MAINTENANCE MANUAL
DUAL FORMAT PCS™ RADIO
FRONT ASSEMBLY

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DESCRIPTION

The two versions of the PCS Dual Format radio are determined by the radio's Front Assemblies. The System model requires a 19D902177G13 Front Assembly and the Scan model requires a 19D902177G15 Front Assembly. Each front assembly consists of the following:

- Front Cap Assembly -19D902180G6 (SYSTEM)
  -19D902180G8 (SCAN)
- Audio/Logic Board -19D903568G1
- **M**etal **O**ver **E**lastomer (MOE) Connector -19A705662P1
- Holder -19B801570P2

ERICSSON

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FRONT CAP ASSEMBLY

The Front Cap Assembly includes the control assembly, the speaker, the SYSTEM or the SCAN versions of the LEXAN front housing, and the keypad board.The control assembly contains the Control Frame, the Liquid Crystal Display (LCD), and the microphone. The Control Frame acts like a three dimensional printed circuit board. The base material consists of "ULTEM" molded plastic with a two layer printed circuit pattern on the outside perimeter of the frame. The Control Frame interfaces with the following:

- Control Switches (Channel, Volume, PTT, & Clear/Monitor)
- Liquid Crystal Display Module (LCD)
- Microphone
- Speaker

User Device Connector (UDC)

The Control Assembly mounts inside the front housing. The front housing contains either the SYSTEM or SCAN keypad boards which hold either the 3 or 12 key rubber keypads in Place. The housing also contains the speaker.

The Audio/Logic Board mounts inside the front housing on top of the speaker. The Metal Over Elastomer (MOE) connector provides the interface between the printed runs on the control frame and the printed runs on the Audio/Logic Board.

AUDIO/LOGIC BOARD

The Audio/Logic board 19D903568G1 is common to both the SYSTEM and the SCAN versions of the PCS radio. The board mounts in the Front Cap Assembly and connects to all Front Cap control switch lines through the MOE interface connector. The SYSTEM keypad board connects to the Audio/Logic Board using a 5 conductor ribbon cable and the SCAN keypad board uses a 4 conductor cable.

A single microprocessor on the board controls the operation of the radio. The processor scans the control switches and issues commands to the RF board and the LCD module. Microphone and speaker audio is also transferred through the MOE connector.The Audio/Logic Board circuitry consists primarily of the following:

- Microprocessor
- Modem
- Flash Memory
- Personality EEPROM
- Audio Signal Processor (ASP) (RX and TX audio)

CIRCUIT ANALYSIS

FRONT CAP ASSEMBLY

Control Switches

The control switches include the PTT, Clear/Monitor, Channel Up/Down and Volume Up/Down controls. A **"dome"** switch pad adheres to the control frame with domed metal switches. When pressed, these switches make direct contact with the runs on the control frame. A rubber keypad fits over the switch assembly for operator interface and weather protection. The switch lines connect to J901 of the Audio/Logic Board through the MOE connector.

All the switch lines are pulled high to +5 Vdc through resistors on the Audio/Logic Board. The switch lines are active low by switch grounding the microprocessor input line when the key is pushed. The PTT line is also used as an output, serving as the serial TX DATA line to send data to the computer when programming.

Liquid Crystal Display (LCD)

The LCD assembly consists of LCD driver board A1, a diffuser, two zebra strips, the LCD and a lens. The LCD assembly is held together by the lens. The primary function of the board is to drive the individual segment lines of the LCD. Serial display data from the Audio/Logic Board microprocessor is sent to the driver board on the IIC DATA and IIC CLK lines (**I**nter **I**ntegrated **C**ircuit Bus). The data is converted by U1 to drive the LCD.

Another function of the driver board is to provide back lighting of the LCD module using four LED devices (CR1-CR4). The LEDs are controlled by the BACKLIGHT line which is a logic switch output from the Audio Signal Processor (ASP) U804-14.Q1 and Q2 buffer the active high BACKLIGHT line to turn on the LEDs. The diffuser placed immediately above the LEDs evenly distributes the light. The zebra strips connect the driver board to the LCD, and the entire assembly plugs into the control frame using six pins (P1 and P2).

Keypad Boards

The SCAN and SYSTEM versions of the PCS radio use different keypad boards.

SCAN:

The SCAN version has a simple 3-key keypad. No parts are present on this keypad board. For a schematic diagram, refer to the Interconnect Diagram for the SCAN version in the PCS Service Section Manual.

The 3 keys and ground of the SCAN keypad are directly connected through a 4 conductor ribbon cable to the Audio/Logic Board on J802. Each key connects to an individual input to the microprocessor. The lines are pulled high to +5 Vdc through resistors on the Audio/Logic Board.

SYSTEM:

The SYSTEM version Keypad Board (19C852173G1) has a 12-key keypad. Refer to the schematic of the Keypad Board in this manual. The keys connect to U780 and U781 shift registers on the board. The microprocessor on the Audio/Logic Board continuously scans the keypad by serially shifting data out of the registers.

The SYSTEM version Keypad Board receives +5 Vdc, ground, and 3 signal lines through a 5 conductor ribbon cable from J802 of the Audio/Logic Board. The same 3 lines which were used with the SCAN keypad are now used to serially clock the data out of the shift registers. 16 bits of information are clocked out of the 2 registers when the keypad is checked by the microprocessor. The first 4 bits are hardwired to 1-0-1-0 followed by the 12 bits of active low keys.

Microphone and Speaker

The microphone (B901) mounts directly onto the control frame (HL1 and HL2). The microphone receives audio through the hole in the front housing.

The speaker (B902), mounted in the front housing, connects to the control frame (HL3 and HL4) through 2 wires. A protective grill is placed in the front housing before the speaker is mounted to screen out foreign material.

User Device Connector (UDC)

Part of the control frame forms UDC connector J902 for customer programming and for connecting external options. J902 provides speaker, microphone, PTT, and ground connections. The mic lead and one of the speaker leads are switched to the UDC only when microswitches S1 and S2 are operated. These switches are activated by plungers on compatible PCS Personal Radio options. A rubber boot is placed over this connector for weather protection.

The **PTT** and **MIC HI** leads on the UDC are also used for **TX DATA** and **RX DATA** for serial communication during PC programming. See the personality EEPROM circuit description for the Audio/Logic Board.

AUDIO/LOGIC BOARD

The schematic diagram for the Audio/Logic Board is divided into 5 sheets. The first sheet contains all input/output connections for the board at J801, J802 and J901. Two bus lines distribute the signal lines to the other 4 sheets. The LOGIC I/O BUS connects to the logic circuitry on sheet 2.The AUDIO I/O BUS connects to the audio circuitry on sheets 3, 4 & 5.

The second sheet of the schematic contains all of the logic circuitry. Signal lines which leave the board are on the **LOGIC I/O BUS** to sheet 1. Signal lines to the Audio Signal Processor (ASP) are on the **ASP I/O BUS** to sheets 3, 4 & 5. These last 3 sheets of the schematic contain all of the audio circuitry of the board.

5 Volt Regulator U801 (sheet 1)

A single 5 volt regulator U801 supplies all circuitry on the board (except OP Amp U301 and Audio PA U603). The regulator receives input voltage from the battery (nominally 7.5 Vdc) on J801-4. D801 on J801-4 provides reverse polarity protection.

The regulator also provides a reset signal if the input voltage falls below 5.2 Vdc. At this point, the regulator will begin to fall out of regulation and pin 5 will switch LOW (to ground). This LOW will discharge capacitor C802 and turn ON Q804. Q804 provides the active HIGH reset signal to Modem U702.

When the input voltage to the regulator exceeds 5.2 Vdc (as when the radio is first turned ON), pin 5 switches to a high impedance state. C802 provides a reset pulse delay by charging through R806 and R807. When C802 charges to greater than 4.3 Vdc, Q804 turns OFF to release the reset signal to the Modem.

Personality EEPROM U802 (sheet 1)

A 2048 X 8 bit EEPROM U802 stores all customer frequencies, tones and option information. Tracking data aligned with the RF Board is stored for the transmit high power level, transmit low power level, mic deviation, data deviation and squelch.

The personality information in the EEPROM matches the unique number in Serial Number ROM U706. See the circuit description on the Serial Number ROM.

NOTE

If replacement of U802 personality EEPROM or U706 Serial Number ROM is necessary, contact Ericsson Inc. Customer Service to obtain programming information.

The microprocessor serially communicates with the EEPROM on the **IIC CLK** and **IIC DATA** lines (or the **I**nter **I**ntegrated **C**ircuit Bus). Programming of the EEPROM is accomplished without opening the radio by communicating with the microprocessor through the UDC connector.

The **MIC HI** lead of the UDC connector is the **RX DATA** line which receives data from the programming computer. The PTT lead is the **TX DATA** line to the computer. With no external signal connected to **MIC HI**, a 2.5 Vdc bias voltage rests on this pin. Op amp U601.2 (on sheet 5) is setup as a comparator to sense the DC level on the **MIC HI** lead. The output of the op amp is normally at a logic high level. When data pulls the **MIC HI** line low (below 1 Vdc), the op amp output switches low. The active low output (PROG RX DATA) feeds Microprocessor U701-31.

To PC program the EEPROM, the radio must be placed into PC programming mode before communicating serially on the **MIC HI** and **PTT** lines. Software checks the status of the volume and channel switches at power up. If one of the volume switches (UP or DOWN) along with one of the channel switches (UP or DOWN) are pushed simultaneously at power up and then released, the radio enters PC programming mode. Power must be recycled OFF/ON to reset the radio to leave programming mode.

DTMF Encoder U803 (sheet 1)

DTMF (Dual Tone Multifrequency) tones are generated by U803. Reference clock oscillator Y801 (3.579545 MHz) only runs while a tone is being generated with the transmitter keyed. The encoder's oscillator is disabled by software to prevent harmonic and other spurious energy from interfering with the radio receiver. When a software command is sent in transmit to generate a tone, the clock oscillator recovers after 3 ms and enables the DTMF generator.

The microprocessor serially communicates with the DTMF encoder on the **IIC CLK** and **IIC DATA** lines. The generated tones from pin 5 are sent to the RX audio path (for speaker sidetone) on ASP U804-29 (sheet 4). They are also sent to the TX audio path on ASP U804-73 (sheet 5).

Low Battery Sense (sheet 1)

When the battery voltage drops below approximately 6.3 Vdc, the BT pixel on the LCD turns on. R801 and R802 divide the battery voltage to one half. This low battery sense voltage is sent to microprocessor U701 pin 44. This pin is an analog input port to the microprocessor which is used to measure the voltage level. D710 protects the microprocessor from over voltage conditions on the battery line.

Microprocessor U701 (sheet 2)

A single microprocessor (U701) controls the operation of the PCS radio. All microprocessor lines which connect to the analog portion of the board or connect externally to the board are first RF bypassed by RC circuits. Most of these RC circuits are shown on the other sheets of the schematic but are physically located as close as possible to each microprocessor pin on the bottom of the PC board.

The microprocessor contains internal "masked" software code to handle the programming of Flash Memory U703. For normal radio operation, this software code is not needed. The microprocessor normally executes the radio software code in the Flash memory. The external address pin 56 is normally low to address the Flash memory. The internal memory is only used during Flash programming. See the Flash Memory description below.

To check the operation of the microprocessor, check that the buffered 11.0592 MHz clock from Modem U702 is present on pin 52. The **ALE** output line (pin 55) should then run continuously at 1.8432 MHz (0.54 µs period on a scope). The **PSEN** output (pin 54) also runs continuously at the same frequency; however, **PSEN** rests at 5 volts when 12 Vdc is applied to the radio during Flash Memory programming.

Flash Memory U703 (sheet 2)

The radio operating system software for the microprocessor resides in U703, a 128 kilobyte Flash Memory device. The Flash Memory allows easy reprogramming of the radio software for additional features and software upgrades without opening the radio or removing standard EPROMs.

The Flash Memory may be reprogrammed through the same PC computer interface that programs the personality EEPROM. See the previous section on the personality EEPROM for a description on the PC data interface.

When the Flash Memory is programmed, 12.0 ±4.5 Vdc is applied to the battery terminals. This voltage is sensed by Q801/Q802 and is applied to the Flash. Also this voltage is divided down to 5V by R726/R727 to feed the external address pin 56 of the microprocessor. With this pin high, the internal "boot code" software masked inside the microprocessor is executed. This "boot code" software handles running the microprocessor to serially communicate with the PC computer to program the Flash.

WARNING

The Flash Memory requires a precise voltage of 11.5 to 12.5 volts for proper programming. This voltage is applied to the radio's normal battery terminals. Damage to the Flash Memory as well as other devices will result if the battery voltage exceeds 12.5 volts.

The radio checks for 12 volts, only at power-up. The supply voltage must be at 12 volts within 20 ms after power-up to prevent U701 from disabling Q801. U701-9 is low at power-up to enable the Q801 sensing circuit. Pin 9 remains low if pin 56 is high. If Q801 does not sense 12V, pin 56 will be low, causing the radio software to immediately switch pin 9 high to disable Q801. Disabling Q801 prevents any momentary high battery voltage conditions from executing instructions out of the internal "boot code" software.

NOTE

12V must be applied to the radio with a fast rise time (within 20 ms). Some power supplies rise too slowly when turned on. If the radio powers up in normal operating mode, manually connect 12V to the radio with the supply already on.

Modem U702 (sheet 2)

Modem U702 performs several functions. The modem's chief function is to perform the serial to parallel and parallel to serial data conversion for receiving and transmitting data respectively. Limited high speed data from ASP U804 (sheet 4) feeds U702-23. Data for transmission on U702-26 is sent to the transmit audio portion of the ASP (sheet 5).

The modem contains a latch which is used with the microprocessor **ALE** (address latch enable) line to demultiplex the address/data bus from the microprocessor. Address information (A0-A7) is separated from the address/data bus and then sent to the Flash Memory and the RAM.Another function of the modem is to provide an address decoder for selecting the modem and the RAM. Q704.1 and Q704.2 form a NAND gate which enables the decoder (active high) on U702-24 whenever the read or write lines are active low.

The modem also provides the reset signal (U702-43) for the microprocessor and the ASP. The active high reset is inverted by Q703 to be sent to the active low reset inputs of the microprocessor (U701-30) and the ASP (U804-9). A 2 second "watch dog timer" inside the modem must be continually reset by the operating software or a 50 ms reset pulse will be sent to the microprocessor if a software failure occurs. Also, the modem receives the reset signal from the 5 volt regulator (U702-33) which is passed to the microprocessor reset.

The 11.0592 MHz clock oscillator is also provided by the modem using Y701. The buffered clock signal (U702-15) is sent to the microprocessor and the ASP. Q702 can provide a clock frequency shift if needed. Normally Q702 is turned off with C735 out of the oscillator circuit (except for the off capacitance of Q702). If a harmonic of the logic circuitry falls on a receiver channel, the clock can be shifted to move the interference.

Serial Number ROM U706 (sheet 2)

The Serial Number ROM (Read Only Memory) U706 contains a unique 48 bit number which is read by the microprocessor at power up. A single pin on the device provides serial communication with the microprocessor as well as +5 Vdc power through R728.

For proper radio operation, the unique serial number must match the personality information in EEPROM U802. Replacing either device may disable operation on all programmed EDACS systems. Conventional and GEMARC systems will continue to function normally. The radio must be reprogrammed based upon the serial number.

NOTE

If replacement of U706 Serial Number ROM or U802 personality EEPROM or is necessary, contact Ericsson Inc. Customer Service to obtain programming information.

RAM U707 (sheet 2)

U707 is a high speed static RAM (Random Access Memory) providing 8 kilobytes of temporary data storage for the microprocessor. The RAM receives the lower 8 bits of address (A0-A7) from the demultiplexer latch inside the modem. Chip select (pin 20) is also provided by the address decoder in the modem.

