

MOTOROLA

MCS 2000 Mobile Radio Service Instructions

Volume 2f

UHF 40W Range 2 Specific

Safety Information

Every radio, when transmitting, radiates energy into the atmosphere which may, under certain conditions, cause the generation of a spark.

All users of vehicles fitted with radios should be aware of the following warnings:

Do not operate radio near flammable liquids or in the vicinity of explosive devices.

To ensure personal safety, please observe the following simple rules:

Check the laws and regulations on the use of two-way mobile radios in the areas where you drive. Always obey them. Also, when using your radio while driving, please:

- Give full attention to driving,
- Use hands-free operation, if available and
- Pull off the road and park before making or answering a call if driving conditions so require.

Airbag Warning

VEHICLES EQUIPPED WITH AIR BAGS

An air bag inflates with great force. DO NOT place objects, including communication equipment, in the area over the air bag or in the air bag deployment area. If the communication equipment is improperly installed and the air bag inflates, this could cause serious injury.

Installation of vehicle communication equipment should be performed by a professional installer/technician qualified in the requirements for such installations.

An air bag's size, shape and deployment area can vary by vehicle make, model and front compartment configuration (e.g., bench seat vs. bucket seats). Contact the vehicle manufacturer's corporate headquarters, if necessary, for specific air bag information for the vehicle make, model and front compartment configuration involved in your communication equipment installation.

LP Gas Warning

It is mandatory that radios installed in vehicles fuelled by liquefied petroleum gas conform to the National Fire Protection Association standard NFPA 58, which applies to vehicles with a liquid propane (LP) gas container in the trunk or other sealed off space within the interior of the vehicle. The NFPA58 requires the following:

- Any space containing radio equipment shall be isolated by a seal from the

space in which the LP gas container and its fittings are located.

- Removable (outside) filling connections shall be used.
- The container space shall be vented to the outside.

Anti-Lock Braking System (ABS) and Anti-Skid Braking System Precautions



WARNING

Disruption of the anti-skid/anti-lock braking system by the radio transmitter may result in unexpected vehicle motion.

Motorola recommends the following radio installation precautions and vehicle braking system test procedures to ensure that the radio, when transmitting, does not interfere with operation of the vehicle braking system.

Installation Precautions

1. Always provide as much distance as possible between braking modulator unit and radio, and between braking modulator unit and radio antenna and associated antenna transmission line. Before installing radio, determine location of braking modulator unit in vehicle. Depending on make and model of vehicle, braking modulator unit may be located in trunk, under dashboard, in engine compartment, or in some other cargo area. If you cannot determine location of braking modulator unit, refer to vehicle service manual or contact a dealer for the particular make of vehicle.
2. If braking modulator unit is located on left side of the vehicle, install radio on right side of vehicle, and conversely.
3. Route all radio wiring including antenna transmission line as far away as possible from braking modulator unit and associated braking system wiring.
4. Never activate radio transmitter while vehicle is in motion and vehicle trunk lid is open.

Braking System Tests

The following procedure checks for the most common types of interference that may be caused to vehicle braking system by a radio transmitter.

1. Run vehicle engine at idle speed and set vehicle transmission selector to PARK. Release brake pedal completely and key radio transmitter. Verify that there are no unusual effects (visual or audible) to vehicle lights or other electrical equipment and accessories while microphone is NOT being spoken into.
2. Repeat step 1. except do so while microphone IS being spoken into.
3. Press vehicle brake pedal slightly just enough to light vehicle brake light(s). Then repeat step 1. and step 2.
4. Press the vehicle brake pedal firmly and repeat step 1. and step 2.
5. Ensure that there is a minimum of two vehicle lengths between front of vehicle and any object in vehicle's forward path. Then, set vehicle

transmission selector to DRIVE. Press brake pedal just far enough to stop vehicle motion completely. Key radio transmitter. Verify that vehicle does not start to move while microphone is NOT being spoken into.

6. Repeat step 5. except do so while microphone IS being spoken into.
7. Release brake pedal completely and accelerate vehicle to a speed between 15 and 25 miles/25 and 40 kilometers per hour. Ensure that a minimum of two vehicle lengths is maintained between front of vehicle and any object in vehicle's forward path. Have another person key radio transmitter and verify that vehicle can be braked normally to a moderate stop while microphone is NOT being spoken into.
8. Repeat step 7. except do so while microphone IS being spoken into.
9. Release brake pedal completely and accelerate vehicle to a speed of 20 miles/30 kilometers per hour. Ensure that a minimum of two vehicle lengths is maintained between front of vehicle and any object in vehicle's forward path. Have another person key radio transmitter and verify that vehicle can be braked properly to a sudden (panic) stop while microphone is NOT being spoken into.
10. Repeat step 9. except do so while microphone IS being spoken into.
11. Repeat step 9. and step 10. except use a vehicle speed of 30 miles/50 kilometers per hour.

LIST OF EFFECTIVE PAGES

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Volume 2f

UHF 40W Range 2 Specific

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Front cover	O	1 through 98	O
Inside front cover (blank)	O	Questionnaire (Front)	O
Title	O	Questionnaire (Back	O
Safety 0 through Safety 2	O	Replacement Parts Ordering (Inside back cover)	O
A and B	O	Back cover	O
i and ii	O		

IMPORTANT
ELECTROMAGNETIC
EMISSION
INFORMATION

In August, 1996, The Federal Communications Commission (FCC) adopted an updated safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment. Motorola subscribes to this same updated safety standard for the use of its products.

In keeping with sound installation practice and to maximize radiation efficiency, a one-quarter (1/4) wave length antenna should be installed at the center of the vehicle roof. If it is necessary to mount the antenna on the vehicle's trunk lid, an appropriate 3db gain antenna should be used. This installation procedure will assure that vehicle occupants will be exposed to radio frequency energy levels lower than the limits specified in the standard adopted by the FCC in General Docket 79144.

To assure that radio frequency (RF) energy exposure to bystanders external to a vehicle is lower than that recommended by FCC adopted standard, transmit with any mobile radio only when bystanders are at least two (2) feet away from a properly installed externally mounted antenna for radios with less than 50 watts of output power, or three (3) feet away for radios with 50 watts or greater power.

Control Station Operation

In the event of Control Station operation, to assure operators and bystanders are exposed to radio frequency (RF) energy levels lower than the limits specified in the FCC adopted standard, the antenna should be installed outside of any building, but in no instance shall the antenna be within two feet (less than 50 watts power output) or within three feet (50 watts or higher power output) of station operators or bystanders.

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Introduction

1

This publication (Service Manual Volume 2f, Motorola Publication 68P81080C39) provides specific information for the 40-Watt MCS 2000 radios listed in Table 1, which operates in the UHF Range 2 frequency range. The coverage in this publication includes radios both without and with receiver preamplifiers.

This publication is a companion volume to Service Manual Volume 1 for MCS 2000 Radios, Motorola Publication 68P81083C20, which provides non-frequency-range-specific information for all MCS 2000 Radios. Service personnel must have both Volume 1 and Volume 2f of this Service Manual in order to have all service information for 40-Watt MCS 2000 Radio that operates in the UHF Range 2 frequency range.

There are other Volume 2 service manuals (e.g., Volume 2a, 2b, 2c), which cover models of the MCS 2000 Radio for other frequency ranges and power levels. Refer to Volume 1 of this service manual for a list of the manuals related to operation and maintenance of all models of the MCS 2000 Radio, and the Motorola publication numbers for those manuals.

Hereafter in this publication, the MCS 2000 Radio is referred to as the radio. The specific hardware portions of the radio covered in this volume of the service manual are as follows:

- Receiver Front End
- Receiver Intermediate Frequency (IF)
- Receiver Back End
- Power Amplifier
- Synthesizer

This volume of the service manual covers the following five topics for the specific hardware portions of the 40-Watt UHF Range 2 radios :

- Theory of operation
- Troubleshooting
- Component locations
- Parts lists
- Schematic diagrams and associated interconnect information

The five topics listed above for the controller section and for the control heads are covered in Volume 1 of this service manual, Motorola Publication Number 68P81083C20.

The radios covered in this service manual contain a single circuit card assembly (a printed circuit board with components mounted), which is called the transceiver board. The transceiver board is identified by a unique Motorola kit number: HUE4022A for the version of the radio that *does not* include a receiver preamplifier; and HUE4024A for the version of the radio that *does* include a receiver preamplifier.

Theory of Operation

This chapter provides theory of operation information for the 40-Watt Range 2 UHF radio. It starts with a block diagram level functional description of the entire radio. This is followed by a detailed functional description for each of the receiver and transmitter functions.

Introduction

The radio is composed of the following five major functions:

- Receiver
- Transmitter
- Controller
- Operator Interface (Control Head)
- Dc Power Control and Regulation

The receiver, transmitter, controller, and power control and regulation functions are physically located on a single circuit card assembly (CCA) in the main body of the radio. The CCA is called the transceiver board.

The operator interface function consists of the control head, which connects to the main body of the radio. There are three different control head types: the Model I for the Model I Radio; the Model II for the Model II Radio; and the Model III for the Model III Radio. The control heads are covered in their entirety in volume 1 of this service manual.

The transceiver board is physically separated into six functional sections as follows:

- Receiver Front End
- Receiver Intermediate Frequency (IF)
- Receiver Back End [Zero Intermediate Frequency (ZIF)]
- Power Amplifier (PA)
- Synthesizer
- Controller

The controller section is further divided into two sub-sections: common controller; and dc power supply and regulation. The mechanical layout of the transceiver board and the electrical interconnections between its sections are illustrated in Chapter 4.

Separate component location diagrams, parts lists, and schematic diagrams are provided in this service manual for each of the six physical sections of the transceiver board and for the control heads.

The component location diagrams, parts lists, and schematic diagrams for the controller section of the transceiver board and for the control heads are located in volume 1 of this service manual. The component location diagrams, parts lists, and schematic diagrams, for the other five physical sections of the transceiver board are located in this volume (Volume 2f).

Block Diagram Level Theory of Operation

The following discussion refers to the overall functional block diagram for the radio, Figure 1.

The receiver function of the radio detects, demodulates, amplifies, and outputs via the loudspeaker, radio signals picked up by the vehicle or fixed-station antenna. The radio signals picked up by the antenna are signals that have been re-broadcast by trunked or conventional repeaters, or that have been broadcast directly by other mobile or fixed station radios. The receiver input signal from the antenna reaches the receiver via the antenna switch, which is located in the transmitter function of the radio.

The receiver function of the radio consists of: the receiver front end section; the receiver intermediate frequency (IF) section; the receiver back end section; and the audio signal filter (ASFIC) and receiver audio power amplifier circuits in the controller section.

The receiver function of the radio uses the double conversion superheterodyne design to optimize image rejection and selectivity.

The 40-Watt version of the UHF radio covered in this volume of the service manual is available with two different receiver configurations, one that includes a preamplifier in the receiver front end and the other that does not. Except when specifically stated otherwise, the discussion that follows applies to both the preamplifier and non-preamplifier versions of the radio.

The receiver front end section converts the receiver input signal to a first intermediate frequency (IF) of 109.65 MHz. It does so by mixing the receiver input signal with a receiver first local oscillator signal. Therefore, the channel frequency of the received signal is determined by the frequency of the receiver first local oscillator signal, which is 109.65MHz above the frequency of the receiver input signal. The local oscillator signal is produced by the synthesizer section of the radio.

In the preamplifier versions only of the radio, a preamplifier in the receiver front end section amplifies the receiver input signal from the antenna switch before it is converted to the first IF.

The IF output signal from the receiver front end section passes through the receiver IF section where it is filtered and amplified. The output signal from the receiver IF section goes to the input of the receiver back end section.

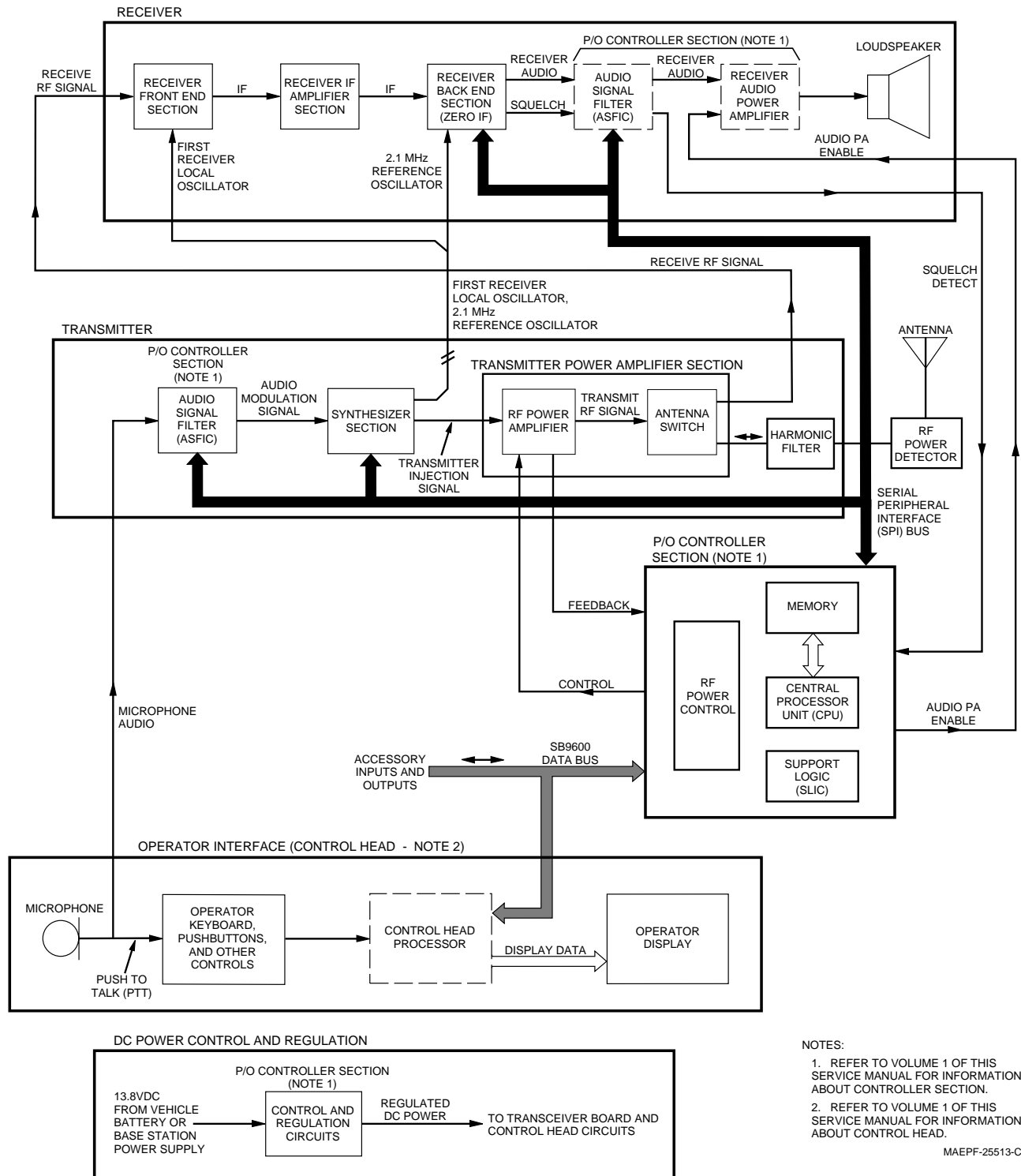


Figure 1 UHF Range 2, 40-Watt Radio Functional Block Diagram

In the receiver back end section, which contains an integrated circuit (IC) called the zero intermediate frequency (ZIF), the receiver IF signal is demodulated to produce receiver audio, signalling, and squelch signals. The ZIF IC contains a number of phase locked loops, which are synchronized by a 2.1-MHz reference oscillator signal provided by the synthesizer section of the radio. The output signals from the receiver back end section go to the input of the receiver audio circuits in the controller section of the radio.

In the controller section of the radio, the receiver audio and squelch signal outputs from the receiver back end section are processed, by an audio signal filter integrated circuit (ASFIC), to generate filtered receiver audio and squelch detect signals. The filtering characteristics and other processes of the ASFIC are controlled by the central processor unit (CPU) in the controller section.

The filtered receiver audio signal from the output of the ASFIC goes to the input of the receiver audio power amplifier circuit, which is located in the controller section of the radio. The receiver audio power amplifier circuit passes the receiver audio signal to the loudspeaker only when it receives an audio PA enable signal from the controller section of the radio. This is known as a squelch function. Its purpose is to prevent receiver noise from passing to the loudspeaker whenever there is no signals being received by the radio.

The controller generates the audio PA enable signal based on such variables as the level of the received signal, the channel frequency, and the operating mode of the radio. When the audio PA enable signal is generated, the audio power amplifier (PA) is activated and passes the receiver audio signal to the loudspeaker.

The transmitter function of the radio produces a 40-Watt radio frequency (RF) output signal. The (RF) output signal is frequency modulated by an audio signal from the microphone or from another source such as a keypad, handset, or external modem.

The transmitter function of the radio consists of: the audio signal filter integrated circuit (ASFIC) in the controller section; the synthesizer section; and the power amplifier (PA) section. The ASFIC develops a modulation signal by amplifying an audio signal from the microphone, keypad, or handset. The synthesizer section generates a radio frequency carrier signal upon which the transmitter portion of the radio operates. The radio frequency carrier signal generated by the synthesizer section is frequency modulated in the synthesizer section by the modulation signal output from the ASFIC.

The frequency modulated output signal from the synthesizer section is amplified to the required 40-Watt power level by the PA section. The RF output from the PA section passes through the antenna switch, harmonic filter, and RF power detector and is radiated into space by the vehicle or control-station antenna. Transmitter output power is monitored continuously and is adjusted by the RF power control circuit in the controller section of the radio.

The controller section of the radio contains a microprocessor that controls the radio in accordance with its built in programming as well as commands input manually by the radio operator. The radio

operator inputs manual commands to the controller section using the pushbuttons and other controls located on the control head. In addition to its controlling functions, the controller section provides audio amplification of the audio output signal in the receiver function. It also contains squelch detect circuitry based on a buffered discriminator signal from the Zero Intermediate Frequency Integrated Circuit (ZIF IC).

The operator interface function of the radio consists of: a microphone or the microphone portion of a handset; a keypad if used; the pushbuttons and other controls on the control head; and the digital and graphics displays on the control head. The pushbuttons and other controls on the control head provide digital commands to the controller section, and in some instances, hardwired commands to controlled circuits. The digital and graphics displays receive display data from the controller section.

The control head contains its own microprocessor, which communicates with the controller section of the radio via an SB9600 serial digital data bus.

The DC power supply and regulation function regulates and distributes DC voltage, to the various sections of the radio, DC power from the vehicle battery, alternator, or fixed station power supply.

Receiver Detailed Functional Description

The portion of the receiver function that is not part of the controller section of the radio is composed of three sections: receiver front end; receiver IF, and receiver back end.

Receiver Front End

The following discussion is based on the schematic diagram for the receiver front end section on page 47.

The radio signal enters the receiver front end through capacitor C5268. In the preamplifier version of the radio, the radio signal passes from capacitor C5268 to the input of the RF preamplifier composed of transistor Q5255 and associated components. The output from the RF preamplifier passes through capacitor C5262 to the input of the passband filter section, which includes a ceramic filter assembly and diode switches D5250 through D5253. In the standard (non-preamplifier) version of the radio, the radio signal passes from C5268, through 0-ohm resistors R5267 and R5269, to the input of the passband filter section. In the preamplifier version of the radio, the radio signal passes from capacitor C5268 to the RF Preamplifier section.

RF Preamplifier Section (Preamplifier Version Only)

In the preamplifier version of the radio only, the radio signal passes from capacitor C5268 through a high pass filter (C5265, C5266, C5267, C5272, C5273, L5259, L5260) to RF preamplifier transistor Q5255. The high pass filter attenuates signals below the receiver passband (450 to 512 MHz). The main purpose of the high pass filter is to attenuate undesired signals that could otherwise frequency multiply onto channel through non-linearities in the RF preamplifier.

The RF preamplifier Q5255 is a low noise amplifier which provides 12 dB of gain and sets the noise figure of the receiver (2.1 dB). Components VR5250, R5257, R5258, R5261, C5258, C5262, L5272 form the bias circuit for Q5255. In normal operation, the RF preamplifier draws about 17 mA of current. It operates from a 13.6-Volt receiver front end regulator in the receiver IF section. (Refer to detailed functional description of receiver IF section for particulars.)

Passband Filter Section

The first local oscillator (LO) uses frequencies in the range of 559.65 MHz to 621.65 MHz. The main function of the passband filter section is to provide rejection of signals at the image frequencies (first LO plus intermediate frequency). This ensures that radio signals in the image frequency range of 669.3 MHz to 731.3 MHz are not converted down to the 109.65 MHz IF by the mixer.

The passband filter section consists of a ceramic filter assembly (B5255) and two diode switches. The ceramic filter assembly consists of two ceramic filters and a bracket. Only one ceramic filter is switched into the receiver signal circuit at a time. This is accomplished by diode switches D5250, D5251, D5252 and D5253, which are controlled by auxiliary bit 1 of Frac-N integrated circuit U5801 in the synthesizer section of the radio. (Refer to detailed functional description of synthesizer section for particulars.)

The passband of the first filter is 450 to 482 MHz and that of the second is 482 to 512 MHz. The ceramic filters attenuate signals below 450 MHz and above 512 MHz, providing most of the attenuation for signals at 109.65 MHz (the IF of the radio).

Mixer Section

The mixer section follows the passband filter section. The mixer (Q5254) converts the incoming signal down to the 109.65 MHz IF (intermediate frequency), using the LO (local oscillator) signal generated by the synthesizer. The frequency of the LO is always 109.65 MHz higher than the incoming RF signal frequency. The LO power level is 6 to 7 dBm going into the mixer section (when disconnected from the mixer and terminated in 50 ohms). The LO signal is passed through the LO Injection Filter (capacitors C5279 through C5291 and inductors L5265 through L5270).

The incoming RF signal and the LO reach the mixer through a matching network consisting of capacitors C5270, C5271 and C5201 and inductors L5257 through L5258 and L5271. The mixer is biased from the 13.6-Volt receiver front end regulator. The mixer draws about 16 mA of current from the regulator. The IF output signal from the mixer goes to the input of the receiver intermediate frequency (receiver IF) section of the radio.

Receiver Intermediate Frequency (IF)

The following discussion is based on the schematic diagram for the receiver IF section on page 49. The main functions of the IF section are to provide optimum selectivity, high signal gain, and low noise. The IF section of the UHF radio consists of a mixer termination, PIN diode attenuators, an IF amplifier, two crystal filters, a resistive pad (R5376, R5377, R5378) for impedance stabilization, and a 13.6-Volt receiver front end regulator).

The mixer termination (L5374, C5371, R5375, C5370, C5412) supplies the UHF mixer in the receiver front end section with an approximate 50-ohm match.

The 13.6-Volt receiver front end regulator consists of (R5390, Q5390, C5410, C5411, R5395, and VR5371). The output voltage of the regulator tracks SW-B+ up to 13.6 Volts, at which point it is clamped by VR5371 and Q5390.

To prevent strong signal overloads, external automatic gain control (AGC) is used in the IF path. The ZIF IC (U3201) provides a received signal-strength indicator (RSSI). The RSSI DC voltage is used to control the signal levels. The AGC consists of PIN diode attenuators (CR5375, CR5376) and associated bias components. The PIN diodes are biased by an operational-amplifier controller circuit (U5375 and associated components) and act as variable resistors in response to the RSSI feedback voltage from the ZIF IC. The variable resistance of the PIN diode allows a portion of the IF signal to be shunted to ground at the input IF string. The feedback voltage is inversely proportional to the amplitude of the IF signal. The voltage range of the RSSI is from approximately 1.5 Volts for strong signals to 5.5 Volts for weak signals.

The two pole crystal filters (Y5378 and Y5379) provide some adjacent channel selectivity and excellent spurious rejection further away from 109.65 MHz, thus, essentially rejecting all signals except the on-channel 109.65 MHz signal that is to be demodulated.

The IF amplifier (Q5388, L5301, R5379, C5301, R5388, R5301, C5386, R5387, C5382) is actively biased (R5386, C5385, C5418, L5380, C5384, C5417, Q5382, R5385, R5384, R5382, L5399, C5383, C5415) by Q5382 and provides about 12 dB of gain with a noise figure of about 3 dB. It operates from 9.3 volts and draws about 30 mA of current in normal operation.

The other capacitors and inductors (C5377, C5376, L5376, C5378, C5379, L5377, L5378, C5380, C5381, L5379, C5375, C5387, C5303, C5372, L5381, C5388, C5389, L5382, C5390, L5383, C5391, C5302, L5302) provide an impedance match from the 50 ohm IF section input to the first crystal filter, from the first crystal filter to the IF amplifier, from the IF amplifier to the second crystal filter, and from the second crystal filter to the back end section.

A 150 ohm resistor (R5389) is used at the output of the IF section to provide impedance stabilization between the receiver back end section and the second crystal filter in the receiver IF section. The crystal filter input and output impedances are approximately 200 ohms.

Receiver Back End

The following discussion is based on the schematic diagram for the receiver back end section on page 51. The selectivity of the receiver back-end is provided by programmable filters contained in the Zero Intermediate Frequency Integrated Circuit (ZIF IC) circuitry. The filter bandwidth is adjusted automatically by the controller section of the radio to a bandwidth appropriate for the channel spacing.

The ZIF IC (U3201) uses a type of direct conversion process, whereby the second local oscillator (LO) frequency is very close to the

frequency of the received IF signal. The voltage controlled oscillator (VCO) in the synthesizer section of the radio is phase-locked to the IF signal and tracks it with a small offset frequency.

In the absence of an IF signal, the second LO VCO searches for a signal. When an IF signal is received, the second LO VCO locks on the signal. The second LO VCO is a Vackar oscillator built around transistor Q3201. A varactor diode (CR3201) adjusts the frequency of the VCO according to feedback voltage from the ZIF IC. This voltage is normally in the range of 1.0 to 3.5 volts.

The feedback voltage is routed through a loop filter consisting of R3215, R3204, C3214, C3215, R3203 and C3233.

The ZIF IC performs several other functions. In addition to providing selectivity, it also provides limiting and FM demodulation functions. The ZIF IC provides a received signal-strength indicator (RSSI) and a squelch output. The RSSI DC voltage is routed from the receiver back-end to the IF section and then to the controller section. The RSSI voltage, after buffering in the controller section of the radio, is available as an auxiliary output at pin 22 of the radio's accessory connector. The RSSI is also routed to the option connectors located in the controller section of the radio.

The ZIF IC also provides a squelch output on pin 29. The squelch signal is routed to shaping and detection circuits in the Audio Signalling Filter Integrated Circuit (ASFIC) in the controller section of the radio. The ASFIC has squelch detect and channel activity outputs that are routed to the controller section of the radio, which in turn controls audio muting and unmuting.

Refer to the discussion under the title Receive Audio Circuits, which is located in the theory of operation portion in volume 1 section 7 of this service manual, for further discussion of the squelch function.

The ZIF IC has both internal and external automatic gain control (AGC) circuitry. This circuitry is used to prevent strong signal overload of the filter circuits in the ZIF IC. The external AGC circuitry is described in the description of the intermediate frequency (IF) section.

Transmitter Detailed Functional Description

The transmitter function of the radio is distributed between the controller, the synthesizer, and the transmitter power amplifier (PA) sections. This is shown on the overall functional block diagram for the radio, Figure 1.

The portion of the transmitter function physically located in the controller section is described in the controller section theory of operation located in volume 1 of this service manual. That portion includes the audio circuits that filter, amplify, and otherwise process the audio signal from the microphone and/or telephone handset.

The portion of the transmitter function located in the synthesizer section of the radio is described in the synthesizer section theory of operation below. The synthesizer section of the transmitter receives the amplified and processed audio signal from the controller section

Synthesizer Detailed Functional Description

and produces a frequency-modulated radio frequency carrier (injection) signal, which is input to the transmitter power amplifier (PA) section.

