MAINTENANCE MANUAL
AUDIO AMPLIFIER BOARD 19D904025G1 (MDR)
AUDIO AMPLIFIER BOARD 19D904025G2 (MDX)

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DESCRIPTION

Audio Amplifier Boards 19D904025G1 (MDR) and G2 (MDX), provide audio compression (transmit and receive), 10 watt audio output to drive the external speaker, audio muting, and power line filtering for the handset or display board. It also passes serial data between the audio/logic board and the handset (MDR) or display board (MDX). Refer to Figures 1 and 2 for a block diagram of the audio amplifier board for the MDR and MDX radios respectively. The diagrams also show how the audio amplifier board interfaces with other boards in the radio.

CIRCUIT ANALYSIS

The Audio Amplifier Boards include the audio compressors (transmit and receive). 10 watt external speaker audio or 4 watt internal speaker audio, muting controls, external option interfaces, power filter, and power supplies

BASIC AUDIO COMPRESSOR

Audio compression is performed on the received audio from the audio/logic board and on the Tx audio from the handset (MDR), but not on the MIC audio from the microphone in MDX radios. The basic audio compressor consists of analog compandor IC U802, op amp U803, and associated circuitry.

Compandor IC U802, contains a temperature compensated linearized gain cell with a full wave rectifier and a buffer amplifier. A 2.5 volt bias is internally derived from the +8 volt supply. Due to the inherent low distortion, low noise, and linearization of large signals, a wide dynamic range is obtained from the device. The internal buffer amplifier provides independent control of the attack and recovery time of the compandor.

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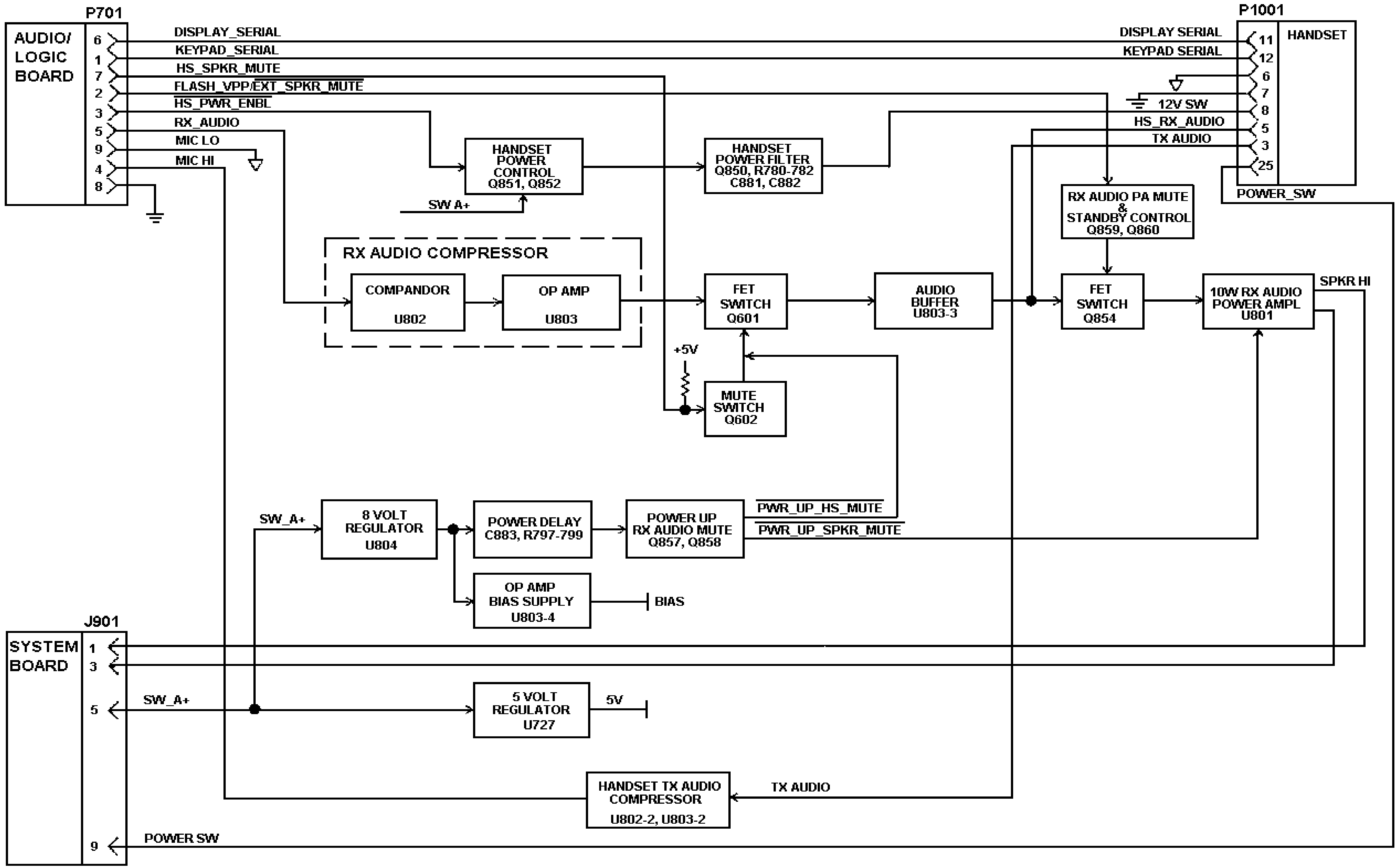


Figure 1 - Audio Amplifier Board, MDR

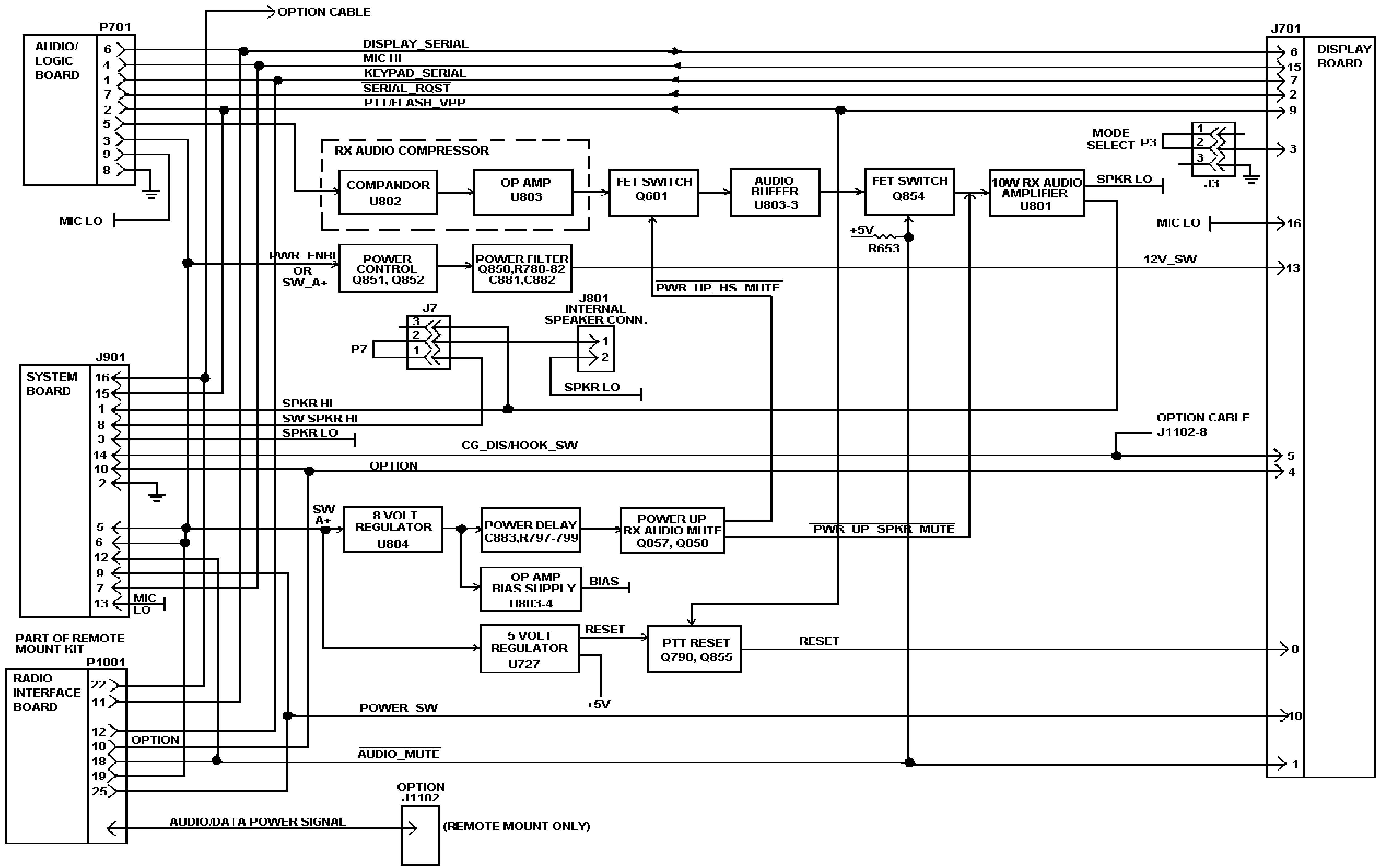


Figure 2 - Audio Amplifier, MDX

TX AUDIO COMPRESSOR

Op amp U803 provides current to voltage conversion for the compandor. The compandor's gain cell provides the variable resistance used to automatically control the gain of the compandor.

