CMD-MZ5

SERVICE MANUAL

AEP-Model
UK-Model

SPECIFICATIONS

Signalling format	Dual-Band
Frequency range	E-GSM 900 MHz, Transmit: 880 ~ 915 MHz
	Receive: 925 ~ 960 MHz
	DCS 1800 MHz, Transmit: 1710 ~ 1785 MHz
	Receive: 1805 ~ 1880 MHz
GSM power class	Class 4 (2W)
DCS power class	Class 1 (1W)
SIM chip	Pluggable mini SIM card
Display	High resolution full graphics display
	Resolution: 96 x 72 pixels
	Graphic Icons
	5 lines x 12 (normal font numeric) charactors
Channel spacing	200 kHz
Number of channels	E-GSM: 174
	DCS : 374
Frequency stability	Transmit frequency drift (synchronized)
	$< \pm 0{,}1$ p.p.m
RF output power	GSM: 2W
	DCS : 1W
Battery life	Standby : 30h - 130h
	Talk time : 1h30 - 3h40

PORTABLE DIGITAL CELLULAR TELEPHONE
WITH ACCESSORIES

SONY®

Power requirements	4.0 V (nominal)	
Operating temperature	-10°C to +55°C	
Accessories operating temperature	± 0°C to +45°C	
Battery pack charging temperature	± 0°C to +40°C	
Dimensions	90 x 50 x 30 mm	
Weight	110 g (with Battery)	
Supplied accessories	AC Adapter	QN-2TC
	AC Cable	Europe
		UK
	Battery Pack	A-3627-234-A
	Desktop Charger	1-476-508-11
	Headphones	1-542-459-11
	Remote with Microphone	1-476-509-11
	Memory Stick	A-7094-682-A
	Carry Bag	3-230-059-01
	Optical Audio Cable	1-757-888-11
	Analog Audio Cable	1-823-050-11
Optional accessories	Cigar Lighter Charger	QN-2CC
	Handsfree kit	QN-MZ5HFK
	EasyCom (SoftModem)	QN-2EC
	PC-Card	QN-2PCM
	Travel Charger	QN-2TC

Design and specifications are subject to change without notice.
This equipment complies with the essential requirements of the Directive 1999/5/EC Radio and Telecommunications Terminal Equipment Directive.

NOTE
This device contains electrostatically sensitive components. Damage can occur to these components if the appropriate handling is not adhered to.

ESD Handling precautions:

A working area in which Digital Cellular Telephones may be safely handled without undue risk of damage from electrostatic discharge must be available.

The area must be equipped as follows:

➢ All working surfaces must have a dissipative bench mat, safe for use with live equipment, connected via 1.2MΩ resistor to a common ground point.
➢ A quick release skin contact device with a flexible cord, which has a built-in safety resistor of a range between 5.2KΩ and 1.2MΩ shall be used. The flexible cord must be attached to a dissipative earth point.
➢ All containers and storage must be of the conductive type.

CAUTION
Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type recommended by the manufacturer.
Discard used batteries according to the manufacturer's instructions.

ADVARSEL!
Lithiumbatteri-Eksplosionsfare ved fejlagtig håndtering.
Udskiftning må kun ske med batteri af samme fabrikat og type.
Levér det brugte batteri tilbage til leverandøren.

ADVARSEL
Eksplosjonsfare ved feilaktig skifte av batteri.
Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten.
Brukte batterier kasseres i henhold til fabrikantens instruksjoner.

VARNING
Explosionsfara vid felaktigt batteribyte.
Använd samma batterityp eller en likvärdig typ som rekommenderas av apparattillverkaren.
Kassera använt batteri enligt gällande föreskrifter.

VAROITUS
Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

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SECTION 2
GENERAL DESCRIPTIONS

2.1 Multi-band :

CMD-MZ5 support E-GSM 900 and DCS 1800 multi-band functionality.

Because the usage of multi-band depends on network capabilities, the phone is able to operate as a single band mobile in GSM 900 as well as in DCS 1800; In addition, it supports the extra functionality required for multi-band mobile stations: Inter-band/"seamless" hand-over, channel assignment, cell selection and re-selection, all between both bands within a **P**ublic **L**and **M**obile **N**etwork.
The manual and automatic PLMN selection in both bands is given.

The user does not need any special action to use the multi-band functionality of the phone.
Users are able to manually roam between PLMN's operating in GSM 900 and DCS 1800 bands.

The CMD-MZ5 is a phase II, GSM 900 class 4, DCS 1800 class 1 mobile phone.
The nominal maximum output power for GSM 900 is 2W, for DCS 1800 1W.

2.2 Real Time Clock (RTC)

The real time clock is integrated into phone.

When the mobile is switched on the RTC is powered via the CPP.
When the phone is powered down, the RTC is powered from the main battery via its own low quiescent current regulator.
When the main battery is low or removed, a back-up battery keeps the clock alive.

2.3 Vibra Alert Functionality

The vibrator is a 1.3V device.

A general port pin of the SC1 controls the switch mode of the vibration motor. It is powered through a regulator by an interface control unit. If the mobile is in the phase of switching on or off the vibrator is off at all times.

2.4 Battery Safety

The battery pack contains a safety circuitry. The charging circuitry and the safety circuitry together guarantee a double fail-safe battery pack. This means that each component can be either short or open and still all the safety requirements will not be violated.

The safety concept protects against:
Over voltage: The charging is stopped when Battery Voltage (Vbat) reaches 4.24V- 4.3V. The charging resumes when Vbat falls below 4.06V - 4.15V.

Under voltage: When the cell voltage drops below 2.5V - 2.7V the cell is disconnected for discharging.
Charging is still possible.

2.5 Battery Charging

Standard Battery   620mAh typical   Li-ion 1-476-508-11

The phone can be charged even during making phone calls.
However, the shortest charging time will be reached when the phone is switched off.

2.6 Accessory Interface

The table explains what kind of pins the phone supplies to the different accessories.

Pins	GND 18	Charge 1/2	ACC Power 3	Audio IN 14	Audio Out 13	ACC ID 11	ACC Detect 6	TX (OUT) 9	RX (IN) 10	Audio GND 12	RF GND 19/22	RF 20
AC-Adapter (QN-2TC)	√	√										
CLC (QN-2CC)	√	√										
Desktop Charger (1-476-508-11)	√	√										
HFK (QN-MZ5HFK)	√	√	√	√	√	√	√			√	√	√
PCMCIA (QN-2PCM)	√		√			√	√	√	√			
EasyCom (QN-2EC)	√		√			√	√	√	√			

Connector layout

Connector view from base of phone
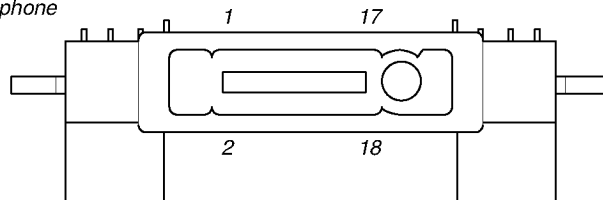
The Connector comprises the following pins:

Detection:
The detection of accessory is done by the charge pin and the detect pin.
Any accessory with an active charge will wake up the phone, indicating the battery icon but cannot be operated.
The insertion and removal of the charger (Cigar Lighter Charger, Desktop-Charger, AC-Charger) is detected by the charge voltage.
The insertion and removal of other accessory is detected via an Interrupt. This detection is only possible when the phone is powered up.

ID:
The ID pin indicates what kind of accessory is connected.

ACC power:
ACC-power has different functionality with different accessories. ACC-power supplies will be used as a signaling pin for the Hands Free Kit.
In the car-kit environment the ext. Vbat indicates that a phone call is accepted/in progress. This information is used by the car-kit to power up the audio section of the car-kit, mute the car stereo and keep the car-kit powered up even when the ignition is switched off.

RX and TX:
This is the communication interface to the PCMCIA card "QN-2PCM" or the PC-link cable "QN-2EC".

Audio In and Audio Out
These pins build the audio interface to the Head-Set and the Hands Free Kit.
Audio IN:
To limit the noise which is coupled on the Mic-line, the Mic amplifier in the Hands Free Kit "QN-MZ5HFK".
Audio OUT:
The single ended output delivers 350mV into a 10kW load.

2.7 RF Antenna connector / antenna switch

To connect an external antenna for accessory use, the CMD-MZ5 contains a stable RF connector with an integrated mechanical switch. This connector is placed on the I/O connector. The integrated mechanical switch switches between the helix antenna and the external RF antenna connection. The switching criterion is mechanical pressure from the RF accessory connector.

2.8 Languages

The CMD-MZ5 supports the following languages:

• Dutch	• German	• Spanish
• English	• Italian	
• French	• Portuguese	

2.9 Memory stick

● You can record sound data onto the memory stick at the bitrate of 132kbps, 105kbps and 66kbps by Optical input or Analog input.

● Receiving an incoming call is stopped during recording sound (to keep good sound quality).

● You can playback sound data recording onto the memory stick

● The Play Settings function allows you to select how to play back such as Bass, AVLS, and Repeat (Shuffle).

