI)		1
D201	MA321	DIODE(SI)		1
		(COILS)		
L201	PQLQR1F27NJ	COIL		1
L202	PQLQR1I68NG	COIL		1
L203	PQLQR1B039MT	COIL		1
L204	PQLQR1B033MT	COIL		1
L205	PQLQR1B039MT	COIL		1
L206	PQLQR1B056MT	COIL		1
L207	PQLQR1I15NG	COIL		1
L208	PQLQR1C101KT	COIL		1
L209	PQLQR1C101KT	COIL		1
L210	PQLQR1C101KT	COIL		1
L211, 212	PQLQR1C470JT	COIL		2
L213	PQLQR1C101KT	COIL		1
L301, 302	PQLQR1I4N7G	COIL		2
L303	PQLRE001	COIL		1
L304	PQLRE002	COIL		1
L305	PQLQR1I4N7G	COIL		1
		(FILTERS)		
F201	EZFB1557AM01	BAND PASS FILTER		1
F202	EF0H387MVP1	SAW FILTER		1
F301	EZFB1575AM01	BAND PASS FILTER		1
		(CRYSTAL OSCILLATORS)		
X101	PQVCG3276N9Z	CRYSTAL OSCILLATOR		1
X201	PQVCA303B163	CRYSTAL OSCILLATOR	S	1
		(RESISTORS)		
R101	ERJ3GEYJ103	10K		1
R102	ERJ3GEYJ473	47K		1
R103, 104	ERJ3GEYJ102	1K		2
R105	ERJ6ENF7501	7.5K		1
R106	ERJ6ENF3301	3.3K		1
R107	ERJ6ENF2702	27K		1
R108	PQ4R10XF1002	10K		1
R109	ERJ3GEYJ103	10K		1
R110	ERJ3GEYJ105	1M		1
R111	ERJ3GEYJ103	10K		1
R201	ERJ3GEYJ102	1K		1
R202	ERJ3GEYJ225	2.2M		1
R203	ERJ3GEYJ392	3.9K		1
R204	ERJ3GEYJ222	2.2K		1
R205	ERJ3GEYJ682	6.8K		1
R206	ERJ3GEYJ102	1K		1
R207	ERJ3GEYJ152	1.5K		1
R208	ERJ3GEYJ683	68K		1
R209	ERJ3GEYJ101	100		1
R210	ERJ3GEYJ473	47K		1

Ref. No.	Part No.	Value		Pcs
R211	ERJ3GEYJ101	100		1
R212	ERJ3GEYJ823	82K		1
R213	ERJ3GEYJ101	100		1
R214	ERJ3GEYJ101	100		1
R215	ERJ3GEYJ103	10K		1
R216	ERJ3GEYJ392	3.9K		1
R217	ERJ3GEYJ105	1M		1
R218	ERJ3GEYJ101	100		1
R219	ERJ3GEYJ101	100		1
R220	ERJ3GEYJ101	100		1
R221	ERJ3GEYJ105	1M		1
R222	ERJ3GEYJ102	1K		1
R301	ERJ3GEYJ823	82K		1
R302	ERJ3GEYJ101	100		1
R303	ERJ3GEYJ104	100K		1
R304	ERJ3GEYJ101	100		1
R305	ERJ3GEYJ104	100K		1
R306	ERJ3GEYJ101	100		1
R308	ERJ3GEYJ471	470		1
R309	ERJ3GEYJ101	100		1
R310	ERJ3GEYJ223	22K		1
R311	ERJ3GEYJ393	39K		1
R312	ERJ3GEYJ101	100		1
R313	ERJ3GEYJ221	220		1
R314	ERJ3GEYJ221	220		1
R315	ERJ3GEYJ271	270		1
R316	ERJ3GEYJ180	18		1
R317	ERJ3GEYJ271	270		1
		(CAPACITORS)		
C101	ECUV1H104ZFV	0.1	S	1
C102	ECST1CY105	1	S	1
C103-107	ECUV1H104ZFV	0.1	S	5
C108	ECSTAJ1AC226	22		1
C109	ECUV1H104ZFV	0.1	S	1
C110	ECUV1H150JCV	15P		1
C111	ECUV1H150JCV	15P		1
C112	ECUV1H104ZFV	0.1	S	1
C113	ECSTAJ1AC226	22		1
C114	ECST1CY225	2.2		1
C115	ECUV1H104ZFV	0.1	S	1
C116	ECUV1H104ZFV	0.1	S	1
C117	ECUM1H680JCV	68P		1
C118	ECUV1H104ZFV	0.1	S	1
C119	ECUV1H333KDV	0.033	S	1
C201, 202	ECUV1H104ZFV	0.1	S	2
