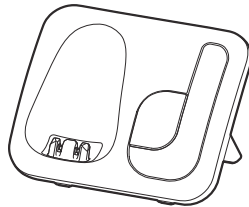


Service Manual

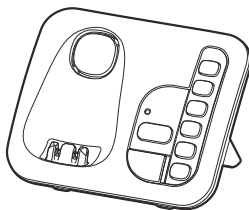
Telephone Equipment



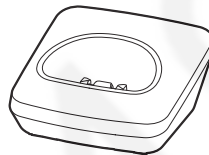
KX-TGCA20
(Handset)



KX-TGC210
(Base Unit)



KX-TGC220
(Base Unit)



(Charger Unit)

Configuration for each model

Model No	Base Unit	Handset	Charger Unit
KX-TGC210	1 (TGC210)	1 (TGCA20)	
KX-TGC212	1 (TGC210)	2 (TGCA20)	1
KX-TGC213	1 (TGC210)	3 (TGCA20)	2
KX-TGC220	1 (TGC220)	1 (TGCA20)	
KX-TGC222	1 (TGC220)	2 (TGCA20)	1
KX-TGCA20		1 (TGCA20)	1

Model No.

KX-TGC210BL/KX-TGC212BL
 KX-TGC213BL/KX-TGC222BL
 KX-TGC210CX/KX-TGC212CX
 KX-TGC210HK/KX-TGC212HK
 KX-TGC210TU/KX-TGC210TW
 KX-TGC212TW/KX-TGC210BX
 KX-TGC212BX/KX-TGC220BX
 KX-TGC222BX/KX-TGC210UE
 KX-TGC212UE/KX-TGC213UE
 KX-TGC220UE/KX-TGC222UE
 KX-TGC210ML/KX-TGC212ML
 KX-TGCA20EX/KX-TGCA20BX
 KX-TGCA20CX/KX-TGCA20HK
 KX-TGCA20TW/KX-TGCA20ML

Digital Cordless Phone

Digital Cordless Answering System

B: Black Version

S: Silver Version

(BL: for Belgium)

(CX: for Singapore, Vietnam, Indonesia)

(HK: for Hong Kong)

(TU: for Tunisia, Algeria, Morocco)

(TW: for Taiwan)

(BX: for Iran, Yemen, Pakistan, Ghana, Libyan Arab, Mauritius, Lebanon, Bahrain)


(UE: for UAE, Nigeria, Kuwait, Qatar)

(ML: for Malaysia)

**WARNING**

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are marked by  in the Schematic Diagrams, Circuit Board Diagrams, Exploded Views and Replacement Parts List. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire or other hazards. Do not modify the original design without permission of manufacturer.

IMPORTANT INFORMATION ABOUT LEAD FREE, (PbF), SOLDERING

If lead free solder was used in the manufacture of this product, the printed circuit boards will be marked PbF. Standard leaded, (Pb), solder can be used as usual on boards without the PbF mark. When this mark does appear, please read and follow the special instructions described in this manual on the use of PbF and how it might be permissible to use Pb solder during service and repair work.

- When you note the serial number, write down all 11 digits. The serial number may be found on the bottom of the unit.
- The illustrations in this Service Manual may vary slightly from the actual product.

TABLE OF CONTENTS

	PAGE		PAGE
1 Safety Precautions -----	5	9.1.13. Check TAM Operation (for KX-TGC220 only) -----	39
1.1. For Service Technicians -----	5	9.2. Troubleshooting by Symptom (Base Unit and Charger Unit) -----	40
2 Warning -----	5	9.2.1. Check Point (Base Unit)-----	40
2.1. Battery Caution-----	5	9.3. Troubleshooting by Symptom (Handset) -----	42
2.2. About Lead Free Solder (PbF: Pb free)-----	5	9.3.1. Check Point (Handset)-----	42
2.2.1. Suggested PbF Solder -----	6	10 Disassembly and Assembly Instructions -----	45
2.3. Discarding of P. C. Board -----	6	10.1. Disassembly Instructions-----	45
3 Specifications -----	7	10.1.1. Base Unit -----	45
4 Technical Descriptions -----	8	10.1.2. Handset -----	48
4.1. Block Diagram (Base Unit_Main)-----	8	10.1.3. Charger Unit -----	49
4.2. Circuit Operation (Base Unit)-----	9	10.2. How to Replace the Handset LCD-----	50
4.2.1. Outline -----	9	11 Measurements and Adjustments -----	51
4.3. Block Diagram (Base Unit_RF Part)-----	10	11.1. Equipment Required -----	51
4.4. Circuit Operation (Base Unit)-----	11	11.2. The Setting Method of JIG-----	51
4.4.1. BBIC (Base Band IC: IC501) -----	11	11.2.1. Connections (Base Unit) -----	51
4.4.2. Flash Memory (IC601)(for KX-TGC220 only)-----	11	11.2.2. How to install Batch file into P.C. -----	52
4.4.3. EEPROM (IC611)-----	11	11.2.3. Commands-----	52
4.4.4. Power Supply Circuit/Reset Circuit-----	12	11.3. Adjustment Standard (Base Unit) -----	53
4.4.5. Telephone Line Interface-----	14	11.3.1. Bottom View -----	53
4.4.6. Transmitter/Receiver-----	14	11.4. The Setting Method of JIG (Handset) -----	54
4.5. Block Diagram (Handset)-----	16	11.4.1. Connections -----	54
4.6. Circuit Operation (Handset)-----	17	11.4.2. How to install Batch file into P.C. -----	55
4.6.1. Outline -----	17	11.4.3. Commands-----	55
4.6.2. Power Supply Circuit/Reset Circuit-----	17	11.5. Adjustment Standard (Handset) -----	56
4.6.3. Charge Circuit -----	17	11.5.1. Component View -----	56
4.6.4. Battery Low/Power Down Detector-----	17	11.6. Things to Do after Replacing IC or X'tal -----	57
4.6.5. Speakerphone -----	17	11.6.1. How to download the data -----	57
4.7. Signal Route -----	18	11.7. RF Specification -----	59
5 Location of Controls and Components -----	20	11.7.1. Base Unit -----	59
6 Installation Instructions -----	20	11.7.2. Handset -----	59
7 Operating Instructions -----	20	11.8. How to Check the Handset Speaker or Receiver -----	60
7.1. For Service Hint-----	20	11.9. Frequency Table (MHz)-----	60
8 Test Mode -----	21	12 Miscellaneous -----	61
8.1. Engineering Mode-----	21	12.1. How to Replace the Flat Package IC -----	61
8.1.1. Base Unit -----	21	12.1.1. Preparation-----	61
8.1.2. Handset -----	23	12.1.2. How to Remove the IC-----	61
8.2. EEPROM LAYOUT (Handset)-----	25	12.1.3. How to Install the IC -----	62
8.2.1. Scope-----	25	12.1.4. How to Remove a Solder Bridge -----	62
8.2.2. Introduction-----	25	12.2. How to Replace the Shield Case -----	63
8.2.3. EEPROM contents -----	25	12.2.1. Preparation-----	63
8.3. How to Clear User Setting-----	26	12.2.2. Caution-----	63
8.3.1. Resetting both base unit and handset-----	26	12.2.3. How to Remove the Shield Case-----	63
8.3.2. Resetting only handset-----	26	12.2.4. How to Install the Shield Case-----	64
9 Troubleshooting Guide -----	27	12.3. Terminal Guide of the ICs, Transistors and Diodes -----	65
9.1. Troubleshooting Flowchart-----	27	12.3.1. Base Unit -----	65
9.1.1. Check Power-----	28	12.3.2. Handset -----	65
9.1.2. Check Record -----	29	13 Schematic Diagram -----	67
9.1.3. Check Playback -----	30	13.1. For Schematic Diagram -----	67
9.1.4. Check Battery Charge -----	30	13.1.1. Base Unit (Base Unit (Main))-----	67
9.1.5. Check Link-----	31	13.1.2. Handset (Handset (Main)) -----	67
9.1.6. Check the RF part -----	33	13.2. Base Unit (Main) -----	68
9.1.7. Registering a Handset to the Base Unit-----	37	13.2.1. KX-TGC210-----	68
9.1.8. Deregistering a Handset -----	37	13.2.2. KX-TGC220-----	70
9.1.9. Check Handset Transmission -----	38	13.3. Base Unit (Operation) -----	72
9.1.10. Check Handset Reception-----	38		
9.1.11. Check Caller ID -----	38		
9.1.12. Bell Reception -----	39		

13.4. Handset (Main) -----	74
14 Printed Circuit Board -----	77
14.1. Base Unit (Main)-----	77
14.1.1. Component View -----	77
14.1.2. Bottom View -----	78
14.2. Base Unit (Operation) (KX-TGC220 only) -----	79
14.3. Handset-----	81
14.3.1. Component View -----	81
14.3.2. Bottom View -----	82
15 Exploded View and Replacement Parts List -----	83
15.1. Cabinet and Electrical Parts (Base Unit)-----	83
15.1.1. KX-TGC210-----	83
15.1.2. KX-TGC220-----	84
15.2. Cabinet and Electrical Parts (Handset)-----	85
15.3. Cabinet and Electrical Parts (Charger Unit)-----	86
15.4. Accessories and Packing Material-----	87
15.4.1. KX-TGC210BL, KX-TGC212BL, KX-TGC213BL, KX-TGC222BL, KX-TGC210CX, KX-TGC212CX, KX-TGC210TU, KX-TGC210BX, KX-TGC212BX, KX-TGC220BX, KX-TGC222BX-----	87
15.4.2. For KX-TGC210HK, KX-TGC210TW, KX-TGC210UE -----	88
15.4.3. For KX-TGC212HK, KX-TGC212TW, KX-TGC212UE-----	89
15.4.4. For KX-TGC213UE -----	90
15.4.5. KX-TGC220UE-----	91
15.4.6. KX-TGC222UE-----	92
15.5. Replacement Parts List-----	93
15.5.1. Base Unit-----	93
15.5.2. Handset-----	96
15.5.3. Charger Unit-----	97
15.5.4. Accessories and Packing Materials-----	98
15.5.5. Screws -----	99
15.5.6. Fixtures and Tools-----	99

1 Safety Precautions

1.1. For Service Technicians

- **Repair service shall be provided in accordance with repair technology information such as service manual so as to prevent fires, injury or electric shock, which can be caused by improper repair work.**
 1. When repair services are provided, neither the products nor their parts or members shall be remodeled.
 2. If a lead wire assembly is supplied as a repair part, the lead wire assembly shall be replaced.
 3. FASTON terminals shall be plugged straight in and unplugged straight out.
- **ICs and LSIs are vulnerable to static electricity.**
When repairing, the following precautions will help prevent recurring malfunctions.
 1. Cover plastic parts boxes with aluminum foil.
 2. Ground the soldering irons.
 3. Use a conductive mat on worktable.
 4. Do not grasp IC or LSI pins with bare fingers.

2 Warning

2.1. Battery Caution

1. Danger of explosion if battery is incorrectly replaced.
2. Replace only with the same or equivalent type recommended by the manufacturer.
3. Dispose of used batteries according to the manufacture's Instructions.

2.2. About Lead Free Solder (PbF: Pb free)

Note:

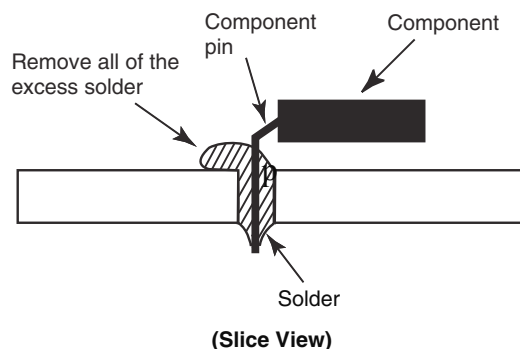
In the information below, Pb, the symbol for lead in the periodic table of elements, will refer to standard solder or solder that contains lead.

We will use PbF solder when discussing the lead free solder used in our manufacturing process which is made from Tin (Sn), Silver (Ag), and Copper (Cu).

This model, and others like it, manufactured using lead free solder will have PbF stamped on the PCB. For service and repair work we suggest using the same type of solder.

Caution

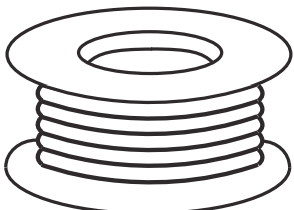
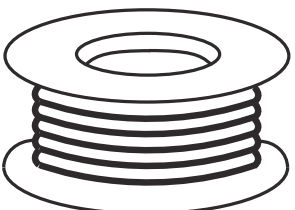
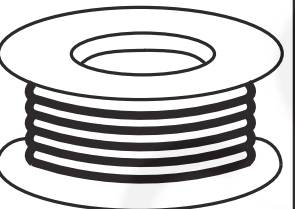
- PbF solder has a melting point that is 50 °F ~ 70 °F (30 °C ~ 40 °C) higher than Pb solder. Please use a soldering iron with temperature control and adjust it to 700 °F ± 20 °F (370 °C ± 10 °C).
- Exercise care while using higher temperature soldering irons.:
Do not heat the PCB for too long time in order to prevent solder splash or damage to the PCB.
- PbF solder will tend to splash if it is heated much higher than its melting point, approximately 1100 °F (600 °C).
- When applying PbF solder to double layered boards, please check the component side for excess which may flow onto the opposite side (See the figure below).



2.2.1. Suggested PbF Solder

There are several types of PbF solder available commercially. While this product is manufactured using Tin, Silver, and Copper (Sn+Ag+Cu), you can also use Tin and Copper (Sn+Cu), or Tin, Zinc, and Bismuth (Sn+Zn+Bi). Please check the manufacturer's specific instructions for the melting points of their products and any precautions for using their product with other materials.

The following lead free (PbF) solder wire sizes are recommended for service of this product: 0.3 mm, 0.6 mm and 1.0 mm.

0.3 mm X 100 g	0.6 mm X 100 g	1.0 mm X 100 g
		

2.3. Discarding of P. C. Board

When discarding P. C. Board, delete all personal information such as telephone directory and caller list or scrap P. C. Board.

3 Specifications

Standard:	DECT (Digital Enhanced Cordless Telecommunications), GAP (Generic Access Profile)
Number of Channels:	120 Duplex Channels
Frequency Range:	1.88 GHz to 1.90 GHz
Duplex Procedure:	TDMA (Time Division Multiple Access)
Channel Spacing:	1,728 kHz
Bit Rate:	1,152 kbit/s
Modulation:	GFSK (Gaussian Frequency Shift Keying)
RF Transmission Power:	Approx. 10mW (average power per channel)
Voice Coding:	ADPCM 32 kbit/s
Operating conditions:	0°C - 40°C, 20 % - 80 % relative air humidity (dry)
Power source (AC Adaptor):	

TU	220 - 240 V AC, 50/60 Hz Base unit: PNLV226CE0Y
BL	220 - 240 V AC, 50/60 Hz Base unit: PNLV226CE0Y Charger: PNLV233CEKZ
BX/CX	100 - 240 V AC, 50/60 Hz Base unit: PNLV226BX0Z Charger: PNLV233BXKZ
UE/HK/ML	220 - 240 V AC, 50/60 Hz Base unit: PNLV226EZ Charger: PNLV233EKZ
TW	110 V AC, 60 Hz Base unit: PNLV226TWZ Charger: PNLV233TWKZ

Power consumption:

Base unit*1:

Standby: Approx. 0.52 W
Maximum: Approx. 2.7 W

Base unit*2:

Standby: Approx. 0.54 W
Maximum: Approx. 2.7 W

Charger:

Standby: Approx. 0.12 W
Maximum: Approx. 1.8 W

Dimensions:

Base unit*1: Approx. 107 mm x 96 mm x 77 mm
Base unit*2: Approx. 107mm x 96 mm x 77 mm
Handset: Approx. 47 mm x 30 mm x 164 mm
Charger unit: Approx. 70 mm x 70 mm x 40 mm

Mass (Weight):

Base unit*1: Approx. 100 g
Base unit*2: Approx. 120 g
Handset: Approx. 130 g
Charger: Approx. 40 g

*1 KX-TGC210

*2 KX-TGC220

Note:

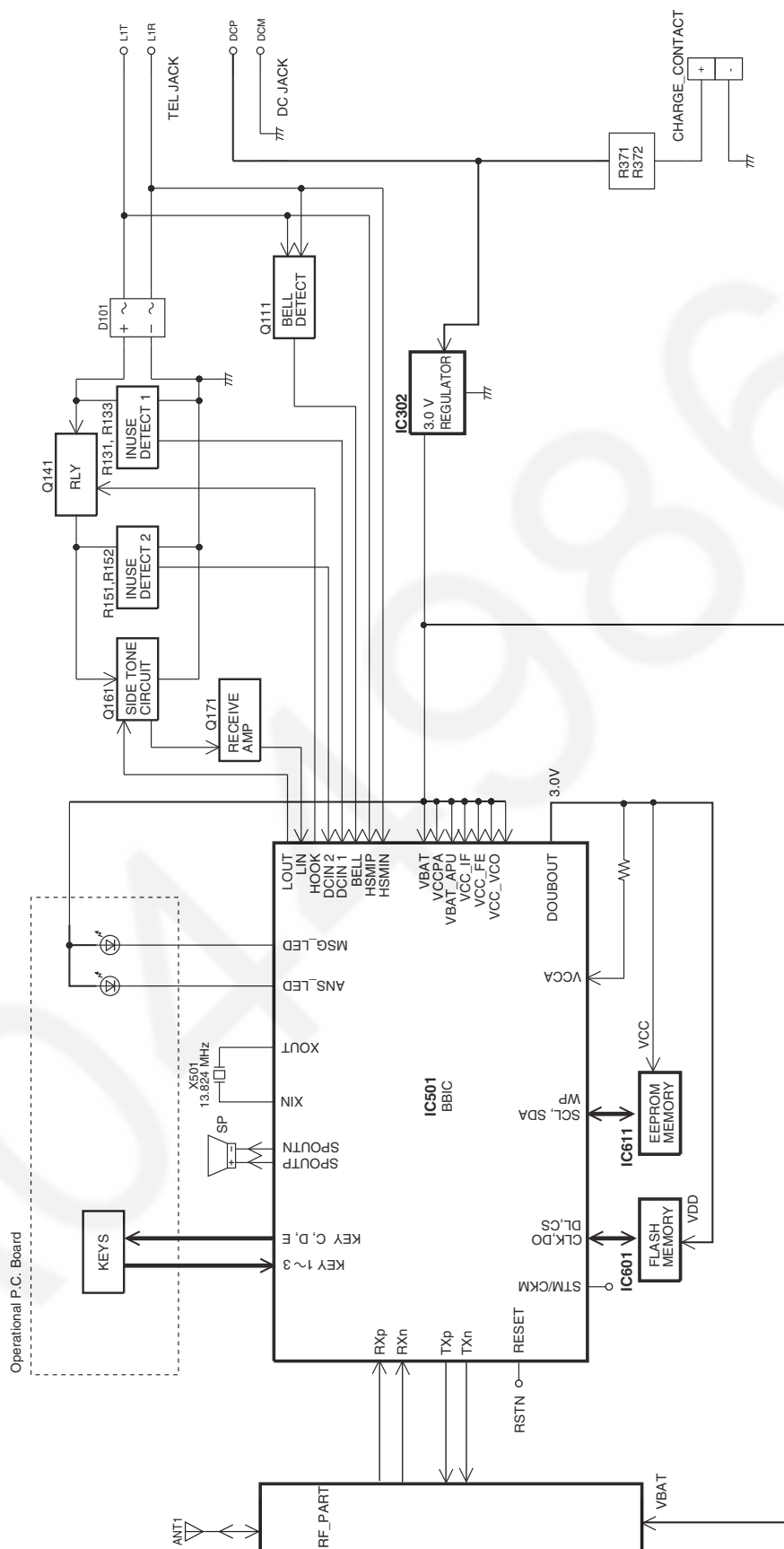
- Design and specifications are subject to change without notice.

Note for Service:

- **Operation range:** Up to 300 m outdoors, Up to 50 m indoors, depending on the condition.
- **Analog telephone connection:** Telephone Line
- **Optional DECT repeater:** KX-A405

4 Technical Descriptions

4.1. Block Diagram (Base Unit_Main)



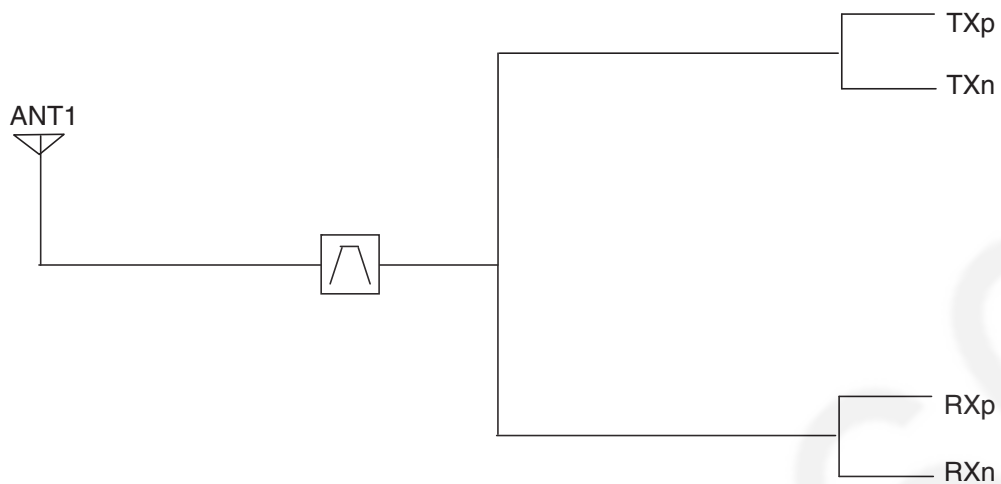
4.2. Circuit Operation (Base Unit)

4.2.1. Outline

Base Unit consists of the following ICs as shown in Block Diagram (Base Unit_Main) (P.8).

- DECT BBIC (**B**ase **B**and IC): IC501
 - Handling all the audio, signal and data processing needed in a DECT base unit
 - Controlling the DECT specific physical layer and radio section (**B**urst **M**odule **C**ontroller section)
 - ADPCM code filter for speech encoding and speech decoding (DSP section)
 - Echo-cancellation and Echo-suppression (DSP section)
 - Any tones (tone, sidetone, ringing tone, etc.) generation (DSP section)
 - DTMF receiver (DSP section)
 - Clock Generation for RF Module
 - ADC, DAC, timer, and power control circuitry
 - PLL Oscillator
 - Detector
 - Compress/Expander
 - First Mixer
 - All interfaces (ex: QSPI FLASH MEMORY, EEPROM, LED, Analog Front End, etc.)
 - Integrated 1.9GHz PA for DECT
- EEPROM: IC611
 - Temporary operating parameters (for RF, etc.)
- FLASH MEMORY: IC601 (for KX-TGC220 only)
 - Voice Prompt (TAM) D/L Area
 - ICM/OGM Recording Area
- Additionally,
 - Power Supply Circuit (+3.0 V, +1.8 V output)
 - Crystal Circuit (10.368 MHz)
 - Charge Circuit
 - Telephone Line Interface Circuit
- QSPI FLASH MEMORY IC502
 - Main Program D/L Area

4.3. Block Diagram (Base Unit_RF Part)

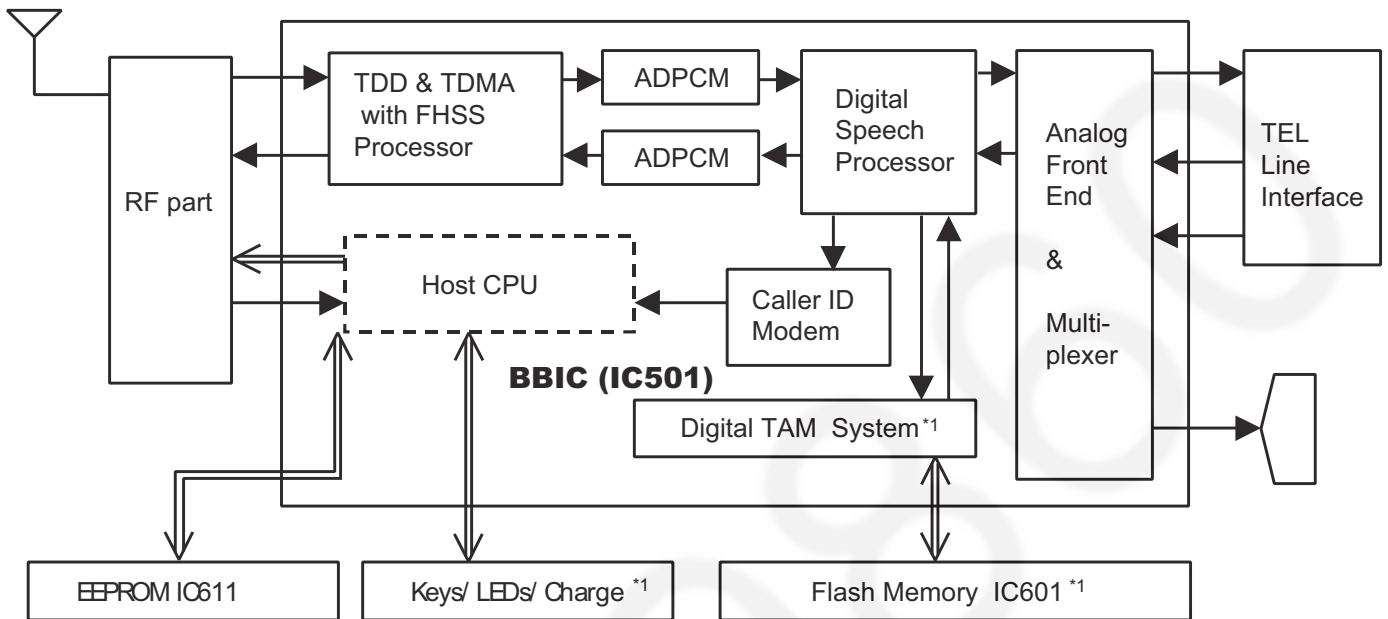


4.4. Circuit Operation (Base Unit)

General Description:

(BBIC, Flash Memory, EEPROM) is a digital speech/signal processing system that implements all the functions of speech compression, record and playback, and memory management required in a digital telephone answering machine.

The BBIC system is fully controlled by a host processor. The host processor provides activation and control of all that functions as follows.



*1 for KX-TGC220 only

4.4.1. BBIC (Base Band IC: IC501)

• Voice Message Recording/Play back

The BBIC system uses a proprietary speech compression technique to record and store voice message in Flash Memory. An error correction algorithm is used to enable playback of these messages from the Flash Memory.

• DTMF Generator

When the DTMF data from the handset is received, the DTMF signal is output.

• Synthesized Voice (Pre-recorded message)

The BBIC implements synthesized Voice, utilizing the built in speech detector and a Flash Memory, which stored the vocabulary.

• Caller ID demodulation

The BBIC implements monitor and demodulate the FSK/DTMF signals that provide CID information from the Central Office.

• Digital Switching

The voice signal from telephone line is transmitted to the handset or the voice signal from the handset is transmitted to the Telephone line, etc. They are determined by the signal path route operation of voice signal.

• Block Interface Circuit

RF part, LED, Key scan, Speaker, Telephone line.

4.4.2. Flash Memory (IC601)(for KX-TGC220 only)

Following information data is stored.

• Voice signal

ex: Pre-recorded Greeting message, Incoming message

4.4.3. EEPROM (IC611)

Following information data is stored.

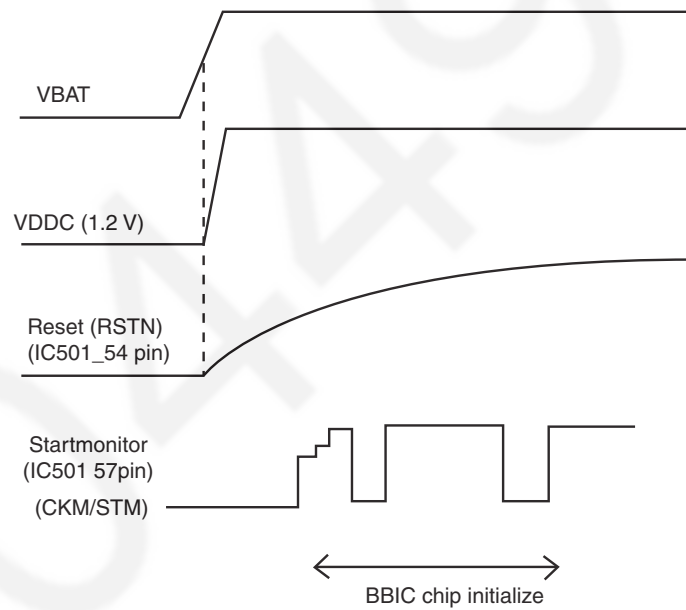
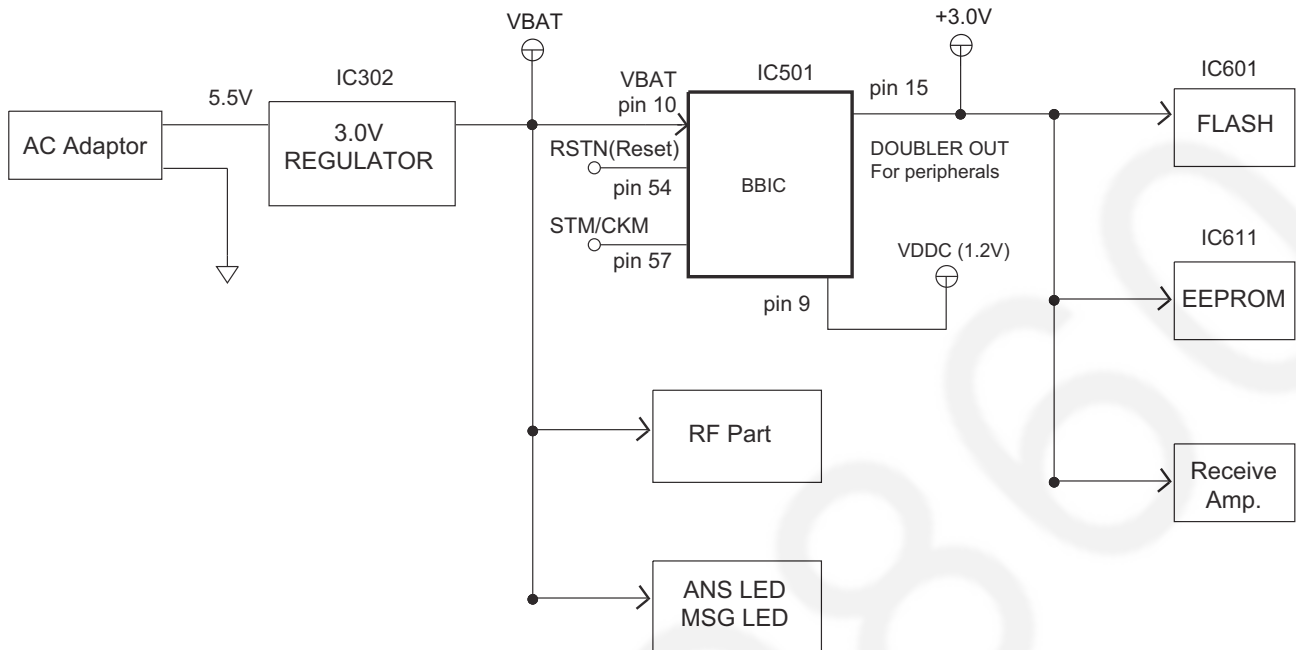
• Settings

ex: message numbers, ID code, Flash Time, Tone/Pulse

4.4.4. Power Supply Circuit/Reset Circuit

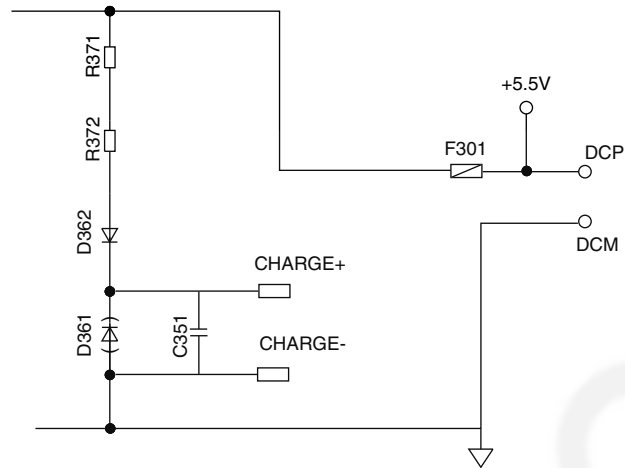
The power supply voltage from AC adaptor is converted to VBAT (3.0V) in IC302. And +3.0V for peripherals and analog part is insulated from VBAT by Doubler of BBIC.

Circuit Operation:



4.4.4.1. Charge Circuit

The voltage from the AC adaptor is supplied to the charge circuits.



4.4.5. Telephone Line Interface

Telephone Line Interface Circuit:

Function

- Bell signal detection
- ON/OFF hook and pulse dial circuit
- Side tone circuit

Bell signal detection and OFF HOOK circuit:

In the idle mode, Q141 is open to cut the DC loop current and decrease the ring load. When ring voltage appears at the Tip (T) and Ring (R) leads (When the telephone rings), the AC ring voltage is transferred as follows:

T → R111 → C111 → Q111 → BBIC pin 5 [BELL]

When the CPU (BBIC) detects a ring signal, Q141 turns on, thus providing an off-hook condition (active DC current flow through the circuit). Following signal flow is the DC current flow.

T → D101 → Q141 → Q161 → R163 → D101 → P101 → R

ON HOOK Circuit:

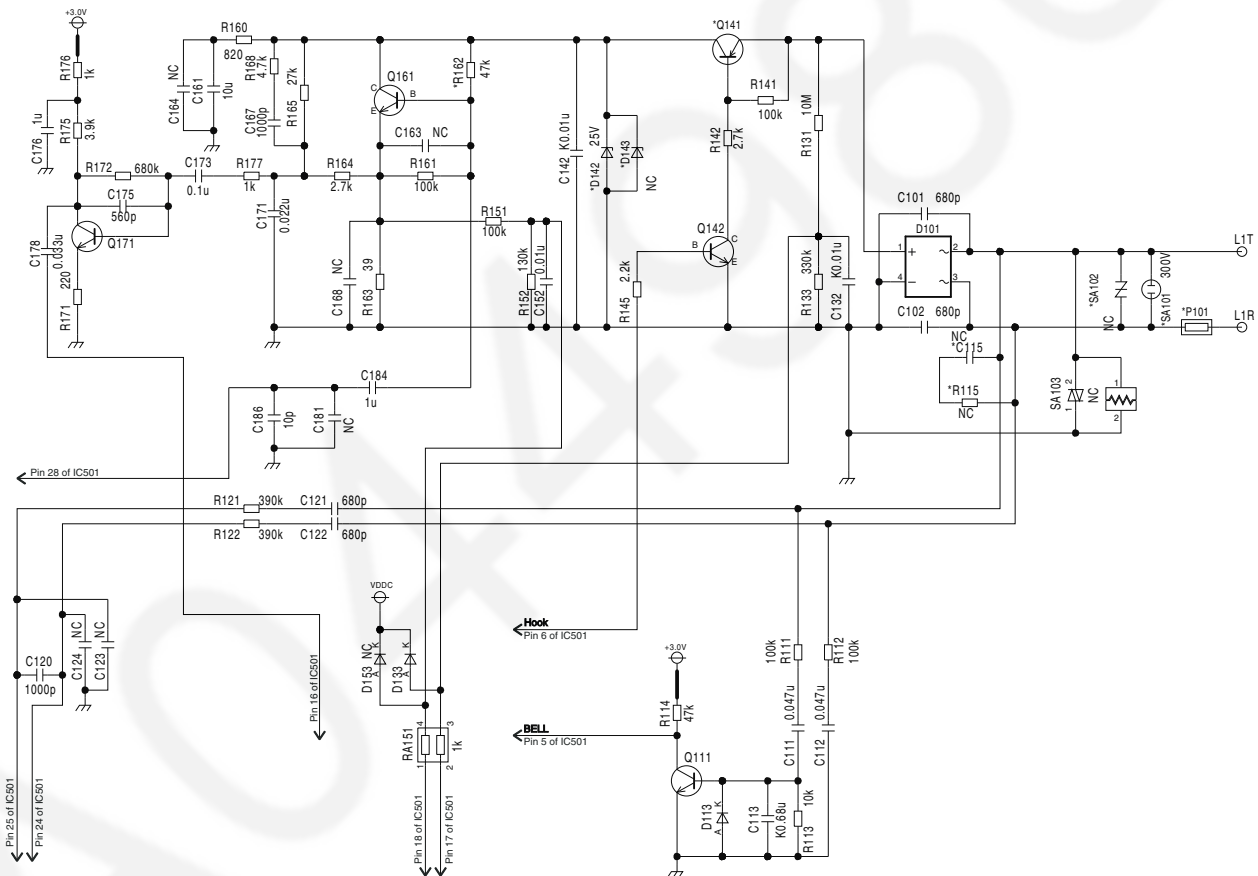
Q141 is open, Q141 is connected as to cut the DC loop current and to cut the voice signal. The unit is consequently in an on-hook condition.