● Selecting the next track, the previous track, going forward, backward and stop are available.

● When you receive an incoming call during playback, playback is stopped automatically and the Ringer is heard from the headphones. An incoming call is received with pressing the answering / ending call button on the remote.

● To end, keep the answering / ending call button on the remote pressed.

● Playback sound can be stopped by pressing the answer / ending call button on the remote during playback.

● Also, to start playback, press the answer / ending call button on the remote.

● When WAP is being used, you can not playback sound recorded onto the memory stick.

SECTION 3
AVAILABLE ACCESSORIES

3.1 Hands Free Kit

The Hands Free Car Kit QN-MZ5HFK is designed to offer superior speech quality and Full Duplex speech transmission. In Full Duplex operation both parties can speak simultaneously. The cradle secures a safe hold of the phone. The Car Kit has a RF connector for the use of an external antenna to offer a high quality radio link to the base station.

Specifications:
Input voltage   DC 12V, negative ground
Rated output voltage   5.0V
Rated output current   500mA

3.2 Cigar Lighter Charger

The QN-2CC Cigar Lighter Charger is an additional charging option or alternative for the standard charger and only for use in vehicles equipped with a 12 volt negative ground electrical system. This Charger is intended for charging purposes only and not for making/receiving phone calls in the car.

Charging Time:
Full charging can take up to ~3 hours, but will be longer if the CMD-MZ5 is switched on or if the temperature is outside the 0°C - 45°C operating range.

Specifications:
Input voltage   DC 12V, negative ground
Rated output voltage   5.0V
Rated output current   500mA
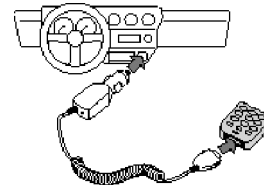
3.3 AC Adapter

The Power Adapter QN-2TC is a small and lightweight device. It has a full Input Voltage Range from 110-240Volts. Using a standard cable makes the connection to the main socket.

Specifications:
Input voltage   110 to 240 V
Rated output voltage   5.0V
Rated output current   500mA
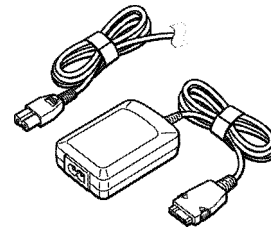
3.4 EasyCom (Soft Modem)

The EasyCom QN-2EC Data Cable connects the phone to a PC via a RS 232 cable. It supports SMS as well as Full Data/Fax Capability 9.6 Kbps. The phonebook management application bundled on the CD can not be used with CMD-MZ5.
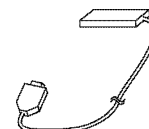This configuration is available for Windows 95/98.
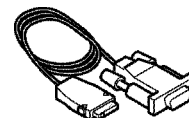
3.5 PCMCIA Card

The functionality of the PC Card QN-2PCM is the same as the Data Cable QN-2EC. But it supports both GSM connections up to 9.6 Kbps and PSTN connections up to 56 Kbps.
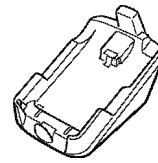For Windows 95, 98, Windows NT, Mac OS.

3.6 Desktop Charger (not for sale by itself)

The desktop charger can charge either the Standard 1-476-508-11 with the phone attached. The Desk Top Charger gets its power supply via the Power adapter QN-2TC.
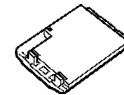
Specifications:
Input voltage   DC 5V
Rated output voltage   5.0V
Rated output current   500mA

3.7 Standard Battery (not for sale by itself)

Specifications:
Lithium Ion Battery   A-3627-234-A (QN-MZ5BPS)
Maximum output voltage   DC 4.2V
Nominal output voltage   DC 4.0V
Capacity   620mAh

3.8 Magic Gate Memory Stick

3.9 Eearphones (1-542-459-11) (not for sale by itself)

Ø 3.5 stereo mini plug

3.10 Remote with Microphone (1-476-509-11) (not for sale by itself)
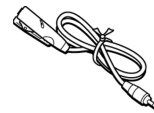
3.11 Optical Cable (1-757-888-11) (not for sale by itself)

3.12 Carry Bag (3-230-059-01) (not for sale by itself)

3.13 Analog Audio Cable (1-823-050-11) (not for sale by itself)
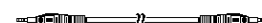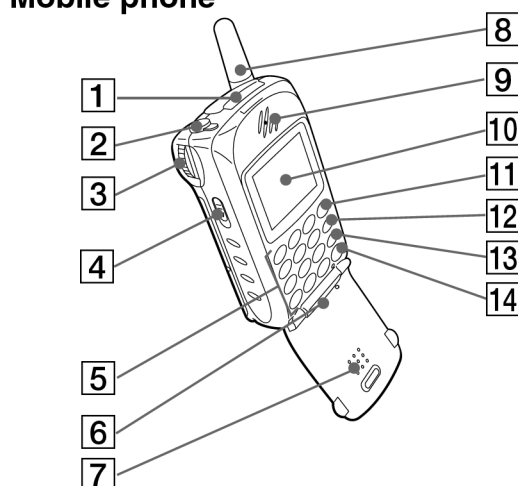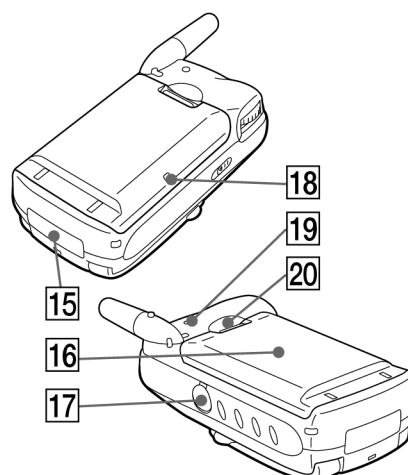
SECTION 4
OPERATING INSTRUCTIONS

This section provides a brief guide to the operation and facilities available on the CMD-MZ5. Refer to the Operating Manual for full operational information.

4.1 Parts and Controls

Mobile phone

1	Memory Stick slot	10	Display
2	Remote with microphone/ headphone jack	11	Send key
3	Advanced Jog Dial	12	Memo key MEMO
4	EJECT lever	13	Clear key C
5	Keys (alphanumeric keys)	14	On/Off key
6	Microphone	15	External connector (Charging and Accessories)
7	Flip	16	Battery pack
8	Antenna	17	LINE IN (OPTICAL) jack
9	Ear piece	18	Charging indicator
		19	Ringer
		20	Battery release hook

MagicGate Memory Stick
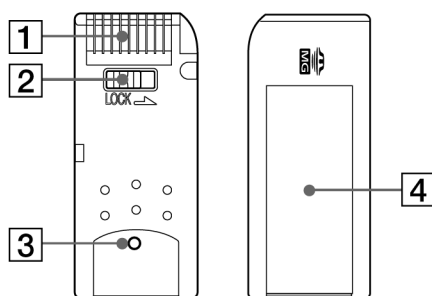
1 Connector

2 Erasure prevention switch

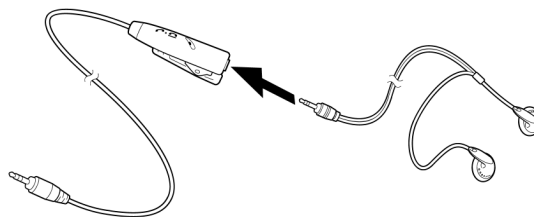3 Distinctive protrusion of "MagicGate Memory Stick"

4 Label space

Remote with microphone
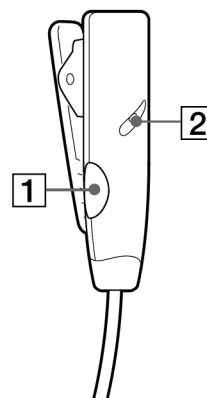
1 Answering/ending call button

2 Microphone

To connect the headphones to the remote

To connect the headphones, plug into the headphone jack on the remote firmly.
No sound will be heard if the connection is loose.

4.2 The Basic Features of the CMD-MZ5

• Flip call

You can answer a call by opening the flip cover.
This feature can be set up by the menu operation.

**Important**

Opening and closing the flip cover may cause the screen to flicker, however this is not a defect.

• Tag window
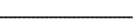
You can still see tags on the display even with the flip cover closed.
Information corresponding to each tag can be displayed. To clear the tag, use ⓒ, Jog Dial, or ☎⓪.

Received SMS To review the details of the received SMS, open the flip cover. Pressing the Jog Dial allows you to see the message. You can then keep (📞) pressed to call back the person who sent the SMS.

Missed call To see the caller's number, open the flip cover. Press (📞) to call the number.

Schedule The first event for the day is displayed from the start of that day. Later events are displayed at their scheduled times. To review the contents of the event, open the flip cover.

Received local area info To display the contents, rotate the Jog Dial.

• Advanced Jog Dial

The Jog Dial provides one-handed operation navigation.
"Jog Dial" in this manual is the "Advanced Jog Dial".

