



kyodo west™

**SERVICE MANUAL  
FOR  
UHF FM MOBILE/REPEATER  
AND  
UHF FM MOBILE/TELEPHONE  
KG106-40 SERIES**

ZR 600

# SAFETY INFORMATION

Please read the following precautions before operating your mobile/repeater or mobile/telephone radio:

- Do not operate the radio if someone outside the vehicle is within two feet (0.6 meters) of the antenna.
- Do not operate the radio in an explosive atmosphere.
- Do not operate the radio in a blasting area or while transporting unprotected blasting caps.
- Do not operate the radio unless all RF connectors are secure and open connections are terminated.
- Do not permit untrained personnel to operate the radio.

## WARNING

This device emits radio frequency energy. This radio has been tested for proper operation and conforms to all Federal Communications Commission (FCC) Rules and Regulations.

If your vehicle contains on-board computer systems (such as electronic fuel injection, electronic cruise control, anti-skid braking systems, etc.), they may not be protected from interference caused by radio frequency energy. Interference, if it occurs, could result in your losing control of the vehicle. Consult the vehicle dealer or manufacturer about the immunity of these devices to possible interference. As the vehicle owner or operator, it is your responsibility to check for possible interference before operating the radio while the vehicle is in motion.

It is mandatory that radios installed in vehicles propelled by a liquid petroleum gas fuel system must conform to National Fire Protection Association standard NFPA 58, which requires that:

- Any space containing radio equipment will be isolated from the space in which the LP-Gas container and fittings are located by a seal.
- Remote (outside) filling connections will be used.

Venting of the container space to the outside is provided.

# TABLE OF CONTENTS

<b>SECTION 1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Scope Of The Manual .....	1
1.2	Description .....	1
1.3	CTCSS Option .....	1
1.4	Accessories .....	1
1.5	Unpacking And Inspection .....	1
 <b>SECTION 2</b>	 <b>PROGRAMMING .....</b>	 <b>5</b>
2.1	General .....	5
2.2	Frequency Programming .....	5
2.2.1	Reference Division Rate "R" .....	5
2.2.2	Transmit Channel Data .....	5
2.2.3	Receive Channel Data .....	6
2.2.4	The Memory Map .....	6
2.2.5	Programming The EPROM .....	6
2.3	EPROM Installation .....	8
2.4	EPROM Charts .....	9
 <b>SECTION 3</b>	 <b>TUNING .....</b>	 <b>46</b>
3.1	Tools And Test Equipment .....	46
3.2	Receiver Adjustment .....	46
3.3	Transmitter Adjustment .....	48
3.4	RX/TX Voltage Waveforms .....	48
3.5	PA Unit Adjustment .....	50
3.6	Handset Base Unit .....	51
3.7	Handset Main PCB .....	51
3.8	Handset Level Settings .....	52
3.9	Handset Voltage Waveforms .....	53
 <b>SECTION 4</b>	 <b>INSTALLATION .....</b>	 <b>54</b>
4.1	Power Wiring .....	54
4.2	Drilling Or Cutting Holes .....	54
4.3	Cable Routing .....	54
4.4	Vehicle Electronics .....	54
4.5	Installation Procedures .....	54
4.6	Antenna .....	55
4.7	Transmitter/Receiver Unit .....	55
4.8	Control Cable .....	55
4.9	Power Cable .....	55
4.10	Microphone Hang-up Clip .....	55
4.11	Handset .....	57
 <b>SECTION 5</b>	 <b>OPERATION .....</b>	 <b>58</b>
5.1	Transceiver Features .....	58
5.2	Power Switch .....	58
5.3	Transmit Indicator .....	58
5.4	Volume Control .....	58
5.5	Noise Squelch Control .....	58
5.6	Busy & Repeater On/off Indicato .....	59
5.7	Channel Selector & Indicator .....	59
5.8	Tone Selector & Indicator .....	59
5.9	Microphone Jack .....	59
5.10	Repeater Microphone Features .....	59
5.11	Push-To-Talk .....	59
5.12	Operator Priority .....	60
5.13	Repeater Time Limiter .....	60
5.14	Microphone Monitor Switch .....	60
5.15	Tone Squelch Option .....	60
5.16	Handset Features .....	60
5.17	Handset (Telephone Models) .....	61