Pulse Dial Circuit:

Pin 6 of BBIC turns Q141 ON/OFF to make the pulse dialing.

Side Tone Circuit:

Basically this circuit prevents the TX signal from feeding back to RX signal. As for this unit, TX signal feed back from Q161 is canceled by the canceller circuit of BBIC.



4.4.6. Transmitter/Receiver

- Audio Circuits and DTMF tone signal circuits.

Base Unit and Handset mainly consist of RF Module and DECT BBIC.

Base Unit and Handset transmit/receive voice signal and data signal through the antenna on carrier frequency.

Signal Path:

*Refer to **Signal Route**(P.18).

4.4.6.1. Transmitter Block

The voice signal input from the TEL LINE interface goes to DECT BBIC (IC501) as shown in **Block Diagram (Base Unit_Main)**(P.8)

The voice signal passes through the analog part of IC501 where it is amplified and converted to a digital audio stream signal. The burst switch controller processes this stream performing encryption and scrambling, adding the various other fields to produce the GAP (**Generic Access Profile**) standard DECT frame, assigning to a time slot and channel etc.

In IC501, the carrier frequency is changing, and frequency modulated RF signal is generated. In IC501, RF signal is amplified, and radiated from antenna. Handset detects the voice signal or data signal in the circuit same as the following explanation of Receiver Block.

4.4.6.2. Receiver Block

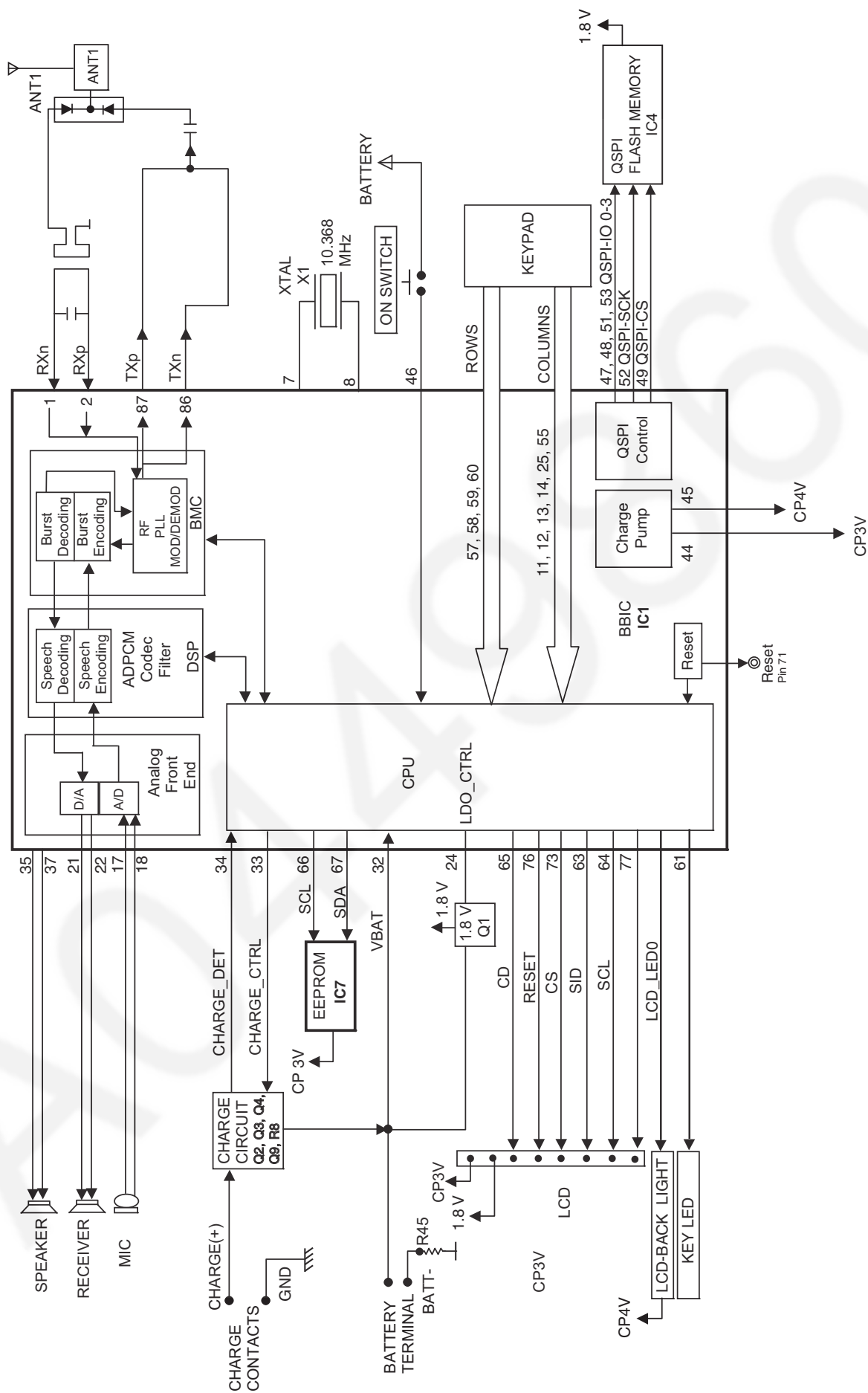
The signal of 1900 MHz band (1881.792 MHz ~ 1897.344 MHz) which is input from antenna is input to IC501 as shown in Block Diagram (Base Unit_Main)(P.8).

In IC501, the signal of 1900 MHz band is downconverted to 864 kHz signal and demodulated, as GAP (**G**eneric **A**ccess **P**rofile) standard DECT frames. It passes through the decoding section burst switch controller where it separates out the frame information and performs de-encryption and de-scrambling as required. It then goes to the DSP section where it is turned back into analog audio. This is amplified by the analog front end, and goes to the TEL LINE Interface.

4.4.6.3. Pulse Dialling (for CX, HK, TU, TW, BX, UE, ML only)

During pulse dialling the hookswitch (Q141, Q142) is used to generate the pulses using the HOOK control signal, which is set high during pulses. To force the line impedance low during the "pause" intervals between dial pulses, the PULSE_DIAL signal turns on Q140.

4.5. Block Diagram (Handset)



4.6. Circuit Operation (Handset)

4.6.1. Outline

Handset consists of the following ICs as shown in **Block Diagram (Handset)** (P.16).

- DECT BBIC (**B**ase **B**and IC): IC1
 - All data signals (forming/analyzing ACK or CMD signal)
 - All interfaces (ex: Key, Detector Circuit, Charge, DC/DC Converter, EEPROM, LCD, RF Power Amp.)
 - PLL Oscillator
 - Detector
 - Compress/Expander
 - Reception
 - Integrated 1.9 GHz PA for DECT
- QSPI FLASH MEMORY: IC4
 - Main Program D/L Area
- EEPROM: IC7
 - Temporary operating parameters (for RF, etc.)

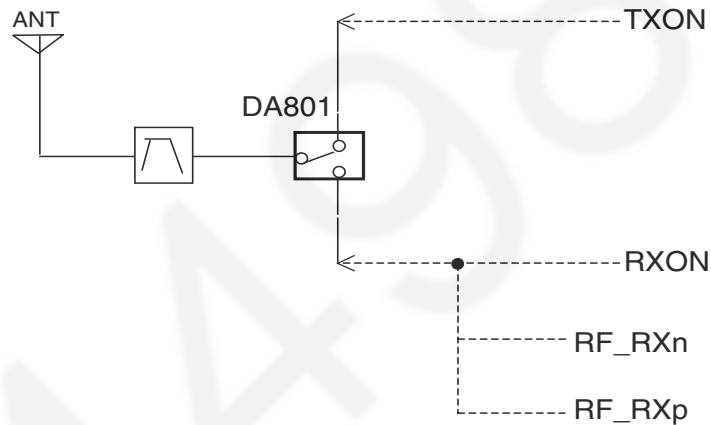
4.6.2. Power Supply Circuit/Reset Circuit

Circuit Operation:

When power on the Handset, the voltage is as follows;

BATTERY(2.2 V ~ 2.6 V: BATT+) → Q1 (1.8 V), IC1-44pin (CP3V)

The Reset signal generates IC1 (71 pin) and 1.8 V.



4.6.3. Charge Circuit

Circuit Operation:

When charging the handset on the Base Unit, the charge current is as follows;

DC+(5.5 V) → R371 → R372 → D362 → CHARGE+(Base) → CHARGE+(Handset) → $\left[\begin{smallmatrix} Q2 \\ R8 \end{smallmatrix} \right] \rightarrow Q3 \rightarrow \text{BATTERY+} \dots \text{Battery} \dots$

BATTERY- → R45 → GND → CHARGE-(Handset) → CHARGE-(Base) → GND → DC-(GND)

In this way, the BBIC on Handset detects the fact that the battery is charged.

The charge current is controlled by switching Q9 of Handset.

Refer to Fig.101 in **Power Supply Circuit/Reset Circuit** (P.17).

4.6.4. Battery Low/Power Down Detector

Circuit Operation:

"Battery Low" and "Power Down" are detected by BBIC which check the voltage from battery.

The detected voltage is as follows;

- Battery Low

Battery voltage: $V(\text{Batt}) \leq 2.25 \text{ V} \pm 50 \text{ mV}$

The BBIC detects this level and "■" starts flashing.

- Power Down



















Battery voltage: $V(\text{Batt}) \leq 2.0 \text{ V} \pm 50 \text{ mV}$

The BBIC detects this level and power down.


4.6.5. Speakerphone

The hands-free loudspeaker at SP+ and SP- is used to generate the ring alarm.

4.7. Signal Route

SIGNAL ROUTE	IN	→	ROUTE	→	OUT
HANDSET TX	MIC (+) - C13 - IC1 (17)  IC1(86)  C859 - ANT to BASE MIC (-) - C11 - IC1 (18)  IC1(87)  C859 - ANT to BASE		---ANT. - <BASE_UNIT_RF_RX_ROUTE> - IC501(46/47 - 28) - C184 - Q161 - Q141 - D101 - P101 - T/R(TEL LINE)		
HANDSET RX	T/R(TEL LINE) - P101 - D101 - Q141 - R165 - R177 - C173 - Q171 - C178 - IC501(16 - 44/45) - <BASE_UNIT_RF_TX_ROUTE> - ANT. ---		from BASE UNIT ANT 1  IC1 (1)  IC1 (21) - RECEIVER (+) IC1 (2)  IC1 (22) - RECEIVER (-)		
HANDSET SP-Phone TX	MIC (+) - C13 - IC1 (17)  IC1(86)  C859 - ANT to BASE MIC (-) - C11 - IC1 (18)  IC1(87)  C859 - ANT to BASE		---ANT. - <BASE_UNIT_RF_RX_ROUTE> - IC501(46/47 - 28) - C184 - Q161 - Q141 - D101 - P101 -T/R(TEL LINE)		
HANDSET SP-Phone RX	T/R(TEL LINE) - P101 - D101 - Q141 - R165 - R177- C173 - Q171 - C178 -R178 - IC501(16-44/45) - <BASE_UNIT RF TX ROUTE> - ANT. ---		from BASE UNIT ANT  IC1 (1)  IC1 (35) - SP (-) IC1 (2)  IC1 (37) - SP (+)		
GREETING RECORDING	MIC (+) - C13 - IC1 (17)  IC1(86)  C859 - ANT to BASE MIC (-) - C11 - IC1 (18)  IC1(87)  C859 - ANT to BASE		---ANT. - <BASE_UNIT_RF_RX_ROUTE> - IC501(46/47- 73/74) - IC601		
GREETING PLAY TO TEL LINE	IC601 - IC501(73/74 - 28) - C184 - Q161 - Q141 - D101 - P101 - T/R(TEL LINE)				
ICM RECORDING	T/R(TEL LINE) - P101 - D101 - Q141 - R165 - R177- C173 - Q171 - C178 - R178 - IC501(16 - 73/74) - IC601				
ICM PLAY TO SPEAKER	IC601 - IC501(73/74 - 29/31) - SPEAKER				
DTMF SIGNAL TO TEL LINE	IC501(28) - C184 - Q161 - Q141 - D101 - P101 - T/R(TEL LINE)				
CALLER ID	T/R(TEL LINE) - P101 - C121/C122 - R121/R122 - IC501(24/25)				
BELL DETECTION	T/R(TEL LINE) - P101 - R111/R112 - C111/C112 - Q111 - IC501(5)				

Note:

: inside of Handset

RF part signal route

SIGNAL ROUTE	IN	→	ROUTE	→	OUT
HANDSET RF [TX_ROUTE]	IC1(86/87) - C859 - ANT				
HANDSET RF [RX_ROUTE]	ANT - IC(1/2)				
BASE UNIT RF [TX_ROUTE]	IC501(44/45) - C819 - C872 - ANT				
BASE UNIT RF [RX_ROUTE]	ANT - C872 - C895 - IC501(46/47)				

Note:

: inside of Handset

5 Location of Controls and Components

Refer to the Operating Instructions.

Note:

You can download and refer to the Operating Instructions (Instruction book) on TSN Server.

6 Installation Instructions

Refer to the Operating Instructions.

Note:

You can download and refer to the Operating Instructions (Instruction book) on TSN Server.













7 Operating Instructions

Refer to the Operating Instructions.

Note:

You can download and refer to the Operating Instructions (Instruction book) on TSN Server.

7.1. For Service Hint

Items	Contents
Battery	You could use other rechargeable batteries sold in a market, but the unit is not guaranteed to work properly.
	The battery strength may not be indicated correctly if the battery is disconnected and connected again, even after it is fully charged. In that case, by recharging the battery as mentioned in the Operating Instructions, you will get a correct indication of the battery strength.
Recall	Earth Recall feature is not supported in this model.
PIN Code	<ul style="list-style-type: none"> Change the PIN using the following method. <ol style="list-style-type: none">  (right soft key)          Enter the new 4-digit base unit PIN. →[OK] : "Yes" →[OK]→

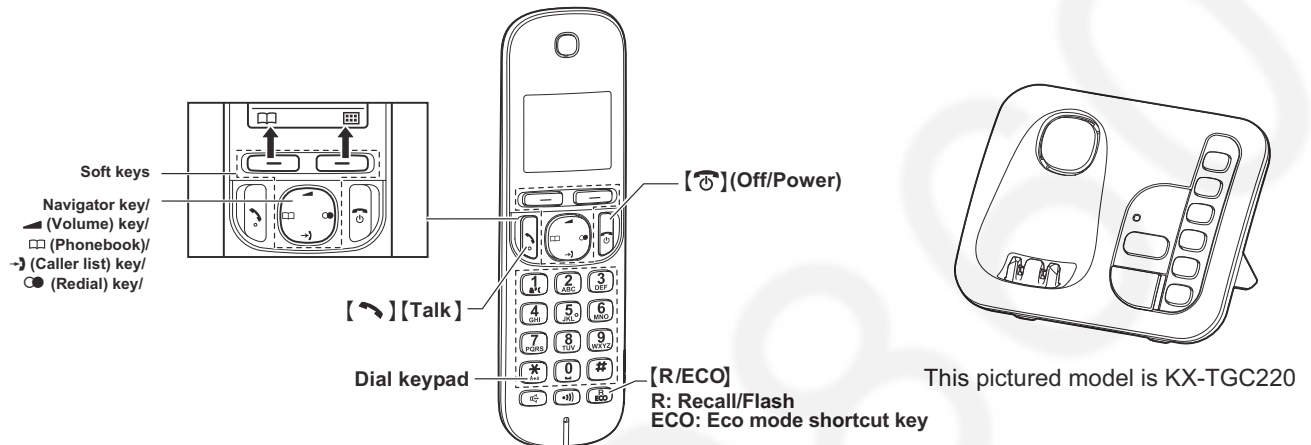
8 Test Mode

8.1. Engineering Mode

8.1.1. Base Unit

Important:

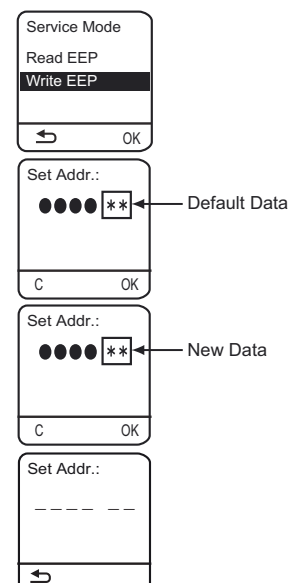
Make sure the address on LCD is correct when entering new data. Otherwise, you may ruin the unit.



H/S key operation

- 1). Press [].
- 2). Select "Initial Setup" using [▲] or [▼] then press [OK].
- 3). Select "Line Setup" using [▲] or [▼] then press [OK] or [▶].
- 4). Enter "7", "2", "6", "2", "7", "6", "6", "4".
Note: 7262 7664 = PANA SONI
(see letters printed on dial keys)
- 5). Select "Write EEP" using [▲] or [▼] then press [OK] or [▶].
- 6). Enter "●", "●", "●", "●" (Address). (*1)
- 7). Enter "*", "*" (New Data). (*1)
- 8). Press [OK], a long confirmation beep will be heard.
- 9). Press [Off/Power] to return to stand by mode.
After that, turn the base unit power off and then power on.

H/S LCD



Frequently Used Items (Base Unit)

ex.)

Items	Address	Default Data	New Data		Remarks
C-ID (FSK) sensitivity	08 6A/08 69	00/28	00/1C (3 dB up)	00/14 (6 dB up)	When hex changes from "00/28" to "00/1C" or "00/14", gain increases by 3 dB or 6 dB.
C-ID (DTMF) sensitivity	08 86/08 85	08/00	0B/4C (3 dB up)	0F/F6 (6 dB up)	When hex changes from "00/01" to "0B/4C" or "0F/F6", gain increases by 3 dB or 6 dB.
Frequency	00 08 / 00 07	01/00	-	-	Use these items in a READ-ONLY mode to confirm the contents. Careless rewriting may cause serious damage to the computer system.
ID	00 02 ~ 00 06	Given value	-	-	
Bell length	03 C6	32 (5 sec) (*2)(for BL,HK,TU,TW, ML)	1E (3 sec)	14 (2 sec)	This is time until bell stops ringing. (Unit: 100 msec)
		64 (10 sec) (*2)(for CX,BX,UE)	1E (3 sec)	14 (2 sec)	This is time until bell stops ringing. (Unit: 100 msec)
PULSE Dial speed (10PPS->20PPS)	03A0	28 (40msec) (*2) (for CX,BX,UE)	14 (20 msec)	-	This is pulse make time. (Unit:1msec)
		21 (33msec)(*2) (for HK,TW,ML)	14 (20 msec)	-	This is pulse break time. (Unit:1msec)
		2A (40msec) (*2) (for TU)	14 (20 msec)	-	This is pulse break time. (Unit:1msec)
	03 A1	3C (60 msec) (*2) (for CX,BX,UE)	1F (30 msec)	-	This is pulse break time. (Unit:1msec)
		43 (67 msec) (*2)(for HK,TW,ML)	1F (30 msec)	-	This is pulse break time. (Unit:1msec)
		3A (60 msec) (*2) (for TU)	1F (30 msec)	-	This is pulse break time. (Unit:1msec)
	03 B5	57 (870 msec) (*2)	2C (440 msec)	-	This is inter-digit time in pulse mode. (Unit:10 msec)

Note:

(*1) When you enter the address or New Data, please refer to the table below.

Desired Number (hex)	Input Keys	Desired Number (hex)	Input Keys
0	0	A	[Flash] + 0
1	1	B	[Flash] + 1
.	.	C	[Flash] + 2
.	.	D	[Flash] + 3
.	.	E	[Flash] + 4
9	9	F	[Flash] + 5

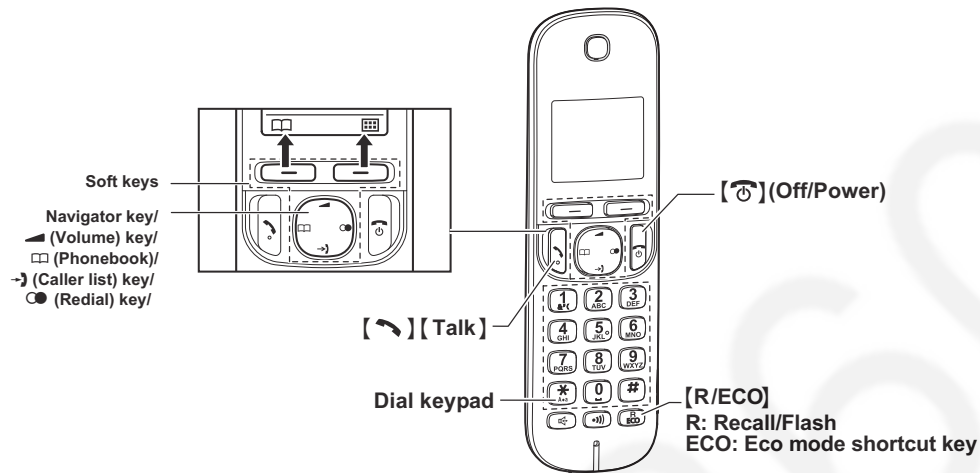
(*2)

Bell length	32 (hex) = 50 (dec) → $50 \times 100 \text{ msec} = 5000 \text{ msec}$ (5 sec)(for BL,HK,TU,TW,ML)
	64 (hex) = 100 (dec) → $100 \times 100 \text{ msec} = 10000 \text{ msec}$ (10 sec)(for CX,BX,UE)
PULSE Dial speed (10PPS -> 20PPS)	28 (hex) = 40 (dec) → $40 \times 1 \text{ msec} = 40 \text{ msec}$ (for CX,BX,UE)
	21 (hex) = 33 (dec) → $33 \times 1 \text{ msec} = 33 \text{ msec}$ (for HK,TW,ML)
	2A (hex) = 42 (dec) → $(42-2) \times 1 \text{ msec} = 40 \text{ msec}$ (for TU)
	3C (hex) = 60 (dec) → $60 \times 1 \text{ msec} = 60 \text{ msec}$ (for CX,BX,UE)
	43 (hex) = 67 (dec) → $67 \times 1 \text{ msec} = 67 \text{ msec}$ (for HK,TW,ML)
	3A (hex) = 58 (dec) → $(58+2) \times 10 \text{ msec} = 60 \text{ msec}$ (for TU)
	57 (hex) = 87 (dec) → $87 \times 10 \text{ msec} = 870 \text{ msec}$

8.1.2. Handset

Important:

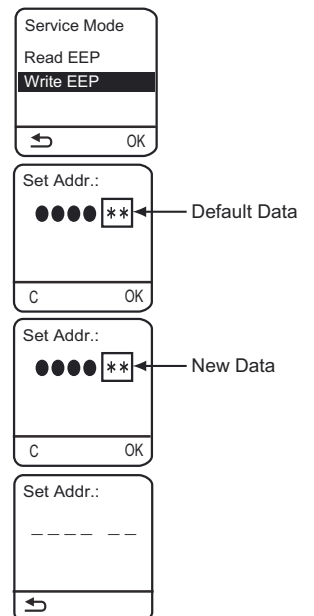
Make sure the address on LCD is correct when entering new data. Otherwise, you may ruin the unit.



H/S key operation

H/S LCD

- 1). Press [].
- 2). Select "Initial Setup" using [▲] or [▼] then press [OK].
- 3). Enter "7", "2", "6", "2", "7", "6", "6", "4".
Note: 7262 7664 = PANA SONI
 (see letters printed on dial keys)
- 4). Select "Write EEP" using [▲] or [▼] then press [OK] or [▶].
- 6). Enter "●", "●", "●", "●" (Address). (*1)
- 7). Enter "*", "*" (New Data). (*1)
- 8). Press [OK], a long confirmation beep will be heard.
- 9). Press [Off/Power] to return to stand by mode.
 After that, turn the base unit power off and then power on.



Frequently Used Items (Handset)

ex.)

Items	Address	Default Data	New Data	Possible Adjusted Value MAX (hex)	Possible Adjusted Value MIN (hex)	Remarks
Battery Low	00 09	70	-	-	-	(*2)
Frequency	00 07 / 00 08	70/02	-	-	-	
ID	00 02 ~ 00 06	Given value	-	-	-	

Note:

(*1) When you enter the address or New Data, please refer to the table below.

Desired Number (hex.)	Input Keys	Desired Number (hex.)	Input Keys
0	0	A	[R] + 0
1	1	B	[R] + 1
.	.	C	[R] + 2
.	.	D	[R] + 3
.	.	E	[R] + 4
9	9	F	[R] + 5

(*2) When adding "01" (hex) to default value, sending level increases by 0.25 dB.

ex.)

Item	Default Data	New Data		Destination
	E7	EB	E3	
Sending level	-1.5 dBm	-0.5 dBm	-2.5 dBm	for BL,TU,BX,UE
	-7.0 dBm	-6.0 dBm	-8.0 dBm	for CX,HK,TW
	-3.5 dBm	-4.5 dBm	-2.5 dBm	for ML

(*3) When reducing "01" (hex) from default value, receiving level increases by 0.25 dB.

ex.)

Item	Default Data	New Data		Destination
	E7	EB	E3	
Receiving level	-13.0 dBm	-14.0 dBm	-12.0 dBm	for BL,TU,BX,UE
	-25.0 dBm	-26.0 dBm	-24.0 dBm	for CX
	-23.0 dBm	-24.0 dBm	-22.0 dBm	for HK,TW
	-22.0 dBm	-23.0 dBm	-21.0 dBm	for ML

(*4) Use these items in a READ-ONLY mode to confirm the contents. Careless rewriting may cause serious damage to the handset.

8.2. EEPROM LAYOUT (Handset)

8.2.1. Scope

The purpose of this section is to describe the layout of the EEPROM (IC7) for the KX-TGCA20 Handset.

The EEPROM contains hardware, software, and user specific parameters. Some parameters are set during production of the handset, some are set by the user when configuring the handset, and some during normal use of the phone.

8.2.2. Introduction

The handset uses a 128k bit serial EEPROM (IC7) for storing volatile parameters. All parameters are set up before the handset the factory. Some of these are vital for the operation of the hardware so a set of default parameters is programmed before the actual hardware fine-tuning can be initiated. This document lists all default settings with a short description.

This document lists all default parameters with a short description.

Initial Type	Description
F	The data initialized by only F command
0	The data initialized by F and 0 command
1	The data initialized by F, 0 and 1 command
2	The data initialized by F, 0, 1 and 2 command
3	The data initialized by all command (F, 0, 1, 2, 3)

Country Setting	Description
x	Default - no specific country setting, so revert to default value.

8.2.3. EEPROM contents

MMI Setting:

Address	Initial Type	Name	Description	Default value	Country Setting
04 B0	3	EEP_Language	Selected Language for LCD GERMAN:0 ENGLISH:1 SPANISH:2 NORWEGIAN:3 FRENCH:4 ITALIAN:5 DENISH:6 DUTCH:7 SWEDISH:8 FINNISH:9 GREEK:10 TURKISH:11 HUNGARIAN:12 PORTUGUESE:13 RUSSIAN:14 POLISH:15 SLOVAKIAN:16 CZECH:17 CROATIAN:18 CATALAN:19 UKRINIAN:20 SPANISHMEX:21 SLOVENIAN:22 ESTNIAN:23 LITHUANIAN:24 LATVIAN:25 ROMANIAN:26 BULGARIAN:27 MACEDONIAN:29 ALBANIAN:30 PORTUGUESEMEX:31 ENGLISH(USA):32 HEBREW:33 ARABIC:34 PERSIA:35 HANTAI:36 HANTAI(HK):37 RUSSIAN(BX):38 BELARUS:39 KAZAKHSTAN:40 UZBEKISTAN:41 TAJIKISTAN:42 TURKMENISTAN:43 AZERBAIJAN:44 ARMENIA:45 MOLDOV:46 CANADAENGLISH:48 USSPANISH:49 USFRENCH:50 PORTUGUESE:51 ENGLISH(AZ):52	0x01	0x07 (for BL) 0x01 (for CX,BX,U E,ML,HK, TW) 0x04 (for TU)

MMI1 Setting:

Address	Initial Type	Name	Description	Default value	Country Setting
00 12	F	EEP_LcdContrast	LCD contrast	0x29	x

8.3. How to Clear User Setting

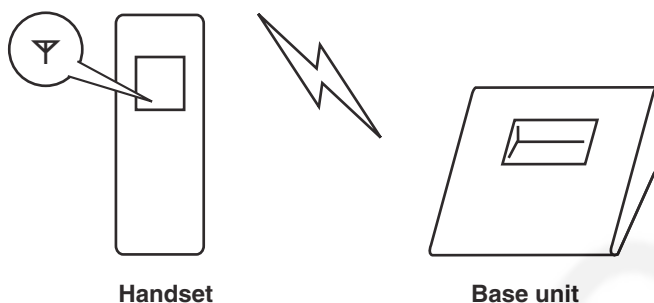
Units are reset to the Factory settings by this operation (Erase recorded Voice messages, stored Phone numbers, Caller list and etc.)

Note:

- Some menus are not reset. Refer to **Operating Instructions** (P.20).
- The reset menus differ depending on the following operations.
- **This operation should not be performed for a usual repair.**

8.3.1. Resetting both base unit and handset

Both the base unit and the registered handset which you did the following steps ① to ④ are reset. Other registered handsets will not be reset.



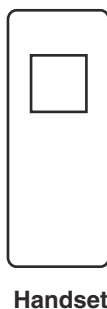
- ① Connect the AC adaptor to the base unit and install the charged batteries into the handset.
- ② Confirm the handset is registered to the base unit (lights).
- If the handset is not registered to the base unit (lights), register it. (*1)
- ③ Lift the handset and press **[①]** to put the handset in standby mode.
- ④ Press **[1], [5], [9]** and **[*]** key of the handset simultaneously until a confirmation tone is heard.
- ⑤ Disconnect the AC adaptor, then remove the battery.

Note:

(*1) Refer to **Registering a Handset to a Base Unit** in the Operating Instructions.

8.3.2. Resetting only handset

The only handset is reset by doing the following steps ① to ④ .



- ① Install the charged batteries into the handset.
- ② Lift the handset and press **[①]** to put the handset in standby mode.
- ③ Press **[3], [5], [7]** and **[#]** key of the handset simultaneously until a confirmation tone is heard. (*2)
- ④ Remove the battery.

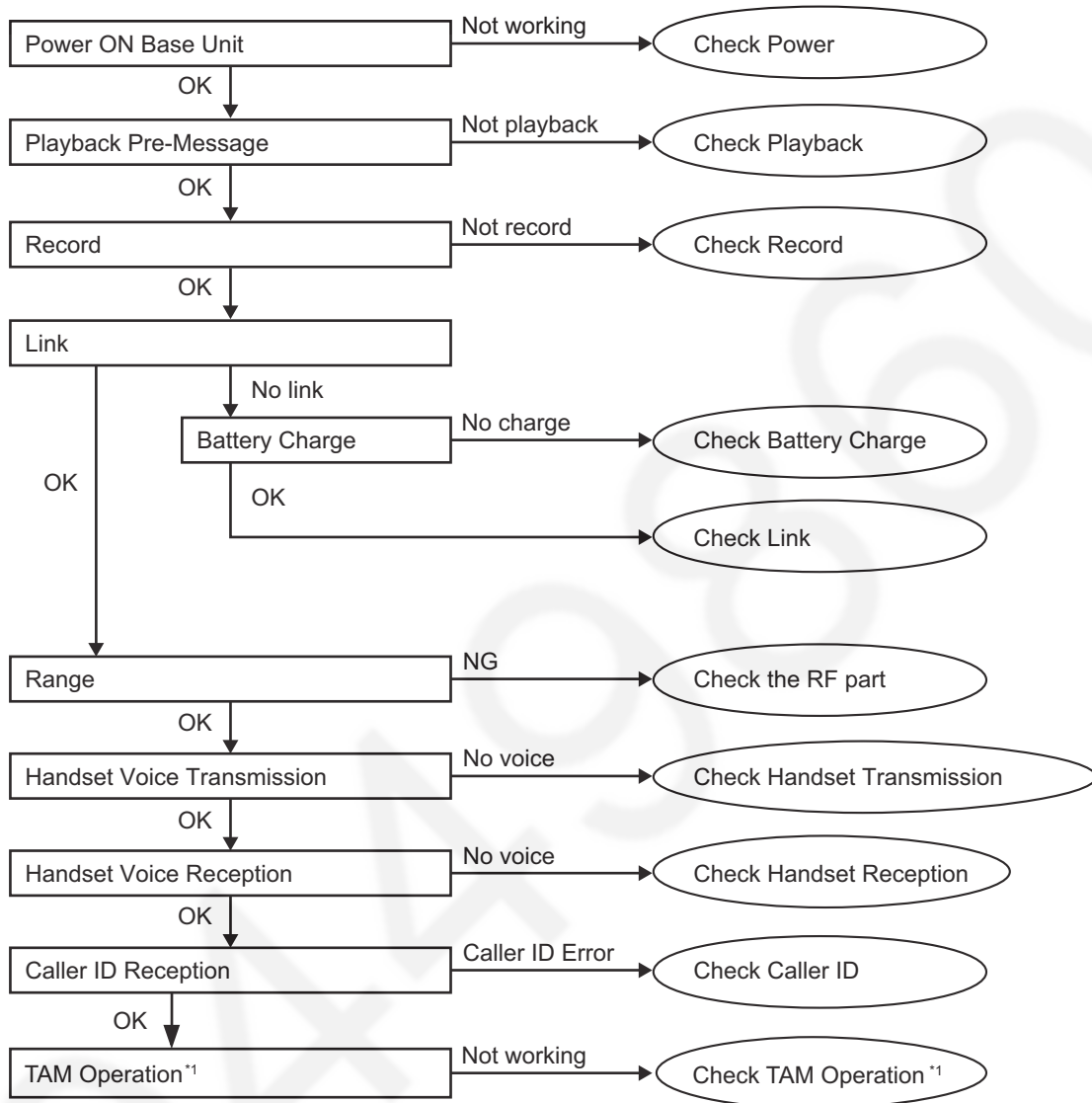
Note: (*2)

- The handset registration to the base unit is cancelled.
- If the handset needs to be registered to the base unit, refer to **Registering a Handset to a Base Unit** in the Operating Instructions.
- If users do not bring the base unit with them, the registration procedure has to be done by users themselves.