Display Icon	Operation		Function
	Rotate the Jog Dial clockwise or counter-clockwise.		Scrolls through menu options.
	Press the Jog Dial straight into the phone.		Confirms the selected option (highlighted) in the display. Accepts an entry made with keys. Takes incoming calls when the flip cover is closed.
	Keep the Jog Dial pressed.		Dials the phone number selected.
	Press the Jog Dial forward.		Exits from one menu to the previous screen. Also ends a call.
	Press the Jog Dial backward.		Opens the "pop up menu". Also opens help.

• Phonebook

You can open the Phonebook from standby mode by rotating the Jog Dial.
You can easily make a call from the Phonebook or a variety of other operations including searching by Group and saving such information as e-mail addresses.

• Memo/Answering machine

In standby mode
  • To listen to the Voice memo — press (MEMO)
  • To record your voice — keep (MEMO) pressed
  • To open the Answering machine menu — keep (2 ABC) pressed
  • To turn on your Answering machine to accept all calls when the flip cover is closed — keep the Jog Dial pressed
When receiving a call
  • To turn on your Answering machine — press (MEMO)
During a call
  • To record the conversation — press (MEMO)

• Manner mode

You can set the Manner mode by pressing the Jog Dial backward while in the standby mode when the flip cover is closed. Select the following icon and press the Jog Dial:
  • [icon] — Silent
  • [icon] — Vibra alert only
  • [icon] — Single beep
  • [icon] — Manner off

• Voice mail

To speed dial your Voice mail, keep (1 ∞) pressed to automatically dial your "Personal answering service" to listen to messages, etc.

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4.3 Icon Glossary

Your phone lets you see at a glance if you have missed calls, have messages waiting and the status of options you have selected (for example if you have diverted your phone or turned the ringer off). Sony has developed the following icons to provide you with a quick overview of your mobile activity:

Status

Icon	Explanation
	Network signal strength
	Battery strength (flashing=battery level low)
	SMS message waiting (flashing=message storage full)
	Answering machine notification
	Answering machine on
	Network voice mail
	Active call
	Network not available (no calls possible)

Icon	Explanation
	Divert option activated
	Missed call
	Barring service in/out activated
	Barring service out activated
	Barring service in activated
	Alarm
	Ringer ➔ Vibra alert
	Vibra alert ➔ Ringer
	Vibra alert on

Manner

Icon	Explanation
	Silent
	Single beep

Icon	Explanation
	Vibra alert only
	Ringer off

Function

Icon	Explanation
	Go to
	Search
	Help notification

Icon	Explanation
	View
	Paste
	T9 (Text editing system)

4.4 Menu Overview

Your phone has two menus; Main menu and Extras menu. The Main menu manages the functions related to the phone and the Extras menu manages the functions related to The Music, Browser, E-mail, Games and MS viewer.

Main menu

Press the Jog Dial from standby mode to access the Main menu:

Messages

Read
Create
Settings
Local area info

Ringer

Ringer
Vibra alert
Manner mode

Schedule

Phonebook

Clock

Alarm
Timer
World clock
Time signal
Clock format
Analogue
Auto power off
Set the day/time

Memo

Voice memo box
Record voice
Answering machine
Capture

Settings

Preferences
Security
Call time, cost
Call settings

Call history

Calculator

Rate conversion

Divert

All calls
If not reachable
If no reply
If busy
All fax
All data
Cancel all

Extras menu

Press the Jog Dial backward from standby mode to access the Extras menu:

Browser
    Home
    Favourites
    Settings

Music
    Playing back sound data

    List of Titles
        Play
        Edit
        Delete

    Play settings
        Bass
        Repeat
        AVLS
        Format stick

    To start recording

    Rec settings
        Bitrate
        Sync. record
        Auto track mark

    Stick Info

E-mail
    Reading
    Writing
    Settings

Games
    Disk golf
    Mole hitting
    Clay shooting
    Sport fishing

MS viewer
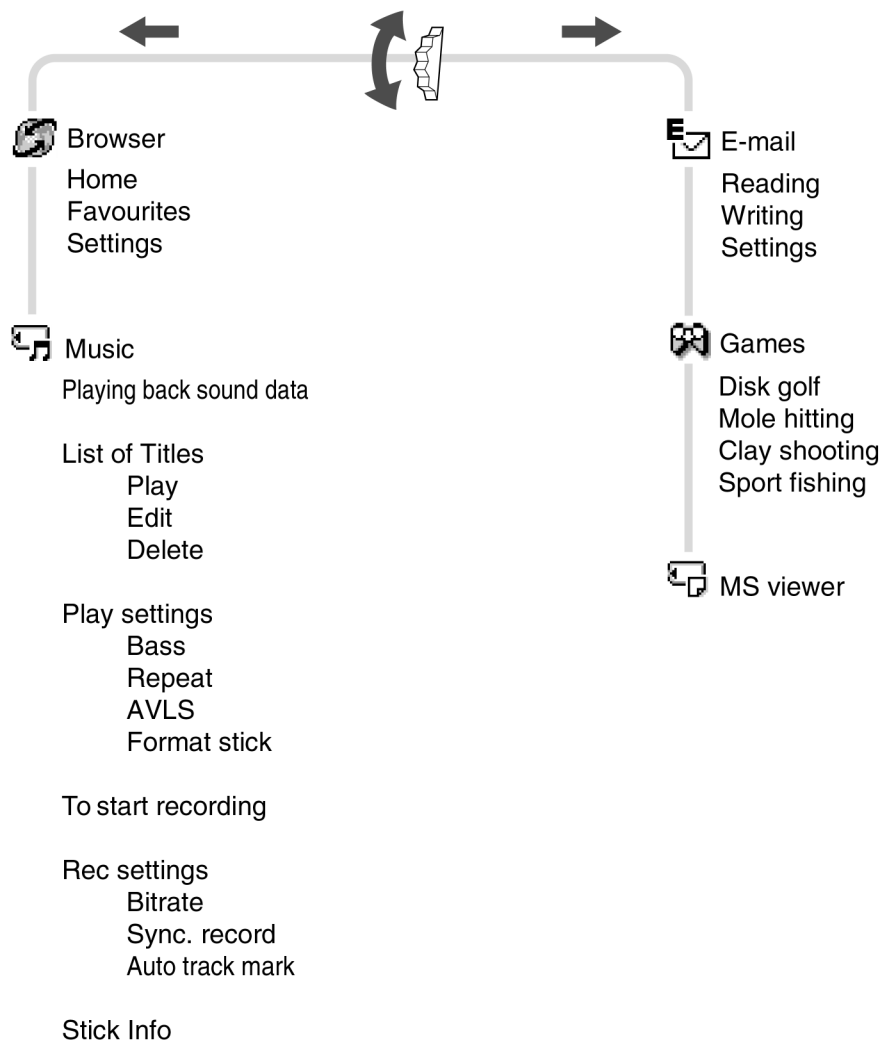
SECTION 5
DISASSEMBLING / TESTING

5.1 Disassembly
IMPORTANT NOTE :

The IMEI Sticker mounted on the MS board (visible from the battery compartment) should not be removed at all.
The IMEI number is the electronic identification of the hardware, and it is stored electronically.
There should be no discrepancy between the number on the sticker and the number within the set logic allowed.

Follow the disassembly procedure in the numerical order given.

CABINET (FRONT) SUB ASSY

❶ *two screws*

❻ *key pad*

❷ *three claws*

❺ *cabinet (front) sub assy*

❷ *three claws*

LCD

❹ *claw*

❹ *LCD*

❶ *two claws*

❸ *flexible board (CN105)*

❶ *two claws*

CN105

MEMORY STICK CONNECTOR

❹ two screws (1.4X3.5)

❺ screw (1.4X3.5)

❻ earphone holder

❼ memory stick connector

❸

❷ OPT cover

❶ earphone cover

BOARD ASSY

ground terminal point of contact

cushion (vibra-motor)

Note 1: Do not touch the ground point of contact
on the flex PWB, ass'y.
Note 2: Do not make the ground point of contact
get into the cushion (vibra-motor).
Note 3: Clean the ground point of contact
with alcohol by cotton fixed to a stick
when it is touched by greasy hands.

❹

❺ board assy

❶ connector cover

❸

❷ two claws

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SHIELD ASSY

❷ *claw*

❷ *claw*

❸ *flexible board*

❶ *connector (CN409)*

❹ *shield assy*

MS BOARD, MAIN BOARD

❹ *three claws*

❻ *main board*

❸ *claw*

❹ *two claws*

IMPORTANT:
Do not detach the shield case from the main board.