5.18	Determining Current Dialing Mode .....	61
5.19	Manual-Only DTMF Mode .....	61
5.20	General Autodialing Information .....	61
5.21	"Store-And-Send" Operation .....	62
5.22	Timed Manual Entry .....	62
5.23	In Case Of Difficulty .....	62
5.24	Enter Dealer Programming Mode .....	62
5.25	Selection Of User Dialing Modes .....	62
5.26	ANI Programming .....	63
5.27	Other Programmable Features .....	63
5.28	ANI Programming Problems .....	63
<b>SECTION 6</b>	<b>TECHNICAL DESCRIPTION .....</b>	<b>64</b>
6.1	Receiver .....	64
6.1.1	Audio .....	64
6.1.2	Squelch .....	64
6.1.3	Simplex/Duplex .....	64
6.2	PLL Section .....	64
6.3	Receiver VCO .....	64
6.4	Transmit VCO .....	65
6.5	Transmitter .....	65
6.6	Modulation Section .....	65
6.7	Transmitter PA .....	65
6.8	Control Unit .....	69
6.8.1	Microphone Circuit .....	69
6.8.2	Speaker .....	69
6.8.3	Power Switch .....	69
6.8.4	Volume Control .....	69
6.8.5	Squelch Control .....	69
6.8.6	Channel Selector And Indicator .....	69
6.8.7	Tone Selectors And Indicators .....	69
6.8.8	Voltage Regulator .....	70
6.8.9	TX Led .....	70
6.8.10	Busy Led .....	70
6.9	Handset .....	70
6.10	Base Unit .....	70
6.11	Handset Circuit Descriptions .....	70
<b>SECTION 7</b>	<b>TROUBLESHOOTING .....</b>	<b>72</b>
7.1	Control Interface .....	72
7.2	Jumper Functions .....	72
7.3	Handset .....	72
7.4	Voltage Charts .....	75
<b>SECTION 8</b>	<b>MAINTENANCE .....</b>	<b>78</b>
8.1	Disassembly Procedures .....	78
8.1.1	KG106 Transceiver Unit .....	78
8.1.2	KD-357M Microphone .....	78
8.1.3	Control Unit .....	82
8.2	Parts List .....	99

# LIST OF TABLES

Table 1-1. Specifications .....	2
Table 2-1. Reference Division Rate Values .....	5
Table 2-2. Receiver Frequency EPROM Memory Map .....	7
Table 2-3. Transmitter Frequency EPROM Memory Map .....	7
Table 2-4. EPROM Installation .....	8
Table 3-1. Tools and Equipment .....	46
Table 3-2. Procedure To Access Devices .....	46
Table 3-3. Receiver Adjustment .....	46
Table 3-4. Transmitter Adjustment .....	48
Table 3-5. PA Unit Adjustment .....	50
Table 3-6. Base Unit DIP Switch Positions .....	51
Table 3-7. Handset Main PCB .....	51
Table 3-8. Handset DIP Switch Settings .....	51
Table 3-9. Level Adjustment .....	52
Table 4-1. Transmitter/Receiver Unit .....	55
Table 4-2. Microphone Hang-up Clip .....	55
Table 4-3. Handset .....	57
Table 5-1. Determining Current Dialing Mode .....	61
Table 5-2. General Autodialing Information .....	61
Table 5-3. Control Codes for Special Functions/Characters .....	61
Table 5-4. "Store-and-Send" Operation .....	62
Table 5-5. Entering Dealer Programming Mode .....	62
Table 5-6. Dialing Mode .....	62
Table 5-7. ANI Programming .....	63
Table 5-8. Other Programmable Features .....	63
Table 6-1. Microphone Circuit .....	69
Table 6-2. Control Line States .....	71
Table 6-3. DTMF Tone Frequencies .....	71
Table 7-1. Control Interface .....	72
Table 7-2. Jumper Functions .....	72
Table 7-3. RX Unit, PLL .....	75
Table 7-4. RX Unit, VCO .....	76
Table 7-5. TX Unit, PLL / VCO .....	77
Table 8-1. KG106 .....	78
Table 8-2. KD-357M Microphone .....	78
Table 8-3. Control Unit .....	82

