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Maintenance Manual
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VHF XG-75 Series
Portable Radios

MANUAL REVISION HISTORY

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Lynchburg, VA 24501

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1. SAFETY INFORMATION

1.1 SAFETY SYMBOL CONVENTION

The following conventions are used throughout this manual to alert the user to general safety precautions that must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Harris assumes no liability for the customer's failure to comply with these standards.

WARNING

The WARNING symbol calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a WARNING symbol until the conditions identified are fully understood or met.

CAUTION

The **CAUTION** symbol calls attention to an operating procedure, practice, or the like, which, if not performed correctly or adhered to, could result in a risk of danger, damage to the equipment, or severely degrade the equipment performance.

NOTE

The **NOTE** symbol calls attention to supplemental information, which may improve system performance or clarify a process or procedure.

The **ESD** symbol calls attention to procedures, practices, or the like, which could expose equipment to the effects of **E**lectro-**S**tatic **D**ischarge. Proper precautions must be taken to prevent ESD when handling circuit modules.

1.2 SERVICE WARNINGS AND OPERATING TIPS

IMPORTANT!

CAUTION **PLEASE READ** CAUTION

1.2.1 Service of XG-75 Model Radios with Immersion Option

To preserve the watertight integrity of the XG-75 portable radio, the radio must be serviced by a service center authorized and certified by Harris to perform the necessary tests to verify the watertight integrity.

The Harris Service Network includes company-owned service facilities as well as the capabilities of service partners located throughout the world. We have over 250 Authorized Service Centers (ASC) qualified to perform warranty repairs, installation and maintenance services. For a list of ASCs, contact our Customer Care center.

The XG-75 model radio with immersion option, under warranty, ***MUST*** be serviced by a service center authorized by Harris to service the immersion-rated radios. If service is performed by the user or by any service center not authorized by Harris for this purpose, the warranty will be ***VOID***. Unauthorized service is made discernible by a tamper-evident label placed over one of the screws within the battery well at the back of the radio. The standard product warranty on the XG-75 radios is two (2) years parts and labor. Harris recommends that the radio's immersibility be tested once a year by a qualified and approved service center with access to the specialized equipment required.

If the radio is out of warranty, it is still recommended that a service center authorized by Harris service immersion-rated radios to maintain the watertight integrity of the radio. However, the assembly and disassembly procedures included in this manual will assist in restoring the radio as close as possible to its original condition.

1.2.2 Operating Tips

Antenna location and condition are important when operating a portable radio. Operating the radio in low lying areas or terrain, under power lines or bridges, inside of a vehicle, or in a metal framed building can severely reduce the range of the unit. Mountains and buildings can also reduce the range of the unit.

In areas where transmission or reception is poor, some improvement may be obtained by ensuring that the antenna is vertical. Moving a few yards in another direction or moving to a higher elevation may also improve communications. Vehicular operation can be aided with the use of an externally mounted antenna.

Battery condition is another important factor in the trouble free operation of a portable radio. Always properly charge the batteries.

1.2.3 Efficient Radio Operation

For the most efficient radio operation, hold the portable radio approximately two inches from your mouth and speak into the microphone at a normal voice level.

Keep the antenna in a vertical position when receiving or transmitting a message.

Do not hold the antenna when receiving a message and, especially, do not hold when transmitting a message.

WARNING

Do NOT hold onto the antenna when the radio is powered on!

1.2.4 Antenna Care and Replacement

WARNING

Do not use the portable radio with a damaged or missing antenna; doing so can damage the radio. A minor burn may result if a damaged antenna comes into contact with the skin. Replace a damaged antenna immediately.

CAUTION

Use only the supplied or approved antenna. Unauthorized antennas, modifications or attachments could damage the radio unit and may violate FCC regulations. Refer to the options and accessories list for antennas approved for use with this radio.

1.2.5 Electronic Devices

CAUTION

RF energy from the portable radio may affect some electronic equipment. Most modern electronic equipment in cars, hospitals, homes, etc. is shielded from RF energy. However, in areas that instruct two-way radio equipment be powered OFF, always observe the rules. ***If in doubt, turn the radio OFF!***

1.2.6 Other Common Transmitter Hazards

1.2.6.1 Aircraft

WARNING

Always turn OFF portable radios before boarding any aircraft!

- **Use a portable radio on the ground only with crew permission.**
- **DO NOT use the radio in flight!!**

1.2.6.2 Electric Blasting Caps

WARNING

To prevent accidental detonation of electric blasting caps, DO NOT use two-way radios within 100 feet of blasting operations. Always obey the "Turn Off Two-Way Radios" signs posted where electric blasting caps are being used. (OSHA Standard 1926.900)

1.2.6.3 Potentially Explosive Atmospheres

WARNING

Areas with potentially explosive atmosphere are often, but not always, clearly marked. These may be fueling areas, such as gas stations, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles, such as grain, dust or metal powders.

Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Turn the radio OFF when in any area with a potentially explosive atmosphere. It is rare, but not impossible, that the radio or its accessories could generate sparks.

2. RADIO MODELS AND SPECIFICATIONS

2.1 RADIO MODELS

Table 2-1 contains a list of XG-75 radios that are supported by this manual.

Table 2-1: XG-75 Portable Radio Models

MODEL #	DESCRIPTION
EVXG-PBV1B	Portable, XG-75, 136-174 MHz, Scan, Black
EVXG-PFV1B	Portable, XG-75, 136-174 MHz, System, Black
EVXG-PBV1Y	Portable, XG-75, 136-174 MHz, Scan, Yellow
EVXG-PFV1Y	Portable, XG-75, 136-174 MHz, System, Yellow

2.2 SPECIFICATIONS

2.2.1 General

Input Voltage Range: 7.5 VDC nominal

Frequency Range
- Receive: 136 - 174 MHz
- Transmit: 136 - 174 MHz

Dimensions H x W x D
- Less knobs and antenna, with Battery: 149.5 x 62.0 x 48.5 mm (5.89 x 2.44 x 1.94 inches)

Weight (with battery)
- Li Ion: 448.0 g (15.8 oz)
- NiMH: 583.0 g (20.6 oz)

Operable Temperature Range:
- Li Ion: -10°C to +50°C (+14°F to +122°F)
- NiMH: -20°C to +50°C (-4°F to +122°F)

Relative Humidity: 90% @ +122°F (+50°C)

Vibration: 5 G (per U.S. Forest Service 10-60 Hz)

Immersion[1]: 1 meter for 4 hours with 49°F (27°C) differential (MIL-STD-810G).

Shock (TIA-603-C): 1.5 meter drop

Altitude
- Operational: 4572 m (15,000 ft.)
- In Transit: 15,240 m (50,000 ft.)

[1] XG-75 Immersion Model only.

2.2.2 Receive

Channel Spacing[2]:	25/30 kHz (wideband), 12.5/15 kHz (narrowband)
FM Sensitivity (12 dB SINAD):	0.20 µV/-121 dBm
P25 Reference Sensitivity (5% BER):	0.20 µV/-121 dBm
Spurious and Image Rejection:	80 dB
P25 Adjacent Channel Rejection @ 12.5 kHz:	>60 dB
Intermodulation:	77 dB
Rated Audio Output:	500 mW rated (3800 mW maximum)
Audio Distortion:	1.5% @ rated power

2.2.3 Transmit

RF Power Output (User-Selectable):	0.5 to 6.0 W
Spurious and Harmonics:	-36 dBm/-75 dBc
Modulation/Deviation[2]:	5.0 kHz (wideband), 2.5 kHz (narrowband)
Audio Distortion (1 kHz tone)[2]:	<1% [3 kHz deviation (wideband)] <1% [1.5 kHz deviation (narrowband)]
Audio Response (dB):	+1/-3
Frequency Stability:	± 1.5 ppm (-30°C to +60°C: + 25°C Ref)
P25 Modulation Fidelity:	<5%
P25 Adjacent Channel Power:	>67dBc
FM Hum and Noise*:	-52 dB (wideband), -50 dB (narrowband)
Frequency Separation (MHz):	Full Bandwidth

2.2.4 Regulatory

FCC Type Acceptance:	OWDTR-0059-E
Applicable FCC Rules:	Part 90
Industry Canada Certification:	3636B-0059
Applicable Industry Canada Rules:	RSS-119

[2] The VHF XG-75 is compliant with applicable FCC narrowbanding mandate below 512 MHz.

3. INTRODUCTION

The VHF XG-75 portable radio provides versatile and reliable communications to meet a range of user requirements. This radio is available in two models: the Scan model with a limited 6-button front-mounted keypad and the System model with a 15-button DTMF front-mounted keypad. The XG-75 delivers end-to-end encrypted digital voice and IP data communications. It is designed to support multiple operating modes including:

- EDACS® (Enhanced Digital Access Communications System) or ProVoice™ Trunked Modes
- P25 Trunked Mode
- P25 Digital Conventional Mode
- Conventional Analog Mode

The XG-75 portables can include all of these modes or just one. Additional modes of operation can be added with software updates.

The XG-75 supports a full range of advanced digital trunking features, including talk group calls, priority scanning, emergency calls, late call entry, and dynamic reconfiguration. It performs autonomous roaming for wide area applications. High quality voice coding and robust audio components assure speech clarity.

In the trunked modes, the user selects a communications "operating" system (i.e., EDACS, ProVoice, or P25) and group. While communicating in a trunked mode, channel selection is transparent to the user and is controlled via digital communication with the system controller (e.g., a CSD in an EDACS system). This provides advanced programmable features and fast access to communication channels.

In Conventional Analog mode, the user selects a channel and communicates directly on that channel. A channel is a transmit/receive radio frequency pair.

The exact operation of the radio will depend on the operating mode, the radio's programming, and the particular radio system. Most features described in this manual can be enabled through programming. Consult your System Administrator for the particular features programmed into your XG-75. Then refer to the corresponding section(s) within this manual for feature and operation information.

The XG-75 series portable radios operate reliably even under adverse conditions. These radios meet MIL-STD-810F specifications for wind driven rain, humidity, and salt fog.

4. OPTIONS AND ACCESSORIES

Table 4-1 lists the Options and Accessories tested for use with the XG-75 series portable radios. Refer to the Harris Products and Services Catalog for a complete list of options and accessories, including those items that do not adversely affect the RF energy exposure.

WARNING

Always use Harris authorized accessories (antennas, batteries, belt clips, speaker/mics, etc). Use of unauthorized accessories may cause the FCC Occupational/Controlled Exposure RF compliance requirements to be exceeded.

CAUTION

Always use the correct options and accessories (battery, antenna, speaker/mic, etc.) for the radio. Immersion rated options must be used with an immersion rated radio. Factory Mutual options must be used with Factory Mutual certified radios.

Table 4-1: Options and Accessories

DESCRIPTION	PART NUMBER
Antennas	
Helical coil (136-151 MHz)	KRE 101 1219/1
Helical coil (150-162 MHz)	KRE 101 1219/2
Helical coil (162-174 MHz)	KRE 101 1219/3
Helical coil (150-174 MHz)	KRE 101 1219/21
Batteries (Immersion-Rated)	
NiMH, immersible, Goldpeak cells	BT-023406-103
Nickel Metal Hydride (NiMH) Battery, Immersible	BT-023406-003
Nickel Metal Hydride (NiMH) Battery, Immersible, <IS>	BT-023406-004
Lithium-Ion (Li-Ion) Battery, Immersible	BT-023406-005
Lithium Polymer, Immersible	BT-023436-001
Chargers	
Sleeve, Desktop Charger	CH-016151-007
Single Charger, Tri-Chemistry	CH-104560-007
6-bay Charger, Tri-Chemistry	CH-104570-007
VC4000 Vehicular Charger	CH–017231-001
Charger, Six Bay, Li-Ion/Polymer	12082-0314-01
Miscellaneous Accessories	
Speaker Mic without Antenna (cc) provision, <IS>	MC-023933-001
Speaker Mic with Antenna (cc) provision, <IS>	MC-023933-002
Earphone for Speaker Mic, <IS>	LS103239V1
GPS	MC-009104-002
Ruggedized Speaker Mic-Coil Cord	MC-011617-601
Standard Speaker Mic - Non Ant	MC-011617-701
Drop Ship Audio Accessories	
Earphone Kit, Black	EA-009580-001
Earphone Kit, Beige	EA-009580-002
2-Wire Kit, Palm Mic, Black	EA-009580-003

DESCRIPTION	PART NUMBER
2-Wire Kit, Palm Mic, Beige	EA-009580-004
3-Wire Kit, Mini-Lapel Mic, Black	EA-009580-005
3-Wire Kit, Mini-Lapel Mic, Beige	EA-009580-006
Explorer Headset with PTT	EA-009580-007
Lightweight Headset Single Speaker with PTT	EA-009580-008
Breeze Headset with PTT	EA-009580-009
Headset, Heavy Duty, N/C Behind-the-Head, with PTT	EA-009580-010
Ranger Headset with PTT	EA-009580-011
Skull Mic with Body PTT and Earcup	EA-009580-012
Headset, Heavy Duty, N/C Over-the-Head, with PTT	EA-009580-013
Throat Mic with Acoustic Tube and Body PTT	EA-009580-014
Throat Mic with Acoustic Tube, Body PTT, and Ring PTT	EA-009580-015
Breeze Headset with PTT and Pigtail Jack	EA-009580-016
Hurricane Headset with PTT	EA-009580-017
Hurricane Headset with PTT and Pigtail Jack	EA-009580-018
Carrying Case Accessories	
14011-0012-01 Black Nylon Case with Belt Loop Kit	Kit containing 14011-0011-01 Black Nylon Case (with radio retaining strap) and CC-014527 Leather Belt Loop
14011-0012-02 Orange Nylon Case with Belt Loop Kit	Kit containing 14011-0011-02 Orange Nylon Case (with radio retaining strap) and CC-014527 Leather Belt Loop
14011-0012-03 Leather Case with Belt Loop Kit	Kit containing 14011-0011-03 Leather Case (with radio retaining strap) without shoulder strap D-rings, KRY1011608/2 swivel mount, and CC-014527 Leather Belt Loop
14011-0012-04 Leather Case with Shoulder Strap Kit	Kit containing 14011-0011-04 Leather Case with shoulder strap D-rings (with radio retaining strap), KRY1011608/2 swivel mount, and CC-014524-001 Shoulder Strap
Short Leather Retaining Strap (use with Shoulder Strap application)	CC-014524-002
Metal Belt Clip	CC23894

CAUTION

Do not carry the radio by the antenna or audio accessories attached to the Universal Device Connector (UDC).

5. SERVICE AIDS

The following tables list the support software, test equipment, and special tools you may need when programming and servicing the XG-75 series radio. To purchase any of these items, please contact the Harris Customer Care center.

Table 5-1: Recommended Tools and Test Equipment

DESCRIPTION	PART NUMBER	PURPOSE
Radio Personality Manager	TQS3385	Software for programming XG-75 series radios for EDACS, P25 Trunking, and Conventional operation.
Radio Personality Manager	TQS3389	Software for programming XG-75 series radios for Conventional and P25 Conventional operation.
Programming Cable	CA-023407-001	Use for programming radios.
USB Adapter Cable	MATQ-03421 (CN24741-0001)	Adapts USB to RS-232.
RF Antenna Adapter	19B801496G2	Provides a BNC-Female connection to the antenna connector on top of the radio.
Power Supply Adapter	BT-023406-015	Interface for a variable voltage - current limited power supply that simulates a battery.
Test Box	TS-011826-001	Selectable resistor values to simulate different external devices. Interface point for audio testing
Audio Test Cable	CA-023407-002	Interface cable for TQ0609A with UDC and DB-25 connector.
Service Computer (IBM compatible PC)	x86 based laptop or desktop computer with Windows XP, Windows Server 2003, or Windows Vista (32-bit version only) operating system.	Required to install, configure, and operate the Radio Personality Manager software.
RF Communications Test Set	Agilent HP8920B, with Option 001 High Stability Timebase (or equivalent)	Use to verify radio performance.
DC Power Supply	Agilent E3610A, (or equivalent)	Use as external radio power source.
Switch Removal Tool	T4WK03399	Use for removing the Volume or Channel switch.
RF Connector Removal Tool	G4UK07188-0	Use for removing the Antenna Connector.
Antenna Insertion Tool	337097G1B	Use to reinstall Antenna Insert Connector.
Handheld Torque Driver	12RTD	Use to apply required torque to screws during reassembly.

6. USER INTERFACE

This section describes the primary user interface; the buttons, knob controls, indicators, switch, and display. Refer to operator's manual 14221-1100-2010, available online at www.pspc.harris.com, for detailed operating instructions.

6.1 CONTROLS

The XG-75 portable radios feature two rotary control knobs, an emergency button, and a dual-position A/B switch located on the top of the radio (Figure 6-1). The Push-To-Talk (PTT) button and two option buttons are located on the side (Figure 6-2) of the radio. The front mounted keypad of the System model has 15 buttons and the Scan model has six buttons. Refer to Figure 6-3 and Figure 6-4, respectively.

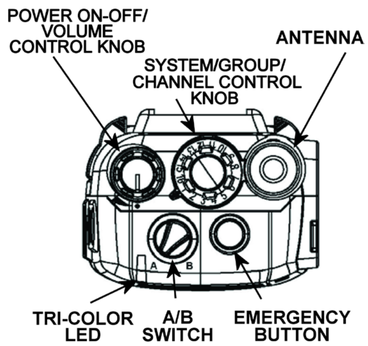


Figure 6-1: Top View

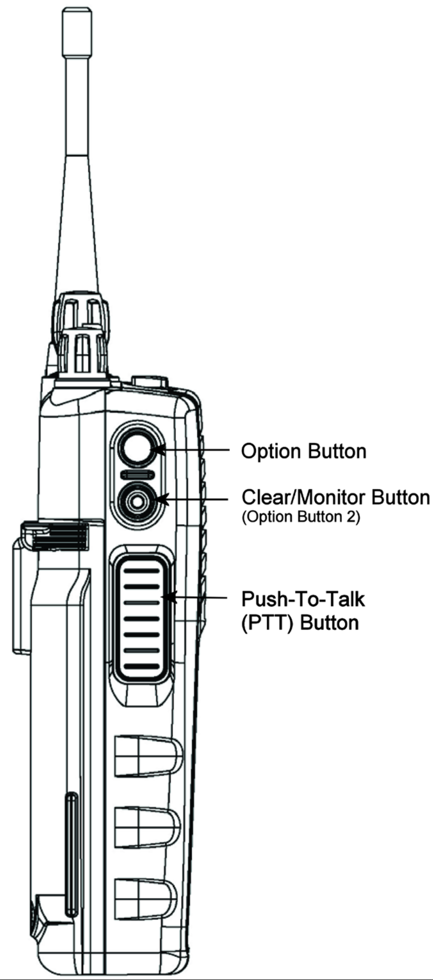


Figure 6-2: Side View

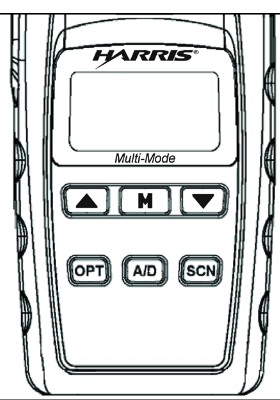
The functions of the buttons and knob controls vary depending on mode of operation. The dual position A/B switch is currently software defined only in ECP mode. Primary functions of the button, switch, and knob controls are discussed in general terms in Table 6-1.

Table 6-1: Buttons, Knobs, and Switch Functions

POWER ON/OFF-VOLUME CONTROL KNOB	Applies power to the radio and adjusts audio volume. Rotating the control clockwise applies power to the radio. If enabled through programming, a single alert tone indicates the radio is operational. Rotating the control clockwise increases the volume level. A minimum volume level can be programmed into the radio to prevent missed calls due to a low volume setting. While adjusting the volume, the display momentarily indicates the volume level (i.e., **VOL=31**). The volume ranges from a minimum programmable level of zero (displayed as **OFF** in the display) up to 40, which is the loudest level.
SYSTEM/GROUP/CHANNEL CONTROL KNOB	Used to select groups/channels. This is a 16-position rotary knob. A mechanical stop, used to limit the number of accessible positions, is shipped with the radio but must be installed. To install the mechanical stop: 1. Remove the System/Group/Channel control knob. 2. Loosen the set screw on the System/Group/Channel control knob metal base (using a 1.27 mm hex wrench). 3. Remove the System/Group/Channel control knob metal base. 4. Replace the 16 channel ring with the channel stop ring located at the desired channel. 5. Re-install the System/Group/Channel control knob metal base, tighten the set screw, and re-install the System/Group/Channel control knob.
EMERGENCY/HOME BUTTON	Press and hold for a programmed duration to automatically select a pre-programmed "Home" Group/System or to declare an emergency. The button can be pre-programmed for either operation, but not both.
PUSH-TO-TALK (PTT) BUTTON	The PTT button is pressed before voice transmission begins.
○	Activates one of a number of programmable software options selected during PC programming.
⊙	Exits the current operation (removing all displays associated with it) and returns the radio to the selected talk group.
A/B SWITCH	Function is user-defined from a list of programmable options.

6.2 KEYPAD

The front mounted keypad of the Scan model has six buttons and System model has 15 buttons. Refer to Figure 6-3 and Figure 6-4, respectively.



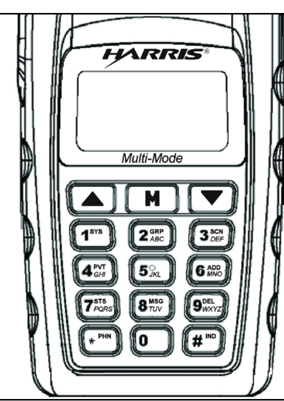


Figure 6-3: Scan Model Front Panel

Figure 6-4: System Model Front Panel

The primary and secondary functions of each key, where applicable, are described in Table 6-2.

Table 6-2: XG-75 Front Keypad Functions

KEY	FUNCTION
M	Primary Function: Accesses the menu. Secondary Function: Activates a selected item within the menu, similar to an "Enter" key.
▲ ▼	Primary Function: Scrolls through available systems, groups, or channels, depending on programming. Secondary Function: Changes the selection for an item within a list.
A/D	Adds/deletes selected groups or channels from the scan list of the currently selected system.
SCN	Toggles scan operation on and off.
OPT	Activates one of any programmable software options selected during radio programming, i.e., high/low TX power and talkaround.
1 SYS	Primary function: Selects a specific system. If the rotary knob is used to select the system and more than 16 systems are programmed in the radio, the 1 SYS key is used to select additional banks (groupings) of systems.
2 GRP ABC	Primary function: Select a group.
3 SCN DEF	Primary function: Turns the Scan operation on and off.
4 PVT GHI	Primary function: Enables or disables encryption for the system/group/channel displayed.
6 ADD MNO	Primary function: Adds groups or channels from the currently selected system to the scan list.
7 STS PQRS	Primary function: Accesses the status list (0-9), permitting the transmission of a pre-programmed status message to an EDACS or P25 site.
8 MSG TUV	Primary function: Accesses the message list (0-9), permitting the transmission of a pre-programmed message to an EDACS or P25 site.
9 DEL WXYZ	Primary function: Deletes selected groups or channels of the currently selected system from the Scan list.
1 SYS, 2 GRP ABC, 3 SCN DEF, 4 PVT GHI, 5 JKL, 6 ADD MNO, 7 STS PQRS, 8 MSG TUV, 9 DEL WXYZ, 0, * PHN, # IND	Secondary function: Acts as a typical DTMF telephone pad used to place telephone interconnect and individual (unit-to-unit) calls.
* PHN	Primary function: In EDACS and P25 modes, initiates telephone interconnect calls.
# IND	Primary function: In EDACS and P25 modes, initiates individual, unit-to-unit calls.

6.3 DISPLAY

The XG-75 display is made up of 4 lines containing twelve alpha-numeric character blocks each. If programmed, the display backlighting will illuminate upon power up or when radio controls are operated.

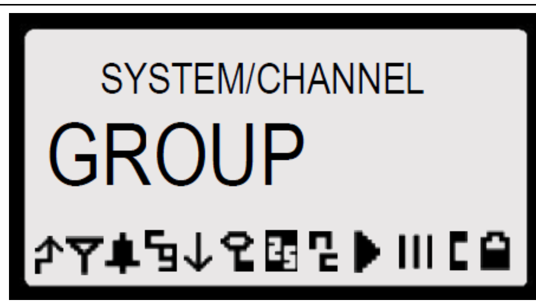


Figure 6-5: XG-75 Radio Display

Table 6-3 describes the icons that may be displayed by the XG-75 during operation.

Table 6-3: Status Icons Descriptions

ICON	DESCRIPTIONS
	Steady – during all radio transmissions.
	Steady – “Busy” transmitting or receiving, call queued.
	Steady – T99 Mode enabled.
	Steady – Channel Guard enabled **If icon is not visible** – Channel Guard is disabled.
	Steady – EDACS system in Failsoft™ mode.
	Steady – transmit at low power. **If icon is not visible** – transmit at high power.
	Steady – transmit in encrypt mode. **Flashing** – receiving an encrypted call.
	Steady – Indicates the current channel is set up as a Project 25 (P25) channel.
	Steady – Indicates the current channel is set up as a ProVoice channel.
	Steady – Indicates the current channel is set up as an analog channel.
	Animated (*rotates clockwise)* – Scan mode enabled. **If icon is not visible** – Scan is disabled.
	Steady – Priority 1 group or channel.
	Steady – Priority 2 group or channel.
	Steady – Group or channel in scan list.
	Steady – Special call mode (individual or telephone).
	Steady – Battery charge indicator. The battery charge indicators illustrate approximate level only, based on battery voltage.
	Flashing – Low battery indicator.
	Steady – Noise cancelling is enabled.

6.4 TRI-COLOR LED

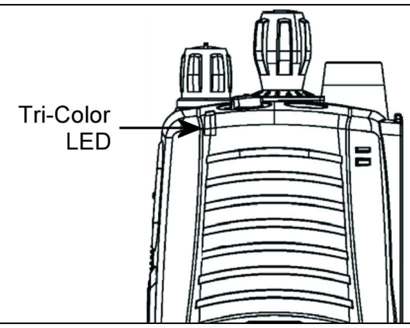


Figure 6-6: Tri-Color LED

The Tri-Color LED changes color to indicate radio status and is visible from both the front and top of the radio (see Figure 6-1). In addition, the mode of operation may also help determine what the color of the LED represents.

Green: Receiving

Red: Transmitting Unencrypted

Orange: Transmitting Encrypted

6.5 UNIVERSAL DEVICE CONNECTOR

The Universal Device Connector (UDC) provides connections for external accessories such as a headset, a speaker-microphone, audio test box, audio test cables, and programming cables. The UDC is located on the right side of the radio, opposite the PTT Button. The UDC facilitates programming and testing the radio. The UDC pins perform different functions depending on the accessory attached to the UDC.

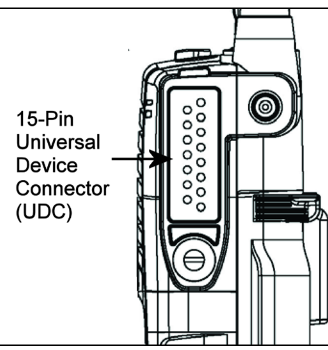


Figure 6-7: XG-75 15-Pin Universal Device Connector

6.6 NOISE CANCELLATION

The XG-75 features Harris' proprietary noise suppression capability to provide clear and crisp voice quality in high-noise environments for use in any mode, including both analog and digital communications.

The XG-75 has two microphones; one located on the front (primary) and one on the rear (secondary). The primary microphone operates in exactly the same manner as a normal radio and is the one you talk into. The secondary microphone is used to pick up the surrounding noise when noise cancellation is turned on.

In the case where noise cancellation is enabled and a speaker microphone is attached to the XG-75, talk into the speaker microphone. In this mode, XG-75 front microphone is used to pick up the surrounding noise, and the rear microphone is unused.

If the secondary microphone is blocked, the XG-75 operates as though noise cancellation is turned off.

6.6.1 Turning Noise Cancellation On and Off

A button on the radio or the A/B switch can be programmed to toggle noise cancellation on or off.

OR

1. Press the [M] button.
2. Use the [▲] or [▼] button to select "NOIS CAN."
3. Press the [M] again to toggle noise cancellation on or off.

The top line of the display will briefly display "NC ON" or "NC OFF." When noise cancellation is enabled, the icon is displayed on the bottom of the display.

6.6.2 Using Noise Cancellation

When using the noise cancellation feature, observe the following:

- Talk within two (2) inches of primary microphone (see Figure 6-8).
- Speak clearly, loudly, and with authority.
- If possible, face the noise source when talking into the radio (see Figure 6-8).
- Ensure the primary and secondary microphones are not covered. See Section 6.6.4 for more information on the primary and secondary microphones.
- In very noisy environments, it is o.k. to yell into the radio. The radio can handle very loud input levels.

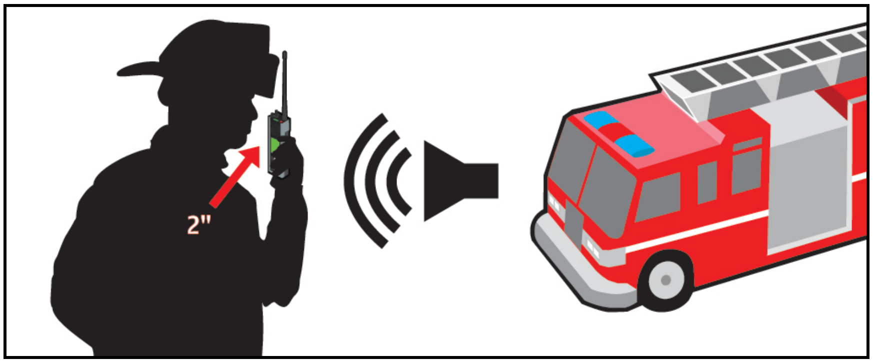


Figure 6-8: Using the Noise Cancellation Feature

6.6.3 The Effect of Distance from the Microphone

Unlike a normal microphone system, noise cancellation makes the level of your voice diminish quickly as you move away from the radio. In essence, the radio starts to see your voice as surrounding noise. Whereas, you may be comfortable speaking up to a foot away from the front of a normal radio, noise cancellation requires that you keep it close.

6.6.4 Primary versus Secondary Microphone

6.6.4.1 Without a Speaker Microphone Attached

The primary microphone is located on the front of the radio and the secondary is on the back of the radio.

6.6.4.2 With a Speaker Microphone Attached

When a speaker microphone is attached, the radio electronically switches over to use the radio's front microphone as secondary. The microphone on the attached speaker microphone becomes the primary microphone.

6.6.5 When Using an SCBA Mask

When using the SCBA mask, the primary microphone can be held directly against the voice port. If the SCBA has a voice amplifier, the same rule applies. Ensure that the secondary microphone is uncovered. If possible, point the secondary microphone toward the noise source.

7. PROGRAMMING

This section contains information and procedures for programming the XG-75 radio.

7.1 RADIO PERSONALITY MANAGER

Harris Radio Personality Manager (RPM) is a Microsoft® Windows®-based software application used to program Harris radios operating in Conventional, EDACS®, EDACS IP, P25 Trunking, or P25 Conventional Communication Systems. RPM creates and modifies radio personalities. A personality is a computer file generated by the user. The computer file (personality) is downloaded from the computer into the radio and contains data that will direct certain operating characteristics of the radio. The technician can program personalities into the radio or can read personalities from the radio and save them to a hard drive or other computer storage media.

7.2 PLACING RADIO IN PROGRAMMING MODE

RPM cannot communicate with the radio unless the radio is in the programming mode.

Perform the following steps to place the radio into automatic programming mode:

1. Ensure the radio is turned OFF.
2. Connect the radio to the PC as shown in Figure 11-1.
3. Turn the radio ON. The radio will automatically enter Program mode when RPM or the Maintenance Tool attempts communication.
4. Turn the radio OFF and disconnect the programming cable after programming is complete.
5. If at any time this method of communication fails, retry this procedure or try the following alternate method.

***Alternate Method*:**

1. Ensure the radio is turned OFF.
2. Connect the radio to the PC as shown in Figure 11-1.
3. Press and hold the **PTT** button.
4. Turn the radio ON and release the **PTT** button.
5. The radio should display Program.

7.3 FLASH PROGRAMMING

The "Flash" software is the XG-75 radio operating software. When changes and enhancements are made to the operating code, the new operating code can be "flashed" to the radio, upgrading the operating code without changing the radio hardware. Flash software is a computer file read from a disk and downloaded to the radio using RPM.

7.4 MANAGING TRACKING DATA

The radio software contains certain information bytes known as "Tracking Data" that allow the radio's OMAP processor to control transmitter power, modulation characteristics, RSSI level, squelch opening threshold, and reference oscillator frequency. Normally, no adjustments to the tracking data are necessary to maintain specified limits for all related functions, since the processor makes the necessary adjustments using the Tracking Data established at the factory.

However, if the Tracking Data is lost, corrupted, or affected by maintenance actions, it may be necessary to establish new Tracking Data to restore calibrated performance. The following examples of repair situations require reloading (restoring) factory Tracking Data or establishing new Tracking Data.

SITUATION	NEW TRACKING DATA REQUIREMENTS
New PA Module	All RF Power settings
New Reference Oscillator	Reference Oscillator setting
New Main Board	All Tracking Data plus Feature Licensing Data and Operating Software
New Flash Memory	All Tracking Data and Operating Software

Hardware repair for this radio is limited. Technicians servicing this radio should be concerned with isolating the problem to hardware or software. Most radio problems are the result of software errors and are usually corrected by reloading the personality, flash, etc. Radios with hardware issues should be returned to an authorized service center.

7.5 PERSONALITY PROGRAMMING

A personality is a computer file that contains the operating characteristics and frequencies for a radio unit. The radio technician uses the Radio Personality Manager (RPM) software (TQS3385 or TQS3389) to create, edit, or read the personality and then to write the personality into the radio.

RPM software, in one setup, communicates with the radio through the CA-023407-001 programming cable. Figure 7-1 shows a diagram of that Programming Setup to program the radio. Refer to RPM On-Line Help “Programming the Radio” section for detailed programming instructions.

To Load a Personality into the radio:

This section assumes the Service PC has RPM installed. For additional information on installing RPM, refer to the RPM Software Release Notes MS-012550-001 (TQS3385) or MS-012761-001 (TQS3389).

1. Connect the radio to the Service PC using the CA-023407-001 programming cable.
2. Click the **Start** button on the PC.
3. Select **Programs → Harris Radio Personality Manager → Radio Personality Manager**.
4. The programming application initializes with a default Personality window called "Person1."
5. Create a new personality or open an existing personality.

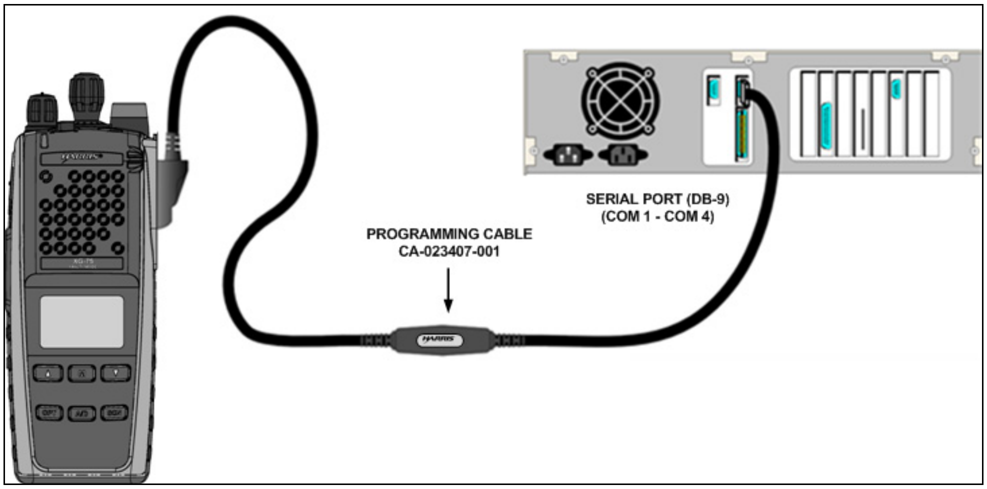


Figure 7-1: XG-75 Programming Setup

6. Select **Radio → Program** and write the personality into the radio.
7. In the "Program Radio Setup" dialog box, click **OK**.
8. The radio will cycle to operational mode after successfully writing the personality to the radio.
9. Exit RPM and disconnect the programming cable.

7.6 LOADING A PERSONALITY INTO A RADIO

To load an existing personality into the radio:

1. Connect the programming cable between the radio and Service PC.

   Use the connection diagram shown in Figure 7-1.

NOTE

> If the PC does not have a serial port, use the USB Adapter Cable MATQ-03421 (CN24741-0001), available from Harris as a service part.

2. On the Service PC, click the Start button and select **Programs → Harris Radio Personality Manager → Radio Personality Manager** to start RPM.
3. Select the **File → Open → *…your directory*** and browse to locate a personality (*.PRS) file.
4. Start with the radio powered off.
5. Press and hold the **PTT** button.
6. Turn the radio on and release the **PTT** button.
7. The radio will respond by displaying XG-75 and the software version, before displaying **PROGRAM**.
8. Select **Radio → Program** or click on the **Program** icon. This starts the process of programming or writing the personality to the radio.
9. The *Program Radio Setup* dialog box should appear and the radio should display **PROGRAM** on the top line.
10. While observing the radio display, click **OK**.

Writing the personality to the radio is successful when the radio resets and RPM returns to the Personality window.

11. Turn off the radio and remove the programming cable.

7.7 LOADING ENCRYPTION KEYS

Harris' Key Manager is designed to assist in the management and distribution of encryption keys to allow the use of P25 and EDACS radios with encrypted talk groups for high-security applications. The Key Manager software manages most key types for Harris devices. It allows the user to load EDACS DES, P25 DES, P25 AES and ProVoice AES keys. Key Manager consists of two applications: Key Admin and Key Loader. The Key Loader media kit (SK102981V1) also includes the P25 UKEK Loader.

Refer to the following documentation for advanced programming and setup instructions:

- Harris OTAR Overview Manual - MM-008069-001
- Network Key Manager Installation and Configuration Manual - MM-008070-001
- Harris UAS Key Management Application Manual - MM-008068-001
- Harris Key Manager Key Admin Overview and Operation Manual - MM1000019423
- Harris Key Manager Key Loader Overview and Operation Manual - MM1000019424

7.7.1 Create Keys Using Harris Key Admin

Harris Key Admin is part of the Harris Key Manager and is for use by the Crypto Officer (CO). The CO creates a Master Set of keys from which a Distribution Set is produced. Using the Key Admin software, the CO can save keys into Distribution key files for technicians to use in radios.

1. Select **Start → Programs → Harris Key Manager → Harris Key Admin**.
2. Select **New Master Set**, **Open**, or **Load Existing Set**. Refer to the Key Admin online help for more information on creating keys.
3. When finished, create a Distribution Key File. A Distribution Key File is used with the Key Loader to load key sets into the radio and cannot be edited. Refer to the Key Admin online help for more information on creating the Distribution Key File.

7.7.2 Load UKEKS with Key Loader and RPM (For OTAR-Enabled Systems)

UKEKs are loaded into Harris OTAR radios using the Key Loader application. Key Loader is a part of Key Manager.

To load encryption keys:

1. Obtain the UKEK file and Storage Location Number (SLN) Binding Report information from the Crypto Officer (CO).

NOTE

Both AES and DES UKEKs can be contained within the same UKEK file.

2. If not already on, power-up the Service PC that has RPM and the Key Loader applications installed on it, and start Windows.
3. Connect radio to the Service PC as shown in Figure 7-1. The setup is similar to the Personality Programming setup.

4. Load the UKEK file from the Crypto Officer onto the Service PC.
5. Run the RPM application and setup the radio's personality according the SLN Binding Report information.
6. Setup the talk groups and the SLN mappings (Talk Group ID to SLN). This includes mapping SLNs to the "System" keys (PSTN, All Call, etc.).
7. Select **Options → P25 OTAR Options** and set the following:
   a. The OTAR Message Number Period (MNP) as defined by the System Administrator.
   b. The radio's Individual RSI (from the SLN Bindings Report).
   c. The KMF's RSI (from the SLN Bindings Report).
8. Select **Radio → Program** or click on the **Program** icon and write the personality to the radio.
9. Run the Key Loader application.
10. Open the UKEK file loaded in step 4.
11. Select the Target Device type (Auto-Detect is preferred) and click the **Load** button.
12. When prompted, enter your user name and password and click **OK**.

    The Key Loader reads the target device's identifying information, retrieves a UKEK of the proper algorithm type from the UKEK file, and downloads the UKEK to the target device at the proper SLN and keyset with the proper key ID.
13. Click the **Finish** button to exit the Key Loader application. New UKEKs are loaded and the radio is now ready to accept TEKs via OTAR with the trunked radio network.

7.7.3 Load Keys Using Harris Key Loader

Harris Key Loader is part of Harris Key Manager and can be used by the Crypto Officer or Technician to load the keys into the radio.

Refer to the Harris Key Loader online help if additional information is required when performing this procedure.

1. Connect radio to the Service PC as shown in Figure 7-1.
2. Power on the radio, if not already.
3. Select **Start → Programs → Harris Key Manager → Harris Key Loader**.
4. At the Key Loader Welcome screen, click **Next**.
5. Select **Load a Distribution Set into one or more devices**.
6. Click **Next**.
7. Browse to the Key File and enter the password.
8. Click **Next** to validate the password and continue. If the password is incorrect, the screen will display an error message.
9. Select the serial port from the drop-down list and select **Next**.
10. Select the radio type from the drop-down list and click **Load**.
11. Click **Finish**.

8. SERVICING

To ensure the XG-75 continues to operate at peak efficiency, we recommend periodically inspecting and cleaning the units. We also recommend periodically testing the units to ensure they are operating within FCC limits.

This section provides the following information:

- Preventive Maintenance (Section 8.1)
- Handling Precautions (Section 8.1.1)
- Annual Physical Inspection (Section 8.1.2).
- Basic Radio Measurements (Section 8.1.3)
- Cleaning (Section 8.1.4)
- Preventive Maintenance for Immersion-Rated radios (Section 8.2)
- Servicing Intrinsically Safe radios (8.3)
- Maintaining Battery Packs (Section 8.5)

8.1 PREVENTIVE MAINTENANCE

To ensure a high operating efficiency and to prevent mechanical and electrical failures, perform periodic maintenance according to the schedule outlined in Sections 8.1.1 and 8.1.3.

8.1.1 Handling Precautions

CAUTION

Do not carry the radio by the antenna.

This radio contains components that are susceptible to damage by ElectroStatic Discharge (ESD). Service personnel should be knowledgeable on the proper handling procedures and should only work on the radio in an approved ESD environment.

Use proper grounding techniques (wrist or waist straps with grounding cords, grounded table-top mats, etc.) and other approved methods in order to minimize the chance of damage from ESD.

8.1.2 Physical Inspection

Before placing the radio into service, inspect it for any physical damage and ensure all buttons, knobs, and switches are functional. There are no requirements for internal inspection of the radios. Refer to Section Table 8-1 for part numbers and ordering information.

Table 8-1: Physical Inspection

ITEM DESCRIPTION	INSPECTION COMMENTS
Knobs (volume-on/off and group/channel select)	Cracks, fractures, wear, contaminants.
Switches (volume-on/off and group/channel select)	Loose switches, erratic updates.
Buttons (PTT, emergency, option, clear/monitor)	Wear, actuation force, tactile feel, erratic updates.
Keypad	Wear, tears, erratic updates.
Display and display lens	Cracks, fractures, scratches, contrast, missing segments, obstructions.
Battery pogo pins	Wear, spring force, stuck pins, contaminants.
Battery gasket	Wear, cracks, scratches, obstructions, color.
Microphone hole and gasket	Contaminants, obstruction, gasket tears and scratches.
LED Lens	Cracks, fractures, scratches, obstructions, colors.
UDC	Wear, plating, cracks, scratches, fractures, contaminants, corrosion, erratic accessory operation.
Case, chassis, and battery integrity	Cracks, scratches, fractures, wear, contaminants, corrosion.
Screws	Loose screws, corrosion, o-rings/seals.
Battery connection	Loose battery fit, erratic power cycling.
Accessory connection	Erratic accessory operation.
Antenna	Loose fit, cracks, fractures, cuts, bends, twists, wear.

8.1.3 Basic Radio Measurements

Perform the following tests annually or as required by local directives.

Basic Radio Measurements	Schedule	Comments
Reference Oscillator (TCXO)	Immediately, if unit was in storage for two (2) months or more.	Refer to Section 11.5.3.
	Six (6) months after first deployment.	
	Annually	
TX power	Annually	Refer to Section 11.5.4.
TX deviation	Annually	Refer to Section 11.5.6.
RX sensitivity	Annually	Refer to Section 11.5.12.2.
RX squelch	Annually	Refer to Section 11.5.11.

8.1.4 Cleaning

Keep the exterior of the radio, battery, antenna, and radio accessories clean. Periodically clean using the following procedures:

1. To remove dust and dirt, use a soft clean damp cloth.
2. For more rigorous cleaning, use the following procedure:

CAUTION

> Do not use chemical cleaners, spray, or petroleum-based products. They may damage the radio housing. We recommend using an "antibacterial hand soap dishwashing liquid."

   a. Cover the speaker and microphone areas to protect them when cleaning.
   b. Prepare the cleaning solution using warm water.
   c. Drop the cleaning cloth into the solution, wring it out, and wipe the radio clean.

NOTE

> Do not apply cleaning solution directly on radio. Repeat the process until the radio is clean.

   d. Follow up by wiping off the radio with clean damp cloth using warm water only.
   e. Wipe dry with clean cloth.

3. Remove the battery and wipe the battery and radio contacts using a soft dry cloth to remove dirt or grease. This will ensure efficient power transfer from the battery to the radio.

4. Remove any accessories and clean the accessories Universal Device Connector (UDC) contacts using a clean dry cloth. When the UDC is not in use, cover the connector with the protective dust cap to prevent the build-up of dust or water particles.
5. If the radio is used in a harsh environment (such as driving rain, salt fog, etc.), it may be necessary to periodically dry and clean the battery and radio contacts with a soft dry cloth or soft-bristle non-metallic brush.

8.2 SERVICING IMMERSION-RATED RADIOS

Preventive Maintenance for Immersion-Rated Radios

CAUTION

XG-75 model radios with Immersion Option must be serviced by a service center authorized and certified by Harris to perform the necessary tests to verify watertight integrity. As part of a thorough preventive maintenance plan, Harris recommends Immersion-Rated XG-75 portable radios are, at a minimum, tested and re-certified on an annual basis. Harris further recommends that the radios be tested on or close to the anniversary of the ship date printed on the Model Number label on the back of the radio (see Figure 8-1).

8.2.1 Authorized Service Centers

To recertify the watertight integrity of the XG-75 portable radio, the radio must be inspected by a service center authorized and certified by Harris to perform the necessary tests to verify the watertight integrity.

The Harris Service Network includes company-owned service facilities as well as the capabilities of service partners located throughout the world. We have over 250 Authorized Service Centers (ASC) qualified to perform warranty repairs, installation and maintenance services. For a list of ASCs, contact our Customer Care center.

The XG-75 model radio with immersion option, under warranty, ***MUST*** be serviced by a service center authorized by Harris to service the immersion-rated radios. If service is performed by the user or by any service center not authorized by Harris for this purpose, the warranty will be ***VOID***. Unauthorized service is made discernible by a tamper-evident label placed within the battery well at the back of the radio. The standard product warranty on the XG-75 radios is two (2) years parts and labor. Harris recommends that the radio's immersibility be tested once a year by a qualified and approved service center with access to the specialized equipment required.

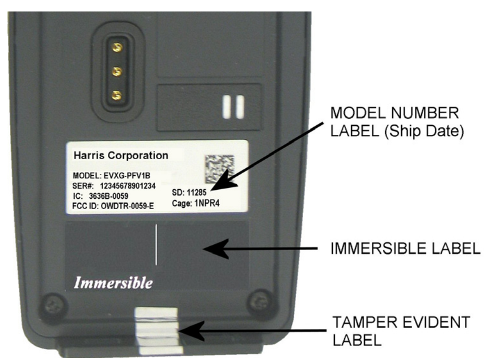


Figure 8-1: Labels

8.2.2 Testing

Procedures for testing the watertight integrity of the XG-75 portable radio are beyond the scope of this manual. Please refer to the *Compressed-Air Immersion Simulator (CIS) Product Manual, MM-009543-001* for instructions. The CIS (TS-009936) provides a quick and accurate means for testing the water-tight integrity of immersible radios using compressed air to simulate immersion. This is a required test whenever an immersible radio has undergone service, the radio chassis has been opened, or the tamper proof label has been broken or is missing.

8.3 SERVICING INTRINSICALLY SAFE RADIOS

Certain models of the XG-75 portable radio are rated “Intrinsically Safe” by the Factory Mutual Research Corporation and Canadian Standards Association. These units must be serviced by FM/CSA-certified service centers to retain the Intrinsically Safe certification. All Harris owned service centers are FM/CSA certified. Other service shops may or may not be certified by the rating agencies. Check with your service provider prior to having any Intrinsically Safe product serviced.

CAUTION

Only approved Intrinsically Safe options can be used with an Intrinsically Safe radio. This includes battery packs, speaker microphones, antennas, etc. The specific antenna, speaker microphone options, and carrying accessories that may be used with Intrinsically Safe radios appear in Table 4-1 designated by <IS>.

8.4 EXTERNAL CONNECTIONS

8.4.1 RF Connections

- Top Antenna Insert
- Side Antenna Bypass Connector

8.4.2 Universal Device Connector (UDC)

The 15 pin UDC connector mates to numerous external devices.

Partial listing:

- Programming
- External Speaker Microphone
- Enhanced Vehicular Charger
- Key Loading for Encrypted Voice
- Data Cable
- Multiple Vendor devices

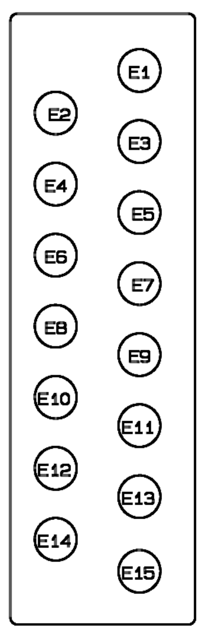


Figure 8-2: UDC Connections

E1* Switched A+
E2 USB D+
E3 USB D-
E4 USB VBUS
E5* UDC Sense
E6* UDC Speaker +
E7* UDC Speaker -
E8* Gnd A-
E9* EXT. MIC. In
E10* EXT. PTT- **
E11* EXT. EMER
E12 TX Data In **
E13* RX Data Out
E14 Mute Out **
E15* T-/R **

* Leads available on TS-011826-001 Test Box

** Leads have other uses.

NOTE

Whenever the UDC is not in use, be sure to install the UDC cover, p/n FM-014712, to protect the UDC from damage or moisture.

8.5 BATTERY PACKS

The XG-75 series portable radios use rechargeable, recyclable Nickel Metal Hydride (NiMH), Lithium-Ion (Li-Ion), or Lithium Polymer (Li-Poly) batteries. Please read carefully, the battery information provided, to maximize the useful life of each type of battery.

WARNING

Do not disassemble or modify Lithium battery packs. Lithium battery packs are equipped with built-in safety and protection features. Should these features be disabled or tampered with in any way, the battery pack can leak electrolyte, overheat, emit smoke, burst, and/or ignite.

WARNING

If the battery is ruptured or is leaking electrolyte that results in skin or eye contact with the electrolyte, immediately flush the affected area with water. If the battery electrolyte gets in the eyes, flush with water for 15 minutes and consult a physician immediately.

8.5.1 Battery Pack Usage

NiMH, Lithium-ion, and Lithium Polymer batteries vary in capacity and life cycle. NiMH, Lithium-Ion, and Lithium Polymer batteries require that basic usage guidelines be followed in order to optimize the battery runtime or shift life.

The following guidelines will help optimize the battery runtime or shift life:

- Ensure Nickel-based battery packs are fully discharged (as indicated by the radio low battery warning) before re-charging. Full discharge is not required for Lithium battery packs.
- Periodically condition Nickel-based battery packs. The frequency should be determined based on usage patterns (refer to ECR-7367). If the battery is fully discharged (to radio Low Battery warning) during routine use, the frequency of conditioning may be reduced. Lithium-ion and Lithium Polymer batteries do not suffer from memory-effect and therefore do not require conditioning.

Do not leave any Harris rechargeable batteries in a charger for more than a few days.

8.5.2 Servicing Battery Packs

To ensure battery packs are readily available for radio operators (that is, the user has a fully charged, long running battery pack at the beginning of the work-shift) we recommend establishing a battery service program (refer to ECR-7367 for details). As part of that program, it is important to actively monitor battery usage and periodically recondition the battery pack (see Table 8-2).

Table 8-2: Battery Pack Usage Patterns

PATTERN	DESCRIPTION	EXAMPLE	NEED TO RECONDITION
A	Battery is taken out of the charger and used for 8-12 hours (low battery warning) then recharged.	A police officer that carries the radio all day.	Annually, to track capacity
B	Battery is charged, used for over 8 hours then recharged and immediately used for the next shift.	A manufacturing plant that has three shifts a day.	Semiannually
C*	Battery is fully charged, used for 4 hours or less, and returned to the charger.	An administrator. May apply to a user that has two batteries.	Monthly
D*	Battery and radio reside in the desktop charger, radio turned ON waiting for a call.	Fireman or EMS	Monthly
E	Battery and radio are used with a vehicular charger.	Vehicle patrol officer.	Monthly
F	Batteries are stored for more than two weeks at room temperature		After one month of storage
G	Batteries are stored for more than two weeks at elevated temperatures (around 30°C)		After two weeks storage
* These patterns are the hardest on a battery pack.			

8.5.3 Reconditioning Battery Packs

CAUTION

Always use Harris authorized chargers and conditioners. Use of unauthorized chargers and conditioners may void the warranty.

8.5.3.1 Conditioning NiMH Battery Packs

CAUTION

Failure to properly condition NiMH battery packs before initial use will result in shortened performance by the battery.

Condition a new NiMH battery pack before putting into use. This also applies to rechargeable NiMH battery packs that have been stored for long periods (weeks, months, or longer). Conditioning requires fully charging and fully discharging the battery pack three (3) times using the tri-chemistry charger. The first time the battery pack is put into the charger, this unit will condition Nickel-based battery packs by automatically charging and discharging (cycling) the battery. Refer to the appropriate charger manual for details.

8.5.3.2 Conditioning Lithium-Based Battery Packs

Lithium battery packs do not suffer from memory effect and therefore do not require conditioning.

CAUTION

Always use Harris authorized chargers and conditioners. Use of unauthorized chargers and conditioners may void the warranty.

8.5.3.3 Additional Information

For more information regarding the proper care of portable radio battery packs or establishing a battery maintenance program, refer to ECR-7367.

8.5.4 Charging Battery Packs

There are a number of battery chargers available from Harris. These include single and multi-position rapid chargers and vehicular chargers.

Harris chargers are specifically designed for charging battery packs. The chargers differentiate between NiCd, NiMH, Li-Ion/Poly battery packs and automatically adjust charging rates. Refer to the appropriate charger manual for specific operating instructions.

8.5.5 Charging Guidelines

Observe the following guidelines when charging a battery pack:

- Avoid high temperatures during charging.
- Discontinue use if the charger is overheating.
- Only charge battery packs using a rapid charger approved for use by Harris.
- Do not leave batteries in the charger indefinitely. For best results leave the battery in the charger for two to six hours after the Green Ready LED comes on. Then place the battery pack into service and fully discharge (as indicated by the radio “Low Batt” warning) before re-charging.

If any faults are encountered while charging the battery pack, consult the chargers’ manual to determine the cause and possible corrective action.

8.5.6 Changing the Battery Pack

8.5.6.1 Intrinsically Safe Battery Pack Replacement

Only battery packs identified with a green FM/CSA label shall be used with a portable radio that is rated and labeled as FM/CSA Intrinsically Safe. Use of non-specified battery packs voids FM/CSA approval.

The following battery pack is approved for use in Intrinsically Safe XG-75 portable radios:

Option BT-023406-004 Nickel Metal Hydride (NiMH) Battery, Immersible

8.5.6.2 Removing the Battery Pack

Make sure the power to the radio is turned off.

CAUTION

Although the XG-75 has been designed to tolerate changing the battery pack without turning power off, Harris recommends turning the radio off before changing battery packs to ensure safety and best operation.

Refer to Figure 8-3 and perform the following to remove the battery pack.

1. Press or pull both latches on either side of the battery pack ① toward the bottom of the radio simultaneously.
2. Pull the battery ② away from the radio.
3. Remove the battery pack from the radio.

Figure 8-3: Removing the Battery Pack

8.5.6.3 Attaching the Battery Pack

Make sure the power to the radio is turned off.

1. Align the tabs at each side on the bottom of the battery pack with the slots at the bottom of the battery cavity ①.
2. Push the top of the battery pack ② down until the latches click to attach the battery to the radio.
3. Tug gently to verify that the latches are secure and the battery pack is properly attached to the radio.

Figure 8-4: Attaching the Battery Pack

8.5.7 Battery Pack Storage and Disposal

If a battery pack is expected to be idle for a month or more, it should be properly prepared.

Battery packs should not be stored fully charged. Before storing Nickel-based battery packs, discharge them to their end-of-life voltage (about six volts). If the battery is not discharged prior to storage, depending on the length of storage, its overall capacity may be reduced.

Lithium batteries should be stored with approximately 40% charge. Although, all battery packs experience some capacity loss during storage, the shelf life varies by chemistry, for example, the shelf life for NiMH battery packs is about three years and for NiCd battery packs about five years. It should be noted that any capacity drop that occurs during storage is permanent and cannot be reversed.

While capacity loss cannot be totally prevented, the following guidelines will reduce loss during storage:

- Battery packs should be stored in a cool dry storage area (32 to 86°F [0 to 30°C]), preferably a refrigerator, but avoid storing in freezers. Place the battery pack in a plastic bag to protect it against condensation.
- Do not store charged battery packs, ensure the battery has been discharged (to about 6 volts).
- Lithium Ion batteries should be stored approximately 40% charged.
- Never leave a nickel-based battery sitting on a charger for more than a few days.
- Recondition the battery pack before returning it to service.

WARNING

Never incinerate a battery. Disposing of a battery pack by burning will cause an explosion.

8.5.7.1 Nickel Metal Hydride Battery

There are no special requirements concerning the disposal of NiMH batteries. NiMH batteries can be recycled. Call Toll Free 1-800-8BATTERY for information.

8.5.7.2 Lithium Batteries

There are no special requirements concerning the disposal of Lithium batteries. Lithium batteries can be recycled. Call Toll Free 1-800-8BATTERY for information.

9. CIRCUIT ANALYSIS

9.1 GENERAL INFORMATION

This section contains the circuit analysis of the XG-75 series portable radios. Each radio contains two primary circuit board assemblies:

- Main Board
- Interface (I/F) Board

These circuits interface with other subassemblies including the Universal Device Connector (UDC), battery, control knobs, and optional keypad assemblies.

The basic relationship between the boards and between the other radio subassemblies is shown in Figure 9-1. Simplified block diagrams are included in this section and schematics are provided at the end of this manual.

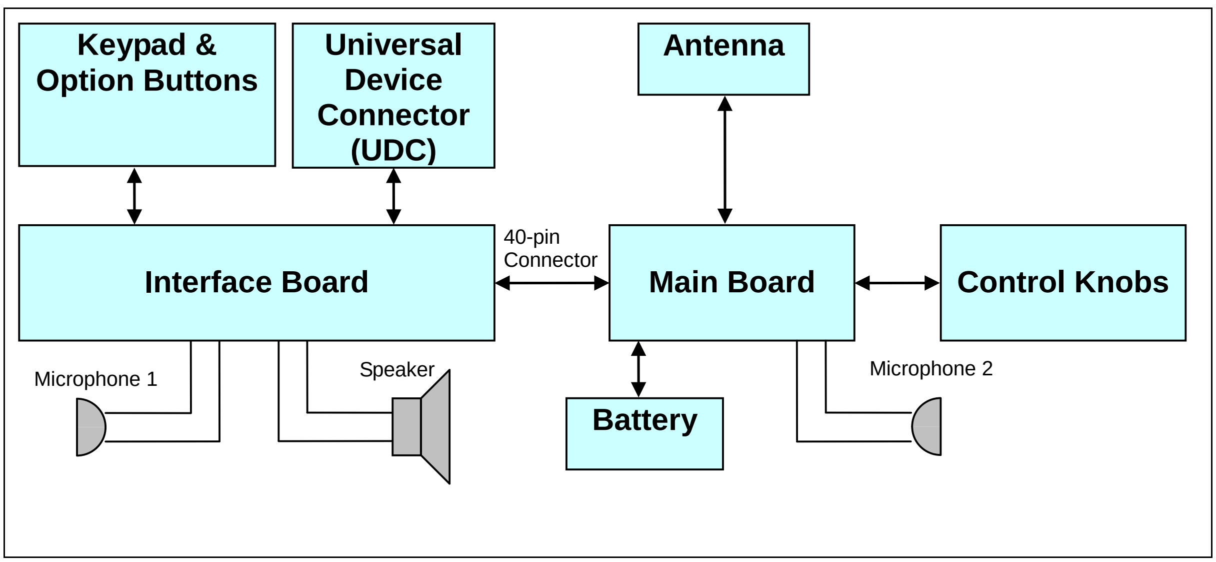


Figure 9-1: XG-75 Radio Block Diagram

9.2 MAIN BOARD

The Main Board contains the following functional circuits:

- Receiver circuitry
- Transmitter circuitry
- Synthesizer circuitry
- Control Logic circuitry

The XG-75 series radios employ a double conversion, dual band I/Q receiver. The receiver input frequency range is 136-174 MHz. The first IF frequency is 48.2 MHz and the second IF frequency is 450 kHz. The signal is I/Q sub-sampled at 30 kHz to translate the filtered signal to baseband. The signal is then processed and demodulated before being applied to an audio power amplifier and the speaker.

The transmit section is a direct baseband-to-RF up-conversion transmitter which takes a complex pair (I/Q) of signals from a baseband dual digital-to-analog converter (DAC) and creates an RF signal in the VHF band. This signal is amplified, filtered, and sent through the High Power Amplifier (HPA) for further amplification prior to being applied to the antenna.

The Control Logic circuitry provides all the necessary program management, memory, and operational control of the radio. A more detailed description is provided in later sections of this manual.

9.2.1 Receiver Section

The Receiver section of the Transceiver consists of the following functional circuits:

- RX Front End
- RX Filtering and 1st Mixer
- RX 2nd Mixer
- IF Amplifiers

The following circuit descriptions are accompanied by simplified block diagrams with references to the Schematic Diagram G3UD09633, sheets 1 through 2.

9.2.1.1 RX Front End

The primary purpose of the Receiver Front End is to filter out unwanted signals. An RF signal from the antenna is coupled through the Rx low pass filter with LC composition and antenna switch with pin diodes, and the band pass filter with LC composition to the input of low noise amplifier Q102. The output of Q102 is coupled through 1 bit attenuators and another switching band pass filter with LC composition to the input of first mixer Z102. Front End selectivity is provided by the band pass filters.

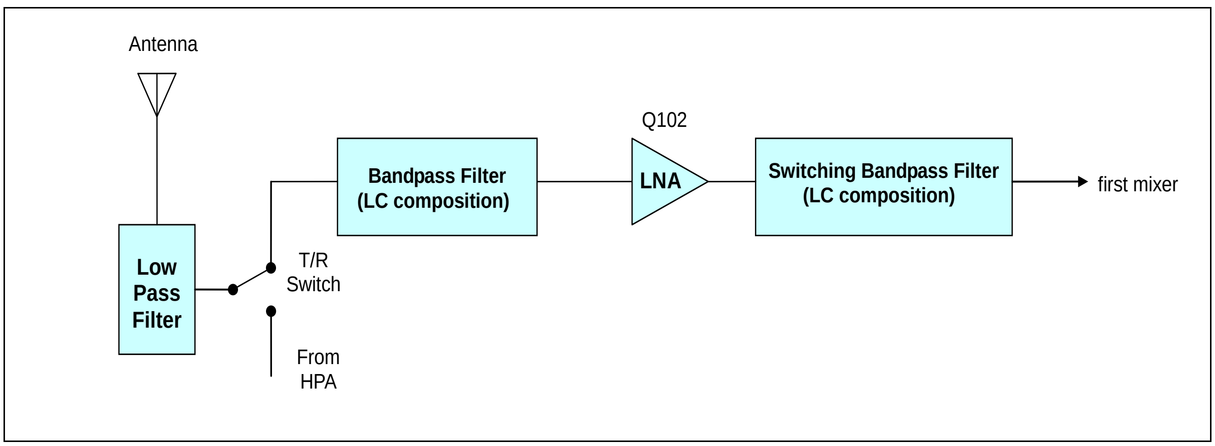


Figure 9-2: Receiver Front End Block Diagram

9.2.1.2 RX Filtering and 1st Mixer

The first mixer is a Double-Balanced-Mixer (Z102) that converts a RF signal in the 136-174 MHz range to the 48.2 MHz first IF frequency. The RX_1st_Lo signal is derived from the Rx LO VCO, amplified by Q103, and input into Z102, pin 6. The signal at the output of Z102 is provided to the input of the first IF crystals filter FL202.

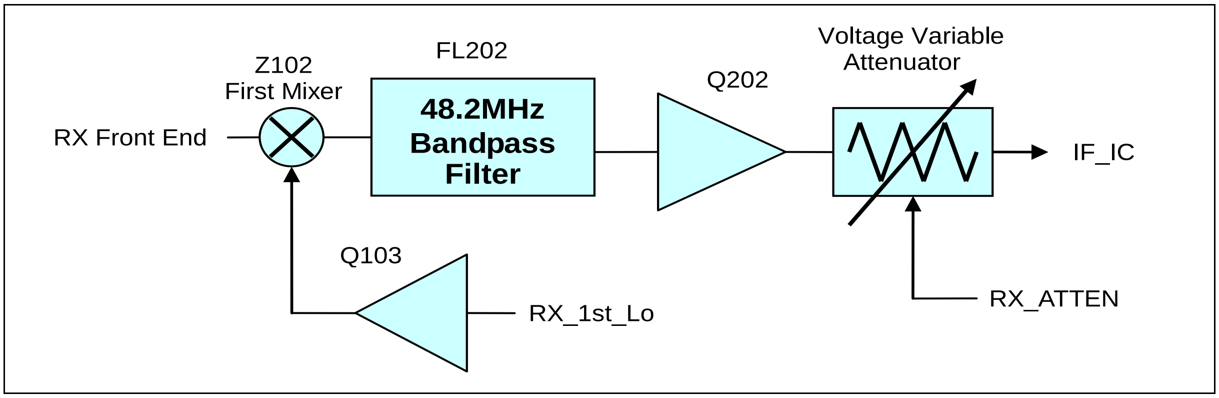


Figure 9-3: RX Filtering and 1st Mixer Block Diagram

The first IF signal from the output of the first Mixer is coupled through first IF crystals filter FL202 to the first IF amplifier Q202, and Voltage Variable Attenuator (VVA).