The remaining portion of the transmitter function is physically located in the PA section. The theory of operation for the PA section follows the theory of operation for the synthesizer section.

The synthesizer section of the radio generates the local oscillator signal for the receiver section of the radio. It also generates the transmitter RF carrier signal, which is frequency modulated by the amplified and processed audio signal from the output of the audio signal filter integrated circuit (ASFIC) in the controller section. The frequency modulated transmitter RF carrier signal, called the transmitter injection signal, is amplified by the power amplifier (PA) section of the radio.

The following discussion is based on the schematic diagrams for the synthesizer section on pages 53 through 56. The synthesizer section consists of a Pendulum reference oscillator (U5800) and a phase locked loop (PLL), which is made up of a fractional-n (Frac-N) synthesizer integrated circuit (IC) (U5801), a loop filter, three voltage controlled oscillators (VCOs), buffer amplifiers, and a feedback amplifier. Two of the VCOs (one at the time) generate the receiver local oscillator. The third VCO generates the transmitter injection signal.

The Pendulum reference oscillator (U5800) contains a temperature compensated crystal, which has an oscillation frequency of 16.8 MHz. The output of the oscillator is applied to pin 14 of U5801 via C5754 and R5750. The Frac-N synthesizer IC, U5801, consists of a prescaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance the low and high frequency analog modulation, a 13V positive voltage multiplier, a serial interface for control, and a super filter for the regulated 9.3 V.

The super filter uses Q5770 as a current amplifier. The super filter drops the 9.3V to 8.5V. The resultant super-filtered 8.5 V source supplies the operating voltage for the voltage-controlled oscillators (VCOs), their corresponding buffers, and the synthesizer charge pump resistor network (R5754). The synthesizer supply voltage is provided by the 5 Volt regulator U5802. The 2.1 MHz reference signal is generated by dividing down the signal of the reference oscillator after it is applied to pin14 of U5801.

The charge pump output stage at pin VEE2 (pin 36 of U5801) is 13V generated at pin 1 of CR5750 by the positive voltage multiplier circuitry (CR5750). This voltage multiplier is basically a diode capacitor network driven by two signals that are 180-degrees out of phase with one another (pins 8 and 9 of U5801).

The serial interface (SPI) is connected to the controller section of the radio via the data line (pin 2 of U5801), clock line (pin 3 of U5801) and chip enable line (pin 4 of U5801). Proper enabling of these lines allows the controller section to program the fractional-N synthesizer IC.

All three VCOs are varactor tuned. The VCO frequencies are controlled by the output voltage of the loop filter. This control voltage ranges from approximately 2.5 to 11.0 Volts. A smaller control voltage produces a lower frequency and a larger control voltage produces a higher frequency.

Frequency modulation is controlled by the Frac-N IC (U5801). The audio signal from the controller section of the radio is applied to pin 5 of the Frac-N synthesizer IC. An A/D converter in the FracN synthesizer IC converts the low frequency portion of the analog modulating signal into a digital code, which is applied to a loop divider. This causes the carrier frequency to deviate.

A balanced attenuator is used to adjust the VCO deviation sensitivity to high frequency modulating signals. The output of the balanced attenuator is present at the MOD OUT (pin 30 of U5801). This signal then goes through a resistive divider and is capacitively coupled to the loop filter via C5781. This changes the control voltage to the transmit VCO thereby frequency modulating the carrier.

The loop filter (which consists of R5760, R5761, R5762, C5775, C5777, C5779, C5788, C5789, C5790, C5991, C5992, C5993, C5994, C5795, C5797) transforms the current produced by the charge pump into a voltage. The loop filter also acts as a low-pass filter to eliminate spurious signals. The output of the loop filter is sent to varactor diodes, which changes the frequency. In transmit mode the voltage is applied to pin 22 of the TX VCO module (U5803). In receive mode, the voltage is applied to pin 3 of CV5903 and CV5904 for the low VCO and pin 3 of CV5901 and CV5902 for the high VCO.

There is one transmit VCO and two receive VCOs. The VCOs are activated by the auxiliary lines on the Frac-N synthesizer IC. Aux2 (pin 38 of U5801) and Aux4 (pin 40 of U5801) turn on the low and high receive VCOs, respectively. Aux3 (pin 39 of U5801) turns on the transmit VCO.

The transmit VCO module, U5803, generates the RF carrier and operates from 450 to 512 MHz. The RX VCOs provide the LO injection signal for the receiver, which is 109.65 MHz above the carrier frequency.

Two receiver VCOs are included in the radio. One VCO, Q5904 and associated circuitry, operates in the frequency range of 280 MHz to 298 MHz, and the other, Q5903 and associated circuitry, operates from 298 to 311 MHz. The receiver operates from the 2nd harmonic produced by the receiver VCOs, which is extracted using the receiver VCO high pass filter composed of C5913 through C5915 and L5909 through L5910. The second harmonics thus produced are in the range of 560-through 596-MHz and 596- through 622-Mhz.

The receiver injection string following the RX VCO high-pass filter is a two-stage amplifier. The first stage is a buffer (Q5905), which provides gain and isolation. The output from the buffer stage feeds into a second amplifier stage (Q5930) to provide additional LO signal strength. A feedback tap to the synthesizer loop is provided through C5796 and is then applied to the input of the feedback amplifier

(Q5940). To close the synthesizer loop, the output of Q5940 is connected to the PREIN port (pin 21) of the synthesizer, U5801.

The transmit injection string in the synthesizer consists of three amplifier stages (Q5942, Q5931, Q5932) whose main purpose is to maintain a constant output to drive the RF power amplifier. Increased isolation is achieved with attenuators R5968 through R5970, R5954 through R5956 and R5961 through R5963. The output of Q5931 is fed back to the synthesizer loop through C5811. The TX injection string is on only with K9.1V activated during transmit mode

Power Amplifier (PA)

Overall PA

The following discussion is based on the schematic diagram for the power amplifier (PA) on page 60.

The PA consists of a four stage power amplifier (PA) followed by an antenna switch, harmonic filter, and directional coupler. The four stages of the power amplifier are: controlled stage Q5500; pre-driver Q5532; driver Q5560; and final amplifier Q5592.

In the transmit mode, the PA amplifies the TX_INJ signal (40 milliwatts amplitude) to a nominal 40 watt level (a nominal 30-Watt level above 494-MHz) at the antenna connector (J5501) while providing isolation to the receiver front end. In the receive mode, the PA provides a low loss path from the antenna connector to the RX_IN. It also distributes A+ voltage from the A+ connector (J5500) to the main board (A+_9_2, A+_9_3).

The controlled stage provides a gain that is a function of control voltage (PA_CNTRL_9). This control voltage comes from the power control section in the controller section of the radio. The control voltage magnitude depends on PA forward output power, temperature, final amplifier current drain, and A+ voltage.

For a detailed explanation of the power control function, refer to the paragraph, titled PA Power Control, located at the end of this section.

TX_INJ is passed to the first PA stage (controlled stage) input by a high pass match (L5502, C5500). Resistor R5500 enhances the stability of the Q5500 device at the lower operating frequencies.

The gain of the controlled stage device (Q5500) is determined by the collector current. The Q5500 BJT device and associated circuitry (Q5501, Q5502, R5502, R5503, R5509, R5510, R5511) are best described as a voltage-controlled current source. This means that the Q5500 collector current is proportional to the magnitude of the control voltage. As the control voltage increases, Q5500 collector current increases. By controlling the output power of the Q5500 Class A stage and in turn the input power of the following stages, the power control loop is able to regulate the transmitter output power.

The 300 milliwatt nominal output power of the controlled stage is transferred to the second (pre-driver) PA stage input by a bandpass match consisting of C5502, C5503, and a transmission line.

The predriver device (Q5532) is an enhancement mode N-channel MOSFET, which requires a positive gate bias to set its quiescent drain current for proper Class A-B operation. Q5531, Q5530, R5532 through R5539 and R5530 comprise an active feedback circuit, which provides the gate bias voltage through R5545 and R5550. The Q5532 drain current is determined by PA_CNRTL_9.

Components R5544 and R5546 through R5548 enhance the stability of device Q5532 at the lower operating frequencies. The network consisting of L5531, C5535, R5542, L5530 and C5533 provide A+ to the Q5532 drain. The nominal output power of the predriver stage is 3 watts. The device is heat-sunked to the chassis via H5530.

A matching network consisting of C5537 through C5540 and transmission lines transfer power to the input of the third (driver) PA stage. The driver stage (BJT Q5560) is operated Class C with L5562, L5563 and R5563 forming the zero volt DC base bias. A+ voltage is distributed to the Q5560 collector by L5561, C5561, L5560, R5560 and C5560. The output power of the driver stage is nominally 15 watts. The heat sink for device Q5560 is screwed directly to the chassis.

The lowpass match utilizing C5563, C5562, C5564, C5599, C5603 and several transmission lines provides power to the base of the final stage PA device Q5592. The Q5592 BJT device is operated Class B to increase transmitter bandwidth. The final stage bias voltage is determined by the voltage regulator U5590, R5601, R5602, R5590, R5593 through R5596, and CR5590. The bias is routed to the Q5592 base by R5597, L5590, C5604 and L5593. The final stage device is screwed directly to the chassis. The final stage bandpass output match consists of C5597, C5600, C5607, L5597, C5598 and several transmission lines. It transfers approximately 50 watts to a 50 ohm circuit impedance point between C5598 and CR5620.

A+ voltage is supplied to the Q5592 collector via L5592, C5609, R5598, L5591 and C5595 and the current sense resistor R5710. The transorb diode, CR5710, in conjunction with a spring contact in the chassis provides reverse polarity and over-voltage protection for the radio. Heat sinks H5590 and H5620 are used to channel heat away from the PC board to the chassis.

The antenna switch utilizes PIN diodes to form a low loss, high isolation RF relay. During transmit, diodes CR5620, CR5621, and CR5623 are forward biased by the K9.1 supply via R5621, R5620, L5620 and R5622. In this state, a low loss path exists from the final amplifier through CR5620 into the harmonic filter and at the same time provides protection to the receiver front end from excessive RF levels. During receive, all three diodes remain unbiased and provide a low loss path from the harmonic filter to the receiver front end.

Capacitors C5622, C5625, C5626, C5629, C5630, and inductors L5622, L5625 and L5623 form a high pass filter in the receive path to attenuate frequencies at half the intended RX frequency. C5628 and a transmission line form a resonant circuit, which improves RX image rejection. Resistors R5623 through R5625 channel heat away from CR5620. Shield SH5681 also lessens filter bypass at the antenna connector J5501.

A low-pass harmonic filter, consisting of C5651 through C5654 and L5650 through L5652, follows the antenna switch. The filter's primary function is to attenuate harmonic energy generated by the amplifier stages, but it also adds some selectivity for the receiver. The filter is shielded via SH5650 to lessen the amount of harmonic energy bypassing the filter.

The directional coupler is the last circuit block before the antenna connector. The coupler is composed of a pair of parallel microstrip transmission lines, which form a forward power sensing directional coupler and detector. The output of the directional coupler and detector is a DC voltage proportional to the forward RF power output from the PA. Diode CR5680 rectifies the RF energy that appears across it. This voltage is then divided by R5680 through R5682, R5684, and RT5680. The resultant coupler detect voltage (VFORWARD_9) is routed back to the power control circuit block. The directional coupler circuit is shielded by SH5680 to lessen the amount of harmonic energy bypassing the harmonic filter.

PA Power Control

The following discussion is based on the simplified schematic diagram for the PA power control function, Figure 2. The first (controlled) stage of the PA provides a gain that is a function of control voltage (PA_CNTRL_9). The control voltage is routed from the power control section in the controller section of the radio. The magnitude of the control voltage depends on PA forward power, PA temperature, final amplifier current drain, and A+ voltage.

The coupler detect voltage (VFORWARD_9), which is proportional to PA forward power, is buffered and summed with PA_PWR_SET provided by the D/A converter (U0551). The resultant voltage level is compared with a reference voltage at U0550-4. Any voltage level difference between U0550-4, pins 9 and 10 causes an increase or decrease in PA_CNTRL, which results in a corresponding change in the VFORWARD voltage level from the PA. The loop operates in this manner unless it is limited by one or more of the four protection mechanisms described below.

The first protection mechanism limits the maximum magnitude of the PA_CTRL voltage. The maximum allowable PA_CNTRL voltage is determined by PA_CNTRL_LIM_9). If PA_CNTRL_LIM increases to a level where CR0551 is forward biased, the voltage level at pin 9 of U0550-4 is clamped and PA_CNTRL cannot increase any further. Control voltage limiting protects the power amplifier against being overdriven and foldback.

The second protection mechanism limits the maximum DC current input to the final device (U5592) in the PA. The DC input to the final device is measured by the voltage drop across a series resistor (R5710). CURRENT_SENSE+_9, the A+ side of R5710, is summed with CUR_LIM_SET from the D/A Converter (U0551). The sum is compared with CURRENT_SENSE-_9, the device side of R5710, at U0550-2.

A change in the voltage level difference between U0550-2, pins 5 and 6 causes a corresponding increase or decrease at U0550-2, pin 7. If the U0550-2, pin 7 voltage increases to a level where CR0550 (diode 2-3) is forward biased, the voltage level at U0550-4, pin 9 is clamped and PA_CNTRL cannot increase any further. Thus if the voltage drop across

R5710 in the PA increases due to increasing final stage current and the voltage at U0550-2, pin 7 increases to the clamping level, the transmitter is current limited. Current limiting protects the final amplifier stage from excessive current drain.

The third protection circuit is temperature limiting. Thermistor RT5710, which is physically located near the final PA device, determines the voltage level at U0550-1 pin 2. This level is compared with a set reference level at U0550-1 pin 3. If the voltage level difference at the input of U0550-1 results in an increase of the output voltage sufficient to forward bias CR0551 (diode 1-3), the voltage level at U0550-4, pin 9 is clamped and PA_CNTRL cannot increase any further. Temperature limiting protects the radio from reaching an excessive temperature.

The fourth (and last) protection circuit is the high line (A+ voltage)/ high temperature shutback circuit, which protects the PA against excessive power dissipation caused by simultaneous high A+ voltage and high temperature. The A+ voltage is divided down and routed to U5720-2 pin 5 where it is compared with a 5.6-Volt reference at U5720-2 pin 6. Simultaneously, the voltage across thermistor RT5710, at U5720-1 pin 3, is compared with a 1.64-Volt reference at U5720-1 pin 2. If the difference in voltage level at the inputs of U5720-2 results in a U5720-2 output voltage sufficiently high to forward bias diode 2-3 of CR5500 and diode CR0551 (which occurs if A+ is above approximately 15.8 Volts), PA_CNTRL drops the PA output power by 6 dB provided the temperature sensed by RT5710 is above approximately 80 degrees C. If, however, the temperature sensed by RT5710 is below approximately 80 degrees C., this feature is inhibited via U5720-1, R5729, R5730, and Q5720.

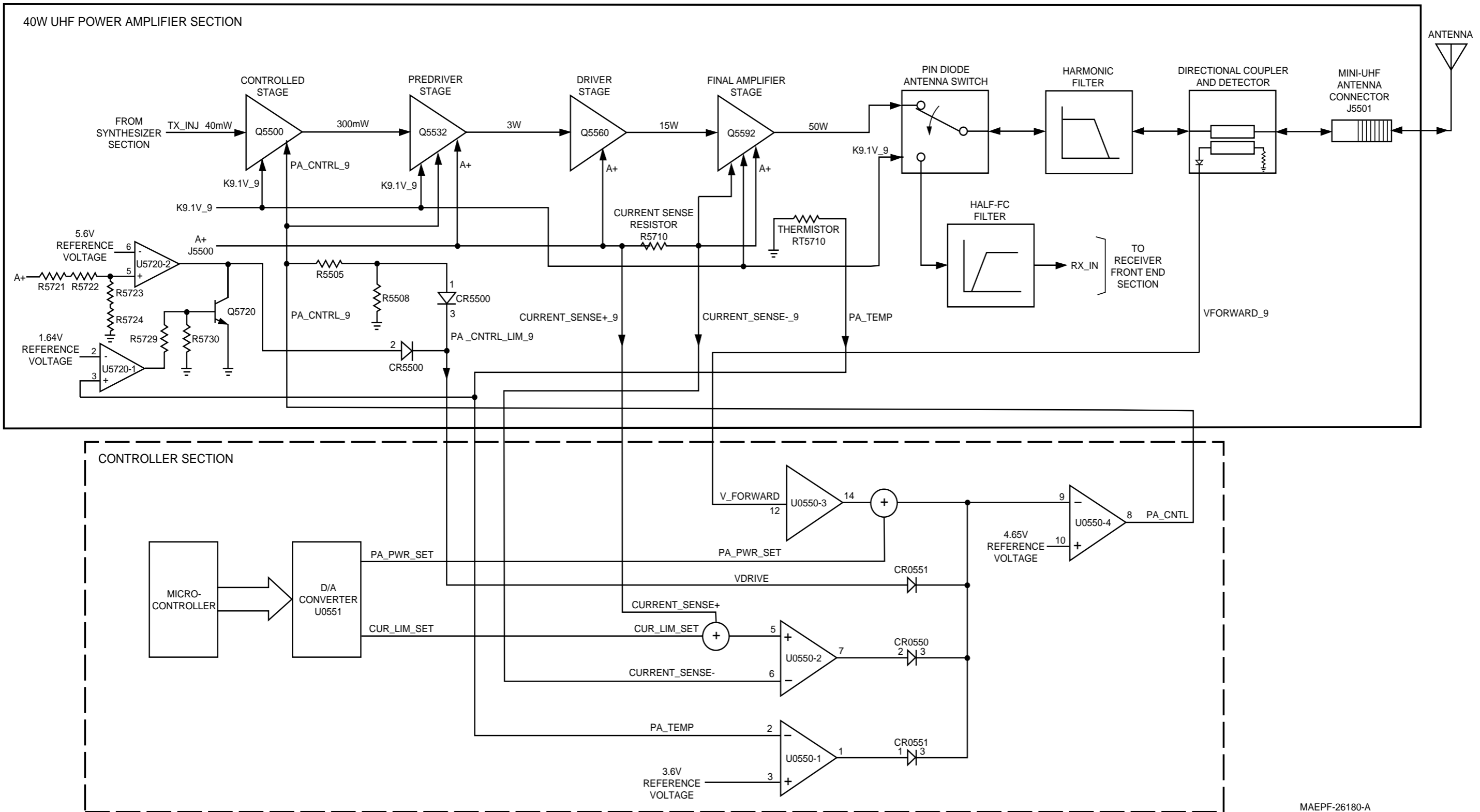
For a more detailed description and a schematic diagram, refer to the controller theory of operation in Volume 1 of this service manual.

Controller Detailed Functional Description

The theory of operation for the controller section of the radio is located in Volume 1 of this service manual, Motorola Publication 68P81083C20.

D.C. Power Control and Regulation Detailed Functional Description

The theory of operation for the dc power supply and regulation section of the radio is located in Volume 1 of this service manual, Motorola Publication 68P81083C20.



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Figure 2 PA Power Control Simplified Schematic Diagram

NOTES

Troubleshooting

3

This chapter provides the troubleshooting charts listed below for the receiver, synthesizer, and power amplifier sections of the radio, which are unique for each frequency range.

Troubleshooting Charts 1-1 through 1-13 for the overall radio and for the sections of the radio that are common in design for all frequency ranges (i.e., controller, power control, and control heads) are located in Volume 1 of this Service Manual, Motorola Publication Number 68P81083C20.

Troubleshooting information and troubleshooting Charts related to the SECURENET Option for the radio are located in the SECURENET Option Service Manual, Motorola Publication 68P81083C25.

- **Receiver:**

- Troubleshooting Chart 2f-1, Receiver Front End - Page 21
- Troubleshooting Chart 2f-2, Receiver IF - Page 22
- Troubleshooting Chart 2f-3, Receiver Back End - Page 24

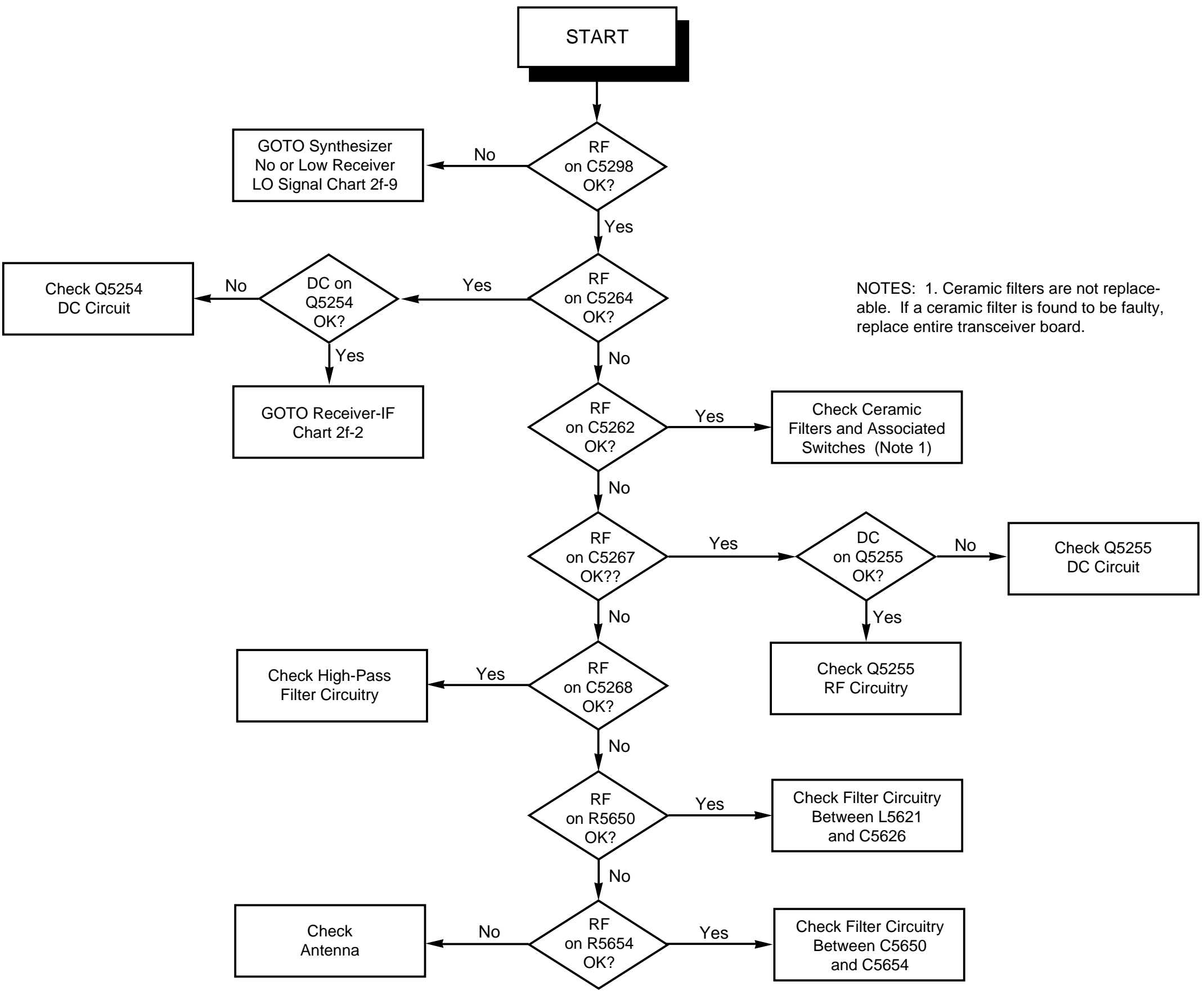
- **Synthesizer:**

- Troubleshooting Chart 2f-4, Synthesizer Deviation - Page 25
- Troubleshooting Chart 2f-5, Synthesizer Pendulum Oscillator - Page 28
- Troubleshooting Chart 2f-6, Synthesizer FAIL 001 - Page 29
- Troubleshooting Chart 2f-7, Synthesizer No Transmit - Page 30
- Troubleshooting Chart 2f-8, Synthesizer No or Low Transmitter Injection Signal - Page 31
- Troubleshooting Chart 2f-9, Synthesizer No or Low Receiver Local Oscillator Signal - Page 32

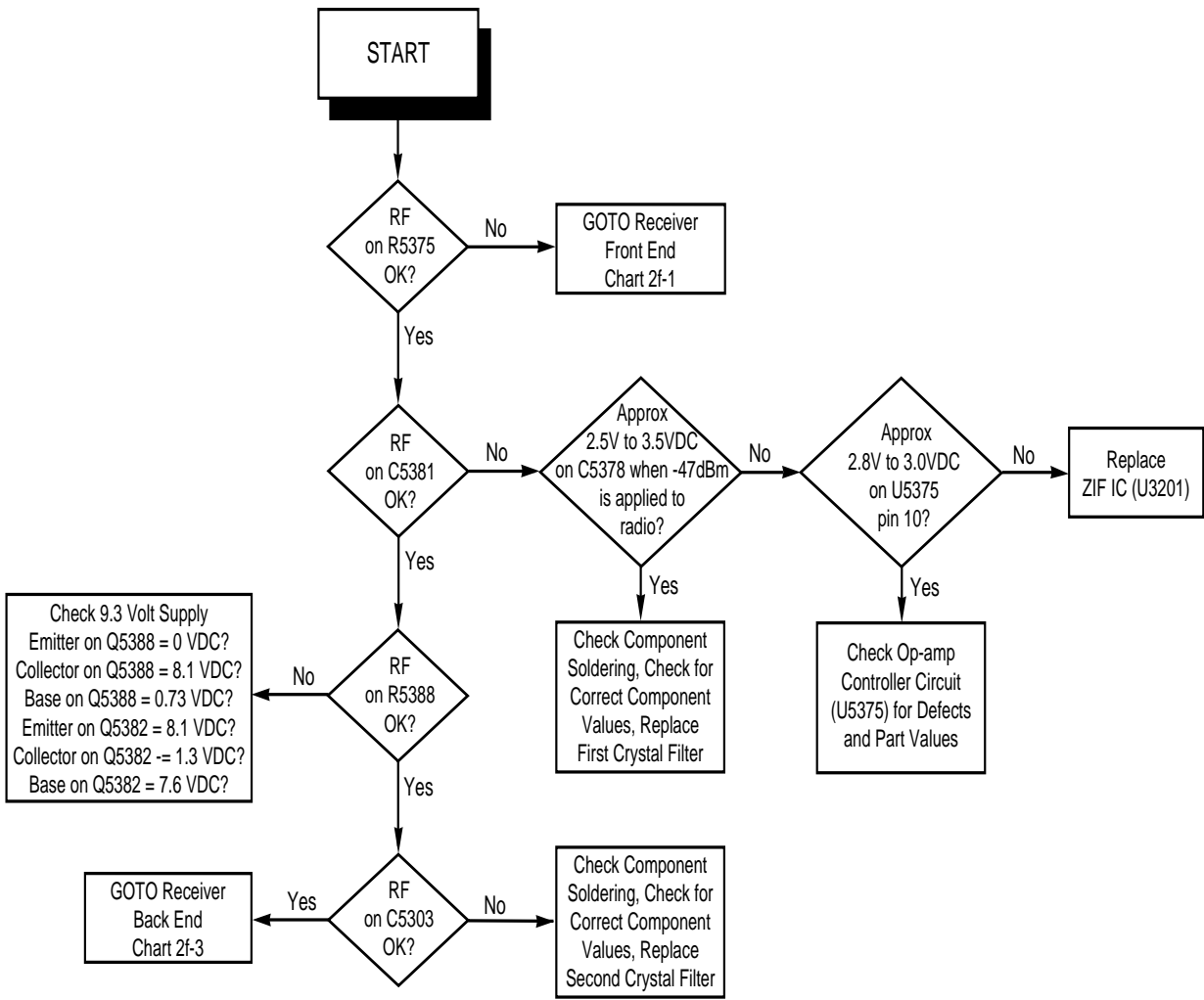
- **Power Amplifier:**

- Troubleshooting Chart 2f-8, Power Amplifier - Page 35

NOTES



NOTES: 1. Ceramic filters are not replaceable. If a ceramic filter is found to be faulty, replace entire transceiver board.