Audio Signal Processor (sheets 3, 4, & 5)

The Audio Signal Processor (ASP) U804 handles nearly all audio functions in the PCS radio. Three sheets of the schematic diagram divide the ASP into three major blocks. A simplified block diagram of the ASP internal circuitry is shown on each schematic sheet for reference. Internal audio switches, filters, controls, etc. are labeled with the ASP software register states (High or Low) for reference only.

EDACS & Conventional Modes RX Audio (sheet 4)

Detector audio enters ASP pin 44, the (-) input of an op amp buffer. R609 and R610 set the gain of the op amp. Since pin 44 is at "virtual ground" for the op amp, the signal level here will not be measurable.

In the ASP, the buffered detector audio is bandpass filtered (300 to 3000 Hz). The filtered audio is selected by ISA/ISB audio multiplex switch in the ASP and then passes through the deemphasis stages. The deemphasized audio passes through the digital volume control, through audio switch RXO, and then leaves on ASP pin 27. The receive audio path for the EDACS and conventional modes never loops out and back into the ASP.

Receive audio leaves the ASP and feeds U603 audio PA.DC power to the PA is controlled by ASP pin 18 (SW0).

High Speed Data Limiter (sheet 4)

Buffered, unfiltered detector audio in the ASP passes through audio gate TDS to ASP pin 45. Busy tone decode switch Q603 is normally OFF (SW5 = 1) to pass data through R612 to the high speed limiter (+) input on ASP pin 32. The average DC level of the data signal is sent to the limiter (-) input on ASP pin 31 as a reference for the comparator. R611 and C605 filter the signal component to provide the DC reference.

The output of the limiter ASP pin 21 is inverted by Q602. The data is sent to the modem for data decoding and also sent to microprocessor U701 port 4.2. This port is normally high. The port is switched low during transmit to clamp limited noise to the modem.

Q601 allows the high speed and low speed limiters to settle quickly when a RF signal appears that differs from the receiver frequency. A 5-10 ms pulse (active low) is sent to Q601 before attempting to read any data from the limiters to quickly charge C601 to the operating DC level.

Low Speed Tone/Data Decoding (sheet 4)

In the ASP, buffered detector audio passes through switch TX to feed the 105/210 Hz low pass filter for removing voice signals fromthe low frequency Channel Guard tones or data. The filter cut off is 105 Hz for tones equal to or less than 105 Hz. For tones above 105 Hz or for data, the 210 Hz low pass filter is selected.

The output of the 105/210 Hz filter passes through audio switch CGE, and out of the ASP on pin 37.The tones/data feed ASP pin 35, the (+) input of the low speed comparator limiter. The average DC level of the tones/data signal is sent to ASP pin 34 as a reference to the comparator (-) input. R618 and C610 filter the signal to provide the DC reference. The output of the limiter on ASP pin 22 is sent to microprocessor U701 Port 4.3 for decoding.

GEMARC Mode RX Audio (sheet 4)

Detector audio enters ASP pin 44. In the ASP, detector audio is bandpass filtered (300-3000 Hz) and is passed out to ASP pin 45 through switch TDS. The filtered receive audio from the ASP is sent to U602 which is a digital switch capacitance notch filter. The notch frequency is determined by ceramic resonators Y601 or Y602 to notch either the standard (3052 Hz) or alternate (2918 Hz) busy tones. Microprocessor port 1.0 selects either resonator.

The notched receive audio is sent to ASP pin 28 and is selected with ISA/ISB multiplex audio switch. The deemphasized audio passes through the digital volume control, through audio switch RXO, and then leaves on ASP pin 27 which feeds the audio PA.

GEMARC Tone Decoding (sheet 4)

Detector audio is bandpass filtered (300-3000 Hz) in the ASP and passed out through switch TDS on ASP pin 45. This audio feeds the notch filter U602, bandpass filter (U301.2 and U601.1), and the high speed limiter.

For signalling tone decode, busy tone decode switch Q603 is OFF (SW5 = 5 Vdc). Wide band audio is passed from the ASP through R612 to the high speed limiter (+) input on ASP pin 32. The average DC level of the audio signal is sent to the limiter (-) input on ASP pin 31 as a reference for the comparator. The output of the limiter on ASP pin 21 is sent to microprocessor U701-7 port 4.2 for tone decoding.

For busy tone decode, bandpass filtered audio at the busy tone frequencies feeds the high speed limiter through Q603. The 3 kHz low pass filtered audio from ASP pin 45 provides some of the high frequency roll off of the bandpass response. U301.2 provides a notch at 2.3 kHz plus a high pass response to reject voice frequencies. U601.1 is a bandpass filter centered at 3 kHz.

For busy tone decoding, busy tone decode switch Q603 is ON (SW5 = 0). Bandpass filtered audio from U601.1 is passed to the limiter. The low impedance output of U601.1 effectively shorts the wide band audio through R612. Busy tone decoding is also done on microprocessor U701-7 port 4.2.

Receive Noise Squelch (sheet 3)

The squelch circuit monitors the level of high frequency noise on the receiver detector audio to determine if a carrier is quieting the receiver. A Digital to Analog converter in the ASP sets the threshold level required to operate the squelch circuit (normally 8 dB SINAD). When the noise falls below the threshold level, the carrier activity sensor (CAS) output switches to 0 Vdc. The CAS signal feeds the microprocessor U701 analog port on pin 43.

Buffered, unfiltered detector audio leaves at ASP pin 43 and feeds ASP pin 50 which is the high pass filter input (7.5 kHz). In the ASP, the high pass filtered audio is rectified and sent out on ASP pin 52. The rectified noise is filtered to provide an average DC level proportional to the noise level. This DC noise level is applied to a noninverting DC buffer amp on ASP pin 55. The output of the amp is on ASP pin 53. The gain of the DC amp is set by R620, R622, R623, and thermistor RT601. The thermistor increases in resistance at cold temperatures, causing the DC amp gain to increase. This compensates for the RF Board detector output level dropping at colder temperatures.

The buffered DC noise level output is sent to the (-) comparator input on ASP pin 49. The comparator (+) input receives a reference voltage from the digital to analog converter. When the DC noise level falls below the comparator reference, the comparator output switches high. The comparator output is buffered and inverted and appears at ASP pin 23. This CAS output is normally high (+5 Vdc) and switches low (0 Vdc) when a signal is detected.

To tighten the squelch, the D/A reference voltage is lowered. Hysteresis for the squelch is done in software. When the squelch output switches to indicate a signal is detected, the D/A reference value is increased slightly to loosen the squelch. The hysteresis eliminates "bubbling" or chattering noise in the speaker. The "bubbling" would normally be caused by transitional changes in the DC noise level around the reference point.

Transistor Q604.1 is normally turned ON with ASP pin 16 (SW2 = 1) at +5 Vdc, placing C611 in the DC noise averaging circuit. C611 provides a conventional slow (60 ms) squelch operation to prevent chopping the audio with rapid squelch closings in weak signal areas. When Q604.1 is turned OFF, a 5 ms fast squelch is provided by only C610.

Receive Alert Tones (sheet 4)

Programmable alert tones are generated in the ASP. The ASP uses a 66.6 kHz clock divided by 2 and then divided by a 6 bit divider. Therefore, the lowest alert tone frequency that can be generated is 33.3k / 63 = 528 Hz.

The output of the alert tone divider is on ASP pin 76. The tone output connects to ASP pin 30 to feed the ISA/ISB audio multiplex switch in the receive audio path. The tones then pass through unused audio switch VG which is hardwired (logic low) to pass the tones through the deemphasis stages. The deemphasized audio passes through the digital volume control, through audio switch RXO, and then leaves on ASP pin 27 which feeds the audio PA.

Transmit Mic Audio (sheet 5)

The microphone receives 2.5 Vdc bias through R315. Mic audio is coupled into ASP pin 74. Mic audio passes through audio switch MIS to the mic amplifier. Switch MGS determines the gain of the amplifier. MGS is normally open (MGS = 1) for high gain. A LOW MIC GAIN option in PC programming can lower the gain 10 dB for noisy environments when MGS is closed. The audio from the mic amp is then preemphasized and 300 Hz high pass filtered in the ASP. The audio then leaves the ASP on pin 70.

Preemphasized mic audio is coupled back into the ASP on pin 57. The audio is passed through muting switch AEN and then feeds the limiter. The limiter threshold can be stepped up by register LMT so that the peak deviation of the mic audio can be increased when no Channel Guard is present.

Limited mic audio then passes through a summing amp in the ASP which sums tones and data. The output of the summing amp feeds switch PBY to allow a choice of passing the audio through the 3 kHz post limiter filter (for limited mic audio) or passing unfiltered audio (for data) directly to the transmit deviation control (TA5 - TA0). The output of the digital deviation control passes through audio switch TXO to ASP pin 60.

The TX audio output from the ASP feeds U301.1 which provides two functions. U301.1 provides some of the low frequency equalization for the synthesizer by increasing in gain 6 dB/octave below 15 Hz. This low frequency gain helps compensate and flatten out the low frequency roll-off normally experienced when modulating the VCO in RF synthesizers. Another function of U301.1 is a second order (12 dB/octave) low pass filter to help attenuate any out of band noise above approximately 8 kHz from the ASP. The cutoff is high enough not to degrade 9600 baud data transmission. The output of U301.1 is DC coupled to the RF Board to feed the synthesizer.

Transmit RF Output Power (sheet 3)

The D/A converter used to set the squelch threshold in receive and is used to set the power level in transmit. The D/A output is on ASP pin 48. The output voltage level can vary from 0 to 5 Vdc in 256 steps to control the transmit power.

Transmit High Speed Data (sheet 5)

Modem data is applied to ASP pin 80. CEN registers select the TX DATA input. The data is passed through a bessel filter in the ASP. The output of the filter is sent to the TX path

summing amp. The output of the summing amp feeds audio switch PBY to allow bypassing the 3 kHz post limiter filter for data transmission. The data passes through the digital deviation control and then through audio switch TXO to feed U301.1 and the synthesizer. U301.1 provides low frequency gain equalization for data transmission. See the Transmit Mic Audio section for a U301.1 circuit description.

During transmit, the modem input from the receive data limiter requires muting to prevent the modem from being disturbed by receive noise. Microprocessor U701 Port 4.2 switches low during transmit to clamp the line to ground.

Transmit CG Tones and Low Speed Data (sheets 4 & 5)

Microprocessor U701 generates the low frequency Channel Guard tones/data on WB1 and WB2. These two bits are also used to generate GEMARC signalling tones (see section on TRANSMIT GEMARC SIGNALLING TONES). The two bit low frequency tones/data are summed into ASP pin 38. The stepped tones or data pass through audio switch TX to a 105/210 Hz low pass filter. The filter has a cutoff of 105 Hz for tones equal to or less than 105 Hz. For data or tones above 105 Hz, the 210 Hz filter is selected.

The filtered tones/data pass through gate CGE, then out of the ASP on pin 37, through R317, and back into the ASP on pin 58 (CGIN). GEMARC busy tone is also fed into this pin through C310. The impedance of C310 is high enough at low frequencies to prevent any loading of the tones/data through R317. See the section on Transmit GEMARC Busy Tone.

In the ASP, the filtered tones/data pass from pin 58 (CGIN) through audio switch BEN to feed the transmit summing amp. The output of the summing amp feeds switch PBY to allow switching the 3 kHz post limiter filter in line. The output of the post limiter passes through the digital deviation control, through switch TXO, and then out of the ASP to U301.1. U301.1 provides low frequency gain equalization for digital Channel Guard transmission. See the Transmit Mic Audio section for a U301.1 circuit description.

Transmit GEMARC Signalling Tone (sheets 4 & 5)

Microprocessor U701 generates the GEMARC signalling tones on WB1 and WB2. These two bits are also used to generate low frequency Channel Guard tones/data (see section on TRANSMIT CG TONES AND LOW SPEED DATA). The 2 bit generated GEMARC tones feed ASP pin 59. Feeding the GEMARC tones here allow using ASP audio switch DEN to mute the unfiltered WB1 and WB2 signal when Channel Guard is generated in EDACS and conventional modes.

In the ASP, the tones pass through audio switch DEN and are sent to the summing amp in the TX audio path. The tones are routed to the 3kHz post limiter filter through audio switch PBY. The tones are filtered, sent through the digital deviation control, audio switch TXO, and then out of the ASP on pin 60.

Transmit DTMF (sheet 4,5)

U803 generates DTMF tones which feed the ASP on pin 73. In the ASP, audio gate MIS passes the DTMF tones to the mic amp while muting the mic audio. Switch MGS determines the mic amp gain and must be set to 1 to open the switch for high gain. The amplified DTMF tones are then preemphasized and follow the same path as the mic audio in the ASP (see section on MIC AUDIO).

For receive audio sidetone, the DTMF audio is also fed into ASP pin 29. The sidetone audio is selected by the ISA/ISB receive audio multiplex switch and then passes through unused audio switch VG which is hard-wired (logic low) to pass the audio through the deemphasis stages. The deemphasized audio passes through the digital volume control, through audio switch RXO, and then leaves on ASP pin 27 which feeds the audio PA.

Transmit GEMARC Busy Tone (sheet 5)

Microprocessor U701 generates either the 3052 Hz (standard) or the 2918 Hz (alternate) busy tone on port 1.5. The square wave busy tone is summed into the TX audio path at the same point as the low frequency CG tones/data at ASP pin 58 (CGIN). R753 and R316 determine the 1 kHz deviation level of the tone. C310 couples the high frequency tone into the ASP. The tone follows the same path in the ASP as the CG tones/data, through switch BEN and into the TX audio summing amp.

DUAL FORMAT PCS FRONT ASSEMBLY
19D902177G13 SYSTEM
19D902177G15 SCAN
ISSUE 6

SYMBOL	PART NUMBER	DESCRIPTION
A2		AUDIO/LOGIC BOARD 19D903568G1
		- - - - - - - - CAPACITORS- - - - - - - -
C303 thru C305	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C306	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C307	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C308	19A702052P130	Ceramic: .022 µF ±5%, 50 VDCW.
C309	19A702052P45	Ceramic: 0.22 µF ±10%, 16 VDCW.
C310	19A149896P121	Ceramic: 0.1 µF ±10%, 50 VDCW.
C311	19A149896P7	Ceramic: 680 pF ±10%, 50 VDCW.
C312	19A705205P19	Tantalum: 2.2 µF, 10 VDCW; sim to Sprague 293D.
C313	19A149897P45	Ceramic:180 pF ±5%, 50 VDCW.
C601	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C602	19A149896P121	Ceramic:.01 µF ±10%, 50 VDCW.
C603 and C604	19A149896P15	Ceramic:3300 pF ±5%, 50 VDCW.
C605	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C606	19A149896P17	Ceramic:4700 pF ±5%, 50 VDCW.
C607	19A149896P121	Ceramic:.01 µF ±10%, 50 VDCW.
C608 and C609	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C610	19A705205P6	Tantalum:10 µF, 16 VDCW; sim to Sprague 293D.
C611	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C612	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C613	19A705205P19	Tantalum:2.2 µF, 10 VDCW; sim to Sprague 293D.
C614	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C615	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C616	19A149897P39	Ceramic:100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C617	19A149896P121	Ceramic:.01 µF ±10%, 50 VDCW.
C618	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C619	19A149896P121	Ceramic:.01 µF ±10%, 50 VDCW.
C620	19A705205P6	Tantalum:10 µF, 16 VDCW; sim to Sprague 293D.
C621 and C622	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C623	19A149897P43	Ceramic:150 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C624	19A149896P51	Ceramic:330 pF ±5%, 50 VDCW.
C625 and C626	19A149896P9	Ceramic:1000 pF ±5%, 50 VDCW.
C627	19A149896P15	Ceramic:3300 pF ±5%, 50 VDCW.
C628	19A149896P17	Ceramic:4700 pF ±5%, 50 VDCW.
C701 and C702	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C703 and C704	19A149897P39	Ceramic:100 pF ±5%, 50 VDCW, temp coef 0±30 PPM.
C705 thru C708	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C709 and C710	19A149897P39	Ceramic:100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C711 thru C715	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C717 thru C721	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C725 and C726	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C727	19A705205P6	Tantalum:10 µF, 16 VDCW; sim to Sprague 293D.
C728 and C729	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C730	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C731	19A705205P6	Tantalum:10 µF, 16 VDCW; sim to Sprague 293D.
C732 and C733	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C734	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C735	19A149897P21	Ceramic:18 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C736 and C737	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C738	19A149897P15	Ceramic:10 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C739	19A149897P27	Ceramic:33 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C740 thru C750	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C751	19A149897P39	Ceramic:100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C752	19A149897P47	Ceramic:220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C753	19A149897P15	Ceramic:10 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C754 and C755	19A149897P27	Ceramic:33 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.

*COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NUMBER	DESCRIPTION
C801	19A705205P2	Tantalum:1 µF, 16 VDCW; sim to Sprague 293D.
C802	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C803	19A702052P45	Ceramic: 0.22 µF ±10%, 16 VDCW.
C805	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C806	19A149897P47	Ceramic: 220 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
C808	19A705205P6	Tantalum:10 µF, 16 VDCW; sim to Sprague 293D.
		-- - - - - - - DIODES - - - - - - - -
D701 thru D710	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.
D720	19A705377P5	Silicon, Hot Carrier: sim to HSMS-2804.
D801	344A3326P1	Surface mount, rectifier.
		- - - - - - - - JACKS- - - - - - - -
J801	19A705482P1	Printed wire, 2-part; sim to SAMTEC SSW-112-01-SS.
J802		Part of printed wire board 19D903569P1.
J901		Part of printed wire board 19D903569P1.
		- - - - - - - - TRANSISTORS- - - - - -
Q601	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q602	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q603	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q604	19A705945P2	Silicon, Dual NPN: sim to R OHM IMX3.
Q605	19A134577P2	Silicon, PNP: sim to Phillips BCX51-16.
Q606	19A703197P2	Silicon, PNP; sim to MMBT4403 low profile.
Q607	19A702503P3	Silicon, NPN: sim to BFS17, low profile.
Q701	19A705945P2	Silicon, Dual NPN: sim to R OHM IMX3.
Q702 and Q703	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q704	19A705945P2	Silicon, Dual NPN: sim to R OHM IMX3.
Q801	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q802	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q804	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
		- - - - - - - RESISTORS- - - - - - -
R301	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R303	19A149818P102	Metal film: 1K ohms ±5%, 1/16 w.
R304	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R305	19A149818P102	Metal film: 1K ohms ±5%, 1/16 w.
R306	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R307	19A149818P154	Metal film: 150K ohms ±5%, 1/16 w.

SYMBOL	PART NUMBER	DESCRIPTION
R308	19A149818P333	Metal film: 33K ohms ±5%, 1/16 w.
R309	19A149818P224	Metal film: 150K ohms ±5%, 1/16 w.
R310	19A149818P683	Metal film: 68K ohms ±5%, .063 watts at 70°C.
R313	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R314	19A149818P470	Metal film: 47 ohms ±5%, 1/16 w.
R315	19A149818P561	Metal film: 560 ohms ±5%, 1/16 w.
R316	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R317	19A149818P682	Metal film: 6.8K ohms ±5%, 1/16 w.
R601 and R602	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R603	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R604	344A3304P1001	Metal film: 1K ohms ±1%, 1/10 w.
R605	19A149818P823	Metal film: 82K ohms ±5%, 1/16 w.
R606	19A149818P223	Metal film: 2K ohms ±5%, 1/16 w.
R607	344A3304P2493	Metal film: 249K ohms ±1%, 1/10 w.
R608	19A149818P333	Metal film: 33K ohms ±5%, 1/16 w.
R609	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R610	19A149818P683	Metal film: 68K ohms ±5%, .063 watts at 70°C.
R611 and R612	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R613 and R614	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R615 and R616	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R617	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R618 and R619	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R620	19A149818P184	Metal film: 180K ohms ±5%, 1/16 w.
R622	19A149818P334	Metal film: 330K ohms ±5%, 1/16 w.
R623	19A149818P154	Metal film: 150K ohms ±5%, 1/16 w.
R624	19A149818P683	Metal film: 68K ohms ±5%, 1/16 w.
R625	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R626	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R627	19A149818P222	Metal film: 2.2K ohms ±5%, 1/16 w.
R628	19A149818P223	Metal film: 22K ohms ±5%, 1/16 w.
R629	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R630 and R631	19A149818P4R7	Metal film: 4.7 ohms ±5%, .063 watts at 70°C.
R632	19A149818P105	Metal film: 1M ohms ±5%, 1/16 w.
R634	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R635	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R636	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R637	19A149818P223	Metal film: 22K ohms ±5%, 1/16 w.
R638	19A149818P472	Metal film: 4.7K ohms ±5%, 1/16 w.
R639	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R640	344A3304P3483	Metal film: 348K ohms ±1%, 1/10 w.
R641	344A3304P1002	Metal film: 10K ohms ±1%, 1/10 w.

SYMBOL	PART NUMBER	DESCRIPTION
R642	19A149818P684	Metal film: 680K ohms ±5%, 1/16 w.
R701 thru R720	19A149818P561	Metal film: 560 ohms ±5%, 1/16 w.
R725	19A149818P100	Metal film: 10 ohms ±5%, 1/16 w.
R726	19A149818P153	Metal film: 15K ohms ±5%, 1/16 w.
R727	19A149818P103	Metal film: 10K ohms ±5%, 1/16 w.
R728	19A149818P682	Metal film: 6.8K ohms ±5%, 1/16 w.
R730 thru R732	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R733 and R734	19A149818P333	Metal film: 33K ohms ±5%, 1/16 w.
R735	19A149818P332	Metal film: 3.3K ohms ±5%, 1/16 w.
R736 thru R739	19A149818P100	Metal film: 10 ohms ±5%, 1/16 w.
R740	19A149818P561	Metal film: 560 ohms ±5%, 1/16 w.
R741	19A149818P333	Metal film: 33K ohms ±5%, 1/16 w.
R742	19A149818P823	Metal film: 82K ohms ±5%, 1/16 w.
R743	19A149818P101	Metal film: 100 ohms ±5%, 1/16 w.
R744 thru R751	19A149818P561	Metal film: 560 ohms ±5%, 1/16 w.
R752	19A149818P101	Metal film: 100 ohms ±5%, 1/16 w.
R753	19A149818P272	Metal film: 2.7K ohms ±5%, 1/16 w.
R770	19A149818P561	Metal film: 560 ohms ±5%, 1/16 w.
R771 and R772	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R773	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R774	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R775	19A149818P472	Metal film: 4.7K ohms ±5%, 1/16 w.
R776	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R777	19A149818P683	Metal film: 68K ohms ±5%, .063 watts at 70°C.
R778	19A149818P272	Metal film: 2.7K ohms ±5%, 1/16 w.
R779	19A4149818P392	Metal film: 3.9K ohms ±5%, 1/16 w.
R801 and R802	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R803 thru R807	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R808	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R811 thru R815	19A149818P104	Metal film: 47K ohms ±5%, 1/16 w.
R816	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R817	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R825	19A149818P184	Metal film: 180K ohms ±1%, 1/10 w.
R826	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R827	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
R828	19A149818P103	Metal film: 10K ohms ±5%, 1/10 w.
R830	19A149818P100	Metal film: 10 ohms ±5%, 1/16 w.
R833	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.

SYMBOL	PART NUMBER	DESCRIPTION
R834	19A149818P105	Metal film: 1M ohms ±5%, 1/16 w.
R835	19A149818P823	Metal film: 82K ohms ±5%, 1/16 w.
R836	19A149818P223	Metal film: 22K ohms ±5%, 1/16 w.
		- - - - - THERMISTOR- - - - -
RT601	19A705813P2	Thermistor: sim to AL03006-58.2K-97-G100.
		- - - INTEGRATED CIRCUITS- - -
U301	19A702293P3	Linear: Dual Op Amp; sim to LM358D.
U601	19A702293P3	Linear: Dual Op Amp; sim to LM358D.
U602	344A3999P201	Linear: Notch Filter; sim to LMF90CC.
U603	19A705452P2	Linear: Audio Amplifier; sim to NJM 2073D.
U701	344A4014P10	Digital: 8-Bit Microcontroller; sim to N83C51GB.
U702	19A704727P6	Digital: Modem.
U703	344A4029P201	Digital: 128K x 8-Bit Flash EEPROM; sim to E28F001BX-T120.
*U706	RYT1186063/1	Digital: 48-Bit Serial Number ROM.
U707	19A705603P6	Digital: 8K x 8-Bit Static CMOS RAM.
U801	344A3202P201	Linear: Voltage Regulator; sim to LP2951ACM.
U802	RYT1186066/1	EEPROM, 2048 X 8 Bit, CMOS.
U803	344A3800P102	Linear: Tone Generator; sim to PCD3312C.
U804	344A3291P1	Digital: Audio Signal Processor; sim to MB87780PFV-G-BND.
		- - - - - - CRYSTALS - - - - - -
Y601	344A4261G2	Resonator: 613.5 kHz.
Y602	344A4261G1	Resonator: 586.5 kHz.
Y701	19A702511G64	Crystal unit, quartz: 11.0592 MHz.
Y801	19A702511G65	Crystal unit, quartz: 3.579545 MHz.
		- - - - MISCELLANEOUS - - - -
		NOTE: Refer to the Assembly Diagram on page 10 for the location of the following miscellaneous parts.
5	19A702364P310	Machine screw, TORX Drive: No. M3-0.5 x 10.
6	19B801570P2	Connector holder.
7	19A705662P1	Connector, Elastomeric.
8	19A702364P304	Machine screw, TORX drive, Pan Head.
		FRONT CAP ASSEMBLY 19D902180G6 (Used in G13, System) 19D902180G8 (Used in G15, Scan)
A5		**LCD ASSEMBLY 19A705090G11**
		- - - - - - - - LEDS - - - - - - - -
H1	19C851660P3	Crystal display.

SYMBOL	PART NUMBER	DESCRIPTION
		- - - - MISCELLANEOUS - - - -
		NOTE: Refer to page 11 for the location of the following miscellaneous parts.
	19A703685P3	LCD connector.
	19B801569P1	Diffuser.
	19C851719P2	Lens.
		LCD DRIVER BOARD 19C852194G1
		- - - - - - DIODES - - - - - -
CR1 thru CR4	19A705713P1	LED, subminiature.
		- - - - - - - JACKS - - - - - - -
J2		Part of printed wire board.
		- - - - - - - - PLUGS - - - - - - - -
P1	19B801235P13	Terminal strip.
P2	19B801235P3	Terminal strip.
		- - - - - TRANSISTORS - - - - -
Q1	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
Q2	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
		- - - - - RESISTORS - - - - -
R1 and R2	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R3	19A149818P472	Metal film: 4.7K ohms ±5%, 1/16 w.
R4 and R5	19A149818P221	Metal film: 220 ohms ±5%, 1/16 w.
R6	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
R7	19A149818P473	Metal film: 47K ohms ±5%, 1/16 w.
		INTEGRATED CIRCUITS
U1	344A3211P201	LCD Driver.
A6		**CONTROL ASSEMBLY 19A705090G10**
		- - - - - - CAPACITORS - - - - - -
C3 thru C7	19A702052P3	Ceramic: 470 pF ±10%, 50 VDCW.
		- - - - - - - JACKS - - - - - - -
J1	19A115834P1	Contact, electrical: sim to AMP 2-330808-8.
		- - - - - - MICROPHONE - - - - - -
M1	19A701301P3	Cartridge: Electret.

SYMBOL	PART NUMBER	DESCRIPTION
		- - - - - - SWITCHES - - - - - -
S1	19A705712P1	Subminiature.
S2	19A705712P2	Subminiature.
		- - - - - MISCELLANEOUS - - - - -
		NOTE: Refer to page 11 for the location of the following miscellaneous parts.
	19A149926P2	Insulator.
	19A705733P4	Control frame, circuitized.
	19B801571P2	Dome switch.
	19C851722P1	Boot, auxiliary jack.
		- - - - - - MODULE - - - - - -
B902	19A149673P1	Round:Water Proof, 24 ohms, 1/2 w.; sim to Line Electric Co. VS-50W24.
		- - - - MISCELLANEOUS - - - -
		NOTE: Refer to page 11 for the location of the following miscellaneous parts.
5	19A702364P304	Machine screw, TORX drive, Pan Head.
8	19C851997P2	Gasket, Speaker.
10	19C851636P2	Switch pad.
26	19A705777P1	Nameplate.
28	19B801568P3	Insulator.
29	344A3854 P1	Insulator.
30	19B234763P22	Pad.
31	19C337135P1	Seal.
		FRONT COVER ASSEMBLY 19D902072G12 (SYSTEM Model)
		NOTE: Refer to page 12 for the location of the following miscellaneous parts.
18	19A116318P4	Foil, Magnetic Shielding:1.50 inches wide.
19	19A705664P1	Gasket.
27 3	44A4654P1	Gasket.
34	19D902072P34	Fr ont cover.
37	19D902072P37	Front cover.
43	19D902072P43	Front cover.
33		**KEYPAD BOARD 19C852173G1**
		- - - - - CAPACITORS - - - - -
C780	19A702052P134	Ceramic: 0.1 µF ±5%, 25 VDCW.
C781 thru C783	19A149897P39	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM.
		- - - - - - DIODES - - - - - -
D780 thru D791	19A700053P2	Silicon: 2 Diodes in Series; sim to BAV99.

SYMBOL	PART NUMBER	DESCRIPTION
		- - - - - - JACKS - - - - - -
J780		Part of printed wire board.
		- - - - - RESISTORS - - - - -
R780 thru R791	19A149818P104	Metal film: 100K ohms ±5%, 1/16 w.
		- - - INTEGRATED CIRCUITS - - -
U780 and U781	19A703987P322	Digital Logic, 8 Bit Shift Register; sim to 74HC165.
21		**FRONT COVER ASSEMBLY 19D902072G14 (SCAN Model)**
		NOTE: Refer to page 12 for the location of the following miscellaneous parts.
17	19C851947P1	Printed wire board.
18	19A116318P4	Foil, Magnetic Shielding:1 .50 inches wide.
19	19A705664P1	Gasket.
27	344A4654P1	Gasket.
34	19D902072P34	Fr ont cover.
39	19D902072P39	Front cover.
41	19D902072P41	Front cover.
46	344A3087P11	Front cover.
47	19B801566P8	Shield.
		CONTROL ASSEMBLY 19A705090G13
		- - - - - CAPACITORS - - - - -
C3 thru C7	19A702052P3	Ceramic: 470 pF ±5%, 50 VDCW.
C8 and C9	19A702236P50	Ceramic: 100 pF ±5%, 50 VDCW, temp coef 0 ±30 PPM/°C.
		- - - - - - - JACKS - - - - - - -
J1	19A115834P1	Contact, electrical: sim to AMP 2-330808-8.
L1 and L2	REG70606/1	EMI Filter.
		- - - - - - MICROPHONE - - - - - -
M1	19A701301P3	Cartridge: Electret.
		- - - - - - - SWITCHES - - - - - - -
S1	19A705712P1	Subminiature.
S2	19A705712P2	Subminiature.

PRODUCTION CHANGES

Changes in the equipment to improve performance or 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/LOGIC BOARD 19D903586G1

To improve 4800 Hz dotting frequency circuit and the alternate and standard busy tone notch circuits. Changed C753, Q606, Q707, R636, R637 and R638.
C753 was 19A149897P21 - Ceramic: 18 pF ± 5%, 50 VDCW.
Q606 was 19A700052P2 - Silicon, PNP: sim to MMBT3906.
Q607 was 19A700076P2 - Silicon, NPN: sim to MMBT3904.
R636 was 19A149818P103 - Metal film: 10K ohms ± 5%, 1/16 w.
R637 was 19A149818P103 - Metal film: 10K ohms ± 5%, 1/16 w.
R638 was 19A149818P102 - Metal film: 1K ohms ± 5%, 1/16 w.