9 Troubleshooting Guide

9.1. Troubleshooting Flowchart

FLOW CHART



*1 KX-TGC220 only

Cross Reference:

Check Power (P.28)

Check Playback (P.30)

Check Record (P.29)

Check Battery Charge (P.30)

Check Link (P.31)

Check the RF part (P.33)

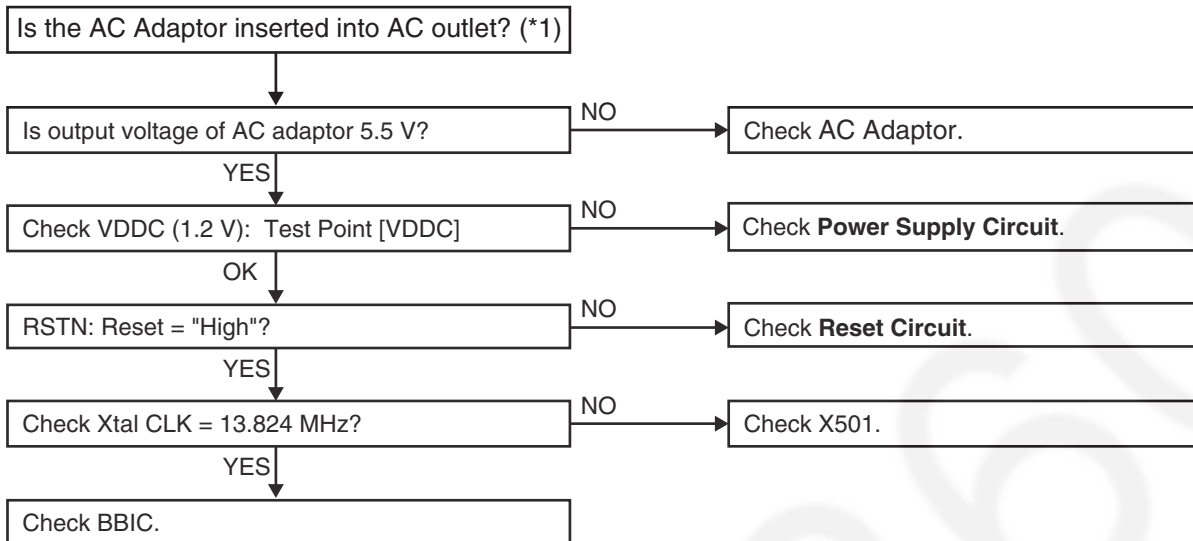
Check Handset Transmission (P.38)

Check Handset Reception (P.38)

Check Caller ID (P.38)

9.1.1. Check Power

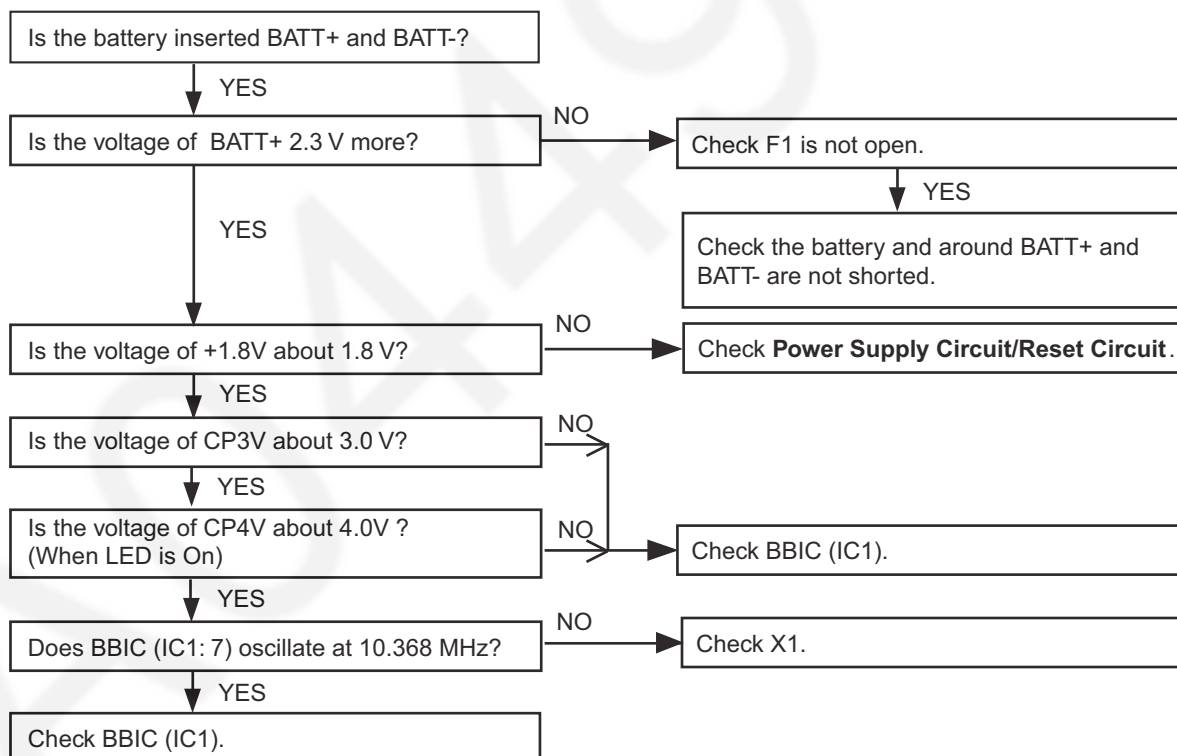
9.1.1.1. Base Unit



Cross Reference:
Power Supply Circuit/Reset Circuit (P.12)

Note:
 BBIC is IC501.
 (*1) Refer to Specifications (P.7) for part number and supply voltage of AC adaptor.
 (*2) Refer to **Base Unit (Main)** (P.77).

9.1.1.2. Handset

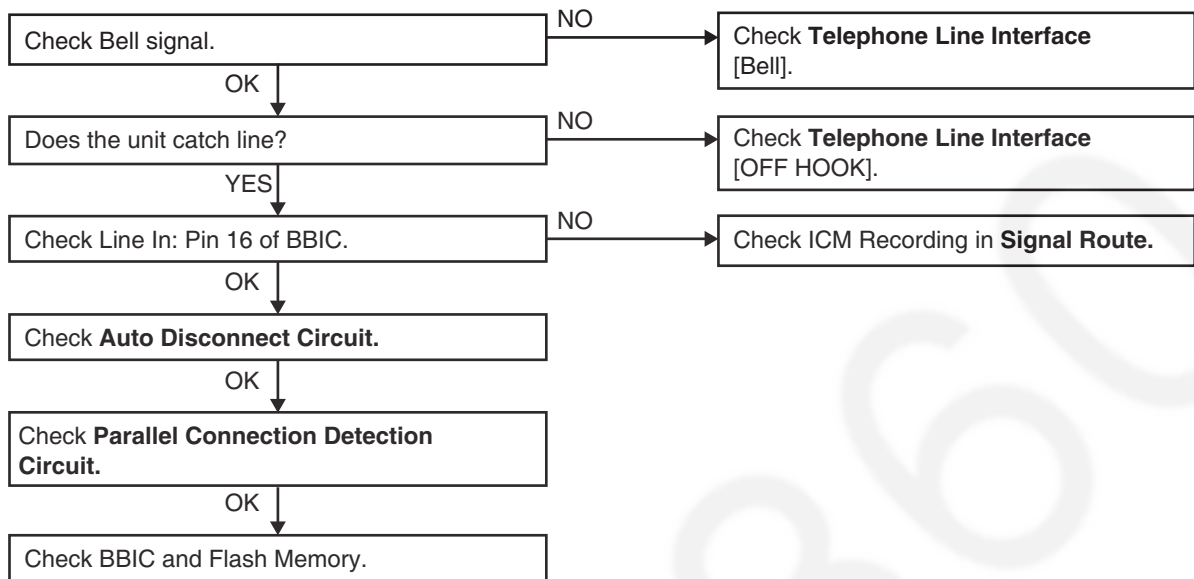


Cross Reference:
Power Supply Circuit/Reset Circuit (P.12)

9.1.2. Check Record

9.1.2.1. Base Unit

A) Not record Incoming Message



Cross Reference:

Signal Route (P.18)

Telephone Line Interface (P.14)

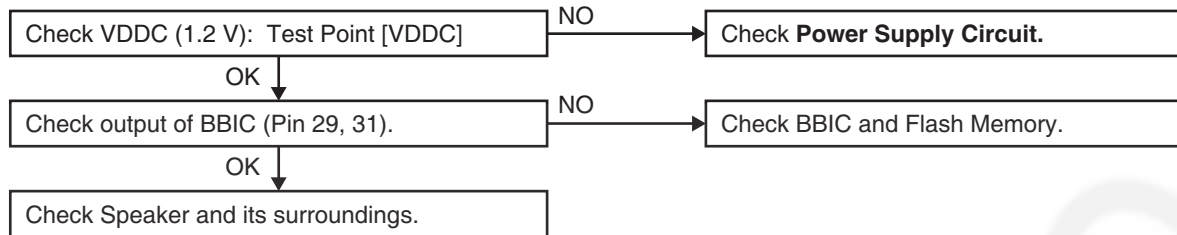
Note:

Flash Memory is IC601.

BBIC is IC501.

9.1.3. Check Playback

9.1.3.1. Base Unit



Cross Reference:

Power Supply Circuit/Reset Circuit (P.12)

Note:

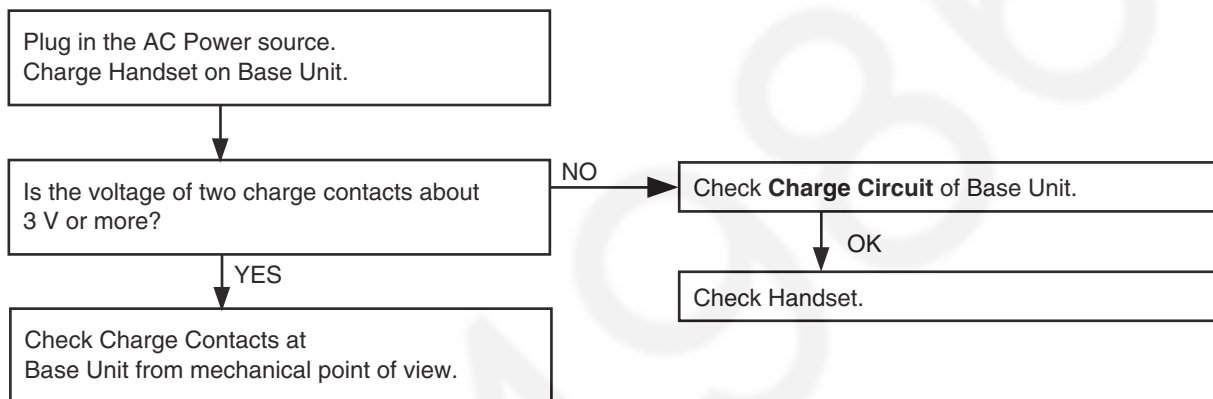
Flash Memory is IC601.

BBIC is IC1.

(*1) Refer to **Base Unit (Main)** (P.77).

9.1.4. Check Battery Charge

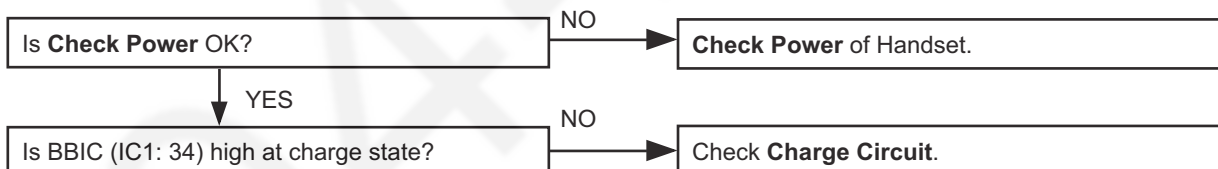
9.1.4.1. Base Unit



Cross Reference:

Charge Circuit (P.13)

9.1.4.2. Handset

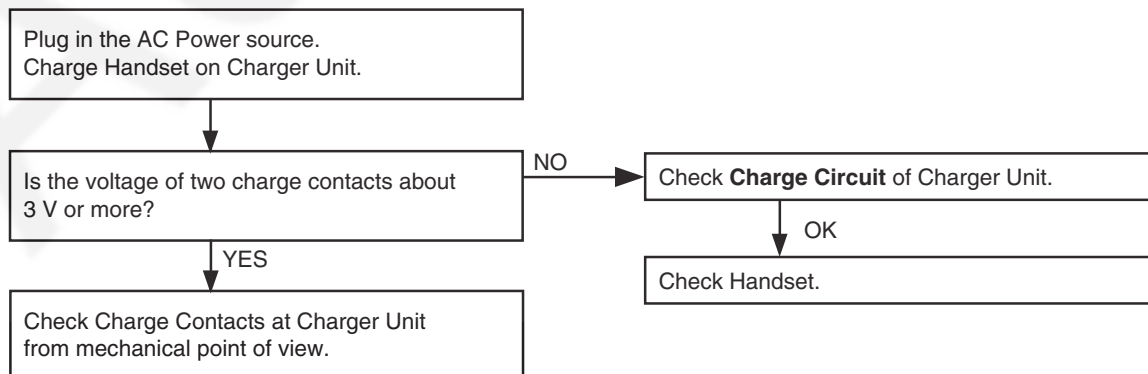


Cross Reference:

Check Power (P.28)

Charge Circuit (P.17)

9.1.4.3. Charger Unit

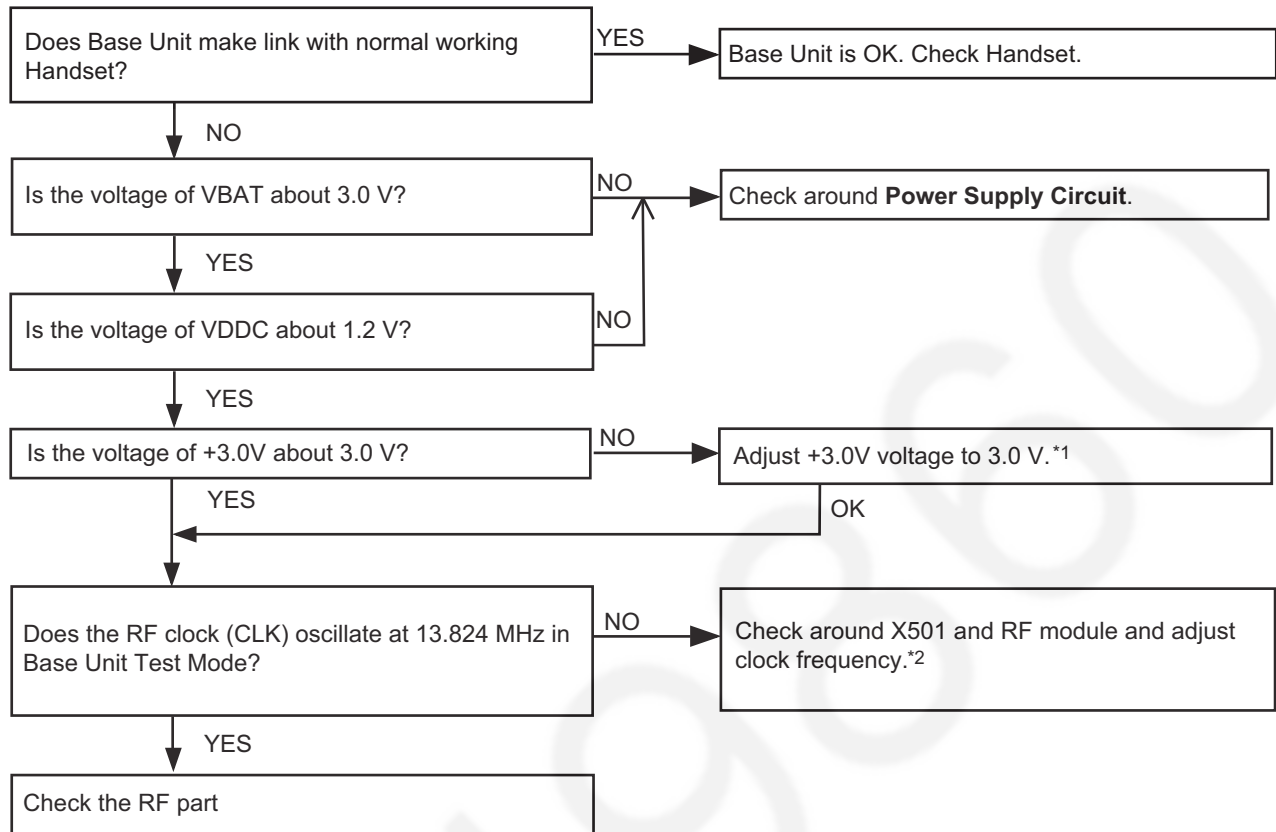


Cross Reference:

Charge Circuit (P.17)

9.1.5. Check Link

9.1.5.1. Base Unit



Cross Reference:

Power Supply Circuit/Reset Circuit (P.12)

Check the RF part (P.33)

Note:

*1 How to adjust +3.0V:

Execute the command "VDA"

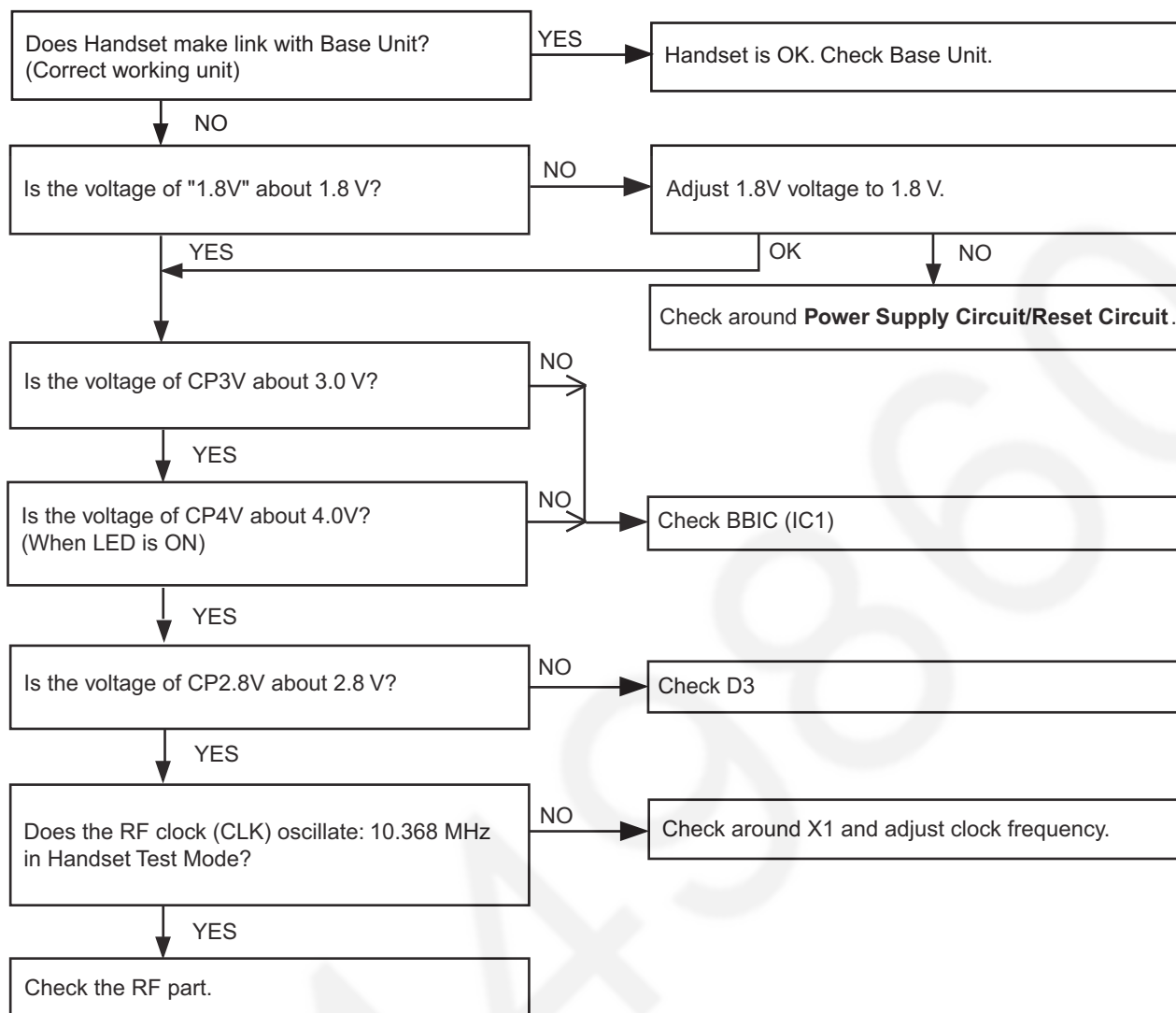
Refer to **Things to Do after Replacing IC or X'tal (P.57)** for Base Unit.

*2 How to adjust the frequency of X501:

To see the frequency, execute the command "SFR", then check the TP_CKM (IC501-57pin).

To adjust frequency, send command "SFR □□□□" until the frequency counter becomes 13.824 MHz±55HZ.

9.1.5.2. Handset



Cross Reference:

Power Supply Circuit/Reset Circuit (P.12)

Check the RF part (P.33)

Note:

(*1) Refer to **Troubleshooting by Handset (P.30)**

To see the frequency, execute the command "SFR", then check the TP_CKM (IC1-55pin).

To adjust frequency, send command "SFR □○○□○○" until the frequency counter becomes 10.368 MHz±55HZ.

Refer to **Things to Do after Replacing IC or X'tal (P.58)** for Handset.

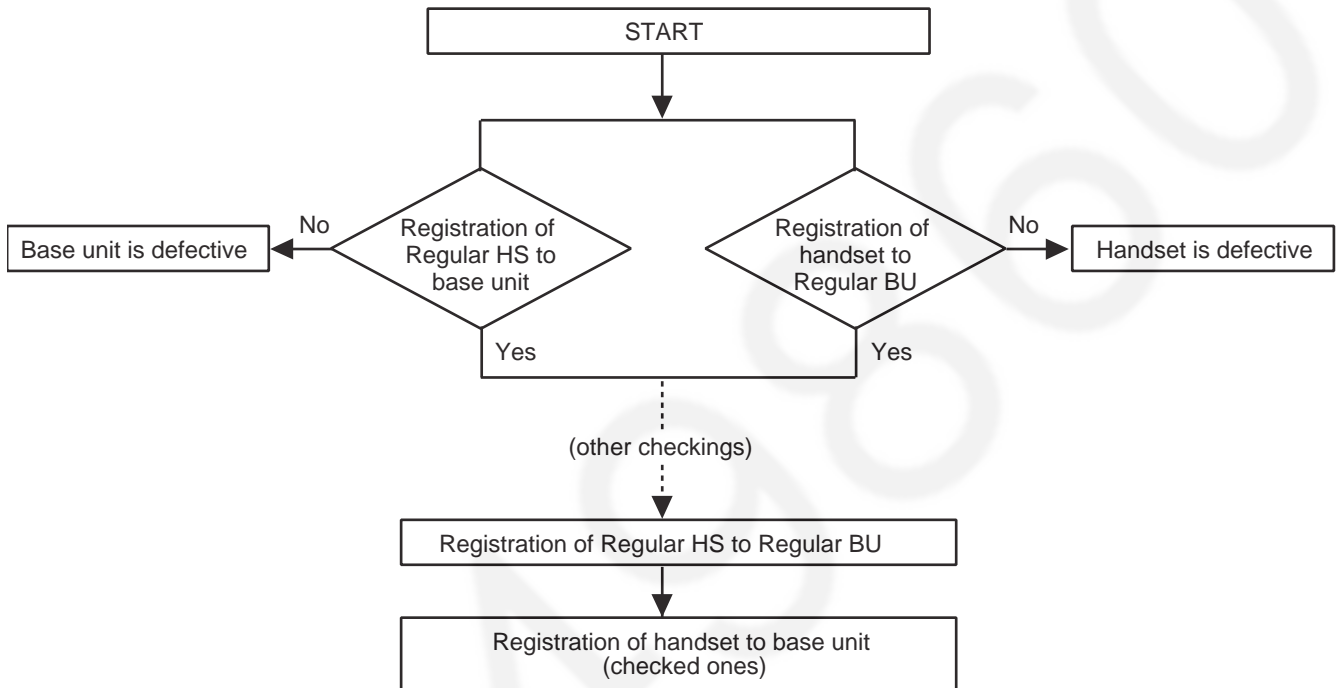
9.1.6. Check the RF part

9.1.6.1. Finding out the Defective part

1. Prepare Regular HS(*1) and Regular BU(*2).
2. a. Re-register regular HS (Normal mode) to base unit (to be checked).
If this operation fails in some ways, the base unit is defective.
- b. Re-register handset (to be checked) to regular BU (Normal mode).
If this operation fails in some ways, the handset is defective.

After All the Checkings or Repairing

1. Re-register the checked handset to the checked base unit, and Regular HS to Regular BU.



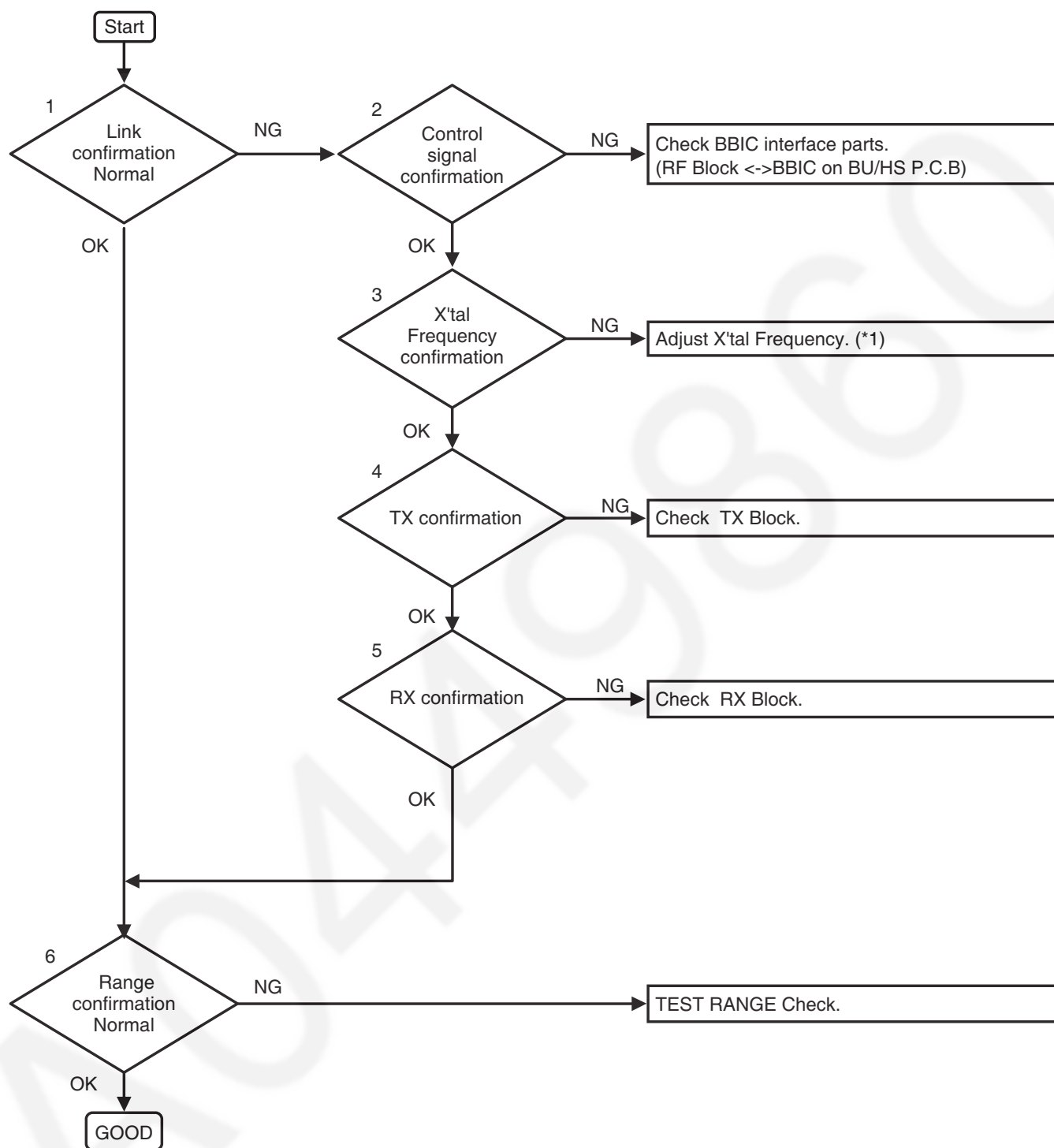
Note:

- (*1) HS: Handset
(*2) BU: Base Unit

9.1.6.2. RF Check Flowchart

Each item (1 ~ 6) of RF Check Flowchart corresponds to **Check Table for RF part** (P.35).

Please refer to the each item.



Note:

(*1) Refer to **Check Link** (P.31).

9.1.6.3. Check Table for RF part

No.	Item	BU (Base Unit) Check	HS (Handset) Check
1	Link Confirmation Normal HS, BU Mode [Normal Mode]	1. Register Regular HS to BU (to be checked). 2. Press [Talk] key of the Regular HS to establish link.	1. Register HS (to be checked) to Regular BU. 2. Press [Talk] key of the HS to establish link.
2	X'tal Frequency confirmation HS, BU Mode: [Adjustment]	Check X'tal Frequency. (13.824000 MHz \pm 100 Hz)	Check X'tal Frequency. (10.368000 MHz \pm 100 Hz)
3	TX confirmation Regular HS (BU) Mode: [Test RX Mode] BU (HS) Mode: [Test TX_Burst Mode]	1. Place Regular HS 15 cm away from a checked BU. 2. Confirm "TXDATA" waveform of BU (*1) and "RXDATA" waveform of Regular HS by Digital Oscilloscope.	1. Place Regular BU 15 cm away from a checked HS. 2. Confirm "TXDATA" waveform of HS (*2) and "RXDATA" waveform of Regular BU by Digital Oscilloscope.
4	RX confirmation Regular HS (BU) Mode: [Test TX_Burst Mode] BU (HS) Mode: [Test RX Mode]	1. Place Regular HS 15 cm away from a checked BU. 2. Confirm "RXDATA" waveform of BU (*1) and "TXDATA" waveform of Regular HS by Digital Oscilloscope.	1. Place Regular BU 15 cm away from a checked HS. 2. Confirm "RXDATA" waveform of HS (*2) and "TXDATA" waveform of Regular BU by Digital Oscilloscope.
5	Range Confirmation Normal HS, BU Mode: [Normal Mode]	1. Register Regular HS to BU (to be checked). 2. Press [Talk] key of the Regular HS to establish link. 3. Compare the range of the BU (being checked) with that of the Regular BU.	1. Register HS (to be checked) to Regular BU. 2. Press [Talk] key of the HS to establish link. 3. Compare the range of the HS (being checked) with that of the Regular HS.

Note:

(*1) **Adjustment Standard (Base Unit)** (P.53)

(*2) **Adjustment Standard (Handset)** (P.56)

9.1.6.4. TEST RANGE Check

Circuit block which range is defective can be found by the following check.

Item	BU (Base Unit) Check	HS (Handset) Check
Range Confirmation TX TEST (TX Power check) HS, BU setting Checked unit: Low TX power (*1) Regular unit: High TX power (*1)	1. Register Regular HS to BU (to be checked). 2. Set TX Power of the BU and the Regular HS according to CHART1. 3. At distance of about 20m between HS and BU, Link OK = TX Power of the BU is OK. No Link = TX Power of the BU is NG.	1. Register HS (to be checked) to Regular BU. 2. Set TX Power of the HS and the Regular BU according to CHART1. 3. At distance of about 20m between HS and BU, Link OK = TX Power of the HS is OK. No Link = TX Power of the HS is NG.
Range Confirmation RX TEST (RX sensitivity check) HS, BU setting Checked unit: High TX power (*1) Regular unit: Low TX power (*1)	1. Register Regular HS to BU (to be checked). 2. Set TX Power of the BU and the Regular HS according to CHART1. 3. At distance of about 20m between HS and BU, Link OK= RX Sensitivity of the BU is OK. No Link = RX Sensitivity of the BU is NG.	1. Register HS (to be checked) to Regular BU. 2. Set TX Power of the Checking HS and the Regular BU according to CHART1. 3. At distance of about 20m between HS and BU, Link OK= RX Sensitivity of the HS is OK. No Link = RX Sensitivity of the HS is NG

CHART1: Setting of TX Power and RX Sensitivity in Range Confirmation TX TEST, RX TEST

	BU (to be checked)	Regular_HS
	TX Power	TX Power
BU (Base Unit) TX Power Check	Low	High
BU (Base Unit) RX Sensitivity Check	High	Low

	HS (to be checked)	Regular_BU
	TX Power	TX Power
HS (Handset) TX Power Check	Low	High
HS (Handset) RX Sensitivity Check	High	Low

Note:

(*1) Refer to **Commands** (P.52).

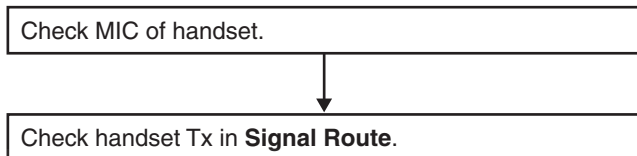
9.1.7. Registering a Handset to the Base Unit

- 1 **Handset:**
[MENU] [#] 1 3 0
- 2 **Base unit:**
Press and hold [•••] for about 5 seconds.
 - If all registered handsets start ringing, press [•••] again to stop, then repeat this step. (KX-TGC212/KX-TGC213/KX-TGC222)
 - The next step must be completed within 90 seconds.
- 3 **Handset:**
Press [OK], then wait until a long beep sounds.

9.1.8. Deregistering a Handset

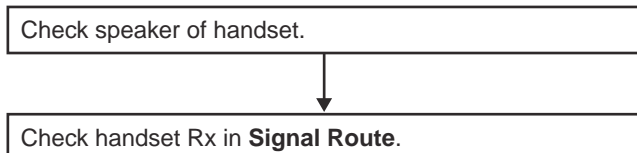
- 1 [MENU] [#] 1 3 1
 - All handsets registered to the base unit are displayed.
- 2 [↕]: Select the handset you want to cancel. → [OK]
- 3 [↕]: “Yes” → [OK] → [📞]

9.1.9. Check Handset Transmission



Cross Reference:
Signal Route (P.18)

9.1.10. Check Handset Reception

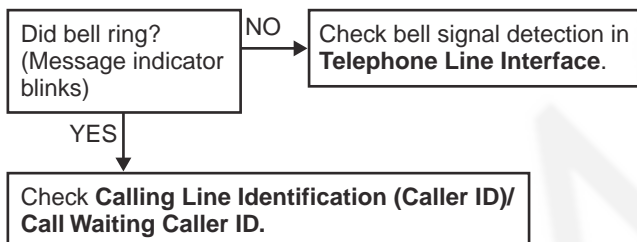


Cross Reference:
Signal Route (P.18)

Note:
 When checking the RF part, Refer to **Check the RF part** (P.33).

9.1.11. Check Caller ID

BASE UNIT



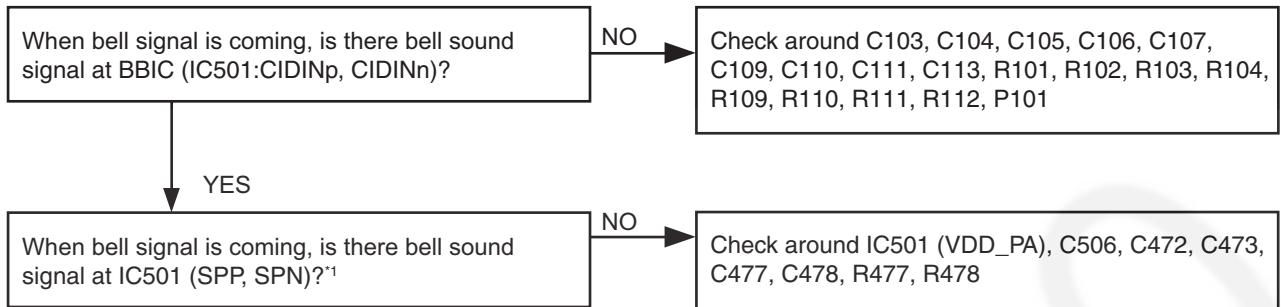
Cross Reference:
Telephone Line Interface (P.14)

Note:

- Make sure the format of the Caller ID service of the Telephone company that the customer subscribes to.
- It is also recommended to confirm that the customer is really a subscriber of the service.

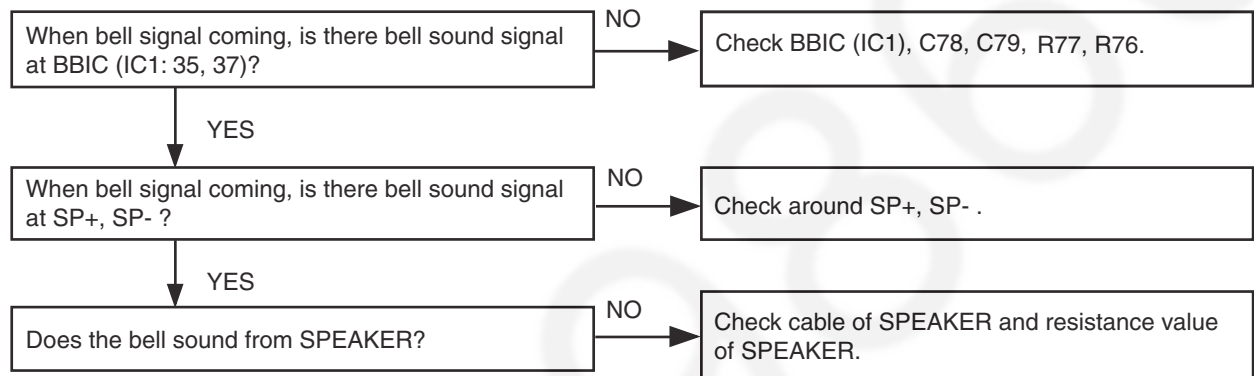
9.1.12. Bell Reception

9.1.12.1. Base Unit



*1 TGC220 only

9.1.12.2. Handset



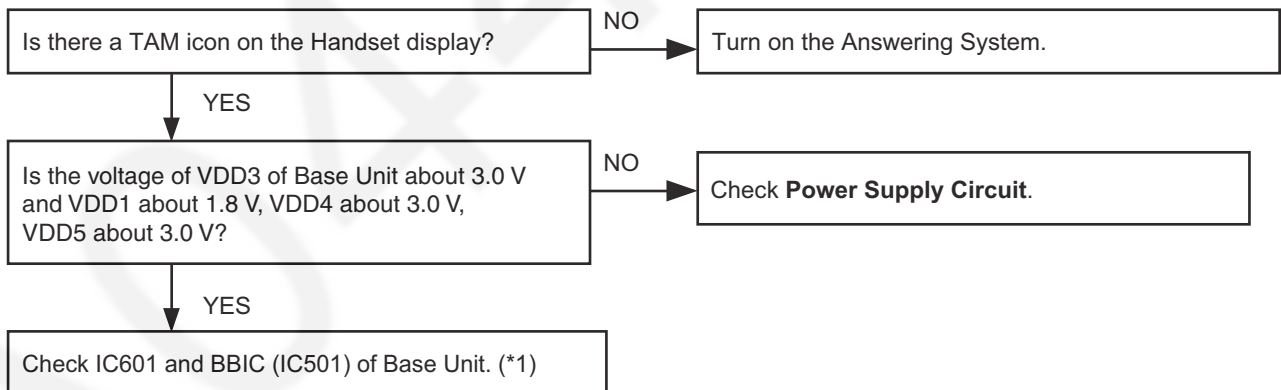
Cross Reference:

Telephone Line Interface (P.14)

Check Link (P.31)

How to Check the Handset Speaker or Receiver (P.60)

9.1.13. Check TAM Operation (for KX-TGC220 only)



Note:

(*1) When replacing FLASH MEMORY (IC601), TAM data need to be written to it. Refer to **Base Unit of Things to Do after Replacing IC or X'tal** (P.57)

9.2. Troubleshooting by Symptom (Base Unit and Charger Unit)

If your unit has below symptoms, follow the instructions in remedy column. Remedies depend on whether you have DECT tester (*1) or not.