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Notes for Receiver Back End Troubleshooting Chart 2f-3

1. If zero IF local oscillator (ZIF LO) is locked, the frequency should be very close to 109.65 MHz. If the ZIF LO is not locked, the frequency can be in the range of 100 to 120 MHz.
2. The ZIF must be programmed properly by the controller section of the radio in order for the ZIF LO to lock on frequency. Verify proper operation of controller section before proceeding.

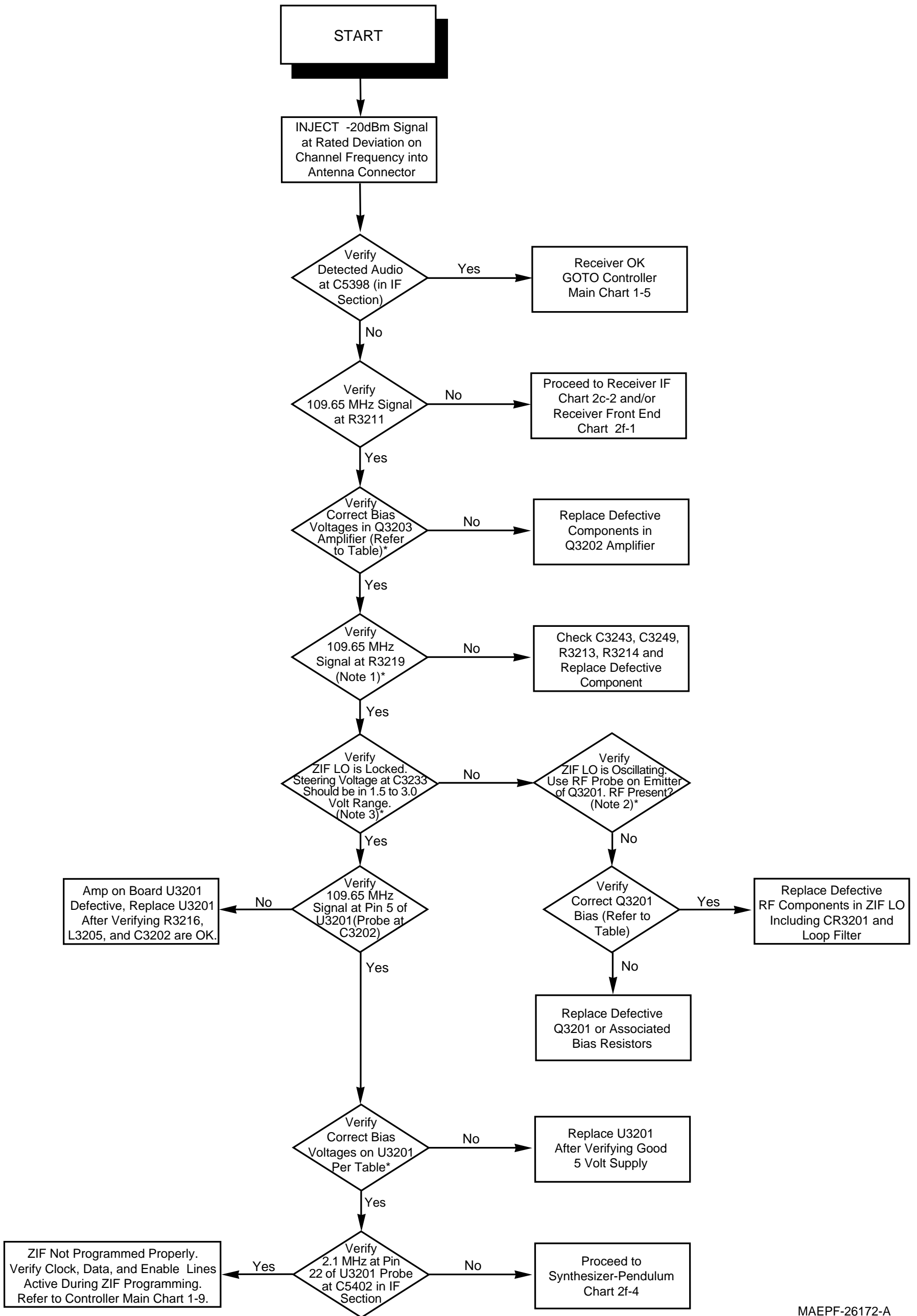
Table 1 Voltage Table (Transistors)

Transistor	Emitter	Base	Collector
Q3201	0.02V	0.7V	2.9V
Q3203	0.0V	0.7V	2.4V

Table 2 Voltage Table (ZIF IC)

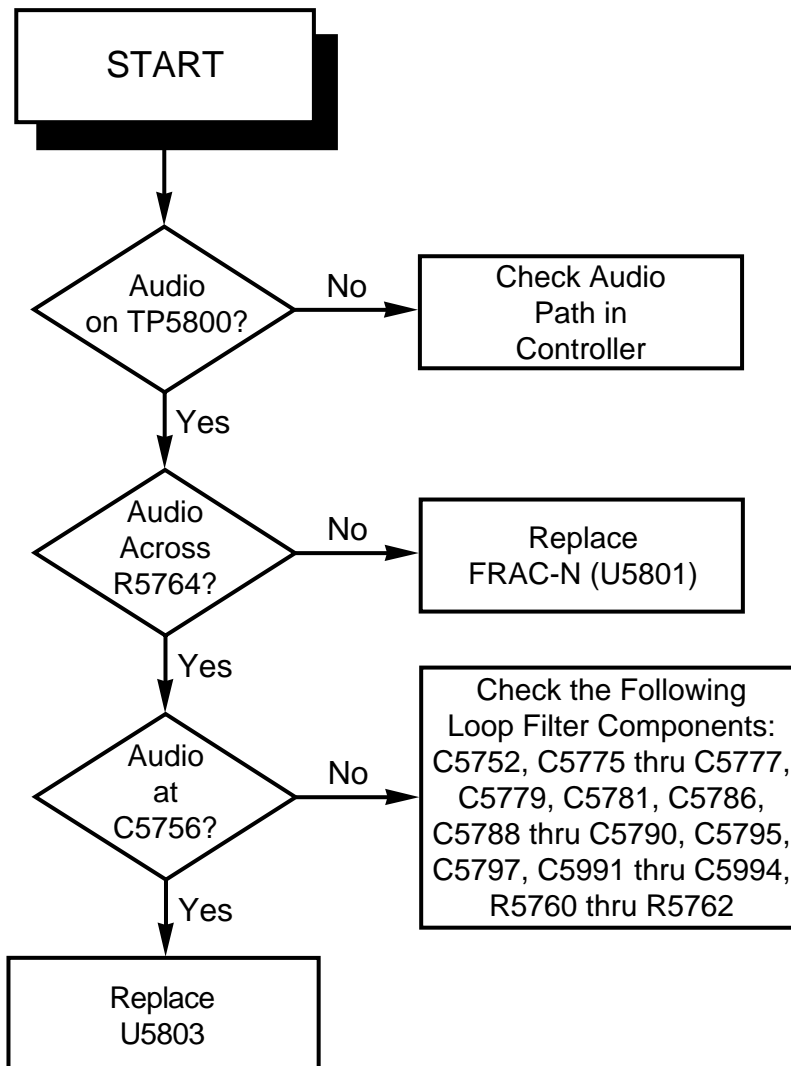
U3201 Pin No.	Probe At	Voltage
2	R3220	2.1
27	C3220	2.5
28	C5398	2.5
35	C3207	2.4
6	C3201	1.6

NOTE: Primary supply for the ZIF IC is 5 Volts. The supply originates in the synthesizer section of the radio.



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* Refer to Notes for Receiver Back End Troubleshooting Chart located on a separate page.



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Notes for Synthesizer Troubleshooting Charts 2f-5 through 2f-9

1. Check that C5759 and C5760 both have a 2.5 V square wave present. If they do not replace the FRAC-N (U5801). If squarewaves are present, check that 5 V is present at pin 4 of CR5750. If 5 V is not present at pin 4, replace CR5750.
2. Refer to the table below and determine which auxiliary bit should be on depending on the programmed receive frequency.

Range No.	Frequency Range	Auxiliary Bit On
1	403.0 to 435.5 MHz	2
2	450.0 to 485.0 MHz	2
1	435.5 to 470.0 MHz	4
2	485.0 to 512.0 MHz	4

3. Use an RF probe as an antenna to examine the area of the active RX VCO to verify that the VCO is oscillating. The table below shows the active component of VCO which is in operation:

Range No.	Frequency Range	Active Component
1	403.0 to 435.5 MHz	Q5904
2	450.0 to 485.0 MHz	Q5904
1	435.5 to 470.0 MHz	Q5903
2	485.0 to 512.0 MHz	Q5903

4. If VCO is not oscillating, probe drain and source of active component to see if it has the corresponding voltages. Drain should be at approximately 8V and source should be at 1 to 2V. Otherwise, look for shorts and opens among the components in the corresponding VCO. Replace any defective parts. If, however, the VCO will oscillate at only one frequency, replace resonators L5903 and L5907.
5. If VCO is oscillating, verify that the two RX buffers (Q5905 and Q5930) are operating properly. If the two RX buffers are not amplifying the signal, check RF path and DC Bias voltages as shown in the table below:

NOTE: The voltages listed in the table below will vary somewhat between radios. Therefore, they should be used only as a guide.

Pin	Q5905	Q5930
Collector	4.5V	6.25V
Base	0.75V	0.78V
Emitter	0.0V	0.0V

6. If there is an oscillation and the radio still exhibits an out of lock condition, it is usually the result of insufficient power getting back to the prescaler. If this is the case, check the prescaler feedback buffer for correct signal amplification and the correct biasing as shown in the table below.

Pin	Q5940
Collector	2.6V
Base	0.75V
Emitter	0.0V

NOTE: Although the amount of power getting back to the prescaler will vary with frequency channel, a level higher than -7 dBm is sufficient to obtain lock.

7. If the radio will not transmit because a synthesizer or TX VCO error exists, the red transmit light will flash when the radio is keyed. Before proceeding make sure that the FAIL 001 error message is not displayed when the radio is in standby mode. If the FAIL 001 message is displayed, go to the FAIL 001 troubleshooting chart.

When there is a transmit error the radio is much easier to troubleshoot if the Lock Detect line is tied to 5V. This will make the radio think that it is in a locked state when in transmit mode. Otherwise, once the PTT is pressed and the synthesizer does not lock in an allotted time period it goes back into receive mode. The following troubleshooting will assume the Lock Det line is forced high and that the radio is keyed.

8. Determine if the AUX3 bit is on.

NOTE: There should be approximately 4.2V at pin 4 of the corresponding switching transistor if the FRAC-N is functioning correctly.

9. Check that there is 8.3V on pin 3 of Q5783.

10. Check that there is 8.3V on pin 2 of Q5783.
11. Use an RF probe as an antenna to examine the area of the TX VCO to verify that the VCO is oscillating.
12. If VCO is oscillating, verify that the three TX buffers (Q5942, Q5931, and Q5932) are operating properly. If the three stages are not amplifying the signal then check the DC Bias voltages in the table below:

NOTE: The voltages listed in the table below will vary somewhat between radios. Therefore, they should be used only as a guide.

Pin	Q5942	Q5931	Q5932
Collector	5.75V	5.9V	7.0V
Base	0.9V	0.9V	1.1V
Emitter	0.15V	0.21V	0.34V

13. If there is an oscillation but it is at the wrong frequency, this is usually caused by insufficient power going to the prescaler. Check the prescaler feedback buffer for signal amplification and the correct biasing shown below.

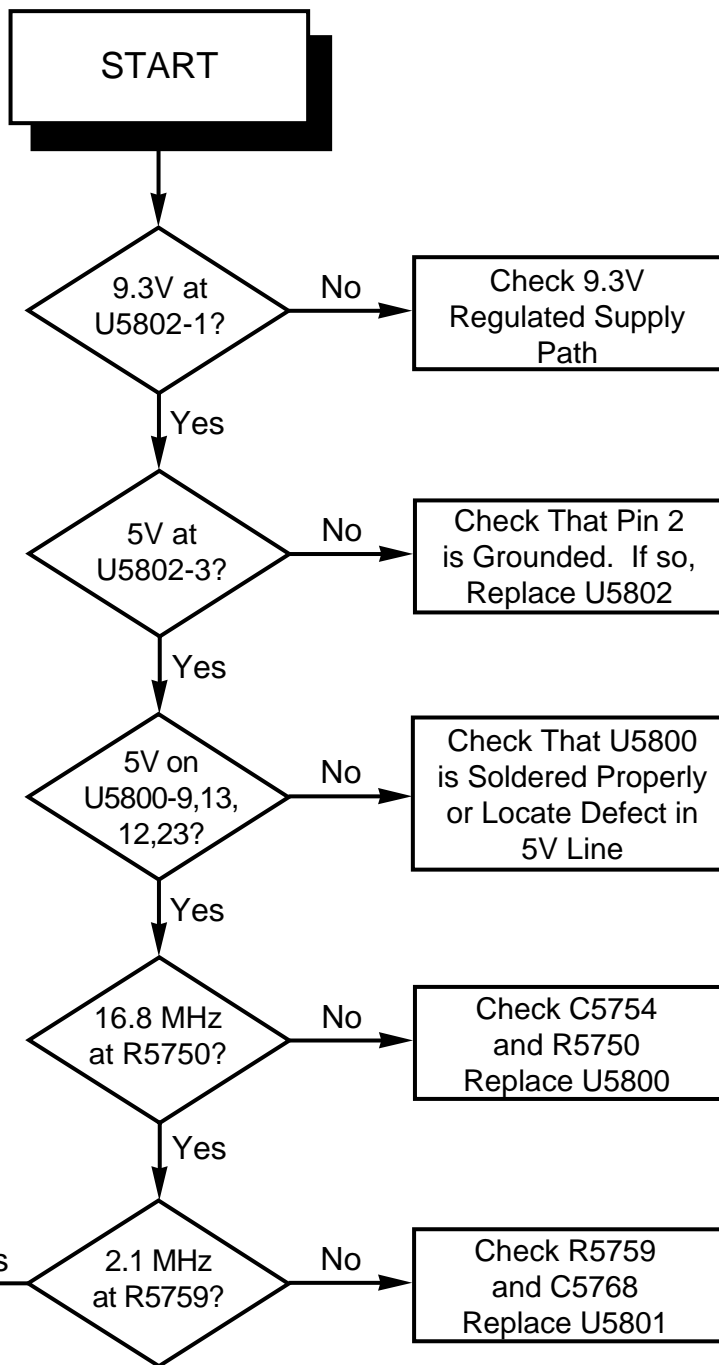
Pin	Q5940
Collector	2.6V
Base	0.75V
Emitter	0.0V

NOTE: Although the amount of power getting back to the prescaler will vary with frequency channel, a level above -7 dBm is adequate to obtain lock.

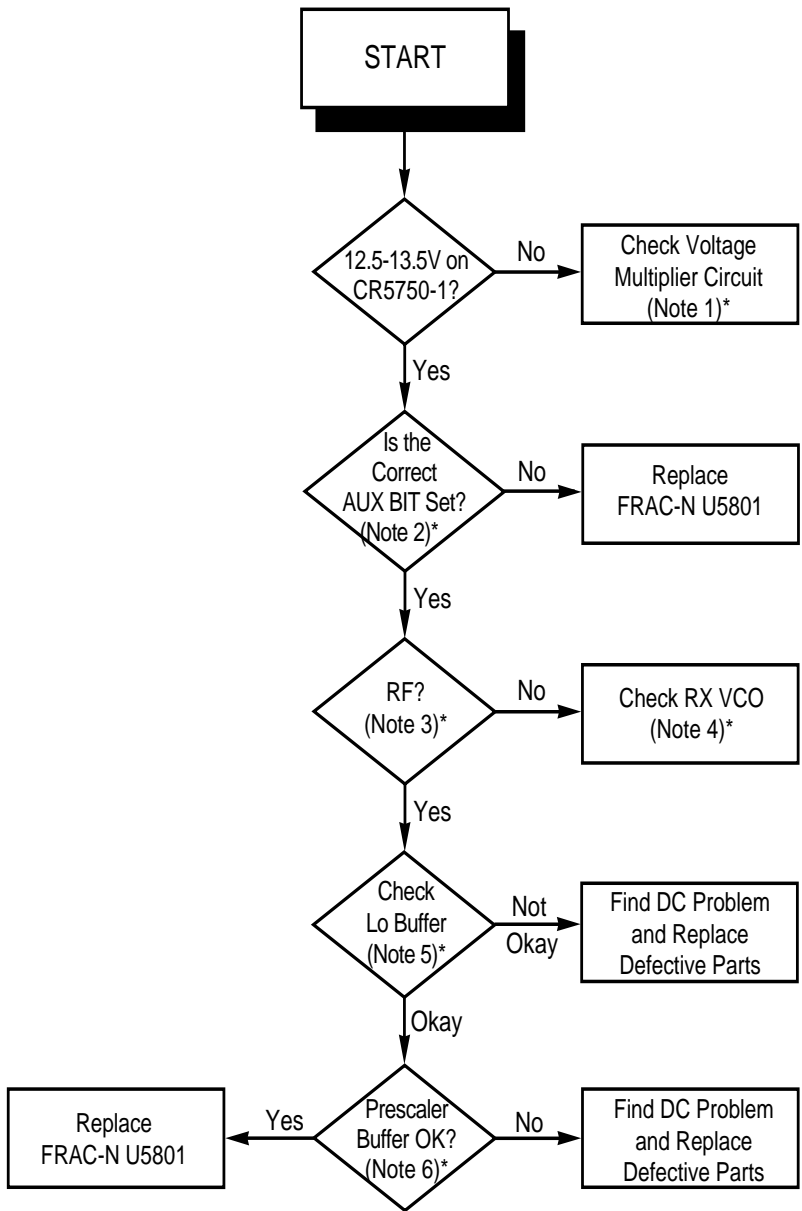
14. If the red transmit light does not stay illuminated when the radio is keyed, there is a synthesizer problem. Go to the synthesizer no transmit troubleshooting chart (chart 2c-7).
15. Check the injection string buffer for signal amplification and the correct biasing shown below.

Pin	Q5932
Collector	7.0V
Base	1.1V
Emitter	0.34V

16. Check the RF path between the collector of Q5932 and R5962 including C5806.
17. Check the path from R5962 to PA section at L5502 and C5500.
18. When in receive or standby mode, verify that FAIL 001 is not displayed. If FAIL 001 is displayed, go to Synthesizer FAIL 001 troubleshooting chart 2c-6.
19. If no LO is getting to the mixer and there is no out of lock error, check C5932. If it is defective or the wrong value replace it. Otherwise, check the continuity of the LO lines going to the mixer.

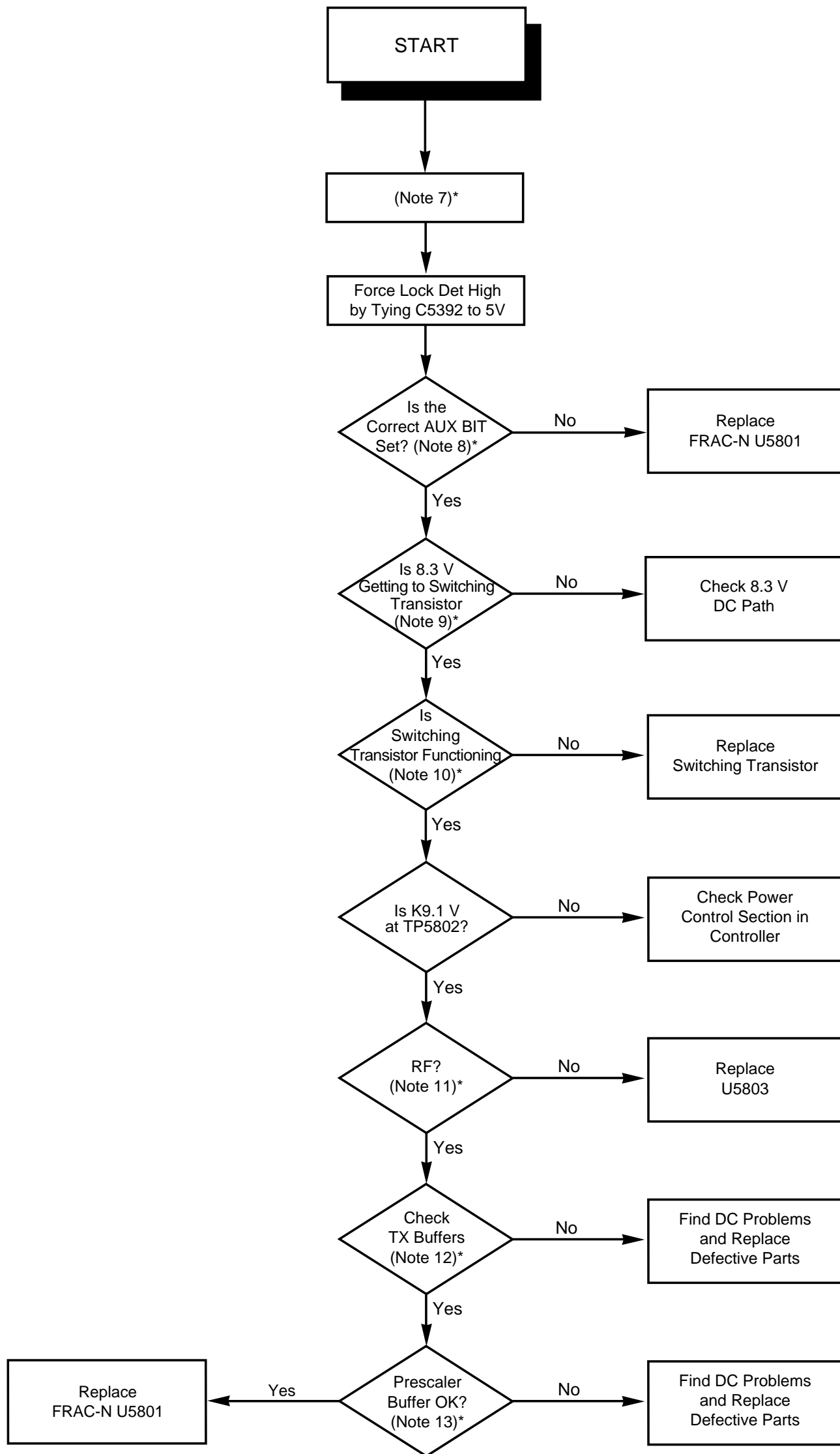


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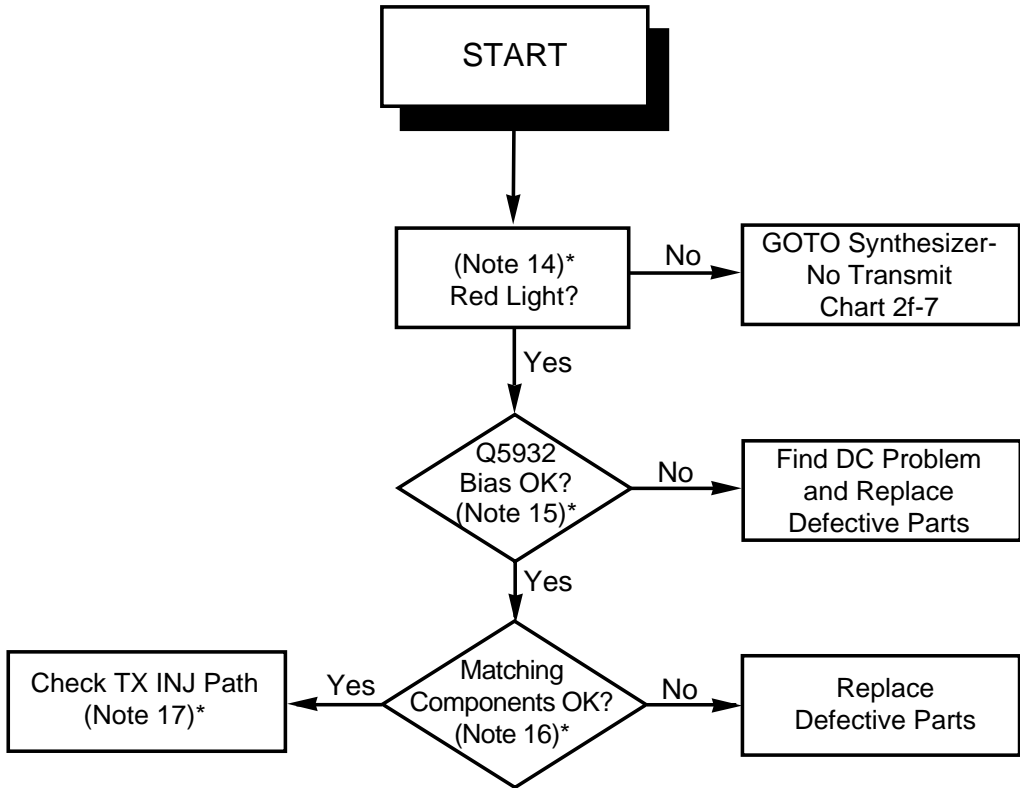
* Refer to Notes for Synthesizer Troubleshooting Charts 2f-6, 2f-7, 2f-8, and 2f-9 located on a separate page.

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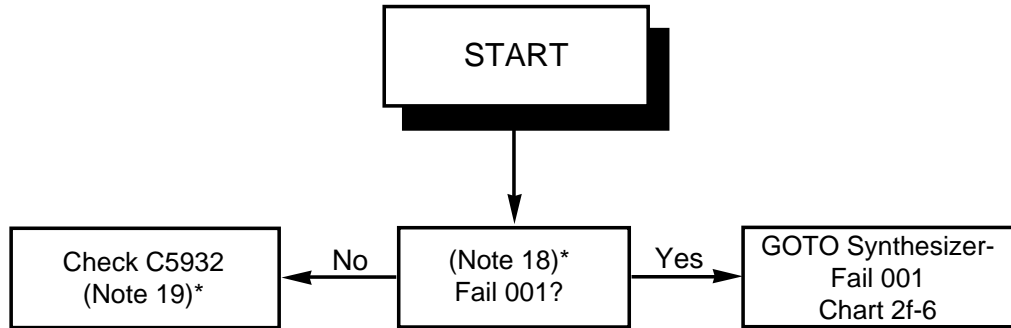
* Refer to Notes for Synthesizer Troubleshooting Charts 2f-6, 2f-7, 2f-8, and 2f-9 located on a separate page.

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* Refer to Notes for Synthesizer Troubleshooting Charts 2f-6, 2f-7, 2f-8, and 2f-9 located on a separate page.

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* Refer to Notes for Synthesizer Troubleshooting Charts 2f-6, 2f-7, 2f-8, and 2f-9 located on a separate page.

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Notes for Troubleshooting Chart 2f-10

General Notes:

- Review the theory of operation before attempting to troubleshoot the power amplifier.
- Some of the transmitter circuitry is located on the side of the transceiver board facing down into the chassis. Therefore, a chassis eliminator ("cutaway" chassis), Motorola stock number 2705816W03, is useful while troubleshooting the radio.



WARNING

To avoid personal injury from high RF Voltages and Currents, exercise extreme care while troubleshooting the transmitter power amplifier.



Caution

To avoid permanent damage to the power amplifier, do not key transmitter unless all screws that attach PA section to chassis are in place and are tightened to a torque level between 6 and 8-inch pounds.



Caution

Keying the transmitter for an extended period of time while using the chassis eliminator can cause damage to the radio. While using chassis eliminator, cool the radio by using a fan to force air through chassis cooling fins

- Set A+ supply to 13.6 volts with current limit set to 20 amperes.
- Ensure that any RF power attenuators used in test setups are rated for at least 500 Watts.
- Calibrate power meter regularly following the manufacture's suggested calibration method.
- Keep in mind that VSWR and insertion losses within any test setup affect the accuracy of RF power measurements.
- Table 1 on page *(To be Determined)* provides a list of typical voltage measurements for the 40W power amplifier.
- If a component is removed for troubleshooting, replace the removed part, regardless of its condition, with a new part.
- To reinstall the transceiver board into the chassis, follow reassembly instructions in volume 1 of this service manual.
- Reapply any thermal paste removed during troubleshooting.
- Use only Motorola specified parts when component replacement is required.