❷ *two claws*

❺ *MS board*

❶ *two screws*
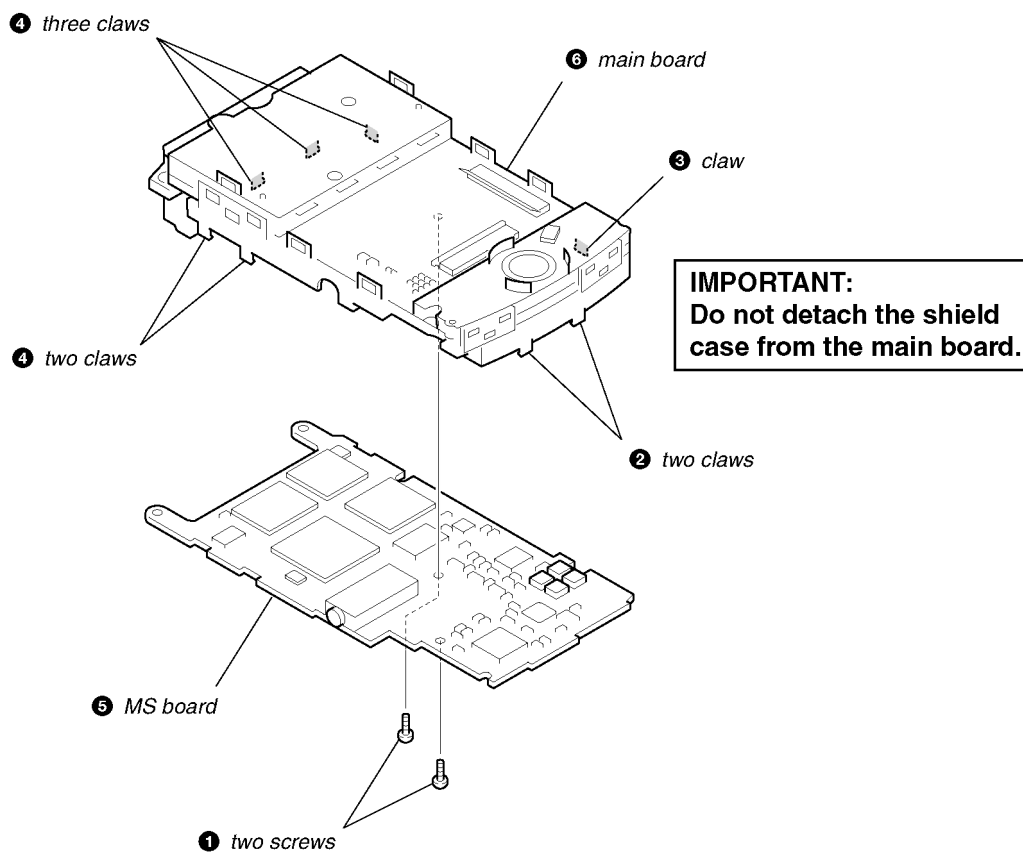
Re-assembly procedure :

To re-assemble the unit, apply the reverse order of the above mention disassembly procedure.

5.2 Interface to GSM-Tester

Test Set Up for CMD-MZ5 Level 1 Testing

**CMD-MZ5
+
Battery Pack
+
Test SIM Card**

Service Test Connector

RF output :
SMA plug*

STC-02 Part No.
1-792-726-11

RF input Connector *

GSM – TESTER

This unit acts as a base station providing all the necessary GSM signalling requirements and provides GSM signal measuring facilities as well.
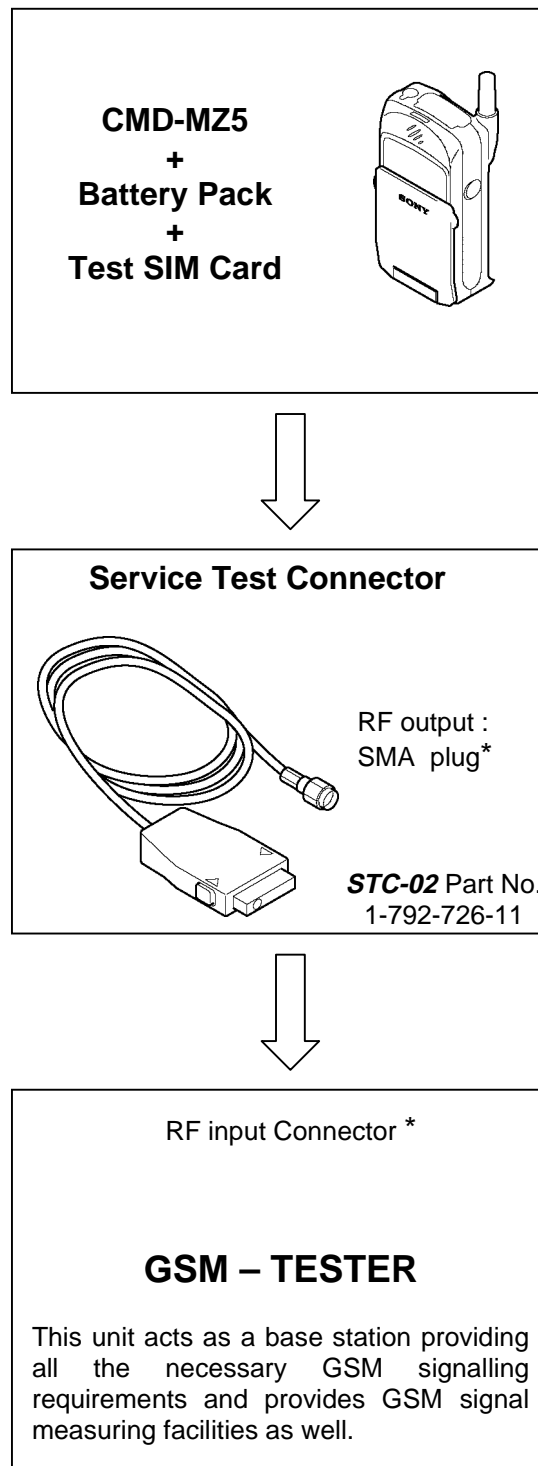
* Use special RF-Adapter for connection of **STC-02** to your GSM–Tester !

Level Test Procedure with GSM TESTER recommendation:

- Simulate GSM call processing – to check the functionality of transmitting and receive audio signals of loudspeaker and microphone.
- Basic GSM transmission & reception parameter testing – to ensure that handset's performance compiles with standard GSM specification.

5.3 Jigs & Tools

Description		Part No	Remark
DATA TRANSFER JIG	*DTJ-01*	1-792-172-11	Necessary For Software Update
HOOK RELEASE JIG		3-043-180-01	For Housing Opening
SERVICE TEST CONNECTOR	*STC-02*	1-792-726-11	For Connection To GSM Measure Equipment
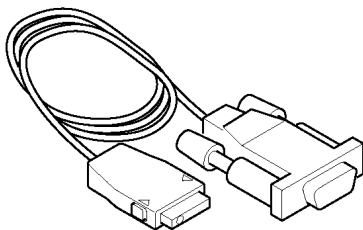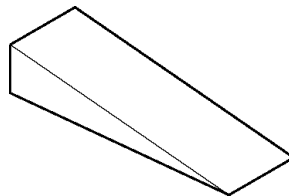
HOOK RELEASE JIG
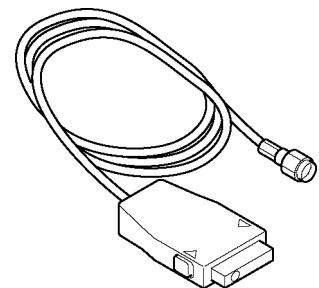
DATA TRANSFER JIG

SERVICE TEST CONNECTOR

SECTION 6
PROGRAMMING INSTRUCTIONS

6.1 Requirement

- PC (486 type or higher) with Microsoft "Windows" Operating System
- One COM-port free for usage
- The Data Transfer Jig (unit: p/n 1-792-172-11)

PREPARATION FOR SOFTWARE UPDATE
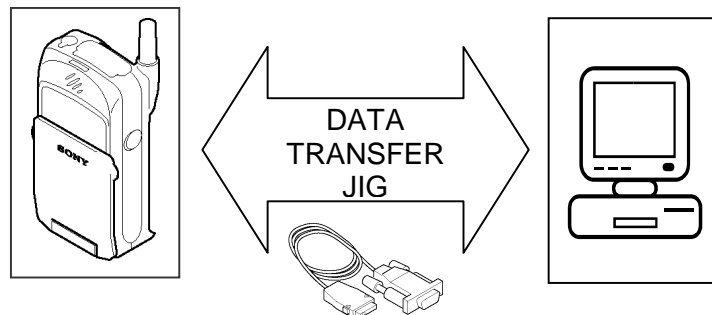
DATA
TRANSFER
JIG

6.2 Hardware set-up

- Copy all the files to the PC (define own directory).
- Connect the Data Transfer Jig to the PC COM-port (COM 1 or COM 2) and the CMD-MZ5 external connector.
- Attach battery pack to CMD-MZ5; the CMD-MZ5 is powered up from the battery pack.
- The initial settings of the flash.exe program may not correspond with the normally correct settings. It is highly advisable to check the settings first (see 6.3 Software set-up).

6.3 Software set-up

6.3.1 ∗ *Download Software to Mobile (Software Update)*

- Start the program flash.exe by double-clicking on its icon in the Windows Explorer.   MZ5 Flash.exe

- Check if the settings for the "Com Port", "Speed" and "Load Option" are correct.