# LIST OF FIGURES

Figure 1-1. KG106R Mobile/Repeater .....	3
Figure 1-2. KG106T Mobile/Telephone .....	4
Figure 2-1. EPROM Installation .....	8
Figure 3-1. Receiver Adjustment .....	47
Figure 3-2. RX/TX Voltage Waveforms .....	48
Figure 3-3. Transmitter Adjustment .....	49
Figure 3-4. PA Unit Adjustment .....	50
Figure 3-5. Opening the Handset Case .....	51
Figure 3-6. Handset Adjustment .....	52
Figure 3-7. Handset Voltage Waveforms .....	53
Figure 4-1. Front Mount Installation .....	54
Figure 4-2. Trunk Mount Installation .....	54
Figure 4-3. Installation-Mobile/Repeater .....	56
Figure 4-4. Handset Installation .....	57
Figure 5-1. Transceiver Controls and Features .....	58
Figure 5-2. Repeater Microphone Controls and Features .....	59
Figure 5-3. Single Tone CTCSS .....	60
Figure 5-4. Handset Controls and Features .....	60
Figure 6-1. KG106 RX/TX/PA Block Diagram .....	67
Figure 6-2. Terminal/Control/Mic./Handset Block Diagram .....	68
Figure 6-3. Handset Base Unit Component Layout .....	70
Figure 7-1. Jumper Positions on Terminal Unit PCB .....	73
Figure 7-2. Handset Troubleshooting Flowchart .....	74
Figure 8-1. Exploded View of KG106 Transceiver Unit .....	79
Figure 8-2. Exploded View of KD-357M Microphone .....	81
Figure 8-3. Exploded View of Control Unit .....	83
Figure 8-4. DTMF Handset Schematic .....	84
Figure 8-5. Handset Base Unit Schematic .....	85
Figure 8-6. KG106 Terminal Unit Schematic .....	86
Figure 8-7. KG106 Microphone/Control Unit Schematic .....	87
Figure 8-8. KG106 RX Unit Schematic .....	88
Figure 8-9. KG106 TX Unit Schematic .....	89
Figure 8-10. KG106 PA Unit Schematic .....	90
Figure 8-11. KG106 Duplex/CTCSS Schematic .....	91
Figure 8-12. KG106 Wiring Diagram .....	92
Figure 8-13. KG106 Terminal Unit Components Layout .....	93
Figure 8-14. KG106 Control Unit Components Layout .....	94
Figure 8-15. KG106 RX/TX Units Components Layout .....	95
Figure 8-16. KG106 PA Unit Components Layout .....	96
Figure 8-17. Duplex/CTCSS Components Layout .....	97

# SECTION 1.

## INTRODUCTION

### 1.1 SCOPE OF THE MANUAL

This manual is written for experienced technicians. It contains the information needed to properly install, operate and service the KG106 series UHF FM mobile/repeater system and mobile telephone systems.

Certain optional and accessory items are shipped separately, complete with applicable instructions.

### 1.2 DESCRIPTION

The KG106 UHF FM Mobile/Repeater provides up to 25 watts at the output of the optional internal duplexer (continuous duty). The system may be operated from any 12V (nominal) negative ground source capable of up to 10A continuous duty. This could include a vehicle battery, AC power supply or a small battery pack for low power portable applications.

The transceiver circuitry and duplexer is contained in a rugged die-cast housing suitable for front or trunk mounting. The system is capable of selecting any of 16 channel pairs within the operating band width of the duplexer. Channel information is contained in two 2764 type EPROMs, one each for the transmitter and receiver. Models are available from 335 to 520 MHz in 6 band splits.