Specific (Numbered) Notes

1. Set current limit softpot to 63 to disable current limit.
2. R5962 is located in the synthesizer section. After transceiver board is removed from chassis, reconnect A+ supply and control head to transceiver board.
3. Perform the following steps in the order listed (Note: Test points TP5803 and TP5804 are located in synthesizer section).
 1. Solder center conductor of a small coaxial cable onto TP5803.
 2. Connect TP5804 to ground.
 3. Connect a milliwatt meter to the free end of the small coaxial cable.
 4. Key transmitter briefly and measure RF injection power at TP5803. Then remove small coaxial cable and replace R5962.
4. Replace R5962 and reassemble transceiver board into chassis.
5. TP5802 is located in synthesizer section.
6. TP0400 is located in controller section.
7. Perform the following in the order listed:
 1. Disconnect A+ supply.
 2. Remove L5501.
 3. Solder wires to pads for L5501 on transceiver board.
 4. Connect milliamp meter to wires on L5501 pads, which places Ammeter in series with Q5500 collector.
 5. Reconnect A+ supply.
 6. Key transmitter briefly and measure DC current.
 7. Disconnect A+ supply, remove wires, and replace L5501.
8. Perform the following in the order listed:
 1. Disconnect A+ supply.
 2. Remove L5531.
 3. Solder wires to pads for L5531 on transceiver board.
 4. Connect milliamp meter to wires on L5531 pads, which places it in series with Q5532 drain.
 5. Reconnect A+ supply.
 6. Key transmitter briefly and measure DC current.
 7. Disconnect A+ supply, remove wires, and replace L5531.
9. Perform the following in the order listed:
 1. Disconnect A+ supply.
 2. Remove L5560 and R5560.
 3. Solder 20 gauge or larger wires to pads for R5560 on transceiver board.
 4. Connect Ammeter to wires on R5560 pads, which places it in series with Q5560 collector.
 5. Reconnect A+ supply.

6. Key transmitter briefly and measure DC current.
7. Disconnect A+ supply, remove wires, and replace L5560 and R5560.

10. Perform the following in the order listed:

1. Disconnect A+ supply.
2. Remove transceiver board from chassis.
3. Remove L5561 and L5562.
4. Using diode check function of multimeter, measure base-emitter junction voltage drop from base to ground, which should be approximately 0.64-Volt.
5. Measure base-collector voltage drop from base to collector, which should be approximately 0.64-Volt.
6. Replace L5561 and L5562. Then reinstall transceiver board into chassis.

11. Perform the following in the order listed:

1. Remove R5962
2. Key transmitter and measure DC voltage at junction of R5603 and C5605.
3. Replace R5962.

12. Perform the following in the order listed:

1. Disconnect A+ supply.
2. Remove R5710 and solder 20 gauge or larger wires to pads for R5710 on transceiver board.
3. Connect Ammeter to wires on R5710 pads, which places it in series with Q5532 collector.
4. Reconnect A+ supply, key transmitter briefly, and measure DC current.
5. Disconnect A+ supply, remove wires, and replace R5710.

13. Perform the following in the order listed:

1. Disconnect A+ supply.
2. Remove L5592 and L5593.
3. Using diode check function of a multimeter, measure base-emitter junction voltage drop from base to ground of Q5592, which should be approximately 0.58 Volt.
4. Measure base to collector voltage drop of Q5592, which should be approximately 0.58 Volts.
5. Replace L5592 and L5593.

14. Check diodes using diode check function of multimeter.

15. Reassemble transceiver board into chassis.

16. Perform the following in the order listed:

1. Disconnect A+ supply.
2. Remove transceiver board from chassis.



Caution

In next step, be careful to lift shield SH5650 straight up vertically. When using hot air gun, the parts within the shield will reflow before shield itself and can be moved off their pads if touched by shield during its removal.

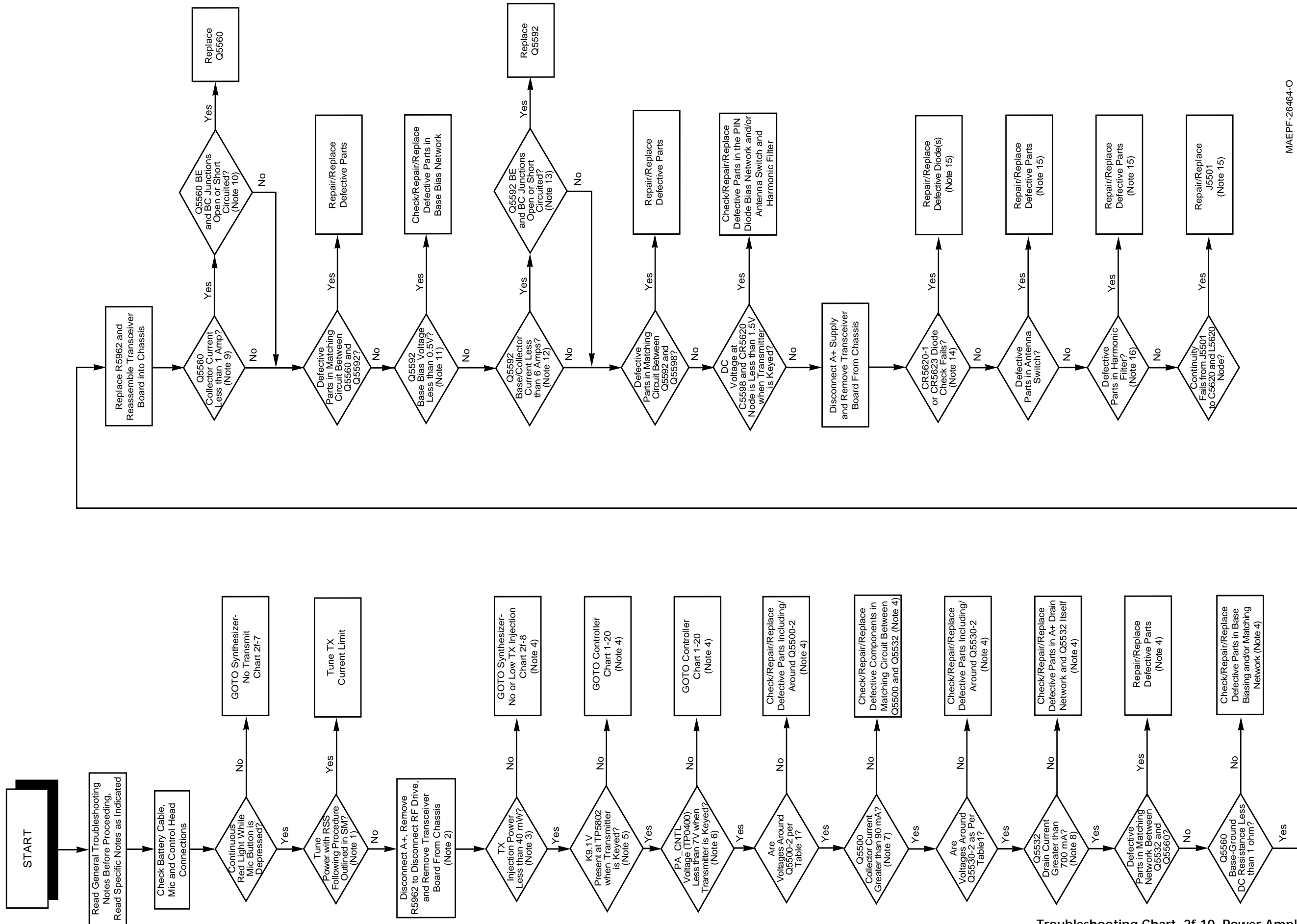
3. Remove shield SH5650 with a hot air gun.
4. Replace SH5650.

Table 1 Typical Voltage Measurements

Test Point	Voltage (DC)
Q5500 Base	
Q5500 Collector	8.0
Q5501 Base	7.4
Q5501 Emitter	8.0
Q5501 Collector	2.1
Q5502 Base	5.8
Q5502 Emitter	5.1
Q5502 Collector	7.4
Q5530 Base	6.0
Q5530 Emitter	5.4
Q5530 Collector	11.7
Q5531 Base	11.7
Q5531 Emitter	12.4
Q5531 Collector	8.3
Q5532 Gate	4.2
Q5532 Drain	12.4

Test Conditions

- A+ = 13.6 VDC
- RF Drive Off
- PA_CNTRL = 7.5VDC



Troubleshooting Chart 2f-10, Power Amplifier - No or Low RF Power Output

NOTES

Reference Drawings

Introduction

This section contains reference drawings for the receiver (front end, IF, and back end) and transmitter (synthesizer and power amplifier) portions of the 40-Watt UHF radio. Reference drawings for the control head and the controller portions of the radio are located in volume 1 of this service manual.

The hierarchy of the schematic diagrams for the 40-Watt UHF radio is shown in Figure 4. The first and highest tier in the hierarchy for the radio consists of three major blocks, which are: control heads, controller, and radio frequency (RF). On the hierarchy illustration, the details for the control head and controller blocks are not provided beyond the first tier level because all the subordinate drawings for these two blocks are located in volume 1 (Motorola Publication 68P81080C20) of this service manual.

Complete details are provided for the RF block because all the reference drawings for the RF block are located in this volume of the service manual.

Complete details for the control head and controller blocks are provided in a similar hierarchy chart located in volume 1 of this service manual.

Reference Drawings Included in this Section

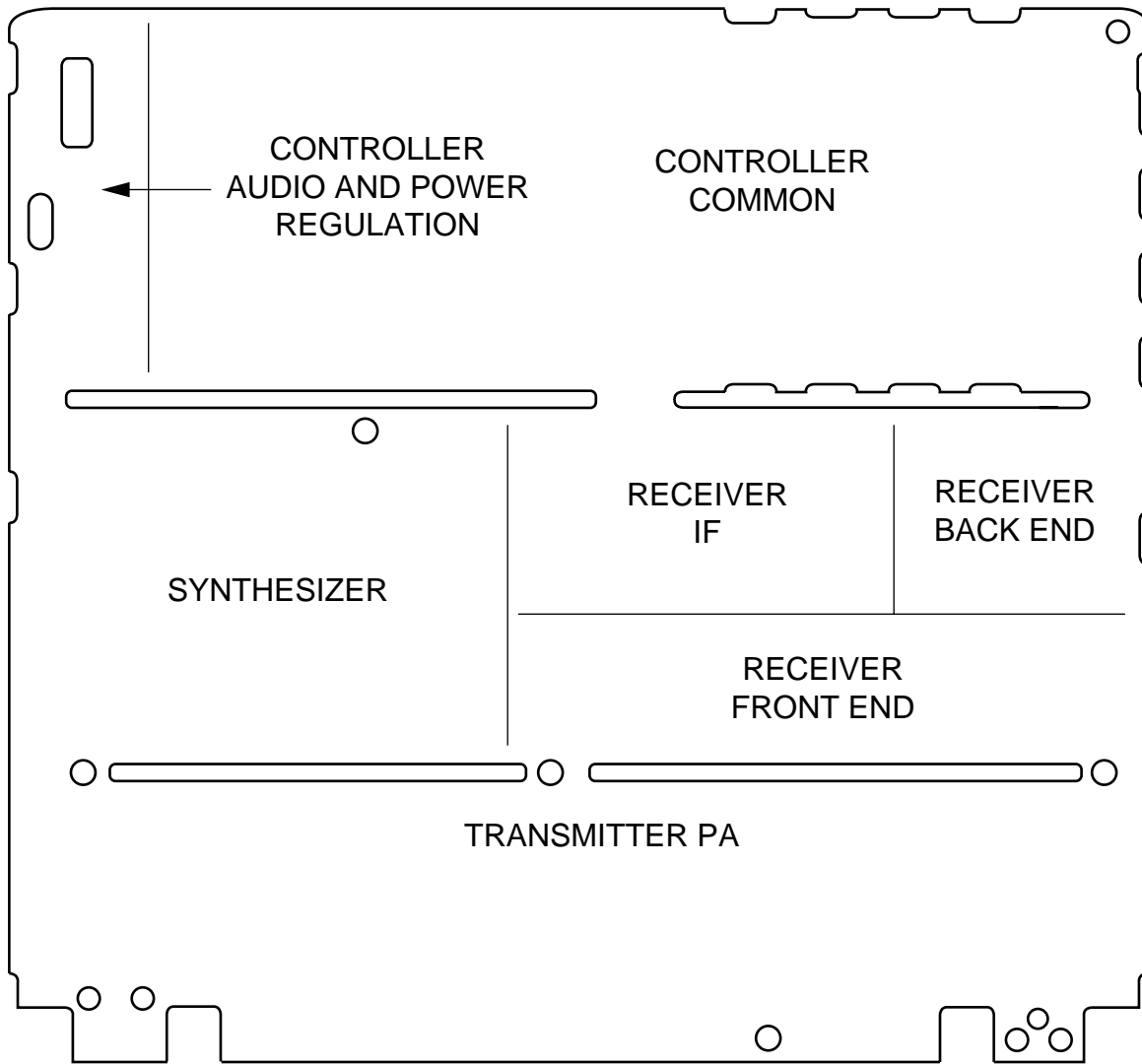
The following reference drawings are provided in this section of this volume of the service manual:

- **Overall Radio:**
 - Transceiver Board Section Locations - Page 39
 - Schematic Diagrams Hierarchy - Page 41
 - Transceiver Board Overall Schematic Diagram - Page 42
 - Radio Frequency (RF) Schematic Diagram - Page 43
 - Schematic Diagram Interconnection List, Table 1 - Page 61
- Receiver
 - Receiver RF Schematic Diagram - Page 44
 - Receiver Front End Component Locations and Parts List - Page 46
 - Receiver Front End Schematic Diagram - Page 47

- Receiver IF Component Locations and Parts List - Page 48
- Receiver IF Schematic Diagram - Page 49
- Receiver Back End Component Locations and Parts List
- - Page 50
- Receiver Back End Schematic Diagram - Page 51
- Synthesizer Component Locations and Parts List - Page 52
- Synthesizer Overall Schematic Diagram - Page 53
- Synthesizer Receiver VCO Schematic Diagram - Page 54
- Synthesizer Receiver Injection String Schematic Diagram - Page 55
- Synthesizer Transmitter Injection String Schematic Diagram - Page 56
- Power Amplifier Component Locations and Parts List - Page 58
- Power Amplifier Schematic Diagram - Page 59

Refer to Volume 1 of this service manual (Motorola Publication 68P81083C20) for reference drawings for the control head and controller portions of the radio.

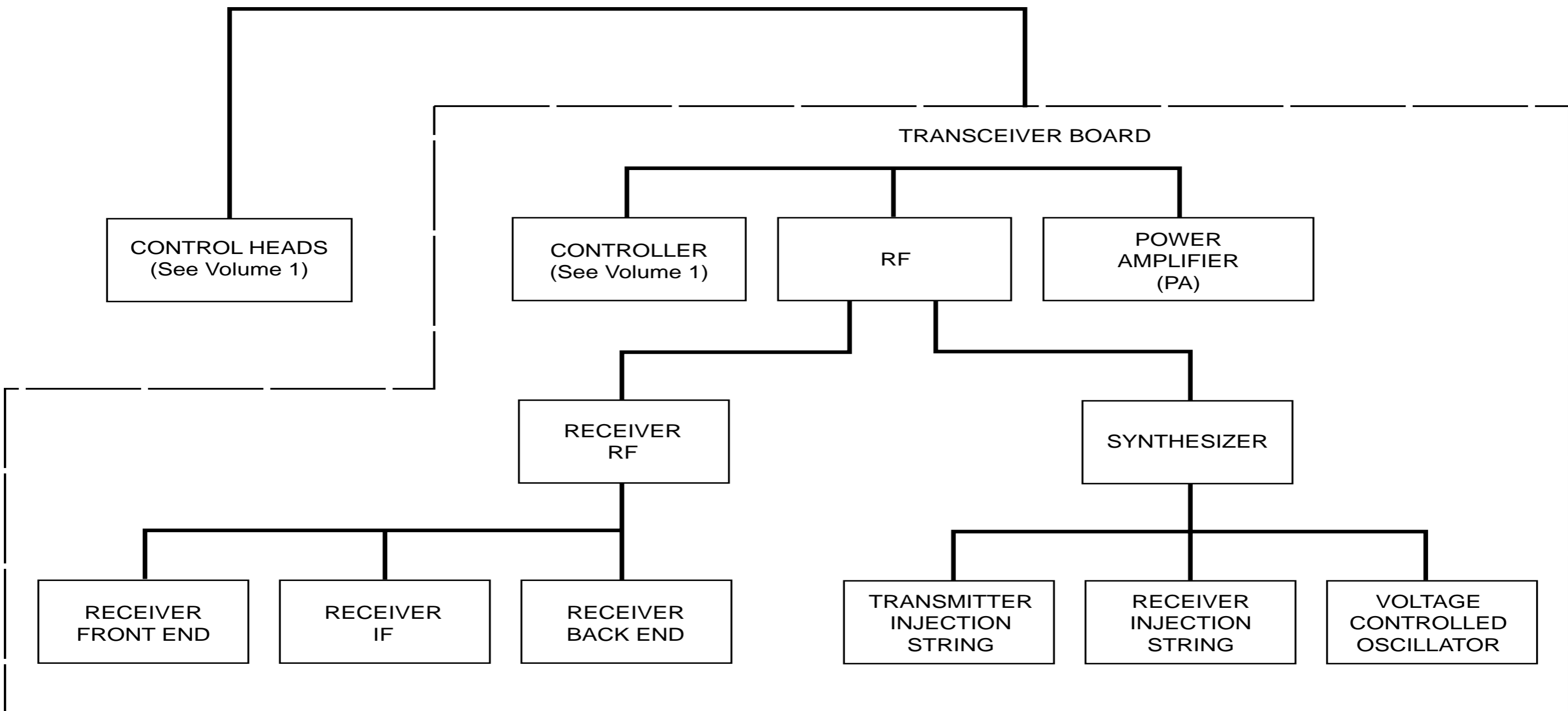
Refer to the Secure Option service manual (Motorola Publication 68P81083C25) for reference drawings for the SECURENET option for the radio.



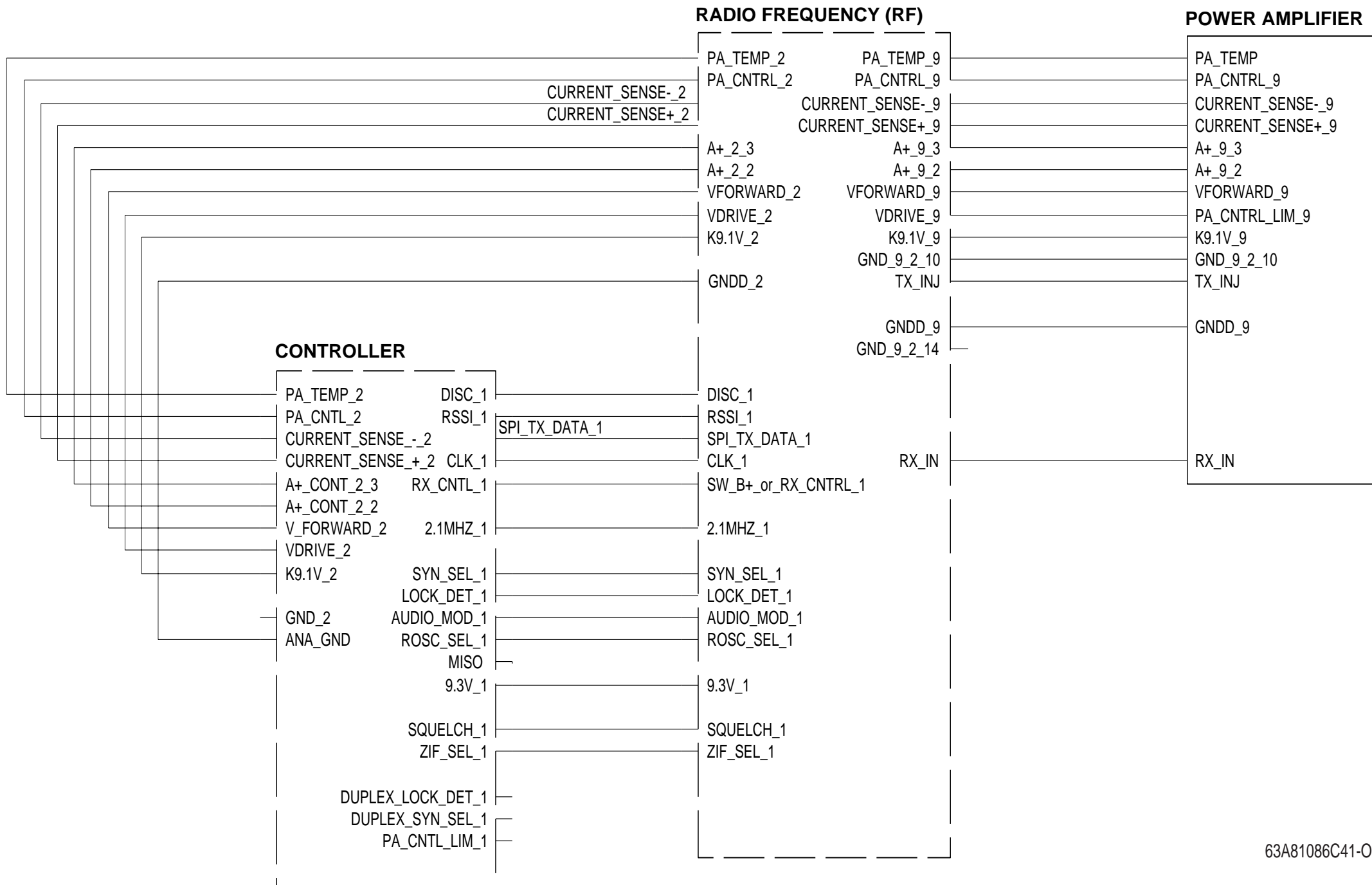
MAEPF-25079-O

Figure 3 Transceiver Board Section Locations

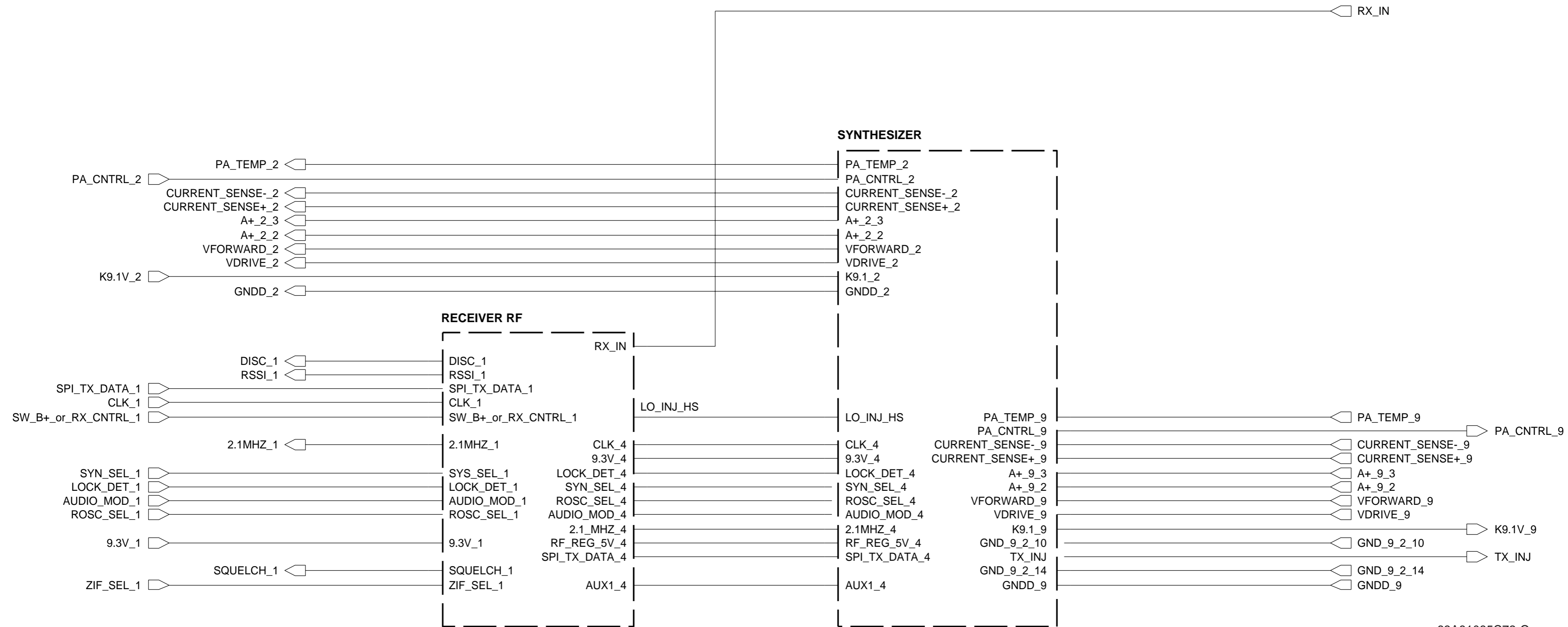
NOTES



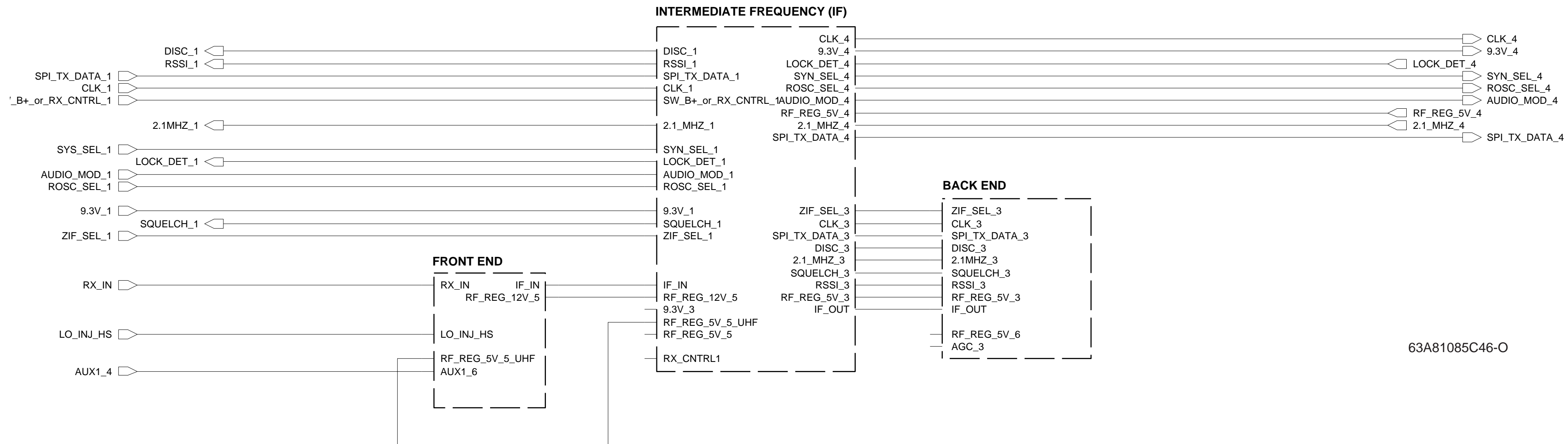
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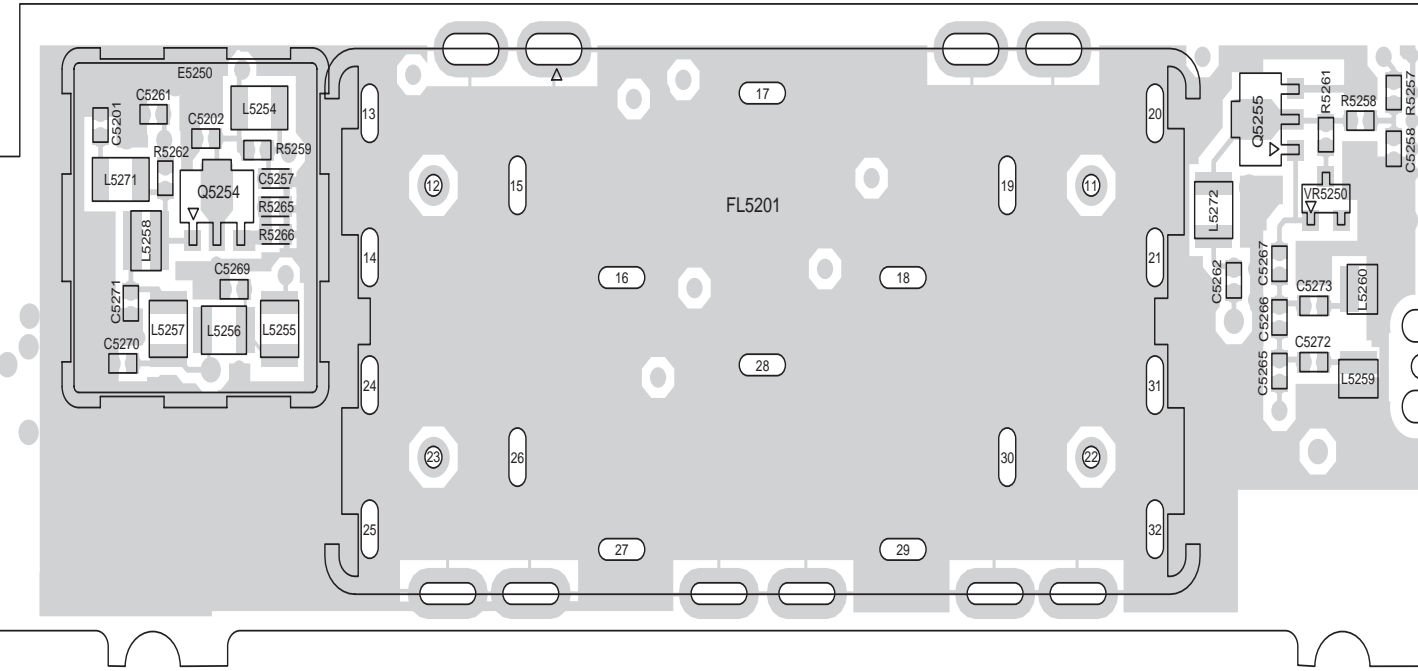