Symptom	Remedy (*2)	
	You don't have DECT Tester.	You have DECT Tester. (Model Number: CMD60)
You cannot dial.	Check item (A) - (I).	Check item (A) - (I), (J) - (N).
You cannot hear the caller's voice.	Check item (A) - (G), (O).	Check item (A) - (G), (J) - (N), (O).
You cannot use the handset a little away from base unit even if the handset is within range of the base unit.	-	Check item (J) - (N).
The acoustic transmit level is high or low.	Check item (O).	Check item (O).
The acoustic reception level is high or low.	Check item (O).	Check item (O).
Base unit and handset do not link to each other.	Check item (A) - (I).	Check item (A) - (N).
The unit cannot charge.	Check item (P).	Check item (P).
TAM does not work. (for KX-TGC220 only)	Check item (Q).	Check item (Q).

Note:

(*1) A general repair is possible even if you don't have the DECT tester because it is for confirming the levels, such as Acoustic level in detail.

(*2) Refer to **Check Point (Base Unit) (P.40)**

9.2.1. Check Point (Base Unit)

Please follow the items below when BBIC or EEPROM or FLASH is replaced.

Note:

After the measuring, suck up the solder of TP.

*. **The Setting Method of JIG (P.51)** is required beforehand.

The connections of simulator equipment are as shown in **Adjustment Standard (Base Unit) (P.53)**.

	Items	Check Point	Procedure	Check or Replace Parts				
(A)	3.0 V Supply Confirmation	VDD3	1. Confirm that the voltage between test point VDD3 and GND is 3.0 V ± 0.2 V.	IC302, R321, R322, C341, C342 , R905, D905				
(B)	1.8 V Supply Confirmation	VDD1	1. Confirm that the voltage between test point VDD1 and GND is 1.8 V ± 0.02 V. 2. Execute the command "VDD", then check the current value. 3. Adjust the 1.8V voltage of VDD1 executing command "VDD XX"(XX is the value).	Q301, IC501, R311, C311, C516, C517				
(C)	Charge Pump 3.0V Supply Confirmation	VDD5	1. Confirm that the voltage between test point VDD5 and GND is 3.0 V -0.1/+0.3 V.	IC501, C512				
(D)	Charge Pump 3.0V Supply Confirmation	VDD4	1. Confirm that the voltage between test point VDD4 and GND is 3.0 V ± 0.2 V.	IC501, C509				
(E)*	BBIC Confirmation	-	1. BBIC Confirmation (Execute the command "getchk"). 2. Confirm the returned checksum value. Connection of checksum value and program number is shown below. <div><div>ex.)</div><table><tr><td>checksum value</td><td>program number</td></tr><tr><td>9CF3</td><td>DE91EN</td></tr></table></div>	checksum value	program number	9CF3	DE91EN	IC501, X501
checksum value	program number							
9CF3	DE91EN							
(F)*	EEPROM Confirmation	-	1. EEP-ROM Confirmation (Execute the command "sendchar EPV"). 2. Confirm the returned Value. (Value for reference is written at "EEPROM C/ SUM" in Software_Version_Table.xls).	IC501, RA611, IC611, C611				
(G)*	BBIC Clock Adjustment	CKM	1. Confirm that the voltage between testpoint VDD4 and GND is less than 1.0 V. 2. Input Command " sendchar sfr", then you can confirm the current value. 3. Check X'tal Frequency. (10.368 MHz ± 100 Hz). 4. If the frequency is not 10.368 MHz ± 100 Hz, adjust the frequency of CKM executing the command "sendchar sfr xx xx (where xx is the value)" so that the reading of the frequency counter is 10.368000 MHz ± 5 Hz.	IC501, X501, C502				
(H)*	Hookswitch Check with DC Characteristics	-	1. Connect Telephone Socket to Tel-simulator which is connected with 600 Ω. 2. Set line voltage to 48 V and line current to 40mA at off-hook condition of normal telephone. 3. Execute the command "hookoff" 4. Confirm that the line current is 40 mA ± 5 mA. 5. Execute the command "hookon". 6. Confirm that the line current is less than + 0.8 mA.	P101, Q141, R141, R142, Q142, R144, R145, D101, R160, R162, R169, R170, D141, Q161, R151, IC501				

	Items	Check Point	Procedure	Check or Replace Parts
(I)	DTMF Generator Check	-	<ol style="list-style-type: none"> 1. Connect Telephone Socket to DTMF tester. (Load=600 Ω) 2. Link Handset and push dial key. 3. Confirm DTMF character. 4. Confirm that the high Group is -8.0 ± 2 dBm (for BL,ML) or -6.0 ± 2 dBm (for TU,BX,UE,CX,HK,TW). 5. Confirm that the low Group is -10.5 ± 2 dBm (for BL) or -8.0 ± 2 dBm (for TU,BX,UE,CX,HK,TW) or 10.0 ± 2 dBm (for ML). 	IC501, C184, Q161, D141
(J)*	Transmitted Power Confirmation	- ANTI_TP	<p>Remove the Antenna before starting step from 1 to 7.</p> <ol style="list-style-type: none"> 1. Configure the DECT tester (CMD60) as follows; <Setting> <ul style="list-style-type: none"> • Test mode: FP • Traffic Carrier: 5 • Traffic Slot: 4 • Mode: Loopback • PMID: 00000 • RF LEVEL = -70 dBm. 2. Execute the command "sendchar TST". 3. Execute the command "sendchar dmv 2 2". 4. Check that "Signalling Status" has been set to "Locked", then press "ACCEPT RFPI". 5. Initiate connection from Dect tester ("set up connect") 6. Execute the command "ANT1". 7. Confirm that the NTP value at ANT is 18.5 dBm ~ 25.0 dBm. 	IC501, C851, C860, C862, C863, C859
(K)*	Modulation Check and Adjustment	- ANTI_TP	<p>Follow steps 1 to 6 of (J).</p> <ol style="list-style-type: none"> 7. Confirm that the B-Field Modulation is $-350 \pm 50/+350 \pm 50$ kHz/div using data type Fig31. 	Refer to (J)
(L)*	Frequency Offset Check	- ANTI_TP	<p>Follow steps 1 to 6 of (J).</p> <ol style="list-style-type: none"> 7. Confirm that the frequency offset is $< \pm 20$ kHz. 	Refer to (J)
(M)*	Sensitivity Receiver Confirmation	- ANTI_TP	<p>Follow steps 1 to 6 of (J).</p> <ol style="list-style-type: none"> 7. Set DECT tester power to -88 dBm. 8. Confirm that the BER is < 1000 ppm. 	Refer to (J)
(N)*	Power RAMP Confirmation	-	<p>Follow steps 1 to 6 of (J).</p> <ol style="list-style-type: none"> 7. Confirm that Power RAMP is matching. 	Refer to (J)
(O)	Audio Check	-	<ol style="list-style-type: none"> 1. Link with Handset which is connected to Line Simulator. 2. Set line voltage to 48 V and line current to 50 mA. 3. Input -45 dBm (600 Ω)/1 kHz to MIC of Handset. Measure the Level at Line I/F and distortion level. 4. Confirm that the level is -1.5 ± 5 dBm (for BL.TU,BX,UE) or -4.0 ± 5 dBm (for HK,TW) or -0.4 ± 5 dBm (for CX) or -3.5 ± 5 dBm (for ML) and that the distortion level is $< 5\%$ at TEL Line (600 Ω Load). 5. Input -20 dBm (600 Ω)/1kHz to Line I/F. Measure the Level at Receiver of Handset and distortion level (Receive volume set to second position from minimum). 6. Confirm that the level is -10 ± 3 dBm and that the distortion level is $< 5\%$ at Receiver (34 Ω Load). 	IC501, SA101, P101, D101, Q141, Q142, R141, R142, R144, R145, D141, Q161, R163, R164, C171, C173, R178, C184
(P)	Charging Check	-	<ol style="list-style-type: none"> 1. Connect Charge Contact 12 Ω/2 W resistor between charge+ and charge-. 2. Measure and confirm voltage across the resistor is $3.9 \text{ V} \pm 0.4 \text{ V}$. 	R371, R372, D362, C351
(Q)	TAM Operation Confirmation (for KX-TGC220 only)	-	<ol style="list-style-type: none"> 1. TAM Confirmation (Execute the command "sendchar VPI"). 2. Confirm the returned Value (Value is "DE97KA 00" (for BL) or "DE97EA 00" (for BX)). 	IC501, IC601, R601, RA601, C601

9.3. Troubleshooting by Symptom (Handset)

If your unit has below symptoms, follow the instructions in remedy column. Remedies depend on whether you have DECT tester (*1) or not.

Symptom	Remedy (*2)	
	You don't have DECT Tester.	You have DECT Tester. (Model Number: CMD60)
Battery strength is not indicated correctly by Battery icon.	Check item (A) - (D), (E) - (G).	Check item (A) - (D), (E) - (G).
You cannot hear the caller's voice.	Check item (A) - (C), (H), (N).	Check item (A) - (C), (H - (L)) - (N).
You cannot use handset little away from base unit even if the handset is within range of the base unit.	-	Check item (I) - (M).
the Audio level is high or low.	Check item (N).	Check item (N).
The SP-Phone level is high or low.	Check item (O).	Check item (O).

Note:

(*1) A general repair is possible even if you don't have the DECT tester because it is for confirming the levels, such as Acoustic level in detail.

(*2) Refer to **Check Point (Handset)** (P.42)

9.3.1. Check Point (Handset)

Please follow the items below when BBIC or EEPROM is replaced.

Note:

After the measuring, suck up the solder of TP.

*: **The Setting Method of JIG (Handset)** (P.54) is required beforehand.

The connections of adjustment equipment are as shown in **Adjustment Standard (Handset)** (P.56).

	Items	Check Point	Procedure	Check or Replace Parts									
(A)*	1.8 V Supply Adjustment	1.8V	1. Confirm that the voltage between test point 1.8V and GND is 1.8 V ± 0.02 V. 2. Execute the command "VDD", then check the current value. 3. Adjust the 1.8V voltage of 1.8V executing command "VDD XX"(XX is the value).	IC1, Q1, C44, R45, C40, C45									
(B)*	BBIC Confirmation	-	1. BBIC Confirmation (Execute the command "getchk"). 2. Confirm the returned checksum value. Connection of checksum value and program number is shown below. <div>ex.)<table><tr><th>Destination</th><th>checksum value</th><th>program number</th></tr><tr><td>BL,CX,HK,TU,BX,UE,ML</td><td>73C7</td><td>DE92EN</td></tr><tr><td>TW</td><td>7258</td><td>DE92TA</td></tr></table></div>	Destination	checksum value	program number	BL,CX,HK,TU,BX,UE,ML	73C7	DE92EN	TW	7258	DE92TA	IC1, X1, R61
Destination	checksum value	program number											
BL,CX,HK,TU,BX,UE,ML	73C7	DE92EN											
TW	7258	DE92TA											
(C)*	EEP-ROM Confirmation	-	1. EEP-ROM Confirmation (Execute the command "sendchar EPV"). 2. Confirm the returned Value. (Value for reference is written at "EEPROM C/SUM" in Software_Version_Table.xls).	IC1, IC3, RA5, C69									
(D)	Charge Control Check & Charge Current Monitor Check	-	1. Apply 5.0 V between CHG(+) and CHG(-) with DC power supply and set current limit to 150 mA. Confirm the indication of "charging" on LCD. 2. Confirm that the current limit LED of DC power supply is ON/OFF. Confirm it after waiting over 1 minute at least. (If charge control cannot be confirmed by this procedure, please use battery to handset power supply and try again.)	IC1, Q4 Q9, Q2, Q3, R2, R7, R8, R6, R9, C19, R45									
(E)*	Charge Detection (OFF) Check	-	1. Stop supplying 5.0 V to CHG (+) and CHG (-). 2. Confirm the indication of "charging" has been cleared.	IC1, Q4 Q9, Q2, Q3, R2, R7, R8, R6, R9, C19, R45									

	Items	Check Point	Procedure	Check or Replace Parts
(F)*	Battery Monitor Check	-	<ol style="list-style-type: none"> 1. Apply 2.25 V between BATT+ and BATT-. 2. Execute the command sendchar PAD sendchar LED 0 sendchar CRX 0 1 sendchar AD1 It assumes that the return value is XX. a) XX: 70: No need to adjust b) XX: 66 ~ 6F: Need to adjust XX: 71 ~ 7A: Need to adjust Write AD value of 2.25 V to EEPROM. ex) read data: XX = 6A, write data: YY = 6A read data: XX = 73, write data: YY = 73 EEPROM = 0009(Low Voltage) write "YY" Execute the command "wreeprom 00 09 01 YY". EEPROM = 000A(No Voltage) write "YY -C" Execute the command "wreeprom 00 0A 01 ZZ". Note: ZZ = YY - C c) XX: 00 ~ 65: Reject XX: 7B ~ FF: Reject 	IC1, R45
(G)	Battery Low Confirmation	-	<ol style="list-style-type: none"> 1. Apply 2.40 V between BATT+ and BATT-. 2. Confirm that there is no flashing of Battery Icon. 3. Apply 2.25 V \pm 0.08 V between BATT+ and BATT-. 4. Confirm that there is flashing of Battery Icon. 	IC1, R45
(H)*	BBIC Clock Adjustment	CKM	<ol style="list-style-type: none"> 1. Apply 2.6 V between BATT+ and BATT- with DC power. 2. Input Command "sendchar sfr", then you can confirm the current value. 3. Check X'tal Frequency. (10.368 MHz \pm 100 Hz). 4. If the frequency is not 10.368 MHz \pm 100 Hz, adjust the frequency of CKM executing the command "sendchar sfr xx xx (where xx is the value)" so that the reading of the frequency counter is 10.368000 MHz \pm 5 Hz. <p>Note: Clear the registered information for Base Unit before measurement, because the Frequency will not possibly get stable due to the registered information. Pressing the button of "3" "5" "7" "#" clears the registration. Register to it on Base Unit after measurement.</p>	IC1, X1, C47
(I)*	Transmitted Power Confirmation	-	<p>Short Antenna pattern to GND.</p> <ol style="list-style-type: none"> 1. Configure the DECT tester (CMD60) as follows; <Setting> • Test mode: PP • RFPI: 0102030405 • Traffic Carrier: 5 • Traffic Slot: 4 • Mode: Loopback • RF LEVEL = -70 dBm • PACKET: PP32Z 2. Execute the command "sendchar TST 01 02 03 04 05". 3. Initiate connection from DECT tester. 4. Confirm that the NTP value at ANT is 19 dBm \sim 25 dBm. 	IC1, C801, C859, C860, C861, C862
(J)*	Modulation Check and Adjustment	-	<p>Follow steps 1 to 3 of (I).</p> <ol style="list-style-type: none"> 4. Confirm that the B-Field Modulation is $-350 \pm 50/+350 \pm 50$ kHz/div using data type Fig 31. 	Refer to (I)
(K)*	Frequency Offset Confirmation	-	<p>Follow steps 1 to 3 of (I).</p> <ol style="list-style-type: none"> 4. Confirm that the frequency Offset is $< \pm 20$ kHz. 	Refer to (I)
(L)*	Sensitivity Receiver Confirmation	-	<p>Follow steps 1 to 3 of (I).</p> <ol style="list-style-type: none"> 4. Set DECT tester power to -88 dBm. 5. Confirm that the BER is < 1000 ppm. 	Refer to (I)
(M)*	Power RAMP Confirmation	-	<p>Follow steps 1 to 3 of (I).</p> <ol style="list-style-type: none"> 4. Confirm that Power RAMP is matching. 	Refer to (I)

	Items	Check Point	Procedure	Check or Replace Parts
(N)	Audio Check and Confirmation	-	<ol style="list-style-type: none"> 1. Link to BASE which is connected to Line Simulator. 2. Set line voltage to 48 V and line current to 50 mA. 3. Input -45 dBm (600 Ω)/1 kHz to MIC of Handset. Measure the Level at Line I/F and distortion level. 4. Confirm that the level is -1.5 ± 5 dBm (for BL,TU,BX,UE) or -0.4 ± 5 dBm (for CX) or -4.0 ± 5 dBm (for HK,TW) or -3.5 ± 5 dBm (for ML) and that the distortion level is $< 5\%$ at TEL Line (600 Ω Load). 5. Input -20 dBm (600 Ω)/1 kHz to Line I/F. Measure the Level at Receiver of Handset and distortion level (Receive volume set to second position from minimum). 6. Confirm that the level is 13.0 ± 4 dBm (for BL,TU,BX,UE) or -25.0 ± 4 dBm (for CX) or -22.0 ± 4 dBm (for HK,TW,ML) and that the distortion level is $< 5\%$ at Receiver (34 Ω Load). 	IC1, C12, C11, C13, MIC, R23, R24, R25, RA4, C70, C71
(O)	SP phone Audio Check and Confirmation	-	<ol style="list-style-type: none"> 1. Link to Base which is connected to Line Simulator. 2. Set line voltage to 48 V and line current to 50 mA. 3. Set the handset off-hook using SP-Phone key. 4. Input -30 dBm (600 Ω)/1 KHz to Line I/F and measure Receiving level at SP+ and SP-. 5. Confirm that the level is -10.0 dBm ± 3 dB and that the distortion level is $< 5\%$. (vol = Max at SP (8 Ω Load)) 	IC1, C78, C79, R76, R77
(P)	Charge Pump 3.0 V Supply Confirmation	CP3V	<ol style="list-style-type: none"> 1. Confirm that the voltage between testpoint CP3.0V and GND is $3.0\text{ V} \pm 0.3\text{ V}$. 	C30, C53, C29
(Q)	Charge Pump CP4V Supply Confirmation	CP4V	<ol style="list-style-type: none"> 1. Confirm that the voltage between testpoint CP4V and GND is $4.0\text{ V} \pm 0.3\text{ V}$. (Power is supplied when LED in on) 	C52, C55, C30, C29

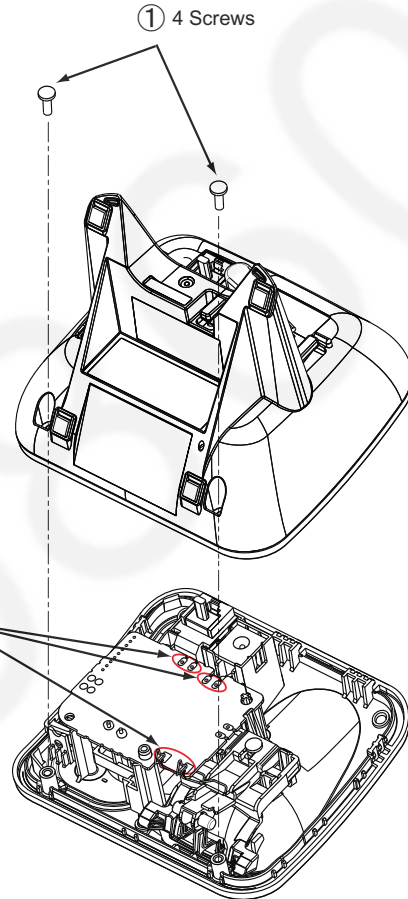
10 Disassembly and Assembly Instructions

10.1. Disassembly Instructions

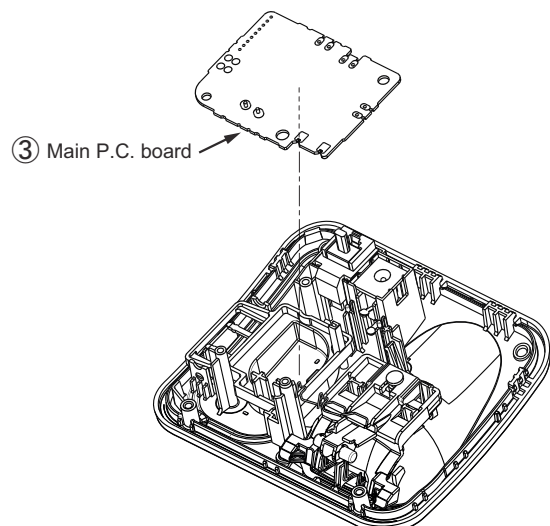
10.1.1. Base Unit

10.1.1.1. KX-TGC210

- ① Remove the 2 screws to remove the cabinet cover.
- ② Remove the solders.

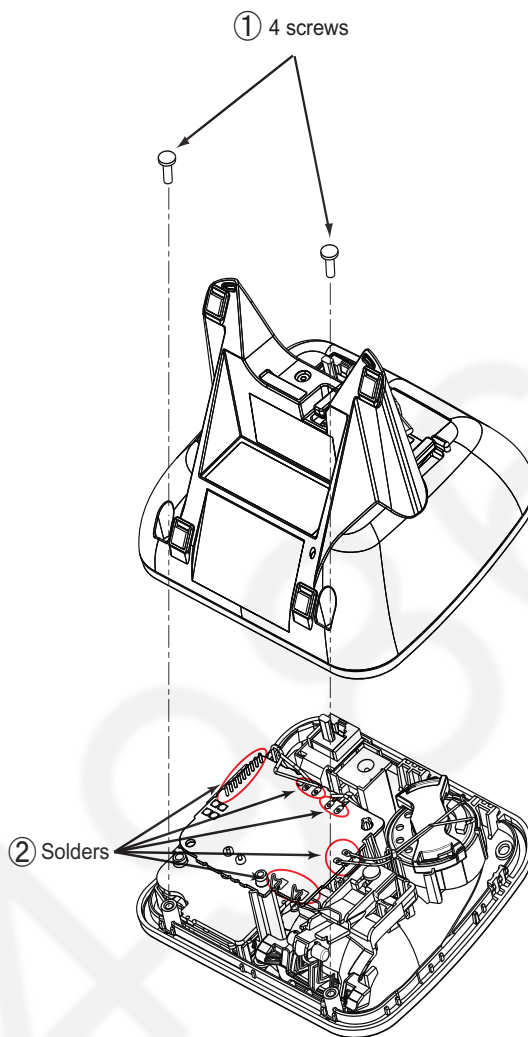


- ③ Remove the main P.C. board.

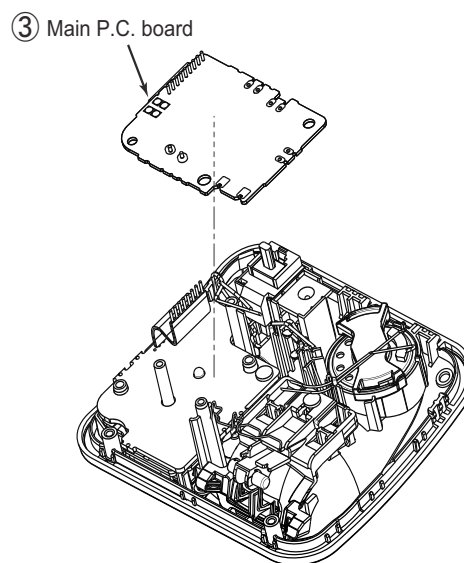


10.1.1.2. KX-TGC220

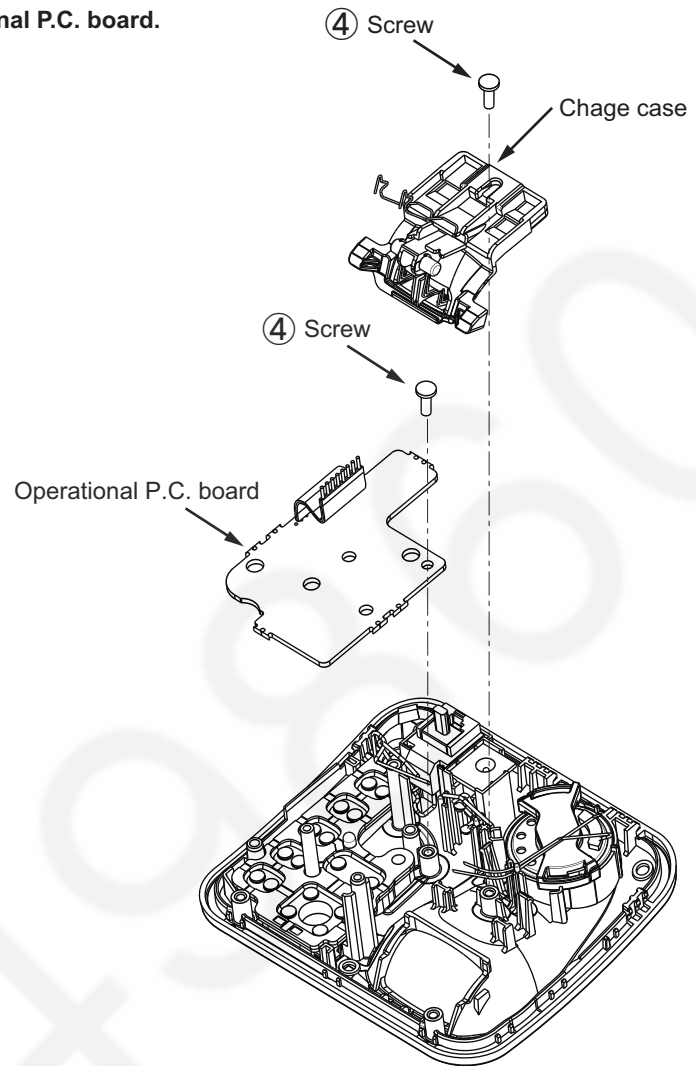
- ① Remove the 2 screws to remove the cabinet cover.
- ② Remove the solders.



- ③ Remove the main P.C. board.

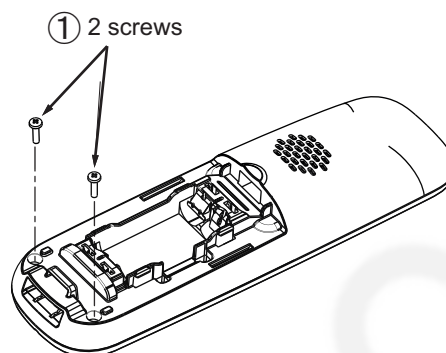


- ④ Remove the 2 screws to remove the charge case and the operational P.C. board.

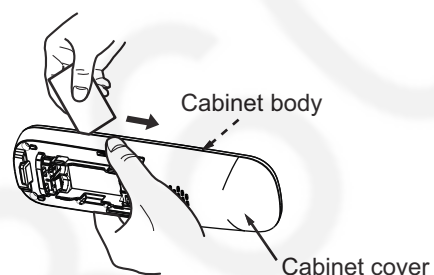


10.1.2. Handset

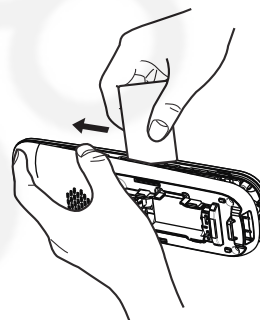
- ① Remove the 2 screws.



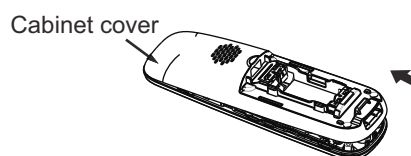
- ② Insert a plastic card.
(Ex. Used SIM card etc.)
between the cabinet body
and the cabinet cover, then
pull it along the gap to open
the cabinet.



- ③ Likewise, open the other
side of the cabinet.



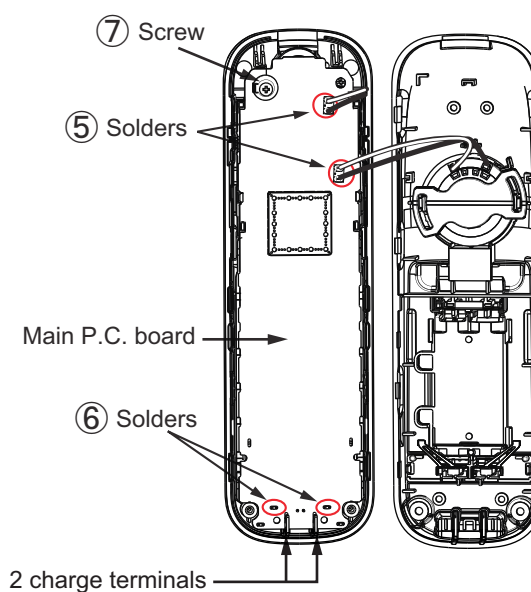
- ④ Remove the cabinet cover
by pushing it upward.



- ⑤ Remove the solders.

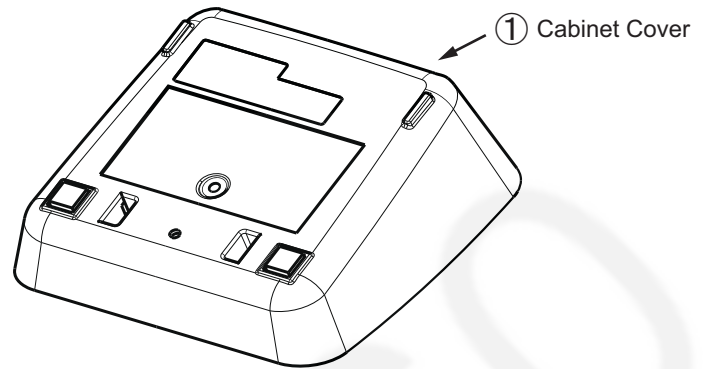
- ⑥ Remove the solders to remove
the 2 charge terminals.

- ⑦ Remove the screw to remove
the Main P. C. board.

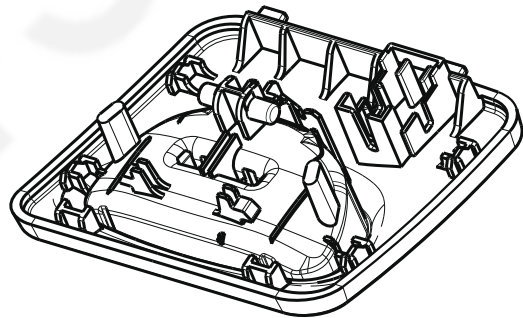
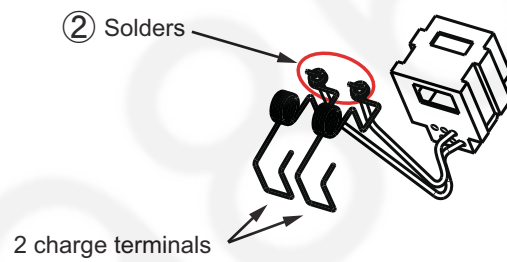


10.1.3. Charger Unit

- ① Remove the cabinet cover.



- ② Remove the solders to remove the 2 charge terminals.

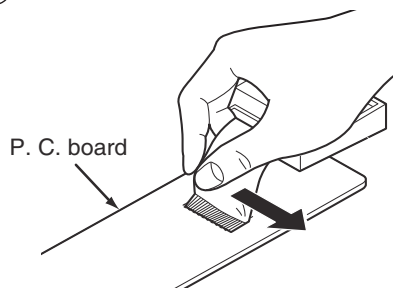


10.2. How to Replace the Handset LCD

Note:

The illustrations are simplified in this page.
They may differ from the actual product.

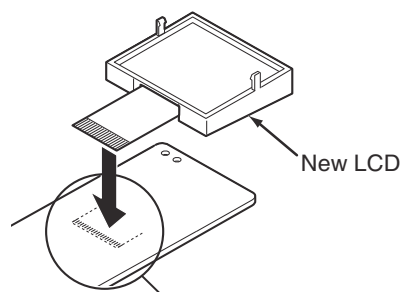
①



P. C. board

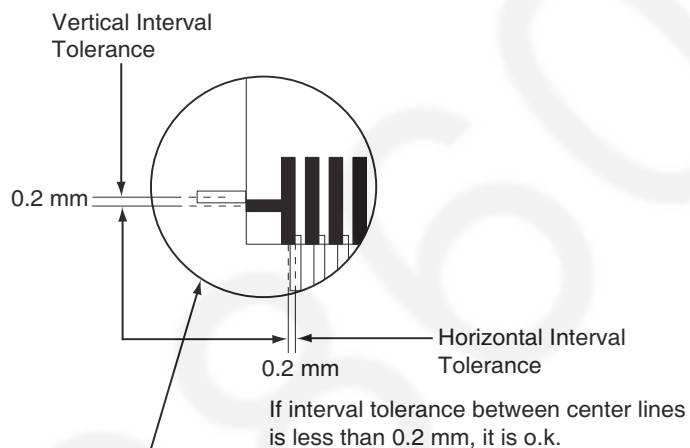
Peel off the FFC (Flexible Flat Cable) from the LCD, in the direction of the arrow. Take care to ensure that the foil on the P.C. board is not damaged.

②



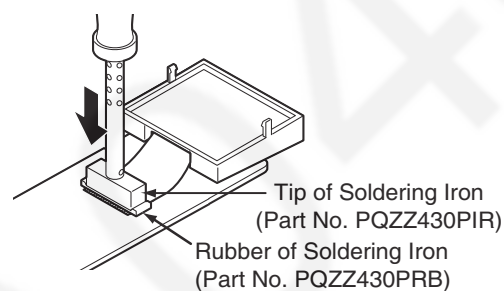
New LCD

Fit the heatseal of a new LCD.

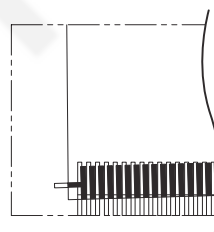


OK

③

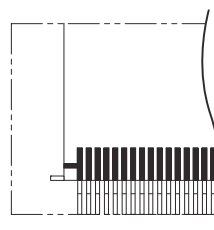


Heatweld with the tip of the soldering iron about 5 to 8 seconds (in case of 60W soldering iron).



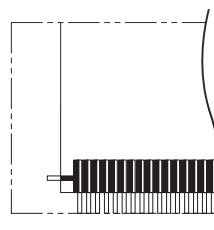
NG

(Inclined)



NG

(Vertical interval tolerance is more than 0.2 mm.)



NG

(Horizontal interval tolerance is more than 0.2 mm.)

11 Measurements and Adjustments

This chapter explains the measuring equipment, the JIG connection, and the PC setting method necessary for the measurement in **Troubleshooting Guide** (P.27)

11.1. Equipment Required

- Digital multi-meter (DMM): it must be able to measure voltage and current.
 - Oscilloscope.
 - Frequency counter: It must be precise enough to measure intervals of 1 Hz (precision; ± 4 ppm)
Hewlett Packard, 53131A is recommended.
 - DECT tester: Rohde & Schwarz, CMD 60 is recommended.
- This equipment may be useful in order to precisely adjust like a mass production.