Com Port :	COM 1
Baud Rate :	115200
Load Option :	**DOWNLOAD TO MOBILE**
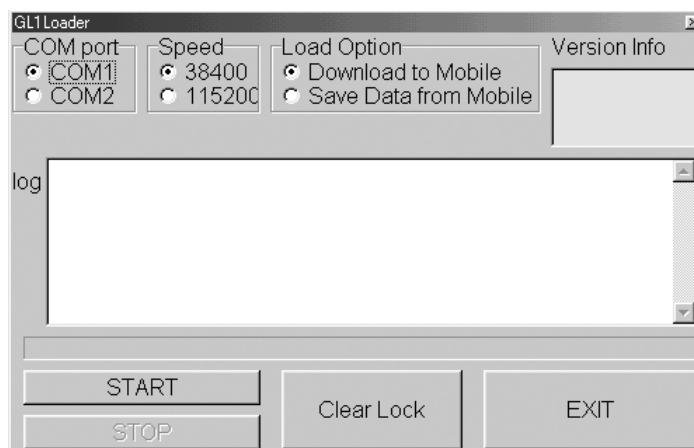
Settings can be saved to "flash.ini" in the windows directory.

- Click on "Start" and select an SRE file for downloading.
    - The CMD-MZ5 software is located in the MZ5. SRE file.

    - Any other SRE file is either only needed for the program itself, or can be a personal data file (see below).

    There are 3 kinds of SRE files: - "MZ5.sre" for actual software download
    - "xxx.sre" for personal data download (see blow)
    - " flash.sre" is an application software (do not use / modify)

    - Flash erase area is automatically calculated with the contents of the life.

- Switch on the CMD-MZ5.

- Now the program run automatically.

6.3.2 ∗ *Save Personal Data in Mobile*

The set-up and all requirements for this data transfer are the same as for the software update.

- Check if the settings for the "Com Port", "Speed" and "Load Option" are correct.

Com Port :	COM 1
Speed :	115200
Load Option :	***SAVE DATA FROM MOBILE***

- Click on "Start"

- Select or input file to save data.

- Switch on the CMD-MZ5.

- Save read data in the selected file.

The read data can be downloaded to the Mobile with this loader as described above.

SECTION 7
DIAGRAMS

7.1 RF Block

7.1.1 Block Diagram

7.1.2 Operational Description

(1) Receiver Section

Radio signals received from the antenna located on the top of cabinet enter the RF connector of common connector (CN401) provided at the bottom of cabinet.
After they are separated from the signals coming from external units by a mechanical switch, they enter the antenna switch module (CP702). This module separates the signals transmitted/received to/from the antenna by means of the switch, and also selects GSM or DCS band. The received signals are separated here into GSM side and DCS side.
The received signals in the GSM band pass through the band-pass filter (SWF702) from CP702 to remove the signals out of the receiving band. Then, the received signals are amplified in the low-noise amplifier using the transistor (Q702).
Further, the band-pass filter (SWF704) removes unnecessary signals out of the band.
The SWF704 output signals are balanced signals. Thus, the signals from band-pass filter can be entered as balanced signals to the subsequent RF IC IC604 having a balanced input system.
Similarly, the received signals in the DCS band pass through the band-pass filter (FL701) from CP702 to remove the signals out of the receiving band. Then, the received signals are amplified in the low-noise amplifier using the transistor (Q701), and further the band-pass filter (SWF703) removes unnecessary signals out of the band. Same as in GSM band, the SWF703 output signals are also balanced signals, so that they can be entered to the IC604 as they are. FL701 is a dielectric filter, while SWF702 to SWF704 are all SAW filters.
To prevent characteristic deterioration due to bias point fluctuation at high temperature, the Q701 and Q702 detect current flowing in the transistors using signals at pins 37 to 39 of IC604 and perform the feedback control so that the current flowing in the transistors is constant at all times.
Respective input signals in GSM and DCS bands entered to the IC604 are entered to the receiving mixer in the IC604. They are mixed with local signals from VCO601 in the mixer and converted into IF signals in the 440MHz band. The output of IF signals passes through the band-pass filter (SWF601) where unnecessary signals are removed. The SWF601 output signals return to the IC604 again.
The SWF601 input/output signals are all balanced signals. The signals in the 440MHz band that returned to the IC604 are adjusted to proper level signals by variable gain amplifier (PGC) in the IC604, and then they are orthogonal-demodulated with 440MHz signal obtained by dividing the oscillation frequency 880MHz by two at the signal reception from VCO602, and they become base band IQ signals in the IC604.
The received signals that became base band IQ signals pass through low-pass filter in the IC604 to remove unnecessary signals, and then they are sent to the base band side.
The signals sent to the base band side are IQ signals having 1.4V DC offset.

(2) Transmitter Section

IQ signals transmitted from base band side are modulated into signals in the transmission IF frequency band by an orthogonal modulator in the IC604. IQ signals must have DC offset voltage 1.575V typ. and signal amplitude 500mVp-p. The transmission IF frequency is 195MHz (975MHz/5) when the terminal is in GSM mode, or 325MHz (975MHz/3) in DCS mode. By this modulation, local signals are generated by dividing the oscillation frequency (975MHz) by an internal frequency divider (3/5 switching) at the signal transmission from VCO602.
The modulated signals outputted from orthogonal modulator pass through low-pass filter in the IC604, and then they enter the phase comparator of the offset loop system modulator.
In the offset loop system modulation, the VCO having same oscillation frequency as transmission frequency is assembled in the phase lock loop, and the reference frequency of this phase lock loop is used as transmission IF frequency to adjust the phase shift of VCO to that of transmission IF frequency. As a result, the same effect as if the phase modulation was applied to the transmission frequency can be attained.
Also, the transmission frequency can be selected simultaneously by using the output of VCO mixed down with the frequency divided by VCO601 as a comparison frequency of the phase lock loop.
Unlike conventional mix up system, this offset loop system can reduce spurious signals generated in the mixer.
The output signals of offset loop are converted into the GMSK modulated signals by the power VCO, VCO801. This VCO has two outputs of GSM band and DCS band, and the operation modes can be switched by signal lines.
The output of VCO801 is already GMSK modulated waves of transmission frequency. The output of VCO801 in the GSM band passes through the low-pass filter FL805 where harmonic component is attenuated. As the PA module CP803 has only one input, this output is composed into one in the diplexer FL806. Also, a part of signals returns to the IC604 for the input of phase lock loop. The output of FL806 enters the PA module CP803 via the matching circuit. The CP803 is a power amplifier having dual bands, and which frequency is to be outputted is switched over by the signal lines.
This power amplifier has output controllable terminals, so that the output voltage can be controlled according to external voltage.
The CP803 generates two outputs, GSM and DCS.

These two outputs pass through low-pass filters CP801 and 802 respectively to remove harmonic component. These CP801 and 802 are also used as directional couplers to detect a part of the power amplifier output for the power control. The outputs of CP801 and 802 are entered to the front-end module CP702. This module switches over the transmission, reception, and band, as mentioned previously. The signals entered to the CP702 are outputted from the antenna via reversed route of received signals.

The signals detected in the CP801 and 802 are entered to the D803 and D802 respectively, and they are rectified to become DC voltage components. These outputs are composed into one, and it is compared with APC signal from base band in the operation amplifier IC801 to be the signal to control the CP803 so that the output voltage can follow the APC signal.

(3) PLL Section

The PLL block consists of dual PLL (IC601) and VCO601 and VCO602. The VCO601 is for channel PLL and generates thefollowing oscillation frequencies.

GSM band	Transmission	1370.4 – 1439.6MHz 400kHz step
	Reception	1365.2 – 1399.8MHz 200kHz step
DCS band	Transmission	1385.2 – 1459.8MHz 200kHz step
	Reception	1365.2 – 1439.8MHz 200kHz step

The output of VCO601 is entered to the FL601 and distributed to two outputs. One of these outputs returns to the IC601, and another output is entered to the IC604. In the transmission of GSM band, the signal entered to the IC604 is divided into two internally, and therefore the frequencies of every 400kHz step are used in this case only. The VCO602 is for local PLL and generates the following oscillation frequencies.

Transmission : 975MHz
Reception :   880MHz

At the signal transmission, 975MHz is divided into five in the GSM band, or three in the DCS band in the IC604.
At the signal reception, 880MHz is always divided into two in the IC604.

Each VCO is provided with an external switching transistor so as to control the power supply.