The 48.2 MHz signal passes through Band Pass Filter FL202. This filter has a ±10 kHz bandwidth. The signal is then amplified by discrete amplifier (Q202). The output signal IF_IC is then applied to the RX 2nd Mixer stage.

9.2.1.3 RX 2nd Mixer

The RX 2nd Mixer circuit consists of a mixer, IF amplifiers, external 450 kHz Band Pass Filters, and an IF limiter. The 48.2 MHz IF signal IF_IC is applied to 2nd Mixer U201. The 2nd Local Oscillator signal RX_LO2 from the Synthesizer (refer to Section 9.2.3) is mixed with the 1st IF signal and down converted to a 450 kHz IF signal.

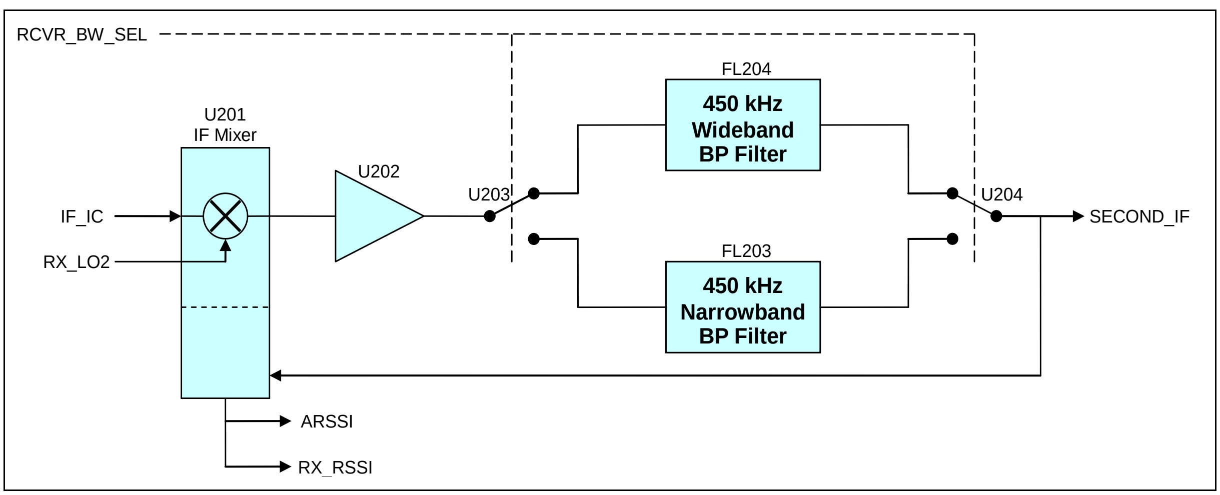


Figure 9-4: RX 2nd Mixer Block Diagram

The 450 kHz IF signal is then connected to Bandwidth switch (U203). U203 provides selection between narrowband filtering (12.5 kHz) using ceramic filters FL203, or wideband filtering (25 kHz) using filter FL204. U203 is controlled by the Dual Core Processor's (U600) Control Circuit General Purpose Input/Output (GPIO) signal RCVR_BW_SEL. When the RCVR_BW_SEL signal is low, U203 selects the 12.5 kHz NB filter. When the signal is high, U203 selects the 25 kHz filter.

The signal is recombined in switch U204. The output from U204, SECOND_IF is routed to the IF Amplifiers, described in the next section. The SECOND_IF signal is also fed back to U201 and used to generate the RSSI signal.

The RSSI signal is used as an Automatic Gain Control (AGC) on the RX path and is provided to the seven-channel ADC (U705) where it can be directly read by software executing on the Main Processor Unit (MPU) section of the Dual Core Processor U600. The RSSI signal is also used to control the RX VVA, causing its attenuation to increase at higher input signal levels. The level at which the attenuator begins to operate is controlled by a combination of the MPU-controlled DAC voltage level and RX_ATTEN signal level from U206.

9.2.1.4 IF Amplifiers

The 2nd IF signal, SECOND_IF, is amplified and limited by the Limiting Amplifier U209. The signal is then filtered by another stage of Band Pass Filtering using FL205 and conditioned by Buffer Amplifier U208. The output of U208 is then fed to the 12-bit ADC U207. U207 performs the A/D conversion and the resulting data is fed to the GATE ARRAY (U703) and then to the Dual Core Processor (U600). The ADC operates at 30k complex samples per second (csps).

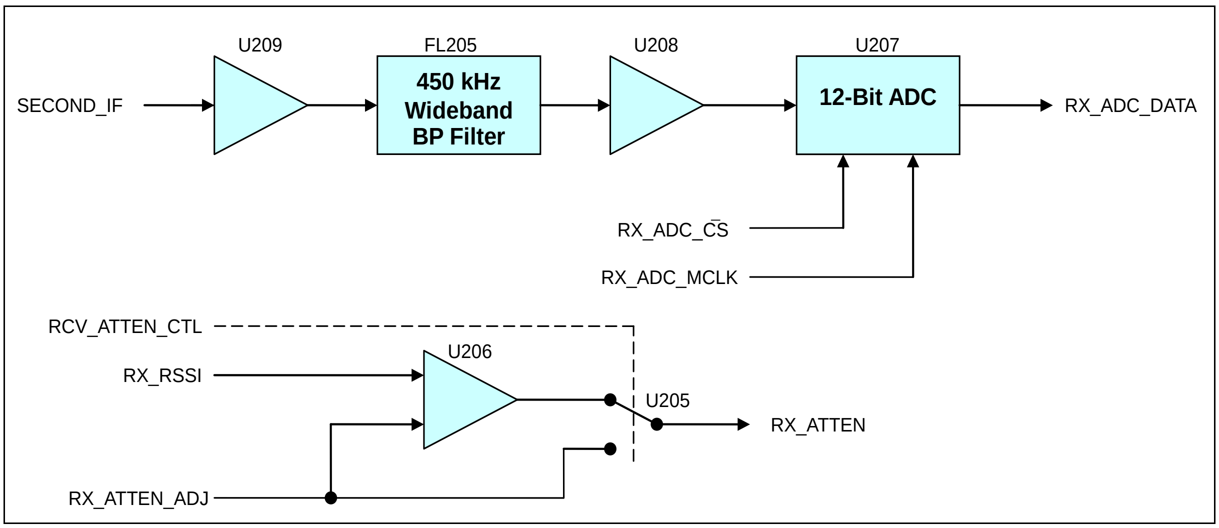


Figure 9-5: IF Amplifier Stage Block Diagram

The position of switch U205 determines whether the attenuator control signal RX_ATTEN applied to Variable Voltage Attenuator circuit is the RSSI signal from U201 or under MPU software control. The switch is controlled by the RCV_ATTEN_CTL signal from the GATE ARRAY U703 (see Section 9.2.4.1). If the RSSI signal is used, the signal is conditioned by U206 before being applied to Variable Voltage Attenuator.

The ADC digital samples (RX_ADC_DATA) of the receive signal are pre-filtered by the MPU section of the Dual Core Processor U600. The processing functions depend on the operating mode of the transceiver. These functions typically include DC blocking, phase correction, low pass filtering, scaling, demodulation, and squelch.

When the digital signal processing is complete, the digitized audio signal is sent to the sigma-delta CODEC U601 (see Section 9.2.5). This produces an audio signal, which is routed to the internal speaker (via audio amplifier U804, U805) or an external speaker via the UDC port.

9.2.2 Transmitter Section

The XG-75 radio employs a single direct conversion transmitter capable of operating output frequency of 136-174 MHz.

The software in the processor selects the desired frequency.

The XG-75 is also multi-mode, in that it is capable of operating in analog or digital mode.

In analog mode, audio signals originate from an internal microphone on the Interface (I/F) board. The audio signal is filtered and converted to digital mode by the audio DUAL CODEC (U601), as described in Section 9.2.4. The Dual Core Processor (U600) then performs additional processing such as microphone ALC, limiting, and scaling. The Dual Core Processor then performs FM modulation with limiting, and generates digital baseband FM (I/Q samples). These are sent to the baseband dual sigma-delta DAC (U602).

In digital mode, digital bits originate at the microphone, serial port, or CPU and are filtered before being modulated by processor U600.

In either mode, only the source of the information is different. The processor generates the actual I/Q modulation waveform.

The transmitter section consists of the following functional circuits:

- Transmitter CODEC and Modulator Interface
- I/Q Modulator
- TX Filtering
- High Power Amplifier (HPA)
- HPA Power Regulation and Temperature Sensor

9.2.2.1 Transmitter CODEC and Modulator Interface

The high performance sigma-delta dual channel digital to analog converter (DAC) U602 converts the serial data from the processor into two analog modulating signals. These signals are complex; and consist of in-phase (I) and quadrature (Q) components. These I/Q signals are each individually fed into dual input, differential amplifiers (U603) to low pass filter the DAC output as shown in Figure 9-6.

The outputs are individually fed into a pair of differential amplifiers U402 and U403 that convert the single ended signal into a differential output signals. The output signals from U402 are the I-Channel positive going base band signal (IBBP), and an I-Channel negative going base band signal (IBBN). The outputs from U403 are the Q-Channel positive going signal (QBBP), and a Q-Channel negative going signal (QBBN). The offset level is controlled by the signal I/Q_VREF that is buffered using op amp U605.

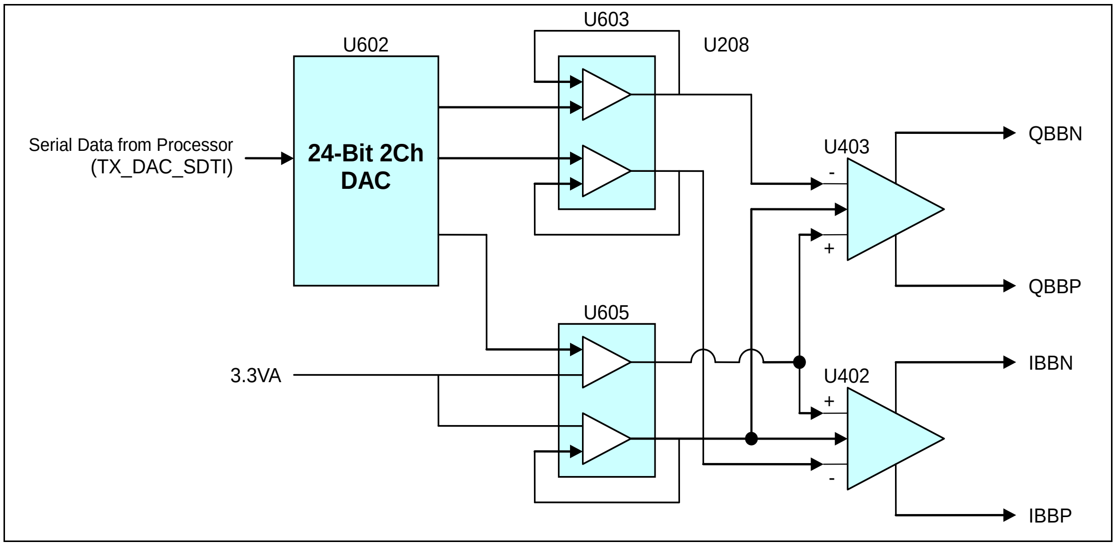


Figure 9-6: TX CODEC and Modulator Interface Block Diagram

9.2.2.2 I/Q Modulator

These differential I/Q signals are subsequently provided to I/Q modulator U401 for direct modulation to the desired RF frequency. The modulator receives a signal (TX_LO) corresponding to the transmit output frequency (136-174 MHz).

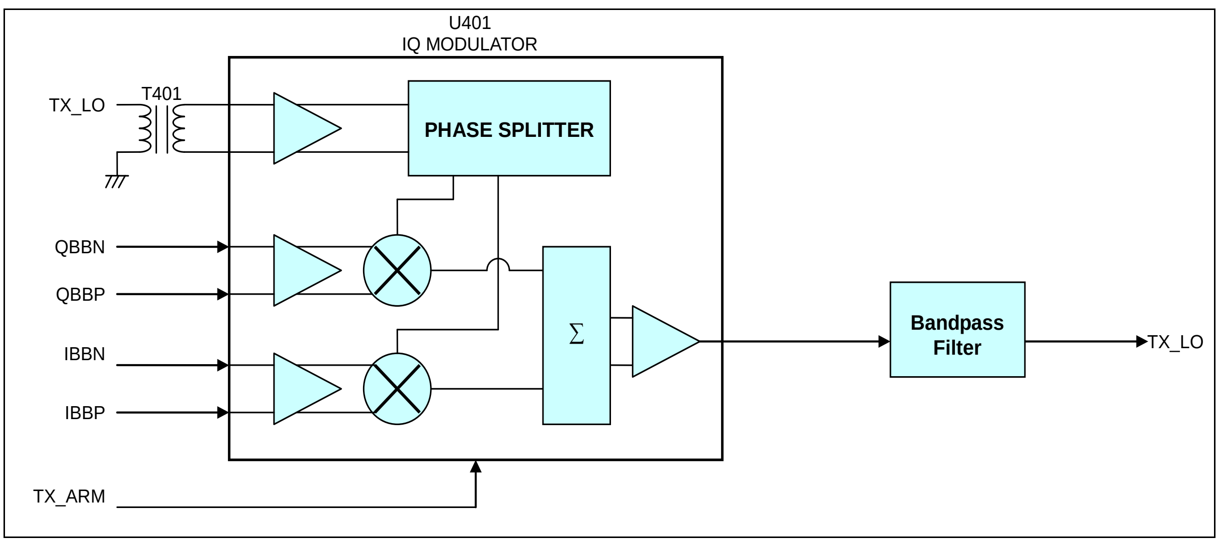


Figure 9-7: IQ Modulator Block Diagram

The LO Phase Splitter generates two LO signals at 90° of phase difference with each other, to drive two mixers in quadrature. Baseband signals are converted into current form in the differential V-to-I converters, feeding into the two mixers. The outputs of the mixers are combined to feed the differential-to- single-ended converter, which provides a 50 Ohm output interface. Bias currents to each section are controlled by the enable signal (TX_ARM).

The modulator output signal is then passed through a band pass filter. The output signal is sent to the TX APC (Automatic Power Control).

9.2.2.3 TX Filtering

The local oscillator signal TX_LO1 from the Synthesizer (refer to Section 9.2.3) is input the next stage is a voltage variable diodes Attenuator. The signal TX_APC_CTRL_D is software-controlled and used to vary the power level of the transmit signal. The signal from a voltage variable diodes Attenuator is through a band pass filters to remove unwanted noise and harmonics.

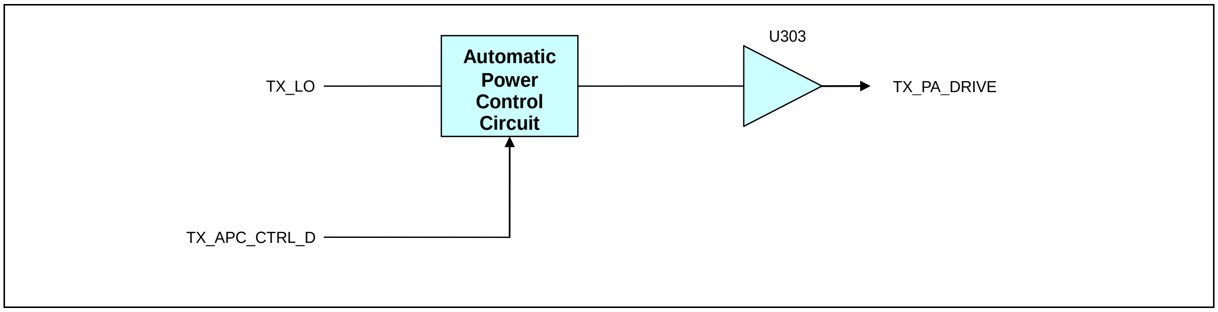


Figure 9-8: TX Filtering Block Diagram

The signal is then amplified by amplifier U303 before being routed to the HPA driver stage.

9.2.2.4 High Power Amplifier (HPA)

The HPA uses MOSFET transistors (Q301, and Q302), as shown in Figure 9-9, which are capable of producing in excess of 7.6 watts output. The RF power N-MOS Q301 is the driver stage of the HPA. The power stage of the HPA has two RF power N-MOS transistors Q302 in the final stage.

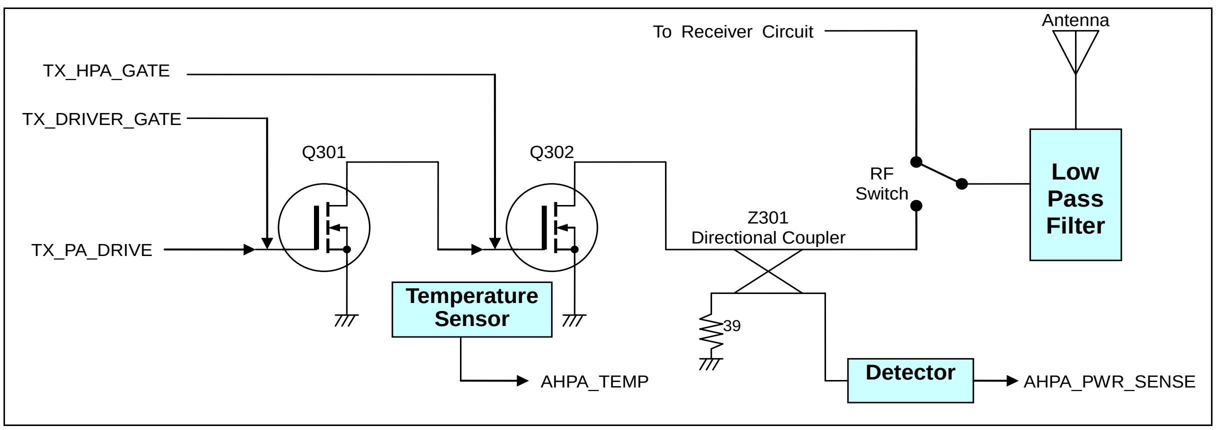


Figure 9-9: HPA Block Diagram

The HPA output passes through an RF coupler (Z301) before going to the TX input of the T/R switch on the transceiver board. From there, the transmit signal passes through a low pass filter in a harmonic trap (L101, L112, C101, C102, C103, C114, and C115) to reduce harmonic content. The radio uses the harmonic trap to filter spurious radiation produced by the RF power amplifier as well as harmonics created by the switching diodes. From there, the transmit signal is routed to the antenna terminal.

9.2.2.5 HPA Power Regulation and Temperature Sensor

The operating power levels of the radio are software-controlled through the Automated Power Control (APC) software configuration parameters. The RF level detector, temperature sensor, and the transmit interlock control circuits feed operating data to the APC circuits.

9.2.2.5.1 Temperature Sensor

As shown in Figure 9-9, the temperature sensor monitors the heat generated by the HPA and the radio. The output from the sensor signal HPA_TEMP is sent to the ADC U705 in the APC circuit. The Dual Core Processor (U600) monitors the output voltage from the ADC.

9.2.2.5.2 MAIN Control DAC (U706)

The Transceiver DAC U706 is an 8-bit, 8-channel DAC used to generate analog voltages which calibrate, set operating levels, and enable controls for the transceiver. The data sent to the DAC originates in the Dual Core Processor U600.

When properly enabled, the DAC sends the TX_ARM and TX_EN signals to the HPA Power Regulation and Temperature Sensor Circuit. In addition, the DAC also enables the HPA by routing signals through the differential amplifiers U301 and sending the TX_DRIVER_GATE and TX_HPA_GATE signals to the HPA as shown in Figure 9-9.

9.2.2.6 TX DAC (U602)

The TX DAC (U602) is a dual 16/24 bit sigma-delta (ΣΔ) DAC. The MCLK is generated by the GATE ARRAY U703 and input to U602. MCLK is divided internally to the GATE ARRAY, to arrive at the DAC sample rate. U602 has an I2S serial interface with the Dual Core Processor for transfer of data. U602 is a slave on the I2S bus.

The GATE ARRAY reference clock Z601 is a 24.576 MHz ±5ppm oscillator. The signal is applied to the GATE ARRAY where it is divided by five to create MCLK for the TX DACs, creating a 19.2 kHz sample rate.

The oscillator frequency is divided by two when a 48 kHz sample rate is required.

9.2.2.7 Automated Power Control (APC) Circuit

HPA output power management is performed by the processor (U600). This allows the power control loop to hold the loop’s last value while the transmitter is off. The main components of the power control loop are a DAC, a variable gain amplifier (VGA), a power detector on the HPA output, and an ADC.

A small amount of transmit energy is sampled by the directional coupler Z301. This signal is detected by the detector circuit (CR302) as shown in Figure 9-9. The output signal (AHPA_PWR_SENSE) is processed by the 12 bit ADC (U705) and the Dual Core Processor (U600) compares the output voltage from the power detector to its programmed set point. If necessary, the Dual Core Processor generates an error value to adjust the output power level by writing to the one channel of the two channel 12-bit DAC U510. U510 generates the control signal (TX_APC_CTRL_D) that adjusts the gain of diode Attenuator output (see Figure 9-8). This enables the radio to maintain the desired transmit output power.

9.2.3 Synthesizer Section

The RF Synthesizer Circuitry contains three Phase-locked-Loop RF synthesizers and a master oscillator (VX/TCXO). These synthesizers provide all of the RF reference signals necessary for the operation of the receiver and transmitter sections.

The radio has three separate local oscillators (LOs). They are RX_LO2, RX_LO1, and TX_LO1.

RX_LO2 is used as Rx_2nd_Local signal. Rx_2nd_Local frequency is 47.75MHz. ADF4252 (PLL U501) cannot be used below 50MHz. Therefore, it locks through BPF of 95.5MHz (47.75MHz*2).

Rx_2nd_Local signal is input into the 2nd Mixer (U201).

RX_LO1 is used as Rx_1st_Local signal. Rx_1st_Local frequency range is 184.2 to 222.2MHz.

The Rx_1st_Local signal is input into the 1st_Mixer (Z102) through the 1st_Local_AMP (Q103).

TX_LO1 is used as Tx_Local signal. Tx_Local frequency range is 136 to 174 MHz. Prescaler (U504) is used in order to prevent interference. Therefore, the local oscillator frequency range is 272 to 348 MHz.

Amplifier Q507 is used for isolation between the local oscillator and I/Q modulator (U401).

LPF is used in order to cut 2nd and 3rd harmonics of local oscillator.

Tx_Local signal is input into the I/Q modulator (U401) through balun (T401).

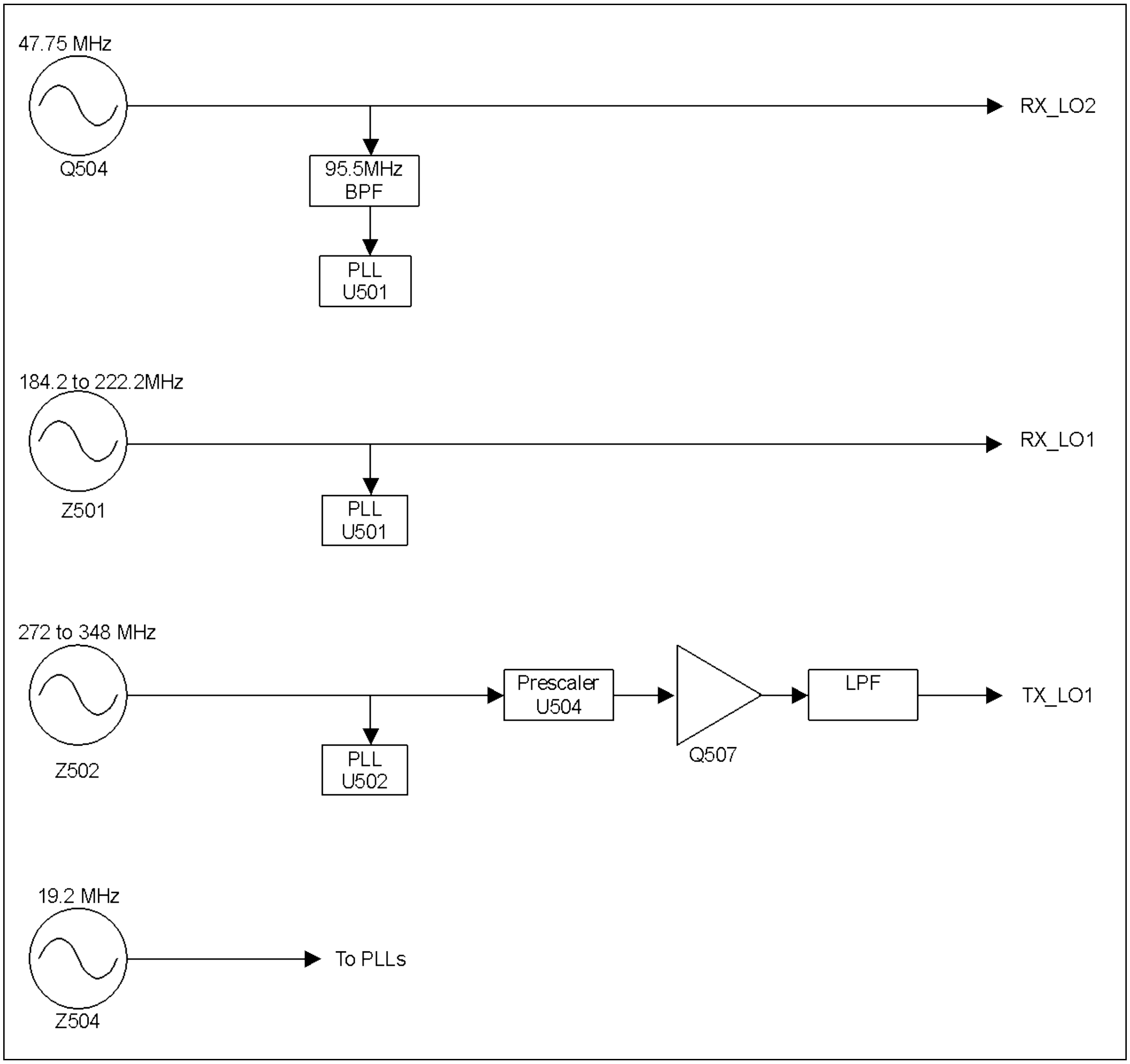


Figure 9-10: Synthesizer Block Diagram

19.2 MHz (Z504) is a crystal oscillator. It is input into PLL_IC (U501 and U502) as a reference.

ADF4252 (Analog devices) is used as device of PLL_IC (U501 and U502). The ADF4252 is a dual fractional-N/integer-N frequency synthesizer. The RF synthesizer has a delta-sigma-based fractional interpolator that allows programmable fractional-N division. The IF synthesizer has programmable integer-N counters.

- The RF synthesizer of ADF4252 (U501) is used for Rx_1st_Local signal.
- The IF synthesizer of ADF4252 (U501) is used for Rx_2nd_Local signal.
- The RF synthesizer of ADF4252 (U502) is used for Tx_Local signal.
- The IF synthesizer of ADF4252 (U502) is not used.

When local oscillators are not required for radio operation, the main processor unit directs the power circuits to power down the unused local oscillators to reduce current drain on the battery.

9.2.4 Control Logic Circuitry

The heart of Control Logic Circuitry is the Dual Core Processor U600. This device contains all the digital processing for the radio and the interface to the Interface (I/F) board.

Operation of the Dual Core Processor is divided into functional circuits, as shown in schematic diagrams G3UD09633, sheets7 through 12. These functional circuits and are described in the following sections of this manual.

9.2.4.1 Dual Core Processor (U600)

The Dual Core Processor U600 is similar to Texas Instruments OMAP5910 JZZG2. The processor contains an ARM925-based Microprocessor Unit (MPU) core and a C55x Digital Signal Processor (DSP) subsystem with internal memory and control. External to the Dual Core Processor, there are SRAM, FLASH, and GATE ARRAY memory mapped registers connected to U600’s EMIFS bus. On power up, the Dual Core Processor boots from the Flash memory.

U600 provides all modulation and demodulation of the air link signals and higher-level protocol processing. In addition, it controls all baseband and audio interfaces, including the microphone and speaker.

The DSP clock input is at 12 MHz. Software control multiplies the clock input by twelve to create an internal processor clock frequency of 144 MHz.

9.2.4.2 Flash Memory

The permanent (non-volatile) program memory is stored in an 8M x 16 Flash memory device, U701. The Flash memory is in the CS0 space of U600 on the EMIFS bus. This device is capable of asynchronous or synchronous operation, has an asynchronous access time of 75 ns when reading, and supports synchronous operation up to 36 MHz.

9.2.4.3 SRAM

The SRAM, U702, is a 1M x 16 volatile memory device that is mapped into the CS1 space of the Dual Core Processor’s EMIFS bus. The SRAM operates asynchronously with read and write access times of 70 ns.

9.2.4.4 Wait State Control

All memory external to the Dual Core Processor U600 requires wait state control for text and tables that need updating. The Flash and SRAM reads require 3 wait states, 5 cycles; writes require 3 wait states, 9 cycles total. The typical wait states are listed in Table 9-1.

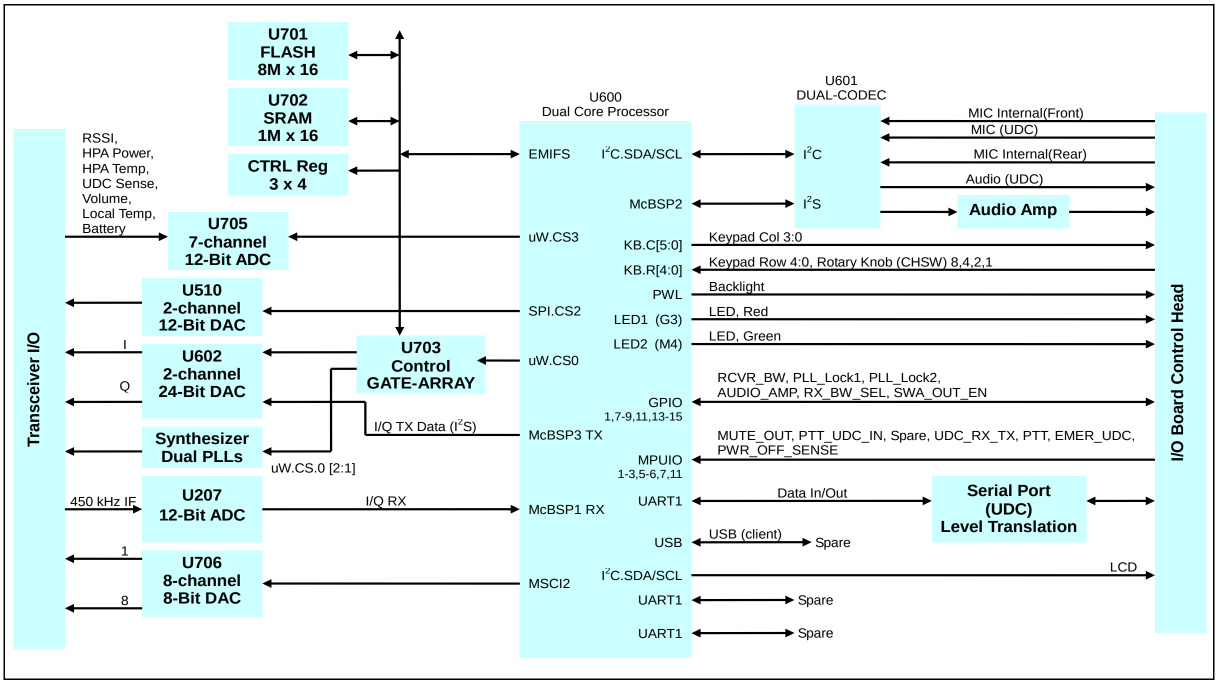


Figure 9-11: Control Logic Circuit Block Diagram

Table 9-1: Wait State Control for MPU at 144 MHz

Memory	Recommended Settings
TC Clock:	72 MHz (div by 2)
EMIFS Clock:	72 MHz (div TC clock by 1)
SRAM:	Reads: 3 wait states, 5 cycles Writes: 3 wait states, 9 cycles total
FLASH:	Reads: 3 wait states, 5 cycles Writes: 3 wait states, 9 cycles total

9.2.4.5 Reset Control

The Microprocessor Supervisor IC, U1105, monitors the +3.3 volts line (+3.3VD). If the amplitude of this line drops below the preset threshold or the processor software directs a reset, the MPU_RST* pin (POWER_BAD_RESET*) is driven to the low state. This causes the Dual Core Processor to pull the reset signal (RESET*) to an active low value.

The RESET* signal initializes the GATE-ARRAY U703 logic and registers, audio DUAL-CODEC, and the transceiver control DAC.

9.2.4.6 GATE-ARRAY

The GATE-ARRAY contains registers that are memory mapped to the Dual Core Processor’s address space, control logic for the µ-Wire interface, TX DAC clock generation and synchronization, and RX ADC I/Q sampling control with digital sample rate adjustment, and data formatting.

The GATE-ARRAY has three internal registers that are each four bits wide. These registers are write-only registers from the EMIFS CS2 memory space of the processor.

The sample rate control logic for the receive ADC U207 is synchronous to the 12 MHz input and generates the chip select (RX_ADC_CS*) for I/Q sampling. It also reduces the rate of ADC serial port from 12 MHz to 6 MHz. The bit clock to the ADC is the 12 MHz clock. A simple state machine is used to generate the required 30k samples per second chip selects to the ADC, with the appropriate timing to create an I/Q sample pair.

The input signal to the ADC is the 450 kHz IF. The sub-sampling of the input signal, by 15, digitally aliases the signal to baseband. The ADC serial output interface operates at 12 MHz. This serial data is received by the GATE-ARRAY and is digitally adjusted to 6 MHz, which is the maximum input rate of the Dual Core Processor's MCBSP port. The eight bit data from the ADC is reframed within the GATE-ARRAY so that it is placed in the upper eight bits of the 16-bit word received by the processor.

The processor's µ-Wire interface controls the RF synthesizer via the GATE-ARRAY. The µ-Wire CS0 interface (UW_CS0_PLL1) from the Dual Core Processor is de-multiplexed with the UW_BANK_SEL bit to create two chip select lines (PLL1_CS0… and PLL2_CS3…), one for each of the PLL chips on the synthesizer board. The GATE-ARRAY also allows control of this serial interface to avoid back power conditions into the transceiver, prior to the applying power to the transceiver.

The GATE-ARRAY, as mentioned previously, also generates clock divisors for the TX DACs. The GATE-ARRAY reference clock (Z601) is a 24.576 MHz ±5ppm oscillator. The signal is applied to the GATE-ARRAY where it is divided by five to create MCLK for the TX DACs, which creates a 19.2 kHz sample rate. The oscillator frequency is divided by two when a 48 kHz sample rate is required.

9.2.4.7 Serial Interfaces

The processor also contains a UART, an LCD interface, keypad monitoring circuitry, side button and PTT activity monitoring, back light LED enable/disable, battery monitoring, and other housekeeping tasks.

9.2.4.8 UARTs

The Dual Core Processor's UART1 (U600) is configured to use the UDC port for connection via TIA/EIA-232C. The EIA/TIA-232 data lines are PTX_DATA_IN (input to U600), PRX_DATA_OUT (transmit from terminal) UART1_CTS*, UART1_RTS*.

The UART1_CTS* may have the UDC PTT* connected to its inputs. This selection is under software control. All of these signals are driven with 5 V CMOS levels and can receive using either 5 V or 3.3 V compatible CMOS or TTL levels. The conversion from 5 V electrical signal levels to TIA/EIA-232 levels is performed in accessories external to the radio.

9.2.4.9 I^2C

The I^2C is a serial bus used to control the LCD on the Interface (I/F) board. The LCD supports full dot matrix of 65 rows, 133 columns.

These dot matrix data are controlled by the Dual Core Processor's LCD section U600.

9.2.4.10 MCBSP Ports

U600's MCBSP1 port receives data from the RF receiver ADC U207. This port on the U600 is a slave interface to the GATE-ARRAY and ADC. The data arrives as two separate 16-bit I/Q words at 30 ksamples per second (ksps).

The MCBSP2 port is a bidirectional port which transfers audio data to the Audio DUAL CODEC U601 in an I2S compatible format.

U600's MCBSP3 output port (MCBSP3_DX) is used to send data (TX_DAC_DIN) to the transmitters dual 16-bit DAC U602. The GATE-ARRAY is the bus master for generating the serial bit clock and frame pulse. The DAC interface is I2S compatible. The bit rate for 19.2 ksps is 614.4 kHz and for 48 ksps is 1.536 MHz.

9.2.4.11 Interface Controls

The U600 PWL output (pin L14) drives the signal PBACKLIGHT signal to the MOSFET Q1001. Q1001 enables or disables the keypad backlight by providing a ground for keypad backlight LEDs via the J1001, Pin 13 connection to the I/F Board.

The Dual Core Processor also controls the Tri-color LED CR1202 on the Main Board. U600's LED1 signal controls the red LED by turning Q1202-1 on or off. The LED2 signal controls the green LED by turning Q1202-2 on or off. If both LED control transistors are conducting, turning on both the green and red LEDs, the LED appears orange.

9.2.4.11.1 General Purpose Input/Output (GPIO)

The Dual Core Processor's General Purpose Input/Output (GPIO) control lines are described in Table 9-2.

Table 9-2: U600 GPIO Control Lines

SIGNAL NAME	I/O	FUNCTION	POWER UP DEFAULT
TX_DAC_PDN	O	Controls the power down line to the TX DAC U602. Logic 0 holds U602 in the power down state. Logic 1 enables the DAC to operate.	Logic 0 (Power down)
PLL_LOCK2	I	Indicates Synthesizer PLL2 lock status. Logic 1 is locked; logic 0 is unlocked.	Logic 0 (Unlocked)
PLL_LOCK1	I	Indicates Synthesizer PLL1 lock status. Logic 1 is locked; logic 0 is unlocked.	Logic 0 (Unlocked)
AUDIO_AMP_EN	O	This signal enables the audio amplifier U804 when audio is sent to the speaker. Logic 0 disables U804; logic 1 enables the amplifier.	Logic 0 (Power down)
RCVR_BW_SEL	O	This signal selects RX Wideband or Narrowband operation. Logic 1 selects the 25 kHz filter; logic 0 selects the 12.5 kHz filter.	Logic 1 (25 kHz filter)
SWA_OUT_EN	O	UDC battery output control. When enabled (logic 1), battery voltage is applied UDC Pin E7.	Logic 0 (Power down)

9.2.4.11.2 Micro-Processor Unit Input/Output (MPUIO)

The Dual Core Processor's Microprocessor Unit Input/Output (MPUIO) control lines interface with the UDC as described in Table 9-3.

Table 9-3: U600 MPUIO UDC Interface

SIGNAL NAME	I/O	FUNCTION	POWER UP DEFAULT
MUTE_OUT	O	This signal places an active low (logic 0) on UDC pin E14.	Logic 0
EXT_PTT	I	This input signal is the push to talk (PTT) input from an accessory attached to the radio's UDC port. When PTT is pressed, signal is active low (logic 0) at UDC pin E10.	Logic 1 No PTT
T/R_OUT	O	This line connects to UDC pin E15 and provides output data for use with some accessories.	Logic 0
EXT_EMER	I	Emergency button input from UDC port E11. This signal is active low (logic 0) when Emergency button is pressed.	Logic 1
PWR_OFF_SENSE	I	This line provides a notice of power going away in 700-2400 ms. This signal is active high (logic 1). It is generated when the Power ON/OFF volume control is rotated to the off position.	Logic 0

9.2.5 Audio Circuitry Overview

9.2.5.1 Audio DUAL CODEC (U601)

The Audio DUAL CODEC (U601) on the XCVR board is a high performance 16-bit converter with a software-controllable programmable gain amplifier that performs A/D and D/A functions and multiple single-ended inputs. An internal 2nd order analog low pass filter (LPF) precedes the sigma-delta ADC.

U601 has two serial interfaces with the Dual Core Processor U600. I^2C bus serial interface is used for control of the Audio DUAL CODEC settings via internal registers. The audio signal data is transferred between the Audio DUAL CODEC and Dual Core Processor via an I^2S interface. The Audio DUAL CODEC sample rate is controlled from the Dual Core Processor, via commands on the I^2C bus interface.

The master input clock to the Audio DUAL CODEC is 12 MHz. The Dual Core Processor then sets registers up internal to the Audio DUAL CODEC to set the divisors to obtain the final sample rate. The data is typically sampled at 8 ksps.

U601 digitizes the microphone input (voice) as well as converting digital audio to analog for transmitting out the speaker through the audio amplifier.

Two of three A/D inputs (INT_Front_Mic_IN, INT_Rear_Mic_IN, and EXT_Mic_IN) can be selected for input to the ADC. Usually, the output of a D/A converter is made to output from INT SP. However, when external accessories are attached, it is made to output from EXT SP.

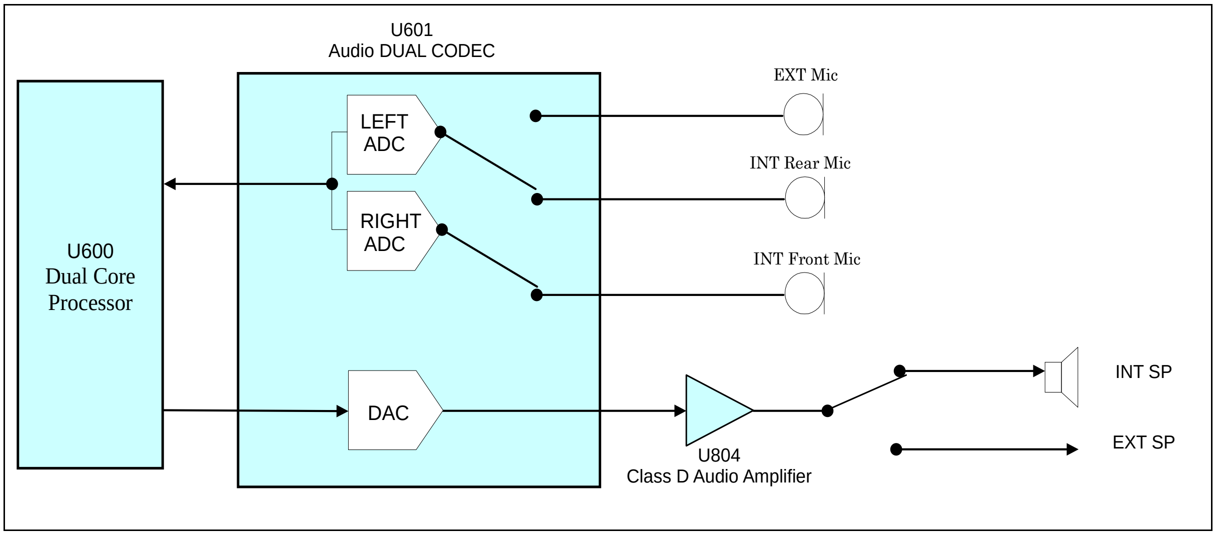


Figure 9-12: Audio Stereo CODEC Block Diagram

9.2.5.2 Class D Audio Amplifier (U804)

U804 audio amplifier operates from +3.3 VDC and B+. The output of this amplifier is controlled by the signal AUDIO_AMP_EN. The amplifier is in a low power standby mode when the control voltage is low to less than 1 V and is enabled when the control voltage is high to more than 2.4 V. The amplifier is normally turned off unless there is audio output to a speaker. Also, when the output current exceeds the hard current limit, the amplifier disables the outputs and initiates a startup sequence. The amplifier is a class D switching amplifier with 70 % to 80 % efficiency. The output of this amplifier (OUT+, OUT-) drives the speaker directly. The output operates directly off the battery voltage to provide the maximum power to the speaker output lines. The output lines (INT_SP- and INT_SP+) drive the internal speaker.

9.2.6 Power Conversion and Voltage Regulators

Input voltage +7.5 VDC power enters the radio via battery contacts, J301 (P1-P3). Power passes through a 2 amp fuse (F301), which is followed by a reverse voltage protection diode (CR309).

9.2.6.1 Voltage Regulators

The transceiver board contains power conversion devices; voltage regulators U1102, U1103, U1104, U1106, U1107, U1108, U305, U306, and U307. These voltages regulators are used to provide +3.74V, +5.0VD, +3.3VD, +1.6VD, +3.3VA, +1.8VD, VRF5 (+5.0 V), VSYN-5 (+5.0 V), and VSYN3 (+3.3 V), as shown in Figure 9-13.

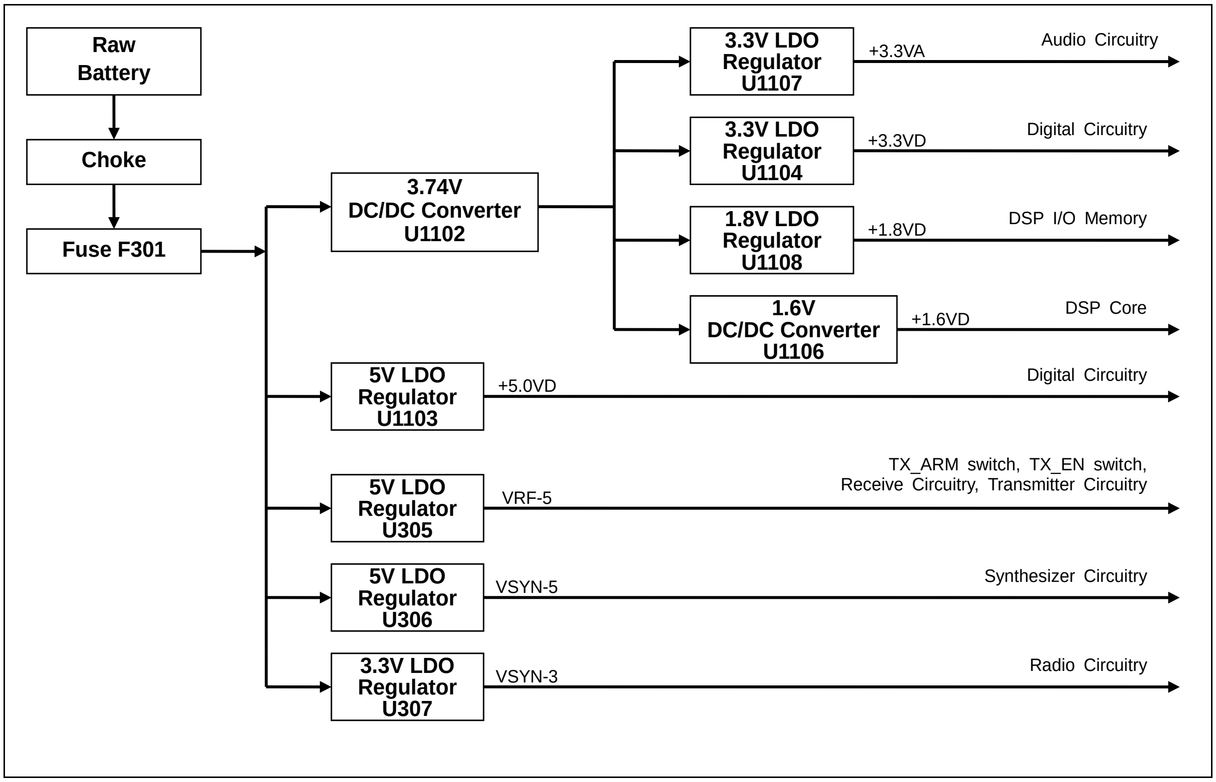


Figure 9-13: Power Conversion Block Diagram

9.2.6.1.1 DC/DC Converter (U1102 and U1106)

The primary switching supply for the MAIN baseband circuitry is derived from the +3.74VDC switching supply, U1102. The DC/DC converter is a fixed voltage regulator where the operating set point is predetermined. The input to the switching regulator is B+. The output voltage is enabled using the Run pin.

The shutdown is controlled by the signal PWR_SW that is sourced by the Power On/Off-Volume knob on top of the radio.

DC/DC converter U1106 is used to generate the +1.6VDC. The voltage output level is adjustable and is set by resistors R1154 and R1146. These values do not need adjustment. This voltage is only used by Dual Core Processor U600. U600 uses three voltages: the internal core uses +1.6 V, and the I/O circuitry operates from either the +1.8 V or the +3.3 V supply. The +1.6 V DC/DC converter uses the +3.74 VDC as its input source for conversion.

9.2.6.1.2 LDO Regulators (U1104, U1108)

LDO regulator, U1108, generates the +1.8 VDC core voltage for the Dual Core Processor, EMIFS, SRAM, FLASH, and Audio DUAL CODEC. The +1.8 V regulator uses the +3.74 VDC as its input source for conversion.

LDO regulator U1104 is used to generate the +3.3 VDC supply via U1102. This +3.3 VD is used throughout the Digital circuitry.

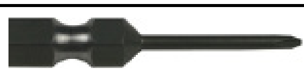
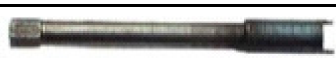
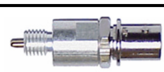
10. DISASSEMBLY AND RE-ASSEMBLY PROCEDURES

This section provides the information and procedures recommended for disassembling and re-assembling the XG-75 series portable radios.

- Disassembly/Re-Assembly Instructions
- Technical Assistance

10.1 SPECIAL TOOLS REQUIRED

The following tools are required to disassemble and re-assemble the XG-75 series portable radio. These tools are specially designed for use with these radios and can be purchased via Harris's Customer Care center. Refer to Section 13.1 for ordering information.

	PART NUMBER	DESCRIPTION
	T8 TORX Bit	Local Purchase
	G4UK07188-0	RF Conn. removal tool
	337097G1B	Antenna insert tool
	B-W1.27 Hex Bit	Knobs Set Screws
	TL-017474-001	#0 Phillips Screw Bit – Dual Switch Knob
	T4WK03399	Volume and channel removal tool
	12RTD	Torque Driver - Range 20 to 120 cN•m
	19B801496G2	RF Antenna Adapter

10.2 ANTENNA

To install the antenna:

1. Ensure radio is turned off.
2. Install antenna and turn clockwise to tighten.

To remove the antenna:

1. Ensure radio is turned off.
2. Rotate the antenna counter-clockwise to remove.

Service of XG-75 Model Radios (Immersion)

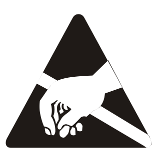
To preserve the watertight integrity of the XG-75 model portable radio, the radio must be serviced by a service center authorized and certified by Harris to perform the necessary tests to verify the watertight integrity.

The Harris Service Network includes company-owned service facilities as well as the capabilities of service partners located throughout the world. We have over 250 Authorized Service Centers (ASC) qualified to perform warranty repairs, installation and maintenance services. For a list of ASCs, contact our Customer Care center.

The XG-75 model radio, under warranty, ***MUST*** be serviced by a service center authorized by Harris to service the XG-75. If service is performed by the user or by any service center not authorized by Harris for this purpose, the warranty will be ***VOID***. Unauthorized service is made discernible by a tamper – evident label placed over one of the screws within the battery well at the back of the radio. The standard product warranty on the XG-75 series portable radio is two (2) year parts and labor.

If the radio is out of warranty it is still recommended that a service center authorized by Harris to service XG-75 radios is utilized to maintain the watertight integrity of the XG-75 radio. However, the assembly and disassembly procedures included in this manual will assist in restoring the radio as close as possible to its original condition.

This section provides the information and procedures recommended for disassembling and re-assembling the XG-75 series portable radios.



This radio contains components which can be damaged by the effects of Electrostatic Discharge (ESD). Be sure to use proper precautions when disassembling this equipment.

These procedures describe the installation of replacement parts and kits available from Harris.

Refer to the assembly diagrams for further detail.

10.3 BATTERY

Refer to Section 8.5.6 for additional information.

To remove the battery:

Ensure radio is turned off.

1. Press the latch at the bottom of the battery pack toward the top of the radio.
2. Lift the battery pack from the bottom.
3. Remove the battery pack from the radio.

To install the Battery:

Ensure radio is turned off.

1. Place top of battery pack into the radio battery cavity and slide forward aligning the battery pack tab with the slot in the radio.
2. Push down to seat the battery to the radio. You should hear the battery latch click.
3. Verify that the battery pack is secure in the radio.

10.4 REAR CASTING DISASSEMBLY

Power the radio OFF and remove the battery as shown in Section 10.3.

Remove the four (4) rear casting screws on the rear cover assembly using a #9 TORX driver.

a. Gently lift the base of the rear casting assembly, just until the rear casting assembly clears the edge of the front cover assembly.

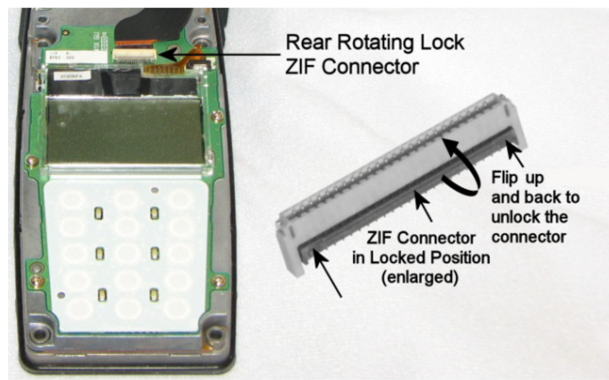
b. Pull the base gently but firmly away from the top of the front cover assembly (knobs end) until a small "pop" is felt. This pop indicates the tabbed portion of the rear casting assembly has been successfully disengaged from the corresponding recesses in the front cover assembly.

CAUTION

Apply as little force as necessary when lifting and pulling on the rear casting assembly during this step in the procedure. The IF Board flex connector still connects the rear casting assembly to the front cover assembly.

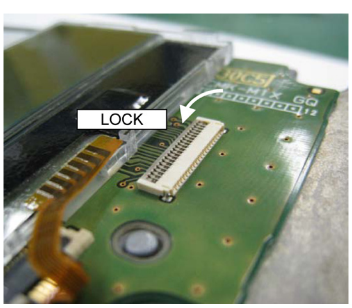
Once the tabs have been disengaged, pivot the rear casting assembly up away from the front cover assembly to expose the IF Board and the Flex connector. Lift and flip the ZIF connector on the Interface Board.

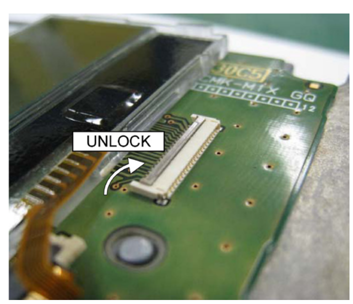
Tug gently on the Flex connector to completely separate the rear casting assembly and the front cover assembly.



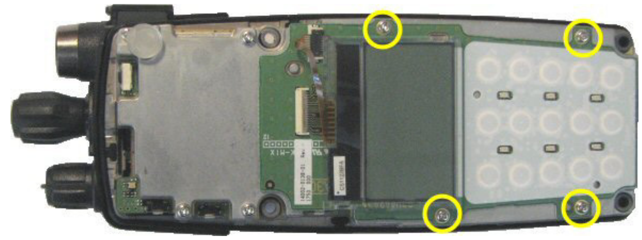
CAUTION

The following illustrations are of the Rear Rotating Lock ZIF connector on the XG-75 Interface Board. Please use extreme caution when disconnecting and reconnecting the Flex to the ZIF connector and follow the instructions as illustrated to avoid damaging the connector.

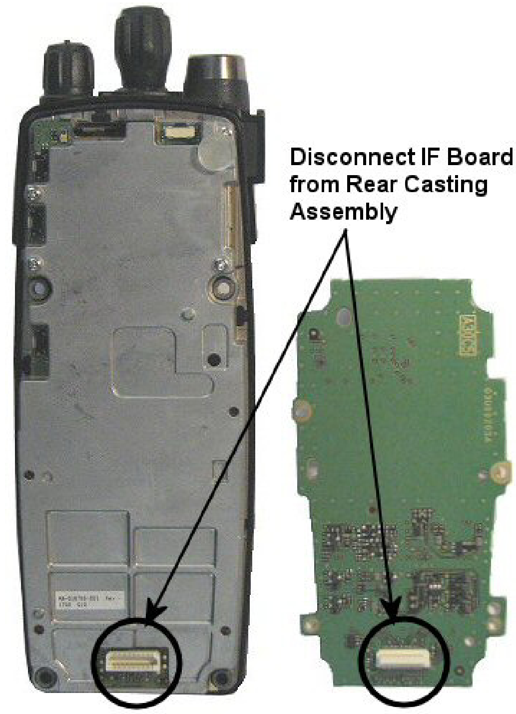




Remove the four (4) Phillips screws securing the IF Board to the RF Shield.

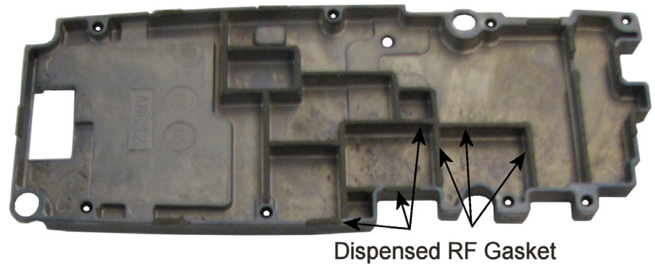


Tug gently on the IF Board to lift it off and away from the RF Shield.

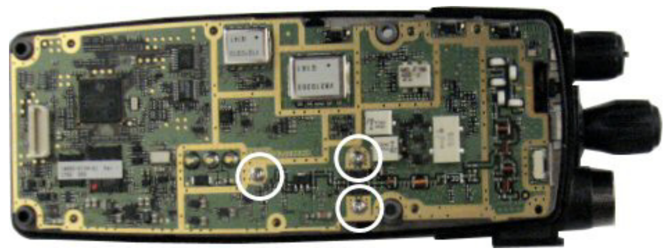


Use extreme caution when removing the RF Shield from the Main XCVR/Synthesizer Board and Rear Casting Assembly to avoid damaging the dispensed RF gasket. If this gasket is damaged, the entire RF Shield must be replaced.

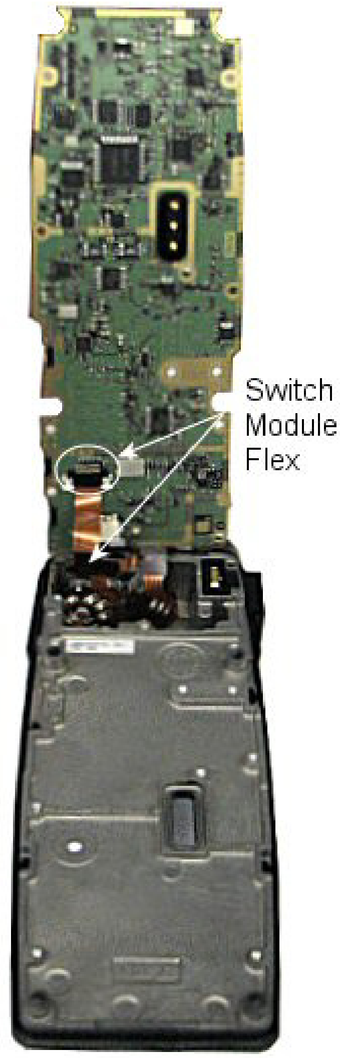
Remove the 4 (four) Phillips screws securing the RF Shield to the rear casting assembly.



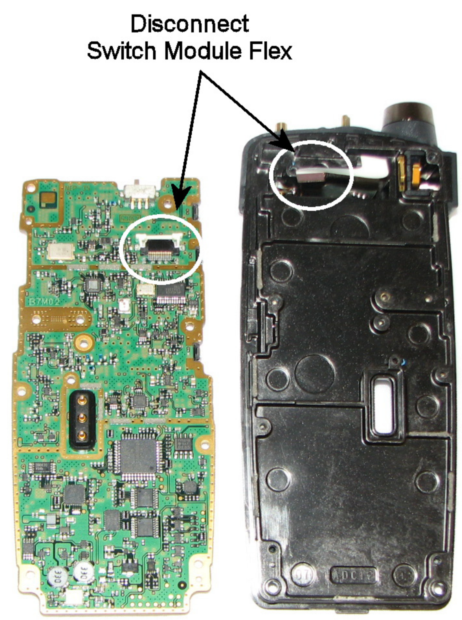
Remove the three (3) Phillips screws securing the Main XCVR/Synthesizer Board to the Rear Casting Assembly.



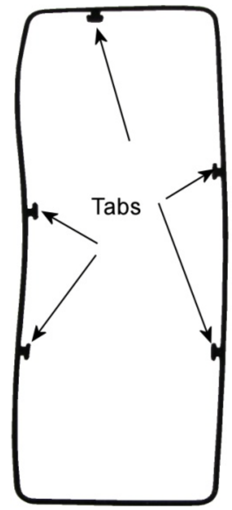
Gently pivot main board up toward top of the radio, using caution to avoid damaging the Switch Module Flex connector still connected beneath.



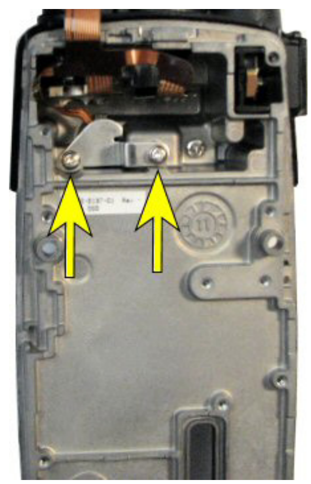
Gently disconnect the Switch Assembly Flex from the underside of the Main XCVR/Synthesizer Board and separate the board from the Rear Casting Assembly.



Remove Rear Casting Assembly Gasket, noting the position of the tabs.

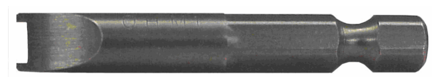


Remove the two screws holding the noise cancelling microphone and use tool T4WK03399 to remove the switch module assembly.

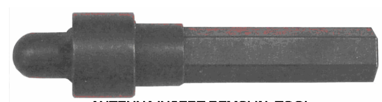


To remove the Rear Plastic Cover Assembly:

- Firmly pull to remove the knob covers.
- Remove the voice group selection knob and volume knob. A 1.27 mm hex wrench is required to remove the voice group selector knob set screw.
- Remove the 1.27 mm antenna insert set screw, remove the antenna insert, and remove the antenna bypass using the special tools listed at the beginning of these procedures.
- Remove the screw from the rear casting assembly.



RF CONNECTOR REMOVAL TOOL

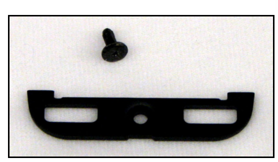


ANTENNA INSERT REMOVAL TOOL

CAUTION

Be sure to loosen/remove the 1.27 mm set screw on the Antenna Insert before attempting to remove the Antenna Insert. Failure to do so could cause severe damage to the radio chassis.

Use a T6 TORX driver to remove the screw holding the Rear Cover plate.



10.5 RADIO REASSEMBLY

To reassemble the radio, follow all steps in reverse, paying particular attention to those areas where NOTES and CAUTIONS emphasize specific items of importance. Refer to the assembly diagrams in Section 18 for special requirements such as the amount of torque to apply to screws.

CAUTION

To preserve the watertight integrity of the XG-75 portable radio, the radio must be serviced by a service center authorized and certified by Harris to perform the necessary tests to verify the watertight integrity. In addition, we recommend the radio be tested periodically to ensure immersion integrity.

10.5.1 Reassemble the Front Cover Assembly

10.5.1.1 Dual Switch Knob

CAUTION

When reassembling the Front Cover Assembly to the Rear Casting Assembly, ensure that the A/B Switch on top of the Radio Front Cover Assembly is in the **A** position.

When reassembling the Rear Casting Assembly to the Front Cover Assembly, the A/B switch knob on Front Cover Assembly should be in the **A** position.

10.5.1.2 Flex Circuit Connection

The flex circuit (FPC) of the Front Cover Assembly is connected to the connector on I/F PWB. This connector is the rotary back lock type. Refer to Figure 10-1.

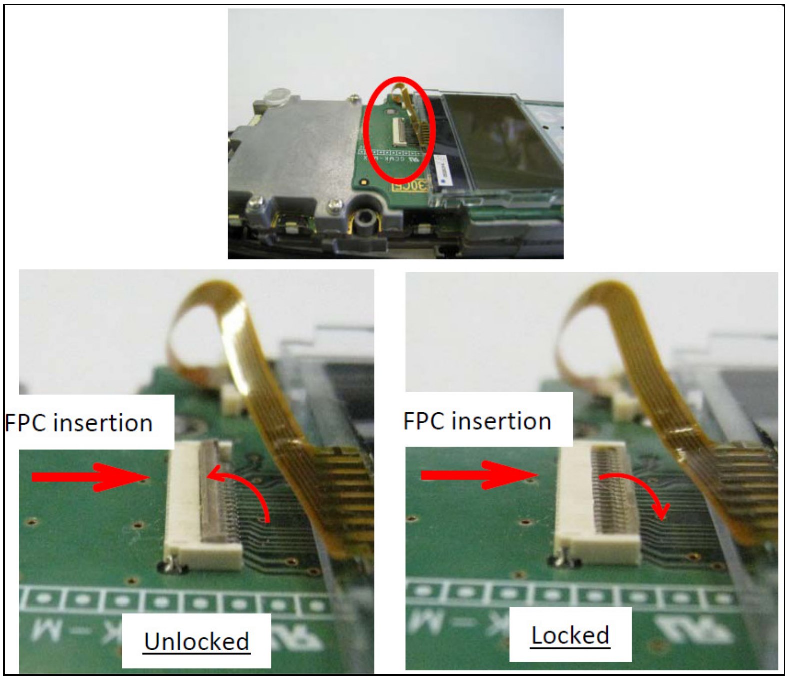


Figure 10-1: Flex Circuit Connection

10.5.1.3 Install Front Cover Assembly to Rear Casting Assembly

The projections of the Rear Casting Assembly are installed into the recesses of the Front Cover Assembly. Ensure proper position of the following components that are compressed between the Rear Casting and Front Cover.

1. Housing Gasket: Ensure that the housing gasket on the disassembled Rear Casting Assembly is in the correct position (see Figure 10-2).