REV. B - AUDIO/LOGIC BOARD 19D903586G1

To improve high speed (9600 baud) reception, changed C605
C605 was 19A705205P6 - Tantalum: 10 uF, 16 VDCW.

REV. C - AUDIO/LOGIC BOARD 19D903586G1

To improve the operation of the Microprocessor and the voltage sensing circuit (Q801/Q802) when the radio is placed in a rapid charger with the power switch ON. The PWB run from the emitter of Q801 to ground was moved to spare microprocessor pin 9.

REV. D - AUDIO/LOGIC BOARD 19D903586G1

Moved C605, C625, C626, C310, R816, R316, R625, R626, R828, R825 and R641 to prevent interference to the speaker magnet. To improve operation, the following components were changed, added or deleted.

Changed:

R825 was 19A149818P184 - Metal film: 180K ohms ± 1%, 1/10 w.
R828 was 19A149818P103 - Metal film: 10K ohms ± 5%, 1/10 w.
U802 was 19A805553P2 - EEPROM, 2048 x 8 Bit, CMOS sim to XICOR X24C16.
U805 was 19A705553P2 - Digital,CMOS: EEPROM sim to XICOR X24C16.
R624 was 19A149818P683 - Metal film: 68K ohms += 1%, 1/16 w.
R301 was 19A149818P153 - Metal film: 15K ohms += 5%, 1/16 w.
R317 was 19A149818P682 - Metal film: 6.8K ohms += 5%, 1/16 w.
R753 was 19A149818P272 - Metal film: 2.7K ohms += 5%, 1/16 w.
C310 was 19A149818P121 - Ceramic: 0.1 uF += 10%, 50 VDCW.
R307 was 19A149818P224 - Metal film: 150K ohms += 5%, 1/16 w.
C308 was 19A149818P130 - Ceramic: 0.22 uF += 5%, 50 VDCW.

Added:

Added R779, C756, R633, C629, R313, C314.

Deleted:

R720 was 19A149818P561 - Metal film: 560 ohms ± 5%, 1/16 w. C721 was 19A149818P47 - Ceramic: 220 pF ± 5%, 50 VDCW.

REV. E - AUDIO/LOGIC BOARD 19D903568G1

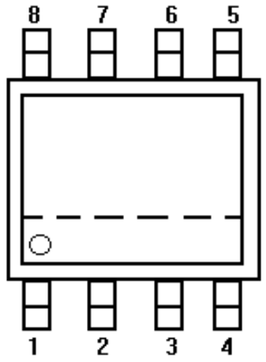
To fix a cold temperature reset problem and notch filter failures, the following components were changed:

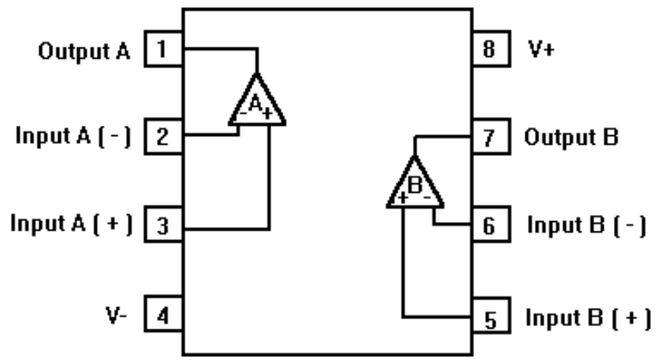
C623 changed from 220 pF (19A149897P47) to 150 pF (19A149897P43).
C624 changed from 470 pF (19A149896P5) to 330 pF (19A149897P51).
Q607 changed from 19A700236P4 to 19A702503P3.
R636 changed from 6.8K ohms (19A149818P682) to 15K ohms (19A149818P153)
R637 changed from 6.8K ohms (19A149818P682) to 22K ohms (19A149818P223)
R743 changed from 560K ohms (19A149818P561) to 100K ohms (19A149818P101)
R779 changed from 2.7K ohms (19A149818P272) to 3.9K ohms (19A149818P392)

REV. F - AUDIO/LOGIC BOARD 19D903568G1

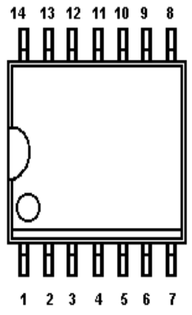
Old part no longer available. U706 was 344A4050P101. Changed to Serial ROM RYT1186063/1.

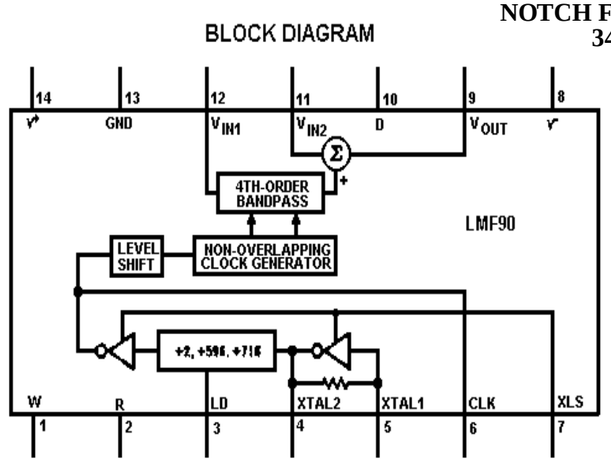
OPERATIONAL AMPLIFIER U301, U601
19A702293P3



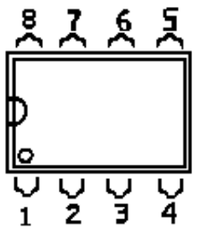


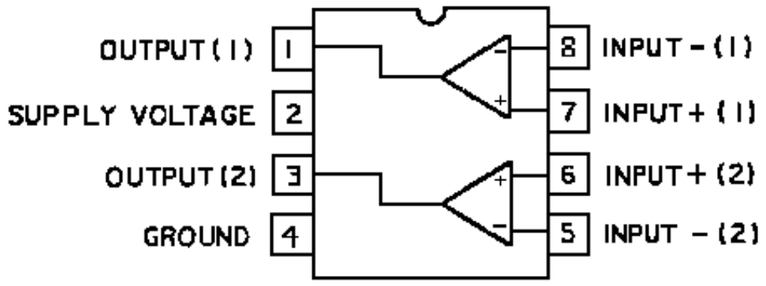
NOTCH FILTER U602
344A3999P201





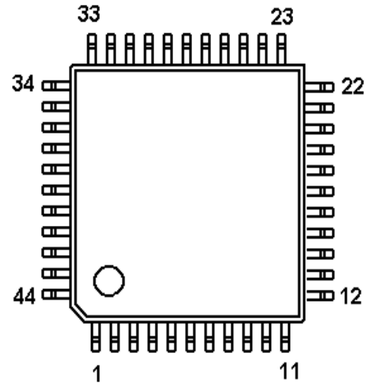
AUDIO AMPLIFIER U603
19A705452P2

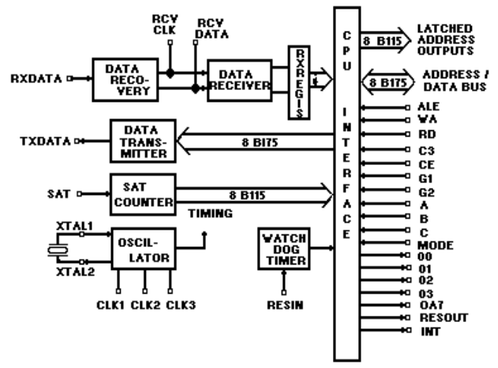




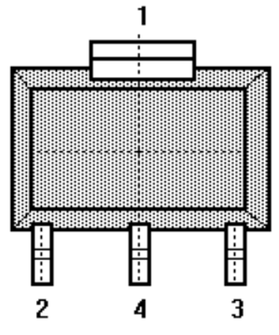
MODEM U702
19A704727P6

PIN NAME	44 PACK PIN	DESCRIPTION
RE	39	READ ENABLE (ACTIVE LOW)
EN	41	CHIP ENABLE (ACTIVE LOW)
RESOUT	43	RESET OUTPUT (ACTIVE HIGH)
AD0	44	BI-DIRECTIONAL ADDRESS / DATA BUS
AD1	1	BI-DIRECTIONAL ADDRESS / DATA BUS
AD2	2	BI-DIRECTIONAL ADDRESS / DATA BUS
AD3	4	BI-DIRECTIONAL ADDRESS / DATA BUS
AD4	6	BI-DIRECTIONAL ADDRESS / DATA BUS
AD5	8	BI-DIRECTIONAL ADDRESS / DATA BUS
AD6	10	BI-DIRECTIONAL ADDRESS / DATA BUS
AD7	11	BI-DIRECTIONAL ADDRESS / DATA BUS
ALE	12	ADDRESS LATCH ENABLE (ACTIVE HIGH)
VSS	13	GROUND
CLK1	15	BUFFERED OSCILLATOR OUTPUT
VDD	17	POWER SUPPLY
XTAL1	19	OSCILLATOR INPUT
XTAL2	21	OSCILLATOR OUTPUT
CLK2	22	640 KHZ OUTPUT
DATAIN	2	RECEIVED DATA INPUT
SAT/G1	24	RECEIVED SAT INPUT/G1 EN. HC138 (ACT. HI)
TXDAT	26	TRANSMIT DATA OUTPUT
RCVCLK/Q2	28	RECOVERED CLOCK OUTPUT/Q2 OUTPUT FOR HC138
RCVDAT/Q0	30	RECOVERED DATA OUTPUT/Q0 OUTPUT FOR HC138
INT	32	INTERRUPT REQUEST (ACTIVE LOW O.D.)
RESIN	33	RESET INPUT (ACTIVE HIGH)
CS	34	CHIP SELECT (ACTIVE LOW)
CLK3/4	35	TRANSMIT CLOCK OUTPUT/CLK 1/6 OUTPUT
WR	37	WRITE ENABLE (ACTIVE LOW
MODE	18	Enable 44 pin functions (active low)
A	38	A input for HC138
B	36	B input for HC138
C	31	C input for HC138
G2B	20	G2B enable for HC138 (active low)
A0	40	A0 address output
A1	42	A1 address output
A2	3	A2 address output
A3	5	A3 address output
A4	7	A4 address output
A5	9	A5 address output
A6	14	A6 address output
A7	16	A7 address output
Q1	29	Q1 output for HC138
Q3	27	Q3 output for HC138
Q47	25	Q4 - Q7 (ored internally) output for HC138



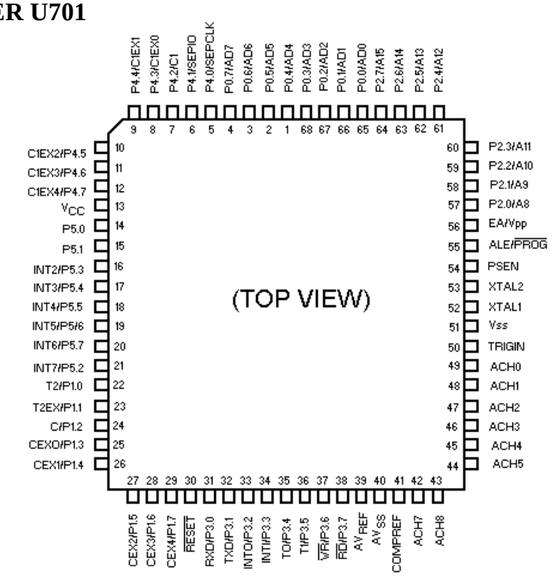


48-BIT SERIAL NUMBER ROM U706
RYT1186063/1

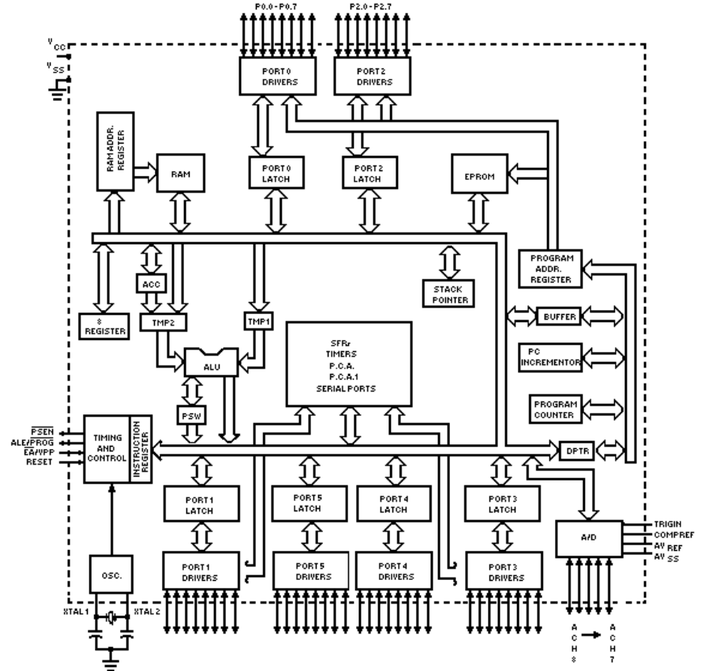


PIN NAMES
Pin 1 Ground
Pin 2 Data (DQ)
Pin 3 No Connec
Pin 4 Ground

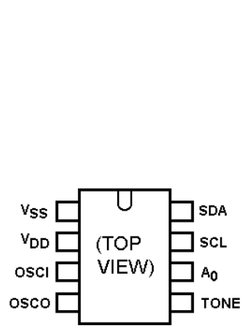
8-BIT MICROCONTROLLER U701
344A401P10

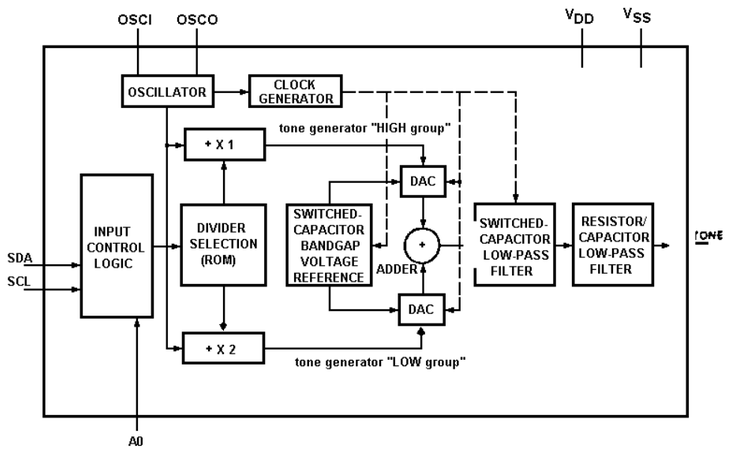


BLOCK DIAGRAM

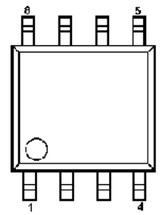


TONE GENERATOR U803
344A3800P102





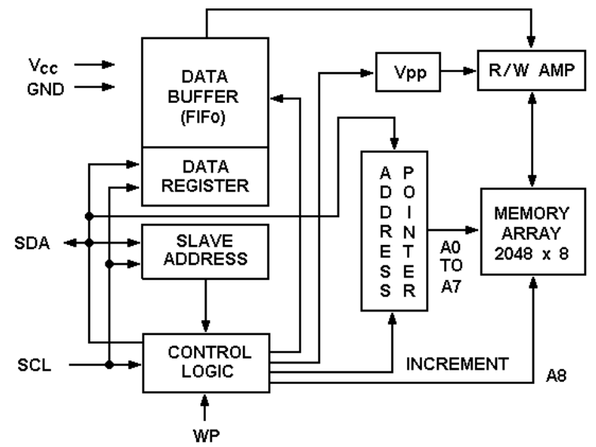
2048 X 8-BIT EEPROM U802
RYT1186066/1



CONNECTIONS

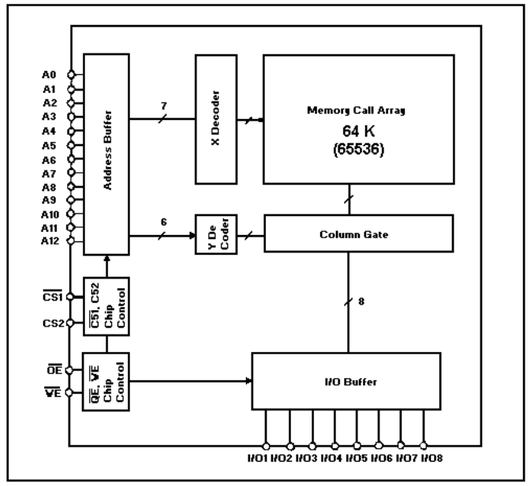
Terminal	Symbol	Function
1	NC	Not connected
2	NC	Not connected
3	NC	Not connected
4	GND	Ground
5	SDA	Serial data line
6	SCL	Serial clock line
7	WP	Write protected
8	Vcc	Supply voltage