The KG106 control unit is compact, easy-to-use, and built for in-dash or under-dash mounting. In the repeater version, the push-to-talk button, a monitor switch and repeater-on/repeater-off buttons are located on the external microphone to maintain driver safety. In the telephone models, the DTMF handset permits manual dialing by means of a lighted keypad. All other controls (including LEDs) are on the front panel of the control unit. The internal speaker provides 1W of audio and an optional 2W external speaker is available.

### 1.3 CTCSS OPTION

With the CTCSS option, you hear only messages having the proper encoded tone signal. A transmitter containing a tone squelch encoder transmits a low frequency tone with the message. The receiver includes a tone squelch decoder. It unsquelches only when the proper tone is present on the transmitted carrier.

### 1.4 ACCESSORIES

You may also add the following accessories to your KG106:

- Suitcase enclosure for transportable operation.
- External battery pack.
- External AC power supply.
- Antenna.
- Antenna tripod for quick set-up in the field (transportable operation).
- EPROM programmer.

### 1.5 UNPACKING AND INSPECTION

The KG106R Mobile/Repeater system consists of the components shown in Figure 1-1. The KG106T Mobile/Telephone system is shown in Figure 1-2. Upon receipt, visually check the carton for any signs of shipping damage. Immediately report any damage to the carrier.

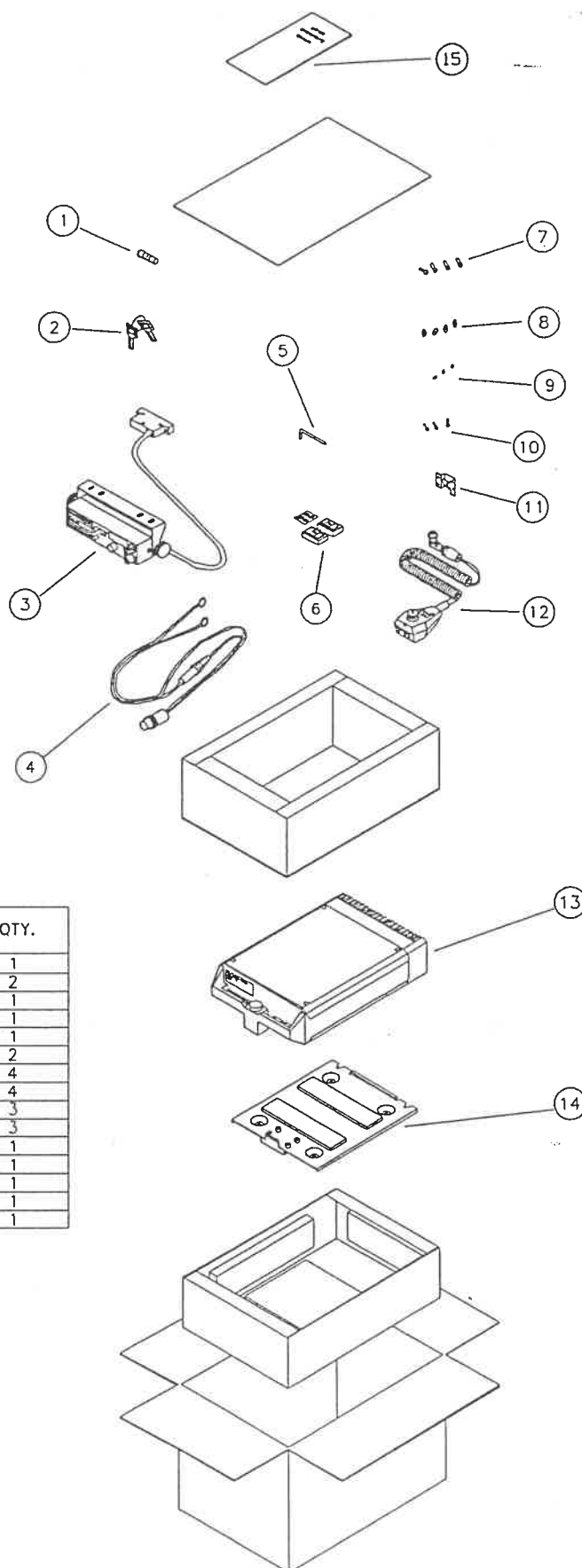
Next, open the carton and verify that all items shown have been included. If anything is missing, notify Kyodo West at once.