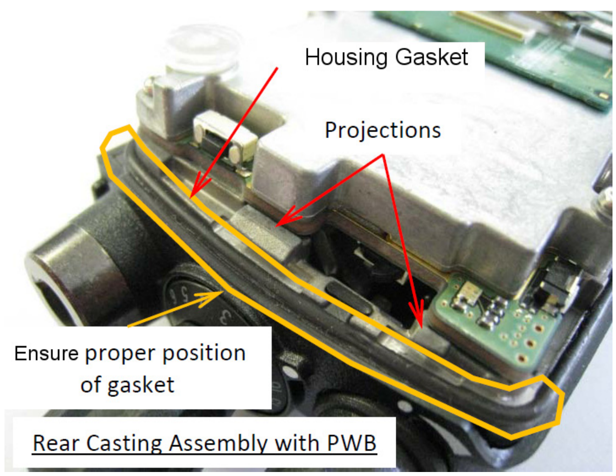
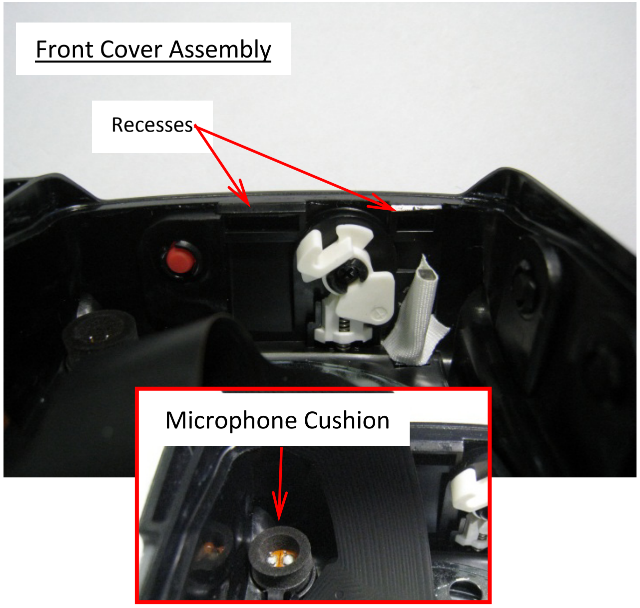


Figure 10-2: Housing Gasket

2. Microphone Cushion: Ensure this cushion does not become mis-positioned during Front Cover Assembly.



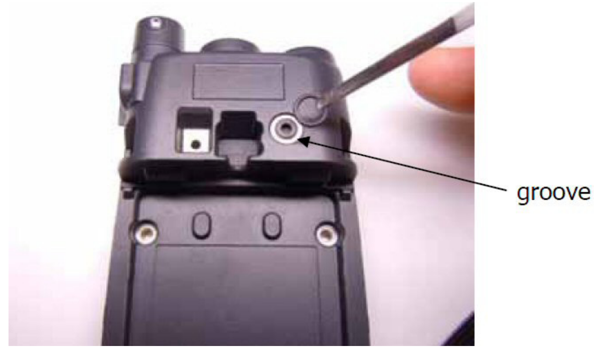
3. Assemble Front Cover Assembly to Rear Casting Assembly using the screw with O-ring properly attached.
   - Screw, Front-Rear: QTY 4
   - O-ring, Screw: QTY 4
4. Carefully inspect the O-ring before re-installation. If the O-ring is damaged, replace using External Hardware Kit KT-016774-001.
5. Check that O-ring is installed correctly under the screw head and is not twisted.
6. Apply the following torque for installing the screws: 0.39 Nm +/-10%.

Ensure that the gasket is not protruding after reassembly (see Figure 10-3).

Figure 10-3: Gasket Protruding

10.5.2 Install the Rear Cover O-ring

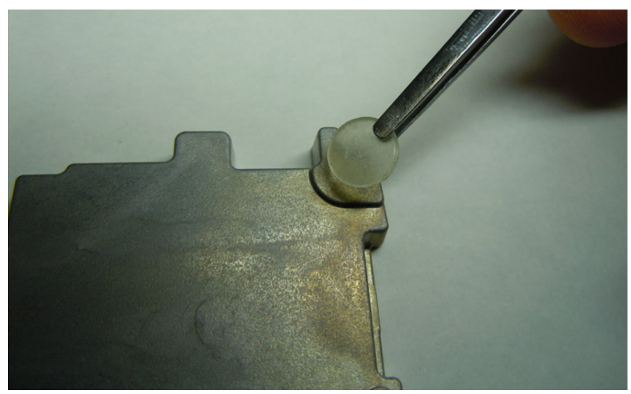
Attach the O-ring into the groove on the back of the rear housing.



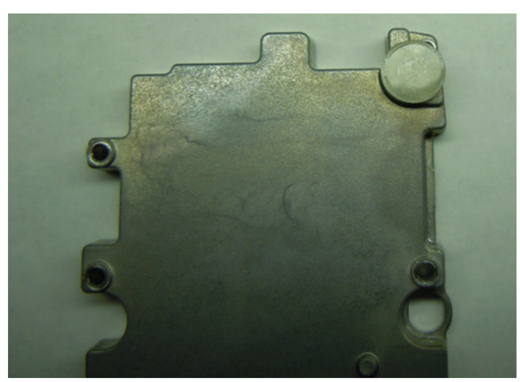
Attach the rear cover.

10.5.3 Install Microphone Spacer

When replacing the RF shield, you must attach the microphone spacer prior to the RF shield prior to installation.



Remove the adhesive backing from the spacer and install as shown.



10.6 DUAL SWITCH (A/B SWITCH) REPLACEMENT PROCEDURES

This section includes removal and installation procedures for the dual switch kit, dual switch actuator, and dual switch spring kit (see Figure 10-4 and Figure 10-5).

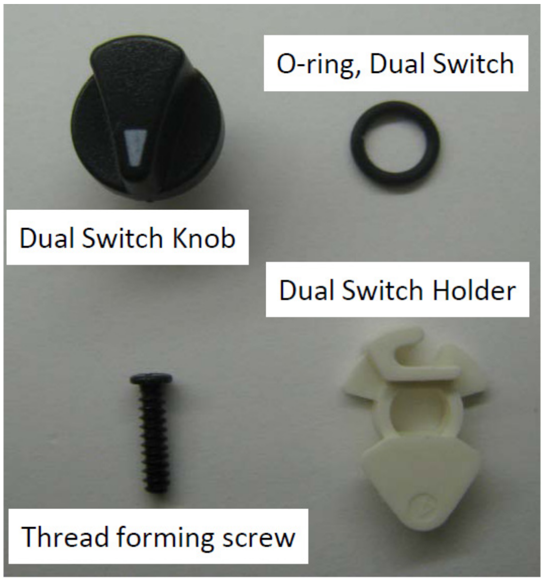


Figure 10-4: Dual Switch Kit

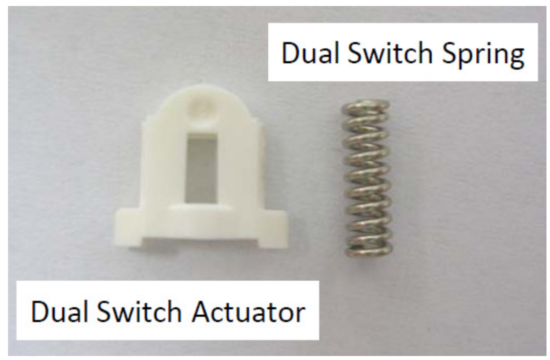


Figure 10-5: Dual Switch Actuator and Spring Kit

10.6.1 Removal

1. Remove the front cover from the radio (see Section 10.4).
2. Set the Dual Switch Knob to position “A” (see Figure 10-6).
3. Remove the thread forming screw.
4. Remove the Dual Switch Knob and Dual Switch Holder.
5. Remove the Dual Switch Actuator and Dual Switch Spring.

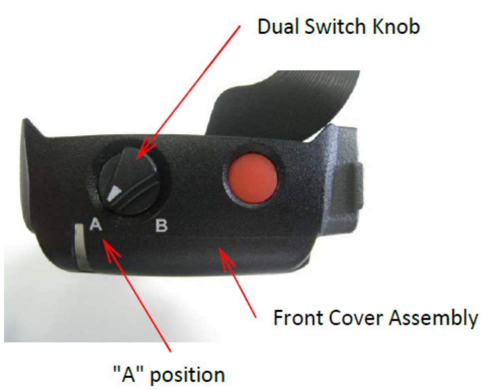


Figure 10-6: Dual Switch Knob in Position A

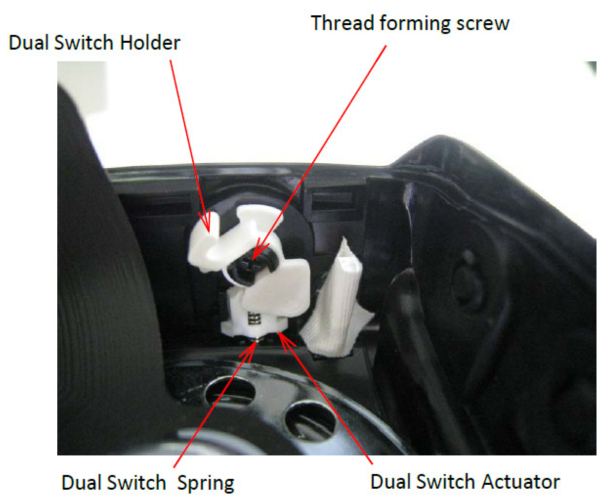
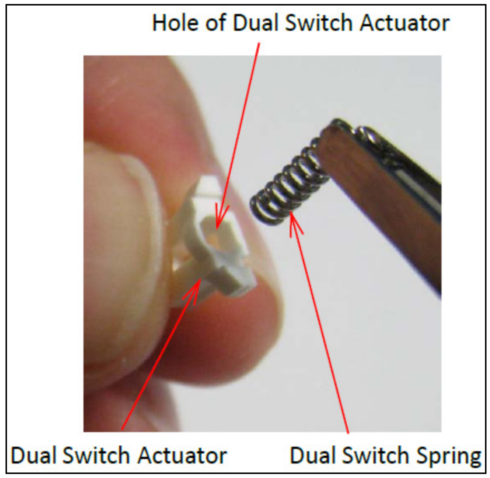


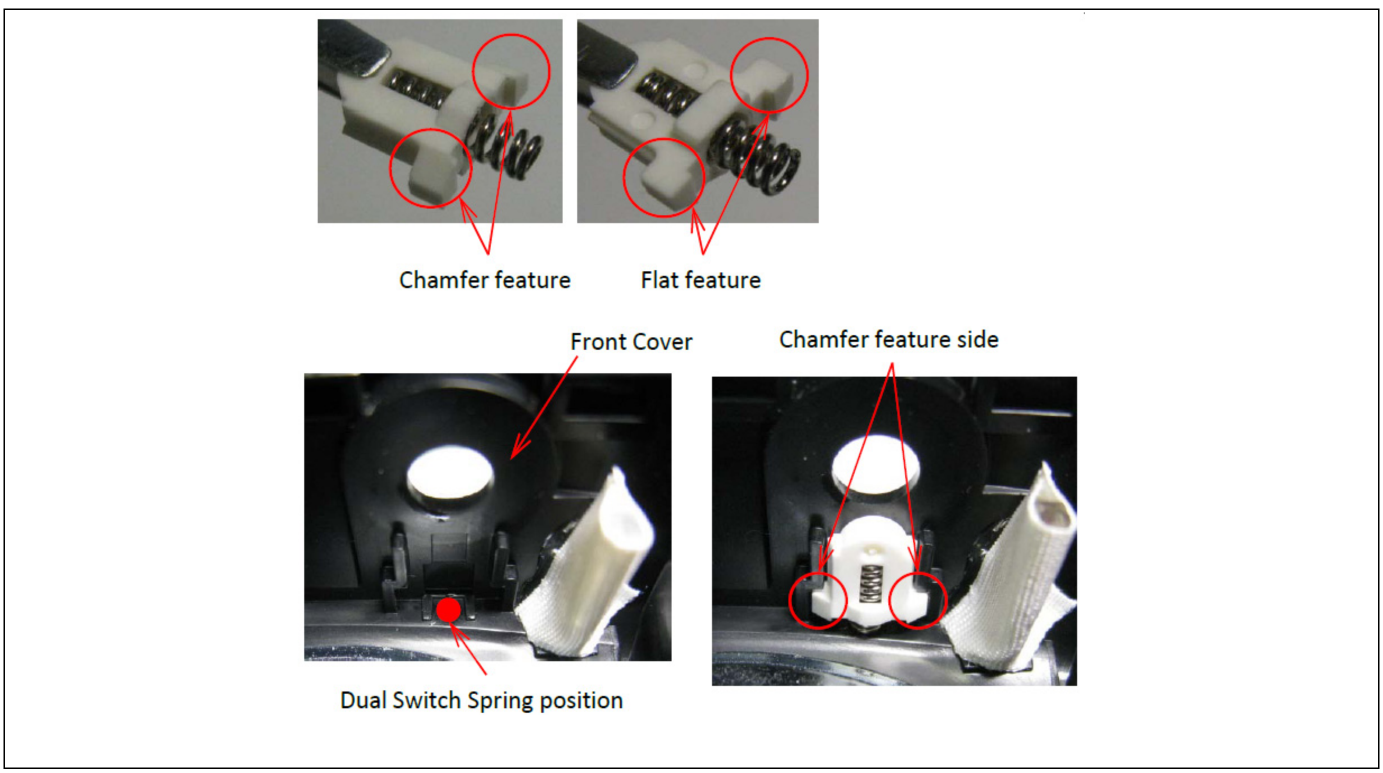
Figure 10-7: Dual Switch Components

10.6.2 Installation

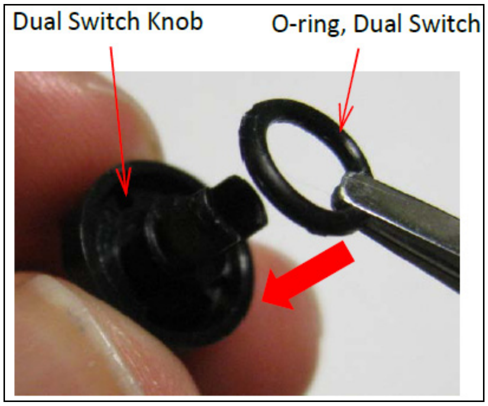
1. Install the Dual Switch Spring into the hole of the Dual Switch Actuator.



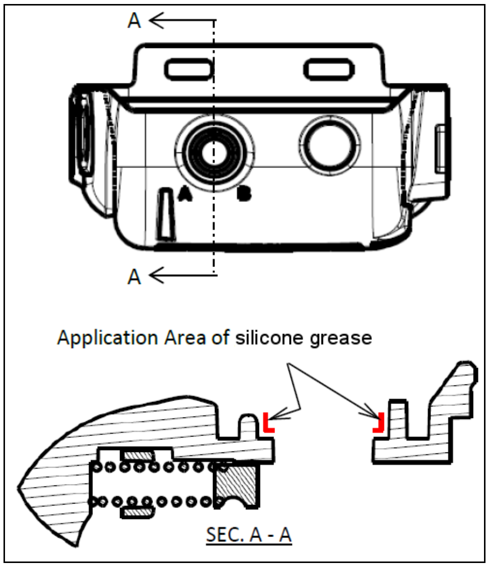
2. Assemble the Dual Switch Actuator and the Dual Switch Spring to the front cover.
   - Ensure that the Dual Switch Actuator is assembled in the direction shown below.
   - Be careful to not deform the Dual Switch Spring.



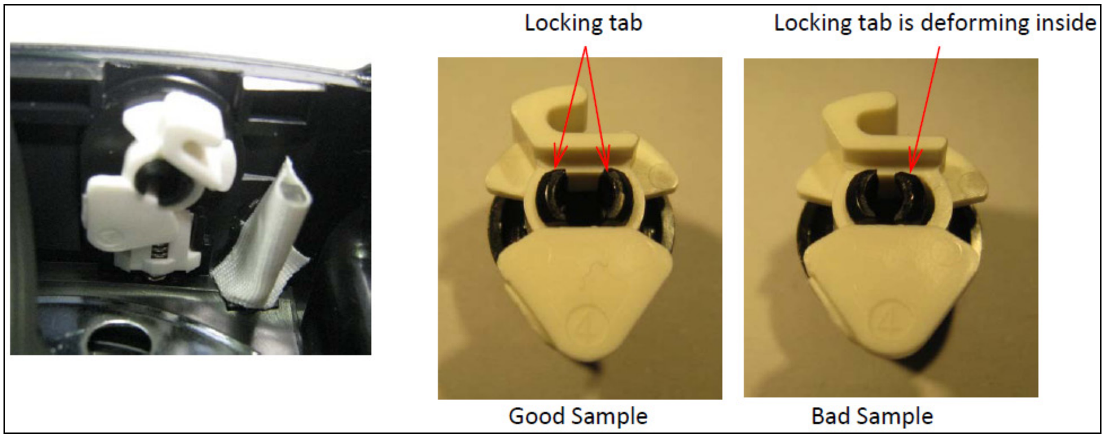
3. Assemble the O-ring to the Dual Switch Knob. Ensure that the O-ring is not twisted.



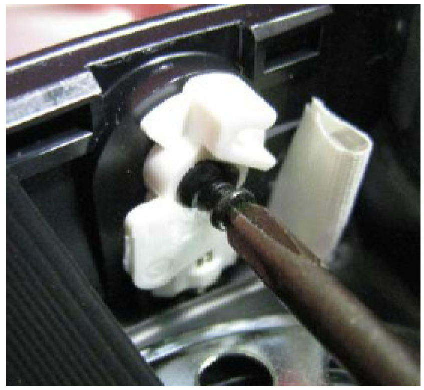
4. Apply silicone grease to the front cover.



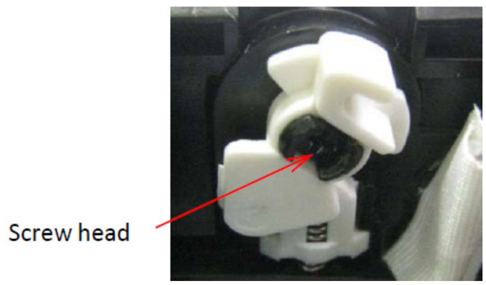
5. Assemble the Dual Switch Knob and the Dual Switch Holder. Ensure that there is no deformation of the locking tab (see below).



6. Set the Dual Switch Knob to the “B” position. Install the thread forming screw into the Dual Switch Knob. Tighten the screw to 0.14 ±0.02 N-m using tool TL-017474-001.



7. Inspect the position of the screw head. Ensure that the screw head is inside of the locking tab of the Dual Switch Knob.



8. Set the Dual Switch Knob to the “A” position. Reassemble the front cover to the radio.

11. RADIO ALIGNMENT

Programming, alignment, and servicing aspects of maintaining a XG-75 portable radio rely on Harris RPM programming software. A software-based Radio Maintenance Utility is included with the RPM software. This tool is installed on the personal computer (PC) when RPM is installed. It is used for various radio alignment and restoration activities, as described in the following subsections.

NOTE

The VHF XG-75 is compliant with applicable FCC narrowbanding mandate below 512 MHz. In certain applications, wideband operation is disabled via Feature Encryption.

11.1 PROGRAMMING SOFTWARE, RADIO CODE, AND TEST EQUIPMENT

Prerequisites required to perform the radio alignment procedures presented in this manual include:

- The minimum version of the RPM programming software, as listed in Table 11-1, must be installed and operating on the technician's PC.
- The minimum version of ECP radio firmware codes, as listed in Table 11-2, must be installed into the radio.
- Test equipment as listed in Table 11-3 is necessary to complete the alignment procedures.

This section also assumes the technician is familiar with the general operation of RPM and that the COM port assigned to the programming cable is properly configured in RPM.

The instructions in this manual are based on the RPM software revisions listed in Table 11-1 which are required when programming, aligning, and servicing the XG-75 portable radios.

Table 11-1: Minimum RPM Programming Software Versions

RPM RADIO SOFTWARE	PART NUMBER	VERSION
RPM for EDACS, ProVoice and P25 Trunked Systems	TQS3385	R08B or later
RPM for Conventional and P25 Conventional Systems	TQS3389	R08B or later

The minimum version of radio ECP firmware codes listed in Table 11-2 must be loaded into the radio. Otherwise, the Radio Maintenance Utility will not function properly with the radio. Determining if a radio has the minimum code versions installed is accomplished by using the Radio Maintenance Utility to read the calibration data from the radio. A pop-up message will appear when the radio does not meet the required minimum ECP firmware code versions.

Table 11-2: Minimum Versions of ECP Radio Firmware Codes for XG-75 Radios

OMAP RADIO SOFTWARE	VERSION
BootApp	R12A or later
LoaderApp	R12B or later
BurnApp	R10A or later
ECP Radio Code	R15A or later

The following equipment is required when programming, aligning, and servicing the XG-75 series portable radios:

Table 11-3: Required Test Equipment

EQUIPMENT DESCRIPTION	PART NUMBER
Audio Test Box	MATQ-03424
RF Antenna Adapter	19B801496G2
Programming Cable (UDC-to-DB9M)	CA-023407-001
Audio Test Cable (UDC-to-DB15HD)	CA-023407-002
Battery Eliminator	BT-023406-015
Radio Communications Analyzer Test Set	Aeroflex 3920 or equivalent

11.2 OVERVIEW OF THE RADIO MAINTENANCE UTILITY

The software-based Radio Maintenance Utility is included with the RPM programming software. It is installed on the PC along with the RPM programming software. This utility may be used to align many Harris mobile and mobile products, including the XG-75 portable radio.

The Radio Maintenance Utility is primarily used with the radio operating from a test personality in analog conventional mode. Test systems and frequency sets must be added to the radio's existing personality to complete the tests. Alternately, a "shop" test personality which includes the test system and frequency sets may be developed and used to align the radio.

Within the Radio Maintenance Utility, most transmitter (Tx) and receiver (Rx) alignment fields contain multiple data points within each alignment test. Some tests use up to forty (40) data points. Each data point sets alignment of a specific function at different frequencies spread across the radio's entire operating frequency range.

Since a radio's RF performance can change over a wide frequency range, this multi-point alignment procedure assures the best possible radio performance at all programmed operating frequencies. Alignment values for frequencies between the specific alignment data points are interpolated from the data points above and below the programmed operating frequency. Therefore, precision alignment at each specific operating frequency is obtained.

11.3 READING AND SAVING FEATURE LICENSE DATA, CALIBRATION DATA, AND PERSONALITY FILES

XG-75 portable radios depend upon feature license data and calibration data for its proper and legal performance. These data sets are specific to an individual radio. Without these data sets, the radio will not function. Should anything happen to the radio resulting in the corruption or loss of this data, a previously saved feature data file can be used to restore corrupted or lost data.

CAUTION

Feature license data and calibration data is very important because **<u>the data sets are specific to each individual radio.</u>** In other words, every radio is different and has different data sets!

CAUTION

Use caution when selecting or loading a calibration data file into a radio. Do not load the wrong data file into a radio.

Radio Maintenance Utility is used to read, write, update, and save feature and calibration data files. This procedure focuses on reading feature and calibration data files from a XG-75 series radio.

Each radio's feature license and calibration data can be backed up locally (i.e., on the PC hard disk or other storage media). Then, if the radio's data becomes corrupt or lost, it may be restored via the Radio Maintenance Utility.

NOTE

It is highly recommended to read each radio's feature license data and calibration data and save these data sets to local files. This is in preparation of radio repairs which may require data reloads. The following sub-sections provide instruction for preparing the radio for the various data acquisitions and updates required to maintain XG-75 radios.

11.3.1 <u>Entering Programming Mode</u>

Perform the following steps to place the radio into automatic programming mode:

1. Ensure the radio is turned OFF.
2. Connect the radio to the PC as shown in Figure 11-1.
3. Turn the radio ON. The radio will automatically enter Program mode when RPM or the Maintenance Tool attempts communication.
4. Turn the radio OFF and disconnect the programming cable after programming is complete.
5. If at any time this method of communication fails, retry this procedure or try one of the following alternate methods.

<u>Alternate Method</u>:

1. Ensure the radio is turned OFF.
2. Connect the radio to the PC as shown in Figure 11-1.
3. Press and hold the **PTT** button.
4. Turn the radio ON and release the **PTT** button.
5. The radio should display Program.

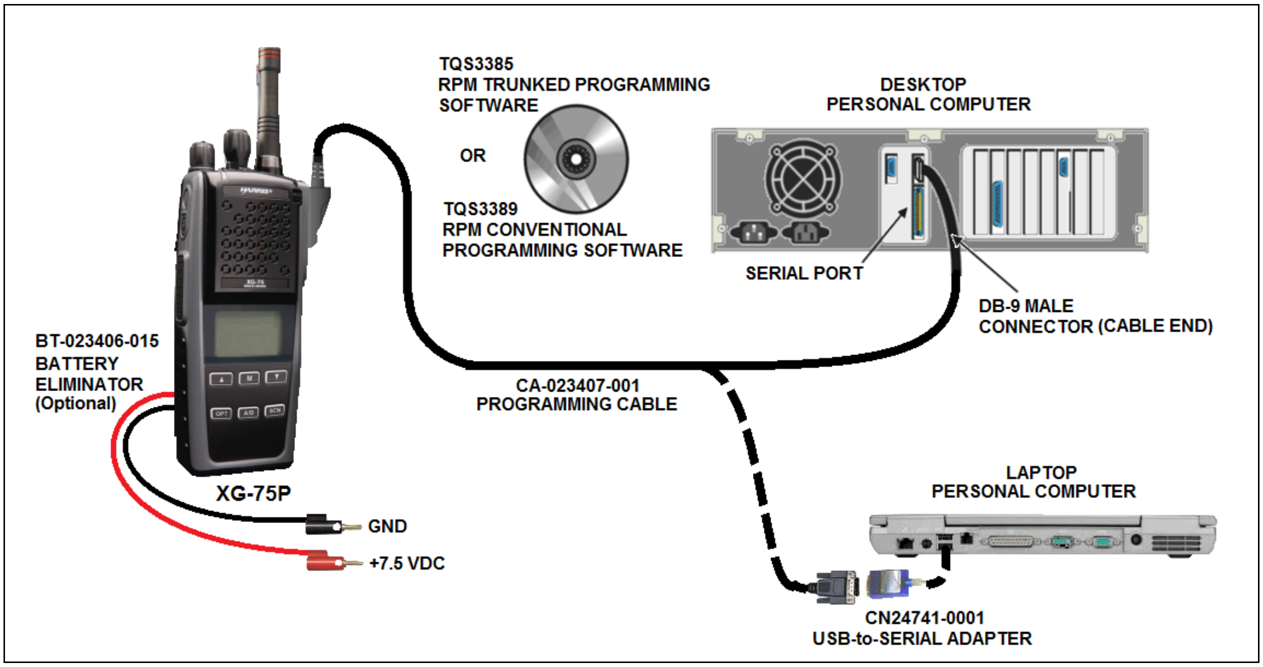


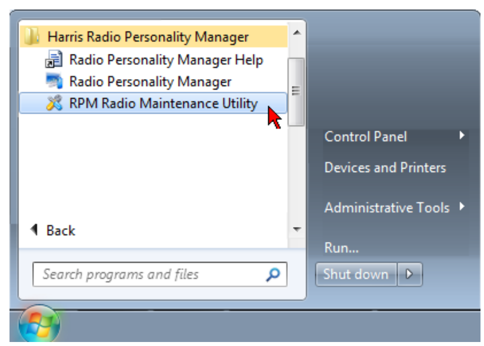
Figure 11-1: Programming Setup

11.3.2 Reading and Saving Feature License Data

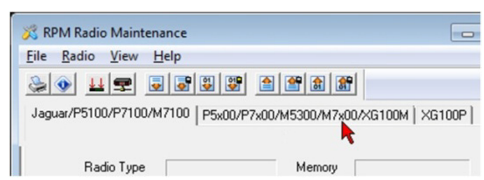
Follow this procedure to read and save a radio's feature license data:

1. Enter programming mode as described in Section 11.3.1.
2. At the PC with the RPM programming software, start the Radio Maintenance Utility:

   Click: **Start > Programs > Harris Radio Personality Manager > RPM Radio Maintenance Utility**



3. Within the utility, click on the tab that includes **P7x00** (for the XG-75).

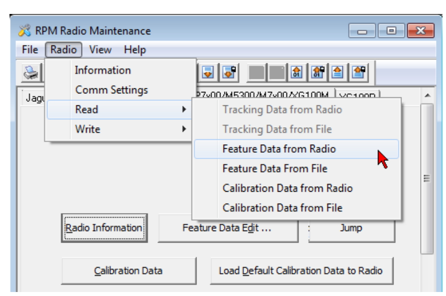


4. From the utility's menu:

   Select: **Radio > Read > Feature Data from Radio**

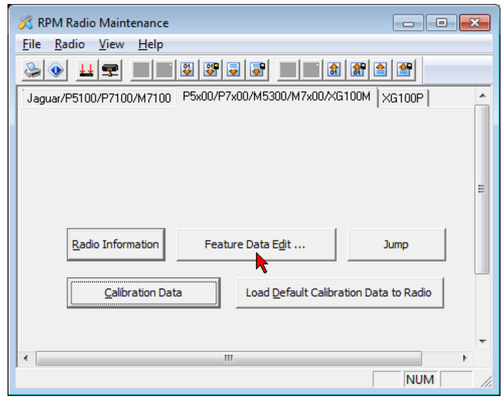
5. When the Read Feature Data Complete message box appears:

   Click: **OK**

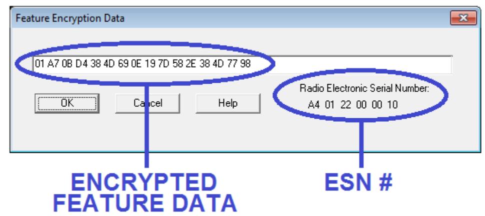


6. In the tab that includes **P7x00**:

   Click: **Feature Data Edit**



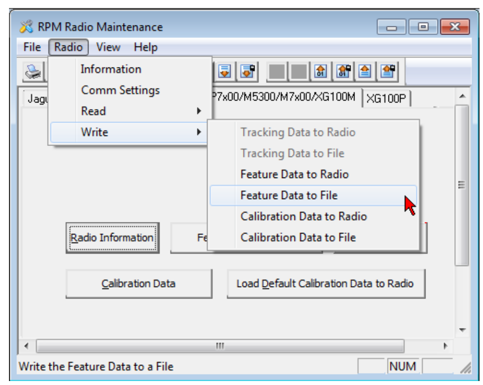
7. The Feature Encryption Data dialog box opens. This dialog box includes the radio's Electronic Serial Number (ESN). Record the ESN for later use. Click **OK** or **Cancel** to exit the box.



8. From the utility's menu:

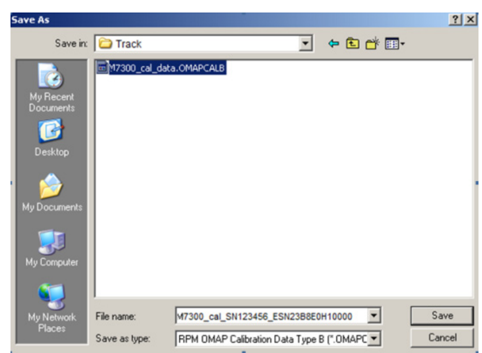
   Select: **Radio > Write > Feature Data to File**

   This action opens up the "Save As" dialog box to the default calibration and feature data folder. If desired, the folder/path may be changed.



9. Enter a unique file name which clearly identifies the radio (such as the serial number of the radio or a property tag number) and the electronic serial number, found on the Feature Encryption Data dialog box.

   Select: **Save**



11.3.3 Reading and Saving Calibration Data

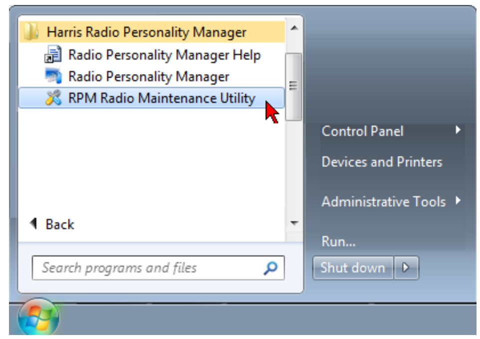
Follow this procedure to read and save a radio's calibration data:

NOTE

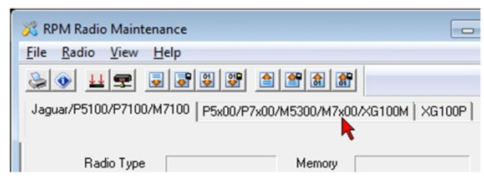
> The radio must have R15A or later code before calibration data can be read from or written to it. See Section 11.1 on page 72 for details.

1. Enter programming mode as described in Section 11.3.1.
2. At the PC with the RPM programming software, start the Radio Maintenance Utility:

   Click: **Start > Programs > Harris Radio Personality Manager > RPM Radio Maintenance Utility**



3. Click on the tab that includes **P7x00** (for the XG-75).

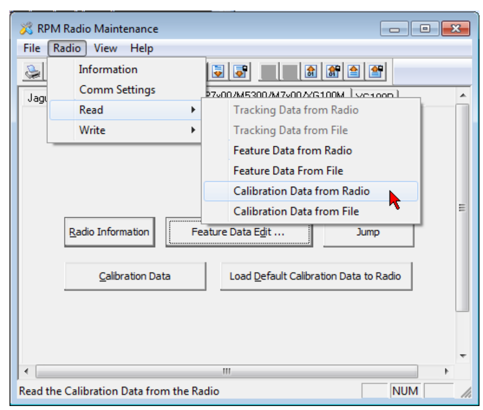


4. From the utility's menu:

   Select: **Radio > Read > Calibration Data from Radio**

5. When the Calibration Data Complete dialog box opens:

   Click: **OK**



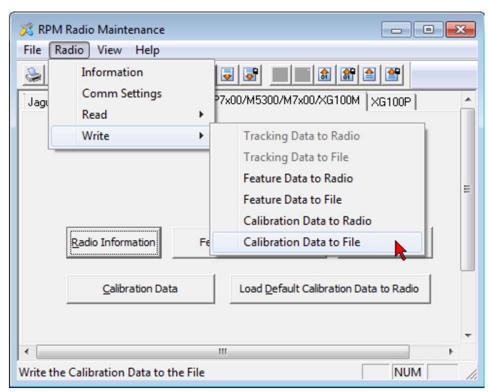
6. From the utility's menu:

   Select: **Radio > Write > Calibration Data to File**

   This action opens up the "Save As" dialog box to the default calibration and feature data folder. If desired, the folder/path may be changed.

7. Enter a unique file name which clearly identifies the radio (such as the serial number of the radio or a property tag number) and the electronic serial number, found on the Feature Encryption Data dialog box.

   Select: **Save**



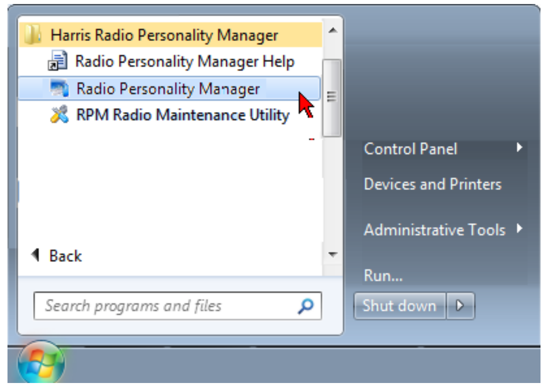
11.3.4 Reading and Saving the Radio Personality

A *personality* file is a computer file created within RPM. It contains the operating characteristics and frequencies for the radio. The personality file is downloaded and stored in the radio. Before beginning any alignment or test procedures, it is highly recommended to save a copy of the personality file to local archive (i.e., on the PC hard disk or other storage media).

1. Enter programming mode as described in Section 11.3.1.

2. At the PC with the RPM programming software, start this software:

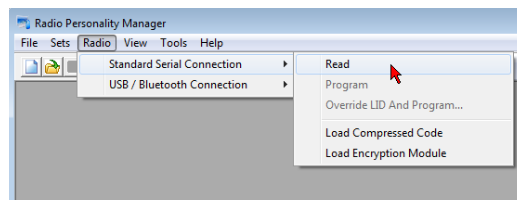
   Click: **Start > Programs > Harris Radio Personality Manager > Radio Personality Manager**



3. From RPM's main menu:

   Select: **Radio > Standard Serial Connection > Read**

   After the radio personality is read, the Personality window will appear.

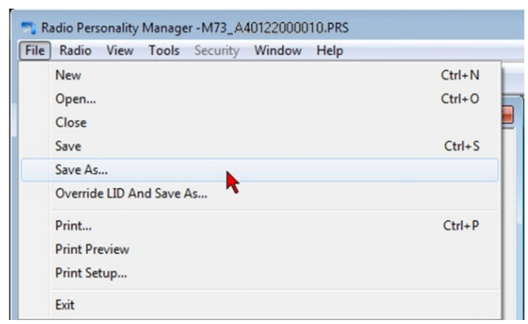


4. Within the personality window, information may be entered in the "Description" and "Author" fields.

5. On the RPM's main menu:

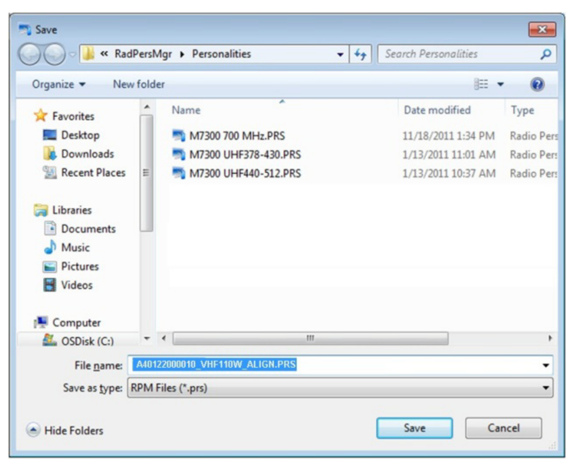
   Click: **File > Save As**

   When reading and saving a radio's personality, always use the Save As feature to prevent overwriting any existing file. RPM can determine the last known personality file name from the radio's personality. Avoid using the Save icon so a previously saved personality is not overwritten.



6. Enter a unique file name which clearly identifies the radio (such as the serial number of the radio, a unit number, a person's name, etc.).

   Select: **Save**



11.4 ADDING AND REMOVING RADIO ALIGNMENT TEST SYSTEMS TO PERSONALITIES

Radio alignment is performed at specific frequencies across the entire RF operating range of the radio. Performing a full radio alignment requires multiple conventional test systems with specific test channels to be added to a personality. The following procedure adds conventional test systems to an existing personality. However, this procedure may be adapted to the creation of a new “shop” test personality specific to each RF band of the XG-75 portable radio series.

11.4.1 Adding Radio Alignment Test Systems to the Personality

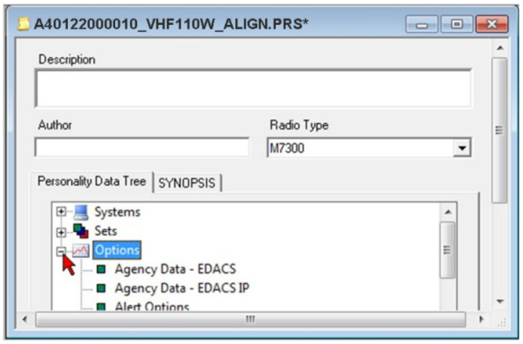
1. Connect the radio to the PC with the RPM programming software and enter programming mode. Refer to Section 11.3.1 as necessary.
2. Verify the feature and calibration data files have been saved to local disk. Refer to Sections 11.3.1 and 11.3.3 as necessary.
3. Read and save the radio’s personality. Be sure to save a copy of the original personality to a local file before making changes to the personality. Refer to Section 11.3.4 as necessary.

NOTE

> Instead of modifying the customer’s personality each time a radio is serviced, it is recommended that a “shop” test personality for the radio be developed and used when radio service is required.

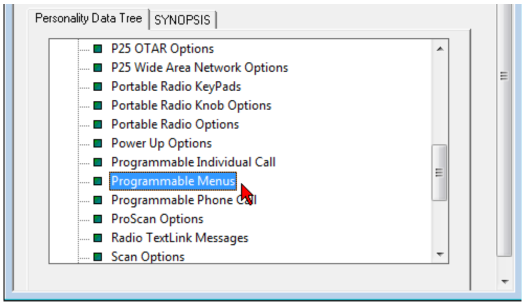
4. In the Personality Data Tree:

   Click: **Options**



5. Scroll down the Options limb:

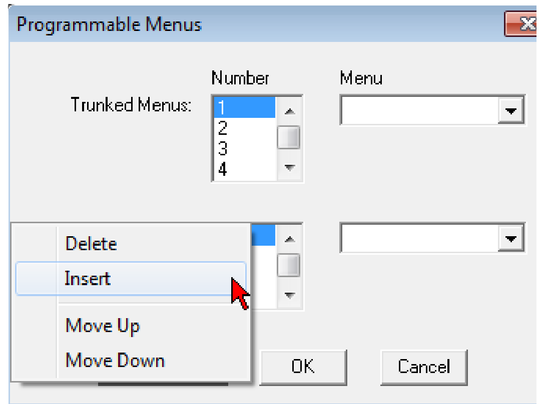
   Double-click: **Programmable Menus**



6. Within the Conventional Menus Number box:

   Double-click: **1**

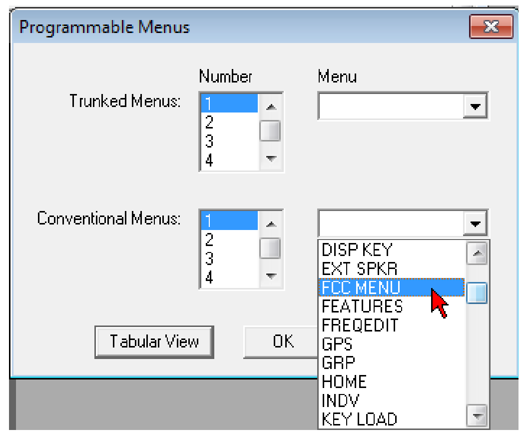
   Click: **Insert**



7. Within the dropdown menu choices:

   Select: **FCC MENU**

   Click: **OK**



NOTE

To support radio alignment and testing, the FCC Menu and several additional conventional frequency sets must be added to the radio's personality. This facilitates proper alignment of the radio.

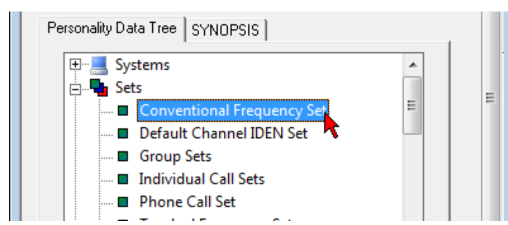
8. In the Personality Data Tree:

   Double-click: **Sets**

   The Sets limb expands.

   Double-click: **Conventional Frequency Set**

   The Conventional Frequency Sets dialog box opens.



NOTE

In the steps that follow, several unique frequency sets will be created and later used to perform alignment test. These sets provide access to various features being tested and the correct test points (frequencies) spread across the radio's RF operating range.

9. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

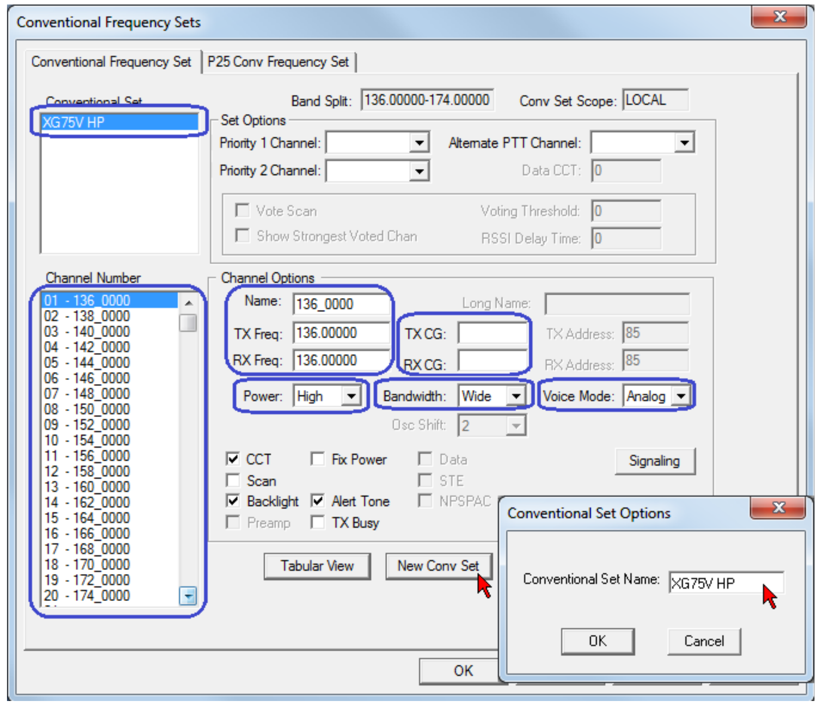
   Click: **New Conv Set**

   Type: **XG75V HP**

   Click: **OK**

   Use the illustration to the right, or reference Table 11-4, and enter for each channel, the channel name, TX and RX frequencies, select High Power, and set any other features as indicated by the outlined boxes. Enter all 20 channels.

   This set is used to align the radio's TX high power.



10. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

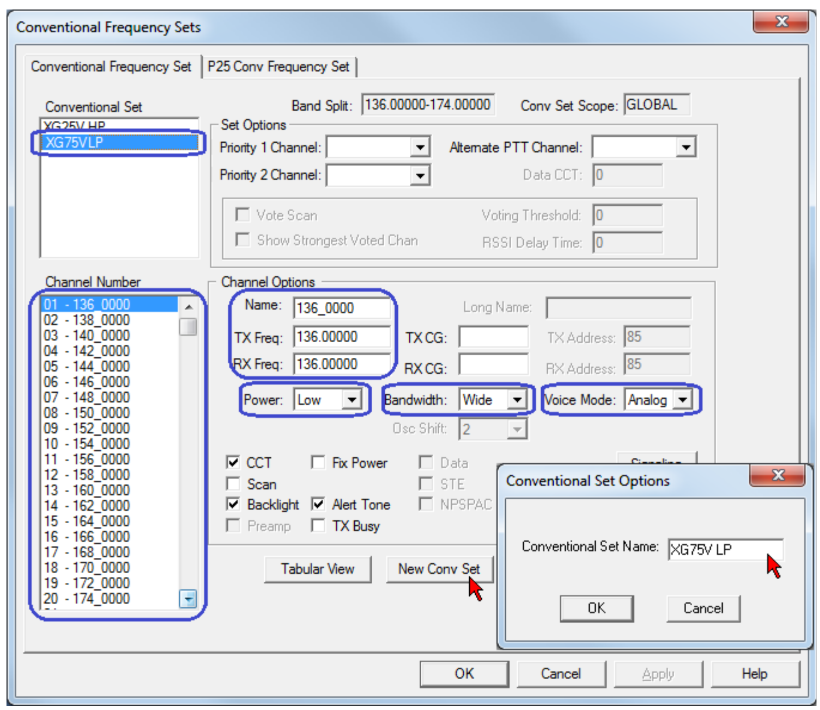
    Click: **New Conv Set**

    Type: **XG75V LP**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-4, and enter the channel name, TX and RX frequencies, select High Power, and set any other features as indicated by the outlined boxes. Enter all 20 channels.

    This set is used to align the TX low power and reference oscillator (TCXO).



11. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

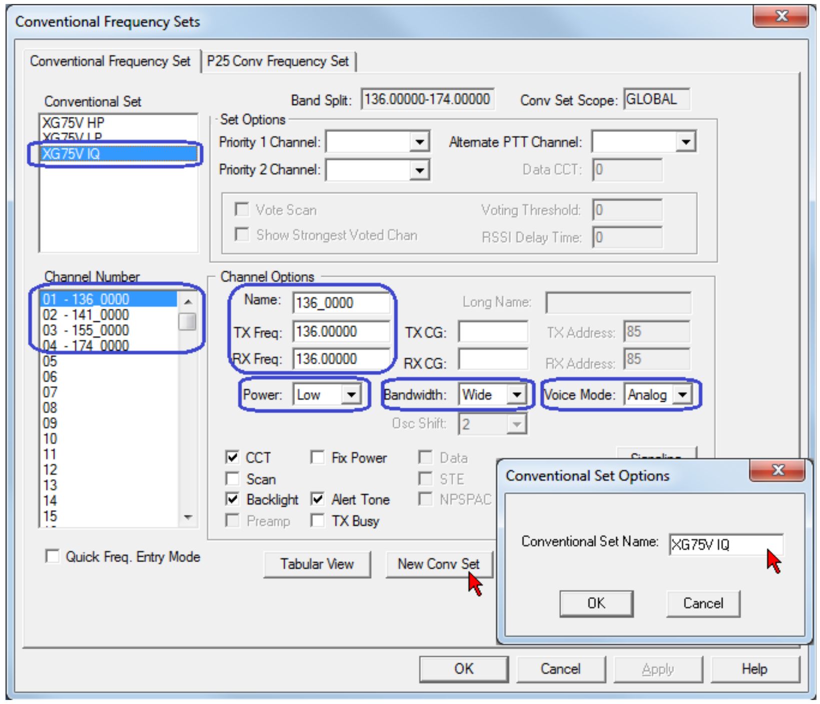
    Click: **New Conv Set**

    Type: **XG75V IQ**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-4, and enter the channel name, TX and RX frequencies, select Low Power, and set any other features as indicated by the outlined boxes. Enter all 4 channels.

    This set is used to align IQ modulation.



12. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

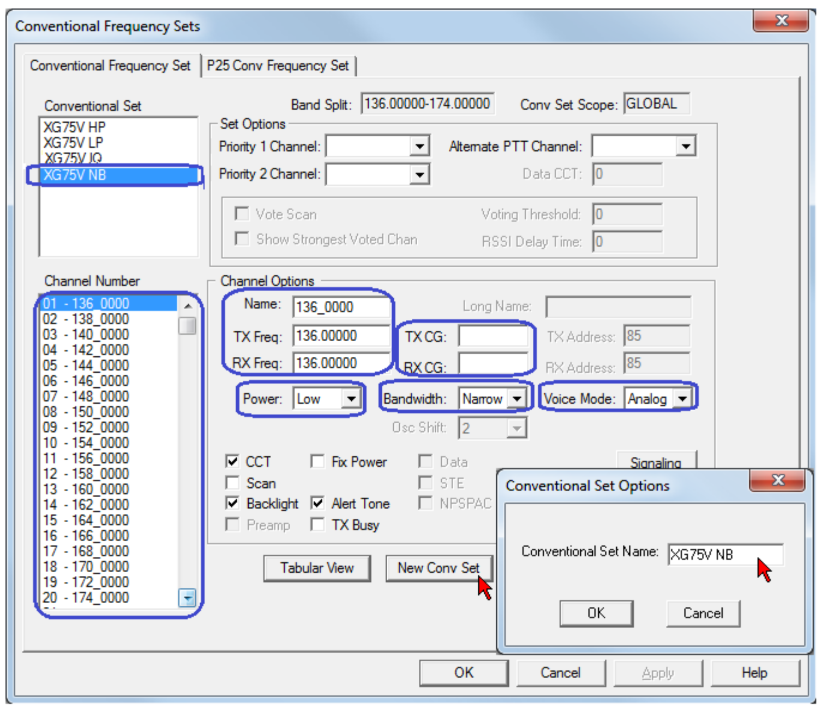
    Click: **New Conv Set**

    Type: **XG75V NB**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-4, and enter the channel name, TX and RX frequencies, select Low Power, Narrowband, and set any other features as indicated by the outlined boxes. Enter all 20 channels.

    This set is used to align Deviation Narrowband.



13. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

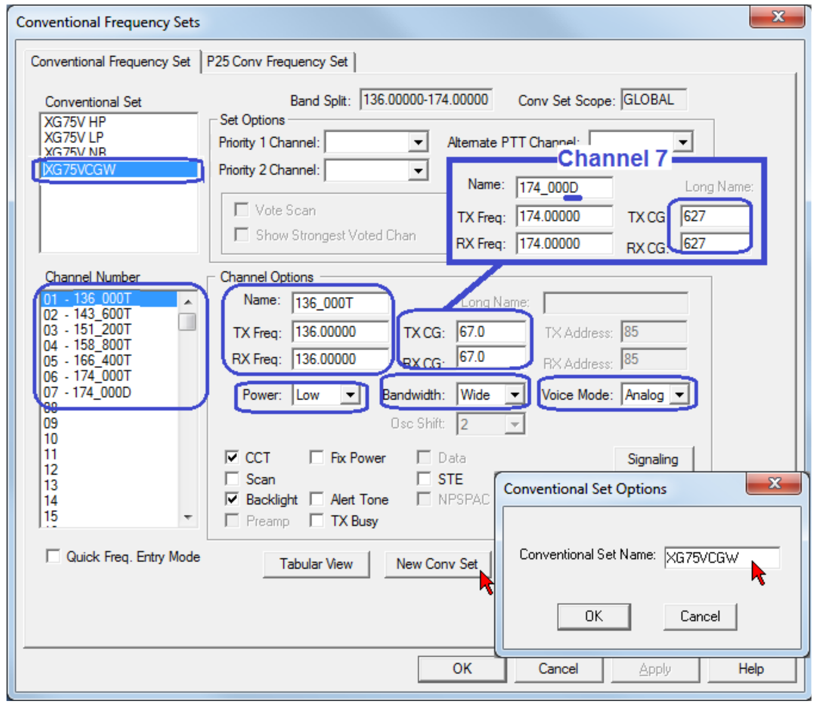
    Click: **New Conv Set**

    Type: **XG75VCGW**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-6, and enter the channel name, frequency, wideband, and set any other features as indicated by the outlined boxes. Enter all 7 channels.

    This conventional channel set is used for aligning wideband TX Tone and Digital Channel Guard.



14. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

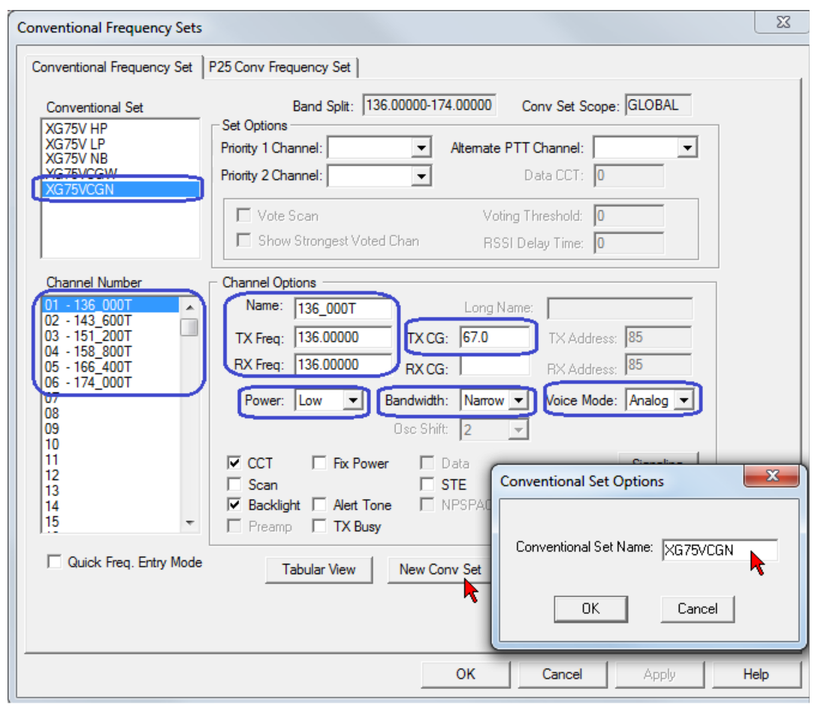
    Click: **New Conv Set**

    Type: **XG75VCGN**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-6, and enter the channel name, frequency, narrowband, and set any other features as indicated by the outlined boxes. Enter all 7 channels.

    This conventional channel set is used for aligning narrowband TX Tone and Digital Channel Guard.



15. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

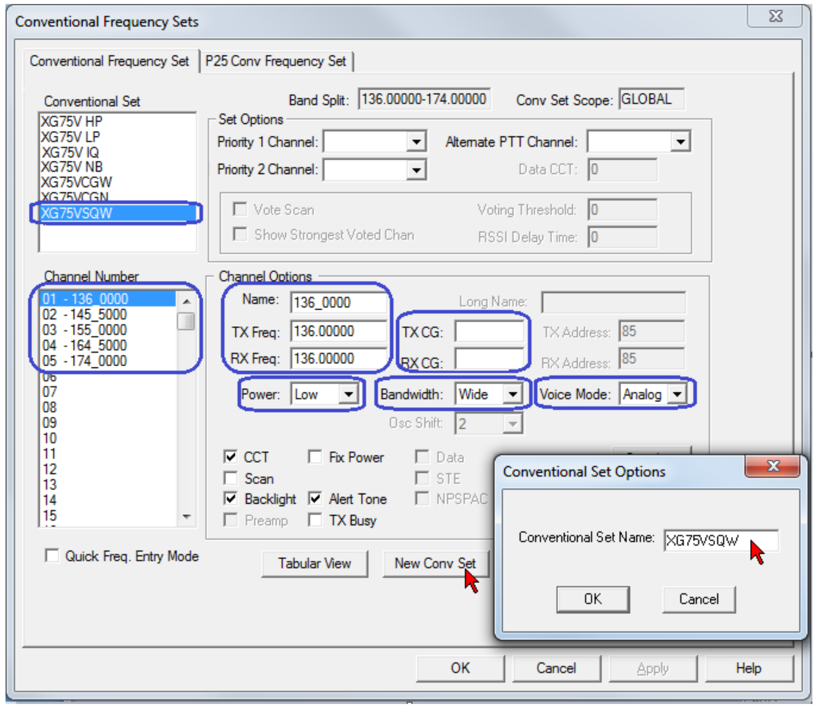
    Click: **New Conv Set**

    Type: **XG75VSQW**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-7, and enter the channel name, frequency, and set any other features as indicated by the outlined boxes. Enter all 5 channels.

    This conventional channel set is used for aligning wideband squelch.



16. In the Conventional Frequency Sets tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

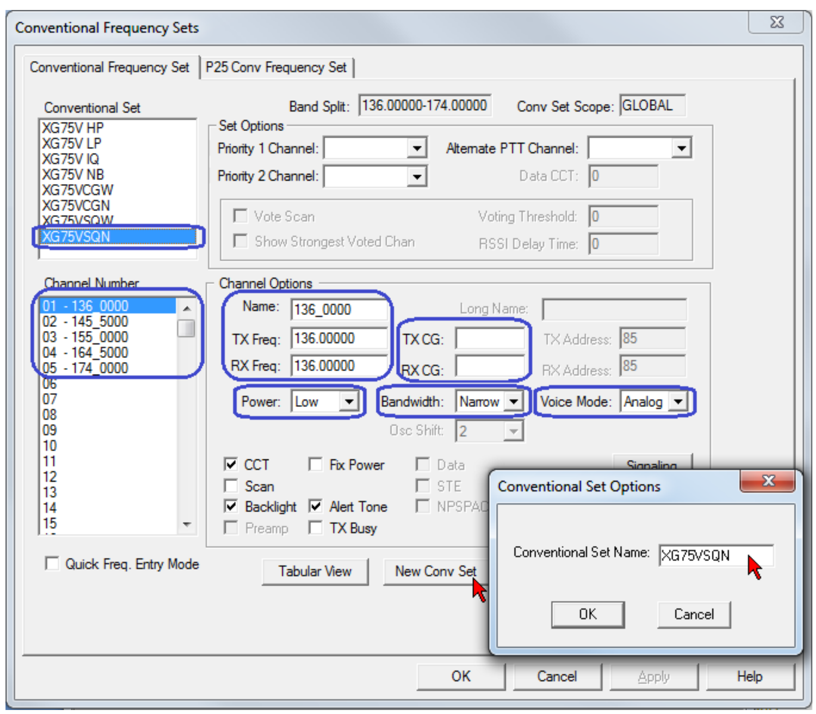
    Click: **New Conv Set**

    Type: **XG75VSQN**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-7, and enter the channel name, frequency, and set any other features as indicated by the outlined boxes. Enter all 5 channels.

    This conventional channel set is used for aligning narrowband squelch.



17. In the P25 Conv Frequency Set tab of the Conventional Frequency Sets dialog box, add a new set to the existing personality as follows:

    Click: **New P25 Freq Set**

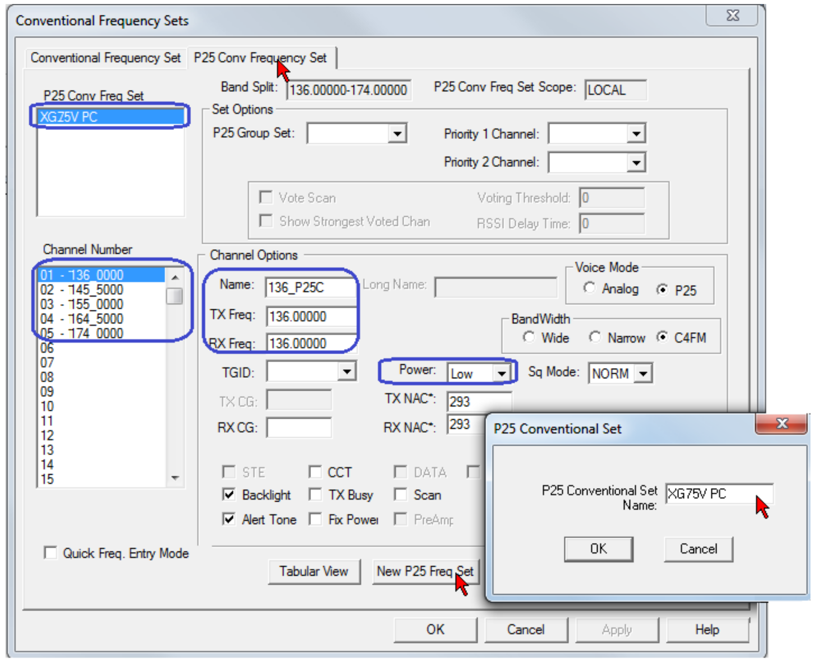
    Type: **XG75V PC**

    Click: **OK**

    Use the illustration to the right, or reference Table 11-7, and enter the channel name, frequency, and set any other features as indicated by the outlined boxes. Enter all 5 channels.

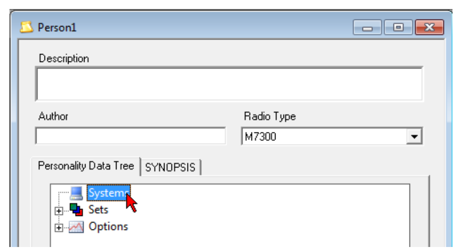
    This conventional channel set is used for aligning narrowband squelch.

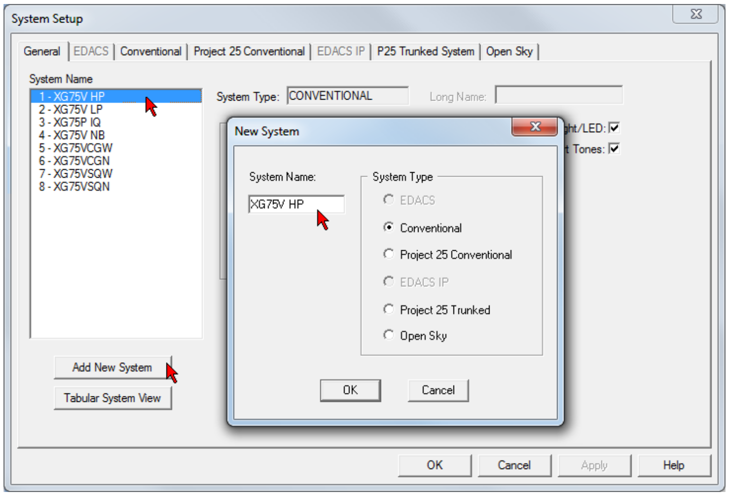
    Click: **OK**



18. In the Personality Data Tree, assign these newly-created frequency sets to new systems:

    Double-click: **Systems**





19. In the General tab of the System Setup dialog box:

    Click: **Add New System**

20. In the New System box:

    Type: **XG75V HP**

    Select: **Conventional**

    Click: **OK**

21. Repeat steps 19 and 20, and create a new System Name for each of the following:

    XG75V LP

    XG75V IQ

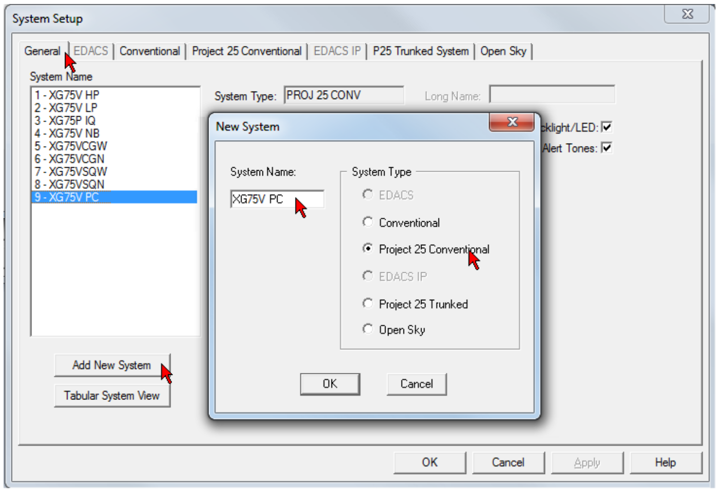
    XG75V NB

    XG75VCGW

    XG75VCGN

    XG75VSQW

    XG75VSQN



22. In the General tab of the System Setup dialog box:

    Click: **Add New System**

23. In the New System box:

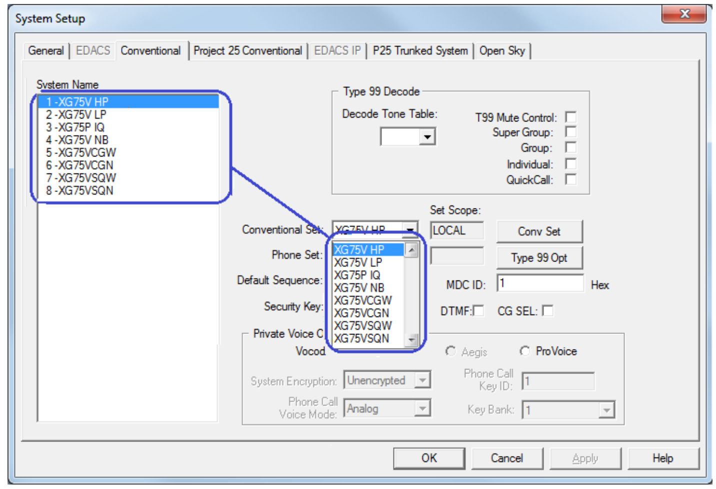
    Type: **XG75V PC**

    Select: **Project 25 Conventional**

    Click: **OK**

24. In the System Setup window, assign a frequency set to each system:

    Click: **Conventional** tab



25. In the System Name field:

    Select: **XG75V HP**

26. In the Conventional Set dropdown:

    Select: **XG75V HP**

27. Repeat steps 25 and 26, and associate each remaining System Name with the matching Conventional Set:

    XG75V LP

    XG75V IQ

    XG75V NB

    XG75VCGW

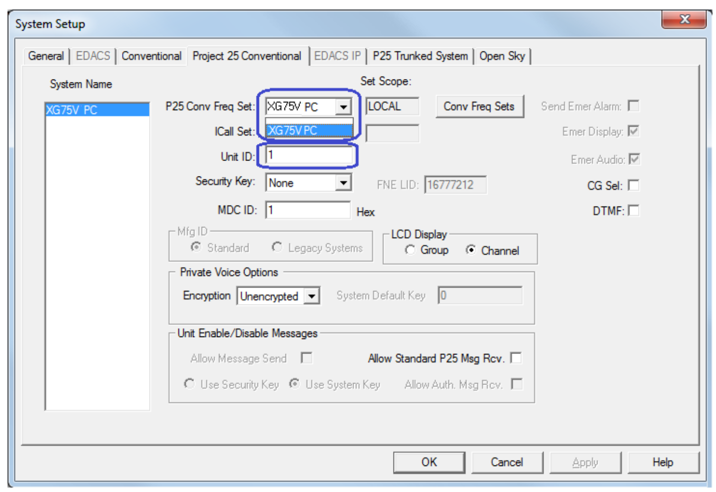
    XG75VCGN

    XG75VSQW

    XG75VSQN

28. In the System Setup window, assign a frequency set to each system:

    Click: **Project 25 Conventional** tab



29. In the Conventional Set dropdown:

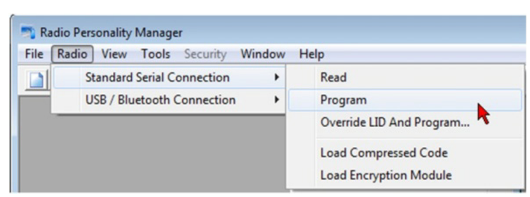
    Select: **XG75V PC**

    Unit ID: **1**

    Click: **OK**

30. From RPM's main menu:

    Select: **Radio > Standard Serial Connection > Program**



31. After the radio personality is programmed, it is recommended to save the updated personality file to different name for future reference as a test personality for the radio.