BLOCK DIAGRAM

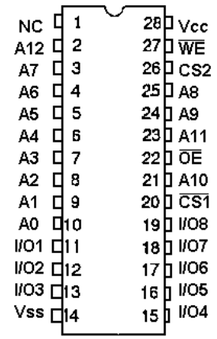


8K X 8-BIT CMOS RAM U707
19A705603P6

BLOCK DIAGRAM



PIN CONFIGURATION

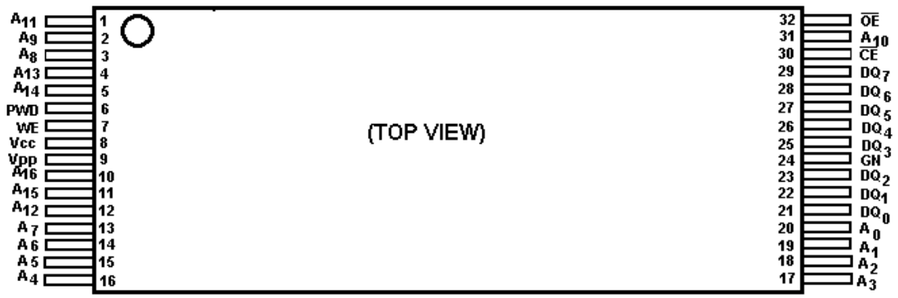


TRUTH TABLE

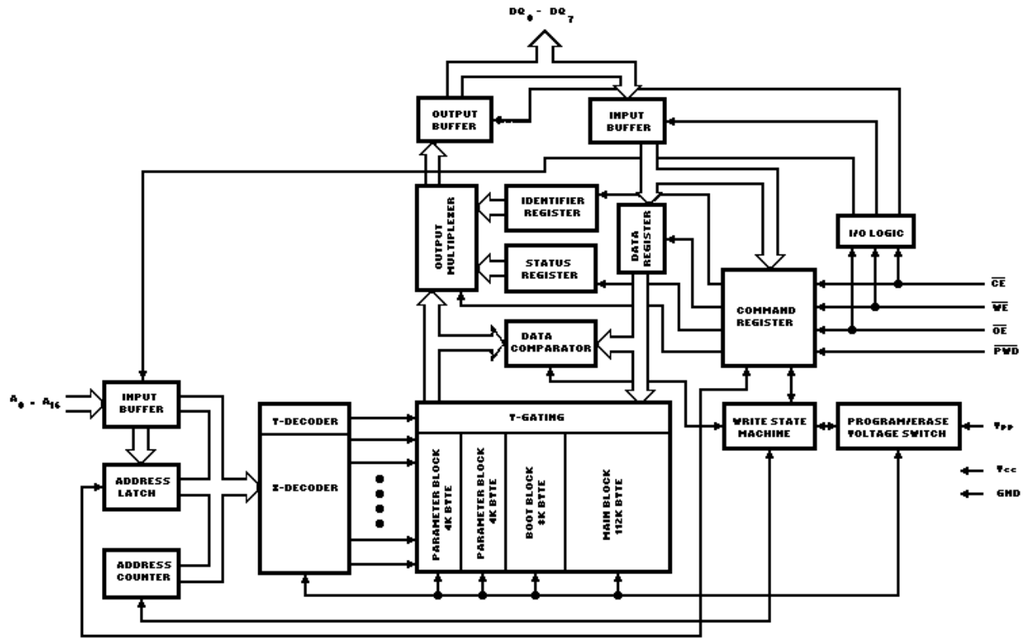
$\overline{WE}$	$\overline{CS_1}$	CS_2	$\overline{OE}$	Mode
X	H	X	X	Not Selected (Power Down)
X	X	L	X	
H	L	H	H	Output Disabled
H	L	H	L	Read
L	L	H	H	Write
L	L	H	L	

X: H or L

128K X 8-BIT FLASH EEPROM U703
344A4029P201

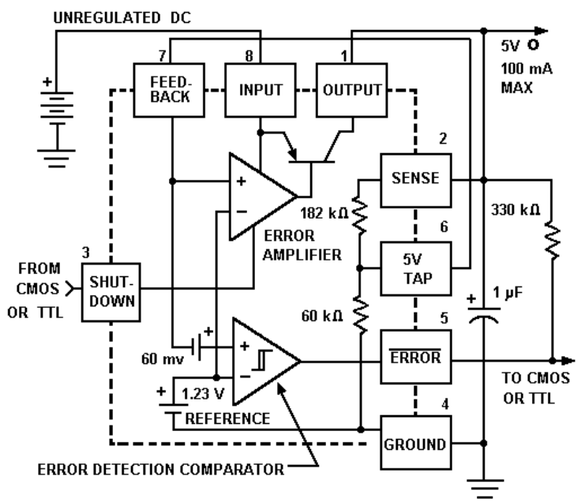


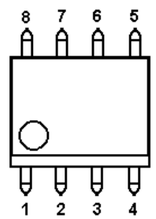
BLOCK DIAGRAM



VOLTAGE REGULATOR U801
344A3202P201

BLOCK DIAGRAM

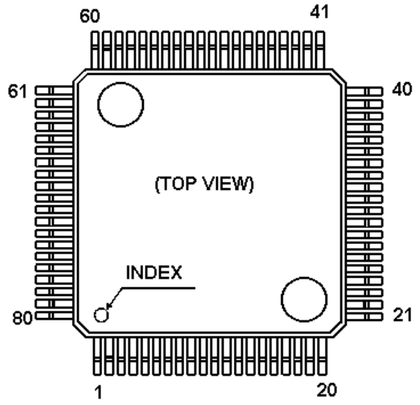




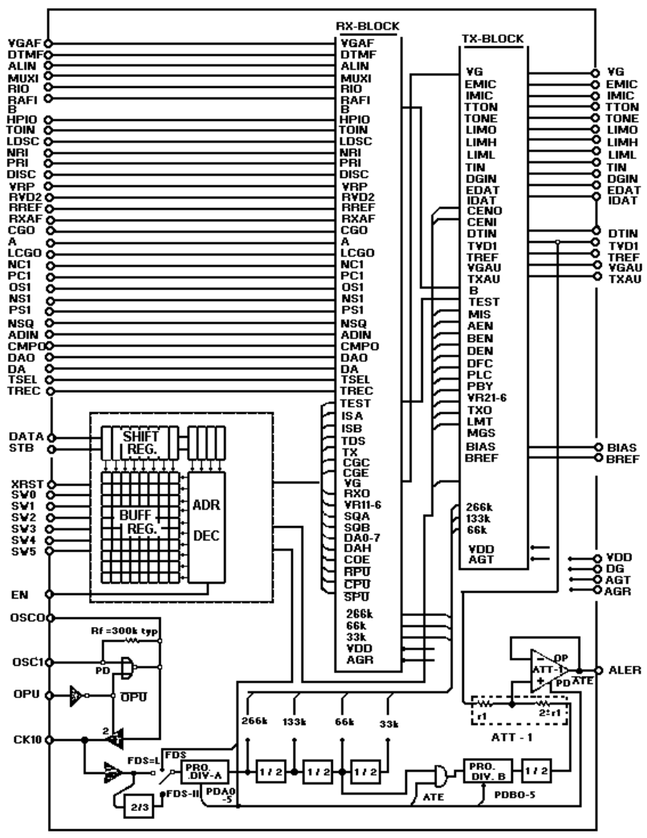
AUDIO SIGNAL PROCESSOR U804
344A3291P1

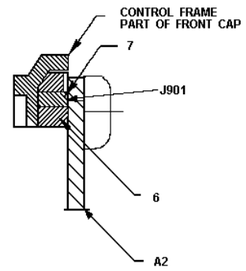
PIN NAME TABLE

No	IO	name	No	IO	name	No	IO	name	No	IO	name
1	---	NC	21	O	LDSC	41	G	AGR	61	---	NC
2	I	OPU	22	O	LCGO	42	AO	MUXI	62	G	AGT
3	G	DG	23	O	CMPO	43	AO	R10	63	AO	TVD2
4	I	OSCI	24	---	NC	44	AI	RAFI	64	AO	TREF
5	O	OSCO	25	I	TSEL	45	AO	HP10	65	AO	BIAS
6	IO	CK10	26	VD	VDD	46	AI	VRP	66	AO	BREF
7	G	DG	27	AO	RXAF	47	AO	DA	67	AO	LIMH
8	VD	VDD	28	AI	VGAF	48	AO	DAO	68	AO	LIML
9	I	XRST	29	AI	DTMF	49	AI	ADIN	69	AO	LIMO
10	I	EN	30	AI	ALIN	50	AI	DISC	70	AO	TONE
11	I	STB	31	AI	NR1	51	IO	TREC	71	---	NC
12	I	DATA	32	AI	PR1	52	AO	NSQ	72	AO	VGAU
13	O	SW5	33	---	NC	53	AO	OS1	73	AI	EMIC
14	O	SW4	34	AI	NC1	54	AI	NS1	74	AI	IMIC
15	O	SW3	35	AI	PC1	55	AI	PS1	75	AI	TTON
16	O	SW2	36	AO	A	56	---	NC	76	AO	ALER
17	O	SW1	37	AO	CGO	57	AI	TIN	77	VD	VDD
18	O	SW0	38	AI	TOIN	58	AI	CGIN	78	I	VG
19	VD	VDD	39	AO	RREF	59	AI	DTIN	79	I	EDAT
20	G	DG	40	AO	RVD2	60	AO	TXAU	80	I	IDAT

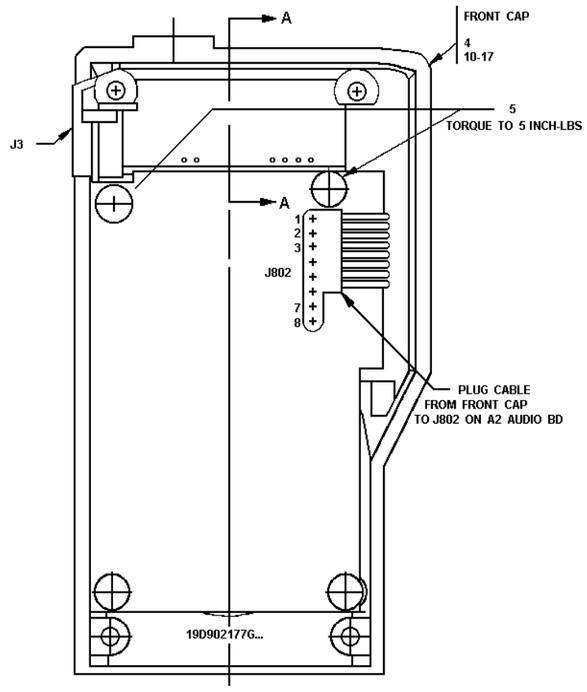


BLOCK DIAGRAM

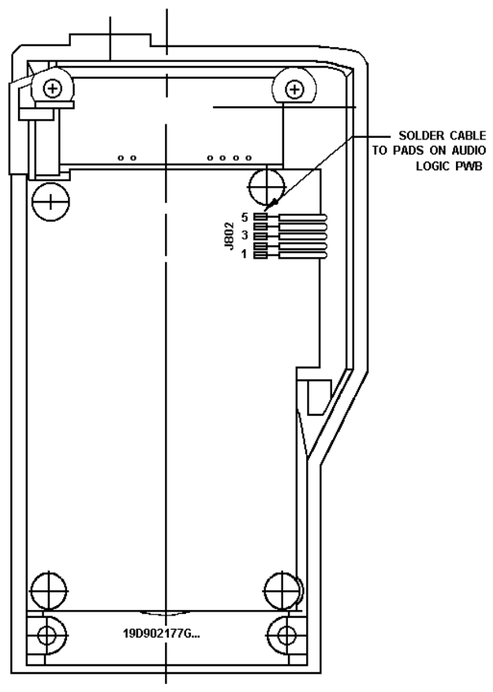




SCAN MODEL



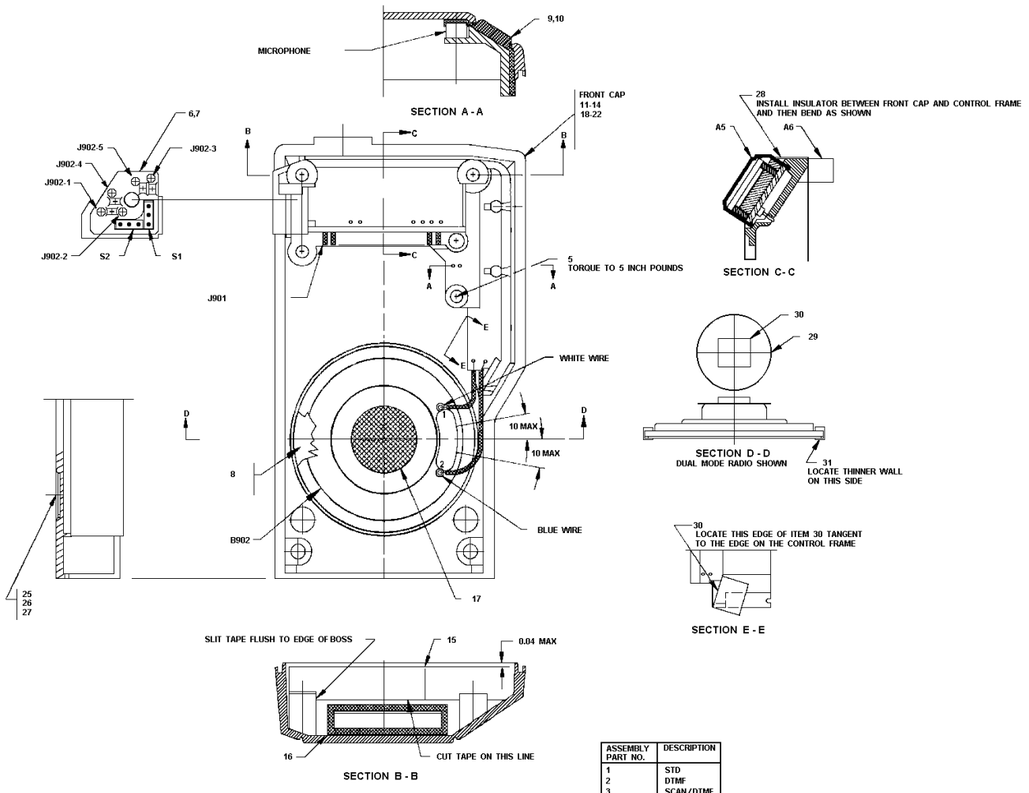
SYSTEM MODEL



DUAL MODE RADIO SHOWN

FRONT ASSEMBLY
19D902177G13 & G15

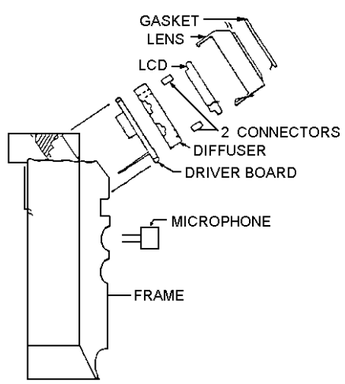
(19D902177, Sh. 2, Rev. 6)