C203	ECSTAJ1AB106	10		1
C204	ECST1CY105	1	S	1
C205	ECST1CY225	2.2	S	1
C206	ECUV1H103KBV	0.01		1
C207	ECUV1H040CCV	4P		1
C208	ECUV1H101JCV	100P		1
C209, 210	ECUV1H150JCV	15P		2
C211	ECUV1H050CCV	5P		1
C212	ECUV1H101JCV	100P		1
C214, 215	ECUV1H070DCV	7P		2
C216	ECUV1H030CCV	3P		1
C217	ECUV1H101JCV	100P		1
C218	ECUV1H1R5CCV	1.5P		1
C219	ECUV1H150JCV	15P		1
C220	ECUV1H120JCV	12P		1
C221	ECUV1H104ZFV	0.1	S	1

Ref. No.	Part No.	Part Name & Description		Pcs
C222	ECUV1H101JCV	100P		1
C223	ECSTAJ1AB106	10		1
C224	ECUV1H102KBV	0.001		1
C225	ECSTAJ1AB106	10		1
C226	ECUV1H102KBV	0.001		1
C227	ECSTAJ1AB106	10		1
C228	ECUV1H103KBV	0.01		1
C229	ECUV1H103KBV	0.01		1
C230	ECUV1H103KBV	0.01		1
C231	ECUV1H103KBV	0.01		1
C232	ECUV1H103KBV	0.01		1
C233	ECUV1H103KBV	0.01		1
C234	ECUV1H103KBV	0.01		1
C235	ECUV1H104ZFV	0.1	S	1
C236, 237	ECUV1H180JCV	18P		2
C238	ECUV1H104ZFV	0.1	S	1
C239, 240	ECUV1H180JCV	18P		2
C241	ECUV1H104ZFV	0.1	S	1
C242	ECSTAJ1AB106	10		1
C243	ECUV1H030CCV	3P		1
C244	PQCVTZC100	TRIMER CAPACITOR		1
C245	ECUV1H104ZFV	0.1	S	1
C246	ECUV1H102KBV	0.001		1
C250	ECSTAJ1AB106	10		1
C251	ECSTAJ1AB106	10		1
C252	ECUM1H0R5CCV	0.5P		1
C253	ECUM1H101JCV	100P		1
C254	ECUV1H040CCV	4P		1
C301	ECUV1H060DCV	6P		1
C302	ECUV1H103KBV	0.01		1
C303	ECUV1H102KBV	0.001		1
C304	ECUV1H120JCV	12P		1
C305	ECUV1H040CCV	4P		1
C306	ECUV1H1R5CCV	1.5P		1
C307	ECUV1H120JCV	12P		1
C308	ECUV1H101JCV	100P		1
C309	ECUV1H220JCV	22P		1
C310	ECUV1H120JCV	12P		1
C311	ECUV1H1R5CCV	1.5P		1
C312	ECUV1H120JCV	12P		1
C313	ECUV1H101JCV	100P		1
C314	ECUV1H150JCV	15P		1
C315	ECUV1H101JCV	100P		1
C316, 317	ECUV1H270JCV	27P		2
C318-323	ECUV1H104ZFV	0.1	S	6
C324	ECUV1H101JCV	100P		1
C325	ECSTAJ1AB106	10		1
C326	ECUV1H820JCV	82P		1
C327	ECUV1H120JCV	12P		1
C328	ECUV1H470JCV	47P		1
C329	ECUV1H180JCV	18P		1
		(CONNECTORS)		
CN101	PQJS02A11Z	CONNECTOR, 2P		1
CN102	PQJS24A12Z	CONNECTOR, 24P		1
CN103	PQJT10009Z	CHARGE TERMINAL		1
CN104	PQJT10010Z	INTERFACE TERMINAL		1
CN201	PQJS01A08Z	CONNECTOR, 1P		1
CN202	PQJS01A08Z	CONNECTOR, 1P		1
CN203	PQJS02A11Z	CONNECTOR, 2P		1
CN301	PQJS01A08Z	CONNECTOR, 1P		1
CN302	PQJS01A08Z	CONNECTOR, 1P		1
CN303	PQJS01A08Z	CONNECTOR,1P		1

Ref. No.	Part No.	Part Name & Description		Pcs
CN304	PQJS02A11Z	CONNECTOR, 2P		1
		OPERATION BOARD PARTS		
PCB2	PQWP2G5500N	OPERATION BOARD ASS'Y (RTL)		1
		(ICs)		
IC1	PQVIPD7225GB	IC		1
