

Maintenance Manual

**Prism HP / LPE-200
SCAN And SYSTEM
PORTABLE RADIOS
800 MHz**

MANUAL REVISION HISTORY

| REVISION | DATE | REASON FOR CHANGE |
|----------|----------|--|
| R1A | OCT 1995 | Original issue |
| R1B | JUL 1996 | Add LPE-200 info. Correct Assembly Diagrams and Parts List |

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SPECIFICATIONS*

GENERAL

| | | |
|----------------------------------|----------------------------------|---------------|
| FCC Identification Number | AXATR-336-A | |
| DOC Certification Number | 287-194-340NA | |
| Input Voltage | 7.5 Vdc (nominal) | |
| Frequency Range: | | |
| Transmit | * 806 - 824 MHz | 851 - 869 MHz |
| Receive | 851 - 869 MHz | |
| Frequency Stability | ±1.5 PPM | |
| Dimensions (Typical)H x W x D: | | |
| Less knobs and antenna | | |
| with High Capacity Battery | 144 mm x 67 mm x 43 mm | |
| with Extra High Capacity Battery | 157 mm x 67 mm x 43 mm | |
| Weight: | | |
| with High Capacity Battery | 20.8 oz. (589 g) | |
| with Extra High Capacity Battery | 22.0 oz. (624g) | |
| Operable Temperature Range | -30°C to +60°C (-22°F to +140°F) | |

* The following models operate 807.5 - 824 Mhz (Limited bandsplit):
KRD 103 103/A11, A12, A21, A22

Continued

SPECIFICATIONS* (Con't)

DIGITAL

AEGIS:

| | |
|------------------|-----------------------------|
| Vocoding Method | Adaptive Multiband Encoding |
| Data Rate | 9600 BPS |
| Error Corr. Eff: | 8.3 dB at 5% BER |

Cryptographic (Optional):

| | |
|-------------------|--------------------------------------|
| Encryption Tech: | Non Linear/Block Transformation |
| Key Permutations: | 1.8 x 10 ¹⁹ VGE Algorithm |
| | 7.2 x 10 ¹⁶ DES Algorithm |
| Key Storage: | 8 banks of 7 keys |

RECEIVE

| | |
|------------------------------|--------------------------------|
| Channel Spacing | 25/12.5 kHz (NPSPAC) |
| Sensitivity (12 dB SINAD) | 0.28 μ V |
| Spurious and Image Rejection | -70 dB |
| Selectivity: | |
| @ 12.5 kHz NPSPAC | -20 dB |
| @ 25 kHz | -72 dB |
| Intermodulation | -72 dB |
| Frequency Separation | Full Bandwidth |
| Audio Output | 500 mW @ 3% Maximum Distortion |

TRANSMIT

| | |
|---|---|
| RF Power Output | 0.5 - 3 Watts (Normal Trunked) |
| Spurious and Harmonics | Meets FCC/DOC Limits (-16 dBm) |
| Modulation/Deviation | \pm 5 kHz |
| Frequency Separation | Full Bandwidth |
| FM Hum & Noise (Companion Receiver) | -40 dB |
| Audio Distortion | Less than 3% @ 1000 Hz, 3 kHz deviation |
| Frequency Stability (-30°C to +60°C: + 25 Ref) | \pm 1.5 PPM |
| Audio Frequency Response | EIA |

*These specifications are intended primarily for the use of the service technician. See the appropriate Specification Sheet for the complete specifications.

DESCRIPTION

The Ericsson Inc. **Prism HP** and LPE-200 Portable Radios are rugged, high-quality, high-performance FM two-way communications unit designed to operate in either **ANALOG or DIGITAL** environments. It is available in either *Scan* or *System* versions. These are Ericsson's smallest and most sophisticated high-specification portable radios, designed to meet worldwide requirements. They utilize custom designed integrated circuits to set new standards for size and weight for a high power, high specification two way radio. These radios are synthesized and can be programmed to operate on both **EDACS**• trunked or conventional communications systems. The **Prism HP** is the first land mobile terminal product capable of being upgraded for **Time Division Multiple Access (TDMA)** operation. Features include:

- **Field Upgradability (Prism HP only)**
Upgradeable to **TDMA** in the field through **FLASH** software and a plug-in DSP module, provides an easy, inexpensive evolution path to **TDMA** operation as future capacity requirements dictate. Also, conventional only radios can be upgraded to **EDACS** or **AEGIS** and optional features such as Prosound can be added.
- **Compact Size**
Designed small and light with rounded edges to fit comfortably in your hand, while providing specifications and performance superior to larger, heavier radios.
- **Light Weight, Rugged Constructions**
Features a molded case made of a polycarbonate blend surrounding a metal casting. This construction provides a lightweight yet durable housing designed to withstand years of rugged use.
- **High System/Group Capacity**
Both the Scan and the System versions can manage up to 800 different EDACS system/group combinations with up to 300 conventional channels. EDACS systems/groups can be configured in many different ways to meet specific user needs.
- **Dual Mode Capability**
Conventional operation by simply selecting a pre-programmed conventional system.
- **Transmit Indicator**
A red LED indicator on the top of the radio indicates when the radio is transmitting.
- **Display**
System and group information, status icons and menu operation is supported by the 3-line, 12-character, alphanumeric back lit **Liquid Crystal Display (LCD)**.
- **Top-Mounted Rotary Knobs**
The rugged rotary knobs are designed for ease of operation by allowing tactile access to groups, systems, conventional channels, as well as volume and power control. Knobs are designed with metal protective sleeves which help prevent bent and broken knobs due to impact.
- **Keypad**
The back lit keypad allows the user to access the many radio functions. The 6-button SCAN provides easy access to preprogrammed telephone and individual radio ID's, while the 15-button System keypad expands this capability, allowing direct entry of these numbers. The LPE-200 radios have a keypad with translucent keys. A detailed description of the keypads and their additional function is found in the **OPERATION** section.
- **Emergency ID And Alarm**
The user can alert the dispatcher to an emergency by pressing a recessed red button located on the top of the radio which sends user ID and an emergency signal.
- **Universal Device Connector (UDC)**
The UDC provides the PC programmer and optional accessories access to the radio for ease and versatility of radio functionality.
- **Variable Power Control**
PC Programmable from 0.5 to 3 watts
- **Weatherproof**
Radios operate reliably under adverse conditions. These portable radios meet military standards MIL-810C, D and E specifications for temperature and pressure extremes, solar radiation, driven rain, humidity, salt fog, blowing dust, shock and vibration.
- **Vibration**
Meets EIA, U.S. Forest Service and MIL-810 environmental and vibration-stability requirements.
- **Personality Programming**
Can easily be hooked up to a personal computer in the field, to allow system and radio parameters to be flexibly programmed as requirements change, without changing parts or opening the radio case.

MECHANICAL

The radios are packaged in a polycarbonate blend exterior housing. A six-cell back mounted nickel cadmium battery pack provides a nominal 7.5 volts. Two different nickel cadmium battery packs offering high and extended capacities are available for use with the portable radios.

The top of the radio has a Volume, Channel/Area/System select knob, Emergency/Home button, TX LED and a screw-on antenna mount connector. Located on the front is a 3-line 12 character per line dot matrix LCD with backlighting. A chip-on-glass filtered super twisted nematic LCD with a transfective rear film is used. A 36 mm speaker and electret microphone are located above the LCD. Below the speaker is either a 6-button keypad for *Scan* operation or a 15-button keypad for *System* operation. A push-to-talk bar is located on the left side along with a Clear/Monitor button and option button. On the opposite side a UDC connector is located for plug-in accessories and PC programming.

One printed wire board assembly contains the transmitter/receiver, audio and logic circuitry. A separate printed wire board assembly (daughter board) contains the DSP Module. One plug-in module is used for FM operation. A second module supports FM and TDMA operation. (Prism HP only). The radio board assembly is cradled in a zinc die casting which is used as a PA heat sink and for housing rigidity. A sheet metal shield completes the RF shielding.

The keypad and LCD assembly are separate from the main board and interconnect by a flex-circuit. This flex-circuit also interconnects the speaker, microphone and UDC assemblies. Top controls mount to another flex-circuit board that plugs into the main radio board assembly.

Radio circuitry is centered mainly on one radio board. This board is mounted in a metal housing with a metal shield covering the top of the board. This enclosure is penetrated only by a flex cable which ties the front, user interface part of the radio to the board and a 3-pin battery connector. Surface mount components populate both top and bottom of the radio board allowing a combination of both RF and digital circuits. Only a few leaded parts are used where no surface mount components are available.

OPTIONS AND ACCESSORIES

| PART NUMBER | DESCRIPTION |
|-----------------------------|---|
| Batteries | |
| BKB 191 203 | High Capacity NICAD Battery |
| BKB 191 202 | Extra High Capacity NICAD Battery |
| BKB 191 203/A2 | High Capacity NICAD Battery (FM Intrinsically Safe) |
| BKB 191 202/A2 | Extra High Capacity NICAD Battery (FM Intrinsically Safe) |
| Chargers | |
| BML 161 51/505 | 120 Volt, Rapid (Ericsson label) |
| BML 161 51/506 | 120 Volt, Rapid (GE label) |
| BML 161 51/507 | 230 Volt, Rapid (Ericsson label) |
| BML 161 51/513 | 120 Volt, Multi Rapid (Ericsson label) |
| BML 161 51/514 | 120 Volt, Multi Rapid (GE label) |
| BML 161 51/515 | 230 Volt, Multi Rapid (Ericsson label) |
| Antenna | |
| KRE 101 1223/01 | 800 MHz Whip Antenna |
| KRE 101 1216/01 | 800 MHz Gain, Elevated Feed |
| Carrying Accessories | |
| KRY101 1605/01 | Leather Case With Belt Loop |
| KRY101 1605/A2 | Leather Case W/Swivel And Belt Loop |
| KRY 101 1609/A1 | Belt Loop With Swivel |
| KRY 101 1232/2 | Plastic Belt Clip |
| KRY 101 1607/1 | Leather Shoulder Strap |
| Audio Accessories | |
| KRY 101 1617/1 | Speaker Microphone (GE label) |
| KRY 101 1617/3 | Speaker Microphone (Ericsson label) |
| KRY 101 1617/A2 | Speaker Mic., With Antenna (GE label) |
| KRY 101 1617/A4 | Speaker Mic., With Antenna (Ericsson label) |
| RLD 541 07/11 | Earpiece Kit, Speaker Microphone |

OPERATION

The **Prism** series of portable radios is designed for **EDACS** and conventional mode operation. When the unit is used in a trunked **EDACS**, the digital control channel is automatically monitored. When the user initiates a call, the unit sends a digital request through a control channel to the site controller. The site controller then assigns the calling radio and all members of the talk group to an available working channel. All operations in **EDACS** configurations are supported from a single-site system to wide-area trunking networks.

For more detailed operating instructions refer to Operator's Manual **AE/LZT 123 1868**.

CONTROLS

The radio features two rotary control knobs and an emergency button mounted on the top of the radio, with side-mounted push-to-talk, monitor/clear and option buttons. The front-mounted keypad has 6 buttons on the **Scan** and 15 buttons on the **System** (refer to Figure 1).

- **Power/Volume Knob**
This knob controls power to the radio (On/Off) and adjusts the Volume level of the speaker.
- **Control Knob**
A 16-position rotary switch can select systems, groups or conventional channels. The knob is fitted with a variable hardware stop for radio customization.
- **Emergency Button**
A recessed red button on the top of the radio initiates an emergency alert to the dispatcher and talk group members.
- **PTT Button**
The weather-sealed Push-To-Talk (PTT) button must be pressed before voice transmission begins. Pressing the PTT button transmits the unit ID. In trunked mode, the ID is transmitted upon depression of the PTT button.
- **Clear/Monitor Button**
In the trunked mode, the weather-sealed Clear/Monitor button is used:
 - 1) to exit the current operation, removing all displays associated with it and return the radio to the selected talk group.
 - 2) to hang-up individual and telephone interconnect calls.

In the conventional mode, the Clear/Monitor button functions are:

- 1) to unsquelch the receiver to allow channel monitoring prior to transmission.
- 2) to remove Channel Guard Decoding from a channel.

- **Option Button**

The weather-sealed option button activates one of a number of programmable software options selected during PC programming. Programmable options include high/low power setting, keypad lock, LCD contrast, LCD and keypad back lighting.

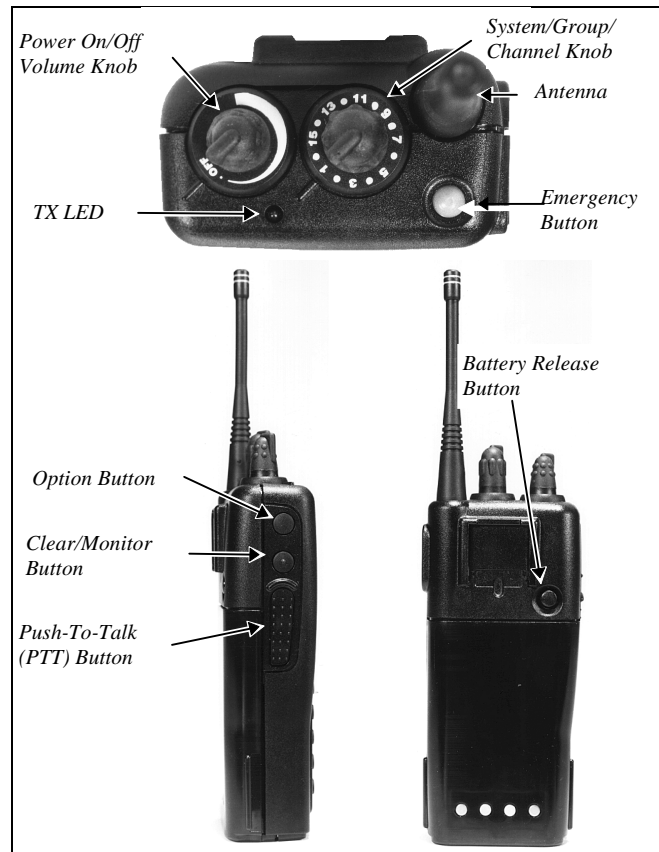


Figure 1 - Controls (Top, Back and Left Panel Views)

KEYPAD SCAN/SYSTEM FUNCTIONS

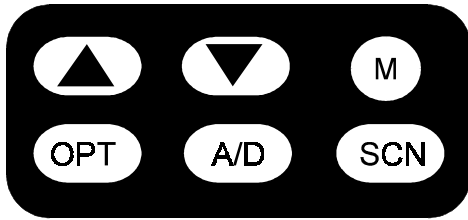


Figure 2 - Scan Keypad

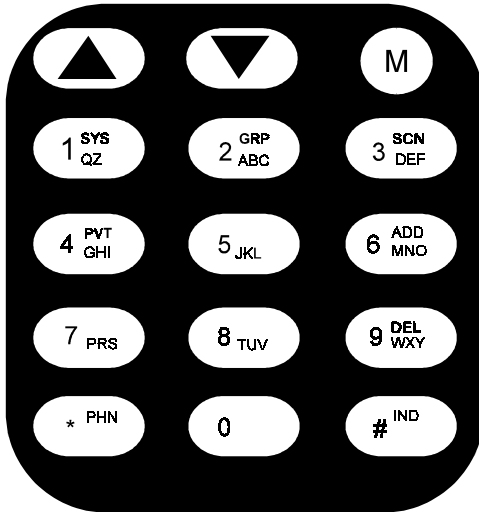


Figure 3 - System Keypad

| Key | Function |
|-----|---|
| ▲ ▼ | <p>Primary Function: Allows user to select either system, groups, or channels, depending on personality programming. The buttons act as STEP UP or STEP DOWN. Pressing one of these buttons displays the next or previous stored system, group or channel.</p> <p>Secondary Function: Changes the selection for an item within a list.</p> |
| M | <p>Primary Function: Accesses the pre-stored menu. The menu can include high/low power setting, keypad lock, LCD contrast, LCD and keypad back lighting.</p> <p>Secondary Function: Activates a selected item within a list. After a menu list is accessed, scroll through the list using the ▲ ▼ keys and then activate specific items with the M key. This is similar to an "Enter" key.</p> |

| Key | Function |
|---|--|
| A/D (Scan only) | Adds/Deletes selected groups or channels from the <i>Scan</i> list of the currently selected system. |
| SCN (Scan only) | Turns the <i>Scan</i> operation On and Off. |
| OPT (Scan only) | Activates one of a number of programmable software options, selected during the PC programming. Programmable options include high/low transmitter power and talk-around. |
| 1^{SYS}_{QZ} (System only) | Used to select a specific system. If the rotary knob is used to select the system and more than 16 systems are programmed in the radio, the 1^{SYS}_{QZ} key is used to select additional banks (groupings) of systems. |
| 1-9, *, 0, # (System only) | These keys are used to place telephone interconnect and individual (unit-to-unit) calls. The keys operate like a normal telephone keypad. |
| 2^{GRP}_{ABC} (System only) | Used to select a specific group. |
| 3^{SCN}_{DEF} (System only) | Used to turn the <i>SCAN</i> operation on and off. |
| *^{PHN} (System only) | Used to place telephone interconnect calls. |
| #^{IND} (System only) | Used to initiate individual calls. |
| 4^{PVT}_{GHI} (System only) | Used to turn private encryption feature on and off. |
| 6^{ADD}_{MNO} (System only) | Adds groups or channels from the <i>Scan</i> list of the currently selected system. |
| 9^{DEL}_{WXY} (System only) | Deletes selected groups or channels from <i>Scan</i> list of the currently selected system. |

CIRCUIT ANALYSIS

The portable radio is unique in the generation of the transmit carrier. The transmit section has an offset frequency loop operating at 134.4 MHz. This means the synthesizer is operating at a frequency that is not harmonically related to the output frequency. This design is intended to prevent frequency “pulling” of the transmitter in the TDMA mode (Prism HP only).

The radio contains five custom integrated circuits as follows:

- **ATTIE** (D601) - Has three major functions: digitizing, voice CODEC and digital to analog conversions.
- **HILLARY** (D701) - Contains the microprocessor, phase digitizer, frequency discriminator and sigma/delta modulator to provide digital modulation.
- **JACQUI** (N150) - Generates the transmit carrier frequency from the main VCO frequency. Generates the transmit offset oscillator frequency and provides modulation through the I/Q inputs.
- **CHERYL** (N203) - The main and auxiliary frequency synthesizers for the main VCO and the 2nd Local Oscillator (LO).
- **DIANE** (N551) - Contains the 2nd mixer and the LO for the 2nd mixer. Contains a limiter circuit which provides a balanced output to HILLARY. Provides the receiver 2nd IF and the Receiver Signal Strength Indicator (RSSI) signal.

The Schematic Diagram for this unit consist of 16 sheets. Component coordinates are provided so the technician can locate different points with ease. For example: A point may be labeled **7-B16**. This means that this point connects to a point shown on sheet 7 with coordinates **B** (read up) and **16** (read right). Borders with vertical and horizontal coordinates are provided to facilitate this capability.

SOFTWARE

Software in the microprocessor handles basic radio controls, interfaces and system protocols. The HILLARY chip and DSP handles all modulation, demodulation and speech processing functions.

Microprocessor software consists of:

- **RAM Bootloader Software** - downloaded by the PC programmer into the radio and executed. This software communicates with the PC using a full network protocol (x3.28). Serial data is transferred through the radio UART for **FLASH** application loading, DSP code

storage and personality storage. This software supports read/write of EEPROM data such as Tracking Data and Feature Encryption. Data compression is used to reduce **FLASH** application loading time.

- **FLASH** Application Software - the main radio controller software. It is divided into the platform and application modules. The platform software provides the hardware level interface, operating system, run-time libraries and software standby (*sleep*) operation. The application software provides all of the user interface trunked signaling, conventional signaling, diagnostics, debugging capability, UDC device support and personality interface.

DSP software includes:

- FM Audio Processing - Transmit
- FM Audio Processing - Receive
- Transmit Waveform Generation
- Transmit Waveform Combinations
- Demodulation/Decoding
- Demodulation/Decoding Combinations

RECEIVER

RX Front End

The 851-869 MHz RF receive frequency is passed from the antenna through a low pass filter/antenna switch to the input of fixed ceramic band pass filter Z400 (Pin 1). The band pass center frequency is 860 MHz and the gain through the filter is typically -1.5 dB. The output of Z400 (Pin 2) is coupled through capacitor C400 and impedance matching inductor L400 to the base of RF amplifier transistor V400.

RF Amplifier (V400)

RF amplifier transistor V400 provides typically +16 dB of gain to the RF signal. The gain of this stage is controlled by feedback voltage from **IF AMP 1** transistor V500 which sets the bias of V400. The emitter voltage of V500 is connected to the collector of V400 through resistors R504 and R401, and filter capacitors C506 and C507. This voltage can be metered at TP400. The bias to the base of V400 is set by resistor R400. RF coil L401 tunes the amplifier load. The output of V400 is coupled through fixed ceramic band pass filter Z401 (Pin 1). The band pass center frequency is 860 MHz and the gain through the filter is typically -1.5 dB. The output of Z401 (Pin 2) is connected to the input of mixer circuit Z402 (Pin 5).

Local Oscillator Buffer (V450)

The injection frequency (940.4-958.4 MHz) from the synthesizer circuit is applied to the base of **Local Oscillator (LO)** NPN buffer transistor V450 through capacitor C450 and inductor L450. This signal at the input of V450 is 0 dBm and is amplified to +4 dBm. This signal can be metered at TP450. The output of V450 is connected to the input of mixer Z402 (Pin 1).

Mixer (Z402)

The LO frequency and the RF signal are mixed to provide an Intermediate Frequency of 89.4 MHz (example: $940.4 \text{ MHz} - 851 \text{ MHz} = 89.4 \text{ MHz}$). This signal on the output of Z450 (Pin 4) is applied to the base of **IF AMP 1** NPN transistor V500 through filter capacitor C505, inductor L500 and coupling capacitor C504.

IF Amp 1 (V500)

IF AMP 1 amplifies the 89.4 IF signal +15 dB. The collector voltage for V500 is from the emitter of **LO BUFFER** amplifier V450 and can be metered at TP500 (3.8 V). The emitter voltage of V500 is used as feed back to control the gain of RF amplifier V400. The output from the collector of V500 is connected through coupling capacitor C502 to the input of band pass Filter Z500 (Pin 4).

IF Filter (Z500)

IF band pass Filter Z500 is a 4-pole crystal filter. The gain of Z500 is -3 dB and the center frequency is 89.4 MHz. The output of Z500 (Pin 6) is coupled to the emitter circuit of **IF AMP 2** through a limiting zener diode circuit consisting of zener diodes V502-1 and V502-2 and coupling capacitor C508.

IF Amp 2 (V501)

The typical emitter voltage of V501 is 0.8 V. The typical base voltage is 1.6V and the typical collector voltage is 3.1 V. These voltage levels produce the proper bias for an input impedance of 250 ohms. This in turn loads the Z500 crystal filter properly. The 89.4 MHz IF output on the collector of V501 connects to the input of a 450 kHz IF chip (N551) located in the rear section of the Prism HP.

Rx Back End

IF Chip (N551)

The IF input (89.4 MHz) to IF Chip N551 is connected through coupling capacitor C550 and inductor L550 to N551 Pin 1, (**RF+**). Internal to N551 (**DIANE**), this input signal is amplified and applied to an input of a second mixer circuit. A second LO synthesizer injection frequency

of 88.95 MHz is internally applied to another input of the mixer circuit. This results in a second IF of 450 kHz ($89.4 \text{ MHz} - 88.95 \text{ MHz} = 450 \text{ kHz}$) on the output of the mixer (N551, Pin 20, Mixer Out). This signal is then routed through a 450 kHz Narrow/Wide ceramic filter to set the channel bandwidth to 25 kHz or 12.5 kHz. The output of the filter is routed to N551, Pin 18, **IF In1**. This input (-3 dB) to N551 is amplified and sent two places. The output (N551, Pin 16, **IF Out 1**) signal goes through capacitor C553 to the input of 450 kHz Ceramic Filter Z550, Pin 2. The output of Z550 on Pin 1 is connected through capacitor C552 to N551, Pin 14, **IF In2**. This input to N551 is further amplified and balanced outputs, **RxIF** and **RxIF_B**, are sent to HILLARY (D701). These two lines, one positive and the other negative, are used to cancel out any noise that might get on the line. These balance outputs are typically +3 dBm and can be metered at test points TP551 and TP552.

The **Receiver Signal Strength Indicator (RSSI)** circuitry internally monitors the RF signal strength. The RF level is represented by a DC voltage level proportional to signal strength. Feedback resistors R554 and R561 set the gain of the RSSI output on Pin 7. This signal becomes the **FAST RSSI** signal going to ATTIE (D601). Feedback resistor R554 connects from the RSSI output on Pin 7 to Pin 8, RSSI Feedback. The RSSI signal can be metered at test point TP550.