Table 11-4: Conventional Frequency Sets XG75V HP and XG75V LP

CHANNEL NUMBER	FREQUENCY (MHz)	CHANNEL NUMBER	FREQUENCY (MHz)
1	136.0000	11	156.0000
2	138.0000	12	158.0000
3	140.0000	13	160.0000
4	142.0000	14	162.0000
5	144.0000	15	164.0000
6	146.0000	16	166.0000
7	148.0000	17	168.0000
8	150.0000	18	170.0000
9	152.0000	19	172.0000
10	154.0000	20	174.0000

Table 11-5: Conventional Frequency Sets XG75V HP and XG75V LP

CHANNEL NUMBER	FREQUENCY (MHz)
1	136.0000
2	141.0000
3	155.0000
4	174.0000

Table 11-6: Conventional Frequency Set XG75VCGW and XG75VCGN

CHANNEL NUMBER	FREQUENCY (MHz)	CG TONE (Hz)	CHANNEL NUMBER	FREQUENCY (MHz)	CG TONE (Hz / DCG)
1	136.0000	67.0	4	158.8000	67.0
2	143.6000	67.0	5	166.4000	67.0
3	151.2000	67.0	6	174.0000	67.0
			7*	174.0000	627

* Channel 7 only used in XG75VCGW wideband channel set.

Table 11-7: Receiver Frequency Sets XG75VSQW, XG75VSQN and XG75V PC

CHANNEL NUMBER	FREQUENCY IN MHz (TX and RX)	CHANNEL NUMBER	FREQUENCY IN MHz (TX and RX)
1	136.0000	4	164.5000
2	145.5000	5	174.0000
3	155.0000		

11.4.2 Removing Radio Alignment Test Systems from the Personality

CAUTION

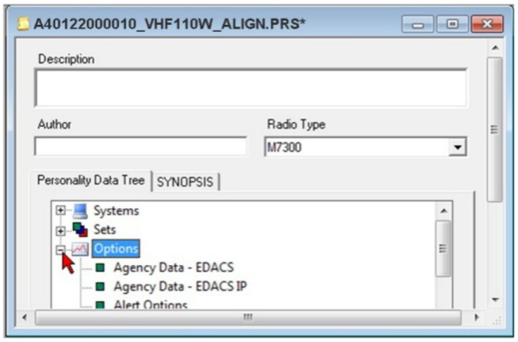
*****IMPORTANT*****

The systems added to the radio for accessing the test conventional frequency sets must **not** be accessible to the end radio user. When testing is completed, reload the radio's original personality, or remove the test systems as described in this section.

In general, deleting the new frequency sets created for radio testing from the radio's personality is not necessary. Simply deleting the test Systems from the System Setup's General tab in RPM and re-programming the radio with this modified personality removes radio user access to the frequency sets used for testing. The respective steps are presented in this procedure:

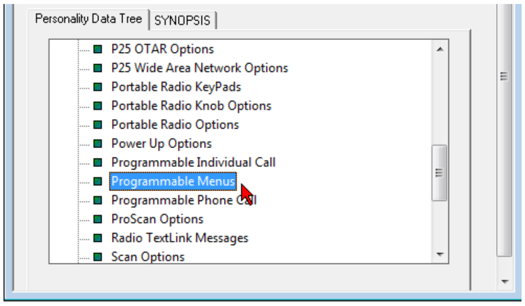
1. Connect the radio to the PC with the RPM programming software and enter programming mode. Refer to Section 11.3.1 as necessary.
2. Verify the feature and calibration data files have been saved to local disk. Refer to Sections 11.3.1 and 11.3.3 as necessary.
3. Read the radio's personality. Refer to Section 11.3.4 as necessary.
4. In the Personality Data Tree tab:

   Click: **Options**



5. Scroll down the Options limb:

   Double-click: **Programmable Menus**

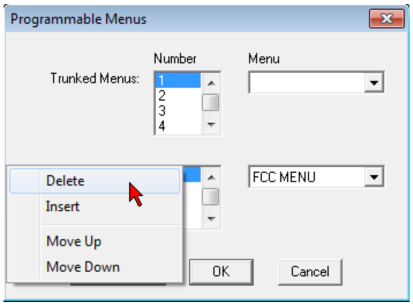


6. Within the Conventional Menus Number box:

   Double-click: **1** ("FCC Menu")

   Click: **Delete**

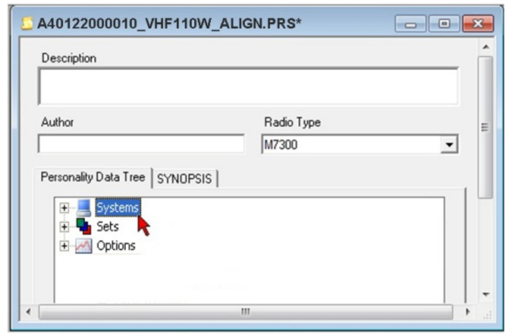
   Click: **OK**



7. In the Personality Data Tree tab:

   Double-click: **Systems**

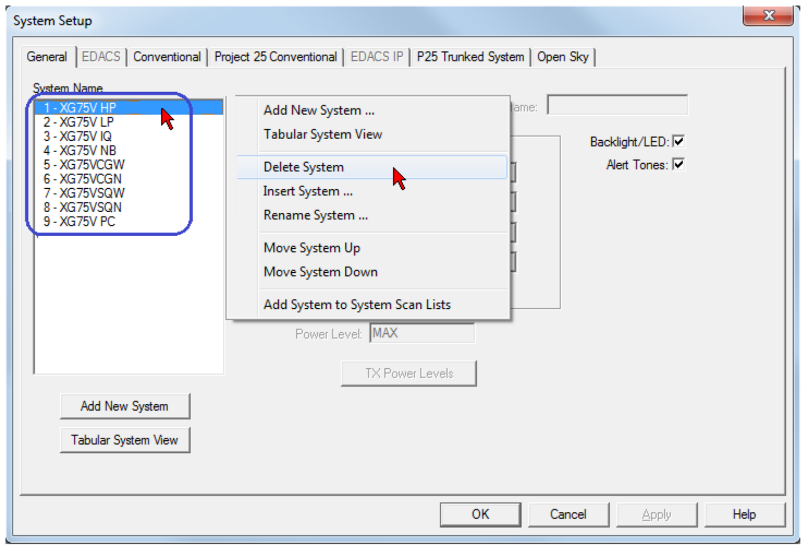
   The System Setup dialog box opens.



8. In the General tab of the System Setup dialog box:

   Double-click: **XG75V HP**

   Click: **Delete System**



9. Repeat to delete each of the other systems previously added for testing:

   XG75V LP

   XG75V IQ

   XG75V NB

   XG75VCGW

   XG75VCGN

   XG75VSQW

   XG75VSQN

   XG75V PC

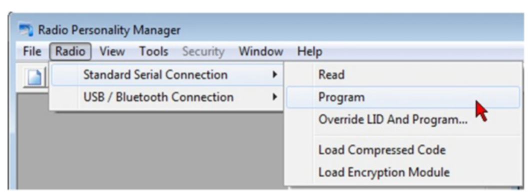
NOTE

It is generally not necessary to delete the new frequency sets created for testing. Deleting the test System from the General Tab removes customer access to the test frequency sets.

10. When all new conventional systems created for testing are deleted, click **OK**.

11. From RPM's main menu:

    Select: **Radio > Standard Serial Connection > Program**



12. Wait for the re-programming operation to complete.

11.5 RADIO TEST AND ALIGNMENT PROCEDURES

11.5.1 General Information

Before beginning any radio alignment procedure, a careful review of Sections 11.1 through 11.4 is recommended. The minimum radio firmware code versions and RPM version listed in Section 11.1 (page 72), and the required test equipment must be in place. Unless otherwise stated, each alignment procedure is written as a standalone procedure; in other words, it may be performed without performing the full battery of procedures.

The following flow of events should be performed before beginning radio alignment:

- Read and save the original feature data, calibration data, and personality data files before making any changes. Refer to Section 11.3 (page 74) as necessary.
- Update the existing personality in the radio with conventional test frequency sets. Refer to Section 11.4 (page 79) as necessary.
- Test the radio per the alignment procedures in this manual and align with updated calibration data as necessary.
- Save the final calibration data to a local file. Refer to Section 11.3.3 (page 77) as necessary.
- Reload the radio's original personality and verify operation.

CAUTION

*****IMPORTANT*****

The systems added to the radio for accessing the test conventional frequency sets must **not** be accessible to the end radio user. When testing is completed, reload the radio's original personality, or remove the test systems as described in Section 11.4.2 on page 89.

CAUTION

RF test cables used to connect the radio to the RF Communications Test Set will affect RF power by adding losses. The longer the cable, the greater the loss. For optimum results, connect the radio the RF test equipment using only high-quality RF cables.

11.5.2 Alignment Test Setup

Use this procedure for setting up the radio under test for RF tests (refer to Figure 11-2):

1. On the Audio Test Box (MATQ-03424), place the UDC switch into position 7.
2. Attach the test cable (CA-023407-002) to the Audio Test Box and to the radio.
3. Attach the RF Antenna Adapter (19B801496G2) to the radio's antenna port and connect a RF test cable from the adapter to the T/R port on the communications analyzer.
4. Attach a BNC-Male to BNC-Male test cable (a 50 ohm RF cable is recommended) from the Mic Hi port on the test box to the FCTN GEN port on the communications analyzer.
5. Attach a BNC-Male to BNC-Male test cable (a 50 ohm RF cable is recommended) from the Speaker Out port on the test box to the Audio In 1 port on the communications analyzer.
6. Optional, attach the Battery Eliminator (BT-023406-015) to the radio. Observing DC polarity, connect a +7.5 VDC power source to the battery eliminator.

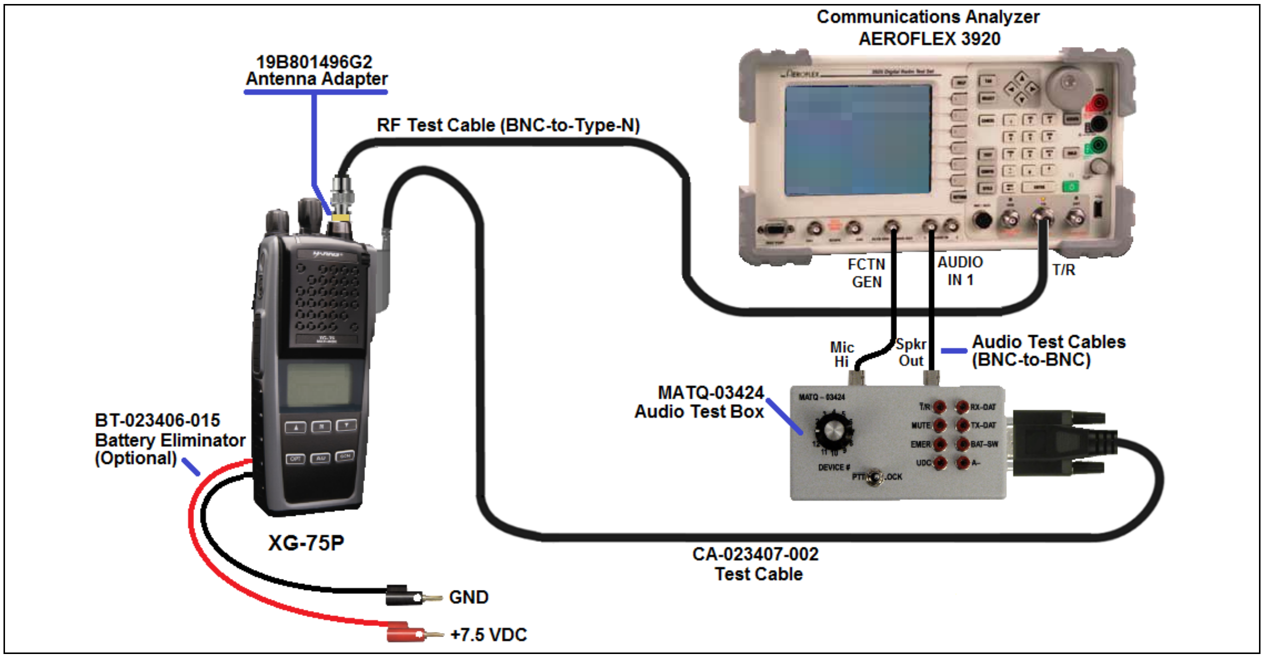


Figure 11-2: Test Equipment Connections for Radio Alignment

11.5.3 Automatic Frequency Control (Reference Oscillator) Test and Alignment

The Automatic Frequency control (AFC) adjusts the radio's reference oscillator frequency. It is critical to use a frequency standard (test instrument) with frequency stability sufficient to assure the radio is within ±0.15 ppm at room temperature.

Perform the following to verify and align the AFC:

1. Add the conventional test systems to the radio personality (refer to Section 11.4).
2. Prepare the radio for RF testing per instructions in Section 11.5.2.
3. Turn ON the radio and do the following:
   a. Select the conventional test system: **XG75V LP**
   b. Select: **Channel 20** (174.0000 MHz)

CAUTION

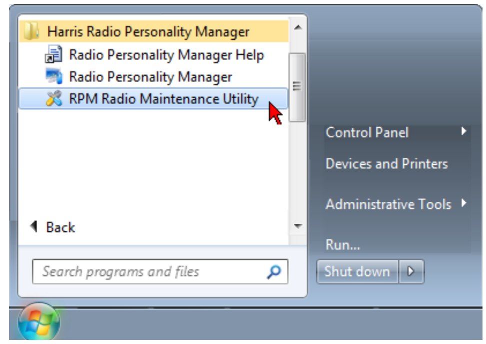
DO NOT attempt AFC alignment while in trunked mode!

Only align the AFC value in analog conventional mode. During trunked mode, an additional AFC compensation value is applied to the radio's reference oscillator frequency control.

The additional compensation value is temporary and refreshed each time the radio locks onto a Control Channel. While locked on a Control Channel, the radio's reference oscillator is precision aligned the match the Control Channel base station's true frequency.

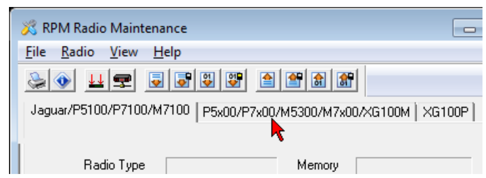
4. Using the PTT switch on the MATQ-03234 test box, key the radio and verify the frequency is 174.0000 MHz ±0.15 ppm at room temperature.
5. Unkey the radio. If the TX frequency is within tolerance, proceed to Step 20. Otherwise, proceed to the next step.

6. Turn the radio OFF.
7. Disconnect the test box and connect the programming cable to the radio as described in Section 11.3.1.
8. Turn the radio ON.

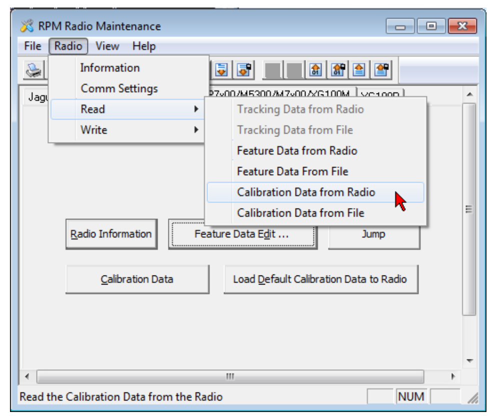


9. From the PC, open the Radio Maintenance Utility tool:

   Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



10. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

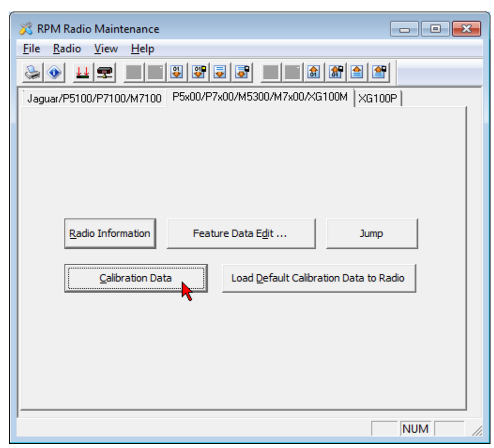


11. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

12. When the Calibration Data complete dialog box appears:

    Click: **[OK]**

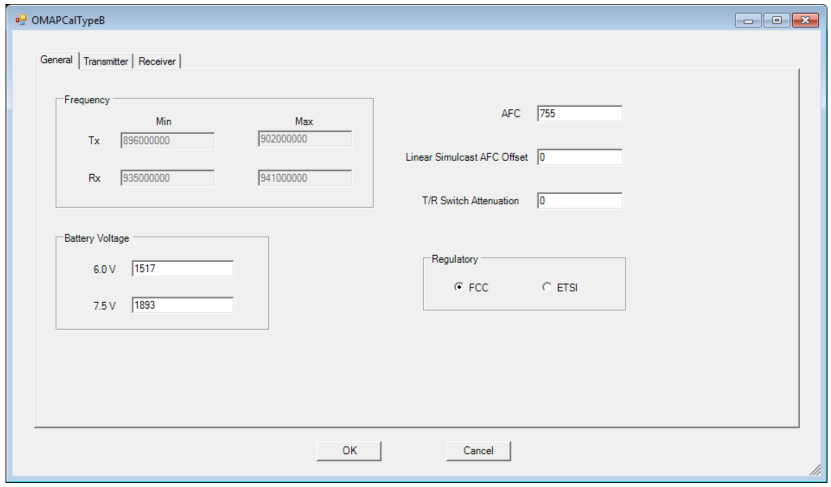


13. Within the center window pane:

    Select: **[Calibration Data]**

14. Within the General tab, adjust the AFC value up or down. The TX frequency should follow the change in AFC value; UP increases the TX frequency while DOWN lowers the TX Frequency.

    Click: **[OK]**



CAUTION

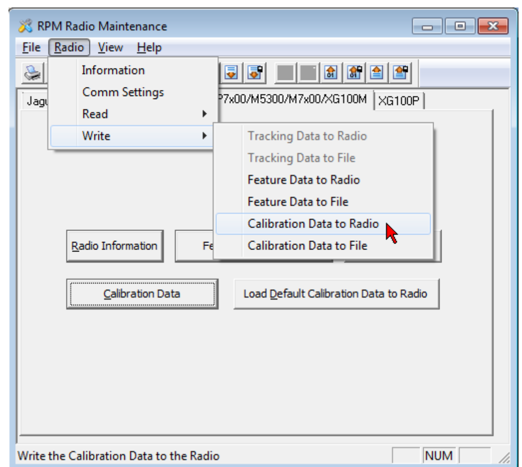
Do not change any of other fields within the General tab.

15. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

16. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



17. Turn the radio OFF.
18. Disconnect the programming cable from the radio and reconnect the radio to the test box (test setup).
19. Repeat the test beginning with Step 3.
20. If no other testing is to be performed, do the following:
    a. Save the final Calibration Data to a local file.
    b. If a “shop” test personality was used to test the radio, reload the original personality into the radio and verify operation.
    c. If conventional test frequency sets were added to the original personality, refer to Section 11.4.2, remove the test sets, and verify radio operation.

11.5.4 TX Power Test and Alignment

The Radio Maintenance Utility tool Calibration Data button accesses tabs (screens) for aligning the following TX power output levels:

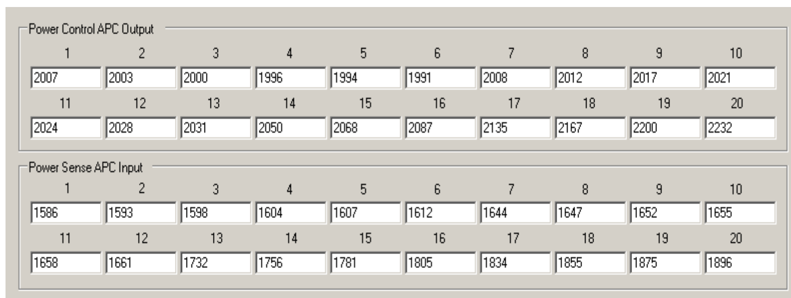
- TX Power Low
- TX Power Mid (field alignment is not supported for XG-75)
- TX Power High

Each power level tab includes the following three (3) types of compensation factors:

- TX Power reference
- Power Control APC Output
- Power Sense APC Input

Field alignment of the RF power output is performed at the high (maximum) and low (minimum) power levels. Within each Tx Power tab (screen), the value displayed in the "Tx Power" input box represents the RF output level which the radio is aligned, the value being a factor of 10 times the expected power output. In other words, an entry of "10" relates to an RF power output of 1.0 Watts (1.0 x 10 = "10"), an entry of "50" relates to an RF power output of 5.0 Watts (5.0 x 10 = 50), etc.

The TX Power data values for 20 different frequencies across the combined VHF band are used to control the transmitter RF output power level over the entire frequency range of the transmitter. Increasing the data values increases the power output at each reference point.



The Power Control APC Output values prevent the radio from producing excessive RF during initial key-up. The Power Sense APC Input values set the radio's steady state power after being keyed for a period of time (settling time).

CAUTION

The TX power levels are aligned before the radio leaves the factory. Factory alignment establishes the appropriate transmit power levels for the radio. New values should not be entered unless original values are lost, corrupted, or associated hardware is replaced (e.g., TX Power Amplifier).

CAUTION

For optimum performance, sufficient battery life, TX power amplifier protection, and to assure compliance with FCC requirements, DO NOT exceed nominal RF power output settings.

Perform the following to verify and align the RF power output of a XG-75 portable:

1. Add the conventional test systems to the radio personality (refer to Section 11.4).
2. Setup the radio for RF testing per instructions in Section 11.5.2.
3. Power up the radio and do the following:
   a. Select the conventional test system: **XG75V LP**

b. Select **Channel 20** (174.0000 MHz), the next lower test channel, or the channel being aligned.

4. Using the PTT switch on the MATQ-03234 test box, key radio and wait for power to stabilize (typically 1-2 seconds).
5. Capture the steady state trace using the Channel Analyzer as shown in Figure 11-3.
6. Unkey radio and turn the Peak Hold function on.
7. Rekey the radio and measure the initial RF power as shown in Figure 11-3.
8. Unkey the radio.
9. Apply the following:

a. If the dispersion between the initial peak power and the steady state power is greater than 0.8 dB, or steady power is not within ±0.25 dB of the expected power output, skip to Step 10 and align the power settings for the channel being tested.

b. If the dispersion between the initial peak power and the steady state power is less than 0.8 dB, and steady power is within ±0.25 dB of the expected power output:

i. Select the next lower test frequency in the selected system.

ii. Repeat the test and alignment process, beginning with Step 3.b, until all channels in the selected system have been tested and aligned.

c. If all data points are aligned in the Low Power system:

i. Select the High Power test system: **XG75V HP**

ii. Repeat the test and alignment process, beginning with Step 3.b, until all channels in the selected system have been tested and aligned for High Power.

d. If High and Low Power alignment has been completed for all test channels, skip to Step 24.

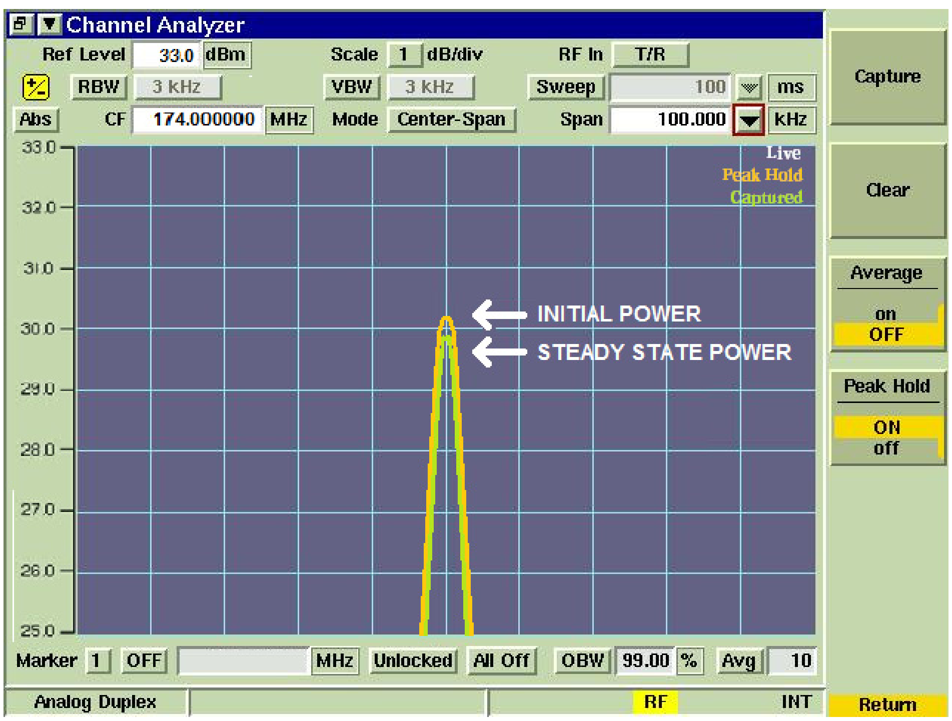
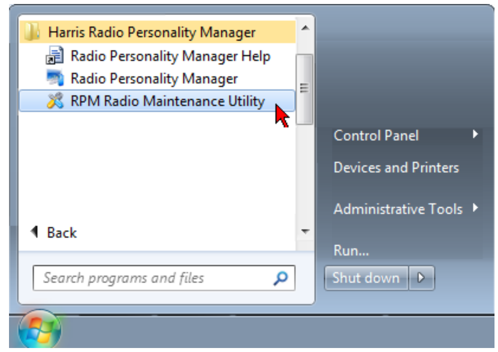


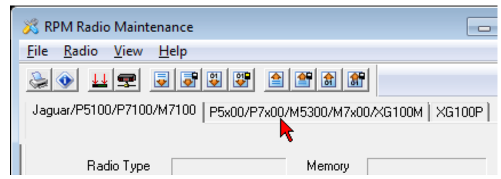
Figure 11-3: Measuring and Aligning APC Input and Output Power with Aeroflex 3920

10. Turn the radio OFF.
11. Disconnect the test box and connect the programming cable to the radio as described in Section 11.5.2.
12. Turn the radio ON.
13. From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



14. Within the center window pane, select the tab which includes the correct radio model. For XG-75 radios, select the tab which includes: **P7x00**

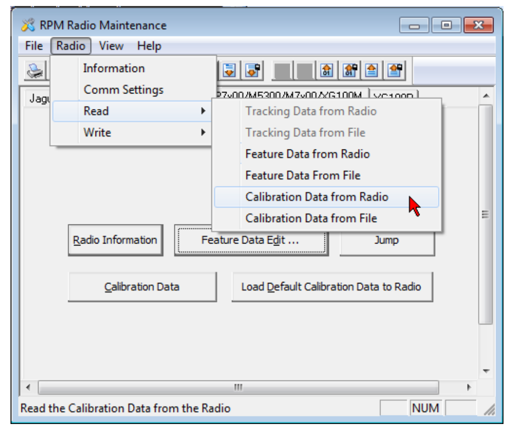


15. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

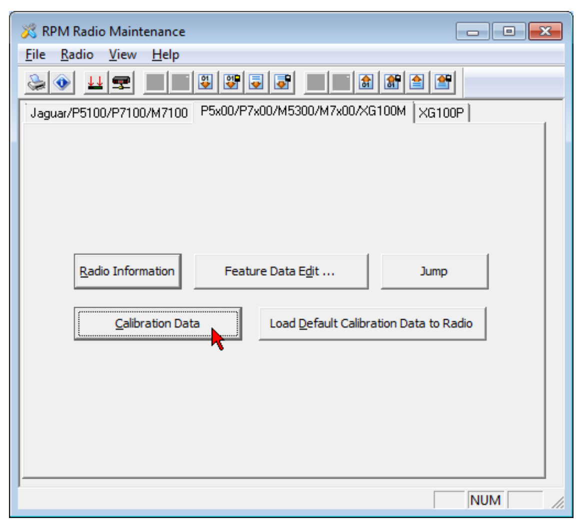
16. When the Calibration Data complete dialog box appears:

    Click: **[OK]**



17. Within the center window pane:

    Select: **[Calibration Data]**



18. From within the Transmitter tab, review the TX Power Low and High tabs and verify the “Tx Power” input box shows the correct values:

    For Low Power: **5** (refer to Figure 11-4)

    For Mid Power: **20** DO NOT make changes to the factory settings within this tab.

    For High Power: **30** (refer to Figure 11-5)

NOTE

> The “Tx Power” input box represents the RF output level with which the Tx Power High and Tx Power Low reference points are aligned. A factor of times 10 is applied; for an RF power output of 0.5 Watts, enter “5” (0.5 x 10 = “5”), for 3.0 Watts RF power output, enter “30” (3.0 x 10 = 30), etc.

19. Adjust the Power Control APC Output and Power Sense APC Input values accordingly for the frequency (test channel) being tested.

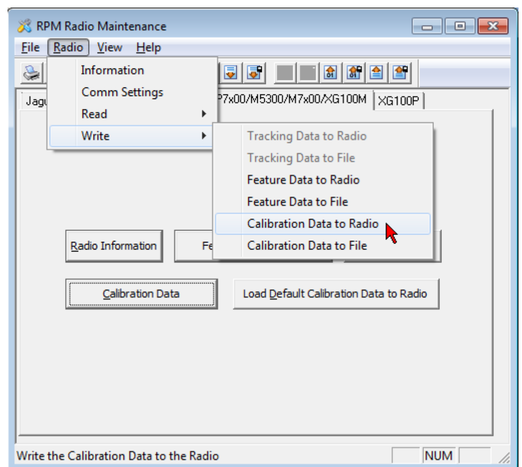
    Click: **[OK]**

20. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

21. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



22. Turn the radio OFF and back ON to apply the changes.
23. Return to Step 3.b and retest the channel.
24. Save the final Calibration Data to a local file.
25. If no other testing is to be performed, do the following:
    a. If a “shop” test personality was used to test the radio, reload the original personality into the radio and verify operation.
    b. If test systems were added to the original personality, refer to Section 11.4.2, remove the systems, and verify radio operation.

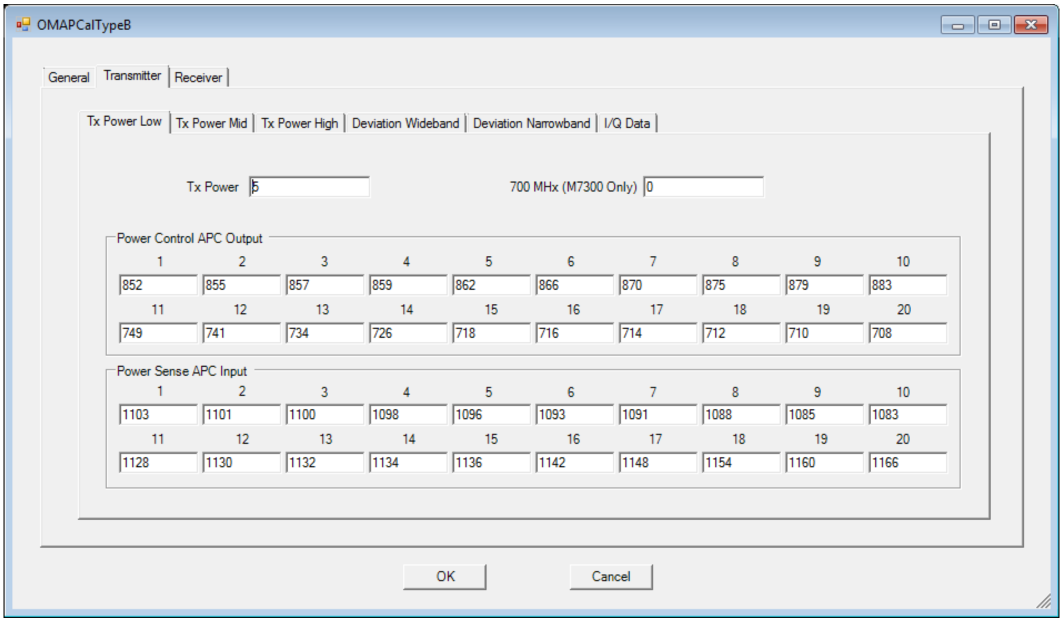


Figure 11-4: Example of TX Power Low APC Input and Output Power Settings

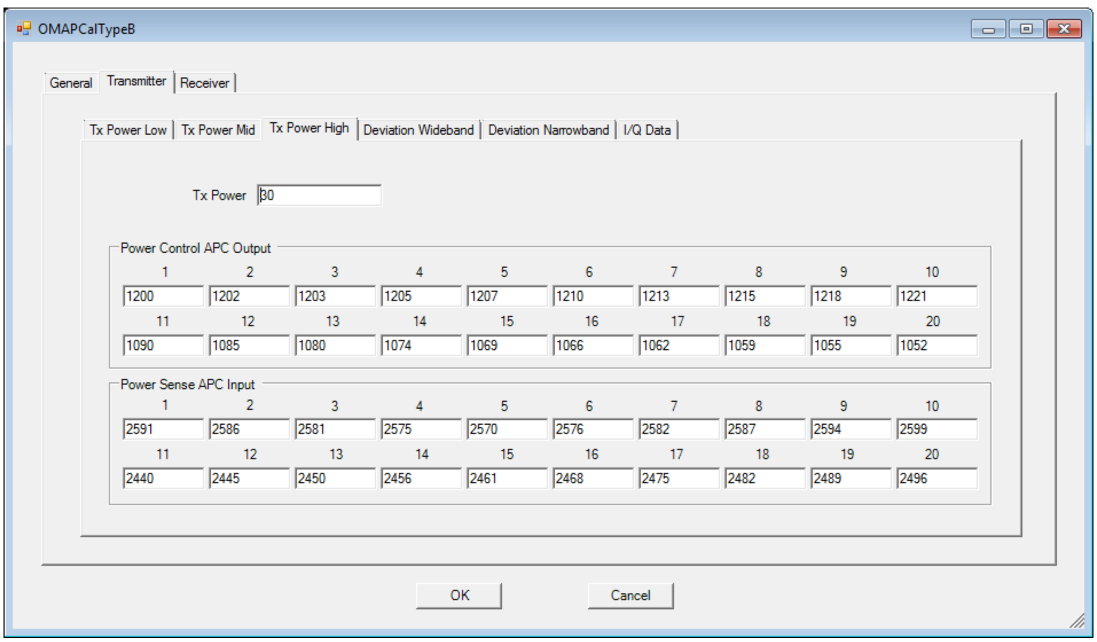


Figure 11-5: Example of TX Power High APC Input and Output Power Settings

11.5.5 I/Q Data Alignment

For XG-75 portables, I and Q alignment is simplified to aligning at only one frequency anywhere across the band. The following procedure will align I and Q at the high end of the band (174.0000 MHz). The Radio Maintenance Utility tool provides alignment tools for setting the DC Offset, Amplitude, and Vector arrays for I and Q modulation.

CAUTION

I/Q Data alignment should only be necessary if hardware components affecting transmitter performance have been replaced or the radio has reset to default factory data. Under any other circumstances where I/Q misalignment is suspected, it is recommended to first verify the test setup, and then determine and correct the cause of radio failure before proceeding with an alignment.

Perform the following to verify and align I and Q modulation:

1. Prepare the radio by adding the test systems to the radio personality (refer to Section 11.4).
2. Connect the communications test set's RF port to the radio antenna port.
3. Setup the communications test set for spectrum analyzer operation at the frequency under test. Refer to Figure 11-6.
4. Power up the radio and do the following:
   a. Select the conventional test channel set: **XG75V IQ**
   b. Select Channel 4 (174.0000 MHz, refer to Table 11-4) or the next lower test channel.
   c. Press **Menu** and use the **Up/Down** arrows to select "**FCC MENU**."
   d. Press **Menu** again and use the **Up / Down** arrows to select "**SSB MODE**."

NOTE

While in the *FCC Menu > SSB MODE*, use the **Menu** button to key and unkey the radio. This is a latching PTT function; the radio's transmit indicator will illuminate red when transmitting.

5. Press the **Menu** button to key the radio.
6. Measure and record the difference between the RF SSB carrier being generated, the center frequency carrier suppression, or the other sideband (refer to Figure 11-6). Carrier and SSB suppression must be at least -45 dBc.
7. Repeat Steps 4.b through Step 6 Measure and record the carrier and SSB suppression for each lower test channel.
8. Unkey the radio by pressing the **Menu** button.
9. If carrier or sideband leakage did not meet the -45 dBc limit, proceed to Step 10. Otherwise, proceed to Step 22 and save data.

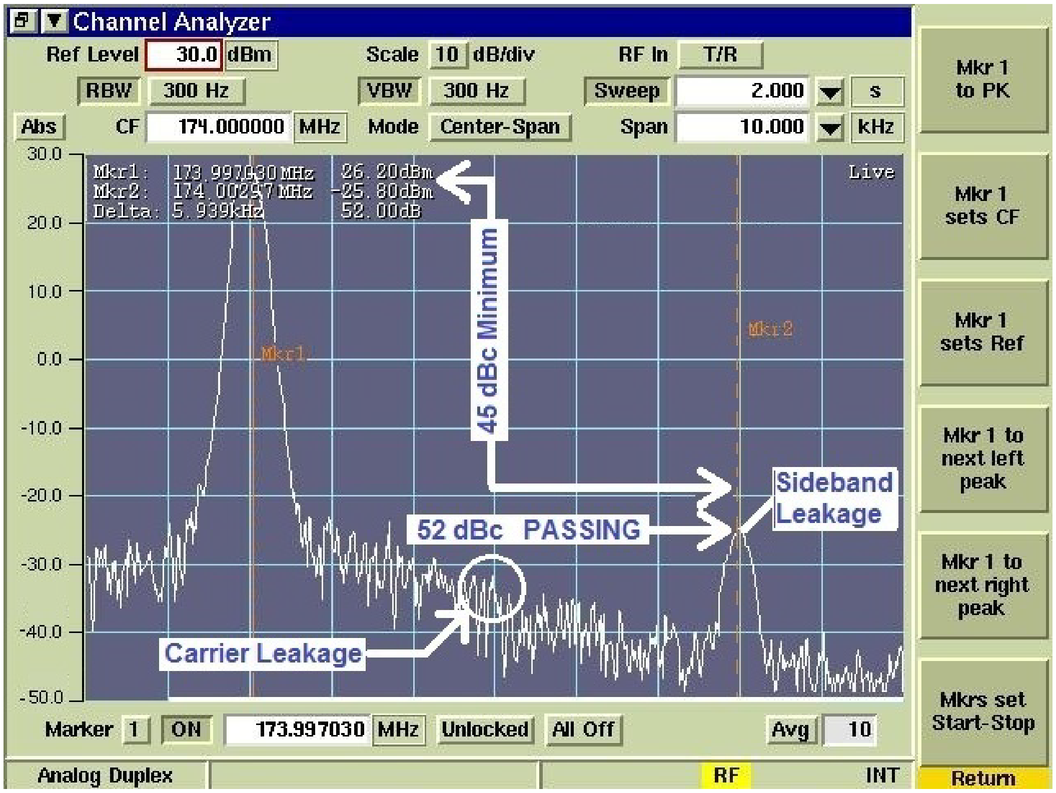
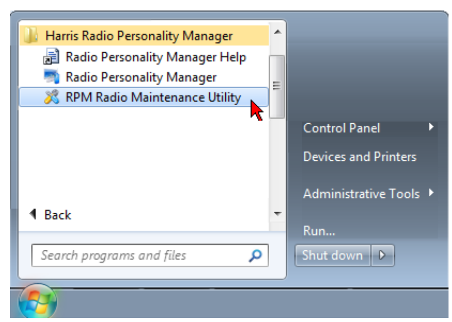


Figure 11-6: I and Q Alignment using FCC Menu SSB MODE

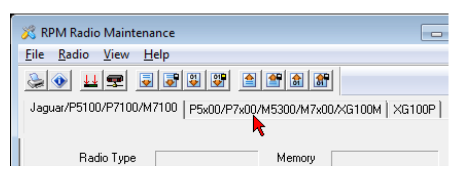
10. Connect the programming cable to the radio as described in Section 11.3.1.

11. From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**

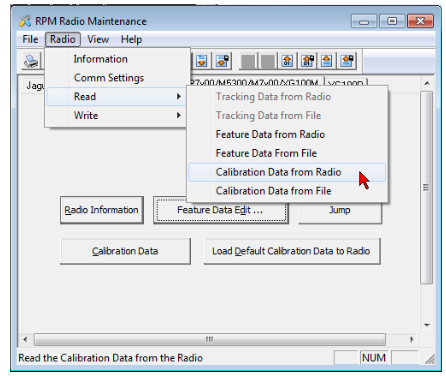


12. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**



13. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

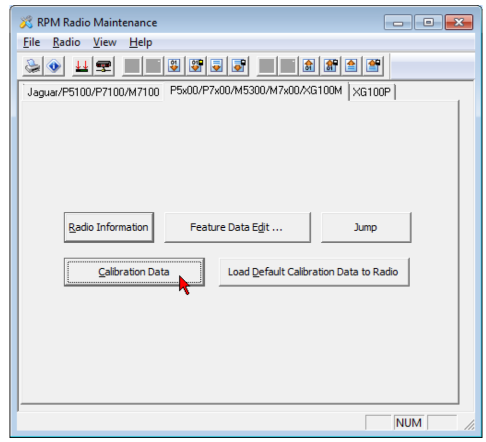


14. When the Calibration Data complete dialog box appears:

    Click: **[OK]**

15. Within the center window pane:

    Select: **[Calibration Data]**



NOTE

Adjusting I and Q values is an iterative (manual) process. The values interact and alignment can be a time consuming process. Start with adjusting the "I" DC Offset up or down and retesting the channel. If an improvement in carrier and sideband suppression is noted, continue updating the value until the improvement ends.

When starting out, it may be helpful to update the values in steps of 10 and note the changes to the RF signal. Once several stepped updates seem to pass by a null, go back and update the values in steps of 1 or 2 units until the best (or a passing) result is achieved.

Continue alignment by systematically adjusting, Q Offset, I Amplitude, Q Amplitude, I Vector, and Q Vector until the best (or a passing) result is achieved. Adjust only one value at a time.

16. Adjust the data points, one at a time. for each channel (as necessary) in the following order, making sure to retest each change before moving onto the next field:

    "I" DC Offset

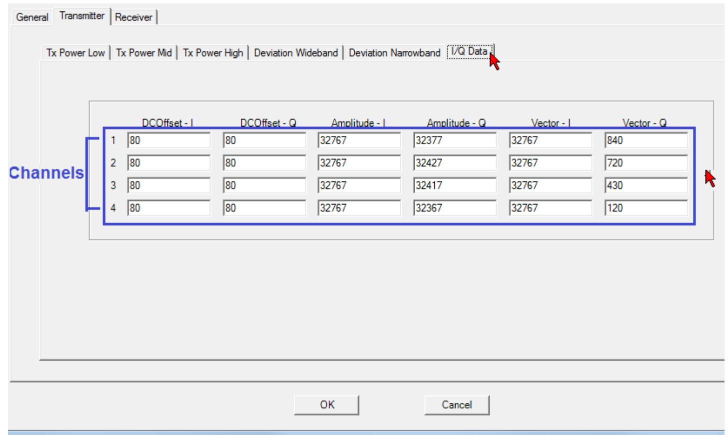
    "Q" DC Offset

    "I" Amplitude

    "Q" Amplitude

    "I" Vector

    "Q" Vector

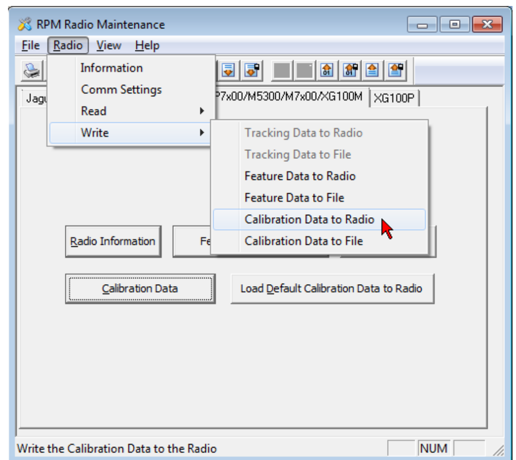


17. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

18. When the Calibration Data Write Complete dialog box appears:

19. Click: **[OK]**



20. Cycle power to the radio or click the **JUMP** button to reset the radio after programming.
21. Return to Step 4; repeat the test and alignment procedure until all channels are correctly aligned.
22. Save the final Calibration Data to a local file.
23. If no other testing is to be performed, do the following:
    a. If a "shop" test personality was used to test the radio, reload the original personality into the radio and verify operation.
    b. If conventional test frequency sets were added to the original personality, refer to Section 11.4.2, remove the test sets, and verify radio operation.

11.5.6 FM Deviation Test and Alignment

Compensation factors are used to maintain consistent modulation characteristics across the radio's bandsplit. These factors are applied at 20 different frequencies across the radio's entire operating range.

Additional input fields for compensating Transmit Channel Guard (TCG) deviation, Data Deviation, and Digital Channel Guard (DCG) modes of operation are aligned in a later section of this manual. The wideband and narrowband analog deviation factors used across the 20 frequencies must first be adjusted. The 6 TCG frequencies followed by the Scalar values are aligned in a later section. Any other order may result in a misaligned radio.

NOTE

There are 2 tabs for entering deviation alignment data, "Deviation Wideband" and "Deviation Narrowband." The 20 alignment frequencies are spread across entire VHF band.

CAUTION

Follow the steps in this verification and alignment procedure in the order which they appear. Certain values rely on others to be done first. Align the deviation and scalar fields in this order:

- 20 Wideband Deviation values (Deviation Wideband tab)
- 20 Narrowband Deviation values (Deviation Narrowband tab)
- 6 Wideband TCG Deviation values (Deviation Wideband tab; relies on the 20 wideband values)
- 6 TCG Deviation values (Deviation Wideband tab; relies on the 20 narrowband values)
- DCG Scalar (relies on the 20 wideband values)
- Data Deviation Scalar (Deviation Wideband tab; relies on the 20 wideband values)
- C4FM Scalar (Deviation Wideband tab; relies on the 20 wideband values)
- Data Deviation Scalar (4800 Baud) (Deviation Narrowband tab; relies on the 20 narrowband values)
- Data Deviation Scalar (9600 Baud) (Deviation Narrowband tab; relies on the 20 narrowband values)

Perform the following to verify and align XG-75 FM deviation settings:

1. Prepare the radio by adding the conventional test systems to the radio personality (refer to Section 11.4).
2. Setup the radio for RF testing per instructions in Section 11.5.2.
3. Connect the Aeroflex 3920 to the radio as shown in Figure 11-3.
4. Set the Aeroflex 3920 Function Generator to generate a 1 kHz sine wave output at 110 mV.
5. Power up the radio and do the following:
   a. To align wideband analog voice deviation, select test channel set: **XG75V LP**
   b. Refer to frequency list in Table 11-4 and select Channel 20 (174.0000 MHz) or the next lower test frequency.
   c. Set the AeroFlex 3920 to monitor FM deviation on the same frequency.
6. Using the PTT switch on the MATQ-03234 test box, key radio on low power and wait for the signal to stabilize (typically 1-2 seconds).
7. Record the measured analog deviation and unkey the radio.
8. Return to Step 5 and repeat the test until FM deviation is tested on all 20 test channels.
9. The maximum Voice Deviation level (no CG or DCG) for the channels being tested should be within the limits specified in Table 11-8. If any channel is out of specification, proceed to Step 11 and realign the channel(s). Otherwise, proceed to Step 29 to save any updated data.
10. If all wideband analog voice deviation levels are within specification, do the following:

a. To align narrowband analog voice operation, select test channel set: **XG75V NB**

b. Return to Step 5.b and test the narrowband deviation settings for all 20 channels.

Table 11-8: Maximum Analog Voice Deviation Levels

MODE	VOICE DEVIATION (NO CG OR DCG)
Narrowband Analog Voice	2.25 kHz ±100 Hz
Wideband Analog Voice	4.3 kHz ±200 Hz

11. If any channel requires realignment, turn the radio OFF.

CAUTION

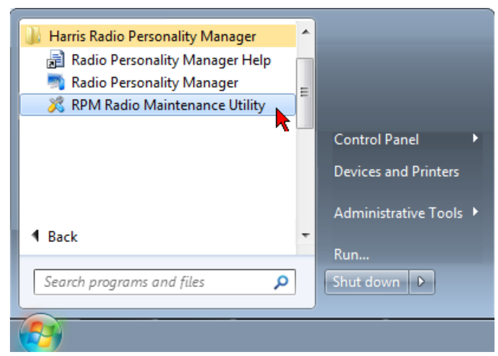
It is the responsibility of anyone entering new tracking data to assure that the radio performs within the legal and operational limits governing the service area. If at any time during the deviation tests the measured deviation is not as expected and resembles the deviation for another mode, check the radio personality settings from RPM first, before attempting realignment.

12. Disconnect the test box and connect the programming cable to the radio as described in Section 11.3.1.

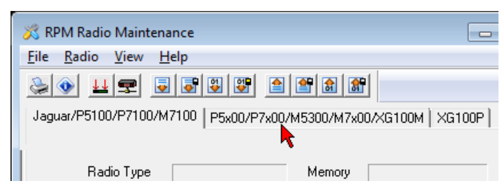
13. Turn the radio ON.

14. From the PC, open the Radio Maintenance Utility tool:

Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



15. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

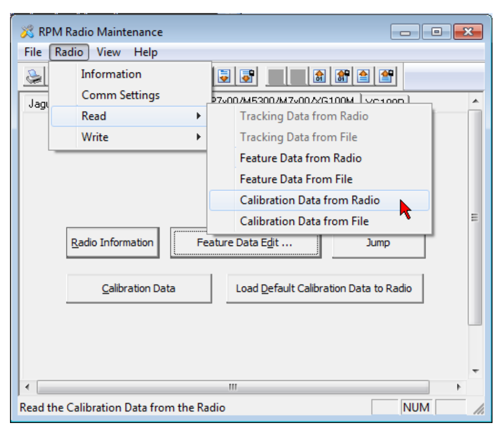


16. From Radio Maintenance Utility tool's top menu bar:

Select: **Radio > Read > Calibration Data from Radio**

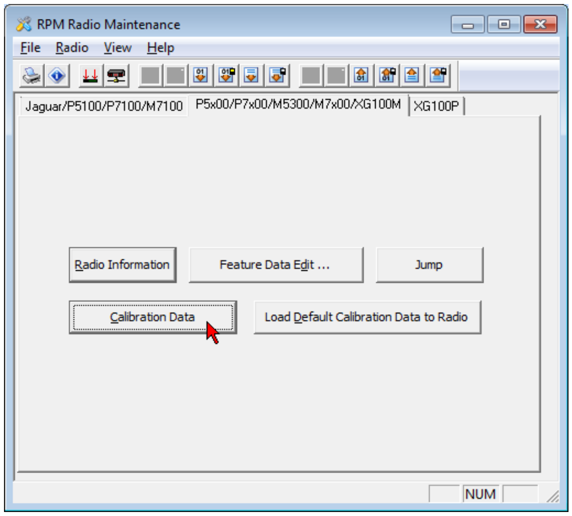
17. When the Calibration Data complete dialog box appears:

Click: **[OK]**



18. Within the center window pane:

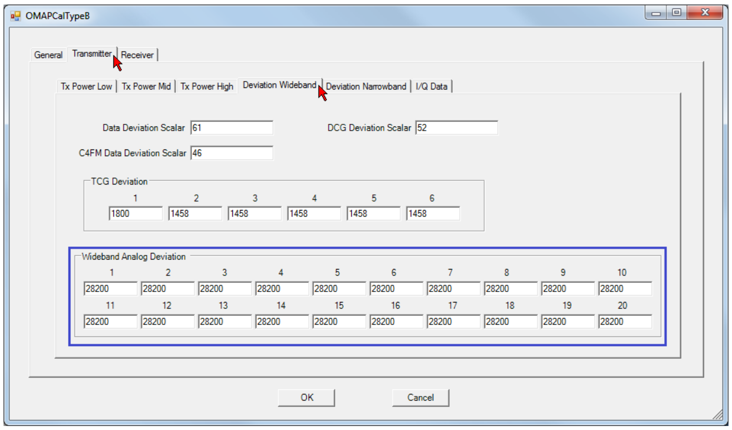
    Select: **[Calibration Data]**



19. If performing narrowband channel alignment, skip to Step 23.
20. For wideband channel alignment:

    Select: **Deviation Wideband**

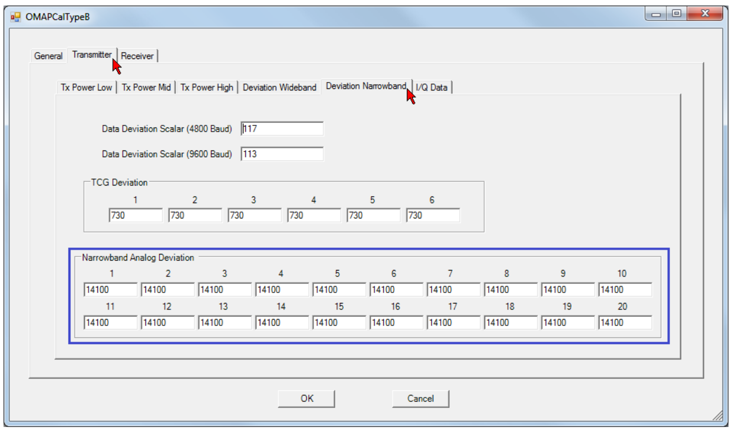
21. Refer to Step 7 and adjust the Wideband Analog Deviation values for the channels requiring alignment. (Increasing the values increases deviation.)
22. Skip to Step 25.



23. For narrowband channel alignment:

    Select: **Deviation Narrowband**

24. Refer to Step 7 and adjust the Narrowband Analog Deviation values for the channels requiring alignment. (Increasing the values increases deviation.)

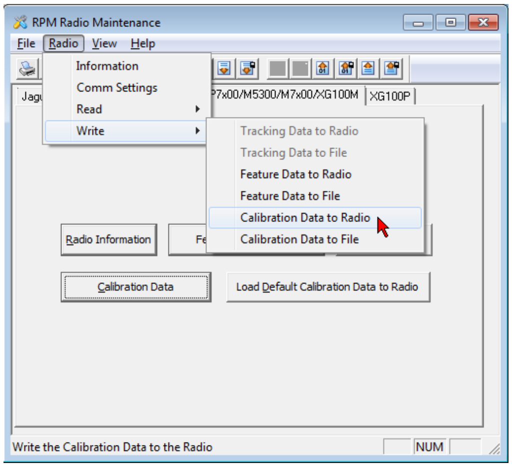


25. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

26. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



27. Turn the radio OFF.
28. Return to Step 5; repeat the test and alignment procedure until the Deviation Wideband and Deviation Narrowband fields are correctly aligned.
29. If no other testing is to be performed, do the following:
    a. Save the final Calibration Data to a local file.
    b. If a “shop” test personality was used to test the radio, reload the original personality into the radio and verify operation.
    c. If test systems were added to the original personality, refer to Section 11.4.2, remove the systems, and verify radio operation.

11.5.7 Channel Guard Deviation and DCG Scalar Test and Alignment

The 6 (six) TCG Deviation set points and the DCG Scalar on the Deviation Wideband tab, and the 6 (six) TCG Deviation set points Deviation Narrowband tab are used to align Tone and Digital Channel Guard operation.

CAUTION

> Follow the steps in this verification and alignment procedure in the order which they appear. Always verify and align the Wideband Analog Deviation values on the Deviation Wideband tab (refer to Section 11.5.6) before aligning any scalar values. Failure to do so may result in a misaligned radio.

Perform the following to verify and align Channel Guard deviation:

1. Prepare the radio by adding the test systems to the radio personality (refer to Section 11.4).
2. Setup the radio for RF testing per instructions in Section 11.5.2. Verify the Function Generator is set to *Off* (alternately, do not connect the Function Generator to the test set for this series of testing).
3. Setup the AeroFlex 3920 to monitor FM deviation starting with the highest frequency programmed for CG operation (refer to frequency list in Table 11-6, channel 6 is 941.0000 MHz and includes a CG tone of 67.0 Hz). As the process is repeated for the remaining test channels, continue down in frequency until all channels with a CG tone have been tested.
4. Power up the radio and do the following:
    a. To align wideband TCG deviation, select test channel set: **XG75VCGW**

b. Select Channel 6 (174.0000 MHz) or the next lower test channel (refer to Table 11-6).

c. Setup the AeroFlex 3920 to monitor the same frequency with the analyzer filter set to **20-300 Hz**.

5. Using the PTT switch on the MATQ-03234 test box, key radio on low power and wait for the signal to stabilize (typically 1-2 seconds).
6. Record the measured deviation and unkey the radio.
7. Repeat Steps 4 through 6; measure and record the CG deviation for all 6 channels programmed with transmit CG tone 67.0 Hz.
8. If CG deviation for any channel is not within the limits shown in Table 11-10, proceed to Step 14 and align the settings.
9. After all wideband TCG deviation levels are aligned, do the following:

   a. Test and align the narrowband TCG deviation levels; select test channel set: **XG75VCGN**

   b. Return to Step 4.b; test and align the narrowband TCG deviation levels.

NOTE

The DCG Deviation Scalar is a compensation value applied to all channel's TCG Deviation settings. DO NOT adjust DCG Deviation Scalar settings until all TCG Deviation settings are properly aligned.

10. After all wideband TCG deviation levels are aligned, do the following:

    a. Test and align DCG deviation level; select test channel set: **XG75VCGW**

    b. Select Channel 7 (174.0000 MHz with DCG tone 627).

    c. Setup the AeroFlex 3920 to monitor the same frequency with the analyzer filter set to **NONE**.

11. Using the PTT switch on the MATQ-03234 test box, key radio on low power and wait for the signal to stabilize (typically 1-2 seconds).
12. If DCG deviation for channel 7 is not within the limits shown in Table 11-10, proceed to Step 14 and align the DCG Scalar.
13. When all CG/DCG deviation measurements are within tolerance, proceed to Step 35 to save any updated data.

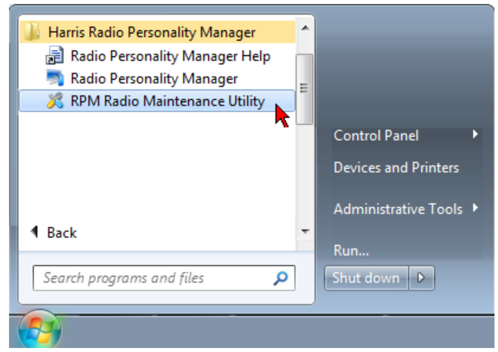
Table 11-9: Maximum CG Deviation Levels

MODE	CG/DCG DEVIATION
Wideband TCG	750 Hz ±50 Hz
Narrowband TCG	400 Hz ±50 Hz
Wideband DCG	600 Hz ±50 Hz

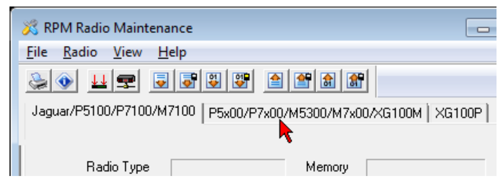
14. Turn the radio OFF.
15. Disconnect the test box and connect the programming cable to the radio as described in Section 11.3.1.

16. Turn the radio ON.
17. From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



18. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

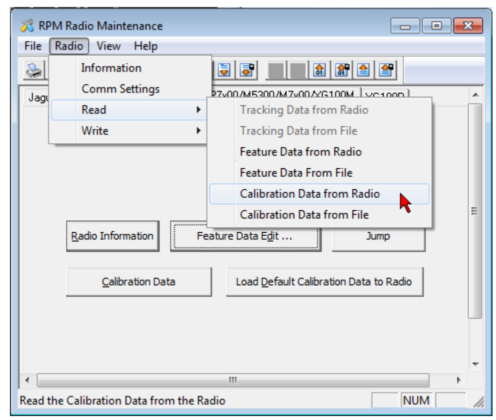


19. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

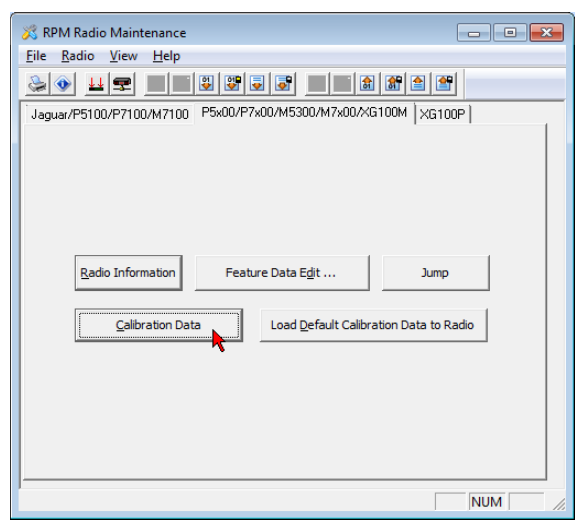
20. When the Calibration Data complete dialog box appears:

    Click: **[OK]**



21. Within the center window pane:

    Select: **[Calibration Data]**



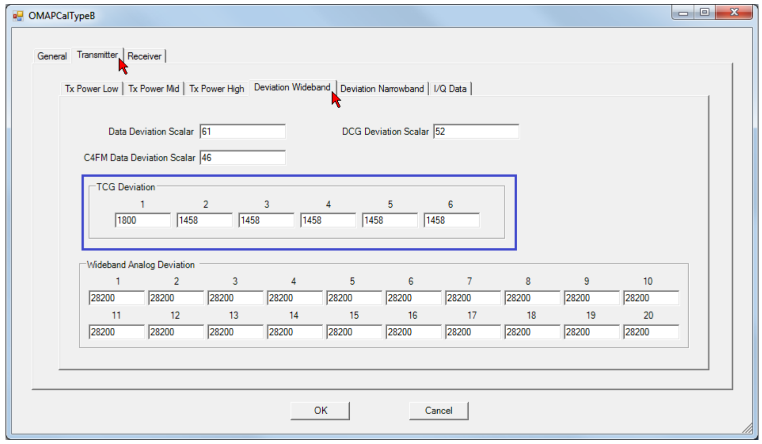
22. If aligning narrowband TCG, skip to Step 26.

23. If aligning DCG Deviation Scalar, skip to Step 28.

24. Otherwise, select the **Deviation Wideband** tab.

    Refer to Step 6 and adjust the wideband TCG Deviation values as necessary. Increasing the values increases TCG deviation.

    Click: **[OK]**



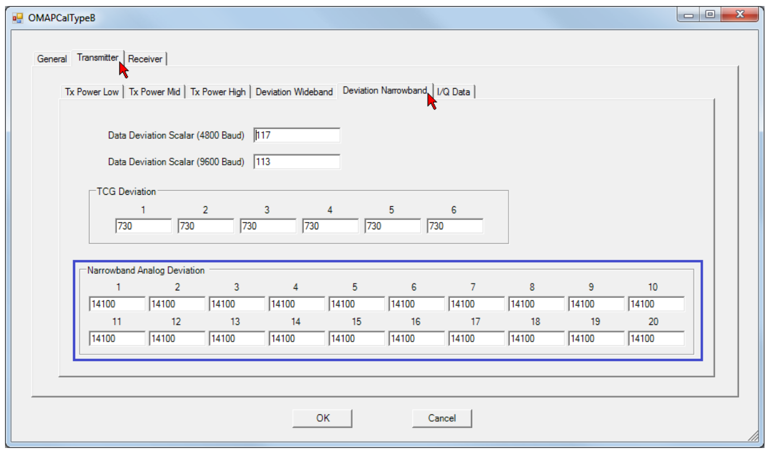
25. Skip to Step 31.

26. Select the **Deviation Narrowband** tab.

    Refer to Step 6 and adjust the narrowband TCG Deviation values as necessary. Increasing the TCG Deviation values increases deviation.

    Click: **[OK]**

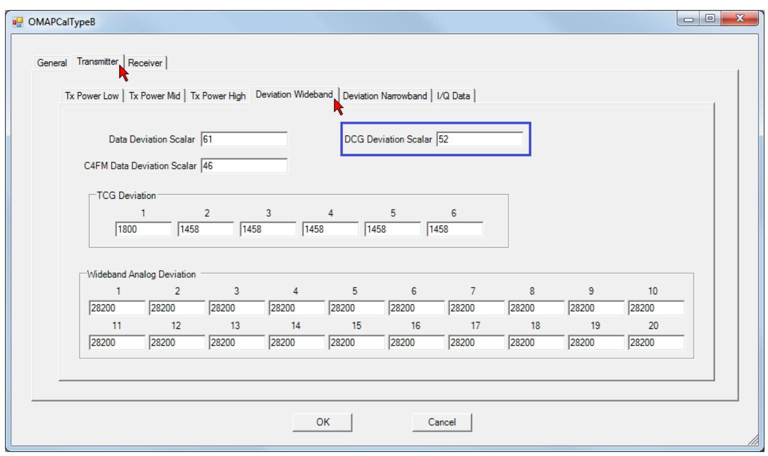
27. Skip to Step 31.



28. Select the **Deviation Narrowband** tab.

29. Refer to Step 6 and adjust the narrowband TCG Deviation values as necessary. Increasing the TCG Deviation values increases deviation.