The configuration of compandor U802 and op amp U803 form a compressor circuit that allows low level signals to pass through while high level signals are compressed. This type of compressor operation is ideal for signals with widely varying amplitudes.

The audio input to the basic compressor circuit is introduced at the op amp and also to the rectifier input of the compandor. The op amp is configured as a standard negative feedback circuit that uses the compandor's variable resistance in the feedback loop.

The value of the compandor's variable resistance is controlled by the average level of the rectified Rx audio input from the audio/logic board. The diode rectifier does not turn on for low level input signals. The gain cell of the compandor is maintained at the maximum resistance level. A resistor provides a scaled sample of the input signal to be rectified and used to control the gain cell. The rectifier input to the compandor is fed from the audio input signal from the audio/logic board in order to obtain the fastest response time for compandor control (faster than the attack time as set by the external capacitor).

The compandor's internal buffer amplifier provides the high impedance isolation and level to drive the gain cell control. The buffer amplifier also controls the attack and decay time constants through a capacitor resistor network. The gain cell provides the variable feedback to control the gain of the op amp.

The compressor attack time is achieved through a single pole RC filter consisting of an internal 10K ohm resistor and an external capacitor.

The compressor decay time is achieved through an internal two pole filter. The audio is processed so that short peaks increase the average loudness while long phrases with high average levels are processed to reduce the annoying rush of gain and noise between words.

The Tx audio compressor is used in MDR radios. The microphone audio is routed through the audio amplifier board in MDX radios; therefore, the Tx audio compression is not used. The transmit compressor level values for the audio amplifier board are listed is Table 1.

The transmit audio frequency response of the audio amplifier board (used in the MDR radios only) is listed in Table 2.

Table 1 - Typical Compressor Audio Levels (At 1000 Hz)

TX AUDIO P1001-3 1000 HZ MV RMS	MIC HI P701-4 MV RMS TYPICAL
50	27
100	55
200	110
400	215
1000	480
2000	610

Table 2 - Compressor Frequency Responses (At 100 mV rms Input

TX AUDIO P1001-3 100 MV RMS FREQUENCY HZ	MIC HI P701-4 DB
300	- 0.2 ± .5
500	- 0.1 ±.5
1000	0 (REF)
2500	- 0.1 ±.5
3000	- 0.2 ±.5

RX AUDIO COMPRESSOR

Receive audio compression is performed by compandor U802 and op amp U803 and associated components. The Rx audio compressor circuit is similar to the transmitter compressor circuit described above; therefore, a separate description is not included here. The receive compressor level values for the audio amplifier board (MDR and MDX) are listed in Table 3.

Table 3 - Typical Compressor Audio Levels (At 1000 Hz)

RD AUDIO P701-5 1000 Hz MV RMS	HS RX AUDIO P1001-5 MV RMS TYPICAL
50	28
100	55
200	110
400	180
1000	220
2000	240
TABLE 3	HS RX AUDIO LEVEL

The receive audio frequency response of the Audio Amplifier Board (used in the MDR and MDX radios) is listed in Table 4.

Table 4 - Compressor Frequency Responses (At 100 mV rms Input)

RX AUDIO P701-5 FREQUENCY HZ	HS RX AUDIO P1001-5 DB
300	- 0.2 ±0 .5
500	- 0.1 ±0 .5
1000	0 (REF)
2500	- 0.1 ±0 .5
3000	0.2 ±0 .5

INTERNAL AND EXTERNAL SPEAKER AUDIO

Internal and external speaker audio is generated from the receive compressed audio output (HS RX AUDIO). The output of op amp U803.3 is applied to 10 watt audio amplifier U801.

R652 and R651 comprise a voltage divider that is used to set the output power of the audio amplifier U801 to 10 watts (into a standard 4 ohm load) or 4 watts (into a standard 8 ohm load). R803, R804, C803, and C804 prevent high frequency oscillations.

The 10 watt audio output to the external speaker is routed to the system board via the SPKR HI line through J901. The external speaker connects to the system board through the option cable when using the external speaker option.

The four watt audio output is routed to the internal speaker connector (J801). The 1 ohm resistors, R801 and R802, drop the voltage to the 8 ohm speaker in order to achieve the rated four watt output.

The audio amplifier gain response for the four and eight ohm speakers as measured at SPKR HI is shown in Table 5.

The audio amplifier frequency response is given in Table 6.

MUTE CONTROLS

Several types of audio muting are found on the audio amplifier board. They include power up, Rx audio to the Rx compressor, external speaker audio, and 10 watt audio amplifier.

Power Up Mute Control

The power up mute occurs through transistors Q857, Q858, and associated circuitry. When A+ SW power is initially applied to the board, the +8V line goes from 0 volts to +8 volts. This change of state on the +8V line at power up causes pull up capacitor C883 to inject a high to the base of transistors Q857 and Q858 through resistors R798 and R799, respectively. Turning on Q857 at power up mutes the 10 watt audio amplifier. Power up muting lasts for approximately 15 milliseconds.

Table 5 - Speaker HI Levels (At 1000 Hz)

RX AUDIO P701-5 MV RMS	SPKR HI 4 OHM J901-1, 3 MV RMS ±20%	SPKR HI 8 OHM J801-1, 2 MV RMS ±20%
50	1068	854
100	2115	1692
200	4223	3378
400	6941	5553
1000	7899	6319
2000	8082	6466

Table 6 - Speaker Audio Frequency Response

RX AUDIO P701-5 100 MV RMS FREQUENCY HZ	SPKR HI 4 OHM J901-1, 3 DB
300	- 0.5 ± .5
500	- 0.2 ± .5
1000	0 (REF)
2500	- 0.2 ± .5
3000	- 0.3 ± .5

RX Audio Muting To The RX Compressor/Ext Spkr Audio (MDR)

Muting the audio to the RX compressor is accomplished by HS_SPKR_MUTE (P701-7). When P701-7 is high, transistor Q602 is turned on. The collector of Q602 and the gate of FET Q601 are pulled low. A low on the gate of Q601 prevents audio from passing between the drain and source of the FET, muting the audio input to the RX compressor. Since the audio input to the 10 watt audio amplifier is generated from the RX compressor output, the external speaker audio is also muted under control of HS_SPKR_MUTE.

Audio Muting To 10 Watt Amplifier (MDR)

Muting the audio to the 10 watt audio amplifier is accomplished by EXT_SPKR_MUTE (P710-2). When P701-2 is low, transistor Q859 is turned off. The collector of Q859 rises to turn transistor Q860 on through pull up resistor R623. With Q860 on, the collector is low, turning off FET transistor Q854.

A second source used to mute the 10 watt audio amplifier is through external control EXT PTT (J901-15). When EXT PTT goes low, the line EXT SPKR MUTE is also brought low, muting the audio amplifier.

MDX RADIOS - AUDIO MUTE (J707-1) from the display board is used to mute the 10 watt speaker audio by tying into the gate of FET transistor Q854.

EXTERNAL OPTIONS (MDR)

There are three lines used for external options: external push-to-talk (J901-15), external MIC HI (J901-7), and audio mute (J901-12).

External Push-To-Talk

EXT PTT is used by external devices to activate the push to talk function on the radio. When this line is brought low by the external device, the external speaker audio is muted. This line is then sampled by the microcomputer on the audio/logic board to determine if an external device is activating a PTT function.