2nd Local Oscillator

A 2nd LO circuit internal to N551 generates the 88.9 MHz injection frequency for the mixer circuit. The tank circuit for this oscillator consists of capacitors C556 through C560, variable capacitor V550 and inductor L551. This tank circuit connects to N551, Pin 3 (**OSC Emitter**) and Pin 4 (**OSC Base**). A **LO_VCTRL** control voltage is applied through resistor R555 to V550 to adjust the capacity of the circuit and maintain the integrity of the injection frequency. The **LO_VCTRL** control voltage is a DC level generated in CHERYL and filtered by resistors R225 and R226 and capacitors C217, C218 and C219. This voltage (nominally 2.6 volts) comes from auxiliary synthesizer N204 and goes to the oscillator tank circuit. A +12 dB signal is then returned to a prescaler circuit in the synthesizer. The synthesizer provides a signal to the loop filter which outputs the control voltage.

Narrow/Wide Switch (N553)

The narrow/wide switch/450 kHz filter circuit consists of bilateral switch N553 and 450 kHz band pass filters Z551 and Z552. This arrangement is actually two filters, one for 25 kHz channel width and one for 12.5 kHz channel width (Dual Mode). The filter labeled **450 WIDE** is for the 25 kHz channel mode and the filter labeled **450 NARROW** is

for 12.5 kHz channel mode. The selection of operation is controlled by HILLARY (D701).

Selecting a preprogrammed digital or conventional channel causes an input from D701 to be applied on the base of inverter transistor V551. This places an input on bilateral switch N553 (Pins 12 & 13). If this input is +5 Volts, the **450 NARROW** filter is switched into the circuit and the **450 WIDE** filter is switched out of the circuit. If the input is 0 Volts, the **450 WIDE** filter is switched into the circuit and the **450 NARROW** is switched out. The input to N553 can be metered at test point TP553 (typically 5.4 volts for the 25 kHz channel mode and 0.2 volts for the 12.5 kHz channel mode).

Digital I/O Lines

The balanced **RxIF** and **RxIF_B** (**B** implies “Barred”) indicating that the condition is true when the line is low) lines connect through resistor and capacitor RF decoupling circuits to HILLARY D701. **RxIF** connects through resistors R715 and R714 and capacitor C707 to D701, Pin 8. **RxIF_B** connects through resistors R717 and R718 and capacitor C709 to D701, Pin 7. Both of these lines connect to a Phase Digitizer internal to D701.

Phase Digitizer (D701)

The phase digitizer demodulates the 450 kHz IF to recover the digitized receive audio. The output of the phase demodulator is connected to Rx DSP Interface (Refer to Schematic Diagram, Sheet 13). The Rx DSP Interface output of D701 connects to the DSP module through D701, Pin 69 (**RXSIF_DSPDATA**), Pin 73 (**RXSIF_DSPCLK**) and Pin 74 (**RXIF_DSPSYNC**). DSP interface lines connect to **DSP TDR (TDM DATA RX)**, **DSP TCKDR (TDM CLOCK RX)** and **DSP TRSR (TDM FRAME SYNC TX)** respectively. These lines can be metered on the DSP module at test points TP8 (data), TP15 (clock) and TP14 (sync), respectively.

DSP Module

The Digital Signal Processing (**DSP**) Module does all the Channel Guard filtering, provides squelch, audio mute, 1.5, 3, and 4.5 dB of volume attenuation and changes the digitized audio into an analog signal. The output of the DSP module is on X21-17 (**PCM_DSEAR**). This output can be metered at test point TP3 on the DSP module.

Host Interface

The **PCM_DSPEAR** line connects to D701, Pin 64 and goes to the **PCM/DSP HOST INTERFACE**. The audio output of D701 is on Pin 40 (**PCM_CDCEAR**) and connects to D601, Pin 34 (DPCI).

ATTIE (D601)

This signal (**PCM_CDCEAR**) is then put through a decoder, low pass filter, volume control circuit and an amplifier. The low pass filter, filters out an 8 kHz sample rate. The volume control provides 24 dB in 6 dB steps. The output of D601 is on Pin 22 (**RXAUDIO**). The signal can be metered at test point TP601. At maximum volume there should be 350 mVolts RMS (1.0V_{p-p}) with a 1 kHz tone and 3 kHz deviation.

Operational Amplifier (N300)

This signal (**RXAUD1**) connects through capacitor C611 and resistor R625 to operational amplifier N300, Pin 6 (**-B**). Feedback for the amplifier is through resistor R627. The gain of this amplifier is changed by the **RX_VOL_ATTN** line (D701, Pin 116) to provide a total of 48 dB of volume control attenuation. This is accomplished by the **RX_VOL_ATTN** line going high, causing transistor V604-1 to conduct and connecting 10k ohms resistor R626 across 68k ohms resistor R627 to reduce the gain of N300B. The output of this amplifier is on Pin 7 (**RXAUD2**).

Audio Power Amplifier (N600)

This signal is attenuated through resistor R629 then coupled through coupling capacitor C613 to audio power amplifier N600A, Pin 7 (+IN). This signal is also connected through resistor R628 and coupling capacitor C612 to the Universal Device Connector (**UDC_AUDIO_OUT**). The audio input to N600A can be metered at test point TP602 and at maximum volume should be 250 mV_{p-p}. The input will be 21 mV RMS (60 mV_{p-p}) to produce 500 mWatts output into 16 ohms. Power amplifiers N600A and N600B provide differential outputs on Pin 1 (+OUT) which is **AUDIO_PA_HI** and Pin 3 (+OUT) which is **SPK_LO**. The bridged output of these two lines provides 2.83 V RMS for 500 mWatts output into 16 ohms. The **SPK_LO** line connects through the flex circuit to the low side of the speaker. The **AUDIO_PA_HI** connects through resistor R641 to the other side of the speaker (**SPKR_HI**). Resistor R641 is used to attenuate the speaker audio during duplex operation. Normally MOSFET V602 is turned on, by-passing R641 to get the full volume to the speaker. V602 is controlled by a binary output line from HILLARY labelled **DUPLEX_SPKR_ATTEN**. When this line is at 0 volts, transistor V603 is off and the collector is high which turns on both V602 MOSFETs, by-passing R641. **SPKR_HI** then connects through the flex circuit to the high side of the speaker. Two series MOSFETs are used to prevent forward biasing the characteristic diodes across the MOSFETs with audio when the MOSFETs are OFF.

TRANSMITTER

Transmit Frequency Generation

The main VCO, in the synthesizer circuit, is programmed to generate the 1st **LO** receive injection frequency (940.4 to 959.4 MHz). This carrier frequency is mixed with a transmit offset frequency of 134.4 MHz to generate the carrier and two side band frequencies. The carrier and upper side band are suppressed and only the lower side band is transmitted. For example: the carrier frequency of 940.4 MHz minus the offset frequency of 134.4 MHz is equal to the transmitted lower side band frequency of 806 MHz. On the upper end of the band, the carrier frequency of 959.4 MHz minus the offset frequency of 134.4 MHz is equal to the transmitted lower side band frequency of 824 MHz.

TX/Converter/Modulator (N150)

Transmit Offset

The **PRISM HP/LPE-200** transmit offset frequency is 134.4 Mhz. This frequency is generated by a seven-times-multiplier circuit off the reference oscillator. The output of this VCO is applied to a **Phase-Lock-Loop (PLL)** where it is divided by 7 ($134.4 \div 7 = 19.2$ MHz) and compared to a reference frequency of 19.2 MHz. The 19.2 MHz reference frequency is generated by oscillator module U201 in the synthesizer circuit. A DC phase lock voltage, which is the difference of the two input frequencies, on N150, Pin 9 (**PHSOUT**) is applied to a loop filter. This loop filter consists of capacitors C151, C152 and C155 and resistors R153 and R154. The DC voltage can be metered at test

point TP150 and should be 1-4 volts while transmitting and 0 volts while receiving. The output of the filter connects to the tank circuit through resistors R155 and R160. The tank circuit for the VCO and consists of capacitors, C160, C161, and two variable capacitors in V180 and inductor L154. The loop filter and the tank circuit are tuned to 7×19.2 MHz or 134.4 MHz. The tank circuit connects across N150, Pins 6 (**TANK_1**) and 7 (**TANK_2**). The DC voltage applied to the loop filter changes the capacitance of the variable capacitors within V180 of the tank circuit to maintain the VCO output of 134.4 MHz.

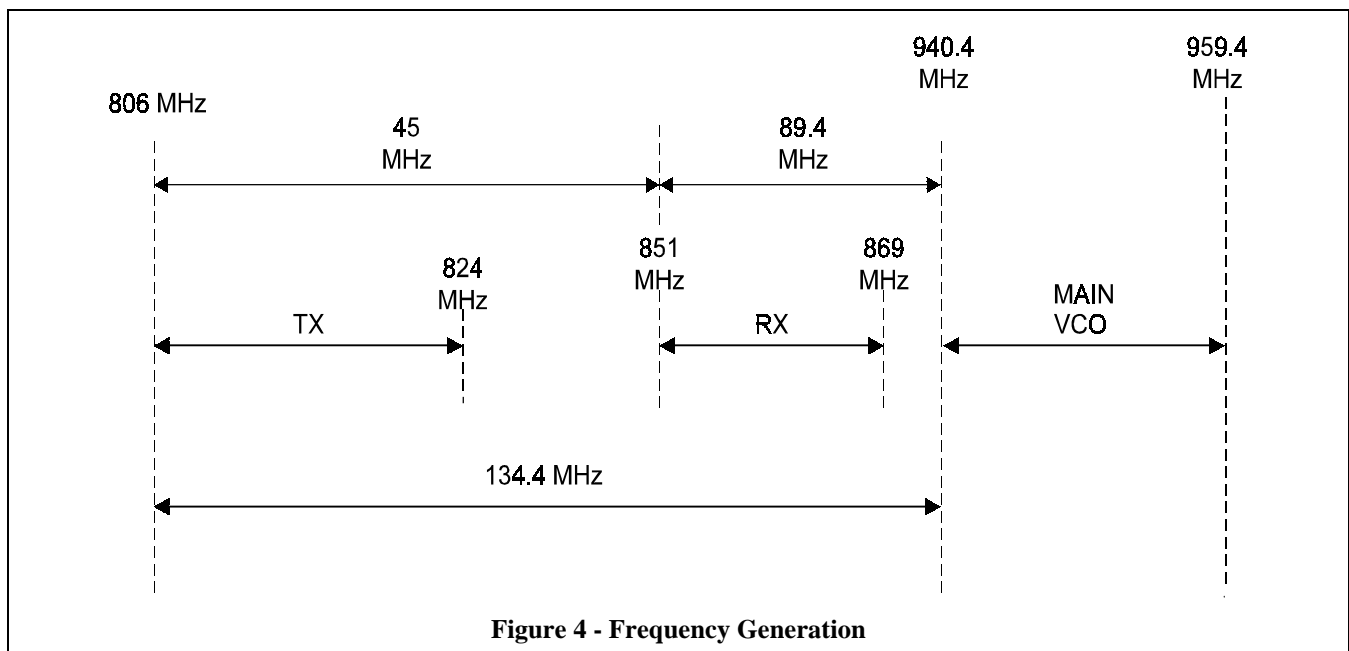
When the transmitter is keyed, transistor V152 conducts to increase the bandwidth for PLL acquisition.

Single Side Band Mixer

The main VCO frequency is amplified then passed through a 90-degrees phase shifting network to the SSB mixer. The 134.4 MHz offset frequency is also amplified and passed through a 90-degree phasing network to the SSB mixer. These two signals are summed together to produce the carrier frequency, an upper side band and a lower side band. The carrier and upper side band are suppressed by 40 dB. The lower side band passes at full amplitude. There are two outputs of the lower side band from the SSB, each 90-degrees out of phase. Each signal is connected to another mixer circuit where it is summed with the transmit modulation from HILLARY. Resistor R159 sets the gain for phase detection.

Low Pass Filters

There are two modulating inputs from HILLARY, one is the **I** input (**MODI** and **MODI_B**) and one is the **Q** input



(**MODQ** and **MODQ_B**). The **I** input passes through a low pass filter consisting of capacitors C191, C192 and C193, resistor R166 and inductors L156 and L157. The output of this filter connects to N150, Pins 43 (**I**) and 42 (**I_bar**). The **Q** input passes through a low pass filter consisting of capacitors C194, C195 and C196, resistor R167 and inductor L158 and L159. The output of this low pass filter connects to N150, Pins 41 (**Q**) and 40 (**Q_bar**). The **I** and **Q** inputs are summed with the lower side band then the outputs of these mixer circuits are summed to produce the lower side band with transmit modulation. This signal is amplified and connected through N150, Pin 34 (**DUAL TX**) to the input of a transmit band pass filter.

Transmit Band Pass Filter

The **TX_RF** signal (0 dBm) connects through coupling capacitor C125 to the input of a TX Band Pass Filter. Filtering of the **TX_RF** line is provided by capacitor C126. The TX Band Pass Filter is tuned to the transmit carrier frequency by applying control voltage **RX_TX_TUNE**. **RX_TX TUNE** comes from ATTIE D601 (DAC02). This control voltage ranges typically from 1 to 4 volts and can be metered at test point TP100. This control voltage is applied through resistors R101 and R102 to the cathodes of variable capacitors V105 and V106 respectively. This application varies the capacitance of V105 and V106, to tune the filter to the lower side band of the transmit carrier frequency. The actual carrier frequency and the upper sideband are attenuated. The lower sideband output of the band pass filter (-8 dB) connects through coupling capacitors C121 and C139 to the base of buffer amplifier transistor V104. Filtering is provided by capacitor C120.

Buffer Amplifier (V104)

When transmitting the collector voltage for transistor V104 is provided through PIN diode V101 and is controlled by DPTT. The collector voltage is typically 4.1Vdc. The base voltage of V104 is typically 1.9 Volts and the emitter voltage is typically 1.2 Volts. The emitter voltage can be metered at test point TP101. The RF output from the collector (+3 dBm) connects through coupling capacitor C116 and resistor R105 to power amplifier N101, Pin 1 (Pin/Vc).

Power Amplifier (N101)

Power amplifier N101 is a three stage Class C operated RF power amplifier module designed to operate over the frequency range of 806-870 MHz (see Figure 5).

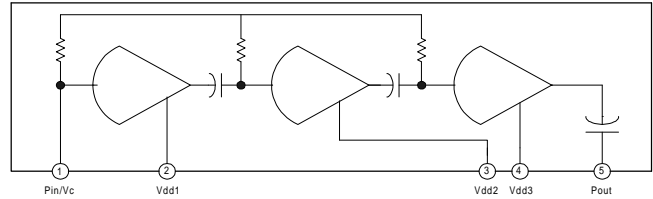


Figure 5 - Power Amplifier

B+ (7.2 Vdc) connects to N101 through RF chokes L114-1, L114-2 and L114-3. Additional RF filtering of the B+ line is provided by capacitors C132 through C137. This voltage is applied to N101, Pin 2 (Vdd1), Pin 3 (Vdd2) and Pin 4 (Vdd3). Vdd1, 2 and 3 refers to drain voltages 1, 2 and 3 shown above. The RF input from the buffer amplifier circuit and the power control voltage from Power Control Buffer N102-A is applied to N101, Pin 1 (Pin/Vc). The + 3 dB on the input of N101 is amplified to 3 watts on the output. This output can be regulated by the power control circuit to as low as 0.1 watts by means of the DC level at Pin 1. The output on N101, Pin 5 (+) connects through inductor L106 and filter capacitor C115 to Directional Coupler W100, Pin 4 (PORT 2).

Directional Coupler (W100)

The RF output connected to W100, Pin 4 (PORT 2) connects directly through W100 to Pin 1 (PORT 1) where it is output to the antenna circuit. The connection between Pin 9 (PORT 3) and Pin 6 (PORT 4) is part of the sensing circuit (See Figure 4).

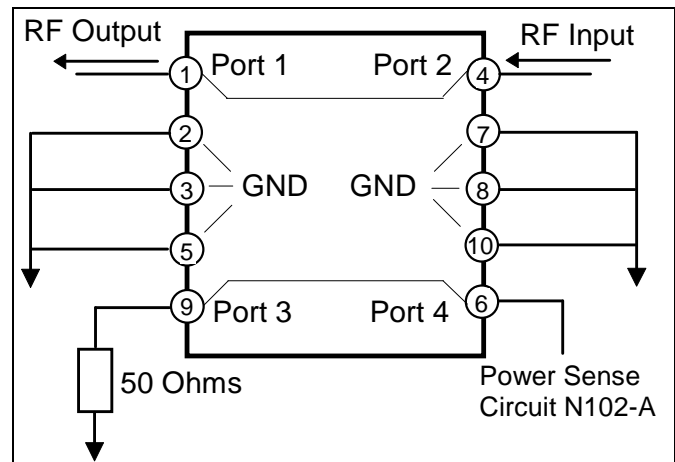


Figure 6 - Directional Coupler

Power Sensor Circuit (N102-A)

The power sensor circuit consist of part of W100, comparator amplifier N102-A and associated circuitry in between. A regulated 5.5 volts (**VTX**) from transmit regulator N190 is applied to N102-A, Pin 8, (V+). This voltage forward biases Schottky diodes V103-1 and V103-2. When forward biased diode V103-1 has 0.3 volts on the

anode, a reference voltage of 0.15 volts is on N102-A, Pin 3 (+IN). Forward biasing V103-2 causes a current to flow through directional coupler W100, Pins 6 and 9 (PORT 3 and PORT 4). This circuit provides temperature compensation for power detection. A voltage directly proportional to the RF power output is applied to N102-A, Pin 2 (-IN). This is due to the rectification of the coupled RF energy into V103-2. A negative DC voltage is developed at the anode of V103-2 proportional to the coupled RF power. This negative DC voltage results in a positive DC voltage at the output of N102-A. This output is the **TX_PWR_SENSE** line and can be metered at test point TP102. At 3 watts output this voltage is typically between 2.8 Vdc and 3.2 Vdc. This line connects to ATTIE, Pin 52 (D601) through decoupling circuit resistors R602 and R603 and capacitor C601. ATTIE converts this DC level to a digital word which is fed to the microprocessor in HILLARY. This word is compared to the value in Tracking Data which represents 3 watts of output power. A word is then generated and fed back to ATTIE. ATTIE generates a **TX_POWER_CONTROL** DC signal on Pin 62 (DAC01). This signal connects through a decoupling circuit consisting of resistors R614 and R615 and capacitor C605 to a voltage divider consisting of resistors R116 and R117. The output of the divider circuit connects to power control buffer amplifier N102-B, Pin 5 (+IN). The output of N102-B drives Pin 1 of the power amplifier.

Power Control Buffer (N102-B)

A regulated 5.5 Vdc is applied to power control buffer N102-B, Pin 8 (V+). The buffer circuit is a shaping circuit which provides a control voltage on Pin 7 (+OUT). This voltage after passing through resistor R120 is typically 2.5 Vdc to 3.0 Vdc at 3 watt output and can be metered at test point TP103. This control voltage connects through filter capacitor C138, RF choke L113 and resistor R105 to power amplifier N101, Pin 1 (Pin/Vc). This voltage regulates the power output of N101. The output of the PA is increased or decreased by the DC level applied to N102, Pin 1. The feedback loop is stable when the output power level produces a detected level equal to the level prestored as a tracking value equal to 3 watts.

Transmit Low-Pass Filter/Antenna Switch

When the transmit circuit is keyed (Push-To-Talk switch pressed), **SW_B+** (7.0 Vdc) is applied through RF choke L105 to PIN diode V100. With 7.0 volt applied, V100 and PIN diode V101 are forward biased. The RF signal is then allowed to pass through the low-pass filter to the antenna. The 6.2 volts on the cathode of V100 connects through inductor L103 to the anode of PIN diode V101. Capacitor C108, L103 and C109 make a parallel resonant circuit which prevents RF from flowing into the RX port.

The voltage on the cathode of V101 (5.3 Vdc) connects through inductor L104, capacitor C112, resistor R100, capacitor C113 and inductor L107 to the collector of buffer amplifier V104 (See **Buffer Amplifier (V104)**).

Transmit Modulation

The microphone input is through capacitor C300 and resistor R301 to operational amplifier N300, Pin 2 (-A) (Refer to *Schematic Diagram sheet 10*). The output of N300 is on Pin 1 (**Out A**). This output is connected to ATTIE D601, Pin 19 (**AUX**). This audio signal is amplified, limited, passed through a low pass filter and an encoder circuit where the analog signal is digitized. The digitized output of the encoder connects through D601, Pin 35 (**DPCO**) to HILLARY D701, Pin 41 (**PCM_CDCMIC**) where it is connected to a **PCM** interface. The output of the interface connects through D701, Pin 68 to the DSP module through X11-18 (See *Schematic Diagram, Sheet 13*). The actual connection to the DSP board is at X21-18 (**PMC_DSPMIC**). The transmit digitized audio can be metered at test point TP6 on the DSP board. This signal is then connected to D1, Pin 63 (**DR**). The audio is filtered and connected through D1, Pin 133 (**TDX**) to X21-13 (**TXSIF_DSPDATA**). This signal can be metered at test point TP4. This connection then connects through X11-13 to HILLARY D701, Pin 77 where it goes through a **TX DSP INTERFACE**. The output of the interface applies the digitized audio to the input of a sigma/delta modulator or DAC. In the sigma/delta modulator a sample of the audio is taken at a 19.2 MHz rate. This generates a pulse that the width varies with the audio. The outputs of the DAC are through D701, Pin 15 (**MODI**), Pin 14 (**MODI_B**), Pin 16 (**MODQ**) and Pin 17 (**MODQ_B**). The pulse rate of each of these outputs is 9.6 MHz or one-half of the 19.2 MHz clock rate. These outputs are connected through low pass filters to the inputs of JACQUI N150 where modulation takes place. The output of the low pass filters is a true analog signal consisting of complex wave forms and a pulse of 800 mV Peak-Peak.

SYNTHESIZER

Dual Synthesizers (N203)

There are two synthesizers in the synthesizer circuit. One is the main synthesizer which generates the 1st LO frequency (940.4 to 959.4 MHz). The other synthesizer circuit is the auxiliary synthesizer which generates the 2nd LO frequency (88.95 MHz). These synthesizer circuits are programmed by **STROBE 1**, **CLOCK** and **DATA**. These programming inputs also go to JACQUI. The only difference is that JACQUI uses **STROBE 2**. This is so that when strobed, the programming information gets written to

the proper device. The main synthesizer can be programmed in 12.5 kHz steps. These inputs can be metered at TP205 (**CLOCK**), TP206 (**DATA**) and TP207 (**STROBE 1**).

Bilateral Switch (N201)

Bilateral Switch N201 selects the loop filter required for programming the main VCO in 12.5 kHz steps. A +5 Volt signal (**LOOP_SEL**) from HILLARY connects to N201, Pin 5 (**2_C_{Control}**) causing N201 to switch in the required resistor-capacitor combinations. The selected loop connects to the VCO at U200, Pin 2 (**Vcont**).

Main Voltage Controlled Oscillator (U200)

A signal from HILLARY (**VCO_BAND_1**) turns transistor V201 on or off to select the band over which the VCO will operate. The collector output of V201 connects to U200, Pin 10 (**SW**). The output of U200 on Pin 8 (**Output**) connects through buffer transistor V200 to the **RX_LO** through coupling capacitor C208. The **TX_LO** is taken from the voltage divider consisting of resistors R203 and R205. The feedback for the synthesizer circuit is taken from the voltage divider consisting of resistors R202 and R204 and can be metered at test point TP202. The level of this signal is typically 25 mV RMS. This feedback signal connects through coupling capacitor C207 to N203, Pin 5 (**INM1**). The voltage level at this point is typically 4.5 V.

Main Synthesizer (N203)

In synthesizer N203 the feedback signal from the VCO is input to a prescaler where it is divided down to produce a 19.2 MHz signal. This signal is compared with the 19.2 MHz reference frequency generated by reference oscillator U201. When these two signals are equal, a lock voltage is connected through N203, Pin 13 (**PHI**) or Pin 14 (**PHP**) to the selected loop filter, locking the circuit to the output frequency.

Auxiliary Synthesizer (N203)

The VCO in DIANE oscillates at the 2nd LO frequency of 88.95 MHz. A +12 dB (100 mV RMS) feedback signal is returned to N203, Pin 10 (**INA**). This signal can be metered at test point TP208. A prescaler circuit divides this signal down to 19.2 MHz. This signal is compared to the 19.2 MHz reference frequency generated by U201. When these two signals are equal, a lock voltage is connected through N203, Pin 11 (**PHA**) to DIANE through a filter circuit consisting of resistors R225 and R226 and capacitors C217 through C219. This voltage can be metered at test point TP209 and is typically 1-4 volts. This lock voltage locks the 2nd LO on frequency.