11.2. The Setting Method of JIG

<Preparation>

- Serial JIG cable: PQZZ1CD300E*
- PC which runs in DOS mode
- **Batch file CD-ROM** for setting: Refer to parts list of **Fixtures and Tools**(P.99)

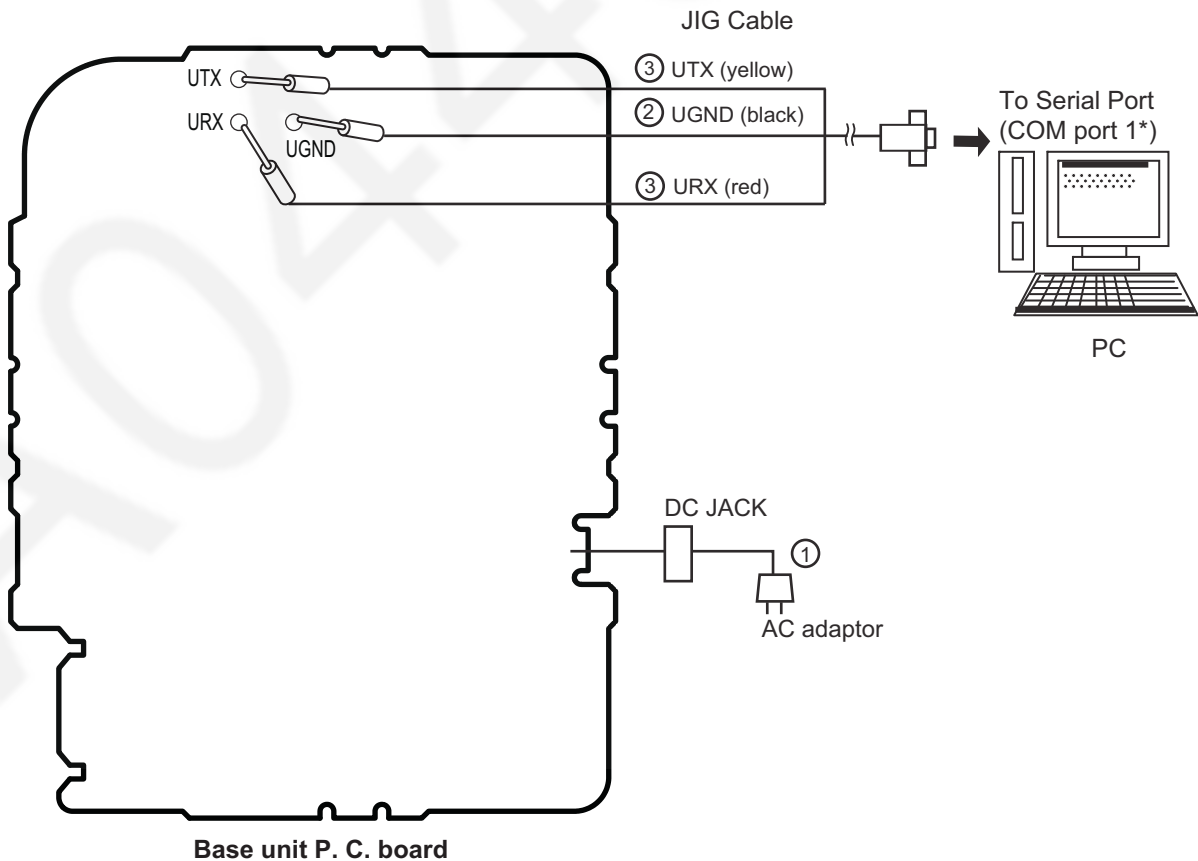
Note:

*: If you have the JIG Cable for TCD500 series (PQZZ1CD505E), change the following values of resistance. Then you can use it as a JIG Cable for both TCD300 and TCD500 series. (It is an upper compatible JIG Cable.)

Resistor	Old value (k Ω)	New value (k Ω)
R2	22	3.3
R3	22	3.3
R4	22	4.7
R7	4.7	10

11.2.1. Connections (Base Unit)

- ① Connect the AC adaptor.
- ② Connect the JIG Cable GND (black).
- ③ Connect the JIG Cable RX (red) and TX (yellow).



Note:

*: COM port names may vary depending on what your PC calls it.

11.2.2. How to install Batch file into P.C.

1. Insert the Batch file CD-ROM into CD-ROM drive and copy PNZZTG**** folder to your PC (example: D drive).

2. Open an MS-DOS mode window.

<Example for Windows>

On your computer, click **[Start]**, select **Programs** (**All Programs** for Windows XP/Windows Server 2003), then click

MS-DOS Prompt. (for Windows 95/Windows 98)

Or

Accessories-MS-DOS Prompt. (for Windows Me)

Or

Command Prompt. (for Windows NT 4.0)

Or

Accessories-Command Prompt.

(for Windows 2000/Windows XP/Windows Server 2003)

3. At the DOS prompt, type "**D:**" (for example) to select the drive, then press the **Enter** key.

4. Type "**CD ¥PNZZTG******", then press the **Enter** key.

5. Type "**SET_COM=X**", then press the **Enter** key
(**X**: COM port number used for the serial connection on your PC).

6. Type "**READID**", then press the **Enter** key.
• If any error messages appear, change the port number or check the cable connection.
• If any value appear, go to next step.

7. Type "**DOSKEY**", then press the **Enter** key.

<Example>

```
C: ¥Documents and Settings>D:
D: ¥>CD ¥PNZZTG****
D: ¥PNZZTG**** >SET_COM=X
D: ¥PNZZTG****>READID
00 52 4F A8 A8
D: ¥PNZZTG****>DOSKEY
D: ¥PNZZTG****>_
```

<Example: error happens>

```
C: ¥Documents and Settings>D:
D: ¥>CD ¥PNZZTG****
D: ¥PNZZTG**** >SET_COM=X
D: ¥PNZZTG****>READID
CreateFile error
ERROR 10: Can't open serial port
D: ¥PNZZTG ****>_
```

Note:

"****" varies depending on the country or models.

11.2.3. Commands

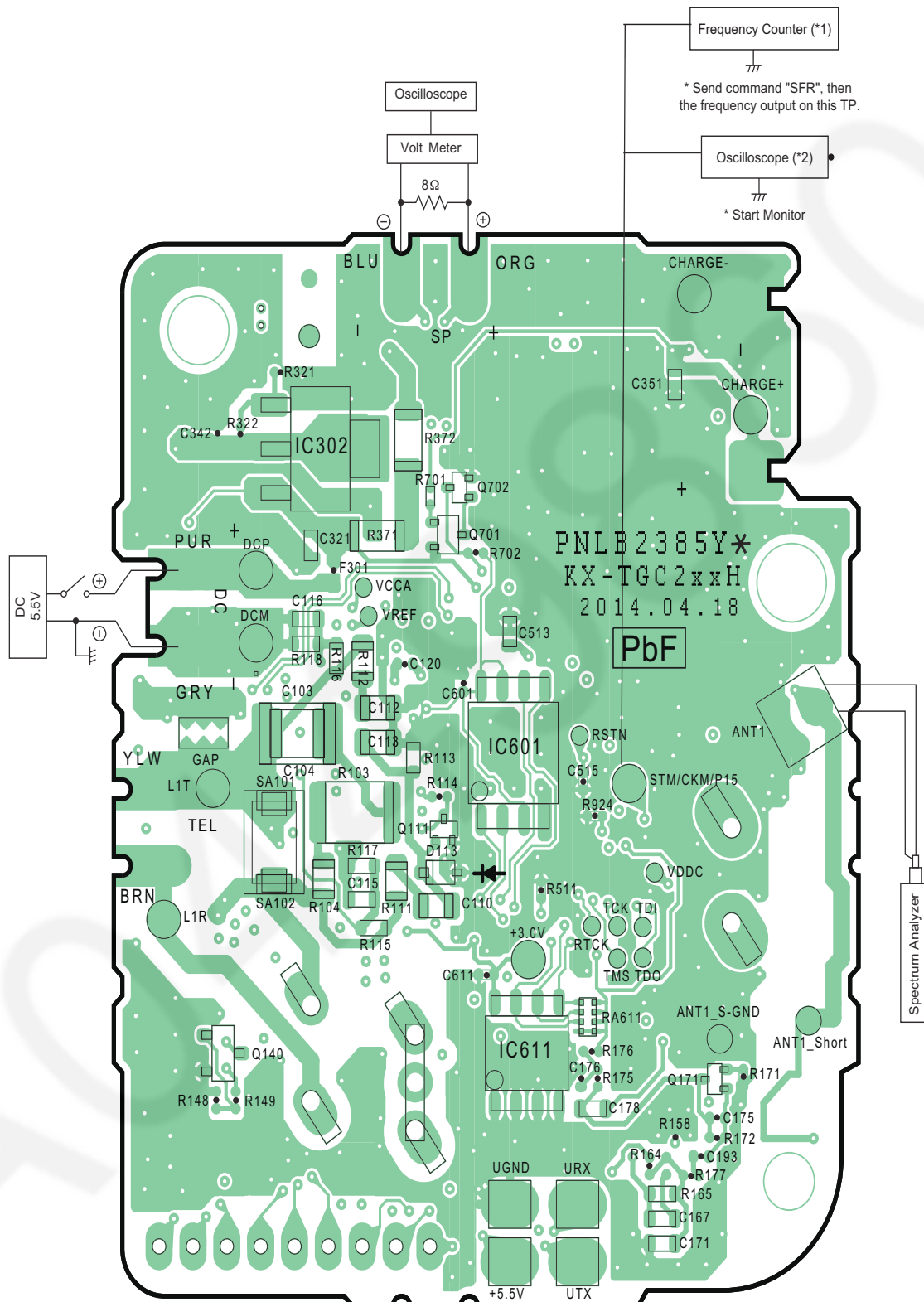
See the table below for frequently used commands.

Command name	Function	Example
rdeeprom	Read the data of EEPROM	Type "rdeeprom 00 00 FF", and the data from address "00 00" to "FF" is read out.
readid	Read ID (RFPI)	Type "readid", and the registered ID is read out.
writeid	Write ID (RFPI)	Type "writeid 00 18 E0 0E 98", and the ID "0018 E0 0E 98" is written.
hookoff	Off-hook mode on Base	Type "hookoff".
hookon	On-hook mode on Base	Type "hookon".
getchk	Read checksum	Type "getchk".
wreeprom	Write the data of EEPROM	Type "wreeprom 01 23 45". "01 23" is address and "45" is data to be written.

11.3. Adjustment Standard (Base Unit)

When connecting the simulator equipment for checking, please refer to below.

11.3.1. Bottom View



Note:

(*1) is referred to No.2 of **Check Table for RF part** (P.35)

(*2) is referred to **Power Supply Circuit/Reset Circuit** (P.12)

11.4. The Setting Method of JIG (Handset)

This section explains the PC setting to use command required in **Check Point (Handset)**(P.42).

<Preparation>

- Serial JIG cable: PQZZ1CD300E*
- PC which runs in DOS mode
- **Batch file CD-ROM** for setting: Refer to parts list of **Fixtures and Tools**(P.99)

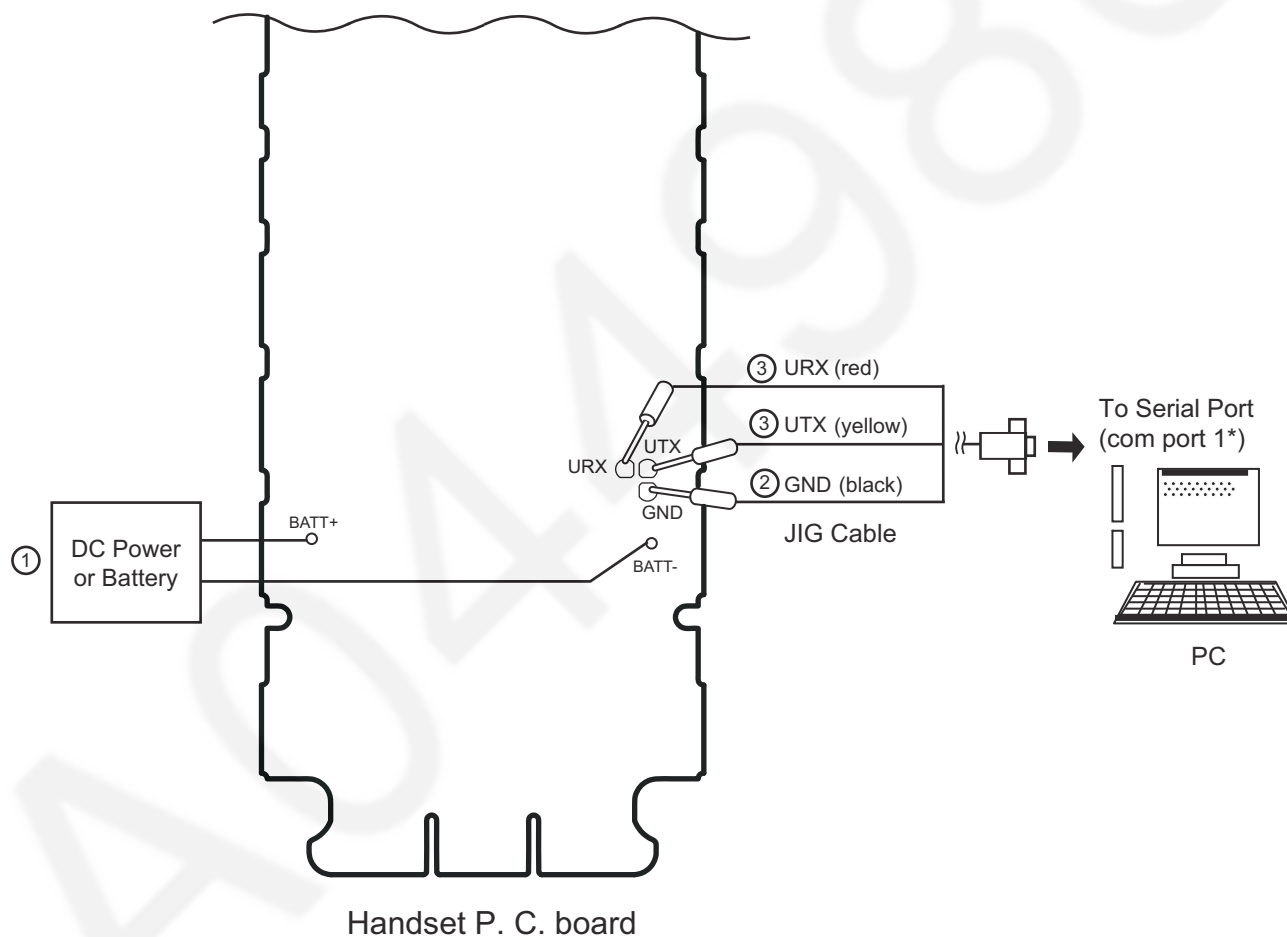
Note:

*: If you have the JIG Cable for TCD500 series (PQZZ1CD505E), change the following values of resistance. Then you can use it as a JIG Cable for both TCD300 and TCD500 series. (It is an upper compatible JIG Cable.)

Resistor	Old value (k Ω)	New value (k Ω)
R2	22	3.3
R3	22	3.3
R4	22	4.7
R7	4.7	10

11.4.1. Connections

- ① Connect the DC Power or Battery to BATT+ and BATT-.
- ② Connect the JIG cable GND (black) to GND.
- ③ Connect the JIG cable UTX (yellow) to UTX and URX (red) to URX.



Note:

*: COM port names may vary depending on what your PC calls it.

11.4.2. How to install Batch file into P.C.

1. Insert the Batch file CD-ROM into CD-ROM drive and copy PNZZTG***** folder to your PC (example: D drive).

2. Open an MS-DOS mode window.

<Example for Windows>

On your computer, click **[Start]**, select **Programs** (**All Programs** for Windows XP/Windows Server 2003), then click

MS-DOS Prompt. (for Windows 95/Windows 98)

Or

Accessories-MS-DOS Prompt. (for Windows Me)

Or

Command Prompt. (for Windows NT 4.0)

Or

Accessories-Command Prompt.

(for Windows 2000/Windows XP/Windows Server 2003)

3. At the DOS prompt, type "**D:**" (for example) to select the drive, then press the **Enter** key.

4. Type "**CD ¥PNZZTG*******", then press the **Enter** key.

5. Type "**SET RTX_COM=X**", then press the **Enter** key
(**X**: COM port number used for the serial connection on your PC).

6. Type "**READID**", then press the **Enter** key.
• If any error messages appear, change the port number or check the cable connection.
• If any value appear, go to next step.

7. Type "**DOSKEY**", then press the **Enter** key.

<Example>

```
C: ¥Documents and Settings>D:
D: ¥>CD ¥PNZZTG*****
D: ¥PNZZTG***** >SET RTX_COM=X
D: ¥PNZZTG*****>READID
00 52 4F A8 A8
D: ¥PNZZTG*****>DOSKEY
D: ¥PNZZTG*****> _
```

<Example: Error happens>

```
C: ¥Documents and Settings>D:
D: ¥>CD ¥PNZZTG*****
D: ¥PNZZTG***** >SET RTX_COM=X
D: ¥PNZZTG*****>READID
CreateFile error
ERROR 10: Can't open serial port
D: ¥PNZZTG*****> _
```

Note:

- "*****" varies depending on the country or models.

11.4.3. Commands

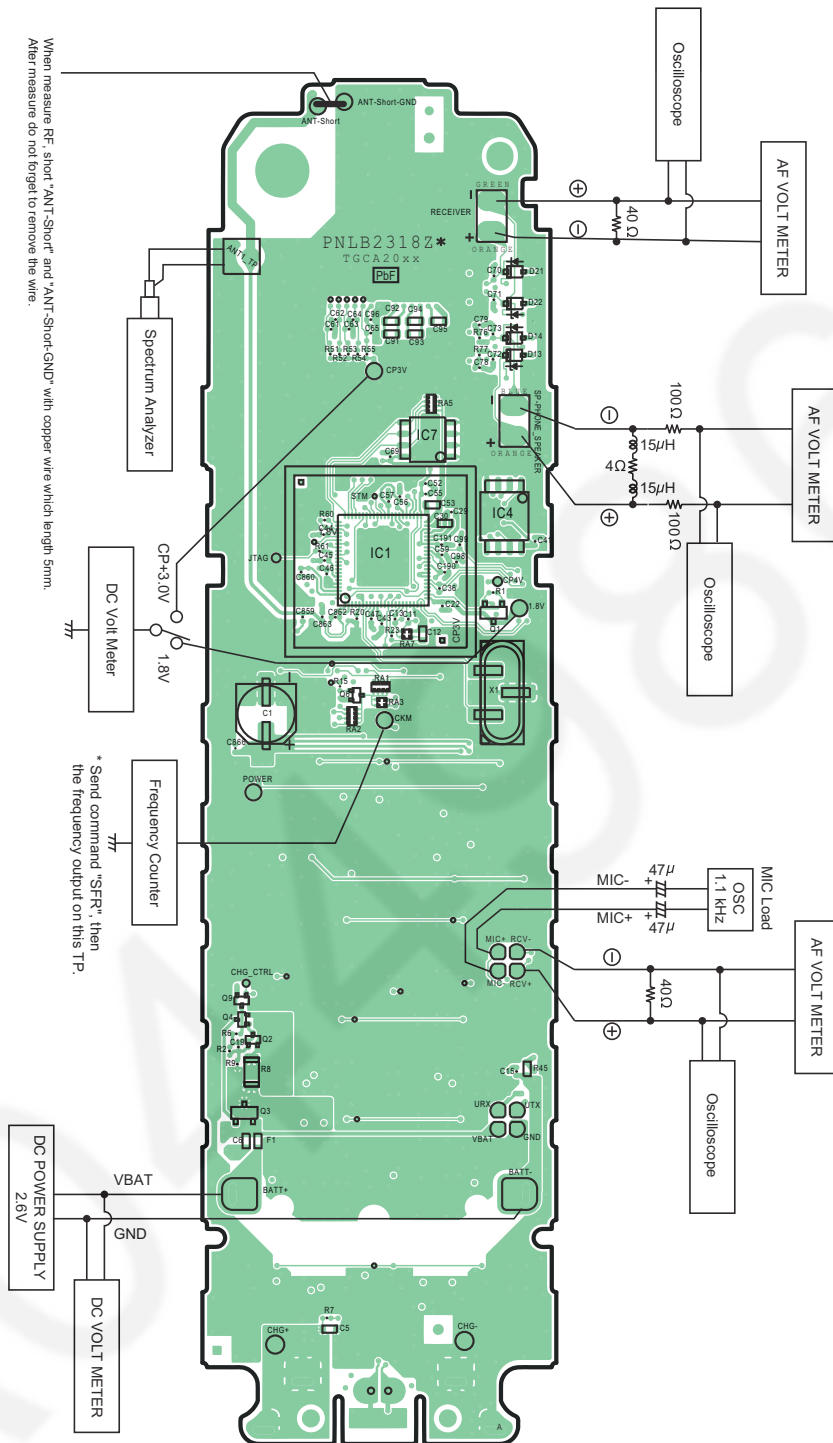
See the table below for frequently used commands.

Command name	Function	Example
rdeeprom	Read the data of EEPROM	Type "rdeeprom 00 00 FF", and the data from address "00 00" to "FF" is read out.
readid	Read ID (RFPI)	Type "readid", and the registered ID is read out.
writeid	Write ID (RFPI)	Type "writeid 00 18 E0 0E 98", and the ID "0018 E0 0E 98" is written.
getchk	Read checksum	Type "getchk".
wreeprom	Write the data of EEPROM	Type "wreeprom 01 23 45". "01 23" is address and "45" is data to be written.

11.5. Adjustment Standard (Handset)

When connecting the simulator equipment for checking, please refer to below.

11.5.1. Component View



Note:

(A) - (R) is referred to **Check Point (Handset)** (P.42)

11.6. Things to Do after Replacing IC or X'tal

If repairing or replacing EEPROM and X'tal, it is necessary to download the required data such as Programming data or adjustment data, etc. in memory.

The set doesn't operate if it is not executed.

11.6.1. How to download the data

11.6.1.1. Base Unit

First, operate the PC setting according to **The Setting Method of JIG**(P.51).

Then download the appropriate data according to the following procedures.

Items		How to download/Required adjustment
EEPROM (IC611)	Adjusted parameter data is stored in memory. (country version batch file, default batch file, etc.)	1) Change the address "0001" of EEPROM to "55" to download the data. 2) Default batch file: Execute the command "default.bat". 3) Country version batch file: Execute the command "TGC21EU_WW_RevXXX_YYY.bat" (KX-TGC210) or "TGC22EU_WW_RevXXX_YYY.bat" (KX-TGC220)(*1) 4) Clock adjustment
X'tal (X501)	System clock	Clock adjustment data is in EEPROM, adjust the data again after replacing it. 1) Apply 5.5V between DCP and DCM with DC power. 2) Input Command "sendchar sfr", then you can confirm the current value. 3) Check X'tal Frequency.(13.824 MHz \pm 100 Hz). 4) If the frequency is not 13.824 MHz \pm 100 Hz, adjust the frequency of CLK executing the command "sendchar sfr xx xx (where xx is the value)" so that the reading of the frequency counter is 13.824000 MHz \pm 15 Hz.

Note:

(*1) WW: country code, XXX_YYY: revision number

"XXX_YYY" vary depending on the country version. You can find them in the batch file, PNZZ- mentioned in **The Setting Method of JIG** (P.51).

11.6.1.2. Handset

First, operate the PC setting according to **The Setting Method of JIG** (P.51).

Then download the appropriate data according to the following procedures.

Items		How to download/Required adjustment
EEPROM (IC7)	Adjusted parameter data is stored in memory. (country version batch file, default batch file, etc.)	1) Default batch file: Execute the command "default.bat". 2) Default batch file (remaining): Execute the command "TGCA20EUEX_DEF_RevXXX_YYY.bat". (*2) 3) Country version batch file: Execute the command "TGCA20EUEX_WW_RevXXX_YYY.bat". (*2) 4) Clock adjustment 5) 2.35 V setting and battery low detection
Battery Monitor Check	-	1) Apply 2.25 V between BATT+ and BATT-. 2) Execute the command sendchar PAD sendchar LED 0 sendchar CRX 0 1 sendchar AD1 It assumes that the return value is XX. a) $6c \leq XX \leq 71$: No need to adjust b) $XX: 6A \sim 6B$: Need to adjust $XX: 72 \sim 74$: Need to adjust Write AD value of 2.25 V to EEPROM. ex) read data: $XX = 6A$, write data: $YY = 6A$ read data: $XX = 73$, write data: $YY = 73$ EEPROM = 0009 (Low Voltage) write "YY" Execute the command "wreeprom 00 09 01 YY". EEPROM = 000A (No Voltage) write "YY - 1D" Execute the command "xwreeprom 00 0A 01 ZZ". Note: No Voltage writing data limit is "00". c) $XX: 00 \sim 69$: Reject $XX: 75 \sim FF$: Reject
Battery Low Confirmation	-	1) Apply 2.40 V between BATT+ and BATT-. 2) Confirm that there is no flashing of Battery Icon. 3) Apply $2.25 \text{ V} \pm 0.08 \text{ V}$ between BATT+ and BATT-. 4) Confirm that there is flashing of Battery Icon.
Battery Clock Adjustment (X1)	CLK	1) Apply 2.6 V between BATT+ and BATT- with DC power. 2) Input Command "sendchar sfr", then you can confirm the current value. 3) Check X'tal Frequency. ($10.368 \text{ MHz} \pm 100 \text{ Hz}$). 4) If the frequency is not $10.368 \text{ MHz} \pm 100 \text{ Hz}$, adjust the frequency of CLK execute in the command "sendchar sfr xx xx (where xx is the value)" so that the reading of the frequency counter is $10.368000 \text{ MHz} \pm 5 \text{ Hz}$.

Note:

(*2) WW: country code, XXX_YYY: revision number

"XXX_YYY" vary depending on the country version. You can find them in the batch file, PNZZ- mentioned in **The Setting Method of JIG** (P.51).

11.7. RF Specification

11.7.1. Base Unit

Item	Value	Refer to -. *
TX Power	18.5 dBm ~ 25 dBm	Check Point (Base Unit) (J)
Modulation	-350 ± 50/+350 ± 50 kHz/div	Check Point (Base Unit) (K)
Frequency Offset	<±20 kHz	Check Point (Base Unit) (L)
RX Sensitivity	< 1000 ppm	Check Point (Base Unit) (M)
Power RAMP	Power RAMP is matching	Check Point (Base Unit) (N)

*: Refer to **Check Point (Base Unit)** (P.40)

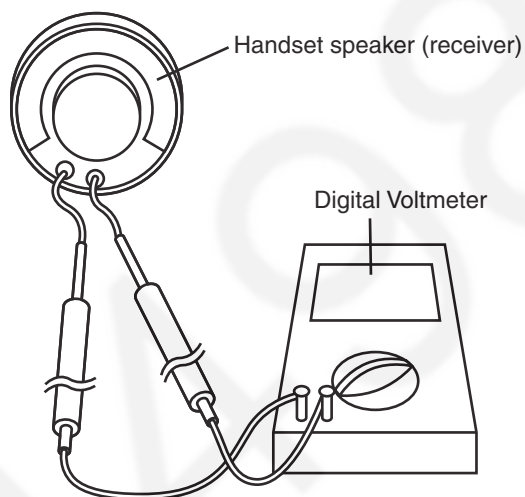
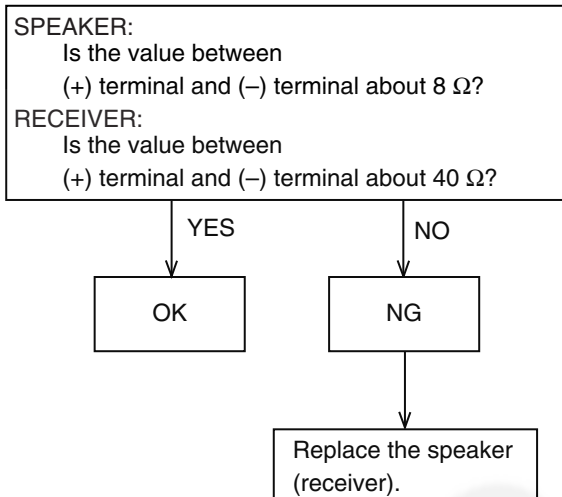
11.7.2. Handset

Item	Value	Refer to -. **
TX Power	19 dBm ~ 25 dBm	Check Point (Handset) (I)
Modulation	-350 ± 50/+350 ± 50 kHz/div	Check Point (Handset) (J)
Frequency Offset	<±20 kHz	Check Point (Handset) (K)
RX Sensitivity	< 1000 ppm	Check Point (Handset) (L)
Power RAMP	Power RAMP is matching	Check Point (Handset) (M)

: Refer to **Check Point (Handset) (P.42)

11.8. How to Check the Handset Speaker or Receiver

1. Prepare the digital voltmeter, and set the selector knob to ohm meter.
2. Put the probes at the speaker terminals as shown below.



11.9. Frequency Table (MHz)

Channel No	BASE UNIT		HANDSET	
	Transmit Frequency	Receive Frequency	Transmit Frequency	Receive Frequency
1	1897.344	1897.344	1897.344	1897.344
2	1895.616	1895.616	1895.616	1895.616
3	1893.888	1893.888	1893.888	1893.888
4	1892.160	1892.160	1892.160	1892.160
5	1890.432	1890.432	1890.432	1890.432
6	1888.704	1888.704	1888.704	1888.704
7	1886.976	1886.976	1886.976	1886.976
8	1885.248	1885.248	1885.248	1885.248
9	1883.520	1883.520	1883.520	1883.520
10	1881.792	1881.792	1881.792	1881.792

Note:

Channel No. 10: In the Test Mode on Base Unit and Handset.

12 Miscellaneous

12.1. How to Replace the Flat Package IC

Even if you do not have the special tools (for example, a spot heater) to remove the Flat IC, with some solder (large amount), a soldering iron and a cutter knife, you can easily remove the ICs that have more than 100 pins.

12.1.1. Preparation

- PbF (: Pb free) Solder

- Soldering Iron

Tip Temperature of $700^{\circ}\text{F} \pm 20^{\circ}\text{F}$ ($370^{\circ}\text{C} \pm 10^{\circ}\text{C}$)

Note: We recommend a 30 to 40 Watt soldering iron. An expert may be able to use a 60 to 80 Watt iron where someone with less experience could overheat and damage the PCB foil.

- Flux

Recommended Flux: Specific Gravity $\rightarrow 0.82$.

Type \rightarrow RMA (lower residue, non-cleaning type)

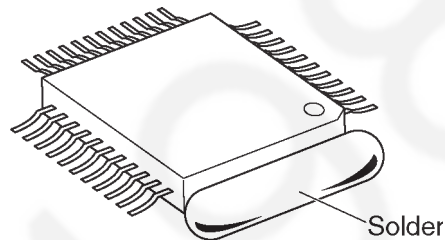
Note: See **About Lead Free Solder (PbF: Pb free)** (P.5)

12.1.2. How to Remove the IC

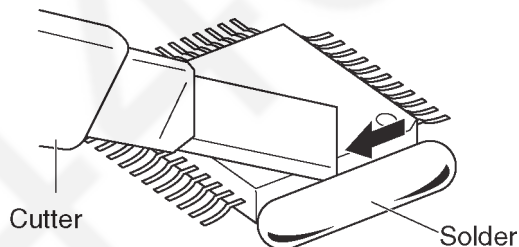
1. Put plenty of solder on the IC pins so that the pins can be completely covered.

Note:

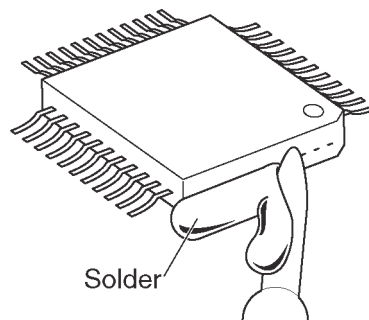
If the IC pins are not soldered enough, you may give pressure to the P.C. board when cutting the pins with a cutter.



2. Make a few cuts into the joint (between the IC and its pins) first and then cut off the pins thoroughly.



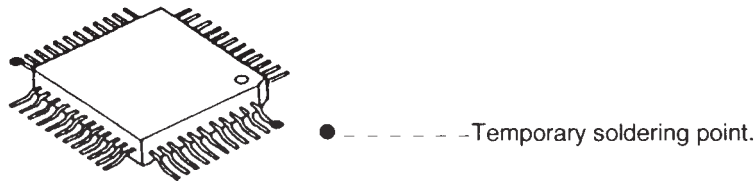
3. While the solder melts, remove it together with the IC pins.



When you attach a new IC to the board, remove all solder left on the board with some tools like a soldering wire. If some solder is left at the joint on the board, the new IC will not be attached properly.

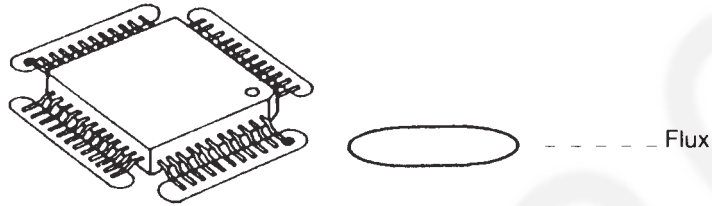
12.1.3. How to Install the IC

1. Temporarily fix the FLAT PACKAGE IC, soldering the two marked pins.

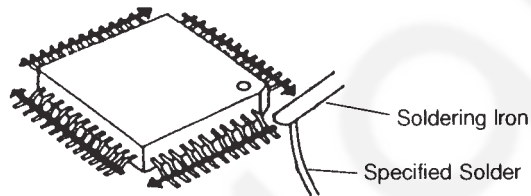


*Check the accuracy of the IC setting with the corresponding soldering foil.

2. Apply flux to all pins of the FLAT PACKAGE IC.

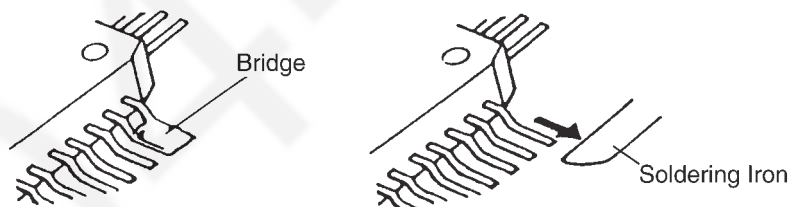


3. Solder the pins, sliding the soldering iron in the direction of the arrow.



12.1.4. How to Remove a Solder Bridge

1. Lightly resolder the bridged portion.
2. Remove the remaining solder along the pins using a soldering iron as shown in the figure below.



12.2. How to Replace the Shield Case

12.2.1. Preparation

- PbF (: Pb free) Solder
- Soldering Iron
Tip Temperature of 700 °F ± 20 °F (370 °C ± 10 °C)

Note:

We recommend a 30 to 40 Watt soldering iron. An expert may be able to use a 60 to 80 Watt iron where someone with less experience could overheat and damage the PCB foil.

- Hot Air Desoldering Tool
Temperature: 608 °F ± 68 °F (320 °C ± 20 °C)

12.2.2. Caution

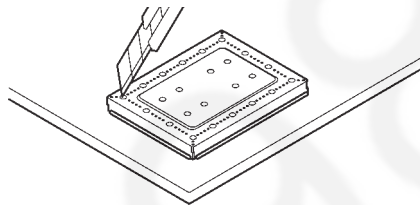
- To replace the IC efficiently, choose the right sized nozzle of the hot air desoldering tool that matches the IC package.
- Be careful about the temperature of the hot air desoldering tool not to damage the PCB and/or IC.

12.2.3. How to Remove the Shield Case

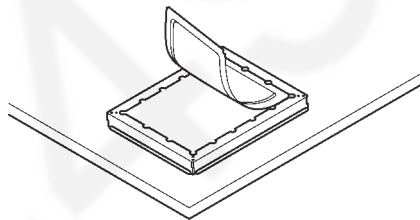
Note:

If you don't have special tools (ex. Hot air disordering tool), conduct the following operations.

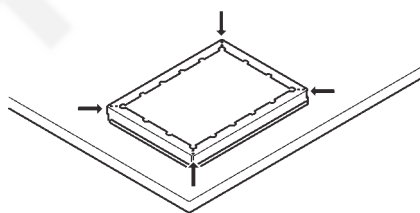
1. Cut the case along perforation.



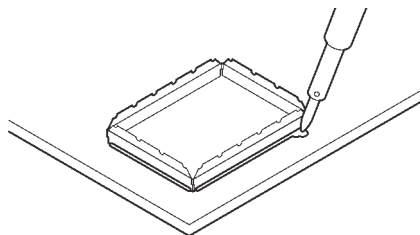
2. Remove the cut part.