When the external speaker audio is enabled (EXT_SPKR_MUTE line high), sampling of the EXT PTT by the logic board detects the low going level and activates the PTT function.

When the external speaker audio is muted (EXT_SPKR_MUTE line low), the microcomputer samples the EXT PTT input on this line as follows. The microcomputer brings the EXT_SPKR_MUTE high for a short period of time. During this short period, the microcomputer reads the state of the line to determine if an external device is holding it low. After the brief sampling period, the microcomputer returns the EXT_SPKR_MUTE line to its original low state. Chatter to the external speaker audio amplifier during this sampling of the external push to talk input is prevented by the RC time constant consisting of R621, R622, and C620. When the sampling period is much shorter than the time constant at the input transistor Q859, this transistor does not turn on. The on time for this sampling is approximately one millisecond with the duty cycle of 12%.

External MIC HI

External MIC HI is used by external devices to inject audio on the transmit path of the radio. EXT_MIC_HI is summed with the handset TX audio prior to being fed to the TX compressor. This summing of audio allows customer devices to generate tones, data (i.e. FSK), or audio, and allows them to be passed through the transmitter of the radio.

Audio Mute

Audio Mute is used by external devices to mute the handset and speaker audio. Audio Mute is activated by customer devices to disable audio during periods of tone of data (i.e. FSK) signalling.

EXTERNAL OPTIONS (MDX)

External PTT, External MIC HI, Audio Mute, SW SPKR HI

These control lines are used by the standard external options supported, such as, T90/T99 encoder/decoder, universal tone cable, etc.

Jumper P7 on J7 selects the switched speaker audio from the system board. This is used with some options that switch speaker audio in and out during the encoding/decoding functions.

HANDSET POWER (MDR) AND DISPLAY BOARD (MDX) BACKLIGHT POWER FILTER

The handset power filter consists of transistor Q850 and associated circuitry. The RC filter consisting of R780, R781, C881, and C882, is a two-pole filter that filters out the ripple on the power supply leads. With the base of transistor Q850 having a steady DC level, the emitter of Q850 is also maintained at a steady DC level that is not affected by the current requirements of the handset.

With an input voltage of 13.8 volts, the power supplied to the handset is approximately 12 volts (J725-5) and current drain approximately 150 milliamps. The typical power supply ripple rejection from this filter is approximately 35 dB.

The handset power supply is turned on by the HS_PWR_ENBL line (P701-3) from the audio/logic board. Optionally, jumper J1/P1 can bypass the enable/disable function from the audio/logic board and supply handset power continuously.

The MDX radio uses this same power source to power the backlight on the display board and to the DTMF microphones.

HANDSET SERIAL DATA (MDR)

The handset communicates with the microcomputer through a 300 baud serial data link (TTL logic levels). Commands are inverted 8 bit ASCII bursts. When the handset display is updated, the microcomputer passes data over the DISPLAY_SERIAL line. When key presses are detected by the handset, the microcomputer receives data over the KEYPAD_SERIAL line. When data is not being transmitted, both lines remain high.

DISPLAY BOARD SERIAL DATA (MDX)

The display board is linked to the microcomputer on the audio/logic board through the serial data lines, DISPLAY_SERIAL (J707-6, P701-6), KEYPAD_SERIAL (J707-7, P701-1), and SERIAL_RQST (J707-2, P701-7).

If MTD/MVS protocol is being used, communication is at 9600 baud on DISPLAY_SERIAL and KEYPAD_SERIAL with SERIAL_RQST used to indicate survive requests from the display board to the audio/logic board.

The mode select line (J707-3) is sent to the display board to indicate MTD/MVS protocol at 9600 baud using SERIAL_RQST.

When the mode select line is at a TTL high (P3 installed on J3-1 and 2), the MTD/MVS protocol is invoked on the display board micro communications (used for MDX Dual Format, MDX-UHF, MDX-VHF). When the mode select line is at a TTL low (P3 on J3-2 and 3), the TMX-8825 protocol is invoked (used in the MDX GE-MARC radio).

When the handset display (MDR) is updated, the microcomputer passes data over the DISPLAY_SERIAL line. When key presses are detected by the handset, the microcomputer receives data over the KEYPAD_SERIAL line. When data is not being transmitted, both lines remain high.

RADIO ON/OFF CONTROL

The radio is turned on and off through the POWER SW control line from the handset (P1001-25) or the display board (J707-10). This control is derived from an independent button on the handset (no handset key press detection performed) or on the display board (no micro sampling performed).

This button press is a closure to ground and is passed to the system board (J901-9). A D-type flip-flop on the system board is used to control a power transistor that routes continuous battery power, A+, to the switched power line, SW A+.

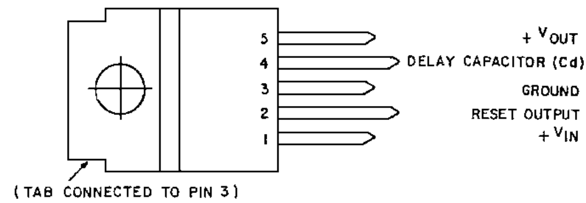
POWER DISTRIBUTION

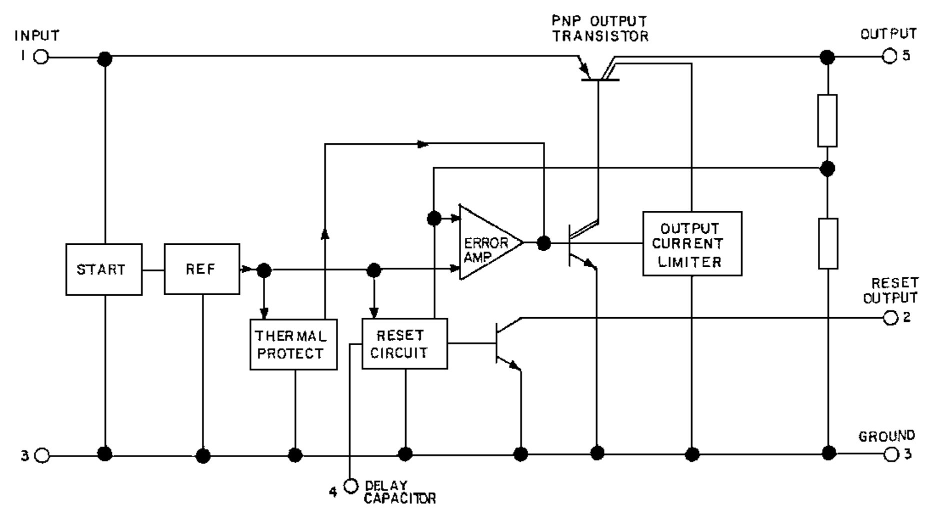
Switched power, SW A+, from the system board, (A5), feeds the audio amplifier board through J901-5,6. SW A+ supplies 13.8 volts (nominal) to the 10 watt audio amplifier, U801, 8 volt regulator, U804, the 5 volt regulator, U727, and the handset/display board power filter, Q850.

The 8 volt regulator, U804, supplies the power to the op amp, U803, the compandor, U802, the power up mute circuitry, Q857, Q858, and associated circuits.

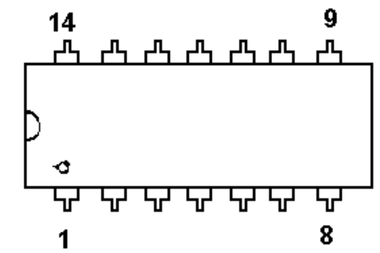
The 5 volt regulator supplies the power up reset and 5 volt power to the display board. The 5 volt supply is also used as a pull-up for various circuits on the audio amplifier board.