30. Click: **[OK]**

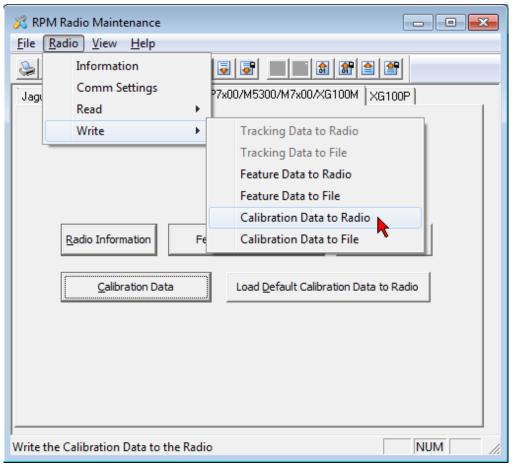


31. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

32. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



33. Turn the radio OFF.
34. Return to Step 4; repeat the test and alignment procedure until all wideband and narrowband CG deviation setting are correctly aligned.
35. Save the final Calibration Data to a local file.
36. If no other testing is to be performed, do the following:
    a. If a “shop” test personality was used to test the radio, reload the original personality into the radio and verify operation.
    b. If test systems were added to the original personality, refer to Section 11.4.2, remove the systems, and verify radio operation.

11.5.8 Data and C4FM Deviation Scalars Test and Alignment

The Deviation Wideband and Deviation Narrowband tabs include scalars for Wideband Data, C4FM, Narrowband 4800 Baud, and Narrowband 9600 Baud data. Alignment of these parameters require the use of the "FCC Menu" function of the radio personality (refer to Section 11.4.1, Step 7). While it is possible to perform scalar alignment on any test frequency, it is normally performed on the highest test frequency.

CAUTION

Follow the steps in this verification and alignment procedure in the order which they appear. Always verify and align the Wideband Analog Deviation values on the Deviation Wideband tab (refer to Section 11.5.6) before aligning any scalar values. Failure to do so may result in a misaligned radio.

NOTE

The FCC Menu selections automatically set the proper bandwidth, regardless of the selected system's bandwidth. The selected system is only used to define the TX or RX frequency of operation. However; observe the caution above, the Wideband Analog Deviation values must be aligned before aligning any scalar values.

Perform the following to verify and align the data deviation scalars:

1. Prepare the radio by adding the test systems to the radio personality (refer to Section 11.4).
2. Setup the radio for RF testing per instructions in Section 11.5.2.
3. Connect the Aeroflex 3920 to the radio as shown in Figure 11-3. Verify the Function Generator is set to *Off* (alternately, do not connect to generator to the test set for this series of testing).
4. Setup the AeroFlex 3920 to monitor FM deviation.
5. Power up the radio and do the following:
   a. Select the conventional low power test channel set: **XG75V LP**
   b. Select Channel 20 (174.0000 MHz).
   c. Press the **M** and use the **Up / Down** arrows to select "**FCC MENU**."
   d. Press the **M** to enter the FCC Menu.

NOTE

There is no need to exit and re-enter the FCC Menu between tests. From the FCC Menu, the **Up / Down** arrows may be used to select the next test in succession to minimize test time. If at any time the FCC Menu is inadvertently exited, repeat Steps 5.c and 5.d to continue testing.

6. To test and align the Wideband data Deviation Scalar, do the following:
   a. Use the **Up / Down** arrows to select "**TX 9600W**."
   b. Press **M** again to key the radio.
   c. Measure and record the 9600 Baud wideband TX data deviation. This measurement is related to the Wideband tab's Data Deviation Scalar value.
   d. Press **M** again to unkey the radio.
7. To test and align the C4FM Deviation Scalar, do the following:
   a. Select the conventional low power test channel set: **XG75V LP**

b. Use the **Up / Down** arrows to select "**P25 HIGH**."

c. Press **M** again to key the radio.

d. Measure and record the P25 HIGH deviation. This measurement is related to the Wideband tab's C4FM Deviation Scalar value.

e. Press **M** again to unkey the radio.

8. To measure the Narrowband 9600 Baud TX Data deviation, do the following:

a. Select the conventional low power test channel set: **XG75V LP**

b. Use the **Up / Down** arrows to select "**TX 4800N**."

c. Press **M** again to key the radio.

d. Measure and record the 4800 Baud TX Data deviation. This measurement is related to the Narrowband tab's 4800 Baud TX Data Deviation Scalar value.

e. Press **M** again to unkey the radio.

9. To measure the Narrowband 4800 Baud TX Data deviation, do the following:

a. Select the conventional low power test channel set: **XG75V LP**

b. Use the **Up / Down** arrows to select "**TX 9600N**."

c. Press **M** again to key the radio.

d. Measure and record the 4800 Baud TX Data deviation. This measurement is related to the Narrowband tab's 4800 Baud TX Data Deviation Scalar value.

e. Press **M** again to unkey the radio.

10. Compare the measurements made in Steps 6 and 8 to the levels shown in Table 11-10. If either scalar is out of specification, proceed to Step 11 and realign the scalar(s). Otherwise, proceed to Step 35 to save any updated data.

Table 11-10: Scalar Deviation Level Settings

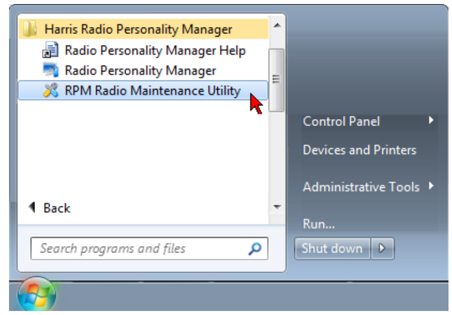
SCALAR	FCC MENU TEST FUNCTION	DEVIATION
Wideband 9600 Baud	TX 9600W	4.5 kHz ±50 Hz
C4FM	P25 HIGH	2.826 kHz ±25 Hz
Narrowband 4800 Baud	TX 4800N	1.65 kHz ±25 Hz
Narrowband 9600 Baud	TX 9600N	2.8 kHz ±25 Hz

11. Turn the radio OFF.

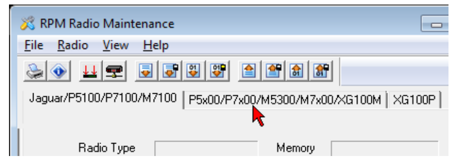
12. Disconnect the test box and connect the programming cable to the radio as described in Section 11.3.1.

13. Turn the radio ON.
14. From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



15. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

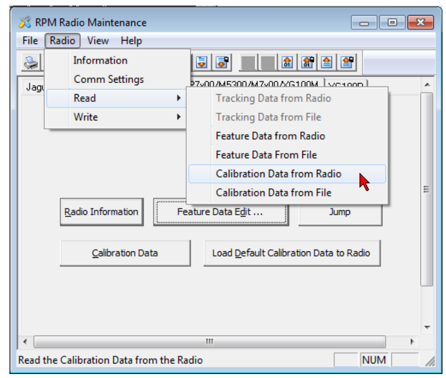


16. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

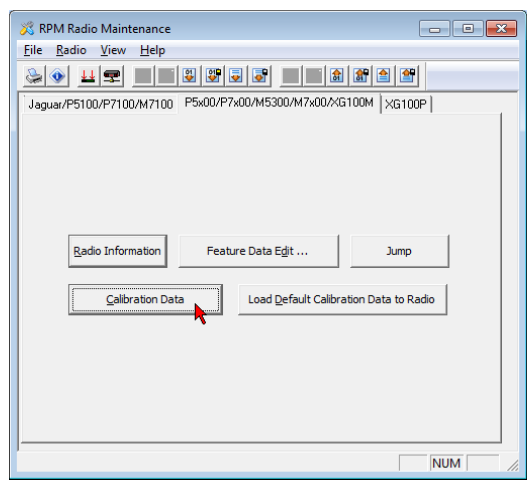
17. When the Calibration Data complete dialog box appears:

    Click: **[OK]**



18. Within the center window pane:

    Select: **[Calibration Data]**



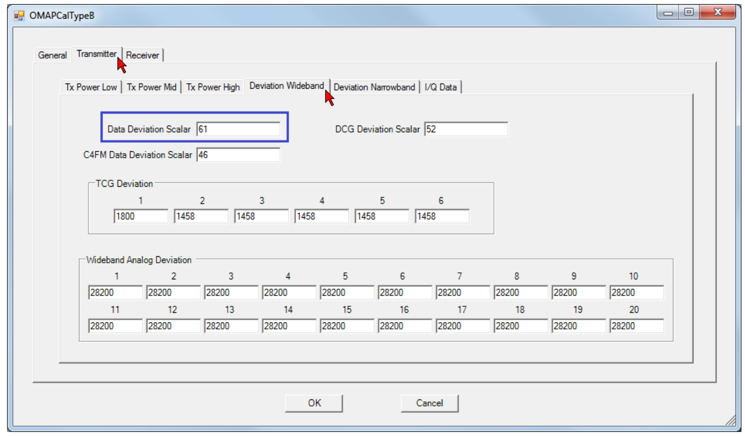
19. To align the Data Deviation Scalar:

    Select: **Transmitter** tab

    Select: **Deviation Wideband** tab

    Align the Data Deviation Scalar as necessary to meet the required deviation shown in Table 11-10. (Increasing the value increases associated deviation.)

    Click: **[OK]**



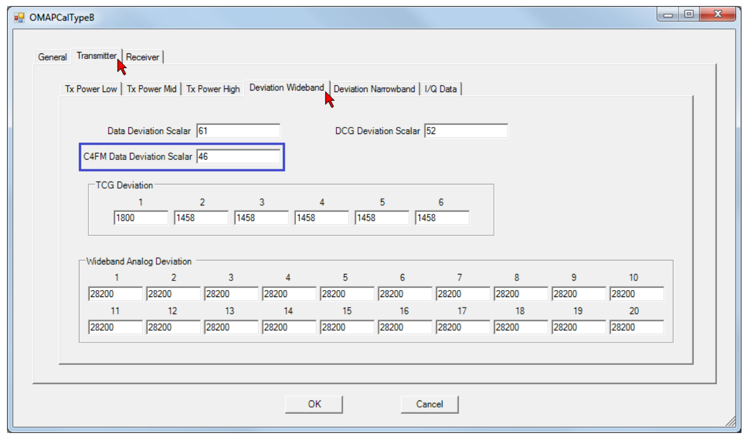
20. To align the C4FM Data Deviation Scalar:

    Select: **Transmitter** tab

    Select: **Deviation Wideband** tab

    Align the C4FM Data Deviation Scalar as necessary to meet the required deviation shown in Table 11-10. (Increasing the value increases associated deviation.)

    Click: **[OK]**



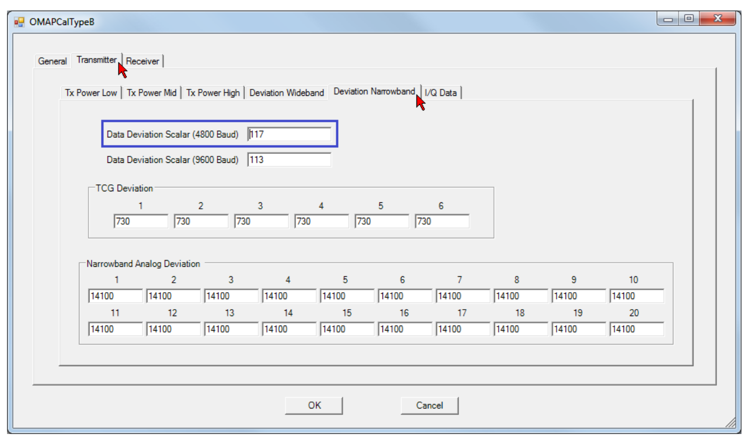
21. To align the Data Deviation Scalar (4800 Baud):

    Select: **Transmitter** tab

    Select: **Deviation Narrowband** tab

    Align the Data Deviation Scalar (4800 Baud) as necessary to meet the required deviation shown in Table 11-10. (Increasing the value increases associated deviation.)

    Click: **[OK]**



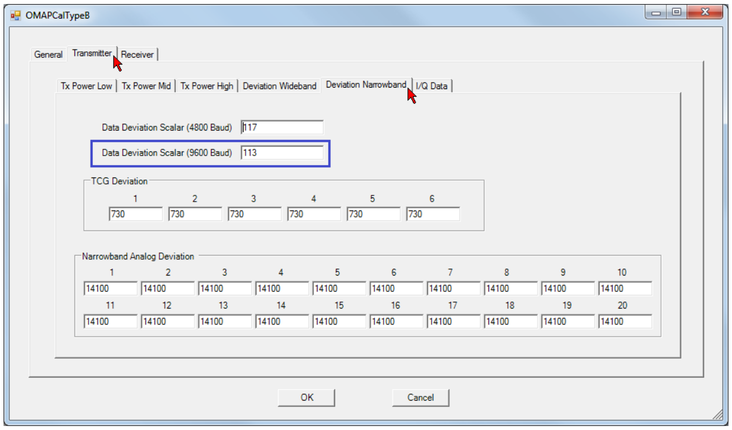
22. To align the Data Deviation Scalar (9600 Baud):

    Select: **Transmitter** tab

    Select: **Deviation Narrowband** tab

    Align the Data Deviation Scalar (9600 Baud) as necessary to meet the required deviation shown in Table 11-10. (Increasing the value increases associated deviation.)

    Click: **[OK]**

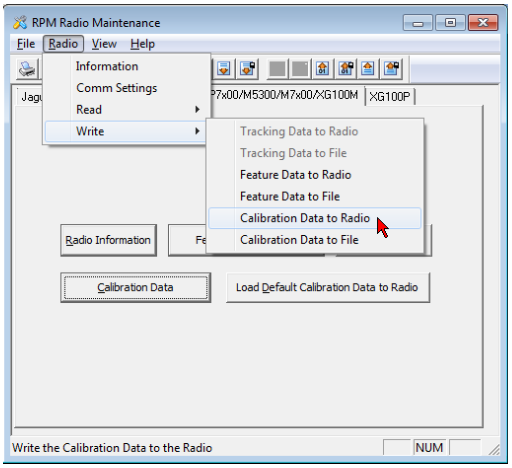


23. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

24. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



25. Turn the radio OFF.
26. Return to Step 5; repeat the test and alignment procedure until all deviation scalars are correctly aligned.
27. Save the final Calibration Data to a local file.
28. If no other testing is to be performed, do the following:
    a. If a "shop" test personality was used to test the radio, reload the original personality into the radio and verify operation.
    b. If test systems were added to the original personality, refer to Section 11.4.2, remove the systems, and verify radio operation.

11.5.9 TX Audio Sensitivity and Distortion

This is a verification-only test and does not require the Utility or any alignment to complete.

1. Prepare the radio by adding the conventional test systems to the radio personality (refer to Section 11.4).
2. Setup the radio for RF testing per instructions in Section 11.5.2.
3. Connect the Aeroflex 3920 to the radio as shown in Figure 11-2.
4. Set the Aeroflex 3920 Function Generator to generate a 1 kHz sine wave output at 10 mV.

5. Power up the radio and do the following:
   a. To test the Audio Sensitivity, select test channel set: **P55V LP**
   b. Refer to frequency list in Table 11-4 and select Channel 20 (174.0000 MHz).
   c. Set the AeroFlex 3920 to monitor FM TX Audio Distortion on the same frequency.
6. Using the PTT switch on the MATQ-03234 test box, key radio on low power and wait for the signal to stabilize (typically 1-2 seconds).
7. Adjust the 1 kHz audio level until the deviation of the transmitter is 60% of systems deviation (refer to Table 11-8) or approximately 3 kHz for a wide band channel. The 1 kHz level should be less than 14 mV.
8. Verify the transmitter audio distortion is less than 3%.

11.5.10 RSSI Test and Alignment

The Receiver tab includes input fields for aligning the RSSI signal strength detection. Alignment is based on weak, medium, and strong input signal levels as measured at five (5) test frequencies spread across the radio's entire operating range.

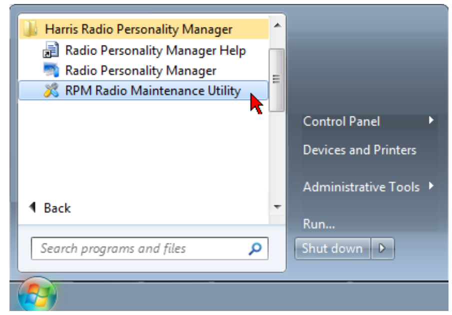
Perform the following to verify and align the receiver squelch values:

1. Prepare the radio by adding the test systems to the radio personality (refer to Section 11.4).
2. Connect the Aeroflex 3920 RF port to the radio antenna port.
3. Setup the AeroFlex 3920 to generate an FM carrier at -110 dBm output level on the same frequency that the radio is receiving (RF reference level for verifying "Weak" RSSI alignment values).
4. Power up the radio and do the following:
   a. Select the conventional test channel set: **XG75VSQW**
   b. Select Channel 5 (174.0000 MHz) or the next lower test channel. Refer to Table 11-7.
   c. Press **M** and use the **Up / Down** arrows to select "**FCC MENU**."
   d. Press **M** again. The radio display will alternately blink between the RX frequency and the RF input level in dBm.
5. Record the RSSI level displayed on the radio.
6. Change the RF Generator level to -90 dBm RF input (RF reference level for verifying "Medium" RSSI alignment values).
7. Record the RSSI level displayed on the radio.
8. Change the RF Generator level to -70 dBm RF input (RF reference for verifying "Strong" RSSI alignment values).
9. Record the RSSI level displayed on the radio.
10. Change the RF Generator frequency to the next frequency in Table 11-7 and repeat Steps 3 through 9 until all 5 receive channels have been tested for RSSI values.
11. If any RSSI level measured is more than ±1 dB from the actual RF input level from the generator, proceed to Step 12. Otherwise, proceed to Step 24 and save data.

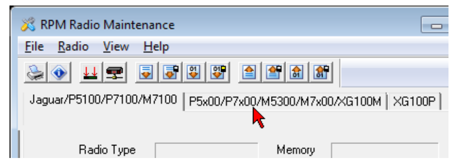
12. Connect the programming cable to the radio as described in Section 11.3.1.

13. Connect From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



14. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

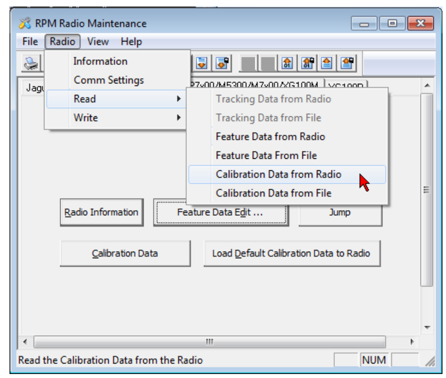


15. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

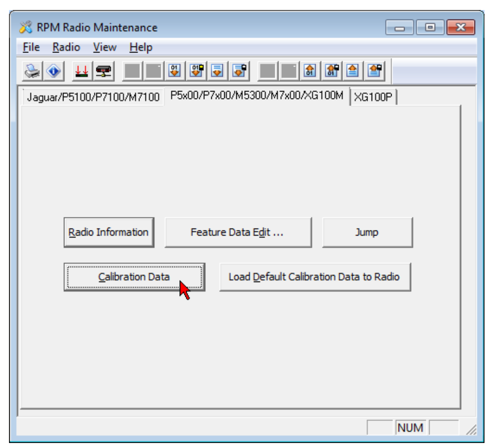
16. When the Calibration Data complete dialog box appears:

    Click: **[OK]**

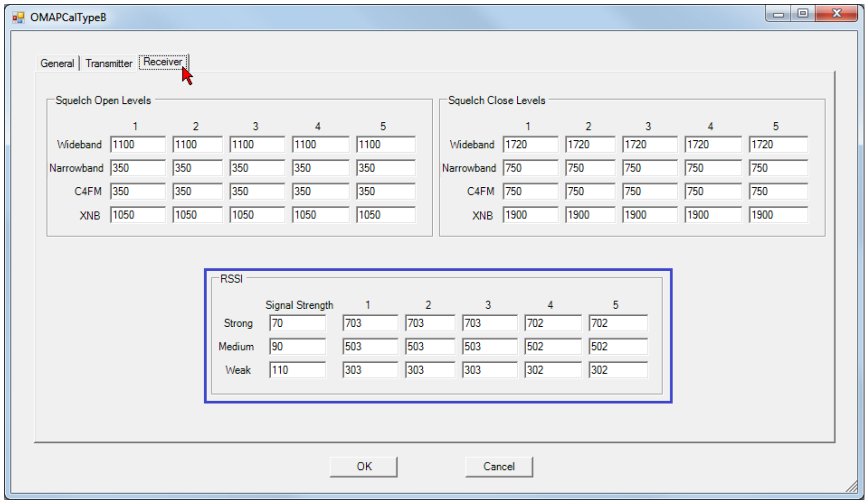


17. Within the center window pane:

    Select: **[Calibration Data]**



18. Select: **Receiver**



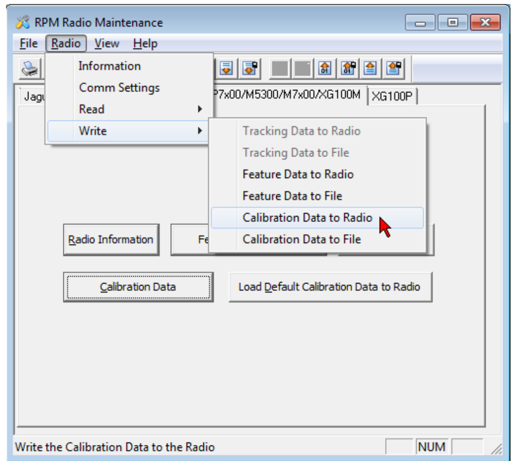
Refer to Step 11 and adjust the Strong, Medium, and Weak RSSI values as necessary.

The Signal Strength reference values in the first column should be 70, 90, and 110 (as shown to the right). If not, update the values and retest the radio before continuing alignment.

19. Click: **[OK]**

20. From the top menu bar:

Select: **Radio > Write > Calibration Data to Radio**



21. When the Calibration Data Write Complete dialog box appears:

22. Click: **[OK]**

23. Return to Step 3; repeat the test and alignment procedure until all RSSI values are correctly aligned.

24. Save the final Calibration Data to a local file.

25. If no other testing is to be performed, do the following:

    a. If a "shop" test personality was used to test the radio, reload the original personality into the radio and verify operation.

    b. If conventional test frequency sets were added to the original personality, refer to Section 11.4.2, remove the test sets, and verify radio operation.

11.5.11 Squelch Open and Close Level Test and Alignment

The Receiver tab within the Calibration Data includes Squelch Open and Squelch Close input fields. The levels entered into these input fields determine the received signal level required to unsquelch the receiver and allow audio to pass to the speaker. The higher the value, the weaker signal the RF signal required to unsquelch the radio.

The Squelch Open and Squelch Close values are set such that a stronger signal is required to open the squelch (Squelch Open Level) and doesn't close until the signal level weakens (Squelch Close Level). This process is called squelch hysteresis. Without hysteresis, the squelch's response to weak signals would result in broken up audio in the speaker.

Squelch alignment is based on the industry standard SIgnal, Noise, And Distortion (SINAD) ratio, a comparison of no signal (all noise) to the desired signal that is that is being received. A hysteresis value of 1.5 to 3.0 dB less in SINAD is considered optimal. Factory alignment sets the Squelch Open level for 8 dB +/- 2 dB SINAD to open the squelch.

NOTE

For the XG-75, the XNB Squelch Open and XNB Squelch Close input fields are not used. Leave these fields set to factory alignment (or default) values.

Perform the following to verify and align the Squelch Open and Squelch Close input fields:

1. Prepare the radio by adding the test systems to the radio personality (refer to Section 11.4).
2. Connect the Aeroflex 3920 to the radio as described in Section 11.5.2.
3. Set the AeroFlex 3920 to generate an on-channel FM carrier with a 1 kHz test tone set to the deviation level define in Table 11-11. Begin with the RF generator's output level set to minimum output.
4. Also prepare the Aeroflex 3920 to measure receiver SINAD via the radio test set.

NOTE

While it may be desirable to perform SINAD testing simply by listening to the audio heard from the speaker, it is highly recommended to setup the test equipment and let it make accurate and repeatable SINAD measurements.

5. Power up the radio and do the following:
   a. Verify Wideband Squelch alignment, select the conventional test channel set: **XG75VSQW**
   b. Select Channel 5 (174.0000 MHz) or the next lower test channel. Refer to Table 11-7.
6. Increase the RF generator level until the squelch opens. Record the SINAD measurement.
7. Slowly decrease the RF Generator level until the squelch closes. Record the SINAD measurement.
8. Change the RF generator level and record the SINAD level and FCC Menu's "SQ" value just before the squelch closes.
9. Return to Step to 5.b and repeat the process for each remaining test channel in the system.
10. Verify Narrowband Squelch alignment; select the conventional test channel set: **XG75VSQN**
11. Return to Step to 5.b and repeat the process for each test channel in the XG75VSQN system.
12. Verify C4FM analog Squelch alignment; select the conventional test channel set: **XG75V PC**

NOTE

While system XG75V PC operates in P25 Conventional mode, the radio is also operating in analog conventional mode at the same time. The C4FM squelch values are controlling the analog squelch operation, not a P25 (C4FM) squelch.

13. Return to Step to 5.b and repeat the process (using an analog RF generator signal) for each test channel in the XG75V PC system.
14. If any channel opened outside of 8 dB ±1 dB SINAD, or closed outside of 6 dB ±1 dB SINAD, then proceed to step 15 and realign the Squelch Open and Squelch Close values. Otherwise, proceed to Step 26 and save data.

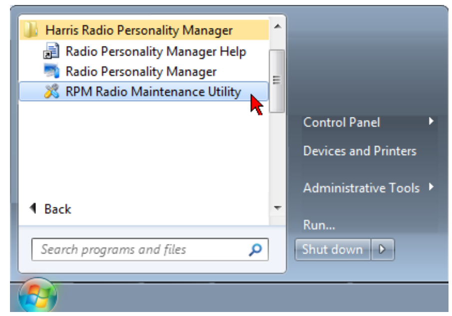
Table 11-11: FM Deviation Levels for Aligning Squelch

SELECTED TEST SYSTEM	MODE	1 kHz TONE DEVIATION (NO CG OR DCG)
XG75VSQW	Wideband (Analog Conventional)	2.7 kHz ±200 Hz
XG75VSQN	Narrowband (Analog Conventional)	1.35 kHz ±100 Hz
XG75V PC	C4FM (Also uses Analog Conventional)	1.35 kHz ±100 Hz

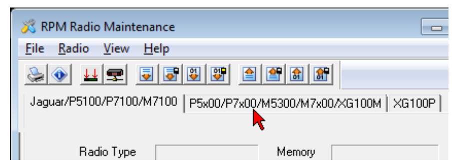
15. Connect the programming cable to the radio as described in Section 11.3.1.

16. Connect From the PC, open the Radio Maintenance Utility tool:

    Click: **Start > Programs > Harris Radio Personality Manager > Radio Maintenance Utility**



17. Within the center window pane, select the tab which includes the correct radio model. For XG-75, select the tab which includes: **P7x00**

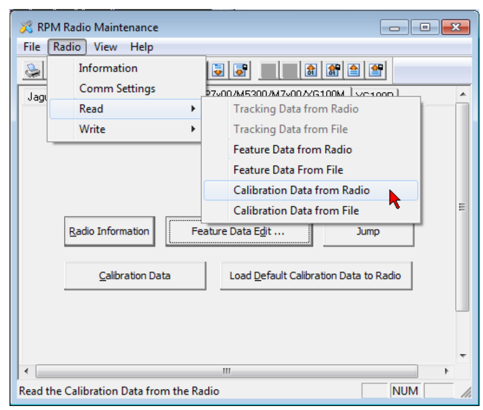


18. From Radio Maintenance Utility tool's top menu bar:

    Select: **Radio > Read > Calibration Data from Radio**

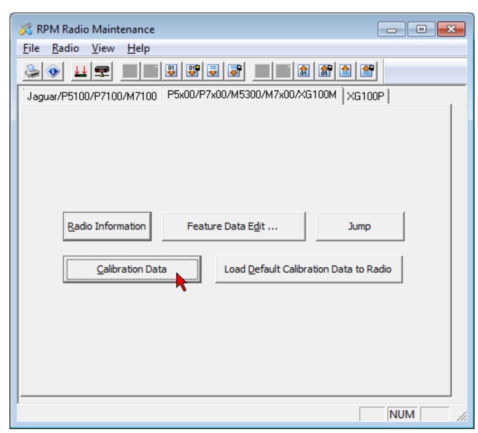
19. When the Calibration Data complete dialog box appears:

    Click: **[OK]**



20. Within the center window pane:

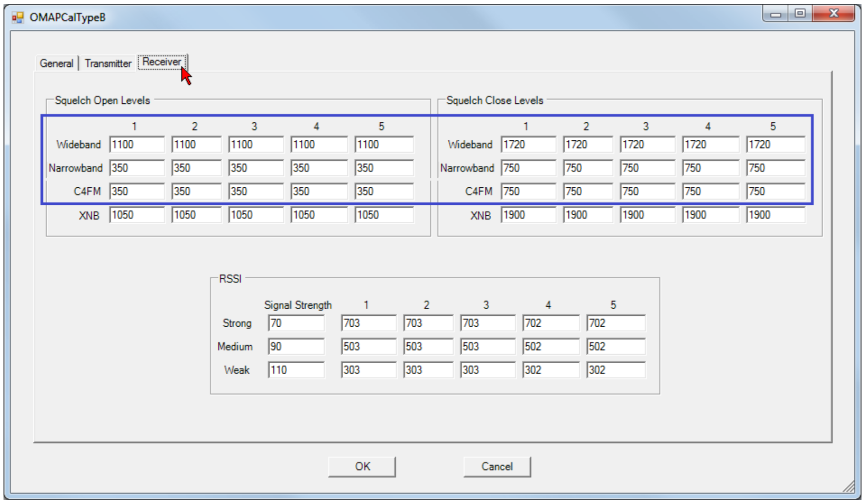
    Select: **[Calibration Data]**



21. Select: **Receiver**

    Adjust the values for any of the channels where the squelch did not open or close as expected. Decreasing the values tightens the squelch operation.

    The Squelch Open value should never be programmed with a value higher than the Squelch Close value. And, neither setting should be programmed with a value greater than the "SQ" value with no carrier present.



22. Click: **[OK]**

NOTE

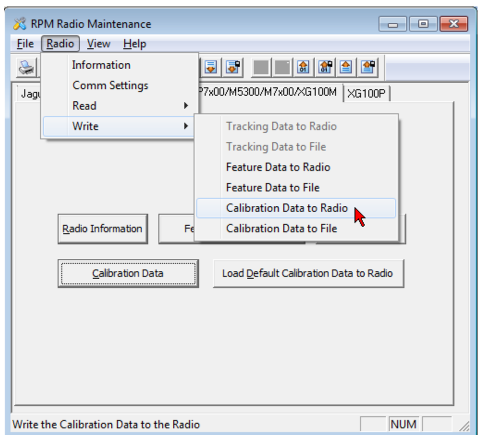
Refer to Section 11.5.11.1 for an alternate squelch alignment procedure. The alternate procedure may be much simpler and less time consuming, depending on the number of squelch values requiring adjustment.

23. From the top menu bar:

    Select: **Radio > Write > Calibration Data to Radio**

24. When the Calibration Data Write Complete dialog box appears:

    Click: **[OK]**



25. Return to Step 5.b; repeat the test and alignment procedure until all Squelch values are correctly aligned.
26. Save the final Calibration Data to a local file.
27. If no other testing is to be performed, do the following:
    a. If a "shop" test personality was used to test the radio, reload the original personality into the radio and verify operation.
    b. If conventional test frequency sets were added to the original personality, refer to Section 11.4.2, remove the test sets, and verify radio operation.

11.5.11.1 Alternate Squelch Alignment Procedure

While the FCC menu functionality is not supported as a field test tool, it is generally available to field service personnel. It may be advantageous to follow this alternate method for setting squelch:

1. Select the conventional test channel set: **XG75VSQW**
2. Begin with the RF generator's RF level set to ***Off***.
3. On the radio, press **M** button and use the **Up** or **Down** arrows to select "**FCC MENU**."
4. Press **M** again.
5. Using the **Up** or **Down** arrows, select: **SQ #####** The numbers will appear to be randomly changing between the 2000 to 4000 range.
6. This is the no-carrier "***SQ***" squelch reference value. The average of the randomly changing number represents the current "no-signal" received noise level being detected by the squelch's DAC circuit.
7. From the Utility, program the Squelch Open values 200 to 300 points lower than the no-carrier "***SQ***" value.
8. Program the Squelch Close values 100 to 200 points lower than the no-carrier "***SQ***" value. This functionally sets the radio's squelch to open with a very weak input signal.
9. Set the generator's RF level to ***On*** and slowly increase the RF level while monitoring the SINAD measurement. Record the average "***SQ***" value seen on the radio's display at 6 dB and 8 dB SINAD.
10. Repeat the above procedure until all channels are tested and "***SQ***" values are recorded for 6 dB and 8 dB SINAD.
11. Repeat the procedure for the other modes (systems): **XG75VSQN** and **XG75V PC**.
12. After recording the measured "***SQ***" values for each channel in all modes, reprogram the Squelch Open values with the corresponding 8 dB "***SQ***" reference values, and reprogram the Squelch Close values with the corresponding 6 dB "***SQ***" reference values.

Return to Step 5 of the main test procedure and retest each mode and channel using the new Open and Close values. The squelch should be opening around 8 dB SINAD and closing around 6 dB SINAD.

11.5.12 Additional Receiver Test

Speaker out is available at the UDC as a balanced output. The Test Box provides the 8 ohm load for the radio and a balanced to unbalanced output available as a BNC connection. Do not place an external load or speaker to this connection. It is intended for connections to test equipment of several kilo-ohm impedance or higher.

11.5.12.1 Receiver Audio Level and Distortion

1. Place the Device # switch on the test box to position 7.

CAUTION

Placing the Device # switch in position 12 while testing with the Test Box will double terminate the speaker amplifier circuit causing errors in receive audio measurement. Damage to the radio is unlikely, but one should not operate the receive audio amplifier in this condition longer than necessary to make quick measurements

2. Power on the radio, and select any channel of the analog test system.
3. Connect AC Voltmeter, distortion analyzer, SINAD meter and oscilloscope to the "Speaker Out" of the Test Box.

4. Apply a 1000 µV (-47 dBm) RF signal on channel to the radio antenna connector. The RF signal should be modulated with 1 kHz tone at 60% of system deviation or 3 kHz for wide band channel. This is a full quieting signal and should not have any noise.
5. Observe the oscilloscope and AC voltmeter and adjust the volume control to maximum. Audio will be greater than 2 volts and appear free from distortion.
6. Reduce the volume control to produce 2 Vrms or as close as possible.
7. Measure the distortion of the receiver audio. It should be less than 3%.

11.5.12.2 SINAD Measurement

1. Apply a -60 dBm RF signal on channel to the radio antenna connector. The RF signal should be modulated with 1 kHz tone at 60% of system deviation or 3 kHz for wide band channel. This is a full quieting signal and should not have any noise.
2. Decrease the RF level of the signal generator until reaching 12-dB SINAD. The RF level of the signal generator should be less than -119 dBm.
3. SINAD measurement should be repeated on all receive test frequencies across the receive band. Do not test other frequencies at this time.

11.5.12.3 Receiver IF Bandwidth - Signal Displacement Bandwidth Method

1. Apply a -60 dBm RF signal on channel to the radio antenna connector. The RF signal should be modulated with 1 kHz tone at 60% of system deviation or 3 kHz for wide band channel. This is a full quieting signal and should not have any noise.
2. Decrease the RF level of the signal generator until reaching 12-dB SINAD. The RF level of the signal generator should be less than -119 dBm.
3. Increase the RF level of the signal generator by 6 dB from the level in the SINAD test. This is the same as multiplying the output voltage of the signal generator by two.
4. Notice the SINAD meter is reading a higher number and the noise on the signal is less.
5. Increase the RF input signal frequency until the SINAD meter again displays 12 dB. Record the value of the RF frequency of the signal generator as FHI. ______________MHz
6. Decrease the RF input signal frequency below the assigned frequency until the SINAD meter again displays 12 dB. Record the value of the RF frequency as FLo. ______________MHz
7. Calculate the frequency differences by the following:
   - FDIFF1 = FHI - assigned frequency
   - FDIFF2 = assigned frequency - FLo
8. The smaller of FDIFF1 or FDIFF2 is the signal displacement bandwidth. This value should be between 2 and 7 kHz for a wide band channel.

NOTE

> The upper tolerances (7 kHz) are not specifications, but rather an observation that the radio will pass adjacent channel selectivity.

11.5.13 Channel Guard Decode

1. Turn power off on the radio.
2. Place the Device # switch on the test box to position 7.
3. Power the radio on and select any channel, 1 through 6, on system **P55VCGW**.
4. Set the signal generator for a1 kHz tone at 3 kHz deviation.
5. Set a second to for channel guard 67.0 Hz at 0.75 kHz deviation.
6. Set the generator RF level to –119 dBm. The receiver should unmute.
7. Remove the 67.0 Hz tone. The receiver should mute.
8. To test Digital Channel Guard decode, select channel 7.
9. Set the generator send a non-inverted Digital Channel Guard code of 627. The receiver should unmute.
10. Remove the digital code. The receiver should mute.

12. TROUBLESHOOTING

12.1 GENERAL

The objective of this section is to guide in quickly isolating a problem to either hardware or software. Software errors and problems can usually be corrected in the field. Hardware failures are difficult to isolate and sometimes very tedious to repair without specialized tools. Hardware repair to this radio is very limited at best and not recommended. Service Parts has set up a Repair and Return policy. Service Parts has also made provisions for Circuit Board and Module replacement, as required.

This section includes a General Troubleshooting Table and Test Point Diagram for checking nominal Transmit/Receive Levels (not recommended). Table 12-1 provides a list of possible problems and their possible cause.

Table 12-1: General Troubleshooting

SYMPTOM	POSSIBLE CAUSE/ACTION REQUIRED
Completely inoperative (no display or audio on power up)	Power Supply Problem? 1. Check battery voltage with a voltmeter. 2. Charge battery or replace battery. 3. Check to be sure battery contacts are not broke or bent. 4. Clean battery contacts.
At power-up an error message is displayed	1. See the Error Message Tables on the following pages for type of error and for a probable solution. 2. Attempt to reprogram the personality, Flash and DSP using RPM.
Receiver inoperative or weak	1. Channel Guard or Type 99 Enabled? 2. Defective antenna or antenna switch assembly - replace antenna or antenna switch assembly. 3. Main Board failure? Return to Harris for repair (recommended).
Transmitter inoperative or low power	1. Programmed incorrectly - check personality. 2. Weak battery - check voltage. 3. Defective antenna or antenna switch assembly - replace antenna or antenna switch assembly. 4. Main Board failure? Return to Harris for repair (recommended).
Transmitter and Receiver inoperative on some channels	1. Programmed incorrectly - check personality. 2. Check the flex circuit inside radio for damage. 3. Defective 16-Position Switch? Return to Harris for repair (recommended).

12.2 ERROR CODES

Table 12-2: Fatal System Error Codes

Number	Message	Error Messages
0	Hardware	less than 100, ROM errors
1	Software	
2	Tracking	RADC tracking data fatal error
3	No Lock	synthesizer became unlocked
4	Freqdata	RADC frequency data fatal error
5	Persdata	Personality errors
6	Network	Network errors, dual CU or radio
STARTUP ERRORS		
	RANGE: 0x00-0x0f	
FATAL_NMI_ERROR	(0x0001)	NMI occurred outside of sleep routine
FATAL_RAM_ERROR	(0x0002)	32k RAM test error
FATAL_ROM_CHKSUM	(0x0003)	not used
FATAL_FLSH_CHKSUM	(0x0004)	Flash checksum test error
FATAL_FLSH_UNKNOWN_TYPE	(0x0005)	Flash part is unknown
FATAL_IV_RANDOM	(0x0006)	FIPS random IV test error
FATAL_BYPASS	(0x0007)	FIPS bypass test error
FATAL_NO_VOICE_KEYS	(0x0008)	FIPS no voice keys error
FATAL_FLSH_WRITE	(0x0009)	Flash write error
	RANGE: 0x10-0x2f	
FATAL_TG_LOAD	(0x0010)	Timing Generator driver failed init
FATAL_DSP_LOAD	(0x0011)	DSP driver failed init
FATAL_ABBIE_LOAD	(0x0012)	Abbie driver failed init
FATAL_EE_LOAD	(0x0013)	EE driver failed init
FATAL_ICP_PORTINIT	(0x0014)	ICP digital Iinit failed
FATAL_INTOUT_LOAD	(0x0015)	INTOUT driver failed init
FATAL_INTIN_LOAD	(0x0016)	INTIN driver failed init
FATAL_RADIO_LOAD	(0x0017)	RADIO driver failed init
FATAL_MODEM_LOAD	(0x0018)	MODEM driver failed init
FATAL_EXTIO_LOAD	(0x0019)	EXTIO driver failed init
FATAL_SCI_LOAD	(0x0020)	SCI driver failed init
FATAL_ICP_CHKSUM	(0x0021)	ICP prom chksum
FATAL_I2C_INIT	(0x0022)	I2C driver initialize had problems
FATAL_I2C_MODE_CHG	(0x0023)	I2C driver mode change had problems
FATAL_I2C_WRITE_ERROR	(0x0024)	I2C driver write error
FATAL_UART_INIT	(0x0025)	UART driver init failed
FATAL_TIMER_CONFIG	(0x0026)	The timer init failed
ADI DRIVER FATAL ERROR CODES		
	RANGE: 0x30-0x37	
FATAL_ADI_NOACK	(0x0030)	ADI did not respond to command
FATAL_DSP_DES_TEST_FAIL	(0x0039)	FIPS DES self test failed to provide correct answer

LCD DRIVER FATAL ERROR CODES		
	RANGE: 0x40-0x48	
FATAL_LCD_NOACK	(0x0040)	LCD did not ack message
FATAL_LCD_HARD_FAIL	(0x0041)	LCD hardware is invalid
SCI DRIVER FATAL ERROR CODES		
	RANGE: 0x50-0x59	
FATAL_SCI_NOHEAP	(0x0050)	SCI out of heap space
CAN DRIVER FATAL ERROR CODES		
	RANGE: 0x60-0x69	
FATAL_CAN_SEM_INIT	(0x0060)	CAN server semaphore init failure
IPC DSP DRIVER FATAL ERROR CODES		
	RANGE: 0x70-0x79	
FATAL_IPC_NO_RESPONSE	(0x0070)	The DSP did not read a message within 500ms
FATAL_IPC_RESPONSE_OVERRUN	(0x0071)	The DSP gave a response longer than the buffer
FATAL_IPC_STREAM_BLOCKED	(0x0072)	The DSP did not read the stream data within 500ms
FATAL_IPC_STREAM_OVERRUN	(0x0073)	The ARM tried to write more data than the DSP could store
FATAL_DSP_DOWNLOAD_FAIL	(0x0074)	The ARM tried to write the DSP code and failed
FATAL_IPC_NO_ACK	(0x0075)	The ARM didn't get an ACK to a command to the DSP
RADIO DRIVER FATAL ERROR CODES		
	RANGE: 0x80-0x89	
FATAL_XCVR_PLL_PROG_ERROR	(0x0080)	The XCVR failed to program the PLL after N retrys due to uwire collision
FATAL_XCVR_MCU_PROG_ERROR	(0x0081)	The XCVR failed to program the MCU after N retrys
FATAL_XCVR_CAL_DATA_ERROR	(0x0082)	The XCVR failed to find the proper cal data for the radio
FATAL_XCVR_MCU_RX_ADC_ERROR	(0x0083)	The XCVR MCU failed to program the rx adc after N retries
BOOT LOADER DRIVER FATAL ERROR CODES		
	RANGE: 0x90-0x97	
FATAL_ROM_NOHEAP	(0x0090)	No malloc space for ROM task
FATAL_BL_NOHEAP	(0x0091)	No malloc space for BL task
FATAL_BL_SCI_ATTACH	(0x0092)	boot loader could not attach to SCI
MCBSP FATAL ERROR CODES		
FATAL_MCBSP_ERROR	(0x0093)	McBSP configuration error
RXSIF PRIMATIVE FATAL ERROR CODES		
FATAL_RXSIF	(0x0098)	RXSIF fatal

OPERATING SYSTEM FATAL ERROR CODES		
	RANGE: 0x100-0x199	
FATAL_UNEXPECTED_INT	(0x0100)	There was an interrupt that had no handler
FATAL_PREFETCH_ABORT	(0x0101)	Prefetch abort handler
FATAL_DATA_ABORT	(0x0102)	Data abort handler
FATAL_RESERVED_INT	(0x0103)	Reserved interrupt handler
FATAL_UNEXPECTED_INSTRUCTION	(0x0104)	Unexpected interrupt handler
FATAL_OS_BAD_INT_CONFIG	(0x0105)	The interrupt handler failed to set up the IRQ
FATAL_OS_FORK_FAIL	(0x0106)	The OS fork creation process failed
FATAL_OS_PIPE_FAIL	(0x0107)	The OS pipe creation process failed
FATAL_OS_TASK_FAIL	(0x0108)	The OS task creation process failed
FATAL_STACK_OVERFLOW	(0x0109)	A task stack has overflowed
FATAL_TIMER_TASK_ERROR	(0x0110)	The OS timer task creation failed
FATAL_NUCLEUS_ERROR	(0x0111)	The OS returned a fatal error
FATAL_FORK_STACK	(0x0112)	The OS fork stack overflowed
FATAL_PRIORITY_FORK_STACK	(0x0113)	The OS priority fork stack overflowed
FATAL_GPIO_CONFIG_ERROR	(0x0114)	The GPIO config was wrong - check radio config
FATAL_MPUIO_CONFIG_ERROR	(0x0115)	The MPUIO config was wrong - check radio config
FATAL_RADIO_CONFIG_ERROR	(0x0116)	Could not set radio type right using sector 0
FATAL_DOWNLOAD_ERROR	(0x0117)	Failure in the download system
FATAL_MEMORY_ALLOC_ERROR	(0x0118)	Memory allocation failed
FATAL_SEM_PEND_ERROR	(0x0119)	A semaphore pend operation went badly wrong
FATAL_SEM_POST_ERROR	(0x0120)	A semaphore post operation went badly wrong
FATAL_FORK_ERROR	(0x0121)	The OS fork stack had a Nucleus error
FATAL_PRIORITY_FORK_ERROR	(0x0122)	The OS priority fork stack had a Nucleus error

Table 12-3: Fatal Application Error Codes

RADC FATAL SYS ERROR CODES		
RADC_PITD_ERROR	(0x2200)	PERS tracking data error
RADC_PIHW_ERROR	(0x5201)	PERS hardware data error
RADC_FREQ_ERROR	(0x4202)	PERS frequency data error
RADC_PITD_MALLOC_ERROR	(0x1203)	PERS tracking data malloc error
RADC_PITD_CKSUM_ERROR	(0x1204)	PERS tracking data checksum error
RADC_HWREV_ERROR	(0x1205)	HW revision could not be determined
DACS FATAL SYS ERROR CODES		
DACS_NOLOCK_ERROR	(0x3300)	no lock message
DACS_MODEM_FATAL_ERROR	(0x1301)	Unable to correctly configure the modem for EDACS operation
DACS_RADC_FAILURE	(0x1302)	Prosound scan failed
DACS_TU_PUT_CISYSMSG_ERROR	(0x1303)	CISYS message buffer not enabled
DACS_TX_CHAN_RADC_FAILURE	(0x1304)	Failure in the Tx frequency load
DACS_RX_CHAN_RADC_FAILURE	(0x1305)	Failure in the Rx frequency load
DACS_TX_CC_HEADER_FAILURE	(0x1306)	Failure to transmit CC header data
DACS_RX_CC_FAILURE	(0x1307)	Failure to set up CC receiver
DACS_RX_WC_FAILURE	(0x1308)	Failure to set up WC receiver
DACS_RX_WC_LSD_FAILURE	(0x1309)	Failure to set up WC LSD receiver
DACS_RX_WC_HSD_LSD_FAILURE	(0x1310)	Failure to set up WC HSD receiver
DACS_TX_CCMSG_FAILURE	(0x1311)	Failure to transmit body of CC message
DACS_TX_IDLE_FAILURE	(0x1312)	Failure to idle transmitter
DACS_TX_WCMSG_FAILURE	(0x1313)	Failure to transmit body of WC message
DACS_SPEAKER_FAILURE	(0x1314)	Failure in radc_speaker
DACS_TX_WC_HSD_FAILURE	(0x1315)	Failure to transmit WC hsd
DACS_TX_WC_PATH_FAILURE	(0x1316)	Failure to select TX hardware path
DACS_TX_DTMF_FAILURE	(0x1317)	Failure to transmit DTMF digit
DACS_TX_LSD_FAILURE	(0x1318)	Failure to transmit LSD
DACS_HSD_SYNC_FAILURE	(0x1319)	Failure of HSD sync setup
EA FATAL SYS ERROR CODES		
EA_MEMORY_ERROR	(0x1350)	mallocfailure message

CONVENTIONAL FATAL SYSTEM ERROR CODES (400 - 499)		
CONV_RADC_ERROR	(0x1400)	error calling RADC function
CONV_NOLOCK_ERROR	(0x3401)	synthesizer became unlocked
CONV_PUT_UIMSG_ERROR	(0x1402)	UI message buffer not enabled
CONV_MODEM_RXOVR	(0x1403)	Conventional DIGV modem overflow
CONV_MODEM_RXAVR	(0x1404)	Conventional DIGV modem underflow
CONV_MODEM_FATAL_ERROR	(0x1405)	Unable to correctly configure the modem for conventional DIGV operation
CONV_PERS_ERROR	(0x5407)	Conventional personality error
CONV_ECP1_RADC_ERROR	(0x1408)	error calling RADC function in ECP1 scan
CONV_RX_CHAN_RADC_ERROR	(0x1409)	error calling RADC function in CHANUTIL - channelized
CONV_RX_ABS_RADC_ERROR	(0x1410)	error calling RADC function in CHANUTIL - absolute freq
CONV_TX_CHAN_RADC_ERROR	(0x1411)	error calling RADC function in CONVTX - channelized
CONV_TX_ABS_RADC_ERROR	(0x1412)	error calling RADC function in CONVTX - absolute freq
CONV_TX_IDLE_RADC_ERROR	(0x1413)	error calling RADC function in CONVTX - idle mode
CONV_P25_DSP_ATTACH_ERROR	(0x1450)	error calling RADC function in CONVTX - idle mode
P25T_DSP_ATTACH_ERROR	(0x1451)	error calling RADC function in trunked P25
P25T_SERIAL_NUMBER_ERROR	(0x1452)	error reading serial number
P25T_BAD_CC_IN_MSG_TYPE	(0x1453)	bad message type requested
PERS INTERFACE FATAL SYSTEM ERROR CODES		
PI_NOPERS_ERROR	(0x5500)	personality data is not present
PI_CRC_ERROR	(0x5501)	flash personality CRC did not match EEPROM
PI_DESC_CRC_ERROR	(0x5502)	personality descriptor table CRC error
PI_MALLOC_ERROR	(0x1503)	descriptor table MALLOC error
PI_CUSTOM_SET_ERROR	(0x5504)	custom freq set table error

USER INTERFACE FATAL SYSTEM ERROR CODES		
UI_FATAL_DEVICE_ERROR	(0x5600)	IO device error
UI_FATAL_SWTO_MALLOC_ERROR	(0x1601)	malloc() returned no more memory
UI_FATAL_SWTO_MAX_ERROR	(0x1602)	maximum number of timers exceeded
UI_FATAL_WINDOW_MAX_ERROR	(0x1603)	too many open windows
UI_FATAL_WINDOW_MALLOC_ERROR	(0x1604)	malloc() returned no more memory
UI_FATAL_MESSAGE_INVPARM	(0x1605)	invalid parameter to ui_put_message()
UI_FATAL_RI_MSGBUF_FULL	(0x1606)	RI BBOS message buffer full error
UI_FATAL_RISYS_MSGBUF_FULL	(0x1607)	RI System (EDACSBBOS message buffer full error
UI_FATAL_CI_MSGBUF_FULL	(0x1608)	CI BBOS message buffer full error
UI_FATAL_DEVICE_NOTSUPPORTED	(0x5609)	Idevice type (from personality) not supported
UI_FATAL_AUXIO_MALLOC_ERROR	(0x1610)	malloc() returned no more memory
UI_FATAL_NET_DEVICE_ERROR	(0x5611)	Network Idevice error
UI_FATAL_INVALID_CUID	(0x6612)	CU ID is invalid, usually CU=07 in a single CU system
UI_FATAL_NO_TONE_DATA	(0x5613)	No tone data is available in pers
UI_FATAL_UIIO_MSGBUF_FULL	(0x1614)	UI IBBOS message buffer full error
UI_FATAL_PROMOTE_MALLOC_ERROR	(0x1615)	malloc() returned no more memory
UI_FATAL_REMAP_MALLOC_ERROR	(0x1616)	malloc() returned no more memory
UI_FATAL_STDIO_ERROR	(0x1617)	UI stdio trash message received error
TEST UNIT FATAL SYSTEM ERROR CODES		
TU_FATAL_RXBUF_MALLOC_ERROR	(0x1701)	rx msg buffer malloc() failed
TU_FATAL_TXBUF_MALLOC_ERROR	(0x1702)	tx msg buffer malloc() failed
TU_FATAL_PUT_UIMSG_ERROR	(0x1703)	bb message to UI task failed
TU_FATAL_PUT_RISYSMSG_ERROR	(0x1704)	bb message to RISYS task failed
TU_FATAL_FASTPUT_TXMSG_ERROR	(0x1705)	bios call for Voter Monitor failed
AEGIS FATAL SYSTEM ERROR CODES		
AEGIS_ADI_OVERFLOW	(0x1801)	ADI Transmit event not serviced in time and buffer has overflowed
AEGIS_RXBUF_MALLOC_ERROR	(0x1802)	malloc() returned no more memory available
AEGIS_KEYLOAD_MALLOC_ERROR	(0x1803)	malloc() for keyloader table returned no more memory available
AEGIS_KEYLOAD_ERROR	(0x1804)	a general keyload error has occurred
AEGIS_DATAMEM_MALLOC_ERROR	(0x1805)	malloc() for data memory returned error
AEGIS_KEYLOAD_NOTABLE	(0x1806)	no key table was found in EEPROM despite personality saying on existed
AEGIS_KEYLOAD_BAD_TABLESIZE	(0x1807)	key table found in e^2 is wrong size for the pers
AEGIS_KEYLOAD_CORRUPT_TABLE	(0x1808)	key table has been corrupted in e^2
FIPS 140 FATAL SYSTEM ERROR CODES		
FIPS_INVALID_DESMAC_KEY	(0x1902)	Invalid DESMAC key
FIPS_DESMAC_CHECKSUM_FAILED	(0x1903)	DESMAC checksum failed
FIPS_DSP_ATTACH_DESMAC_FAILED	(0x1904)	DESMAC DSP ATTACH Failed
RI FATAL SYSTEM ERROR CODES		
RI_FATAL_MRADIO_FAILURE	(0x6901)	Mult-radio device stopped talking to each other

Table 12-4: Non-Fatal Application Error Codes

ERROR MESSAGES USED BY ALL LIBRARIES		
ERRMSG_FEAT_ENC	(1)	Feature encryption error message
ERRMSG_NOLOCK	(2)	synthesizer became unlocked message
ERRMSG_NOKEYBANK	(3)	no key banks have been allocated in the personality
ERRMSG_NO_PVT	(4)	private operation (including keyloading) is not allowed because Aegis unencrypted is the ADI file
ERRMSG_BAD_TRACK_DATA	(5)	Tracking data was in error Prism is using default
ERRMSG_PI_DUALPERS	(6)	Dual personality recoverable error message
ERRMSG_GSTAR_ERROR	(7)	GSTAR Error
ERRMSG_TONE_ENC_ERROR	(8)	Tone Encode Error
ERRMSG_DSP_CRC_ERROR	(9)	Traffic encryption keys CRC Error
ERRMSG_KEY_ERROR	(10)	DSP Did not respond to key query
ERRMSG_AES_ERROR	(11)	AES configuration error
ERRMSG_DES_ERROR	(12)	DES configuration error
FLAGS TO SET PERSISTENT ERROR MESSAGES, THOSE ERRORS WILL BE DISPLAYED UNTIL ERROR IS DECLARED AGAIN WITH THE CLEAR FLAG SET.		
PERSIST_NONFATAL_ERROR	(0x8000)	set for persist error condition, error will be cleared with another call
CLEAR_NONFATAL_ERROR	(0x1000)	clear persisting error

Table 12-5: Personality Interface Non-Fatal System Error Codes

FEATURE ENCRYPTION ERRORS		
PIFEAT_SNR_ERROR	(0x0550)	Can not read SROM
PIFEAT_READ_ERROR	(0x0551)	PERS sizes don't match
PIFEAT_CRC_ERROR	(0x0552)	decryption failure
PIFEAT_TRACK_ERROR	(0x0553)	Tracking data failure
DUAL PERSONALITY ERRORS - THE OLD PERSONALITY, EEPROM WILL BE RECOVERED		
PIDP_PERS_ERR	(0x0580)	Personality failure
PIDP_TRACK_ERR	(0x0581)	Tracking data failure
PIDP_FEAT_ERR	(0x0582)	Feature data failure
PIDP_IMAGE_ERR	(0x0583)	Image failure
CALIBRATION PARAMETER ERROR CODES		
CAL_DATA_MISSING_ERROR	(0x0560)	ECP Calibration data missing; Cal data updated to current defaults
CAL_DATA_UPDATE_ERROR	(0x0561)	Cal data update failed
CAL_DATA_DATED_REVISION_ERROR	(0x0562)	ECP Calibration data older than current revision; Cal data updated to current defaults
CAL_DATA_NEWER_REVISION_ERROR	(0x0563)	ECP Calibration data newer than current revision
TA_CAL_DATA_MISSING_ERROR	(0x0590)	TestApp Calibration data missing; Cal data updated
TA_CAL_DATA_UPDATE_ERROR	(0x0591)	TestApp Cal data update failed
TA_CAL_DATA_DATED_REVISION_ERROR	(0x0592)	TestApp Calibration data older than current revision; Cal data updated to current defaults
TA_CAL_DATA_NEWER_REVISION_ERROR	(0x0593)	TestApp Calibration data newer than current revision

Table 12-6: Non-Fatal System Error Codes

USER INTERFACE		
AEGIS_PVT_NONE	(0x0870)	
AEGIS_KEYLOAD_NOBANKS	(0x0871)	
AEGIS_DSP_CRC	(0x0872)	
DIGVOICE_ERR_SYS_NOT_DIG	(0x0880)	Group is set to digital but system vocoder is set to analog
DIGVOICE_ERR_NO_VG_SUPPORT	(0x0881)	VG is not supported by the DSP
DIGVOICE_ERR_NO_AEGIS_SUPPORT	(0x0882)	Aegis is not supported by the DSP
DIGVOICE_ERR_NO_IMBE_SUPPORT	(0x0883)	IMBE is not supported by the DSP
DIGVOICE_ERR_NO_DIG_FEAT	(0x0884)	Attempt to use VG or Aegis vocoder with the Digital voice feature turned off
DIGVOICE_ERR_NO_IMBE_FEAT	(0x0885)	Attempt to use IMBE vocoder with the IMBE feature turned off
DIGVOICE_ERR_NO_ENC_SUPPORT	(0x0886)	Attempt to use encryption the DSP doesn't support
DIGVOICE_ERR_NO_ENC_FEAT	(0x0887)	Attempt to use encryption with the feature turned off
RADC_NO_HWREV	(0x0890)	HW revision could not be determined
RADC_GSTAR_ERROR	(0x0891)	No GSTAR response from DSP
RADC_TONE_ENC_ERROR	(0x0892)	No Tone Encode response from DSP
RADC_KEY_QUERY_ERROR	(0x0894)	DSP did not respond to key query

13. CUSTOMER SERVICE

13.1 CUSTOMER CARE

If any part of the system equipment is damaged on arrival, contact the shipper to conduct an inspection and prepare a damage report. Save the shipping container and all packing materials until the inspection and the damage report are completed. In addition, contact the Customer Care center to make arrangements for replacement equipment. Do not return any part of the shipment until you receive detailed instructions from a Harris representative.

Contact the Customer Care center at http://www.pspc.harris.com/CustomerService or:

North America:

Phone Number:	1-800-368-3277
Fax Number:	1-321-409-4393
E-mail:	PSPC_CustomerFocus@harris.com

International:

Phone Number:	1-434-455-6403
Fax Number:	1-321-409-4394
E-mail:	PSPC_InternationalCustomerFocus@harris.com

13.2 TECHNICAL ASSISTANCE

The Technical Assistance Center's (TAC) resources are available to help with overall system operation, maintenance, upgrades and product support. TAC is the point of contact when answers are needed to technical questions.

Product specialists, with detailed knowledge of product operation, maintenance and repair provide technical support via a toll-free (in North America) telephone number. Support is also available through mail, fax and e-mail.

For more information about technical assistance services, contact your sales representative, or call the Technical Assistance Center at:

North America:	1-800-528-7711
International:	1-434-385-2400
Fax:	1-434-455-6712
E-mail:	PSPC_tac@harris.com

14. REPLACEABLE PARTS

Replaceable assemblies can be ordered through Harris' Customer Care center (see Section 13.1 for contact information). Component Items listed in the following sections, identified with Harris part numbers, are available through the Customer Care center and are listed in the Harris Service Parts and Accessories Catalog. The parts lists in Section 15 are for reference only or are considered common parts and can be obtained from your local electronic parts distributor.

14.1 PRINTED WIRE BOARDS AND MODULES

Refer to assembly diagrams at the back of this manual.

PART NUMBER	DESCRIPTION
14002-0134-01	Main Board Assembly, VHF, Scan Model
14002-0134-02	Main Board Assembly, VHF, System Model
14002-0138-01	Interface Board and LCD/Lightguide. See the following **Note**.

NOTE

The Interface Board and LCD/lightguide have to be replaced as one unit. You cannot replace one and not the other.

14.2 MECHANICAL ASSEMBLIES

Refer to assembly diagrams at the back of this manual.

PART NUMBER	DESCRIPTION
14002-0136-01	Front Cover Assembly, XG-75 System
14002-0136-02	Front Cover Assembly, XG-75 Scan
14002-0136-03	Yellow Front Cover Assembly, XG-75 System
14002-0136-04	Yellow Front Cover Assembly, XG-75 Scan
14002-0137-01	Rear Casting Assembly
MA-016766-001	RF Shield Assembly
14002-0138-02	Rear Cover Assembly
EA-013717	UDC PWB Kit
FM-014712	UDC Weatherproof Cover

14.3 KITS

Refer to assembly diagrams at the back of this manual.

PART NUMBER	DESCRIPTION
MA-013712	XG-75 Outer Knob Kit
MA-016768-001	Channel Knob Kit
MA-016768-002	Volume Knob Kit
MA-013714	Antenna Insert Assembly
14002-0138-07	Antenna Bypass Connector Assembly
MA-013739	Dual SW Actuator and Dual SW Spring Kit
MA-013716	Antenna Launch Assembly
14002-0138-12	System Keypad
14002-0138-13	Scan Keypad
14002-0138-08	Flex Circuit Assembly, Includes Speaker and Microphone
MA-013720	Button Kit
14002-0138-03	Switch Module Assembly
14002-0138-09	XG-75 LCD Lens Kit
14002-0158-02	Hardware Kit
14002-0158-01	Installation Kit
KT-016775-001	Gasket Kit
14002-0138-11	XG-75 Dome Label
14002-0169-02	Channel Stopper Ring Kit

14.4 MISCELLANEOUS TOOLS

Refer to the Service Section of this manual.