3. Cut the four corners along perforation.



4. Remove the reminds by melting solder.

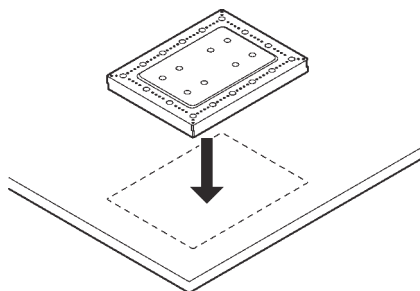


12.2.4. How to Install the Shield Case

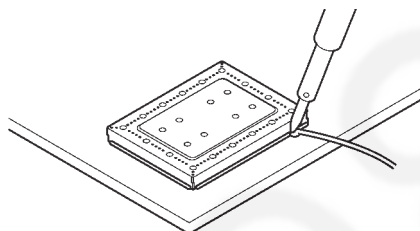
Note:

- If you don't have special tools (ex. Hot air disordering tool), conduct the following operations.
- Shield case's No. : PNMC1091Z

1. Put the shield case.

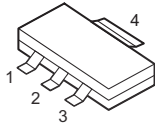
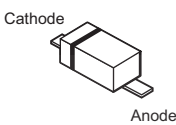
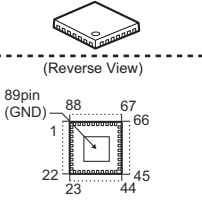
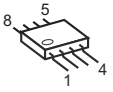

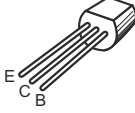
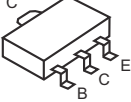
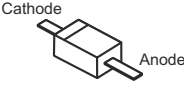

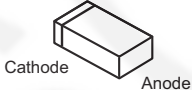
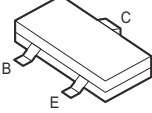
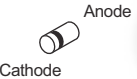


2. Solder the surroundings.



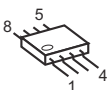
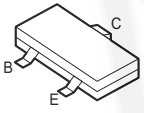
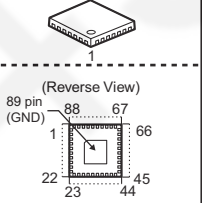
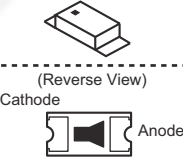
12.3. Terminal Guide of the ICs, Transistors and Diodes

12.3.1. Base Unit

 <p>C0DBEYY00102</p>	 <p>DA2J10100L *1</p>	 <p>C2HBCY000144</p>	 <p>PNWI1GC210GH PNWI1GC220GH *1 PNWI2GC220GH *1</p>	 <p>PQVDPTZT2530</p>
 <p>B1ACGP000008</p>	 <p>DSC7003S0L</p>	 <p>DA2J10100L 1SS355</p>	 <p>B0EDER000009</p>	 <p>B0ECKM000008</p>
 <p>2SC6054JSL, B1GBCFYY0020 B1ABDM000001, 2SA1576S DRC9113Z0L *1, B1ABCE000009</p>		 <p>B0BC02000015</p>		

*1 for KX-TGC220 only

12.3.2. Handset

 <p>C3FBLY000162 PNWIGCA20EXR</p>	 <p>B1ADGE000012 B1ABGE000011 B1ADCF000040 2SC6054JSL UNR9216J0L</p>	 <p>C1CB00003837</p>	 <p>B3ACB0000190</p>
--	---	---	--

Memo

13 Schematic Diagram

13.1. For Schematic Diagram

13.1.1. Base Unit (Base Unit (Main))

Notes:

1. DC voltage measurements are taken with voltmeter from the negative voltage line.

Important Safety Notice:

Components identified by \triangle mark have special characteristics important for safety. When replacing any of these components, use only the manufacture's specified parts.

2. The schematic diagrams may be modified at any time with the development of new technology.

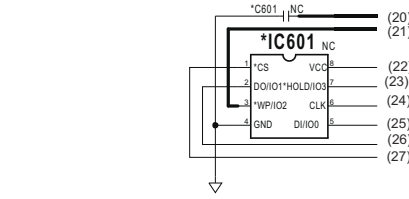
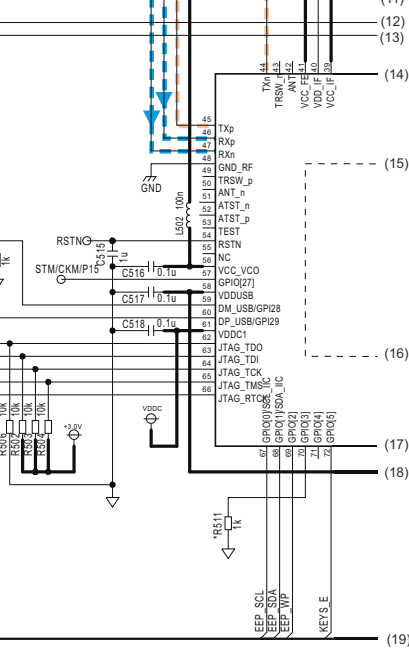
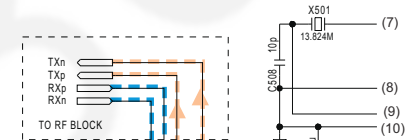
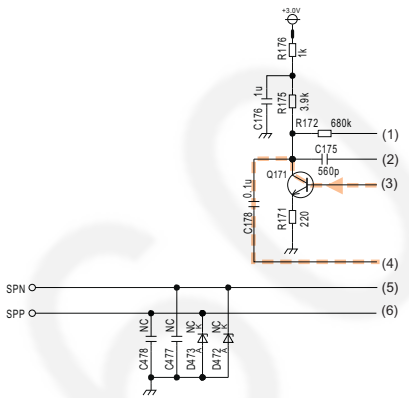
13.1.2. Handset (Handset (Main))

Notes:

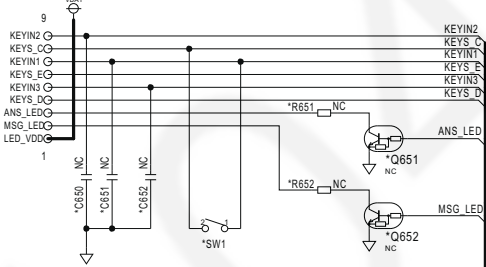
1. DC voltage measurements are taken with an oscilloscope or a tester with a ground.
2. The schematic diagrams may be modified at any time with the development of new technology.

$\frac{1}{2}$

The schematic diagram illustrates a 60 GHz CMOS Power Amplifier (PA) circuit. The input stage features an Antenna Tuning Network (ANT-TUNING) consisting of ANT1, ANT1 Short, and GND connections, followed by a series of capacitors (C872, C873, C874, C875) and inductors (L803). The main signal path is a transmission line (W=0.4mm, Lm=10mm) leading to a matching network (C895, C893, C892) and a SHORT1 connection. The output stage includes a Tx-balun (SL W=0.3, L=4.0mm), a Tx-patch (MSL W=0.25, L=2.0mm), and a Tx-match network (C810, MSL W=0.25, L=2.0mm). The circuit also includes a Pre-matching section (SHORT4, VBAT) and a feedback loop (C811, SHORT5, SL W=0.2mm, L=20mm). Various other components like C819, C820, C821, C822, C823, C824, C825, C826, C827, C828, C829, C830, C831, C832, C833, C834, C835, C836, C837, C838, C839, C840, C841, C842, C843, C844, C845, C846, C847, C848, C849, C850, C851, C852, C853, C854, C855, C856, C857, C858, C859, C860, C861, C862, C863, C864, C865, C866, C867, C868, C869, C870, C871, C872, C873, C874, C875, C876, C877, C878, C879, C880, C881, C882, C883, C884, C885, C886, C887, C888, C889, C890, C891, C892, C893, C894, C895, C896, C897, C898, C899, C900 are shown.



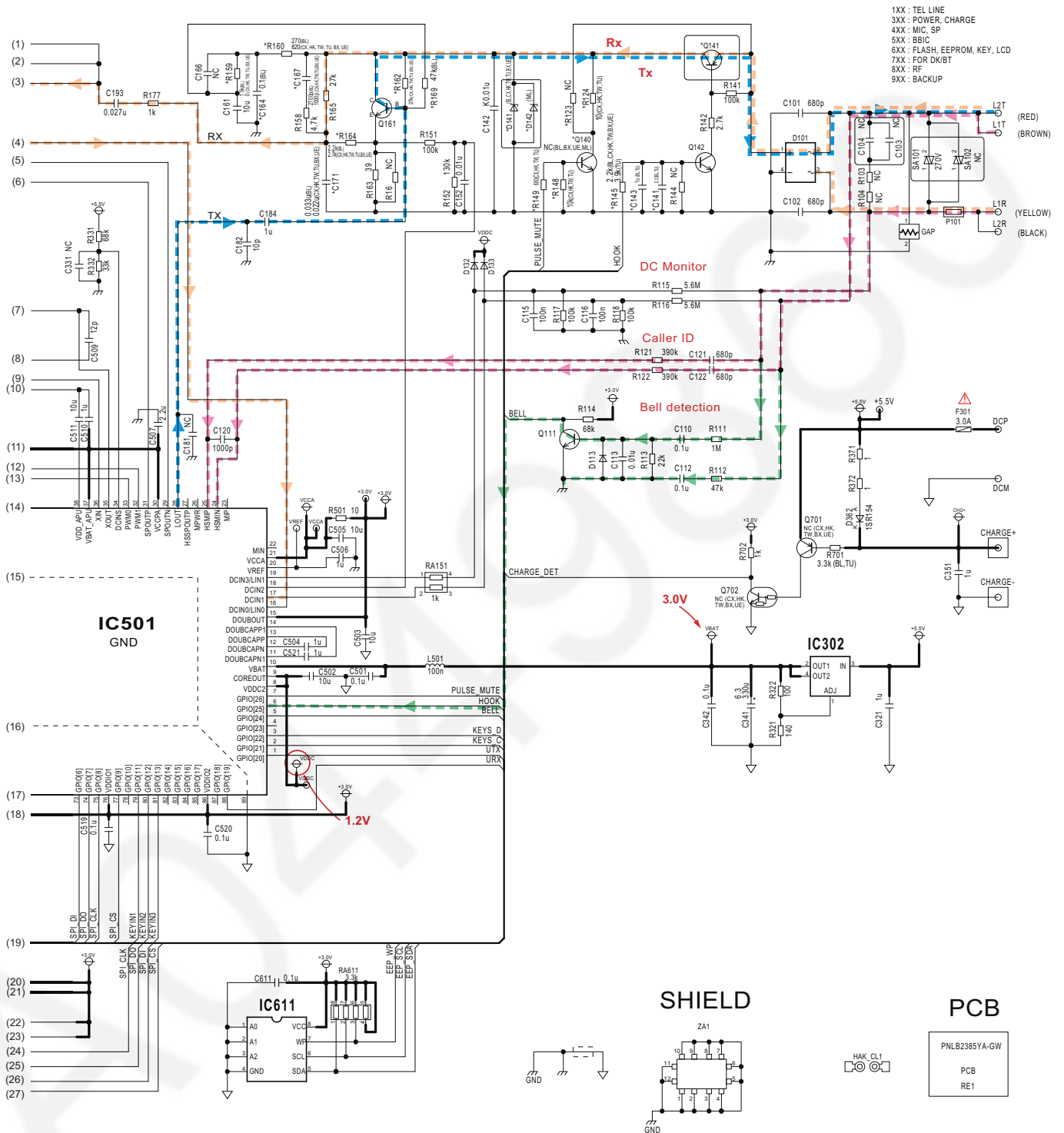
*WBX01 NC
PARALLEL WIRE



U-ART

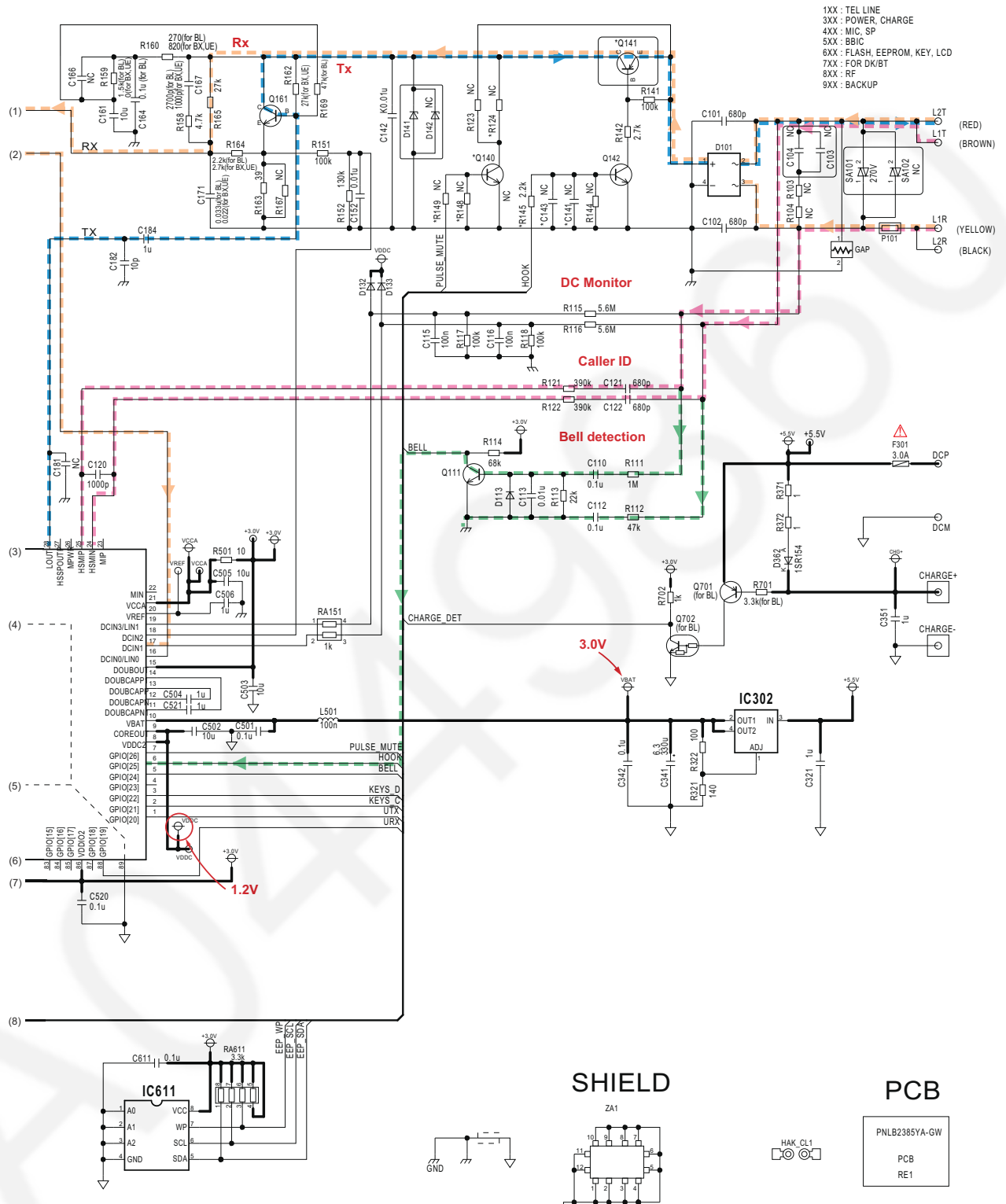
JTAG

NC: No Components



NC: No Components
 KX-TGC210 SCHEMATIC DIAGRAM (Base Unit (Main))

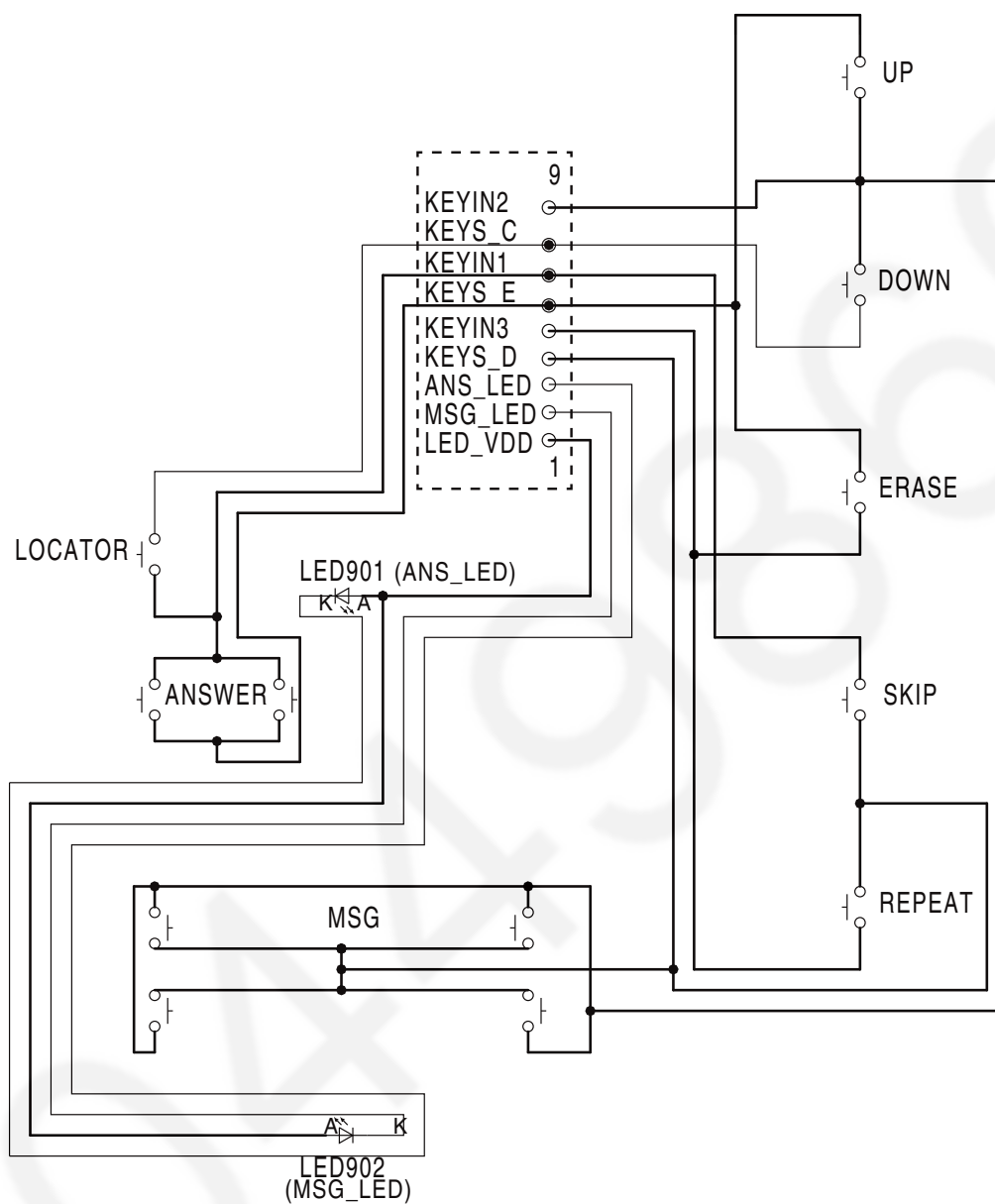




NC: No Components
KX-TGC220 SCHEMATIC DIAGRAM (Base Unit (Main))

13.3. Base Unit (Operation)

1/1



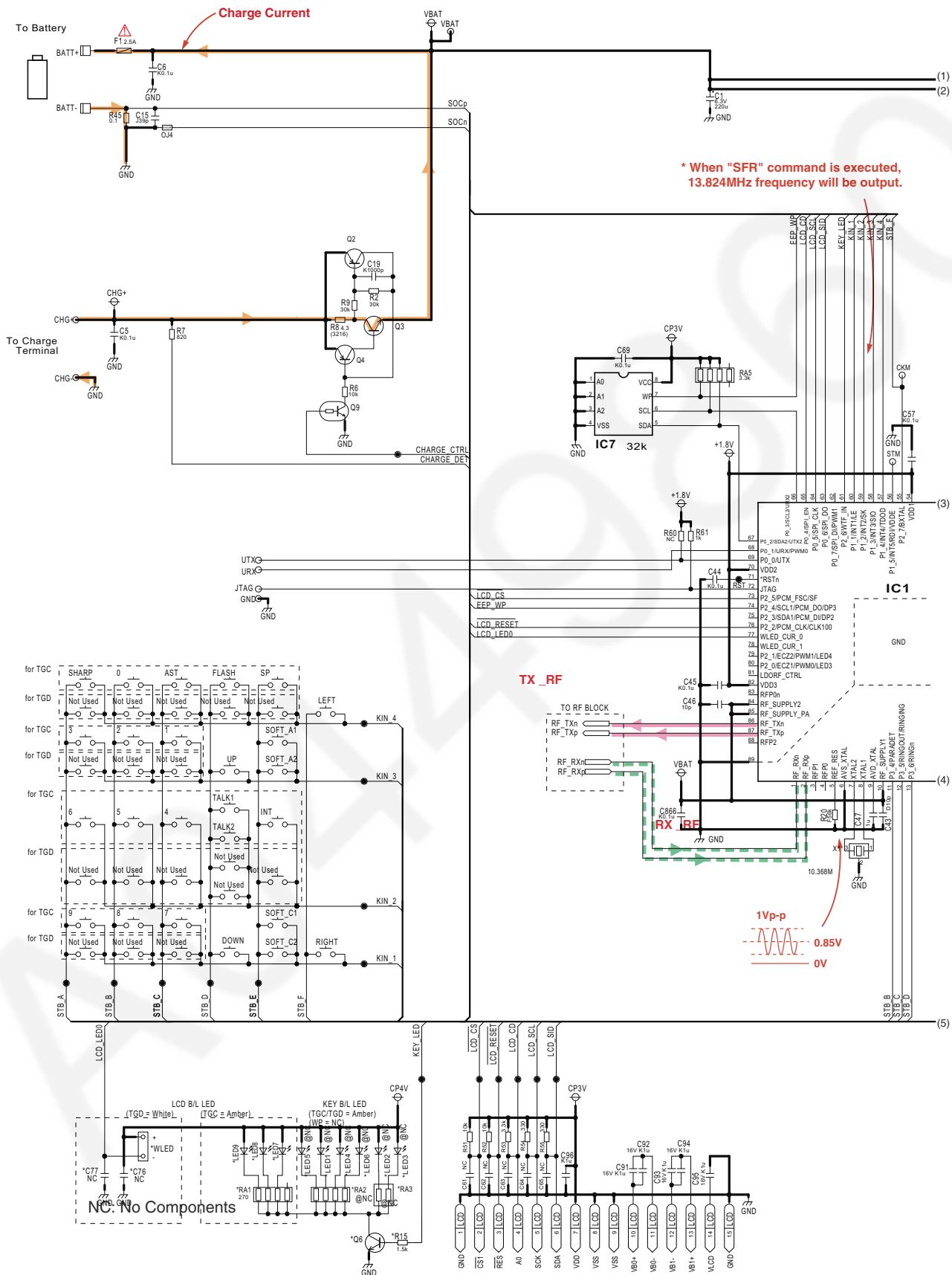
NC: No Components

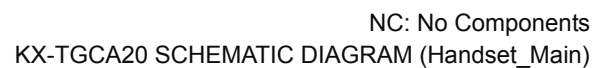
KX-TGC220 SCHEMATIC DIAGRAM (Base Unit_Operation)

Memo

13.4. Handset (Main)

1/2



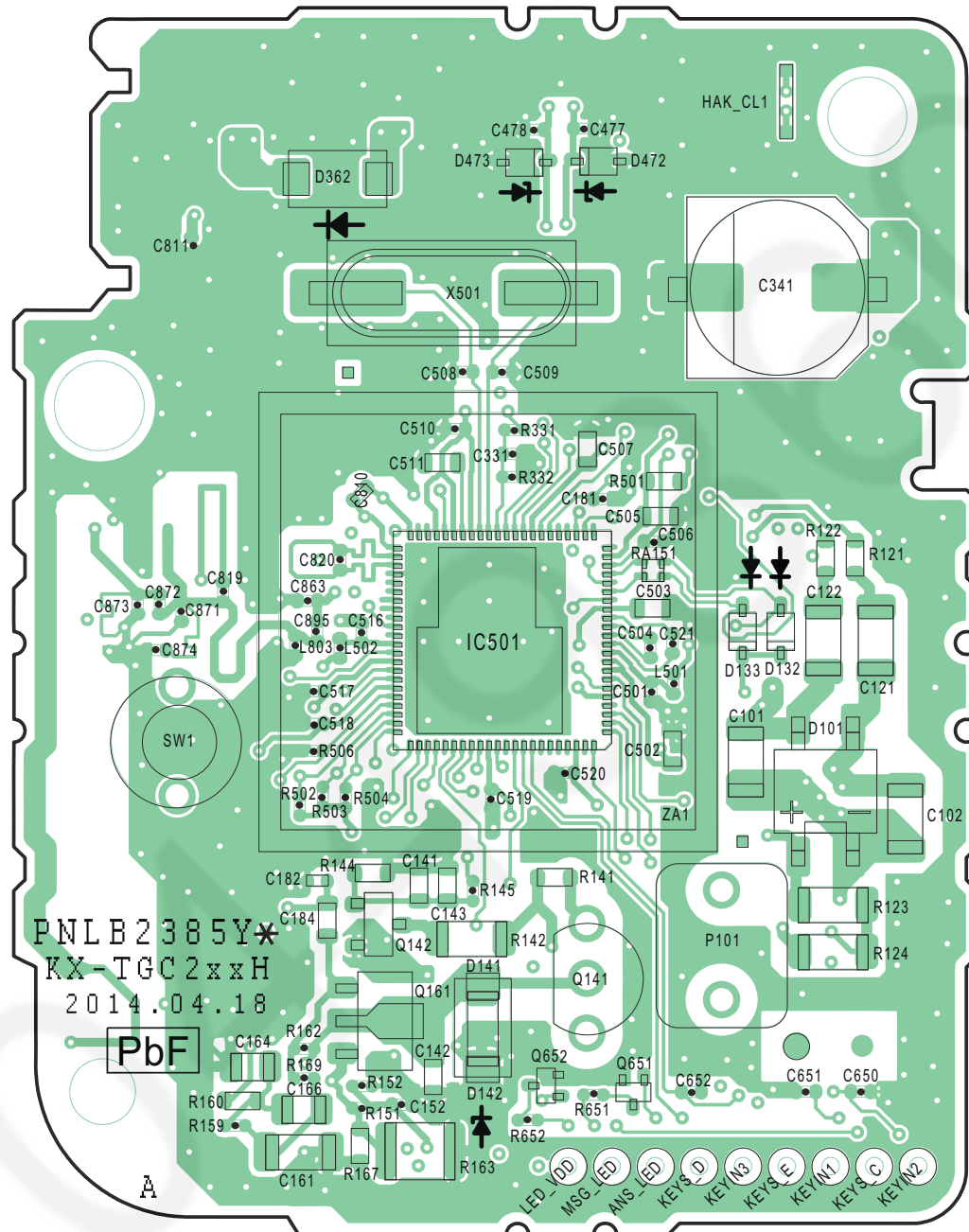


Memo

14 Printed Circuit Board

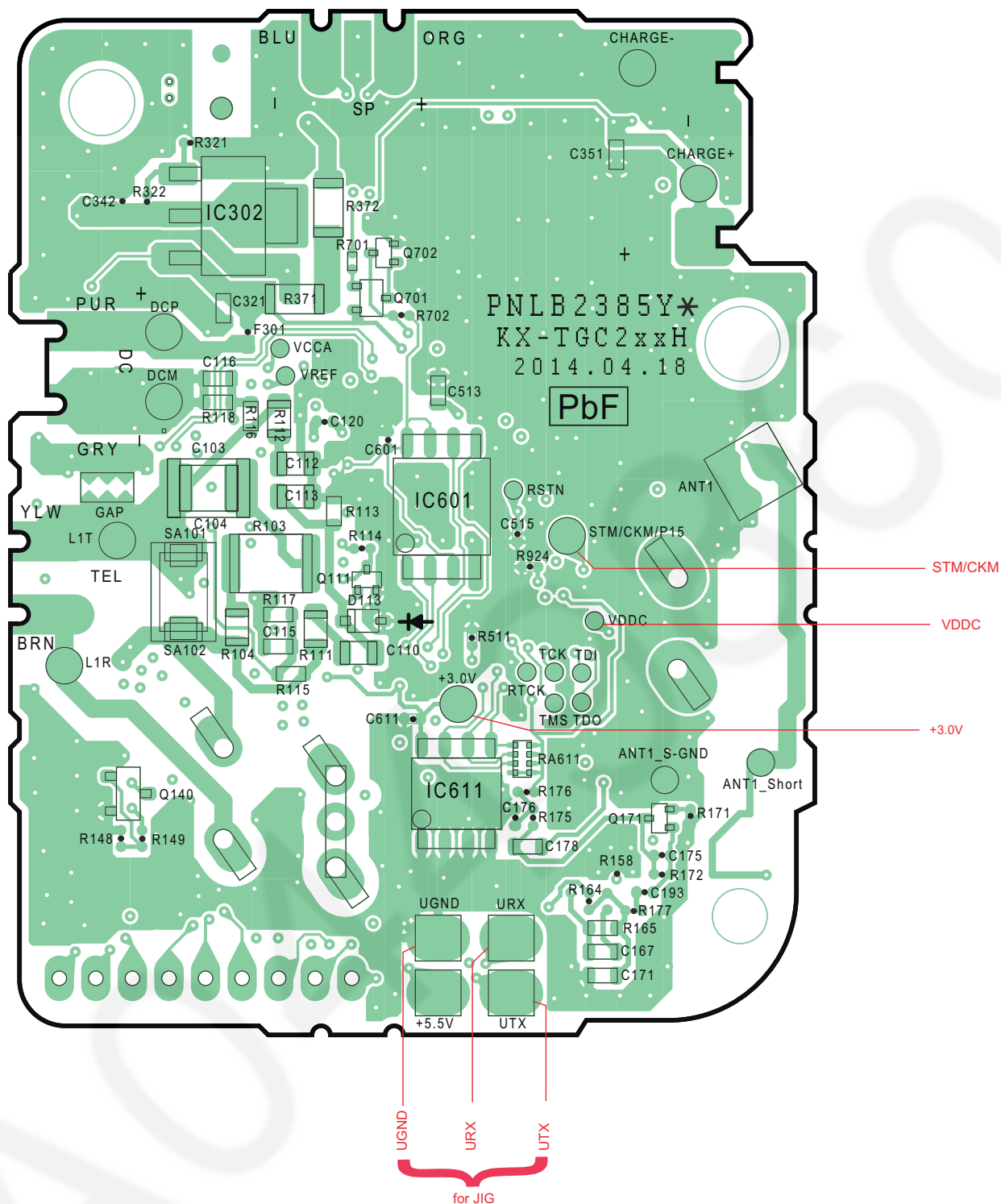
14.1. Base Unit (Main)

14.1.1. Component View



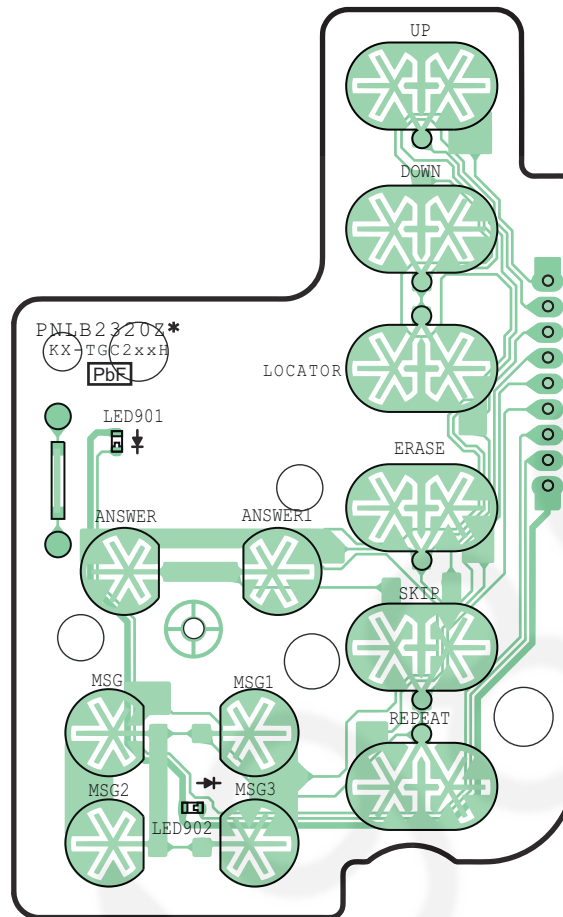
KX-TGC210/220 MAIN BOARD (Base Unit (Component View))

14.1.2. Bottom View



KX-TGC210/220 MAIN BOARD (Base Unit (Bottom View))

14.2. Base Unit (Operation) (KX-TGC220 only)

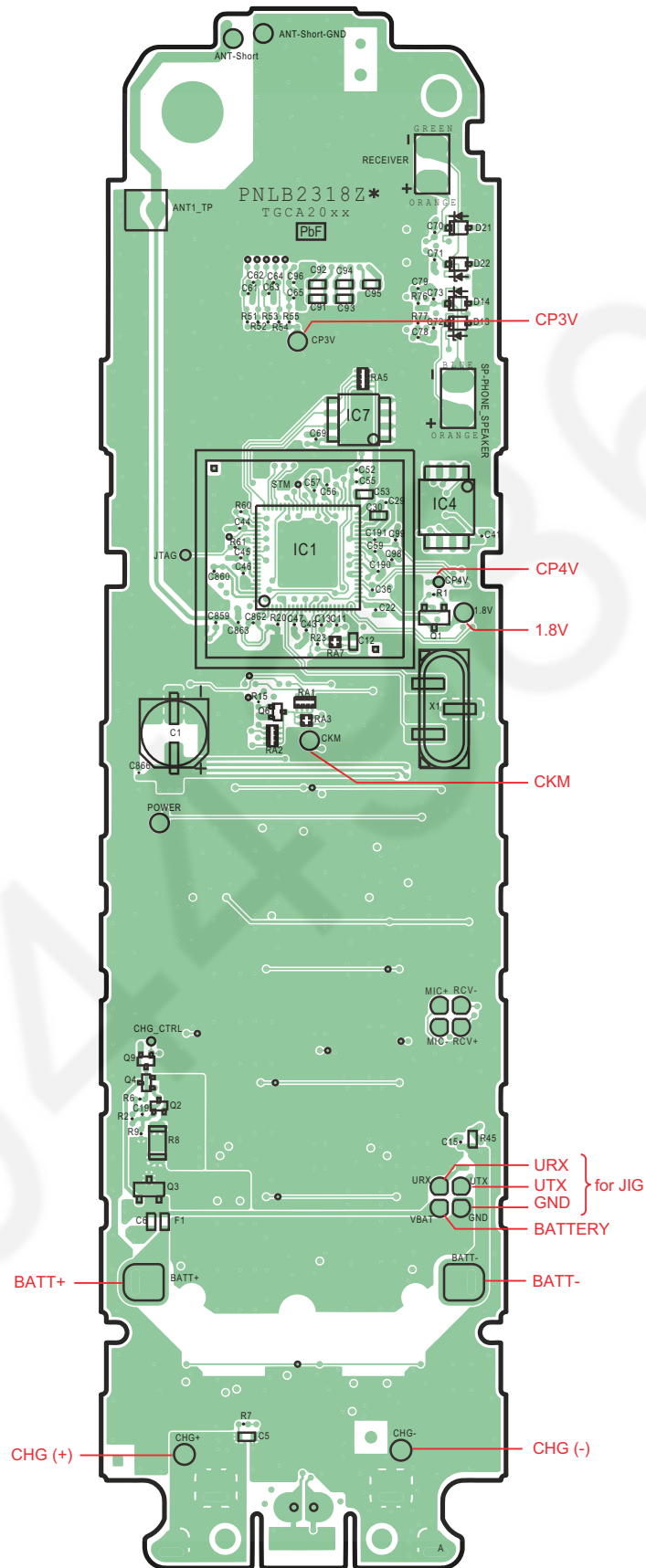


KX-TGC220 OPERATION BOARD (Base Unit (Component View))

Memo

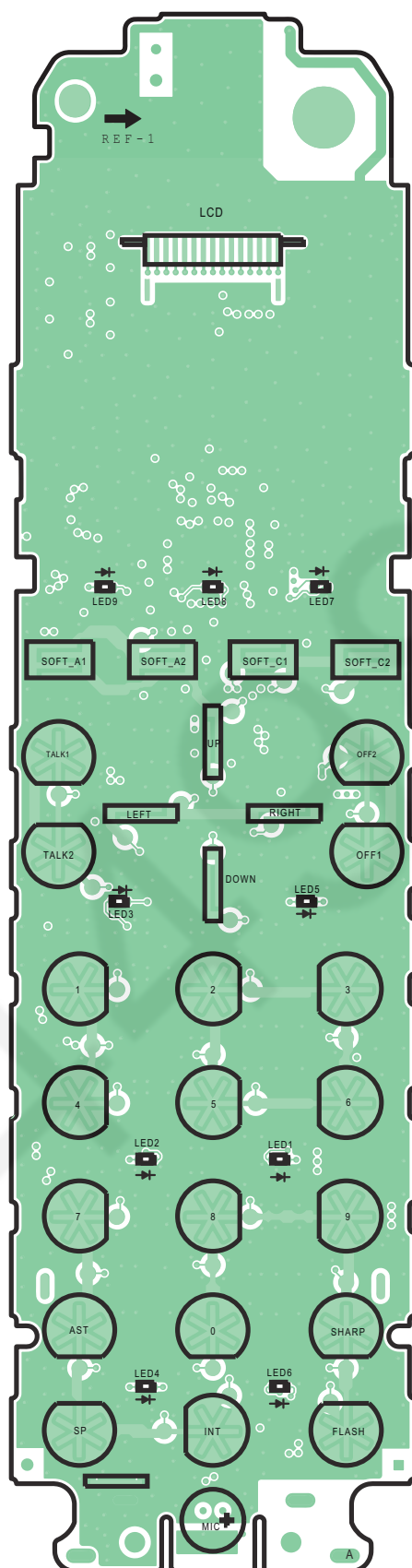
14.3. Handset

14.3.1. Component View



KX-TGCA20 HANDSET BOARD (Component View)