Then inspect each item for signs of hidden shipping damage. Again, report any hidden shipping damage to the carrier.

Table 1-1. Specifications

GENERAL	
Frequency range	KG106-40A: 335-370 MHz KG106-40B: 360-400 MHz KG106-40C: 400-440 MHz KG106-40D: 440-470 MHz KG106-40E: 470-512 MHz KG106-40F: 480-520 MHz
FCC ID	IOJ KG10640
Mode of operation	Simplex, half duplex, or full duplex
Number of channels	Up to 16 synthesized
Channel spacing	30/25/20 kHz standard, 12.5 kHz optional
Channel spread	2.0 MHz
TX/RX frequency separation	5 MHz below 470 MHz, 3 MHz above 470 MHz
Antenna impedance	50 ohms
Power supply	13.6V DC $\pm$ 20%, negative ground
Power consumption (less control head)	450 mA (standby), 9A transmit (maximum)
Duty cycle	Continuous
Dimensions (transceiver) (WxHxD)	220 mm x 347 mm x 82 mm (8.66 in x 13.66 in x 3.23 in)
Weight (transceiver)	6.8 kg (14.9 lbs)
Ambient temperature	-30° C to +60° C
Relative humidity	95% at 35° C
TRANSMITTER	
RF power output	20-40 watts, continuously variable
Maximum frequency deviation	$\pm$ 5 kHz (wide spacing) $\pm$ 2.5 kHz (narrow spacing)
Frequency stability	$\pm$ 0.0005% (wide spacing) $\pm$ 0.0003% (narrow spacing)
Frequency response	Within +1, -3 dB of 6 dB/octave pre-emphasis from 300 to 3000 Hz, 1000 Hz reference
Signal to noise ratio	More than 50 dB at 1kHz 70% modulation
Modulation distortion	Less than 3% at kHz 70% modulation
Spurious and harmonics	More than 70 dB below rated power
RECEIVER	
Intermediate frequency	1st IF: 21.6 MHz 2nd IF: 455 kHz
Frequency stability	$\pm$ 0.0005% (wide spacing) $\pm$ 0.0003% (narrow spacing)
Sensitivity	Less than 0.35 $\mu$ V for 20 dB noise quieting Less than 0.25 $\mu$ V for 12 dB SINAD
Modulation acceptance	$\pm$ 7 kHz
Squelch sensitivity	Less than 0.25 $\mu$ V
Bandwidth	More than 12 kHz for 6 dB down
Adjacent channel selectivity	More than 70 dB at 25 kHz point
Blocking	More than 90 dB
Intermodulation	More than 70 dB
Spurious responses	More than 80 dB
AF response	Within +1, -3 dB of 6 dB/octave de-emphasis from 0.3 to 3 kHz, 1 kHz reference
AF output	1W internal speaker, 2W external speaker into 4 ohm load, 0 dBm at 600 ohm balanced line
AF distortion	Less than 5% at 1 kHz 70% modulation
Signal to noise ratio	More than 50 dB at 1 kHz 70% modulation