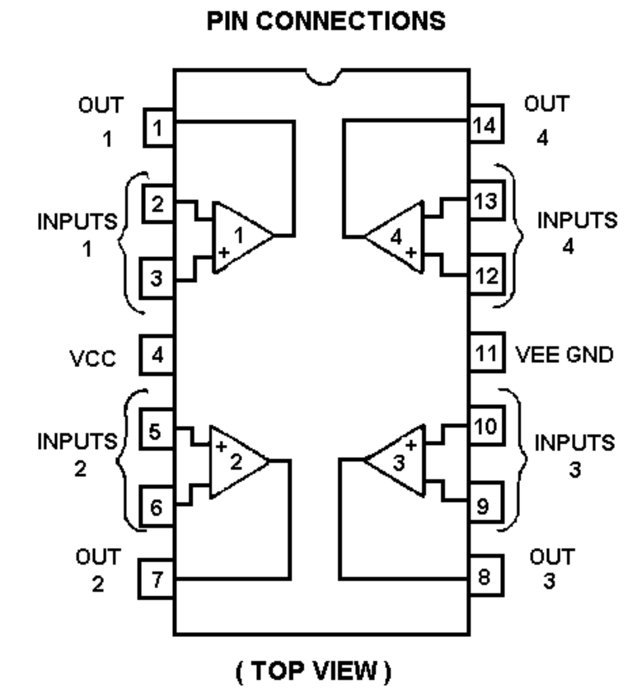
U727 5 Volt Regulator
19A704970P1



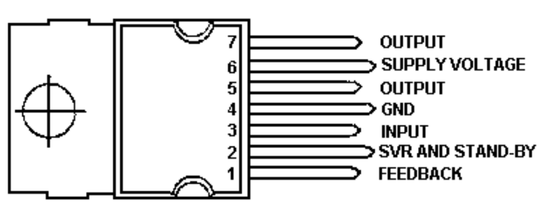


U803 Quad Operational Amplifier
19A704883P2

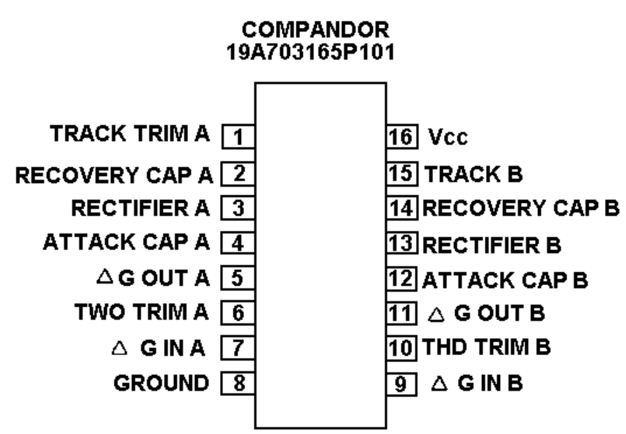




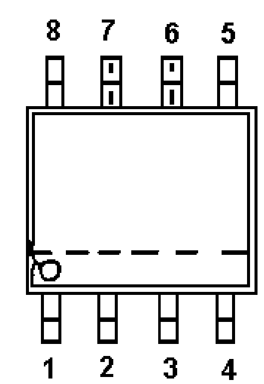
U801 Audio Amplifier
344A4186P1



U802 Dual Compandor
19A70165P101



U804 Voltage Regulator
19A704971P11



PIN	FUNCTION
1	Vout
2	GROUND
3	GROUND
4	N.C.
5	N.C.
6	GROUND
7	GROUND
8	Vin

PARTS LIST

AUDIO AMPLIFIER BOARD
19D904025G1 (MDR)
19D904025G2 (MDX)

SYMBOL	PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C301	19A702052P45	Ceramic: 0.22 µF ±10%. 16 VDCW.
C302 thru C305	19A705205P19	Tantalum: 2.2 µF ±20%, 10VDCW; sim to Sprague 293D.
C306	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C307	19A704879P1	Electrolytic: 100 µF, 6.3 VDCW.
C308	19A705205P206	Tantalum: 10 µF, ±20% 16 VDCW.
C309	19A705205P12	Tantalum: .33 µF, 16 VDCW; sim to Sprague 293D.
C310	19A704879P2	Electrolytic: 47 µF ±20%, 16 VDCW.
C601	19A702052P45	Ceramic: 0.22 µF ±10%. 16 VDCW.
C602 thru C605	19A705205P19	Tantalum: 2.2 uF ±20%, 10VDCW; sim to Sprague 293D.
C606	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C607	19A705205P206	Tantalum: 10 mF, ±20% 16 VDCW.
C608	19A704879P1	Electrolytic: 100 µF, 6.3 VDCW.
C609	19A705205P12	Tantalum: .33 µF, 16 VDCW; sim to Sprague 293D.
C610	19A702052P134	Ceramic: 0.1µF ±5%, 25 VDCW.
C611	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C612	19A705205P206	Tantalum: 10 µF, ±20% 16 VDCW.
C620	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C651 and C652	19A702052P134	Ceramic: 0.1µF ±5%, 25 VDCW.
C653 and C654	19A705205P21	Tantalum: 22 µF ±20%, 20VDCW; sim to Sprague 293D.
C701 thru C707	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C720	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C723	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C724	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C730	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C790	19A702052P45	Ceramic: 0.22 µF ±10%. 16 VDCW.
C791 and C792	19A705205P19	Tantalum: 2.2 µF ±20%, 10VDCW; sim t o Sprague 293D.
C793	19A702052P134	Ceramic: 0.1µF ±5%, 25 VDCW.
C794	19A705205P21	Tantalum: 22 µF ±20%, 20VDCW; sim to Sprague 293D.
C803 and C804	19A702052P45	Ceramic: 0.22 µF ±10%. 16 VDCW.
C810	19A702052P134	Ceramic: 0.1µF ±5%, 25 VDCW.
C880	19A703314P15	Electrolytic: 100 µF ±20%, 25 VDCW.
C881 and C882	19A705205P15	Tantalum: 33 µF, 16 VDCW; sim to Sprague 293D.
C883	19A705205P19	Tantalum: 2.2 µF, 10 VDCW; sim to Sprague 293D.
C884	19A705205P21	Tantalum: 22 µF ±20%, 20VDCW; sim to Sprague 293D.
C901	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C902	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C903 and C904	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C907 thru C909	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C910	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C911	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C912	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C914 thru C916	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C922 thru C924	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C925	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C926 thru C931	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C933	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C935 and C936	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1002 thru C1004	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1006	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
C1009	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1011	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1013 thru C1015	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1017 thru C1024	19A702061P61	Ceramic: 100 pF ±5%, 50 VDCW.
C1025	19A702061P77	Ceramic: 470 pF ±5%, 50 VDCW.
		- - - - - - - - - - - DIODES - - - - - - - - - -
D652	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
		- - - - - - - - - - - JACKS - - - - - - - - - - -
J1	19A703248P11	Post: Gold Plated, 10 mm length.
J3	19A703248P11	Post: Gold Plated, 10 mm length.
J7	19A703248P11	Post: Gold Plated, 10 mm length.
J707	19A703248P11	Post: Gold Plated, 10 mm length.
J801	19A704852P132	Printed wire board, two-part; sim to Molex 22-12-2024.
J901	19A703248P11	Post: Gold Plated, 10 mm length.
J1102	19A703248P11	Post: Gold Plated, 10 mm length.
		- - - - - - - - - - - PLUGS - - - - - - - - - - -
P1	19A702104P2	Connector: Shorting Jumper, Gold Plated. (Housing Color: White).
P3	19A702104P2	Connector: Shorting Jumper, Gold Plated. (Housing Color: White).
P7	19A702104P2	Connector: Shorting Jumper, Gold Plated. (Housing Color: White).
P701	19B209727P31	Connector, shielded: 9 contacts sim to 74951-1.
P1001	19B209727P58	Connector, 25 position with 25 press fit contacts; sim to 745628-2. (Used in G1).
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q601	344A4183P1	N-Channel FET: sim to MMBF5484LT1.
Q602	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q790	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q850	19A702503P2	Silicon, NPN: sim to 2N4401.
Q851	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q852	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q854	344A4183P1	N-Channel FET: sim to MMBF5484LT1
Q855	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q857 thru Q860	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R301	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R302	19A702931P368	Metal film: 49.9K ohms ±1%, 200 VDCW, 1/8 w.
R303	19A702931P383	Metal film: 71.5K ohms ±1%, 200 VDCW, 1/8 w.
R304	19A702931P401	Metal film: 100K ohms ±1%, 200 VDCW, 1/8 w.
R305	19B801251P102	Metal film: 1K ohms ±5%, 1/10 w.
R306	19B801251P274	Metal film: 270K ohms ±5%, 1/10 w.
R307	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R308	19B801251P100	Metal film: 10 ohms ±5%, 1/10 w.
R601	19B801251P104	Metal film: 100K ohms ±-5%, 1/10 w.
R602	19A702931P368	Metal film: 49.9K ohms ±1%, 200 VDCW, 1/8 w.
R603	19A702931P337	Metal film: 23.7K ohms ±-1%, 200 VDCW, 1/8 w.
R604	19A702931P418	Metal film: 150K ohms ±1%, 200 VDCW, 1/8 w.
R605	19B801251P102	Metal film: 1K ohms ±-5%, 1/10 w.
R606	19B801251P274	Metal film: 270K ohms ±5%, 1/10 w.
R607	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R608 thru R610	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R611	19B801251P100	Metal film: 10 ohms ±5%, 1/10 w.
R613	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R614	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R615 thru R617	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R620	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R621	19B801251P563	Metal film: 56K ohms ±5%, 1/10 w.
R622	19B801251P223	Metal film: 22K ohms ±5%, 1/10 w.
R623 and R624	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R651	19B801251P682	Metal film: 6.8K ohms ±5%, 1/10 w.
R652	19B801251P472	Metal film: 4.7K ohms ±5%, 1/10 w.
R653	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R780 and R781	19B800607P470	Metal film: 47 ohms ±5%, 1/8 w.
R782	19B800607P222	Metal film: 2.2K ohms ±5%, 1/8 w.
R783	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R784 and R785	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R786	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R787	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R790 and R791	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R795 and R796	19B801251P473	Metal film: 47K ohms ±5%, 1/10 w.
R797 thru R799	19B801251P104	Metal film: 100K ohms ±5%, 1/10 w.
R801 and R802	344A4173P1R0	Metal film: 1 ohm ±5%, 1 w.
R803 and R804	19B801251P2R2	Metal film: 2.2 ohms ±5%, 1/10 w.
R810	19B801251P103	Metal film: 10K ohms ±5%, 1/10 w.
R811	19B801251P184	Metal film: 180K ohms ±5%, 1/10 w.
R880	344A4173P110	Metal film: 110 ohms ±5%, 1 w.
R904	19B801251P1	Jumper. (Used in G2).
R905	19B801251P1	Jumper. (Used in G1).
R906	19B801251P1	Jumper.
R907 thru R909	19B801251P1	Jumper. (Used in G1).
R910 and R911	19B801251P1	Jumper. (Used in G2).
		- - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U727	19A704970P1	Linear: 5 Volt Regulator with Reset Output; sim to SGS L387.
U801	344A4186P1	Audio Amplifier, 20 watt bridge; sim to TDA7240AH.
U802	19A703165P101	Compandor:Dual Programmable; sim to NE572.
U803	19A704883P2	Digital: Quad Op Amp; sim to MC3303D.
U804	19A704971P11	Linear: 8-Volt Regulator; sim to MC78LO8ACD.