Reference Oscillator (U201)

Reference Oscillator U201 provides a reference frequency of 19.2 MHz at 1.5 PPM for the Phase-Lock-Loop circuit in the JACQUI module (the main synthesizer for the receiver 1st LO, HILLARY and ATTIE). The output level of this module is +16 dBm and can be metered at test point TP204. The output of U201, Pin 3 (**Output**) connects through a band-pass filter consisting of capacitor C235, inductor L202 and capacitor C236. This output then connects to the JACQUI circuit through the **REF_OSC** line and to Frequency Synthesizer N203, Pin 8 (**INR**) through coupling capacitor C223. The voltage level on Pin 8 is typically 330 mV. A buffered output from JACQUI on Pin 19, drives the clock input of HILLARY and ATTIE. An Automatic Frequency Control (**AFC**) line from ATTIE (**DAC03**) provides a control voltage ranging typically from 0.5 volts to 4.5 volts to maintain oscillator integrity. This DC level adjusts the reference oscillator frequency and is set by tracking data. Filtering of this line is provided by capacitors C222 and C234. Supply voltage for U201 is supplied by synthesizer regulator N290 through the **VSYN** line. This voltage connects through resistor R218 to U201, Pin 4 (**Vcc**) and is filtered by capacitors C220 and C221.

DC POWER DISTRIBUTION

Battery voltage (7.2 Volts) connects to battery connector X101, the positive terminal (**BATT +**) Pin 1 and the negative terminal (**BATT -**) Pin 3. Fuse F190 and diode V190 provide short circuit and reverse polarity protection. If the battery terminals were connected incorrectly (positive to negative and negative to positive), V190 would conduct and fuse F190 would blow.

Synthesizer Regulator (N290)

Battery voltage connects through a decoupling circuit consisting of inductor L290 and capacitor C290 to voltage regulator N290, Pin 6 (**Vin**). A **PWR_ENABLE_B** line, originating from Power Switch V905, connects to N290, Pin 1 (**Cntrl**). When the Cntrl input is low, N290 is enabled and a regulated 5.5 Volts is on N290, Pin 4 (**Vout**). Filtering for this line is provided by capacitor C291. This voltage can be metered at test point TP290 and becomes the **VSYN** line going to the synthesizer circuit.

Receiver Regulator (N490)

Battery voltage connects through a decoupling circuit consisting of inductor L490 and capacitor C490 to receiver voltage regulator N490, Pin 6 (**Vin**). A **RX_ON** signal, generated by D701, connects through enabling switch transistor V490 to N490, Pin 1 (**Cntrl**). Resistor R290 connected to the base of transistor V490 is the pull-up

resistor for **RX_ON**. Regulator N490 is normally enabled. When **RX_ON** goes high, V490 conducts and N490 is enabled. The control voltage can be metered at test point TP490. With N490 enabled a regulated 5.5 Volts is on N490, Pin 4 (**Vout**). This voltage can be metered at TP491. Capacitor C491 provides line filtering. This voltage becomes the **VREC** line going to the receive circuit to enable the LO buffer, IF Amp 1, IF Amp 2, IF chip and the bilateral switch in the 450 kHz Narrow/Wide filter circuit.

Transmit Regulator (N190)

Battery voltage connects through a decoupling circuit consisting of inductor L190 and capacitor C198 to transmit voltage regulator N190, Pin 6 (Vin). The **PWR_ENABLE_B** line connects to Pin 1 (**Cntrl**) to enable the regulator. When the **Cntrl** is low, the regulator is enabled. When enabled, a regulated 5.5 Volts is on Pin 4 (Vout). This voltage can be monitored at test point TP190. Filtering for this Voltage Transmit (**VTX**) line is provided by capacitor C199. The **VTX** line connects to power control circuit N102-A, power control buffer N102-B, transistor switch V153 and TX/Converter/Modulation circuit N150 (JACQUI).

Tx Switch (V192)

The Tx Switch consists of transistor V192. Transistor V192 is normally off (receive). When the Delayed Push-To-Talk (DPTT) line goes high (transmitter keyed), transistor V192 conducts and the base of B+ Switch PNP transistor V191 goes low.

B+ Switch (V191)

B+ Switch transistor V191 supplies 7.0 volts to the directional coupler in the antenna circuit. When the base of this PNP transistor goes low, 7.0 volts is on the collector and can be metered at test point TP191. This voltage goes to directional coupler W100, Pin 1 (PORT 1). The B+ Switch circuit and the TX Switch circuit are tagged **BUFFER** on the Block Diagram (Sheet 1 of the Schematic Diagram).

Analog Regulator (N900)

Battery voltage connects directly to analog regulator N900, Pin 8 (**Input**). Capacitor C900 provides filtering at this point. To enable N900, Pin 3 (EN) must be grounded. This is accomplished by grounding one end of resistor R912 when the power switch is turned on. The voltage divider relationship between pull-up resistor R909 and resistor R910 is enough to produce a ground which will enable N900. This signal is typically < 0.6 Volts when the radio is on and > 2.0 volts when the radio is off and can be metered at test point TP904. The ground at R912 can be metered at test

point TP907 and is 0 Vdc when the power switch is on and 7.5 Vdc when the power switch is off. When enabled, the output on N900, Pin 1 is a regulated +5 Volts. This voltage can be metered at test point TP901. Filtering is provided by capacitor C901. The output of N900 becomes the **+5V_A** line. The **+5V_A** connects to the base of transistor V905, causing V905 to conduct. Transistor V905 conducting causes the collector (**PWR_ENABLE_B**) to go low and enable the RF regulators. The **+5V_A** also goes to the emitter of PNP transistor V906. This caused V906 to conduct placing an active high on the Shut Down (**SHDN**) input of +5V_D switching regulator N902. The **+5V_A** also goes to the TX/RX audio circuits in ATTIE (D601).

+5V-D Switching Regulator (N902)

B+ is connected to N902, Pins 1, 15 and 16 (**U+**). When an active high is on N902, Pin 2 (**SHDN**), N902 turns on and produces **+5V_D** on the output to power all digital circuits.

Processor Reset

+5V_D is connected through resistor R901 to open collector output N900, Pin 5 (**ERROR**). Timing is provided by pull-up resistor R901 and capacitor C905. The ERROR voltage can be metered at test point TP903. This voltage is normally + 5 Volts or 0 Vdc on reset. This voltage also connects back to N902, Pin 7 (SS) Soft-Start. When capacitor C905 charges up, the output of buffer gate D900 goes high. This high on D701, Pin 1 (**RESPOW_B**) starts the processor.

Power Switch Turned Off

Due to software programming, when the power switch is switched off, the power to all circuits may not be immediately turned off. For example, the processor may need to transmit log off messages before that happens. When the radio is turned on and the processor is started, a **PWR_LATCH** signal (2.6 Volts) is applied to the base of transistor V903 turning it on. The collector of V903 goes low and the enable line to N900 is latched in a low state, holding N900 on. N900 can be held on indefinitely if programmed to do so. A **PWR_SW_SENSE** line monitors the condition of the power switch so the processor knows when to start the power down program. When the power switch is on, diode V904, Pin 3 is low. The **+5V_A** through resistor R911 forward biases V904 and holds the **PWR_SW_SENSE** line low. When the power switch is turned off, the diode is no longer forward biased. Pull-up resistor R911 now pulls the **PWR_SW_SENSE** line high to indicate to the processor that the power switch has been turned off.

Low Battery Power Down

The battery voltage is monitored with A/D input to ATTIE. To protect the battery against deep discharge conditions a **LOW_BATT_PWR_OFF** line is provided to shut the radio down until a fresh battery is attached. When the battery voltage falls below 5.6 Volts, diode V900 is forward biased conducting through V902. When the **LOW_BATT_PWR_OFF** line is switched high, V901 and V902 latch on forcing enable pin N900-3 high, which results in shutting the radio off.

LCD NEGATIVE BIAS GENERATOR

A 96 kHz, 5V p-p square wave from HILLARY D701-57 is rectified and inverted to a negative supply voltage by C922, V909 and C923. This negative voltage is controlled to the LCD by V910 to vary the display contrast. Thermistor R604 is monitored via the A/D input to ATTIE. As the temperature varies, the bias is varied using 4 binary output lines from HILLARY:

- **LCD_BIAS 0**
- **LCD_BIAS 1**
- **LCD_BIAS 2**
- **LCD_BIAS 3**

SERVICE

Due to the state of the art manufacturing processes and the complexity of the circuits designed into the radio, field test and repair to the hardware is very limited. It is not practical to service the main circuit board in this radio to component level. Technicians servicing this radio should be concerned with isolating the problem to hardware or software. Software errors or problems are usually corrected by reloading the personality, flash, etc.

NOTE

It is recommended that all hardware repairs to the main circuit board be done at Ericsson Inc. in Lynchburg, VA.

On occasion it may become necessary to perform certain hardware repairs in the field. Therefore, Service Parts will provide replacement parts for the following hardware items:

- Flex Assembly
- Loudspeaker
- Battery Connector
- PA Module
- DSP Module
- Main PCB Assembly
- Keypad
- Vol/Grp Switch Module
- Rx RF Filter (Z400)
- Rx RF Filter (Z401)
- Fuse

Keeping in mind the service philosophy for this product, it is not the intent of this service section to provide detailed instructions for testing and troubleshooting the portable radio. This section will provide the following:

- Programming instructions (Personality, Flash and Equipment Setup)
- Basic Troubleshooting (determine if problem is hardware or software)
- Error Codes
- Dissassembly

EQUIPMENT REQUIRED

| Equipment Description | Part Number |
|--|----------------------------------|
| 1. EDACS-3 Programming Software | <i>TQ-3374</i> |
| 2. Programming Interface Module With Power Supply (19B800850P2) | <i>TQ-3370 (19D438367G2)</i> |
| 3. Programming Cable | <i>TQ-3368 (19B801971P3)</i> |
| 4. RS-232 Cable | <i>19B235027P1</i> |
| 5. Test Box | <i>TQ-0609A</i> |
| 6. Test Cable | <i>19B801971P6</i> |
| 7. Radio Test Set | <i>customer supplied</i> |
| 8. IBM PC/XT/AT/286/386/486 or any true compatible with MS-DOS version 3.3 or later. | <i>customer supplied</i> |

PROGRAMMING

Personality Programming

The EDACS-3 PC Programmer (TQ-3374) Version **13** or later is used to edit, read or write the personality to the radio. A *personality* is simply a computer file generated (created) by the user of the EDACS-3 program. The computer file (or personality) is downloaded into the radio and contains data that will direct certain operating characteristics of the radio unit.

The EDACS-3 PC Programming software communicates with the radio through the TQ-3370 programming box (item 2 in the equipment list). Figure 7 provides a diagram of the Equipment Setup required to PC Program the radio. Refer to the PC Programming manual (TQ-3374) for detailed software operating instructions.

The CONV-1 PC Programmer (TQ-3367) Version **12** or later is used to program conventional only radios.

Flash Programming

The “FLASH” software is the current version of the Prism HP radio operating software. When changes and enhancements are made to the operating code, the new operating code can be “FLASHED” to the radio, upgrading the operating code without any hardware changes to the radio. Flash software is simply a computer file which is read from a disk and downloaded to the radio using the EDACS-3 PC Programmer. The Equipment Setup shown in Figure 7 is same as for Personality Programming. Refer to the PC Programming manual (TQ-3374) for detailed software operating instructions.

Programming Mode

The EDACS-3 PC Programmer cannot communicate with the radio unless the radio is in the Programming Mode. To place the radio in Programming Mode:

1. Initially the radio should be OFF.
2. Press and hold the **PTT**, **Monitor** and **Clear** buttons.

3. Power the radio ON. Release the buttons.
4. All pixels on the display should be lit until communication with the PC begins.

BASIC TROUBLESHOOTING

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

This section includes a General Troubleshooting Table and Test Point Diagram for checking Nominal Transmit/Receive Levels (not recommended). Start by following Table 1 - General Troubleshooting and then use the remaining reference material as needed.

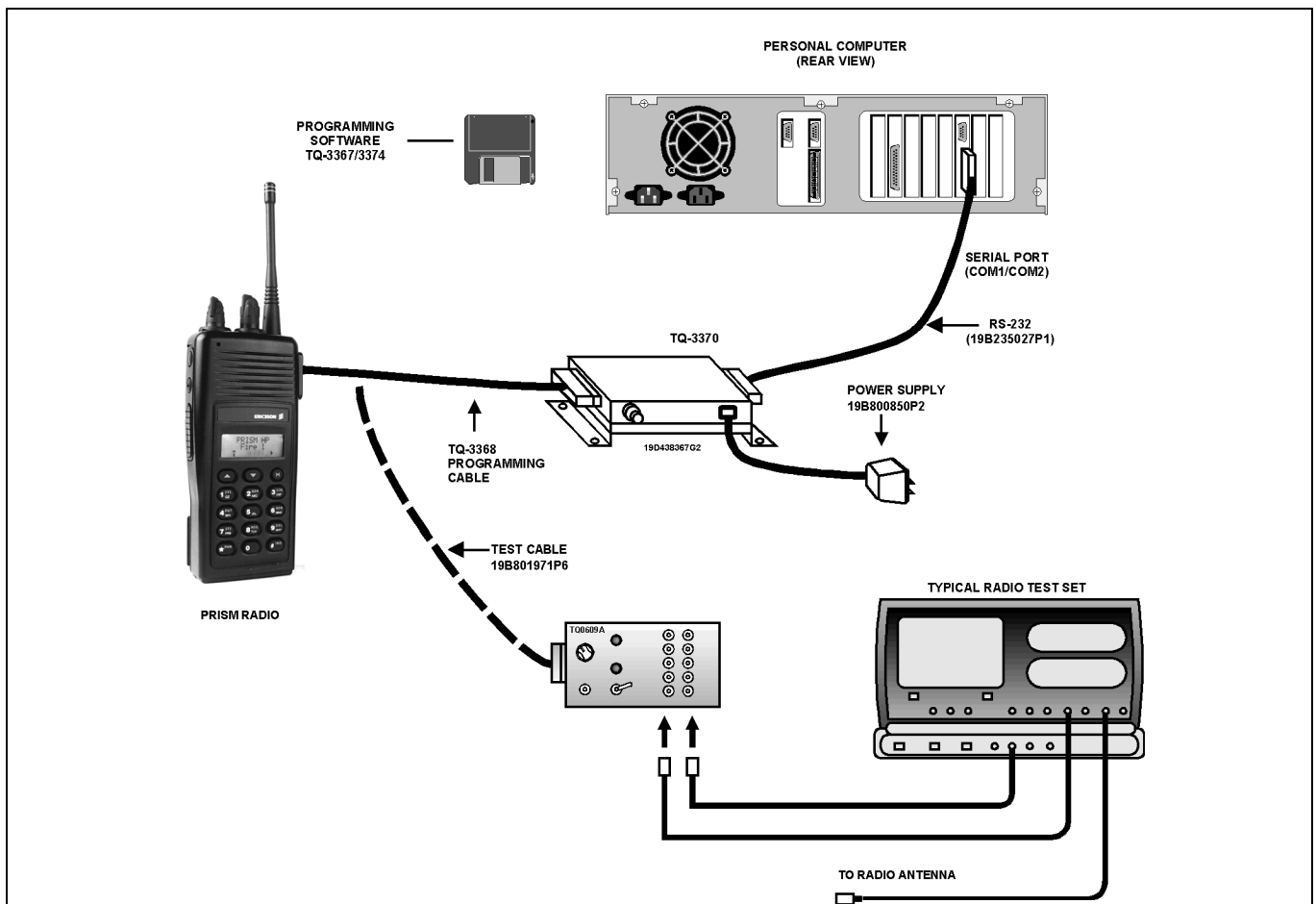


Figure 7 - Programming And Test Equipment Setup

Table 1 - General Troubleshooting

| Symptom | Possible Cause/Action Required |
|---|--|
| <i>Completely Inoperative (no display or audio on power up)</i> | <p>Power Supply Problem?</p> <ol style="list-style-type: none"> 1. Check battery voltage with a voltmeter. 2. Charge battery or replace battery. 3. Check to be sure battery contacts are not broke or bent. 4. Clean battery contacts. 5. Check Fuse (F190). |
| <i>At power -up an error message is displayed.</i> | <ol style="list-style-type: none"> 1. See the Error Message Tables in the following pages for type of error and for a probable solution. 2. Always attempt to reprogram the personality and flash using the EDACS-3 PC Programmer. |
| <i>Receiver inoperative or weak.</i> | <ol style="list-style-type: none"> 1. Channel Guard or Type 99 Enabled? 2. Defective antenna/ or antenna switch assembly - replace antenna/ or antenna switch assembly. 3. Main Board failure? <ul style="list-style-type: none"> • Return to Lynchburg Depot for repair (recommended) <p>or</p> <ul style="list-style-type: none"> • Troubleshoot Main Board using the test point diagrams in Figure 8. Replace or repair board as required. |
| <i>Transmitter inoperative or low power</i> | <ol style="list-style-type: none"> 1. Programmed Incorrectly - check personality. 2. Weak battery - check voltage 3. Defective antenna/ or antenna switch assembly - replace antenna/ or antenna switch assembly. 4. PA Module failure - replace PA Module. 5. Main Board failure? <ul style="list-style-type: none"> • Return to Lynchburg Depot for repair (recommended) <p>or</p> <ul style="list-style-type: none"> • Troubleshoot Main Board using the test point diagrams in Figure 8. Replace or repair board as required. |
| <i>Transmitter and Receiver Inoperative on some channels</i> | <ol style="list-style-type: none"> 1. Programmed Incorrectly - check personality. 2. Main Board failure? <ul style="list-style-type: none"> • Return to Lynchburg Depot for repair (recommended) <p>or</p> <ul style="list-style-type: none"> • Troubleshoot Main Board using the test point diagrams in Figure 8. Replace or repair board as required. |

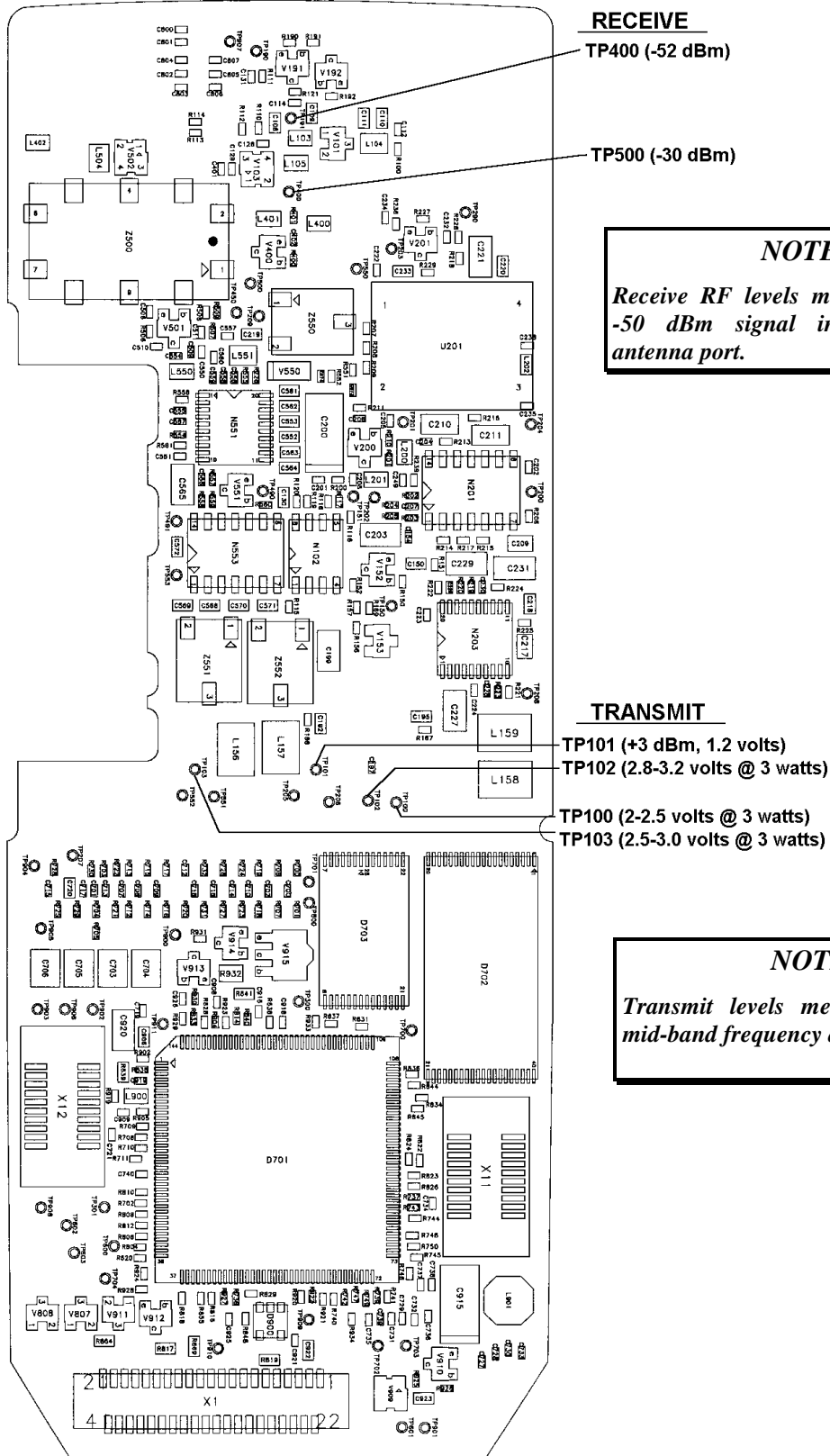


Figure 8 - Transmit Path - Test Points and Levels

ERROR CODES INTRODUCTION

This section lists all the radio errors and warnings. The radio displays errors and warnings to the user to indicate problems that have occurred. Radio errors can occur at any time from power up to power down. Each error code in the list includes an explanation of what went wrong and what action to take to correct the problem.

Error codes are divided into three categories:

- Fatal operational error codes. These errors will cause the radio to reset.
- Non-fatal operational error codes. These errors will not cause the radio to reset.
- Radio programming error codes. These errors are displayed on the radio or the programming PC display during radio programming.

ERROR CODE OVERVIEW

Error Code Format

The errors are displayed on the radio display as follows:

message
ERR=xxxx

Where: xxxx is the error code and message is one of the messages listed below.