63A81085C72-O



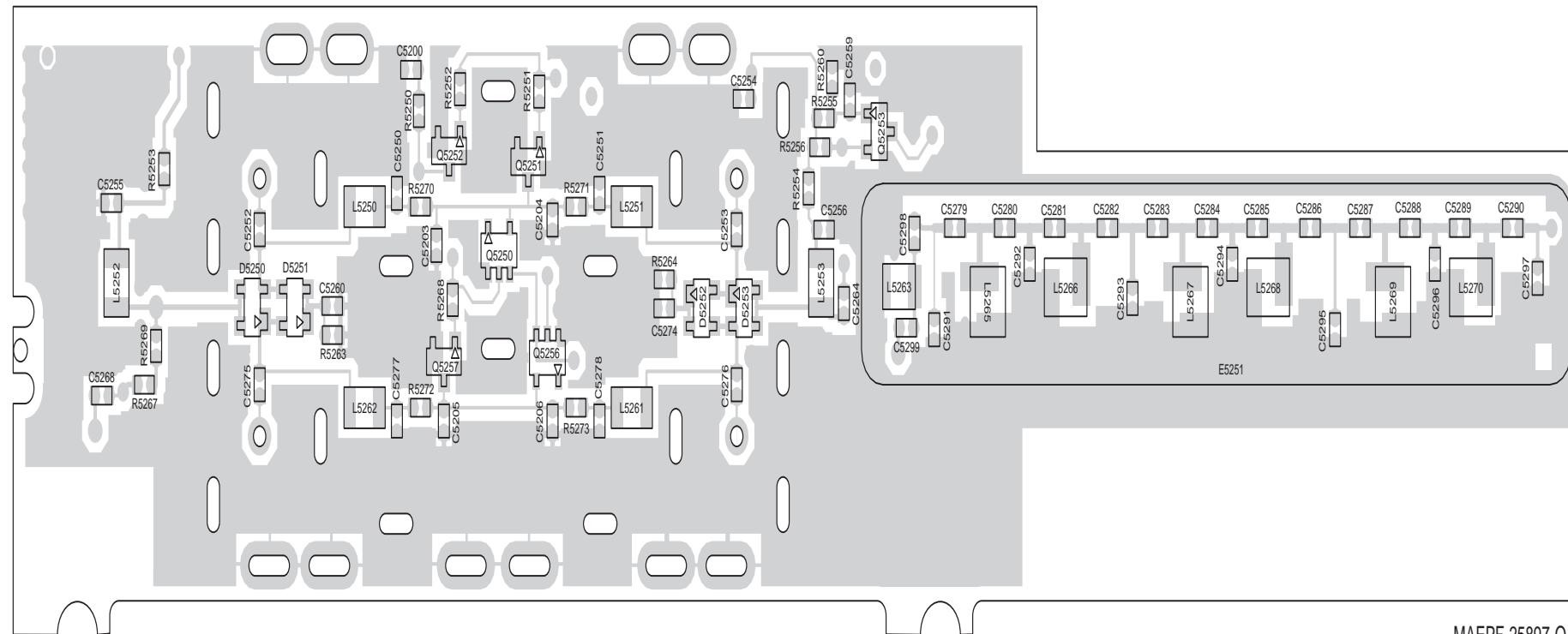
NOTES

RECEIVER FRONT END COMPONENT LOCATIONS



HEAVY COMPONENTS SIDE

MAEPF-25896-0



LIGHT COMPONENTS SIDE

MAEPF-25897-0

RECEIVER FRONT END PARTS LIST

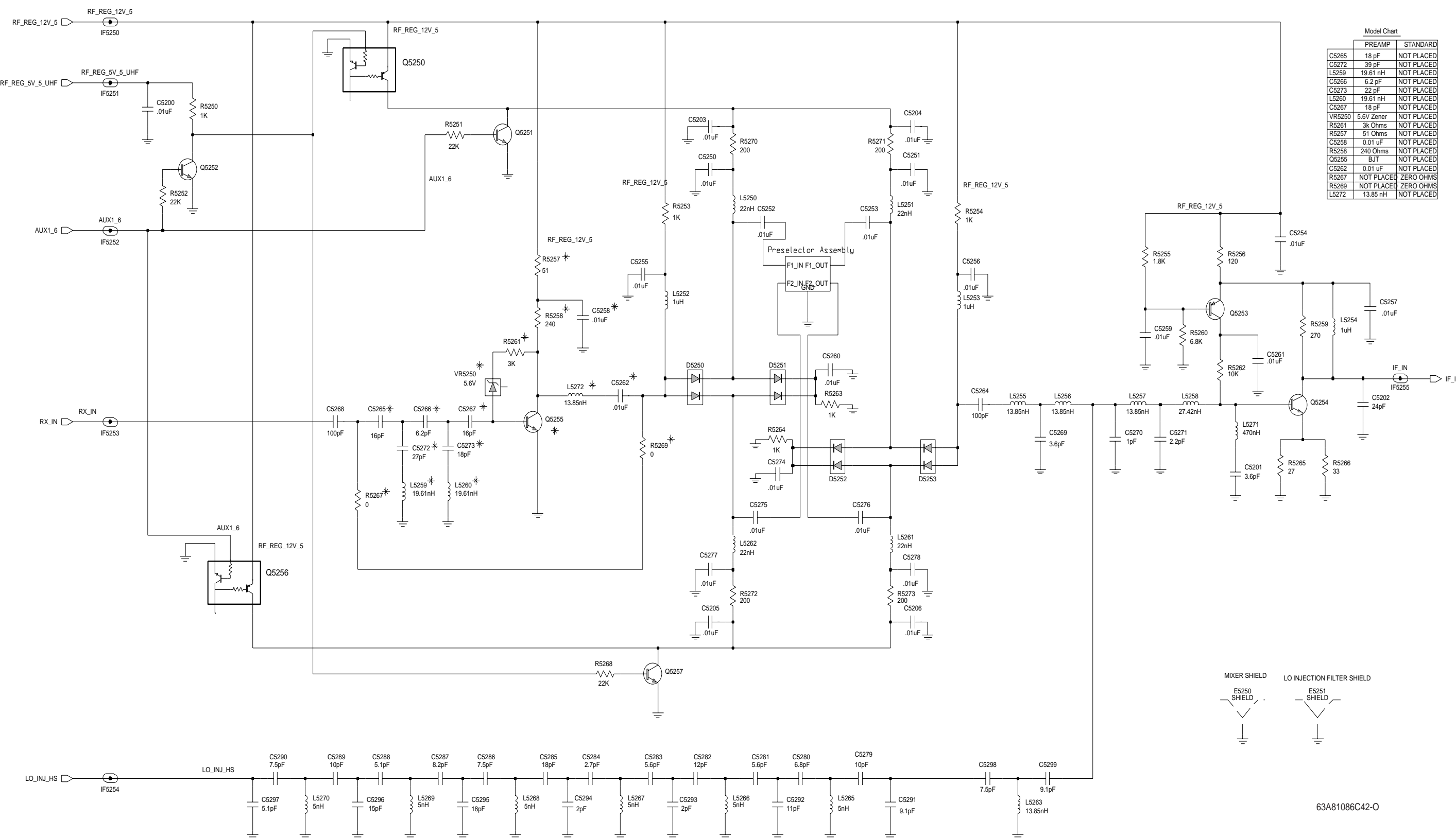
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITORS:
C5200	2113931F49	0.01uF
C5201	2113930F16	3.6 pF
C5202	2113930F36	24 pF
C5250	2113931F49	0.01uF
C5251	2113931F49	0.01uF
C5252	2113931F49	0.01uF
C5253	2113931F49	0.01uF
C5254	2113931F49	0.01uF
C5255	2113931F49	0.01uF
C5256	2113931F49	0.01uF
C5257	2113931F49	0.01uF
C5258 *	2113931F49	0.01uF
C5259	2113931F49	0.01uF
C5260	2113931F49	0.01uF
C5261	2113931F49	0.01uF
C5262 *	2113931F49	0.01uF
C5264	2113930F51	100pF
C5265 *	2113930F32	16pF
C5266 *	2113930F22	6.2pF
C5267 *	2113930F32	16pF
C5268	2113930F51	100pF
C5269	2113930F16	3.6pF
C5270	2113930F03	1pF
C5271	2113930F11	2.2pF
C5272 *	2113930F37	27pF
C5273 *	2113930F33	18pF
C5274	2113931F49	0.01uF
C5275	2113931F49	0.01uF
C5276	2113931F49	0.01uF
C5277	2113931F49	0.01uF
C5278	2113931F49	0.01uF
C5279	2113930F27	10pF
C5280	2113930F23	6.8pF
C5281	2113930F21	5.6pF
C5282	2113930F29	12pF
C5283	2113930F21	5.6pF
C5284	2113930F13	2.7pF
C5285	2113930F33	18pF
C5286	2113930F24	7.5pF
C5287	2113930F25	8.2pF
C5288	2113930F20	5.1pF
C5289	2113930F27	10pF
C5290	2113930F24	7.5pF
C5291	2113930F26	9.1pF
C5292	2113930F28	11pF
C5293	2113930F10	2pF
C5294	2113930F10	2pF
C5295	2113930F33	18pF
C5296	2113930F31	15pF
C5297	2113930F20	5.1pF
C5298	2113930F24	7.5pF

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C5299	2113930F26	9.1pF
		DIODES:
D5250	4880154K06	PIN Schottky
D5251	4880154K06	PIN Schottky
D5252	4880154K06	PIN Schottky
D5253	4880154K06	PIN Schottky
VR5250 *	4813830A15	Zener, 5.6V
		SHIELDS:
E5250	2605778Y01	RF Mixer
E5251	2604400J01	RF Front End
		FILTER ASSEMBLY:
B5255	9180209N11	Ceramic
		INDUCTORS:
L5250	2462587T38	22nH
L5251	2462587T38	22nH
L5252	2462587T30	1uH
L5253	2462587T30	1uH
L5254	2462587T30	1uH
L5255	2460591C23	13.85nH
L5256	2460591C23	13.85nH
L5257	2460591C23	13.85nH
L5258	2460591M32	27.42nH
L5259 *	2460591B80	19.61nH
L5260 *	2460591B80	19.61nH
L5261	2462587T38	22nH
L5262	2462587T38	22nH
L5263	2460591C23	13.85nH
L5265	2484562T20	5nH
L5266	2484562T20	5nH
L5267	2484562T20	5nH
L5268	2484562T20	5nH
L5269	2484562T20	5nH
L5270	2484562T20	5nH
L5271	2462587T23	470nH
L5272 *	2460591C23	13.85nH
		TRANSISTORS:
Q5250	4805921T04	Dual (Switch)
Q5251	4813824A10	NPN
Q5252	4813824A10	NPN
Q5253	4805128M16	PNP
Q5254	4882971R01	NPN
Q5255 *	4882971R01	NPN
Q5256	4805921T04	Dual (Switch)
Q5257	4813824A10	NPN
		RESISTORS:
R5250	0662057A49	1K
R5251	0662057A81	22K
R5252	0662057A81	22K
R5253	0662057A49	1K
R5254	0662057A49	1K
R5255	0662057A55	1.8K
R5256	0662057A27	120

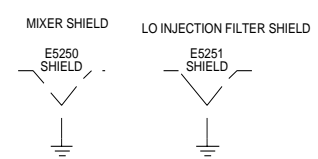
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R5257 *	0662057A18	51
R5258 *	0662057A34	240
R5259	0662057A35	270
R5260	0662057A69	6.8K
R5261 *	0662057A60	3K
R5262	0662057A73	10K
R5263	0662057A49	1K
R5264	0662057A49	1K
R5265	0662057A11	27
R5266	0662057A15	39
R5267 #	0662057B47	0
R5268	0662057A81	22K
R5269 #	0662057B47	0
R5270	0662057A32	200
R5271	0662057A32	200
R5272	0662057A32	200
R5273	0662057A32	200
	8405114Y01	PRINTED CIRCUIT BOARDS (For Reference Only): For kits HUE4022A, HUE4024A

NOTES:

- All resistance values are in ohms unless indicated otherwise.
- Components shown on schematic diagram but not included in parts list are not placed.
- Items indicated in the parts list with an asterisk (*) are placed only in preamplifier models of radio.
- Items indicated in the parts list with a pound sign (#) are not placed in preamplifier models of radio.

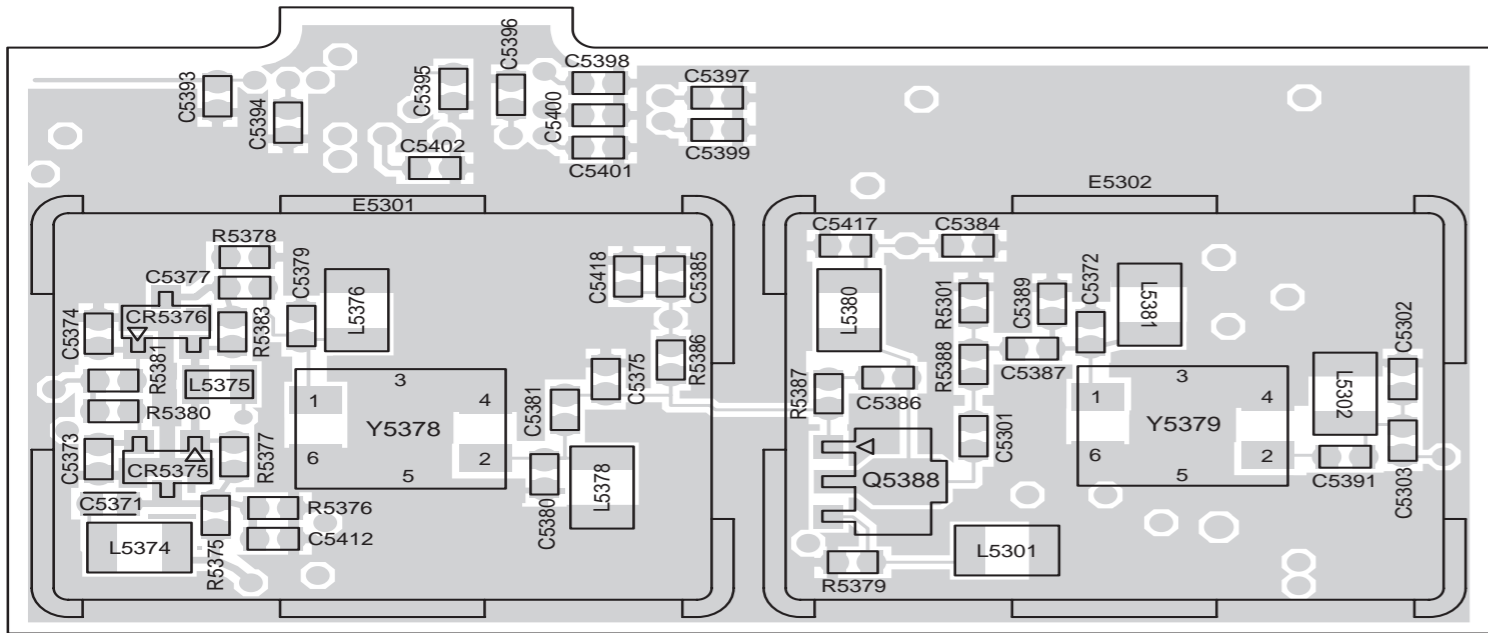


Model Chart		
	PREAMP	STANDARD
C5265	18 pF	NOT PLACED
C5272	39 pF	NOT PLACED
L5259	19.61 nH	NOT PLACED
C5266	6.2 pF	NOT PLACED
C5273	22 pF	NOT PLACED
L5260	19.61 nH	NOT PLACED
C5267	18 pF	NOT PLACED
VR5250	5.6V Zener	NOT PLACED
R5261	3k Ohms	NOT PLACED
R5257	51 Ohms	NOT PLACED
C5258	0.01 uF	NOT PLACED
R5258	240 Ohms	NOT PLACED
Q5255	BJT	NOT PLACED
C5262	0.01 uF	NOT PLACED
R5267	NOT PLACED ZERO OHMS	
R5269	NOT PLACED ZERO OHMS	
L5272	13.85 nH	NOT PLACED



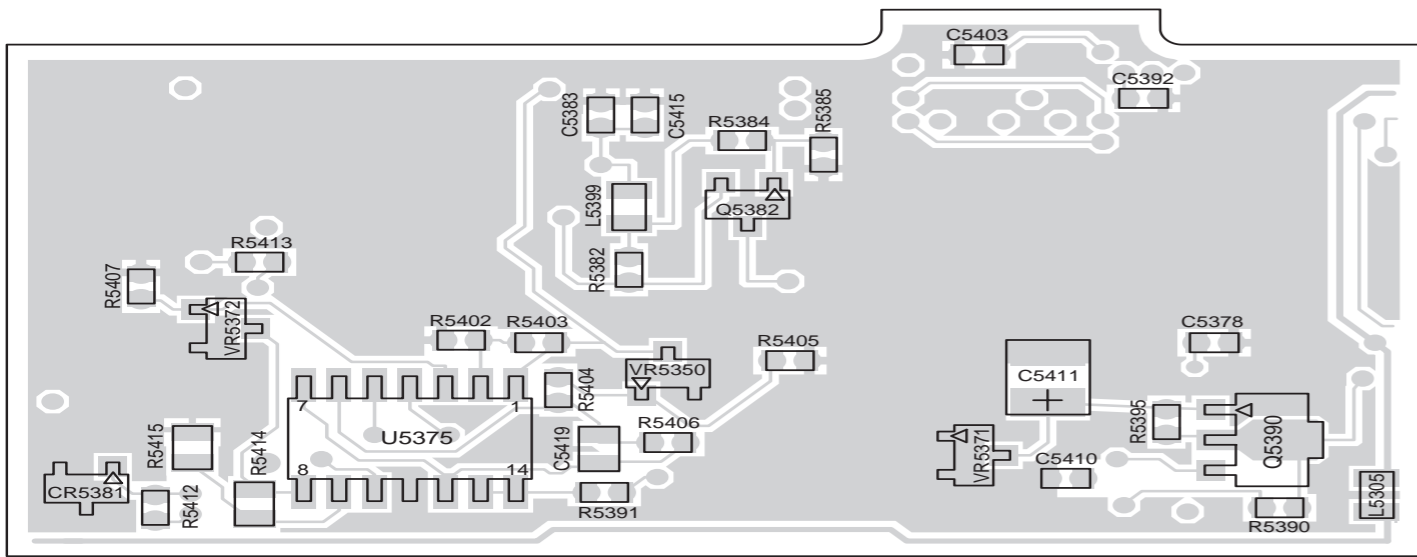
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RECEIVER IF COMPONENT LOCATIONS



MAEPF-25898-O

HEAVY COMPONENTS SIDE



MAEPF-25899-O

LIGHT COMPONENTS SIDE

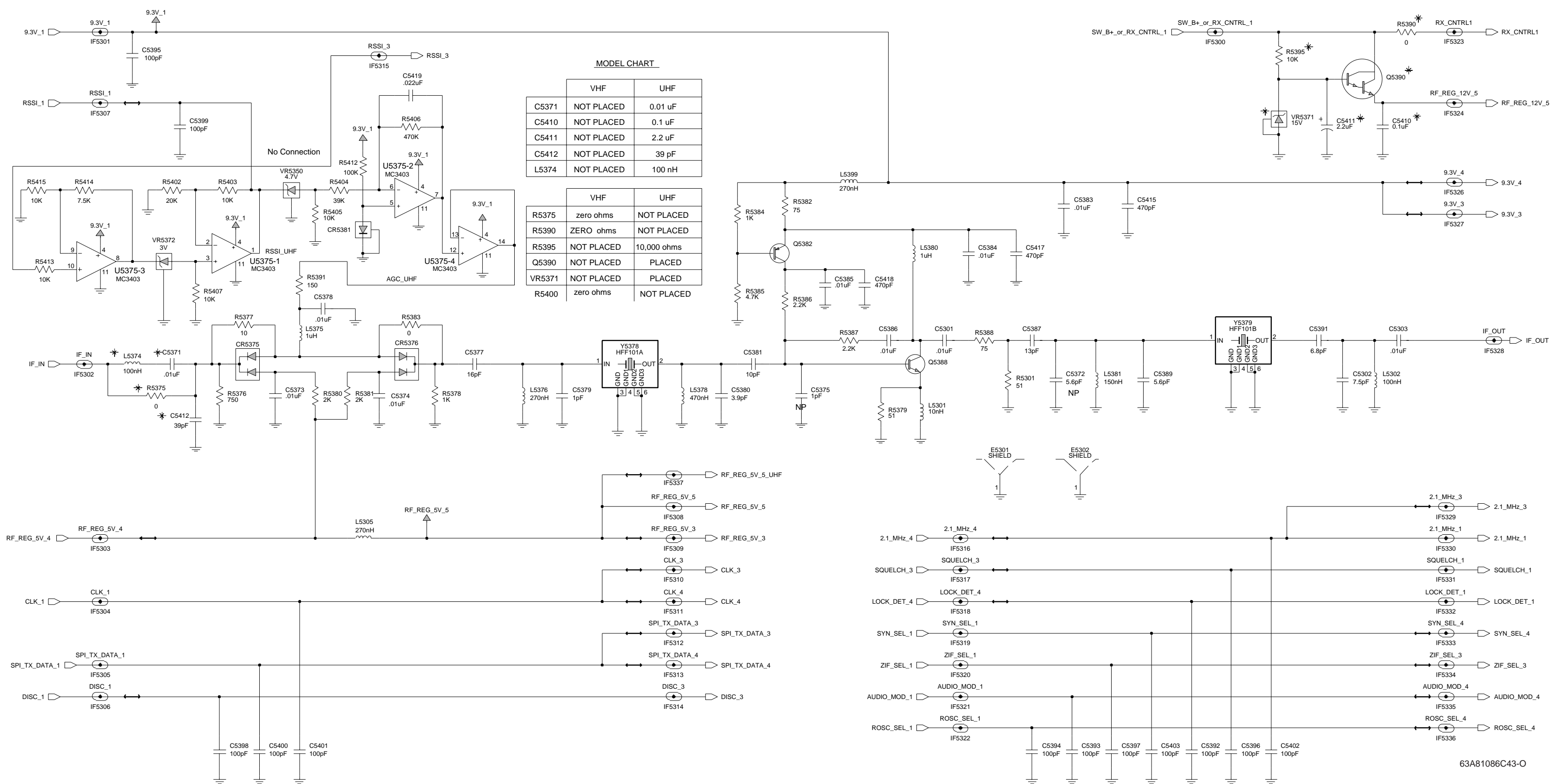
RECEIVER IF PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CAPACITORS:		
C5301	2113931F49	0.01uF
C5302	2113930F24	7.5pF
C5303	2113931F49	0.01uF
C5371	2113931F49	0.01uF
C5373	2113931F49	0.01uF
C5374	2113931F49	.01uF
C5377	2113930F32	16pF
C5378	2113931F49	0.01uF
C5380	2113930F17	3.9pF
C5381	2113930F27	10pF
C5383	2113931F49	0.01uF
C5384	2113931F49	0.01uF
C5385	2113931F49	0.01uF
C5386	2113931F49	0.01uF
C5387	2113930F30	13pF
C5391	2113930F23	6.8pF
C5392	2113930F51	100pF
C5393	2113930F51	100pF
C5394	2113930F51	100pF
C5395	2113930F51	100pF
C5396	2113930F51	100pF
C5397	2113930F51	100pF
C5398	2113930F51	100pF
C5399	2113930F51	100pF
C5400	2113930F51	100pF
C5401	2113930F51	100pF
C5402	2113930F51	100pF
C5403	2113930F51	100pF
C5410	2113743A19	0.100uF
C5411	2311049A09	2.2uF
C5412	2113930F41	39pF
C5415	2113931F17	470pF
C5417	2113931F17	470pF
C5418	2113931F17	470pF
DIODES:		
CR5375	4880154K07	Dual
CR5376	4880154K07	Dual
CR5381	4811058B11	
VR5350	4880140L05	Zener, 4.7V
VR5371	4813830A28	Zener, 15V
VR5372	4813830A08	Zener, 3.0V
SHIELDS:		
E5301	2605915V01	
E5302	2605915V01	
INDUCTORS:		
L5301	2462587T03	10nH
L5302	2462587T15	100nH
L5305	2462587Q40	270nH
L5374	2462587T15	100nH
L5375	2462587Q47	1nH
L5376	2462587T20	270nH
L5378	2462587T23	470nH
L5380	2462587T30	1uH
L5381	2462587T17	150nH
L5399	2462587Q40	270nH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
TRANSISTORS:		
Q5382	4805128M16	PNP
Q5388	4882971R01	NPN
Q5390	4880052M01	NPN
RESISTORS:		
R5301	0662057A18	51
R5376	0662057A46	750
R5379	0662057A18	51
R5380	0662057A56	2K
R5381	0662057A56	2K
R5382	0662057A22	75
R5383	0662057B47	0
R5384	0662057A49	1K
R5385	0662057A65	4.7K
R5386	0662057A57	2.2K
R5387	0662057A57	2.2K
R5388	0662057A22	75
R5391	0662057A29	150
R5395	0662057A73	10K
R5402	0662057A80	20K
R5403	0662057A73	10K
R5404	0662057A87	39K
R5405	0662057A73	10K
R5406	0662057B14	470K
R5407	0662057A73	10K
R5412	0662057A89	100K
R5413	0662057A73	10K
R5414	0662057R55	7.5K
R5415	0662057R60	10K
INTEGRATED CIRCUITS:		
U5375	5183222M49	Operational Amplifier
FILTERS:		
Y5378	4805736Y03	Crystal, 109.65 MHZ
Y5379	4805736Y04	Crystal, 109.65 MHZ
PRINTED CIRCUIT BOARDS (For Reference Only):		
	8405114Y01	For Kits HUE4022A, HUE4024A
	Revision O	

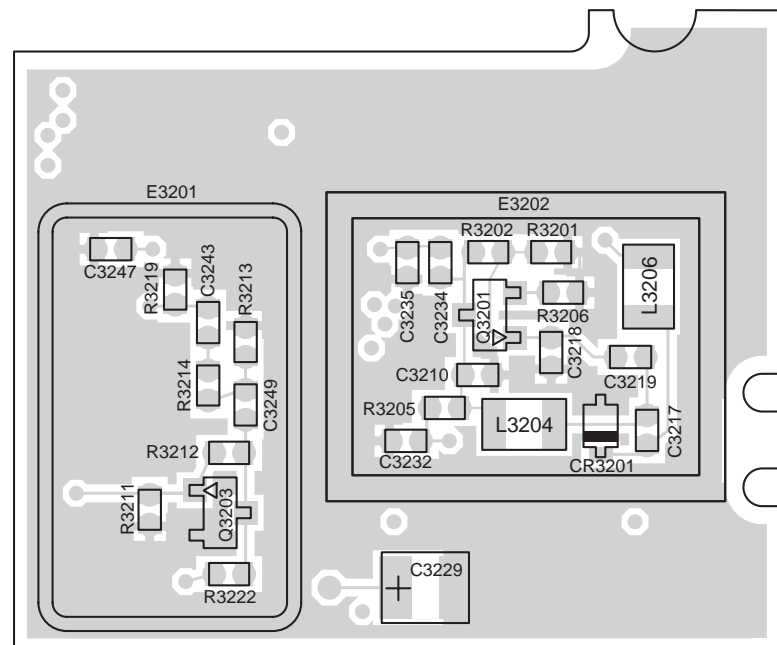
NOTES:

- All resistance values are in ohms unless indicated otherwise.
- Components shown on the schematic diagram but not included in the parts list are not placed.