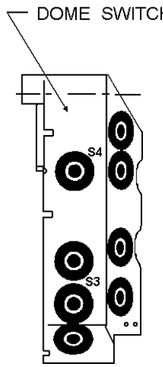


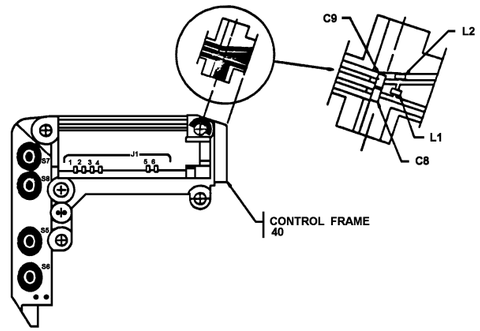
ASSEMBLY PART NO.	DESCRIPTION
1	STD
2	DTMF
3	SCAN/DTMF
4	SCAN

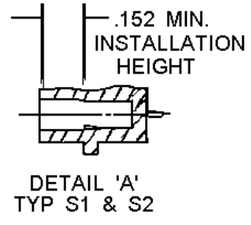
FRONT CAP ASSEMBLY
19D902180G6 & G8

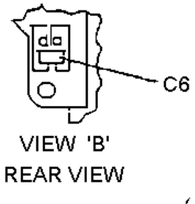
(19D902180, Sh. 1, Rev. 19)











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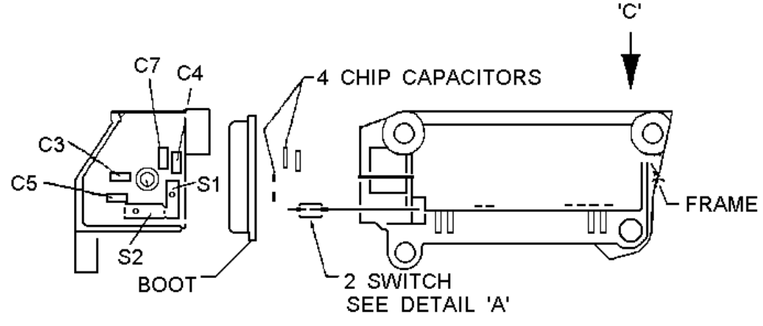
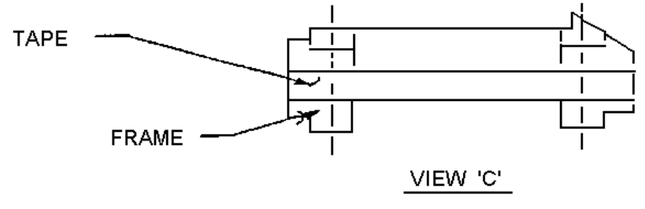
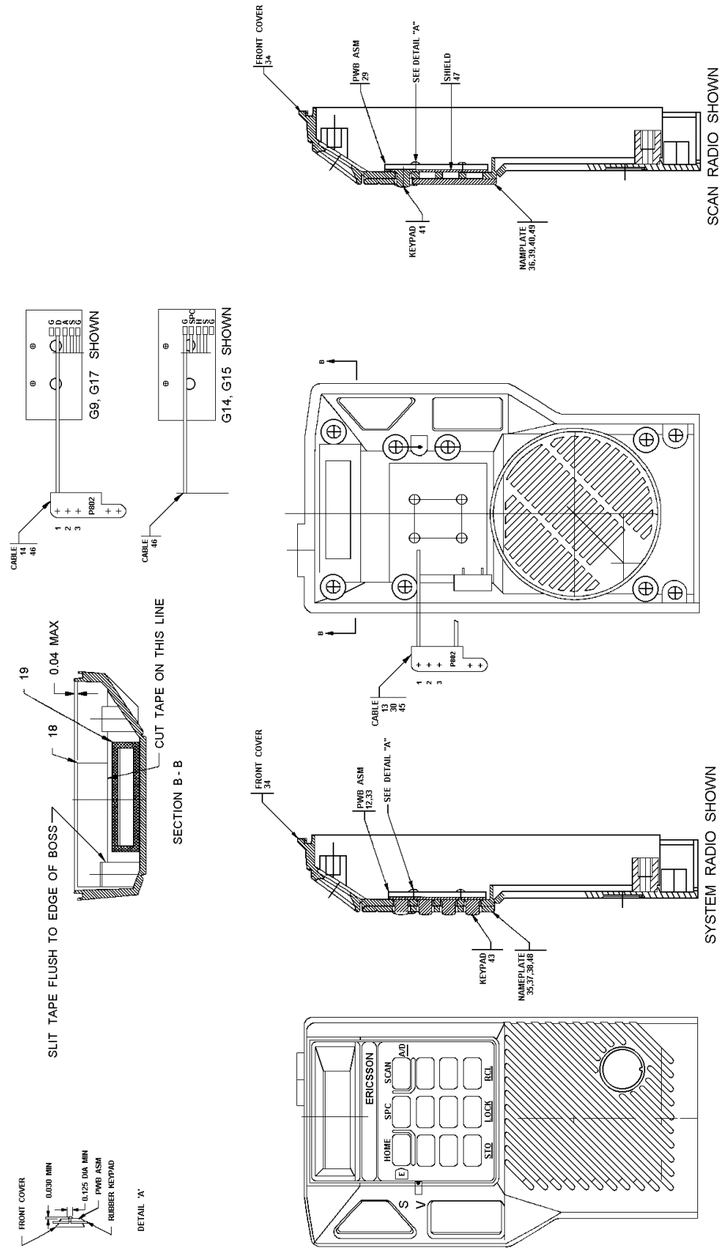




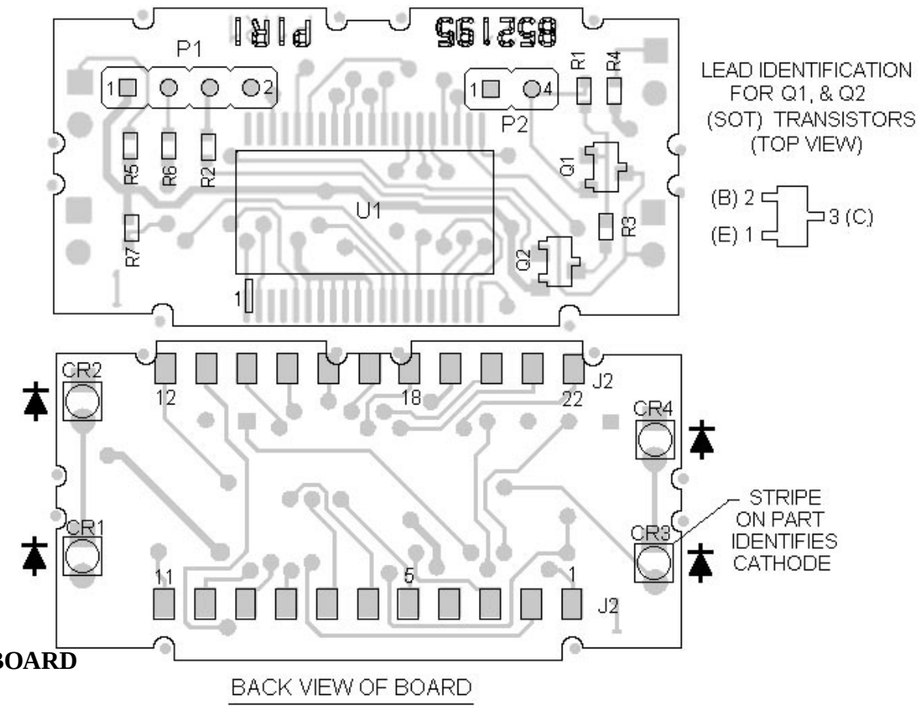
CONTROL ASSEMBLY
19A705090G10 & G13 (Control Frame)
19A705090G11 (LCD Assembly)

(19A705090, Sh. 9, Rev. 16A)
(19A705090, Sh. 13, Rev. 16A)



FRONT COVER ASSEMBLY
19D902072G12 (System Model)
19D902072G14 (Scan Model)

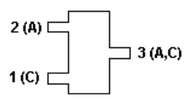
(19D902072, Sh. 12, Rev. 23)

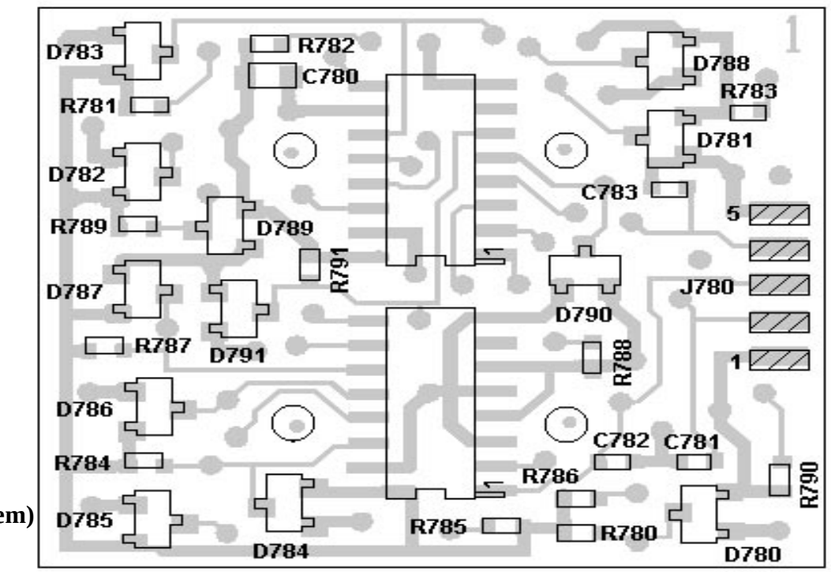


LCD DRIVER BOARD
19C852194G1

(19C852194, Rev. 2)
(19C852195, Comp. Side, Rev. 1B)
(19C852195, Solder Side, Rev. 1B)

LEAD IDENTIFICATION FOR
D780-D791
(SOT) DIODES
(TOP VIEW)

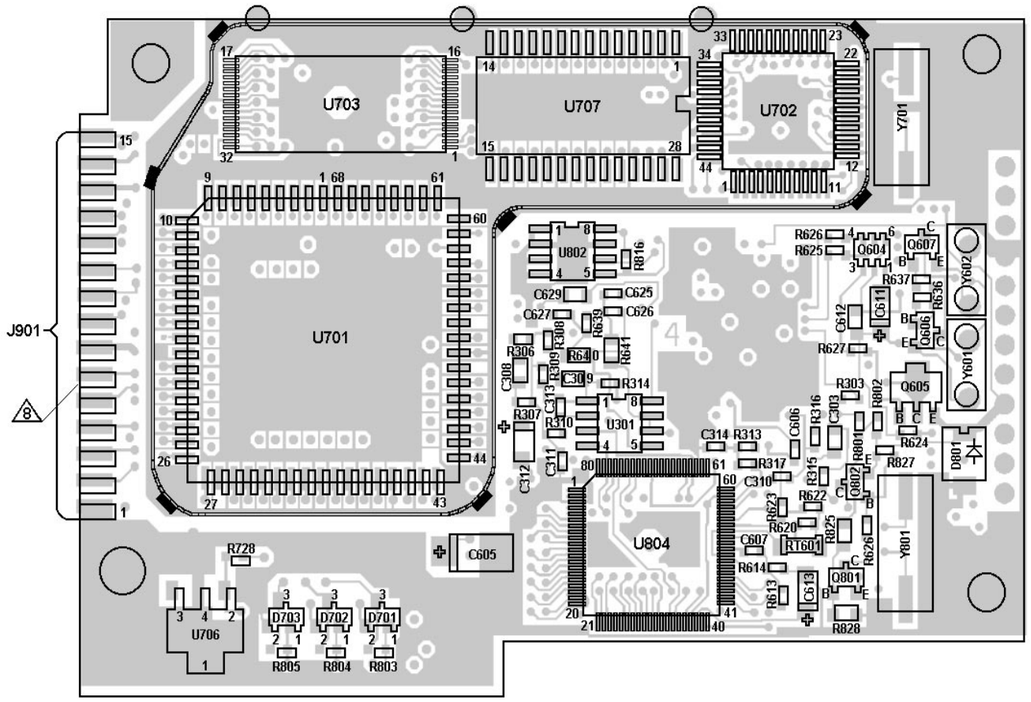




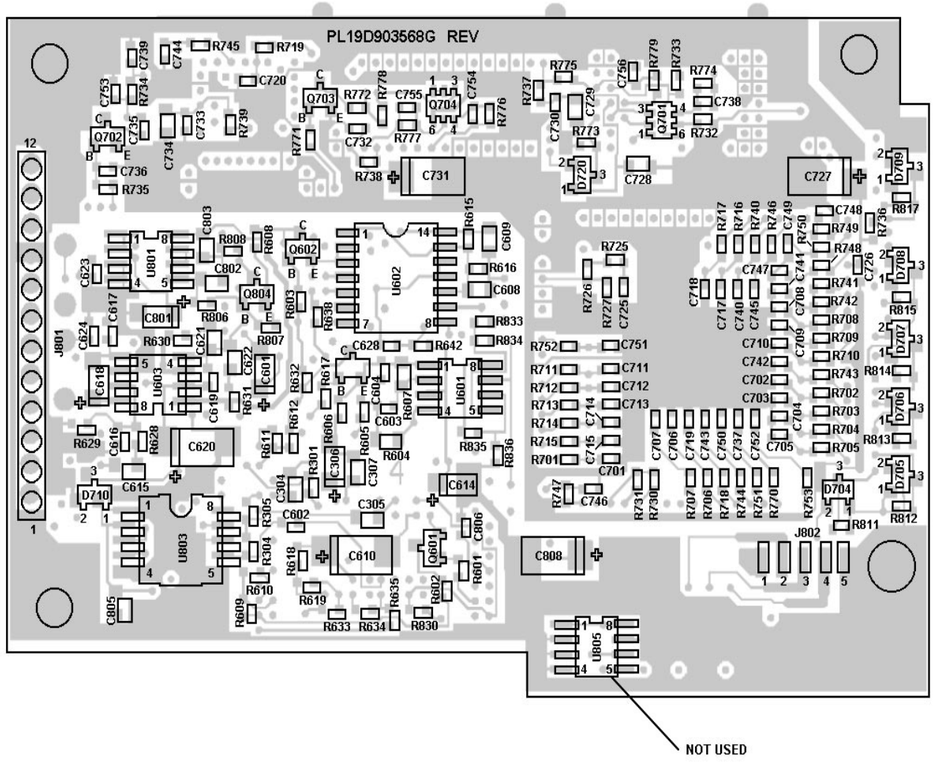
KEYPAD BOARD (System)
19C852173G1

(19C852173, Rev. 2)
(19C852172, Layer 1, Rev. 1)

Front View



Rear View



THE FOLLOWING ITEMS ARE MOS DEVICES REQUIRING SPECIAL CARE PER 19A701294: U602, U701, U702, U703, U706, U707, U802, U803, U804, U805.

GOLD CONTACT FINGERS ARE TO BE KEPT FREE OF ANY FOREIGN SUBSTANCE.