IC2	PQVISN7H00D	IC		1
		(TRANSISTORS)		
Q1	UN5213	TRANSISTOR(SI)	S	1
Q3	2SB956R	TRANSISTOR(SI)		1
Q4	2SB956R	TRANSISTOR(SI)		1
Q5, 6	UN5213	TRANSISTOR(SI)	S	2
Q8	PQVTDTC123E	TRANSISTOR(SI)		1
		(DIODES)		
D1	MA718	DIODE(SI)		1
D2-5	PQVDCL170YGC	LED		4
D6	MA110	DIODE(SI)		1
		(BATTERY)		
BA1	PQPCR2025T09	LITHIUM BATTERY		1
		(SWITCHS)		
S1	EVQQEJ04K	SWITCH		1
S2-7	EVQQFV02K	SWITCH		6
		(LCD)		
LCD	PQADDLC2957	LIQUID CRYSTAL DISPLAY		1
		(RESISTORS)		
J1	ERJ3GEYJ0R00	0		1
R1	ERJ3GEYJ472	4.7K		1
R2	ERJ3GEYJ103	10K		1
R3	ERJ3GEYJ473	47K		1
R4	ERJ3GEYJ102	1K		1
R5	ERJ3GEYJ102	1K		1
R6	ERJ3GEYJ102	1K		1
R7	ERJ3GEYJ222	2.2K		1
R8	ERJ3GEYJ103	10K		1
R9	ERJ3GEYJ154	150K		1
R10	ERJ3GEYJ222	2.2K		1
R11	ERJ3GEYJ222	2.2K		1
R12	ERJ3GEYJ222	2.2K		1
R20	ERJ6GEYJ750	75		1
R21	ERJ3GEYJ183	18K		1
		(CAPACITORS)		
C1	ECUV1H104ZFV	0.1	S	1
C2	ECUV1H104ZFV	0.1	S	1
C3	ECUV1H104ZFV	0.1	S	1
C4	ECUV1H104ZFV	0.1	S	1
C5	ECUV1H104ZFV	0.1	S	1
C6	ECUV1H104ZFV	0.1	S	1
C7	ECUV1H104ZFV	0.1	S	1
C8	ECUV1H104ZFV	0.1	S	1
C9	ECUV1H104ZFV	0.1	S	1
C10	ECUV1H104ZFV	0.1	S	1
C11	ECUV1H104ZFV	0.1	S	1
C15	ECUV1H104ZFV	0.1	S	1
C16	ECUV1H104ZFV	0.1	S	1
C17	ECUV1H104ZFV	0.1	S	1
C18	ECUV1H104ZFV	0.1	S	1
		(CONNECTOR)		
CN2	PQJS24A13Z	CONNECTOR, 24P		1
		BATTERY CHARGER BOARD PARTS		
PCB3	PQWPG36M	BATTERY CHARGER BOARD ASS'Y (RTL)		1
		(IC)		
IC401	AN6780	IC		1
		(TRANSISTORS)		
Q401	2SD1991A	TRANSISTOR(SI)		1
Q402	2SD1266	TRANSISTOR(SI)		1
Q403	2SD1991A	TRANSISTOR(SI)		1
Q404	2SD1991A	TRANSISTOR(SI)		1
Q405	PQVTDTC144ES	TRANSISTOR(SI)		1
Q406	PQVTDTC144ES	TRANSISTOR(SI)		1
Q407	PQVTDTC144ES	TRANSISTOR(SI)		1
		(DIODES)		
D401	1SS131	DIODE(SI)		1
D402	1SS131	DIODE(SI)		1
D403	PQVDS5688G	DIODE(SI)		1
D404	MA4062	DIODE(SI)		1
D405	LN21RCPHV	LED	S	1
D406	PQVDS5688G	DIODE(SI)		1
D407	PQVDS5688G	DIODE(SI)		1
D408	PQVDS5688G	DIODE(SI)		
		(JACK)		
J	PQJJ1B6Z	DC JACK		1
		(RESISTORS)		
R401	ERDS2TJ561	560		1
R402	ERDS2TJ561	560		1
R403	ERDS2TJ561	560		1
R404	ERDS2TJ561	560		1
R405	ERDS2TJ150	15		1
R406	ERDS2TJ103	10K		1
R407	ERDS2TJ473	47K		1
R408	ERDS2TJ473	47K		1
R409	ERDS2TJ103	10K		1
R410	ERDS2TJ561	560		1
R411	ERDS2TJ332	3.3K		1
R412	ERDS2TJ564	560K		1
R413	ERDS2TJ101	100		1
R414	ERDS2TJ473	47K		1
		(CAPACITORS)		
C401	ECEA1EU331	330		1
C402	ECEA1AKS101	100		1
C403	ECEA1EU470	47	S	1
C404	ECEA1CKS100	10		1
C405	ECEA1CM100	10		1
C406	ECQV1H333JZ	0.033		1