*COMPONENTS ADDED , DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts affected by these revisions.

REV. A - Audio Amplifier Board 19D904025G1

Change for desk top applications and fix display board whine in audio path.
Deleted R708 (19B800607P1) and R903 (19B801251P1).
Changed C794 to 19A705205P21, 22 µF, 20V, Tantalum.
Added C904, Ceramic, 100 pF, 50V (19A702061P61).
Added C724, Ceramic, 470 pF, 50V (19A702061P77).
Added C884, Tantalum, 22µF, 20V (19A705205P21).
Added C935 and C936, Ceramic, 100pF, 50V (19A702061P61).

REV. A - Audio Amplifier Board 19D904025G2

Change for desk top applications and fix display board whine in audio path.
Deleted R708 (19B800607P1) and R903 (19B801251P1).
Changed C794 to 19A705205P21, 22 µF, 20V, Tantalum.
Added C904, Ceramic, 100 pF, 50V (19A702061P61).
Added C724, Ceramic, 470 pF, 50V (19A702061P77).
Added C884, Tantalum, 22µF, 20V (19A705205P21).
Added C935 and C936, Ceramic, 100pF, 50V (19A702061P61).
Added R910 and R911 Metal Film chip, 0 ohms (19B801251P1).
Deleted R902 (19B801251P1).

REV. B - Audio Amplifier Board 19D904025G1, G2

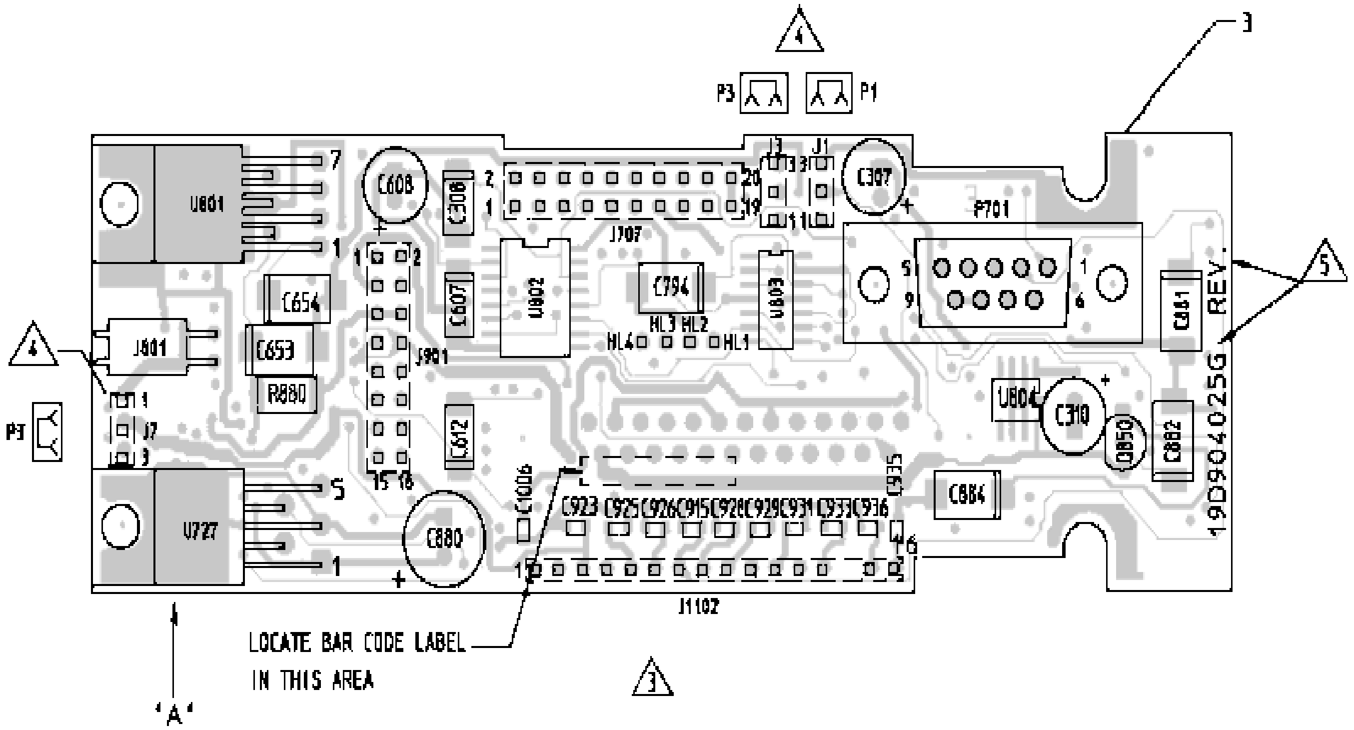
To improve handset sensitivity.
Changed R303 to 19A702931P383, Metal Film, 71.5k ohms.
Changed R304 to 19A702931P401, Metal Film, 100k ohms.

REV. C - Audio Amplifier Board 19D904025G1, G2

To eliminate high frequency oscillation and noise in handset audio.
C724 was 470pF, 50V, Ceramic (19A702061P77).