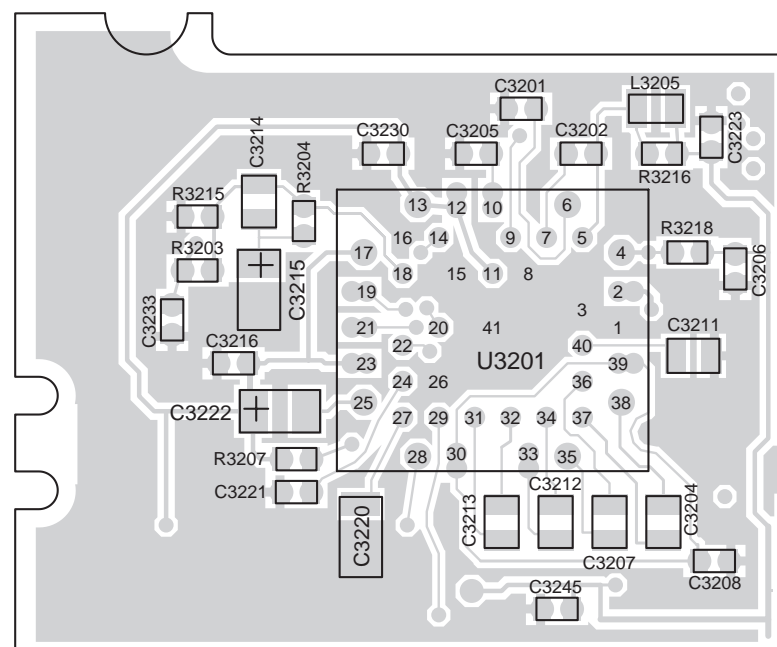
Receiver IF Schematic Diagram

RECEIVER BACK END COMPONENT LOCATIONS



MAEPF-25900-O

HEAVY COMPONENTS SIDE



MAEPF-25901-O

LIGHT COMPONENTS SIDE

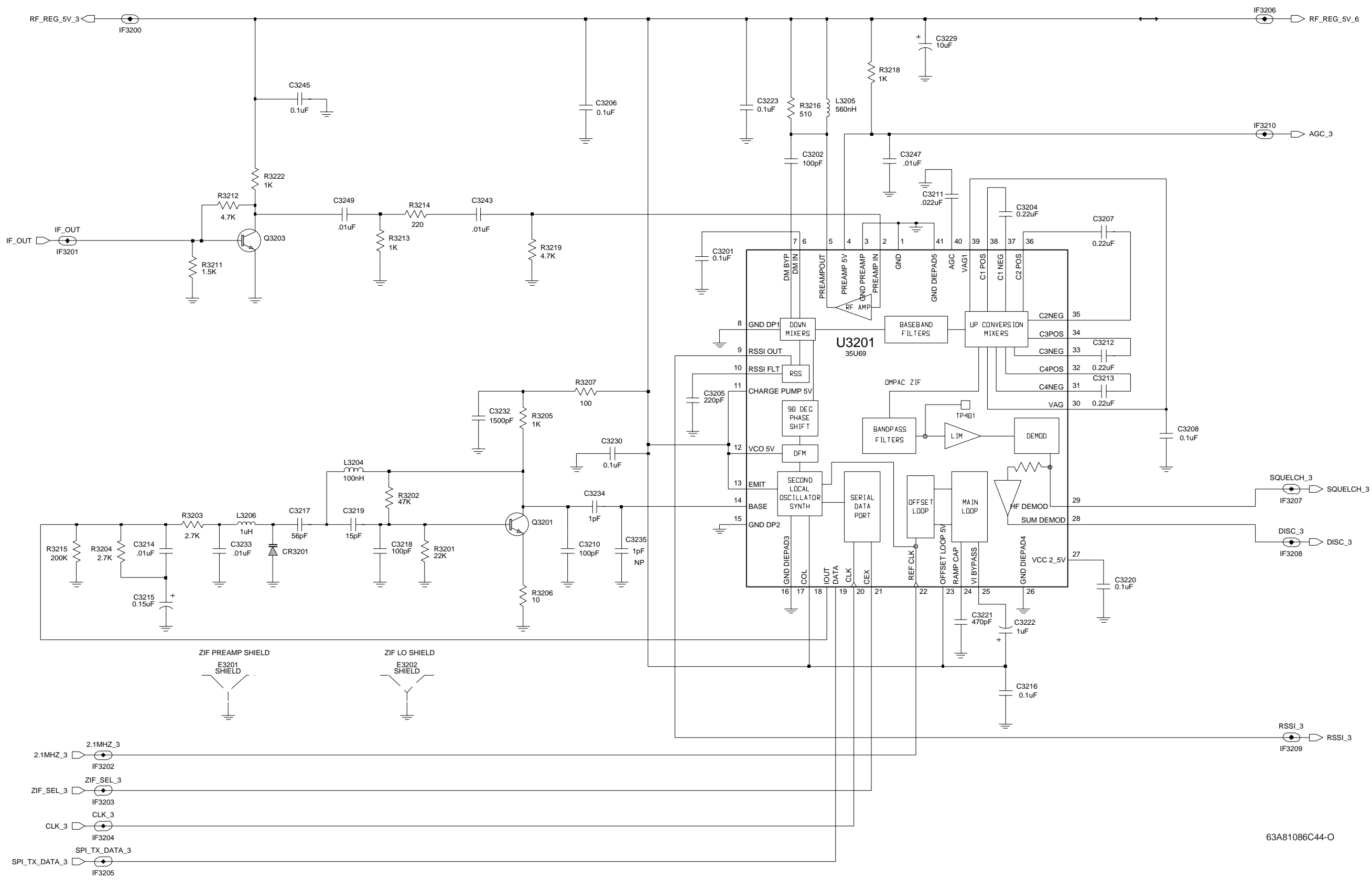
RECEIVER BACK END PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C3201	2113932K15	CAPACITORS: 0.1uF
C3202	2113930F51	100pF
C3204	2113743A23	0.22uF
C3205	2113930F59	220pF
C3206	2113932K15	0.1uF
C3207	2113743A23	0.22uF
C3208	2113932K15	0.1uF
C3210	2113930F51	100pF
C3211	2113741M53	0.022uF
C3212	2113743A23	0.22uF
C3213	2113743A23	0.22uF
C3214	2113741A45	10000pF
C3215	2311049A02	0.15uF
C3216	2113932K15	0.1uF
C3217	2113930F45	56pF
C3218	2113930F51	100pF
C3219	2113930F31	15pF
C3220	2109720D14	0.1uF
C3221	2113931F17	470pF
C3222	2311049A07	1uF
C3223	2113932K15	0.1uF
C3229	2311049J23	10uF
C3230	2113932K15	0.1uF
C3232	2113931F29	.0015uF
C3233	2113931F49	.01uF
C3234	2113930F03	1pF
C3243	2113931F49	0.01uF
C3245	2113932K15	0.1uF
C3247	2113931F49	0.01uF
C3249	2113931F49	0.01uF
CR3201	4862824C01	DIODES: Varactor
E3201	2602660J01	SHIELDS: Harmonic Filter
E3202	2605261V01	Zero IF (Z1F)
L3204	2462587T15	INDUCTORS: 100nH
L3205	2462587Q44	560nH
L3206	2462587T30	1uH
Q3201	4882022N70	TRANSISTORS: NPN
Q3203	4882022N70	NPN
R3201	0662057A81	RESISTORS: 22K
R3202	0662057A89	47K
R3203	0662057A59	2.7K
R3204	0662057A59	2.7K
R3205	0662057A49	1K
R3206	0662057A01	10
R3207	0662057A25	100
R3211	0662057A53	1.5K
R3212	0662057A65	4.7K
R3213	0662057A49	1K
R3214	0662057A33	220
R3215	0662057B05	200K
U3201	518629A02	INTEGRATED CIRCUITS: Zero IF (ZIF)
	8405114Y01 Revision O	PRINTED CIRCUIT BOARDS (For Reference Only): For Kits HUE4022A, HUE4024A

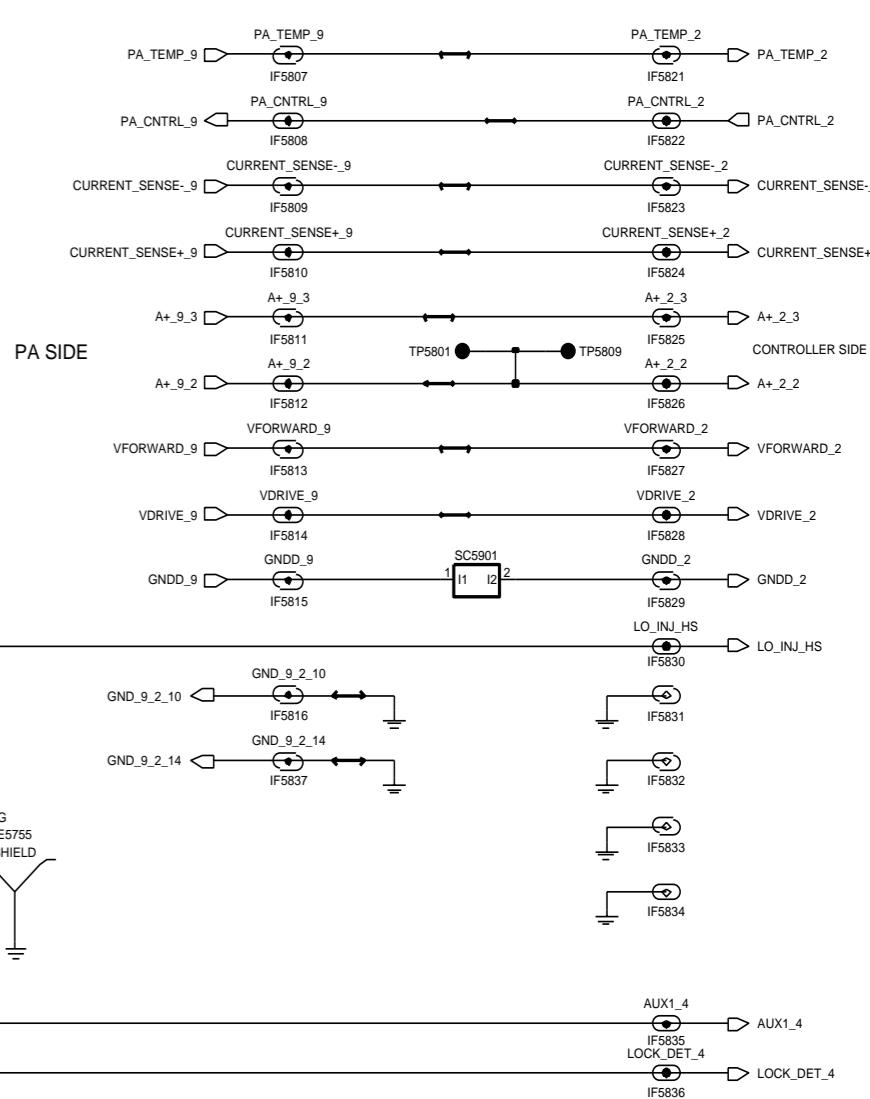
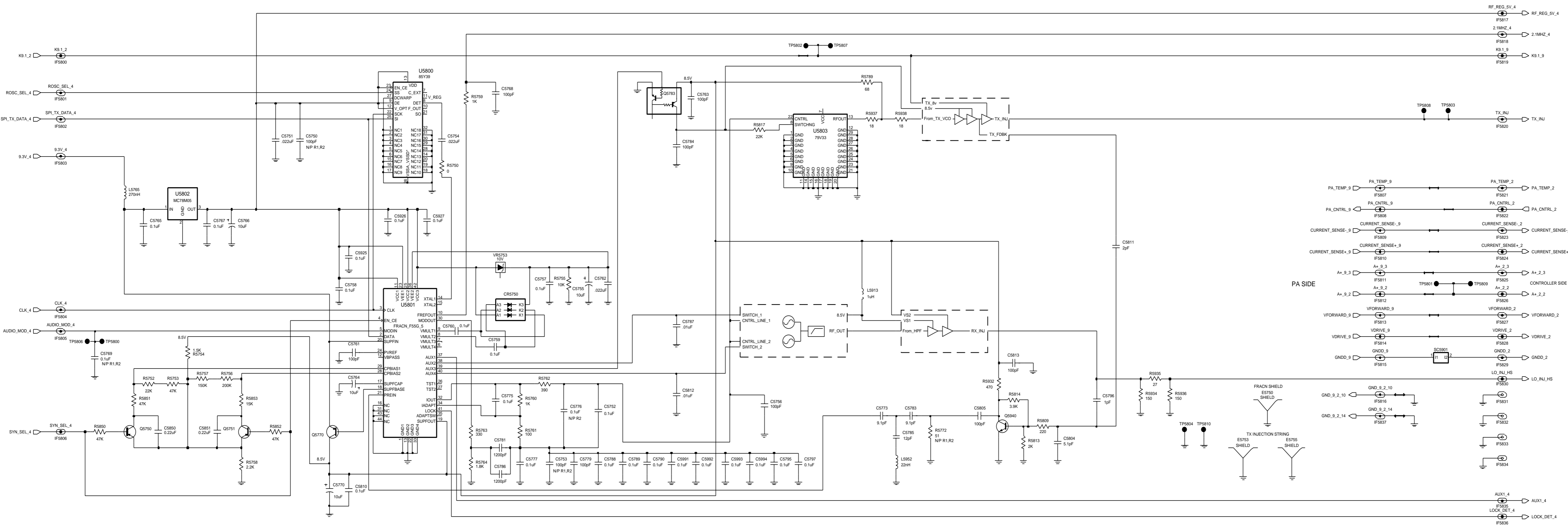
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R3216	0662057A42	510
R3218	0662057A49	1K
R3219	0662057A65	4.7K
R3222	0662057A49	1K
U3201	518629A02	INTEGRATED CIRCUITS: Zero IF (ZIF)
	8405114Y01 Revision O	PRINTED CIRCUIT BOARDS (For Reference Only): For Kits HUE4022A, HUE4024A

NOTES:

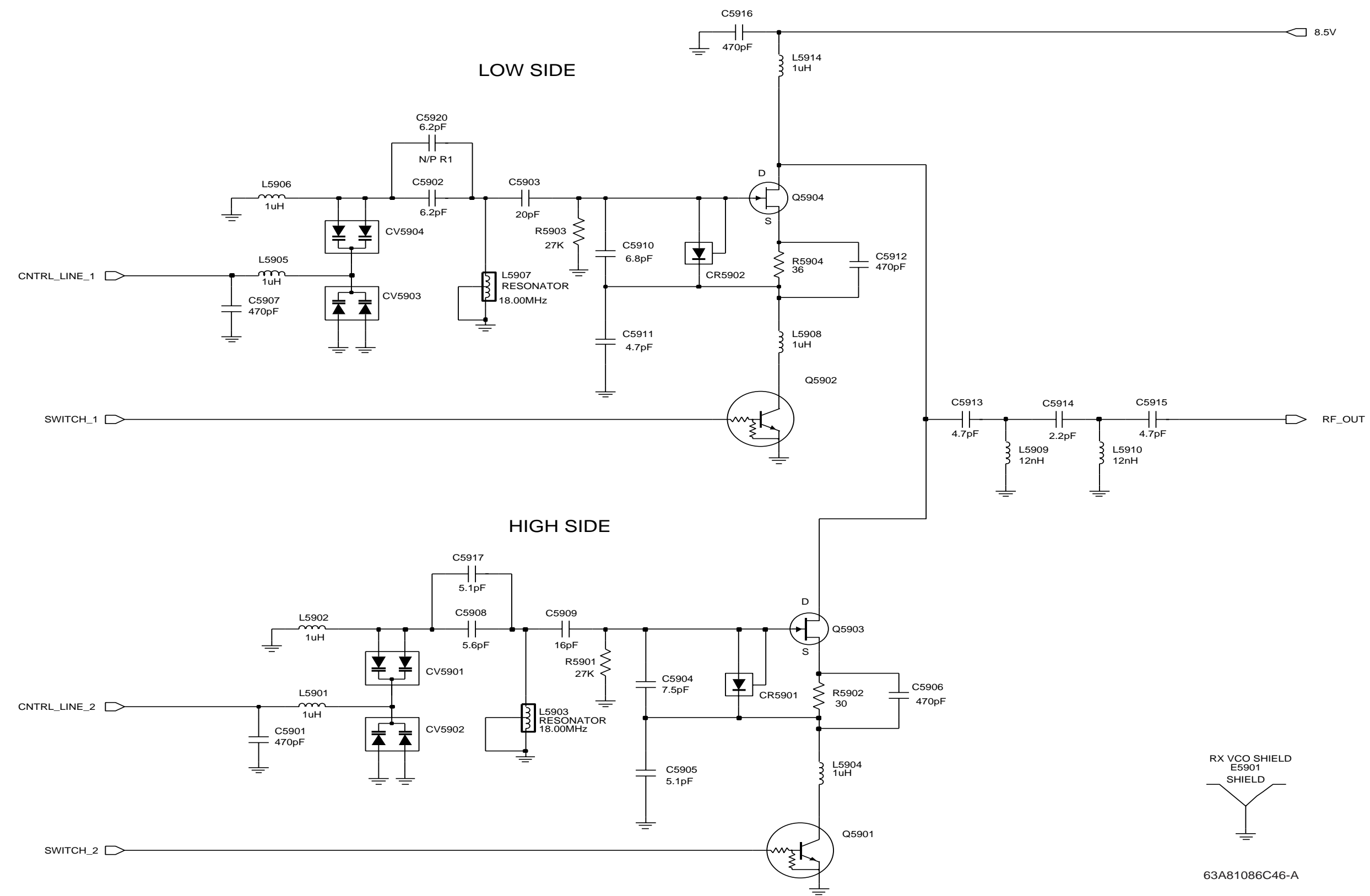
1. All resistance values are in ohms unless indicated otherwise.
2. Components shown on schematic diagram but not included in parts list are not placed.



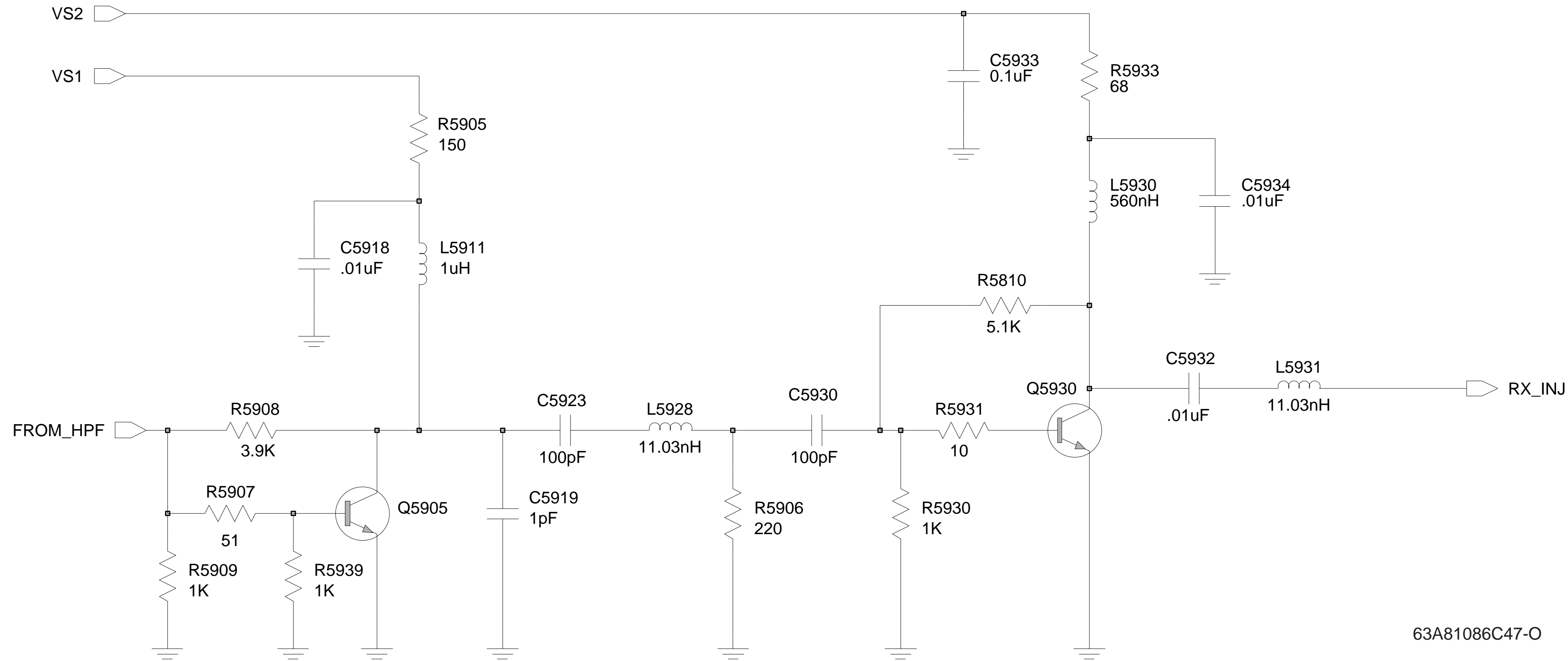
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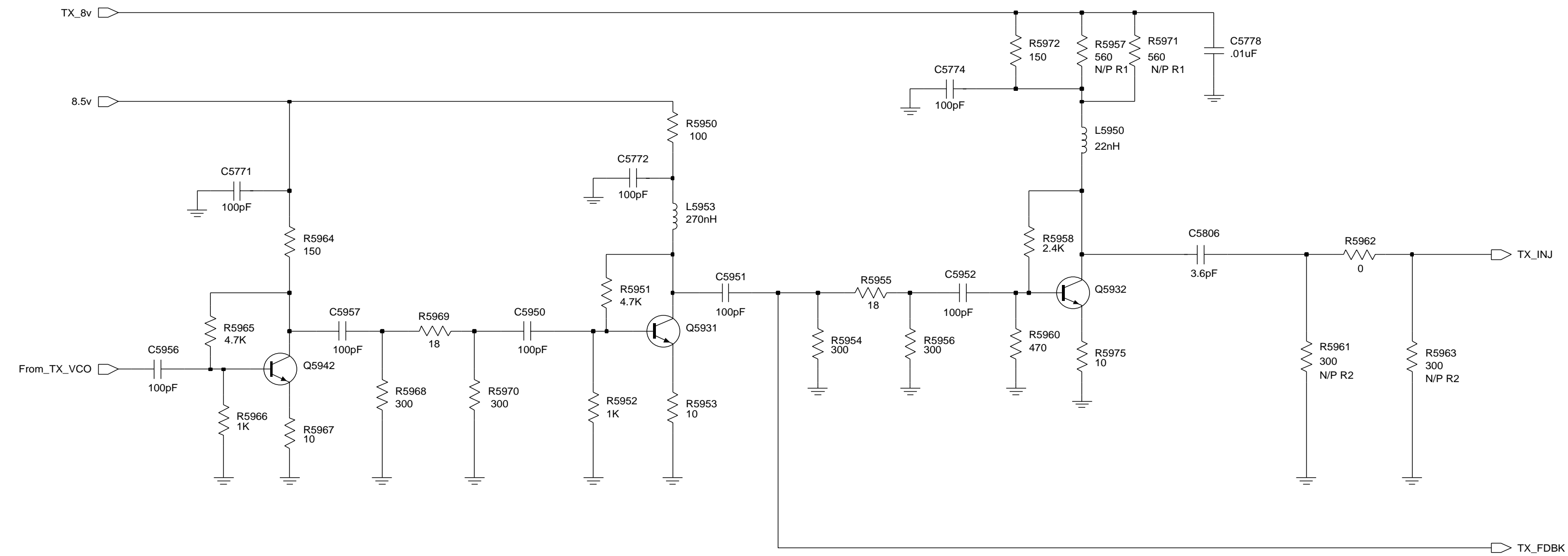
63A81086C45-A