PART NUMBER	DESCRIPTION
12RTD	Torque Driver
B-W1.27	Hex Bit, 1.27mm
FM-016782-001	Channel Sw Ring Nut Replacement Driver Bit Tool
FM-016782-002	Volume Sw Ring Nut Replacement Driver Bit Tool
T4WK03399	Special Tool for Volume and Channel Switch
337097G1B	Antenna Insert Tool
G4UK07188-0	Antenna Bypass Connector Tool
19B801496G2	RF Antenna Adapter
CA-023407-004	Universal Test Cable
CA-023407-002	Audio Test Cable
BT-023406-015	Battery Eliminator
MATQ-03424	Audio Test Box
CA-023407-001	Programming/Keyloader Cable
CA-023407-003	Data Cable
TL-017474-002	Torque tool for Dual Switch screw
TL-017474-001	Torque tool bit for Dual Switch screw

15. PARTS LIST

15.1 VHF MAIN BOARD

G4UD09634, Rev. 9

REF	DESCRIPTION
CAPACITORS	
C101	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C102	CAPACITOR CERAMIC CHIP 1.5p ±0.1pF 50V SIMILAR TO TAIYO YUDEN UVK105CH1R5BW-F
C103	CAPACITOR CERAMIC CHIP 3.9p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH3R9JW-F
C104	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C105	CAPACITOR CERAMIC CHIP 3.9p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH3R9JW-F
C106	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C107	CAPACITOR CERAMIC CHIP 470p ±5% 50V SIMILAR TO MURATA GRM1552C1H471JA01D
C108	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C110	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C111	CAPACITOR CERAMIC CHIP 18p ±5% 50V SIMILAR TO MURATA GRM1552C1H180JZ01D
C113	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C114	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C115	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C117	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C118	CAPACITOR CERAMIC CHIP 18p ±5% 50V SIMILAR TO MURATA GRM1552C1H180JZ01D
C120	CAPACITOR CERAMIC CHIP 3.0p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH030JW-F
C121	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C124	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C125	CAPACITOR CERAMIC CHIP 1.8p ±0.1pF 50V SIMILAR TO TAIYO YUDEN UVK105CH1R8BW-F
C126	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C127	CAPACITOR CERAMIC CHIP 2.7p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH2R7JW-F
C129	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C132	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C134	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C135	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C136	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C138	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C139	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C140	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F
C141	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C142	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C143	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C144	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C147	CAPACITOR CERAMIC CHIP 27p ±5% 50V SIMILAR TO MURATA GRM1552C1H270JZ01D
C148	CAPACITOR CERAMIC CHIP 4.3p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH4R3JW-F
C149	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F
C150	CAPACITOR CERAMIC CHIP 7p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H7R0DZ01D
C154	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C155	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C164	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C167	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C168	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C169	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C171	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C172	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F
C173	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C174	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C175	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C176	CAPACITOR CERAMIC CHIP 2.7p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH2R7JW-F
C177	CAPACITOR CERAMIC CHIP 3.3p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH3R3JW-F
C178	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C179	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C180	CAPACITOR CERAMIC CHIP 6p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H6R0DZ01D
C181	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C182	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C183	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F
C184	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C185	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C186	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C188	CAPACITOR CERAMIC CHIP 0.033u ±10% 25V SIMILAR TO MURATA GRM155R11E333KA88D
C189	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C201	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D

REF	DESCRIPTION
C202	CAPACITOR CERAMIC CHIP 0.033u ±10% 25V SIMILAR TO MURATA GRM155R11E333KA88D
C204	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C207	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F
C209	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C212	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C213	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C214	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C215	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C216	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C218	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C221	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C223	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C224	CAPACITOR CERAMIC CHIP 3300p ±10% 50V SIMILAR TO MURATA GRM155R11H332KA01D
C225	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C226	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C229	CAPACITOR CERAMIC CHIP 3.9p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH3R9JW-F
C232	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C236	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C239	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C240	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C241	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C243	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C244	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C245	CAPACITOR CERAMIC CHIP 470p ±5% 50V SIMILAR TO MURATA GRM1552C1H471JA01D
C247	CAPACITOR CERAMIC CHIP 470p ±5% 50V SIMILAR TO MURATA GRM1552C1H471JA01D
C248	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C249	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C250	CAPACITOR CERAMIC CHIP 33p ±5% 50V SIMILAR TO MURATA GRM1552C1H330JZ01D
C251	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C252	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C253	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C255	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C257	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D

REF	DESCRIPTION
C258	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C265	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C267	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C272	CAPACITOR CERAMIC CHIP 0.5p ±0.1pF 50V SIMILAR TO TAIYO YUDEN UVK105CH0R5BW-F
C274	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C301	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C302	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
C303	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C304	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
C305	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C306	CAPACITOR CERAMIC CHIP 10p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C308	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C309	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C310	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C312	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C313	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C314	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C316	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C321	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C324	CAPACITOR CERAMIC CHIP 18p ±5% 50V SIMILAR TO MURATA GRM1552C1H180JZ01D
C326	CAPACITOR CERAMIC CHIP 10u 25V SIMILAR TO MURATA GRM31CR71E106KA12L
C327	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C328	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C330	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C331	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C333	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C334	CAPACITOR CERAMIC CHIP 0.022u ±10% 25V SIMILAR TO MURATA GRM155R11E223KA61D
C335	CAPACITOR CERAMIC CHIP 10u 25V SIMILAR TO MURATA GRM31CR71E106KA12L
C336	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C337	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C338	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C339	CAPACITOR CERAMIC CHIP 27p ±5% 50V SIMILAR TO MURATA GRM1552C1H270JZ01D
C340	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D

REF	DESCRIPTION
C341	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C342	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C343	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C344	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C345	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C346	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C347	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C348	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C349	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C350	CAPACITOR CERAMIC CHIP 13p ±5% 50V SIMILAR TO MURATA GRM1552C1H130JZ01D
C351	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C352	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C355	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C356	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C358	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C359	CAPACITOR CERAMIC CHIP 3300p ±10% 50V SIMILAR TO MURATA GRM155R11H332KA01D
C360	CAPACITOR CERAMIC CHIP 3300p ±10% 50V SIMILAR TO MURATA GRM155R11H332KA01D
C365	CAPACITOR CERAMIC CHIP 43p ±5% 50V SIMILAR TO MURATA GRM1552C1H430JZ01D
C369	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM21BR11C105KA01L
C370	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C371	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C372	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C373	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM21BR11C105KA01L
C374	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C375	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C376	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C377	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C378	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM21BR11C105KA01L
C379	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C380	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C382	CAPACITOR CERAMIC CHIP 2200p ±10% 50V SIMILAR TO MURATA GRM155R11H222KA01D
C383	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C384	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D

REF	DESCRIPTION
C401	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C402	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C403	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C405	CAPACITOR CERAMIC CHIP 6p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H6R0DZ01D
C406	CAPACITOR CERAMIC CHIP 2.4p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH2R4JW-F
C407	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C408	CAPACITOR CERAMIC CHIP 6p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H6R0DZ01D
C409	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C410	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C411	CAPACITOR CERAMIC CHIP 18p ±5% 50V SIMILAR TO MURATA GRM1552C1H180JZ01D
C412	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C413	CAPACITOR CERAMIC CHIP 18p ±5% 50V SIMILAR TO MURATA GRM1552C1H180JZ01D
C414	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C416	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C417	CAPACITOR CERAMIC CHIP 7p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H7R0DZ01D
C418	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C420	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C422	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C424	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C429	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C439	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C440	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C441	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C442	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C501	CAPACITOR CERAMIC CHIP 2.2u ±10% 16V SIMILAR TO MURATA GRM21BB31C225KA87L
C504	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C505	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C506	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C507	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C508	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C511	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C513	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C514	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D

REF	DESCRIPTION
C516	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C517	CAPACITOR CERAMIC CHIP 120p ±5% 50V SIMILAR TO MURATA GRM1552C1H121JA01D
C518	CAPACITOR CERAMIC CHIP 39p ±5% 50V SIMILAR TO MURATA GRM1552C1H390JZ01D
C519	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C520	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C521	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C523	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C525	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C526	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C527	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C528	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C529	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C530	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C531	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C532	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C533	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C535	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C536	CAPACITOR CERAMIC CHIP 2.2u ±10% 16V SIMILAR TO MURATA GRM21BB31C225KA87L
C537	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C538	CAPACITOR CERAMIC CHIP 82p ±5% 50V SIMILAR TO MURATA GRM1552C1H820JZ01D
C539	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C540	CAPACITOR CERAMIC CHIP 0.033u ±10% 25V SIMILAR TO MURATA GRM155R11E333KA88D
C541	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C542	CAPACITOR CERAMIC CHIP 150p ±5% 50V SIMILAR TO MURATA GRM1552C1H151JA01D
C543	CAPACITOR CERAMIC CHIP 120p ±5% 50V SIMILAR TO MURATA GRM1552C1H121JA01D
C544	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C545	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C546	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C547	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C548	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C549	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C550	CAPACITOR CERAMIC CHIP 8p ±0.5pF 50V SIMILAR TO MURATA GRM1552C1H8R0DZ01D
C551	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C552	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C553	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C554	CAPACITOR CERAMIC CHIP 2.2u ±10% 16V SIMILAR TO MURATA GRM21BB31C225KA87L
C555	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C556	CAPACITOR CERAMIC CHIP 120p ±5% 50V SIMILAR TO MURATA GRM1552C1H121JA01D
C557	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C558	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C559	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C560	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C561	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C562	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C564	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C565	CAPACITOR CERAMIC CHIP 0.22u ±10% 16V SIMILAR TO MURATA GRM188R11C224KA01D
C566	CAPACITOR CERAMIC CHIP 0.22u ±10% 16V SIMILAR TO MURATA GRM188R11C224KA01D
C567	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C568	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C571	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C572	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C573	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C574	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C575	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C576	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C577	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C580	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C582	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C583	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C584	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C585	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C586	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C587	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C588	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C590	CAPACITOR CERAMIC CHIP 11p ±5% 50V SIMILAR TO MURATA GRM1552C1H110JZ01D
C591	CAPACITOR CERAMIC CHIP 5.1p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH5R1JW-F

REF	DESCRIPTION
C592	CAPACITOR CERAMIC CHIP 4.3p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH4R3JW-F
C593	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C594	CAPACITOR CERAMIC CHIP 3.3p ±5% 50V SIMILAR TO TAIYO YUDEN UVK105CH3R3JW-F
C595	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C601	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C602	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C603	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C604	CAPACITOR CERAMIC CHIP 2700p ±2% 50V SIMILAR TO MURATA GRM1882C1H272GA01D
C605	CAPACITOR CERAMIC CHIP 1800p ±2% 50V SIMILAR TO MURATA GRM1882C1H182GA01D
C606	CAPACITOR CERAMIC CHIP 2700p ±2% 50V SIMILAR TO MURATA GRM1882C1H272GA01D
C607	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C608	CAPACITOR CERAMIC CHIP 560p ±2% 50V SIMILAR TO MURATA GRM1552C1H561GA01D
C609	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C610	CAPACITOR CERAMIC CHIP 4.7u ±10% 16V SIMILAR TO MURATA GRM21BB31C475KA87L
C611	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C612	CAPACITOR CERAMIC CHIP 560p ±2% 50V SIMILAR TO MURATA GRM1552C1H561GA01D
C613	CAPACITOR CERAMIC CHIP 1800p ±2% 50V SIMILAR TO MURATA GRM1882C1H182GA01D
C614	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C615	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C618	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C620	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C702	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C704	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C705	CAPACITOR CERAMIC CHIP 0.068u ±10% 16V SIMILAR TO MURATA GRM155R11C683KA88D
C706	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C707	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C708	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C709	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C710	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C711	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C712	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C713	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C714	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D

REF	DESCRIPTION
C715	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C716	CAPACITOR CERAMIC CHIP 0.033u ±10% 25V SIMILAR TO MURATA GRM155R11E333KA88D
C717	CAPACITOR CERAMIC CHIP 0.033u ±10% 25V SIMILAR TO MURATA GRM155R11E333KA88D
C718	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C720	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C721	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C722	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C726	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C727	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C728	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C729	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C730	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C731	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C801	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C804	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C805	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C806	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C807	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C808	CAPACITOR CERAMIC CHIP 1500p ±10% 50V SIMILAR TO MURATA GRM155R11H152KA01D
C809	CAPACITOR CERAMIC CHIP 1500p ±10% 50V SIMILAR TO MURATA GRM155R11H152KA01D
C811	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C813	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C814	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C815	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C817	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C818	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C819	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C820	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C821	CAPACITOR CERAMIC CHIP 560p ±2% 50V SIMILAR TO MURATA GRM1552C1H561GA01D
C822	CAPACITOR CERAMIC CHIP 560p ±2% 50V SIMILAR TO MURATA GRM1552C1H561GA01D
C824	CAPACITOR CERAMIC CHIP 1000p ±5% 50V SIMILAR TO MURATA GRM1552C1H102JA01D
C828	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C831	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D

REF	DESCRIPTION
C832	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C833	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C835	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C836	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C837	CAPACITOR CERAMIC CHIP 2.2u ±10% 16V SIMILAR TO MURATA GRM21BB31C225KA87L
C838	CAPACITOR CERAMIC CHIP 0.22u ±10% 16V SIMILAR TO MURATA GRM188R11C224KA01D
C840	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C841	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C842	CAPACITOR CERAMIC CHIP 560p ±2% 50V SIMILAR TO MURATA GRM1552C1H561GA01D
C843	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C844	CAPACITOR CERAMIC CHIP 0.47u ±10% 25V SIMILAR TO MURATA GRM188R71E474KA12D
C845	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C846	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C850	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C852	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C855	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C904	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C909	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C910	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C911	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C912	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C913	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C914	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C915	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C916	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C917	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1002	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1003	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1004	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1005	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1006	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1007	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1008	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D

REF	DESCRIPTION
C1009	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1011	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1012	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1013	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1017	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1018	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1024	CAPACITOR CERAMIC CHIP 330p ±5% 50V SIMILAR TO MURATA GRM1552C1H331JA01D
C1026	CAPACITOR CERAMIC CHIP 330p ±5% 50V SIMILAR TO MURATA GRM1552C1H331JA01D
C1037	CAPACITOR CERAMIC CHIP 330p ±5% 50V SIMILAR TO MURATA GRM1552C1H331JA01D
C1046	CAPACITOR CERAMIC CHIP 330p ±5% 50V SIMILAR TO MURATA GRM1552C1H331JA01D
C1047	CAPACITOR CERAMIC CHIP 330p ±5% 50V SIMILAR TO MURATA GRM1552C1H331JA01D
C1101	CAPACITOR CERAMIC CHIP 1u ±10% 10V SIMILAR TO MURATA GRM155B31A105KE15D
C1102	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1104	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1105	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1106	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1107	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1108	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1109	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1110	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1112	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1113	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1114	CAPACITOR CERAMIC CHIP 0.22u ±10% 16V SIMILAR TO MURATA GRM188R11C224KA01D
C1115	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM21BR11C105KA01L
C1116	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1117	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1118	CAPACITOR TANTALUM CHIP 3.3u ±20% 10V SIMILAR TO NICHICON F921A335MPA
C1119	CAPACITOR CERAMIC CHIP 10u ±10% 10V SIMILAR TO MURATA GRM21BB31A106KE18L
C1120	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1121	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1123	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1124	CAPACITOR TANTALUM CHIP 3.3u ±20% 10V SIMILAR TO NICHICON F921A335MPA
C1125	CAPACITOR CERAMIC CHIP 0.068u ±10% 16V SIMILAR TO MURATA GRM155R11C683KA88D

REF	DESCRIPTION
C1126	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1127	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1128	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1129	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1130	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1131	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1132	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1133	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1134	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1135	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1136	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1137	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1138	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1139	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1140	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1141	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1142	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1143	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1144	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1145	CAPACITOR CERAMIC CHIP 0.22u ±10% 16V SIMILAR TO MURATA GRM188R11C224KA01D
C1146	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1147	CAPACITOR TANTALUM CHIP 3.3u ±20% 10V SIMILAR TO NICHICON F921A335MPA
C1148	CAPACITOR CERAMIC CHIP 22p ±5% 50V SIMILAR TO MURATA GRM1552C1H220JZ01D
C1150	CAPACITOR CERAMIC CHIP 10p ±5% 50V SIMILAR TO MURATA GRM1552C1H100JZ01D
C1151	CAPACITOR CERAMIC CHIP 10u ±10% 10V SIMILAR TO MURATA GRM21BB31A106KE18L
C1152	CAPACITOR CERAMIC CHIP 10u ±10% 16V SIMILAR TO MURATA GRM21BB31C106KE15L
C1153	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1156	CAPACITOR CERAMIC CHIP 2200p ±10% 25V SIMILAR TO MURATA GRM155R11H222KA01D
C1158	CAPACITOR CERAMIC CHIP 2.2u ±10% 16V SIMILAR TO MURATA GRM21BB31C225KA87L
C1201	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1203	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1205	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1206	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D

REF	DESCRIPTION
C1207	CAPACITOR CERAMIC CHIP 12p ±5% 50V SIMILAR TO MURATA GRM1552C1H120JZ01D
C1208	CAPACITOR CERAMIC CHIP 15p ±5% 50V SIMILAR TO MURATA GRM1552C1H150JZ01D
C1209	CAPACITOR CERAMIC CHIP 270p ±5% 50V SIMILAR TO MURATA GRM1552C1H271JA01D
C1210	CAPACITOR CERAMIC CHIP 1u ±10% 16V SIMILAR TO MURATA GRM188B31C105KA92D
C1211	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1212	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1213	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1214	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1215	CAPACITOR CERAMIC CHIP 47p ±5% 50V SIMILAR TO MURATA GRM1552C1H470JZ01D
C1216	CAPACITOR CERAMIC CHIP 4.7u ±10% 16V SIMILAR TO MURATA GRM21BB31C475KA87L
C1218	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1219	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1220	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1224	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
C1227	CAPACITOR CERAMIC CHIP 0.1u ±10% 16V SIMILAR TO MURATA GRM155R11C104KA88D
C1228	CAPACITOR CERAMIC CHIP 0.01u ±10% 25V SIMILAR TO MURATA GRM155R11E103KA01D
C1229	CAPACITOR CERAMIC CHIP 100p ±5% 50V SIMILAR TO MURATA GRM1552C1H101JZ01D
DIODES	
CR101	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR102	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR103	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR104	DIODE HSD88 SIMILAR TO RENESAS HSD88KRF-E
CR106	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR107	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR108	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR109	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR110	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR111	DIODE HVD144A SIMILAR TO RENESAS HVD144AKRF-E
CR113	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR201	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR202	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR203	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR204	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR205	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E

REF	DESCRIPTION
CR206	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR207	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR208	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR209	DIODE RB521G SIMILAR TO ROHM RB521G-30T2R
CR301	DIODE HSD88 SIMILAR TO RENESAS HSD88KRF-E
CR302	DIODE HSD88 SIMILAR TO RENESAS HSD88KRF-E
CR303	DIODE HZC12 SIMILAR TO RENESAS HZC12TRF-E
CR304	DIODE HZC12 SIMILAR TO RENESAS HZC12TRF-E
CR305	DIODE HZC12 SIMILAR TO RENESAS HZC12TRF-E
CR306	DIODE HZC12 SIMILAR TO RENESAS HZC12TRF-E
CR309	DIODE CMS14 SIMILAR TO TOSHIBA CMS14(TE12L,Q)
CR310	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR311	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR312	DIODE HVD131 SIMILAR TO RENESAS HVD131KRF-E
CR501	DIODE HVD358B SIMILAR TO RENESAS HVD358BKRF-E
CR701	DIODE DA3S101F SIMILAR TO Panasonic DA3S101F0L
CR702	DIODE RB521G SIMILAR TO ROHM RB521G-30T2R
CR703	DIODE RB521G SIMILAR TO ROHM RB521G-30T2R
CR704	DIODE RB521G SIMILAR TO ROHM RB521G-30T2R
CR801	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1001	DIODE 5.6V SIMILAR TO NEC NNCD5.6G-T1-AT
CR1002	DIODE 5.6V SIMILAR TO NEC NNCD5.6G-T1-AT
CR1003	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1005	DIODE 5.6V SIMILAR TO NEC NNCD5.6G-T1-AT
CR1006	DIODE 5.6V SIMILAR TO NEC NNCD5.6G-T1-AT
CR1008	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1009	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1010	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1011	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1012	LED TLGE1002A SIMILAR TO TOSHIBA TLGE1002A(T02)
CR1101	DIODE HSC119 SIMILAR TO RENESAS HSC119TRF-E
CR1201	DIODE RB521G SIMILAR TO ROHM RB521G-30T2R
CR1202	LED BRPY1211C SIMILAR TO STANLEY BRPY1211C-TR
CR1203	DIODE 5.6V SIMILAR TO NEC NNCD5.6D-T1-AT
MISCELLANEOUS	
F301	FUSE CHIP FUSE F0603E2R00FSTRM SIMILAR TO AVX F0603E2R00FSTRM
FL202	FILTER CRYSTAL FILTER 48E10AB SIMILAR TO NDK 48E10AB
FL203	FILTER CERAMIC FILTER CFWKA450KFFA-R0 SIMILAR TO MURATA CFWKA450KFFA-R0
FL204	FILTER CERAMIC FILTER CFUKF450KC4X-R0 SIMILAR TO MURATA CFUKF450KC4X-R0
FL205	FILTER CERAMIC FILTER CFUKF450KC4X-R0 SIMILAR TO MURATA CFUKF450KC4X-R0
J301	Battery contact BATT-C/N BATT-C/N SIMILAR TO DAIWA G4UK07288-1

REF	DESCRIPTION
J1001	CONNECTOR AXK5S40247YG SIMILAR TO Panasonic AXK5S40247YG
J1002	CONNECTOR FPC CONNECTOR IL-FPR-U13S-HF-N1 SIMILAR TO JAE IL-FPR-U13S-HF-N1-R3000
J1201	IL-WX-10S-VF-B-E1000E SIMILAR TO IL-WX-10S-VF-B-E1000E
S1001	TACT SWITCH EVQP4203M SIMILAR TO Panasonic EVQP4203M
S1002	TACT SWITCH EVQP4203M SIMILAR TO Panasonic EVQP4203M
S1003	TACT SWITCH EVQP4203M SIMILAR TO Panasonic EVQP4203M
S1004	LEVER TYPE SWITCH SW1AB-491-T30 SIMILAR TO SHINMEI SW1AB-491-T30
S1005	TACT SWITCH SKQTLAE010 SIMILAR TO ALPS SKQTLAE010
T401	Multilayer Chip Balun ATB2012-500-11-T SIMILAR TO TDK ATB2012-500-11-T
Y1201	X'tal TFX-02 SIMILAR TO REVER Electronics TFX-02 (32.768kHz,20ppm,7pF)
Z102	MIXER ADE-2+ SIMILAR TO Mini-curcuits ADE-2+
Z201	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z202	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z203	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z204	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z205	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z206	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z207	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z208	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z209	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z210	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z211	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z212	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z213	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z214	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z215	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z216	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z217	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z218	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z219	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z220	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z221	GASKET EMI GASKET 25SMT-3645-09 SIMILAR TO Junkosha 25SMT-3645-09
Z301	MICRO CIRCUIT CHIP COUPLER DCS3D20-0157-G SIMILAR TO MKT TAISEI DCS3D20-0157-G-TR

REF	DESCRIPTION
Z501	RX_LO_VCO SIMILAR TO MKT TAISEI VCO25B21-0203-G
Z502	TX_LO_VCO2 SIMILAR TO MKT TAISEI VCO02121-0310-G
Z504	VC-TCXO KSA3161D-19.2M(10ppm) 10ppm SIMILAR TO NDK KSA3161D-19.2M
Z601	KSA3173A 10ppm SIMILAR TO NDK KSA3173A(24.576MHz)
Z801	PHOTO RELAY TLP176A SIMILAR TO TOSHIBA TLP176A-TP,F
Z1201	VC-TCXO KSA3164A_12M SIMILAR TO NDK KSA3164A-12M
INDUCTORS	
L101	INDUCTOR AIR CORE 0.32-1.4-8TL SIMILAR TO UCHIDA 0.32-1.4-8TL
L102	INDUCTOR AIR CORE 0.32-1.4-8TL SIMILAR TO UCHIDA 0.32-1.4-8TL
L103	INDUCTOR AIR CORE 0.32-1.4-8TL SIMILAR TO UCHIDA 0.32-1.4-8TL
L104	INDUCTOR CHIP 820n ±5% SIMILAR TO TDK MLF1608DR82JT000
L107	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L108	INDUCTOR CHIP 56n ±5% SIMILAR TO MURATA LQW31HN56NJ03L
L109	INDUCTOR CHIP 120n ±5% SIMILAR TO TAIYO YUDEN HK1005R12J-T
L110	INDUCTOR CHIP 820n ±5% SIMILAR TO TDK MLF1608DR82JT000
L111	INDUCTOR CHIP 1u ±5% SIMILAR TO TDK MLF1608A1R0JT000
L112	INDUCTOR AIR CORE 0.32-1.4-8TL SIMILAR TO UCHIDA 0.32-1.4-8TL
L113	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
L114	INDUCTOR CHIP 64n ±5% SIMILAR TO MURATA LQW31HN64NJ03L
L115	INDUCTOR CHIP 64n ±5% SIMILAR TO MURATA LQW31HN64NJ03L
L116	INDUCTOR CHIP 68n ±5% SIMILAR TO TAIYO YUDEN HK100568NJ-T
L117	INDUCTOR CHIP 68n ±5% SIMILAR TO TAIYO YUDEN HK100568NJ-T
L119	INDUCTOR CHIP 39n ±5% SIMILAR TO TAIYO YUDEN HK100539NJ-T
L124	INDUCTOR CHIP 10n ±5% SIMILAR TO TAIYO YUDEN HK100510NJ-T
L125	INDUCTOR CHIP 220n ±5% SIMILAR TO TAIYO YUDEN HK1005R22J-T
L126	INDUCTOR CHIP 56n ±2% SIMILAR TO MURATA LQW18AN56NG00D
L127	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L128	INDUCTOR CHIP 64n ±5% SIMILAR TO MURATA LQW31HN64NJ03L
L129	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L131	INDUCTOR CHIP 64n ±5% SIMILAR TO MURATA LQW31HN64NJ03L
L201	INDUCTOR CHIP 270n ±5% SIMILAR TO TDK MLF1608DR27JT000
L202	INDUCTOR CHIP 680n ±5% SIMILAR TO TDK MLF1608DR68JT000
L203	INDUCTOR CHIP 820n ±5% SIMILAR TO TDK MLF1608DR82JT000

REF	DESCRIPTION
L204	INDUCTOR CHIP 39n ±5% SIMILAR TO TAIYO YUDEN HK100539NJ-T
L205	INDUCTOR CHIP 680n ±5% SIMILAR TO TDK MLF1608DR68JT000
L209	INDUCTOR CHIP 470n ±5% SIMILAR TO TDK MLF1608DR47JT000
L211	INDUCTOR CHIP 680n ±5% SIMILAR TO TDK MLF1608DR68JT000
L212	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L213	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L301	INDUCTOR AIR CORE 0.40-1.2-3t SIMILAR TO UCHIDA 0.40-1.2-3TL
L302	RESISTOR METAL CHIP 0 ±5% 0.0625W SIMILAR TO ROHM MCR03EZPJ000
L304	INDUCTOR CHIP 68n ±5% SIMILAR TO TAIYO YUDEN HK100568NJ-T
L305	INDUCTOR CHIP 120n ±5% SIMILAR TO TAIYO YUDEN HK1005R12J-T
L306	RESISTOR METAL CHIP 0 ±5% 0.0625W SIMILAR TO ROHM MCR03EZPJ000
L308	INDUCTOR CHIP 56n ±5% SIMILAR TO TAIYO YUDEN HK100556NJ-T
L309	CHIP BEADS RFC SIMILAR TO MURATA BLM21PG220SN1D
L310	INDUCTOR CHIP 39n ±5% SIMILAR TO TAIYO YUDEN HK100539NJ-T
L311	INDUCTOR CHIP 220n ±5% SIMILAR TO TAIYO YUDEN HK1005R22J-T
L312	CHIP BEADS RFC SIMILAR TO MURATA BLM21PG220SN1D
L313	INDUCTOR AIR CORE 0.40-1.2-3t SIMILAR TO UCHIDA 0.40-1.2-3TL
L314	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L315	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L321	CHIP BEADS RFC SIMILAR TO MURATA BLM21PG220SN1D
L322	INDUCTOR AIR CORE 0.4-1.4-7TL SIMILAR TO UCHIDA 0.4-1.4-7TL
L323	INDUCTOR CHIP 12n ±5% SIMILAR TO TAIYO YUDEN HK100512NJ-T
L324	INDUCTOR CHIP 47n ±5% SIMILAR TO TAIYO YUDEN HK100547NJ-T
L401	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L402	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L403	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L405	INDUCTOR CHIP 68n ±2% SIMILAR TO MURATA LQW18AN68NG00D
L413	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L418	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L419	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L503	INDUCTOR CHIP 1u ±5% SIMILAR TO TDK MLF1608A1R0JT000
L504	INDUCTOR CHIP 220n ±2% SIMILAR TO MURATA LQW18ANR22G00D
L505	INDUCTOR CHIP 56n ±5% SIMILAR TO TAIYO YUDEN HK100556NJ-T

REF	DESCRIPTION
L507	INDUCTOR CHIP 82n ±5% SIMILAR TO TAIYO YUDEN HK100582NJ-T
L508	INDUCTOR CHIP 15n ±5% SIMILAR TO TAIYO YUDEN HK100515NJ-T
L509	INDUCTOR CHIP 15n ±5% SIMILAR TO TAIYO YUDEN HK100515NJ-T
L512	INDUCTOR CHIP 82n ±5% SIMILAR TO TAIYO YUDEN HK100582NJ-T
L513	INDUCTOR CHIP 33n ±5% SIMILAR TO TAIYO YUDEN HK100533NJ-T
L514	INDUCTOR CHIP 33n ±5% SIMILAR TO TAIYO YUDEN HK100533NJ-T
L601	CHIP BEADS RFC SIMILAR TO MURATA BLM15BA330SN1D
L602	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L603	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L605	CHIP BEADS RFC SIMILAR TO MURATA BLM15BA330SN1D
L606	CHIP BEADS ARRAY RFC SIMILAR TO MURATA BLA2ABB121SN4D
L607	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L609	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L610	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L611	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L701	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L702	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L703	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L704	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L705	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L707	CHIP BEADS ARRAY RFC SIMILAR TO TAIYO YUDEN BK20104L181-T
L726	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L801	INDUCTOR CHIP 2.2u ±20% SIMILAR TO MURATA LQH32CN2R2M53L
L802	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L803	INDUCTOR CHIP 1.5u SIMILAR TO MURATA LQM2HPN1R5MG0L
L804	INDUCTOR CHIP 1.5u SIMILAR TO MURATA LQM2HPN1R5MG0L
L805	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L806	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L807	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L808	CHIP BEADS RFC SIMILAR TO MURATA BLM21PG220SN1D
L809	CHIP BEADS RFC SIMILAR TO MURATA BLM21PG220SN1D
L810	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L811	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D

REF	DESCRIPTION
L901	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L902	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L903	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L904	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L905	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L908	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L909	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L1001	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L1002	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L1003	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1004	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1005	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L1006	CHIP BEADS RFC SIMILAR TO MURATA BLM15BB221SN1D
L1007	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L1008	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1009	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L1011	CHIP BEADS ARRAY RFC SIMILAR TO MURATA BLA2ABD102SN4D
L1014	CHIP BEADS RFC SIMILAR TO MURATA BLM15BD102SN1D
L1015	CHIP BEADS ARRAY RFC SIMILAR TO MURATA BLA2ABD102SN4D
L1016	CHIP BEADS ARRAY RFC SIMILAR TO MURATA BLA2ABD102SN4D
L1017	CHIP BEADS ARRAY RFC SIMILAR TO MURATA BLA2ABD102SN4D
L1101	INDUCTOR CHIP 0.22uH ±20% SIMILAR TO MURATA LQH31CNR22M03L
L1102	INDUCTOR CHIP 2.2uH ±20% SIMILAR TO TDK VLF4014ST-2R2M1R9
L1103	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1104	INDUCTOR CHIP 1.5u SIMILAR TO MURATA LQH3NPN1R5NJ0L
L1105	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1201	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
L1202	CHIP BEADS RFC SIMILAR TO MURATA BLM15AG601SN1D
TRANSISTORS	
Q101	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q102	TRANSISTOR 2SC5007 SIMILAR TO NEC 2SC5007-T1-A
Q103	TRANSISTOR 2SC5007 SIMILAR TO NEC 2SC5007-T1-A
Q104	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR

REF	DESCRIPTION
Q201	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q202	TRANSISTOR 2SC5007 SIMILAR TO NEC 2SC5007-T1-A
Q301	TRANSISTOR RQA0004 SIMILAR TO RENESAS RQA0004PXTL-E
Q302	TRANSISTOR RD12MVS1 SIMILAR TO MITSUBISHI RD12MVS1-T112
Q303	TRANSISTOR EMD30 SIMILAR TO ROHM EMD30-T2R
Q304	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q305	FET SSM3K36FS SIMILAR TO TOSHIBA SSM3K36FS(TE85L,F)
Q501	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR
Q502	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR
Q504	TRANSISTOR 2SC5007 SIMILAR TO NEC 2SC5007-T1-A
Q505	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q506	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q507	TRANSISTOR 2SC5007 SIMILAR TO NEC 2SC5007-T1-A
Q801	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR
Q1001	FET SSM3K36FS SIMILAR TO TOSHIBA SSM3K36FS(TE85L,F)
Q1101	TRANSISTOR EMD5 SIMILAR TO ROHM EMD5-T2R
Q1102	TRANSISTOR EMD5 SIMILAR TO ROHM EMD5-T2R
Q1103	TRANSISTOR 2SA1774 SIMILAR TO ROHM 2SA1774-TLR
Q1104	TRANSISTOR 2SA1774 SIMILAR TO ROHM 2SA1774-TLR
Q1105	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR
Q1106	TRANSISTOR EMH9 SIMILAR TO ROHM EMH9-T2R
Q1107	FET SSM6N15FU SIMILAR TO TOSHIBA SSM6N15FU(TE85L,F)
Q1109	TRANSISTOR 2SA1774 SIMILAR TO ROHM 2SA1774-TLR
Q1110	FET SSM3K36FS SIMILAR TO TOSHIBA SSM3K36FS(TE85L,F)
Q1201	FET SSM6L05FU SIMILAR TO TOSHIBA SSM6L05FU-TE85L,F
Q1202	TRANSISTOR EMH9 SIMILAR TO ROHM EMH9-T2R
Q1203	TRANSISTOR 2SC4617 SIMILAR TO ROHM 2SC4617-TLR
Q1204	TRANSISTOR 2SA1774 SIMILAR TO ROHM 2SA1774-TLR
Q1205	TRANSISTOR 2SB1132 SIMILAR TO ROHM 2SB1132-T100Q
RESISTORS	
R101	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R102	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R103	RESISTOR METAL CHIP 560 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ561
R104	RESISTOR METAL CHIP 560 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ561
R105	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001

REF	DESCRIPTION
R107	RESISTOR METAL CHIP 39k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3902
R108	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R109	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R110	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R111	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R112	RESISTOR METAL CHIP 27 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF27R0
R113	RESISTOR METAL CHIP 18k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1802
R114	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R115	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R116	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R117	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R124	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R125	RESISTOR METAL CHIP 15 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF15R0
R126	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R127	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R130	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R131	RESISTOR METAL CHIP 6.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6801
R132	RESISTOR METAL CHIP 4.7 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ4R7
R133	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R135	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R145	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R146	RESISTOR METAL CHIP 560 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ561
R147	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R148	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R149	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R150	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R152	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R153	RESISTOR METAL CHIP 4.7 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ4R7
R155	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R201	RESISTOR METAL CHIP 18k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1802
R202	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R205	RESISTOR METAL CHIP 27 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF27R0
R206	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0

REF	DESCRIPTION
R207	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R209	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R210	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R211	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R212	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R213	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R214	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R215	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R216	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R217	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R218	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R219	RESISTOR METAL CHIP 1.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1801
R220	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R221	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R222	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R223	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R224	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R225	RESISTOR METAL CHIP 470k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4703
R226	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R227	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R228	RESISTOR METAL CHIP 1.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1201
R229	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R230	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R231	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R232	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R233	RESISTOR METAL CHIP 3.9k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3901
R234	RESISTOR METAL CHIP 6.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6801
R235	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R236	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203
R239	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R240	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R241	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R242	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203

REF	DESCRIPTION
R243	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R244	RESISTOR METAL CHIP 1.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1801
R247	RESISTOR METAL CHIP 1.5k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1501
R248	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R249	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R250	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R251	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R252	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R253	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R254	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R259	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R260	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R263	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R265	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R301	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R302	RESISTOR METAL CHIP 22k ±5% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R303	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R304	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R305	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R306	RESISTOR METAL CHIP 15k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1502
R307	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R308	RESISTOR METAL CHIP 39k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3902
R309	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R310	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R312	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R313	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R314	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R316	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R317	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R318	RESISTOR METAL CHIP 10 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ100
R319	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R321	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R322	RESISTOR METAL CHIP 22 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF22R0

REF	DESCRIPTION
R323	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R324	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R325	RESISTOR METAL CHIP 15k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1502
R326	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R327	RESISTOR METAL CHIP 3.3 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ3R3
R328	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R329	RESISTOR METAL CHIP 15 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF15R0
R330	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R331	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R332	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R334	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R335	RESISTOR METAL CHIP 1.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1201
R339	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R341	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R342	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R345	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R349	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R365	RESISTOR METAL CHIP 56k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5602
R408	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R412	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R413	RESISTOR METAL CHIP 6.8 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ6R8
R414	RESISTOR METAL CHIP 680 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6800
R421	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R422	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R423	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R424	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R425	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R426	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R427	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R428	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R429	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R430	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R431	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302

REF	DESCRIPTION
R433	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R435	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R436	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R437	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R438	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R439	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R440	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R501	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R502	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R503	RESISTOR METAL CHIP 15 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF15R0
R504	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R505	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R506	RESISTOR METAL CHIP 470 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4700
R507	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R508	RESISTOR METAL CHIP 39 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF39R0
R509	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R511	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R512	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R513	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R515	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R516	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R517	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R519	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R520	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R521	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R522	RESISTOR METAL CHIP 820k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF8203
R523	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R524	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R525	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R526	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R527	RESISTOR METAL CHIP 270 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2700
R528	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R529	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001

REF	DESCRIPTION
R530	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R531	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R532	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R533	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R535	RESISTOR METAL CHIP 33 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF33R0
R536	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R537	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R538	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R539	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R540	RESISTOR METAL CHIP 47 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF47R0
R543	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R544	RESISTOR METAL CHIP 120 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1200
R545	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R547	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R551	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R554	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R555	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R556	RESISTOR METAL CHIP 6.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF6801
R557	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R558	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R559	RESISTOR METAL CHIP 15 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF15R0
R560	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R601	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R602	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R603	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R604	RESISTOR METAL CHIP 1M ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1004
R605	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R606	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R609	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R610	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R613	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R614	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R615	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000

REF	DESCRIPTION
R616	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R617	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R618	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R620	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R621	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R623	RESISTOR METAL CHIP 27k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2702
R624	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R625	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R626	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R628	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R631	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R632	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R633	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R701	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R702	RESISTOR METAL CHIP 1.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1801
R703	RESISTOR METAL CHIP 390k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3903
R704	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R706	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R708	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R709	RESISTOR METAL CHIP 5.6k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5601
R710	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R711	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R712	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R713	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R714	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R715	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R716	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R717	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R718	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R719	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R720	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R721	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R722	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001

REF	DESCRIPTION
R724	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R725	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R726	RESISTOR METAL CHIP 3.3k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3301
R727	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R728	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R729	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R730	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R731	RESISTOR METAL CHIP 56k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5602
R732	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R734	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R735	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R736	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R737	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R803	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R806	RESISTOR METAL CHIP 9.1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF9101
R808	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R809	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R810	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R813	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R814	RESISTOR METAL CHIP 9.1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF9101
R817	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R820	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R822	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R823	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R824	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R827	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R829	RESISTOR METAL CHIP 24k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2402
R830	RESISTOR METAL CHIP 18k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1802
R831	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R832	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R833	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R834	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R835	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002

REF	DESCRIPTION
R837	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R838	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R839	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R840	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R841	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R842	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R843	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R844	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R845	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R901	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R902	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R903	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R905	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R907	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R908	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R909	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R910	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R911	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R912	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R913	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R914	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R916	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R917	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R919	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R920	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R921	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R922	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R923	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R924	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R925	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R928	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R932	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R933	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000

REF	DESCRIPTION
R934	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R936	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R937	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R938	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R939	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R941	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R945	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R946	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R948	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R951	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R953	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R954	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R955	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R957	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R958	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R959	RESISTOR ARRAY METAL CHIP 100 0.06W SIMILAR TO ROHM MNR04M0APJ101
R963	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1001	RESISTOR METAL CHIP 22 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF22R0
R1002	RESISTOR METAL CHIP 22 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF22R0
R1004	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1005	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R1006	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1007	VARISTOR METAL CHIP 22V 0.06W SIMILAR TO MARUWA CVS05A220M-TPA
R1008	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1009	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1010	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R1011	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R1012	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1013	RESISTOR ARRAY METAL CHIP 220 0.06W SIMILAR TO ROHM MNR04M0APJ221
R1014	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1015	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1018	RESISTOR METAL CHIP 1.5k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1501
R1019	RESISTOR METAL CHIP 27 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF27R0

REF	DESCRIPTION
R1020	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1021	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1022	RESISTOR METAL CHIP 27 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF27R0
R1023	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1024	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1026	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1028	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1029	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1030	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1031	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1034	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R1035	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1037	RESISTOR ARRAY METAL CHIP 10k 0.06W SIMILAR TO ROHM MNR04M0APJ103
R1038	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1039	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1040	RESISTOR METAL CHIP 1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1001
R1041	RESISTOR METAL CHIP 12k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1202
R1042	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1043	RESISTOR METAL CHIP 2.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2701
R1044	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1046	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1047	RESISTOR METAL CHIP 220 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2200
R1048	VARISTOR METAL CHIP 22V 0.06W SIMILAR TO MARUWA CVS05A220M-TPA
R1049	RESISTOR METAL CHIP 390 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ391
R1101	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203
R1102	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1103	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1104	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R1106	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1107	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1108	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203
R1109	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1110	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702

REF	DESCRIPTION
R1111	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1112	RESISTOR METAL CHIP 8.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF8201
R1113	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1115	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1116	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1117	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R1118	RESISTOR METAL CHIP 820k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF8203
R1119	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R1120	RESISTOR METAL CHIP 150k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1503
R1121	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1122	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1123	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1124	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1125	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203
R1126	RESISTOR METAL CHIP 1M ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1004
R1127	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1130	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R1131	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1132	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R1133	RESISTOR METAL CHIP 10 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF10R0
R1134	RESISTOR METAL CHIP 10 ±5% 0.1W SIMILAR TO ROHM MCR03EZPJ100
R1136	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R1139	RESISTOR METAL CHIP 330k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3303
R1140	RESISTOR METAL CHIP 330k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3303
R1141	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1142	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1143	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R1144	RESISTOR METAL CHIP 220k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2203
R1146	RESISTOR METAL CHIP 56k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF5602
R1152	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1153	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1154	RESISTOR METAL CHIP 33k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3302
R1155	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000

REF	DESCRIPTION
R1157	RESISTOR METAL CHIP 9.1k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF9101
R1207	RESISTOR METAL CHIP 330 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF3300
R1208	RESISTOR METAL CHIP 1M ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1004
R1209	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R1212	RESISTOR METAL CHIP 47 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF47R0
R1213	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
R1214	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1216	RESISTOR METAL CHIP 0 ±5% 0.06W SIMILAR TO ROHM MCR01MZPJ000
R1217	RESISTOR METAL CHIP 1.1 0.125W SIMILAR TO ROHM MCR10EZHFL1R10
R1220	RESISTOR METAL CHIP 47 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF47R0
R1221	RESISTOR METAL CHIP 470 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4700
R1222	RESISTOR METAL CHIP 820 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF8200
R1223	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1224	RESISTOR METAL CHIP 4.7k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4701
R1225	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1226	RESISTOR METAL CHIP 1.8k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1801
R1227	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1228	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1229	RESISTOR ARRAY METAL CHIP 22k 0.06W SIMILAR TO ROHM MNR04M0APJ223
R1230	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1231	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1232	RESISTOR METAL CHIP 47 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF47R0
R1233	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1234	RESISTOR METAL CHIP 47 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF47R0
R1235	RESISTOR ARRAY METAL CHIP 47 0.06W SIMILAR TO ROHM MNR04M0APJ470
R1239	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1240	RESISTOR METAL CHIP 47k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF4702
R1241	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1242	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201
R1243	RESISTOR METAL CHIP 1.1 0.125W SIMILAR TO ROHM MCR10EZHFL1R10
R1246	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1247	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1253	RESISTOR METAL CHIP 2.2k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2201

REF	DESCRIPTION
R1254	RESISTOR METAL CHIP 100 ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1000
R1255	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1256	RESISTOR METAL CHIP 100k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1003
R1257	RESISTOR METAL CHIP 22k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF2202
R1258	RESISTOR METAL CHIP 12k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1202
R1259	RESISTOR METAL CHIP 10k ±1% 0.06W SIMILAR TO ROHM MCR01MZPF1002
RT301	THERMISTOR METAL CHIP 47k SIMILAR TO MURATA NCP15WB473F03RC
RT701	THERMISTOR METAL CHIP 47k SIMILAR TO MURATA NCP15WB473F03RC
INTEGRATED CIRCUITS	
U201	MICRO CIRCUIT IF-IC NJM2552 SIMILAR TO JRC NJM2552V-TE1
U202	OP-AMP LMV651MGX SIMILAR TO LMV651MGX/NOPB
U203	MICRO CIRCUIT ANALOG SW SN74LVC2G53 SIMILAR TO T.I. SN74LVC2G53DCUR
U204	MICRO CIRCUIT ANALOG SW SN74LVC2G53 SIMILAR TO T.I. SN74LVC2G53DCUR
U205	MICRO CIRCUIT ANALOG SW SN74LVC2G53 SIMILAR TO T.I. SN74LVC2G53DCUR
U206	MICRO CIRCUIT OP AMP LMV321IDCKR SIMILAR TO T.I. LMV321IDCKR
U207	A/D CONVERTER ADS7886SB SIMILAR TO T.I. ADS7886SBDBVR
U208	OP-AMP LMV651MGX SIMILAR TO LMV651MGX/NOPB
U209	OP-AMP LMV651MGX SIMILAR TO LMV651MGX/NOPB
U301	MICRO CIRCUIT OP AMP LMC6482 SIMILAR TO T.I. LMC6482IMM/NOPB
U303	MICRO CIRCUIT RF AMP uPC2710 SIMILAR TO NEC uPC2710TB-E3-A
U304	MICRO CIRCUIT OP AMP LMV358I SIMILAR TO T.I. LMV358IDGKR
U305	MICRO CIRCUIT REGULATOR IC TK77250 SIMILAR TO TOKO TK77250AMHG0L
U306	MICRO CIRCUIT REGULATOR IC TK77250 SIMILAR TO TOKO TK77250AMHG0L
U307	MICRO CIRCUIT REGULATOR IC TK77233 SIMILAR TO TOKO TK77233AMHG0L
U401	Q-MOD AD8345 SIMILAR TO A.D. AD8345AREZ-RL7
U402	LTC1992HMS8 SIMILAR TO LINEAR LTC1992HMS8#TRPBF
U403	LTC1992HMS8 SIMILAR TO LINEAR LTC1992HMS8#TRPBF
U501	ADF4252 SIMILAR TO A.D. ADF4252BCPZ-R7
U502	ADF4252 SIMILAR TO A.D. ADF4252BCPZ-R7
U504	PRESCALER UPB1509GV SIMILAR TO RENESAS UPB1509GV-E1-A
U510	D/A CONVERTER DAC7552(TI) SIMILAR TO T.I. DAC7552IRGTR
U600	DSP OMAP5910 SIMILAR TO T.I. OMAP5910JZZG2
U601	CODEC IC TLV320AIC3105 SIMILAR TO T.I. TLV320AIC3105IRHBT
U602	AK4386 SIMILAR TO ASAHIKASEI AK4386VT-E2
U603	MICRO CIRCUIT OP AMP TLV2372 SIMILAR TO T.I. TLV2372IDGKR
U604	I.C TC7SHU04FU SIMILAR TO TOSHIBA TC7SHU04FU(TE85L,JF)
U605	MICRO CIRCUIT OP AMP LMV358I SIMILAR TO T.I. LMV358IDGKR
U701	FLASH ROM S29WS256P0PBFW00 SIMILAR TO SPANSION S29WS256P0PBFW000
U702	SRAM CY62167EV18LL-55BVXIT SIMILAR TO CYPRESS CY62167EV18LL-55BVXIT
U703	GateArray UPD65880GB SIMILAR TO RENESAS UPD65880GB-104-UES-A
U704	LEVEL SHIFTER SN74LVC8T245 SIMILAR TO T.I. SN74LVC8T245RHLR
U705	A/D CONVERTER ADC78H89 SIMILAR TO N.S. ADC78H89CIMTX/NOPB
U706	D/A CONVERTER LTC1665IGN SIMILAR TO LINEAR LTC1665IGN#TRPBF
U707	AND IC SN74LVC1G08DCKR SIMILAR TO T.I. SN74LVC1G08DCKR
U804	A.PA MAX9768B SIMILAR TO MAXIM MAX9768BETG+T
U805	MICRO CIRCUIT OP AMP LMV321 SIMILAR TO T.I. LMV321IDCKR
U906	SHIFT REGISTER SN74LV595APWR SIMILAR TO T.I. SN74LV595APWR
U908	MICRO CIRCUIT SHMITT-TRIGER INV IC SN74LVC1G14DCKR SIMILAR TO T.I. SN74LVC1G14DCKR
U1002	Level Shift TC7WBD125AFK SIMILAR TO TOSHIBA TC7WBD125AFK-T5L,F
U1102	DC/DC CONVERTER LTC3601 SIMILAR TO LINEAR LTC3601EUD#TRPBF
U1103	REGULATOR TAR5S50U SIMILAR TO TOSHIBA TAR5S50U-TE85L,F
U1104	REGULATOR S-1165B33 SIMILAR TO SII S-1165B33MC-N6S-TFG
U1105	Detector TPS3808G01 SIMILAR TO T.I. TPS3808G01DBVR
U1106	DC/DC CONVERTER LTC3542 SIMILAR TO LINEAR LTC3542ES6#TRMPBF
U1107	REGULATOR S-1165B33 SIMILAR TO SII S-1165B33MC-N6S-TFG
U1108	REGULATOR S-1165B18MC SIMILAR TO SII S-1165B18MC-N6D-TFG
U1109	Detector S-80850CNNB-B9BT2G SIMILAR TO SII S-80850CNNB-B9BT2G
U1202	SN74CBTD3306C SIMILAR TO T.I. SN74CBTD3306CPWR
U1203	I.C TC7SHU04FU SIMILAR TO TOSHIBA TC7SHU04FU(TE85L,JF)
U1204	INV IC TC7SG14FU SIMILAR TO TOSHIBA TC7SG14FU(TE85L/F)

15.2 INTERFACE BOARD
G4UD09640, Rev. 4

REF	DESCRIPTION
CAPACITORS	
C1	CAPACITOR, CERAMIC CHIP, 1u, 16V, Similar to MURATA GRM188B31C105KA92D
C5	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C6	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E

REF	DESCRIPTION
C7	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C8	CAPACITOR ARRAY, CERAMIC CHIP, 47p, 50V, Similar to MURATA GNM2142C1H470KD01D
C11	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C12	CAPACITOR ARRAY, CERAMIC CHIP, 47p, 50V, Similar to MURATA GNM2142C1H470KD01D
C14	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C15	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C16	CAPACITOR ARRAY, CERAMIC CHIP, 47p, 50V, Similar to MURATA GNM2142C1H470KD01D
C18	CAPACITOR ARRAY, CERAMIC CHIP, 47p, 50V, Similar to MURATA GNM2142C1H470KD01D
C26	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C27	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C28	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C30	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C31	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C32	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C33	CAPACITOR, CERAMIC CHIP, 47p, 50V, Similar to MURATA GRM1552C1H470JZ01E
C39	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
C40	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
C41	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
C42	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
C43	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
C44	CAPACITOR, CERAMIC CHIP, 0.01u, 25V, Similar to MURATA GRM155R11E103KA01E
DIODES	
CR1	Thyristor, NYC0102BLT1G, Similar to ON Semi NYC0102BLT1G
CR3	Thyristor, NYC0102BLT1G, Similar to ON Semi NYC0102BLT1G
CR4	DIODE, 12V, Similar to NEC NNCD12F-T1B-A
CR5	DIODE, Similar to ROHM EDZTE616.8B
CR6	DIODE, Similar to ROHM EDZTE616.8B
CR7	DIODE, Similar to ROHM EDZTE616.8B

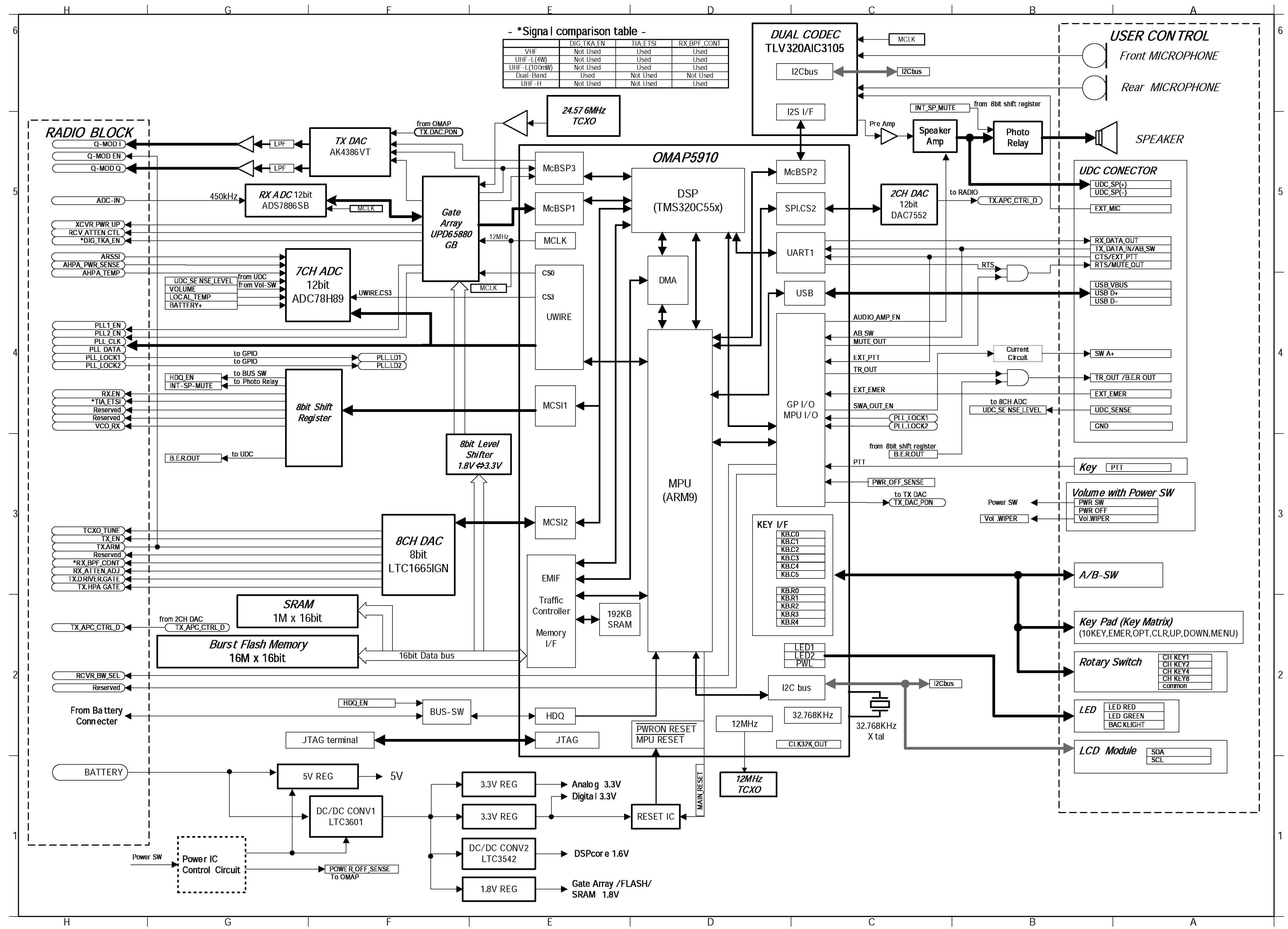
REF	DESCRIPTION
CR8	DIODE, 6.2V, Similar to NEC NNCD6.2G-T1-A
CR9	Thyristor, NYC0102BLT1G, Similar to ON Semi NYC0102BLT1G
CR10	DIODE, 12V, Similar to NEC NNCD12F-T1B-A
CR13	DIODE, 6.2V, Similar to NEC NNCD6.2G-T1-A
CR21	LED, HSMG-C170, Similar to Avago HSME-C170
CR22	LED, HSMG-C170, Similar to Avago HSME-C170
CR23	LED, HSMG-C170, Similar to Avago HSME-C170
CR24	LED, HSMG-C170, Similar to Avago HSME-C170
CR25	LED, HSMG-C170, Similar to Avago HSME-C170
CR26	LED, HSMG-C170, Similar to Avago HSME-C170
CR29	DIODE, CL-221YG, Similar to Avago HSME-C110
CR30	DIODE, CL-221YG, Similar to Avago HSME-C110
CR31	DIODE, CL-221YG, Similar to Avago HSME-C110
CR32	DIODE, CL-221YG, Similar to Avago HSME-C110
CONNECTORS	
J11	CONNECTOR, AXK6S40547YG, Similar to Panasonic AXK6S40547YG
J12	CONNECTOR, CFP4508-0150F, Similar to SMK CFP4508-0150F
J13	CONNECTOR, XF2W-2015-1A, Similar to OMRON XF2W-2015-1A
RESISTORS	
R1	RESISTOR METAL CHIP 1k 0.06W SIMILAR TO ROHM MCR01MZPF1001
R3	RESISTOR METAL CHIP 0 0.1W SIMILAR TO ROHM MCR03EZPJ000
R4	RESISTOR METAL CHIP 0 0.1W SIMILAR TO ROHM MCR03EZPJ000
R5	RESISTOR METAL CHIP 0 0.1W SIMILAR TO ROHM MCR03EZPJ000
R11	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R12	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R13	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R15	RESISTOR METAL CHIP 1k 0.06W SIMILAR TO ROHM MCR01MZPF1001
R16	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R17	RESISTOR METAL CHIP 22k 0.06W SIMILAR TO ROHM MCR01MZPF2202
R18	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R19	RESISTOR METAL CHIP 0 0.1W SIMILAR TO ROHM MCR03EZPJ000
R20	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R22	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R24	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R25	RESISTOR METAL CHIP 270 0.1W SIMILAR TO ROHM MCR03EZPJ271

REF	DESCRIPTION
R26	RESISTOR METAL CHIP 270 0.1W SIMILAR TO ROHM MCR03EZPJ271
R27	RESISTOR METAL CHIP 270 0.1W SIMILAR TO ROHM MCR03EZPJ271
R29	RESISTOR METAL CHIP 1.5k 0.1W SIMILAR TO ROHM MCR03EZPJ152
R30	RESISTOR METAL CHIP 1.5k 0.1W SIMILAR TO ROHM MCR03EZPJ152
R31	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R32	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R33	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R34	RESISTOR METAL CHIP 150k 0.06W SIMILAR TO ROHM MCR01MZPF1503
R35	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R36	RESISTOR METAL CHIP 150k 0.06W SIMILAR TO ROHM MCR01MZPF1503
R37	RESISTOR METAL CHIP 100 0.06W SIMILAR TO ROHM MCR01MZPF1000
R38	RESISTOR ARRAY METAL CHIP 150k 0.06W SIMILAR TO ROHM MNR04M0APJ154
R39	RESISTOR METAL CHIP 150k 0.06W SIMILAR TO ROHM MCR01MZPF1503
R41	RESISTOR METAL CHIP 1k 0.06W SIMILAR TO ROHM MCR01MZPF1001

REF	DESCRIPTION
R44	RESISTOR METAL CHIP 22k 0.06W SIMILAR TO ROHM MCR01MZPF2202
R45	RESISTOR METAL CHIP 1.5k 0.1W SIMILAR TO ROHM MCR03EZPJ152
R46	RESISTOR METAL CHIP 1.5k 0.1W SIMILAR TO ROHM MCR03EZPJ152
R49	RESISTOR METAL CHIP 22k 0.06W SIMILAR TO ROHM MCR01MZPF2202
R54	BARRISTER METAL CHIP 22V SIMILAR TO MARUWA CVS05A220M-TPA
R58	RESISTOR METAL CHIP 0 0.1W SIMILAR TO ROHM MCR03EZPJ000
R60	BARRISTER METAL CHIP 22V SIMILAR TO MARUWA CVS05A220M-TPA
INTEGRATED CIRCUITS	
U2	AND IC SN74LVC1G08 SIMILAR TO T.I. SN74LVC1G08DCKR
U3	AND IC SN74AHCT1G08 SIMILAR TO T.I. SN74AHCT1G08DCKR
U4	MICRO CIRCUIT TRANSIENT SUPPRESSOR SN65220 SIMILAR TO T.I. SN65220DBVR
U5	AND IC SN74AHCT1G08 SIMILAR TO T.I. SN74AHCT1G08DCKR
U6	AND IC SN74AHCT1G08 SIMILAR TO T.I. SN74AHCT1G08DCKR
U7	AND IC SN74LVC1G08 SIMILAR TO T.I. SN74LVC1G08DCKR