Fatal Errors

Fatal errors will cause the radio to display the error message and error code and then reset to its starting operation. The reset condition will remain until the fatal error is corrected.

| Fatal Errors | |
|---------------|---------------------------|
| Error message | Description |
| HARDWARE | BIOS errors. |
| SOFTWARE | General software failure. |
| FREQDATA | Frequency data error. |
| PERSDATA | Personality errors. |
| NETWORK | Network errors. |

An example of a personality error is shown below:

```

  █ █ P E R S D A T A █ █
  █ █ E R R = 0 5 0 0 █ █
  █ █ █ █ █ █ █ █ █ █ █ █

```

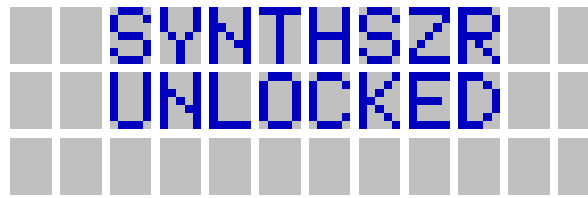
Non-Fatal Errors

Non-fatal errors are displayed for a short period (about two seconds) then normal radio operation will resume.

| Non-Fatal Errors | |
|-------------------------|---|
| Error message | Description |
| UNKNOWN | Undocumented error. |
| FEAT ERR | Feature encryption error. |
| DSP ERR | DSP error. |
| NO KBANK | Attempt to keyload w/o bank storage. |
| NO PVT | Attempt to keyload w/o private DSP file loaded. |

Special Error Codes

When the synthesizer becomes unlocked on any frequency (RX or TX), the radio will display a message and sound an alert tone. The message will be displayed for approximately 2 seconds and the alert tone will continuously beep on and off. During this time, the radio is trying to reload the synthesizer to get a lock condition. If the lock condition is achieved, the unlock indications will cease. If the lock condition can not be achieved, the user will not be able to RX or TX on that frequency. The message displayed on the radio is shown below:



ERROR CODES - SPECIFIC

Hardware Fatal System Errors

Hardware fatal errors will automatically reset the radio. When the radio reset does not correct the problem, the radio must be serviced.

| Error Name | Message | Code | Description |
|-------------------|----------------|-------------|--|
| FATAL_SYS_TRAP | HARDWARE | 0 | Fatal system error trap number. |
| FATAL_NMI_ERROR | HARDWARE | 1 | NMI occurred outside of sleep. |
| FATAL_RAM_ERROR | HARDWARE | 2 | 8k RAM test error. |
| FATAL_FLSH_CHKSUM | HARDWARE | 4 | Flash checksum test error. |
| FATAL_TG_LOAD | HARDWARE | 10 | TG driver failed initialization. |
| FATAL_DSP_LOAD | HARDWARE | 11 | DSP driver failed initialization. |
| FATAL_ABBIE_LOAD | HARDWARE | 12 | ABBIE driver failed initialization. |
| FATAL_EE_LOAD | HARDWARE | 13 | EEPROM driver failed initialization. |
| FATAL_INTOUT_LOAD | HARDWARE | 15 | Standard input/output driver failed initialization. |
| FATAL_INTIN_LOAD | HARDWARE | 16 | Standard input driver failed initialization. |
| FATAL_RADIO_LOAD | HARDWARE | 17 | RADIO driver failed initialization. |
| FATAL_MODEM_LOAD | HARDWARE | 18 | MODEM driver failed initialization. |
| FATAL_EXTIO_LOAD | HARDWARE | 19 | External I/O driver failed initialization. |
| FATAL_SCI_LOAD | HARDWARE | 20 | Serial communication interface driver failed initialization. |
| FATAL_I2C_NOSI | HARDWARE | 22 | I2C failed to return SI status. |

| | | | |
|----------------------|----------|----|--|
| FATAL_LCD_NOACK | HARDWARE | 40 | LCD did not ack message. |
| FATAL_LCD_HARD_FAIL | HARDWARE | 41 | LCD hardware is invalid. |
| FATAL_SCI_NOHEAP | HARDWARE | 50 | Serial communication interface out of heap (RAM memory) space. |
| FATAL_DSP_NOACK | HARDWARE | 60 | DSP did not ack message. |
| FATAL_DSP_FIFOVR | HARDWARE | 61 | DSP RX FIFO overflow. |
| FATAL_DSP_BADMSG | HARDWARE | 62 | Unknown message received from DSP. |
| FATAL_DSP_WRONGRESP | HARDWARE | 63 | Unexpected response received from DSP. |
| FATAL_DSP_TWOACKS | HARDWARE | 64 | Back-to-back ACKS received from DSP. |
| FATAL_DSP_NORESOURCE | HARDWARE | 65 | DSP queue is full. |
| FATAL_BL_NOHEAP | HARDWARE | 91 | Software memory error - Boot loader. |
| FATAL_BL_SCI_ATTACH | HARDWARE | 92 | Boot loader could not attach to SCI. |
| FATAL_RXSIF | HARDWARE | 98 | Phase samples are not changing. |

Operational Software Fatal System Errors

Software fatal errors will automatically reset the radio. When the radio reset does not correct the problem, the radio must be serviced. Some of the errors listed below contain additional information to help resolve the problem.

| Error Name | Message | Code | Description |
|----------------------------|----------------|-------------|---|
| RADC_PITD_ERROR | TRACKING | 200 | Personality tracking data error. Reprogram the tracking data. |
| RADC_PIHW_ERROR | PERSDATA | 201 | Personality hardware data error. Reprogram the personality. |
| RADC_FREQ_ERROR | FREQDATA | 202 | Personality frequency data error. Reprogram the personality. |
| RADC_PITD_MALLOC_ERROR | SOFTWARE | 203 | Personality tracking data malloc error. Reprogram the tracking data. |
| RADC_PITD_CKSUM_ERROR | SOFTWARE | 204 | Personality tracking data checksum error. Reprogram the tracking data. |
| DACS_MODEM_FATAL_ERROR | SOFTWARE | 301 | Unable to correctly configure the modem for EDACS operation. Reprogram the personality. |
| DACS_RADC_FAILURE | SOFTWARE | 302 | Power cycle the radio. |
| DACS_TU_PUT_CISYSMSG_ERROR | SOFTWARE | 303 | CI message buffer is not enabled. |
| CONV_RADC_ERROR | SOFTWARE | 400 | Error calling RADC function. Power cycle the radio. |
| CONV_PUT_UIMSG_ERROR | SOFTWARE | 402 | UI message buffer not enabled. Power cycle the radio. |
| CONV_MODEM_RXOVR | SOFTWARE | 403 | Conventional DIGV modem overflow. |
| CONV_MODEM_RXAVR | SOFTWARE | 404 | Conventional DIGV modem underflow. |
| CONV_MODEM_FATAL_ERROR | SOFTWARE | 405 | Unable to correctly configure the modem for conventional DIGV operation |
| CONV_PERS_ERROR | PERSDATA | 407 | Conventional personality error. |
| PI_NOPERS_ERROR | PERSDATA | 500 | Personality data is not present. Program the personality. |
| PI_CRC_ERROR | PERSDATA | 501 | Flash personality CRC did not match EEPROM. Reprogram the personality. |
| PI_DESC_CRC_ERROR | PERSDATA | 502 | Crucial personality data has incorrect CRC. Reprogram the personality. |

| | | | |
|-------------------------------|----------|-----|--|
| PI_MALLOC_ERROR | SOFTWARE | 503 | Could not allocate memory to store crucial personality data. |
| UI_FATAL_DEVICE_ERROR | PERSDATA | 600 | Input/output device error. |
| UI_FATAL_SWTO_MALLOC_ERROR | SOFTWARE | 601 | Software memory error. |
| UI_FATAL_SWTO_MAX_ERROR | SOFTWARE | 602 | Software error, power cycle the radio. |
| UI_FATAL_WINDOW_MAX_ERROR | SOFTWARE | 603 | Too many open windows. |
| UI_FATAL_WINDOW_MALLOC_ERROR | SOFTWARE | 604 | Software memory error. |
| UI_FATAL_MESSAGE_INVPARM | SOFTWARE | 605 | Invalid parameter to ui_put_message(). Software error, report how error was encountered. |
| UI_FATAL_RI_MSGBUF_FULL | SOFTWARE | 606 | UI Task message buffer full error. Software error, report how error was encountered. |
| UI_FATAL_RISYS_MSGBUF_FULL | SOFTWARE | 607 | Radio Interface System (EDACS/CONV) task message buffer full. |
| UI_FATAL_CI_MSGBUF_FULL | SOFTWARE | 608 | CI Task message buffer full. |
| UI_FATAL_DEVICE_NOTSUPPORTED | PERSDATA | 609 | I/O device type (from personality) not supported. |
| UI_FATAL_AUXIO_MALLOC_ERROR | SOFTWARE | 610 | Software memory error. |
| UI_FATAL_NET_DEVICE_ERROR | PERSDATA | 611 | Network I/O device error. |
| UI_FATAL_NO_TONE_DATA | PERSDATA | 613 | No tone data is available in personality. |
| UI_FATAL_UIIO_MSGBUF_FULL | SOFTWARE | 614 | UI I/O BBOS message buffer full. |
| UI_FATAL_PROMOTE_MALLOC_ERROR | SOFTWARE | 615 | No memory available. |
| UI_FATAL_REMAP_MALLOC_ERROR | SOFTWARE | 616 | No memory available. |
| TU_FATAL_RXBUF_MALLOC_ERROR | SOFTWARE | 701 | No memory available. |
| TU_FATAL_TXBUF_MALLOC_ERROR | SOFTWARE | 702 | No memory available. |
| TU_FATAL_PUT_UIMSG_ERROR | SOFTWARE | 703 | BB message to UI task failed. |
| TU_FATAL_PUT_RISYSMSG_ERROR | SOFTWARE | 704 | BB message to RISYS task failed. |
| TU_FATAL_FASTPUT_TXMSG_ERROR | SOFTWARE | 705 | BIOS call for Voter Monitor failed. |
| AEGIS_RXBUF_MALLOC_ERROR | SOFTWARE | 802 | No memory available. |
| AEGIS_KEYLOAD_MALLOC_ERROR | SOFTWARE | 803 | No Keyloader table memory available. |
| AEGIS_KEYLOAD_ERROR | SOFTWARE | 804 | General keyload error has occurred. |
| AEGIS_DATAMEM_MALLOC_ERROR | SOFTWARE | 805 | No memory is allocated for data. |
| AEGIS_KEYLOAD_NOTABLE | SOFTWARE | 806 | No key table was found in EEPROM. |
| AEGIS_KEYLOAD_BAD_TABLESIZE | SOFTWARE | 807 | Key table found in EEPROM is wrong size. |
| AEGIS_KEYLOAD_CORRUPT_TABLE | SOFTWARE | 808 | Key table has been corrupted in EEPROM. |

Operational Software Non-Fatal System Errors

Software non-fatal errors will be displayed for a short duration and then the radio will try to resume normal operation. If the error persist, the radio will continue to display the appropriate message everytime the error occurs. Some of the errors listed below contain additional information to help solve the problem.

| Error Name | Message | Code | Description |
|-----------------------|----------|------|--|
| PIFEAT_SNR_ERROR | FEAT ERR | 550 | Feature encryption - Cannot read radio ROM serial number. |
| PIFEAT_READ_ERROR | FEAT ERR | 551 | Personality feature encryption read failure or data not available. |
| PIFEAT_CRC_ERROR | FEAT ERR | 552 | decryption failure. Personality feature encryption CRC failure. |
| RI_DSPDOWN_NOATTEMPT | DSP ERR | 850 | DSP not found. |
| RI_DSPDOWN_NOTFOUND | DSP ERR | 851 | DSP file not found. |
| RI_DSPDOWN_CRCFAIL | DSP ERR | 852 | DSP file is corrupted. |
| RI_DSPDOWN_ENCERR | DSP ERR | 853 | Radio feature encryption does not match DSP file. |
| RI_DSPDOWN_PMFFAIL | DSP ERR | 854 | DSP file is corrupted or hardware failure. Reprogram radio or power cycle the radio. |
| RI_DSPDOWN_DMFAIL | DSP ERR | 855 | DSP file is corrupted or hardware failure. Reprogram radio or power cycle the radio. |
| RI_DSPDOWN_BIOSERR | DSP ERR | 856 | Hardware failure. |
| AEGIS_KEYLOAD_NOBANKS | NO KBANK | 860 | Attempt to keyload radio w/o bank storage. |
| AEGIS_PVT_NONE | NO PVT | 870 | Attempt to keyload radio w/o private DSP file. |

Radio Programming Errors

Programming errors are divided into three categories.

Protocol Errors Produced By The Low Level Communication Routines

| Message | Code | Description |
|---|------|--|
| Successful | 0 | Command was performed successfully. |
| Protocol- Canceled by receiver | 5 | x328 protocol received a cancel, The radio detected a cancel command. |
| Protocol- Canceled by sender | 6 | x328 protocol transmitted cancel. The radio is canceling the read command. |
| Protocol- Terminate transmission | 7 | x328 protocol received an end of transmission. |
| Protocol- Transmit error | 8 | x328 protocol could not transmit. Reliable communication can not be established. It could be radio or PC hardware problems (programming cable, interface box or radio hardware). |
| Protocol- Protocol initialization error | 9 | x328 protocol not initialized or failed to initialize. |

Radio Errors That Are Returned From The Bootloader Software

| Message | Code | Description |
|-------------------------------------|------|--|
| Radio- Programmed successfully | 10 | Radio responded with a success. Radio acknowledged successful programming. |
| Radio- Comport configuration failed | 11 | Radio could not configure its comport (hardware failure). |
| Radio- Flash erase failed | 12 | Radio failed to erase the flash memory. The radio flash memory part is unusable or it can not detect the 12 volts power, Check the programming box and cables. |
| Radio- Flash write failed | 13 | Radio failed in writing to the flash memory. Retry the programming process (hardware failure). |
| Radio- Flash code CRC did not match | 14 | Flash code not programmed correctly, CRC did not match, the operating software will not execute. Re-program the radio. |

| | | |
|-------------------------------------|----|--|
| Radio- Canceled by receiver | 15 | The radio operating software received a cancel command. |
| Radio- Canceled by sender | 16 | |
| Radio- End of transmission received | 17 | The radio software received or sent an end of transmission. |
| Radio- Transmit error | 18 | Radio could not transmit the required data. Check all hardware connections and try programming again. |
| Radio- Invalid command | 19 | Radio did not understand the received command. |
| Radio- No application code | 20 | No application code is loaded, radio can not accept personality commands. Reprogram the operating software (flash code) and reprogram personality. |
| Radio- Application code error | 21 | The radio application code failed to perform the command. |
| Radio- EEPROM programming error | 22 | Could not program the radio EEPROM part. |
| Radio- Baud rate has changed | 23 | The radio acknowledged a successful baud communication baud rate change. |

PC Errors Produced By The PC Programming Software

| Message | Code | Description |
|--|------|--|
| PC- Cannot allocate memory | 50 | The PC programming software could not allocate adequate memory space to perform the function. |
| PC- Cannot open data file | 51 | The specified file (code or personality) could not be opened (file does not exist or has access protection). |
| PC- Cannot read data file | 52 | The specified file (code or personality) could not be read. |
| PC- Cannot write to file | 53 | The specified file (code or personality) could not be written. |
| PC- File not found | 54 | The specified file (code or personality) is not found in the current directory. |
| PC- File is larger than radio memory | 55 | The radio flash part size is unknown or the operating software file size is larger than the radio's flash memory size. |
| PC- Incorrect Tracking data RF band split | 57 | Incorrect tracking data RF band split. |
| PC- Incorrect Tracking data version | 58 | Incorrect tracking data version. |
| PC- Tracking data check sum error | 59 | Tracking data check sum error. |
| PC- Time-out, radio not responding | 60 | Radio not connected or not turned on or the selected PC comport number is invalid. |
| PC- Comport configuration error | 61 | Comport configuration error, can not set comport. |
| PC- Abort, message canceled | 62 | Aborted by operator, message canceled. |
| PC- Requested personality data does not exist. | 63 | The personality table does not exist (tracking or encryption table). |

DISASSEMBLY PROCEDURE

To disassemble the Prism radio:

Figure 9

1. Remove the battery pack by pushing the battery release button and sliding the battery pack straight back until it stops, then lift the battery pack out. When replacing the battery pack align the ribs on the sides of the battery pack with the slots in the sides of the radio. Push down and slide the battery pack into place.

NOTE

If the radio is equipped with a belt clip it may be necessary to lift up on the clip when replacing battery pack

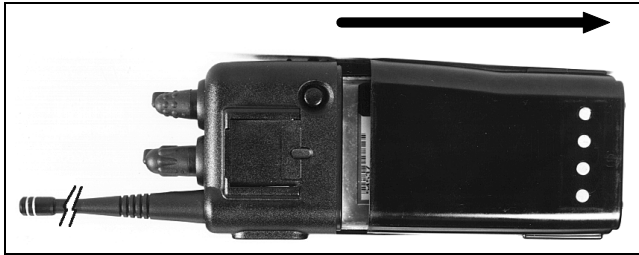


Figure 9 - Removing the Battery Pack

Figure 10

2. Remove the control knobs and stop washer.
3. Using a T7x50 TORX® driver, remove the screws at (A).
4. Insert a small flat head screwdriver between the plastic front cover and the metal frame at location (B). Gently pry each side of the plastic front cover out while prying the metal frame up to release the plastic snaps securing the metal frame to the front cover.

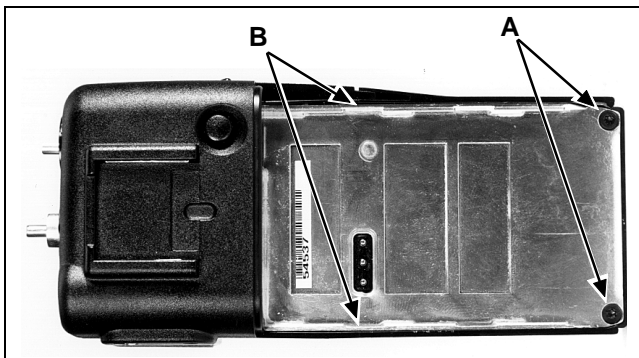


Figure 10 - Removing Front Cover

Figure 11

5. Once the plastic snaps have been released, separate the metal frame from the front cover. First lift up on the bottom of the metal frame and then slide and lift the metal frame down and away from the front cover.

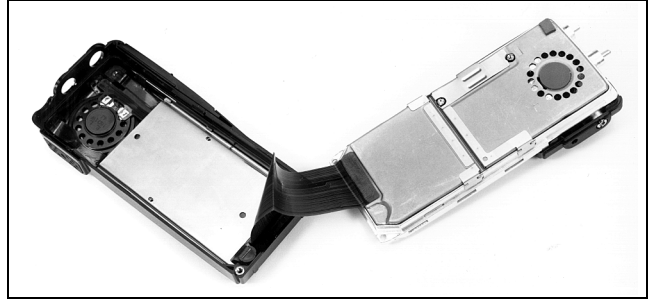


Figure 11 - Metal Frame Separated From The Front Cover

Figure 12

6. Carefully unplug the flex circuit at the bottom of the radio (C).
7. Remove gasket. **Note:** when replacing the gasket watch for bulging sections.
8. Using a flat head screw driver, remove the PA nuts at (D).
9. Pry clips loose from both sides of the metal frame at (E).

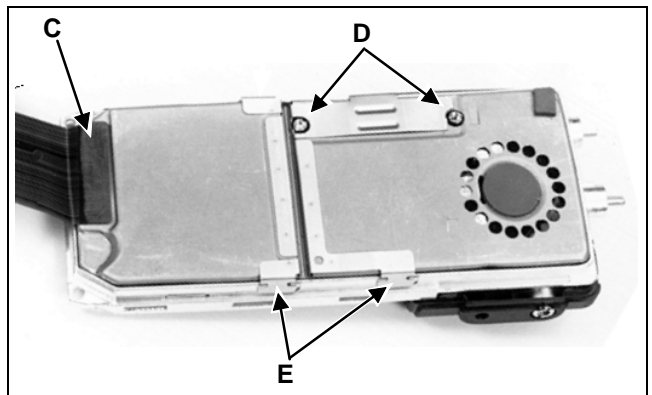


Figure 12 - Remove Flex Circuit, PA Nuts And Side Clips

Figure 13

10. Using a flat blade screwdriver, push on the battery contacts. Be careful not to damage the gasket. Applying pressure on the battery contacts will slowly separate the main circuit board and shield from the metal frame.

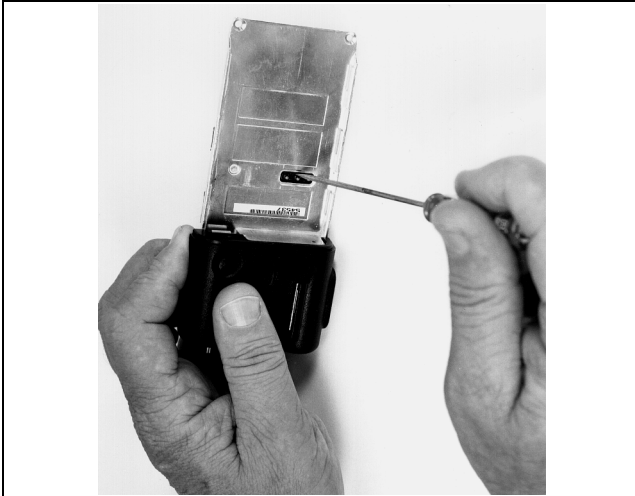


Figure 13 - Push Battery Contacts

Figure 14

11. Carefully unplug the small flex at the top of the radio (F).

NOTE

This connector is **not** keyed. When replacing be careful to plug back properly.

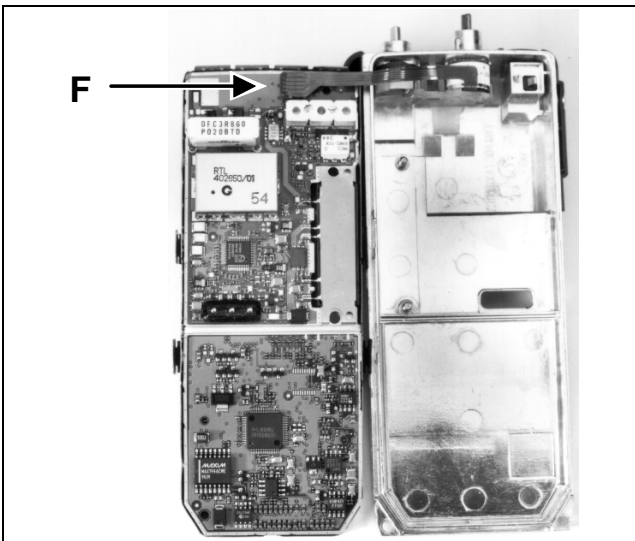


Figure 14 - Board/Shield Separated From Metal Frame

Figure 15

12. Remove the board from the shield by prying up on a corner and working around the board to release the snaps.

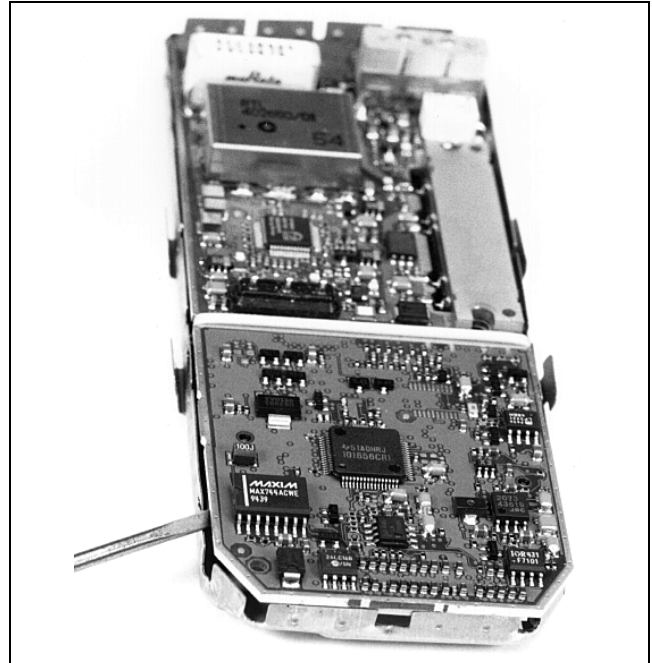


Figure 15 - Separating Board From Shield

Figure 16

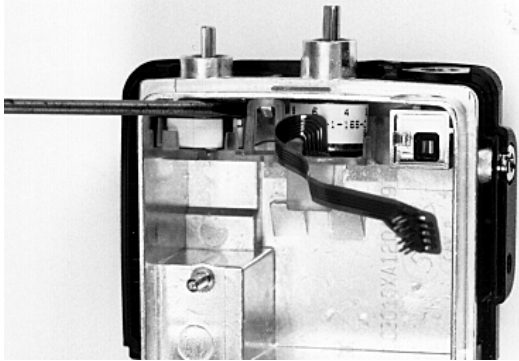
13. To remove the switch assembly use a small flat blade screw driver and pry up on the bottom latch.



Figure 16 - Removing the Switch Assembly
(Pry up on bottom latch)

Figure 17

14. Pry up on the hook to release from the latch and push down on the switches to remove the assembly from the housing.



**Figure 17 - Removing Switch Assembly
(Pry up on the latch)**

Figure 18

15. To remove the Antenna Switch Assembly the switch assembly must be removed first.
16. Unscrew the RF nut. Remove the switch being careful not to lose the washer.



Figure 18 - Removing the Antenna Switch

PA Module Replacement

Remove the PA Module by unsoldering the five (5) leads attached to the Main Board (see the Outline Diagram). Solder new module in same location.

Filters Z400 And Z401 Replacement

Filter Z400 has four (4) leads that go all the way through the board and are soldered on the reverse side of the board. Unsolder the four leads to remove Z400.

Filter Z401 also has four leads. But Z401 is surface mounted on the same side of the board. Unsolder the leads to remove Z401.