(4) TCXO Section

The X601 is a VCTCXO module and it oscillates 13MHz reference signal. This oscillation frequency can be finely adjusted by AFC signal from the DSP. The output signal of X601 is given to the IC601 as it is, and also buffered in the Q602 and then supplied to the base band.
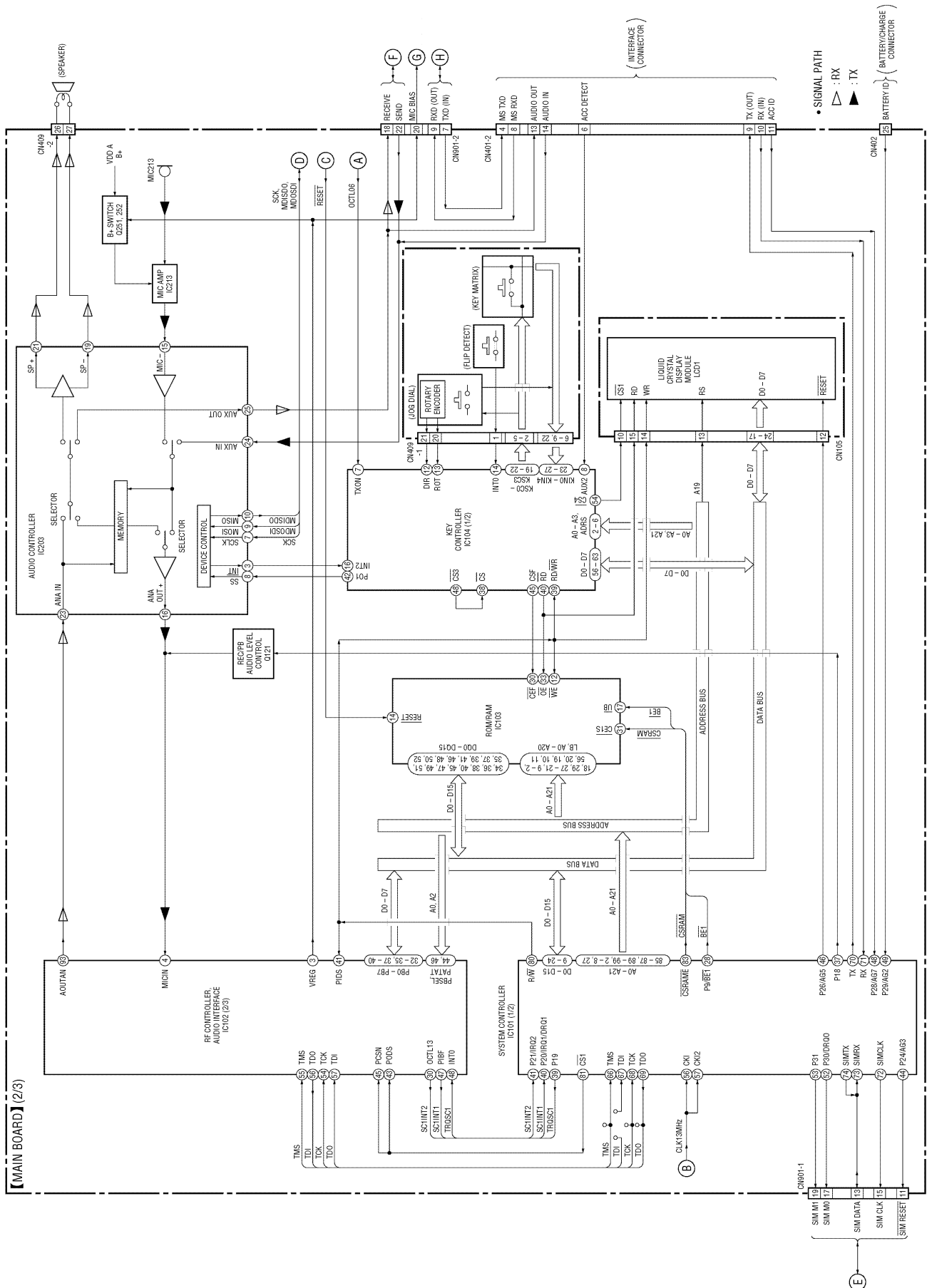
(5) Power Supply Section

The power supply voltage given from the battery side is supplied directly to the power amplifier module (CP803). For other blocks, the power is supplied from the regulator ICs, IC501 and IC502.
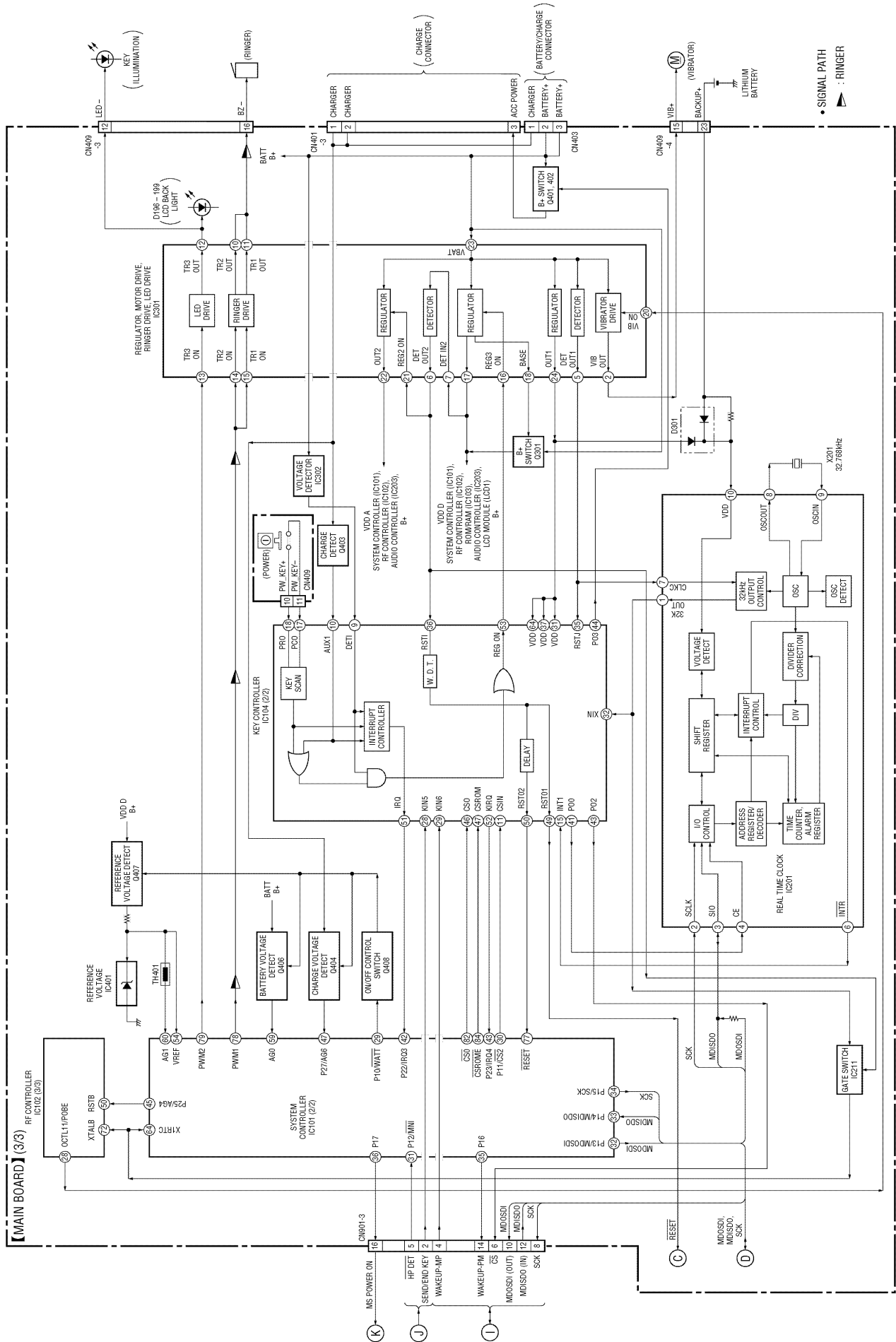The IC501 supplies 2.8V to the PLL block, while the IC502 supplies 2.8V to other blocks.

7.2 Base Band Block

7.2.1 Block Diagram (1/2)

7.2.3 Operational Description

(1) IC102

This device provides the functions such as DSP1600 core, ADC, DAC, ROM, RAM, serial port, parallel host interface, two timers, and error correction coprocessor (ECCP). This device is connected to the system controller, RF, and Mic & Speaker to perform RF control and input/output of audio signals. As the operation clock, it uses 13MHz from the VCTCXO.

(2) IC101

This device provides the functions such as 32bit RISC processor, on-chip RAM, DMA, synchronous serial interface, asynchronous serial interface, interrupt controller, SIM interface, timer, and ADC.
This device performs system control. As the operation clock, it uses 13MHz from the VCTCXO.

(3) IC103

A flash type ROM with the capacity of 32Mbits is used. The RAM capacity is 4Mbits. The data bus width is 16 bits or 8 bits. Here, the programs and telephone directory data are stored.

(4) IC104

This device provides the functions such as key scanning, interrupt extension, power supply circuit control, watch dog timer, voltage monitoring, and output port extension. It is connected to the system controller (IC101) data bus.

(5) IC203

This device provides the audio signal recording and playing function and also the audio path switching function. It is capable of recording for 4 minutes at 8kHz sampling. It is subject to synchronous serial control by the system controller (IC101).

(6) IC301

This device is a system power supply with the built-in three regulators, two voltage detectors, one vibrator driver, and three FETs.

(7) IC201

This device is a real time clock. It is subject to synchronous serial control by the system controller (IC101). This real time clock outputs 32kHz clock, and supplies it to the IC101, IC102 and IC104.