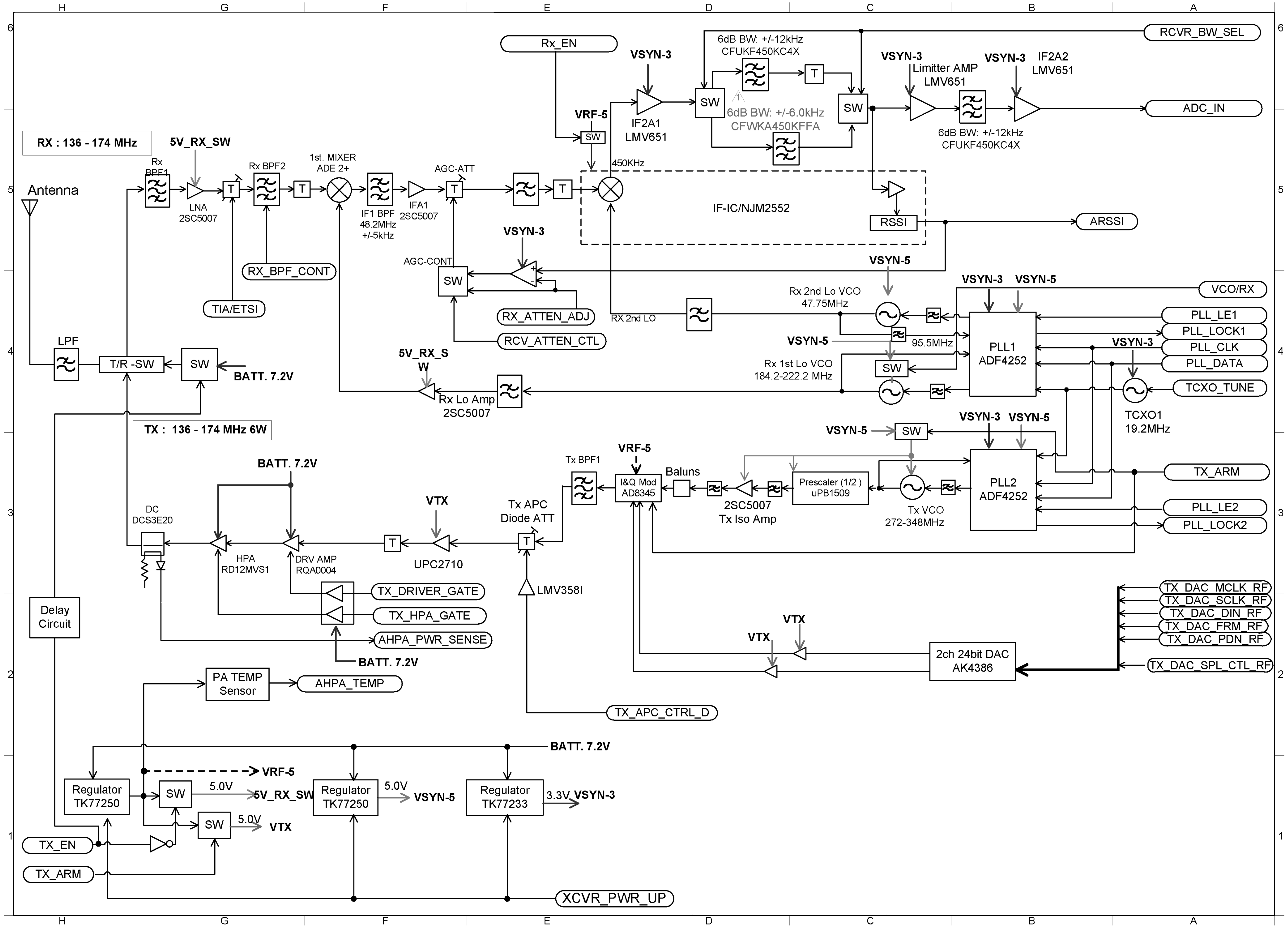
16. BLOCK DIAGRAMS

16.1 LOGIC BLOCK DIAGRAM



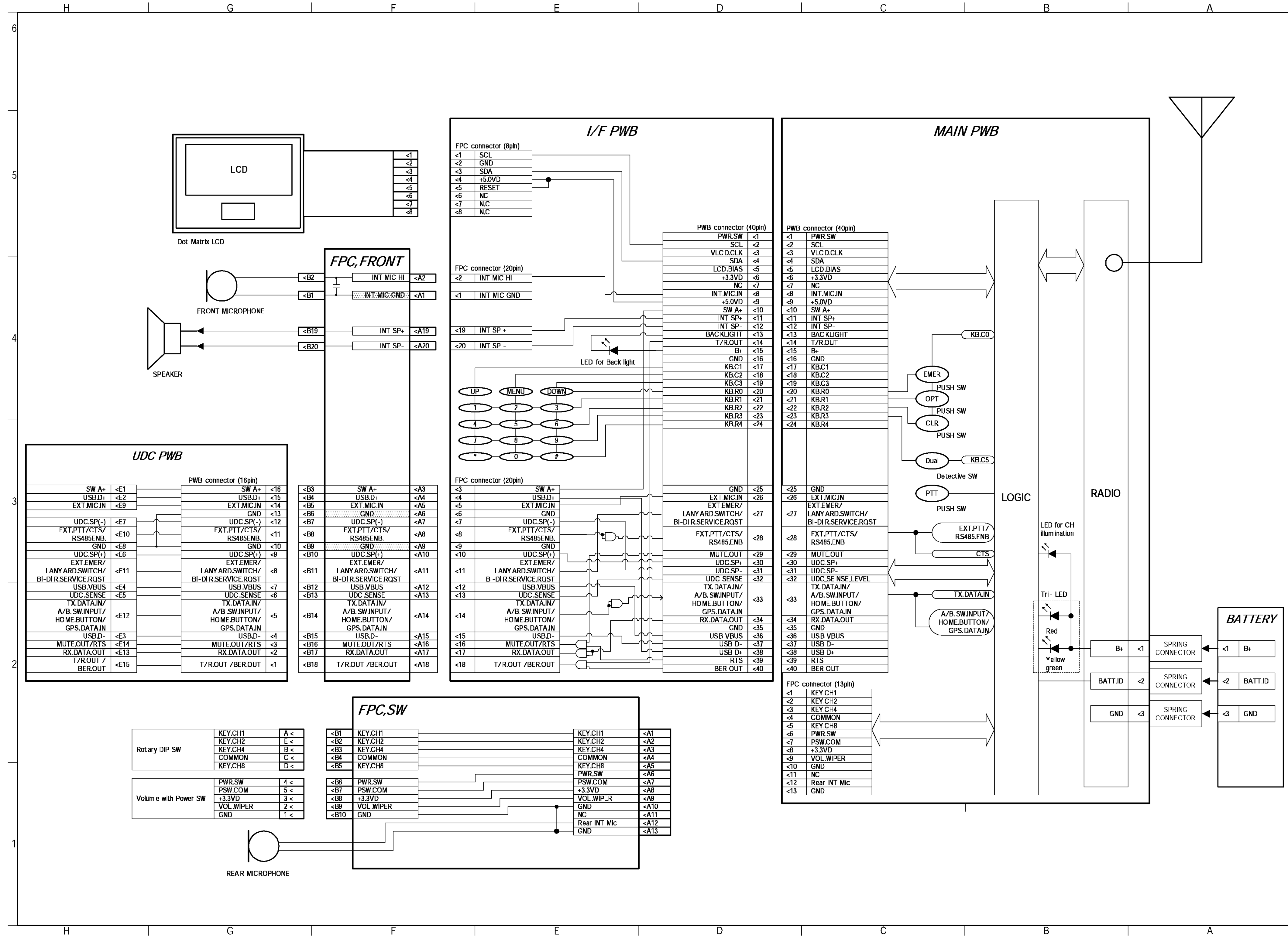
LOGIC BLOCK DIAGRAM
G3UD10021, Rev. 0

16.2 RF BLOCK DIAGRAM



RF BLOCK DIAGRAM
G3UD10061, Rev. 1

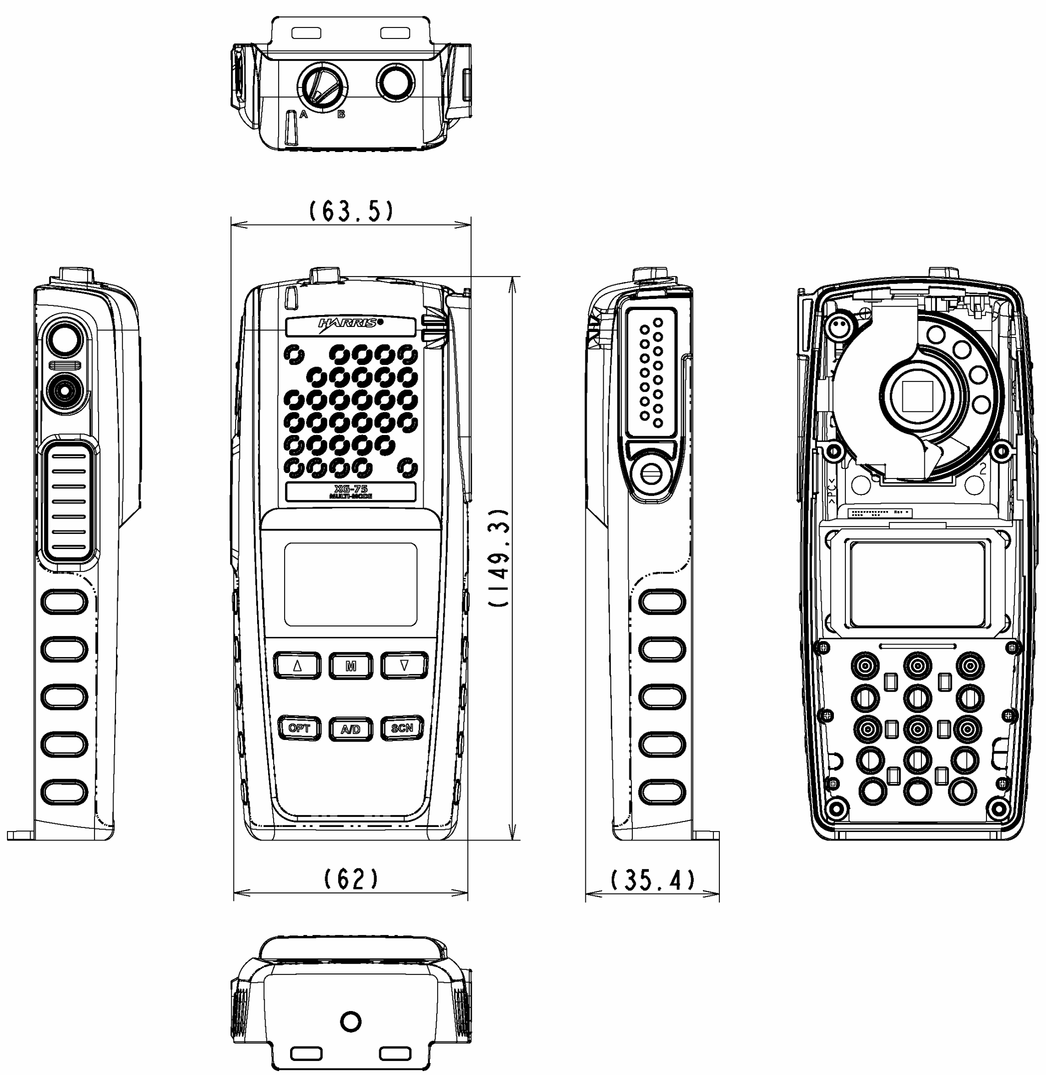
17. INTERCONNECTION DIAGRAM



INTERCONNECTION DIAGRAM
G3UD10023, Rev. 0

18. ASSEMBLY DIAGRAMS

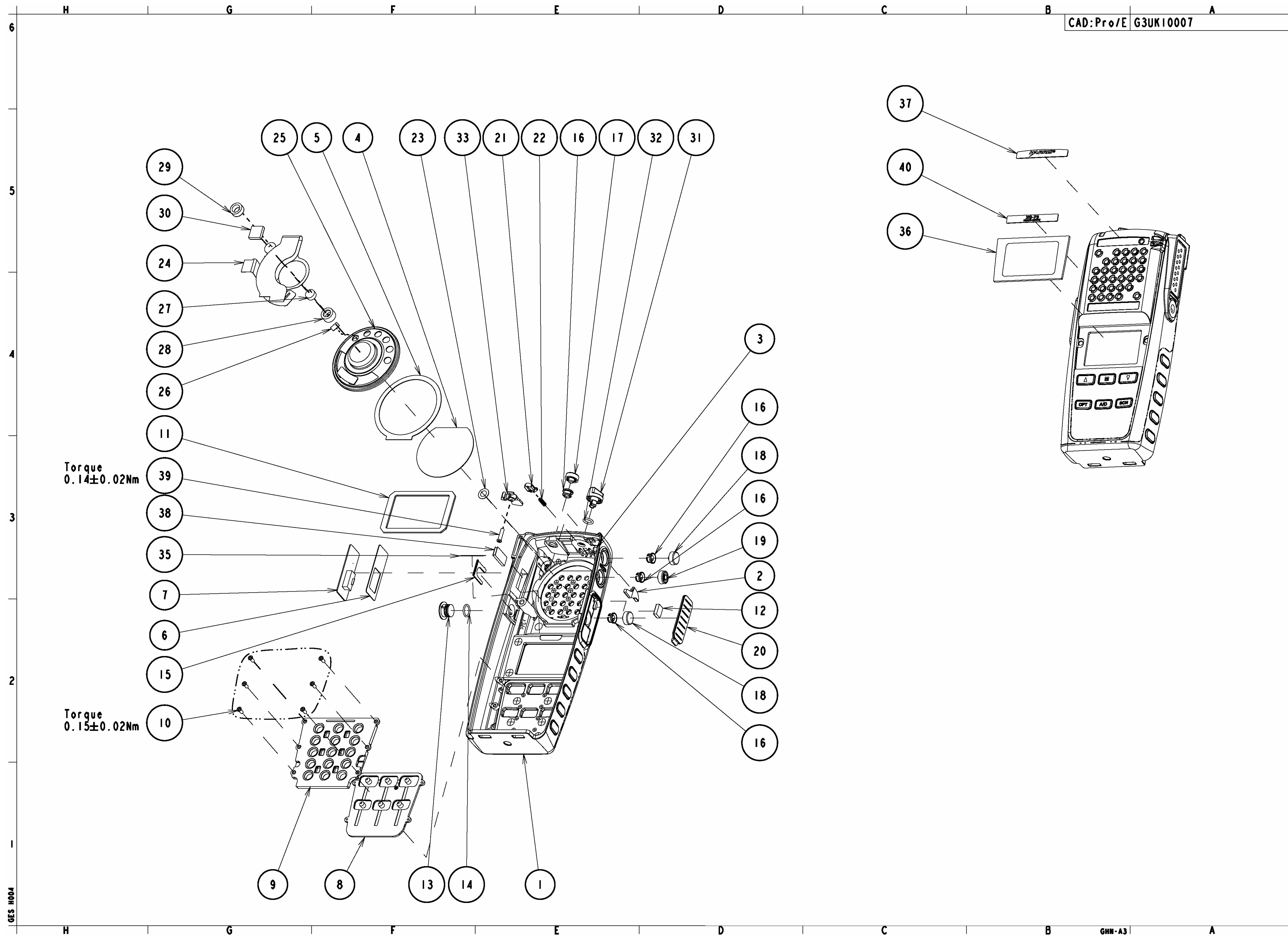
18.1 FRONT COVER ASSEMBLY



CAD:Pro/E G3UK10007

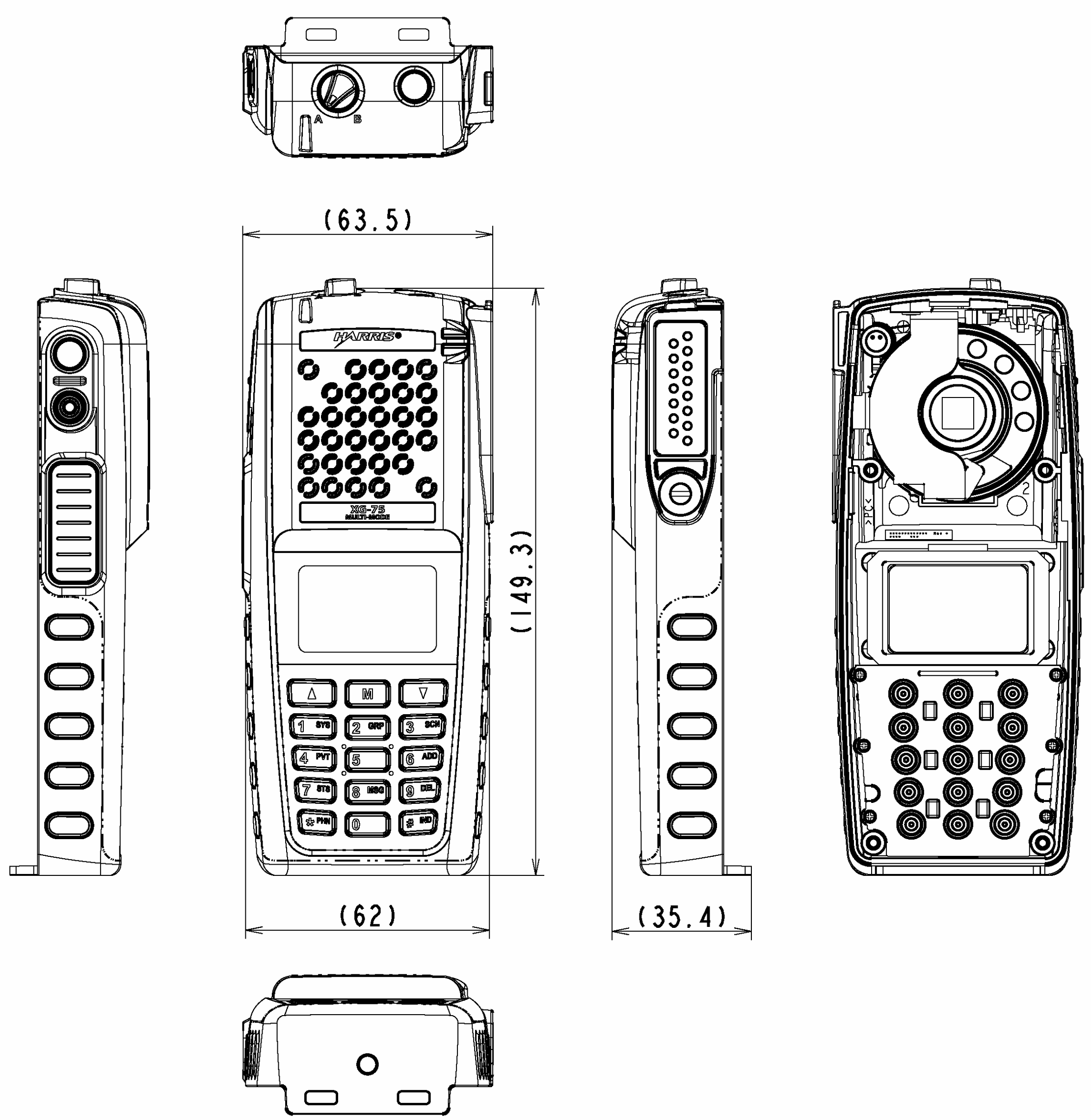
1	Front Housing, Scan (B/G)			1	
2	Indicator, LED			1	
3	Adhesive			1	0.1g
4	Cloth, Speaker			1	
5	Adhesive Tape, Speaker			1	
6	Gasket, UDC			1	
7	UDC P/B			1	
8	Keypad, Scan			1	
9	Lightguide, Keypad			1	
10	Screw M1.7x4			6	
11	Dust Gasket, LCD			1	
12	Cussion, PTT (Hard)			1	
13	Insert Quarter Turn			1	
14	O-ring, Quarter Turn			1	
15	Stopper, Quarter Turn			1	
16	Button Holder			4	
17	Emergency Button			1	
18	Option Button			2	
19	Clear Button			1	
20	PTT Button			1	
21	Dual SW Actuator			1	
22	Dual SW Spring			1	
23	Mic Net			1	
24	FPC, Front			1	
25	Speaker			1	
26	Adhesive Tape, FPC Front			1	
27	Microphone			1	
28	MIC Holder			1	
29	Cussion, Mic			1	
30	Cussion, Speaker			1	
31	Dual SW Knob			1	
32	O-Ring, Dual SW			1	
33	Dual SW Holder			1	
34	Silicone Grease			1	0.1g
35	ASSY REVISION LABEL (L)			1	
36	LCD Lens			1	
37	Logo Label A			1	
38	Shading Tape			1	
39	Theread Forming Screw			1	
40	Logo Label B			1	

FRONT COVER ASSEMBLY (SCAN)
G3UK10007, Rev. 0, Page 1 of 2



FRONT COVER ASSEMBLY (SCAN)
G3UK10007, Rev. 0, Page 2 of 2

CAD:Pro/E G3UK10009



PARTS No.	PARTS NAME	SPECIFICATIONS	MATERIAL	Q'TY	REMARKS
1	Front Housing, System (B/G)			1	
2	Indicator, LED			1	
3	Adheasive			1	0.1g
4	Cloth, Speaker			1	
5	Adhesive Tape, Speaker			1	
6	Gasket, UDC			1	
7	UDC P/B			1	
8	Keypad, System			1	
9	Lightguide, Keypad			1	
10	Screw M1.7x4			6	
11	Dust Gasket, LCD			1	
12	Cussion, PTT (Hard)			1	
13	Insert Quarter Turn			1	
14	O-ring, Quarter Turn			1	
15	Stopper, Quarter Turn			1	
16	Button Holder			4	
17	Emergency Button			1	
18	Option Button			2	
19	Clear Button			1	
20	PTT Button			1	
21	Dual SW Actuator			1	
22	Dual SW Spring			1	
23	Mic Net			1	
24	FPC, Front			1	
25	Speaker			1	
26	Adhesive Tape, FPC Front			1	
27	Microphone			1	
28	MIC Holder			1	
29	Cussion, Mic			1	
30	Cussion, Speaker			1	
31	Dual SW Knob			1	
32	O-Ring, Dual SW			1	
33	Dual SW Holder			1	
34	Silicone Grease			1	0.1g
35	ASSY REVISION LABEL (L)			1	
36	LCD Lens			1	
37	Logo Label A			1	
38	Shading Tape			1	
39	Theread Forming Screw			1	
40	Logo Label B			1	

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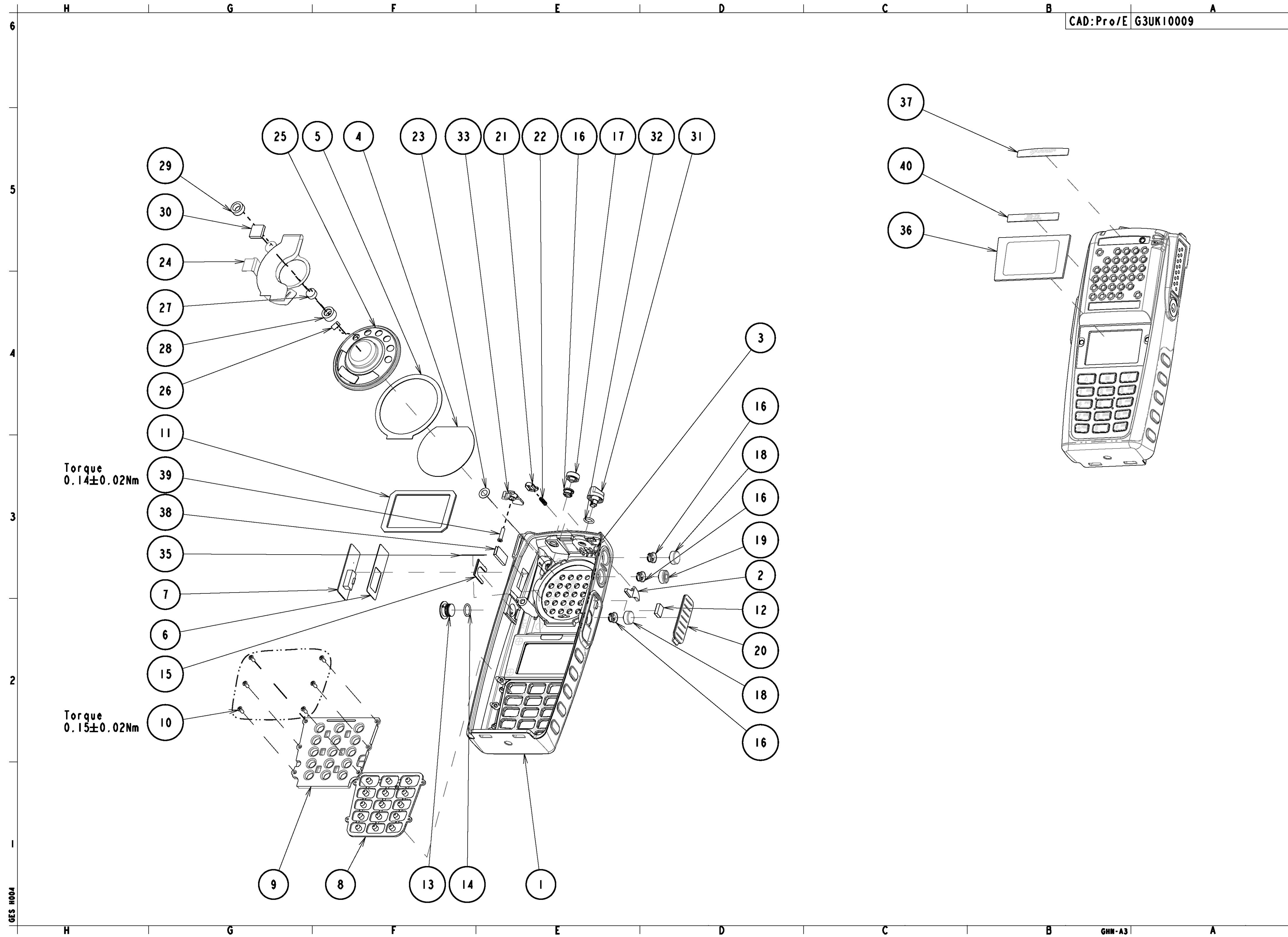
FRONT COVER ASSEMBLY
(SYSTEM)



FRONT COVER ASSEMBLY (SYSTEM)
G3UK10009, Rev. 0, Page 2 of 2

18.2 REAR CASTING ASSEMBLY

REVISIONS

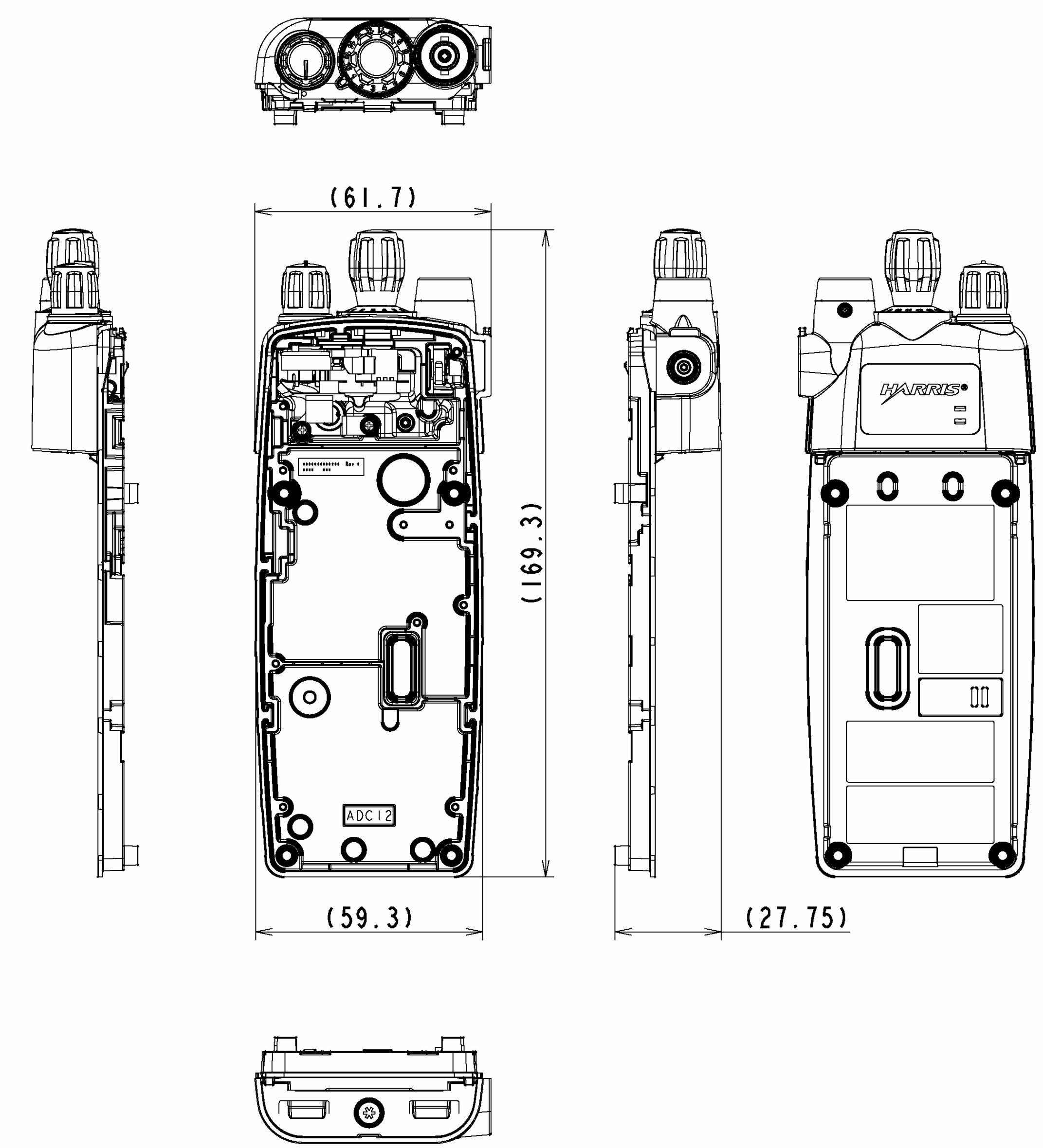
SYMBOL	DATE	POSITION	DESCRIPTION	APPROVED	CHECKED	REVISED
Δ1						
Δ2						
Δ3						
Δ4						
Δ5						

TOLERANCES ±mm GES H017

GRID REFERENCE\CLASS	FIRST	SECOND	THIRD
UNDER 6	0.05	0.1	0.3
OVER 6 UNDER 30	0.1	0.2	0.5
OVER 30 UNDER 120	0.15	0.3	0.8
OVER 120 UNDER 400	0.2	0.5	1.2
OVER 400 UNDER1000	0.3	0.8	2.0
OVER 1000 UNDER2000	0.5	1.2	3.0

CAD:Pro/E G3UK10010

1	Rear Housing			1	
2	Adheasive			1	0.2g
3	Cussion, Mic			1	
4	MIC Holder			1	
5	Rear Cover			1	
6	Screw, Rear Cover			1	
7	Gasket(Screw)			1	
8	Indicator, CH Number			1	
9	O-Ring, Indicator, CH			1	
10	FPC,SW			1	
11	VOL SW			1	
12	CH SW			1	
13	O-Ring, SW			2	
14	SW Nut			2	
15	CH Knob Holder			1	
16	LOCTITE			1	0.03ml
17	Lightguide, CH Number			1	
18	Super CH Knob			1	
19	VOL Knob Holder			1	
20	O-Ring, Vol Knob			1	
21	Super Vol Knob			1	
22	Antenna Launch			1	
23	Antenna Contact			1	
24	Screw, Antenna Launch			2	
25	Antenna Insert			1	
26	O-ring ANT Insert			1	
27	Set Screw M2.6x3			3	
28	RF Connector			1	
29	O-ring, RF Connector 1			2	
30	O-ring, RF Connector 2			1	Wire D=0.7mm
31	Mic Net			1	
32	Gasket, Housing			1	
33	ASSY REVISION LABEL (L)			1	
34	Microphone			1	
35	Plate, MC			1	
36	Rear Cover Label			1	
37	Silicon Grease			1	0.1g
38	Shading Tape, Indicator			1	
39	Screw, Main P/B			2	



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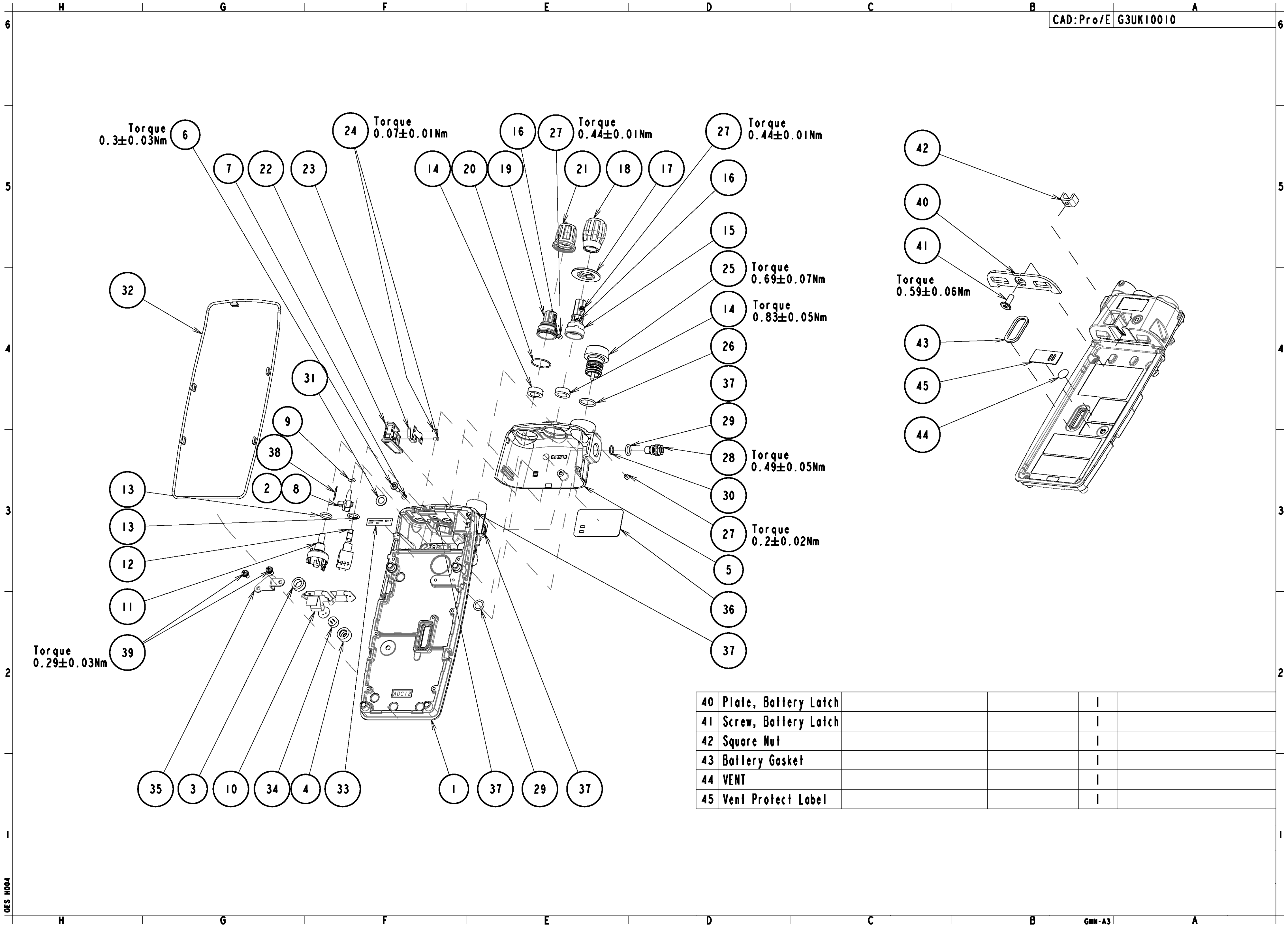
REAR CASTING ASSEMBLY
G3UK10010, Rev. 0, Page 1 of 2



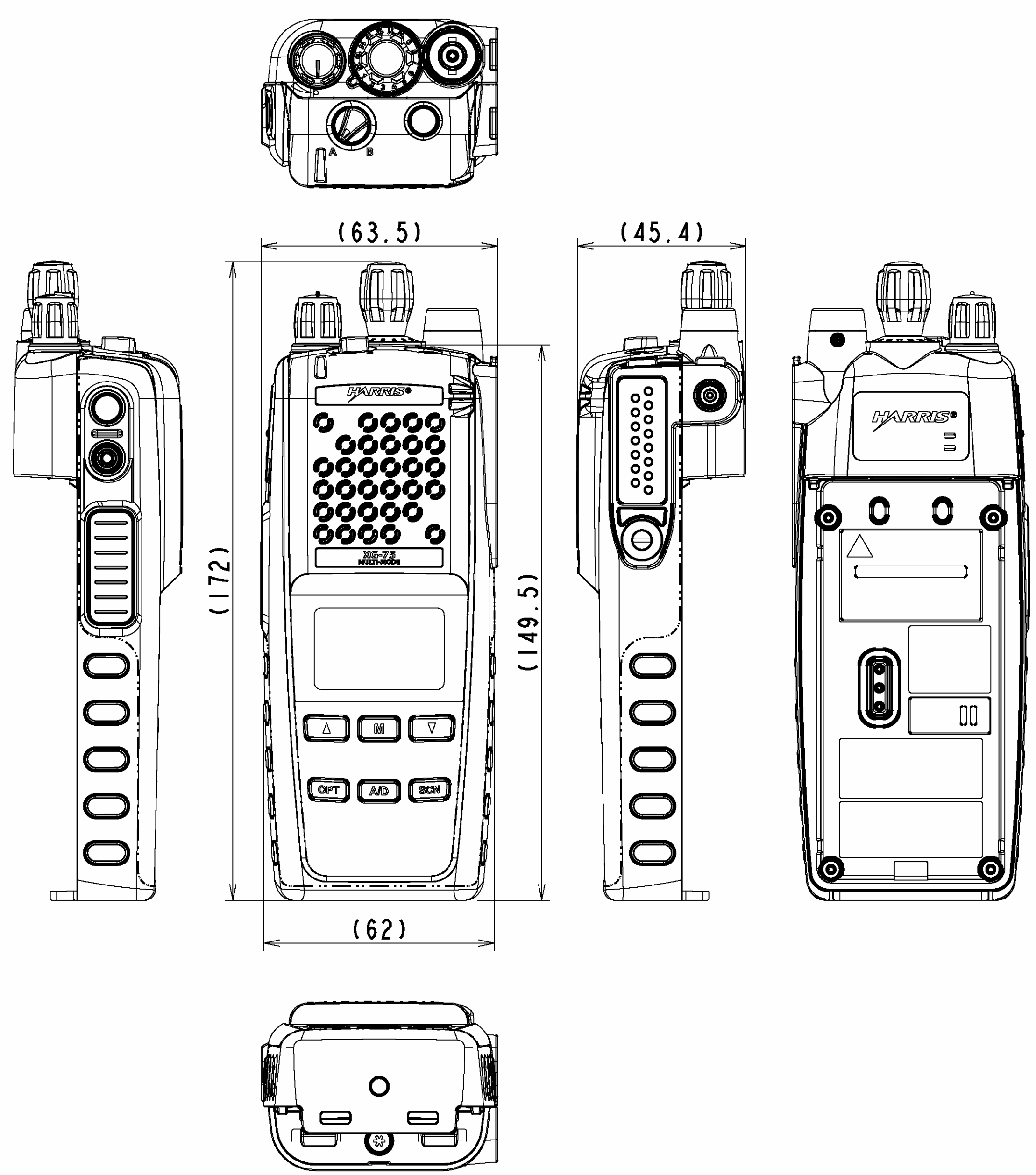
40	Plate, Battery Latch			1	
41	Screw, Battery Latch			1	
42	Square Nut			1	
43	Battery Gasket			1	
44	VENT			1	
45	Vent Protect Label			1	

REAR CASTING ASSEMBLY

G3UK10010, Rev. 0, Page 2 of 2

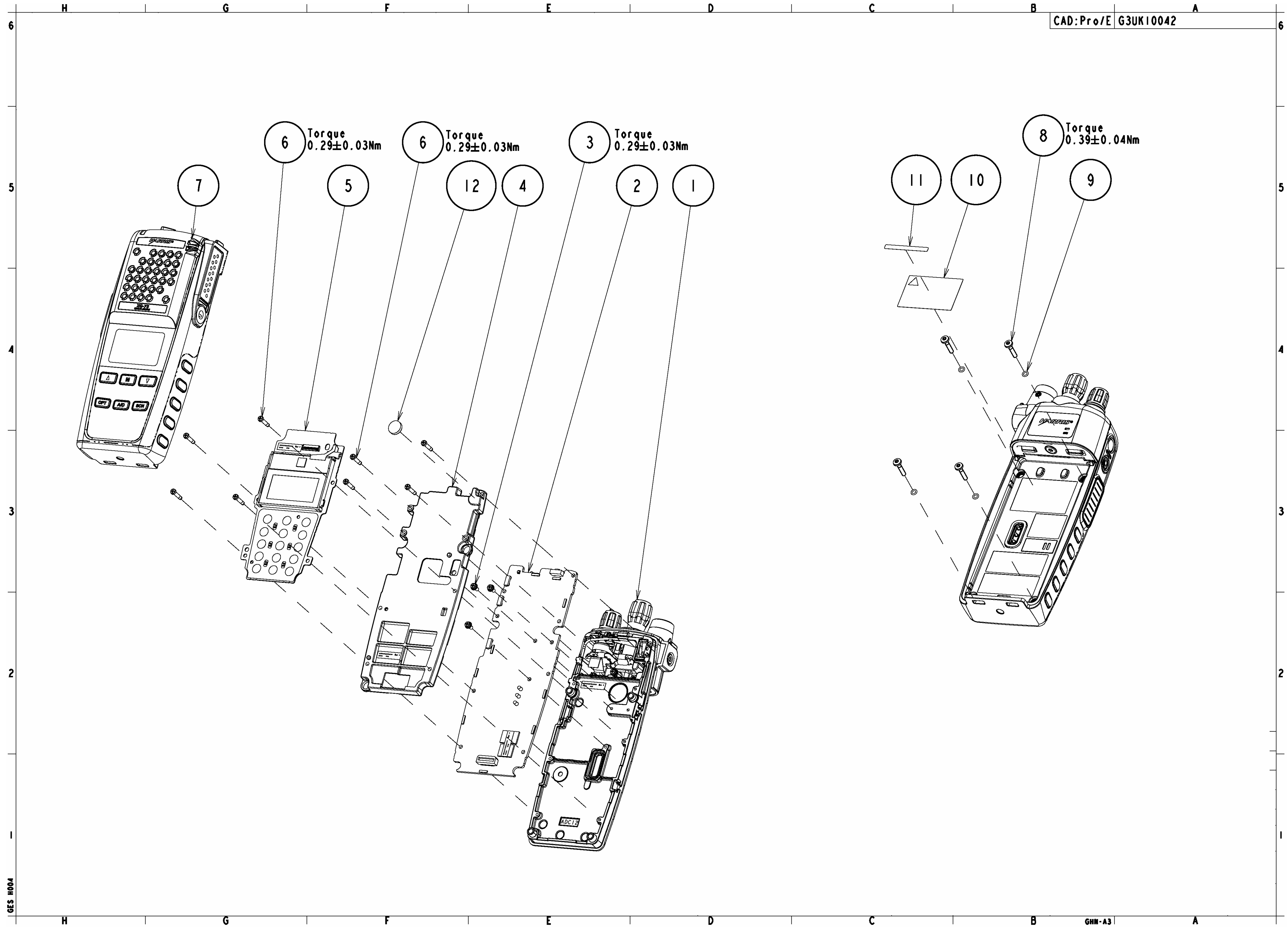
18.3 UNIT ASSEMBLY

CAD:Pro/E G3UK10042



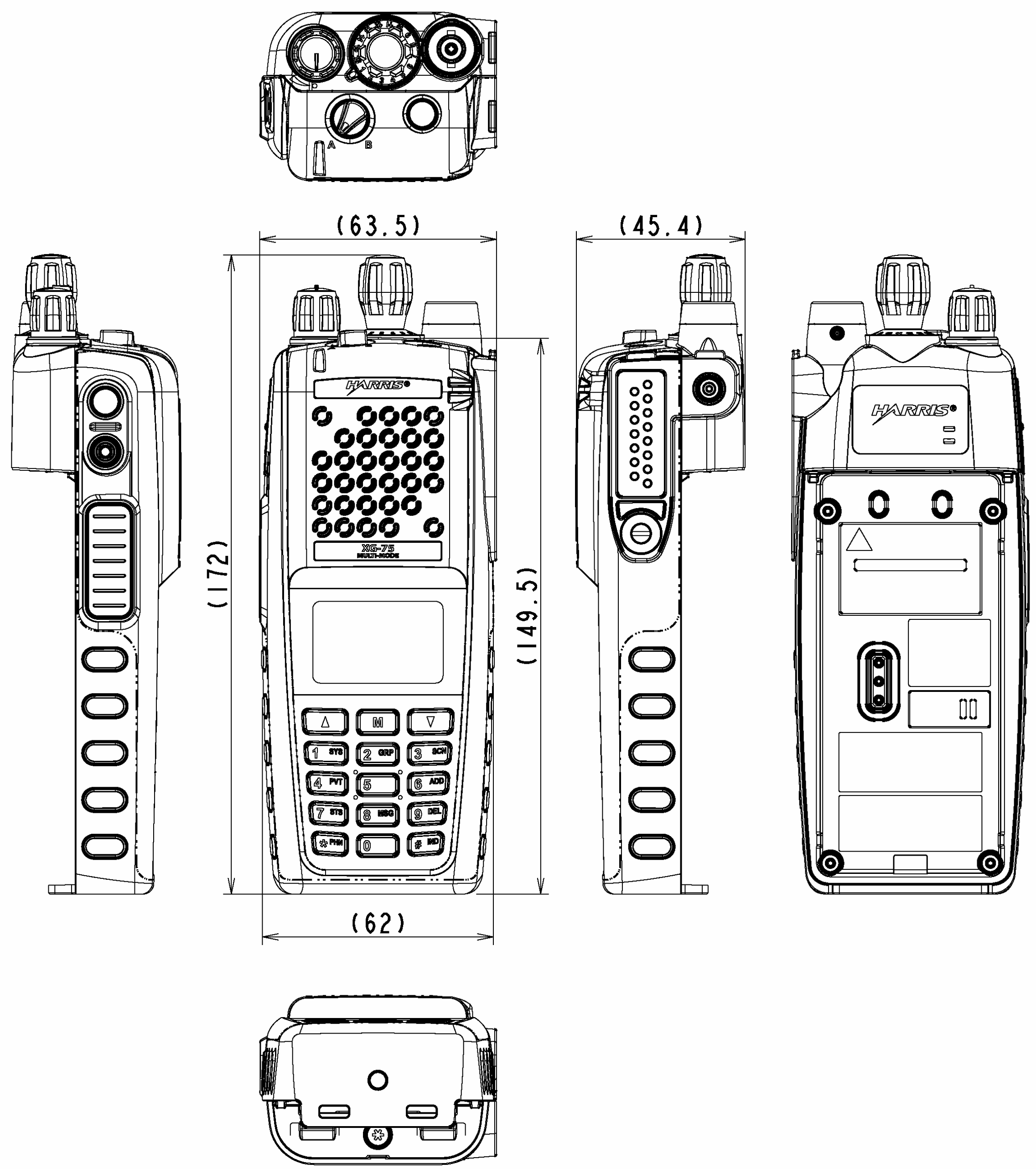
1	Rear Casting Assembly			1	
2	Main PWB Asssembly			1	
3	Screw, Main P/B			3	
4	RF Shield Assembly			1	
5	Interface Board Assembly			1	
6	Screw, IF P/B			8	
7	Fornt Cover Assembly			1	Scan (B/G)
8	Screw, Front-Rear			4	
9	O-ring, Screw			4	
10	Permanent Label			1	
11	Protection Film			1	
12	MIC Spacer			1	

UNIT ASSEMBLY (SCAN)
G3UK10042, Rev. 0, Page 1 of 2



UNIT ASSEMBLY (SCAN)
G3UK10042, Rev. 0, Page 2 of 2

CAD:Pro/E G3UK10044



1	Rear Casting Assembly	G3UK10010		1	
2	Main PWB Asssembly			1	
3	Screw, Main P/B	M2×5 Ni		3	
4	RF Shield Assembly	G3UK09169		1	
5	Interface Board Assembly	G3UK10012		1	
6	Screw, IF P/B	G4UK08252		8	
7	Front Cover Assembly	G3UK10009		1	System (B/G)
8	Screw, Front-Rear	G4UK09037		4	
9	O-ring, Screw	G4UK08315		4	
10	Permanent Label	G3UK09170		1	
11	Protection Film	G4UK07612		1	
12	MIC Spacer	G4UK09823		1	

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UNIT ASSEMBLY (SYSTEM)

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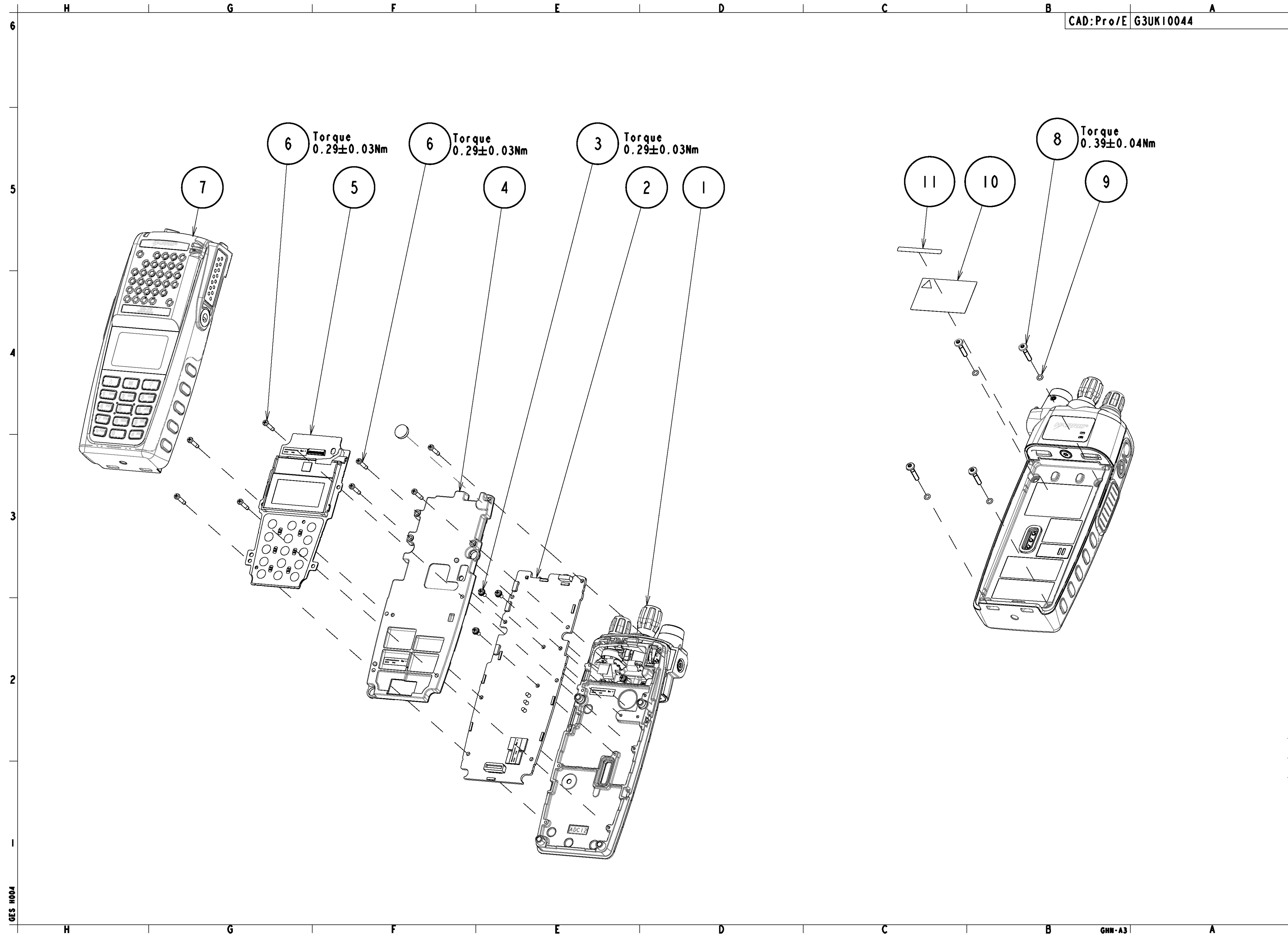
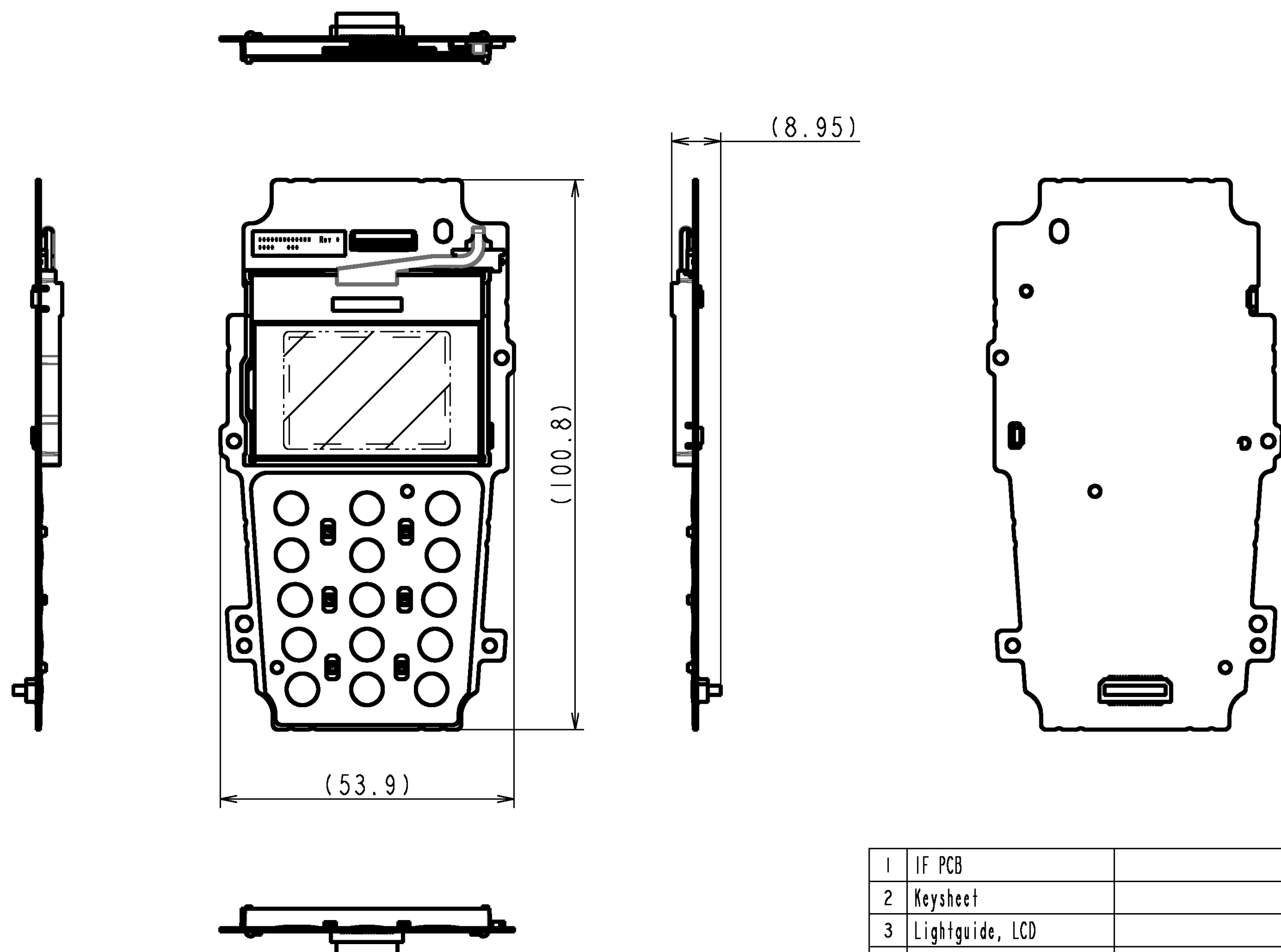


UNIT ASSEMBLY (SYSTEM)
G3UK10044, Rev. 0, Page 2 of 2

18.4 INTERFACE BOARD ASSEMBLY

CAD:Pro/E G3UK10012



PARTS No.	PARTS NAME	SPECIFICATIONS	MATERIAL	Q'TY	REMARKS
1	IF PCB			1	
2	Keysheet			1	
3	Lightguide, LCD			1	
4	LCD Adhesive tape			1	
5	LCD Module			1	
6	ASSY REVISION LABEL (L)			1	

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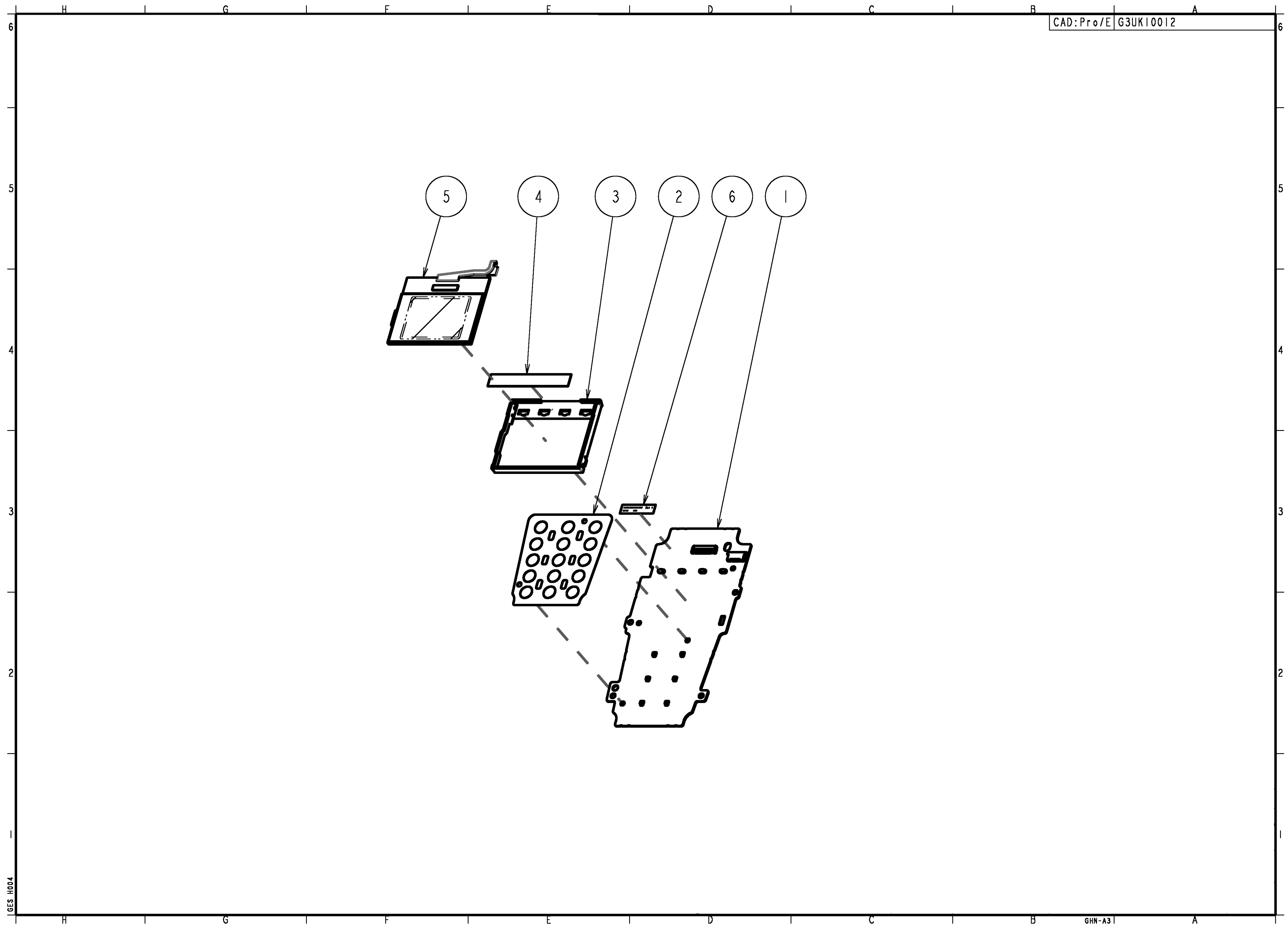
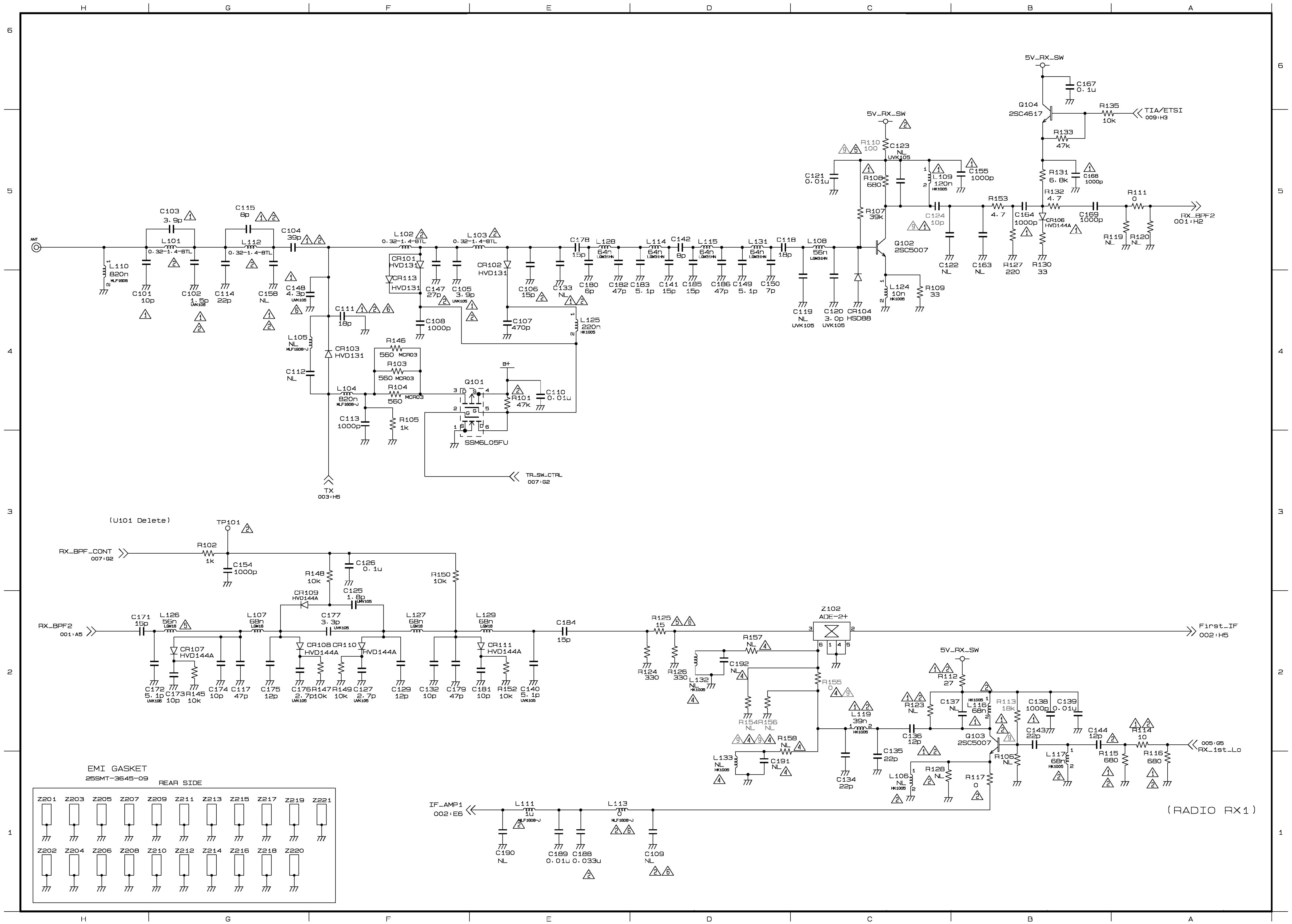
UNIT ASSEMBLY (SYSTEM)
G3UK10012, Rev. 0, Page 1 of 2