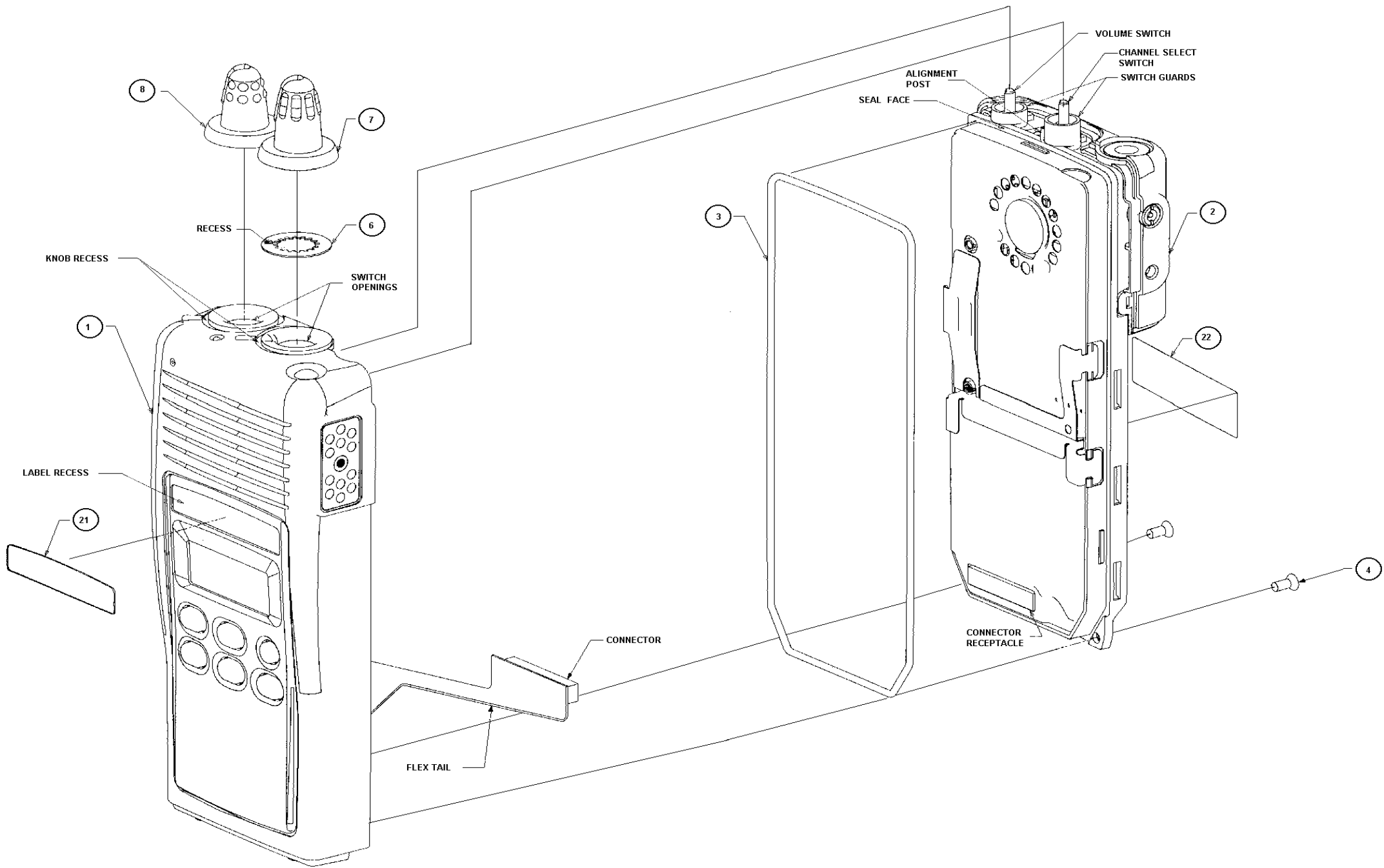
REASSEMBLY

Reassemble the radio by reversing the instructions (steps 1-16) provided in the **Dissassembly Section**.

Prism Radio
800 MHz

| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|------------------|------------------------------------|
| 1 | SXK 107 3807 | Front Assembly (Scan) |
| 1 | SXK 107 3807/2 | Front Assembly (LPE-200 Scan) |
| 1 | SXK 107 3808 | Front Assembly (System) |
| 1 | SXK 107 3808/2 | Front Assembly (LPE-200 System) |
| 2 | SXK 107 3814 | Rear Assembly (807.5 - 824 MHz TX) |
| 2 | SXK 107 3814/2 | Rear Assembly (806 - 824 MHz TX) |
| | | MARRIAGE HARDWARE KIT |
| 3 | SXA 120 4145 | Main Gasket |
| 4 | SXA 124 025/0080 | Screw (2) |
| 6 | SXA 120 4118 | Washer Stop. Knob |
| 7 | SXA 120 4117 | Channel Knob |
| 8 | SXA 120 4116 | Vol Knob |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.



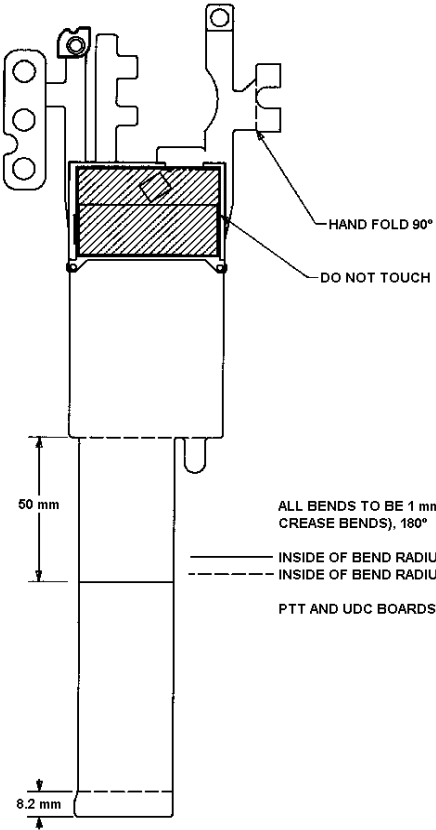
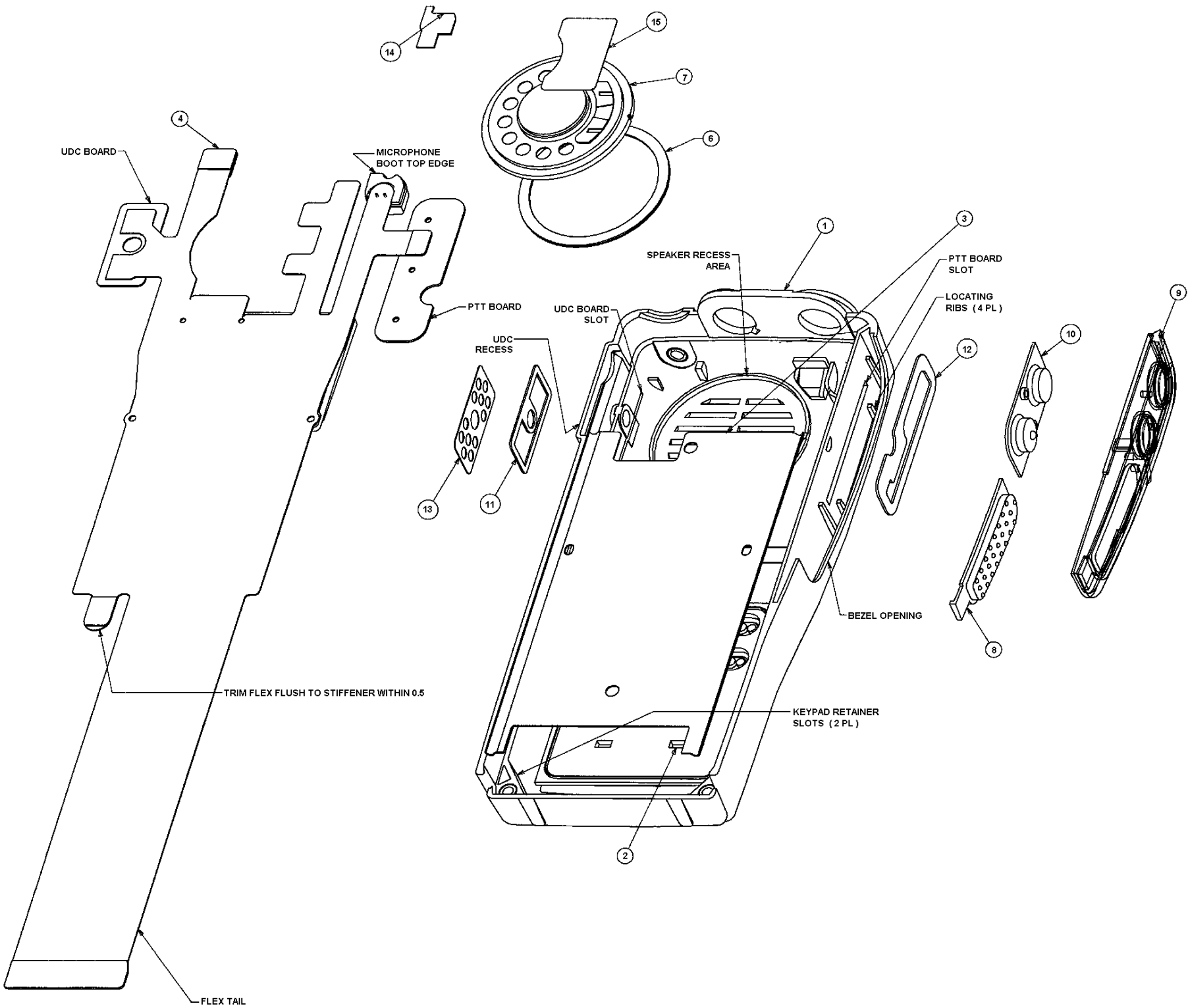
Radio, 800 MHz

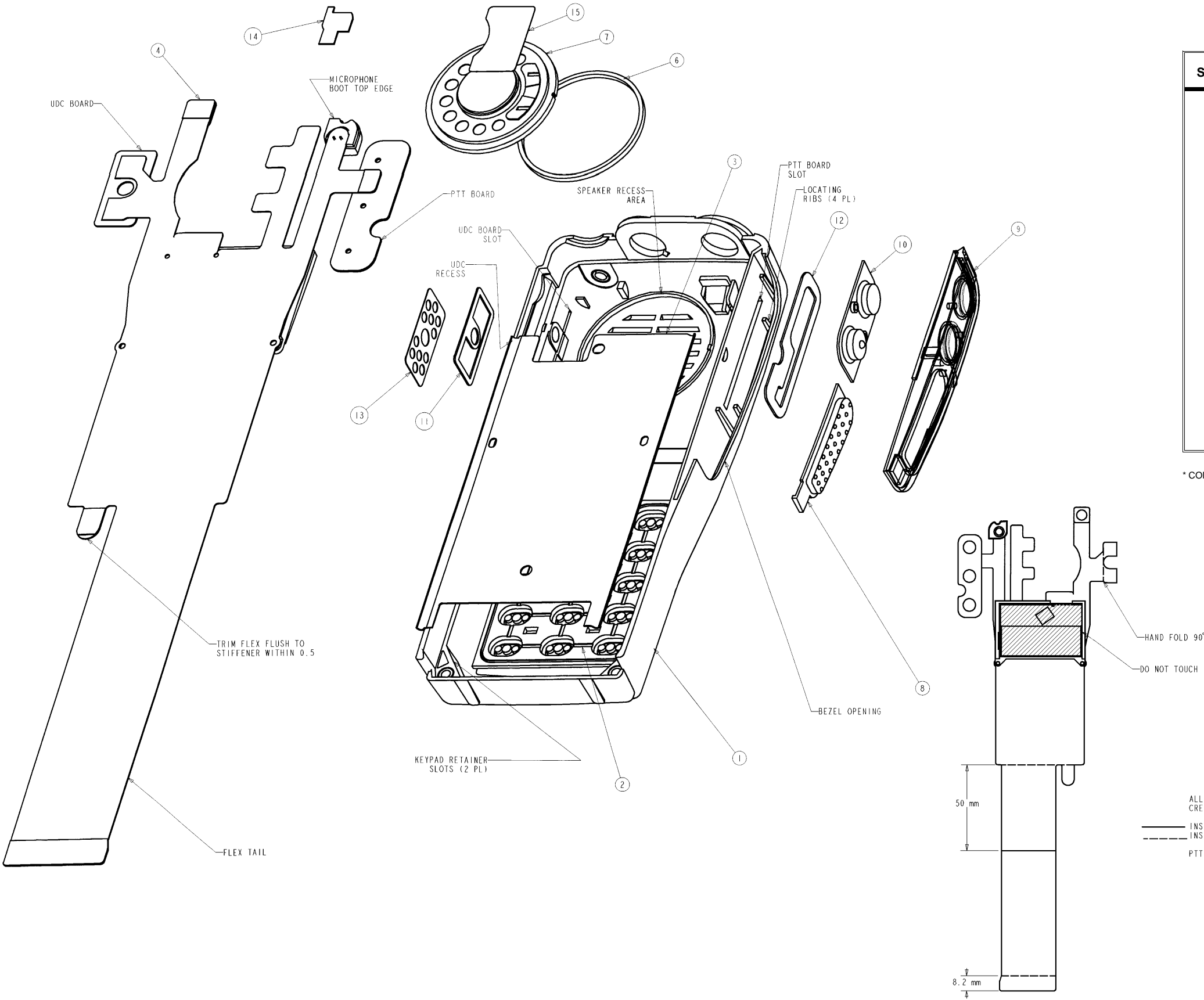
(151 88-KRD 103 103/A1 Uen, Rev. A)

Front Assembly (Scan)
SXX 107 3807

| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|-----------------|--------------------------|
| 1 | | Front Cover |
| 2 | SXA 120 4112 | Keypad Scan |
| 2 | SXA 120 4112/02 | Keypad Scan (LPE-200) |
| 3 | SXA 120 4122 | Keypad Retainer |
| 4 | ROA 117 2216 | Flex Assembly/Printed Bd |
| 6 | SXA 120 4119 | Speaker Gasket |
| 7 | RLE 906 18/2 | Loudspeaker |
| 8 | SXA 120 4121 | PTT Actuator |
| 9 | SXA 120 4120 | Side Control Bezel |
| 10 | SXA 120 4136 | Side Control Keypad |
| 11 | SXA 120 4128 | Gasket: UDC PWB |
| 12 | SXA 120 4129 | Gasket: PTT |
| 13 | SVF 930 1252 | UDC Label |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.





Front Assembly (System)
SXK 107 3808

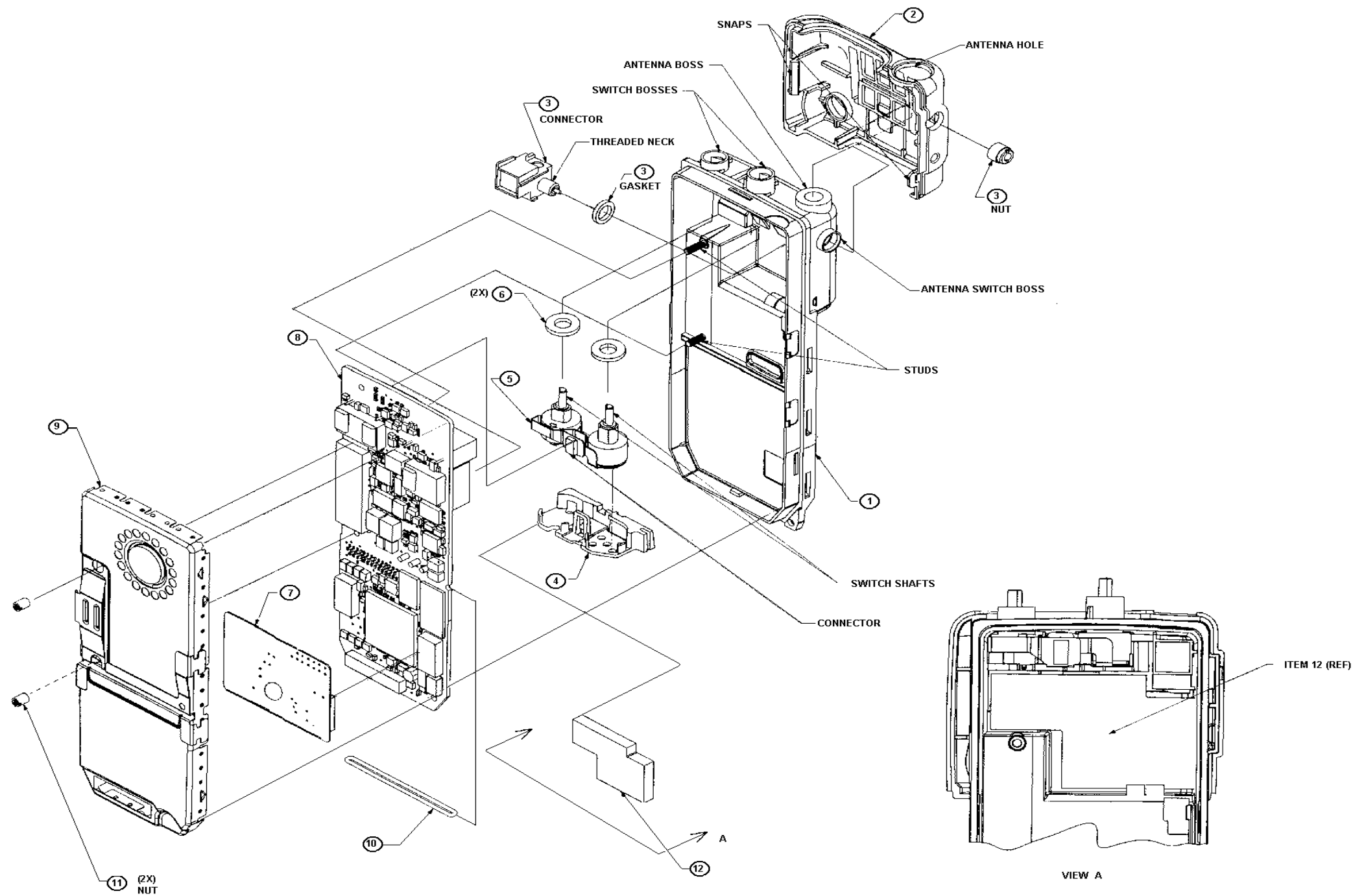
| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|-----------------|--------------------------|
| 1 | | Front Housing |
| 2 | SXA 120 4115 | Keypad (System) |
| 2 | SXA 120 4115/02 | Keypad System (LPE-200) |
| 3 | SXA 120 4122 | Keypad Retainer |
| 4 | ROA 117 2216 | Flex Assembly/Printed Bd |
| 6 | SXA 120 4119 | Speaker Gasket |
| 7 | RLE 906 18/2 | Loudspeaker |
| 8 | SXA 120 4121 | PTT Actuator |
| 9 | SXA 120 4120 | Side Control Bezel |
| 10 | SXA 120 4136 | Side Control Keypad |
| 11 | SXA 120 4128 | Gasket: UDC PWB |
| 12 | SXA 120 4129 | Gasket: PTT |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.

ALL BENDS TO BE 1 mm INNER DIAMETER MINIMUM (NO
CREASE BENDS), 180° UNLESS OTHERWISE NOTED.
—— INSIDE OF BEND RADIUS ON FRONT SIDE.
- - - INSIDE OF BEND RADIUS ON BACK SIDE.
PTT AND UDC BOARDS ARE NOT SHOWN FOR CLARITY.

Assembly Drawing

Front Assembly SYSTEM
(151 88-SXK 107 3808 Uen, Rev. E)



Rear Assembly
SXX 107 3814

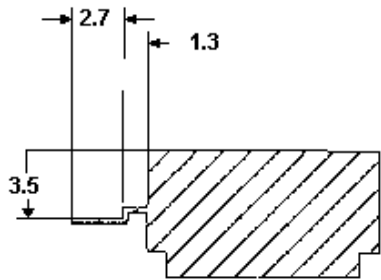
| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|----------------|-------------------------------------|
| 1 | SXX 107 3816 | Rear Housing Casting |
| 2 | SXA 120 4110 | Rear Cosmetic Cover |
| 3 | RNT 403 351/01 | Antenna Switch Assembly |
| 3 | SXA 120 4137 | RF Gasket |
| 3 | | Nut |
| 4 | SXA 120 4133 | Switch Retainer |
| 5 | ROA 117 2220 | Switch Module Assembly |
| 6 | SXA 120 4134 | Switch Gasket Assembly |
| 7 | ROA 117 2212 | DSP Module |
| 8 | ROA 117 2201 | Main Board Asm (807.5 - 824 MHz) |
| 8 | ROA 117 2201/1 | Main Board Asm (806 - 824 MHz) |
| 9 | SXX 107 3818 | RF/ Logic Shield |
| 10 | SXA 120 4137 | RF Gasket |
| 11 | SXA 120 4155 | PA Nuts |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.

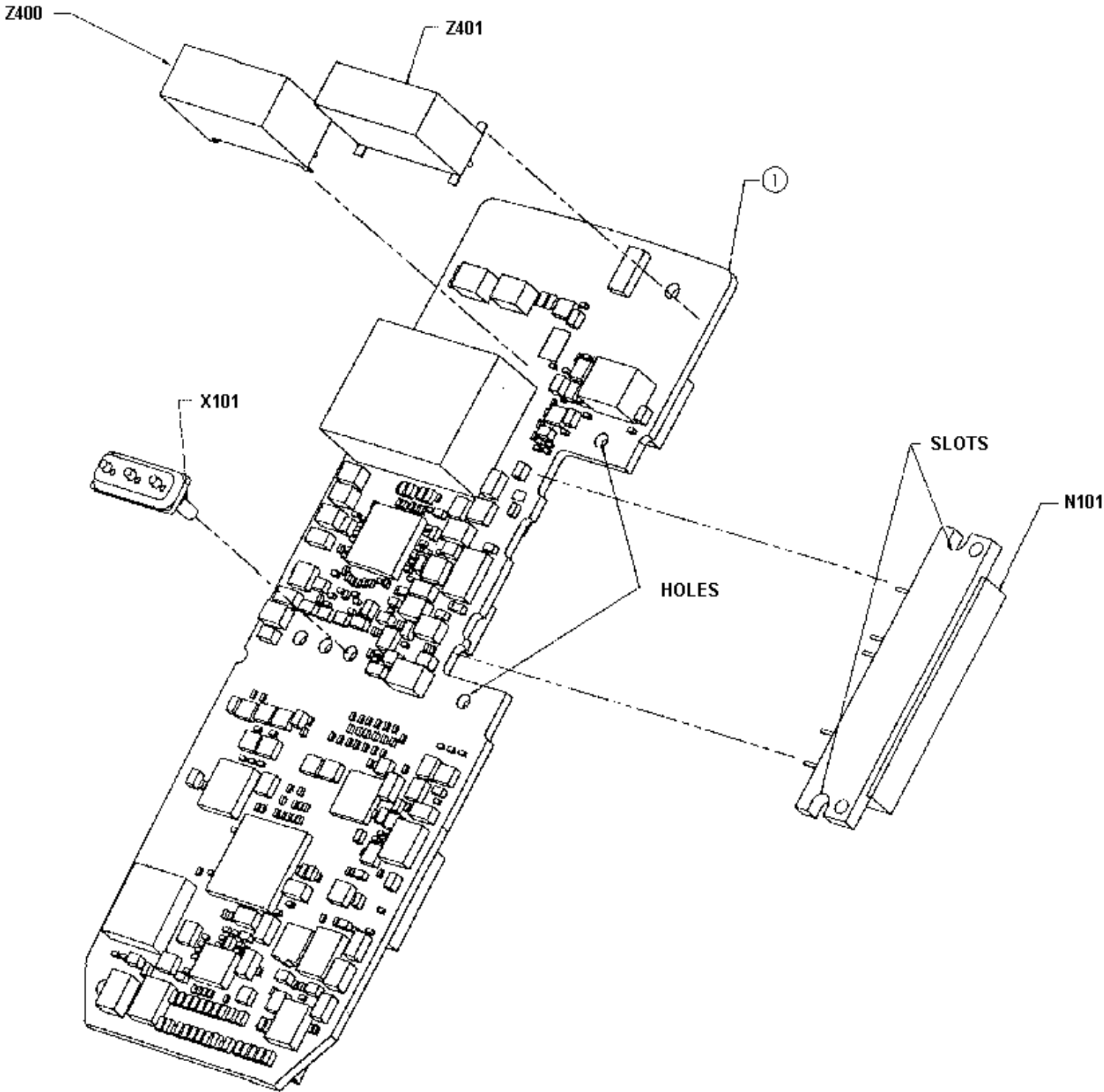
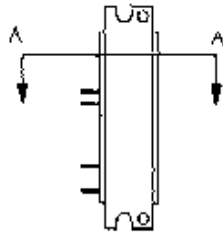
800 MHz Main Board Assembly
ROA 117 2201

| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|-----------------|-----------------------|
| 1 | | Printed Circuit Board |
| N101 | RYTUA 901 07/01 | PA Module |
| X101 | RPT 403 303/01 | Battery Connector |
| Z400 | RTN 202 699/01 | Filter |
| Z401 | RTN 202 728/01 | Filter |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.



SECTION A-A
SCALE 4/1
LEAD CONFIGURATION
REQUIRED FOR N101.
MODIFY RADIUS AND
ANGLE AS REQUIRED
FOR MANUFACTURING.