14.3.2. Bottom View

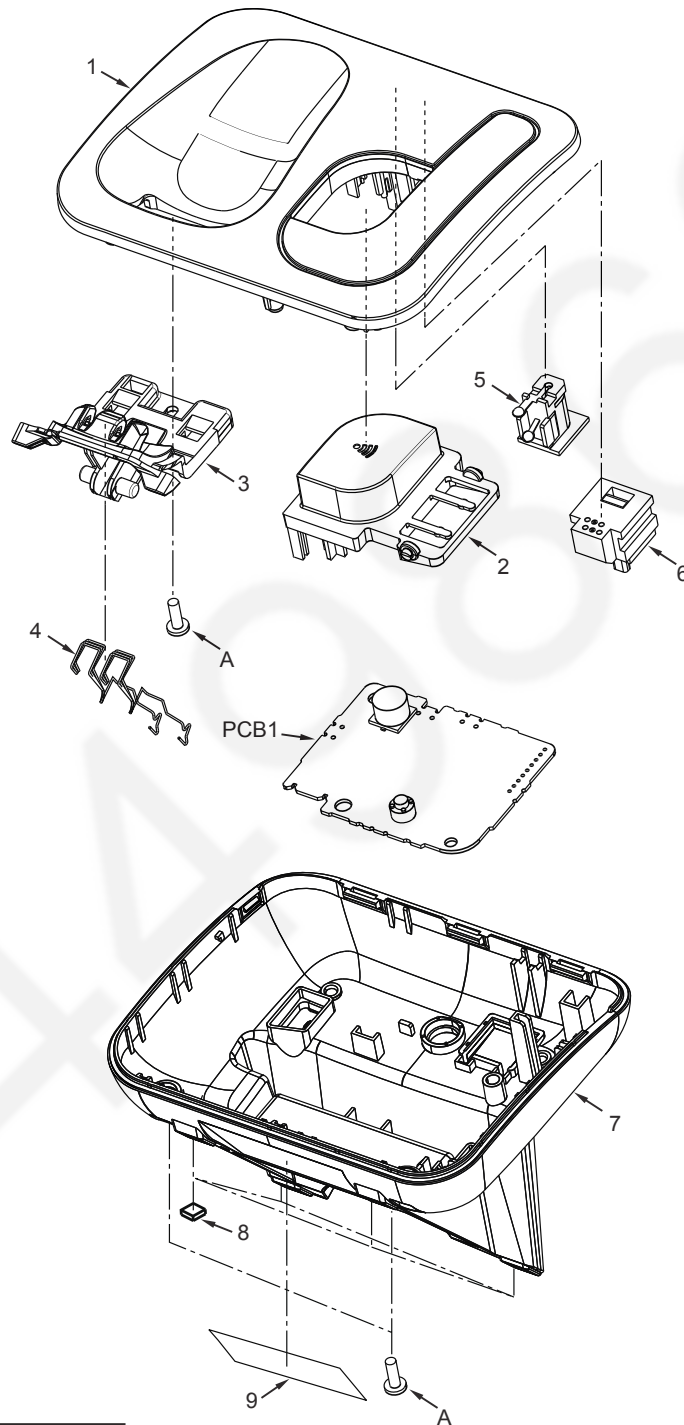



KX-TGCA20 HANDSET BOARD (Bottom View)

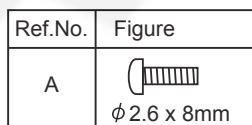
15 Exploded View and Replacement Parts List

15.1. Cabinet and Electrical Parts (Base Unit)

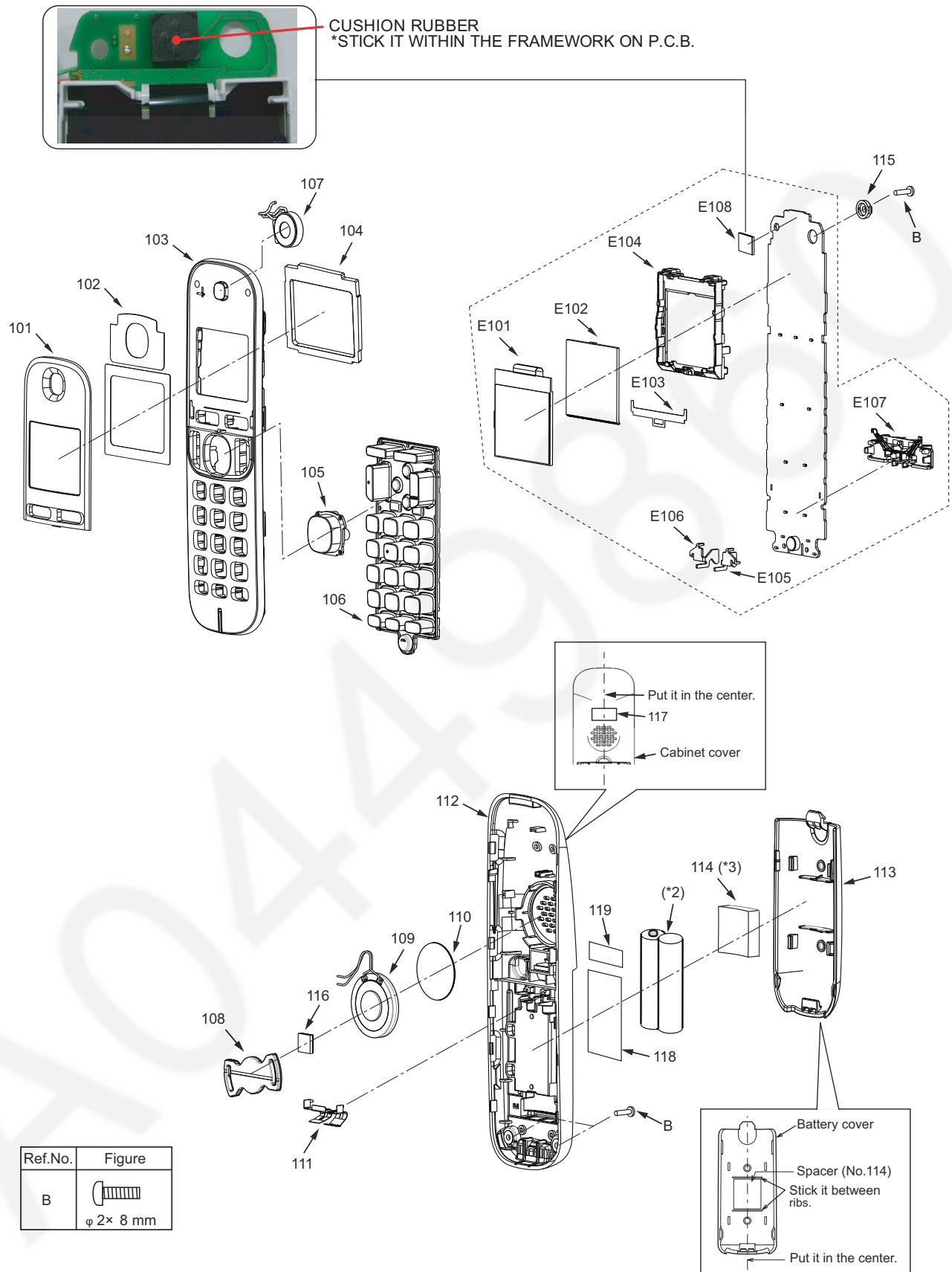
15.1.1. KX-TGC210



Ref.No.	Figure
A	 φ 2.6 x 8mm



15.2. Cabinet and Electrical Parts (Handset)



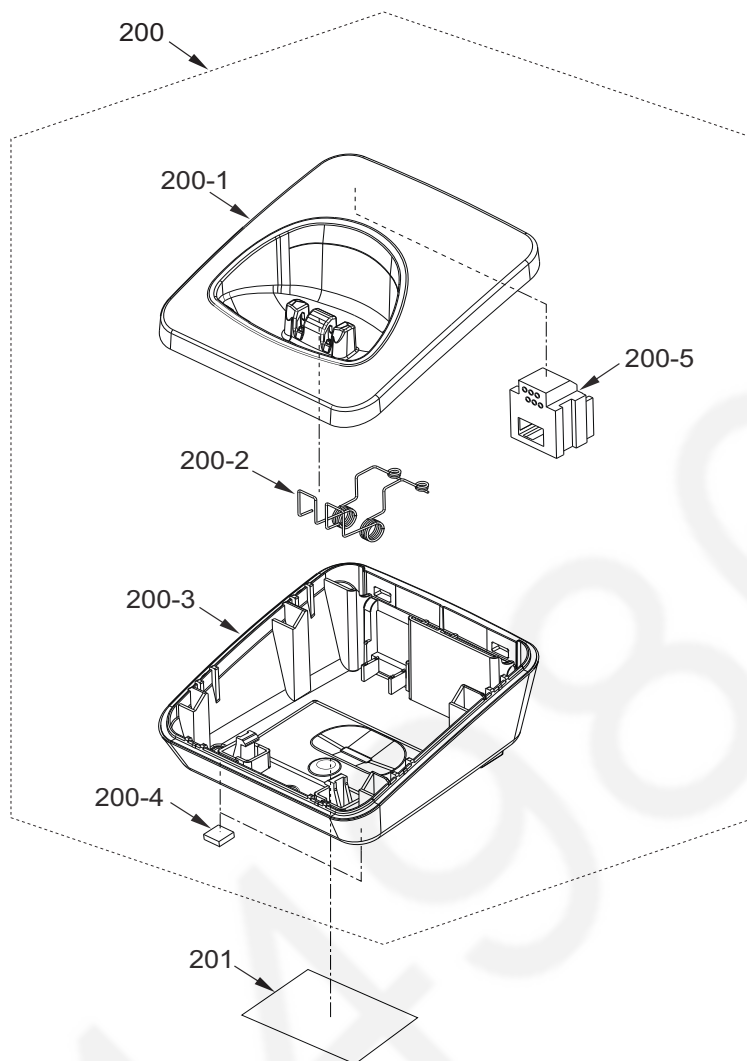
Note:

(*1) This cable is fixed by welding. Refer to **How to Replace the Handset LCD** (P.50).

(*2) The rechargeable Ni-MH battery HHR-4MVE (for BL) , HHR-4MY (for CX/HK/TU/TW/BX/UE/ML) is available through sales route of Panasonic.

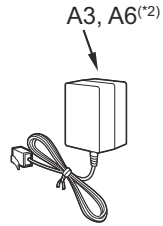
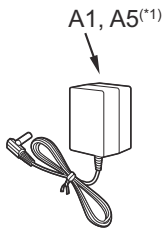
(*3) Attach the SPACER (No. 114) to the exact location described above.

15.3. Cabinet and Electrical Parts (Charger Unit)



15.4. Accessories and Packing Material

15.4.1. KX-TGC210BL, KX-TGC212BL, KX-TGC213BL, KX-TGC222BL, KX-TGC210CX, KX-TGC212CX, KX-TGC210TU, KX-TGC210BX, KX-TGC212BX, KX-TGC220BX, KX-TGC222BX

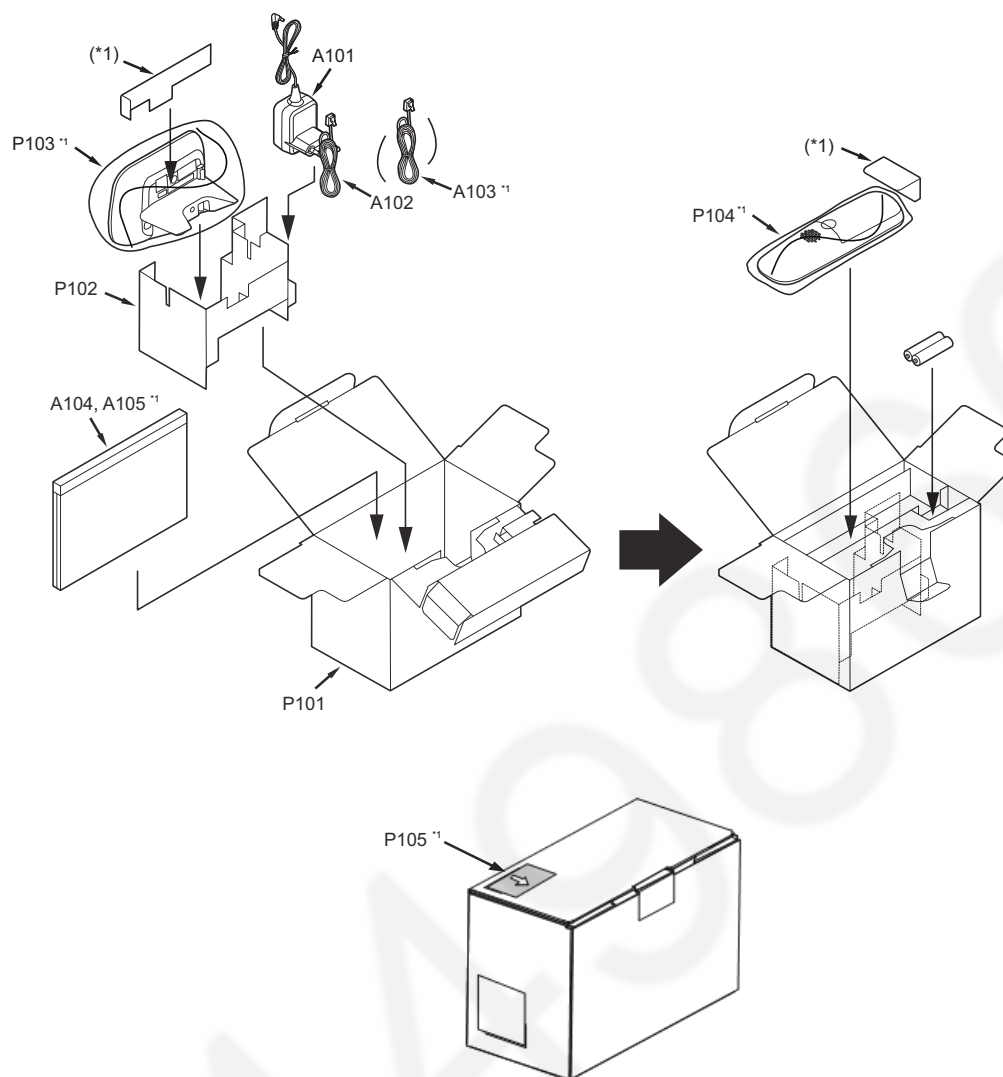


Note:

(*1) for Base unit

(*2) for Charger unit

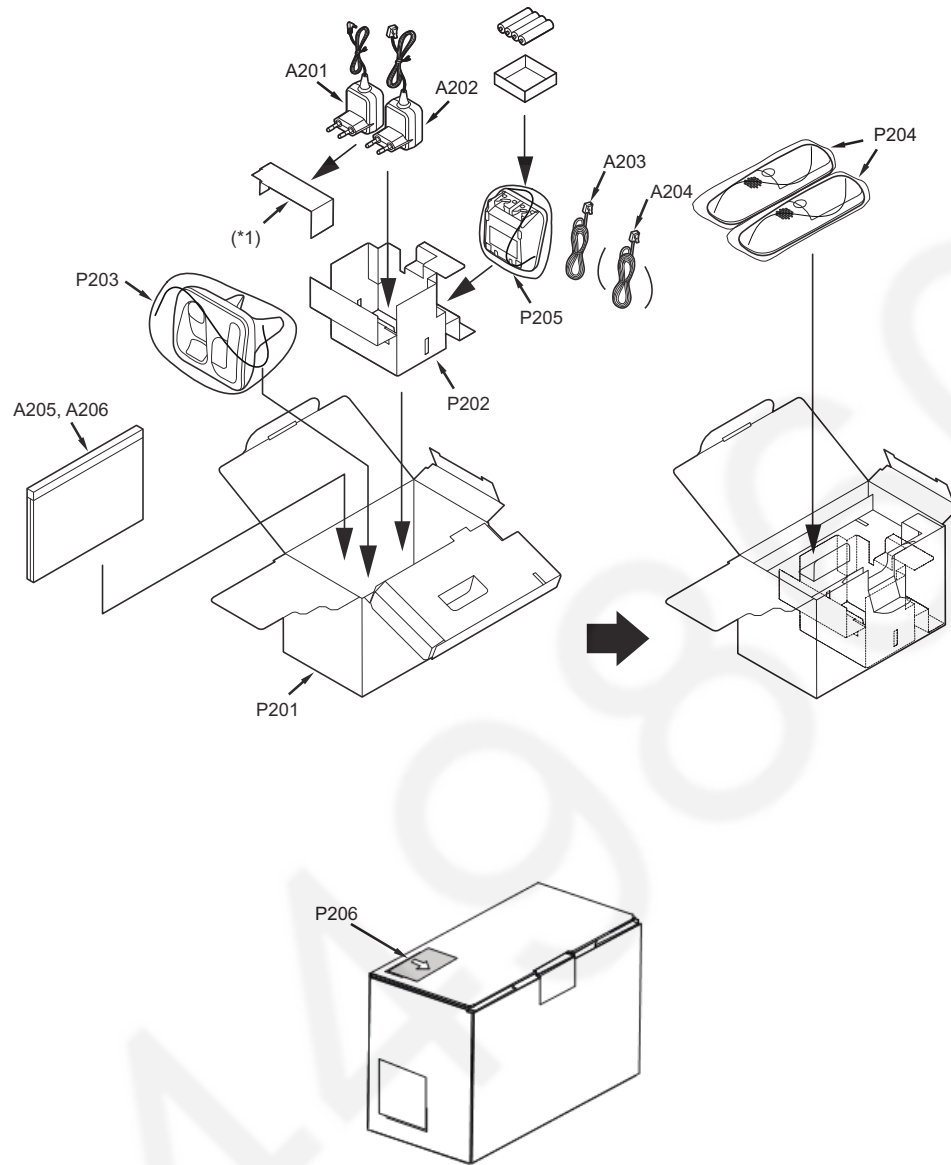
15.4.2. For KX-TGC210HK, KX-TGC210TW, KX-TGC210UE



Note:

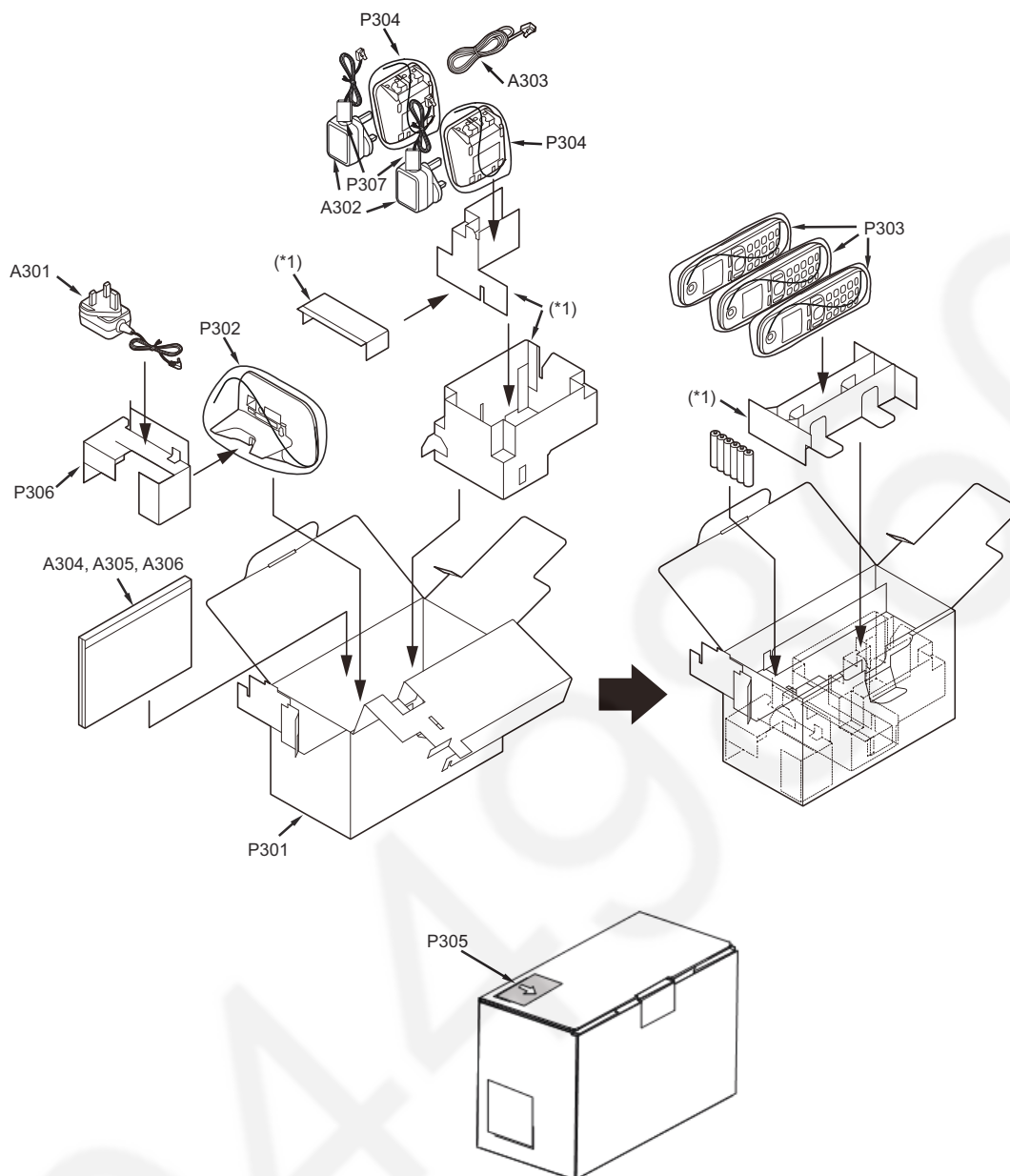
(*1) This pad is a piece of Ref No.P102 (PAD).

15.4.3. For KX-TGC212HK, KX-TGC212TW, KX-TGC212UE



Note:
 (*1) This pad is a piece of Ref No.P202 (PAD).

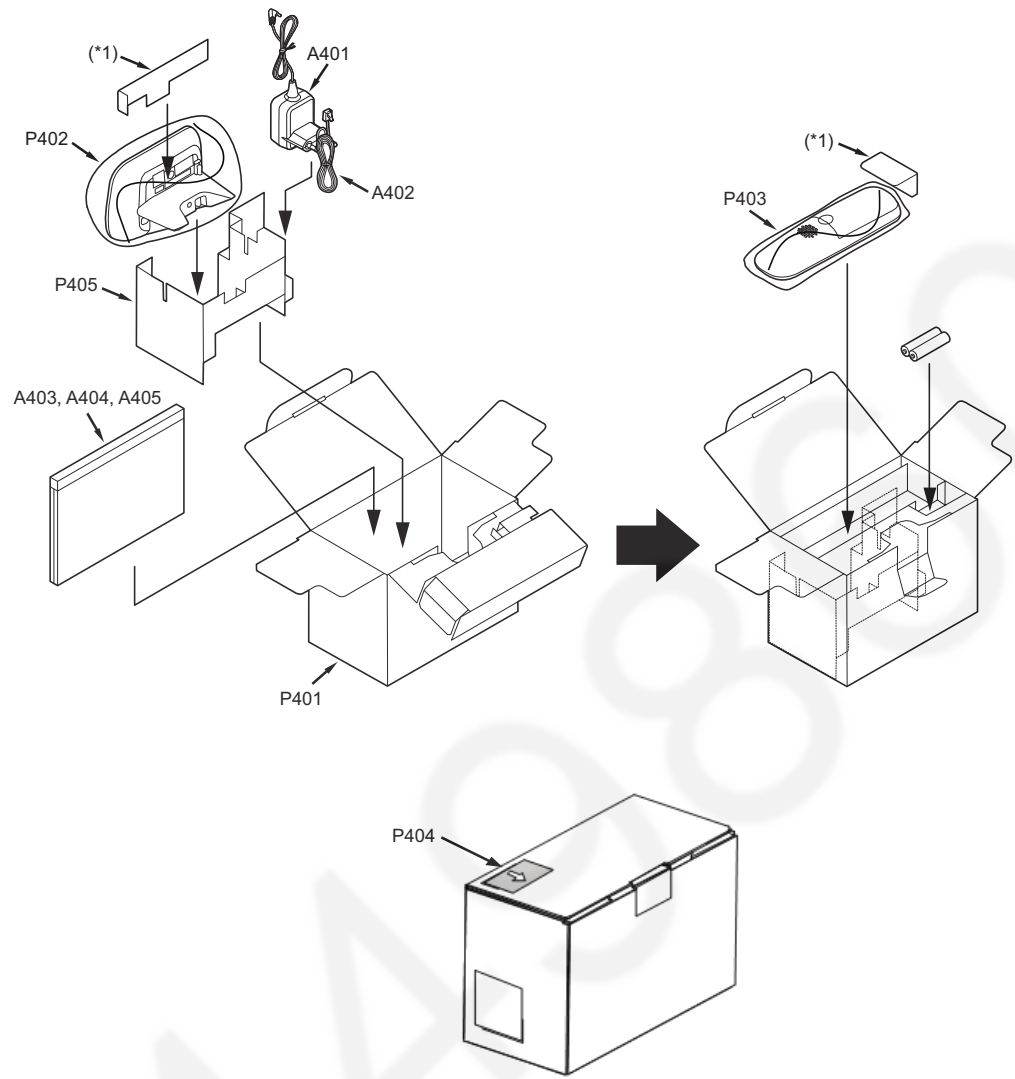
15.4.4. For KX-TGC213UE



Note:

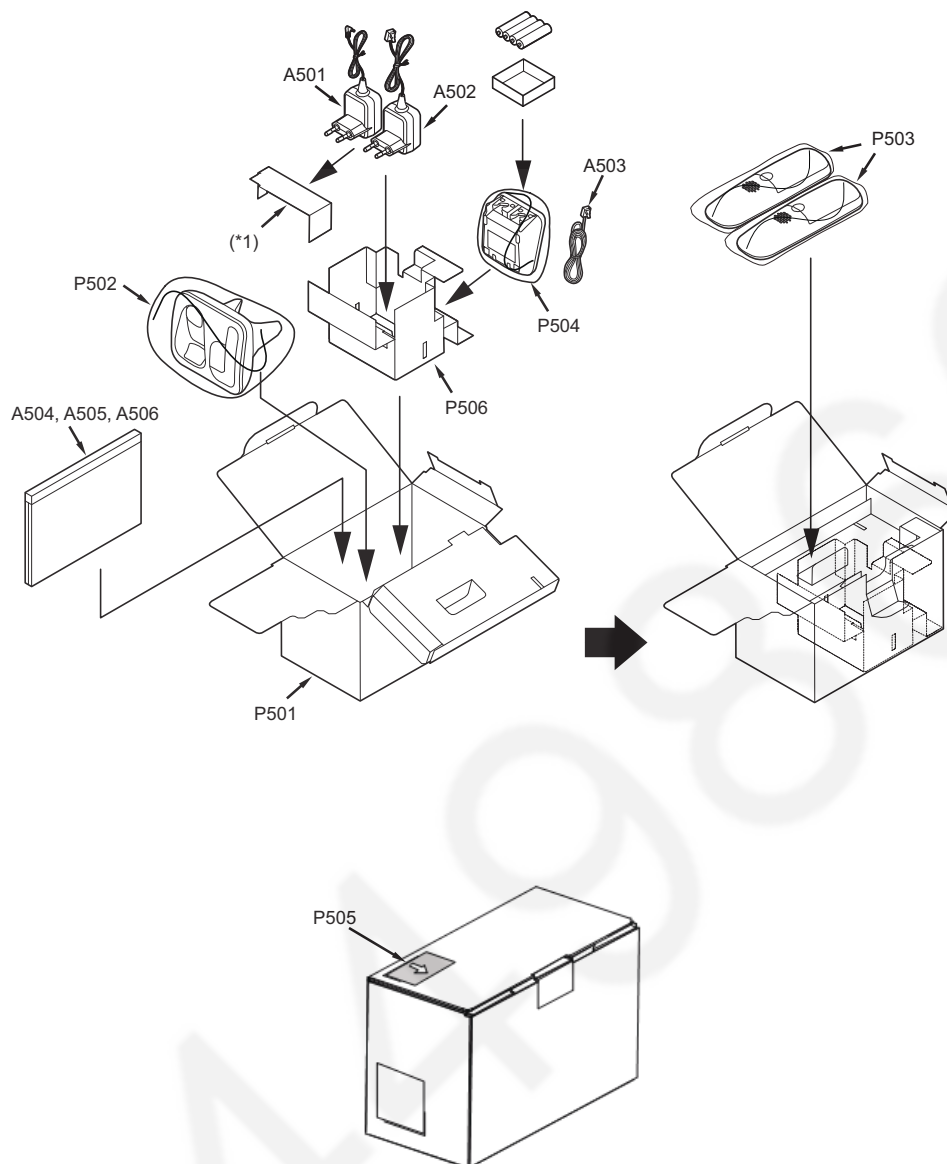
(*1) This pad is a piece of Ref No. P306 (PAD).

15.4.5. KX-TGC220UE



Note:
 (*1) This pad is a piece of Ref No.P405 (PAD).

15.4.6. KX-TGC222UE



Note:

(*1) This pad is a piece of Ref No.P506 (PAD).

15.5. Replacement Parts List

1. RTL (Retention Time Limited)

Note:

The "RTL" marking indicates that its Retention Time is Limited.

When production is discontinued, this item will continue to be available only for a specific period of time.

This period of time depends on the type of item, and the local laws governing parts and product retention. At the end of this period, the item will no longer be available.

2. Important safety notice

Components identified by the Δ mark indicates special characteristics important for safety. When replacing any of these components, only use specified manufacture's parts.

3. The S mark means the part is one of some identical parts.

For that reason, it may be different from the installed part.

4. ISO code (Example: ABS-94HB) of the remarks column shows quality of the material and a flame resisting grade about plastics.

5. RESISTORS & CAPACITORS

Unless otherwise specified;

All resistors are in ohms (Ω) k=1000 Ω , M=1000k Ω

All capacitors are in MICRO FARADS (μ F) p= μ F

*Type & Wattage of Resistor

Type

ERC:Solid	ERX:Metal Film	PQ4R:Chip
ERDS:Carbon	ERG:Metal Oxide	ERS:Fusible Resistor
ERJ:Chip	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,F1K,ECUV: Ceramic
ECQS:Styrol	ECQE,ECQV,ECQG: Polyester
ECUV,PQCUV, ECUE:Chip	ECEA,ECST,EEE:Electlytic
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 :16V	
2H:500V		0J:6.3V	1E,25:25V	2A :100V	

15.5.1. Base Unit

15.5.1.1. Cabinet and Electrical Parts

15.5.1.1.1. KX-TGC210

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	1	PNKM1544W2	CABINET BODY(for KX-TGC210BLB/KX-TGC212BLB/KX-TGC213BLB)	ABS-HB
	1	PNKM1544S2	CABINET BODY(for KX-TGC210HKB)	ABS-HB

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	1	PNKM1544T4	CABINET BODY(for KX-TGC210CXS/KX-TGC212CXS/KX-TGC210HKS/KX-TGC212HKS/KX-TGC210TUS/KX-TGC210TWS/KX-TGC212TWS/KX-TGC210BXS/KX-TGC212BXS/KX-TGC210UES/KX-TGC212UES/KX-TGC213UES/KX-TGC210MLS/KX-TGC212MLS)	ABS-HB
	2	PNBC1557Z1	BUTTON, LOCATOR	ABS-HB
	3	PNKE1274Z1	CASE, CHARGE TERMINAL (for KX-TGC210BLB/KX-TGC212BLB/KX-TGC213BLB/KX-TGC210HKB)	PS-HB
	3	PNKE1274Z5	CASE, CHARGE TERMINAL (for KX-TGC210CXS/KX-TGC212CXS/KX-TGC210HKS/KX-TGC212HKS/KX-TGC210TUS/KX-TGC210TWS/KX-TGC212TWS/KX-TGC210BXS/KX-TGC212BXS/KX-TGC210UES/KX-TGC212UES/KX-TGC213UES/KX-TGC210MLS/KX-TGC212MLS)	PS-HB
	4	PNJT1189Z	CHARGE TERMINAL	PS-HB
	5	K2ECYZ000002	JACK, DC	
	6	PQJJ1T039H	JACK, MODULAR	
	7	PNKF1325Y2	CABINET COVER (for KX-TGC210BLB/KX-TGC212BLB/KX-TGC213BLB/KX-TGC212HKB)	PS-HB
	7	PNKF1325Y1	CABINET COVER (for KX-TGC210CXS/KX-TGC212CXS/KX-TGC210HKS/KX-TGC212HKS/KX-TGC210TUS/KX-TGC210TWS/KX-TGC212TWS/KX-TGC210BXS/KX-TGC212BXS/KX-TGC210UES/KX-TGC212UES/KX-TGC213UES/KX-TGC210MLS/KX-TGC212MLS)	PS-HB
	8	PNHA1013Z	RUBBER PARTS, FOOT CUSHION	
	9	PNGT8604X	NAME PLATE (for KX-TGC210HKS/KX-TGC212HKS)	
	9	PNGT8604Z	NAME PLATE (for KX-TGC212HKB)	
	9	PNGT8598X	NAME PLATE (for KX-TGC210UES/KX-TGC212UES/KX-TGC213UES)	
	9	PNGT8627X	NAME PLATE (for KX-TGC210MLS/KX-TGC212MLS)	

15.5.1.1.2. KX-TGC220

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	1	PNKM1543V3	CABINET BODY (for KX-TGC222BLB)	ABS-HB
	1	PNKM1543T1	CABINET BODY (for KX-TGC220BXS, KX-TGC222BXS, KX-TGC220UES, KX-TGC222UES)	ABS-HB
	2	PNBC1558X1	BUTTON, NAVIGATOR KEY	PMMA-HB
	3	PNJK1225X	KEYBOARD SWITCH	
	4	PNKE1274Z1	CASE, CHARGE TERMINAL (for KX-TGC222BLB)	PS-HB
	4	PNKE1274Z5	CASE, CHARGE TERMINAL (for KX-TGC220BXS, KX-TGC222BXS, KX-TGC220UES, KX-TGC222UES)	PS-HB
	5	PNJT1189Z	TERMINAL, CHARGE	
	6	L0AA02A00087	SPEAKER	
	7	PQHG10729Z	RUBBER PARTS, SPEAKER	
	8	PQHR11313Z	GUIDE, SPEAKER	ASB-HB
	9	K2ECYZ000001	JACK, DC	
	10	PQJJ1T039H	JACK, MODULAR	

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	11	PNKF1325Y2	CABINET COVER(for KX-TGC222BLB)	PS-HB
	11	PNKF1325Y1	CABINET COVER(for KX-TGC220BXS, TGC222BXS, TGC220UES, TGC222UES)	PS-HB KX- KX-
	12	PNHA1013Z	RUBBER PARTS, FOOT CUSHION	
	13	PNGT8600X	NAME PLATE (for KX-TGC220UES, TGC222UES)	KX- KX-

15.5.1.2. Main P.C.Board Parts

Note:

- (*1) When replacing IC611 or X501, make the adjustment using **Batch file CD-ROM** for setting. Refer to parts list of **Fixtures and Tools** (P.99). Refer to **Base Unit** (P.57) of Things to Do after Replacing IC or X'tal.
- (*2) When removing ZA1 use special tools (ex. Hot air disordering tool).
- (*3) Backside of this IC has a ground plate. Refer to **How to Replace the Flat Package IC** (P.61).
- (*4) Supplied IC is Flat Package Type.