UNIT ASSEMBLY (SYSTEM)
G3UK10012, Rev. 0, Page 2 of 2

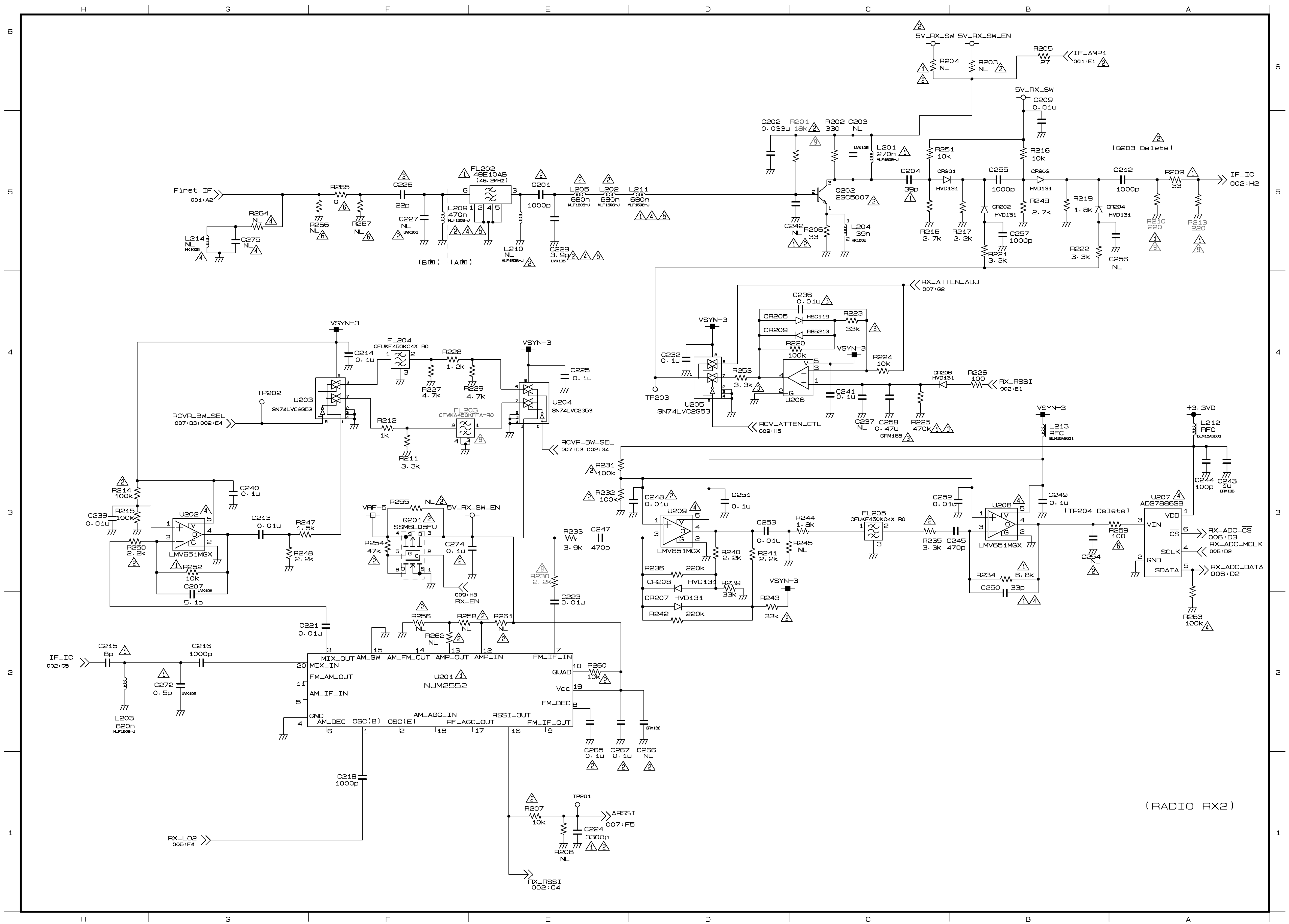
19. SCHEMATICS

19.1 VHF MAIN SCHEMATIC DIAGRAM

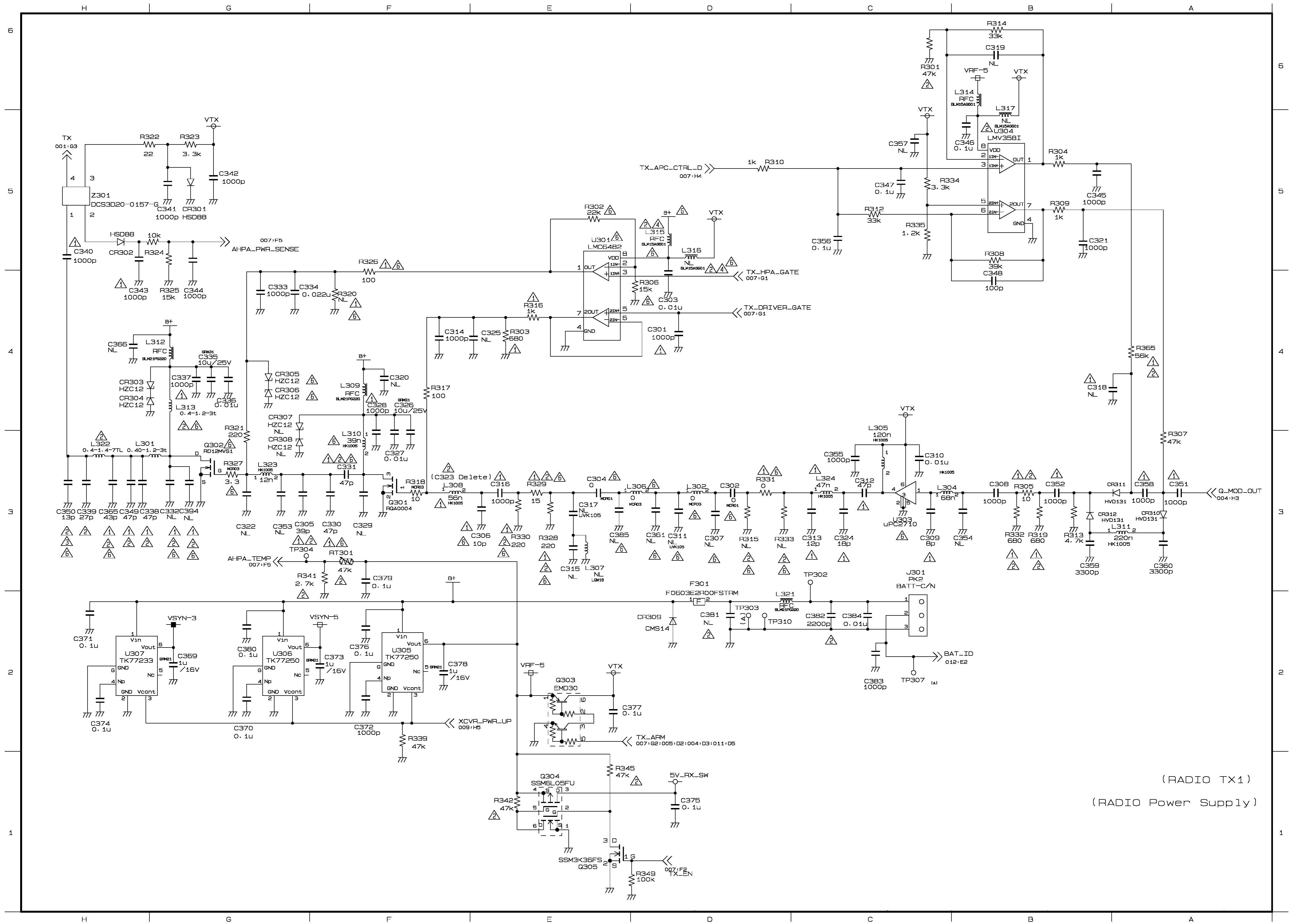


MAIN BOARD SCHEMATIC

G3UD09633, Rev. 9, Page 1 of 12

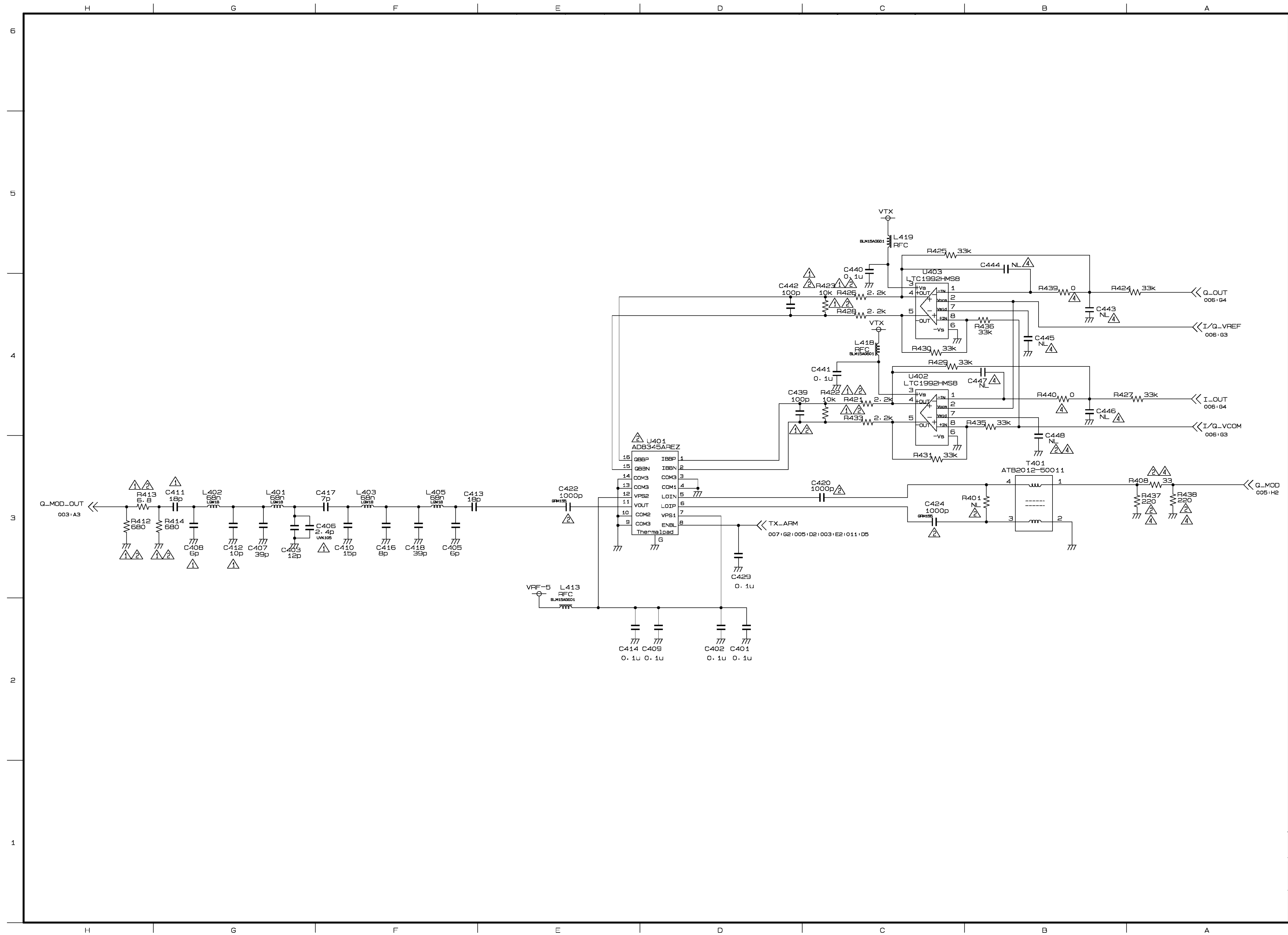


MAIN BOARD SCHEMATIC
G3UD09633, Rev. 9, Page 2 of 12



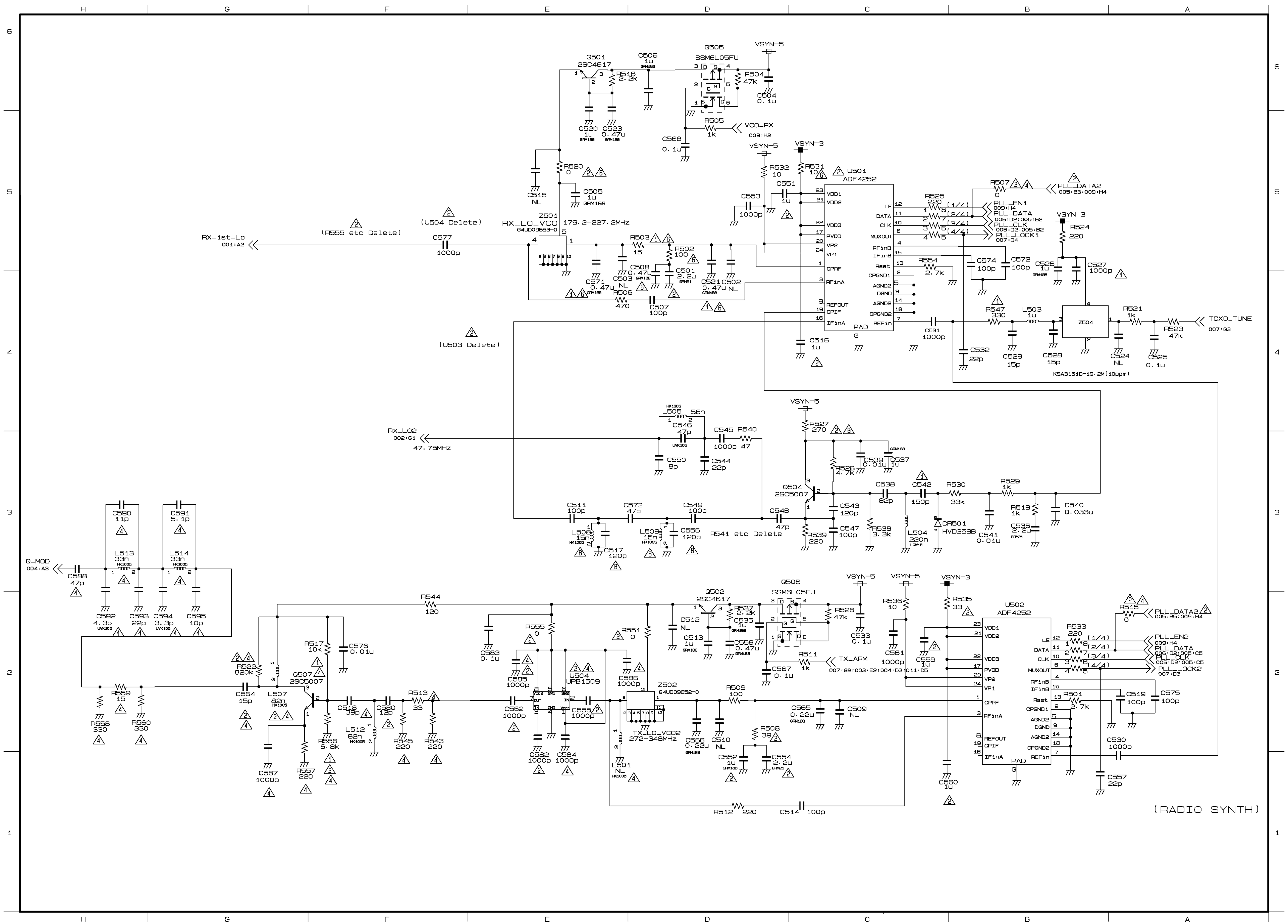
MAIN BOARD SCHEMATIC

G3UD09633, Rev. 9, Page 3 of 12

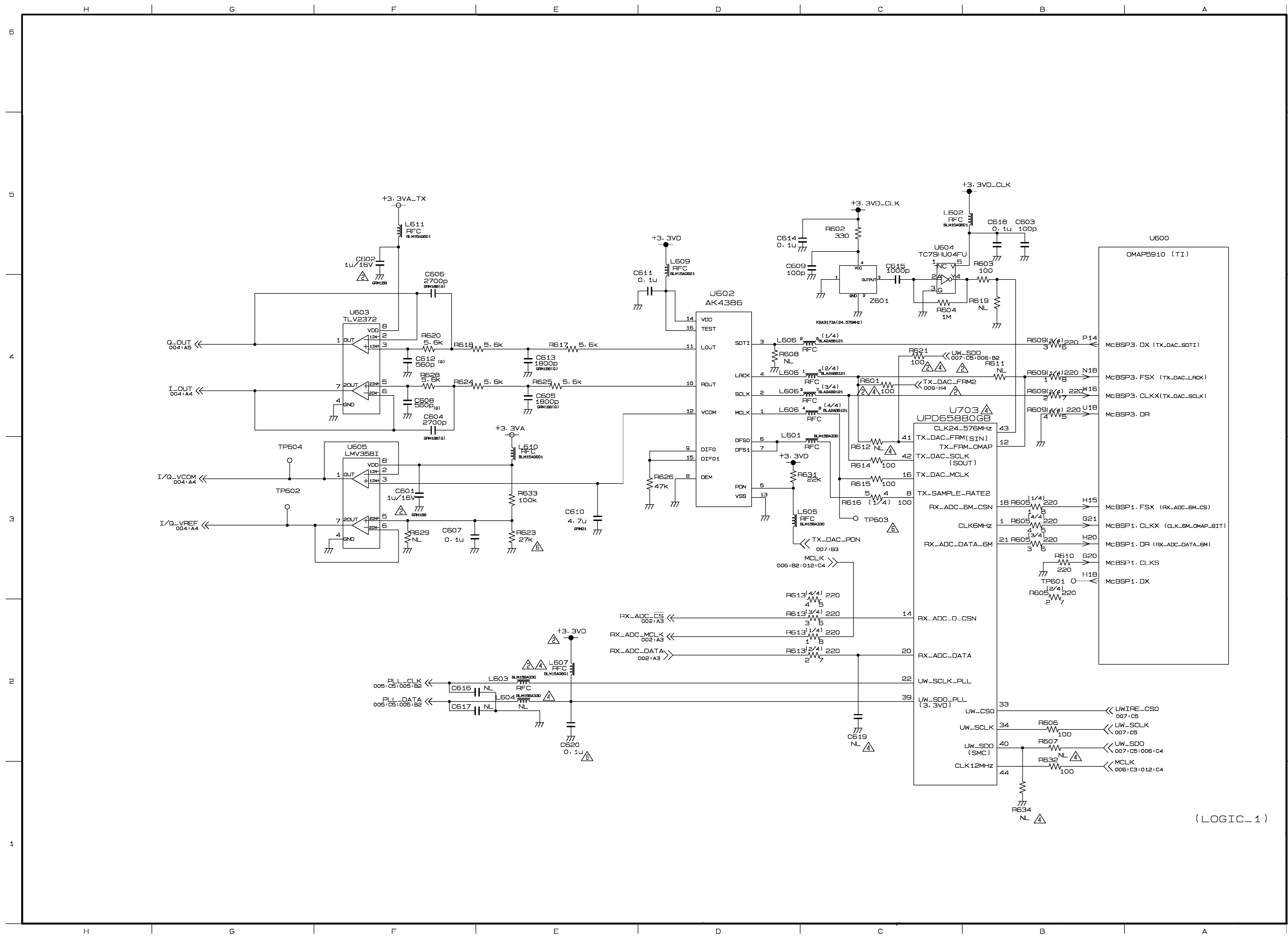


MAIN BOARD SCHEMATIC

G3UD09633, Rev. 9, Page 4 of 12



MAIN BOARD SCHEMATIC
G3UD09633, Rev. 9, Page 5 of 12



MAIN BOARD SCHEMATIC
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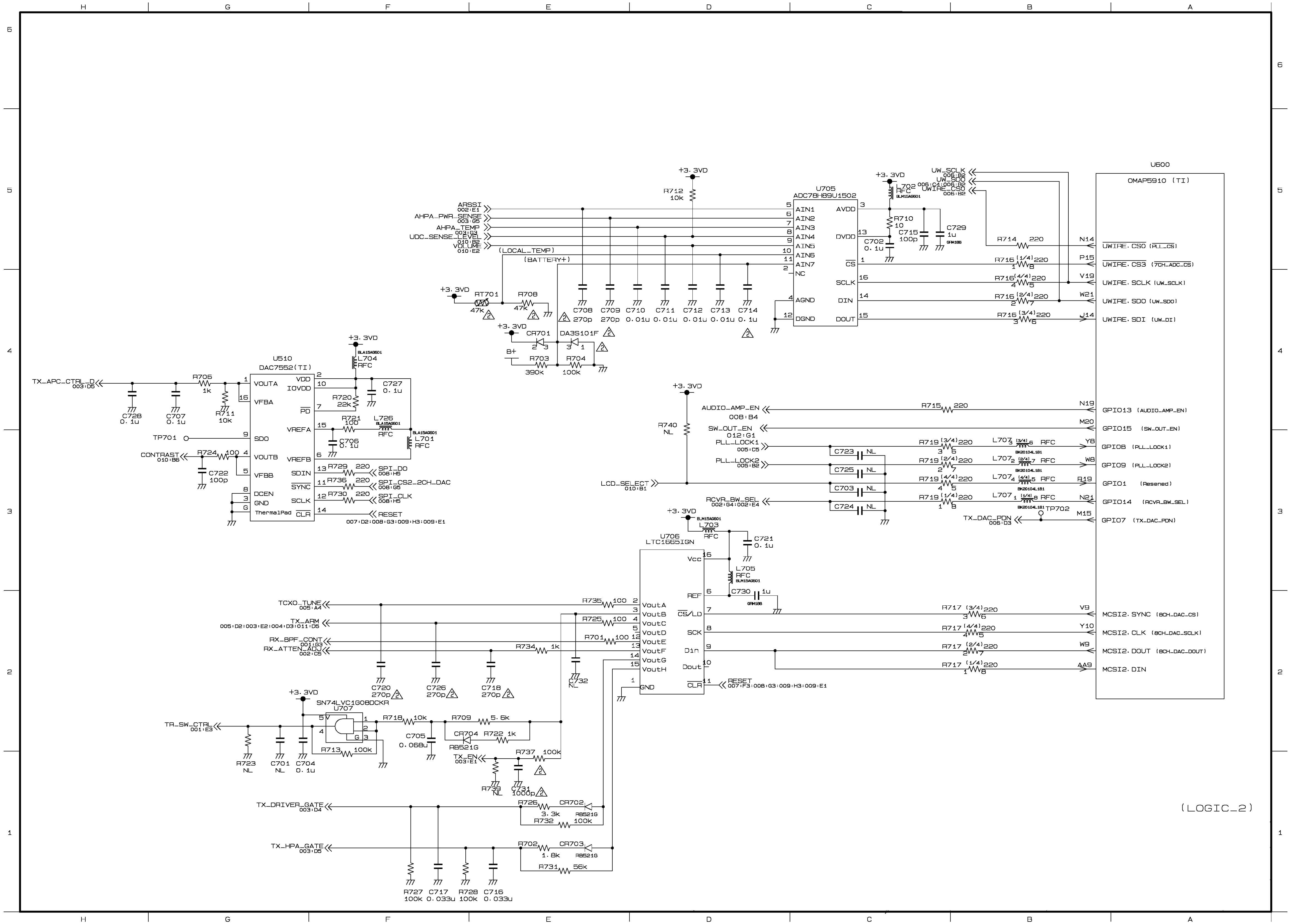

MAIN BOARD SCHEMATIC

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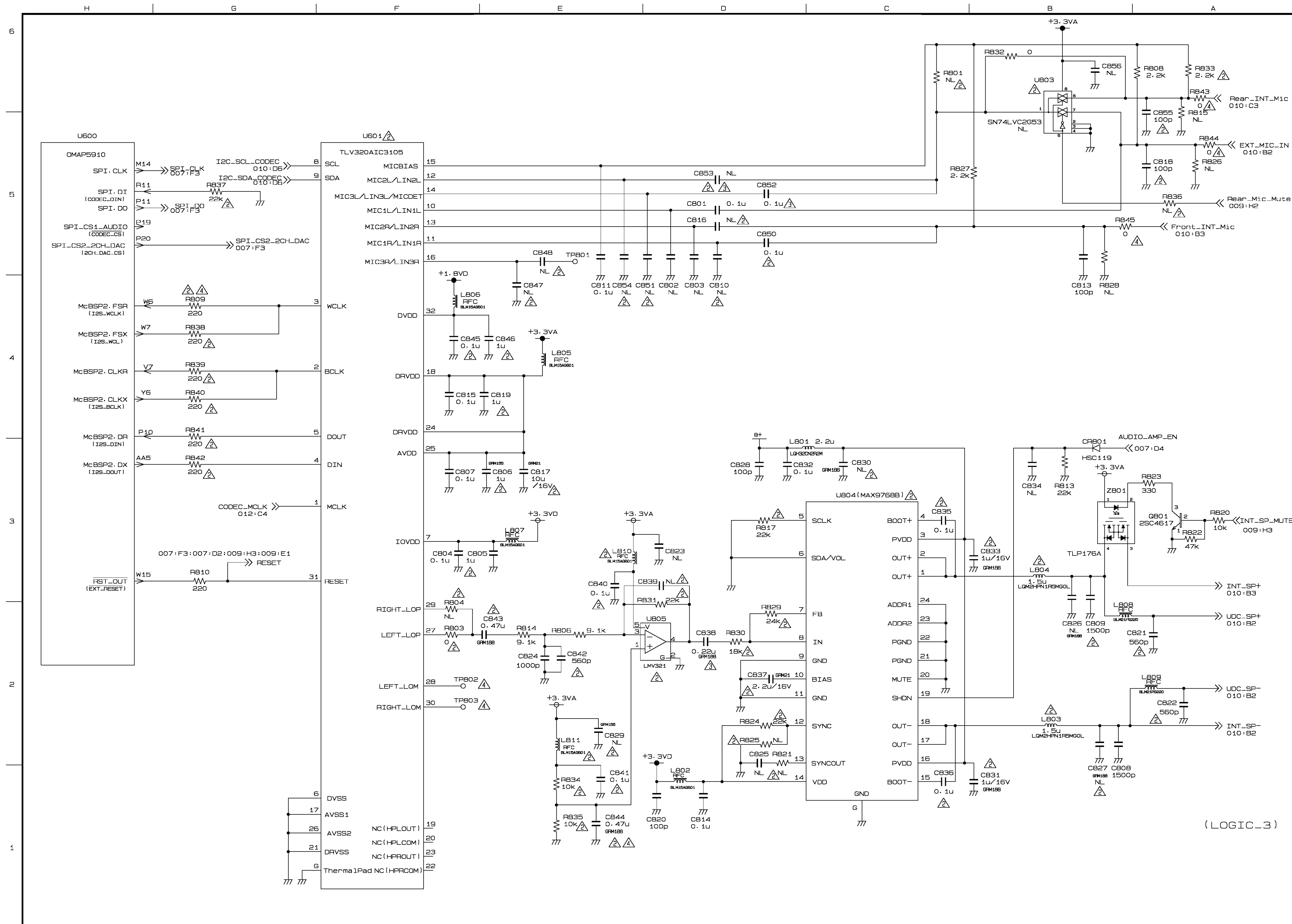

MAIN BOARD SCHEMATIC
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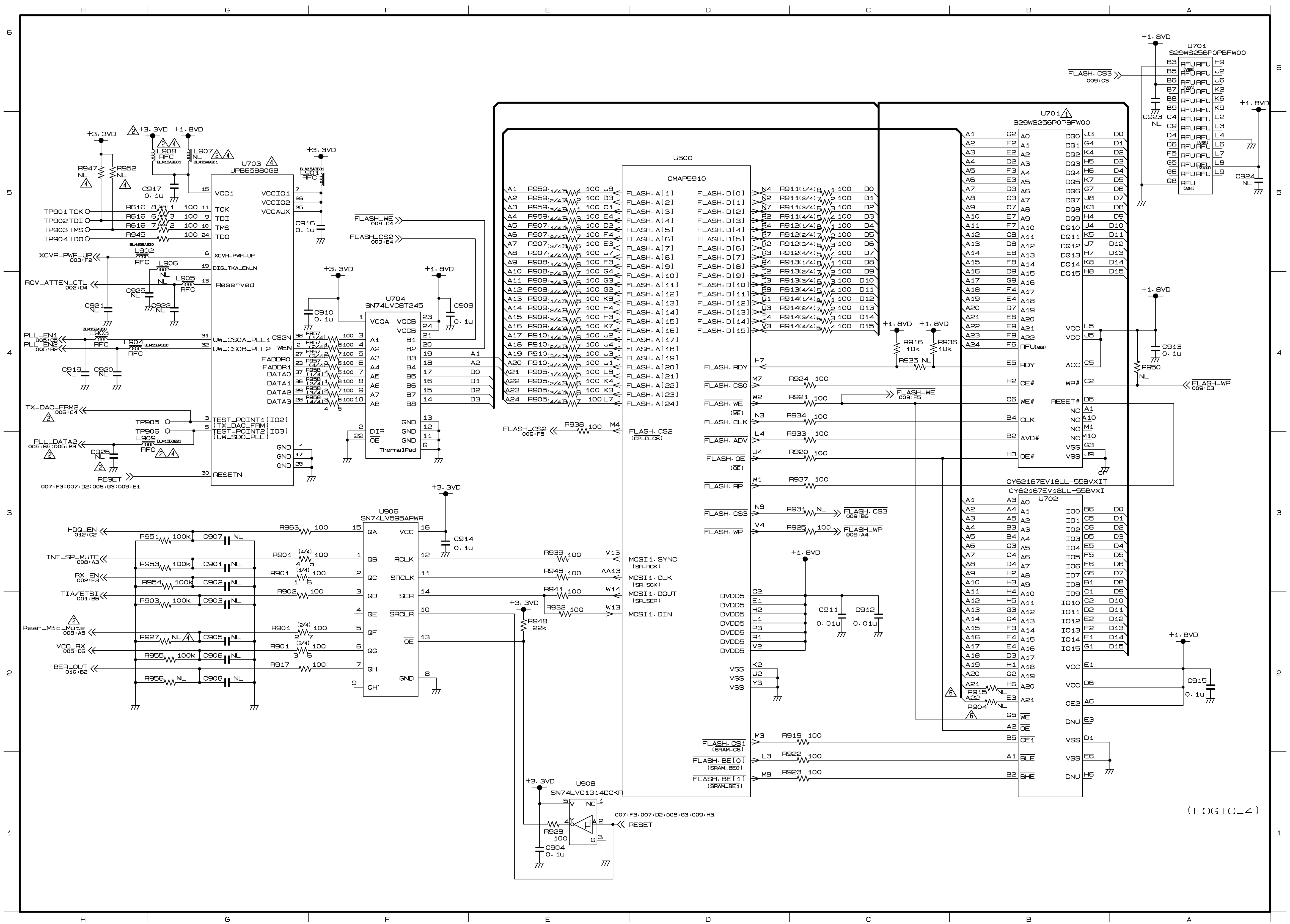

MAIN BOARD SCHEMATIC

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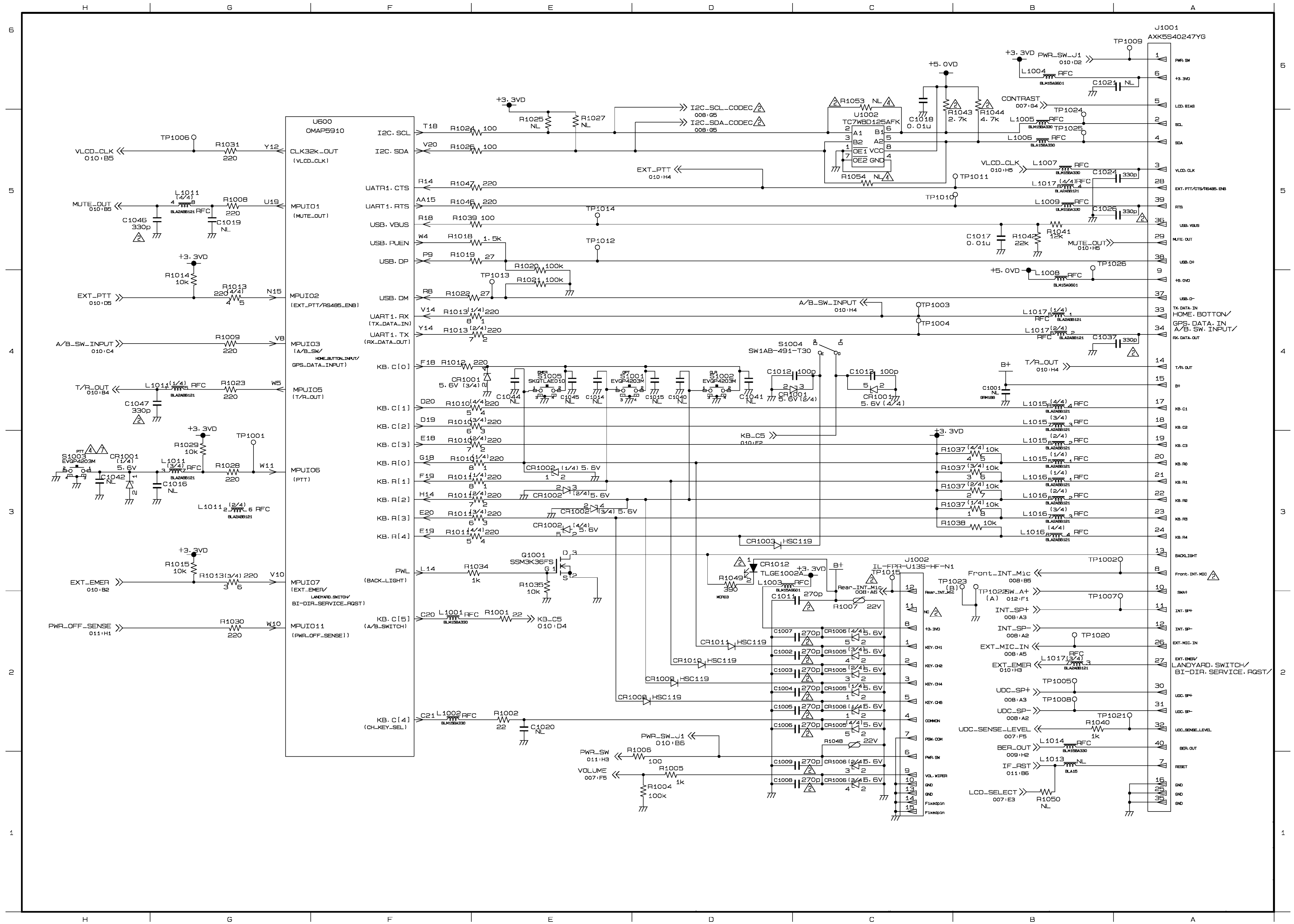
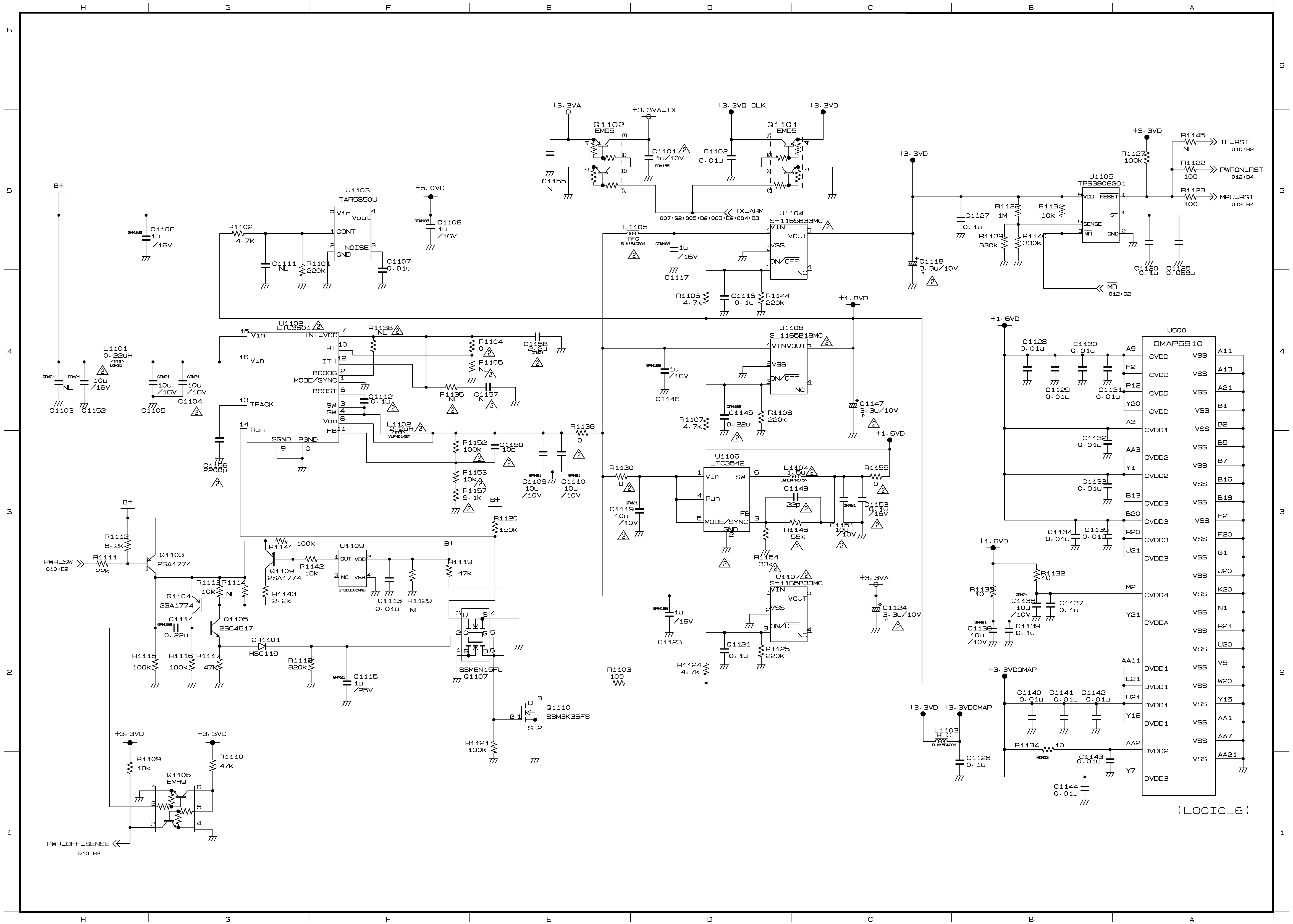

U600
OMAP5910
J1001
AXK5S40247YG
J1002
IL-FPR-U13S-HF-N1
U1002
TC7WBD125AFK
Q1001
SSM3K36FS
S1004
SW1AB-491-T30
VLCD_CLK
MUTE_OUT
EXT_PTT
A/B_SW_INPUT
T/R_OUT
EXT_EMER
PWR_OFF_SENSE
I2C_SCL_CODEC
I2C_SDA_CODEC
CLK32K_OUT
MPUIO1
MPUIO2
MPUIO3
MPUIO5
MPUIO6
MPUIO7
MPUIO11
I2C.SCL
I2C.SDA
UATR1.CTS
UART1.RTS
USB.VBUS
USB.PUEN
USB.DP
USB.DM
UART1.RX
UART1.TX
KB.C[0]
KB.C[1]
KB.C[2]
KB.C[3]
KB.R[0]
KB.R[1]
KB.R[2]
KB.R[3]
KB.R[4]
PWL
KB.C[5]
KB.C[4]
+3.3VD
+5.0VD
B+
HOME.BOTTON/
GPS.DATA.IN
A/B.SW.INPUT/
LANDYARD.SWITCH/
BI-DIR.SERVICE.RQST/
Front_INT_Mic
SW_A+
INT_SP+
INT_SP-
EXT_MIC_IN
EXT_EMER
UDC_SP+
UDC_SP-
UDC_SENSE_LEVEL
BER_OUT
IF_RST
LCD_SELECT
PWR_SW_J1
PWR_SW
VOLUME
CONTRAST



MAIN BOARD SCHEMATIC

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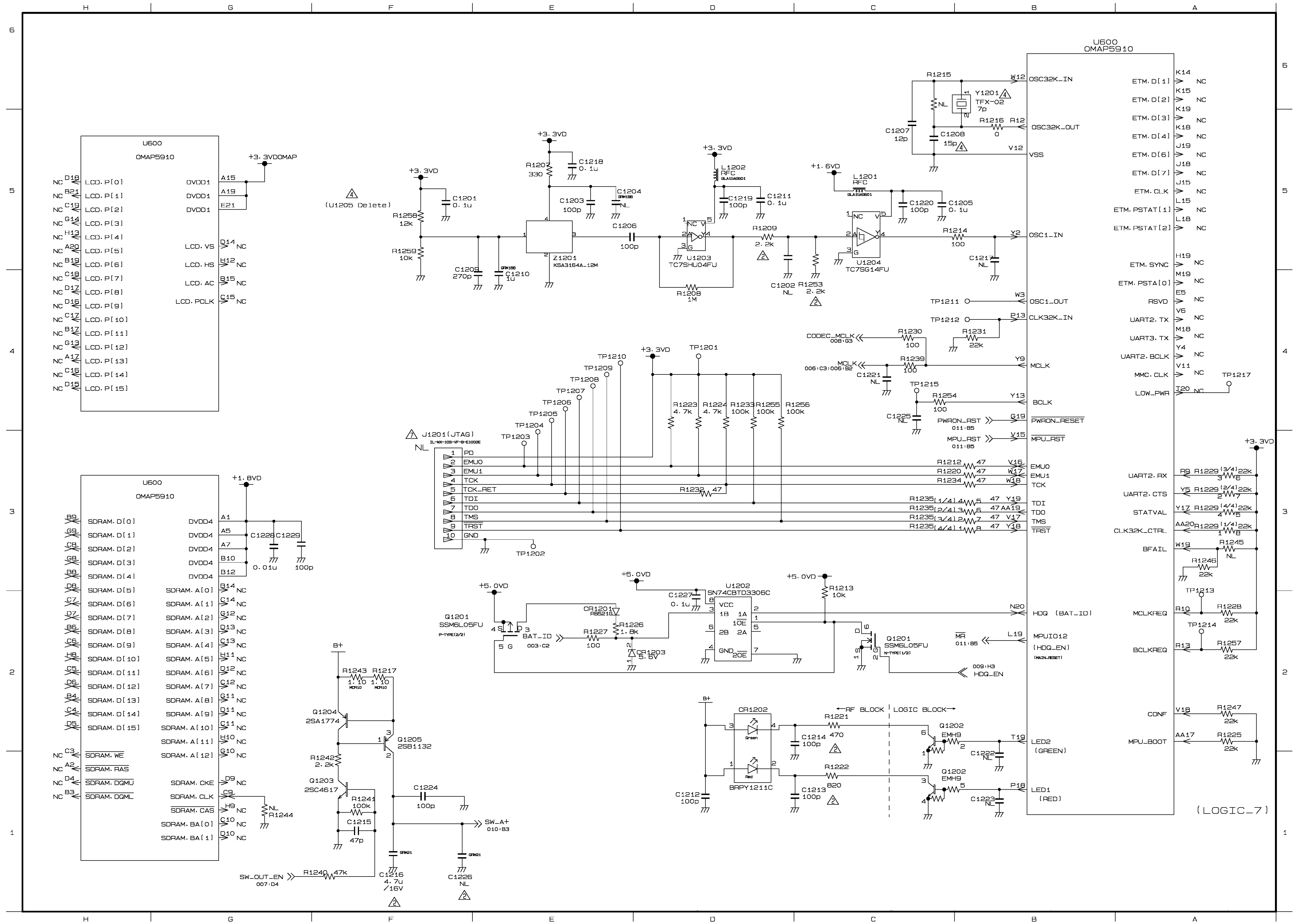

MAIN BOARD SCHEMATIC
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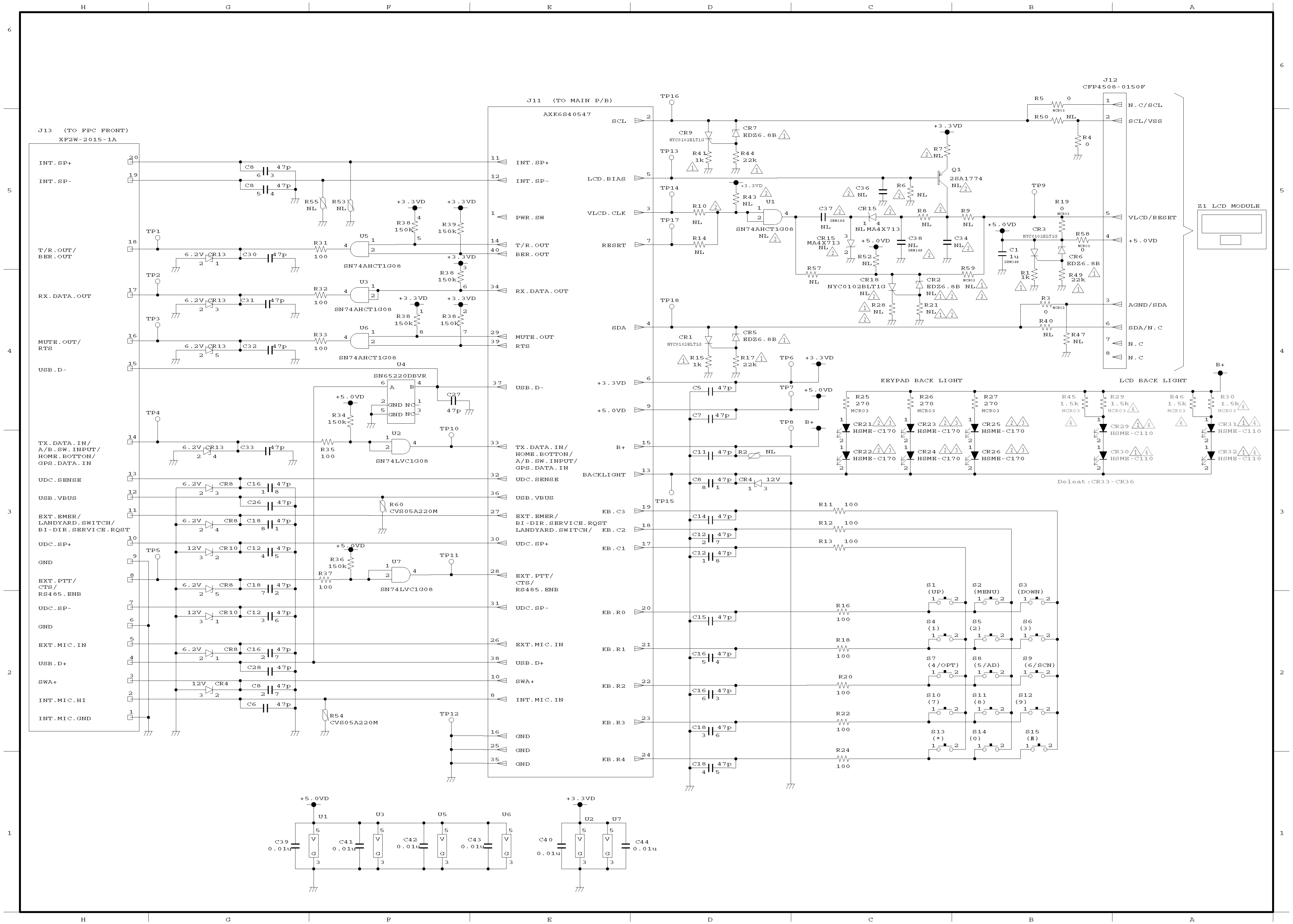
19.2 IF DOT MARTIX LCD SCHEMATIC DIAGRAM



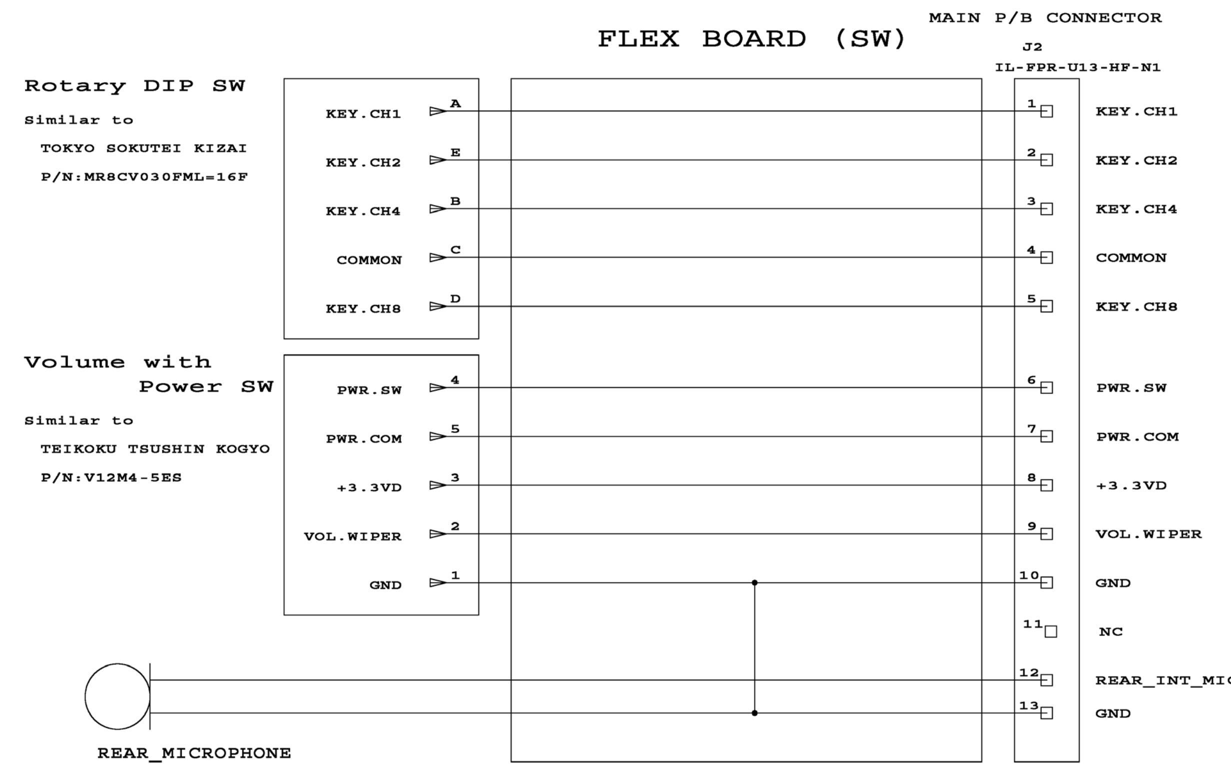
IF DOT MARTIX LCD SCHEMATIC DIAGRAM
G3UD09638, Rev. 4

19.3 FPC BOARD (SW) SCHEMATIC DIAGRAM

CODE & Truth Table

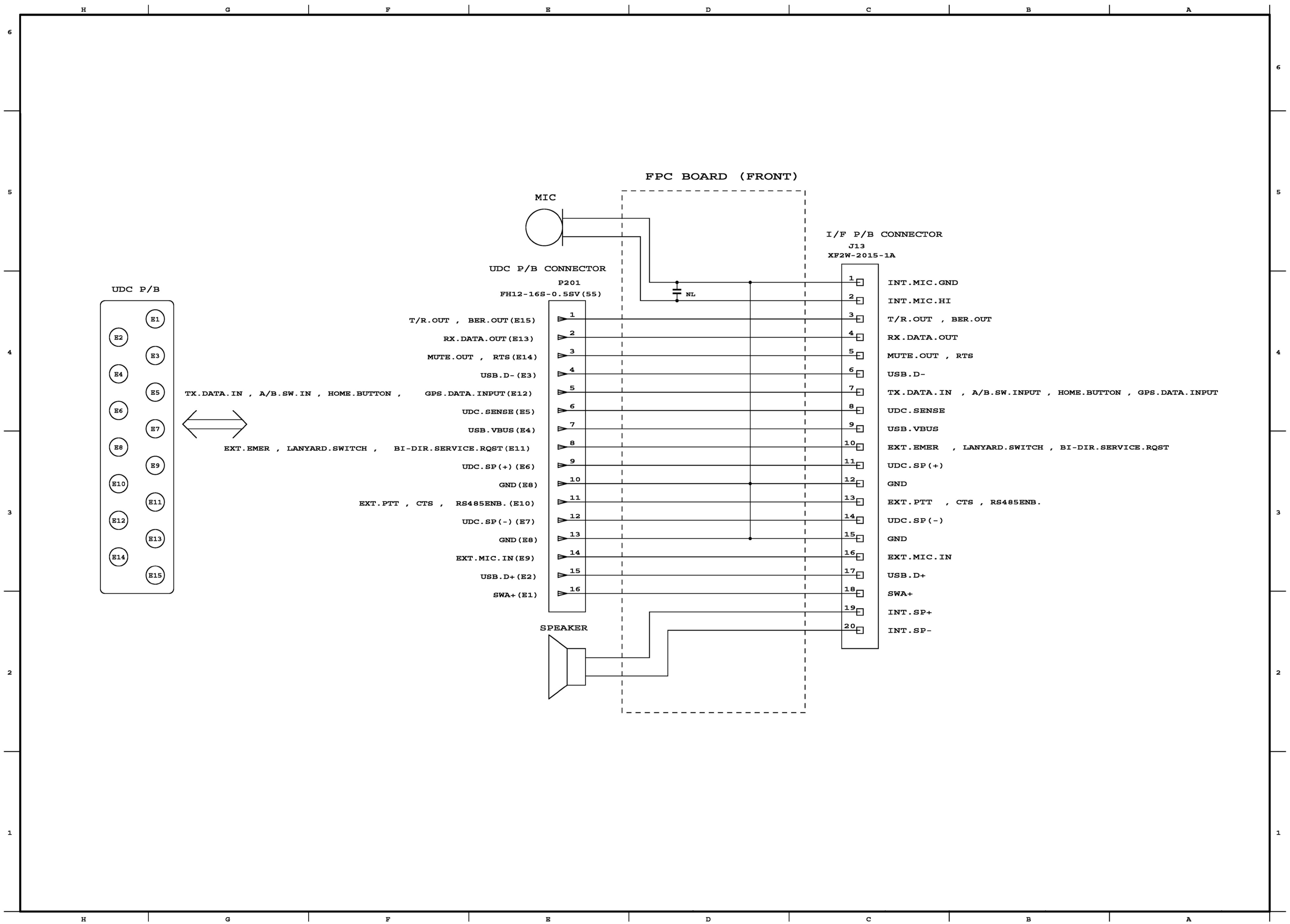
Channel Switch Switch Position	Code Output * CH1	CH2	CH4	CH8
0				
1	●			
2	●	●		
3		●		
4		●	●	
5	●	●	●	
6	●		●	
7			●	
8			●	●
9	●		●	●
10	●	●	●	●
11		●	●	●
12		●		●
13	●	●		●
14	●			●
15				●

*Dot indicates terminal to common connection.
A switch is continuous rotation.



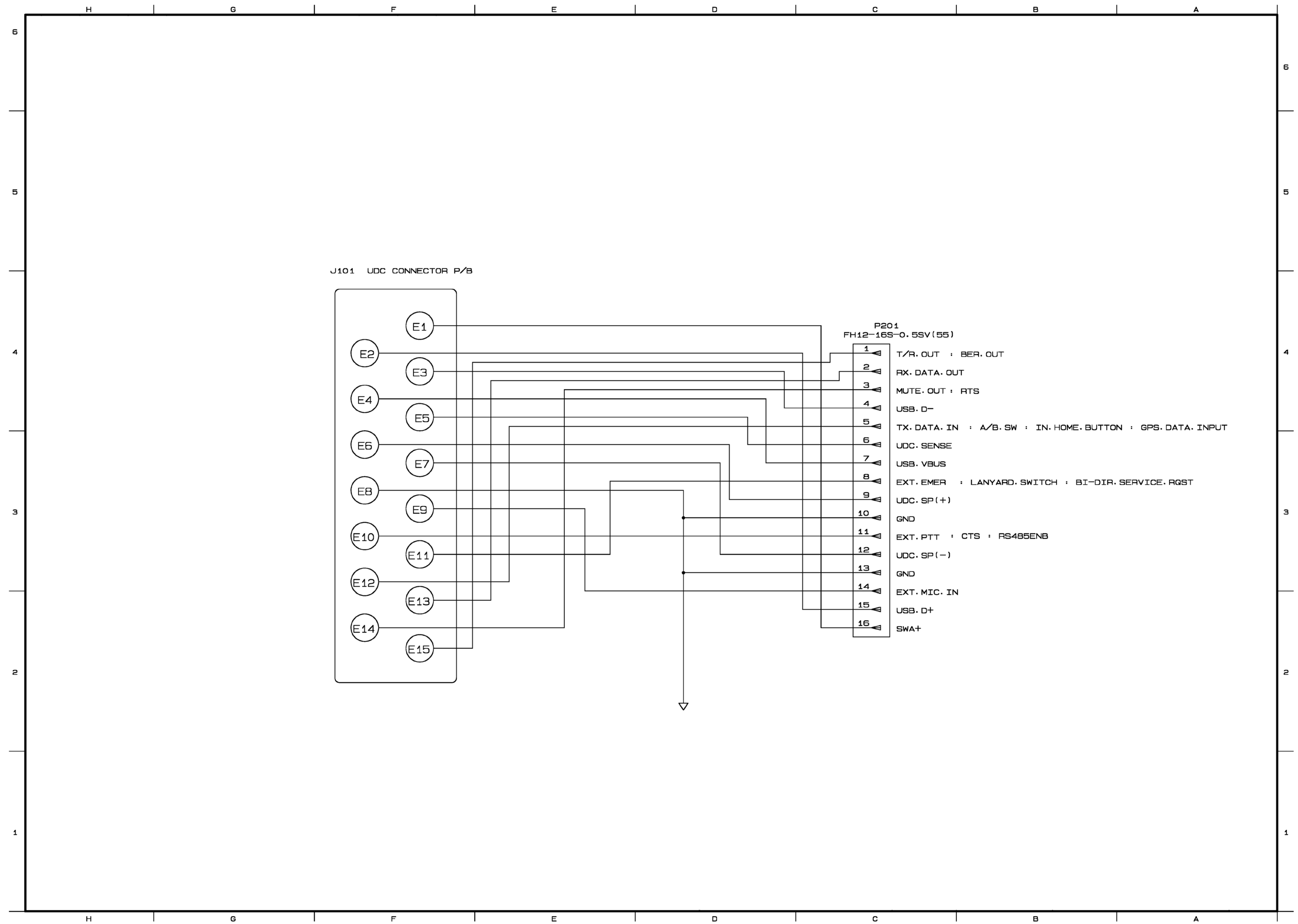
FPC BOARD (SW) SCHEMATIC DIAGRAM
G3UD10038, Rev. 0

19.4 FPC BOARD (FRONT) SCHEMATIC DIAGRAM



FPC BOARD (FRONT) SCHEMATIC DIAGRAM
G3UD09148, Rev. 1

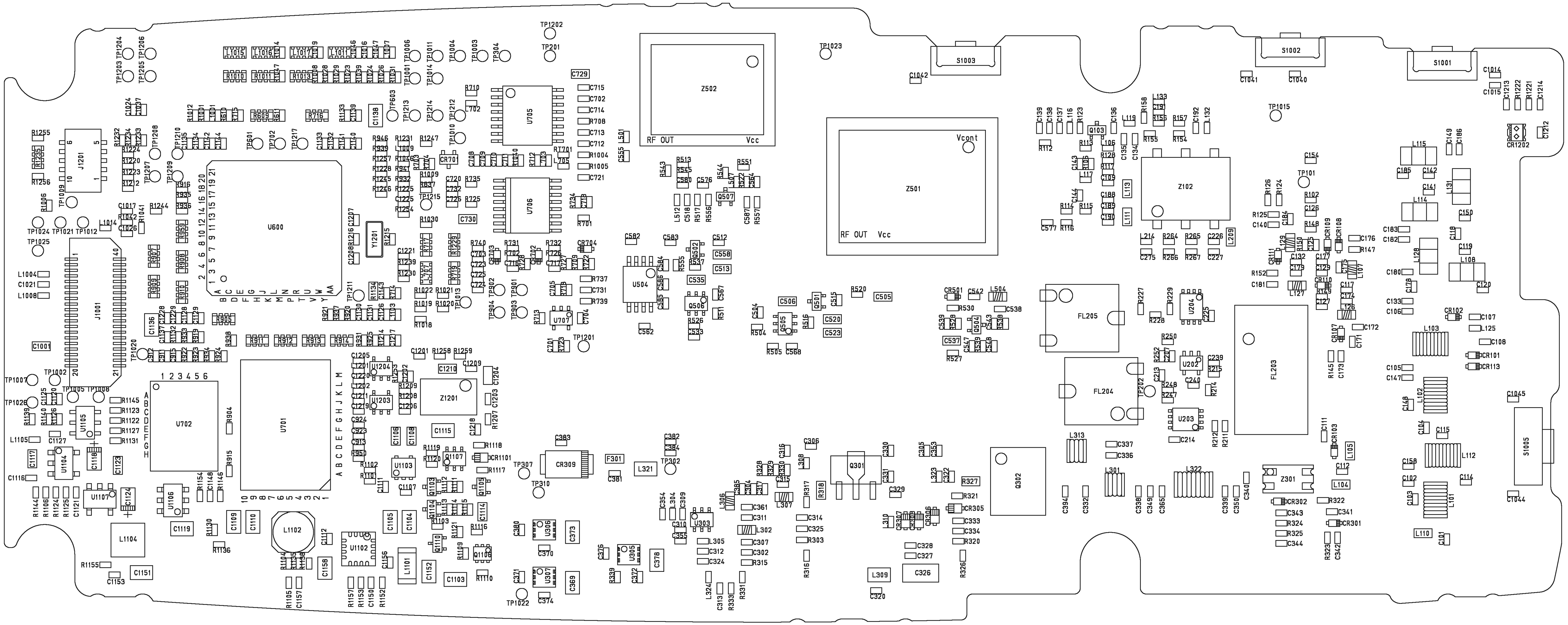
19.5 UDC SCHEMATIC DIAGRAM



UDC SCHEMATIC DIAGRAM
G3UD08424, Rev. 0

20. BOARD LAYOUTS

20.1 VHF MAIN BOARD LAYOUT



VHF MAIN BOARD LAYOUT
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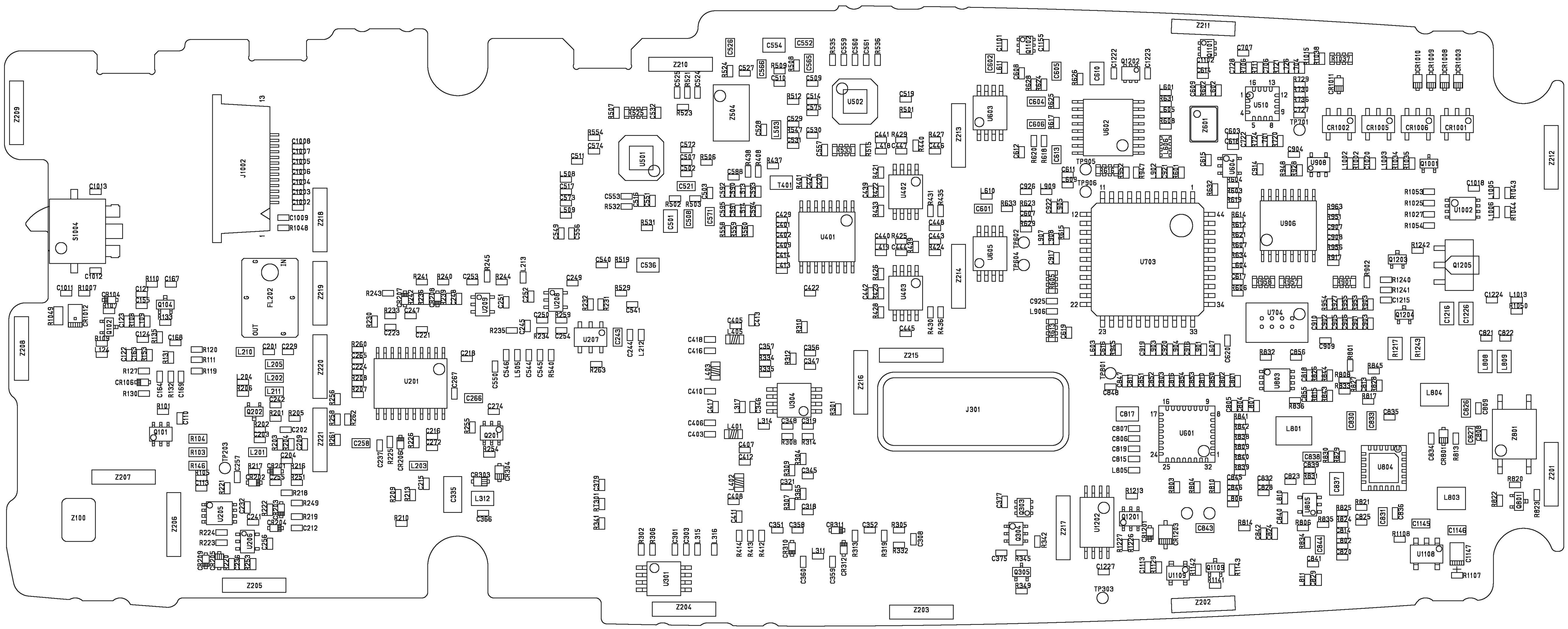

MAIN BOARD LAYOUT
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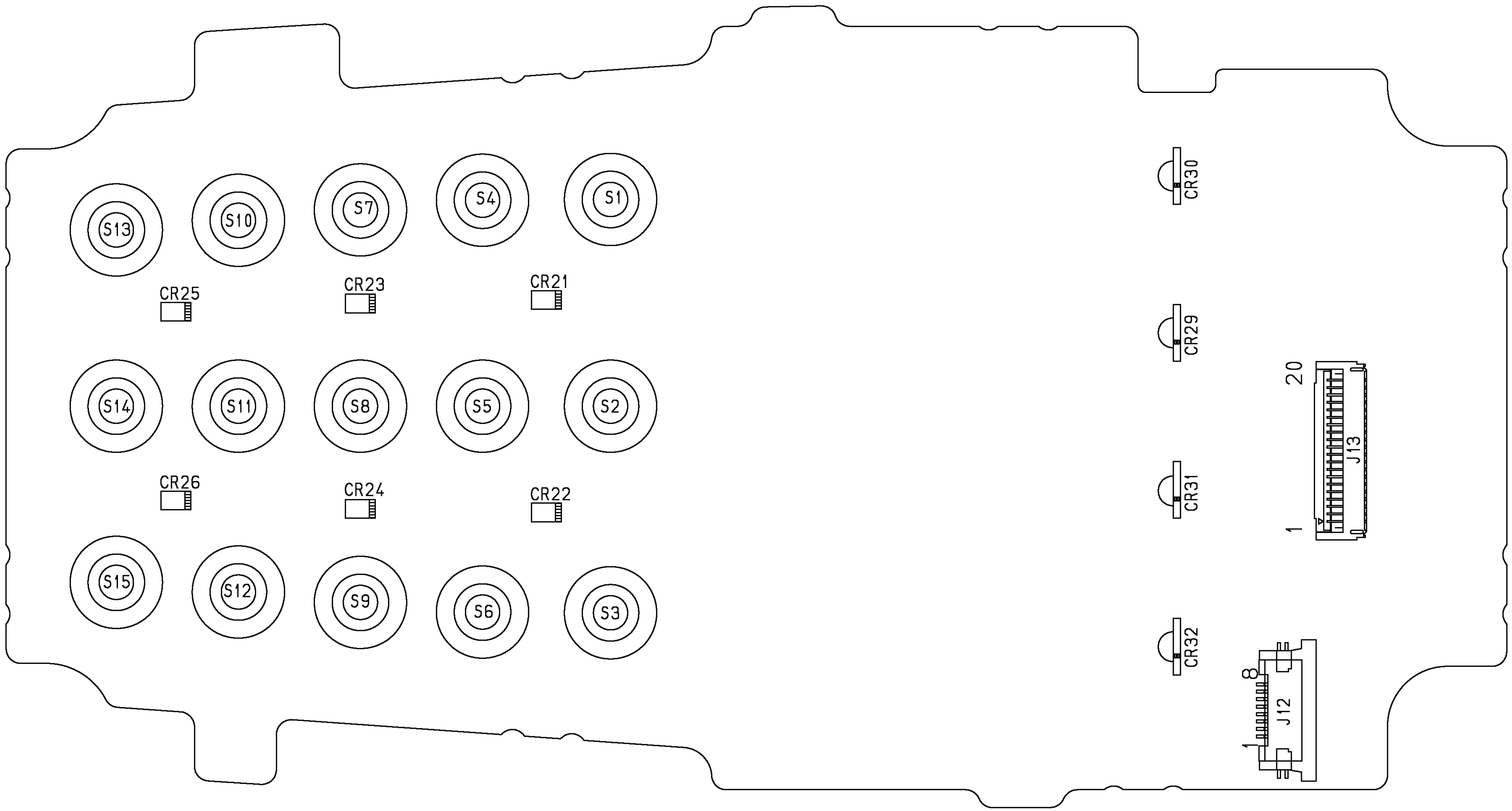
20.2 INTERFACE BOARD LAYOUT



INTERFACE BOARD LAYOUT
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INTERFACE BOARD LAYOUT
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21. TEST POINTS

TEST POINT DEFINITION
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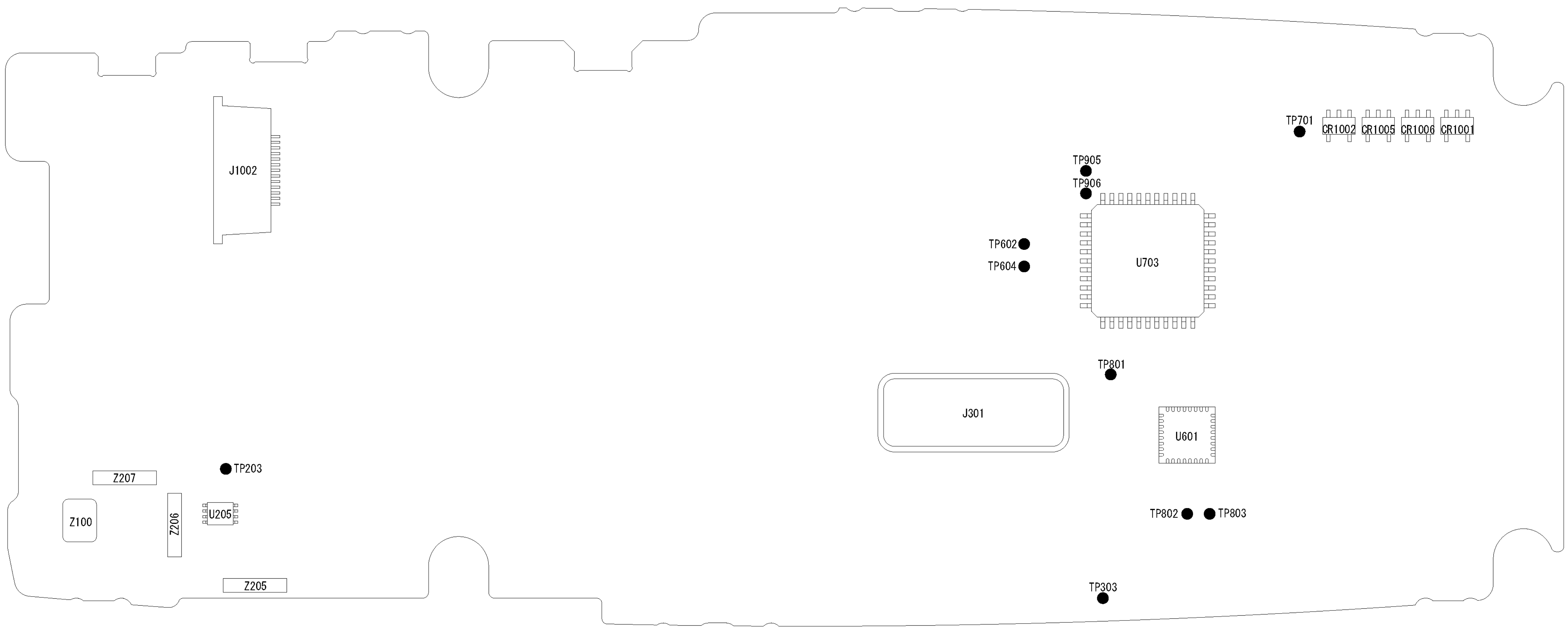
TP701
CR1002
CR1005
CR1006
CR1001
TP905
TP906
J1002
TP602
TP604
U703
TP801
J301
U601
TP203
Z207
Z100
Z206
U205
TP802
TP803
Z205
TP303

B Side

TP No.	NAME	DESCRIPTION	VALUE	Side
TP101	RX_BPF_CONT	Signal for RX BPF select	0V at H side Frequency 2.9V at L side Frequency	A
TP201	RSSI	RSSI Voltage output	0.4 to 0.7V at -110dBm 1.7 to 2.0V at -47dBm	A
TP202	RCVR_BW_SEL	WIDE/NARROW select	3.3V at WIDE 0V at NARROW	A
TP203	Rx AGC_CONT	AGC Setting time Measuring point	-	B
TP302	BATT	Battery voltage	Typ. +7.5VDC	A
TP303	GND	GND	0VDC	B
TP304	AHPA_TEMP	Power AMP Temperature	0.4V at 30℃	A
TP307	BAT_ID	Battery ID	HDQ data, TTL level	A
TP310	GND	GND	0VDC	A
TP601	McBSP1.DX	Not used	-	A
TP602	I/Q_Vref	I/Q Reference voltage	0.7V	B
TP603	TX DAC MCLK	Master clock for TX DAC	12.288MHz clock	A
TP604	I/Q_Vcom	I/Q Common Signal	1.815V	B
TP701	SDO(2CH DAC)	Not used	-	B
TP702	GPIO7	TX DAC PDN	0V at Tx_DAC OFF 3.3V at Tx_DAC ON	A
TP801	MIC3R/LIN3R	Not used	-	B
TP802	LEFT_LOM	Not used	-	B
TP803	RIGHT_LOM	Not used	-	B
TP901	NC	NC pin in GATE ARRAY	-	A
TP902	NC	NC pin in GATE ARRAY	-	A
TP903	NC	NC pin in GATE ARRAY	-	A
TP904	NC	NC pin in GATE ARRAY	-	A
TP905	TX DAC FRM	TX DAC FRAME SIGNAL	CMOS levele data	B
TP906	UW SDO PLL	PLL DATA SIGNAL	CMOS levele data	B
TP1001	PTT	PTT control signal	0V at PTT ON 3.3V at PTT OFF	A
TP1002	Front_INT_MIC	INT MIC input signal	3mV RMS(8.5mVp-p) 1kHz tone , 3kHz DEV	A
TP1003	TX.DATA.IN	TX DATA signal	9.6k or 19.2k band CMOS level data out of the radio in Data Terminal mode. 38.4 baud CMOS level data out of the radio in Programmer mode.	A
TP1004	RX.DATA.OUT	RX DATA signal	9.6k or 19.2k band CMOS level data out of the radio in Data Terminal mode. 38.4 baud CMOS level data into	A
TP1005	UDC.SP+	UDC.SP+ output signal	1.0V RMS at 0.5W	A
TP1006	VLCD_CLK	Clock output	32.768kHz clock	A
TP1007	INT/SP+	INT.SP+ output signal	1.0V RMS at 0.5W	A
TP1008	UDC.SP-	UDC.SP- output signal	1.0V RMS at 0.5W	A

TP No.	NAME	DESCRIPTION	VALUE	Side
TP1009	PWR_SW	PWR.SW signal	POWER SW ON 0VDC POWER SW OFF 7.5VDC	A
TP1010	RTS	Request To Send,output signal used for PC data& keyloader	CMOS level	A
TP1011	EXT.PTT	External Push-to-Talk input used key Tx	0V at active	A
	CTS	Clear To-Send, input signal used for PC Data & Keyloader	CMOS level	A
	RS485.ENB	RS485 data driver enable signal	TTL Low at active	A
TP1012	USB.D+	USB data in/out	Data rate TBD	A
TP1013	USB.D-	USB data in/out	Data rate TBD	A
TP1014	USB.VBUS	USB voltage Bus enable	3.24V at active	A
TP1015	Rear_INT_Mic	INT MIC input signal	3mV RMS(8.5mVp-p) 1kHz tone , 3kHz DEV	A
TP1020	EXT.MIC.IN	EXT MIC input signal	11mV RMS(31.1mVp-p) 1kHz tone , 3kHz DEV	A
TP1021	UDC.SENSE_LEVEL	Sense of external accessory type	0V:Test mode	A
TP1022	GND	GND	0VDC	A
TP1023	GND	GND	0VDC	A
TP1024	SCL	I2Cbus Serial Clock	TTL level data	A
TP1025	SDA	I2Cbus serial Data	TTL level data	A
TP1026	+5.0VD	Regulator output	5.0V	A
TP1201	+3.3VD	Regulator output	3.3V	A
TP1202	GND	GND	0VDC	A
TP1203	EMU0	JTAG for OMAP	-	A
TP1204	EMU1	JTAG for OMAP	-	A
TP1205	TCK	JTAG for OMAP	-	A
TP1206	TCK_RET	JTAG for OMAP	-	A
TP1207	TDI	JTAG for OMAP	-	A
TP1208	TDO	JTAG for OMAP	-	A
TP1209	TMS	JTAG for OMAP	-	A
TP1210	TRST	JTAG for OMAP	-	A
TP1211	OSC1_OUT	Analog output from base oscillator (Not used)	-	A
TP1212	CLK32K_IN	32kHz clock input(Not used)	-	A
TP1213	MCLKREQ	M-clock request	3.3V	A
TP1214	BCLKREQ	B-clock request	3.3V	A
TP1215	BCLK	B-clock	CMOS 12MHz clock	A
TP1217	LOW_PWR	Low power request output	3.3V at low-power sleep mode 0V at reset & functional modes	A

TEST POINT DEFINITION
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