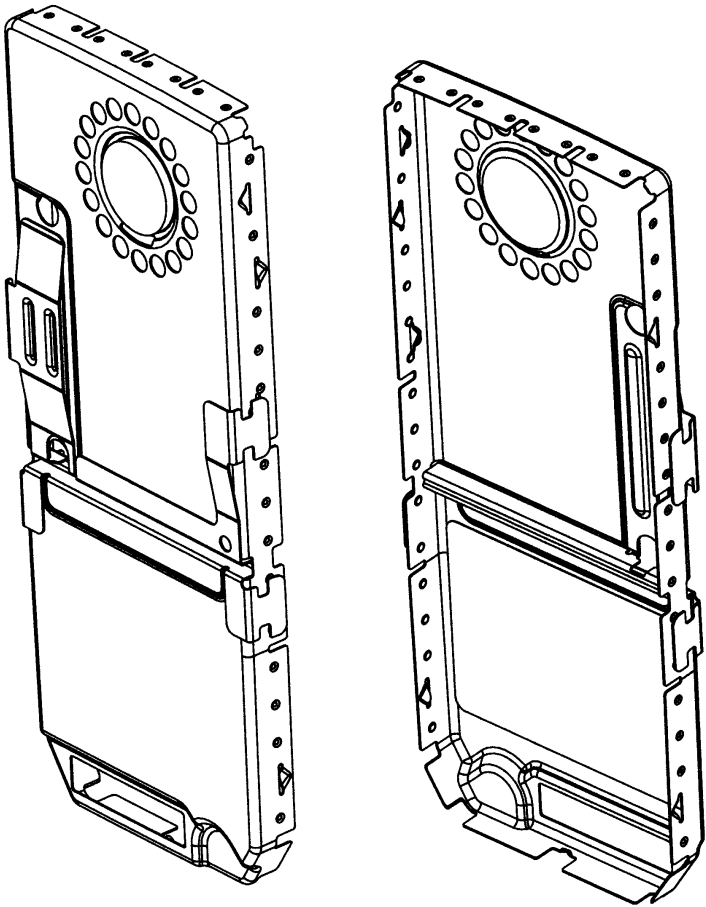
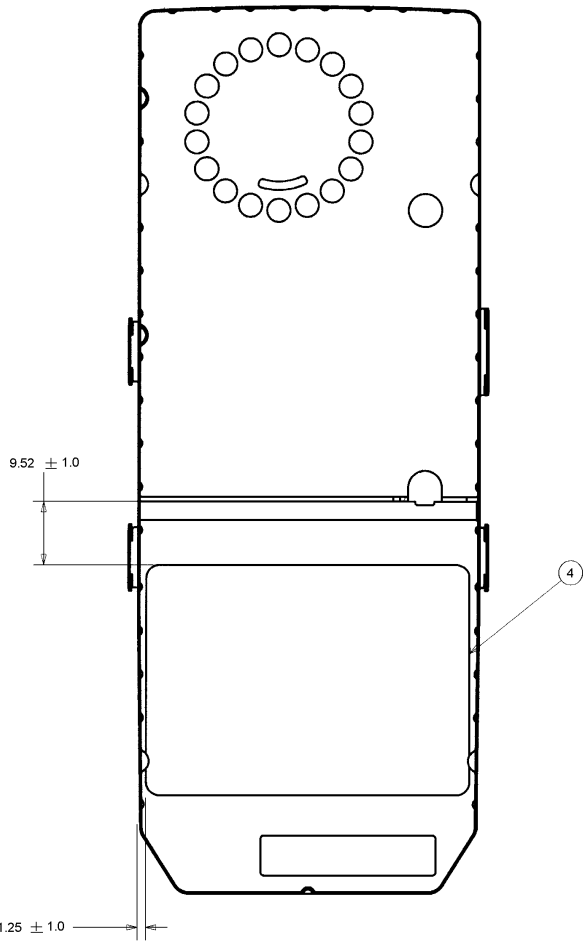
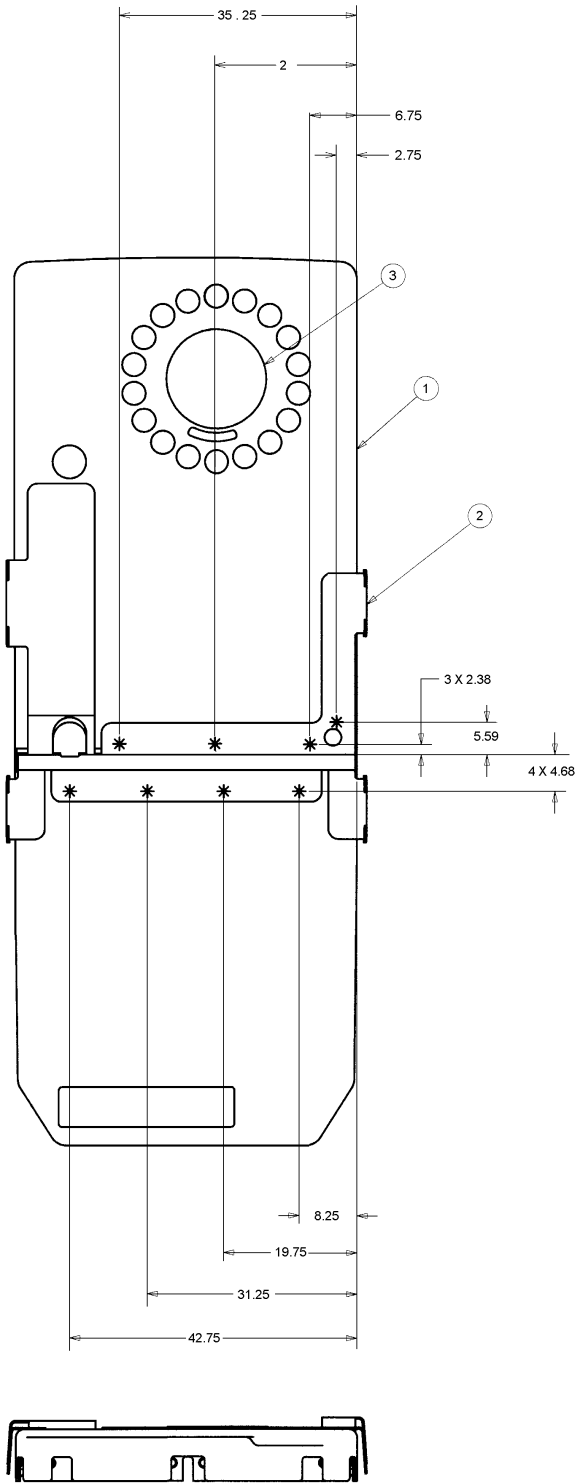
800 MHz Main Circuit Board Assembly

(151 88-ROA 117 2201, Rev. D)

RF/LOGIC SHIELD
SXX 107 3818

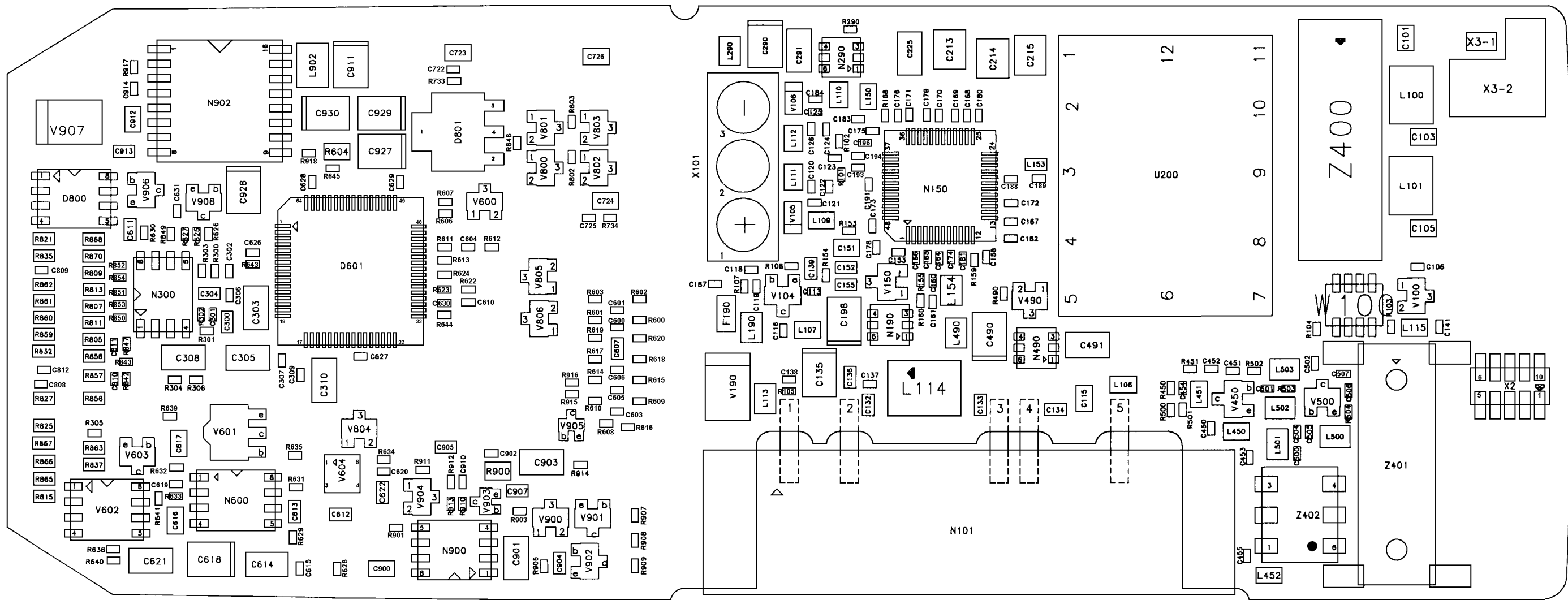
| SYMBOL | PART NUMBER | DESCRIPTION |
|--------|--------------|------------------|
| 1 | SXA 120 4111 | Shield |
| 2 | SXA 120 4139 | Shield Wall |
| 3 | SXA 120 4149 | Speaker Pad |
| 4 | SXA 120 4148 | Shield Insulator |

* COMPONENTS ADDED, DELETED, OR CHANGED BY PRODUCTION CHANGES.



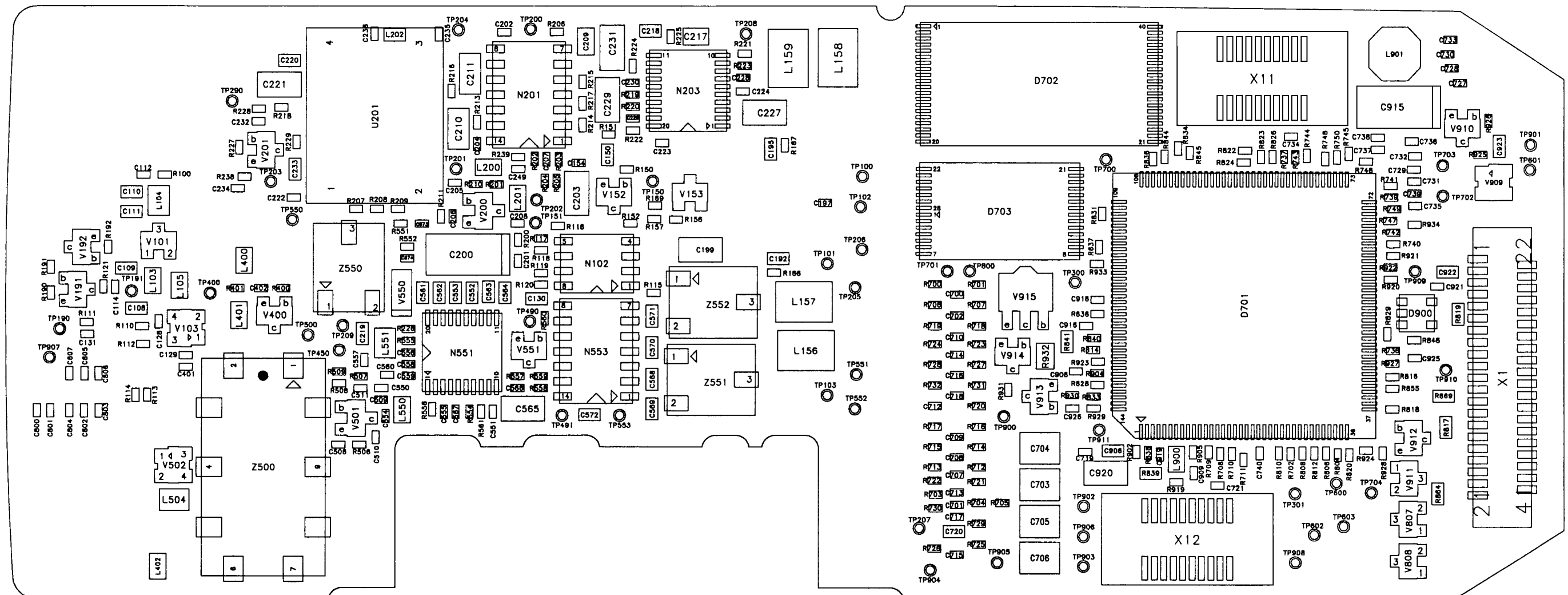
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FRONT SIDE



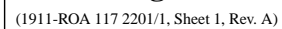
(1078-ROA 117 2201 Uen, Sheet 1, Rev. E)

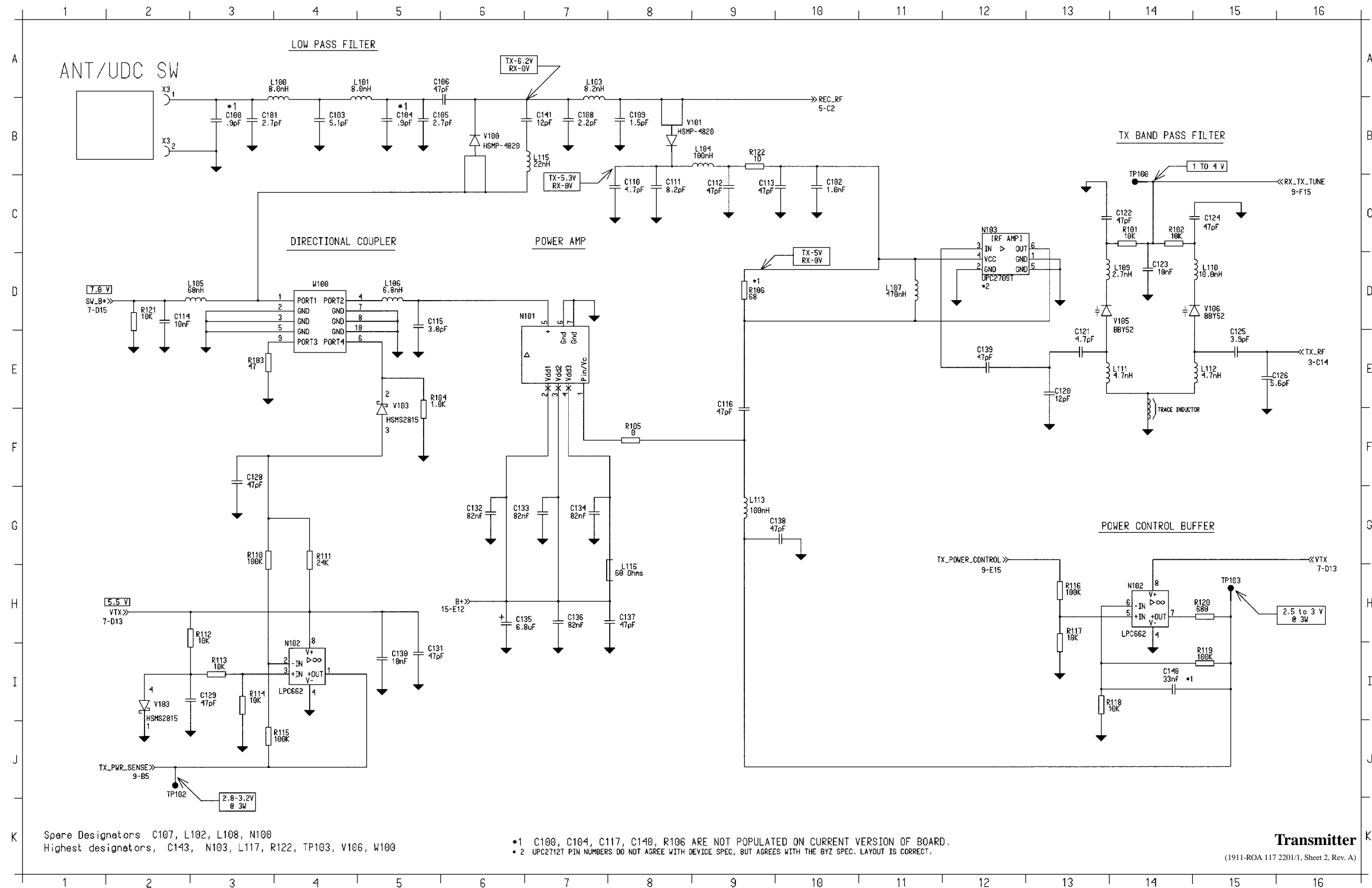
BACK SIDE

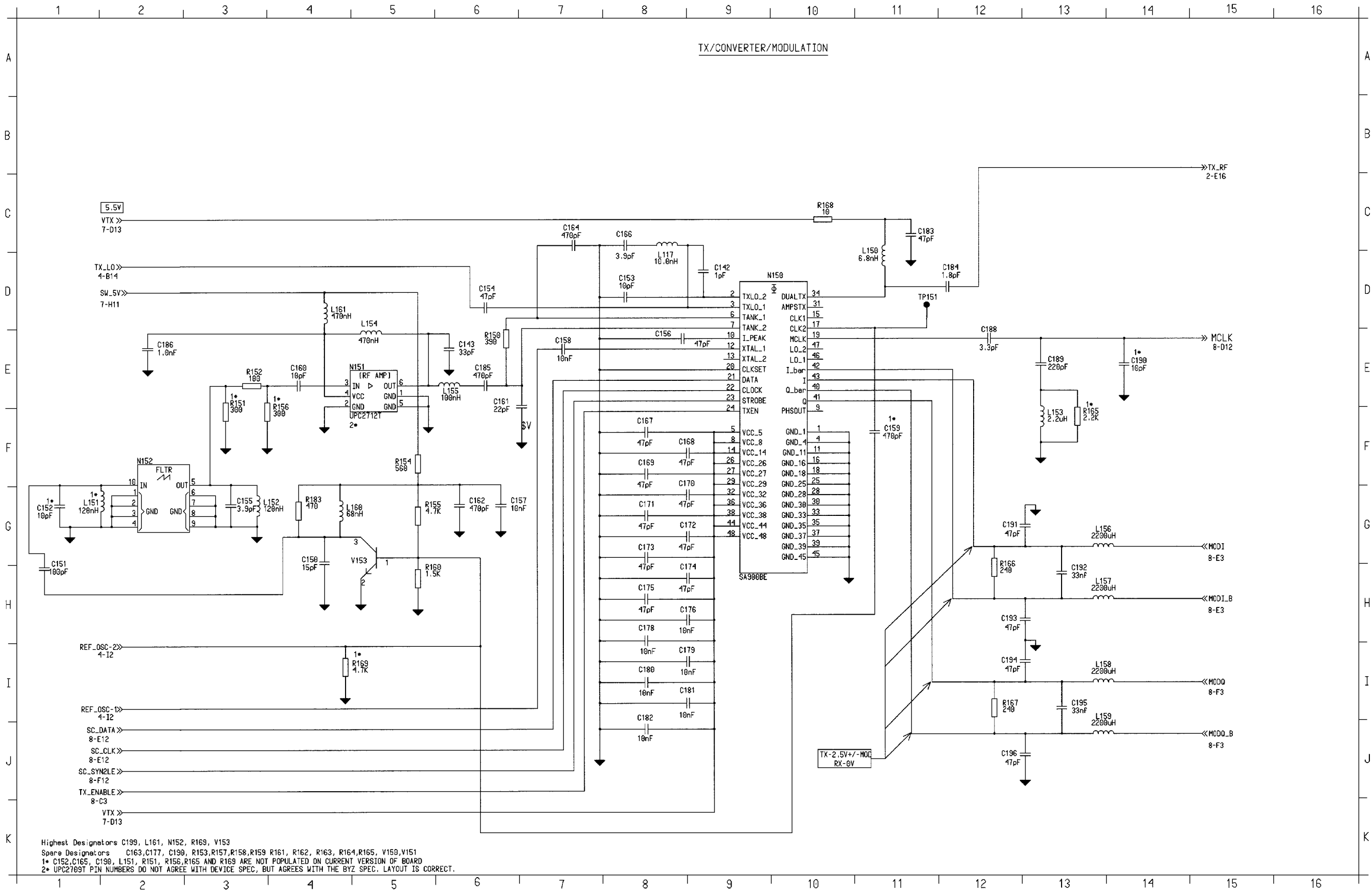


800 MHz Circuit Board

(1078-ROA 117 2201 Uen, Sheet 2, Rev. E)

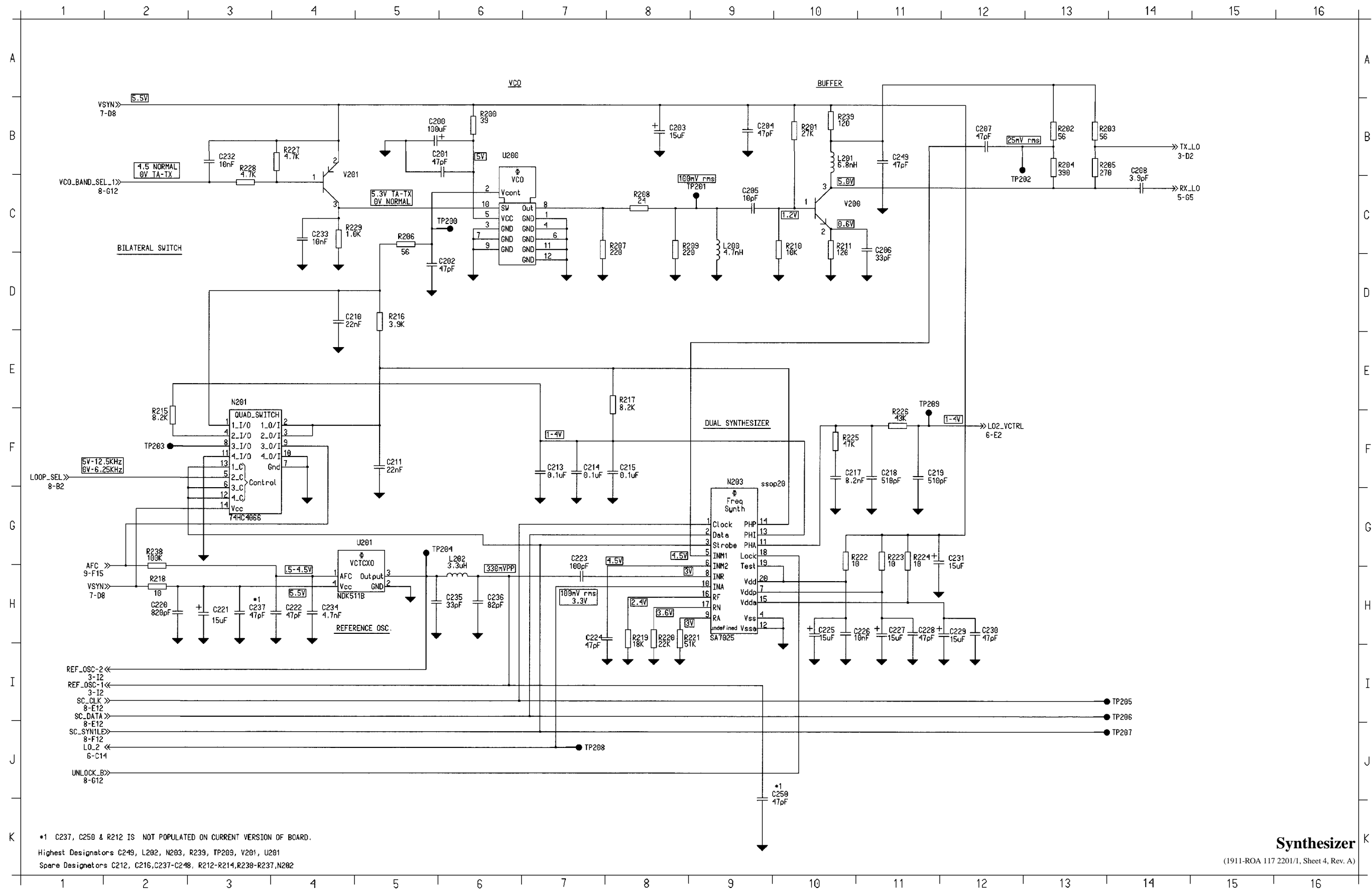






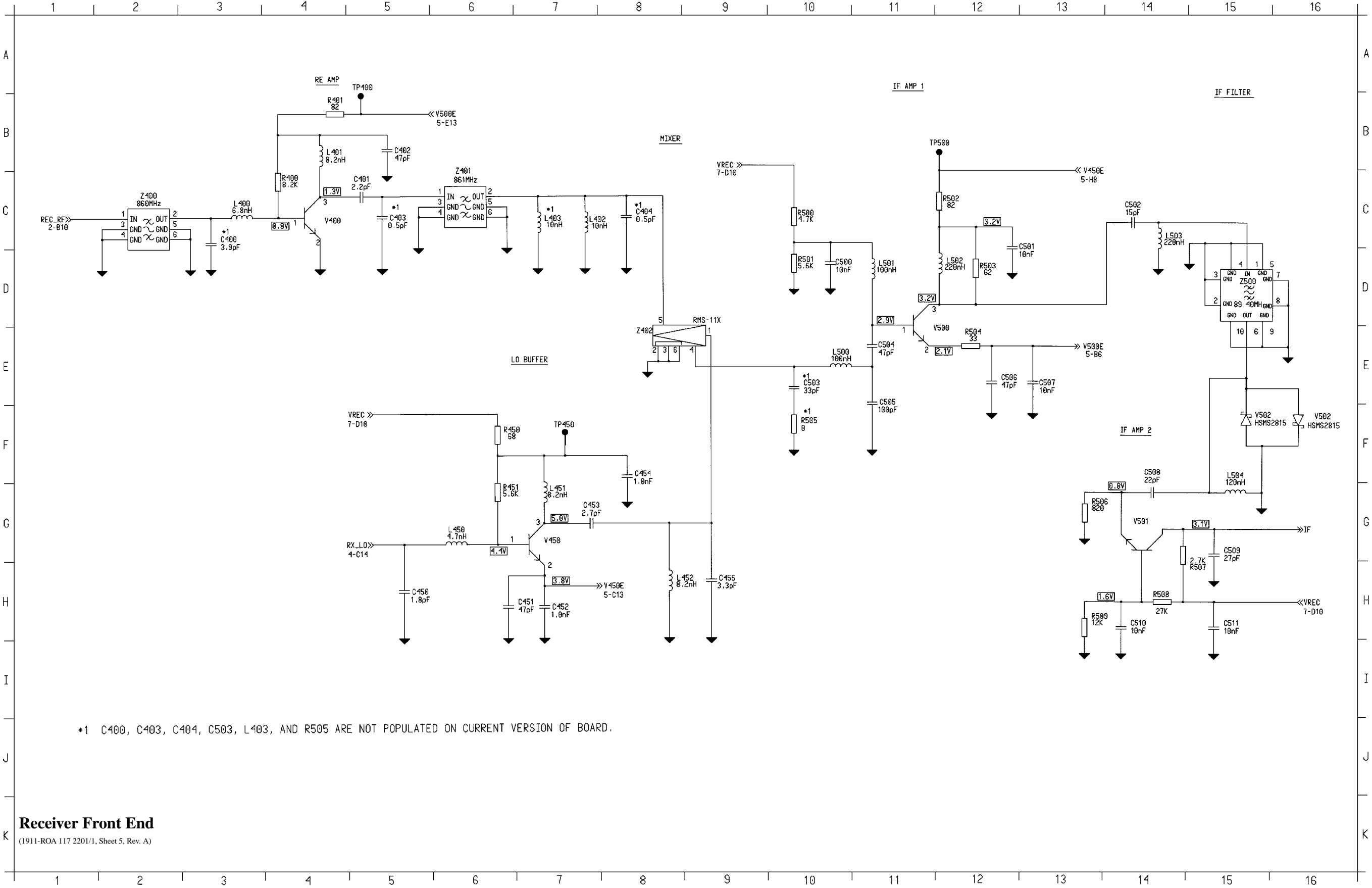
Transmit Offset

(1911-ROA 117 2201/1, Sheet 3, Rev. A)