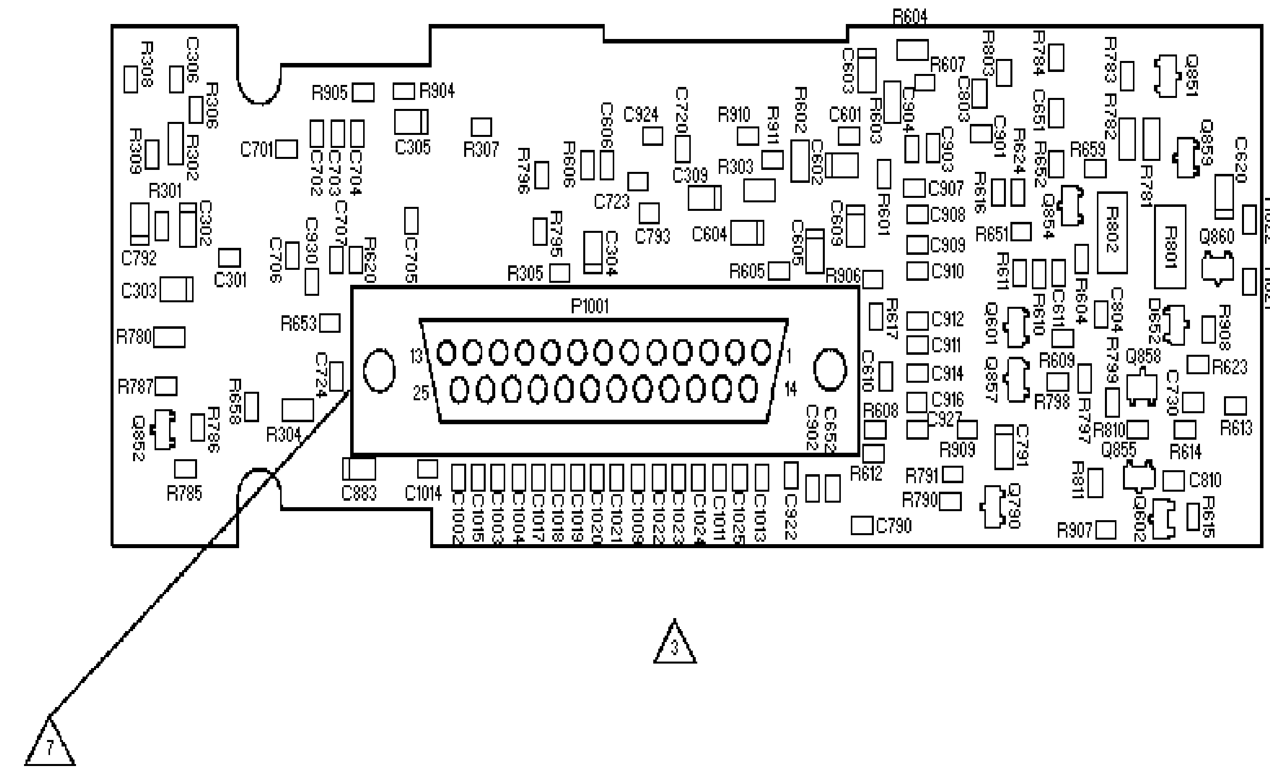
REV. D - Audio Amplifier Board 19D904025G1, G2

To prevent damage to R614 when mounting in casting. R614, R615 and C730 relocated on board.



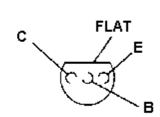
VIEW FROM COMPONENT SIDE

(19D904025, Rev. 8)



(19D904025, Rev. 8)

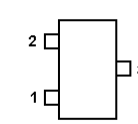
LEAD IDENTIFICATION FOR Q850



IN - LINE TOP VIEW

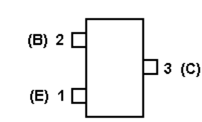
NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION

LEAD IDENTIFICATION FOR D651 & D652



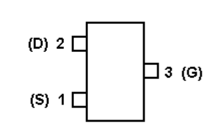
TOP VIEW

LEAD IDENTIFICATION FOR Q602, Q790, Q851-Q853, Q855, & Q860

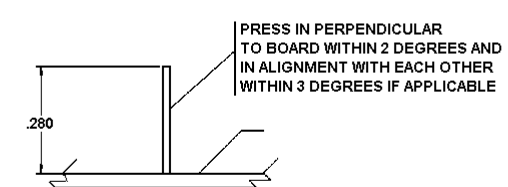


TOP VIEW

LEAD IDENTIFICATION FOR Q601 & Q854



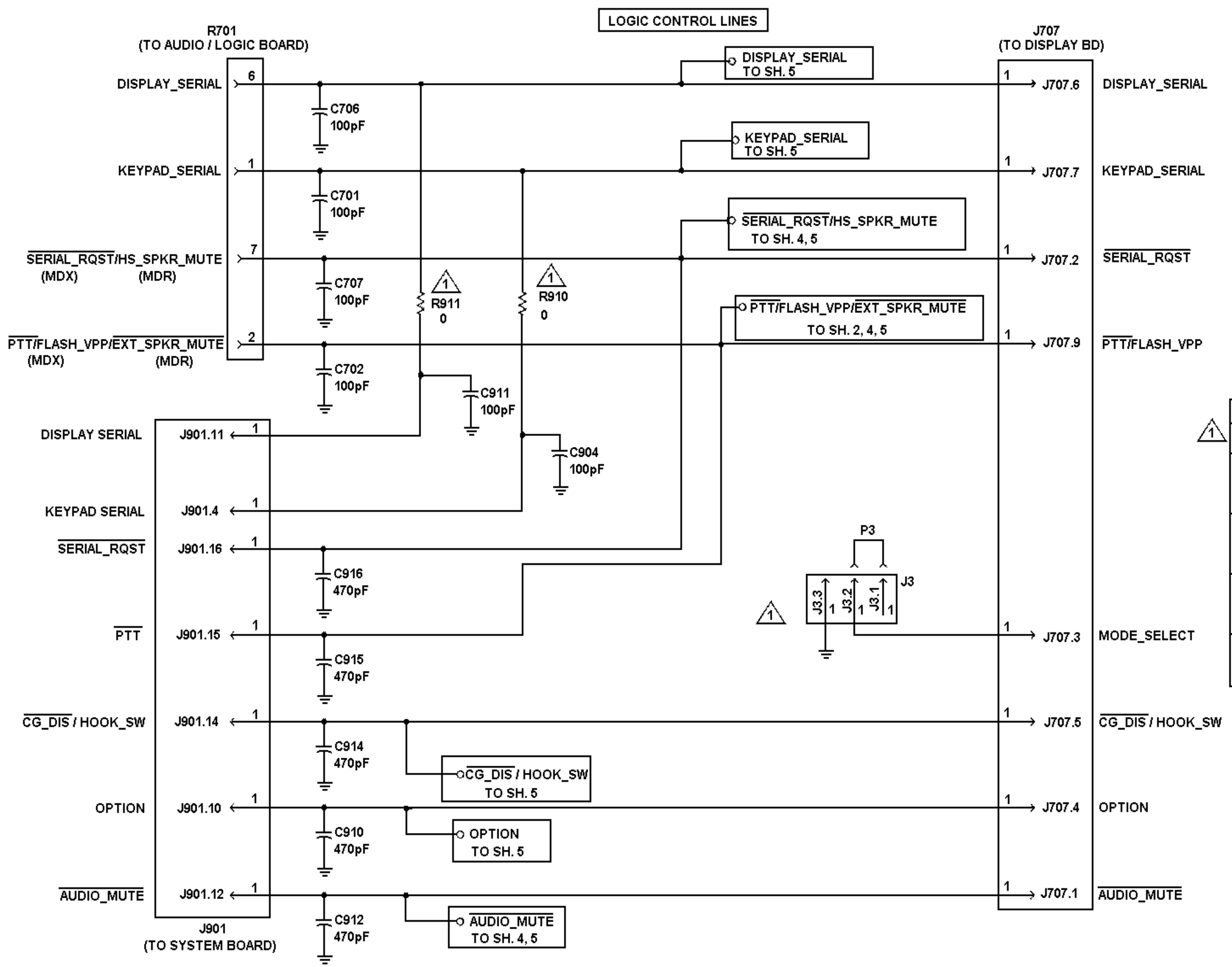
TOP VIEW



MOUNTING FOR J1, J3, J7, J707, J901, & J1102

AUDIO AMPLIFIER BOARD
19D904025G1, 2

SCHEMATIC DIAGRAM



RESISTOR VALUES ARE IN OHMS UNLESS FOLLOWED BY A MULTIPLIER K OR M. CAPACITOR VALUES IN F UNLESS FOLLOWED BY A MULTIPLIER U, N OR P. INDUCTANCE VALUES IN H UNLESS FOLLOWED BY A MULTIPLIER M OR U.