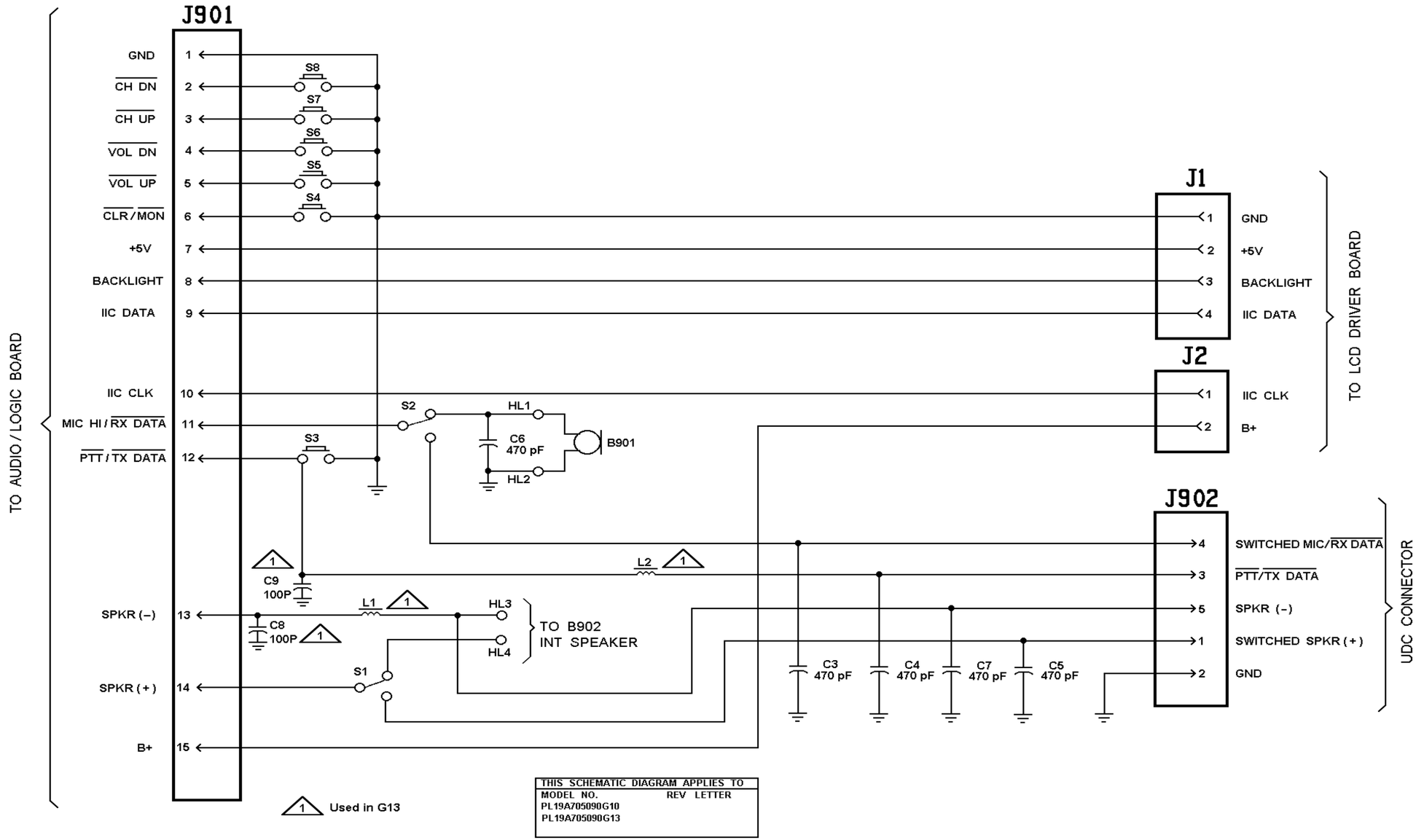
CAUTION
OBSERVE PRECAUTIONS FOR HANDLING
ELECTROSTATIC SENSITIVE DEVICES

AUDIO LOGIC BOARD
19D903568G1

19D903568, Sh. 1, Rev. 5)
(19D903569, Rev. 4, Layer 1)

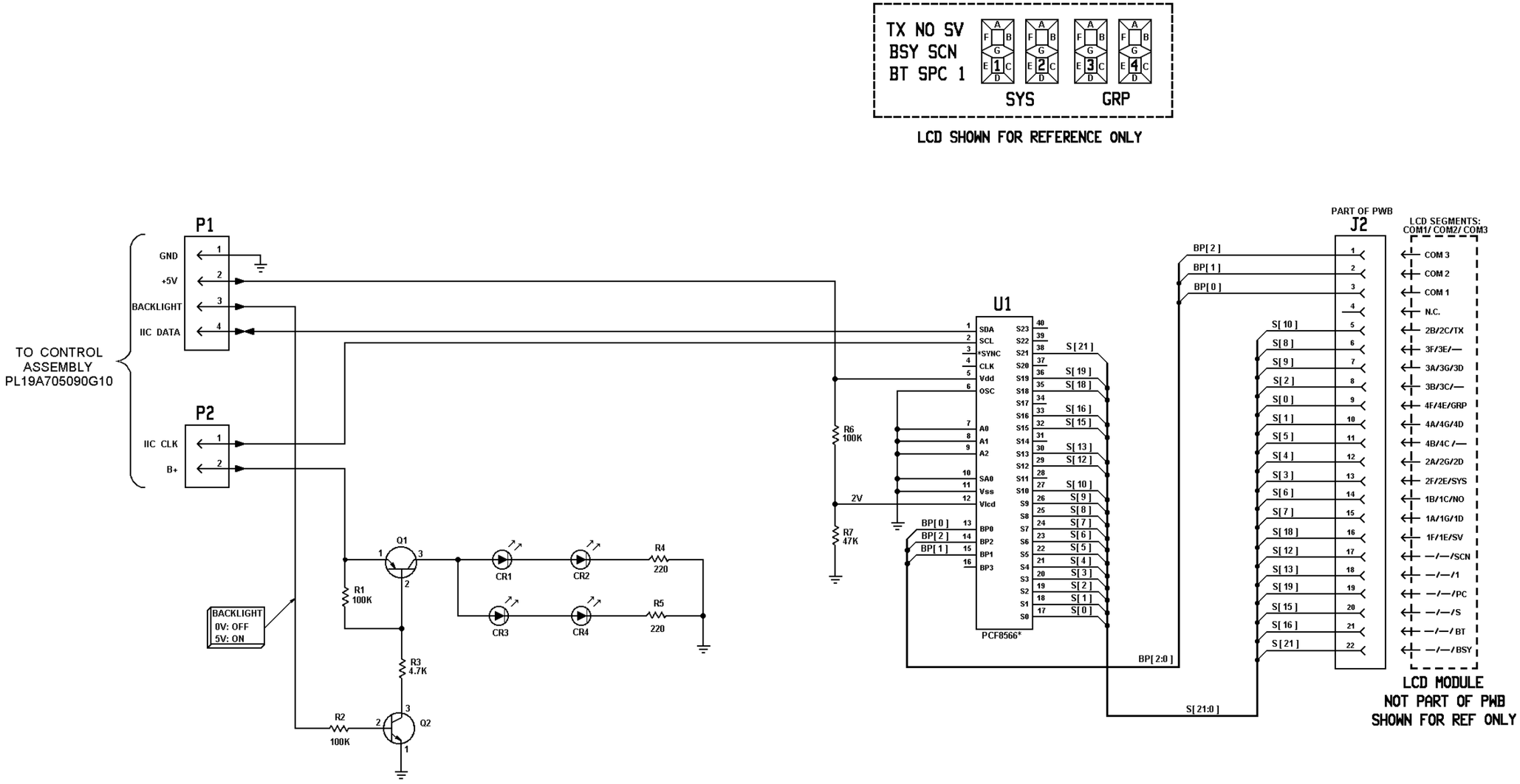
AUDIO LOGIC BOARD
19D903568G1

19D903568, Sh. 1, Rev. 5)
(19D903569, Rev. 4, Layer 8)



CONTROL ASSEMBLY
19A705090G10 & G13

(19C852199, Rev. 1)

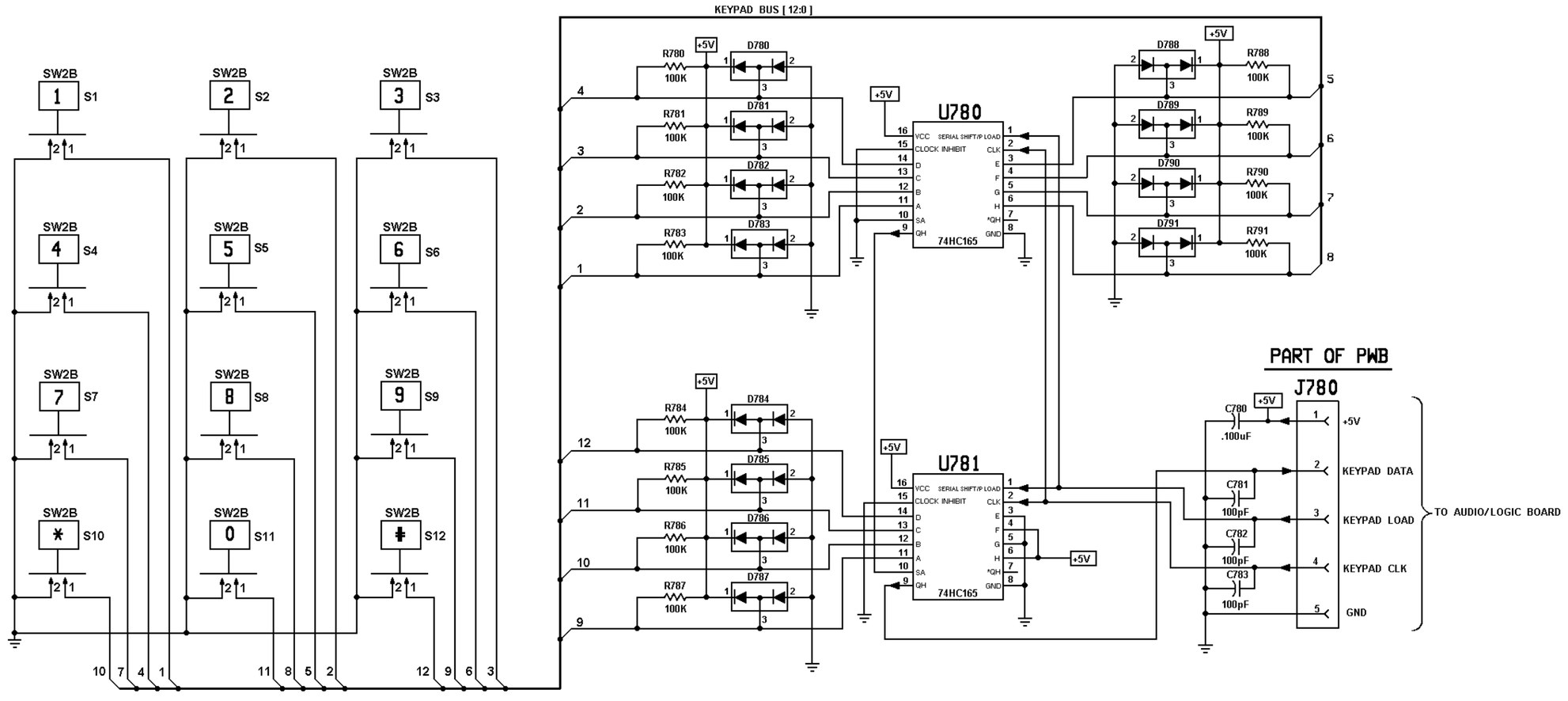


THIS SCHEMATIC DIAGRAM APPLIED TO	
MODEL NO.	REV LETTER
PL19C852194G1	

NOTES:
1. RESISTORS VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
2. ALL RESISTORS, AND Q1, Q2 ARE CHIP COMPONENTS.

LCD DRIVER BOARD
19C852194G1

(19D903816, Rev. 2)

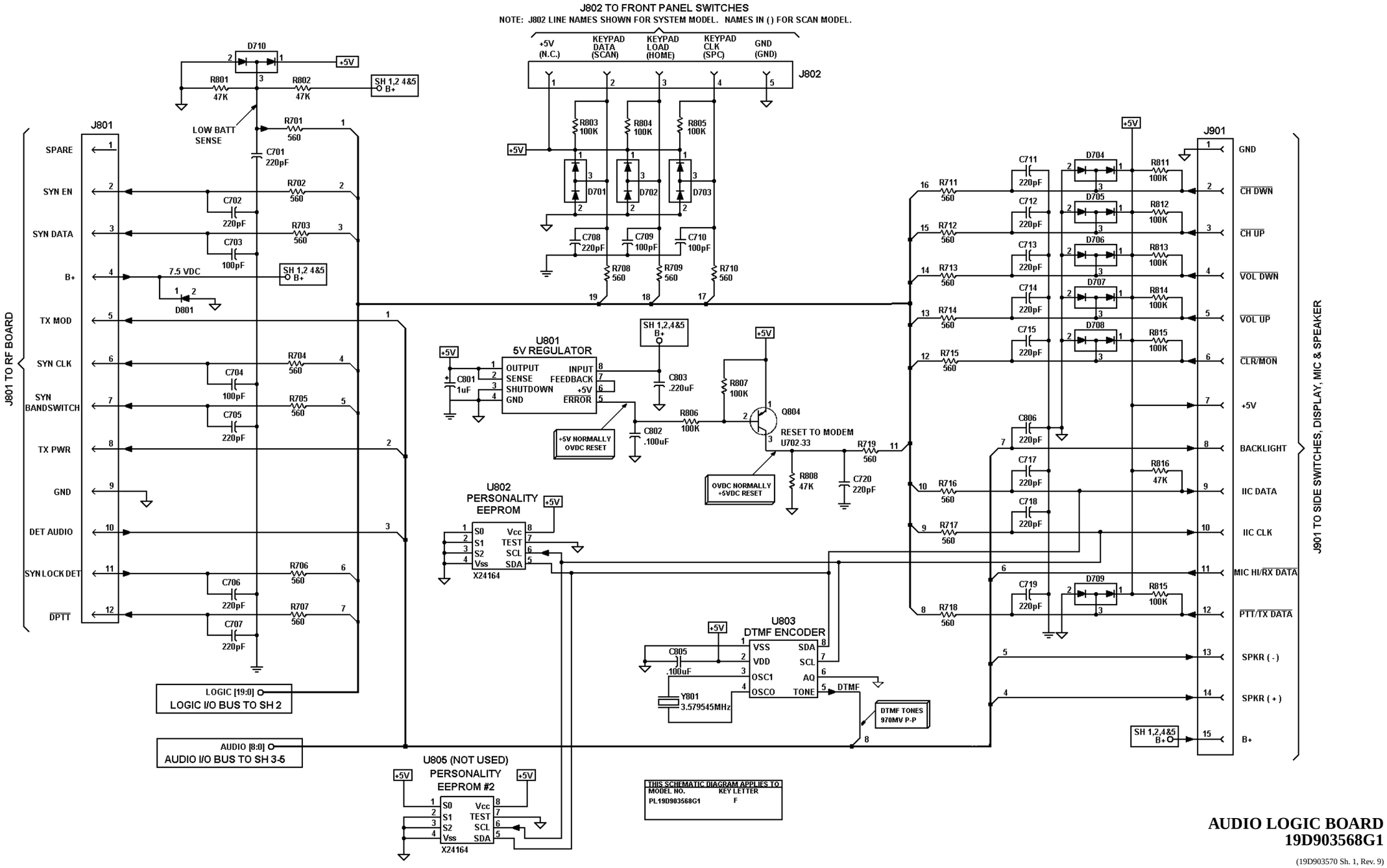


THIS SCHEMATIC DIAGRAM APPLIES TO	
MODEL NO.	REV LETTER
PL19C852173G1	

NOTES:
1. RESISTORS VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER K OR M.
2. ALL COMPONENTS ARE CHIP COMPONENTS.