RX VCO SHIELD
E5901
SHIELD
63A81086C46-A



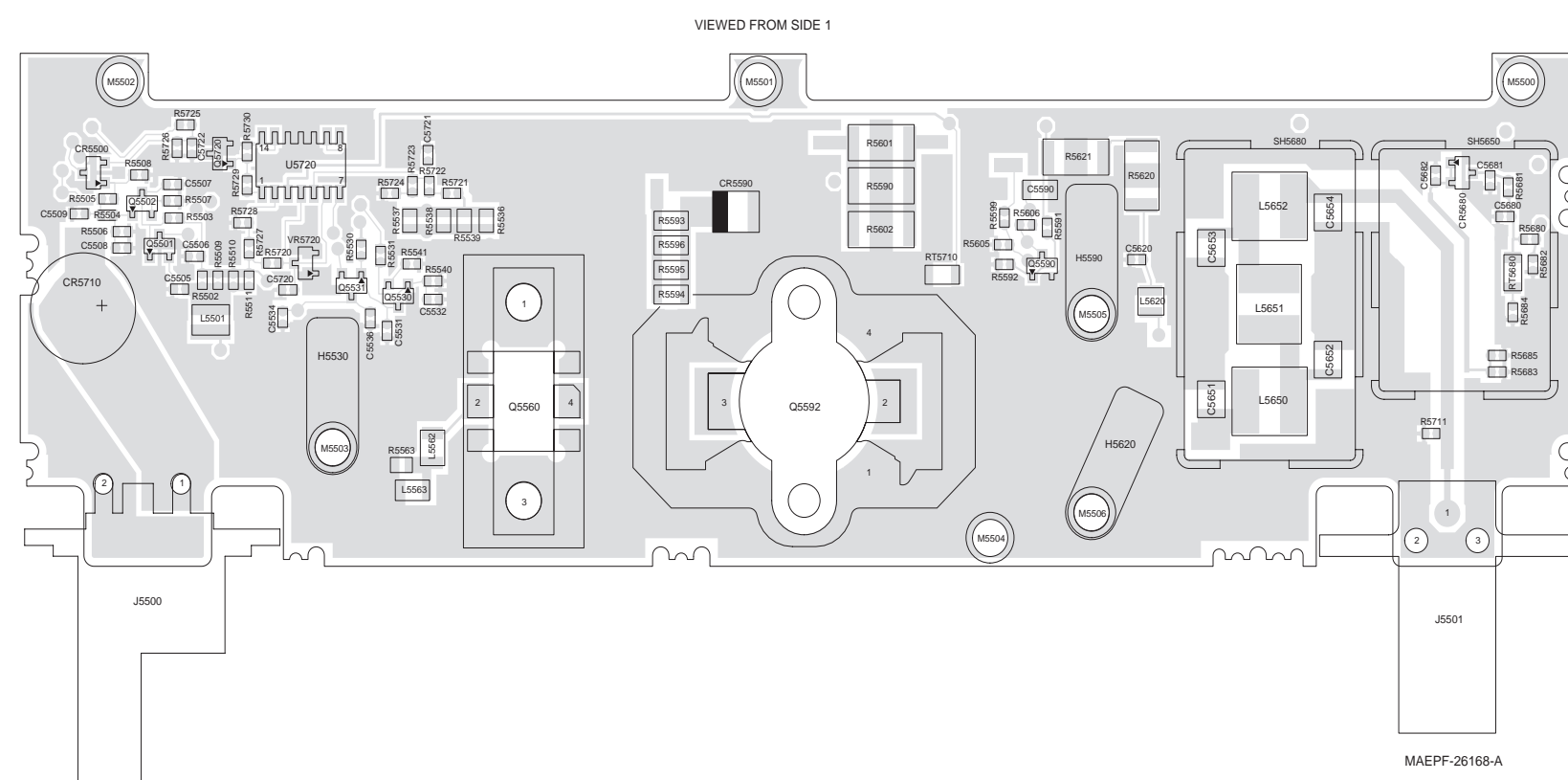
63A81086C47-O



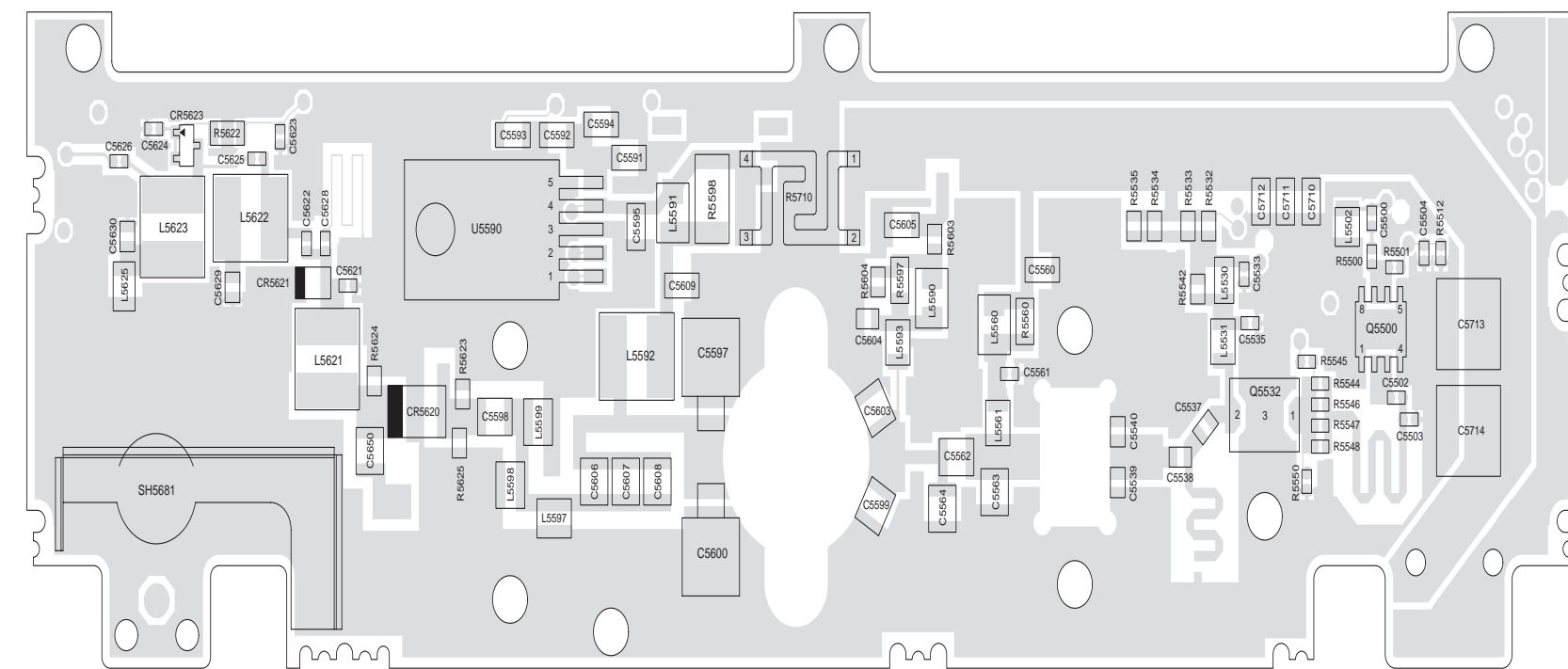
63A81086C48-A

NOTES

POWER AMPLIFIER COMPONENT LOCATIONS



HEAVY COMPONENTS SIDE



LIGHT COMPONENTS SIDE

40W POWER AMPLIFIER PARTS LIST

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CAPACITORS:		
C5500	2113930F29	12 pF
C5502	2113930F39	33 pF
C5503	2113930F28	11 pF
C5504	2113931F49	0.01 uF
C5505	2113931F49	0.01 uF
C5506	2113931F49	0.01 uF
C5507	2113931F49	0.01 uF
C5508	2113930F51	100 pF
C5509	2113930F51	100 pF
C5531	2113931F25	1000 pF
C5532	2113931F49	0.01 uF
C5533	2113931F49	0.01 uF
C5534	2113931F49	0.01 uF
C5535	2113930F51	100 pF
C5536	2113931F49	0.01 uF
C5537	2113740A55	100 pF
C5538	2113740A39	27 pF
C5539	2113740A36	20 pF
C5540	2113740A35	18 pF
C5560	2113741N69	0.1 uF
C5561	2113930F51	100 pF
C5562	2111078B42	100 pF
C5564	2111078B23	24 pF
C5590	2113741N69	0.1 uF
C5591	2113741N69	0.1 uF
C5592	2113741N69	0.1 uF
C5593	2113741N69	0.1 uF
C5594	2113741N69	0.1 uF
C5595	2113741N69	0.1 uF
C5597	2183785X13	32 pF
C5598	2111078B42	100 pF
C5599	2111078B29	33 pF
C5600	2183785X13	32 pF
C5603	2111078B29	33 pF
C5604	2113740A55	100 pF
C5605	2113741N69	0.1 uF
C5607	2111078B10	7.5 pF
C5609	2113741N69	0.1 uF
C5620	2113930F51	100 pF
C5622	2113930F41	39 pF
C5623	2113931F49	0.01 uF
C5624	2113930F39	33 pF
C5625	2113930F24	7.5 pF
C5626	2113930F35	22 pF
C5628	2113930F17	3.9 pF
C5629	2113740A37	22 pF
C5630	2113740A39	27 pF
C5650	2111078B42	100 pF
C5651	2111078B07	5.6 pF
C5652	2111078B13	10 pF
C5653	2111078B11	8.2 pF
C5654	2111078B03	3.9 pF
C5680	2113931F49	0.01 uF
C5681	2113930F51	100 pF
C5682	2113930F25	8.2 pF
C5710	2113741N69	0.1 uF
C5711	2113741N69	0.1 uF

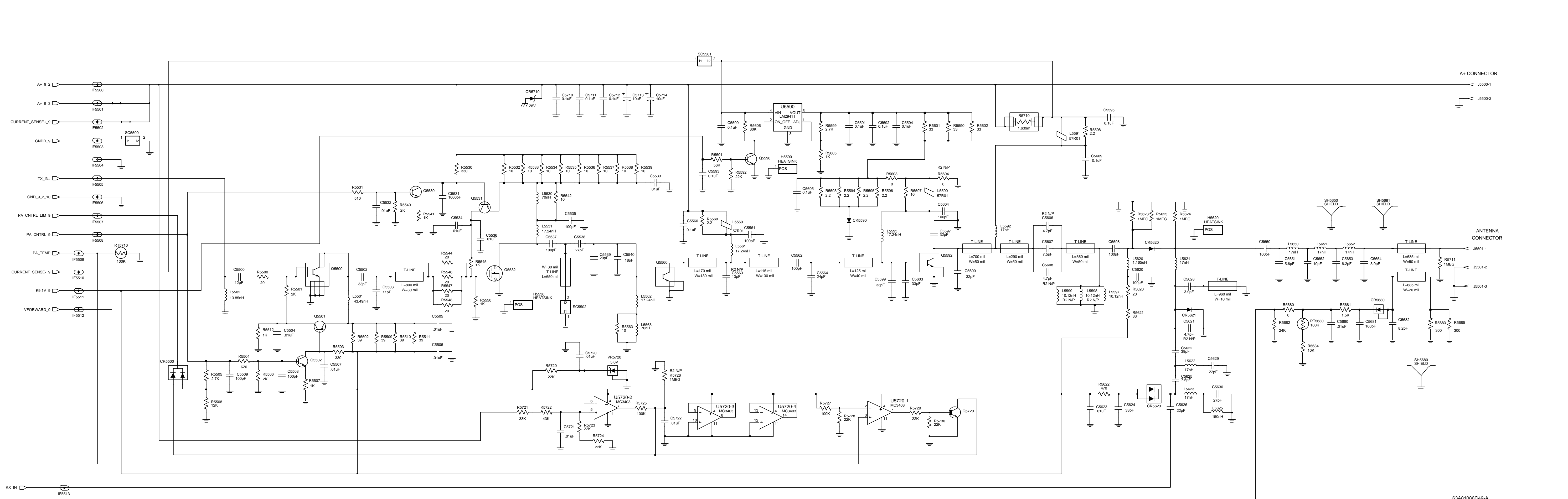
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C5712	2113741N69	0.1 uF
C5713	2380090M24	10 uF
C5714	2380090M24	10 uF
C5720	2113931F49	0.01 uF
C5721	2113931F49	0.01 uF
C5722	2113931F49	0.01 uF
DIODES:		
CR5500	4880154K07	Dual, Common Cathode
CR5590	4813833B03	Schottky
CR5620	4880121R01	PIN
CR5621	4802482J02	PIN
CR5623	4880154K07	Dual, Common Cathode
CR5680	4813825A05	Hot carrier
CR5710	4880222R01	Transorb
VR5720	4813830A15	Zener, 5.6V
HEATSINKS:		
H5530	2605132Y02	
H5590	2605132Y02	
H5620	2605132Y02	
CONNECTORS:		
J5500	0905902V04	Power
J5501	0905901V08	Antenna
INDUCTORS:		
L5501	2460591N67	43.49
L5502	2460591C23	13.85
L5530	2480067M01	Bead
L5531	2460591D23	17.24
L5560	2484657R01	Bead
L5561	2460591D23	17.24
L5562	2460591D23	17.24
L5563	2480067M01	Bead
L5590	2484657R01	Bead
L5591	2484657R01	Bead
L5592	2460592A01	17
L5593	2460591D23	17.24
L5597	2460591L05	10.12
L5620	2480140E01	1.165 uH
L5621	2460592A01	17
L5622	2460592A01	17
L5623	2460592A01	17
L5625	2462587T17	150
L5650	2460592A01	17
L5651	2460592A01	17
L5652	2460592A01	17
TRANSISTORS:		
Q5500	4880182D50	MRF8372
Q5501	4805128M16	PNP, MMBT3906
Q5502	4880141L02	NPN, MMBT3904
Q5530	4880141L02	NPN, MMBT3904
Q5531	4805128M16	PNP, MMBT3906
Q5532	4813827A36	N-Channel FET, MRF5003
Q5560	2685699A05	MRF654
Q5590	4880141L02	NPN, MMBT3904
Q5592	2685700A02	SRFM25C30
Q5720	4880141L02	NPN, MMBT3904

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
RESISTORS:		
R5500	0662057A08	20
R5501	0662057A56	2000
R5502	0662057A15	39
R5503	0662057A37	330
R5504	0662057A44	620
R5505	0662057A59	2700
R5506	0662057A56	2000
R5507	0662057A49	1000
R5508	0662057A75	12K
R5509	0662057A15	39
R5510	0662057A15	39
R5511	0662057A15	39
R5512	0662057A49	1000
R5530	0662057A37	330
R5531	0662057A42	510
R5532	0660076A01	10
R5533	0660076A01	10
R5534	0660076A01	10
R5535	0660076A01	10
R5536	0660076A01	10
R5537	0660076A01	10
R5538	0660076A01	10
R5539	0660076A01	10
R5540	0662057A56	2000
R5541	0662057A49	1000
R5542	0660076A01	10
R5544	0662057A08	20
R5545	0662057A49	1000
R5546	0662057A08	20
R5547	0662057A08	20
R5548	0662057A08	20
R5550	0662057A49	1000
R5560	0611077A10	2.2
R5563	0660076A01	10
R5590	0680194M13	33
R5591	0662057A91	56K
R5592	0662057A81	22K
R5593	0611077A10	2.2
R5594	0611077A10	2.2
R5595	0611077A10	2.2
R5596	0611077A10	2.2
R5597	0611077A26	2.2
R5598	0680194M50	2.2
R5599	0662057A59	2700
R5601	0680194M13	33
R5602	0680194M13	33
R5603	0662057C01	Jumper
R5605	0662057A49	1000
R5606	0662057A84	30K
R5620	0680194M08	20
R5621	0680194M13	33
R5622	0611077A66	2.2
R5623	0660076B25	1M
R5624	0660076B25	1M
R5625	0660076B25	1M
R5680	0662057B47	Jumper
R5681	0662057A53	1500
R5682	0662057A82	24K
R5683	0662057A36	300

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R5684	0662057A73	10K
R5685	0662057A36	300
R5710	1705603W01	Shunt
R5711	0662057B22	1M
R5720	0662057A81	22K
R5721	0662057A85	33K
R5722	0662057A88	43K
R5723	0662057A81	22K
R5724	0662057A81	22K
R5725	0662057A97	100K
R5727	0662057A97	100K
R5728	0662057A81	22K
R5729	0662057A81	22K
R5730	0662057A81	22K
THERMISTORS:		
RT5680	0680149M02	100K
RT5710	0680149M02	100K
SHIELDS:		
SH5650	2605915V01	Harmonic filter (Note 3)
SH5680	2605915V04	Coupler
SH5681	2685629B01	Antenna
INTEGRATED CIRCUITS:		
U5590	5105625U25	Voltage regulator
PRINTED CIRCUIT BOARDS (For Reference Only):		
	8405114Y01	For Kits HUE4022A, HUE4024A
	Revision O	

NOTES:

- All resistor values are in ohms unless indicated otherwise.
- Transistors Q5560 and Q5592 are replaceable only by a Motorola depot.
- When reinstalling harmonic filter shield SH5650 after removing it, associated spring clip, part no. 4185738601, must be replaced simultaneously with a brand new unused one.



63A81086C49-A

NOTES

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
RECEIVER FRONT END					
RF_REG_12V_5	Receiver Front End	68P81080C39-O	RF_REG_12V_5	Receiver IF	68P81080C39-O
RF_REG_5V_5_UHF	Receiver Front End	68P81080C39-O	RF_REG_5V_4	Receiver IF	68P81080C39-O
			RF_REG_5V_4_UHF	Receiver IF	68P81080C39-O
			RF_REG_5V_5	Receiver IF	68P81080C39-O
			RF_REG_5V_3	Receiver IF	68P81080C39-O
AUX1_6	Receiver Front End	68P81080C39-O	AUX1_4	Synthesizer	68P81080C39-O
RX_IN	Receiver Front End	68P81080C39-O	RX_IN	Power Amplifier	68P81080C39-O
LO_INJ_HS	Receiver Front End	68P81080C39-O	LO_INJ_HS	Synthesizer	68P81080C39-O
IF_IN	Receiver Front End	68P81080C39-O	IF_IN	Receiver IF	68P81080C39-O
RECEIVER INTERMEDIATE FREQUENCY (IF)					
RF_REG_5V_4	Receiver IF	68P81080C39-O	RF_REG_5V_5	Receiver IF	68P81080C39-O
			RF_REG_5V_3	Receiver IF	68P81080C39-O
			RF_REG_5V_5_UHF	Receiver IF	68P81080C39-O
			RF_REG_5V_4	Synthesizer	68P81080C39-O
			RF_REG_5V_6	Receiver Back End	68P81080C39-O
9.3V_1	Receiver IF	68P81080C39-O	9.3V_4	Receiver IF	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
			9.3V_3	Receiver IF	68P81080C39-O
			9.3V_7_2_26	LPAUD	68P81080C39-O
			9.3V_7_2_30	LPAUD	68P81080C39-O
			9.3V_4	Synthesizer	68P81080C39-O
RSSI_1	Receiver IF	68P81080C39-O	RSSI_3	Receiver Back End	68P81080C39-O
RX_CNTRL1	Receiver IF	68P81080C39-O			
2.1MHZ_4		68P81080C39-O	2.1MHZ_3	Receiver IF	68P81080C39-O
			2.1MHZ_1	Receiver IF	68P81080C39-O
			2.1MHZ_1	Receiver Back End	
LOCK_DET_1	Receiver IF	68P81080C39-O	LOCK_DET_4	Receiver IF	68P81080C39-O
RF_REG_12V_5	Receiver IF	68P81080C39-O			
Receiver Back End_SEL_1	Receiver IF	68P81080C39-O	ZIF_SEL_3	Receiver IF	68P81080C39-O
			ZIF_SEL_3	Receiver Back End	68P81080C39-O
CLK_1	Receiver IF	68P81080C39-O	CLK_3	Receiver IF	68P81080C39-O
			CLK_4	Receiver IF	68P81080C39-O
			CLK_3	Receiver Back End	68P81080C39-O
			CLK_4	Synthesizer	68P81080C39-O
IF_OUT	Receiver Back End	68P81080C39-O	IF_OUT	Receiver Back End	68P81080C39-O
SPI_TX_DATA_1	Receiver IF	68P81080C39-O	SPI_TX_DATA_3	Receiver IF	68P81080C39-O
			SPI_TX_DATA_4	Receiver IF	68P81080C39-O
			SPI_TX_DATA_4	Synthesizer	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
			SPI_TX_DATA_3	Receiver Back End	68P81080C39-O
SYN_SEL_1	Receiver IF	68P81080C39-O	SYN_SEL_4	Receiver IF	68P81080C39-O
			SYN_SEL_4	Synthesizer	68P81080C39-O
AUDIO_MOD_1	Receiver IF	68P81080C39-O	AUD_MODE_4	Receiver IF	68P81080C39-O
			AUD_MODE_4	Synthesizer	68P81080C39-O
SQUELCH_3	Receiver IF	68P81080C39-O	SQUELCH_1	Receiver IF	68P81080C39-O
			SQUELCH_3	Receiver Back End	68P81080C39-O
ROSC_SEL_1	Receiver IF	68P81080C39-O	ROSC_SEL_4	Receiver IF	68P81080C39-O
			ROSC_SEL_4	Synthesizer	68P81080C39-O
DISC_1	Receiver IF	68P81080C39-O	DISC_3	Receiver IF	68P81080C39-O
			DISC_3	Receiver Back End	68P81080C39-O
IF_IN	Receiver IF	68P81080C39-O	IF_IN	Receiver Front End	68P81080C39-O
SW_B+or_RX_CNTRL_1	Receiver IF	68P81080C39-O			
RECEIVER BACK END/ZERO INTERMEDIATE FREQUENCY (ZIF)					
RF_REG_5V_3	Receiver Back End	68P81080C39-O	RF_REG_5V_4	Receiver IF	68P81080C39-O
			RF_REG_5V_5	Receiver IF	68P81080C39-O
			RF_REG_5V_3	Receiver IF	68P81080C39-O
			RF_REG_5V_5_UHF	Receiver IF	68P81080C39-O
			RF_REG_5V_5_UHF	Receiver Front End	68P81080C39-O
			RF_REG_5V_3	Receiver Back End	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
IF_OUT	Receiver Back End	68P81080C39-O	IF_OUT	Receiver IF	68P81080C39-O
2.1MHZ_3	Receiver Back End	68P81080C39-O	2.1MHZ_4	Receiver IF	68P81080C39-O
			2.1MHZ_3	Receiver IF	68P81080C39-O
			2.1MHZ_1	Receiver IF	68P81080C39-O
			2.1MHZ_4	Synthesizer	68P81080C39-O
ZIF_SEL_3	Receiver Back End	68P81080C39-O	ZIF_SEL_1	Receiver IF	68P81080C39-O
CLK_3	Receiver Back End	68P81080C39-O	CLK_1	Receiver IF	68P81080C39-O
			CLK_3	Receiver IF	68P81080C39-O
			CLK_4	Receiver IF	68P81080C39-O
			CLK_4	Synthesizer	68P81080C39-O
SPI_TX_DATA_3	Receiver Back End	68P81080C39-O	SPI_TX_DATA_1	Receiver IF	68P81080C39-O
			SPI_TX_DATA_3	Receiver IF	68P81080C39-O
			SPI_TX_DATA_4	Receiver IF	68P81080C39-O
			SPI_TX_DATA_4	Synthesizer	68P81080C39-O
AGC_3	Receiver Back End	68P81080C39-O			
SQUELCH_3	Receiver Back End	68P81080C39-O	SQUELCH_3	Receiver IF	68P81080C39-O
			SQUELCH_1	Receiver IF	68P81080C39-O
DISC_3	Receiver Back End	68P81080C39-O	DISC_1	Receiver IF	68P81080C39-O
			DISC_3	Receiver IF	68P81080C39-O
RSSI_3	Receiver Back End	68P81080C39-O			68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SYNTHESIZER					
ROSC_SEL_4	Synthesizer				68P81080C39-O
SPI_TX_DATA_4	Synthesizer	68P81080C39-O	SPI_TX_DATA_3	Receiver Back End	68P81080C39-O
9.3V_4	Synthesizer	68P81080C39-O	9.3V_1	Receiver IF	68P81080C39-O
CLK_4	Synthesizer	68P81080C39-O	CLK_3	Receiver Back End	68P81080C39-O
AUDIO_MOD_4	Synthesizer	68P81080C39-O			68P81080C39-O
Synthesizer_SEL_4	Synthesizer	68P81080C39-O			68P81080C39-O
RF_REG_5V_4	Synthesizer	68P81080C39-O	RF_REG_5V_4	Receiver IF	68P81080C39-O
			RF_REG_5V_6	Receiver Back End	
			RF_REG_5V_3	Receiver Back End	
2.1MHZ_4	Synthesizer	68P81080C39-O	2.1MHZ_3	Receiver Back End	68P81080C39-O
K9.1_9	Synthesizer	68P81080C39-O	K9.1_9	Power Amplifier	68P81080C39-O
TX_INJ	Synthesizer	68P81080C39-O			68P81080C39-O
PA_TEMP_2	Synthesizer	68P81080C39-O	PA_TEMP_9	Synthesizer	68P81080C39-O
			PA_TEMP	Power Amplifier	68P81080C39-O
PA_CNTRL_2	Synthesizer	68P81080C39-O	PA_CNTRL_9	Synthesizer	68P81080C39-O
			PA_CNTRL_9	Power Amplifier	68P81080C39-O
CURRENT_SENSE-_2	Synthesizer	68P81080C39-O	CURRENT_SENSE-_9	Synthesizer	68P81080C39-O
			CURRENT_SENSE-_9	Power Amplifier	
CURRENT_SENSE+_2	Synthesizer	68P81080C39-O	CURRENT_SENSE+_9	Synthesizer	68P81080C39-O
			CURRENT_SENSE+_9	Power Amplifier	

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
A+_2_3	Synthesizer	68P81080C39-O	A+-2_2	Synthesizer	68P81080C39-O
		68P81080C39-O	A+_9_2	Synthesizer	68P81080C39-O
			A+_9_2	Power Amplifier	
			A+_9_3	Power Amplifier	
VFORWARD_2	Synthesizer	68P81080C39-O	VFORWARD_9	Synthesizer	68P81080C39-O
			VFORWARD	Power Amplifier	
VDRIVE_2	Synthesizer	68P81080C39-O	VDRIVE_9	Synthesizer	68P81080C39-O
GNDD_2	Synthesizer	68P81080C39-O	GNDD_9	Synthesizer	68P81080C39-O
			GNDD_9	Power Amplifier	
			GNDD_9_2_10	Power Amplifier	
			GND_9_2_10	Synthesizer	
LO_INJ_HS	Synthesizer	68P81080C39-O	GND_9_2_14	Synthesizer	68P81080C39-O
AUX1_4	Synthesizer	68P81080C39-O			68P81080C39-O
LOCK_DET_4	Synthesizer	68P81080C39-O			68P81080C39-O
POWER AMPLIFIER (PA)					
K9.1_2	Synthesizer	68P81080C39-O	K9.1V_9	Power Amplifier	68P81080C39-O
ROSC_SEL_4	Synthesizer				68P81080C39-O
SPI_TX_DATA_4	Synthesizer	68P81080C39-O	SPI_TX_DATA_3	Receiver Back End	68P81080C39-O
9.3V_4	Synthesizer	68P81080C39-O	9.3V_1	Receiver IF	68P81080C39-O
CLK_4	Synthesizer	68P81080C39-O	CLK_3	Receiver Back End	68P81080C39-O
AUDIO_MOD_4	Synthesizer	68P81080C39-O			68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SYN_SEL_4	Synthesizer	68P81080C39-O			68P81080C39-O
RF_REG_5V_4	Synthesizer	68P81080C39-O	RF_REG_5V_4	Receiver IF	68P81080C39-O
			RF_REG_5V_6	Receiver Back End	
			RF_REG_5V_3	Receiver Back End	
2.1MHZ_4	Synthesizer	68P81080C39-O	2.1MHZ_3	Receiver Back End	68P81080C39-O
K9.1_9	Synthesizer	68P81080C39-O	K9.1_9	Power Amplifier	68P81080C39-O
TX_INJ	Synthesizer	68P81080C39-O			68P81080C39-O
PA_TEMP_2	Synthesizer	68P81080C39-O	PA_TEMP_9	Synthesizer	68P81080C39-O
			PA_TEMP	Power Amplifier	68P81080C39-O
PA_CNTRL_2	Synthesizer	68P81080C39-O	PA_CNTRL_9	Synthesizer	68P81080C39-O
			PA_CNTRL_9	Power Amplifier	68P81080C39-O
CURRENT_SENSE-_2	Synthesizer	68P81080C39-O	CURRENT_SENSE-_9	Synthesizer	68P81080C39-O
			CURRENT_SENSE-_9	Power Amplifier	
CURRENT_SENSE+_2	Synthesizer	68P81080C39-O	CURRENT_SENSE+_9	Synthesizer	68P81080C39-O
			CURRENT_SENSE+_9	Power Amplifier	
A+_2_3	Synthesizer	68P81080C39-O	A+-2_2	Synthesizer	68P81080C39-O
		68P81080C39-O	A+_9_2	Synthesizer	68P81080C39-O
			A+_9_2	Power Amplifier	
			A+_9_3	Power Amplifier	
VFORWARD_2	Synthesizer	68P81080C39-O	VFORWARD_9	Synthesizer	68P81080C39-O
			VFORWARD	Power Amplifier	