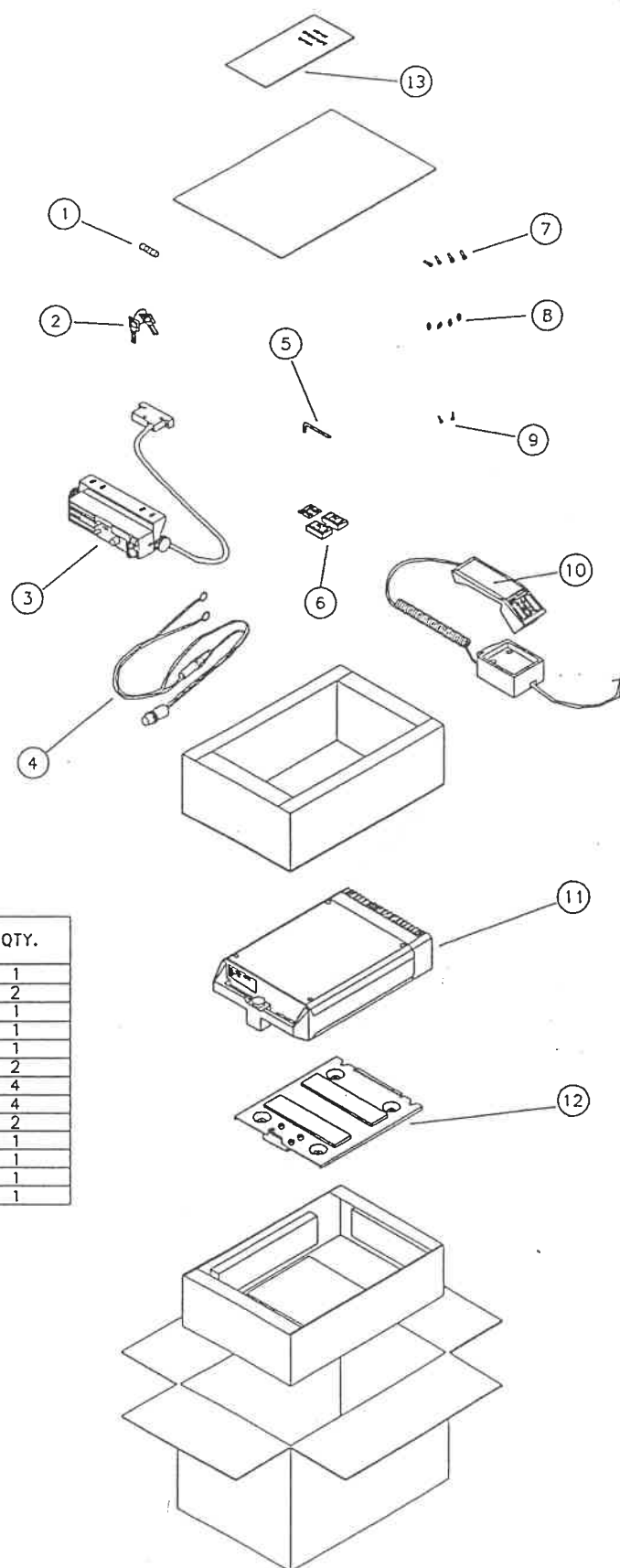


REF. NO.	PART NAME	PART NO.	QTY.
1	FUSE	FU-12.5A	1
2	KEY	VMZ-C	2
3	CONTROL UNIT	-	1
4	BATTERY CABLE	-	1
5	WRENCH	4PAI	1
6	EPROM	MBM2764	2
7	MTG. SCREW	-	4
8	MTG. WASHER	-	4
9	HANGER WASHER	99-47-1104-23	3
10	HANGER SCREW	99-40-0204-1214	3
11	HANGER	14-11-64-01	1
12	MICROPHONE	KD-357M	1
13	TRANSCIVER	KG106	1
14	MTG. BRACKET	3A10-0319	1
15	OPERATOR'S MANUAL	-	1

## NOTE :

- ALL KG106 MOBILE/REPEATER PARTS ARE ENCLOSED IN PLASTIC BAGS

Figure 1-1. KG106R Mobile/Repeater



REF. NO.	PART NAME	PART NO.	QTY.
1	FUSE	FU-12.5A	1
2	KEY	VMZ-C	2
3	CONTROL UNIT	-	1
4	BATTERY CABLE	-	1
5	WRENCH	4PAI	1
6	EPROM	MBM2764	2
7	MTG. SCREW	-	4
8	MTG. WASHER	-	4
9	HANDSET MTG. SCREW	-	2
10	HANDSET	-	1
11	TRANSCIVER	KG106	1
12	MTG. BRACKET	3A10-0319	1
13	OPERATOR'S MANUAL	-	1

## NOTE :

\* ALL KG106 MOBILE/TELEPHONE PARTS  
ARE ENCLOSED IN PLASTIC BAGS

Figure 1-2. KG106T Mobile/Telephone