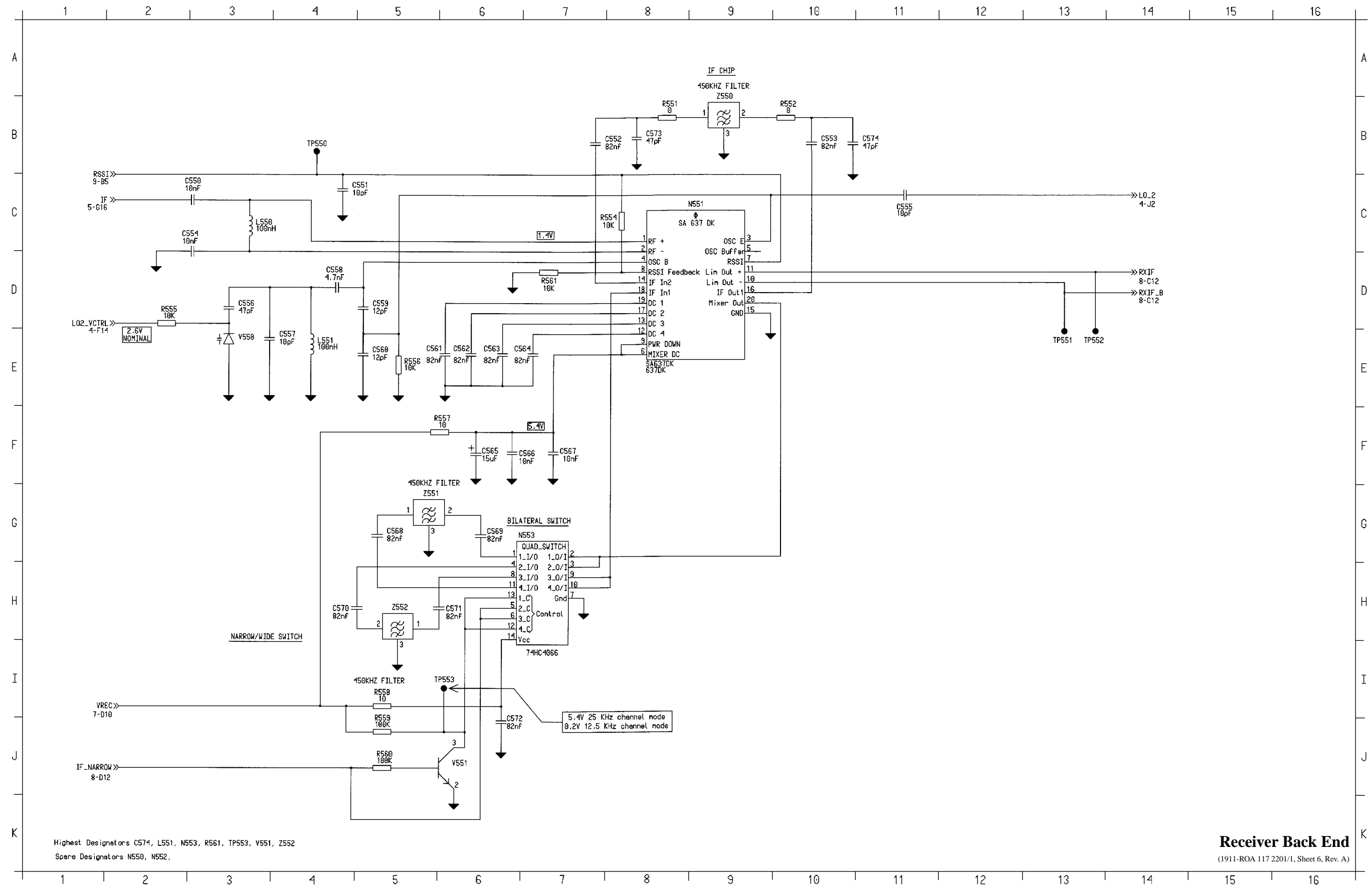
Synthesizer

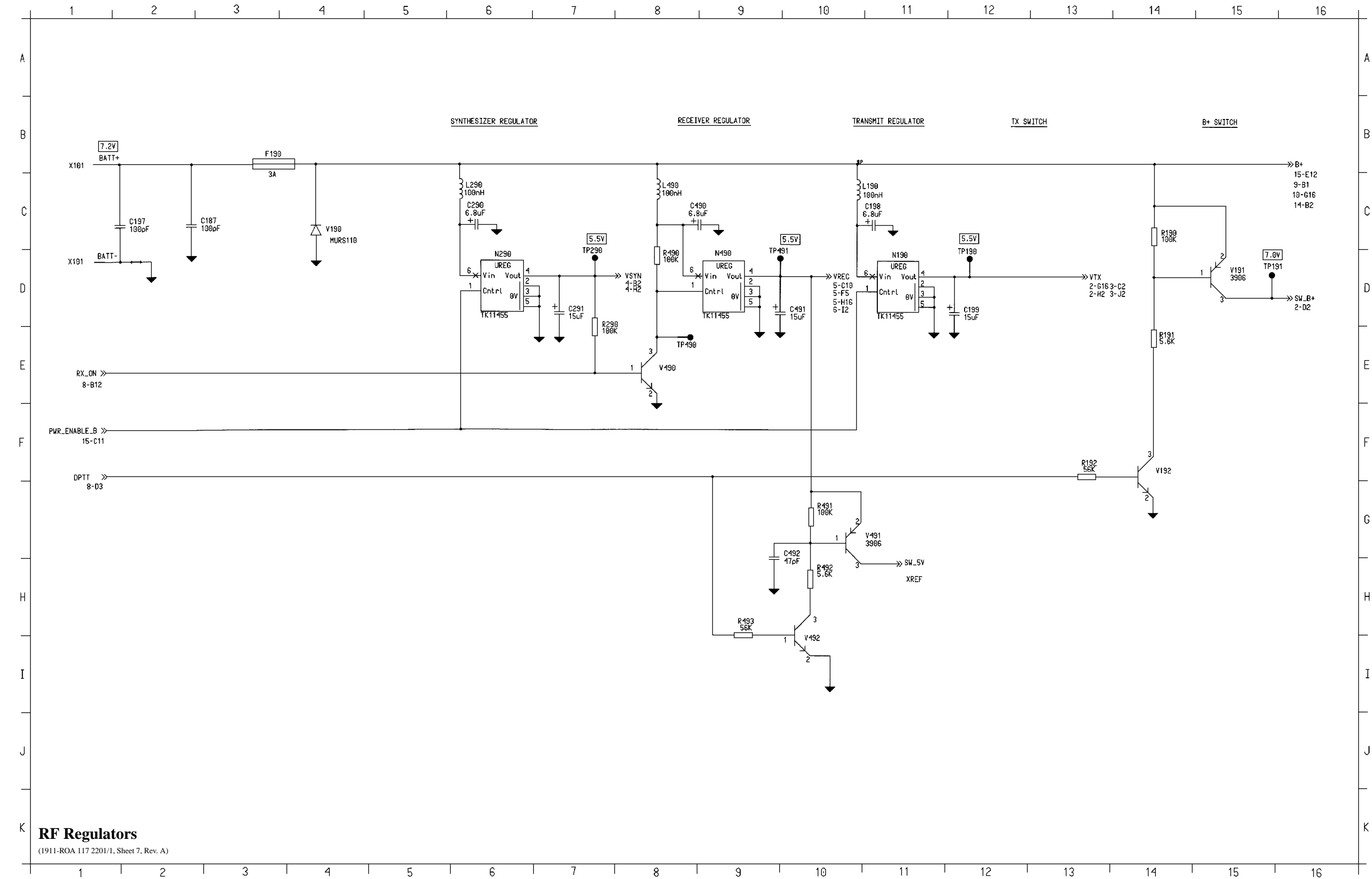
(1911-ROA 117 2201/1, Sheet 4, Rev. A)



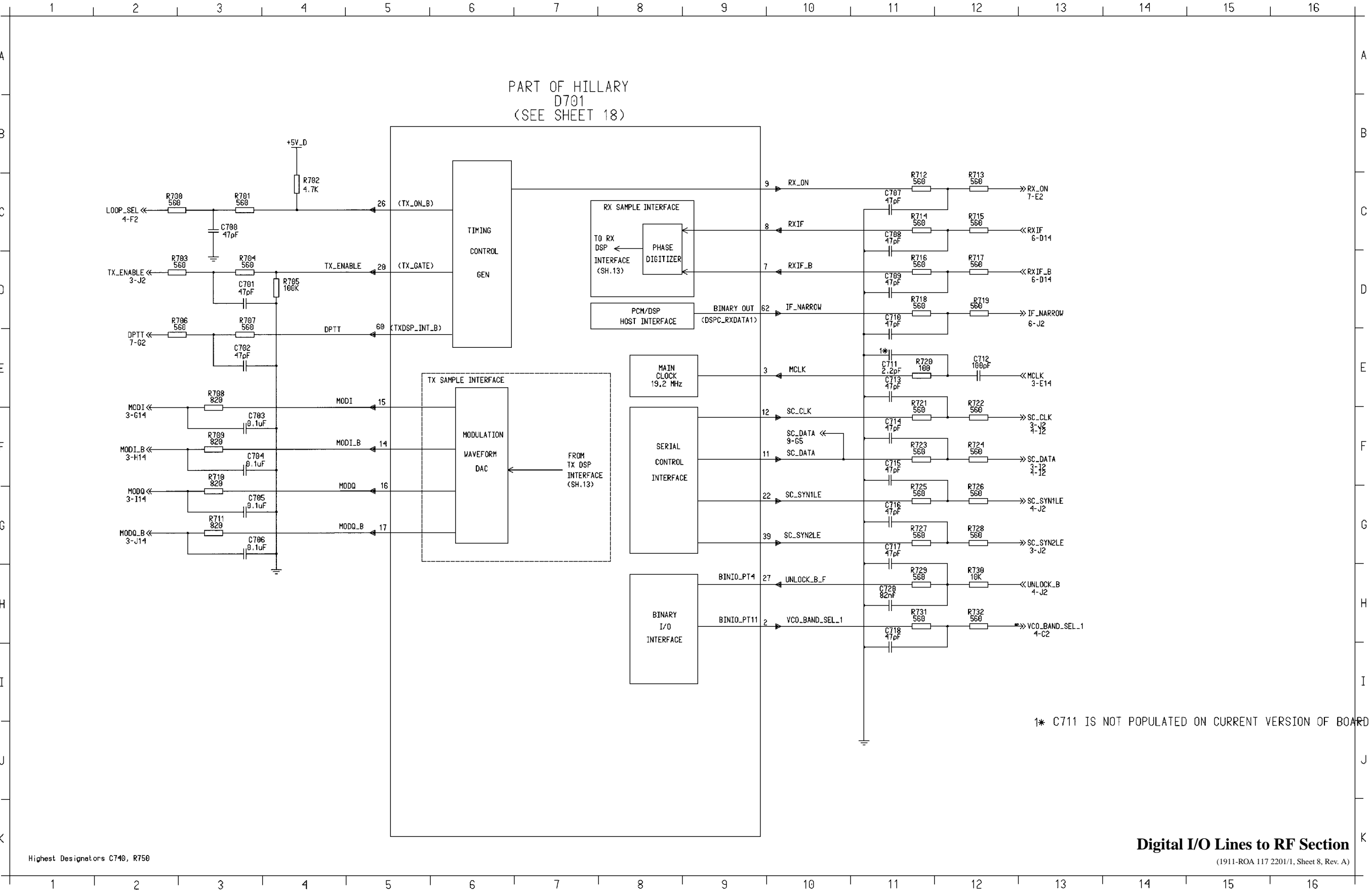
Receiver Front End

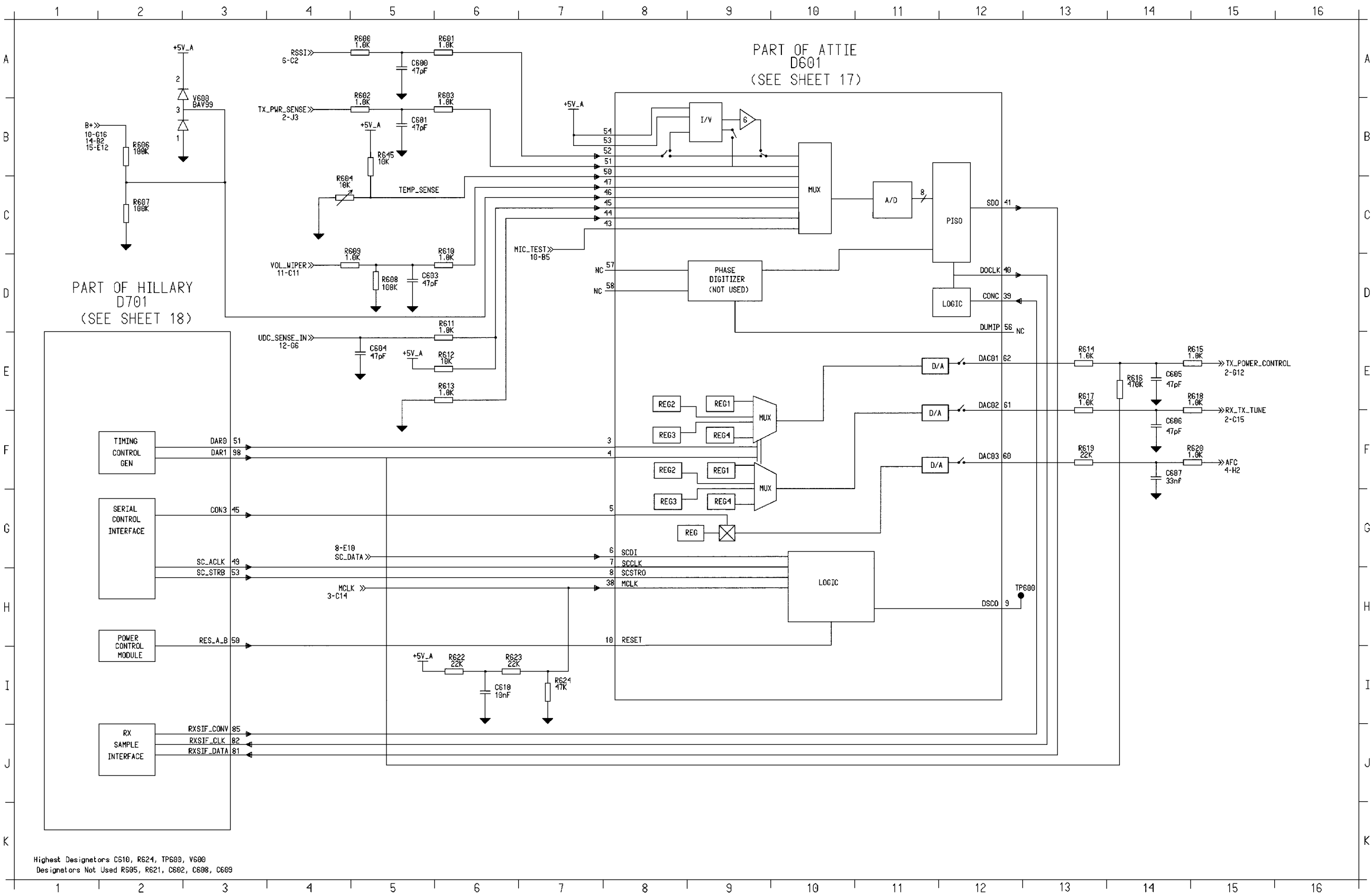
(1911-ROA 117 2201/1, Sheet 5, Rev. A)





RF Regulators
(1911-ROA 117 2201/1, Sheet 7, Rev. A)

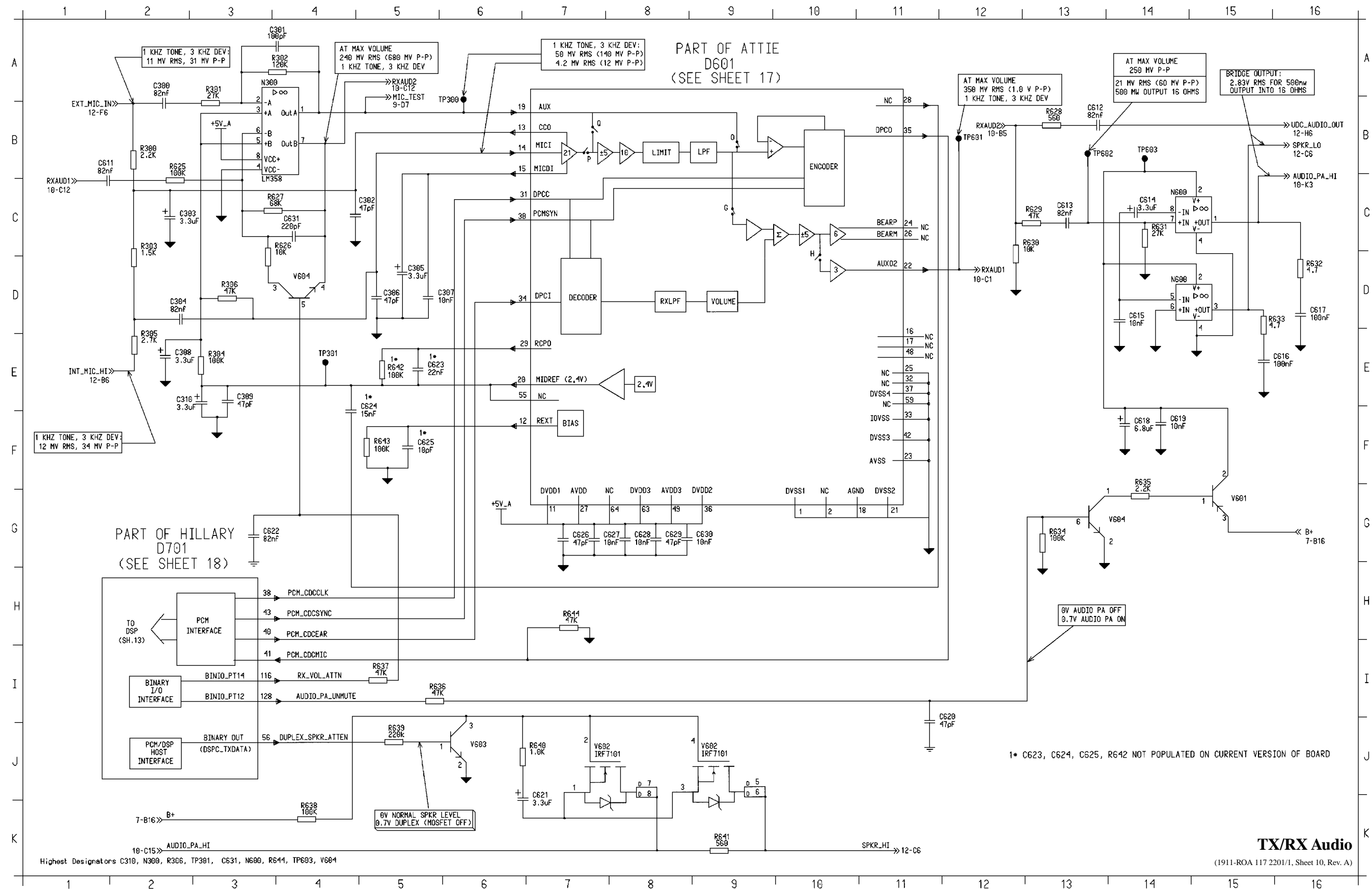


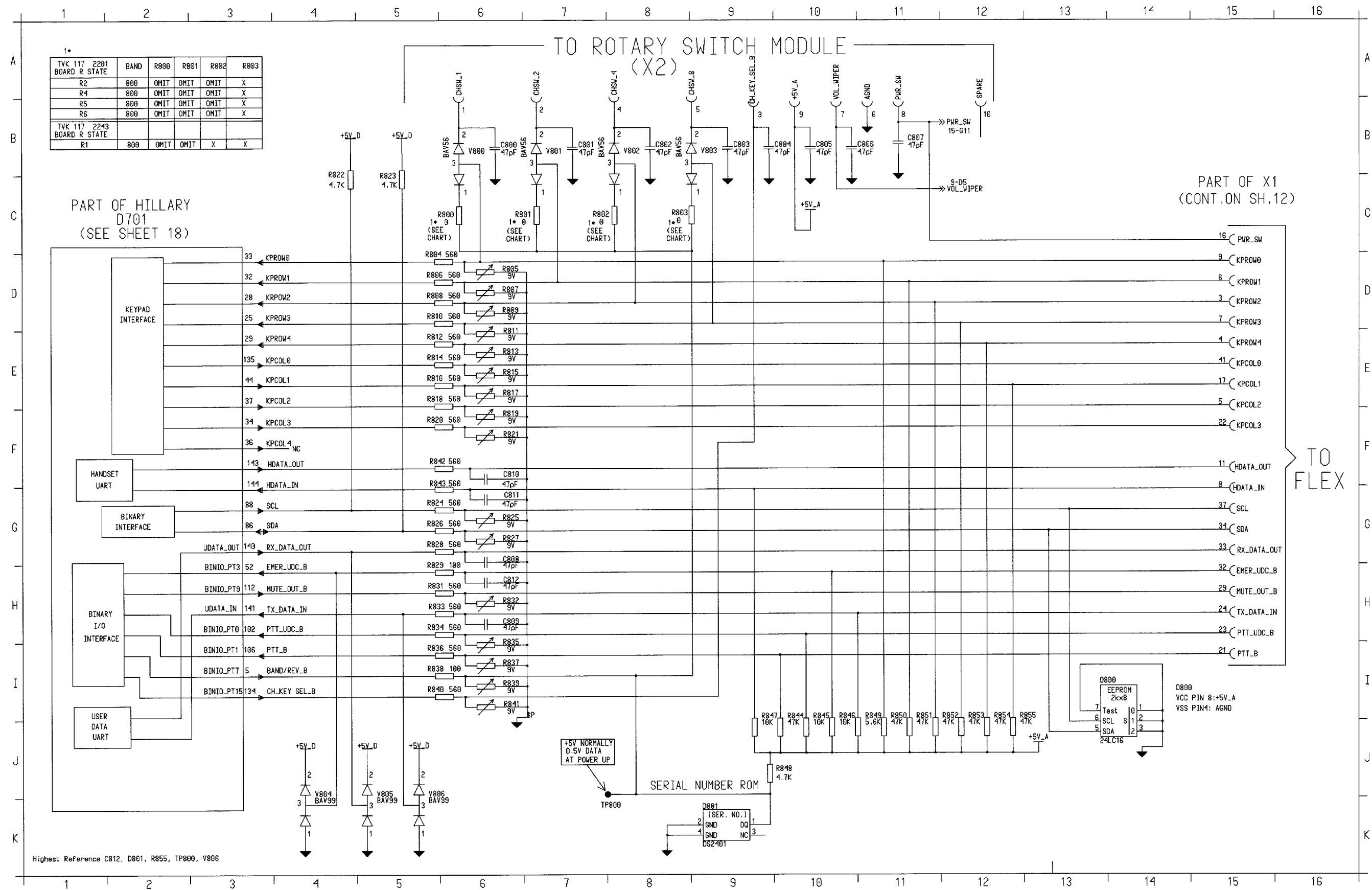


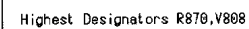
Highest Designators: C610, R624, TP600, V600
Designators Not Used: R605, R621, C602, C608, C609