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
VDRIVE_2	Synthesizer	68P81080C39-O	VDRIVE_9	Synthesizer	68P81080C39-O
GNDD_2	Synthesizer	68P81080C39-O	GNDD_9	Synthesizer	68P81080C39-O
			GNDD_9	Power Amplifier	
			GNDD_9_2_10	Power Amplifier	
			GND_9_2_10	Synthesizer	
LO_INJ_HS	Synthesizer	68P81080C39-O	GND_9_2_14	Synthesizer	68P81080C39-O
AUX1_4	Synthesizer	68P81080C39-O			68P81080C39-O
LOCK_DET_4	Synthesizer	68P81080C39-O			68P81080C39-O
A+_9_2	Power Amplifier	68P81080C39-O	A+_9_3	Power Amplifier	68P81080C39-O
			A+_2_3	Synthesizer	68P81080C39-O
			A+_9_2	Synthesizer	68P81080C39-O
			A+_2_2	Synthesizer	68P81080C39-O
CURRENT SENSE+_9	Power Amplifier	68P81080C39-O	CURRENT SENSE+_9	Synthesizer	68P81080C39-O
			CURRENT SENSE+_2	Synthesizer	68P81080C39-O
			CURRENT SENSE+_2	Controller: Regulator and Audio Power Amplifier	68P81083C20-B
GNDD_9	Power Amplifier	68P81080C39-O	GNDD_2	Synthesizer	68P81080C39-O
			GNDD_9	Synthesizer	68P81080C39-O
			GNDD_9_2_10	Power Amplifier	68P81080C39-O
			GNDD_9_2_10	Synthesizer	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
			GNDD_2	Controller: Regulator and Audio Power Amplifier	68P81083C20-B
			GNDD_9_2_14	Synthesizer	68P81080C39-O
TX_INJ	Power Amplifier	68P81080C39-O	TX_INJ	Synthesizer	68P81080C39-O
PA_CNTRL_LIM_9	Power Amplifier	68P81080C39-O			
PA_CNTRL_9	Power Amplifier	68P81080C39-O	PA_CNTRL_2	Synthesizer	68P81080C39-O
PA_TEMP	Power Amplifier	68P81080C39-O	PA_TEMP_2	Synthesizer	68P81080C39-O
CURRENT SENSE-_9	Power Amplifier	68P81080C39-O	CURRENT SENSE-_2	Synthesizer	68P81080C39-O
K9.1V_9	Power Amplifier	68P81080C39-O	K9.1_2	Synthesizer	68P81080C39-O
			K9.1_9	Synthesizer	68P81080C39-O
			K9.1_9	Controller: Regulator and Audio Power Amplifier	68P81083C20-B
VFORWARD	Power Amplifier	68P81080C39-O	VFORWARD	Synthesizer	68P81080C39-O
			VFORWARD	Controller: Regulator and Audio Power Amplifier	68P81083C20-B
RX_IN	Power Amplifier	68P81080C39-O	RX_IN	Receiver Front End	68P81080C39-O
CONTROLLER					
VDRIVE	Controller, Power Control/ MainController	68P81083C20-B	VDRIVE	Power Amplifier	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
PWR_RANGE	Controller, Power Control/ MainController	68P81083C20-B	PWR_RANGE	Controller/Main Controller	68P81083C20-B
V_FORWARD	Controller, Power Control/ MainController	68P81083C20-B	VFORWARD	Power Amplifier	68P81080C39-O
VFWD_BUF	Controller, Power Control/ MainController	68P81083C20-B	VFWD_BUF	Audio PA & Voltage Regulators	68P81083C20-B
VSUM	Controller, Power Control/ Main Controller	68P81083C20-B	VSUM	Audio PA & Voltage Regulators	68P81083C20-B
CLK	Controller, Power Control/ MainController	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
DA_SEL	Controller, Power Control/ MainController	68P81083C20-B	DA_SEL	Controller/Main Controller	68P81083C20-B
SPI_TX_DATA	Controller, Power Control/ MainController	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
TEMP_GND	Controller, Power Control/ MainController	68P81083C20-B			
CURRENT_SENSE+	Controller, Power Control/ Main Controller	68P81083C20-B	CURRENT_SENSE+	Power Amplifier	68P81080C39-O
CURRENT_SENSE-	Controller, Power Control/ MainController	68P81083C20-B	CURRENT_SENSE-	Power Amplifier	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
PA_TEMP	Controller, Power Control/ MainController	68P81083C20-B	PA_TEMP	Power Amplifier	68P81080C39-O
PA_DIS	Controller, Power Control/ MainController	68P81083C20-B	PA_DIS	Controller/Main Controller	68P81083C20-B
K9.1_ENB	Controller, Power Control/ MainController	68P81083C20-B	K9.1_ENB	Controller/Main Controller	68P81083C20-B
9.3V	Controller, Power Control/ MainController	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
SW_B+	Controller, Power Control/ MainController	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
+5V	Controller, Power Control/ MainController	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
PA_CNTL_LIM	Controller, Power Control/ MainController	68P81083C20-B			
PA_CNTL	Controller, Power Control/ MainController	68P81083C20-B	PA_CNTL	Power Amplifier	68P81080C39-O
TEMP	Controller, Power Control/ MainController	68P81083C20-B	TEMP	Controller/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
RX_CNTL1	Controller, Power Control/Main Controller	68P81083C20-B	RX_CNTL1	Receiver IF	68P81080C39-O
			RX_CNTL1	Receiver IF	68P81080C39-O
K9.1V	Controller, Power Control/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
A+_CONT	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
UNSW_5V	Audio PA & Voltage Regulators	68P81083C20-B	UNSW_+5V	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
CL_UNSW_5V	Audio PA & Voltage Regulators	68P81083C20-B			
+5V	Audio PA & Voltage Regulators	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
SW_B+	Audio PA & Voltage Regulators	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
AUPA_EN	Audio PA & Voltage Regulators	68P81083C20-B	AUPA_EN	Controller/Main Controller	68P81083C20-B
RX_AUDIO	Audio PA & Voltage Regulators	68P81083C20-B	RX_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SPKR+	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B	SPKR+	Controller Interface	68P81083C20-B
SPKR-	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B	SPKR-	Controller Interface	68P81083C20-B
				Controller Interface	68P81083C20-B
A+	Audio PA & Voltage Regulators	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
B+_ON_OFF	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B	B+_ON_OFF	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
IGNITION_CLEAR	Audio PA & Voltage Regulators	68P81083C20-B	IGNITION_CLEAR	Controller/Main Controller	68P81083C20-B
B+_IGNITION	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B	B+_IGNITION	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
9.3	Audio PA & Voltage Regulators	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
Vdd	Audio PA & Voltage Regulators	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
Vaud	Audio PA & Voltage Regulators	68P81083C20-B	Vaud	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
PWR_RST	Audio PA & Voltage Regulators	68P81083C20-B	PWR_RST	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
			PWR_RST	Controller/Main Controller	68P81083C20-B
VFWD_BUF	Audio PA & Voltage Regulators	68P81083C20-B	VFWD_BUF	Controller, Power Control/Main Controller	68P81083C20-B
VSUM	Audio PA & Voltage Regulators	68P81083C20-B	VSUM	Controller, Power Control/Main Controller	68P81083C20-B
EXP_FILTERED_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B	EXP_FILTERED_AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B
AUX_RX_IN1	Controller, ASFIC/ Audio Block Diagram/Main Controller/Controller Interface	68P81083C20-B	AUX_RX_IN1	Controller Interface	68P81083C20-B
AUX_RX_IN2	Controller, ASFIC/ Audio Block Diagram/Main Controller/Controller Interface	68P81083C20-B	AUX_RX_IN2	Controller Interface	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
AUX_RX_IN3	Controller, ASFIC/ Audio Block Diagram/Main Con- troller/Controller Interface	68P81083C20-B	AUX_RX_IN3	Controller Interface	68P81083C20-B
AUX_TX_IN1	Controller, ASFIC/ Audio Block Diagram/Main Con- troller/Controller Interface	68P81083C20-B	AUX_TX_IN1	Controller Interface	68P81083C20-B
AUX_TX_IN2	Controller, ASFIC/ Audio Block Diagram/Main Con- troller/Controller Interface	68P81083C20-B	AUX_TX_IN2	Controller Interface	68P81083C20-B
AUX_TX_IN3	Controller, ASFIC/ Audio Block Diagram/Main Con- troller/Controller Interface	68P81083C20-B	AUX_TX_IN3	Controller Interface	68P81083C20-B
9.3V	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
VAG	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	VAG	Controller, IO RSSI Buffers Controller Interface/ Main Controller	68P81083C20-B
Vaud	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	Vaud	Audio PA & Voltage Regulators	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
CLK	Controller, ASFIC/ AUdio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
PL_TX	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	PL_TX	Controller/Main Con- troller	68P81083C20-B
2.1MHZ	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
TX_DATA	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	TX_DATA	Controller/Main Con- troller	68P81083C20-B
LG_DTMF	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	LG_DTMF	Controller/Main Con- troller	68P81083C20-B
ASFIC_SEL	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	ASFIC_SEL	Controller/Main Con- troller	68P81083C20-B
SPI_TX_DATA	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
EXP_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	EXP_AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
RX_IN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	RX_IN	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B
TRL_HD2:KEY_FAIL	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	TRL_HD2:KEY_FAIL	Controller Interface	68P81083C20-B
SQUELCH_IN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	SQUELCH	Receiver IF	68P81080C39-O
			SQUELCH	Receiver IF	68P81080C39-O
MIC_VOLTAGE	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	MIC_VOLTAGE	Controller, Emer- gency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
MIC_IN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	MIC_IN	Controller, Emer- gency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
DISC	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	DISC	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B
			DISC	Receiver IF	68P81080C39-O
			DISC	Receiver IF	68P81080C39-O
			DISC	Receiver Back End	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
EXT_MIC_IN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	EXT_MIC_IN	Controller Interface	68P81083C20-B
TX_IN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	TX_IN	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B
RSSI	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
PWR_RST	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	PWR_RST	Audio PA & Voltage Regulators	68P81083C20-B
			PWR_RST	Controller/Main Con- troller	68P81083C20-B
RX_HI&FIL_ AUDIO_OUT	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	RX_HI&FIL_ AUDIO_OUT	Controller Interface	68P81083C20-B
RX_HI	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	RX_HI	Controller Interface	68P81083C20-B
1200	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	1200	Controller/Main Con- troller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
UP_CLK	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	UP_CLK	Controller/Main Con- troller	68P81083C20-B
PL_RX	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	PL_RX	Controller/Main Con- troller	68P81083C20-B
RX_DATA	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	RX_DATA	Controller/Main Con- troller	68P81083C20-B
RX_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	RX_AUDIO	Audio PA & Voltage Regulators	68P81083C20-B
FILTERED_ AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	FILTERED_ AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B
ASFIC_MIC_ AUD_OUT	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	ASFIC_MIC_ AUD_OUT	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B
VOX	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	VOX	Controller/Main Con- troller	68P81083C20-B
ASFIC_PRE-EMP_OUT	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	ASFIC_PRE-EMP_OUT		68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
AUDIO_MOD	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	AUDIO_MOD	Receiver IF	68P81080C39-O
			AUDIO_MOD	Receiver IF	68P81080C39-O
			AUDIO_MOD	Synthesizer	68P81080C39-O
FF_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	FF_EN	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B
HCI_DIS	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	HCI_DIS	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B
LC_DIS	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	LC_DIS	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B
COMP_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	COMP_EN	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B
HI_CLMP_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	HI_CLMP_EN	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B
CH_ACT	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	CH_ACT	Controller/Main Con- troller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SQ_DET	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	SQ_DET	Controller/Main Con- troller	68P81083C20-B
UNIV_IO	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B	UNIV_IO	Controller Interface	68P81083C20-B
			UNIV_IO	Controller, IO RSSI Buffers/Controller Interface/Main Con- troller	68P81083C20-B
COMP_EN	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B	COMP_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B
FF_EN	Controller, Hear Clear/audio Block Diagram/Main Con- troller	68P81083C20-B	FF_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B
HI_CLMP_EN	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B	HI_CLMP_EN	Controller, ASFIC/ Audio Block Diagram/Main Con- troller	68P81083C20-B
RSSI	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
DISC	Controller, Hear Clear/Audio Block Diagram/Main Con- troller	68P81083C20-B	DISC	Receiver IF	68P81080C39-O

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
			DISC	Receiver IF	68P81080C39-O
			DISC	Receiver Back End	68P81080C39-O
			DISC	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
HCI_DIS	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	HCI_DIS	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
LC_DIS	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	LC_DIS	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
FILTERED_AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	FILTERED_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
ASFIC_MIC_AUD_OUT	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	ASFIC_MIC_AUD_OUT	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
9.3V	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
EXP_FILTERED_AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	EXP_FILTERED_AUDIO	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
EXP_AUDIO	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	EXP_AUDIO	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
RX_IN	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	RX_IN	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
TX_IN	Controller, Hear Clear/Audio Block Diagram/Main Controller	68P81083C20-B	TX_IN	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
UNIV_IO	Controller, IO RSSI Buffers/Controller Interface/Main Controller	68P81083C20-B	UNIV_IO	Controller Interface	68P81083C20-B
			UNIV_IO	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
RSSI	Controller, IO RSSI Buffers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
UNIV_IO_OUT	Controller, IO RSSI Buffers/Controller Interface/Main Controller	68P81083C20-B	BUFFERED DISCRIMINATOR		68P81083C20-B
RSSI_OUT	Controller, IO RSSI Buffers/Controller Interface/Main Controller	68P81083C20-B	RSSI_OUT	Controller/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
			RSSI_OUT	Controller Interface	68P81083C20-B
9.3V	Controller, IO RSSI Buffers/ Controller Interface/ Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
Vdd	Controller, IO RSSI Buffers/ Controller Interface/ Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
VAG	Controller, IO RSSI Buffers/ Controller Interface/ Main Controller	68P81083C20-B	VAG	Controller, ASFIC/ AUdio Block Diagram/Main Controller	68P81083C20-B
MIC_VOLTAGE	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	MIC_VOLTAGE	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
MIC_IN	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	MIC_IN	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
EMERGENCY	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	EMERGENCY	Controller Interface	68P81083C20-B
B+_CTRL	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	B+_CTRL	Controller/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
IGNITION	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	IGNITION	Controller Interface	68P81083C20-B
SW_B+_SENSE	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	SW_B+_SENSE	Controller/Main Controller	68P81083C20-B
B+_ON_OFF	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	B+_ON_OFF	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B
EMER_OUT	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	EMER_IN	Controller/Main Controller	68P81083C20-B
A+_SENSE	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	A+_SENSE	Controller/Main Controller	68P81083C20-B
IGNITION_SENSE	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	IGNITION_SENSE	Controller/Main Controller	68P81083C20-B
B+_IGNITION	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	B+_IGNITION	Audio PA & Voltage Regulators/ Controller Interface	68P81083C20-B
+5V	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SW_B+	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
UNSW_+5V	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B	UNSW_5V	Audio PA & Voltage Regulators	68P81083C20-B
Vdd	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
BUS-	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	BUS-	Controller Interface	68P81083C20-B
BUS+	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	BUS+	Controller Interface	68P81083C20-B
SCI_TX	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	SCI_TX	Controller/Main Controller	68P81083C20-B
BUSY_OUT	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	BUSY_OUT	Controller/Main Controller	68P81083C20-B
BUSY	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	BUSY	Controller Interface	68P81083C20-B
RESET_OUT	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B	RESET_OUT	Controller/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
LH_RESET	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B	RESET	Controller Interface	68P81083C20-B
			RESET	Controller Interface	68P81083C20-B
SCI_RX	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B	SCI_RX	Controller/Main Controller	68P81083C20-B
SCI_ECHO	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B	SCI_ECHO	Controller	68P81083C20-B
BUS_SCI	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B			
BUSY_IN	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B	BUSY_IN	Controller/Main Controller	68P81083C20-B
RESET_IN	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B	RESET_IN	Controller/Main Controller	68P81083C20-B
CLOSED_RESET (On Closed Architecture Only)	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B			
+5V	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
Vdd	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
IO2	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IO2	Controller Interface	68P81083C20-B
OUT2	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	OUT_2	Controller/Main Controller	68P81083C20-B
IO3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IO3	Controller Interface	68P81083C20-B
			VPP_PROGRAM	Controller/Main Controller	68P81083C20-B
OUT3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	OUT_3	Controller/Main Controller	68P81083C20-B
IO4	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IO4	Controller Interface	68P81083C20-B
OUT4	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	OUT_4	Controller/Main Controller	68P81083C20-B
IO5	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IO5	Controller Interface	68P81083C20-B
OUT5	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	OUT_5	Controller/Main Controller	68P81083C20-B
IO6	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IO6	Controller Interface	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
OUT6	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	OUT_6	Controller/Main Controller	68P81083C20-B
IN2	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IN_2	Controller/Main Controller	68P81083C20-B
IN3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IN_3	Controller/Main Controller	68P81083C20-B
IN4	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IN_4	Controller/Main Controller	68P81083C20-B
IN5	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IN_5	Controller/Main Controller	68P81083C20-B
IN6_:_RTSBIN	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B	IN_6	Controller/Main Controller	68P81083C20-B
Vdd	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
SW_B+	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
+5V	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
RX_DATA_IN	Controller/Main Controller	68P81083C20-B	SW_5V:RX_DATA_IN	Controller Interface	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
RTSB_OUT	Controller/Main Controller	68P81083C20-B	BUF_CH_EN: RTSB_OUT	Controller Interface	68P81083C20-B
RESET*	Controller/Main Controller	68P81083C20-B	RESET*	Controller Interface	68P81083C20-B
PWR_RST	Controller/Main Controller	68P81083C20-B	PWR_RST	Audio PA & Voltage Regulators	68P81083C20-B
			PWR_RST	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
RESET_OUT	Controller/Main Controller	68P81083C20-B	RESET_OUT	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B
RESET_IN	Controller/Main Controller	68P81083C20-B	RESET_IN	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B
RX_DATA	Controller/Main Controller	68P81083C20-B	RX_DATA	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
ASN_SEL	Controller/Main Controller	68P81083C20-B			
K9.1_ENB	Controller/Main Controller	68P81083C20-B	K9.1_ENB	Controller, Power Control/Main Controller	68P81083C20-B
OUT_3	Controller/Main Controller	68P81083C20-B	OUT3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
OUT_2	Controller/Main Controller	68P81083C20-B	OUT2	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
AUPA_EN	Controller/Main Controller	68P81083C20-B	AUPA_EN	Audio PA & Voltage Regulators	68P81083C20-B
JABBA_SEL	Controller/Main Controller	68P81083C20-B	O:JABBA_SEL_C:DTMF_SEL	Controller Interface	68P81083C20-B
PWR_RANGE	Controller/Main Controller	68P81083C20-B	PWR_RANGE	Controller, Power Control/Main Controller	68P81083C20-B
DA_SEL	Controller/Main Controller	68P81083C20-B	DA_SEL	Controller, Power Control/Main Controller	68P81083C20-B
PL_RX	Controller/Main Controller	68P81083C20-B	PL_RX	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
DUPLEX_SYN_SEL	Controller/Main Controller	68P81083C20-B	DUPLEX_SYN_SELECT	Receiver IF	68P81080C39-O
BUF_SPI_DATA:SECURE_SEL	Controller/Main Controller	68P81083C20-B	BUF_SPI_DATA:SECURE_SELECT	Controller Interface	68P81083C20-B
IGNITION_CLEAR	Controller/Main Controller	68P81083C20-B	IGNITION_CLEAR	Audio PA & Voltage Regulators	68P81083C20-B
ZIF_SEL	Controller/Main Controller	68P81083C20-B	ZIF_SEL	Receiver IF	68P81080C39-O
			ZIF_SEL	Receiver IF	68P81080C39-O
			ZIF_SEL	Receiver BACK-END	68P81080C39-O
OUT_6	Controller/Main Controller	68P81083C20-B	OUT6	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
BUSY_OUT	Controller/Main Controller	68P81083C20-B	BUSY_OUT	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B
B+_CTRL	Controller/Main Controller	68P81083C20-B	B+_CTRL	Controller, Emergency Ignition/Controller Interface/Main Controller	68P81083C20-B
LOCK_DET	Controller/Main Controller	68P81083C20-B	LOCK_DET	Receiver IF	68P81080C39-O
			LOCK_DET	Receiver IF	68P81080C39-O
			LOCK_DET	Synthesizer	68P81080C39-O
IN_3	Controller/Main Controller	68P81083C20-B	IN3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
IN_4	Controller/Main Controller	68P81083C20-B	IN4	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
ASN_INT	Controller/Main Controller	68P81083C20-B	ASN_INT_OPT_TX	Controller Interface	68P81083C20-B
OUT_5	Controller/Main Controller	68P81083C20-B	OUT5	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
OUT_4	Controller/Main Controller	68P81083C20-B	OUT4	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
EMER_IN	Controller/Main Controller	68P81083C20-B	EMER_OUT	Controller, Emergency Ignition/Controller Interface/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SW_B+_SENSE	Controller/Main Controller	68P81083C20-B	SW_B+_SENSE	Controller, Emergency Ignition/Controller Interface/Main Controller	68P81083C20-B
DUPLEX_LOCK_DET (Not Connected For Half Duplex)	Controller/Main Controller	68P81083C20-B			
IGNITION_SENSE	Controller/Main Controller	68P81083C20-B	IGNITION_SENSE	Controller, Emergency Ignition/Controller Interface/Main Controller	68P81083C20-B
IN_6	Controller/Main Controller	68P81083C20-B	IN6_:RTSBIN	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
JABBA_INT	Controller/Main Controller	68P81083C20-B	O:JABBA_INT_C:DTMF_SEL	Controller Interface	68P81083C20-B
SQ_DET	Controller/Main Controller	68P81083C20-B	SQ_DET	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
IN_5	Controller/Main Controller	68P81083C20-B	IN5	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
CH_ACT	Controller/Main Controller	68P81083C20-B	CH_ACT	Controller, ASFIC/Audio Block Diagram/Main Controller	68P81083C20-B
IN_2	Controller/Main Controller	68P81083C20-B	IN2	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
PL_TX	Controller/Main Controller	68P81083C20-B	PL_TX	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
TX_DATA	Controller/Main Controller	68P81083C20-B	TX_DATA	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
LG_DTMF	Controller/Main Controller	68P81083C20-B	LG_DTMF	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
1200	Controller/Main Controller	68P81083C20-B	1200	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
BUSY_IN	Controller/Main Controller	68P81083C20-B	BUSY_IN	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B
A+_SENSE	Controller/Main Controller	68P81083C20-B	A+_SENSE	Controller, Emergency Ignition/ Controller Interface/ Main Controller	68P81083C20-B
UP_CLK	Controller/Main Controller	68P81083C20-B	UP_CLK	Controller, ASFIC/ Audio Block Diagram/ Main Controller	68P81083C20-B
MOD_A_B	Controller/Main Controller	68P81083C20-B	MOD_A_B	Controller Interface	68P81083C20-B
SCI_RX	Controller/Main Controller	68P81083C20-B	SCI_RX	Controller, SCI Drivers/ Controller Interface/ Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
SCI_TX	Controller/Main Controller	68P81083C20-B	SCI_TX	Controller, SCI Drivers/Controller Interface/Main Controller	68P81083C20-B
SPI_RX_DATA	Controller/Main Controller	68P81083C20-B	SPI_RX_DATA	Controller Interface	68P81083C20-B
SPI_TX_DATA	Controller/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
CLK	Controller/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
PA_DIS	Controller/Main Controller	68P81083C20-B	PA_DIS	Controller, Power Control/Main Controller	68P81083C20-B
RSSI	Controller/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
RSSI_OUT	Controller/Main Controller	68P81083C20-B	RSSI_OUT	Controller, IO RSSI Buffers/Controller Interface/Main Controller	68P81083C20-B
			RSSI_OUT	Controller Interface	68P81083C20-B
LBAT	Controller/Main Controller	68P81083C20-B	LBAT	Controller Interface	68P81083C20-B
TEMP	Controller/Main Controller	68P81083C20-B	TEMP	Controller, Power Control/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
VOX	Controller/Main Controller	68P81083C20-B	VOX	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
SYN_SEL	Controller/Main Controller	68P81083C20-B	SYN_SEL	Receiver IF	68P81080C39-O
			SYN_SEL	Receiver IF	68P81080C39-O
			SYNT_SEL	Synthesizer	68P81080C39-O
ROSC_SEL	Controller/Main Controller	68P81083C20-B	ROSC_SEL	Receiver IF	68P81080C39-O
			ROSC_SEL	Receiver IF	68P81080C39-O
			ROSC_SEL	Synthesizer	68P81080C39-O
ASFIC_SEL	Controller/Main Controller	68P81083C20-B	ASFIC_SEL	Controller, ASFIC/ Audio Block Diagram/Main Controller	68P81083C20-B
VPP_PROGRAM	Controller/Main Controller	68P81083C20-B	IO3	Controller, IO Buffers/Controller Interface/Main Controller	68P81083C20-B
			IO3	Controller Interface	68P81083C20-B
Vdd	Controller/Main Controller	68P81083C20-B		All Nodes with this Signal Name are Common within the Entire Radio	
SW_5V:RX_DATA_IN	Controller Interface	68P81083C20-B	RX_DATA_IN	Controller/Main Controller	68P81083C20-B
BUF_CH_EN:RTSB_OUT	Controller Interface	68P81083C20-B	RTSB_OUT	Controller/Main Controller	68P81083C20-B

Table 1: Schematic Diagram Interconnection List

From/To			From/To		
Signal Name	Schematic Diagram Title	Publication No.	Signal Name	Schematic Diagram Title	Publication No.
O:JABBA_SEL_C:DTMF_SEL	Controller Interface	68P81083C20-B	JABBA_SEL	Controller/Main Controller	68P81083C20-B
BUF_SPI_DATA:SECURE_SELECT	Controller Interface	68P81083C20-B	BUF_SPI_DATA:SECURE_SEL	Controller/Main Controller	68P81083C20-B
O:JABBA_INT_C:DTMF_SEL	Controller Interface	68P81083C20-B	JABBA_INT	Controller/Main Controller	68P81083C20-B
MOD_A_B	Controller Interface	68P81083C20-B	MOD_A_B	Controller/Main Controller	68P81083C20-B
SPI_RX_DATA	Controller Interface	68P81083C20-B	SPI_RX_DATA	Controller/Main Controller	68P81083C20-B
RSSI_OUT	Controller Interface	68P81083C20-B	RSSI_OUT	Controller, IO RSSI Buffers/ Controller Interface/ Main Controller	68P81083C20-B
			RSSI_OUT	Controller/Main Controller	68P81083C20-B
LBAT	Controller Interface	68P81083C20-B	LBAT	Controller/Main Controller	68P81083C20-B

NOTES

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SERVICE MANUAL QUESTIONNAIRE

We believe that reports from users provide valuable information for producing quality manuals. By taking a few moments to answer the following questions as they relate to this specific manual, you can take an active role in the continuing effort to ensure that our manuals contain the most accurate and complete information of benefit to you. Thank you for your cooperation.

In reference to Manual Number: 68P81080C39-O

MCS 2000™ Mobile Radio

1. Please check all the appropriate boxes:

	Complete	Incomplete	Correct	Incorrect	Clear	Confusing	Size Adequate	Size Too Small	Not Covered in This Manual
Disassembly Procedures									
Alignment Procedures									
Exploded Views									
Schematic Diagrams									
Circuit Board Details									
Electrical Parts Lists									
Exploded View Parts List									

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- excellent
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3. Did this Service manual provide you with the information necessary to service and maintain the specific equipment?

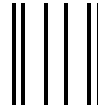
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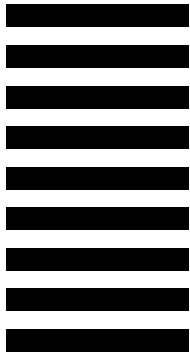
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5. We would appreciate any corrections or recommendations for improving this manual. Please include the specific page number(s) of the diagram or procedure in question.

- a. Disassembly Procedures:(Page No. _____)
- b. Alignment Procedures:(Page No. _____)
- c. Exploded Views:(Page No. _____)



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- d. Schematic Diagrams: (Page No. _____)
- e. Component Location Details: (Page No. _____)
- f. Electrical Parts List: (Page No. _____)
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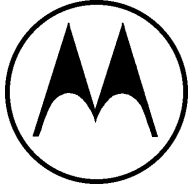
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MCS 2000 Mobile Radio Service Instructions

UHF 40W Range 2 Specific

Publication Number 68P81080C39-O



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