C407	ECQV1H333JZ	0.033		1

Ref. No.	Part No.	Part Name & Description	Pcs
E400	PQJT3134Z	(OTHER) TERMINAL	2
		CABINET AND ELECTRICAL PARTS	
1	PQYMG5500N	FRONT CABINETCABINET ASS'Y	1
2	PQBX10027Z1	BUTTON, FUNCTION	1
3	PQHR10034Z	HOLDER, FUNCTION BUTTON	1
4	PQBC10030Z1	BUTTON, MODE	1
5	PQHR10033Z	HOLDER, MODE BUTTON	1
6	PQSA10002Z	ANTENNA	1
7	PQJE10013Z	FLAT CABLE	1
8	PQYFG5500M	REAR CABINET ASS'Y	1
8-1	PQHG10028Z	RUBBER PARTS, PACKING	1
9	PQHG10032Z	RING	8
10	PQHE10010Z	SCREW	8
11	PQKT10001Z	PIN	1
12	PQKH10001Z	HAND STRAP	1
13	PQYMG36M	UPPER CABINET	1
14	PQJT10013Z	TERMINAL	2
15	PQKF10023Y1	LOWER CABINET	1
16	PQHG316Z	RUBBER PARTS, FOOT	4
17	PQGT10374Y	NAME PLATE	1
18	PQQT10292Z	LABEL, ADAPTOR	1
		ACCESSORIES AND PACKING MATERIALS	
A1	KX-A10	AC ADAPTOR ⚠ S	1
A2	PQQK10001Z	SOFT CASE	1
A3	PQQW10281Z	INSTRUCTION BOOK (ENGLISH) (QUICK REFERENCE)	1
A4	PQQW10241Z	INSTRUCTION BOOK (SPANISH) (QUICK REFERENCE)	1
A5	PQQX10283Z	INSTRUCTION BOOK	1
P1	PQPK10264Z	GIFT BOX	1
P2	PQPN10080Z	CUSHION-A	1
P3	PQPN10154Z	ACCESSORY BOX	1
P4	PQPN10155Z	CUSHION-B	1
P5	PQPN10156Z	CUSHION-C	1
P6	PQPP94Y	PROTECTION COVER	5
P7	XZB15X25A04	PROTECTION COVER (SOFT CASE)	1
P8	XZB20X25A04	PROTECTION COVER (DOCUMENTS)	1

SPECIFICATIONS

GP-22 RECEIVER	Receiving Methode	5channel, parallel receiving (1575.42 MHz)
	Receiving sensitivity	− 130 dBm
	Position accuracy	15 m RMS (GDOP ≦ 6) Position accuracy may be degraded up to 328 feet 2D RMS under the control of the U.S. Department Defense.
	Display type	2 lines, 7 segments, LCD
	Memory backup	5 years (Internal Lithium battery)
	Ambient temperature	−10 ℃ to +50 ℃ (14 ℉ to 122 ℉)
	Power supply	**Rechargeable battery** Lasting time: Approx. 80 min. in continuous use at 68 ℉) **5 AA alkaline batteries** Battery life: Approx. 300 min. in continuous use at 68 ℉)
	Dimensions (W × H × D)	65 × 131 × 35 mm $2^{9}/_{16} \times 5^{5}/_{32} \times 1^{3}/_{4}$ in (when using rechageable battery) 65 × 131 × 52 mm $2^{9}/_{16} \times 1^{3}/_{4} \times 2^{1}/_{16}$ in (when using battery case)
	Weight	240 g (8.4 oz) mai body only 330 g (11.6 oz) with rechargeable battery 420 g (14.7 oz) with alkaline batteries
CHARGER	Ambient temperature	+10 ℃ to +35 ℃ (50 ℉ to 95 ℉)
	Dimensions (W × H × D)	66 × 34 × 130 mm $2^{19}/_{32} \times 1^{11}/_{32} \times 5^{1}/_{8}$ in
	Weight	Approx. 100 g (3.5 oz)