Analog I/O Lines to RF Section

(1911-ROA 117 2201/1, Sheet 9, Rev. A)

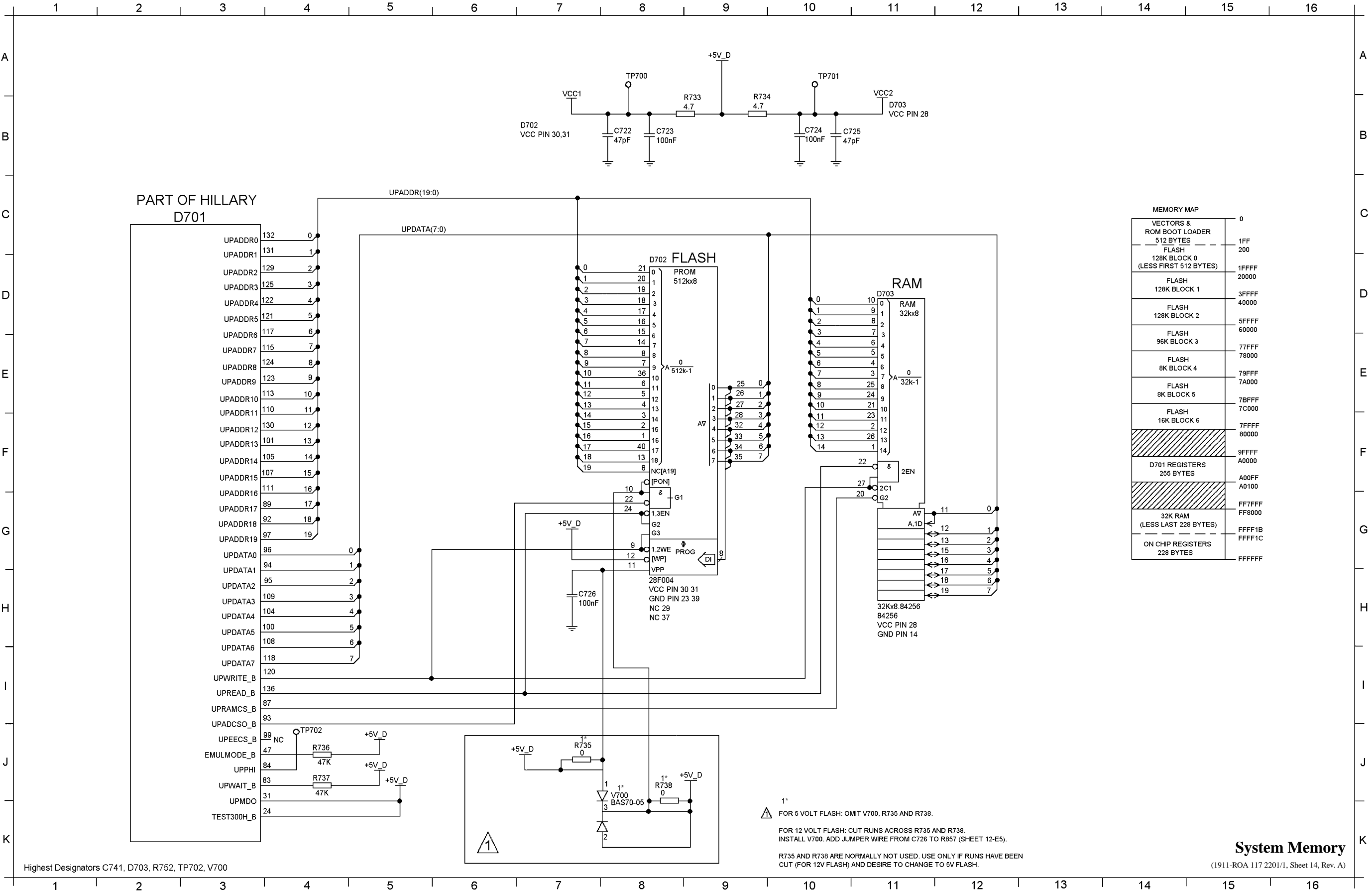






(1911-ROA 117 2201/1, Sheet 12, Rev. A)





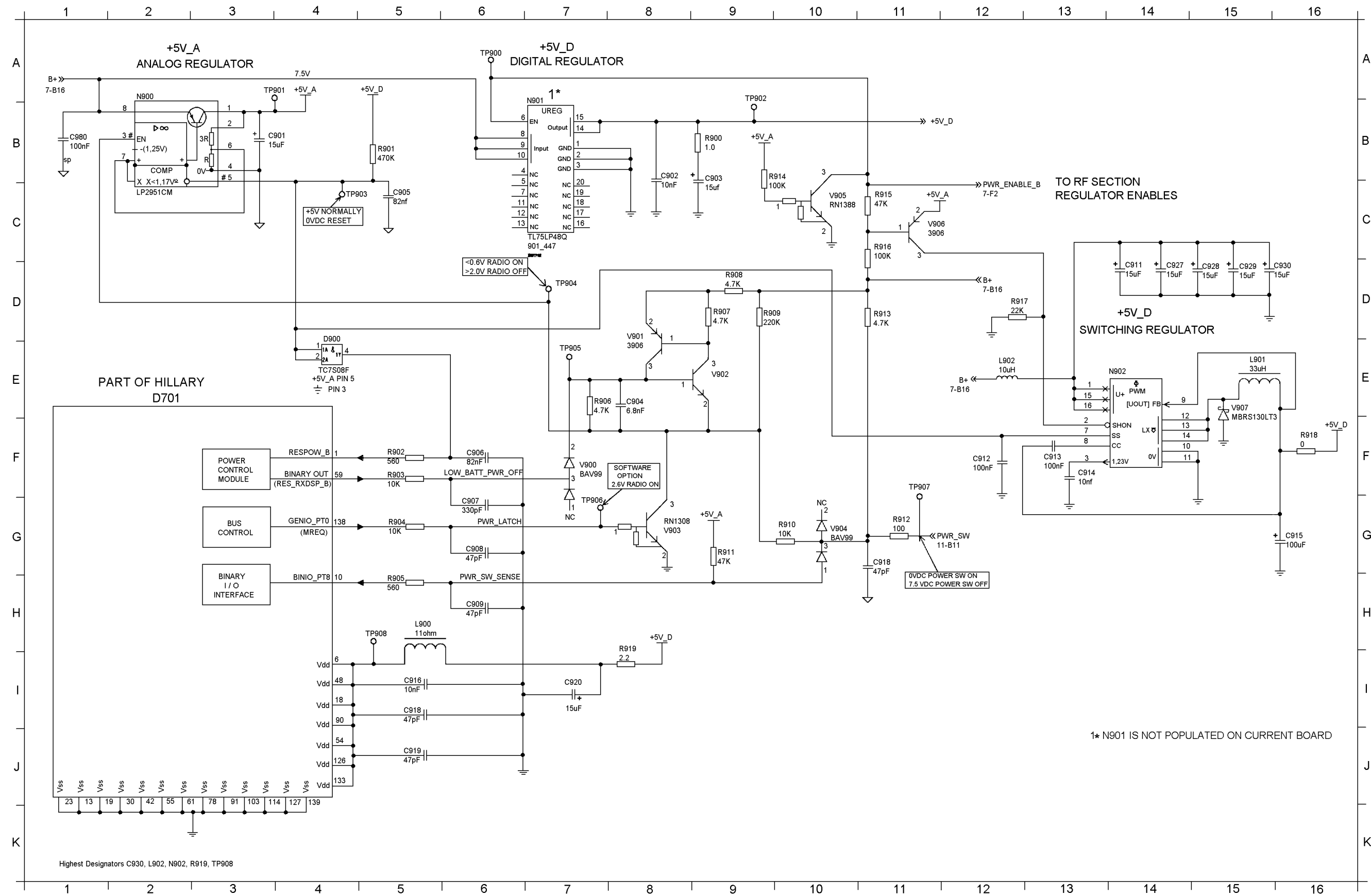
MEMORY MAP

| | |
|---|------------------|
| VECTORS & ROM BOOT LOADER 512 BYTES | 0 1FF |
| FLASH 128K BLOCK 0 (LESS FIRST 512 BYTES) | 200 1FFFF |
| FLASH 128K BLOCK 1 | 20000 3FFFF |
| FLASH 128K BLOCK 2 | 40000 5FFFF |
| FLASH 96K BLOCK 3 | 60000 77FFF |
| FLASH 8K BLOCK 4 | 78000 79FFF |
| FLASH 8K BLOCK 5 | 7A000 7BFFF |
| FLASH 16K BLOCK 6 | 7C000 7FFFF |
| | 80000 9FFFF |
| D701 REGISTERS 255 BYTES | A0000 A00FF |
| | A0100 A0100 |
| | FF7FFF |
| 32K RAM (LESS LAST 228 BYTES) | FF8000 FFFF1B |
| ON CHIP REGISTERS 228 BYTES | FFFF1C FFFFF |

System Memory

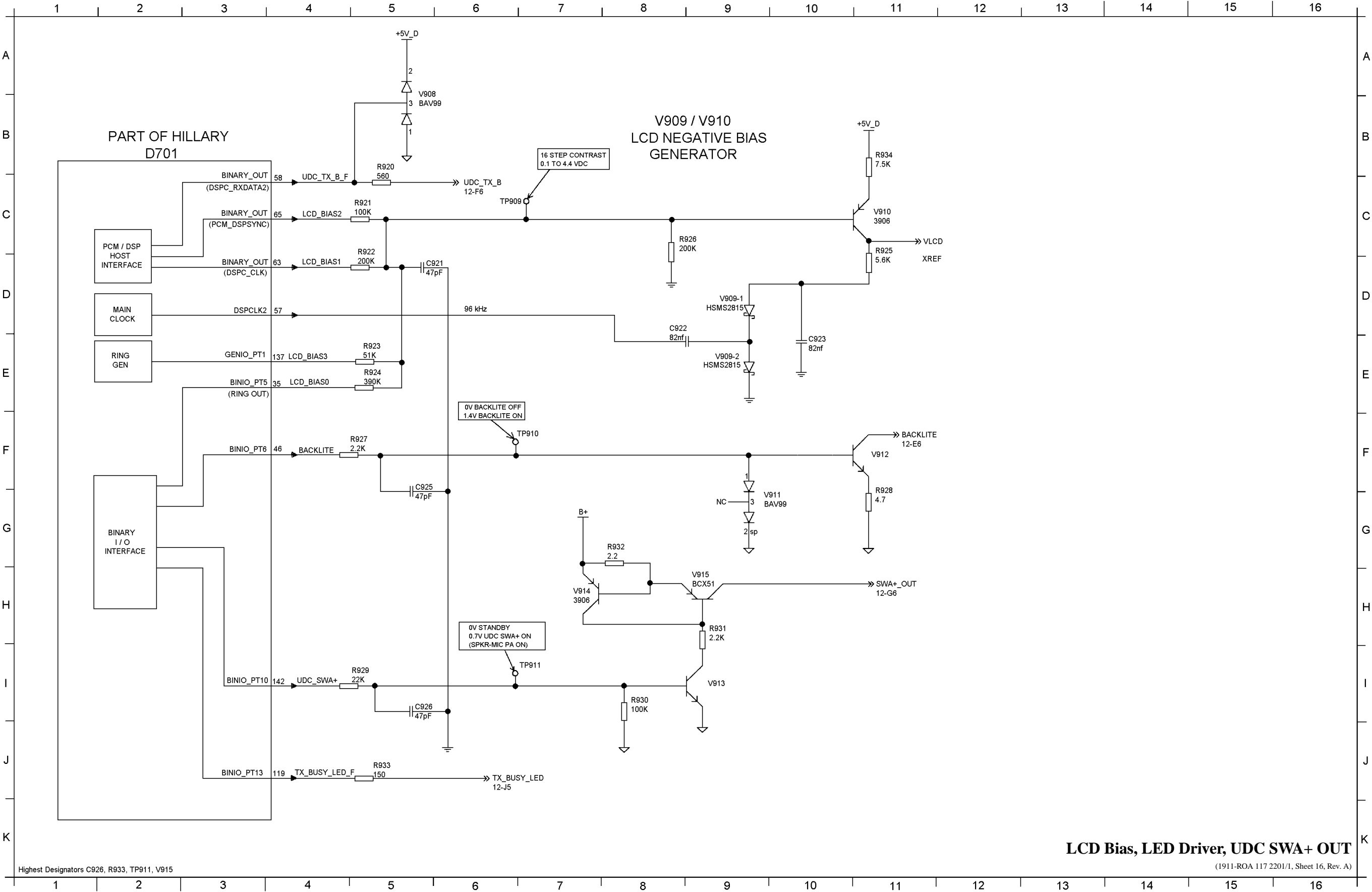
(1911-ROA 117 2201/1, Sheet 14, Rev. A)

Highest Designators C741, D703, R752, TP702, V700

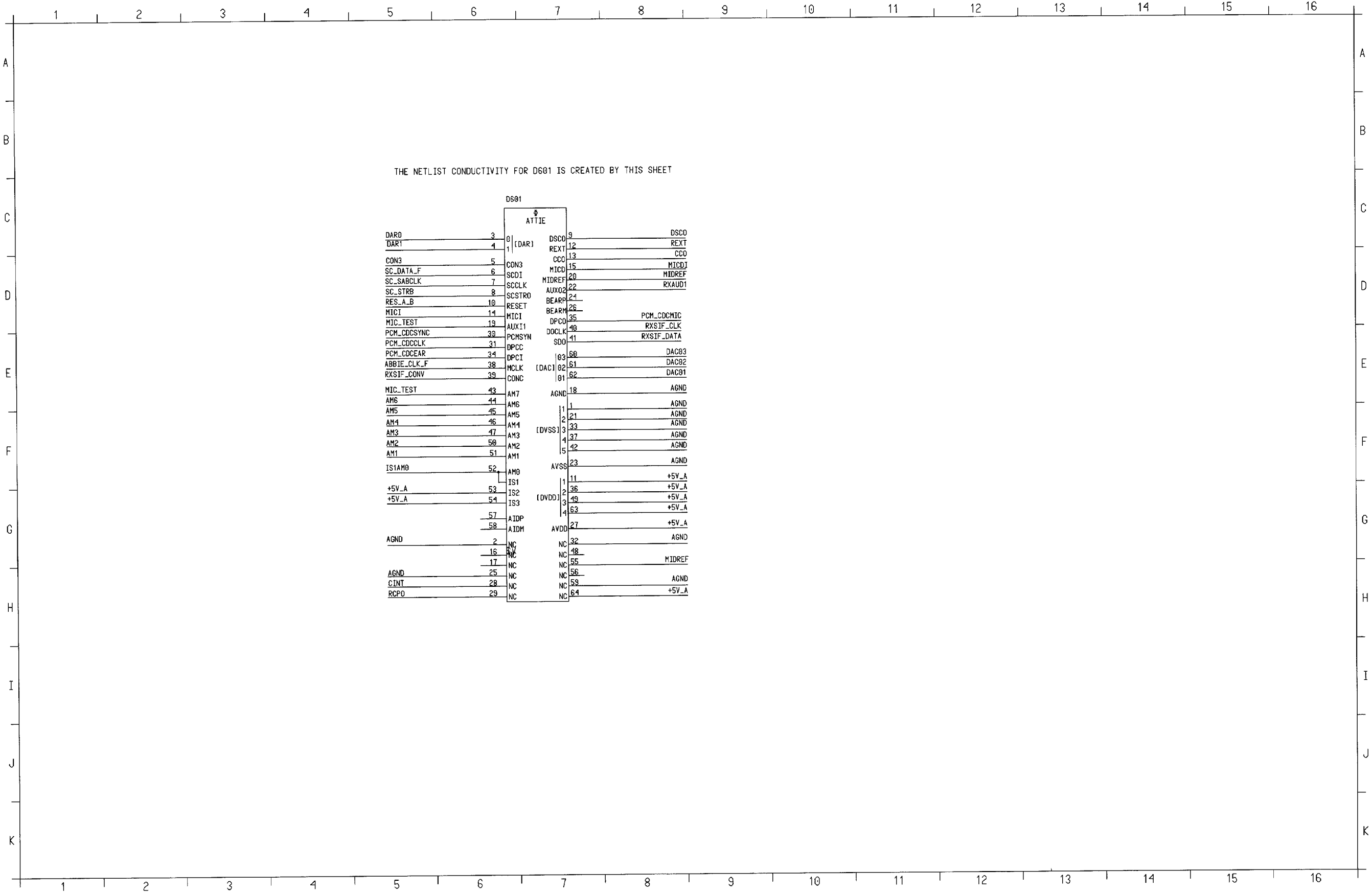


Regulators/Power Switch

(I911-ROA 117 2201/I, Sheet 15, Rev. A)



LCD Bias, LED Driver, UDC SWA+ OUT



THE NETLIST CONDUCTIVITY FOR D701 IS CREATED BY THIS SHEET
D701

| | | | | |
|-------------------|----|---------------|-----|-----------------|
| RESPON_B | 1 | RESPON_B | 144 | HDATA_IN |
| VCO_BAND_SEL1_F | 2 | BINIO_PT11 | 143 | HDATA_OUT |
| MCLK_F | 3 | INPCLK | 142 | BINIO_PT10 |
| TG_SYNC | 4 | TG_SYNC | 141 | TX_DATA_IN_F |
| BINIO_PT7 | 5 | BINIO_PT7 | 140 | RX_DATA_OUT_F |
| Vdd | 6 | AVDD1 | 139 | GND |
| RXIF_B_F | 7 | IFIN_B | 138 | MREQ |
| RXIF_F | 8 | IFIN | 137 | LCD_BIAS3 |
| RX_ON_F | 9 | RX_ON_B | 136 | UPREAD_B |
| BINIO_PT8 | 10 | BINIO_PT8 | 135 | KPCOL0_F |
| SC_DATA_F | 11 | SC_DO | 134 | BINIO_PT15 |
| SC_CLK_F | 12 | SC_SYNCLK | 133 | Vdd |
| GND | 13 | VSS0 | 132 | UPADDR0 |
| MODI_B_F | 14 | MODI_B | 131 | UPADDR1 |
| MODI_F | 15 | MODI | 130 | UPADDR12 |
| MODQ_F | 16 | MODQ | 129 | UPADDR2 |
| MODQ_B_F | 17 | MODQ_B | 128 | AUDIO_PA_UNMUTE |
| Vdd | 18 | VDD0 | 127 | GND |
| GND | 19 | VSS0 | 126 | Vdd |
| TX_ENABLE_F | 20 | TX_GATE | 125 | UPADDR3 |
| | 21 | BINIO_PT2 | 124 | UPADDR8 |
| SC_SYN1LE_F | 22 | SC_SYN1LE | 123 | UPADDR9 |
| GND | 23 | AVSS1 | 122 | UPADDR4 |
| +5V_D | 24 | TEST300H_B | 121 | UPADDR5 |
| KPROW3_F | 25 | KPROW3 | 120 | UPWRITE_B |
| TX_ON_B_F | 26 | TX_ON_B | 119 | TX_BUSY_LED_F |
| UNLOCK_B_F | 27 | BINIO_PT4 | 118 | UPDATA7 |
| KPROW2_F | 28 | KPROW2 | 117 | UPADDR6 |
| KPROW4_F | 29 | KPROW4 | 116 | RX_VOL_ATTEN |
| GND | 30 | VSS1 | 115 | UPADDR7 |
| +5V_D | 31 | UPMD0 | 114 | GND |
| KPROW1_F | 32 | KPROW1 | 113 | UPADDR10 |
| KPROW0_F | 33 | KPROW0 | 112 | MUTE_OUT_B_F |
| KPCOL3_F | 34 | KPCOL3 | 111 | UPADDR16 |
| LCD_BIAS0 | 35 | BINIO_PT5 | 110 | UPADDR11 |
| | 36 | KPCOL4 | 109 | UPDATA3 |
| KPCOL2_F | 37 | KPCOL2 | 108 | UPDATA6 |
| PCM_CDCLK | 38 | PCM_CDCLK | 107 | UPADDR15 |
| SC_SYN2LE_F | 39 | SC_SYN2LE | 106 | PTT_B_F |
| PCM_CDCEAR | 40 | PCM_CDCEAR | 105 | UPADDR14 |
| PCM_CDGMIC | 41 | PCM_CDGMIC | 104 | UPDATA4 |
| GND | 42 | VSS0 | 103 | GND |
| PCM_CDCSYNC | 43 | PCM_CDCSYNC | 102 | PTT_UDC_B_F |
| KPCOL1_F | 44 | KPCOL1 | 101 | UPADDR13 |
| CON3 | 45 | CON3 | 100 | UPDATA5 |
| BINIO_PT6 | 46 | BINIO_PT6 | 99 | |
| EMULMODE_B | 47 | PERIPH_B | 98 | DAR1 |
| Vdd | 48 | VDD0 | 97 | UPADDR19 |
| SC_SABCLK | 49 | SC_ACLK | 96 | UPDATA0 |
| RES_A_B | 50 | RES_A_B | 95 | UPDATA2 |
| DAR0 | 51 | DAR0 | 94 | UPDATA1 |
| EMER_UDC_B_F | 52 | BINIO_PT3 | 93 | UPADCS0_B |
| SC_STRB | 53 | SC_STRB | 92 | UPADDR18 |
| Vdd | 54 | VDD1 | 91 | GND |
| GND | 55 | VSS0 | 90 | Vdd |
| DUPLEX_SPKR_ATTEN | 56 | DSPC_TXDATA | 89 | UPADDR17 |
| DSPCLK2 | 57 | DSPCLK2 | 88 | SCL_F |
| UDC_TX_B_F | 58 | DSPC_RXDATA2 | 87 | UPRAMCS_B |
| RES_RXDSP_B | 59 | RES_RXDSP_B | 86 | SDA_F |
| DPTT_F | 60 | TXDSP_INT_B | 85 | RXSIF_CONV |
| GND | 61 | VSS0 | 84 | UPPHI |
| IF_NARROW_F | 62 | DSPC_RXDATA1 | 83 | UPWAIT_B |
| LCD_BIAS1 | 63 | DSPC_CLK | 82 | RXSIF_CLK |
| PCM_DSPEAR | 64 | PCM_DSPEAR | 81 | RXSIF_DATA |
| LCD_BIAS2 | 65 | PCM_DSPSYNC | 80 | TXSIF_DSPSYNC |
| DSPC_RXSYNC | 66 | DSPC_RXSYNC | 79 | TXSIF_DSPCLK |
| +5V_+3V | 67 | VDD0_3V | 78 | GND |
| PCM_DSPMIC | 68 | PCM_DSPMIC | 77 | TXSIF_DSPDATA |
| RXSIF_DSPDATA | 69 | RXSIF_DSPDATA | 76 | DSPCLK1 |
| DSP_INTB | 70 | RXDSP_INT_B | 75 | DSPRST_B |
| DSPC_TXSYNC | 71 | DSPC_TXSYNC | 74 | RXSIF_DSPSYNC |
| PCM_DSPCLK | 72 | PCM_DSPCLK | 73 | RXSIF_DSPCLK |

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