15.5.1.2.1. KX-TGC210

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	PCB1	PNWP1C210BLH	MAIN P.C. BOARD ASS'Y (RTL) (for BL)	
	PCB1	PNWP1C210CXH	MAIN P.C. BOARD ASS'Y (RTL) (for CX)	
	PCB1	PNWP1C210HKH	MAIN P.C. BOARD ASS'Y (RTL) (for HK)	
	PCB1	PNWP1C210TUH	MAIN P.C. BOARD ASS'Y (RTL) (for TU)	
	PCB1	PNWP1C210TWH	MAIN P.C. BOARD ASS'Y (RTL) (for TW)	
	PCB1	PNWP1C210BXH	MAIN P.C. BOARD ASS'Y (RTL) (for BX)	
	PCB1	PNWP1C210UEH	MAIN P.C. BOARD ASS'Y (RTL) (for UE)	
	PCB1	PNWP1C210MLH	MAIN P.C. BOARD ASS'Y (RTL) (for ML)	
			(ICs)	
	IC302	C0DBEYY00102	IC	
	IC501	C2HBCY000144	IC (*3) (*4)	
	IC611	PNWT1GC210GH	IC (EEPROM) (*1)	
			(TRANSISTORS)	
	Q111	2SC6054JSL	TRANSISTOR(SI)	S
	Q140	B1ABCE000009	TRANSISTOR(SI) (for CX, HK, ML, TW, TU)	S
	Q141	B1ACGP000008	TRANSISTOR(SI) (for BL, CX, HK, ML, TW, TU, BX, UE)	S
	Q142	B1ABDM000001	TRANSISTOR(SI)	S
	Q161	DSC7003S0L	TRANSISTOR(SI)	
	Q171	2SC6054JSL	TRANSISTOR(SI)	S
	Q701	2SA1576S	TRANSISTOR(SI) (for BL, TU)	S
	Q702	B1GBCFY0020	TRANSISTOR(SI) (for BL, TU)	S
			(DIODES)	
	D101	B0EDER000009	DIODE(SI)	S
	D113	DA2J10100L	DIODE(SI)	
	D132	1SS355	DIODE(SI)	S
	D133	1SS355	DIODE(SI)	S
	D141	B0BC02000015	DIODE(SI) (for BL, CX, HK, TW, TU, BX, UE)	
	D142	PQVDPTZT2530	DIODE(SI) (for ML)	
	D362	B0ECKM000008	DIODE(SI)	
			(COILS)	
	L501	G1CR10J00010	COIL	
	L502	G1CR10J00010	COIL	

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	L803	G1C2N7Z00009	COIL	
			(RESISTOR ARRAYS)	
	RA151	EXB24V102JX	COMPONENTS PARTS	
	RA611	EXB28V332JX	COMPONENTS PARTS	
			(VARISTOR)	
	SA101	J0LE00000047	VARISTOR	
			(RESISTORS)	
	R111	PQ4R10XJ105	1M	S
	R112	PQ4R10XJ473	47k	S
	R113	ERJ3GEYJ223	22k	S
	R114	ERJ2GEJ683	68k	S
	R115	ERJ3GEYJ565	5.6M	S
	R116	ERJ3GEYJ565	5.6M	S
	R117	ERJ3GEYJ104	100k	S
	R118	ERJ3GEYJ104	100k	S
	R121	ERJ3GEYJ394	390k	S
	R122	ERJ3GEYJ394	390k	S
	R124	PQ4R18XJ100	10 (for CX, HK, ML, TW, TU)	S
	R141	ERJ3GEYJ104	100k	S
	R142	PQ4R18XJ272	2.7k	S
	R145	ERJ2GEJ222	2.2k (for BL, CX, HK, ML, TW, BX, UE)	S
	R145	D0GA392JA015	3.9k (for TU)	S
	R148	ERJ2GEJ103	10k (for CX, HK, ML, TW, TU)	S
	R149	D0GA681JA021	680 (for CX, HK, ML, TW, TU)	S
	R151	ERJ2GEJ104	100k	S
	R152	ERJ2GEJ134X	130k	S
	R158	ERJ2GEJ472X	4.7k	S
	R159	D0GA152JA021	1.5k (for BL)	S
	R159	ERJ2GE0R00	0 (for CX, HK, ML, TW, TU, BX, UE)	S
	R160	ERJ3GEYJ271	270 (for BL)	S
	R160	ERJ3GEYJ821	820 (for CX, HK, ML, TW, TU, BX, UE)	S
	R162	ERJ2GEJ273X	27k (for CX, HK, ML, TW, TU, BX, UE)	S
	R163	D0GG390JA007	39	
	R164	ERJ2GEJ222	2.2k (for BL)	S
	R164	ERJ2GEJ272	2.7k (for CX, HK, ML, TW, TU, BX, UE)	S
	R165	ERJ3GEYJ273	27k	S
	R169	ERJ2GEJ473	47k (for BL)	S
	R171	ERJ2GEJ221	220	S
	R172	ERJ2GEJ684	680k	S
	R175	D0GA392JA015	3.9k	S
	R176	ERJ2GEJ102	1k	S
	R177	ERJ2GEJ102	1k	S
	R321	ERJ2RKF1400	140	S
	R322	ERJ2RKF1000	100	S
	R331	ERJ2RKF6802	68k	S
	R332	ERJ2RKF3302	33k	S
	R371	ERJ8GEYJ1R0	1	S
	R372	ERJ8GEYJ1R0	1	S
	R501	ERJ3GEYJ100	10	S
	R502	ERJ2GEJ103	10k	S
	R503	ERJ2GEJ103	10k	S
	R504	ERJ2GEJ103	10k	S
	R506	ERJ2GEJ103	10k	S
	R511	ERJ2GEJ102	1k (for ML)	S
	R511	ERJ2GEJ103	10k	S
	R701	D0GA332JA015	3.3k (for BL, TU)	S
	R702	ERJ2GEJ102	1k	S
	R924	ERJ2GEJ102	1k	S
			(CAPACITORS)	
	C101	F1K2H681A008	680p	S
	C102	F1K2H681A008	680p	S
	C110	F1J2A104A025	CERAMIC CAPACITOR	
	C112	F1J2A104A025	CERAMIC CAPACITOR	
	C113	PQCUV1H103KB	0.01	
	C115	ECUV1C104KBV	0.1	
	C116	ECUV1C104KBV	0.1	
	C120	ECUE1H102KBQ	0.001	

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	C121	F1K2H681A008	680p	S
	C122	F1K2H681A008	680p	S
	C141	F1H1A225A051	2.2 (for BL, TU)	
	C142	ECUV1H103KBV	0.01	
	C143	ECUV1A105KBV	1 (for BL, TU)	
	C152	ECUE1C103KBQ	0.01	
	C161	F1K1E1060001	10	
	C164	PQCUV1H104KB	0.1 (for BL)	
	C167	ECUV1H272KBV	0.0027 (for BL)	
	C167	ECUV1H102KBV	0.001 (for CX, HK, ML, TW, TU, BX, UE)	
	C171	ECUV1C333KBV	0.033 (for BL)	
	C171	ECUV1C223KBV	0.022 (for CX, HK, ML, TW, TU, BX, UE)	
	C175	ECUE1H561KBQ	560p	
	C176	ECUE0J105KBQ	1	
	C178	ECUV1C104KBV	0.1	
	C182	ECUE1H100DCQ	10p	
	C184	ECUV1C105KBV	1	
	C193	ECUE1A273KBQ	0.027	
	C321	ECUV1C105KBV	1	
	C341	F2G0J331A146	330	
	C342	ECUE1A104KBQ	0.1	
	C351	ECUV1C105KBV	1	
	C501	ECUE1A104KBQ	0.1	
	C502	ECJ1VB0G106M	10	S
	C503	ECJ1VB0G106M	10	S
	C504	ECUE0J105KBQ	1	
	C505	ECJ1VB0G106M	10	S
	C506	ECUE0J105KBQ	1	
	C507	ECUV0J225KBV	2.2	
	C508	ECUE1H100DCQ	10p	
	C509	ECUE1H120JCQ	12p	
	C510	ECUE0J105KBQ	1	
	C511	ECJ1VB0G106M	10	S
	C513	ECUV0J225KBV	2.2	
	C515	ECUE0J105KBQ	1	
	C516	ECUE1A104KBQ	0.1	
	C517	ECUE1A104KBQ	0.1	
	C518	ECUE1A104KBQ	0.1	
	C519	ECUE1A104KBQ	0.1	
	C520	ECUE1A104KBQ	0.1	
	C521	ECUE0J105KBQ	1	
	C611	ECUE1A104KBQ	0.1	
	C810	F1G1H1R5A765	1.5p	
	C811	ECUE1H100DCQ	10p	
	C819	ECUE1H100DCQ	10p	
	C820	F1G1H1R5A765	1.5p	
	C863	F1G1H1R5A765	1.5p	
	C871	F1G1H1R5A765	1.5p	
	C872	F1G1H1R3A765	1.3p	
	C873	F1G1H2R0A765	2p	
	C874	ECUE1H150JCQ	15p	
	C895	F1G1H2R0A765	2p	
			(OTHERS)	
⚠	F301	K5H302Y00003	FUSE	
	P101	D4DAY220A022	THERMISTOR	
	SW1	KOH1BA000259	SPECIAL SWITCH	
	X501	H0J138500011	CRYSTAL OSCILLATOR (*1)	
	ZA1	PNMC1091Z	MAGNETIC SHIELD (*2)	

15.5.1.2.2. KX-TGC220

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	PCB1	PNWP1C220BLH	MAIN P.C.BOARD ASS'Y (RTL) (for BL)	
	PCB1	PNWP1C220BXH	MAIN P.C.BOARD ASS'Y (RTL) (for BX)	
	PCB1	PNWP1C220UEH	MAIN P.C.BOARD ASS'Y (RTL) (for UE)	
			(ICs)	
	IC302	C0DBEYY00102	IC	
	IC501	C2HBCY000144	IC (*3) (*4)	

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20				
Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	IC601	PNWI2GC220GH	IC (FLASH)	
	IC611	PNWI1GC220GH	IC (EEPROM) (*1)	
			(TRANSISTORS)	
	Q111	2SC6054JSL	TRANSISTOR (SI)	S
	Q141	B1ACGP000008	TRANSISTOR (SI)	S
	Q142	B1ABDM000001	TRANSISTOR (SI)	S
	Q161	DSC7003S0L	TRANSISTOR (SI)	
	Q171	2SC6054JSL	TRANSISTOR (SI)	S
	Q651	DRC9113Z0L	TRANSISTOR (SI)	
	Q652	DRC9113Z0L	TRANSISTOR (SI)	
	Q701	2SA1576S	TRANSISTOR (SI) (for BL)	S
	Q702	B1GBCFY0020	TRANSISTOR (SI) (for BL)	S
			(DIODES)	
	D101	B0EDER000009	DIODE (SI)	S
	D113	DA2J10100L	DIODE (SI)	
	D132	1SS355	DIODE (SI)	S
	D133	1SS355	DIODE (SI)	S
	D141	B0BC02000015	DIODE (SI)	
	D362	B0ECKM000008	DIODE (SI)	
			(COILS)	
	L501	G1CR10J00010	COIL	
	L502	G1CR10J00010	COIL	
	L803	G1C2N7Z00009	COIL	
			(RESISTOR ARRAYS)	
	RA151	EXB24V102JX	COMPONENTS PARTS	
	RA611	EXB28V332JX	COMPONENTS PARTS	
			(VARISTOR)	
	SA101	J0LE00000047	VARISTOR	
			(RESISTORS)	
	R111	PQ4R10XJ105	1M	S
	R112	PQ4R10XJ473	47k	S
	R113	ERJ3GEYJ223	22k	S
	R114	ERJ2GEJ683	68k	S
	R115	ERJ3GEYJ565	5.6M	S
	R116	ERJ3GEYJ565	5.6M	S
	R117	ERJ3GEYJ104	100k	S
	R118	ERJ3GEYJ104	100k	S
	R121	ERJ3GEYJ394	390k	S
	R122	ERJ3GEYJ394	390k	S
	R141	ERJ3GEYJ104	100k	S
	R142	PQ4R18XJ272	2.7k	S
	R145	ERJ2GEJ222	2.2k	S
	R151	D0GA104JA021	100k	S
	R152	ERJ2GEJ134X	130k	S
	R158	ERJ2GEJ472X	4.7k	S
	R159	D0GA152JA021	1.5k (for BL)	S
	R159	ERJ2GE0R00	0 (for BX, UE)	S
	R160	ERJ3GEYJ271	270 (for BL)	S
	R160	ERJ3GEYJ821	820 (for BX, UE)	S
	R162	ERJ2GEJ273X	27k (for BX, UE)	
	R163	D0GG390JA007	39	
	R164	ERJ2GEJ222	2.2k (for BL)	S
	R164	ERJ2GEJ272	2.7k (for BX, UE)	S
	R165	ERJ3GEYJ273	27k	S
	R169	ERJ2GEJ473	47k (for BL)	S
	R171	D0GA221JA021	220	S
	R172	ERJ2GEJ684	680k	S
	R175	D0GA392JA015	3.9k	S
	R176	D0GA102JA021	1k	S
	R177	D0GA102JA021	1k	S
	R321	ERJ2RKF1400	140	S
	R322	ERJ2RKF1000	100	S
	R331	ERJ2RKF6802	68k	S
	R332	ERJ2RKF3302	33k	S
	R371	ERJ8GEYJ1R0	1	S
	R372	ERJ8GEYJ1R0	1	S
	R501	ERJ3GEYJ100	10	S
	R502	D0GA103JA021	10k	S
	R503	D0GA103JA021	10k	S
	R504	D0GA103JA021	10k	S
	R506	D0GA103JA021	10k	S
	R651	ERJ2GEJ122	1.2k	S
	R652	ERJ2GEJ122	1.2k	S

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	R701	D0GA332JA015	3.3k (for BL)	S
	R702	D0GA102JA021	1k	S
	R924	D0GA102JA021	1k	S
			(CAPACITORS)	
	C101	F1K2H681A008	680p	S
	C102	F1K2H681A008	680p	S
	C110	F1J2A104A025	10	
	C112	F1J2A104A025	10	
	C113	PQCUV1H103KB	0.01	
	C115	ECUV1C104KBV	0.1	
	C116	ECUV1C104KBV	0.1	
	C120	ECUE1H102KBQ	0.001	
	C121	F1K2H681A008	680p	S
	C122	F1K2H681A008	680p	S
	C142	ECUV1H103KBV	0.01	
	C152	ECUE1C103KBQ	0.01	
	C161	F1K1E1060001	10	
	C164	PQCUV1H104KB	0.1 (for BL)	
	C167	ECUV1H272KBV	0.0027 (for BL)	
	C167	ECUV1H102KBV	0.001 (for BX, UE)	
	C171	ECUV1C333KBV	0.033 (for BL)	
	C171	ECUV1C223KBV	0.022 (for BX, UE)	
	C175	ECUE1H561KBQ	560p	
	C176	ECUE0J105KBQ	1	
	C178	ECUV1C104KBV	0.1	
	C182	ECUE1H100DCQ	10p	
	C184	ECUV1C105KBV	1	
	C193	ECUE1A273KBQ	0.027	
	C321	ECUV1C105KBV	1	
	C341	F2G0J331A146	330	
	C342	ECUE1A104KBQ	0.1	
	C351	ECUV1C105KBV	1	
	C501	ECUE1A104KBQ	0.1	
	C502	ECJ1VB0G106M	10	S
	C503	ECJ1VB0G106M	10	S
	C504	ECUE0J105KBQ	1	
	C505	ECJ1VB0G106M	10	S
	C506	ECUE0J105KBQ	1	
	C507	ECUV0J225KBV	2.2	
	C508	ECUE1H100DCQ	10p	
	C509	ECUE1H120JCQ	12p	
	C510	ECUE0J105KBQ	1	
	C511	ECJ1VB0G106M	10	S
	C513	ECUV0J225KBV	2.2	
	C515	ECUE0J105KBQ	1	
	C516	ECUE1A104KBQ	0.1	
	C517	ECUE1A104KBQ	0.1	
	C518	ECUE1A104KBQ	0.1	
	C519	ECUE1A104KBQ	0.1	
	C520	ECUE1A104KBQ	0.1	
	C521	ECUE0J105KBQ	1	
	C601	ECUE1A104KBQ	0.1	
	C611	ECUE1A104KBQ	0.1	
	C650	ECUE1H680JCQ	68p	
	C651	ECUE1H680JCQ	68p	
	C652	ECUE1H680JCQ	68p	
	C810	F1G1H1R5A765	1.5p	
	C811	ECUE1H100DCQ	10p	
	C819	ECUE1H100DCQ	10p	
	C820	F1G1H1R5A765	1.5p	
	C863	F1G1H1R5A765	1.5p	
	C871	F1G1H1R5A765	1.5p	
	C872	F1G1H1R3A765	1.3p	
	C873	F1G1H2R0A765	2p	
	C874	ECUE1H150JCQ	15p	
	C895	F1G1H2R0A765	2p	
			(OTHERS)	
⚠	F301	K5H302Y00003	FUSE	
	P101	D4DAY220A022	THERMISTOR	
	X501	H0J138500011	CRYSTAL OSCILLATOR (*1)	
	ZA1	PNMC1091Z	MAGNETIC SHIELD (*2)	

15.5.1.3. Operational P.C.Board Parts (KX-TGC220 only)

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	PCB2	PNWP2TGC220H	OPERATIONAL P.C.BOARD ASS'Y (RTL)	
			(LEDS)	
	LED901	B3AAB0000347	DIODE (SI)	
	LED902	B3AAB0000347	DIODE (SI)	

15.5.2. Handset

15.5.2.1. Cabinet and Electrical Parts

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	101	PNGP1327Z1	PANEL, LCD	PMMA-HB
	102	PNYE1128Z	TAPE, DOUBLE SIDED	
	103	PNKM1545U3	CABINET BODY (for KX-TGCA20EXB, KX-TGCA20HKB)	ABS-HB
	103	PNKM1545T4	CABINET BODY (for KX-TGCA20CXS/KX-TGCA20HKS/KX-TGCA20MLS/KX-TGCA20EXS/KX-TGCA20TWS/KX-TGCA20BXS)	ABS-HB
	104	PNYE1126Z	TAPE, DOUBLE SIDED	
	105	PNBC1492W1	BUTTON, NAVIGATOR KEY	ABS-HB
	106	PNJK1240Z	KEYBOARD SWITCH (for KX-TGCA20EXB, KX-TGCA20HKB)	
	106	PNJK1240U	KEYBOARD SWITCH (for KX-TGCA20CXS/KX-TGCA20HKS/KX-TGCA20MLS/KX-TGCA20EXS/KX-TGCA20TWS/KX-TGCA20BXS)	
	107	L0AD01A00024	RECEIVER (for KX-TGCA20EXB/KX-TGCA20EXS/KX-TGCA20BXS)	
	107	L0AD01A00029	RECEIVER (for KX-TGCA20CXS/KX-TGCA20HKS/KX-TGCA20MLS/KX-TGCA20HKB/KX-TGCA20TWS)	
	108	PNHR1757Z	GUIDE, SPEAKER	ABS-HB
	109	L0AD02A00026	SPEAKER	
	110	PNHS1502Z	SPACER, SPEAKER NET	
	111	PNJC1018Z	BATTERY TERMINAL	
	112	PNKF1275Z1	CABINET COVER (for KX-TGCA20EXB/KX-TGCA20HKB)	ABS-HB
	112	PNKF1275Z4	CABINET COVER (for KX-TGCA20CXS/KX-TGCA20HKS/KX-TGCA20MLS/KX-TGCA20EXS/KX-TGCA20TWS/KX-TGCA20BXS)	ABS-HB
	113	PNKK1077Z1	LID, BATTERY (for KX-TGCA20EXB/KX-TGCA20HKB)	ABS-HB
	113	PNKK1077Z4	LID, BATTERY (for KX-TGCA20CXS/KX-TGCA20HKS/KX-TGCA20MLS/KX-TGCA20EXS/KX-TGCA20TWS/KX-TGCA20BXS)	ABS-HB
	114	PNHS1466Z	SPACER, BATTERY	
	115	PNHR1644Z	SPACER	
	116	PQHG10729Z	RUBBER PARTS	
	117	PNQT3001Z	LABEL, TA (for KX-TGCA20HKS, KX-TGCA20HKB)	
	118	PNGT8605X	NAME PLATE (for KX-TGCA20HKS)	
	118	PNGT8605Z	NAME PLATE (for KX-TGCA20HKB)	
	118	PNGT8883X	NAME PLATE (for KX-TGCA20UES)	
	118	PNGT8628X	NAME PLATE (for KX-TGCA20MLS)	
	119	PNQT2006Z	LABEL, ATTENTION (for KX-TGCA20HKS, KX-TGCA20HKB, KX-TGCA20UES, KX-TGCA20MLS)	

15.5.2.2. Main P.C.Board Parts

Note:

- (*1) Reconfirm the model No. written on the handset's name plate when replacing PCB100. Because the model No. of the optional handset may differ from the included handset.
- (*2) When replacing IC4, IC7 or X1, make the adjustment using **Batch file CD-ROM** for setting. Refer to parts list of **Fixtures and Tools** (P.99). Refer to **Handset** (P.58) of Things to Do after Replacing IC or X'tal.
- (*3) When replacing the handset LCD, See **How to Replace the Handset LCD** (P.50).
- (*4) Backside of this IC has a ground plate. Refer to **How to Replace the Flat Package IC** (P.61).
- (*5) Supplied IC is Flat Package Type.

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	PCB100	PNWP1CA20EXR	MAIN P.C.BOARD ASS'Y (RTL) (*1) (for BL,TU,BX)	
	PCB100	PNWP1CA20CXR	MAIN P.C.BOARD ASS'Y (RTL) (*1) (for CX)	
	PCB100	PNWP1CA20HXR	MAIN P.C.BOARD ASS'Y (RTL) (*1) (for HK)	
	PCB100	PNWP1CA20TWR	MAIN P.C.BOARD ASS'Y (RTL) (*1) (for TW)	
	PCB100	PNWP1CA20MLR	MAIN P.C.BOARD ASS'Y (RTL) (*1) (for ML)	
		(ICs)		
	IC1	C1CB00003837	IC(*4) (*5)	
	IC4	C3FBLY000162	IC(*2)	
	IC7	PNWIGCA20EXR	IC (EEPROM) (*2)	
			(TRANSISTORS)	
	Q1	B1ADGE000012	TRANSISTOR (SI)	
	Q2	B1ADCF000040	TRANSISTOR (SI)	
	Q3	B1ABGE000011	TRANSISTOR (SI)	
	Q4	B1ADCF000040	TRANSISTOR (SI)	
	Q6	2SC6054JSL	TRANSISTOR (SI)	S
	Q9	UNR9216J0L	TRANSISTOR (SI)	S
			(DIODES)	
	LED7	B3ACB0000190	DIODE (SI)	
	LED8	B3ACB0000190	DIODE (SI)	
	LED9	B3ACB0000190	DIODE (SI)	
			(RESISTOR ARRAYS)	
	RA1	EXB28V271JX	RESISTOR ARRAY	
	RA5	EXB28V332JX	RESISTOR ARRAY	
	RA7	EXB24V821JX	RESISTOR ARRAY	
			(RESISTORS)	
	R1	ERJ2GEJ103	10k	S
	R2	ERJ2GEJ303	30k	S
	R6	ERJ2GEJ103	10k	S
	R7	ERJ2GEJ821	820	S
	R8	ERJ8GEYJ4R3V	4.3	S
	R9	ERJ2GEJ303	30k	S
	R15	D0GA152JA021	1.5k	S
	R20	D0GA563ZA006	56k	
	R23	ERJ2GEJ102	1k	S
	R45	D0GBR10JA113	0.1	
	R51	ERJ2GEJ103	10k	S
	R52	ERJ2GEJ103	10k	S
	R53	ERJ2GEJ332	3.3k	S
	R54	ERJ2GEJ331	330	S
	R55	ERJ2GEJ331	330	S
	R61	ERJ2GEJ102	1k	S
	R76	ERJ2GEJ1R0	1	S
	R77	ERJ2GEJ1R0	1	S
			(CAPACITORS)	
	C1	EEE0JA221WP	220	
	C5	ECUV1C104KBV	0.1	
	C6	ECUV1C104KBV	0.1	
	C11	ECUE1A104KBQ	0.1	
	C12	ECUV0J225KBV	2.2	
	C13	ECUE1A104KBQ	0.1	

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20				
Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	C15	ECUE1H390JCQ	39p	
	C19	ECUE1H102KBQ	0.001	
	C22	ECUE0J105KBQ	1	
	C29	ECUE0J105KBQ	1	
	C30	ECUV1A105KBV	1	
	C36	ECUE1H390JCQ	39p	
	C41	ECUE1A104KBQ	0.1	
	C43	ECUE1H100DCQ	10p	
	C44	ECUE1A104KBQ	0.1	
	C45	ECUE1A104KBQ	0.1	
	C46	ECUE1H100DCQ	10p	
	C47	ECUE0J105KBQ	1	
	C52	ECUE0J105KBQ	1	
	C53	ECUV1A225KBV	2.2	
	C55	ECUE1H100DCQ	10p	
	C56	ECUE0J105KBQ	1	
	C57	ECUE1A104KBQ	0.1	
	C59	ECUE0J105KBQ	1	
	C69	ECUE1A104KBQ	0.1	
	C70	ECUE1H680JCQ	68p	
	C71	ECUE1H680JCQ	68p	
	C78	ECUE1H222KBQ	0.0022	
	C79	ECUE1H222KBQ	0.0022	
	C91	ECUV1C105KBV	1	
	C92	ECUV1C105KBV	1	
	C93	ECUV1C105KBV	1	
	C94	ECUV1C105KBV	1	
	C95	ECUV1C105KBV	1	
	C96	ECUE0J105KBQ	1	
	C98	ECUE1H100DCQ	10p	
	C99	ECUE1H100DCQ	10p	
	C190	ECUE1A104KBQ	0.1	
	C191	ECUE0J105KBQ	1	
	C859	ECUE1H100DCQ	10p	
	C860	F1G1H1R1A765	CERAMIC CAPACITOR	
	C862	F1G1H1R5A765	CERAMIC CAPACITOR	
	C863	F1G1H1R8A765	CERAMIC CAPACITOR	
	C866	ECUE1A104KBQ	0.1	
			(OTHERS)	
	E101	L5DYBYY00067	LIQUID CRYSTAL DISPLAY (*3)	
	E102	PNHR1950Z	PLATE, LCD	
	E103	PNHX1761Z	COVER, LCD	
	E104	PNHR1949Z	GUIDE, LCD	
	E105	PNJT1142Z	CHARGE TERMINAL (L)	
	E106	PNJT1143Z	CHARGE TERMINAL (R)	
	E107	PNVE1015Z	BATTERY TERMINAL	
	E108	PQHG10729Z	RUBBER PARTS	
⚠	F1	K5H252Y00002	FUSE	
	MIC100	L0CBAY000053	BUILT IN -MICROPHONE	
	X1	H0J103500039	CRYSTAL OSCILLATOR (*2)	
	ZA1	PNMC1091Z	MAGNETIC, SHIELD	

15.5.3. Charger Unit

15.5.3.1. Cabinet and Electrical Parts

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	200	PNLC1042ZB	CHARGER UNIT ASS'Y without NAME PLATE (RTL) (for Black Version)	
	200	PNLC1042ZS	CHARGER UNIT ASS'Y without NAME PLATE (RTL) (for Silver Version)	
	200-1	PNKM1479Z1	CABINET BODY (for Black Version)	PS-HB
	200-1	PNKM1479Y2	CABINET BODY (for Silver Version)	PS-HB
	200-2	PNJT1148Z	CHARGE TERMINAL	
	200-3	PNKF1280Z1	CABINET COVER (for Black Version)	PS-HB

KX-TGC210/KX-TGC212/KX-TGC213/KX-TGC220/KX-TGC222/KX-TGCA20

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	200-3	PNKF1280Z4	CABINET COVER (for Silver Version)	PS-HB
	200-4	PQHA10023Z	RUBBER PARTS, FOOT CUSHION	
	200-5	PNJJ021001Z	JACK, MODULAR	
	201	PNGT8725Z	NAME PLATE (for KX-TGC212HKS/KX-TGC212MLS)	
	201	PNGT7662Z	NAME PLATE (for KX-TGC212UES, KX-TGC213UES, KX-TGC222UES)	

15.5.4. Accessories and Packing Materials

Note:

(*1) You can download and refer to the Operating Instructions (Instruction book) on TSN Server.

15.5.4.1. KX-TGC210BL, KX-TGC212BL, KX-TGC213BL, KX-TGC222BL, KX-TGC210CX, KX-TGC212CX, KX-TGC210TU, KX-TGC210BX, KX-TGC212BX, KX-TGC220BX, KX-TGC222BX,

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	A105	PNQW4164Z	LEAFLET, TRA (for KX-TGC210UE) (*1)	
	A106	PNQW4162Z	QUICK GUIDE (ARA) (for KX-TGC210UE) (*1)	
	P101	PNPK3787022Z	GIFT BOX (for KX-TGC210HK, KX-TGC210TW, KX-TGC210ML)	
	P101	PNPK3787020Z	GIFT BOX (for KX-TGC210UE)	
	P102	PNPD1853Z	PAD	
	P103	PQPP10152Z	PROTECTION COVER (for Base) (for KX-TGC210HK, KX-TGC210UE, KX-TGC210ML)	
	P104	XZB08X25B02	PROTECTION COVER (for Handset) (for KX-TGC210HK, KX-TGC210UE, KX-TGC210ML)	
	P105	PNQA5983Z	LABEL, APPROVAL (for KX-TGC210HK)	
	P105	PNQA5968Z	LABEL, TRA (for KX-TGC210UE)	
	P105	PNQA3594Z	LABEL, IMPORTER (for KX-TGC210ML)	

15.5.4.3. KX-TGC212HK, KX-TGC212TW, KX-TGC212UE, KX-TGC212ML

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A1	PNLV226CE0Y	AC ADAPTOR (for base unit) (for KX-TGC210/212/213/222BL, KX-TGC210TU)	
	A2	PQJA10075Z	CORD, TELEPHONE	
⚠	A3	PNLV233CEKZ	AC ADAPTOR (for Charger Unit) (for KX-TGC212/213/222BL)	
	A4	PNJS041037Z	PLUG, TELEPHONE (for KX-TGC210/212/213/222BL)	
⚠	A5	PNLV226BX0Z	AC ADAPTOR (for base unit) (for KX-TGC210/212CX, KX-TGC210/212/220/222BX)	
⚠	A6	PNLV233BXKZ	AC ADAPTOR (for Charger Unit) (for KX-TGC212CX, KX-TGC212BX)	

15.5.4.2. KX-TGC210HK, KX-TGC210TW, KX-TGC210UE, KX-TGC210ML

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A101	PNLV226EZ	AC ADAPTOR (for base unit) (for KX-TGC210HK, KX-TGC210UE) (for KX-TGC210ML)	
⚠	A101	PNLV226TWZ	AC ADAPTOR (for base unit) (for KX-TGC210TW)	
	A102	PQJA10075Z	CORD, TELEPHONE	
	A103	PNJA1037Z	PLUG, TELEPHONE (for KX-TGC210HK)	
	A104	PNQX6628Z	INSTRUCTION BOOK (for English) (for KX-TGC210HK) (*1)	
	A104	PNQX6634Z	INSTRUCTION BOOK (for English) (for KX-TGC210TW) (*1)	
	A104	PNQX6630Z	INSTRUCTION BOOK (for English) (for KX-TGC210UE) (*1)	
	A104	PNQX6626Z	INSTRUCTION BOOK (for English) (for KX-TGC210ML) (*1)	
	A105	PNQX6629Z	INSTRUCTION BOOK (for Chinese) (for KX-TGC210HK) (*1)	

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A201	PNLV226EZ	AC ADAPTOR (for base unit) (for KX-TGC212HK, KX-TGC212UE, KX-TGC212ML)	
⚠	A201	PNLV226TWZ	AC ADAPTOR (for base unit) (for KX-TGC212TW)	
⚠	A202	PNLV233EKZ	AC ADAPTOR (for Charger Unit) (for KX-TGC212HK, KX-TGC212UE, KX-TGC212ML)	
⚠	A202	PNLV233TWKZ	AC ADAPTOR (for Charger Unit) (for KX-TGC212TW)	
	A203	PQJA10075Z	CORD, TELEPHONE	
	A204	PNJA1037Z	PLUG, TELEPHONE (for KX-TGC212HK)	
	A205	PNQX6628Z	INSTRUCTION BOOK (for English) (*1) (for KX-TGC212HK)	
	A205	PNQX6634Z	INSTRUCTION BOOK (for English) (*1) (for KX-TGC212TW)	
	A205	PNQX6630Z	INSTRUCTION BOOK (for English) (*1) (for KX-TGC212UE)	
	A205	PNQX6626Z	INSTRUCTION BOOK (for English) (*1) (for KX-TGC212ML)	
	A206	PNQX6629Z	INSTRUCTION BOOK (for Chinese) (*1) (for KX-TGC212HK)	
	A206	PNQW4164Z	LEAFLET, TRA (for KX-TGC212UE) (*1)	
	A207	PNQW4162Z	QUICK GUIDE (ARA) (for KX-TGC212UE) (*1)	
	P201	PNPK3794016Z	GIFT BOX (for KX-TGC212HK, KX-TGC212TW, KX-TGC212ML)	
	P201	PNPK3794015Z	GIFT BOX (for KX-TGC212UE)	
	P202	PNPD1854Z	PAD	
	P203	PQPP10152Z	PROTECTION COVER (for Base) (for KX-TGC212HK, KX-TGC212UE)	
	P204	XZB08X25B02	PROTECTION COVER (for Handset) (for KX-TGC212HK, KX-TGC212UE)	
	P205	XZB13X19C03	PROTECTION COVER (for Changer) (for KX-TGC212HK, KX-TGC212UE)	

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	P206	PNQA5983Z	LABEL, APPROVAL(for KX-TGC212HK)	
	P206	PNQA5968Z	LABEL, TRA (for KX-TGC212UE)	
	P206	PNQA3594Z	LABEL, IMPORTER (for KX-TGC212ML)	

15.5.4.4. KX-TGC213UE

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A301	PNLV226EZ	AC ADAPTOR (for base unit)	
⚠	A302	PNLV233EKZ	AC ADAPTOR (for Charger Unit)	
	A303	PQJA10075Z	CORD, TELEPHONE	
	A304	PNQX6630Z	INSTRUCTION BOOK (for English) (*1)	
	A305	PNQW4164Z	LEAFLET, TRA (*1)	
	A306	PNQW4162Z	QUICK GUIDE (ARA) (*1)	
	P301	PNPK3804011Z	GIFT BOX	
	P302	PQPP10152Z	PROTECTION COVER (for Base)	
	P303	XZB08X25B02	PROTECTION COVER (for Handset)	
	P304	XZB13X19C03	PROTECTION COVER (for Changer)	
	P305	PNQA5968Z	LABEL, TRA	
	P306	PNPD1855Z	PAD	
	P307	PNPD1782Z	PAD	

15.5.4.5. KX-TGC220UE

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A401	PNLV226EZ	AC ADAPTOR (for base unit)	
	A402	PQJA10075Z	CORD, TELEPHONE	
	A403	PNQX6630Z	INSTRUCTION BOOK (for English) (*1)	
	A404	PNQW4164Z	LEAFLET, TRA (*1)	
	A405	PNQW4162Z	QUICK GUIDE (ARA) (*1)	
	P401	PNPK3787023Z	GIFT BOX	
	P402	PQPP10152Z	PROTECTION COVER (for Base)	
	P403	XZB08X25B02	PROTECTION COVER (for Handset)	
	P404	PNQA5968Z	LABEL, TRA	
	P405	PNPD1853Z	PAD	

15.5.4.6. KX-TGC222UE

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
⚠	A501	PNLV226EZ	AC ADAPTOR (for base unit)	
⚠	A502	PNLV233EKZ	AC ADAPTOR (for Charger Unit)	
	A503	PQJA10075Z	CORD, TELEPHONE	
	A504	PNQX6630Z	INSTRUCTION BOOK (for English) (*1)	
	A505	PNQW4164Z	LEAFLET, TRA (*1)	
	A506	PNQW4162Z	QUICK GUIDE (ARA) (*1)	
	P501	PNPK3794017Z	GIFT BOX	
	P502	PQPP10152Z	PROTECTION COVER (for Base)	
	P503	XZB08X25B02	PROTECTION COVER (for Handset)	
	P504	XZB13X19C03	PROTECTION COVER (for Changer)	
	P505	PNQA5968Z	LABEL, TRA	
	P506	PNPD1854Z	PAD	

15.5.5. Screws

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
	A	XTB26+8GFJ	TAPPING SCREW	
	B	XTB2+8GFJ	TAPPING SCREW	

15.5.6. Fixtures and Tools

Note:

(*1) See **Equipment Required** (P.51) and **The Setting Method of JIG (Handset)**(P.54).

(*2) When replacing the Handset LCD, See **How to Replace the Handset LCD** (P.50).

Safety	Ref. No.	Part No.	Part Name & Description	Remarks
		PNZZTGC220BL	BATCH FILE CD-ROM (*1) (for BL)	
		PNZZTGC210CX	BATCH FILE CD-ROM (*1) (for CX)	
		PNZZTGC210HK	BATCH FILE CD-ROM (*1) (for HK)	
		PNZZTGC210TU	BATCH FILE CD-ROM (*1) (for TU)	
		PNZZTGC210TW	BATCH FILE CD-ROM (*1) (for TW)	
		PNZZTGC220BX	BATCH FILE CD-ROM (*1) (for BX)	
		PNZZTGC220UE	BATCH FILE CD-ROM (*1) (for UE)	
		PNZZTGC210ML	BATCH FILE CD-ROM (*1) (for ML)	
		PQZZ430PIR	TIP OF SOLDERING IRON (*2)	
		PQZZ430PRB	RUBBER OF SOLDERING IRON (*2)	
		PQZZ1CD300E	JIG CABLE (*1)	