THIS SCHEMATIC DIAGRAM APPLIES TO	
MODEL NO.	REV LETTER
19D904025G1	D
19D904025G2	D

JUMPER TABLE (1)

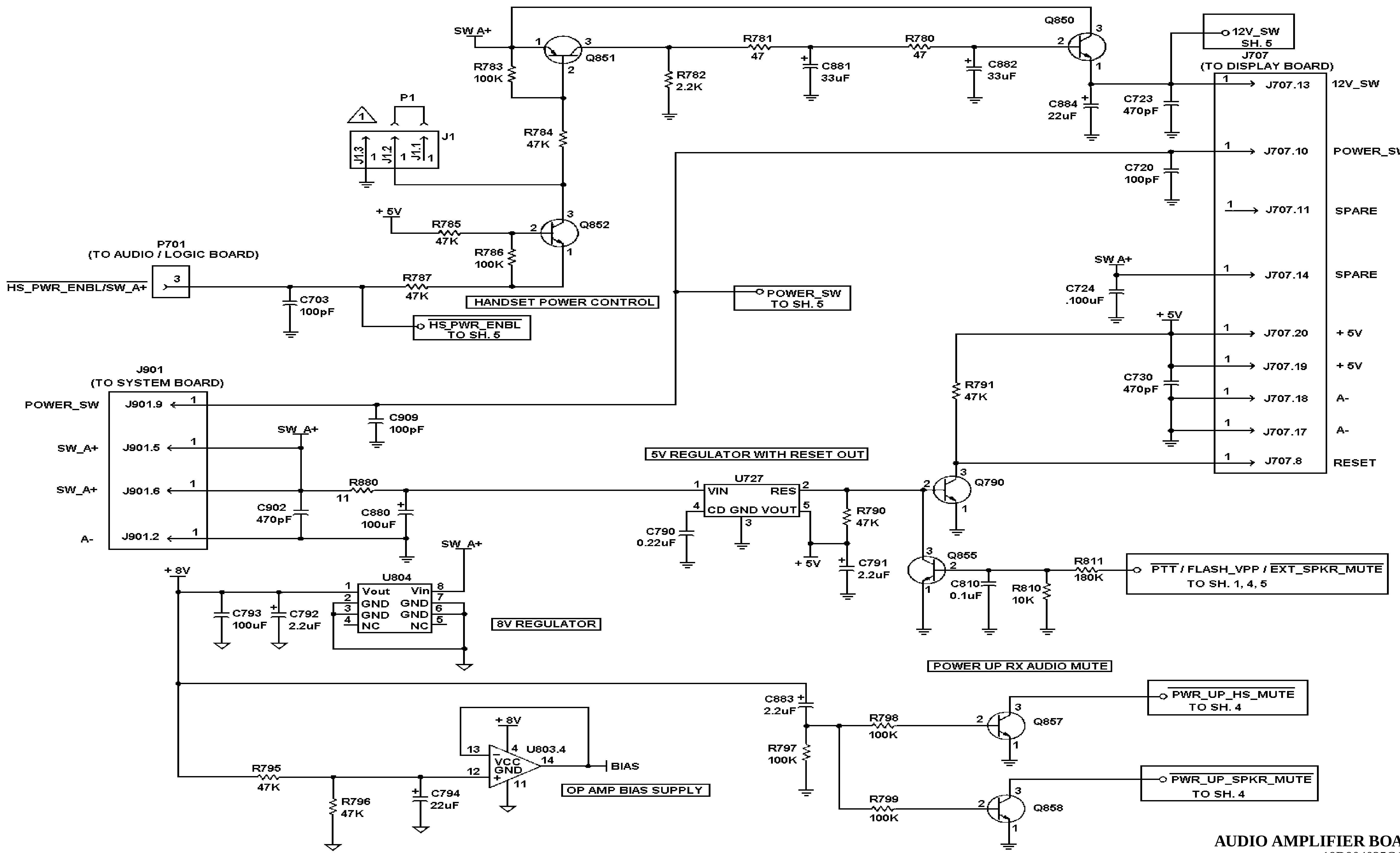
JUMPER	POSITION	FUNCTION RADIO	APPLICATION
J1 / P1	1, 2	12V SW POWER CONTROLLED	MDX-DM, MDR-DM, MDX CONV, MDR GE-MARC
	2, 3	12V SW POWER ON	MDX GE-MARC
J3 / P3	1, 2	MODE SELECT HIGH FRONT PANEL	MDX-DM, MDR-DM, MDX CONV, MDR GE-MARC
	2, 3	MODE SELECT LOW FRONT PANEL	MDX GE-MARC
J7 / P7	2, 3	SWITCHED SPKR HI AUDIO	MDX-DM, MDR-DM, MDX CONV, MDX GE-MARC, MDR GE-MARC
	1, 2	SPKR HI AUDIO AND SWITCHED SPKR HI	MDX LT-DM AND REMOTE MOUNT APPLC.

R904, R612, R658, R309 AND R659 ARE NOT PRESENT IN GROUP 1
R905, R907, R908, R909, R612, R658, R309 AND R659 ARE NOT PRSENT IN GROUP 2.

(2) HL_1 THROUGH HL_3 NOT USED.

(4) REMOTE MOUNT APPLICATION
J1102 PIN 14 NOT INSTALLED.
J1102 PINS 15, 16 NOT USED.
OPTIONS CABLE INSTALLED
J1102 PINS 1-13.

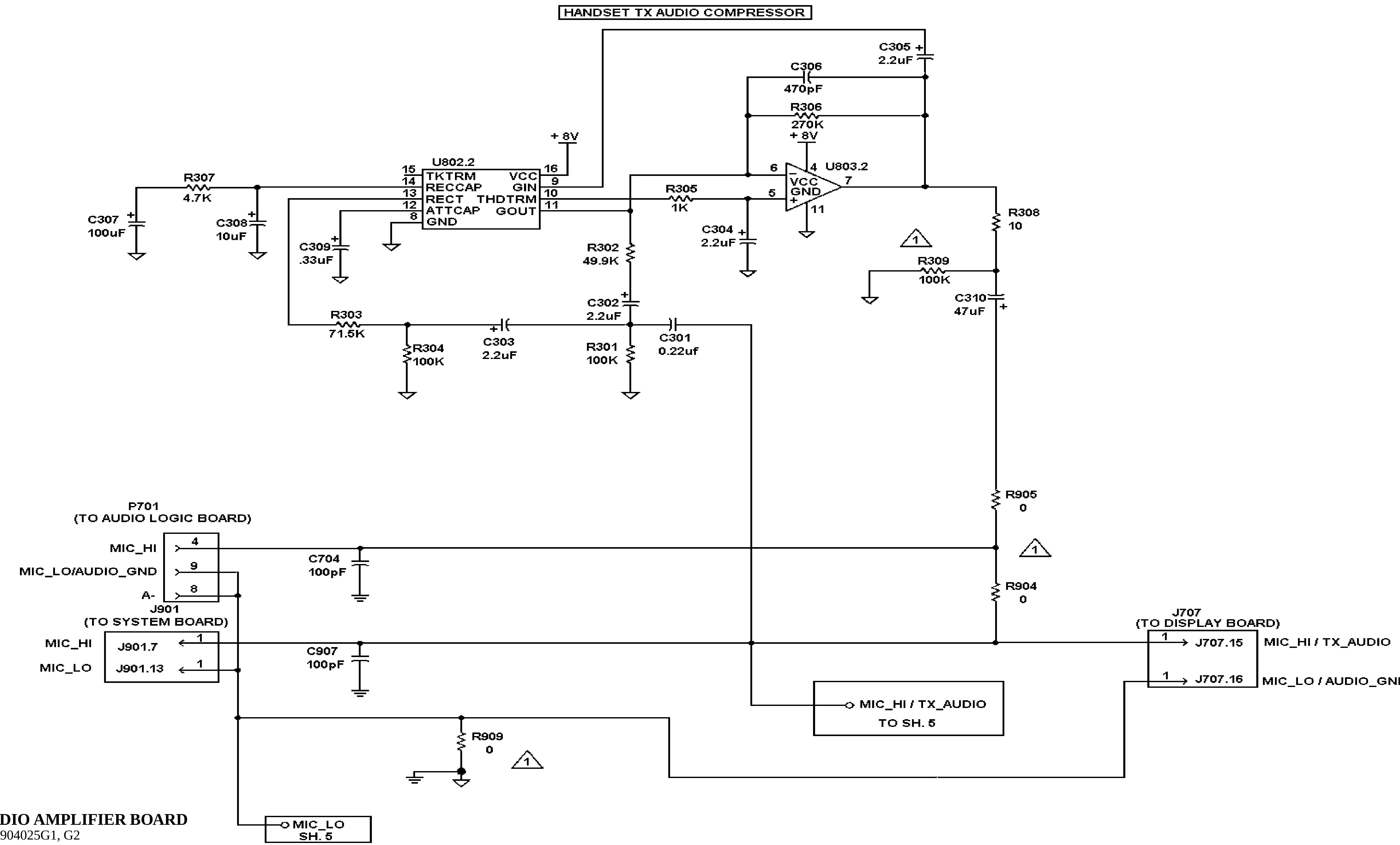
AUDIO AMPLIFIER BOARD
19D904025G1, G2
(19D904024, Sh. 1, Rev. 7)