(8) LCD1 (LCD Module)

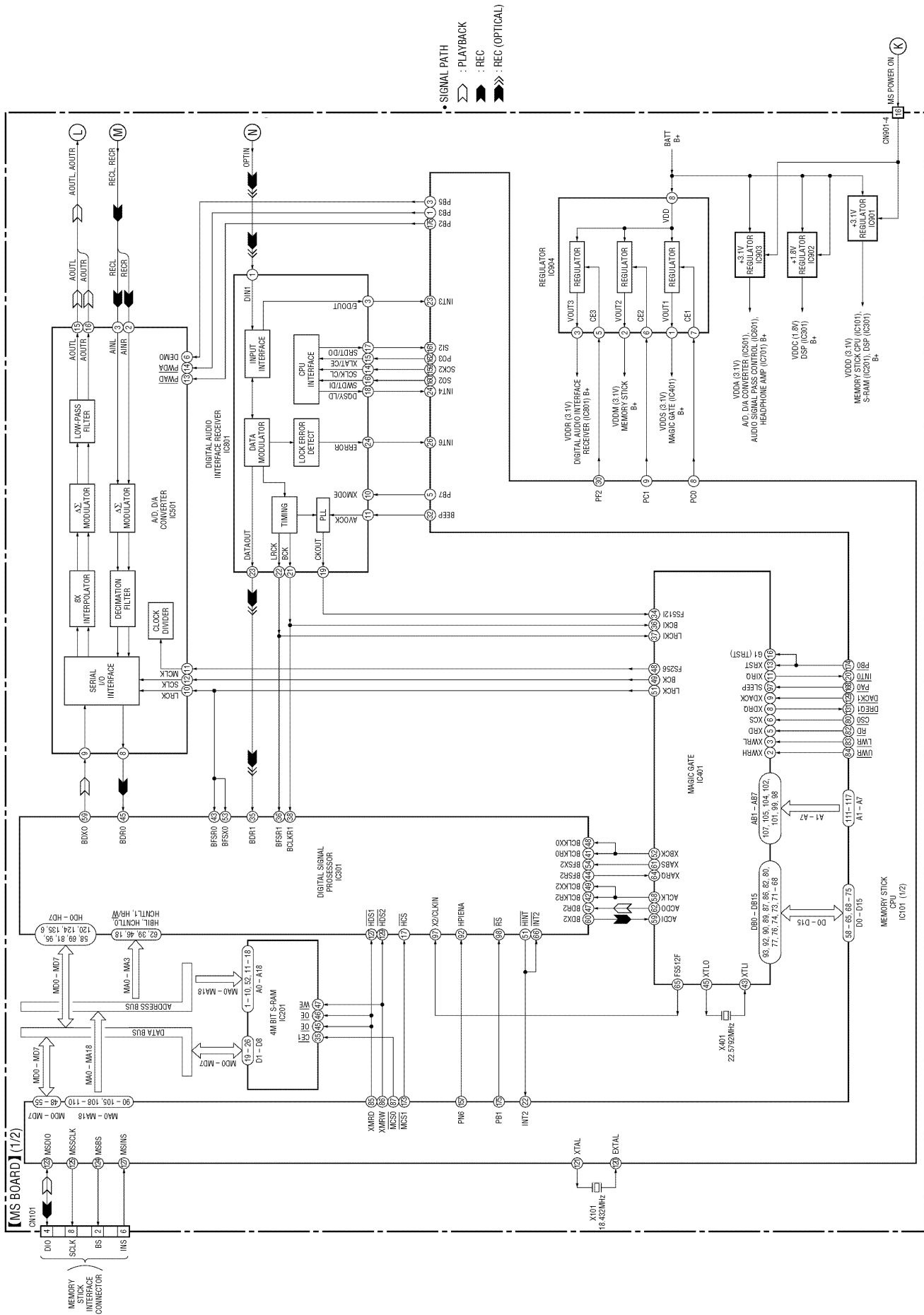The specifications of this liquid crystal display are as follows.
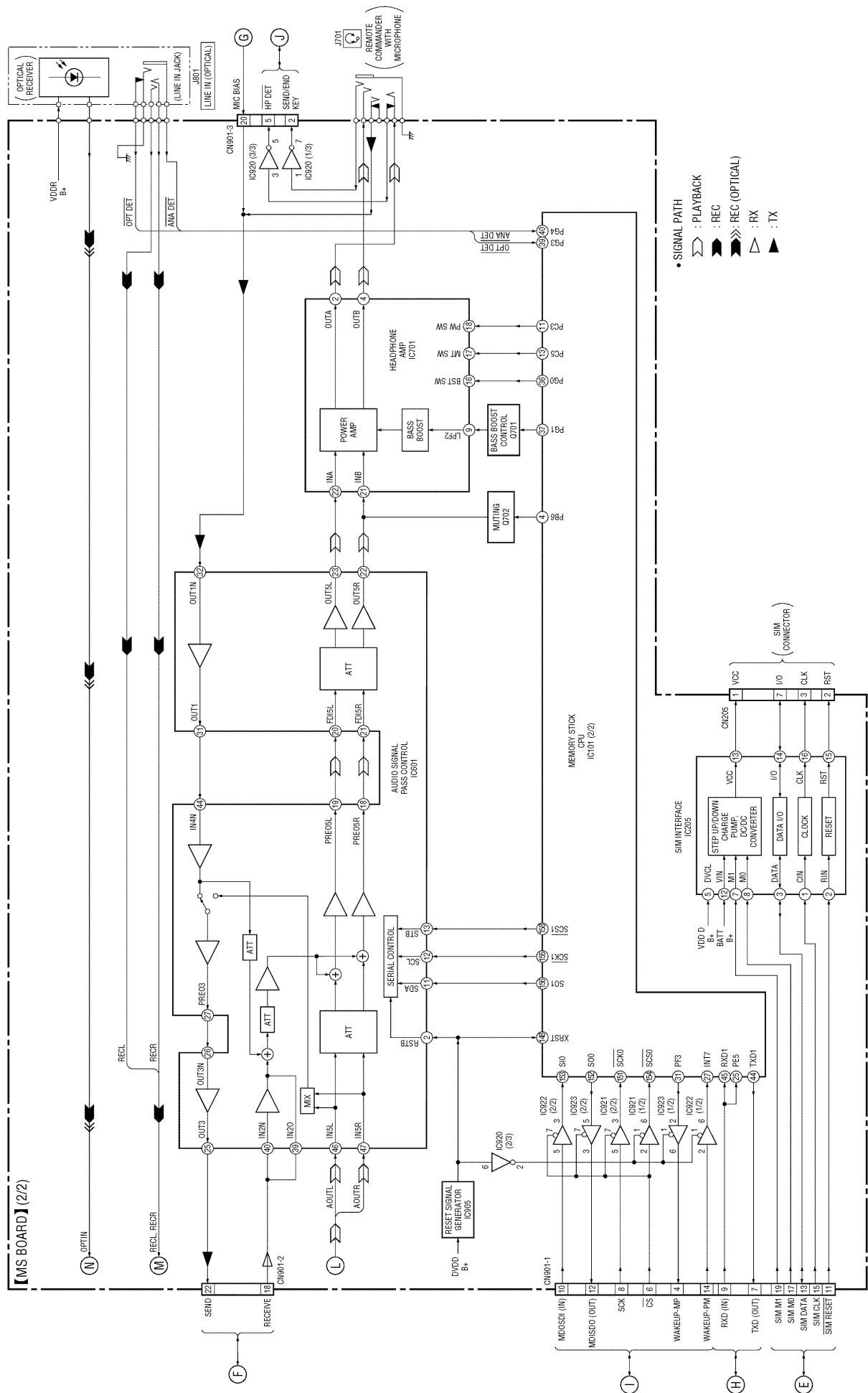Glass size: 38mm x 31.5mm
Number of dots: 96x72 dots
LCD driver: HD66728
The LCD is connected to the system controller (IC101) data bus.

7.3 Memory Stick Block

7.3.1 Block Diagram (1/2)

7.3.3 Operational Description

(1) Memory Stick Bock Configuration

The memory stick block consists of a CPU (IC101) with the built-in ARM 7 cores + MS I/F, digital signal processing IC (IC301), magic gate IC (IC401), audio path control IC (IC601), A/D and D/A converter (IC501), digital audio I/F (IC801), headphone amplifier (IC701), S-RAM (IC201), CMOS regulator (IC901, IC902, IC903, IC904), SIM I/F (IC205), optical connector, remote control jack, and 64M memory stick.

(2) Audio Compression and Expansion Section

The audio data are compressed and expanded in the digital signal processing IC (IC301) to support the SDMI (Water Mark compatible). For this purpose, the ATRAC3 system is used, and the compressed data are encrypted in the magic gate IC (IC401), and stored in the memory stick. Also, the expanded data are D/A-converted, and its low frequency components are amplified in the headphone amplifier (IC701) via audio path control IC (IC601), then outputted to the headphone.