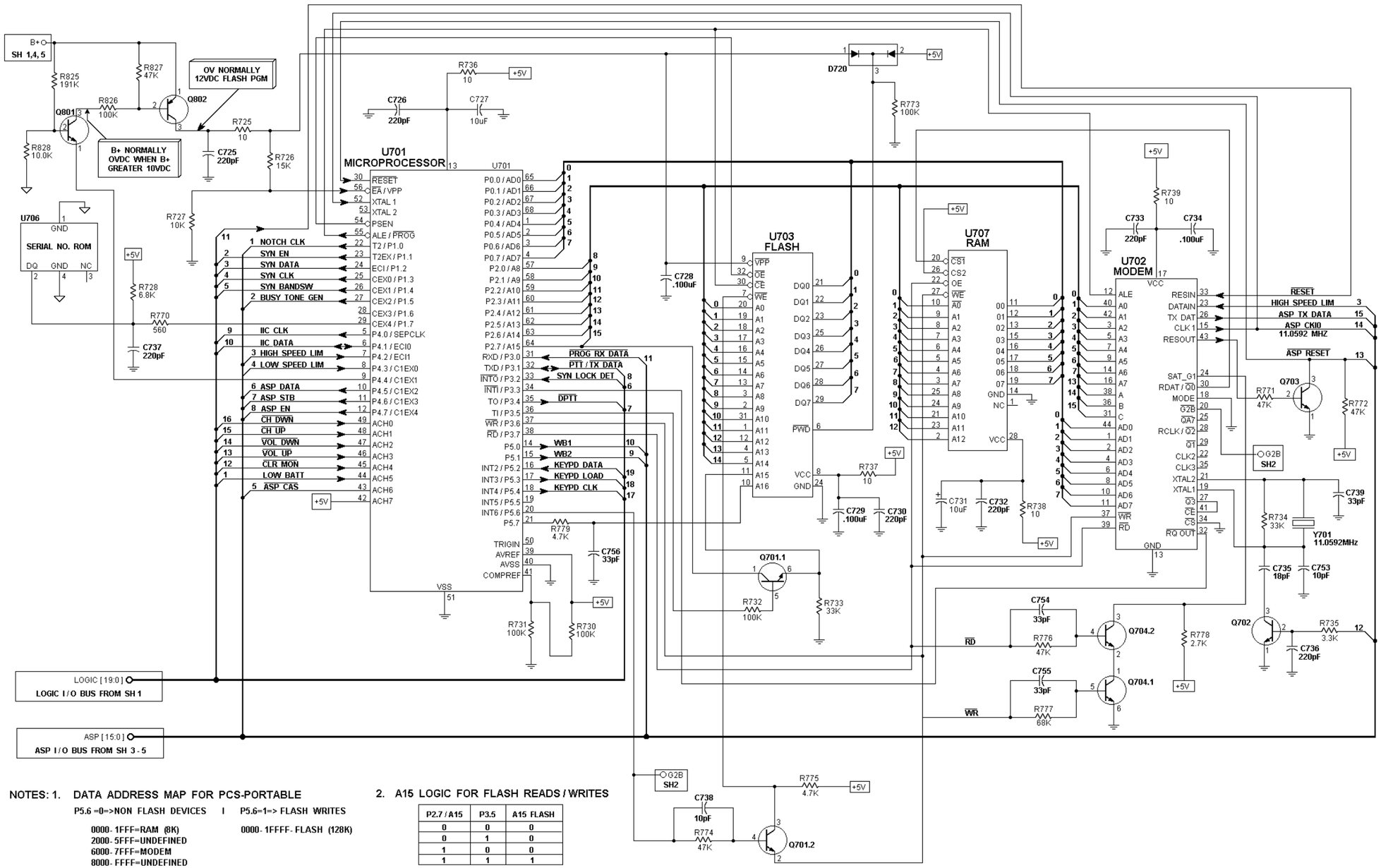
KEYPAD BOARD
19C852173G1

(19D903683, Rev. 0)



AUDIO LOGIC BOARD
19D903568G1

(19D903570 Sh. 1, Rev. 9)



NOTES: 1. DATA ADDRESS MAP FOR PCS-PORTABLE

P5.6 =0=>NON FLASH DEVICES I P5.6=1=> FLASH WRITES

0000- 1FFF=RAM (8K)
2000- 5FFF=UNDEFINED
6000- 7FFF=MODEM
8000- FFFF=UNDEFINED

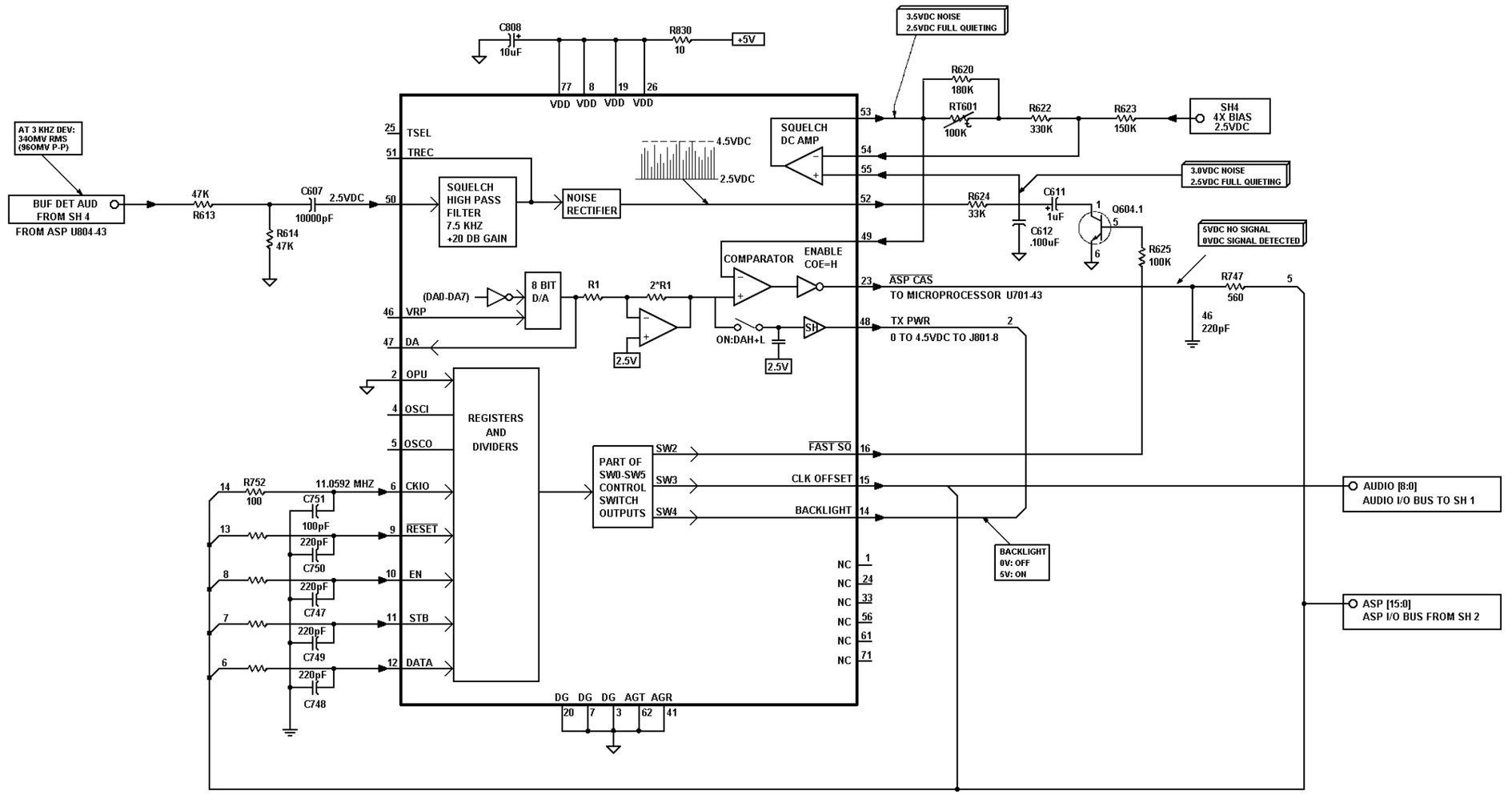
0000- 1FFFF- FLASH (128K)

2. A15 LOGIC FOR FLASH READS / WRITES

P2.7 / A15	P3.5	A15 FLASH
0	0	0
0	1	0
1	0	0
1	1	1

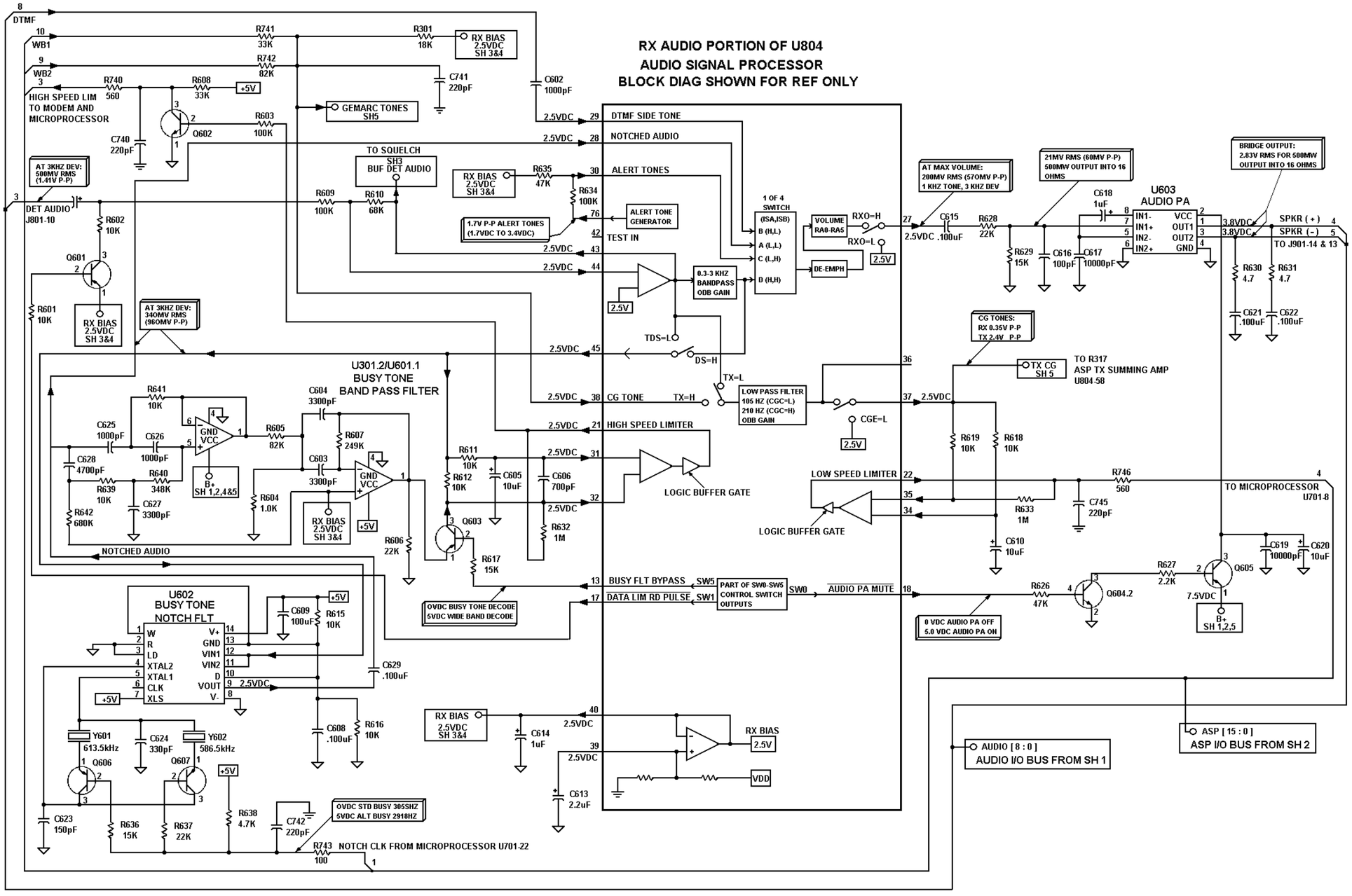
AUDIO LOGIC BOARD
19D903568G1

(19D903570 Sh. 2, Rev. 6)



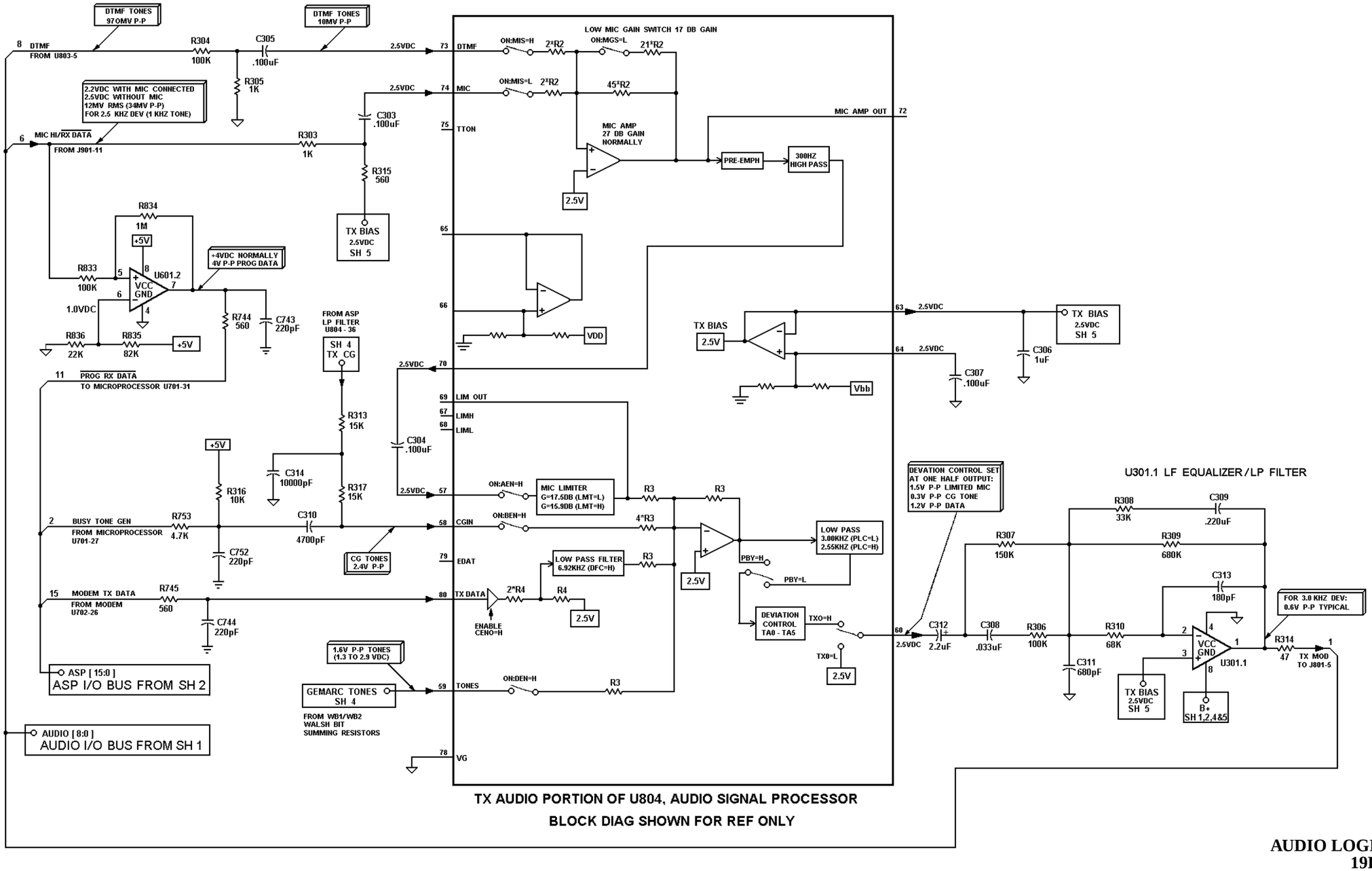
AUDIO LOGIC BOARD
19D903568G1

(19D903570 Sh. 3, Rev. 3)



AUDIO LOGIC BOARD
19D903568G1

(19D903570 Sh. 4, Rev. 7)



AUDIO LOGIC BOARD
19D903568G1

(19D903570 Sh. 5, Rev. 3)