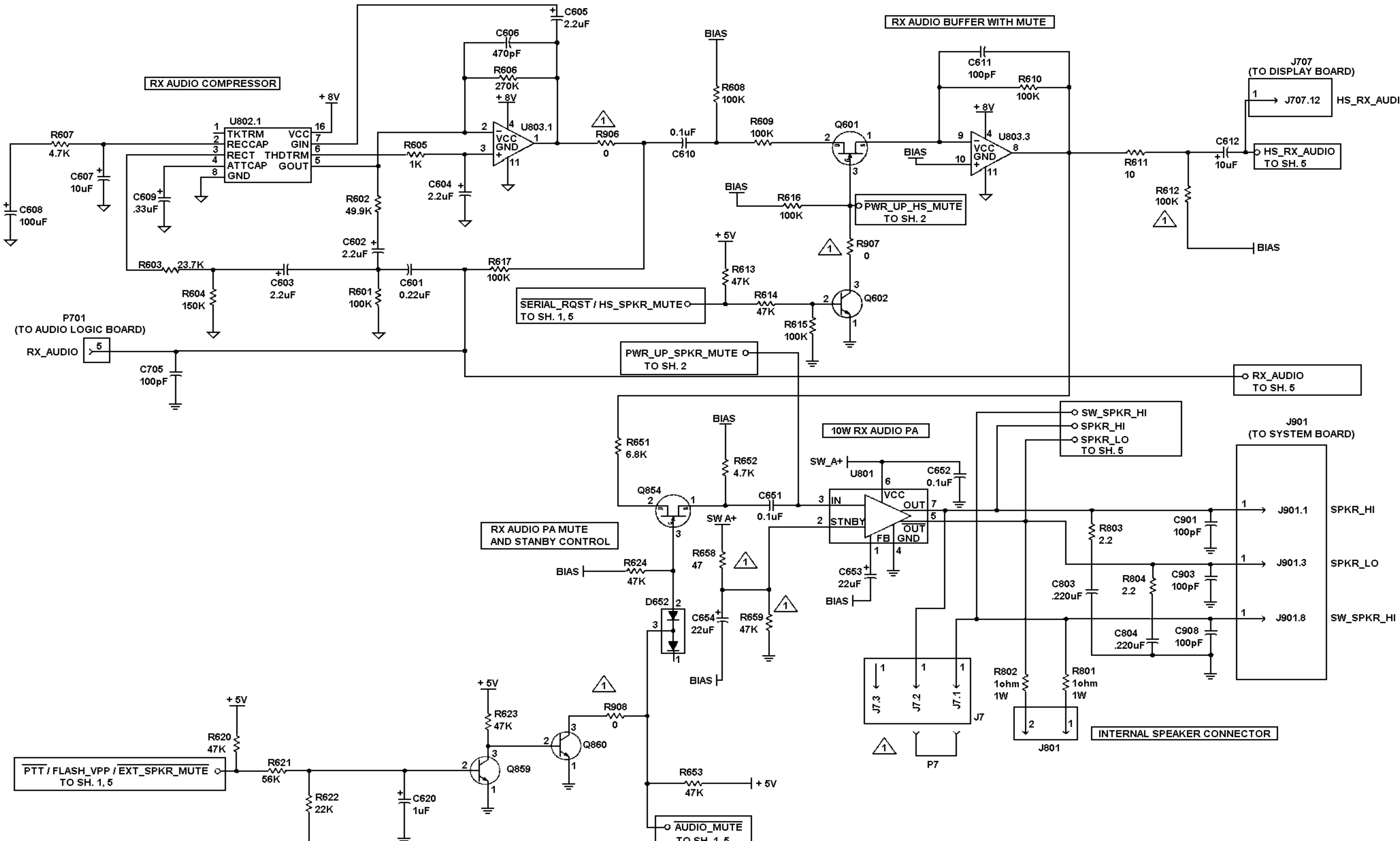
AUDIO AMPLIFIER BOARD

19D904025G1, G2

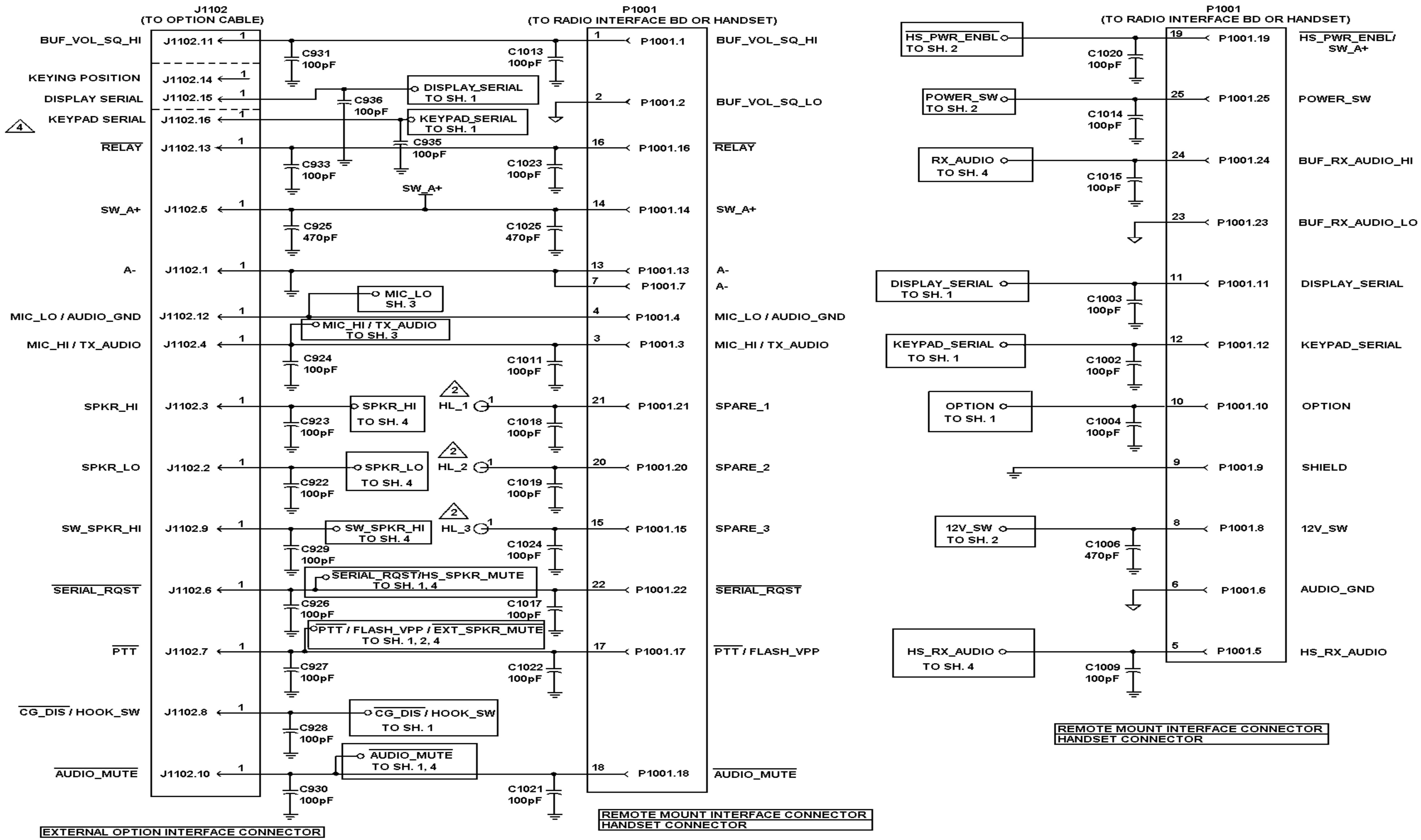
(19D904024, Sh. 2, Rev. 7)



AUDIO AMPLIFIER BOARD
19D904025G1, G2
(19D904024, Sh. 3, Rev. 7)



AUDIO AMPLIFIER BOARD
19D904025G1, G2
(19D904024, Sh. 4, Rev. 7)



AUDIO AMPLIFIER BOARD
19D904025G1, G2
(19D904024, Sh. 5, Rev. 7)

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