(3) Magic Gate Section

The memory stick recognition is made between magic gage IC (IC401) and magic gate IC in the memory stick via CPU so as to check the memory stick for magic gate compatibility.
Further, at the recording, music data compressed in the digital signal processing IC (IC301) are encrypted and stored in the memory stick.
Also, at the playing, the encrypted data in the memory stick are decrypted and led to the digital signal processing IC (IC301).

(4) Audio Path Control Section

The output paths of received audio, played back audio, terminating tone and key tone are switched over to the receiver, headphone, or earphone, and audio signals are mixed and the volume is controlled, then the signals are led to the headphone amplifier.

(5) Digital Recording Section

Optical digital audio signals entered from optical connector are synchronized in the digital audio interface (IC801) and demodulated into normal format, and led to the digital signal processing IC (IC301) and compressed there. Then, they are encrypted in the magic gate IC (IC401) and stored in the memory stick.

(6) Analog Recording Section

Analog audio signals entered from optical connector are A/D-converted and led to the digital signal processing IC (IC301) and compressed there, and then they are encrypted in the magic gate IC (IC401) and stored in the memory stick.

(7) SIM Interface Section

This device is a SIM interface IC (IC205) with the built-in charge pump so as to support both 3V and 5V SIMs.

(8) Remote Control Section

The remote controller is equipped with the TEL key for originating a call and answering a terminating call, and the microphone for the talk through earphone and the headphone output line.
The headphone output line is provided with a ϕ3.5 stereo mini pin jack, and commercial headphones can also be used.
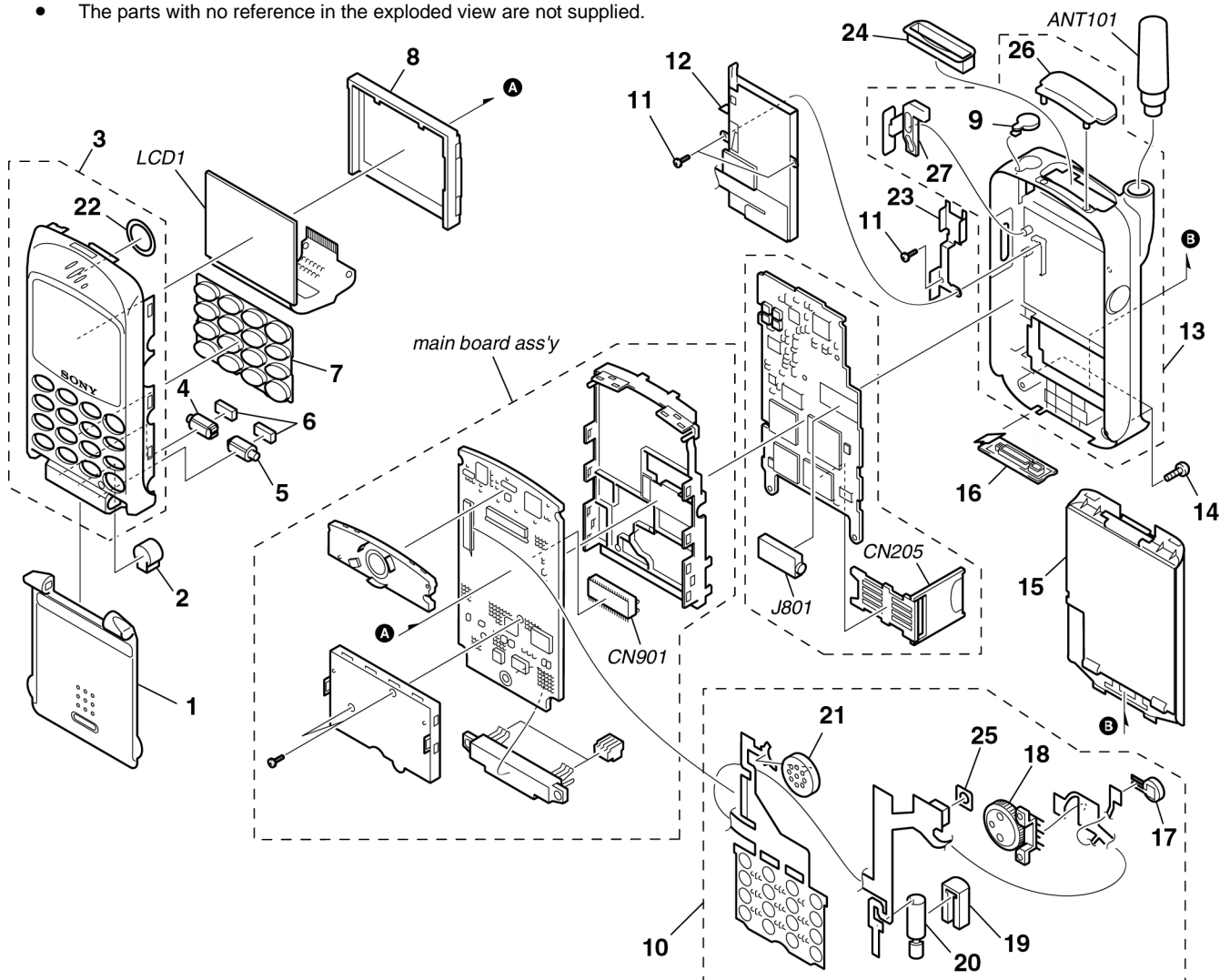
SECTION 8
SPARE PARTS AND ACCESSORIES LIST

8.1 Spare Parts

Note:

- The parts with no reference in the exploded view are not supplied.

Ref. No.	Part No.	Description	Remark	Ref. No.	Part No.	Description	Remark
1	A-3649-273-A	CABINET (FLIP) ASSY		17	1-528-999-11	BATTERY, BACK UP	
2	1-542-424-11	MICROPHONE		18	1-418-983-11	JOG, CODER	
3	A-3649-272-A	CABINET (FRONT) SUB ASSY		19	3-046-962-01	CUSHION (VIBRA-MOTOR)	
4	3-229-711-01	ASSY (L), BEARING		20	1-763-510-11	VIBRA-MOTOR	
5	3-229-712-01	ASSY (R), BEARING		21	1-544-797-11	SPEAKER	
6	3-226-472-01	SPACER (HINGE)		22	3-226-473-01	CUSHION, SPEAKER	
7	1-786-161-11	SWITCH, RUBBER KEY		23	3-226-149-01	HOLDER, EARPHONE	
8	X-3378-891-1	LIGHT GUIDE ASSY		24	3-226-150-01	GUIDE, MS	
9	3-226-146-01	COVER, EARPHONE		25	3-027-631-01	CUSHION, RINGER	
10	A-3622-524-A	FLEXIBLE MOUNT ASSY		26	3-226-144-01	COVER, MS	
11	3-226-135-01	SCREW (1.4X3.5), PRECISION		27	3-226-145-01	BUTTON, MS EJECT	
12	1-815-290-11	CONNECTOR, MEMORY STICK		ANT101	1-754-185-11	ANTENNA	
13	A-3649-270-A	CABINET (REAR) ASSY		CN205	1-815-291-11	CONNECTOR, SIM	
14	3-926-356-01	SCREW, ROTARY SWITCH		CN901	1-815-292-11	CONNECTOR, BOARD TO BOARD	
15	A-3627-234-A	BATTERY PACK		J801	1-815-288-11	JACK, CONNECTOR	
16	3-226-148-01	COVER, CONNECTOR		LCD1	1-803-928-11	LCD	

8.2 Accessories List

Ref. No.	Part No.	Description	Remark
101	1-418-645-13	ADAPTOR, AC (AC-110-240V)	
102	1-476-508-11	DESK TOP CHARGER	
103	1-476-509-11	REMOTE CONTROL UNIT	
104	1-542-459-11	HEADPHONE	
105	1-757-888-11	CORD, CONNECTION (OPTICAL)	
106	1-791-964-12	AC POWER-SUPPLY CORD SET (EU)	
106	1-792-884-12	AC POWER-SUPPLY CORD SET (UK)	
107	3-230-059-01	CARRY BAG	
108	A-3627-234-A	BATTERY PACK	
109	A-7094-682-A	MEMORY STICK	
110	1-823-050-11	CORD, CONNECTION (ANALOG)	
	3-229-247-11	MANUAL, INSTRUCTION (ENGLISH)	
	3-229-247-21	MANUAL, INSTRUCTION (GERMAN)	
	3-229-247-31	MANUAL, INSTRUCTION (FRENCH)	
	3-229-247-41	MANUAL, INSTRUCTION (ITALIAN)	
	3-229-247-51	MANUAL, INSTRUCTION (DUTCH, FRENCH)	
	3-229-247-61	MANUAL, INSTRUCTION (SPANISH, PORTUGUESE)	

101

AC adaptor (1)

102

Desktop holder (1)

103

Remote with Microphone (1)

104

Headphones (1)

105

Optical Audio recording cable (1)

106

AC cable (1)

107

Carrying case (1)

108

Lithium ion standard battery pack (1)

109

Magic Gate Memory Stick (1)

110

Analog Audio recording cable (1)